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

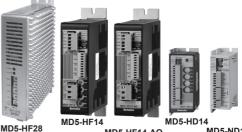
CE CALUS ROHS

- Bipolar constant pentagon drive method
- Includes auto current down and self-diagnosis function
- Low speed rotation and high accuracy controlling with microstep-driving (MD5-HĎ14, 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



MD5-ND14 MD5-HF14-AO

us: MD5-HF14 HS: MD5-ND14

	formation		
<b>5</b> – <b>H</b>		No mark	Zero point excitation output <sup>*1</sup>
	Output	AO	Alarm output
	RUN current	14	1.4A/Phase
		28	2.8A/Phase
	Power supply	D	20-35VDC
		F	100-220VAC 50/60Hz
S	ep type (Resolution)	Н	Micro step (250-division)
		Ν	Normal Step
Motor phas	e	5	5-Phase
em		MD	Motor Driver

MC can be replaced with MD5-HD14. IC can be replaced with MD5-ND14. IF14 can be replaced with MD5-HF14. 5G can be replaced with MD5-HF28.

### Specifications

manual before using.

<b>-</b> 3	pecificatio	7115				
Model		MD5-HD14	MD5-HF14	MD5-HF14-AO	MD5-HF28	MD5-ND14
Power	supply	20-35VDC*1	100-220VAC 50/60Hz			20-35VDC*1
Allowa	ble voltage range	90 to 110% of the rated	voltage			
	urrent consumption*	2 3A			5A	3A
RUN c	urrent <sup>**3</sup>	0.4-1.4A/Phase			1.0-2.8A/Phase	0.5-1.5A/Phase
STOP	current	27 to 90% of RUN curre	nt (set by STOP current	switch)		25 to 75% of RUN current (set by STOP current volume)
Drive n	nethod	Bipolar constant current	pentagon drive			
Basic s	step angle	0.72°/Step				
Resolu	tion	1, 2, 4, 5, 8, 10, 16, 20,	25, 40, 50, 80, 100, 125,	, 200, 250-division(0.72° t	o 0.00288°/Step)	1, 2-division (0.72°, 0.36°/Step)
6	Pulse width	Min. 1µs (CW, CCW), M	in. 1ms (HOLD OFF)			Min. 10µs (CW, CCW), Min. 1ms (HOLD OFF)
sti	Duty rate	50%(CW, CCW)				
Input pulse characteristic	Rising/Falling time	Below 130ns(CW, CCW	)			
ac	Pulse input voltage	H]: 4-8VDC, [L]: 0-0.5V	DC			
hai	Pulse input current	7.5-14mA(CW, CCW), 1	0-16mA(HOLD OFF, DIV	/ISION SELECTION, ZEI	RO OUT) <sup>#4</sup>	
0	Max. input pulse frequency <sup>*5</sup>	Max. 500kHz(CW, CCW	()			Max. 50kHz(CW, CCW)
Input re	esistance	270Ω(CW, CCW), 390Ω(HOLD OFF, DIVIS 10Ω(ZERO OUT)	SION SELECTION),	270Ω(CW, CCW), 390Ω(HOLD OFF), 10Ω(ALARM)	270Ω(CW, CCW), 390Ω(HOLD OFF, DIVISION SELECTION), 10Ω(ZERO OUT)	390Ω (CW, CCW, HOLD OFF)
Insulat	ion resistance	Over. 100MΩ (at 500VD	C megger, between all t	erminals and case)		
Dielect	ric strength	1000VAC 50/60Hz for 1	min.(between all termina	Is and case)		
Noise I	resistance	±500V the square wave noise (pulse width: 1μs) by the noise simulator		ve noise (pulse width: 1µs	) by the noise simulator	±500V the square wave noise (pulse width: 1μs) by the noise simulator
Vibratio	Mechanical	1.5mm amplitude at free	uency of 5 to 60Hz (for	1 min.) in each X, Y, Z dir	ection for 2 hours	
vibratio	Malfunction	1.5mm amplitude at free	uency of 5 to 60Hz (for	1 min.) in each X, Y, Z dir	ection for 10 min.	
Enviro	n- Ambient temp	0 to 40°C, storage: -10 to 60°C	0 to 50°C, storage: -10	to 60°C		0 to 40°C, storage: -10 to 60°C
linein	Ambient humi.					
Approv	ral	CE		CE	((	CE Rons
Weight		Approx. 327.5g (approx. 220g)	Approx. 840g (approx. 680g)	Approx. 820g (approx. 660g)	Approx. 1.35kg (approx. 1.2kg)	Approx. 183g (approx. 130g)

x1: 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.

