5-Phase Stepping Motor and Driver Specifications

(○ : **General specifications**, ◎ : **High-torque specifications**)

	Motor				Driver		
	Type	Model	Torque (kgf·cm)	A/phase (A)	MD5-HD14/MD5-ND14/ MD5-HD14-2X(3X)	MD5-HF14	MD5-HF28
24 Square	Shaft type	02K-S523(W)	0.18	0.75	○	◎	
		04K-S525(W)	0.28	0.75	○	◎	
42 Square	Shaft type	A1K-S543(W)	1.3	0.75	○	◎	
		A2K-S544(W)	1.8	0.75	○	◎	
		A3K-S545(W)	2.4	0.75	○	◎	
	Hollow shaft type	AH1K-S543	1.3	0.75	○	◎	
		AH2K-S544	1.8	0.75	○	◎	
		AH3K-S545	2.4	0.75	○	◎	
	Geared built-in type	A10K-S545(W)-G5	10	0.75	○	◎	
		A15K-S545(W)-G7.2	15	0.75	○	◎	
		A15K-S545(W)-G10	15	0.75	○	◎	
60 Square	Shaft type / Shaft + Brake built-in type	A4K-S564(W)-[B]	4.2	0.75	○	◎	
		A4K-M564(W)-[B]	4.2	1.4	○	◎	
		A8K-S566(W)-[B]	8.3	0.75	○	◎	
		A8K-M566(W)-[B]	8.3	1.4	○	◎	
		A16K-M569(W)-[B]	16.6	1.4	○	◎	
		A16K-G569(W)-[B]	16.6	2.8			◎
	Hollow shaft type	AH4K-S564(W)	4.2	0.75	○	◎	
		AH4K-M564(W)	4.2	1.4	○	◎	
		AH8K-S566(W)	8.3	0.75	○	◎	
		AH8K-M566(W)	8.3	1.4	○	◎	
		AH16K-M569(W)	16.6	1.4	○	◎	
		AH16K-G569(W)	16.6	2.8			◎
	Geared built-in type/ Geared + Brake built-in type	A35K-M566(W)-G[B]5	35	1.4	○	◎	
		A40K-M566(W)-G[B]7.2	40	1.4	○	◎	
		A50K-M566(W)-G[B]10	50	1.4	○	◎	
	Rotary actuator type/ Rotary actuator + Brake built-in type	A35K-M566(W)-R[B]5	35	1.4	○	◎	
		A40K-M566(W)-R[B]7.2	40	1.4	○	◎	
		A50K-M566(W)-R[B]10	50	1.4	○	◎	
85 Square	Shaft type / Shaft + Brake built-in type	A21K-M596(W)-[B]	21	1.4	○	◎	
		A21K-G596(W)-[B]	21	2.8			◎
		A41K-M599(W)-[B]	41	1.4	○	◎	
		A41K-G599(W)-[B]	41	2.8			◎
		A63K-M5913(W)-[B]	63	1.4	○	◎	
		A63K-G5913(W)-[B]	63	2.8			◎
	Hollow shaft type	AH21K-M596(W)	21	1.4	○	◎	
		AH21K-G596(W)	21	2.8			◎
		AH41K-M599(W)	41	1.4	○	◎	
		AH41K-G599(W)	41	2.8			◎
		AH63K-M5913(W)	63	1.4	○	◎	
		AH63K-G5913(W)	63	2.8			◎
	Geared built-in type/ Geared + Brake built-in type	A140K-M599(W)-G[B]5	140	1.4	○	◎	
		A140K-G599(W)-G[B]5	140	2.8			◎
		A200K-M599(W)-G[B]7.2	200	1.4	○	◎	
		A200K-G599(W)-G[B]7.2	200	2.8			◎
		A200K-M599(W)-G[B]10	200	1.4	○	◎	
		A200K-G599(W)-G[B]10	200	2.8			◎

※(W) stands for dual shaft stof motor. The brake built-in type provides single shaft only.
※The motor has a big difference in torque by the characteristics of the driver.
　Please refer to the graph in this catalogue that shows the characteristics of motors and drivers.
　For MD5-HD14, MD5-ND14, the high-speed region torque characteristics are better at 35VDC than at 20VDC.
　In addition, MD5-HF14, MD5-HF28 have further improved torque characteristics in the high-speed area than using DC type driver.

Autonics

5-Phase Stepping Motor Driver

Small, light and high speed and torque 5-phase stepping 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−HF28) [Max. resolution − 250 division / In case of 5−phase stepping 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.
- Photo coupler insulation for input signals to minimize the influence of external noise
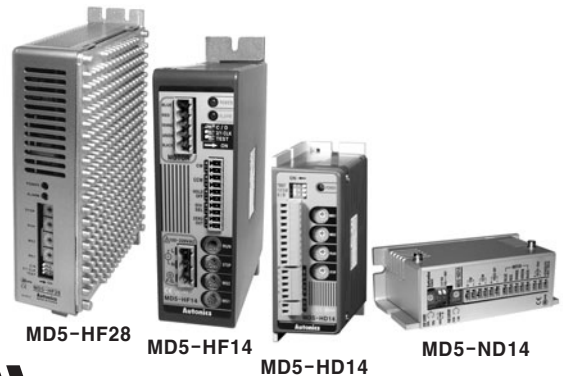
⚠ **Please read "Caution for your safety" in operation manual before using.**

MD5−HF28   MD5−HF14   MD5−HD14   MD5−ND14

CE c(UL)us
(Except for MD5−HD14, ND14)

■Ordering information

| MD | 5 | − | H | F | 14 |

RUN current	14	1.4A/Phase
	28	2.8A/Phase
Power supply	D	20−35VDC
	F	100−220VAC
Step type (Resolution)	H	Microstep(250divisions)
	N	Normal step
Motor phase	5	5−Phase
Item	MD	Motor Driver

※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.

