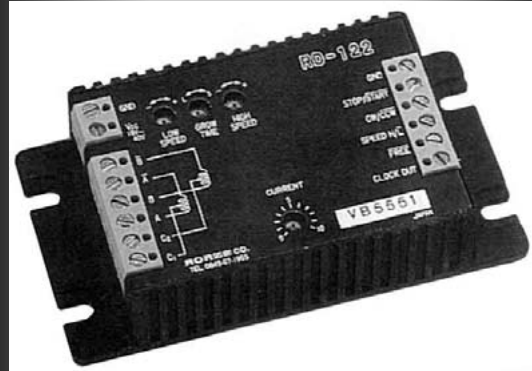


RORZE

RORZE Instruction Manual



2-ph Stepping Motor Driver
RD-122

Be sure to read the following precautions for your safety.

This section describes safety precautions to avoid danger to you or someone else, to avoid damage of your property, and to use this product safely.

Precautions before using this product

This product is designed to be incorporated into general industrial machinery, and is NOT developed to be used in devices such as aerospace machines, security equipment, or other safety devices where a failure or malfunction of this product may directly threaten human lives or health.

Even if you use this product in a general device, make sure that you establish a sufficient level of safety in your device by incorporating a protection function into your machine and guarantee your products based on safety tests on the whole set.

If you will use this product in devices like the above, please contact us. It should be noted that RORZE will not be responsible for any damage caused by using a product in such a device without the consent of RORZE.



WARNING

Ignoring the following warnings may cause a death or a serious injury.

- ◇ Use this product at places where no explosive or flammable stuff exist nearby and no water is splashed on the product. Otherwise it may cause a fire and/or an injury.
- ◇ Turn off the power before moving or wiring the product. Otherwise you may suffer injuries or electric shocks.
- ◇ Do not forcibly bend, pull, or nip lead wires. Otherwise they may cause an electric shock, fire, and/or failure.
- ◇ Do not use lead wires with their sheath damaged. Otherwise they may cause an electric shock, fire, and/or failure.
- ◇ Make sure that wires are correctly and securely connected at electrical terminals. Otherwise they may cause an electric shock, fire, and/or failure.
- ◇ Do not touch the internal parts of this product.
- ◇ Do not disassemble or modify this product.
- ◇ Do not wire or operate a product with wet hands. Otherwise it may cause electric shocks.
- ◇ Assign a qualified person to transport, install, connect, operate, maintenance, or check this product. Otherwise it may cause an electrical shock, a fire and/or an injury.



CAUTION

Ignoring the following cautions may result in personal injuries and/or property damages.

- ◇ Make sure that the delivered product is the one you ordered. Installing the wrong product may cause a fire and/or a failure.

Check the following items before turning on the power.

- ◇ The output voltage of the power supply is as described in the specifications.
- ◇ The voltage/current of the input/output terminals conforms to the ratings in the specifications.
- ◇ Input/output terminals are not incorrectly wired or accidentally short-circuited.
- ◇ Do not use with the motor except the stepping motor.
- ◇ Operate the rated current of stepping motor within the specified input current limits only.
- ◇ Please use the wire rod with the cross-section area corresponding to current value.
- ◇ Because this product generates heat, please make it stick to metal board etc. or put the fan and radiate enough. Keep the driver's maximum temperature below 60°C.
- ◇ When connecting with terminal block, use a screwdriver whose tip fits an adjustment slot. Tighten the screw in the torque of less than 3.5kgf·cm(0.35N·m)(proper torque is 2.5kgf·cm(0.25N·m)).
- ◇ When you run a product for the first time, make sure that the operation can be stopped immediately under an emergency situation.

Ignoring the above cautions may cause a fire and/or a failure.

- ◇ Immediately turn off the power, if you hear an unusual noise. Otherwise it may cause a fire and/or an injury.
- ◇ Do not touch this product when it is in operation, as a malfunction may occur.
- ◇ Do not carry this product by holding its terminal blocks or lead wires. When the product is accidentally dropped, it may cause a personal injury.
- ◇ Do not place this product in unstable positions. When the product is accidentally dropped, it may cause a personal injury.

Under some circumstances, ignoring the precaution described in the CAUTION section may also result in a death or a severe injury.

Follow the above precautions described in both the WARNING and the CAUTION section.

