MD2U Series   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.**

CE

MD2U-MD20   **MD2U-ID20**

▣Ordering information

| MD | 2 | U | — | M | D | 20 |

Run current	20	2A/Phase
Power supply	D	24-35VDC
Operation type	M	Microstep
	I	Intelligent type
Run method	U	Unipolar drive
Motor phase	2	2 Phase
Item	MD	Motor Driver

▣Specifications

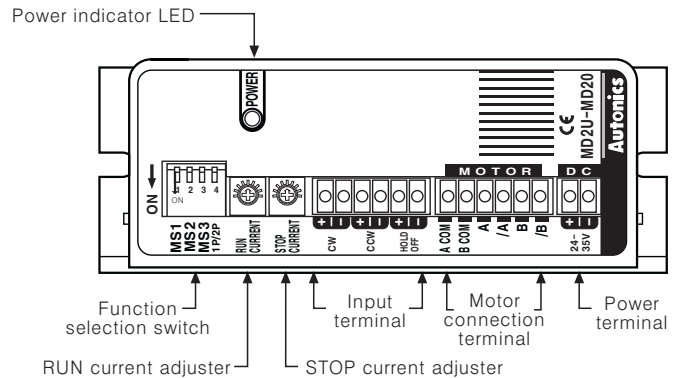| Model	MD2U-MD20	MD2U-ID20
Power supply	(★1) 24-35VDC 3A	
RUN current	0.5 to 2.0A / Phase	
RUN method	Unipolar constant current drive	
Resolution	1, 2, 4, 5, 8, 10, 16, 20 division	———
Input pulse width	Min. 10μs	———
Pulse duty	Max. 50%	———
Rising/falling time	Max. 0.5μs	———
Max. input pulse frequency	(★2) 50kHz	———
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 (atn 500VDC megger)	
Dielectric strength	1000VDC 60Hz for 1 minute	
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours	
Shock	300m/s² (30G) in X, Y, Z directions for 3 times	
Ambient temperature	0 to 50℃ (at non-freezing status)	
Storage temperature	-20 to 60℃ (at non-freezing status)	
Ambient humidity	35 to 85%RH	
Approval	CE	
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]

Power indicator LED

Function selection switch

RUN current adjuster — STOP current adjuster

Input terminal · Motor connection terminal · Power terminal

◎Function selection switch

●Setting microstep

	MS1	MS2	MS3	Resolution	Step angle
ON 1 2 3	ON	ON	ON	Full-step	1.8 °
ON 1 2 3	ON	ON	OFF	2 division	0.9 °
ON 1 2 3	ON	OFF	ON	4 division	0.45 °
ON 1 2 3	ON	OFF	OFF	5 division	0.36 °
ON 1 2 3	OFF	ON	ON	8 division	0.225 °
ON 1 2 3	OFF	ON	OFF	10 division	0.18 °
ON 1 2 3	OFF	OFF	ON	16 division	0.1125 °
ON 1 2 3	OFF	OFF	OFF	20 division	0.09 °

●Setting input type

	1P / 2P
ON 4	1 Pulse input
ON 4	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;

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

※It may cause step-out if resolution is changed while motor is running.
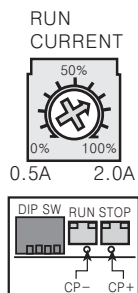
●1P/2P