■Specifications

| Model	MD5-HD14	MD5-HF14	MD5-HF28	MD5-ND14
Power supply	(※1) 20−35VDC 3A	100−220VAC 50/60Hz		20−35VDC 3A
RUN current	0.4 to 1.4A / Phase		1.0 to 2.8A / Phase	0.5 to 1.5A / Phase
RUN method	Bipolar constant pentagon drive			
Basic step angle	0.72 ˚ / 1Phase			
Resolution	1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 125, 200, 250 division (0.72 ˚ to 0.00288 ˚ / 1Phase)			1, 2 division (0.72 ˚, 0.36 ˚ / 1Phase)
Input pulse width	Min. 0.5μs			Min. 10μs
Pulse duty	Max. 50%			
Rising/Falling time	Max. each 120ns			
Max. input pulse frequency	(※2) 1MHz			50kHz
Input voltage level	High : 4−8VDC, Low : 0−0.5VDC			
Input resistance	270Ω (CW, CCW) 390Ω (HOLD OFF, DIVISION SELECTION)			390Ω (CW, CCW, HOLD OFF)
Ambient temperature	0 to 40℃ (at non−freezing status)	0 to 50℃ (at non−freezing status)	0 to 40℃ (at non−freezing status)	
Ambient humidity	35 to 85%RH			
Approval	CE	CE c(UL)us		CE
Unit weight	Approx. 220g	Approx. 650g	Approx. 1kg	Approx. 120g

※(※1)When using over 30VDC, it should be mounted at ventilated place due to increasing heat.
※(※2)Max. pull−out frequency and max. slewing frequency are variable depending on resolution, or load.

MD5 Series

5-Phase microstepping motor driver [MD5-HD14]
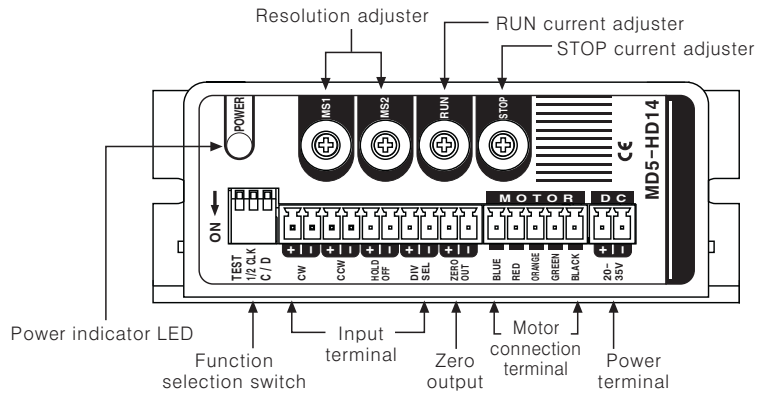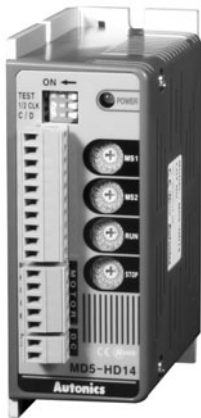
◎Function selection switch

NO	Name	Function	Switch position	
			ON	OFF
1	TEST	Self-diagnosis	Rotate in 30rpm	——
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.
 ※ It activates when there is no pulse input of motor operation for over 200ms.

◎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 stepping motor.
 ※ Be sure to set RUN current at the rated current or below. If not, it may cause heat generation, loss of torque or step-out.
 ※ Adjust the RUN current in case severe heat generation occurs. Be sure that torque decreasing may occur when adjusting the current.
 ※ RUN current setting value may have some deviation depending on motor's running frequency.
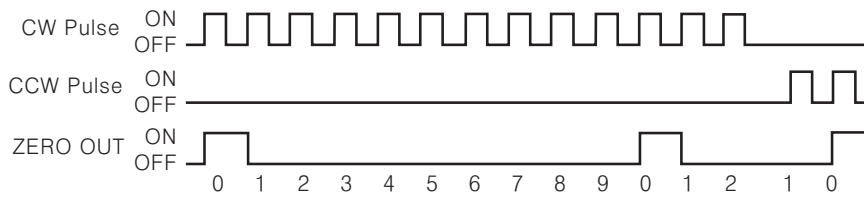 Note) Be sure to adjust RUN current while motor is running.

◎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 stepping 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.

Autonics

◎Zero point excitation output signal (ZERO OUT)

CW Pulse ON/OFF

CCW Pulse ON/OFF

ZERO OUT ON/OFF

0 1 2 3 4 5 6 7 8 9 0 1 2 1 0

※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)

※It is set to MS1 when division selection signal is [L], and MS2 when division selection signal is [H].

※Two different micro step can be set using DIVISION SELECTION. Users can select one of them via external input signals.

