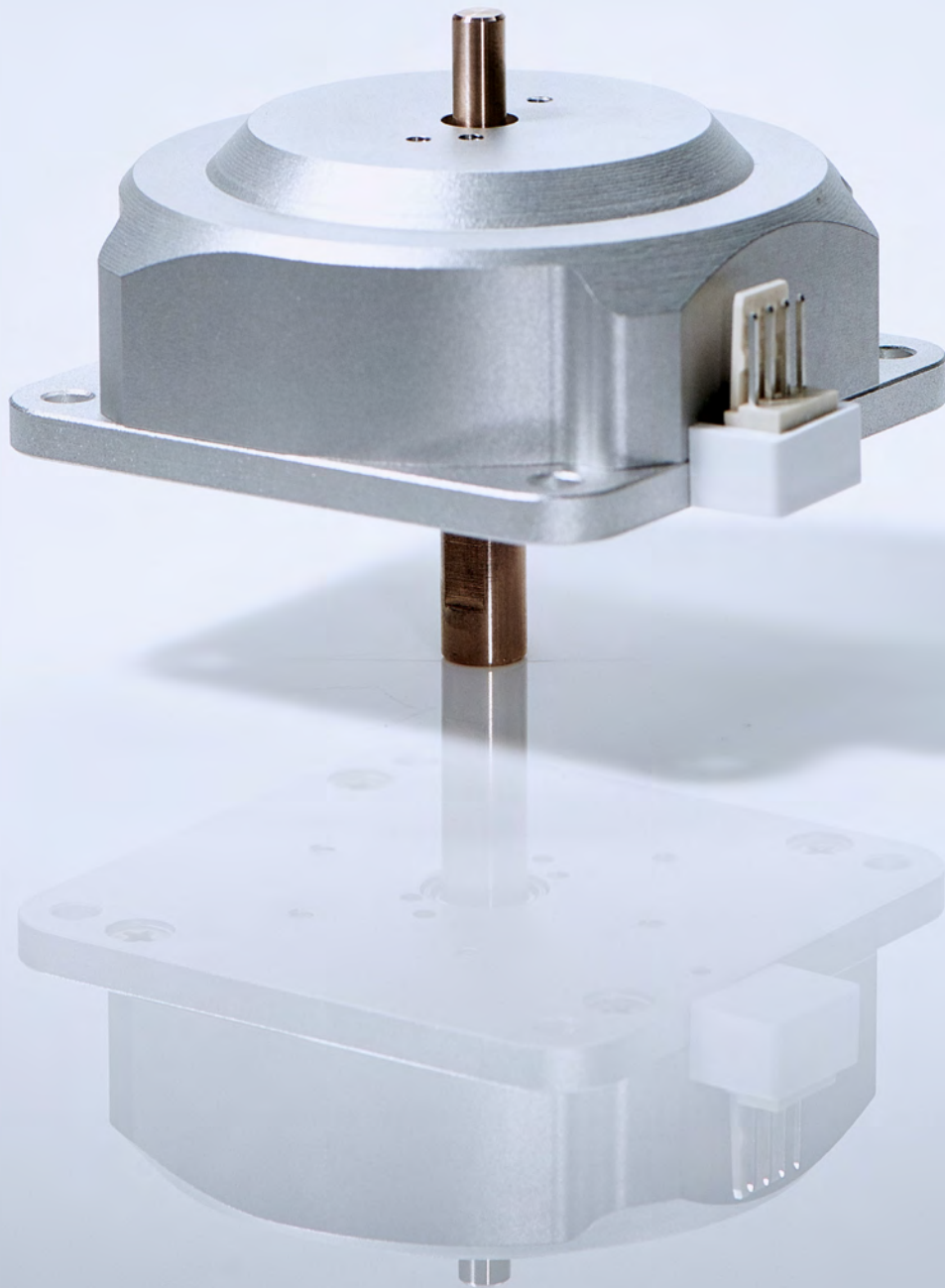# PIEZO SONIC MOTOR

Product catalog

Piezo Sonic

Piezosonic Motor

Small size, high torque, posture can be maintained with zero power,
and can be used in a magnetic field environment.
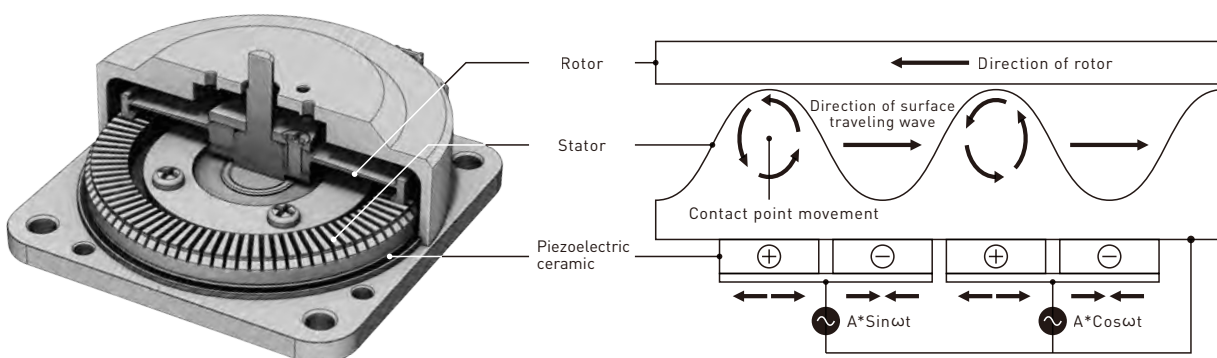
A big energy from a small body

Piezosonic motor engineers who have been researching and developing for more than 20 years have been working on solving two contradictory problems of ultrasonic motors such as longer life and higher torque. As a result, we succeeded in prolonging the life as compared with conventional ultrasonic motors. In addition, the technology received a prize from [The Japan Society for Precision Engineering] that is academic societies in Japan. (Patented)

We are developing ultrasonic motors suitable for stages for semi-conductor manufacturing equipment requiring high precision, nonmagnetic and high torque, and various positioning devices. And, because we have the circuit technology of ultrasonic motor which is difficult to configure, we are developing a driver with a drive circuit with excellent response and control characteristics.

PIEZO SONIC MOTOR

What is Piezosonic Motor?

Piezosonic motors do not use magnets and coils, The driving energy is the vibration of piezoelectric ceramic. Because it rotates by using friction, it is small and lightweight. The torque is 5 to 10 times that of a DC motor of the same size. Since it does not use coils and magnets for the drive source, it can construct a nonmagnetic motor, and it can be used with confidence in a semiconductor manufacturing equipment or the like which is unlikely to be affected by high magnetic field in MRI and magnetic field. In addition, it is possible to maintain posture with non-energized or non-control signals. And because there is no backlash, highly accurate position control by direct drive of the device is possible.It is also highly responsive to start and stop signals. Our ultrasonic motor is suitable for transport equipment such as stage, camera cloud stand, gimbal, indexing device and articulated robot joint motor.

Rotor

Stator

Piezoelectric ceramic

Direction of rotor

Direction of surface traveling wave

Contact point movement

$A*Sin\omega t$ $A*Cos\omega t$

Comparison with other types

Even though it is small and quiet, precise positioning with high torque is possible.

Rotation speed · Torque

This figure focuses on the relationship between the torque and the rotation speed of the same size Ultrasonic motor, DC motor, Brushless motor, Stepping motor.

The ultrasonic motor has characteristics of Low speed and High torque compared with other motors.

Because of the frictional force it can maintain high holding force even when it is not controlled and there is no backlash. So you can construct a direct drive actuator system that does not use gears.

