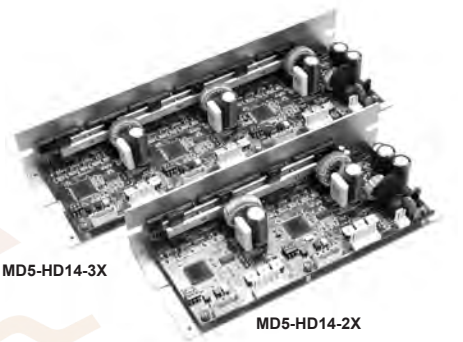
MD5-HD14-2X, 3X

Low Noise, Low Vibration Multi Axis 5-Phase Stepper Motor Driver

▣ Features

- **Simultaneous operation of 2, 3-axis by single power supply 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
- Includes auto current down and self-diagnosis function
- Photocoupler input insulation method to minimize the effects from external noise



MD5-HD14-3X

MD5-HD14-2X

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

▣ Ordering Information

MD 5 – H D 14 – 2X

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

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

▣ Specifications

Model		MD5-HD14-2X	MD5-HD14-3X
Power supply※1		20-35VDC	
Allowable voltage range		90 to 110% of the rated voltage	
Max. current consumption※2		5A	7A
RUN current※3		0.4-1.4A/Phase	
STOP current		27 to 90% of RUN current (set by STOP current switch)	
Drive method		Bipolar constant current pentagon drive	
Basic step angle		0.72°/Step	
Resolution		1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 125, 200, 250-division (0.72° to 0.00288°/Step)	
Input pulse characteristic	Pulse width	Min. 1μs (CW, CW), Min. 1ms (HOLD OFF)	
	Duty rate	50% (CW, CCW)	
	Rising/Falling time	Below 130ns (CW, CW)	
	Pulse input voltage	[H]: 4-8VDC, [L]: 0-0.5VDC	
	Pulse input current	7.5-14mA(CW, CCW),10-16mA(HOLD OFF, ZERO OUT)	
	Max. input pulse frequency※4	Max. 500kHz (CW, CCW)	
Input resistance		270Ω(CW, CCW), 390Ω(HOLD OFF), 10Ω(ZERO OUT)	
Insulation resistance		Over. 100MΩ (at 500VDC megger, between all terminals and case)	
Dielectric strength		1,000VAC 50/60Hz for 1min.(between all terminals and case)	
Noise resistance		±500V the square wave noise (pulse width: 1μs) by the noise simulator	
Vibration	Mechanical	1.5mm amplitude at frequency of 5 to 60Hz(for 1 min.) in each X, Y, Z direction for 2 hours	
	Malfunction	1.5mm amplitude at frequency of 5 to 60Hz(for 1 min.) in each X, Y, Z direction for 10 min.	
Environment	Ambient temp.	0 to 40℃, Storage: -10 to 60℃	
	Ambient humi.	35 to 85%RH, Storage: 35 to 85%RH	
Approval		CE	
Weight※5		Approx. 446g (approx. 292g)	Approx. 597g (approx. 411g)

※1: When using over 30VDC power supply, torque characteristics are improved but the driver temperature raise. The unit should be installed at the well ventilation environment.
※2: Based on ambient temperature 25℃, ambient humidity 55%RH.
※3: RUN current varies depending on the input RUN frequency and max. RUN current at the moment varies also varies depending on the load.
※4: Max. input pulse frequency is max. frequency to be input and is not same as max. pull-out frequency or max. slewing frequency.
※5: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

◎ Function selection DIP switch

No	Name	Function	Switch position	
			ON	OFF (default)
1	TEST	Self diagnosis function	30rpm rotation	Not use
2	1/2 CLK	Pulse input method	1-pulse input method	2-pulse input method
3	C/D	Auto Current Down	Not use	Use

● TEST

- Self diagnosis function is for motor and driver test.
- This function makes the motor rotate with 30rpm in full step. Rotation speed varies with resolution settings.
- Rotation speed = 30rpm/resolution
- In 1-pulse input method, it rotates to CCW, and in 2-pulse input method, it rotates to CW.

※Be sure that the TEST switch is OFF before supplying the power.
If the TEST switch is ON, the motor operates immediately and it may be dangerous.