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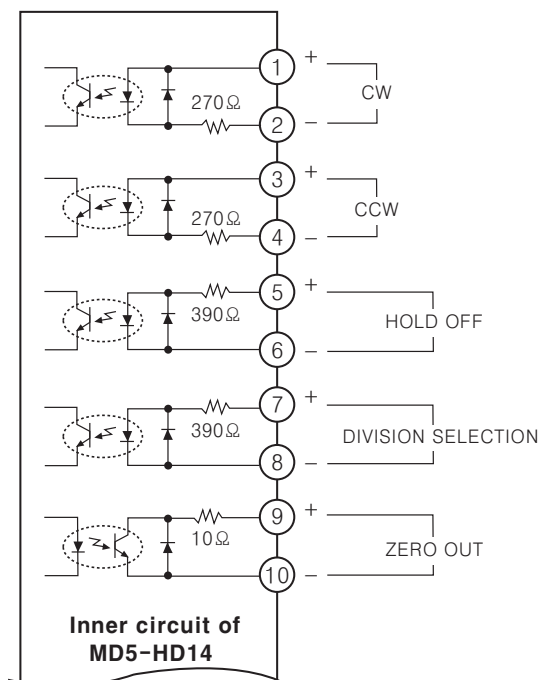
※The formula for microstep angle is ;

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

※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

※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

※DIVISION SELECTION

Division selection signal

→ [L] : Operated by MS1 setting resolution.

[H] : Operated by MS2 setting resolution.

※ZERO OUT

Zero point excitation output signal ON for zero point excitation

MD5 Series

▣ Connections

Note) Add external resistance when power for pulse from the external of the unit exceeds +5V.
(Input current : 10 to 20mA)

Power 20-35VDC

Division selection signal +/−
Zero point excitation output signal +/−

User controller

CW+ CW− CCW+ CCW− HOLD OFF+ HOLD OFF−

Black
Green
Orange
Red
Blue

Motor

※Please refer to Q−32 for standard wiring.

▣ Dimensions

(Unit:mm)

5-Phase microstepping motor driver [MD5-HF14]

Function selection switch
STOP current adjuster
RUN current adjuster
Resolution adjuster
ALARM LED(Red)
Power indicator LED
Input terminal
Motor connection terminal
Power terminal

◎Function selection switch

No	Name	Function	Switch position	
			ON	OFF
1	TEST	Self−diagnosis	Rotate in 30rpm	――
2	2/1 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.
※ It activates when there is no pulse input of motor operation for over 200ms.

◎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 stepping motor.
※ Be sure to set RUN current at the rated current or below. If not, it may cause heat generation, loss of torque or step−out.
※ Adjust the RUN current in case severe heat generation occurs. Be sure that torque decreasing may occur when adjusting the current.
※ RUN current setting value may have some deviation depending on motor's running frequency.
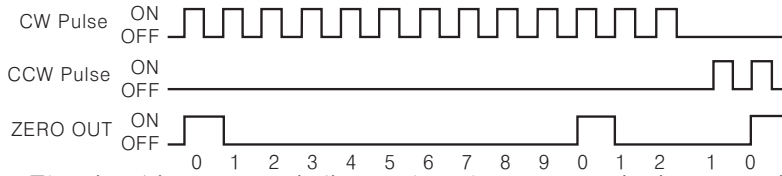Nete) Be sure to adjust RUN current while motor is running.

◎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 stepping 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.

MD5 Series

◎Zero point excitation output signal (ZERO OUT)

CW Pulse ON / OFF

CCW Pulse ON / OFF

ZERO OUT ON / OFF

0 1 2 3 4 5 6 7 8 9 0 1 2 1 0

※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)

※It is set to MS1 when division selection signal is [L], and MS2 when division selection signal is [H].

※Two different micro step can be set using DIVISION SELECTION. Users can select one of them via external input signals.

※Microstepping 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˚

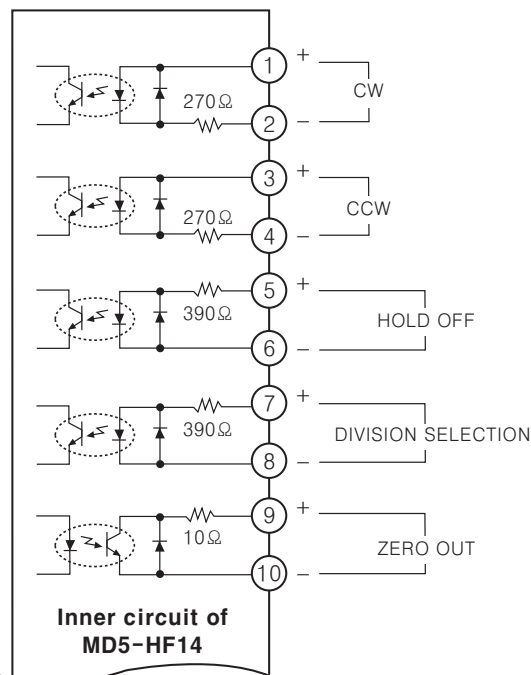※It may cause step-out if resolution is changed while motor is running.

◎ALRAM Function

※Over heat：When the temperature in driver BASE is over 80℃, Alarm LED will be ON and motor will stop with holding the torque. Remove the Over Heat Alarm causing factors and reset the power in order to reset alarm function.

※Overcurrent：When overcurrent is applied to the motor due to driver damage or errors, Alarm LED will be flickering. In case of overcurrent, the motor will be HOLD OFF. Cut off the power and remove overcurrnet-causing factors in order to resume normal operation.

