

منوال E MINAS



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0938 1234717



Compact Servo Only for Position Control.

Ultra compact
position control type

MINAS E Series

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



1 Best Fit to Small Drives

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

(Note) Compared to MUDS043A1

2 Easy to Handle, Easy to Use

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



3 High-Speed Positioning with Resonance Suppression Filters

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

4 Smoother operation for Low Stiffness Machine

- Damping control function suppresses vibration during acceleration/deceleration

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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.

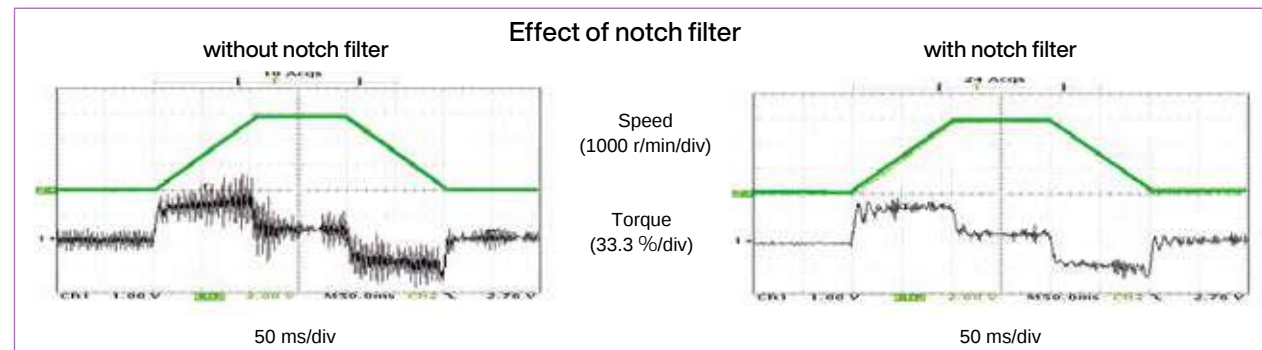
2. Further Reduction of Vibration

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.

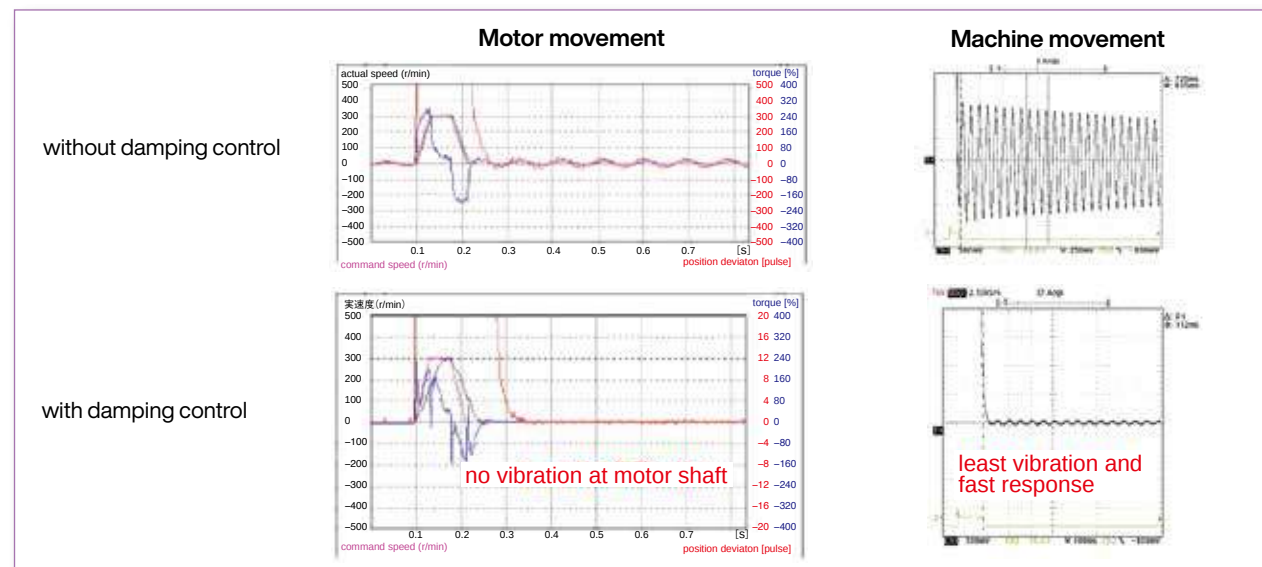
Notch filter (Note1)

- 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 : European 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.

MINAS E Series		Motor Line-up									
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				
Ultra low inertia	MUMA	0.05 to 0.4	3000 (5000)	○	—	○	○	○	IP65 Except shaft throughhole and connector	Small capacity Ultra low inertia	SMT machines Inserters High repetitive positioning application
											



MINAS E Series Model Designation

Servo Motor

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

Symbol	Specifications
1	Standard

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

* Motor with oil seal is manufactured by order.

Symbol	Specifications
1	Standard

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

Special specifications

Motor structure

Design order

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)

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

Symbol	Specifications
1	100 V
2	200 V

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

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

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

Motor rated output

Voltage specifications

Rotary encoder specifications

Gear reduction ratio, gear type

Motor structure

See P.394 for motor with gear reducer specifications

Servo Driver

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

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

Symbol	Current rating
T1	10 A
T2	15 A

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

Symbol	Specifications
P	Pulse train

Symbol	Current rating
05	5 A
10	10 A

Special specifications

Control mode

Current detector current rating

Supply voltage specifications

Power device Max. current rating

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	

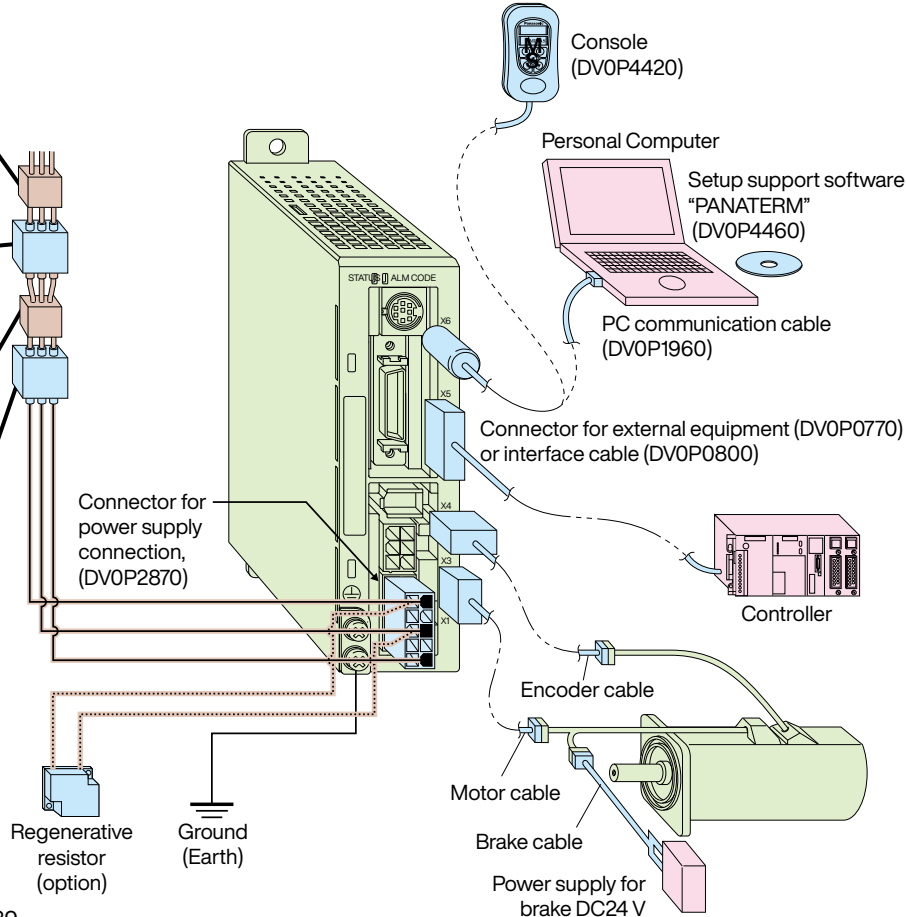


Table of Part Numbers and Options

Power supply	Output (W)	2500P/r, Incremental				Option																		
		Motor ^{Note) 1}	Rating/Spec. (page)	Driver	Dimensions (Frame symbol)	Encoder Cable ^{Note) 2}	Motor Cable ^{Note) 2}		Brake Cable ^{Note) 2}	External Regenerative Resistor	Reactor	Noise Filter												
Single phase 100 V	50	MUMA5AZP1 □	389	MKDET1105P	388 (K)	MFECA0 * * 0EAM	MFMCA0 * * 0AEB			DV0P2890	DV0P227	DV0P4160												
	100	MUMA011P1 □	389	MKDET1110P	388 (K)						DV0P228													
	200	MUMA021P1 □	389	MLDET2110P	388 (L)																			
Single phase 200 V	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)					MFECA0 * * 0EAM	MFMCA0 * * 0AEB				DV0P2891	DV0P220	DV0P4160							
	100	MUMA012P1 □	391	MKDET1505P	388 (K)																			
	200	MUMA022P1 □	391	MLDET2210P	388 (L)																			
	400	MUMA042P1 □	391	MLDET2510P	388 (L)																			
3-phase 200 V	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)													MFECA0 * * 0EAM	MFMCA0 * * 0AEB			DV0P2891	DV0P220	DV0P4160
	100	MUMA012P1 □	391	MKDET1505P	388 (K)																			
	200	MUMA022P1 □	391	MKDET1310P	388 (K)																			
	400	MUMA042P1 □	391	MLDET2510P MLDET2310P	388 (L)																			

Note) 1 Motor model number suffix: □
S : Key way with center tap, without brake
T : Kew way with center tap, with brake

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

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 mm² to 0.85 mm² AWG18
		100 W	0.4 kVA				
		200 W	0.5 kVA	10 A			
Single phase, 200 V		50 W	0.3 kVA	5 A		15 A (3P+1a)	
		100 W					
		200 W	0.5 kVA	10 A			
3-phase 200 V		400 W	0.9 kVA	10 A		10 A (3P+1a)	
		50 W	0.3 kVA	5 A			
		100 W					
		200 W	0.5 kVA				
			400 W			0.9 kVA	

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

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

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

<Remarks>

- Use a copper conductor cables with temperature rating of 60 °C or higher for main power connector and ground terminal wiring.
Use a cable for ground with diameter of 2.0 mm² (AWG14) or larger.

Fastening torque list

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

(Note 3) <Caution>

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

<Remarks>

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

Carrying page

Options			Part No.	Carrying page
Console			DV0P4420	403
Setup Support Software, PANATERM	Japanese		DV0P4460	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) ^(Note 4)		DV0P37300		400
Cable Set (5 m) ^(Note 4)		DV0P39200		400
DIN Rail Mount Unit		DV0P3811		404
External Regenerative Resistor	100 V	50 Ω 10 W	DV0P2890	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

Basic specifications

Wiring Diagram

Use a retractor for 3-phase in case of single phase, 200V.

power supply

MCCB

Noise filter

ON

OFF

ALM

MC

Coil surge suppression units

10

6

5

3

172167-1

172159-1

5557-10R-210

(Molex Inc.)

1

4

6

3

5557-06R-210

(Molex Inc.)

Red

White or Yellow

Black

Green/Yellow

Motor

DC12 V to 24 V (±5 %)

ALM

9

13

ALM+

ALM-

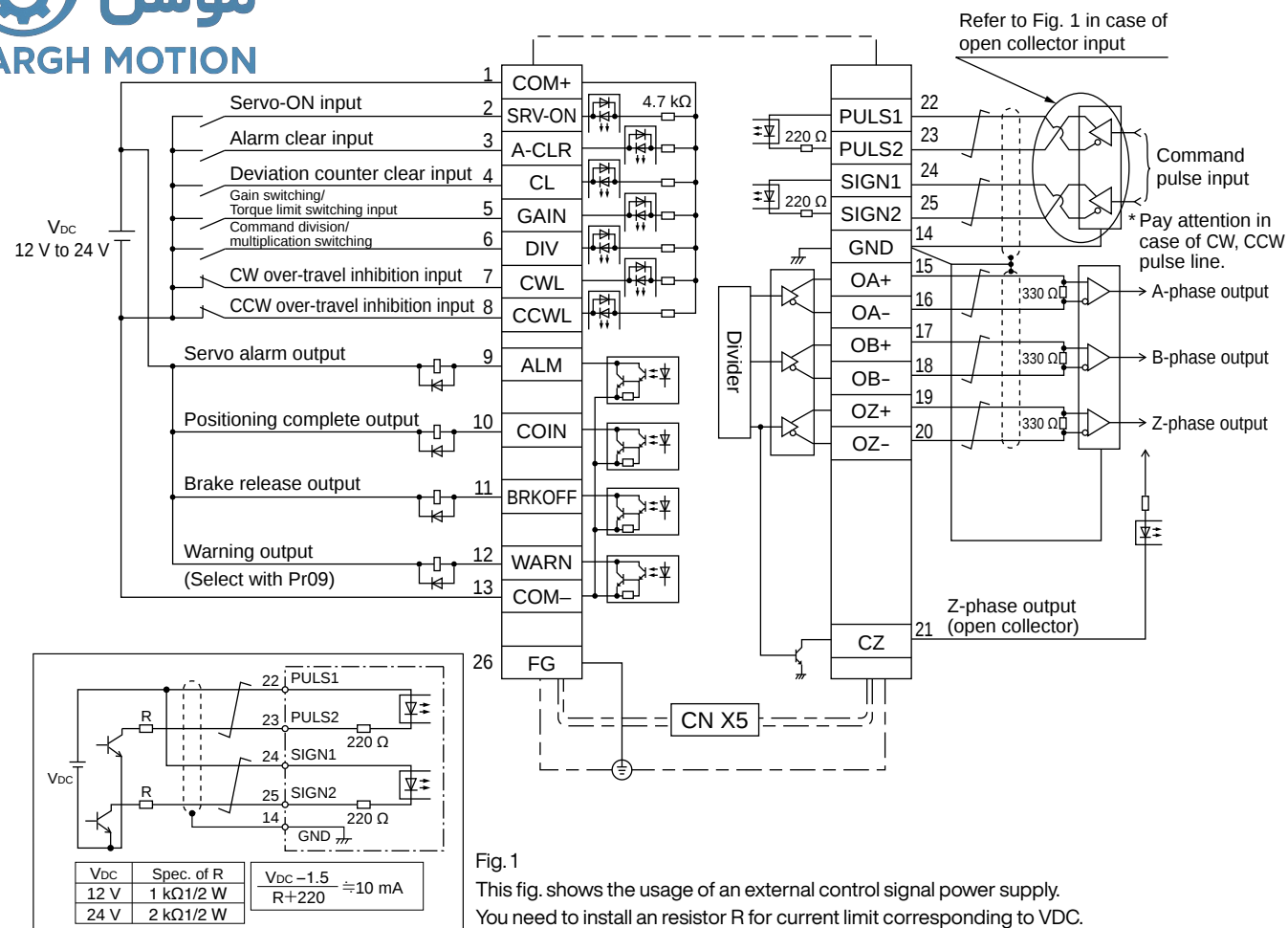
CN X1

CN X3

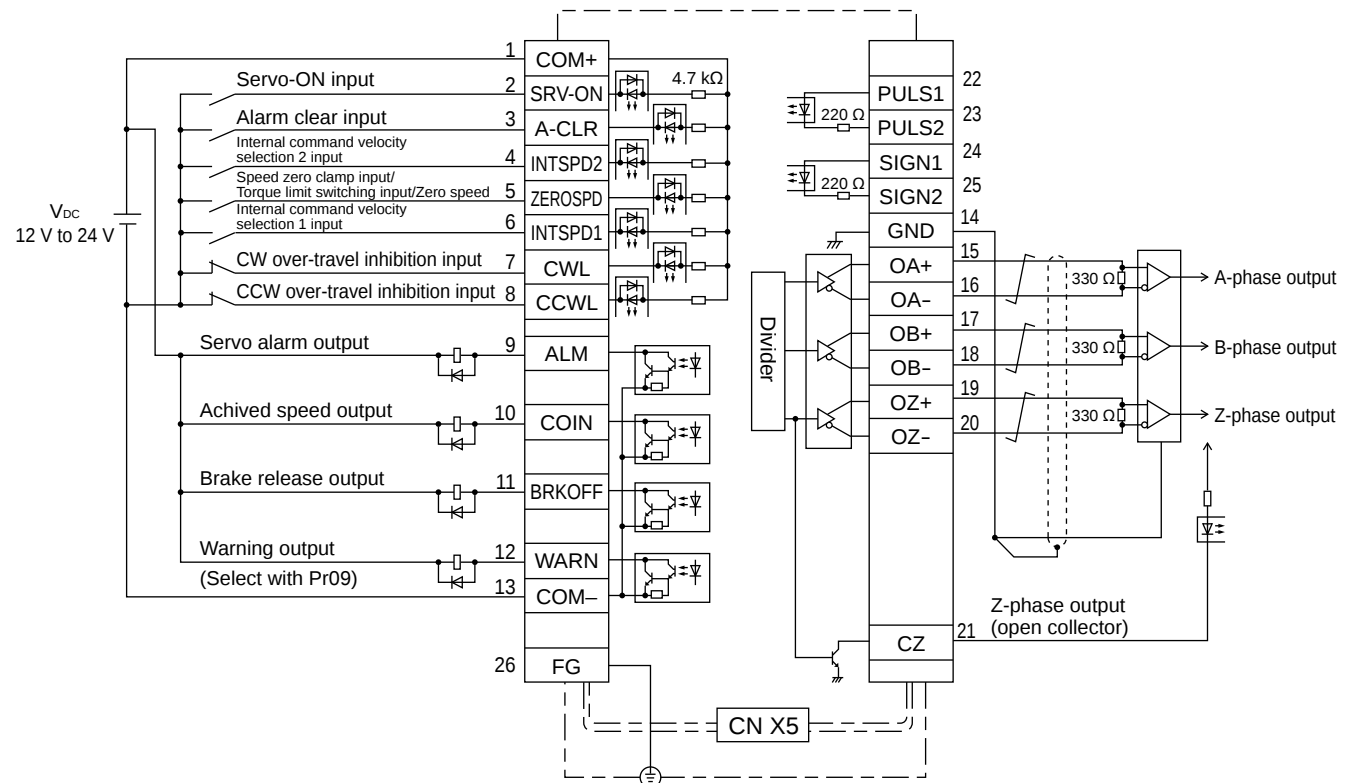
CN X5

Panasonic Industry Co., Ltd. | 386

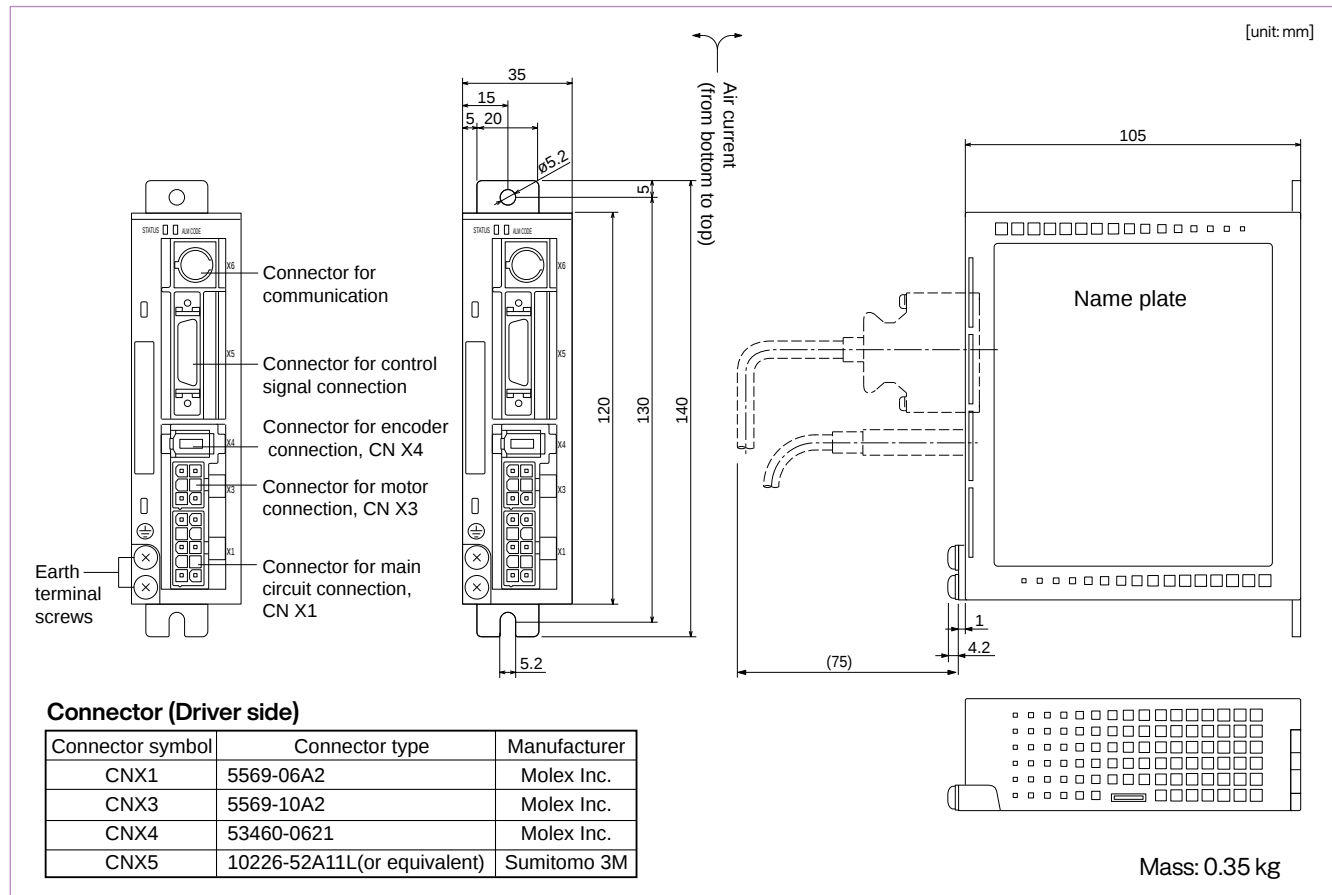
CN X 5 Wiring Example at Position Control Mode



