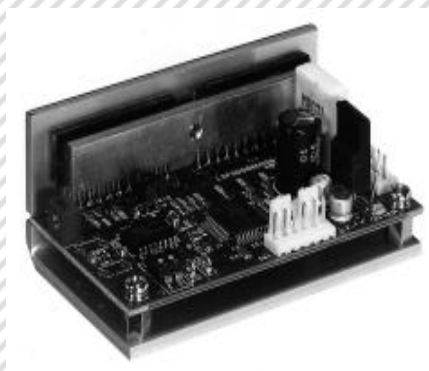




Operation Manual and Technical Specifications

5-Phase Motor Driver

Model **SD-5D**



Thank you for purchasing our product.

Before use, be sure to read this Operation Manual
carefully for correct operations.

Keep this Operation Manual at a specified location so that
it can be referred to at any time when in doubt.

2004.8TI VOL.1

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KOHZU Precision Co., Ltd.



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1. Safety instructions

In order to use the product safely and correctly, and to prevent harm to customers and others and damage to property, follow the warnings and cautions in this Operation Manual.






Degrees of influence exerted in the case of failure to observe the precautions are as follows:






 WARNING	Indicates that a possibility of death or serious injury is assumed.
 CAUTION	Indicates that a possibility of bodily injury or occurrence of only property damage is assumed.






Malfunctions or accidents assumed in the case of failure to observe the precautions are as follows:

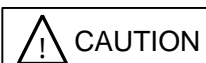
 Risk of fire	Indicates that a possibility of smoke or fire is assumed.	 Risk of injury	Indicates that a possibility of injury is assumed.
 Risk of breakage	Indicates that a possibility of breakage is assumed.	 Risk of high temperature	Indicates that a possibility of injury due to high temperature is assumed.
 Risk of electric shock	Indicates that a possibility of an electric shock is assumed.		








General	
 Risk of fire	Do not use in explosive, flammable-gas or corrosive atmospheres, in locations splashed with water, oil or other liquids, or near combustibles.
 Risk of breakage	Do not mount, connect, move or inspect with the power on. Perform such work after turning off the power.
 Risk of electric shock	Mounting, connection and inspection should be performed by personnel having expert technical knowledge. Stepping motors may step out when stopping or driving depending on the magnitude of the load.
 Risk of injury	Especially, if they step out when used for up-and-down driving (Z-axis, etc.), the object being carried may drop. Use after careful testing under operating load conditions and check that the load can be driven securely.
 Risk of high temperature	This product is not designed or manufactured for applications relating to nuclear power or posing a direct danger to life.

		<h2>Connection</h2>
		Perform connection securely in accordance with the connection diagram.
Risk of electric shock	Risk of fire	
		Do not pull or pinch the power lines or motor connecting lines.
Risk of injury	Risk of breakage	
		Do not use except for the indicated power source (24V – 40V DC).
Risk of high temperature		Be sure to ground the FG terminal.

		<h2>Drive</h2>
		When the motor free signal is input, the motor torque becomes zero (0), and the object being carried may not be held.
Risk of electric shock	Risk of fire	
		Especially, if this signal is input when used for up-and-down driving, the object being carried may drop, resulting in injury or breakage of equipment.
Risk of injury	Risk of breakage	
		
Risk of high temperature		



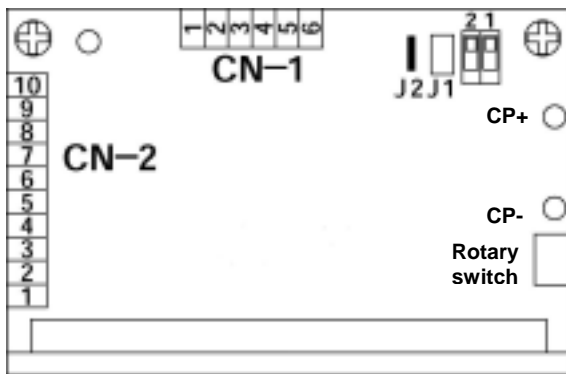
	Do not use exceeding the spec values of the driver.
Risk of fire	Do not put fingers, metals or easy-to-burn objects in the openings of the driver such as the ventilation slots.
	Do not touch the motor or driver with your hands or body after turning on the power and immediately after turning off the power.
Risk of breakage	Do not touch the rotating or moving body on the output shaft with your hands, body or with other objects during driving.
	The motor temperature rises markedly depending on the driving conditions.
Risk of electric shock	Use with the motor case temperature 100°C or less.
	Do not change the function selector switches with the power on. Otherwise, injury may result.
Risk of injury	This device is designed and manufactured for indoor use. Do not install in a location that will create excessive vibrations or shocks.
	
