

Motor 2相ステッピングモータ用 For 2 Phase Stepping

バイポーラマイクロステップドライバ Bipolar Micro Step Driver

SD4030B2

Operating Manual



LOW COST
3Amax / phase
40V max Supply Voltage
Low Vibration

HPtec

- Before using -

Thank you for purchasing the HI-P Tec products. This manual describes on the specification and the usage.

Please review the material in this manual thoroughly before using SD4030B2.

— After Sales Service(Repair) —

When the product is incorporate to the machine inspire of your correct usage within a year, we will replace it by new product in free of charge.

— Cautions for Proper Use —

Please use under the absolute maximum ratings and the environmental.

This product is intended to be used with a general industries products, but nor designed or manufactured to be used in a machine or system that may cause personal death when it is failed.



Consult us if the application of this product is under such special conditions and environments.

We have been making the best effort to ensure the highest quality of the products, however, it is highly recommended that you make a redundant design, Anti-fire design, secure the safety in the operative range and fail-safe design in order to avoid damage or loss of social.

Contents of this manual are subject to change without prior notice for functional improvement, change of Specifications or user's better understanding..

— Safety Precautions —

Various icons and important messages are used in this manual to avoid problems that could result in hazards to personnel and damage to properties.. Please observe the contents.

 危険 Danger	Danger statements are used to indicate hazardous unsafe practices witch could result in severe personal injury or death.
 注意 Caution	Caution statements are used to indicate hazards or unsafe practices which could result in minor personal injury or product or property damage.

**禁止**

Inhibition: This symbol is used to indicate a practice that shall not be attempted.

**強制**

Imposition: This symbol is used to indicate a practice that shall not be attempted.

**危険 Danger**

- Never touch any terminals and internal in active. Could cause electric shock.
- Don't damage leadwires or subject leadwires to excessive stress such as strong pressure, heavy object and clamping load.. Could cause electric shock.
- Never touch part of rotating, parts,. Could cause personal injury by involved to the rotor.
- Don't touch potentially hot motor casing, it will cause burn injury.

**注意 Caution**

- Don't use at where splashed with water, oil, chemicals and at where corrosive environment or flammable gas.
- Please use the rated voltage. Could cause a fire.
- During power distribution and while after power loss, don't touch any electric parts due to such high temperature to burn.
- Wiring work should be done by a qualified electrician.

**禁止 Inhibition**

- Don't use and keep in a place of direct sunshine where.
- Don't use and keep in a place of such where may be beyond the range of ambient temperature and relative humidity specifications.
- Don't use and keep in a place of dust, dirt and a lot of.
- Don't use and keep in a place subject to excessive vibration or shock..
- Never attempt to perform repair and modification by yourself.

**強制 Imposition**

- Connect a emergency stop circuit to turn off upon being emergency case.

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1. Caution : Please read following contents before using the product.

1-1 Installation

- This driver can be set in two kinds of direction but obey to following setup method.
- Setup a driver at atmosphere well-ventilated and **within ranged temperature (less than 40degree) in ambient temperature at around 5cm..**
- Using for multi-axis, keep space more than **10mm** space among the driver..
- As being condition of using the driver on cooling body, especially impale the chassis with screws in case of using at more than 2A continuously. After setup, implement much aging work, and make sure that the body temperature is less than 50degree.
- When becoming any more temperature, it uses current down and lower current value or do forced air cooling with the fan motor and so on.

1-2 Supply Voltage

If power supply beyond 24V continuously, use under lower current according to the graph of page 11 because of peak current of output become lower rated..

1-3 Connector

Especially, be careful of the wiring by the power sufficiently. In the circuit composition which doesn't break even if this driver makes a mistake in the polarity of the power.

The wire rods which were mentioned to page 4 and the cable keep uncoated length of wire turning. Also, fasten up the fastening-up of a terminal block screw at the torque of **0.22-0.24N.m.**

The pulling-out of the looseness, the wire of the screw can be prevented by this.

1-4 Micro-step Resolution

Micro-stepping is split into A and B phase sine wave current in each electrical phase since splitting from the vector. The positional accuracy is not guaranteed as it is a mechanical step angle is divided

Mechanical positioning accuracy depends on the accuracy and precision mechanical devices driven by the motor machinery of confidence.

1-5 Motor Heating

Since the surface temperature of motor becomes high during operation, take care not to burn injury. In case of the surface temperature of motor exceeding 100 degrees C, it is possible to damage the motor.

So Operate not to exceed 100 degrees C by dropping the current by RUN volume or forced cooling. Then enable of auto current down function become prevent heating due to decreasing current under suspension.

1-6 Micro step current

Configuration current by RUN Volume equal to peak current of approximate sine wave.

1-7 Operating Unipolar Operating.

This driver is for the bipolar -type motor but can drive the motor of unipolar-type, too.

Refer to the page 6 of this operation manual therefore in the connection method.

