



Stepping Motor Units

PMU Series

OPERATING MANUAL

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Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

Precautions

Precautions for Installation

- Do not use in a place where there is inflammable gas and / or corrosive gas.
- Products for use only in equipment of protection class I.
- The motor and the driver must be properly grounded.
- When installing the motor into your equipment, ensure that the motor lead wires are fixed and do not move.
In addition, do not apply any pressure to these lead wires.
- Installation must be performed by a qualified installer.

Precautions for Operation

- Always turn off the power to the driver before conducting checks or performing work on the product.
- The enclosure temperature of this motor and driver can exceed 70°C (depending on operation conditions).
In case product is accessible during operation please attach the following warning label so that it is clearly visible.



Warning label

Package Contents

The **PMU** series comes as a combined stepping motor and driver set.

Confirm the motor and driver combination when unpacking.

The model names of the individual motors and drivers in each unit are as shown below.

Model	Motor	Driver
PMU33AH3	PMM33AH2	PMD07UA
PMU33BH3	PMM33BH2	
PMU35AH3	PMM35AH2	
PMU35BH3	PMM35BH2	
PMU33AH1-MG□*	PMM33AH-MG□*	
PMU33BH1-MG□*	PMM33BH-MG□*	

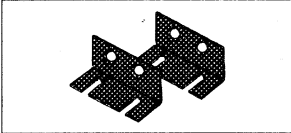
* □ : 3,6,7,2,10,20,30

Operating manual (this manual) — 1pc.

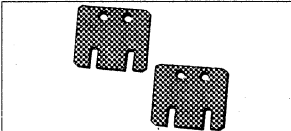
Interpreting the model name

Accessories

Driver Mounting Bracket A ... 2pcs.



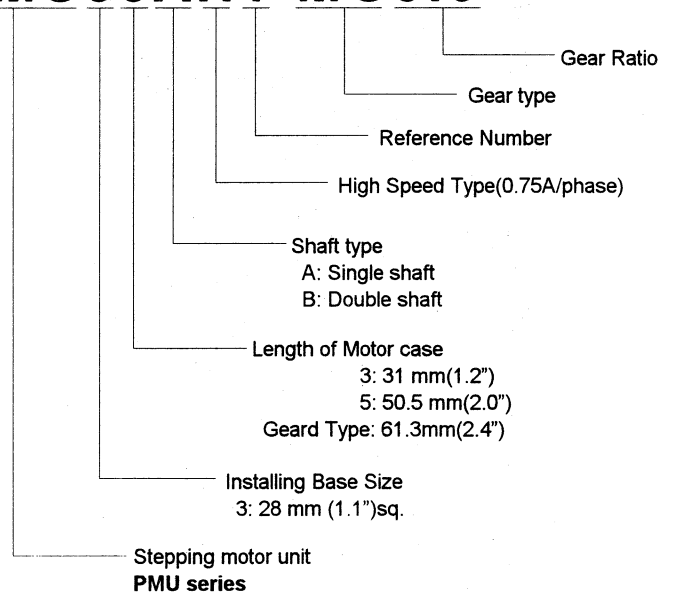
Driver Mounting Bracket B ... 2pcs.



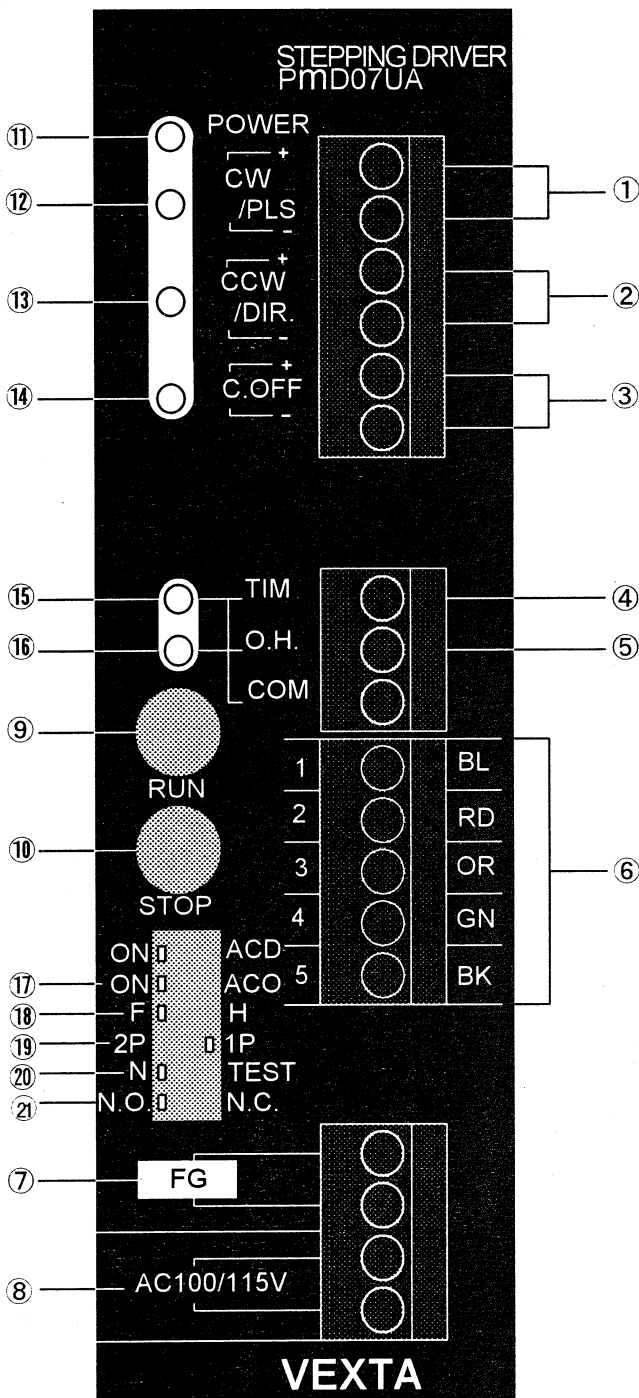
M3 flat -headed screws ... 4pcs.
(for mounting brackets)

Geared motor mounting screws:
M2.5 × P0.45 × 8 ... 4pcs.
(geared type only)

PMU33AH1-MG3.6



Names and Functions of Driver Parts



- ① Pulse/ CW Pulse Signal Input Terminals [P.12]
Pulse input for motor operation command. (Functions as CW rotation command pulse input in 2-pulse input mode.)
- ② Direction - of - Rotation / CCW Pulse Signal Input Terminals [P.12]
Input for direction-of-rotation command. At "L" level, command designates CW direction; at "H" level, command designates CCW direction. (Functions as CCW rotation command pulse input in 2-pulse input mode.)
- ③ C . OFF (Output Current OFF) Signal Input Terminals [P.13]
Signal for cutting off the supply of electric current to the motor. When this signal has been input, the motor cannot be operated even by inputting a pulse signal.
- ④ Timing (Excitation - Timing) Signal Output Terminal [P.14]
Signal indicating that the motor excitation sequence is at step "0."
Full step mode: A signal is output once every 10 pulses at 0.72°/step.
Half step mode: A signal is output once every 20 pulses at 0.36°/step.
- ⑤ Overheat Signal Output Terminal [P.15]
Signal is output when the temperature in the driver becomes extremely hot, stopping the output current automatically. (It is also possible to override the output current stop feature with the function switches.)
- ⑥ Motor Connection Terminals [P.19]
Motor output terminal.
- ⑦ Frame Ground Terminals [P.18]
Mounted on the driver case. Ground to your equipment.
- ⑧ Power Supply Connection Terminals [P.18]
Connects to a 115 V AC \pm 15% 60 Hz power supply or a 100 V AC \pm 15% 50 / 60Hz power supply.
- ⑨ Run Rotary Switch [P.20]
Current adjustment rotary switch used to adjust the current level while the motor is running.

- ⑩ Stop Rotary Switch [P. 20]
The current value on the stop rotary switch is active when the motor is at standstill. (no pulses are input)
- ⑪ Power Input Indicator
Indicates that the power is turned on.
- ⑫ Pulse /CW Pulse Signal Input Indicator
Under the 1-pulse input mode, lights when a pulse has been received. (Under the 2-pulse input mode, lights when a CW /PLS pulse has been received at the CW /PLS terminals.)
- ⑬ Direction-of-Rotation /CCW Pulse Signal Input Indicator
Under the 1-pulse input mode, lights when a CW signal has been received. (Under the 2-pulse input mode, lights when a CCW/ DIR. pulse has been received at the CCW/ DIR. terminals.)
- ⑭ Output Current Off Signal Input Indicator
Lights when an output current off signal has been received at the C.OFF terminals.
- ⑮ Excitation-Timing Signal Output Indicator
Lights when an excitation timing output signal has been output from TIMING terminals.
- ⑯ Overheat Signal Output Indicator
Lights when the overheat protection function is activated, and an overheat signal has been output from O.HEAT terminals.
- ⑰ Automatic Current Off Select Switch (ON / ACO) [P. 10]
Set to ON mode to cut the current to the motor if the driver overheats.
- ⑱ Step Angle Select Switch (F/H) [P. 10]
Switch for selecting between full-step mode, where each pulse equals $0.72^\circ/\text{step}$, and half-step mode, where each pulse equals $0.36^\circ/\text{step}$.
- ⑲ Pulse Input Mode Select Switch (2P/1P) [P. 10]
Switch for selecting between 1-pulse input mode, in which control is performed with a pulse signal and a direction signal, and 2-pulse input mode, in which control is performed with two systems of pulse signals (CW pulse and CCW pulse).
- ⑳ Self Inspection Switch (N / TEST) [P. 11]
Utilizing the built in pulse generator to test the driver is correctly functioning. Set to "N" for the normal operation mode.
- ㉑ Overheat Output Logic Select Switch (N.O. / N.C.) [P. 11]
Set to N.O.(Normal Open) so that photo-coupler turns ON (level L) when the overheat signal is output. To reverse the logic, set to N.C.(Normal Close).

