Interface produces more than 50 types of reaction torque transducers and rotary torque transducers.

All our torque transducers are precision-machined and use our proprietary torque sensors for the most accurate data possible. A torque sensor, is a transducer that converts a torsional mechanical input into an electrical output signal. A reaction torque sensor measures static torque, and rotary measures dynamic torque. Rotary torque transducers are used in applications where the torque transducer must rotate when attached to a spinning shaft. A rotary torque transducer provides a method of getting the signal off of the rotating element without an attached cable. We can help you find mounts from pedestals to shafts to flanges, and drives vary from hex to square to pulley, with more styles in between.

### Reaction versus Rotary

<table>
<thead>
<tr>
<th>Reaction (static) –measures torque without rotating</th>
<th>Rotary (dynamic) – rotates as a part of a system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normally has a cable attached to it for supplying excitation voltage to the strain gage bridge and for output of the mV/V signal</td>
<td>Uses slip rings, rotary transformers, rotating electronics, rotating digital electronics, or radio telemetry to get around the issue of the attached cable</td>
</tr>
<tr>
<td>Spinning of the sensor is prevented by the attached cable</td>
<td>A reaction sensor is at the heart of every rotary sensor</td>
</tr>
</tbody>
</table>

### Shaft vs Flange

<table>
<thead>
<tr>
<th>Shaft</th>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth shaft –more uniform introduction of the torque into the measuring shaft, ease of assembly and disassembly, zero backlash</td>
<td>Flange – typically shorter than shaft style, have pilots on their flange faces as a centering feature</td>
</tr>
<tr>
<td>Keyed shaft – simpler, cost less, can suffer from wear due to backlash especially in reciprocating applications</td>
<td></td>
</tr>
</tbody>
</table>

### Shaft Style Torque

- Convenient mounting with standard shaft style coupling
- Longer installed length than flange style
- Rotating shaft style sensors typically have bearings
- Smooth or keyed shafts available

### Flange Style Torque

- Short install length
- Better resistance to overhung moments
- Can be more convenient to mount
- Can be hollow
- Bearingless rotary torque sensors tend to be flange style

### Couplings

- Should be used for **ALL** torque installations
- Insure isolation of torque loads
- Prevent error and/or damage from extraneous loads

<table>
<thead>
<tr>
<th>Single-flex (half)</th>
<th>Double-flex (full)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has a single flex point</td>
<td>Has two flex points</td>
</tr>
<tr>
<td>Allows only angular misalignment</td>
<td>Allows both angular and radial misalignment</td>
</tr>
</tbody>
</table>

### Floating vs Fixed

**Floating Mount Installations**

- Sensor is supported only by the drive and load side connections (typically single-flex style couplings)
- A flexible strap keeps the sensor from rotating
- Bearingless sensors are always floating mount

**Fixed Mount Installation**

- Applies only to sensors with bearings
- Involves attaching the sensor housing to a fixed support

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**T14** Slip-Ring  
8.85 lbf-in to 4.43K lbf-in  
1 Nm to 500 Nm

