

# 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.

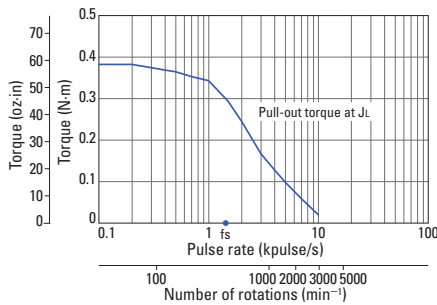
### Unipolar winding, Lead wire type

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 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )]	[kg (lbs)]	mm (in)
<b>103H7121-0140</b>	<b>103H7121-0110</b>	0.39 (55.2)	1	4.8	8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
<b>103H7121-0440</b>	<b>103H7121-0410</b>	0.39 (55.2)	2	1.25	1.9	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
<b>103H7121-0740</b>	<b>103H7121-0710</b>	0.39 (55.2)	3	0.6	0.8	0.1 (0.55)	0.47 (1.04)	41.8 (1.65)
<b>103H7123-0140</b>	<b>103H7123-0110</b>	0.83 (117.5)	1	6.7	15	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
<b>103H7123-0440</b>	<b>103H7123-0410</b>	0.83 (117.5)	2	1.6	3.8	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
<b>103H7123-0740</b>	<b>103H7123-0710</b>	0.78 (110.5)	3	0.77	1.58	0.21 (1.15)	0.65 (1.43)	53.8 (2.12)
<b>103H7124-0140</b>	<b>103H7124-0110</b>	0.98 (138.8)	1	7	14.5	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
<b>103H7124-0440</b>	<b>103H7124-0410</b>	0.98 (138.8)	2	1.7	3.1	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
<b>103H7124-0740</b>	<b>103H7124-0710</b>	0.98 (138.8)	3	0.74	1.4	0.245 (1.34)	0.8 (1.76)	63.8 (2.51)
<b>103H7126-0140</b>	<b>103H7126-0110</b>	1.27 (179.8)	1	8.6	19	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)
<b>103H7126-0440</b>	<b>103H7126-0410</b>	1.27 (179.8)	2	2	4.5	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)
<b>103H7126-0740</b>	<b>103H7126-0710</b>	1.27 (179.8)	3	0.9	2.2	0.36 (1.97)	0.98 (2.16)	75.8 (2.98)

