Torque sensor

Rotating, non-contact transmission of measured value
Integral detection of angle or speed of rotation (option)

Model 8651

Code:	8651E
Manufacturer:	burster
Delivery:	4-5 weeks
Warranty:	24 months
Issue:	1.5.2004

- **Ranges 0 ... ± 0.02 Nm up to 0 ... ± 1000 Nm**
- **Non-linearity up to 0.1 % full-scale**
- **Analogue output signal ± 10 V at rated torque**
- **Maintenance-free operation**
- **Angle or speed measurement (option)**
- **Max. speed 10,000 rpm**
- **Special versions**

8651-E

Application

The slip-ring-free torque sensor for the measurement of torque, angular rotation or speed with integral measuring amplifier is suitable for use in the laboratory and in an industrial environment.

Thanks to the inductive, non-contact transfer of the supply voltage and the optical, non-contact transmission of the measuring signal, the sensor can be used wherever low-wear and maintenance-free operation, high speeds or continuous running are required.

The reliable measurement of constant and variable torques enables it to be used in quality assurance in the test area and in the construction of test rigs and machines as well as in the service area.

Description

The main components of the torque sensor consist of the measuring shaft with applied precision strain gauge, the rotating electronics with secondary coil and optical transmission ring. Power is supplied to the strain gauge bridge without contact by means of a rotary transformer.

A torque applied between the two ends of the shaft produces a mechanical strain, which is measured with the help of a strain gauge bridge circuit. An output signal is obtained from the bridge, which is proportional to the applied torque. This voltage converted into a frequency-modulated signal is transmitted by means of infrared LEDs to the receiver in the stator.

As an option, a conditioned, rectangular output voltage of 5 V can be provided for the direct further processing of the angle or speed of rotation signal by means of the electronics integrated within the sensor.

