Operating Instructions

Torque Transducer

for screw fastening applications

Important Advice:

The torque transducers for screw fastening applications can be used as machine elements (e.g. for controlling, checking and supervising of torque-controlled tools).

Torque transducers type DRFS have adapters for machine-driven screwing tools.
On using manual screwing tools the hexagonal adapter can be broken

The torque transducer is not designed with the usual safety factor (2...20), favouring high sensitivity instead.

Pay attention to the overload limit.

You have to protect users from danger of being hurt (metal cover etc.)

The torque transducer is not designed for explosion endangered areas.

Warranty is void if opened or disassembled.

The transducer must only be opened by authorized personnel.

1. Introduction

The torque transducers have different adapters according to measurement range.
Torque transducers' measurement unit is Nm respectively kNm.

2. Application

Torque transducers are able to measure clockwise as well as counter clockwise torque. With clockwise torque the output signal is positive. The type label indicates the range of the transducer.

The torque transducers measure static torque as precise as dynamic torque. Yet you have to pay attention to the transducer's signal rise time. It is indicated in the Data sheet.

The torque transducers are maintenance-free.

Handle the torque transducer with care, especially when transporting or mounting. Because it can be damaged by hard shocks or by dropping to ground. Even a short peak torque above the allowed overload capacity can damage the measurement shaft. If you cannot rule out appearing peaks you will have to use a transducer with the next higher measurement range.

The absolute maximum ratings regarding mechanical, thermal and electric parameters are listed in the data sheet and must be met absolutely. Please consider these ratings in design, mounting and operating.

3. Technical Details

3.1 Torque Shaft

The shaft is made of hardened steel and it is fixed in the housing with two ball bearings.
To measure the torque it causes a proportional torsion of the shaft (within the elastic range) and this is measured with applied strain gages. The strain gages are connected as a wheatstone bridge.
The power transmission happens on square or hexagonal drives. Additional angle measurement is optionally available. (See the data sheet.)

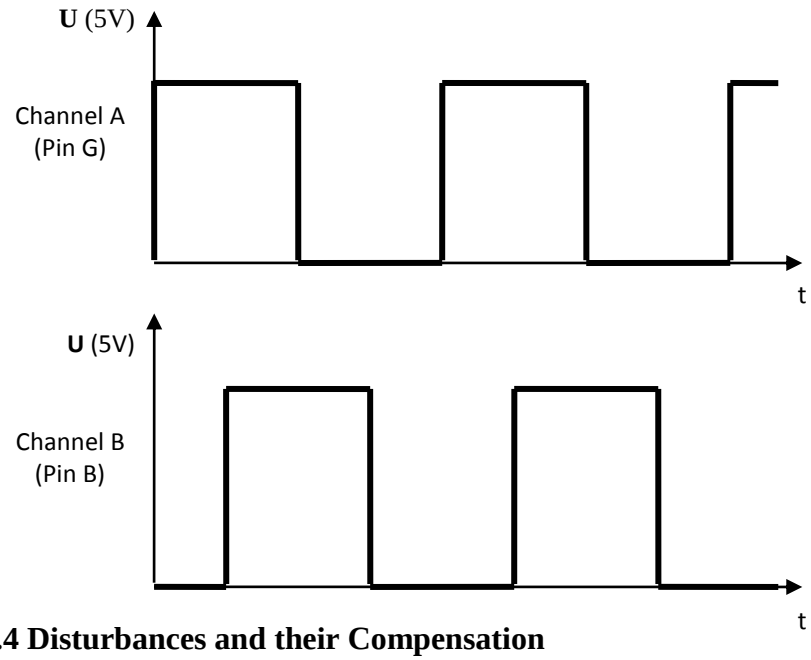
3.2 Housing

The housing of the torque transducer is made of aluminum with a special surface.

3.3 Measurement

The torque causes the torsion of the shaft and the expansion of the strain gages. The resistance of the strain gages changes proportional to the change of their length. And this is converted into an electrical signal that causes a frequency modulation. This modulated signal is transmitted optically to an electronic circuit in the casing. There it is converted back to a proportional analog output voltage. This output voltage has a separate ground that is electrically separated from the transducer's supply.

For angle measurement the pulses of a code wheel are encoded to a square wave signal. With option angle measurement two square wave signals are provided with an output of 360 pulses per revolution. While clockwise rotation the signal of channel A is leading on 90 degrees ahead of channel B.



3.4 Disturbances and their Compensation

Avoid bending, axial and radial forces.
To connect the transducer to a measurement unit you need a shielded cable.

The transducers are EMC-tested and are complying with EN 55011/03.91 (DIN VDE 0875-11/07.92) respective prEN 50082-2/1993 (E DIN EN 50082-2/03.94).

4. Operating conditions

4.1 Environment Temperature

For best accuracy you have to meet the environment temperature specification. The temperature should be constant or slowly changing. The specified temperature errors apply only for changes less than 5 K/h. Radiation heat or cooling on one side has to be avoided or appropriate precautions have to be taken.

