Melec

5-phase Stepping Motor Driver

ADB-5F41EL

Instructions Manual

(For designers' use)

USER'S MANUAL

Please ensure to read and understand this Instructions Manual before using the product.
Please keep this Instructions Manual at hand

CE

MN0300-1

Introduction

This Instructions Manual describes the safe and proper method of handing "5-phase Stepping Motor Driver ADB-5F41EL" with emphasis on the specifications, assuming that our readers are engaged in designing of control devices incorporating stepping motors.

Please ensure to read and understand this Instructions Manual before using the product.

Please keep this Instructions Manual at hand so that it is always available for reference.

Descriptions in this manual on safety matters:

This product must be operated and used properly.

Otherwise , or when it is operated and used erroneously, unforeseen accidents may occur, causing physical injuries or property damages.

Majority of these accidents can be avoided if you are well informed of hazardous circumstances in advance.

Consequently, this instructions manual describes all the hazardous and dangerous circumstances and situations which can be foreseen and anticipated as well as necessary precautions.

All the above descriptions are being titled by the following symbol-marks and signal-words, namely:

⚠ WARNING	Represents warnings ignorance of which can cause accidents involving fatal or serious physical injuries.
⚠ CAUTION	Represents cautions ignorance of which can cause accidents involving minor physical injuries or property damages.

Introduction

Descriptions in this manual on safety matters:

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8. Maintenance and Check-up

9. Storing and Disposal

10. Specifications

The main parts which revised by this manual

1. Safety

1－1. Safety Precautions

⚠ WARNING

(1) This product is not designed or manufactured for application for equipment requiring high level of reliability such as equipment related to nuclear energy, aeronautics-related equipment, automobiles, ships, medical appliances directly handling the human body and equipment that might seriously affect properties.

(2) Do not use or keep the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, fine particles, soot, steam, or exposed to radiation or direct sunshine. Doing so may cause injury or fire.

(3) For the driver's power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.
Failure to do so may cause electric shock.

(4) This product is designed for use within machinery, so it should be installed within an enclosure.
Failure to do so may cause injury.

(5) Do not transport, move, install the product, perform connections or inspections when the power is on.
Doing so may cause electric shock, injury or fire.

(6) Only qualified personnel are allowed to transport, move, install the product, perform connections or inspections.
Failure to do so may cause injury or fire.

⚠ CAUTION

(7) Do not touch the driver during operation or immediately after stopping.
Doing so may cause burn on the skin due to overheating of the driver.

(8) Ensure to use this product according to the method specified in the Instructions Manual and within the specifications.

(9) Depending on the operational conditions, the stepping motor may step out when it is on holding-state or driving-state.
In particular, the load in transport may fall if the motor steps out on the vertical drive (such as the Z-axis).
Start operation after test run for deliberate confirmation of operation.

(10) Provide fail-safe measures so that the entire system may operate in a safe mode even in cases of the external power supply failure, disconnection of the signal line, or any failure on the driver.

1－2. Safety Information for Handling

●Overall:

⚠ CAUTION

Do not touch the driver during operation or immediately after stopping.
It may cause burn on the skin due to overheating of the driver.

●When setting up the STEP ANGLE SELECT switch:

⚠ CAUTION

Erroneous setting may cause breakage of the machine or injury due to unexpected rotation of the motor.
Ensure correct setting.

●When setting up the HOLD CURRENT SELECT switch:

⚠ CAUTION

A high setting value may cause burn on the skin due to overheating of the motor.
Do not select a high value beyond the required.

●When setting up the DRIVE CURRENT SELECT switch:

⚠ CAUTION

Erroneous setting may cause motor deterioration or damage and burn on the skin due to overheating of the motor.
Ensure correct setting.

●When installing:

⚠ WARNING

Overheating may cause fire.
Mount it on a noncombustible member.
Keep it away from combustibles.

●When connecting the DC Input/Motor Output Connectors (J2, J3):

⚠ CAUTION

Erroneous connection may cause breakage of the motor or the driver.
Correctly connect the DC Input/Motor output connector.

●When inputting power:

⚠ CAUTION

Breakage of the machine or injury is apprehended due to unexpected behavior of the motor. Maintain the state where emergency stop is enabled at any time.

●When the alarm LED comes on:

⚠ WARNING

Overheating may cause fire.
Stop operation when this LED comes on.

●When performing maintenance and checking:

⚠ WARNING

Injury or fire is apprehended due to unexpected behavior.
Do not replace fuse.
Do not disassemble, repair or modify.

2. Overview

2－1. Characteristics

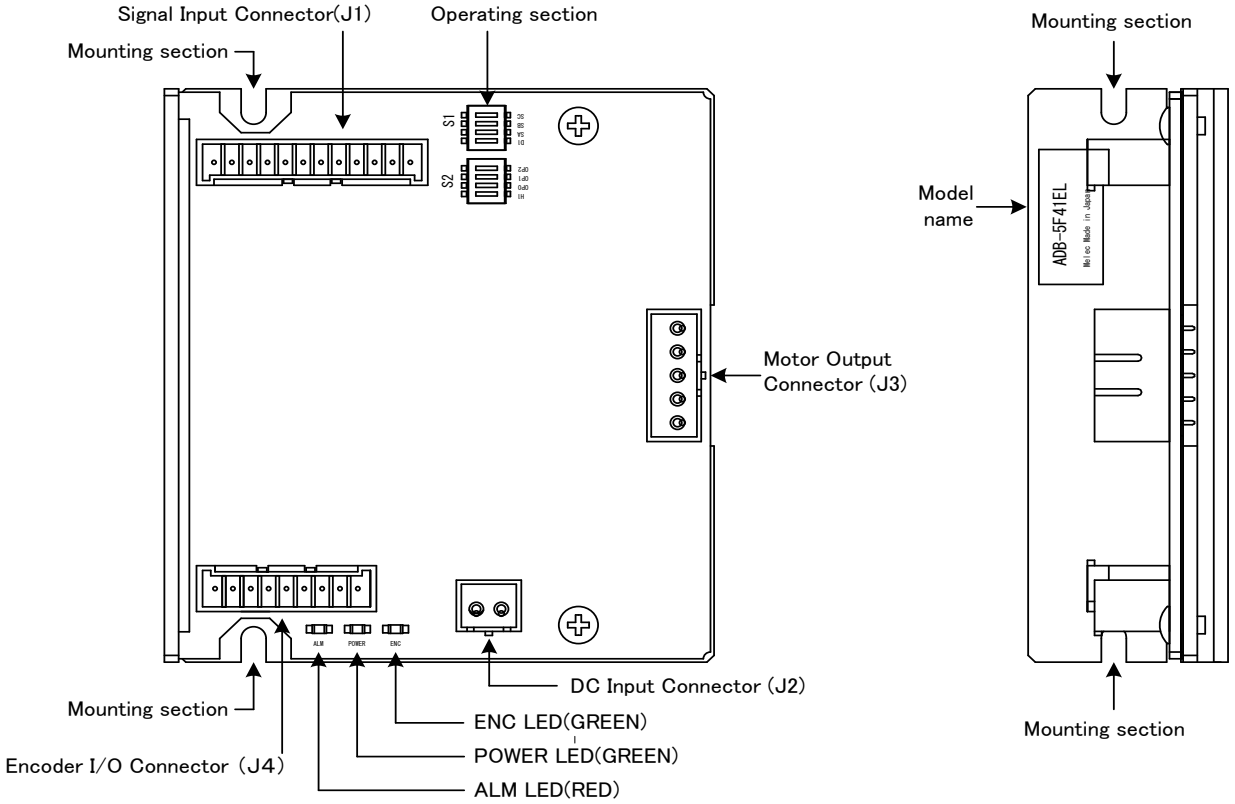
ADB-5F41EL is a step-out detection function driver for a 5-phase stepping motor with DC +24V input.
It can drive a 5-phase stepping motor with 0.75A/phase and 1.4A/phase.
Step angles can be selected from six step angles ranging from a 1/1,1/2, 1/4,1/10,1/20,1/40 division of the basic angle.
HOLD CURRENT and DRIVE CURRENT can be set up.
It offers a 5-phase stepping motor with incremental encoder (Sanyo Denki Co., Ltd.) at our company.

2－2. Product Configuration

●ADB-5F41EL　　One unit(main frame)

J1, J2, J3, J4 of the housing and the contact is not in accessories.

