



# 2-phase Stepping Motor Driver ADB-2F60B Instructions Manual (For designers' use)

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.

**CE** 

## Introduction

This Instructions Manual describes the safe and proper method of handing "2-phase Stepping Motor Driver ADB-2F60B" 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.

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#### 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:



Represents warnings ignorance of which can cause accidents involving fatal or serious physical injuries.



Represents cautions ignorance of which can cause accidents involving minor physical injuries or property damages.

## Introduction

1. Safety

## Descriptions in this manual on safety matters:

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The main parts which revised by this manual

# 1. Safety

#### 1-1. Safety Precautions

#### \Lambda 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.

## 

- (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:

## 

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:

## A 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:

## 

Erroneous setting may cause burn on the skin, injury or damage to the motor due to overheating of the motor. Ensure correct setting. ●When setting up the PULSE INPUT TYPE SELECT switch:

▲ CAUTION

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

•When installing:

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):

## 

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 inputting the motor excitation stop (M.F) signal:

Deterioration of the holding power with the motor may cause breakage of the machine or injury. Check safety before inputting.

●When the overheat alarm (O.H.A) signal is output:

Overheating may cause fire. Stop operation upon output of this signal.

●When the overheat alarm (O.H.A) LED comes on:

\land 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

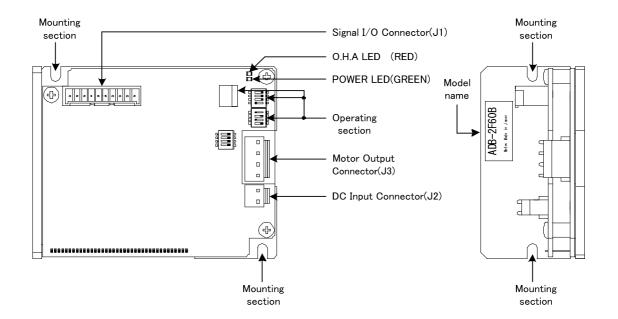
ADB-2F60B is a driver for a 2-phase stepping motor with DC+24V input. Driving method is bipolar constant current type. It can drive a 2-phase stepping motor of bipolar winding ranging from 3.0A/phase to 4.5/phase. Step angles can be selected from fourteen step angles ranging from 1 division to 100 division of the basic angle. HOLD CURRENT and DRIVE CURRENT can be set up.

#### 2-2. Product Configuration

The product consists of the main frame and the accessories.

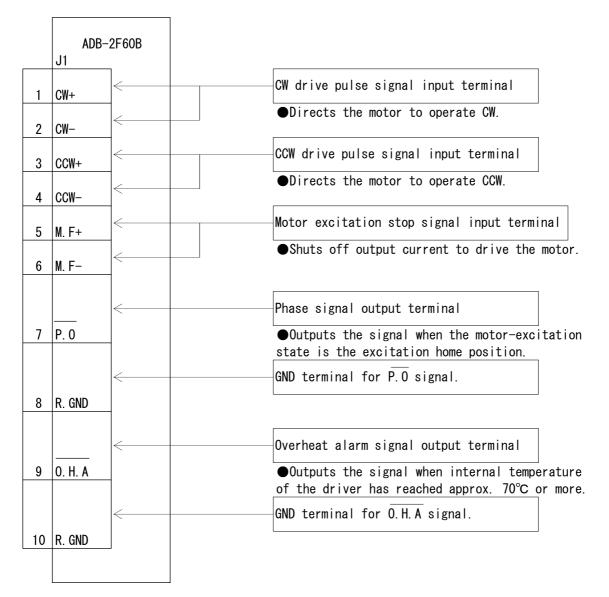
| ●ADB-2F60B                                | One unit    |                            |
|---|-------------|----------------------------|
| ●Housing for J1(51103-1000:Molex)         | One unit    | (accessory)                |
| ●Housing for J2 (VHR-2N:J.S.T)            | One unit    | (accessory)                |
| ●Housing for J3 (VHR-4N:J.S.T)            | One unit    | (accessory)                |
| ●Contact for J1(50351-8100:Molex)         | 12 contacts | (accessories,2 for spares) |
| • Contact for J2, J3 (BVH-21T-P1.1:J.S.T) | 8 contacts  | (accessories,2 for spares) |

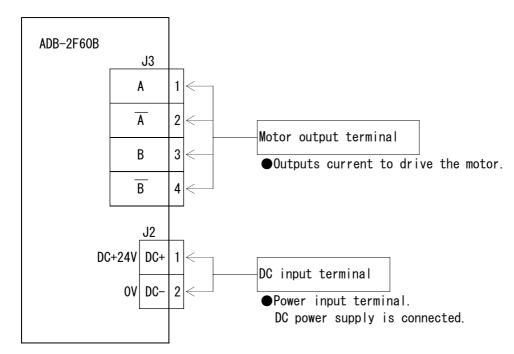
## 2-3. Appearance



# 3. Name and Function of Each Section

3-1. Signal I/O Connector (J 1)





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

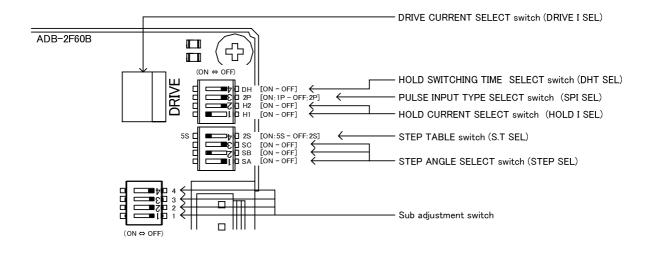
## 3-3. POWER LED

POWER LED(GREEN) comes on upon inputting power.