33: 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.

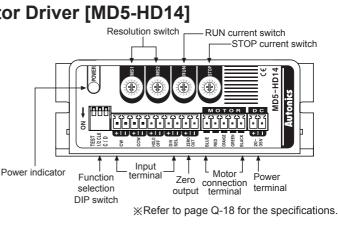
%5: Max. input pulse frequency is max. frequency to be input and is not same as max. pull-out frequency or max. slewing frequency. %6: The weight includes packaging. The weight in parentheses is for unit only. %Environment resistance is rated at no freezing or condensation.



# 5-Phase Micro Stepper Motor Driver [MD5-HD14]

Unit Description





# © Function selection DIP switch

		No.	Name	Function	Switch position		Sockets
		INO.	Iname	Function	ON	OFF (default)	
		1	TEST	Self diagnosis function	30rpm rotation	Not use	(H) Temperature
	ON I	2	1/2 CLK	Pulse input method	1-pulse input method	2-pulse input method	Controllers
		3	C/D	Auto current down	Not use	Use	
•	TEST						(I) SSRs / Power Controllers

#### 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 CI K
- 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:  $CW \rightarrow CW$  rotation signal input,  $CCW \rightarrow CCW$  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 torgue of motor also reduced.

XSet the STOP current by the STOP current switch.

### Setting RUN current

E D J	S/W No.	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F	(P) Switching Mode Pov
	Current	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	14	Supplies
68L~	(A/Phase)	0.1	0.0	0.07	0.00	0.7 1	0.77	0.01	0.0	0.00	1.02	1.00	1.15	1.22	1.21	1.00	1.7	(0)

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.

XWhen 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

(		ng STOP (	curre	nt															Network
ĺ	6.FO1	S/W No	0	1	2	3	4	5	6	7	8	9	А	В	С	D	E	F	Devices
	<b>()</b>																		(T)
	4 6 8 L 9	%	27	31	36	40	45	50	54	58	62	66	70	74	78	82	86	90	Software

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 torgue 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.



(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity

Sensor

(E) Pressure Sensors

(F) Rotary Encode

(G)

(J) Counters

(K) Timers

(L) Panel Meters

(M) Tacho / Speed / Puls Meters

(N) Display Units

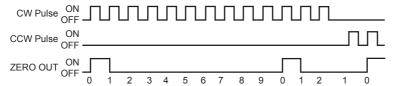
(O) Sensor Controllers

(R) Graphic

Logic Panels

(S)

## ◎ 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.

### **O 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.
- XMust stop the motor for using this function.

\*Refer to I/O Circuit and Connections.

### © Setting microstep (Microstep: Resolution)

KEO /	S/W No	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
	Resolution	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250
4 6 8 L 9	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)

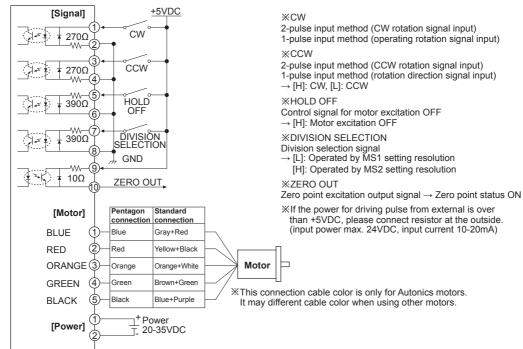
- The MS1, MS2 switches is for resolution setting.
- Select MS2 or MS2 by DIVISION SELECTION signal ([L]: MS1, [H]: MS2)
- Select the step angle (motor rotation angle per 1 pulse).
- The set step angle is dividing basic step angle(0.72°) of 5-phase stepping motor by setting value.
- The calculation formula of divided step angle is as below.