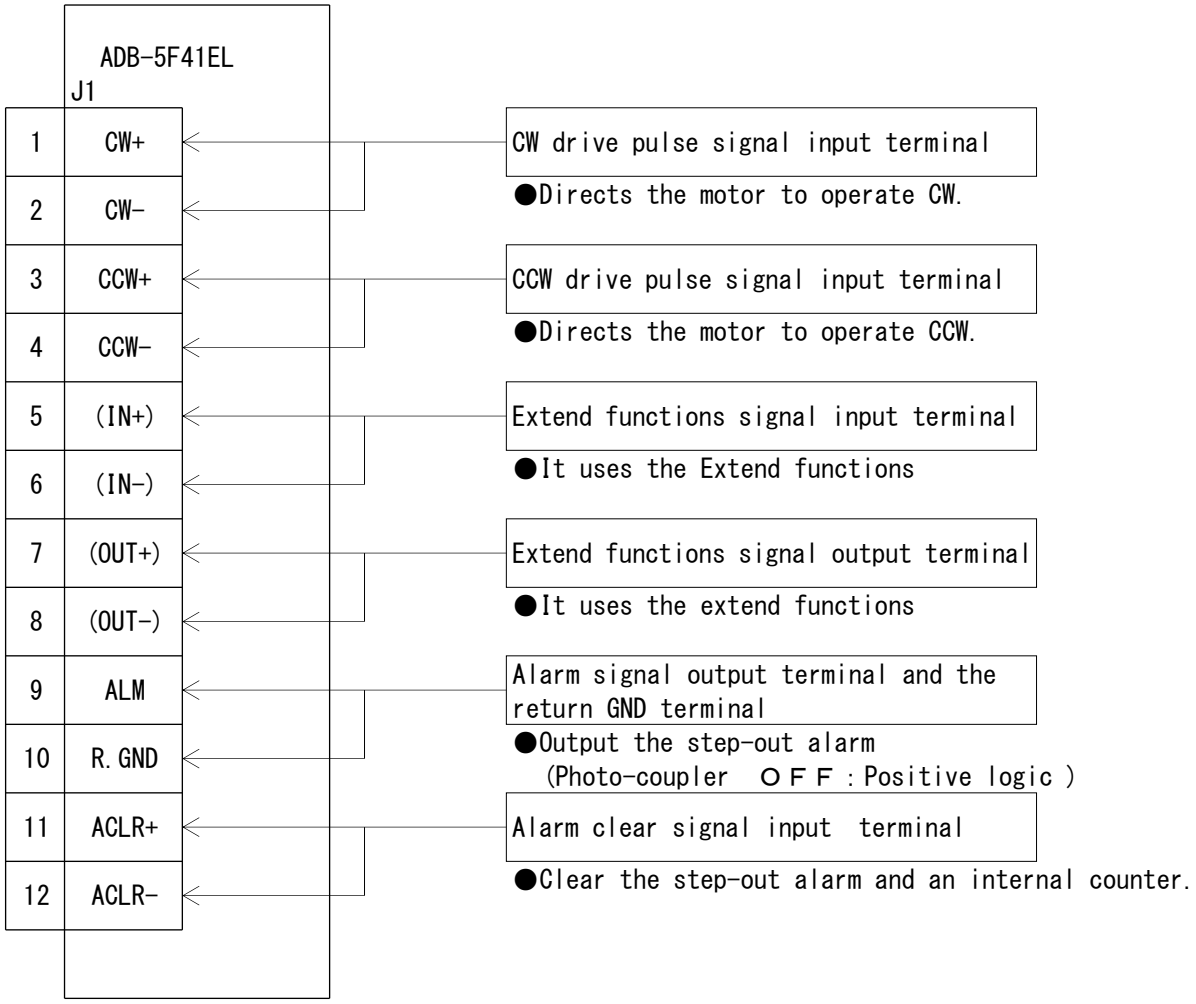
2－3. Appearance



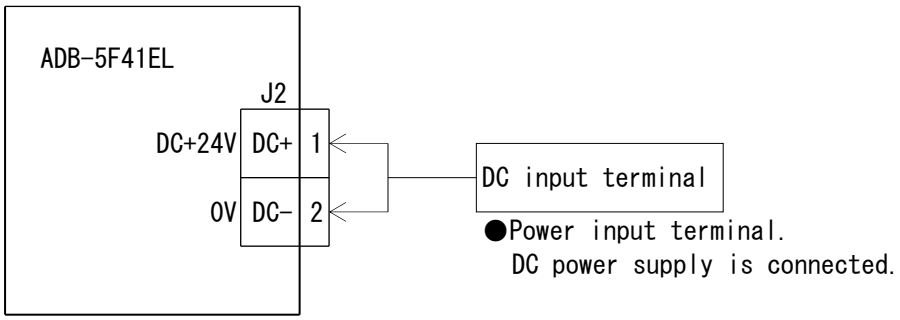
3. Name and Function of Each Section

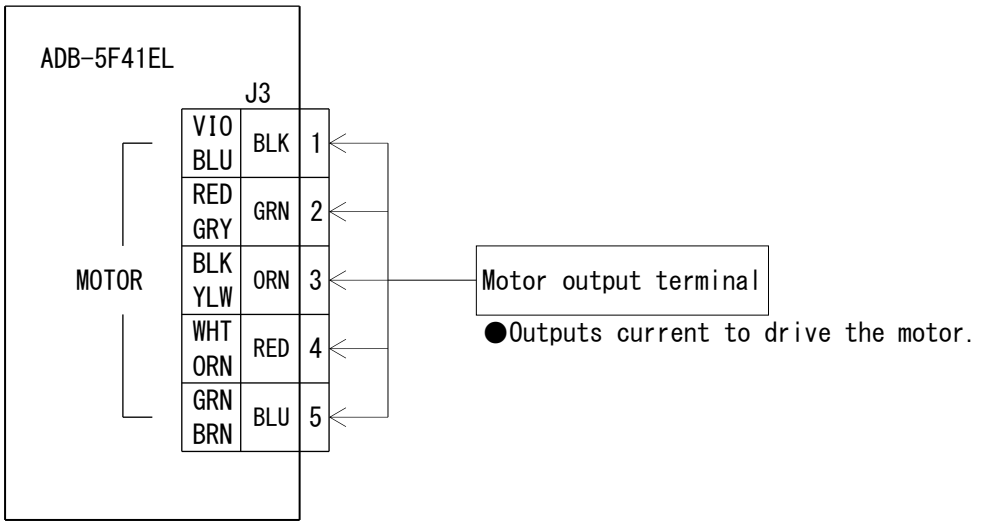
R1

3－1. Signal I/O Connector （J 1）

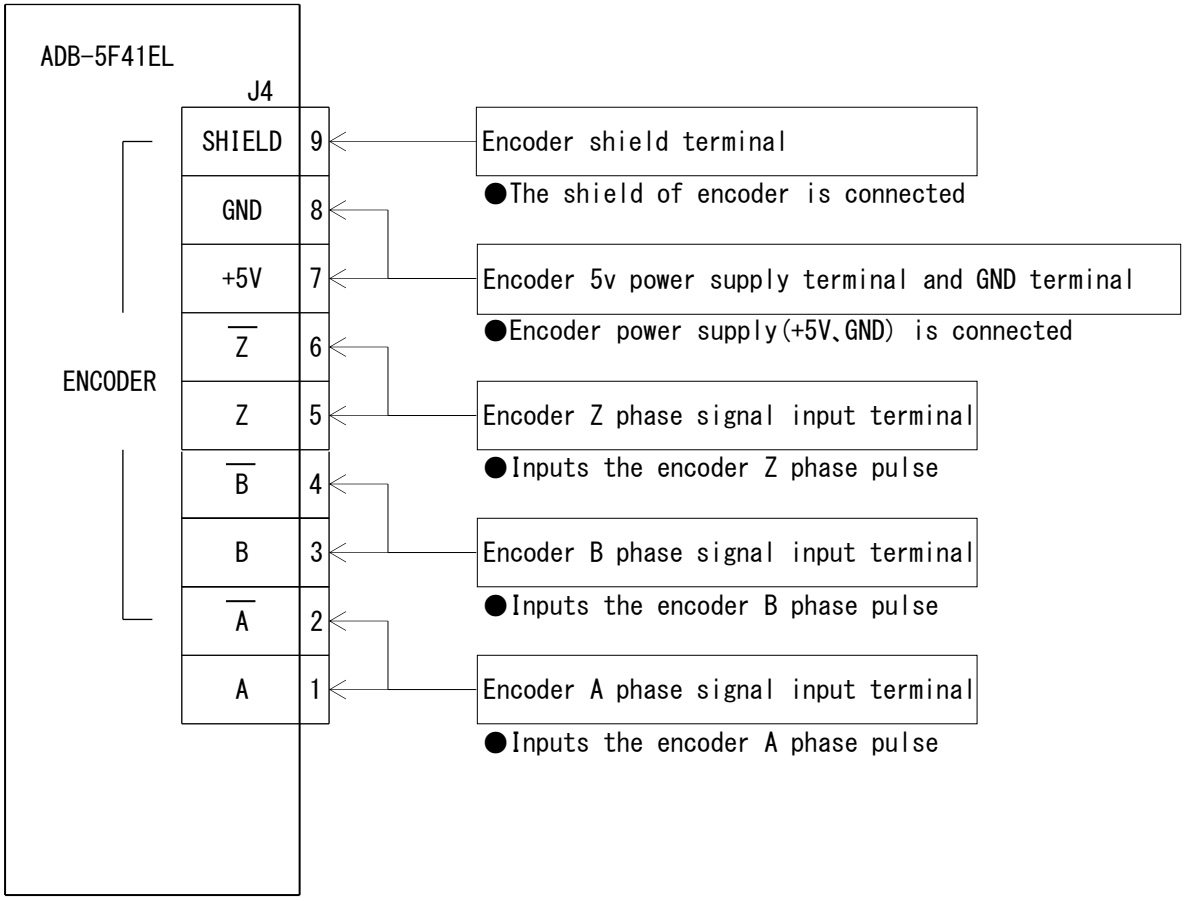


3－2. DC Input/Motor Output Connector （J 2, J 3）





3－3. Encoder I/O Connecter (J4)



3－4. POWER LED

POWER LED(GREEN) comes on upon inputting power.

3－5. ENC LED

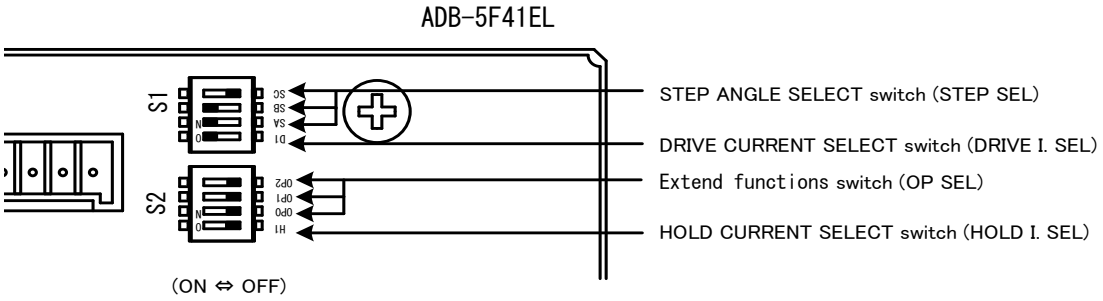
ENC LED (GREEN) comes on upon outputting of +5V power for encoder.

3－6. ALM LED

When an alarm occurs, ALM LED (red) comes on or flashing.

- In case of internal temperature of the driver reaches approx. 70℃ or more, ALM LED comes on.
- When it detects the step-out Flashes (0.5-second intervals).
- It blinks at 5V output abnormality of the encoder.
  (0.5-second intervals twice, repeat of off 1.5 seconds)

3－7. Operating Section



Name of Operating Section	Function	Factory Setting
S1 1 DRIVE CURRENT SELECT switch	Selects DRIVE CURRENT.	D1 : 〔ON〕
S1 2 STEP ANGLE SELECT switch	Selects a step angle.	SA : 〔ON〕
S1 3 STEP ANGLE SELECT switch		SB : 〔ON〕
S1 4 STEP ANGLE SELECT switch		SC : 〔OFF〕
S2 1 HOLD CURRENT SELECT switch	Selects HOLD CURRENT.	H1 : 〔OFF〕
S2 2 Extend functions switch	Selects Extend functions	OP0 : 〔OFF〕
S2 3 Extend functions switch		OP1 : 〔OFF〕
S2 4 Extend functions switch		OP2 : 〔OFF〕

4. Function Set-up by Use

4－1. Setting STEP ANGLE SELECT switch

⚠ CAUTION

Erroneous setting may cause breakage of the machine or injury due to unexpected rotation of motor.
Ensure correct setting.

The step angle is set up with the STEP SEL switch. The step angle can be selected from six different types of step angles.

(1) Set the step angle required by the STEP SEL switch [SA,SB,SC].

●Relationship between the STEP SEL switch and the step angle.

STEP SEL switch			1/ Divisions	Step angle(°)	
SC	SB	SA		0.72° motor	
ON	ON	ON	1/1	0.72	
ON	ON	OFF	1/2	0.36	
ON	OFF	ON	1/4	0.18	
ON	OFF	OFF	1/10	0.072	
OFF	ON	ON	1/20	0.036	(Factory setting)
OFF	ON	OFF	1/40	0.018	
OFF	OFF	ON	Sub adjustment		(Not available)
OFF	OFF	OFF	Sub adjustment		(Not available)

4－2. Setting HOLD CURRENT SELECT switch

> ⚠ CAUTION
>
> A high setting value may cause burn on the skin due to overheating of the motor.
> Do not select a high value beyond the required.

DRIVE CURRENT is set up with the HOLD I.SEL switch.
The ratio of HOLD CURRENT to DRIVE CURRENT can be selected.

(1) Set the HOLD I.SEL switch No. to the ratio of HOLD CURRENT to DRIVE CURRENT required.

● Ratio of HOLD CURRENT

$$\text{Ratio of HOLD CURRENT (\%)} = \frac{\text{HOLD CURRENT}}{\text{DRIVE CURRENT}} \times 100$$

HOLD I.SEL switch H1	Ratio of HOLD CURRENT (%)	
ON	Approx. 50%	
OFF	Approx. 40%	(Factory setting)

● HOLD CURRENT changes relative to DRIVE CURRENT setting.

● The greater the ratio of HOLD CURRENT grows, the more heat the motor generates when is on holding-state.

4－3. Setting DRIVE CURRENT SELECT switch

> ⚠ CAUTION
>
> Erroneous setting may cause motor deterioration or damage and burn on the skin due to overheating of the motor.
> Ensure correct setting.

DRIVE CURRENT is set up with the DRIVE I.SEL switch.
The DRIVE CURRENT can be selected from two different types of DRIVE CURRENT.

(1) Set the DRIVE CURRENT required by the RIVE I.SEL switch [D1].

● Relationship between the DRIVE I.SEL switch and DRIVE CURRENT.

DRIVE I.SEL switch D1	DRIVE CURRENT	
ON	1.4A/phase moter	(Factory setting)
OFF	0.75A/phase moter	

4－4. Setting of the Extend functions switch

⚠ CAUTION

Erroneous setting may cause breakage of the machine or injury due to unexpected rotation of motor.
Ensure correct setting.

Set this switch with power OFF.

(1) Set the functions required by the OP SEL switch [OP2,OP1,OP0].

Extend functions switch			Function allocation	
OP2	OP1	OP0		
OFF	OFF	OFF	－	(Factory setting)
OFF	OFF	ON	－	
OFF	ON	OFF	－	
OFF	ON	ON	－	
ON	OFF	OFF	－	
ON	OFF	ON	－	
ON	ON	OFF	－	
ON	ON	ON	Sub adjustment (Step-out detection function is disabled)	

5. Installation

5－1. Conditions for Installation

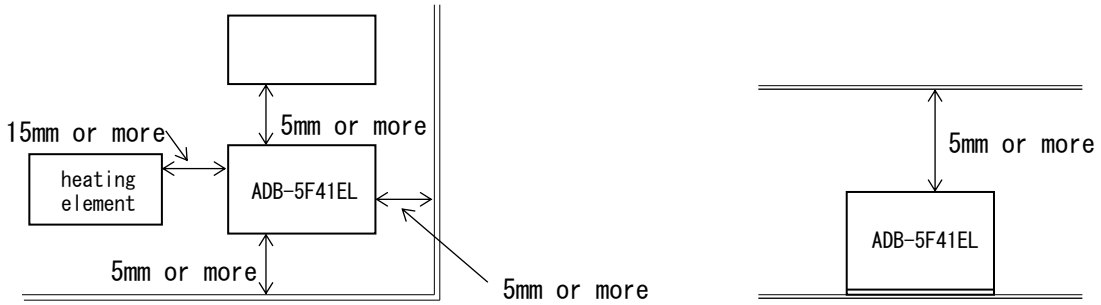
⚠ WARNING

Overheating may cause fire.
Mount it on a noncombustible member.
Keep it away from combustibles.

