Information

Contents

EU Directives/ UK Regulation

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

EU EMC Directives/UK EMC Regulation

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

Conformity to UL Standards

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

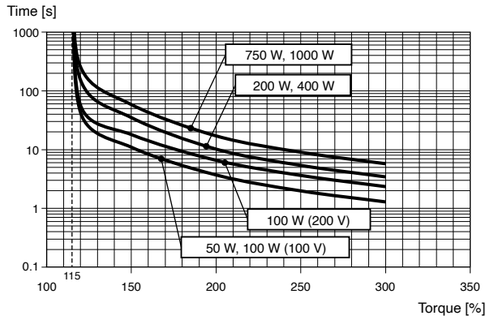
(1) Use the driver in an environment of Pollution Degree 2 or 1 prescribed in IEC60664-1.
(e.g. Install in the control box with IP54 enclosure.)

(2) 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.

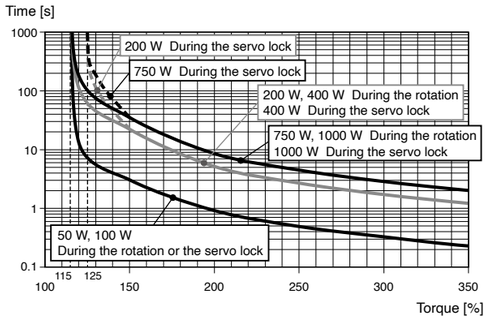
(3) Over-load protection level
Over-load protective function will be activated when the effective current exceeds 115 % or more than the rated current based on the time characteristics (see the graph). Confirm that the effective current of the driver does not exceed the rated current.
Set up the peak permissible current with Pr0.13 (Setup of 1st torque limit) and Pr5.22 (Setup 2nd torque limit).

■ Overload protection time characteristics

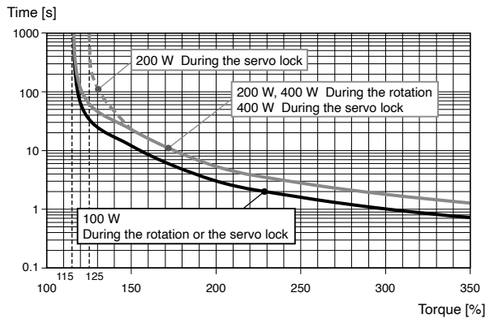
▪ **Motor type: 80 mm sq. or less MSMF**



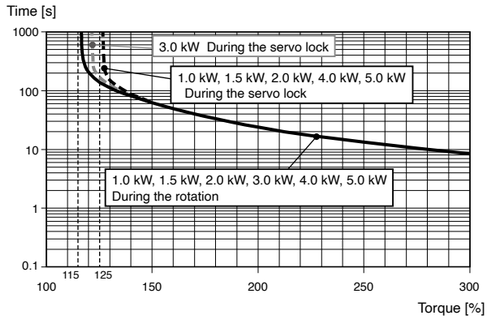
▪ **Motor type: 80 mm sq. or less MHMF**



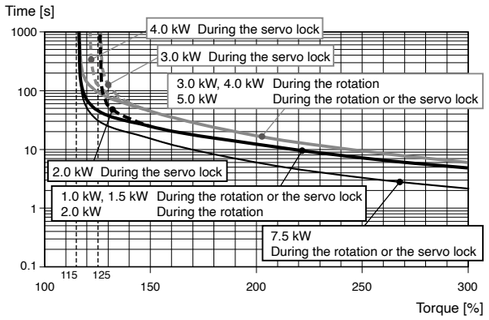
▪ **Motor type: 80 mm sq. or less MQMF**



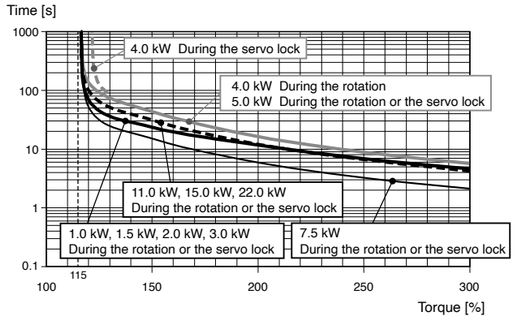
▪ **Motor type: 100 mm sq. or more MSMF**



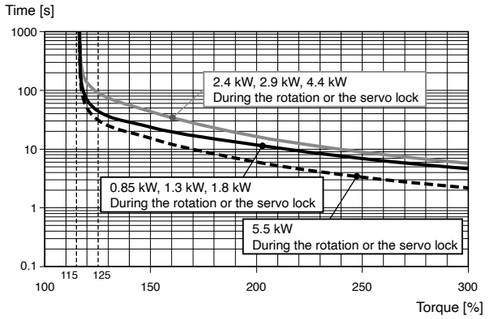
▪ **Motor type: 100 mm sq. or more MHMF**



▪ **Motor type: 100 mm sq. or more MDMF**



▪ **Motor type: 100 mm sq. or more MGMF**



Conformed Standards

		Driver	Motor
EU/UK Standards	**EU EMC Directives/ UK EMC Regulation**	EN55011 EN61000-6-2 EN61000-6-4 EN61800-3	—
	EU Low Voltage Directives/ UK Low Voltage Regulation	EN61800-5-1	EN60034-1 EN60034-5
	Machinery (Functional safety *1)	ISO13849-1(PL e, Cat.3) EN61508(SIL3) EN62061(SILCL 3) EN61800-5-2(SIL3, STO)	—
UL Standards		UL61800-5-1 (E164620)	UL1004-1, UL1004-6 (E327868)
CSA Standards		C22.2 No.14	C22.2 No.100
Radio Waves Act (South Korea) (KC) *2		KN11 KN61000-4-2,3,4,5,6,8,11	—

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

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

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

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

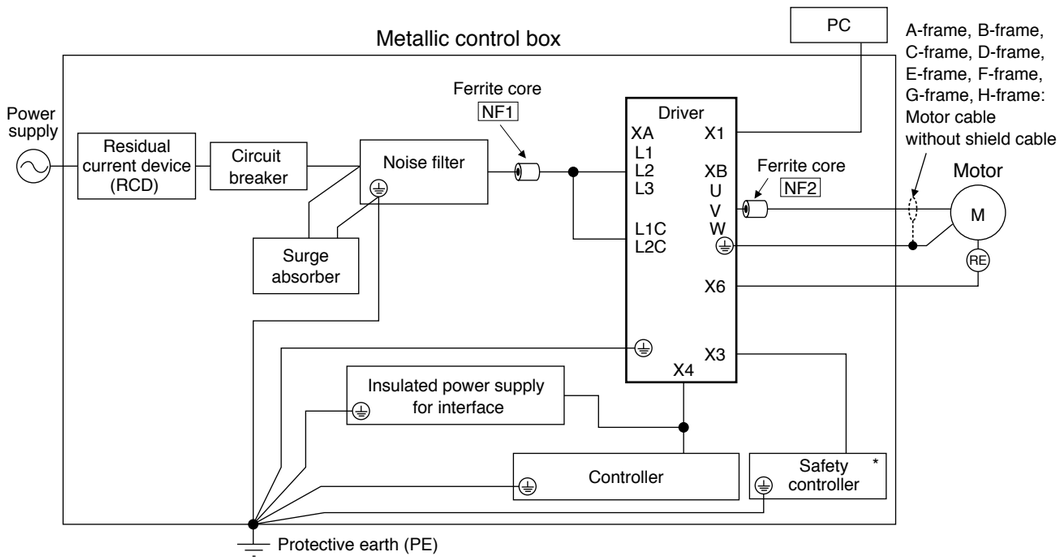
*2 Information related to the Korea Radio Law
This servo driver is a Class A commercial broadcasting radio wave generator not designed for home use. The user and dealer should be aware of this fact.

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

(대상기종 : Servo Driver **)**

Installation Environment

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



For NF1 to NF2, refer to the Table "Ferrite core" (P.414).

* A6SE, A6SG, A6NE, A6BE is not provided with X3 terminal.

<Caution>

Use options correctly after reading Operating Instructions of the options to better understand the precautions.

Take care not to apply excessive stress to each optional part.

Power Supply

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

(1) This product is designed to be used in over-voltage category (installation category) III of EN 61800-5-1:2007.

(2) Use an insulated power supply of DC12 V to 24 V which has CE marking or complies with EN60950.

Circuit Breaker

Install a circuit breaker which complies with IEC Standards and UL recognized (Listed and marked) between power supply and noise filter.

The short-circuit protection circuit on the product is not for protection of branch circuit.

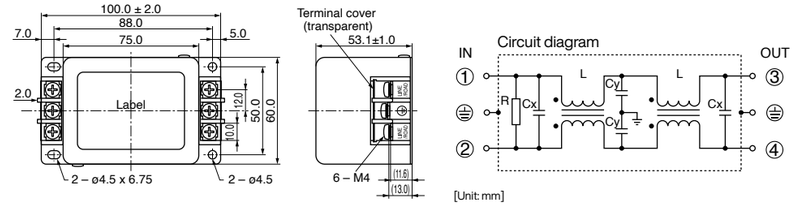
The branch circuit should be protected in accordance with NEC and the applicable local regulations in your area.

Noise Filter

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

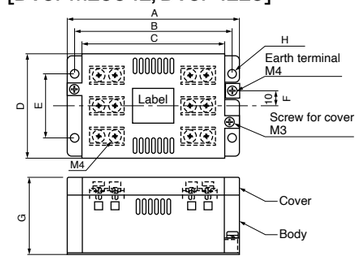
▪ Options

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

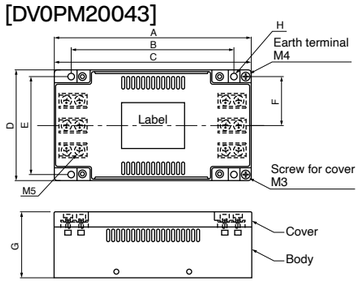


Option part No.	Voltage specifications for driver	Manufacturer's part No.	Applicable driver (frame)	Manufacturer
DV0PM20042	3-phase 200 V	3SUP-HU10-ER-6	A-frame and B-frame	Okaya Electric Ind.
	Single phase 100 V, 200 V 3-phase 200 V		C-frame	
DV0P4220	Single/3-phase 200 V	3SUP-HU30-ER-6	D-frame	
DV0PM20043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

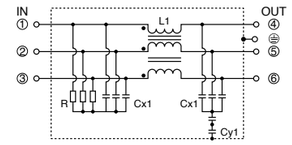
[DV0PM20042, DV0P4220]



[DV0PM20043]



Circuit diagram

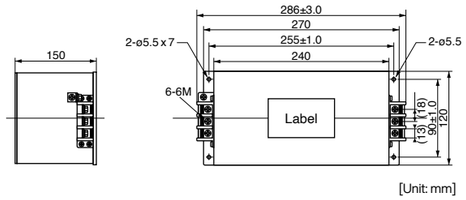


[Size] [Unit: mm]

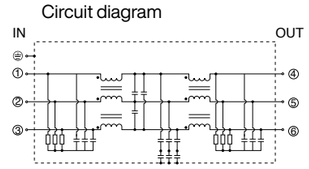
	A	B	C	D	E	F	G	H
DV0PM20042	115	105	95	70	43	10	52	5.5
DV0P4220	145	135	125	70	50	10	52	5.5
DV0PM20043	165	136	165	90	80	40	54	5.5

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

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



Circuit diagram



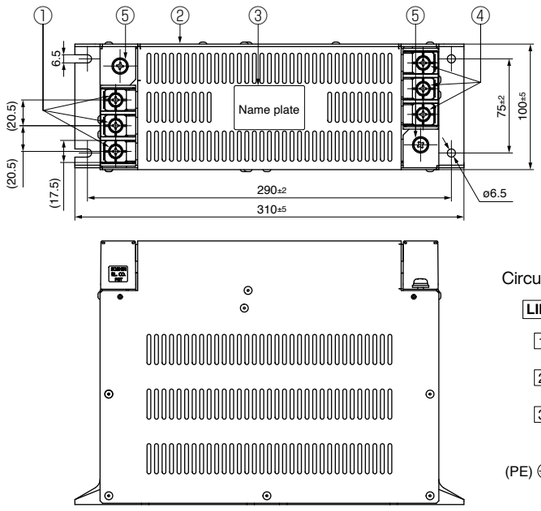
<Remarks>

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

Noise Filter

▪ Recommended components

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



<Remarks>

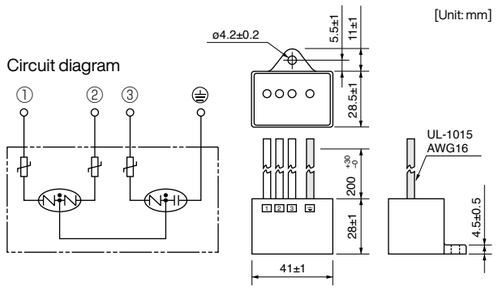
- Select a noise filter of capacity that exceeds the capacity of the power source (also check for load condition).
- For detailed specification of the filter, contact the manufacturer.
- When you install one noise filter at the power supply for multi-axes application, contact the manufacturer of the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

Surge Absorber

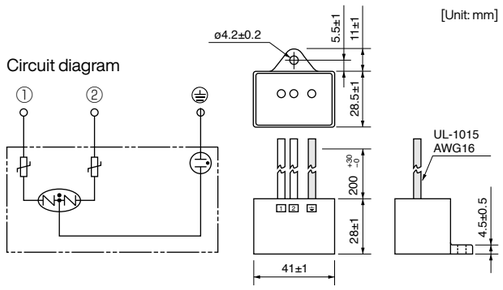
Provide a surge absorber for the primary side of noise filter.

