


2-Phase Stepping Motor Driver

Compact and high-performance of 2-phase stepping motor driver

■ Features

- Unipolar constant current drive type
- Enable to brake when it stops by STOP current adjustment.
- Low speed and precise control with microstep
- Insulate using photocoupler to minimize the influence by external noise.
- Power supply : 24–35VDC

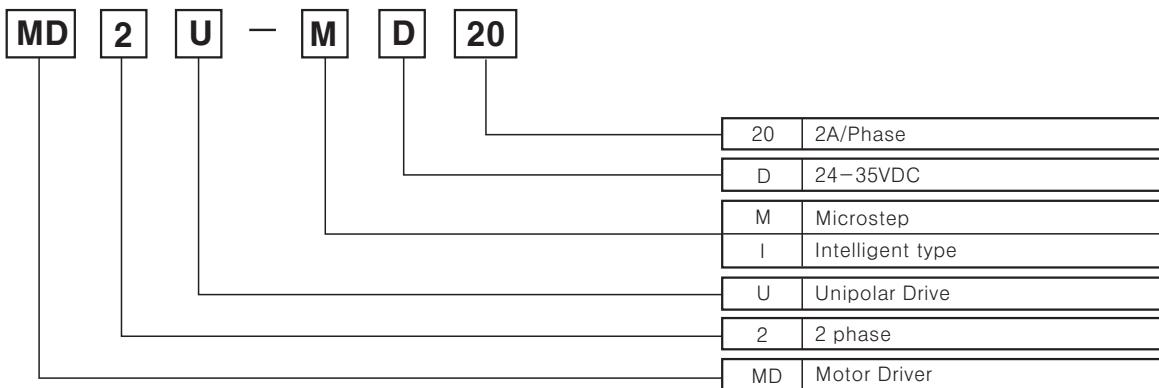
 Please read "Caution for your safety" in operation manual before using.




MD2U-MD20

MD2U-ID20

■ Ordering information



■ Specifications

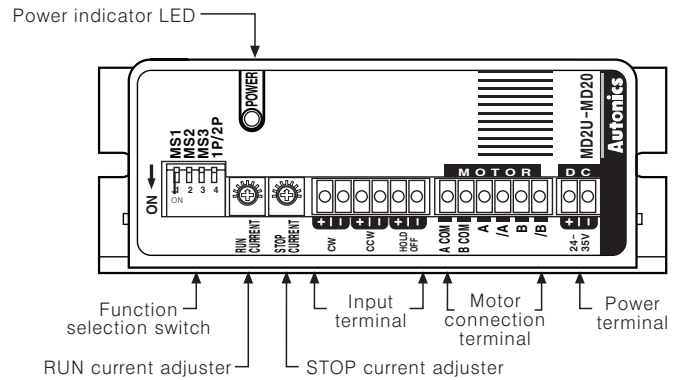
Model	MD2U-MD20	MD2U-ID20
Power supply	(★1)	24–35VDC 3A
RUN current		0.5 ~ 2.0A / Phase
RUN method		Unipolar constant current drive
Resolution	1, 2, 4, 5, 8, 10, 16, 20 division	—
Input pulse width	Min. 6μs	—
Input pulse interval	Min. 6μs	—
Rising/falling time	Max. 0.5μs	—
Max. input pulse frequency	(★2)	40kpps
Input voltage	High : 4–8VDC, Low : 0–0.5VDC	—
Input resistance	300Ω (CW, CCW), 390Ω (HOLD OFF)	3.3kΩ (CW/CCW, RUN/STOP, HOLD OFF)
Insulation resistance	Min. 200MΩ (Based on 500VDC mega)	
Dielectric strength	1000VDC 60Hz for 1 minute	
Vibration	1.5mm amplitude at frequency of 10~55Hz in each of X, Y, Z directions for 2 hours	
Shock	300m/s ² (30G) in X, Y, Z directions for 3 times	
Ambient temperature	0 ~ 50°C (at non-freezing status)	
Storage temperature	-20 ~ 60°C (at non-freezing status)	
Ambient humidity	35 ~ 85%RH	
Approval		
Unit weight	Approx. 180g	Approx. 190g

※(★1) When using over 30VDC, it should be mounted at ventilative place due to increasing heat.

