MD2U Series 2-Phase Unipolar Stepper Motor Driver

Compact And High-Performance Of 2-Phase Stepper 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 (MD2U-MD20)
- 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.**

$C \in$

MD2U-MD20　　　**MD2U-ID20**

■ Ordering Information

MD	2	U	–	M	D	20

RUN current	20	2A/Phase
Power supply	D	24-35VDC
Step method (resolution)	M	Micro Step (20-division)
	I	Intelligent type
Drive method	U	Unipolar drive
Motor phase	2	2-Phase
Item	MD	Motor Driver

■ Specifications

Model		MD2U-MD20	MD2U-ID20
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 to 2A / Phase	
STOP current		20 to 70% of RUN current (set by STOP current volume)	
Drive 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 spec.	Input pulse width	Min. 10μs(CW, CCW), 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 frequency[4]	Max. 50kHz (CW, CCW)	
Input resistance		300Ω(CW, CCW), 390Ω(HOLD OFF)	3.3kΩ (CW/CCW, RUN/STOP, HOLD OFF)
Insulation resistance		Min. 200MΩ (at 500VDC megger, between all terminals and case)	
Dielectric strength		1000VAC 50/60Hz for 1 minute (between all terminals and case)	
Noise resistance		±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	Vibration	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times	
Environment	Ambient temperature	0 to 50℃, storage: -10 to 60℃	
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH	
Approval		$C \in$	
Weight[5]		Approx. 295g (approx. 180g)	Approx. 303g (approx. 190g)

※1: When using over 30VDC power supply, torque characteristics are improved but the driver temperature raise. The unit should be installed at the well ventilation environment.
※2: Based on ambient temperature 25℃, ambient humidity 55%RH.
※3: RUN current varies depending on the input RUN frequency and max. RUN current at the moment also varies depending on the load.
※4: Max. input pulse frequency is max. frequency to be input and is not same as max. pull-out frequency or max. slewing frequency.
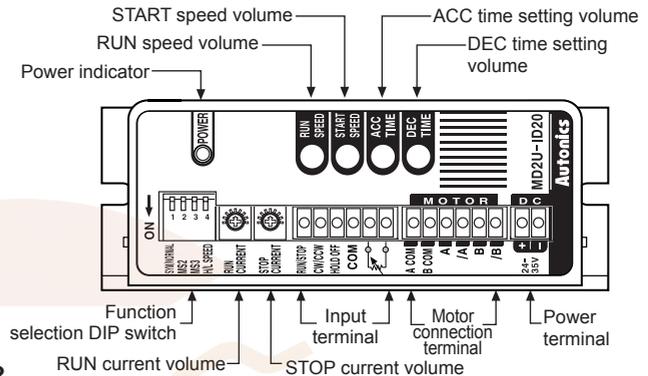※5: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

(A) Photoelectric Sensors
(B) Fiber Optic Sensors
(C) Door/Area Sensors
(D) Proximity Sensors
(E) Pressure Sensors
(F) Rotary Encoders
(G) Connectors/ Sockets
(H) Temperature Controllers
(I) SSRs / Power Controllers
(J) Counters
(K) Timers
(L) Panel Meters
(M) Tacho / Speed / Pulse Meters
(N) Display Units
(O) Sensor Controllers
(P) Switching Mode Power Supplies
(Q) Stepper Motors & Drivers & Controllers
(R) Graphic/ Logic Panels
(S) Field Network Devices
(T) Software

2-Phase Unipolar Intelligent Stepper Motor Driver

2-Phase Intelligent Stepper Motor Driver [MD2U-ID20]

▣ Unit Descriptions

START speed volume
RUN speed volume
Power indicator
ACC time setting volume
DEC time setting volume

MD2U-ID20 Autonics

Function selection DIP switch
RUN current volume
STOP current volume
Input terminal
Motor connection terminal
Power terminal

◎ Intelligent type stepper motor driver?

MD2U-ID20 is an intelligent type stepper motor driver including all features to control 2-phase stepper motors so that no controllers are required.
● Realizing AC motor's driving features to stepper motors
● Controlling START speed, RUN speed and ACC/DEC speed
● User-friendly design to realize various functions (front switch and volume)
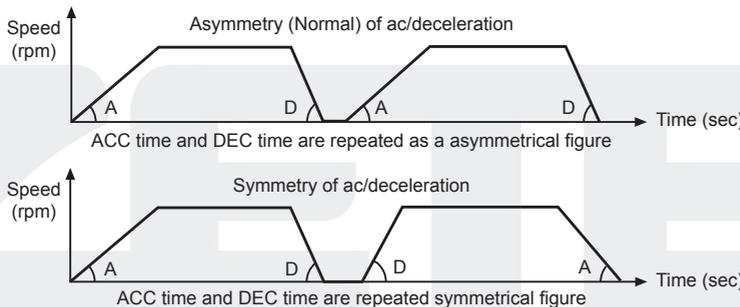
◎ Function selection DIP switch

	No.	Name	Function	Switch position			
				ON			OFF
	1	SYM/ NORMAL	SYM/NORMAL	Symmetry			Asymmetry
	2	MS2	Max. speed	MS2	MS3	H/L SPEED	Max. speed (rpm)
				ON	ON	ON: High speed	1500
	3	MS3		ON	OFF		1350
				OFF	ON		1000
				OFF	OFF		500
	4	H/L SPEED	High/Low speed	D※1	D※1	OFF: Low speed	150

※1: D=Don't care
※Reset the power after changing function selection switch operations.