Mounting the Motor

Important

- Mount the motor and driver before connecting the motor, driver, and controller together.
- Install the motor so that it is securely fastened to a metal surface that is a good thermal conductor, such as steel or aluminum.

Mounting Location

In order to prevent damage to the motor, mount the motor in a place that meets the following conditions.

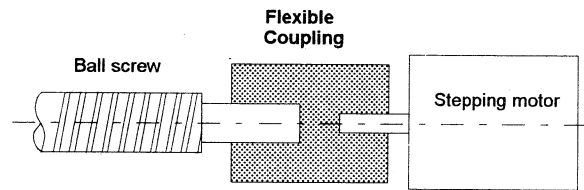
- Indoors
- Ambient temperature: -10°C – $+50^{\circ}\text{C}$ (where it won't freeze)
- Ambient humidity: 85% or less (where there is no condensation)
- Good ventilation
- No exposure in direct sunlight
- Free from corrosive / inflammable gas and dust
- No exposure to water or oil (The motor is not waterproof. If there is a chance of it being exposed to liquid, provide a cover.)
- Not subject to continuous vibration

Mounting Direction and Method

- There are no restrictions on the direction of mounting, but motors are usually mounted sideways. They can also be mounted facing up or down.
- Fix the motor firmly. If motor drops, it may damage the air gap between the rotor and the stator, and cause the rotor not be turned.
- Mount the motor tightly against a metal surface with good thermal conductivity.

Connecting the Motor to the Machine (load)

When connecting the motor shaft to the machine being. It must be centered to the load. Inadequate alignment will cause vibration and can drastically shorten the life of the motor's ball bearings, resulting in fatigue failure of the motor shaft. Use a flexible coupling to connect the motor shaft to the machine being used (load).

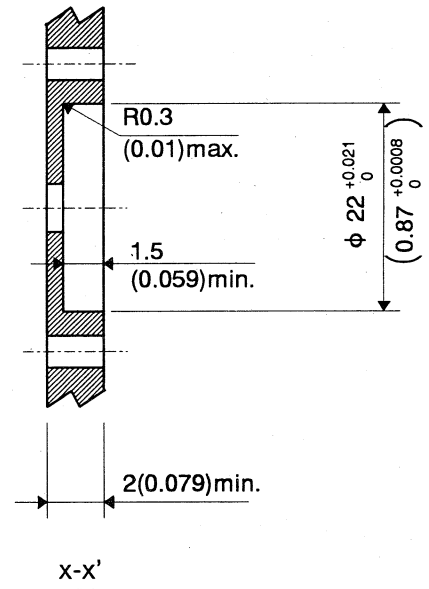
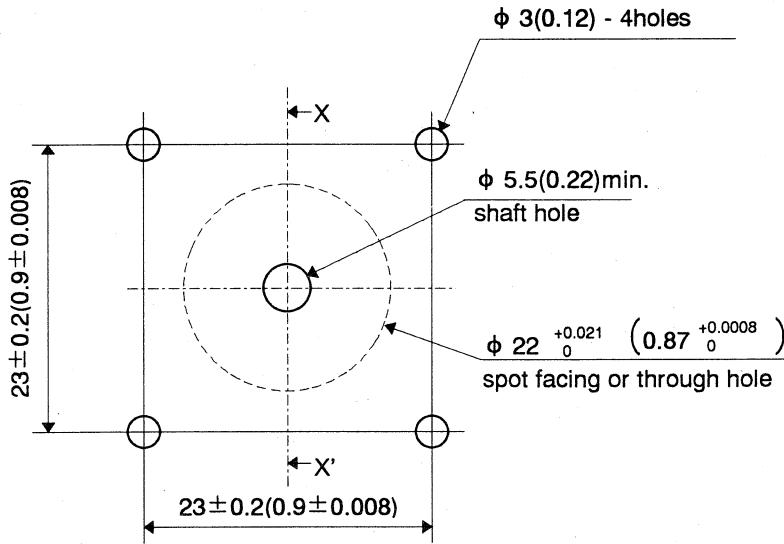


Notes:

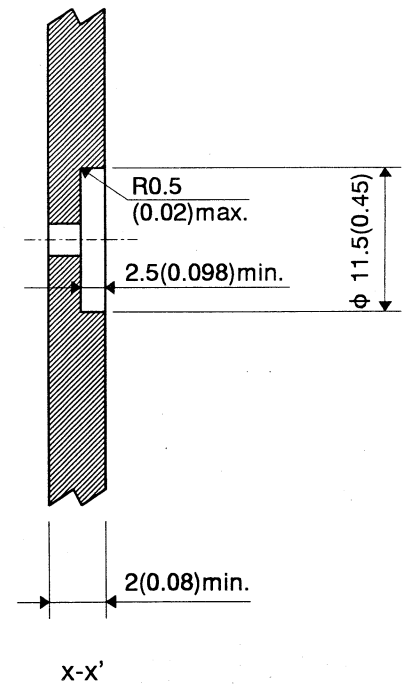
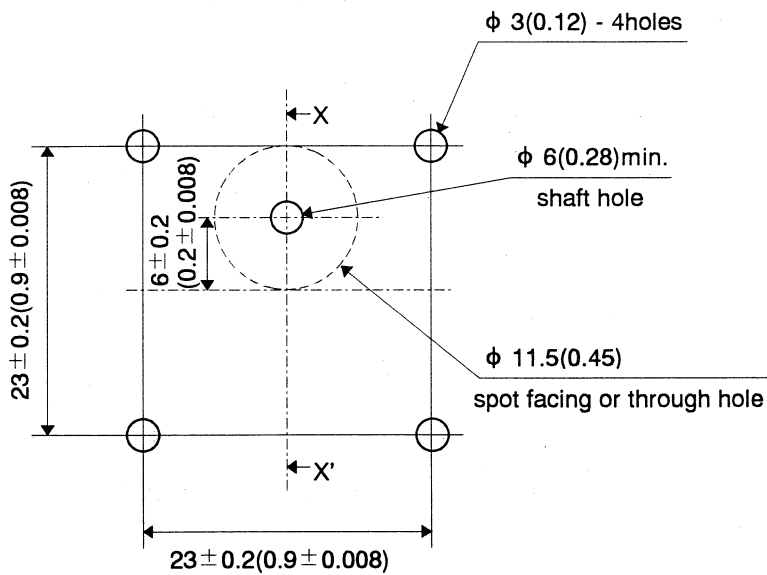
- Support the motor shaft when attaching a coupling, timing pulley, or other device to the shaft. Make sure that there is excess no thrust or overhung loads between the shaft and motor and avoid shock loading. Such loads or shock could damage the equipment or the motor.
- The air gap between the rotor and stator inside the motor is extremely small. Therefore, do not subject the motor shaft to any shocks. Shocks will cause the rotor and stator to rub against each other. This can also damage the shaft bearings.

Mounting Plate Dimensions unit: mm(inch)

PMU3□A(B)H3



PMU33A(B)H1-MG□



Mounting the Driver

Mounting Location

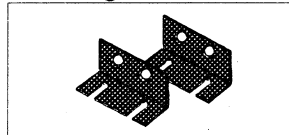
Mount the driver in a place that meets the following conditions.

- Indoors
- Ambient temperature: 0°C – +50°C (where it won't freeze) (When the ambient temperature exceeds 50°C, use a fan to cool the driver, as overheating could damage the driver's components.)
- Ambient humidity: 85% or less (non condensing)
- Free from corrosive / inflammable gas and dust
- No exposure to water or oil
- No exposure in direct sunlight
- Mount driver so that there is at least 25 mm(1") between each side of the driver and any other equipment or structural components.
- When mounting the driver in an airtight location, such as a control panel, or near to heat-generating equipment, be sure to establish ventilation holes to prevent overheating.
- When the driver is mounted close to a source of vibration, install shock absorbers in order to prevent damage to the driver.
- When there is a source of significant noise near the driver (high-frequency welding machine, large electromagnetic switch, etc.), take measures to prevent noise interference, such as inserting a noise filter or connecting the driver to a separate power supply line.
- Prevent conductive materials (filings, pins, pieces of electric wires, etc.) from adhering to the inside of the driver, as this could damage the circuits inside the driver.

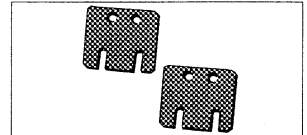
Mounting Direction and Method

The driver is designed to disperse heat through natural convection. When installing the driver, be sure to install only in the position shown below.

Use Mounting bracket "A" when install the driver vertical to the equipment. When install it horizontally to bottom line of equipment, use mounting bracket "B".



Driver Mounting Bracket A



Driver Mounting Bracket B

Notes:

- Fix the drivers to a metal plate at least 2 mm(0.08") thick with good heat-conduction such as aluminum or steel.
- When mounting the driver directly to the machine without using the mounting bracket provided with the product, pay attention to length of mounting screws. Use the screws to extend 2~3.5mm (0.08"~0.14") into the driver. Screws that are longer than necessary length may cause bad insulation.
- When overheat signal is output, cool the driver by force using cooling fan, etc.