1-8 Notice to SD4030B user

This driver is upper compatible to SD4030B, then it adds 2 pulse mode as input command pulse and changed a switch of setting for Mixed Decay to volume. Refer to subject 17 for the details.

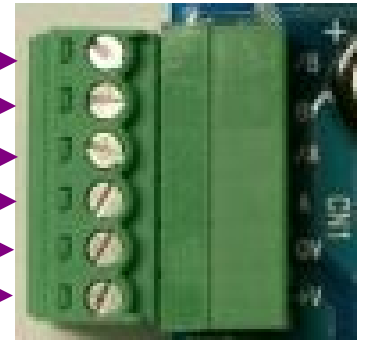
2.Specifications

Item		Description	Notes
Model name		SD4030B2	
Input Voltage		+18 to 40V	
Input Current		3A (MAX)	On setting output current to 3A
Applicable Motor		2 Phase Step Motor(Bipolar type)	Available for Unipolar operation
Output Current		0.5 to 3Apeak($\pm 5\%$) /Phase	Being lower rated output current beyond Power Supply 24V
Drive Method		Chopper mode by Bipolar constant current	
Current Down function		Auto Current down Adjusting to set lower current of CND volume after 0.7 second after pulse stop	Selectable by switch.
Maximum Input Pulse Cycle		100Kpps	
Adjusting	RUN	For Coil current (0.5 to 3A)	The default factory setting is 2A.
	STOP	For current value on current down mode.	Selectable between 10% to 60% of RUN current.
	JOG	For JOG speed.	300pps ~ 14Kpps
Select Function	SW-1,2,3	Select of Resolutions	1/2, 1/8, 1/10, 1/16, 1/20 1/32, 1/40, 1/64
	SW-4	ON/OFF for auto current down mode..	Switch ON is condition and OFF is no condition. The default factory setting is ON..
	SW-5,6	SW-5 ON: JOG is effective. SW-6 ON: CW SW-6 OFF: CCW	SW-5 ON: JOG is effective. SW-6 ON : CW, SW-6 OFF: CCW
Input Signals	P+,P-	Command pulse	Selectable either 1 pulse or 2 pulse for pulse command.
	D+,D-	Direction pulse	Photo Isolated input.
	OFF+ OFF-	OFF Motor Stop	
Output Signals	ALM+, ALM-	Alarm (Prospecting of over-heat for Power device)	Isolation ON is conditions, OFF is no Conditions (ALARM).
Dimension		W90xD55xH28	
Weight		106g	
Operating Temperature and Humidity		0 to 40 degree and 35 to 80%	No condensation
Storage Temperature and Humidity		-20 to +85 degree and 35 to 80%	No condensation

3. Connector pin assignment

3-1CN1

No .	Signal	Description	IN/OUT
6	/B	/B phase of motor	OUT
5	B	B phase of motor	OUT
4	/A	/A phase of motor	OUT
4	A	A phase of motor	OUT
2	0V	0V of Power Supply	IN
1	+V	18V to 40V of Power Supply	IN



Terminal Information : MC1.5/6-ST-3.5 (by Phoenix Contact)

3-2 CN2

No .	Signal	Description	IN/OUT
8	ALM-	Alarm for overheating of Power Device (OFF during alarm work)	OUT
7	ALM+		OUT
6	OFF-	Input for excitation OFF (Input resistance 220Ω)	IN
5	OFF+		IN
4	D-	Input for direction of motor (Input resistance 220Ω)	IN
3	D+		IN
2	P-	Input for Command pulse (Input resistance 220Ω)	IN
1	P+		IN

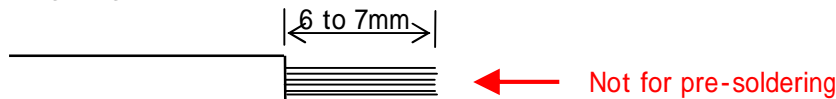


Terminal conformance MC1.5/6-ST-3.5 (by Phoenix Contact)

Note 1) Especially take extra care pin number not to mix up Power line for Motor line.

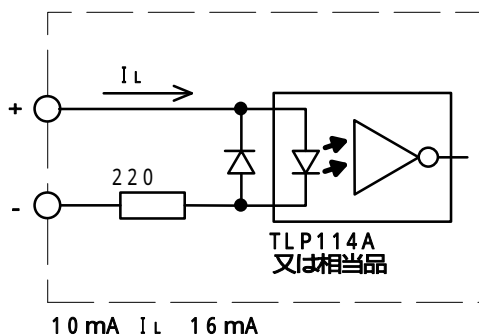
Note 2) Usable specification of Power line is AWG28 to AWG16 with twisted pair line.