# 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°

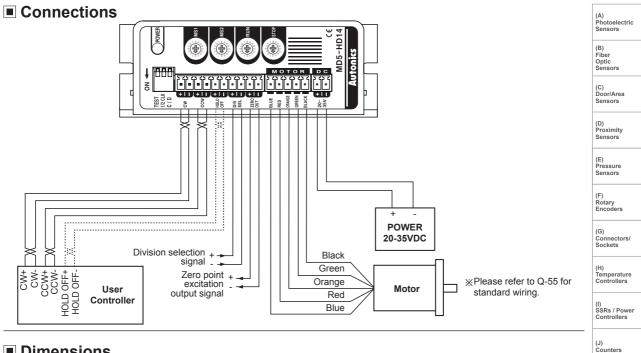
XMust stop the motor before changing the resolution.

## I/O Circuit and Connections



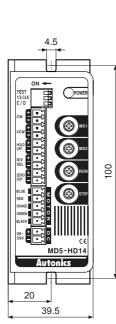
**Autonics** 

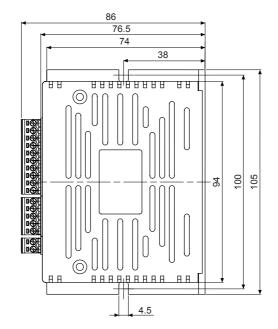
# 5-Phase Stepper Motor Driver (1.4A/Phase, DC Power)



Dimensions

(unit: mm)





(L) Panel Meters

(K) Timers

(M) Tacho / Speed / Pulse Meters

(N) Display Units (O) Sensor Controllers

(P) Switching Mode Power Supplies

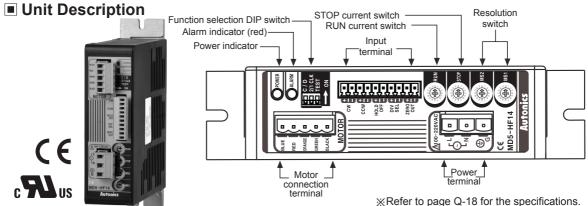
(Q) Ste (Q) Stepper Moto & Drivers & Controllers

(R) Graphic/ Logic Panels

(S) Field Network Devices

(T) Software

# 5-Phase Micro Stepper Motor Driver [MD5-HF14]



## ◎ Function selection DIP switch

No	Name	Function	Switch position	
INO	INAILIE	Function	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:  $CW \rightarrow CW$  rotation signal input,  $CCW \rightarrow CCW$  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

EF 0 7	S/W No.	0	1	2	3	4	5	6	7	8	9	А	В	С	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 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.

XSet 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

LED / Co	S/W No	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
((러는)~	%	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.

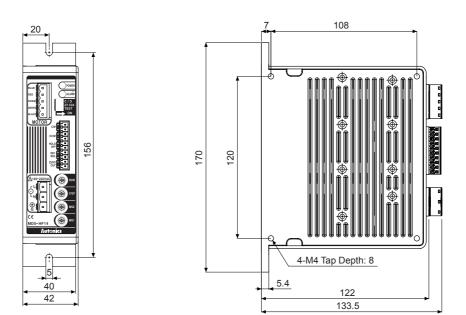
# 5-Phase Stepper Motor Driver (1.4A/Phase, AC Power)

