

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



Ver.6

SANYO DENKI

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



AC Input Set Models



AC Input Drivers



DC Input Set Models



DC Input Drivers



Stepping Motors

Stepping Motors, IP65 Splash and Dust Proof Stepping Motors,
Stepping Motors for Vacuum Environments, Synchronous Motors



Stepping Motors with Integrated Drivers



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Stepping Motors

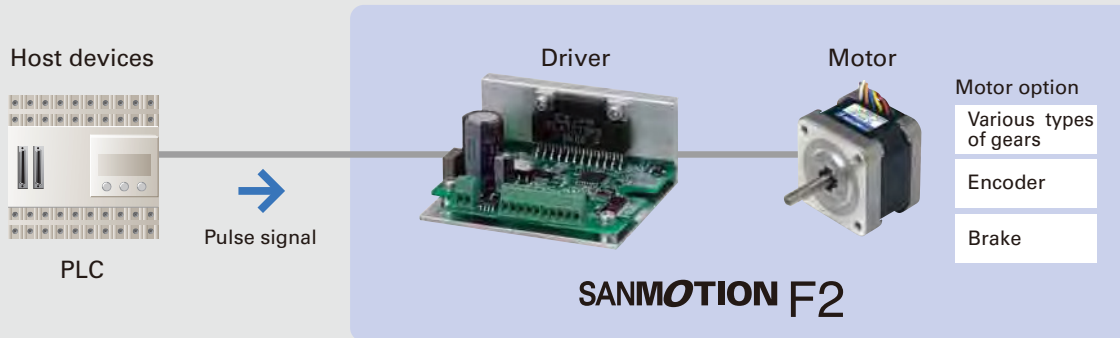
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Stepping Motors with Integrated Drivers

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The SANMOTION F2 is a 2-phase stepping system that provides precise positioning with easy control. The typical basic step angle is 1.8°, and accurate control is provided by pulse signals.



• **What is a stepping motor?**

A stepping motor is a motor that rotates at a fixed angle for each pulse. The rotation speed is proportional to the speed of the command pulse (frequency). Also, the rotation angle can be controlled according to the number of command pulses. Stepping motors are able to make stable stops without vibrating, as they have holding power when the motor is stopped.

• **Bipolar and unipolar drive**

The bipolar drive allows current to flow across both directions of the winding. The drive circuit is more complex, but it offers high torque. The unipolar drive allows current to flow across a single direction of the winding. The drive circuit is simpler than that of the bipolar drive.

Application Examples

The SANMOTION F2 can be used in a wide variety of applications, including fixed-speed drive synchronized to a command pulse, accurate positioning, and stable stopping.

- Semiconductor devices, analytical and testing devices used in medical and environmental fields, ATMs, monitoring cameras and spotlights, packaging machines, embroidering machines, automatic ticket gates and more



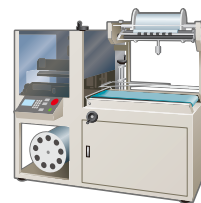
ATMs



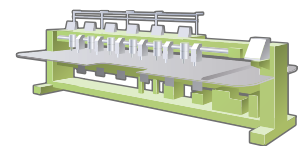
Blood analyzers



Wafer cleaners



Food packaging machines



Embroidering machines

All model numbers in this catalog are compliant with the tolerances for specified toxic substances (cadmium, lead, mercury, hexavalent chromium, PBB, and PBDE) found in supplement II of the EU RoHS directive (2011/65/EU), as of the October 2012 production lot. SANMOTION F2 drivers also feature standard specifications that are compliant with CE (European Norm) and UL standards. The AC input driver complies with the KC mark standards.



We also provide quick delivery service for products required earlier than the usual delivery time. Contact the point of sale for information on the applicable model numbers and delivery times.

Lineup

Set Models ▶p. 9-

AC input

Bipolar

The AC power supply input driver comes as a set model with the motor. A wide range of input voltages can be handled, from 100 to 240 VAC*. The motor winding is bipolar. *The 42 mm sq. (1.65 inch sq.) motor model only supports 100 to 120 VAC.

Motor size:
42 mm sq. (1.65 inch sq.)/60 mm sq. (2.36 inch sq.)/86 mm sq. (3.39 inch sq.)



DC input

Unipolar

These set models consist of a DC-powered driver and motor. The input voltage range is from 24 to 36 VDC, and the motor winding is unipolar.

Motor size:
28 mm sq. (1.10 inch sq.)/42 mm sq. (1.65 inch sq.)/56 mm sq. (2.20 inch sq.)



Bipolar

These set models consist of a DC-powered driver and motor. The input voltage range is from 24 to 36 VDC, and the motor winding is bipolar.

Motor size:
28 mm sq. (1.10 inch sq.)/42 mm sq. (1.65 inch sq.)/50 mm sq. (1.97 inch sq.)/56 mm sq. (2.20 inch sq.)/60 mm sq. (2.36 inch sq.)



Stepping Motors ▶p. 49-

Stepping Motors ▶p. 54-

High-torque stepping motors. Select from among a broad lineup of products from an ultra-compact 14 mm sq. (0.55 inch sq.) motor size, to a thin 11.4 mm (0.45 inch) motor — the shortest motor length.

Consult with us regarding customization. ▶p. 52
A separate driver is required.

Motor size:
14 mm sq. (0.55 inch sq.)/28 mm sq. (1.10 inch sq.)/
35 mm sq. (1.38 inch sq.)/42 mm sq. (1.65 inch sq.)/
50 mm sq. (1.97 inch sq.)/56 mm sq. (2.20 inch sq.)/
60 mm sq. (2.36 inch sq.)/86 mm sq. (3.39 inch sq.,
CE and UL models are available.)/^φ106 mm (*4.17 inch)



IP65 Splash and Dust Proof Stepping Motors **Waterproof, dustproof** ▶p. 89-

These IP65 rated motors* have superior water and dust resistance, and can be safely utilized in harsh or wet environments such as in food processing machines. The input voltage range of the motors is up to 250 VAC.

*Except for the shaft and the cable end.
A separate driver is required.

Motor size:
56 mm sq. (2.20 inch sq.)/
86 mm sq. (3.39 inch sq.)



Stepping Motors for Vacuum Environments **Customized Products** ▶p. 93

We can customize motors for use in low to ultra-high vacuum environments to suit your system requirements.
A separate driver is required.



Synchronous Motors **Customized Products** ▶p. 93

Synchronous motors rotate at a constant speed in proportion to the AC power frequency. They operate on the commercial (AC) power supply.



Stepping Motors with Integrated Drivers ▶p. 94-




These motors include integrated drivers. This reduces mounting space requirements and wiring complexity. Three separate control modes: pulse train control, general purpose I/O (parallel interface), and RS-485 compliant serial communications can be selected.

Motor size:
42 mm sq. (1.65 inch sq.)/60 mm sq. (2.36 inch sq.)



Lineup Details

Set Models ▶ p. 9-

		AC input set models	DC input set models Unipolar	DC input set models Bipolar
Series				
Input source		100 to 240 VAC*	24 to 36 VDC	24 to 36 VDC
Number of divisions		1-256 (16 levels)	1, 2, 4, 8, 16	1, 2, 4, 8, 16
Step-angle	Motors with 1.8° basic step angle	1.8° to 0.00703125°/pulse	1.8° to 0.1125°/pulse	1.8° to 0.1125°/pulse
	Motors with 0.9° basic step angle	—	0.9° to 0.05625°/pulse	0.9° to 0.05625°/pulse
Corresponding motor sizes		42 mm sq. (1.65 in sq.)*/ 60 mm sq. (2.36 in sq.)/ 86 mm sq. (3.39 in sq.)	28 mm sq. (1.10 in sq.)/ 42 mm sq. (1.65 in sq.)/ 56 mm sq. (2.20 in sq.)	28 mm sq. (1.10 in sq.)/ 42 mm sq. (1.65 in sq.)/ 50 mm sq. (1.97 in sq.)/ 56 mm sq. (2.20 in sq.)/ 60 mm sq. (2.36 in sq.)
Control method		Pulse input, Open loop (Closed loop is optional)	Pulse input, Open loop	Pulse input, Open loop
Set configuration items		Driver, Motor, Connector, I/O cable	Driver, Motor, Cable with connector (Supplied only with connector-type motors)	Driver, Motor, Cable with connector (Supplied only with connector-type motors)
Page	System Configuration Diagram	p. 12	p. 30	p. 30
	Set Model Configuration	p. 14	p. 32	p. 32
	Specifications/ Characteristics Diagram	pp. 16 to 19	pp. 33 to 35	pp. 36 to 40
	Dimensions	pp. 20, 22	pp. 41 to 42, 44	pp. 41 to 42, 44
	Motor Specifications	p. 21	p. 43	p. 43
	Driver Specifications/ Safety Standards	p. 22	p. 45	p. 45

*The 42 mm sq. (1.65 inch sq.) motor model (AC input set model) only supports 100 to 120 VAC input.

Stepping Motors ▶ p. 49–

Stepping Motors ▶ p. 54–

Basic step angle	Motor size	Holding torque N·m (oz·in)	Model number	Page	
				Specifications/ Characteristics diagram	Dimensions
0.9°	42 mm sq. (1.65 in sq.)	0.2 to 0.48 (28.3 to 68.0)	SH142 □ - □□□ 1	pp. 58 to 59	pp. 58 to 59
0.9°	60 mm sq. (2.36 in sq.)	0.57 to 2.15 (80.7 to 304)	SH160 □ - □□□ 0	pp. 72 to 73	pp. 72 to 73
1.8°	14 mm sq. (0.55 in sq.) Ultra-compact	0.0065 (0.92)	SH2141-55 □ 1	p. 54	p. 54
1.8°	28 mm sq. (1.10 in sq.)	0.055 to 0.145 (7.79 to 20.5)	SH228 □ -5 □□ 1	pp. 55 to 56	pp. 55 to 56
1.8°	35 mm sq. (1.38 in sq.)	0.12 to 0.23 (17.0 to 32.6)	SH35 □□ -12U □ 0	p. 57	p. 57
1.8°	42 mm sq. (1.65 in sq.) Slim form	0.083 to 0.186 (11.8 to 26.3)	SS242 □ -50 □ 1	p. 60	p. 60
1.8°	42 mm sq. (1.65 in sq.)	0.2 to 0.51 (28.3 to 72.2)	103H52 □□ - □□□ 0	pp. 61 to 63	pp. 61 to 63
1.8°	50 mm sq. (1.97 in sq.)	0.28 to 0.53 (39.7 to 75.1)	103H670 □ - □□□ 0	pp. 64 to 66	pp. 65 to 66
1.8°	50 mm sq. (1.97 in sq.) Slim form	0.1 to 0.215 (14.2 to 30.4)	SS250 □ -80 □ 0	p. 67	p. 67
1.8°	56 mm sq. (2.20 in sq.)	0.39 to 2.0 (55.2 to 283)	103H712 □ - □□□ 0	pp. 68 to 71	pp. 69, 71
1.8°	60 mm sq. (2.36 in sq.)	0.78 to 2.7 (110 to 382)	103H782 □ - □□□ 0	pp. 74 to 77	pp. 75, 77
1.8°	86 mm sq. (3.39 in sq., CE and UL models are available.)	2.5 to 9 (358 to 1270)	SH286 □ - □□□ 1 SM286 □ - □□□□	pp. 78 to 81	pp. 79, 82
1.8°	φ 106 mm (φ 4.17 in)	10.8 to 19 (1530 to 2690)	103H8922 □ - □□□ 1	p. 83	p. 83
1.8°	56 mm sq. (2.20 in sq., CE Model)	0.39 to 1.27 (55.2 to 179.8)	103H712 □ -6 □□ 0	p. 84	p. 84
1.8°	φ 86 mm (φ 3.39 in, CE Model)	2.74 to 7.44 (388 to 1053.6)	103H822 □ -6 □□ 0	p. 85	p. 85
1.8°	φ 106 mm (φ 4.17 in, CE Model)	13.2 to 19 (1869.2 to 2690.5)	103H8922 □ -63 □ 1	p. 86	p. 86

• Contact us for available encoders, gears and motors with brakes.

IP65 Splash and Dust Proof Stepping Motors **Waterproof, dustproof** ▶ p. 89–

Basic step angle	Motor size	Holding torque N·m (oz·in)	Safety standards	Model number	Page	
					Specifications/ Characteristics diagram	Dimensions
1.8°	56 mm sq. (2.20 in sq.)	1 to 1.7 (141.6 to 240.7)	CE/UL Model	SP256 □ -5 □ 60	p. 90	p. 92
1.8°	86 mm sq. (3.39 in sq.)	6.4 to 9 (906.3 to 1274.5)	CE/UL Model	SP286 □ -5 □ 60	p. 91	p. 92

Stepping Motors for Vacuum Environments **Customized Products** ▶ p. 93

We can customize motors for use in low to ultra-high vacuum environments to suit your system requirements. The motors can handle a wide range of vacuum conditions, including low vacuum, high vacuum, and ultra-high vacuum.

Synchronous Motors **Customized Products** ▶ p. 93

Synchronous motors rotate at a constant speed in proportion to the AC power frequency. The motor can be directly driven using the AC power supply, so a driver is unnecessary.

Stepping Motors with Integrated Drivers ▶ p. 94–

Motor size	Input source	Interfaces	Model number	Page	
				Specifications/ Characteristics diagram	Dimensions
42 mm sq. (1.65 in sq.)	24 VDC	• Pulse input • General-purpose I/O (Parallel) • Serial communications (compliant with RS-485)	DB21M142S-01	p. 95	p. 101
60 mm sq. (1.65 in sq.)			DB22M162S-01	p. 95	p. 101

Set Models

AC Input Set Models

▶ p. 12

DC Input Set Models

▶ p. 30

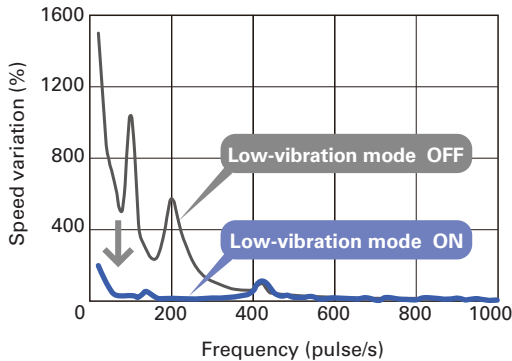
Features

Low vibration

AC DC

This driver features approximately 10% less vibration compared with our conventional product (when used with an AC input driver).

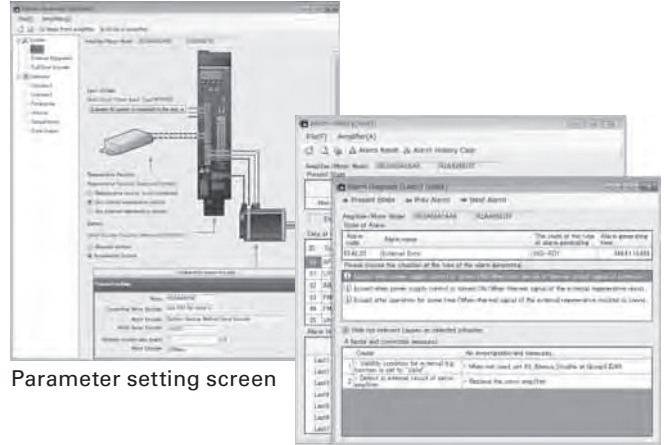
Also, a low-vibration mode function provides smooth driving, even with one-division (full-step) and two-division (half-step) coarse resolution settings. This allows vibrations to be suppressed without control system restrictions.



Settings possible with setup software

AC

Setup software can be used with a personal computer to adjust control parameters, or to analyze alarms and operation status.



Parameter setting screen

Diagnostic screen

Micro-step drive

AC DC

The basic step angle of 1.8° can be set to a resolution of up to 256 divisions (for AC input) or 16 divisions (for DC input). This allows for smooth operations with minimal vibrations.

Handles a wide range of voltages

AC

A wide range of input voltages can be handled, from 100 to 240 VAC*. This makes it possible to use the device in many different countries and regions.

Also, the input voltage is automatically detected and the optimal motor characteristics are used for control.

*The 42 mm sq. (1.65 inch sq.) motor model only supports 100 to 120 VAC.

Compact size

AC

This driver features a 24% reduction in volume compared with our conventional product. This makes it easier to use in places where the setup space is limited.

Multiple options

AC

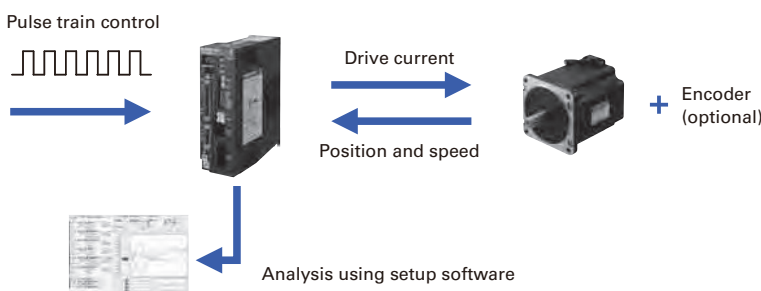
A 4000 P/R high-resolution encoder, and a motor with electromagnetic brake are available as options. The switch timing for motors with an electromagnetic brake is controlled automatically. An external power supply for the brake is unnecessary.

Analysis function and device startup support (option)

AC

Using an optional encoder with the motor makes it possible to monitor information such as the current position and speed. It simplifies determining causes of vibration and step-out.

Analysis mode This mode is suited for device startup and alarm analysis.



How To Read the Specifications

Unipolar DC input driver (Model No.: US1D200P10) + Motor

RoHS

2		Motor size	28 mm sq. (1.10 in sq.)/Basic step angle 1.8°		42 mm sq. (1.65 in sq.)/Basic step angle 1.8°	
3		Motor length	32 mm (1.26 in)	51.5 mm (2.03 in)	33 mm (1.30 in)	39 mm (1.89 in)
Single shaft	Set model number	DU14S281S	DU14S285S	DU15H521S	DU15H522S	
	Configuration item: motor number	SH2281-5271	SH2285-5271	103H5205-0440	103H5208-0440	
Dual shaft	Set model number	DU14S281D	DU14S285D	DU15H521D	DU15H522D	
	Configuration item: motor number	SH2281-5231	SH2285-5231	103H5205-0410	103H5208-0410	
4	Holding torque	N·m (oz·in)	0.055 (7.79)	0.115 (16.28)	0.2 (28.32)	0.3 (42.48)
5	Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.01 (0.05)	0.022 (0.12)	0.036 (0.20)	0.056 (0.31)
6	Rated current	A/phase	1	1	1.2	1.2
7	Motor mass *1	kg (lbs)	0.11 (0.24)	0.2 (0.44)	0.23 (0.51)	0.29 (0.64)
8	Allowable thrust load	N (lbs)	3 (0.67)	3 (0.67)	10 (2.25)	10 (2.25)
9	Allowable radial load *2	N (lbs)	42 (9.44)	49 (11.02)	26 (5.85)	25 (5.62)

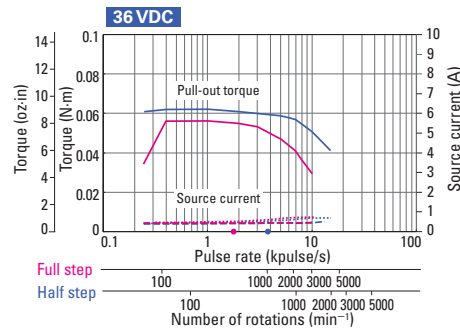
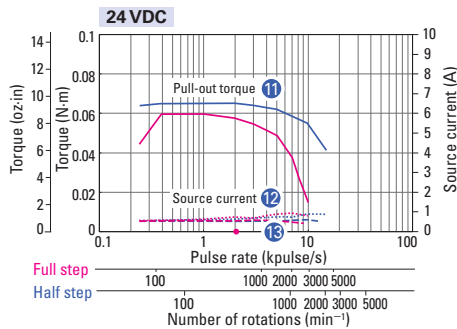
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

10 Characteristics diagram

With rubber coupling

Pull-out torque Full step Half step fs: Maximum self-start frequency when not loaded Full step Half step
Source current (no load) Full step Half step Source current (load applied) Full step Half step

DU14S281S
DU14S281D



- 1 Model number of the driver included in the set.
- 2 Size and length of the stepping motor included in the set. When driving in full step mode, the basic step angle is the rotation angle with each pulse. When driving in half step mode, the motor rotates at half of the basic step angle.
- 3 The set model number and the model number of the stepping motor included in the set. The model number for the stepping motor shaft varies for single shaft and dual shaft.
- 4 This is the maximum torque that occurs when using 2-phase excitation at rated current, causing the shaft to rotate from the outside.
- 5 This is the moment of inertia of the rotor.
- 6 This is the rated current that flows to the motor winding.
- 7 This is the mass of the stepping motor.
- 8 This is the allowable load when applying a load to the shaft in the axial direction. Do not exceed this value when using this product.
- 9 This is the allowable load when applying a load to the shaft perpendicular to the axial direction. Do not exceed this value when using this product.
- 10 This graph shows the relationship between the pulse rate (frequency), speed, and torque. The driver source current is shown in addition to the torque. Full step is shown in red, and half step is shown in blue.
- 11 The pull-out torque is the maximum torque in which synchronized operation is possible for a certain command pulse. If a torque that exceeds this value is applied to the stepping motor, it will be unable to synchronize with the command pulse. Thus, when

selecting a motor, you should allow for a torque margin of 1.4 to 2 times, in order to avoid step-out.

- 12 This graph shows the current value for the power supply that supplies the driver.

--- The red and blue dashed lines show the source current value when there is no load (motor by itself).

..... The red and blue dotted lines show the source current value when the maximum torque is applied to the stepping motor (during load).

The required power supply capacity (W) is calculated from this graph.

- 13 The red- and blue-colored dots in the lower part of the graph show the upper limit for the self-start frequency (maximum self-start frequency: fs) of the stepping motor by itself (no load). Full step is shown in red, and half step is shown in blue. The stepping motor will not operate normally if it is started using frequencies that exceed these values. For this reason, it is necessary to start the stepping motor using frequencies that are lower than these values. The maximum self-start frequency (fL) which includes the load can be determined using the relational expression below.

$$f_L = \frac{f_s}{\sqrt{1 + \frac{J_L}{J_M}}}$$

J_M: Rotor inertia

J_L: Load inertia

f_s: Maximum self-start frequency when not loaded

AC Input Set Models

Bipolar

Set Model Configuration ▶ p. 14
 Specifications/Characteristics Diagram ▶ pp. 16 to 19
 Motor Dimensions ▶ p. 20 Motor Specifications ▶ p. 21
 Driver Dimensions ▶ p. 22 Driver Specifications ▶ p. 22



Set configuration items RoHS

Driver CE RoHS c UL US K

Model number: F2BAW200M100 Motor rated current: 2 A
 Model number: F2BAW400M100 Motor rated current: 4 A

- The operation manual can be downloaded from our website.
- Drivers are available for separate purchase.

Connector

Model number for power supply (CN1): FC5P0000A
 Model number for motor connection (CN2): FC5M0000A

Cable

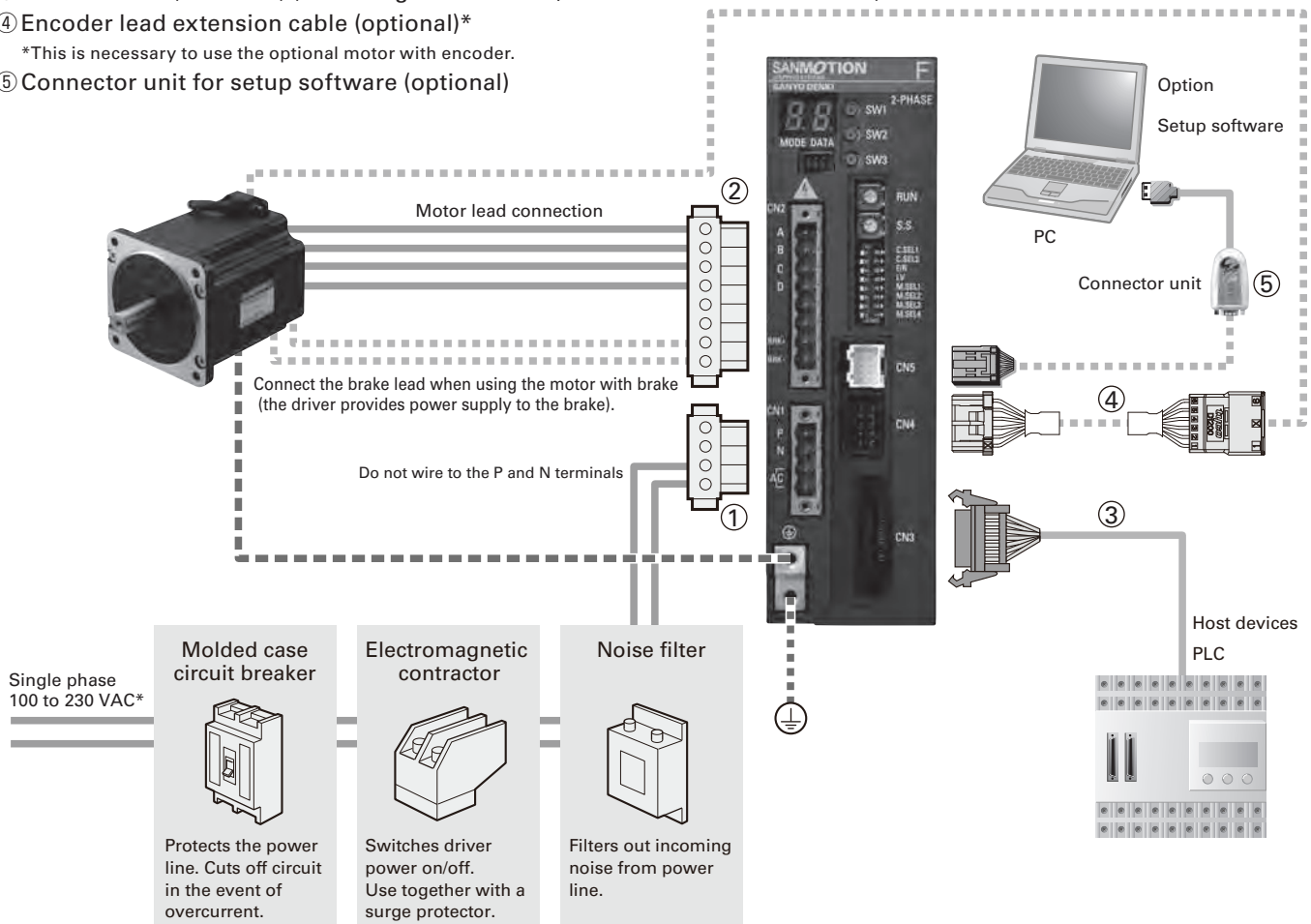
Model number for I/O (for connecting host devices) (CN3): FC5S0010A
 Cable length 1 m (39.4 inch)

Motor

Motor size: 42 mm sq. (1.65 inch sq.), 60 mm sq. (2.36 inch sq.),
 86 mm sq. (3.39 inch sq.)

System Configuration Diagram

- ① Power supply connector CN1 (set configuration items; model number: FC5P0000A)
 - ② Motor connector CN2 (set configuration items; model number: FC5M0000A)
 - ③ I/O cable 1 m (39.4 inch) (set configuration items; model number: FC5S0010A)
 - ④ Encoder lead extension cable (optional)*
 - ⑤ Connector unit for setup software (optional)
- *This is necessary to use the optional motor with encoder.

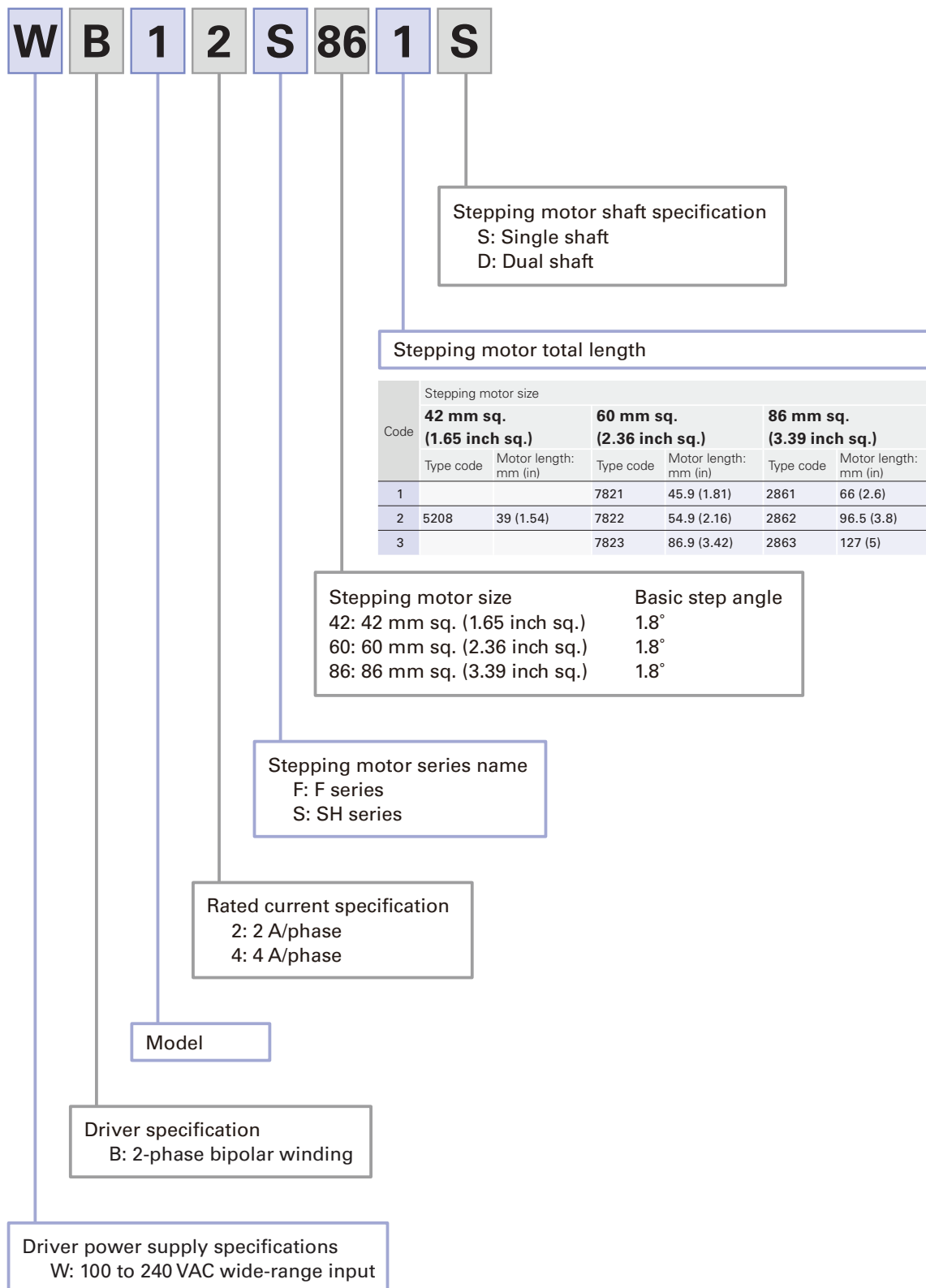


*The 42 mm sq. (1.65 inch sq.) motor model only supports 100 to 120 VAC.

Set Model Numbering Convention

Not every combination of the following codes or characters is available. Check the set model component details on the following page for the model number combinations, or contact us.

Example: This is a set model number for the AC input driver (model number: F2BAW200M100) and motor (model number: SH2861-4041). The motor specifications are motor size: 86 mm sq. (3.39 inch sq.), motor length: 66 mm (2.6 inch), single shaft.



Set Model Configuration

This set includes the driver, motor, power supply connector, motor connector, and an I/O cable.

Bipolar

Motor size	Single shaft			Dual shaft			Basic step angle	Rated current (A/phase)	Page	
	Set model number	Set configuration items (Connectors and cables are listed below the table)		Set model number	Set configuration items (Connectors and cables are listed below the table)				Specifications	Dimensions
		Motor	Driver		Motor	Driver				
42 mm sq.	WB12F422S	103F5208-4041 (100 VAC only)	F2BAW200M100	WB12F422D	103F5208-4011 (100 VAC only)	F2BAW200M100	1.8°	2	p. 16	p. 20
60 mm sq.	WB12F601S	103F7821-4041	F2BAW200M100	WB12F601D	103F7821-4011	F2BAW200M100	1.8°	2	p. 16	p. 20
	WB14F601S	103F7821-4141	F2BAW400M100	WB14F601D	103F7821-4111	F2BAW400M100	1.8°	4	p. 16	p. 20
	WB12F602S	103F7822-4041	F2BAW200M100	WB12F602D	103F7822-4011	F2BAW200M100	1.8°	2	p. 17	p. 20
	WB14F602S	103F7822-4141	F2BAW400M100	WB14F602D	103F7822-4111	F2BAW400M100	1.8°	4	p. 17	p. 20
	WB12F603S	103F7823-4041	F2BAW200M100	WB12F603D	103F7823-4011	F2BAW200M100	1.8°	2	p. 17	p. 20
	WB14F603S	103F7823-4141	F2BAW400M100	WB14F603D	103F7823-4111	F2BAW400M100	1.8°	4	p. 17	p. 20
86 mm sq.	WB12S861S	SH2861-4041	F2BAW200M100	WB12S861D	SH2861-4011	F2BAW200M100	1.8°	2	p. 18	p. 20
	WB14S861S	SH2861-4141	F2BAW400M100	WB14S861D	SH2861-4111	F2BAW400M100	1.8°	4	p. 18	p. 20
	WB12S862S	SH2862-4041	F2BAW200M100	WB12S862D	SH2862-4011	F2BAW200M100	1.8°	2	p. 18	p. 20
	WB14S862S	SH2862-4141	F2BAW400M100	WB14S862D	SH2862-4111	F2BAW400M100	1.8°	4	p. 19	p. 20
	WB12S863S	SH2863-4041	F2BAW200M100	WB12S863D	SH2863-4011	F2BAW200M100	1.8°	2	p. 19	p. 20
	WB14S863S	SH2863-4141	F2BAW400M100	WB14S863D	SH2863-4111	F2BAW400M100	1.8°	4	p. 19	p. 20

- Motors with brakes, encoders, or with both brakes and encoders are available as options. Contact us for details.
- Encoders are for use in closed-loop control, with specs of 4000 P/R and 3 channels.
- 42 mm sq. (1.65 inch sq.) and 60 mm sq. (2.36 inch sq.) motors include lead wires. 86 mm sq. (3.39 inch sq.) motors are a cable type, with lead wires exiting from the terminal. The lead wire and cable length is 500 mm (19.69 inch) or greater.

Power supply connector (CN1)

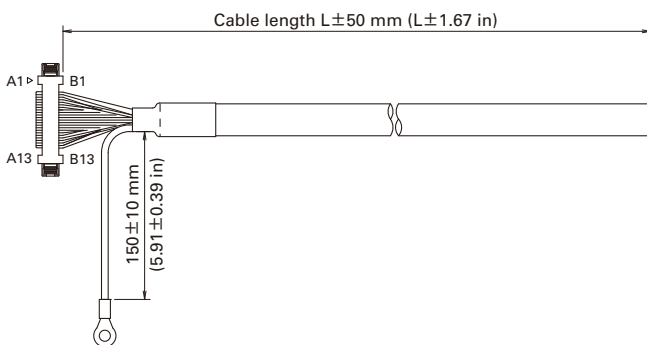
Model number	Manufacturer model number	Manufacturer
FC5P0000A	MSTBT 2,5/4-STF-5,08	PHOENIX CONTACT

Motor connector (CN2)

Model number	Manufacturer model number	Manufacturer
FC5M0000A	MSTBT 2,5/8-STF-5,08	PHOENIX CONTACT

I/O cable (CN3), 1 m (39.4 inch)

Model number
FC5S0010A



Options (sold separately)

Power supply and motor connector set Model number: FA-002

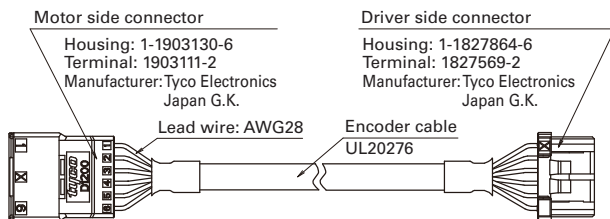
Manufacturer	Name	Manufacturer model number	Quantity
PHOENIX CONTACT	Connector	MSTBT 2,5/4-STF-5,08	1
	Connector	MSTBT 2,5/8-STF-5,08	1

Encoder extension connector set Model number: FC5E0000A

Manufacturer	Name	Manufacturer model number	Quantity
Tyco Electronics Japan G.K.	Recessed housing	1-1827864-6	1
	Recessed contact	1827570-2	10
	Tab housing	1-1903130-6	1
	Tab contact	1903112-2	10

Encoder extension cable

Model number	Cable length (L)
FC5E0010A	1 m (39.4 in)
FC5E0020A	2 m (78.7 in)
FC5E0030A	3 m (118.1 in)



Connector for I/O signals Model number: FC5S0000A

Manufacturer	Name	Manufacturer model number	Quantity
KEL CORPORATION	Connector	8822E-026-171D-F	1

I/O cable

Model number	Cable length (L)
FC5S0010A	1 m (39.4 in)
FC5S0020A	2 m (78.7 in)

Dimensions are the same as the diagram shown in "Set Model Configuration" on p. 14.

- Contact us if you need a different cable length than those listed here.
- Contact us if you need a robot cable.
- Special crimping and pressure welding tools are required to assemble the harness. Refer to the manufacturer of the individual connectors for details.
- Refer to pp. 25 to 26 for compatible wires, model number details, and connector pin arrangements.

Connector unit for setup software Model number: PBFM-U6

Name	Manufacturer model number	Quantity
USB/RS-485 converter	Uport 1130 (manufactured by MOXA)	1
Cable	PBC6T0005A (5 m) (19.7 in)	1

Refer to the included installation manual (CD-ROM) or the manufacturer's website for instructions on installing the Uport 1130 driver or details on its use.

Setup software (free)

Name	SANMOTION MOTOR SETUP SOFTWARE
Compatible operating systems	Windows XP (SP3 or higher)/Vista/7

The software can be downloaded from the Product Information page on our website. URL: <http://www.sanyodenki.com>

Size	Motor size	42 mm sq. (1.65 in sq.)	60 mm sq. (2.36 in sq.)	
	Motor length	39 mm (1.54 in)	45.9 mm (1.81 in)	45.9 mm (1.81 in)
Single shaft	Set model number	WB12F422S (100 VAC only)	WB12F601S	WB14F601S
	Configuration item: motor number	103F5208-4041	103F7821-4041	103F7821-4141
	Configuration item: driver number	F2BAW200M100	F2BAW200M100	F2BAW400M100
Dual shaft	Set model number	WB12F422D (100 VAC only)	WB12F601D	WB14F601D
	Configuration item: motor number	103F5208-4011	103F7821-4011	103F7821-4111
	Configuration item: driver number	F2BAW200M100	F2BAW200M100	F2BAW400M100
Holding torque	N·m (oz·in)	0.325 (46.02)	0.91 (128.87)	0.91 (128.87)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.056 (0.31)	0.275 (1.50)	0.275 (1.50)
Rated current	A/phase	2	2	4
Motor mass *1	kg (lbs)	0.29 (0.64)	0.6 (1.32)	0.6 (1.32)
Allowable thrust load	N (lbs)	10 (2.25)	20 (4.5)	20 (4.5)
Allowable radial load *2	N (lbs)	48 (10.79)	209 (47.04)	209 (47.04)

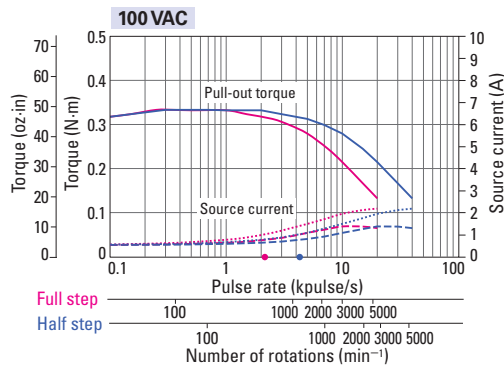
*1 Driver mass ▶ p. 22 *2 The load point is at the tip of the output shaft.

Characteristics diagram

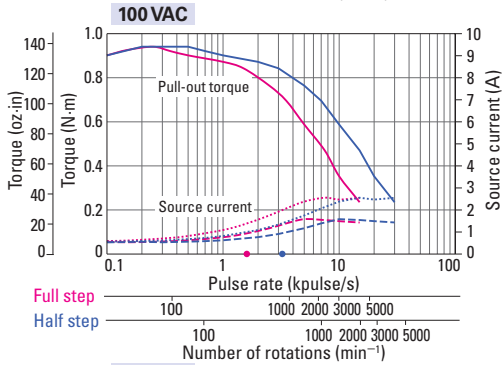
With rubber coupling

Pull-out torque — Full step — Half step — fs : Maximum self-start frequency when not loaded
 Source current (no load) — Full step — Half step — Source current (load applied) — Full step — Half step

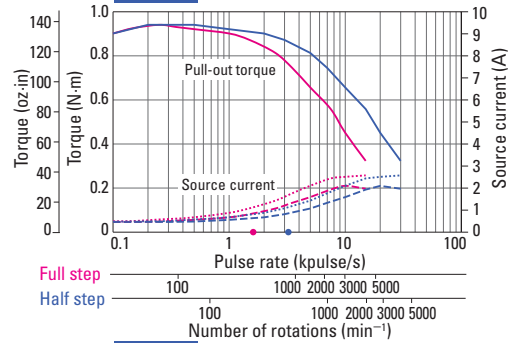
WB12F422S
WB12F422D



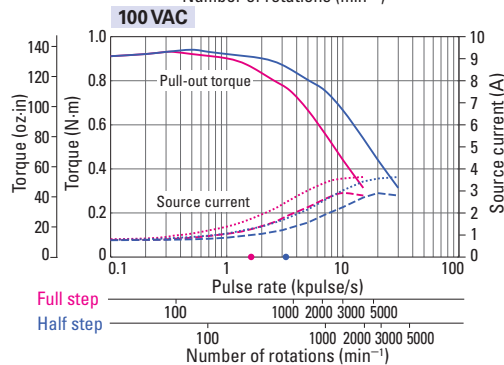
WB12F601S
WB12F601D



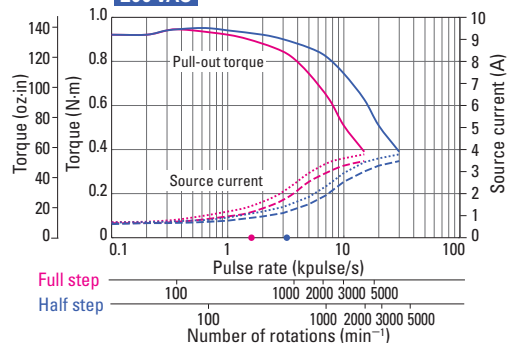
200 VAC



WB14F601S
WB14F601D



200 VAC



Size		60 mm sq. (2.36 in sq.)			
		54.9 mm (2.16 in)	54.9 mm (2.16 in)	86.9 mm (3.42 in)	86.9 mm (3.42 in)
Single shaft	Motor size				
	Motor length				
	Set model number	WB12F602S	WB14F602S	WB12F603S	WB14F603S
Single shaft	Configuration item: motor number	103F7822-4041	103F7822-4141	103F7823-4041	103F7823-4141
	Configuration item: driver number	F2BAW200M100	F2BAW400M100	F2BAW200M100	F2BAW400M100
Dual shaft	Set model number	WB12F602D	WB14F602D	WB12F603D	WB14F603D
	Configuration item: motor number	103F7822-4011	103F7822-4111	103F7823-4011	103F7823-4111
	Configuration item: driver number	F2BAW200M100	F2BAW400M100	F2BAW200M100	F2BAW400M100
Holding torque	N·m (oz·in)	1.35 (191.18)	1.35 (191.18)	2.35 (332.79)	2.35 (332.79)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.4 (2.19)	0.4 (2.19)	0.84 (4.59)	0.84 (4.59)
Rated current	A/phase	2	4	2	4
Motor mass *1	kg (lbs)	0.77 (1.70)	0.77 (1.70)	1.34 (2.95)	1.34 (2.95)
Allowable thrust load	N (lbs)	20 (4.5)	20 (4.5)	20 (4.5)	20 (4.5)
Allowable radial load *2	N (lbs)	200 (44.96)	200 (44.96)	178 (40.02)	178 (40.02)

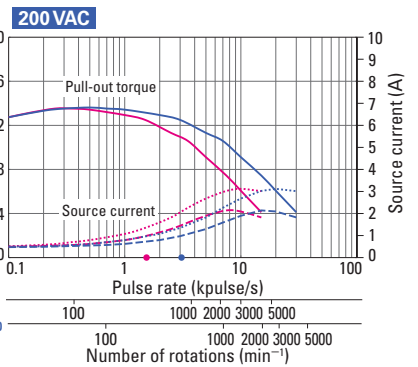
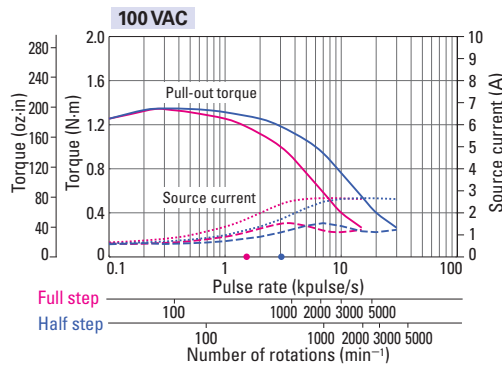
*1 Driver mass ▶ p. 22 *2 The load point is at the tip of the output shaft.

Characteristics diagram

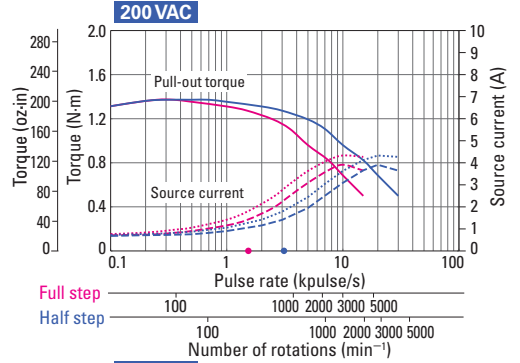
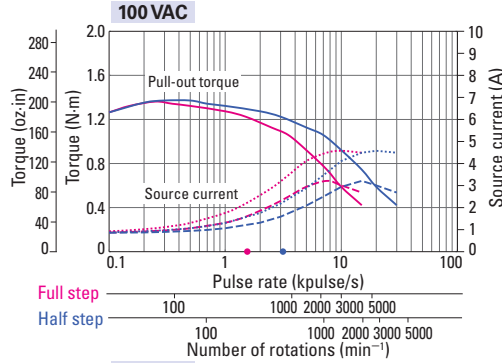
With rubber coupling

Pull-out torque Full step Half step fs : Maximum self-start frequency when not loaded Full step Half step
 Source current (no load) Full step Half step Source current (load applied) Full step Half step

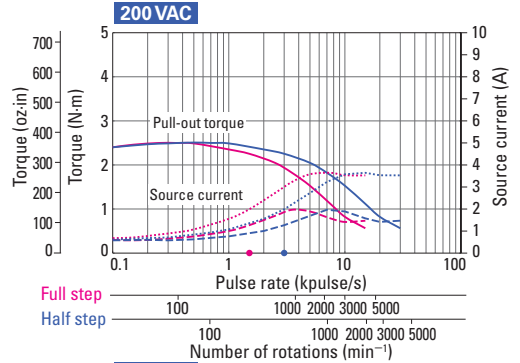
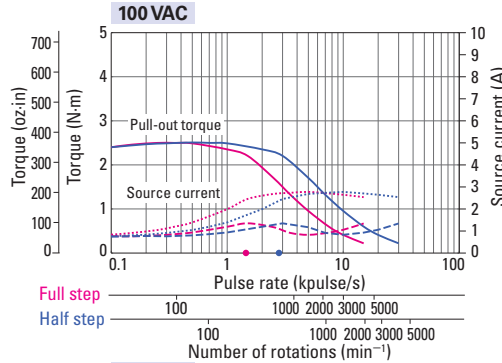
WB12F602S
WB12F602D



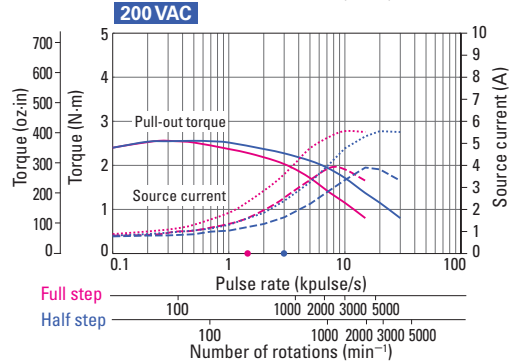
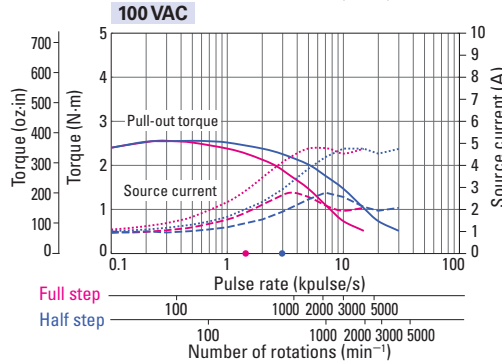
WB14F602S
WB14F602D



WB12F603S
WB12F603D



WB14F603S
WB14F603D



Size		86 mm sq. (3.39 in sq.)		
		66 mm (2.6 in)	66 mm (2.6 in)	96.5 mm (3.8 in)
Single shaft	Motor size			
	Motor length			
	Set model number	WB12S861S	WB14S861S	WB12S862S
Configuration item: motor number		SH2861-4041	SH2861-4141	SH2862-4041
	Configuration item: driver number	F2BAW200M100	F2BAW400M100	F2BAW200M100
Dual shaft	Set model number	WB12S861D	WB14S861D	WB12S862D
	Configuration item: motor number	SH2861-4011	SH2861-4111	SH2862-4011
	Configuration item: driver number	F2BAW200M100	F2BAW400M100	F2BAW200M100
Holding torque	N·m (oz·in)	3.3 (495.64)	3.3 (495.64)	6.4 (906.32)
Rotor inertia	× 10 ⁻⁴ kg·m ² (oz·in ²)	1.48 (8.09)	1.48 (8.09)	3.0 (16.4)
Rated current	A/phase	2	4	2
Motor mass *1	kg (lbs)	1.75 (3.85)	1.75 (3.85)	2.9 (6.38)
Allowable thrust load	N (lbs)	60 (13.49)	60 (13.49)	60 (13.49)
Allowable radial load *2	N (lbs)	200 (44.96)	200 (44.96)	200 (44.96)

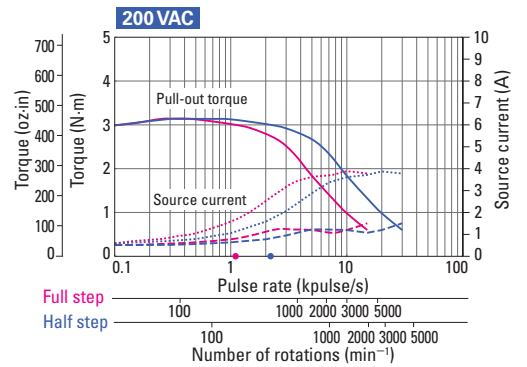
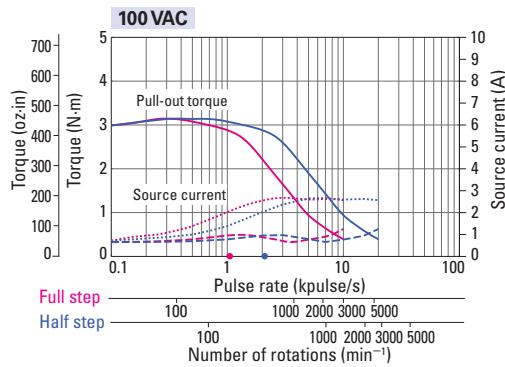
*1 Driver mass ▶ p. 22 *2 The load point is at the tip of the output shaft.

