

# 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 <sup>2</sup> (oz·in <sup>2</sup> )]	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)

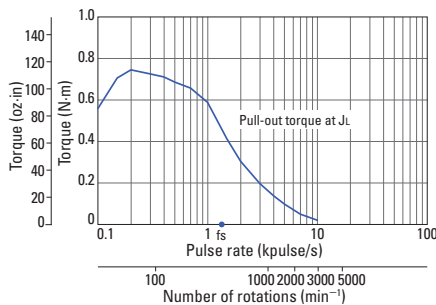
Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [ $\times 10^{-4}$ kg·m <sup>2</sup> (oz·in <sup>2</sup> )]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
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

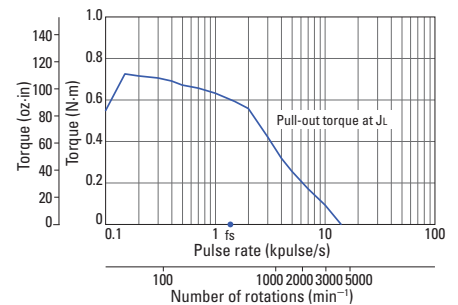
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
1 A/phase, 2-phase  
energization (full-step)  
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$  use the rubber  
coupling]  
 $f_s$ : Maximum self-start  
frequency when not  
loaded



103H7821-0440  
103H7821-0410

103H7821-0460  
103H7821-0430

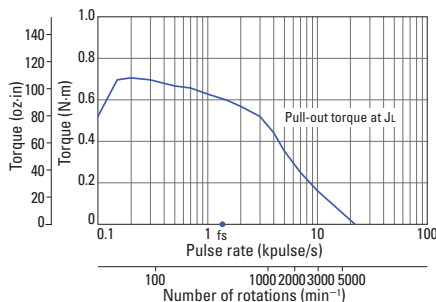
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
2 A/phase, 2-phase  
energization (full-step)  
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$  use the rubber  
coupling]  
 $f_s$ : Maximum self-start  
frequency when not  
loaded



103H7821-0740  
103H7821-0710

103H7821-0760  
103H7821-0730

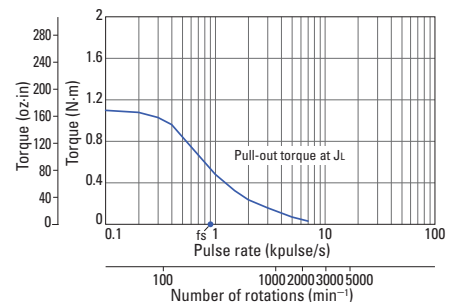
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
3 A/phase, 2-phase  
energization (full-step)  
 $J_L = [0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{oz} \cdot \text{in}^2)]$  use the rubber  
coupling]  
 $f_s$ : Maximum self-start  
frequency when not  
loaded



103H7822-0140  
103H7822-0110

103H7822-0160  
103H7822-0130

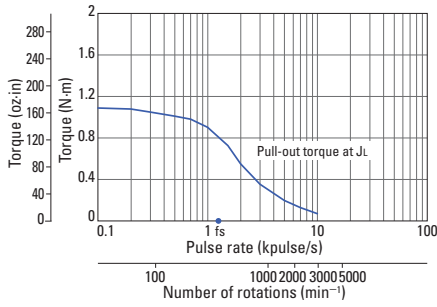
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
1 A/phase, 2-phase  
energization (full-step)  
 $J_L = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$  use the rubber  
coupling]  
 $f_s$ : Maximum self-start  
frequency when not  
loaded



## Characteristics diagram

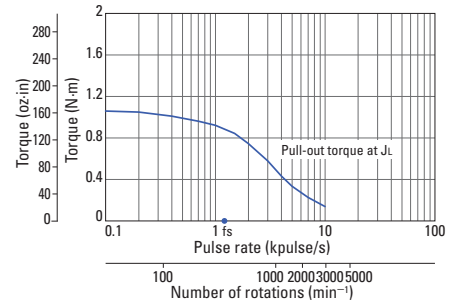
**103H7822-0440**  
**103H7822-0410**  
**103H7822-0460**  
**103H7822-0430**

