



**AL- II Series Slave Controller Driver**

**2CD-7713v1/GDB5F40**

**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 so that it is always available for reference.

MN0193-1

## Introduction

This instructions manual explains the handling of "AL- Series Slave Controller Driver 2CD-7713v1 /GDB5F40 for 5-phase stepping motor ", emphasizing the specifications to enable proper and safe use. The manual is thus intended for designers of control systems using stepping motors. Before using the product, read this manual carefully for better understanding. Keep the manual handy so that you can read it whenever you want.

The 2CD-7713v1/GDB5F40 allows axes to be controlled independently and therefore referred to each axis as follows:

|          |          |
|----------|----------|
| 1st axis | 2nd axis |
| X-axis   | Y-axis   |

This manual basically explains only the X-axis.

## Description of safety

This product must be handled correctly.

Handling the product incorrectly may cause unexpected accidents resulting in personal injuries or damage to your properties.

Many of those accidents can be avoided if you have advance information on dangerous situations. This manual provides precautions where dangerous situations are predicted. The manual provides the following alert marking and messages for this purpose:

### **WARNING**

This indicates a hazardous situation that could result in death or serious personal injury if you do not perform the procedure correctly.

### **CAUTION**

This indicates a potentially hazardous situation that could result in personal injury or physical damage if you do not perform the procedure correctly.

## Before use

This product is not designed for use in the equipment related to nuclear power, aerospace equipment, vehicles, marine vessels, medical equipment directly in touch with human body, equipment anticipated to give a serious impact to properties, and other equipment required to provide high reliability.

Take failsafe measures so that the whole system operates safely even if the input power causes an error, a signal line is disconnected, or the main unit fails.

This product is equipped with a LIMIT (overtravel) signal and an FSSTOP signal to prevent mechanical damage.

The initial values of these signals are set to ACTIVE OFF (B contact). Accordingly, even in a system configuration in which the FSSTOP and LIMIT signals are not used, pulses are not output unless NORMAL ON (GND connection) is enabled.

Be sure to use this product within the scope of the specifications described in this instruction manual in accordance with the specification method described therein.

Set up the product before operating it.  
Please refer to the Section 3, "Setting."

Please refer to separate manual "AL- series device driver manual for Windows" also when you handle this product.

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The main parts which revised by this manual

## 1 . Overview

### 1-1. Features

The AL- series is a high speed serial communication system of original controlling the flexible stepping motor, servo motor which can cope easily as well and I/O in the decentralization of the device and supporting axial addition.

- The AL- series is an insulation type high-speed serial communications of 20 Mbps/50 m or 10 Mbps/100 m. As a result, the saving wiring for the personal computer system can be attempted by the performance ( ratio of our company) that equals a board controller so far.
- The shift of board controller C-VX870 series ( Device-function) for PCI made of our company and the USB series ( Device-function and Unit-function) is easy depending on the device driver function for Windows.

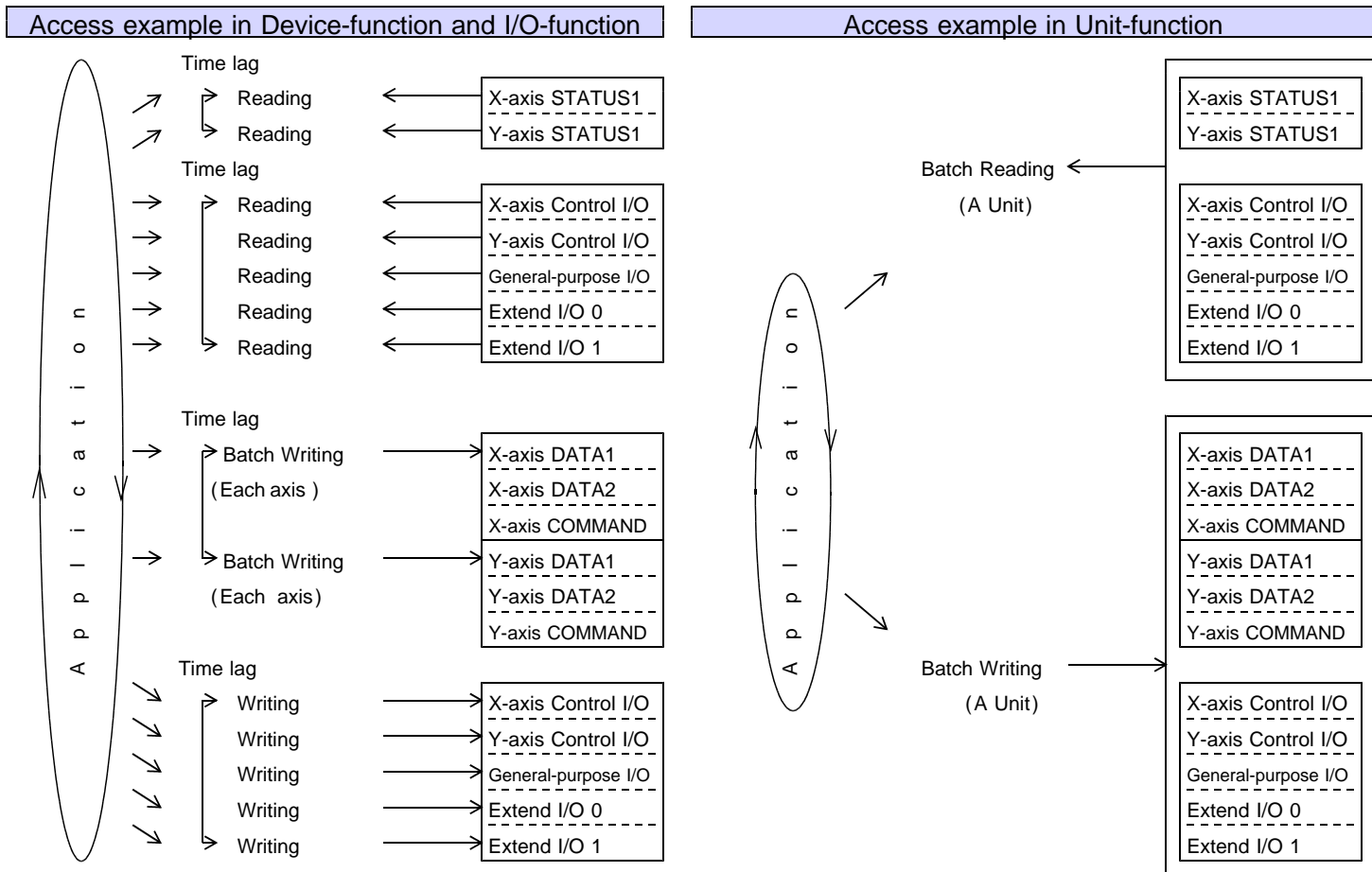
2CD-7713v1/GDB5F40 is a version up product with the 2CD-7713/GDB5F40 upward compatibility.

The status of two axis batch reading and the command of two axis batch execution by the Unit Function became possible.

This Unit-function can perform a unit and AL- interface by one function execution from an application.

By this,

- The time crunch can be done compared with accessed Device-function of each axis and I/O-port-function of each I/O port.
- The unit function (writing) suppresses the difference at time until it instructs time each axis and each I/O output signal.
- The Unit-function can reduce the load of the application.
- It supports the Device-function, and can use the Device-function.
- The Unit-function can be used together with the Device-function and the I/O-function.



2CD-7713v1/GDB5F40 is equipped with our chip controller MCC to enable motor control using simple commands.

- It enables drive of two axes of 5-phase stepping motor of from 0.75 A/phase to 1.4 A/phase.
- It enables two independent drive and two axes linear interpolation drive by an easy commands.
- After the command being executed is finished, the commands stored in the reservation register are executed sequentially. Then this function can be allowed continuous drive. (Applied function)
- The wiring working efficiency improves by an unnecessary driver all-in-one design to wire between the controller and the motor driver.

2CD-7713v1/GDB5F40 is equipped with for each two points general-purpose I/O.

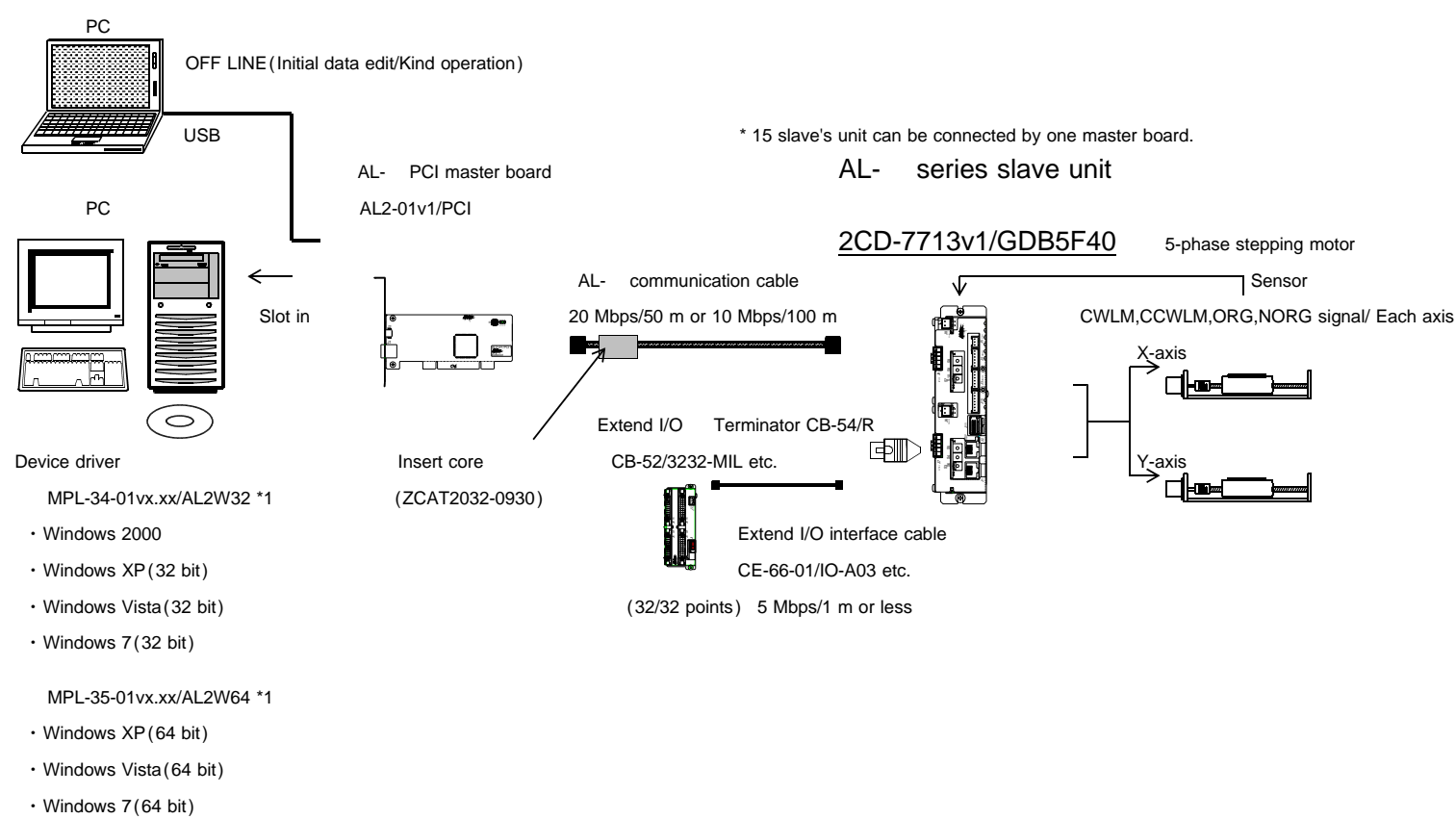
In addition, connect an Extend I/O unit (16/16 points or 32/32 points) by the serial communication without minding address setting and add a general-purpose I/O and can control it.

This general-purpose I/O and Extend I/O unit can read and write at the same time accessing MCC according to the Unit-Function.

1-2. Product configuration

| Product name | Rating             | Maker      | Quantity | Remarks   |
|--------------|--------------------|------------|----------|---|
| Controller   | 2CD-7713v1/GDB5F40 | Melec Inc. | 1        | (Main Unit)                                       |
| Connector    | 51067-0200         | Molex      | 2        | For driver power supply connector (Accessory)     |
| Connector    | 51067-0500         | Molex      | 2        | For motor connector (Accessory)                   |
| Connector    | 51103-0300         | Molex      | 1        | For controller power supply connector (Accessory) |
| Connector    | 51103-0600         | Molex      | 2        | For sensor connector (Accessory)                  |
| Connector    | 51103-0700         | Molex      | 1        | For general-purpose I/O connector (Accessory)     |
| Contact      | 50217-9101         | Molex      | 16       | For 51067 connector (Accessory)                   |
| Contact      | 50351-8100         | Molex      | 24       | For 51103 connector (Accessory)                   |
| Screw        | M2.6 × 4           | -          | 2        | For shield cable fixation (Accessory)             |








1-3. Example of system configuration



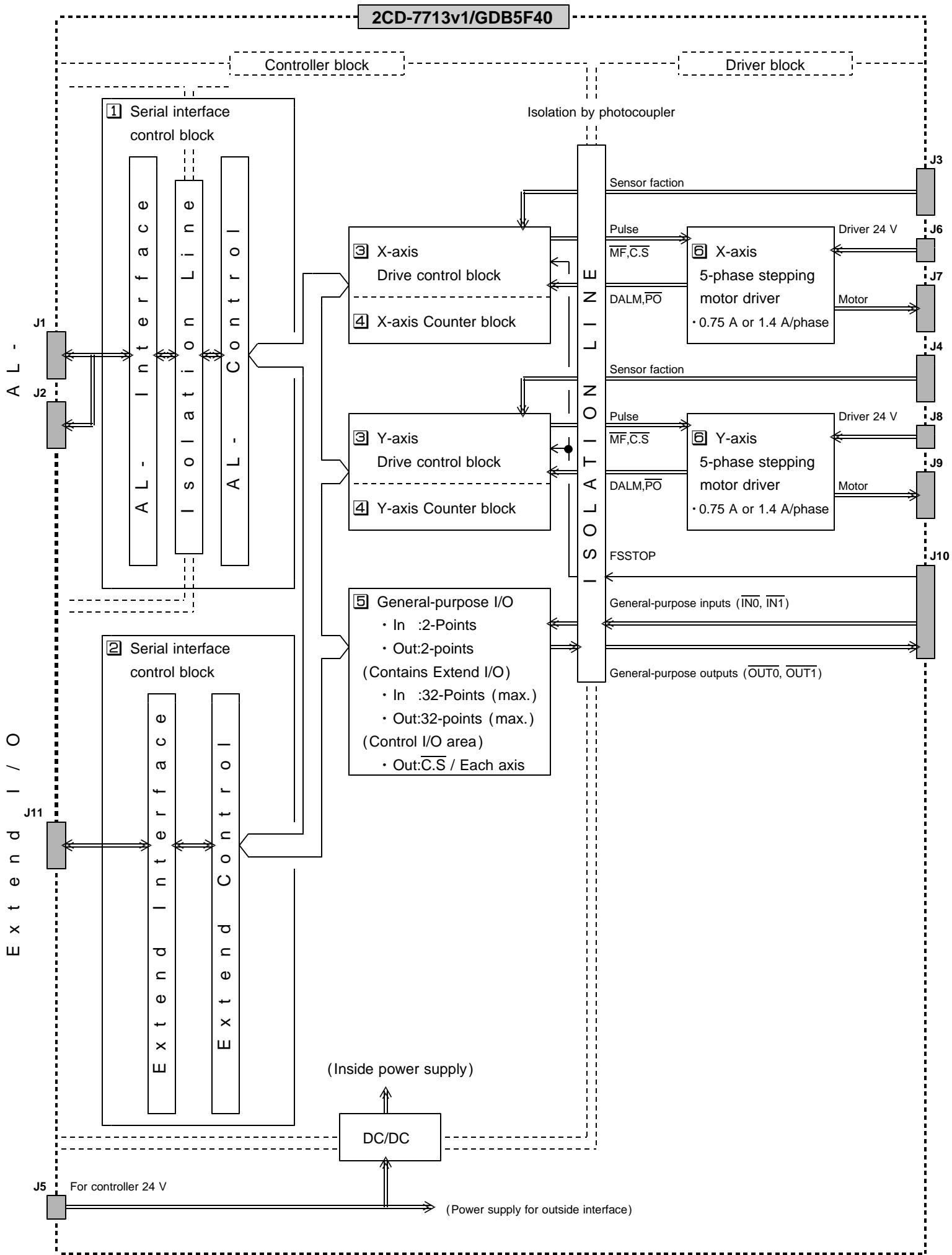
\*1 Version No. ... Please confirm the latest version of vx.xx at the manual of the device driver.

- AL- series prepared connectable cables easily.  
Please refer to the "connection / others" instruction manual for details of connection of the AL- series.