Risk of high temperature	

2. Outline

The SD-5D is a 5-phase bipolar pentagon driver for 24V – 40V DC input. This driver can be changeable full/half step angle and 5V 30mA output for customer sensor power supply.

Target motors are 0.5A/phase – 1.4A/phase 5-phase stepping motors manufactured by TAMAGAWA SEIKI, ORIENTAL MOTOR, etc.

3. Name and function of each part



Attention

- 1) Ignore the number in actual circuit board. Please use this number.
- 2) No.6 and 7, No.8 and 9 are connected internally each other.

CN-2▶	Motor current output, Power input and output
CN-1▶	Signal input
Dip switch▶	Dip switch
Rotary switch▶	Drive current adjust switch
Contact▶	Adjustment reference contact

1. Motor current output, Power input and output

	5 leads	10 leads
1	● Black	(○ White + ● Gray)
2	● Green	(● Green + ● Yellow)
3	● Orange	(● Orange + ● Purple)
4	● Red	(● Red + ● Brown)
5	● Blue	(● Blue + ● Black)
6 } 7 } } Ground (0V)	
8 } 9 } } Power input (+24~+40VDC)	
10 Power output (+5V, 30mA max.)	

2. Signal input

Pin No.	Name	Function
1, 2	HO-, HO+	Current OFF switch
3, 4	R-, R+	CCW pulse input (1-clock mode), Direction input (2-clock mode)
5, 6	F-, F+	CW pulse input (1-clock mode), Pulse input (2-clock mode)

3. Dip switch

No.	Function
1	Step angle select (Full or Half)
2	Input pulse selection

4, 5. Drive current adjustment switch

Drive current adjustment by variable rotary switch from 0.5A to 1.4A. User motor is connected proper way and check voltage at the reference contact.

CP+, CP-	: Reference contact
Rotary switch	: Drive current adjust

4. Mounting

4-1 Environment of mounting location

Install the main body in the following environment.

Indoors.

Out of explosive, flammable and corrosive gases.

Where the ambient temperature is 0 – 40°C, and the ambient humidity is 0 – 85%.

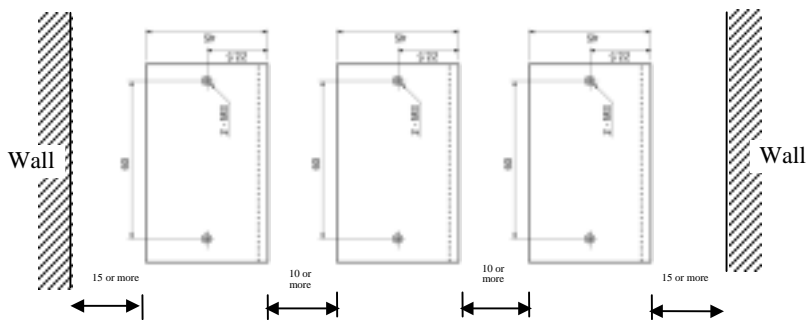
Out of water, oil, dust, etc.

Where the main body does not come into direct contact with objects, and is not subject to vibrations.

4-2 Mounting method

Since the main body is cooled by natural convection, mount so that it will not be filled with heat.

