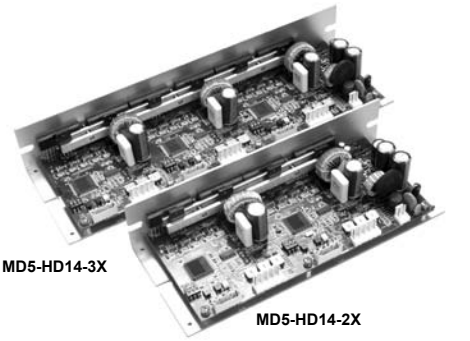
# Low noise, low vibration multi axis 5-phase stepper motor driver

## ▣ Features

- **Simultaneous operation of 2, 3-axis by single 20-35VDC.**
- Small, light weight and advanced quality by custom IC and surface mounted circuit
- Realizing low noise, low vibration rotation with microstep-driving
- Low speed rotation and high accuracy controlling with microstep-driving
- Max. resolution - 250 division : In case of 5-phase stepper motor of which basic step angle is 0.72 , it enables to control up to 0.00288 per pulse and it requires 125,000 pulses per rotation.
- Includes auto current down and self-diagnosis function
- Photocoupler input insulation method to minimize the effects from external noise.




**Please read "Caution for your safety" in operation manual before using.**

## ▣ Ordering information

**MD 5 – H D 14 – 2X**

| | | |
|---|---|---|
| Item | MD | Motor Driver |
| Motor phase | 5 | 5-Phase |
| Step type (Resolution) | H | Micro step(250divisions) |
| Power supply | D | 20-35VDC |
| RUN current | 14 | 1.4A/Phase |
| Axis | 2X | 2-Axis |
| | 3X | 3-Axis |

※Bulit-in zero point excitation output signal is optional.

## ▣ Specifications

| Model | | MD5-HD14-2X | MD5-HD14-3X |
|---|---|---|---|
| Power supply | | 20-35VDC 5A Max.(-10%, +20%)※1 | 20-35VDC 7A Max.(-10%, +20%) |
| RUN current | | 0.4 ~ 1.4A / Phase | |
| RUN method | | Bipolar constant current pentagon drive | |
| Basic step angle | | 0.72°/ 1Step | |
| Resolution | | 1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 125, 200, 250 division<br>(0.72°to 0.00288°/ 1Step) | |
| Input pulse width | | Min. 0.5μs | |
| Pulse duty | | 50% | |
| Rising/Falling time | | Max. each 120ns | |
| Max. input pulse frequency | | 1MHz | |
| Input voltage level | | High : 4-8VDC, Low : 0-0.5VDC | |
| Input resistance | | 270Ω(CW, CCW). 390Ω(HOLD OFF) | |
| Environ-ment | Ambient temperature | 0 to 40℃, storage: -20 to 60℃ | |
| | Ambient humidity | 30 to 85%RH, storage: 30 to 85%RH | |
| Approval | | CE | |
| Unit weight | | Approx. 292g | Approx. 411g |

※1: When using over 30VDC, it should be mounted at ventilated place due to increasing heat.
※Environment resistance is rated at no freezing of condensation.

## ◎ Function selection switch


| NO | Name | Function | Switch position | |
|---|---|---|---|---|
| | | | ON | OFF |
| 1 | TEST | Self-diagnosis | Rotate in 30rpm | Not using |
| 2 | 1/2 CLK | Pulse input method | 1 Pulse input | 2 Pulse input |
| 3 | C/D | Auto current down | Not using | Using |

**● TEST**

※Self-diagnosis function is to test motors and drivers.
※Motors rotate with 30 rpm in full-step. Motor rotation speed is subject to change depending on resolution setting.
※Rotation speed = 30 rpm / resolution
※The motor will rotate in CCW direction when in 1-pulse input mode and in CW direction when in 2-pulse input mode.
Note) Make sure that TEST switch is set to OFF before supplying the power.
It may cause injury or danger if TEST switch is set to ON when power is supplied.

**● 1/2 CLK**

※1/2 CLK switch is to select pulse input mode.
※1-pulse input mode : CW → operation command pulse input, CCW → rotation direction pulse input
([H]: CW rotation, [L]: CCW rotation)
※2 Pulse input mode : CW → CW direction rotation pulse input, CCW → CCW direction rotation pulse input

**●C/D (Auto current down)**

※This function is reducing current automatically according to STOP current setting value in order to suppress generated heat when motor is stop.
※After inputting the last pulse, current is decreased after approx. 500ms.