Characteristics diagram

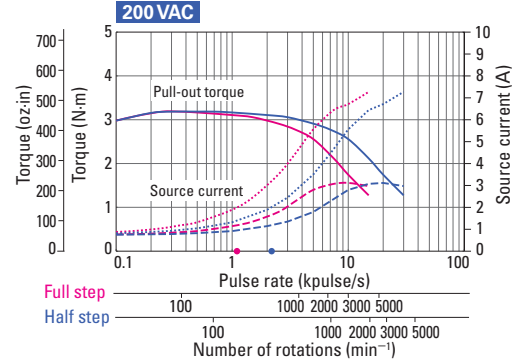
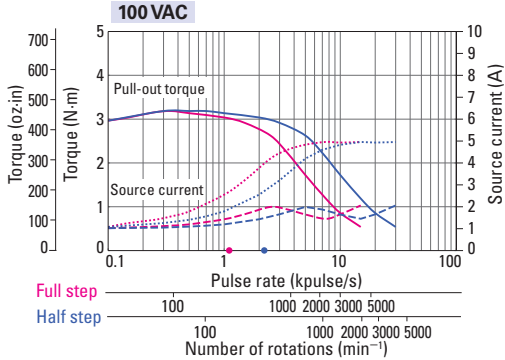
With rubber coupling

Pull-out torque Full step — Half step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) Full step - - - Half step - - - Source current (load applied) Full step ····· Half step ·····

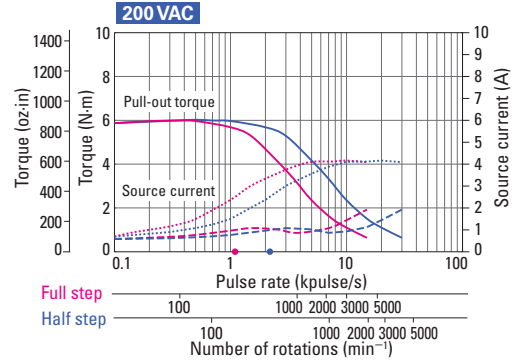
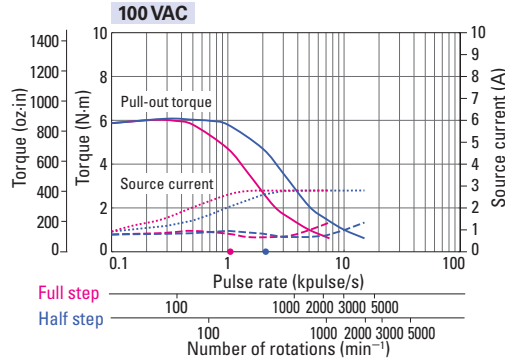
WB12S861S
WB12S861D



WB14S861S
WB14S861D



WB12S862S
WB12S862D



Size		86 mm sq. (3.39 in sq.)		
		96.5 mm (3.8 in)	127 mm (5 in)	127 mm (5 in)
Single shaft	Motor size			
	Motor length			
	Set model number	WB14S862S	WB12S863S	WB14S863S
Configuration item: motor number	SH2862-4141	SH2863-4041	SH2863-4141	
	Configuration item: driver number	F2BAW400M100	F2BAW200M100	F2BAW400M100
Dual shaft	Set model number	WB14S862D	WB12S863D	WB14S863D
	Configuration item: motor number	SH2862-4111	SH2863-4011	SH2863-4111
	Configuration item: driver number	F2BAW400M100	F2BAW200M100	F2BAW400M100
Holding torque	N·m (oz·in)	6.4 (906.32)	9 (1274.51)	9 (1274.51)
Rotor inertia	× 10 ⁻⁴ kg·m ² (oz·in ²)	3 (16.4)	4.5 (24.6)	4.5 (24.6)
Rated current	A/phase	4	2	4
Motor mass *1	kg (lbs)	2.9 (6.38)	4 (8.8)	4 (8.8)
Allowable thrust load	N (lbs)	60 (13.49)	60 (13.49)	60 (13.49)
Allowable radial load *2	N (lbs)	200 (44.96)	200 (44.96)	200 (44.96)

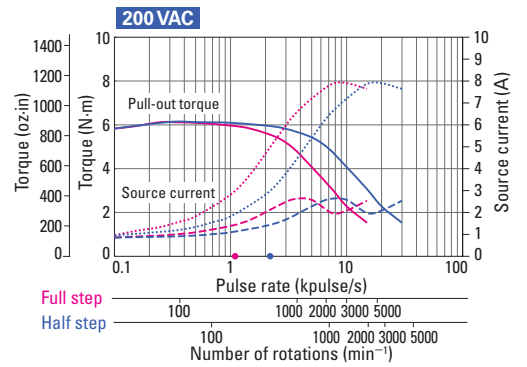
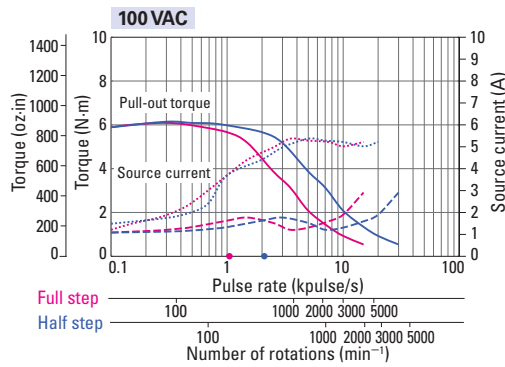
*1 Driver mass ▶ p. 22 *2 The load point is at the tip of the output shaft.

Characteristics diagram

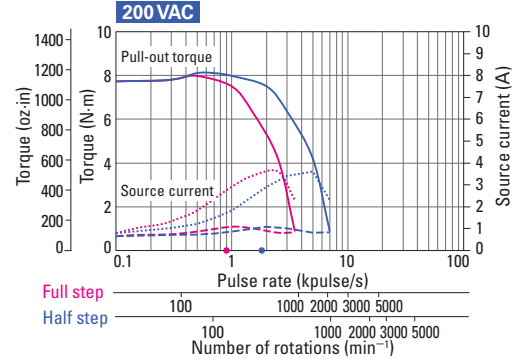
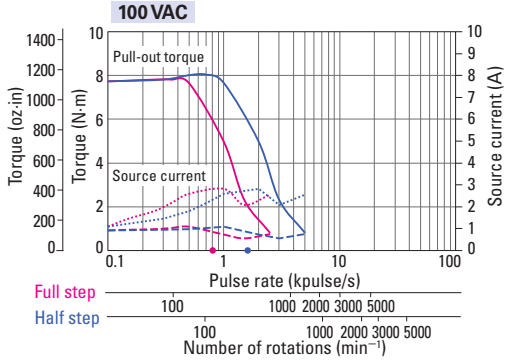
With rubber coupling

Pull-out torque Full step Half step fs : Maximum self-start frequency when not loaded Full step Half step
 Source current (no load) Full step Half step Source current (load applied) Full step Half step

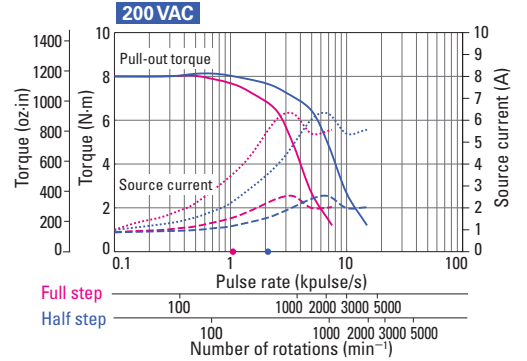
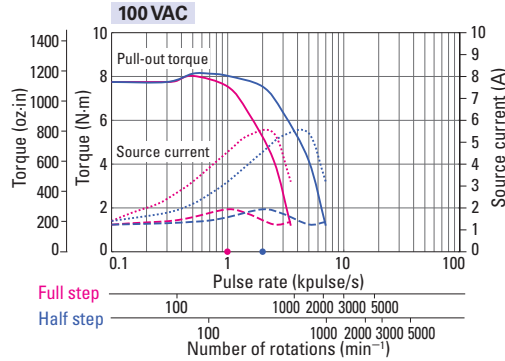
WB14S862S
WB14S862D



WB12S863S
WB12S863D



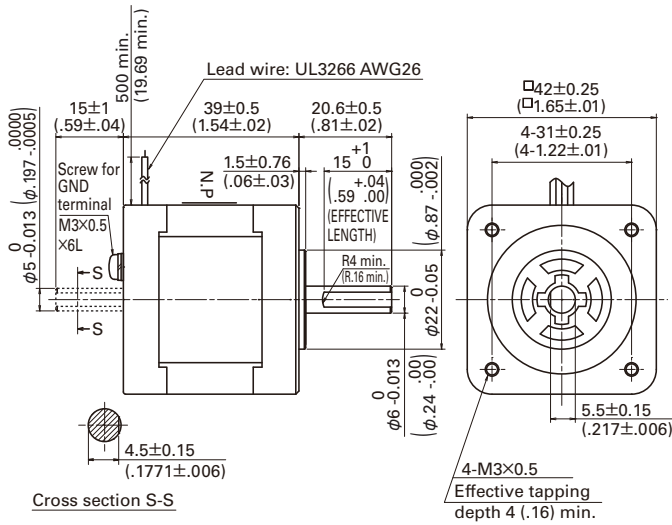
WB14S863S
WB14S863D



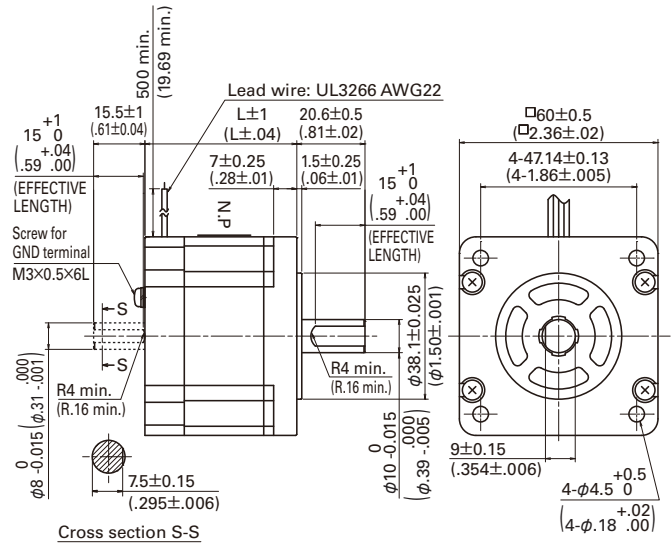
Stepping Motor: Dimensions

[Unit: mm (inch)]

42 mm sq. (1.65 inch sq.)



60 mm sq. (2.36 inch sq.)



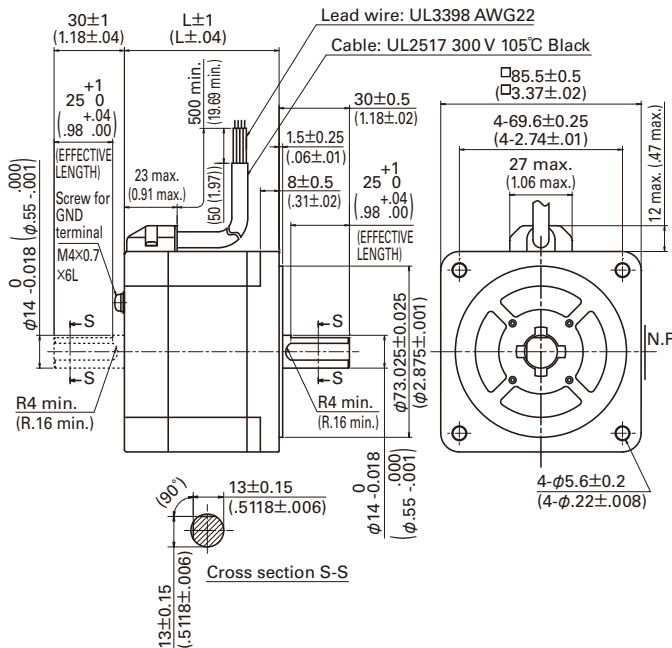
Bipolar

Set model number		Motor model number	
Single shaft	Dual shaft	Single shaft	Dual shaft
WB12F422S	WB12F422D	103F5208-4041	103F5208-4011

Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
WB12F601S	WB12F601D	103F7821-4041	103F7821-4011	45.9 (1.81)
WB14F601S	WB14F601D	103F7821-4141	103F7821-4111	45.9 (1.81)
WB12F602S	WB12F602D	103F7822-4041	103F7822-4011	54.9 (2.16)
WB14F602S	WB14F602D	103F7822-4141	103F7822-4111	54.9 (2.16)
WB12F603S	WB12F603D	103F7823-4041	103F7823-4011	86.9 (3.42)
WB14F603S	WB14F603D	103F7823-4141	103F7823-4111	86.9 (3.42)

86 mm sq. (3.39 inch sq.)



Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
WB12S861S	WB12S861D	SH2861-4041	SH2861-4011	66 (2.6)
WB14S861S	WB14S861D	SH2861-4141	SH2861-4111	66 (2.6)
WB12S862S	WB12S862D	SH2862-4041	SH2862-4011	96.5 (3.8)
WB14S862S	WB14S862D	SH2862-4141	SH2862-4111	96.5 (3.8)
WB12S863S	WB12S863D	SH2863-4041	SH2863-4011	127 (5)
WB14S863S	WB14S863D	SH2863-4141	SH2863-4111	127 (5)

Stepping Motor: General Specifications

Motor model number	103F5208	103F782 <input type="checkbox"/>	SH286 <input type="checkbox"/>
Type	-		
Operating ambient temperature	- 10°C to + 40°C		
Conversation temperature	- 20°C to + 60°C		
Operating ambient humidity	90% RH: 40°C max. (no condensation)		
Conversation humidity	90% RH: 40°C max., 57% RH: 50°C max., 35% RH: 60°C max. (no condensation)		
Operation altitude	1000 m (3281 feet) max. above sea level		
Vibration resistance	Vibration frequency 10 to 500 Hz, total amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s ² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.		
Impact resistance	500 m/s ² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.		
Insulation class	Class B (+130°C)		
Withstandable voltage	At normal temperature and humidity, no failure with 1500 VAC @50/60 Hz applied for one minute between motor winding and frame.		
Insulation resistance	At normal temperature and humidity, not less than 100 M Ω between winding and frame by 500 VDC megger.		
Protection grade	IP40		
Winding temperature rise	80 K max. (Based on Sanyo Denki standard)		
Static angle error	± 0.09°	± 0.054°	± 0.09°
Thrust play *1	0.075 mm (0.003 in) (load: 0.35 N (0.08 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))
Radial play *2	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))
Shaft runout	0.025 mm (0.001 in)	0.025 mm (0.001 in)	0.025 mm (0.001 in)
Concentricity of mounting pilot relative to shaft	φ 0.05 mm (φ 0.002 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)
Squareness of mounting surface relative to shaft	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.15 mm (0.006 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally		

*1 Thrust play: Shaft displacement under axial load.

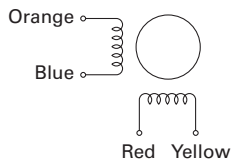
*2 Radial play: Shaft displacement under radial load applied 1/3rd of the length from the end of the shaft.

Internal Wiring and Rotation Direction

Bipolar winding

Lead wire type

Internal wire connection

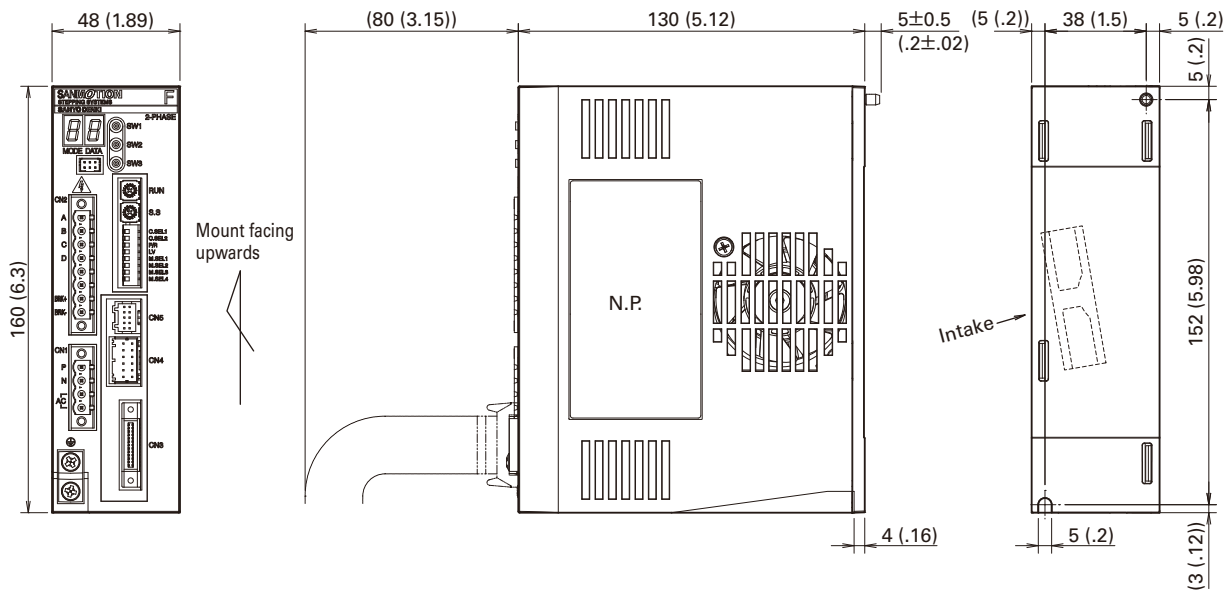


Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Lead wire color			
	Red	Blue	Yellow	Orange
1	-	-	+	+
2	+	-	-	+
3	+	+	-	-
4	-	+	+	-

Driver Dimensions [Unit: mm (inch)]



Driver Specifications

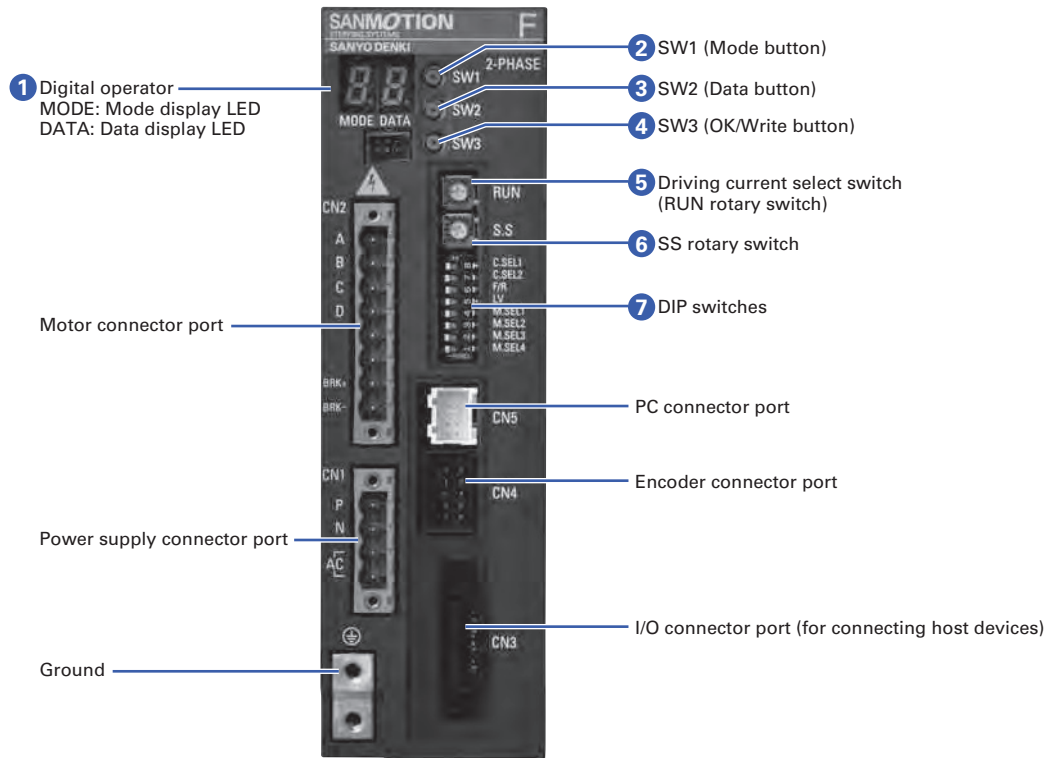
General specifications

	Model number	F2BAW200M100	F2BAW400M100	
	Input source	Single Phase 100 to 240 VAC +10, -15%, 50/60 Hz		
	Source current	5 A	10 A	
Basic specifications	Environment	Protection class	Class I	
		Operation environment	Installation category (over-voltage category): II, pollution degree: 2	
		Ambient operation temperature	0 to + 50°C	
		Conservation temperature	- 20 to + 70°C	
		Operating ambient humidity	90% RH or less (no condensation)	
		Conservation humidity	90% RH or less (no condensation)	
		Operation altitude	1000 m (3281 feet) or less above sea level	
		Vibration resistance	Tested under the following conditions: 5 m/s ² frequency range 10 to 55 Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	20 m/s ²	
		Withstandable voltage	Not influenced when 1.5 kVAC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10 M Ω min. when measured with 500 VDC megohmmeter between input terminal and cabinet.	
	Mass (Weight)	0.8 kg (0.20 lbs)		
Functions	Selection functions	Control mode, input pulse type, low-vibration mode, motor select, step angle, driving current		
	Protection functions	Overvoltage protection, power supply voltage reduction protection, overheat protection, overcurrent protection		
	LED indication	Status display, alarm display		
I/O signals	Command pulse input signal	Line receiver input system, maximum input frequency: 400 kpulse/s		
	Input signal	From the photocoupler by the open collector output Output specification: V _{ceo} = 4.75 to 26.4 V		
	Output signal	From the photocoupler by the open collector output Output specification: V _{ceo} = 4.75 to 26.4 V		

Safety standards

	Directives	Standard	Name
CE (TÜV)	Low-voltage directives	EN61800-5-1	—
	EMC directives	EN61800-3	—
	Acquired standards	Applicable standard	File No.
UL	UL	UL508C	E179775
	UL for Canada (c-UL)		
	KC Mark (Korea Certification Mark)	Standard	KN61000-6-2, KN61000-6-4

Driver Controls and Connectors



1 Digital operator

Allows specific parameters to be set, and for jog operations.

• MODE (Mode display LED)

Displays the current mode number.

MODE	Functions	Data range (DATA display)
0	Driver status display	Displays the driver status
1	Closed control gain settings	0-F (small to large)
2	Feed-forward gain settings	0-A (10%/LSB)
3	Deviation-free control gain settings	0-F (small to large)
4	Current settings when stopped	0-F (100%-25%)
5	Step division mode settings	2=2-phase; 5=5-phase
6	Step division 2 settings	0-F (same as SS rotary switch)
7	Hold brake	0=release; 1=hold
8	Jog operation speed	1-F (100 pps/LSB)
9	Jog operation	—
A	Alarm code display	Displays the alarm code

• DATA (data display LED)

Displays monitor and parameter setting values. Blinks when the displayed parameter setting value is different from the current setting value.

2 SW1 (Mode button)

3 SW2 (Data button)

4 SW3 (OK/Write button)

Used for each setting in conjunction with the digital operator. See the operation manual for details on the settings. Download the necessary manual from the Product Information page on our website.

5 Driving current select switch (RUN rotary switch)

Sets the driving current.

Dial	0	1	2	3	4	5	6	7
Stepping motor current (%)	100	95	90	85	80	75	70	65
Dial	8	9	A	B	C	D	E	F
Stepping motor current (%)	60	55	50	45	40	35	30	25

• The factory setting is 0 (100%).

6 SS rotary switch

Sets the step division 1 settings.

SS setting value	0	1	2	3	4	5	6	7
[P/R]	200	400	800	1000	1600	2000	3200	5000
SS setting value	8	9	A	B	C	D	E	F
[P/R]	6400	10000	12800	20000	25000	25600	50000	51200

• The factory setting is 0.

• Step division 1 and step division 2 can be used while switching with the I/O signal.

7 DIP switches

Sets the control mode, input pulse type, low-vibration mode, and motor select.

SW No.	Symbol	Functions
8	C.SEL1	Control mode select
7	C.SEL2	
6	F/R	Input pulse type select
5	LV	Low-vibration mode select
4	M.SEL1	Motor select
3	M.SEL2	
2	M.SEL3	
1	M.SEL4	



• Set the DIP switches while the power supply is shut off. These settings cannot be changed after the power has been turned on.

Control mode select

Select the stepping motor control mode.

SW7 C.SEL2	SW8 C.SEL1	Control mode
OFF	OFF	Open-loop control
OFF	ON	Analysis mode*
ON	OFF	Closed-loop control*
ON	ON	Deviation-free closed-loop control*

*An optional motor with encoder is required for modes other than open-loop control.

- **Open-loop control**
Controls general stepping motors.
- **Analysis mode**
The optional encoder allows you to detect step-out, monitor speed, and monitor current position, etc.
- **Closed-loop control**
Performs closed-loop control based on feedback from the encoder. Since the motor current is optimally controlled by matching the load, heat buildup and current consumption are both reduced. As this operates with positional deviation, use the following deviation-free closed-loop control on devices that require synchronization with pulse commands.
- **Deviation-free closed-loop control**
Performs closed-loop control based on feedback from the encoder. Although the motor current is controlled according to the load, a control to lessen positional deviation has been added.

[Positional deviation]

Open-loop control and analysis mode < Deviation-free closed-loop control << Closed-loop control

[Heat buildup, current consumption]

Closed-loop control < Deviation-free closed-loop control < Open-loop control and analysis mode

Input pulse type select

Select the input pulse type.

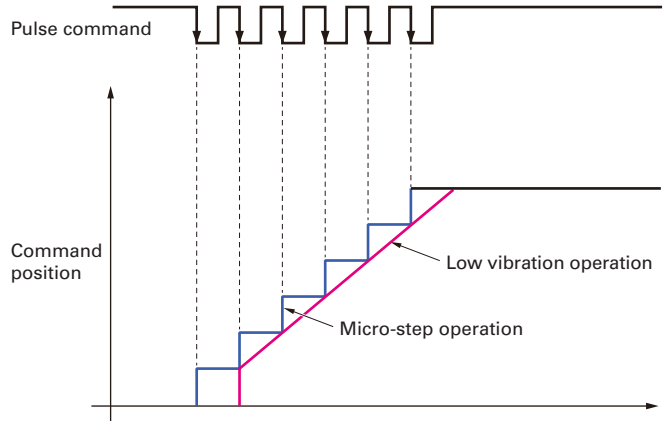
SW6 F/R	Input pulse type
OFF	2-input type (CW pulse/CCW pulse)
ON	1-input type (Pulse/Direction)

Low-vibration mode select

Allows for smooth operation with low vibrations, even with step division set at coarse resolution.

SW5 LV	Operation
OFF	Micro-step operation
ON	Low vibration operation

During low vibration operation, operational processes for the driving pulse will be carried out inside the driver. For this reason, motor movement will be delayed by 1 pulse for each input pulse.



Motor select

Select a motor to be used with the driver.

Driver model number: F2BAW200M100

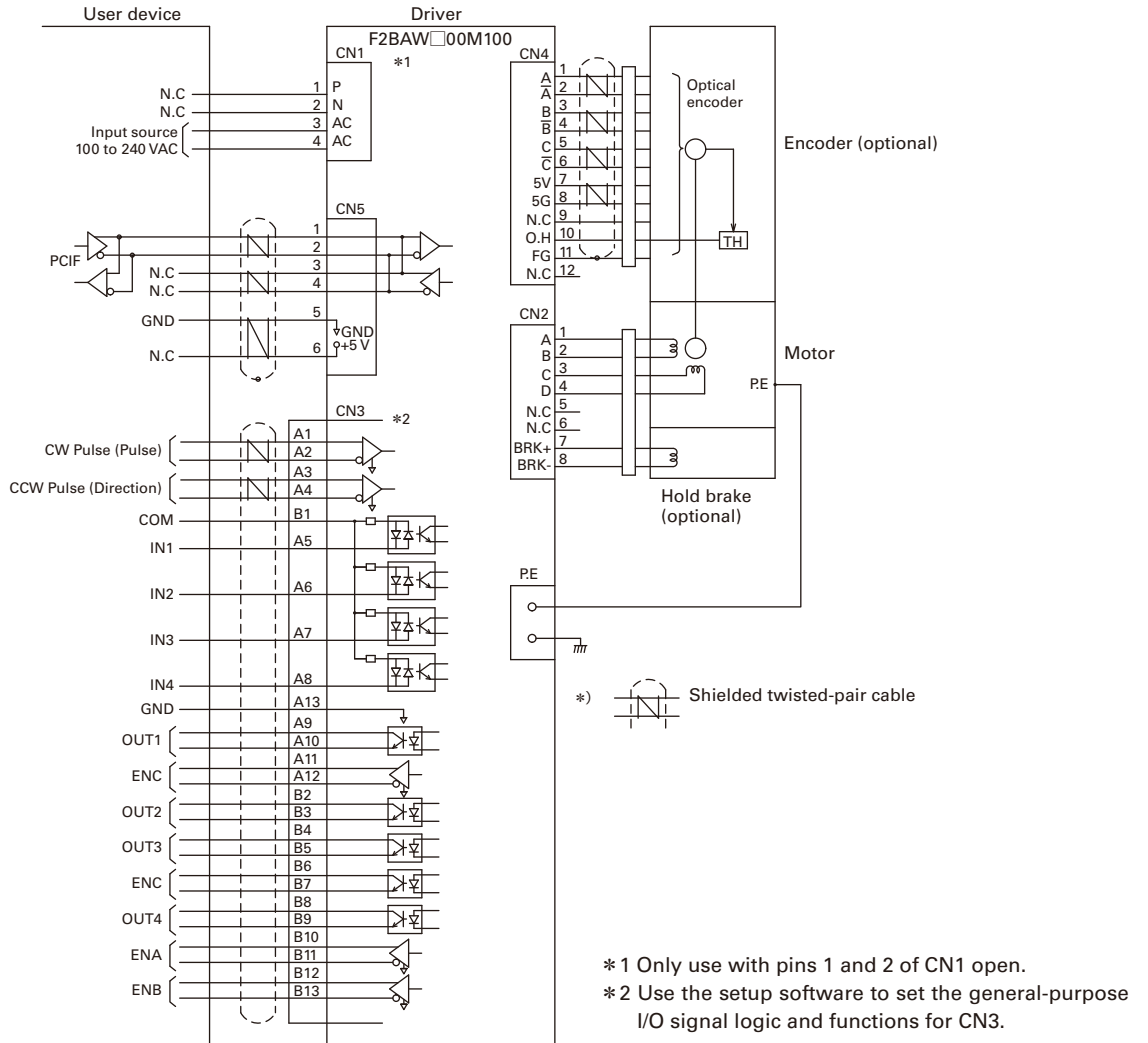
SW1 M.SEL4	SW2 M.SEL3	SW3 M.SEL2	SW4 M.SEL1	Motor model number	Remarks
OFF	OFF	OFF	ON	103F5208	100 VAC input only
OFF	ON	ON	OFF	103F7821	
OFF	ON	ON	ON	103F7822	
ON	OFF	OFF	OFF	103F7823	
ON	OFF	OFF	ON	SH2861	
ON	OFF	ON	OFF	SH2862	
ON	OFF	ON	ON	SH2863	
Other settings				Reserved	

Driver model number: F2BAW400M100

SW1 M.SEL4	SW2 M.SEL3	SW3 M.SEL2	SW4 M.SEL1	Motor model number	Remarks
OFF	ON	ON	OFF	103F7821	
OFF	ON	ON	ON	103F7822	
ON	OFF	OFF	OFF	103F7823	
ON	OFF	OFF	ON	SH2861	
ON	OFF	ON	OFF	SH2862	
ON	OFF	ON	ON	SH2863	
Other settings				Reserved	

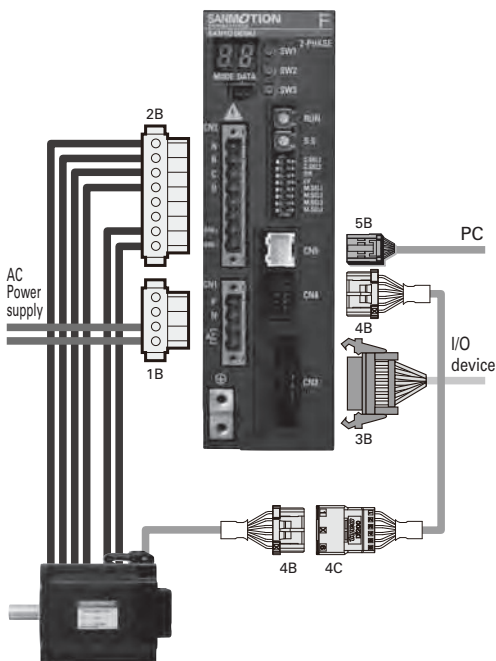
Connections and Signals

External wiring diagram



Wiring

Connector model, compatible wires



Applicable use	Code	Name	Model	Compatible wires	Maximum extension	Manufacturer
Power supply	CN1	Socket	MSTBT 2,5/4-GF-5,08	AWG18	2 m	PHOENIX CONTACT
	1B	Plug	MSTBT 2,5/4-STF-5,08	Discrete line		
Power, brakes	CN2	Socket	MSTBT 2,5/8-GF-5,08	AWG18 to 22	20 m	PHOENIX CONTACT
	2B	Plug	MSTBT 2,5/8-STF-5,08	Discrete line		
I/O	CN3	Plug	8831E-026-170LD-F	AWG28 (7/0.127)	2 m	KEL CORPORATION
	3B	Receptacle	8822E-026-171D			
encoder	CN4	Tab header	1-1827876-6	AWG22 to 28 Shielded twisted-pair* *The contact model number varies by jacket dimension.	20 m	Tyco Electronics Japan G.K.
		Recessed housing	1-1827864-6			
	4B	Recessed contact	1827569-2 (AWG28 to 30) 1827570-2 (AWG22 to 28)			
	4C	Tab contact	1-1903130-6 1903111-2 (AWG28 to 30) 1903112-2 (AWG22 to 28)			
Communications	CN5	Post with base housing	S10B-PADSS-1GW PADP-10V-1-S	AWG28 to 24 Shielded twisted-pair	2 m	J.S.T Mfg Co., Ltd.
	5B	Contact	SPH-002GW-P0.5S			

· Refer to the manufacturer's catalog for the detailed connector specifications.
· If the length will exceed the maximum extension, take precautions to ensure that the unit does not malfunction due to line noise.

Wiring

Power supply connector (CN1)

Pin No.	Symbol	Signal name
1	P	—
2	N	—
3	AC	AC
4	AC	AC

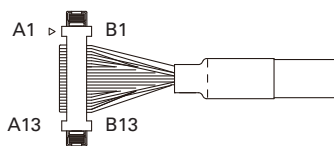
- Do not wire the motor power line, I/O cable, or encoder cable together with the power cable inside the same duct.
- Make sure to wait for at least 1 minute after shutting down the power, before plugging or unplugging the power cable. Failure to do so may cause damage to the driver.
- Select the appropriate breaker, electromagnetic contactor, and noise filter after referring to the details in the Operation Manual on power supply current, inrush current, and leakage current.

Power connector (CN2)

Pin No.	Symbol	Signal name	Lead wire color
1	A	Power A phase	Orange
2	B	Power \bar{A} phase	Blue
3	C	Power B phase	Red
4	D	Power \bar{B} phase	Yellow
5	—	—	—
6	—	—	—
7	BRK+	Hold brake +	White
8	BRK-	Hold brake —	Black

- The color of the lead wires on the hold brake vary with the polarity. Hold brakes without polarity use the same lead wire color.
- The power supply for the hold brake is inside of the driver. The hold brake is automatically controlled by the driver.
- Make sure to wait for at least 1 minute after shutting down the power before plugging or unplugging the power lines. Failure to do so may cause damage to the driver.

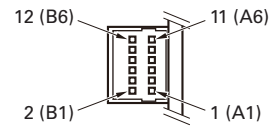
I/O signal connector (CN3)



Pin No.	Signal name	Functions	Lead wire color	Mark display	Mark color
A1	Pulse/+Pulse	Forward-direction pulse/pulse	Orange		Red
A2	Pulse/+Pulse				Black
A3	DIR/-Pulse	Reverse-direction pulse/direction	Gray		Red
A4	DIR/-Pulse				Black
A5	IN1	General-purpose input 1	White		Red
A6	IN2	General-purpose input 2			Black
A7	IN3	General-purpose input 3	Yellow		Red
A8	IN4	General-purpose input 4			Black
A9	OUT1+	General-purpose output 1	Pink		Red
A10	OUT1-				Black
A11	ENC+	Encoder C	Orange	Red	
A12	ENC-			Black	
A13	GND	Signal ground	Gray	Red	
B1	+/-COM	Common		Black	
B2	OUT2+	General-purpose output 2	White	Red	
B3	OUT2-			Black	
B4	OUT3+	General-purpose output 3	Yellow	Red	
B5	OUT3-			Black	
B6	ENC+	Encoder C	Pink	Red	
B7	ENC-			Black	
B8	OUT4+	General-purpose output 4	Orange	Red	
B9	OUT4-			Black	
B10	ENA+	Encoder A	Gray	Red	
B11	ENA-			Black	
B12	ENB+	Encoder B	White	Red	
B13	ENB-			Black	

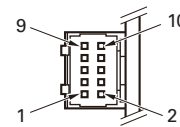
- Optional setup software and communications unit are required to set the I/O signal logic and functions.

Encoder connector (CN4)



Pin No.	Signal name	Lead wire color
1 (A1)	A phase +	Blue
2 (B1)	A phase -	Brown
3 (A2)	B phase +	Green
4 (B2)	B phase -	Purple
5 (A3)	C phase +	White
6 (B3)	C phase -	Yellow
7 (A4)	VCC	Red
8 (B4)	GND	Black
9 (A5)	—	—
10 (B5)	Motor overheat detection	Orange
11 (A6)	FG	Black
12 (B6)	—	—

Communications connector (CN5)

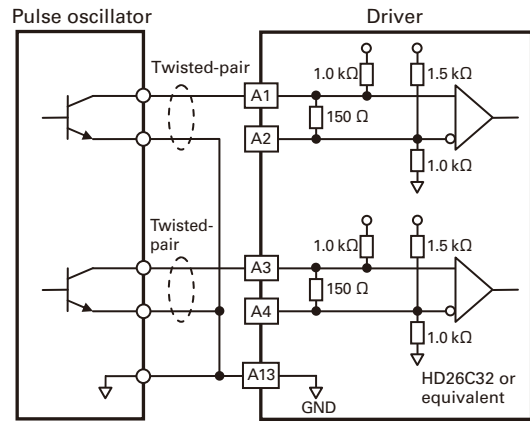
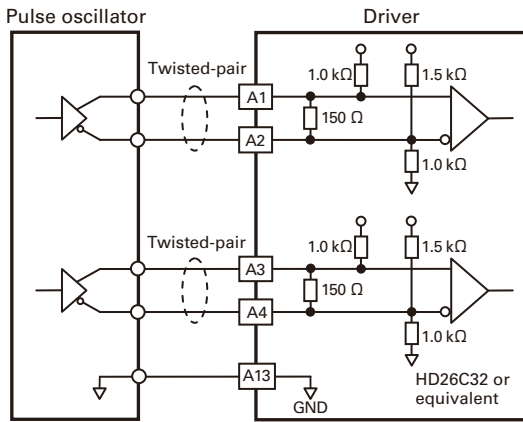


Pin No.	Signal name	Lead wire color
1	A	Yellow
2	B	White
3	(A)	—
4	(B)	—
5	GND	Black
6	(VCC)	—
7	—	—
8	—	—
9	—	—
10	—	—

Pulse Command Input

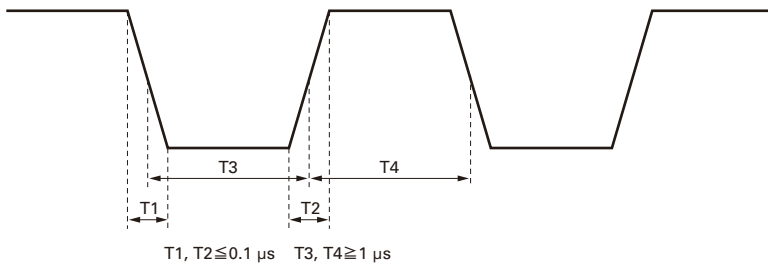
Connection example

Connection to line driver output Applicable line driver: HD26C31 or equivalent Make sure that GND is connected. Failure to do so may cause malfunction or damage.	Connect to open collector output Make sure that GND is connected. Failure to do so may cause malfunction or damage due to noise.
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Pulse waveform

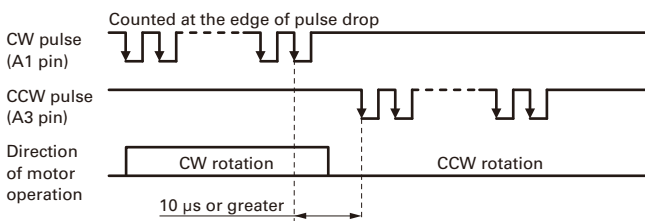
Maximum response frequency: 400 kpulse/s



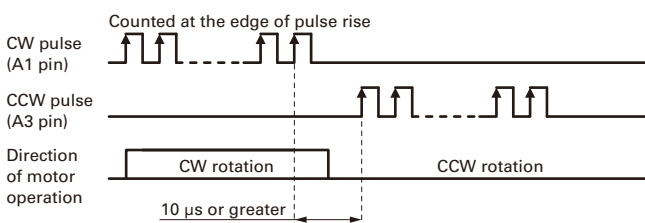
• Note that the unit cannot be operated at maximum speed if the step division is high due to maximum response frequency limits.

Timing chart

◆ 2-input type (negative logic)

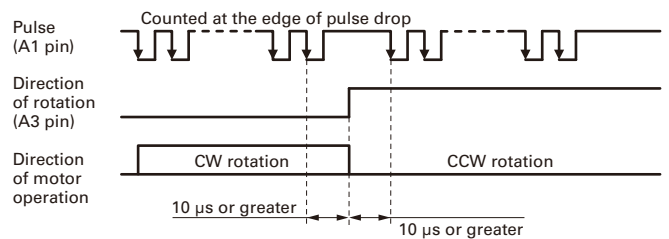


◆ 2-input type (positive logic)

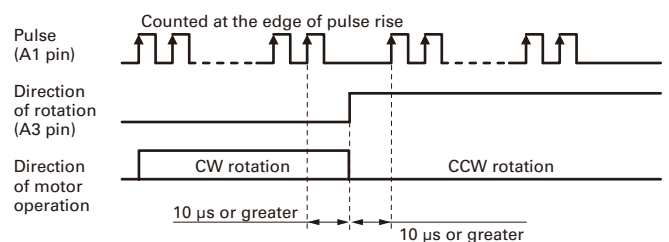


- CW rotation means rotation in a clockwise direction when viewed from the motor flange side; and CCW rotation means rotation in a counterclockwise direction when viewed from the motor flange side.
- Do not input CW/CCW pulses at the same time.
- The CW/CCW pulse switching time of "10 μs or greater" is the operating time for the driver internal circuit, not the motor response time. Set a time in which the motor can respond for actual operations.

◆ 1-input type (negative logic)



◆ 1-input type (positive logic)



- CW rotation means rotation in a clockwise direction when viewed from the motor flange side; and CCW rotation means rotation in a counterclockwise direction when viewed from the motor flange side.
- The rotating direction switching time of "10 μs or greater" is the operating time for the driver internal circuit, not the motor response time. Set a time in which the motor can respond for actual operations.

- Either positive or negative logic can be switched and selected using a parameter. The factory preset is negative logic.
- 1-input type and 2-input type can be switched by setting the DIP switch.

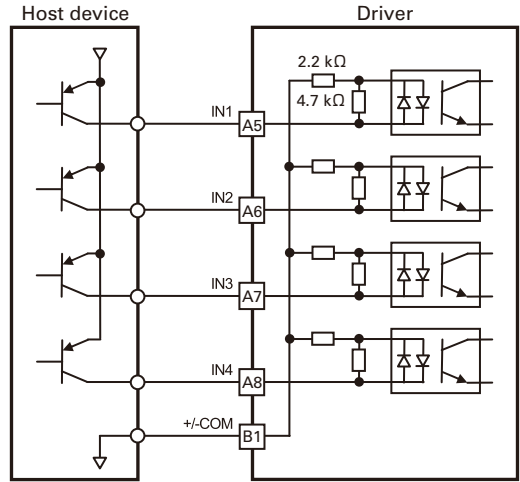
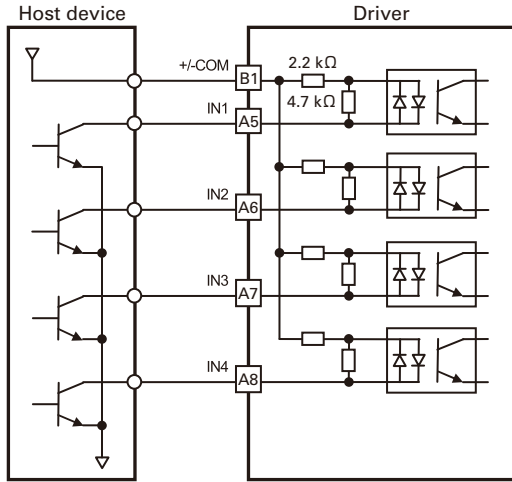
General-purpose Input

Connection example

Power supply voltage range 5 to 24 VDC

With host device current sync output

With host device current source output



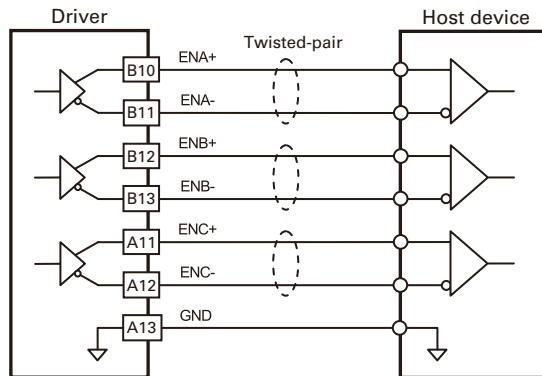
Encoder Output (The motor with encoder is optional.)

Connection example

Line driver output

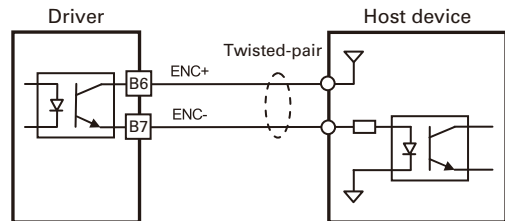
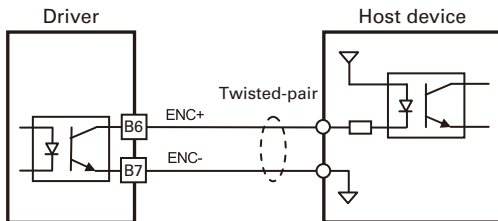
Applicable line receiver: HD26C32 or equivalent

Make sure that GND is connected. Failure to do so may cause damage or malfunction due to noise.



When used with ENC sync output

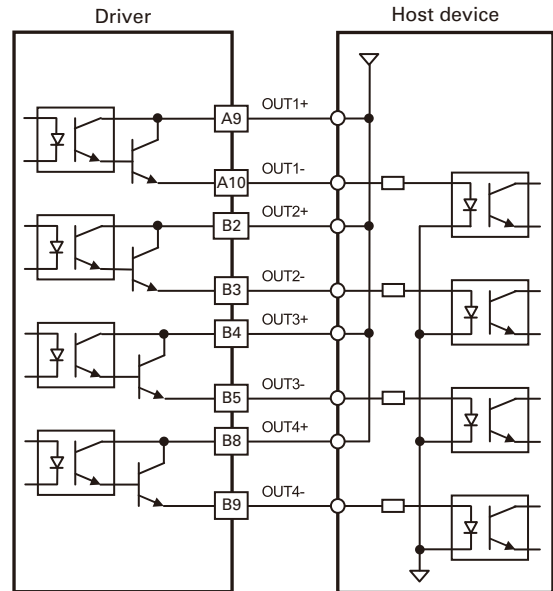
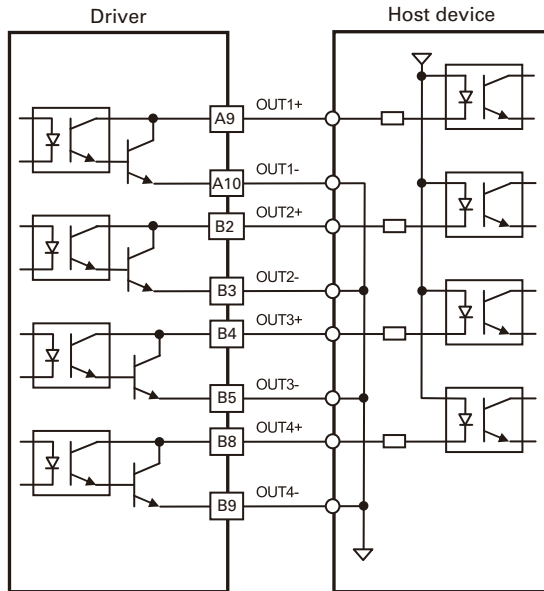
When used with ENC source output



General-purpose Output

Connection example

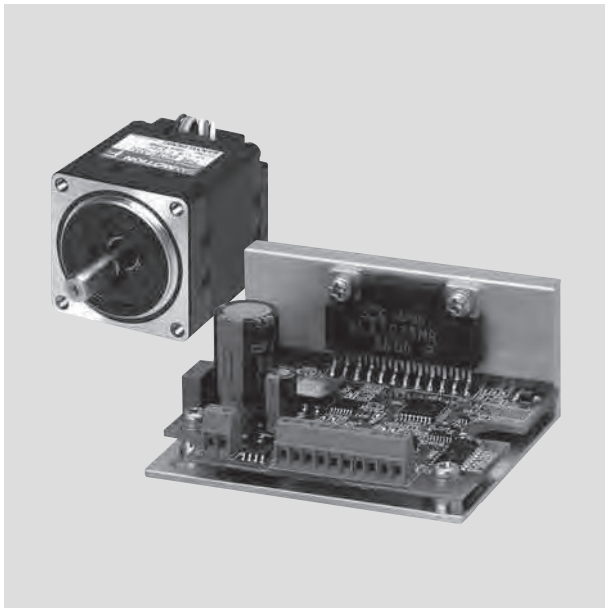
Power supply voltage range	5 to 24 VDC	
Maximum current	When used at 24 VDC	50 mA (maximum saturation voltage: 3.5 V or lower)
	When used at 12 VDC	30 mA (maximum saturation voltage: 3.0 V or lower)
	When used at 5 VDC	10 mA (maximum saturation voltage: 2.0 V or lower)
When used with sync output		
When used with source output		



DC Input Set Models

Unipolar, Bipolar

Set Model Configuration ▶ p. 32
 Specifications/Characteristics Diagram ▶ pp. 33 to 40
 Motor Dimensions ▶ pp. 41 to 42 Motor Specifications ▶ p. 43
 Driver Dimensions ▶ p. 44 Driver Specifications ▶ p. 45



Set configuration items RoHS

Driver Terminal block type CE c UL US RoHS

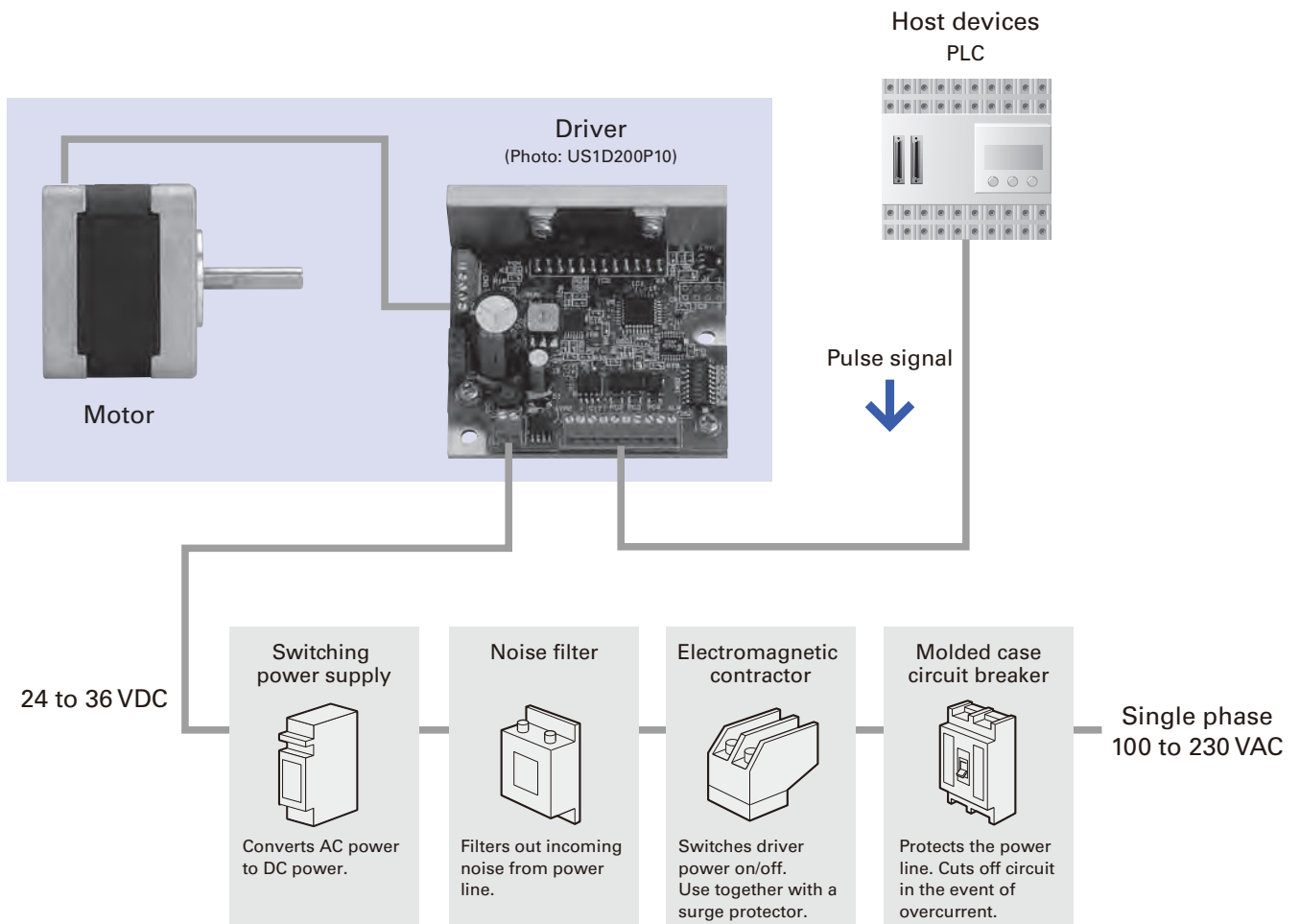
Unipolar Model number: US1D200P10 Input source: 24/36 VDC
 Bipolar Model number: BS1D200P10 Input source: 24/36 VDC
 · The operation manual can be downloaded from our website.
 · Drivers are available for separate purchase.
 Connector-type drivers are also available. Contact us for details.

