

OPERATION MANUAL

Torque Sensor Models 8627, 8628, 8632

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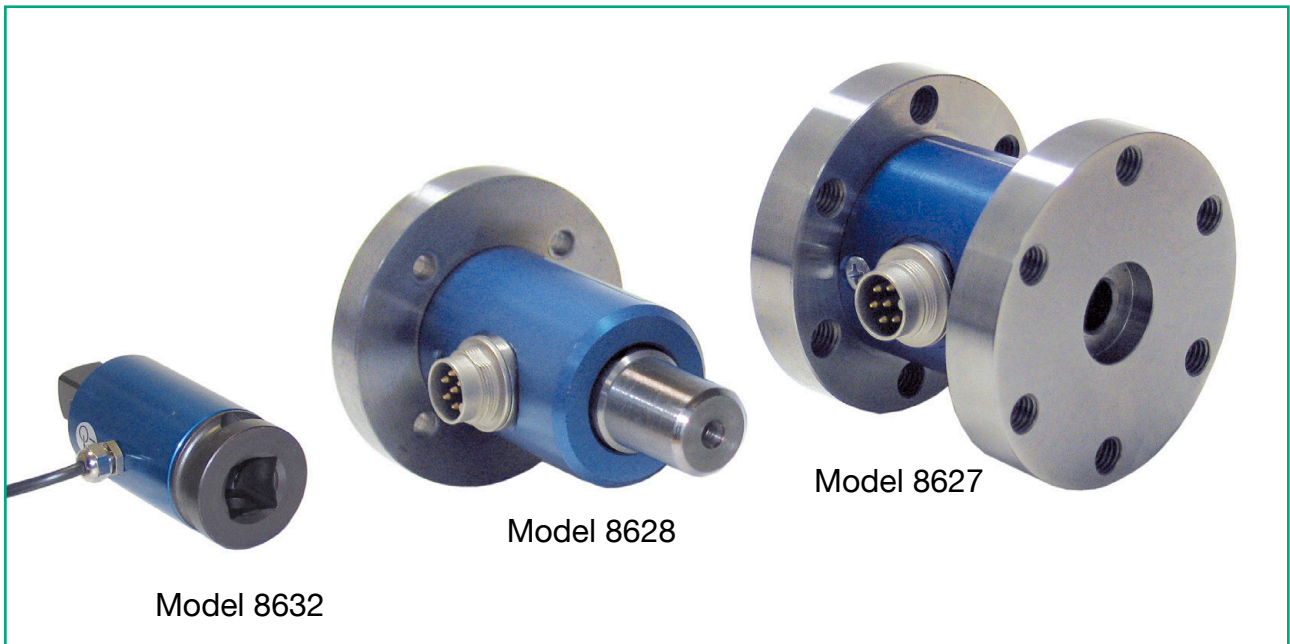
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Torque Sensors



References in this text

1.6 Warning notes; Page 8



Attention must be paid to the accident prevention regulations of the trade associations.

During operation the safety precautions must be serviceable.

4. Mechanical assembly; Page 11



Caution: During the assembly inadmissibly large forces may not act on the sensor or the coupling. At small torques (< 20 Nm) connect the sensor electrically during the assembly and observe the signal, the measurement signal may not exceed the limit values.



During the assembly, the sensor must be supported to protect it from falling down.



Caution at permutation of drive side and measuring side.

4.1 Sensors up to 15 Nm; Page 11



Sensor with nominal torques up to 15 Nm are very sensitive regarding overload; therefore treat the sensors with great caution.

6.1 Engaging; Page 15



The warm-up period of the torque sensor is approx. 5 min.

6.4.2 Natural resonance; Page 16



Operation of the device in natural resonance can lead to permanent damages.

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1. Read First

1.1 Safety and Caution Symbols



Caution:

Injury risk for Persons.

Damage of the device is possible.



Note:

Important points to be considered.

1.2 Intended Use

Torque sensor are intended for the measurement of torques. This measured is further suitable for control tasks. The valid safety regulations should be absolutely respected. The torque sensors are not safety components in the sense of the intended use. The sensors need to be transported and stored appropriately. The assembly, commissioning and disassembly must take place professionally.

1.3 Dangers

The torque sensor is fail-safe and corresponding to the state of technology.

1.3.1 Neglecting of Safety Notes

At inappropriate use, remaining dangers can emerge (e.g. by untrained personnel). The operation manual must be read and understood by each person entrusted with the assembly, maintenance, repair, operation and disassembly of the torque sensor.

