

**Autonics**

**Motor Driver(5-Phase micro stepping)**

**MD5-MF14**

**M A N U A L**



Thank you very much for selecting Autonics products.  
For your safety, please read the following before using.

**Caution for your safety**

- ※Please keep these instructions and review them before using this unit.
- ※Please observe the cautions that follow:
- Warning** Serious injury may result if instructions are not followed.
- Caution** Product may be damaged, or injury may result if instructions are not followed.
- ※The following is an explanation of the symbols used in the operation manual.
- caution**: Injury or danger may occur under special conditions.

**Warning**

- In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it requires installing fail-safe device, or contact us for information on type required.  
It may cause serious human injury or a fire, property.
- Installation, connection, operation, control, maintenance should be carried out by person who has been qualified.  
It may cause a fire or human injury, give electronic shock.
- When install this unit, it has to be a good earth ground itself and grounding wire should be over than AWG No.18(0.75mm<sup>2</sup> ).  
It may give electronic shock.
- Please install this unit after considering count plan against power failure.  
It may cause human injury or damage to product by releasing holding torque of motor.
- Do not use this unit outdoors or place where there are flammable, corrosive gas, water, big vibration etc.  
It may cause a fire or give electronic shock.
- Do not touch this unit or connection terminal of condenser within 30sec after turn off the power.  
It may give electric shock by residual current.
- Do not put finger or any object in to this product.  
It may cause a fire or give electronic shock.
- Do not disassemble and modify this unit, when it requires, please contact us.  
It may cause a fire or give electronic shock.
- Please adjust the volume switch with insulated screw driver.  
It may give electronic shock.

**Caution**

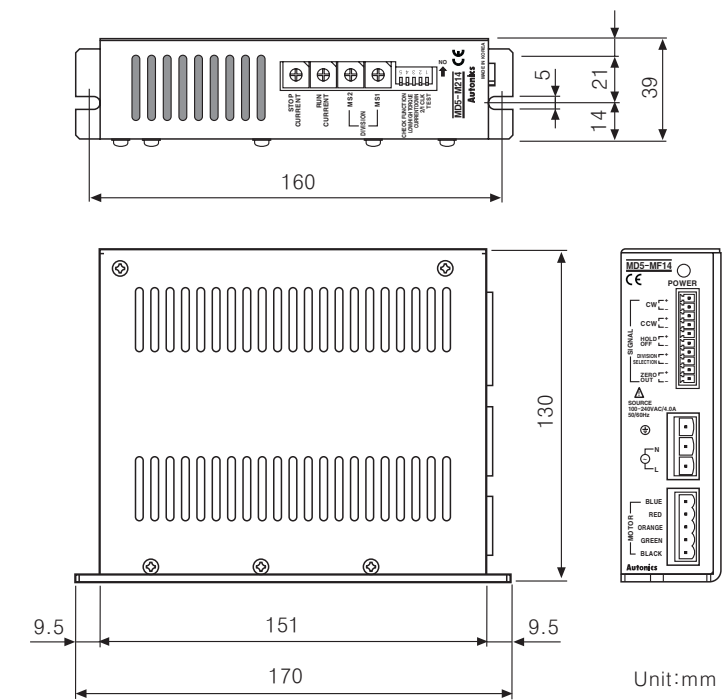
- Do not move, install or maintain during it is operating.  
It may give electronic shock.
- Power input voltage must be used within rating specification and power line should be over than AWG NO. 18(0.75mm<sup>2</sup> ).  
It may cause a fire or give electronic shock.
- Please check the connection before power.  
It may cause a fire or give electronic shock, damage to product.
- When you connect to power, please install current breaker.  
It may cause a fire.
- Please turn off when power failure occurred.  
It may cause human injury or damage to product due to sudden movement when recover power failure.
- Please supply power after checking control input signal.  
It may cause a burn due to high temperature in surface.
- The emergency stop needed during operating.  
It may cause human injury or damage to product.
- Please apply power after checking control input signal.  
It may cause human injury or damage to product by sudden movement.
- Do not turn on the HOLD OFF signal input while it is maintaining vertical position.  
It may cause human injury or damage to product by releasing holding torque of motor.
- Please install a safety device when need to remain the vertical position after turn off the power.  
It may cause human injury or damage to product by releasing holding torque of motor.
- Please check if HOLD OFF signal input is ON when need to set the output manually.  
It may cause human injury by sudden movement.
- Please stop this unit when mechanical trouble occurred.  
It may cause a fire or human injury.
- Do not touch the terminal when test check pressure or insulation resistance.  
It may give electronic shock.
- Please observe rating specification.  
It may cause human injury or give electronic shock, damage to product.
- In cleaning the unit, do not use water or an oil-based detergent.  
It may cause a fire or give electronic shock.
- Please separate as industrial scrapped material when disuse this unit.
- Non-shortcircuit proof.  
It may cause a fire or damage to product.

※The above specification is anytime changeable without notice.

