



## 2-phase Stepping Motor

**42mm sq.** 103H52 □□  
(1.65inch sq.) 1.8°/step

Recommendable Driver  
Refer to the page 7,17,27 and 45.

### Recommended Drivers

Unipolar motors : US1D200P10

Bipolar motors : BS1D200P10

Connector and cables:

Unipolar : order optional lead wire:  
4835710-1

Bipolar : order optional lead wire:  
4835728-1

## Specifications

### Unipolar winding

Model		Holding torque at 2-phase energization N-m (oz-in)MIN.	Rated current A/phase	Resistance Ω/phase	Inductance mH/phase	Rotor inertia x10 <sup>-4</sup> kg-m <sup>2</sup> (oz-in <sup>2</sup> )	Mass(Weight) kg(lbs)
Single shaft	Double shaft						
103H5205-0440	-0410	0.2(28.32)	1.2	2.4	2.3	0.036(0.20)	0.23(0.51)
103H5208-0440	-0410	0.3(42.48)	1.2	2.9	3.4	0.056(0.31)	0.29(0.64)
103H5209-0440	-0410	0.32(45.31)	1.2	3	3.9	0.062(0.34)	0.31(0.68)
103H5210-0440	-0410	0.37(52.39)	1.2	3.3	3.4	0.074(0.40)	0.37(0.82)

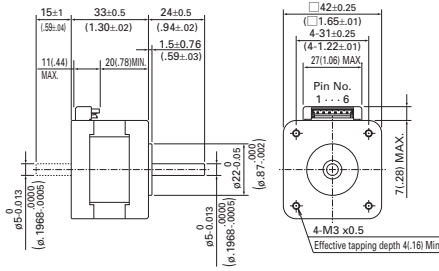
### Bipolar winding

Model		Holding torque at 2-phase energization N-m (oz-in)MIN.	Rated current A/phase	Resistance Ω/phase	Inductance mH/phase	Rotor inertia x10 <sup>-4</sup> kg-m <sup>2</sup> (oz-in <sup>2</sup> )	Mass(Weight) kg(lbs)
Single shaft	Double shaft						
103H5205-4240	-4210	0.265(37.53)	1	3.4	6.5	0.036(0.20)	0.23(0.51)
103H5205-5040	-5010	0.23(32.57)	0.25	54	78	0.036(0.20)	0.23(0.51)
103H5205-5140	-5110	0.25(35.40)	0.5	13.4	23.4	0.036(0.20)	0.23(0.51)
103H5205-5240	-5210	0.265(37.53)	1	3.4	6.5	0.036(0.20)	0.23(0.51)
103H5208-4240	-4210	0.39(55.23)	1	4.1	9.5	0.056(0.31)	0.3(0.66)
103H5208-5040	-5010	0.35(49.56)	0.25	66	116	0.056(0.31)	0.3(0.66)
103H5208-5140	-5110	0.38(53.81)	0.5	16.5	34	0.056(0.31)	0.3(0.66)
103H5208-5240	-5210	0.39(55.23)	1	4.1	9.5	0.056(0.31)	0.3(0.66)
103H5209-4240	-4210	0.425(60.18)	1	4.4	11	0.062(0.34)	0.31(0.68)
103H5209-5040	-5010	0.38(53.81)	0.25	71.4	132	0.062(0.34)	0.31(0.68)
103H5209-5140	-5110	0.41(58.06)	0.5	18.2	39	0.062(0.34)	0.31(0.68)
103H5209-5240	-5210	0.425(60.18)	1	4.4	11	0.062(0.34)	0.31(0.68)
103H5210-4240	-4210	0.51(72.22)	1	4.8	9.5	0.074(0.40)	0.37(0.82)
103H5210-5040	-5010	0.465(65.85)	0.25	80	123.3	0.074(0.40)	0.37(0.82)
103H5210-5140	-5110	0.49(69.39)	0.5	20	35	0.074(0.40)	0.37(0.82)
103H5210-5240	-5210	0.51(72.22)	1	4.8	9.5	0.074(0.40)	0.37(0.82)

**Dimensions** [Unit:mm(inch)]

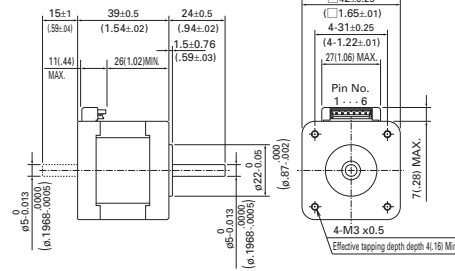
**103H5205-0440 (Single shaft)**  
**103H5205-0410 (Double shaft)**

Applicable connector (J.S.T. MFG., CO.)  
Connector: EHR-6  
Terminal: SEH-001T-P0.6



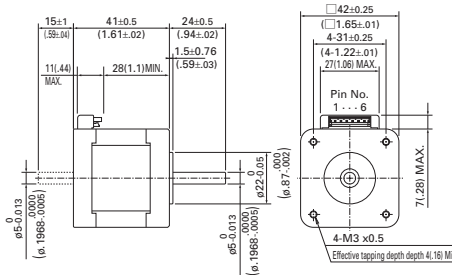
**103H5208-0440 (Single shaft)**  
**103H5208-0410 (Double shaft)**

Applicable connector (J.S.T. MFG., CO.)  
Connector: EHR-6  
Terminal: SEH-001T-P0.6



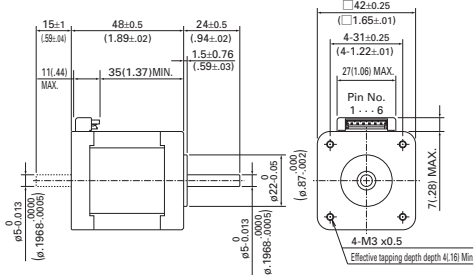
**103H5209-0440 (Single shaft)**  
**103H5209-0410 (Double shaft)**

Applicable connector (J.S.T. MFG., CO.)  
Connector: EHR-6  
Terminal: SEH-001T-P0.6



