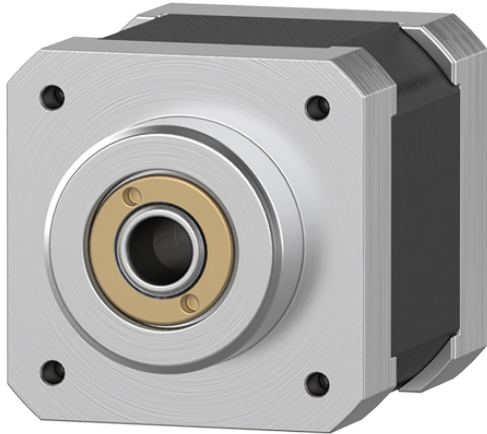


Hollow Shaft Type 5-phase Stepper Motor

(□ 42 mm, □ 60 mm, □ 85 mm)



AHK Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Direct connection of Ball-screw, TM-screw and etc. without couplings
- No resonance (vibration, noise) due to removed coupling
- Low cost of applied system by improving the coupling accuracy and reducing the number of parts and installation process
- Compact and light weight with high accuracy, high speed and high torque
- Ideal for building compact sized system

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

- 01. 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, economic loss or fire.
- 02. Do not use the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Fix the unit on the metal plate.**
Failure to follow this instruction may result in personal injury or product and ambient equipment damage.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- 05. Install the unit after considering counter plan against power failure.**
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 06. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 07. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.
- 08. Install the motor in the housing or ground it.**
Failure to follow this instruction may result in personal injury, fire or electronic shock.
- 09. Make sure to install covers on motor rotating components.**
Failure to follow this instruction may result in personal injury
- 10. 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.
- 11. Upon occurrence of an error, disconnect the power source.**
Failure to follow this instruction may result in personal injury, fire or electronic shock.

⚠ Caution Failure to follow instructions may result in injury or product damage.

- 01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
- 03. The motor may overheat depending on the environment. Install the unit at the well-ventilated environment and forced cooling with a cooling fan.**
Failure to follow this instruction may result in product damage or degradation by heat.
- 04. Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in fire or product damage.

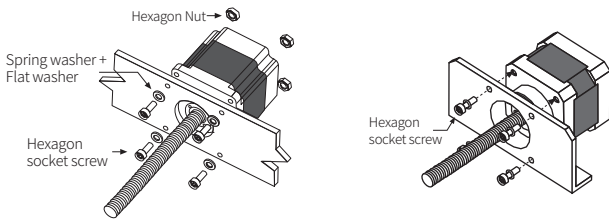
Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- At low temperature, reducing the grease's consistency of ball-bearing and etc. causes the friction torque increment.
Start the motor gradually since motor's torque is in normal state.
- Maintain and inspect regularly the following lists.
 - Unwinding bolts and connection parts for the unit installation and load connection
 - Abnormal sound from Ball-bearing of the unit
 - Damage and stress of lead cable of the unit
 - Connection error with driver
 - Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II

Cautions during Installation

- Follow instructions in 'Safety Considerations' and 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Install the motor in a place that meets the certain conditions specified below. It may cause product damage if it is used out of following conditions.
 - Inside of the housing which is installed indoors
(This unit is designed/manufactured for the purpose of attaching to equipment. Install a ventilation device.)
 - The place without contact with water, oil, or other liquid
 - The place without contact with strong alkali or acidity
 - The place with less electronic noise occurs by welding machine, motor, etc.
 - The place where no radioactive substances and magnetic fields exist. It shall be no vacuum status as well.
- Motor can be installed horizontally and vertically. Refer to 'Shaft Allowable Load along Installation Direction'.
- If a force (30 N) exceeding the specification is applied to the motor cable during installation, it may cause the contact failure and disconnection. If the excessive force or frequent cable movement is required, establish safety measures before use.
- In consideration of heat dissipation and vibration prevention, mount the motor as tight as possible against a metal panel with high thermal conductivity such as iron or aluminum.

Installation Method

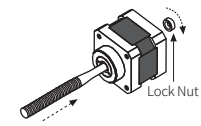


Frame size	Mounting plate thickness	Applied bolt
□ 42 mm	≥ 4 mm	M3
□ 60 mm	≥ 5 mm	M4
□ 85 mm	≥ 8 mm	M6

Cautions during Shaft Assembly

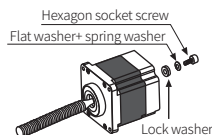
- Make sure that the external shaft assembly into the motors must be made sturdy.
- If the shaft is not installed firmly, the motor torque may not be thoroughly transmitted to the external shaft.
- In case no additional shaft assembly changes would be made, it is recommended to apply adhesives on bolt fixing part.
- Use pliers to fasten lock nut tightly.