Example of other AL- series

| Power supply relay board   |   | Controller for servo or stepping motor   |  | Controller with built-in driver  |   | General-purpose I/O (Extend type and Slave type)  |  |
|--|---|--|--|--|---|---|--|
| CB-55-01/PS-T35  | 2C-771v1  | 2C-776Av1  | 2CD-7710v1/ADB5F30   | CB-53/1616-MIL   | 2CB-01v1/3232-MIL   | 2CB-02v1/1616-MIL   |  |
|   |              |   |                         |                         |                        |                        |  |
| <ul style="list-style-type: none"><li>• 4-distribution output of DC 24 V</li><li>• 1 A/terminal (3.5 A in total)</li></ul> | <ul style="list-style-type: none"><li>• 4-axes</li><li>• For stepping or simple servo</li></ul> | <ul style="list-style-type: none"><li>• 4-axes</li><li>• For encoder input</li></ul> | <ul style="list-style-type: none"><li>• 2-axes for 5-phase stepping motor</li><li>• 0.75 A/phase</li></ul> | <ul style="list-style-type: none"><li>• Extend type</li><li>• In:16-points</li><li>• Out:16-points</li></ul> | <ul style="list-style-type: none"><li>• Slave type</li><li>• In:32-points</li><li>• Out:32-points</li></ul> | <ul style="list-style-type: none"><li>• Slave type</li><li>• In:16-points</li><li>• Out:16-points</li></ul> |  |

1-4. Function block diagram



① Serial interface control block

This department is control block for AL- serial communication.

The AL- serial communications interface department is insulated with +24 V power supply and the internal logics.

② Serial interface control block

This department is control block for serial communication of Extend unit.

This block performs an Extend I/O unit and serial communication and can extend the I/O of 32 points /32 points input output (at the maximum).

The serial communication interface part is insulated from power supply +24 V.

③ Drive control block

The drive control block outputs serial pulses to the motor driver from pulse generator MCC.

(MCC is made by MELEC Inc.)

- This department detects origin sensor and a limit sensor signal and motor is controlled.
- Enables two axes independent drive or two axes linear interpolation drive.
- Enables stop two axes at immediate stop by FSSTOP signal from the outside.

To distinguish two axes, it is named X-axis and Y-axis.

④ Counter block

The counter block has two types of counters: ADDRESS COUNTER, and PULSE COUNTER.

ADDRESS COUNTER, PULSE COUNTER has 32-bit counter.

These counters count pulses output by the controller.

Each counter equipped with three compare registers. These registers count optional count.

\* The counter function of 2CD-7713v1/GDB5F40 is specifications to count pulse of the pulse output.

When the application of the counter which used an outside pulse is necessary, please examine a controller product corresponding to the outside pulse input.

⑤ General-purpose I/O block

This block is controlling the following input/output.

These input/output ports can control easily by I/O-function.

- Control I/O area  
... Driver's resolution switch ( $\overline{C.S}$ ) signal can be operated.
- General-purpose I/O area  
... The reading of the general-purpose Input  $\overline{IN0}$  signal and  $\overline{IN1}$  signal, the operation of the general-purpose output  $\overline{OUT0}$  signal and  $\overline{OUT1}$  signal are possible.  
Moreover, enables operation as Latch signal and Clear signal of X-axis SS0 signal by the  $\overline{IN0}$  signal input.  
And, enables operation as Latch signal and Clear signal of Y-axis SS1 signal by the  $\overline{IN1}$  signal input.
- Extend I/O area  
... When the area secure an extension input/output area for 32 points /32 points input/output and access it from an application in this input/output area, the area can control input/output by an Extend I/O unit and cyclic communication.

⑥ Stepping motor driver block

This block which installed two axes driver can drive 5-phase stepping motors until 1.4 A/ phase.

This block can drive a stepping motor from low speed smoothly, and the resolution is possible until maximum 2,000,000 (pulse/revolution).

Control part and the driver part are isolated by a photocoupler.

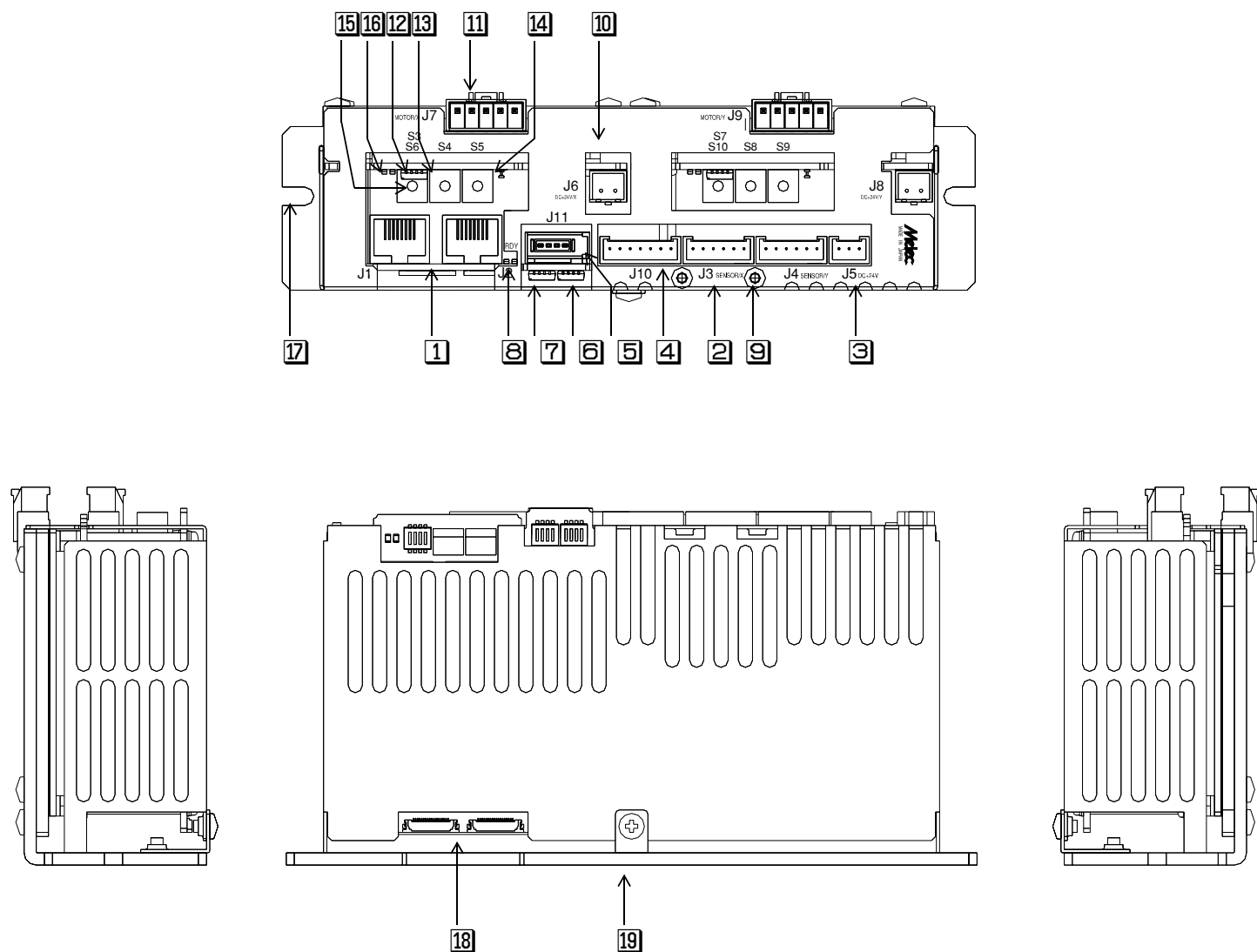
In addition, the power supply of a stepping motor driver part and the control part is independent.

This part can control the following signal from the drive control block.

- M.F ... Enables interception of the stepping motor current by  $\overline{M.F}$  on/off operation of MCC SIGNAL OUT command (DRST/M.F bit).
- O.H.A ... By MCC DRIVE STATUS2 PORT(DALM bit), O.H.A can detect driver overheat warning.  
In addition, by an MCC SPEC INITIALIZE3 command, the stop of the motor drive is possible with the detection of the driver's overheat warning.
- P.O ... The machine origin detection that used the phase out( $\overline{P.O}$ ) signal of the driver for by an ORIGIN SPEC SET function is possible.



## 1-5. Externals of product



### 【 Controller block 】

- ① J1, J2 ----- These are shield connector of the RJ-45 type that connects the AL- communication.  
J1 and J2 are connected with each unit and the communications cable can be connected in the multidrop.
- ② J3, J4 ----- These are connectors to connect the sensor signals such as a limit signal or the ORG signal.  
J3 is the one for the X-axis, and J4 is the one for the Y-axis.
- ③ J5 ----- This is a connector to connect +24 V power supply for controllers.
- ④ J10 ----- This is a connector that connects immediate stop (FSSTOP signals) and general-purpose I/O (IN0, IN1, OUT0, and OUT1 signals).
- ⑤ J11 ----- This is a connector to connect an Extend I/O unit.
- ⑥ S1 ----- This is a setting switch of the slave address of the AL- communication.
- ⑦ S2 ----- This is a setting switch of the baud rate of the AL- communication.
- ⑧ Controller LED --- RDY LED (Green color) turns on at the time of RDY state the X-axis and Y-axis of each axis.  
(RDY)
- ⑨ Terminal ----- The terminal connect to the shield when the sensor cable of shield.  
Use the screw of attached M2 .6 × 4.

【 Driver block 】

- ⑩ J6, J8 ----- These are connectors to connect +24 V power supply for drivers.  
The power shutdown can turn the power supply on and off independently of the power supply in the controller's part.  
J6 is the one for the X-axis, and J8 is the one for the Y-axis.
- ⑪ J7, J9 ----- These are connectors to connect a motor.  
J7 is the one for the X-axis, and J9 is the one for the Y-axis.
- ⑫ S3, S7 ----- These are switches that sets for the motor driver each.  
(Please refer to the setting at chapter 3. for the details.)  
S3 is the one for the X-axis, and S7 is the one for the Y-axis.
- ⑬ S4, S8 ----- These are DRIVE I. SEL (DRIVE current selection) switch.  
S4 is the one for the X-axis, and S8 is the one for the Y-axis.
- ⑭ S5, S9 ----- These are STEP SEL (STEP ANGLE selection) switch.  
S5 is the one for the X-axis, and S9 is the one for the Y-axis.
- ⑮ S6, S10 ----- These are HOLD I. SEL (HOLD current selection) switch.  
S6 is the one for the X-axis, and S10 is the one for the Y-axis.
- ⑯ Driver LED ----- POWER LED (Green color) turns on at the time of power on state the X-axis and Y-axis of each axis.  
(POWER, O.H.A) O.H.A LED (Red color) turns on when the driver part overheats and cooling is needed.  
The state of O.H.A can be read from the application by the DALM signal.
- ⑰ Base installation -- These are part that fixes the main unit to the installation base. (two places)  
part Use the M3 or M4 screw.
- ⑱ Connector for --- This is a connector for adjustment of the main unit.  
adjustment Do not connect anything.
- ⑲ ----- This is surface of heat radiation in the driver part.  
Set up so that this surface may stick to a metallic panel.

## 2 . Specifications

### 2-1. General specifications

| No. | Item                                       | Specifications  |
|-----|--|---|
| 1   | Supply voltage                             | Contoroller power supply :DC +24 V (less than $\pm 10\%$ of the power supply voltage)<br>Driver power supply :DC +24 V (less than rippled voltage 2.0 V p-p)  |
| 2   | Power consumption                          | Contoroller power supply :350 mA or less *1<br>Driver power supply *2 :<br>• Current rating/axis at DRIVE [ DRIVE I. SEL No. F setting ] : 2.0 A/axis<br>• Current rating/axis at HOLD [ HOLD I. SEL 40 % setting ] : 0.4 A/axis<br><br>*1 The value when the main body supplies the power supply for the sensor is indicated.<br>The main body current consumption is 110 mA.<br>Example: at the sensor of the current consumption 25 mA<br>(4 pieces $\times$ 25 mA $\times$ 2 axes) + 110 mA = 200 + 110 = 310 mA<br>The totaled current consumption must not exceed 350 mA.<br><br>*2 Use a power supply that provides sufficient driver consumption current. |
| 3   | Operating ambient temperature and humidity | • 0 ~ + 40<br>• 80 % RH or less (without dew condensation)  |
| 4   | Storage temperature and humidity           | • 0 ~ + 55<br>• 80 % RH or less (without dew condensation)  |
| 5   | Installation environment                   | • Inside a well-ventilated cabinet installed indoor, free from direct sunlight.<br>• Not exposed to corrosive and flammable gasses, and not affected by oil mist, dust, salt, iron powder, water, and chemicals.<br>• Not subject to constant vibration or excessive shock.<br>• Not affected by electromagnetic noise caused by power equipment.<br>• Free of radioactive materials and magnetic fields, and not in vacuum.  |
| 6   | Dimensions                                 | W 45.7 $\times$ H 87.5 $\times$ D 170 (mm)  |
| 7   | Weight                                     | Approx. 0.6 kg  |

### 2-2. Communication specifications

| No. | Item             | Specifications  |
|-----|------------------|---|
| 1   | AL- interface    | • Conformity standard :RS485 (insulation type)<br>• Transmission protocol :Protocol for AL- communication<br>• Slave connection number :1 ~ 15 slave (slave address setting range: H' 1 ~ H' F)<br>• Wiring distance/ baud rate :100 m (10 Mbps) / 50 m (20 Mbps) |
| 2   | Extend interface | • Conformity standard :RS485 (non-insulation: but there is insulation with +24 V. )<br>• Connection number :Up to one unit<br>• Wiring distance/ baud rate :1 m/5 Mbps  |

## 2-3. Specifications

### (1) Controller part

#### Basic Specifications

| No. | Item                  | Specifications                          |   |
|-----|-----------------------|---|---|
| 1   | Pulse output function | Output frequency                        | 0.1 Hz to 1 MHz   |
|     |                       | Acceleration/deceleration time constant | 5000 ms/kHz to 0.0025 ms/kHz (Trapezoid/S-curve)  |
|     |                       | Acceleration/deceleration shape         | <ul style="list-style-type: none"> <li>• Trapezoid</li> <li>• S-curve (This feature enables to set asymmetrical shape.)</li> </ul>  |
|     |                       | Triangular drive prevention function    | During S-shaped acceleration/deceleration drive, INDEX drive may end before the maximum speed is reached.<br>In this event, triangular drive can be automatically avoided.  |
|     |                       | Number of output pulses                 | <ul style="list-style-type: none"> <li>• JOG drive : -65,535 to +65,535 pulse</li> <li>• SCAN drive : Up to infinite pulses</li> <li>• INDEX drive : -2,147,483,647 to + 2,147,483,647 pulses</li> </ul>  |
| 2   | Drive function        | JOG drive                               | Pulses are constantly output until the specified pulses.  |
|     |                       | SCAN drive                              | Pulses are continuously output until a stop command is detected.  |
|     |                       | INDEX drive                             | Pulses are output until the specified relative or absolute address is reached.  |
|     |                       | ORIGIN drive                            | The specified drive processes are performed.<br>This drive is finished when the ORG signal specified edge is detected.  |
|     |                       | 2-axis linear interpolation drive       | <ul style="list-style-type: none"> <li>• Linear interpolation is performed toward the specified coordinates from the current coordinates.</li> <li>• Driving type is selected from INDEX drive or SCAN drive.</li> <li>• Positional errors for the specified straight line are <math>\pm 0.5</math> LSB.</li> <li>• The absolute and relative addresses that can be specified for coordinates range from -2,147,483,647 to +2,147,483,647 (32 bits).</li> </ul>   |
| 3   | Stop function         | Linear speed constant control           | Control is performed to keep the synthesized speed of the two axes working for interpolation drive constant.  |
|     |                       | Slow stop function                      | <ul style="list-style-type: none"> <li>• SLOW STOP command</li> <li>• Detection of a match of the comparator of each counter.</li> <li>• Deceleration stop by overheating warning of driver.</li> </ul>   |
|     |                       | Immediate stop function                 | <ul style="list-style-type: none"> <li>• FAST STOP command</li> <li>• FSSTOP signal (two axes stop)</li> <li>• Detection of a match of the comparator of each counter.</li> <li>• Immediate stop by overheating warning of driver.</li> </ul>   |
| 4   | Counter function      | LIMIT signal                            | <ul style="list-style-type: none"> <li>+ direction stop</li> <li>• Immediate stop by CWLM signal and slow stop can be selected.</li> <li>• Slow stop or immediate stop can be performed for each axis upon detection of a match of the comparator (COMP2) of each counter.</li> <li>- direction stop</li> <li>• Immediate stop by CCWLM signal and slow stop can be selected.</li> <li>• Slow stop or immediate stop can be performed for each axis upon detection of a match of the comparator (COMP3) of each counter.</li> </ul> |
|     |                       | ADDRESS COUNTER                         | 32-bit counter that manages absolute addresses by counting drive output pulses.   |
|     |                       | PULSE COUNTER                           | 32-bit counter that counts the drive pulse output.  |
|     |                       | Comparator function                     | Detection of a match of the three comparators of each counter. <ul style="list-style-type: none"> <li>• Upon detection of a match by the comparator, pulse output can be decelerated and then stopped, or stopped immediately.</li> <li>• Upon detection of a match by the comparator, status can be read.</li> </ul>   |
|     |                       | AUTO CLEAR function                     | The counter can automatically be cleared upon detection of a match of COMP1 of each counter.  |
|     |                       | AUTO ADD function                       | If the counter value reaches the COMP1, a value that is set by the data add to COMPARE REGISTER1 of each counter.   |

| No. | Item            | Specifications        |   |
|-----|-----------------|-----------------------|---|
| 5   | Other functions | Data reading function | Current status information can be read in real time.<br>Current status information includes status data, count data of a counter etc. |
|     |                 | General-purpose I/O   | Two points of input/output are prepared as general purpose I/O.   |

Applied functions

| No. | Item             | Specifications   |   |
|-----|------------------|--|---|
| 1   | Drive function   | PLS INDEX CHANGE function                                | Upon detection of the PLS INDEX CHANGE command, the system performs PLS INDEX drive by setting the specified data at the stop position of the relative address for which the start position is the origin.  |
|     |                  | INDEX drive control the start point at auto deceleration | This function is allowed to set OFFSET of the start point at auto deceleration.<br>This function can be used when INDEX drive, liner interpolation and INDEX drive.   |
| 2   | Counter function | Count data latch/clearance function                      | This function latches count data of a counter at a specific latch timing and holds it till the next latch timing.<br>Each counter can latch counter value at arbitrary timing.<br>It is possible to clear a counter value at the latch timing.<br>IN0 signal: for X-axis<br>IN1 signal: for Y-axis  |
| 3   | Other functions  | Command reservation function                             | Each axis has a reservation register that can store data commands for ten instructions.<br>• General-purpose commands of drive commands can be reserved in the reservation register.<br>• After the command being executed is finished, the commands stored in the reservation register are executed sequentially.<br>Then this function can be allowed continuous drive. |
|     |                  | Input signal logical switch function                     | The logic of the following input signals can be changed:<br>• CWLM signal<br>• CCWLM signal<br>• FSSTOP signal  |

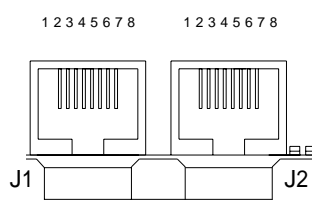
Please refer to the chapter of the AL- series device driver manual application function for details of applied specification.