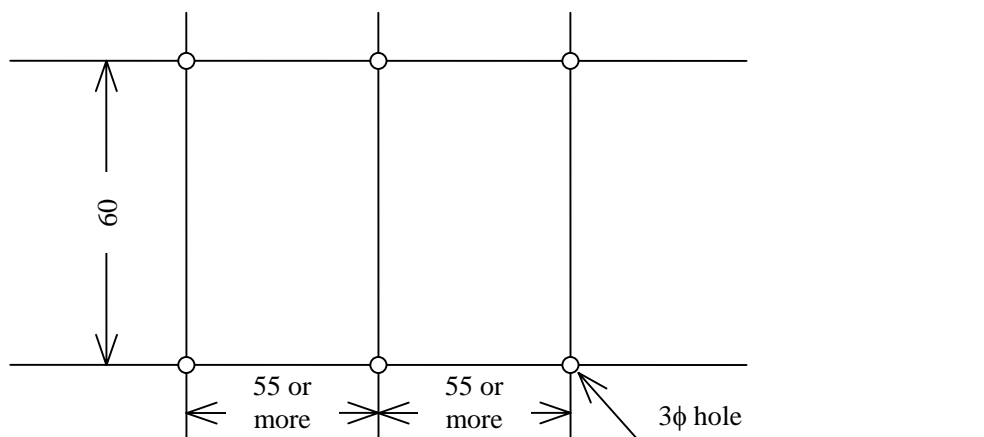
Mounting on a vertical surface



Two mounting screws M3×8 (not attached)

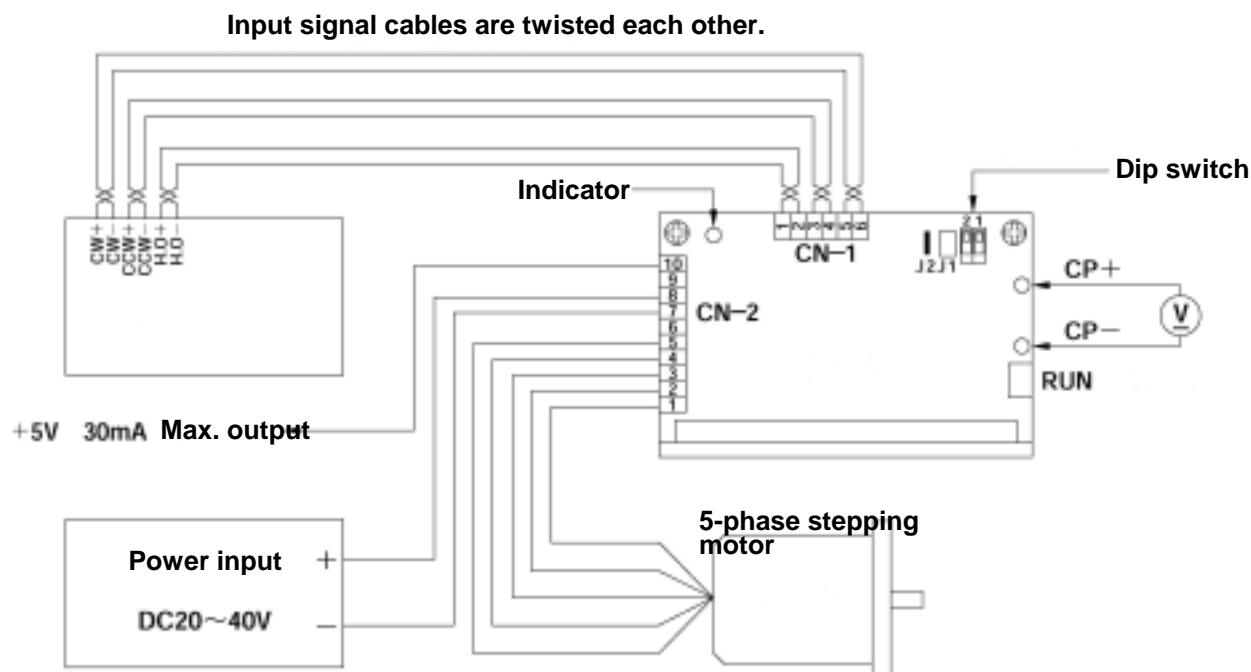
4-3 Mounting hole dimensions

(Example: Hole dimension drawing for mounting three units parallel) [Unit: mm]



5. Driver function selection settings

5-1 Drive current setting



Procedure

1. All wires are connected correctly, refer above figure.
2. Contact a voltage meter to the CP+ and CP- point.
3. Rotate RUN rotary switch CCW direction up to touching to prevent breaking the motor.
4. Send the pulse from the controller to driver more than 10pps frequency, appropriate voltage. Refer below relation.