(1) Designed for incorporating into equipment used indoors, this product requires to be installed in the following environment:

- ●Indoors (where it is not exposed to direct sun).
- ●Where ambient temperature and humidity are controlled within the range set out in the specifications.
- ●Where there is no explosive, corrosive or inflammable gas.
- ●Where it can be protected from dust, salt or iron powder.
- ●Where the product main frame is not exposed to direct vibration or shock.
- ●Where it is not exposed to splashes of water, oil or chemicals.

(2) Install the driver at least 5mm away from other equipment.
However, please be installed to a distance of at least 15mm from the heating element.



- ●Please contact us if you are not installed to a distance of at least 15mm from the heating element.

(3) Considering heat release, control the ambient temperature around the driver within the specified value.

- ●Take measures against accumulation of heat such as allowing generous space around the driver or installing a fan so that heat release is taken care of.

- ●Install the driver securely in contact with metal or other substance with adequate heat conductivity.

(4) In the case that the alarm(ALM) LED comes on, perform the cooling measure of the mounting plate is enlarged or compulsion air cooling etc.
Use the driver on the condition that the alarm(ALM) LED goes out.

(5) Do not allow standing or placing anything heavy on the product.

5－2. Mounting Method

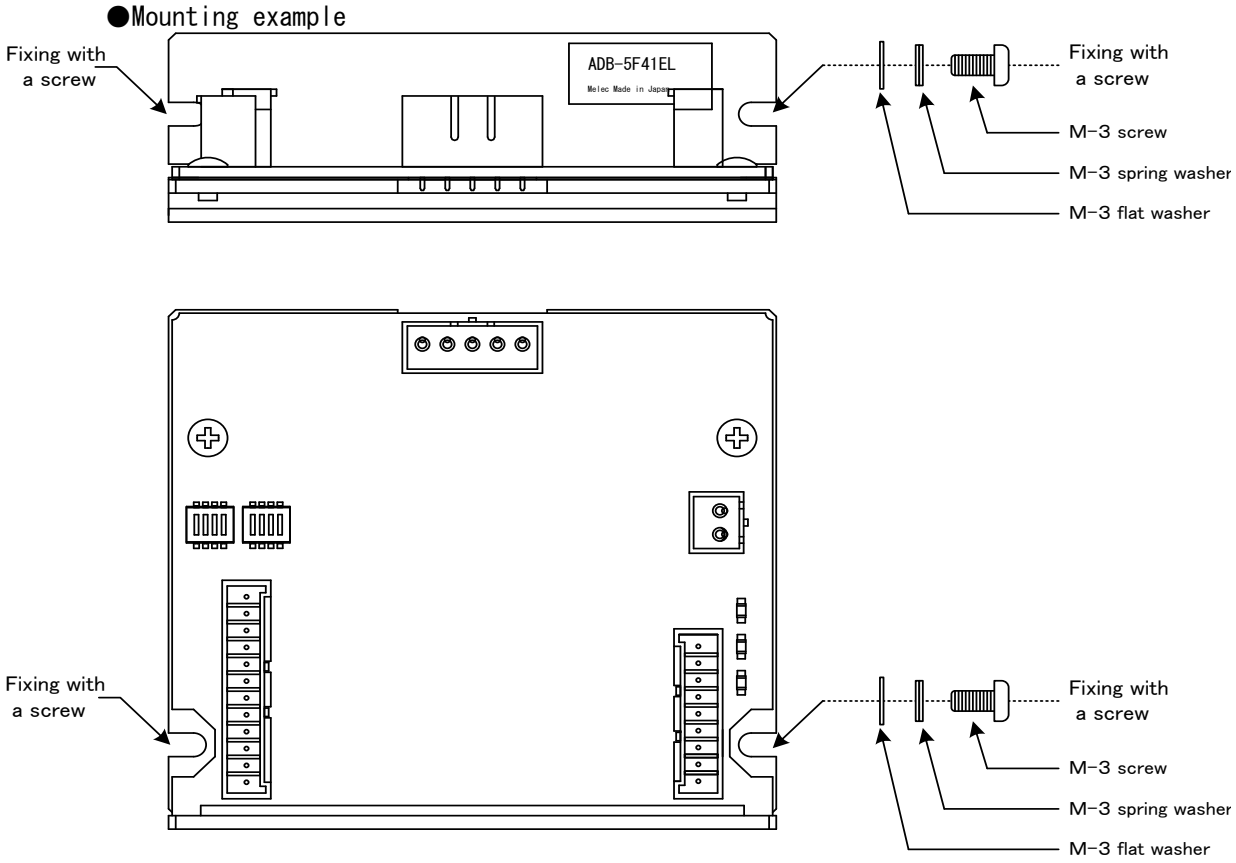
The round holes on the main frame are used.

The following items are required:

●M-3 screw (8mm or more in length): ------ 2
●M-3 spring washer: ---------- 2
●M-3 flat washer: ---------- 2

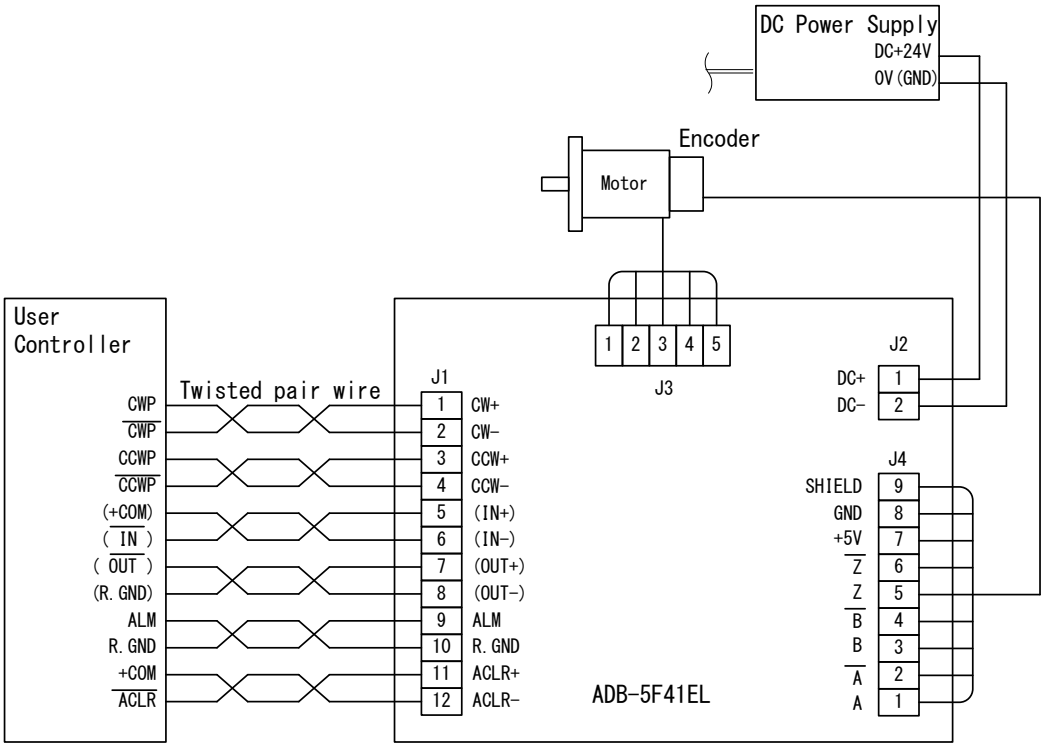
(1) Fix the product at the two round holes on the main frame.

●Mounting example



6. Connection

6－1. Overview of Connection Configuration



●Connect only one motor to one driver.

●Use twisted pair wire for the CW/CCW input signal line.

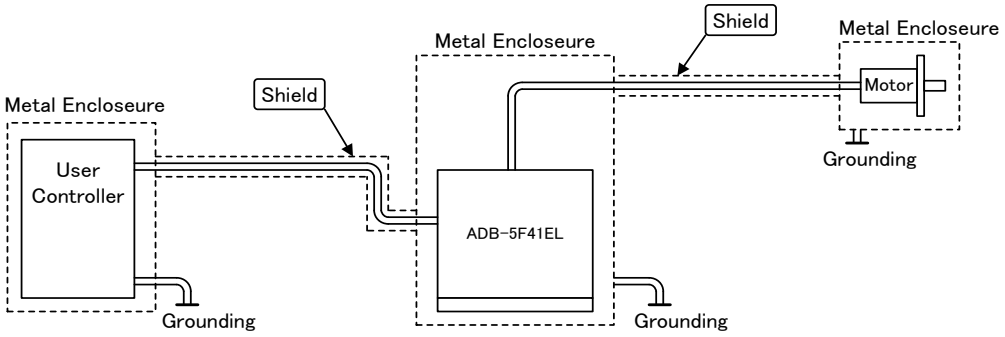
●Provide shielding for the signal line where considerable noise is generated.

●Use the wire material of the characteristic that is difficult to burn.

●Provide shielding for the motor line if it generates significant noise.

●For the driver's power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.

〔Example configuration〕
The metallic enclosure and shielded wires work to shield noise.



6－2. Connecting Signal I/O Connector (J1) R1

The following items are required:

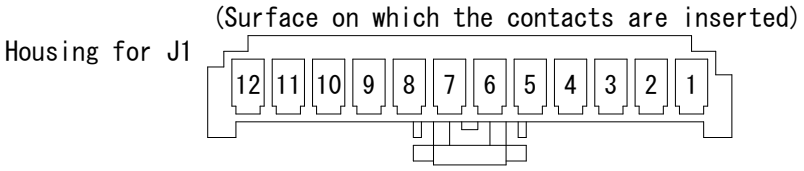
- ●Housing for J1 (51103-0800:Molex) One unit
- ●Contact for J1 (50351-8100:Molex) 12 contacts
- ●Manually operated crimping tool for AWG28-22(57295-5000:Molex) One unit

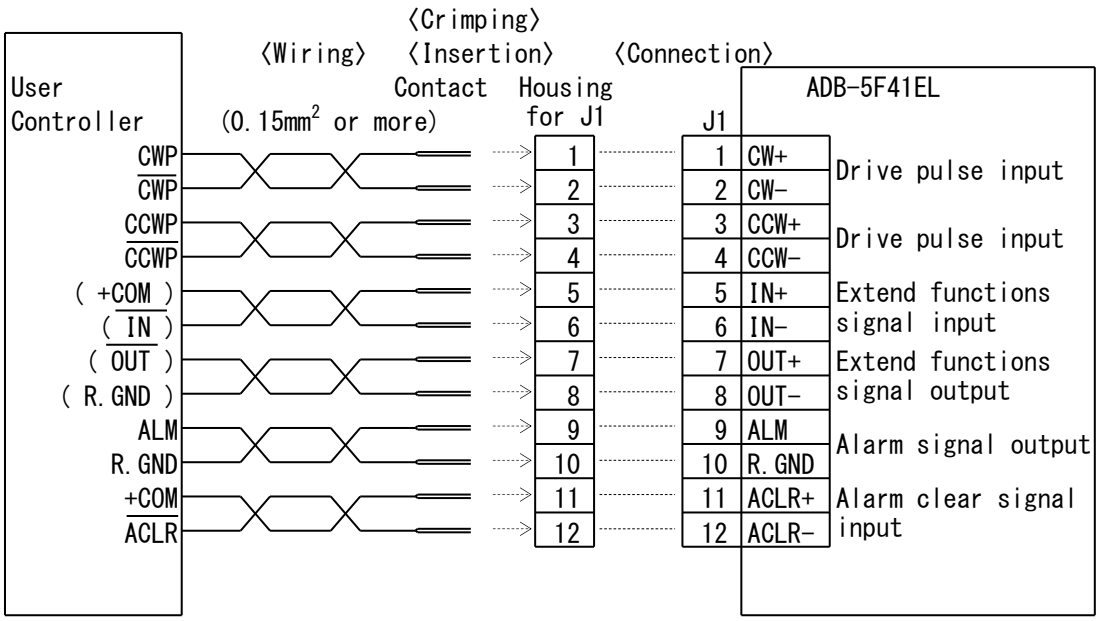
(1) Crimp the contact to the cable used for wiring.

(2) Insert the contact into the housing.
Make sure that the housing No. and the connector No. on the main frame are matched before inserting the contacts.

(3) Connect the housings to the connectors on the main frame.

- ●The contacts for J1 are 12 pieces.
- ●When inserting, keep pushing J1 housing into the connectors until it is locked. Also, check if the contacts are not displaced from the housing.
- ●In wiring, isolate the J1 signal lines from equipment that may be a source of noise, the power line and the motor line.





6－3. Connecting DC Input/Motor Output Connector (J2, J3)

> ⚠ CAUTION
>
> Erroneous connection may cause breakage of the motor or the driver. Correctly connect the DC Input/Motor output connector.