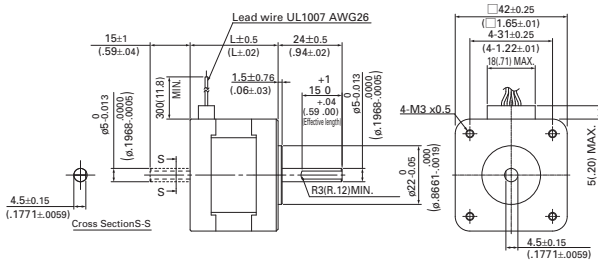
**103H5210-0440 (Single shaft)**  
**103H5210-0410 (Double shaft)**

Applicable connector (J.S.T. MFG., CO.)  
Connector: EHR-6  
Terminal: SEH-001T-P0.6



**Bipolar winding**

**103H520**□-□□**40 (Single shaft)**  
**103H520**□-□□**10 (Double shaft)**

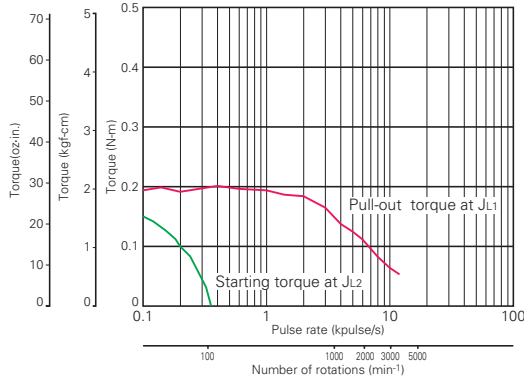


Model	L
103H5205-□□□□	33 (1.30)
103H5208-□□□□	39 (1.54)
103H5209-□□□□	41 (1.61)
103H5210-□□□□	48 (1.89)

35mm(1.38)/1.8"  
39mm(1.54)/1.9"  
42mm(1.65)/1.8"  
42mm(1.65)/1.8"  
42mm(1.65)/1.8"  
50mm(2.00)/1.8"  
56mm(2.20)/1.8"  
60mm(2.36)/1.8"  
86mm(3.39)/1.8"  
106mm(4.17)/1.8"  
106mm(4.17)/1.8"  
106mm(4.17)/1.8"  
106mm(4.17)/1.8"  
Specifications of 2-phase stepping motor  
In-vacuum stepping motor  
2-phase synchronous motor

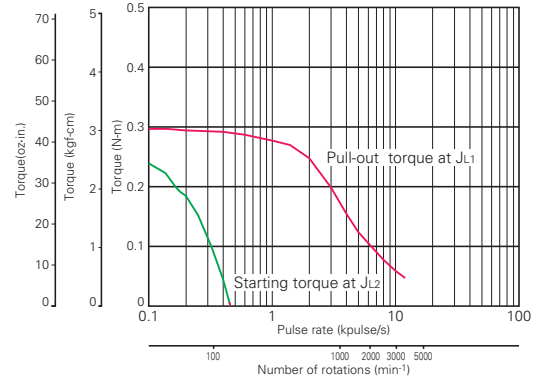
## Pulse Rate - Torque Characteristics

### ● 103H5205-0440



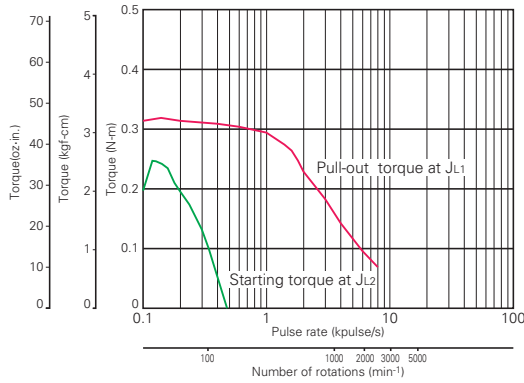
Sanyo constant current circuit  
 Source voltage: DC24V Operating current :1.2A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5208-0440



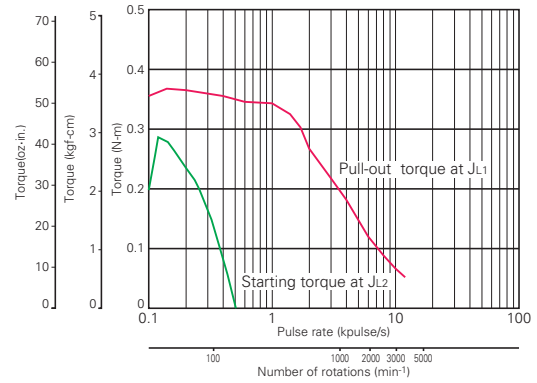
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1.2A/phase, 2-phase energization (full-step)  
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 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5209-0440



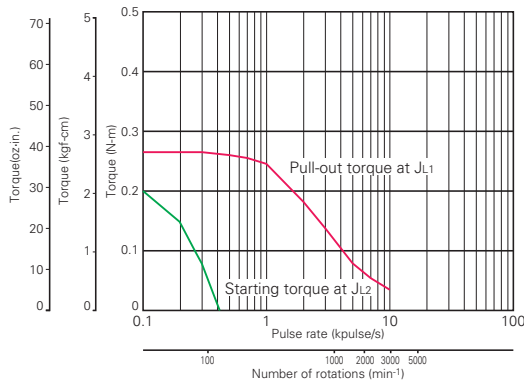
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1.2A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5210-0440



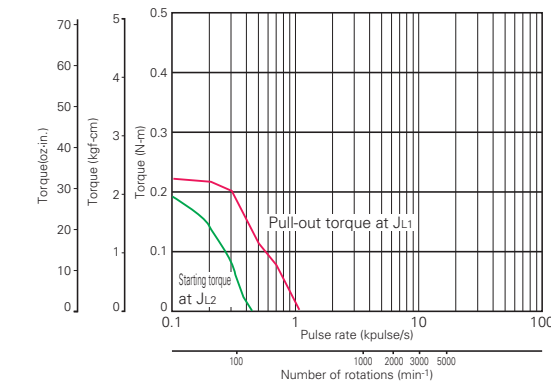
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1.2A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5205-4240



Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

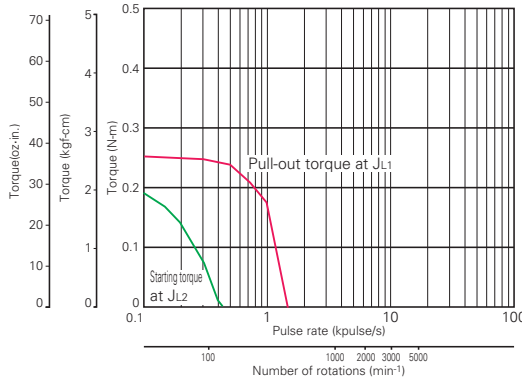
### ● 103H5205-5040



Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 25A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

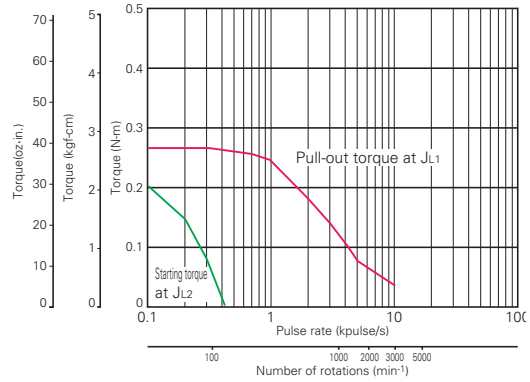
Pulse Rate - Torque Characteristics

● 103H5205-5140



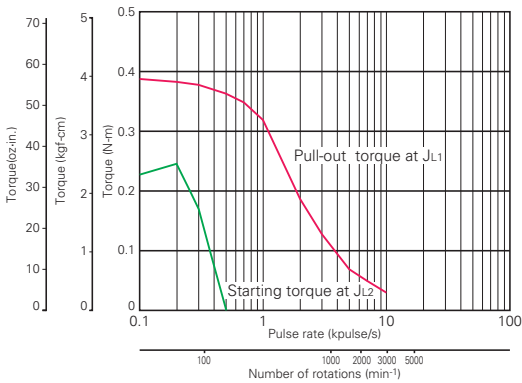
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

● 103H5205-5240



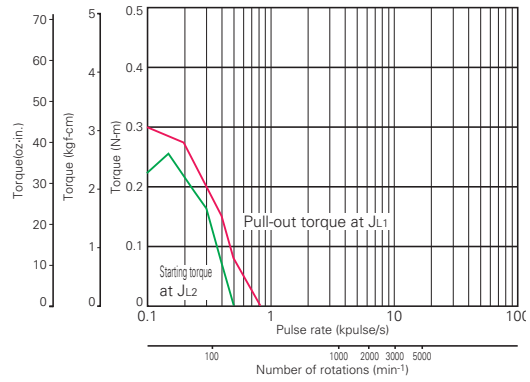
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

● 103H5208-4240



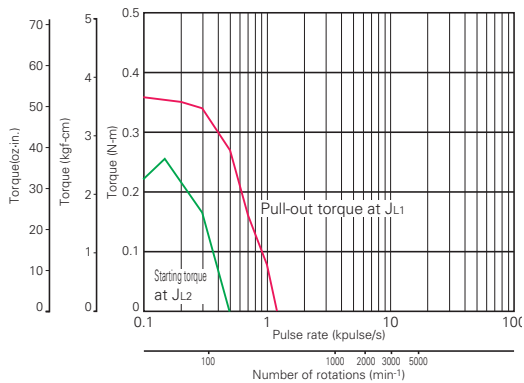
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

● 103H5208-5040



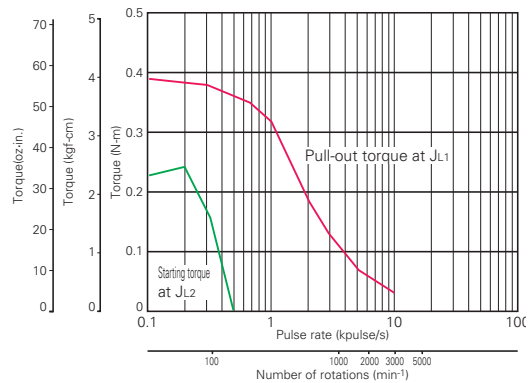
Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 0.25A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

● 103H5208-5140



Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

● 103H5208-5240

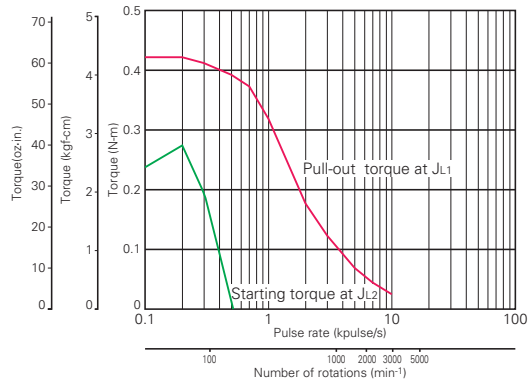


Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

Specifications of 2-phase stepping motor  
 In-vacuum stepping motor  
 2-phase synchronous motor

## Pulse Rate - Torque Characteristics

### ● 103H5209-4240



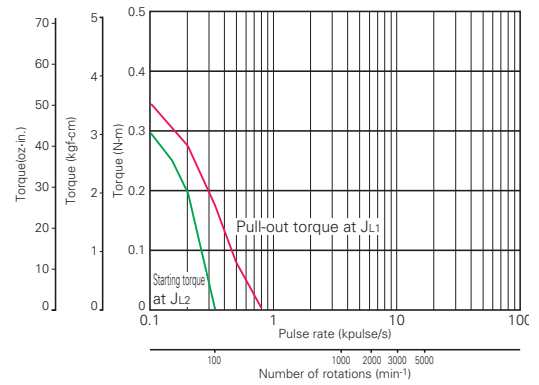
Sanyo constant current circuit

Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5209-5040



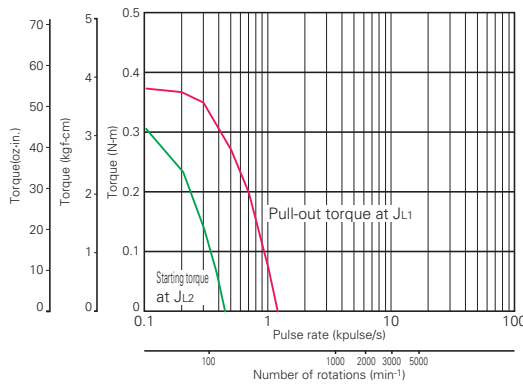
Sanyo constant current circuit

Source voltage: DC24V Operating current : 0.25A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5209-5140



