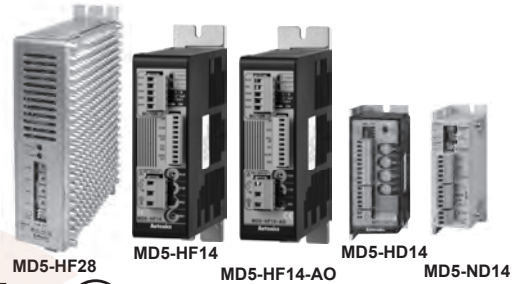


MD5 Series

Small, Light, High Speed & Torque 5-Phase Stepper Motor Driver

Features

- Bipolar constant pentagon drive method
- Includes auto current down and self-diagnosis function
- Low speed rotation and high accuracy controlling with microstep-driving (MD5-HD14, MD5-HF14, MD5-HF14-AO, MD5-HF28)
- [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.]
- Photocoupler input insulation method to minimize the effects from external noise



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



Ordering Information

Item	MD	5	-	H	F	14	-	Output
Output								No mark
								Zero point excitation output*1
RUN current								AO Alarm output
								14 1.4A/Phase
								28 2.8A/Phase
Power supply								D 20-35VDC
								F 100-220VAC 50/60Hz
Step type (Resolution)								H Micro step (250-division)
								N Normal Step
Motor phase								5 5-Phase
Item	MD							Motor Driver

Ⓜ: MD5-HF14
Ⓜ: MD5-ND14

Ⓜ: KR-55MC can be replaced with MD5-HD14.
Ⓜ: KR-5MC can be replaced with MD5-ND14.
Ⓜ: MD5-MF14 can be replaced with MD5-HF14.
Ⓜ: KR-505G can be replaced with MD5-HF28.

*1: Except MD5-ND14

Specifications

Model	MD5-HD14	MD5-HF14	MD5-HF14-AO	MD5-HF28	MD5-ND14	
Power supply	20-35VDC*1	100-220VAC 50/60Hz			20-35VDC*1	
Allowable voltage range	90 to 110% of the rated voltage					
Max. current consumption*2	3A			5A	3A	
RUN current*3	0.4-1.4A/Phase			1.0-2.8A/Phase	0.5-1.5A/Phase	
STOP current	27 to 90% of RUN current (set by STOP current switch)				25 to 75% of RUN current (set by STOP current volume)	
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)				1, 2-division (0.72°, 0.36°/Step)	
Input pulse characteristics	Pulse width	Min. 1μs (CW, CCW), Min. 1ms (HOLD OFF)			Min. 10μs (CW, CCW), Min. 1ms (HOLD OFF)	
	Duty rate	50%(CW, CCW)				
	Rising/Falling time	Below 130ns(CW, CCW)				
	Pulse input voltage	[H]: 4-8VDC, [L]: 0-0.5VDC				
	Pulse input current	7.5-14mA(CW, CCW), 10-16mA(HOLD OFF, DIVISION SELECTION, ZERO OUT)*4				
	Max. input pulse frequency*5	Max. 500kHz(CW, CCW)				Max. 50kHz(CW, CCW)
Input resistance	270Ω(CW, CCW), 390Ω(HOLD OFF, DIVISION SELECTION), 10Ω(ZERO OUT)		270Ω(CW, CCW), 390Ω(HOLD OFF), 10Ω(ALARM)	270Ω(CW, CCW), 390Ω(HOLD OFF, DIVISION SELECTION), 10Ω(ZERO OUT)	390Ω (CW, CCW, HOLD OFF)	
Insulation resistance	Over. 100MΩ (at 500VDC megger, between all terminals and case)					
Dielectric strength	1000VAC 50/60Hz for 1min.(between all terminals and case)					
Noise resistance	±500V the square wave noise (pulse width: 1μs) by the noise simulator		±2000V the square wave noise (pulse width: 1μs) by the noise simulator		±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°C, storage: -10 to 60°C			0 to 40°C, storage: -10 to 60°C	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH				
Approval	CE	CE, C, RU, US	CE	CE	CE, RoHS	
Weight*6	Approx. 327.5g (approx. 220g)	Approx. 840g (approx. 680g)	Approx. 820g (approx. 660g)	Approx. 1.35kg (approx. 1.2kg)	Approx. 183g (approx. 130g)	

*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°C, 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: In case of MD5-HF14-AO, MD5-ND14, there are no DIVISION SELECTION, ZERO OUT function.

