E300 RWT1 - TORQSENSE™ Rayleigh Wave Rotary Torque Transducer

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TORQSENSE Torque Transducer [E300 RWT1]

General Description

Rotary torque has historically been difficult and expensive to measure. However, by using existing technology in a novel way, inexpensive transducers can be produced for situations where monitoring or control of drive mechanisms is required. Developed in conjunction with a UK government programme, TORQSENSE E300 RWT (Rayleigh Wave Transducers) are the world's first low cost non-contact rotary torque transducers suitable for OEM applications.

TORQSENSE E300 RWT's require a minimal shaft length, have low inertia, no physical contact between shaft and housing, wide bandwidth, high resolution, high accuracy and excellent noise immunity.

Each TORQSENSE E300 RWT contains an embedded non-volatile memory chip storing data on parameters, calibration etc., which are passed to the stand alone E302 interface/readout and then if required to a host PC operating TORQVIEW 2, a virtual instrumentation display system. This provides the user with a very cost-effective solution to measuring, recording and displaying data from a wide variety of applications. Please refer to relevant data sheets for information on E302 interfaces and TORQVIEW 2. All TORQSENSE RWTs operate statically as well as dynamically.

Technology

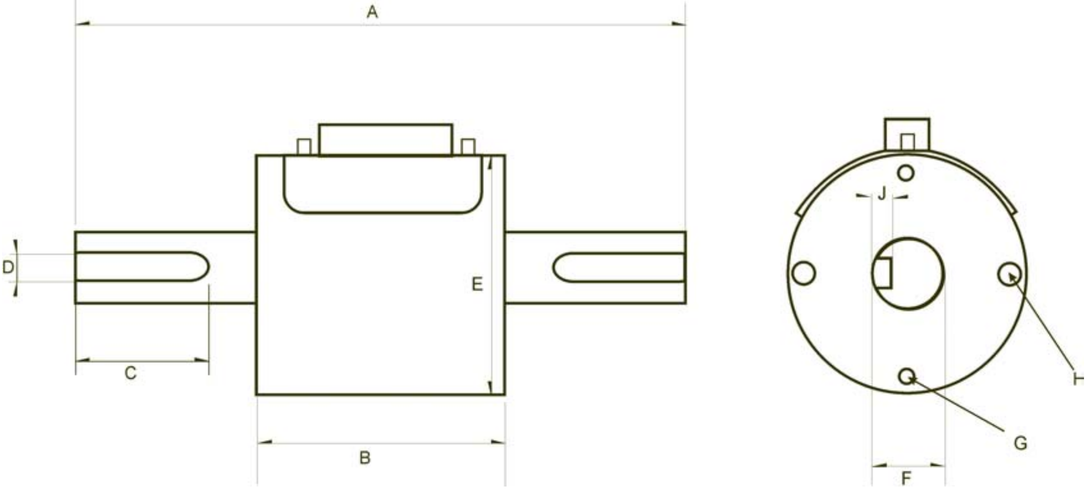
The patented method uses surface acoustic wave devices as essentially 'frequency dependent' strain gauges to measure the change in resonant frequency caused by an applied shaft strain. The signal is coupled via a non contact RF rotating couple from the shaft to a fixed pick-up. Saw devices are not affected by magnetic fields.