Rotation speed

DC motor

Brushless motor

Stepping motor

Ultrasonic motor

Torque
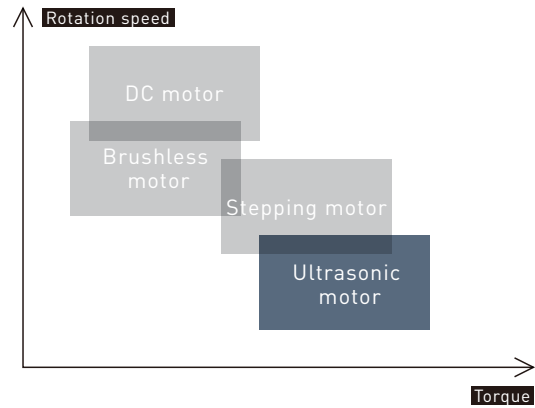
Weight · Position control

This figure forcuses on the relationship between position controllability and weight (lightness) of the same sized Ultrasonic motor, DC motor, Brushless motor, and Stepping motor.

The ultrasonic motor has a feature that it is lighter and has higher position controllability than other motors.

Since the weight of the rotating part is light, the inertia is small, and when the driving signal stops it will stop by the frictional force quickly, so precise positioning is possible.

※The final positioning accuracy depends on external sensors (encoder, potentiometer and control controller).

Weight (lightness)

Ultrasonic motor

Brushless motor

DC motor

Stepping motor

Position controllability
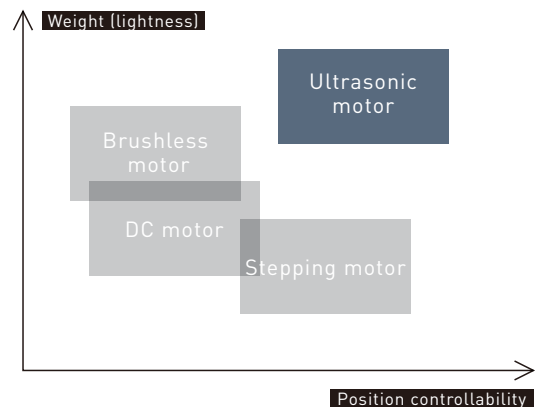
Application example of Ultrasonic motor

Transport systems for general and magnetic environments, robot actuators

- Compact transport device usable in office etc.
- Small sorting and dispensing equipment available in offices, etc.
- Silent moving device for monitoring camera
- Gimbal device for attitude control
- Motors for transport and drive in medical equipment CT and MRI
- Robot arm capable of fine control
- Motor for driving in a strong radiation environment
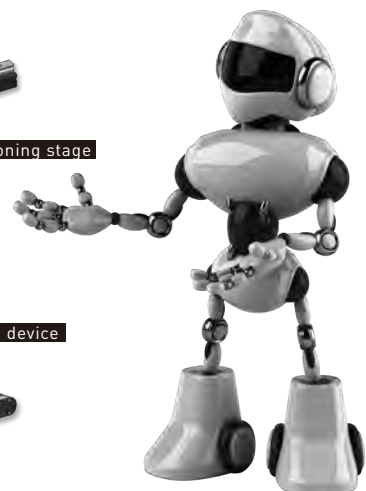- Motor for vacuum environment (space environment etc.)

Precision positioning stage

Indexing device
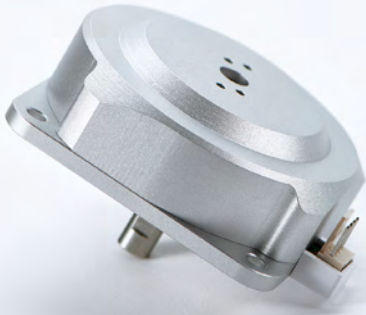
Conveyor for conveyance

Robot joint control

Motor for general environment
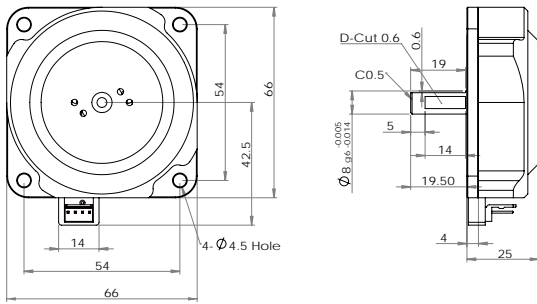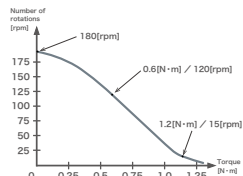
PSM60S SERIES

PSM60S-A

Sensorless single-shaft motor for general environment.
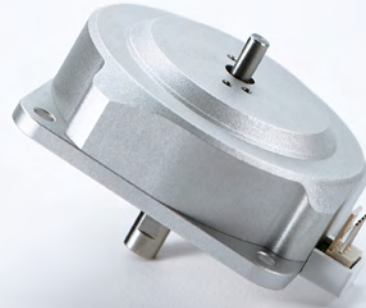The minimum size in PSM 60S series.
It is suitable for positioning using a sensor mounted on the device or as an intermittent same action motor with a timer.

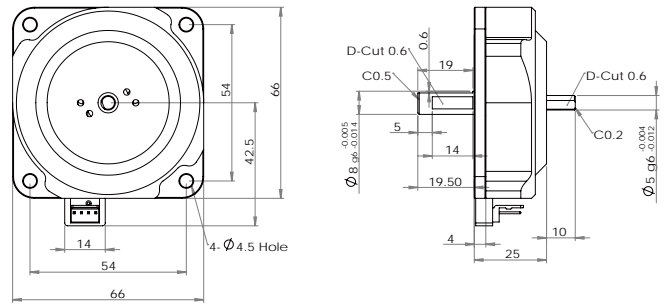| Model Name	Single-shaft motor PSM60S-A
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×45 [mm]
Weight	230 [g]
Encoder resolution	Without encoder, single-shaft
Minimum Accuracy	Depends on external sensor

PSM60S-B

Sensorless double-shaft motor for general environment.
It has a sub shaft for directly attaching external sensors made by other companies to the motor.
Control using the encoder and tacho generator becomes possible.

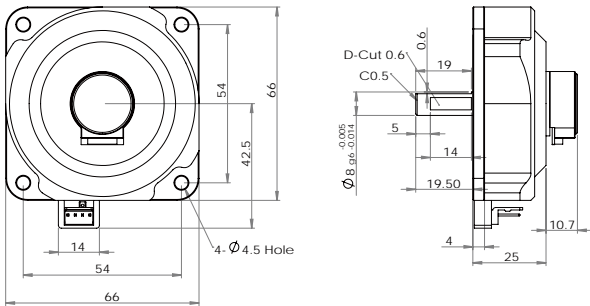| Model Name	Double-shaft motor PSM60S-B
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×53 [mm]
Weight	233 [g]
Encoder resolution	Without encoder, double-shaft
Minimum Accuracy	Depends on external sensor
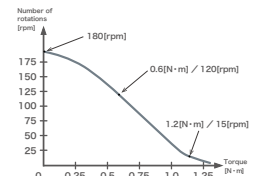
Motor for general environment

PSM60S SERIES

PSM60S-E

Motor with 500 p/r encoder for general environment.
Equipped with 500 pulse/turn TTL signals output encoder.
Motor position and speed can be controlled with accuracy of ± 0.18 ° (Multiplying by 4 times).
It is ideal as a motor for transfer equipment using ball screws.