Reference Voltage (OP)= 2 x Motor current

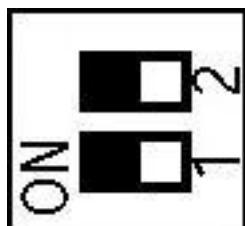
(Ex. 1.4(A) motor : 2.8V
 0.75(A) motor : 1.5V)

5. Motor current will reduce 60% value of drive current when after receiving last pulse 150ms. This reduction value is fixed.

5-4 Function switch setting

Switch No.

2 : 2/1CK: Input pulse selector switch (default setting: OFF)



- Two types of pulse inputs for general use can be prepared.
(For details, see 7-1 Input/output signals mentioned later.)
- Set according to the pulse output form of the controller.
- By turning off the switch, the 2-clock mode is set, so that the motor is driven corresponding to the pulse signals of the two systems: CW and CCW.
- By turning on the switch, the 1-clock mode is set, so that the motor is driven corresponding to the signals of the two systems: pulse and direction of rotation.

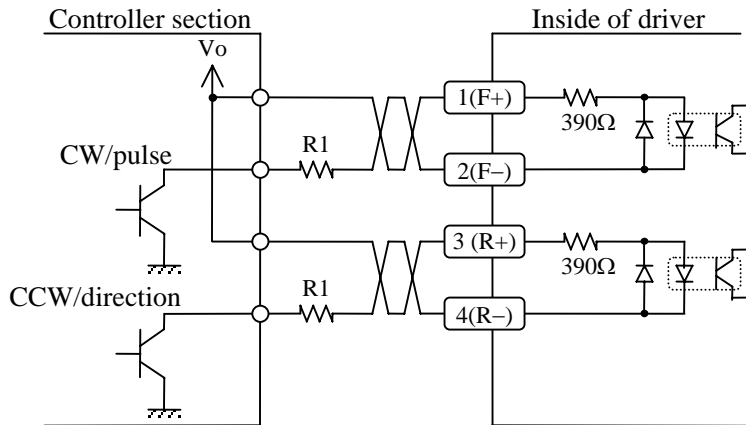
1 : Step: Motor step switch

ON : Full step drive

OFF : Half step

6. Input/output signals

6-1 F input and R input



- In the case of the 2-clock mode

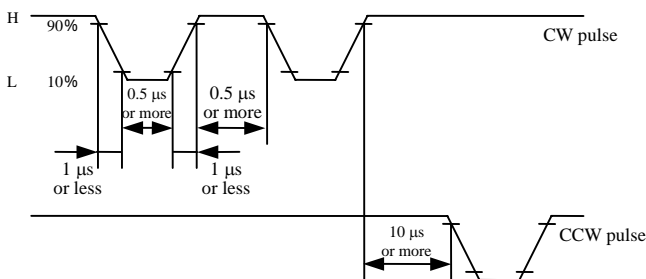
When a pulse signal is input to the F signal input, the motor operates in the CW direction on the rising edge of the pulse.

When a pulse signal is input to the R signal input, the motor operates in the CCW direction on the rising edge of the pulse. (The rising edge of the pulse indicates the time when current starts flowing into the photocoupler circuit.)

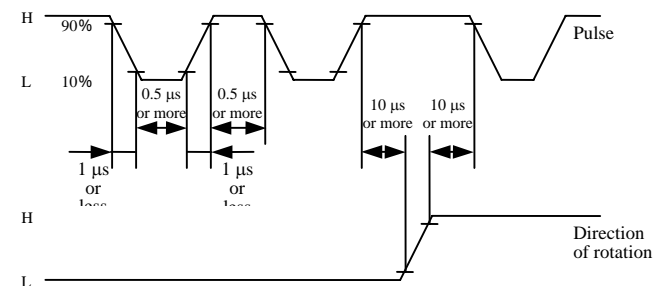
- In the case of the 1-clock mode

When a pulse signal is input to the F signal input, the motor operates on the rising edge of the pulse. The direction of rotation of the motor is determined by the R signal input. The R signal input is the input of the direction of rotation. When a signal is input to the R signal input, the motor operates in the CW direction.

