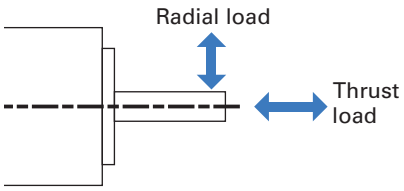
# Allowable Radial and Thrust Loads




| Motor size | Model no. | Distance from shaft end (mm) | | | | Thrust load (N) |
|---|---|---|---|---|---|---|
| | | 0 | 5 | 10 | 15 | |
| | | Radial load (N) | | | | |
| **14 mm sq.** | SH214 ☐ | 10 | 10 | 10 | – | 0.7 |
| **28 mm sq.** | SH2281 | 42 | 42 | 42 | – | 3 |
| | SH2285 | 49 | 49 | 49 | – | |
| **35 mm sq.** | SH35 ☐☐ | 40 | 51 | 67 | 90 | 10 |
| **42 mm sq.** | SF242 ☐ | 20 | 29 | 47 | 64 | 10 |
| | SH142 ☐ | 20 | 25 | 32 | 37 | |
| | SS242 ☐ -50 ☐ 1 | 10 | – | – | – | 4.9 |
| | SS242 ☐ -50 ☐ 00 | 25 | 25 | – | – | |
| **50 mm sq.** | 103H670 ☐ | 74 | 91 | 120 | 174 | 15 |
| | SS250 ☐ | 8.5 | – | – | – | 4.9 |
| **56 mm sq.** | SM256 ☐ | 70 | 87 | 114 | 166 | 20 |
| **60 mm sq.** | SH160 ☐ | 65 | 86 | 129 | 210 | 15 |
| | SH1603 | 83 | 103 | 135 | 197 | |
| **86 mm sq.** | SM286 ☐<br>SH286 ☐ | 200 | 200 | 200 | 200 | 60 |
| **ø106 mm** | 103H8922 ☐ | 321 | 356 | 400 | 457 | 100 |

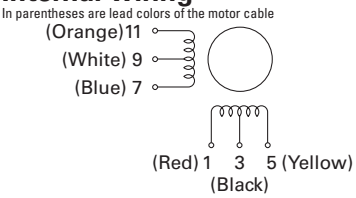
# Internal Wiring and Rotational Directions

## Unipolar winding

### Connector type, model no.: SF242 □

#### Internal wiring

In parentheses are lead colors of the motor cable




#### Direction of motor rotation

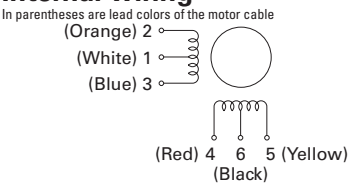
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

| | | Connector pin no. | | | | |
|---|---|---|---|---|---|---|
| | | 3, 9 | 1 | 7 | 5 | 11 |
| Excitation sequence | 1 | + | − | − | | |
| | 2 | + | | − | − | |
| | 3 | + | | | − | − |
| | 4 | + | − | | | − |

### Connector type, model no.: SM256 □ (and 103H782 □)

#### Internal wiring

In parentheses are lead colors of the motor cable



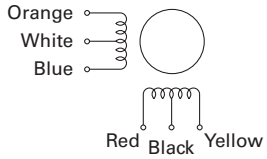

#### Direction of motor rotation

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 no. | | | | |
|---|---|---|---|---|---|---|
| | | 1, 6 | 4 | 3 | 5 | 2 |
| Excitation sequence | 1 | + | − | − | | |
| | 2 | + | | − | − | |
| | 3 | + | | | − | − |
| | 4 | + | − | | | − |

### Lead type

#### Internal wiring




#### 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.

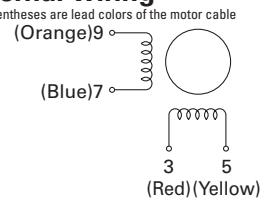
| | | Lead color | | | | |
|---|---|---|---|---|---|---|
| | | White, Black | Red | Blue | Yellow | Orange |
| Excitation sequence | 1 | + | − | − | | |
| | 2 | + | | − | − | |
| | 3 | + | | | − | − |
| | 4 | + | − | | | − |