#### 3 – 4. O.H.A LED

0. H. A LED (RED) comes on when internal temperature of the driver has reached approx.  $70^{\circ}C$  or more.

## 3-5. Operating Section



| 1                         | Name of Operating Section   | Function   | Factory Setting   |
|---------------------------|---|--|---|
|                           | RIVE CURRENT<br>ELECT switch  | Selects DRIVE CURRENT.   | (No. 8)   |
| 1                         | Name of Operating Section   | Function   | Factory Setting   |
| 4                         | HOLD SWITCHING TIME<br>SELECT switch  | DRIVE/HOLD CURRENT automatic switching time is selected.                     | [OFF(150ms)]  |
| 3                         | PULSE INPUT TYPE SELECT switch  | Selects a pulse input type.  | [OFF (2P)]  |
| 2                         | HOLD CURRENT SELECT switch  | Selects HOLD CURRENT.  | H2: [OFF]   |
| 1                         | HOLD CURRENT SELECT switch  | SETECTS HOLD CORRENT.  | H1 : (ON)   |
| Name of Operating Section |   |  |   |
| 1                         | Name of Operating Section   | Function   | Factory Setting   |
| 4                         | Name of Operating Section   | Function<br>Selects STEP TABLE.  | Factory Setting<br>[ON(5S)]   |
|                           |   |  |   |
| 4                         | STEP TABLE switch   |  | [ON (5S)]   |
| 4                         | STEP TABLE switch<br>STEP ANGLE SELECT switch   | Selects STEP TABLE.  | [ON (5S) ]<br>SC : [OFF]  |
| 4<br>3<br>2<br>1          | STEP TABLE switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch   | Selects STEP TABLE.  | [ON (5S)]<br>SC : [OFF]<br>SB : [ON]  |
| 4<br>3<br>2<br>1          | STEP TABLE switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch   | Selects STEP TABLE.<br>Selects a step angle.                                 | [ON (5S)]<br>SC : [OFF]<br>SB : [ON]<br>SA : [OFF]                            |
| 4<br>3<br>2<br>1          | STEP TABLE switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch<br>Name of Operating Section                          | Selects STEP TABLE.<br>Selects a step angle.<br>Function                     | [ON(5S)]<br>SC: [OFF]<br>SB: [ON]<br>SA: [OFF]<br>Factory Setting             |
| 4<br>3<br>2<br>1<br>1     | STEP TABLE switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch<br>STEP ANGLE SELECT switch<br>Name of Operating Section<br>Sub adjustment switch | Selects STEP TABLE.<br>Selects a step angle.<br>Function<br>Use it with OFF. | [ON(5S)]<br>SC: [OFF]<br>SB: [ON]<br>SA: [OFF]<br>Factory Setting<br>4: [OFF] |

## 4. Function Set-up by Use

4-1. Setting STEP TABLE switch and STEP ANGLE SELECT switch

#### 

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 S.T SEL switch and the STEP SEL switch. The step angle can be selected from fourteen different types of step angles. Set S.T SEL switch with power OFF. The switches are factory-set to [50 divisions].

- (1) Turn power [OFF].
- (2) Set the step angle required by combining the S.T SEL switch and the STEP SEL switch.

Relationship between the S.T SEL switch, the STEP SEL switch and the step angle.

|                 | S   |       |           |               |                   |
|-----------------|-----|-------|-----------|---------------|-------------------|
| STEP SEL switch |     | witch | 1/        | Step angle(°) |                   |
| SC              | SB  | SA    | Divisions | 1.8° motor    |                   |
| ON              | ON  | ON    | 1/2.5     | 0. 72         |                   |
| ON              | ON  | 0FF   | 1/5       | 0.36          |                   |
| ON              | 0FF | ON    | 1/10      | 0. 18         |                   |
| ON              | 0FF | 0FF   | 1/20      | 0. 09         |                   |
| 0FF             | ON  | ON    | 1/25      | 0. 072        |                   |
| 0FF             | ON  | 0FF   | 1/50      | 0. 036        | (Factory setting) |
| 0FF             | 0FF | ON    | 1/100     | 0. 018        |                   |
| 0FF             | 0FF | 0FF   | _         | _             |                   |

|       | S.T SEL switch [OFF:2S] |       |           |               |  |  |
|-------|-------------------------|-------|-----------|---------------|--|--|
| 0.757 |                         |       |           |               |  |  |
| SIE   | ' SEL SI                | witch | 1/        | Step angle(°) |  |  |
| SC    | SB                      | SA    | Divisions | 1.8° motor    |  |  |
| ON    | ON                      | ON    | 1/1       | 1.8           |  |  |
| ON    | ON                      | 0FF   | 1/2       | 0.9           |  |  |
| ON    | 0FF                     | ON    | 1/4       | 0. 45         |  |  |
| ON    | 0FF                     | 0FF   | 1/8       | 0. 225        |  |  |
| 0FF   | ON                      | ON    | 1/16      | 0. 1125       |  |  |
| 0FF   | ON                      | 0FF   | 1/32      | 0.05625       |  |  |
| 0FF   | 0FF                     | ON    | 1/64      | 0. 028125     |  |  |
| 0FF   | 0FF                     | 0FF   | _         | _             |  |  |

#### 4-2. Setting HOLD CURRENT SELECT switch

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.

HOLD CURRENT is set up with the HOLD I. SEL switch. The ratio of HOLD CURRENT to DRIVE CURRENT can be selected. The switch is factory-set to [approx 40%].