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-in<sup>2</sup>) use the rubber  
 coupling]  
 $f_s$ : Maximum self-start  
 frequency when not  
 loaded



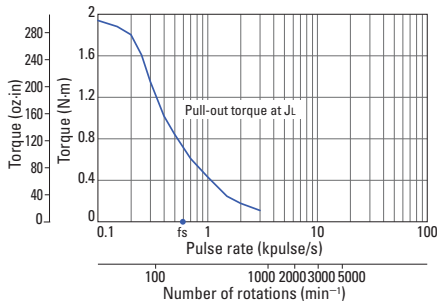
**103H7822-0740**  
**103H7822-0710**  
**103H7822-0760**  
**103H7822-0730**

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-in<sup>2</sup>) use the rubber  
 coupling]  
 $f_s$ : Maximum self-start  
 frequency when not  
 loaded



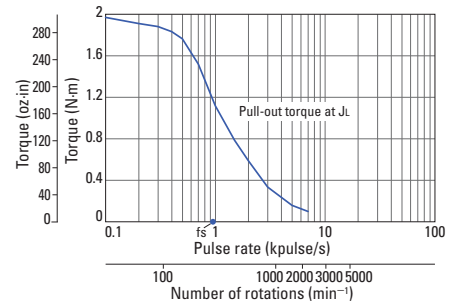
**103H7823-0140**  
**103H7823-0110**  
**103H7823-0160**  
**103H7823-0130**

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-in<sup>2</sup>) use the rubber  
 coupling]  
 $f_s$ : Maximum self-start  
 frequency when not  
 loaded



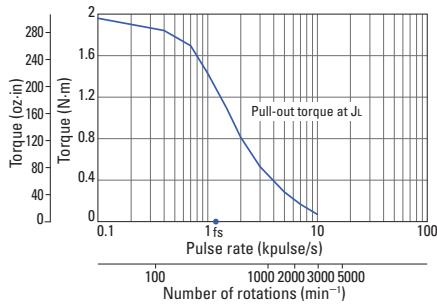
**103H7823-0440**  
**103H7823-0410**  
**103H7823-0460**  
**103H7823-0430**

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-in<sup>2</sup>) use the rubber  
 coupling]  
 $f_s$ : Maximum self-start  
 frequency when not  
 loaded



**103H7823-0740**  
**103H7823-0710**  
**103H7823-0760**  
**103H7823-0730**

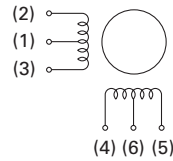
Constant current circuit  
 Source voltage: 24 VDC  
 Operating current:  
 3 A/phase, 2-phase  
 energization (full-step)  
 $J_L = [7.4 \times 10^{-4} \text{kg}\cdot\text{m}^2$  (40.46  
 oz-in<sup>2</sup>) use the rubber  
 coupling]  
 $f_s$ : Maximum self-start  
 frequency when not  
 loaded