● 1/2 CLK

- 1/2 CLK switch is to select pulse input method.
- 1-pulse input method: CW → operating rotation signal input, CCW → rotation direction signal input ([H]: CW, [L]: CCW)
- 2-pulse input method: CW → CW rotation signal input, CCW → CCW rotation signal input.

● C/D (auto current down)

- This function is to reduce the current provided for motor automatically for preventing severe motor's heat when motor stops.
- If motor RUN pulse is not applied, the current provided for motor reduces as the set STOP current.

※Be sure that when motor RUN current is reduced, the stop torque of motor also reduced.
※Set the STOP current by the STOP current switch.

◎ Setting RUN current

S/W No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Current (A/Phase)	1.14	1.25	1.36	1.50	1.63	1.74	1.86	1.97	2.10	2.20	2.30	2.40	2.50	2.60	2.78	2.88

- RUN current setting is for the current provided for motor when the motor runs.

※When RUN current is increased, RUN torque of the motor is also increased.
※When RUN current is set too high, the heat is severe.
※Set RUN current within the range of motor's rated current according to its load.
※Change RUN current only when the motor stops.

◎ Setting STOP current

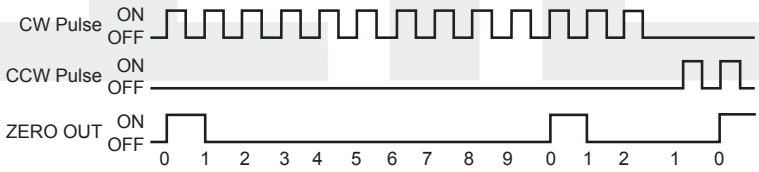
S/W No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
%	27	31	36	40	45	50	54	58	62	66	70	74	78	82	86	90

- STOP current setting is for the current provided for motor when the motor stops for preventing severe motor's heat.
- This setting is applied when using C/D(Current down) function.
- Setting value of STOP current is percentage (%) ratio of the set RUN current.

E.g.) Set RUN current as 1.4A and STOP current as 40%.
STOP current is set as 1.4A×0.4=0.56A

※When STOP current is decreased, STOP torque of the motor is also decreased.
※When STOP current is set too low, the heat is lower.
※Change STOP current only when the motor stops.

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



- This output indicates the initial step of excitation order of stepping motor and rotation position of motor axis .
- This signal outputs every 7.2° of rotation of the motor axis regardless of resolution.
(50 outputs per 1 rotation of the motor.)
E.g.) Full step: outputs one time by 10 pulses input, 20-division: outputs one time by 200 pulses input.

◎ HOLD OFF function

- This signal is for rotating motor's axis using external force or used for manual positioning.
- When hold off signal maintains over 1ms as [H], motor excitation is released.
- When hold off signal maintains over 1ms as [L], motor excitation is in a normal status.

※Must stop the motor for using this function.
※Refer to ▣ I/O Circuit and Connections.

◎ Setting microstep (Microstep: Resolution)

S/W 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°

● Setting resolution (MS1)

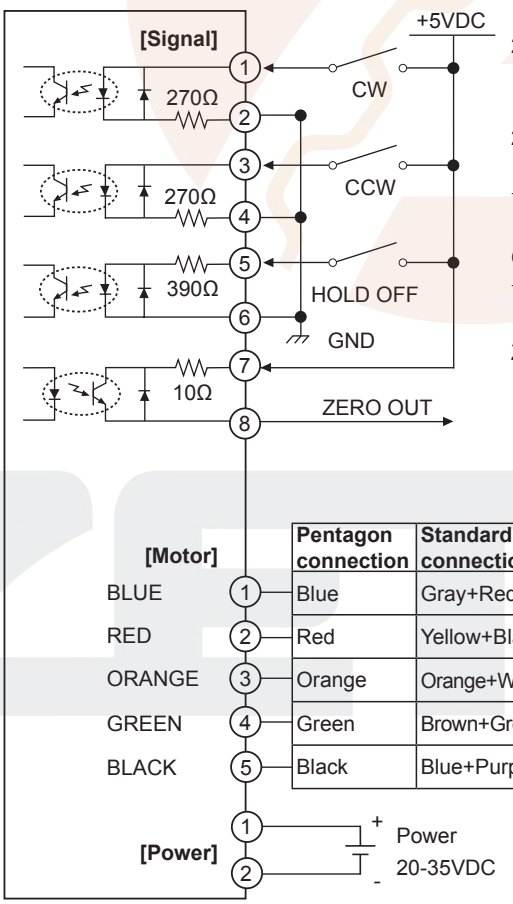
- The set step angle is dividing basic step angle(0.72°) of 5-phase stepping motor by setting value.
- The calculation formula of divided step angle is as below.

