

## Technical reference AC Servo Motor & Driver MINAS E-series

This product is for industrial equipment. Don't use this product at general household.



- Thank you very much for your purchase of Panasonic AC Servo Motor & Driver, MINAS E-series.
- Before use, refer this manual and safety instructions to ensure proper use. Keep this manual and read when necessary.
- Make sure to forward this manual for safety to the final user.

If you are the first user of this product, please be sure to purchase and read the optional Engineering Material (DV0P3700), or downloaded instruction Manual from our Web Site.

**[Web address of Motor Company, Matsushita Electric Industrial Co., Ltd.]**  
[http://industrial.panasonic.com/ww/i\\_e/25000/motor\\_fa\\_e/motor\\_fa\\_e.html](http://industrial.panasonic.com/ww/i_e/25000/motor_fa_e/motor_fa_e.html)

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# 1. Introduction

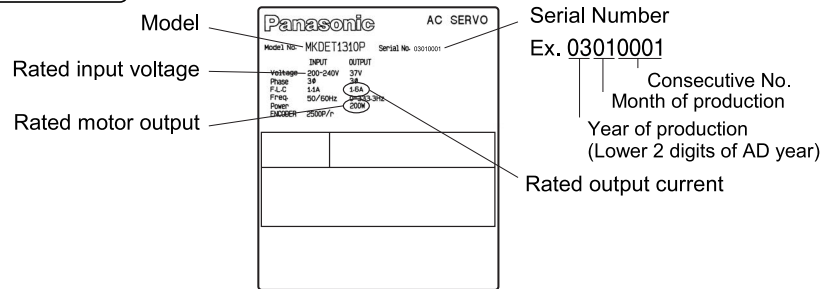
## After Opening the Package

- Make sure that the product is what you have ordered.
- Check whether the product has been damaged or not during transportation.
- The operating manual (Safety edision) is included in the received package.

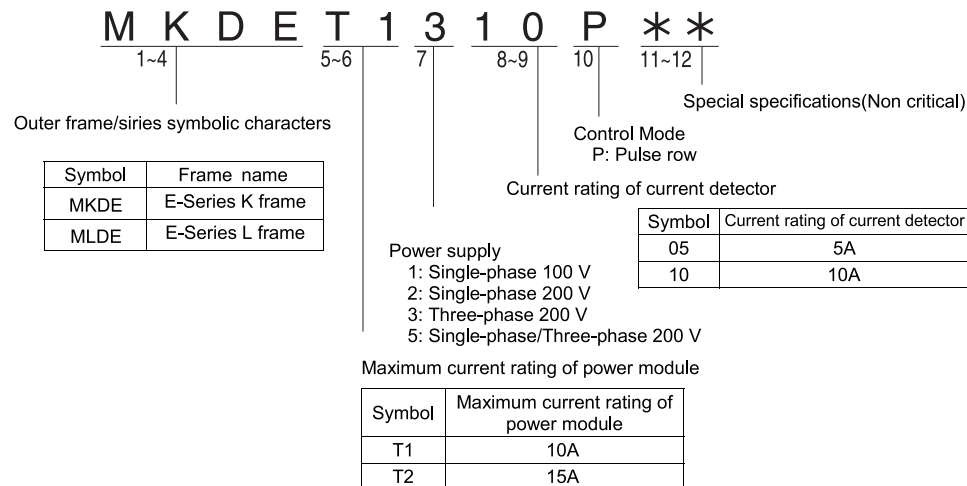
If the product is not correct, or it has been damaged, contact dealer or sales agent.

## Check the Model of Driver

### Name plate



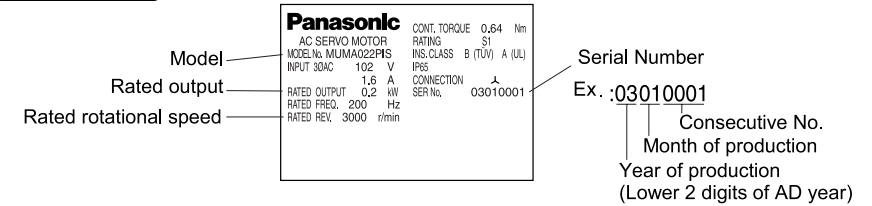
### Model Designation



# 1. Introduction

## Check the Model of Motor

### Name plate



### Model Designation

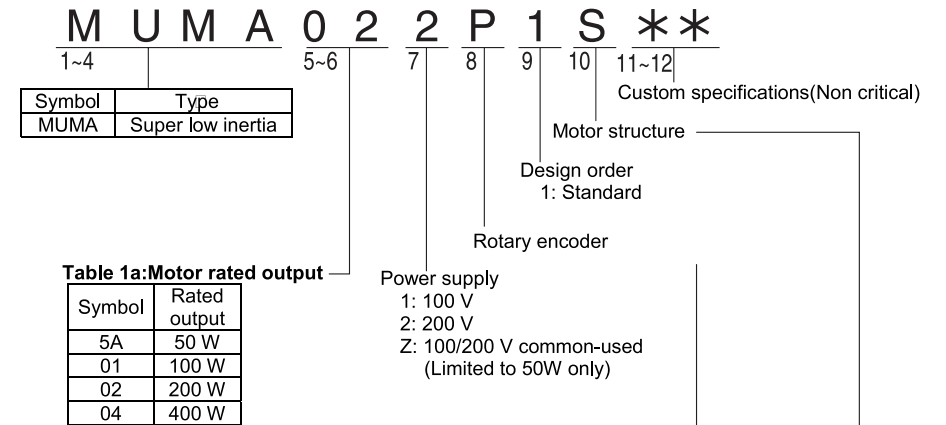


Table 1b: Rotary encoder

Symbol	Specifications			
	Type	No. of pulses	Resolution	Lead wire
P	Incremental	2500 P/r	10000	5-wire