Motor

Unipolar Motor size: 28 mm sq. (1.10 inch sq.), 42 mm sq. (1.65 inch sq.), 56 mm sq. (2.20 inch sq.)
 Bipolar Motor size: 28 mm sq. (1.10 inch sq.), 42 mm sq. (1.65 inch sq.), 50 mm sq. (1.97 inch sq.), 56 mm sq. (2.20 inch sq.), 60 mm sq. (2.36 inch sq.)

Cable with connector (Supplied only with connector-type motors)

System Configuration Diagram



Set Model Numbering Convention

Not every combination of the following codes or characters is available. Check the set model component details on the p. 32 for the model number combinations, or contact us.

Example: This is a set model number for the AC input driver (model number: US1D200P10) and motor (model number: 103H7121-0440). The motor specifications are motor size: 56 mm sq. (2.20 inch sq.), motor length: 41.8 mm (1.65 inch), single shaft.

D U 1 6 H 71 1 S

Stepping motor shaft specification
S: Single shaft
D: Dual shaft

Stepping motor total length

Code	Stepping motor size													
	28 mm sq. (1.10 in sq.)		42 mm sq. (1.65 in sq.)		50 mm sq. (1.97 in sq.)		56 mm sq. (2.20 in sq.)		60 mm sq. (2.36 in sq.)					
	Type code	Motor length: mm (in)	Type code	Motor length: mm (in)	Type code	Motor length: mm (in)	Type code	Motor length: mm (in)	Type code	Motor length: mm (in)	Type code	Motor length: mm (in)		
1	SH2281	32 (1.26)	103H5205	33 (1.30)	SH1421	33 (1.30)	103H6701	39.8 (1.57)	103H7121	41.8 (1.65)	103H7821	44.8 (1.76)	SH1601	42 (1.65)
2			103H5208	39 (1.54)	SH1422	39 (1.54)					103H7822	53.8 (2.12)	SH1602	54 (2.12)
3							103H6703	51.3 (2.02)	103H7123	53.8 (2.12)	103H7823	85.8 (3.38)		
4			103H5210	48 (1.89)	SH1424	48 (1.89)								
5	SH2285	51.5 (2.03)												
6									103H7126	75.8 (2.89)				

Stepping motor size	Basic step angle
28: 28 mm sq. (1.10 inch sq.)	1.8°
52: 42 mm sq. (1.65 inch sq.)	1.8°
14: 42 mm sq. (1.65 inch sq.)	0.9°
67: 50 mm sq. (1.97 inch sq.)	1.8°
71: 56 mm sq. (2.20 inch sq.)	1.8°
78: 60 mm sq. (2.36 inch sq.)	1.8°
16: 60 mm sq. (2.36 inch sq.)	0.9°

Stepping motor series name
H: H series
S: SH series

Rated current specification
4: 1 A/phase 5: 1.2 A/phase 6: 2 A/phase

Model

Driver specification
U: Unipolar B: Bipolar

D: DC input

Set Model Configuration This set includes the driver, motor and cable with motor connector.

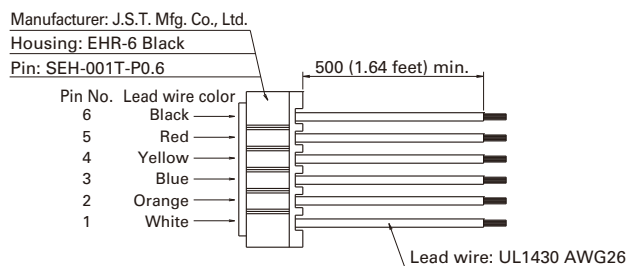
Unipolar Bundled driver model number: US1D200P10

Motor size	Single shaft			Dual shaft			Basic step angle	Rated current (A/phase)	Page	
	Set model number	Set configuration items		Set model number	Set configuration items				Specifica-tions	Dimen-sions
		Motor model number	Cable with motor con- nector model number		Motor model number	Cable with motor con- nector model number				
28 mm sq.	DU14S281S	SH2281-5271	L —	DU14S281D	SH2281-5231	L —	1.8°	1	p. 33	p. 41
	DU14S285S	SH2285-5271	L —	DU14S285D	SH2285-5231	L —	1.8°	1	p. 33	p. 41
42 mm sq.	DU15H521S	103H5205-0440	C 4835710-1	DU15H521D	103H5205-0410	C 4835710-1	1.8°	1.2	p. 33	p. 41
	DU15H522S	103H5208-0440	C 4835710-1	DU15H522D	103H5208-0410	C 4835710-1	1.8°	1.2	p. 33	p. 41
	DU15H524S	103H5210-0440	C 4835710-1	DU15H524D	103H5210-0410	C 4835710-1	1.8°	1.2	p. 34	p. 41
	DU15S141S	SH1421-0441	L —	DU15S141D	SH1421-0411	L —	0.9°	1.2	p. 34	p. 41
	DU15S142S	SH1422-0441	L —	DU15S142D	SH1422-0411	L —	0.9°	1.2	p. 34	p. 41
	DU15S144S	SH1424-0441	L —	DU15S144D	SH1424-0411	L —	0.9°	1.2	p. 34	p. 41
56 mm sq.	DU16H711S	103H7121-0440	L —	DU16H711D	103H7121-0410	L —	1.8°	2	p. 35	p. 42
	DU16H713S	103H7123-0440	L —	DU16H713D	103H7123-0410	L —	1.8°	2	p. 35	p. 42
	DU16H716S	103H7126-0440	L —	DU16H716D	103H7126-0410	L —	1.8°	2	p. 35	p. 42

Motors marked with an (L) are lead wire types. Either a 300 mm (11.81 inch) or a 305 mm (12.01 inch) or greater lead wire is attached to the motor.
Motors marked with a (C) are connector types. Cables with connectors for motors as shown below are included.

● **Cable with motor connector** (Supplied only with connector-type motors)

Bundled cable (Unipolar 42 mm sq. (1.65 inch sq.) motors only, model number: 4835710-1)



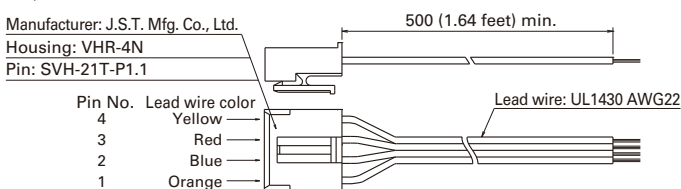
Bipolar Bundled driver model number: BS1D200P10

Motor size	Single shaft			Dual shaft			Basic step angle	Rated current (A/phase)	Page	
	Set model number	Set configuration items		Set model number	Set configuration items				Specifica-tions	Dimen-sions
		Motor model number	Cable with motor con- nector model number		Motor model number	Cable with motor con- nector model number				
28 mm sq.	DB14S281S	SH2281-5771	L —	DB14S281D	SH2281-5731	L —	1.8°	1	p. 36	p. 41
	DB14S285S	SH2285-5771	L —	DB14S285D	SH2285-5731	L —	1.8°	1	p. 36	p. 41
42 mm sq.	DB14H521S	103H5205-5240	L —	DB14H521D	103H5205-5210	L —	1.8°	1	p. 36	p. 41
	DB14H522S	103H5208-5240	L —	DB14H522D	103H5208-5210	L —	1.8°	1	p. 36	p. 41
	DB14H524S	103H5210-5240	L —	DB14H524D	103H5210-5210	L —	1.8°	1	p. 37	p. 41
	DB16S141S	SH1421-5241	L —	DB16S141D	SH1421-5211	L —	0.9°	2	p. 37	p. 41
	DB16S142S	SH1422-5241	L —	DB16S142D	SH1422-5211	L —	0.9°	2	p. 37	p. 41
	DB16S144S	SH1424-5241	L —	DB16S144D	SH1424-5211	L —	0.9°	2	p. 37	p. 41
50 mm sq.	DB16H671S	103H6701-5040	L —	DB16H671D	103H6701-5010	L —	1.8°	2	p. 38	p. 42
	DB16H673S	103H6703-5040	L —	DB16H673D	103H6703-5010	L —	1.8°	2	p. 38	p. 42
56 mm sq.	DB16H711S	103H7121-5740	L —	DB16H711D	103H7121-5710	L —	1.8°	2	p. 38	p. 42
	DB16H713S	103H7123-5740	L —	DB16H713D	103H7123-5710	L —	1.8°	2	p. 38	p. 42
	DB16H716S	103H7126-5740	L —	DB16H716D	103H7126-5710	L —	1.8°	2	p. 39	p. 42
60 mm sq.	DB16H781S	103H7821-5740	C 4837961-1	DB16H781D	103H7821-5710	C 4837961-1	1.8°	2	p. 39	p. 42
	DB16H782S	103H7822-5740	C 4837961-1	DB16H782D	103H7822-5710	C 4837961-1	1.8°	2	p. 39	p. 42
	DB16H783S	103H7823-5740	C 4837961-1	DB16H783D	103H7823-5710	C 4837961-1	1.8°	2	p. 39	p. 42
	DB16S161S	SH1601-5240	L —	DB16S161D	SH1601-5210	L —	0.9°	2	p. 40	p. 42
	DB16S162S	SH1602-5240	L —	DB16S162D	SH1602-5210	L —	0.9°	2	p. 40	p. 42

Motors marked with an (L) are lead wire types. Either a 300 mm (11.81 inch) or a 305 mm (12.01 inch) or greater lead wire is attached to the motor.
Motors marked with a (C) are connector types. Cables with connectors for motors as shown below are included.

● **Cable with motor connector** (Supplied only with connector-type motors)

Bundled cable (Bipolar 60 mm sq. (2.36 inch sq.) motors only, model number: 4837961-1)



Size	Motor size	28 mm sq. (1.10 in sq.)/Basic step angle 1.8°		42 mm sq. (1.65 in sq.)/Basic step angle 1.8°	
	Motor length	32 mm (1.26 in)	51.5 mm (2.03 in)	33 mm (1.30 in)	39 mm (1.89 in)
Single shaft	Set model number	DU14S281S	DU14S285S	DU15H521S	DU15H522S
	Configuration item: motor number	SH2281-5271	SH2285-5271	103H5205-0440	103H5208-0440
Dual shaft	Set model number	DU14S281D	DU14S285D	DU15H521D	DU15H522D
	Configuration item: motor number	SH2281-5231	SH2285-5231	103H5205-0410	103H5208-0410
Holding torque	N·m (oz·in)	0.055 (7.79)	0.115 (16.28)	0.2 (28.32)	0.3 (42.48)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.01 (0.05)	0.022 (0.12)	0.036 (0.20)	0.056 (0.31)
Rated current	A/phase	1	1	1.2	1.2
Motor mass *1	kg (lbs)	0.11 (0.24)	0.2 (0.44)	0.23 (0.51)	0.29 (0.64)
Allowable thrust load	N (lbs)	3 (0.67)	3 (0.67)	10 (2.25)	10 (2.25)
Allowable radial load *2	N (lbs)	42 (9.44)	49 (11.02)	26 (5.85)	25 (5.62)

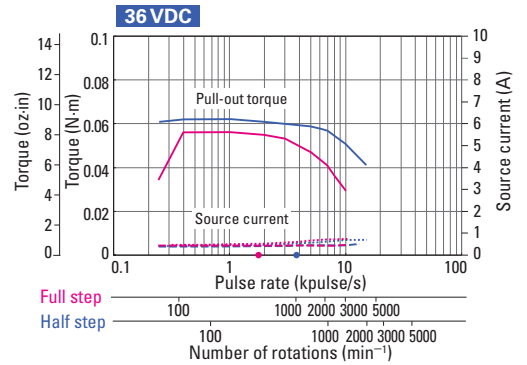
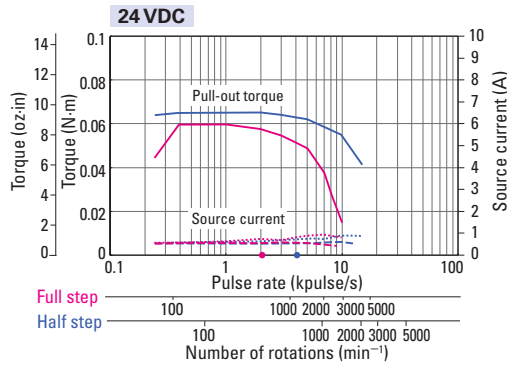
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

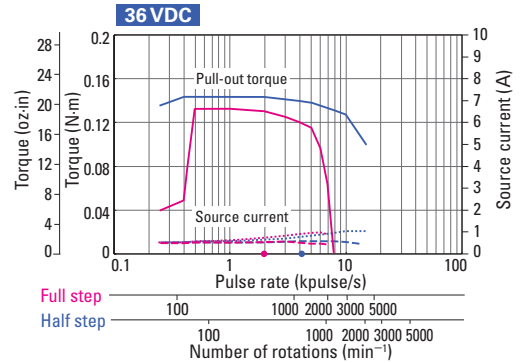
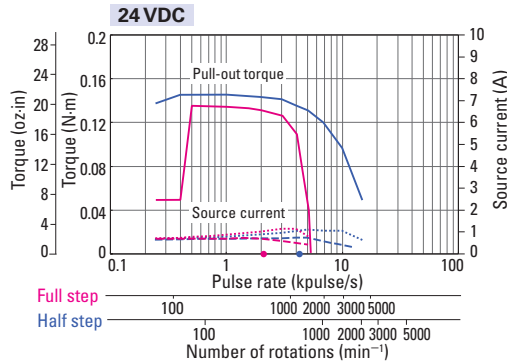
With rubber coupling

Pull-out torque — Full step — Half step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) — Full step - - - Half step - - - Source current (load applied) Full step Half step

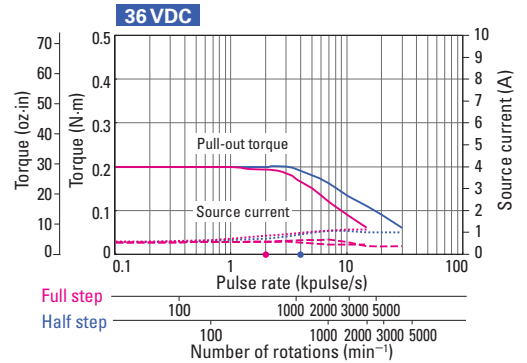
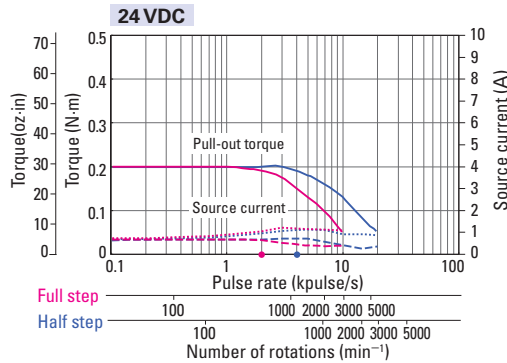
DU14S281S
DU14S281D



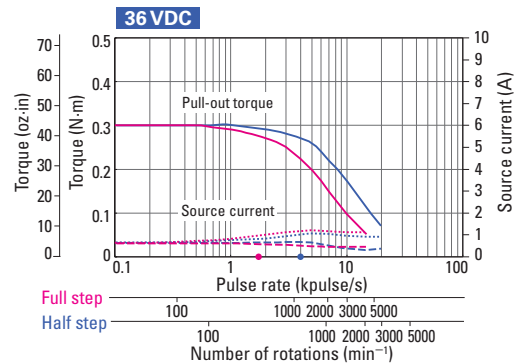
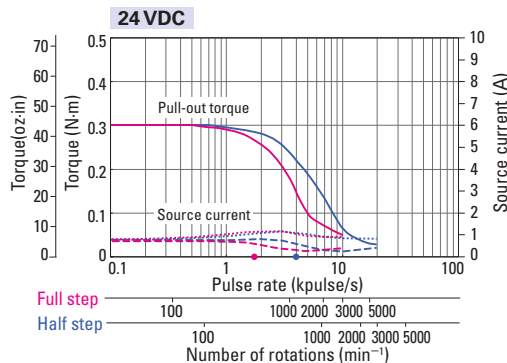
DU14S285S
DU14S285D



DU15H521S
DU15H521D



DU15H522S
DU15H522D



Size	Motor size	42 mm sq. (1.65 in sq.)/Basic step angle 0.9°				
	Motor length	48 mm (1.89 in)	33 mm (1.30 in)	39 mm (1.54 in)	48 mm (1.89 in)	
Single shaft	Set model number	DU15H524S	DU15S141S	DU15S142S	DU15S144S	
	Configuration item: motor number	103H5210-0440	SH1421-0441	SH1422-0441	SH1424-0441	
Dual shaft	Set model number	DU15H524D	DU15S141D	DU15S142D	DU15S144D	
	Configuration item: motor number	103H5210-0410	SH1421-0411	SH1422-0411	SH1424-0411	
Holding torque		N·m (oz·in)	0.37 (52.39)	0.2 (28.32)	0.29 (41.07)	0.39 (55.23)
Rotor inertia		$\times 10^{-4}$ kg·m ² (oz·in ²)	0.074 (0.40)	0.044 (0.24)	0.066 (0.361)	0.089 (0.487)
Rated current		A/phase	1.2	1.2	1.2	1.2
Motor mass *1		kg (lbs)	0.37 (0.82)	0.24 (0.53)	0.29 (0.64)	0.38 (0.84)
Allowable thrust load		N (lbs)	10 (2.25)	10 (2.25)	10 (2.25)	10 (2.25)
Allowable radial load *2		N (lbs)	23 (5.17)	25 (5.62)	24 (5.4)	20 (4.5)

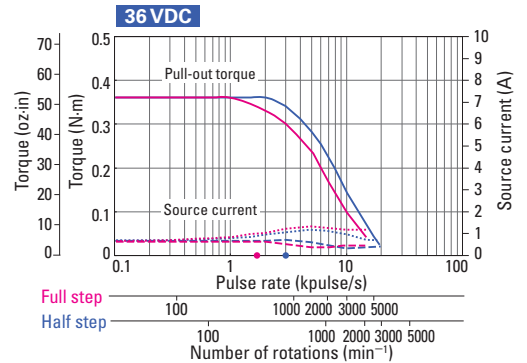
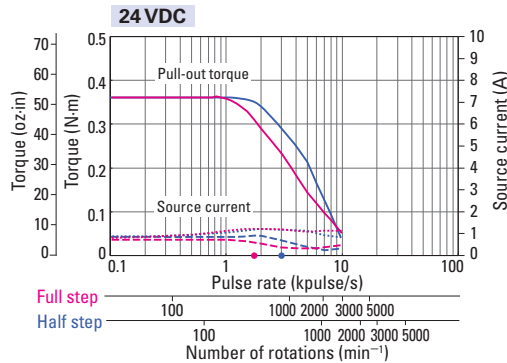
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

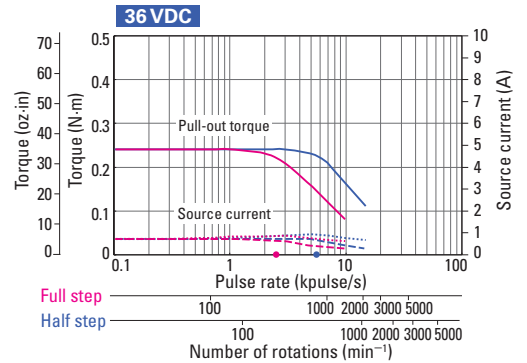
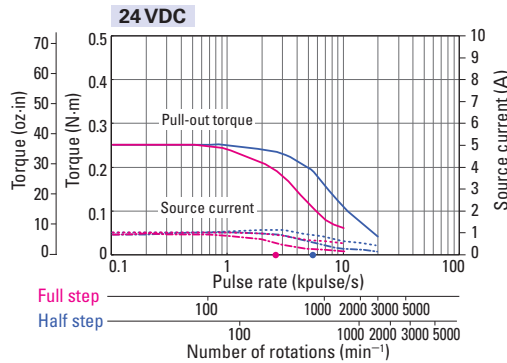
With rubber coupling

Pull-out torque Full step — Half step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) Full step - - - Half step - - - Source current (load applied) Full step ····· Half step ·····

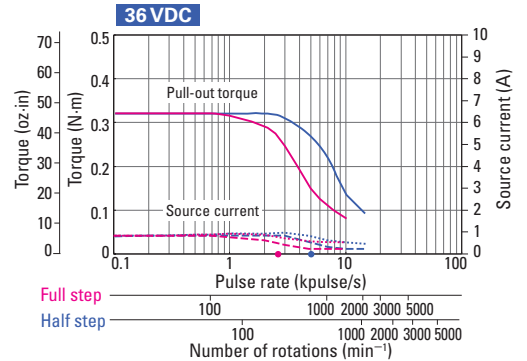
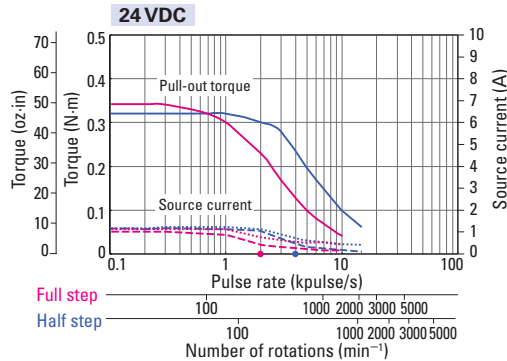
DU15H524S
DU15H524D



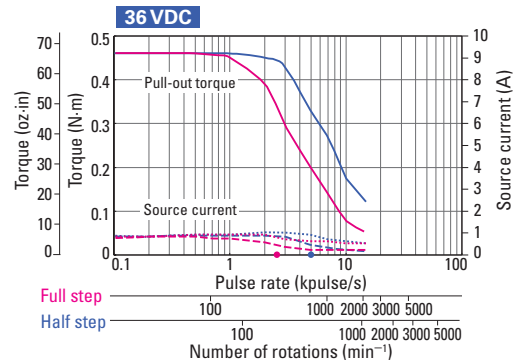
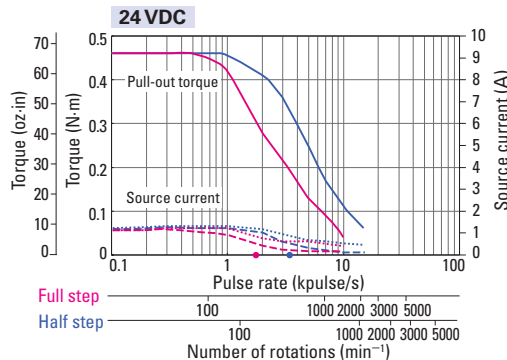
DU15S141S
DU15S141D



DU15S142S
DU15S142D



DU15S144S
DU15S144D



Size		56 mm sq. (2.20 in sq.)/Basic step angle 1.8°		
		41.8 mm (1.65 in)	53.8 mm (2.12 in)	75.8 mm (2.98 in)
Single shaft	Motor size			
	Motor length			
Single shaft	Set model number	DU16H711S	DU16H713S	DU16H716S
	Configuration item: motor number	103H7121-0440	103H7123-0440	103H7126-0440
Dual shaft	Set model number	DU16H711D	DU16H713D	DU16H716D
	Configuration item: motor number	103H7121-0410	103H7123-0410	103H7126-0410
Holding torque	N·m (oz·in)	0.39 (55.23)	0.83 (117.5)	1.27 (179.8)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.1 (0.55)	0.21 (1.15)	0.36 (1.97)
Rated current	A/phase	2	2	2
Motor mass *1	kg (lbs)	0.47 (1.04)	0.65 (1.43)	0.98 (2.16)
Allowable thrust load	N (lbs)	15 (3.37)	15 (3.37)	15 (3.37)
Allowable radial load *2	N (lbs)	78 (17.54)	71 (15.96)	62 (13.94)

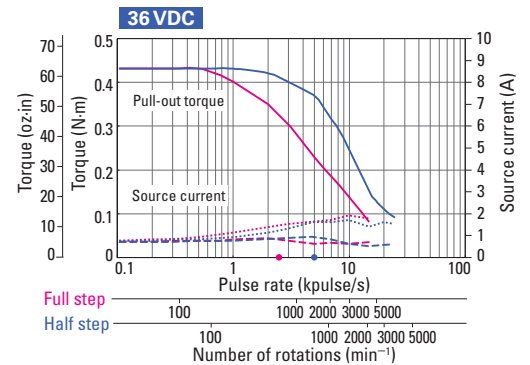
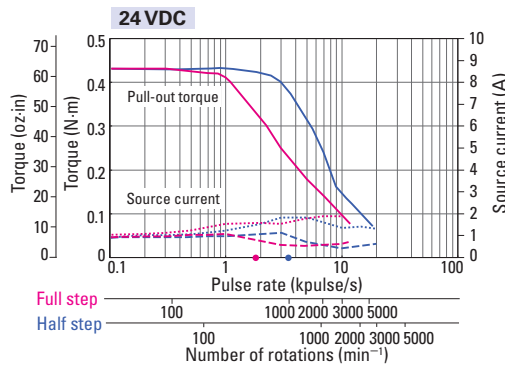
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

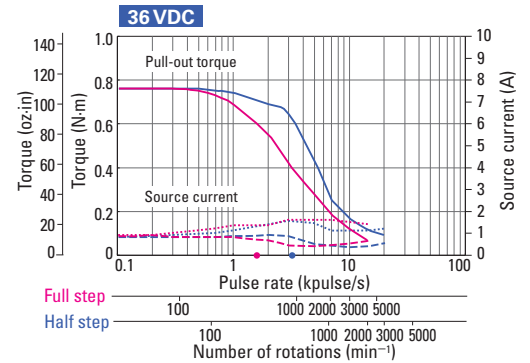
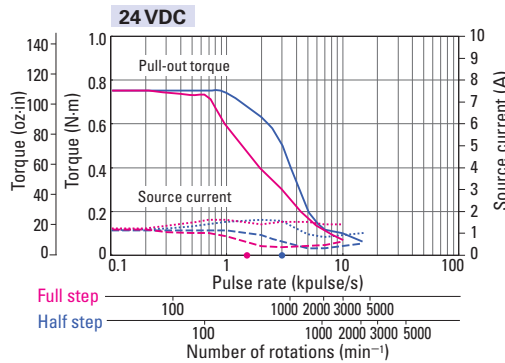
With rubber coupling

Pull-out torque Source current (no load) Full step Half step fs : Maximum self-start frequency when not loaded Full step Half step Source current (load applied) Full step Half step

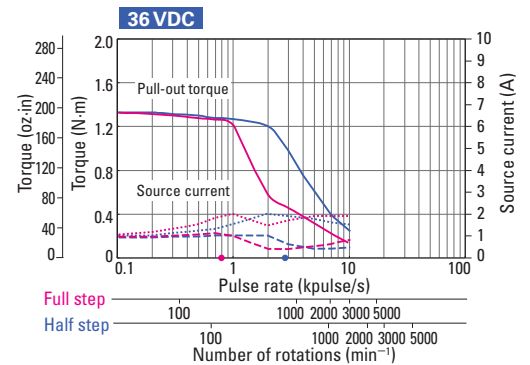
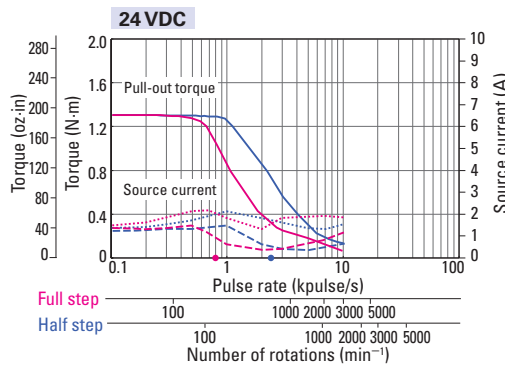
DU16H711S
DU16H711D



DU16H713S
DU16H713D



DU16H716S
DU16H716D



Size	Motor size	28 mm sq. (1.10 in sq.)/Basic step angle1.8°		42 mm sq. (1.65 in sq.)/Basic step angle1.8°	
	Motor length	32 mm (1.26 in)	51.5 mm (2.03 in)	33 mm (1.30 in)	39 mm (1.54 in)
Single shaft	Set model number	DB14S281S	DB14S285S	DB14H521S	DB14H522S
	Configuration item: motor number	SH2281-5771	SH2285-5771	103H5205-5240	103H5208-5240
Dual shaft	Set model number	DB14S281D	DB14S285D	DB14H521D	DB14H522D
	Configuration item: motor number	SH2281-5731	SH2285-5731	103H5205-5210	103H5208-5210
Holding torque	N·m (oz·in)	0.07 (9.91)	0.145 (20.53)	0.265 (37.53)	0.39 (55.23)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.01 (0.05)	0.022 (0.12)	0.036 (0.20)	0.056 (0.31)
Rated current	A/phase	1	1	1	1
Motor mass *1	kg (lbs)	0.11 (0.24)	0.2 (0.44)	0.23 (0.51)	0.29 (0.64)
Allowable thrust load	N (lbs)	3 (0.67)	3 (0.67)	10 (2.25)	10 (2.25)
Allowable radial load *2	N (lbs)	42 (9.44)	49 (9.44)	26 (5.85)	24 (5.4)

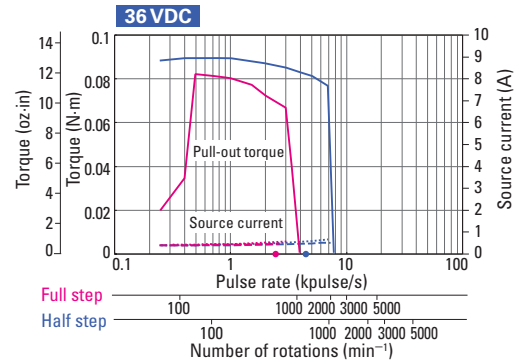
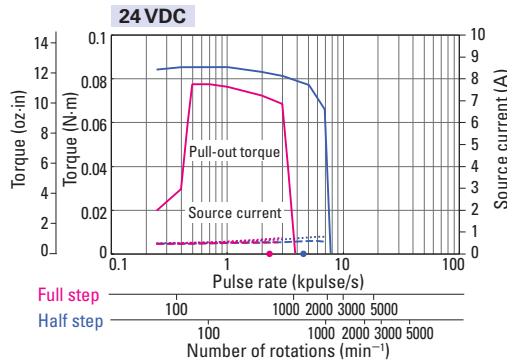
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

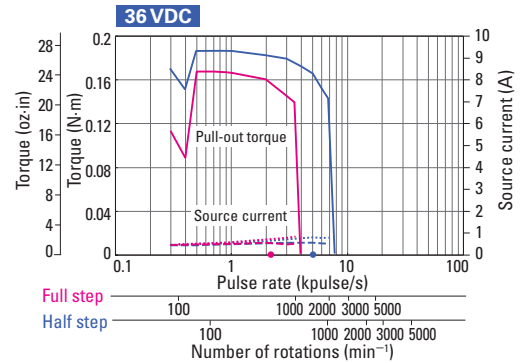
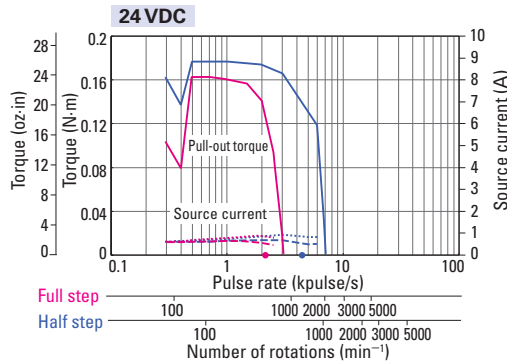
With rubber coupling

— Pull-out torque Full step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
- - - Source current (no load) Full step - - - Half step - - - Source current (load applied) Full step ⋯⋯ Half step ⋯⋯

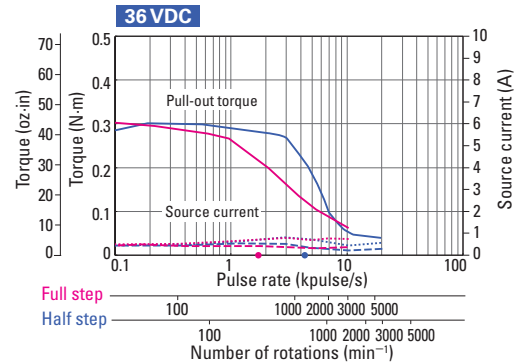
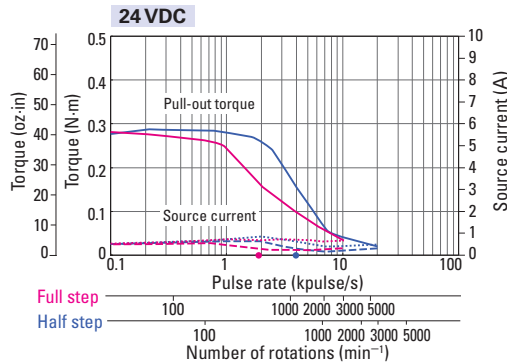
DB14S281S
DB14S281D



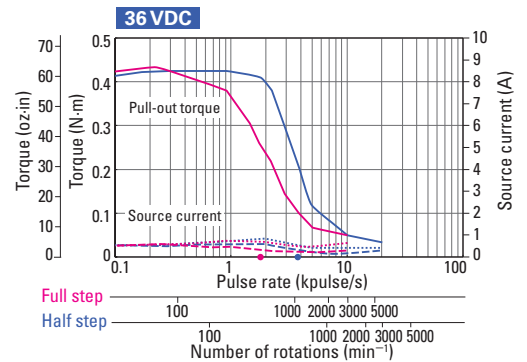
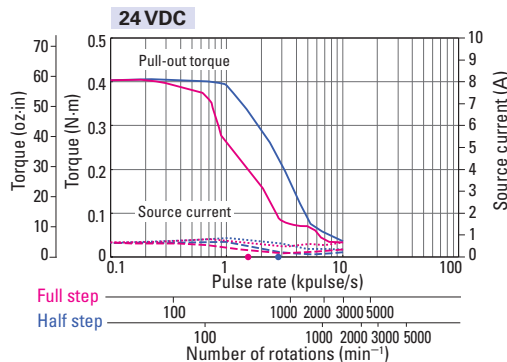
DB14S285S
DB14S285D



DB14H521S
DB14H521D



DB14H522S
DB14H522D



Size	Motor size	42 mm sq. (1.65 in sq.)/Basic step angle 1.8°			
	Motor length	48 mm (1.89 in)	33 mm (1.30 in)	39 mm (1.54 in)	48 mm (1.89 in)
Single shaft	Set model number	DB14H524S	DB16S141S	DB16S142S	DB16S144S
	Configuration item: motor number	103H5210-5240	SH1421-5241	SH1422-5241	SH1424-5241
Dual shaft	Set model number	DB14H524D	DB16S141D	DB16S142D	DB16S144D
	Configuration item: motor number	103H5210-5210	SH1421-5211	SH1422-5211	SH1424-5211
Holding torque	N·m (oz·in)	0.51 (72.22)	0.23 (32.57)	0.34 (48.15)	0.48 (67.97)
Rotor inertia	× 10 ⁻⁴ kg·m ² (oz·in ²)	0.074 (0.40)	0.044 (0.24)	0.066 (0.361)	0.089 (0.487)
Rated current	A/phase	1	2	2	2
Motor mass *1	kg (lbs)	0.37 (0.82)	0.24 (0.53)	0.29 (0.64)	0.38 (0.84)
Allowable thrust load	N (lbs)	10 (2.25)	10 (2.25)	10 (2.25)	10 (2.25)
Allowable radial load *2	N (lbs)	21 (4.72)	25 (5.62)	24 (5.4)	20 (4.5)

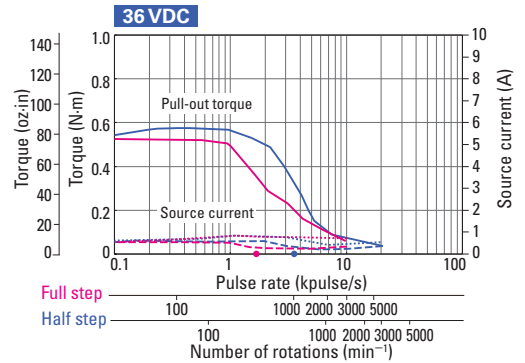
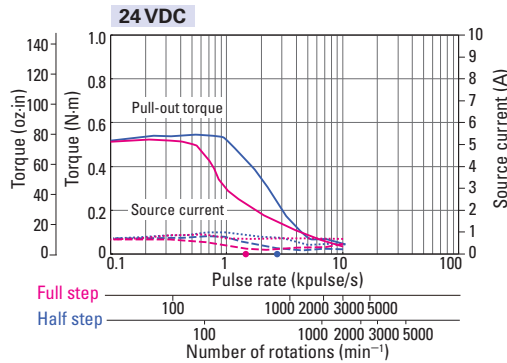
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

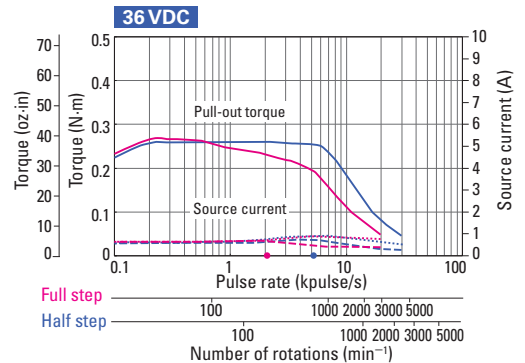
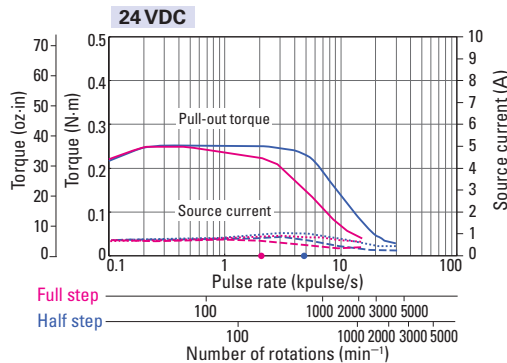
With rubber coupling

Pull-out torque Full step — Half step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) Full step - - - Half step - - - Source current (load applied) Full step Half step

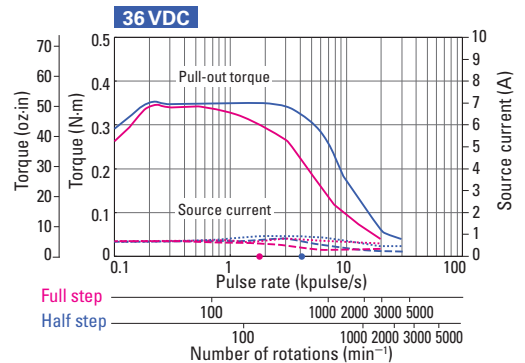
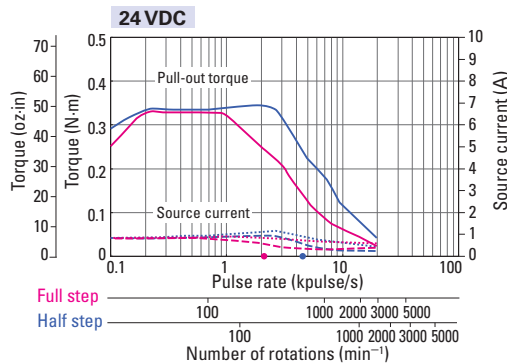
DB14H524S
DB14H524D



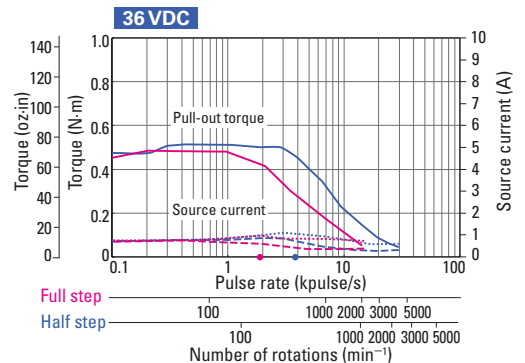
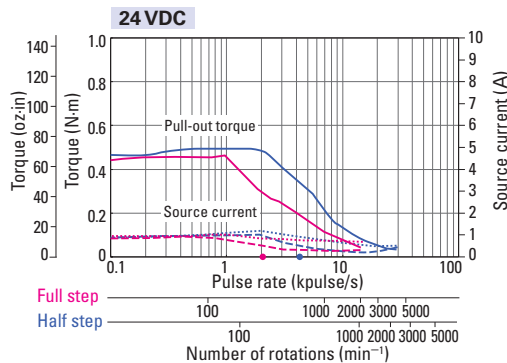
DB16S141S
DB16S141D



DB16S142S
DB16S142D



DB16S144S
DB16S144D



Size	Motor size	50 mm sq. (1.97 in sq.)/Basic step angle 1.8°		56 mm sq. (2.20 in sq.)/Basic step angle 1.8°		
	Motor length	39.8 mm (1.57 in)	51.3 mm (2.02 in)	41.8 mm (1.65 in)	53.8 mm (2.12 in)	
Single shaft	Set model number	DB16H671S	DB16H673S	DB16H711S	DB16H713S	
	Configuration item: motor number	103H6701-5040	103H6703-5040	103H7121-5740	103H7123-5740	
Dual shaft	Set model number	DB16H671D	DB16H673D	DB16H711D	DB16H713D	
	Configuration item: motor number	103H6701-5010	103H6703-5010	103H7121-5710	103H7123-5710	
Holding torque		N·m (oz·in)	0.28 (39.6)	0.49 (69.4)	0.55 (77.9)	1.0 (141.6)
Rotor inertia		$\times 10^{-4}$ kg·m ² (oz·in ²)	0.057 (0.31)	0.118 (0.65)	0.1 (0.55)	0.21 (1.15)
Rated current		A/phase	2	2	2	2
Motor mass *1		kg (lbs)	0.35 (0.77)	0.5 (1.10)	0.47 (1.04)	0.65 (1.43)
Allowable thrust load		N (lbs)	15 (3.37)	15 (3.37)	15 (3.37)	15 (3.37)
Allowable radial load *2		N (lbs)	79 (17.76)	75 (16.86)	70 (15.74)	56 (12.59)

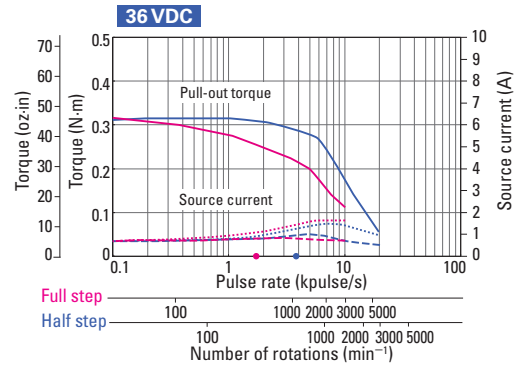
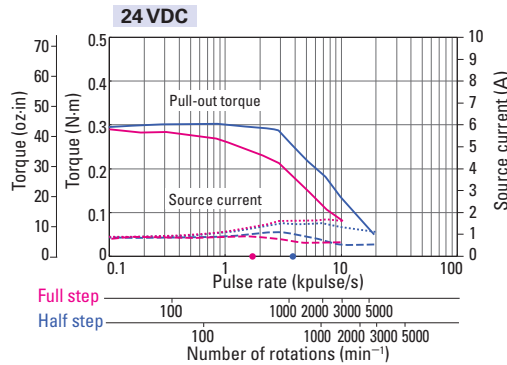
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

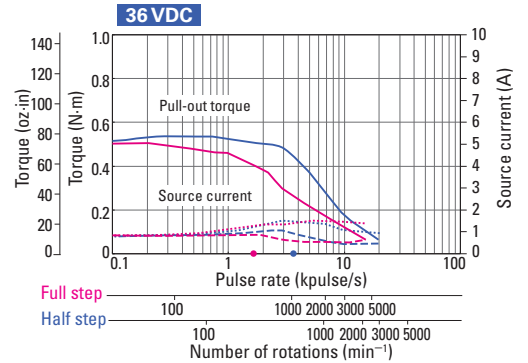
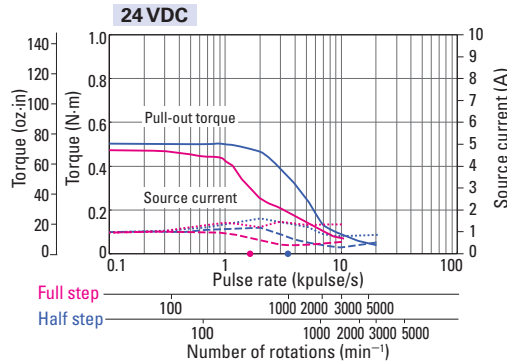
With rubber coupling

Pull-out torque ——— Full step ——— Half step ——— fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) ——— Full step - - - - - Half step - - - - - Source current (load applied) Full step Half step

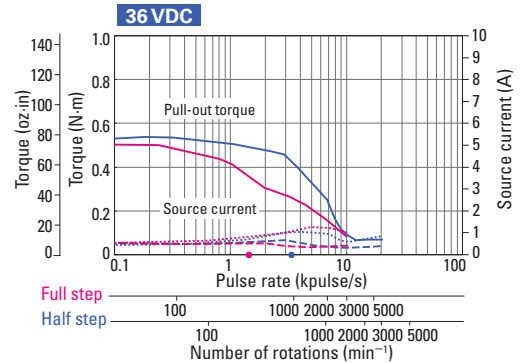
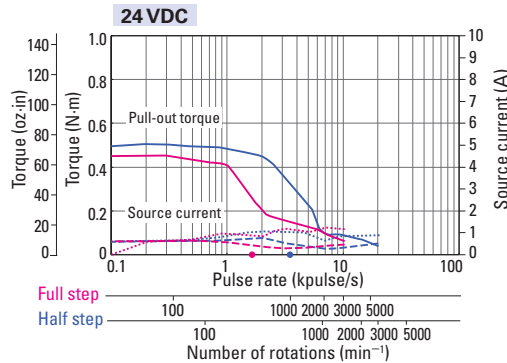
DB16H671S
DB16H671D



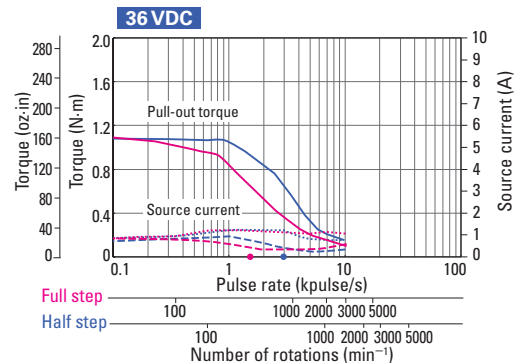
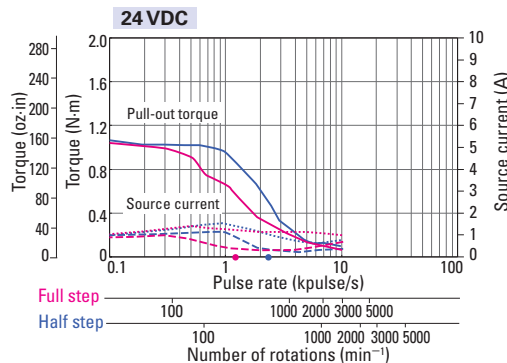
DB16H673S
DB16H673D



DB16H711S
DB16H711D



DB16H713S
DB16H713D



Size	Motor size	60 mm sq. (2.36 in sq.)/Basic step angle 1.8°			
	Motor length	75.8 mm (2.98 in)	44.8 mm (1.76 in)	53.8 mm (2.12 in)	85.8 mm (3.38 in)
Single shaft	Set model number	DB16H716S	DB16H781S	DB16H782S	DB16H783S
	Configuration item: motor number	103H7126-5740	103H7821-5740	103H7822-5740	103H7823-5740
Dual shaft	Set model number	DB16H716D	DB16H781D	DB16H782D	DB16H783D
	Configuration item: motor number	103H7126-5710	103H7821-5710	103H7822-5710	103H7823-5710
Holding torque	N·m (oz·in)	1.6 (226.6)	0.88 (124.6)	1.37 (194.0)	2.7 (382.3)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.36 (1.97)	0.275 (1.50)	0.4 (2.19)	0.84 (4.59)
Rated current	A/phase	2	2	2	2
Motor mass *1	kg (lbs)	0.98 (2.16)	0.6 (1.32)	0.77 (1.70)	1.34 (2.95)
Allowable thrust load	N (lbs)	15 (3.37)	15 (3.37)	15 (3.37)	15 (3.37)
Allowable radial load *2	N (lbs)	33 (7.42)	109 (24.5)	101 (22.71)	71 (15.96)

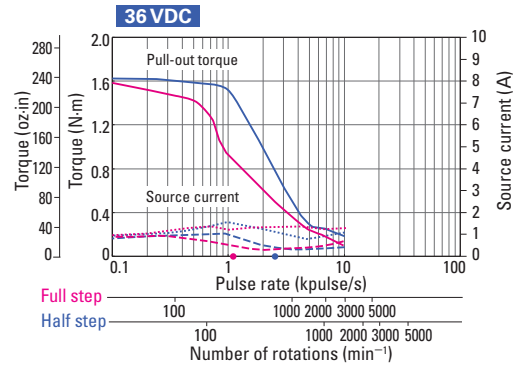
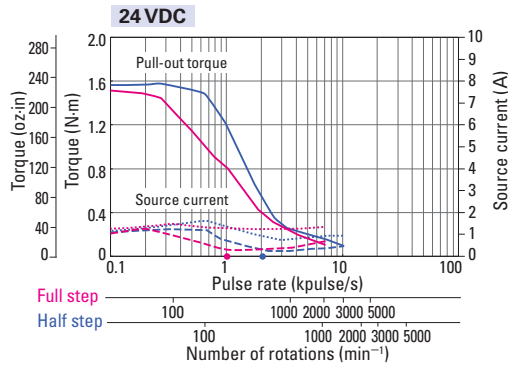
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

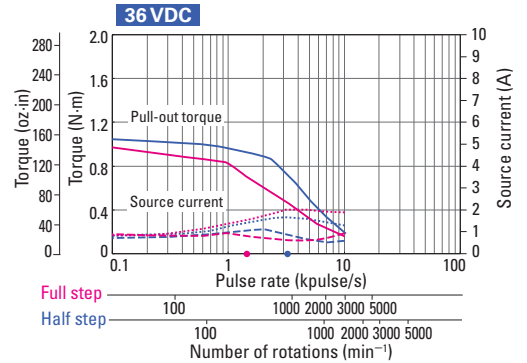
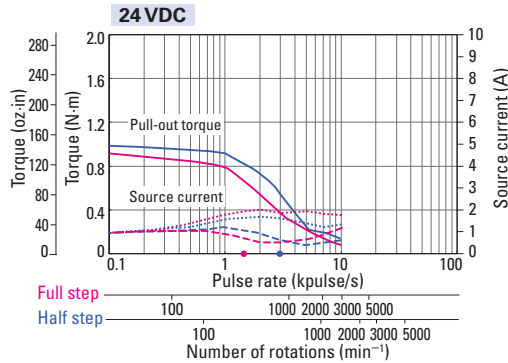
With rubber coupling

Pull-out torque — Full step — Half step — fs: Maximum self-start frequency when not loaded — Full step — Half step — Source current (no load) — Full step — Half step — Source current (load applied) — Full step — Half step

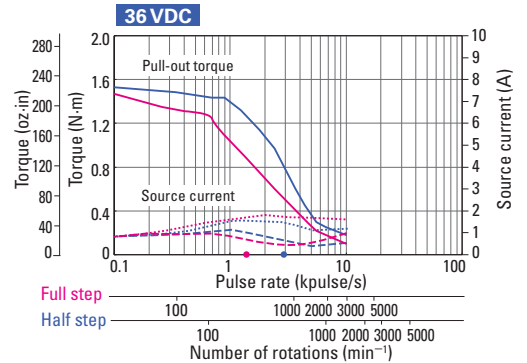
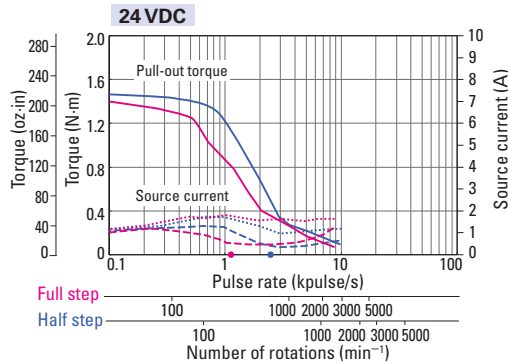
DB16H716S
DB16H716D



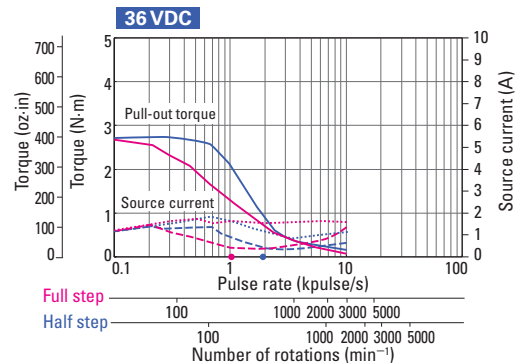
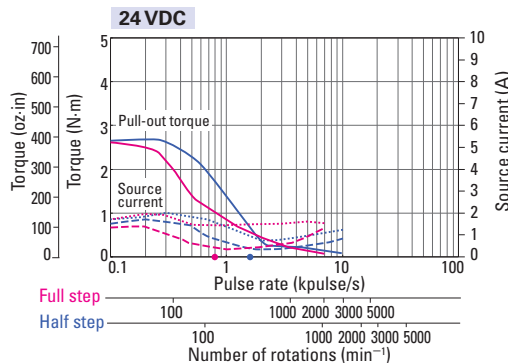
DB16H781S
DB16H781D



DB16H782S
DB16H782D



DB16H783S
DB16H783D



Size	Motor size	60 mm sq. (2.36 in sq.)/Basic step angle 0.9°	
	Motor length	42 mm (1.654 in)	54 mm (2.126 in)
Single shaft	Set model number	DB16S161S	DB16S162S
	Configuration item: motor number	SH1601-5240	SH1602-5240
Dual shaft	Set model number	DB16S161D	DB16S162D
	Configuration item: motor number	SH1601-5210	SH1602-5210
Holding torque	N·m (oz·in)	0.69 (97.71)	1.28 (181.26)
Rotor inertia	$\times 10^{-4}$ kg·m ² (oz·in ²)	0.24 (1.312)	0.4 (2.187)
Rated current	A/phase	2	2
Motor mass *1	kg (lbs)	0.55 (1.21)	0.8 (1.76)
Allowable thrust load	N (lbs)	15 (3.37)	15 (3.37)
Allowable radial load *2	N (lbs)	78 (17.54)	65 (14.61)

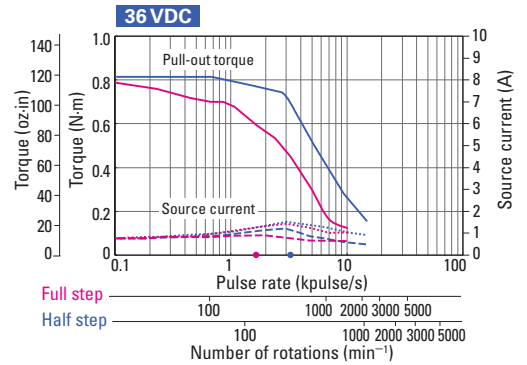
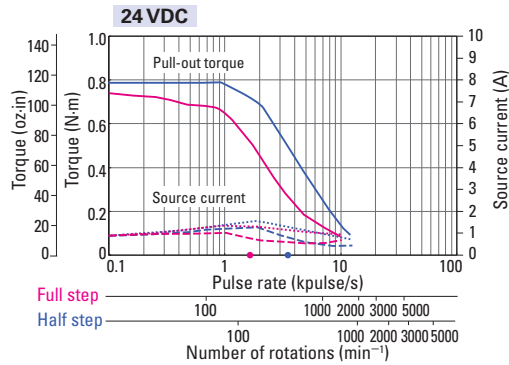
*1 Driver mass ▶ p. 45 *2 The load point is at the tip of the output shaft.