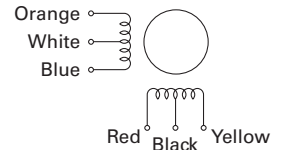
## Internal wiring

### Connector type

( ) connector pin number

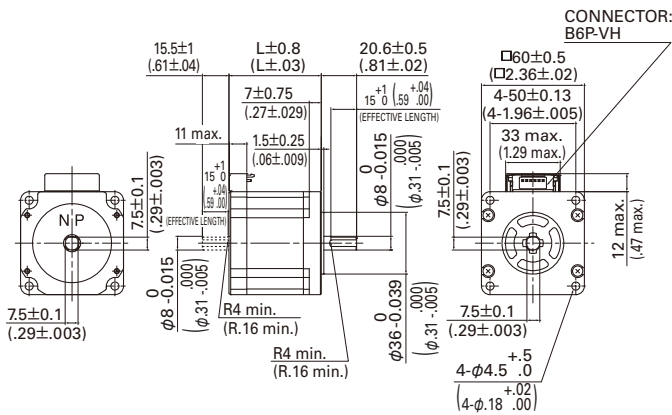


### Lead wire type

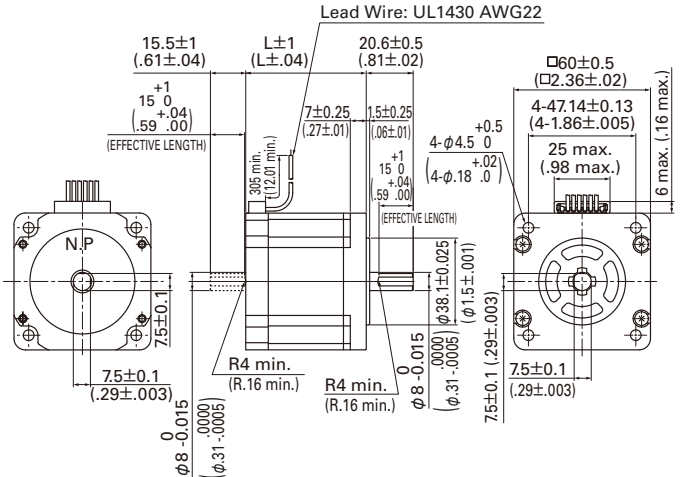


## Dimensions [Unit: mm (inch)]

### Connector type

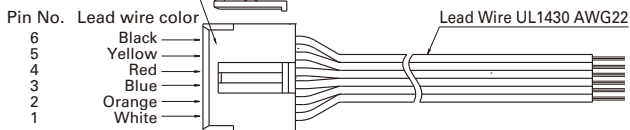


### Lead wire type



### Motor cable Unipolar Model number: 4837798-1

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

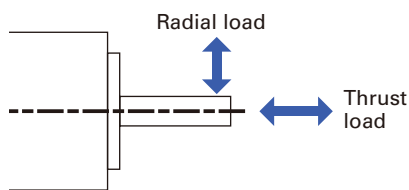


## Compatible drivers

- 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.

# Allowable Radial/Thrust Load



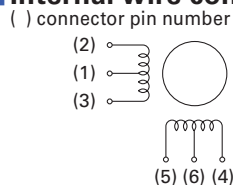
Flange size	Model number	Distance from end of shaft : mm (in)				Thrust load N (lbs)
		0	5	10	15	
Radial load : N (lbs)						
14 mm sq. (0.55 in sq.)	SH2141	10 (2.25)	11 (2.47)	13 (2.92)	-	0.7 (0.16)
28 mm sq. (1.10 in sq.)	SH228 □	42 (9)	48 (10)	56 (12)	66 (14)	3 (0.67)
35 mm sq. (1.38 in sq.)	SH353 □	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 □ SH286 □	167 (37)	193 (43)	229 (51)	280 (62)	60 (13.488)
	103H822 □					191 (43)
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



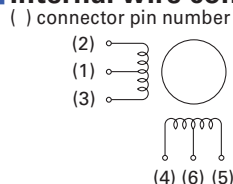
#### Direction of motor rotation

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	+	-	-	-	-

Connector type Model number: 103H782 □□

#### Internal wire connection



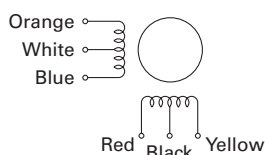
#### Direction of motor rotation

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)	(4)	(3)	(5)	(2)
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

Lead wire type

#### Internal wire connection



#### Direction of motor rotation

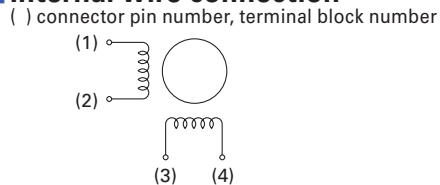
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