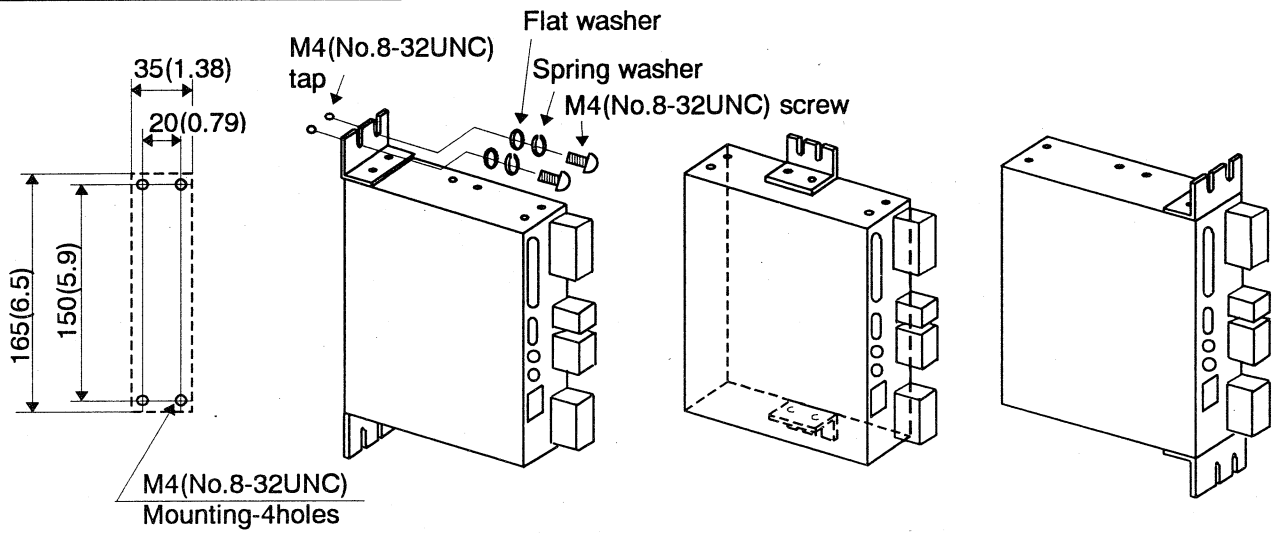
When Using Multiple Drivers

When using multiple drivers in a series, the heat produced by the drivers will raise the ambient temperature. Leave at least 20 mm(0.8") between drivers to prevent overheating and damage to the drivers.

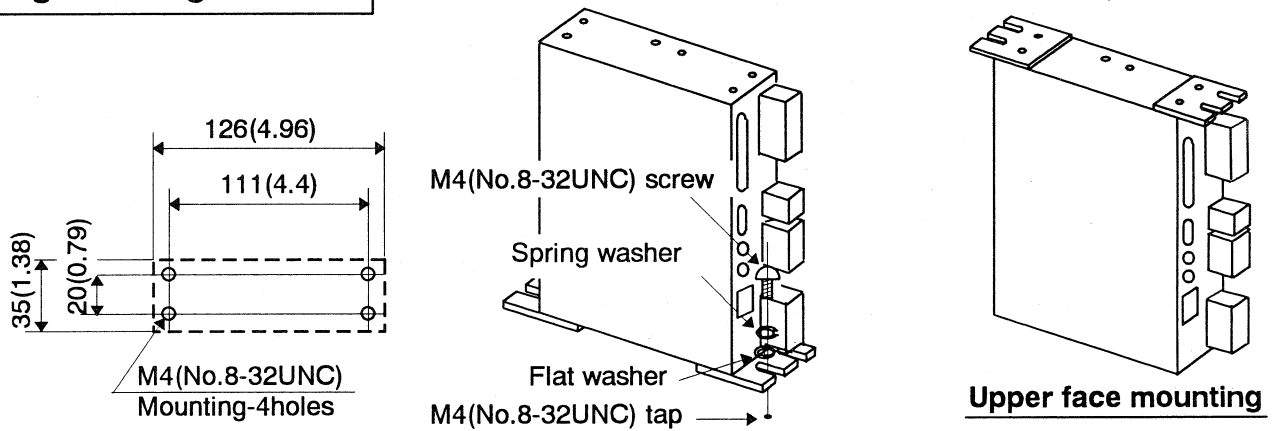
Mounting Dimensions

unit: mm(inch)

Using mounting bracket A

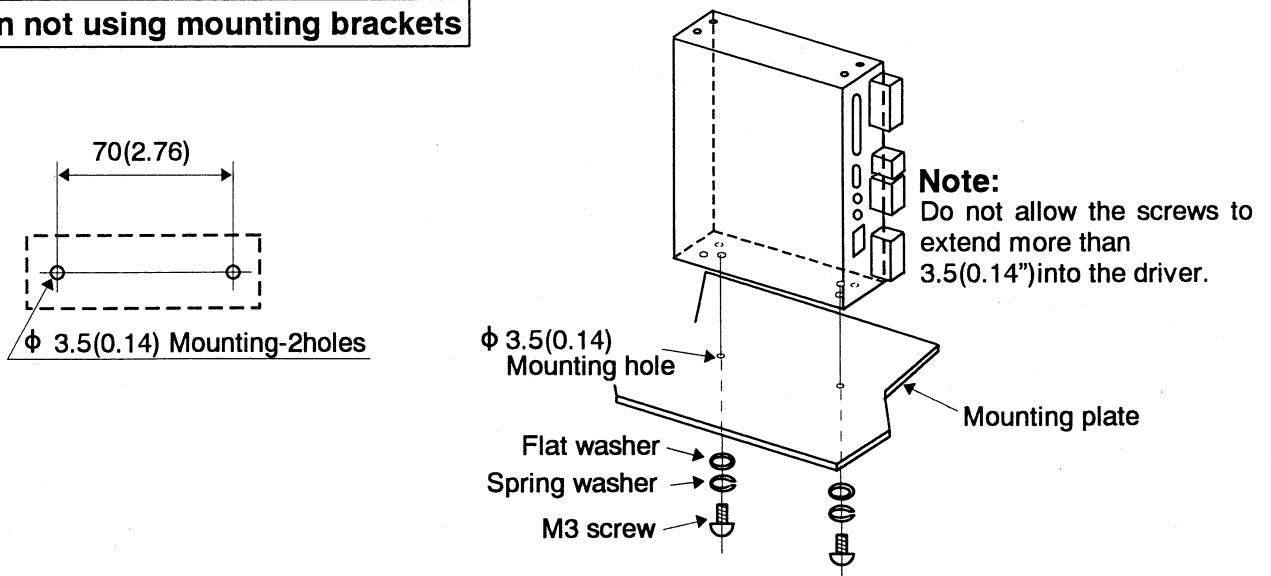


Using mounting bracket B



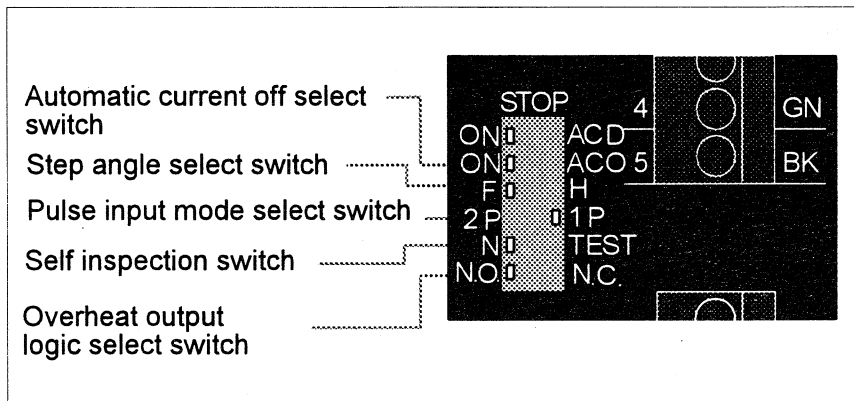
Bottom face mounting

When not using mounting brackets

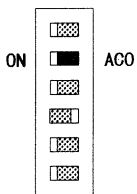


Function Switches

The following function switches are used to change the driver's factory settings. (The factory settings are as indicated in the following diagram.)



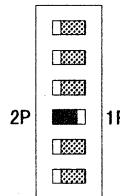
Automatic current off (ON/ACO)



Set Automatic Current Off function flipping this switch to "ON". When the overheat protection is engaged (When temperature inside the driver becomes extremely hot) current output to the motor is automatically stopped and the motor comes to a natural stop.

In situation where stopping of the motor due to overheat protection could pose problems, Automatic Current Off can be overridden by setting this switch to "ACO". However, as a rule, whenever the overheat protection function is active (shown by overheat signal on display) the motor should be stopped as soon as possible.

Pulse input mode(2P/1P)



The driver is designed to function under either of the following pulse output mode. When the switch is flipped to "1P", the driver is set for the 1-pulse input mode, in which a pulse signal and a direction-of-rotation signal are used to control the motor. When pulse input switch is flipped to "2P", the driver is set for the 2-pulse input mode, in which two types of pulse signal (one each for CW and CCW) are used to control the motor.

Notes:

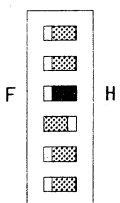
1-Pulse Input Mode

Switch direction of rotation when the pulse signal is stopped (when it is at the "H" level).

2-Pulse Input Mode

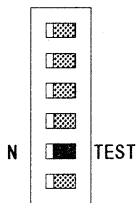
Do not input CW pulse and CCW pulse signals simultaneously. When either the CW or CCW pulse signal is at the "L" level, the motor will not function properly even if a pulse is input to the other signal.

Step angle(F/H)



When step angle switch is flipped to "FULL", the driver is set for 0.72°/step (500 pulses per revolution) ; When the switch is flipped to "HALF", the driver is set for 0.36°/step (1000 pulses per revolution.)

Self inspection (N/TEST)



The self inspection function utilizes the built-in pulse generator to test whether driver, stepping motor and wiring between motor and driver are correctly functioning.

Preparations

Connect the motor to the driver and turn on the power.

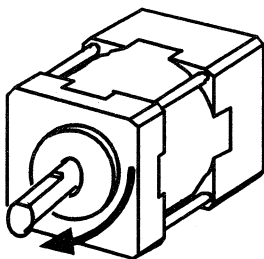
Do not connect any wires to the input / output signal terminals.

Performing a Self inspection

Switch the self inspection function switch from the "N" position to the "TEST" position.