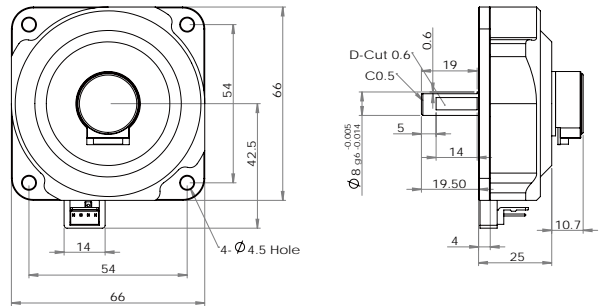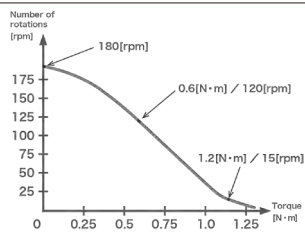| Model Name	Motor with 500 p/r encoder PSM60S-E
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	500 [p/r]
Minimum Accuracy	0.18°

PSM60S-ET

Motor with 1,000 p/r encoder for general environment.
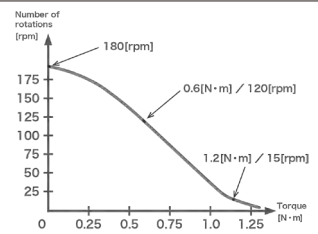Equipped with 1,000 pulse/turn TTL signals output encoder.
Motor position and speed can be controlled with accuracy of ± 0.09 ° (Multiplying by 4 times).
It is ideal as a motor for transportation equipment such as high-precision positioning stages.

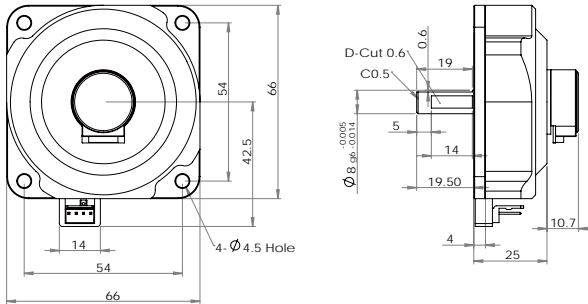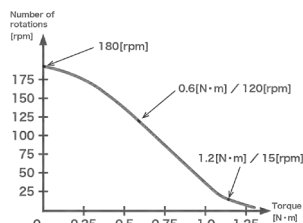| Model Name	Motor with 1,000 p/r encoder PSM60S-ET
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	1,000 [p/r]
Minimum Accuracy	0.09°

Motor for general environment

PSM60S-E2T

Motor with 2,000 p/r encoder for general environment. Equipped with 2,000 pulse/turn TTL signals output encoder.

Motor position and speed can be controlled with accuracy of ± 0.045 ° (Multiplying by 4 times).

It is ideal as a motor for ultra-high precision indexing equipment.

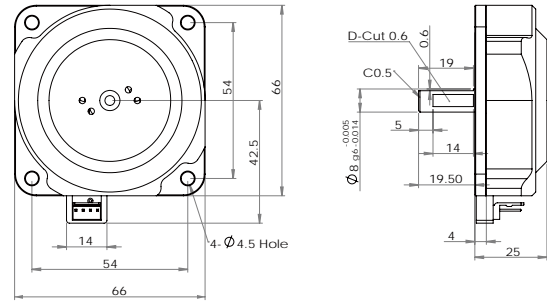| Model Name	Motor with 2,000 p/r encoder PSM60S-E2T
Drive Frequency	40〜47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	2,000 [p/r]
Minimum Accuracy	0.045°

Motor for magnetic field environment

PSM60N-A

Sensorless single-shaft motor for magnetic field environment.

Applicable to 3 [T] magnetic field environment.

Minimum size for PSM 60 N series.

It is ideal as a positioning and transport motor using sensors installed in devices such as MRI and elemental analyzers that are used in high-magnetic field.

Model Name	Single-shaft motor PSM60N-A
Drive Frequency	40〜47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×45 [mm]
Weight	230 [g]
Encoder resolution	Without encoder, single-shaft
Minimum Accuracy	Depends on external sensor

Motor for magnetic field environment

PSM60N-B

Sensorless double-shaft motor for magnetic field environment.
It has a subshaft for mounting external sensors of other manufacturers directly to the motor.
This motor can control the equipment using a third-party encoder or tacho generator that can be used in a magnetic field.

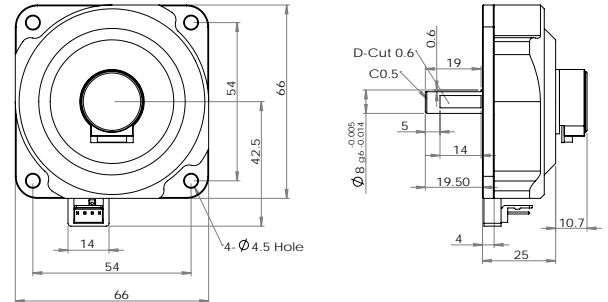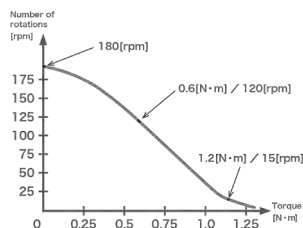| Model Name	Double-shaft motor PSM60N-B
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×53 [mm]
Weight	233 [g]
Encoder resolution	Without encoder, double-shaft
Minimum Accuracy	Depends on external sensor
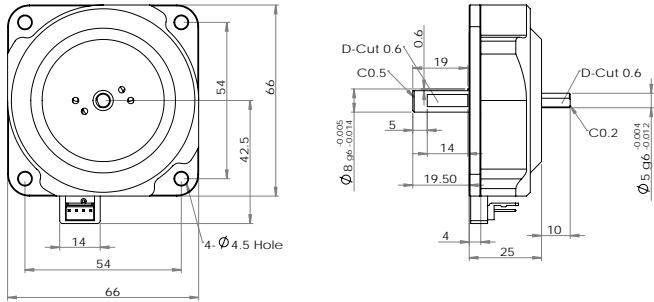
PSM60N-E

Motor with 500 p/r encoder for magnetic field environment.
Equipped with 500 pulse/turn TTL signals output encoder. Motor position and speed can be controlled with accuracy of ± 0.18 ° (Multiplying by 4 times) in a magnetic field environment of 3 [T].
It is ideal as a motor for transfer equipment using ball screws.

Model Name	Motor with 500 p/r encoder PSM60N-E
Drive Frequency	40～47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	500 [p/r]
Minimum Accuracy	0.18°

Motor for magnetic field environment

PSM60N SERIES

PSM60N-ET

Motor with 1,000 p/r encoder for magnetic field environment.
Equipped with 1,000 pulse/trun TTL signals output encoder. Motor position and speed can be controlled with accuracy of ± 0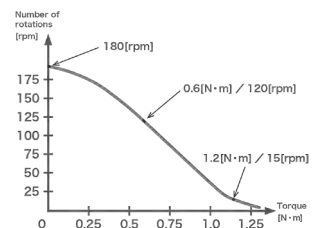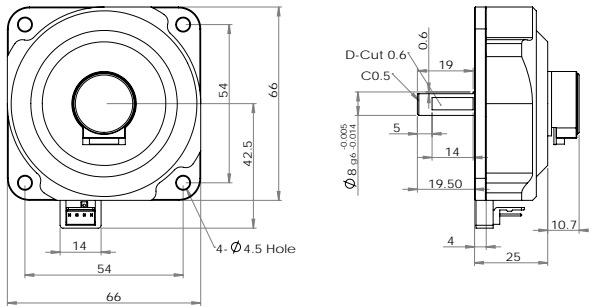.09 ° (Multiplying by 4 times) in a magnetic field of 3 [T]. It is ideal as a motor for high-precision positioning stages used in MRI.