Baring length of wire: 6 to 7mm

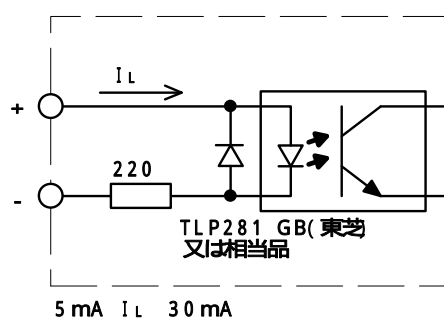


4. Input/Output schematic

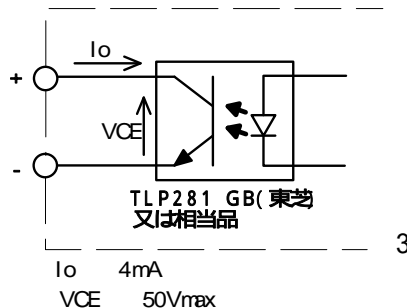
Command Pulse(P), Direction Pulse(D)



Excitation OFF



Alarm Output



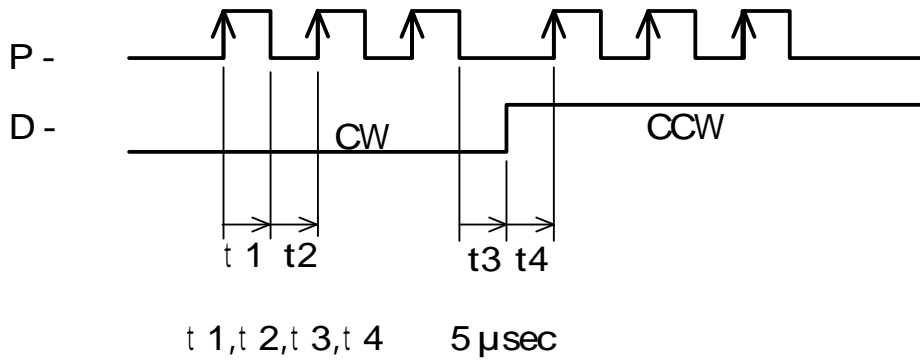
Note) Operating with line drive component, there is a possibility that minimum input current is lower than 10mA, then wire plus pin of line drive input to 5V and the another pin to minus.

5. Logic of command input pulse

5-1 The case of 1-pulse input

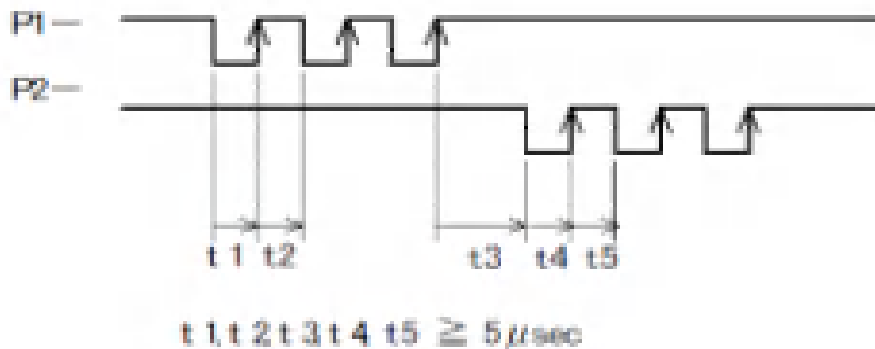
Pulse command acknowledges the rising edge of internal photo coupler output. when output of internal photo coupler is low, the motor direction is CW and CCW on high level.

The timing chart is shown in following figure...



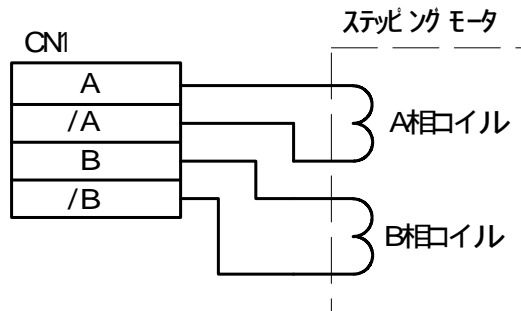
5-2 The case of 2-pulse input

Pulse command acknowledges the rising edge of internal photo coupler output, both input status are non-conduction on High Level (Photo coupler is OFF.). P1 pulse shows the motor direction toward to CW and P2 shows the motor direction toward to CCW. Incidentally be careful that the motor direction changes with user wiring too. The timing chart is shown in following figure.



