

Standard / Built-in Brake Type 2-Phase Closed-loop Stepper Motor (□ 42 mm, □ 56 mm, □ 60 mm)



Ai-M Series CATALOG

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

- Supports □ 42 mm, □ 56 mm, □ 60 mm
- Non-excitation electromagnetic built-in brake type motor (Ai-M-B Series)

Ordering Information

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

Ai - **M** - **①** **②** **A** - **③**

① Frame size

Number: frame size (unit: mm)

② Axial length

S: Short
M: Medium
L: Long

③ Motor type

No mark: standard type
B: built-in brake type

Product Components

- Product
- Instruction manual

Specifications

Model	Ai-M-42SA-□	Ai-M-42MA-□	Ai-M-42LA-□
Max. stop torque	0.25 N m	0.4 N m	0.48 N m
Rotor inertia moment	$35 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$54 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$77 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	1.7 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	1.7 Ω / Phase ± 10%	1.85 Ω / Phase ± 10%	2.1 Ω / Phase ± 10%
Inductance	1.9 mH / Phase ± 20%	3.5 mH / Phase ± 20%	4.4 mH / Phase ± 20%
Unit weight (packaged) ⁰¹⁾	≈ 0.34 kg (≈ 0.45 kg)	≈ 0.41 kg (≈ 0.52 kg)	≈ 0.48 kg (≈ 0.59 kg)

Model	Ai-M-56SA-□	Ai-M-56MA-□	Ai-M-56LA-□
Max. stop torque	0.6 N m	1.2 N m	2.0 N m
Rotor inertia moment	$140 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$280 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$480 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	3.5 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	0.55 Ω / Phase ± 10%	0.57 Ω / Phase ± 10%	0.93 Ω / Phase ± 10%
Inductance	1.05 mH / Phase ± 20%	1.8 mH / Phase ± 20%	3.0 mH / Phase ± 20%
Unit weight (packaged) ⁰¹⁾	≈ 0.62 kg (≈ 0.76 kg)	≈ 0.85 kg (≈ 0.99 kg)	≈ 1.22 kg (≈ 1.36 kg)

Model	Ai-M-60SA-□	Ai-M-60MA-□	Ai-M-60LA-□
Max. stop torque	1.1 N m	2.2 N m	2.9 N m
Rotor inertia moment	$240 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$490 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$690 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Rated current	3.5 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	1.0 Ω / Phase ± 10%	1.23 Ω / Phase ± 10%	1.3 Ω / Phase ± 10%
Inductance	1.5 mH / Phase ± 20%	2.6 mH / Phase ± 20%	3.8 mH / Phase ± 20%
Unit weight (packaged) ⁰¹⁾	≈ 0.75 kg (≈ 0.89 kg)	≈ 1.13 kg (≈ 1.27 kg)	≈ 1.44 kg (≈ 1.58 kg)

01) Listed in order of

Standard type	—
Built-in brake type	—

Motor phase	2-phase
RUN method	Bipolar
Insulation class	B type (130°C)
Insulation resistance	Between motor coil and case: ≥ 100 MΩ (500 VDC≐ megger)
Dielectric strength	Between motor coil and case: 500 VAC ~ 50 / 60 Hz for 1 minute
Vibration	1.5 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 50 G
Ambient temp.	0 to 50°C, storage: -20 to 70°C (no freezing or condensation)
Ambient humi.	20 to 85%RH, storage: 15 to 90%RH (no freezing or condensation)
Protection rating	IP30 (IEC34-5 standard)
Approval	CE ENEC
Stop angle error	± 0.09° (Full step, no load)
Shaft vibration	0.03 mm T.I.R.
Radial movement ⁰¹⁾	≤ 0.025 mm T.I.R.
Axial movement ⁰²⁾	≤ 0.01 mm T.I.R.
Shaft concentricity	0.05 mm T.I.R.
Shaft perpendicularity	0.075 mm T.I.R.