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

[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				3
			—	RJ8095	Konno Kogyosho Co.Ltd	1
NF2	Motor cable	A, B, C, D, E	DV0P1460	ZCAT3035-1330	TDK Corp.	1
		F				2
		G, H				3
			—	T400-61D	MICROMETALS	1

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

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

<Remarks>

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

<Caution>

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

Fig.1: DV0P1460 (Option) 4 pieces

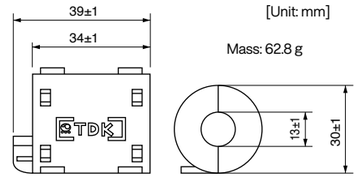


Fig.3: T400-61D (Recommended components) 1 pieces

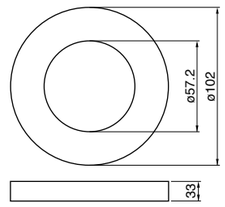
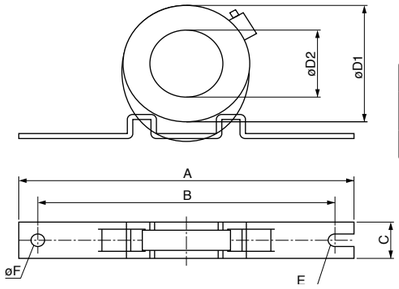


Fig.2: RJ8095 (Recommended components) 1 pieces



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

Residual Current Device

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

Grounding

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

<Note>

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

Compliance to EU/ UK Regulation and EMC Directives

EU Directives/ UK Regulation

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

EU EMC Directives/UK EMC Regulation

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

Conformed Standards

Subject	Conformed Standard		
Motor	IEC60034-1	IEC60034-5 UL1004 CSA22.2 No.100	Conforms to EU Low Voltage Directives/UK Low Voltage Regulation
Motor and driver		UL61800-5-1 CSA22.2 No.14	
	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	
	IEC61000-4-2	Electrostatic Discharge Immunity Test	
	IEC61000-4-3	Radio Frequency Electromagnetic Field Immunity Test	
	IEC61000-4-4	Electric High-Speed Transition Phenomenon/Burst Immunity Test	
	IEC61000-4-5	Lightening Surge Immunity Test	
	IEC61000-4-6	High Frequency Conduction Immunity Test	
	IEC61000-4-11	Instantaneous Outage Immunity Test	

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

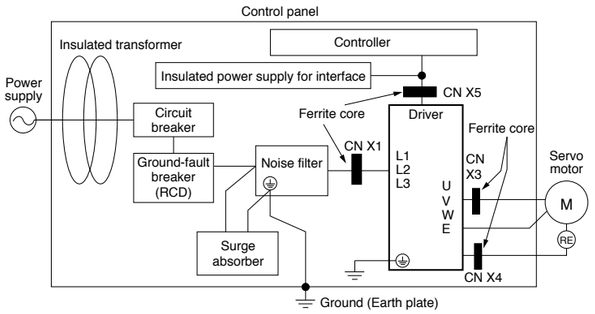
Pursuant to at the directive 2004/108/EC, article 9(2)

Composition of Peripheral Components

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

Installation Environment

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



Power Supply

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

(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).

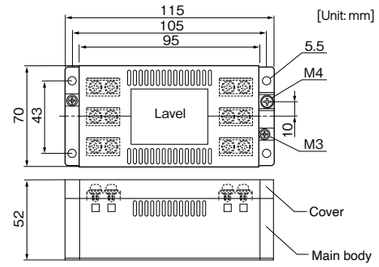
Circuit Breaker

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

Noise Filter

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

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



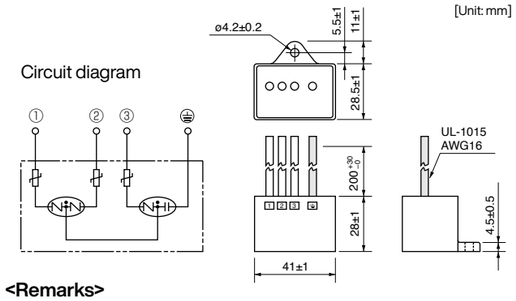
Surge Absorber

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

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

[Unit: mm]

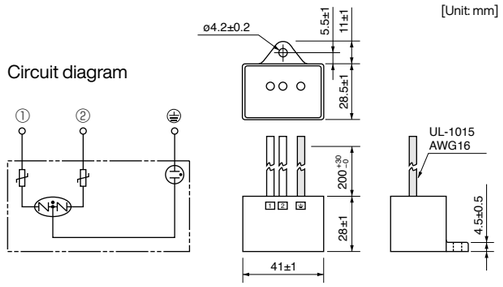
Circuit diagram



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

[Unit: mm]

Circuit diagram



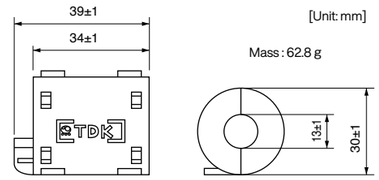
<Remarks>
Remove this surge absorber when you perform dielectric test on the machine, or surge absorber might be damaged.

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

AC Servo Motor Capacity Selection Software

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

▪ Three-step selection

1. Select components and specified values

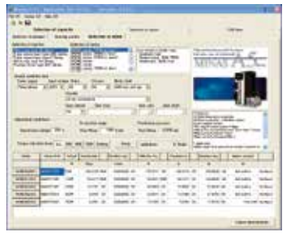
Select appropriate mechanical parameter items and fill them with parameter values derived from the real machine. To simulate the target machine as practical as possible, use maximum number of parameters available.

2. Enter operation pattern

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

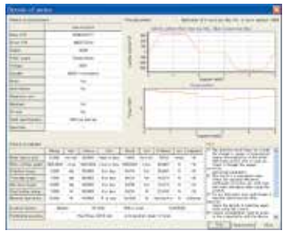
3. Select the motor

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



Details of motor

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



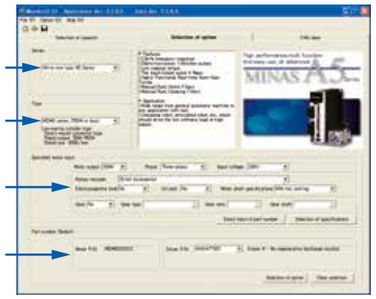
Option Selection Software for AC Servo Motor

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

▪ Two procedures for option selection

1. Selection according to driver series and motor type

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

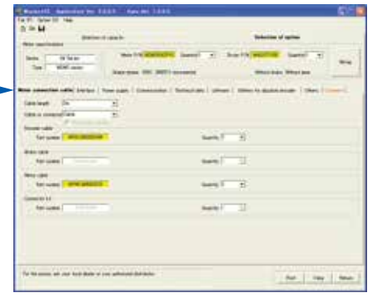


2. Entry of model number

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

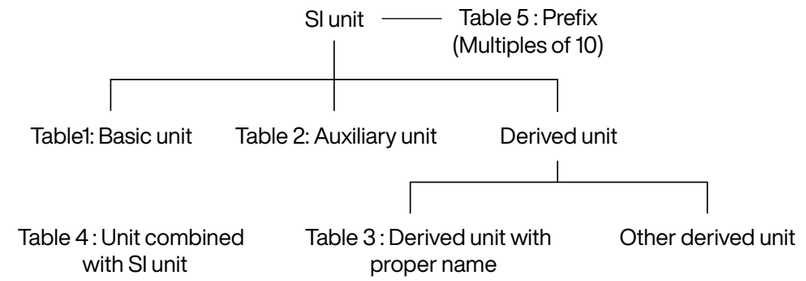


Table1: Basic unit

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	$1\,N = 1\,kg{\cdot}m/s^2$
Pressure, Stress	pascal	Pa	$1\,Pa = 1\,N/m^2$
Energy, Work, Amount of heat	joule	J	$1\,J = 1\,N{\cdot}m$
Amount of work, Work efficiency, Power, Electric power	watt	W	$1\,W = 1\,J/s$
Electric charge, Amount of electricity	coulomb	C	$1\,C = 1\,A{\cdot}s$
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	$1\,\Omega = 1\,V/A$
Electric conductance	siemens	S	$1\,S = 1\,\Omega^{-1}$
Magnetic flux	weber	Wb	$1\,Wb = 1\,V{\cdot}s$
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	$1\,lm = 1\,cd{\cdot}sr$
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 x 10^4 Pa = 0.980665 bar
	at (Engineering atmospheric pressure)	Pa	1 at = 9.80665 x 10^4 Pa
	atm (Atmospheric pressure)	Pa	1 atm = 1.01325 x 10^5 Pa
	mH_2O, mAq	Pa	1 mH_2O = 9.80665 x 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 x 10^6 Pa =9.80665 x 10^6 N/m^2
	kgf/cm^2	Pa or N/m^2	1 kgf/cm^2 = 9.80665 x 10^4 Pa = 9.80665 x 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 x 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”.

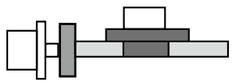
Flow of Motor Selection

Flow of Motor Selection

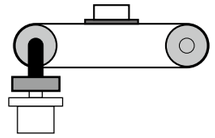
1. Definition of mechanism to be driven by motor.
Define details of individual mechanical components (ball screw length, lead and pulley diameters, etc.)

<Typical mechanism>

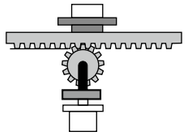
Ball screw mechanism



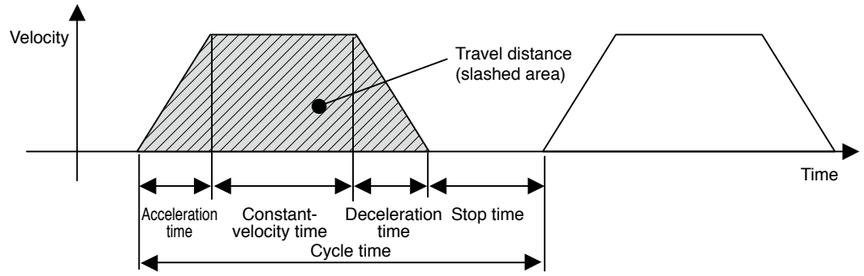
Belt mechanism



Rack & pinion, etc.



2. Definition of operating pattern.
Acceleration/deceleration time, Constant-velocity time, Stop time, Cycle time, Travel distance



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

3. Calculation of load inertia and inertia ratio.
Calculate load inertia for each mechanical component. (Refer to "General inertia calculation method" described later.)
Divide the calculated load inertia by the inertia of the selected motor to check the inertia ratio.
For calculation of the inertia ratio, note that the catalog value of the motor inertia is expressed as "× 10^{-4} kg·m^2".

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

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

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

Description on the Items Related to Motor Selection

1. Torque

(1) Peak torque

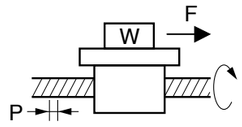
Indicate the maximum torque that the motor requires during operation (mainly in acceleration and deceleration steps). The reference value is 80% or less of the maximum motor torque. If the torque is a negative value, a regenerative discharge resistor may be required.

(2) Traveling torque, Stop holding torque

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

Traveling torque calculation formula for each mechanism

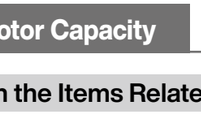
Ball screw mechanism



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

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 $T_f = \frac{D}{2\pi\eta}(\mu g W + F)$

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.

$$Trms = \sqrt{\frac{Ta^2 \times ta + Tf^2 \times tb + Td^2 \times td}{tc}}$$

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

2. Motor velocity

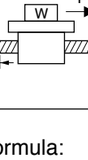
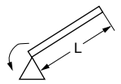
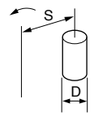
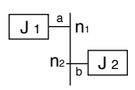
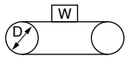
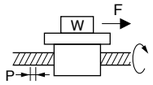
Maximum velocity

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.)

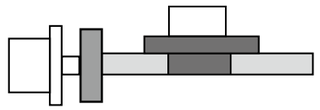
General inertia calculation method

Shape	J calculation formula	Shape	J calculation formula
Disk 	$J = \frac{1}{8} W D^2$ [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 	$J = \frac{1}{3} W L^2$ [kg·m^2] W : Weight [kg] L : Length [m]	**Separated rod** 	$J = \frac{1}{8} W D^2 + W S^2$ [kg·m^2] W : Weight [kg] D : Outer diameter [m] S : Distance [m]
Reduction gear 	Inertia on shaft "a" $J = J_1 + (\frac{n_2}{n_1})^2 J_2$[kg·m^2] n_1 : A rotational speed of a shaft [r/min] n_2 : A rotational speed of b shaft [r/min]		
Conveyor 	$J = \frac{1}{4} W D^2$ [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/m^3] x Volume V[m^3]
Density of each material
Iron ρ =7.9 x 10^3 [kg/m^3] Aluminum ρ =2.8 x 10^3 [kg/m^3]
Brass ρ =8.5 x 10^3 [kg/m^3]

To Drive Ball Screw Mechanism

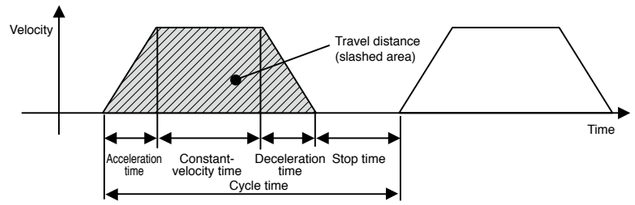
1. Example of motor selection for driving ball screw mechanism



Workpiece weight $W_A = 10\ [kg]$
Ball screw length $B_L = 0.5\ [m]$
Ball screw diameter $B_D = 0.02\ [m]$
Ball screw lead $B_P = 0.02\ [m]$
Ball screw efficiency $B\eta = 0.9$
Travel distance 0.3[m]
Coupling inertia $J_C = 10 \times 10^{-6}\ [kg \cdot m^2]$ (Use manufacturer-specified catalog value, or calculation value.)