6. Connection Diagram to motor

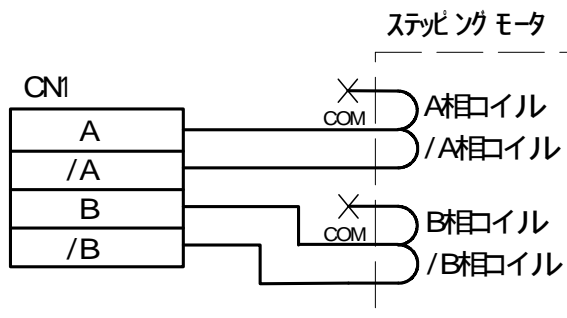
6-1 Connection to Bipolar motor



6-2 Connection to Unipolar motor

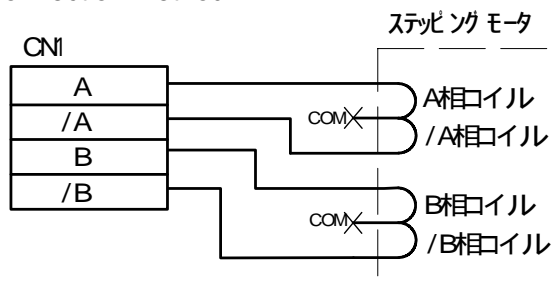
Connection method 1: That a torque and a motor are heated becomes the same approximately with the electric current setting which is the same as the micro-step driver of unipolar.

To be general use a way of this connection method.

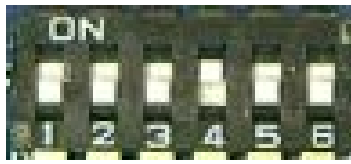


Connection method 2: It becomes effective when wanting to be used at low speed in the high torque. To make that a motor is heated equivalent to connection method 1, narrow down a maximum electric current to 70 % and use it.

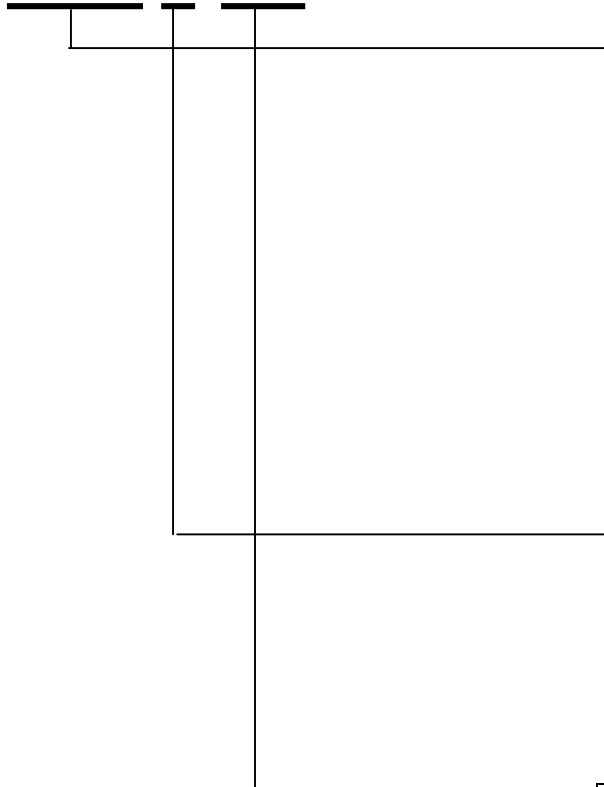
The falling of the torque to the rise of the number of rotations becomes big because the torque of the case low speed area gets for 1.4 but the inductance of the coil becomes quadruple compared with connection method 1.



7. Set of Switch 1



ON



Set of Micro-Step Resolution

1	2	3	Resolution
ON	ON	ON	1/2
ON	ON	OFF	1/8
ON	OFF	ON	1/10
ON	OFF	OFF	1/16
OFF	ON	ON	1/20
OFF	ON	OFF	1/32
OFF	OFF	ON	1/40
OFF	OFF	OFF	1/64

Setting of Auto current down

4	
ON	In operating
OFF	Out operating

Setting of JOG operation

5	6	JOG rotation
ON	ON	CW
ON	OFF	CCW
OFF	OFF	No effect of JOG

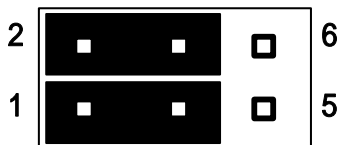
Note: It is necessary for setting 5 and 6 to OFF in normal input pulse operating.

8. Set of Jump Lead

To be set according to the kind of user's input pulse. The default factory setting is as 1pulsetype.

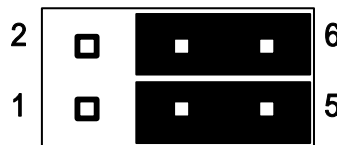
- For one-pulse method (Pulse, Direction)

Short circuit in 1-3 and 2-4



- For two-pulse method(CW, CCW)

Short circuit in 3-5 and 4-6



9. POW LED

It lights up to the green when a power is invested. When not lighting up even if it turns on, there is possibility that the polarity of the power becomes opposite or that the connection mistake breaks a power module.

Because this driver becomes the circuit composition which doesn't break even if a power is connected oppositely, re- turn on after correcting to the right connection.

When a power module is broken, it becomes this unit exchange.

Refer to component layout which is page of 12 for LED location.