The following items are required:

●Housing for J2 (51067-0200:Molex)	One unit
●Housing for J3 (51067-0500:Molex)	One unit
●Contact for J2,J3 (50217-9101:Molex)	7 contacts
●Manually operated crimping tool for AWG24-18(57189-5000:Molex)	One unit

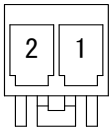
(1) Crimp the contact to the cable used for wiring.

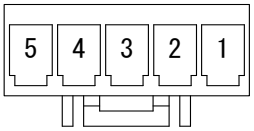
(2) Insert the contact into the housing.
Make sure that the housing No. and the connector No. on the main frame are matched before inserting the contacts.

(3) Connect the housings to the connectors on the main frame.

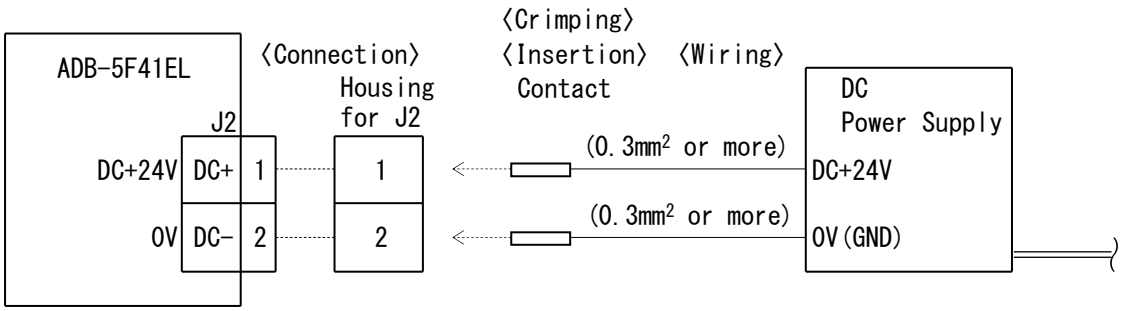
- ●The contacts for J2(for DC input) are 2 pieces, and for J3(motor output) are 5 pieces.
- ●When inserting, keep pushing J2,J3 housings into the connectors until it is locked. Also, check if the contacts are not displaced from the housing.

(Surface on which the contacts are inserted)

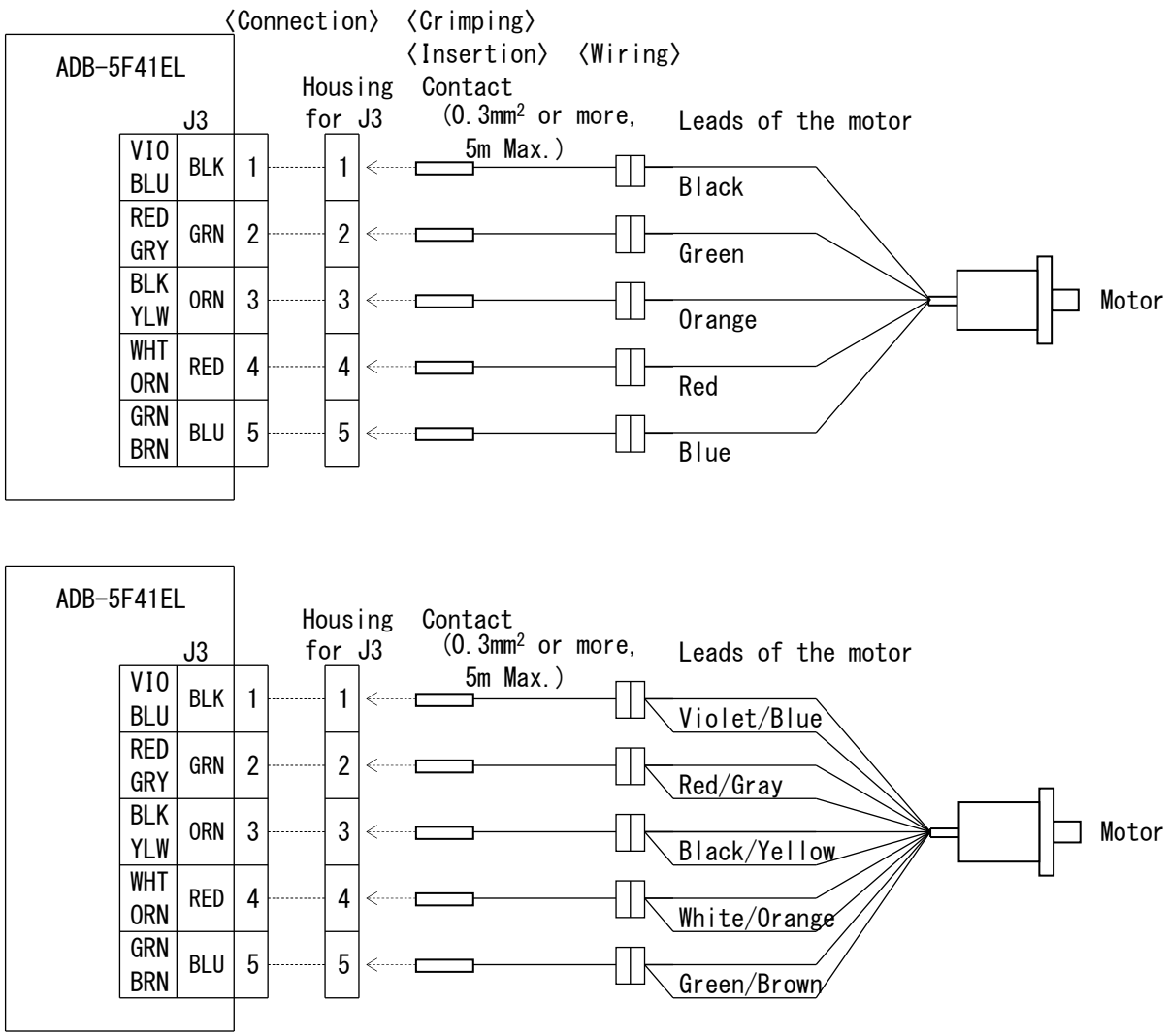
Housing for J2 

Housing for J3 

〔DC input Connector〕



〔Motor output Connector〕 R1



●Color indications for the motor crimping J3 represent colors of the leads of the motor.

●Use a cable of 5m or less for the motor cable .

6－4. Connecting Encoder I/O Connecter (J4)

The following items are required:

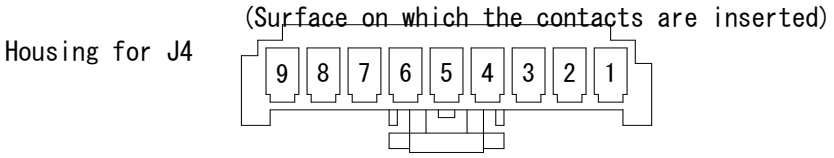
●Housing for J4 (51103-0800:Molex)	One unit
●Contact for J4 (50351-8100:Molex)	9 contacts
●Manually operated crimping tool for AWG28-22(57295-5000:Molex)	One unit

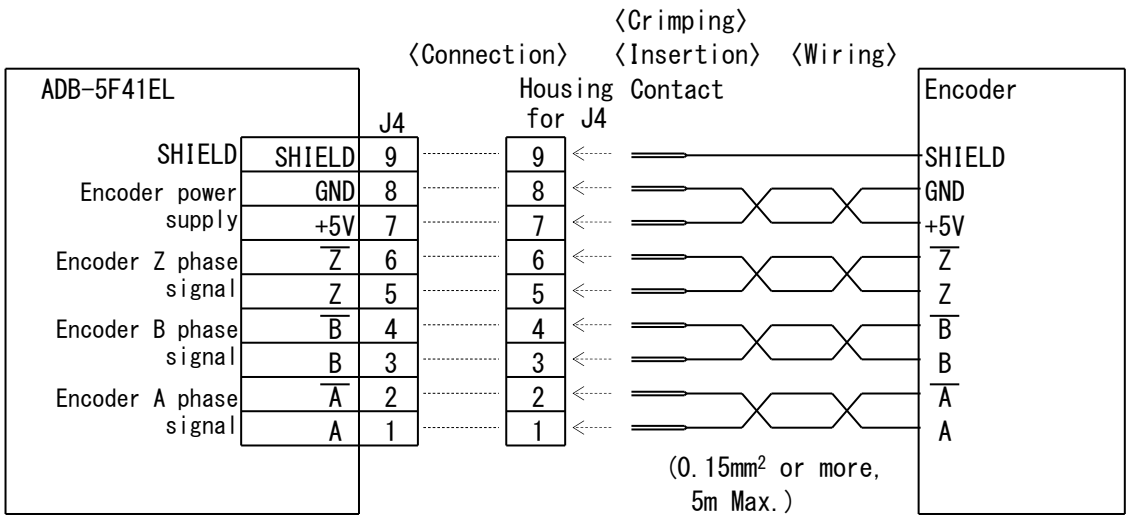
(1) Crimp the contact to the cable used for wiring.

(2) Insert the contact into the housing.
Make sure that the housing No. and the connector No. on the main frame are matched before inserting the contacts.

(3) Connect the housings to the connectors on the main frame.

- ●The contacts for J4 are 9 pieces.
- ●When inserting, keep pushing J4 housing into the connectors until it is locked. Also, check if the contacts are not displaced from the housing.
- ●In wiring, isolate the J4 signal lines from equipment that may be a source of noise, the power line and the motor line.
- ●Use a cable of 5m or less for the encoder cable .



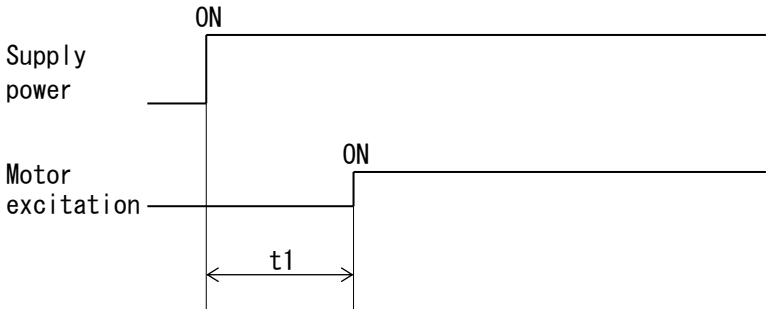


６－５. Inputting Power

> ⚠ CAUTION
>
> Breakage of the machine or injury is apprehended due to unexpected behavior of the motor. Maintain the state where emergency stop is enabled at any time.

(1) Input the DC power supply (DC+24V) in the cable that connected to No.1 and No. 2 terminals of J2.

① Timing chart



t1≦300ms (t1 : Time required for the motor to be enabled.)

7. Confirmation of Setting and Connection

7－1. Check Points

This product requires different switch setting and motor wiring depending on the motor used.
Check if the switch setting and the motor wiring are correctly performed.

Check Points		Check	Remarks
Setting of DRIVE CURRENT SELECT switch	DRIVE I.SEL (D1)		
Setting of STEP ANGLE SELECT switch	STEP SEL (SA, SB, SC)		
Setting of HOLD CURRENT SELECT switch	HOLD I.SEL (H1)		
Setting of the Extend functions switch	OP0, OP1, OP2		
Connection of J1	Signal connection		
Connection of J2	DC+, DC-		
Connection of J3	MOTOR		
Connection of J4	Encoder connection		

8. Maintenance and Check-up

8－1. Maintenance and Check-up

⚠ WARNING

Injury or fire is apprehended due to unexpected behavior.
Do not replace fuse.
Do not disassemble, repair or modify.

(1) As for maintenance inspections the engineer of the specialty shall do it.

(2) We recommend that the following check-ups should be performed periodically:

- ●Checking for any loosened contact on the connectors.
- ●Checking for any flaw and crack on the cabling.

(3) In case of failure, return the driver to us and have it repaired.

８－２. Troubleshooting

Trouble	Check Item	Assumed Cause
1. POWER LED does not come on.	・Connection of power supply. ・Value of power voltage.	・Wiring error with power supply. ・Power voltage failure. ・Driver failure.
2. The motor is not excited. (It can be easily rotated by hand.)	・Connection of the motor to the driver.	・Wiring error with the motor and the driver. ・Driver failure.
3. The motor does not rotate. The motor behaves abnormally. The motor steps out.	・The same check items as those under item 2 above. ・Connection of the pulse signal. ・Voltage and wave form of the pulse signal. ・Setting of the DRIVE CURRENT SELECT switch. ・Setting of the STEP ANGLE SELECT switch. ・Encoder signal connection ・Check items of ALM LED	・Wiring error with the pulse signal line. ・Pulse signal of wrong specifications. ・Wrong Setting for DRIVE CURRENT selection. ・Wrong setting for the step angle. ・Wiring error with encoder signal. ・Driver failure. ・Motor failure.
4. The motor steps out during acceleration.	・Starting pulse speed. ・Acceleration time.	・Starting pulse signal speed is too high. ・Acceleration time is too short.
5. The motor generates excessive heat.	・Setting of the DRIVE CURRENT SELECT switch. ・Value of the HOLD CURRENT ADJUSTMENT trimmer.	・Wrong setting for DRIVE CURRENT selection. ・The setting for HOLD CURRENT is too high.