※(★2) Max. input pulse frequency is subject to change depending on resolution.

MD2U Series

2-Phase microstepping driver [MD2U-MD20]



○Function selection switch

●Setting microstep

	MS1	MS2	MS3	Resolution	Step angle
	ON	ON	ON	Full-step	1.8 °
	ON	ON	OFF	2 division	0.9 °
	ON	OFF	ON	4 division	0.45 °
	ON	OFF	OFF	5 division	0.36 °
	OFF	ON	ON	8 division	0.225 °
	OFF	ON	OFF	10 division	0.18 °
	OFF	OFF	ON	16 division	0.1125 °
	OFF	OFF	OFF	20 division	0.09 °

●Setting input type

	1P / 2P
	1 Pulse input
	2 Pulse input

●Resolution Setting (MS1/ MS2/ MS3)

※ A switch to select micro step angle to drive a motor.

※ Microstepping is to make basic step angle of 2-phase motors (1.8°) divided into smaller angle according to setting values

※ The formula for microstep angle is;

$$\text{Rotation angle per pulse of 2-phase} [^\circ] = \frac{1.8^\circ \text{ or } 0.9^\circ}{\text{Resolution}}$$

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

●1P/2P

※ A switch to select pulse input type

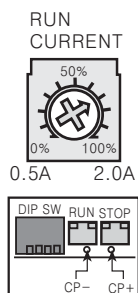
※ 1-pulse input mode

CW : Operation command pulse input, CCW : Rotation direction pulse input ([H] : CW, [L] : CCW)

※ 2-pulse input mode

CW : CW direction rotation pulse input, CCW : CCW direction rotation pulse input

○RUN current setting



※ RUN current is a phase current provided to 2-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 ~ 2.0A

※ RUN current setting : Measure the voltage by connecting a DC voltage meter to both CT+ and CT- terminals while the motor is running (Max. 150rpm).

Ex) Input Voltage (3V) × 2 / 3 = 2A (Motor's excitation current)

※ Adjust the RUN current in case severe heat generation occurs.

Be sure that torque decreasing may occur when adjusting the current.

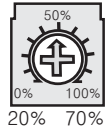
※ RUN current setting value may have some deviation depending on motor's running frequency.

Note) Be sure to adjust RUN current while motor is running.

2-Phase Stepping Motor Driver

◎STOP current setting

STOP CURRENT



- ※ Stop current is a phase current provided to 2-phase stepping motor at standstill.
- ※ A function to reduce the current in order to suppress the heat generation at motor standstill / Use variable resistance ratio within 0~100% of RUN current to set STOP current (Actual setting range is 20~70% of RUN current).