(1) Set the HOLD I.SEL switch to the ratio of HOLD CURRENT to DRIVE CURRENT required.

•Relationship between the HOLD CURRENT.

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

| DRIVE 1. SEL [No. 0~No. 2] |     |                  |  |  |
|----------------------------|-----|------------------|--|--|
| HOLD I.SEL switch          |     | Ratio of         |  |  |
| H2                         | H1  | HOLD CURRENT (%) |  |  |
| 0FF                        | 0FF | -                |  |  |
| 0FF                        | ON  | 40               |  |  |
| ON                         | 0FF | 50               |  |  |
| ON                         | ON  | 100              |  |  |

| DRIVE 1. SEL [No. 3~No. 9] |           |                  |  |  |
|----------------------------|-----------|------------------|--|--|
| HOLD I.SI                  | EL switch | Ratio of         |  |  |
| H2 H1                      |           | HOLD CURRENT (%) |  |  |
| OFF OFF                    |           | 30               |  |  |
| OFF ON                     |           | 40               |  |  |
| ON OFF                     |           | 50               |  |  |
| ON                         | ON        | 100              |  |  |

DRIVE I. SEL [No. A~No. F] HOLD I.SEL switch Ratio of HOLD CURRENT (%) H2 H1 0FF 0FF 30 0FF ON 40 ON 0FF 50 ON ON —

(Factory setting)

 HOLD CURRENT changes relative to DRIVE CURRENT setting. The ratio of HOLD CURRENT [100%] represents the same as the setting for DRIVE CURRENT.

- The effective range of the HOLD I.SEL switch varies according to the setting of the DRIVE I.SEL switch.
- 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

## 

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

DRIVE CURRENT is set up with the DRIVE I.SEL switch. The switch is factory-set to [No.8].

(1) Set the switch No. to the setting specified in the table "10-4. Applicable Motors."

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

| Switch No. | A/phase |                   |
|------------|---------|-------------------|
| 0          | 1.15    |                   |
| 1          | 1. 38   |                   |
| 2          | 1.61    |                   |
| 3          | 1.84    |                   |
| 4          | 2. 07   |                   |
| 5          | 2. 30   |                   |
| 6          | 2. 53   |                   |
| 7          | 2.76    |                   |
| 8          | 2.99    | (Factory setting) |
| 9          | 3. 22   |                   |
| A          | 3. 45   |                   |
| В          | 3.68    |                   |
| С          | 3.91    |                   |
| D          | 4.14    |                   |
| E          | 4. 37   |                   |
| F          | 4.60    |                   |

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## 4-4. Setting PULSE INPUT TYPE SELECT switch

## 

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

Pulse input method is set up with the SPI SEL switch. Set this switch with power OFF. The switch is factory-set to [2P].

- (1) Turn power [OFF].
- (2) Set the SPI SEL [2P/1P] switch.

| SP1 SEL | Input type  |                   |
|---------|-------------|-------------------|
| ON      | 1PULSE (1P) |                   |
| OFF     | 2PULSE (2P) | (Factory setting) |

- When the motor is operated with two pulse signal inputs of CW and CCW, set the SPI SEL switch to [OFF(2P)].
- When the motor is operated with the pulse signal and direction signal input, set the SPI SEL switch to [ON(1P)].
- In the case that 1-pulse input method is selected, the CCW terminal becomes direction signal input designating the direction of the motor rotation.
   Drive pulse set to the CW terminal (CW+, CW-).

CCW terminal(CCW+, CCW-) direction set > Photo-coupler OFF : CCW direction > Photo-coupler ON : CW direction

● The input timing is same with 2-pulse input method and 1-pulse input method . As for input timing, refer to "10-2. (2)Drive pulse input (CW, CCW)"

## 4-5. Setting HOLD SWITCHING TIME SELECT switch

DRIVE/HOLD CURRENT automatic switching time is set up with the DHT SEL switch. The switch is factory-set to [150ms].

#### (1) Set the DHT SEL switch.

| DHT SEL | Hold Switching<br>Time |                   |
|---------|------------------------|-------------------|
| ON      | 16ms                   |                   |
| 0FF     | 150ms                  | (Factory setting) |

## 5. Installation

#### 5-1. Conditions for Installation

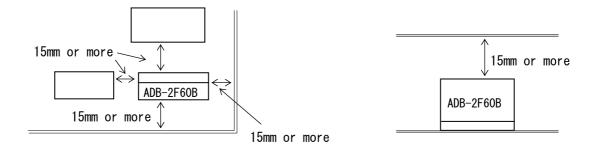
## A WARNING

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 15mm away from other equipment.



- (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 overheat alarm signal is output, perform the cooling measure of the mounting plate is enlarged or compulsion air cooling etc. Use the driver on the condition that the overheat alarm signal is not output.
- (5) Do not allow standing or placing anything heavy on the product.

