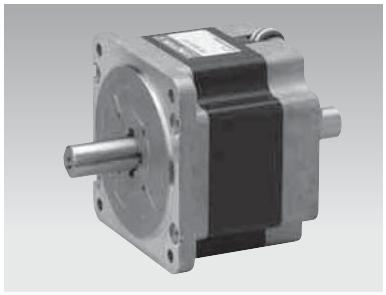


86 mm sq. (3.39 inch sq.)

1.8˚ /step RoHS

Bipolar winding, Lead wire type
Bipolar winding, Lead wire type CE/UL model
Bipolar winding, Terminal block type CE/UL model
Unipolar winding, Lead wire type ▶p. 78
Unipolar winding, Lead wire type CE/UL model ▶p. 78

Customizing
Hollow | Shaft modification | Encoder
Varies depending on the model number and quantity. Contact us for details.

Bipolar 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	[×10⁻⁴kg·m² (oz·in²)]	[kg (lbs)]	mm (in)
SH2861-5041	SH2861-5011	3.3 (467.3)	2	2.2	15	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2861-5141	SH2861-5111	3.3 (467.3)	4	0.56	3.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2861-5241	SH2861-5211	3.3 (467.3)	6	0.29	1.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SH2862-5041	SH2862-5011	6.4 (906.3)	2	3.2	25	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2862-5141	SH2862-5111	6.4 (906.3)	4	0.83	6.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2862-5241	SH2862-5211	6.4 (906.3)	6	0.36	2.8	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SH2863-5041	SH2863-5011	9 (1274.4)	2	4.0	32	4.5 (24.6)	4.0 (8.96)	127 (5)
SH2863-5141	SH2863-5111	9 (1274.4)	4	1.0	7.9	4.5 (24.6)	4.0 (8.96)	127 (5)
SH2863-5241	SH2863-5211	9 (1274.4)	6	0.46	3.8	4.5 (24.6)	4.0 (8.96)	127 (5)

Bipolar winding, Lead wire type CE/UL model

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)
SM2861-5051	SM2861-5021	3.3 (467.3)	2	2.2	15	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2861-5151	SM2861-5121	3.3 (467.3)	4	0.56	3.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2861-5251	SM2861-5221	3.3 (467.3)	6	0.29	1.7	1.48 (8.09)	1.75 (3.92)	66 (2.6)
SM2862-5051	SM2862-5021	6.4 (906.3)	2	3.2	25	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2862-5151	SM2862-5121	6.4 (906.3)	4	0.83	6.4	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2862-5251	SM2862-5221	6.4 (906.3)	6	0.36	2.8	3.0 (16.4)	2.9 (6.5)	96.5 (3.8)
SM2863-5051	SM2863-5021	9 (1274.4)	2	4.0	32	4.5 (24.6)	4.0 (8.96)	127 (5)
SM2863-5151	SM2863-5121	9 (1274.4)	4	1.0	7.9	4.5 (24.6)	4.0 (8.96)	127 (5)
SM2863-5251	SM2863-5221	9 (1274.4)	6	0.46	3.8	4.5 (24.6)	4.0 (8.96)	127 (5)

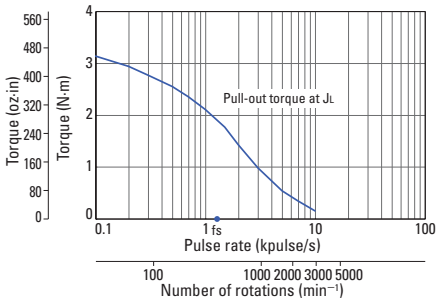
Bipolar winding, Terminal block type CE/UL model