## Characteristics diagram

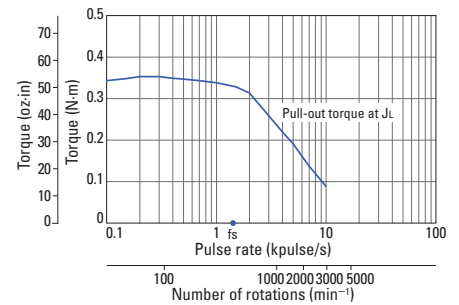
### 103H7121-0140 103H7121-0110

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



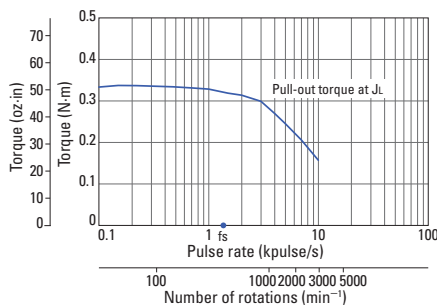
### 103H7121-0440 103H7121-0410

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



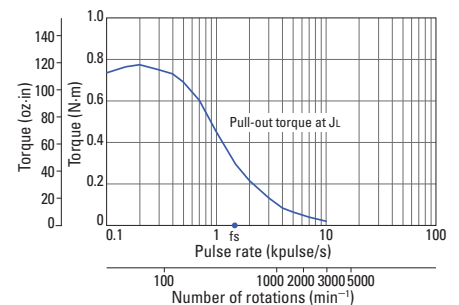
### 103H7121-0740 103H7121-0710

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



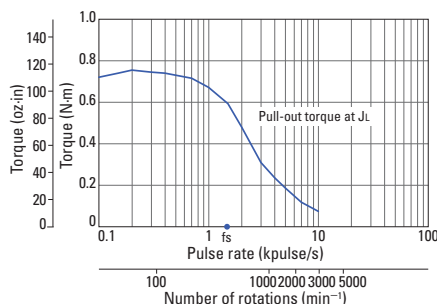
### 103H7123-0140 103H7123-0110

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



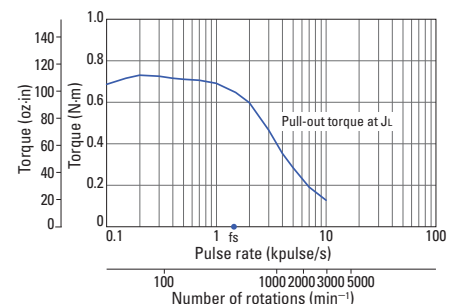
### 103H7123-0440 103H7123-0410

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



### 103H7123-0740 103H7123-0710

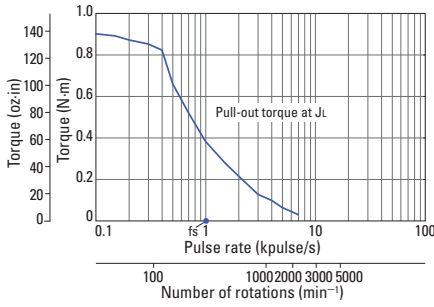
Constant current circuit  
Source voltage: 24 VDC  
Operating current:  
3 A/phase, 2-phase  
energization (full-step)  
 $J_L=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2$  (5.14  
oz-in<sup>2</sup>) use the rubber  
coupling]  
fs: Maximum self-start  
frequency when not  
loaded



## Characteristics diagram

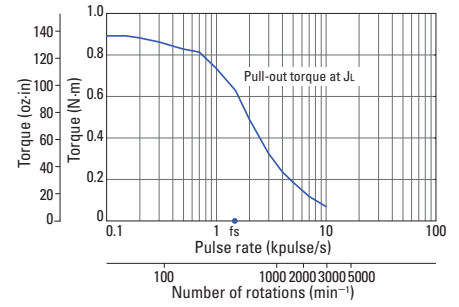
### 103H7124-0140 103H7124-0110

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



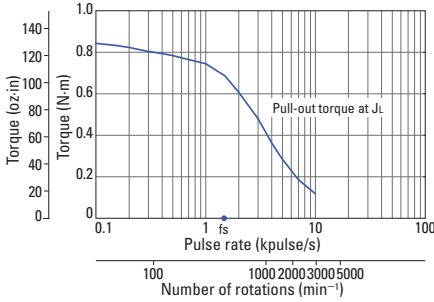
### 103H7124-0440 103H7124-0410

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



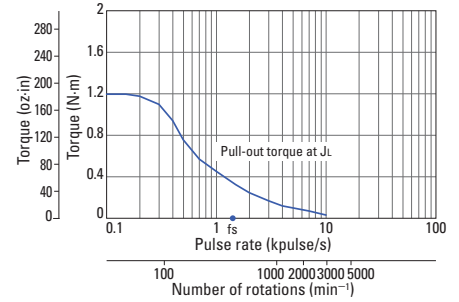
### 103H7124-0740 103H7124-0710

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



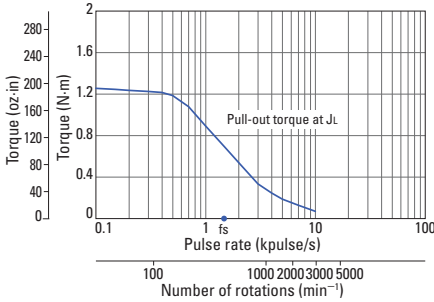
### 103H7126-0140 103H7126-0110

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



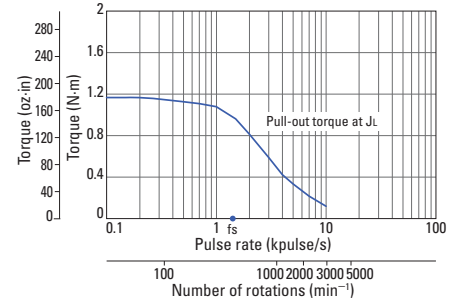
### 103H7126-0440 103H7126-0410

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



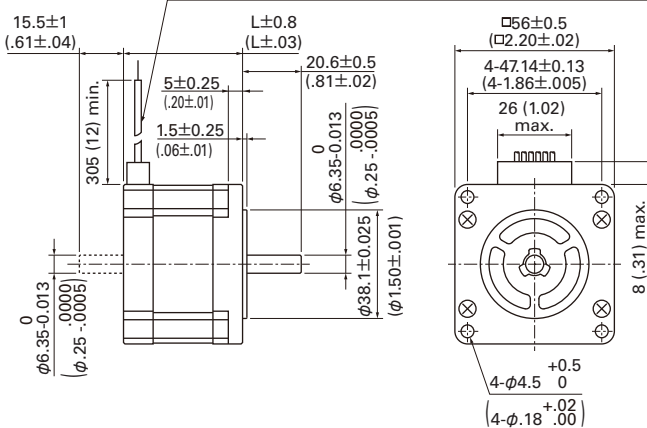
### 103H7126-0740 103H7126-0710

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

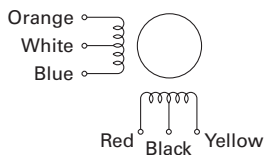


## Dimensions [Unit: mm (inch)]

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.

