

# 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 <sup>2</sup> (oz·in <sup>2</sup> )]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft							
<b>103H7821-5740</b>	<b>103H7821-5710</b>	0.88 (124.6)	2	1.27	3.3	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
<b>103H7821-1740</b>	<b>103H7821-1710</b>	0.88 (124.6)	4	0.35	0.8	0.275 (1.50)	0.6 (1.32)	44.8 (1.76)
<b>103H7822-5740</b>	<b>103H7822-5710</b>	1.37 (194.0)	2	1.55	5.5	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
<b>103H7822-1740</b>	<b>103H7822-1710</b>	1.37 (194.0)	4	0.43	1.38	0.4 (2.19)	0.77 (1.70)	53.8 (2.12)
<b>103H7823-5740</b>	<b>103H7823-5710</b>	2.7 (382.3)	2	2.4	9.5	0.84 (4.59)	1.34 (2.95)	85.8 (3.38)
<b>103H7823-1740</b>	<b>103H7823-1710</b>	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)

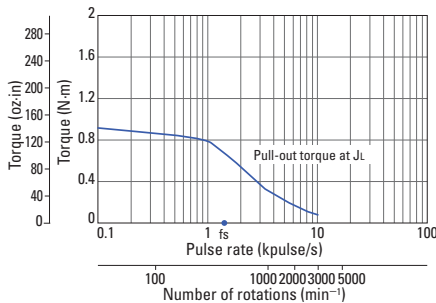
Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [ $\times 10^{-4}$ kg·m <sup>2</sup> (oz·in <sup>2</sup> )]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft				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

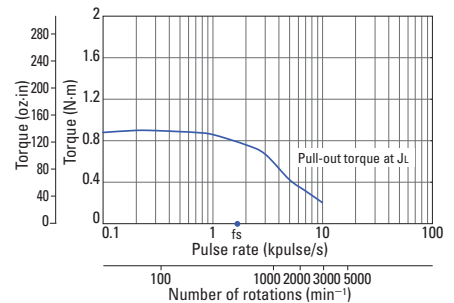
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
2 A/phase, 2-phase energization (full-step)  
 $J_L=[2.6 \times 10^{-4}$ kg·m<sup>2</sup> (14.22 oz·in<sup>2</sup>) use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



**103H7821-1740**  
**103H7821-1710**

**103H7821-1760**  
**103H7821-1730**

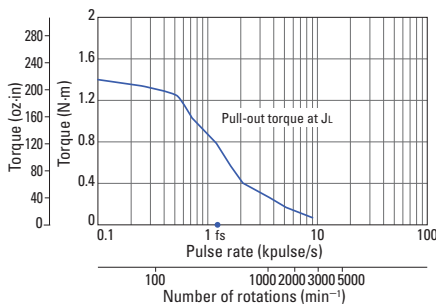
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
4 A/phase, 2-phase energization (full-step)  
 $J_L=[2.6 \times 10^{-4}$ kg·m<sup>2</sup> (14.22 oz·in<sup>2</sup>) use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



**103H7822-5740**  
**103H7822-5710**

**103H7822-5760**  
**103H7822-5730**

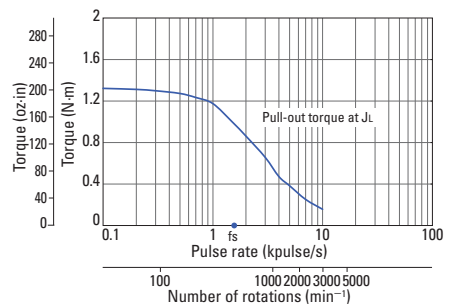
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
2 A/phase, 2-phase energization (full-step)  
 $J_L=[2.6 \times 10^{-4}$ kg·m<sup>2</sup> (14.22 oz·in<sup>2</sup>) use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



