

# DC/DC Torque Sensor

## For very high rotary speeds

### Model 8652

Code:	8652 EN
Delivery:	approx. 4 weeks
Warranty:	24 months

CAD data 2D/3D for this sensor:  
Download directly at [www.traceparts.com](http://www.traceparts.com)  
Info: refer to data sheet 80-CAD-EN



**New** **Option**  
Sensor with 2 measurement ranges

- Measuring ranges between 0 ... 0.2 Nm and 0 ... 5000 Nm
- High linearity of 0.1% F.S.
- Rotation speed up to 50 000 min<sup>-1</sup>
- Integrated overload protection up to measuring range of 0 ... 1 Nm
- Integrated measurement amplifier
- Measurement of rotary speed
- Options:  
2 measuring ranges 1 : 5 or 1 : 10  
Linearity 0.05% F.S., output 0 ... ± 10 V,  
angular displacement measurement

#### Application

The maintenance-free model 8652 torque sensor is used to measure constant and changing torques in both directions of rotation. The range from stationary up to continuous operation at high speeds of rotation is permitted.

With the option of the two, switchable measuring ranges, it is possible to use a single sensor to measure even an unusually large range of torques with high accuracy. This saves refitting time; only one pair of couplings is needed, and the smaller measuring range has a high level of overload protection. The rotation speed pulses generated by the sensor also permit a direct determination of power.

Typical applications include:

- ▶ Test beds for engines, turbines and gearboxes, extruders
- ▶ Machine building
- ▶ Drive equipment
- ▶ Aerospace engineering
- ▶ Automotive
- ▶ Product development
- ▶ Quality assurance

#### Description

The full bridge, consisting of four active wire strain gauges attached to the measuring shaft, converts the mechanical magnitude, torque, which causes a relative rotation between the two shaft ends, into a proportional electrical signal. Measuring electronics are integrated into the shaft. This digitizes the measured value at a high sampling rate and transmits it without contact to the stator. There it is again converted into an analog voltage and normalized. For the nominal torque of ± M<sub>N</sub> the sensor delivers ± 5 V (± 10 V, see option).

TTL pulses are generated in order to measure the speed of rotation (standard) and the angular displacement (as an alternative to the rotation speed, see option). The power required by the measuring shaft is transmitted inductively, i.e. once again without contact.

A control input can be used to check the function of the transmission of the torque signal. An analog voltage of either 0 V or + 5 V is present at the unloaded analog output of the sensor, depending on the level of the control signal.