Table 1c: Motor structure

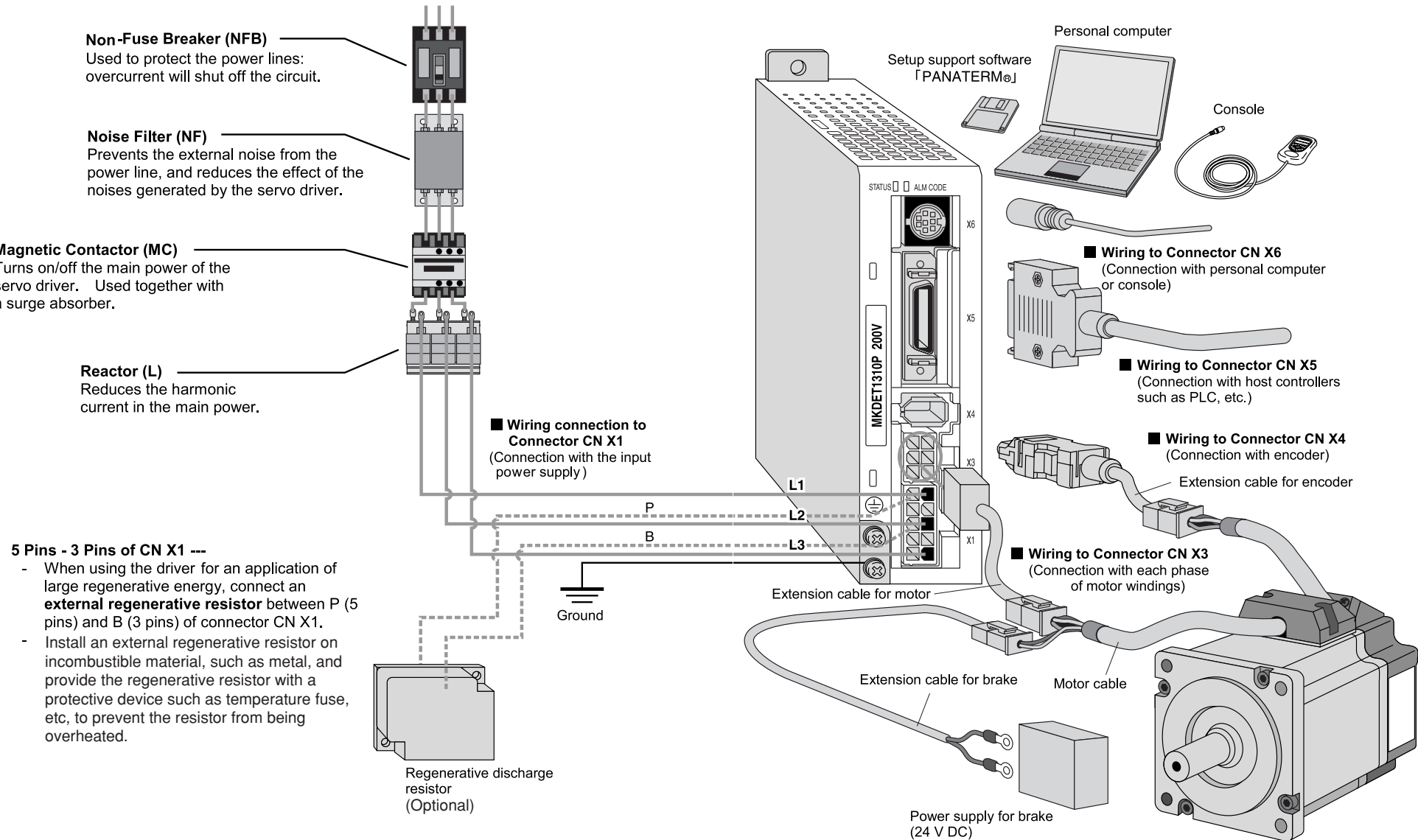
	Shaft	Holding brake		Oil seal	
	Center tap on key-wayed shaft end	Without	With	Without	With
S	●	●		●	
T	●		●	●	

The product with oil seal is a special order product.