Standard Specifications

Model	**Full Scale Deflection** *Calibration in any equivalent units below is possible. The FSD can be set to any value within the range of a specific model and the torque measurement is therefore from zero to that FSD. For example, a 30 Nm FSD transducer would require an E300 RWT1-3 and it would measure from 0 to 30 Nm, bi-directionally.*		**Max speed (RPM)**
	Min FSD	Max FSD	
E300 RWT1-1B	0 - 50 mNm 0 - 0.5 lbf.in	0 - 100 mNm 0 - 1 lbf.in	30,000
E300 RWT1-1A	0 - 101 mNm 0 - 1 lbf.in	0 - 500 mNm 0 - 5 lbf.in	30,000
E300 RWT1-1	0 -501 mNm 0 - 5 lbf.in	0 - 1 Nm 0 - 10 lbf.in	30,000
E300 RWT1-2	0 - 1 Nm 0 - 10 lbf.in	0 - 20 Nm 0 - 200 lbf.in	20,000
E300 RWT1-3	0 - 20 Nm 0 - 200 lbf.in	0 - 100 Nm 0 - 1000 lbf.in	15,000
E300 RWT1-4	0 - 100 Nm 0 - 1000 lbf.in	0 - 200 Nm 0 - 2000 lbf.in	14,000
E300 RWT1-5	0 - 200 Nm 0 - 2000 lbf.in	0 - 500 Nm 0 - 5000 lbf.in	12,000
E300 RWT1-6	0 - 500 Nm 0 - 5000 lbf.in	0 - 2000 Nm 0 - 20,000 lbf.in	9,000
E300 RWT1-7	0 - 2000Nm 0 - 20,000 lbf.in	0 - 10000Nm 0 - 100,000 lbf.in	6,000

Standard

Cable length	2 metres - see options 3&4	Interface readout	E302
Outputs	From E302 module (±5V)		
Power supply	From E-302 interface	Safe mechanical overload	300% of rating
Accuracy	± 0.25% FSD; ±0.1% to order	Memory	Embedded non-volatile memory chip
Bandwidth	Better than 2KHz	Hysteresis	Better than 0.1%
Output frequency change	± 200KHz for ±full scale at 500 microstrain	Bearings	Deep grooved shielded bearings with oil lubrication- see options 5&6
Temperature range	-10ºC to + 50ºC	Temperature coefficient	Less than 0.05% per ºC.



Mechanical Parameters

Model	A	B	C	D	E	F	G	H PCD	J	Rotational Inertia (NmSec²)	Critical Speed (Rad/Sec)	Natural Freq (Hz)	Torsional Stiffness (Nm/Rad)
	Dimensions (mm)												
RWT1-1, 1A, 1B	125	72	N/A	N/A	62	6	M3	56	N/A	1.48×10^{-7}	3.98 x 10	3.76×10^{3}	9.28 x 10
RWT1-2	125	72	18	4	62	12	M3	56	2	1.82×10^{-6}	1.09×10^{2}	4.68×10^{3}	2.04×10^{3}
RWT1-3	172	80	30	6	68	20	M3	62	3.5	2.17×10^{-5}	1.28×10^{2}	2.90×10^{3}	9.92×10^{3}
RWT1-4	194	82	37.5	8	80	25	M3	74	4	5.41×10^{-5}	1.45×10^{2}	2.78×10^{3}	2.54×10^{4}
RWT1-5	216	82	45	10	80	30	M3	74	5	1.15×10^{-4}	1.57×10^{2}	2.64×10^{3}	5.42×10^{4}
RWT1-6	260	90	70	16	98	50	M3	92	6	1.15×10^{-3}	2.16×10^{2}	2.05×10^{3}	3.78×10^{5}
RWT1-7	284	96	85	22	150	75	M5	140	9	7.47×10^{-3}	2.71×10^{2}	1.63×10^{3}	1.50×10^{6}

Options

Option	Description	Information/remarks
1	Optical RPM Pickoff	External dimensions are not affected
2	Transducer Sealing to IP65	Some external dimensions change. Maximum running speeds will be considerably reduced, and drag torque will increase - Consult factory
3	Extension Cable	Between 2 metres and 10 metres a standard or heavy-duty extension cable may be used. Please specify required length
4	Cable Driver	Between 10 metres and 120 metres, a cable driver is fitted close to the transducer together with an extension lead. Please specify required length
5	High Speed Bearings	At very high speeds, for better balance, we recommend plain or splined shafts – Consult factory. See chart below for max speeds
6	Sealed Bearings	See chart below for max speeds

Max speed (Note: quoted in RPM with no radial or side loads)

Option	RWT1-1, 1A, 1B	RWT1-2	RWT1-3	RWT1-4	RWT1-5	RWT1-6	RWT1-7
5	Consult factory	30,000	25,000	23,000	20,000	14,000	9,000
6	15,000	12,000	9,000	8,000	7,000	4,500	3,000
Standard	30,000	20,000	15,000	14,000	12,000	9,000	6,000

Patents pending. US Patents: US5585571, US6478584.

