

# 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)

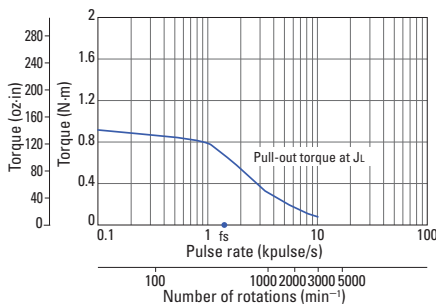
Model number		Holding torque at 2-phase energization [N·m (oz·in) min.]	Rated current A/phase	Wiring resistance Ω /phase	Winding inductance mH/phase	Rotor inertia [ $\times 10^{-4}$ kg·m <sup>2</sup> (oz·in <sup>2</sup> )]	Mass (Weight) [kg (lbs)]	Motor length (L) mm (in)
Single shaft	Dual shaft				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

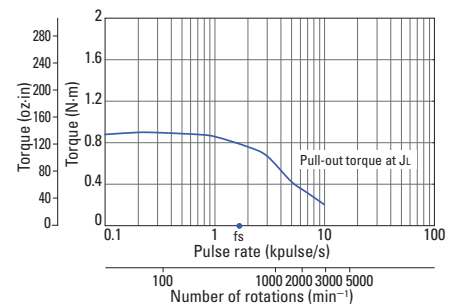
Constant current circuit  
Source voltage: 24 VDC  
Operating current: 2 A/phase, 2-phase energization (full-step)  
 $J_L = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$  use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



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

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

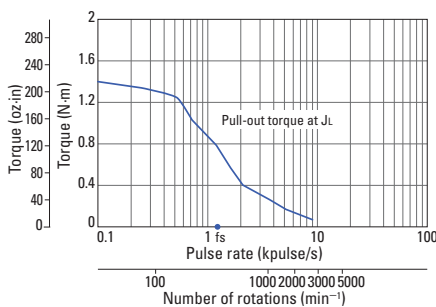
Constant current circuit  
Source voltage: 24 VDC  
Operating current: 4 A/phase, 2-phase energization (full-step)  
 $J_L = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$  use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



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

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

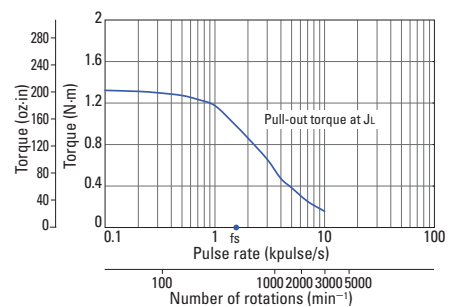
Constant current circuit  
Source voltage: 24 VDC  
Operating current: 2 A/phase, 2-phase energization (full-step)  
 $J_L = [2.6 \times 10^{-4} \text{kg} \cdot \text{m}^2 (14.22 \text{oz} \cdot \text{in}^2)]$  use the rubber coupling]  
 $f_s$ : Maximum self-start frequency when not loaded



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

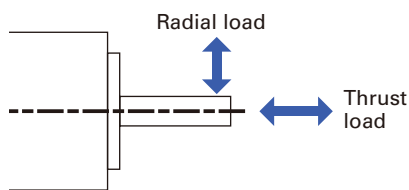
**103H7822-1760**  
**103H7822-1730**

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





# 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)

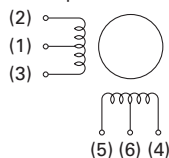
## Internal Wiring and Rotation Direction

### Unipolar winding

Connector type Model number: 103H52 □□

#### Internal wire connection

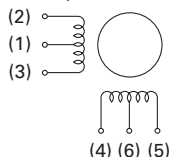
( ) connector pin number



Connector type Model number: 103H782 □□

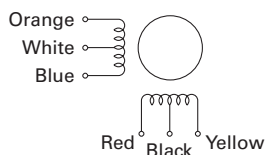
#### Internal wire connection

( ) 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.

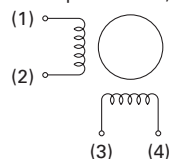
Exciting order	Lead wire color				
	White & black	Red	Blue	Yellow	Orange
1	+	-	-	-	-
2	+	-	-	-	-
3	+	-	-	-	-
4	+	-	-	-	-

### Bipolar winding

Connector type

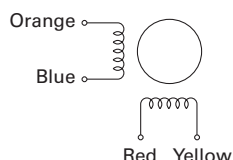
#### Internal wire connection

( ) 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	-	+	+	-

# General Specifications

Motor model number	SH2141	SH228 <input type="checkbox"/>	SH353 <input type="checkbox"/>	SS242 <input type="checkbox"/>	SH142 <input type="checkbox"/>	103H52 <input type="checkbox"/>	SS250 <input type="checkbox"/>	103H67 <input type="checkbox"/>	103H712 <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 <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 <input type="checkbox"/>	103H78 <input type="checkbox"/>	SH286 <input type="checkbox"/>	103H8922 <input type="checkbox"/>	SM286 <input type="checkbox"/>	103H712 <input type="checkbox"/> -6 <input type="checkbox"/> 0 CE Model	103H822 <input type="checkbox"/> -6 <input type="checkbox"/> 0 CE Model	103H8922 <input type="checkbox"/> -63 <input type="checkbox"/> 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.