## Bipolar winding

### Connector type, model no.: SF242 □

#### Internal wiring

In parentheses are lead colors of the motor cable




#### Direction of motor rotation

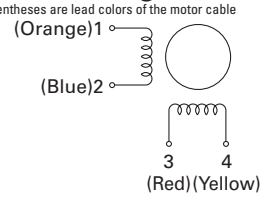
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

| | | Connector pin no. | | | |
|---|---|---|---|---|---|
| | | 3 | 7 | 5 | 9 |
| Excitation sequence | 1 | − | − | + | + |
| | 2 | + | − | − | + |
| | 3 | + | + | − | − |
| | 4 | − | + | + | − |

### Connector type, model no.: SM256 □ (and 103H782 □)

#### Internal wiring

In parentheses are lead colors of the motor cable



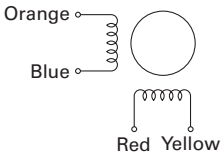

#### Direction of motor rotation

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 no. | | | |
|---|---|---|---|---|---|
| | | 3 | 2 | 4 | 1 |
| Excitation sequence | 1 | − | − | + | + |
| | 2 | + | − | − | + |
| | 3 | + | + | − | − |
| | 4 | − | + | + | − |

### Lead type

#### Internal wiring




#### 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 color | | | |
|---|---|---|---|---|---|
| | | Red | Blue | Yellow | Orange |
| Excitation sequence | 1 | − | − | + | + |
| | 2 | + | − | − | + |
| | 3 | + | + | − | − |
| | 4 | − | + | + | − |

# General Specifications

| Motor model no. | SH214□ | SH228□ | SH353□ | SS242□ | SH142□ | SF242□ | SS250□ | 103H670□ |
|---|---|---|---|---|---|---|---|---|
| Operation type | – | | | | | | | |
| Operating ambient temperature | -10 to +50°C | | | | | | | |
| Storage temperature | -20 to +65°C | | | | | | | |
| Operating ambient humidity | 20 to 90% RH (non-condensing) | | | | | | | |
| Storage humidity | 5 to 95 % RH (non-condensing) | | | | | | | |
| Operating altitude | Up to 1000 m above sea level | | | | | | | |
| Vibration resistance | Frequency 10 to 500 Hz, amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s² (70 to 500 Hz), sweep time 15 min/cycle, a total of 12 tests in both opposite directions for each of X, Y, and Z axes. | | | | | | | |
| Shock resistance | Acceleration 500 m/s², duration 11 ms, half sine wave, tested 3 times in both directions for each X, Y, and Z axis for a total of 18 times | | | | | | | |
| Thermal class | B (+130°C) | | | | | | | |
| Dielectric strength | 500 VAC for one minute (between motor winding and frame) | | | | | | | 1000 VAC for one minute (between motor winding and frame) |
| Insulation resistance | 100 MΩ or more at 500 VDC (between motor winding and frame) | | | | | | | |
| Protection rating | – | | | | | | | |
| Winding temperature rise | 80 K or less (based on our own standard) | | | | | | | |
| Positional accuracy | ±0.09° | | | | ±0.054° | ±0.09° | | |
| Thrust play (1) | 0.075 mm or less (With a 0.35 N load) | 0.075 mm or less (With a 1.5 N load) | 0.075 mm or less (With a 5 N load) | 0.075 mm or less (With a 4 N load) | 0.075 mm or less (With a 5 N load) | 0.075 mm (With a 5 N load) | 0.075 mm or less (With a 4 N load) | 0.075 mm (With a 10 N load) |
| Radial play (2) | 0.025 mm (With a 5 N load) | | | | | | | |
| Shaft runout | 0.025 mm | | | | | | | |
| Concentricity of motor shaft and fitting part | ø0.05 mm | ø0.05 mm | ø0.075 mm | ø0.075 mm | ø0.05 mm | ø0.05 mm | ø0.075 mm | ø0.075 mm |
| Perpendicularity of mounting surface and motor shaft | 0.1 mm | 0.1 mm | 0.1 mm | 0.1 mm | 0.1 mm | 0.1 mm | 0.1 mm | 0.1 mm |
| Motor mounting orientation | Can be installed vertically or horizontally. | | | | | | | |