Model number	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass (Weight)	Motor length (L)
Single shaft	[N·m (oz·in) min.]	A/phase	Ω /phase	mH/phase	[×10⁻⁴kg·m² (oz·in²)]	[kg (lbs)]	mm (in)
SM2861-5066	3.3 (467.3)	2	2.03	15	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2861-5166	3.3 (467.3)	4	0.52	3.7	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2861-5266	3.3 (467.3)	6	0.27	1.7	1.48 (8.09)	1.9 (4.19)	97.9 (3.9)
SM2862-5066	6.4 (906.3)	2	3.08	25	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2862-5166	6.4 (906.3)	4	0.79	6.4	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2862-5266	6.4 (906.3)	6	0.33	2.8	3.0 (16.4)	3.05 (6.72)	128.4 (5.1)
SM2863-5066	9 (1274.4)	2	3.83	32	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)
SM2863-5166	9 (1274.4)	4	0.96	7.9	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)
SM2863-5266	9 (1274.4)	6	0.48	3.8	4.5 (24.6)	4.15 (9.15)	158.8 (6.3)

Characteristics diagram

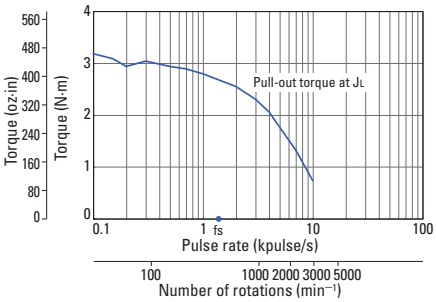
SH2861-5041
SH2861-5011
SM2861-5051
SM2861-5021
SM2861-5066

Constant current circuit
Source voltage: 100 VAC
Operating current:
2 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10⁻⁴kg·m² (83.65 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



SH2861-5141
SH2861-5111
SM2861-5151
SM2861-5121
SM2861-5166

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10⁻⁴kg·m² (83.65 oz·in²) use the rubber coupling]
fs: Maximum self-start frequency when not loaded

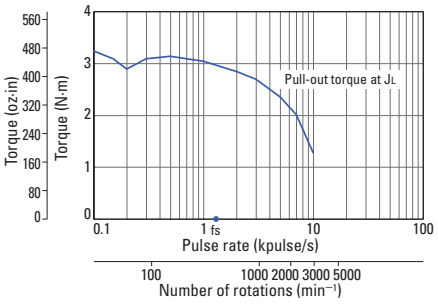


Allowable Load, Rotation Direction ▶p. 87 General Specifications ▶p. 88

Characteristics diagram

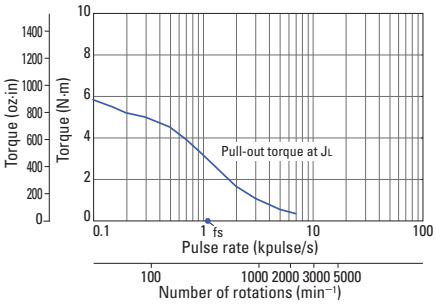
SH2861-5241
SH2861-5211
SM2861-5251
SM2861-5221
SM2861-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10^{-4}kg·m^2 (83.65 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



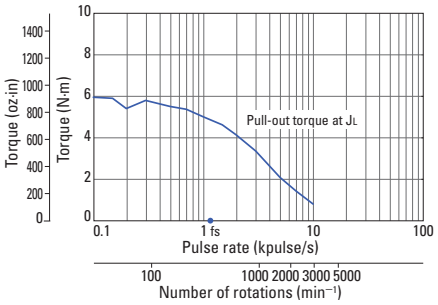
SH2862-5041
SH2862-5011
SM2862-5051
SM2862-5021
SM2862-5066

Constant current circuit
Source voltage: 100 VAC
Operating current:
2 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10^{-4}kg·m^2 (83.65 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



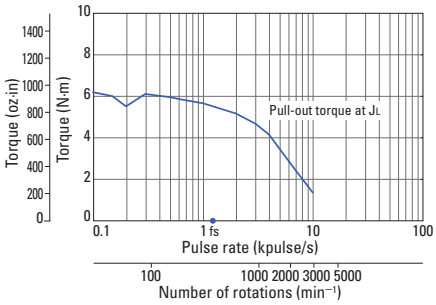
SH2862-5141
SH2862-5111
SM2862-5151
SM2862-5121
SM2862-5166