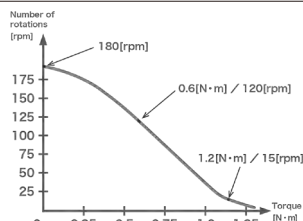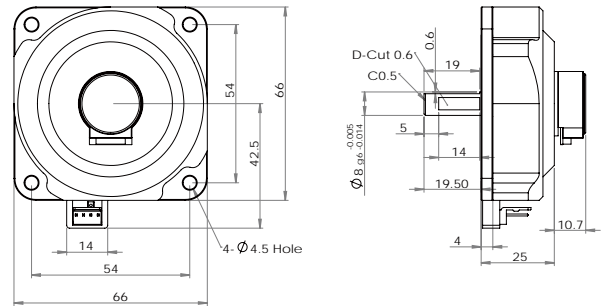| Model Name	Motor with 1,000 p/r encoder PSM60N-ET
Drive Frequency	40〜47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	1,000 [p/r]
Minimum Accuracy	0.09°

PSM60N-E2T

Motor with 2,000 p/r encoder for magnetic field environment.
Equipped with 2,000 pulse/turn TTL signals output encoder. Motor position and speed can be controlled with an accuracy of ± 0.045 ° (Multiplying by 4 times) in a magnetic field of 3 [T]. It is ideal as a motor for ultra-high precision indexing equipment used in MRI.

Model Name	Motor with 2,000 p/r encoder PSM60N-E2T
Drive Frequency	40〜47 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	120 [rpm]
Maximum Speed	180 [rpm]
Rated Torque	0.6 [N·m]
Maximum Torque	1.2 [N·m]
Holding Torque	1.2 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	66×66×56 [mm]
Weight	240 [g]
Encoder resolution	2,000 [p/r]
Minimum Accuracy	0.045°

Motor for general environment

PSM40S-A

Sensorless single-shaft small motor for general environment.

The minimum size in PSM 40S series.

It is suitable for positioning using a sensor mounted on the device or as an intermittent same action motor with a timer.

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Single-shaft motor PSM40S-A
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×35.5 [mm]
Weight	83 [g]
Encoder resolution	Without encoder, Single-shaft
Minimum Accuracy	Depends on external sensor

PSM40S-B

Sensorless double-shaft small motor for general environment.

It has a sub shaft for directly attaching external sensors made by other companies to the motor.

Control using the encoder and tacho generator becomes possible.

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Double-shaft motor PSM40S-B
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×43.5 [mm]
Weight	84 [g]
Encoder resolution	Without encoder, double-shaft
Minimum Accuracy	Depends on external sensor

※PSM40 series will be made to order.

Motor for general environment

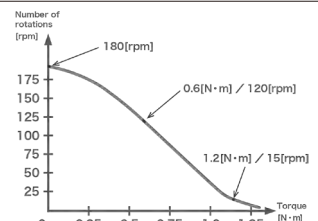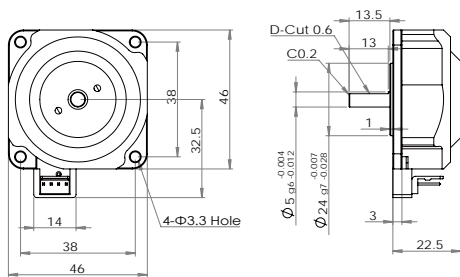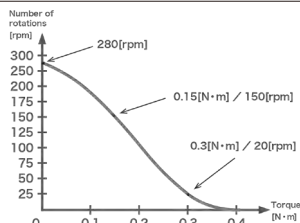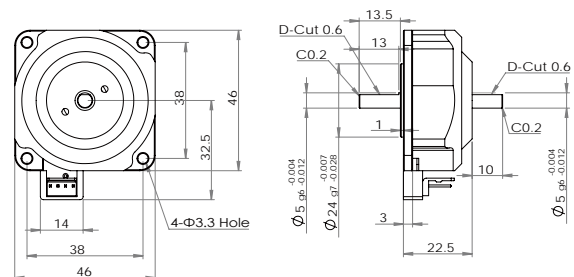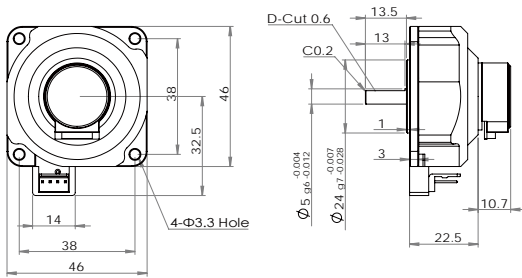## PSM40S-E

Small motor with 500 p/r encoder for general environment.
Equipped with 500 pulse/turn TTL signals output encoder.Motor position and speed can be controlled with accuracy of ± 0.18 ° (Multiplying by 4 times).
It is ideal as a motor for small transfer equipment using ball screws.

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Motor with 500 p/r encoder PSM40S-E
Drive Frequency	52〜58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	500 [p/r]
Minimum Accuracy	0.18°

PSM40S-ET

Small motor with 1,000 p/r encoder for general environment.
Equipped with 1,000 pulse/turn TTL signals output encoder.Motor position and speed can be controlled with accuracy of ± 0.09 ° (Multiplying by 4 times).
It is ideal as a motor for small transportation equipment such as high-precision positioning stages.
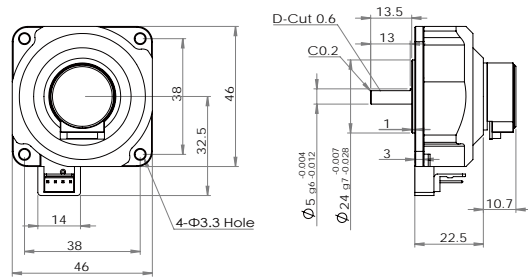
※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Motor with 1,000 p/r encoder PSM40S-ET
Drive Frequency	52〜58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 〜 +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	1,000 [p/r]
Minimum Accuracy	0.09°

※PSM40 series will be made to order.
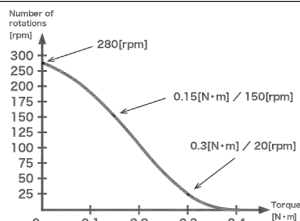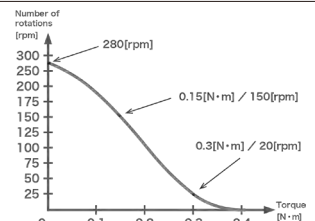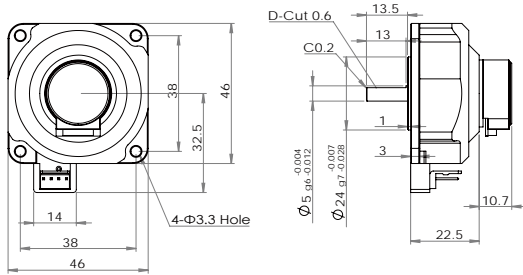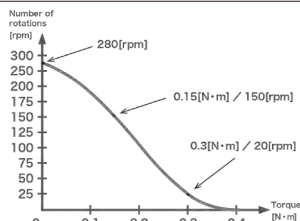
Motor for general environment

PSM40S-E2T

Small motor with 2,000 p/r encoder for general environment.
Equipped with 2,000 pulse/turn TTL signals output encoder.Motor position and speed can be controlled with accuracy of ± 0.045 ° (Multiplying by 4 times).
It is ideal as a motor for ultra-high precision indexing equipment.

