Torque Sensor
Rotating, contact ring transfer

Model 86403 with square end
Model 86413 with round shaft ends
Model 86423 with hexagonal shaft end

Application
Precise, reliable measurements of both static and dynamic torques in either direction can be made with this range of sensors. This opens a wide range of possible applications to the user. These torque sensors are standard equipment in a wide range of industrial automation, quality control and automotive components industry applications, as well as in laboratories.

Typical applications:
- Screwing technology
  - Checking and adjusting bolting tools such as torque limiting wrenches, screwdrivers
  - Testing bolted connections
- Measuring the drag torque of motors and pumps
  - Frictional torques of gears, bearings and seals
  - Testing torsion springs
  - Adjusting equipment in the automobile industry (sunroof, power windows etc.)

Description
Strain gauges are mounted on the torsion shaft of the sensor element, itself made of steel, connected to form a full bridge. The electrical power excitation for the wire strain gauge full bridge and the transmission of the measured signal is provided through a high-quality slip-ring system between the stator and the rotor.

For a clockwise torque, the measurement signal is positive, and it is negative for a counterclockwise torque.

The sensor for the optionally available angle measurement for the square shaft versions is fitted with an additional pulse-generating disk.

With the aid of a second encoder track, displaced by 90°, allows the subsequent evaluation units to perform 4-fold edge evaluation. This allows significantly improved resolution to be achieved. The offset track makes it possible to detect the direction of the rotation.

The characteristic parameters for the sensors are standardized in order to reduce the effort required to check a connected amplifier or to exchange the sensor.

- Measuring ranges between 0 ... ± 1 Nm and 0 ... 1000 Nm
- Excellent reproducibility
- Standardized output signal makes exchange easy
- Optionally available with factory calibration certificate
- Designed for clockwise and counterclockwise torque
- Optionally available with integrated angle measurement
- Rotation speed up to 3000 min⁻¹ (short-term)
Technical Data
Model 86403

Torque sensor, rotating, standard square ends according to DIN 3121

<table>
<thead>
<tr>
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<td>±1 Nm</td>
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<td>1/4&quot;</td>
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Higher ranges on request.

Dimensional drawing
Model 86403

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Technical Data
Model 86403-...-V501

Torque sensor, rotating, standard square ends, with angle measurement

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Dimensional drawing
Model 86403-...-V501
Technical Data

Model 86413
Torque sensor, rotating, round shaft ends with parallel key

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<td>0 ± 2 Nm</td>
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<td>86413-5200</td>
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<td>9.15 ·10⁻⁵</td>
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<td>A 55 B 32 C 41.6 D 40 E 140 F 34.3 G 68 H 60 I 30 J - K - L - M 10.5 N 5</td>
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Dimensional drawing
Models 86413 and 86413-...V501

Model 86413-...V501
Torque sensor, rotating, round shaft with keyways and internal angle measurement

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<td>0 ± 1 Nm</td>
<td>0.5</td>
<td>1.9 ·10⁻²</td>
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<tr>
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<td>2.43 ·10⁻²</td>
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<td>0.16</td>
<td>A 8 B 19.7 C 18 D 85 E 19.7 F 39 G 24 H 12 I 5 J 9 K 27.9 L 33.3 M 5</td>
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<td>86413-5010-V501</td>
<td>0 ± 10 Nm</td>
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<td>4.56 ·10⁻²</td>
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<td>A 8 B 19.7 C 18 D 85 E 19.7 F 39 G 24 H 12 I 5 J 9 K 27.9 L 33.3 M 5</td>
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<tr>
<td>86413-5020-V501</td>
<td>0 ± 20 Nm</td>
<td>2</td>
<td>1.77 ·10⁻²</td>
<td>12</td>
<td>1.16 ·10⁻⁵</td>
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<td>A 15 B 21.1 C 20 D 90 E 21.5 F 54 G 42 H 21 I 6 J 9.5 K 11 L 10.5 M 5</td>
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<tr>
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<td>0 ± 50 Nm</td>
<td>2</td>
<td>4.82 ·10⁻²</td>
<td>28</td>
<td>1.17 ·10⁻⁵</td>
<td>0.38</td>
<td>A 15 B 21.1 C 20 D 90 E 21.5 F 54 G 42 H 21 I 6 J 9.5 K 11 L 10.5 M 5</td>
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<tr>
<td>86413-5100-V501</td>
<td>0 ± 100 Nm</td>
<td>2</td>
<td>9.85 ·10⁻³</td>
<td>65</td>
<td>1.25 ·10⁻⁵</td>
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<td>A 15 B 21.1 C 20 D 90 E 21.5 F 54 G 42 H 21 I 6 J 9.5 K 11 L 10.5 M 5</td>
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<td>86413-5200-V501</td>
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<td>0.90</td>
<td>A 55 B 32 C 41.6 D 40 E 140 F 34.3 G 68 H 60 I 30 J - K - L - M 10.5 N 5</td>
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Dimensional drawing
Models 86413 and 86413-...V501

Model 86423
Torque sensor, rotating, standard
hexagonal shaft ends 1/4" DIN 3126 Form E/F

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<tr>
<td>86423-5001</td>
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<td>0.5</td>
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<td>0 ± 5 Nm</td>
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<td>86423-5010</td>
<td>0 ± 10 Nm</td>
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<tr>
<td>86423-5020</td>
<td>0 ± 20 Nm</td>
<td>2</td>
<td>0.2</td>
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The CAD drawing (3D/2D) for this sensor can be imported online directly into your CAD system.