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INSTRUCTION MANUAL FOR RD-122

1. Features

- Can drive 1.3A/phase motor
- Large supply voltage range (18 to 40VDC)
- Circuit protection to protect against low voltage
- Auto current down circuit to reduce heat generation when motor is stationary
- Built-in oscillator makes PLC - or computer – control possible

2. Specifications

Supply voltage	Single 18 to 40VDC (including ripple)
Supply current	Approx. 2.4 times rated coil current of motor (max.)
Motor current	0 to 1.3A/phase (Adjustable by Current Adjustment Trimmer)
Drive method	Unipolar, constant current chopper method
Excitation method	Full step(2P)
Auto. current down	50% of the rated current after about 0.3 seconds of inactivity
Protective circuitry	Low voltage protection
Oscillating frequency	7 kpps max.
Accel./Decel. time	200msec to 2sec (when you change SPEED H/L terminal from 0V to 5V.or from 5V to 0V)
Speed change function	Digital (High/Low)
Weight	Approx. 250g (8.8oz.)
Outside dimensions	27.5H x 105W x 56Dmm (1.1"H x 4.1"W x 2.2"D)

3. Part Name

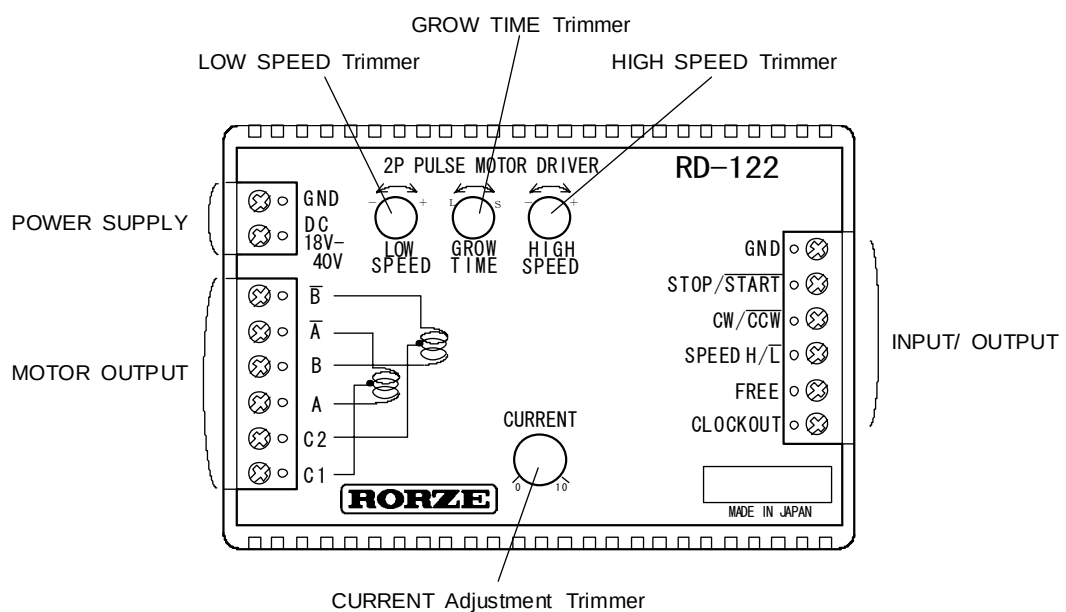


Fig.1. Name Plate

4. Current Adjustment

4. Current Adjustment

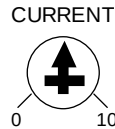


Fig.2. Current Setting Trimmer

4-1 Current Adjustment Trimmer



Caution

**Please use after adjusting the current within the motor rated current.
Exceeding the rated current causes the failure of motor or fire.**

This is used to adjust the stepping motor drive current and in general it makes twice to the rated current.

If a motor is used at a high rpm with a lower-than-rated torque, better efficiency and less temperature rise can be obtained by using the motor with a current lower than the rated value.

(Note: As the current decreases, the torque will lower.)

The drive current changes relative to the dial. The value of the setting will be $\pm 10\%$ of the set value.