## ◎ RUN current setting

| Switch No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current (A/Phase) | 0.4 | 0.5 | 0.57 | 0.63 | 0.71 | 0.77 | 0.84 | 0.9 | 0.96 | 1.02 | 1.09 | 1.15 | 1.22 | 1.27 | 1.33 | 1.4 |

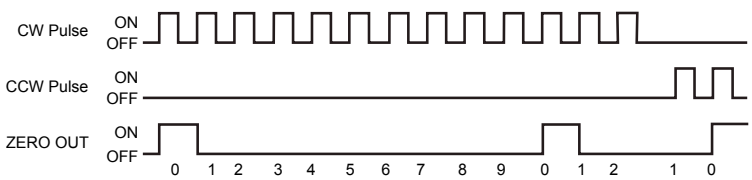
※RUN current is a phase current provided to 5-phase stepper motor.
※Be sure to set RUN current at the rated current or below.
※ Adjust the RUN current in case severe heat generation occurs. Be sure that torque decreasing may occur when adjusting the current.
Note)Be sure to adjust RUN current while motor is running.

## ◎ STOP current setting

| Switch No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | 27 | 31 | 36 | 40 | 45 | 50 | 54 | 58 | 62 | 66 | 70 | 74 | 78 | 82 | 86 | 90 |

※STOP current is a phase current provided to 5-phase stepper motor at standstill.
※It will be activated when C/D (Auto current down) is set to ON. By setting STOP current, it is possible to suppress the heat generation at motor standstill.
※STOP current setting value is the ratio of RUN current setting value (%).
Ex) In case RUN current setting value is set to 1.4A and STOP current setting value is set to 50%, auto current down current is set to 0.7A
※STOP current setting value may have some deviation depending on resistance impedance of motor.
※Auto current down function will be activated when HOLD OFF signal is [L]. When HOLD OFF signal is [H], the function is not activated since the current provided to each phase is cut off.
Note) Be sure to adjust STOP current while motor is at standstill.

## ◎ Zero point excitation output signal (ZERO OUT)[※Option]




※The signal is output to indicate when the motor excitation status is in the initial stage. / Used to check the rotation position of motor's axis
※In case of full step, the signal is output every 7.2°. (50 times / rotation)
EX) Full step (0.72°/Step): Signal is output every 10 pulses
20 divisions (0.036°/Step): Signal is output every 200 pulses.

### ◎ HOLD OFF function

※When HOLD OFF input signal is [H], motor excitation is released.
When HOLD OFF input signal is [L], motor excitation is in a normal status.
※A function used to rotate motor's axis using external force or used for manual positioning.
※HOLD OFF Input signal [H] and [L] represent Photocoupler ON/OFF in a circuit.
※Please do not use for stopping motor.

### ◎ Setting microstep(Microstep : Resolution)

| Switch No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Resolution | 1 | 2 | 4 | 5 | 8 | 10 | 16 | 20 | 25 | 40 | 50 | 80 | 100 | 125 | 200 | 250 |
| Step angle | 0.72° | 0.36° | 0.18° | 0.144° | 0.09° | 0.072° | 0.045° | 0.036° | 0.0288° | 0.018° | 0.0144° | 0.009° | 0.0072° | 0.00576° | 0.0036° | 0.00288° |

**● Resolution setting(Same as MS1, MS2)**

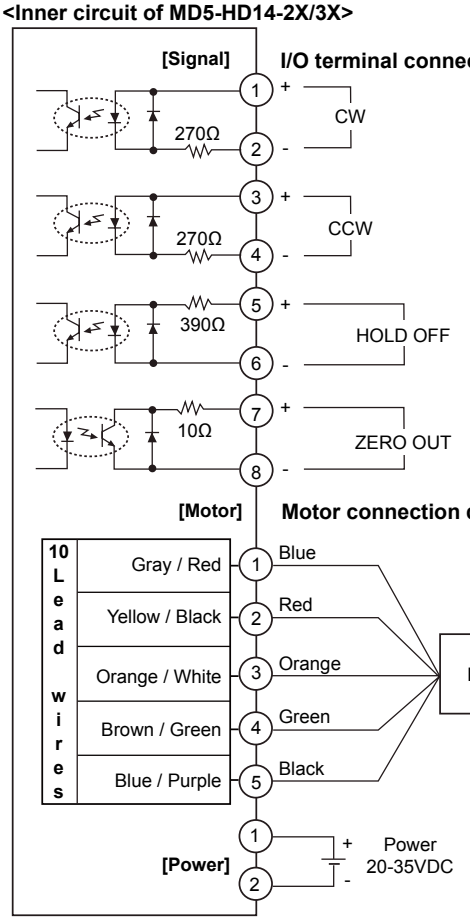
※Microstep is to make basic step angle of 5-phase motors (0.72°) divided into smaller angle according to setting values.
※The formula for microstep angle is ;

$$\text{Motor revolution angle (5-phase motors)} = \frac{\text{Basic step angle}(0.72°)}{\text{Resolution}}$$

※In case of geared motors, step angle shall be determined by dividing step angle by gear ratio.
EX) 0.72˚/ 10 (1:10) = 0.072˚
※It may cause step-out if resolution is changed while motor is running.

