Autonics

2-Phase Microstep Stepper Motor Driver
MD2U-MD20

INSTRUCTION MANUAL

CE

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

▣ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.
⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in fire, personal injury, or economic loss.
2. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
3. **Install the unit after considering counter plan against power failure.**
   Failure to follow this instruction may result in personal injury, or economic loss.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.
6. **Install the driver in the housing or ground it.**
   Failure to follow this instruction may result in personal injury, fire.
7. **Do not touch the unit during or after operation for a while.**
   Failure to follow this instruction may result in burn due to high temperature of the surface.
8. **For rotating the motor manually when turning off the power, separate the motor and the driver.**
   Power may be supplied to the driver.
9. **Emergency stop directly when error occurs.**
   Failure to follow this instruction may result in fire, or personal injury.

⚠ Caution

1. **When connecting the power input, use AWG 18(0.75mm^2) cable or over.**
2. **Install over-current prevention device (e.g. the current breaker, etc) to connect the driver with power.**
   Failure to follow this instruction may result in fire.
3. **Check the control input signal before supplying power to the driver.**
   Failure to follow this instruction may result in personal injury or product damage by unexpected signal.
4. **Install a safety device to maintain the vertical position after turn off the power of this driver.**
   Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of the motor.
5. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
6. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in fire.
7. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
8. **The driver may overheat depending on the environment.**
   Install the unit in the well ventilated place and forced cooling with a cooling fan.
   Failure to follow this instruction may result in product damage and degradation.
9. **Keep metal chip, dust, and wire residue from flowing into the unit.**
   Failure to follow this instruction may result in fire or product damage.
10. **Use the designated motor only.**
    Failure to follow this instruction may result in fire or product damage.

※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

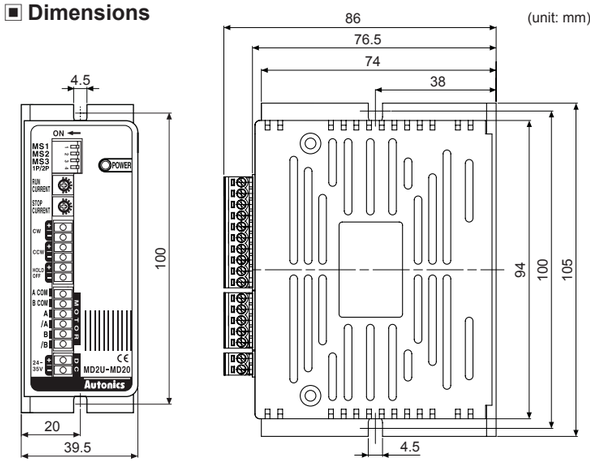
▣ Specifications

Model		**MD2U-MD20**
Power supply※1		24-35VDC⎓
Allowable voltage range		90 to 110% of the rated voltage
Max. current consumption※2		3A
RUN current※3		0.5-2A/Phase
STOP current		20 to 70% of RUN current (set by STOP current volume)
RUN method		Unipolar constant current drive type
Basic step angle		1.8˚/step
Resolution		1, 2, 4, 5, 8, 10, 16, 20-division (1.8˚ to 0.09˚/step)
Input pulse characteristic	Input pulse width	Min. 10μs (CW, CCW), Min. 1ms (HOLD OFF)
	Duty rate	50% (CW, CCW)
	Rising/Falling time	Max. 0.5μs (CW, CCW)
	Pulse input voltage	[H]: 4-8VDC⎓, [L]: 0-0.5VDC⎓
	Max. input current	4mA (CW, CCW), 10mA (HOLD OFF)
	Max. input pulse freq.※4	Max. 50kHz (CW, CCW)
Input resistance		300Ω (CW, CCW), 390Ω (HOLD OFF)
Insulation resistance		Over 200MΩ (at 500VDC megger, between all terminals and case)
Dielectric strength		1000VAC 50/60Hz for 1 minute (between all terminals and case)
Noise immunity		±500V the square wave noise (pulse width: 1μs) by the noise simulator
Vibration		1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock		300m/s² (approx. 30G) in each X, Y, Z direction for 3 times
Environment	Ambient temp.	0 to 50℃, storage: -10 to 60℃
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight※5		Approx. 295g (approx. 180g)