Once the self inspection function has been switched to "TEST" the motor will immediately start rotating in a CW direction at a pulse rate of approximately 3Hz; this confirms that there are no problems with the driver, motor and their connections. (The motor will rotate as long as the setting remains in the "TEST" position.)

If the motor rotates with abrupt, jerky movements or rotates in a CCW direction, turn off the power immediately and check the connections to the motor.



Confirm that the TIMING indicator is illuminated.

When the step angle switch is set to;

FULL: 0.72° step - the indicator will light every 10 steps.

HALF: 0.36° step - the indicator will light every 20 steps.

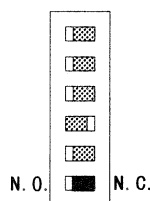
Conclusion

In order to conclude a self-test, switch the self-test function switch from the "TEST" to the "N" position. The motor stops and the driver returns to the normal operating mode.

Note:

Always set this switch at "N" position whenever operating.

Overheat output logic (N.O./N.C.)



Overheat output logic switch set to "N.O." :

When the overheat signal is output, the photocopier is switched on; during normal operation, photo-coupler is off.

Overheat output logic switch set to "N.C." :

When the overheat signal is output, the photo-coupler is switched off; during normal operation, photo-coupler is on.

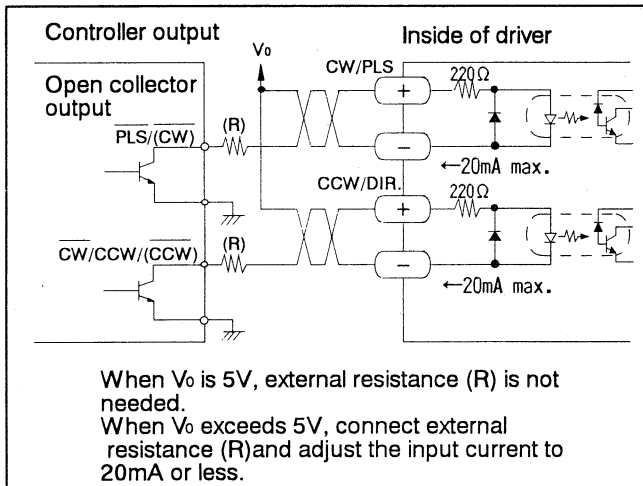
Input / Output Signals

Pulse, Direction (CW, CCW) Input

Input Circuits and Connection

Example

Signals inside parentheses indicate signals in 2-pulse input mode.



1-Pulse Input Mode

• Pulse input

When a negative logic pulse is input to the CW/PLS-terminal, the motor rotates one step on the rising edge of the pulse.

The direction of the motor's rotation is determined by the following direction-of-rotation input.

• Direction-of-rotation input

Direction signal is input to CCW/DIR.-terminal.

At "L" level (photocoupler ON): clockwise direction.

At "H" level (photocoupler OFF): counterclockwise direction.

2-Pulse Input Mode

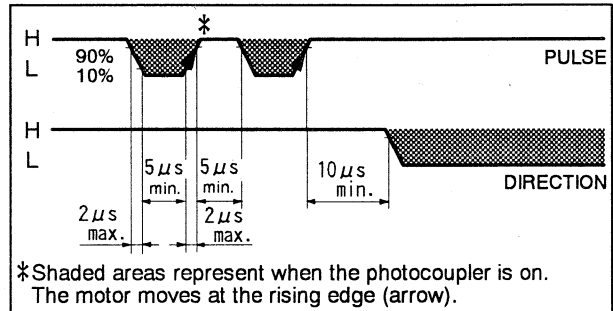
• CW pulse input

When a negative logic pulse is input to the CW/PLS-terminal, the motor rotates one step clockwise on the rising edge of the pulse.

• CCW pulse input

When a negative logic pulse is input to the CCW/DIR.-terminal, the motor rotates one step counterclockwise on the rising edge of the pulse.

Pulse Wave



- Pulse voltage: H=4–5 V, L=0–0.5 V
- Input a pulse with a pulse width of 5 μ s or more, pulse rise/fall time of 2 μ s or less, and pulse duty of 50% or less. (Responds up to 100 kHz with a pulse of 50%. When using at a faster speed, reduce the pulse width [shorten the photocoupler ON time].)
- When switching from clockwise to counterclockwise direction, an interval of 10 μ s or more is needed for the circuit response. The time required for motor response varies considerably depending on the load inertia and the pulse rate.

Notes:

1-Pulse Input Mode

Switch direction-of-rotation when the pulse signal is stopped (when it is at the "H" level).

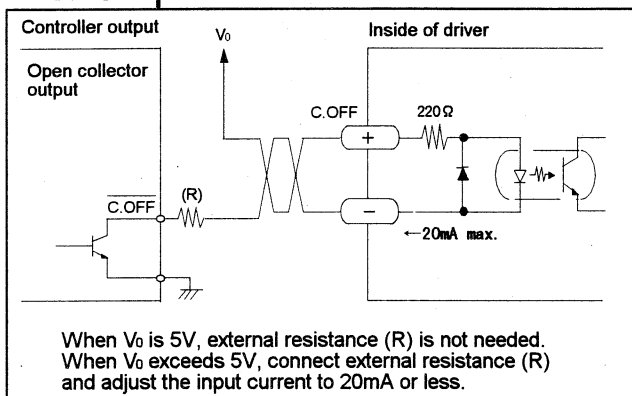
2-Pulse Input Mode

Do not input CW pulse and CCW pulse signals simultaneously.

When either the CW or CCW pulse signal is at the "L" level, the motor will not function properly even if a pulse is input to the other signal.

C.OFF (Output Current OFF) Input

Input Circuits and Connection Example



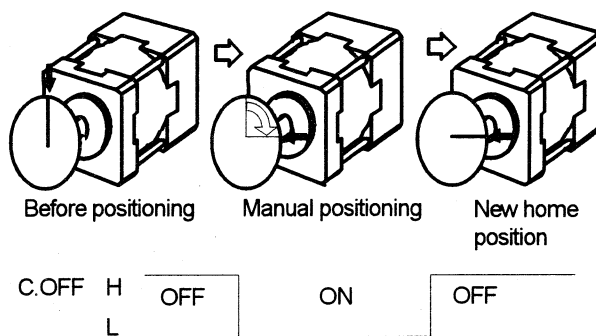
- When the C.OFF signal is at the "L" level (photo-coupler is ON), current stops flowing to the motor (holding torque is off) and the motor shaft can be turned by hand. This is done in order to move the motor shaft externally and when manually setting the shaft's position.
- Always set this signal to the "H" level when the motor is on. When not required, there is no harm in not connecting it at all.

Notes:

- Turning the C.OFF signal from ON to OFF will not change the motor's excitation sequence (phase).
- When turning the motor shaft by hand when the C.OFF signal has been input, the shaft may move within a range of $\pm 3.6^\circ$ from the manually set position when the C.OFF signal is canceled.

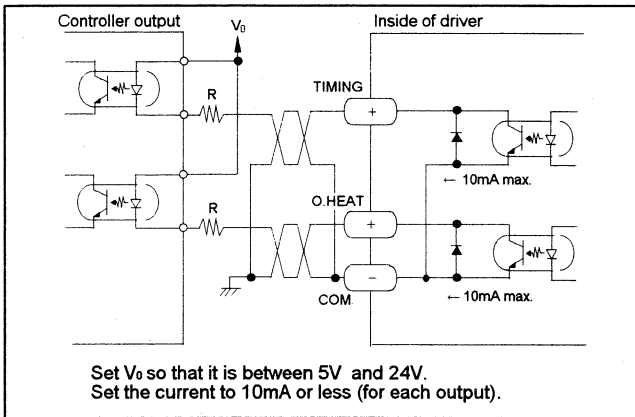
Manual Home Position Determination

When manually setting the shaft's position and using that position as the home position, input the C.OFF signal, set the shaft's position, and then cancel the C.OFF signal.



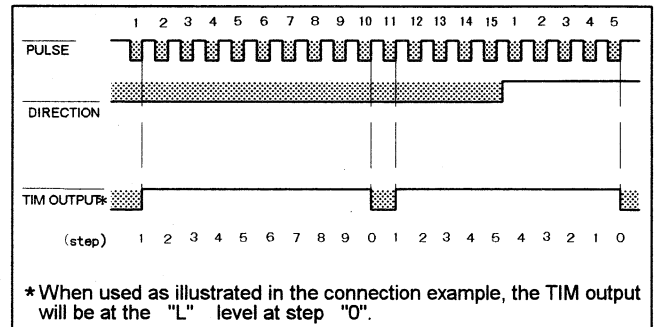
Timing (Excitation Timing) Output

■ Output Circuits and Connection Example



- The-Excitation-Timing Signal indicates that the motor's excitation sequence is at its initial setting (step "0"). This signal is used to align the apparatus's mechanical home position and the motor's excitation home position (step "0"), to achieve more accurate home position detection.
 - A signal is output every time the excitation sequence returns to step "0" in sync with the input pulse. The excitation sequence is configured so that when the motor shaft moves 7.2° , it complete one electrical cycle.
 - Full-step ($0.72^\circ/\text{step}$) : once every 10 pulses
 - Half-step ($0.36^\circ/\text{step}$) : once every 20 pulses
- The timing indicator on the front panel lights at same time.