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10^{-4}kg·m^2 (83.65 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



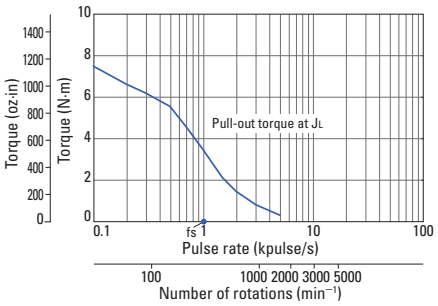
SH2862-5241
SH2862-5211
SM2862-5251
SM2862-5221
SM2862-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[15.3 × 10^{-4}kg·m^2 (83.65 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



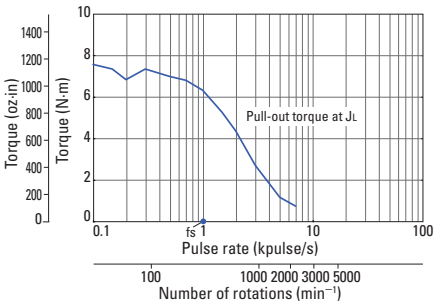
SH2863-5041
SH2863-5011
SM2863-5051
SM2863-5021
SM2863-5066

Constant current circuit
Source voltage: 100 VAC
Operating current:
2 A/phase, 2-phase energization (full-step)
J_L=[44 × 10^{-4}kg·m^2 (240.56 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



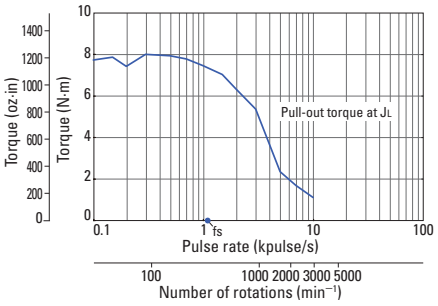
SH2863-5141
SH2863-5111
SM2863-5151
SM2863-5121
SM2863-5166

Constant current circuit
Source voltage: 100 VAC
Operating current:
4 A/phase, 2-phase energization (full-step)
J_L=[44 × 10^{-4}kg·m^2 (240.56 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded



SH2863-5241
SH2863-5211
SM2863-5251
SM2863-5221
SM2863-5266

Constant current circuit
Source voltage: 100 VAC
Operating current:
6 A/phase, 2-phase energization (full-step)
J_L=[44 × 10^{-4}kg·m^2 (240.56 oz·in^2) use the rubber coupling]
fs: Maximum self-start frequency when not loaded