## 2. System Configuration and Wiring

### General Wiring Diagram

#### ■ Main Circuits



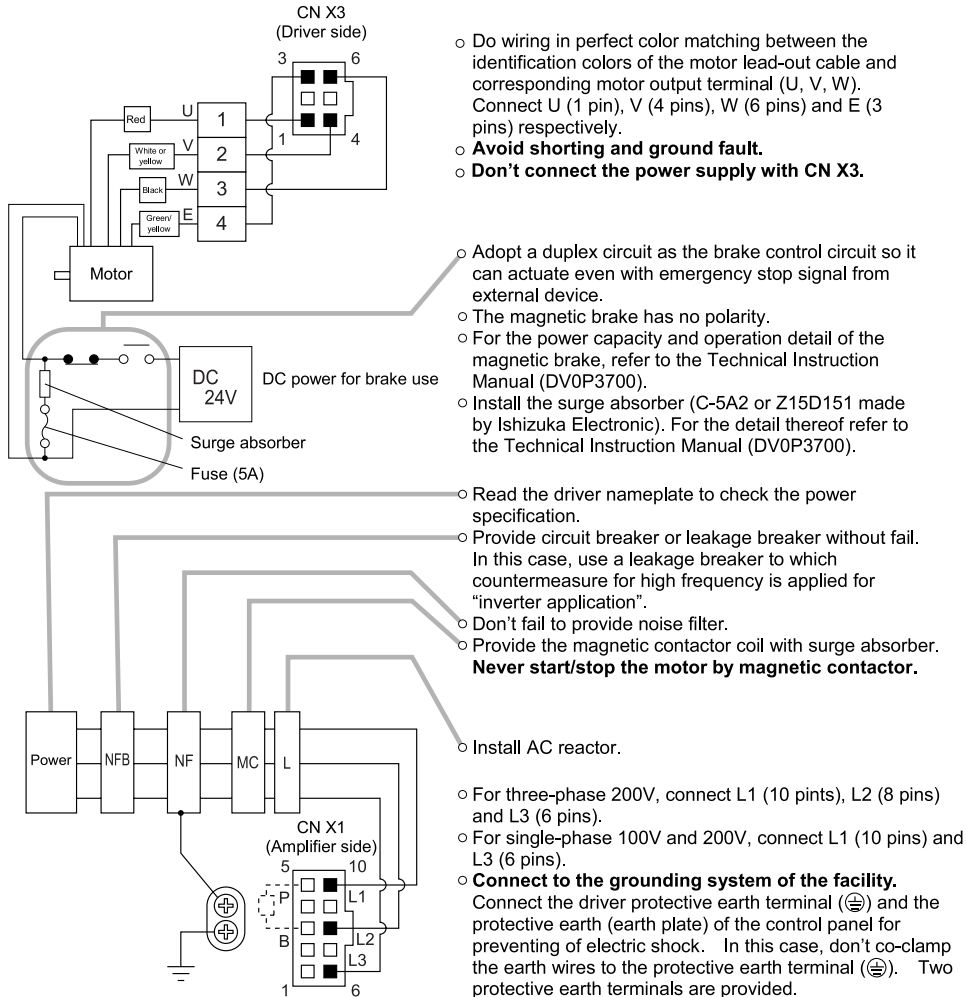
## 2. System Configuration and Wiring

### Wiring of Connectors CNX1, X3 (Wiring of Main Circuits)

- Don't fail to request an electric wiring specialist for wiring.
- Don't switch ON the electric power until completion of the wiring, to prevent electric shock.

#### Points in Wiring

- [1] For the cable diameter used, refer to the technical instruction manual (DV0P3700) for sale at option.
- [2] Insert securely the connectors.

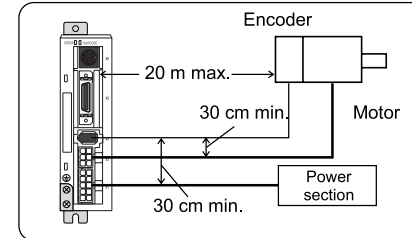


Ground resistance: 100 Ω max.  
For applicable wire, see DV0P3700.

## 2. System Configuration and Wiring

### Wiring to Connector CN X4 (Connection with Encoder)

#### Points in Wiring

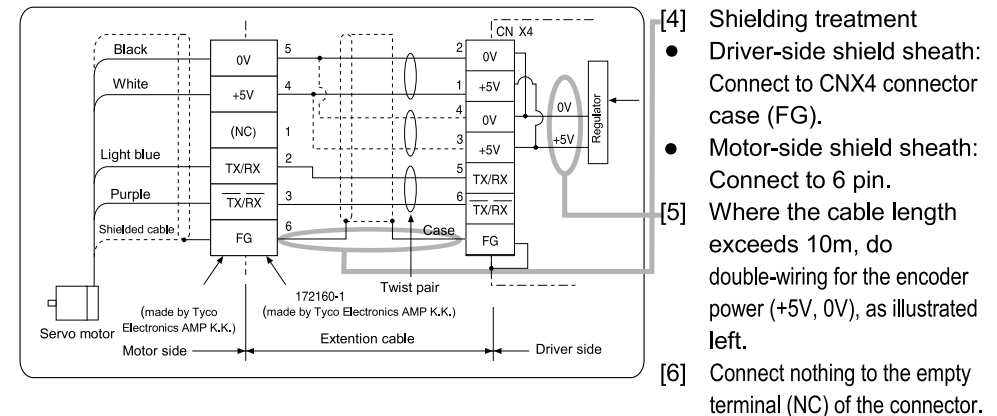


- Cable length between the driver and the motor – 20 m max. If this cable length exceeds 20m, consult with the dealer/distributor from which you have purchased the driver.
- Keep 30 cm or more spacing from the main circuit wiring. Neither guide this wiring through the same duct, together with the main circuit nor bundle these two together.

#### Wiring Diagram

- Requests, where extension cable for the encoder is self-manufactured (For the connector detail, refer to "Technical Instruction Manual" (DV0P3700) for sale at option)

- [1] Refer to the wiring diagram below.
- [2] Cable used: Shielded twist pair cable of 0.18 mm<sup>2</sup> (AWG 24) minimum in conductor diameter that is excellent in bending resistance.
- [3] For signal/power wiring in pair, use twist pair cable.