◎ Zero point excitation output signal (ZERO OUT)	
	(A) Photoelectric Sensors
CCW Pulse ON OFF	(B) Fiber Optic Sensors
ZERO OUT OFF 0 1 2 3 4 5 6 7 8 9 0 1 2 1 0	(C) Door/Area Sensors
<ul> <li>This output indicates the initial step of excitation order of stepping motor and rotation position of motor axis .</li> <li>This signal outputs every 7.2° of rotation of the motor axis regardless of resolution. (50 outputs per 1 rotation of the motor.)</li> <li>E.g.) Full step: outputs one time by 10 pulses input, 20-division: outputs one time by 200 pulses input.</li> </ul>	(D) Proximity Sensors
© HOLD OFF function	(E) Pressure Sensors
<ul> <li>This signal is for rotating motor's axis using external force or used for manual positioning.</li> <li>When hold off signal maintains over 1ms as [H], motor excitation is released.</li> <li>When hold off signal maintains over 1ms as [L], motor excitation is in a normal status.</li> <li>*Must stop the motor for using this function.</li> </ul>	(F) Rotary Encoders
※Refer to II/O Circuit and Connections. Setting microstep (Microstep: Resolution)	(G) Connectors/
S/W No 0 1 2 3 4 5 6 7 8 9 A B C D E F	Sockets
Resolution 1 2 4 5 8 10 16 20 25 40 50 80 100 125 200 250	(H) Temperature
L <sup>Δ</sup> <sub>δ 8 L</sub> <sup>6</sup> 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° 0.002	
<ul> <li>Setting resolution (same as MS1, MS2)</li> <li>The MS1, MS2 switches is for resolution setting.</li> <li>Select MS2 or MS2 by DIVISION SELECTION signal ([L]: MS1, [H]: MS2)</li> <li>Select the step angle (motor rotation angle per 1 pulse).</li> </ul>	(I) SSRs / Power Controllers
<ul> <li>The set step angle is dividing basic step angle(0.72°) of 5-phase stepping motor by setting value.</li> <li>The calculation formula of divided step angle is as follow.</li> <li>Set step angle = Basic step angle(0.72°)</li> </ul>	(J) Counters
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°	(K) Timers
XMust stop the motor before changing the resolution.	(L) Panel
<ul> <li>Alarm output function</li> <li>Overheat: When the temperature of driver base is over 80°C, alarm indicator (red) turns ON and motor stops with hold the excision. Turn OFF the power and remove the causes. Turn ON the power and alarm output is OFF.</li> <li>Overcurrent: When overcurrent is applied from motor damage by burn, driver damage, or error, alarm LED (Red) is</li> </ul>	Meters ng (M) Tacho / Speed / Pulse Meters
flashed. When overcurrent occurs, the motor becomes HOLD OFF. Turn OFF the power and remove the causes to	(N)
normal operation.  I/O Circuit and Connections	Display Units
+5VDC XCW	(O)
2-pulse input method (CW rotation signal input)	Sensor Controllers
	(P) Switching
2-pulse input method (CCW rotation signal input) 1-pulse input method (rotation direction signal input)	Mode Power Supplies
$\rightarrow [H]: CW, [L]: CCW$	(Q)
HOLD OFF 3900 HOLD OFF Control signal for motor excitation OFF	& Drivers & Controllers
$\rightarrow$ [H]: Motor excitation OFF	(R)
With the second sec	Graphic/ Logic Panels
$\downarrow \qquad \downarrow \qquad \qquad$	(S)
[H]: Operated by switch MS2 ZERO OUT W = 0 ZERO OUT W = 0 ZERO OUT XZERO OUT	Field Network Devices
[Motor] [Moto	
BLUE       0       Blue       Gray+Red       XIf 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)	(T) Software
ORANGE 3 Orange Orange+White Motor	
GREEN (4) Green Brown+Green BLACK (5) Black Blue+Purple	
[Power] It may different cable color when using other motors.	
Power N AC 100-220VAC 50/60Hz	

#### Connections RUN ŝ C / D 2/1 CLK TEST **(** 4 4 С 000 3 SEL 10LD ZERO Auton MD5-HF14 0 o <u>-</u>0 Z Ð 2 Blue Red Orange $\breve{\Delta}^{-} = \mathsf{F.G.}$ -@ Motor ſ Green Black 100-220VAC 50/60Hz ※Please refer to Q-55 for standard wiring. Division selection + Zero point excitation + output signal CCW+ CCW-HOLD OFF-HOLD OFF-CW+ CW-User Controller