**Technical Data**

**Model 8652, standard rotary speed**

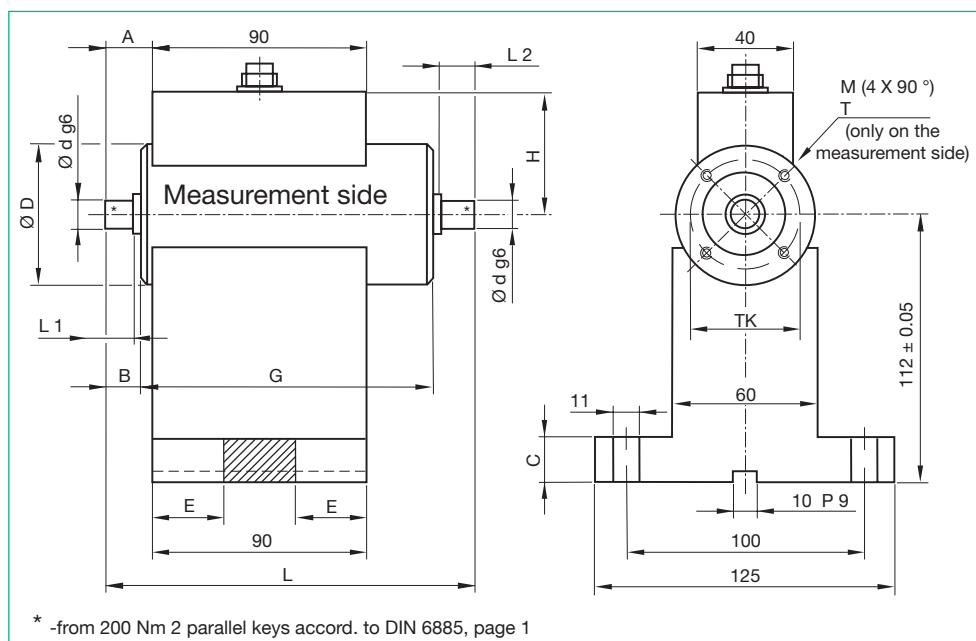
Order Code	Measurement Range	Rotary Speed [min <sup>-1</sup> ]	Dimensions [mm]													Depth of Thread	Mass [kg]	
			L	L1	L2	øD	ød g6	A	B	C	E	G	H	TK	M			T
8652-4200	0 ... ± 0.2 Nm	20 000	160.5	16	16	58	9	23.5	19	18	30	122	51	46	M5	10	0.8	
8652-4500	0 ... ± 0.5 Nm	20 000	160.5	16	16	58	9	23.5	19	18	30	122	51	46	M5	10	0.8	
8652-5001	0 ... ± 1.0 Nm	20 000	159	16	16	58	9	22	17.5	18	30	122	51	46	M5	10	0.8	
8652-5002	0 ... ± 2 Nm	20 000	163	18	18	58	10	24	19.5	18	30	122	51	46	M5	10	1.4	
8652-5005	0 ... ± 5 Nm	20 000	163	18	18	58	10	24	19.5	18	30	122	51	46	M5	10	1.4	
8652-5010	0 ... ± 10 Nm	20 000	166	20	20	58	12	25	20.5	18	30	122	51	46	M5	10	1.4	
8652-5020	0 ... ± 20 Nm	20 000	166	20	20	58	12	25	20.5	18	30	122	51	46	M5	10	1.4	
8652-5050	0 ... ± 50 Nm	12 000	180	28	28	78	22	43.5	34	18	30	113	66	64	M6	12	2.0	
8652-5100	0 ... ± 100 Nm	12 000	180	28	28	78	22	43.5	34	18	30	113	66	64	M6	12	2.0	
8652-5200	0 ... ± 200 Nm	8 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.0	
8652-5500	0 ... ± 500 Nm	8 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.0	
8652-6001	0 ... ± 1000 Nm	8 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.0	
8652-6002	0 ... ± 2000 Nm	5 000	418	122	122	148	70								132	M8	16	18.0
8652-6005	0 ... ± 5000 Nm	5 000	418	120	122	148	70								132	M8	16	18.0

**Model 8652, high rotary speed**

Order Code	Measurement Range	Rotary Speed [min <sup>-1</sup> ]	Dimensions [mm]													Depth of thread	Mass [kg]	
			L	L1	L2	øD	ød g6	A	B	C	E	G	H	TK	M			T
8652-4200-V001	0 ... ± 0.2Nm	50 000	160.5	16	16	58	9	23.5	19	18	30	122	51	46	M5	10	0.9	
8652-4500-V001	0 ... ± 0.5Nm	50 000	160.5	16	16	58	9	23.5	19	18	30	122	51	46	M5	10	0.9	
8652-5001-V001	0 ... ± 1.0Nm	50 000	159	16	16	58	9	22	17.5	18	30	122	51	46	M5	10	0.9	
8652-5002-V001	0 ... ± 2Nm	50 000	163	18	18	58	10	24	19.5	18	30	122	51	46	M5	10	1.5	
8652-5005-V001	0 ... ± 5Nm	50 000	163	18	18	58	10	24	19.5	18	30	122	51	46	M5	10	1.5	
8652-5010-V001	0 ... ± 10Nm	50 000	166	20	20	58	12	25	20.5	18	30	122	51	46	M5	10	1.5	
8652-5020-V001	0 ... ± 20Nm	50 000	166	20	20	58	12	25	20.5	18	30	122	51	46	M5	10	1.5	
8652-5050-V001	0 ... ± 50Nm	30 000	180	28	28	78	22	43.5	34	18	30	113	66	64	M6	12	2.1	
8652-5100-V001	0 ... ± 100Nm	30 000	180	28	28	78	22	43.5	34	18	30	113	66	64	M6	12	2.1	
8652-5200-V001	0 ... ± 200Nm	20 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.1	
8652-5500-V001	0 ... ± 500Nm	20 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.1	
8652-6001-V001	0 ... ± 1000Nm	20 000	267	60	61	98	42	83.5	64.5	15	32	137	78	87	M6	12	5.1	
8652-6002-V001	0 ... ± 2000Nm	10 000	418	122	122	148	70								132	M8	16	18.0
8652-6005-V001	0 ... ± 5000Nm	10 000	418	122	122	148	70								132	M8	16	18.0