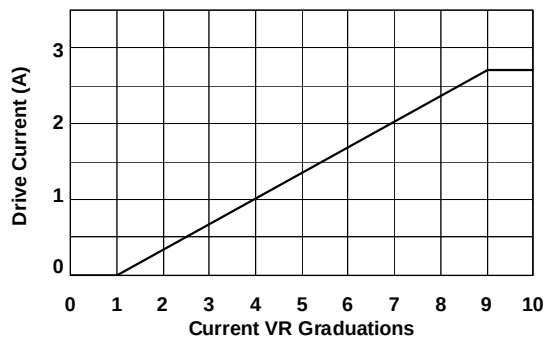


Fig.3. Current Setting

4-2 Wiring

In order to measure the exact drive current, connect an ammeter as shown in the 4. "Wiring dimension" and follow the next instructions.

1. Turn on the power after setting High Speed and Low Speed Trimmer to the minimum value.
2. As reading at the ammeter, adjust Current Trimmer and set to twice value of the rated current /phase.

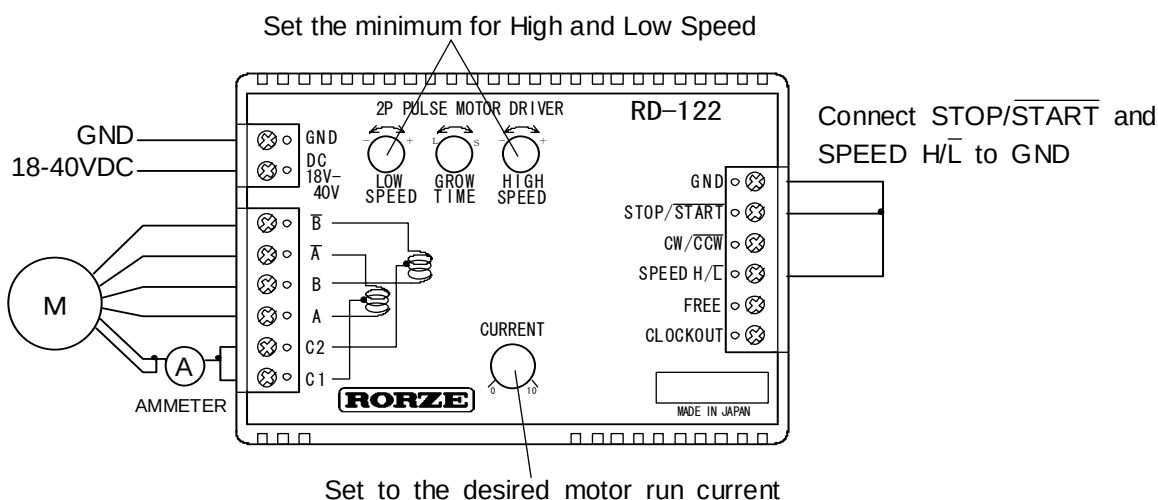


Fig.4. Wiring dimension

5. Speed Setting



Caution

Set the speed after setting Current Adjustment Trimmer to MIN or removing motor wire. Setting the speed during motion is dangerous because it may result in serious result.

☆ How to set Low/High Speed of RD-122

Owing to the structure of the internal circuit, setting Low Speed trimmer will make high speed change and vice versa. Therefore, when setting oscillating frequency please follow the below instructions.

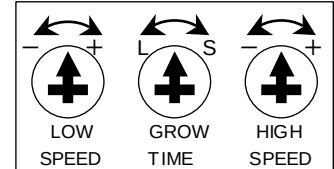


Fig.5. Speed Setting Trimmers

- 1) Connect STOP/START terminal to GND potential.
- 2) Turn SPEED H/L terminal to High level (open) and then set High Speed trimmer to high speed frequency that meets your application specifications.
- 3) Turn SPEED H/L terminal to Low level (connects to GND potential) and then set Low Speed trimmer to low speed frequency that meets your application specifications.
- 4) Review 2 and 3 to verify whether the value meets your application specifications or not.

5-1 High Speed Trimmer

This trimmer is used for setting the high speed. Setting this trimmer can make the frequency change. Turn SPEED H/L terminal to High level (open) and then set High Speed trimmer to your desired speed frequency. (The Max. of the setting value is approx. 7,000pps=2,100rpm/1.8°)

5-2 Low Speed Trimmer

This trimmer is used for setting the low speed. To set this pot, turn SPEED H/L terminal to Low level (connects to GND potential) and then set low speed to your desired speed frequency.

6. Grow Time Trimmer

Trimmer to adjust the duration of time in which the motor's rpm changes from the stationary state to the rpm set for High Speed and then to the rpm set for the Low Speed.