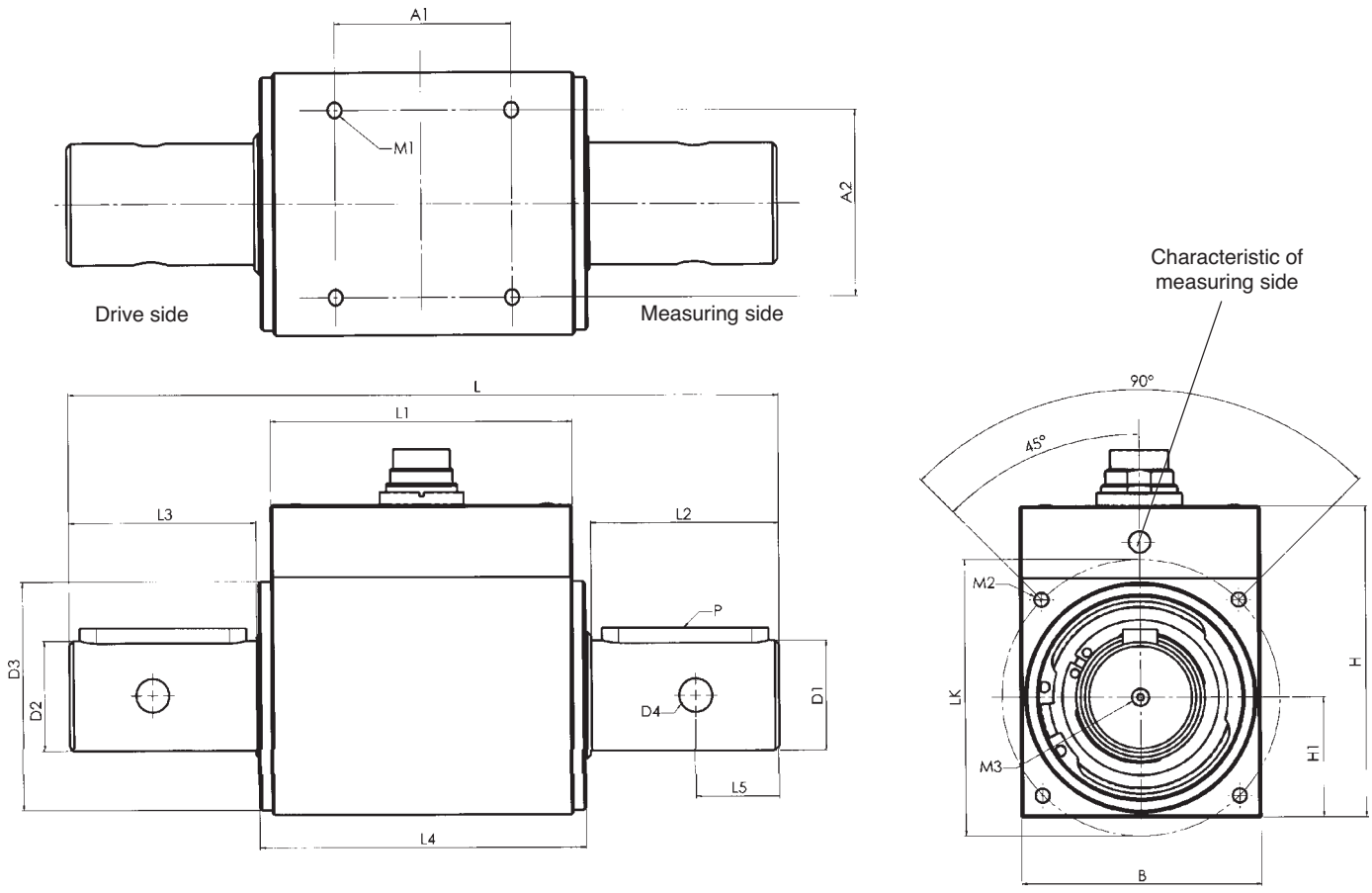
Table 1

Technical Data

Order Code	Measuring range [Nm]	Dimensions [mm] A1	A2	B	D1 g6 ø	D2 g6 ø	D3 -0,1 ø	D4 H7 ø	H	H1	L	L1	L2	L3	L4	L5	LK±0,1 ø	M1	M2	M3	P DIN 6885
8651 - 4020	0 ... ± 0.02	50	24	32	3	3	15	-	47	14	82	63	7.5	7.5	67	-	32.6	M2.5x5 deep		-	
8651 - 4050	0 ... ± 0.05	40	22	28	5	8	27	2	48.5	14	89	62	10	11	66	4	32	M 3 x 5 deep	M 3 x 6 deep	-	-
8651 - 4100	0 ... ± 0.1	40	22	28	5	8	27	2	48.5	14	89	62	10	11	66	4	32				
8651 - 4200	0 ... ± 0.2	40	22	28	5	8	27	2	48.5	14	89	62	10	11	66	4	32				
8651 - 4500	0 ... ± 0.5	40	22	28	5	8	27	2	48.5	14	89	62	10	11	66	4	32				
8651 - 5001	0 ... ± 1	40	22	28	5	8	27	2	48.5	14	89	62	10	11	66	4	32				
8651 - 5002	0 ... ± 2	40	22	28	6	8	27	2,5	48.5	14	95	62	14	14	66	5	32				
8651 - 5005	0 ... ± 5	60	32	42	15	15	38	-	58	21	145	79	30	30	83	-	46	M 3 x 6 deep	M 3 x 6 deep	-	2x A5x5x25
8651 - 5010	0 ... ± 10	60	32	42	15	15	38	-	58	21	145	79	30	30	83	-	46				
8651 - 5020	0 ... ± 20	60	32	42	15	15	38	-	58	21	145	79	30	30	83	-	46				
8651 - 5050	0 ... ± 50	42	40	56	26	26	54	-	73	28	170	72	45	45	78	-	65	M 4 x 8 deep	M 4 x 8 deep	M 8 x 15 deep	2x A8x7x40
8651 - 5100	0 ... ± 100	42	40	56	26	26	54	-	73	28	170	72	45	45	78	-	65				
8651 - 5200	0 ... ± 200	42	40	56	26	26	54	-	73	28	170	72	45	45	78	-	65				
8651 - 5500	0 ... ± 500	46	70	88	45	45	80	-	104	44	270	84	85	85	90	-	98	M 6 x 12 deep	M 6 x 12 deep	M 10 x 20 deep	4x A14x9x80
8651 - 6001	0 ... ± 1000	46	70	88	45	45	80	-	104	44	270	84	85	85	90	-	98				