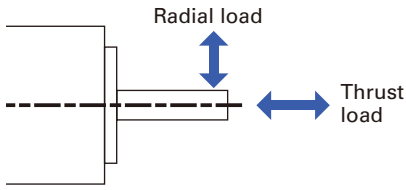
- For model number 103H712 □ -04 □ 0 (2 A/phase)

**Model number: US1D200P10 (DC input) for 103H7126-0740**

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)

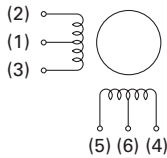
## Internal Wiring and Rotation Direction

### Unipolar winding

Connector type Model number: 103H52 □□

#### Internal wire connection

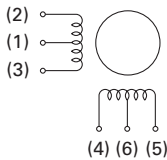
( ) connector pin number



Connector type Model number: 103H782 □□

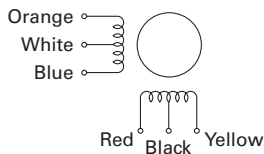
#### Internal wire connection

( ) 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.

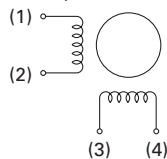
Exciting order	Lead wire color				
	White & black	Red	Blue	Yellow	Orange
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

### Bipolar winding

Connector type

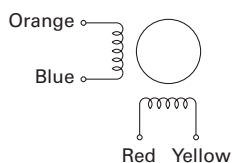
#### Internal wire connection

( ) 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	-	+	+	-

AC Input Set Models/  
Drivers

DC Input Set Models/  
Drivers

Stepping Motors

IP65 Splash and Dust  
Proof Stepping Motors

Stepping Motors for  
Vacuum Environments

Synchronous Motors

Stepping Motors with  
Integrated Drivers

## 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)	0.075 mm (0.003 in)	0.075 mm (0.003 in)
Direction of motor mounting	Can be freely mounted vertically or horizontally								

Motor model number	<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.

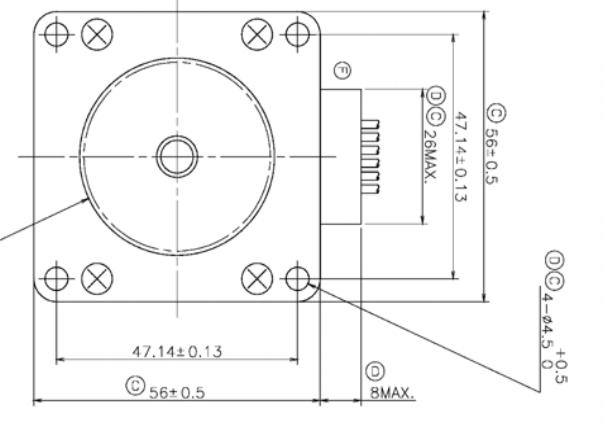
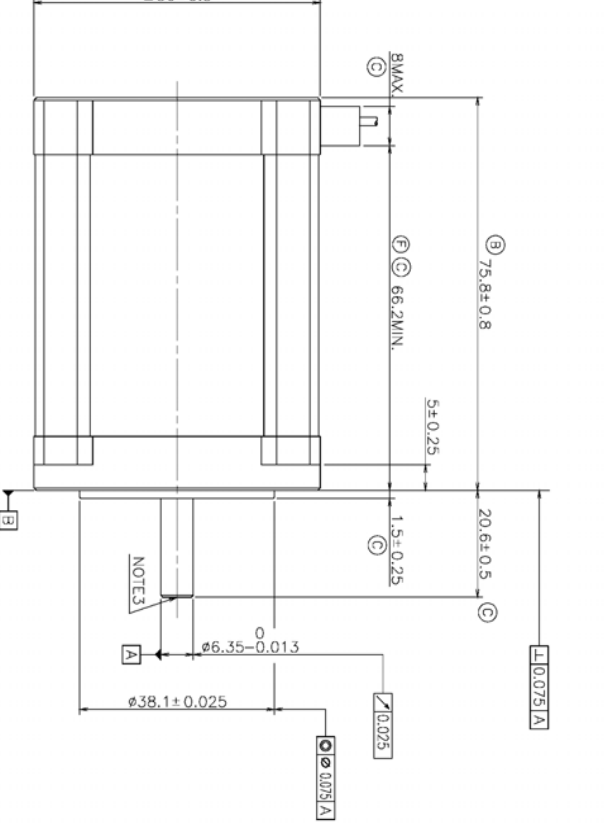
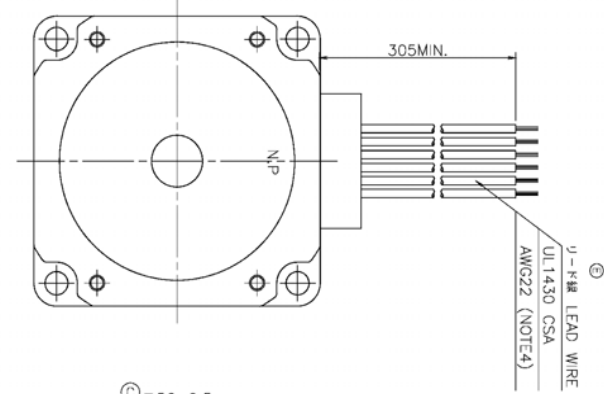
### Safety standards