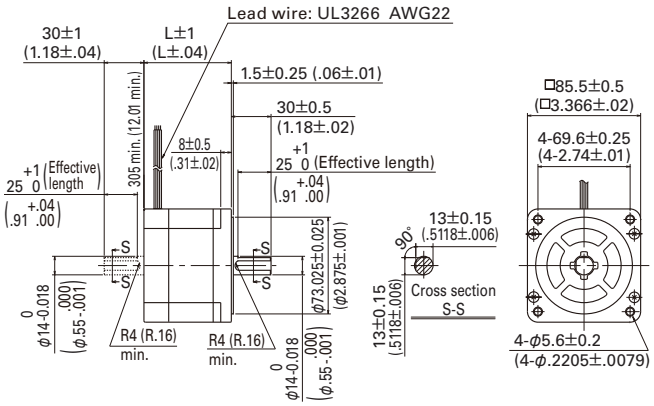


Allowable Load, Rotation Direction ▶ p. 87 General Specifications ▶ p. 88

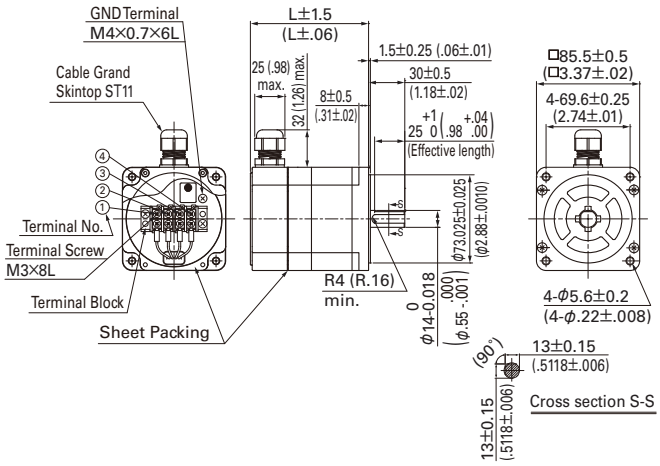
Data is measured under the trial conditions of SANYO DENKI. Driving torque may vary according to actual machine precision.

Dimensions [Unit: mm (inch)]

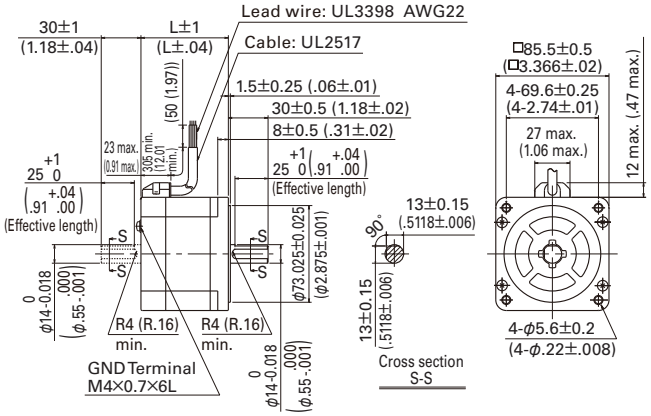
Lead wire type



Terminal block type CE/UL model

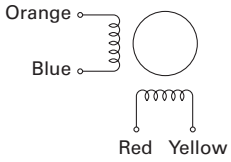


Lead wire type CE/UL model



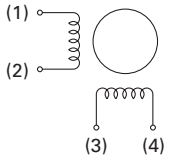
Internal wiring

Lead wire type



Terminal block type

( ) terminal block number



Compatible drivers

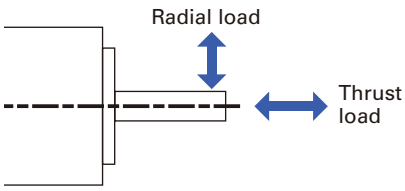
Driver is not included.

If you require assistance finding a driver, contact us for details.

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)

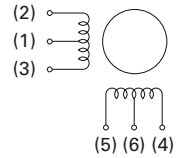
Internal Wiring and Rotation Direction

Unipolar winding

Connector type Model number: 103H52 □□

Internal wire connection

( ) connector pin number



Direction of motor rotation

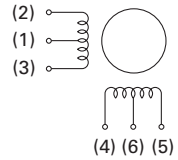
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		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



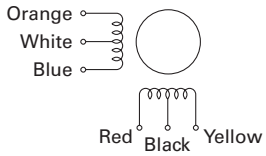
Direction of motor rotation

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.

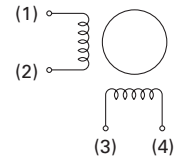
		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1	+	–	–		
	2	+		–	–	
	3	+			–	–
	4	+	–			–

Bipolar winding

Connector type

Internal wire connection

( ) connector pin number, terminal block number



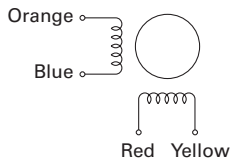
Direction of motor rotation

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

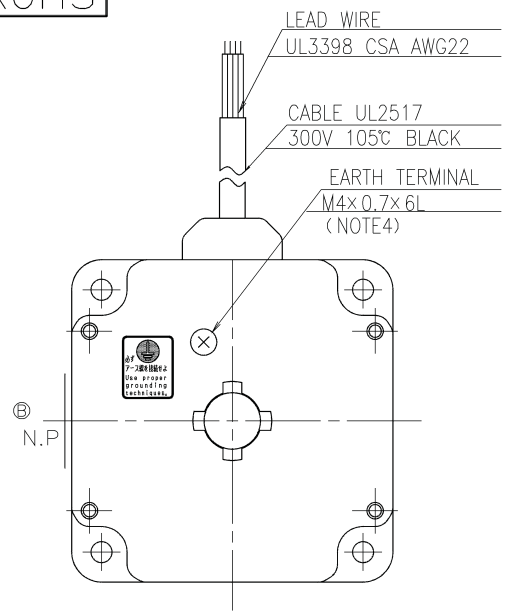
Model Number: SM286 □ CE/UL marked models