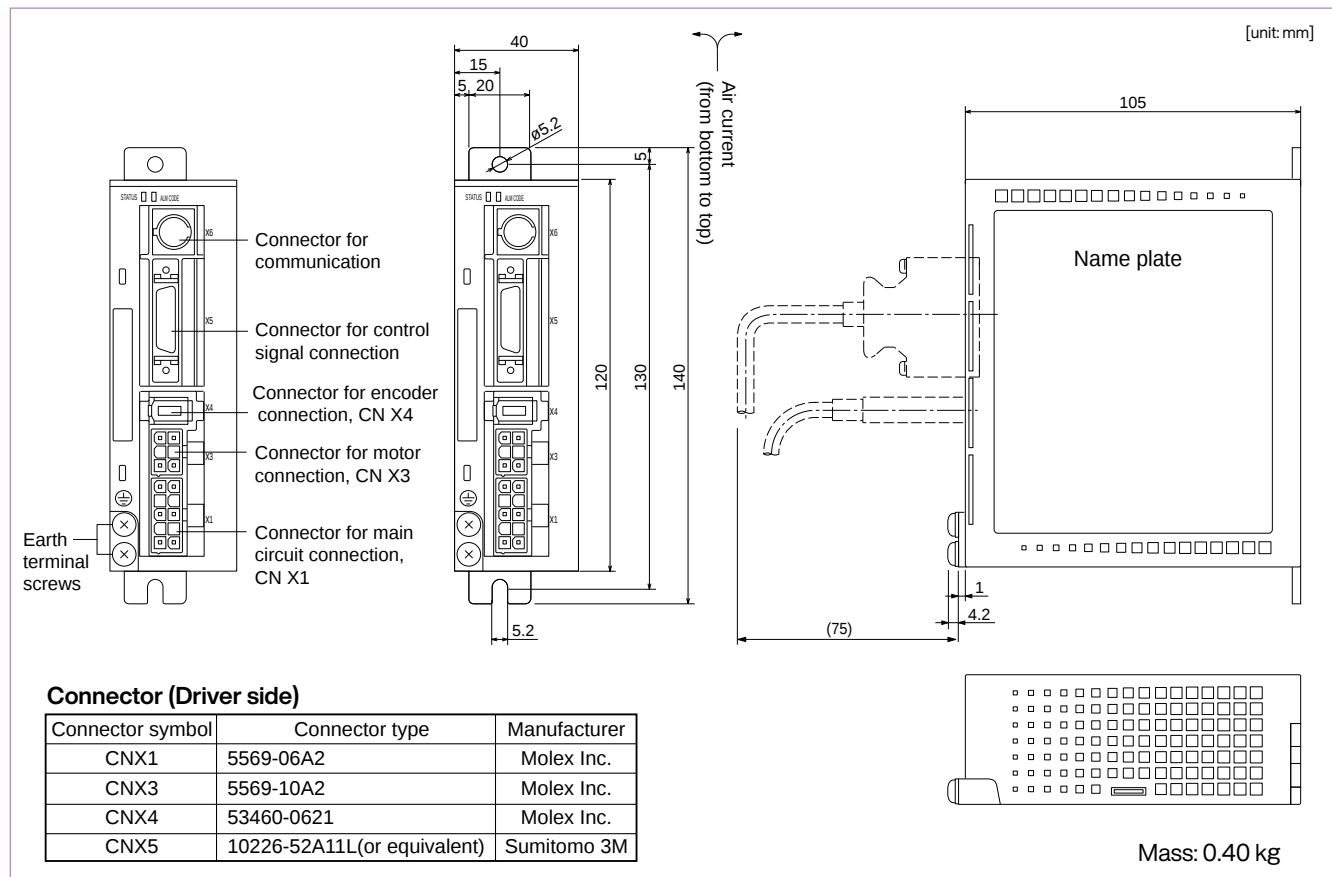
CN X 5 Wiring Example at Internal Velocity Control Mode



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)	Without option	No limit Note)2			
	Note)1 DV0P2890	No limit Note)2			
Rated rotational speed (r/min)		3000			
Max. rotational speed (r/min)		5000			
Moment of inertia of rotor (×10 ⁻⁴ kg·m²)	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	Ambient temperature	0 °C to 40 °C (free from freezing), Storage : −20 °C to 65 °C (Max.temperature guarantee 80 °C for 72 hours <nomal humidity>)			
	Ambient humidity	85 %RH or lower (free from condensing)			
	Installation location	Indoors (no direct sunlight), free from corrosive gas, inflammable gas, oil mist and dust			
	Altitude	1000 m or lower			
	Vibration resistance	49 m/s² or less			
Mass (kg), () represents holding brake type		0.4 (0.6)	0.5 (0.7)	0.96 (1.36)	

Brake specifications (This brake will be released when it is energized. Do not use this for braking the motor in motion.)		
Static friction torque (N · m)	0.29	1.27
Engaging time (ms)	25	50
Releasing time (ms) Note)4	20 (30)	15 (100)
Exciting current (DC) (A)	0.26	0.36
Releasing voltage	DC 1 V or more	
Exciting voltage	DV 24 V ±10 %	

Permissible load			
During assembly	Radial load P-direction (N)	147	392
	Thrust load A-direction (N)	88	147
	Thrust load B-direction (N)	117	196
During operation	Radial load P-direction (N)	68	245
	Thrust load A-direction (N)	58	98
	Thrust load B-direction (N)	58	98

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

Model Designation

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

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

Motor rated output	
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

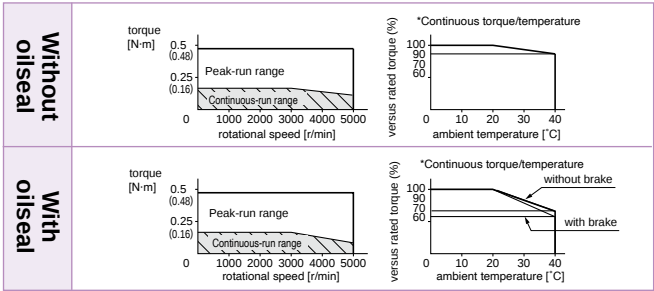
Motor structure					
Symbol	Shaft Key-way, center tap	Holding brake without	with	Oil seal without	with
S	●	●		●	
T	●		●	●	

Rotary encoder specifications

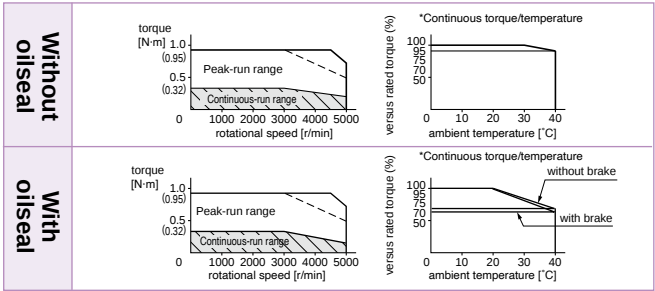
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

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

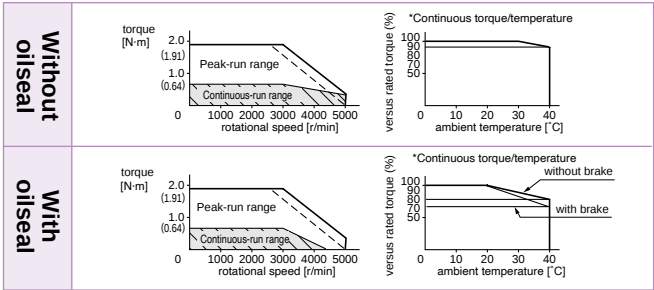
MUMA5AZP1□



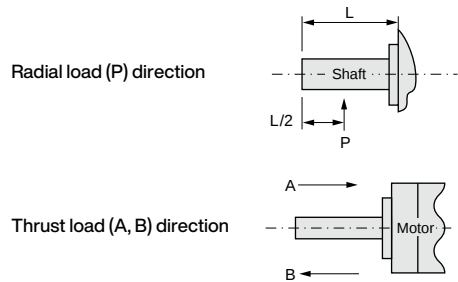
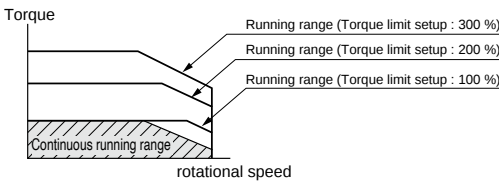
MUMA011P1□



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 = (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 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		MKDET2210P	MLDET2510P	
				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 (Ao-p)		4.3	4.3	7.5	11.7	
Regenerative brake frequency (times/min) Note)1	Without option	No limit		Note)2		
	DV0P2891	No limit		Note)2		
Rated rotational speed (r/min)		3000				
Max. rotational speed (r/min)		5000				
Moment of inertia of rotor (×10 ⁻⁴ kg·m ²)	Without brake	0.021	0.032	0.10	0.17	
	With brake	0.026	0.036	0.13	0.20	
Recommended moment of inertia ratio of the load and the rotor Note)3		30 times or less				
Rotary encoder specifications		2500 P/r Incremental				
	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 <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/s² 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)
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)

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

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

Design order
1: Standard

Motor structure

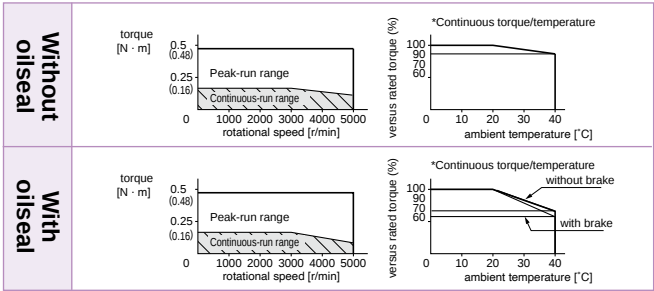
Symbol	Shaft Key-way, center tap	Holding brake		Oil seal	
		without	with	without	with
S	●	●		●	
T	●		●	●	

Rotary encoder specifications

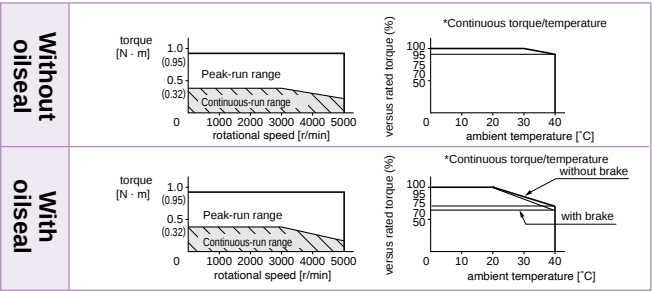
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

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

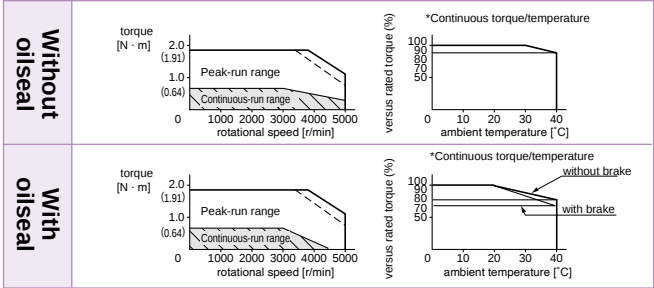
MUMA5AZP1□



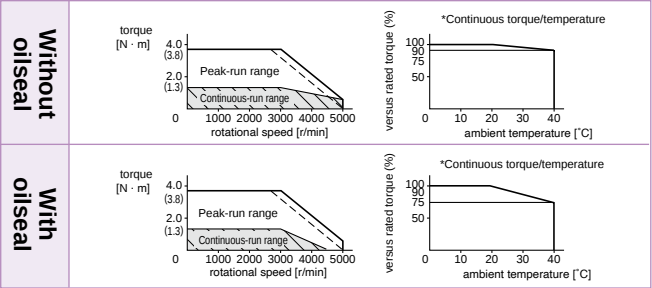
MUMA012P1□



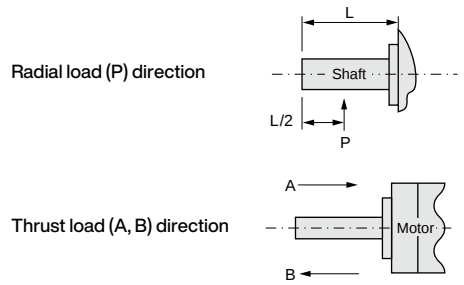
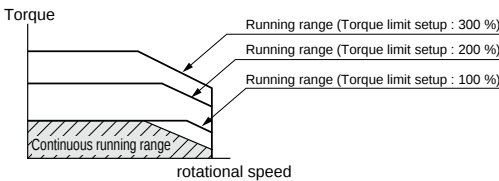
MUMA022P1□



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.

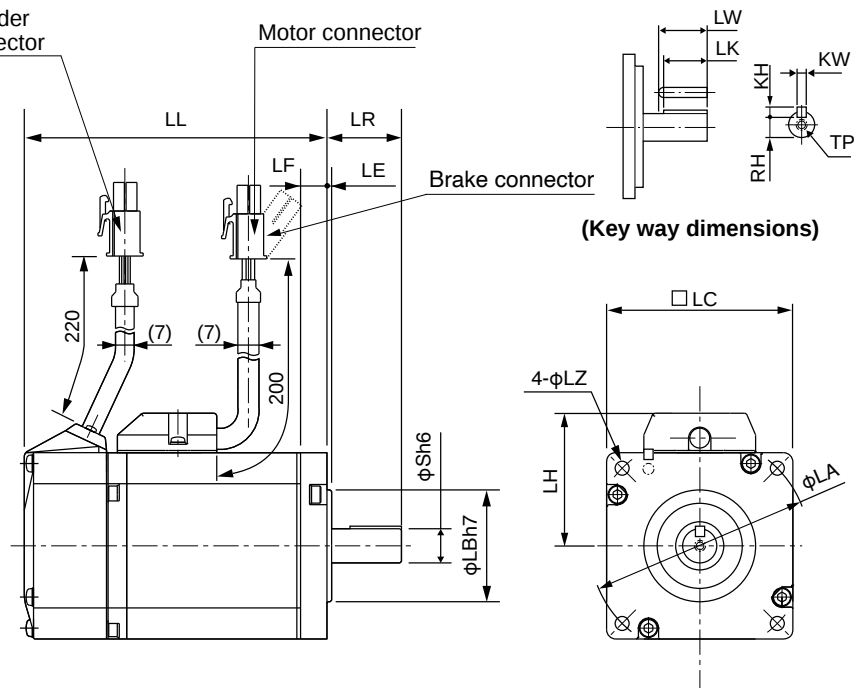
- If the load is connected, frequency will be defined as 1/(m+1), where m = (load moment of inertia) / (rotor moment of inertia).
- When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
- Power supply voltage 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 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)



[Unit: mm]

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

MUMA series (Ultra low inertia)					
Motor output		50 W	100 W	200 W	400 W
Motor model		MUMA 5A□P1□	01□P1□	02□P1□	04□P1□
Rotary encoder specifications		2500 P/r Incremental	2500 P/r Incremental	2500 P/r Incremental	2500 P/r Incremental
L L	Without brake	75.5	92.5	96	123.5
	With brake	107	124	129	156.5
L R		24	24	30	30
S		8	8	11	14
L A		48	48	70	70
L B		22	22	50	50
L C		42	42	60	60
L E		2	2	3	3
L F		7	7	7	7
L H		34	34	43	43
L Z		3.4	3.4	4.5	4.5
Key way	L W	14	14	20	25
	L K	12.5	12.5	18	22.5
	K W	3h9	3h9	4h9	5h9
	K H	3	3	4	5
	R H	6.2	6.2	8.5	11
	T P	M3 × 6 (depth)	M3 × 6 (depth)	M4 × 8 (depth)	M5 × 10 (depth)
Mass (kg)	Without brake	0.40	0.50	0.96	1.5
	With brake	0.60	0.70	1.36	1.9
Connector/Plug specifications		refer to Options, P.401, P.402.			

<Cautions>

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

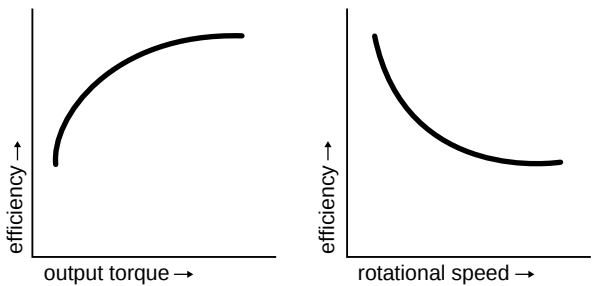
Read the Instruction Manual carefully and understand all precautions and remarks before using the products.

MINAS E Series Motors with Gear Reducer

Motor Types with Gear Reducer

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

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



Model No. Designation

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

Symbol	Series
MUMA	Low inertia (100 to 400 W)

Motor rated output

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

Voltage specifications

Symbol	Specifications
1	100 V
2	200 V

Rotary encoder specifications

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

Motor types with gear reducer

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

Motor structure

Symbol	Shaft Key-way	Holding brake	
		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
	Permissible moment of inertia of the load (conversion to the motor shaft)	10 times or smaller than rotor moment of inertia of the motor
	Protective structure	IP44 (at gear reducer)
Environment	Ambient temperature	0 °C to 40 °C
	Ambient humidity	85 %RH (free from condensation) or less
	Vibration resistance	49 m/s ² or less (at motor frame)
	Impact resistance	98 m/s ² or less



Table of Motor with Gear Reducer Specifications

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

For dimensions, refer to P.397.

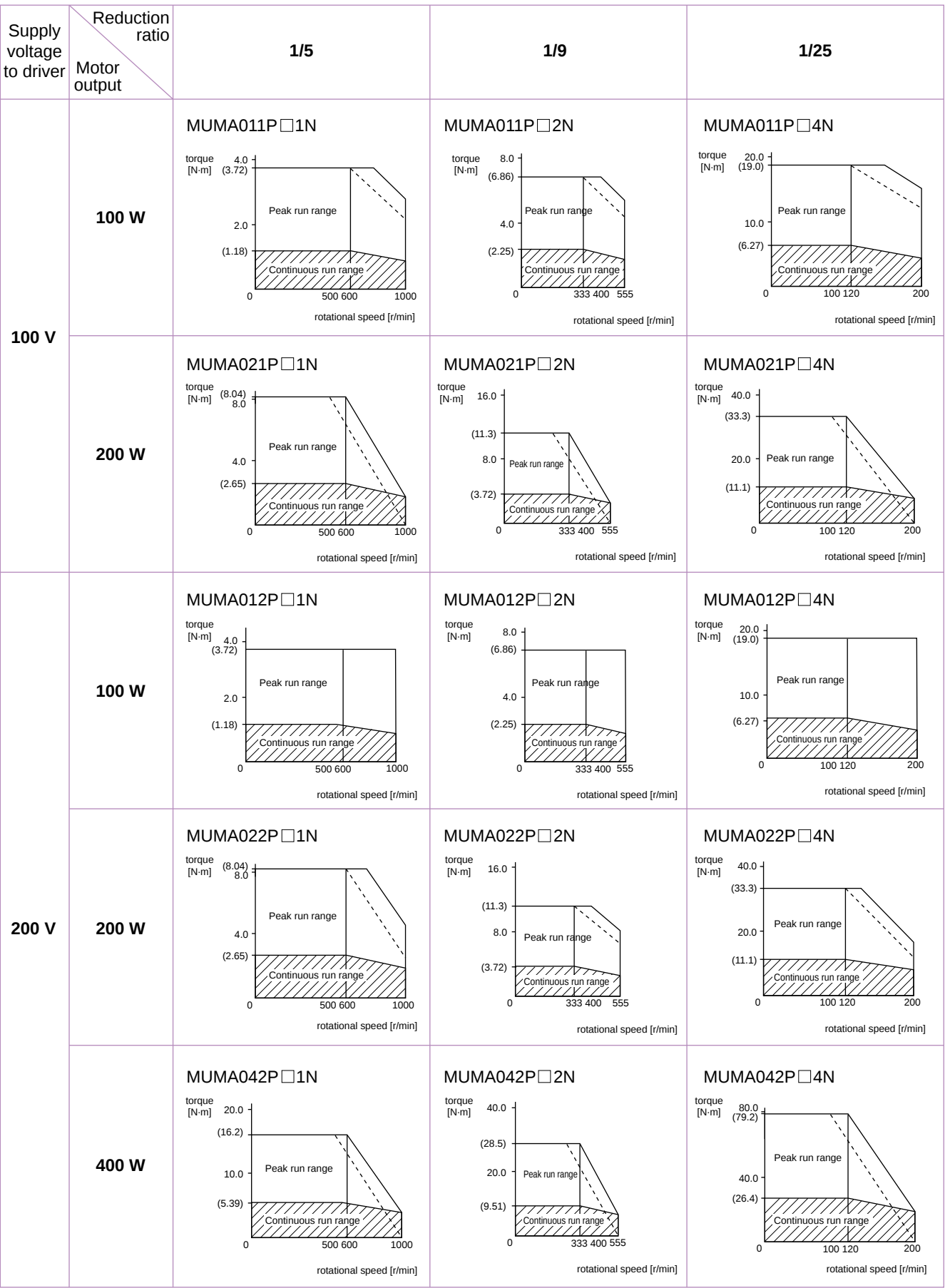
The Combination of the Driver and the Motor with Gear Reducer

Combination with driver		100 V			200 V		
Encoder	Motor output	Part No. of motor with gear reducer	Single phase, 100 V		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
	200 W	MUMA021P□□N	MLDET2110P		MUMA022P□□N		MLDET2210P
	400 W	—	—		MUMA042P□□N		MLDET2510P

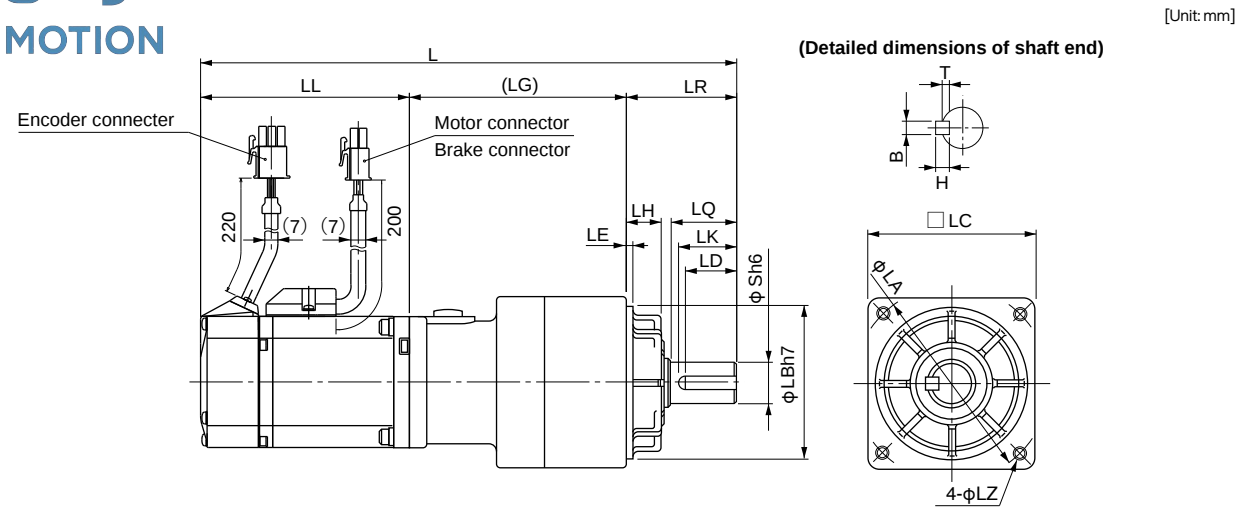
For dimensions of driver, refer to P.388.