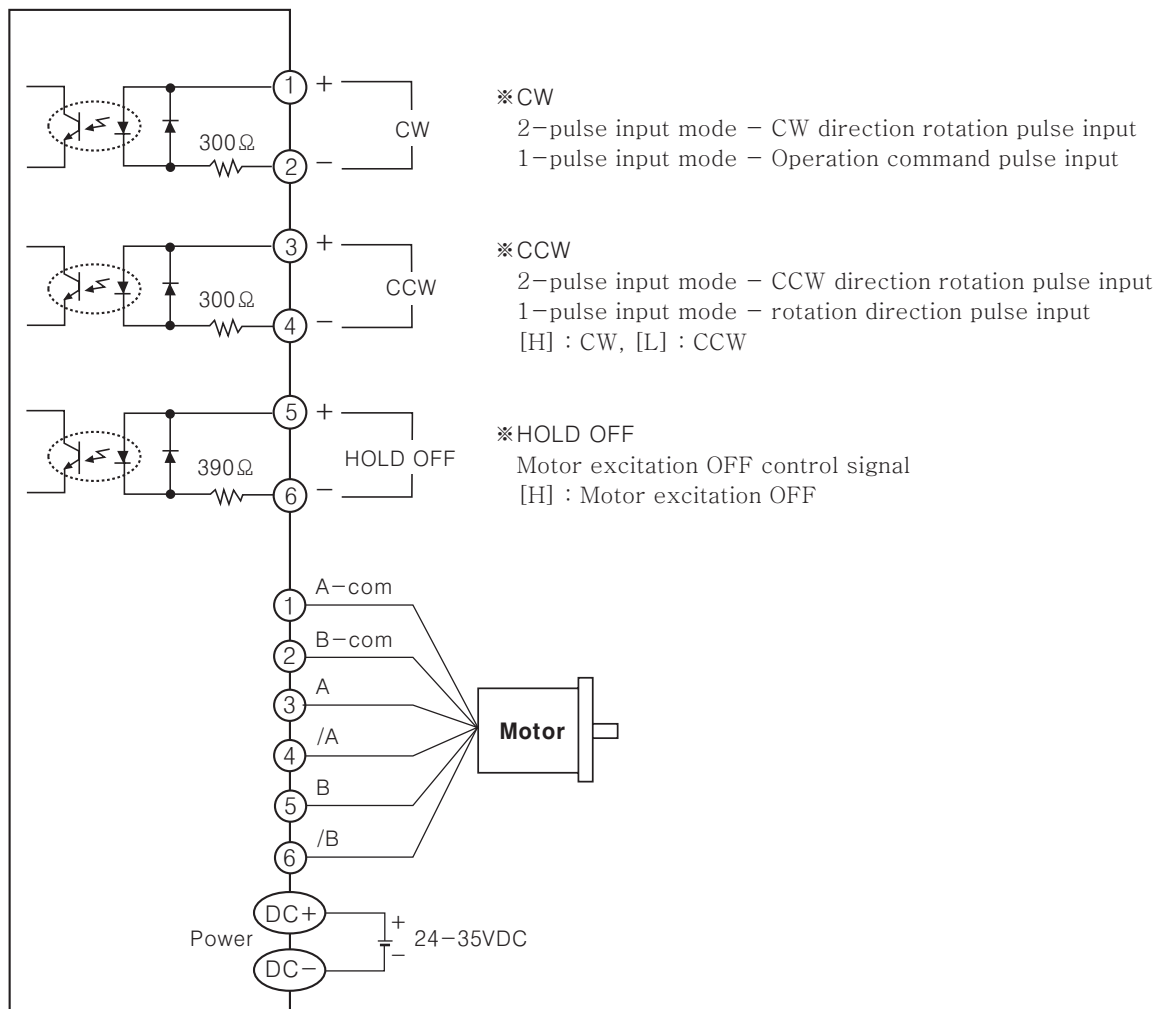
Ex) If RUN current setting value is 2A and STOP current setting value is 0%, STOP current will be set to 0.4A.

- ※ 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.

◎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 i ?s axis using external force or used for manual positioning.
- ※ HOLD OFF Input signal [H] and [L] represent Photocoupler ON/OFF in a circuit.

■ Input · Output diagram and connections

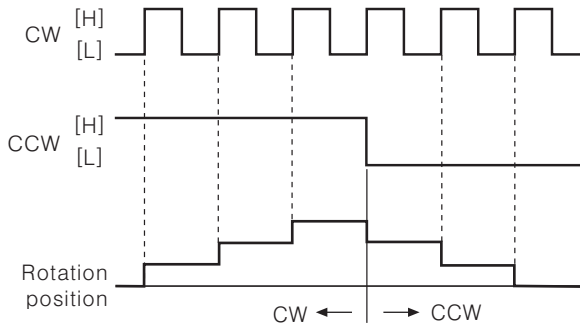


Note) Add external resistance when power for pulse from the external of the unit exceeds +5V.
 (Input power : Max. DC24V, Input current : 10~20mA)