## (2) Driver part

| No. | Item                               | Specifications  |
|-----|------------------------------------|---|
| 1   | Motor output current               | <p>DRIVE current: 0.3 A/phase ~ 1.35 A/phase<br/> HOLD current: Approx. 40 % of DRIVE current value (factory-set)</p> <p>Can set the DRIVE current with a DRIVE I. SEL switch in conformity to an application motor. In addition, user can set the HOLD current by the ratio (approx. 10 % - 100 %) with the DRIVE current by an HOLD I. SEL switch. (It is approx. 40 % at the time of factory-set)</p>  |
| 2   | Resolution of step angle (° /STEP) | <p>At S.T SEL1<br/> 0.72/ 0.36/ 0.18/ 0.072/ 0.036/ 0.018/ 0.0072/ 0.0036/ 0.0018/ 0.0009/<br/> 0.00072/ 0.00036/ 0.00018<br/> At S.T SEL2<br/> 0.09/ 0.045/ 0.009/ 0.0045</p> <p>The above-mentioned resolution can be selected by step table selection (S.T SEL) and step angle selection (STEP SEL).<br/> Moreover, the resolution set with the switch by the <math>\overline{C.S}</math> signal operation from the application can be switched to 0.036° step.<br/> • The motor can be driven at high speed by switching the <math>\overline{C.S}</math> signal from the application when the setting of resolution is high.</p>  |
| 3   | Motor excitation current ON/OFF    | <p>The stepping motor output current can be intercepted by the M.F signal operation from the application. As a result,</p> <ul style="list-style-type: none"> <li>• The manual operation of the machine can be done.</li> <li>• Generation of heat of the motor can be lowered.</li> </ul> <p>At this time, the holding torque of the motor is lost.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>⚠ CAUTION</b></p> <p>Deterioration of the holding power with the motor may cause breakage of the machine or injury. Check safety before inputting.</p> <p>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).</p> </div>   |
| 4   | Hold switching time select         | <p>DRIVE/HOLD current automatic switching time is set up with the DHT SEL switch.</p> <ul style="list-style-type: none"> <li>• There is a possibility to become heat decrease of the motor when the stop time of the drive is short.</li> </ul>   |
| 5   | Warning of overheat                | <p>When the temperature in the unit reaches at the temperature (approx. 70 °C) for which cooling is necessary, driver alarm signal (DALM) status is outputted.<br/> Moreover, LED of overheating warning (O.H.A: Red color) is lighted.</p> <ul style="list-style-type: none"> <li>• Consecutive driving is possible in the range where this signal is not output.</li> <li>• The motor output current is not intercepted at the time of ON this signal.</li> <li>• When DALM is enabled by the setting of the controller's department, the motor can be stopped automatically.</li> </ul> <div style="border: 1px solid black; padding: 5px;"> <p><b>⚠ WARNING</b></p> <p>May be fired by overheat.<br/> When this signal output, please stop driving.<br/> Confirm whether abnormality occurred at the motor and the product.<br/> When this signal is turned on with abnormality not found, please enlarge the installation base or give cooling of the forced air cooling etc.</p> </div> |
| 6   | P.O detection                      | <p>The P.O signal is generated only once in the pulse number hit that rotates by 7.2° by setting each resolution.<br/> When this signal is set as a origin detection signal of the controller's department, a highly accurate machine origin point can be detected.</p>   |

## 2-4. Input and output signal table

### (1) Serial communication connector (J1, J2)



Connector :RJ-45 (Shield type)  
Recommendation cable :KB-STP- L : length ( ~ 30 m or less)  
(Made by Sanwa Supply: It is not an accessory.)

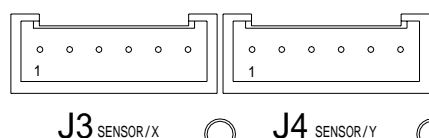
#### Reference

For more information about a cable preparing in the AL- series and a recommended cable, refer to the instruction manual of "connection / others" .

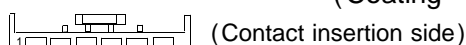
| No. | Direction | Signal name | Description  |
|-----|-----------|-------------|--|
| 1   | -         | N.C         | Connection is prohibited.  |
| 2   | -         | N.C         | Connection is prohibited.  |
| 3   | I/O       | +AL         | + side input/output signal of the serial data (line driver positive logic) |
| 4   | I         | +V          | Power supply for AL- communication (+6 V)                                  |
| 5   | I         | -V          | GND for AL- communication (0 V)  |
| 6   | I/O       | -AL         | - side input/output signal of the serial data (line driver negative logic) |
| 7   | -         | N.C         | Connection is prohibited.  |
| 8   | -         | N.C         | Connection is prohibited.  |

- J1 and J2 are the same terminal arrays. It is possible to connect with either.
- When the multidrop is connected, the divergence connection is done to other slave equipment through J1 or the J2 connector.

### (2) Sensor connector (J3: X-axis, J4: Y-axis)



Connector : 53426-0610 (Molex)  
Conformity connector : 51103-0600 (Molex: accessories)  
Conformity contact : 50351-8100 (Molex: accessories)  
Conformity crimp tool : 57295-5000 (Molex)  
Acceptable wire : AWG28 ~ AWG22  
(Coating 1.15 ~ 1.8)

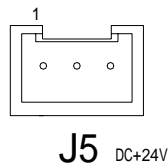


For shield connection (M2.6 tap)

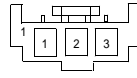
| No. | Direction | Signal name              | Description                               |
|-----|-----------|--------------------------|---|
| 1   | I         | CWLM                     | +(CW) direction LIMIT signal (B contact)  |
| 2   | I         | CCWLM                    | -(CCW) direction LIMIT signal (B contact) |
| 3   | I         | $\overline{\text{NORG}}$ | Machine origin proximity signal           |
| 4   | I         | $\overline{\text{ORG}}$  | Machine origin signal                     |
| 5   | -         | GND                      | Power supply (GND) for sensor             |
| 6   | O         | EXTVCOM+                 | Power supply (+24 V) for sensor           |

- The sensor connector is the same terminal array in both X-axis and Y-axis.
- The default values of the LIMIT signal of each axis are ACTIVE OFF input (B contact).  
The pulse is not output if it doesn't connect into the status of NORMAL ON (GND connection) when signal unused.
- +24 V power supply GND and internal can be connected , and can use as power supply GND for return GND of sensor.
- GND and +24 V power supply GND is mutually connected internally.  
These can be used as power supply GND for return GND and sensor.
- It can supply EXTVCOM+ as a power supply for sensor to the +24 V Max 150 mA/axis.  
(There is an overcurrent protection circuit.)
- When user drops the shield of a cable for sensor, user uses a terminal in the sensor connector side, and please connect it.

### (3) Controller power supply connector(J5)



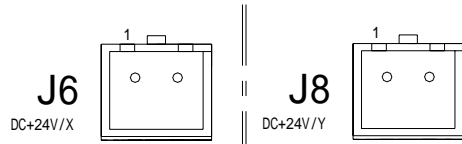
(Contact insertion side)



Connector : 53426-0310 (Molex)  
Conformity connector : 51103-0300 (Molex: accessories)  
Conformity contact : 50351-8100 (Molex: accessories)  
Conformity crimp tool : 57295-5000 (Molex)  
Acceptable wire : AWG28 ~ AWG22  
(Coating 1.15 ~ 1.8)  
Conformity cable : CE-76/003C10-51103  
(1 m: It is not an accessories.)

| No. | Direction | Signal name | Description                       |
|-----|-----------|-------------|-----------------------------------|
| 1   | I         | +24 V       | DC +24 V power supply             |
| 2   | -         | GND         | GND of +24 V power supply         |
| 3   | -         | F.G         | Frame GND is connected with case. |

### (4) Driver power supply connector(J6: X-axis, J8: Y-axis)



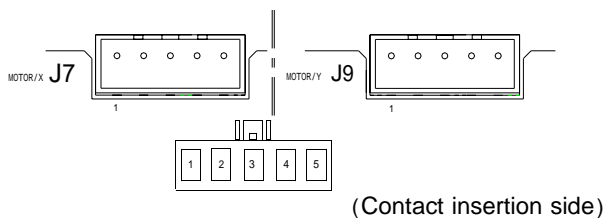
(Contact insertion side)

Connector : 53259-0229 (Molex)  
Conformity connector : 51067-0200 (Molex: accessories)  
Conformity contact : 50217-9101 (Molex: accessories)  
Conformity crimp tool : 57189-5000 (Molex)  
Acceptable wire : AWG24 ~ AWG18  
(Coating 1.4 ~ 3.0)  
Conformity cable : CE-48/002C10-51067  
(1 m: It is not an accessories.)

| No. | Direction | Signal name | Description               |
|-----|-----------|-------------|---------------------------|
| 1   | I         | +24 V       | DC +24 V power supply     |
| 2   | -         | GND         | GND of +24 V power supply |

- The driver power supply is independent with the controller power supply.
- The driver power supply of X-axis and Y-axis is independent with each axis.

### (5) Motor connector(J7: X-axis, J9: Y-axis)



(Contact insertion side)

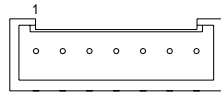
Connector : 53259-0529 (Molex)  
Conformity connector : 51067-0500 (Molex: accessories)  
Conformity contact : 50217-9101 (Molex: accessories)  
Conformity crimp tool : 57189-5000 (Molex)  
Acceptable wire : AWG24 ~ AWG18  
(Coating 1.4 ~ 3.0)  
Conformity cable : CE-50/005C10-51067  
(1 m: It is not an accessories.)

| No. | Direction | Signal name | Description                 |                             |
|-----|-----------|-------------|-----------------------------|-----------------------------|
|     |           |             | Example of motor lead color | Example of motor lead color |
| 1   | O         | A-phase     | VIO/BLU                     | BLK                         |
| 2   | O         | B-phase     | RED/GRY                     | GRN                         |
| 3   | O         | C-phase     | BLK/YLW                     | ORN                         |
| 4   | O         | D-phase     | WHT/ORN                     | RED                         |
| 5   | O         | E-phase     | GRN/BRN                     | BLU                         |

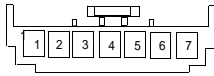
- The motor connector is the same terminal array in both X-axis and Y-axis.
- The display according to the color is a lead wire color of motor.



## (6) General-purpose I/O connector (J10)



J10



(Contact insertion side)

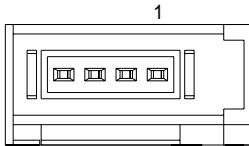
Connector : 53426-0710 (Molex)  
 Conformity connector : 51103-0700 (Molex: accessories)  
 Conformity contact: : 50351-8100 (Molex: accessories)  
 Conformity crimp tool : 57295-5000 (Molex)  
 Acceptable wire : AWG28 ~ AWG22  
 (Coating 1.15 ~ 1.8)

| No. | Direction | Signal name              | Description   |
|-----|-----------|--------------------------|---|
| 1   | -         | R.GND                    | Return GND of each signal (for +24 V interface)             |
| 2   | I         | FSSTOP                   | Immediate stop signal of both X-axis and Y-axis (B contact) |
| 3   | I         | $\overline{\text{IN0}}$  | General-purpose input 0                                     |
| 4   | I         | $\overline{\text{IN1}}$  | General-purpose input 1                                     |
| 5   | O         | $\overline{\text{OUT0}}$ | General-purpose output 0                                    |
| 6   | O         | $\overline{\text{OUT1}}$ | General-purpose output 1                                    |
| 7   | -         | N.C                      | Connection is prohibited.                                   |

- The default values of the FSSTOP signal is ACTIVE OFF input (B contact).  
 The pulse is not output if it doesn't connect into the status of NORMAL ON (GND connection) when signal unused.

## (7) Extend I/O communication connector (J11)

J11



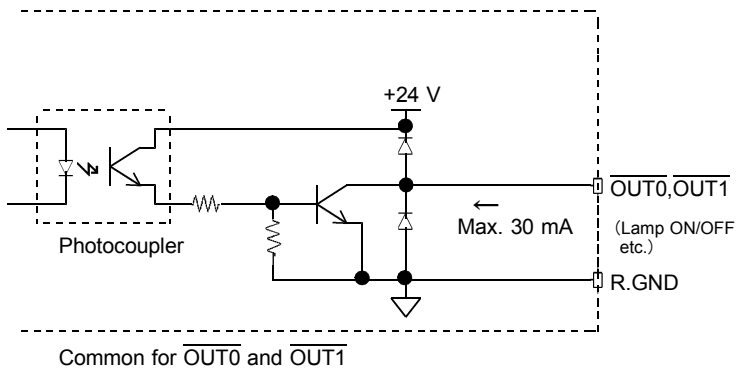
Connector : 1565994-4 (e-CON:Tyco Electronics)  
 Conformity cable : CE-66-01/IO-A03 (0.3 m, It is not an accessories.)  
 : CE-66-02/IO-A10 (1 m, It is not an accessories.)

| No. | Direction | Signal name  | Description  |
|-----|-----------|--------------|--|
| 1   | I/O       | +RS485 (EXT) | + side signal of the Extend I/O serial data (Line driver positive logic) |
| 2   | I/O       | -RS485 (EXT) | - side signal of the Extend I/O serial data (Line driver negative logic) |
| 3   | -         | S.G          | Signal GND for Extend I/O  |
| 4   | -         | F.G          | Frame GND is connected with case.  |

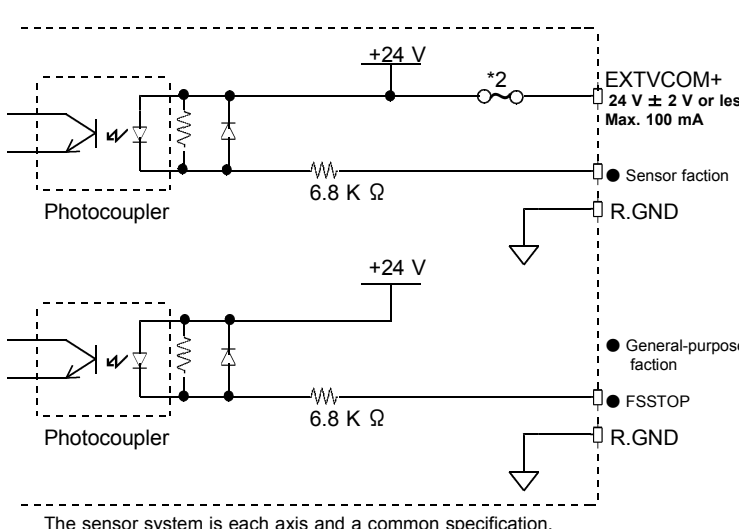
- Number of Extend I/O that can be connected from J11 is one unit.