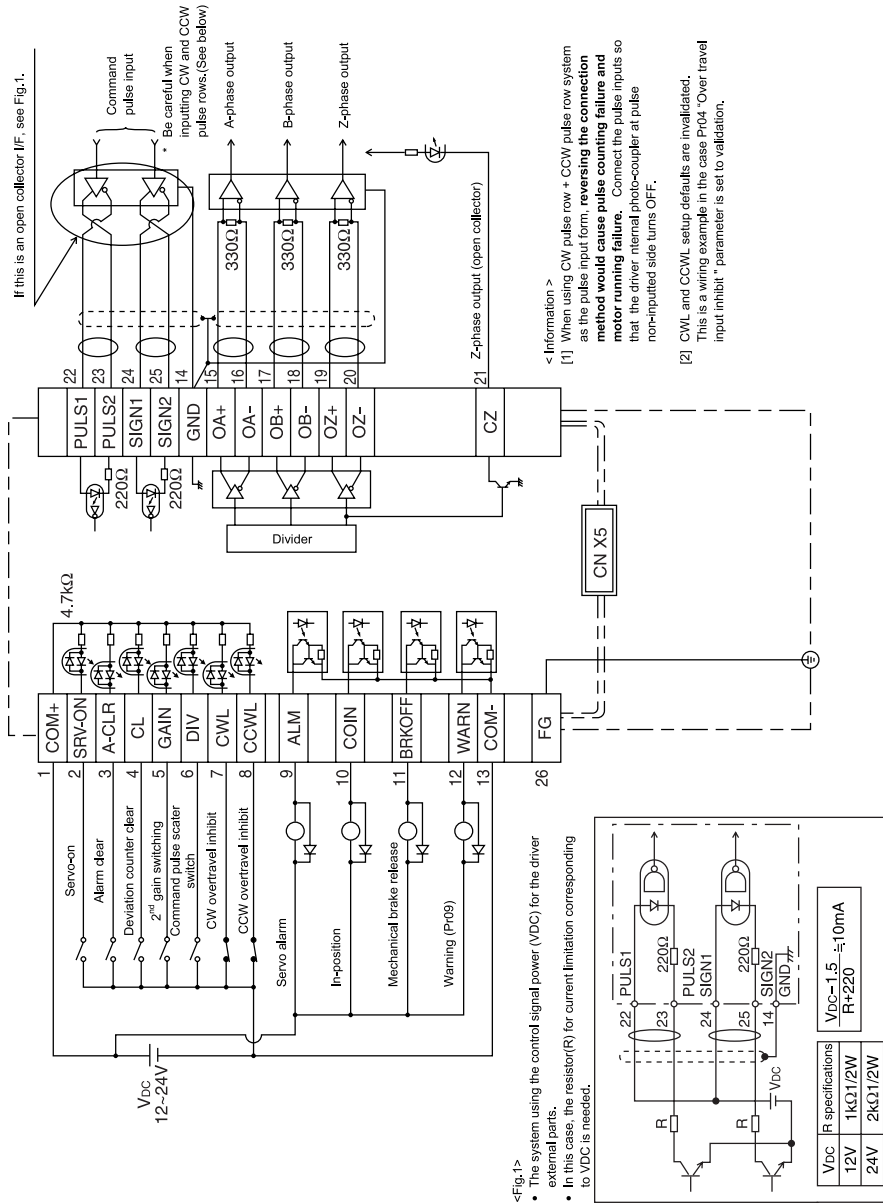


- [7] Don't use a cable pair composed of the motor cable and encoder cable which were shielded in batch.

## 2. System Configuration and Wiring

### Circuit Available for Typical Control Modes

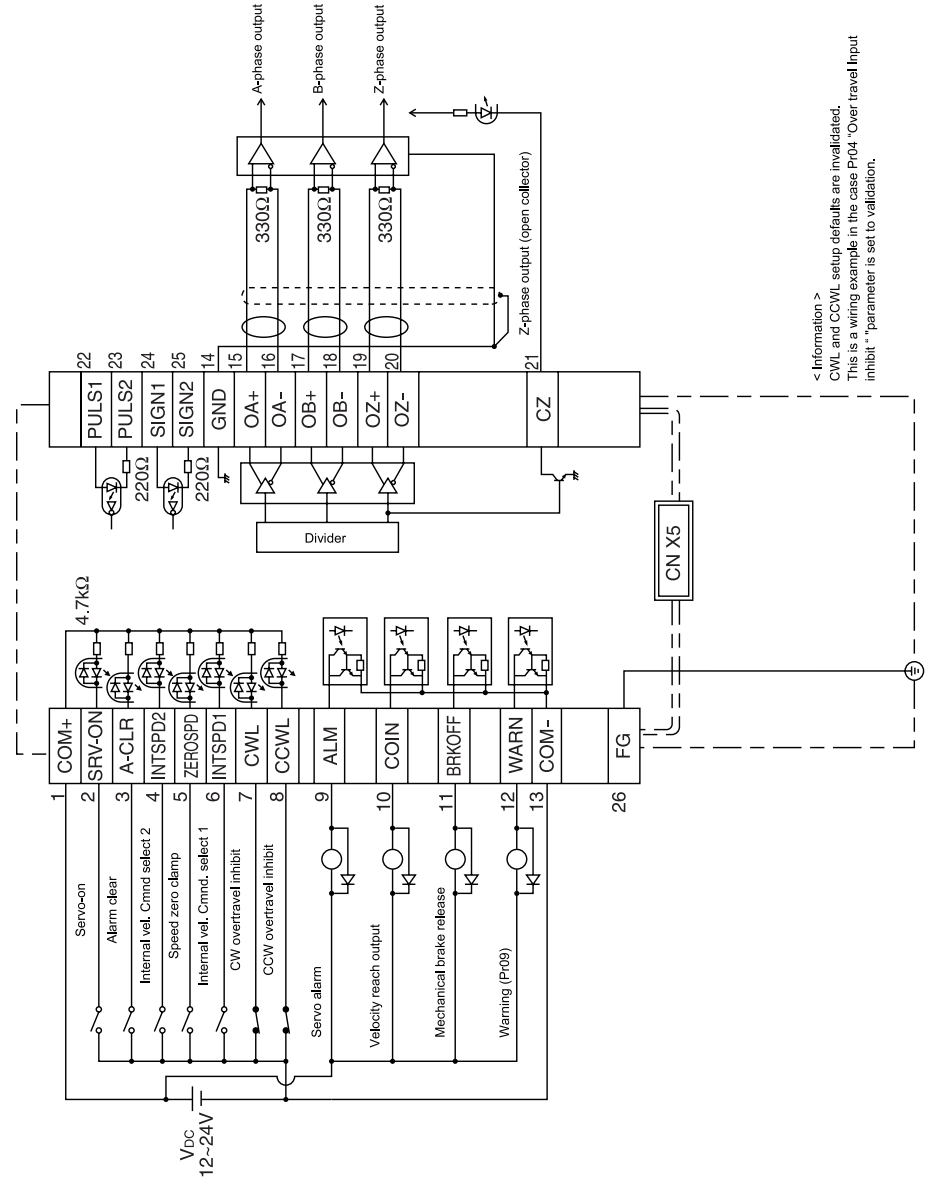
#### Example of CN X5 Position control in Wiring