4.2 Humidity and Dust

The torque transducers comply with IP40 according to DIN 40050

Advice: Don't let humidity seep into the transducer's connector!

4.3 Chemically Resistance

The torque transducers are not resistant against chemicals. They may not be used in aggressive surroundings.

4.4 Deposition

Dust, dirt and other particles mustn't accumulate so that they can get into the ball bearings and the connector.

5. Mounting

5.1 Precautions at Assembly

* If necessary prevent the housing against being turned around

* Handle the transducer carefully

* Watch out for a properly fixation of the adapters.

* With fast running tools and if people could be hurt by loosening parts prefer using adapters Form F according DIN 3121.

5.2 General Mounting Instructions

Bending, axial and radial forces are disturbing quantities and will cause measurement faults.

6. Measuring Chain

For measuring with the transducer, a whole measuring chain is necessary.

* torque transducer
* Measuring cable
* Supply and display unit
* Printer (if needed)

You need a supply and display unit to supply the transducer with power and to display the measured torque.

7. Connection

7.1 Hints for Connection

Electric and magnetic fields cause interference with the measuring signal. These interference are mainly caused by power cords, relays or motors installed nearby. Besides these, interference can be caused by multiple grounding of the measurement chain on more than one point.

Pay attention to the following:

* Use only shielded cables with low capacitance (like our measuring cables).
* Connect supply voltage correctly (no reverse polarity protection).
* Measuring cables shouldn't be nearby to high voltage or control cables.
* Magnetic radiation from transformers, motors or relays must be avoided.
* Don't ground transducer and display unit multiple. Connect all devices of the measurement chain to the same ground.

7.2 Connectors

The transducer is equipped with a 12 pin fitted connector.
Optional a 6 pin or a 7 pin is available (only for transducers without angle detection).

7.3 Pin Configuration of the Connector

The pin configuration of the connector can be found in the according document.
The measurement signal is internally separated. The ground connections may not be bridged at the transducer, this would cause measurement faults. If necessary bridge at supply-source.
The "calibration in" is used for testing the transducer, that will give its maximum signal (+ 5V), test voltage can be from 4,5V to supply voltage, ground is the output ground.

7.4 Prolongation of Cable

Prolongation cables have to be shielded and of low capacity. We recommend the use of our cables.

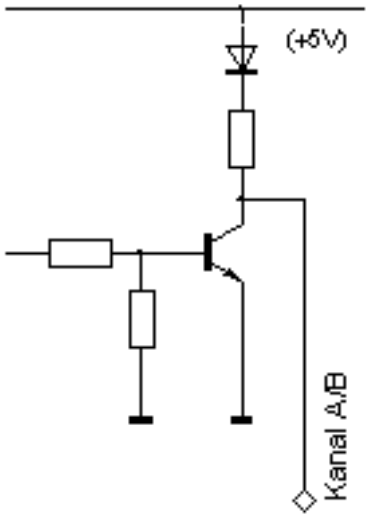
Good electrical connection of the prolongation cables is essential. It is important to use a cable with sufficient diameter so that the voltage drop on the supply lines isn't too high.

7.5 Supply Voltage

Regard to the correct polarity. The rise time of the supply voltage should be less than 1 ms to assure that the DC-DC-transformer will work.

8. Output

The transducer's output voltage is proportional to torque and ± 5V for maximum torque.
With clockwise torque the output is positive; with counter clockwise torque the output voltage is negative.
The outputs for angle measurement have an open collector stage, with an internal 10 KΩ pull up resistor in series with a diode. See schematic below.



Angle and speed measurement at high rotation speeds:

(Transducers with 360 pulses per rotation)

Remarks: Beware of the maximum speed of your transducer type, listed in the data sheet!

With GMV2:

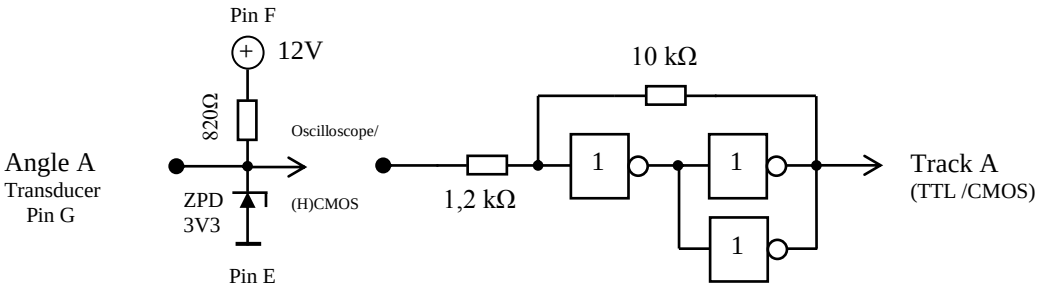
Cable length:	Maximum speed:
2.5 m / 8 ft	10.000 RPM
5 m / 41 ft	10.000 RPM
10 m / 33 ft	6000 RPM

With external measurement unit:

Maximum speed in RPM:

Cable length	*R pull up (to 5V ... 12V)*	
	10 kΩ	1,2 kΩ
2,5 m / 8 ft	4000	15.000
5 m / 41 ft	2000	12.000
10 m / 33 ft	1000	10.000

With this circuit you can measure speed of **more than 15,000 RPM** and with a cable of **up to 33 ft**.
The signal level of the circuit on the left hand side is suitable for opto couplers, frequency counters, oscilloscopes and for (H)CMOS logic. If you need standard TTL levels you can add the circuit on the right hand side.



