Support the Growth of Ultrasonic Motors.
Create Innovative Actuators.
## High Quality, Compact, Quiet, High Torque Motor

Motor for High Magnetic Field Environment is Ultrasonic Motor made by SHINSEI

### Product Lineup

<table>
<thead>
<tr>
<th>Model / Product Number</th>
<th>Drive Frequency (KHz)</th>
<th>Rotation Speed (rpm)</th>
<th>Torque (N·m/Kg·cm)</th>
<th>Power (W)</th>
<th>Available Drivers (24V/12V)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Rating</td>
<td>Minimum</td>
</tr>
<tr>
<td>For Built-in Caseless Model</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>USR30-B3/USR30-B4</td>
<td>47~52</td>
<td>250</td>
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<td>0.05/0.5</td>
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<td>USR60-B3/USR60-B4</td>
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<tr>
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<td></td>
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<td>With Encoder Model</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>USR60-D3/USR60-D4</td>
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<tr>
<td>Ring Model</td>
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</tr>
<tr>
<td>USR60-RS</td>
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1. Notation is a reference value: Rotation Speed × Torque, it does not indicate Electric Power.
2. Motor and Cable are guaranteed to operate in 3T Magnetic Field Environment (Driver is Not Nonmagnetic Compatible)
About Ultrasonic Motor

Piezoelectric ceramic deforms when voltage is applied to piezoelectric ceramic. The Ultrasonic Motor rotates using its deformation. It is called “Ultrasonic Motor” because the frequency of its driving voltage exceeds the human audible range. The Ultrasonic Motor rotates based on a completely new principle that does not use materials (such as coils and magnets) that affect the magnetic field. Our company’s Ultrasonic Motor obtains rotational force by using deformation obtained by piezoelectric ceramic and frictional force between rotor and stator. To obtain the frictional force, high pressure is applied to the rotating part, and high holding torque is realized without power source. The features of our company’s Ultrasonic Motor are listed below.

Features of the Ultrasonic Motor

1. **Low Speed & High Torque**

   High torque is obtained at low speed of several rpm to 100 rpm, and direct drive of the device is possible without backlash.

2. **High Responsiveness, High Controllability**

   The braking force due to the friction of the motor is large and the inertia of the rotor is small, so it has unrivaled high responsiveness and high controllability.

3. **Small size, Light weight, Quietness**

   It is Compact and Lightweight due to its simple structure. Quietness is also excellent.

Application of Ultrasonic Motor

Utilizing the above characteristics, Ultrasonic Motors are applied to the following applications.

- XY table, robotic hand, Compact Lift/Holding Mechanism
- Auto focus of camera, video, High-Speed Rotation
- Opening/closing of the Curtain, Desk, low speed - High Speed
- Motor Controller: Inspection equipment for breaking strength of materials / High response
- \[ \text{Imperial} \] Model: Stable in Position Control
- \[ \text{Adjustment of angle and position with precision of rotation} \] / Non-Magnetic: Compactness - Light weight and Non-Magnetic

High Controllability Realized by Ultrasonic Motor

Control the Motor at USR series dedicated Driver

Servo system with Encoder signal and Controller

Special drivers are available for you to take advantage of low speed, high torque, quiet noise, high responsiveness which is features of Ultrasonic Motor. By using the encoder signal, it is possible to construct a servo system with excellent speed controllability and position controllability.

In order to realize position control and precise speed control, a controller is required in addition to our company’s drivers. Two TTL signals and a variable voltage of 0 to 3.2 V are required when controlling our company’s driver by customer’s controller.

We recommend USR-MC1, a position control controller for Ultrasonic Motors jointly developed with T.S.D. Corporation. As a unique function of this USR-MC1, it has a remote reset function of the driver. If you connect with your PC via LAN, you can control the position of the Ultrasonic Motor without any special knowledge or equipment.