<Fig.1>

## 2. System Configuration and Wiring

### Example of CN X5 Internal Velocity Control Mode in Wiring



### 3. Parameter

#### Parameters Related to Function Selection

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
*00	Axis address	1 - 15	1	-	All control modes
*01	7-segment LED status for console, initial condition display	0 - 15	1	-	All control modes
*02	Control mode set up	0 - 2	2	-	All control modes* <sup>1</sup>
03	(For manufacturer use)	-	0	-	-
*04	Overtravel Input inhibit	0 - 1	1	-	All control modes
05	(For manufacturer use)	-	0	-	-
*06	ZEROSPD/TC input selection	0 - 2	1	-	All control modes
07	(For manufacturer use)	-	0	-	-
08	(For manufacturer use)	-	0	-	-
09	Warning output selection	0 - 6	2	-	All control modes
0A	(For manufacturer use)	-	0	-	-
0B	(For manufacturer use)	-	0	-	-
*0C	Baud rate set-up of RS232C	0 - 2	2	-	All control modes
0D	(For manufacturer use)	-	0	-	-
0E	Auto recognition motor parameters	0 - 1	0	-	All control modes
0F	(For manufacturer use)	-	0	-	-

- \*-marked parameter No. in the above table is validated by writing the parameter No. in EEPROM after set up and re-switching ON the power after once switched OFF.

#### < Information > \*1

Pr	Parameter description	Quick response positioning	High function positioning
02	Control mode set up	0	2
1D	1st notch frequency	Limited See below	Validated
2B	Damping frequency	Limited See below	Validated
21	Real time auto tuning set up	Limited See below	Validated
2F	Adaptive notch filter frequency	Invalidated	Validated

Under "Quick Response Positioning control" mode, it is not allowed to use simultaneously the parameters of "1st notch frequency", "Damping frequency" and "Real time auto tuning set up". The parameter which is inputted in first is valid by priority.

(Ex.) By setting "Real time auto tuning" parameter, 1st notch frequency is set compulsorily to 1500 (Invalidated) at the driver side even it was input.

### 3. Parameter

#### Parameters for adjusting the servo gain and time constants of filter

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
10	1st position loop gain	0 - 32767	<63>	1/s	P·P2
11	1st velocity loop gain	1 - 3500	<35>	Hz	All control modes
12	1st velocity loop integration time constant	1 - 1000	<16>	ms	All control modes
13	1st velocity detection filter	0 - 5	<0>	-	All control modes
14	1st torque filter time constant	0 - 2500	<65>	0.01 ms	All control modes
15	Velocity feed forward	-2000 - 2000	<300>	0.1%	P·P2
16	Feed forward filter time constant	0 - 6400	<50>	0.01 ms	P·P2
17	(For manufacturer use)	-	0	-	-
18	2nd position loop gain	0 - 32767	<73>	1/s	P·P2
19	2nd velocity loop gain	1 - 3500	<35>	Hz	All control modes
1A	2nd velocity loop integration time constant	1 - 1000	<1000>	ms	All control modes
1B	2nd velocity detection filter	0 - 5	<0>	-	All control modes
1C	2nd torque filter time constant	0 - 2500	<65>	0.01 ms	All control modes
1D	1st notch frequency	100 - 1500	1500	Hz	All control modes* <sup>1</sup>
1E	1st notch width selection	0 - 4	2	-	All control modes
1F	(For manufacturer use)	-	0	-	-
26	Software limit set-up	0 - 1000	10	0.1 rev	P·P2
27	(For manufacturer use)	-	0	-	-
28	(For manufacturer use)	-	0	-	-
29	(For manufacturer use)	-	0	-	-
2A	(For manufacturer use)	-	0	-	-
2B	Damping frequency	0 - 5000	0	0.1 Hz	P·P2* <sup>1</sup>
2C	Damping filter setting	-200 - 2500	0	0.1 Hz	P·P2

#### Parameters for Auto Gain Tuning

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
20	Inertia ratio	0 - 10000	<100>	%	All control modes
21	Real time auto tuning set-up	0 - 7	1	-	All control modes* <sup>1</sup>
22	Machine stiffness set-up at auto turning	0 - 15	4	-	All control modes
23	(For manufacturer use)	-	0	-	-
24	(For manufacturer use)	-	0	-	-
25	Normal auto tuning motion set-up	0 - 7	0	-	All control modes
2D	(For manufacturer use)	-	0	-	-
2E	(For manufacturer use)	-	0	-	-
2F	Adaptive notch filter frequency	0 - 64	<0>	-	P2* <sup>1</sup>

### 3. Parameter

#### Parameters for Adjustment (Related to 2nd Gain)

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
30	2nd gain action set-up	0 - 1	<1>	-	P·P2
31	Position control switching mode	0 - 10	<10>	-	P·P2
32	Position control switching delay time	0 - 10000	<33>	166 μs	P·P2
33	Position control switching level	0 - 10000	<50>	-	P·P2
34	Position control switching hysteresis	0 - 10000	<30>	-	P·P2
35	Position loop gain switching time	0 - 10000	<20>	Setup value × 166 μs	P·P2
36	(For manufacturer use)	-	0	-	-
37	(For manufacturer use)	-	0	-	-
38	(For manufacturer use)	-	0	-	-
39	(For manufacturer use)	-	0	-	-
3A	(For manufacturer use)	-	0	-	-
3B	(For manufacturer use)	-	0	-	-
3C	(For manufacturer use)	-	0	-	-
3D	(For manufacturer use)	-	0	-	-
3E - 3F	(For manufacturer use)	-	0	-	-

< Requests >

- The parameters which of "default value" is enclosed with < > vary automatically with execution of the real time auto tuning function. For adjusting in MANUAL mode, set Pr21 (real time auto tuning mode) to "0" (invalidated).