Short-circuiting of the motor output connector may cause the driver to fail.

●The motor output connector and the power line.
●The motor output connector and the motor output connector.

When the failure phenomenon cannot be remedied, contact our office.

９．Storing and Disposal

９－１．Storing

(1) Keep the product in the following environment:

- ●Indoors (where it is not exposed to direct sun).
- ●Where ambient temperature and humidity are controlled within the range set out in the specifications.
- ●Where there is no explosive, corrosive or inflammable gas.
- ●Where it can be protected from dust, salt or iron powder.
- ●Where the product main frame is not exposed to direct vibration or shock.
- ●Where it is not exposed to splashes of water, oil or chemicals.

(2) Do not allow standing or placing anything heavy on the product.

９－２．Disposal

(1) Dispose of the product as industrial waste.

１０. Specifications

R1

１０－１. General Specifications

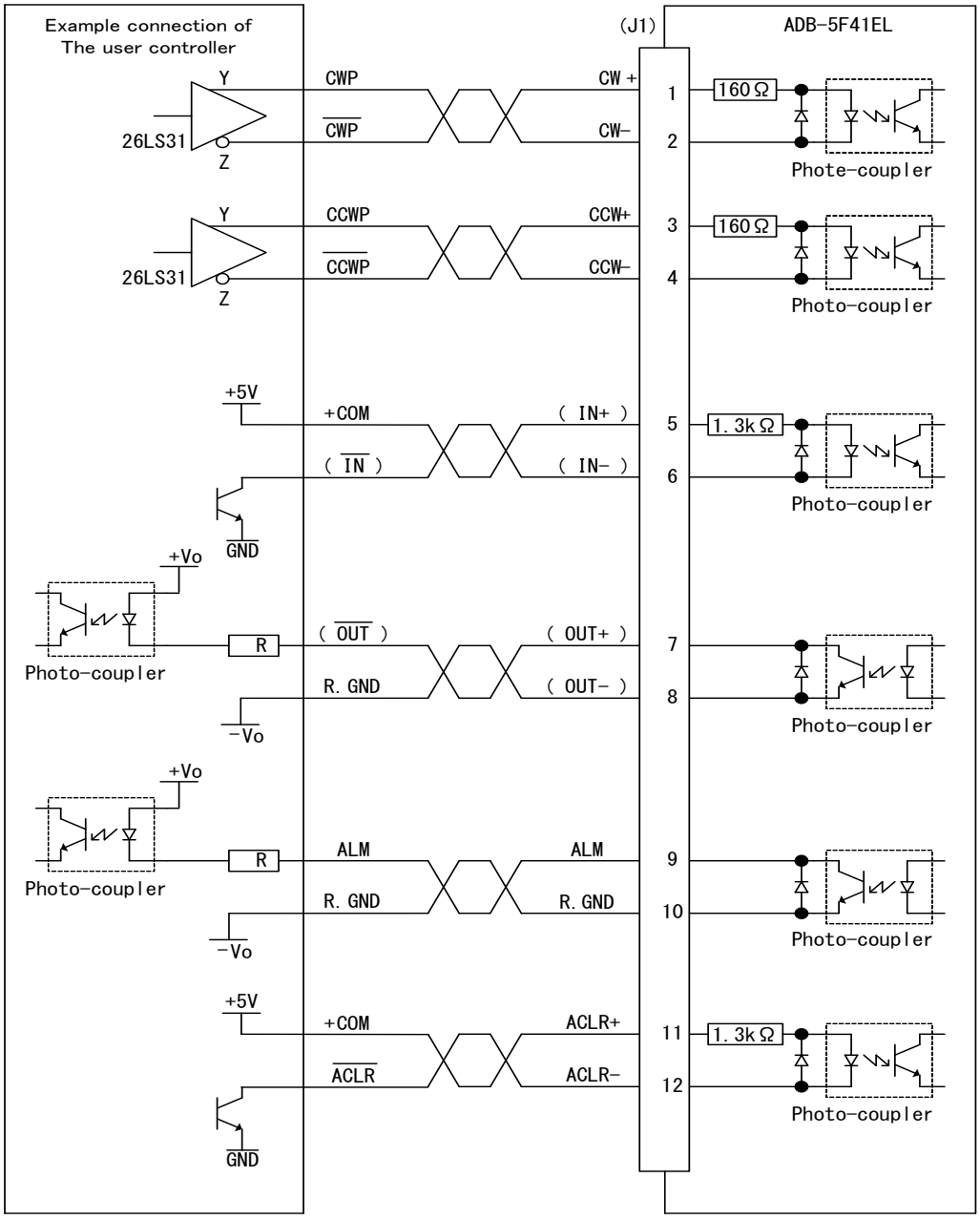
Supply Power	DC+24V *1 (Ripple voltage P-P 2.0V or less) ●Rated input current 〔DRIVE I.SEL ⇒ D1=ON set up〕 at DRIVE DC+24V: 2.1A *2 ●Rated input current 〔HOLD I.SEL ⇒ H1=OFF set up〕 at HOLD DC+24V: 0.3A
Motor output current	●Drive pulse input DRIVE I.SEL OFF:0.75A/phase(typical) DRIVE I.SEL ON :1.40A/phase(typical) ●Motor excitation stop input HOLD I.SEL OFF : Approx. 40% of DRIVE CURRENT HOLD I.SEL ON : Approx. 50% of DRIVE CURRENT
Input Signal	●Drive pulse input (CW,CCW) ..... Photo-coupler input ●Alarm clear signal input (ACLR) ..... Photo-coupler input ●Extend functions signal (IN) ..... Photo-coupler input ●Encoder signal input (A phase,B phase,Z phase) ..... Photo-coupler input
Output Signal	●Alarm signal output (ALM) ..... O/C output ●Feature expansion signal output (OUT) ..... O/C output
Functions of Operating Sections	●Step angle selection (STEP SEL) ●DRIVE CURRENT selection (DRIVE I.SEL) ●HOLD CURRENT selection (HOLD I.SEL) ●Extend functions selection (OP SEL)
Overheat alarm	●Overheat alarm (ALM LED)
Operating Ambient Temperature	0℃ ～ +40℃ (No freezing allowed.)
Operating Ambient Humidity	80%RH or less (No condensation allowed.)
Storing Temperature	-10℃ ～ +55℃ (No freezing allowed.)
Storing Humidity	80%RH or less (No condensation allowed.)
Altitude	Up to 1000m above sea level
Atmosphere	Indoor (Exposure to direct sun is not allowed.) Without any explosive, corrosive or inflammable gas, oil mist, or dust.
Withstanding Vibration	No abnormality should be found after a vibration test at 10～55Hz, 0.15mm P-P
Insulation resistance	DC connector - signal connector - Frame (Each other) : DC500V 100MΩ or more
Exterior Dimensions	$^{H}77 \times {}^{W}85 \times {}^{D}28$ (mm)
Weight	0.1kg

*1 Input voltage range is DC+24V±10%.

*2 Use a power supply that provides sufficient input current.

１０－２. I/O Signal

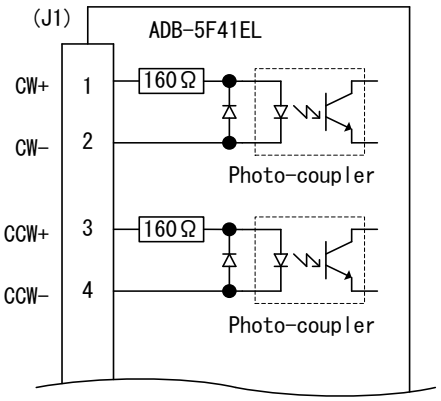
(1) Example Circuit Connection(J1)



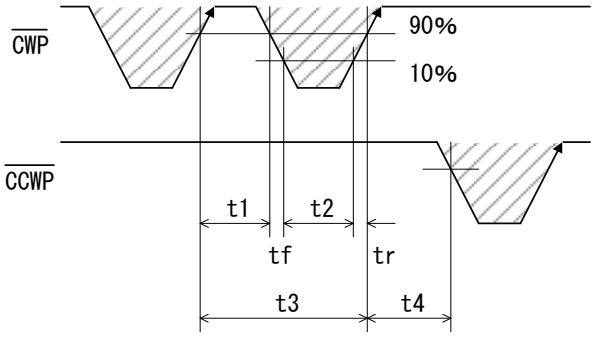
(2) Drive pulse input (CW, CCW)

① Operating current range

The photo-coupler turns on with inter-terminal voltage of 3.1 V～5.5 V. (Photo-coupler diode $V_F \fallingdotseq$ 1.6 V)



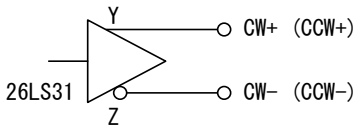
② Timing chart



t1≧0.5μs, t2≧0.5μs, tf,tr≦1μs
t3≧1μs, t4>1μs

(50% duty)

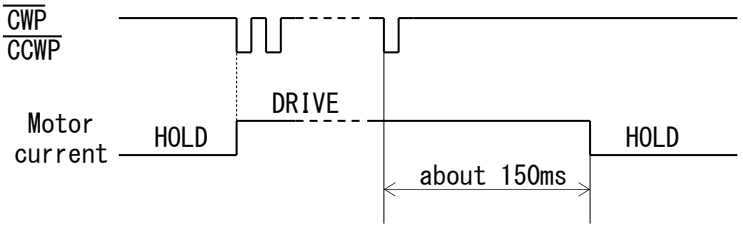
[To the line driver 26LS31]



Maximum response frequency : 1MHz
(at 50% duty)

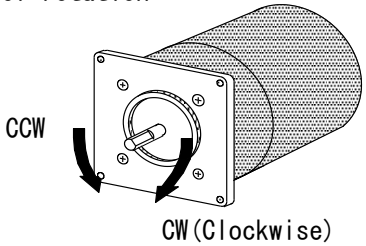
● The shaded area (▨) indicates light emission from the photo-coupler, and the motor is driven at the rising edge (↗). "t4" greatly varies according to the inertial moment including that of the motor.

③ Automatic switching for DRIVE/HOLD



● Inputting drive pulse causes the current output to the motor to change from HOLD CURRENT to DRIVE CURRENT, which returns to HOLD CURRENT in about 150ms. DRIVE CURRENT continues if pulse is input on driving-state.

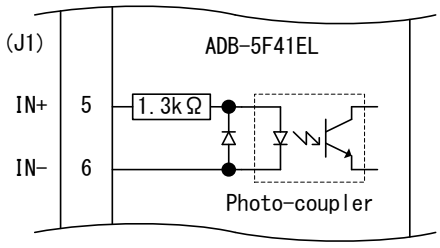
④ Direction of rotation



CW(Clockwise)

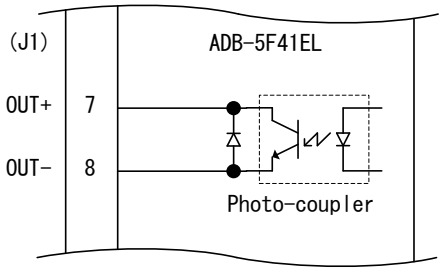
(3) Extend functions signal input (IN)

① Operating current range
The photo-coupler turns on with inter-terminal voltage of 4.5 V～26.4 V.
(Photo-coupler diode $V_F \fallingdotseq$ 1.1 V)



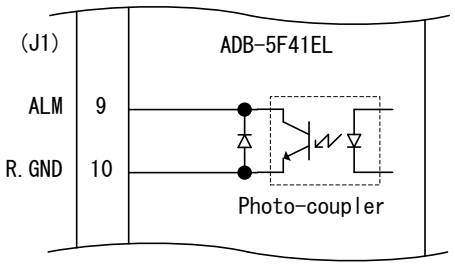
(4) Extend functions signal output (OUT)

① Output current a. $I_C \leqq 6mA$, $V_{CE} < 2V$
b. $I_C \leqq 2mA$, $V_{CE(sat)} \leqq 0.6V$
$V_{CEO} \leqq 30V$



(5) Alarm signal output (ALM)

① Output current a. $I_C \leqq 6mA$, $V_{CE} < 2V$
b. $I_C \leqq 2mA$, $V_{CE(sat)} \leqq 0.6V$
$V_{CEO} \leqq 30V$

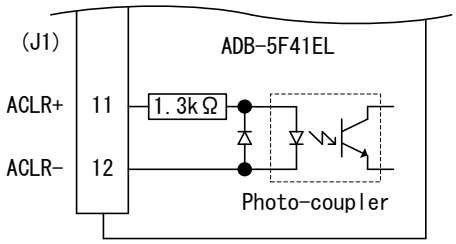


● Upon detection of the step-out and OFF the coupler output of the alarm signal. The ALM LED flashes. (0.5-second intervals)

● During the alarm signal output is, it makes the motor in HOLD state. Drive pulse will not be accepted.