■Input · Output diagram

Inner circuit of MD5-HF14

1 + / 2 − CW 270Ω

3 + / 4 − CCW 270Ω

5 + / 6 − HOLD OFF 390Ω

7 + / 8 − DIVISION SELECTION 390Ω

9 + / 10 − ZERO OUT 10Ω

※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
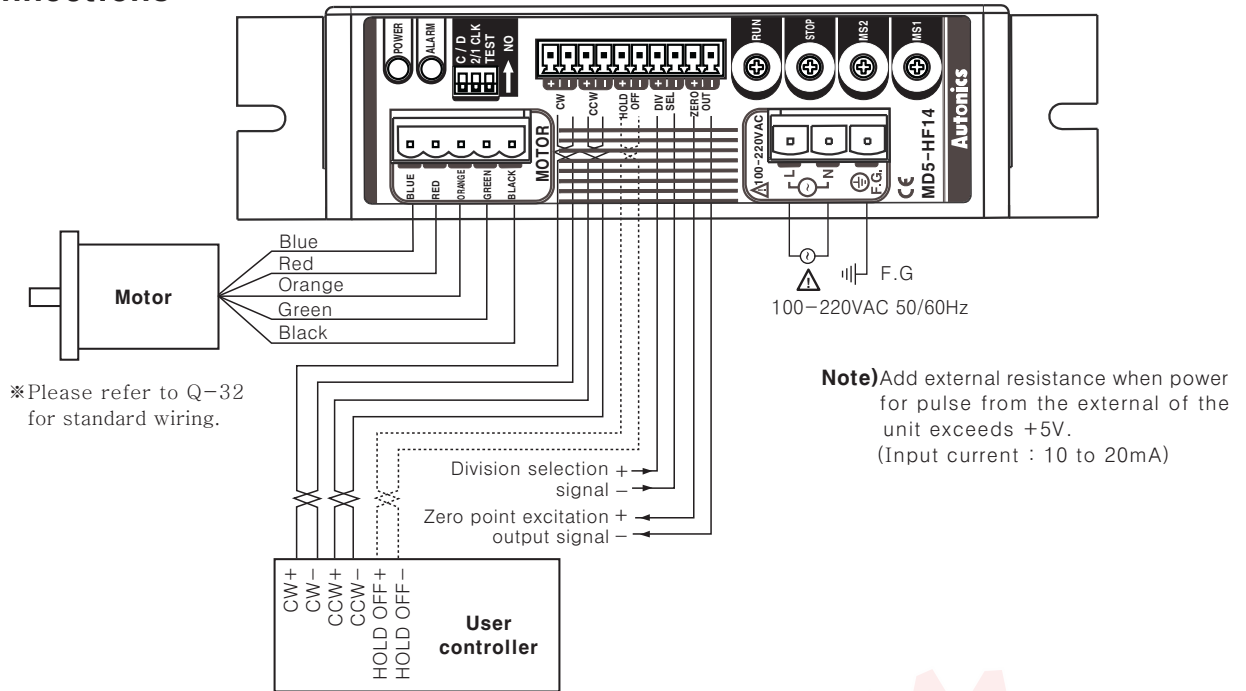 [H]：Motor excitation OFF

※DIVISION SELECTION
  Division selection signal
  → [L]：Operated by MS1 setting resolution.
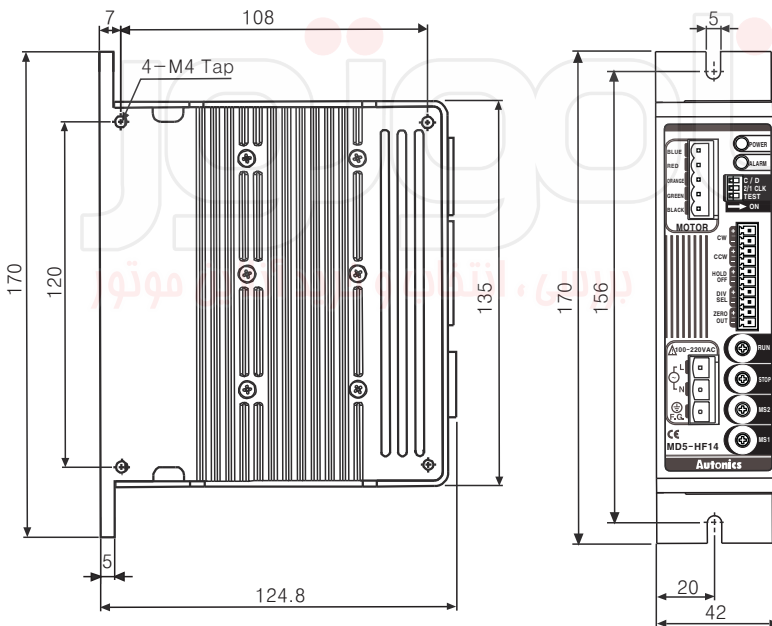   [H]：Operated by MS2 setting resolution.

