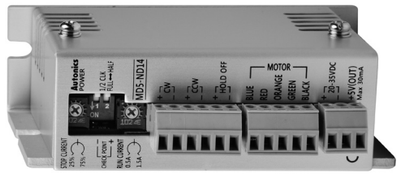
Autonics

Motor Driver (5-phase Stepper Motor Driver)

MD5-ND14

INSTRUCTION MANUAL



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 personal injury.
3. **Use reinforced insulation DC power at primary and secondary part for DC type input product.**
   Failure to follow this instruction may result in product damage.
4. **Install the unit 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 is outside or flammable or explosive gas, corrosive material, water, vibration, or combustible material may be present.**
   Failure to follow this instruction may result in fire, or personal injury.
6. **Do not disassemble or modify the unit. Please contact us if maintenance necessary.**
   Failure to follow this instruction may result in fire, or product damage.
7. **Do not insert any objects at the openings of the unit.**
   Failure to follow this instruction may result in fire, or personal injury.

⚠Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in product damage, degradation, shorten the life cycle of the unit, personal injury, or peripheral devices damage.
2. **Do not put obstacles around the unit which may obstruct ventilation.**
   Failure to follow this instruction may result in malfunction of the unit, product and peripheral devices damage by overheat.
3. **When connecting the power input cables, use the unit within the rated power supply and over AWG18 (0.75mm^2) cables.**
   Failure to follow this instruction may result in fire.
4. **Refer to the connection diagrams and check the connection correctly before supplying the power.**
   Failure to follow this instruction may result in fire, or product damage.
5. **Turn OFF the power when power is failed.**
   Failure to follow this instruction may result in personal injury or product damage due to sudden movement when recover power failure.
6. **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.
7. **Emergency stop should be available during operation.**
   Failure to follow this instruction may result in personal injury or product damage.
8. **Check the control input signal of the unit before supplying the power.**
   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 motor.
10. **Install safety device when it is required to remain the vertical position after turn off the power.**
    Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of motor.
11. **Check HOLD OFF signal input is ON when moving the output axis (manual positioning etc.) manually.**
    Failure to follow this instruction may result in personal injury by unexpected signal input.
12. **Stop the unit when mechanical problem occurs.**
    Failure to follow this instruction may result in fire, or personal injury.
13. **Do not touch terminals when testing insulation resistance or dielectric strength.**
    Failure to follow this instruction may result in personal injury.
14. **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.
15. **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.**

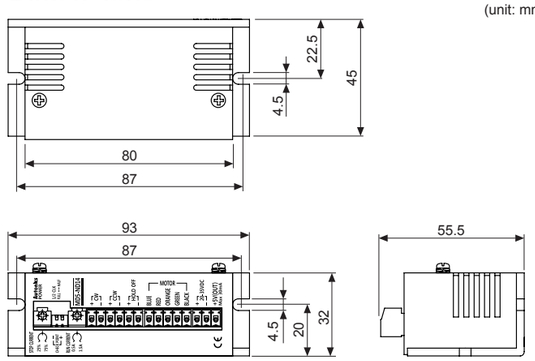
▣ Specifications

Model		MD5-ND14
Power supply※1		20-35VDC
Allowable voltage fluctuation range		90 to 110% of the rated voltage
Max. current consumption※2		3A
RUN current※3		0.5-1.5A/Phase
STOP current		25 to 75% of RUN current (set by STOP current volume)
Drive method		Bipolar constant current pentagon drive
Basic step angle		0.72°/Step
Resolution		1-division (0.72°/Step), 2-division (0.36°/Step)
Input pulse characteristic	Pulse width	Min. 10μs (CW, CCW), Min. 1ms (HOLD OFF)
	Duty Rate	50% (CW, CCW)
	Rising/Falling time	Below 130ns (CW, CCW)
	Pulse input voltage	[H]: 4-8VDC, [L]: 0-0.5VDC
	Pulse input current	7.5-14mA (CW, CCW), 10-16mA (HOLD OFF)
	Max. input pulse frequency※4	Max. 50kHz (CW, CCW)
Input resistance		390Ω (CW, CCW, HOLD OFF)
Insulation resistance		Over. 100MΩ (at 500VDC megger, between all terminals and case)
Dielectric strength		1,000VAC 50/60Hz for 1min.(between all terminals and case)
Noise resistance		±500V the square wave noise (pulse width: 1μs) by the noise simulator
Vibration	Mechanical	1.5mm amplitude at frequency of 5 to 60Hz(for 1 min.) in each X, Y, Z direction for 2 hours
	Malfunction	1.5mm amplitude at frequency of 5 to 60Hz(for 1 min.) in each X, Y, Z direction for 10 min.
Environment	Ambient temp.	0 to 40℃, storage: -10 to 60℃
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH
Approval		CE RoHS
Weight※5		Approx. 183g (approx. 130g)

※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 varies 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.