| Motor model no. | SM256□ UL | SH160□ | SH286□ | 103H8922□ | SM286□ CE/UKCA/UL | 103H712□-6□□0 CE/UKCA | 103H8922□-63□1 CE/UKCA |
|---|---|---|---|---|---|---|---|
| Operation type | – | | | | Continuous operation (S1) | | |
| Operating ambient temperature | -10 to +50°C | | | | -10 to +40°C | | |
| Storage temperature | -20 to +65°C | | | | -20 to +60°C | | |
| Operating ambient humidity | 20 to 90% RH (non-condensing) | | | | 95% RH or less: Below 40°C (non-condensing) | | |
| Storage humidity | 5 to 95 % RH (non-condensing) | | | | 95% RH or less: Below 40°C,<br>57% RH or less: Below 50°C,<br>35% RH or less: Below 60°C, (non-condensing) | | |
| Operating altitude | Up to 1000 m above sea level | | | | | | |
| Vibration resistance | Frequency 10 to 500 Hz, amplitude 1.52 mm (10 to 70 Hz), vibration acceleration 150 m/s² (70 to 500 Hz), sweep time 15 min/cycle, a total of 12 tests in both opposite directions for each of X, Y, and Z axes. | | | | | | |
| Shock resistance | Acceleration 500 m/s², duration 11 ms, half sine wave, tested 3 times in both directions for each X, Y, and Z axis for a total of 18 times | | | | | | |
| Thermal class | B (+130°C) (A for UL models) | B (+130°C) | | | F (+155°C) | B (+130°C) | |
| Dielectric strength | 1120 VAC for one minute (between motor winding and frame) | 1000 VAC for one minute (between motor winding and frame) | 1500 VAC for one minute (between motor winding and frame) | | | | |
| Insulation resistance | 100 MΩ or more at 500 VDC (between motor winding and frame) | | | | | | |
| Protection rating | – | | | | IP43 | | |
| Winding temperature rise | 80 K or less (based on our own standard) | | | | | | |
| Positional accuracy tolerance | ±0.054° | | ±0.09° | | | ±0.054° | ±0.09° |
| Thrust play (1) | 0.075 mm (With a 10 N load) | | | | | | |
| Radial play (2) | 0.025 mm (With a 5 N load) | 0.025 mm (With a 5 N load) | 0.025 mm (With a 5 N load) | 0.025 mm (With a 10 N load) | 0.025 mm (With a 5 N load) | 0.025 mm (With a 5 N load) | 0.025 mm (With a 10 N load) |
| Shaft runout | 0.025 mm | | | | | | |
| Concentricity of motor shaft and fitting part | ø0.075 mm | | | | | | |
| Perpendicularity of mounting surface and motor shaft | 0.1 mm | 0.1 mm | 0.15 mm | 0.1 mm | 0.15 mm | 0.1 mm | 0.1 mm |
| Motor mounting orientation | Can be installed vertically or horizontally. | | | | | | |

(1) Thrust play: Maximum shaft position displacement when a load is exerted in a direction parallel to the motor shaft.
(2) Radial play: Maximum shaft position displacement when a load is exerted in a direction perpendicular to the motor shaft.

## Safety standards

| | Directive | Standards |
|---|---|---|
| CE (TÜV) | Low Voltage Directive 2014/35/EU | IEC 60034-1, IEC60034-5 |
| | RoHS Directive 2011/65/EU | EN IEC 63000：2018 |
| UKCA | Electrical Equipment (Safety) Regulations 2016 | IEC 60034-1, IEC60034-5 |
| | RoHS Regulations 2012 | EN IEC 63000：2018 |

| | Classification | Standards | File no. |
|---|---|---|---|
| UL | UL | UL 1004-1, UL 1004-6 | E179832 |
| | UL for Canada (cUL) | CSA C22.2 No. 100 | |