*5: Max. input pulse frequency is max. frequency to be input and is not same as max. pull-out frequency or max. slewing frequency.

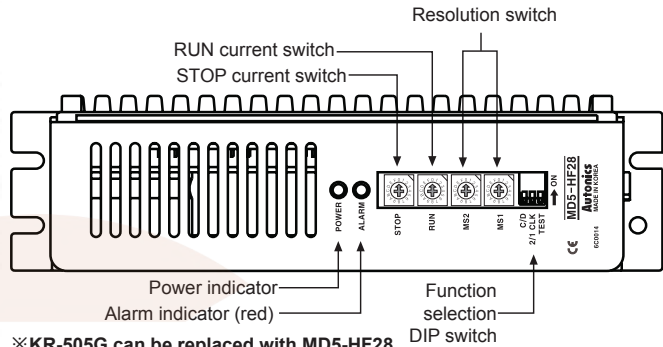
*6: The weight includes packaging. The weight in parentheses is for unit only.

Ⓜ: Environment resistance is rated at no freezing or condensation.

MD5 Series

5-Phase Microstep Motor Driver [MD5-HF28]

Unit Description



※KR-505G can be replaced with MD5-HF28.
 ※Power supply 100-220VAC and socket type wire terminal blocks are upgraded comparing to KR Series.

※Refer to page Q-18 for the specifications.

Function selection DIP switch

No	Name	Function	Switch position	
			ON	OFF (default)
1	TEST	Self diagnosis function	30rpm rotation	Not use
2	2/1 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.

● 2/1 CLK

- 2/1 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 2.5A and STOP current as 40%.
 STOP current is set as 2.5A×0.4=1A

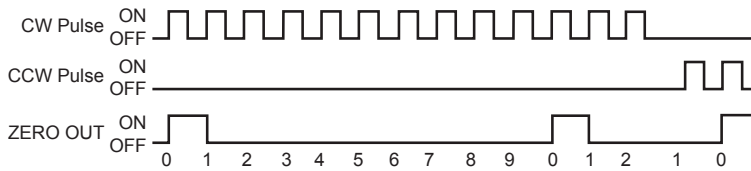
※When STOP current is decreased, STOP torque of the motor is also decreased.

※When STOP current is set too low, the heat is lower.

※Change STOP current only when the motor stops.

5-Phase Stepper Motor Driver (2.8A/Phase, AC Power)

◎ Zero point excitation output signal (ZERO OUT)



- 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 (same as MS1, MS2)

- The MS1, MS2 switches is for resolution setting.
- Select MS2 or MS2 by DIVISION SELECTION signal ([L]: MS1, [H]: MS2)
- Select the step angle (motor rotation angle per 1 pulse).
- 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 follow.
$$\text{Set step angle} = \frac{\text{Basic step angle}(0.72^\circ)}{\text{Resolution}}$$

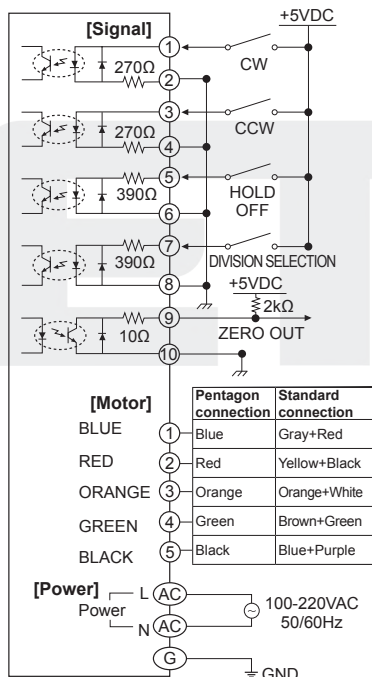
- When using geared type motor, the angle is step angle divided by gear ratio.
Step angle / gear ratio = Step angle applied gear
E.g) 0.72° / 10(1:10) = 0.072°

※ Must stop the motor before changing the resolution.