10. Mixed Decay

Mixed Decay operation can control the vibration of the motor. Select the position where the vibration decreases by adjusting MIX volume. Finally set to user's busy-condition because the set value depends on user's motor, the rotation speed and electric current (RUN volume), the load condition (Inertia and so on) and also power voltage.

11. JOG operation

When SW 1-5 turns ON, PUSH switch allows JOG operation

Working of JOG operation, go off CN2 also set JP1 to 1 pulse.

Select the direction of rotation by SW 1-6 and adjust pulse frequency with Volume JOG..

JOG operation is used for test run for driver and motor end, therefor can operate under alone motor.

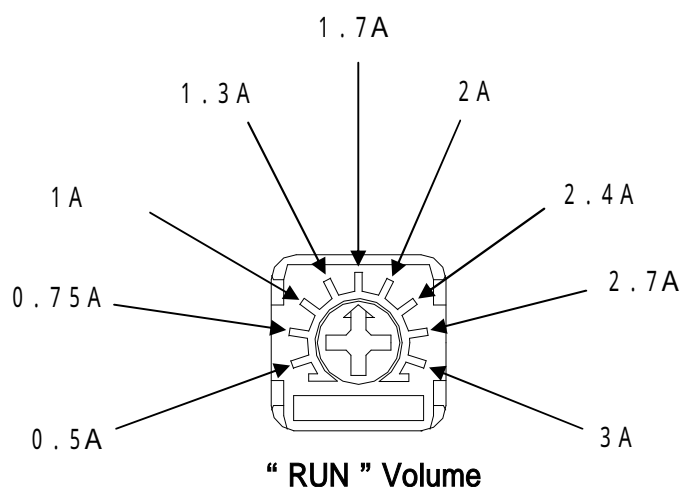
Do not use JOG operation for adjusting after installing to the equipment due to damage to driver. .

At usual pulse input operation, SW1-5 and 6 are necessary to be OFF.

12. Set of Volume

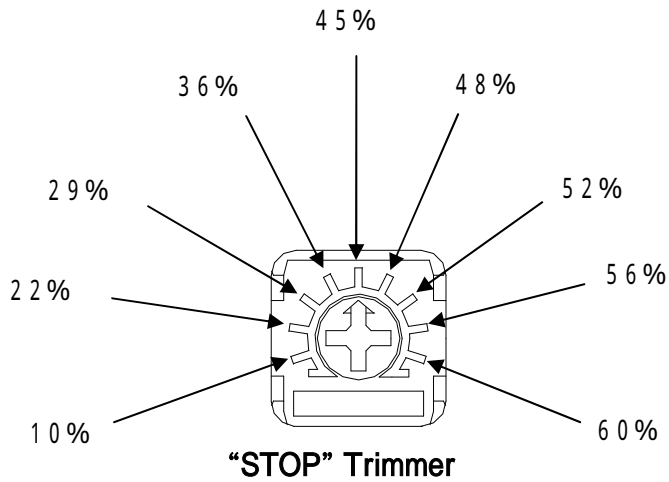
12-1 RUN Volume

Enable to use for adjusting of peak current in operation, and the default factory shipment is 2A.



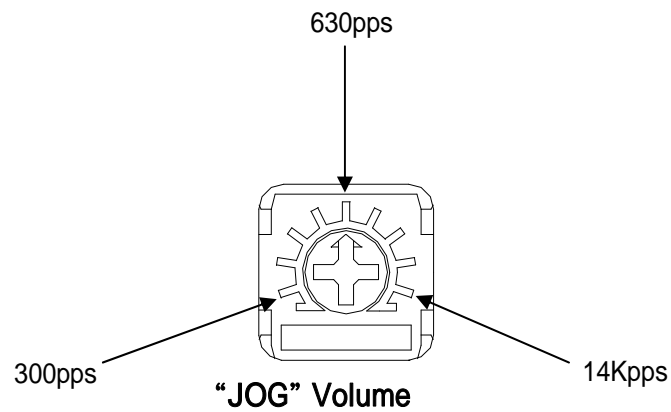
12-2 STOP Volume

For adjusting of current value in auto current down mode and selectable the ratio (%) to peak current "RUN Volume".



12-3 JOG Volume

For adjusting of the frequency during JOG operation. The following frequency is estimated only so looking at the motor speed while adjustment. The angle and the frequency do not change linearity with the trimmer. Therefore be much careful for rising up rapidly from part of center..