Sensor Technology Ltd reserves the right to change specification and dimensions without notice.
See cover page or contact company for warranty and EMC compliance

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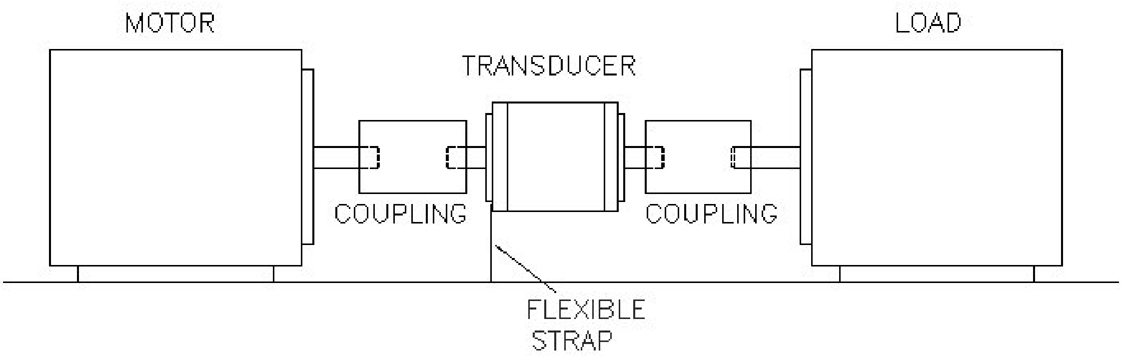
Rotary Torque Transducer Installation Guide

To get the best from your Sensor Technology (ST) Torque Transducer it is essential that it is correctly installed.

1. ***For Transducers above 1Nm or 10lbf.in.*** it is recommended that the body of the transducer is restrained from rotation using a strap or straps connected to the tapped holes in the end plates and that it is not rigidly mounted. Couplings should be used to allow for angular misalignment while the transducer shaft takes up any parallel misalignment. Care should be taken not to induce any end loads or bending moments to the shaft, see paragraph 3 below, as these may induce inaccuracies to the torque measurement and in extreme cases damage the transducer.



Should rapid variations in torque need to be measured in detail e.g. torque fluctuations in gearboxes or multi vane pumps then it is recommended using torsionally rigid couplings fitted at both ends of the transducer shaft such as single membrane couplings and that these are ***correctly selected for the transducer rating and speed***. An undersized coupling will not transmit the torque while the high inertia of an oversized coupling can result in instantaneous peak torques far in excess of the measured torque. Alternatively, for lower bandwidth applications where it is more important to measure the 'average' torque rather than fast torque fluctuations then couplings with a degree of compliance would be more appropriate.

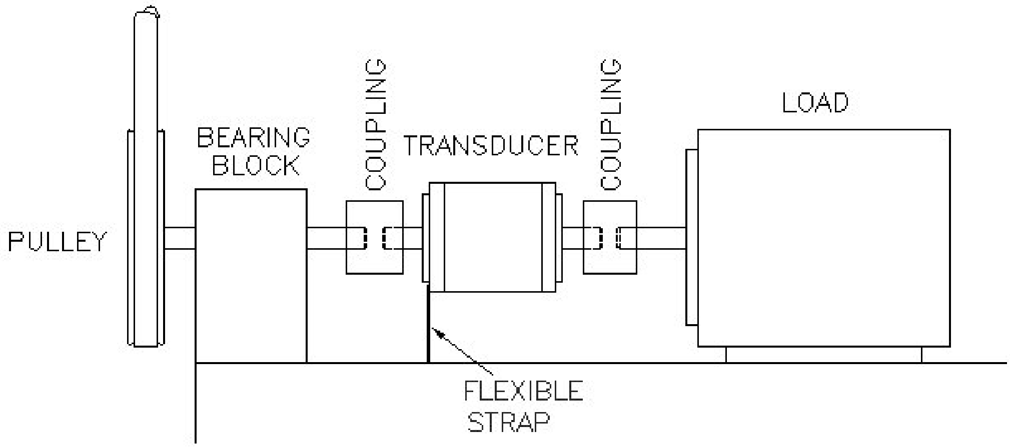
Membrane coupling
Single

Never use a solid coupling to connect a ST Torque Transducer.

