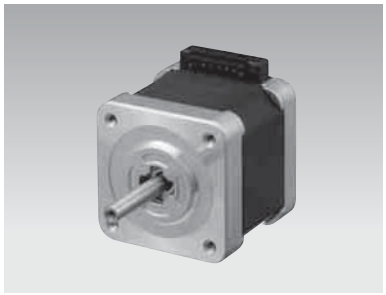


42 mm sq. (1.65 inch sq.)

1.8˚ /step RoHS

Unipolar winding, Connector type

Bipolar winding, Lead wire type ▶p. 62

Customizing

Hollow | Shaft modification | Decelerator | Encoder | Brake

Varies depending on the model number and quantity. Contact us for details.

Unipolar winding, Connector type

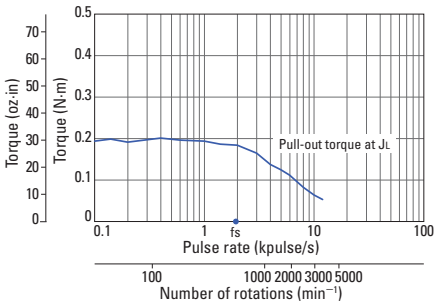
Model number		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	Dual shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10⁻⁴kg·m² (oz·in²)]	[kg (lbs)]	mm (in)
103H5205-0440	103H5205-0410	0.2 (28.32)	1.2	2.4	2.3	0.036 (0.20)	0.23 (0.51)	33 (1.25)
103H5208-0440	103H5208-0410	0.3 (42.48)	1.2	2.9	3.4	0.056 (0.31)	0.29 (0.64)	39 (1.54)
103H5209-0440	103H5209-0410	0.32 (45.31)	1.2	3	3.9	0.062 (0.34)	0.31 (0.68)	41 (1.61)
103H5210-0440	103H5210-0410	0.37 (52.39)	1.2	3.3	3.4	0.074 (0.40)	0.37 (0.82)	48 (1.89)

Motor cable: Model No.4835710-1

Characteristics diagram

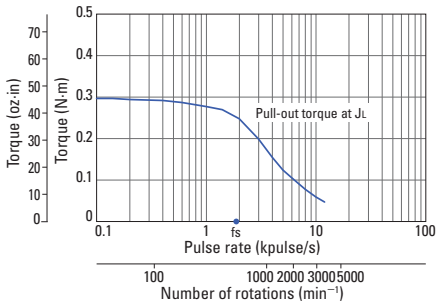
103H5205-0440
103H5205-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
J_L=[0.94 × 10⁻⁴kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



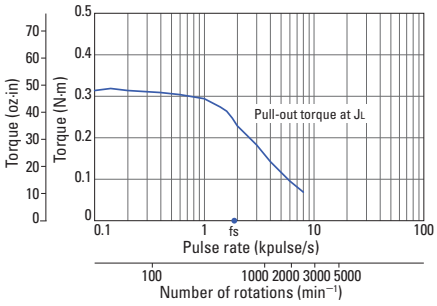
103H5208-0440
103H5208-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
J_L=[0.94 × 10⁻⁴kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



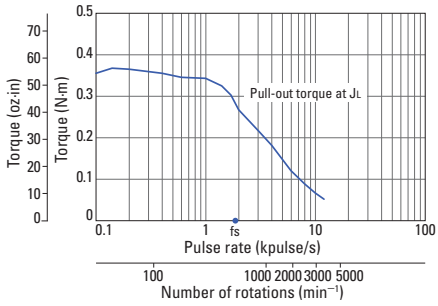
103H5209-0440
103H5209-0410

Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
J_L=[0.94 × 10⁻⁴kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded

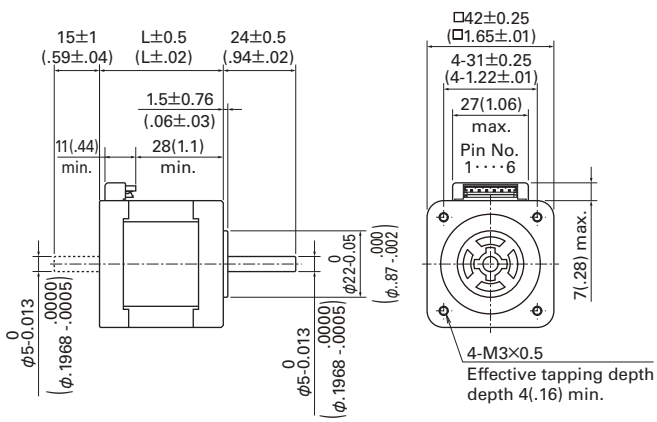


103H5210-0440
103H5210-0410

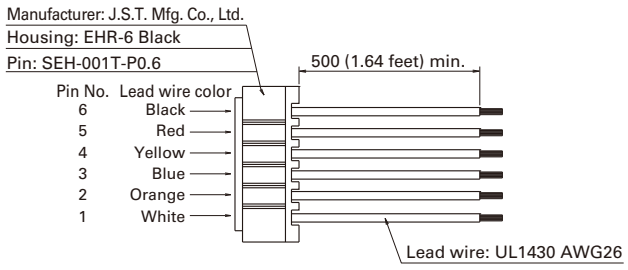
Constant current circuit
Source voltage: 24 VDC
Operating current:
1.2 A/phase, 2-phase energization (full-step)
J_L=[0.94 × 10⁻⁴kg·m² (5.14 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