2. Running pattern :

Acceleration time $t_a = 0.1\ [s]$
Constant-velocity time $t_b = 0.8\ [s]$
Deceleration time $t_d = 0.1\ [s]$
Cycle time $t_c = 2\ [s]$
Travel distance 0.3[m]



3. Ball screw weight

$$B_W = \rho \times \pi \times \left(\frac{B_D}{2}\right)^2 \times B_L = 7.9 \times 10^3 \times \pi \times \left(\frac{0.02}{2}\right)^2 \times 0.5$$
$$= 1.24\ [kg]$$

4. Load inertia

$$J_L = J_C + J_B = J_C + \frac{1}{8} B_W \times B_D^2 + \frac{W_A \cdot B_P^2}{4\pi^2}$$
$$= 0.00001 + (1.24 \times 0.02^2) / 8 + 10 \times 0.02^2 / 4\pi^2$$
$$= 1.73 \times 10^{-4}\ [kg \cdot m^2]$$

5. Provisional motor selection

In case of MSMF 200 W motor : $J_M = 0.14 \times 10^{-4}\ [kg \cdot m^2]$

6. Calculation of inertia ratio

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

7. Calculation of maximum velocity (Vmax)

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

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

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

9. Calculation of torque

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

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

Deceleration torque $T_d = \frac{(J_L + J_M) \times 2\pi N[r/s]}{\text{Deceleration time}\ [s]}$ – Traveling torque
$= \frac{(1.73 \times 10^{-4} + 0.14 \times 10^{-4}) \times 2\pi \times 16.7}{0.1} - 0.035$
$= 0.196 - 0.035 = 0.161\ [N \cdot m]$

10. Verification of maximum torque

Acceleration torque = $T_a = 0.231\ [N \cdot m] < 1.91\ [N \cdot m]$ (Maximum torque of MSMF 200 W motor)

11. Verification of effective torque

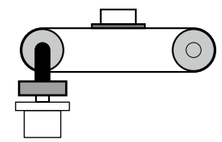
$$T_{rms} = \sqrt{\frac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}}$$
$$= \sqrt{\frac{0.231^2 \times 0.1 + 0.035^2 \times 0.8 + 0.161^2 \times 0.1}{2}}$$
$$= 0.067\ [N \cdot m] < 0.64\ [N \cdot m]$$ (Rated torque of MSMF 200 W motor)

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

Example of Motor Selection

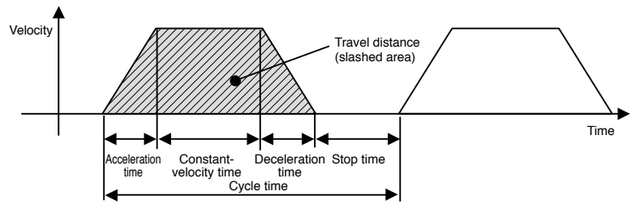
Example of motor selection for timing belt mechanism

1.Mechanism
Workpiece weight $W_A = 2[kg]$ (including belt)
Pulley diameter $P_D = 0.05[m]$
Pulley weight $W_P = 0.5[kg]$ (Use manufacturer-specified catalog value, or calculation value.)
Mechanical efficiency $B\eta = 0.8$
Coupling inertia $J_C = 0$ (Direct connection to motor shaft)
Belt mechanism inertia J_B
Pulley inertia J_P



2. Running pattern

Acceleration time $t_a = 0.1[s]$
Constant-velocity time $t_b = 0.8[s]$
Deceleration time $t_d = 0.1[s]$
Cycle time $t_c = 2[s]$
Travel distance 1[m]



3. Load inertia $J_L = J_C + J_B + J_P$

$= J_C + \frac{1}{4} W_A \times P_D^2 + \frac{1}{8} W_P \times P_D^2 \times 2$
$= 0 + \frac{1}{4} \times 2 \times 0.05^2 + \frac{1}{8} \times 0.5 \times 0.05^2 \times 2$
$= 0.00156 = 15.6 \times 10^{-4}\ [kg \cdot m^2]$

4. Provisional motor selection

In case of MSMF 750 W motor : $J_M = 0.96 \times 10^{-4}\ [kg \cdot m^2]$

5. Calculation of inertia ratio

$J_L / J_M = 15.6 \times 10^{-4} / 0.96 \times 10^{-4}$ Therefore, the inertia ratio is "16.3" (less than "20")

6. Calculation of maximum velocity (Vmax)

$\frac{1}{2}$ × Acceleration time × Vmax + Constant-velocity time × Vmax + $\frac{1}{2}$ × Deceleration time × Vmax = Travel distance

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

$$0.9 \times Vmax = 1$$

$$Vmax = 1 / 0.9 = 1.111[m/s]$$

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

A single rotation of pulley : $\pi \times P_D = 0.157[m]$

$N = 1.111 / 0.157 = 7.08[r/s]$

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

8. Calculation of torque

Traveling torque

$$T_f = \frac{P_D}{2\eta}(\mu g W_A + F) = \frac{0.05}{2 \times 0.8}(0.1 \times 9.8 \times 3 + 0)$$

$$= 0.061[N \cdot m]$$

Acceleration torque

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

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

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

Deceleration torque

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

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

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

9. Verification of maximum torque

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

10. Verification of effective torque

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

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

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

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

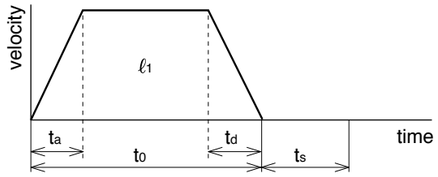
Request Sheet for Motor Selection

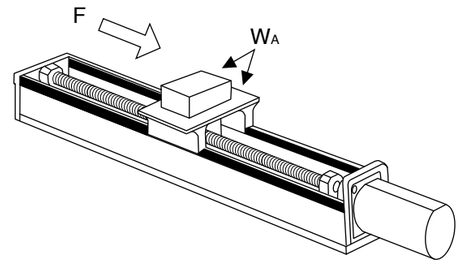
Request for motor selection Ⅰ : Ball screw drive

1. Driven mechanism and running data

1)	Travel distance of the work load per one cycle	ℓ_1:	mm
2)	Cycle time	t_0:	s
	(Fill in items 3) and 4) if required.)		
3)	Acceleration time	t_a:	s
4)	Deceleration time	t_d:	s
5)	Stopping time	t_s:	s
6)	Max. velocity	V:	mm/s
7)	External force	F:	N
8)	Positioning accuracy of the work load	±	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		mm
13)	Lead of the ball screw		mm
14)	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:

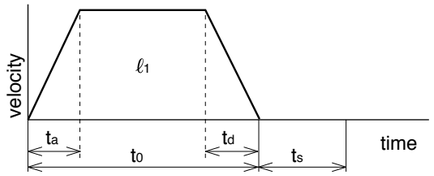
Request Sheet for Motor Selection

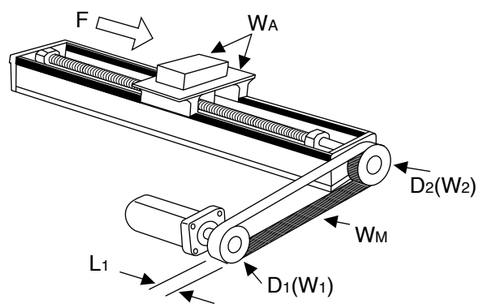
Request for motor selection Ⅱ : Timing pulley + Ball screw drive

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	to: 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	ta: s	17) Width of the pulley	L1: mm	
4)	Deceleration time	td: s	18) Material of the pulley		
5)	Stopping time	ts: 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	± 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.)				

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:

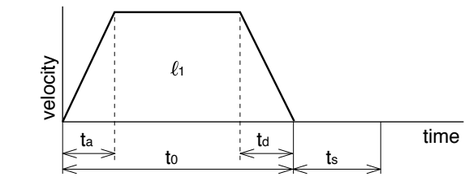
Request Sheet for Motor Selection

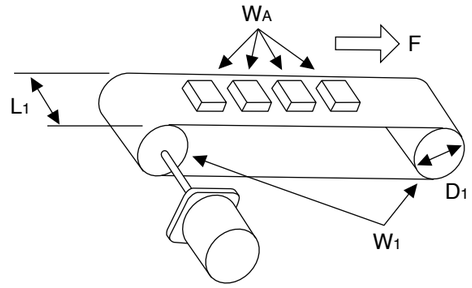
Request for motor selection Ⅲ : Belt drive

1. Driven mechanism and running data

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

Running pattern





(or item 14) and 15))

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

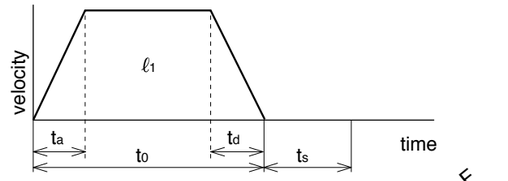
1. Driven mechanism and running data

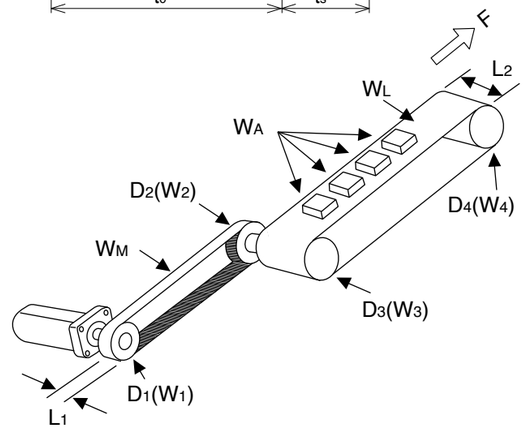
1)	Travel distance of the work load per one cycle	ℓ_1:	mm		
2)	Cycle time	t_0:	s		
	(Fill in items 3) and 4) if required.)				
3)	Acceleration time	t_a:	s		
4)	Deceleration time	t_d:	s		
5)	Stopping time	t_s:	s		
6)	Max. velocity	V:	mm/s		
7)	External force	F:	N		
8)	Positioning accuracy of the work load	±	mm		
9)	Total weight of the work load	W_A:	kg		
10)	Power supply voltage		V		
11)	Weight of motor side belt	W_M:	kg		

		Motor side		Belt side	
12)	Diameter of the pulley	D_1:	mm	D_2:	mm
13)	Weight of the pulley	W_1:	kg	W_2:	kg
	(or item 14) and 15))				
14)	Width of the belt	L_1:	mm		
15)	Material of the pulley				

		Motor side		Belt side	
16)	Diameter of the pulley	D_3:	mm	D_4:	mm
17)	Weight of the pulley	W_3:	kg	W_4:	kg
	(or item 18) and 19))				
18)	Width of the pulley	L_2:	mm		
19)	Material of the pulley				
20)	Weight of the belt	W_L:	kg		
21)	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:

Request Sheet for Motor Selection

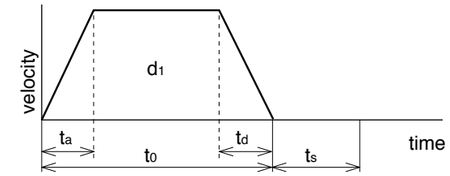
Request for motor selection Ⅴ : Turntable drive

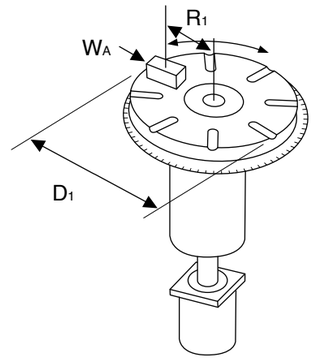
1. Driven mechanism and running data

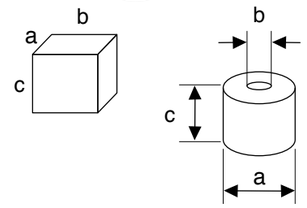
1)	Travel distance of the work load per one cycle	d_1:	deg
2)	Cycle time	t_0:	s
	(Fill in items 3) and 4) if required.)		
3)	Acceleration time	t_a:	s
4)	Deceleration time	t_d:	s
5)	Stopping time	t_s:	s
6)	Max. rotational speed of the table	v:	deg/s
	(or)	V:	r/s
7)	Positioning accuracy of the work load	±	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

		Prism		Cylinder	
14)	Dimensions of the work load	a:	mm	a:	mm
		b:	mm	b:	mm
		c:	mm	c:	mm
15)	Number of work loads		pcs		

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

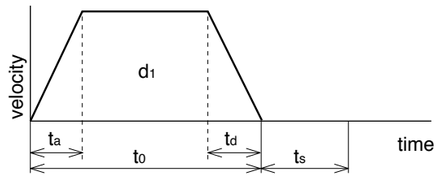
1. Driven mechanism and running data

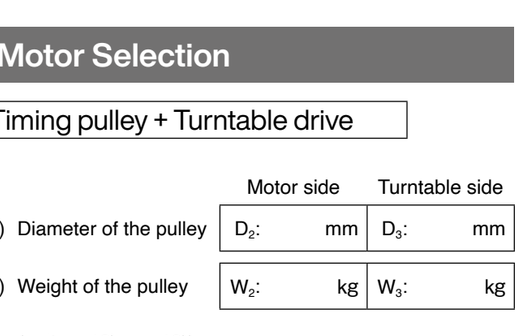
1)	Travel distance of the work load per one cycle	d_1:	deg		
2)	Cycle time	t_0:	s		
	(Fill in items 3) and 4) if required.)				
3)	Acceleration time	t_a:	s		
4)	Deceleration time	t_d:	s		
5)	Stopping time	t_s:	s		
6)	Max. rotational speed of the table	v:	deg/s		
	(or)	V:	r/s		
7)	Positioning accuracy 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		

		(Prism)		(Cylinder)	
14)	Dimension of the work load	a:	mm	a:	mm
		b:	mm	b:	mm
		c:	mm	c:	mm
15)	Number of work loads		pcs		

		Motor side		Turntable side	
16)	Diameter of the pulley	D_2:	mm	D_3:	mm
17)	Weight of the pulley	W_2:	kg	W_3:	kg
	(or item 18) and 19))				
18)	Width of the pulley	L_1:	mm		
19)	Material of the pulley				
20)	Weight of the belt	W_M:	kg		

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:

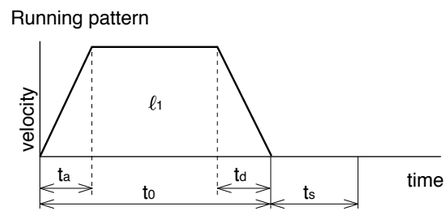
Request Sheet for Motor Selection

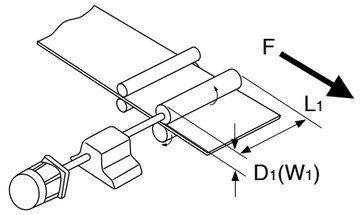
Request for motor selection Ⅶ : Roller feed drive

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		
12)	Mass of the roller	W_1:	kg		
	(or item 13) and 14))				
13)	Width of the roller	L_1:	mm		
14)	Material of the roller				

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:

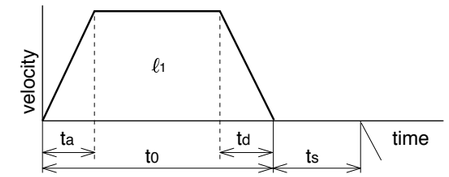
Request Sheet for Motor Selection

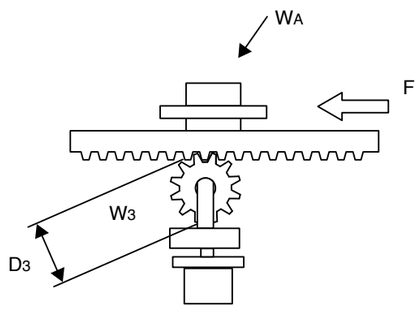
Request for motor selection Ⅷ : Driving with Rack & Pinion

1. Driven mechanism and running data

1)	Travel distance of the work load per one cycle	ℓ_1:	mm
2)	Cycle time	to:	s
	(Fill in items 3) and 4) if required.)		
3)	Acceleration time	ta:	s
4)	Deceleration time	td:	s
5)	Stopping time	ts:	s
6)	Max. velocity	V:	mm/s
7)	External force	F:	N
8)	Positioning accuracy of the work load	±	mm
9)	Total weight of the work load	W_A:	kg
10)	Power supply voltage		V
11)	Diameter of the pinion	D_3:	mm
12)	Mass of the pinion	W_3:	kg
13)	Traveling direction (horizontal, vertical, etc.)		

Running pattern

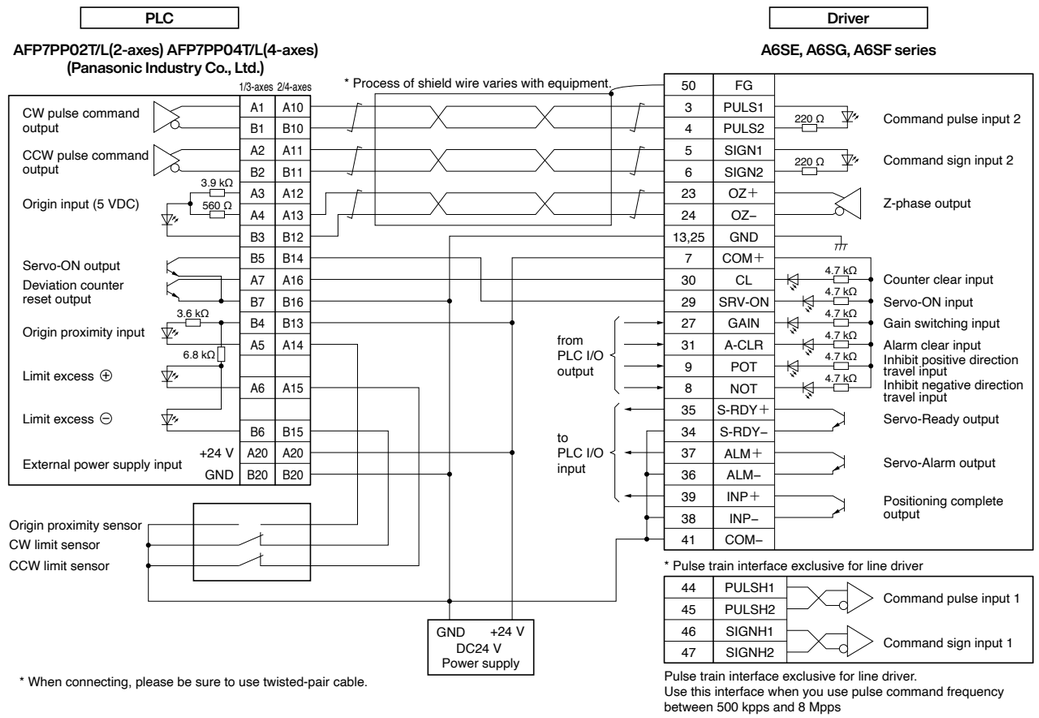




2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

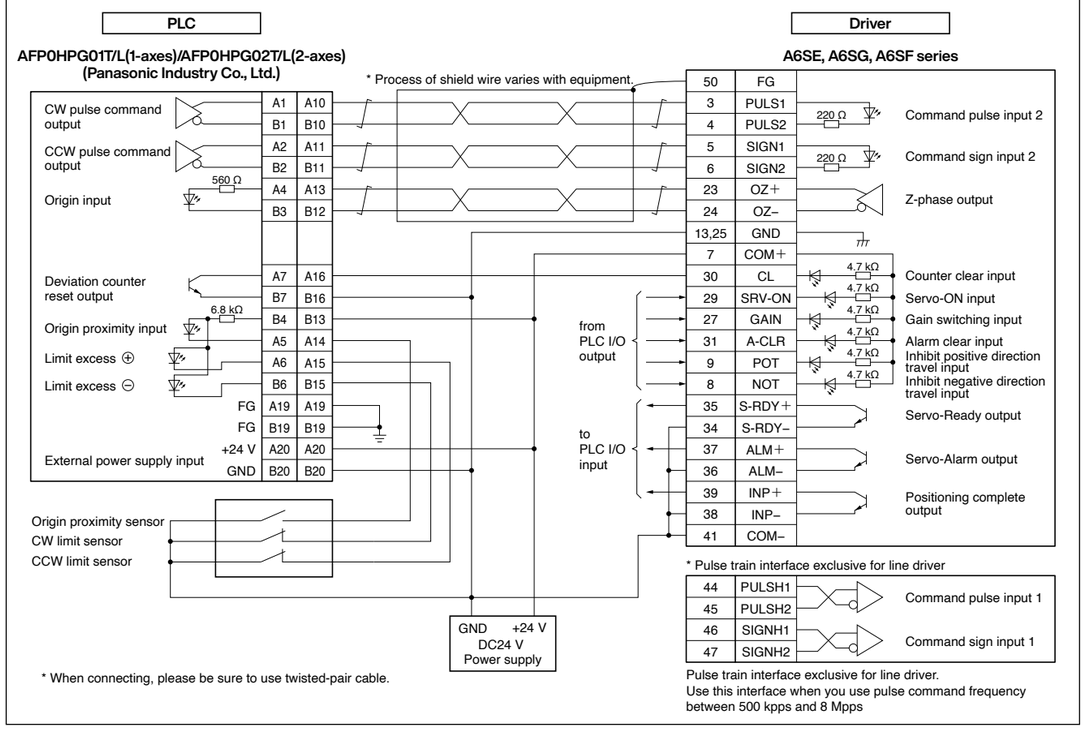
	Company name :
	Department/Section :
	Name :
	Address :
	Tel :
	Fax :
	E-mail address:

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



CW pulse command output	A1	A10	50	FG	
	B1	B10	3	PULS1	Command pulse input 2
CCW pulse command output	A2	A11	4	PULS2	
	B2	B11	5	SIGN1	Command sign input 2
Origin input (5 VDC)	A3	A12	6	SIGN2	
	A4	A13	23	OZ+	Z-phase output
	B3	B12	24	OZ–	
	B5	B14	13,25	GND	
Servo-ON output	A7	A16	7	COM+	
Deviation counter reset output	B7	B16	30	CL	Counter clear input
	B4	B13	29	SRV-ON	Servo-ON input
Origin proximity input	A5	A14	27	GAIN	Gain switching input
			31	A-CLR	Alarm clear input
Limit excess ⊕	A6	A15	9	POT	Inhibit positive direction travel input
Limit excess ⊖			8	NOT	Inhibit negative direction travel input
	B6	B15	35	S-RDY+	Servo-Ready output
External power supply input +24 V	A20	A20	34	S-RDY–	
GND	B20	B20	37	ALM+	Servo-Alarm output
			36	ALM–	
			39	INP+	Positioning complete output
			38	INP–	
			41	COM–	
			44	PULSH1	Command pulse input 1
			45	PULSH2	
			46	SIGNH1	Command sign input 1
			47	SIGNH2	

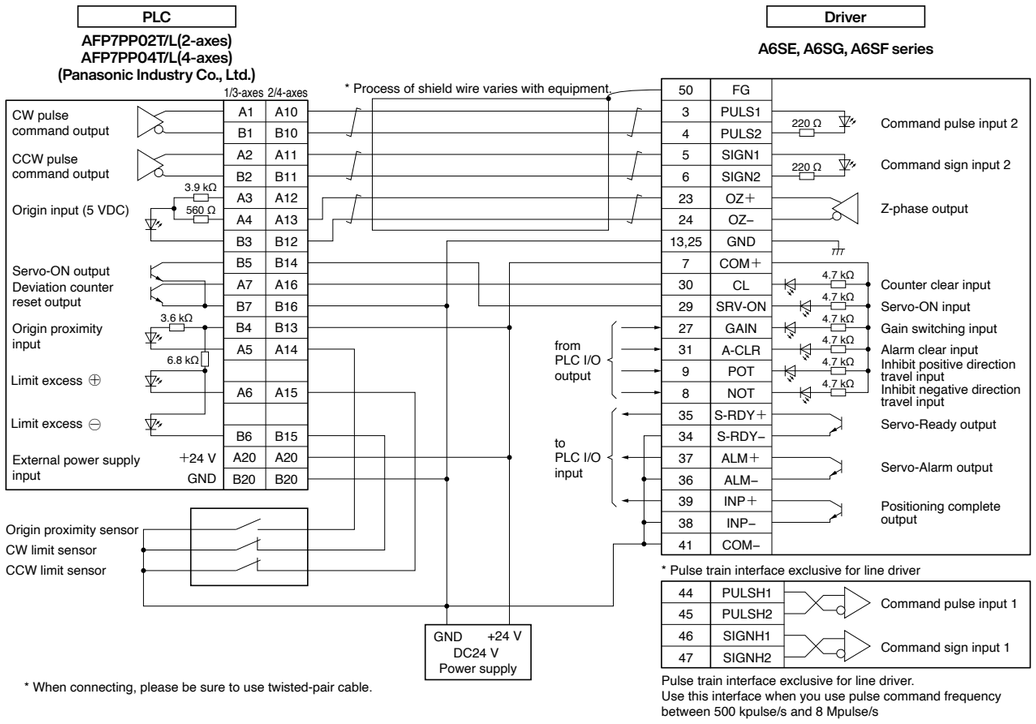
FP0H AFP0HPG01T/L (1 axis) Connection with AFP0HPG02T/L (2 axes)



CW pulse command output	A1	A10	50	FG	
	B1	B10	3	PULS1	Command pulse input 2
CCW pulse command output	A2	A11	4	PULS2	
	B2	B11	5	SIGN1	Command sign input 2
Origin input	A4	A13	6	SIGN2	
	B3	B12	23	OZ+	Z-phase output
			24	OZ–	
			13,25	GND	
Deviation counter reset output	A7	A16	7	COM+	
	B7	B16	30	CL	Counter clear input
Origin proximity input	B4	B13	29	SRV-ON	Servo-ON input
	A5	A14	27	GAIN	Gain switching input
Limit excess ⊕	A6	A15	31	A-CLR	Alarm clear input
Limit excess ⊖	B6	B15	9	POT	Inhibit positive direction travel input
FG	A19	A19	8	NOT	Inhibit negative direction travel input
FG	B19	B19	35	S-RDY+	Servo-Ready output
+24 V	A20	A20	34	S-RDY–	
External power supply input GND	B20	B20	37	ALM+	Servo-Alarm output
			36	ALM–	
			39	INP+	Positioning complete output
			38	INP–	
			41	COM–	
			44	PULSH1	Command pulse input 1
			45	PULSH2	
			46	SIGNH1	Command sign input 1
			47	SIGNH2	

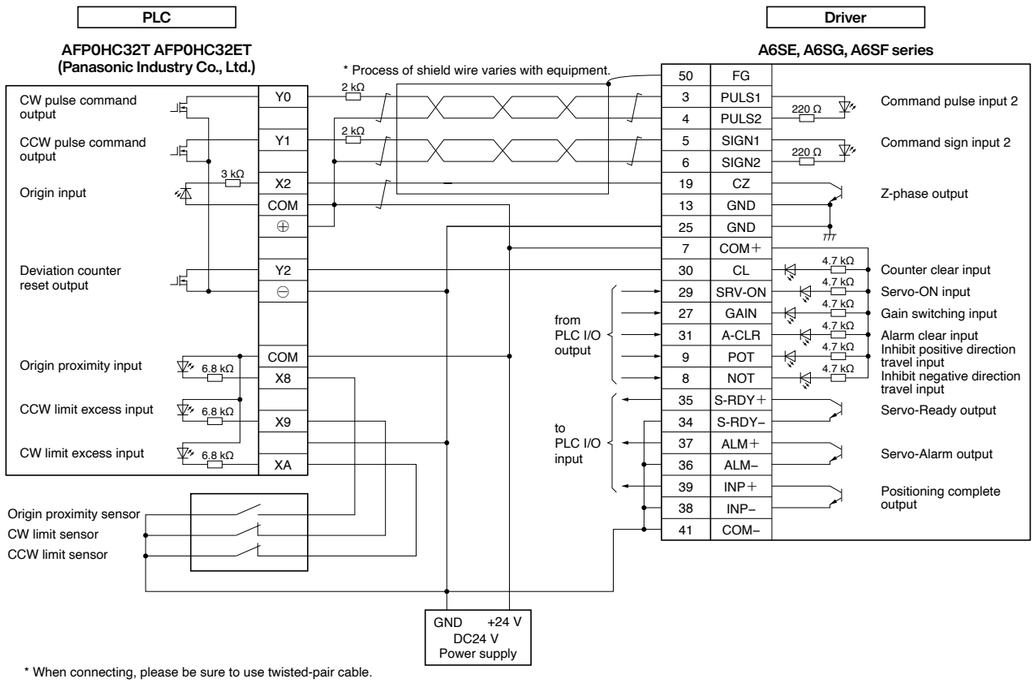
Connection Between Driver and Controller