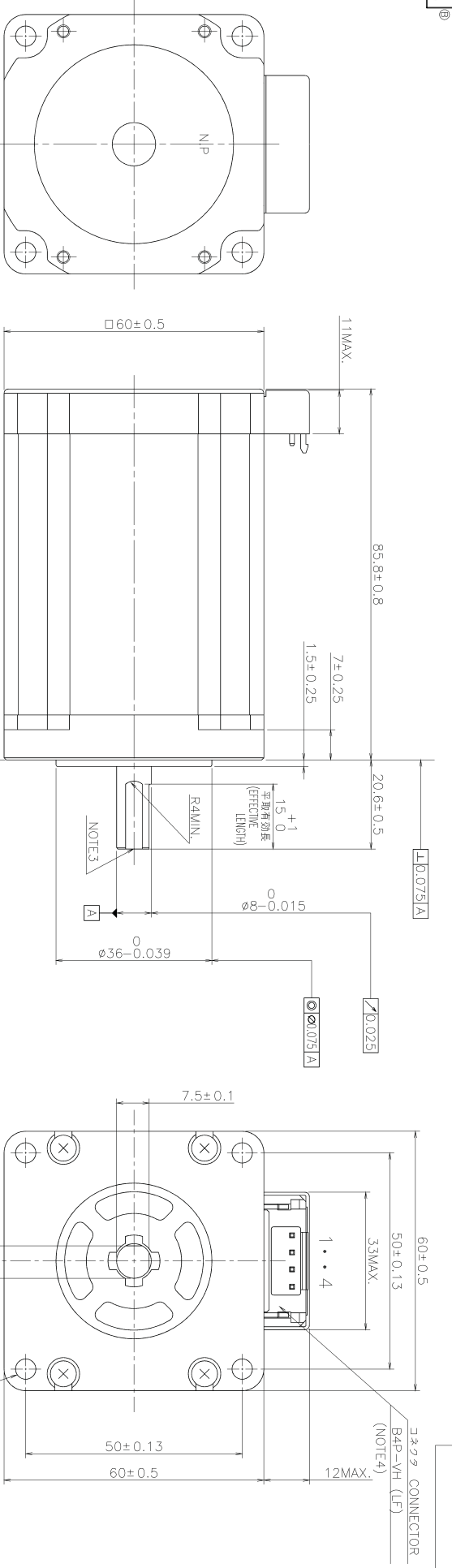
## Safety standards

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  
MAX. STARTING RATE 1100 pulse/s MIN. at NO. LOAD

注1. 最大連続応答周波数  
MAX. SLEWING RATE 3700 pulse/s MIN. at NO. LOAD

注2. 温度上昇係数  
TEMPERATURE RISE 80 K MAX.

ロータイナーシア  
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: PMW-CS-803 E=100VAC, I=4 A/相, 2相駆動。  
DRIVER: PMW-CS-803 E=100VAC, I=4 A/PHASE, 2EX.

注2. 160x160x6t プラミ放熱板に取付け, 2相所磁=4 A/相多連続通電し, 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.

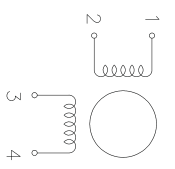
MEASURED BY THE CHANGE OF RESISTANCE METHOD.

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.)



下記の順に直列駆動した場合は, 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.

回転方向・DIRECTION OF ROTATION

コネクタピン番号 CONNECTOR PIN NO.	1	2	3	4
駆動順序 DRIVE ORDER	1	2	3	4
回転方向 ROTATION	⊕	⊖	⊕	⊖

品名 MODEL NO.	103H7823-1740	標準仕様 STANDARD SPEC.	標準寸法 STANDARD DIM.	標準重量 STANDARD WEIGHT
設計 DESIGN	07-01-06	設計 DESIGN	07-01-06	設計 DESIGN
承認 APPROVAL	07-01-06	承認 APPROVAL	07-01-06	承認 APPROVAL
製造 MANUFACTURE	07-01-06	製造 MANUFACTURE	07-01-06	製造 MANUFACTURE
検査 INSPECTION	07-01-06	検査 INSPECTION	07-01-06	検査 INSPECTION
出荷 SHIPMENT	07-01-06	出荷 SHIPMENT	07-01-06	出荷 SHIPMENT
納入 DELIVERY	07-01-06	納入 DELIVERY	07-01-06	納入 DELIVERY
廃棄 DISPOSAL	07-01-06	廃棄 DISPOSAL	07-01-06	廃棄 DISPOSAL

山洋電気株式会社  
SAVYO DENKI CO., LTD.

103H7823-1740