Dimensions [Unit: mm (inch)]

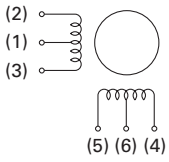


Option (sold separately): Motor cable Model number: 4835710-1



This driver-motor cable is for motor model numbers 103H52□□-04□□.

Internal wiring



Compatible drivers

Model number: US1D200P10

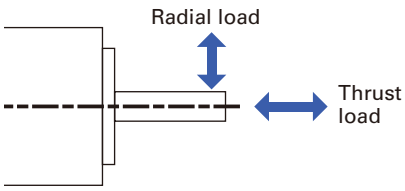
Operating current select switch setting: 8

The characteristics diagram shown above is from our experimental circuit.

Allowable Load, Rotation Direction ▶p. 87 General Specifications ▶p. 88

Data is measured under the trial conditions of SANYO DENKI. Driving torque may vary according to actual machine precision.

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)
86 mm sq. (3.39 in sq.)	103H822 □	191 (43)	234 (53)	301 (68)	421 (95)	60 (13.488)
ϕ106 mm (ϕ4.17 in)	103H8922 □	321 (72)	356 (79)	401 (90)	457 (101)	100 (22.48)

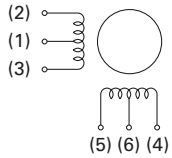
Internal Wiring and Rotation Direction

Unipolar winding

Connector type Model number: 103H52 □□

Internal wire connection

( ) connector pin number



Direction of motor rotation

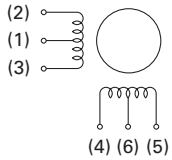
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

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

Connector type Model number: 103H782 □□

Internal wire connection

( ) connector pin number



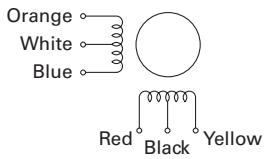
Direction of motor rotation

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

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

Lead wire type

Internal wire connection



Direction of motor rotation

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

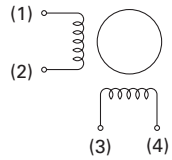
		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1	+	–	–		
	2	+		–	–	
	3	+			–	–
	4	+	–			–

Bipolar winding

Connector type

Internal wire connection

( ) connector pin number, terminal block number



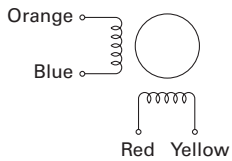
Direction of motor rotation

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

		Connector pin number, terminal block number			
		(3)	(2)	(4)	(1)
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–

Lead wire type

Internal wire connection



Direction of motor rotation

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

		Lead wire color			
		Red	Blue	Yellow	Orange
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–

General Specifications

Motor model number	SH2141	SH228 □	SH353 □	SS242 □	SH142 □	103H52 □□	SS250 □	103H67 □□	103H712 □
Type	—								
Operating ambient temperature	− 10℃ to + 50℃								
Conversation temperature	− 20℃ to + 65℃								
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/s² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.								
Impact resistance	500 m/s² 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℃)								
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) (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) (load: 10 N (2.25 lbs))	0.075 mm (0.003 in) (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℃ to + 50℃				− 10℃ to + 40℃			
Conversation temperature	− 20℃ to + 65℃				− 20℃ to + 60℃			
Operating ambient humidity	20 to 90% RH (no condensation)				95% max.: 40℃ max., 57% max.: 50℃ max., 35% max.: 60℃ 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/s² (70 to 500 Hz), sweep time 15 min/cycle, 12 sweeps in each X, Y and Z direction.							
Impact resistance	500 m/s² 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℃)				Class F (+155℃)	Class B (+130℃)		
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 then 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.