$$\text{Set step angle} = \frac{\text{Basic step angle(0.72°)}}{\text{Resolution}}$$

- When using geared type motor, the angle is step angle divided by gear ratio.
  Step angle / gear ratio = Step angle applied gear
  E.g) 0.72° / 10(1:10) = 0.072°

※Must stop the motor before changing the resolution.

▣ I/O Circuit and Connections



Pentagon connection	Standard connection
Blue	Gray+Red
Red	Yellow+Black
Orange	Orange+White
Green	Brown+Green
Black	Blue+Purple

※CW
2-pulse input method (CW rotation signal input)
1-pulse input method (operating rotation signal input)

※CCW
2-pulse input method (CCW rotation signal input)
1-pulse input method (rotation direction signal input)
→ [H]: CW, [L]: CCW

※HOLD OFF
Control signal for motor excitation OFF
→ [H]: Motor excitation OFF

※ZERO OUT (Option)
Zero point excitation output signa → Zero point status ON

※If the power for driving pulse from external is over than +5VDC, please connect resistor at the outside. (input voltage max. 24VDC, input current 10-20mA)

※In case of standard connection, refer to Q-55 page.

※This connection cable color is only for Autonics motors.
It may different cable color when using other motors.

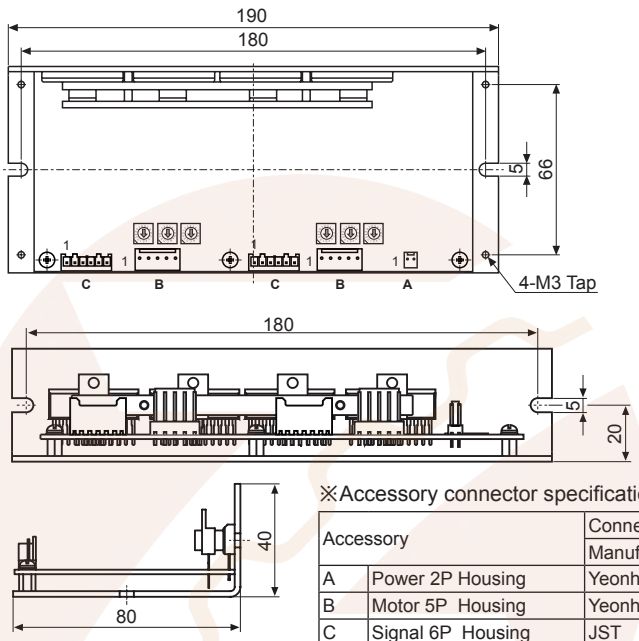
※Power input of 2/3-axis are used as same and I/O terminals are proportional to the number of axes.

5-Phase Stepper Motor Driver(1.4A/Phase, DC Power, Multi-Axis)

▣ Dimensions

(unit: mm)