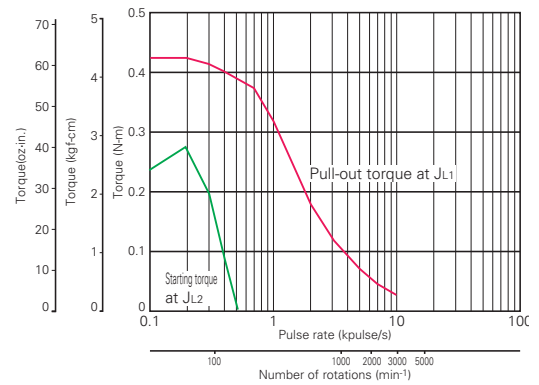
Sanyo constant current circuit

Source voltage: DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5209-5240



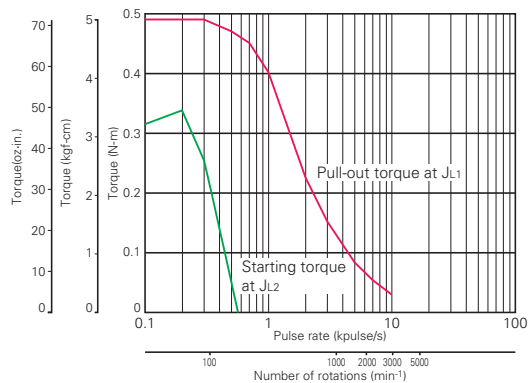
Sanyo constant current circuit

Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5210-4240



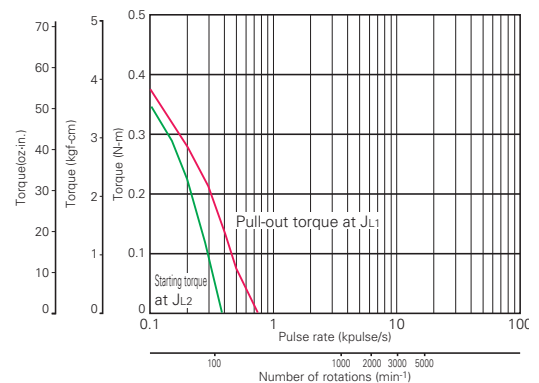
Sanyo constant current circuit

Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

### ● 103H5210-5040



Sanyo constant current circuit

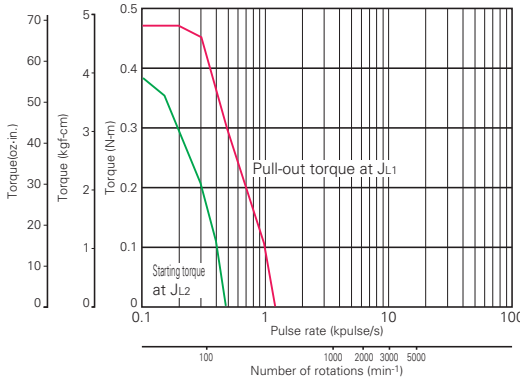
Source voltage: DC24V Operating current : 0.25A/phase, 2-phase energization (full-step)

$J_{L1}=[0.94 \times 10^{-4} \text{kg}\cdot\text{m}^2 (5.14 \text{ oz}\cdot\text{in}^2)]$  Use the rubber coupling]

$J_{L2}=[0.8 \times 10^{-4} \text{kg}\cdot\text{m}^2 (4.37 \text{ oz}\cdot\text{in}^2)]$  Use the direct coupling]

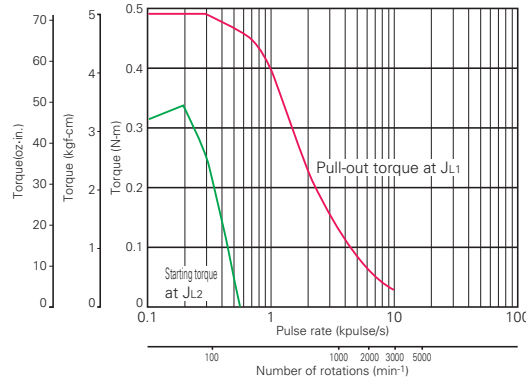
Pulse Rate - Torque Characteristics

● 103H5210-5140



Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{ oz} \cdot \text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg} \cdot \text{m}^2 (4.37 \text{ oz} \cdot \text{in}^2)]$  Use the direct coupling]

● 103H5210-5240



Sanyo constant current circuit  
 Source voltage: DC24V Operating current : 1A/phase, 2-phase energization (full-step)  
 $J_{L1}=[0.94 \times 10^{-4} \text{kg} \cdot \text{m}^2 (5.14 \text{ oz} \cdot \text{in}^2)]$  Use the rubber coupling]  
 $J_{L2}=[0.8 \times 10^{-4} \text{kg} \cdot \text{m}^2 (4.37 \text{ oz} \cdot \text{in}^2)]$  Use the direct coupling]

Specifications of 2-phase stepping motor  
 In-vacuum stepping motor  
 2-phase synchronous motor  
 ø42mm(1.65)/1.8  
 ø28mm(1.10)/1.8  
 ø39mm(1.54)/0.9  
 ø35mm(1.38)/1.8

## Specifications of 2-Phase Stepping Motor

### General Specifications

	103-4902	103-591	103-771□	103H32□□	103H52□□
Insulation class	Class B (130°C)				
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperture and humidity.				
Withstand voltage	Without abnormality when applying 50/60Hz, 0.5kV AC (1KV AC for 103-771□) for 1minute (leakage current 1mA) between winding and frame at nomal temperature and humidity.				
Operating environment	Ambient temperature: -10°C~+50°C Ambient humidity: 20~90% RH (no condensation)				
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)				
Standing angle error	±0.045°	±0.054°	±0.045°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)
Radial play (Note 1)	0.025mm(0.001inch) MAX Load 4.4N(1lbs)				
Shaft runouts	0.025mm(0.001inch)				
Concentricity of mounting spigot relative to shaft	ø0.05mm(0.002inch)	ø0.05mm(0.002inch)	ø0.075mm(0.003inch)	ø0.05mm(0.002inch)	ø0.05mm(0.002inch)
Perpendicularity of mounting surface relative to shaft	0.075mm(0.03inch)	0.075mm(0.03inch)	0.075mm(0.003inch)	0.1mm(0.004inch)	0.1mm(0.004inch)

(Note 1) When load is applied at 1/3 length from output shaft edge.