Adjustable range: 200msec. to 2sec. (When SPEED H/L voltage is changed from 0 to 5Vdc or from 5 to 0Vdc.)

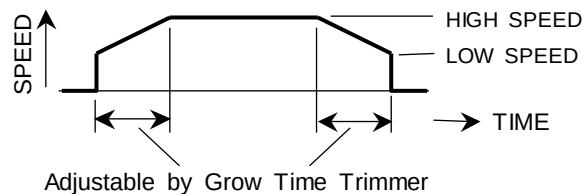


Fig.6 GROW TIME

7. Terminals

7-1 STOP/ $\overline{\text{START}}$ (Input)

Turning STOP/ $\overline{\text{START}}$ input to Low level (connecting to GND potential) will make the motor start to run and the driver outputs CLOCK OUT signal to motor.

Turning STOP/ $\overline{\text{START}}$ input to High level (open) will make the motor stop and the driver stops to output CLOCK OUT signal.

7-2 CW/ $\overline{\text{CCW}}$ (Input)

Turning CW/ $\overline{\text{CCW}}$ to Low level (connecting to GND potential) will make the motor rotate in CCW direction.

Turning CW/ $\overline{\text{CCW}}$ to High level (open) will make the motor rotate in CW direction.

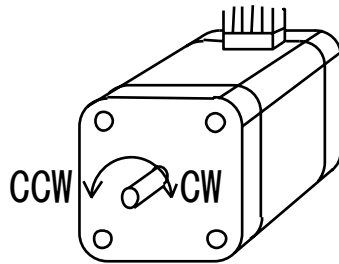


Fig.7 Direction of Rotation

7-3 SPEED H/ $\overline{\text{L}}$ (Input)

This input is used for changing speed. Turning this SPEED H/ $\overline{\text{L}}$ input terminal to High level (open) or Low level (connecting to GND potential) will change the frequency to the value set by Low Speed trimmer or High Speed trimmer.

7-4 $\overline{\text{FREE}}$ (Input)

Stepping motor drive current turns OFF at Low level (connects to GND potential) and the motor shaft can be rotated by hand.

When turning FREE input to High level (open) again, the motor is excited at the phase home.

NOTE: Do not turn this input ON when motor is running at high speed, this operation would damage the amplifier circuits.

7-5 CLOCK OUT (Output)

This is a terminal to output clock pulses. One pulse is putout every time a motor rotates one step.

The driver outputs 1 pulse every time the motor rotates by full step (1.8°).

The duty of output clock pulse is approx. 40 to 60%.

8. Timing Diagrams

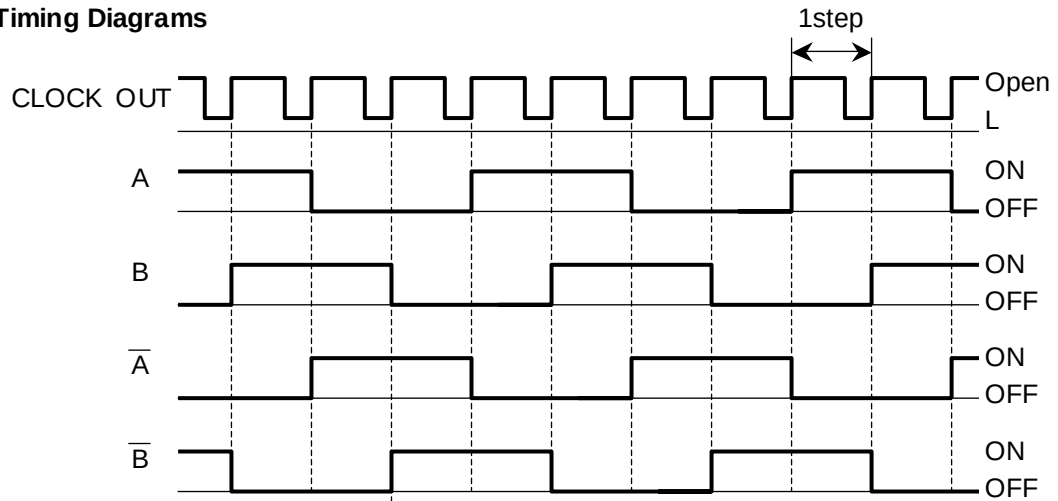


Fig.8. 2-phase Excitation Method (full step)