D-Cut 0.6
13.5
13
C0.2
38
46
32.5
1
3
14
38
46
4-Φ3.3 Hole
$\Phi 5 \ g6 \ ^{-0.004}_{-0.012}$
$\Phi 24 \ g7 \ ^{-0.007}_{-0.028}$
10.7
22.5

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Motor with 2,000 p/r encoder PSM40S-E2T
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	2,000[p/r]
Minimum Accuracy	0.045°

Number of rotations [rpm]
300
280[rpm]
250
200
175
150
0.15[N·m] / 150[rpm]
125
100
0.3[N·m] / 20[rpm]
75
50
25
0   0.1   0.2   0.3   0.4
Torque [N·m]

※PSM40 series will be made to order.

Motor for magnetic field environment

PSM40N-A

Sensorless single-shaft small motor for magnetic field environment.
Applicable to 3 [T] magnetic field environment.
Minimum size for PSM 60 N series.
It is ideal as a positioning and transport motor using sensors installed in devices such as MRI and elemental analyzers that are used in high-magnetic field.

D-Cut 0.6
13.5
13
C0.2
38
46
32.5
1
3
14
38
46
4-Φ3.3 Hole
$\Phi 5 \ g6 \ ^{-0.004}_{-0.012}$
$\Phi 24 \ g7 \ ^{-0.007}_{-0.028}$
22.5

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Single-shaft motor PSM40N-A
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×35.5 [mm]
Weight	83 [g]
Encoder resolution	Without encoder, Single-shaft
Minimum Accuracy	Depends on external sensor

Number of rotations [rpm]
300
280[rpm]
250
200
175
150
0.15[N·m] / 150[rpm]
125
100
0.3[N·m] / 20[rpm]
75
50
25
0   0.1   0.2   0.3   0.4
Torque [N·m]

Motor for magnetic field environment

PSM40N-B

Sensorless double-shaft small motor for magnetic field environment.

It has a subshaft for mounting external sensors of other manufacturers directly to the motor.

This motor can control the equipment using a third-party encoder or tacho generator that can be used in a magnetic field.

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Double-shaft motor PSM40N-B
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×43.5 [mm]
Weight	84 [g]
Encoder resolution	Without encoder, double-shaft
Minimum Accuracy	Depends on external sensor

PSM40N-E

Small motor with 500 p/r encoder for magnetic field environment.

Equipped with 500 pulse/turn TTL signals output encoder. Motor position and speed can be controlled with accuracy of ± 0.18 ° (Multiplying by 4 times) in a magnetic field environment of 3 [T].

It is ideal as a motor for small transfer equipment using ball screws.

※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Motor with 500 p/r encoder PSM40N-E
Drive Frequency	52～58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ～ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	500 [p/r]
Minimum Accuracy	0.18°

※PSM40 series will be made to order.
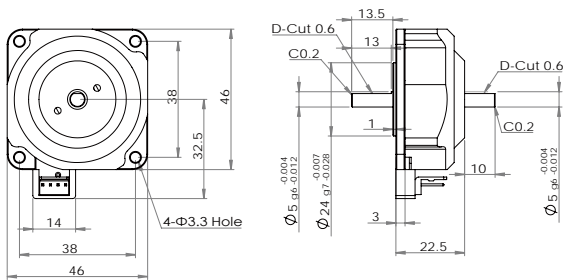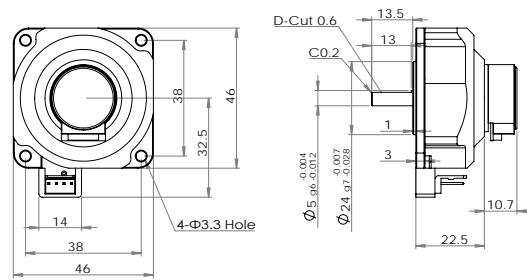
Motor for magnetic field environment

PSM40N SERIES

PSM40N-ET

Small motor with 1,000 p/r encoder for magnetic field environment.
Equipped with 1,000 pulse/trun TTL signals output encoder. Motor position and speed can be controlled with accuracy of ± 0.09 ° (Multiplying by 4 times) in a magnetic field of 3 [T]. It is ideal as a motor for high-precision positioning stages used in MRI.
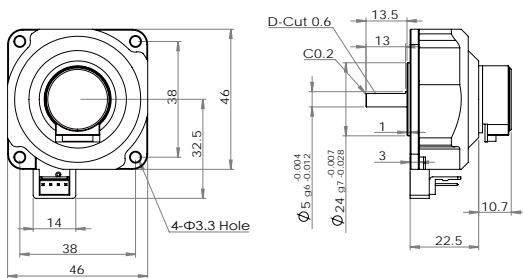
※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

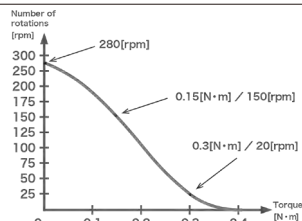| Model Name	Motor with 1,000 p/r encoder PSM40N-ET
Drive Frequency	52~58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ~ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	1,000 [p/r]
Minimum Accuracy	0.09°

PSM40N-ET2

Small motor with 2,000 p/r encoder for magnetic field environment.
Equipped with 2,000 pulse/turn TTL signals output encoder. Motor position and speed can be controlled with an accuracy of ± 0.045 ° (Multiplying by 4 times) in a magnetic field of 3 [T]. It is ideal as a motor for ultra-high precision indexing equipment used in MRI.
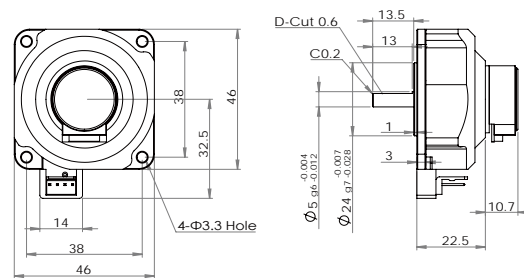
※ There is a mounting screw hole with a depth of 3.5 mm with 3-M3 PCD Φ28 on the motor base side

Model Name	Motor with 2,000 p/r encoder PSM40N-E2T
Drive Frequency	52~58 [KHz]
Drive Voltage	130 [Vrms]
Rated Speed	150[rpm]
Maximum Speed	250[rpm]
Rated Torque	0.15 [N·m]
Maximum Torque	0.3 [N·m]
Holding Torque	0.3 [N·m]
Direction & Response	CW、CCW、Less than 1 [ms] (No-load)
Temperature Range	-10 ~ +55 [℃]
Life Time	3,000 [Hours]
Size(W×D×H)	46×46×46 [mm]
Weight	90[g]
Encoder resolution	2,000[p/r]
Minimum Accuracy	0.045°

※PSM40 series will be made to order.

Motor Driver

PSMD-SPC

This analog control model allows you to control the direction of motor rotation with two TTL signals and an analog voltage of 0 to 3.2[V].It can be used in combination with a motor with an encoder to stabilize the speed of the equipment.It is ideal for applications where an external analog voltage is used to control ultrasonic motors at a constant speed.