This Manual expresses each control mode with the following symbols.

- P: Quick response positioning control  
P2: High function positioning control  
S: Internal velocity control

### 3. Parameter

#### Parameters for Positioning control

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
*40	Command pulse multiplier set-up	1 - 4	4	-	P·P2
*41	Command pulse rotational direction set-up	0 - 3	0	-	P·P2
*42	Command pulse input mode set-up	0 - 3	1	-	P·P2
43	(For manufacturer use)	-	0	-	-
*44	Output pulses per single turn.	1 - 16384	2500	P/r	All control modes
*45	Pulse output logic inversion	0 - 1	0	-	All control modes
46	Numerator of 1st command pulse ratio	1 - 10000	10000	-	P·P2
47	Numerator of 2nd command pulse ratio	1 - 10000	10000	-	P·P2
48	(For manufacturer use)	-	0	-	-
49	(For manufacturer use)	-	0	-	-
4A	Multiplier of numerator of command pulse ratio	0 - 17	0	2 <sup>n</sup>	P·P2
4B	Denominator of command pulse ratio	1 - 10000	10000	-	P·P2
4C	Smoothing filter set-up	0 - 7	1	-	P·P2
4D	(For manufacturer use)	-	0	-	-
4E	FIR filter set-up	0 - 31	0	(Setup value + 1) cycles	P·P2
*4F	(For manufacturer use)	-	0	-	-

- \*-marked parameter No. in the above table is validated by writing the parameter No. in EEPROM after set up and re-switching ON the power after once switched OFF.

#### Parameters for Internal Velocity Control and Torque Limit

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
50	(For manufacturer use)	-	0	-	-
51	(For manufacturer use)	-	0	-	-
52	(For manufacturer use)	-	0	-	-
53	1st internal speed set-up	-20000 - 20000	0 r/	min	S
54	2nd internal speed set-up	-20000 - 20000	0 r/	min	S
55	3rd internal speed set-up	-20000 - 20000	0 r/	min	S
56	4th internal speed set-up	-20000 - 20000	0 r/	min	S
57	JOG speed set-up	0 - 500	300	r/min	All control modes
58	Acceleration time set-up	0 - 5000	0	2 ms (1000r/min)	S
59	Deceleration time set-up	0 - 5000	0	2 ms (1000r/min)	S
5A	(For manufacturer use)	-	0	-	-
5B	(For manufacturer use)	-	0	-	-
5C	(For manufacturer use)	-	0	-	-
5D	(For manufacturer use)	-	0	-	-
5E*1	1st torque limit set-up	0 - 500	See DV0P3700	%	All control modes
5F	(For manufacturer use)	-	0	-	-

- \*1: Each default setup value in Pr5E differs depending on combination of driver and motor. For details please refer to the Technical Instruction Manual (DV0P3700) for sale at option.

### 3. Parameter

#### Parameters for Sequence

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
60	In-position range	0 - 32767	10	Pulse	P·P2
61	Zero speed	0 - 20000	50	r/min	All control modes
62	At-speed	0 - 20000	1000	r/min	S
63	1st position over-deviation set-up	0 - 32767	1875	256 Pulse	P·P2
64	Position over-deviation invalidation	0 - 1	0	-	P·P2
65	(For manufacturer use)	-	0	-	-
*66	Mode set-up after overtravel limit detection.	0 - 2	0	-	All control modes
67	(For manufacturer use)	-	0	-	-
68	Sequence at alarm	0 - 3	0	-	All control modes
69	Sequence at Servo-OFF	0 - 7	0	-	All control modes
6A	Mech. break action set-up at motor standstill	0 - 100	0	2 ms	All control modes
6B	Mech. break action set-up at motor in motion	0 - 100	0	2 ms	All control modes
6C	External regenerative discharge resistor selection	0 - 3	3	-	All control modes
6D	(For manufacturer use)	-	0	-	-
6E - 6F	(For manufacturer use)	-	0	-	-

Pr63 position over-deviation is set up at the over-deviation detection value of “setup value × 256pulses”. The default setup value, before shipping, would result in position over-deviation error if the value of “1875 × 256pulses” is exceeded.

Parameter No. (Pr□□)	Parameter description	Range	Default	Unit	Related control mode
70	1st over-velocity level set-up	0 - 6000	0	r/min	All control modes
71	2nd torque limit set-up	0 - 500	0	%	All control modes
72	2nd position over-deviation set-up	1 - 32767	1875	256 Pulse	P·P2
73	2nd over-velocity level set-up	0 - 6000	0	r/min	All control modes

### 4. Protective Functions

#### Protective Functions (What is alarm code?)

- The driver has various protective functions. If any of these functions acts, the motor stops immediately, being then put in trip condition, and simultaneously “Servo Alarm Output” (ALM) is turned OFF.
- Counteractions against motor trip
  - If the motor is in tripping, STATUS display on the front panel of the servo driver discolours into red display and Alarm Code LED (ALM Code) blinks simultaneously, then disabling “Servo ON”.

In addition, when the console is in use Alarm code No. is displayed on the LED display unit of the console, then disabling “Servo ON”.
- Motor trip condition can be reset (released) by keeping “Alarm Clear Input (A-CLR)” ON for 120 ms or more.
- If the overload protective function acts, the alarm can be cleared according to Alarm Clear (A-CLR) signal after elapse of 10 sec or more since alarm output. If the driver power is switched OFF, the overload time limit characteristic (OVERLOAD) is cleared.
- The above alarms can be cleared even by operation of “PANATERM®”.
- Furthermore, the above alarms can be cleared even by operation of the console.
- If any of \*-marked functions in “Table of Protective Functions” acts, Alarm Clear Input (A-CLR) is unable to be reset (cleared). In such a case, after switching OFF the driver power, search and remove the cause and thereafter re-switch ON the same power for resetting the alarm.

