Autonics

2-Phase Unipolar Intelligent Stepper Motor Driver

MD2U-ID20

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.
※Safety considerations are categorized as follows.
⚠**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.
※The symbols used on the product and instruction manual represent the following.
⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ 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 personal injury, fire, or economic loss.
2. **Installation, connection, operation, maintenance, and inspection should be handled by qualified individuals.**
   Failure to follow this instruction may result in fire or product damage.
3. **Please use DC power with reinforced insulating the primary and secondary part for the DC power product.**
   Failure to follow this instruction may result in fire.
4. **Install the driver after considering counter plan against power failure.**
   Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of motor.
5. **Do not use the unit where flammable or explosive gas, corrosive material, water, or combustible material are likely to exist.**
   Failure to follow this instruction may result in fire or burn.
6. **Do not put a finger or any object into the opening of the driver.**
   Failure to follow this instruction may result in fire or personal injury.
7. **Do not disassemble or modify the unit. Please contact us if necessary.**
   Failure to follow this instruction may result in fire or product damage.
8. **Please use the adjuster with insulated screw driver.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **Disconnect all power sources for installation, connection, inspection, or maintenance work.**
   Failure to follow this instruction may result in product damage.
2. **Power input voltage for this driver must be used within the rated specification and power line should be over than AWG 18 (0.75mm²).**
   Failure to follow this instruction may result in fire.
3. **Check whether the connection is correct, based on the connection diagram before supplying the power to the driver.**
   Failure to follow this instruction may result in fire or product damage.
4. **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.
5. **Turn OFF the driver power in case of a power failure.**
   Failure to follow this instruction may result in personal injury or product damage due to restoration.
6. **Do not touch the unit while operating or right after stopping the driver.**
   Failure to follow this instruction may burn due to high temperature in surface of the driver.
7. **The emergency stop should be available while the driver is operating.**
   Failure to follow this instruction may result in personal injury or product damage.
8. **Before supplying the power to the driver, check the control input signal of this unit.**
   Failure to follow this instruction may result in personal injury or product damage by unexpected signal input.
9. **Do not turn on the HOLD OFF signal input while it is maintaining vertical position.**
   Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of the motor.
10. **Please install a safety device when requiring to maintain the vertical position after turning 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.
11. **Please check if HOLD OFF signal input is ON when it is required to set the output manually.**
    Failure to follow this instruction may result in personal injury by sudden movement.
12. **Stop with emergency this driver when any error occurs to this driver.**
    Failure to follow this instruction may result in fire or personal injury.
13. **Do not touch terminals during measuring insulation resistance or testing insulation dielectric strength of the driver.**
    Failure to follow this instruction may result in product damage.
14. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in product damage, performance loss, shortening the life cycle of the unit, personal injury, or ambient equipment damage.
15. **Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.**
    Failure to follow this instruction may result in fire.
16. **Use the designated 2-phase stepper motor only.**
    Failure to follow this instruction may result in fire or product damage.
17. **When disposing the unit, please categorize it as industrial waste.**