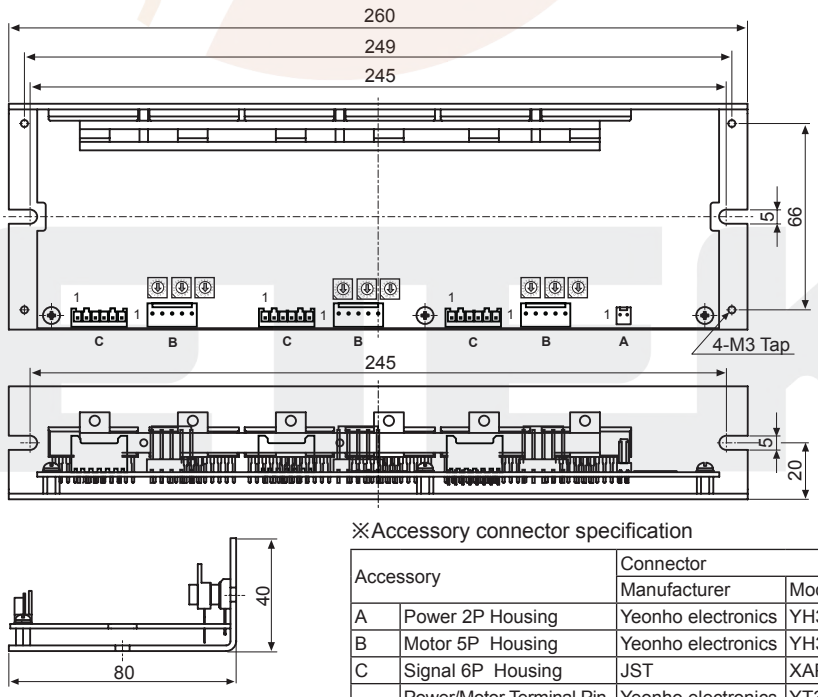
◎ MD5-HD14-2X



※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-06V-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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		Manufacturer	Model No.	
A	Power 2P Housing	Yeonho electronics	YH396-02V	1
B	Motor 5P Housing	Yeonho electronics	YH396-05V	3
C	Signal 6P Housing	JST	XAP-06V-1	3
—	Power/Motor Terminal Pin	Yeonho electronics	YT396	17
—	Signal Terminal Pin	JST	SXA -001T-P0.6	18

▣ Caution During Use

1. For signal input

①Do not input CW, CCW signal at the same time in 2-pulse input method. Failure to follow this instruction may result in malfunction. It may not operate properly if another direction signal is inputted when one of CW or CCW is [H].
②When the signal input voltage is exceeded the rated voltage, connect additional resistance at the outside.

2. For RUN current, STOP current setting

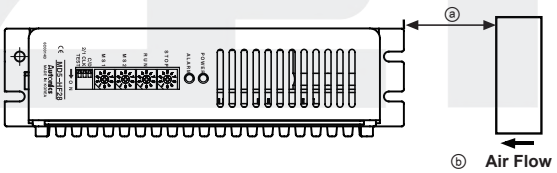
①Set RUN current within the range of motor's rated current. Failure to follow this instruction may result in severe heat of motor or motor damage.
②If motor stops, switching for STOP current executed by the current down function. When hold off signal is [H] or current down function is OFF, the switching does not execute. (except MD5-ND14)
③Use the power for supplying sufficient current to the motor.
④Check the polarity of power before operating the unit. (only for MD5-HD14, HD14-2X/3X, ND14)

3. For cable connection

①Use twisted pair (over 0.2mm^2) for the signal cable which should be shorter than 2m.
②The thickness of cable should be same or thicker than the motor cable's when extending the motor cable.
③Must separate between the signal cable and the power cable over 10cm.

4. For installation

①**The unit must be installed with heat protection. The conditions of ②, ③ should be satisfied. (※MD5-ND14)**
②In order to increase heat protection efficiency of the driver, must install the heat sink close to metal panel and keep it well-ventilated.
③Excessive heat generation may occur on driver. Keep the heat sink under 80℃ when installing the unit. (at over 80℃, forcible cooling shall be required.)
④If the unit is installed in distribution panel, enclosed space or place with heat, it may cause product damage by heat. Install a ventilation. (only for MD5-HF28)
⑤For heat radiation of driver, install a fan as below figure. (distance between the ⓐ fan and the unit: approx. within 70mm, ⓑ min. airflow: 0.71m^3/min at least) (only for MD5-HF28)



5. For using function selection DIP switches

①Be sure that the TEST switch is OFF before supplying the power. If the TEST switch is ON, the motor operates immediately and it may be dangerous. (except MD5-ND14)
②Do not change the pulse input method during the operation. It may cause danger as the revolution way of the motor is changed conversely.

6. This product may be used in the following environments.

① Indoor
② Altitude under 2000m
③ Pollution degree 2
④ Installation category II