Deviation of Dimensions acc. DIN 2768-m

Scale Drawing



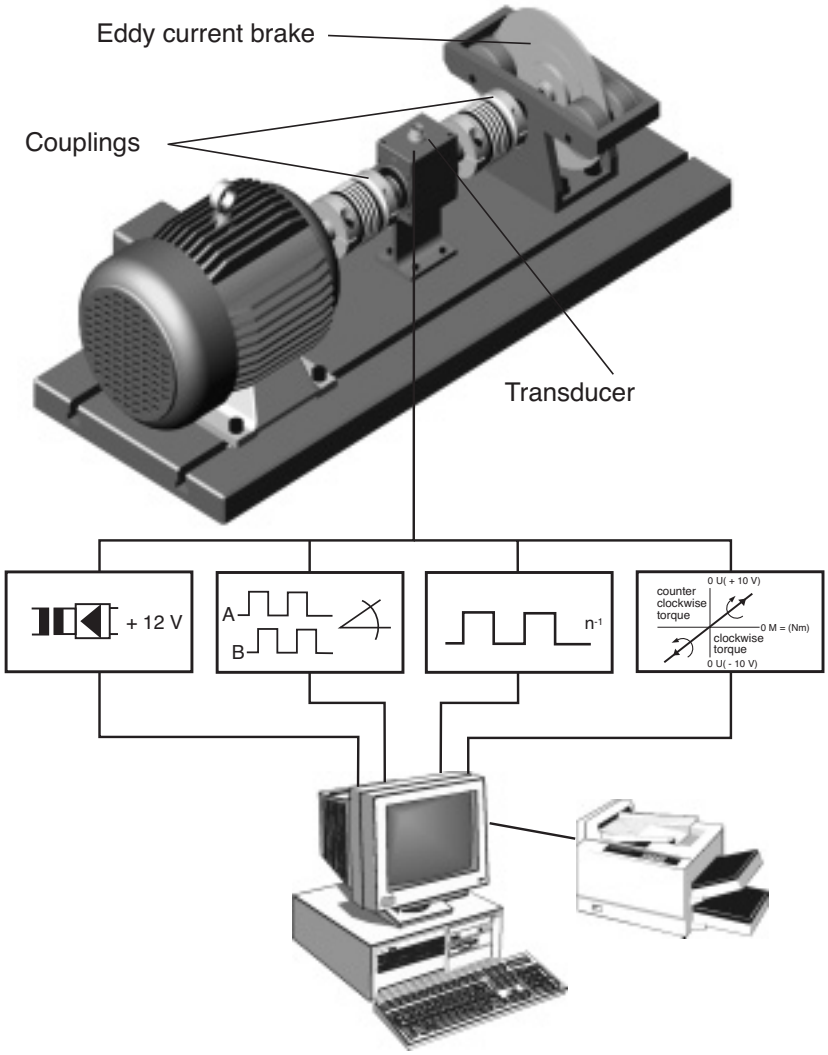
Sensor CAD drawing can be imported in 3D or 2D version from CD-ROM or downloaded from the Internet.
For more information on POWERPARTS by web2CAD please refer to the introduction of product section 8 in the catalog.

Table 2

Technical Data

Model	Measuring range [Nm]	Spring constant C [Nm/rad]	Mass moment of Inertia J [g/cm²]	Maximum permissible axial load [N]	Maximum permissible radial load [N]	Weight [Gram]
8651 - 4020	0 ... ± 0.02	13	0.313	9	9	200
8651 - 4050	0 ... ± 0.05	53	1.82	12	12	170
8651 - 4100	0 ... ± 0.1	80	1.84	16	16	170
8651 - 4200	0 ... ± 0.2	80	1.84	16	16	170
8651 - 4500	0 ... ± 0.5	100	1.85	20	20	170
8651 - 5001	0 ... ± 1	175	1.93	40	40	170
8651 - 5002	0 ... ± 2	248	2.11	77	77	170
8651 - 5005	0 ... ± 5	979	67.7	32	32	600
8651 - 5010	0 ... ± 10	2 167	68.1	66	66	600
8651 - 5020	0 ... ± 20	4 052	69.1	65	65	600
8651 - 5050	0 ... ± 50	17 307	692.4	156	156	1 300
8651 - 5100	0 ... ± 100	30 603	700.7	272	272	1 300
8651 - 5200	0 ... ± 200	55 353	727.7	567	567	1 300
8651 - 5500	0 ... ± 500	265 661	9 377	749	749	4 500
8651 - 6001	0 ... ± 1000	396 759	9 586	1 465	1 465	4 500