2-5. Input and output specifications  
(1) Output specifications

R1

| Circuit   | Description          |   |
|---|----------------------|---|
|  | Signal name          | $\overline{\text{OUT0}}, \overline{\text{OUT1}}$  |
|   | Interface voltage    | +24 V   |
|   | Output method        | Nch transistor<br>Open collector output   |
|   | Output current       | ON : 30 mA ( $V_{ce} = 1 \text{ V}$ or less)<br>50 mA ( $V_{ce} = 2 \text{ V}$ or less)<br>OFF : 0.1 mA or less |
|   | Output response time | 1 ms or less<br>(ON $\rightarrow$ OFF、OFF $\rightarrow$ ON)   |
|   | Insulation           | Photocoupler isolation<br>(Between internal circuits and external circuits.)                                    |

(2) Input specifications

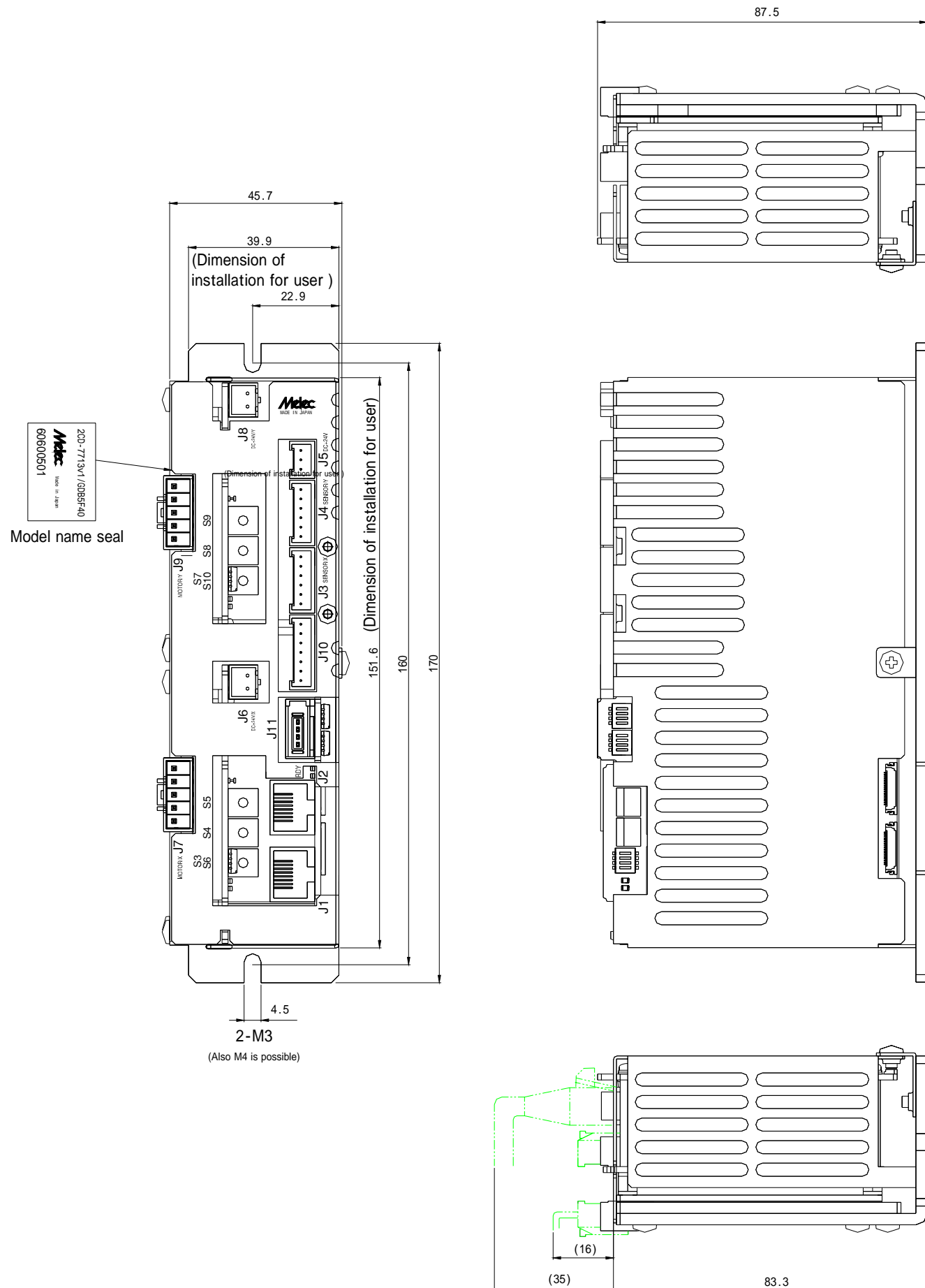
| Circuit   | Description  |   |
|---|--|---|
|  | Signal name  | ● Sensor faction<br>$\overline{\text{ORG}}, \overline{\text{NORG}}, \text{CWLM}, \text{CCWLM}$ *1<br>(EXTVCOM+ can be supplied by 24V for the sensor: Up to 100mA)<br>● General-purpose faction<br>$\overline{\text{IN0}}, \overline{\text{IN1}}$<br>● Other<br>FSSTOP *1 |
|   | Interface voltage  | +24 V   |
|   | Input impedance  | 6.8 K $\Omega$  |
|   | ON/OFF level   | ON : 2.5 mA or more<br>OFF : 0.8 mA or less   |
|   | Input response time  | 1 ms or less<br>(ON $\rightarrow$ OFF、OFF $\rightarrow$ ON)   |
|   | Insulation   | Photocoupler isolation<br>(Between internal circuits and external circuits.)  |
|   | The sensor system is each axis and a common specification.<br>(The general purpose faction and additionally FSSTOP is excluded.) |   |

- \* 1 The default value of each axis LIMIT signal and the FSSTOP signal is the ACTIVE OFF input (B contact) .  
The pulse is not output if it doesn't connect it in the state of NORMAL ON (GND connection)  
when it is signal unused.
  - The logic of B contact input can be switched to A contact input. (Applied function)
- \* 2 An output electrical overload and short circuit should be careful.  
An internal protection circuit (fuse) is blown.

## 2-6. Outside dimensions

General tolerance  $\pm 0.5$  mm or less

Externals tolerance  $\pm 1$  mm or less



## 3 . Setting

### 3-1. Setting of the controller part

#### (1) Installation of device driver for Windows

Device driver for Windows is necessary to operate this product.

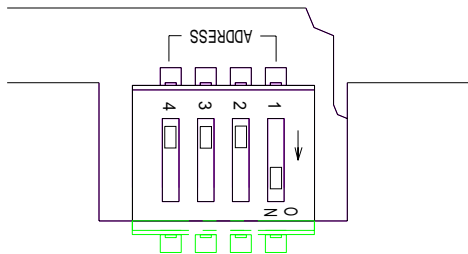
- Please refer to the installation manual attachment to a exclusive use device driver 「 MPL-34-01vx.xx/AL2W32 or MPL-35-01vx.xx/AL2W64 」 for details of the installation method.
- Please refer to the PCI master manual of the AL- series when it sets and operating by using application MAP-19-01vx.xx.

\* Version No. ... Please confirm the latest version of vx.xx at the manual of the device driver, and MAP-19 application.

#### (2) Address setting of the AL- series (S1)

The slave address of the AL- communication is set with dip switch S1.

The master address is H' 0 fixation. And, please set not to overlap the address of each slave unit.



| ADDRESS \ SWITCH No.   | 4   | 3   | 2   | 1   |
|------------------------|-----|-----|-----|-----|
| Setting is prohibited. | OFF | OFF | OFF | OFF |
| H' 1                   | OFF | OFF | OFF | ON  |
| H' 2                   | OFF | OFF | ON  | OFF |
| H' 3                   | OFF | OFF | ON  | ON  |
| H' C                   | ON  | ON  | OFF | OFF |
| H' D                   | ON  | ON  | OFF | ON  |
| H' E                   | ON  | ON  | ON  | OFF |
| H' F                   | ON  | ON  | ON  | ON  |

Factory-set

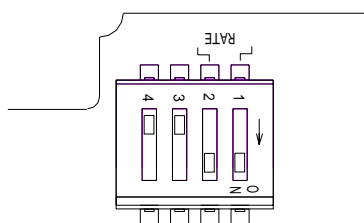
- When turning on power, the setting of S1 becomes effective.  
Set switch while turning off the power supply.  
And, turn on the power supply after the setting change.

#### (3) Baud rate setting of the AL- series (S2)

The baud rate of the slave units of AL- communication is set with dip switch S2.

Set to masters the baud rate by an Environment-function.

And, set the same transmission rate as master to all slave units connected with the AL- series by the dip switch S2.



| RATE \ SWITCH No.      | 4   | 3   | 2   | 1   |
|------------------------|-----|-----|-----|-----|
| Setting is prohibited. | OFF | OFF | OFF | OFF |
| Setting is prohibited. | OFF | OFF | OFF | ON  |
| 10 Mbps                | OFF | OFF | ON  | OFF |
| 20 Mbps                | OFF | OFF | ON  | ON  |

Factory-set

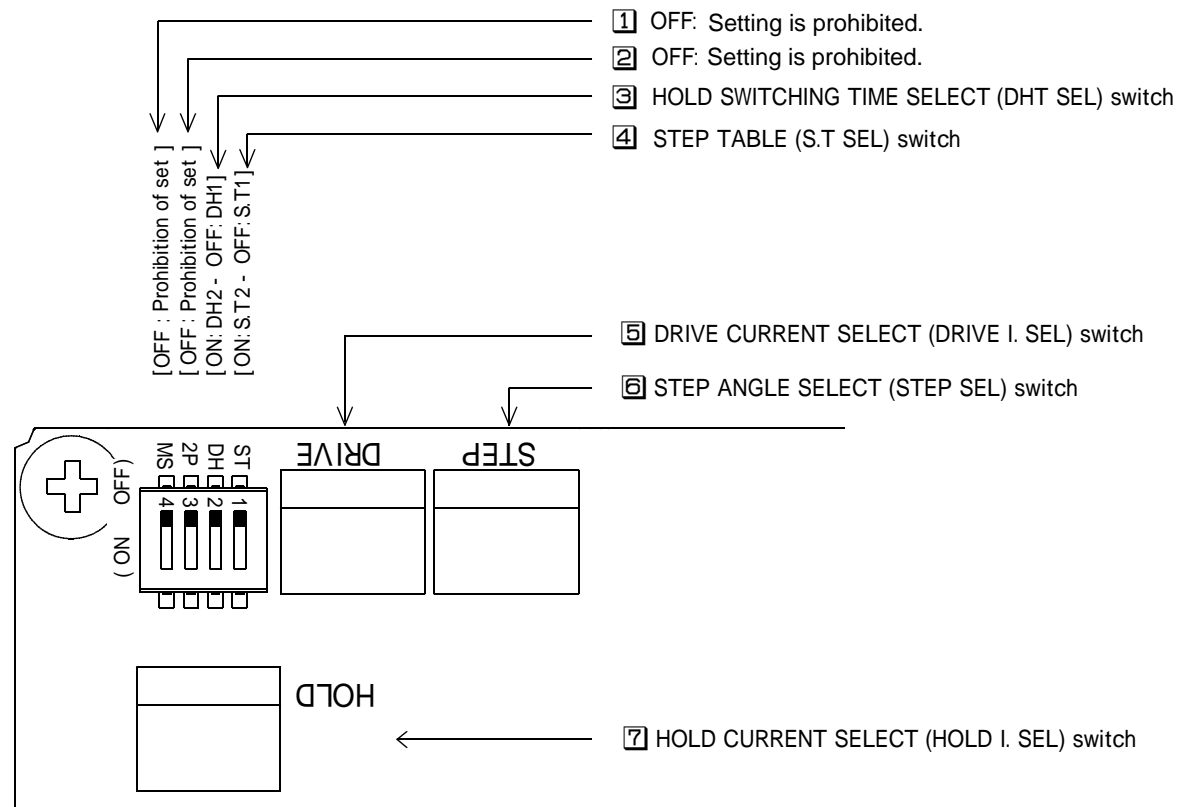
- Turn off the 3rd and 4th bit of S2. These are the set prohibition.
- When turning on power, the setting of S2 becomes effective.  
Set switch while turning off the power supply.  
And, turn on the power supply after the setting change.

## 3-2. Setting of the driver part

### (1) Description of operating

Operation method is the same in both X-axis and Y-axis.

Turn off the power supply when you operate the switch.

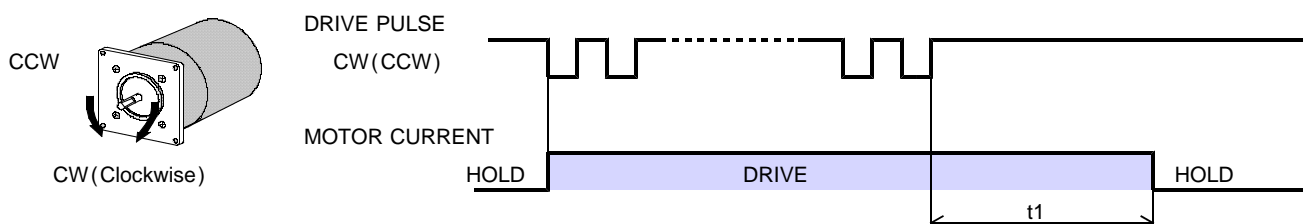


| Sign | Name of operation element |                                   | Description                                      | Factory-set    |
|------|---------------------------|-----------------------------------|--|----------------|
| ①    | MS                        | MOTOR SEL switch                  | Setting is prohibited. ( OFF setting )           | [ OFF ]        |
| ②    | 2P                        | Pulse input select switch         | Setting is prohibited. ( OFF setting )           | [ OFF ]        |
| ③    | DHT SEL                   | HOLD SWITCHING TIME SELECT switch | Selects the automatic DRIVE/HOLD switching time. | [ OFF: DH1 ]   |
| ④    | S.T SEL                   | STEP TABLE switch                 | Selects the STEP TABLE.                          | [ OFF (S.T1) ] |
| ⑤    | DRIVE I. SEL              | DRIVE CURRENT SELECT switch       | Selects the Drive Current.                       | [ No. F ]      |
| ⑥    | STEP SEL                  | STEP ANGLE SELECT switch          | Selects the step angle.                          | [ No. 1 ]      |
| ⑦    | HOLD I. ADJ               | HOLD CURRENT SELECT switch        | Selects the Hold Current.                        | [ No. 3 ]      |

### (2) Setting of HOLD SWITCHING TIME SELECT(DHT SEL) switch

DRIVE/HOLD current automatic switching time is set up with the DHT SEL switch.

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.



| DHT SEL | t1 (Hold Switching Time ) |
|---------|---------------------------|
| ON      | DH2 ( 16 ms)              |
| OFF     | DH1 ( 150 ms)             |

Factory-set

- The switch is factory-set to [ DH1 ( 150 ms ) ].
- When time from a pulse stop to the next pulse input is short, because the supply ratio of the DRIVE current rises, motor fever may become high.  
For this case, motor fever can be suppressed by setting the HOLD current switch time to fast.
- Confirm the step out doesn't occur when the motor stops with the real systems.

### (3) Setting of STEP TABLE (S.T SEL) switch and STEP ANGLE SELECT (STEP SEL) switch



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

Set the step angle required by the S.T SEL switch and STEP SEL switch.

The switches are factory-set to [S.T: 1], and [No. 1].

| S.T SEL switch [ OFF : S.T1 ] |          |                |
|-------------------------------|----------|----------------|
| STEP SEL No.                  | Division | Step Angle (°) |
| 0                             | 1/1      | 0.72           |
| 1                             | 1/2      | 0.36           |
| 2                             | 1/4      | 0.18           |
| 3                             | 1/10     | 0.072          |
| 4                             | 1/20     | 0.036          |
| 5                             | 1/40     | 0.018          |
| 6                             | 1/100    | 0.0072         |
| 7                             | 1/200    | 0.0036         |
| 8                             | 1/400    | 0.0018         |
| 9                             | 1/800    | 0.0009         |
| A                             | 1/1000   | 0.00072        |
| B                             | 1/2000   | 0.00036        |
| C                             | 1/4000   | 0.00018        |
| D                             | -        | -              |
| E                             | -        | -              |
| F                             | -        | -              |

Factory-set

| S.T SEL switch [ ON : S.T2 ] |          |                |
|------------------------------|----------|----------------|
| STEP SEL No.                 | Division | Step Angle (°) |
| 0                            | -        | -              |
| 1                            | -        | -              |
| 2                            | -        | -              |
| 3                            | -        | -              |
| 4                            | -        | -              |
| 5                            | -        | -              |
| 6                            | -        | -              |
| 7                            | -        | -              |
| 8                            | -        | -              |
| 9                            | -        | -              |
| A                            | -        | -              |
| B                            | -        | -              |
| C                            | 1/8      | 0.09           |
| D                            | 1/16     | 0.045          |
| E                            | 1/80     | 0.009          |
| F                            | 1/160    | 0.0045         |

- The step angle is value of 0.72 ° motor.
- STEP SEL No. D ~ No. F setting becomes number of partitions 1/4000 when the S.T SEL switch is turning off S.T1.
- When the S.T SEL switch is turned on [ S.T2 ], the setting of STEP SEL No. 0 ~ No. B is number of division of same S.T1.
- When the step angle is switched from the setting of number of partitions 1/1000, 1/2000, 1/4000 to other numbers of division (1/1 ~ 1/800), misregistration might be caused. The resolution set with the switch by the C.S signal operation from the application can be switched to 1/20 (0.036 °) step.  
The motor can be driven at high speed by switching the C.S signal from the application when the setting of resolution is high.

### (4) Setting of DRIVE CURRENT SELECT (DRIVE I. SEL) switch



Erroneous setting may cause 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 switch is factory-set to [No. F].