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



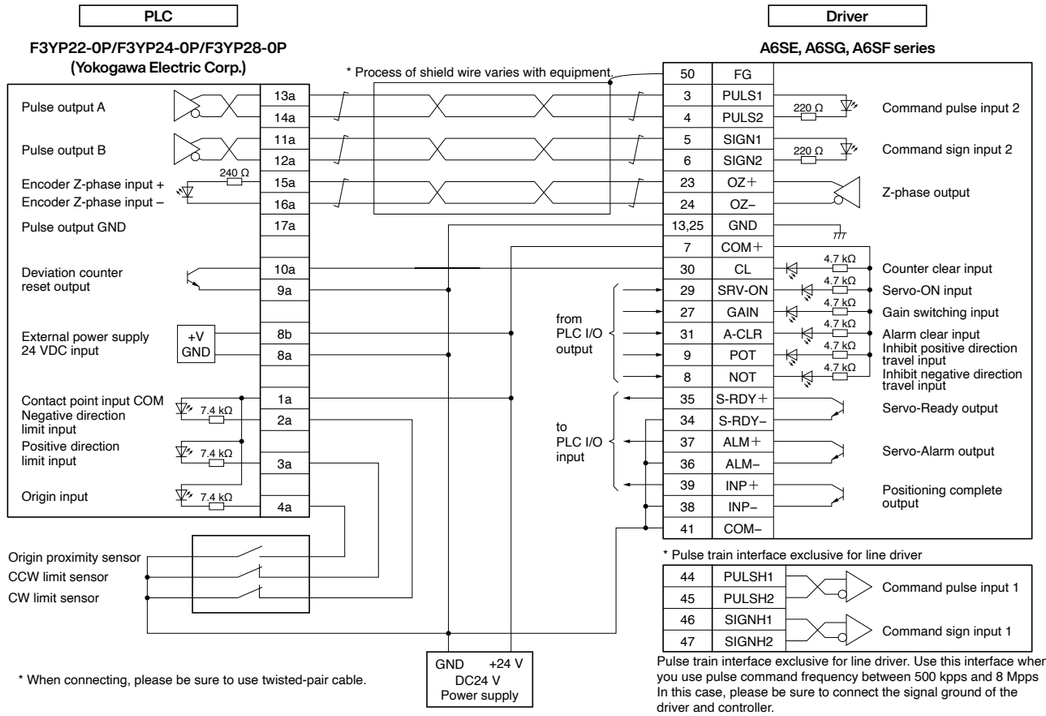
		A1	A10	50	FG
		B1	B10	3	PULS1
		A2	A11	4	PULS2
		B2	B11	5	SIGN1
		A3	A12	6	SIGN2
		A4	A13	23	OZ+
		B3	B12	24	OZ–
		B5	B14	13,25	GND
		A7	A16	7	COM+
		B7	B16	30	CL
		B4	B13	29	SRV-ON
		A5	A14	27	GAIN
				31	A-CLR
		A6	A15	9	POT
				8	NOT
		B6	B15	35	S-RDY+
+24 V		A20	A20	34	S-RDY–
GND		B20	B20	37	ALM+
				36	ALM–
				39	INP+
				38	INP–
				41	COM–
				44	PULSH1
				45	PULSH2
				46	SIGNH1
				47	SIGNH2

FP0H AFP0HC32T Connection with AFP0HC32ET



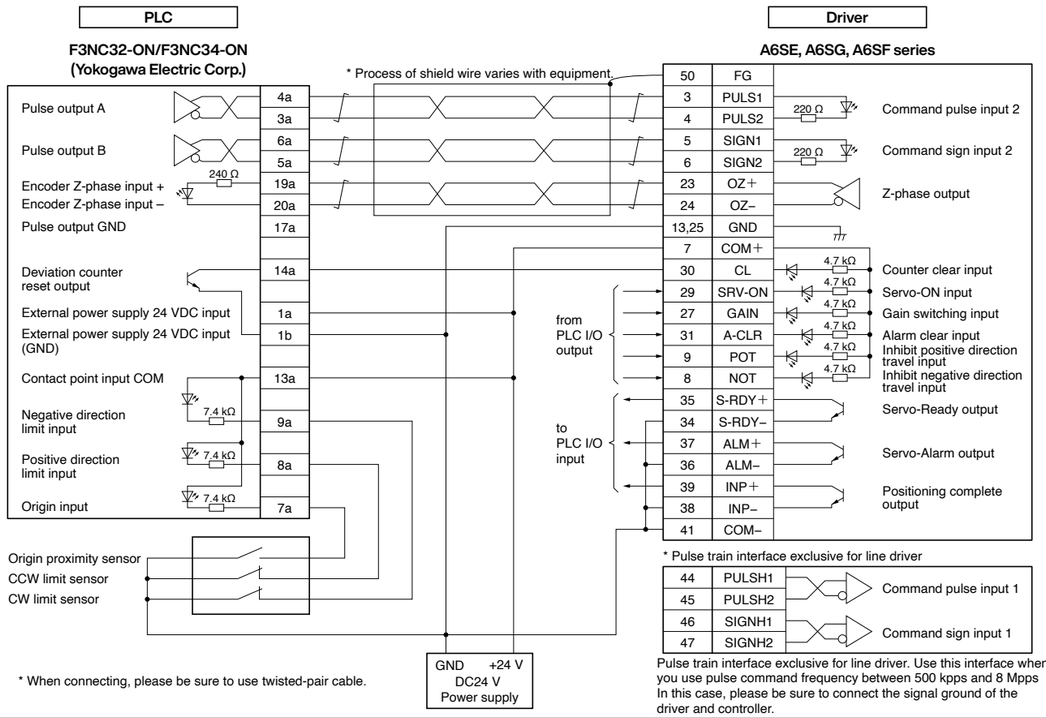
		Y0		50	FG
		Y1		3	PULS1
		X2		4	PULS2
		COM		5	SIGN1
		⊕		6	SIGN2
				19	CZ
		Y2		13	GND
		⊖		25	GND
				7	COM+
		COM		30	CL
		X8		29	SRV-ON
				27	GAIN
		X9		31	A-CLR
				9	POT
		XA		8	NOT
				35	S-RDY+
				34	S-RDY–
				37	ALM+
				36	ALM–
				39	INP+
				38	INP–
				41	COM–

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



		13a		50	FG
		14a		3	PULS1
		11a		4	PULS2
		12a		5	SIGN1
		15a		6	SIGN2
		16a		23	OZ+
		17a		24	OZ–
				13,25	GND
		10a		7	COM+
		9a		30	CL
				29	SRV-ON
		8b		27	GAIN
		8a		31	A-CLR
				9	POT
		1a		8	NOT
		2a		35	S-RDY+
				34	S-RDY–
		3a		37	ALM+
				36	ALM–
		4a		39	INP+
				38	INP–
				41	COM–
				44	PULSH1
				45	PULSH2
				46	SIGNH1
				47	SIGNH2

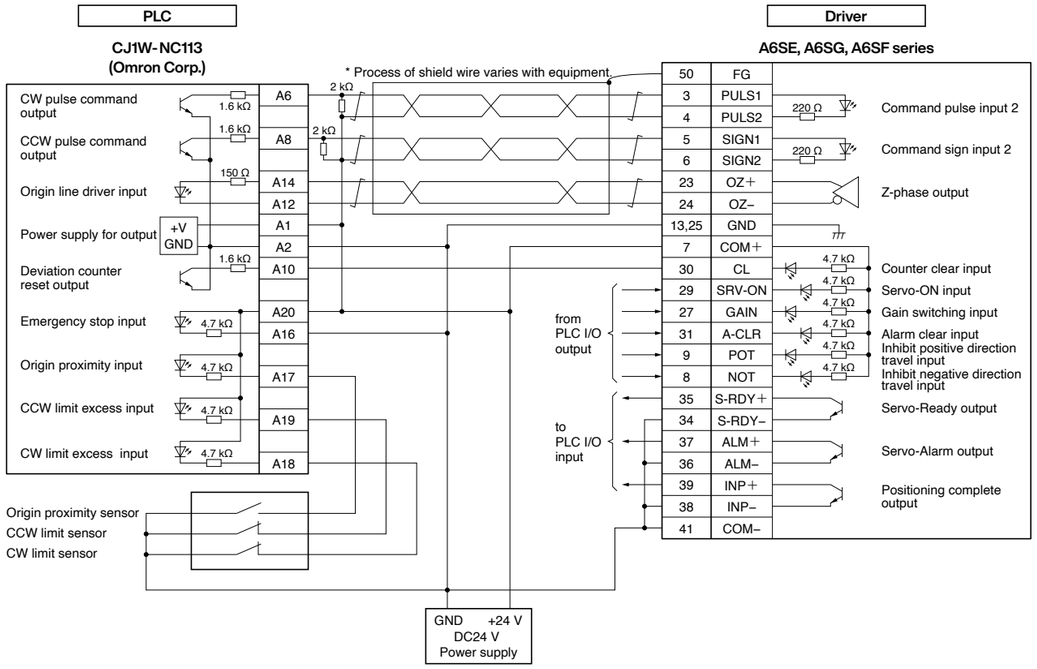
F3NC32-ON/F3NC34-ON Connection with the Yokogawa Electric Corp.



		4a		50	FG
		3a		3	PULS1
		6a		4	PULS2
		5a		5	SIGN1
		19a		6	SIGN2
		20a		23	OZ+
		17a		24	OZ–
				13,25	GND
		14a		7	COM+
				30	CL
		1a		29	SRV-ON
		1b		27	GAIN
				31	A-CLR
		13a		9	POT
				8	NOT
		9a		35	S-RDY+
				34	S-RDY–
		8a		37	ALM+
				36	ALM–
		7a		39	INP+
				38	INP–
				41	COM–
				44	PULSH1
				45	PULSH2
				46	SIGNH1
				47	SIGNH2

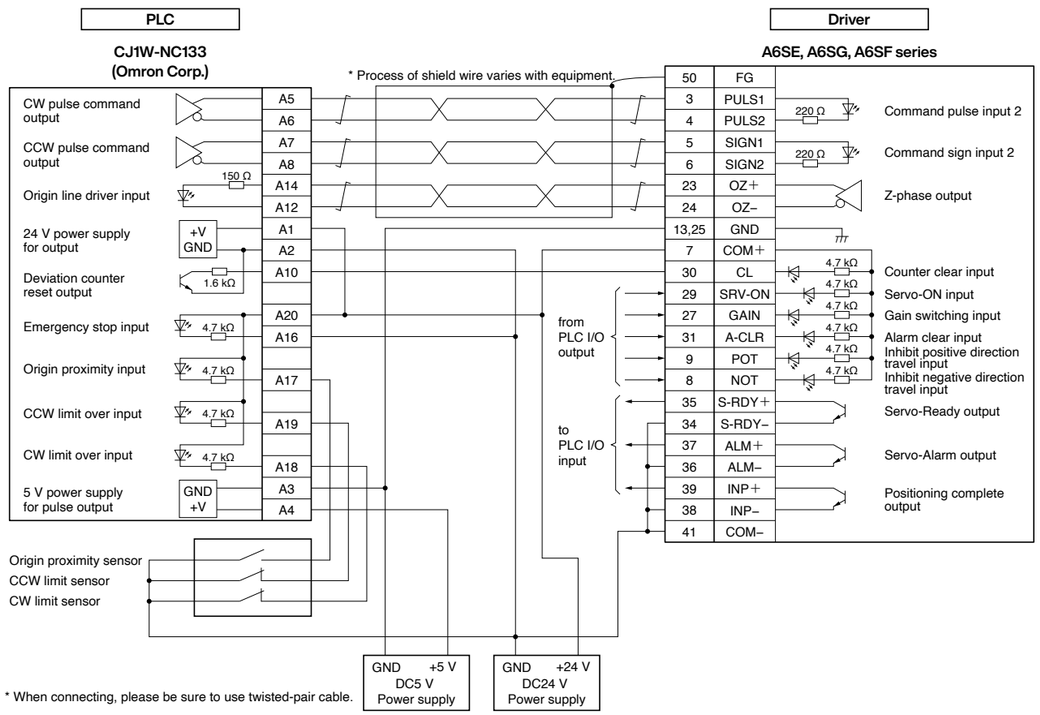
Connection Between Driver and Controller

CJ1W-NC113 Connection with the Omron Corp.