1.3.2 Remaining Dangers

The plant designer, the supplier, as well as the operation must plan, realize and take responsibility for safety-related interests for the sensor. Remaining dangers must be minimized. Remaining dangers of the torque measurement technique must be pointed out.

1.4 Reconstructions and Modifications

Each modification of the sensors without our written approval excludes liability on our part.

1.5 Personnel

The installation, assembly, commissioning, operation and the disassembly must be carried out by qualified only. The personnel must have the knowledge and make use of the legal regulations and safety instructions.

1.6 Warning Notes



Attention must be paid to the accident prevention regulations of the trade associations.

During operation the safety precautions must be serviceable.

2. Term Definitions

2.1 Terms

Measuring side:

Shaft connection in which the torque to be measured is applied. Usually this side has the smallest moment of inertia.

Dive side:

The shaft end on the opposite side of the measuring side with the larger moment of inertia. A static torque sensors the housing is fastened on this side.

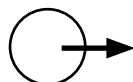
Low torque resistance side:

The shaft of the arrangement (drive, load) which can be turned considerably smaller with torque than the nominal torque sensor $M \ll M_{\text{nom}}$.

2.2 Definition of the Pictogram on the Torque Sensors

The measuring side of the torque sensor is designated as follows:

Measuring side: **M** or **M**



More information can be found on the data sheet if needed.

3. Product Description

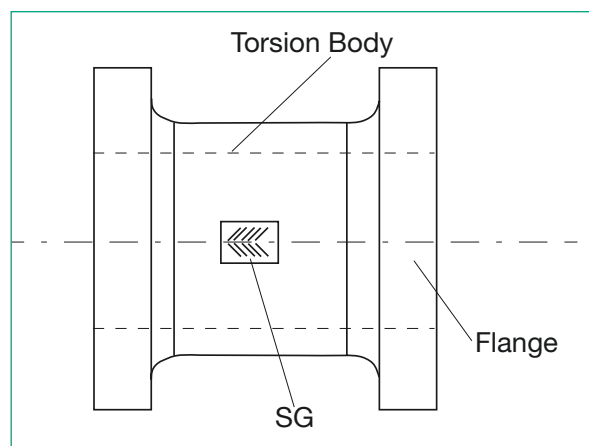
The sensor measures static and dynamic torques. The mounting position of the torque sensor is horizontally or vertically.

Caution: It is to be differentiated between measuring side and drive side, see data sheet of the sensor on the burster website.

3.1 Mechanical Setup

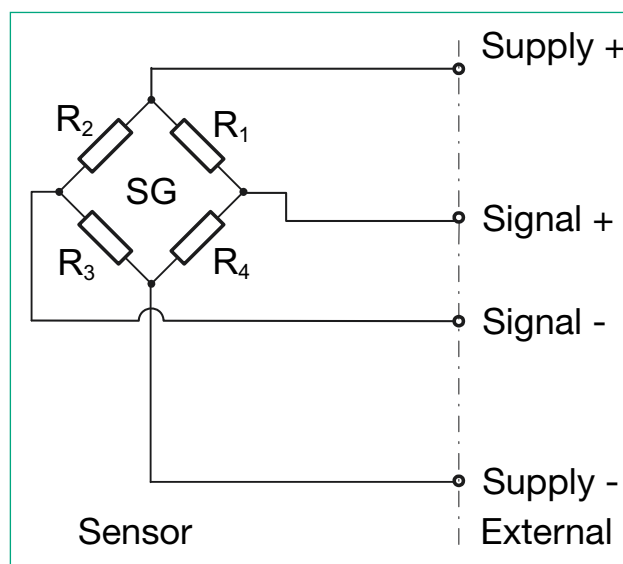
The sensor do not contain rotary parts.

They consist of a torsion body with different connection possibilities (flanges, shaft, square, hexagonal etc.). The torsion body, applied with strain gauges, is protected by a housing. A plug or a cable connection is fixed at the housing.



3.2 Electrical Setup

The strain gauge full bridge is directly connected at the plug or at the cable.



Basic sketch of the strain gauge full bridge

4. Mechanical Assembly



Caution: During the assembly inadmissibly large forces may not act on the sensor or the couplings. At small torque (< 20 Nm) connect the sensor electrically during the assembly and observe the signal, the measurement signal may not exceed the limit values.

During the assembly the sensor must be supported to protect it from falling down.

It is to be differentiated between measuring side and drive side of the sensor. The housing is fixed at the drive side or of the sensor.



Caution at permutation of drive side and measuring side.