Tap hole



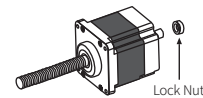
Lock Nut provided

Single shaft through hole



Hexagon socket screw, flat washer, spring washer, lock washer provided

Dual shaft through hole



Lock Nut provided

Ordering Information

This is only for reference, the actual product does not support all combinations.. For selecting the specified model, follow the Autonics website.

A ① ② **K** - ③ ④ ⑤ ⑥ ⑦ - ⑧

① Motor shape

H: Hollow shaft type

② Max. stop torque

Number: Max. stop torque (unit: kgf cm)

③ Rated current

S: 0.75 A / Phase

M: 1.4 A / Phase

G: 2.8 A / Phase

④ Motor phase

5: 5-phase

⑤ Frame size

4: □ 42 mm

6: □ 60 mm

9: □ 85 mm

⑥ Axial length

Number: Refer to 'Dimensions'

⑦ Shaft type

No mark: single shaft

W: dual shaft

⑧ Wiring method

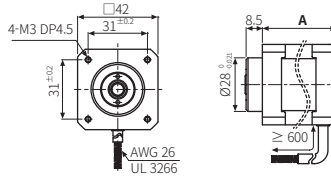
No mark: Pentagon

S: Standard (option)

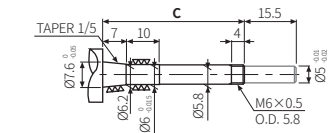
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.
- The external shaft must be processed as shown below.
- The corresponding motor follows direct connection instead of using coupling.
- Depending on shaft processing, hollow shaft can be used both single and dual. Gray line in shaft process is only available in dual shaft type.

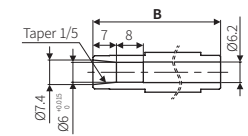
□ 42 mm



Shaft Process

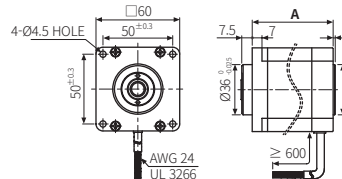


Hole dimensions

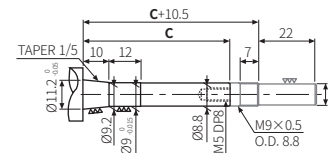


Axial length	3	4	5
A	33	39	47
B	38	44	52
C	42.5	48.5	56.5

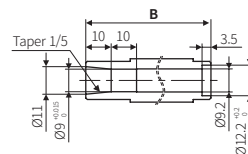
□ 60 mm



Shaft Process

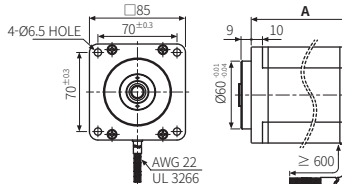


Hole dimensions

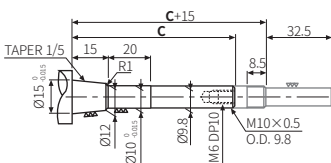


Axial length	4	6	9
A	47	58	87.5
B	49.3	60.3	89.8
C	46	57	86.5

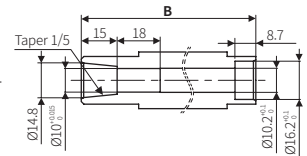
□ 85 mm



Shaft Process



Hole dimensions



Axial length	6	9	13
A	68.4	97.9	128.4
B	73	102.5	133
C	64.5	94	124.5

Product Components

• Product


• Instruction manual

Specifications

Model	AH1K-S543-□	AH2K-S544-□	AH3K-S545-□
Max. stop torque	1.3 kgf cm (0.13 N m)	1.8 kgf cm (0.18 N m)	2.4 kgf cm (0.24 N m)
Rotor inertia moment	$35 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$54 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$68 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	0.75 A / Phase		
Basic step angle	0.72° / 0.36° (Full / Half step)		
Unit weight (packaged)	≈ 0.25 kg (≈ 0.35 kg)	≈ 0.30 kg (≈ 0.40 kg)	≈ 0.40 kg (≈ 0.50 kg)