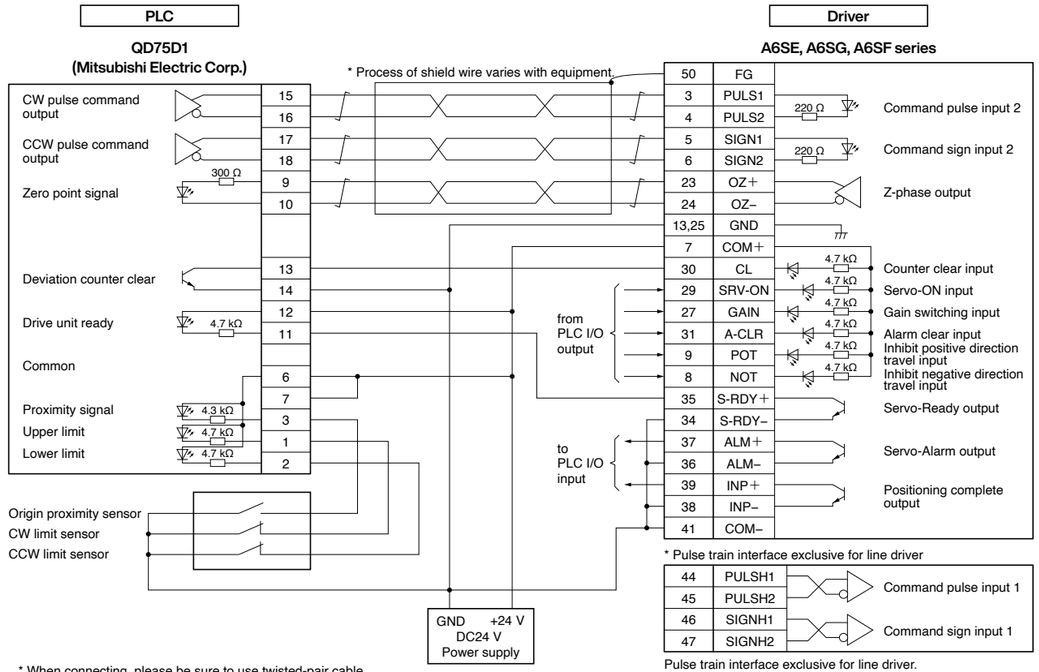
* When connecting, please be sure to use twisted-pair cable.

CJ1W-NC133 Connection with the Omron Corp.



* When connecting, please be sure to use twisted-pair cable.

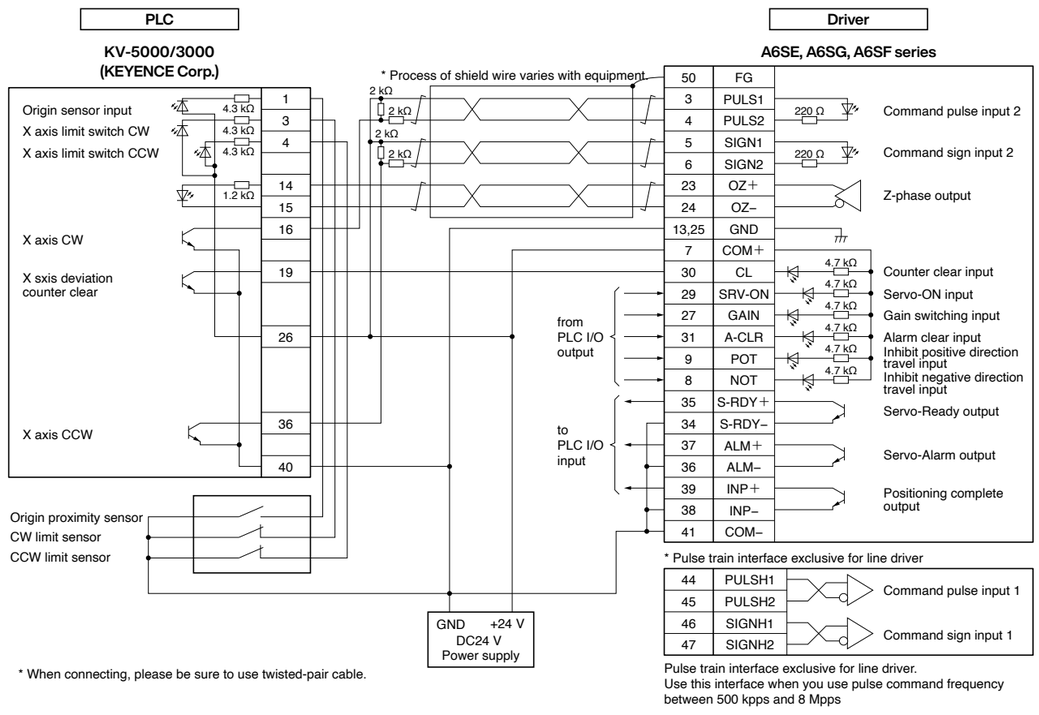
QD75D1 Connection with the Mitsubishi Electric Corp.



* When connecting, please be sure to use twisted-pair cable.

Pulse train interface exclusive for line driver.
Use this interface when you use pulse command frequency between 500 kpps and 8 Mpps

KV-5000/3000 Connection with the KEYENCE Corp.



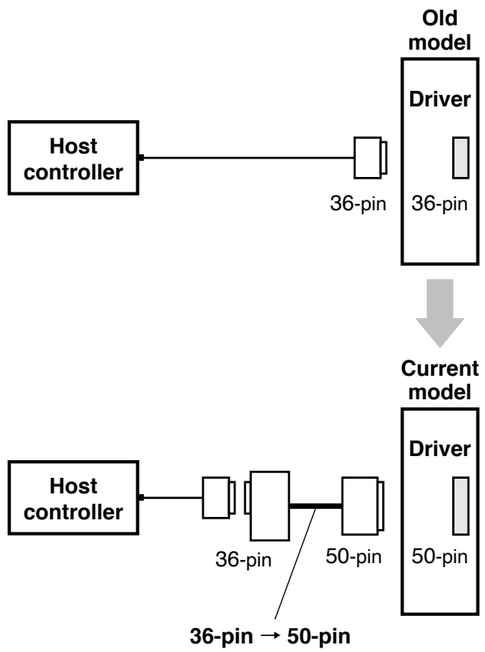
* When connecting, please be sure to use twisted-pair cable.

Pulse train interface exclusive for line driver.
Use this interface when you use pulse command frequency between 500 kpps and 8 Mpps

Replacing Old Model Servo Driver with MINAS A6 series

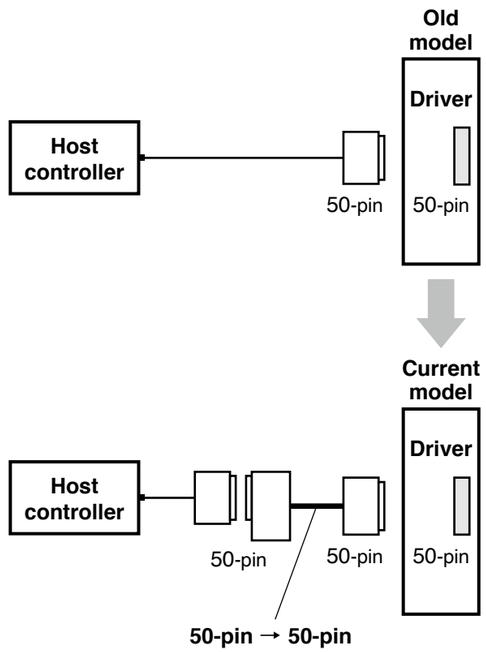
For easier replacement of old driver (MINAS X/XX/V series) with A6 series, use the interface conversion connector.

〈36-pin → 50-pin〉



36-pin → 50-pin
Conversion cable
DV0P4120
DV0P4121

〈50-pin → 50-pin〉



50-pin → 50-pin
Conversion cable
DV0P4130
DV0P4131
DV0P4132

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

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

* For external dimensions, refer to P.322.

Conversion Wiring Table

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

* “NC” is no connect.

Replacing Old Model Servo Driver with MINAS A6 series

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

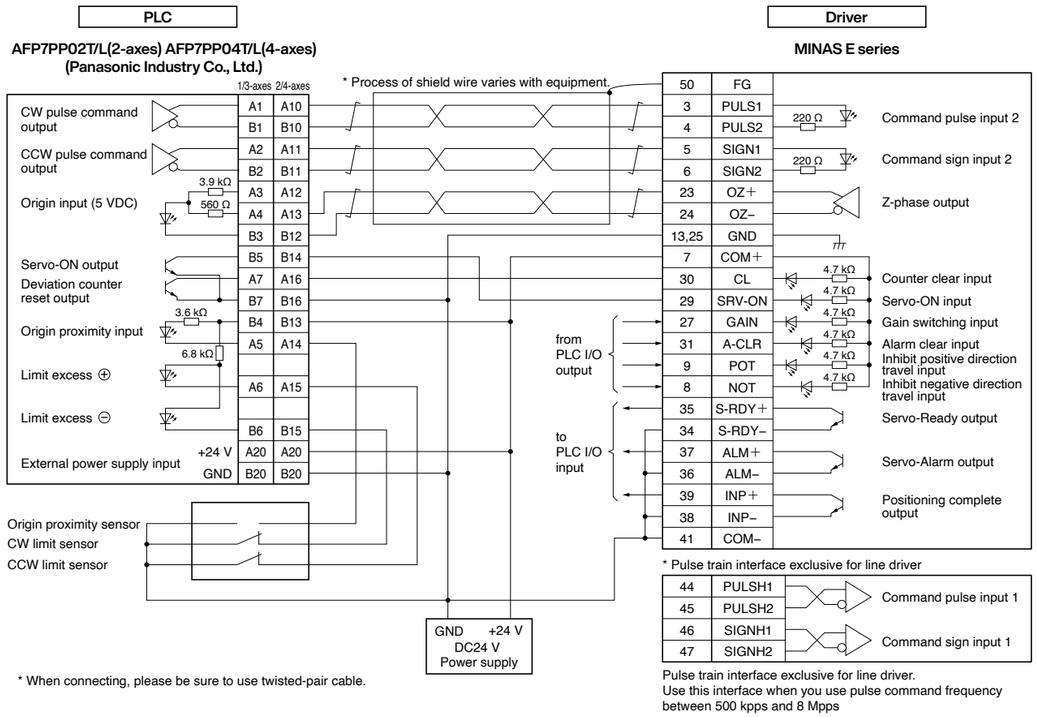
* “NC” is no connect.

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

* “NC” is no connect.

Connection Between Driver and Controller

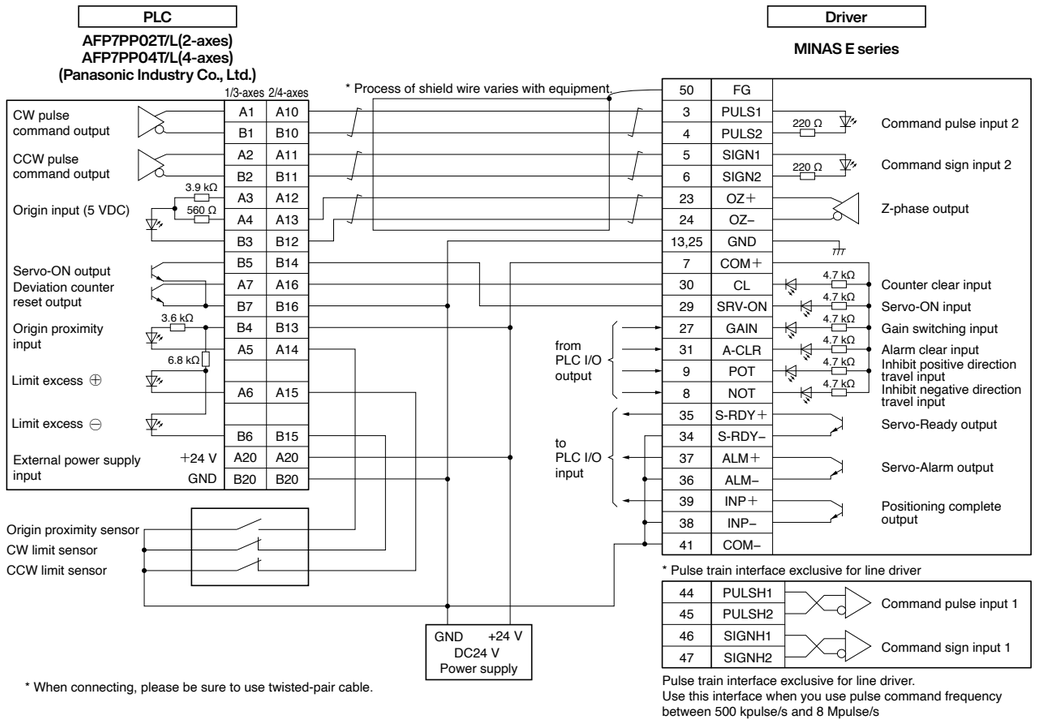
FP7 AFP7PPL02T/L (2 axes) Connection with AFP7PP04T/L (4 axes)



* When connecting, please be sure to use twisted-pair cable.

Pulse train interface exclusive for line driver.
Use this interface when you use pulse command frequency between 500 kpps and 8 Mpps

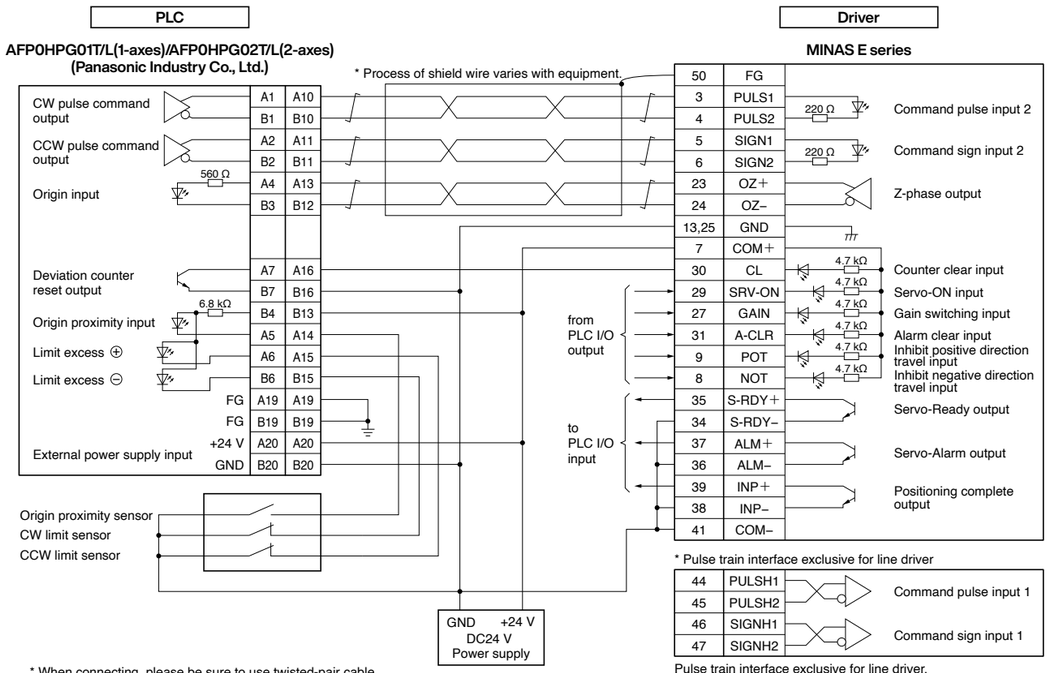
FP7 AFP7PG02T/L (2 axes) Connection with AFP7PG04T/L (4 axes)



* When connecting, please be sure to use twisted-pair cable.