PSMD-PCC

In addition to the functions of PSMD-SPC, this model enables digital control of the motor rotation direction and speed from the outside through USB connection with PC and SPI communication.
To control a motor by a digital signal without inputting a TTL signal for rotation direction control or an analog voltage for speed control.
Ideal for precise control of ultrasonic motors.
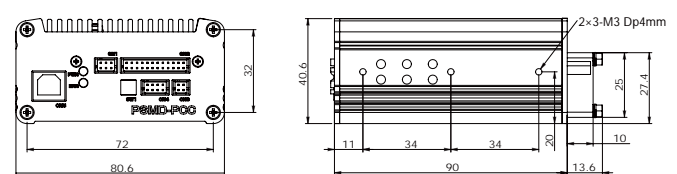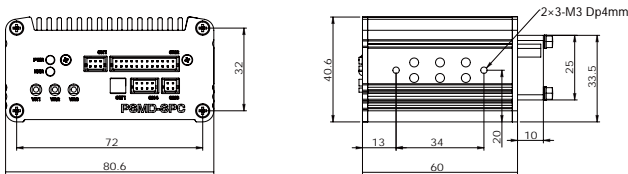
Model Name	Driver with speed stabilization function PSMD-SPC
Frequency / Wave Form	40 [KHz] ～ 60 [KHz] / Synthetic sine wave
Motor Drive Voltage	130 [Vrms] ~ 140 [Vrms]
Variable speed system	Analog voltage（DC 0 [V] ～ 3.2 [V]）
No-load Speed Range	1 [rpm] ～ Maximum number of revolutions of the motor
Start-Stop Control	Switch to CW, CCW control terminal, Operation by external signal (active-low)
Starting Response	10 [ms]（No inertial load）
Stopping Response	Less than 50[ms] (No inertial load)
Temperature Range	-10 [℃] ～ +60 [℃]
Power Supply	DC 24 [V] ± 0.5 [V] / Normal 1 [A], up to 2.5 [A]
Over Current Protection	Equipped with Resettable overcurrent protection circuit
Life Time	Operation 10,000 [Hours] or 1 year after shipment whichever is shorter
Size(W×D×H)	80 × 60 × 45 [mm] （Excluding fans）
Weight	210[g]
Remarks	With speed stabilization function

※ It is adjusted by the motor of the serial number and the pair at the time of shipment.
※ PSM60/40 S motor for general environment, PSM60/40 N Motor for magnetic field environment can be controlled in the same way.

Model Name	High-precision control driver with USB connection PSMD-PCC
Frequency / Wave Form	40 [KHz] ～ 60 [KHz] / Synthetic sine wave
Motor Drive Voltage	130 [Vrms] ～ 140 [Vrms]
Variable speed system	Analog voltage（DC 0 [V] ～ 3.2 [V]） or Digital signal control via USB connection and SPI communication
No-load Speed Range	0.1 [rpm] ～ Maximum number of revolutions of the motor
Start-Stop Control	Operation by external signal (active-low) or Digital signal control via USB connection and SPI communication
Starting Response	10 [ms]（No inertial load）
Stopping Response	Less than 10[ms] (No inertial load)
Temperature Range	-10 [℃] ～ +60 [℃]
Power Supply	DC 24 [V] ± 0.5 [V] / Normal 1 [A], up to 2.5 [A]
Over Current Protection	Equipped with Resettable overcurrent protection circuit
Life Time	Operation 10,000 [Hours] or 1 year after shipment whichever is shorter
Size(W×D×H)	80 × 90 × 45 [mm] （Excluding fans）
Weight	300[g]
Remarks	Operable via USB connection or SPI communication

※ It is adjusted by the motor of the serial number and the pair at the time of shipment.
※ PSM60/40 S motor for general environment, PSM60/40 N Motor for magnetic field environment can be controlled in the same way.

Pin Assignment of the Driver

Each driver is equipped with a volume for adjustment (VR1-VR3) and various connectors (CN1-CN5) according to its characteristics

VR1:   Volume for minimum speed adjustment (PSMD-SPC only)
VR2:   Volume for maximum speed adjustment (PSMD-SPC only)
VR3:   CW and CCW speed balancing volume (PSMD-SPC only)

CN1:   Power connector (All Drivers)
CN2:   Connector for motor control signal (All Drivers)
CN3:   Connector for motor connection (All Drivers)

CN4:   Connector for encoder (All Drivers)
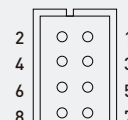**CN5:**   Connector for PC connection (PSMD-PCC only)

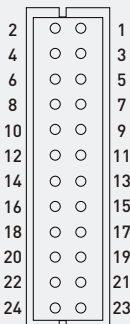Be sure to check the information of each terminal before using.

CN1
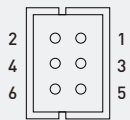
1. Main_power_input (+24V)
2. Main_power_input (+24V)
3. GND
4. GND
5. CASE
6. CASE

CN4

1. Voltage output for encoder (+5V)	Red
2. GND	Black
3. Encoder A phase (+) input	Blue
4. Encoder A phase (−) input	Green
5. Encoder B phase (+) input	White
6. Encoder B-phase (−) input	Gray
7. Encoder Z-phase (+) input	Yellow
8. Encoder Z-phase (−) input	Orange

CN2

1. Reference Output (3.3 V)
2. Speed specified voltage input
3. GND
4. Direction Control:CW
5. Direction Control:CCW
6. GND
7. SPI_CS input
8. SPI_CLK input
9. SPI_DT input
10. SPI_DT output
11. Non Connect
12. GND
13. PWM_code_02 input (Options)
14. PWM_code_01 input (Options)
15. PWM_code_00 input (Options)
16. PWM_SEL_input (Options)
17. ERROR_output
18. AUX_01_input (Options)
19. AUX_00_ nput (Options)
20. GND
21. Phase_A(+)_output (Only when the encoder is connected)
22. Phase_B(+)_output (Only when the encoder is connected)
23. --
24. --

CN3
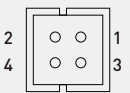
1. Sin signal output	Red
2. Cos signal output	White
3. FB signal input	Yellow
4. GND	Black

CN5

1. --
2. - Data
3. + Data
4. GND

SW1
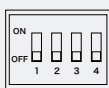
◎No encoder (No speed control)
   1:OFF、2: OFF、3:OFF、4:OFF

◎Single-mode encoder
· PSM60＊- E
   1:ON、2: OFF、3:OFF、4:OFF
· PSM60＊- ET
   1:ON、2: OFF、3:OFF、4:ON
· PSM60＊- E2T
   1:ON、2: OFF、3:ON、4:OFF

◎Differential mode encoder
· PSM60＊- E
   1:ON、2: ON、3:OFF、4:OFF
· PSM60＊- ET
   1:ON、2: ON、3:OFF、4:ON
· PSM60＊- E2T
   1:ON、2: ON、3:ON、4:OFF
· PSM60＊- E36
   1:ON、2: ON、3:ON、4:ON

How to connect the motor and the driver

PSMD-SPC[1]

No encoder signal, simple operation using the control board

Enter the CN1 dc24v power supply, the TTL signal level signal (2: Active-Low), which controls the motor's rotational direction (CW/CCW) and stop state to CN2, and an analog signal of dc0v to 3.2 V for Speed change.Connect the CN3 to the signal input terminal of the motor. The signal required for motor control can be used for the port and analog voltage output of the microcomputer board, or it is possible to use the switch and the semi-fixed resistor.CN4 is not used because the motor has no encoder.