In the case of the 2-pulse input method



In the case of the 1-pulse input method



The CW rotation indicates that the motor shaft rotates in the clockwise direction when viewed from the motor mounting flange surface.



Note: When V_o exceeds 5V with the CW/CCW signal, connect external resistance R1.

External resistance R1 (standard value) is calculated by the following expression.

$$R1 = (V_o - 1.5) / 0.008 - 390$$

Use resistance of the above $R1 \pm 20\%$ for actual mounting.

When V_o is 5V, R1 is not needed.

Note: Pulse voltages are as follows: H=4V – 8V, and L=-8V – 0.5V. Keep the pulse width 0.5 μ s or more, the pulse interval 0.5 μ s or more, and the rise time 1 μ s or less.

Keep the direction reversing interval time (common to the 2-clock and 1-clock mode) 10 μ s or more.

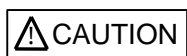
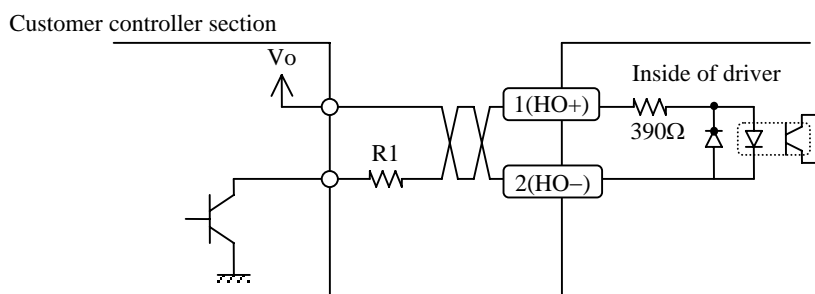
6-2 Motor free input HO

When the HO signal is on, no current flows into the motor, so that the motor shaft can be rotated by external force. Use it for moving the motor shaft externally or for manual positioning.

For motor driving, always set it at off.

Note: Motor exciting phases will not vary as a result of HO signal being on or off.

If this signal input is not used, nothing can be connected. If the motor shaft is rotated by external force after inputting the HO signal, it is held at a position where it is rotated by an integral multiple of 7.2° from a position where it was before inputting the HO signal (in the case where no pulse signal is input when the HO signal is input).



Note: When V_o exceeds 5V with the signal, connect external resistance R1.

External resistance R2 (standard value) is calculated by the following expression.

$$R2 = (V_o - 1.5) / 0.008 - 390$$

Use resistance of the above $R2 \pm 20\%$ for actual mounting.

When V_o is 5V, R2 is not needed.

Note: Pulse voltages are as follows: H=4V – 8V, and L=-8V – 0.5V.