- Set the DRIVE I. SEL switch to the setting specified in the table "5. Applicable motors."

| DRIVE I.SEL No. | A/phase |
|-----------------|---------|
| 0               | 0.30    |
| 1               | 0.325   |
| 2               | 0.35    |
| 3               | 0.40    |
| 4               | 0.50    |
| 5               | 0.60    |
| 6               | 0.70    |
| 7               | 0.75    |
| 8               | 0.80    |
| 9               | 0.90    |
| A               | 1.05    |
| B               | 1.15    |
| C               | 1.20    |
| D               | 1.25    |
| E               | 1.30    |
| F               | 1.35    |

Factory-set

## (5) Setting of HOLD CURRENT SELECT(HOLD I. SEL) switch



### CAUTION

Erroneous setting 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 the HOLD current to the DRIVE current is set.  
 It is set [ No. 3: 40 % ] in factory-set.

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

| DRIVE I. SEL [ No. 0 ~ No. 2 ] |                            |
|--------------------------------|----------------------------|
| HOLD I. SEL No.                | Ratio of HOLD current( % ) |
| 0                              | -                          |
| 1                              | 20                         |
| 2                              | 30                         |
| 3                              | 40                         |
| 4                              | 50                         |
| 5                              | 60                         |
| 6                              | 70                         |
| 7                              | 80                         |
| 8                              | 90                         |
| 9                              | 100                        |

| DRIVE I. SEL [ No. 3 ~ No. F ] |                            |
|--------------------------------|----------------------------|
| HOLD I. SEL No.                | Ratio of HOLD current( % ) |
| 0                              | 10                         |
| 1                              | 20                         |
| 2                              | 30                         |
| 3                              | 40                         |
| 4                              | 50                         |
| 5                              | 60                         |
| 6                              | 70                         |
| 7                              | 80                         |
| 8                              | 90                         |
| 9                              | 100                        |

Factory-set

- HOLD current is changed relative to DRIVE current setting.  
 The ratio of HOLD current of 100% (No. 9 setting) represents the same as the setting for DRIVE current.
- When the DRIVE I. SEL switch is set to No. 0 ~ No. 2, the useful range of the HOLD I. SEL switch becomes No. 1 ~ No. 9.  
 No.0 becomes the range of 0 ~ 20 %.
- The greater the ratio of HOLD current grows, the more heat the motor generates when on holding-state.

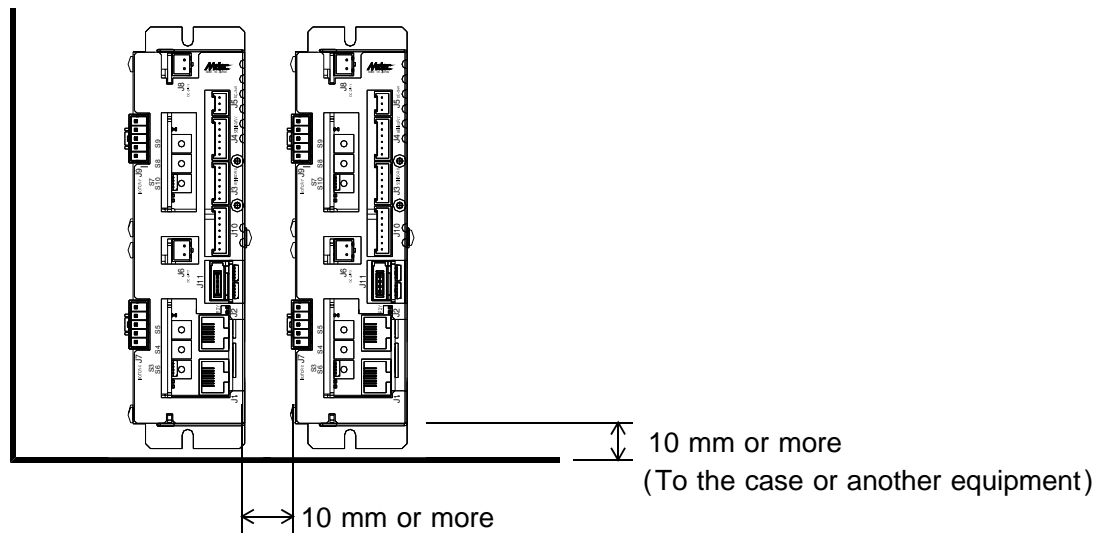
## 4 . Installation and connection

### 4-1. Installation

#### (1) Installation distance

Secure the flow of the wind for the upper and lower right and left 10 mm or more apart and set up 2CD-7713v1/GDB5F40 as follows.

- Distance when two or more is arranged.
- Distance with panel of case.
- Distance with another equipment.

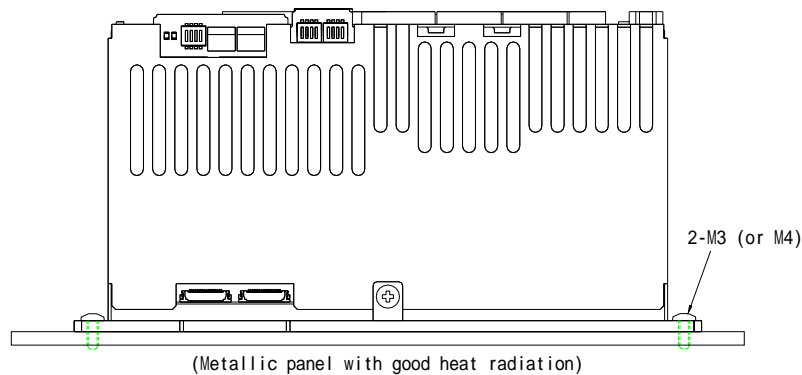


#### (2) Installation method

##### Horizontal installation

Install in a metallic panel with excellent heat radiation by M3 or M4 screw.

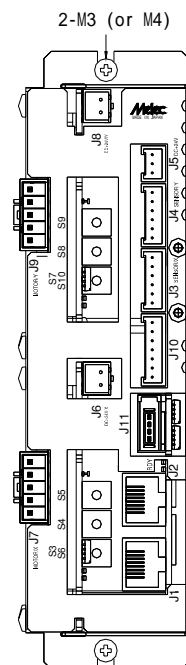
The length of the screw must use appropriate length corresponding to the thickness of a metallic panel.



##### Vertical installation

Install it in a metallic panel with excellent heat radiation by M3 or M4 screw in the direction (upward) where the logo can be read.

The length of the screw must use appropriate length corresponding to the thickness of a metallic panel.



The product can be prevented from falling by installing the product after a lower screw is stopped.



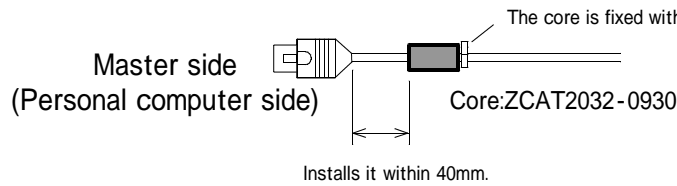
## 4-2. Connection of AL- communication system

### CAUTION

Operation not anticipated may cause damage of the machine and the product.  
To prevent the malfunction by the noise, the AL- communications cable recommends recommended cable.

### (1) Core connection of AL- communications cable

Please install the core in the master side. And, the personal computer system including the AL- communication is made to operated with stability.

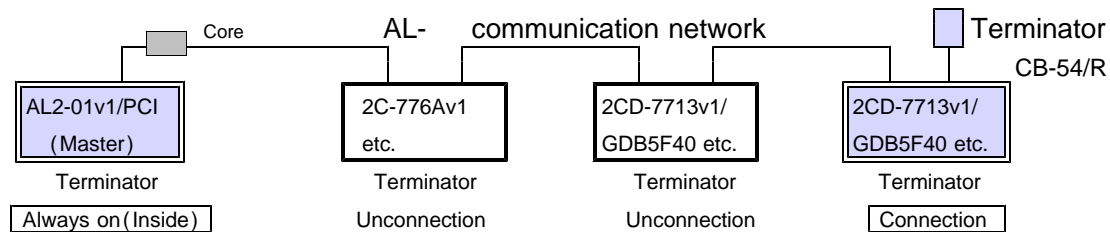


The core is prepared by our company.  
Please refer to the "connection/other" manual.

### (2) Connection of terminator

Please connect terminator (CB-54/R) with the slave unit arranged on the AL- communication network edge.  
Please do not connect the terminator with other equipment.

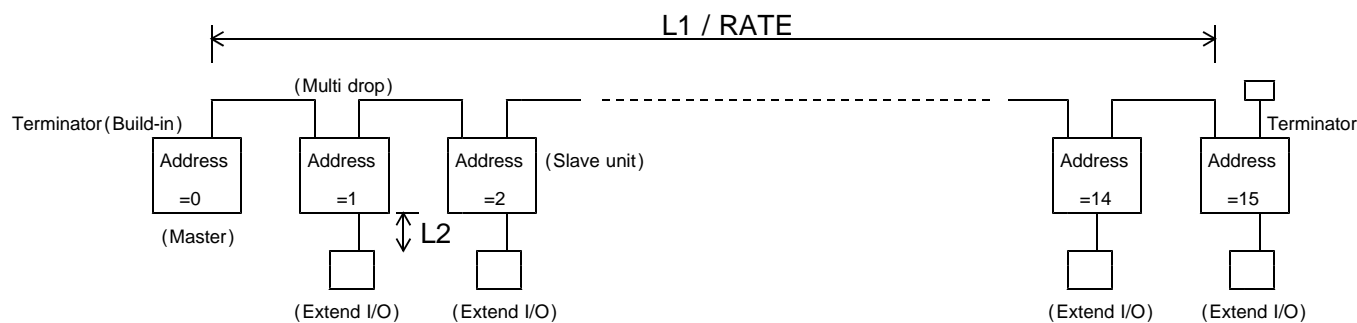
There is no problem even if AL- communications or the terminator are connected with either of J1, J2.



### (3) Wiring distance of AL- communication

The total wiring distance of the AL- communications cable is the following range including the multidrop wiring.

- The wiring distance of Extend I/O doesn't relate to AL- communication baud rate (RATE).
- The wiring distance of Extend I/O from each slave is within 1 m.



AL- communication baud rate and wiring distance

| Wiring distance               | RATE          |              |
|-------------------------------|---------------|--------------|
|                               | 10 Mbps       | 20 Mbps      |
| L1 (AL- communication)        | 100 m or less | 50 m or less |
| L2 (Extend I/O communication) | 1 m or less   |              |

The number of slaves that can be connected directly with the AL- communication are 15 units or less.  
Extend I/O that can be extended directly from the slave unit is not included in the number of slaves.

### (4) Power supply and slave power supply for communication

The AL- communication power supply of each slave unit is supplied from the AL- master through the communications cable so that the entire AL- communication network should not become unstable when the power supply on each slave unit side is intercepted.

The reconnection of communications can be done by executing Environment-function to the master when the power supply of the main unit on the slave side is obstructed.

Moreover, 2CD-7713v1/GDB5F40 can independently intercept driving power supply with the controller power supply maintained for the safety of the equipment.

### 4-3. Connection example

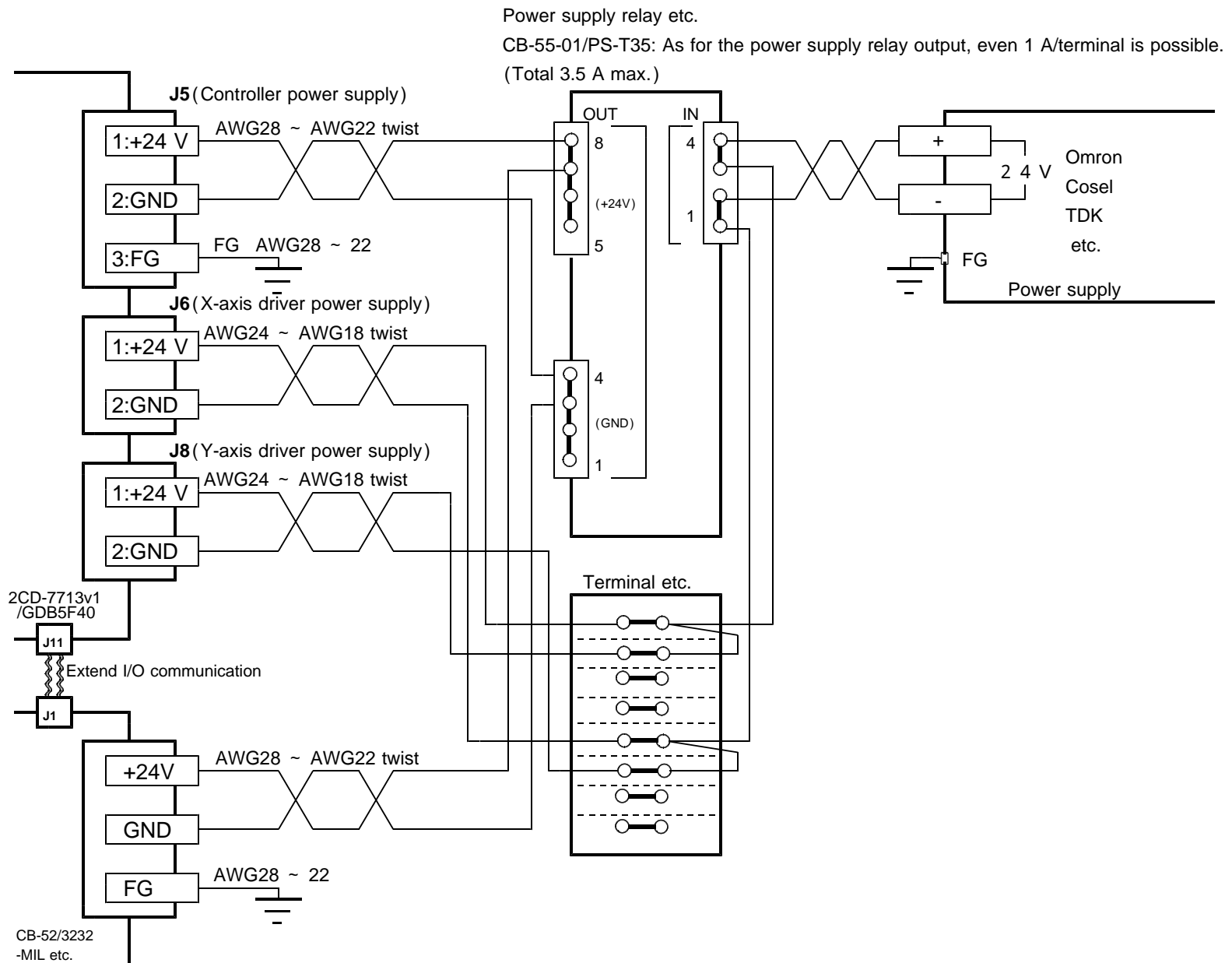
#### (1) Examples of connection to power supply

#### CAUTION

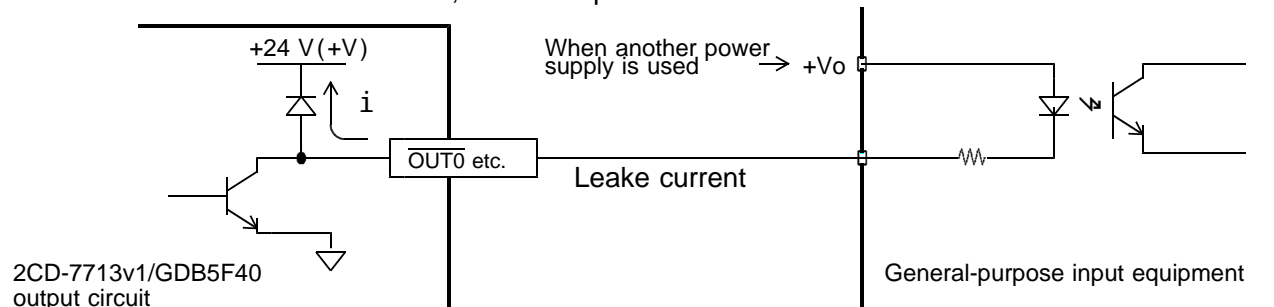
Operation not anticipated may cause damage of the machine and the product.

Separate the wiring for the power supply line by the following signal and 50 mm or more to prevent the malfunction by the noise.

- Principal circuit of another equipment.
- Power line of another equipment.
- AL- communications cable.



- 2CD-7713v1/GDB5F40 please connect a driver power supply to a controller power supply each.  
The above is an example supplying +24 V power supply from the same power supply, but can intercept a driver power supply independently.
- Consider to confirm the current consumption of the wiring distance (resistance of the wire rod) and the AL- series product, and for the voltage drop of wiring to fill the input power supply specification of the product the thickness of the wire rod of the power supply.
- Take general-purpose I/O interface power supply from the same power supply as 2CD-7713v1/GDB5F40.  
The Leake current flows through the protection diode of the output circuit when becoming power supply (+V) of power supply > 2CD-7713v1/GDB5F40 of a general-purpose output when supplying it in the power supply besides 2CD-7713v1/GDB5F40, and the input circuit of the connection destination enters the state of turning on.