## ■ Input·Output diagram

**<Inner circuit of MD5-HD14-2X/3X>**




※CW
2-pulse input mode - CW direction rotation pulse input
1-pulse input mode - Operation command pulse input

※CCW
2-pulse input mode - CCW direction rotation pulse input
1-pulse input mode - Rotation direction pulse input
[H] : CW, [L] : CCW

※HOLD OFF
Motor excitation OFF control signal [H] Motor excitation OFF

※ZERO OUT [※Option]
Zero point excitation output signal ON for zero point excitation

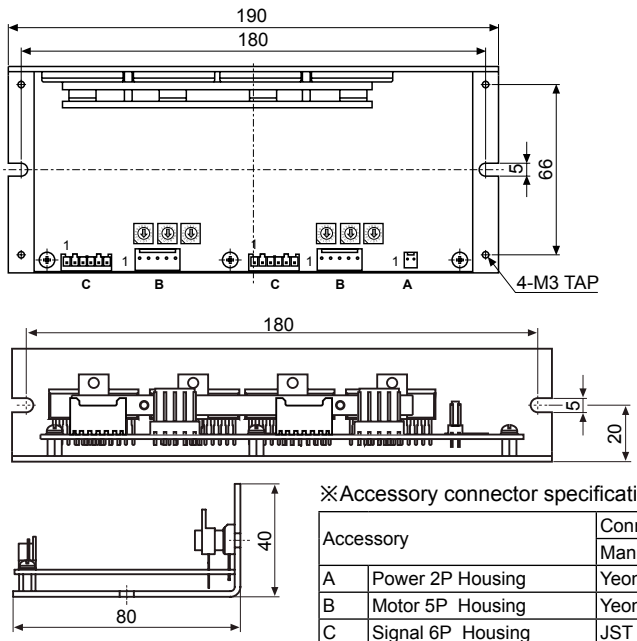
※Please refer to Q-37 for standard wiring.

**Note)** Add external resistance when power for pulse from the external of the unit exceeds +5V. (Input current:10 to 20mA)
**Note)** 2/3-axis use power supply in common and input/output terminals are proportional to the number of axises of mode.

## ▣ Dimensions

(unit: mm)

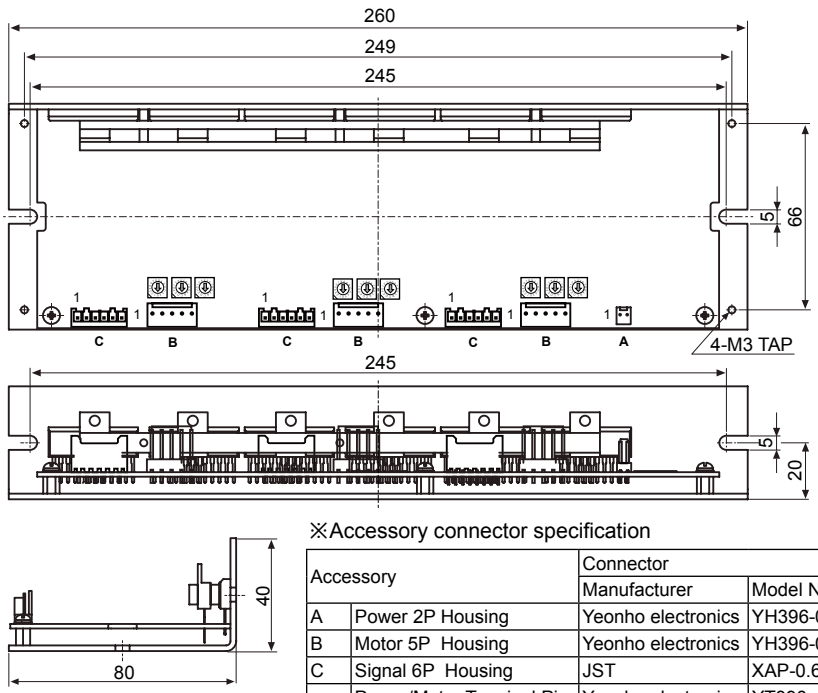
### ◎ MD5-HD14-2X




※Accessory connector specification

| Accessory | | Connector | | Qty |
|---|---|---|---|---|
| | | Manufacturer | Model No. | |
| A | Power 2P Housing | Yeonho electronics | YH396-02V | 1 |
| B | Motor 5P Housing | Yeonho electronics | YH396-05V | 2 |
| C | Signal 6P Housing | JST | XAP-0.6V-1 | 2 |
| — | Power/Motor Terminal Pin | Yeonho electronics | YT396 | 12 |
| — | Signal Terminal Pin | JST | SXA -001T-P0.6 | 12 |

### ◎ MD5-HD14-3X

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| B | Motor 5P Housing | Yeonho electronics | YH396-05V | 3 |
| C | Signal 6P Housing | JST | XAP-0.6V-1 | 3 |
| — | Power/Motor Terminal Pin | Yeonho electronics | YT396 | 17 |
| — | Signal Terminal Pin | JST | SXA -001T-P0.6 | 18 |