**Dimensions** (refer to table)

**Sensor with mounting rack** range 0 ... ± 0,2 Nm up to 0 ... ± 100 Nm  
(the mounting rack is NOT in scope of delivery, refer to accessory)



**Installation Instructions**

For measuring ranges < 100 Nm (due to the loading of its own weight) and at higher rotation speeds of 10,000 min<sup>-1</sup> and above (due to resonance effects), the sensor housing should be mounted to the existing mechanical structure. A mounting block and mounting bracket are available for this purpose (see pages 2 and 3).

A fixed mount is helpful if the sensor often has to be removed and refitted.

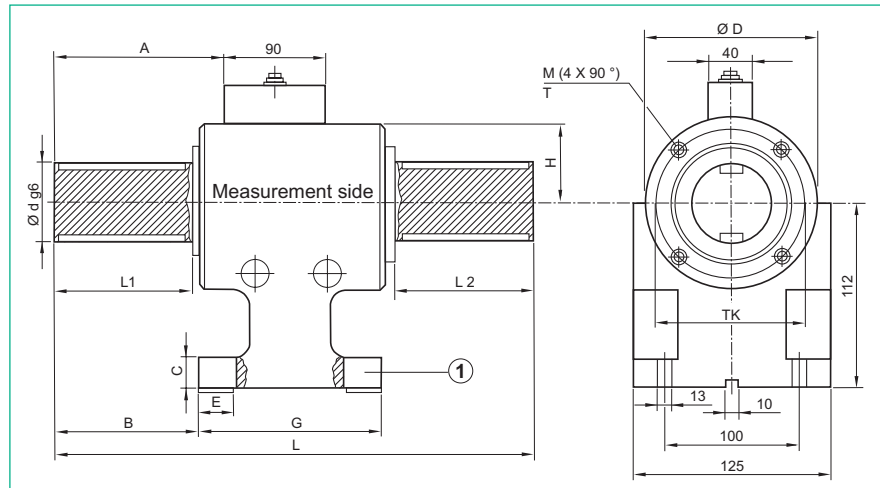
Suitable couplings must be employed to avoid applying unacceptable loads to the sensor as a result of parallel or angular displacement of the shafts. When the sensor is freely mounted, this can be achieved using two half-couplings; for fixed mounting, two extensible, rotationally rigid full couplings should be used.