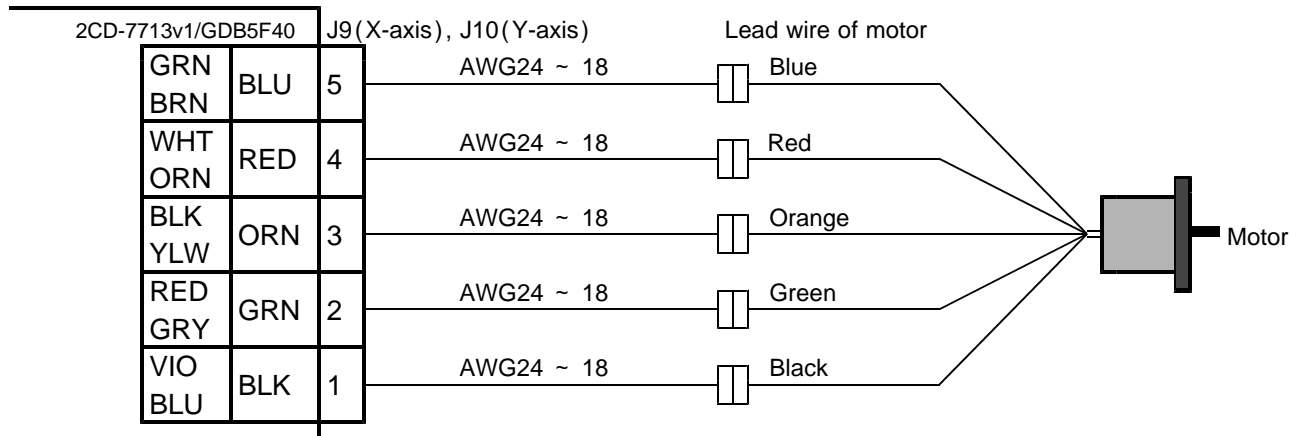
## (2) Examples of connection to motor

### ⚠ CAUTION

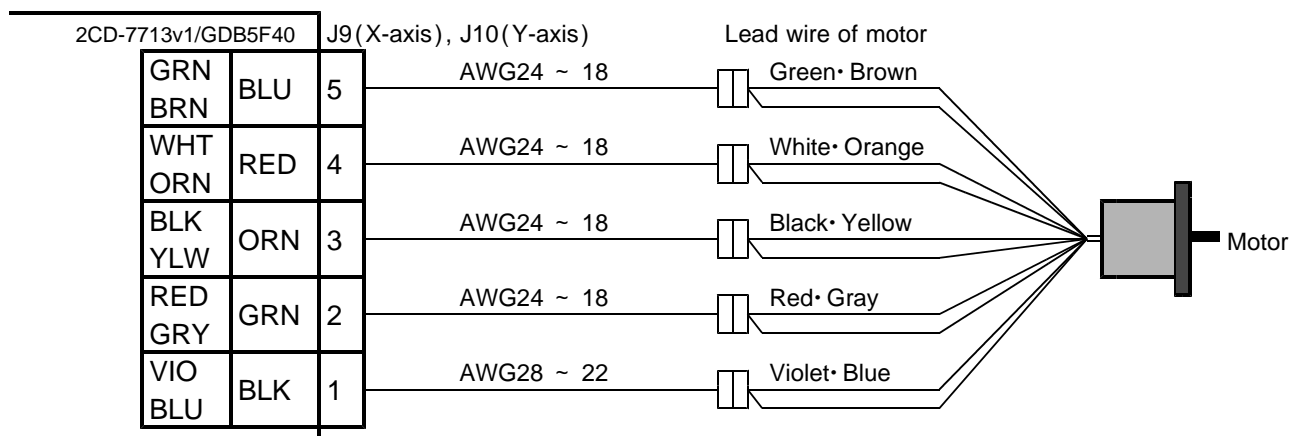
Operation not anticipated may cause damage of the machine and the product.  
Separate the wiring for the motor line by the following signal and 50 mm or more to prevent the malfunction by the noise.

- Line of another equipment.
  - AL- communications cable.
- Make the motor wiring within 5 m.

Example 1 of connection to motor




Example 2 of connection to motor



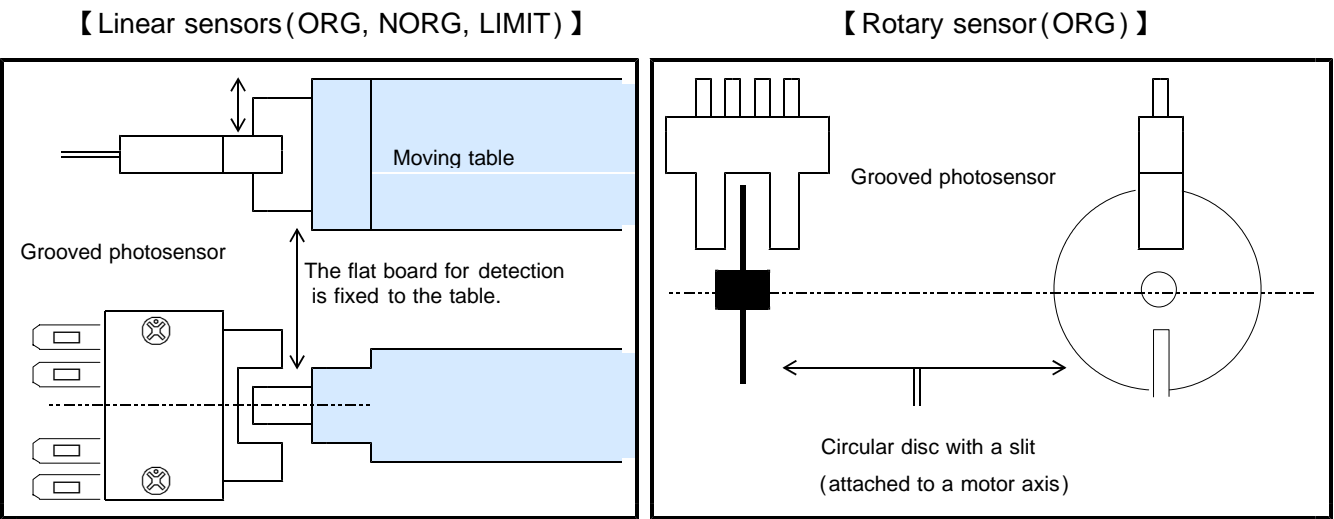
- The display of J9 and J10 according to the color is the lead wire colors of the motor.
- Wire the motor within 5 m.

(3) Examples of connection to sensor (at photosensor)

**CAUTION**

Operation not anticipated may cause damage of the machine and the product.  
Separate the signal wire of each sensor by the power line and 50 mm or more to prevent the malfunction by the noise.  
Wire each signal within 5 m.

Example of sensor attachment(photosensor)



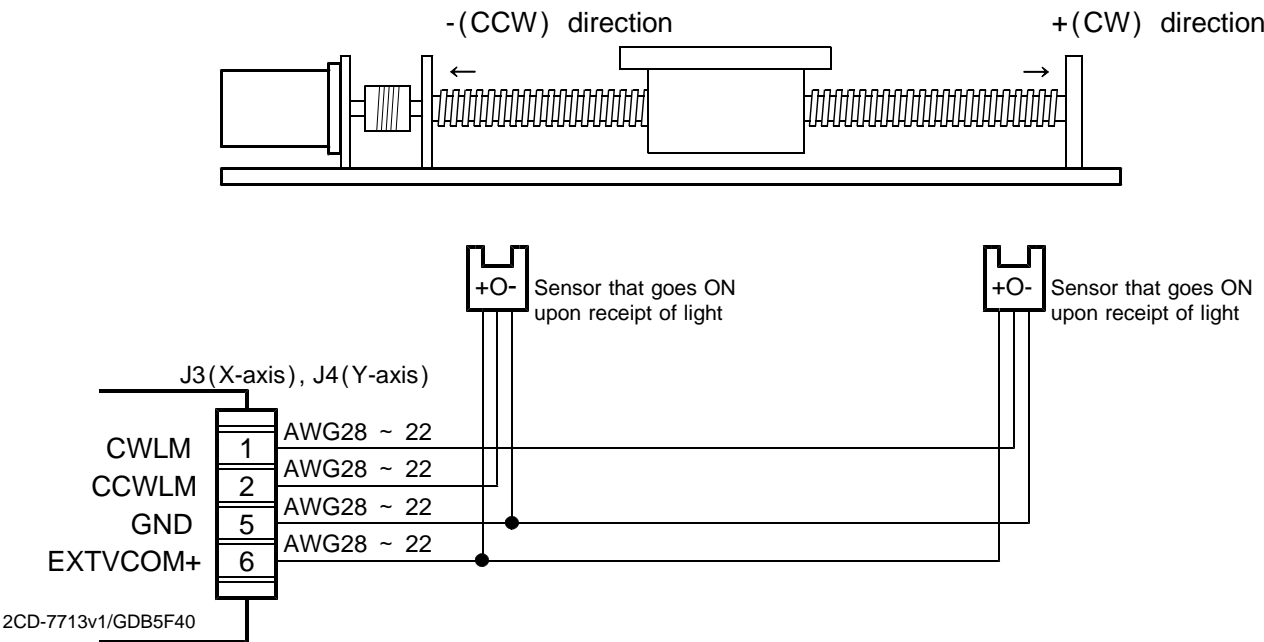
Example of recommended sensors

| Sensor that goes OFF upon receipt of light |           | Sensor that goes ON upon receipt of light |           | Remarks<br>Reference: Consumptioncurrent and type |
|--|-----------|---|-----------|---|
| Maker                                      | Rating    | Maker                                     | Rating    |   |
| SUNX                                       | PM- 24    | SUNX                                      | PM- 24    | 15 mA or less • NPN Type                          |
|  | PM- 44    |   | PM- 44    | 15 mA or less • NPN Type                          |
|  | PM- 54    |   | PM- 54    | 15 mA or less • NPN Type                          |
|  | PM- 64    |   | PM- 64    | 15 mA or less • NPN Type                          |
| OMRON                                      | EE-SX910R | OMRON                                     | EE-SX910R | 15 mA or less • NPN Type                          |

- Contact us, when you use sensors other than the above.  
(Example: large 35 mA article of consumption current etc.)

Example of connection to a LIMIT sensor

The pin numbering of each axis is the same.

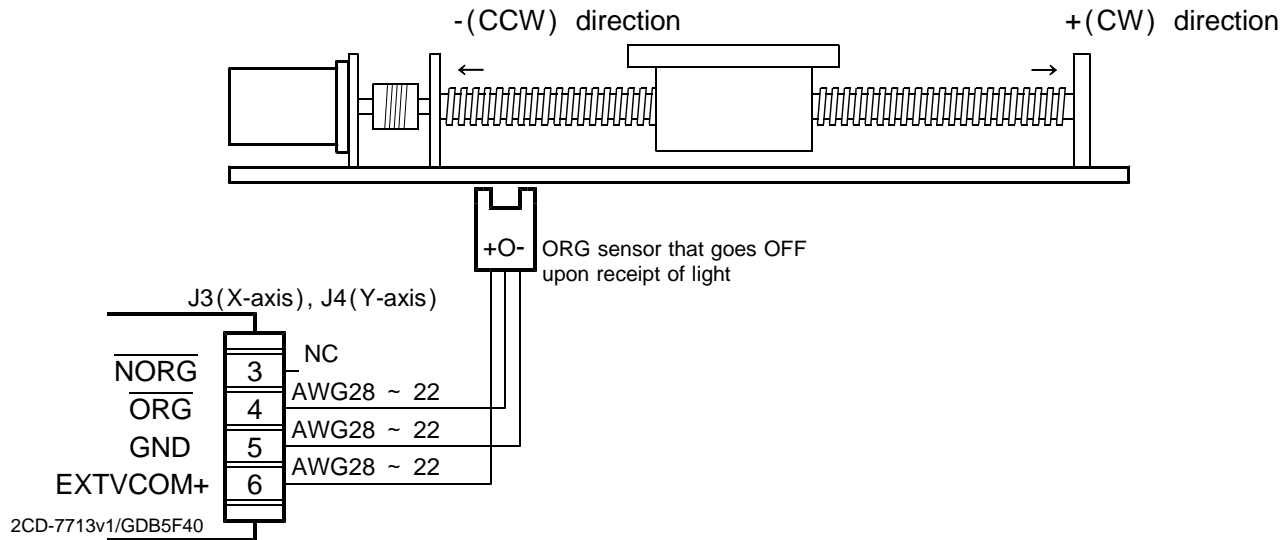


- The default value of the limit signal is ACTIVE OFF (B contact) input.  
Even when the LIMIT signal is not used, the LIMIT signal input must be connected to GND in order to output pulses.

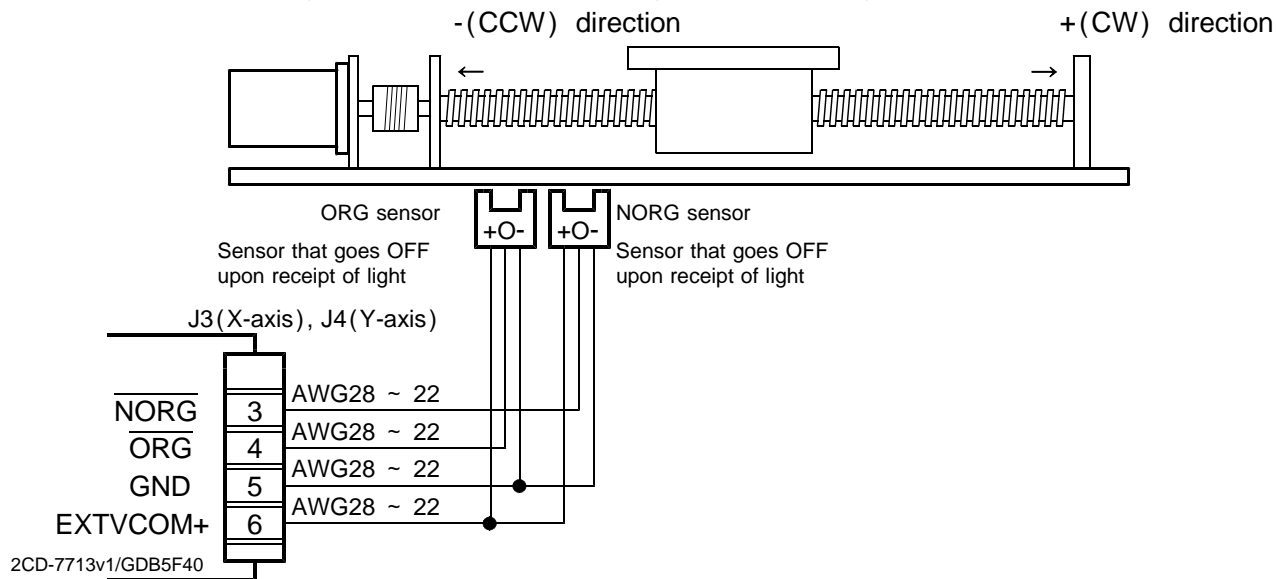
## Example of connection to an ORIGIN sensor

The pin numbering of each axis is the same.

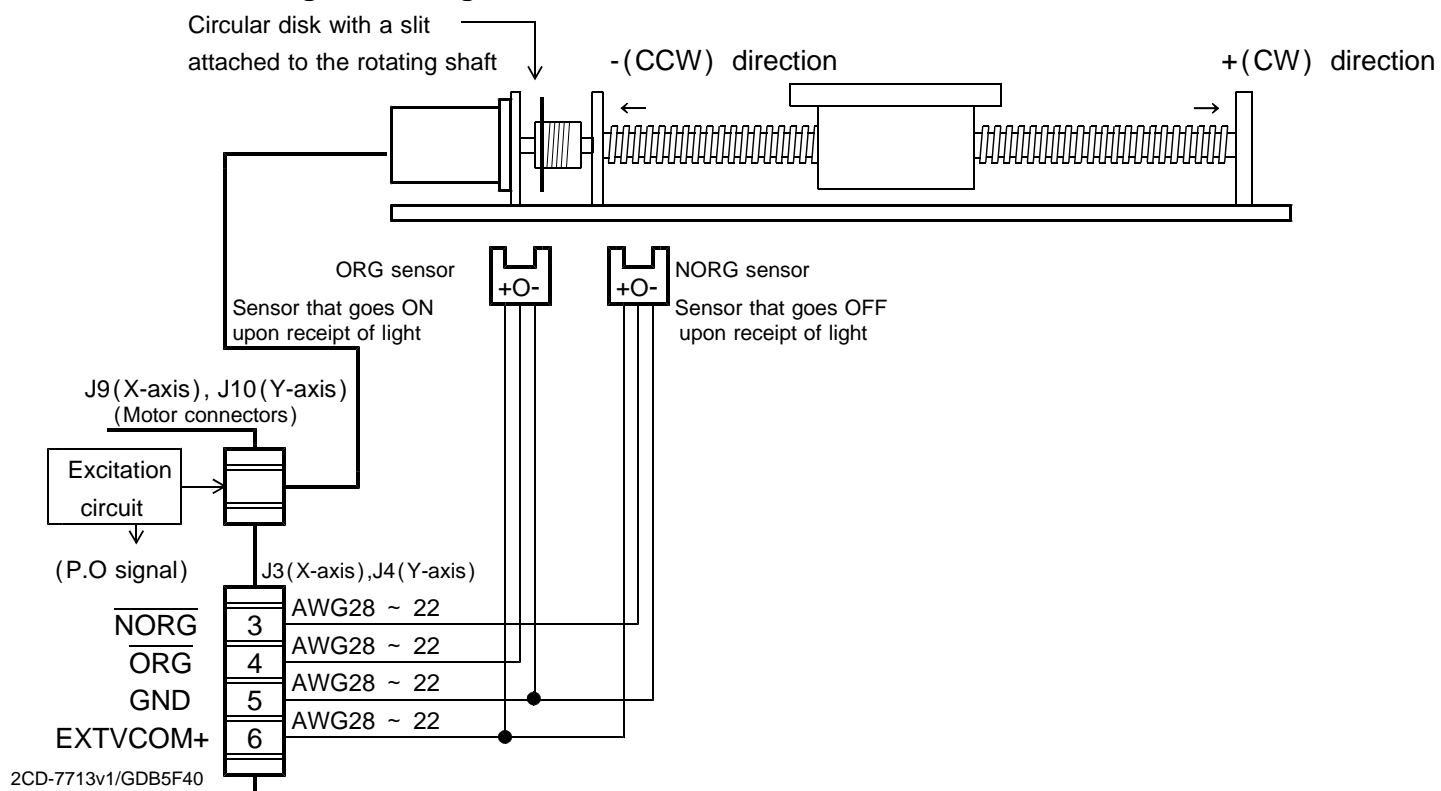
### 【 When using the ORIGIN sensor only 】



### 【 When using the ORIGIN sensor + origin proximity signal 】



### 【 When using the P.O signal of motor driver 】



- The ORG signal can be detected by phase output (P.O) signal in 2CD-7713v1/GDB5F40. In this case, change to the setting that detects the machine origin point by the P.O signal according to the ORIGIN SPEC SET function.