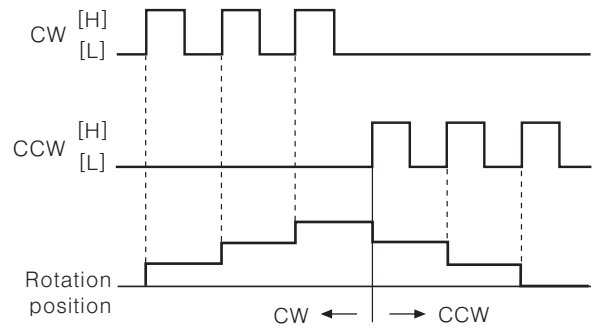
MD2U Series

Time chart

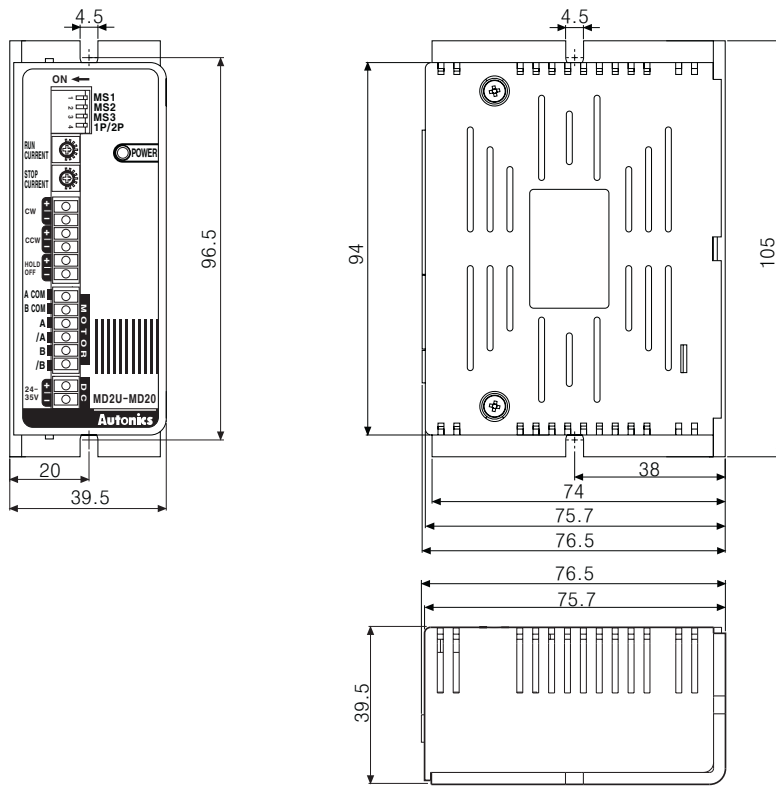
●1 Pulse input



●2 Pulse input



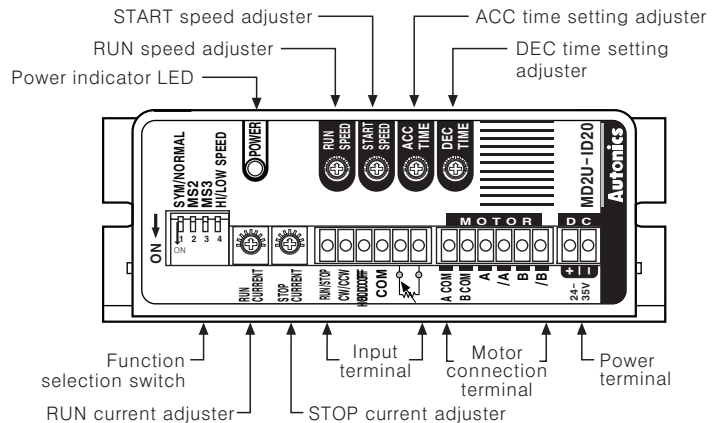
Dimensions



(Unit:mm)

2-Phase Stepping Motor Driver

2-Phase intelligent stepping motor driver [MD2U-ID20]



◎Intelligent Type Stepping Motor Driver?

MD2U-ID20 is an intelligent type stepping motor driver including all features to control 2-phase stepping motors so that no controllers are required.