◎ Selection of Symmetry/Asymmetry

※The 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
A   D   A   D   Time (sec)
ACC time and DEC time are repeated as a asymmetrical figure

Speed (rpm)
Symmetry of ac/deceleration
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)

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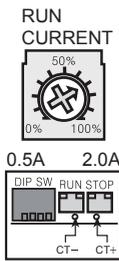※Lower the max. speed to run a motor smoothly.

◎ Selection of H/L SPEED

※H/L SPEED mode selection switch: 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.
※High speed mode: It is able to drive a motor up to 1500rpm of max. drive speed.

MD2U Series

◎ Setting RUN current

- RUN current setting is for the current provided for motor when the motor runs.

RUN CURRENT

50%

0%   100%

0.5A   2.0A

DIP SW   RUN STOP

CT−   CT+

※When RUN current is increased, RUN torque of the motor is also increased.
※When RUN current is set too high, the heat is severe.
※Set RUN current within the range of motor's rated current according to its load.
※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

50%

0%   100%

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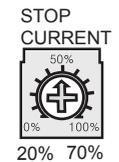
- STOP current setting is for the current provided for motor when the motor stops for preventing severe motor's heat.
- This function is for reducing the heat by variable resistance ratio setting within 0 to 100% of RUN current setting range (actual setting range: 20 to 70%) .

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

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

◎ Setting RUN speed

RUN SPEED

50%

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

50%

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.

◎ Setting ACC time

ACC TIME

50%

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.

◎ Setting DEC time

DEC TIME

50%

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.
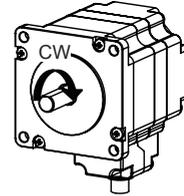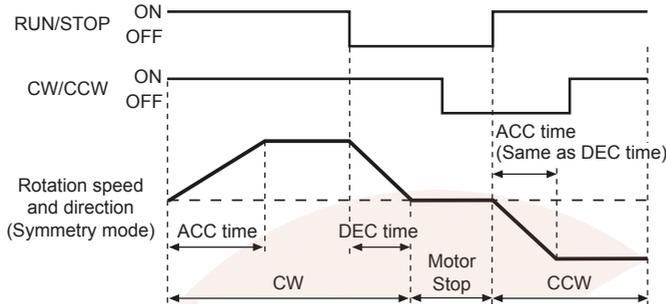※The figures above indicate the factory default for each value.

◎ HOLD OFF function

- This signal is for rotating motor's axis using external force or used for 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.
※Must stop the motor for using this function.
※Refer to I/O Circuit and Connections.

2-Phase Unipolar Intelligent Stepper Motor Driver

■ Time Chart

● High speed mode

RUN/STOP — ON / OFF

CW/CCW — ON / OFF

ACC time
(Same as DEC time)

Rotation speed
and direction
(Symmetry mode)

ACC time   DEC time   Motor Stop
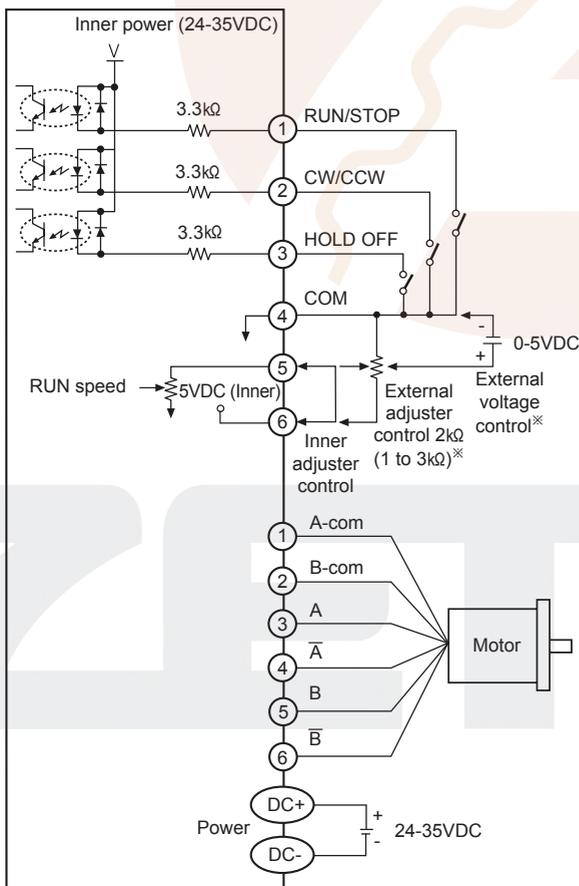
CW   CCW

CW

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 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.