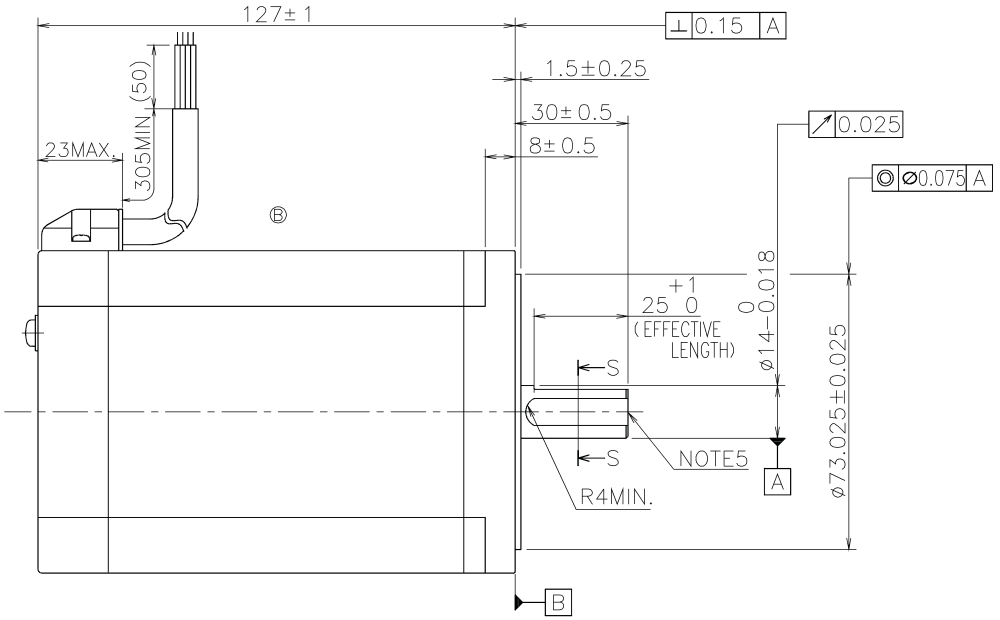
CE (TÜV)	Standard category		Applicable standard
	Low-voltage directives		EN60034-1, EN60034-5
UL	Acquired standards	Applicable standard	File No.
	UL	UL1004-1, UL1004-6	E179832
	UL for Canada	CSA C22.2 No.100	

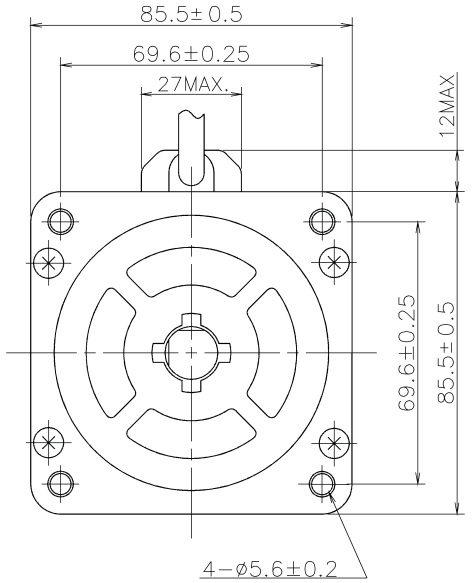
Model Number: 103H712 □ -6 □□ 0, 103H822 □ -6 □□ 0, 103H8922 □ -63 □ 1 CE marked model

CE (TÜV)	Standard category	Applicable standard
	Low-voltage directives	EN60034-1, EN60034-5

RoHS

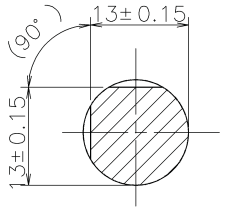






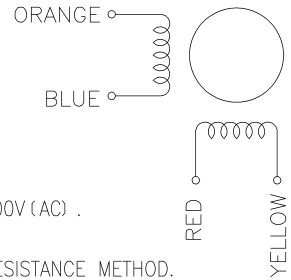
RATED CHARACTERISTICS (2Ex.)