01) Amount of radial shaft displacement when applying radial load (25 N) to the end of the shaft.
02) Amount of axial shaft displacement when applying axial load (50 N) to the motor shaft.

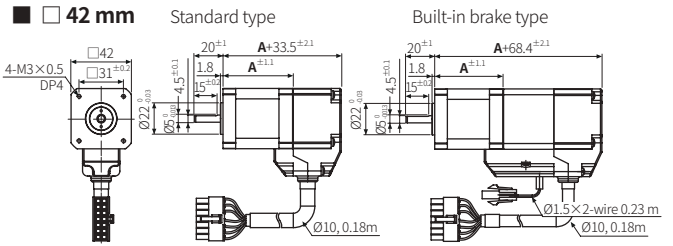
Encoder type	Incremental rotary encoder
Power supply	5 VDC≐ ± 5% (ripple P-P: ≤ 5%)
Current consumption	≤ 50 mA (no load)
Resolution	10,000 PPR (2,500 PPR × 4)
Control output	Line driver output
Output phase	A, A̅, B, B̅, Z, Z̅
Output waveform	Output duty rate: $\frac{T}{2} \pm \frac{T}{4}$, A-B phase difference: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A)
Inflow current	≤ 20 mA
Residual voltage	≤ 0.5 VDC≐
Outflow current	≤ -20 mA
Output voltage	≥ 2.5 VDC≐
Response speed	≤ 0.5 μs (based on cable length: 2 m, I sink = 20 mA)
Max. response freq.	300 kHz

Built-in brake type frame size	□ 42 mm	□ 56 mm	□ 60 mm
Rated excitation voltage ⁰¹⁾	24 VDC≐ ± 10%		
Rated excitation current	0.208 A	0.275 A	
Static friction torque	≥ 0.18 N m	≥ 0.8 N m	
Rotation part inertia moment	$6 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	$19 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	
Insulation class	B type (130°C)		
B type brake	Brake is released when power ON, brake is locked when power OFF		
Operating time	≤ 25 ms	≤ 30 ms	
Releasing time	≤ 10 ms	≤ 20 ms	

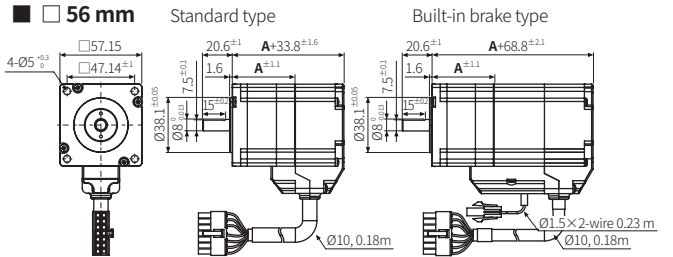
01) In order to reduce the heat generation of the built-in brake, the voltage drops from 24 VDC≐ to 11.5 VDC≐ to control.

Dimensions

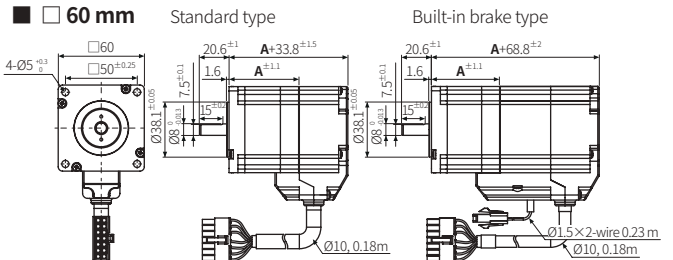
• Unit: mm, For the detailed drawings, follow the Autonics website.



Axial length	S	M	L
A	34	40	48



Axial length	S	M	L
A	43.4	56.4	77.4



Axial length	S	M	L
A	48	68.9	85.9

Sold Separately

- Motor + Encoder cable: C1D14M-□ (fixed type), C1DF14M-□ (flexible type)
- Flexible coupling: ERB Series