Download via www.burster.com or directly at www.traceparts.com. For further information about the burster traceparts cooperation refer to data sheet 80-CAD-EN.

Note: The max. allowed static lateral force is smaller than 10 % of the lower value of the measurement range.

Drive end --- hexagon head
Measurement side --- hexagon socket
Quick-action chuck

86403 EN - 3

Technical changes reserved. All data sheets at www.burster.com

86403 EN

Technical changes reserved. All data sheets at www.burster.com
General Technical Data for all Sensors

**Electrical values**

**Torque sensor**
- **Bridge resistance (full bridge):** 350 Ω
- **Excitation voltage:** 2 ... 12 V DC
- **Characteristic:** standardized 0.5 mV/V, 1mV/V
  or 2 mV/V (refer to tables)
- **Tolerance of characteristic:** ± 0.1 %
- **Test (option):**
  - If the full bridge is connected to the positive strain gauge excitation voltage, it generates an electrical signal equivalent to 100 % of the nominal signal.

**Angle displacement sensor (refer to options)**
- **Excitation voltage:** 5 V DC
- **Angle displacement measurement:** 360 pulses/rotation
- **2 TTL outputs with two encoders, angle displacement 90° for detection of direction.**

**Environmental conditions**
- **Range of operation temperature:** ± 10 °C ... + 60 °C
- **Range of nominal temperature:** ± 5 °C ... + 50 °C
- **Influence of temperature in range of nominal temperature:**
  - to zero signal ±0.01 % F.S./K
  - to characteristic ±0.003 % F.S./K

**Mechanical values**
- **Measurement error, consisting of non-linearity and hysteresis:** ≤ ± 0.1 % F.S.
- **Relative spread in unchanged mounting position:** ≤ ± 0.05 % F.S.
- **Range of rotation:**
  - an exceedance of the max. rotary speed, up to 1.5 x max. rotary speed, is possible only for short time
  - max. rotary speed for ranges from von 0 ≤ 0 ... 12 Nm 2000/min
    ranges from 0 ... 25 Nm to 0 ... 160 Nm 1500/min
    ranges from 0 ... 500 Nm to 0 ... 1000 Nm 1000/min
    ranges from 0 ... 2000 Nm to 0 ... 5000 Nm 500/min
- **Max. operation torque:** 120 % of nominal torque
- **Dynamic torques (peak-peak):** max. 70 % of nominal torque
- **Limit torque (static):** 130 % of nominal torque
- **Breakaway torque (static):** 250 % of nominal torque
- **Angle displacement at nominal torque:** < 0.5 °
- **Material:** high strength heat-treated steel, similar to 1.2826 or 12738
- **Protection class:** acc. to EN 60529 IP50

**Dimensions:** refer to table and dimensional drawing

**Maintenance/cleaning (contact ring abrasion, recommended change**
- forces. It is recommended that the cable connection points upwards,
- accurately aligned. This should be done without free play or lateral
- should only be mounted on the coupling after the parts have been
- in the equipment should be kept away from the sensor. The sensor
- output signal is watched at the time of fitting. Vibrations originating
- in the measurement.

**Mounting Instructions**

**Sensors without measurement of angle displacement**
- 6 pin plug-in connection Mating connector model 9953

**Wiring:**
1. excitation negative
2. excitation positive
3. shield (not connected in the sensor)
4. output positive for clockwise torques
5. output signal negative for clockwise torques
6. 100 % check

**Sensors with measurement of angle displacement**
- 12 pin plug-in connection Mating connector model 9940

**Wiring:**
- **A** excitation negative for torque (0 V DC)
- **B** excitation positive for torque (2 ... 12 V DC)
- **C** output signal positive for clockwise torque
- **D** output signal negative for clockwise torque
- **E** excitation negative for angle disp. (0 V DC)
- **F** excitation positive for angle disp. (+ 5 V DC)
- **G** angle output 1 (TTL pulses)
- **H** angle output 2 (TTL pulses)
- **J** check, shunt calibration (option)
- **L** NC
- **M** shield

**Accessories**

**for sensors without measurement of angle displacement**
- Mating connector 6 pin, in scope of delivery Model 9993
- Mating connector 6 pin, 9° outlet Model 9990-V589

**Connection cable, one end open,**
- length 3 m Model 99553-000A-0110030
- Connection cable to burster desktop devices with 12 pin panel jack, length 3 m Model 99141-553A-0150030
- Connection cable to 9235 and 9310 length 3 m Model 99209-553A-0110030
- Cable adapter to 9163-V3XXX
  - length 0.2 m Model 99209-609A-0090002

**for sensors with measurement of angle displacement**
- Mating connector 12 pin, in scope of delivery Model 9940
- Mating connector 12 pin, 9° outlet Model 9990-V539

**Connection cable, one end open,**
- length 3 m Model 99540-000K-0270030
- Connection cable to model 9307, length 3 m Model 99163-540C-0270030
- Strain gauge simulator Model 9405

**The sensor will be replaced by the strain gauge simulator for checking amplifiers or indicators.**

**Options**

**Higher measurement ranges on request.**

**Manufacturers Calibration Certificate (WKS)**

Calibration of a torque sensor with or without amplifier / indicator (measurement chain) in clockwise or / and counter clockwise direction in increments of 20 % of the measurement range.