Characteristics diagram

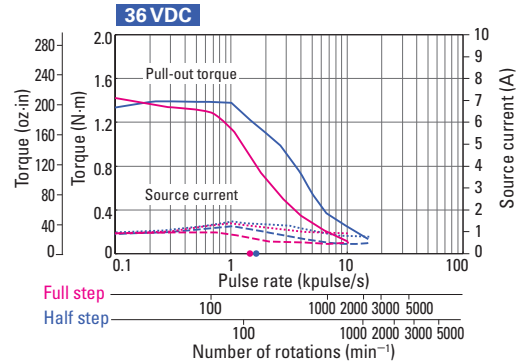
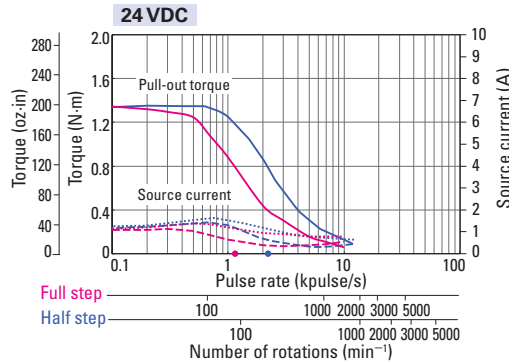
With rubber coupling

Pull-out torque Full step — Half step — fs : Maximum self-start frequency when not loaded Full step ● Half step ●
 Source current (no load) Full step - - - Half step - - - Source current (load applied) Full step ····· Half step ·····

DB16S161S
DB16S161D



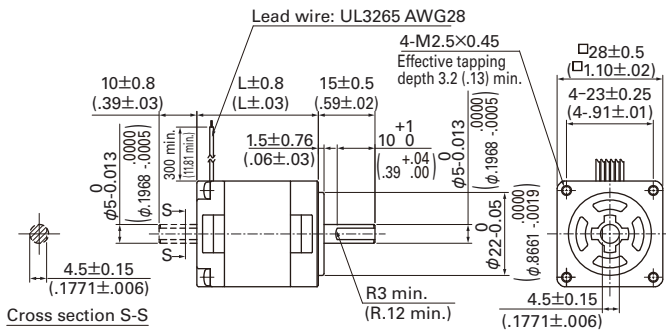
DB16S162S
DB16S162D



Stepping Motor: Dimensions

[Unit: mm (inch)]

28 mm sq. (1.10 inch sq.)



Note: A unipolar motor is illustrated; bipolar motors have four lead wires.

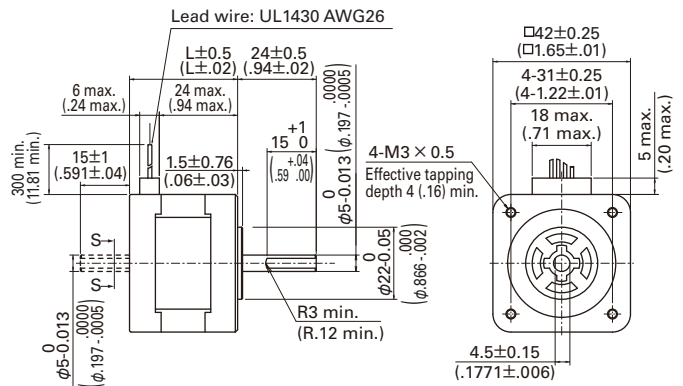
Unipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU14S281S	DU14S281D	SH2281-5271	SH2281-5231	32 (1.26)
DU14S285S	DU14S285D	SH2285-5271	SH2285-5231	51.5 (2.03)

Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB14S281S	DB14S281D	SH2281-5771	SH2281-5731	32 (1.26)
DB14S285S	DB14S285D	SH2285-5771	SH2285-5731	51.5 (2.03)

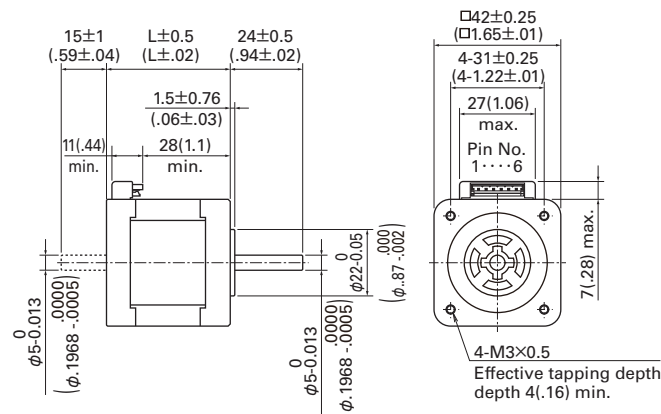
42 mm sq. (1.65 inch sq.)



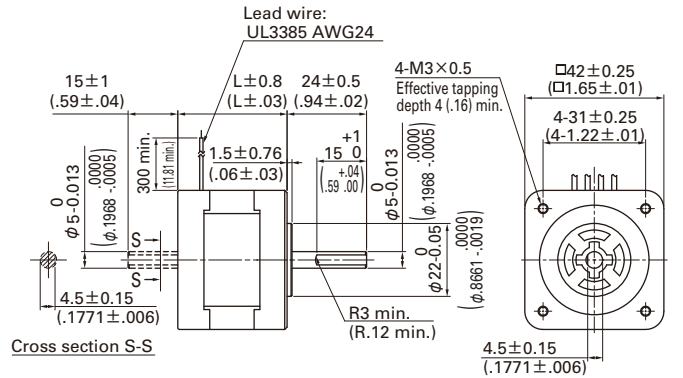
Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB14H521S	DB14H521D	103H5205-5240	103H5205-5210	33 (1.25)
DB14H522S	DB14H522D	103H5208-5240	103H5208-5210	39 (1.54)
DB14H524S	DB14H524D	103H5210-5240	103H5210-5210	48 (1.89)

42 mm sq. (1.65 inch sq.)



42 mm sq. (1.65 inch sq.)



Note: A bipolar motor is illustrated; unipolar motors have six lead wires.

Unipolar

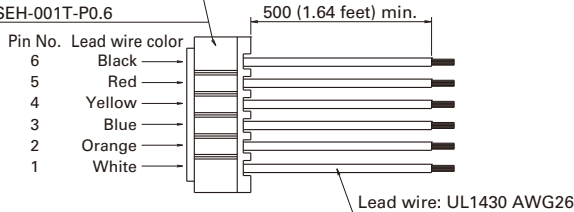
Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU15S141S	DU15S141D	SH1421-0440	SH1421-0410	33 (1.25)
DU15S142S	DU15S142D	SH1422-0441	SH1422-0411	39 (1.54)
DU15S144S	DU15S144D	SH1424-0441	SH1424-0411	48 (1.89)

Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16S141S	DB16S141D	SH1421-5241	SH1421-5211	33 (1.25)
DB16S142S	DB16S142D	SH1422-5241	SH1422-5211	39 (1.54)
DB16S144S	DB16S144D	SH1424-5241	SH1424-5211	48 (1.89)

Motor cable Model number: 4835710-1

Manufacturer: J.S.T. Mfg. Co., Ltd.
Housing: EHR-6 Black
Pin: SEH-001T-P0.6

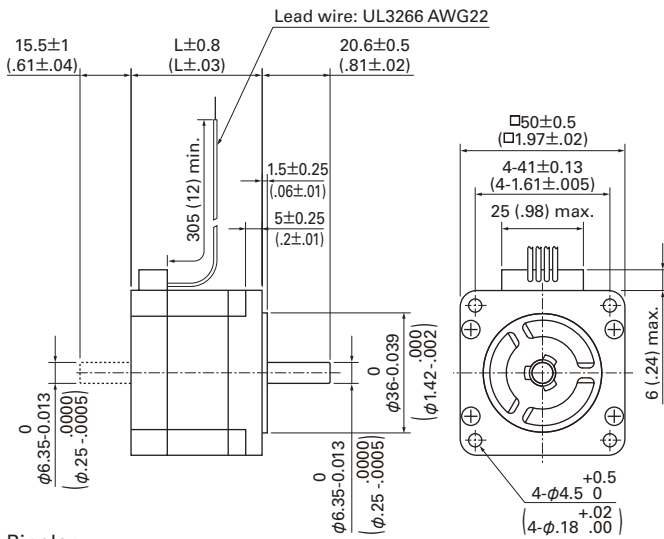


This driver-motor cable is for motor model numbers 103H52□□-04□□.

Stepping Motor: Dimensions

[Unit: mm (inch)]

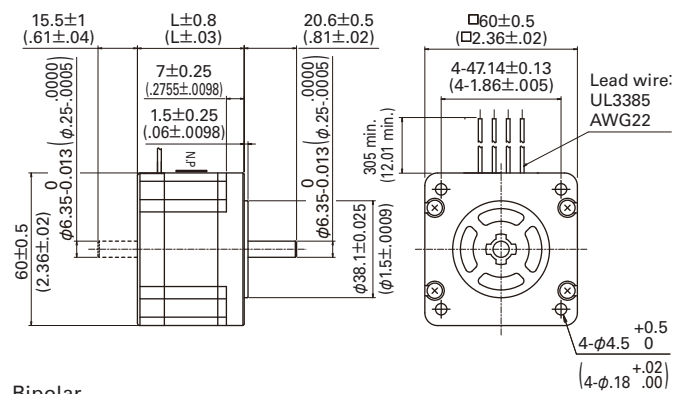
50 mm sq. (1.97 inch sq.)



Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16H671S	DB16H671D	103H6701-5040	103H6701-5010	39.8 (1.57)
DB16H673S	DB16H673D	103H6703-5040	103H6703-5010	51.3 (2.02)

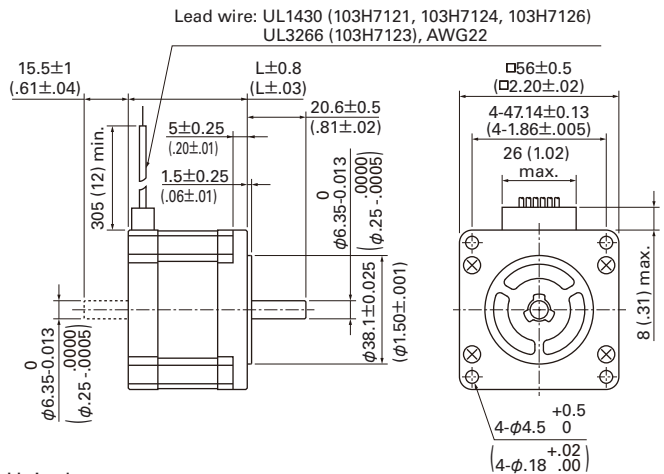
60 mm sq. (2.36 inch sq.)



Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16S161S	DB16S161D	SH1601-5240	SH1601-5210	42 (1.65)
DB16S162S	DB16S162D	SH1602-5240	SH1602-5210	54 (2.13)

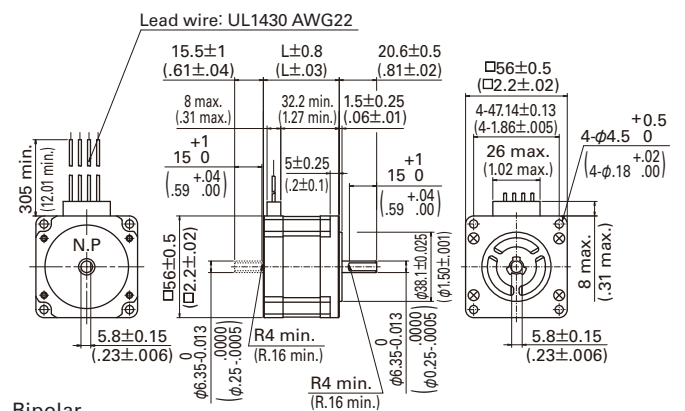
56 mm sq. (2.20 inch sq.)



Unipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU16H711S	DU16H711D	103H7121-0440	103H7121-0410	41.8 (1.65)
DU16H713S	DU16H713D	103H7123-0440	103H7123-0410	53.8 (2.12)
DU16H716S	DU16H716D	103H7126-0440	103H7126-0410	75.8 (2.98)

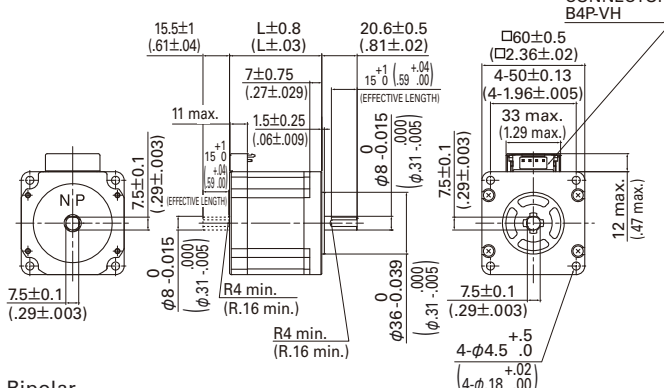
56 mm sq. (2.20 inch sq.)



Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16H711S	DB16H711D	103H7121-5740	103H7121-5710	41.8 (1.65)
DB16H713S	DB16H713D	103H7123-5740	103H7123-5710	53.8 (2.12)
DB16H716S	DB16H716D	103H7126-5740	103H7126-5710	75.8 (2.98)

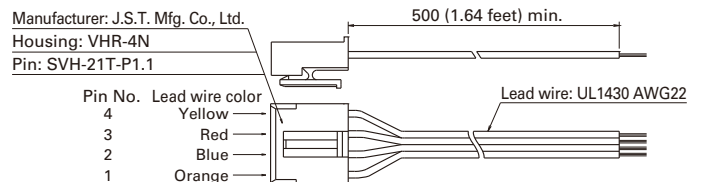
60 mm sq. (2.36 inch sq.)



Bipolar

Set model number		Motor model number		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16H781S	DB16H781D	103H7821-5740	103H7821-5710	44.8 (1.76)
DB16H782S	DB16H782D	103H7822-5740	103H7822-5710	53.8 (2.12)
DB16H783S	DB16H783D	103H7823-5740	103H7823-5710	85.8 (3.38)

Motor cable Bipolar Model number: 4837961-1



Stepping Motor: General Specifications

Motor model number	SH228 <input type="checkbox"/>	SH142 <input type="checkbox"/>	103H52 <input type="checkbox"/>	103H67 <input type="checkbox"/>	103H712 <input type="checkbox"/>	SH160 <input type="checkbox"/>	103H78 <input type="checkbox"/>
Type	-						
Operating ambient temperature	- 10°C to + 50°C						
Conversation temperature	- 20°C to + 65°C						
Operating ambient humidity	20 to 90% RH (no condensation)						
Conversation humidity	5 to 95% RH (no condensation)						
Operation altitude	1000 m (3281 feet) max. above sea level						
Vibration resistance	Vibration frequency 10 to 500 Hz, total amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s ² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.						
Impact resistance	500 m/s ² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.						
Insulation class	Class B (+130°C)						
Withstandable voltage	At normal temperature and humidity, no failure with 500 VAC @50/60 Hz applied for one minute between motor winding and frame.			At normal temperature and humidity, no failure with 1000 VAC @50/60 Hz applied for one minute between motor winding and frame.			
Insulation resistance	At normal temperature and humidity, not less than 100 MΩ between winding and frame by 500 VDC megger.						
Protection grade	IP40						
Winding temperature rise	80 K max. (Based on Sanyo Denki standard)						
Static angle error	± 0.09°		± 0.054°		± 0.09°		± 0.09°
Thrust play *1	0.075 mm (0.003 in) max. (load: 1.5 N (0.34 lbs))	0.075 mm (0.003 in) max. (load: 5 N (1.12 lbs))	0.075 mm (0.003 in) (load: 5 N (1.12 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) (load: 10 N (2.25 lbs))
Radial play *2	0.025 mm (0.001 in) max. (load: 5 N (1.12 lbs))						
Shaft runout	0.025 mm (0.001 in)						
Concentricity of mounting pilot relative to shaft	φ 0.05 mm (φ 0.002 in)	φ 0.05 mm (φ 0.002 in)	φ 0.05 mm (φ 0.002 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)
Squareness of mounting surface relative to shaft	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.075 mm (0.003 in)	0.075 mm (0.003 in)	0.1 mm (0.004 in)	0.075 mm (0.003 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally						

*1 Thrust play: Shaft displacement under axial load.

*2 Radial play: Shaft displacement under radial load applied one-third of the length from the end of the shaft.

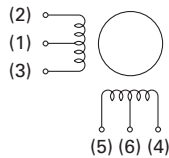
Internal Wiring and Rotation Direction

Unipolar winding

Connector type Model number: 103H52

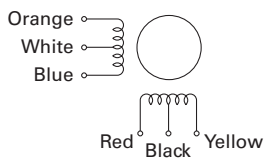
Internal wire connection

() connector pin number



Lead wire type

Internal wire connection



Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Connector pin number				
	(1.6)	(5)	(3)	(4)	(2)
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

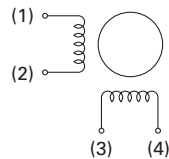
Exciting order	Lead wire color				
	White & black	Red	Blue	Yellow	Orange
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Bipolar winding

Connector type

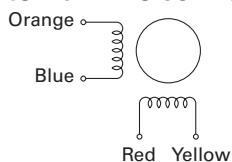
Internal wire connection

() connector pin number, terminal block number



Lead wire type

Internal wire connection



Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Connector pin number, terminal block number				
	(3)	(2)	(4)	(1)	
1	-	-	+	+	
2	+	-	-	-	
3	+	+	-	-	
4	-	+	+	-	

Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Lead wire color			
	Red	Blue	Yellow	Orange
1	-	-	+	+
2	+	-	-	-
3	+	+	-	-
4	-	+	+	-

Driver Specifications

General specifications

		Unipolar	Bipolar	
Basic specifications	Model number	US1D200P10	BS1D200P10	
	Input source	24/36 VDC ± 10%		
	Source current	3 A		
	Environment	Protection class	Class III	
		Operation environment	Installation category (over-voltage category) : I, pollution degree: 2	
		Ambient operation temperature	0 to + 50°C	
		Conservation temperature	- 20 to + 70°C	
		Operating ambient humidity	35 to 85% RH (no condensation)	
		Conservation humidity	10 to 90% RH (no condensation)	
		Operation altitude	1000 m (3281 feet) or less above sea level	
		Vibration resistance	Tested under the following conditions: 5 m/s ² frequency range 10 to 55 Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division "C".	
		Withstandable voltage	Not influenced when 0.5 kVAC is applied between power input terminal and cabinet for one minute.	
	Insulation resistance	10 MΩ min. when measured with 500 VDC megohmmeter between input terminal and cabinet.		
Mass (Weight)	0.09 kg (0.20 lbs)			
Functions	Selection functions	Step angle, pulse input mode, low vibration mode, step current, operating current, original excitation phase		
	Protection functions	Open phase protection, Main circuit power source voltage decrease		
	LED indication	Power monitor, alarm display		
I/O signals	Command pulse input signal	Photocoupler input system, input resistance: 220 Ω input-signal "H" level: 4.0 to 5.5 V, input-signal "L" level: 0 to 0.5 V Maximum input frequency: 150 kpulse/s		
	Power down input signal	Photocoupler input system, input resistance: 220 Ω input-signal "H" level: 4.0 to 5.5V, input-signal "L" level: 0 to 0.5 V		
	Phase origin monitor output signal	From the photocoupler by the open collector output Output specification: V _{ceo} = 40 V max., I _c = 10 mA max.		
	Rotation monitor output signal	From the photocoupler by the open collector output Output specification: V _{ceo} = 40 V max., I _c = 10 mA max.		

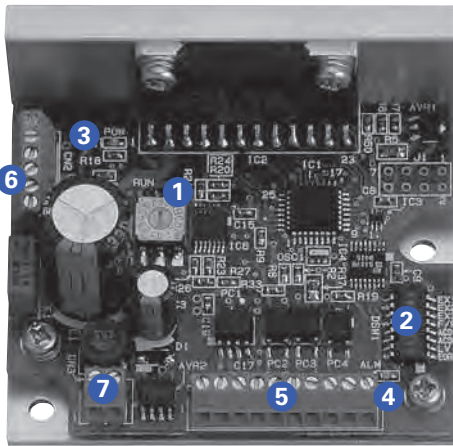
Safety standards

	Directives	Category	Standard	Name
CE (TÜV)	Low-voltage directives	—	EN61010-1	—
	EMC directives	Emission	EN55011-A	Terminal disturbance voltage
			EN55011-A	Electromagnetic radiation disturbance
			EN61000-4-2	ESD (Electrostatic discharge)
		Immunity	EN61000-4-3	RS (Radio-frequency amplitude modulated electromagnetic field)
			EN61000-4-4	Fast transients/burst
			EN61000-4-6	Conducted disturbances
UL	Acquired standards		Applicable standard	File No.
	UL		UL508C	E179775
	UL for Canada			

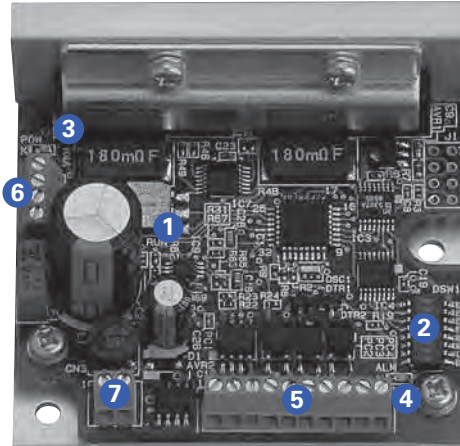
- EMC characteristics may vary depending on the configuration of the users' control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and toroidal type ferrite cores may be required depending on circumstances.
- Validation test of driver has been performed for low-voltage EMC directives at TÜV (TÜV product service) for self-declaration of CE marking.
- Drivers are available for separate purchase. Connector-type drivers are also available. Contact us for details.

Driver Controls and Connectors

Unipolar



Bipolar



1 Operating current selection switch (RUN)

The value of the motor current can be set when operating.

Dial	0	1	2	3	4	5	6	7
Stepping motor current (A)	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current (A)	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

- The factory setting is F (0.5 A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

Factory settings

	OFF	ON	
EX1	<input type="checkbox"/>	<input type="checkbox"/>	OFF
EX2	<input type="checkbox"/>	<input type="checkbox"/>	OFF
EX3	<input type="checkbox"/>	<input type="checkbox"/>	OFF
F/R	<input type="checkbox"/>	<input type="checkbox"/>	OFF
ACD1	<input type="checkbox"/>	<input type="checkbox"/>	OFF
ACD2	<input type="checkbox"/>	<input type="checkbox"/>	OFF
LV	<input type="checkbox"/>	<input type="checkbox"/>	OFF
EORG	<input type="checkbox"/>	<input type="checkbox"/>	OFF

Partition number: 8
Input method 2 (CW/CCW pulse input)
Stopping current: 40% of driving current
Micro step operation
Phase origin

1. Step angle select (EX1, EX2, EX3)

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

2. Input method select (F/R)

Select input pulse type.

F/R	Input pulse type
ON	1 input (CK, U/D)
OFF	2 input (CW, CCW)

3. Current selection when stopping (ACD1, ACD2)

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

- Initial configuration of factory shipment is set to 40% of rated value.
Driver and motor should be operated at around 50% of rated value to reduce heat.

4. Low-vibration mode select (LV)

Provides low-vibration, smooth operation even if resolution is coarse (1-division, 2-division, etc).

LV	Operation
ON	Auto-micro function
OFF	Micro-step

5. Excitation select (EORG)

The excitation phase when the power supply is engaged is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

- By turning on the EORG, the excitation phase during power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

3 LED for power supply monitor (POW)

Lit up when the main circuit power supply is connected.

4 LED for alarm display (ALM)

Lights in the following conditions:

- Motor cable is broken.
- Switching element in driver is faulty.
- The main circuit voltage is out of specifications range (19 VDC max.).

When "ALM" is displayed, the winding current of the stepping motor is cut off and it is in a "non-excitation" state. At the same time, an output signal (photocoupler ON) is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal terminal block (CN1)

Connect the I/O signal.

6 Motor terminal block (CN2)

Connect the motor's power line.

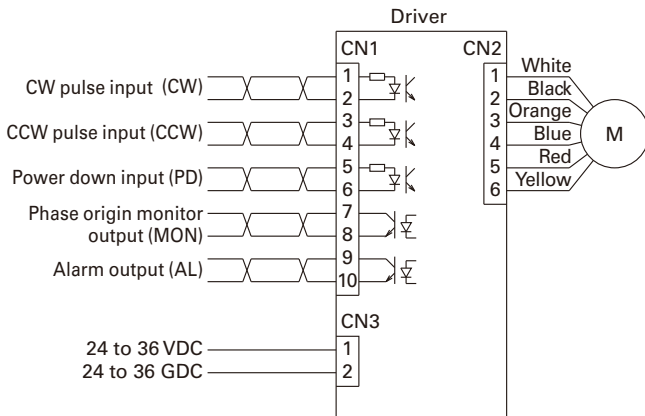
7 Power supply terminal block (CN3)

Connect the main circuit power supply.

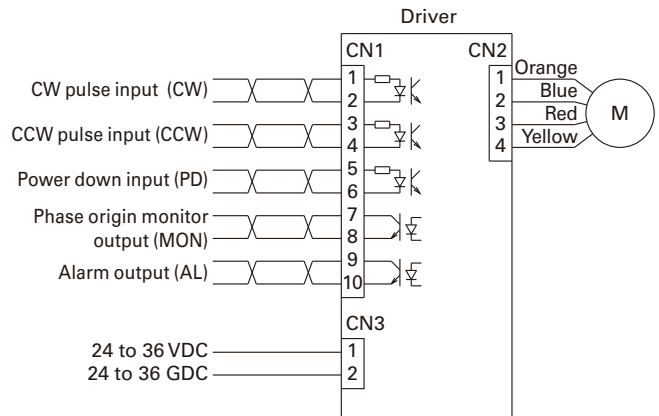
Connections and Signals

External wiring diagram

Unipolar



Bipolar



Applicable wire sizes

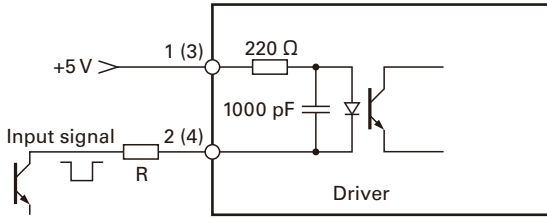
Part	Wire sizes	Allowable wire length
For power supply	AWG22 (0.3 mm ²)	2 m max.
For input/output signal	AWG24 (0.2 mm ²) to AWG22 (0.3 mm ²)	2 m max.
For motor	AWG22 (0.3 mm ²)	Under 3 m

Specification summary of input/output signals

Signal	CN1 Pin number	Function summary
CW pulse input (CW) (Standard)	1 2	When in "2 input mode", input the drive pulse that rotates in a CW direction.
Pulse train input (CK)	1 2	When in "1 input mode", input the drive pulse train for motor rotation.
CCW pulse input (CCW) (Standard)	3 4	When in "2 input mode", input the drive pulse train that rotates in a CCW direction.
Rotational direction input (U/D)	3 4	When "1 input mode", input the motor rotational direction signal. Internal photocoupler ON ... CW direction Internal photocoupler OFF ... CCW direction
Power down input (PD)	5 6	Inputting PD signal will cut off (power off) the current flowing to the motor (With DIP switch select, change to the Power low function is possible). PD input signal on (internal photocoupler on) ... PD function is valid. PD input signal off (internal photocoupler off) ... PD function is invalid.
Phase origin monitor output (MON)	7 8	When the excitation phase is at the origin (during power on) this function turns on. When FULL step, ON once for 4 pulses; when HALF step, ON once for 8 pulses.
Alarm output (AL)	9 10	When alarm circuits are actuated inside the driver, outputs signals to outside, after which the stepping motor changes to unexcited status.

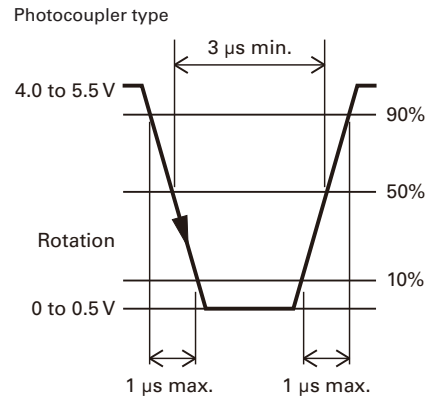
· As for the motor rotational direction, CW direction is regarded as the clockwise rotation, and CCW direction is regarded as the counterclockwise rotation by viewing the motor from output shaft side.

Circuit Configuration of Pulse Input CW (CK), CCW (U/D)



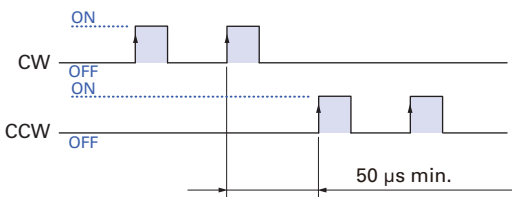
- Pulse duty 50% max.
- Maximum input frequency: 150 kpulse/s
- When the crest value of the input signal exceeds 5 V, use the external limit resistance R to limit the input current to approximately 15 mA.

Input signal specifications



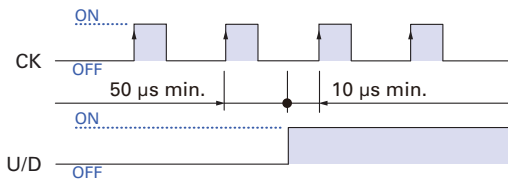
Timing of the command pulse

2 input mode (CW, CCW)



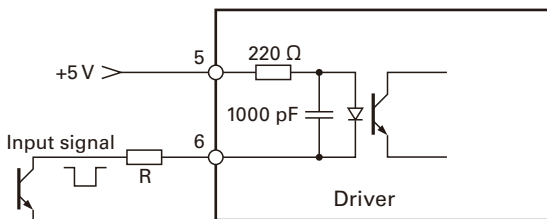
- Shaded area indicates internal photocoupler ON. Internal circuit (motor) starts operating at leading edge of the photocoupler ON.
- To apply pulse to CW, set CCW side internal photocoupler to OFF.
- To apply pulse to CCW, set CW side internal photocoupler to OFF.

1 input mode (CK, U/D)



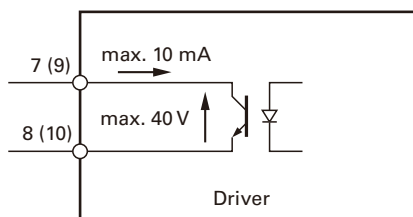
- Shaded area indicates internal photocoupler ON. Internal circuit (motor) starts operating at leading edge of CK side photocoupler ON.
- Switching of U/D input signal must be done while CK side internal photocoupler is OFF.

Input Circuit Configuration of Power Down Input (PD)

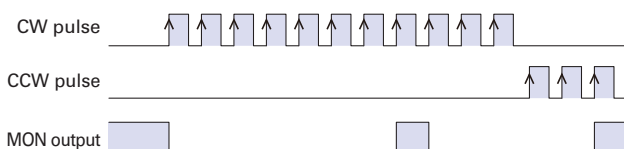


- When the crest value of the input signal exceeds 5 V, use the external limit resistance R to limit the input current to approximately 15 mA.

Output Signal Configuration of Phase Origin Monitor Output (MON) and Alarm Output (AL)



MON output



- Photocoupler is set to ON at phase origin of motor excitation (setting when number of divisions is 2).
- MON output is taken at every 7.2 degrees of motor output shaft from phase origin.

Stepping Motors

Stepping Motors

▶ p. 54–

IP65 Splash and Dust Proof Stepping Motors

Waterproof, dustproof

▶ p. 89–

Stepping Motors for Vacuum Environments

Customized Products

▶ p. 93

Synchronous Motors












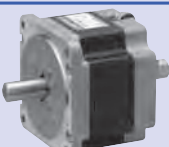
Customized Products

▶ p. 93





Lineup

Stepping Motors RoHS

These motors can be purchased as separate units.

Basic step angle	Motor size	Holding torque N·m (oz·in) Model number	Customizing*	Page
1.8°	14 mm sq. (0.55 inch sq.) Ultra-compact	 0.0065 (0.92) SH2141-55□1	Hollow Shaft modification	p. 54
	28 mm sq. (1.10 inch sq.)	 0.055 to 0.145 (7.79 to 20.53) SH228□-5□□1	Hollow Shaft modification Decelerator Encoder	pp. 55 to 56
	35 mm sq. (1.38 inch sq.)	 0.12 to 0.23 (16.99 to 32.57) SH35□□-12U□0	Hollow Shaft modification	p. 57
0.9°	42 mm sq. (1.65 inch sq.)	 0.2 to 0.48 (28.32 to 67.9) SH142□-□□□1	Hollow Shaft modification Decelerator Encoder	pp. 58 to 59
1.8°	42 mm sq. (1.65 inch sq.) Slim form	 0.083 to 0.186 (11.75 to 26.33) SS242□-50□1	Hollow Shaft modification	p. 60
	42 mm sq. (1.65 inch sq.)	 0.2 to 0.51 (28.32 to 72.22) 103H52□□-□□□0	Hollow Shaft modification Decelerator Encoder Brake	pp. 61 to 63
	50 mm sq. (1.97 inch sq.)	 0.28 to 0.53 (39.6 to 75.1) 103H670□-□□□0	Hollow Shaft modification	pp. 64 to 66
	50 mm sq. (1.97 inch sq.) Slim form	 0.1 to 0.215 (14.16 to 30.44) SS250□-80□0	Hollow Shaft modification	p. 67
	56 mm sq. (2.20 inch sq.)	 0.39 to 2.0 (55.2 to 283.2) 103H712□-□□□0	Hollow Shaft modification Decelerator Encoder	pp. 68 to 71
	0.9°	60 mm sq. (2.36 inch sq.)	 0.57 to 2.15 (80.71 to 304.4) SH160□-□□□0	Hollow Shaft modification Decelerator Encoder
1.8°	60 mm sq. (2.36 inch sq.)	 0.78 to 2.7 (110.5 to 382.3) 103H782□-□□□0	Hollow Shaft modification Decelerator Encoder Brake	pp. 74 to 77
	86 mm sq. (3.39 inch sq.) (CE and UL models are available.)	 2.5 to 9 (354 to 1274.4) S□286□-□□□□	Hollow Shaft modification Encoder	pp. 78 to 82

*Specifications can be customized, depending on the model number and quantity. Contact us for details.

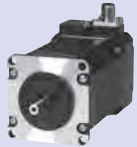
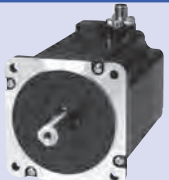
Basic step angle	Motor size	Holding torque N·m (oz-in) Model number	Customizing*	Page
1.8°	<p>ϕ 106 mm (ϕ 4.17 inch)</p> 	<p>10.8 to 19 (1529.4 to 2690.5) 103H8922□-□□□1</p>	<p>Hollow Shaft modification Brake</p>	p. 83
	<p>56 mm sq. (2.20 inch sq.)</p> <p>CE Model</p> 	<p>0.39 to 1.27 (55.2 to 179.8) 103H712□-6□□0</p>	<p>Hollow Shaft modification</p>	p. 84
	<p>ϕ 86 mm (ϕ 3.39 inch)</p> <p>CE Model</p> 	<p>2.74 to 7.44 (388 to 1053.6) 103H822□-63□0</p>	<p>Hollow Shaft modification</p>	p. 85
	<p>ϕ 106 mm (ϕ 4.17 inch)</p> <p>CE Model</p> 	<p>13.2 to 19 (1869.2 to 2690.5) 103H8922□-63□1</p>	<p>Hollow Shaft modification</p>	p. 86

*Specifications can be customized, depending on the model number and quantity. Contact us for details.

IP65 Splash and Dust Proof Stepping Motors

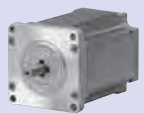
Waterproof, dustproof

RoHS

Basic step angle	Motor size	Holding torque N·m (oz-in) Model number	Page
1.8°	<p>56 mm sq. (2.20 inch sq.)</p> <p>CE/UL Model</p> 	<p>1 to 1.7 N·m (141.6 to 240.7 oz-in) SP256□-5□□0</p>	p. 90
	<p>86 mm sq. (3.39 inch sq.)</p> <p>CE/UL Model</p> 	<p>6.5 to 9 N·m (906.3 to 1274.5 oz-in) SP286□-5□□0</p>	p. 91

Stepping Motors for Vacuum Environments

Customized Products

Motor size	Page
<p>42 mm sq. to ϕ 106 mm (1.65 inch sq. to ϕ 4.17 inch)</p> 	p. 93

Synchronous Motors

Customized Products

Motor size	Page
<p>56 mm sq. to ϕ 106 mm (2.20 inch sq. to ϕ 4.17 inch)</p> 	p. 93

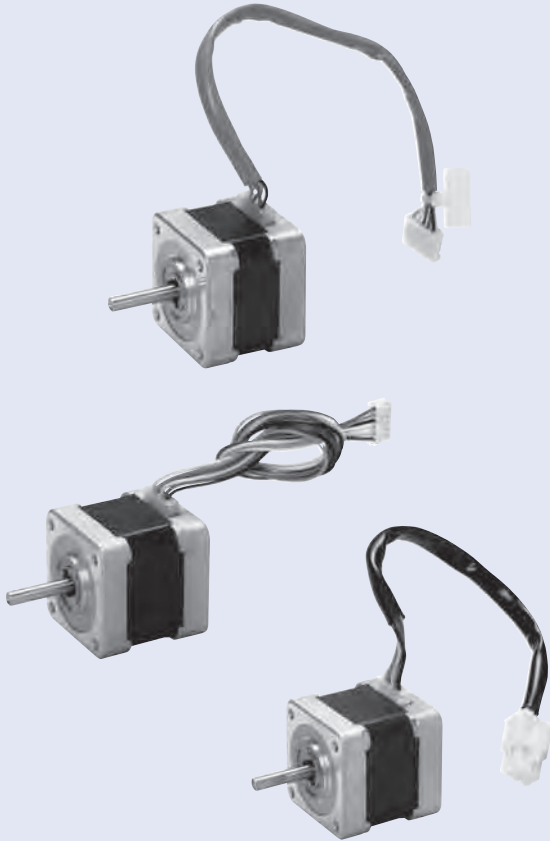
Customization

Different types of customization are possible, depending on the request and quantity. Contact us for details.

Manufacturing example

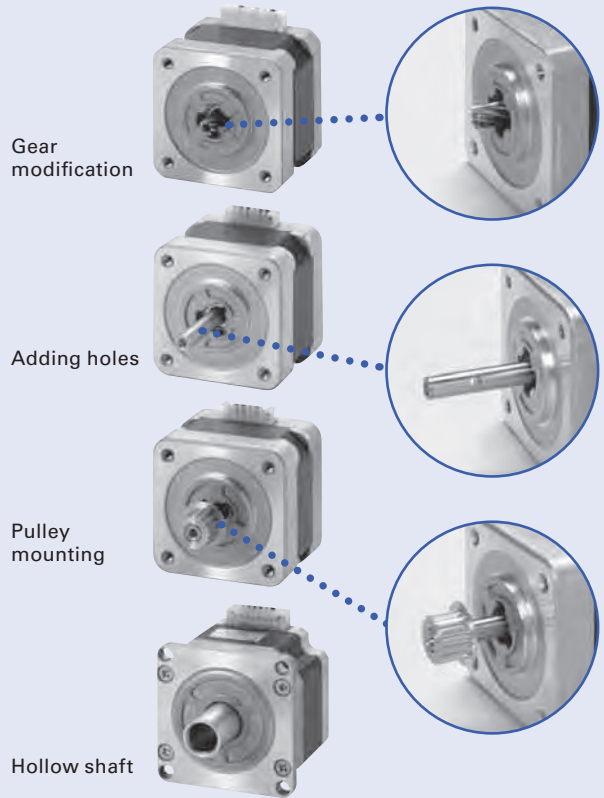
Harness modification

Connectors, cable ties, and plastic tubing can be added.



Shaft modification

D-cuts, key grooves, and through holes can be added; and gears and pulleys can be mounted. The shaft can also be hollowed to allow airflow or to pass lead wires through.



Rotating damper, mounting-side damper

A damper can be added to reduce vibrations when rotating.



Rotating damper



Mounting-side damper

Decelerator, encoder, brake

- A decelerator can be added when a large high-load torque is required at low speeds.
- An encoder can be added in order to detect position and speed.
- A brake can be added to hold the position when the motor is stopped.



With brake+encoder



With decelerator+encoder

How To Read the Specifications

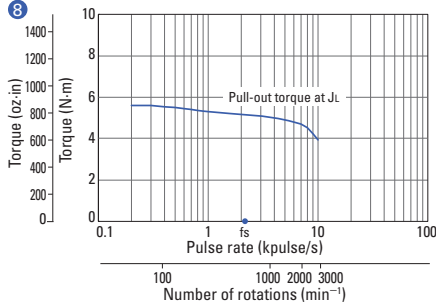
Bipolar winding, Lead wire type

1 Model number		2 Holding torque at 2-phase energization [N·m (oz-in) min.]	3 Rated current A/phase	4 Wiring resistance Ω /phase	5 Winding inductance mH/phase	6 Rotor inertia [$\times 10^{-4}$ kg·m ² (oz-in ²)]	7 Mass (Weight) [kg (lbs)]
Single shaft	Dual shaft	[N·m (oz-in) min.]	A/phase	Ω /phase	mH/phase	[$\times 10^{-4}$ kg·m ² (oz-in ²)]	[kg (lbs)]
SH2141-5541	SH2141-5511	0.0065 (0.92)	0.3	21	4.2	0.00058 (0.0032)	0.028 (0.062)

Characteristics diagram

SH2141-5541
SH2141-5511

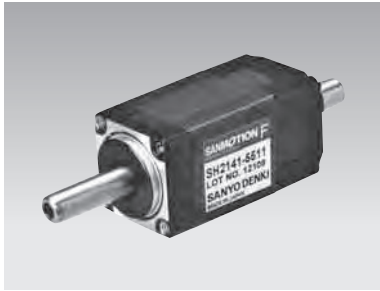
Constant current circuit
Source voltage: 24 VDC
Operating current:
0.3 A/phase, 2-phase
energization (full-step)
 $J=0.01 \times 10^{-4}$ kg·m² (1.80
oz-in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



- This is the stepping motor model number.
- This is the maximum torque that occurs with 2-phase excitation of the stepping motor at rated current, causing the shaft to rotate from the outside.
- This is the rated current that flows to the motor winding. Allowing this amount of current to flow to the motor will create torque equal to the holding torque value.
- This is the resistance for one phase of the stepping motor winding.
- This is the inductance for one phase of the stepping motor winding.
- This is the moment of inertia of the rotor, which shows how much torque is required to cause the rotor to accelerate or decelerate.
- This is the mass (weight) of the stepping motor.
- This graph shows the relationship between the full step pulse rate (frequency), speed, and pull-out torque.

Stepping Motors

Allowable Load, Internal Wiring, Rotation Direction ▶ p. 87
 General Specifications ▶ p. 88



14 mm sq. (0.55 inch sq.)

1.8° /step Ultra-compact RoHS

Bipolar winding, Lead wire type

Customizing

Hollow Shaft modification

Varies depending on the model number and quantity. Contact us for details.

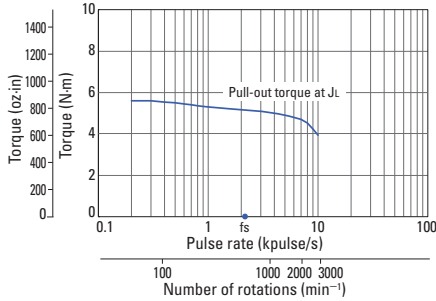
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]
SH2141-5541	SH2141-5511	0.0065 (0.92)	0.3	21	4.2	0.00058 (0.0032)	0.028 (0.062)

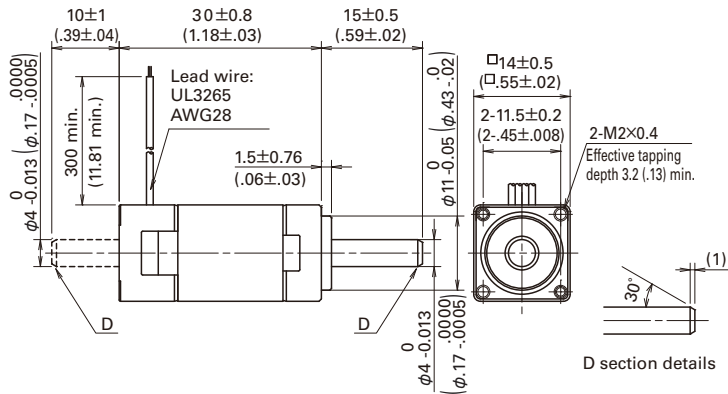
Characteristics diagram

SH2141-5541
SH2141-5511

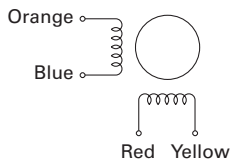
Constant current circuit
 Source voltage: 24 VDC
 Operating current:
 0.3 A/phase, 2-phase
 energization (full-step)
 $J_r = [0.01 \times 10^{-4} \text{kg} \cdot \text{m}^2 (1.80 \text{oz} \cdot \text{in}^2)]$ pulley balancer
 method
 fs: Maximum self-start
 frequency when not
 loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



28 mm sq. (1.10 inch sq.)