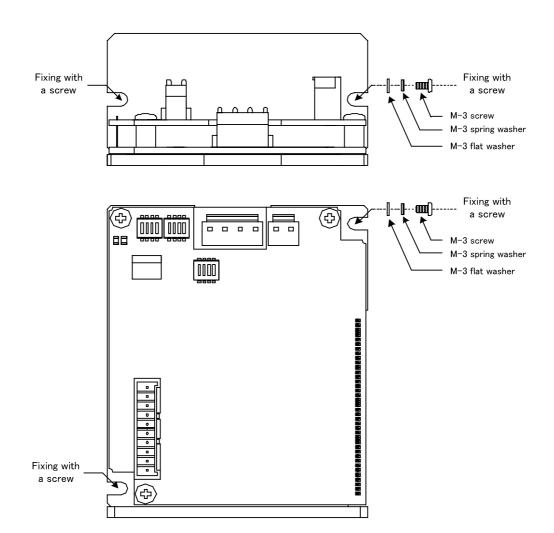
#### 5-2. Mounting Method

The round holes on the main body 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 |

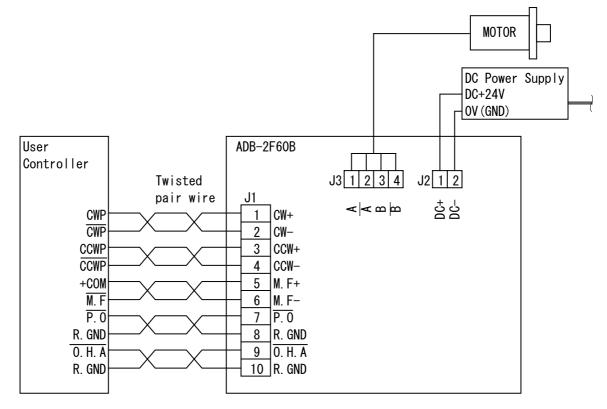
(1) Fix the product at the two round holes on the main body.



#### •Mounting example

## 6. Connection

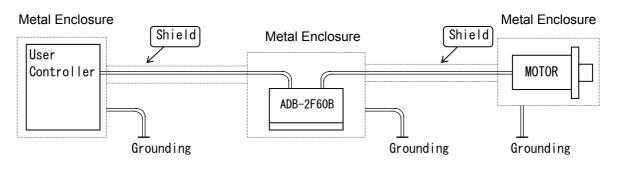
## 6-1. Overview of Connection Configuration



•Connect only one motor to one driver.

- ullet Do not power ON/OFF by the relay etc. in the output side of the DC power supply.
- ●Use twisted pair wire for the CW/CCW input signal line.
- •Provide shielding for the signal line where considerable noise is generated.
- ullet 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.

The metallic enclosure and shielded wires work to shield noise.



<sup>[</sup>Example configuration]

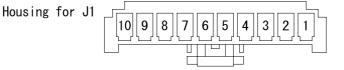
6-2. Connecting Signal I/O Connector (J 1)

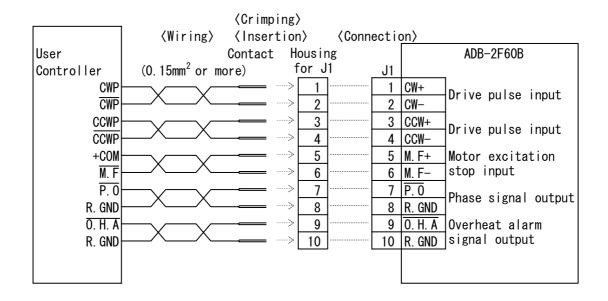
The following items are required:

| ●Housing for J1 (51103-1000:Molex) | One unit (accessory)      |
|------------------------------------|---------------------------|
| ●Contact for J1 (50351-8100:Molex) | 10 contacts (accessories) |
| Manually operated crimping tool    | One unit                  |
| for AWG28-22(57295-5000:Molex)     |                           |

- (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 10 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.

(Surface on which the contacts are inserted)





6-3. Connecting DC Input/Motor Output Connector (J 2, J 3)

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

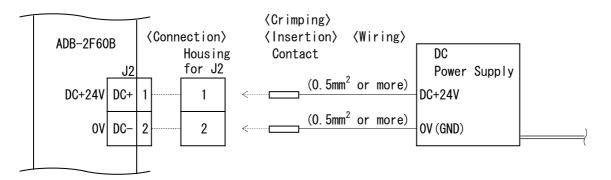
The following items are required:

| ●Housing for J2 (VHR-2N:J.S.T)           | One unit   | (accessory)   |
|--|------------|---------------|
| ●Housing for J3 (VHR-4N:J.S.T)           | One unit   | (accessory)   |
| ●Contact for J2, J3 (BVH-21T-P1.1:J.S.T) | 6 contacts | (accessories) |
| Manually operated crimping tool          | One unit   |               |
| for AWG22-18(YC-160R:J.S.T)              |            |               |

- (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 4 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.

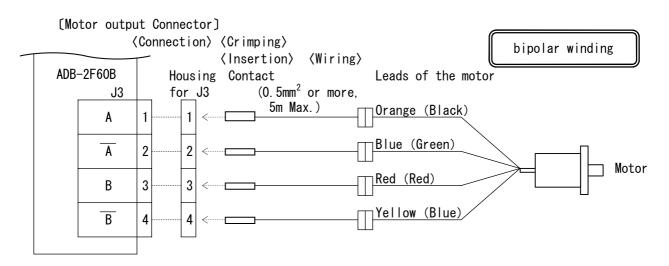
(Surface on which the contacts are inserted) Housing for  $J2\begin{bmatrix} 2 \\ 1 \end{bmatrix}$  Housing for  $J3\begin{bmatrix} 4 \\ 3 \\ 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ 

[DC input Connector]



●Do not power ON/OFF by the relay etc. in the output side of the DC power supply.

#### ADB-2F60B Instructions Manual



- Color indications for leads of the motor indicate motor of the SANYO DENKI CO., LTD.. Color indications for leads of the motor in parentheses indicate motor of the ORIENTAL MOTOR Co., Ltd..
- ullet Use a cable of 5m or less for the motor cable .