※**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

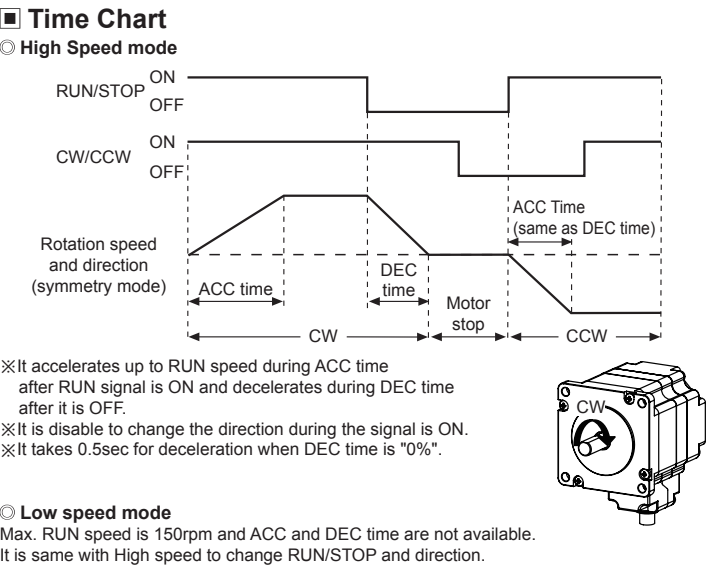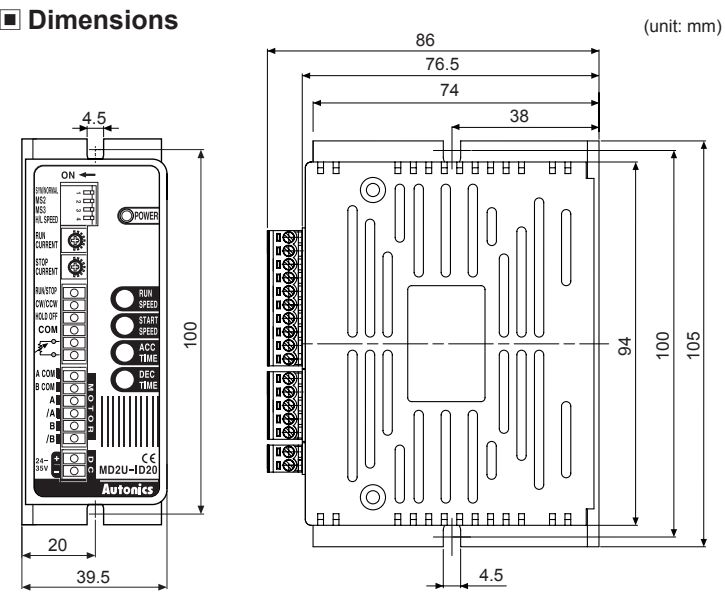| Model	MD2U-ID20
Power supply※1	24-35VDC⎓
Allowable voltage range	90 to 110% of rating voltage
Max. current consumption※2	3A
RUN current※3	0.5-2A/Phase
STOP current	20 to 70% of RUN current (set by STOP current volume)
RUN method	Unipolar constant current drive type
Basic step angle	1.8°/step
Max. drive speed	1500rpm
Input resistance	3.3kΩ (CW/CCW, RUN/STOP, 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
Environ-ment	Ambient temp.	0 to 50℃, storage: -10 to 60℃
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH
Approval	CE
Weight※4	Approx. 303g (approx. 190g)

※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.
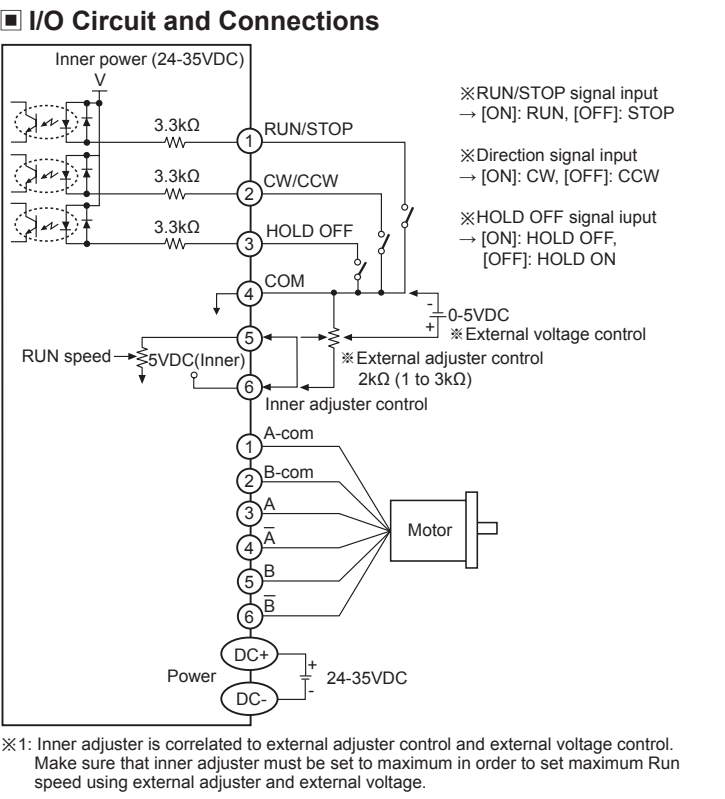※3: RUN current varies depending on the input RUN frequency, and the max. instantaneous RUN current varies also.
※4: The weight includes packaging. The weight in parenthesis is for unit only.