2. ***For Transducers below 1Nm or 10lbf.in*** or if the application requires the body to be **rigidly mounted** then it is recommended that double couplings should be used at each end to compensate for any misalignment of the input/output shafts and the system designed to eliminate any end loads on the transducer shaft. For applications where ***end loads cannot be avoided*** please consult the ST sales department for advice ***prior to ordering.***

Membrane coupling
Double

3. When using a pulley or pulleys it is recommended a bearing block or blocks should be used to ensure bending loads are not transmitted to the transducer.



4. Whilst the transducer is resistant to EMC interference to BS EN 55011, the sensible routing of cables is important to avoid possible EMC interference. Avoid running the transducer cables close, and/or parallel, to high voltage cables, solenoid valves, generators or inverters etc. If the cables must follow the same route as interfering cables then additional screening such as metal conduit should be used to provide isolation. Do not attempt to lengthen, shorten or modify the cable between the transducer and an E-Series instrument. Contact ST if a longer cable is required.

5. ***To avoid damaging the transducer during installation it is highly recommended that it is electrically connected and working during this process so that any torque overloads due to handling can be monitored.***

If in doubt, please ask for advice on the installation of your ST Torque Transducer. Tel: 01869 238400 Email: info@sensors.co.uk

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RWT2279V
Rev 1

TORQSENSE Torque Transducer [E300 RWT1] Operating Guide

1. Introduction

The TORQSENSE Rayleigh Wave Rotary Torque Transducer, in conjunction with the E301 or E302 readout, provides a method of precisely measuring bi-directional rotary or static torque in mechanical systems, and may be fitted with an optical speed sensor for monitoring the speed of rotation of the transducer shaft in dynamic applications, enabling direct measurements of transmitted power to be made on rotating shafts and mechanisms.

The transducer is used in conjunction with an E301 or E302, any transducer being interchangeable with any E301 or E302. Where angular speed data is to be displayed, the E302 is used.

2. Operating Principles

The transducer shaft is connected into the mechanical system on which the measurements are to be made and can spin freely with relation to the transducer body.

Torque applied to the shaft causes an angular deflection in the shaft (approximately 0.5 degree at maximum rated torque). This deflection is sensed by the surface acoustic wave devices, resulting in a frequency change, which is processed by the E301 or E302 to give torque out.

Torque applied in the clockwise sense along the transducer shaft axis produces a positive polarity output signal while anticlockwise torque gives rise to a negative output. The polarity of the transducer signal is sensed by the E302.

Where an optical rotary speed sensor is fitted, a light beam is interrupted by the rotation of a disc attached to the transducer shaft which consists of alternate opaque and translucent segments, giving rise to pulse modulation of the speed – sensor beam, which is amplified to TTL compatible output at the “RPM OUT” socket of the E301 or E302.

3. Operating Instructions

Connect the 15-pin plug of the interconnection lead to the 15-pin socket of the torque transducer ensuring to secure the plug with the clips provided on the transducer body. Plug the other end of the lead into E301 / E302 transducer socket. Switch on the E301 / E302 and allow five minutes for the equipment to reach thermal equilibrium. Zero the transducer output using the E301 / E302 “Zero” controls. The transducer is now ready for use.

Each E300 RWT1 transducer must be connected to the E301 / E302 with its own lead, identifiable by the matching serial number on the 25-pin plug end of the lead.

THE SERIAL NUMBER OF THE LEAD MUST MATCH THE E300/RWT SERIAL NUMBER

The lead contains calibration information on the E300 RWT1, which is reported to the E301/E302 to give the correct scaling on the display. The E301 will only display torque. The E302 will display torque, and if a speed sensor is fitted to the E300 RWT1, it will display speed and computed power.

4. Options Fitted To Your Transducer

E300 Serial Number

No options fitted.