#### (4) Examples of connection to general-purpose I/O

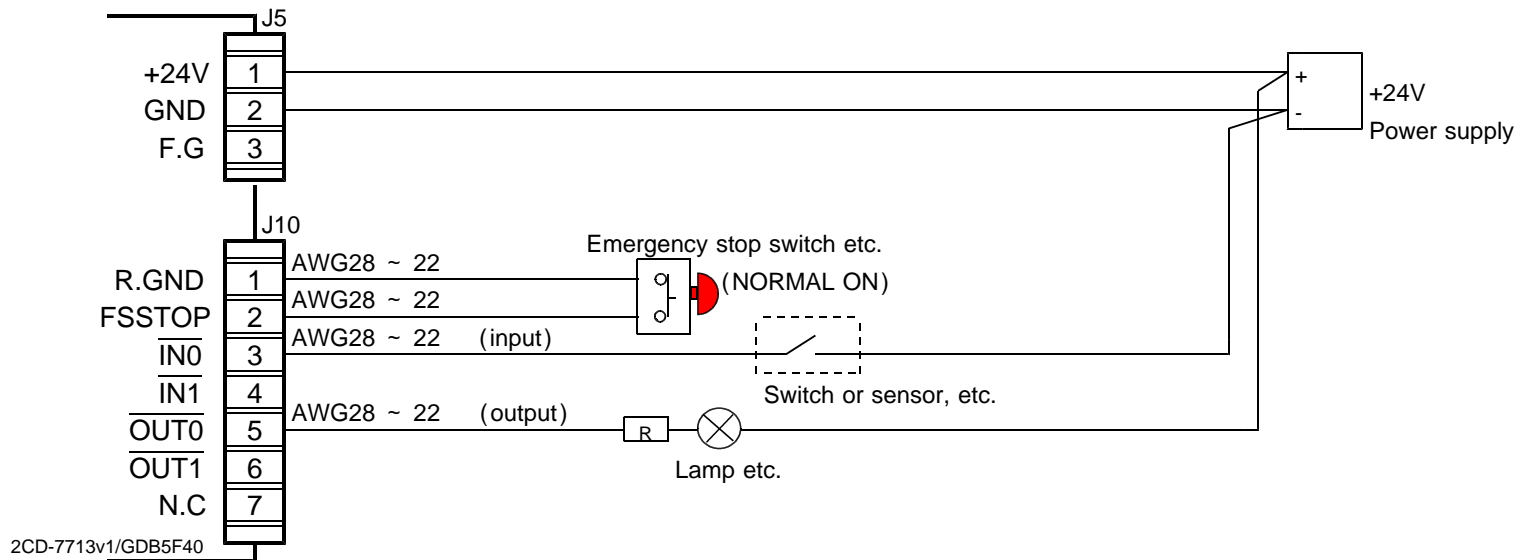


#### CAUTION

Operation not anticipated may cause damage of the machine and the product.

Separate the signal wire by the power line and 50 mm or more to prevent the malfunction by the noise.

Wire each signal within 5 m.



- The default value of the FSSTOP signal is ACTIVE OFF (B contact) input. Even when the FSSTOP signal is not used, the FSSTOP signal input must be connected to GND in order to output pulses.
- When general purpose I/O point is insufficient, Extend I/O unit can be connected from 2CD-7713v1/GDB5F40.

#### (5) Examples of connection to Extend I/O unit

One Extend I/O unit can be connected from the J11 connector of 2CD-7713v1/GDB5F40.

- Please refer to the manual for details about an Extend unit.

## 5 . Applicable motor

### 5-1. List of applicable motor

2CD-7713v1/GDB5F40 can drive a 5-phase stepping motor with 0.75 A/phase and 1.4 A/phase.

| Shape | ORIENTAL MOTOR Co., Ltd. | Basic angle ( ° ) | Current (A/phase) | DRIVE I.SEL switch | MOTOR SEL switch | Torque Data Fig. No. |
|-------|--------------------------|-------------------|-------------------|--------------------|------------------|----------------------|
| 42    | PK543-A(B)               | 0.72              | 0.75              | 7                  | OFF              | Fig. 1               |
|       | PK544-A(B)               | 0.72              | 0.75              | 7                  | OFF              | Fig. 2               |
|       | PK545-A(B)               | 0.72              | 0.75              | 7                  | OFF              | Fig. 3               |
| 60    | PK564-A(B)               | 0.72              | 0.75              | 7                  | OFF              | Fig. 4               |
|       | PK564H-A(B)              | 0.72              | 1.4               | F                  | OFF              | Fig. 5               |
|       | PK566-A(B)               | 0.72              | 0.75              | 7                  | OFF              | Fig. 6               |
|       | PK566H-A(B)              | 0.72              | 1.4               | F                  | OFF              | Fig. 7               |
|       | PK569-A(B)               | 0.72              | 1.4               | F                  | OFF              | Fig. 8               |

| Shape           | SANYO DENKI Co., Ltd. | Basic angle ( ° ) | Current (A/phase) | DRIVE I.SEL switch | MOTOR SEL switch | Torque Data Fig. No. |
|-----------------|-----------------------|-------------------|-------------------|--------------------|------------------|----------------------|
| 28              | 103F3505-7441 (7411)  | 0.72              | 0.75              | 7                  | OFF              | Fig. 9               |
|                 | 103F3515-7441 (7411)  | 0.72              | 0.75              | 7                  | OFF              | Fig. 10              |
| 42              | 103F5505-7241 (7211)  | 0.72              | 0.75              | 7                  | OFF              | Fig. 11              |
|                 | 103F5505-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 12              |
|                 | 103F5508-7241 (7211)  | 0.72              | 0.75              | 7                  | OFF              | Fig. 13              |
|                 | 103F5508-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 14              |
|                 | 103F5510-7241 (7211)  | 0.72              | 0.75              | 7                  | OFF              | Fig. 15              |
|                 | 103F5510-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 16              |
|                 | 103F7851-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 17              |
| 60              | 103F7852-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 18              |
|                 | 103F7853-8241 (8211)  | 0.72              | 1.4               | F                  | OFF              | Fig. 19              |
| Factory Setting |                       |                   |                   | F                  | OFF              | -                    |

( ) : Both axes

### 5-2. Torque characteristics

Representations in the torque characteristics table are made in terms of the motor rotation (s<sup>-1</sup>) vs. torque (N · m). Motor rotation (s<sup>-1</sup>) and drive pulse frequency (Hz) are converted as follows:

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

- Maximum value of the rotate speed is 100s<sup>-1</sup> at 0.72° motor.

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

Upon operation, provide adequate allowance for torque.

The stepping motor may attain high temperature, depending on the operational conditions.  
Use the stepping motor according to the Instructions Manual produced by motor-makers.

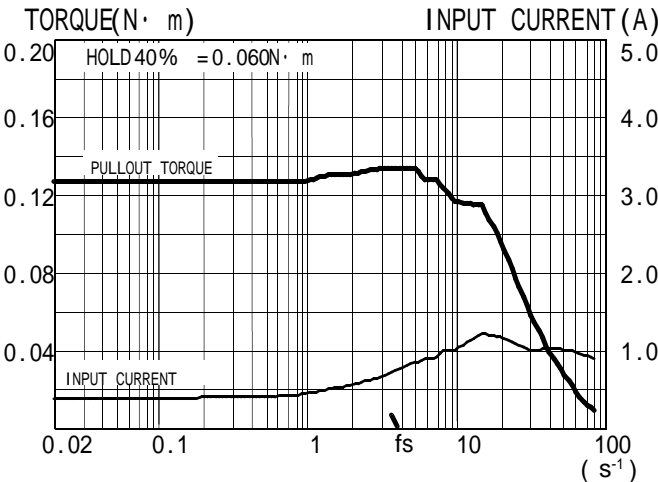
【ORIENTAL MOTOR Co., Ltd.】

42

Fig.1

2CD-7713v1/GDB5F40  
PK543-A(B)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

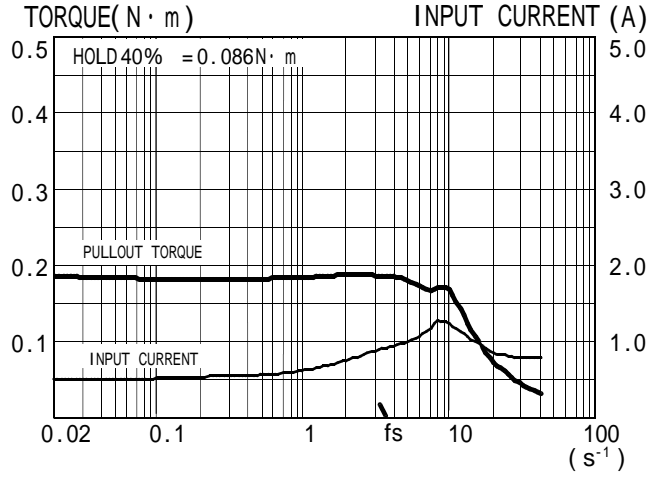


42

Fig.2

2CD-7713v1/GDB5F40  
PK544-A(B)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

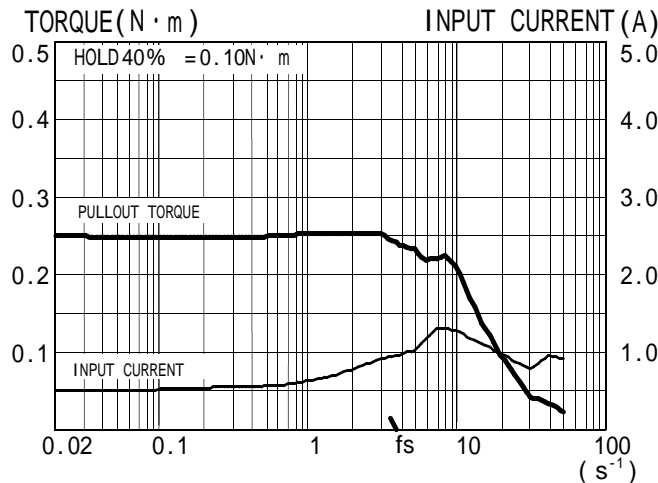


42

Fig.3

2CD-7713v1/GDB5F40  
PK545-A(B)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

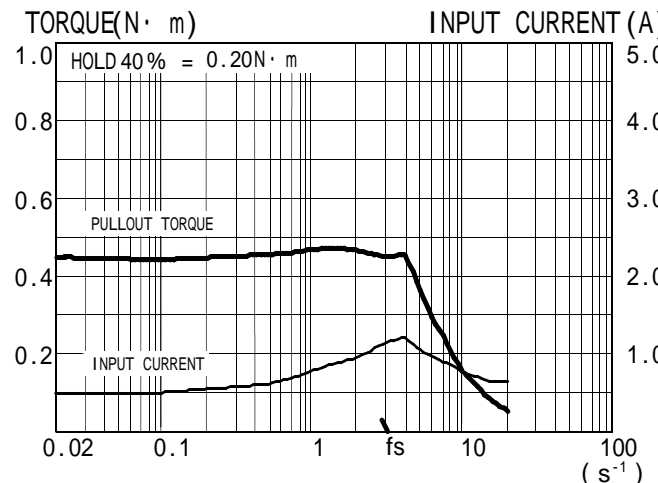


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Fig.4

2CD-7713v1/GDB5F40  
PK564-A(B)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

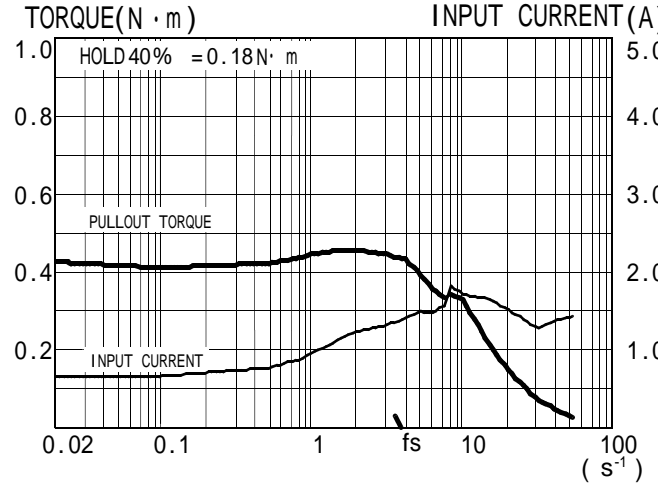


60

Fig.5

2CD-7713v1/GDB5F40  
PK564H-A(B)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

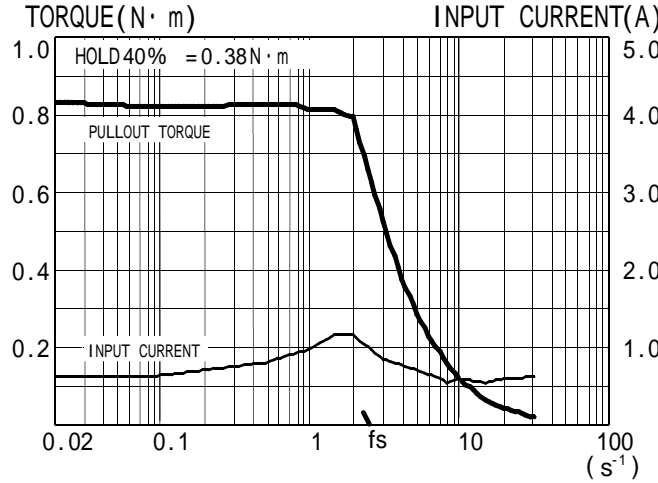


60

Fig.6

2CD-7713v1/GDB5F40  
PK566-A(B)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V





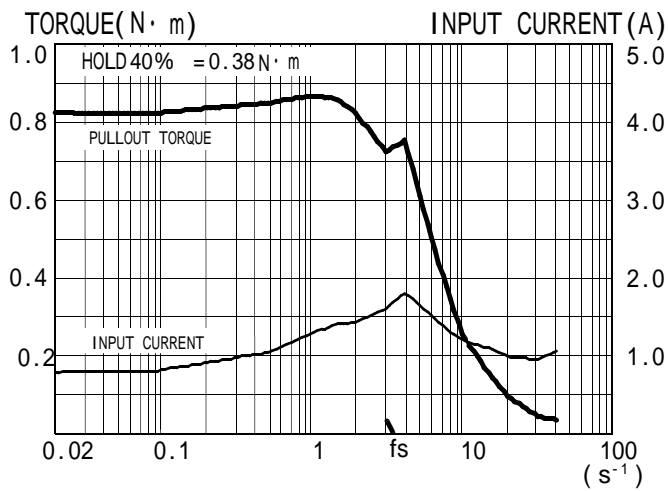
【ORIENTAL MOTOR Co., Ltd.】

60

Fig.7

2CD-7713v1/GDB5F40  
PK566H-A(B)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

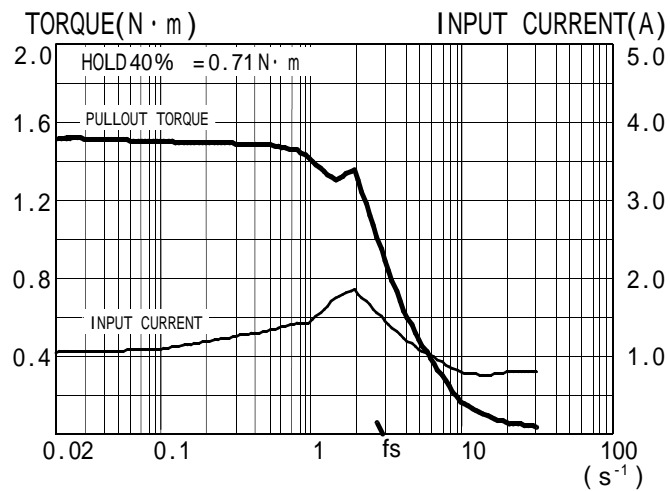


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Fig.8

2CD-7713v1/GDB5F40  
PK569-A(B)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V