**T15** Hex Drive  
1.77 lbf-in to 177 lbf-in  
0.2 Nm to 20 Nm

**T16** Compact Rotary Torque  
8.85 lbf-in to 4.43K lbf-in  
1 Nm to 500 Nm

**T22** Pulley Belt  
177 lbf-in to 44K lbf-in  
20 Nm to 5K Nm

**T23** Low Cost  
2.66K lbf-in to 4.43K lbf-in  
300 Nm to 500 Nm

**T25** High Speed  
0.885 lbf-in to 44.3K lbf-in  
0.1 Nm to 5K Nm

**T27** Hollow Flange Bearingless  
443 lbf-in to 8.85K lbf-in  
50 Nm to 1K Nm

**T31, T32, T33, & T34** Spindle Torque  
8.85 lbf-in to 4.43K lbf-in  
1 Nm to 500 Nm

**TR1** Rod End Reaction Torque  
25 ozf-in to 1K lbf-in  
0.18 Nm to 110 Nm

**TS11** Flange Style  
88.5 lbf-in to 177K lbf-in  
10 Nm to 20K Nm

**TS12** Shaft Style  
0.04 lbf-in to 177K lbf-in  
0.005 Nm to 20K Nm

**TS14** Square Drive  
17.7 lbf-in to 44.2 lbf-in  
2 Nm to 5K Nm

**TS15** Square Flange Style  
17.7 lbf-in to 44.3K lbf-in  
2 Nm to 5K Nm

**TS16** Square Flange Style  
17.7 lbf-in to 17.7K lbf-in  
2 Nm to 2K Nm

**TS17** Hex Drive  
1.77 lbf-in to 177 lbf-in  
0.2 Nm to 20 Nm

**TS18** Shaft to Flange Style  
44.3 lbf-in to 17.7K lbf-in  
5 Nm to 2K Nm

**TS19** Short Flange Style  
443 lbf-in to 88.5K lbf-in  
50 Nm to 10K Nm

**TS20** Hollow Flange  
88.5 lbf-in to 1.77K lbf-in  
10 Nm to 200 Nm

**TS21** Miniature Shaft Style  
8.85 lbf-in to 885 lbf-in  
1 Nm to 100 Nm

**TS22** Low Capacity Overload Protected  
0.04 lbf-in to 177 lbf-in  
0.005 Nm to 20 Nm
Interface
Torque Transducers

- Bearingless
- Rotary (Dynamic)
- Flange Mount
- Wireless
- Reaction (Static)
- Miniature
- Overload Protected
- Shaft
- Square Drive
- Hex Drive
- Spindle Torque
- USB Output

Accuracy and Resolution

- Usually quoted as a percentage of Capacity
- A common rating is 0.1% combined error
- For example: a 100Nm sensor with 0.1% combined error – will have +/- 0.1Nm error
- Other considerations:
  - Temperature error
  - Noise and resolution
  - Measurement Bandwidth – sample rate
- There is ALWAYS a compromise between accuracy and resolution as well as safety factor
- Signal types
  - 5V, 10V, Frequency, USB, RS485
- Digital versus Analog

Capacity Selection

- Torque sensor capacity MUST accommodate the maximum expected torque for the application
- Overload range is reserved for the occasional accident
- Calculate average running torque -
  \[ \text{Torque (LB-IN)} = \left[ \frac{\text{Horsepower} \times 63025}{\text{RPM}} \right] \]
- Apply appropriate Load and Drive service factors (see Interface Torque Primer)
- Consider startup and inertia loads
- Extraneous loading

Load Factors

- Smooth, constant load devices, fans, centrifugal blowers
- Non-reversing, non-constant load or start/stop devices, extruder’s, hoists, conveyors, and mixers
- High variable shock or light reversing loads, crushers, hammer mills, single cylinder reciprocating pumps, vehicle drive lines
- Heavy to full torque reversals, undamped torsional vibrations, single and double acting reciprocating compressors

Starting Conditions

- High inertia load driven by induction motor
- Soft starts and soft stops

Dual Range

- Can seem very attractive but are not a “magic bullet”
- Excellent choice for certain applications
  - Convenience
  - Less fixture changes
  - More safety factor

Compromise

- Noise - bandwidth
- Temperature sensitivity
- Larger fixtures

RPM Considerations

- Observe maximum rpm limit – All sensors have max rating
- Balancing – for high speed operation the entire rotating string must be balanced – NOT JUST THE SENSOR
- Limit may be bearings, balancing or g-forces on rotating parts

To learn more about the Interface products or force measurement solutions call 480-948-5555.
Interface is the world’s trusted leader in technology, design and manufacturing of force measurement solutions. Our clients include a “who’s who” of the aerospace, automotive and vehicle, medical device, energy, industrial manufacturing, test and measurement industries.

Interface engineers around the world are empowered to create high-level tools and solutions that deliver consistent, high quality performance. These products include load cells, torque transducers, multi-axis sensors, wireless telemetry, instrumentation and calibration equipment.

Interface, Inc., was founded in 1968 and is a US-based, woman-owned technology manufacturing company headquartered in Scottsdale, Arizona.