※1: Since torque characteristics are improved but the driver temperature rises with the 30VDC power supply, the driver should be installed at the well ventilated environment. Torque is variable by power supply.
※2: Based on the ambient temperature 25℃, ambient humidity 55%RH.
※3: RUN current varies depending on the input RUN frequency, and the max. instantaneous RUN current varies also.
※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 parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

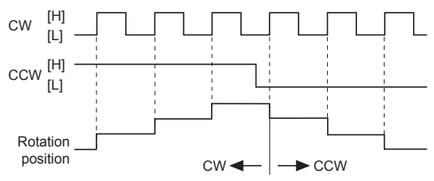
▣ Dimensions

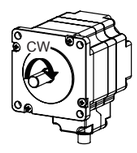
(unit: mm)



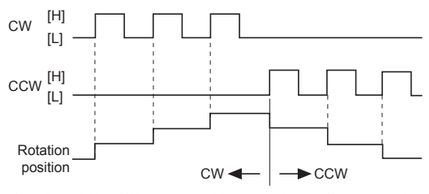
▣ Time Chart

◎ **1 pulse input method**



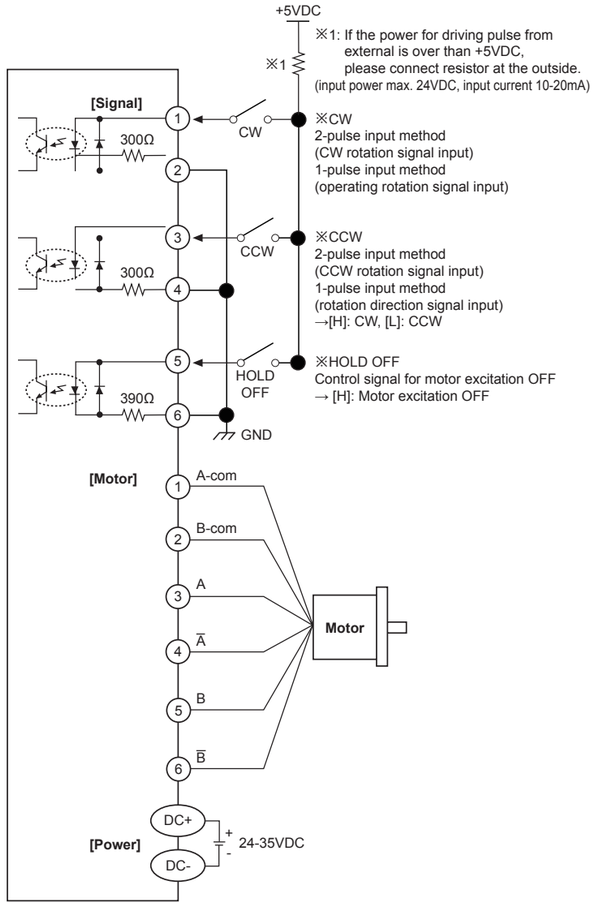


◎ **2 pulse input method**



※Do not input CW, CCW signals at the same time in 2-pulse input method.
It may not operate properly if another direction signal is inputted when one of CW or CCW is [H].

▣ I/O Circuit and Connections



▣ Functions

◎ **Function selection DIP switch**

● **Microstep, pulse input method setting**

No.	Name	Function	Switch position	
			ON	OFF
1	MS1	Microstep setting		
2	MS2			
3	MS3			
4	1P/2P	Pulse input method	1-pulse input method	2-pulse input method

MS1	MS2	MS3	Resolution
ON	ON	ON	1 (Full-step)
ON	ON	OFF	2-division
ON	OFF	ON	4-division
ON	OFF	OFF	5-division
OFF	ON	ON	8-division
OFF	ON	OFF	10-division
OFF	OFF	ON	16-division
OFF	OFF	OFF	20-division

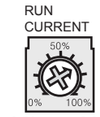
● **Resolution setting (MS1/ MS2/ MS3)**
- Select the step angle (motor rotation angle per 1 pulse).
- The set step angle is dividing basic step angle(1.8°) of 2-phase stepping motor by set resolution value.