#### 6-4. Inputting Power

## 

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.

# 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<br>PULSE INPUT TYPE SELECT switch    | SPI SEL<br>(1P/2P)          |       |         |
| Setting of HOLD SWITCHING TIME<br>SELECT switch | DHT SEL                     |       |         |
| Setting of<br>STEP TABLE switch                 | S. T SEL<br>(5S/2S)         |       |         |
| Setting of STEP ANGLE<br>SELECT switch          | STEP SEL<br>(SA, SB, SC)    |       |         |
| Setting of DRIVE CURRENT<br>SELECT switch       | DRIVE I.SEL<br>(switch No.) |       |         |
| Setting of HOLD CURRENT<br>SELECT switch        | HOLD I. SEL<br>(H1, H2)     |       |         |
| Sub adjustment switch                           |                             |       |         |
| Connection of J1                                |                             |       |         |
| Connection of J2 DC+, DC-                       |                             |       |         |
| Connection of J3                                | MOTOR                       |       |         |

## 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<br>come on.   | <ul> <li>Connection of power supply.</li> <li>Value of power voltage.</li> </ul>  | <ul> <li>Wiring error with power<br/>supply.</li> <li>Power voltage failure.</li> <li>Driver failure.</li> </ul>                                      |
| 2. The motor is not excited.<br>(It can be easily<br>rotated by hand.)                    | <ul> <li>Connection of the motor to<br/>the driver.</li> <li>ON/OFF status of the M.F<br/>signal.</li> </ul>  | <ul> <li>Wiring error with the motor<br/>and the driver.</li> <li>The M.F signal is input.</li> <li>Driver failure.</li> </ul>                        |
| 3. The motor does not rotate.<br>The motor behaves<br>abnormally.<br>The motor steps out. | <ul> <li>The same check items as<br/>those under item 2 above.</li> <li>Setting of the PULSE INPUT<br/>TYPE SELECT switch.</li> <li>Connection of the pulse<br/>signal.</li> <li>Voltage and wave form of the<br/>pulse signal.</li> <li>Setting of the DRIVE CURRENT<br/>SELECT switch.</li> <li>Setting of the STEP ANGLE<br/>SELECT switch.</li> </ul> | specifications.   |
| 4. The motor steps out during acceleration.   | <ul> <li>Starting pulse speed.</li> <li>Acceleration time.</li> </ul>   | <ul> <li>Starting pulse signal speed<br/>is too high.</li> <li>Acceleration time is too<br/>short.</li> </ul>   |
| 5. The motor generates<br>excessive heat.   | <ul> <li>Setting of the DRIVE CURRENT<br/>SELECT switch.</li> <li>Value of the HOLD CURRENT<br/>SELECT switch.</li> </ul>   | <ul> <li>DRIVE CURRENT is higher than<br/>the setting for the<br/>applicable motor.</li> <li>The setting for HOLD CURRENT<br/>is too high.</li> </ul> |

- (1) 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.
- (2) Disconnection of the motor output line may cause the driver to fail.
   Disconnection of the motor output line cable.
   Loose connection of connector.
- (3) When a large inertial load (motor rotor inertia x 5 or more) is operated at high speed(rotational speed 20s<sup>-1</sup> or more), regenerative energy will generate and increase the power supply voltage, which can damage the driver. Review the operating condition and make sure regenerative voltage will not generate.

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.

# 1 O. Specifications

## 1 O - 1. General Specifications

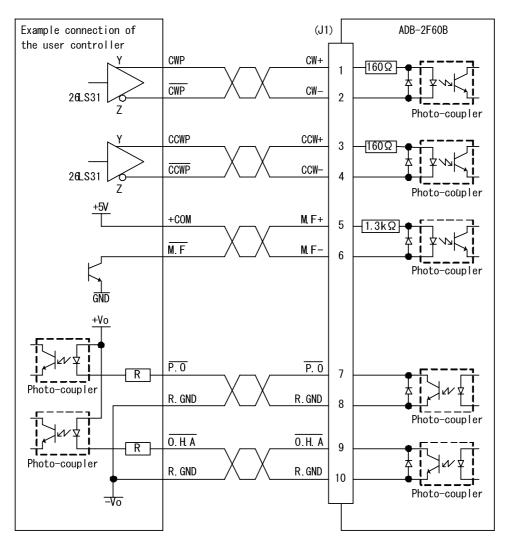
| Supply Power                       | DC+24V *1 (Ripple voltageP-P 2.0V or less) $\bullet$ Rated input current :(DRIVE I.SEL $\Rightarrow$ No.F set up)at DRIVEDC+24V: 4.8A *2 $\bullet$ Rated input current :(HOLD I.SEL $\Rightarrow$ Approx. 40% set up)at HOLDDC+24V: 0.9A  |  |  |  |
|------------------------------------|---|--|--|--|
| Motor output<br>current            | <ul> <li>DRIVE CURRENT</li> <li>HOLD CURRENT</li> <li>HOLD CURRENT</li> <li>Approx. 40% of DRIVE CURRENT<br/>(factory-set)</li> </ul>   |  |  |  |
| Input Signal                       | ●Drive pulse input (CW, CCW) Photo-coupler input<br>●Motor excitation stop input (M.F) Photo-coupler input  |  |  |  |
| Output Signal                      | ●Phase signal output (P. 0) ·········· 0/C output<br>●Overheat alarm output (O. H. A) ·········· 0/C output   |  |  |  |
| Functions of<br>Operating Sections | <ul> <li>HOLD CURRENT selection (HOLD I. SEL)</li> <li>DRIVE CURRENT selection (DRIVE I. SEL)</li> <li>STEP TABLE selection (S. T SEL)</li> <li>STEP ANGLE selection (STEP SEL)</li> <li>HOLD SWITCHING TIME selection (DHT SEL)</li> <li>PULSE INPUT TYPE selection (SPI SEL)</li> </ul> |  |  |  |
| Operating Ambient<br>Temperature   | 0°C ∼ +40°C (No freezing allowed.)  |  |  |  |
| Operating Ambient<br>Humidity      | 80%RH or less (No condensation allowed.)  |  |  |  |
| Storing Temperature                | -10°C ~ +55°C (No freezing allowed.)  |  |  |  |
| Storing Humidity                   | 80%RH or less (No condensation allowed.)  |  |  |  |
| Atmosphere                         | Indoor (Exposure to direct sun is not allowed.)<br>Without any explosive, corrosive or inflammable gas, oil mist,<br>or dust.   |  |  |  |
| Withstanding<br>Vibration          | No abnormality should be found after a vibration test<br>at 10~55Hz, 0.15mm P-P   |  |  |  |
| Insulation resistance              | DC connector - signal connector - Frame<br>(Each other) DC500V 100MΩ or more  |  |  |  |
| Exterior Dimensions                | $^{\rm H}85 \times ^{\rm W}70 \times ^{\rm D}36$ (mm)   |  |  |  |
| Weight                             | 0.13 kg   |  |  |  |

