1. Introduction

The USR30 Series is an updated, improved version of our USR30 model: by resolving the problems that existed with our previous model, we were able to achieve excellent stability and reliability in a compact, lightweight package, engineered for durability and offered at very reasonable prices. As pioneers in the manufacturing of ultrasonic motors, we at Shimer are proud to present to you our highly practical USR30 Series.

2. Precautions

- Wiring the connections improperly is likely to result in destruction of the driver.
- If the motor lead wire is short-circuited, the fuse will melt. But if the DC input is connected in the wrong manner (e.g., polarity reversed, connected to wrong terminal, etc.), or the voltage of the power source is too high, the weldable elements will be destroyed. (If the power indicator lamp comes on, but the motor does not run, the correct fuse has been determined.) Before switching on the motor, make sure that all external wiring has been properly done.

3. Specifications

- Rated speed: 250 rpm
- Holding torque: 1.0 kg-cm
- Start-up response time: approx. 30 msec (using driver and with no inertial motor load)
- Stepping response time: approx. 5% at rated load; approx. 10% at no load
- Operating ambient temperature: -10°C to +55°C
- Driver voltage: approx. 110 Vrms
- Driving frequency: approx. 50 kHz
- Rated torque: 0.5 kg-cm
- Maximum torque: 1.0 kg-cm
- Direction of rotation: CW/CCW
- Allowable temperature rise: 65°C at case surface
- Operating life: 3000 hrs minimum

4. Motor characteristics and operating range

- Speed setting range: Maximum 200 kHz, Minimum 10 kHz
- Allowable operating range for short-term periods during acceleration or deceleration.

4.1 Motor specifications (common to all USR30 Series models) (at maximum driver speed setting)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated output</td>
<td>1.3 W</td>
</tr>
<tr>
<td>Rated speed</td>
<td>250 rpm</td>
</tr>
<tr>
<td>Holding torque</td>
<td>1.0 kg-cm</td>
</tr>
<tr>
<td>Start-up response</td>
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</tr>
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</tbody>
</table>

4.2 USR30-33-54 motor dimensions

- Motor diameter: 33 mm
- Motor length: 54 mm
- Motor lead wire: 1 m
- Connector: M30S
- Lead wire: 3 holes

5. Mount plate (optional) Material: aluminum

- M8 x 30S
- M6 x 30S

6. Driver specifications

- Supply voltage: 220V ±10%
- Current control: 0.2 A max
- Standby current: 30 mA max
- Over-current protection: 60 A max
- Motor drive voltage: 110 Vrms
- Oscillation frequency and waveform: 50 kHz
- No-load variable speed range: 0 to 300 rpm
- Variable speed control: based on frequency variation
- Frequency control: automatic tracking by vibration amplitude feedback
- Response time: approx. 50 msec/approx. 1 msec (with no inertial load)
- Speed setting volume: 10 kΩ (B 1/2 W)
- Speed setting external voltage: 0 to 32.5 V DC
- Start-up control: contact or non-contact positive logic
- H level between 2.5 V and 5 V
- L level 0.4 V max
- Storage temperature: -10°C to +55°C
- Operating ambient temperature: 0 to +70°C

7. Motor unit (independent unit D6310) dimensions

- M8 harness Housing Size 2-6 Terminal 3-Hole
- M6 x 30S
- Motor lead wire: 1 m

8. Encoder specifications

- Supply voltage: DC 5V ±10%
- Operation-type incremental
- A, B, 24-turns square waves with 90° phase difference and origin signal square waves
- Maximum sink current: 5 mA
- Collector-emitter voltage loss: 8.4 V max (at maximum sink current)
- Current demand: 60 mA max
- Output format: open collector
- Output pulse rate: 5000 Hz

Note: If motors (the 2-3 holes at bottom and side) are to be used, the cover must first be removed.
4. External control

4-1 Driver circuit in terms of external terminals

- The power source's DC24V is supplied to the output transformer's primary-side common and to each device.
- A reference voltage of 3.2 volts is provided to the common terminal (2, light blue) of the star-wound switch and to the speed setting terminal (6, blue). 5 mA max.
- The CW rotation command terminal (4, brown) has an impedance of about 11 kΩ.
- The CCW rotation command terminal (3, purple) has an impedance of about 5.5 kΩ.

6. Circuit configuration

- Motor start-up and shutdown: Positive logic level: between 2.4 and 5 volts; L level: 0.4 volt max.
- Using the driver's output voltage

- Direct driving using digital IC

9. Adjusting the driver

The driver must be re-adjusted when connected to a motor with which it was not originally paired at the time of shipping, or when changing the length of the motor's lead wire. This is done as follows:

- Frequency meter (variable input voltage 150 Vrms minimum)
- Thermometer (non-contact type preferable)
- Small screw driver (regular or Phillips)

Procedure:
1) Connect frequency meter between GND and Sin (or Cos) of the ultrasonic motor's lead wire.
2) With the motor at no-load condition, set up the frequency for speed measurement.
3) VR1: Adjustment of maximum speed (zero adjustment for speed setting voltage)
   - Turn the speed setting volume to the lowest setting, or set the external speed command voltage at 0 volts, whichever may be applicable to your set-up. Adjust trimmer VR3 so that the speed falls in the range 20-20 rpm when CW/CCW rotation commands are given (speed can be increased by turning the trimmer clockwise). Check to see that the frequency at this time is 51-54 kHz.
4) VR2: Adjustment of maximum speed (open adjustment of speed setting volume)
   - Turn the speed setting volume to the highest setting, or set the external speed command voltage at 3.2 volts, whichever may be applicable to your set-up. Adjust trimmer VR2 so that the speed falls in the range 300-320 rpm when CW/CCW rotation commands are given (speed can be increased by turning the trimmer clockwise). Check to see that the frequency at this time is 49-51 kHz.
5) VR3: Balance correction (connecting the impedances between CW and CCW speeds)
   - Adjust trimmer VR3 so that the CW and CCW speeds are equal in step 4 above.

Repeat steps 4 and 5 until the maximum speed for the CW and CCW directions are the same.

Note that the driving frequency and speed are inversely proportional to each other; i.e., when frequency increases, speed decreases.

10. Warranty

We warrant our product for a period of one year from the date of purchase, or until a cumulative operating time of 3000 hours is reached, whichever is sooner, from date of manufacture. Any failure occurring during this period will be repaired free of charge.

This product has been manufactured under a strict quality control program. In the event a failure should occur but be, however, we reserve the right to repair the equipment at our own discretion. To the extent allowed by law, our liability is limited to the purchase price of the product. In no event shall we be liable for indirect, incidental, or consequential damages.