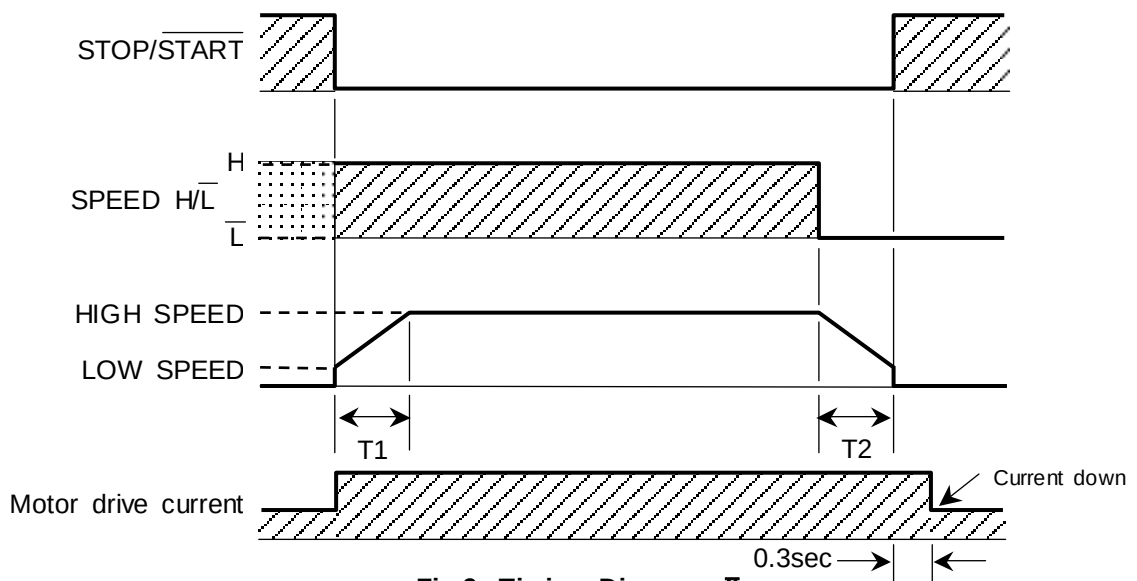


Fig.9. Timing Diagram II

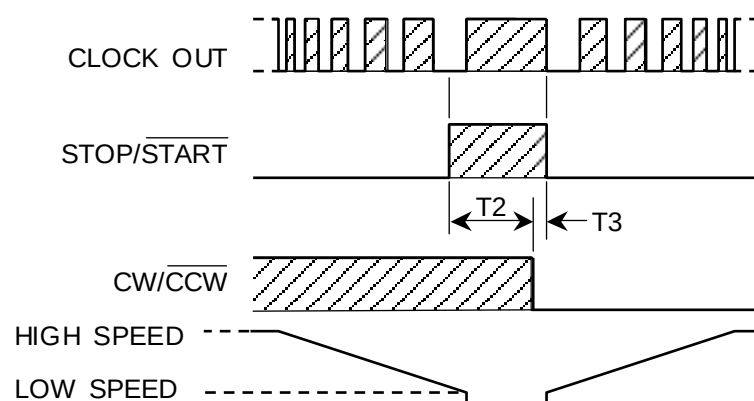


Fig.10. Timing Diagram III

T2: Changing direction of rotation from CW to CCW or vice versa should be done at least 10msec after stopping. ($T_2 > 10\text{msec}$)

T3: If the motor has been idle for more than 0msec, the direction can be changed at any time. ($T_3 \geq 0\text{msec}$)

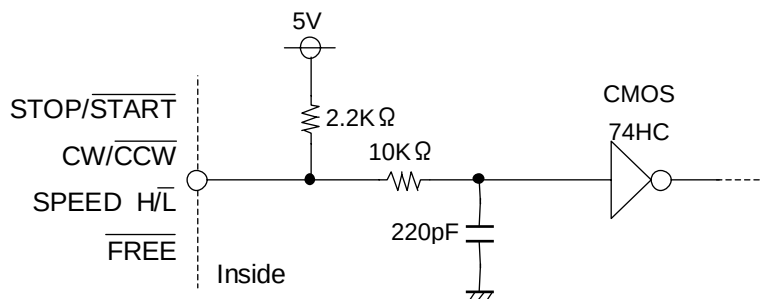
9. Input/Output Circuits



Caution

Do not exceed max. rated current · voltage of each I/O circuit.
It causes failure or malfunction.