- Realizing AC motor's driving features to stepping motors
- Controlling START speed, RUN speed and ACC/DEC speed
- User-friendly design to realize various functions (front switch and volume)
- Realizing low vibration driving with microstepping

◎Function selection switch

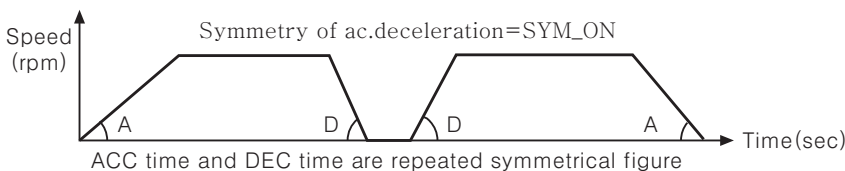
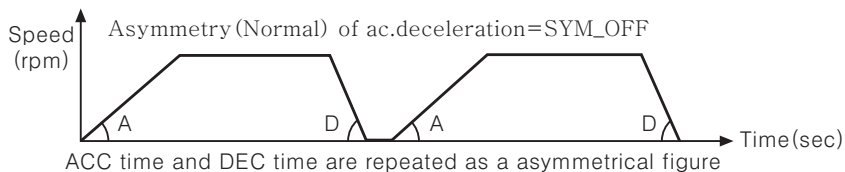
S/W No.	1	2	3	4	Max. speed (rpm)
	Name	SYM/NORMAL	MS2	MS3	
 Switch	ON: Symmetry OFF: Asymmetry (Normal) D (Note1)	ON	ON	ON: Hi speed OFF: Low speed	1500
		ON	OFF		1350
		OFF	ON		1000
		OFF	OFF		500
		D (Note1)	D (Note1)		150

※(Note1)D=Don't care

※Reset the power after changing function selection switch operations.

◎Selection of Symmetry/Asymmetry

※A function to make the ACC/DEC time of run-speed as asymmetry or symmetry using Dip switch No. 1.



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

◎Selection of max. speed (MS2, MS3)

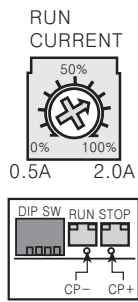
- ※A function to select the max. speed of motors.
- ※The max. speed of stepping motor is changed by MS2/MS3 and Hi/Low speed.
- ※The features of run and vibration are able to change depending on MS2, MS3.
- ※Lower the maximum speed to run a motor smoothly.

◎Selection of Hi/Low speed

- ※Hi/Low speed switch : Ac.deceleration control is not available in LS mode since all sections are included in Pull-in range.
- ※LS mode : It is able to drive a motor up to 150rpm of max. drive speed.
- ※HS mode : It is able to drive a motor up to 1500rpm of max. drive speed.

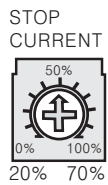
MD2U Series

○RUN current setting



- ※ RUN current is a phase current provided to 2-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 ~ 2.0A
 - ※ RUN current setting : Measure the voltage by connecting a DC voltage meter to both CT+ and CT- terminals while the motor is running (Max. 150rpm).
- Ex) Input Voltage(3V) × 2 / 3 = 2A (Motor's excitation current)
- ※ 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



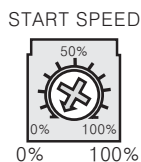
- ※ Stop current is a phase current provided to 2-phase stepping motor at standstill.
 - ※ A function to reduce the current in order to suppress the heat generation at motor standstill / Use variable resistance ratio within 0~100% of RUN current to set STOP current (Actual setting range is 20~70% of RUN current).
- Ex) If RUN current setting value is 2A and STOP current setting value is 0%, STOP current will be set to 0.4A.
- ※ 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.

○RUN speed setting



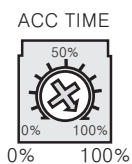
- ※ It sets max. RUN speed.
- ※ Max. RUN speed can be different depending on max. speed setting (MS2, MS3) and driving mode setting (Hi/Low speed).
- ※ Consider motor type and its RUN current when setting Max. RUN speed. Missing step could occur due to max. input pulse frequency of motors.
- ※ Set the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

○START speed setting



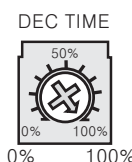
- ※ It sets desired START speed.
- ※ Max. START speed value is same with RUN speed value.
- ※ START speed must be set within max. starting frequency. It is recommended to set up START speed within 0~50% for stable driving.
- ※ Set the value when the motor stops.

○ACC time setting



- ※ It sets the acceleration time from START speed to max. driving speed.
- ※ 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 when the motor stops.

○DEC time setting



- ※ It sets the deceleration time from max. RUN speed to STOP.
- ※ 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 when the motor stops.