Motor

Driver (PSMD-SPC)

Microcomputer board

CN3
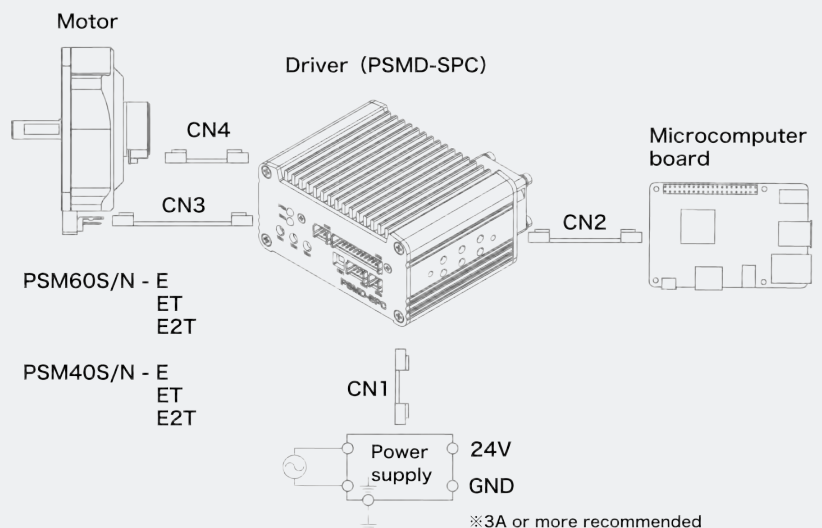CN2

PSM60S/N - A
B
E
ET
E2T

PSM40S/N - A
B
E
ET
E2T

CN1

Power supply 24V
GND

※3A or more recommended
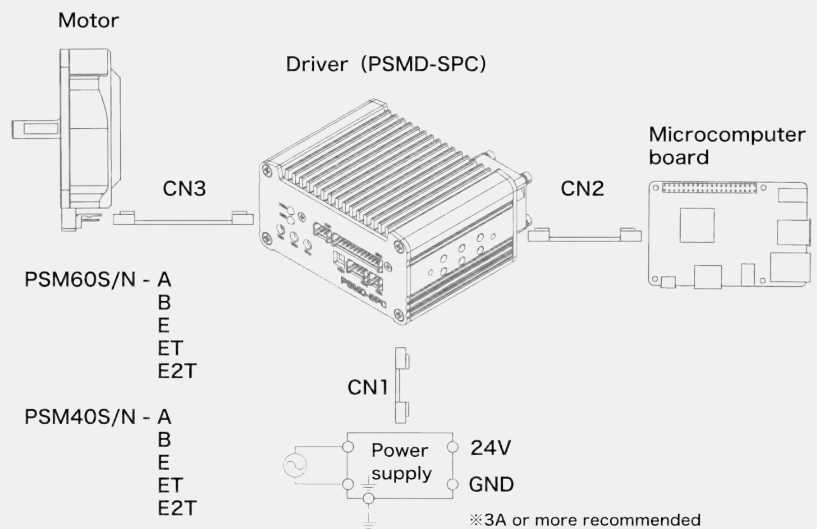
PSMD-SPC[2]

Speed control by encoder signal

It is possible to maintain the speed of the motor by adding a constant voltage to the speed designation terminal without the speed control on the external microcomputer board by the speed stabilization function using the encoder signal.
Enter the CN1 DC24 V power supply, the TTL signal level signal (2: Active-Low), which controls the motor's rotational direction (CW/CCW) and stop state to CN2, and an Analog signal of DC0 V to 3.2 V for Speed change. Connect the CN3 to the signal input terminal of the motor. Connect the CN4 to the encoder signal terminal of the motor.*SW1 settings vary depending on the number of encoder pulses.

Motor

Driver (PSMD-SPC)

Microcomputer board

CN4

CN3
CN2

PSM60S/N - E
ET
E2T

PSM40S/N - E
ET
E2T

CN1

Power supply 24V
GND

※3A or more recommended

PSMD-PCC[1]

No encoder signal, simple operation using the control board

The signals required for motor control are the microcomputer board port and Analog voltage output. Or, operation with a switch and a semi-fixed resistor is possible.
Enter the CN1 DC24 V power supply, the TTL signal level signal (2: Active-Low), which controls the motor's rotational direction (CW/CCW) and stop state to CN2, and an Analog signal of DC0 V to 3.2 V for Speed change. Connect the CN3 to the signal input terminal of the motor. CN4 and CN5 are not connected.

Motor

Driver (PSMD-PCC)

Microcomputer board

CN3
CN2

PSM60S/N - A
B
E
ET
E2T

PSM40S/N - A
B
E
ET
E2T

CN1

Power supply 24V
GND

※3A or more recommended

How to connect the motor and the driver

PSMD-PCC[2]

Speed control by encoder signal

It is possible to maintain the speed of the motor by adding a constant voltage to the speed designation terminal without the speed control on the external microcomputer board by the speed stabilization function using the encoder signal.
Enter the CN1 DC24 V power supply, the TTL signal level signal (2: Active-Low), which controls the motor's rotational direction (CW/CCW) and stop state to CN2, and an Analog signal of DC0 V to 3.2 V for Speed change. Connect the CN3 to the signal input terminal of the motor. Connect the CN4 to the encoder signal terminal of the motor.CN5 is not connected.*SW1 settings vary depending on the number of encoder pulses.
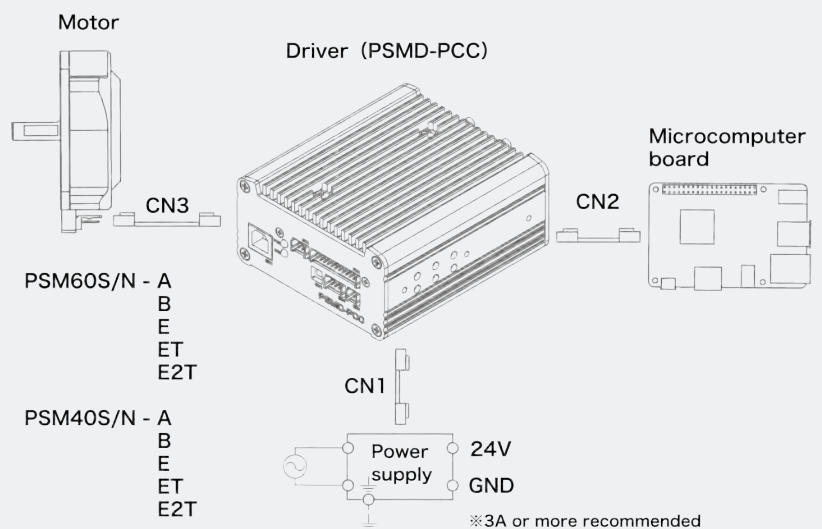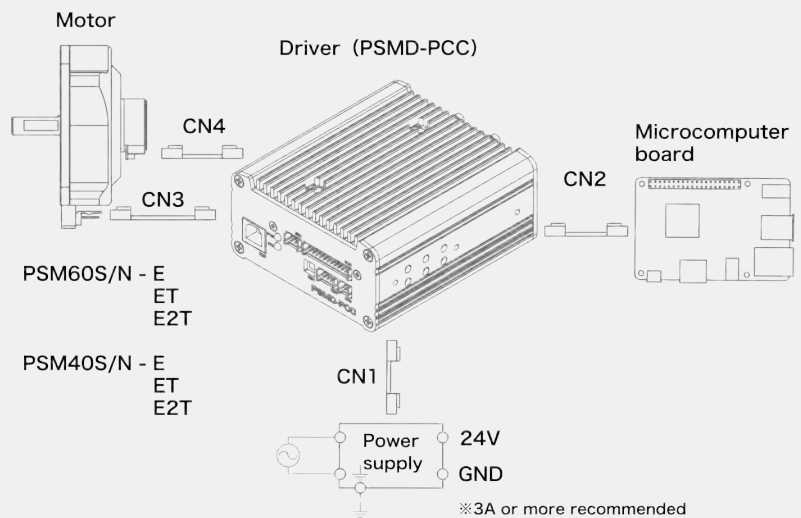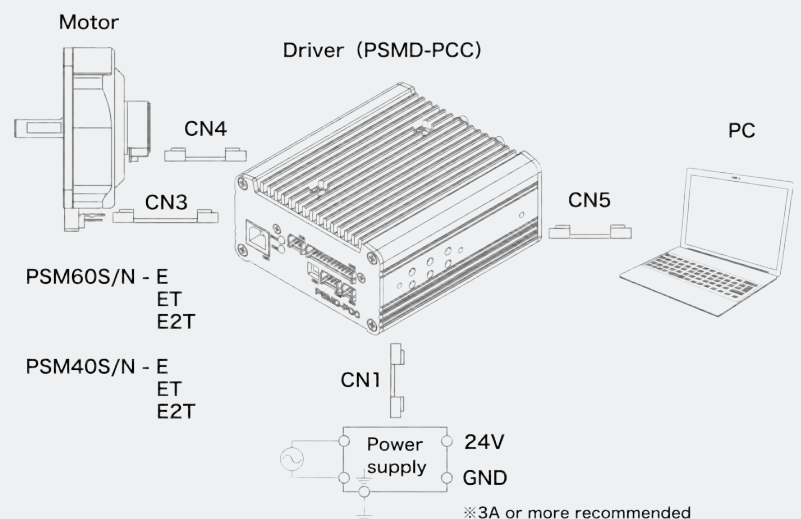
Motor
Driver (PSMD-PCC)
CN4
CN3
Microcomputer board
CN2
PSM60S/N - E
ET
E2T
PSM40S/N - E
ET
E2T
CN1
Power supply
24V
GND
※3A or more recommended