### Sensor with mounting rack

Measurement ranges

0 ... ± 200 Nm up to 0 ... ± 1000 Nm

(the mounting rack is NOT in scope of delivery, refer to accessory)



### Sensor with mounting angle (1 pair)

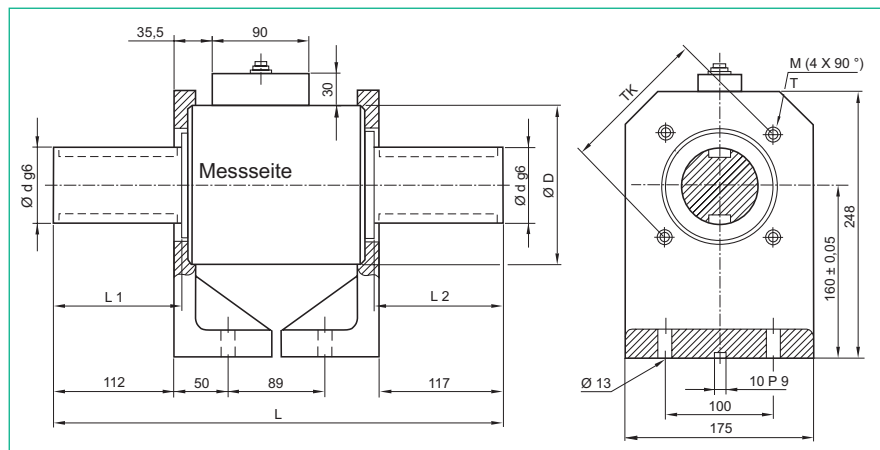
Measurement range

0 ... ± 2000 Nm and 0 ... ± 5000 Nm

(mounting angles are NOT in scope of delivery, refer to accessory)

The CAD drawing (3D/2D) for this sensor can be imported online directly into your CAD system.

Download via [www.burster.com](http://www.burster.com) or directly at [www.traceparts.com](http://www.traceparts.com). For further information about the burster traceparts cooperation refer to data sheet 80-CAD-EN.



### Constants and limits for dynamic loads

Model	Nominal Torque		Rotary Speed	Spring Constant	Measuring Side				Drive Side			
					Inertia	Mass	Max. Lateral Force	Max. Axial Force	Inertia	Mass	Max. Lateral Force	Max. Axial Force
			[min <sup>-1</sup> ]	[Nm/rad]	[kg cm <sup>2</sup> ]	[kg]	[N]	[N]	[kg cm <sup>2</sup> ]	[kg]	[N]	[N]
8652	0 ... ±	0.2 Nm	20 000	10	0.0015	0.07	10	50	0.14	0.25	100	50
	0 ... ±	0.2 Nm	50 000	10	0.0015	0.011	10	50	0.14	0.2	100	50
	0 ... ±	0.5 Nm	20 000	10	0.0015	0.2	25	50	0.14	0.25	150	50
	0 ... ±	0.5 Nm	50 000	10	0.0015	0.034	25	50	0.14	0.2	150	50
	0 ... ±	1.0 Nm	20 000	180	0.0054	0.2	50	50	0.16	0.25	200	50
	0 ... ±	1.0 Nm	50 000	180	0.0054	0.06	50	50	0.16	0.2	200	50
	0 ... ±	2 Nm	20 000	250	0.06	0.2	100	50	0.17	0.25	200	50
	0 ... ±	2 Nm	50 000	250	0.06	0.08	100	50	0.17	0.2	200	50
	0 ... ±	5 Nm	20 000	450	0.06	0.2	200	50	0.17	0.25	200	50
	0 ... ±	5 Nm	50 000	450	0.06	0.1	200	50	0.17	0.2	200	50
	0 ... ±	10 Nm	20 000	520	0.08	0.2	200	50	0.19	0.25	200	50
	0 ... ±	10 Nm	50 000	520	0.08	0.15	200	50	0.19	0.2	200	50
	0 ... ±	20 Nm	20 000	580	0.08	0.2	200	50	0.19	0.25	200	50
	0 ... ±	20 Nm	50 000	580	0.08	0.2	200	50	0.19	0.2	200	50
	0 ... ±	50 Nm	12 000	9 100	0.54	2.2	200	100	1.16	3	400	800
	0 ... ±	50 Nm	30 000	9 100	0.54	0.38	200	100	1.16	2.5	300	100
	0 ... ±	100 Nm	12 000	13 500	0.54	3.0	400	200	1.16	3	800	800
	0 ... ±	100 Nm	30 000	13 500	0.54	0.5	200	100	1.16	3	300	100
	0 ... ±	200 Nm	8 000	60 000	4.0	3.5	400	200	8.3	10	2 000	2 000
	0 ... ±	200 Nm	20 000	60 000	4.0	0.6	400	200	8.3	4	400	200
0 ... ±	500 Nm	8 000	100 000	4.2	7	1 000	500	8.3	10	2 000	2 000	
0 ... ±	500 Nm	20 000	100 000	4.2	1.2	400	200	8.3	4	400	200	
0 ... ±	1 000 Nm	8 000	135 000	4.2	10	2 000	1 000	8.3	10	2 000	2 000	
0 ... ±	1 000 Nm	20 000	135 000	4.2	2.2	400	200	8.3	4	400	200	
0 ... ±	2 000 Nm	5 000	520 000	61.0	40	4 000	2 000	85	40	10 000	10 000	
0 ... ±	2 000 Nm	10 000	520 000	61.0	10	4 000	2 000	85	40	4 000	2 000	
0 ... ±	5 000 Nm	5 000	720 000	61.0	80	10 000	5 000	85	80	10 000	10 000	
0 ... ±	5 000 Nm	10 000	720 000	61.0	25	4 000	2 000	85	80	4 000	2 000	