※ZERO OUT
  Zero point excitation output signal ON for zero point excitation

Autonics
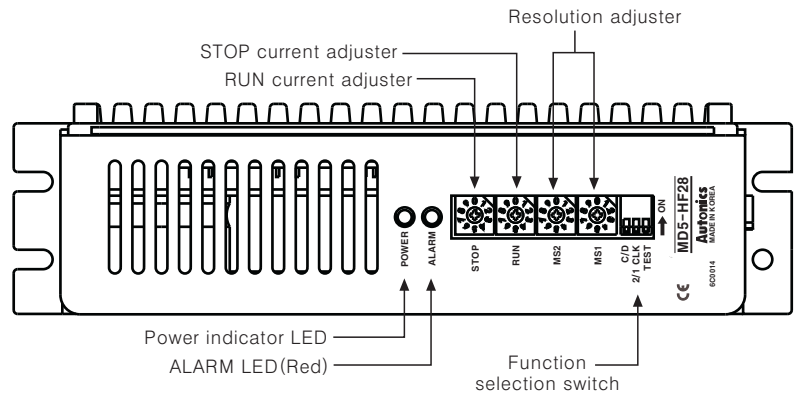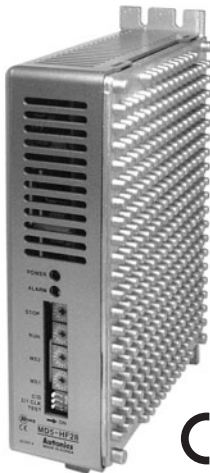
5-Phase Stepping Motor Driver

■Connections

Note) Add external resistance when power for pulse from the external of the unit exceeds +5V.
(Input current : 10 to 20mA)

Motor

Blue
Red
Orange
Green
Black

※Please refer to Q-32 for standard wiring.

100-220VAC 50/60Hz

F.G

Division selection + signal -
Zero point excitation + output signal -

CW+
CW-
CCW+
CCW-
HOLD OFF+
HOLD OFF-

User controller

■Dimensions

4-M4 Tap

7
108
170
120
135
5
124.8

5
170
156
20
42

(Unit:mm)

5-Phase microstepping motor driver [MD5-HF28]

Resolution adjuster
STOP current adjuster
RUN current adjuster
Power indicator LED
ALARM LED(Red)
Function selection switch

※**KR-505G is changed as MD5-HF28.**
※**Power supply 100-220VAC and connected socket are upgraded.**

◎Function selection switch
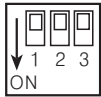
No	Name	Function	Switch position	
			ON	OFF
1	TEST	Self-diagnosis	Rotate in 30rpm	――
2	2/1 CLK	Pulse input method	1 Pulse input	2 Pulse input
3	Current down	Auto current down	Using	Not using

●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.
　※It activates when there is no pulse input of motor operation for over 200ms.

◎RUN current setting

Switch 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 is a phase current provided to 5-phase stepping motor.
　※Be sure to set RUN current at the rated current or below. If not, it may cause heat generation, loss of torque or step-out.
　※Adjust the RUN current in case severe heat generation occurs. Be sure that torque decreasing may occur when adjusting the current.
　※RUN current setting value may have some deviation depending on motor's running frequency.
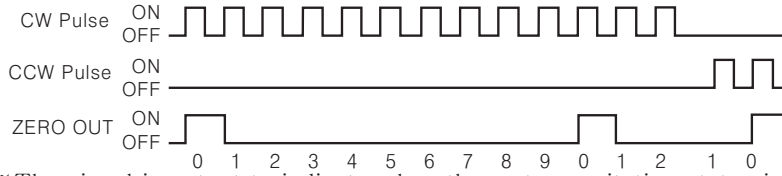　Note)Be sure to adjust RUN current while motor is running.

◎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 stepping 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.

5-Phase Stepping Motor Driver

| (A) Photo electric sensor |
| (B) Fiber optic sensor |
| (C) Door/Area sensor |
| (D) Proximity sensor |
| (E) Pressure sensor |
| (F) Rotary encoder |
| (G) Connector/ Socket |
| (H) Temp. controller |
| (I) SSR/ Power controller |
| (J) Counter |
| (K) Timer |
| (L) Panel meter |
| (M) Tacho/ Speed/ Pulse meter |
| (N) Display unit |
| (O) Sensor controller |
| (P) Switching power supply |
| (Q) Stepping motor & Driver & Controller |
| (R) Graphic/ Logic panel |
| (S) Field network device |
| (T) Production stoppage models & replacement |

◎Zero point excitation output signal (ZERO OUT)

※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)