**103H7822-1740**  
**103H7822-1710**

**103H7822-1760**  
**103H7822-1730**

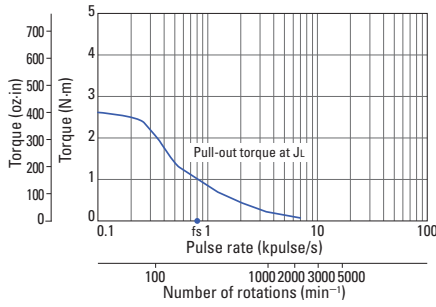
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
4 A/phase, 2-phase energization (full-step)  
 $J_L=[2.6 \times 10^{-4}$ kg·m<sup>2</sup> (14.22 oz·in<sup>2</sup>) use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



## Characteristics diagram

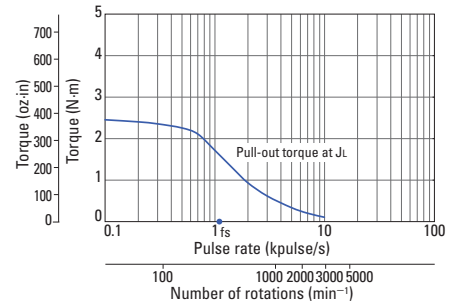
**103H7823-5740**  
**103H7823-5710**  
**103H7823-5760**  
**103H7823-5730**

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



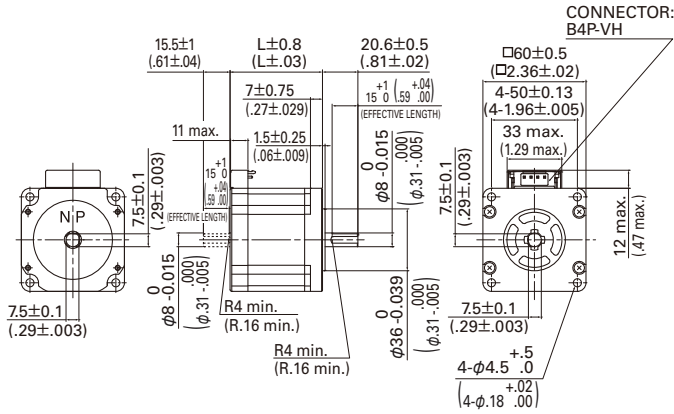
**103H7823-1740**  
**103H7823-1710**  
**103H7823-1760**  
**103H7823-1730**

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

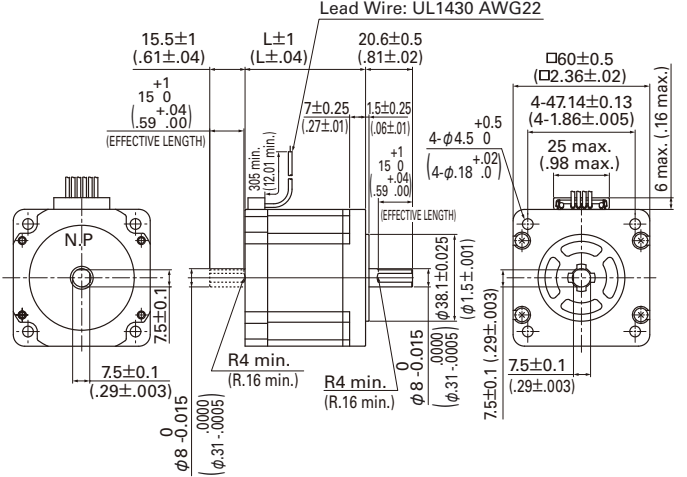


## Dimensions [Unit: mm (inch)]

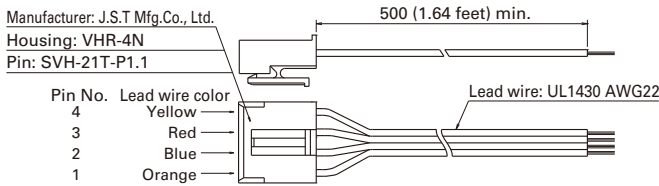
### Connector type



### Lead wire type



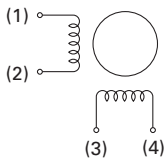
### Motor cable Bipolar Model number: 4837961-1