(6) Alarm clear signal input (ACLR)

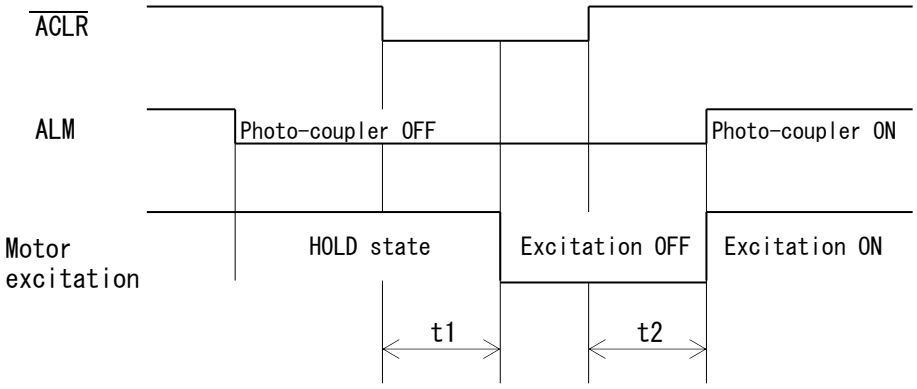
① Operating current range : 2.6mA～19.5mA
The photo-coupler turns on with inter-terminal voltage of 4.5 V～26.4 V.
(Photo-coupler diode $V_F \fallingdotseq 1.1$ V)



● When you enter the alarm clear signal to shut off the excitation current of the motor, and returns the internal process for the step-out to the initial state.

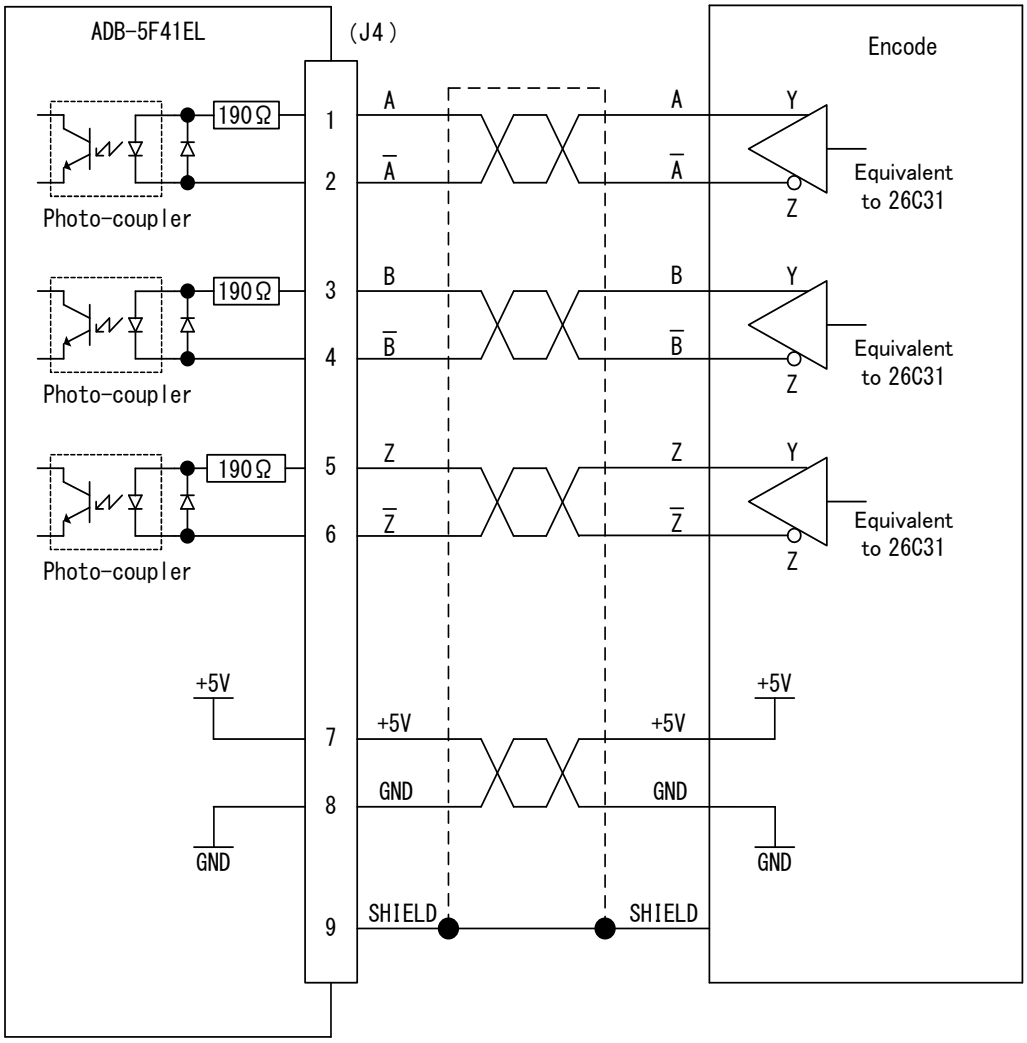
● When you release the input of the alarm clear signal, it will be canceled the alarm output signal. (Photo-coupler ON), and I will output the excitation current to the motor.

② Timing chart



t1≦5ms (t1 : Time required for the motor excitation current to be shut off.)
t2≦100ms (t2 : Time required for the motor to be enabled.)

(7) Example Circuit Connection (J4)

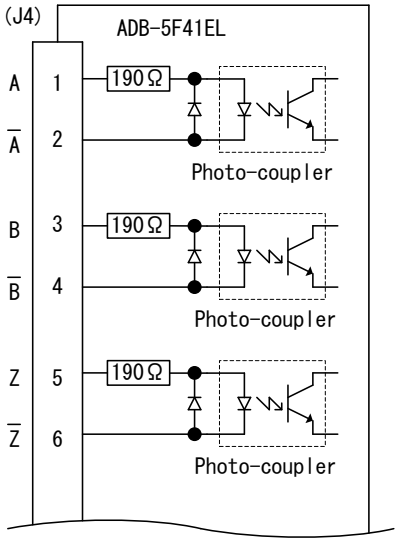


● + 5V and GND are not insulated from the internal power supply of the ADB-5F41EL.

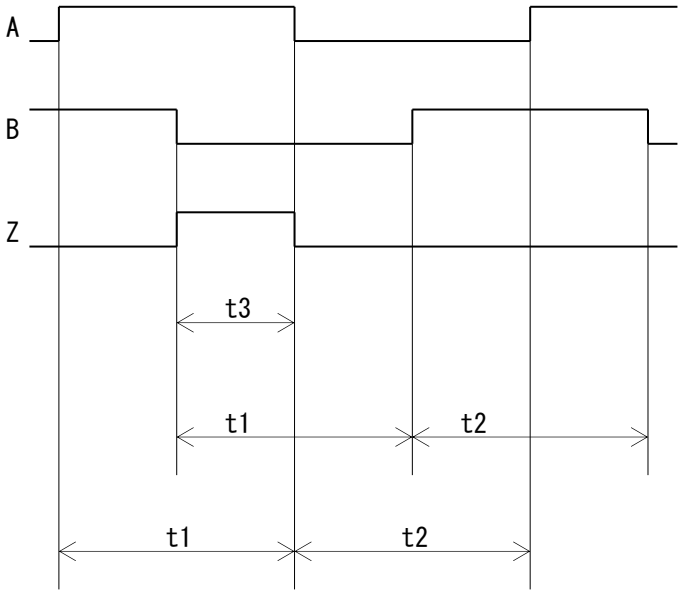
(8) Encoder input (A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$)

① Operating current range

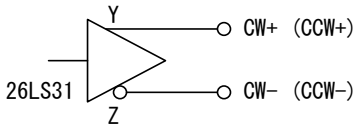
The photo-coupler turns on with inter-terminal voltage of 3.1 V～5.5 V.
(Photo-coupler diode V_F≒ 1.6 V)
Coupler OFF in the inter-terminal voltage ≦ 1V.



② Timing chart



[To the line driver 26LS31]

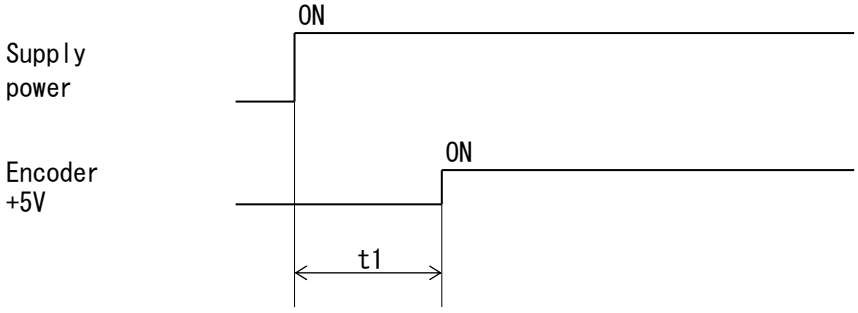


t1≧2.5μs, t2≧2.5μs, t3≧2.5μs
Maximum response frequency : 200kHz

(9) Encoder + 5V output

① Output voltage and Operating current range +5V±5%、MAX200mA

② Timing chart



t1≦100ms

１０－３. Alarm LED (ALM)

> ⚠ WARNING
>
> Overheating may cause fire.
> Stop operation when this LED comes on.

(1) Overheat alarm

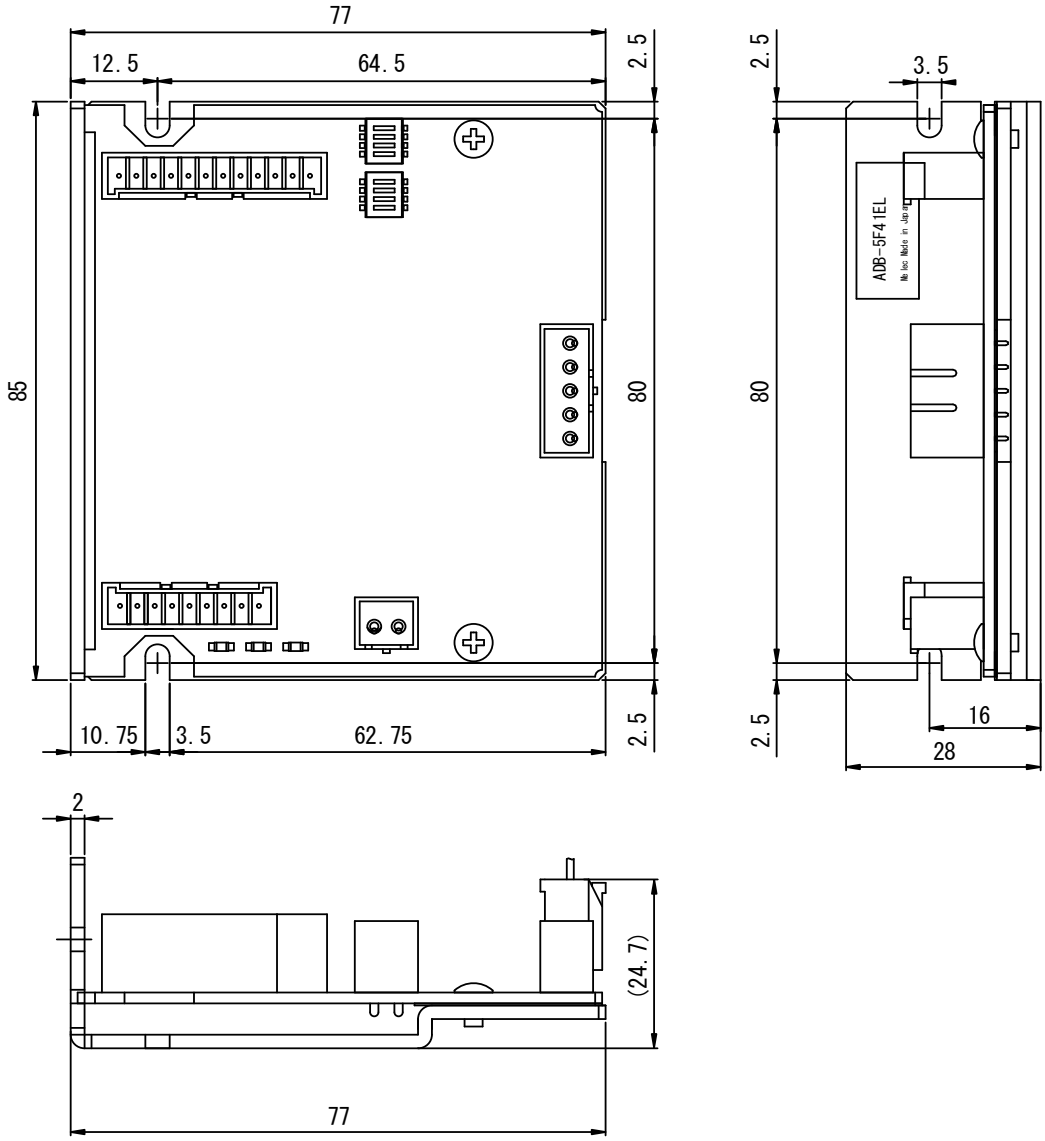
- In case of internal temperature of the driver reaches approx. 70℃ or more, O.H.A LED comes on. At this time the motor output current is not blocked.
- When this LED comes on, stop operation and check if there is any abnormality occurring with the motor and the driver.
- Provide mechanical cooling, for example, if this LED comes on while no abnormality is detected.
- Continuous operation is possible unless this LED comes on.