※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
50%
0% 100%
0.5A 2.0A

DIP SW RUN STOP
CP- CP+

※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 to 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.
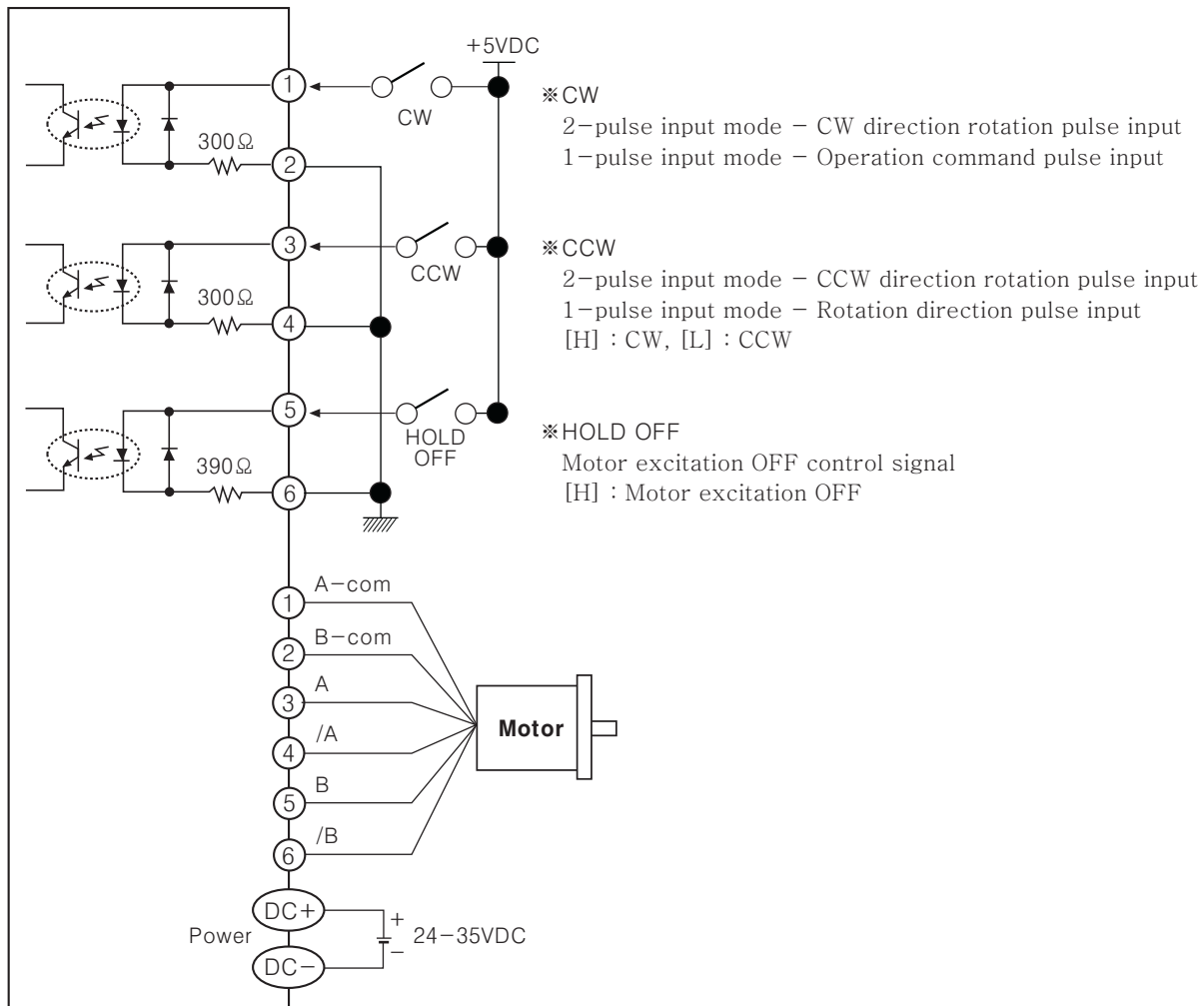
Autonics

2-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

◎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 to 100% of RUN current to set STOP current (Actual setting
   range is 20 to 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'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.

■Input · Output diagram and connections

※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
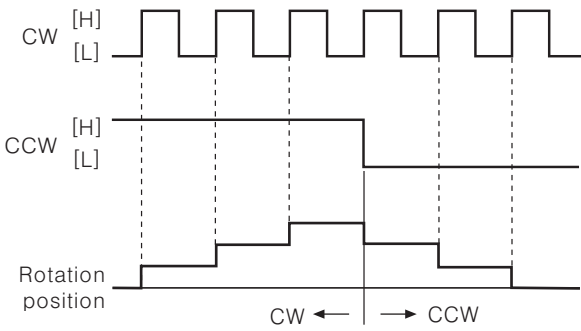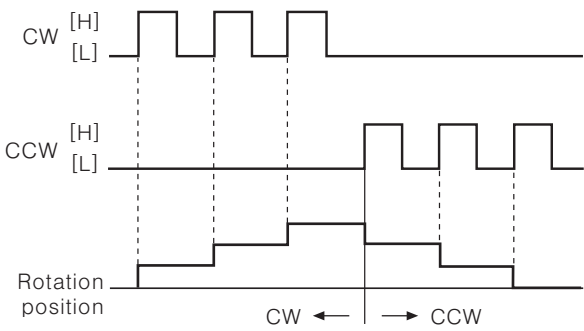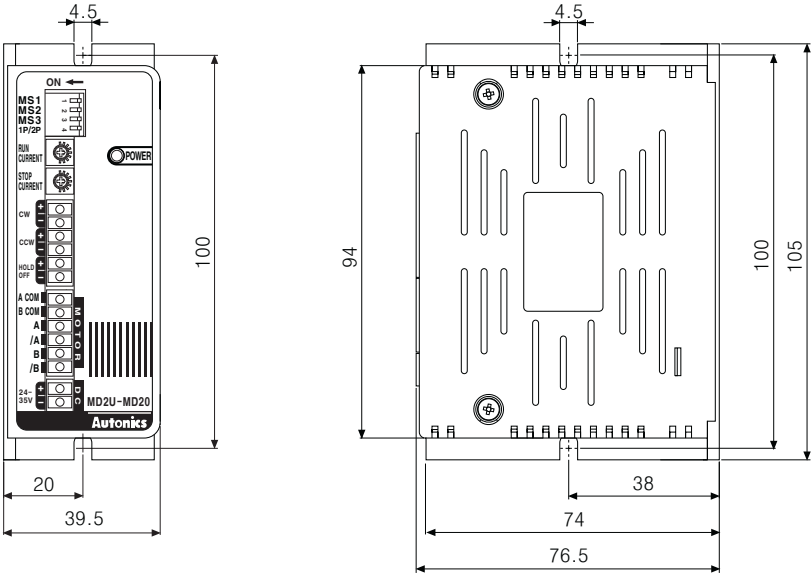   [H] : Motor excitation OFF