- ▶ The cable connection can influence the torque measurement.
- ▶ At dynamic measurements, the measured value can be influenced by the inert masses of the housing.

Measuring side - see corresponding data sheet.

4.1 Sensors up to 15 Nm



Sensors with nominal torques up to 15 Nm are very sensitive regarding overload; therefore treat the sensor with great caution.

1. Connect the sensor electrically during the assembly and watch the signal; the measuring signal may not exceed the limit values.
2. Align the arrangement before the parts are firmly connected.
3. Mount the sensor at the **low torque resistance side** first, then at the stationary side. (This avoids impermissibly large torques from acting on the sensor.)
4. Counter-hold by hand, so that impermissibly large torques or disturbance variables can not act on the torque sensor.

4.2 Flange Connection

Before the assembly, flanges must be cleaned with dissolver (e.g. acetone), no foreign particles may adhere to them. The surface of the flange must indicate a evenness of at least 0.02 mm.

Tighten screw consistently. The flange may not slip while torque is applied (surface pressure), if necessary use fitting bolts.

4.3 Shaft Connection

The shaft must be cleaned with dissolver (e.G. acetone) before the assambly, no foreign particles may adhere to them.

The hub must fit corresponding to the connection.

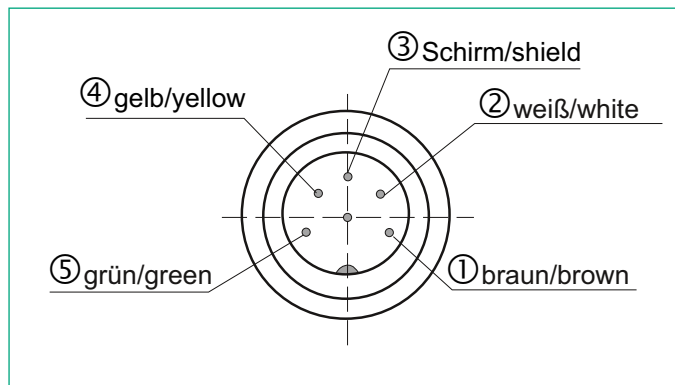
4.4 Inside Square and Outside Square

The inside and outside square must be cleaned before the assembly. No foreign particles may adhere to them.

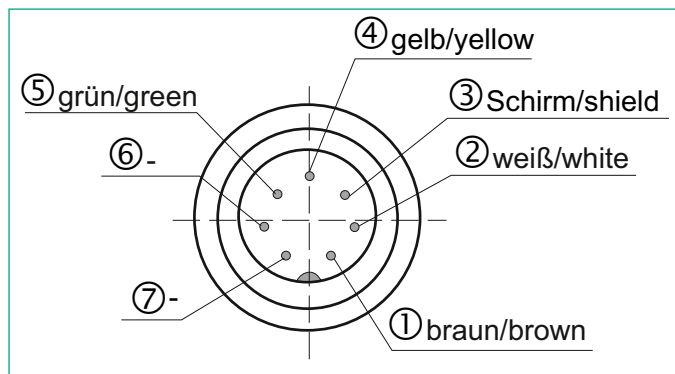
5. Electrical Connection

5.1 Pin Connection (model 8627, 8628)

6 pin	Function
1	SG excitation -
2	SG excitation +
3	Shield
4	SG signal +
5	SG signal -
6	-



7 pin	Function
1	SG excitation -
2	SG excitation +
3	Shield
4	SG signal +
5	SG signal -
6	-
7	-



View: Socket on soldering side

5.2 Free Cable Ends (model 8632)

Wire	Function
brown	SG excitation -
white	SG excitation +
yellow	SG signal +
green	SG signal -
netting	Shield

5.3 Cable

Only use a shielded cable with preferably small capacity. We recommend measuring cables from our product range. They have been tested in combination with our sensors and meet the metrological requirements.

5.4 Shielding Connection

In combination with the sensor and the external electronics, the shield forms a Faraday Cage. By this, electro-magnetic disturbances do not have any influence on the measurement signal.

At potential difference problem we recommend to ground the sensor.

5.5 Extension Cable

Caution: Depending on bridge resistance and wire cross section, the measuring cable length enters into the characteristic value of the sensor. Therefore order the sensor together with the extension cable and the calibration at burster praezisionsmesstechnik gmbh & co kg.