	103H670□	103H712□	103H782□	103H822□□	103H8922□□
Insulation class	Class B (130°C)				
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperture and humidity.				
Withstand voltage	Without abnormality when applying 50/60Hz, 1kV AC for 1minute (leakage current 1mA) between winding and frame at nomal temperature and humidity.				
Operating environment	Ambient temperature: -10°C~+50°C Ambient humidity: 20~90% RH (no condensation)				
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)				
Standing angle error	±0.09°	±0.054°	±0.054°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)
Radial play (Note 1)	0.025mm MAX. Load 4.4N(1lbs)				
Shaft runouts	0.025mm(0.001inch)				
Concentricity of mounting spigot relative to shaft	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)
Perpendicularity of mounting surface relative to shaft	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)

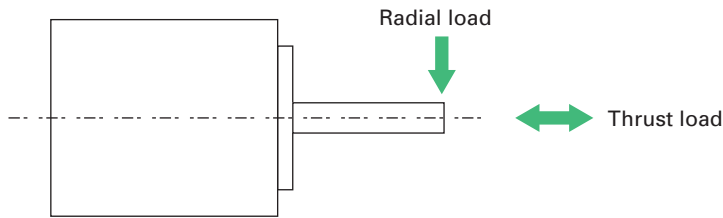
(Note 1) When load is applied at 1/3 length from output shaft edge.

### General Specifications (CE Marked Models)

	103H712□	103H822□	103H8922□
Rated voltage	12-200VDC	12-300VDC	12-300VDC
Applied standards(Low voltage directive)	EN60034-1, IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1		
Operation type	S1 (continuous rating)		
Protection grade	IP43		
Device category	Class I		
Operation environment	Pollution dgree		
Insulation class	Class B (130°C)		
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperture and humidity.		
Withstand voltage	Without abnormality when applying 50/60Hz, 1600V AC (1500V AC for 103H712□) for 1minute (leakage current 10mA) between winding and frame at nomal temperature and humidity.		
Operating environment	Ambient temperature: -10°C~+40°C Ambient humidity 20~90% (no condensation)		
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)		
Standing angle error	±0.054°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX. Load 9N(2lbs)		
Radial play (Note 1)	0.025mm(0.001inch) MAX. Load 4.4N(1lbs)		
Shaft runouts	0.025mm(.001inch)		
Concentricity of mounting spigot relative to shaft	ø0.075mm(0.003inch)	ø0.075mm(0.03inch)	ø0.075mm(0.03inch)
Perpendicularity of mounting surface relative to shaft	0.1mm(0.04inch)	0.1mm(0.004inch)	0.1mm(0.004inch)

(Note 1) When load is applied at 1/3 length from output shaft edge.

Allowable radial load / thrust load



Frange size	Model. No.	Distance from end of shaft:mm (inch)				Thrust load N(lbs)
		0	5(0.20)	10(0.39)	15(0.59)	
		Radial load:N(lbs)				
□28mm(□1.10inch)	103H32□□	30(6)	38(8)	53(11)	84(18)	3(0.67)
□35mm(□1.38inch)	SH35□□	40(8)	50(11)	67(15)	98(22)	10(2.25)
□39mm(□1.54inch)	103-49□□	43(9)	59(13)	93(20)	216(48)	30(6.75)
□42mm(□1.65inch)	103H52□□	22(4)	26(5)	33(7)	46(10)	10(2.25)
	103-59□					
□50mm(□1.97inch)	103H670□	71(15)	87(19)	115(25)	167(37)	15(3.37)
□56mm(□2.20inch)	103H712□	52(11)	65(14)	85(19)	123(27)	15(3.37)
	103H7128	85(19)	105(23)	138(31)	200(44)	15(3.37)
φ 56mm(φ 2.20inch)	103-77□□	75(16)	92(20)	121(27)	176(39)	15(3.37)
□60mm(□2.36inch)	103H782□	70(15)	87(19)	114(25)	165(37)	20(4.50)
φ 86mm(φ 3.39inch)	103H822□	191(42)	234(52)	301(67)	421(94)	60(13.488)
φ 106mm(φ 4.17inch)	103H8922□	321(72)	356(80)	401(90)	457(102)	100(22.48)

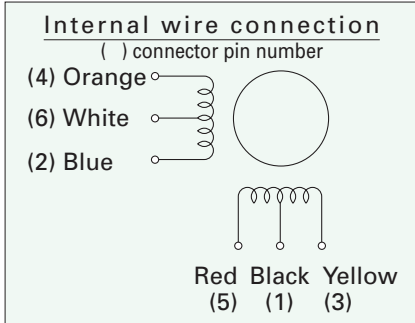
□35mm(1.38)/1.8"  
 □39mm(1.54)/0.9"  
 □42mm(1.65)/0.9"  
 □28mm(1.10)/1.8"  
 □42mm(1.65)/1.8"  
 □50mm(1.97)/1.8"  
 □56mm(2.20)/1.8"  
 □60mm(2.36)/1.8"  
 φ86mm(3.39)/1.8"  
 φ106mm(4.17)/1.8"  
 φ56mm(2.20)/CE  
 φ86mm(3.39)/CE  
 φ106mm(4.17)/CE  
 Specifications of  
 2-phase stepping motor  
 In-vacuum  
 stepping motor  
 2-phase  
 synchronous motor