# Dimensions

(unit: mm)



	lioro	Cto.		и вл	<b>. .</b>	~ D.		- FR/		uе		• • •					
5-Phase M		-		on sele				_				40]					(A) Photoelectric Sensors
		V		arm indi			_	F	RUN cu			ו ר					(B) Fiber
				Power	indicat	or —				/Output minal	7		Г	– Resc	lution s	witch	Optic Sensors
		9 8				► POWER	) ∧⊔∧RM C / D 2/1 CLK		•	u   u   u   u	•	RUN STOP		٣,			(C) Door/Area Sensors
	MOTOR CCT KQ	Aller a serve and					U 		9 	<u></u>	523			MD5-HF14-AO	40101163		(D) Proximity Sensors
								BLACK						BOM			(E) Pressure Sensors
CE	MD5-HF14-AO Autonics					Ĺ	Moto onnect termin	ion			fan 1a 1	ter	ower minal			-41	(F) Rotary Encoders
◎ Function se	lection	DIP	 switc	:h						жке	ier to p	age G	2-1010	n the s	pecilic	ations.	(G) Connectors/ Sockets
		ame		inction			5	Switch	position								Sockets
								DN					F (defa	ult)			(H) Temperature
<b>▼</b> 1 2 3		EST		elf diagn				· ·	otation	- 4			use				Controllers
ON		1 CLK /D		ulse inpu uto curre				I-puise Not use	input m	ietnoa		Use		out met	noa		(I) SSRs / Power
• TEST	0 0		//(				!'	101 030				1030	<i>.</i>				Controllers
<ul> <li>Self diagnosis fu</li> <li>This function ma</li> <li>Rotation speed =</li> </ul>	kes the n	notor ro	otate w			full ste	p. Rot	ation	speed	varies	with re	esoluti	on set	tings.			(J) Counters
<ul> <li>In 1-pulse input r</li> <li>Be sure that the If the TEST switch</li> </ul>	nethod, i TEST sw	t rotate itch is	s to C OFF b	efore s	supplyi	ng the	powe	r.									(K) Timers
• 2/1 CLK • 2/1 CLK switch is	s to selec	t pulse	input	metho	d.												(L) Panel Meters
<ul> <li>1-pulse input me</li> <li>2-pulse input me</li> <li>C/D (auto curr</li> </ul>	thod: CV	$I \rightarrow CV$											put ([F	ij: Cvv	, [L]: C	CVV)	(M) Tacho / Speed / Pulse Meters
<ul> <li>This function is to stops.</li> <li>If motor RUN put</li> </ul>								,						eat wh	en mo	tor	(N) Display Units
<ul> <li>Be sure that whe</li> <li>Set the STOP cu</li> <li>Setting RUN</li> </ul>	en motor Irrent by	RUN ci the ST(	urrent	is redu	iced, th												(O) Sensor Controllers
		1	2	3	4	5	6	7	8	9	A	В	С	D	E	F	(P) Switching Mode Power
Current								ľ.									Supplies
RUN current setti				 ovided		 otor wl				1.02	1.09	1.15	1.22	1.27	1.33	1.4	(Q) Stepper Motors & Drivers & Controllers
When RUN curre When RUN curre Set RUN current	ent is set	too hig	h, the	heat is	sever	e.				ıd.							(R) Graphic/ Logic Panels
%Change RUN cu	-		the mo	otor sto	ops.			•									(S) Field
© Setting STO	P curr	ent	1		1			1		1			1		1	,	Network Devices
S/W No	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F	(T)
	27	31	36	40	45	50	54	58	62	66	70	74	78	82	86	90	Software
STOP current set     This setting is app     Setting value of S     E.g.) Set RUN cu	olied whe TOP cur	n using rent is	g C/D( percer	Curren ntage ( <sup>e</sup>	t dowr %) rati	n) func o of th	tion.				orever	iting se	evere	notor's	s heat.	11	
STOP curre	ent is set	as 1.4A	\×0.4=	0.56A				-1		1							
When STOP curies When STOP curies Change STOP curies	rent is se	t too lo	w, the	heat is	s lower		DTOT IS	aiso d	ecreas	ed.							

## **OHOLD 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.

XMust stop the motor for using this function.

※Refer to I/O Circuit and Connections.

### © Setting microstep (Microstep: Resolution)

					-			·									
KEO/P	S/W No	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
	Resolution	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250
468L9	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.