Dependence of the characteristic value on the cable length:

Wire-cross section	Cable resistance per m	Deviation per m cable length at bridge resistance 350 Ω	Deviation per m cable length at bridge resistance 700 Ω	Deviation per m cable length at bridge resistance 1000 Ω
0.14 mm ²	0.28 Ω	0.08 %	0.04 %	0.028 %
0.25 mm ²	0.16 Ω	0.046 %	0.023 %	0.016 %
0.34 mm ²	0.12 Ω	0.034 %	0.017 %	0.012 %

Cable resistance = 2 x resistance of the cable length (both feed lines of the sensor). The sensor with the ordered cable length are calibrated at burster praezisionsmesstechnik gmbh & co kg. Therefore the cable length does not need to be considered in this case.

5.6 Running of Measuring Cables

Do not run measuring cables together with control or heavy-current cables. Always assure that large distance is kept to engines, transformers and contractors, because their stray fields can lead to interferences of the measuring signals. If troubles occur through the measuring cable, we recommend to run the cable in a grounded steel conduit.

6. Measuring

6.1 Engaging

The warming-up period of the torque sensor is approx. 5 min. Afterwards the measurement can be started.



The warming-up period of the torque sensor is approx. 5 min.

6.2 Direction of Torque

Torque mains clockwise or clockwise torque if the torque acts clockwise when facing the shaft end. In this case a positive electrical signal is obtained at the output. Torque sensors by burster praezisionsmesstechnik gmbh & co kg can measure both, clockwise and counter-clockwise direction.

6.3 Static / Quasi-Static Torques

Static and/or quasi-static torque is a slowly changing torque. The calibration of the sensor occurs statically on a calibration device. The applied torque may accept any value up to the nominal torque.

6.4 Dynamic Torques

6.4.1 General

The static calibration procedure of torque sensors is also valid for dynamic applications.

Note:

The frequency of torques must be smaller than the natural frequency of the mechanical measurement setup.

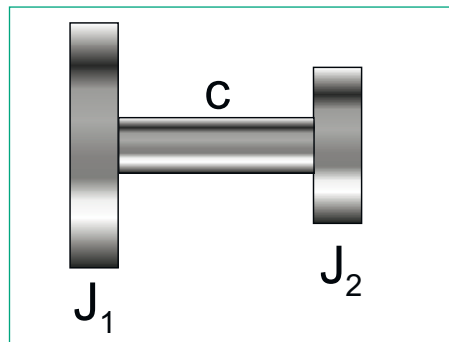
The band width must be limited to 70 % of the nominal torque.

6.4.2 Natural Resonances

Estimate of the mechanical natural frequencies:

$$f_0 = \frac{1}{2 \cdot \pi} \cdot \sqrt{c \cdot \left(\frac{1}{J_1} + \frac{1}{J_2} \right)}$$

f_0 = Natural frequency in Hz
 J_1, J_2 = Moment of inertia in kg*m²
 c = Torsional rigidity in Nm/rad



Further methods for the calculation of natural resonances are corresponding purchasable programs or books /e.g. Holzer-Procedure, Dubbel, Taschenbuch für den Maschinenbau, Springer Verlag).



Operation of the device in natural resonance can lead to permanent damages.

6.5 Disturbance Variables

By disturbances, measured value falsifications can occur by

- ▶ vibrations,
- ▶ temperature gradients in the torque sensors,
- ▶ temperature changes,
- ▶ electrical disturbances,
- ▶ magnetic disturbances,
- ▶ EMC (electromagnetic disturbances),

therefore avoid these disturbance variables by decoupling of vibrations, covers, etc.

7. Maintenance

7.1 Maintenance Schedule

Action	Frequency	Date	Date	Date
Control of cables and connectors	1 x p.a.			
Calibration	< 26 months			
Control of fixation (flanges, shafts)	1 x p.a.			

7.2 Trouble Shooting

Problem	Possible Cause	Trouble Shooting
No signal	No sensor excitation	<ul style="list-style-type: none"> ▶ Outside of permissible range ▶ Connect excitation ▶ Cable defect ▶ No mains supply
	Signal output connected wrong	<ul style="list-style-type: none"> ▶ Connect output correctly ▶ Evaluation electronics defect
Sensor does not react to torque	Shaft not clamping	▶ Clamp correctly
	No power supply	<ul style="list-style-type: none"> ▶ Outside of permissible range ▶ Connect supply ▶ Cable defect ▶ No mains supply
	Cable defect	▶ Repair cable
	Connector connected wrong	▶ Connect correctly
Signal has dropouts	Cable defect	▶ Repair cable
Zero point outside of tolerance	Cable defect	▶ Repair cable
	Shaft mounted distorted	▶ Mount correctly
	Distorted shaft string	▶ Release from distortion
	Strong lateral forces	▶ Reduce lateral forces
	Shaft overloaded	▶ Send to manufacturer
Wrong torque indication	Calibration not correct	▶ Re calibrate
	Sensor defect	▶ Repair by manufacturer
	Torque shunt	▶ Eliminate shunt

8. Decommission

- ▶ All sensors must be dismantled professionally.
- ▶ Do not strike sensor housing with tools.
- ▶ Do not apply bending moments on the sensor, e.g. through levers.
- ▶ The torque sensor must be supported to avoid falling down during the dismantling.