Pulse train interface exclusive for line driver.
Use this interface when you use pulse command frequency between 500 kpulse/s and 8 Mpulse/s

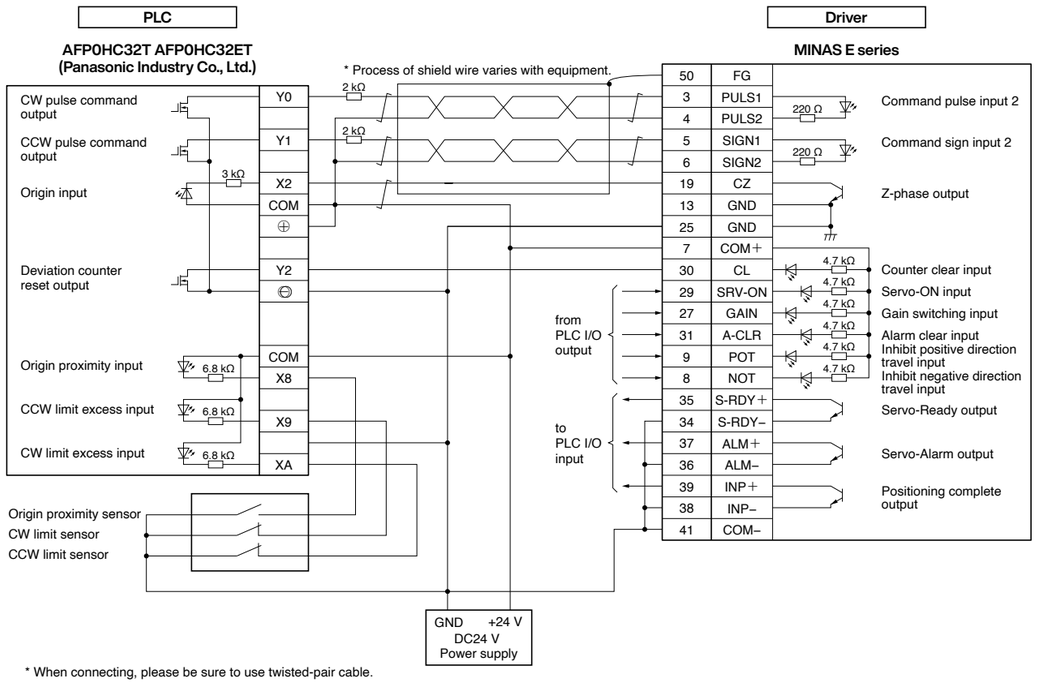
FP0H AFP0HPG01T/L (1 axis) Connection with AFP0HPG02T/L (2 axes)



* When connecting, please be sure to use twisted-pair cable.

Pulse train interface exclusive for line driver.
Use this interface when you use pulse command frequency between 500 kpps and 8 Mpps

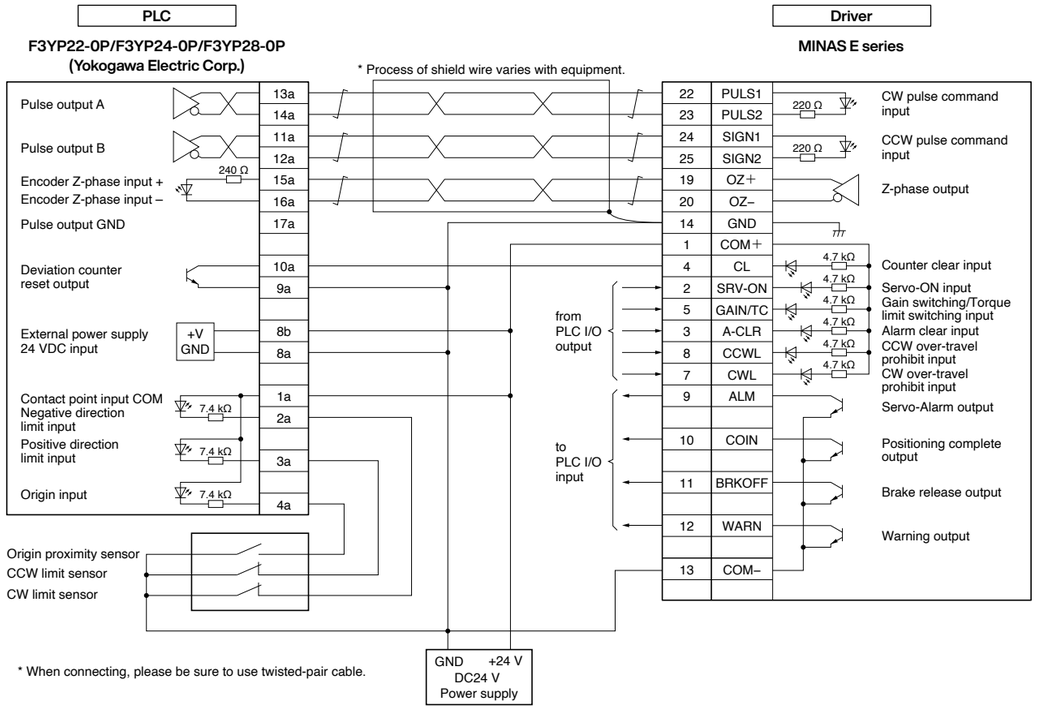
FP0H AFP0HC32T Connection with AFP0HC32ET



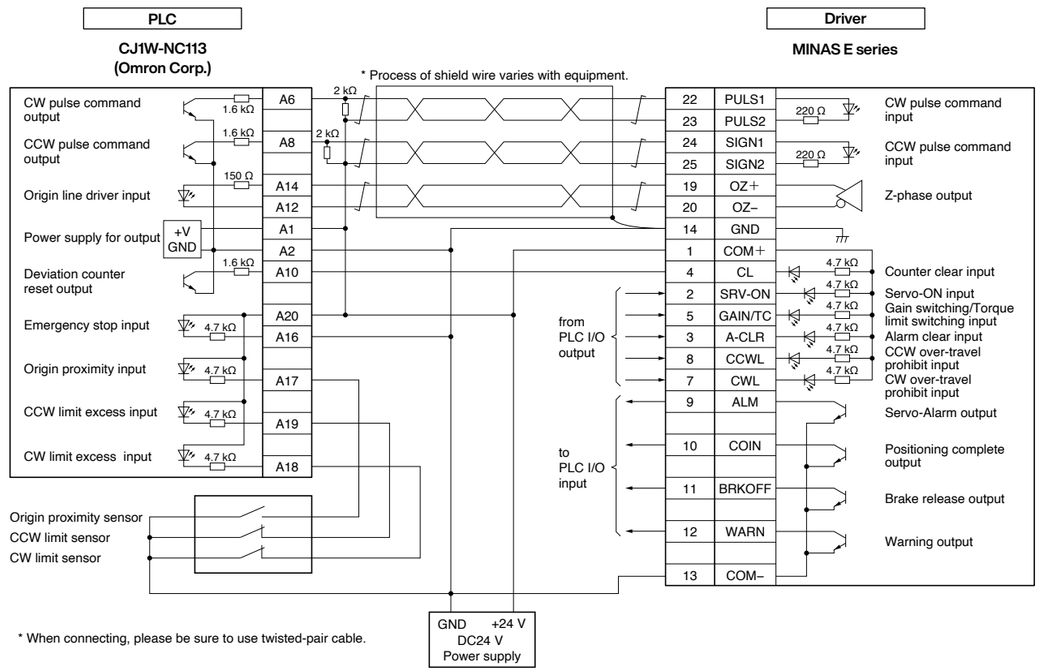
* When connecting, please be sure to use twisted-pair cable.

Connection Between Driver and Controller

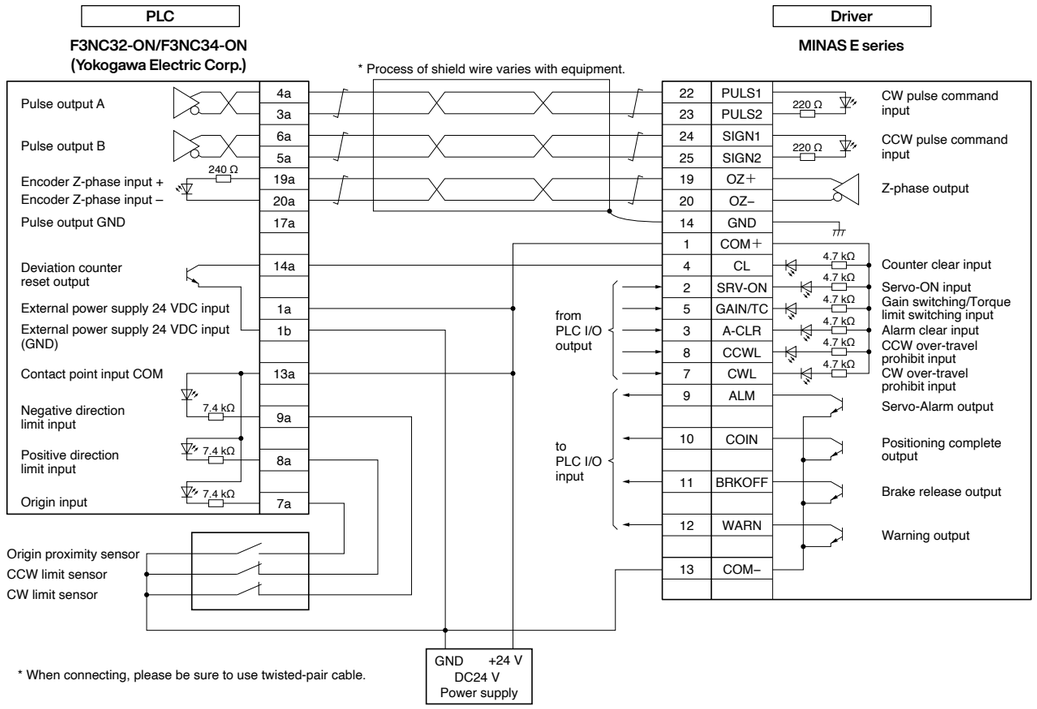
F3YP22-0P/F3YP24-0P/F3YP28-0P Connection with the Yokogawa Electric Corp.



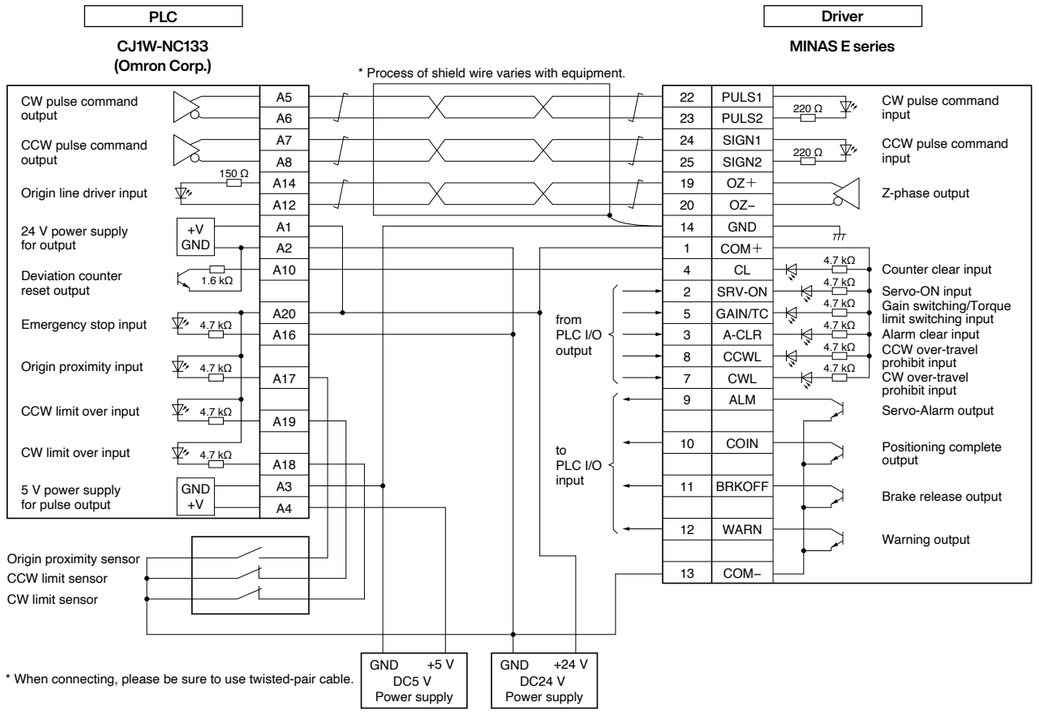
CJ1W-NC113 Connection with the Omron Corp.