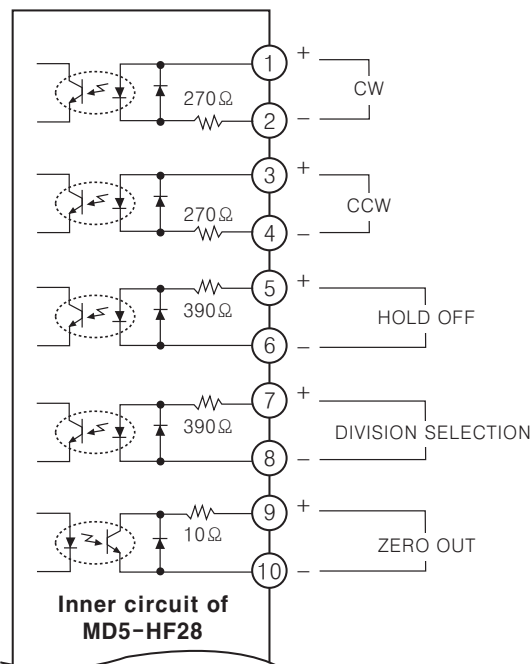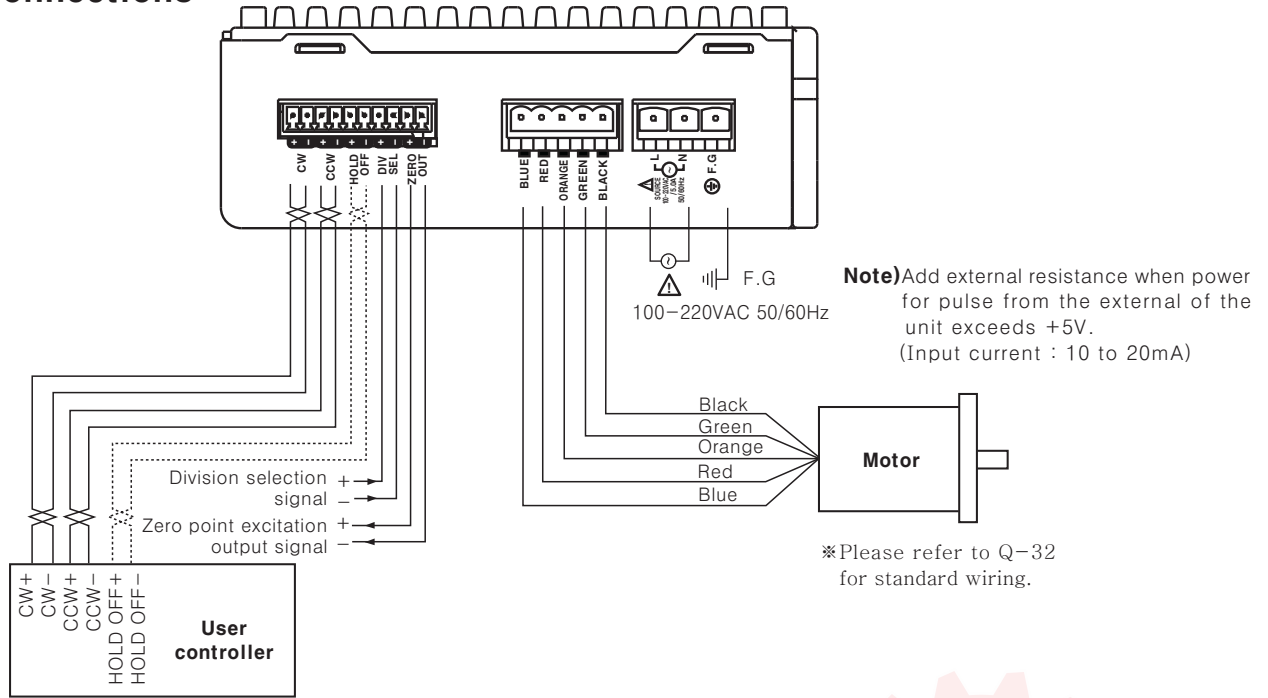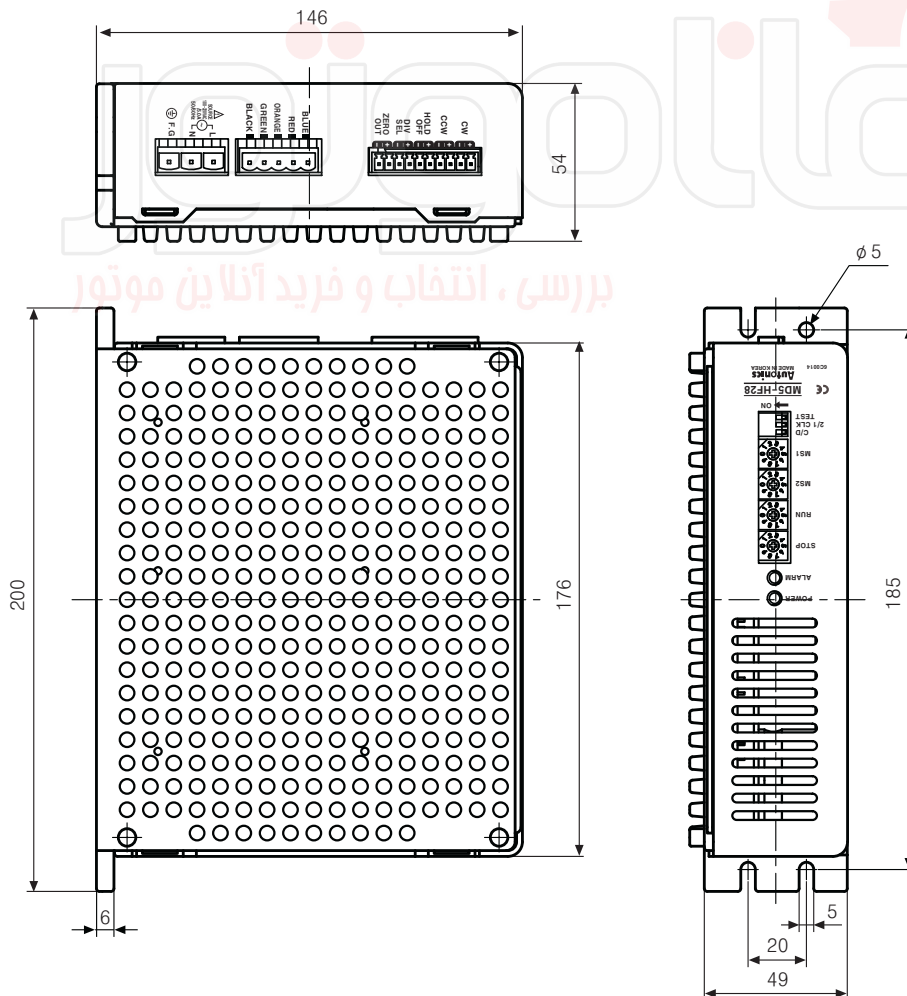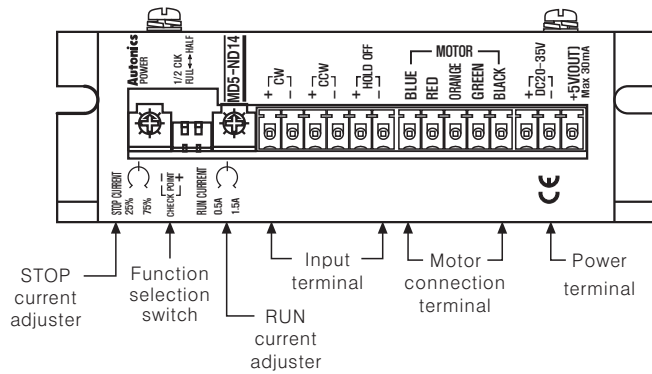| Switch No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Resolution	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250
Step angle	0.72˚	0.36˚	0.18˚	0.144˚	0.09˚	0.072˚	0.045˚	0.036˚	0.0288˚	0.018˚	0.0144˚	0.009˚	0.0072˚	0.00576˚	0.0036˚	0.00288˚