Torque Characteristics

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



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



2500 P/r Encoder

[Unit: mm]																													
Model	Motor output	Reduction ratio	L	LL	LR	LQ	LC	LB	LA	S	LH	LZ	LK	(LG)	LE	Key way B×H×LD	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	4×4×16	2.5												
MUMA01□P□2N			223.5	124																									
MUMA01□P□4N		1 / 9	192	92.5																									
			223.5	124																									
		1/25	234.5	92.5	50	30	78	70	90	19	17	M6 (Depth: 20)	26	92		6×6×22	3.5												
			266	124																									
MUMA02□P□1N	200 W	1 / 5	200.5	96	32	20	52	50	60	12	10	M5 (Depth: 12)	18	72.5		4×4×16	2.5												
MUMA02□P□2N			233.5	129																									
MUMA02□P□4N		1 / 9	235.5	96	50	30	78	70	90	19	17	M6 (Depth: 20)	26	89.5		6×6×22	3.5												
			268.5	129																									
		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	8×7×30	4
MUMA042P□2N			296	156.5																									
		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

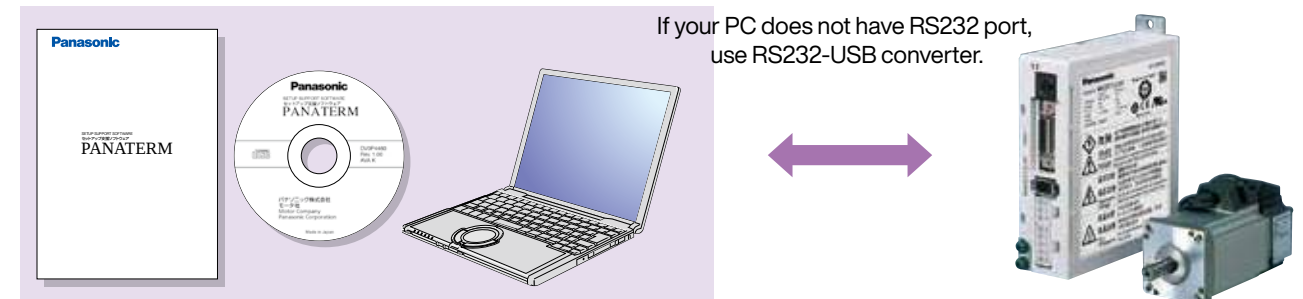
Options

E Series

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

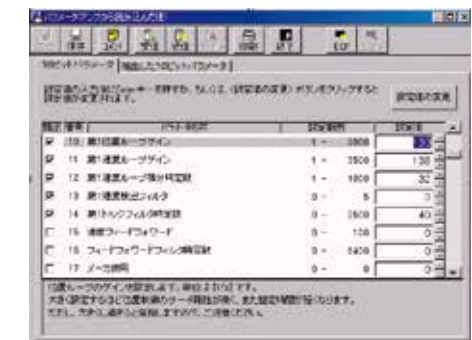
Frequency analysis

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

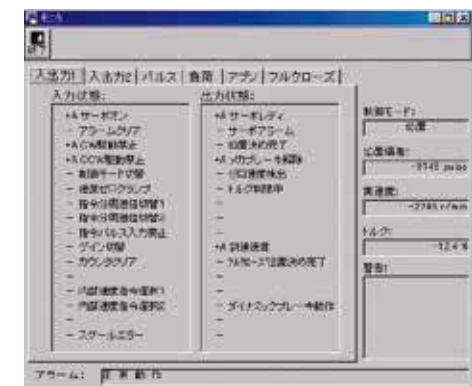
Can not use with A5, A6 Family.

Hardware configuration

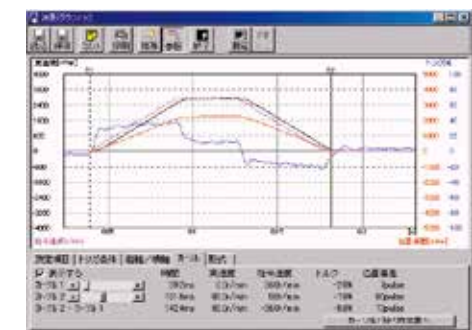
- [Personal computer]** • CPU : Pentium 100MHz or more • Memory : 16 MB or more (32 MB recommended)
- Hard disk capacity (vacancy of 25 MB or more recommended) • OS : Windows® 98, Windows® Me, Windows® 2000, Windows® XP (US version)
- Communication speed of serial communication port : 2400 bps or more (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



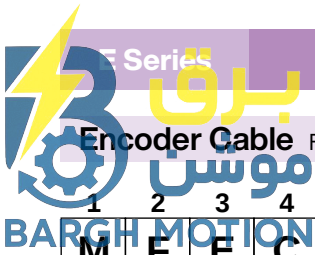
Parameter



Monitor



Graphic waveform display



E Series

Options

Cable part No. Designation

Encoder Cable

For available optional items, please refer to P400.

121110987654321

MFECA0050EAM

Cable end (Driver side)

MConnector (MUMA)

Cable end (Encoder side)

ATyco Electronics Japan G.K. connector

Cable type

E

PVC cable with shield by Oki Electric Cable Co., 0.20 mm² × 3P

Cable length

00303 m

00505 m

010010 m

020020 m

Type classification

MFECA: Encoder cable

Motor Cable, Brake Cable

For available optional items, please refer to P400.

121110987654321

MFMCA0050AEB

Cable end at driver side

B

Molex Inc.

T

Clamp terminal

Cable end at motor side

E

Tyco Electronics Japan G.K. connector

Cable type

A

ROBO-TOP® 4-wire (DYDEN CORPORATION)

G

ROBO-TOP® 2-wire (DYDEN CORPORATION)

Cross section of cable core

0

0.75 mm²

1

1.25 mm²

2

2.0 mm²

3

3.5 mm²

Type classification

A

Standard

B

Special

:

Design Oder

Cable length

0033 m

0055 m

01010 m

02020 m

AC servo motor cable

ROBO-TOP® is a trade mark of DYDEN CORPORATION

Cable

Options

E Series

Cable Set (3 m)

Cable Set (5 m)

Part No.

DV0P37300

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

Part No.

DV0P39200

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

Encoder Cable

Part No.

MFECA0 * * 0EAM

[Unit: mm]

Title	Part No.	Manufacturer
Connector (Driver side)	3E206-0100KV	Sumitomo 3M
Shell kit	3E306-3200-008	or equivalent
Connector	172160-1	Tyco Electronics
Connector Pin	170365-1	
Cable	0.20 mm ² × 3P	Oki Electric Cable Co., Ltd.

L (m)	Part No.
3	MFECA0030EAM
5	MFECA0050EAM
10	MFECA0100EAM
20	MFECA0200EAM

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

ROBO-TOP® is a trade mark of DYDEN CORPORATION

Part No.

MFMCA0 * * 0AEB

[Unit: mm]

Title	Part No.	Manufacturer
Connector	172159-1	Tyco Electronics
Connector Pin	170362-1, 170366-1	
Connector	5557-06R-210	Molex Inc
Connector Pin	5556T	
Cable	ROBO-TOP 600 V 0.75 mm ²	Daiden Co.,Ltd.

L (m)	Part No.
3	MFMCA0030AEB
5	MFMCA0050AEB
10	MFMCA0100AEB
20	MFMCA0200AEB

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

ROBO-TOP® is a trade mark of DYDEN CORPORATION

Part No.

MFMCB0 * * 0GET

[Unit: mm]

Title	Part No.	Manufacturer
Connector	172157-1	Tyco Electronics
Connector Pin	170362-1, 170366-1	
Nylon insulated round terminal	N1.25-M4	J.S.T Mfg. Co., Ltd.
Cable	ROBO-TOP 600 V 0.75 mm ²	Daiden Co.,Ltd.

L (m)	Part No.
3	MFMCB0030GET
5	MFMCB0050GET
10	MFMCB0100GET
20	MFMCB0200GET

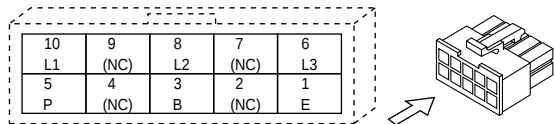
Connector Kit for Power Supply Connection

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	5556PBTB	6		

● Pin configuration of connector CN X1



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

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

<Cautions>

- 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.
- Refer to P.386 for wiring and connection.
- 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.)

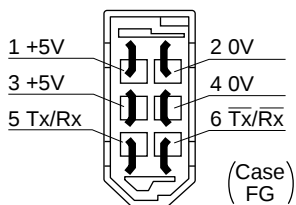
● Parts composition

Title	Part No.	Number	Manufacturer	Note
Connector (Driver side)	3E206-0100 KV	1	Sumitomo 3M or equivalent	For connector, CN X4 (6 pins)
Shell kit	3E306-3200-008	1		
Connector (6 pins)	172160-1	1	Tyco Electronics	For junction to encoder cable (6 pins)
Connector pin	170365-1	6		
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	5556PBTB	4		

<Remarks>

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

● Pin configuration of connector CN X4 plug



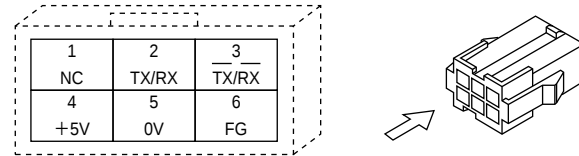
● Recommended manual crimping tool (to be prepared by customer)

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

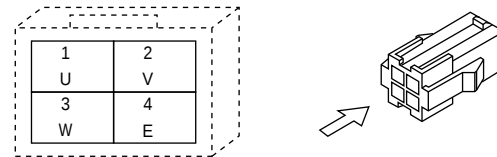
<Remarks>

- 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.
- Connect the shield of the wire to the case (FG) without fail.
- For wiring and connection, refer to P.386.

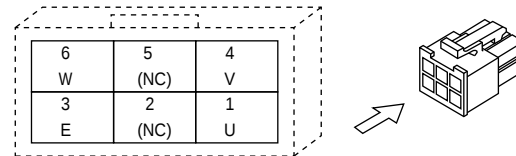
● Pin configuration of encoder cable junction



● Pin configuration of motor power cable junction



● Pin configuration of mating connector to CN X3 connector



<Cautions>

- 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.
- Refer to P.386 for wiring and connection.

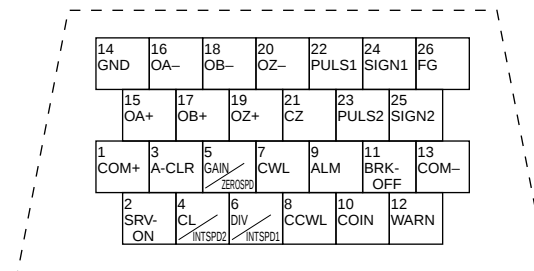
Connector Kit for Interface

Part No. DV0P0770

● Parts composition

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

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



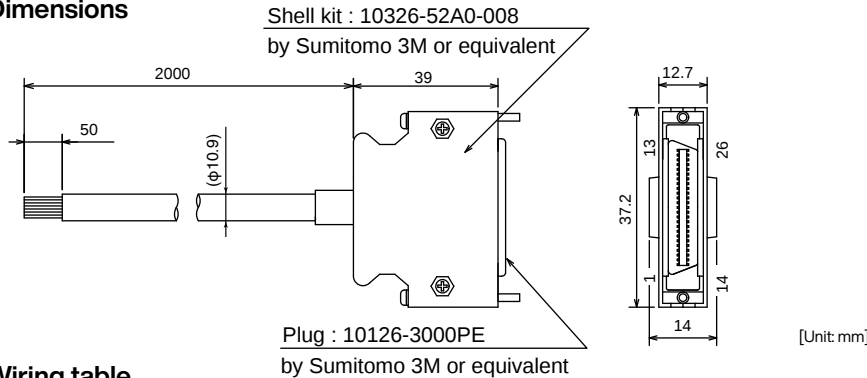
<Cautions>

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

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>

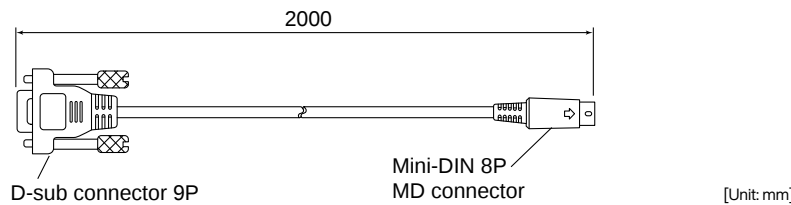
e. g. of Pin No. designation :
Pin No. 1 ... Wire color is orange, and one red dot.
Pin No. 12 ... Wire color is orange, and two black dot.

<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.

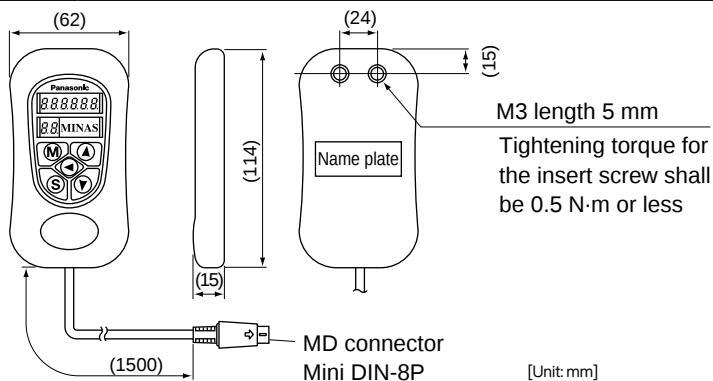
Communication Cable (For Connection with PC)

Part No. DV0P1960



Console

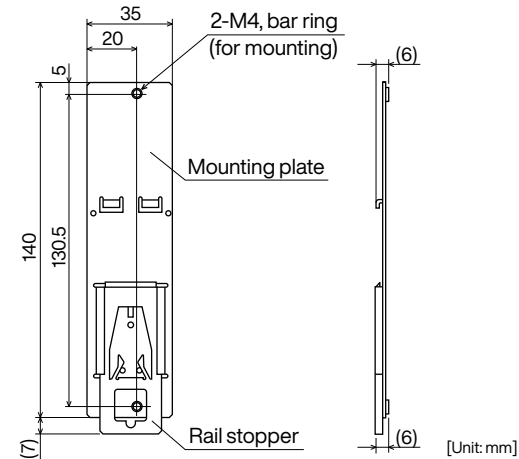
Part No. DV0P4420



DIN Rail Mounting Unit

Part No. DV0P3811

● Dimensions



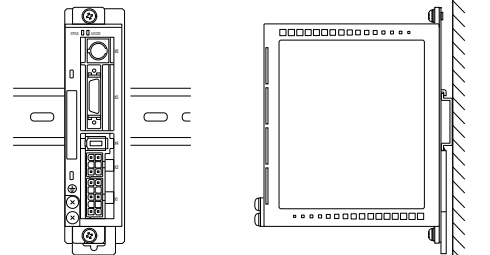
<Notes>

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

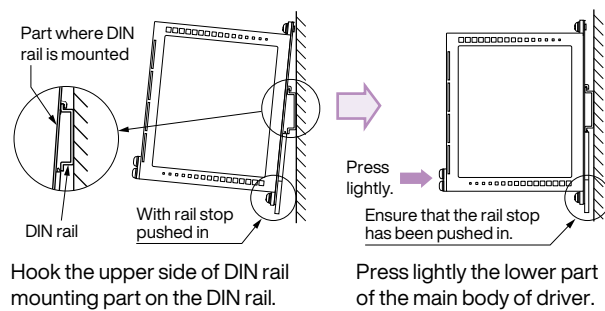
<Cautions>

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

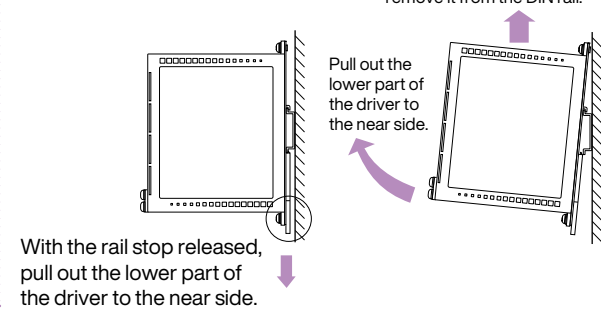
• Driver mounted to DIN rail



• How to Install



• Removing from DIN Rail

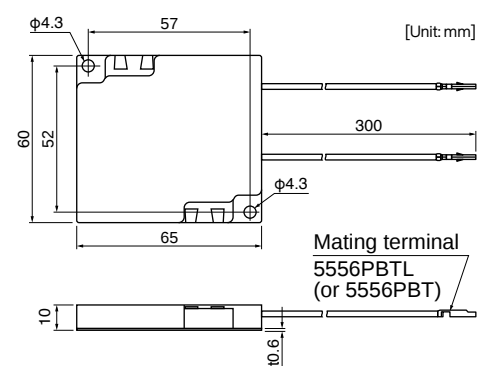


External Regenerative Resistor

Part No.	Manufacturer's Part No.	Specifications			Note (Input Power of drive)
		Resistance Ω	Rated power W	Activation temperature of built-in fuse °C	
DV0P2890	45M03	50	10	137 $\pm$ 3	Single phase, 100 V
DV0P2891	45M03	100	10	137 $\pm$ 3	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.

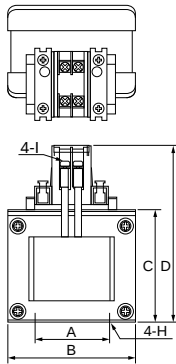
- Attach to incombustibles, such as metal.
 - Install in the place which cannot touch directly by covering with incombustibles etc.
 - Do not install near the combustibles.
- Although the thermal cutoff is built in external regeneration resistor, the skin temperature of regeneration resistor may become 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.

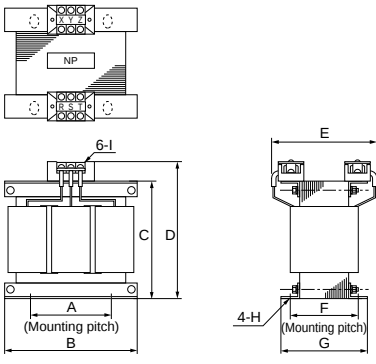
Frame symbol of driver	Power supply specifications	Rated output	Part No.	Fig.
MKDE	Single phase, 100 V	50 W to 100 W	DV0P227	1
	Single phase, 200 V	50 W to 100 W	DV0P220	2
	3-phase, 200 V	50 W to 200 W		
MLDE	Single phase, 100 V	200 W	DV0P228	1
	Single phase, 200 V	200 W to 400 W	DV0P220	2
	3-phase,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

Fig.1



• Wiring of the reactor <Single phase>

Fig.2



• Wiring of the reactor <3-Phase>

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/

<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

List of Peripheral Devices

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

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

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

Contents

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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.

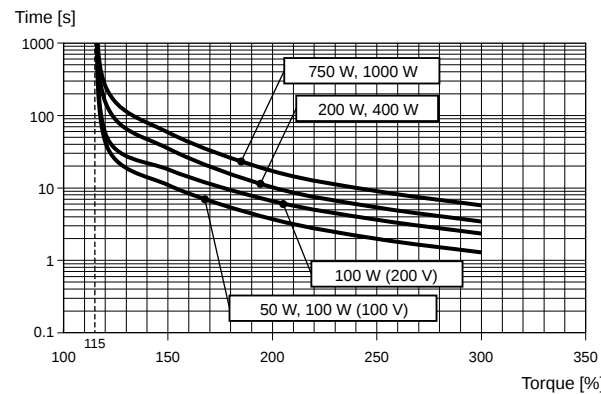
Conformity to UL Standards

Observe the following conditions of (1) and (2) to make the system conform to UL508C (E164620).

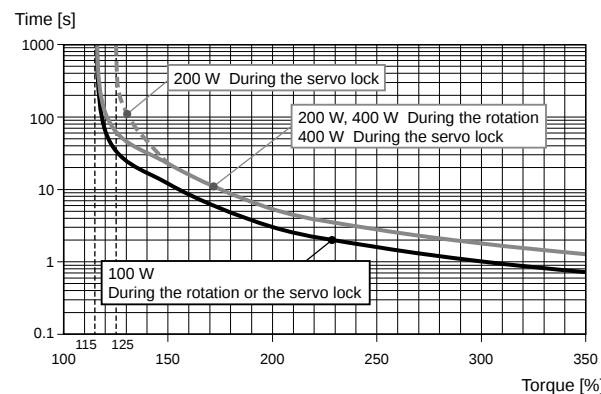
- Use the driver in an environment of Pollution Degree 2 or 1 prescribed in IEC60664-1.
(e.g. Install in the control box with IP54 enclosure.)
- Make sure to install a circuit breaker or fuse which are UL recognized (Listed ) marked) between the power supply and the noise filter.
For rated current of 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

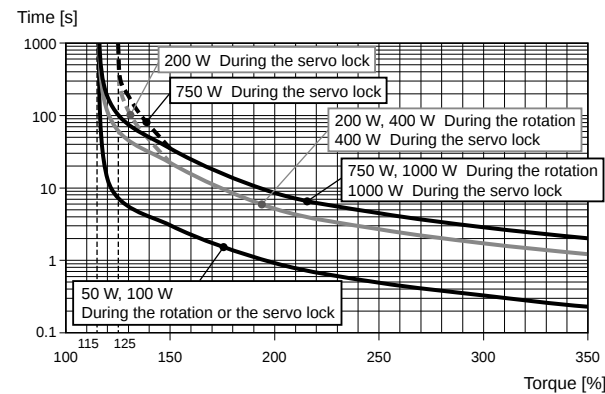
Motor type: 80 mm sq. or less MSMF



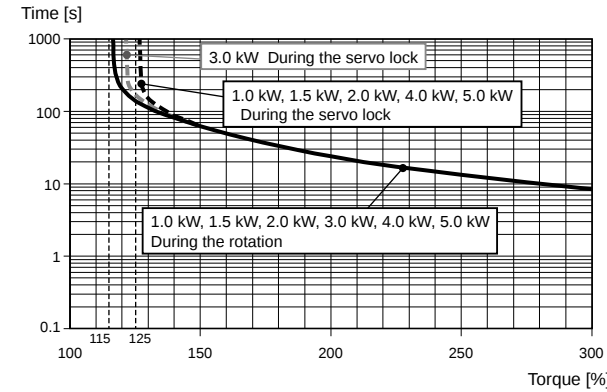
Motor type: 80 mm sq. or less MQMF



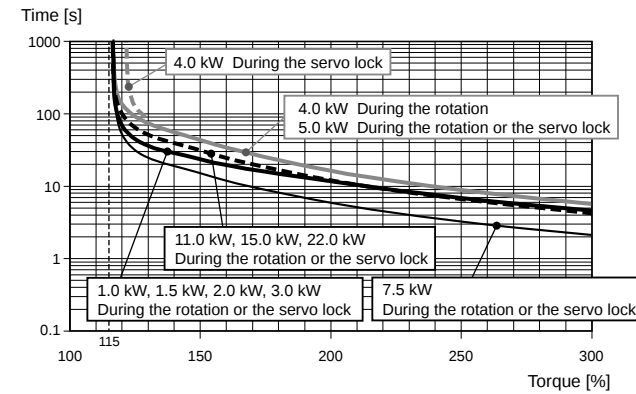
Motor type: 80 mm sq. or less MHMF



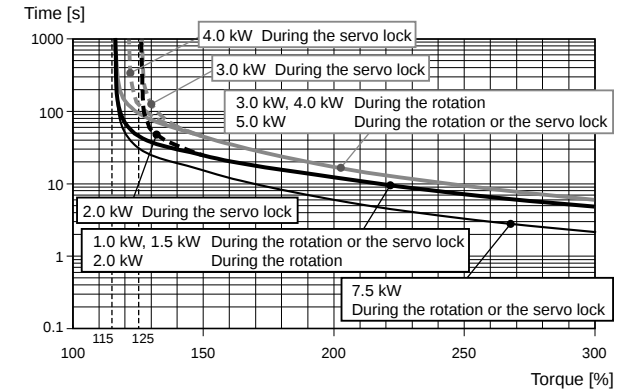
Motor type: 100 mm sq. or more MSMF



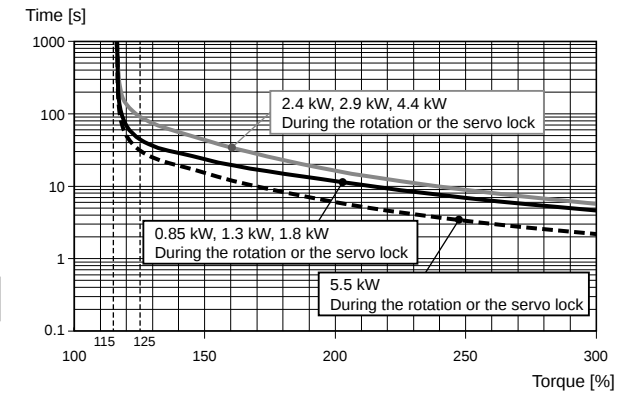
Motor type: 100 mm sq. or more MDMF



Motor type: 100 mm sq. or more MHMF



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 : Europäischen 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.