Model	AH4K-□564-□-□	AH8K-□566-□-□	AH16K-□569-□-□
Max. stop torque	4.2 kgf cm (0.42 N m)	8.3 kgf cm (0.83 N m)	16.6 kgf cm (1.66 N m)
Rotor inertia moment	$175 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$280 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$560 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	S: 0.75 A / Phase M: 1.4 A / Phase		
Basic step angle	0.72° / 0.36° (Full / Half step)		
Unit weight (packaged)	≈ 0.60 kg (≈ 0.87 kg)	≈ 0.80 kg (≈ 1.07 kg)	≈ 1.30 kg (≈ 1.57 kg)

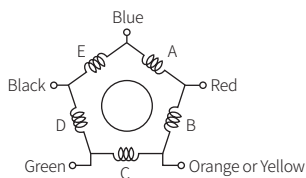
Model	AH21K-□596-□-□	AH41K-□599-□-□	AH63K-□5913-□-□
Max. stop torque	21 kgf cm (2.1 N m)	41 kgf cm (4.1 N m)	63 kgf cm (6.3 N m)
Rotor inertia moment	$1,400 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$2,700 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$4,000 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	M: 1.4 A / Phase G: 2.8 A / Phase		
Basic step angle	0.72° / 0.36° (Full / Half step)		
Unit weight (packaged)	≈ 1.70 kg (≈ 2.18 kg)	≈ 2.80 kg (≈ 3.28 kg)	≈ 3.80 kg (≈ 4.28 kg)

Motor phase	5-phase
Insulation class	B type (130°C)
Insulation resistance	Between the charging part and the case: $\geq 100 \text{ M}\Omega$ (500 VDC≡ megger)
Dielectric strength (01)	Between the charging part and the case: 1,000 VAC~ 50 / 60 Hz for 1 minute
Temperature rise	$\leq 80^\circ\text{C}$ (5-phase excitation for rated current, while stop)
Ambient temp.	-10 to 50°C, storage: -25 to 85°C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP30 (IEC34-5 standard)
Certification	CE 

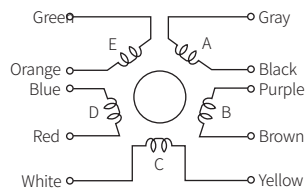
01) In case of rated current: 0.75 A / Phase, Between motor coil and case: 500 VAC~ 50 / 60 Hz for 1 minute

Connection Diagram

■ Pentagon



■ Standard (option)



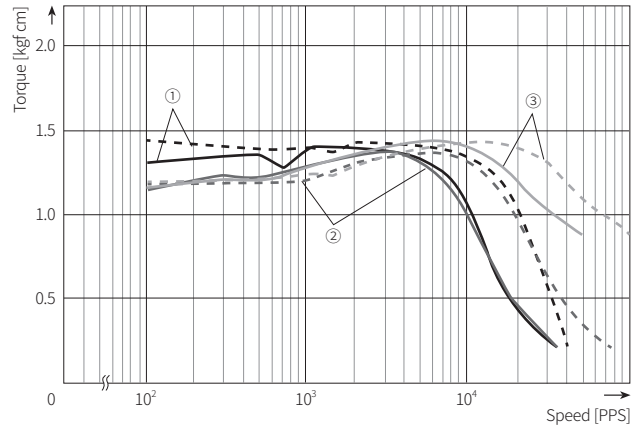
- In case of connecting standard wiring to 5-phase stepping motor driver, make sure that the motor's lead wire connection must be made as table below.

	Pentagon	Standard (option)
Lead wire Color	Blue	Gray + Red
	Red	Yellow + Black
	Orange	Orange + White
	Green	Brown + Green
	Black	Blue + Purple