◎ Alarm output function

- Overheat: When the temperature of driver base is over 80°C, alarm indicator (red) turns ON and motor stops with holding the excision. Turn OFF the power and remove the causes. Turn ON the power and alarm output is OFF.
- Overcurrent: When overcurrent is applied from motor damage by burn, driver damage, or error, alarm LED (Red) is flashed. When overcurrent occurs, the motor becomes HOLD OFF. Turn OFF the power and remove the causes to normal operation.

■ I/O Circuit and Connections



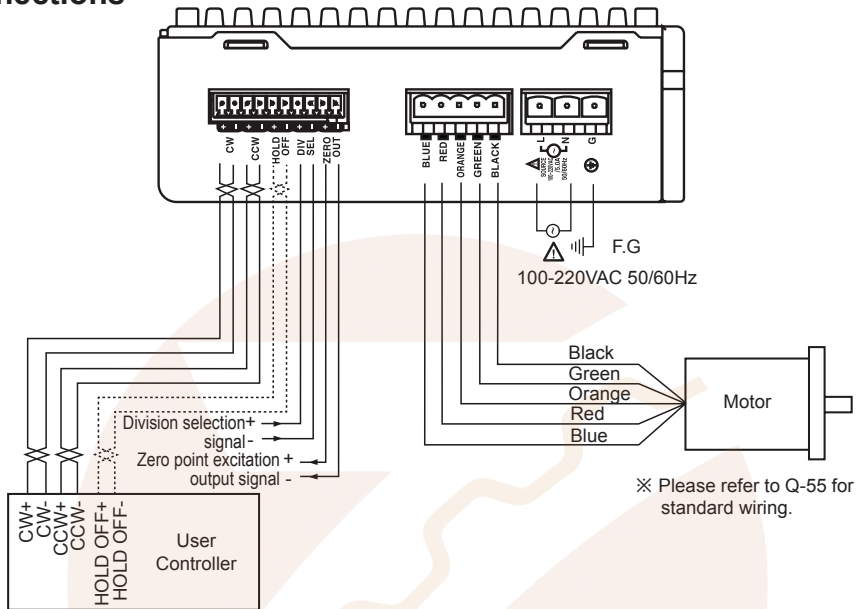
- ※ CW
2-pulse input method (CW rotation signal input)
1-pulse input method (operating rotation signal input)
- ※ CCW
2-pulse input method (CCW rotation signal input)
1-pulse input method (rotation direction signal input)
→ [H]: CW, [L]: CCW
- ※ HOLD OFF
Control signal for motor excitation OFF
→ [H]: Motor excitation OFF
- ※ DIVISION SELECTION
Division selection signal
→ [L]: Operated by switch MS1
[H]: Operated by switch MS2
- ※ ZERO OUT
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 power max. 24VDC, input current 10-20mA)

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

(A)	Photoelectric Sensors
(B)	Fiber Optic Sensors
(C)	Door/Area Sensors
(D)	Proximity Sensors
(E)	Pressure Sensors
(F)	Rotary Encoders
(G)	Connectors/ Sockets
(H)	Temperature Controllers
(I)	SSRs / Power Controllers
(J)	Counters
(K)	Timers
(L)	Panel Meters
(M)	Tacho / Speed / Pulse Meters
(N)	Display Units
(O)	Sensor Controllers
(P)	Switching Mode Power Supplies
(Q)	Stepper Motors & Drivers & Controllers
(R)	Graphic/ Logic Panels
(S)	Field Network Devices
(T)	Software

MD5 Series

■ Connections



■ Dimensions

(unit: mm)