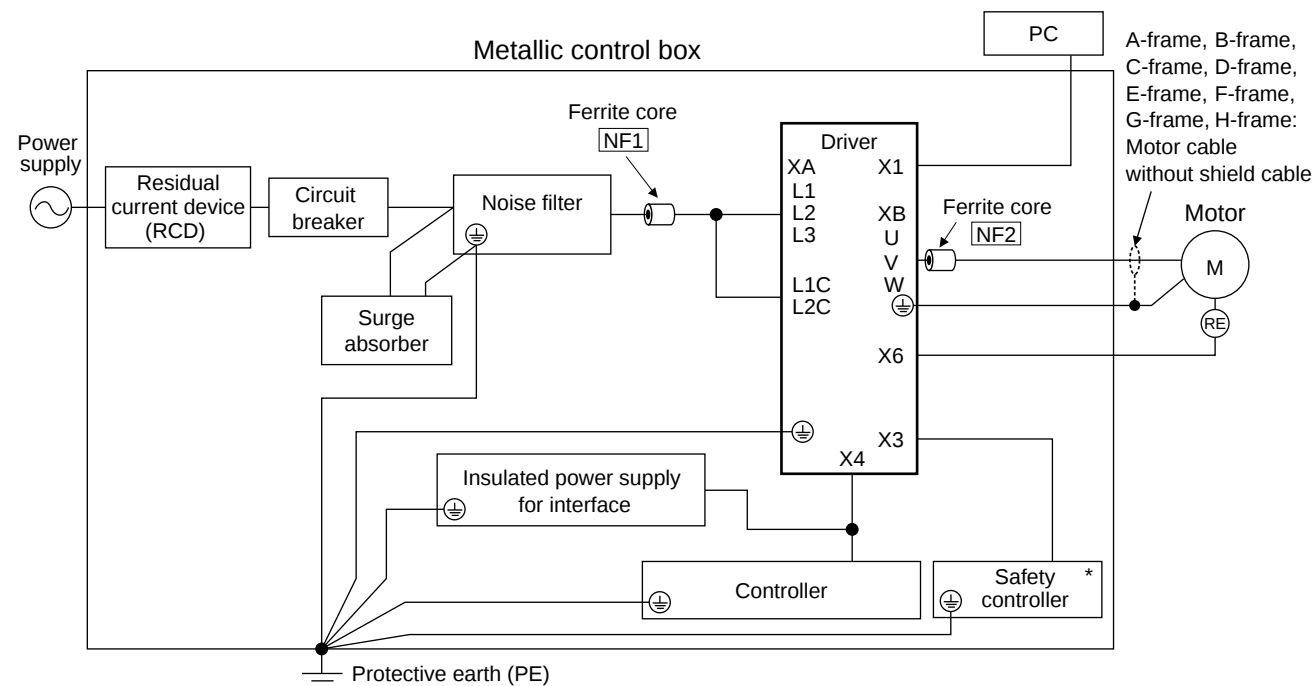
^{*1} A6SE, A6SG, A6NE, A6BE series doesn't correspond to the functional safety standard.

^{*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 $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$ to 120 V $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$	50 Hz/60 Hz
200 V type (A-frame to D-frame)	Single/3-phase, 200 V $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$ to 240 V $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$	50 Hz/60 Hz
200 V type (E-frame to H-frame)	3-phase, 200 V $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$ to 240 V $\begin{smallmatrix} +10 \% \\ -15 \% \end{smallmatrix}$	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.

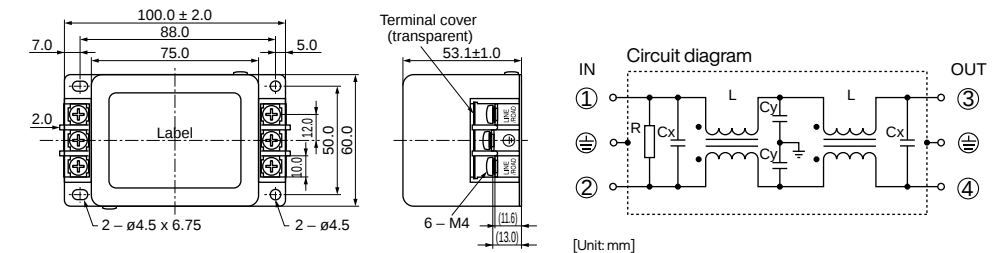
The branch circuit should be protected in accordance with NEC and the applicable local regulations in your area.

Noise Filter

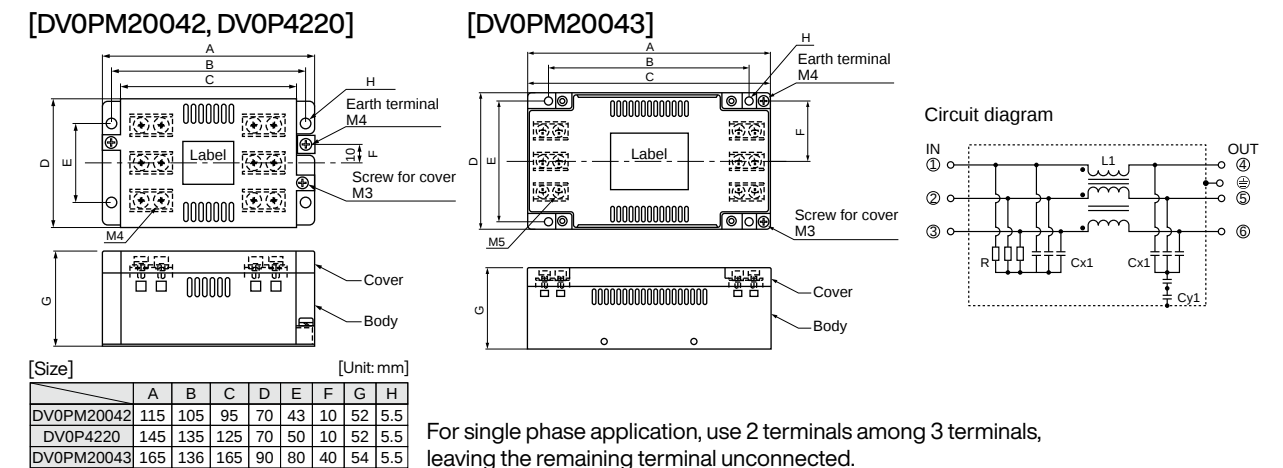
When you install one noise filter at the power supply for multi-axes application, contact the manufacturer of the noise filter. If noise margin is required, connect 2 filters in series to emphasize effectiveness.

- Options

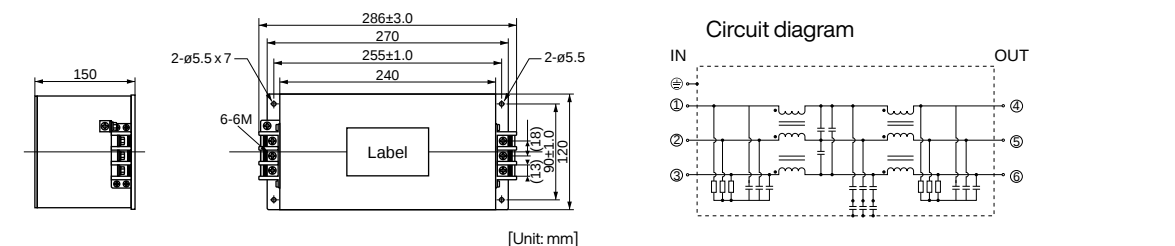
Option part No.	Voltage specifications for driver	Manufacturer's part No.	Applicable driver (frame)	Manufacturer
DV0P4170	Single phase 100 V, 200 V	SUP-EK5-ER-6	A-frame and B-frame	Okaya Electric Ind.



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.
	Single phase 100 V, 200 V 3-phase 200 V		C-frame	
DV0P4220	Single/3-phase 200 V	3SUP-HU30-ER-6	D-frame	
DV0PM20043	3-phase 200 V	3SUP-HU50-ER-6	E-frame	



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.

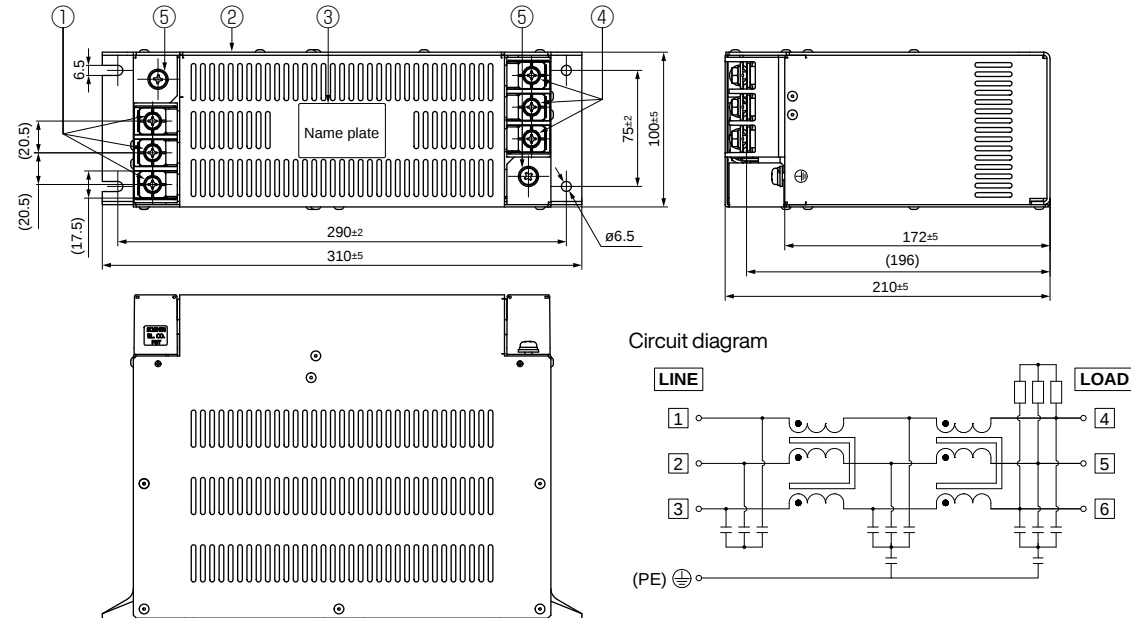


<Remarks>

- 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.

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>

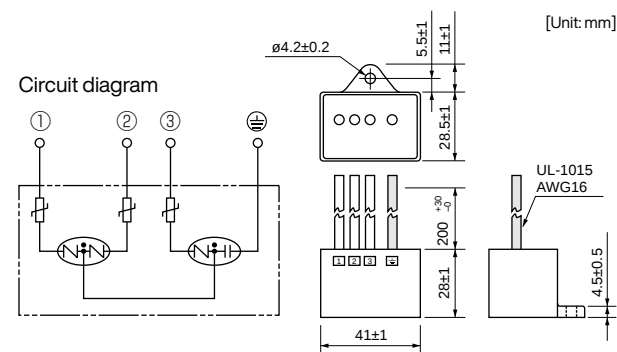
- Select a noise filter of capacity that exceeds the capacity of the power source (also check for load condition).
- For detailed specification of the filter, contact the manufacturer.
- When you install one noise filter at the power supply for multi-axes application, contact the manufacturer of the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

Surge Absorber

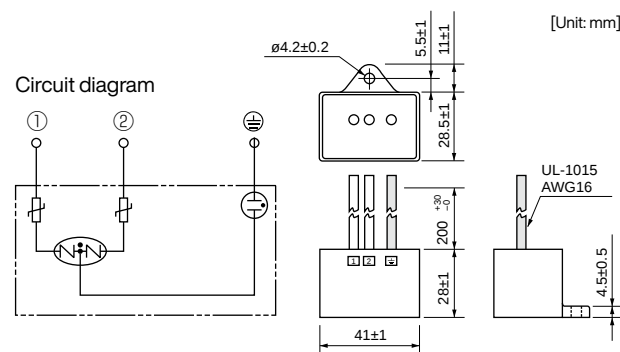
Provide a surge absorber for the primary side of noise filter.

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	

[DV0P1450]



[DV0P4190]



<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 ¹	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

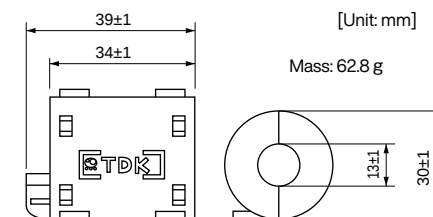


Fig.3: T400-61D (Recommended components) 1 pieces

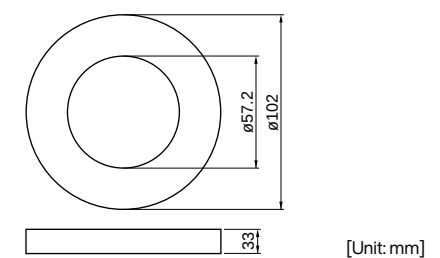
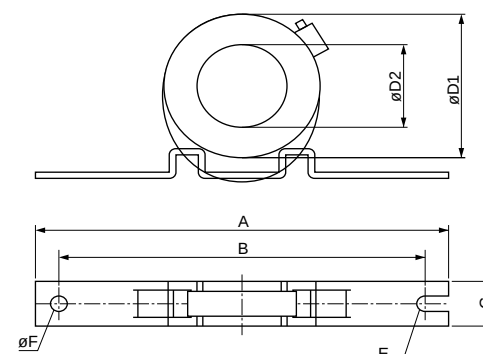


Fig.2: RJ8095 (Recommended components) 1 pieces



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

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

- Connect the protective earth terminal (⊕) of the driver and the protective earth terminal (PE) of the control box without fail to prevent electrical shocks.
- 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					IEC : International Electrotechnical Commission
Motor	IEC60034-1	IEC60034-5	UL1004	CSA22.2 No.100	Conforms to EU Low Voltage Directives/UK Low Voltage Regulation	EN : Europäischen Normen EMC: Electromagnetic Compatibility UL : Underwriters Laboratories CSA : Canadian Standards Association
Motor and driver		UL61800-5-1	CSA22.2 No.14		Conforms to references by EU EMC Directives/UK EMC Regulation	Pursuant to at the directive 2004/108/EC, article 9(2)
	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				

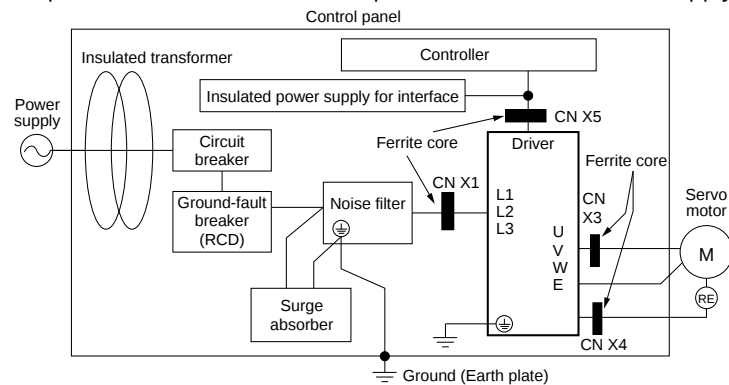
Composition of Peripheral Components

<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 $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	to	115 V $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	50 Hz/60 Hz
200 V system	Single phase, 200 V $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	to	240 V $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	50 Hz/60 Hz
200 V system	3-phase, 200 V $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	to	240 V $\begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$	50 Hz/60 Hz

- (1) Use the power supply under an environment of Overvoltage Category II specified in IEC60664-1.
- (2) 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

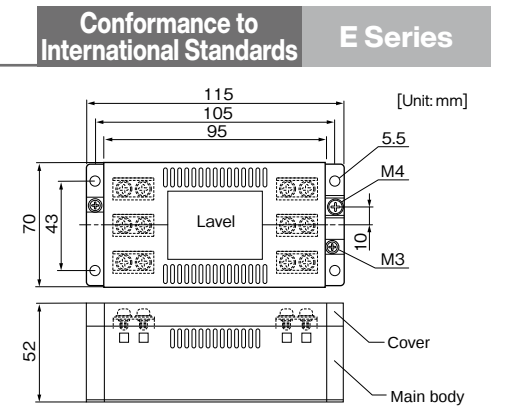
Connect a circuit breaker which conforms to IEC standards and is UL recognized (UL Listed,  marked), between the power supply and the noise filter.

Composition of Peripheral Components Conformity to UL Standards

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

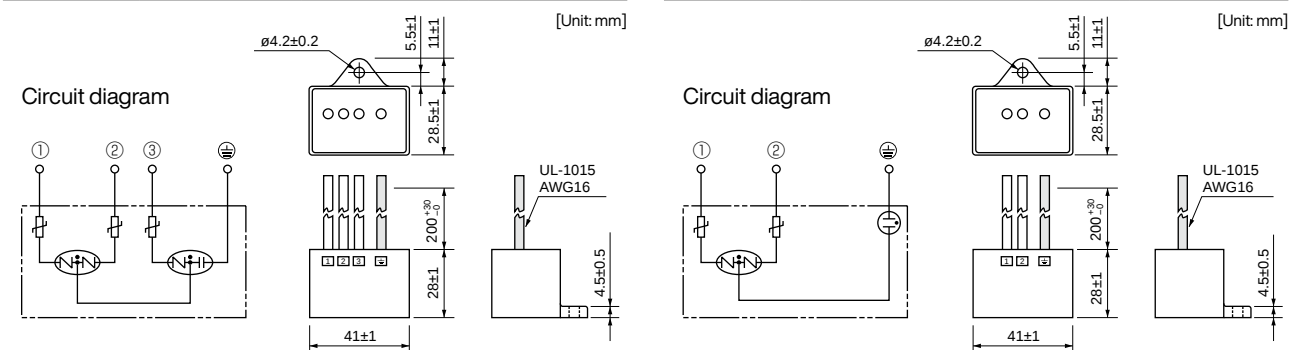


Surge Absorber

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.

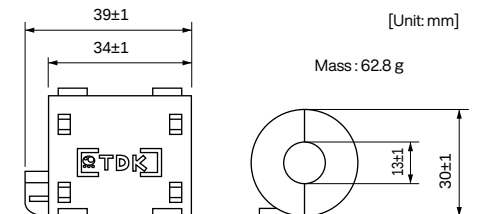
Ferrite core

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

- (1) Connect the protective earth terminal of the driver () and protective earth terminal of the control panel (PE) without fail to prevent electrical shocks.
- (2) 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.

Motor Capacity Selection Software

AC Servo Motor Capacity Selection Software

Option Selection Software for AC Servo Motor

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 pulldown menu.

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.

* 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-panaterm>

Organization of the System of Units

Guide to the International System of Units (SI)

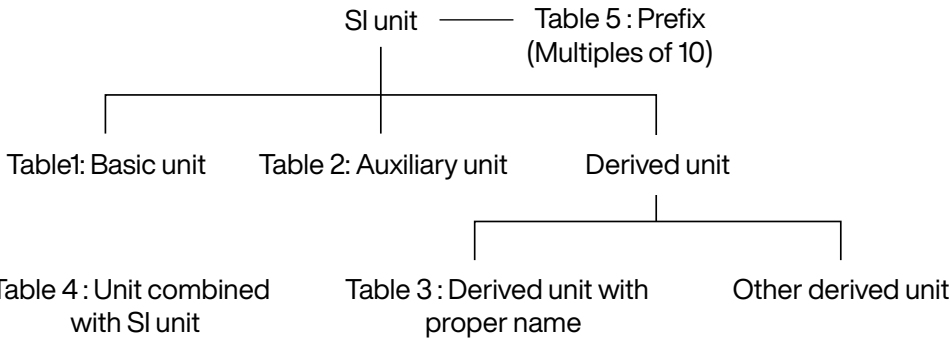


Table1: Basic unit

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 ⁻¹
Force	newton	N	1 N = 1 kg·m/s ²
Pressure, Stress	pascal	Pa	1 Pa = 1 N/m ²
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 ⁻¹
Magnetic flux	weber	Wb	1 Wb = 1 V·s
Magnetic flux density, Magnetic induction	tesla	T	1 T = 1 Wb/m ²
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 ²

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 ¹⁸	exa	E
10 ¹⁵	peta	P
10 ¹²	tera	T
10 ⁹	giga	G
10 ⁶	mega	M
10 ³	kilo	k
10 ²	hecto	h
10	deca	da
10 ⁻¹	deci	d
10 ⁻²	centi	c
10 ⁻³	milli	m
10 ⁻⁶	micro	μ
10 ⁻⁹	nano	n
10 ⁻¹²	pico	p
10 ⁻¹⁵	femto	f
10 ⁻¹⁸	atto	a

Major Compatible Unit

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 ²	1 Gal = 10 ⁻² m/s ²
	G	m/s ²	1 G = 9.80665 m/s ²
Frequency	c/s, c	Hz	1 c/s = Hz
Revolving speed, Number of revolutions	rpm	s ⁻¹ or min ⁻¹ , r/min	1 rpm = 1 min ⁻¹
Weight	kgf	—	} Same value
Mass	—	kg	
Weight flow rate	kgf/s	—	} Same value
Mass flow rate	—	kg/s	
Specific weight	kgf/m ³	—	} Same value
Density	—	kg/m ³	
Specific volume	m ³ /kgf	m ³ /kg	Same value
Load	kgf	N	1 kgf = 9.80665 N
Force	kgf	N	1 kgf = 9.80665 N
	dyn	N	1 dyn = 10 ⁻⁵ N
Moment of force	kgf·m	N·m	1 kgf·m = 9.806 N·m
Pressure	kgf/cm ²	Pa, bar ⁽¹⁾ or kgf/cm ²	1 kgf/cm ² = 9.80665 × 10 ⁴ Pa = 0.980665 bar
	at (Engineering atmospheric pressure)	Pa	1 at = 9.80665 × 10 ⁴ Pa
	atm (Atmospheric pressure)	Pa	1 atm = 1.01325 × 10 ⁵ Pa
	mH ₂ O, mAq	Pa	1 mH ₂ O = 9.80665 × 10 ³ Pa
	mmHg	Pa or mmHg ⁽²⁾	1 mmHg = 133.322 Pa
	Torr	Pa	
Stress	kgf/mm ²	Pa or N/m ²	1 kgf/mm ² = 9.80665 × 10 ⁶ Pa = 9.80665 × 10 ⁶ N/m ²
	kgf/cm ²	Pa or N/m ²	1 kgf/cm ² = 9.80665 × 10 ⁴ Pa = 9.80665 × 10 ⁴ N/m ²
Elastic modulus	kgf/m ²	Pa or N/m ²	1 kgf/m ² = 9.80665 Pa = 9.80665 N/m ² 1 kgf/cm ² = 9.80665 × 10 ⁴ N/m ²
Energy, Work	kgf·m	J (joule)	1 kgf·m = 9.80665 J
	erg	J	1 erg = 10 ⁻⁷ 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 ² /s	10 ⁻² St = 1 mm ² /s
Thermodynamic temperature	K	K (kelvin)	1 K = 1 K
Temperature interval	deg	K ⁽³⁾	1 deg = 1 K
Amount of heat	cal	J	1 cal = 4.18605 J
Heat capacity	cal/°C	J/K ⁽³⁾	1 cal/°C = 4.18605 J/K
Specific heat, Specific heat capacity	cal/ (kgf·°C)	cal/ (kgf·K) ⁽³⁾	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 ²)	W/m ²	1 kcal/ (h·m ²) = 1.16279 W/m ²
Thermal conductivity	cal/ (h·m·°C)	W/ (m·K) ⁽³⁾	1 kcal/ (h·m·°C) = 1.16279 W/ (m·K)
Coefficient of thermal conductivity	cal/ (h·m ² ·°C)	W/ (m ² ·K) ⁽³⁾	1 kcal/ (h·m ² ·°C) = 1.16279 W/ (m ² ·K)
Intensity of magnetic field	Oe	A/m	1 Oe = 10 ³ / (4π) A/m
Magnetic flux	Mx	Wb (weber)	1 Mx = 10 ⁻⁸ Wb
Magnetic flux density	Gs, G	T (tesla)	1 Gs = 10 ⁻⁴ T

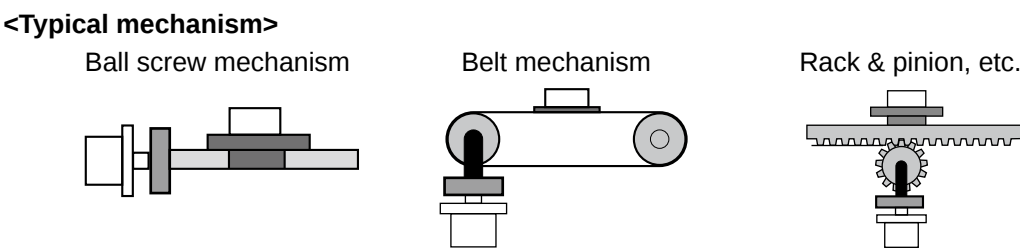
Note
 (1) Applicable to liquid pressure. Also applicable to atmospheric pressure of meteorological data, when “bar” is used in international standard.
 (2) Applicable to scale or indication of blood pressure manometers.
 (3) “°C” can be substituted for “K”.