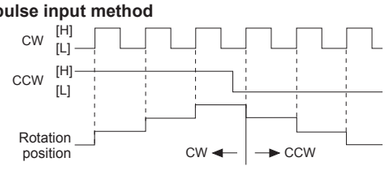
▣ Dimensions

(unit: mm)

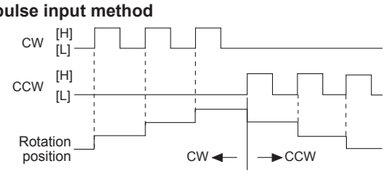


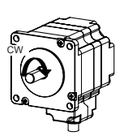
▣ Time Chart

◎ 1-pulse input method



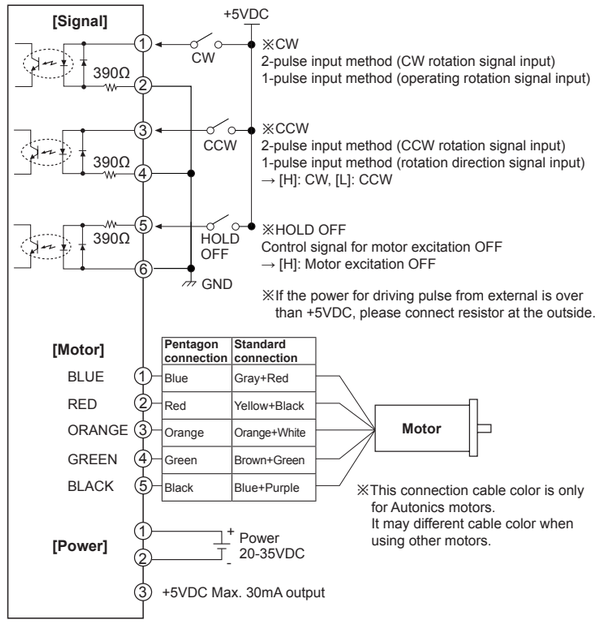
◎ 2-pulse input method





※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



▣ Function Selection DIP Switch

No.	Nameplate	Function	Switch position	
			ON	OFF (factory default)
1	1/2 CLK	Pulse input method	1-pulse input method	2-pulse input method
2	FULL↔HALF	Select resolution	1-division (0.72°)	2-division (0.36°)

※Changing pulse input method or resolution is available only when stepper motor stops. If changing the resolution during operation, the motor may be out of phase.

● 1/2 CLK

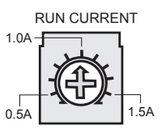
- 1/2 CLK switch is to select pulse input method.
- 1-pulse input method: CW → operating rotation signal input,
  CCW → rotation direction signal input ([H]: CW, [L]: CCW)
- 2-pulse input method: CW → CW rotation signal input,
  CCW → CCW rotation signal input.

● FULL ↔ HALF

- FULL ↔ HALF switch is to set basic step angle for 5 phase stepper motor.

※Change resolution only when the motor stops.

◎ Setting RUN current



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

※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.
※Change RUN current only when the motor stops.

◎ Setting STOP current

- STOP current setting is for the current provided for motor when the motor stops.
- Setting value of STOP current is percentage (%) ratio of the set RUN current.
  E.g.) Set RUN current as 1.4A and STOP current as 40%.
  STOP current is set as 1.4A×0.4=0.56A.

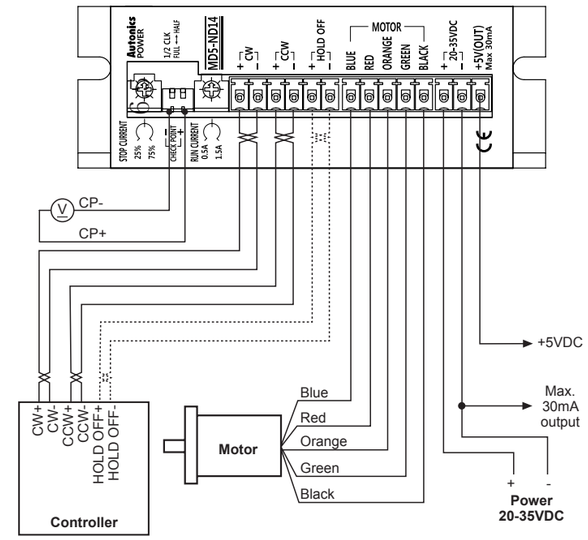
※When STOP current is decreased, STOP torque of the motor is also decreased.
※When STOP current is set too low, the heat is lower.
※Change STOP current only when the motor stops.

◎ 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.

▣ Connections



▣ Cautions 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. It may not operate properly if another direction signal is inputted when one of CW or CCW is [H].
②When 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. If not, it may cause severe heat of motor or motor damage.
②Use the power for supplying sufficient current to the motor.
③Check the polarity of power before operating the unit.

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
①**The unit must be installed with heat protection. Follow the below ②, ③ cautions.**
②In order to increase heat protection efficiency of the driver, must install the heat sink close to metal panel and keep it well-ventilated.
③Excessive 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 input signal method during the operation. It may cause danger as the revolution way of the motor is changed conversely.

6. This product may be used in the following environments.
① Indoor
② Altitude under 2000m
③ Pollution degree 2
④ Installation category II

※**Failure to follow these instructions may result in product malfunction.**

▣ 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
- SSR/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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