■ Timing Chart: (Full-Step Mode)

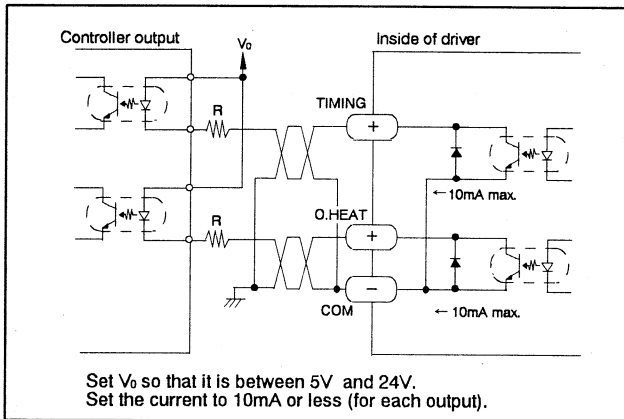


Notes:

- When the power supply is turned on, the excitation sequence is reset to "0" and the timing indicator lights.
- The timing indicator blinks at high speeds when the motor is running, so it may appear to be on continuously.
- When using this signal, input the pulse signals in multiples of 10 in full-step mode and in multiples of 20 in half-step mode.

O.HEAT (Overheat) Output

Output Circuits and Connection Example



- The Overheat signal is output when the temperature of the driver inside becomes extremely hot. The overheat indicator on the front panel lights when this signal is output.
- If the automatic output current off function has been set at this time, output current to the motor drops to "0" and the motor comes to a natural stop.
- On the above connecting diagram, outputs "L" level signal (photocoupler is on) when the switch is set to "N.O.". If "H" level signal (photocoupler is off) is required, set the switch to "N.C."
- When an overheat signal is output, either reconsider the operating conditions (ambient temperature, operating patterns, etc.) or take other measures such as forced cooling of the driver.
- Overheat signal will be canceled automatically as soon as the inner temperature of the driver drops. (The level of the overheat signal returns to "H" level at this time and the overheat indicator on the front panel goes out.)

Be aware that the above return/release cannot be controlled by external signals or by restarting the system.

Notes:

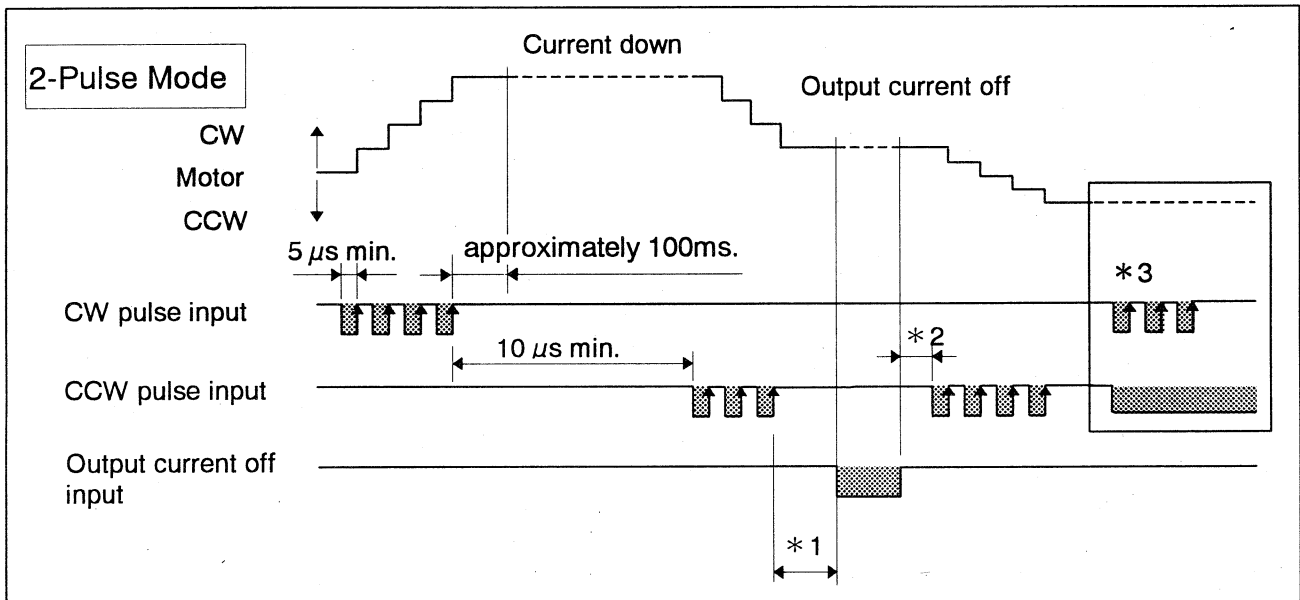
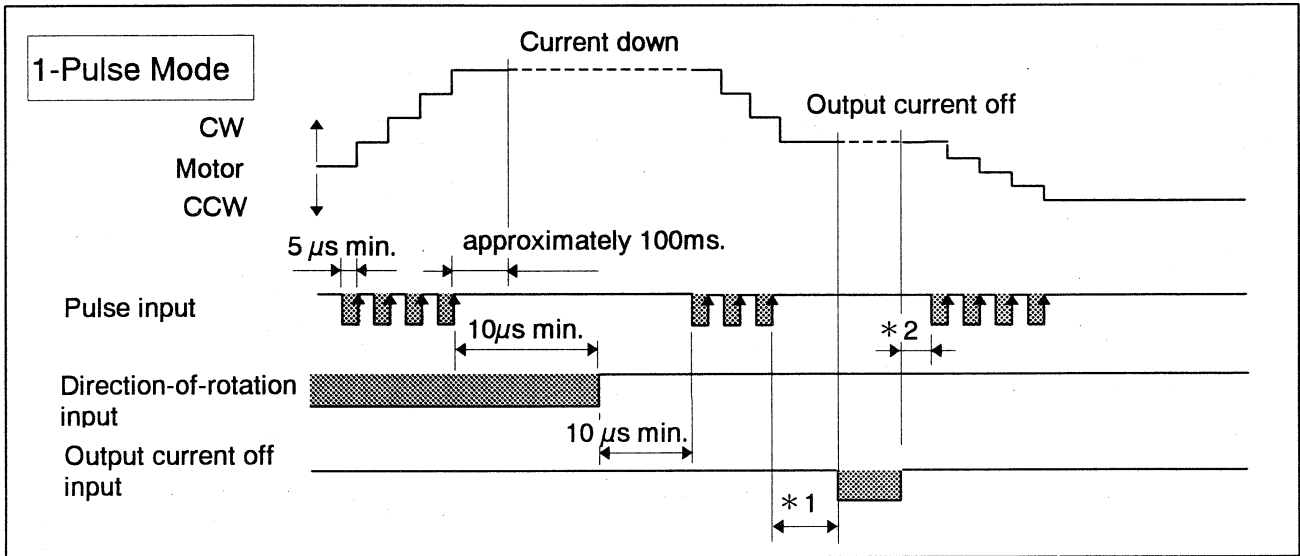
When the overheat protection function is activated

Cut the power to the driver and check the conditions (ambient temperature, operation pattern, etc.) ; or, reduce the driver's temperature by cooling it with a fan, etc.


Possible condition for overheating

- Placement of the driver in a location with insufficient air circulation for proper heat radiation, or when the driver's internal temperature becomes high due to high ambient temperatures and the heat generated by the driver.
- Continuous operation of the driver at the pulse rate with the largest current input to the driver. Input to the driver varies considerably according to motor size and pulse rate. Achieves its max. Input at over 50kHz. Please refer to the driver input current ratings in the "speed torque characteristics" section of the catalog.

Timing Chart



Notes

-  Shaded areas represent when photocoupler is on.
- When the level of the pulse signal is kept low (photocoupler on), the automatic current down function will not operate. Always return the level to high after the pulse signal ends (photocoupler off).

* 1: After pulses are stopped, stepping motors come to rest after a series of slight overshoots and undershoots. The time involved varies with the inertial load, friction load and motor type. Activation of the Output Current Off before the motor stops can cause inaccurate positioning. Therefore, always wait until the motor has stopped.

* 2: Do not input pulse signals immediately after switching the output current off input signal to the "H" level, as this will affect the motor's start-up characteristics. Ordinarily, the interval should be around 100 ms.

* 3: When a pulse is input while either the CW pulse input or CCW pulse input is low, the motor will not operate, properly.

Connections

Power Supply

The PMU series can be used with either a single-phase 115V 60Hz or single-phase 100V 50/60Hz power supply.

The power supply input current is 1.1A max.

Use a power source which is able to provide sufficient input current.

(The listed power supply input current is the driver's maximum input current when a load has been applied to the motor.)

Notes:

When the power capacity is insufficient, the following problems may arise due to a drop in the motor's output.

- The motor does not rotate normally during high speed operation (insufficient torque).
- The motor starts and stops slowly.

Indicators illuminated when turning on the unit

Before turning on the unit confirm that there are no mis-wirings in the signal lines, motor and power lines.

Power Input Indicator

Normally illuminated when turning on the power.

Excitation-Timing Signal Output Indicator

When turning on the power, the motor excitation sequence is reset to its original position at step "0" and this indicator is illuminated.

Note: Turning the power back on

- After the power has been turned off, wait 5 seconds before turning it back on again. If the power is turned on again immediately after it has been turned off, the timing indicator will not be illuminated and the motor excitation sequence will not be reset to step "0".

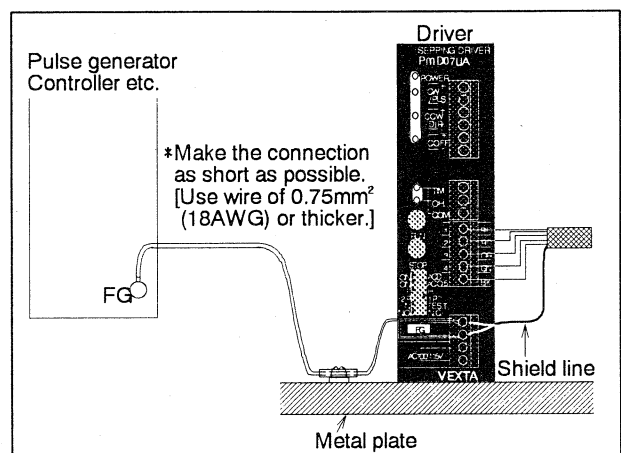
Frame Ground(FG) Terminal

FG terminal must be properly grounded to reduce the chance of electrical shock.