9. Transportation and Storage

The transportation of the sensor must occur in suitable packing. For smaller sensors, stable cartons which are well padded are sufficient (e.g. air cushion film, epoxy crisps, paper shaving). The sensor should be tidily packed into film. Larger sensor should be packed in cases.

9.1 Transportation

Only release well packed sensors for transportation. The sensor should not be able to move back and forth in the packing. The sensors must be protected from moisture.

Only use suitable means of transportation.

9.2 Storage

The storage of the sensors must occur in dry, dust-free rooms, only. Slightly lubricate shafts and flanges with oil before storing (rust).

10. Disposal

Please fulfill your legal obligations and dispose of unserviceable equipment in accordance with applicable legal requirements. Thus you contribute to environmental protection.

11. Calibration

At the time of delivery, torque sensors have been adjusted and tested with traceable calibrated measuring equipment at factory side. Optionally, a calibration of the sensors can be carried out.

11.1 Proprietary Calibration

Acquisition of measurement points and issuing of a calibration protocol traceable calibrated measuring equipment is being used for the calibration. The sensor data are being checked during this calibration.

11.2 DKD/DAkkS Calibration

The calibration of the sensor is carried out according to the guidelines of the DKD/DAkkS. The surveillance of the calibrating-laboratory takes place by the DKD/DAkkS. At this calibration, the uncertainty of measurement of the torque sensors is determined. Further information can be obtained burster praezisionsmessgeräte gmbh & co kg.

11.3 RE-Calibration

The re-calibration of the torque sensor should be carried out after 26 months. at the latest.

Shorter intervals are appropriate:

- ▶ overload of the sensor,
- ▶ after repair,
- ▶ after inappropriate handling,
- ▶ demand of high-quality standards,
- ▶ special traceability requirements.

12. Technical Data

12.1 General Technical Data

Electrical values

Resistor bridge (full bridge):
foil strain gauge 350 Ω, nominal*

* Deviation from the indicated values are possible.

Excitation voltage: 2 ... 12 V,
recommended 10 V

Nominal value: standard, 1 mV/V
model 8627-5010: 0.5 mV/V

Environmental conditions

Operating temperature range:
- 15 °C ... + 55 °C

Nominal temperature of operating range:
- 5 °C ... + 45 °C

Sensitivity of temperature effects:
at zero ± 0.01 % F.S./K
on span ± 0.003 % Rdg./K

Mechanical values

Non-linearity:
model 8627 ± 0.1 % F.S.
models 8628/8632 ± 0.2 % F.S.

Hysteresis:
model 8627 ± 0.1 % F.S.
models 8628/8632 ± 0.2 % F.S.

Repeatability: ± 0.1 % F.S.

Utility moment: 130 % of nominal value

Max. utility moment (static):
150 % of nominal value

Overload moment (static):
> 300 % of nominal value

Dynamic load:
recommended ≤ 70 % of nominal value

Twist angle by nominal load: approx. 0.2°

Material: steel, 1.2826 res. 1.2738

Degree of protection: acc. EN 60529 IP50

Pins assignment: see chapter 5.

12.2 Technical Data Model 8627

Mechanical connection: both ends with flag

Electrical connection:
6 pins plug connection

Mating connector (cable coupling):

6 pole model 9953
(one included in scope of delivery)

12.3 Technical Data Model 8628

Mechanical connection: one end with flag,
and one end with keyway shaft end
acc. DIN 6885, page 1
(keyway included in scope of delivery)

Electrical connection:
6pins plug connection
Mating connector (cable coupling):
6 pole model 9953
(on included in scope of delivery)

12.4 Technical Data Model 8632

Mechanical connection:
external square and square drive acc.
DIN 3121 e.g. for the linkage to screw-
driver tools

Electrical connection:
shield PVC cable, 3 m
PVC cable is not suitable for too many
bending cycles trailing capable upon re-
quest

13. Literature

Dubbel, Taschenbuch für den Maschinenbau, Springer Verlag.