NOTE1	POWER INPUT	250	V(AC) MAX.
	PHASES	2	
	FUNDAMENTAL STEP ANGLE	1.8	°
	RATED VOLTAGE	2.76	V[DC]
	AMPS	6	A/PHASE
	WINDING RESISTANCE	0.46	Ω±10% at 25 ℃
	COIL INDUCTANCE	3.8	mH±20% at 1 kHz, 1 V[rms]
	HOLDING TORQUE	9	N・m MIN. at I=6 A/PHASE 2EX.
NOTE2	PULL OUT TORQUE	6.4	N・m MIN. at 100 pulse/s
			INERTIAL LOAD 44×10^{-4} kg・m^2
			(INERTIA OF RUBBER COUPLING IS INCLUDED.)
NOTE2	MAX. STARTING RATE	800	pulse/s MIN. at NO LOAD
NOTE2	MAX. SLEWING RATE	1400	pulse/s MIN. at NO LOAD
	POSITIONAL ACCURACY	±0.09	° (0.18 ° SPREAD MAX.) 2EX.
NOTE3	COIL TEMPERATURE RISE	80	K MAX.
	ROTOR INERTIA	4.5×10^{-4}	kg・m^2 NOMINAL
	INSULATION CLASS	F	(CLASS-F AS FOR UL RECOGNITION)
	ALLOWABLE THRUST LOAD	60	N
	ALLOWABLE RADIAL LOAD	200	N LOAD TO SHAFT END.
Ⓑ	IP RATING	IP40	EN60034-5



CROSS SECTION S−S

CONNECTION



DIRECTION OF ROTATION

WHEN A MOTOR IS SEQUENCED AS SHOWN IN THE TABLE BELOW, THE SHAFT ROTATION MUST BE CLOCKWISE WHEN YOU SEE FROM SURFACE B SIDE.

		LEADS COLOR			
		RED	BLUE	YELLOW	ORANGE
STEP	1	⊖	⊖	⊕	⊕
	2	⊕	⊖	⊖	⊕
	3	⊕	⊕	⊖	⊖
	4	⊖	⊕	⊕	⊖

NOTE1. DRIVER INPUT VOLTAGE.
NOTE2. SANYO STANDARD 2PHASE EXCITATION DRIVE CIRCUIT WAS USED. (PMM-BA-4804) E=100V(AC).
NOTE3. MOUNT A MOTOR ON 200X200Xt6 ALUMINUM HEAT SINK AND ENERGIZE THE COIL AT 2 PHASE EXCITATION, I=6 A/PHASE CONSTANTLY. MEASURED BY THE CHANGE OF RESISTANCE METHOD.
NOTE4. TIGHTENING TORQUE OF THE SCREWS SHOULD BE 1±0.1 N・m.
NOTE5. CENTER HOLE ON THE SHAFT END IS NOT ALWAYS MADE.

REV.	記事 DESCRIPTION	日付 DATE
B	E0077028	06-05-22
A	NEW DESIGN	05-09-01

単位 UNIT mm
尺度 SCALE

承認 APPROVED BY K. Mizutima 06-05-31
審査 CHECKED BY S. Miyairi 06-05-31
設計 DESIGNED BY J.SHIMIZU 06-05-22

名称 TITLE: STEPPING MOTOR

山洋電気株式会社
SANYO DENKI CO.,LTD.

図番 DWG NO. SM2863-5251 REV. B

A2G-F1

00596939