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

MD2U Series

▣ Time chart

● 1 Pulse input

CW [H] [L]

CCW [H] [L]

Rotation position

CW ← | → CCW

● 2 Pulse input

CW [H] [L]

CCW [H] [L]

Rotation position

CW ← | → CCW

▣ Dimensions

4.5

ON ←

MS1
MS2
MS3
1P/2P

RUN
CURRENT

STOP
CURRENT

CW
CCW
HOLD
OFF

A COM
B COM
A
/A
B
/B

24~
35V

POWER

M
O
T
O
R

D
C

MD2U-MD20

Autonics

100

20

39.5

4.5

94

100

105

38

74

76.5

(Unit:mm)

2-Phase Stepping Motor Driver

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

(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

START speed adjuster — ACC time setting adjuster
RUN speed adjuster — DEC time setting adjuster
Power indicator LED —

Function selection switch
RUN current adjuster — STOP current adjuster
Input terminal
Motor connection terminal
Power terminal

◎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
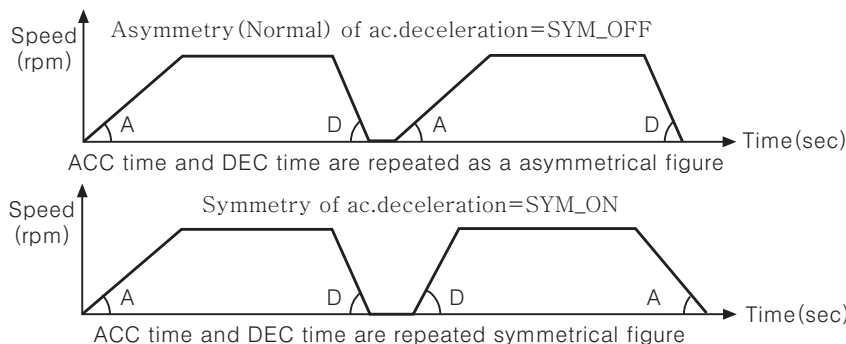
◎Function selection switch

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

Speed (rpm)
Asymmetry (Normal) of ac.deceleration=SYM_OFF
A D A D
Time(sec)
ACC time and DEC time are repeated as a asymmetrical figure

Speed (rpm)
Symmetry of ac.deceleration=SYM_ON
A D D A
Time(sec)
ACC time and DEC time are repeated symmetrical figure

※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.
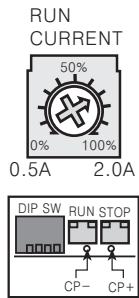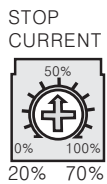※Lower the max. speed to run a motor smoothly.

◎Selection of Hi/Low speed

※Hi/Low speed mode selection switch : Ac.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.
※Hi speed mode : It is able to drive a motor up to 1500rpm of max. drive speed.