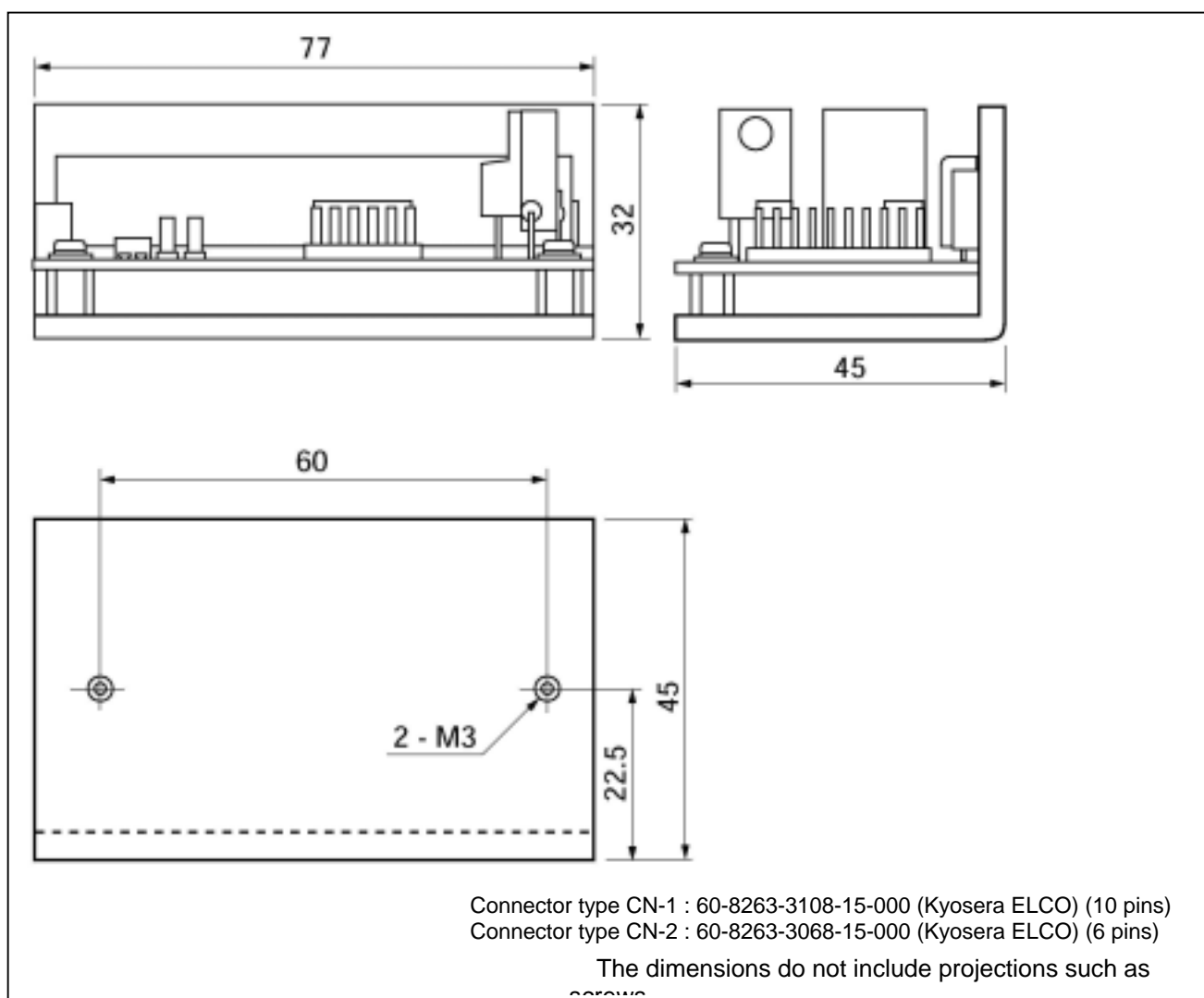
If the HO signal is input to the driver used for up-and-down movements, the object being carried may drop, resulting in injury or breakage of equipment.

7. Specifications

Product name	5-phase stepping motor driver
Model	SD-5D
Drive system	Bipolar pentagon driving
Power requirement	24 – 40V DC 3A
Drive current	0.5 – 1.4A/phase
Applicable motor	Berger type 5-phase stepping motor
Number of divisions	1(Full step) , 2(Half step)
Input signal	Photocoupler input [1]: 4 – 8V, [0]: –8 – 0.5V Input resistance HO, F, R: 390Ω
Maximum response frequency	70kpps
Output signal	Photocoupler open collector output External operating conditions: 30V DC or less, 50mA or less
Functions	Pulse input method selection, automatic current down, step angle selection, drive voltage selection, self-diagnosis function
Cooling	Air cooling by natural convection
Weight	100g
Insulation resistance	The value is 50MΩ or more when measured with a 500V DC insulation resistance tester between AC input and a case at normal temperature and humidity.
Withstand voltage	There is no problem when 1,500V AC is applied for 1 minute between AC input and a case at normal temperature and humidity.
Usage environment	0 – 40°C non-freezing, 0-85% non-condensing

The power source current is the maximum current value of the driver, which varies depending on the pulse speed, motor type, and load.

9. Outline drawing [Unit: mm]



Please be aware that specifications are subject to change without notice due to improvements.

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