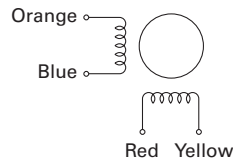
## Internal wiring

### Connector type

( ) connector pin number,  
 terminal block number



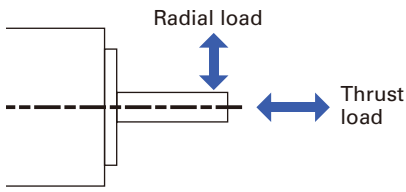
### Lead wire type



## 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

# Allowable Radial/Thrust Load



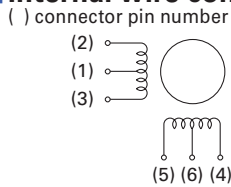
Flange size	Model number	Distance from end of shaft : mm (in)				Thrust load N (lbs)
		0	5	10	15	
Radial load : N (lbs)						
14 mm sq. (0.55 in sq.)	SH2141	10 (2.25)	11 (2.47)	13 (2.92)	-	0.7 (0.16)
28 mm sq. (1.10 in sq.)	SH228 □	42 (9)	48 (10)	56 (12)	66 (14)	3 (0.67)
35 mm sq. (1.38 in sq.)	SH353 □	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

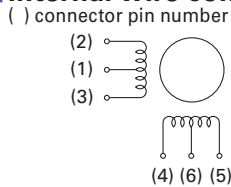
Connector type Model number: 103H52 □□

#### Internal wire connection



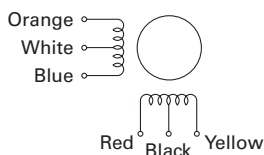
Connector type Model number: 103H782 □□

#### Internal wire connection



Lead wire type

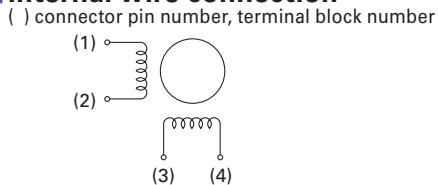
#### Internal wire connection



### Bipolar winding

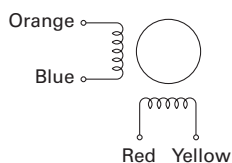
Connector type

#### Internal wire connection



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	+	-	-	-	-

#### 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 <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)	0.075 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 <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.