Motor Characteristics

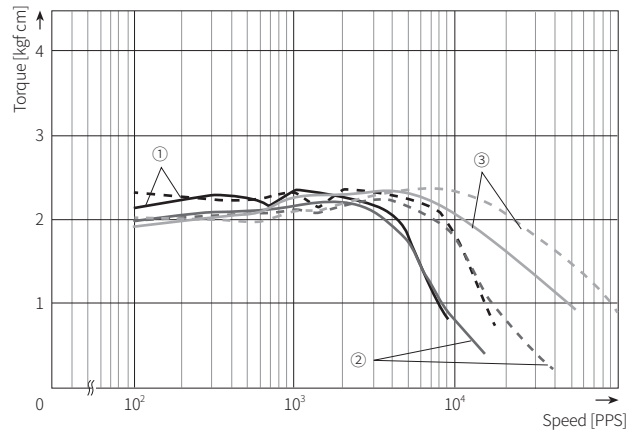
— Full Step
- - - Half Step

■ AH1K-S543-□



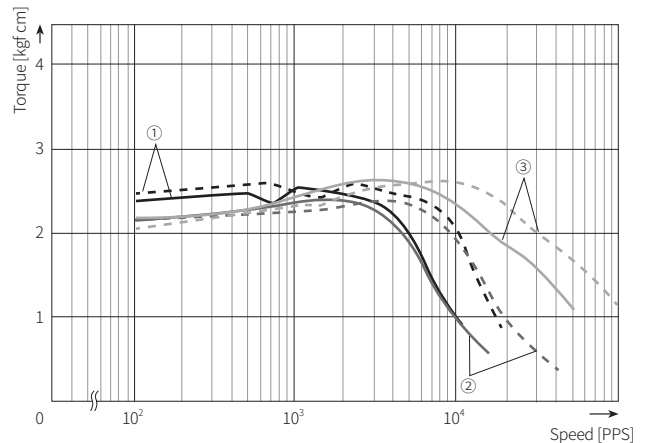
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	0.75 A / Phase	3.3 / 6.6 kpps
②	MD5-HD14	24 VDC	0.75 A / Phase	3.4 / 6.7 kpps
③	MD5-HF14	220 VAC	0.75 A / Phase	3.5 / 6.8 kpps

■ AH2K-□544



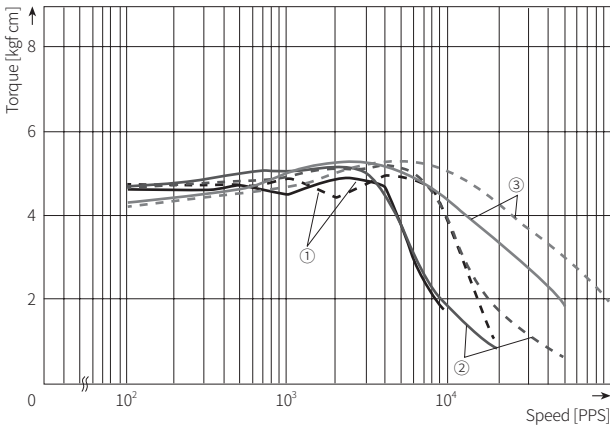
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	0.75 A / Phase	3.2 / 6.3 kpps
②	MD5-HD14	24 VDC	0.75 A / Phase	3.3 / 6.5 kpps
③	MD5-HF14	220 VAC	0.75 A / Phase	3.4 / 6.7 kpps

■ AH3K-S545



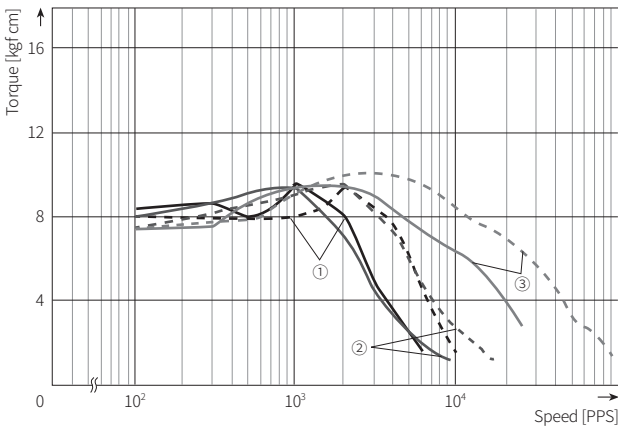
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	0.75 A / Phase	3.0 / 5.9 kpps
②	MD5-HD14	24 VDC	0.75 A / Phase	3.1 / 6.1 kpps
③	MD5-HF14	220 VAC	0.75 A / Phase	3.2 / 6.4 kpps

AH4K-□564



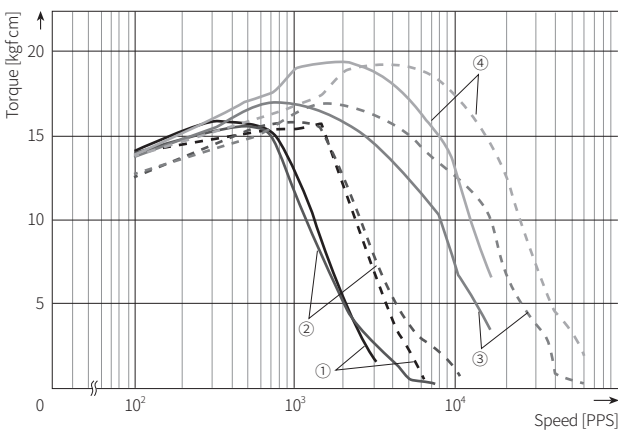
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	2.7 / 5.3 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	2.7 / 5.8 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	3.7 / 7.2 kpps