## Internal Wiring and Rotation Direction

Unipolar winding

● 103H32□□

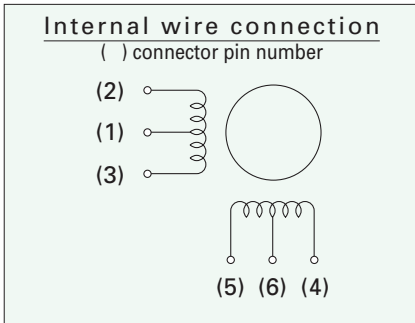


### Direction of motor rotate

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

		Lead wire color, connector type pin number				
		White & black	Red	Blue	Yellow	Orange
Lead wire		(1.6)	(5)	(2)	(3)	(4)
Exciting order	1	+	-	-	-	-
	2	+	-	-	-	-
	3	+	-	-	-	-
	4	+	-	-	-	-

● 103H52□□

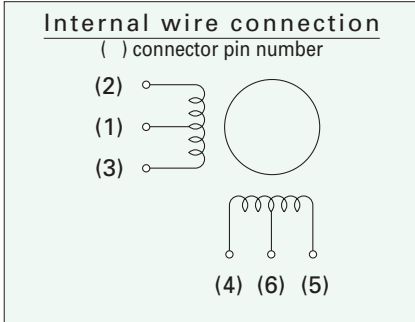


### Direction of motor rotate

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

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

● 103H782□

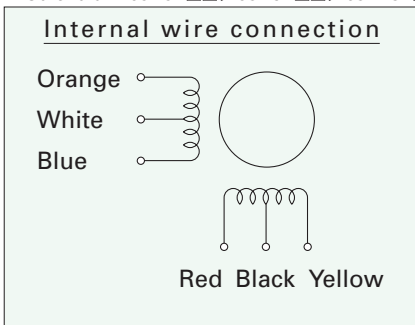


### Direction of motor rotate

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

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

● Other than 103H32□□, 103H52□□, 103H782□

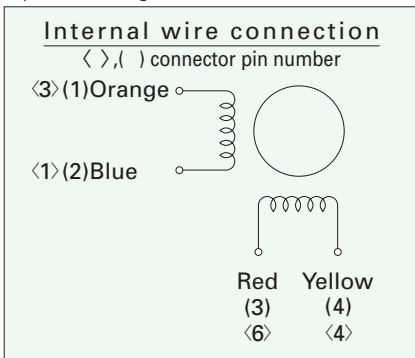


### Direction of motor rotate

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

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

Bipolar winding



### Direction of motor rotate

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

		Lead wire color, connector type pin number			
		Red	Blue	Yellow	Orange
Exciting order	1	-	-	+	+
	2	+	-	-	+
	3	+	+	-	-
	4	-	+	+	-
Connector	103H52□□	<6>	<1>	<4>	<3>
	103H782□	(3)	(2)	(4)	(1)

## Specifications of 2-Phase Stepping Motor

### General Specifications

	103-4902	103-591	103-771□	103H32□□	103H52□□
Insulation class	Class B (130°C)				
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperature and humidity.				
Withstand voltage	Without abnormality when applying 50/60Hz, 0.5kV AC (1kV AC for 103-771□) for 1minute (leakage current 1mA) between winding and frame at normal temperature and humidity.				
Operating environment	Ambient temperature: -10°C~+50°C Ambient humidity: 20~90% RH (no condensation)				
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)				
Standing angle error	±0.045°	±0.054°	±0.045°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)	0.075mm(0.003inch) MAX Load 4.4N(1lbs)
Radial play (Note 1)	0.025mm(0.001inch) MAX Load 4.4N(1lbs)				
Shaft runouts	0.025mm(0.001inch)				
Concentricity of mounting spigot relative to shaft	ø0.05mm(0.002inch)	ø0.05mm(0.002inch)	ø0.075mm(0.003inch)	ø0.05mm(0.002inch)	ø0.05mm(0.002inch)
Perpendicularity of mounting surface relative to shaft	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)	0.1mm(0.004inch)	0.1mm(0.004inch)

(Note 1) When load is applied at 1/3 length from output shaft edge.

	103H670□	103H712□	103H782□	103H822□□	103H8922□□
Insulation class	Class B (130°C)				
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperature and humidity.				
Withstand voltage	Without abnormality when applying 50/60Hz, 1kV AC for 1minute (leakage current 1mA) between winding and frame at normal temperature and humidity.				
Operating environment	Ambient temperature: -10°C~+50°C Ambient humidity: 20~90% RH (no condensation)				
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)				
Standing angle error	±0.09°	±0.054°	±0.054°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)	0.075mm(0.003inch) MAX Load 9N(2lbs)
Radial play (Note 1)	0.025mm MAX. Load 4.4N(1lbs)				
Shaft runouts	0.025mm(0.001inch)				
Concentricity of mounting spigot relative to shaft	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)
Perpendicularity of mounting surface relative to shaft	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)	0.075mm(0.003inch)

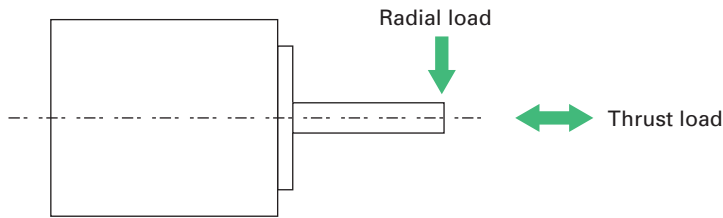
(Note 1) When load is applied at 1/3 length from output shaft edge.