1.8° /step RoHS

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type ▶ p. 56

Customizing

Hollow Shaft modification
Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

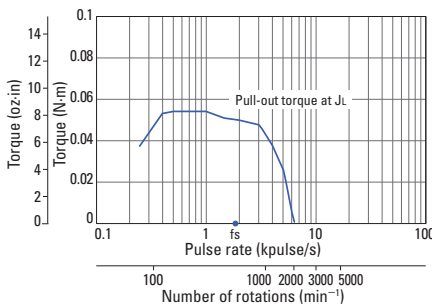
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SH2281-5171	SH2281-5131	0.055 (7.79)	0.5	10.5	3.7	0.01 (0.05)	0.11 (0.24)	32 (1.26)
SH2281-5271	SH2281-5231	0.055 (7.79)	1	2.85	1	0.01 (0.05)	0.11 (0.24)	32 (1.26)
SH2285-5171	SH2285-5131	0.115 (16.28)	0.5	17	7	0.022 (0.12)	0.2 (0.44)	51.5 (2.03)
SH2285-5271	SH2285-5231	0.115 (16.28)	1	4.1	1.9	0.022 (0.12)	0.2 (0.44)	51.5 (2.03)

Characteristics diagram

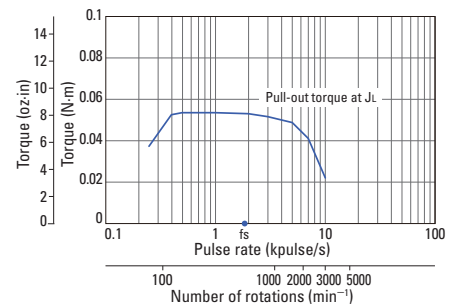
SH2281-5171 SH2281-5131

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



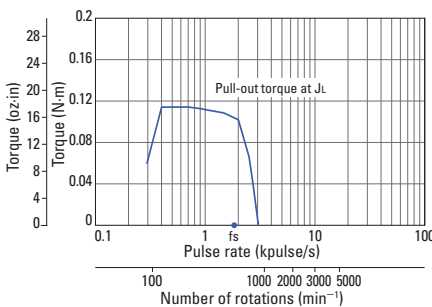
SH2281-5271 SH2281-5231

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



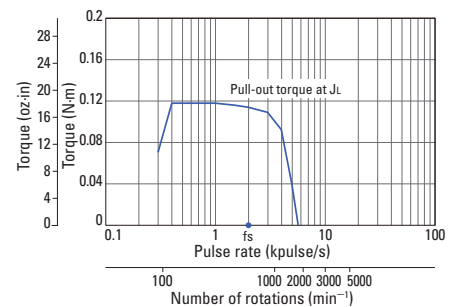
SH2285-5171 SH2285-5131

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded

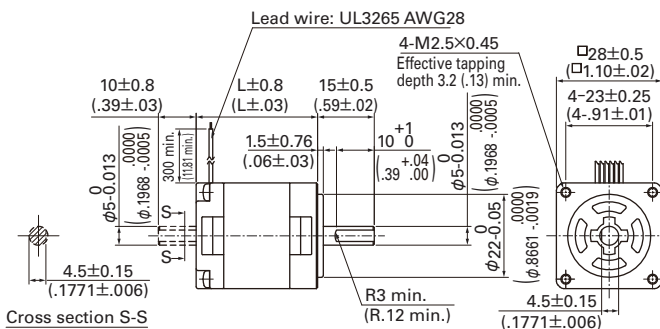


SH2285-5271 SH2285-5231

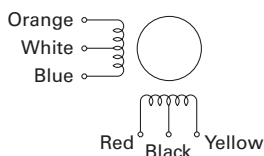
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

- For motor model number SH228 □ -51 □ 1 (0.5 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For model number SH228 □ -52 □ 1 (1 A/phase)
Model number: BS1D200P10 (DC input)
Operating current select switch setting: A
The characteristics diagram shown above is from our experimental circuit.



28 mm sq. (1.10 inch sq.)

1.8° /step RoHS

Bipolar winding, Lead wire type
Unipolar winding, Lead wire type ▶ p. 55

Customizing

Hollow Shaft modification
Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

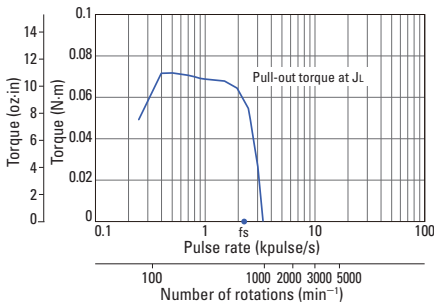
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SH2281-5671	SH2281-5631	0.07 (9.91)	0.5	10.5	7.2	0.01 (0.05)	0.11 (0.24)	32 (1.26)
SH2281-5771	SH2281-5731	0.07 (9.91)	1	2.6	1.85	0.01 (0.05)	0.11 (0.24)	32 (1.26)
SH2285-5671	SH2285-5631	0.145 (20.53)	0.5	15	13.5	0.022 (0.12)	0.2 (0.44)	51.5 (2.03)
SH2285-5771	SH2285-5731	0.145 (20.53)	1	3.75	3.4	0.022 (0.12)	0.2 (0.44)	51.5 (2.03)

Characteristics diagram

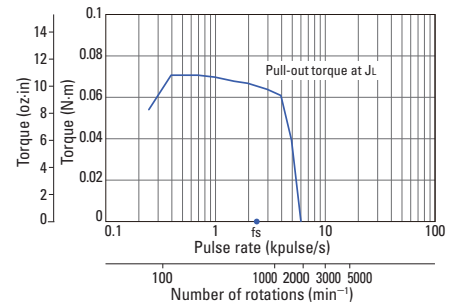
SH2281-5671 SH2281-5631

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



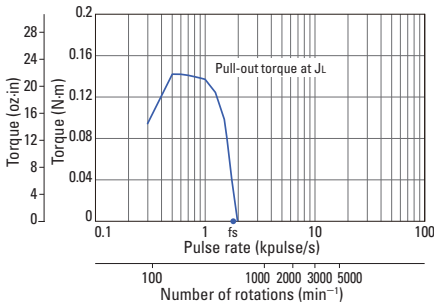
SH2281-5771 SH2281-5731

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



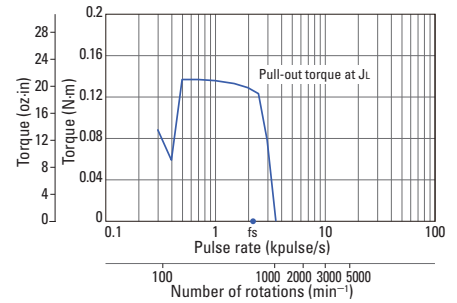
SH2285-5671 SH2285-5631

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded

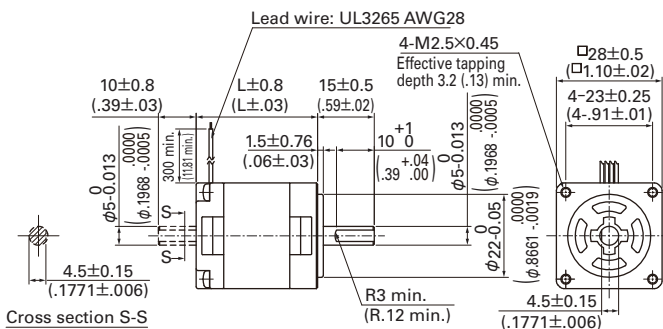


SH2285-5771 SH2285-5731

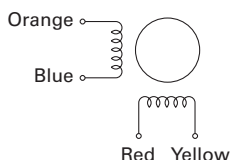
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.01 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (1.80
oz·in²) pulley balancer
method]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]

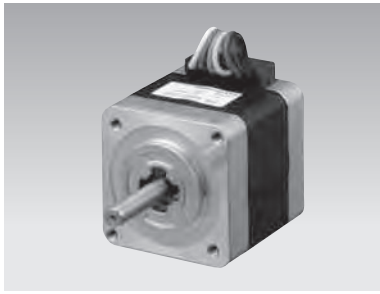


Internal wiring



Compatible drivers

- For motor model number SH228 □ -56 □ 1 (0.5 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For model number SH228 □ -57 □ 1 (1 A/phase)
Model number: BS1D200P10 (DC input)
Operating current select switch setting: A
The characteristics diagram shown above is from our experimental circuit.



35 mm sq. (1.38 inch sq.)

1.8° /step **RoHS**

Unipolar winding, Lead wire type

Customizing

Hollow **Shaft modification**

Varies depending on the model number and quantity. Contact us for details.

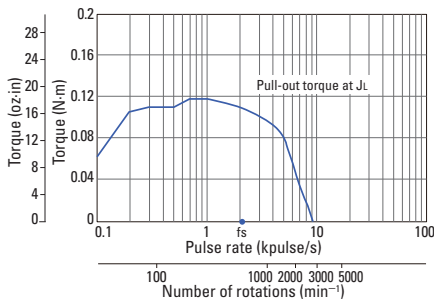
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz-in) min.]	A/phase	Ω /phase	mH/phase	[$\times 10^{-4}$ kg·m ² (oz-in ²)]	[kg (lbs)]	mm (in)
SH3533-12U40	SH3533-12U10	0.12 (16.99)	1.2	2.4	1.3	0.02 (1.09)	0.17 (0.37)	33 (1.25)
SH3537-12U40	SH3537-12U10	0.15 (21.24)	1.2	2.7	2	0.025 (1.37)	0.2 (0.44)	37 (1.54)
SH3552-12U40	SH3552-12U10	0.23 (32.57)	1.2	3.4	2.8	0.043 (2.35)	0.3 (0.66)	52 (1.89)

Characteristics diagram

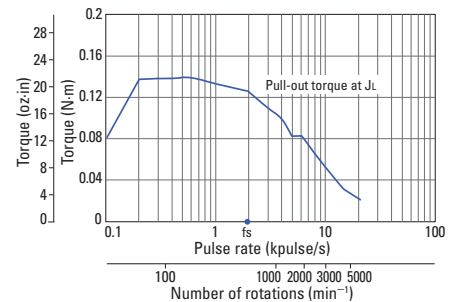
SH3533-12U40 SH3533-12U10

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.33 \times 10^{-4} \text{kg} \cdot \text{m}^2 (1.80 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded



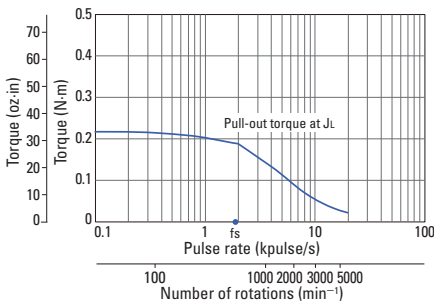
SH3537-12U40 SH3537-12U10

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.33 \times 10^{-4} \text{kg} \cdot \text{m}^2 (1.80 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

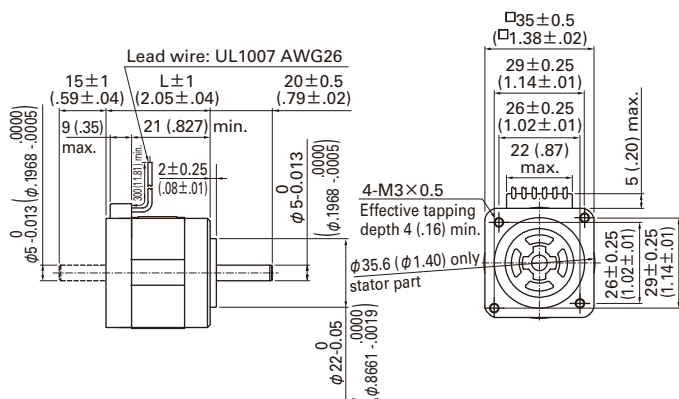


SH3552-12U40 SH3552-12U10

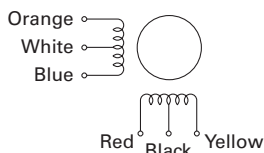
Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Model number: US1D200P10 (DC input)

Operating current select switch setting: 8

The characteristics diagram shown above is from our experimental circuit.



42 mm sq. (1.65 inch sq.)

0.9° /step RoHS

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type

Customizing

- Hollow Shaft modification
- Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

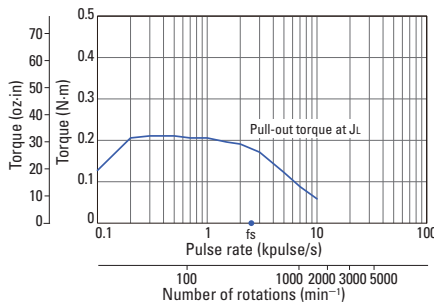
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SH1421-0441	SH1421-0411	0.2 (28.32)	1.2	2.7	3.2	0.044 (0.241)	0.24 (0.53)	33 (1.25)
SH1422-0441	SH1422-0411	0.29 (41.07)	1.2	3.1	5.3	0.066 (0.361)	0.29 (0.64)	39 (1.54)
SH1424-0441	SH1424-0411	0.39 (55.23)	1.2	3.5	5.3	0.089 (0.487)	0.38 (0.84)	48 (1.89)

Characteristics diagram

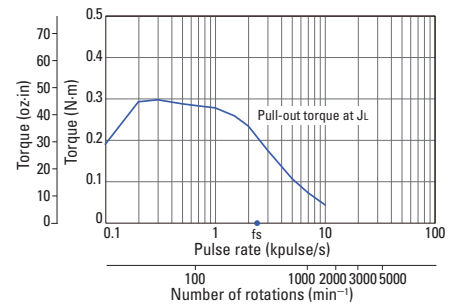
SH1421-0441 SH1421-0411

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{oz}\cdot\text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded



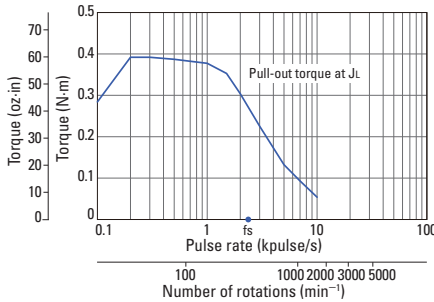
SH1422-0441 SH1422-0411

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{oz}\cdot\text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

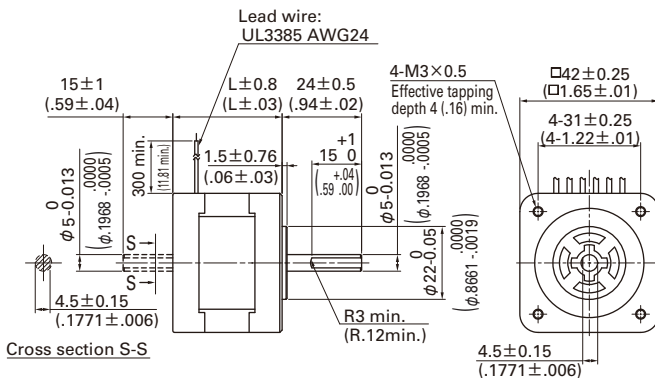


SH1424-0441 SH1424-0411

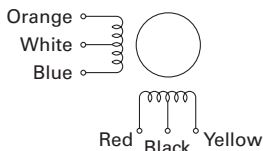
Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{oz}\cdot\text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Model number: US1D200P10 (DC input)

Operating current select switch setting: 8

The characteristics diagram shown above is from our experimental circuit.

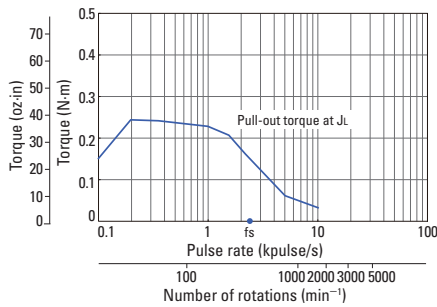
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SH1421-5041	SH1421-5011	0.23 (32.5)	1	3.3	8.0	0.044 (0.24)	0.24 (0.53)	33 (1.25)
SH1421-5241	SH1421-5211	0.23 (32.5)	2	0.85	2.1	0.044 (0.24)	0.24 (0.53)	33 (1.25)
SH1422-5041	SH1422-5011	0.34 (48.1)	1	4.0	14.0	0.066 (0.36)	0.29 (0.64)	39 (1.54)
SH1422-5241	SH1422-5211	0.34 (48.1)	2	1.05	3.6	0.066 (0.36)	0.29 (0.64)	39 (1.54)
SH1424-5041	SH1424-5011	0.48 (67.9)	1	4.7	15.0	0.089 (0.49)	0.38 (0.84)	48 (1.89)
SH1424-5241	SH1424-5211	0.48 (67.9)	2	1.25	3.75	0.089 (0.49)	0.38 (0.84)	48 (1.89)

Characteristics diagram

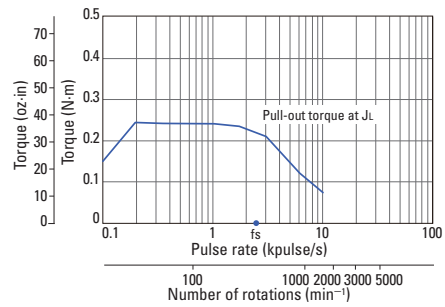
**SH1421-5041
SH1421-5011**

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



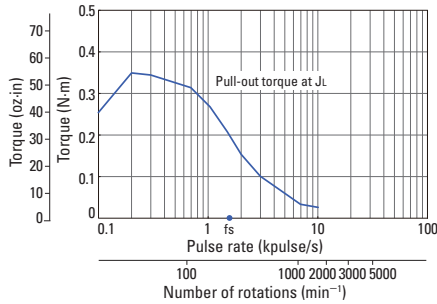
**SH1421-5241
SH1421-5211**

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



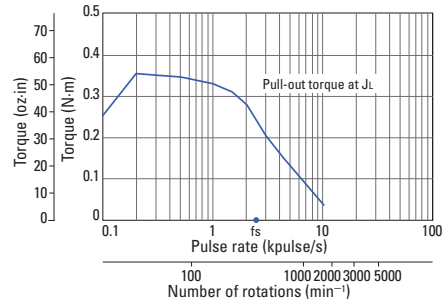
**SH1422-5041
SH1422-5011**

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



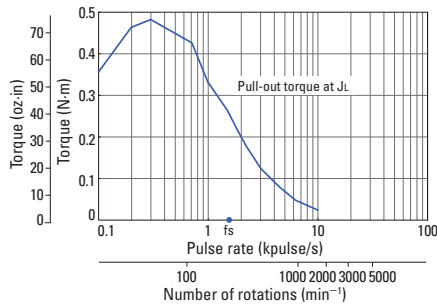
**SH1422-5241
SH1422-5211**

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



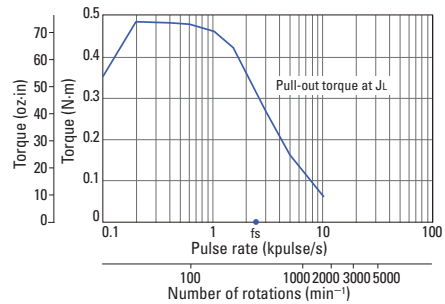
**SH1424-5041
SH1424-5011**

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

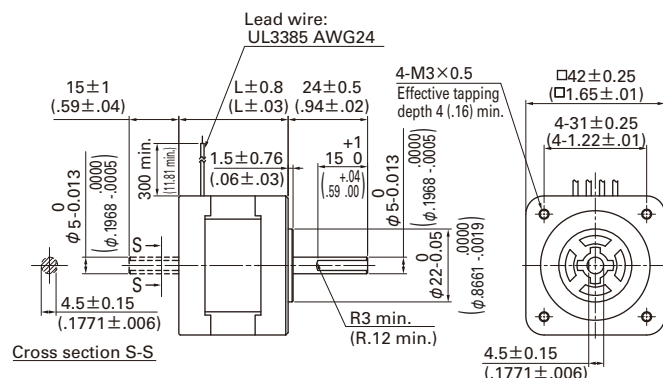


**SH1424-5241
SH1424-5211**

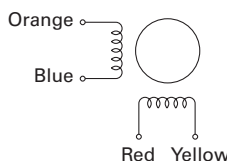
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

- For motor model number SH142 □ -50 □ 1 (1 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For model number SH142 □ -52 □ 1 (2 A/phase)
Model number: BS1D200P10 (DC input)
Operating current select switch setting: 0
The characteristics diagram shown above is from our experimental circuit.



42 mm sq. (1.65 inch sq.)

1.8° /step Slim form RoHS
Bipolar winding, Lead wire type

Customizing

Hollow Shaft modification

Varies depending on the model number and quantity. Contact us for details.

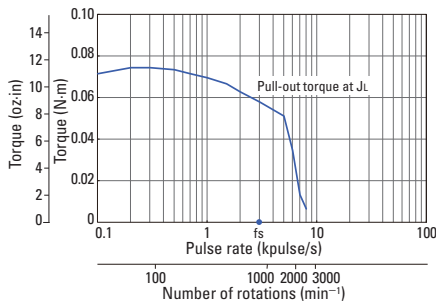
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SS2421-5041	SS2421-5011	0.083 (11.75)	1	3.5	1.2	0.015 (0.082)	0.07 (0.15)	11.6 (.457)
SS2422-5041	SS2422-5011	0.186 (26.33)	1	5.4	2.9	0.028 (0.153)	0.14 (0.31)	18.6 (.732)

Characteristics diagram

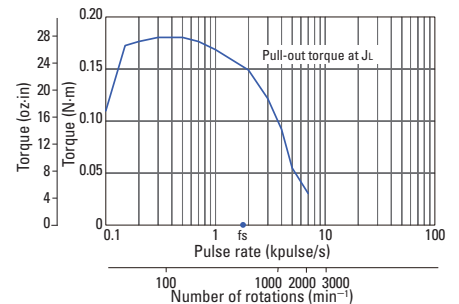
SS2421-5041 SS2421-5011

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_i=[0.33 × 10⁻⁴kg·m² (1.80
oz·in²) use the rubber
coupling]
f_s: Maximum self-start
frequency when not
loaded

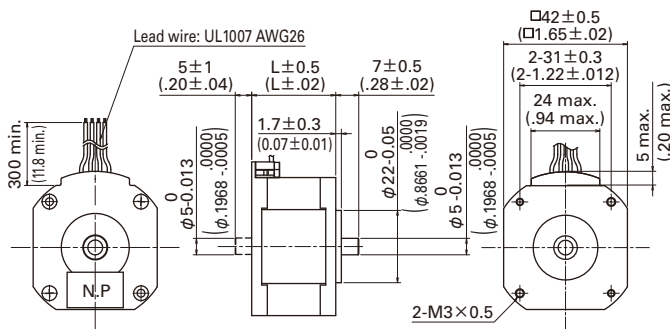


SS2422-5041 SS2422-5011

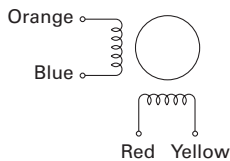
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_i=[0.33 × 10⁻⁴kg·m² (1.80
oz·in²) use the rubber
coupling]
f_s: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



42 mm sq. (1.65 inch sq.)

1.8° /step RoHS

Unipolar winding, Connector type
Bipolar winding, Lead wire type ▶ p. 62

Customizing

- Hollow Shaft modification
- Decelerator Encoder
- Brake

Varies depending on the model number and quantity. Contact us for details.

Unipolar winding, Connector type

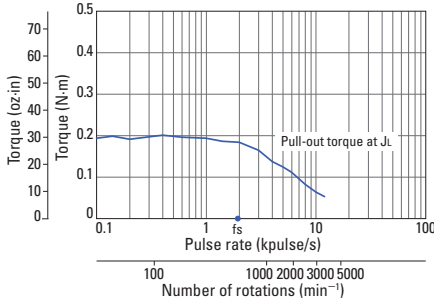
Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H5205-0440	103H5205-0410	0.2 (28.32)	1.2	2.4	2.3	0.036 (0.20)	0.23 (0.51)	33 (1.25)
103H5208-0440	103H5208-0410	0.3 (42.48)	1.2	2.9	3.4	0.056 (0.31)	0.29 (0.64)	39 (1.54)
103H5209-0440	103H5209-0410	0.32 (45.31)	1.2	3	3.9	0.062 (0.34)	0.31 (0.68)	41 (1.61)
103H5210-0440	103H5210-0410	0.37 (52.39)	1.2	3.3	3.4	0.074 (0.40)	0.37 (0.82)	48 (1.89)

Motor cable: Model No.4835710-1

Characteristics diagram

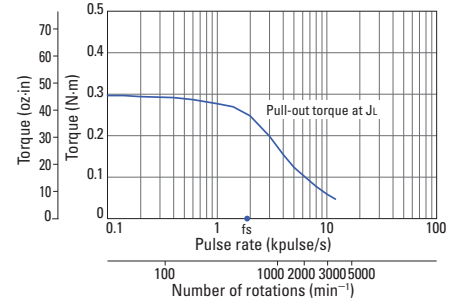
103H5205-0440 103H5205-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded



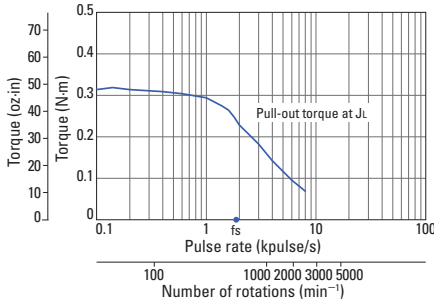
103H5208-0440 103H5208-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded



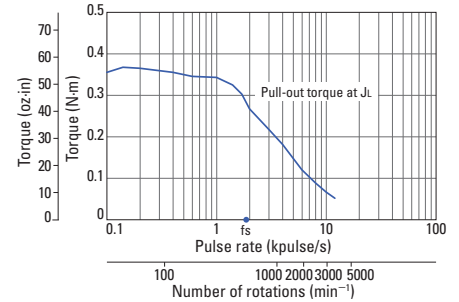
103H5209-0440 103H5209-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

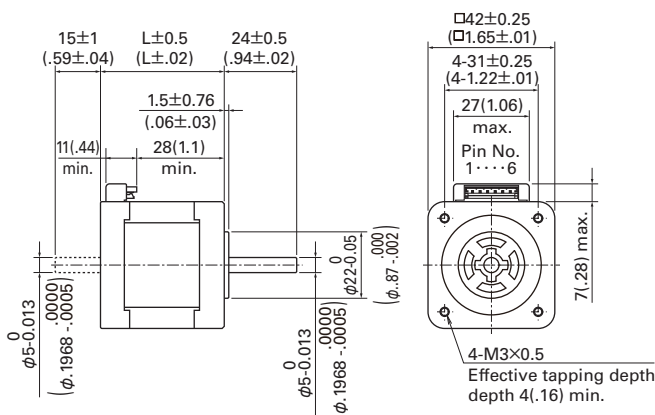


103H5210-0440 103H5210-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

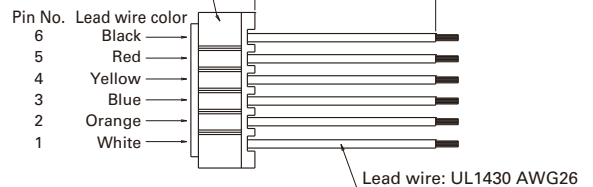


Dimensions [Unit: mm (inch)]



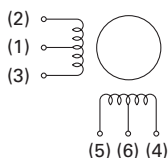
Option (sold separately): Motor cable Model number: 4835710-1

Manufacturer: J.S.T. Mfg. Co., Ltd.
Housing: EHR-6 Black
Pin: SEH-001T-P0.6



This driver-motor cable is for motor model numbers 103H52□□-04□□.

Internal wiring

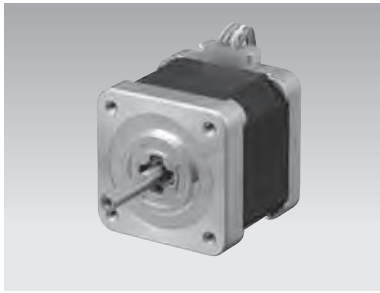


Compatible drivers

Model number: US1D200P10

Operating current select switch setting: 8

The characteristics diagram shown above is from our experimental circuit.



42 mm sq. (1.65 inch sq.)

1.8° /step RoHS

Bipolar winding, Lead wire type
Unipolar winding, Connector type ▶ p. 61

Customizing

- Hollow Shaft modification
- Decelerator Encoder
- Brake

Varies depending on the model number and quantity. Contact us for details.

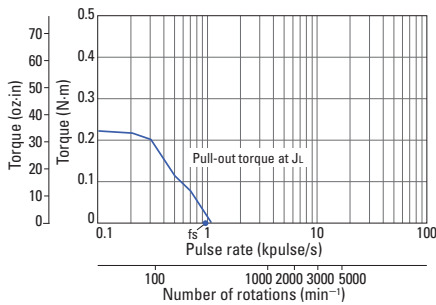
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz-in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz-in ²)]	[kg (lbs)]	mm (in)
103H5205-5040	103H5205-5010	0.23 (32.57)	0.25	54	78	0.036 (0.20)	0.23 (0.51)	33 (1.25)
103H5205-5140	103H5205-5110	0.25 (35.40)	0.5	13.4	23.4	0.036 (0.20)	0.23 (0.51)	33 (1.25)
103H5205-5240	103H5205-5210	0.265 (37.53)	1	3.4	6.5	0.036 (0.20)	0.23 (0.51)	33 (1.25)
103H5208-5040	103H5208-5010	0.35 (49.56)	0.25	66	116	0.056 (0.31)	0.29 (0.64)	39 (1.54)
103H5208-5140	103H5208-5110	0.38 (53.81)	0.5	16.5	34	0.056 (0.31)	0.29 (0.64)	39 (1.54)
103H5208-5240	103H5208-5210	0.39 (55.23)	1	4.1	9.5	0.056 (0.31)	0.29 (0.64)	39 (1.54)
103H5209-5040	103H5209-5010	0.38 (53.81)	0.25	71.4	133	0.062 (0.34)	0.31 (0.68)	41 (1.61)
103H5209-5140	103H5209-5110	0.41 (58.06)	0.5	18.2	39	0.062 (0.34)	0.31 (0.68)	41 (1.61)
103H5209-5240	103H5209-5210	0.425 (60.18)	1	4.4	11	0.062 (0.34)	0.31 (0.68)	41 (1.61)
103H5210-5040	103H5210-5010	0.465 (65.85)	0.25	80	123.3	0.074 (0.40)	0.37 (0.82)	48 (1.89)
103H5210-5140	103H5210-5110	0.49 (69.39)	0.5	20	35	0.074 (0.40)	0.37 (0.82)	48 (1.89)
103H5210-5240	103H5210-5210	0.51 (72.22)	1	4.8	9.5	0.074 (0.40)	0.37 (0.82)	48 (1.89)

Characteristics diagram

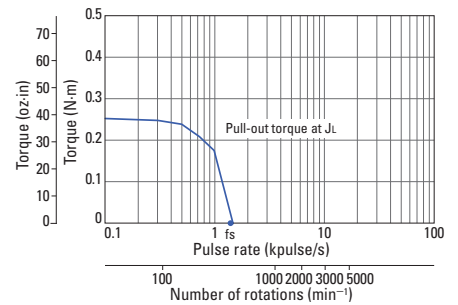
103H5205-5040 103H5205-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.25 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



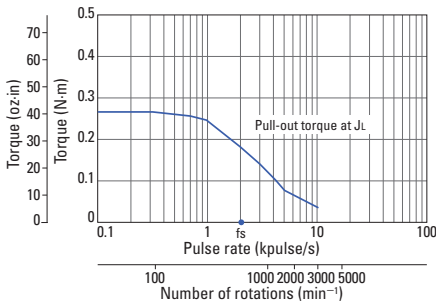
103H5205-5140 103H5205-5110

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



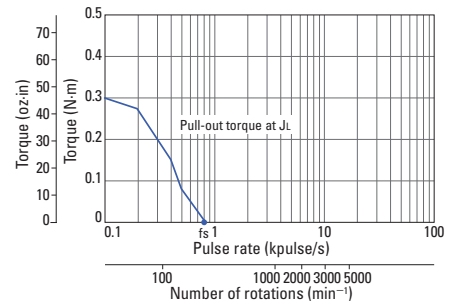
103H5205-5240 103H5205-5210

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



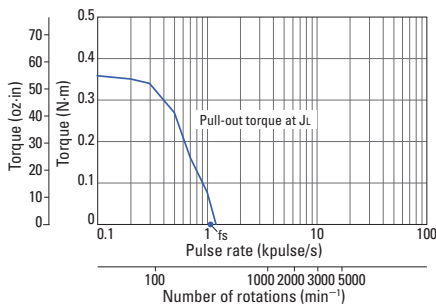
103H5208-5040 103H5208-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.25 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



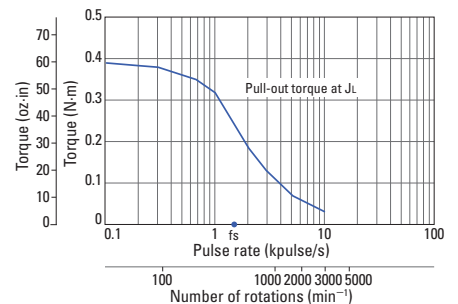
103H5208-5140 103H5208-5110

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H5208-5240 103H5208-5210

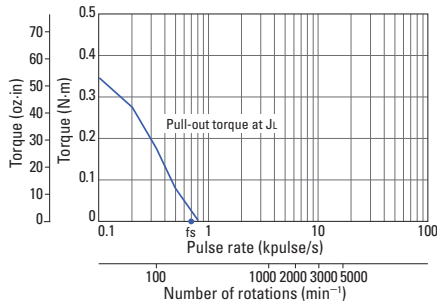
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Characteristics diagram

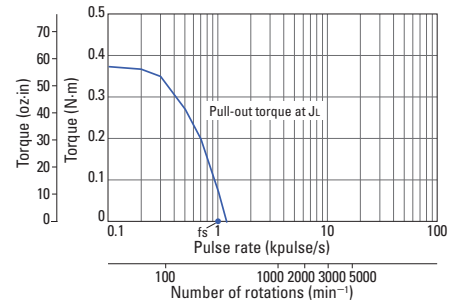
103H5209-5040 103H5209-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.25 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



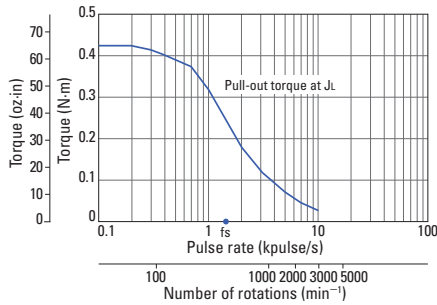
103H5209-5140 103H5209-5110

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



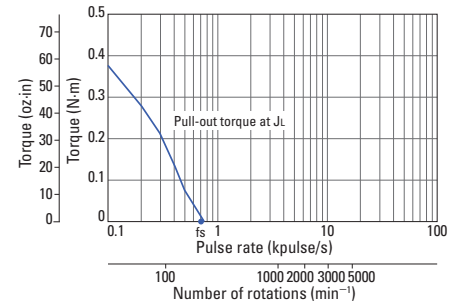
103H5209-5240 103H5209-5210

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



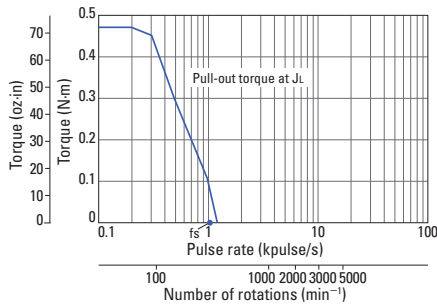
103H5210-5040 103H5210-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.25 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



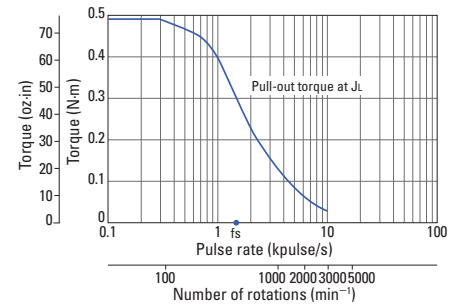
103H5210-5140 103H5210-5110

Constant current circuit
Source voltage: 24 VDC
Operating current:
0.5 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

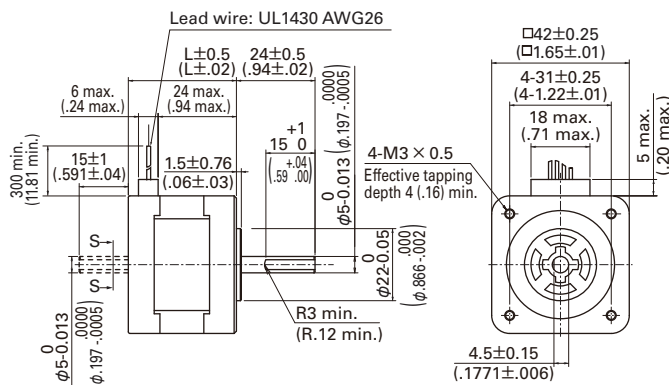


103H5210-5240 103H5210-5210

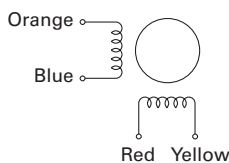
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



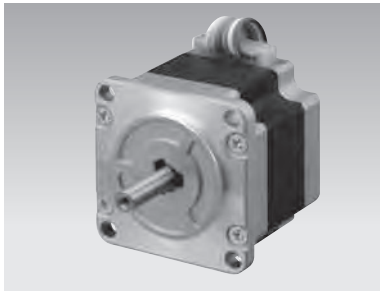
Compatible drivers

- For motor model number 103H52 □□ -50 □ 0 (0.25 A/phase), 103H52 □□ -51 □□ (0.5 A/phase)
Driver is not included.

If you require assistance finding a driver, contact us for details.

- For model number 103H52 □□ -52 □□ (1 A/phase)
Model number: BS1D200P10 (DC input)
Operating current select switch setting: A

The characteristics diagram shown above is from our experimental circuit.



50 mmsq. (1.97 inch sq.)

1.8° /step RoHS

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type ▶ p. 66

Customizing

Hollow Shaft modification

Varies depending on the model number and quantity. Contact us for details.

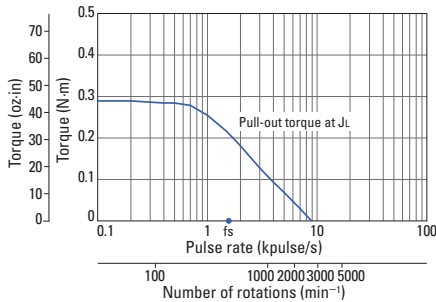
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H6701-0140	103H6701-0110	0.28 (39.6)	1	4.3	6.8	0.057 (0.31)	0.35 (0.77)	39.8 (1.57)
103H6701-0440	103H6701-0410	0.28 (39.6)	2	1.1	1.6	0.057 (0.31)	0.35 (0.77)	39.8 (1.57)
103H6701-0740	103H6701-0710	0.28 (39.6)	3	0.6	0.7	0.057 (0.31)	0.35 (0.77)	39.8 (1.57)
103H6703-0140	103H6703-0110	0.49 (69.4)	1	6	13	0.118 (0.65)	0.5 (1.10)	51.3 (2.02)
103H6703-0440	103H6703-0410	0.49 (69.4)	2	1.6	3.2	0.118 (0.65)	0.5 (1.10)	51.3 (2.02)
103H6703-0740	103H6703-0710	0.49 (69.4)	3	0.83	1.4	0.118 (0.65)	0.5 (1.10)	51.3 (2.02)
103H6704-0140	103H6704-0110	0.53 (75.1)	1	6.5	16.5	0.14 (0.77)	0.55 (1.21)	55.8 (2.20)
103H6704-0440	103H6704-0410	0.52 (73.6)	2	1.7	3.8	0.14 (0.77)	0.55 (1.21)	55.8 (2.20)
103H6704-0740	103H6704-0710	0.53 (75.1)	3	0.9	1.7	0.14 (0.77)	0.55 (1.21)	55.8 (2.20)

Characteristics diagram

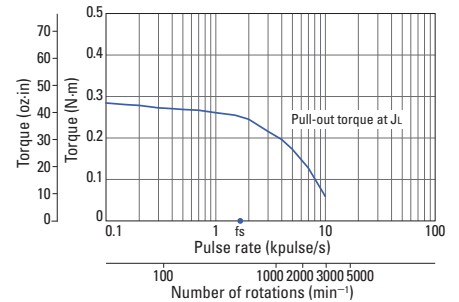
103H6701-0140 103H6701-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



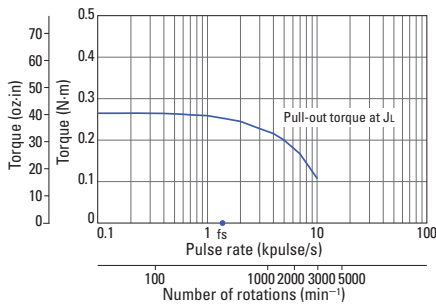
103H6701-0440 103H6701-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



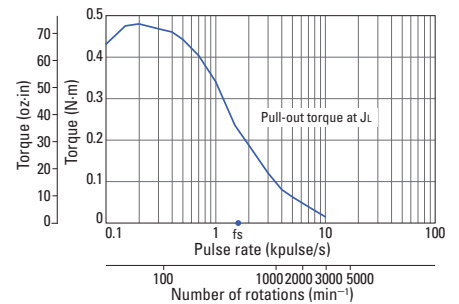
103H6701-0740 103H6701-0710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



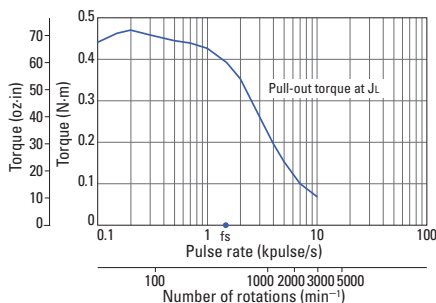
103H6703-0140 103H6703-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



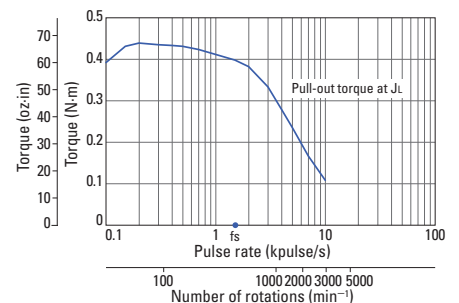
103H6703-0440 103H6703-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H6703-0740 103H6703-0710

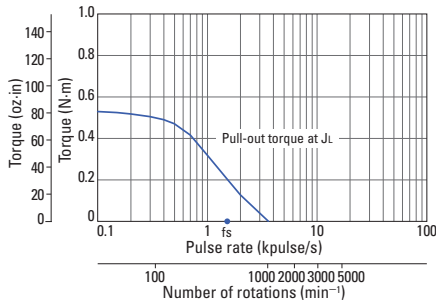
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Characteristics diagram

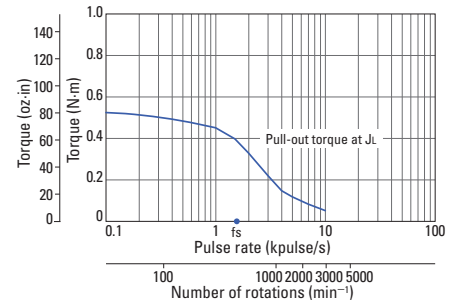
103H6704-0140 103H6704-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



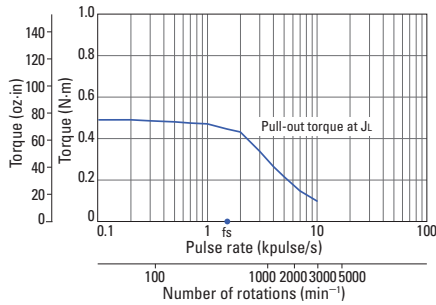
103H6704-0440 103H6704-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

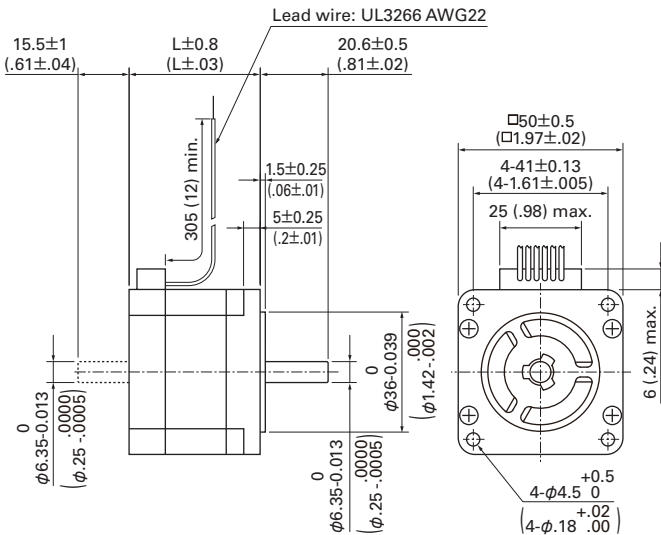


103H6704-0740 103H6704-0710

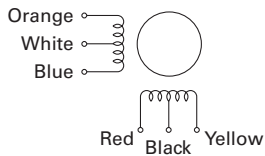
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

- For motor model number 103H670 □ -01 □ 0 (1 A/phase), 103H670 □ -07 □ 0 (3 A/phase)

Driver is not included.

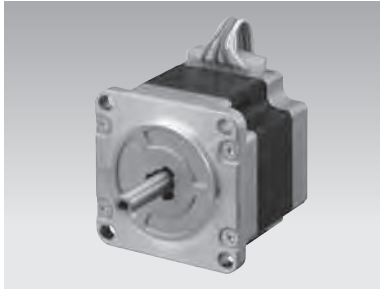
If you require assistance finding a driver, contact us for details.

- For model number 103H670 □ -04 □ 0 (2 A/phase)

Model number: US1D200P10 (DC input)

Operating current select switch setting: 0

The characteristics diagram shown above is from our experimental circuit.



50 mm sq. (1.97 inch sq.)

1.8° /step **RoHS**

Bipolar winding, Lead wire type
Unipolar winding, Lead wire type ▶ p. 64

Customizing

Hollow **Shaft modification**

Varies depending on the model number and quantity. Contact us for details.

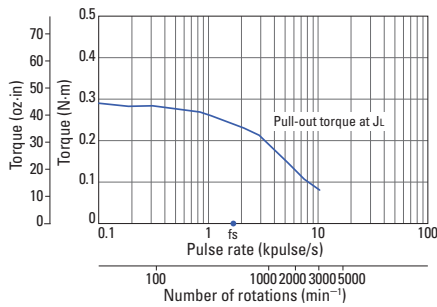
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz-in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz-in ²)]	[kg (lbs)]	mm (in)
103H6701-5040	103H6701-5010	0.28 (39.6)	2	0.6	1.6	0.057 (0.31)	0.35 (0.77)	39.8 (1.57)
103H6703-5040	103H6703-5010	0.49 (69.4)	2	0.8	3.2	0.118 (0.65)	0.5 (1.10)	51.3 (2.02)
103H6704-5040	103H6704-5010	0.52 (73.6)	2	0.9	3.8	0.14 (0.77)	0.55 (1.21)	55.8 (2.20)

Characteristics diagram

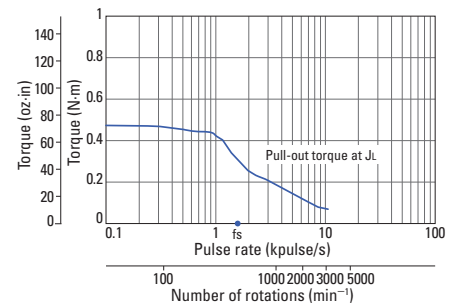
103H6701-5040 103H6701-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



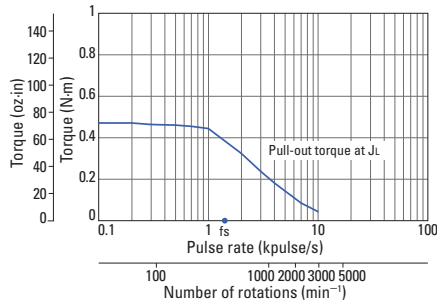
103H6703-5040 103H6703-5010

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

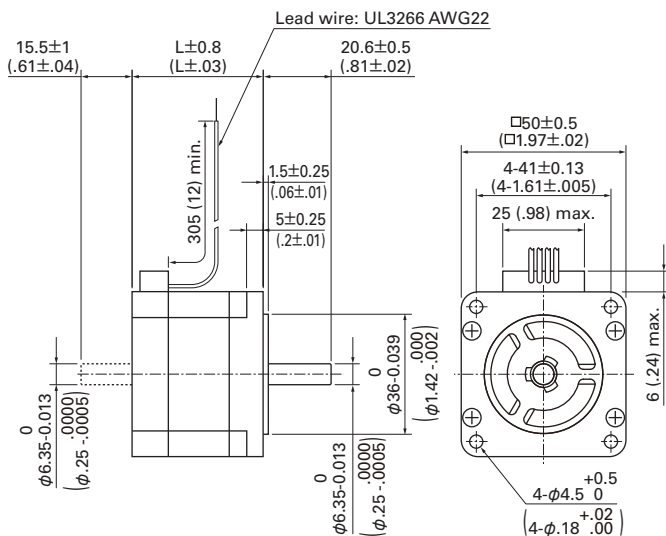


103H6704-5040 103H6704-5010

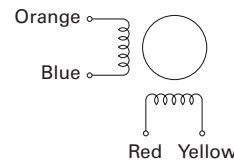
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]

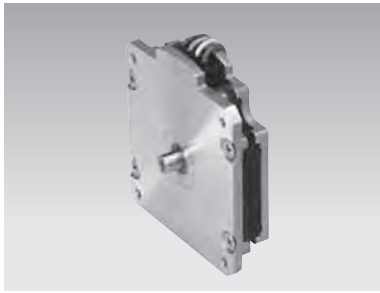


Internal wiring



Compatible drivers

Model number: BS1D200P10
(DC input)
Operating current select
switch setting: 0
The characteristics diagram
shown above is from our
experimental circuit.



50 mm sq. (1.97 inch sq.)

1.8° /step 薄型 RoHS
Bipolar winding, Lead wire type

Customizing

Hollow Shaft modification

Varies depending on the model number and quantity. Contact us for details.