(2) Step-out. 5V output abnormality for encoder

- When it detects the step-out Flashes (0.5-second intervals).
  Drive pulse will not be accepted.
- It blinks at 5V output abnormality of the encoder.
  (0.5-second intervals twice, repeat of off 1.5 seconds)
  Drive pulse will not be accepted.
  ENC LED will turn off.
  By cutting off the power, please remove the cause Check the wiring and connections and the like. And please ON the power.

１０－４. Dimensions

(Unit：mm)



１０－５. Applicable Motors

●5-phase stepping motor with encoder (Sanyo Denki Co., Ltd.)

Representative Motors	Basic Angle (°)	Current (A/phase)	Setting DRIVE I.SEL switch No.	Torque Data Fig. No.
103F5510-72XE43	0.72	0.75	OFF	Fig.1
103F7851-82XE42 103F7852-82XE42	0.72	1.4	ON	Fig.2 Fig.3
Factory Setting			ON	—

●Please contact us if you want to use the motor other than the above to our office.

１０－６. 5-phase stepping motor specifications with encoder

(1) General Specifications

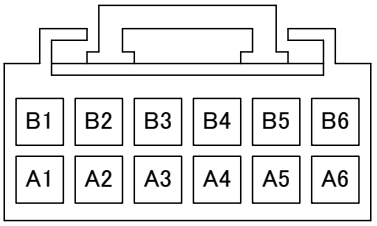
Motor type	103F5510-72XE43	103F7851-82XE42	103F7852-82XE42
Exterior Dimensions	□42mm×63.3mm	□60mm×61.5m	□60mm×70.2mm
Shaft Diameter	φ5mm	φ8mm	φ8mm
Holding Torque	0.25 N·m	0.55 N·m	0.87 N·m
Rotor Inertia	0.065×10^{-4} kg·m²	0.275×10^{-4} kg·m²	0.400×10^{-4} kg·m²
Weight	0.46kg	0.66kg	0.83kg
Current	0.75 A/phase	1.40 A/phase	1.40 A/phase
D.C Resistance	2.30±10% Ω	0.74±10% Ω	0.89±10% Ω
Step Angle	0.72°	0.72°	0.72°
Class of Insulation	Class B (+130℃)		
Withstand Voltage	AC 1000 V 50/60 Hz, for one minute	AC 1500 V 50/60 Hz, for one minute	
Insulation Resistance	DC500V 100MΩ or more		
Operating Ambient	-10℃～50℃		
Operating Ambient	20%～90%(no condensation allowed)		
Motor surface temperature	85℃ or less		

(2) Encoder Specifications R1

Motor type		103F5510-72XE43	103F7851-82XE42	103F7852-82XE42
Encoder specifications	Supply Power	DC5V ±5% input current 150mA		
	Basic number of divisions	500 C/T		
	Maximum response frequency	100 kHz		
	Output Signal	Encoder outputs(A phase, B phase, Z phase) ..... To the line driver output		
	connector (Encoder side)	Encoder Housing : 1-1318118-6(Tyco Electronics) Contact : 1318106-1(Tyco Electronics)		

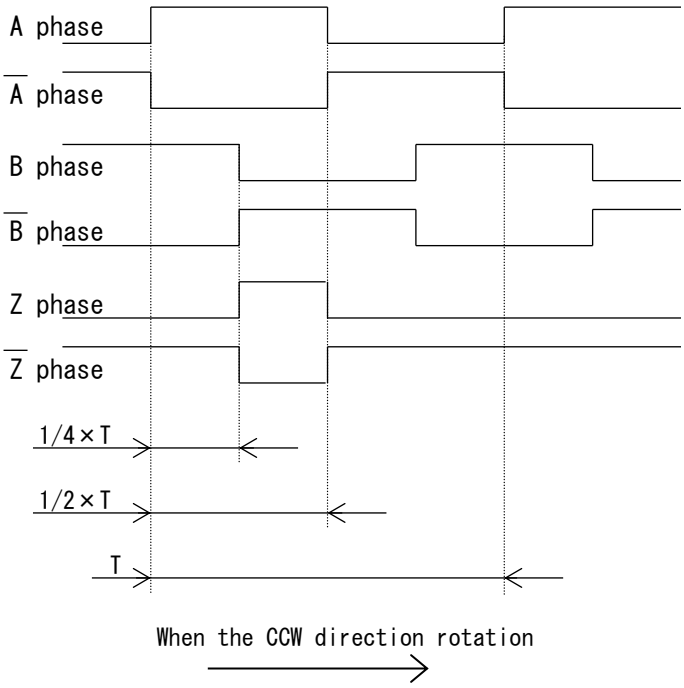
Pin No.	Signal	Leads of color
A1	A phase	Blue
B1	$\overline{A}$ phase	Brown
A2	B phase	Green
B2	$\overline{B}$ phase	Violet
A3	Z phase	White
B3	$\overline{Z}$ phase	Yellow
A4	+5V	Red
B4	GND	Black
A5	N.C	
B5	N.C	
A6	Shield	Black
B6	N.C	

(Surface on which the contacts are inserted)



●Adaptable connector
(Tyco Electronics)
・Housing : 1-1318115-6
・Contact : 1318112-1
・Manually operated crimping tool
: 91576-1(AWG28-24)

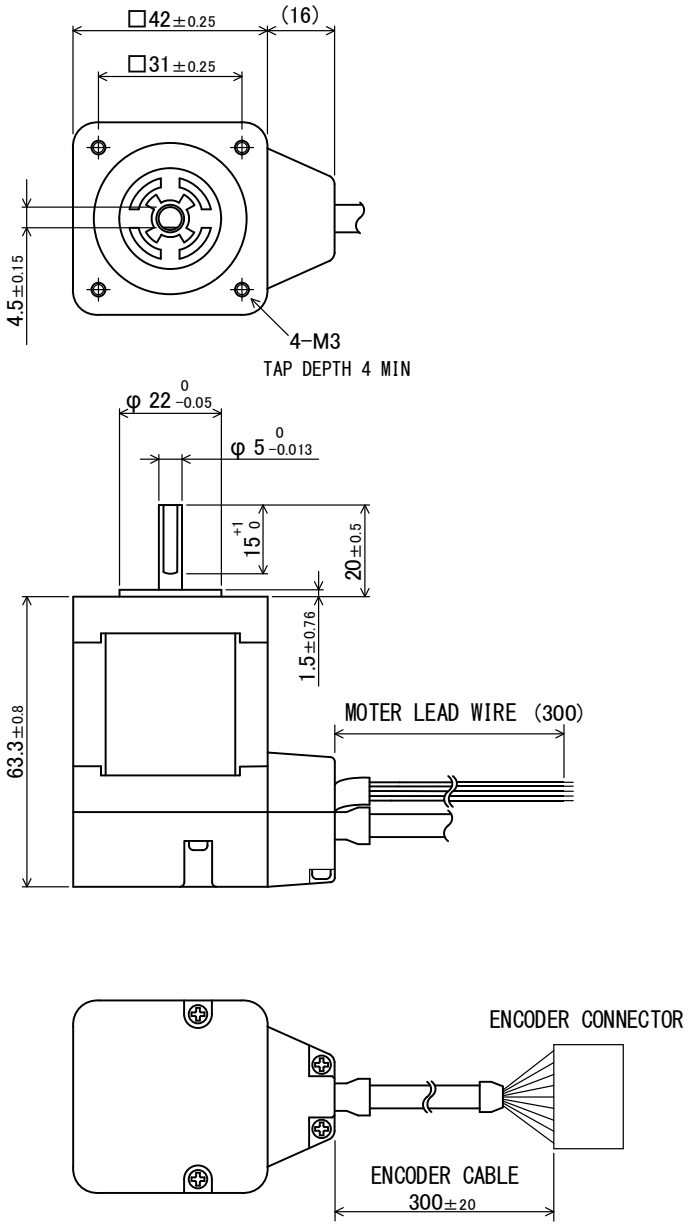
Timing



●Please do not Insulation Resistance test and Insulated Withstanding Voltage test between the encoder signal line and frame.

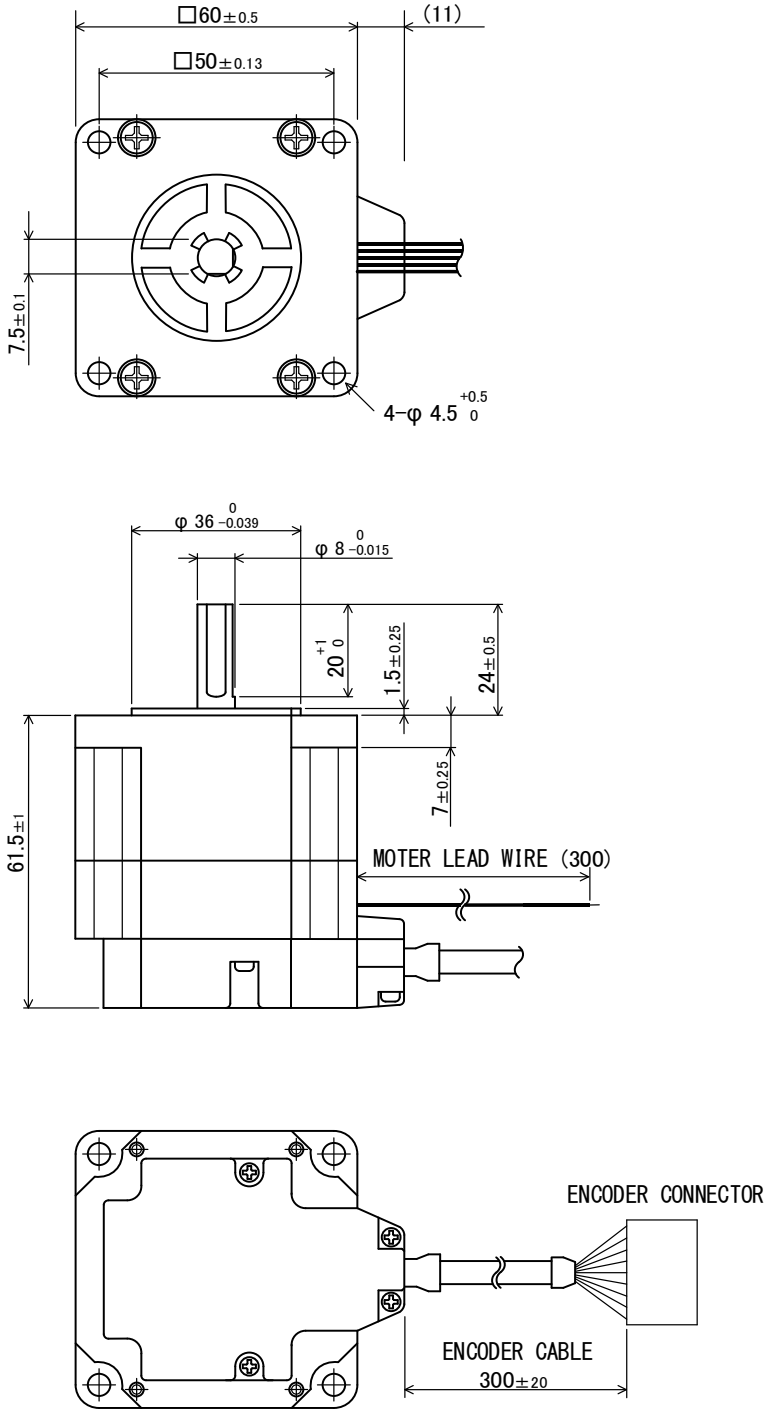
(3) 5-phase stepping motor Dimensions with encoder
a. 103F5510-72XE43

(Unit : mm)