Application Motor test stand



8651-E

Technical Data

E l e c t r i c a l

Torque sensor

Excitation voltage U_b:	+ 15 V DC +5 %/-10 %
Excitation current:	< 150 mA
Output at rated capacity:	± 10 V
Rise time 10 ... 90 %:	2 ms
Internal resistance:	100 Ω
Insulation resistance:	> 5 MΩ
Signal bandwidth (-3dB):	200 Hz
Ripple:	< 100 mV_{PP}
Calibration signal:	The output voltage is +10V, if U_b at Pin K is put on (sensor unloaded)

The supply is electrically isolated from the measuring channel

Angle and speed sensor (Options, see table below)

Output:	Open Coll.
Internernal pull-up resistor:	10 kΩ (5 V level)
External pull-up	$U_{max.}$ = 24 V / $I_{max.}$ = 20 mA
(Current open-collector output:	$I_{max.}$ = 20 mA)
Angle measurement:	2 x 360 pulses/rev., 90° displaced, TTL, direction of rotation recognition
max. Speed:	3 000 rpm
Speed measurement:	60 pulses/rev.
max. speed:	10 000 rpm

E n v i r o n m e n t a l

Operating temperature range:	0 °C ... 60 °C
Temperature compensated:	5 °C ... 45 °C
Temperature effect	
on zero:	± 0.02 F.S./K
on span:	± 0.01 F.S./K

M e c h a n i c a l

Non-Linearity:		
Ranges	0 ... ± 0.02 Nm and 0 ... ± 0.05 Nm	< ± 0.2 % F.S.
Ranges	≥ 0 ... ± 0.1 Nm	< ± 0.1 % F.S.
Hysteresis:		
Ranges	0 ... ± 0.02 Nm and 0 ... ± 0.05 Nm	< ± 0.2 % F.S.
Ranges	≥ 0 ... ± 0.1 Nm	< ± 0.1 % F.S.

Overload:	100 % over capacity
Alternating load:	70 % of capacity
Life duration of bearings:	20 000 h
Case material:	anodised aluminium
Grade of protection acc. EN 60529:	IP40
Mechanical coupling:	see Table 1
Weight:	see Table 2
Electrical connection	
sensor without option:	connector 6 Pin Mating connector model 9953 (included on delivery)
sensor with option angle or speed detection:	connector 12 Pin Mating connector model 9940 (included on delivery)
Mounting:	Both ends and bottom of sensorcase with 4 thread holes for fixing see drawing and table 1

Option	Description
V001	Angle detection 360 pulses / rev.
V002	Speed detection 60 pulses / rev.

Order Information

Torque sensor, range 2 Nm, angle detection integrated — **Model 8651-5002-V001**

Accessories

For sensor without option speed or angle detection

- Mating connector, 6-pin, female — **Model 9953**
- Connecting cable, length 3m, second end without plug — **Model 99553-000C-0160030**
- Connecting cable, length 3m, connector 9941, 12-pin, male, on second end, for e.g. 9162-V2... — **Model 99141-553B-0160030**

For sensor included option speed or angle detection

- Mating connector, 12-pin, female — **Model 9940**
- Connecting cable, length 3 m, second end without plug — **Model 99540-000B-0270030**
- Connecting cable, length 3 m, connector 9941, 12-pin, male, on second end
  for SEMMEG 9000 — **Model 99141-540E-0270030**
  for DIGIFORCE® 9306-V510X — **Model 99141-540M-0270030**

Instrumentation

a) for torque measurement — **e.g. digital measuring value display 9162**

b) for torque and angle measurement — **DIGIFORCE 9306 and SEMMEG 9000 see section 9 of the catalog**

c) for torque and speed measurement — **SEMMEG 9000 see section 9 of the catalog**

Special Calibration (WKS)

Special calibration for clockwise or/and counter clockwise direction torque, 20% steps of range up and down.

Mounting Instructions

When assembling the sensor, it is to be made certain that

1. indicated limit values for axial and radial forces on shaft ends - see table 2 - are not exceeded (danger of damage)

2. shaft ends are aligned as accurately as possible to each other.

Damages through radial and angle disalignment must be avoided by clutches.