MD2U Series

◎RUN current setting
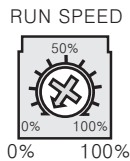
RUN CURRENT

0.5A   2.0A

DIP SW RUN STOP

CP− CP+

※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 to 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

20% 70%

※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 to 100% of RUN current to set STOP current (Actual setting range is 20 to 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

RUN SPEED

0%   100%

※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

START SPEED

0%   100%
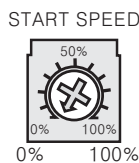
※It sets desired START speed.
※Max. START speed value is same with RUN speed value.
※START speed must be set within max. starting frequency. It is recommended to set up START speed within 0 to 50% for stable driving.
※Set the value when the motor stops.

◎ACC time setting

ACC TIME

0%   100%
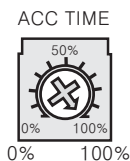
※It sets the acceleration time from START speed to max. driving speed.
※AT_1 operation mode when ACC time is under 33.3%, AT_2 operation mode when ACC time is under 66.6% and AT_3 operation mode when ACC time is over 66.6%.
※AT_1 is 0.5 sec. when RUN speed=100%, START speed=0%.
※AT_2 is 1 sec. when RUN 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

DEC TIME

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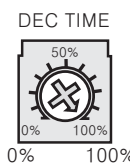
※It sets the deceleration time from max. RUN speed to STOP.
※DT_1 operation mode when DEC time is under 33.3%, DT_2 operation mode when DEC time is under 66.6% and DT_3 operation mode when DEC time is over 66.6%.
※DT_1 is 0.5 sec. when RUN speed=100%, START speed=0%.
※DT_2 is 1 sec. when RUN speed=100%,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

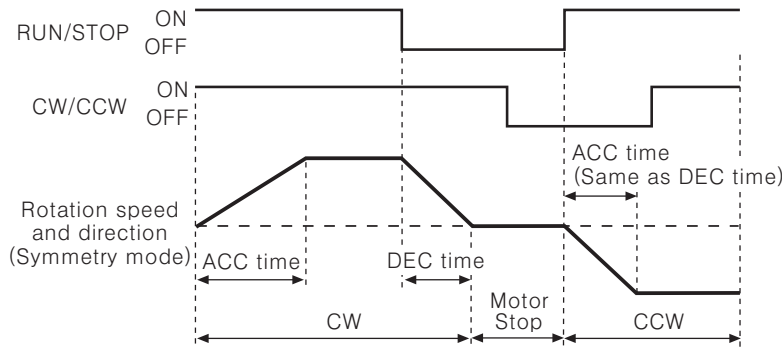※ACC Time and DEC Time are declined in proportion to the setting value of START speed.

◎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.
※Please do not use for stopping motor.

Autonics

2-Phase Stepping Motor Driver

■Time chart

● High speed

RUN/STOP — ON / OFF

CW/CCW — ON / OFF

Rotation speed and direction (Symmetry mode)

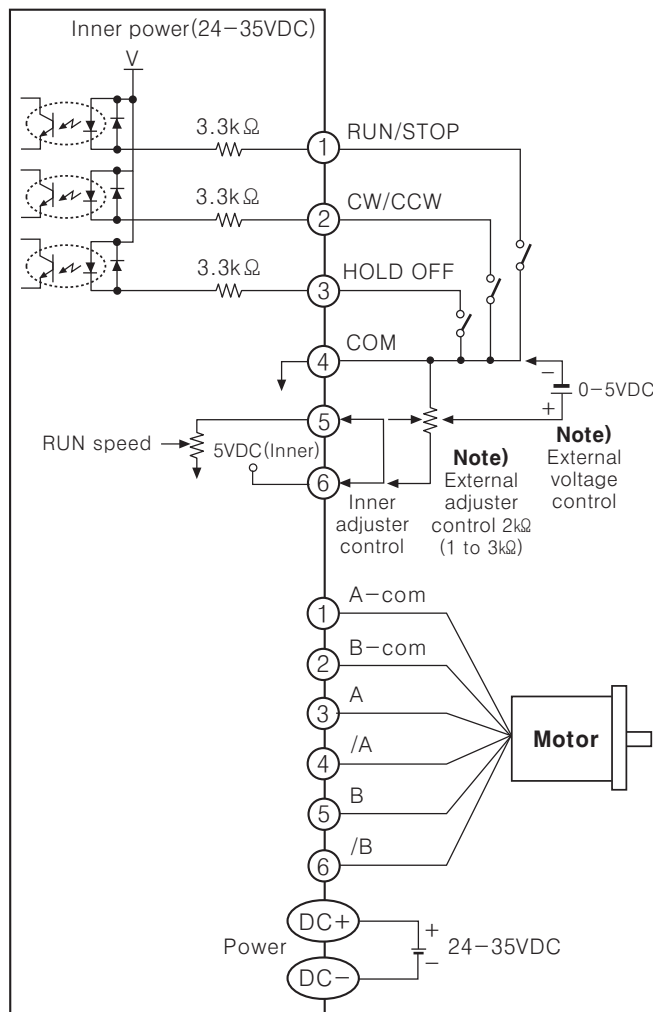ACC time | DEC time | ACC time (Same as DEC time)

CW | Motor Stop | CCW

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 Hi speed to change RUN/STOP and direction.