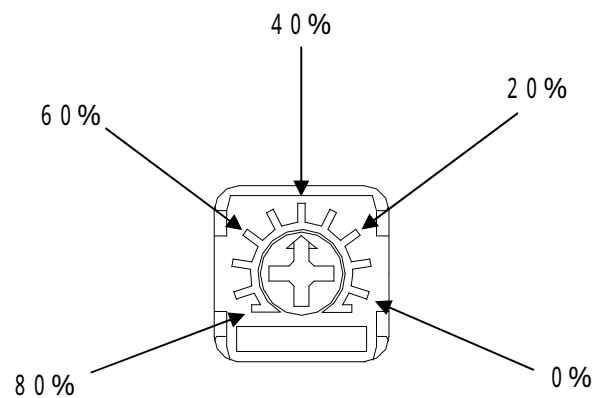
12-4 MIX Volume

The Mixed Decay function enable to change motor PWM electric current attenuation curve by 2nd steps with slow and enable to restrain the vibration of the motor by the ratio of Slow-Decay and Fast-Decay.

Set ratio of Slow-Decay according to final customer condition independently because the optimal value changes with the model of the used motor, number of rotations (PPS), the electric current (RUN Volume), the driving load-condition (in the inertia and so on) and the line voltage.

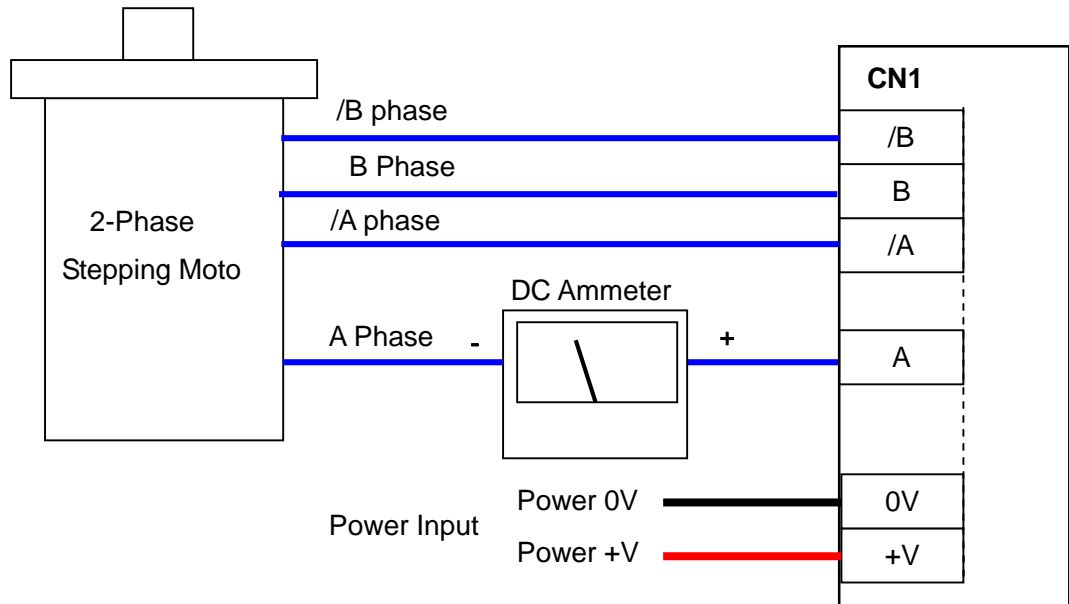
Ratio of Volume setting and Slow-Decay

As the ratio is not concern linearly about rotation angle of trimmer, set trimmer position individually at point where the vibration decreases most. The default factory shipment is 80%. (Full on the left)