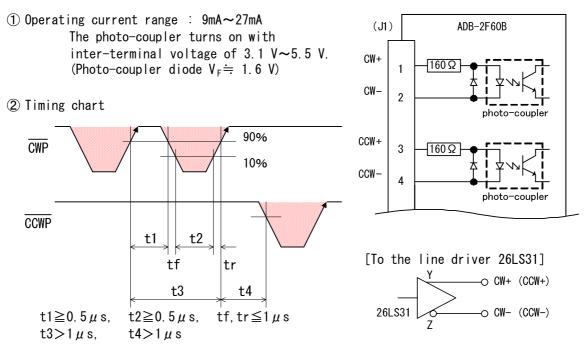
\*1 Input voltage range is DC+24V $\pm$ 10%.

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

## 10 - 2. I/O Signal

#### (1) Example Circuit Connection

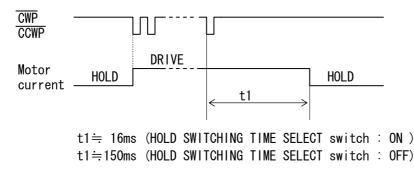




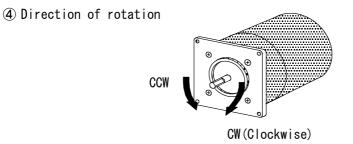
Maximum response frequency : 1MHz

(2) Drive pulse input (CW, CCW)

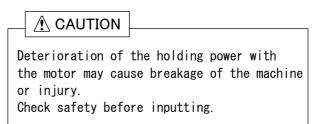
- The shaded area ( ) indicates light emission from the photo-coupler, and the motor is driven at the rising edge ( ∧).
  "t4" greatly varies according to the inertial moment including that of the motor.
- 3 Automatic switching for DRIVE/HOLD



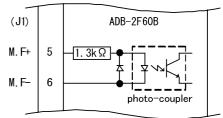
 Inputting drive pulse causes the current output to the motor to change from HOLD CURRENT to DRIVE CURRENT, which returns to HOLD CURRENT in about "t1".
 DRIVE CURRENT continues if pulse is input on driving-state.



(3) Motor excitation stop input (M.F)

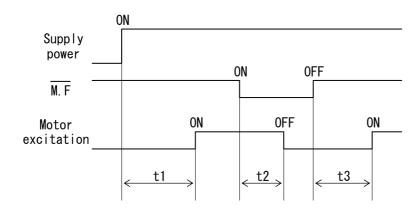


(1) Operating current range : 2.6mA ~ 19.5mA (A The photo-coupler turns on with inter-terminal voltage of 4.5 V ~ 26.4 V. (Photo-coupler diode  $V_F \rightleftharpoons 1.1$  V)

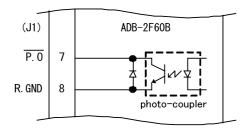


- Motor output current is shut off with the photo-coupler ON. At this time, motor torque changes to detent torque.
- When this signal is input, motor torque may be lost, resulting in failure to retain the load transported.
   In particular, this risk is high with the vertical drive (such as the Z-axis).

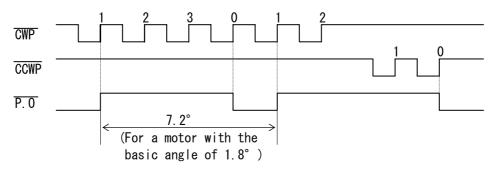
② Timing chart



- (4) Phase signal output (P.O)
  - (1) Output current a.  $lc \leq 6mA$ , VCE < 5Vb.  $lc \leq 2mA$ ,  $VCE(sat) \leq 0.6V$  $VCE0 \leq 30V$



- In case of the excitation home position, the signal is output. (photo-coupler ON)
- 2 Timing chart
  - $\bullet$  P.O output timing (for 1/1 STEP)