Set step angle =	Basic step angle(0.72°)
Set step allyle -	Resolution

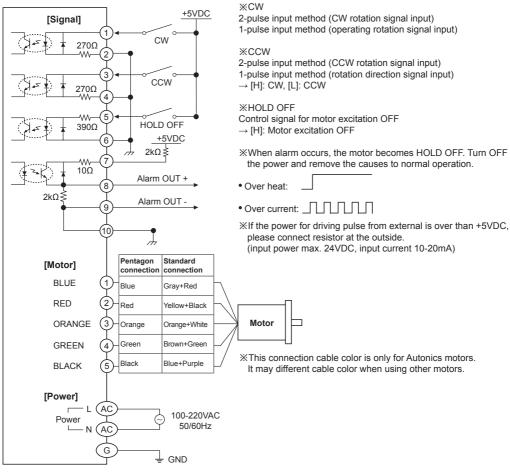
• When using geared type motor, the angle is step angle divided by gear ratio. Step angle / gear ratio = Step angle applied gear E.g)  $0.72^{\circ}$  /  $10(1:10) = 0.072^{\circ}$ 

Must stop the motor before changing the resolution.

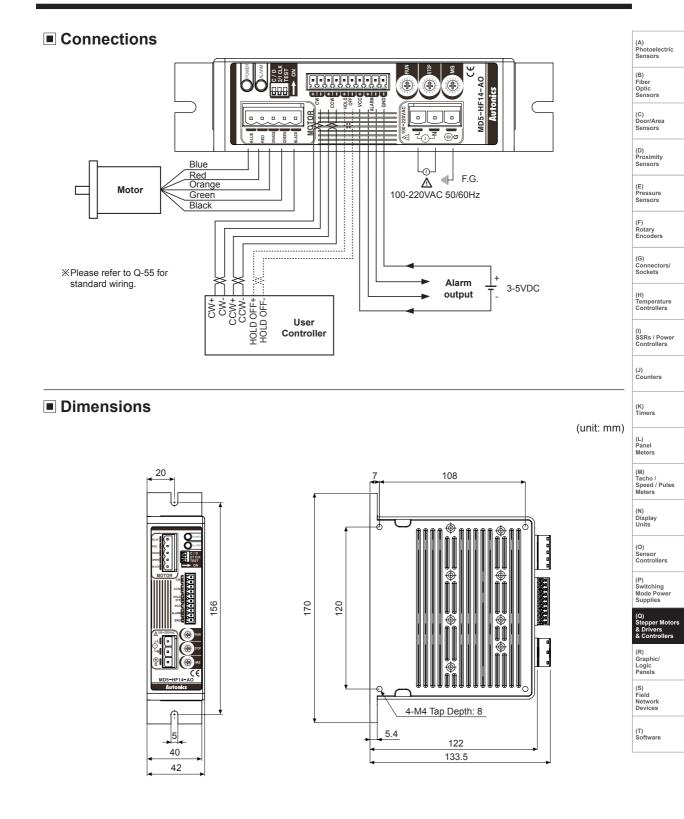
#### O Alarm output function

- 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



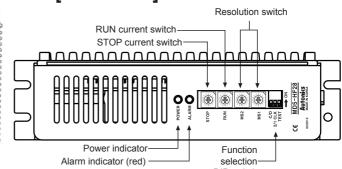
# 5-Phase Stepper Motor Driver (1.4A/Phase, AC Power, Alarm Output)



# 5-Phase Microstep Motor Driver [MD5-HF28]

Unit Description





KR-505G can be replaced with MD5-HF28. DIP switch
 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						
	NO	Name	Function	ON	OFF (default)					
	1	TEST	Self diagnosis function	30rpm rotation	Not use					
ON ON	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)
- $\bullet$  2-pulse input method: CW  $\rightarrow$  CW rotation signal input, CCW  $\rightarrow$  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.

## **O Setting RUN current**

-	0																
4 F 0 7 S/	/W No.	0	1	2	3	4	5	6	7	8	9	A	В	С	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.

 $\ensuremath{\mathbbmm}$  When RUN current is increased, RUN torque of the motor is also increased.

When RUN current is set too high, the heat is severe.