Flow of Motor Selection

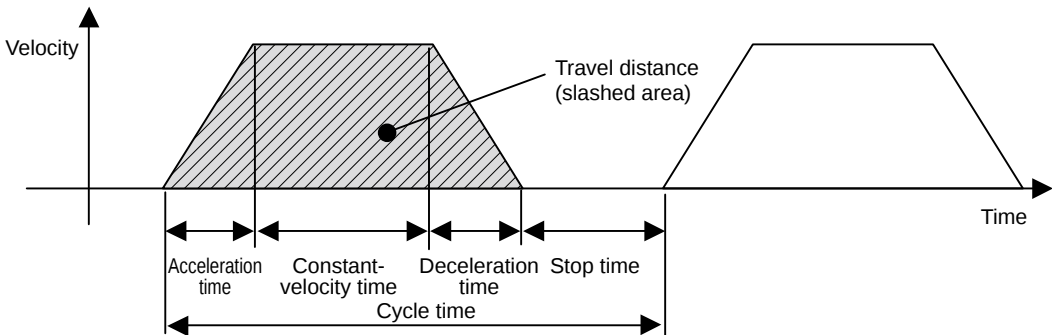
Selecting Motor Capacity

Flow of Motor Selection

- Definition of mechanism to be driven by motor.**
 Define details of individual mechanical components (ball screw length, lead and pulley diameters, etc.)



- 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.

- 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 "× 10⁻⁴ kg·m²".
- Calculation of motor velocity**
 Calculate the motor velocity from the moving distance, acceleration / deceleration time and constant-velocity time.
- Calculation of torque**
 Calculate the required motor torque from the load inertia, acceleration/deceleration time and constant-velocity time.
- Calculation of motor**
 Select a motor that meets the above 3 to 5 requirements.

Description on the Items Related to Motor Selection

1. Torque

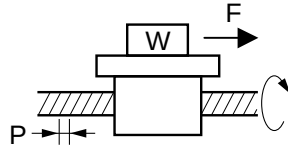
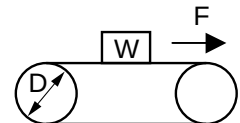
(1) Peak torque

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] P : Lead [m] F : External force [N]		η : Mechanical efficiency μ : Coefficient of friction g : Acceleration of gravity 9.8[m/s ²]
Belt mechanism 		Traveling torque $T_f = \frac{D}{2\pi\eta} (\mu gW + F)$
W : Weight [kg] P : Pulley diameter [m] F : External force [N]		η : Mechanical efficiency μ : Coefficient of friction g : Acceleration of gravity 9.8[m/s ²]

(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_a : Acceleration torque [N·m] t_a : Acceleration time [s] t_c : Cycle time [s]
 T_f : Traveling torque [N·m] t_b : Constant-velocity time [s] (Run time + Stop time)
 T_d : Deceleration torque [N·m] t_d : 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.

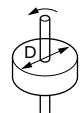
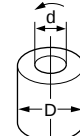
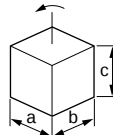
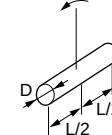
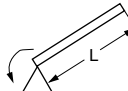
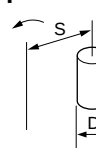
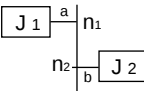
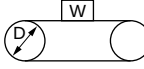
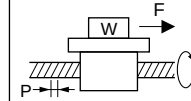
Inertia ratio is calculated by dividing load inertia by rotor inertia.

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

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

Weight W[kg]=Density ρ [kg/m³] x Volume V[m³]

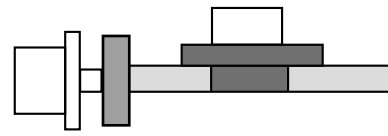
Density of each material

Iron ρ =7.9 x 10³ [kg/m³] Aluminum ρ =2.8 x 10³ [kg/m³]

Brass ρ =8.5 x 10³ [kg/m³]

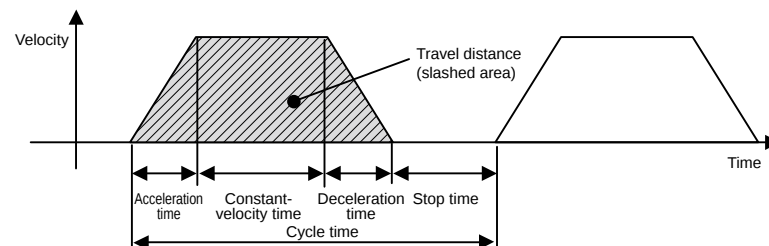
1. Example of motor selection for driving ball screw mechanism

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 ⁻⁶ [kg·m ²] (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 $BW = \rho \times \pi \times \left(\frac{BD}{2}\right)^2 \times BL = 7.9 \times 10^3 \times \pi \times \left(\frac{0.02}{2}\right)^2 \times 0.5 = 1.24 \text{ [kg]}$

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

5. Provisional motor selection

In case of MSMF 200 W motor : JM = 0.14 × 10⁻⁴ [kg·m²]

6. Calculation of inertia ratio

$JL / JM = 1.73 \times 10^{-4} / 0.14 \times 10^{-4}$ Therefore, the inertia ratio is "12.3" (less than "30")
(In case of MSMF 100 W motor: JM = 0.048 × 10⁻⁴ Therefore, the inertia ratio is "36.0".)

7. Calculation of maximum velocity (Vmax)

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

$$\frac{1}{2} \times 0.1 \times V_{\max} + 0.8 \times V_{\max} + \frac{1}{2} \times 0.1 \times V_{\max} = 0.3$$

$$0.9 \times V_{\max} = 0.3$$

$$V_{\max} = 0.3 / 0.9 = 0.334 \text{ [m/s]}$$

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

$$N = 0.334 / 0.02 = 16.7 \text{ [r/s]}$$

$$= 16.7 \times 60 = 1002 \text{ [r/min]} < 3000 \text{ [r/min]} \text{ (Rated velocity of MSMF 200 W motor)}$$

9. Calculation of torque

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

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

$$= \frac{(1.73 \times 10^{-4} + 0.14 \times 10^{-4}) \times 2\pi \times 16.7}{0.1} + 0.035$$

$$= 0.196 + 0.035 = 0.231 \text{ [N·m]}$$

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

$$= \frac{(1.73 \times 10^{-4} + 0.14 \times 10^{-4}) \times 2\pi \times 16.7}{0.1} - 0.035$$

$$= 0.196 - 0.035 = 0.161 \text{ [N·m]}$$

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

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

$$= \sqrt{\frac{0.231^2 \times 0.1 + 0.035^2 \times 0.8 + 0.161^2 \times 0.1}{2}}$$

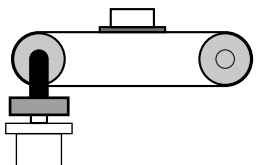
$$= 0.067 \text{ [N·m]} < 0.64 \text{ [N·m]} \text{ (Rated torque of MSMF 200 W motor)}$$

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

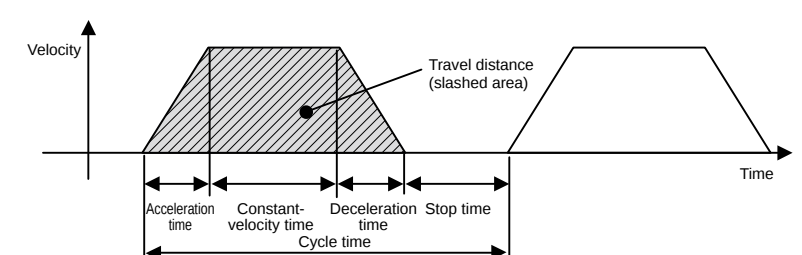
Example of motor selection for timing belt mechanism

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

$$= JC + \frac{1}{4}WA \times PD^2 + \frac{1}{8}WP \times PD^2 \times 2$$

$$= 0 + \frac{1}{4} \times 2 \times 0.05^2 + \frac{1}{8} \times 0.5 \times 0.05^2 \times 2$$

$$= 0.00156 = 15.6 \times 10^{-4} \text{ [kg·m}^2\text{]}$$

4. Provisional motor selection

In case of MSMF 750 W motor : JM = 0.96 × 10⁻⁴ [kg·m²]

5. Calculation of inertia ratio

$JL / JM = 15.6 \times 10^{-4} / 0.96 \times 10^{-4}$ 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])

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

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

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

8. Calculation of torque

$$\begin{aligned} \text{Traveling torque} \quad T_f &= \frac{PD}{2\eta} (\mu g W_A + F) = \frac{0.05}{2 \times 0.8} (0.1 \times 9.8 \times 3 + 0) \\ &= 0.061 [\text{N}\cdot\text{m}] \end{aligned}$$

$$\begin{aligned} \text{Acceleration torque} \quad T_a &= \frac{(J_L + J_M) \times 2\pi N [\text{r/s}]}{\text{Acceleration time} [\text{s}]} + \text{Traveling torque} \\ &= \frac{(15.6 \times 10^{-4} + 0.96 \times 10^{-4}) \times 2\pi \times 7.08}{0.1} + 0.061 \\ &= 0.736 + 0.061 = 0.797 [\text{N}\cdot\text{m}] \end{aligned}$$

$$\begin{aligned} \text{Deceleration torque} \quad T_d &= \frac{(J_L + J_M) \times 2\pi N [\text{r/s}]}{\text{Deceleration time} [\text{s}]} - \text{Traveling torque} \\ &= \frac{(15.6 \times 10^{-4} + 0.96 \times 10^{-4}) \times 2\pi \times 7.08}{0.1} - 0.061 \\ &= 0.736 - 0.061 = 0.675 [\text{N}\cdot\text{m}] \end{aligned}$$

9. Verification of maximum torque

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

10. Verification of effective torque

$$\begin{aligned} T_{\text{rms}} &= \sqrt{\frac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}} \\ &= \sqrt{\frac{0.797^2 \times 0.1 + 0.061^2 \times 0.8 + 0.675^2 \times 0.1}{2}} \\ &= 0.237 [\text{N}\cdot\text{m}] < 2.4 [\text{N}\cdot\text{m}] \text{ (Rated torque of MSMF 750 W motor)} \end{aligned}$$

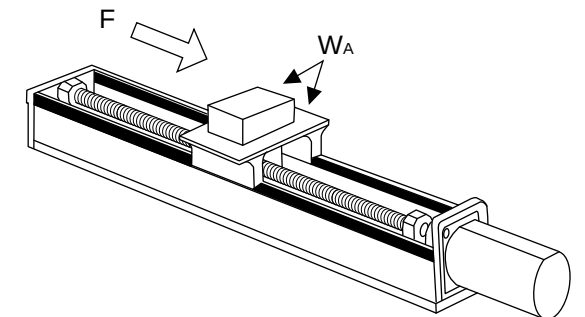
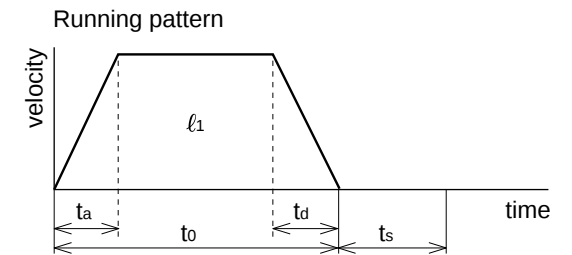
11. Judging from the above calculation result, selection of MSMF 750W motor is acceptable.

Request Sheet for Motor Selection

Request for motor selection I : Ball screw drive

1. Driven mechanism and running data

- Travel distance of the work load per one cycle
 ℓ_1 : mm
- Cycle time
to: s
(Fill in items 3) and 4) if required.)
- Acceleration time
ta: s
- Deceleration time
td: s
- Stopping time
ts: s
- Max. velocity
V: mm/s
- External force
F: N
- Positioning accuracy of the work load
 $\pm$ mm
- Total weight of the work load and the table
 W_A : kg
- Power supply voltage
V
- Diameter of the ball screw
mm
- Total length of the ball
mm
- Lead of the ball screw
mm



14) Traveling direction (horizontal, vertical etc.)

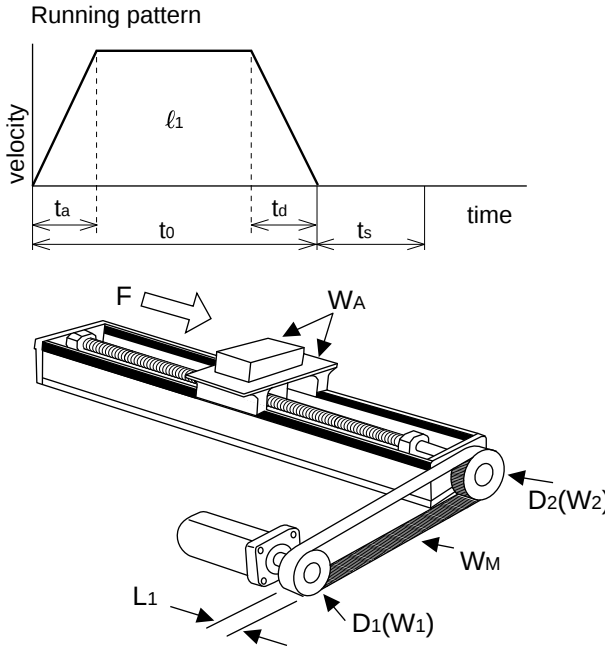
2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

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

Request Sheet for Motor Selection

Request for motor selection 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.)				

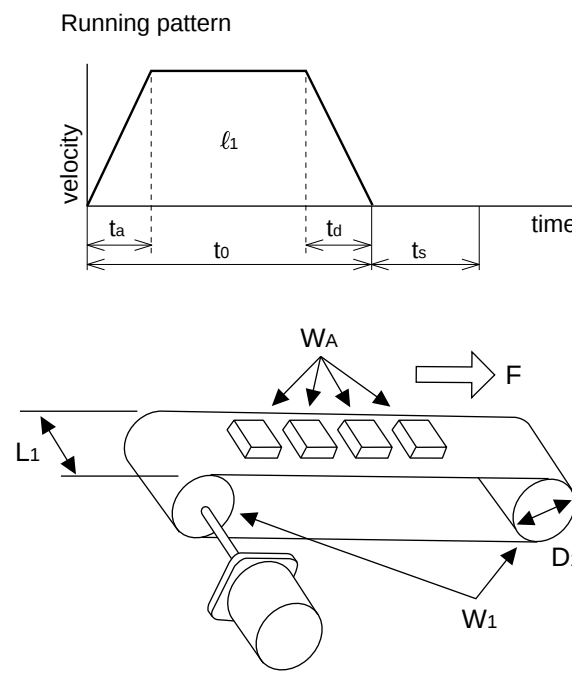
2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

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	(or item 14) and 15))	
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	W_A : kg		
10) Power supply voltage	V	14) Width of the pulley	L_1 : mm
11) Weight of the belt	W_M : kg	15) Material of the pulley	
12) Diameter of the driving pulley	D_1 : mm	16) Traveling direction (horizontal, vertical etc.)	
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

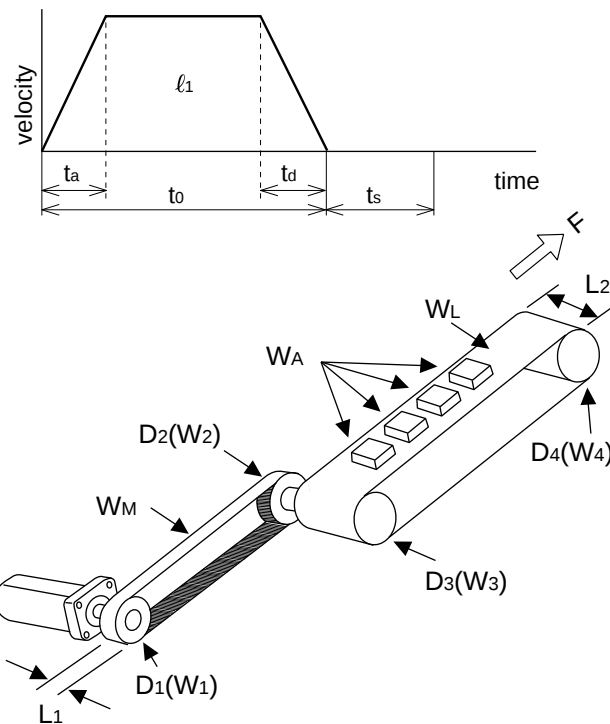
			Motor side	Belt side
1) Travel distance of the work load per one cycle	ℓ_1 : mm	16) Diameter of the pulley	D_3 : mm	D_4 : mm
2) Cycle time	t_0 : s	17) Weight of the pulley	W_3 : kg	W_4 : kg

(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		

Running pattern



	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:

Request Sheet for Motor Selection

Request for motor selection **V** : Turntable drive

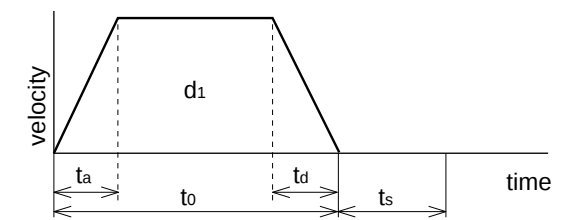
1. Driven mechanism and running data

			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.)

3) Acceleration time	t_a : s	15) Number of work loads	pcs
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		

Running pattern



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 VI : Timing pulley + Turntable drive

1. Driven mechanism and running data

1) Travel distance of the work load per one cycle	d ₁ : deg	16) Diameter of the pulley	Motor side D ₂ : mm	Turntable side D ₃ : mm	
2) Cycle time	t ₀ : 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	± 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)				(Cylinder)
	a: mm				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 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 pulling force	F: N		
8) Positioning accuracy of the work load	± mm		
9) Number of rollers	pcs		
10) Power supply voltage	V		
11) Diameter of the roller	D ₁ : mm		13) Width of the roller
12) Mass of the roller	W ₁ : kg	14) Material of the roller	

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:

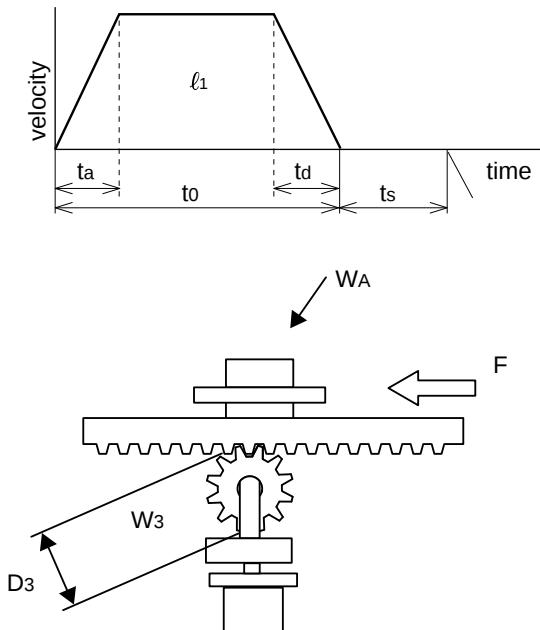
Request Sheet for Motor Selection

Request for motor selection VIII : Driving with Rack & Pinion

1. Driven mechanism and running data

- Travel distance of the work load per one cycle
 l_1 : mm
- Cycle time
 t_0 : s
- (Fill in items 3) and 4) if required.)
- Acceleration time
 t_a : s
- Deceleration time
 t_d : s
- Stopping time
 t_s : s
- Max. velocity
 V : mm/s
- External force
 F : N
- Positioning accuracy of the work load
 $\pm$ mm
- Total weight of the work load
 W_A : kg
- Power supply voltage
V
- Diameter of the pinion
 D_3 : mm
- Mass of the pinion
 W_3 : kg
- Traveling direction
(horizontal, vertical, etc.)