■ I/O Circuit and Connections

Inner power (24-35VDC)

3.3kΩ ① RUN/STOP

3.3kΩ ② CW/CCW

3.3kΩ ③ HOLD OFF

④ COM

0-5VDC

RUN speed ⑤ 5VDC (Inner)

⑥ Inner adjuster control

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

External voltage control※

① A-com

② B-com

③ A

④ $\overline{A}$

⑤ B

⑥ $\overline{B}$
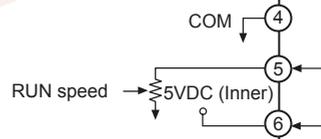
Motor

DC+

Power   24-35VDC

DC-

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

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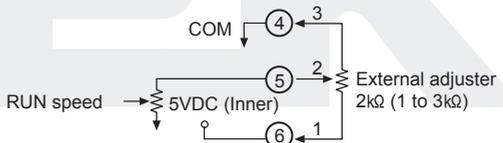
HOLD OFF signal iuput
→ [ON]: HOLD OFF, [OFF]: HOLD ON

● Inner adjuster control (Adjusting RUN speed with front VR)
Make the connection between terminal No.5 and No.6.
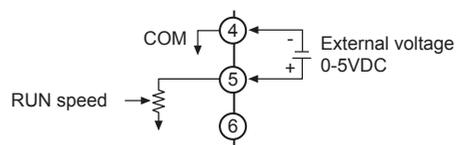
COM ④

⑤

RUN speed → 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

⑤ 2   External adjuster 2kΩ (1 to 3kΩ)

RUN speed → 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   External voltage 0-5VDC
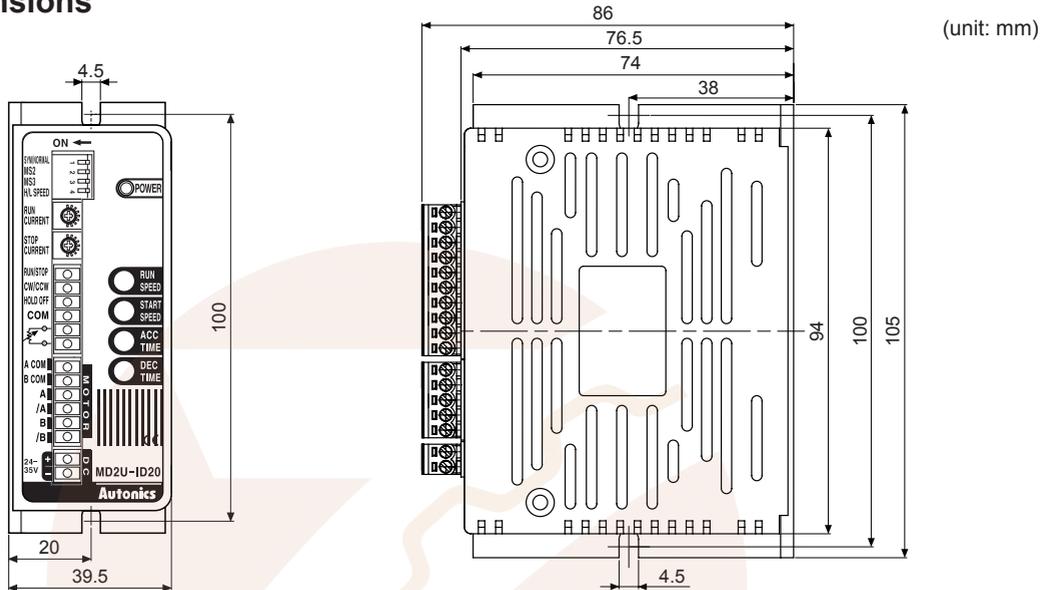
⑤

RUN speed →

⑥

※ 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)

[Figure: Dimensional drawings of MD2U-ID20 driver unit. Front panel labels include: ON, SYNH/HALF, MS2, MS1, H/L SPEED, POWER, RUN CURRENT, STOP CURRENT, RUN/STOP, CW/CCW, HOLD OFF, COM, A COM, B COM, A, /A, B, /B, 24-35V, MOTOR, D.C, MD2U-ID20, Autonics, RUN SPEED, START SPEED, ACC TIME, DEC TIME. Dimensions shown: 4.5, 100, 20, 39.5, 86, 76.5, 74, 38, 94, 100, 105, 4.5]

▣ 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,
  • Check the connection of driver and motor.
  • Check driver output current and RUN current of motor depending on current adjuster are correct.

◎ Caution during use
1. For signal input
①Do not input CW, CCW signal at the same time in 2-pulse input method. Failure to follow this instruction may result in malfunction. (MD2U-MD20)
②Direction cannot be changed during the operation. (MD2U-ID20)
③When the signal input voltage is exceeded the rated voltage, connect additional resistance at the outside.
2. For RUN current, STOP current setting
①Set RUN current within the range of motor's rated current. 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 cable connection
①Use twisted pair (over 0.2mm^2) for the signal cable which should be shorter than 2m.
②The thickness of cable should be same or thicker than the motor cable's when extending the motor cable.
③Must separate between the signal cable and the power cable over 10cm.
4. 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.)
5. 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.
6. 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.
7. This product may be used in the following environments.
① Indoor   ② Altitude under 2000m
③ Pollution degree 2   ④ Installation category II