PSMD-PCC[3]

PC application control via USB connection

It is possible to control the rotation direction of the motor (CW/CCW), stop state, and control instructions for speed change via USB. Because the analog voltage control signal is not necessary, it is possible to operate the Ultrasonic Motor easily without the peripheral device such as a microcomputer board is prepared.
CN1 Connect DC24 V power. CN2 is not connected. Connect the CN3 to the signal input terminal of the motor. Connect the CN4 to the encoder signal terminal of the motor. Connect the CN5 to the USB terminal of the PC.*SW1 settings vary depending on the number of encoder pulses.

Motor
Driver (PSMD-PCC)
CN4
CN3
PC
CN5
PSM60S/N - E
ET
E2T
PSM40S/N - E
ET
E2T
CN1
Power supply
24V
GND
※3A or more recommended

PSMD-PCC[4]

Motor Operation Using Microcontroller, Control Device and SPI Communication

CN1 is equipped with a 24VDC power supply, and CN2 is used to communicate with microcomputers and PLCs by the SPI method. Connect CN3 to the signal input terminal of the motor and CN4 to the encoder signal terminal of the motor. The CN5 is not used.
The direction and speed of the motor's rotation can be controlled by command, allowing you to use your existing system to operate the motor with digital signals.*SW1 settings vary depending on the number of encoder pulses.

Motor
Driver (PSMD-PCC)
CN4
CN3
Microcomputer board
CN2
PSM60S/N - E
ET
E2T
PSM40S/N - E
ET
E2T
CN1
Power supply
24V
GND
※3A or more recommended
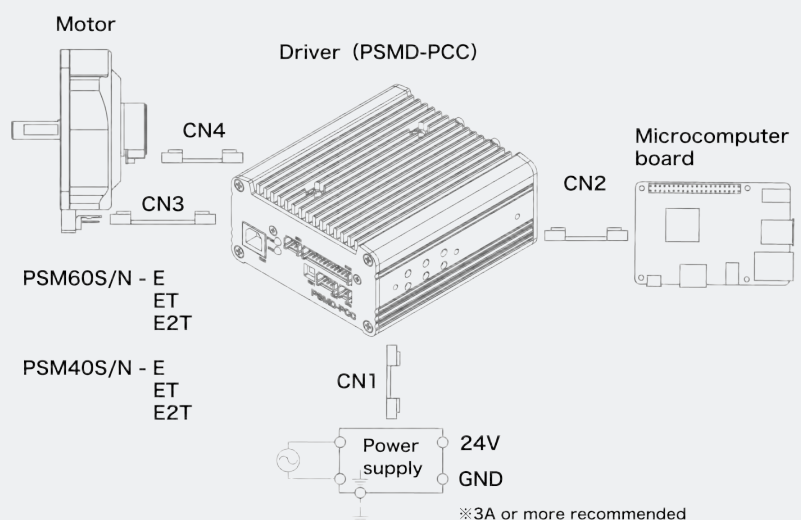
Frequently Asked Questions

FAQ

Q Where can I buy a product?

A There are three ways to purchase our products.
1. Purchase from our affiliated trading company
2. Online purchase on the web (Official Online Store,Yahoo! Shopping)
3. Please contact us directly and purchase
If you would like to receive a quantity discount, please contact us directly.

Q Please tell me how to order products.

A The order method is different depending on the method of purchase.
1. When purchasing from the website, please order the required quantity from the official online store or the Yahoo! shopping site. As soon as we confirm the information, we will inform you the delivery date.
2. In case of direct purchase from us or our affiliated company, please ask for a quotation. If you request us directly, please use the email or contact form.

Q Can I order from one piece?

A All of our products can be purchased from one piece.

Q Which drivers should I choose?

A PSMD-SPC is recommended for analog motor control using a microcomputer, PLC, or external resistor. PSMD-PCC is recommended for digital control of the motor by USB connection or SPI communication from PC, microcomputer or PLC.

Q Is it possible to combine a motor and a driver with different serial numbers?

A PSMD-SPC and PSMD-PCC can be used because the setting can be changed according to the presence or absence of an encoder and the resolution by switching the switch.However, the speed stabilization function of the driver is not available when a motor without encoder (***- A/B) is used.If you are combining motors or drivers with different serial numbers,It is recommended to adjust the minimum and maximum speeds.

Q How are endurance times calculated?

A We consider the condition that the maximum torque has dropped to 60% against the characteristics at the time of shipment as the motor's life expectancy.

Q Can I use it in a vacuum environment?

A Our Ultrasonic Motor can operate even in a vacuum. However, in a vacuum environment, the condition of friction is deteriorated, so the life expectancy may be shortened. The operation is not guaranteed because it is different from the use in the general environment.

Q Is there anything special to pay attention to in the usage environment or storage environment?

A Because the Ultrasonic Motor rotates by using friction, it is necessary to avoid the state of the friction greatly changes. For example, please refrain from using it in water, high humidity, hot environment (humidity: 60% or more, temperature: 65 °c or higher).

Q What is the difference with DC motor etc.?

A When compared to a DC motor with the same torque, our Ultrasonic Motor is small in size from 1/5 to 1/10 times. The weight also becomes lighter along with it. The Ultrasonic Motor is very quiet sound even in operation. Even with non-energized / uncontrolled situations, our Ultrasonic Motor can maintain attitude and angle with electric power 0 by friction force.

Q What are the advantages of Ultrasonic Motors?

A Ultrasonic motors are non-magnetic motors that can be used in compact, high-torque, quiet, and magnetic environments.By replacing the existing motor with an ultrasonic motor, it is possible to keep the device in a state of zero power, which leads to the miniaturization and low power consumption of the entire device. It is also safe to use for products such as MRI, semiconductor manufacturing equipment, and elemental analyzers that do not like magnetic fields.

Q What are the disadvantages of Ultrasonic Motors?

A Our Ultrasonic Motors life can compete with that of stepper motors. However, it is still shorter than the life of a DC motor.

Q How far can the motor and driver be separated?

A The standard cable length is 3m. Motor and driver can be separated up to 30m (limited to our genuine products).

Q Is it possible to custom order?

A We can customize one shaft length change and one diameter change. It is also possible to produce a complete custom motor. Please contact us by e-mail or contact form for custom specifications.

Q Is there a list of commands for USB and SPI communication?

A A command list is available. Please contact us directly for a list of commands.

TEL	+81-3-6379-6020
WEB	https://www.piezo-sonic.com/
E-mail	info@piezo-sonic.com

Piezo Sonic

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