 $\ensuremath{\times}\xspace$  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

EE 0 / 20	S/W No	0	1	2	3	4	5	6	7	8	9	А	В	С	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

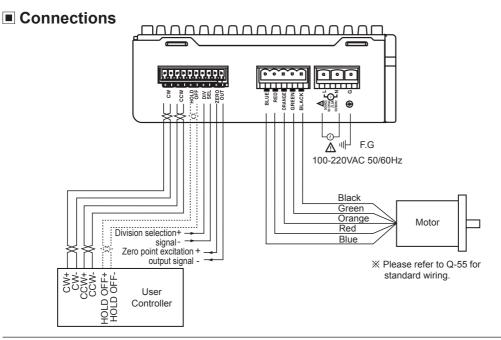
 $\ensuremath{\mathbbmm}$  When STOP current is decreased, STOP torque of the motor is also decreased.

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

\*Change STOP current only when the motor stops.

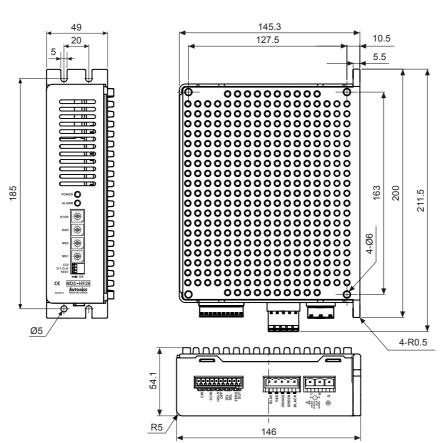
# 5-Phase Stepper Motor Driver (2.8A/Phase, AC Power)

© Zero point excitation output signal (ZERO OUT)													
	(B) Fiber Optic Sensors												
ZERO OUT OFF 0 1 2 3 4 5 6 7 8 9 0 1 2 1 0													
<ul> <li>This output indicates the initial step of excitation order of stepping motor and rotation position of motor axis .</li> <li>This signal outputs every 7.2° of rotation of the motor axis regardless of resolution. (50 outputs per 1 rotation of the motor.)</li> <li>E.g.) Full step: outputs one time by 10 pulses input, 20-division: outputs one time by 200 pulses input.</li> </ul>													
<ul> <li>O HOLD OFF function</li> <li>This signal is for rotating motor's axis using external force or used for manual positioning.</li> <li>When hold off signal maintains over 1ms as [H], motor excitation is released.</li> </ul>													
$\sqrt{1 + 2} \sqrt{1 + 2} \sqrt$	Connectors/ Sockets												
Resolution 1 2 4 5 8 10 16 20 25 40 50 80 100 125 200 250	(H)												
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°	Temperature Controllers												
<ul> <li>Setting resolution (same as MS1, MS2)</li> <li>The MS1, MS2 switches is for resolution setting.</li> <li>Select MS2 or MS2 by DIVISION SELECTION signal ([L]: MS1, [H]: MS2)</li> </ul>													
<ul> <li>Select the step angle (motor rotation angle per 1 pulse).</li> <li>The set step angle is dividing basic step angle(0.72°) of 5-phase stepping motor by setting value.</li> <li>The calculation formula of divided step angle is as follow.</li> <li>Set step angle = Basic step angle(0.72°)</li> </ul>													
When using geared type motor, the angle is step angle divided by gear ratio.     Step angle / gear ratio = Step angle applied gear     XMust stop the motor before changing the resolution.     Resolution     Resolution	(K) Timers												
<ul> <li>O Alarm output function</li> <li>Overheat: When the temperature of driver base is over 80°C, alarm indicator (red) turns ON and motor stops with holding</li> </ul>	(L) Panel Meters												
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	(M) Tacho / Speed / Pulse Meters												
normal operation. I/O Circuit and Connections	(N) Display Units												
[Signal]       CW         270Ω       CW         270Ω       CW         2000	(O) Sensor Controllers												
$2\text{-pulse input method (CCW rotation signal input)}$ $2\text{-pulse input method (rotation direction signal input)}$ $1\text{-pulse input method (rotation direction signal input)}$ $\rightarrow [H]: CW, [L]: CCW$	(P) Switching Mode Power Supplies												
HOLD OFF $390\Omega$ OFF G OFF OFF $G$ OFF G OFF G OFF OFF $G$ OFF G OFF	(Q) Stepper Motor & Drivers & Controllers												
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(R) Graphic/ Logic Panels												
[H]: Operated by switch MS2	(S) Field Network Devices												
[Motor]       Pentagon       Standard       % If the power for driving pulse from external is over than +5VDC, please connect resistor at the outside.         BLUE       Blue       Gray+Red       (input power max. 24VDC, input current 10-20mA)	(T) Software												
RED 2 Red Yellow+Black ORANGE 3 Orange Orange+White Motor													
BLACK Blue+Purple * This connection cable color is only for Autonics motors.													
Power NAC 50/60Hz													
↓ GND	_												