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

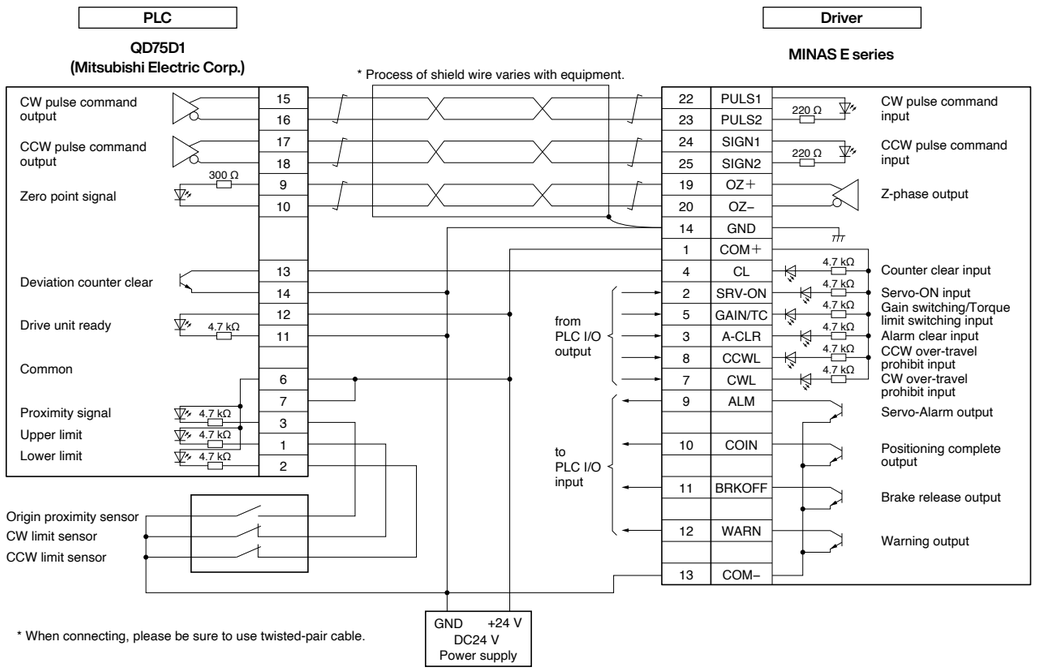


CJ1W-NC133 Connection with the Omron Corp.



Connection Between Driver and Controller

QD75D1 Connection with the Mitsubishi Electric Corp.



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Sales Office

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

(November 01, 2023)

Region	Company Name [Category]	City	Address	TEL / FAX
U.S.A	Panasonic Industrial Devices Sales Company of America	New Jersey	Two Riverfront Plaza, 10th Floor Newark, NJ 07102-5490 U.S.A	+1-877-624-7872 / —
			Web site: http://na.industrial.panasonic.com/	
	Component Sales Division		Two Riverfront Plaza, 10th Floor Newark, NJ 07102-5490 U.S.A	+1-800-344-2112 / —
	Energy Sales Division		1701 Golf Road, Suite 3-1100 Rolling Meadows, IL 60008, U.S.A	1-877-PANABAT: +1-877-726-2228 Parts & Accessories: +1-800-332-5368 / —
	Industrial Automation Division		Two Riverfront Plaza, 10th Floor Newark, NJ 07102-5490 U.S.A	Sales Support : +1-800-228-2350, Customer & Technical: +1-877-624-7872 / —
	Food Chain & Building Products Division		Two Riverfront Plaza, 10th Floor Newark, NJ 07102-5490 U.S.A	— / —
Canada	Panasonic Canada Inc	Ontario	5770 Ambler Drive 27, Mississauga, Ontario, L4W 2T3, Canada	+1-905-624-5010 / +1-905-238-4057
Brazil	Panasonic Do Brasil Limitada	São Paulo	Rua Alexandre Dumas, 1711 - 8 Andar torre 11 , Chácara Santo Antônio, São Paulo SP Brazil	— / —
Germany	Panasonic Electric Works Europe AG European Headquarters	Munich	Caroline-Herschel-Straße 100, 85521 Ottobrunn, Germany	+49-89-45354-1000 / +49-89-45354-2111
			Web site: http://www.panasonic-electric-works.com/	
France	French Branch Office	Verrières-Le-Buisson	10, rue des petits ruisseaux, 91370 Verrières-Le-Buisson, France	+ 33 (0) 1-60-13-5757 / + 33 (0) 1-60-13-5758
			Web site: http://www.panasonic-electric-works.fr/	
Italy	Panasonic Industry Italia s.r.l	Verona	Via del Commercio 3-5, 37012 Bussolengo-Ferlina, Italy	+39-45-6752711 / +39-45-6700444
			Web site: http://www.panasonic-electric-works.it/	
Great Britain	Panasonic Electric Works UK Ltd.	Milton Keynes	Sunrise Parkway, Linford Wood, Milton Keynes MK14 6LF, United Kingdom	+44-1908-231-555 / +44-1908-231-599
			Web site: http://www.panasonic-electric-works.co.uk/	
Austria	Panasonic Electric Industry Austria GmbH	Biedermannsdorf	Josef Madersperger Straße 2, 2362 Biedermannsdorf, Austria	+43-2236-26846-7 / +43-2236-46133
			Web site: http://www.panasonic-electric-works.at/	
Poland	Panasonic Industry Poland	Warszawa	Ul. Dowborczykow 25, 90-019 Lodz, Poland	+48-422309633 / —
			Web site: http://www.panasonic-electric-works.pl/	
Benelux	Panasonic Electric Works Sales Western Europe B.V.	PJ Best	De Rijn 4, 5684 PJ Best, Netherlands	+31(0)499-37-27-27 / +31(0)499-37-21-85
			Web site: http://www.panasonic-electric-works.nl/	
Sweden	Sweden Branch Office	Kista	Knarrarnäsgatan 15, 164 40 Kista, Sweden	+46-8-5947-6680 / +46-8-5947-6690
Czech Republic	Panasonic Electric Works Europe AG Czech Representative Office	Brno	Veveri 3163/111, 61600 Brno, Czech Republic	+420-541-217-001 / +420-541-217-101
			Web site: http://www.panasonic-electric-works.cz/	
Spain	Panasonic Industry Iberia S.A.	Madrid	Barajas Park, San Severo 20, 28042 Madrid, Spain	+34-913293875 / +34-913292976
			Web site: http://www.panasonic-electric-works.es/	
Portugal	Portuguese Branch Office	Cascais	Avda Adelino Amaro da Costa, 728-R/C J, 2750-277 Cascais, Portugal	+351-2148-12520 / +351-21-4812529

Sales Office

Region	Company Name [Category]	City	Address	TEL / FAX
Hungary	Panasonic Electric Works Europe AG Hungarian Representative Office	Budapest	Neumann Janos. u. 1., 1117 Budapest, Hungary	+43 2236 26846-25 / +43 2236 46133
Switzerland	Panasonic Industry Switzerland AG	Rotkreuz	Grundstraße 8, 6343 Rotkreuz ZG, Switzerland Web site http://www.panasonic-electric-works.ch/	+41(0)417997054 / +41(0)417997055
Turkey	Panasonic Elektronik Satis A.S., PTR. (Turkey)	Istanbul	Ruzgarlibahce Mah. Sehit Yzb. Sinan Eroglu Cad. No:6 Akel Is Merkezi A Blok Beykoz Kavacik Istanbul, Turkey	+90-216-681-400 / +90-216-681-401
China	Panasonic Hong Kong Co., Limited (PHK) Panasonic Industrial Devices Sales (Hong Kong) Co., Ltd.	Hong Kong	Level 9, Tower II, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong	+852-2367-0181 / +852-2865-3697
	Panasonic Industry (China) Co.,Ltd.	Shanghai	15F, 1601-02, No.18, Lane 666, Haiyang West Road, Pudong New District, Shanghai, 200126, China Web site https://industrial.panasonic.com/ea/	+86-21-38552000 / +86-21-38552370
	Panasonic Industry (China) Co.,Ltd.	Shenzhen	10F, Tower D, China Resources Land Building, No.91 Kefa Road, Nanshan District, Shenzhen, 518057, China Web site https://industrial.panasonic.com/ea/	+86-755-22074488 / +86-755-22074498
	Panasonic Industry (China) Co.,Ltd.	Tianjin	Room 1001, No.75 Nanjing Road, Tianjin 300050, China	+86-22-58969100 / +86-22-58969111
	Panasonic Industry (China) Co.,Ltd.	Guangzhou	17F, Leatop Plaza, 32 Zhujiang East Road, Zhujiang New Town, Guangzhou, 510627, China	+86-20-87130888 / +86-20-87130987
	Panasonic Industry (China) Co.,Ltd.	Qingdao	2108-2109, No.1 Excellence Century Center, 31 Longcheng Road, Shibei District, Qingdao, Shandong Province, 266000, China	+86-532-85971288 / +86-532-85757230
	Panasonic Industry (China) Co.,Ltd.	Dalian	1601C, ShenMao Building, No. 147 Zhongshan Road, Xigang District, Dalian, 116011, China	+86-411-88008676 / 8696 / +86-411-83686802
	Panasonic Industry (China) Co.,Ltd.	Xian	Room 04-05, 7th Floor, Zhong Hai Buliding, No.3 South Furong Road, Yanta District, Xian, 710061, China	+86-29-87607961 / +86-29-87607960
	Panasonic Industry (China) Co.,Ltd.	Wuhan	04-7F, Zhongshan Jiangan District Road No.1627, Wuhan, Hubei, 430030, China	+86-27-85711665 / 6896 / +86-27-86668837
	Panasonic Industry (China) Co.,Ltd.	Chongqing	Room 1610-11, Metropolitan Oriental Plaza, NO. 68 Zhourong Road, YuZhong District, Chongqing, 400010, China	+86-23-63803502 / +86-23-63803503
India	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Gurgaon(HQ))	Delhi	12th Floor, Ambience Corporate Office, Tower-2, Ambience Island, NH-8, Gurgaon-122002, Haryana, India	+91-124-4871300 / +91-124-4751333
	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Bangalore Office)	Bengaluru	"J.P. Chambers" 2nd Floor, #276/22-1, 46th Cross, 5th Block, Jayanagar, Bangalore - 560041	+91-124-6676-311 / —
	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Mumbai Office)	Mumbai	502 / 503, Windfall, Sahar Plaza Complex, JB Nagar Andheri Kurla Road, Andheri (E) Mumbai - 400059, India	+91-22-6196-8480 M: -919004229452 / —

Region	Company Name [Category]	City	Address	TEL / FAX
India	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Chennai Office)	Chennai	Spic House Ann exe, 6th Floor, No.88, Mount Road, Guindy, Chennai - 600032, Tamilnadu	+91-44-6108-9300 / —
	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Pune Office)	Pune	Office No. 401 & 402, Godrej Eternia, Above At Home Centre, Next to Shopper's Stop, Shivaji Nagar, Mumbai Pune Road, Pune - 411005, Maharashtra India	+91-20-67449907 / —
Korea	Panasonic Industrial Devices Sales Korea Co., Ltd.	Seoul	114-38 Teheran-ro, Gangnam-gu, Seoul, 06176, Korea (1004 Daechi dong, DONGIL Tower 5-6F) Web site https://industrial.panasonic.com/kr/	+82-2-795-9600 / +82-2-2052-1053
	Panasonic Industrial Devices Sales Korea Co., Ltd.	Daegu	Sales Facility 101-210, Worldmark Westend, 169, Waryong-ro, Dalseo-gu, Daegu, 42688, Korea	+82-(0)53-710-2301 / +82-(0)53-710-2300
	Panasonic Industrial Devices Sales Korea Co., Ltd.	Cheonan	M-408 MIRAE ACE-HIGHTECHCITY, 10, Baekseokgongdan 1-ro, Seobuk-gu, Cheonan, 31094, Korea	+82-(0)41-622-9128 / +82-(0)41-622-9129
Taiwan	Panasonic Industrial Devices Sales Taiwan Co.,Ltd.	Taipei	12F, No. 9, SongGao Rd. , Taipei 110, Taiwan	+886-2-2757-1900 / +886-2-2758-7502
Southeast Asia	Panasonic Industry Sales Asia Pacific	Singapore	No.3 Bedok South Road, Singapore 469269	+65-6299-9181 / +65-6390-3801
	Malaysia Panasonic Industrial Devices Sales (M) Sdn. Bhd.	Kuala Lumpur	13th Floor, Menara IGB, Mid Valley City, Lingkaran Syed Putra, 59200 Kuala Lumpur, Malaysia	+60-3-2297-6888 / +60-3-2297-6798
	Malaysia Panasonic Industrial Devices Sales (M) Sdn. Bhd.	Pinang	Lebuh Sg. Pinang 5, Promenade 28, 11600 Penang, Malaysia	+60-4-6531-888 / +60-4-6531-899
	Thailand Panasonic Industrial Devices Sales (Thailand) Co., Ltd.	Bangkok	252/133 Muang Thai-Phatra Complex Building, 31st Floor, Ratchadaphisek Road, Huaykwang, Bangkok 10320, Thailand	+66-2693-3403-21 / +66-2693-3422-27
	Thailand Panasonic Solutions (Thailand) Co., Ltd.	Bangkok	252/133 Muang Thai-Phatra Complex Building, 31st Floor, Ratchadaphisek Road, Huaykwang, Bangkok 10320, Thailand	+66-2-693-1870 / +66-2-693-1872
	Indonesia PT. Panasonic Gobel Life Solutions Sales Indonesia	Jakarta	Summitmas 1 Bldg. 8th Floor, Jl. Jend. Sudirman Kav. 61-62, Jakarta 12190 Indonesia	+62-21-252-1616 / +62-21-252-1686
	Vietnam Panasonic Vietnam	Ho Chi Minh	Floor 7, E-Town Building, 364 Cong Hoa, Ward 13, Tan Binh District, Ho Chi Minh City, Vietnam	+84-2838130613-3004 / +84-8-3813-4595
	Vietnam Panasonic Vietnam	Ha Noi	Plot J1-J2, Thang Long Industrial Zone, Dong Anh, Ha Noi, Vietnam	+84-24-3955-111 / —
	Philippines Panasonic Manufacturing Philippines Corporation (Sales Division of PMPC)	Makati	14th Floor, 6788 Ayala Avenue, 1226 Makati City, Philippines	+632-886-6291 / +632-886-6295