Ground the FG terminal of the external controller (pulse generator) to same point in order to prevent malfunctions due to external noise.

(The motor can be grounded to a device using the assembly screws.)

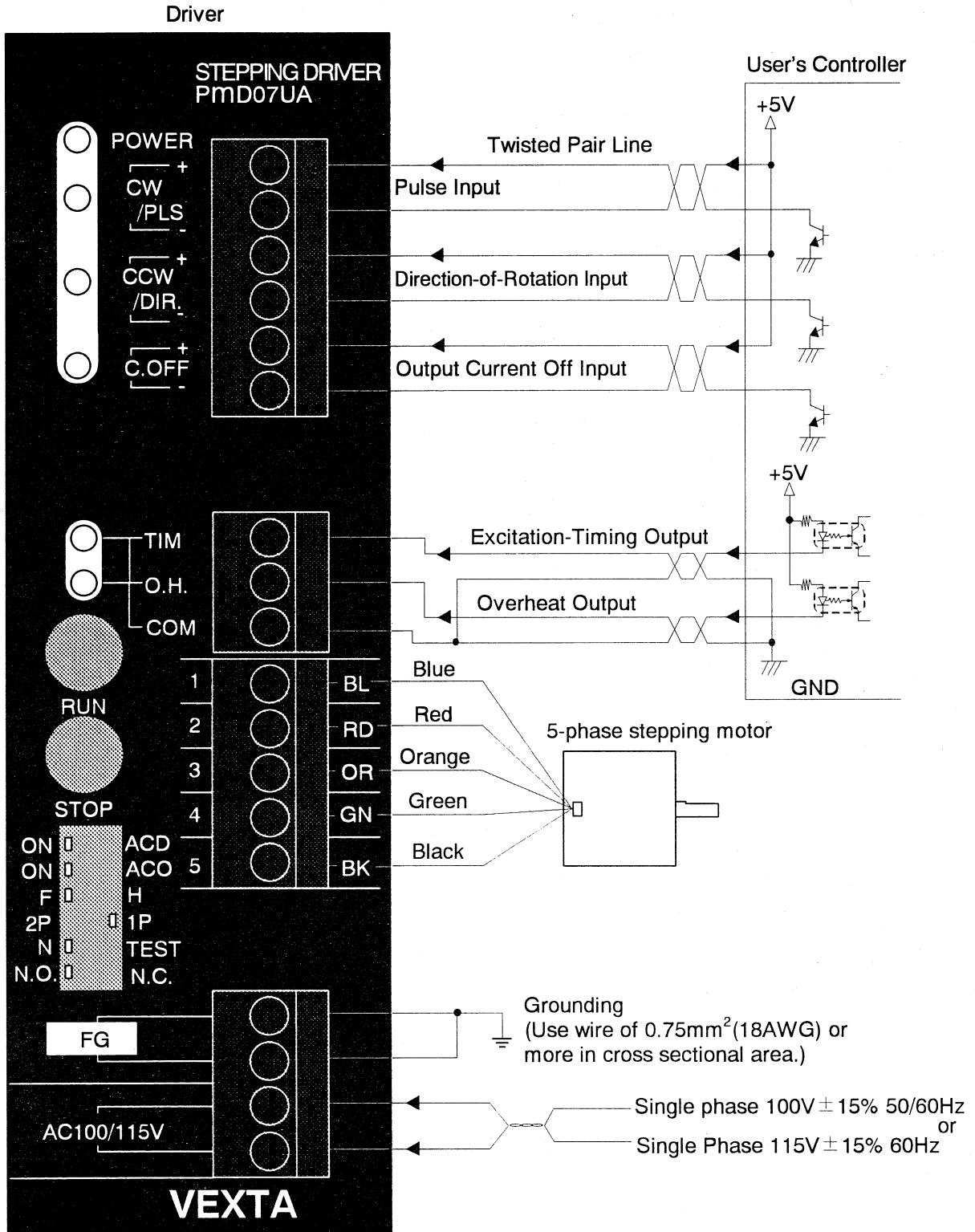
- If the noise generated from the motor lead wires should cause a problem, shield the motor lead wires with conductivity tape or wire mesh.



Notes:

- Use twisted-pair wire of 1m (39.4") or less in length for the signal lines.
- Use wire of 0.5mm² (20AWG) or thicker for motor lines and power supply lines, and use 0.75mm² (18AWG) or thicker for the wire for the ground line.
- Signal lines should be kept away at least 30cm (12") from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use an open collector transistor (sink type) at the controller signal output.

Connection Diagram

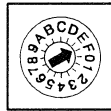


Adjusting the Driver Output Current

Motor operating current

- ① Adjust the motor current with RUN rotary switch. It can be adjusted in the range from 0.21A/phase to 0.75A/phase.
- ② The motor operating current is set for rated current 0.75A / phase when shipping, but it can be readjusted using the RUN rotary switch to lower the operating current in order to suppress temperature rise in the motor / driver, or lower operating current in order to allow a margin for motor torque or to suppress vibration.

Following table shows operating current values against the RUN rotary switch position.

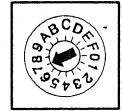


Operating Current against RUN Rotary Switch Position (Representative values)

RUN Rotary Switch Position	Operating Current [A/phase]
0	0.21
1	0.25
2	0.28
3	0.32
4	0.36
5	0.39
6	0.43
7	0.46
8	0.50
9	0.54
A	0.57
B	0.61
C	0.64
D	0.68
E	0.72
F	0.75

Current down at motor standstill

- ① Use the STOP rotary switch to adjust the current when the motor is stopped.
- ② When shipping, the current down is set for 43% (0.32A/phase). The rotary switch can be used to readjust the current at motor standstill, to reduce the temperature rise of the motor and the driver.



Rate of Current Down against STOP Rotary Switch Position (Representative values)

STOP Rotary Switch	Rate of current down [%]
0	10
1	10
2	10
3	15
4	23
5	29
6	37
7	43
8	51
9	57
A	65
B	72
C	79
D	86
E	93
F	100

Troubleshooting

When your stepping motor is not operating properly, identify the problem using the table below and then take the measures described therein.

If that does not solve the problem, inquire at your nearest sales office.

Note:

- Do not take the motor apart. The motor may not perform as indicated in the specifications after reassembling.

Problem	Things to Check	Possible Solution
The motor doesn't have any holding torque. (The shaft can be easily turned by hand.)	<p>(1) Is the driver's power indicator on? (It should be on.)</p> <p>(2) Is the driver's C.OFF indicator off? (It should be off.)</p> <p>(3) Is the driver's O.H. indicator off? (It should off.)</p> <p>(4) Have the driver, motor, and power supply been connected correctly and securely?</p> <p>(5) Have the driver's RUN and STOP rotary switches been turned down too far?</p>	<ul style="list-style-type: none"> • If it is not on, check the power connection voltage, and then recheck to see if the power indicator is on. • When the output current off signal has been input, the C.OFF indicator is illuminated and the motor ceases to be excited (has no holding torque). • The O.H. indicator is illuminated when the driver's overheat protection function has been activated (see page 15). When the automatic current off function switch is in the "ACO" position, the motor ceases to be excited (has no holding torque). • Check the wiring configuration. If the lead wires have been extended, check the connection. • The problem lies in the rotary switch for adjusting the output current to the motor (see page 19). If it is turned down too far, turn it back to the factory setting and then recheck.
<p>If the motor fails to return to normal even after checking all of the above, the problem could be that the driver is damaged. If that appears to be the case, have the unit repaired after checking the power supply voltage and connections once again.</p>		
The motor doesn't move.	<ul style="list-style-type: none"> • Begin by checking items (1), (2), (3), (4) and (5). 	
The motor doesn't move even after a pulse signal is input.	<p>(6) After input of the pulse signal, are the driver's CW / PLS or CCW / DIR. indicators illuminated?</p> <p>(7) When using the 1-pulse input mode (when the pulse input switch is set to "1P"), has the pulse signal been miswired to the CCW / DIR. terminal?</p> <p>(8) When using the 2-pulse input mode (when the pulse input switch is set to "2P"), are the CW / PLS and CCW / DIR. indicators illuminated simultaneously?</p>	<ul style="list-style-type: none"> • If neither the CW / PLS nor the CCW / DIR. indicators are illuminated, check the connections and the pulse signal's voltage and waveform (see page 12). • Connect the pulse signal to the CW / PLS terminal. • When a pulse is being input, the motor will not operate if the other pulse input terminal is at the "L" level. Be sure to set the other terminal to the "H" level.
The motor rotates in the opposite direction as the CW/CCW pulse signal (or direction signal).	<p>(9) When using the 1-pulse input mode (when the pulse input mode switch is set to "1P"), input a pulse signal to the CW / PLS terminal without making any connections to the CCW / DIR. terminal.</p> <p>(10) When using the 2-pulse input mode (when the pulse input mode switch is set to "2P"), have the CW / PLS and CCW / DIR. pulse signals been connected in reverse?</p>	<ul style="list-style-type: none"> • If the motor then rotates in the CCW / DIR. the motor and driver are functioning properly. Check the level of the direction of rotation signal once again. (The correct configuration is "L"= CW / PLS, "H"= CCW / DIR.). • Connect the CW pulse to the CW / PLS terminal and the CCW pulse to the CCW / DIR. terminal.