### General Specifications (CE Marked Models)

	103H712□	103H822□	103H8922□
Rated voltage	12-200VDC	12-300VDC	12-300VDC
Applied standards(Low voltage directive)	EN60034-1, IEC34-5(EN60034-5), EN60204-1, EN60950, EN61010-1		
Operation type	S1 (continuous rating)		
Protection grade	IP43		
Device category	Class I		
Operation environment	Pollution degree		
Insulation class	Class B (130°C)		
Insulation resistance	Not less than 100MΩ between winding and frame by DC500V megger or normal temperature and humidity.		
Withstand voltage	Without abnormality when applying 50/60Hz, 1600V AC (1500V AC for 103H712□) for 1minute (leakage current 10mA) between winding and frame at normal temperature and humidity.		
Operating environment	Ambient temperature: -10°C~+40°C Ambient humidity 20~90% (no condensation)		
Winding temperature rise	80K MAX. (Based on Sanyo Denki standard)		
Standing angle error	±0.054°	±0.09°	±0.09°
Axial play	0.075mm(0.003inch) MAX. Load 9N(2lbs)		
Radial play (Note 1)	0.025mm(0.001inch) MAX. Load 4.4N(1lbs)		
Shaft runouts	0.025mm(0.001inch)		
Concentricity of mounting spigot relative to shaft	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)	ø0.075mm(0.003inch)
Perpendicularity of mounting surface relative to shaft	0.1mm(0.004inch)	0.1mm(0.004inch)	0.1mm(0.004inch)

(Note 1) When load is applied at 1/3 length from output shaft edge.

Allowable radial load / thrust load



Frange size	Model. No.	Distance from end of shaft:mm (inch)				Thrust load N(lbs)
		0	5(0.20)	10(0.39)	15(0.59)	
		Radial load:N(lbs)				
□28mm(□1.10inch)	103H32□□	30(6)	38(8)	53(11)	84(18)	3(0.67)
□35mm(□1.38inch)	SH35□□	40(8)	50(11)	67(15)	98(22)	10(2.25)
□39mm(□1.54inch)	103-49□□	43(9)	59(13)	93(20)	216(48)	30(6.75)
□42mm(□1.65inch)	103H52□□	22(4)	26(5)	33(7)	46(10)	10(2.25)
	103-59□					
□50mm(□1.97inch)	103H670□	71(15)	87(19)	115(25)	167(37)	15(3.37)
□56mm(□2.20inch)	103H712□	52(11)	65(14)	85(19)	123(27)	15(3.37)
	103H7128	85(19)	105(23)	138(31)	200(44)	15(3.37)
φ 56mm(φ 2.20inch)	103-77□□	75(16)	92(20)	121(27)	176(39)	15(3.37)
□60mm(□2.36inch)	103H782□	70(15)	87(19)	114(25)	165(37)	20(4.50)
φ 86mm(φ 3.39inch)	103H822□	191(42)	234(52)	301(67)	421(94)	60(13.488)
φ 106mm(φ 4.17inch)	103H8922□	321(72)	356(80)	401(90)	457(102)	100(22.48)

□35mm(1.38)/1.8"  
 □39mm(1.54)/0.9"  
 □42mm(1.65)/0.9"  
 □28mm(1.10)/1.8"  
 □42mm(1.65)/1.8"  
 □50mm(1.97)/1.8"  
 □56mm(2.20)/1.8"  
 □60mm(2.36)/1.8"  
 φ86mm(3.39)/1.8"  
 φ106mm(4.17)/1.8"  
 φ56mm(2.20)/CE  
 φ86mm(3.39)/CE  
 φ106mm(4.17)/CE

Specifications of  
2-phase stepping motor

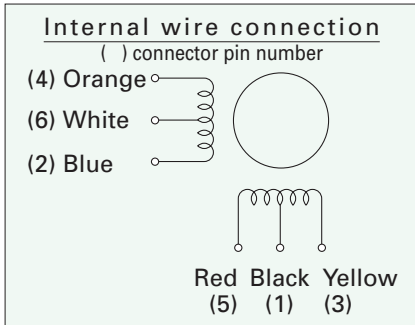
In-vacuum  
stepping motor

2-phase  
synchronous motor

## Internal Wiring and Rotation Direction

Unipolar winding

● 103H32□□

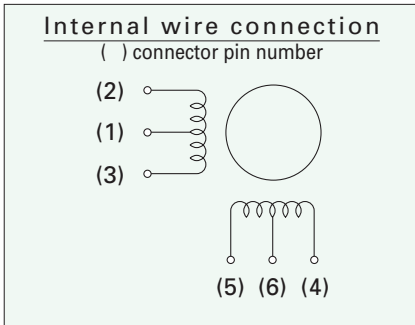


### Direction of motor rotate

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

		Lead wire color, connector type pin number				
		White & black	Red	Blue	Yellow	Orange
Lead wire		(1.6)	(5)	(2)	(3)	(4)
Exciting order	1	+	-	-	-	-
	2	+	-	-	-	-
	3	+	-	-	-	-
	4	+	-	-	-	-