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
	UL	UL1004-1, UL1004-6
	UL for Canada	CSA C22.2 No.100
		File No. E179832

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



④ 定格特性・RATED CHARACTERISTICS

相数	2
基本ステップ角	1.8°
FUNDAMENTAL STEP ANGLE	1.8°
定格電圧	2.75 V(DC)
VOLTS	2.75 V(DC)
定格電流	3 A/PHASE
AMPS	3 A/PHASE
巻線抵抗	0.9 Ω±10% at 25℃
WINDING RESISTANCE	0.9 Ω±10% at 25℃
巻線インダクタンス	2.2 mH±20% at 1 kHz 1 V(rms)
WINDING INDUCTANCE	2.2 mH±20% at 1 kHz 1 V(rms)
ホルディングトルク	1.27 N·m MIN. at 1/3 A/PHASE 2 PHASE EXCITATION
HOLDING TORQUE	1.27 N·m MIN. at 1/3 A/PHASE 2 PHASE EXCITATION
注1・引出トルク	0.91 N·m MIN. at 200 pulse/s
NOTE1・PULL OUT TORQUE	0.91 N·m MIN. at 200 pulse/s

注1・最大自動起動速度  
NOTE1・MAX STARTING RATE 1200 pulse/s MIN. at NO LOAD

注1・最大連続動作速度  
NOTE1・MAX SLEWING RATE 3000 pulse/s MIN. at NO LOAD

注2・位置精度  
POSITIONAL ACCURACY ±0.054° (0.108° SPREAD MAX.) 2 PHASE EXCITATION

注2・温度上昇  
NOTE2・COIL TEMPERATURE RISE 80 K MAX.

ローインertia  
ROTOR INERTIA 0.36x10<sup>-4</sup> kg·m<sup>2</sup> NOMINAL

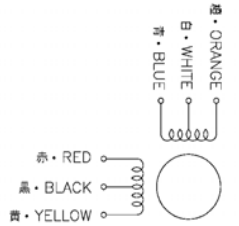
絶縁等級  
INSULATION CLASS B

許容 thrust 荷重  
ALLOWABLE THRUST LOAD 15 N

許容 radial 荷重  
ALLOWABLE RADIAL LOAD 62 N LOAD TO SHAFT END.

注1・山洋標準の相対回転速度図による。  
NOTE) SANYO STANDARD 2 PHASE EXCITATION DRIVE CIRCUIT WAS USED.  
2. 160x160x6t プラス鉄板に取付け、2相励磁=3 A/相を連続通電し、低抵抗にて測定した時の値。  
MOUNT A MOTOR ON 160X160X6T ALUMINIUM HEAT SINK AND CONTINUOUSLY ENERGIZE A COIL AT 2 PHASE EXCITATION, I=3 A/PHASE.  
3. シフトセンゾーの有無及び形状は、製造上の都合により任意とする。  
MEASURED BY THE CHANGE OF RESISTANCE METHOD.  
CENTER HOLE ON THE SHAFT END IS NOT ALWAYS MADE.  
④4. ミニターミナル端子出し部の配色は任意とする。  
A COLOR SCHEME OF LEAD WIRE OF MOTOR'S OUTLET IS DISCRETION.  
④5. 部品の形状は、製造上の都合により任意とする。  
THE SHAPE OF INSIDE OF C IS DISCRETION BY THE REASON IN MANUFACTURE.

内部接続 CONNECTION



④ 回転方向・DIRECTION OF ROTATION  
下記の様に任意指定した場合は、回転方向は正面より見て時計方向回転のことで、  
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	1	2	3	4	リード線色 LEADS COLOR
①	+	-	-	-	赤・RED
②	-	+	-	-	青・BLUE
③	-	-	+	-	黄・YELLOW
④	-	-	-	+	橙・ORANGE

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103-7126-0740