※ ACC Time and DEC Time are declined in proportion to the setting value of START speed.

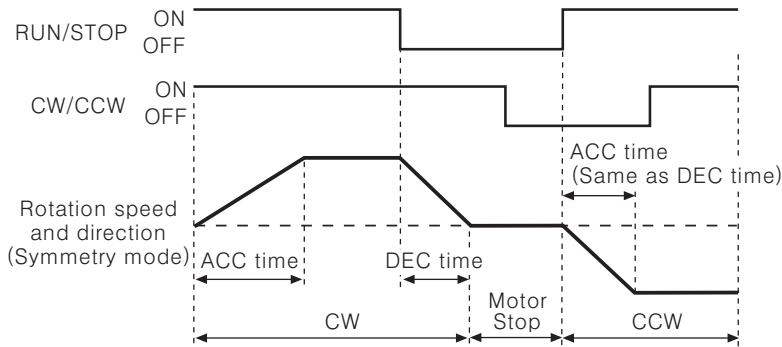
○HOLD OFF function

- ※ 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.

2-Phase Stepping Motor Driver

Time chart

High speed

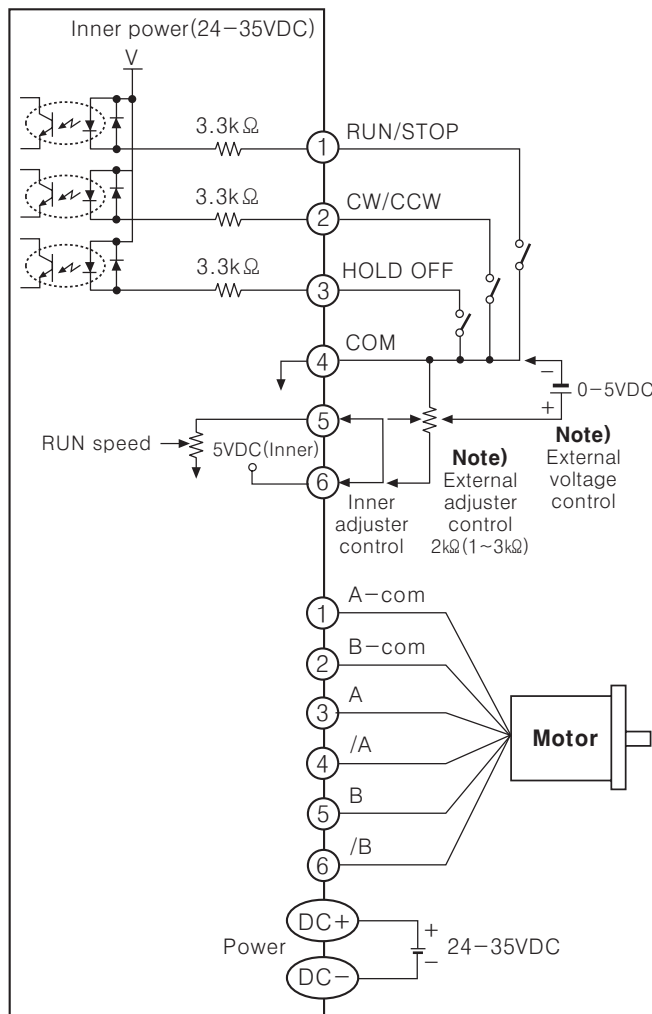


It accelerates up to RUN speed during ACC time after RUN signal is ON and decelerates during DEC time after it is OFF. It is disable to change the direction during the signal is ON and it takes 0.5sec for deceleration when DEC time is "0%".

Low speed

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.