AH8K-□566



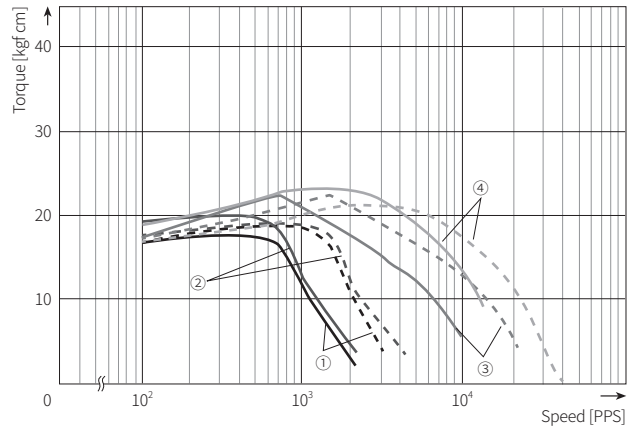
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	2.1 / 4.1 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	2.1 / 4.2 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	3.2 / 6.3 kpps

AH16K-□569



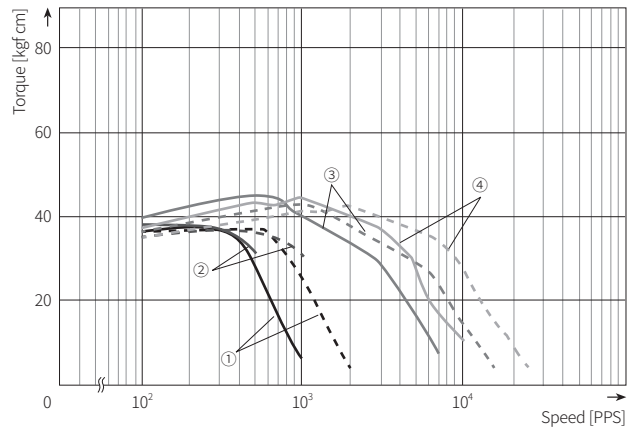
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	1.8 / 3.5 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	1.9 / 3.5 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	2.6 / 5.2 kpps
④	MD5-HF28	220 VAC	2.8 A / Phase	3.4 / 6.8 kpps

AH21K-□596



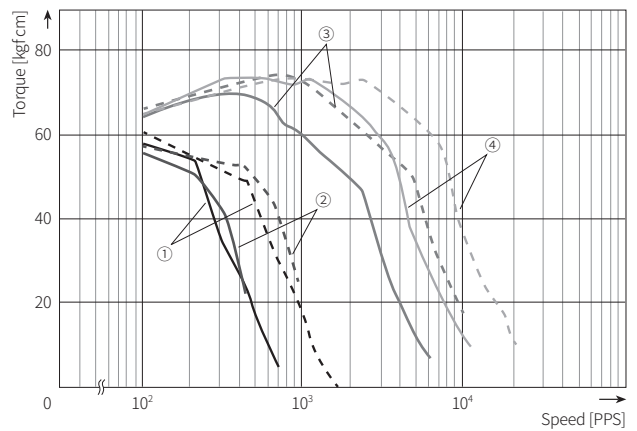
Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	1.5 / 2.9 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	1.6 / 3.1 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	2.2 / 4.4 kpps
④	MD5-HF28	220 VAC	2.8 A / Phase	2.3 / 4.6 kpps

AH41K-□599



Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	1.4 / 2.7 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	1.5 / 2.9 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	1.8 / 3.6 kpps
④	MD5-HF28	220 VAC	2.8 A / Phase	2.1 / 4.3 kpps

AH63K-□5913



Index	Driver	Power supply	Setting current	Max. self-starting frequency (Full Step / Half Step)
①	MD5-ND14	24 VDC	1.4 A / Phase	1.0 / 2.1 kpps
②	MD5-HD14	24 VDC	1.4 A / Phase	1.1 / 2.2 kpps
③	MD5-HF14	220 VAC	1.4 A / Phase	1.8 / 3.6 kpps
④	MD5-HF28	220 VAC	2.8 A / Phase	1.9 / 3.8 kpps