Problem	Things to Check	Possible Solution
The motor isn't operating properly. Start-up is irregular.	<ul style="list-style-type: none"> • Begin by checking items (4), (5), and (6). <p>(11) In 2-pulse input mode (pulse input mode select switch set to 2P): Are the driver's CW/PLS indicator and CCW/DIR. line both illuminated at the same time?</p> <p>(12) Are the motor and load accurately centered? Is the load too large?</p>	<ul style="list-style-type: none"> • The motor will run irregularly if two pulses are input at the same time. • Reduce the load on the motor at start-up by aligning the motor and load shaft centers, reducing static friction load, etc.
The motor doesn't move enough. The motor moves too much.	<p>(13) Is the actual motor step angle the same as the motor step angle required by the device? (Full / Half step)</p> <p>(14) Is the number of pulses sent to the driver what you expect? Check your controller settings.</p>	<ul style="list-style-type: none"> • Check the driver's step angle select switch setting. • Check the setting on the controller.
The motor loses synchronism during acceleration (or operation).	<p>(15) Begin by checking item (3).</p> <p>(16) Is the start pulse rate too high?</p> <p>(17) Is the acceleration time too short?</p> <p>(18) Is external noise having an effect?</p>	<ul style="list-style-type: none"> • Reduce it, and then check. • Extend it, and then check. • Turn off any devices thought to be possible sources of noise, and check the motor when it is operating alone.
There is too much vibration.	<p>(19) There may be excessive torque.</p> <p>(20) Try changing the pulse rate.</p>	<ul style="list-style-type: none"> • Try lowering the motor's running current. • If changing the pulse rate reduces vibration, the source may be motor resonance. Try changing the pulse rate or the step angle. • Try installing a clean damper (double-shaft motors only).
The motor is too hot. [Temperature of the motor case must be less than 100°C(212°F)]	<p>(21) The motor is running too long.</p> <p>(22) Try changing the pulse rate.</p> <p>(23) Is the pulse indicator OFF after the pulse signals are complete?</p> <p>(24) Is the STOP rotary switch readjusted at the position "8" or more.</p>	<ul style="list-style-type: none"> • Shorten running time or extend at rest break time. • The motor's temperature rise varies depending on the pulse rate. Refer to the speed-input current characteristics in the catalog, and operate at a lower input speed. • When the pulse indicator is ON (light on), the pulse signal is held at the "L" level and the motor current is not reduced. Always return it to the "H" level. • Refer to P29, and readjust to the position "7" or less.

Specifications

Motor

Package model	Single shaft	PMU33AH3	PMU35AH3
	Double shaft	PMU33BH3	PMU35BH3
Motor model	Single shaft	PMM33AH2	PMM35AH2
	Double shaft	PMM33BH2	PMM35BH2
Max. holding torque	N·m (oz·in)	0.033 (4.6)	0.06 (8.3)
Rotor inertia	kg·m ² (oz·in ²)	9×10 ⁻⁷ (0.05)	18×10 ⁻⁷ (0.10)
Rated current	A/phase		0.75
Mass	kg (lbs.)	0.1(0.22)	0.17(0.37)
Step angle		0.72°	
Insulation resistance	100MΩ or more under normal ambient temperature and humidity when the megger reading between the motor coil and the case is DC 500 V.		
Dielectric strength	Sufficient to withstand 0.5 kV at 50 / 60 Hz applied between the motor coil and case for one minute under normal ambient temperature and humidity.		
Insulation class	Class B (130°C)		
Ambient temperature	-10°C ~ +50°C (14°F ~ +122°F)		

Notes:

- Max. holding torque refers to the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation). Use this value to compare motor torque performance. When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces max. holding torque by approximately 40%.

Driver

Driver model	PMD07UA		
Driving mode	Constant current chopper drive		
Driving motor current	0.75A / phase max.		
Excitation mode	Full step: 0.72° / step (4-phase excitation) Half step: 0.36° / step (4-5-phase excitation)		
Input signal circuit	Photo-coupler input, input impedance: 220 Ω, input current 20mA max. H: +4 ~ +5 V, L: 0 ~ +0.5 V		
Pulse input	Operation command (Clockwise rotation command at 2-pulse input mode) Pulse width: 5 μs min., Pulse rise / pulse fall time: 2 μs max. Motor moves at pulse rising edge. (Negative logic pulse input)		
Rotational direction input (2-pulse input mode)	Directional command, H: CCW, L: CW (Counterclockwise rotation command at 2-pulse input mode) Pulse width: 5 μs min., pulse rise / pulse fall time: 2 μs max. Motor moves at pulse rising edge. (Negative logic pulse input)		
Output-current-off input	At "L" level, the current to the motor is cut off and the shaft can be rotated by hand. At "H" level, the current set by RUN potentiometer is supplied to the motor.		
Output signal circuit	Photo-coupler open-collector output (Emitter common) External equipment requirements: 24V DC max., 10 mA max.		
Excitation-timing output	Signal is output at every time the excitation sequence returns to step "0" (Photo-coupler is ON). Full step: signal is output every 10 pulses, half step: signal is output every 20 pulses.		
Overheat output	Signal is output when the temperature of the driver inside becomes extremely high (photo-coupler is ON, automatically returns). The motor comes to a natural stop by automatic output-current-off function. Output logic of photo-coupler can be delectable by overheat output logic switch.		
Functions	automatic output-current-off, self-inspection, switching pulse input mode, switching step angle, switching overheat output logic.		
LED indicators	Power, pulse input / CW pulse input, rotational direction input / CCW pulse input, output-current -off input. Excitation-timing output, overheat output.		
Driver cooling method	Natural ventilation		
Power supply voltage	Single-phase 115V ± 15% 60 Hz 1.1 A max. or Single-phase 100V ± 15 % 50 / 60 Hz 1.1 A max.		
Mass	kg (lbs.)	0.47 (1.03)	
Insulation resistance	100 M Ω or more when 500V DC is applied between the following part under normal ambient temperature and humidity. <ul style="list-style-type: none"> • Between the power supply terminals and the case • Between the motor terminals and the case • Between the signal input terminals and the case • Between the power supply terminals and the signal input terminals • Between the motor terminals and the signal input terminals 		
Dielectric strength	Sufficient to withstand 1kV at 50 / 60 Hz applied between the above for 1 minute under normal ambient temperature and humidity.		
Ambient temperature	0°C ~ +50°C (32°F ~ +122°F)		

Note:

- The value for the power supply current is the driver's maximum input current when the motor is under a load. The minimum required value varies within range depending on the type of motor, operating rate, and load.

Geared Motor

Package model	Single shaft	PMU33AH1-MG3.6	PMU33AH1-MG7.2	PMU33AH1-MG10	PMU33AH1-MG20	PMU33AH1-MG30
	Double shaft	PMU33BH1-MG3.6	PMU33BH1-MG7.2	PMU33BH1-MG10	PMU33BH1-MG20	PMU33BH1-MG30

Motor

Geared motor model	Single shaft	PMM33AH-MG3.6	PMM33AH-MG7.2	PMM33AH-MG10	PMM33AH-MG20	PMM33AH-MG30
	Double shaft	PMM33BH-MG3.6	PMM33BH-MG7.2	PMM33BH-MG10	PMM33BH-MG20	PMM33BH-MG30
Permissible Torque	N·m	0.08	0.16	0.21	0.34	0.51
	(oz·in)	(11.3)	(22.7)	(29.7)	(48.1)	(72.2)
Rotor inertia	kg·m ² (oz·in ²)	9×10 ⁻⁷ (0.05)				
Rated current	A/phase	0.75				
Mass	kg (lbs.)	0.16 (0.35)				
Step angle		0.2°	0.1°	0.072°	0.036°	0.024°
Gear ratio		1:3.6	1:7.2	1:10	1:20	1:30
Direction of Motor Shaft		Same	Same	Opposite	Same	Same
Permissible Thrust Load	N(oz)	10(35.3)				
Permissible Overhang Load	N(oz)	15(53.0)				
Speed range (Speed of output shaft)	Full step	25000Hz 833r/min.	25000Hz 416r/min.	25000Hz 300r/min.	25000Hz 150r/min.	25000Hz 100r/min.
	Half step	50000Hz 833r/min.	50000Hz 416r/min.	50000Hz 300r/min.	50000Hz 150r/min.	50000Hz 100r/min.
Insulation resistance		100 MΩ or more under normal ambient temperature and humidity when the megger reading between the motor coil and the case is DC 500 V.				
Dielectric strength		Sufficient to withstand 0.5 kV at 50 / 60 Hz applied between the motor coil and case for one minute under normal ambient temperature and humidity.				
Insulation class		Class B (130°C)				
Ambient temperature		-10°C ~ +50°C (14°F ~ +122°F)				

Driver

Driver model	PMD07UA
Driving mode	Constant current chopper drive
Driving motor current	0.75A / phase max.
Excitation mode	Full step: 0.72° / step (4-phase excitation) Half step: 0.36° / step (4-5-phase excitation)
Input signal circuit	Photo-coupler input, input impedance: 220 Ω, input current 20mA max. H: +4 ~ +5 V, L: 0 ~ +0.5 V
Pulse input	Operation command (Clockwise rotation command at 2-pulse input mode) Pulse width: 5 μs min., Pulse rise / pulse fall time: 2 μs max. Motor moves at pulse rising edge. (Negative logic pulse input)
Rotational direction input (2-pulse input mode)	Directional command, H: CCW, L: CW (Counterclockwise rotation command at 2-pulse input mode) Pulse width: 5 μs min., pulse rise / pulse fall time: 2 μs max. Motor moves at pulse rising edge. (Negative logic pulse input)
Output-current-off input	At "L" level, the current to the motor is cut off and the shaft can be rotated by hand. At "H" level, the current set by RUN potentiometer is supplied to the motor.
Output signal circuit	Photo-coupler open-collector output (Emitter common) External equipment requirements: 24V DC max., 10 mA max.
Excitation-timing output	Signal is output at every time the excitation sequence returns to step "0" (Photo-coupler is ON). Full step: signal is output every 10 pulses, half step: signal is output every 20 pulses.
Overheat output	Signal is output when the temperature of the driver inside becomes extremely high (photo-coupler is ON, automatically returns). The motor comes to a natural stop by automatic output-current-off function. Output logic of photo-coupler can be detectable by overheat output logic switch.
Functions	automatic output-current-off, self-inspection, switching pulse input mode, switching step angle, switching overheat output logic.
LED indicators	Power, pulse input / CW pulse input, rotational direction input / CCW pulse input, output-current-off input. Excitation-timing output, overheat output.
Driver cooling method	Natural ventilation
Power supply voltage	Single-phase 115V ± 15% 60 Hz 1.1 A max. or Single-phase 100V ± 15% 50 / 60 Hz 1.1 A max.
Mass kg(lbs.)	0.47 (1.03)
Insulation resistance	100 MΩ or more when 500V DC is applied between the following part under normal ambient temperature and humidity. <ul style="list-style-type: none"> Between the power supply terminals and the case Between the motor terminals and the case Between the signal input terminals and the case Between the power supply terminals and the signal input terminals Between the motor terminals and the signal input terminals
Dielectric strength	Sufficient to withstand 1kV at 50 / 60 Hz applied between the above for 1 minute under normal ambient temperature and humidity.
Ambient temperature	0°C ~ +50°C(32°F ~ +122°F)