## Technical Data

### Electrical values

#### Torque measurement

Excitation voltage:	+ 11 V DC ... + 30 V DC
Excitation current:	150 - 200 mA
Output voltage at $\pm$ nominal torque ( $M_N$ ), 1 and 2 measurement ranges:	$\pm 5$ V
Cut-off frequency (-3dB):	1 kHz
Internal resistance (output):	10 $\Omega$ . short-circuit proof to GND
Load resistance:	> 10 k $\Omega$
Test signal at 3.5 V < U $\leq$ 30 V at control input with unloaded sensor:	100 % $\pm$ 0.2 %
Status LED:	green/OK, red/overload

**Rotary speed measurement:** 60 pulses/rotation,  
Open collector output, internal  
1k $\Omega$  pull-up, TTL level, max. rotary  
speed refer to table on page 2

**Angle displacement meas.:** 360 pulses/rotation, indication of  
direction by 2 pulse trains with 90°  
displacement, maximum rotary  
speed is 7000 1/min, refer to options

### Environmental conditions

Operating temperature range:	0 °C ... 70 °C
Nominal temperature range:	10 °C ... 60 °C
Storage temperature range:	-25 °C ... 80 °C
Influence of temperature in operating temperature range:	
1 range sensor	to zero signal: < $\pm$ 0.05 %/10K to characteristic: < $\pm$ 0.1 %/10K
2 range sensor, high range	to zero signal: < $\pm$ 0.05 %/10K to characteristic: < $\pm$ 0.1 %/10K
2 ranges sensor small range	to zero signal: < $\pm$ 0.2 %/10K to characteristic: < $\pm$ 0.2 %/10K

### Mechanical values

Non-linearity including hysteresis at the small range of the 2 range sensor:	from 0 ... 1 Nm,	< $\pm$ 0.1 % F.S. < $\pm$ 0.2 % F.S.
Variation: at the small range of the 2 range sensor:	from 0 ... 1 Nm,	< $\pm$ 0.05 % F.S. < $\pm$ 0.1 % F.S.
Overload:		
Meas. range $\leq$ 0 ... $\pm$ 1 Nm	mech. overload protection up to 3 Nm	
Operation torque:		
Meas. range $\geq$ 0 ... $\pm$ 2 Nm		150 % of nominal torque
Fracture torque:		400 % of nominal torque
Alternating torque:		70 % of nominal torque
Quality of balance:	Q = 6.3 at standard version Q = 2.5 at high rotary speed	
Protection class according to EN 60529:		IP40
Material of housing:		high strength aluminium, anodized
Mechanical connection:		
up to meas. range 0 ... $\pm$ 100 Nm	smooth shaft ends	
from meas. range 0 ... $\pm$ 200 Nm	both shaft ends with 2 keyways according to DIN 6885, page 1	
meas. range 0 ... $\pm$ 200 Nm	up to 0 ... $\pm$ 1000 Nm (12P9x 50/2x180°)	
meas. range 0 ... $\pm$ 2000 Nm and (20P9x110/2x180°)	0 ... $\pm$ 5000 Nm	
(Parallel keys are in scope of delivery)		
Electrical connection:	12 pin plug-in connector, mating connector model 9940,	(in scope of delivery)
in addition, at the 2 range sensor:	7 pin plug-in connector, mating connector model 9952,	(in scope delivery)