For details of the controller, please contact T.S.D.Corporation.
**Product Introduction/For General Environment Motor**

- **Basic Model**
  - USR60-S3/USR60-S4

- **With Encoder Model**
  - USR30-E3/E3T/E3R
  - USR60-E3/E3T/E3R

- **Double Rotor Model**
  - USR60-D3/D4

- **With Encoder Double Rotor Model**
  - USR60-DE3/DE3T/DE3R

- **Ring Model**
  - USR60-RS

**USR60-S series** is a basic type model that is highly rugged because it is housed in a case allowing cable attachment and detachment by connectors. Maximum Torque is 1.0 [Nm].

**USR60-E series** has an incremental type rotary encoder. Maximum Torque is 0.1 [Nm].

**USR60-D series** contains two ultrasonic motors are high-torque type ultrasonic motor that achieves twice the torque of USR60-S series. Maximum Torque is 2.0 [Nm].

**USR60-DE series** is a high torque type ultrasonic motor with an incremental rotary encoder. Maximum Torque is 2.0 [Nm].

**USR60-R series** is a hollow type ultrasonic motor that can be used in general environments. Maximum Torque is 1.0 [Nm].

**Remarks**

- **Weight**
  - 258 [g]
  - 454 [g]

- **Size**
  - 67×77×56 [mm]
  - 67×77×66 [mm]
  - 67×77×71 [mm]

- **Temperature Range**
  - -10°C to 60°C

- **Humidity Range**
  - 0% to 90% RH (Without Condensation)

- **Endurance Time**
  - 1,500 [Hours]

- **Drive Voltage**
  - 130 [Vrms]
  - 110 [Vrms]

- **Drive Frequency**
  - 40 [KHz]
  - 50 [KHz]

- **Model Name**
  - USR60-S3, USR60-E3
  - USR60-D3, USR60-DE3

- **Direction of Rotation**
  - CW, CCW

- **Response**
  - Less than 1 [ms]

- **Holding Torque**
  - 0.5 [Nm]

- **Maximal Load Torque**
  - 0.1 [Nm]

- **Rated Torque**
  - 1.0 [Nm]

- **Rated Speed**
  - 500 [P/R], 1,000 [P/R], 3,600 [P/R]

- **Rated Output**
  - 5.0 [W]

- **Encoder Resolution**
  - 1,392 [P/R] (USR60-S3)
  - 1,536 [P/R] (USR60-E3)

- **Surface of Stator**
  - 70 [°C] (No-load)

- **Use range**
  - Normal use range: Motor speed range from rated to maximum torque
  - Short-time use range: Motor speed range below the rated torque

- **Cameras, sensors, etc., contributing to downsizing of equipment and realization of new mechanisms.**

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05 | 06
### Temperature Range

<table>
<thead>
<tr>
<th>Model</th>
<th>USR30-B3N/USR30-B4N</th>
<th>USR30-S3N/USR30-S4N</th>
<th>USR60-S3N/USR60-S4N</th>
<th>USR30-E3N/E3NT/E3NR</th>
<th>USR60-E3N/E3NT/E3NR</th>
<th>USR60-RN</th>
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</thead>
<tbody>
<tr>
<td>Temperature Limit</td>
<td>-10°C to +55°C</td>
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</table>

### Rated Torque

<table>
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<tr>
<th>Model</th>
<th>USR30-B3N/USR30-B4N</th>
<th>USR30-S3N/USR30-S4N</th>
<th>USR60-S3N/USR60-S4N</th>
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<th>USR60-E3N/E3NT/E3NR</th>
<th>USR60-RN</th>
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</thead>
<tbody>
<tr>
<td>Torque</td>
<td>48[Nm]</td>
<td>50[Nm]</td>
<td>200[Nm]</td>
<td>120[Nm]</td>
<td>200[Nm]</td>
<td>120[Nm]</td>
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</table>

### Maximum Speed

<table>
<thead>
<tr>
<th>Model</th>
<th>USR30-B3N/USR30-B4N</th>
<th>USR30-S3N/USR30-S4N</th>
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<th>USR30-E3N/E3NT/E3NR</th>
<th>USR60-E3N/E3NT/E3NR</th>
<th>USR60-RN</th>
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### Drive Voltage