#### Check LED Status

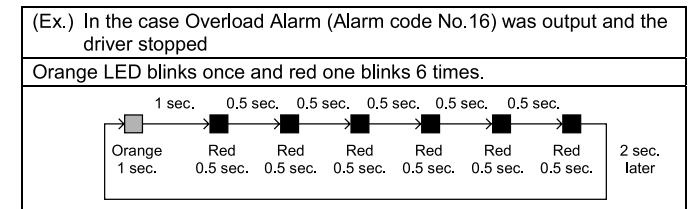
Status LED color	Content
<input type="checkbox"/> Green	Power ON. The driver power is switched ON.
<input type="checkbox"/> Orange	This LED blinks (1 sec) against warning conditions. (LED in blinking indicates overload/over-regeneration/abnormal revolutions of cooling fan.) This is not displayed on the LED display unit of the console.
<input type="checkbox"/> Red	Alarm output



Alarm code LED is not in blinking? (Normally OFF)

This LED blinks against alarm output. Alarm code No. is expressed by blinking frequency in orange and red. For the detail refer to the Technical Instruction Manual (DV0P3700) for sale at option or the Instruction Manual downloaded from our web site.

Orange: 10 digit, Red: 1 digit





## 4. Protective Functions

### ■ Protective Functions

Alarm code No.	Code representation	Corrective actions
11	Under-voltage protection	Measure the power voltage to CNX1 and input the rated voltage.
12	Over-voltage protection	Measure the power voltage to CNX1 and input the rated voltage.
14	* Over-current and/or ground fault protection	This is caused by trouble of the motor/driver. If the inter-cable resistance in the motor is unbalanced upon check, replace the motor with new one. Repair the motor cable if shorted.
15	* Internal resistor over-heat protection	Improve the peripheral environment into the driver operating environment. Reduce load acting on the driver. Replace the cooling fan if it has resulted in trouble.
16	Overload protection	Check the load factor under "Monitor" mode and review the on-load running pattern. Readjust the gain. Check the motor cable for disconnection. Release the motor brake.
18	* Regenerative discharge protection	Check load factor of the regenerative resistor under "Monitor" mode and review the on-load running pattern.
21	* Encoder communication error protection	Communication between the encoder and the driver was interrupted, and the encoder cable disconnection detecting function acted. Replace the encoder cable with new one.
23	* Encoder communication data error protection	Data from the encoder resulted in communication error. Undertake proper countermeasure against noise.
24	Position over-deviation protection	The command pulse is inputted, but the motor is in stopping or in slow running. Adjust the gain so the motor rotates normally as commanded. Adjust the parameter Pr63 setup value.
26	Over-speed protection	The motor rotational velocity exceeds the specified value. Readjust the gain. Reduce the commanded speed (pulse frequency).
27	Command pulse multiplier error protection	Reduce the multiplication ratio set up on "command dividing multiplier" parameter.
29	Deviation counter overflow protection	The number of pulses on the deviation counter exceeded 2 <sup>31</sup> . Command pulse is inputted, but the motor is in stopping or in slow running. Adjust the gain so the motor rotates normally as commanded.
34	Software limit protection	Readjust the gain. Adjust the parameter Pr26 setup value.
36	* EEPROM parameter error protection	Re-set the parameter. If this error happens repeatedly several times, it is caused by trouble of the driver. In such a case, replace the driver with new one. Thereafter, return the defective driver to the dealer (from which you purchased the driver) for investigation and repair.
37	* EEPROM check code error protection	This is caused by trouble of the driver. Replace it with new one and thereafter return the defective driver to the dealer (from which you purchased it) for investigation and repair.
38	Overtravel inhibit protection	Check parameter setup value and wiring to the sensor detecting overtravel.
44	ABS 1-revolution counter error protection	This is caused by trouble of the motor. Replace the motor with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.
45	ABS multi-revolution counter error protection	This is caused by trouble of the motor. Replace the motor with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.
48	* Encoder Z-phase error protection	This is caused by trouble of the motor. Replace the motor with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.
49	* Encoder CS signal error protection	This is caused by trouble of the motor. Replace the motor with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.
95	* Motor auto recognition error protection	The encoder cable is disconnected. Connect CN X4. The motor model is different.
96	* LSI setup error protection	This is caused by trouble of the driver. Replace the driver with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.
Other No.	Other trouble and error	Re-switch ON the power. If same trouble/error occurs repeatedly several times, it is caused by trouble of the motor/driver. In such a case, replace the motor/driver with new one and thereafter return it to the dealer (from which you purchased it) for investigation and repair.

### < Information >

- Load factor and regenerative resistor load factor can be checked in the monitor mode of PANATERM<sup>®</sup> or console.
- Under-voltage protection (Alarm Code No. 11), EEPROM parameter error protection (Alarm code No. 36), EEPROM check code error protection (Alarm code No. 37), and overtravel inhibit protection (Alarm code No. 38) are not memorized in "Alarm History".
- If other trouble/error occurs, STATUS LED and Alarm LED (ALM Code) could eventually turn ON simultaneously in 4 different modes given below, instead of blinking (flashing) as staged in the above Table.

STATUS LED	Alarm Code LED	Alarm content
■ Red	■ Red	Other trouble/error
■ Red	□ Orange	
□ Orange	■ Red	
□ Orange	□ Orange	

## 5. Conformance to EC Directives and UL Standards

### EC Directives

The EC Directives apply to all such electronic products as those having specific functions and directly sold to general consumers in EU countries. These products are required to meet the EU unified standards and to be furnished with CE Marking.