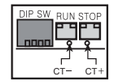
E.g.) Set step angle = $\frac{\text{Basic angle (1.8°)}}{\text{Resolution}}$

※Change resolution setting value only when the motor stops.

● **1P/2P**
- The 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.

◎ **Setting RUN current**





- RUN current setting is for the current provided to the motor in running status.

※When RUN current is increased, RUN torque of the motor is also increased.
※When RUN current is set too high, the heat of the motor is increased.
※Set RUN current properly for the load within the rated current range of the motor.
※RUN current setting range: 0.5 to 2.0A
※RUN current setting method: Measure the voltage by connecting a DC voltage meter to both CT+ and CT- terminals while the motor is running (max. 150rpm)

E.g.) Input voltage (3V) × $\frac{2}{3}$ = 2A (motor excitation current)

※Change RUN current only when the motor stops.

◎ **Setting STOP current**

- STOP current setting is for the current provided to the motor in stopped status, preventing severe heat of the motor.
- This function is for reducing the heat by variable resistance ratio setting within 0 to 100% of RUN current setting range (actual setting range: 20 to 70%) .

E.g.) In case of RUN current setting value is 2A and STOP current setting value is 0% (actual setting range: 20%), STOP current is 2A×0.2=0.4A.

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

◎ **HOLD OFF function**
- This signal is for rotating axis of the motor with external force or 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.

※Use this function only when the motor stops.
※Refer to I/O Circuit and Connections.

▣ Troubleshooting

1. **When the motor does not rotate**
   ①Check the connection of controller and driver.
2. **When motor rotates to the reverse direction**
   ①Check the DIR input of the driver.
   ②DIR input is [ON] for CW, and [OFF] for CCW.
3. **When operation of motor is unstable**
   ①Check whether driver and motor are connected correctly.
   ②Check whether output current of the driver by current setting is proper for operation of the motor.

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 24-35VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Re-supply power after min. 1 sec from disconnected power.
4. When the signal input voltage is exceeded the rated voltage, connect additional resistance at the outside.
5. Set RUN current within the range of motor's rated current depending on the load. When the rated motor current is over, the heat may be increased and motor may be damaged.
6. If 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.
7. Use twisted pair (over 0.2mm^2) for the signal cable which should be shorter than 2m.
8. The thickness of cable should be same or thicker than the motor cable's when extending the motor cable.
9. Keep the distance between power cable and signal cable more than 10cm.
10. If the TEST switch is ON, the motor operates immediately and it may be dangerous.
11. Do not change any setting switchs (function, run/stop current, resolution switches) during the operation or after supplying power. Failure to follow this instruction may result in malfunction.
12. Motor vibration and noise can occur in specific frequency period
    ①Change motor installation method or attach the damper.
    ②Use the unit out of the dedicated frequence range when vibration and noise occurs due to changing motor RUN speed.
13. For using motor, it is recommended to maintenance and inspection regularly.
    ①Unwinding bolts and connection parts for the unit installation and load connection
    ②Strange sound from ball bearing of the unit
    ③Damage and stress of lead cable of the unit
    ④Connection error with motor
    ⑤Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
14. This product does not prepare protection function for a motor.
15. This unit may be used in the following environments.
    ①Indoors (in the environment condition rated in 'Specifications')
    ②Altitude max. 2,000m
    ③Pollution degree 2
    ④Installation category II

▣ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/Sockets
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System (Fiber, CO_2, Nd: YAG)
■ Laser Welding/Cutting System
■ Temperature Controllers
■ Temperature/Humidity Transducers
■ SSRs/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers

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