<table>
<thead>
<tr>
<th>Model</th>
<th>USR30-B3N/USR30-B4N</th>
<th>USR30-S3N/USR30-S4N</th>
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### Endurance Time

<table>
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<tr>
<th>Model</th>
<th>USR30-B3N/USR30-B4N</th>
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<tr>
<td>Time</td>
<td>1,000[Hours]</td>
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<td>1,000[Hours]</td>
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<td>1,000[Hours]</td>
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### Normal Use Range

- Motor speed range below the rated torque
- Short-time use range: Motor speed range from rated to maximum torque

### Short-time Use Range

- Motor speed range from rated to maximum torque
**Product Introduction/Motor Driver For USR Series**

**For USR30 Series Motor**

**D6030/24V (12V)**

- Motor rotation speed by analog voltage of DC 0 V to 3.2 V.
- This driver makes it possible to construct a low cost system using the USR360 series motor. By controlling the TTL level signal, it is possible to control the CW, CCW, and stop of the motor and change the motor rotation speed by analog voltage of DC 0 V to 3.2 V.

**For USR60 Series Motor**

**D6060/24V (12V)**

- Motor rotation speed by analog voltage of DC 0 V to 3.2 V.
- This driver makes it possible to control the CW, CCW, and stop of the motor and change the motor rotation speed by analog voltage of DC 0 V to 3.2 V.

**D6060E/24V (12V)**

- Motor rotation speed by analog voltage of DC 0 V to 3.2 V.
- This driver makes it possible to control the CW, CCW, and stop of the motor and change the motor rotation speed by analog voltage of DC 0 V to 3.2 V.

**Remarks**

- Matching the driver with the motor attached to the device can lower the minimum number of revolutions that can be controlled.
Speed control & position control by encoder signal

Input the rotation / stop signal and the analog signal of DC 0 V to 3.2 V for speed change from the control board to the driver. The driver uses the encoder signal from the motor to rotate the motor. The D6060S can switch ON / OFF of the voltage boost circuit by inputting the TTL level signal from the control board.

Speed control & position control by encoder signal

Input the rotation / stop signal and the analog signal of DC 0 V to 3.2 V for speed change from the control board to the driver. The speed control and position control of the motor can be performed by using the encoder signal of the motor on the external control board. The D6060S can switch ON / OFF of the voltage boost circuit by inputting the TTL level signal from the control board.

Simple operation using control board

Input the rotation / stop signal and the analog signal of DC 0 V to 3.2 V for speed change from the control board to the driver. The driver uses the encoder signal from the motor to rotate the motor. The speed control and position control of the motor can be performed by using the encoder signal of the motor on the external control board.

Simple operation using control board

Input the rotation / stop signal and the analog signal of DC 0 V to 3.2 V for speed change from the control board to the driver. The driver uses the encoder signal from the motor to rotate the motor. The D6060S can switch ON / OFF of the voltage boost circuit by inputting the TTL level signal from the control board.

Simple operation using Switch and Resistors

By connecting an external switch to the driver, you can operate the rotation direction and stop of the motor. You can also change the speed by connecting a variable resistor.

If the motor gets hot due to rotation, the speed of the motor may be delayed.

Basic Connection Diagram

Configuration of the Connection Terminals

D6030

D6060E/D6060E/D6060S

D6060E/D6060S External Connector

Encoder specification

Power Source Voltage: DC24Vx10%
Consumption Current: Less than 20 mA
Connection method: Optical incremental
Pulse number: 1000P /R, 2000P /R, 3000P /R
Output format: Voltage
Output phase: A, B, Z(I)
Output voltage i: Over DC5V
Output voltage o: Less than DC0.4V

Encoder cable

Driver Side(6P)

Motor Side

Driver Side(6P)

(For D6060E/D6060S)

Shield

Ph.Z(I)

Ph.A

Ph.B

White

Ph.B

Red

Power+5V

Brake Down Ph.A

Yellow

Ph.Z(I)

Black Comm.