# Dimensions

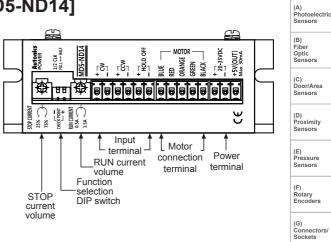
(unit: mm)



# 5-Phase Stepper Motor Driver [MD5-ND14]

Unit Description





CE Rons 🧔

%Refer to page Q-18 for the specifications.

### **©** Function selection DIP switch

Γ		No.	Nemenlete	Function	Switch position					
			Nameplate	Function	ON	OFF (default)	(H) Temperature			
		1	1/2 CLK	Pulse input method	1-pulse input method	2-pulse input method	Controllers			
	1 2	2	2	FULL↔HALF	Select resolution	1-division	2-division			
					(0.72°)	(0.36°)	(I) SSRs / Pow			
							Controllers			

%Changing pulse input method or resolution is available only when stepper motor stops.

If changing the resolution during operation, the motor may be out of phase.

#### • 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:  $CW \rightarrow CW$  rotation signal input,  $CCW \rightarrow CCW$  rotation signal input.

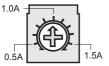
#### $\bullet \ \textbf{FULL} \leftrightarrow \textbf{HALF}$

● FULL ↔ HALF switch is to set basic step angle for 5 phase stepper motor.

\*Change resolution only when the motor stops.

## **© Setting RUN current**

RUN CURRENT



• 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

STOP CURRENT

75%

- STOP current setting is for the current provided for motor when the motor stops.
- 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.

(T) Software

(J) Counters

(K) Timers

(L) Panel Meters

(M) Tacho / Speed / Pulse Meters

(N) Display Units

(O) Sensor Controllers

(P) Switching Mode Powe Supplies

(Q) Stepper Mote & Drivers & Controllers

(R) Graphic/ Logic Panels

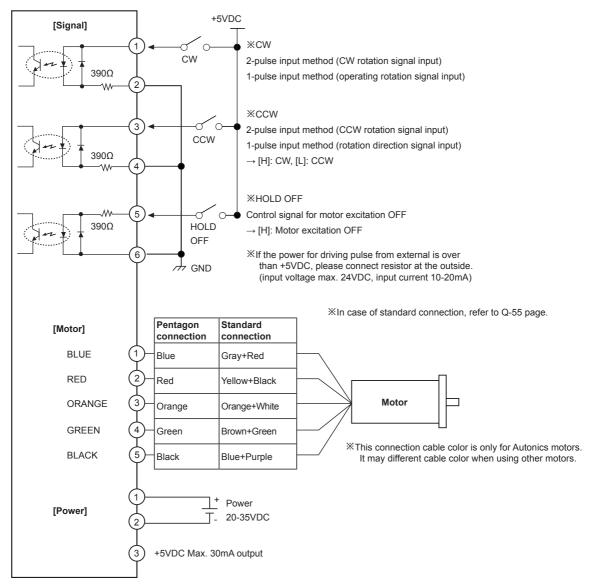
(S) Field Network Devices

# ◎ HOLD OFF function

25%

- 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.

# I/O Circuit and Connections



# 5-Phase Stepper Motor Driver (1.5A/Phase, DC Power)