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

### Bipolar winding

Connector type

#### Internal wire connection



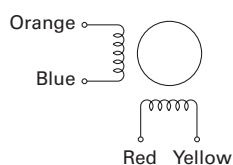
#### Direction of motor rotation

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	-	+	+	-

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	-	+	+	-

## General Specifications

Motor model number	<b>SH2141</b>	<b>SH228</b> □	<b>SH353</b> □	<b>SS242</b> □	<b>SH142</b> □	<b>103H52</b> □□	<b>SS250</b> □	<b>103H67</b> □□	<b>103H712</b> □
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 <sup>2</sup> (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.								
Impact resistance	500 m/s <sup>2</sup> 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)	0.1 mm (0.004 in)	0.1 mm (0.004 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally								

Motor model number	<b>SH160</b> □	<b>103H78</b> □□	<b>SH286</b> □	<b>103H8922</b> □	<b>SM286</b> □	<b>103H712</b> □ -6 □□ 0 CE Model	<b>103H822</b> □ -6 □□ 0 CE Model	<b>103H8922</b> □ -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 <sup>2</sup> (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.								
Impact resistance	500 m/s <sup>2</sup> 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.

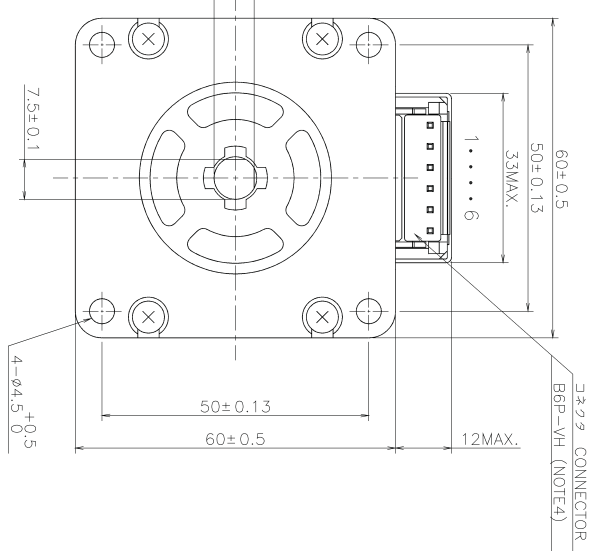
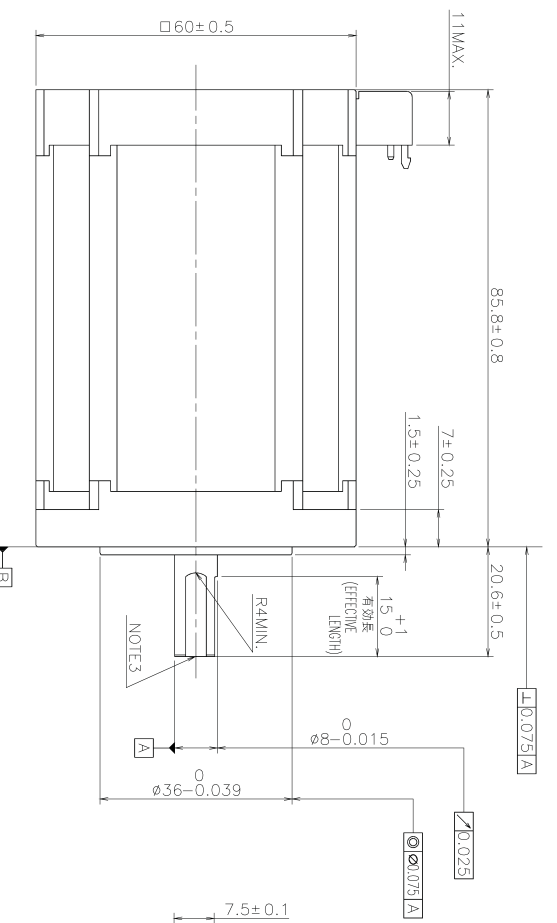
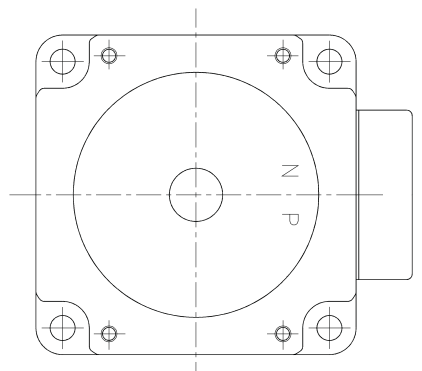
### Safety standards