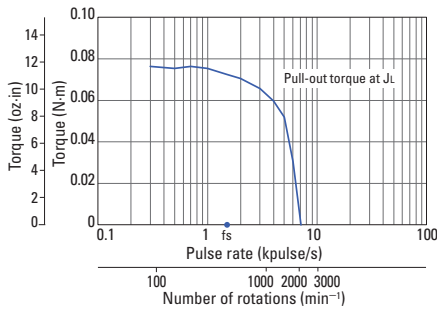
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SS2501-8040	SS2501-8010	0.1 (14.16)	1	4.5	2	0.026 (0.142)	0.09 (0.20)	11.4 (.43)
SS2502-8040	SS2502-8010	0.215 (30.44)	1	5.9	3.2	0.049 (0.268)	0.15 (0.33)	16.4 (.63)

Characteristics diagram

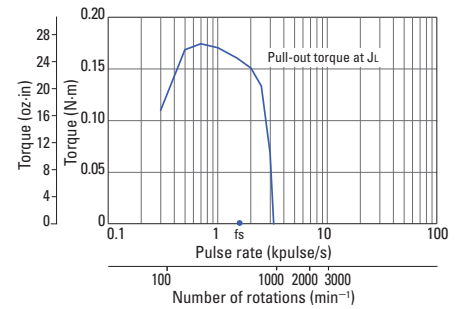
SS2501-8040 SS2501-8010

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_r=[0.01 × 10⁻⁴kg·m² (1.80
oz·in²) pulley balancer
method]
f_s: Maximum self-start
frequency when not
loaded

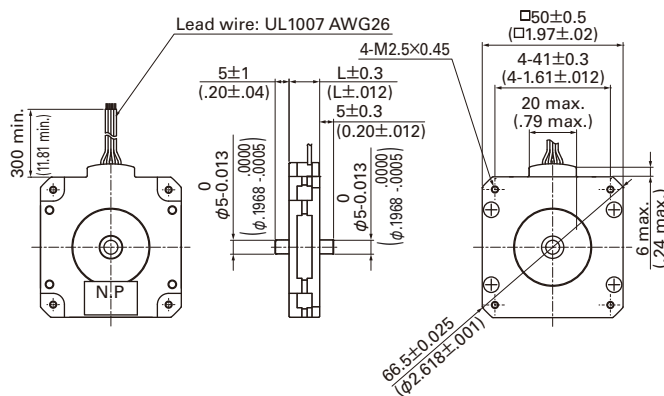


SS2502-8040 SS2502-8010

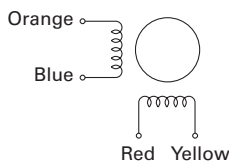
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
J_r=[0.01 × 10⁻⁴kg·m² (1.80
oz·in²) pulley balancer
method]
f_s: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



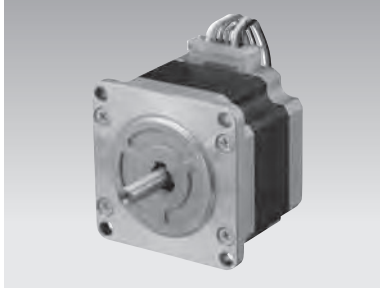
Internal wiring



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



56 mm sq. (2.20 inch sq.)

1.8° /step RoHS

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type ▶ p. 70

Customizing

- Hollow Shaft modification
- Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

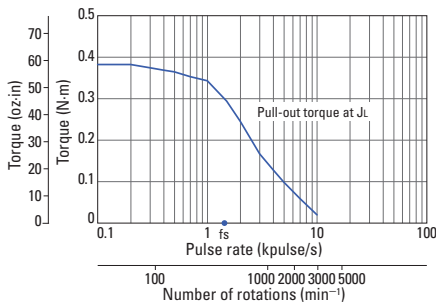
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz-in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz-in ²)]	[kg (lbs)]	mm (in)
103H7121-0140	103H7121-0110	0.39 (55.2)	1	4.8	8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
103H7121-0440	103H7121-0410	0.39 (55.2)	2	1.25	1.9	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
103H7121-0740	103H7121-0710	0.39 (55.2)	3	0.6	0.8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
103H7123-0140	103H7123-0110	0.83 (117.5)	1	6.7	15	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
103H7123-0440	103H7123-0410	0.83 (117.5)	2	1.6	3.8	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
103H7123-0740	103H7123-0710	0.78 (110.5)	3	0.77	1.58	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
103H7124-0140	103H7124-0110	0.98 (138.8)	1	7	14.5	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
103H7124-0440	103H7124-0410	0.98 (138.8)	2	1.7	3.1	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
103H7124-0740	103H7124-0710	0.98 (138.8)	3	0.74	1.4	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
103H7126-0140	103H7126-0110	1.27 (179.8)	1	8.6	19	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)
103H7126-0440	103H7126-0410	1.27 (179.8)	2	2	4.5	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)
103H7126-0740	103H7126-0710	1.27 (179.8)	3	0.9	2.2	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)

Characteristics diagram

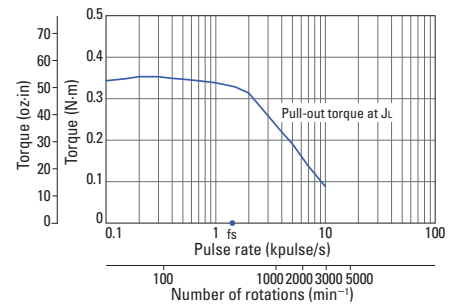
103H7121-0140 103H7121-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



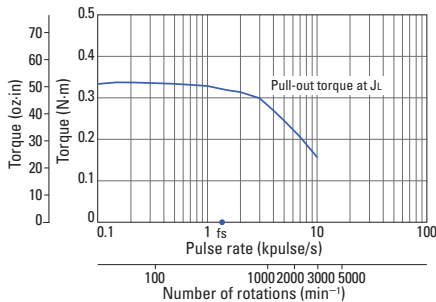
103H7121-0440 103H7121-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



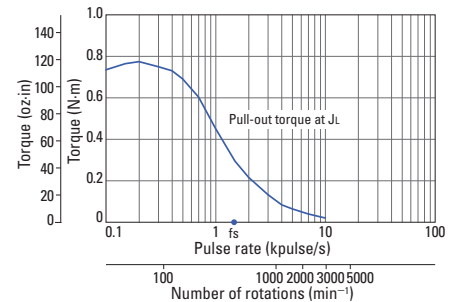
103H7121-0740 103H7121-0710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



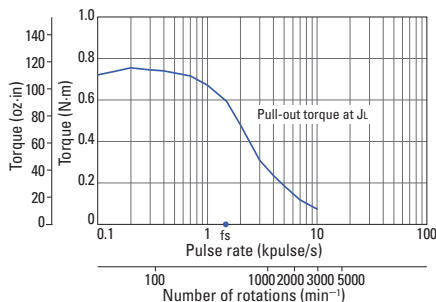
103H7123-0140 103H7123-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



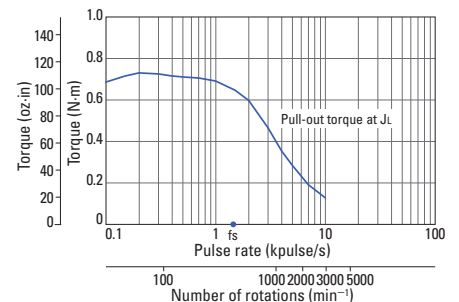
103H7123-0440 103H7123-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7123-0740 103H7123-0710

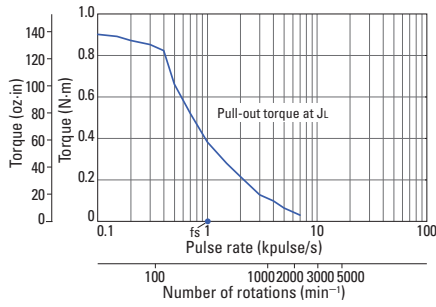
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (5.14
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Characteristics diagram

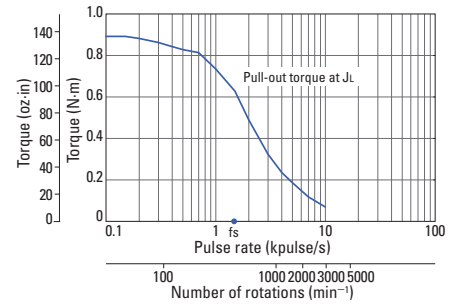
103H7124-0140 103H7124-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



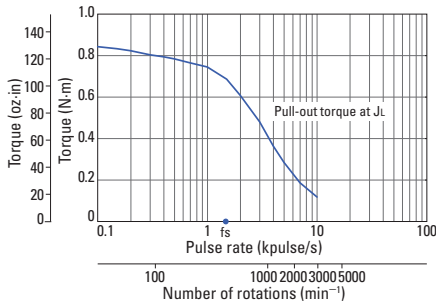
103H7124-0440 103H7124-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



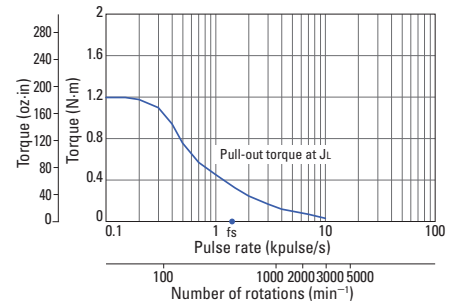
103H7124-0740 103H7124-0710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



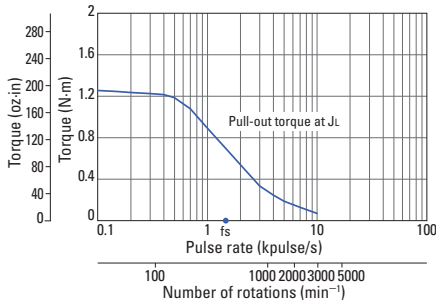
103H7126-0140 103H7126-0110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



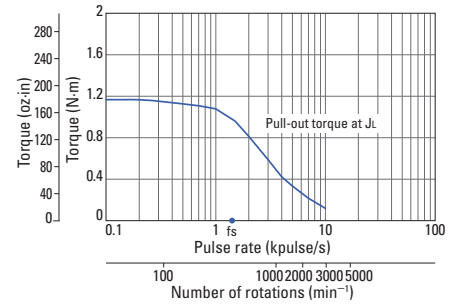
103H7126-0440 103H7126-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



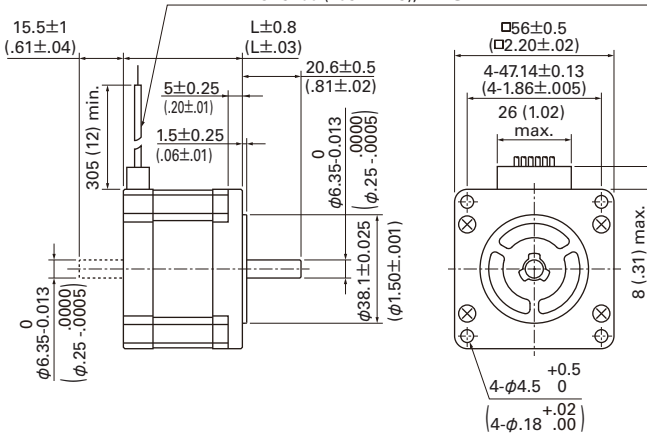
103H7126-0740 103H7126-0710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

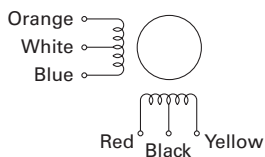


Dimensions [Unit: mm (inch)]

Lead wire: UL1430 (103H7121, 103H7124, 103H7126), AWG22
UL3266 (103H7123), AWG22



Internal wiring



Compatible drivers

- For motor model number 103H712 □ -01 □ 0 (1 A/phase), 103H712 □ -07 □ 0 (3 A/phase)

Driver is not included.

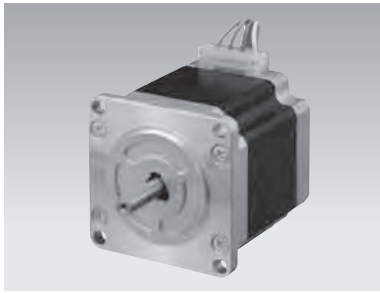
If you require assistance finding a driver, contact us for details.

- For model number 103H712 □ -04 □ 0 (2 A/phase)

Model number: US1D200P10 (DC input)

Operating current select switch setting: 0

The characteristics diagram shown above is from our experimental circuit.



56 mm sq. (2.20 inch sq.)

1.8° /step RoHS

Bipolar winding, Lead wire type
Unipolar winding, Lead wire type ▶ p. 68

Customizing

- Hollow Shaft modification
- Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

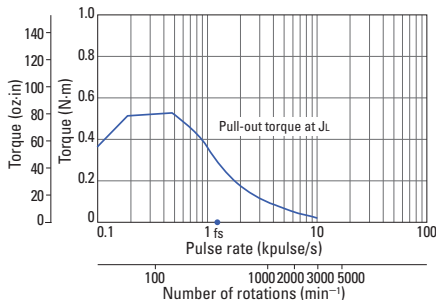
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)	Shaft diameter (D)	Dcut thickness (T)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[$\times 10^{-4}$ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)	mm (in)	mm (in)
103H7121-5640	103H7121-5610	0.55 (77.9)	1	4.3	14.5	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7121-5740	103H7121-5710	0.55 (77.9)	2	1.1	3.7	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7121-5840	103H7121-5810	0.55 (77.9)	3	0.54	1.74	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7123-5640	103H7123-5610	1.0 (141.6)	1	5.7	29.4	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7123-5740	103H7123-5710	1.0 (141.6)	2	1.5	7.5	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7123-5840	103H7123-5810	1.0 (141.6)	3	0.7	3.5	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7126-5640	103H7126-5610	1.6 (226.6)	1	7.7	34.6	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7126-5740	103H7126-5710	1.6 (226.6)	2	2	9.1	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7126-5840	103H7126-5810	1.6 (226.6)	3	0.94	4	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)	φ 6.35 (φ 0.25)	5.8 (0.23)
103H7128-5640	103H7128-5610	2.0 (283.2)	1	8.9	40.1	0.49 (2.68)	1.3 (2.87)	94.8 (3.73)	φ 8 (φ 0.31)	7.5 (0.30)
103H7128-5740	103H7128-5710	2.0 (283.2)	2	2.3	10.4	0.49 (2.68)	1.3 (2.87)	94.8 (3.73)	φ 8 (φ 0.31)	7.5 (0.30)
103H7128-5840	103H7128-5810	2.0 (283.2)	3	1.03	4.3	0.49 (2.68)	1.3 (2.87)	94.8 (3.73)	φ 8 (φ 0.31)	7.5 (0.30)

Characteristics diagram

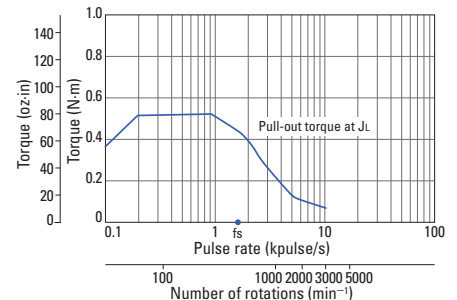
103H7121-5640 103H7121-5610

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



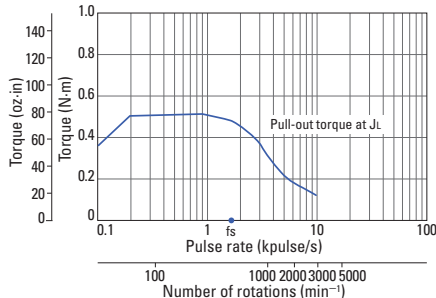
103H7121-5740 103H7121-5710

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



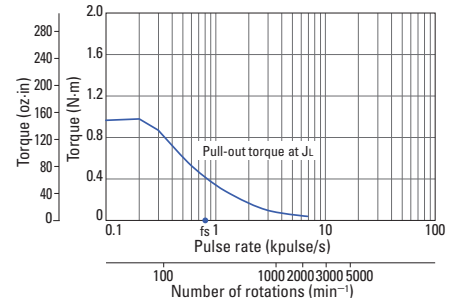
103H7121-5840 103H7121-5810

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7123-5640 103H7123-5610

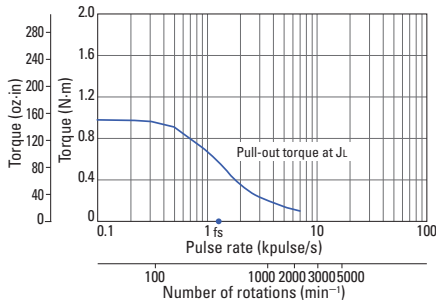
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2$ (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Characteristics diagram

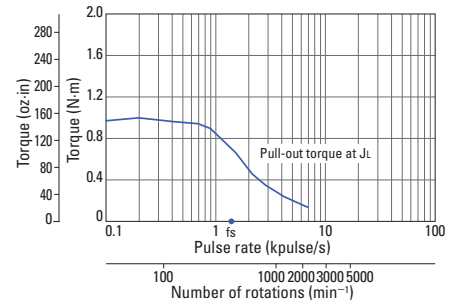
103H7123-5740 103H7123-5710

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



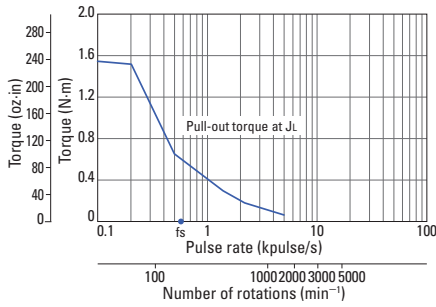
103H7123-5840 103H7123-5810

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



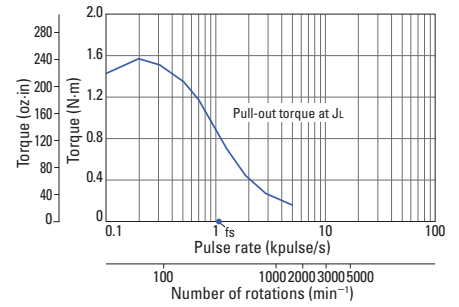
103H7126-5640 103H7126-5610

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



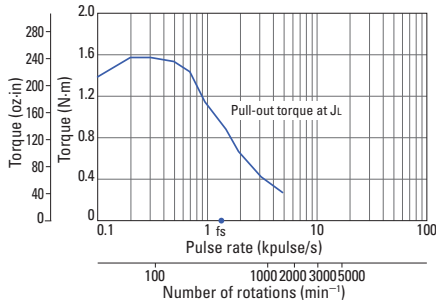
103H7126-5740 103H7126-5710

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



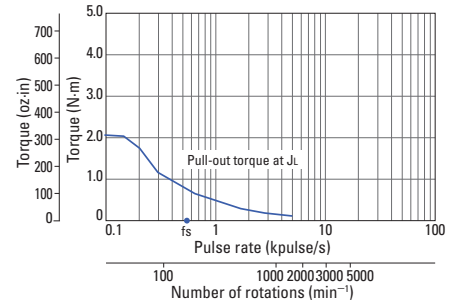
103H7126-5840 103H7126-5810

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



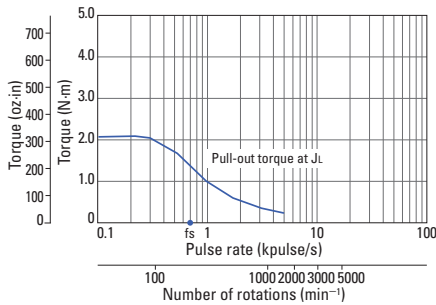
103H7128-5640 103H7128-5610

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



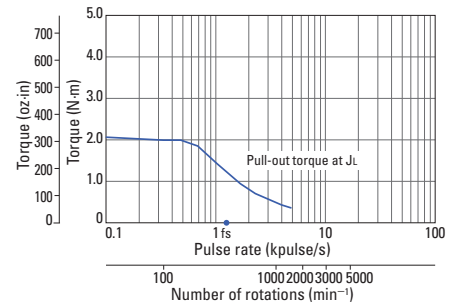
103H7128-5740 103H7128-5710

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

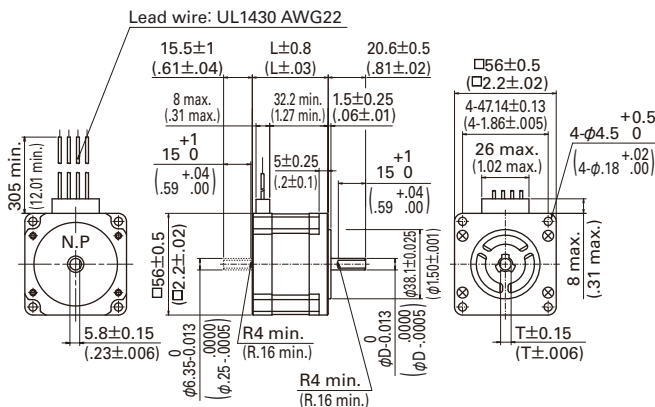


103H7128-5840 103H7128-5810

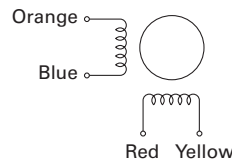
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Driver is not included.
If you require assistance finding a driver, contact us for details.



60 mm sq. (2.36 inch sq.)

0.9° /step RoHS

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type

Customizing

- Hollow Shaft modification
- Decelerator Encoder

Varies depending on the model number and quantity. Contact us for details.

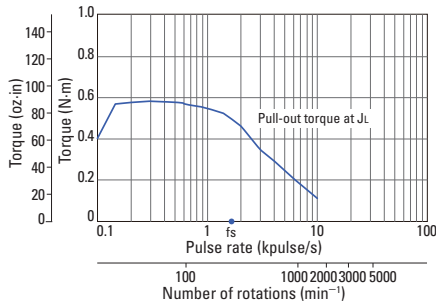
Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)	Shaft diameter (D)	
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω / phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)	mm (in)	
SH1601-0440	SH1601-0410	0.57 (80.71)	2	1.35	2	0.24 (1.312)	0.55 (1.21)	42 (1.65)	0 φ 6.35-0.013 (φ .25-.0005)	
SH1602-0440	SH1602-0410	1.1 (155.77)	2	1.8	3.5	0.4 (2.187)	0.8 (1.76)	54 (2.13)	0 φ 6.35-0.013 (φ .25-.0005)	
SH1603-0440	SH1603-0410	1.7 (240.74)	2	2.3	4.5	0.75 (4.101)	1.2 (2.64)	76 (2.99)	0 φ 8-0.015 (φ .31-.0006)	

Characteristics diagram

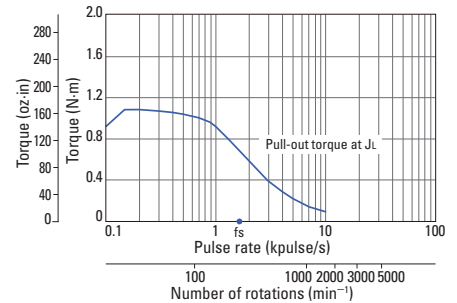
SH1601-0440 SH1601-0410

Constant current circuit
Source voltage: 24 VDC
Operating current: 2 A/phase, 2-phase energization (full-step)
J_s=[0.94 × 10⁻⁴kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



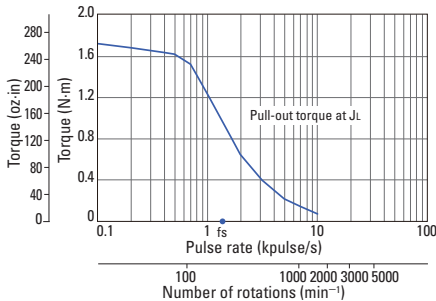
SH1602-0440 SH1602-0410

Constant current circuit
Source voltage: 24 VDC
Operating current: 2 A/phase, 2-phase energization (full-step)
J_s=[2.6 × 10⁻⁴kg·m² (14.22 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded

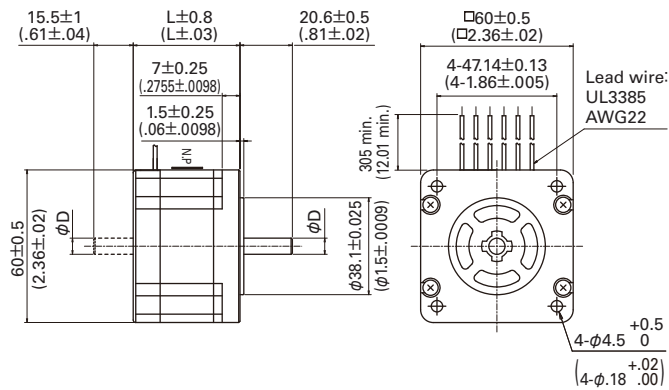


SH1603-0440 SH1603-0410

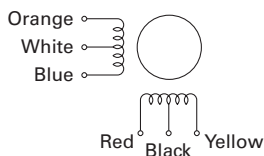
Constant current circuit
Source voltage: 24 VDC
Operating current: 2 A/phase, 2-phase energization (full-step)
J_s=[7.4 × 10⁻⁴kg·m² (40.46 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.

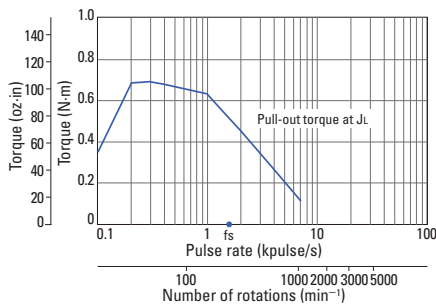
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)	Shaft diameter (D)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω / phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)	mm (in)
SH1601-5240	SH1601-5210	0.69 (97.7)	2	1.2	3.5	0.24 (1.31)	0.55 (1.21)	42 (1.65)	$\begin{matrix} 0 \\ \phi 6.35-0.013 \end{matrix} \left(\begin{matrix} .0000 \\ \phi .25-.0005 \end{matrix} \right)$
SH1602-5240	SH1602-5210	1.28 (181.2)	2	1.65	6.1	0.4 (2.19)	0.8 (1.76)	54 (2.13)	$\begin{matrix} 0 \\ \phi 6.35-0.013 \end{matrix} \left(\begin{matrix} .0000 \\ \phi .25-.0005 \end{matrix} \right)$
SH1603-5240	SH1603-5210	2.15 (304.4)	2	2.3	8.8	0.75 (4.10)	1.2 (2.65)	76 (2.99)	$\begin{matrix} 0 \\ \phi 8-0.015 \end{matrix} \left(\begin{matrix} .0000 \\ \phi .31-.0006 \end{matrix} \right)$

Characteristics diagram

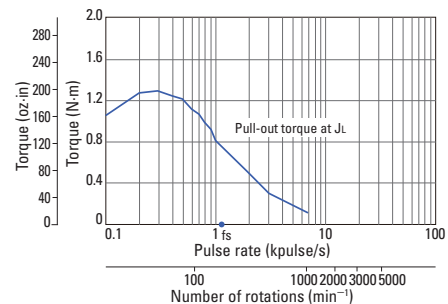
**SH1601-5240
SH1601-5210**

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[0.94 × 10⁻⁴kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



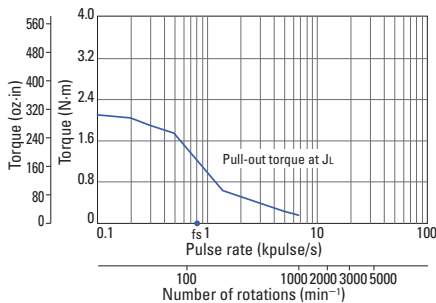
**SH1602-5240
SH1602-5210**

Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[2.6 × 10⁻⁴kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

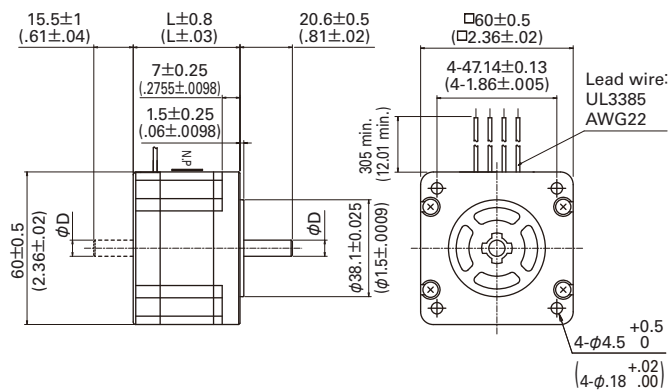


**SH1603-5240
SH1603-5210**

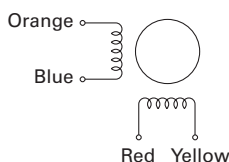
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
J_r=[7.4 × 10⁻⁴kg·m² (40.46
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]

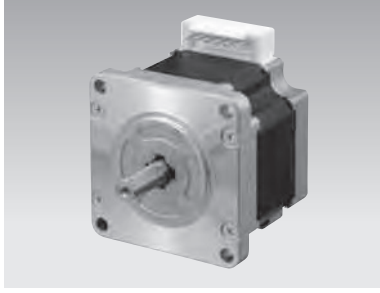


Internal wiring



Compatible drivers

Model number: BS1D200P10 (DC input)
Operating current select switch setting: 0
The characteristics diagram shown above is from our experimental circuit.



60 mm sq. (2.36 inch sq.)

1.8° /step **RoHS**

Unipolar winding, Connector type
Unipolar winding, Lead wire type

Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch)

Bipolar winding, Connector type ▶ p. 76

Bipolar winding, Lead wire type

Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch) ▶ p. 76

Customizing

Hollow **Shaft modification**

Decelerator **Encoder**

Brake

Varies depending on the model number and quantity. Contact us for details.

Unipolar winding, Connector type

Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [$\times 10^{-4}$ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
103H7821-0140	103H7821-0110	0.78 (110.5)	1	5.7	8.3	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
103H7821-0440	103H7821-0410	0.78 (110.5)	2	1.5	2	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
103H7821-0740	103H7821-0710	0.78 (110.5)	3	0.68	0.8	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
103H7822-0140	103H7822-0110	1.17 (165.7)	1	6.9	14	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
103H7822-0440	103H7822-0410	1.17 (165.7)	2	1.8	3.6	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
103H7822-0740	103H7822-0710	1.17 (165.7)	3	0.8	1.38	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
103H7823-0140	103H7823-0110	2.1 (297.4)	1	10	21.7	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)
103H7823-0440	103H7823-0410	2.1 (297.4)	2	2.7	5.6	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)
103H7823-0740	103H7823-0710	2.1 (297.4)	3	1.25	2.4	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)

Motor cable: Model No. 4837798-1

Unipolar winding, Lead wire type Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch)

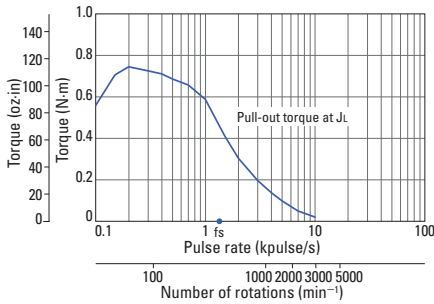
Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [$\times 10^{-4}$ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
103H7821-0160	103H7821-0130	0.78 (110.5)	1	5.7	8.3	0.275 (1.50)	0.6 (1.32)	43.5 (1.71)
103H7821-0460	103H7821-0430	0.78 (110.5)	2	1.5	2	0.275 (1.50)	0.6 (1.32)	43.5 (1.71)
103H7821-0760	103H7821-0730	0.78 (110.5)	3	0.68	0.8	0.275 (1.50)	0.6 (1.32)	43.5 (1.71)
103H7822-0160	103H7822-0130	1.17 (165.7)	1	6.9	14	0.4 (2.19)	0.77 (1.70)	52.5 (2.07)
103H7822-0460	103H7822-0430	1.17 (165.7)	2	1.8	3.6	0.4 (2.19)	0.77 (1.70)	52.5 (2.07)
103H7822-0760	103H7822-0730	1.17 (165.7)	3	0.8	1.38	0.4 (2.19)	0.77 (1.70)	52.5 (2.07)
103H7823-0160	103H7823-0130	2.1 (297.4)	1	10	21.7	0.84 (4.59)	1.34 (2.95)	84.5 (3.33)
103H7823-0460	103H7823-0430	2.1 (297.4)	2	2.7	5.6	0.84 (4.59)	1.34 (2.95)	84.5 (3.33)
103H7823-0760	103H7823-0730	2.1 (297.4)	3	1.25	2.4	0.84 (4.59)	1.34 (2.95)	84.5 (3.33)

Characteristics diagram

103H7821-0140
103H7821-0110

103H7821-0160
103H7821-0130

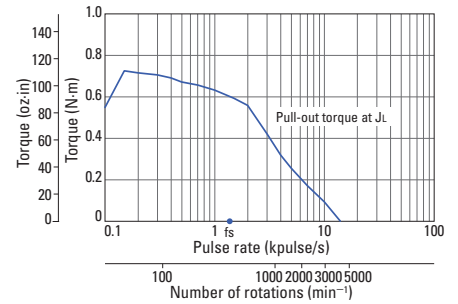
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4}$ kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



103H7821-0440
103H7821-0410

103H7821-0460
103H7821-0430

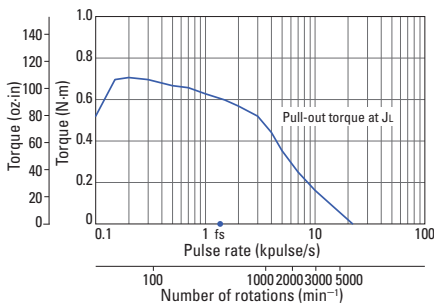
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4}$ kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



103H7821-0740
103H7821-0710

103H7821-0760
103H7821-0730

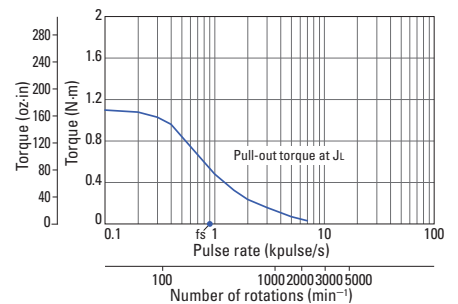
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L = [0.94 \times 10^{-4}$ kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



103H7822-0140
103H7822-0110

103H7822-0160
103H7822-0130

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L = [2.6 \times 10^{-4}$ kg·m² (14.22 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded

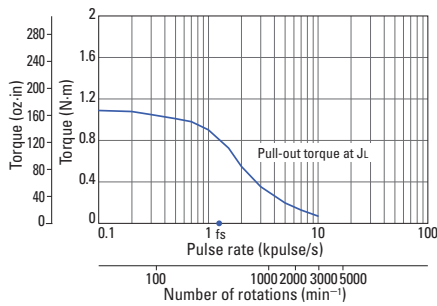


Characteristics diagram

103H7822-0440
103H7822-0410

103H7822-0460
103H7822-0430

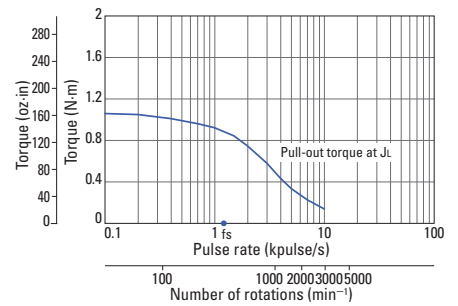
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7822-0740
103H7822-0710

103H7822-0760
103H7822-0730

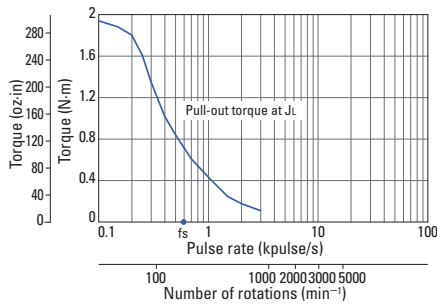
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (14.22
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7823-0140
103H7823-0110

103H7823-0160
103H7823-0130

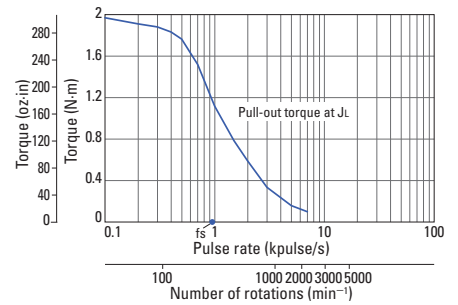
Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7823-0440
103H7823-0410

103H7823-0460
103H7823-0430

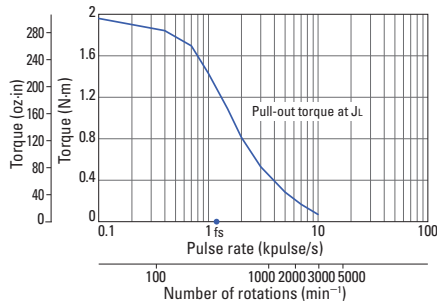
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7823-0740
103H7823-0710

103H7823-0760
103H7823-0730

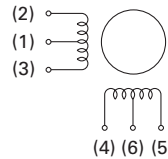
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



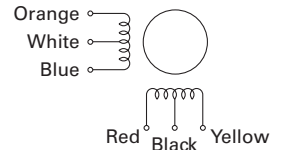
Internal wiring

Connector type

() connector pin number

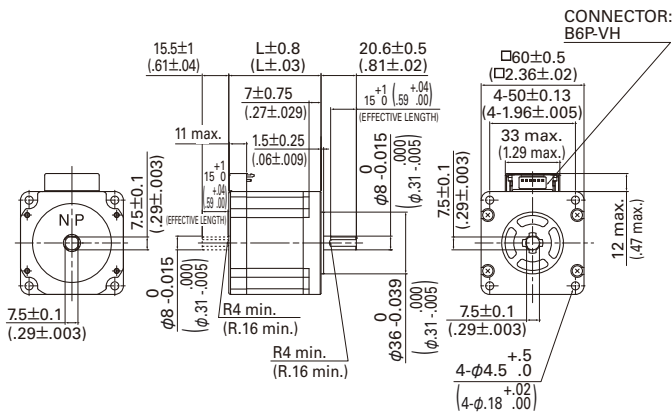


Lead wire type

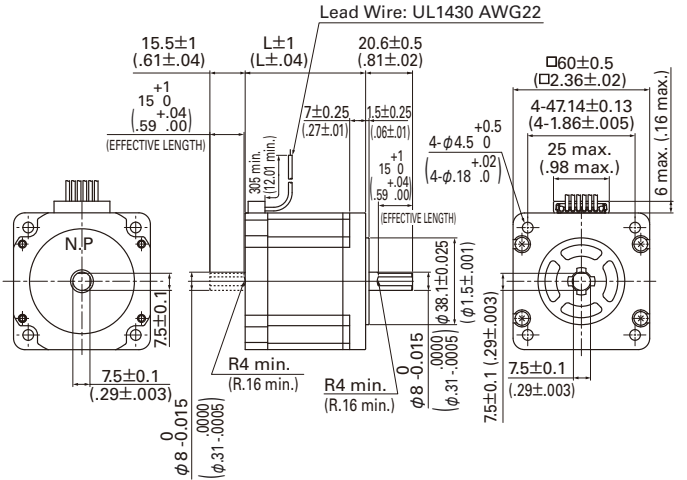


Dimensions [Unit: mm (inch)]

Connector type

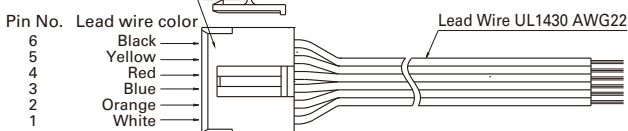


Lead wire type



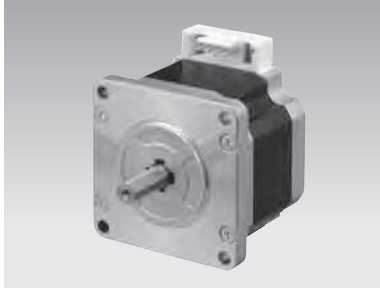
Motor cable Unipolar Model number: 4837798-1

Manufacturer: J.S.T. Mfg. Co., Ltd.
Housing: VHR-6N
Pin: SVH-21T-P1.1



Compatible drivers

- For motor model number 103H782 □ -01 □ 0 (1 A/phase), 103H782 □ -07 □ 0 (3 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For model number 103H782 □ -04 □ 0 (2 A/phase)
Model number: US1D200P10 (DC input)
Operating current select switch setting: 0
The characteristics diagram shown above is from our experimental circuit.



60 mm sq. (2.36 inch sq.)

1.8° /step **RoHS**

Bipolar winding, Connector type

Bipolar winding, Lead wire type

Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch)

Unipolar winding, Connector type ▶ p. 74

Unipolar winding, Lead wire type

Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch) ▶ p. 74

Customizing

Hollow **Shaft modification**

Decelerator **Encoder**

Brake

Varies depending on the model number and quantity. Contact us for details.

Bipolar winding, Connector type

Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [$\times 10^{-4}$ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
103H7821-5740	103H7821-5710	0.88 (124.6)	2	1.27	3.3	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
103H7821-1740	103H7821-1710	0.88 (124.6)	4	0.35	0.8	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
103H7822-5740	103H7822-5710	1.37 (194.0)	2	1.55	5.5	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
103H7822-1740	103H7822-1710	1.37 (194.0)	4	0.43	1.38	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
103H7823-5740	103H7823-5710	2.7 (382.3)	2	2.4	9.5	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)
103H7823-1740	103H7823-1710	2.7 (382.3)	4	0.65	2.4	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)

Motor cable: Model No. 4837961-1

Bipolar winding, Lead wire type Dimensions for attaching NEMA23 are interchangeable (47.14 mm-pitch)

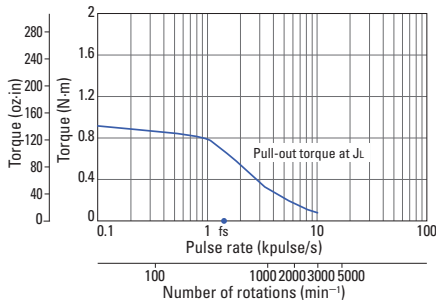
Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [$\times 10^{-4}$ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
103H7821-5760	103H7821-5730	0.88 (124.6)	2	1.27	3.3	0.275 (1.50)	0.6 (1.32)	43.5 (1.71)
103H7821-1760	103H7821-1730	0.88 (124.6)	4	0.35	0.8	0.275 (1.50)	0.6 (1.32)	43.5 (1.71)
103H7822-5760	103H7822-5730	1.37 (194.0)	2	1.55	5.5	0.4 (2.19)	0.77 (1.70)	52.5 (2.07)
103H7822-1760	103H7822-1730	1.37 (194.0)	4	0.43	1.38	0.4 (2.19)	0.77 (1.70)	52.5 (2.07)
103H7823-5760	103H7823-5730	2.7 (382.3)	2	2.4	9.5	0.84 (4.59)	1.34 (2.95)	84.5 (3.33)
103H7823-1760	103H7823-1730	2.7 (382.3)	4	0.65	2.4	0.84 (4.59)	1.34 (2.95)	84.5 (3.33)

Characteristics diagram

103H7821-5740
103H7821-5710

103H7821-5760
103H7821-5730

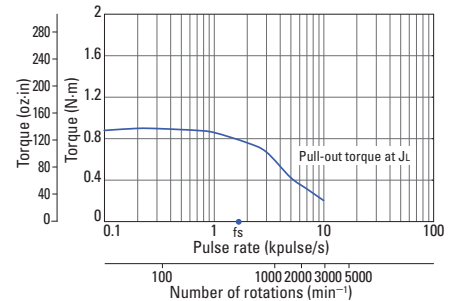
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7821-1740
103H7821-1710

103H7821-1760
103H7821-1730

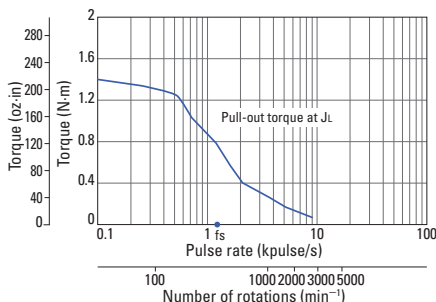
Constant current circuit
Source voltage: 24 VDC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7822-5740
103H7822-5710

103H7822-5760
103H7822-5730

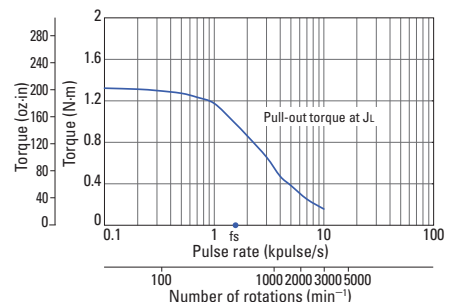
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7822-1740
103H7822-1710

103H7822-1760
103H7822-1730

Constant current circuit
Source voltage: 24 VDC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

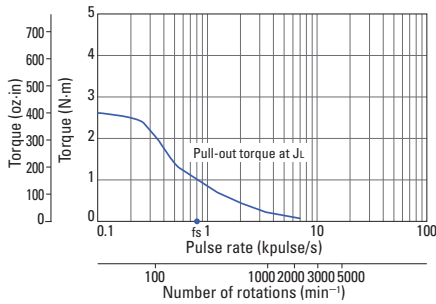


Characteristics diagram

103H7823-5740
103H7823-5710

103H7823-5760
103H7823-5730

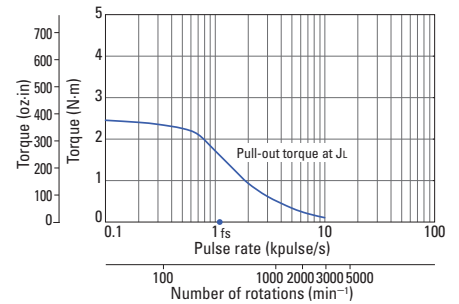
Constant current circuit
Source voltage: 24 VDC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L = 7.4 \times 10^{-4} \text{ kg} \cdot \text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



103H7823-1740
103H7823-1710

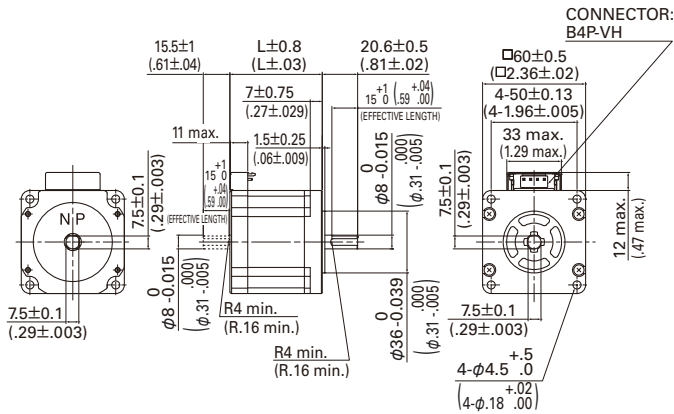
103H7823-1760
103H7823-1730

Constant current circuit
Source voltage: 24 VDC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L = 7.4 \times 10^{-4} \text{ kg} \cdot \text{m}^2$ (40.46
oz-in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

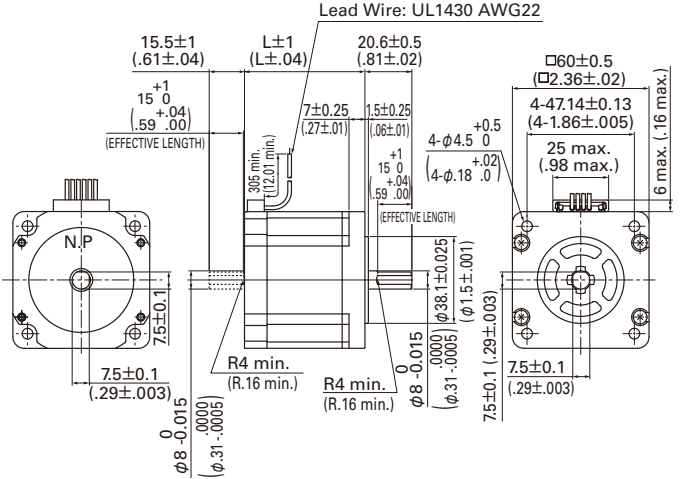


Dimensions [Unit: mm (inch)]

Connector type

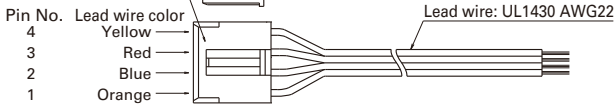


Lead wire type



Motor cable Bipolar Model number: 4837961-1

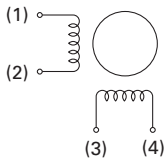
Manufacturer: J.S.T Mfg.Co., Ltd.
Housing: VHR-4N
Pin: SVH-21T-P1.1



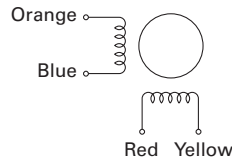
Internal wiring

Connector type

() connector pin number,
terminal block number

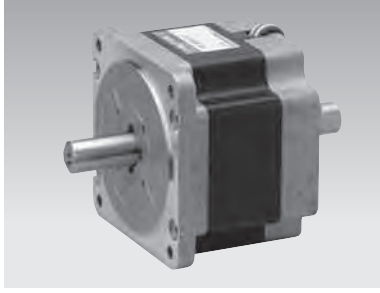


Lead wire type



Compatible drivers

- For motor model number 103H782 □ -17 □ 0 (4 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For motors not listed above (2 A/phase)
Model number: BS1D200P10 (DC input)
Operating current select switch setting: 0



86 mm sq. (3.39 inch sq.)

1.8° /step **RoHS**

Unipolar winding, Lead wire type
 Unipolar winding, Lead wire type CE/UL model
 Bipolar winding, Lead wire type ▶ p. 80
 Bipolar winding, Lead wire type CE/UL model ▶ p. 80
 Bipolar winding, Terminal block type CE/UL model ▶ p. 80

Customizing

Hollow **Shaft modification**
Encoder

Varies depending on the model number and quantity. Contact us for details.

Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SH2861-0441	SH2861-0411	2.5 (354)	2	2.3	8.0	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2861-0941	SH2861-0911	2.5 (354)	4	0.6	2.0	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2862-0441	SH2862-0411	4.7 (665.6)	2	3.2	13.0	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2862-0941	SH2862-0911	4.7 (665.6)	4	0.85	3.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2863-0441	SH2863-0411	6.7 (948.8)	2	4.0	17.0	4.5 (24.6)	4.0 (8.96)	127 (5)
SH2863-0941	SH2863-0911	6.7 (948.8)	4	0.9	4.2	4.5 (24.6)	4.0 (8.96)	127 (5)

Unipolar winding, Lead wire type CE/UL model

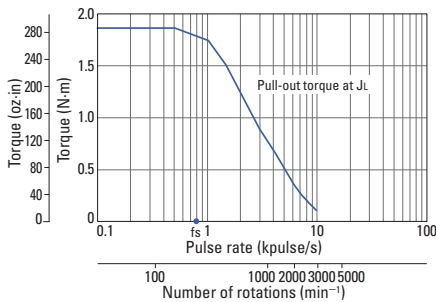
Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
SM2861-0451	SM2861-0421	2.5 (354)	2	2.3	8.0	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2861-0951	SM2861-0921	2.5 (354)	4	0.6	2.0	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2862-0451	SM2862-0421	4.7 (665.6)	2	3.2	13.0	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2862-0951	SM2862-0921	4.7 (665.6)	4	0.85	3.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2863-0451	SM2863-0421	6.7 (948.8)	2	4.0	17.0	4.5 (24.6)	4.0 (8.96)	127 (5)
SM2863-0951	SM2863-0921	6.7 (948.8)	4	0.9	4.2	4.5 (24.6)	4.0 (8.96)	127 (5)

Characteristics diagram

SH2861-0441
SH2861-0411

SM2861-0451
SM2861-0421

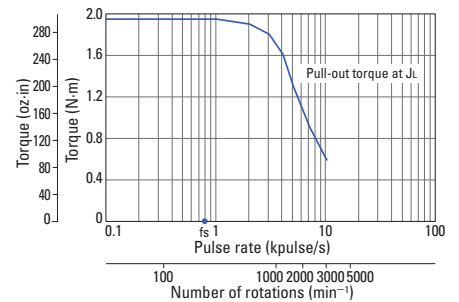
Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 2 A/phase, 2-phase
 energization (full-step)
 $J_L=[7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded



SH2861-0941
SH2861-0911

SM2861-0951
SM2861-0921

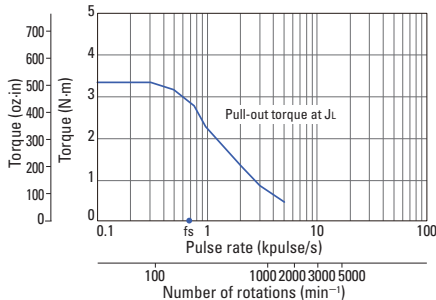
Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 4 A/phase, 2-phase
 energization (full-step)
 $J_L=[7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (40.46
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded



SH2862-0441
SH2862-0411

SM2862-0451
SM2862-0421

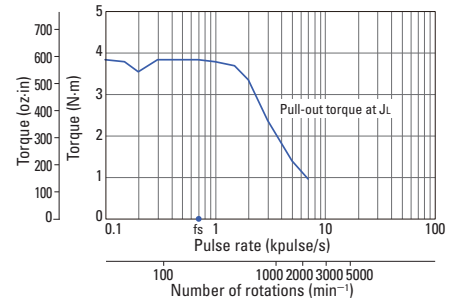
Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 2 A/phase, 2-phase
 energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded



SH2862-0941
SH2862-0911

SM2862-0951
SM2862-0921

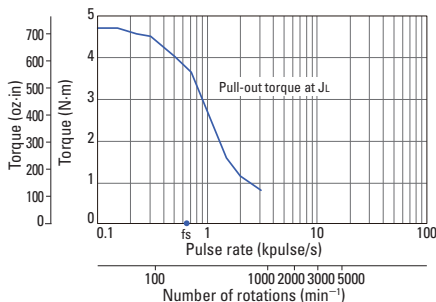
Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 4 A/phase, 2-phase
 energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded



SH2863-0441
SH2863-0411

SM2863-0451
SM2863-0421

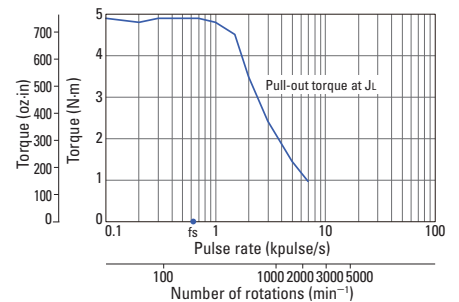
Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 2 A/phase, 2-phase
 energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded



SH2863-0941
SH2863-0911

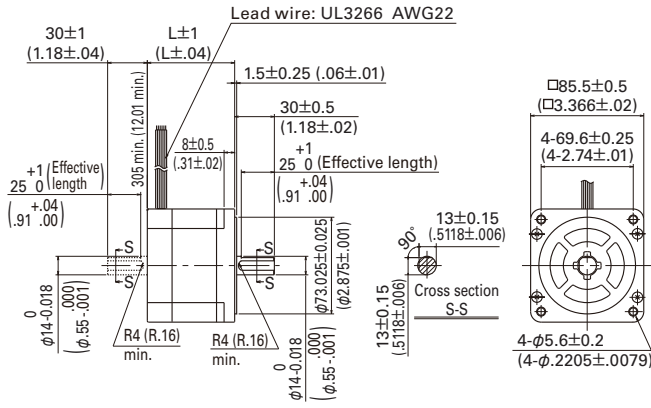
SM2863-0951
SM2863-0921

Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 4 A/phase, 2-phase
 energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
 oz·in²) use the rubber
 coupling]
 fs: Maximum self-start
 frequency when not
 loaded

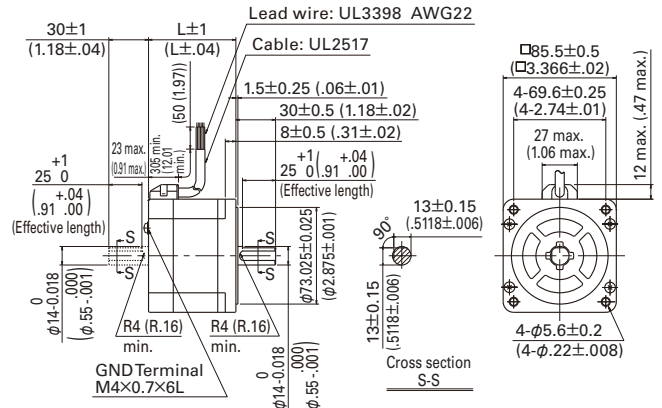


Dimensions [Unit: mm (inch)]

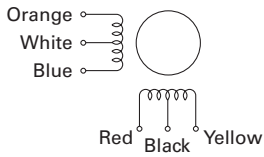
Lead wire type



Lead wire type CE/UL model



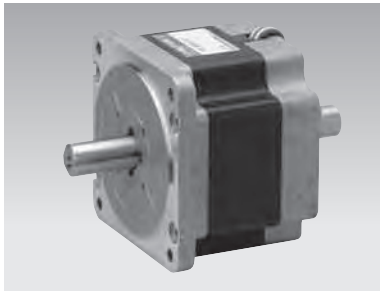
Internal wiring



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



86 mm sq. (3.39 inch sq.)

1.8° /step RoHS

Bipolar winding, Lead wire type
 Bipolar winding, Lead wire type CE/UL model
 Bipolar winding, Terminal block type CE/UL model
 Unipolar winding, Lead wire type ▶ p. 78
 Unipolar winding, Lead wire type CE/UL model ▶ p. 78

Customizing

Hollow Shaft modification
Encoder

Varies depending on the model number and quantity. Contact us for details.

Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [×10 ⁻⁴ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
SH2861-5041	SH2861-5011	3.3 (467.3)	2	2.2	15	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2861-5141	SH2861-5111	3.3 (467.3)	4	0.56	3.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2861-5241	SH2861-5211	3.3 (467.3)	6	0.29	1.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2862-5041	SH2862-5011	6.4 (906.3)	2	3.2	25	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2862-5141	SH2862-5111	6.4 (906.3)	4	0.83	6.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2862-5241	SH2862-5211	6.4 (906.3)	6	0.36	2.8	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2863-5041	SH2863-5011	9 (1274.4)	2	4.0	32	4.5 (24.6)	4.0 (8.96)	127 (5)
SH2863-5141	SH2863-5111	9 (1274.4)	4	1.0	7.9	4.5 (24.6)	4.0 (8.96)	127 (5)
SH2863-5241	SH2863-5211	9 (1274.4)	6	0.46	3.8	4.5 (24.6)	4.0 (8.96)	127 (5)

Bipolar winding, Lead wire type CE/UL model

Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [×10 ⁻⁴ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
SM2861-5051	SM2861-5021	3.3 (467.3)	2	2.2	15	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2861-5151	SM2861-5121	3.3 (467.3)	4	0.56	3.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2861-5251	SM2861-5221	3.3 (467.3)	6	0.29	1.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2862-5051	SM2862-5021	6.4 (906.3)	2	3.2	25	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2862-5151	SM2862-5121	6.4 (906.3)	4	0.83	6.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2862-5251	SM2862-5221	6.4 (906.3)	6	0.36	2.8	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2863-5051	SM2863-5021	9 (1274.4)	2	4.0	32	4.5 (24.6)	4.0 (8.96)	127 (5)
SM2863-5151	SM2863-5121	9 (1274.4)	4	1.0	7.9	4.5 (24.6)	4.0 (8.96)	127 (5)
SM2863-5251	SM2863-5221	9 (1274.4)	6	0.46	3.8	4.5 (24.6)	4.0 (8.96)	127 (5)

Bipolar winding, Terminal block type CE/UL model

Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [×10 ⁻⁴ kg·m ² (oz·in ²)]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
SM2861-5066		3.3 (467.3)	2	2.03	15	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2861-5166		3.3 (467.3)	4	0.52	3.7	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2861-5266		3.3 (467.3)	6	0.27	1.7	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2862-5066		6.4 (906.3)	2	3.08	25	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2862-5166		6.4 (906.3)	4	0.79	6.4	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2862-5266		6.4 (906.3)	6	0.33	2.8	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2863-5066		9 (1274.4)	2	3.83	32	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)
SM2863-5166		9 (1274.4)	4	0.96	7.9	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)
SM2863-5266		9 (1274.4)	6	0.48	3.8	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)

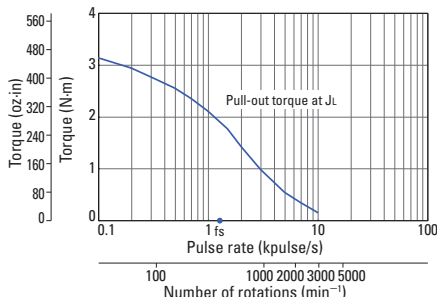
Characteristics diagram

SH2861-5041
SH2861-5011

SM2861-5051
SM2861-5021

SM2861-5066

Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 2 A/phase, 2-phase
 energization (full-step)
 $J_L = [15.3 \times 10^{-4} \text{kg} \cdot \text{m}^2 (83.65 \text{oz} \cdot \text{in}^2)]$ use the rubber
 coupling]
 f_s : Maximum self-start
 frequency when not
 loaded

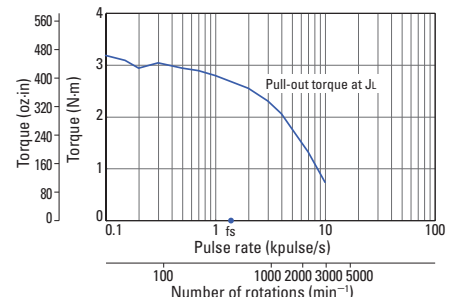


SH2861-5141
SH2861-5111

SM2861-5151
SM2861-5121

SM2861-5166

Constant current circuit
 Source voltage: 100 VAC
 Operating current:
 4 A/phase, 2-phase
 energization (full-step)
 $J_L = [15.3 \times 10^{-4} \text{kg} \cdot \text{m}^2 (83.65 \text{oz} \cdot \text{in}^2)]$ use the rubber
 coupling]
 f_s : Maximum self-start
 frequency when not
 loaded



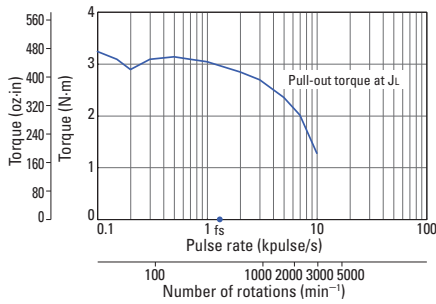
Characteristics diagram

SH2861-5241
SH2861-5211

SM2861-5251
SM2861-5221

SM2861-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

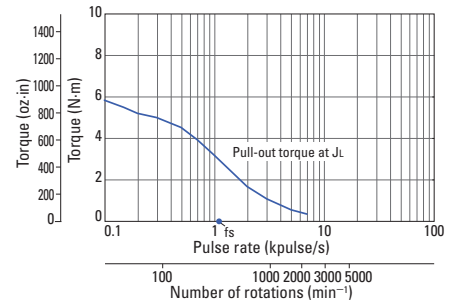


SH2862-5041
SH2862-5011

SM2862-5051
SM2862-5021

SM2862-5066

Constant current circuit
Source voltage: 100 VAC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

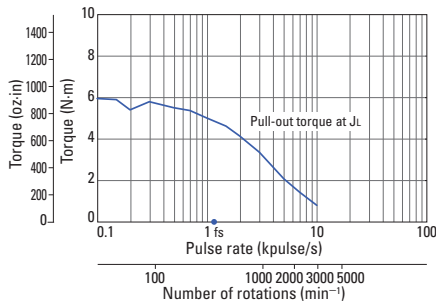


SH2862-5141
SH2862-5111

SM2862-5151
SM2862-5121

SM2862-5166

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

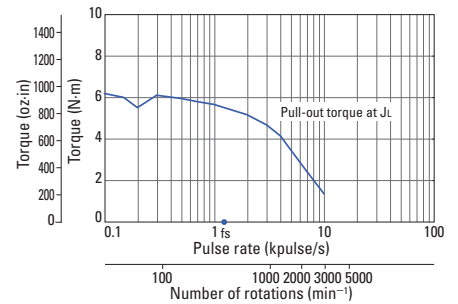


SH2862-5241
SH2862-5211

SM2862-5251
SM2862-5221

SM2862-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
 $J_L=[15.3 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (83.65
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

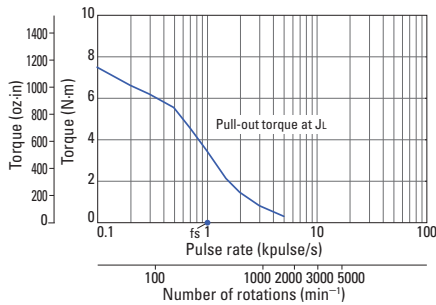


SH2863-5041
SH2863-5011

SM2863-5051
SM2863-5021

SM2863-5066

Constant current circuit
Source voltage: 100 VAC
Operating current:
2 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

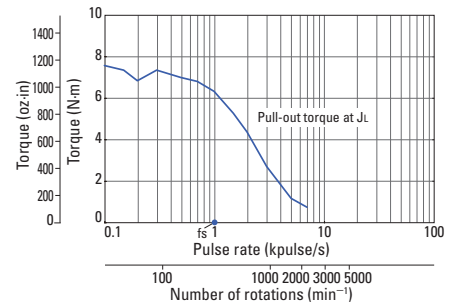


SH2863-5141
SH2863-5111

SM2863-5151
SM2863-5121

SM2863-5166

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

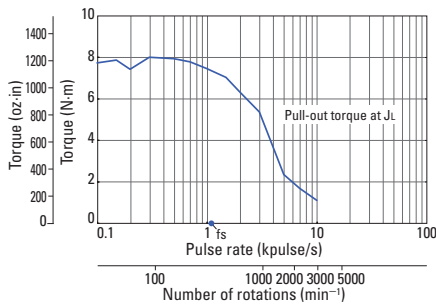


SH2863-5241
SH2863-5211

SM2863-5251
SM2863-5221

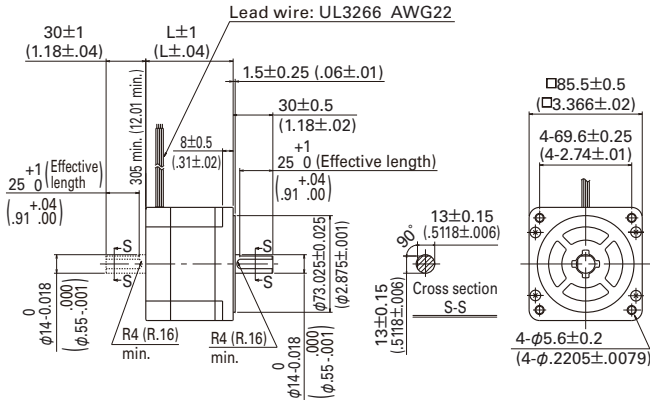
SM2863-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

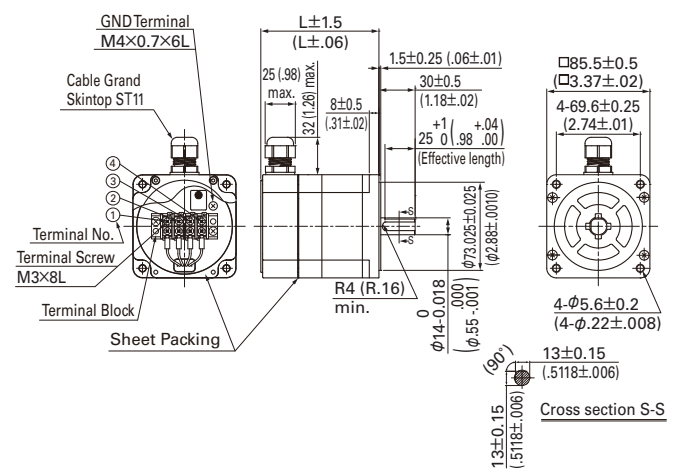


Dimensions [Unit: mm (inch)]

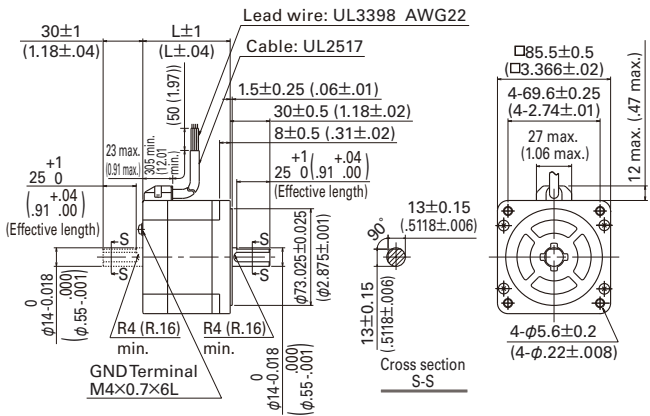
Lead wire type



Terminal block type CE/UL model

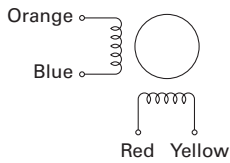


Lead wire type CE/UL model



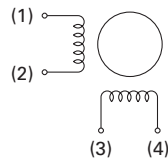
Internal wiring

Lead wire type



Terminal block type

() terminal block number



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



φ 106 mm (φ 4.17 inch)

1.8° /step **RoHS**

Unipolar winding, Lead wire type
Bipolar winding, Lead wire type

Customizing

- Hollow
- Shaft modification
- Brake

Varies depending on the model number and quantity. Contact us for details.

Unipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H89222-0941	103H89222-0911	10.8 (1529.4)	4	0.98	6.3	14.6 (79.83)	7.5 (16.53)	163.3 (6.4)
103H89223-0941	103H89223-0911	15.5 (2194.9)	4	1.4	9.7	22 (120.28)	10.5 (23.15)	221.3 (8.7)

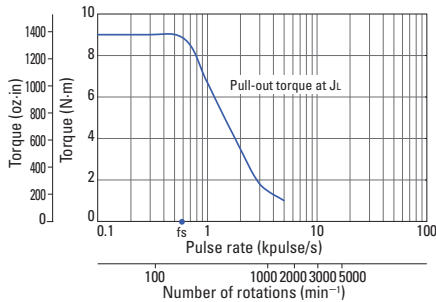
Bipolar winding, Lead wire type

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H89222-5241	103H89222-5211	13.2 (1869.2)	6	0.45	5.4	14.6 (79.83)	7.5 (16.53)	163.3 (6.4)
103H89223-5241	103H89223-5211	19 (2690.5)	6	0.63	8	22 (120.28)	10.5 (23.15)	221.3 (8.7)

Characteristics diagram

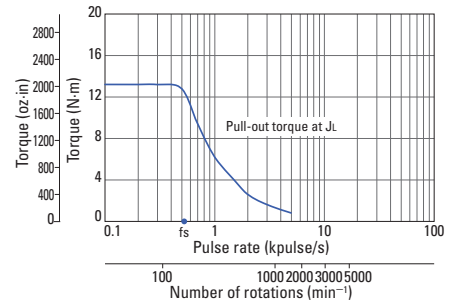
103H89222-0941 103H89222-0911

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



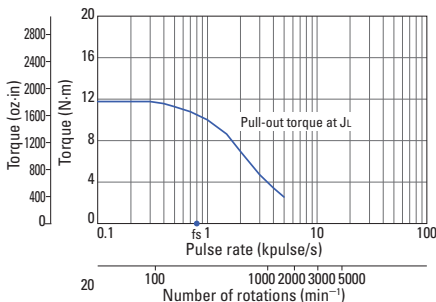
103H89223-0941 103H89223-0911

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



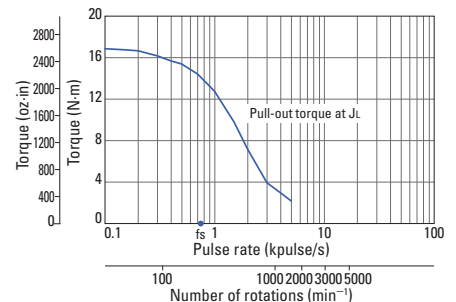
103H89222-5241 103H89222-5211

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

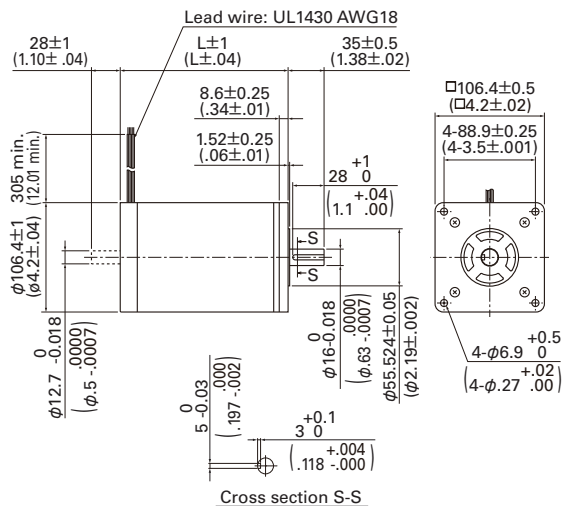


103H89223-5241 103H89223-5211

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
 $J_L=[44 \times 10^{-4} \text{kg}\cdot\text{m}^2$ (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

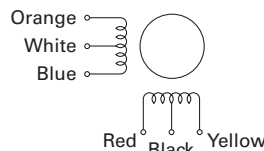


Dimensions [Unit: mm (inch)]

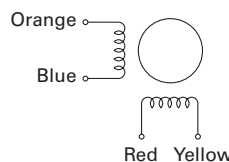


Internal wiring

Unipolar



Bipolar



Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.



56 mm sq. (2.20 inch sq.)

1.8° /step RoHS

Unipolar winding, Lead wire type CE model



Customizing

Hollow Shaft modification

Varies depending on the model number and quantity. Contact us for details.

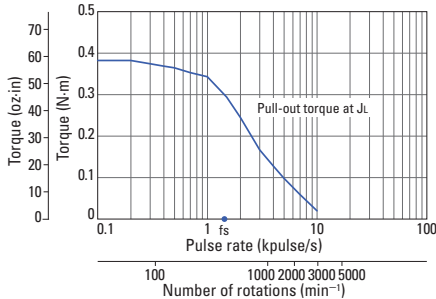
Unipolar winding, Lead wire type CE model

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[$\times 10^{-4}$ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H7121-6140	103H7121-6110	0.39 (55.2)	1	4.8	8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
103H7121-6740	103H7121-6710	0.39 (55.2)	3	0.6	0.8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
103H7123-6140	103H7123-6110	0.83 (117.5)	1	6.7	15	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
103H7123-6740	103H7123-6710	0.78 (110.5)	3	0.77	1.58	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
103H7126-6140	103H7126-6110	1.27 (179.8)	1	8.6	19	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)
103H7126-6740	103H7126-6710	1.27 (179.8)	3	0.9	2.2	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)

Characteristics diagram

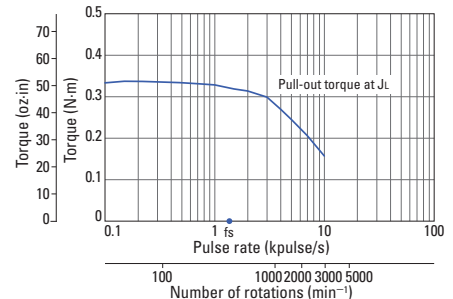
103H7121-6140 103H7121-6110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=0.94 \times 10^{-4}$ kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



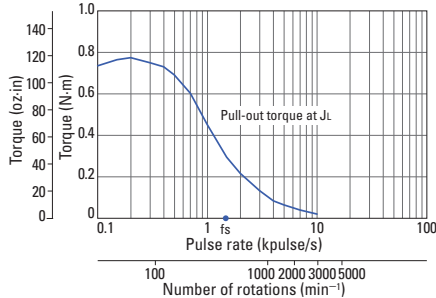
103H7121-6740 103H7121-6710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=0.94 \times 10^{-4}$ kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



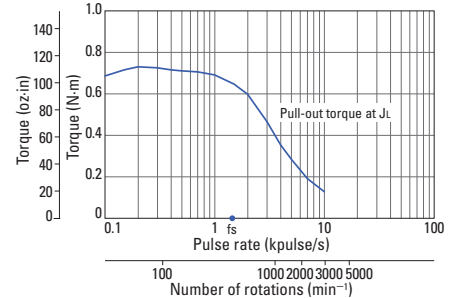
103H7123-6140 103H7123-6110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=0.94 \times 10^{-4}$ kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



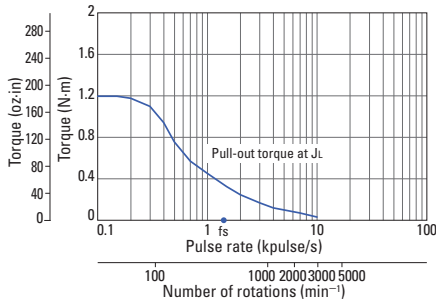
103H7123-6740 103H7123-6710

Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=0.94 \times 10^{-4}$ kg·m² (5.14
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



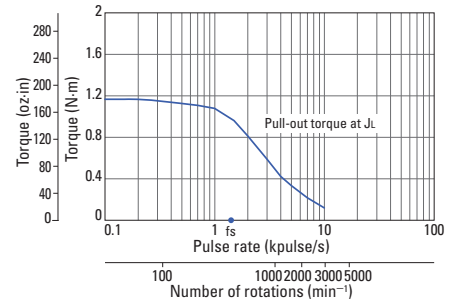
103H7126-6140 103H7126-6110

Constant current circuit
Source voltage: 24 VDC
Operating current:
1 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

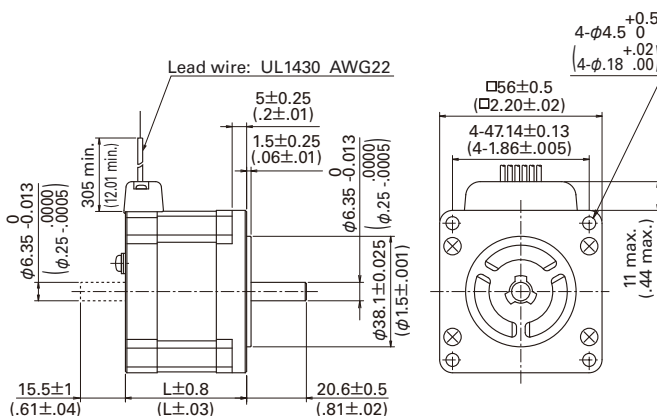


103H7126-6740 103H7126-6710

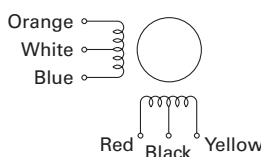
Constant current circuit
Source voltage: 24 VDC
Operating current:
3 A/phase, 2-phase
energization (full-step)
 $J_L=2.6 \times 10^{-4}$ kg·m² (14.22
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

- For motor model number 103H712 □ -67 □ 0 (3 A/phase)
Driver is not included.
If you require assistance finding a driver, contact us for details.
- For motors not listed above (1 A/phase)
Model number: US1D200P10 (DC input)
Operating current select switch setting: A



φ 86 mm (φ 3.39 inch)

1.8° /step **RoHS**

Bipolar winding, Lead wire type CE model



Customizing

Hollow **Shaft modification**

Varies depending on the model number and quantity. Contact us for details.

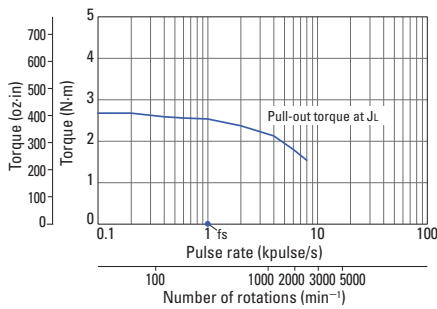
Bipolar winding, Lead wire type CE model

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[× 10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H8221-6240	103H8221-6210	2.74 (388)	6	0.3	1.65	1.45 (7.93)	1.5 (3.31)	62 (3.31)
103H8222-6340	103H8222-6310	5.09 (720.8)	6	0.35	2.7	2.9 (15.86)	2.5 (5.51)	92.2 (5.51)
103H8223-6340	103H8223-6310	7.44 (1053.6)	6	0.45	3.4	4.4 (24.06)	3.5 (7.72)	125.9 (7.72)

Characteristics diagram

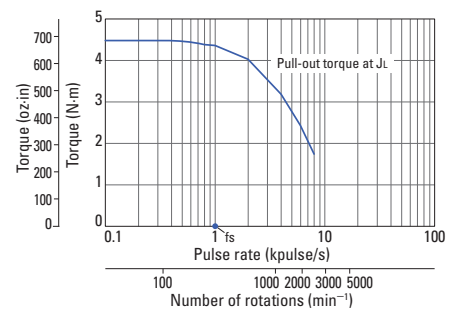
103H8221-6240 103H8221-6210

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[7.4 × 10⁻⁴kg·m² (40.46 oz·in²)] use the rubber coupling]
fs: Maximum self-start frequency when not loaded



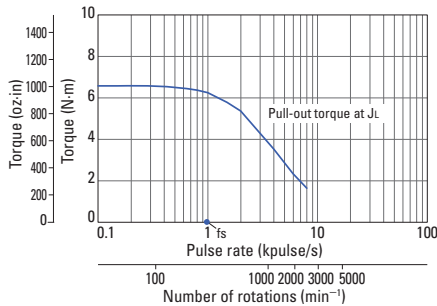
103H8222-6340 103H8222-6310

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10⁻⁴kg·m² (83.65 oz·in²)] use the rubber coupling]
fs: Maximum self-start frequency when not loaded

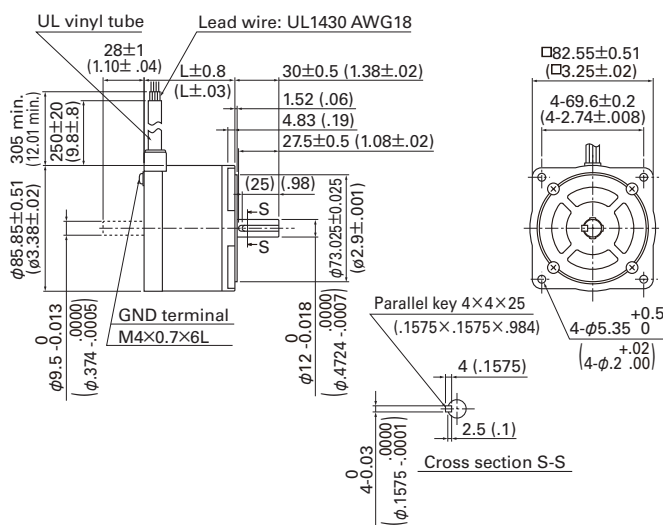


103H8223-6340 103H8223-6310

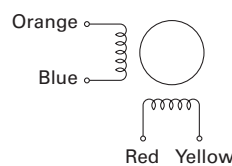
Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[44 × 10⁻⁴kg·m² (240.56 oz·in²)] use the rubber coupling]
fs: Maximum self-start frequency when not loaded



Dimensions [Unit: mm (inch)]



Internal wiring



Compatible drivers

Driver is not included.
If you require assistance finding a driver, contact us for details.



φ 106 mm (φ 4.17 inch)

1.8° /step **RoHS**

Bipolar winding, Lead wire type CE model



Customizing

Hollow **Shaft modification**

Varies depending on the model number and quantity. Contact us for details.

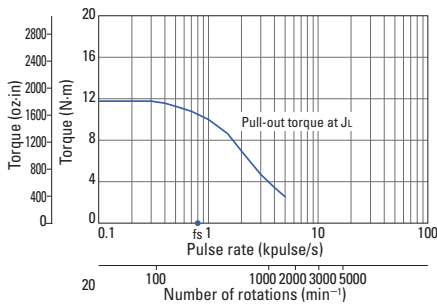
Bipolar winding, Lead wire type CE model

Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	mm (in)
103H89222-6341	103H89222-6311	13.2 (1869.2)	6	0.45	5.4	14.6 (79.83)	7.5 (16.53)	163.3 (6.4)
103H89223-6341	103H89223-6311	19 (2690.5)	6	0.63	8	22 (120.28)	10.5 (23.15)	221.3 (8.7)

Characteristics diagram

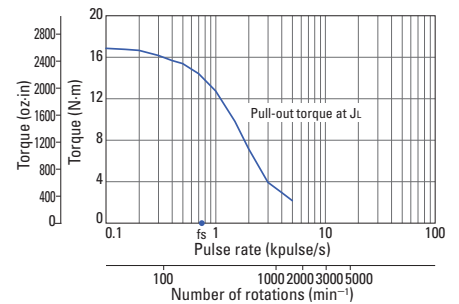
103H89222-6341 103H89222-6311

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
J_r=[44 × 10⁻⁴kg·m² (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded

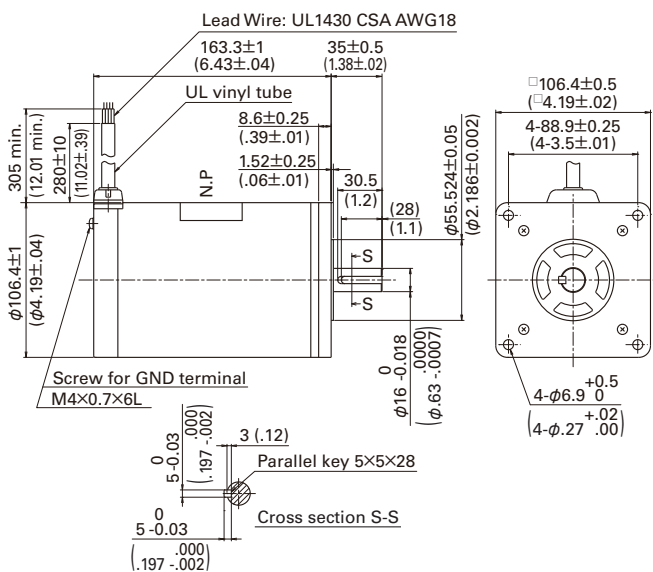


103H89223-6341 103H89223-6311

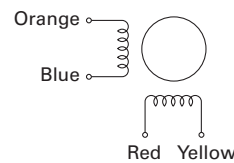
Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase
energization (full-step)
J_r=[44 × 10⁻⁴kg·m² (240.56
oz·in²) use the rubber
coupling]
fs: Maximum self-start
frequency when not
loaded



Dimensions [Unit: mm (inch)]



Internal wiring

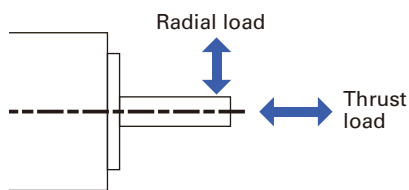


Compatible drivers

Driver is not included.

If you require assistance finding a driver, contact us for details.

Allowable Radial/Thrust Load



Flange size	Model number	Distance from end of shaft : mm (in)				Thrust load N (lbs)
		0	5	10	15	
Radial load : N (lbs)						
14 mm sq. (0.55 in sq.)	SH2141	10 (2.25)	11 (2.47)	13 (2.92)	-	0.7 (0.16)
28 mm sq. (1.10 in sq.)	SH228 □	42 (9)	48 (10)	56 (12)	66 (14)	3 (0.67)
35 mm sq. (1.38 in sq.)	SH353 □	40 (8)	50 (11)	67 (15)	98 (22)	10 (2.25)
42 mm sq. (1.65 in sq.)	103H52 □□ SH142 □	22 (4)	26 (5)	33 (7)	46 (10)	10 (2.25)
50 mm sq. (1.97 in sq.)	103H670 □	71 (15)	87 (19)	115 (25)	167 (37)	15 (3.37)
56 mm sq. (2.20 in sq.)	103H712 □	52 (11)	65 (14)	85 (19)	123 (27)	15 (3.37)
	103H7128	85 (19)	105 (23)	138 (31)	200 (44)	15 (3.37)
60 mm sq. (2.36 in sq.)	103H782 □	70 (15)	87 (19)	114 (25)	165 (37)	20 (4.50)
	SH160 □					15 (3.37)
86 mm sq. (3.39 in sq.)	SM286 □	167 (37)	193 (43)	229 (51)	280 (62)	60 (13.488)
	SH286 □					
86 mm sq. (3.39 in sq.)	103H822 □	191 (43)	234 (53)	301 (68)	421 (95)	60 (13.488)
φ 106 mm (φ 4.17 in)	103H8922 □	321 (72)	356 (79)	401 (90)	457 (101)	100 (22.48)

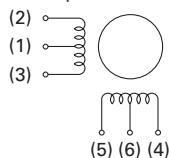
Internal Wiring and Rotation Direction

Unipolar winding

Connector type Model number: 103H52 □□

Internal wire connection

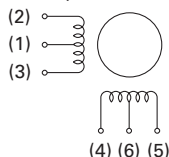
() connector pin number



Connector type Model number: 103H782 □□

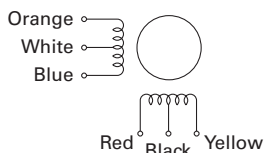
Internal wire connection

() connector pin number



Lead wire type

Internal wire connection



Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Connector pin number				
	(1.6)	(5)	(3)	(4)	(2)
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Connector pin number				
	(1.6)	(4)	(3)	(5)	(2)
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

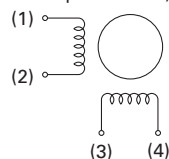
Exciting order	Lead wire color				
	White & black	Red	Blue	Yellow	Orange
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Bipolar winding

Connector type

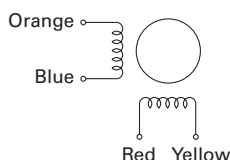
Internal wire connection

() connector pin number, terminal block number



Lead wire type

Internal wire connection



Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Connector pin number, terminal block number			
	(3)	(2)	(4)	(1)
1	-	-	+	+
2	+	-	-	+
3	+	+	-	-
4	-	+	+	-

Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

Exciting order	Lead wire color			
	Red	Blue	Yellow	Orange
1	-	-	+	+
2	+	-	-	+
3	+	+	-	-
4	-	+	+	-

General Specifications

Motor model number	SH2141	SH228 □	SH353 □	SS242 □	SH142 □	103H52 □□	SS250 □	103H67 □□	103H712 □
Type	-								
Operating ambient temperature	- 10°C to + 50°C								
Conversation temperature	- 20°C to + 65°C								
Operating ambient humidity	20 to 90% RH (no condensation)								
Conversation humidity	5 to 95% RH (no condensation)								
Operation altitude	1000 m (3281 feet) max. above sea level								
Vibration resistance	Vibration frequency 10 to 500 Hz, total amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s ² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.								
Impact resistance	500 m/s ² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.								
Insulation class	Class B (+130°C)								
Withstandable voltage	At normal temperature and humidity, no failure with 500 VAC @50/60 Hz applied for one minute between motor winding and frame.						At normal temperature and humidity, no failure with 1000 VAC @50/60 Hz applied for one minute between motor winding and frame.		
Insulation resistance	At normal temperature and humidity, not less than 100 MΩ between winding and frame by 500 VDC megger.								
Protection grade	IP40								
Winding temperature rise	80 K max. (Based on Sanyo Denki standard)								
Static angle error	± 0.09°				± 0.054°		± 0.09°		
Thrust play *1	0.075 mm (0.003 in) max. (load: 0.35 N (0.08 lbs))	0.075 mm (0.003 in) max. (load: 1.5 N (0.34 lbs))	0.075 mm (0.003 in) max. (load: 5 N (1.12 lbs))	0.075 mm (0.003 in) max. (load: 4 N (0.9 lbs))	0.075 mm (0.003 in) max. (load: 5 N (1.12 lbs))	0.075 mm (0.003 in) max. (load: 5 N (1.12 lbs))	0.075 mm (0.003 in) max. (load: 4 N (0.9 lbs))	0.075 mm (0.003 in) max. (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) max. (load: 10 N (2.25 lbs))
Radial play *2	0.025 mm (0.001 in) max. (load: 5 N (1.12 lbs))								
Shaft runout	0.025 mm (0.001 in)								
Concentricity of mounting pilot relative to shaft	φ 0.05 mm (φ 0.002 in)	φ 0.05 mm (φ 0.002 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)	φ 0.05 mm (φ 0.002 in)	φ 0.05 mm (φ 0.002 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)	φ 0.075 mm (φ 0.003 in)
Squareness of mounting surface relative to shaft	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	0.075 mm (0.003 in)	0.075 mm (0.003 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally								

Motor model number	SH160 □	103H78 □□	SH286 □	103H8922 □	SM286 □	103H712 □ -6 □□ 0 CE Model	103H822 □ -6 □□ 0 CE Model	103H8922 □ -63 □ 1 CE Model	
Type	-				S1 (continuous operation)				
Operating ambient temperature	- 10°C to + 50°C				- 10°C to + 40°C				
Conversation temperature	- 20°C to + 65°C				- 20°C to + 60°C				
Operating ambient humidity	20 to 90% RH (no condensation)				95% max.: 40°C max., 57% max.: 50°C max., 35% max.: 60°C max. (no condensation)				
Conversation humidity	5 to 95% RH (no condensation)								
Operation altitude	1000 m (3280 feet) max. above sea level								
Vibration resistance	Vibration frequency 10 to 500 Hz, total amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s ² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.								
Impact resistance	500 m/s ² of acceleration for 11 ms with half-sine wave applying three times for X, Y and Z axes each, 18 times in total.								
Insulation class	Class B (+130°C)				Class F (+155°C)		Class B (+130°C)		
Withstandable voltage	At normal temperature and humidity, no failure with 1000 VAC @50/60 Hz applied for one minute between motor winding and frame.				At normal temperature and humidity, no failure with 1500 VAC @50/60 Hz applied for one minute between motor winding and frame.				
Insulation resistance	At normal temperature and humidity, not less than 100 MΩ between winding and frame by 500 VDC megger.								
Protection grade	IP40				IP43				
Winding temperature rise	80 K max. (Based on Sanyo Denki standard)								
Static angle error	± 0.054°		± 0.09°						
Thrust play *1	0.075 mm (0.003 in) max. (load: 10 N (2.25 lbs))								
Radial play *2	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 10 N (2.25 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 5 N (1.12 lbs))	0.025 mm (0.001 in) (load: 10 N (2.25 lbs))	
Shaft runout	0.025 mm (0.001 in)								
Concentricity of mounting pilot relative to shaft	φ 0.075 mm (φ 0.003 in)								
Squareness of mounting surface relative to shaft	0.1 mm (0.004 in)	0.075 mm (0.003 in)	0.15 mm (0.006 in)	0.1 mm (0.004 in)	0.15 mm (0.006 in)	0.075 mm (0.003 in)	0.1 mm (0.004 in)	0.1 mm (0.004 in)	
Direction of motor mounting	Can be freely mounted vertically or horizontally								

*1 Thrust play: Shaft displacement under axial load.

*2 Radial play: Shaft displacement under radial load applied 1/3rd of the length from the end of the shaft.

Safety standards

Model Number: SM286 □ CE/UL marked models

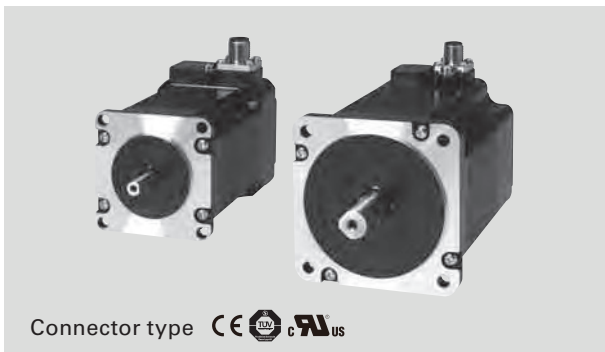
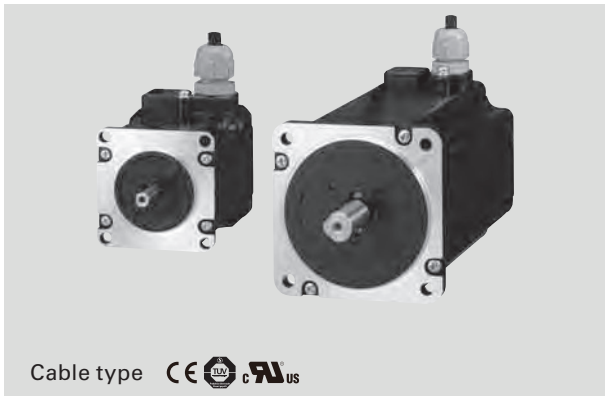
CE (TÜV)	Standard category		Applicable standard
	Low-voltage directives		EN60034-1, EN60034-5
UL	Acquired standards	Applicable standard	File No.
	UL	UL1004-1, UL1004-6	E179832
	UL for Canada	CSA C22.2 No.100	

Model Number: 103H712 □ -6 □□ 0, 103H822 □ -6 □□ 0, 103H8922 □ -63 □ 1 CE marked model

CE (TÜV)	Standard category		Applicable standard
	Low-voltage directives		EN60034-1, EN60034-5

IP65 Splash and Dust Proof Stepping Motors

Waterproof, dustproof



Features

- These IP65 rated motors* have superior water and dust resistance, and can be safely utilized in harsh or wet environments such as in food processing machines.

*Except for the shaft and the cable end.

- The input voltage range of the motors is up to 250 VAC.
- Brake, encoder, and oil seal can be combined.

Safety standards

CE/UL-certified.

Specifications

	56 mm sq. (2.20 in sq.)	86 mm sq. (3.39 in sq.)
Motor model number	SP256 □ -5 □ 60	SP286 □ -5 □ 60
Type	S1 (continuous operation)	
Operating ambient temperature	- 10°C to + 40°C	
Conversation temperature	- 20°C to + 60°C	
Operating ambient humidity	95% max.: 40°C max., 57% max.: 50°C max.	
Conversation humidity	35% max.: 60°C max. (no condensation)	
Operation altitude	1000 m (3281 feet) max. above sea level	
Vibration resistance	Vibration frequency 10 to 500 Hz, total amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s ² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.	
Impact resistance	500 m/s ² of acceleration for 11 ms with half-sine wave applying three times for X, Y and Z axes each, 18 times in total.	
Insulation class	Class F (+155°C)	
Withstandable voltage	At normal temperature and humidity, no failure with 1500 VAC @50/60 Hz applied for one minute between motor winding and frame.	
Insulation resistance	At normal temperature and humidity, not less than 100 MΩ between winding and frame by 500 VDC megger.	
Protection grade	IP65 (Except for the shaft and the cable end)	
Winding temperature rise	100 K max. (Based on Sanyo Denki standard)	
Static angle error	± 0.054°	± 0.09°
Thrust play	0.075 mm (0.003 in) max. (load: 10 N (2.25 lbs))	
Radial play	0.025 mm (0.001 in) max. (load: 5 N (1.12 lbs))	
Shaft runout	0.025 mm (0.001 in)	
Concentricity of mounting pilot relative to shaft	φ 0.075 mm (φ 0.003 in)	
Squareness of mounting surface relative to shaft	0.1 mm (0.004 in)	0.15 mm (0.006 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally	

Safety standards

CE	Standard category	Applicable standard	
	Low-voltage directives	EN60034-1, EN60034-5	
UL	Acquired standards	Applicable standard	File No.
	UL	UL1004-1, UL1004-6	E179832
	UL for Canada (c-UL)	CSA C22.2 No.100	

Model no. differs when the motor is equipped with a brake or oil seal.

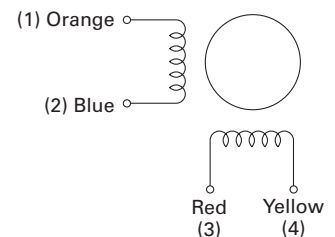
Model no. and vibration resistance levels differ when the motor is equipped with a brake or oil seal.

Internal wiring and rotation direction

Bipolar winding

Internal wire connection

() : connector pin number



Direction of motor rotation

The output shaft rotates clockwise as seen from the shaft side, when excited by DC in the following order.

Lead wire color	Red	Blue	Yellow	Orange
Connector pin number	3	2	4	1
Exciting order	1	-	-	+
	2	+	-	+
	3	+	+	-
	4	-	+	-

56 mm sq. (2.20 inch sq.)

1.8° /step RoHS

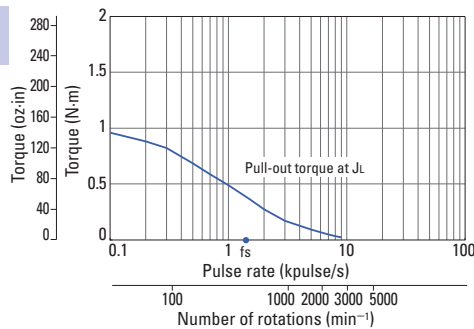
Bipolar winding

Model number		Holding torque at 2-phase energization	Rated current	Winding resistance	Winding inductance	Rotor inertia	Mass (Weight)	Allowable thrust load	Allowable radial load
Cable type	Connector type	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10 ⁻⁴ kg·m ² (oz·in ²)]	[kg (lbs)]	N (lbs)	N (lbs)
SP2563-5060	SP2563-5000	1 (141.6)	1	5.8	29	0.21 (1.15)	0.9 (2)	15 (3.37)	52 (11.69)
SP2563-5160	SP2563-5100	1 (141.6)	2	1.5	7.3	0.21 (1.15)	0.9 (2)	15 (3.37)	52 (11.69)
SP2563-5260	SP2563-5200	1 (141.6)	3	0.75	3.4	0.21 (1.15)	0.9 (2)	15 (3.37)	52 (11.69)
SP2566-5060	SP2566-5000	1.7 (240.7)	1	7.8	35.4	0.36 (1.97)	1.2 (2.65)	15 (3.37)	23 (5.17)
SP2566-5160	SP2566-5100	1.7 (240.7)	2	2	9.2	0.36 (1.97)	1.2 (2.65)	15 (3.37)	23 (5.17)
SP2566-5260	SP2566-5200	1.7 (240.7)	3	1	4.4	0.36 (1.97)	1.2 (2.65)	15 (3.37)	23 (5.17)

* The model no., rotor inertia and mass differ when the motor is equipped with brake, encoder or oil seal.

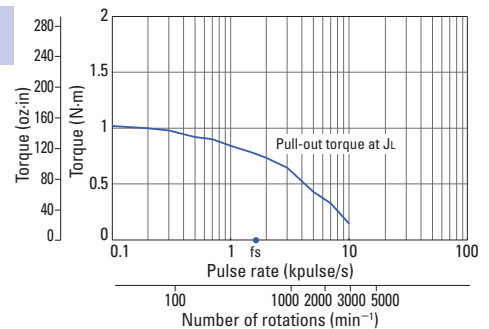
Characteristics diagram

SP2563-5000
SP2563-5060



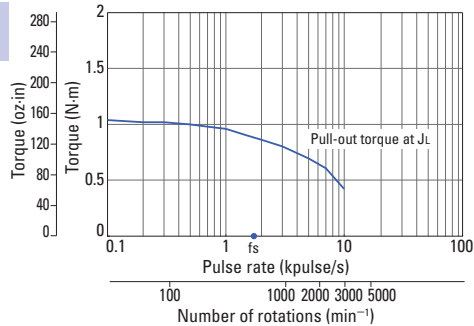
Constant current circuit
Source voltage: 100 VAC
Operating current: 1 A/phase, 2-phase energization (full-step)
 $J_t = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

SP2563-5100
SP2563-5160



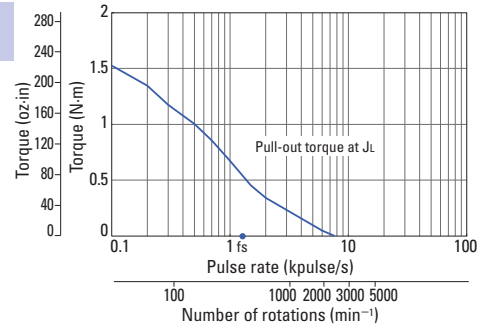
Constant current circuit
Source voltage: 100 VAC
Operating current: 2 A/phase, 2-phase energization (full-step)
 $J_t = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

SP2563-5200
SP2563-5260



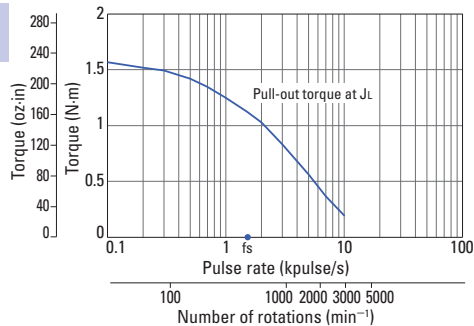
Constant current circuit
Source voltage: 100 VAC
Operating current: 3 A/phase, 2-phase energization (full-step)
 $J_t = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

SP2566-5000
SP2566-5060



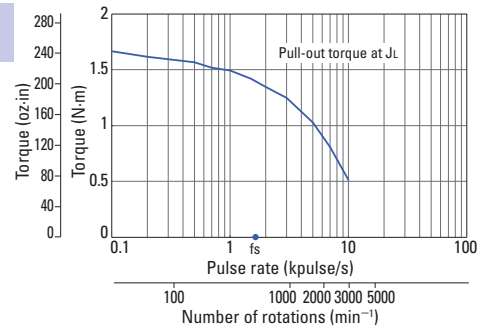
Constant current circuit
Source voltage: 100 VAC
Operating current: 1 A/phase, 2-phase energization (full-step)
 $J_t = [7.4 \times 10^{-4} \text{kg} \cdot \text{m}^2 (40.46 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

SP2566-5100
SP2566-5160



Constant current circuit
Source voltage: 100 VAC
Operating current: 2 A/phase, 2-phase energization (full-step)
 $J_t = [7.4 \times 10^{-4} \text{kg} \cdot \text{m}^2 (40.46 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

SP2566-5200
SP2566-5260



Constant current circuit
Source voltage: 100 VAC
Operating current: 3 A/phase, 2-phase energization (full-step)
 $J_t = [7.4 \times 10^{-4} \text{kg} \cdot \text{m}^2 (40.46 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
fs: Maximum self-start frequency when not loaded

86 mm sq. (3.39 inch sq.)