Shielded wire

Encoder cable

Driver Side(6P)

Motor Side

Driver Side(6P)

(For D6060E/D6060S)
External dimensions

Motor

USR30 Series

USR30-B3

USR30-B4N

USR30-S3/S3N

USR30-E3/E3T/E3R/E3N/E3NT/E3NR

USR60 Series

USR60-B3

USR60-S3/S3N

USR60-E3/E3T/E3R/E3N/E3NT/E3NR
External dimensions

Motor

USR60-D Series

USR60-D3

USR60-DE/DE3T/DE3R

Motor mounting hole dimensions

USR60-R Series

USR60-R5/RN

Motor mounting hole dimensions

Driver

For USR30 Series Motor

D6030

For USR60 Series Motor

D6060

D6060E/D6060S
External dimensions

Driver

For USR60-D Series Motor

D6060D

D6060DE

Q&A

Q Are there any special precautions in the usage environment and storage environment?
A Due to the structure of the ultrasonic motor, the constituent material of the motor expands or deforms depending on the preservation environment, and the characteristics of the motor may change. Please keep as low humidity condition as possible when storing. Also, please heat dissipate so that the case temperature does not exceed 55 °C.

Q Can I use it in a vacuum environment?
A I'm sorry. In our current lineup there is no product for vacuum compatibility. However, we plan to announce new products such as vacuum-compatible motors in the future.

Q How can I use a nonmagnetic compatible motor in a magnetic field environment?
A Our USR-N series can be operated with a magnetic field of 3 [T] or more. These motors operate stably in MRI equipment and superconducting experiment equipment.

Q Can I use a cable other than the standard cable?
A It is also possible to adjust the motor and driver with the customer specified cable. In that case, please send us your cable to us. In addition, separate adjustment fee is required for adjustment using customer specified cable.

Q Is it possible to custom-order, such as changing the length of the shaft?
A Extension of the motor shaft etc, special correspondence to customer's specification is possible. Please submit drawings and illustrations (may be handiered) for estimate. For specification change, additional cost, such as shaft processing cost, is required.

Q Is there a demonstration machine lending?
A I'm sorry. We do not have demonstration machines for rent now. For customers who want to check the behavior of ultrasonic motors, our sales staff will show you a demonstration.

Q Is there any necessary equipment to move the Ultrasonic Motor?
A In order to move our ultrasonic motor, in addition to our driver, · One pole double throw intermediate stop switch for rotation stop signal(CW/CCW/STOP Control), · One 10KΩ B type variable resistor, · One power supply capable of 24 VDC output is required.

About power supply
If the motor to be used is the USR 30 series, prepare at least 1A. For the USR 60 series, please have equipment with capacity of 2.5 A or more. In addition, when performing speed control using external signals, a power supply capable of outputting 0 to 3.2 V or a DAC board etc. is required separately.

About support
For support on SHINSEI products, please refer to the web site.

About development of applied products
For Ultrasonic Motor controllers and applied products, please contact "T.S.D. Corporation" of our affiliated company.
T.S.D.Corporation
http://www.tsd.jp
TEL:+81-3-5357-8795

Contact us
For product inquiries
Sales department
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FAX: +81-3-3332-0066
E-Mail: info@shinsei-motor.com
Business hours (1000~1800)  weekend off
Inquiries on technical contents
Technical & Development department
E-Mail: technical@shinsei-motor.com
Warning

Please pay special attention to the following points:

1. Avoid applying excessive load and excessive inertial load to the motor as much as possible. This condition may shorten motor life due to wear of stator and rotor.
2. Do not apply a thrust load to the output shaft of the motor. It may cause deterioration of motor characteristics.
3. Do not apply torque greater than the holding torque from the outside when the motor is stopped. There is a possibility of destroying the motor.
4. The tolerance of the motor output shaft is g6 finished. Avoid fitting into the output shaft by press fitting or hitting.
5. Please ensure that the case temperature of the motor does not exceed 55°C.
6. When using and storing the motor, please keep the humidity around the equipment below 45%.
7. The motor is adjusted as a set on the driver and cable. Please readjust the driver when changing the combination or changing cable length.
8. Prepare a power source for the driver that has enough power capacity.

Manufacturer

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