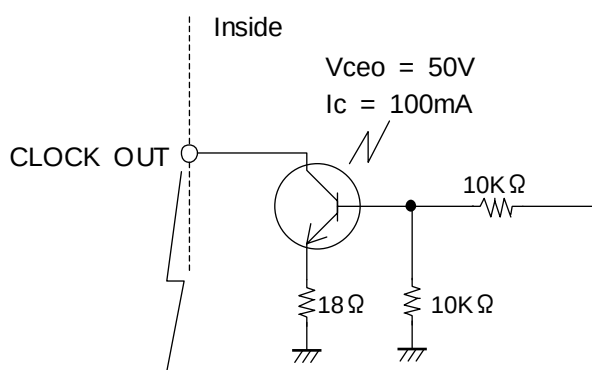
9-1 Input circuits (STOP/START, CW/CCW, SPEED H/L, FREE)



Low Level: Less than 1.5V
High Level: More than 3.5V

Fig.11. Input Circuits

9-2 Output Circuit (CLOCK OUT)



$V_{OL}(\text{low level output } I_c=10\text{mA}) = 0.38\text{V}$
 $V_{OL}(\text{low level output } I_c= 1\text{mA}) = 0.22\text{V}$

Fig.12. Output Circuit

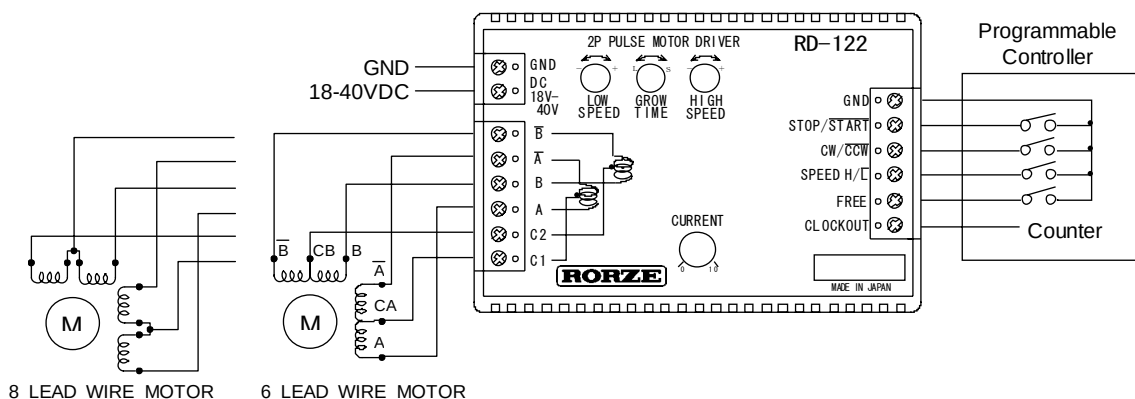
Do not supply the voltage more than 50V, the current more than 100mA to this terminal.

10. Wiring Diagram

**Caution**

Make sure that there are no mis-wiring and short-circuiting and do not turn power on before wiring correctly. There is danger of fire or failure.
Please tighten the terminals with the torque of less than 3.5kgf·cm (0.35N·m).

Please use the wire rod with the cross-section area corresponding to current value.
Use twisted wire pair for the signal input wiring. Please tighten the terminals less than 3.5kgf·cm (0.35N·m). (Proper torque is 2.5kgf·cm (0.25N·m))

**Fig.13. Wiring Diagram**

10-1 Suitable Motor

You can use any HB(hybrid) or PM(permanent magnet) stepping motor with rating of 0 to 1.3A/ph. Select motors with rating of less than supply voltage $\times$ 0.7(V).

RORZE 2-Ph Stepping Motors (Torque -- 1kgf·cm = 13.9oz·in Inertia -- 1g·cm² = 5.46745 $\times$ 10⁻³oz·in²)

ModelNo.	Holding Torque		FullStep Angle (Degree)	Rated Current (A/ph)	Rotor Inertia (g·cm ²)	Resistance (Ω)	Inductance (mH)
	(kgf·cm)	(N·m)					
RM2414S/D	1.4	0.14	1.8	1.5	30	1.3	0.96
RM2424S/D	2.4	0.24	1.8	1.5	53	1.75	2.2

Color of RORZE motor's wire

	Terminal					
	C1	C2	A	Ā	B	B̄
RORZE MOTOR	Black	White	Red	Yellow	Blue	Orange

1 1 . Heat Dissipation



Caution

**Please dissipate heat generated by driver and motor enough.
If it is insufficient, temperature rise causes malfunction, failure or fire.**

Keep the motor's maximum case temperature below 100°C and driver's below 60°C by adjusting the drive current or by installing a cooling fin, fan, etc.