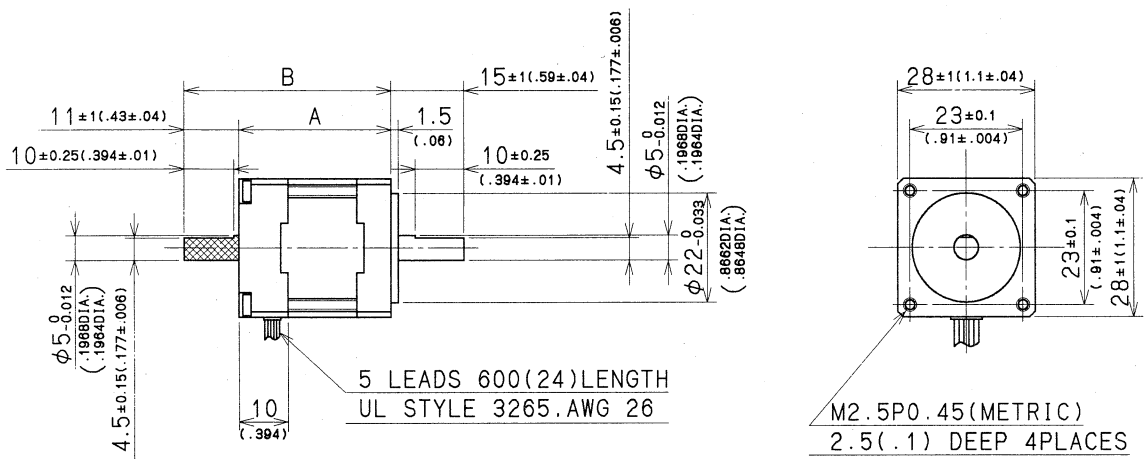
Note:

- The value for the power supply current is the driver's maximum input current when the motor is under a load. The minimum required value varies within range depending on the type of motor, operating rate, and load.

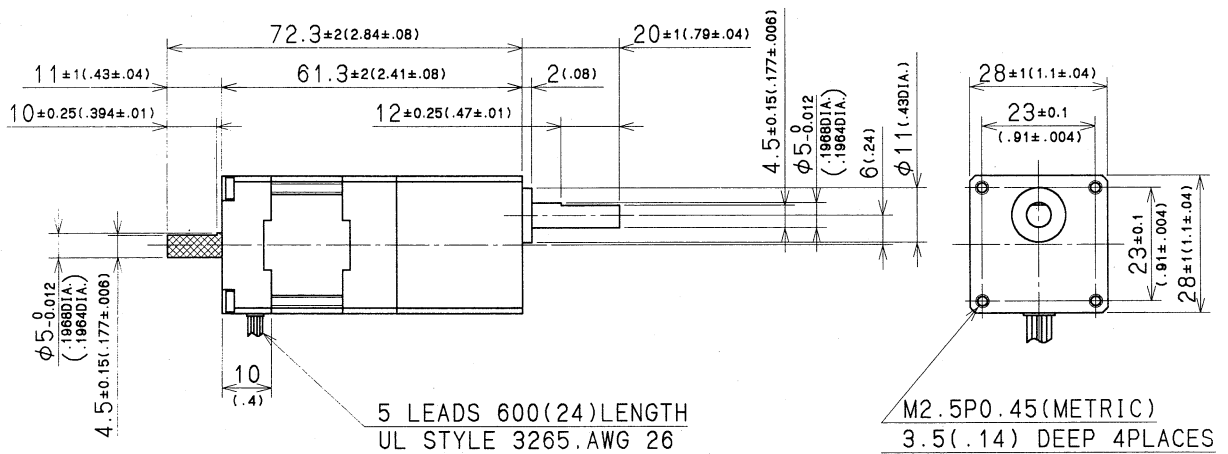
Dimensions

Motor unit: mm(inch)
PMU3□A(B)H3

Package model Single shaft Double shaft	Motor model Single shaft Double shaft	Dimension A mm(inch)	Dimension B mm(inch)
PMU33AH3	PMM33AH2	31 ± 1 (1.22 ± 0.04)	-
PMU33BH3	PMM33BH2	31 ± 1 (1.22 ± 0.04)	42 ± 2 (1.65 ± 0.08)
PMU35AH3	PMM35AH2	50.5 ± 1 (1.99 ± 0.04)	-
PMU35BH3	PMM35BH2	50.5 ± 1 (1.99 ± 0.04)	61.5 ± 2 (2.42 ± 0.08)



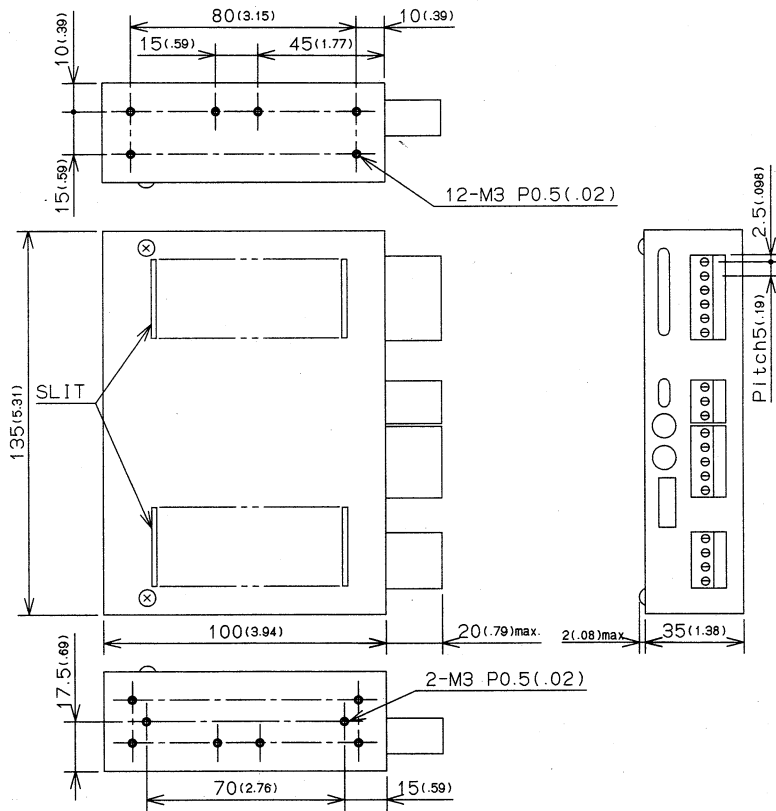
PMU33A(B)H1-MG□



WIPING DIAGRAM

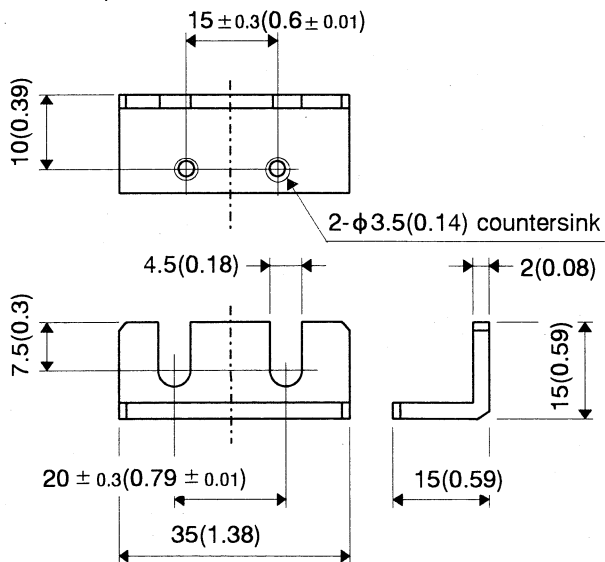
Note:  Shaded areas indicate double shaft models only.

Driver unit: mm(inch)
PMD07UA

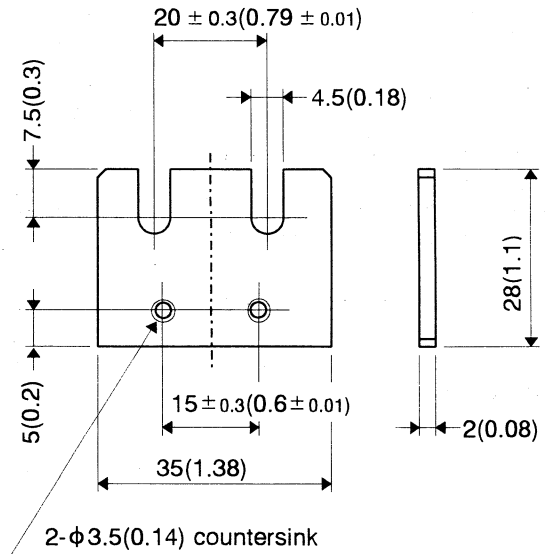


Mounting bracket unit: mm(inch)

Mounting bracket A



Mounting bracket B



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