■ Dimensions

(unit: mm)

■ Time Chart

◎ High Speed mode

※It accelerates up to RUN speed during ACC time after RUN signal is ON and decelerates during DEC time after it is OFF.
※It is disable to change the direction during the signal is ON.
※It takes 0.5sec for deceleration when DEC time is "0%".

◎ Low speed mode
Max. RUN speed is 150rpm and ACC and DEC time are not available.
It is same with High speed to change RUN/STOP and direction.

■ 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.
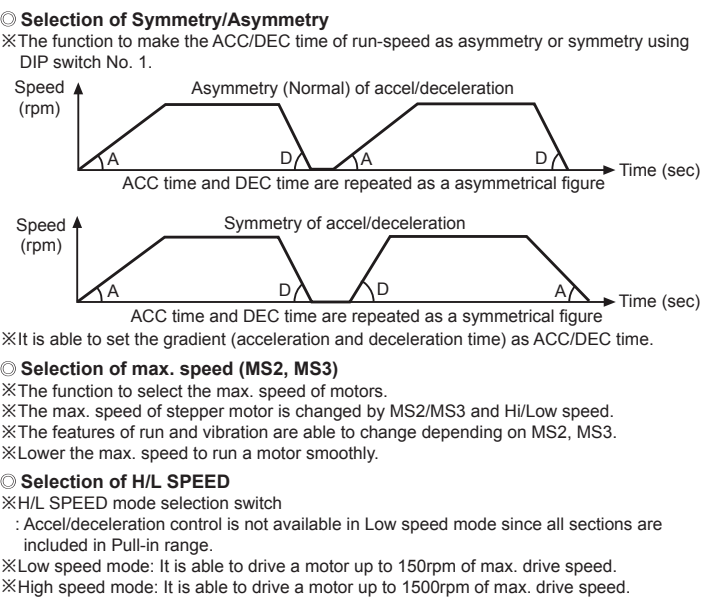   ②Check whether output current of the driver by current setting is proper for operation of the motor.

■ I/O Circuit and Connections

※RUN/STOP signal input
→ [ON]: RUN, [OFF]: STOP

※Direction signal input
→ [ON]: CW, [OFF]: CCW

※HOLD OFF signal iuput
→ [ON]: HOLD OFF, [OFF]: HOLD ON

※External voltage control
※External adjuster control 2kΩ (1 to 3kΩ)

※1: Inner adjuster is correlated to external adjuster control and external voltage control. Make sure that inner adjuster must be set to maximum in order to set maximum Run speed using external adjuster and external voltage.

■ Functions

◎ Function DIP Switch

No.	Name	Function	Switch position ON	OFF
1	SYM/NORMAL	SYM/NORMAL	Symmetry	Asymmetry
2	MS2	Max. speed		
3	MS3			
4	H/L SPEED	High/Low speed		

MS2	MS3	H/L SPEED	Max. speed (rpm)
ON	ON	ON: High speed	1500
ON	OFF		1350
OFF	ON		1000
OFF	OFF		500
D※1	D※1	OFF: Low speed	150

※1: D=Don't care
※Reboot the driver after changing function selection switch.

◎ Selection of Symmetry/Asymmetry
※The function to make the ACC/DEC time of run-speed as asymmetry or symmetry using DIP switch No. 1.

Asymmetry (Normal) of accel/deceleration
ACC time and DEC time are repeated as a asymmetrical figure

Symmetry of accel/deceleration
ACC time and DEC time are repeated as a symmetrical figure

※It is able to set the gradient (acceleration and deceleration time) as ACC/DEC time.

◎ Selection of max. speed (MS2, MS3)
※The function to select the max. speed of motors.
※The max. speed of stepper motor is changed by MS2/MS3 and Hi/Low speed.
※The features of run and vibration are able to change depending on MS2, MS3.
※Lower the max. speed to run a motor smoothly.