Running pattern



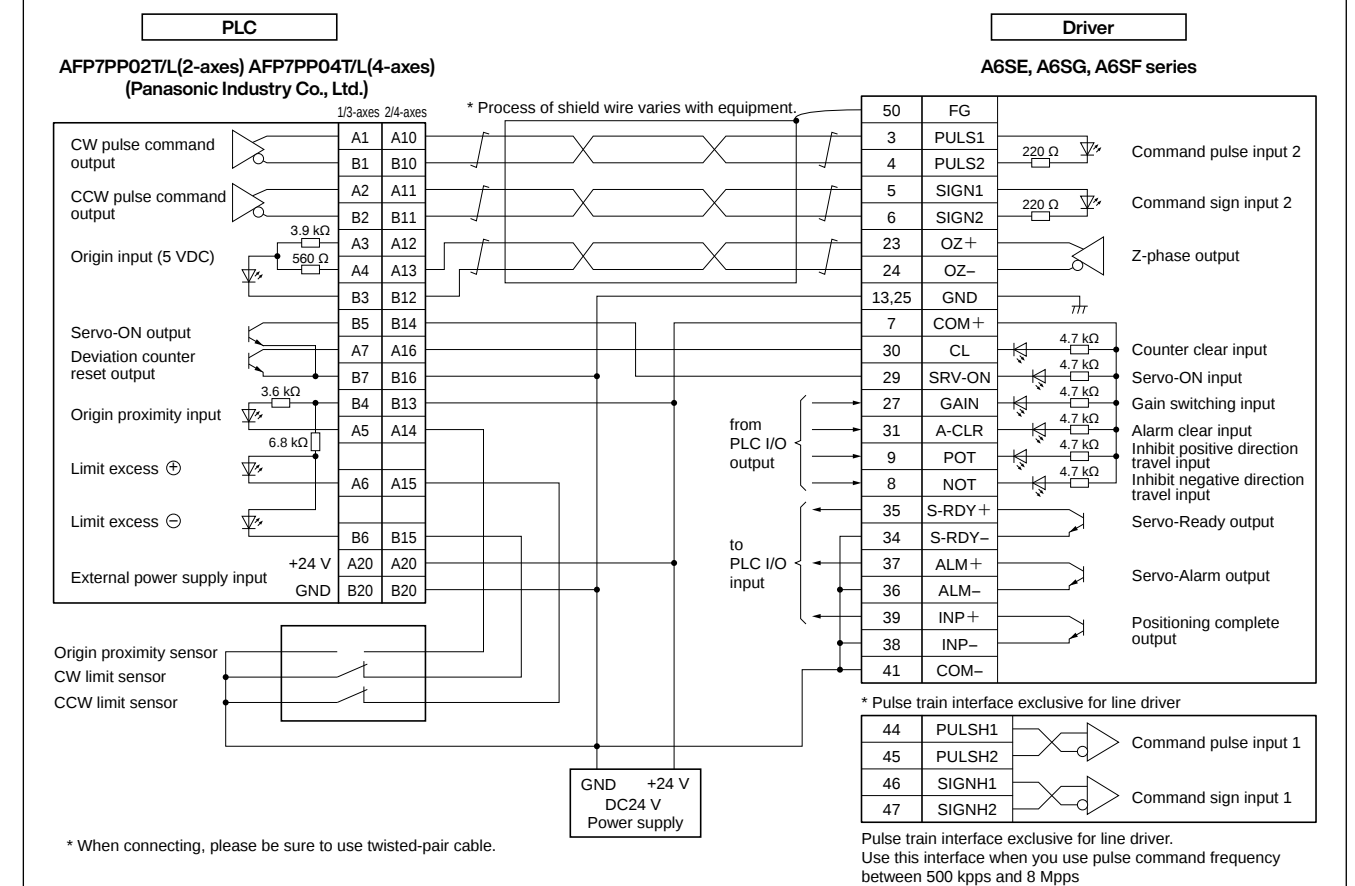
2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

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

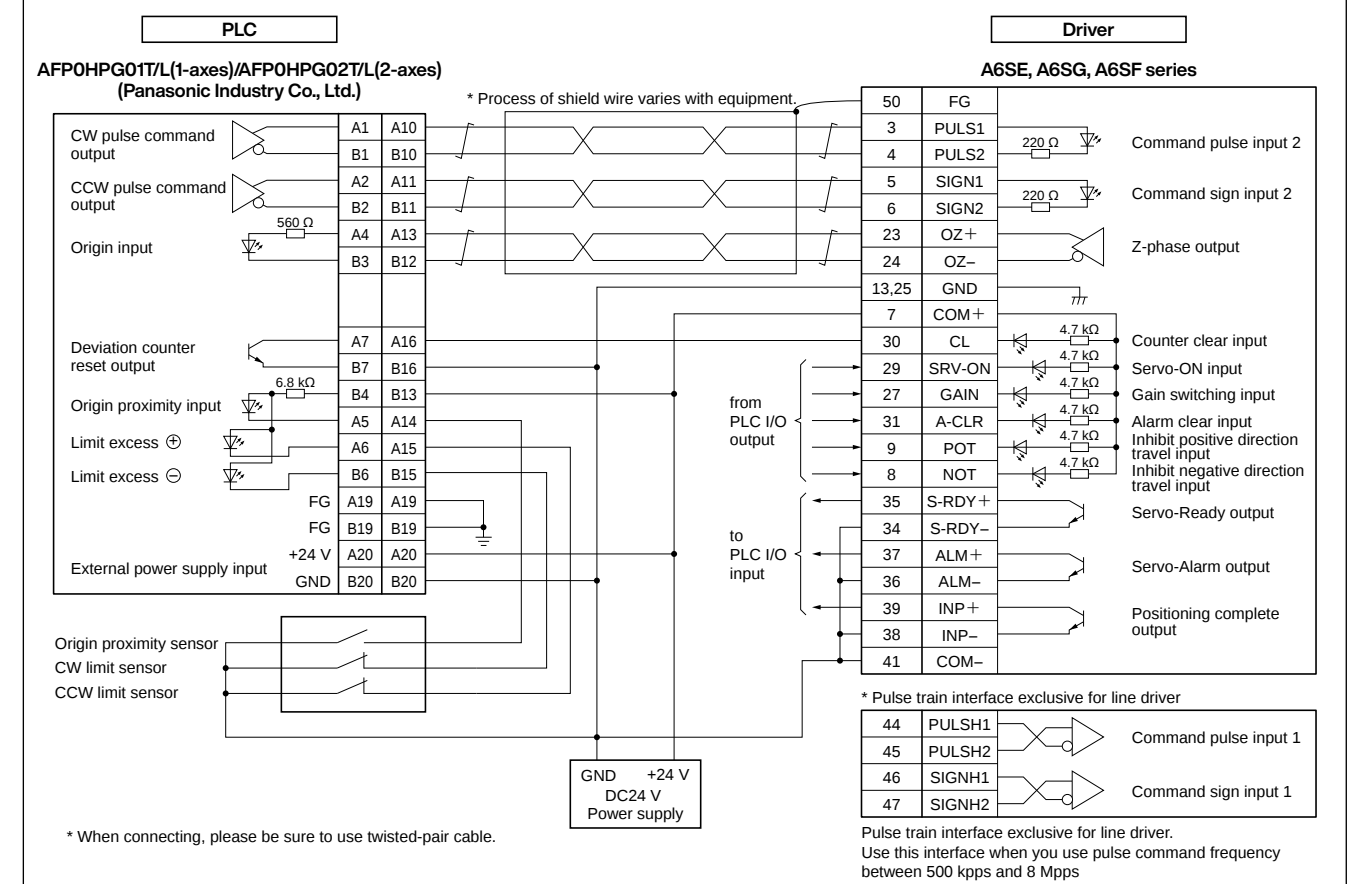
Connection Between Driver and Controller

Connection Between Driver and Controller A6 Series

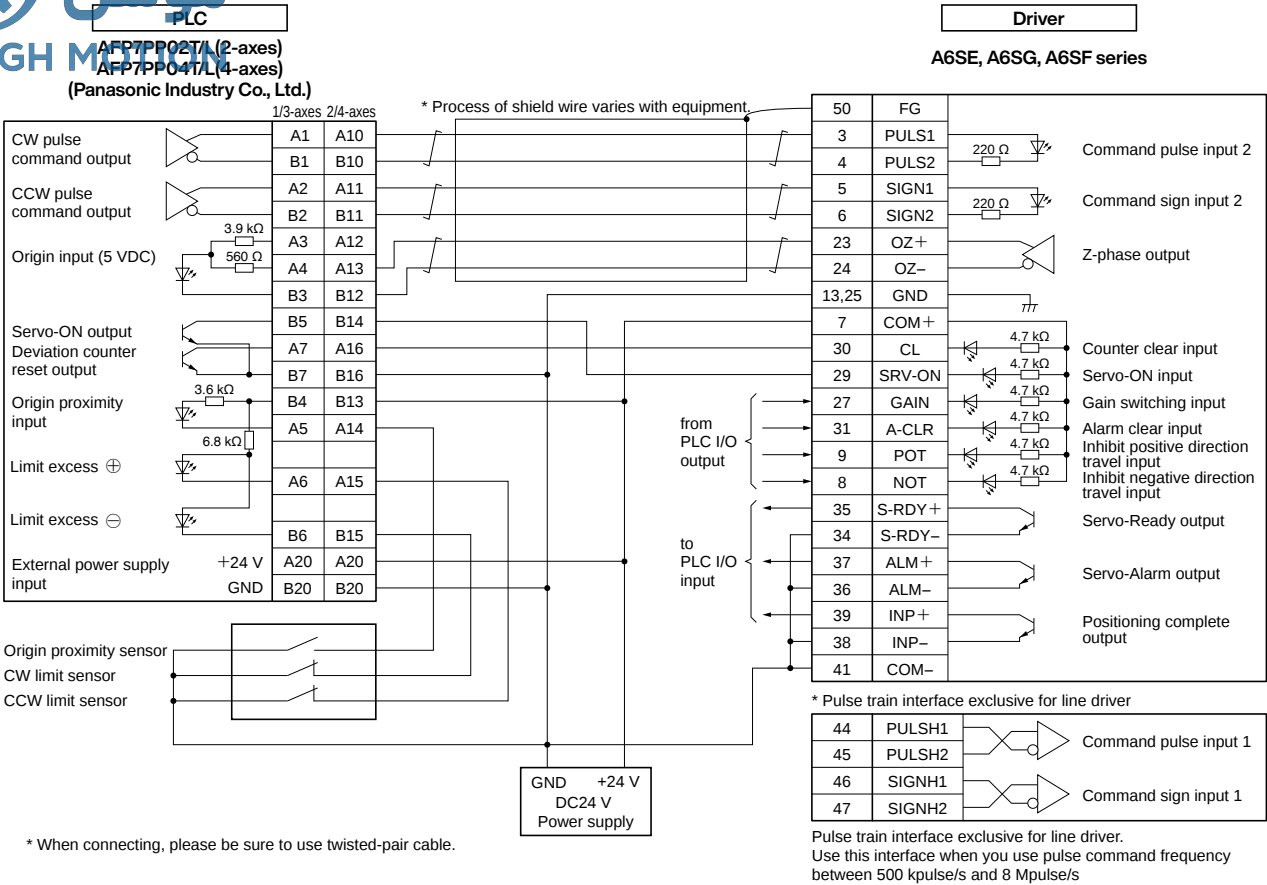
FP7 AFP7PPL02T/L (2 axes) Connection with AFP7PP04T/L (4 axes)



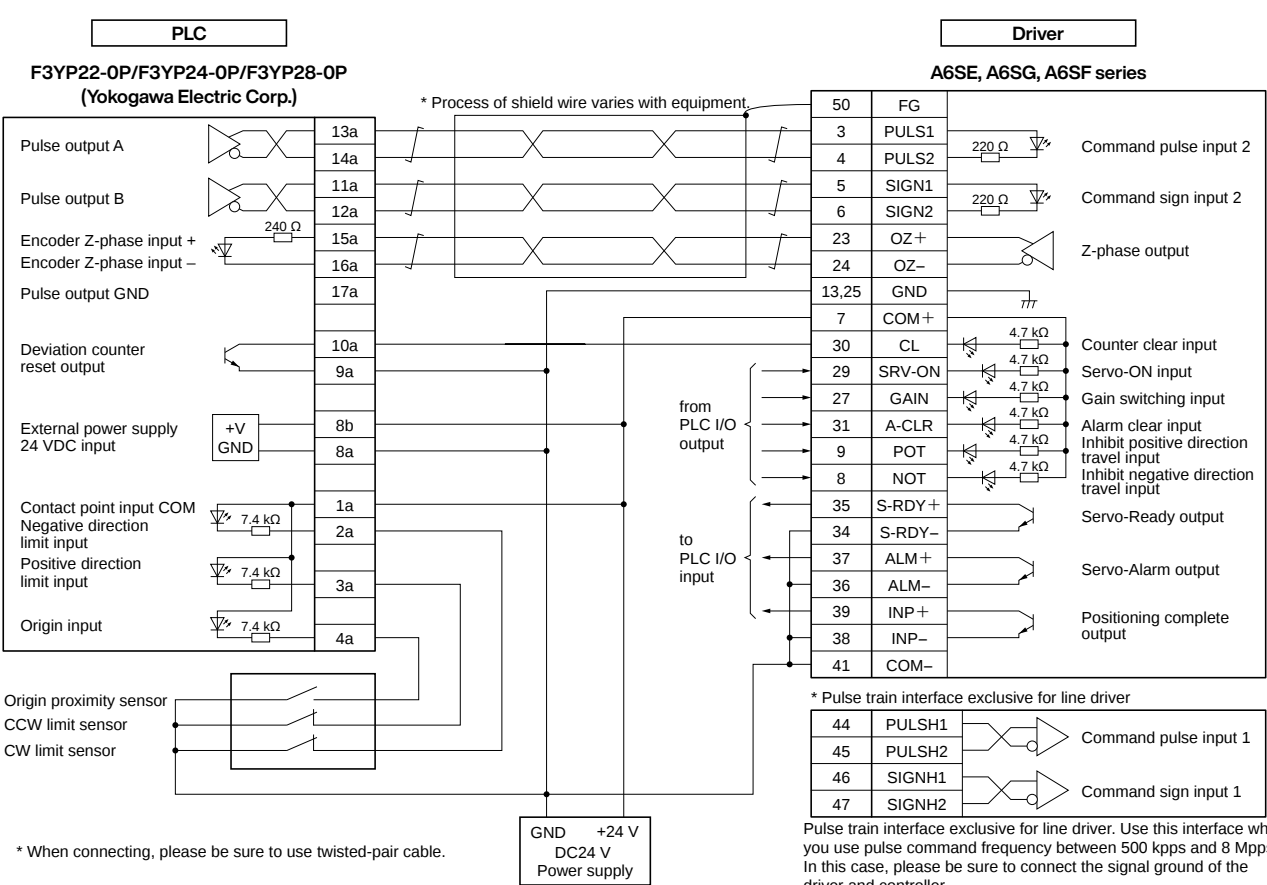
FP0H AFP0HPG01T/L (1 axis) Connection with AFP0HPG02T/L (2 axes)



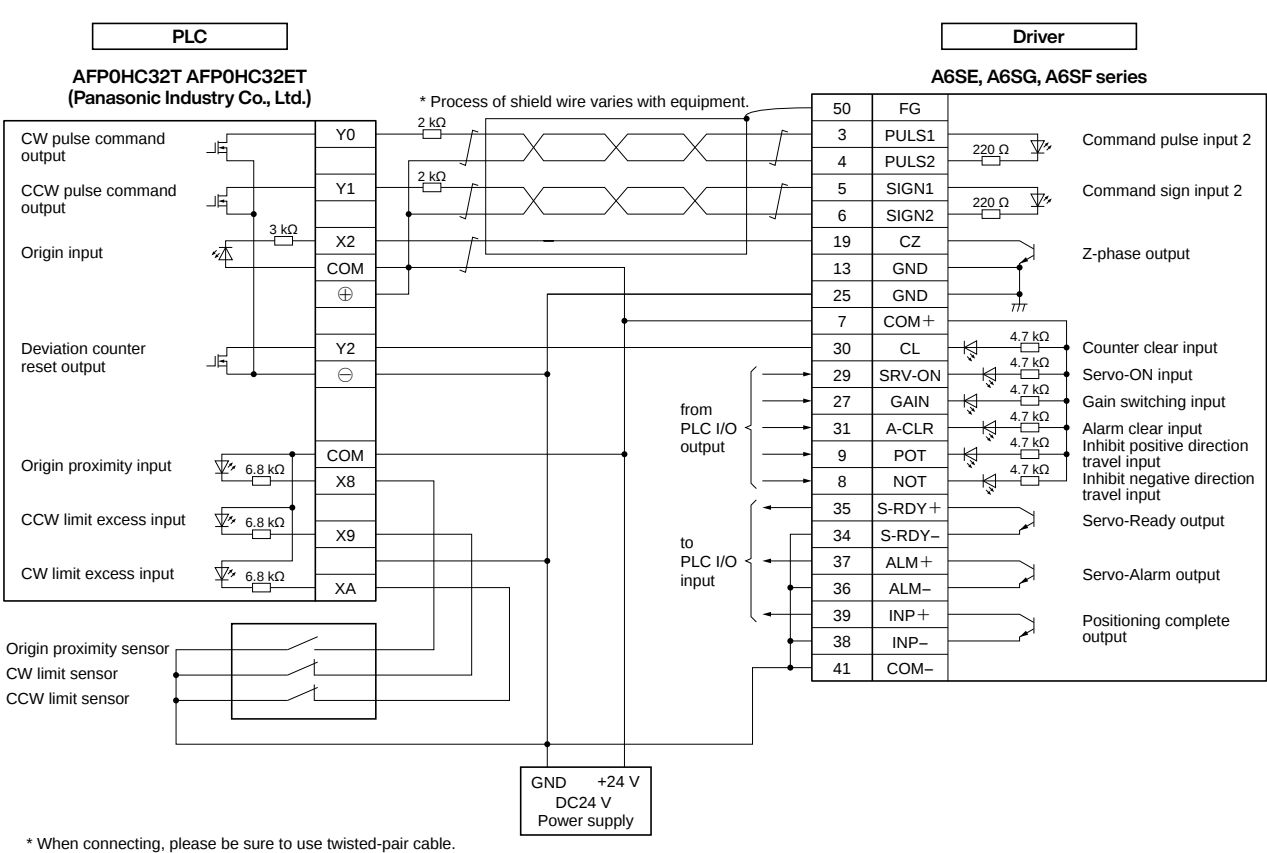
FP7 AFP7PG02T/L (2 axes) Connection with AFP7PG04T/L (4 axes)



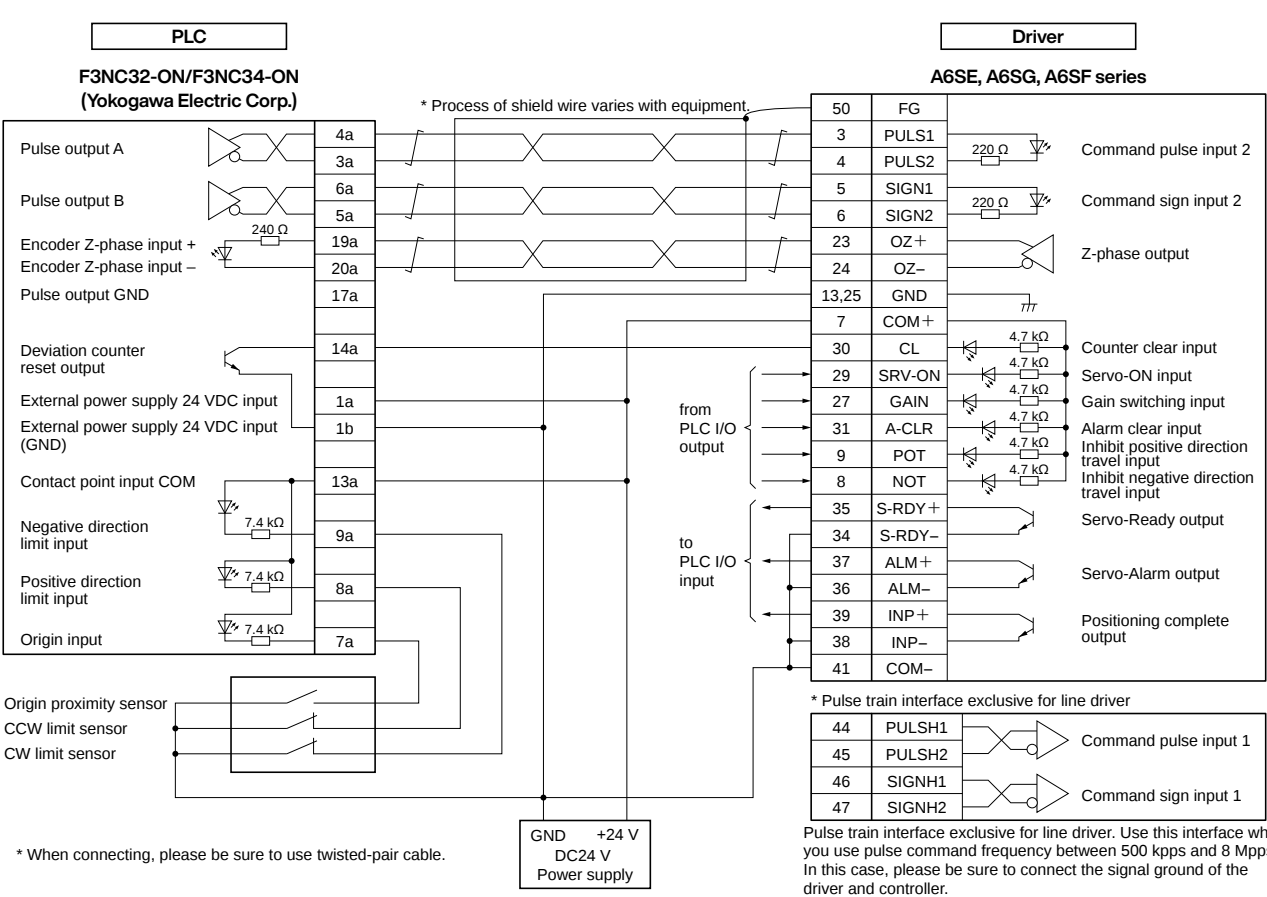
F3YP22-0P/F3YP24-0P/F3YP28-0P Connection with the Yokogawa Electric Corp.



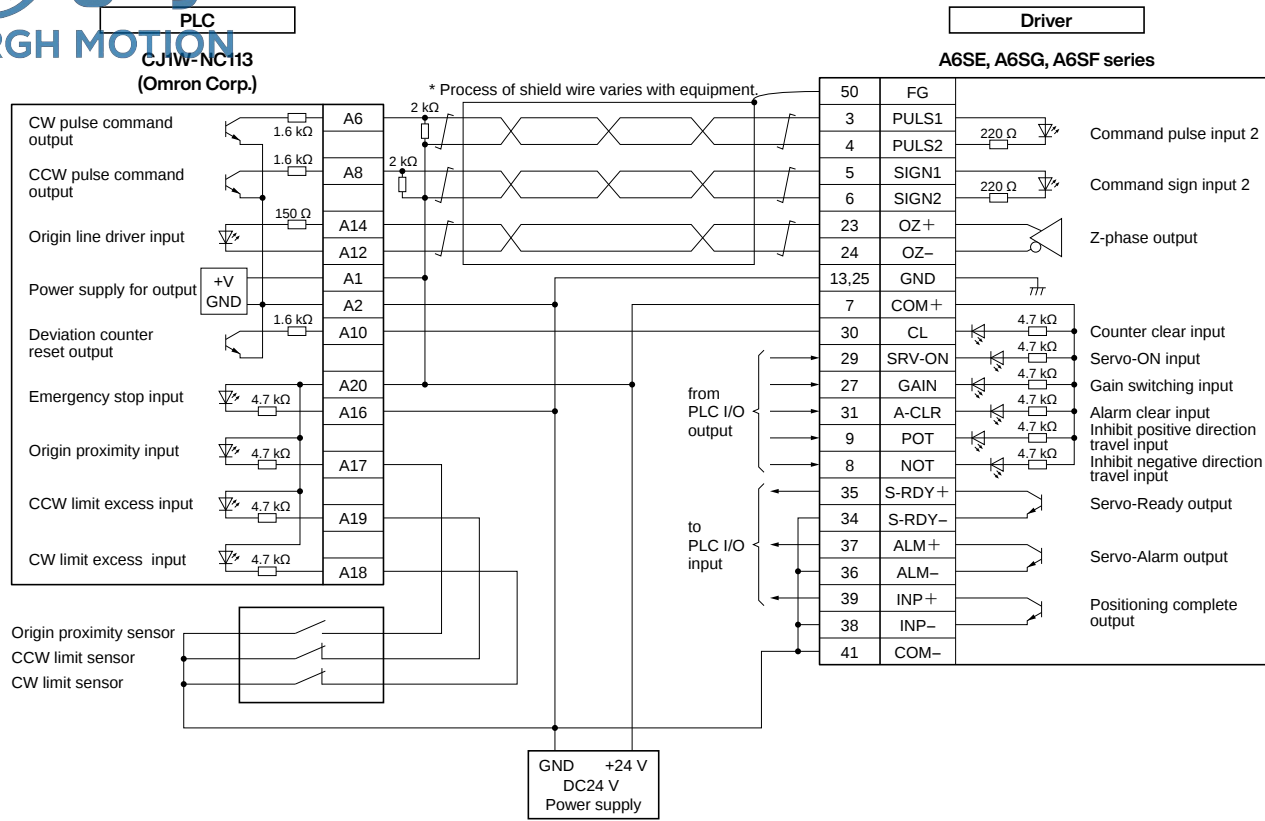
FP0H AFP0HC32T Connection with AFP0HC32ET



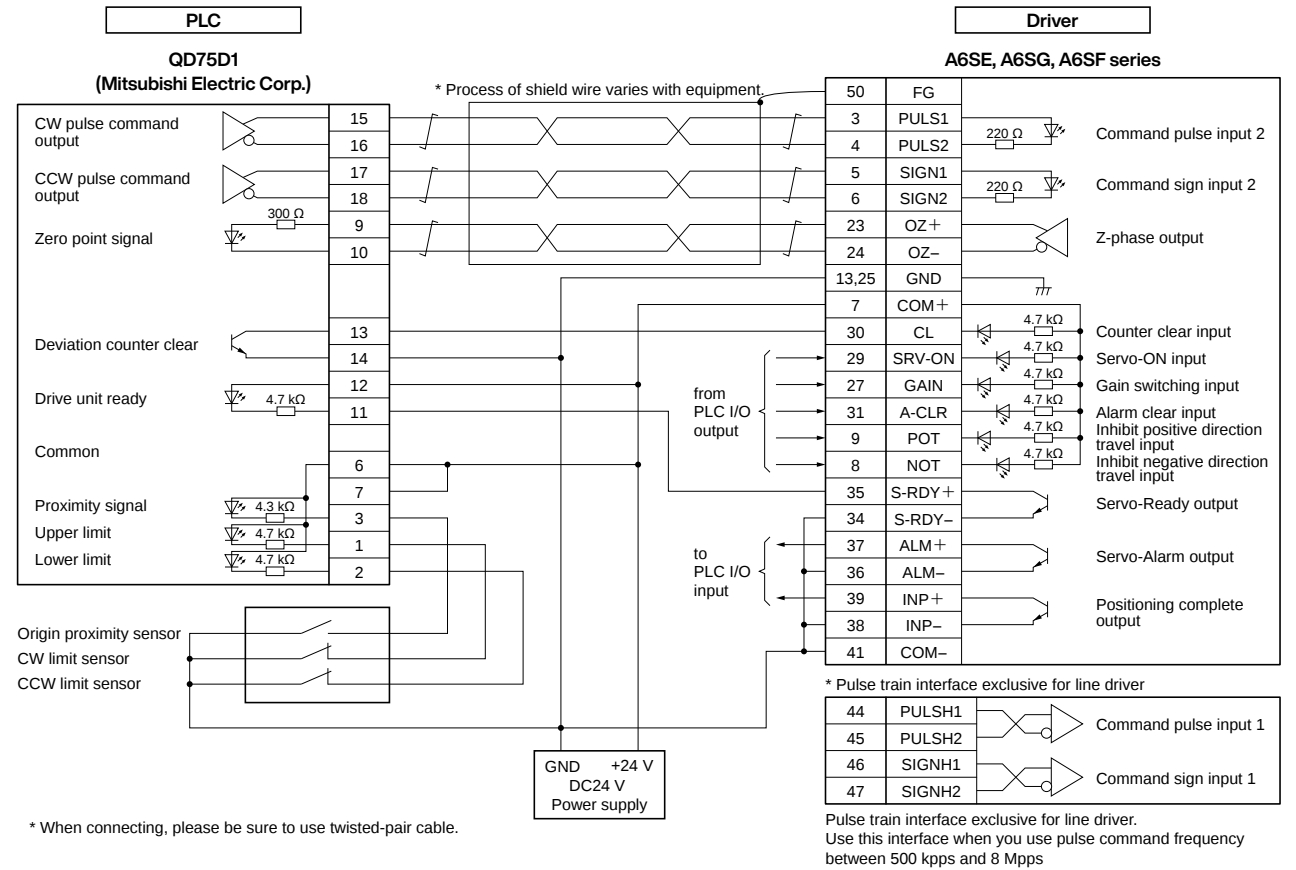
F3NC32-ON/F3NC34-ON Connection with the Yokogawa Electric Corp.