**Specifications**

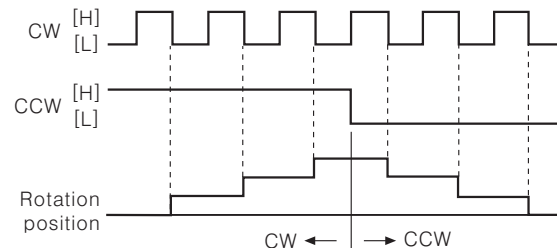
Model	<b>MD5-MF14</b>	
Power supply	100-240VAC 50/60Hz	
Allowable voltage range	90 to 110% of rated voltage	
Power consumption	4A(Max.)	
Drive current	1.4A/Phase(Max.)	
Step angle	Micro step(1, 2, 4, 5, 8, 10, 16, 20, 40, 80 division)	
Input pulse spec.	Pulse width	Min. 0.5μs
	Pulse interval	Max. 1μs
	Rising/falling time	Max. 1μs
	Pulse input voltage	[H] 4-8VDC, [L] 0-0.5VDC
	Max. input pulse frequency	500kpps
Ambient temperature	0 ~ 40°C	
Ambient humidity	35 ~ 85%RH	
Weight	Approx. 750g	

**Dimensions**

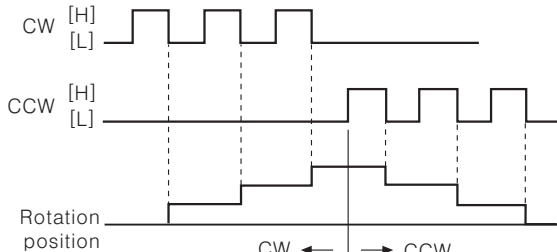


**Time chart**

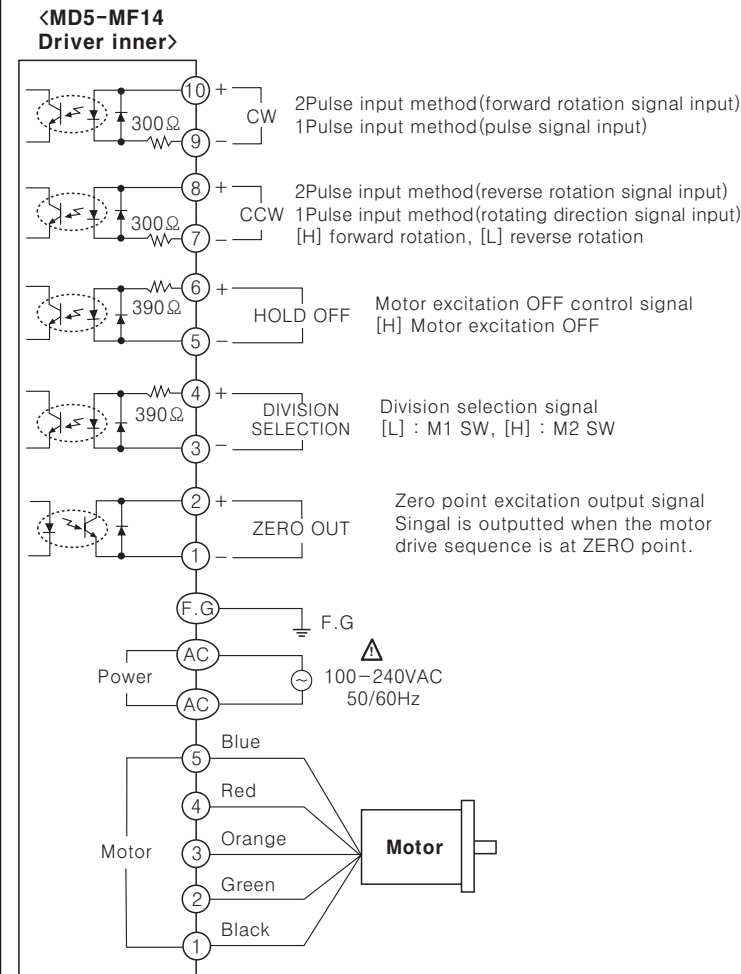
● 1 pulse input method



● 2 pulse input method



**Input · Output diagram**



**Setting RUN and STOP Current**

<RUN CURRENT>

S/W No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Current (A)	0.5	0.58	0.66	0.75	0.81	0.88	0.96	1.03	1.1	1.15	1.25	1.3	1.4	1.47	1.53	1.6

※The run current is phase current for 5 phase stepping motor.