## Order Information

- Torque sensor, measurement range 0 ... 100 Nm,  
rotary speed up to 8 000 min<sup>-1</sup> **Model 8652-5100**
- Torque sensor, measurement range 0 ... 100 Nm,  
rotary speed up to 30 000 min<sup>-1</sup> **Model 8652-5100-V001**
- Torque sensor with 2 ranges,  
meas. ranges 0 ... 50 Nm and 0 ... 5 Nm **Model 8652-5050-V402**
- Mounting rack suitable for torque sensor,  
meas. range 0 ... 100 Nm **Model 8652-Z003**

## Accessories

### Mounting rack

Model	Measurement Range	Mass [kg]
8652-Z001	0 ... 0,2 Nm	1.2
	0 ... 0,5 Nm	
	0 ... 1 Nm	
	0 ... 2 Nm	
	0 ... 5 Nm	
	0 ... 10 Nm	
	0 ... 20 Nm	
8652-Z003	0 ... 50 Nm	1.4
	0 ... 100 Nm	
8652-Z004	0 ... 200 Nm	1.5
	0 ... 500 Nm	
	0 ... 1000 Nm	
<b>Mounting angle (1 pair)</b>		
8652-Z005	0 ... 2000 Nm	5.0
	0 ... 5000 Nm	

Dimensions refer to table and drawing on page 2 and 3.

Mating connector (socket), 12 pin  
(1 exemplar is in scope of delivery) **Model 9940**

Mating connector, 7 pin  
(in scope of delivery) **Model 9952**

Connection cable, length 3 m,  
one end open **Model 99540-000B-0270030**

Connection cable suitable to  
burster desktop units, length 3 m **Model 99141-540EA0270030**

Supply units, amplifiers and process control units like process  
indicator 9163 or DIGIFORCE® 9306-V510X  
**refer to section 9 of the catalog.**

## Options

**Angle displacement measurement,**  
(as an alternative to rotary speed measurement)  
2 x 360 pulses/rotation, max 3000 1/min **-V401**

**Sensor with 2 measurement ranges**  
(possible from measurement ranges 0 ... 50 Nm)  
The rotary speed sensor with 2 calibrated ranges has an additional  
7 pin plug-in connector. This connector is used for the opto-decoupled  
switching between ranges.  
0 ... 2 V ► high measurement range  
3.5 V ... 30 V ► small measurement range  
Nominal torques 1:10 (e.g. 0 ... 5 Nm and 0 ... 50 Nm) **-V402**  
Nominal torques 1:5 (e.g. 0 ... 10 Nm and 0 ... 50 Nm) **-V403**

Output voltage 0 ...  $\pm$  10 V **-V404**

higher accuracy from measurement range 0 ... 5 Nm Non-linearity  
and hysteresis  $\pm$  0,05 % F.S.  
(only for sensors with one measurement range) **-V405**

## Manufacturer Calibration Certificate (WKS)

Calibration of a sensor or a measurement chain in 20 % steps of the mea-  
surement range in clockwise and counterclockwise direction. Three se-  
ries upwards for each mounting position and one series downwards.