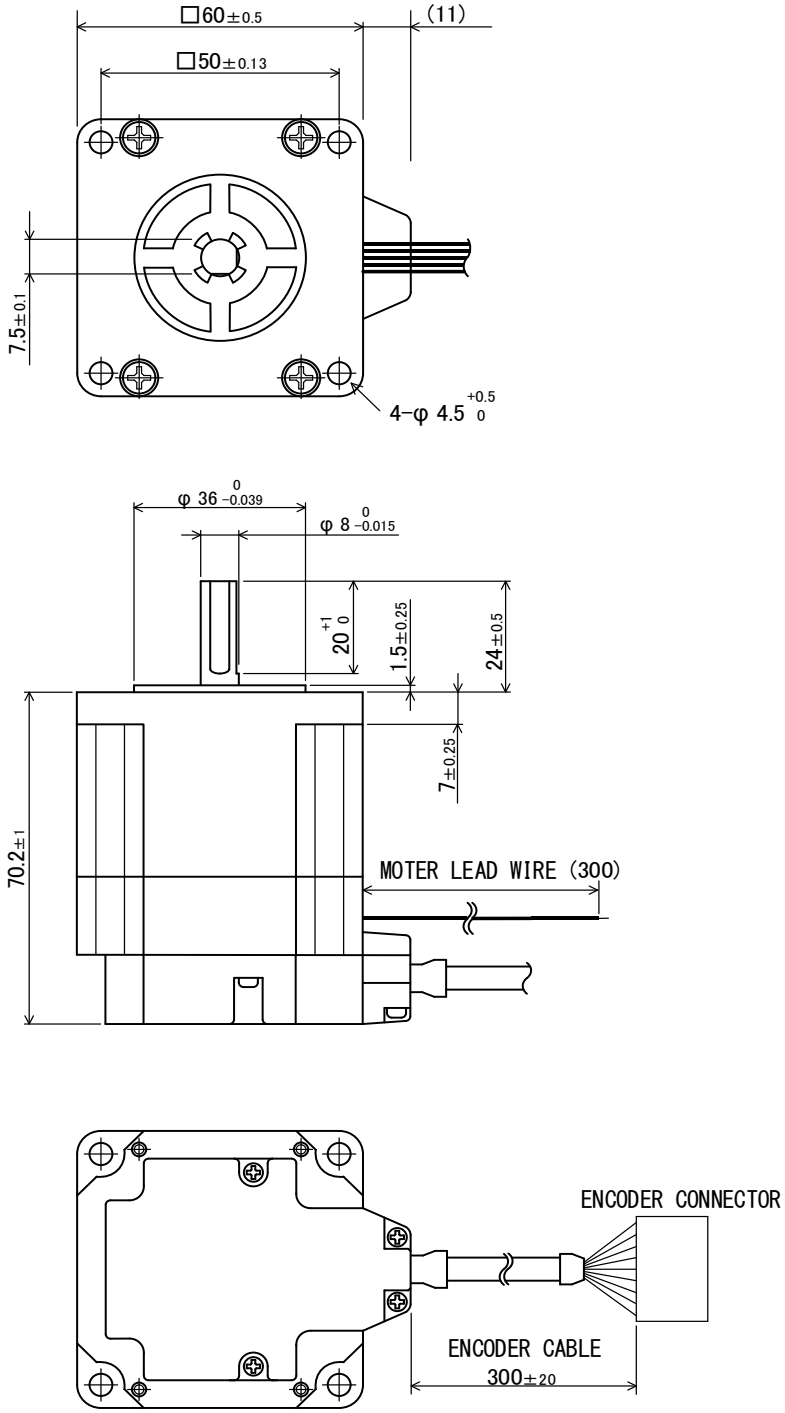
b. 103F7851-82XE42

(Unit : mm)



c. 103F7852-82XE42

(Unit : mm)



１０－７. Torque Characteristics

(1) Representations in the torque characteristics table are made in terms of the motor rotation (s^{-1}) vs. torque (N・m).
Motor rotation (s^{-1}) and drive pulse frequency (Hz) are converted as follows:

$$\text{Motor rotation}(s^{-1}) \times \frac{360^\circ}{\text{Step ang}} = \text{Drive pulse input frequency}(Hz)$$

(2) The Maximum Starting Pulse Rate is represented as "fs" by the value at zero inertial load.

(3) Upon operation, provide adequate allowance for torque.

(4) The stepping motor may attain high temperature, depending on the operational conditions.
Use the stepping motor according to the Instructions Manual produced by motormakers.

Fig.1

ADB-5F41EL
103F5510-72XE43
0.75A/PHASE

DRIVE I.SEL = OFF
DC24V

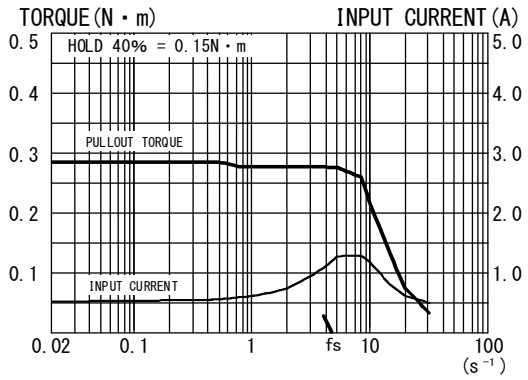


Fig.2

ADB-5F41EL
103F7851-82XE42
1.4A/PHASE

DRIVE I.SEL = ON
DC24V

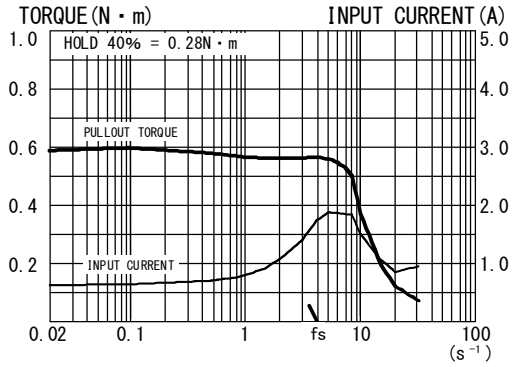
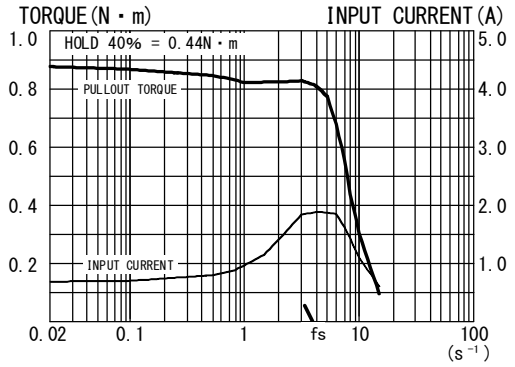


Fig.3

ADB-5F41EL
103F7852-82XE42
1.4A/PHASE

DRIVE I.SEL = ON
DC24V



１０－８. Conforming to Europe standards R1

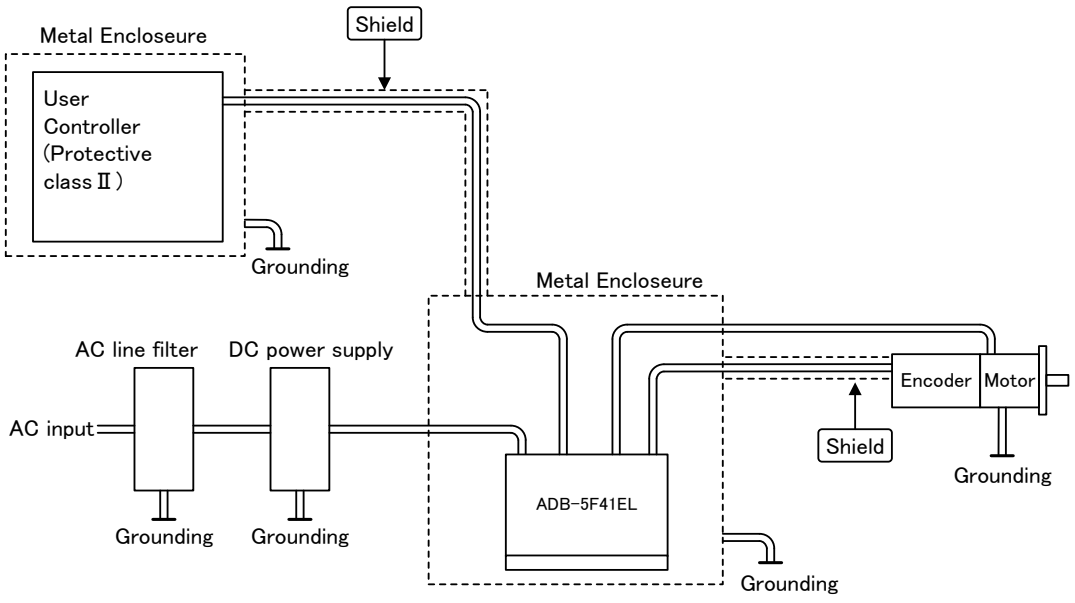
(1) Low voltage directive
This product is not subject to the EC' s Low Voltage Directive by the following.
・This product should be installed within an enclosure.
・For the driver' s power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.

(2) EMC derective
This product declares the CE marking based on the EMC Directive
2004/108/EC(until 19.April. 2016)
2014/30/EU (from 20.April. 2016)
by oneself.

● Applicable Standards
EN61000-6-4
EN61000-6-2

● This product conducted EMC measurement with the system configuration for EMC.
・EMC characteristic may vary depending on the configuration of the equipment that contains the driver or stepping motor. Be sure to conduct EMC measurement with the product assembled in your equipment.

Configuration
The metallic enclosure and shielded wires and ferrite core work to shield noise.



１０－９. Encoder cable specifications

R1

(1) General Specifications

Model name	CE-100-01 /A10-1318115-6	CE-100-02 /A20-1318115-6	CE-100-03 /A30-1318115-6	CE-100-04 /A50-1318115-6
Housing (Driver side)	51103-0900 (Molex)			
Housing (Encoder side)	1-1318115-6(Tyco Electronics)			
Standards	A、$\overline{A}$、B、$\overline{B}$、Z、$\overline{Z}$、+5V、GND Shield		AWG24,UL20276 AWG24,UL3266	
Length (L)	1m	2m	3m	5m

Wiring

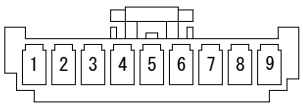
(Driver side)

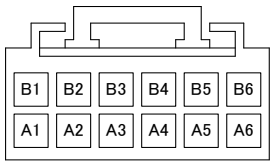
Pin No.	Signal	Leads of color
1	A	BLU
2	$\overline{A}$	WHT
3	B	GRN
4	$\overline{B}$	BLK
5	Z	YLW
6	$\overline{Z}$	BRN
7	+5V	RED
8	GND	GRY
9	Shield	ORN

(Encoder side)

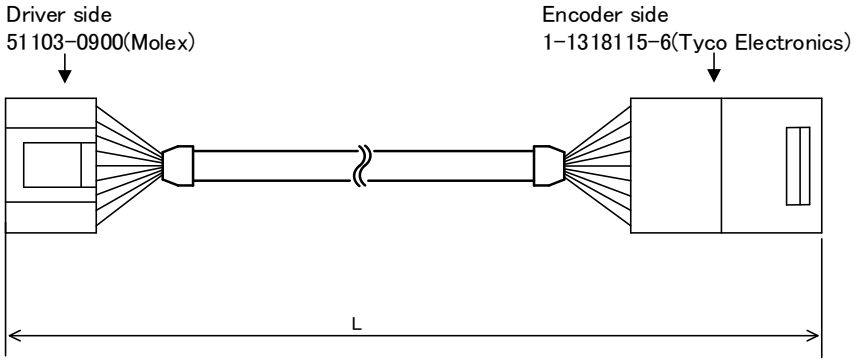
Pin No.	Signal	Leads of color
A1	A	BLU
B1	$\overline{A}$	WHT
A2	B	GRN
B2	$\overline{B}$	BLK
A3	Z	YLW
B3	$\overline{Z}$	BRN
A4	+5V	RED
B4	GND	GRY
A5	NC	-
B5	NC	-
A6	Shield	ORN
B6	NC	-

(Surface on which the contacts are inserted)





(2) Encoder cable Dimensions (Unit:m)



The main parts which revised by this manual

Parts	Content
	【R1】
P5, 46	・Addition of 「Encoder cable specifications」
P10, 19, 22, 28, 39	・Correction of errors or incorrect translations
P45	・Addition of 「EMC Directive 2014/30/EU」

Technical Service

TEL.(042)664-5382 FAX.(042)666-5664
E-mail s-support@melec-inc.com

Sales and Service

TEL.(042)664-5384 FAX.(042)666-2031
URL:http://www.melec-inc.com

Melec Inc. Control equipment marketing department
516-10,Higashiasakawa-cho,Hachioji-shi,Tokyo 193-0834,Japan

C1609