However, our AC servos meet the EC Directives for Low Voltage Equipment so that the machine or equipment comprising our AC servos can meet relevant EC Directives.

### EMC Directives

Our servo systems can meet EMC Directives and related standards. However, to meet these requirements, the systems must be limited with respect to configuration and other aspects, e.g. the distance between the servo driver and motor is restricted, and some special wiring conditions must be met. This means that in some cases machines and equipment comprising our servo systems may not satisfy the requirements for wiring and grounding conditions specified by the EMC Directives. Therefore, conformance to the EMC Directives (especially the requirements for emission noise and noise terminal voltage) should be examined based on the final products that include our servo drivers and servo motors.

### Applicable Standards

Subject	Applicable standard		
Motor	IEC60034-1	Standards referenced by Low-Voltage Directives	
Motor and driver	EN50178		
	EN55011	Radio Interference Wave Characteristics for Industrial, Chemical and Medical high frequency Equipment	Standards referenced by EMC Directives
	EN61000-6-2	Generic standards-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	Lightning Surge Immunity Test	
	— IEC61000-4-6	High Frequency Conduction Immunity Test	
	— IEC61000-4-11	Momentary Power Failure Immunity Test	

IEC: International Electrotechnical Commission

EN: Europaischen Normen

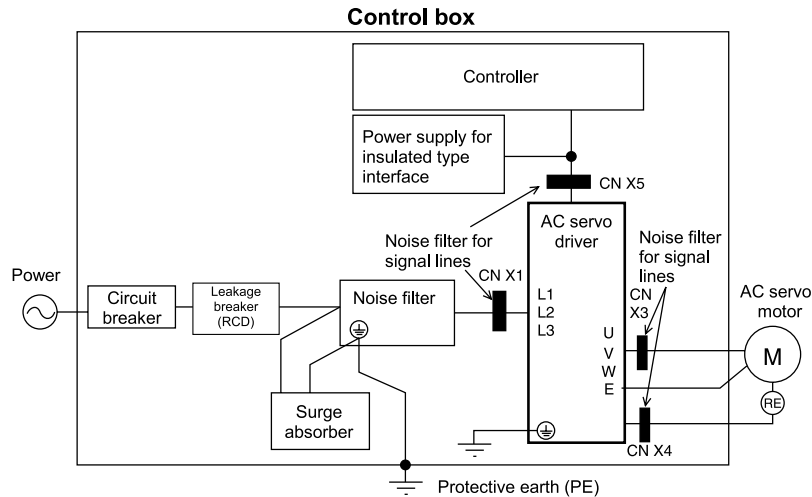
EMC: Electromagnetic Compatibility

## 5. Conformance to EC Directives and UL Standards

### Peripheral Equipment

#### Environment

The servo driver should be used under Contamination Level 2 or 1 specified by IEC60664-1 (housing the driver in an IP54 control box).



#### Power

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

- (1) Use under the environment of Over-voltage Category II specified by IEC60664-1. In order to realize above environment of Over-voltage Category II, use the insulated transformer which conforms to EN60742 at the power source input.
- (2) The power for interface should be marked CE or appropriate EN Standard type (EN60950), 12VDC to 24VDC, insulated.

#### Circuit Breaker

Install a circuit breaker between the power supply and noise filter. The circuit breaker should be IEC Standard and UL listed ( marked ).

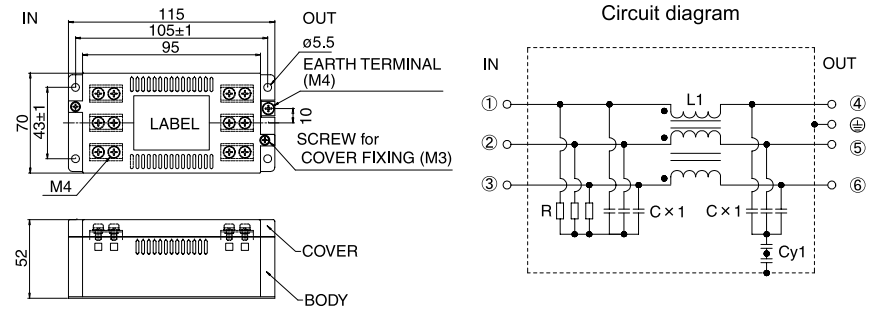
## 5. Conformance to EC Directives and UL Standards

#### Noise Filter

Install the noise filter on the primary line as shown in previous page.

Where two or more drivers are used and, in addition, one set of noise filters is installed in the power unit for all the drivers, feel free to consult with the noise filter manufacturer.

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



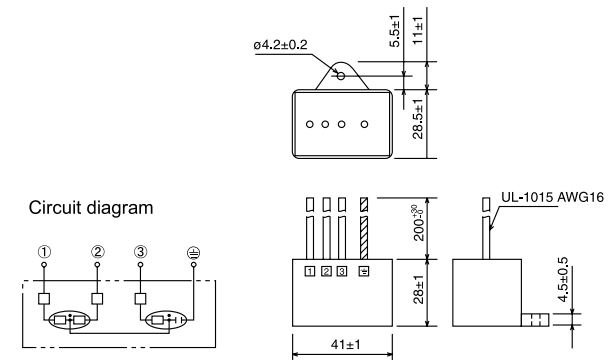
#### Surge Absorber

Install the surge absorber on the primary line of the noise filter.

< Request >

When performing voltage-resistant test on the machine/equipment, remove the surge absorber. Otherwise the absorber may be damaged.

Option Part No.	Manufacturer's part No.	Manufacturer
DV0P1450	R·A·V-781BXZ-4	Okaya Electric Industries Co., Ltd.





单击下面可查看定价，库存，交付和生命周期等信息

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