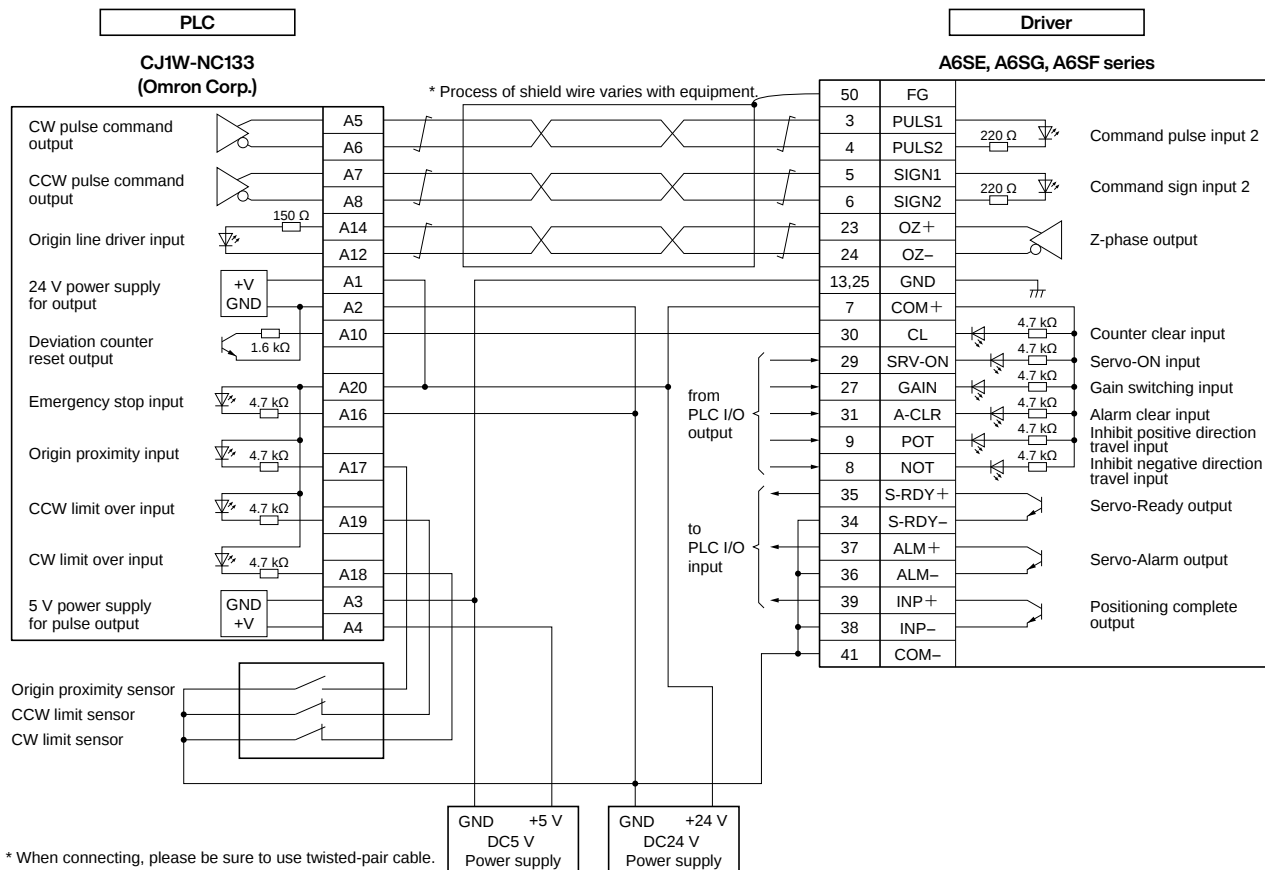
CJ1W-NC113 Connection with the Omron Corp.



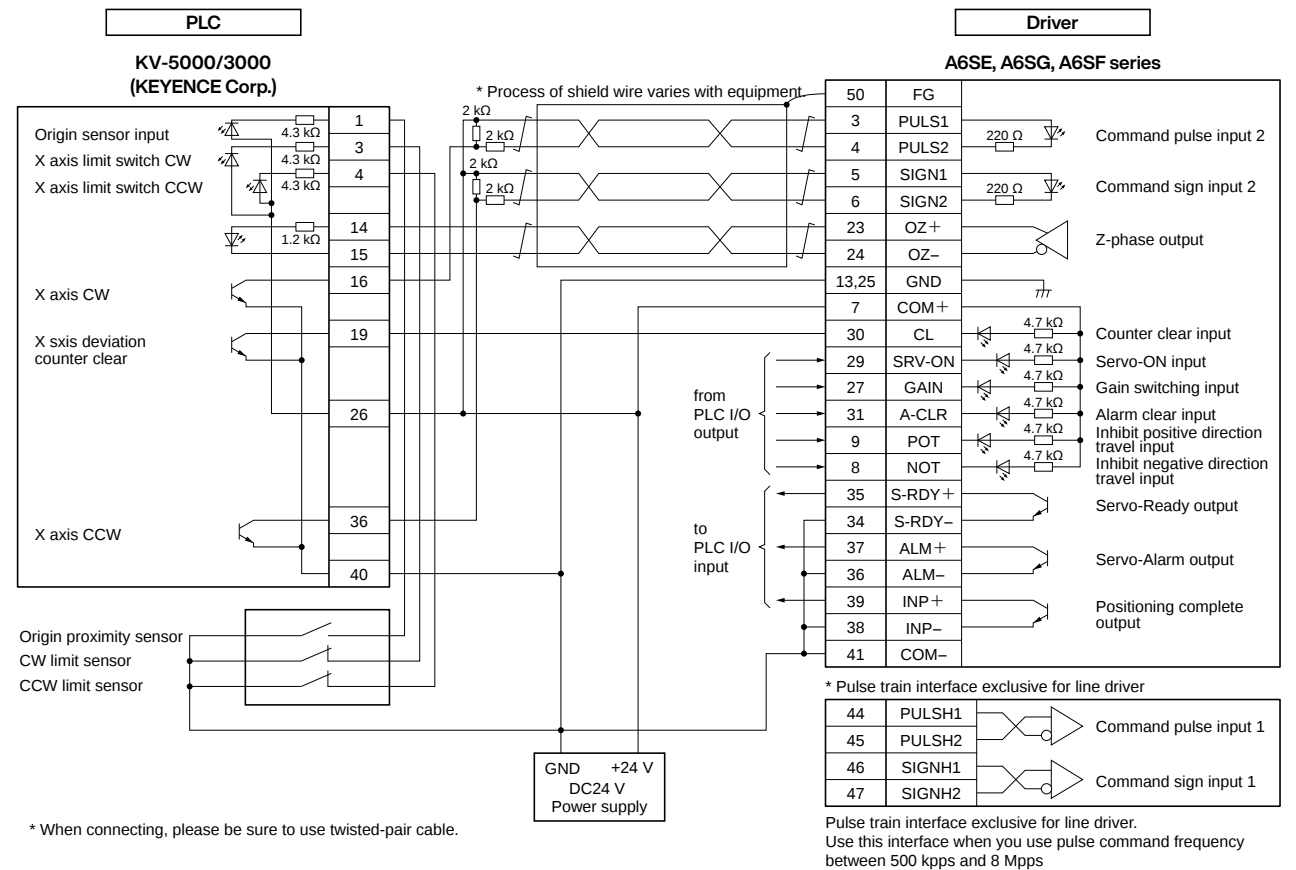
QD75D1 Connection with the Mitsubishi Electric Corp.



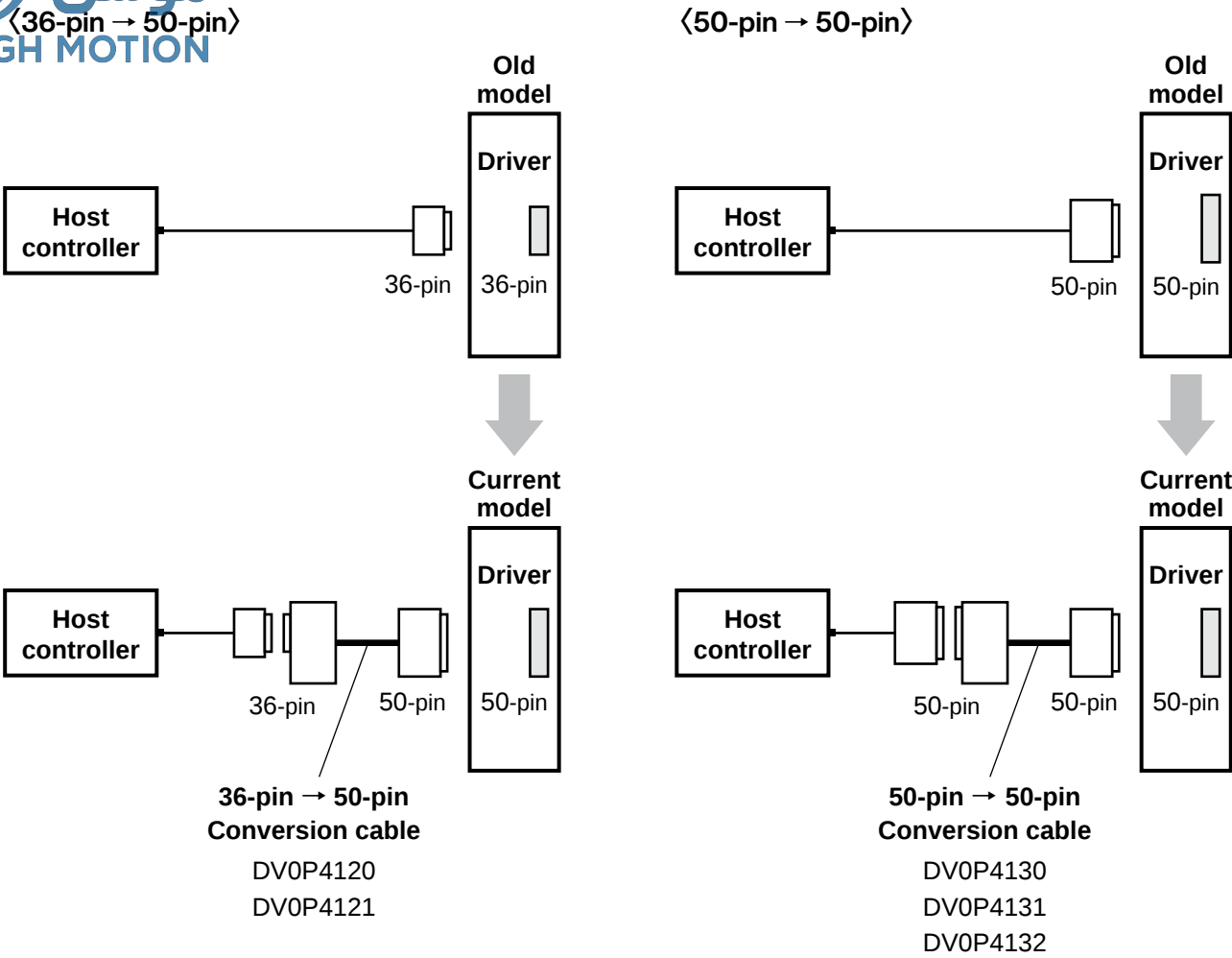
CJ1W-NC133 Connection with the Omron Corp.



KV-5000/3000 Connection with the KEYENCE Corp.



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



Replacing Old Model Servo Driver with MINAS A6 series

Pin No. on Old Model	Pin No. on Current Model	DV0P4130		Pin No. on Current Model	DV0P4131	
		Signal Name	Symbol		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	Pin No. on Current Model	DV0P4132	
		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

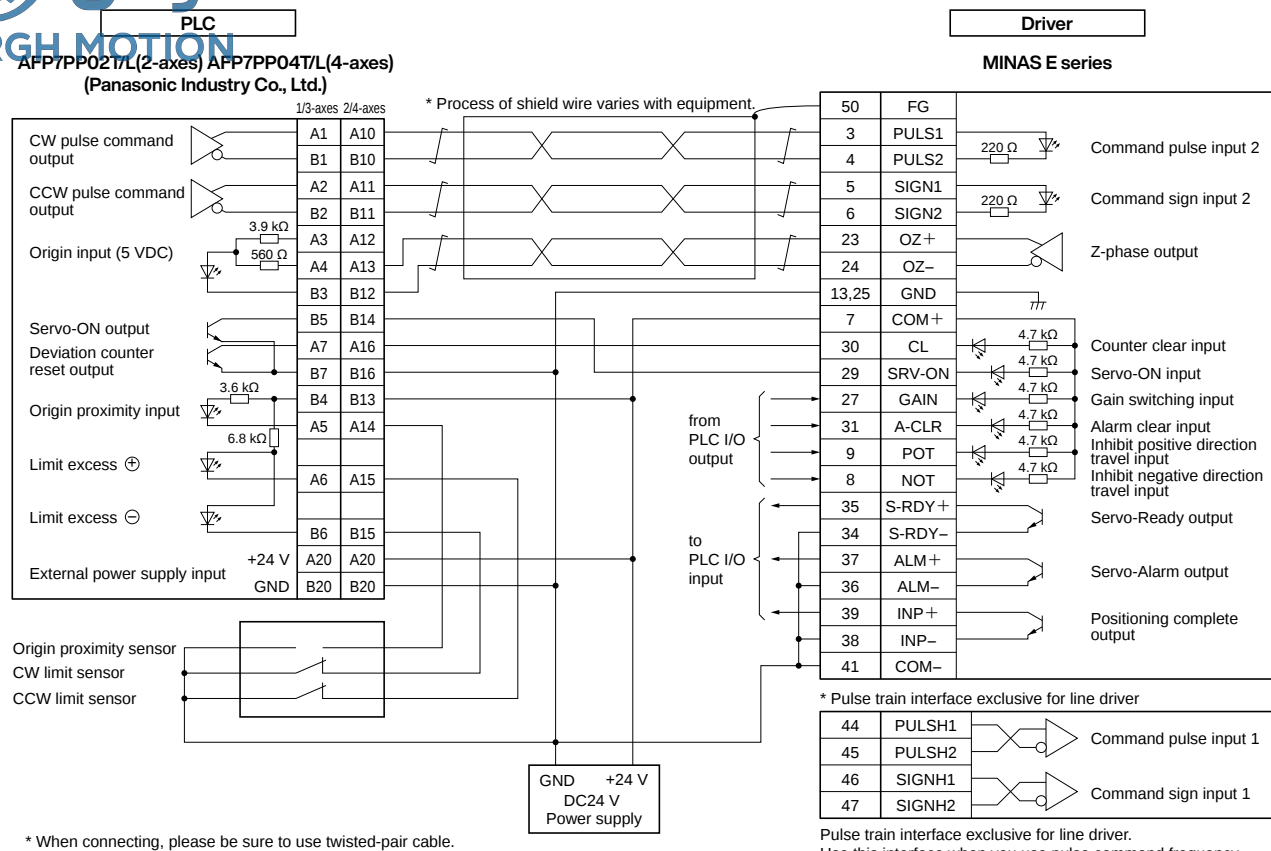
A6N Series

A6B Series
[Special Order Product]

