TF SERIES
TORQUE FLANGE SENSORS

FEATURES

▪ Complete torque measuring system including:
  measuring flange with signal amplifier,
  HF transmitter, conditioner and 4m coaxial cable
▪ Contactless signal transmission: via telemetry
▪ Torque range: 20 N·m to 150,000 N·m
  (higher on demand)
▪ High accuracy: 0.1% to 0.2% (0.05% option)
▪ Overload capacity: up to 200% (limit of adhesion)
▪ Measuring range: 200%
▪ Breaking torque: 400%
▪ Compact, easy-to-mount design
▪ High torsional stiffness
▪ Bearingless: maintenance and wear-free
▪ Excellent noise immunity and shock resistance
▪ Protection class: IP 42 (IP 54 optional)
▪ Integrated speed sensor and conditioner for
  rotational speed measurement (optional)
▪ High temperature capability: up to 125 °C (optional)

DESCRIPTION

With its compact, bearingless, maintenance-free design, the TF Torque Flange Sensor from Magtrol brings many appealing advantages to torque measurement applications. The TF’s high torsional rigidity supports direct mounting on the machine shaft or flange, avoiding the use of couplings on one side. This allows easy integration into a test system, shortens the overall length of the test bench and reduces costs.

Based on strain-gauge technology, the TF Sensor’s precise telemetry system enables highly accurate signal transmission. A signal amplifier mounted in the measuring flange amplifies the measuring signal, modulates it to high frequency and transmits it inductively (via the HF transmitter) to the conditioner. In the conditioner, the digitized torque signal is transformed into an analog output signal of ±5 VDC. Rotational speed can be measured and converted to a TTL output signal with the optional speed sensor.

The contactless design of the Torque Flange Sensor permits a gap of up to 5 mm (typically 2 or 3 mm) between the rotor antenna and HF transmitter, which makes the signal acquisition insensitive to any axial or radial misalignment. Another advantage of this torque measurement system is its insusceptibility to signal interference since the antenna does not need to be looped around the measuring flange. Additionally, a protective cover can be mounted close to the TF Sensor with no effect on the signal.
TF series

ASSEMBLY

APPLICATIONS

TF Torque Flange Sensors measure both static and dynamic torque on stationary and rotating shafts. They are used in general combustion engines, electric motor and gearbox test benches; and can also be mounted inline for active torque monitoring of transmissions, powertrains, wind generators, gas turbines, boat engines, etc.

Fig.2: 1) HF Transmitter  2) Measuring flange with signal amplifier  3) 4 meter coaxial cable  4) Torque conditioner

SYSTEM CONFIGURATION

Fig.3: TF SERIES mounting example

ELECTRICAL CONFIGURATION

Fig.4: TF SERIES electrical configuration schematic
## TECHNICAL FEATURES

### MECHANICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>RATED TORQUE</th>
<th>OVERLOAD CAPACITY</th>
<th>ACCURACY CLASS</th>
<th>MAXIMUM SPEED</th>
<th>NUMBER OF TEETH (c)</th>
<th>TORSIONAL STIFFNESS</th>
<th>DEFORMATION ANGLE</th>
<th>SENSOR WEIGHT</th>
<th>MOMENT OF INERTIA</th>
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<tbody>
<tr>
<td></td>
<td>N·M</td>
<td>% OF RT</td>
<td>RPM</td>
<td>Z</td>
<td>N·M / RAD</td>
<td>°</td>
<td>KG</td>
<td>KG·M²</td>
<td>LB·FT·S²</td>
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<td>5.04 x 10⁴</td>
<td>0.023</td>
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<tr>
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<tr>
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<tr>
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<tr>
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<td>7.803 x 10⁻³</td>
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<td>200</td>
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<td>0.055</td>
<td>63.5</td>
<td>1.397</td>
<td>1.03</td>
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Maximum Dynamic Torque without Damage (Overload Limit): 400 % of Rated Torque

### ENVIRONMENT

- **Rated Temperature Range**: +10 °C to +85 °C
- **Storage Temperature Range**: -25 °C to +85 °C
- **Extended Temperature Range (optional)**: -30 °C to +125 °C
- **Temperature influence on zero**: 0.01 % / °C
- **Protection class**: IP 42 (optional IP 54)

### ELECTRICAL CHARACTERISTICS

- **Power Supply**: 24 V DC ±10%, max 350 mA
- **Torque Output Signal (rated / max.)**: ±5 V DC / ±10 V DC
- **Filter Bandwidth**: 0 to 1 kHz (-3dB) / (optional 5 kHz)

### SPEED MEASUREMENT (OPTION)

- **Number of Teeth**: Depending on TF size; refer to number of teeth
- **Speed Pick-Up Transducer**: Magnetoresistive
- **Minimum Speed Detection**: < 1 rpm
- **Speed Output**: TTL (pulses per revolution corresponds to number of teeth)

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a) Torque up to 150 kN·m or higher, and high speed versions are available on request

b) Linearity- hysteresis error 0.05 % is available on request
c) Inductive speed detection is available on request
d) Add 0.8-2.8 kg to weight (depending on configuration), for electronic devices attached to the sensor (HF transmitter, receiver, speed conditioner,...)
e) Dynamic torque peak values are due to force transmission limit of mounting screws.