● Resolution setting(Same as MS1, MS2)
※It is set to MS1 when division selection signal is [L], and MS2 when division selection signal is [H].
※Two different micro step can be set using DIVISION SELECTION. Users can select one of them via external input signals.
※Microstepping 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.

◎ALRAM Function
※Over heat : When the temperature in driver BASE is over 80℃, Alarm LED will be ON and motor will stop with holding the torque. Remove the Over Heat Alarm causing factors and reset the power in order to reset alarm function.
※Overcurrent : When overcurrent is applied to the motor due to driver damage or errors, Alarm LED will be flickering. In case of overcurrent, the motor will be HOLD OFF. Cut off the power and remove overcurrnet-causing factors in order to resume normal operation.

■ Input · Output diagram

Inner circuit of MD5-HF28

※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

※DIVISION SELECTION
Division selection signal
→ [L] : Operated by MS1 setting resolution.
[H] : Operated by MS2 setting resolution.

※ZERO OUT
Zero point excitation output signal ON for zero point excitation

MD5 Series

▣ Connections

Note) Add external resistance when power for pulse from the external of the unit exceeds +5V.
(Input current : 10 to 20mA)

100−220VAC 50/60Hz

CW
CCW
HOLD OFF
DIV SEL
ZERO OUT

BLUE
RED
ORANGE
GREEN
BLACK

F.G

Division selection signal + −
Zero point excitation output signal + −

Black
Green
Orange
Red
Blue

Motor

※Please refer to Q−32 for standard wiring.

CW+
CW−
CCW+
CCW−
HOLD OFF+
HOLD OFF−

User controller

▣ Dimensions

146

54

200

176

6

ø5

MD5-HF28

185

20

49

5

(Unit：mm)

5-Phase Stepping Motor Driver

5-Phase stepping motor driver [MD5-ND14]

(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/ Socket
(H) Temp. controller
(I) SSR/ Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/ Speed/ Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching power supply
(Q) Stepping motor & Driver & Controller
(R) Graphic/ Logic panel
(S) Field network device
(T) Production stoppage models & replacement

◎Function selection switch

NO	Name	Function	Switch position	
			ON	OFF
1	1/2 CLK	Pulse input method	1 Pulse input	2 Pulse input
2	FULL ↔ HALF	Resolution Setting	×1(0.72°)	×2(0.36°)

● 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
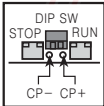
● FULL ↔ HALF

※FULL ↔ HALF switch is to select pulse input mode.
※If changing resolution while the motor is running, it may cause step-out.

◎RUN current setting

※RUN current is a phase current provided to 5-phase stepping motor.
※Be sure to set RUN current at the rated current or below. If not, it may cause heat generation, loss of torque or step-out.
※RUN current setting range: 0.5 to 1.5A
※When changing RUN current, connect CP+ to voltmeter (+) terminal and CP- to voltmeter (-) terminal, then adjust the volume.
※The formula for phase-current setting is ;

$$\text{Setting current(A)} = \frac{CP \text{ Input Voltage(V)}}{2}$$

※Adjust the RUN current in case severe heat generation occurs. Be sure that torque decreasing may occur when adjusting the current.
※RUN current setting value may have some deviation depending on motor's running frequency.
Note)Be sure to adjust RUN current while motor is running.

◎STOP current setting

※STOP current is a phase current provided to 5-phase stepping motor at standstill.
※A function to reduce the current in order to suppress the heat generation at motor standstill / STOP current setting range : 25 to 75% of RUN current using VR
※In case Run current setting value is set to 1.0A and STOP current setting value is set to 50%, STOP current is set to 0.5A.
※STOP current setting value may have some deviation depending on resistance impedance of motor.
※STOP current 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.
※STOP current function will be activated when no operation command pulse is input within 500ms.
Note)Be sure to adjust STOP current while motor is at standstill.

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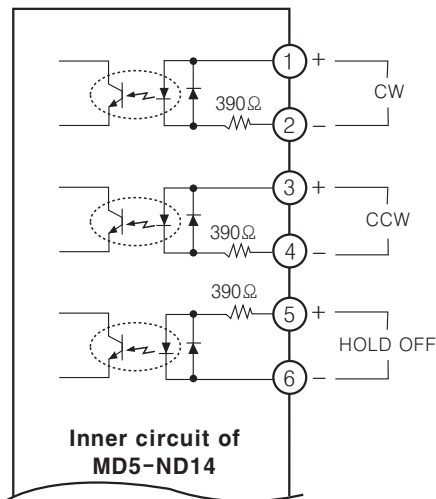※A function used to rotate motor's axis using external force or used for manual positioning.
※HOLD OFF Input signal [H] and [L] represent Photocoupler ON/OFF in a circuit.
※Please do not use for stopping motor.