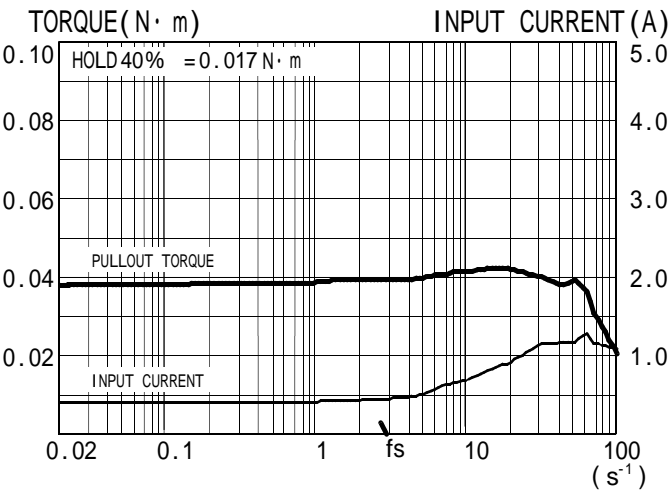
【SANYO DENKI Co., LTD.】

28

Fig.9

2CD-7713v1/GDB5F40  
103F3505-7441(7411)  
0.75A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

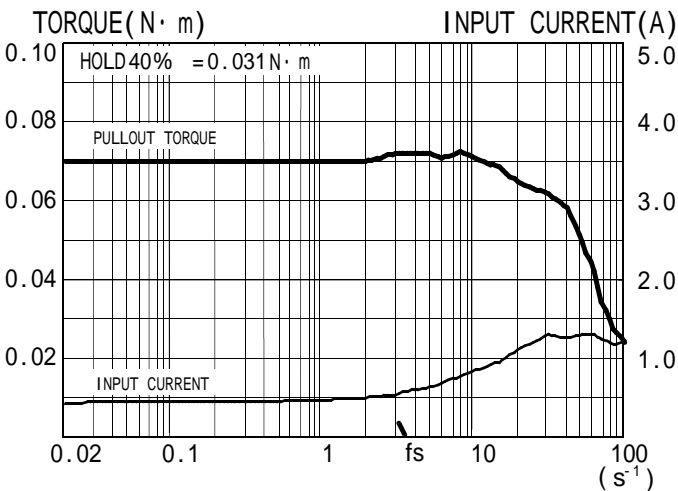


28

Fig.10

2CD-7713v1/GDB5F40  
103F3515-7441(7411)  
0.75A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

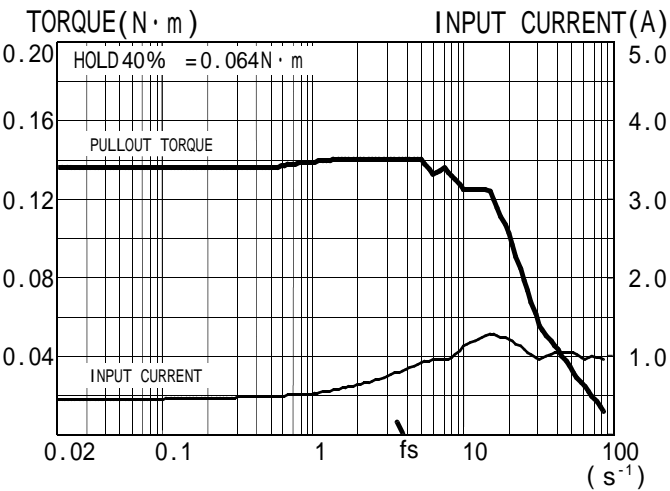


42

Fig.11

2CD-7713v1/GDB5F40  
103F5505-7241(7211)  
0.75A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

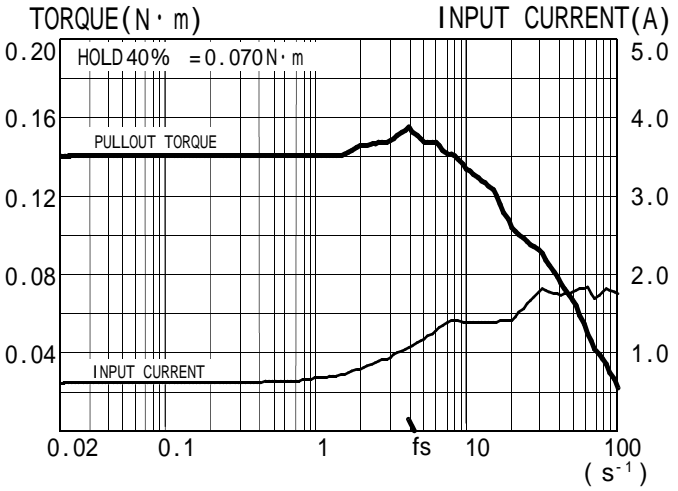


42

Fig.12

2CD-7713v1/GDB5F40  
103F5505-8241(8211)  
1.4A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

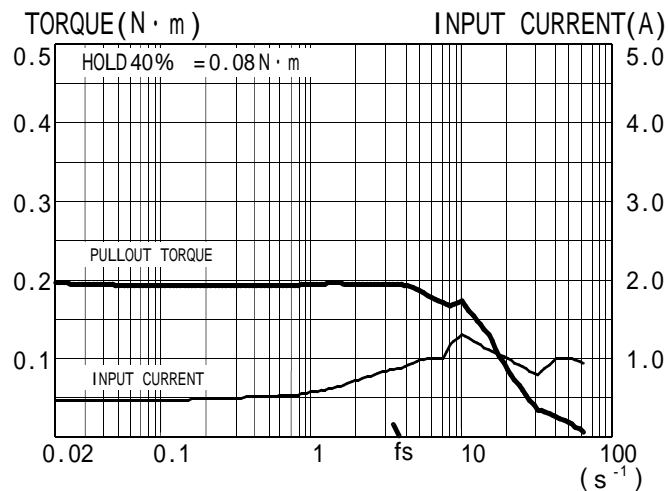


42

Fig.13

2CD-7713v1/GDB5F40  
103F5508-7241(7211)  
0.75A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

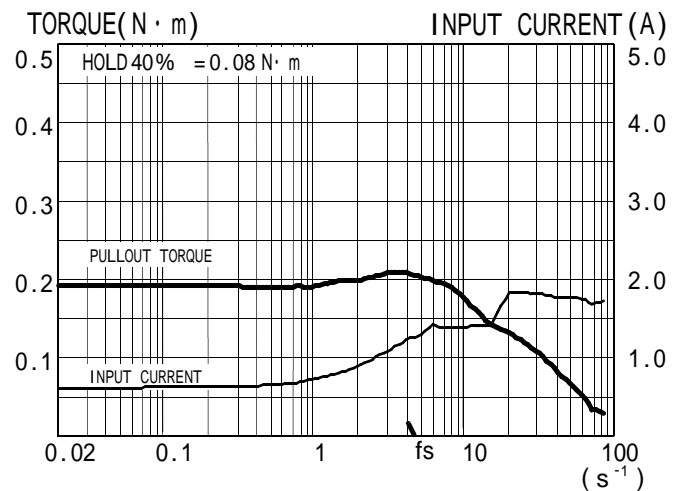


42

Fig.14

2CD-7713v1/GDB5F40  
103F5508-8241(8211)  
1.4A/PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V



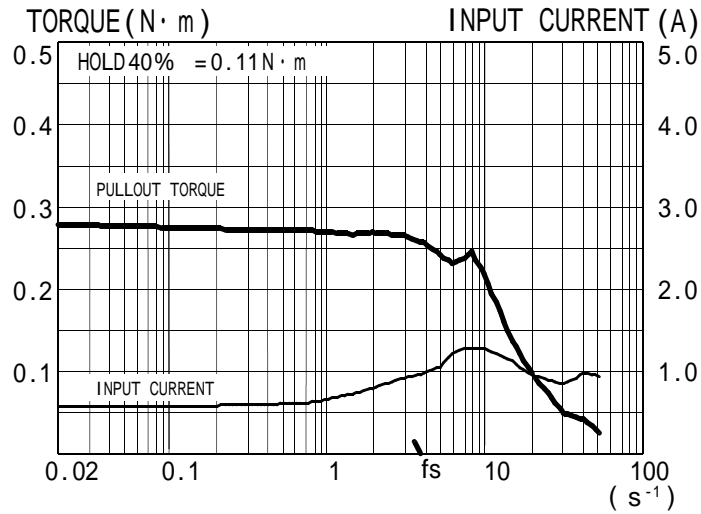
【SANYO DENKI Co., LTD.】

42

Fig.15

2CD-7713v1/GDB5F40  
103F5510-7241(7211)  
0.75A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.7  
DC24V

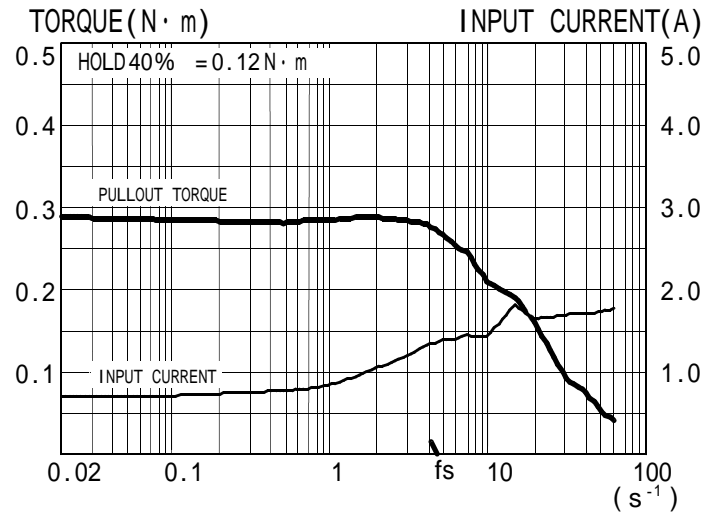


42

Fig.16

2CD-7713v1/GDB5F40  
103F5510-8241(8211)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

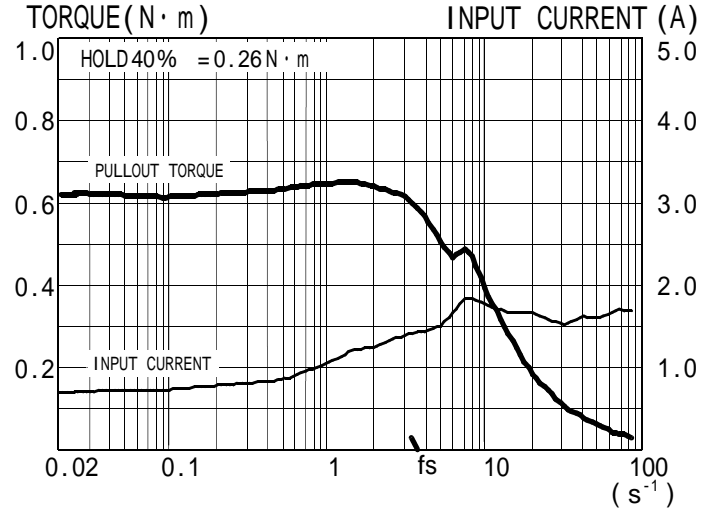


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Fig.17

2CD-7713v1/GDB5F40  
103F7851-8241(8211)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

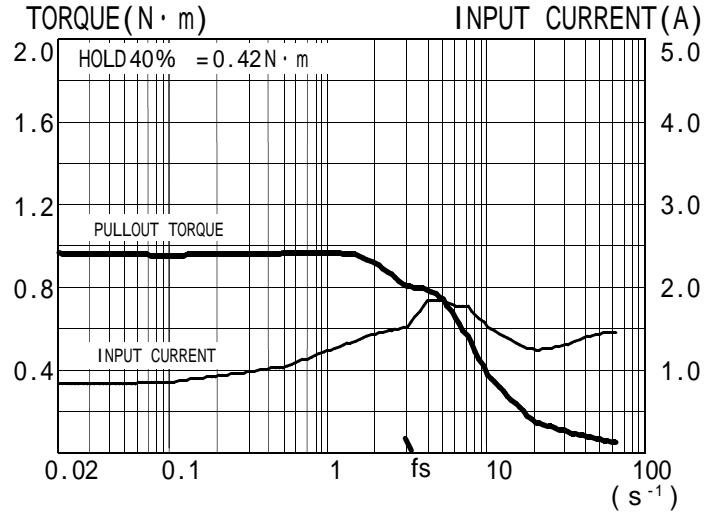


60

Fig.18

2CD-7713v1/GDB5F40  
103F7852-8241(8211)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V

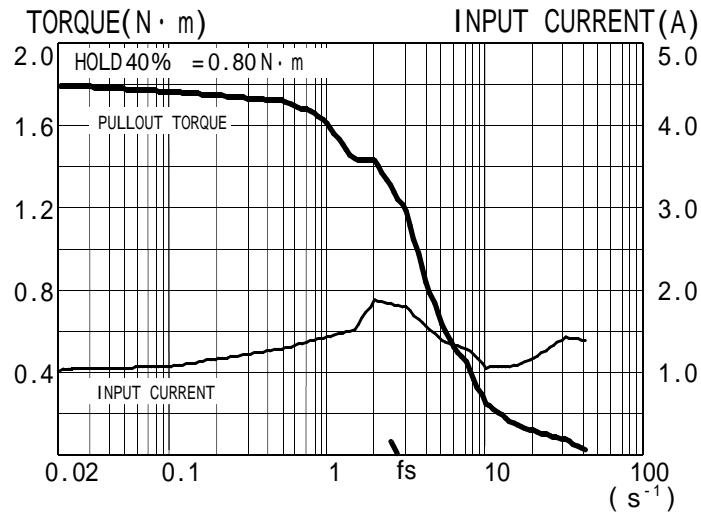


60

Fig.19

2CD-7713v1/GDB5F40  
103F7853-8241(8211)  
1.4A/ PHASE

MOTOR SEL = OFF  
DRIVE I. SEL = No.F  
DC24V



## 6 . Maintenance

### ⚠ CAUTION

Incorrect handling may lead to an electric shock.  
Inspection and maintenance need to be conducted by an expert engineer only.  
Before inspecting and maintaining this product, turn off the power.

### ⚠ CAUTION

An electric shock, injuries, and fire may be caused.  
Do not make repair and modification such as product disassembly and parts replacement.

### 6-1. Maintenance and inspection

#### (1) Cleaning method

To use the product in a favorable condition, conduct cyclic cleaning as follows.

- During the cleaning of the connector terminal plating part, wipe it with a dry, soft cloth.
- If stain is not removed by the dry wiping, soak a cloth in a solution in which neutral detergent is diluted, wring it out, and wipe off the stain with it.
- Do not use a high-volatile solvent such as benzene and thinner, and a wipe.  
This may deteriorate gold plating by transformation and oxidation.

#### (2) Inspection method

To use the product in a favorable condition, conduct periodic inspection.

Usually conduct the inspection every six months or every year.

To use the product in an extremely hot and humid or dusty environment, shorten the inspection interval.

| Inspection item    | Inspection details   | Criteria                                     | Inspection method |
|--------------------|--|--|-------------------|
| Environment state  | Check whether ambient and intra-device temperatures are appropriate. | 0 ~ + 40                                     | Thermometer       |
|                    | Check whether ambient and intra-device humidifies are appropriate.   | 10 % ~ 80 % RH<br>(without dew condensation) | Hygrometer        |
|                    | Check whether dust is deposited.                                     | No dust                                      | Visual check      |
| Installation state | Check whether the product is firmly secured.                         | Not loose (6 kg·cm)                          | Torque wrench     |
|                    | Check whether connectors are completely inserted.                    | Not loose and removed                        | Visual check      |
|                    | Check whether cables are to be removed.                              | Not loose and removed                        | Visual check      |
|                    | Check whether connecting cables are to be broken.                    | Appearance is normal.                        | Visual check      |

#### (3) Replacement method

If the product becomes faulty, repair it immediately because the entire device system may be affected.

To make the repair smoothly, a spare product should be prepared.

- To prevent an accident such as an electric shock during replacement, stop the device and turn off the power.
- If poor contacting is assumed, wipe contacts with a clean cotton cloth that is wet with industrial alcohol.
- Take a record of switch settings during replacement and return them to their state before the replacement.
- After the replacement, confirm that the new product is normal.
- For the faulty product replaced, have it repaired by returning it to the company with a report indicating as much details on the failure as possible.

### 6-2. Saving and Disposal

#### (1) Saving method

Save the product in the following environment.

- Indoor (place in which the product is not in the path of direct sunlight.)
- Place at ambient temperature and humidity within the specifications.
- Place free of corrosive and inflammable gases.
- Place free of dust, dirt, salt, and iron powder.
- Place free of direct vibration and shock to the product body.
- Place free of water, oil, and chemicals droplets.
- Place where a person cannot ride or put objects on the product.

#### (2) Disposal method

Handle the product as industrial waste.

**The main parts which revised by this manual**

| Parts | Content   |
|-------|---|
| P18   | <b>【R1】</b><br>・ The Polyswitch of a protection circuit is revised at a fuse. |

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

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