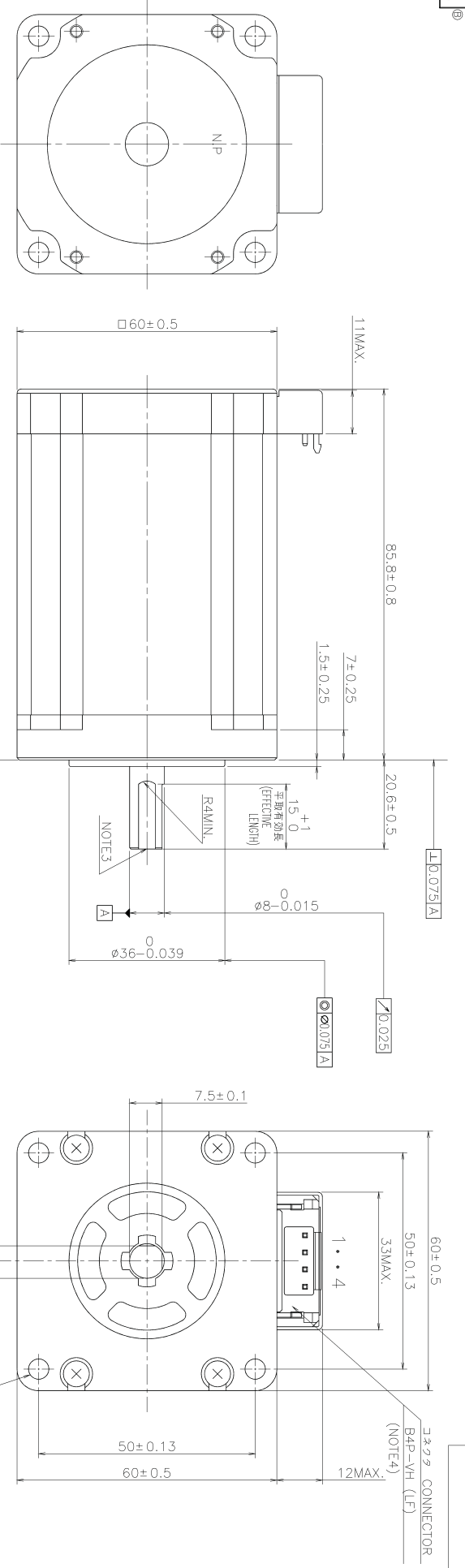
## Safety standards

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



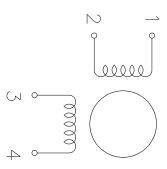
定格特性 RATED CHARACTERISTICS

相数	2
基本ステップ角 FUNDAMENTAL STEP ANGLE	1.8°
定格電圧 VOLTS	2.6 V(DC)
定格電流 AMPS	4 A/phase
巻線抵抗 WINDING RESISTANCE	0.65 Ω±10% at 25°C
巻線インダクタンス WINDING INDUCTANCE	2.4 mH±20% at 1 kHz, 1 V(p-p)
ホールデイングトルク HOLDING TORQUE	2.7 N・m MIN. at I=4 A/phase 2EX.
脱出力トルク PULL OUT TORQUE	2 N・m MIN. at 200 pulse/s

注1. 最大起動周波数  
 NOTE 1. MAX. STARTING RATE 1100 pulse/s MIN. at NO. LOAD  
 注1. 最大連続応答周波数  
 NOTE 1. MAX. SLEWING RATE 3700 pulse/s MIN. at NO. LOAD  
 静止角度誤差  
 POSITIONAL ACCURACY ±0.054° (0.108° SPREAD MAX.) 2EX.  
 温度上昇係数  
 ROTOR INERTIA 0.84x10<sup>-4</sup> kg・m<sup>2</sup> NOMINAL  
 絶縁階級  
 INSULATION CLASS B  
 許容ラスト荷重  
 ALLOWABLE THRUST LOAD 20 N  
 許容ラジアル荷重  
 ALLOWABLE RADIAL LOAD 71 N LOAD TO SHAFT END.

注1. ライバー: PWM-CS-803 E=100VAC, I=4 A/相, 2相駆動。  
 NOTE) DRIVER: PWM-CS-803 E=100VAC, I=4 A/PHASE, 2EX.  
 2. 160x160x6t プラミ放熱板に取付け、2相所磁=4 A/相を連続通電し、抵抗法にて測定した時の値。  
 MOUNTED A MOTOR ON 160X160X6t ALUMINUM HEAT SINK AND CONTINUOUSLY ENERGIZED THE COIL AT 2 PHASE I=4 A/PHASE.  
 MEASURED BY THE CHANGE OF RESISTANCE METHOD.  
 3. シフトセンターの有無及び形状は、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-4N, SVH-21T-P1.1(日本圧着端子)  
 MATING HOUSING AND CONTACT.(e.g.): VHR-4N, 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.)



回転方向・DIRECTION OF ROTATION

下記の順に直流駆動した場合は、回転方向は面B側より見て時計方向回転のこと。  
 WHEN A MOTOR IS SEQUENCED AS SHOWN IN THE TABLE BELOW,  
 THE SHAFT ROTATION MUST BE CLOCKWISE WHEN YOU SEE  
 FROM SURFACE "B" SIDE.

励磁順序 MAGNETIC SEQUENCE	コネクタピン番号 CONNECTOR PIN NO.
1	1
2	2
3	3
4	4

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