Input - Output diagram and connections

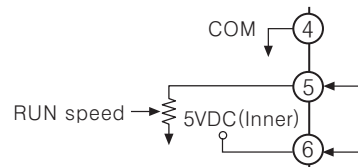


RUN/STOP signal input
→ [ON] : RUN, [OFF] : STOP

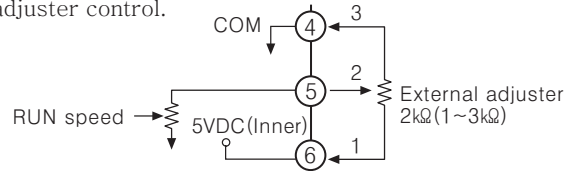
Direction signal input
→ [ON] : CW, [OFF] : CCW

HOLD OFF signal input
→ [ON] : HOLD OFF, [OFF] : HOLD ON

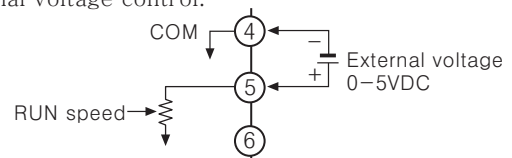
- Inner adjuster control (Adjusting RUN SPEED with front VR)
Make the connection between terminal no.5 and no.6.



- External adjuster control (Adjusting RUN SPEED with connecting external variable resistance)
Connect variable resistance 2kΩ (1~3kΩ) for external adjuster control. If variable resistance is too low, full range setting might not be possible. Make sure to adjust RUN speed VR to maximum for external adjuster control.



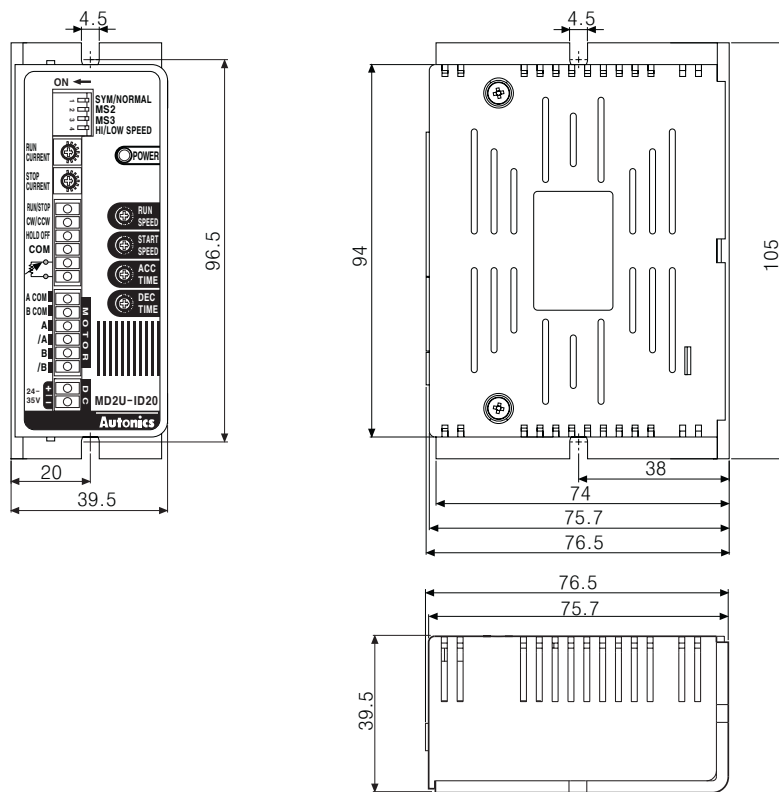
- External voltage control (Adjusting RUN SPEED with external voltage input)
Make sure to adjust RUN speed VR to maximum external voltage control.



Note) 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.

MD2U Series

■ Dimensions



(Unit:mm)

■ Proper usage

◎ Failure diagnosis and management

- Check the connection of controller and driver, if motor does not rotate.
- Check the DIR input of driver, if motor rotates as a reverse direction, it is CW for [ON] and CCW for [OFF].
- If motor does not work properly,
 - ① Check the connection of driver and motor.
 - ② Check driver output current and RUN current of motor depending on current adjuster are correct.

◎ Caution for using

- Do not change DIR signal during the operation.
- Set RUN current as under the rated current of motor, or it emits heat too much.
- When using over 30VDC, it should be mounted at ventilative place due to increasing heat.
- Use twisted pair (Min. 0.2mm²) for the signal wire should be shorter than 2m.
- Use an electric wire thicker than the motor lead wire when extending the motor wires.
- Install a heat sink on metal surface closely.
- Installation environment
 - ① It shall be used indoor.
 - ② Altitude Max.2000m
 - ③ Pollution Degree 2
 - ④ Installation Category II