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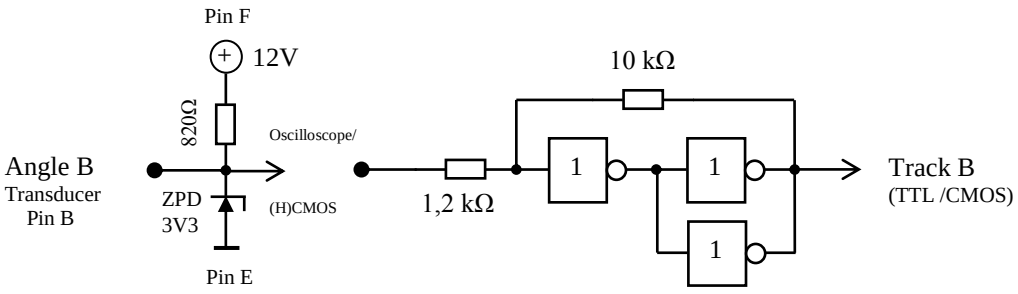

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Pin Configuration

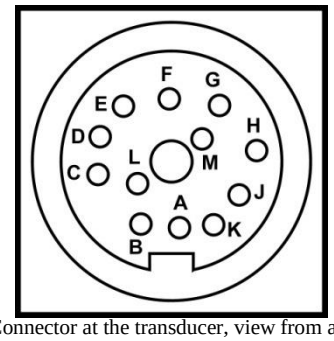
Torque transducer without special option

Model DRF(N; S; SK)-A

Pin	Connection	Colour (ETH measurement cable with flying leads) Type AK12.2F	Type AK12.2DF(double shielded)
A	NA	Black	Brown
B	NA	Red	Brown/Green
C	Torque	Brown	Yellow
D	Torque GND	White	White
E	Supply GND	Yellow	Black
F	Supply	Violet	Red
G	NA	Green	White/Green
H	NA	Pink	Pink
J	NA	Grey	Blue
K	Input to get Calibration Signal	Grey/Pink	Grey
L	NA	Blue/Red	Green
M	NA	Blue	Violet

Supply Voltage: 12V

Output Signal: ±5V



(Connector at the transducer, view from above)

PIN D (torque GND) and PIN E (supply and speed GND) are internally separated. If necessary bridge at supply source (not at the transducer!).

Between Pin E and K; between Pin E and F as well as between Pin C and D there is a high frequency bypass capacitor connected (100nF/50V). We recommend carrying out this EMI protection at the supply source as well.

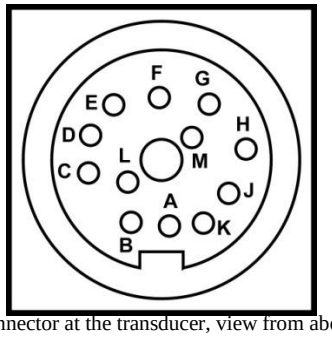
Pin Configuration

Torque transducer with **angle sensing**

Model DRF(N; S; SK)-w

Pin	Connection	Colour (ETH measurement cable with flying leads) Type AK12.2F	Type AK12.2DF(double shielded)
A	NA	Black	Brown
B	Angle Track A=0°	Red	Brown/Green
C	Torque	Brown	Yellow
D	Torque GND	White	White
E	Supply GND and Angle GND	Yellow	Black
F	Supply	Violet	Red
G	Angle Track B=90°	Green	White/Green
H	NA	Pink	Pink
J	NA	Grey	Blue
K	Input to get Calibration Signal	Grey/Pink	Grey
L	NA	Blue/Red	Green
M	NA	Blue	Violet

Supply Voltage:	12V
Output Signal:	±5V
Type of Angle Output:	Open Collector
Internal Pull Up:	10kΩ (to 5V)
External Pull Up:	Max. 24V; Max. Current: 20 mA



(Connector at the transducer, view from above)

PIN D (torque GND) and PIN E (supply and angle GND) are internally separated. If necessary bridge at supply source (not at transducer!).

Between Pin E and K; between Pin E and F as well as between Pin C and D there is a high frequency bypass capacitor connected (100nF/50V). We recommend carrying out this EMI protection at the supply source as well.