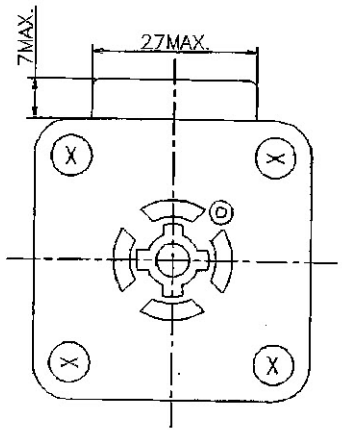
Safety standards

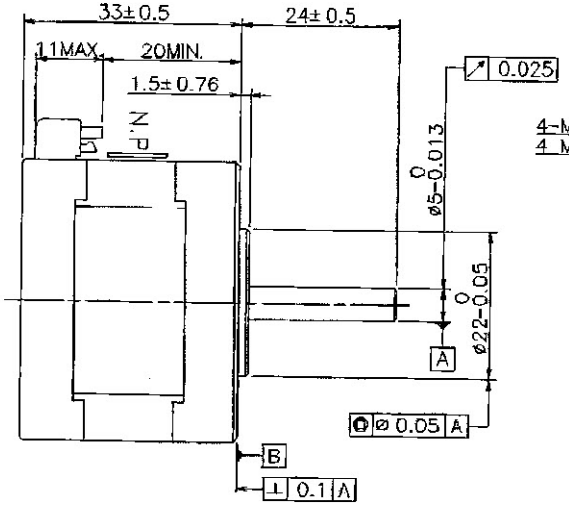
Model Number: SM286 □ CE/UL marked models

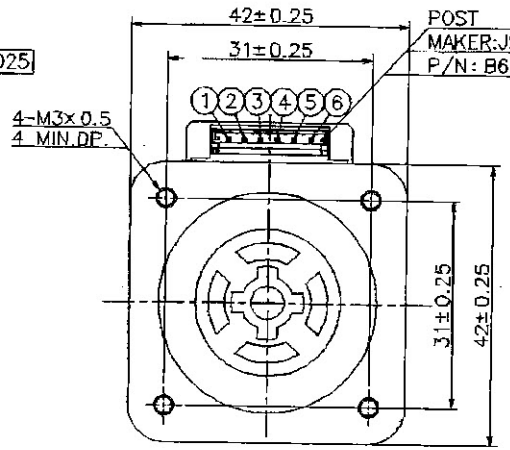
CE (TÜV)	Standard category		Applicable standard
	Low-voltage directives		EN60034-1, EN60034-5
UL	Acquired standards	Applicable standard	File No.
	UL	UL1004-1, UL1004-6	E179832
	UL for Canada	CSA C22.2 No.100	

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







PIN No.	PHASE	LEADS COLOR
1	BCOM	WHITE
2	$\overline{B}$	ORANGE
3	B	BULE
4	$\overline{A}$	YELLOW
5	A	RED
6	ACOM	BLACK

CONNECTOR (JST) NOTE4
HOUSING: EHR-6
CONTACT: SEH-001T-P0.6

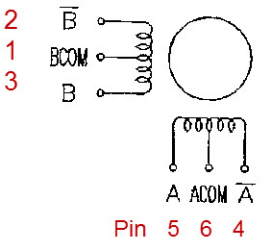
Preliminary

RATED CHARACTERISTICS

	PHASES	2	
	FUNDAMENTAL STEP ANGLE	1.8	°
	VOLTS	2.88	V [DC]
	AMPS	1.2	A/PHASE
	WINDING RESISTANCE	2.4	Ω ± 10% at 25 °C
	WINDING INDUCTANCE	2.3	mH ± 20% at 1 kHz 1 V [rms]
	HOLDING TORQUE	0.2	N·m MIN. at I= 1.2 A/PHASE 2EX
NOTE1.	PULL OUT TORQUE	0.15	N·m MIN. at 1000 pulse/s LOAD INERTIA 0.94×10^{-4} kg·m² (INCLUDE COUPLING INERTIA)
NOTE1.	MAX. STARTING RATE	1600	pulse/s MIN. at NO LOAD
NOTE1.	MAX. SLEWING RATE	3400	pulse/s MIN. at NO LOAD
	POSITIONAL ACCURACY	±0.09	° (0.18° SPREAD MAX.) 2EX
NOTE2.	COIL TEMPERATURE RISE	80	K MAX.
	ROTOR INERTIA	0.036×10^{-4}	kg·m² NOMINAL
	INSULATION CLASS	B	

NOTE1. SANYO PMM-MD-23221 DRIVE CIRCUIT. (TWO PHASE EXCITATION)
E=24 V [DC], I=1.2 A/PHASE (AVE)
NOTE2. MOUNTED ON 100×100×2t SPCC 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.

Pin 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.

		ACOM/BCOM	A	B	$\overline{A}$	$\overline{B}$
STEP ↑	1	⊕	⊖	⊖		
	2	⊕		⊖	⊖	
	3	⊕			⊖	⊖
	4	⊕	⊖			⊖

D	E0028997	99-10-12	
C	E0023258	99-01-25	
B	E0021293	98-11-06	
A	NEW DESIGN	98-10-05	

APPROVED BY Y. Tsuda 99-10-15
CHECKED BY K. Miyama 99-10-14
DRAWN BY Y.OYAMADA 99-10-12
UNIT m m
SCALE
TITLE: STEPPING MOTOR

山洋電気株式会社 SANYO DENKI CO.,LTD.
DWG NO. 103H5205-0440 REV. D
A2G-F3
100332497.0902