1 2 . Other Functions

12-1 Auto. current down

After about 0.3 seconds of inactivity, current will be reduced to 50% of running current. This reduces driver and motor heat generation during idle periods.

12-2 Low voltage protection circuit

The driver has a built-in low voltage protection circuit to prevent current overload. The low supply voltage condition normally occurs when power is turned ON.

1 3 . Consumption Current

The current consumed by driver and motor varies, depending on the supply voltage, pulse (clock) frequency, motor's inductance, rated current and holding torque. Also, the ripple according to the cycle of PWM and RPM is added into the consumption current. Please use the power supply which current is more than 2.4 times the rated current of the motor as a standard.

If other devices share the same power supply and voltage change can't be allowed, then use the power supply which can flow 1.7 times of the max value of the supply current, or incorporate a large capacitor.

1 4. Relationship between Frequency(pps) and Motor speed(rpm)

“pps” is about pulse speed and stands for the number of pulses per second.
Formula to calculate rpm:

$$\text{Motor speed(rpm)} = \frac{\text{Step Angle} / \text{Resolution} \times \text{Frequency} \times 60}{360(\text{degree})}$$

Example

Step Angle: 1.8degree, Full step (Resolution: 1), Frequency: 1,000pps

$$\text{Motor speed(rpm)} = \frac{1.8 / 1 \times 1,000 \times 60}{360} = \underline{300 \text{ rpm}}$$

1 5. Dimensions

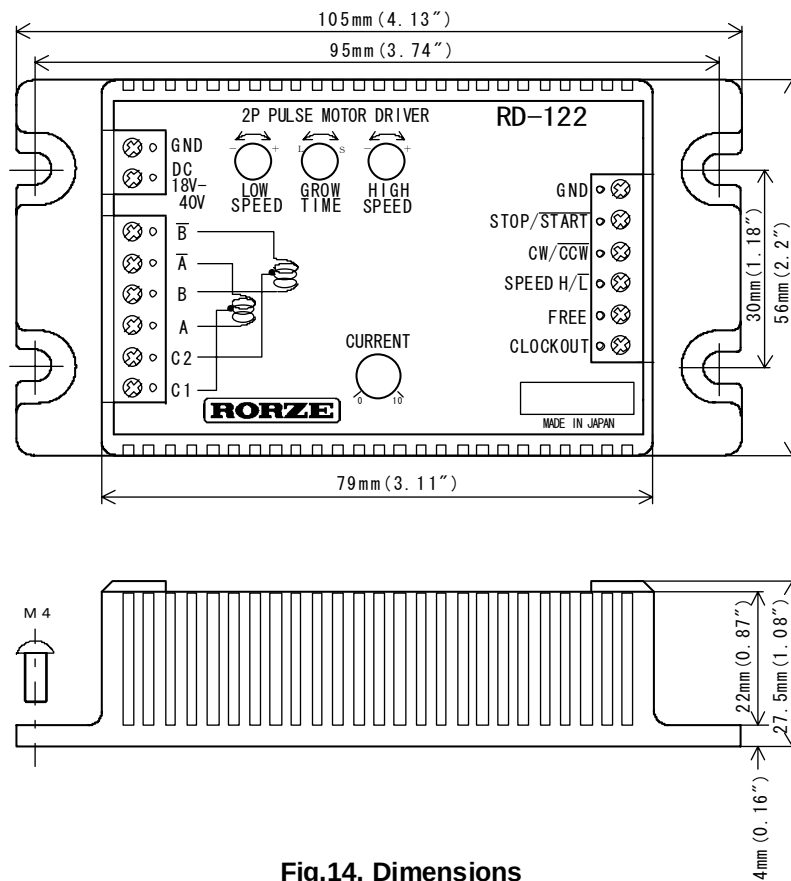


Fig.14. Dimensions

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*Specifications and products are subject to change without any obligation on the part of the manufacturer.