<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

※The switch setting value of STOP CURRENT is a percentage of the RUN CURRENT S/W setting current value. Please refer to the below the maintaining torque when the motor stopped.

$$\text{Maintaining torque} \left[ \frac{\text{kgf} \cdot \text{cm}}{\text{kgf} \cdot \text{cm}} \right] = \frac{\text{Max. holding torque}[\text{kgf} \cdot \text{cm}] \times \text{Stopping current}[\text{A}]}{\text{Rated motor current}[\text{A}]}$$

**S/W with selection of function**

No	Name	Function	S/W position	
			ON	OFF
1	TEST	Self diagnosis function	100pps rotation	Normal
2	2/1 CLK	Pulse input method	1Pulse input	2Pulse input
3	CURRENT DOWN	Auto CURRENT DOWN	Not use	Use
4	LOW/HIGH TORQUE	Drive voltage conversion	High speed torque	Normal
5	CHECK FUNCTION	Check internal function	When it is used, OFF	

- ※Self-diagnosis : The self-diagnosis outputs a pulse of 100pps during the S/W[ON] setting to test the motor and driver.
- ※Auto CURRENT DOWN function : The Auto CURRENT DOWN reduces the drive current at a constant rate to minimize heating when stopping the motor
- ※Drive voltage conversion function(LOW/HIGH Torque) : The functions is to increase the high speed torque of motor by changing drive voltage of motor.
- ※Check internal function : It must be set as OFF, because all kinds of function of driver is stopped when S/W is set as ON.

**Setting resolution**

S/W NO	0	1	2	3	4	5	6	7	8	9
Resolution	1	2	4	5	8	10	20	40	80	16

MS1 MS2 5-Phase motor rotation angle =  $\frac{\text{Basic step}(0.72^\circ)}{\text{Resolution}}$

- ※The adjustment of division during stepping motor operation may cause malfunction.
  - ※Allows a double micro-step operation with the division selecting signal.
  - ※Please refer to the below formula of zero point excitation output signal.
- $$\text{Cycle of zero point excitation output signal [s]} = \frac{1}{\text{Input frequency}[\text{Hz}] \times 10 \times \text{Resolution}}$$

**Failure diagnosis and measurement**

- If motor does not rotate
  - Check the connection status of controller and driver and pulse input specification. (Voltage, width)
  - Check the input pulse method and connected method is same.
  - Check pulse and direction signal is connected correctly for 1 pulse input method.
- If motor rotates as a reverse direction.
  - Check input pulse connection of CW and CCW is correct for 2 pulse input method.
  - When the input is [H] with CCW, it is forward rotation and it is reverse rotation for [L].
- If motor does not work properly.
  - Check the connection of driver and motor.
  - Check the pulse input specification of driver. (Voltage, width)
  - Check output current for current adjusting S/W and current for motor operation as correct.

**Caution for using**

- Caution for signal input
    - When using the 2 pulse input method, do not input CW and CCW at the same time. It may cause malfunction.
    - In case, the signal input supply is higher than rated supply expressed on the specification, please connect the additional resistance to external part.
  - Caution for setting the drive and stopping current
    - A driver current must be set under a rated current of the motor because motor emits heat too much when a driver current is set over a rated current of the motor.
    - A stopping current its driven by Auto CURRENT DOWN function when the motor HOLD OFF signal is [L]. In case, the motor HOLD OFF signal is [H], or Auto CURRENT DOWN function is nor set, a stopping current setting value is not apply to the motor.
  - Caution for wiring
    - Use Twist pair(Over 0.2mm<sup>2</sup> ) for the signal wire should be shorter than 2m.
    - Please use an electric wire is thicker than the motor lead when product the motor wire connection.
    - Please leave a space over 10cm between a signal wire connection and power wire.
  - Caution for installation
    - Please mount a heating panel on metal surface closely.
    - Please mount this product at well-ventilated place in order to increase the heating efficiency of heating panel.
  - Function S/W
    - Check the position of self-diagnosis S/W before turn on the power. If turn on the power at the state of [ON], It could be dangerous due to abrupt motor starting.
    - When the selection switch of input signal method is changed to 2 Pulse input method during the operation with 1 Pulse input method, it may be danger as the revolution way of the motor is changed conversely. Please do not change the input signal method during the operation.
  - Installation environment
    - It shall be used indoor
    - Altitude Max. 2000m
    - Pollution Degree 2
    - Installation Category II
- ※It may cause malfunction if above instructions are not followed.

**Major products**

- PROXIMITY SENSOR ■ PHOTOELECTRIC SENSOR ■ AREA SENSOR
- FIBER OPTIC SENSOR ■ DOOR/DOOR SIDE SENSOR ■ PRESSURE SENSOR
- ROTARY ENCODER ■ COUNTER ■ TIMER
- TEMPERATURE CONTROLLER
- TEMPERATURE/HUMIDITY TRANSDUCER
- POWER CONTROLLER
- PANEL METER
- TACHO/LINE SPEED/PULSE METER
- DISPLAY UNIT
- SENSOR CONTROLLER
- SWITCHING POWER SUPPLY
- GRAPHIC PANEL
- 5-PHASE STEPPING MOTOR & DRIVER & CONTROLLER
- LASER MARKING SYSTEM(CO<sub>2</sub>, Nd:YAG)

**Autonics Corporation**  
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**Global Partner for IA**

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