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DIMENSIONS TF & TFHS 309 - 312

DIMENSIONS TF 213 - 217

<table>
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<tr>
<th>MODEL</th>
<th>A</th>
<th>B</th>
<th>εC</th>
<th>εD H7</th>
<th>εE</th>
<th>εF ±0.05</th>
<th>8x øG</th>
<th>8x øH</th>
<th>I</th>
<th>J</th>
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<td>46 mm</td>
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<td>75 mm</td>
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<td>101.5 mm</td>
<td>18 mm</td>
<td>10.1 mm</td>
<td>3 mm</td>
<td>3 mm</td>
<td>M10</td>
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<tr>
<td>TF 215</td>
<td>15.5 mm</td>
<td>47 mm</td>
<td>169.5 mm</td>
<td>90 mm</td>
<td>164 mm</td>
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<td>55 mm</td>
<td>199.5 mm</td>
<td>110 mm</td>
<td>194 mm</td>
<td>155.5 mm</td>
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<td>17.0 mm</td>
<td>11 mm</td>
<td>3 mm</td>
<td>M16</td>
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NOTES: 3D .STEP files of most of our products are available as free downloads from our website: www.magtrol.com. Other files are available on request.
DIMENSIONS TF 318 - 319

DIAMETERS TF 318 - 319

Air gap 1.5-2.5mm

Speed sensor (optional)

HF Transmitter
Rotor antenna

Air gap 3mm

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STANDARD SPEED SENSOR

The standard speed sensor is delivered with TF Torque Flange Sensors when the speed measurement option is ordered.

HIGH TEMPERATURE SPEED SENSOR

The high-temperature speed sensor is delivered with TF Torque Flange Sensors when both the speed measurement and extended temperature range options (125°C) are ordered.
STANDARD CONDITIONER

Conditioner (1.5 W),
for TF 309 to TF 312 and TF 213 to TF 217

CONDITIONER WITH SPEED OPTION

Conditioner (1.5 W) with speed option,
for TF 309 to TF 312 and TF 213 to TF 217
CONDITIONER FOR TF 318-320

Conditioner with speed (5 W), for TF 318 to TF 320
ORDERING INFORMATION

ORDERING NUMBER

<table>
<thead>
<tr>
<th>HS : for high speed series</th>
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<tbody>
<tr>
<td>309, 310, 214, 217, ..., 320 : Model TF or TFHS</td>
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</table>

1 : Basic
2 : With speed measurement
5 : High temperature version (up to 125°C)
6 : Speed measurement & high temperature (up to 125°C)

Example: TF 312 Torque Flange Sensor, high speed version, with speed measurement, would be ordered as: TFHS 312 / 02X.

SYSTEM OPTIONS

MODEL 3411 TORQUE TRANSDUCER DISPLAY
Magtrol offers the Model 3411 Display which supplies power to any TF Sensor and displays torque, speed and mechanical power. Features include:

- Adjustable English, metric and SI torque units
- Large, easy-to-read vacuum fluorescent display
- Built-in self-diagnostic tests
- Overload indication
- Tare function
- Ethernet connectivity
- Torque and speed outputs
- Closed-box calibration
- Includes Magtrol Torque 7 Software

TORQUE 7 SOFTWARE
Magtrol’s Torque 7 Software is an easy-to-use Windows® executable program, used to automatically collect torque, speed and mechanical power data. The data can be printed, displayed graphically or quickly saved as a Microsoft® Excel spreadsheet. Standard features of Magtrol’s Torque 7 Software include: peak torque capture, multi-axes graphing, measured parameter vs. time, adjustable sampling rates and polynomial curve fitting.

COUPLINGS
For our TF Torque Flange Sensors, Magtrol offers couplings (flexible disc or below type). For more details, please contact your regional sales office.

CABLE ASSEMBLY

ORDERING NUMBER

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<tr>
<td>16 : 14 Pin connector a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 : Pigtail wires</td>
<td></td>
<td></td>
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</tbody>
</table>

1 : Cable length 5 m
2 : Cable length 10 m
3 : Cable length 20 m

a) For use with 3411 Torque Display or DSP Controller

Fig.7 : 3411 Torque Display
Fig.8 : example of flexible disc coupling