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

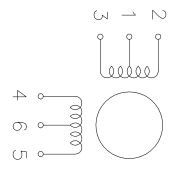


定格特性 RATED CHARACTERISTICS

相数	2
基本ステップ角度	1.8 °
STEP ANGLE	1.8 °
定格電圧	3.75 V(DC)
VOLTS	3.75 V(DC)
定格電流	3 A/phase
AMPS	3 A/phase
巻線抵抗	1.25 Ω±10% at 25℃
D.C. RESISTANCE	1.25 Ω±10% at 25℃
巻線インダクタンス	2.4 mH±20% at 1 kHz, 1 V(p-p)
COIL INDUCTANCE	2.4 mH±20% at 1 kHz, 1 V(p-p)
ホールディンクトルク	2.1 N·m MIN. at I=3 A/phase 2EX.
HOLDING TORQUE	2.1 N·m MIN. at I=3 A/phase 2EX.
出力トルク	1.61 N·m MIN. at 200 pulse/s
注1. PULL OUT TORQUE	1.61 N·m MIN. at 200 pulse/s

注1. ドライバ: サンクスSLA-7026M E=24V I=3A/相(AVE) 2相励磁。  
 NOTE) DRIVER: SANKEN SLA-7026M E=24 V,I=3 A/PHASE, 2EX.  
 2. 160×160×6t アルミ放射板に取付け、2相励磁=3 A/相を連続通電し、抵抗法により測定。  
 MOUNTED A MOTOR ON 160X160X6t ALUMINUM HEAT SINK AND CONTINUOUSLY ENERGIZED THE COIL AT 2 phase, I=3 A/phase CONSTANT. MEASURED BY THE CHANGE OF RESISTANCE METHOD.  
 3. シャフトセンター穴の有無及び形状は、製造上の都合により任意とする。  
 CENTER HOLE ON THE SHAFT END IS NOT ALWAYS MADE.  
 4. 適合ハウジング及びコネクタ(物): VHR-6N,SVH-21T-P1.1(日本圧着端子)  
 MATING HOUSING AND CONTACT.(e.g.) VHR-6N,SVH-21T-P1.1(UST)  
 5. 適合ハウジング及びコネクタはユーザー様で用意してください。  
 PLEASE SUPPLY MATING HOUSING AND CONTACTS BY THE USER-SELF.

内部結線・CONNECTION  
(ピン番号) (PIN NO.)



下記の順に直線接続した場合、回転方向は面B側より見て時計方向回転のごと。  
 WHEN A MOTOR IS SEQUENCED AS SHOWN IN THE TABLE BELOW,  
 THE SHAFT ROTATION MUST BE CLOCKWISE WHEN YOU SEE FROM SURFACE "B" SIDE.

コネクタピン番号	CONNECTION PIN NO.
1	1
2	2
3	3
4	4
5	5
6	6

山洋電機株式会社 SANYO DENKI CO.,LTD. 103HT7823-0740

型式	103HT7823-0740
機種	STEPING MOTOR
寸法	φ62x11-08
重量	約0.015kg
製造年	2014