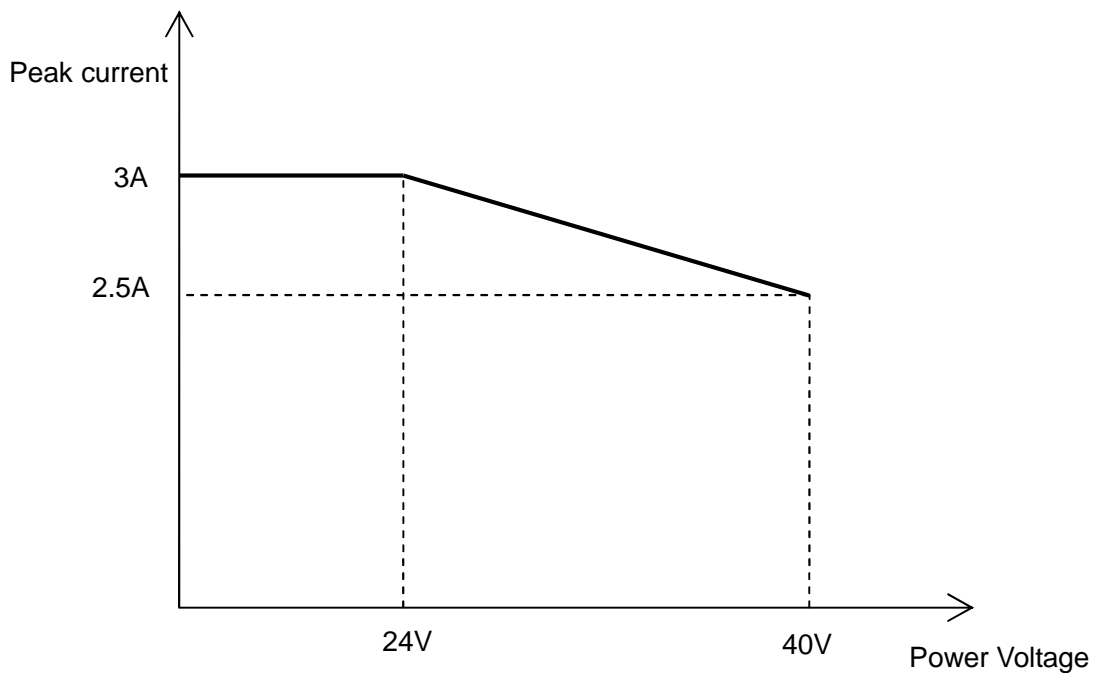
13. Correct adjustment of RUN Volume

- Set up a DC ammeter.
- Before power ON, connect plus pole of DC ammeter to A-phase of CN1 and minus pole to A-phase of Motor.
- Turn OFF SW1-4 of the driver.
- After power ON, adjust to target current value with "RUN" Trimmer.