● P.0 output time

| 1/1 STEP: once in  | 4 pulses   | 1/2.5 STEP: once in | 10 pulses  |
|--------------------|------------|---------------------|------------|
| 1/2 STEP: once in  | 8 pulses   | 1/5 STEP: once in   | 20 pulses  |
| 1/4 STEP: once in  | 16 pulses  | 1/10 STEP: once in  | 40 pulses  |
| 1/8 STEP: once in  | 32 pulses  | 1/20 STEP: once in  | 80 pulses  |
| 1/16 STEP: once in | 64 pulses  | 1/25 STEP: once in  | 100 pulses |
| 1/32 STEP: once in | 128 pulses | 1/50 STEP: once in  | 200 pulses |
| 1/64 STEP: once in | 256 pulses | 1/100 STEP: once in | 400 pulses |

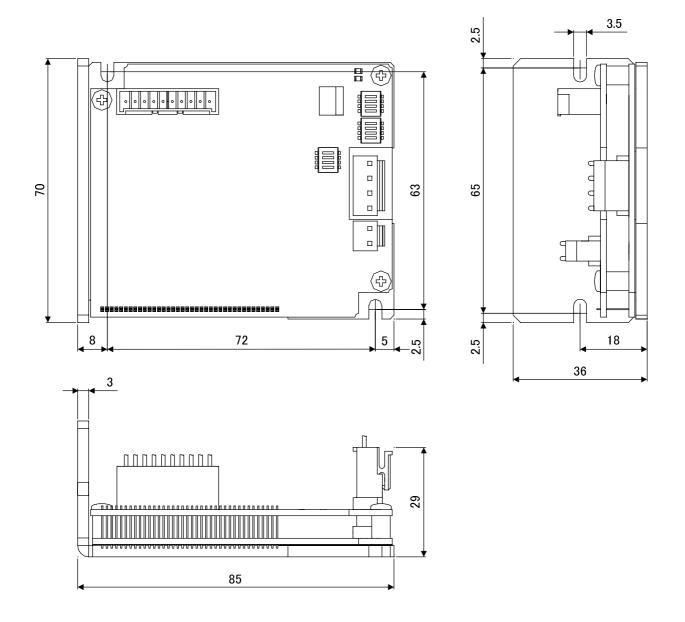
(5) Overheat alarm signal output and overheat alarm LED (O.H.A)

WARNING Overheating may cause fire. Stop operation upon output of this signal. 🕂 WARNING Overheating may cause fire. Stop operation when this LED comes on. ① Output current a.  $IC \leq 6mA$ , VCE < 5Vb. IC $\leq 2mA$ , VCE(sat)  $\leq 0.6V$ (J1) ADB-2F60B  $VCE0 \leq 30V$ 0. H. A 9 R. GND 10 photo-coupler

- Use overheat alarm signal output (O.H.A) without fail.
- In case of internal temperature of the driver reaches approx. 70°C or more, the signal is output(photo-coupler ON) and O. H. A LED comes on. At this time the motor output current is not blocked.
- When this signal is output, stop operation and check if there is any abnormality occurring with the motor and the driver.
- Provide mechanical cooling, for example, if this signal is output while no abnormality is detected.
- Continuous operation is possible unless this signal is output.

1 O - 3. Dimensions

(Unit:mm)



## 1 O - 4. Applicable Motors

| SANYO DENKI CO., LTD.    |                      | Basic<br>Angle<br>(°) | Current<br>(A/phase) | Setting<br>DRIVE I.SEL<br>switch No. | Torque Data<br>Fig. No. |
|--------------------------|----------------------|-----------------------|----------------------|--------------------------------------|-------------------------|
| □56mm                    | 103H7121-5840 (5810) | 1.8                   | 3.0                  | 8                                    | Fig.1                   |
|                          | 103H7123-5840 (5810) | 1.8                   | 3.0                  | 8                                    | Fig. 2                  |
|                          | 103H7126-5840 (5810) | 1.8                   | 3.0                  | 8                                    | Fig.3                   |
|                          | 103H7128-5840 (5810) | 1.8                   | 3.0                  | 8                                    | Fig.4                   |
| □60mm                    | 103H7821-1740 (1710) | 1.8                   | 4.0                  | С                                    | Fig.5                   |
|                          | 103H7822-1740(1710)  | 1.8                   | 4.0                  | C                                    | Fig.6                   |
|                          | 103H7823-1740 (1710) | 1.8                   | 4.0                  | C                                    | Fig.7                   |
| ORIENTAL MOTOR Co., Ltd. |                      | Basic<br>Angle<br>(°) | Current<br>(A/phase) | Setting<br>DRIVE I.SEL<br>switch No. | Torque Data<br>Fig. No. |
| □56.4                    | PK264DA (B)          | 1.8                   | 4.2                  | D                                    | Fig.8                   |
| mm                       | PK266DA (B)          | 1.8                   | 4.2                  | D                                    | Fig.9                   |
|                          | PK268DA (B)          | 1.8                   | 4.2                  | D                                    | Fig. 10                 |
| □85mm                    | PK296DA (B)          | 1.8                   | 4.5                  | E                                    | Fig.11                  |
|                          | PK299DA (B)          | 1.8                   | 4.5                  | E                                    | Fig.12                  |
| Factory Setting          |                      |                       | 8                    |                                      |                         |

●ADB-2F60B can drive a 2-phase stepping motor of bipolar winding ranging from 3.0A/phase to 4.5A/phase.