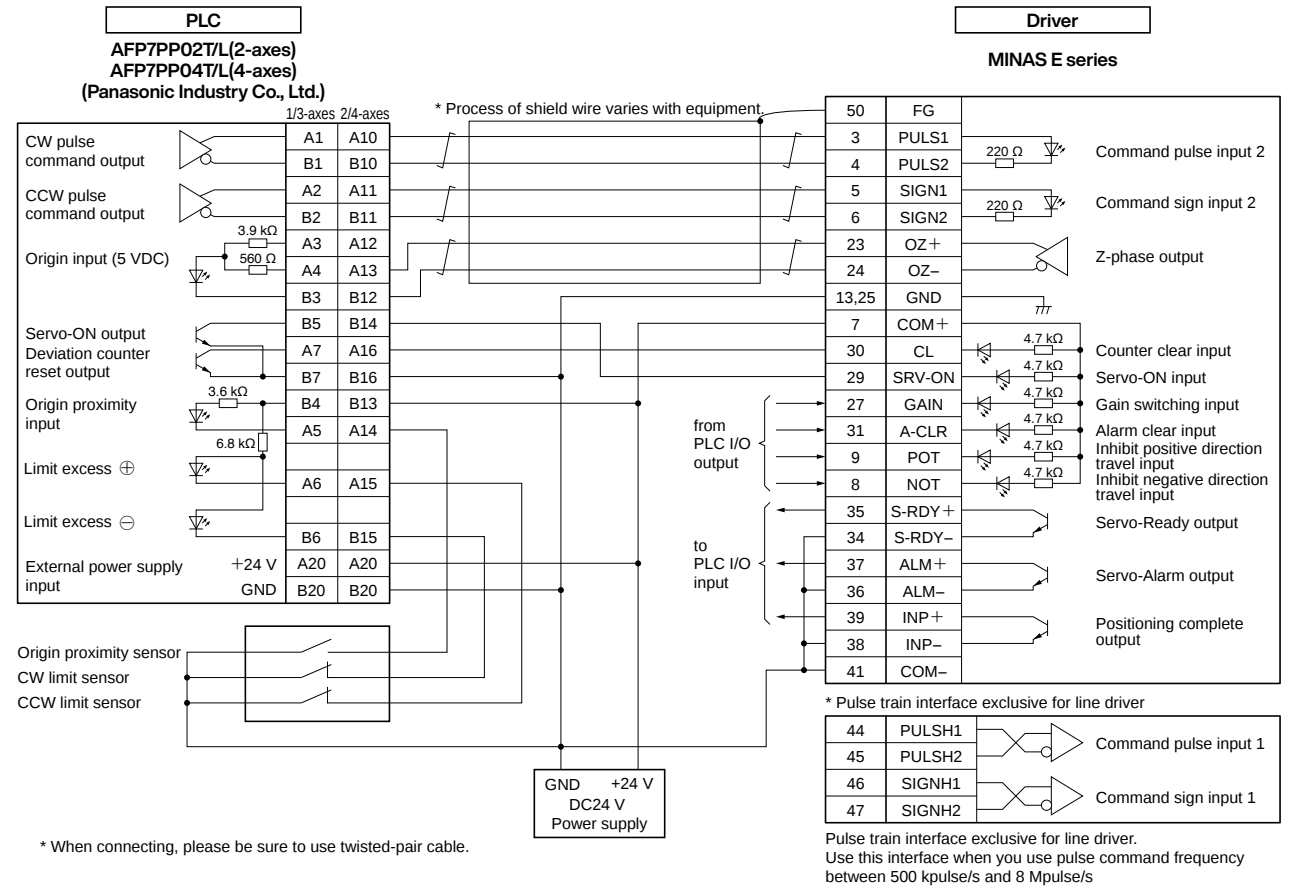
E Series

Information

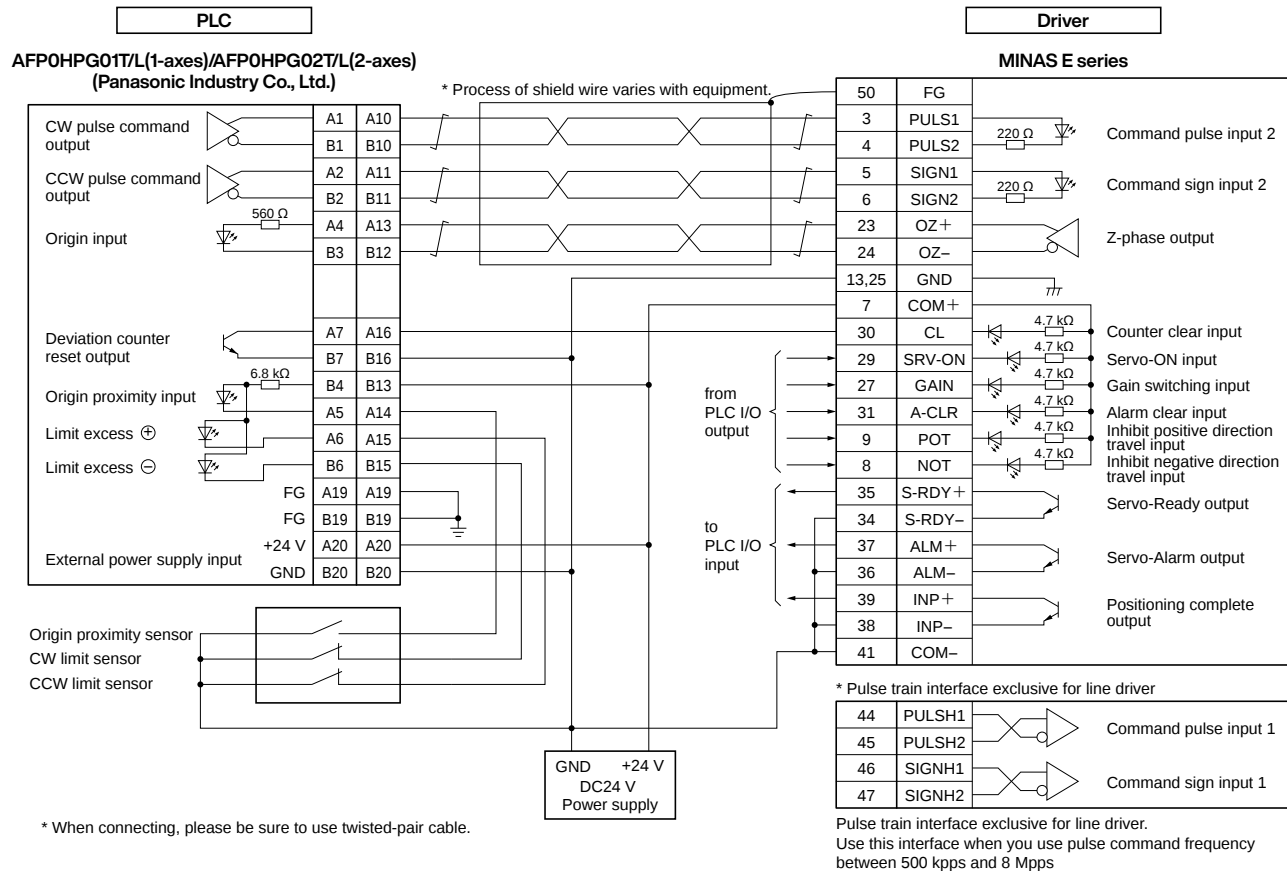
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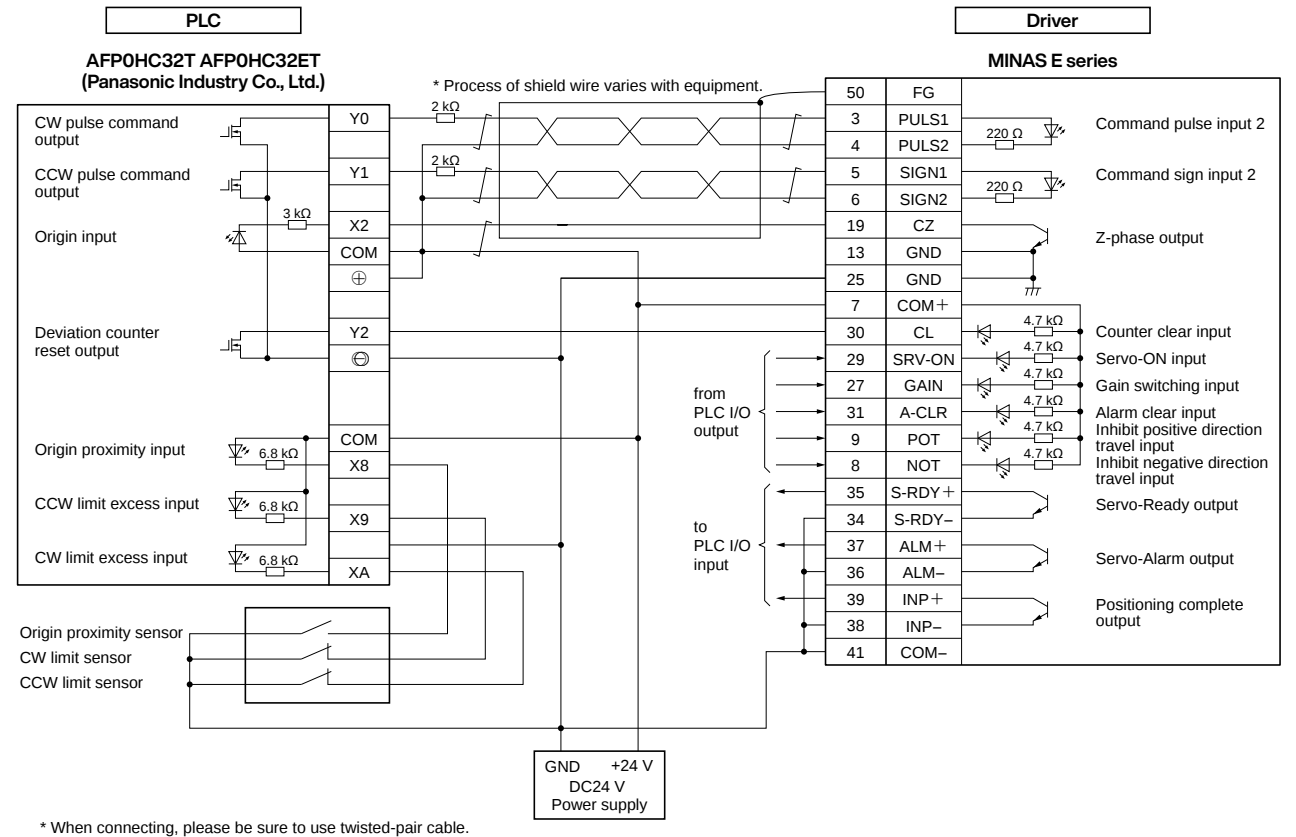
FP7 AFP7PG02T/L (2 axes) Connection with AFP7PG04T/L (4 axes)



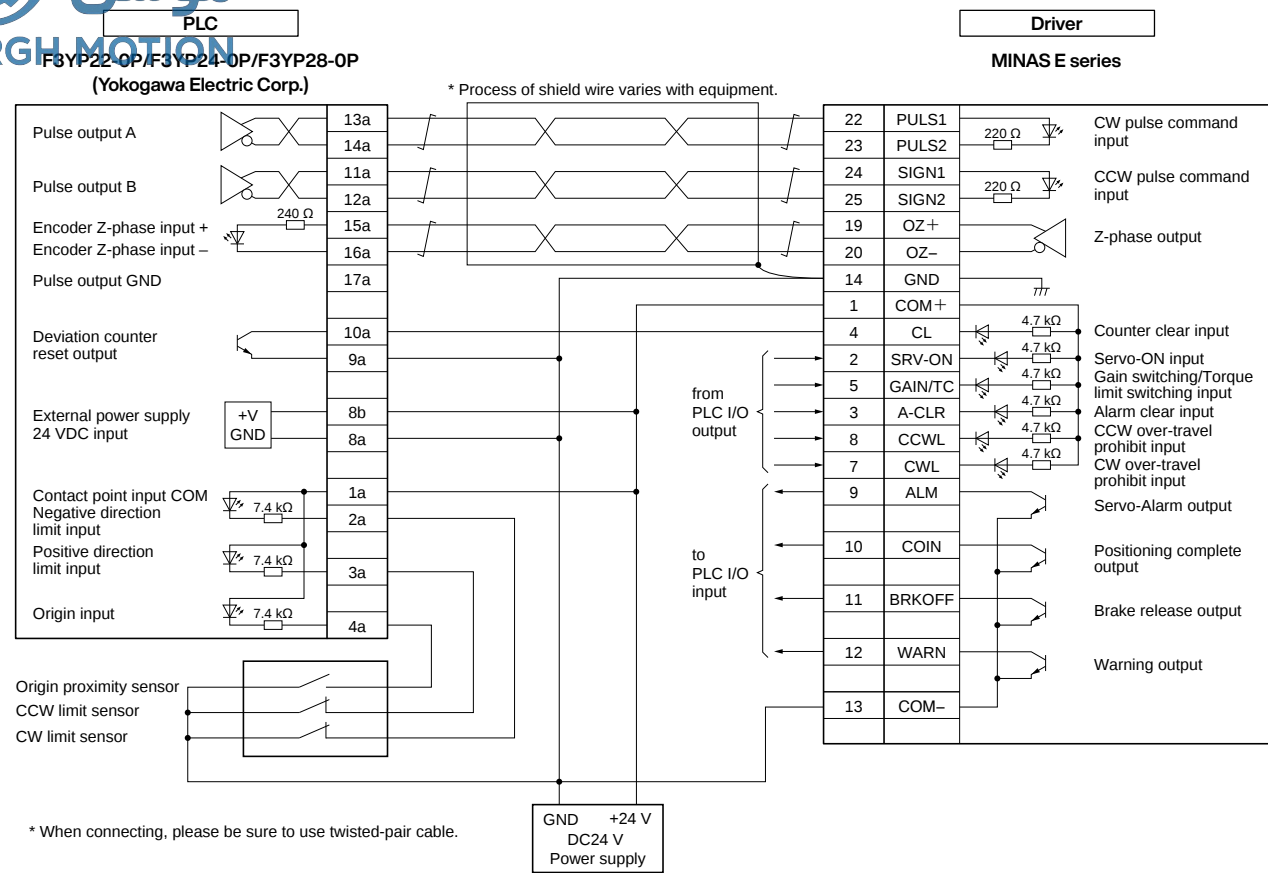
FP0H AFP0HPG01T/L (1 axis) Connection with AFP0HPG02T/L (2 axes)



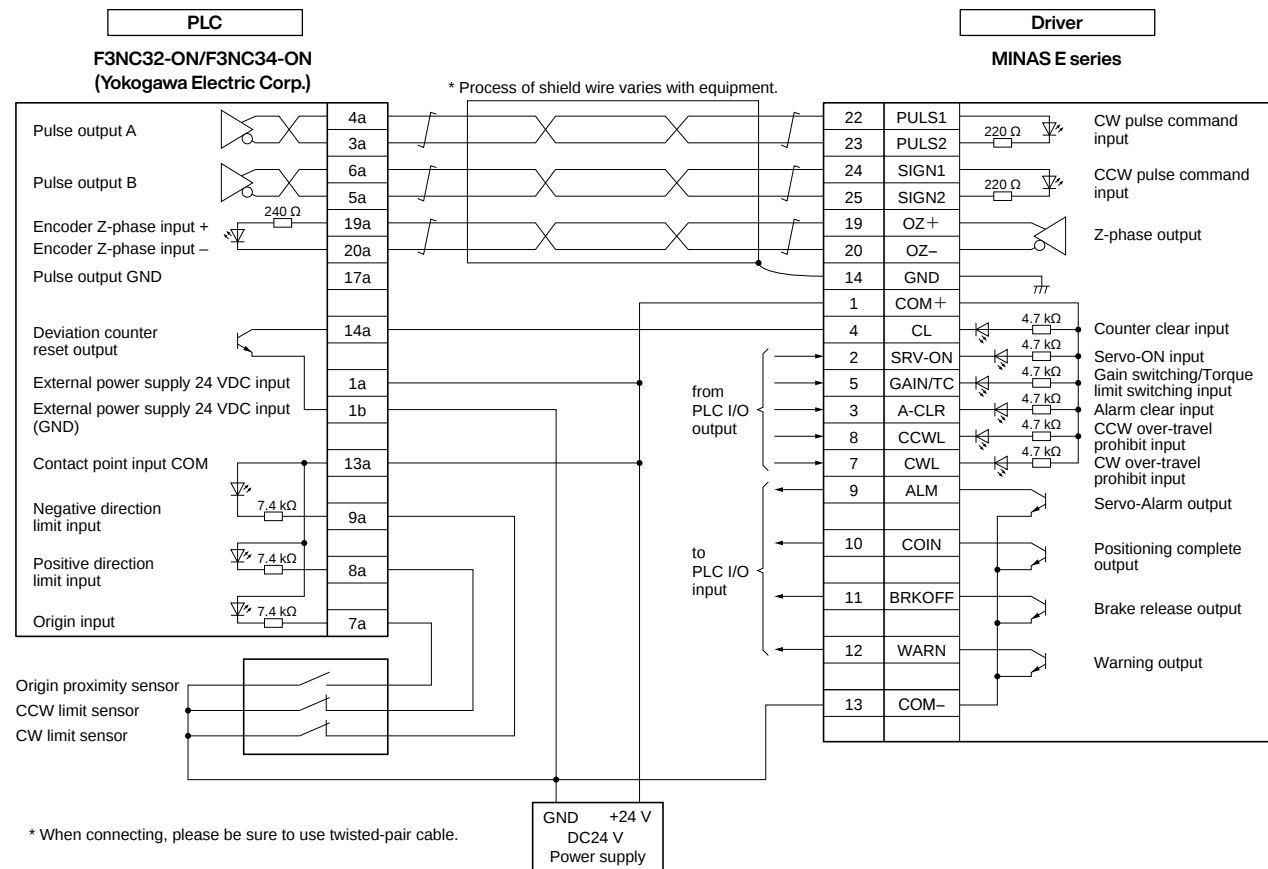
FP0H AFP0HC32T Connection with AFP0HC32ET



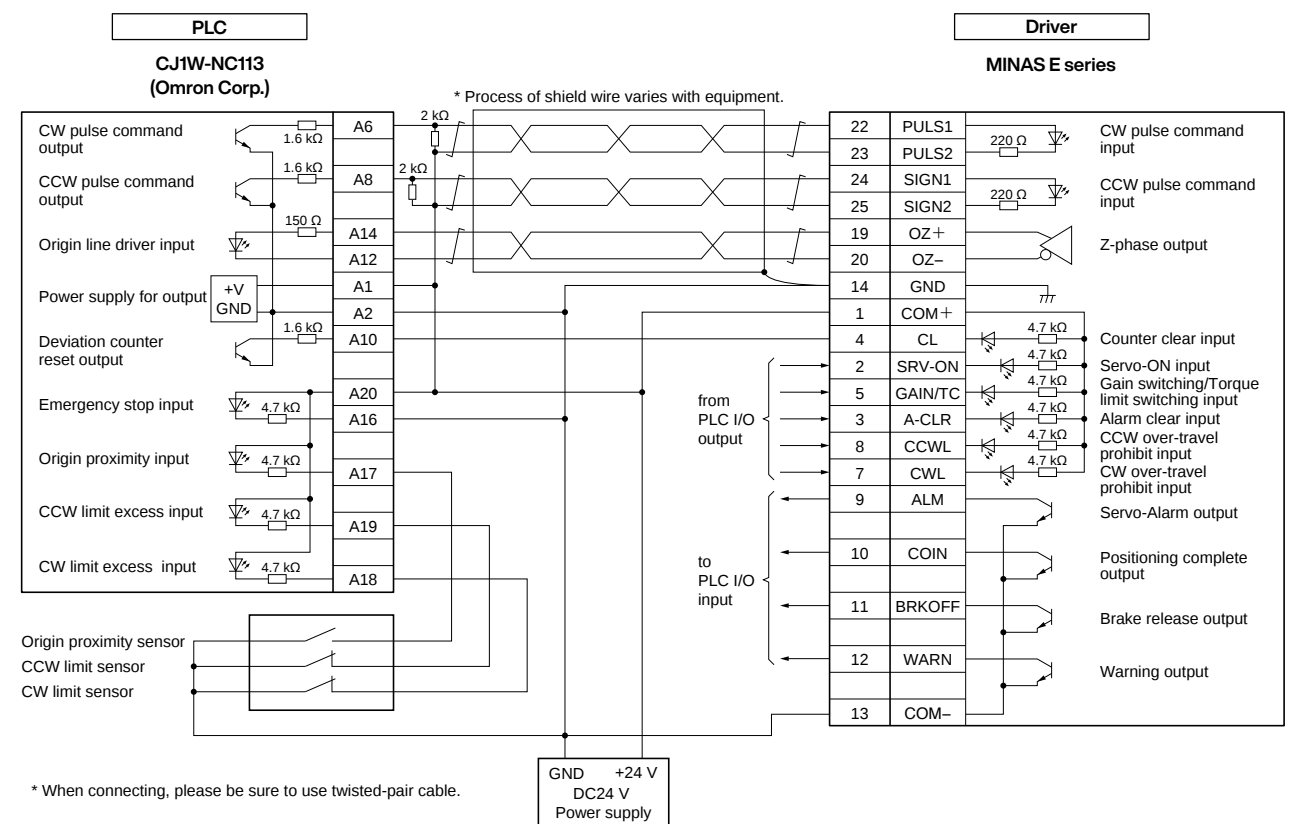
F3YP22-0P/F3YP24-0P/F3YP28-0P Connection with the Yokogawa Electric Corp.



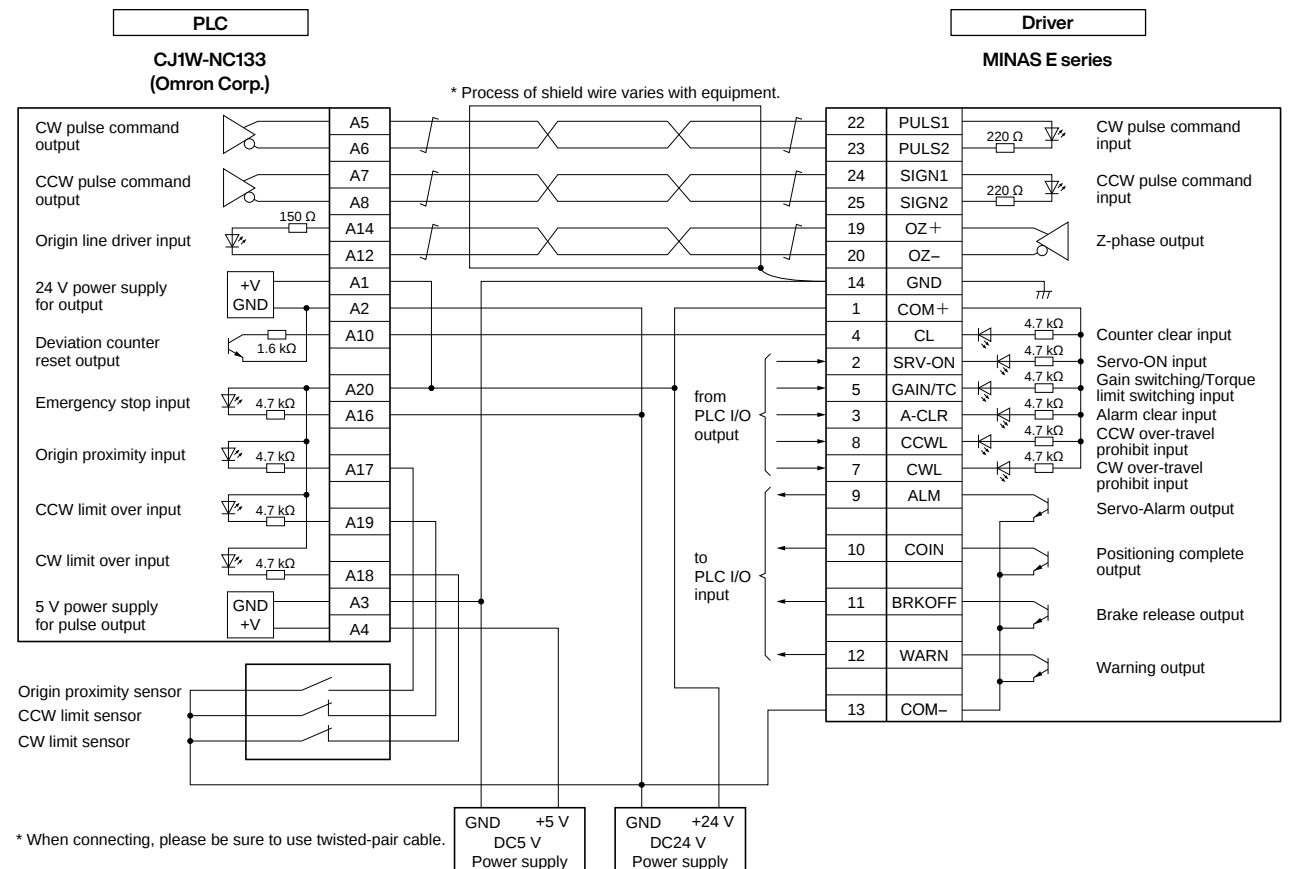
F3NC32-ON/F3NC34-ON Connection with the Yokogawa Electric Corp.



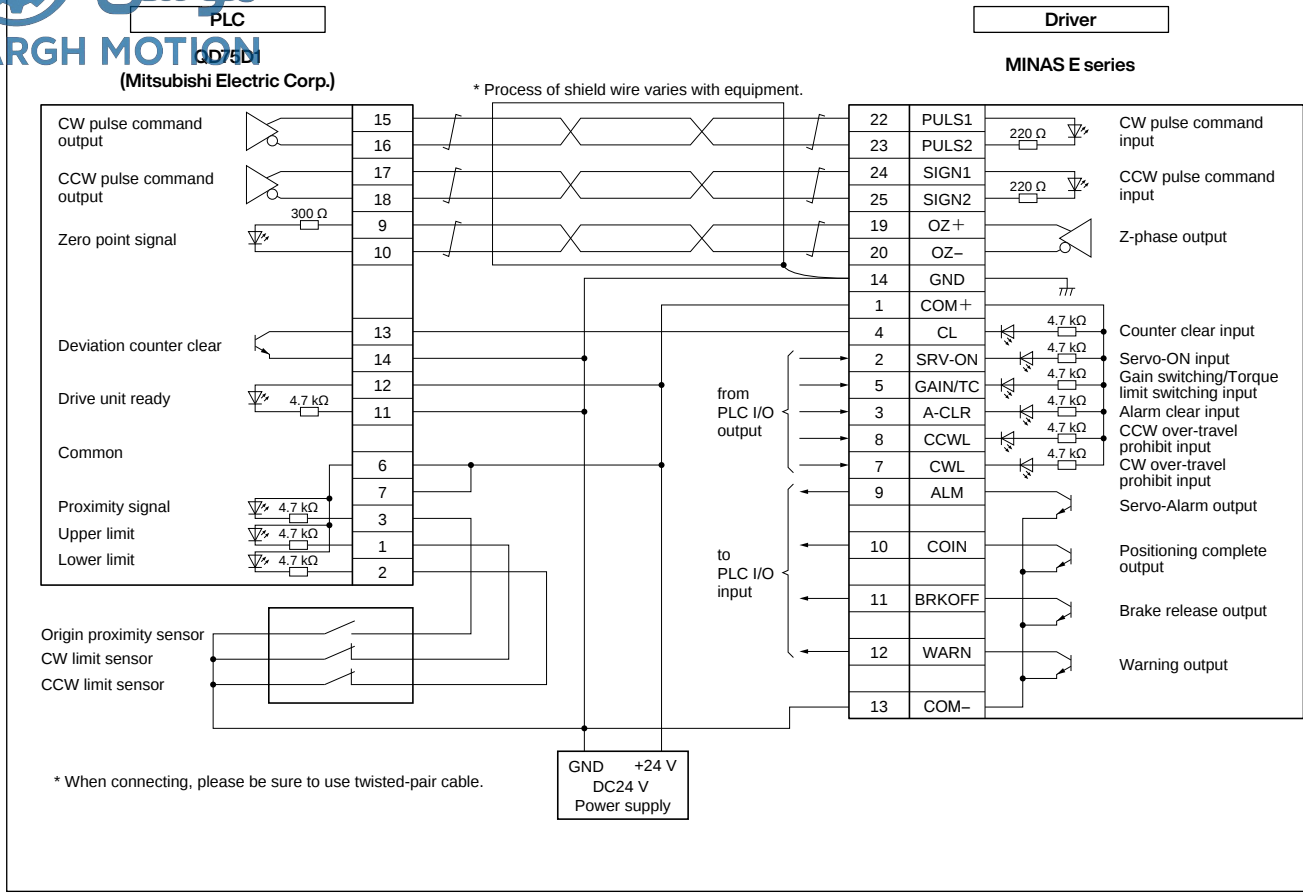
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