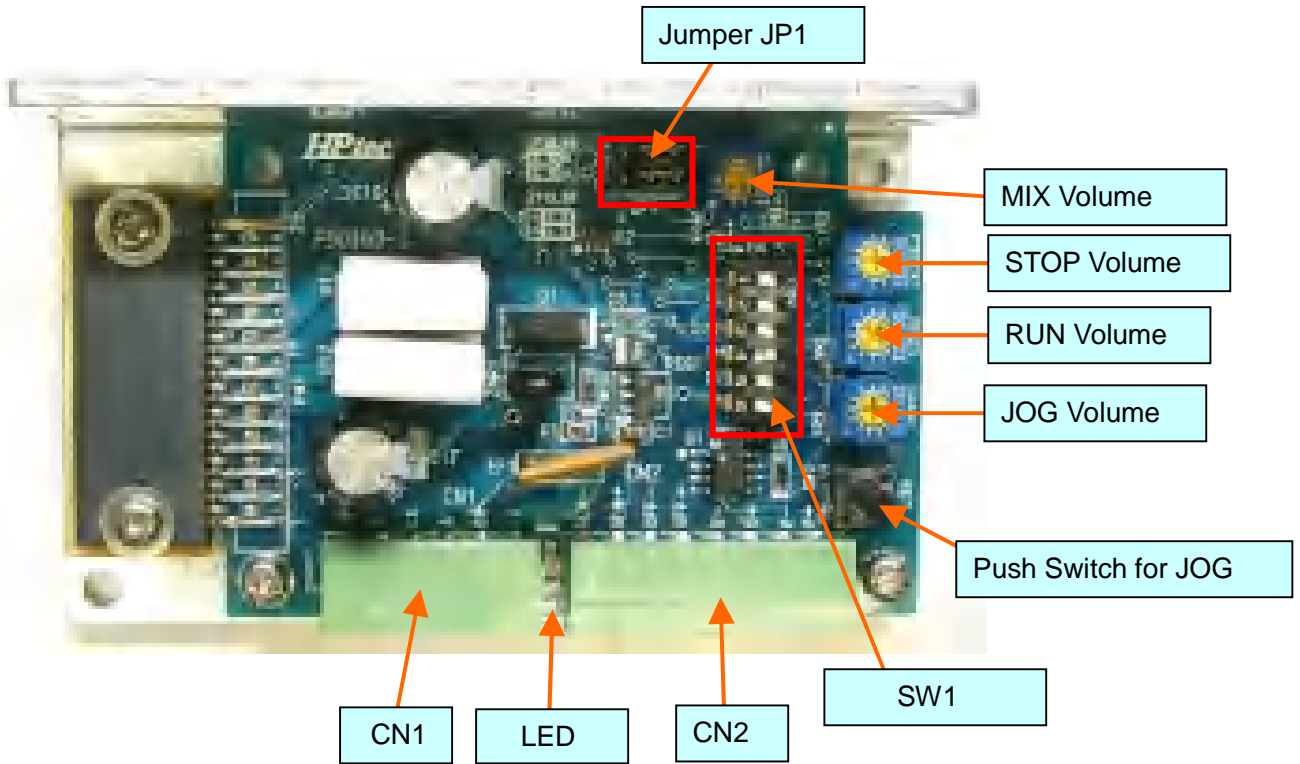


14. Output Current depends on Supply Voltage

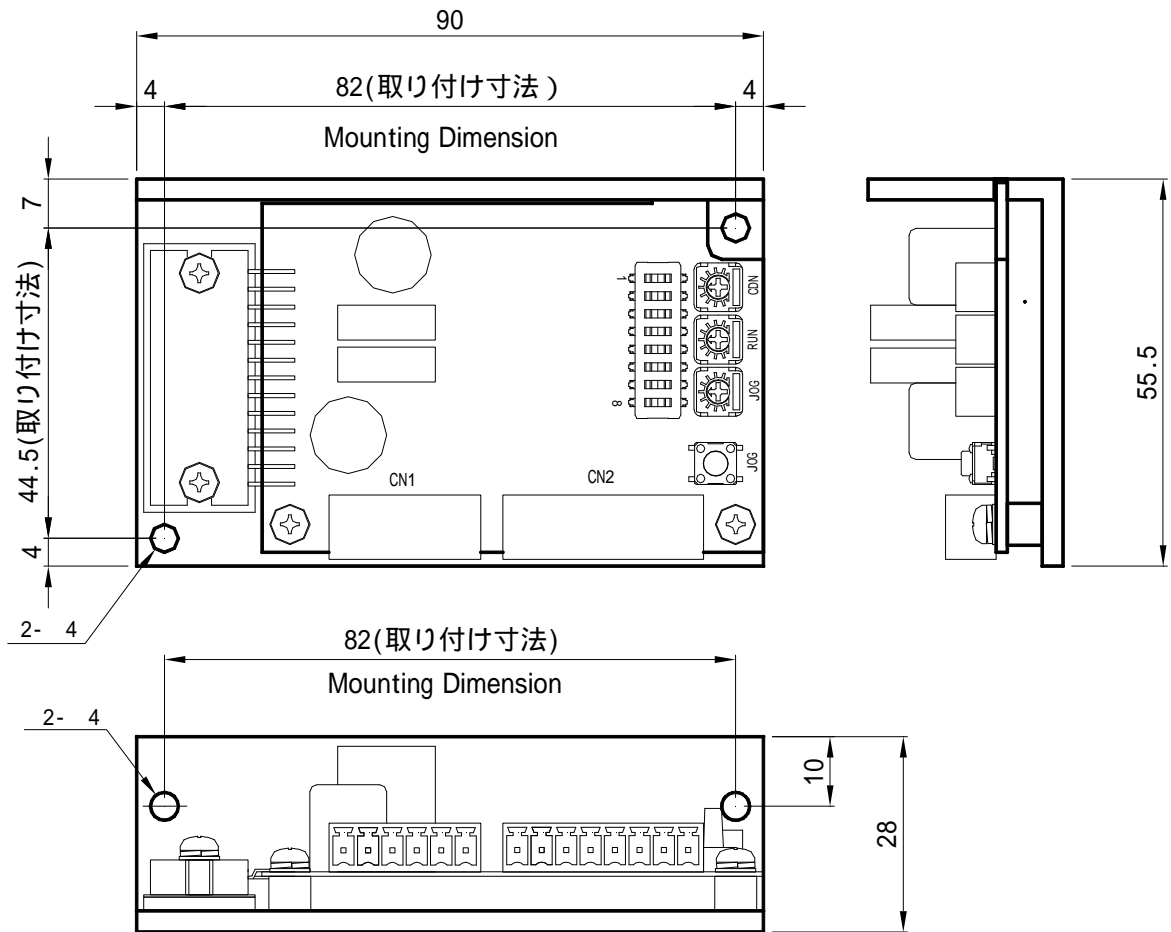
Using over 24V supply voltage to rotate continuously at the motor, use it with focused peak current value according to following graph.



15. Components Layout



16. Dimension



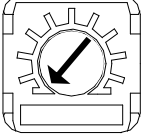


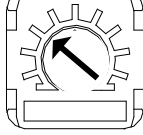


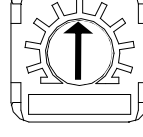


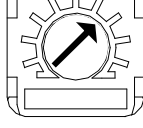


17. Differences of SD4030B and SD4030B2

SD4030B2 is upper compatible product but has some differences as follows.

Specification	SD4030B	SD4030B2
Input for command pulse	Only a way of one-pulse	One-pulse/Two-pulse Added Jumper JP1 for selecting
Mixed Decay adjustment	4 selection with 2bits of DIP switch	Enable to adjusting to optimal value with volume.
Details of DIP Switch	1-3: Select of micro-step resolution 4: Select of Auto Current Down Mode 5 and 6: Select of Mixed Decay 7 and 8: Select of JOG	1-3 : Select of micro-step resolution 4: Select of Auto Current Down Mode 5 and 6: Select of Mixed Decay

- Reference table for Switch and Trimmer to set Mixed Decay

Ratio of Slow-Decay in SD4030B	SD4030B	SD4030B2
	ON/OFF status of DIP SW 5 and 6	Set position of Mix volume
75%	OFF OFF ON ↑   5 6	 0
50%	ON OFF ON ↑   5 6	 3
25%	ON OFF ON ↑   5 6	 5
5%	ON OFF ON ↑   5 6	 6.5

High Performance Technology **HPtec**

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