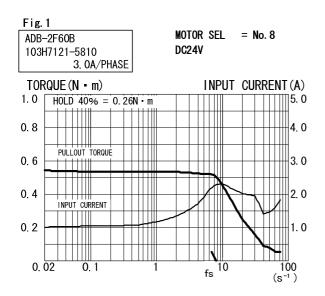
( ) : Both axis

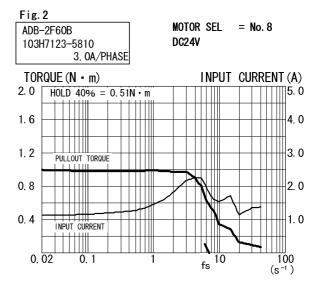
#### 1 0 - 5. Torque Characteristics

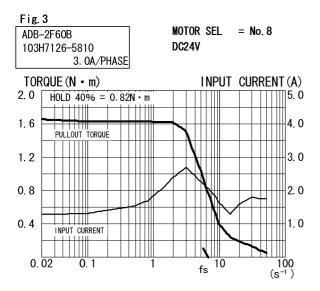
(1) Representations in the torque characteristics table are made in terms of the motor rotation  $(s^{-1})$  vs. torque  $(N \cdot m)$ . Motor rotation  $(s^{-1})$  and drive pulse frequency (Hz) are converted as follows:

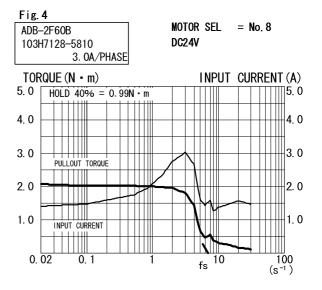
Motor rotation(s<sup>-1</sup>) ×  $\frac{360^{\circ}}{\text{Step angle}}$  = Drive pulse input frequency(Hz)

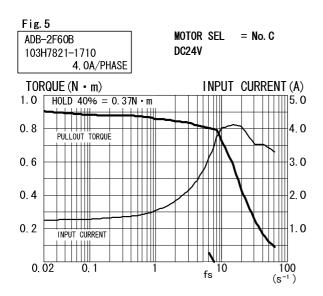
- (2) The Maximum Starting Pulse Rate is represented as "fs" by the value at zero inertial load.
- (3) Upon operation, provide adequate allowance for torque.
- (4) The stepping motor may attain high temperature, depending on the operational conditions. Use the stepping motor according to the Instructions Manual produced by motormakers.

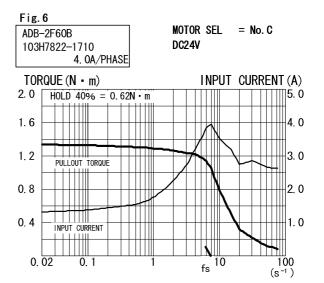


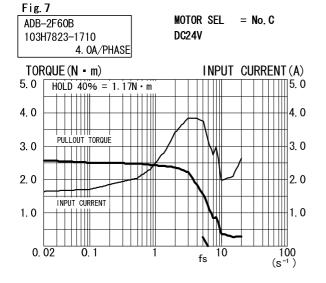


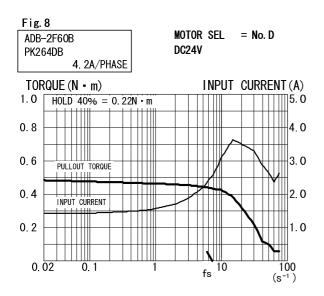


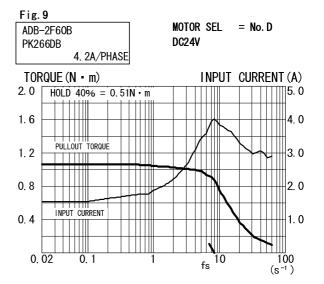


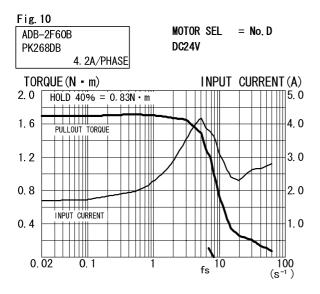


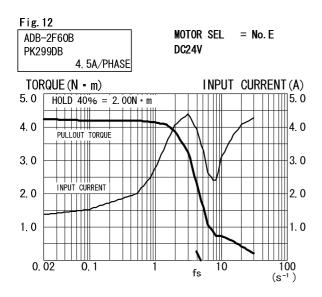


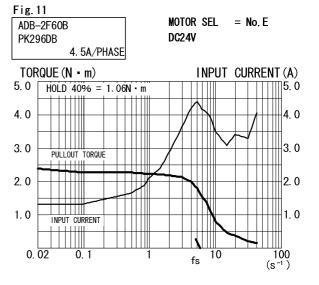












R1

#### 1 O - 6. Conforming to Europe standards

(1) Low voltage directive

This product is not subject to the EC's Low Voltage Directive by the following.

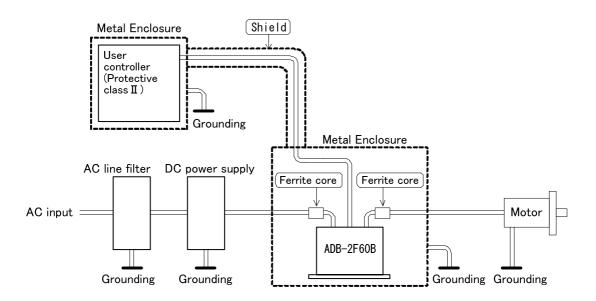
- This product should be installed within an enclosure.
- For the driver's power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.
- (2) EMC directive

This product declares the CE marking based on the EMC Directive 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.



| Parts | Content   |
|-------|---|
| P41   | <pre>[R1]<br/>Deletion of the directive number.</pre> |

# The main parts which revised by this manual

## 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

This Operating Manual is subject to change without prior notice for the purpose of product improvement.