MD5 Series

▣Input diagram

Inner circuit of MD5-ND14

※CW
  2 pulse input method(CW direction rotation pulse input)
  1 pulse input method(Operating command pulse input)
Note)If the power for driving pulse from external is over than +5V,
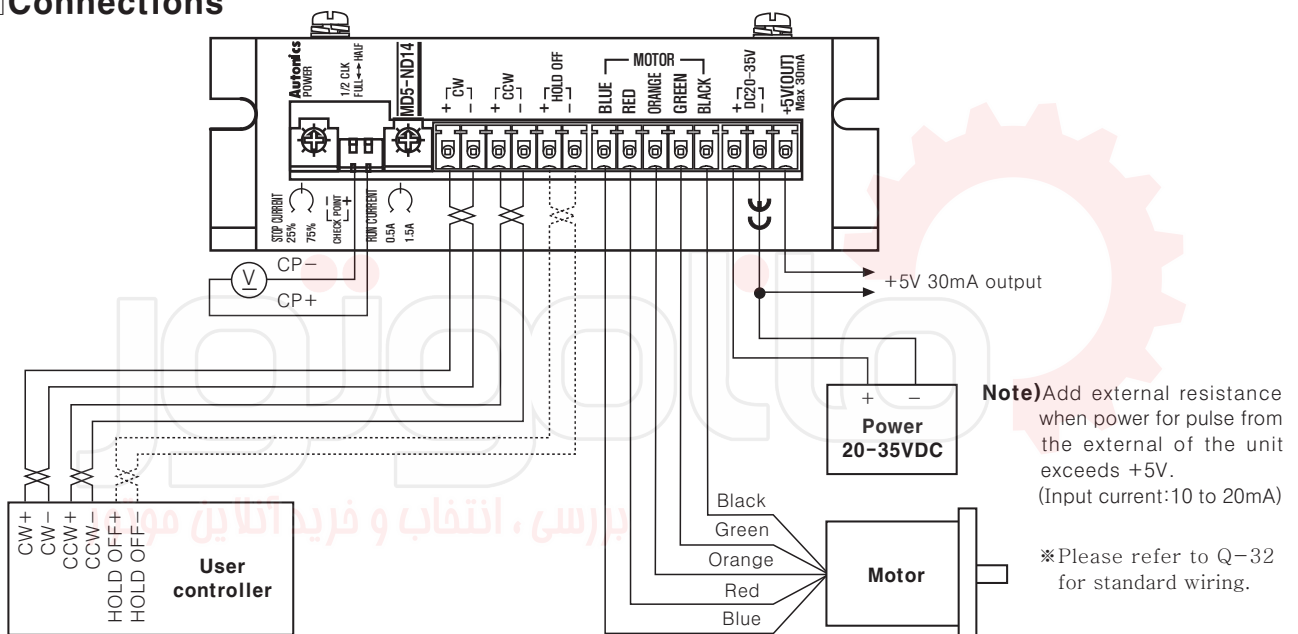   please connect resistor.

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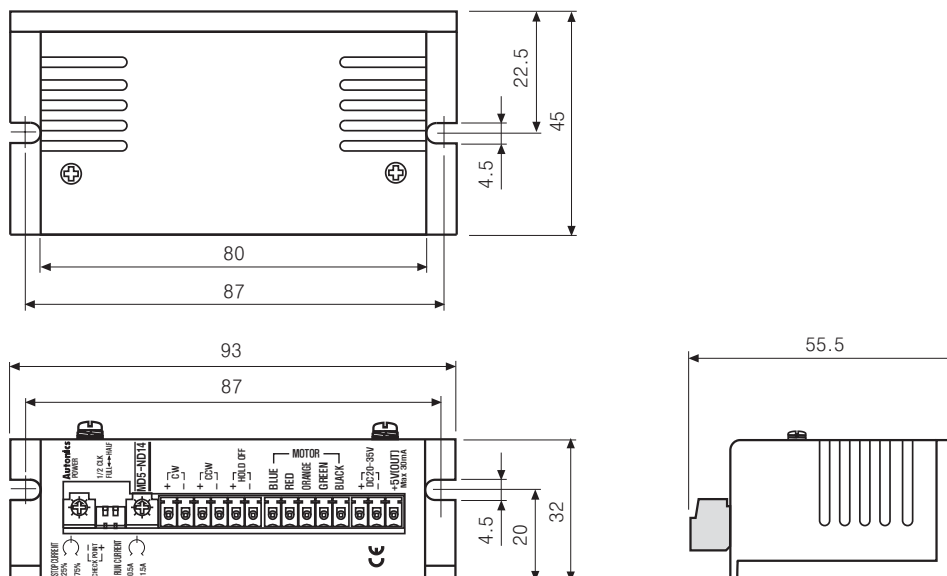 1 pulse input method(Rotating direction pulse input)
  → [H] : CW, [L] : CCW

※HOLD OFF
  The control signal for hold off of Motor → [H] : Motor Hold OFF

▣Connections

→ +5V 30mA output

Note) Add external resistance when power for pulse from the external of the unit exceeds +5V.
(Input current:10 to 20mA)

※Please refer to Q-32 for standard wiring.

Power 20-35VDC

Black
Green
Orange
Red
Blue

Motor

▣Dimensions

(Unit:mm)