1.8° /step **RoHS**

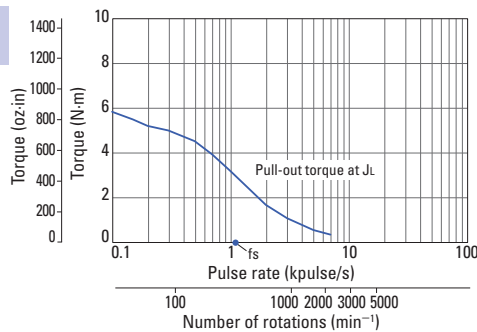
Bipolar winding

Model number		Holding torque at 2-phase energization	Rated current	Winding resistance	Winding inductance	Rotor inertia	Mass (Weight)	Allowable thrust load	Allowable radial load
Cable type	Connector type	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[$\times 10^{-4}$ kg·m ² (oz·in ²)]	[kg (lbs)]	N (lbs)	N (lbs)
SP2862-5060	SP2862-5000	6.4 (906.3)	2	3.2	25	3 (16.4)	3.1 (6.8)	60 (13.49)	200 (44.96)
SP2862-5160	SP2862-5100	6.4 (906.3)	4	0.85	6.4	3 (16.4)	3.1 (6.8)	60 (13.49)	200 (44.96)
SP2862-5260	—	6.4 (906.3)	6	0.41	2.8	3 (16.4)	3.1 (6.8)	60 (13.49)	200 (44.96)
SP2863-5060	SP2863-5000	9 (1274.5)	2	4	32	4.5 (24.6)	4.2 (9.3)	60 (13.49)	200 (44.96)
SP2863-5160	SP2863-5100	9 (1274.5)	4	1.05	7.9	4.5 (24.6)	4.2 (9.3)	60 (13.49)	200 (44.96)
SP2863-5260	—	9 (1274.5)	6	0.53	3.8	4.5 (24.6)	4.2 (9.3)	60 (13.49)	200 (44.96)

- The model no., rotor inertia and mass differ when the motor is equipped with brake, encoder or oil seal.
- The rated current of the motor with the connector is 4 A or less.

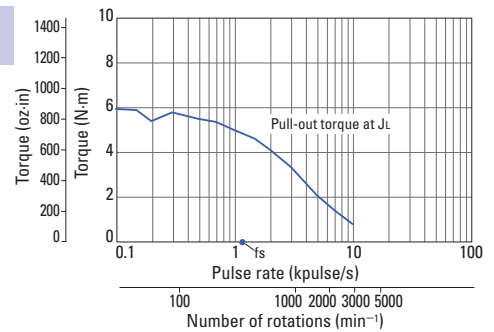
Characteristics diagram

SP2862-5000
SP2862-5060



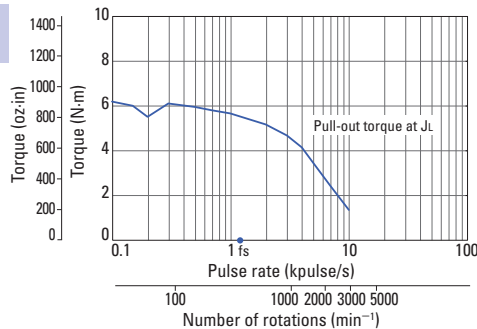
Constant current circuit
Source voltage: 100 VAC
Operating current: 2 A/phase, 2-phase energization (full-step)
 $J_t = [15.3 \times 10^{-4} \text{kg} \cdot \text{m}^2 (83.65 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

SP2862-5100
SP2862-5160



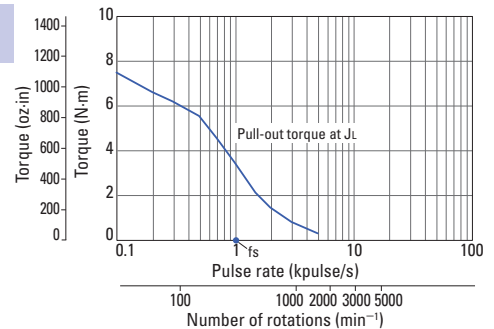
Constant current circuit
Source voltage: 100 VAC
Operating current: 4 A/phase, 2-phase energization (full-step)
 $J_t = [15.3 \times 10^{-4} \text{kg} \cdot \text{m}^2 (83.65 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

SP2862-5260



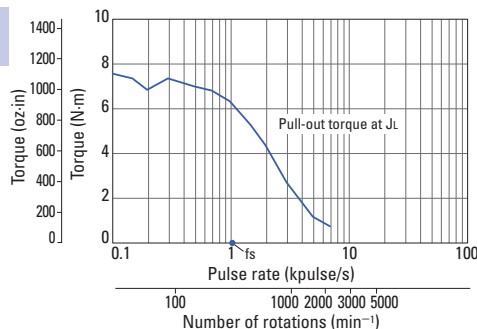
Constant current circuit
Source voltage: 100 VAC
Operating current: 6 A/phase, 2-phase energization (full-step)
 $J_t = [15.3 \times 10^{-4} \text{kg} \cdot \text{m}^2 (83.65 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

SP2863-5000
SP2863-5060



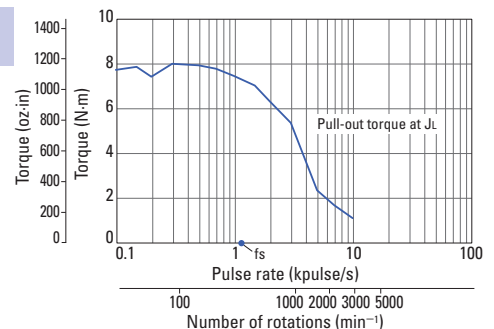
Constant current circuit
Source voltage: 100 VAC
Operating current: 2 A/phase, 2-phase energization (full-step)
 $J_t = [44 \times 10^{-4} \text{kg} \cdot \text{m}^2 (240.56 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

SP2863-5100
SP2863-5160



Constant current circuit
Source voltage: 100 VAC
Operating current: 4 A/phase, 2-phase energization (full-step)
 $J_t = [44 \times 10^{-4} \text{kg} \cdot \text{m}^2 (240.56 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

SP2863-5260

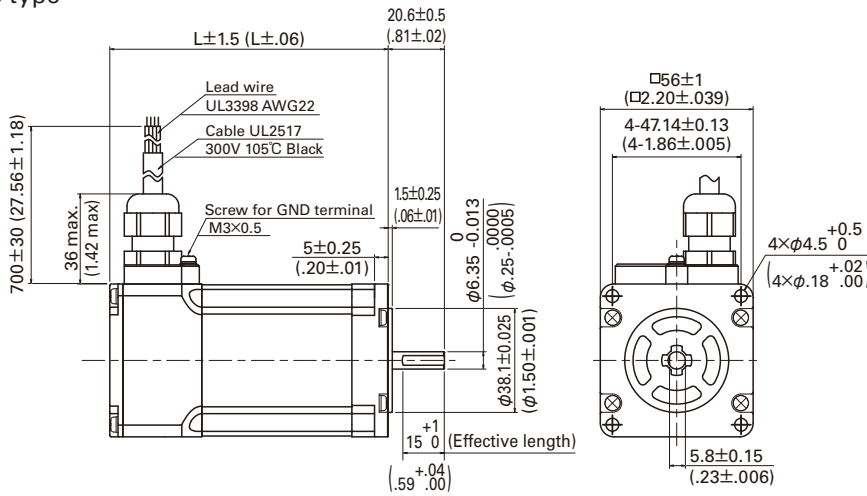


Constant current circuit
Source voltage: 100 VAC
Operating current: 6 A/phase, 2-phase energization (full-step)
 $J_t = [44 \times 10^{-4} \text{kg} \cdot \text{m}^2 (240.56 \text{oz} \cdot \text{in}^2)]$ use the rubber coupling]
 f_s : Maximum self-start frequency when not loaded

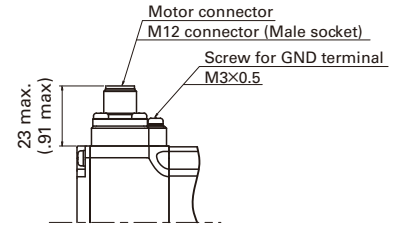
Dimensions [Unit: mm (inch)]

56 mm sq. (2.20 inch sq.)

Cable type



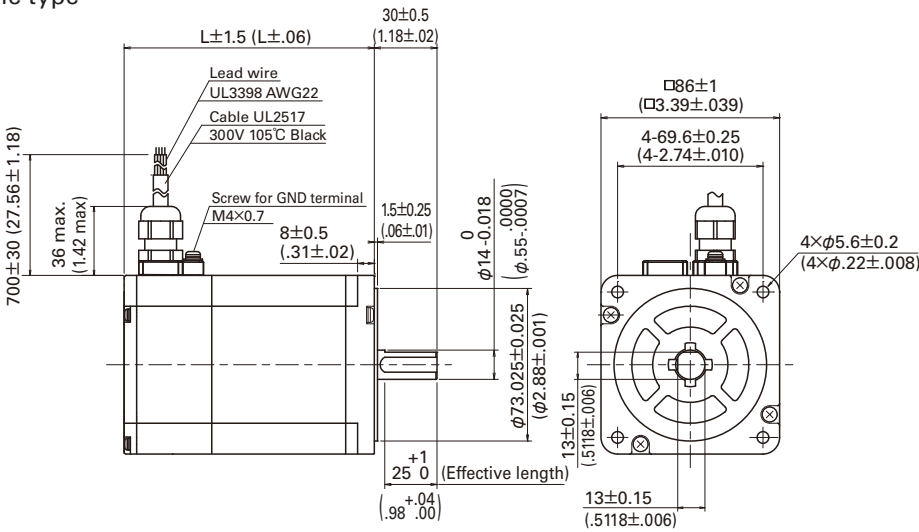
Connector type



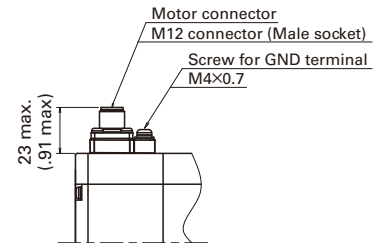
Model number	Motor length (L)
Cable type Connector type	
SP2563-5 □ 60 SP2563-5 □ 00	80 (3.15)
SP2566-5 □ 60 SP2563-5 □ 00	102 (4.02)

86 mm sq. (3.39 inch sq.)

Cable type

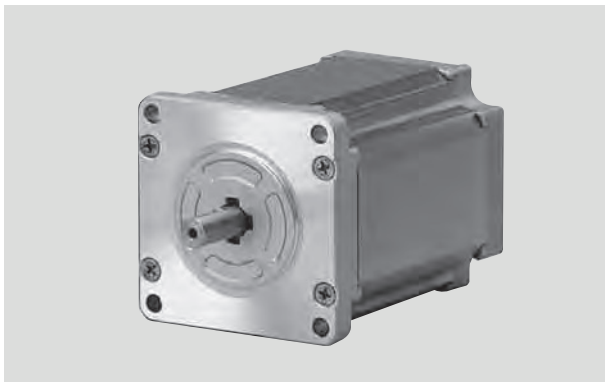


Connector type



Model number	Motor length (L)
Cable type Connector type	
SP2862-5 □ 60 SP2862-5 □ 00	120 (4.72)
SP2863-5 □ 60 SP2862-5 □ 00	150 (5.91)

Stepping Motors for Vacuum Environments Customized Products



■ Features

- These stepping motors can be driven in a vacuum environment without requiring a vacuum feedthrough. Use as vacuum-compatible actuators while retaining the stepping motor benefits of easy high-precision open-loop control.
- We can customize for a wide range of environment pressures, from low to ultra-high vacuums.
- Available baked at 200°C.
- Size is similar to that of typical stepping motors.

■ Intended operating pressure

Low vacuum			Medium vacuum			High vacuum			Ultra-High vacuum				
10 ⁵	10 ⁴	10 ³	10 ²	10 ¹	1	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻⁶	10 ⁻⁷	10 ⁻⁸ [Pa]

■ Applications

Ideal for the following applications. Contact us to discuss your particular application environment needs.

- Semiconductor manufacturing equipment
- Satellite robotics
- Electron microscopes
- Large-scale research facilities such as accelerators, synchrotron radiation analysis equipment, etc.

■ Motor size

42 mm sq. (1.65 inch sq.) to ϕ 106 mm (ϕ 4.17 inch)

Synchronous Motors Customized Products



■ Features

- These motors always maintain a constant speed under variable load and voltage conditions, rotating in step with the frequency of the power supply. This eliminates motor slip.
- Provides high torque at ultraslow speeds with gearless construction.
- Allows for simplification by connecting directly to the commercial (AC) power supply, eliminating the need for a driver circuit.

■ Applications

Ideal for the following applications. Contact us to discuss your particular application environment needs.

- Conveyor drives
- Printers
- Cryopumps
- Cryocoolers
- Switchgears

■ Motor size

56 mm sq. (2.20 inch sq.) to ϕ 106 mm (ϕ 4.17 inch)

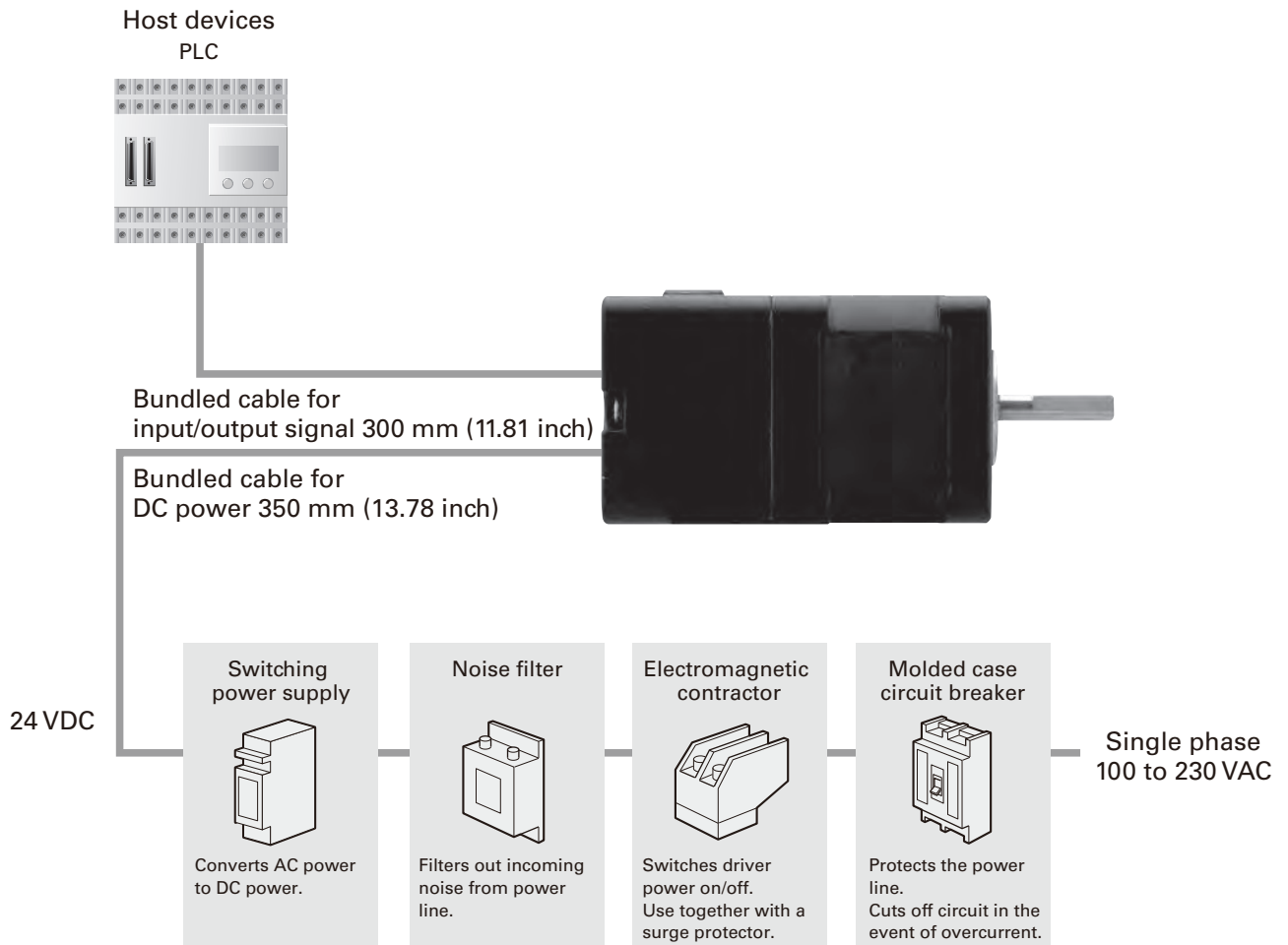
Stepping Motors with Integrated Drivers



Features

1. Driver and motor are now integrated into a single unit.
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit, enabling a more compact installation space and less wiring.
2. Three types of operation modes can be selected to match the specific application.
 - (1) Pulse train interface mode:
Control by command pulses
 - (2) Parallel interface mode:
Program control by general-purpose I/O (Parallel)
 - (3) Serial interface mode:
Compliant with RS-485, half-duplex asynchronous communication

System Configuration Diagram



Specifications

RoHS

Model number		DB21M142S-01	DB22M162S-01	
Basic specifications	Motor size	42 mm sq. (1.65 in sq.)	60 mm sq. (2.36 in sq.)	
	Input source *1	24 VDC ±10%		
	Source current (A)	2 max.	3 max.	
	Environment	Protection class	Class I	
		Operation environment	Installation category (over-voltage category): I , pollution degree: 2	
		Operating ambient temperature *2	0 to + 40°C	
		Conservation temperature	- 20 to + 60°C	
		Operating ambient humidity	35 to 85% RH (no condensation)	
		Conservation humidity	10 to 90% RH (no condensation)	
		Operation altitude	1000 m (3281 feet) max. above sea level	
		Vibration resistance	Tested under the following conditions ; 100 m/s ² , frequency range 10 to 2000 Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division "C".	
	Withstandable voltage	Not influenced when 500 VAC is applied between power input terminal and cabinet for one minute.		
	Insulation resistance	10 MΩ min. when measured with 500 VDC megohmmeter between input terminal and cabinet.		
Mass (Weight)	0.5 kg (1.10 lbs)	0.87 kg (1.92 lbs)		
Allowable thrust load	10 N (2.25 lbs)	15 N (3.37 lbs)		
Allowable radial load	24 N (5.4 lbs)	65 N (14.61 lbs)		
Direction of motor mounting	Can be freely mounted vertically or horizontally			
Function	Protection function	Against driver overheating		
	LED indicator	Alarm monitor		
I/O signals	Command pulse input signal *3	Photocoupler input method, input resistance 220 Ω	Input signal voltage: "H" = 4.0 to 5.5V, "L" = 0 to 0.5V	
	Power down input signal (PD)	Photocoupler input method, input resistance 470 Ω	Input signal voltage: "H" = 4.0 to 5.5V, "L" = 0 to 0.5V	
	Step angle setting selection input (EXT)	Photocoupler input method, input resistance 470 Ω	Input signal voltage: "H" = 4.0 to 5.5V, "L" = 0 to 0.5V	
	FULL/HALF setting selection input (F/H)	Photocoupler input method, input resistance 470 Ω	Input signal voltage: "H" = 4.0 to 5.5V, "L" = 0 to 0.5V	
	EMG input signal	Photocoupler input method, input resistance 470 Ω	Input signal voltage: "H" = 4.0 to 5.5V, "L" = 0 to 0.5V	
	BUSY output signal	Open collector output by photocoupler	Output signal standard: Vceo = 30 V max., Ic = 20 mA max.	
	Phase origin monitor output signal (MON)	Open collector output by photocoupler	Output signal standard: Vceo = 30 V max., Ic = 20 mA max.	
	Alarm output signal (AL)	Open collector output by photocoupler	Output signal standard: Vceo = 30 V max., Ic = 20 mA max.	

*1 Note that the power voltage must not exceed 24 VDC + 10% (26.4 VDC).

*2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.

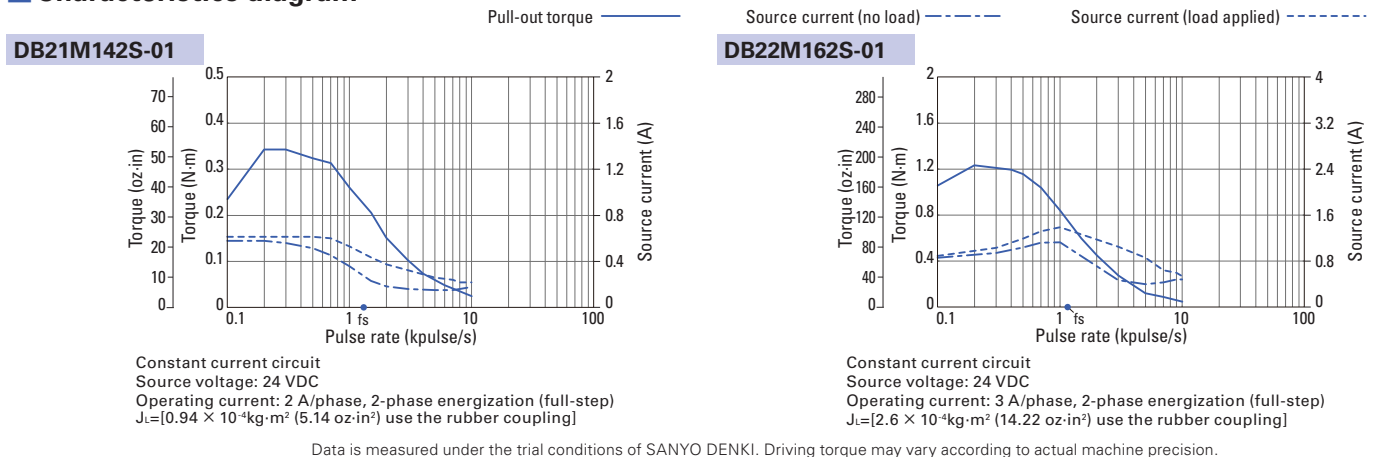
*3 The maximum input frequency is 250 k pulse/s.

Safety standards

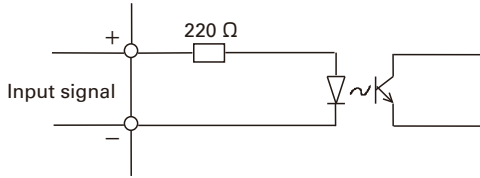
CE (TÜV)	Directives	Category	Name	Applicable standard		
				DB21M142S-01	DB22M162S-01	
EMC directives	Low-voltage directives	—	—	EN60034-1	EN60034-1	
				EN60034-5	EN60034-5	
				EN61010-1	EN61010-1	
	Emission	—	—	Terminal disturbance voltage	EN55011-A	EN61000-6-4
				Electromagnetic radiation disturbance	EN55011-A	EN61000-6-4
				ESD (Electrostatic discharge)	EN61000-4-2	EN61000-4-2
				RS (Radio-frequency amplitude modulated electromagnetic field)	EN61000-4-3	EN61000-4-3
				Fast transients/burst	EN61000-4-4	EN61000-4-4
				Conducted disturbances	EN61000-4-6	EN61000-4-6
Immunity	—	—	EN61000-4-3	EN61000-4-3		
			EN61000-4-4	EN61000-4-4		
			EN61000-4-6	EN61000-4-6		
UL	Acquired standards	—	Applicable standard	File No.		
	UL	—	UL508C	E179775		
	UL for Canada	—	UL508C	E179775		

- EMC characteristics may vary depending on the configuration of the users' control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
- Parts for EMC noise suppression like noise filters and toroidal type ferrite cores may be required depending on circumstances.
- Validation test of driver has been performed for low-voltage EMC directives at TÜV (TÜV product service) for self-declaration of CE marking.

Characteristics diagram

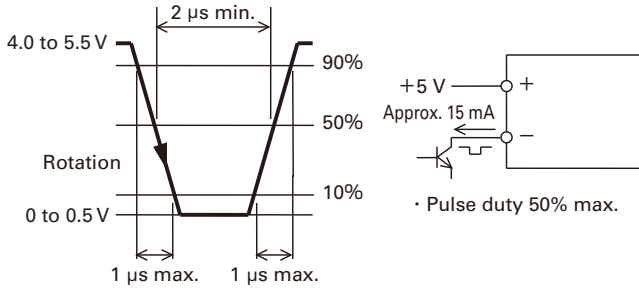


Input Circuit Configuration (CW, CCW)

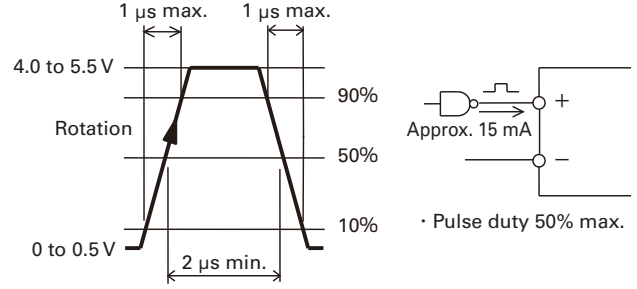


Input signal specifications

Negative logic

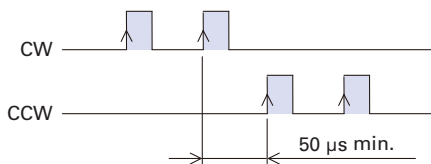


Positive logic



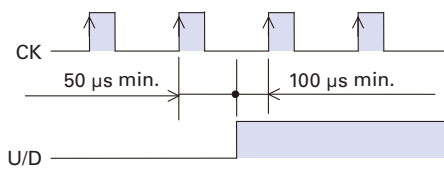
Timing of the command pulse

2-input mode (CW, CCW)



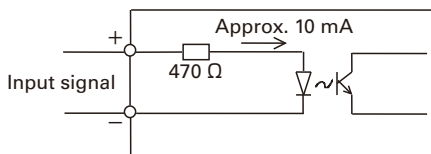
- Shaded area indicates internal photocoupler ON. Internal circuit (motor) starts operating at leading edge of the photocoupler ON.
- To apply pulse to CW, set CCW side internal photocoupler to OFF.
- To apply pulse to CCW, set CW side internal photocoupler to OFF.

Pulse and direction mode (CK, U/D)

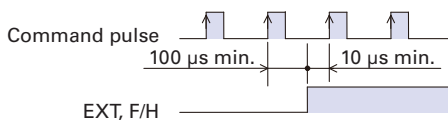


- Shaded area indicates internal photocoupler ON. Internal circuit (motor) starts operating at leading edge of CK side photocoupler ON.
- Switching of U/D input signal must be done while CK side internal photocoupler is OFF.

Input Circuit Configuration (PD, EXT, F/H, EMG)

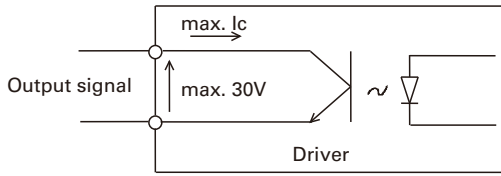


Timing of command pulse, step angle selection, and FULL/HALF selection input signal



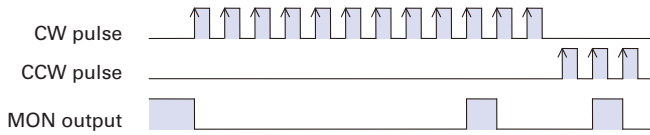
- Shaded area indicates internal photocoupler ON.
- EXT input signal
 - EXT photocoupler ON enables a function by external F/H input signal.
 - EXT photocoupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
 - F/H photocoupler ON sets HALF step (2-division) operation.
 - F/H photocoupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Output Interface (BUSY, MON, AL)



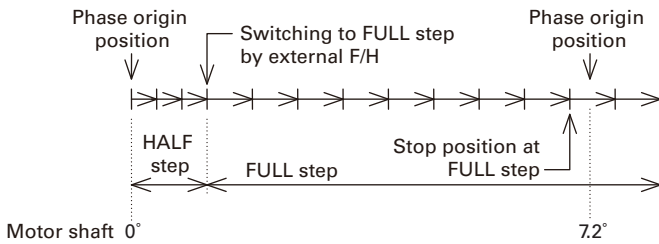
- Max. I_c current: 20 mA

MON output



- When the motor excitation phase is at the phase origin (power ON status), the photocoupler is turned ON, and the upper D.P of status LED turns on synchronously.
- MON output is taken at every 3.6 degrees of motor output shaft from phase origin.

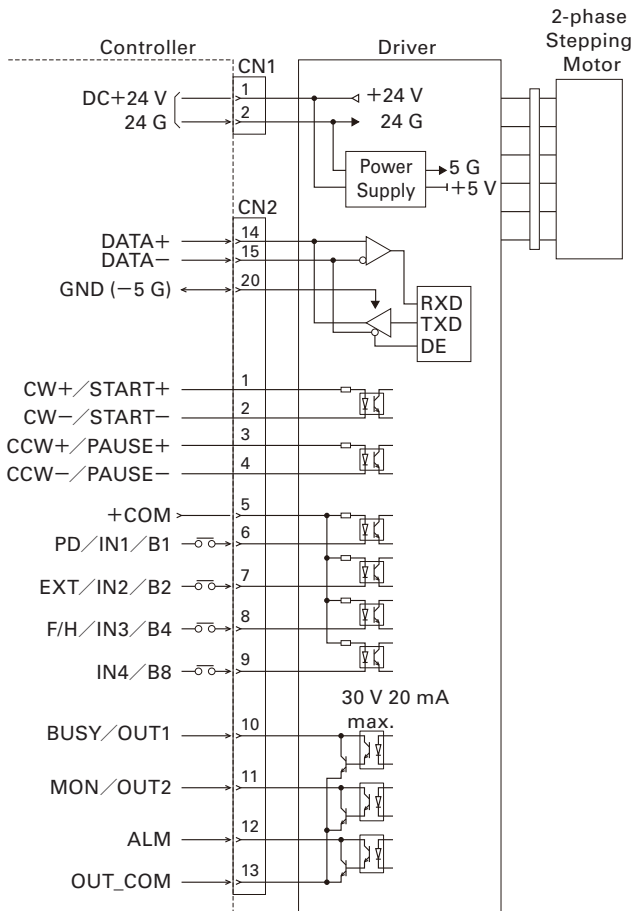
When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

Connections and Signals

External wiring diagram



Wiring

■ Specification summary of input/output signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive start/stop	START + START -	1 2	Commands the start and stop of program driving. Internal photocoupler on ...Program driving start Internal photocoupler off ...Program driving stop
Program pause	PAUSE + PAUSE -	3 4	When START signal is on, a pause in program driving is commanded. Internal photocoupler on ...Program driving pause Internal photocoupler off ...Program driving pause release
General-purpose input common	+ COM	5	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal (standard)	ALMC	6	Recoverable alarms are cleared. Internal photocoupler off → on...Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on ...General purpose input 1 on Internal photocoupler off ...General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. (Subordinate bit) Internal photocoupler on...Corresponding bit 1 Internal photocoupler off...Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photocoupler on...No emergency stop Internal photocoupler off...Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photocoupler on...Origin signal on Internal photocoupler off...Origin signal off
+ direction overtravel signal	+ OT	7	An overtravel signal in the + direction is input. Internal photocoupler on ...+ direction overtravel not arrived Internal photocoupler off ...+ direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on ...General purpose input 2 on Internal photocoupler off ...General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. (The second bit from the subordinate) Internal photocoupler on...Corresponding bit 1 Internal photocoupler off...Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photocoupler on...No emergency stop Internal photocoupler off...Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photocoupler on...Origin signal on Internal photocoupler off...Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photocoupler off → on...Alarm clear
- direction overtravel signal	- OT	8	An overtravel signal in the - direction is input. Internal photocoupler on ...- direction overtravel not arrived Internal photocoupler off ...- direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on ...General purpose input 3 on Internal photocoupler off ...General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. (The third bit from the subordinate) Internal photocoupler on...Corresponding bit 1 Internal photocoupler off...Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photocoupler on...No emergency stop Internal photocoupler off...Emergency stop

Signal	Reference Designation	Pin Number	Function Summary
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photocoupler on...Origin signal on Internal photocoupler off...Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photocoupler off → on...Alarm clear
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photocoupler on ...No emergency stop Internal photocoupler off ...Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on ...General purpose input 4 on Internal photocoupler off ...General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. (The fourth bit from the subordinate) Internal photocoupler on...Corresponding bit 1 Internal photocoupler off...Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photocoupler on...Origin signal on Internal photocoupler off...Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photocoupler off → on...Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photocoupler on ...During motor operation Internal photocoupler off ...During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photocoupler on ...During program execution Internal photocoupler off ...Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photocoupler on ...During program execution Internal photocoupler off ...Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photocoupler on ...During motor operation Internal photocoupler off ...During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor changes to non-excited status.
Output signal common	OUT_COM	13	This is for the output signal common.
DATA +	DATA +	14	This is for the serial signal.
DATA -	DATA -	15	This is for the serial signal.

■ Specification summary of input/output signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+ COM	5	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal (standard)	ALMC	6	Recoverable alarms are cleared. Internal photocoupler off → on → Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on …General purpose input 1 on Internal photocoupler off …General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photocoupler on → No emergency stop Internal photocoupler off → Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photocoupler on → Origin signal on Internal photocoupler off → Origin signal off
+ direction overtravel signal	+ OT	7	An overtravel signal in the + direction is input. Internal photocoupler on …+ direction overtravel not arrived Internal photocoupler off …+ direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on …General purpose input 2 on Internal photocoupler off …General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photocoupler on → No emergency stop Internal photocoupler off → Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photocoupler on → Origin signal on Internal photocoupler off → Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photocoupler off → on → Alarm clear
- direction overtravel signal	- OT	8	An overtravel signal in the - direction is input. Internal photocoupler on …- direction overtravel not arrived Internal photocoupler off …- direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on …General purpose input 3 on Internal photocoupler off …General purpose input 3 off
Emergency stop input	EMG	8	Emergency stop signal is input. Internal photocoupler on → No emergency stop Internal photocoupler off → Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photocoupler on → Origin signal on Internal photocoupler off → Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photocoupler off → on → Alarm clear
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photocoupler on → No emergency stop Internal photocoupler off → Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photocoupler on …General purpose input 4 on Internal photocoupler off …General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photocoupler on → Origin signal on Internal photocoupler off → Origin signal off
Alarm clear signal	ALMC	9	Alarms are cleared. Internal photocoupler off → on → Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photocoupler on → During motor operation Internal photocoupler off → During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photocoupler on …During program execution Internal photocoupler off …Program execution complete

Signal	Reference Designation	Pin Number	Function Summary
Zone signal	ZONE	10	This is on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photocoupler on …During program execution Internal photocoupler off …Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photocoupler on → During motor operation Internal photocoupler off → During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor changes to non-excited status.
Output signal common	OUT_COM	13	This is for the output signal common.
DATA +	DATA +	14	This is for the serial signal.
DATA -	DATA -	15	This is for the serial signal.

■ Specification summary of input/output signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input (Standard)	CW + CW -	1 2	When in "2 input mode", Input drive pulse rotating CW direction.
Pulse train input	CK + CK -	1 2	When in "1 input mode", Input drive pulse train for motor rotation.
CCW pulse input (Standard)	CCW + CCW -	3 4	When in "2 input mode", Input drive pulse rotating CCW direction.
Rotational direction input	U / D + U / D -	3 4	When in "1 input mode", Input motor rotational direction signal. Internal photocoupler ON → CW direction Internal photocoupler OFF → CCW direction
General-purpose input common	+ COM	5	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off (power off) the current flowing to the motor (with DIP switch select, change to the Power low function is possible). PD input signal on (internal photocoupler on) → PD function is valid. PD input signal off (internal photocoupler off) → PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on (internal photocoupler on) → External input signal F/H is valid EXT input signal off (internal photocoupler off) → Main body rotary switch S.S is valid
FULL/HALF select input	F / H	8	When EXT input signal on (internal photocoupler on), F/H input signal on (internal photocoupler on) → HALF step F/H input signal off (internal photocoupler off) → FULL step
-	-	9	Reserved
During motor operation	BUSY	10	The operation status of the motor is output. Internal photocoupler on …During motor operation Internal photocoupler off …During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin (during power ON), this turns on. For FULL step, ON occurs once per 4 pulses; and for HALF step, ON occurs once per 8 pulses.
Alarm output	ALM	12	When the alarm circuits are actuated inside, the driver, outputs signals to outside. Then, the stepping motor changes to unexcited status.
Output signal common	OUT_COM	13	This is for the output signal common.

* As for the motor rotational direction, CW direction is regarded as the clockwise revolution, and CCW direction is regarded as the counterclockwise revolution when viewing the motor from output shaft side.

Set Up

Function select DIP switch

The functions according to the specification can be selected with this DIP switch.

Confirm the ex-factory setting as follows.

	OFF	ON		
① F/R	<input type="checkbox"/>	<input type="checkbox"/>	OFF	2 input mode (CW/CCW pulse)
② LV	<input type="checkbox"/>	<input type="checkbox"/>	OFF	Micro step operation
③ PD	<input type="checkbox"/>	<input type="checkbox"/>	OFF	Power OFF
④ Reserved	<input type="checkbox"/>	<input type="checkbox"/>	OFF	Not available. Do not turn ON.
⑤ I. SEL	<input type="checkbox"/>	<input type="checkbox"/>	OFF	Pulse stream I/F mode
⑥ S. SEL	<input type="checkbox"/>	<input type="checkbox"/>	OFF	

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed (bps)		
		9,600	19,200	38,400
F/R	OFF	✓	✓	✓
	ON			
LV	OFF	✓	✓	
	ON			✓
PD	OFF	✓		✓
	ON		✓	

· The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.

· The communication speed of pulse stream I/F mode is fixed at 9600bps.

For pulse stream I/F mode

① Input mode select (F/R)

Input pulse mode selection

This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode (CK,U/D)
OFF	2 input mode (CW,CCW)

② Low vibration mode select (LV)

Low vibration and smooth operation are enabled even during coarse resolution settings (e.g. 1 division, 2 division).

This switch setting is only effective in pulse stream I/F mode. For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

· When LV select is ON (low vibration mode), operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load, driving profile etc., it may take a while until the shaft is adjusted when the Motor stops. (In parallel I/F mode and serial I/F mode there is no delay)

③ Power down select (PD)

Select the Motor winding current value when inputting the power down signal. This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP (Power Low)
OFF	0A (Power OFF)

· PD function (the setting selected by PD of the function select DIP switch) is enabled by PD input signal ON (built-in photocoupler ON) of Input/Output signal connector (CN2). Power down signal input takes priority over all the other current settings except for alarms. The operational status may not be able to be maintained due to power swings caused by a drop in output torque, or due to dropped work caused by motor current OFF (unexcited motor).

Pay extra attention to the input timing of the power down signal and also install security devices to the machine.

④ Reserved

· Do not turn ON this switch.

⑤, ⑥ Operation mode selection (I.SEL, S.SEL)

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF	—	Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

· Change the operation mode selection switch after shutting off the driver's power supply.

Rotary switch (RSW) and the mode change switch (PSW)

For pulse stream I/F mode

The combination of rotary switch (RSW) and mode change switch (PSW) select the step angle, driving current and stop the current.

1. Step angle select (S.S)

The divisions of the basic step angle (0.9° /step) during micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Initial setting is at gradation 1 (division 2)

· The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photocoupler ON) of Input/Output signal connector (CN2).

2. Driving current select (RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Initial setting is at gradation 0 (motor current 100%, rated).

· When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when, stopped and when power down input signal ON (power low function is selected by DIP switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Initial setting is set at gradation A (motor current 50%).

· The current setting when stop by STP becomes valid when the motor stops (approximately 200 ms after the last pulse input) and when power down input signal output torque is approximately proportional to motor current.

Pay attention to output torque when stopping motor (especially when dropping Z-axis workload).

· If motor output torque is unconstrained, motor/driver heating can be suppressed by selecting appropriate drive current and stopping current settings.

For parallel I/F mode and serial I/F mode

The slave bureau address of serial communications can be set.

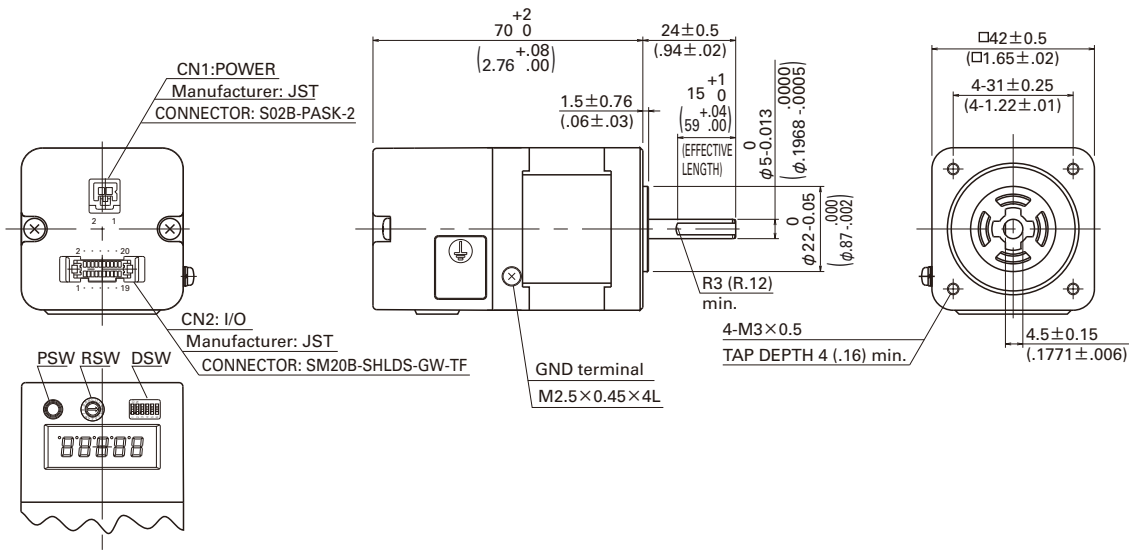
RSW	Slave station address (HEX)
0	0
1	1
:	:
E	E
F	F

Initial setting is set at 0

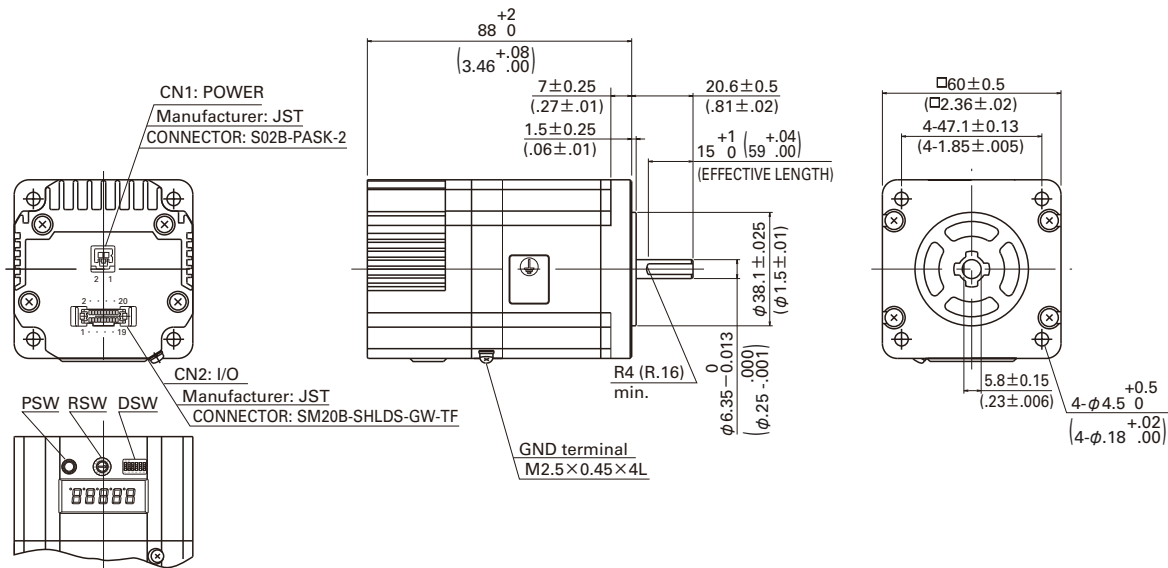
· The slave station address of the pulse stream I/F mode is fixed at 0.

Dimensions [Unit: mm (inch)]

42 mm sq. (1.65 inch sq.)



60 mm sq. (2.36 inch sq.)



Safety Considerations

Drivers and stepping motors are designed to be used with the general industrial devices. When using them, pay sufficient attention to the following points.

- Read the Operation Manual thoroughly prior to placement, assembly and/or operation in order to use the product properly.
- Refrain from modifying or processing the product in any way.
- Consult with the distributor or professional experts for placement or maintenance services of the product.
- In case of the following uses of the product, contact us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.
 - ① Use in medical devices concerned with a fatal accident.
 - ② Use on trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
 - ③ Use in computer systems that could have a great effect on society or public systems.
 - ④ Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation. Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

Indication by (Warning Label) on the Product

Either or all of the following indications are expressed by the Warning Labels depending on the type of driver or stepping motor.



This label is affixed near high voltage parts such as the electrically charged or cover-protected section, warning of the places where it is likely to cause an electric shock.



This label is affixed near the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.



This label is affixed near the GND terminals of the driver or stepping motors for which grounding is required, suggesting that the terminals should be well grounded.



This label is affixed for the driver to which the power source is applied in the voltage exceeding the safety standard, drawing attention to the risk of the electric shock.

Safety Ranks of the Cautions


Following four ranks are provided.



DANGER Improper operations or use is most likely to result in serious injury or death.



CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

In spite of the cautions with the  CAUTION label, it may cause serious results. Either the contents or the labels is describing important cautions to be followed inevitably.



PROHIBITED Indicates what must not be done.



COMPULSORY Indicates what must be done.

DANGER

< General matters >

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.
2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product.
Without such knowledge, it may cause an electric shock, injury or fire.
3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.
4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.
5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)
6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

< Wiring >

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.
8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.
9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.
10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.
11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

< Operation >

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.
13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.
14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

CAUTION

< General matters >

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.
2. Do not use the driver or the stepping motor outside the specified conditions.
Doing so may cause an electric shock, injury or fire.
3. Do not insert a finger or a thing into the opening of the product.
Doing so may cause an electric shock, injury or fire.
4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.
5. Use the driver and stepping motor in the designated combination.
Using otherwise may cause fire or a trouble.
6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

< Unpacking >

7. Unpack while confirming the ceiling. Failure to do so may cause injury.
8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

< Wiring >

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.
10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.
11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.
12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

< Placement >

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.
14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle.
Doing so may cause fire.
15. Make sure to use the specified driver mounting direction. Failure to do so will result in product failure.
16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices.
Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.
18. Mount the product on an incombustible material such as metal.
Doing otherwise may cause fire.
19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.
20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.
21. Do not apply a load to the output shaft of the motor that exceeds the tolerance.
22. Make sure not to apply force to the lead wire or cables.

< Operation >

23. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.
24. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100° C or under.
25. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.
26. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.
27. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.
28. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.
29. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.
30. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.
31. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.
32. Fix the key firmly when operating the motor with key individually.
Failure to do so may cause injury.

< Maintenance services >

33. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame.
Failure to do so may cause burns.
34. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40° C. The expected life of the fuse is 10 years in the average 40° C. Thus, the periodical replacement is recommended.
35. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

< Transportation >

36. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.
37. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

< Retirement >

38. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

< Storage >

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product.
Failure to do so may cause a trouble.

< Maintenance services >

2. Do not disassemble or repair the product. Doing so may cause fire or an electric shock.

< General matters >

3. Do not remove the rating plate.

COMPULSORY

< Storage >

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.
2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

< Operation >

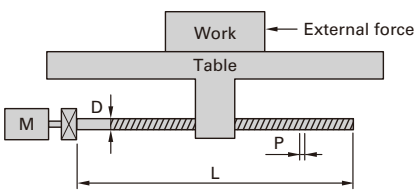
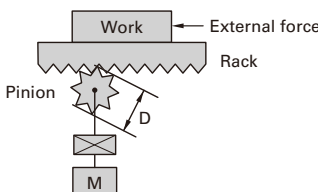
3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.
4. Put the product into operation in the specified ambient temperature and humidity.

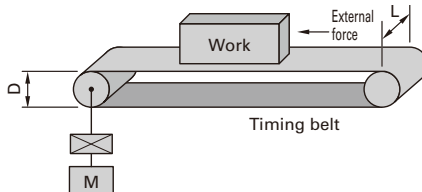
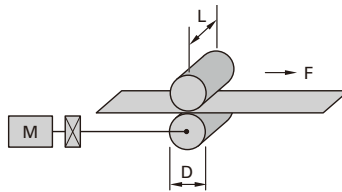
< Transportation >

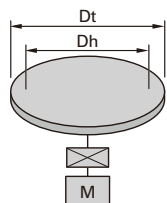
5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

■ Selection materials for each mechanism

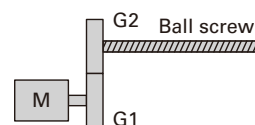
The diagrams below depict representative mechanisms and the points used in their selection. Notify us of the information shown here when requesting us to make a selection.

Ball screw			Rack and pinion		
					
External force	F	N	External force	F	N
Weight of work+table	W	kg	Work+rack weight	W	kg
Ball screw diameter	D	m	Pinion diameter	D	m
Ball screw length	L	m	Pinion thickness	L	m
Ball screw lead wire	P	m	Pinion material specific gravity	ρ	kg/m ³
Ball screw material specific gravity	ρ	kg/m ³	Friction coefficient	μ	
Friction coefficient	μ		Gear ratio*	G	
Gear ratio*	G		Mechanical efficiency	η	
Mechanical efficiency	η				

Belt drive			Roll feed		
					
External force	F	N	Sheet tension	F	N
Work+belt weight	W	kg	Roll diameter	D	m
Pulley diameter	D	m	Roll width	L	m
Pulley width	L	m	Roll material specific gravity	ρ	kg/m ³
Pulley material specific gravity	ρ	kg/m ³	Roll moment of inertia	J	kg · m ²
Pulley moment of inertia	J	kg · m ²	Gear ratio*	G	
Gear ratio*	G		Mechanical efficiency	η	
Mechanical efficiency	η				

Rotary table		
		
Table weight	W	kg
Table diameter	Dt	m
Table support diameter	Dh	m
Table moment of inertia	J	kg · m ²
Support area friction coefficient	μ	
Gear ratio*	G	
Mechanical efficiency	η	

*How to find the gear ratio (G)



$$G = \frac{\text{Number of ball screw gears (G2)}}{\text{Number of motor gears (G1)}}$$

■ Precautions For Adoption

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident. Always follow all listed precautions.

Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The products presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

*For any question or inquiry regarding the above, contact our Sales Department.

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