◎ Selection of H/L SPEED
※H/L SPEED mode selection switch
: Accel/deceleration control is not available in Low speed mode since all sections are included in Pull-in range.
※Low speed mode: It is able to drive a motor up to 150rpm of max. drive speed.
※High speed mode: It is able to drive a motor up to 1500rpm of max. drive speed.

◎ 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) $\times \frac{2}{3}$ = 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.

◎ Setting RUN speed

※It sets max. RUN speed.
※Max. RUN speed can be different depending on max. speed setting (MS2, MS3) and driving mode setting (Hi/Low speed).
※Since missing step can occur due to max. input pulse frequency of motors, consider motor type and its RUN current when setting max. RUN speed.
※Set the value only when the motor stops.

◎ Setting START speed

※It sets START speed.
※Max. START speed value is same with RUN speed value.
※Although START speed must be set within max. starting frequency, it is recommended to set up START speed within 0 to 50% for stable driving.
※Set the value only when the motor stops.

◎ Setting ACC time

※It sets the acceleration time from START speed to max. RUN speed.
※Operates in AT_1 operation mode when ACC time is under 33.3%, AT_2 operation mode when ACC time is under 66.6%, and AT_3 operation mode when ACC time is over 66.6%.
※AT_1 is 0.5 sec when RUN speed=100%, START speed=0%.
※AT_2 is 1 sec when RUN speed=100%, START speed=0%.
※AT_3 is 2 sec when RUN speed=100%, START speed=0%.
※Set the value only when the motor stops.

◎ Setting DEC time

※It sets the deceleration time from max. RUN speed to STOP.
※Operates in DT_1 operation mode when DEC time is under 33.3%, DT_2 operation mode when DEC time is under 66.6%, and DT_3 operation mode when DEC time is over 66.6%.
※DT_1 is 0.5 sec when RUN speed=100%, START speed=0%.
※DT_2 is 1 sec when RUN speed=100%, START speed=0%.
※DT_3 is 2 sec when RUN speed=100%, START speed=0%.
※Set the value only when the motor stops.

※ACC Time and DEC Time are declined in proportion to the setting value of START speed.
※The figures above indicate the factory default for each value.

◎ 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.

■ Cautions during Use

1. **For signal input**
   ①Direction cannot be changed during the operation.
   ②When the signal input voltage is exceeded the rated voltage, connect additional resistance at the outside. (Connect 3kΩ of resistance when applying 24V of power)
2. **For RUN current, STOP current setting**
   ①Set RUN current within the rated current range of the motor. Failure to follow this instruction may result in severe heat of motor or motor damage.
   ②Use the power for supplying sufficient current to the motor.
3. **For rotating motor**
   ①For rotating the motor when driver power turns OFF, separate the motor from the driver. (if not, the driver power turns ON)
   ②For rotating the motor when driver power turns ON, use Hold OFF function.
4. **For cable connection**
   ①Use twisted pair (over 0.2mm²) for the signal cable which should be shorter than 2m.
   ②The thickness of the cable should be same or thicker than the motor cable when extending the motor cable.
   ③Must separate between the signal cable and the power cable over 10cm.
5. **For installation**
   ①In order to increase heat protection efficiency of the driver, must install the heat sink close to metal panel and keep it well-ventilated.
   ②Excessive heat generation may occur on driver. Keep the heat sink under 80℃ when installing the unit. (at over 80℃, forcible cooling shall be required.)
6. **For using function selection DIP switches**
   ①Do not change the pulse input method during the operation. It may cause danger as the revolution way of the motor is changed conversely.
7. **Motor vibration and noise can occur in specific frequency period.**
   ①Motor vibration and noise can be lowered by changing motor installation or attaching damper.
   ②Use the unit in a range without vibration and noise by changing RUN speed or resolution.
8. **This product may be used in the following environments.**
   ①Indoors
   ②Altitude max. 2000m
   ③Pollution degree 2
   ④Installation category II
   Failure to follow these instructions may result in product damage.

■ 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, CO₂, 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