● 103H52□□

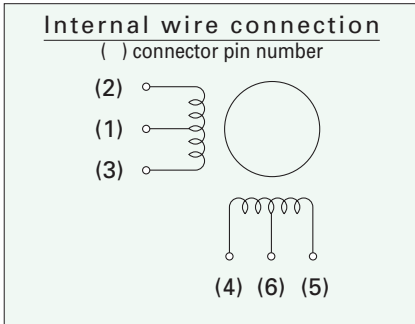


### Direction of motor rotate

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

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

● 103H782□

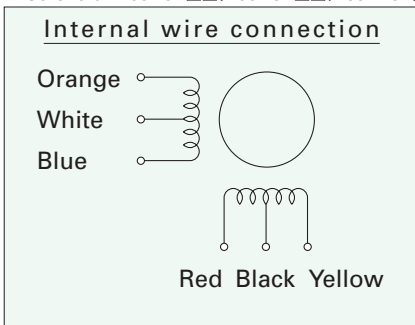


### Direction of motor rotate

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

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

● Other than 103H32□□, 103H52□□, 103H782□

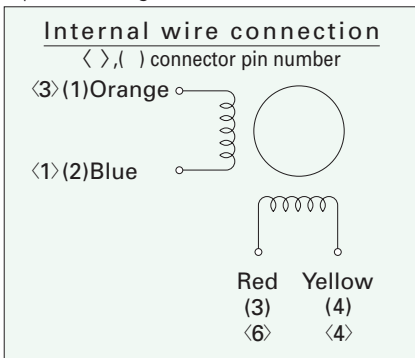


### Direction of motor rotate

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

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

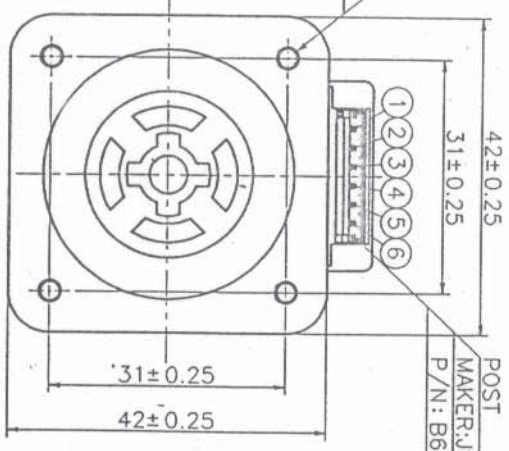
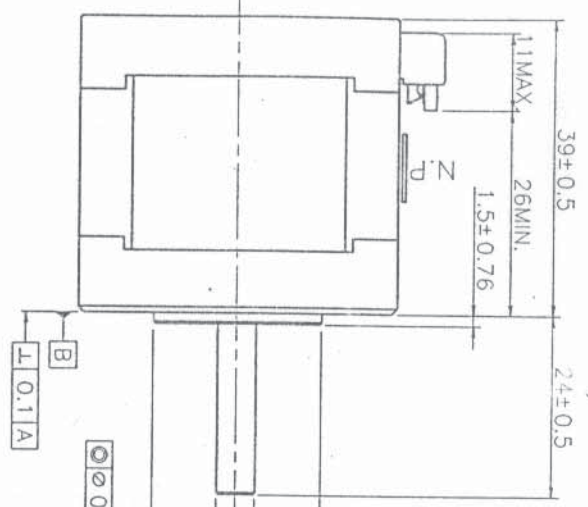
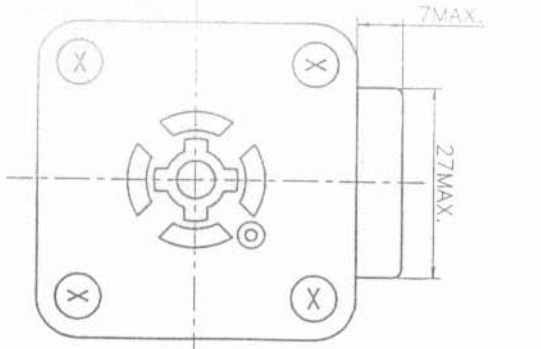
Bipolar winding



### Direction of motor rotate

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

		Lead wire color, connector type pin number			
		Red	Blue	Yellow	Orange
Exciting order	1	-	-	+	+
	2	+	-	-	+
	3	+	+	-	-
	4	-	+	+	-
Connector	103H52□□	<6>	<1>	<4>	<3>
	103H782□	(3)	(2)	(4)	(1)



PIN No.	PHASE	LENS COLOR
1	BCOM	WHITE
2	B	ORANGE
3	B	BULE
4	A	YELLOW
5	A	RED
6	ACOM	BLACK

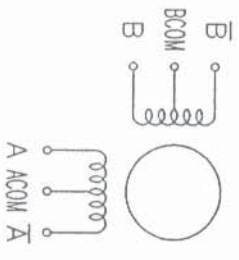
RATED CHARACTERISTICS

PHASES	2
FUNDAMENTAL STEP ANGLE	1.8°
VOLTS	3.48 V(DC)
AMPS	1.2 A/PHASE
WINDING RESISTANCE	2.9 Ω ± 10% at 25 °C
WINDING INDUCTANCE	3.4 mH ± 20% at 1 kHz 1 V(rms)
HOLDING TORQUE	0.3 N·m MIN. at 1.2 A/PHASE 2EX
NOTE1. PULL OUT TORQUE	0.23 N·m MIN. at 1000 pulse/s
	LOAD INERTIA 0.94x10 <sup>-4</sup> kg·m <sup>2</sup>
	(INCLUDE COUPLING INERTIA)
NOTE1. MAX. STARTING RATE	1550 pulse/s MIN. at NO LOAD
NOTE1. MAX. SLEWING RATE	2300 pulse/s MIN. at NO LOAD
POSITIONAL ACCURACY	± 0.09° (0.18° SPREAD MAX.) 2EX
NOTE2. COIL TEMPERATURE RISE	80 KMAX.
ROTOR INERTIA	0.056x10 <sup>-4</sup> kg·m <sup>2</sup> NOMINAL
INSULATION CLASS	B

NOTE1. SANVO PMM-MD-23221 DRIVE CIRCUIT. (TWO PHASE EXCITATION )  
 E=24 V(DC), I=1.2 A/PHASE (AVE)  
 NOTE2. MOUNTED ON 100x100x21SPC HEAT SINK, TWO PHASE-ENERGIZED  
 AT I=1.2 A/PHASE CONSTANT. MEASURED BY THE CHANGE OF RESISTANCE METHOD.  
 NOTE3. CENTER HOLE ON THE SHAFT END IS NOT ALWAYS MADE.  
 NOTE4. MATCHING CONNECTOR IS NOT ACCESSORY.



CONNECTION



DIRECTION OF ROTATION

WHEN MOTOR IS SEQUENCED AS SHOWN IN FIGURE2. THE SHAFT ROTATION MUST BE CLOCK WISE AS VIEWED FROM SURFACE "B" SIDE.

STEP	ACOM/BCOM	A	B	Ā	B̄
1	⊕	⊖	⊖		
2	⊕		⊖	⊖	
3	⊕			⊖	⊖
4	⊕	⊖			⊖

CONNECTOR (JST) NOTE4  
 HOUSING: EHR-6  
 CONTACT: SEH-0011T-P0.6

Model	Order No.	Release Date	Release Date	Release Date	Release Date
C E0023258	99-01-25	99-02-16	99-02-16		
B E0021293	98-11-06				
A NEW DESIGN	98-10-05				

山洋電気株式会社  
 SANYO DENKI CO., LTD.  
 103H5208-0440