■Input · Output diagram and connections

Inner power(24−35VDC)

3.3kΩ RUN/STOP ①
3.3kΩ CW/CCW ②
3.3kΩ HOLD OFF ③
COM ④
RUN speed ⑤ 5VDC(Inner) ⑥

0−5VDC

Note) External voltage control

Note) External adjuster control 2kΩ (1 to 3kΩ)

Inner adjuster control

A−com ①
B−com ②
A ③
/A ④
B ⑤
/B ⑥

Motor

Power DC+ / DC− 24−35VDC

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.

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

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

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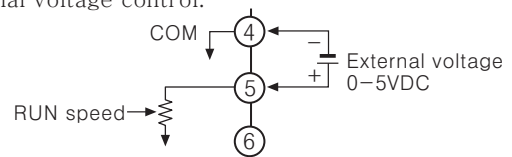→ [ON] : HOLD OFF, [OFF] : HOLD ON

● Inner adjuster control (Adjusting RUN speed with front VR)
Make the connection between terminal No.5 and No.6.

COM ④
RUN speed ⑤ 5VDC(Inner) ⑥
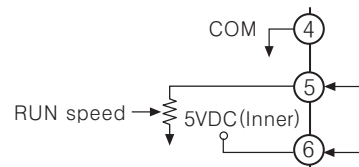
● External adjuster control (Adjusting RUN speed with connecting external variable resistance)
Connect variable resistance 2kΩ(1 to 3kΩ) for external adjuster control. If variable resistance is too low, full range setting might not be possible. Make sure to adjust RUN speed VR to maximum for external adjuster control.


COM ④ 3
RUN speed ⑤ 2 External adjuster 2kΩ(1 to 3kΩ)
5VDC(Inner) ⑥ 1
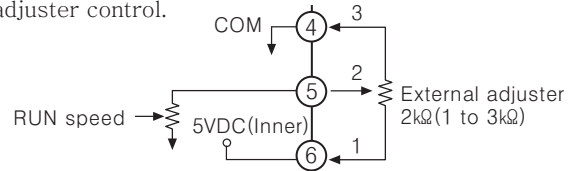
● External voltage control (Adjusting RUN speed with external voltage input)
Make sure to adjust RUN speed VR to maximum external voltage control.

COM ④
RUN speed ⑤ External voltage 0−5VDC
⑥

(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

MD2U Series

▣ Dimensions
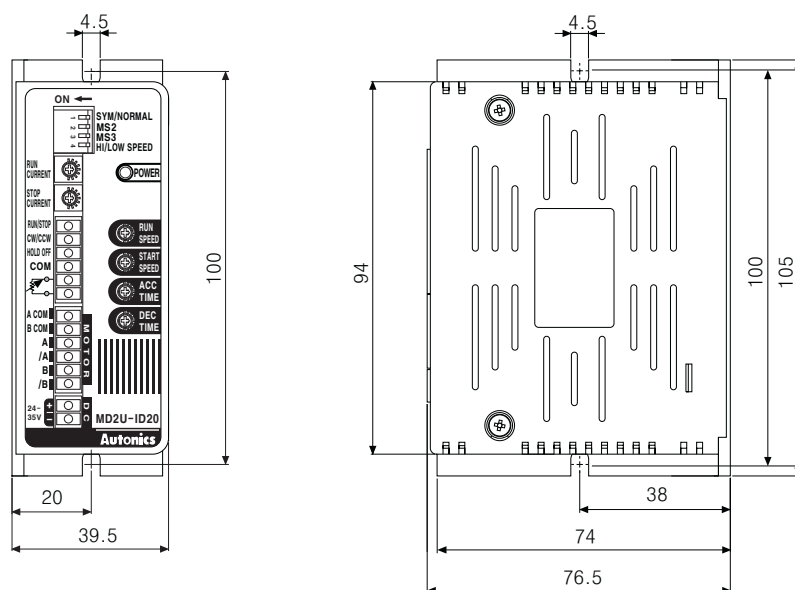
(Unit:mm)

▣ 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. 0.2㎟) 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

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