



RWT310/320 SERIES TRANSDUCER

USER MANUAL



CAUTION

This instruction manual should be read carefully and the safety instructions observed before installing or operating the equipment related to this manual.

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Patents

Sensor Technology Ltd's RWT series products are manufactured under one of the following US patents: 5,585,571; 6,237,417; 6,467,351; 6,765,493; 6,838,958; 6,864,759.

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WEEE



This product may contain substances that can be hazardous to the environment if not disposed of properly. Electrical and electronic equipment should never be disposed of with general household waste but must be separately collected for their proper treatment and recovery. The crossed out bin symbol, placed on this product, is a reminder of the need to dispose of the product correctly at the end of its life and prevent the release of potential hazardous substances into the environment. In this way materials used in the product can be recovered, recycled or reused.

For users based in the EU, please contact Sensor Technology Ltd or your EU Distributor for information on collection arrangements for this product. Please recycle packaging where possible

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1. RWT320/340 Series Transducer Control Utility

Attachments (the following documents may also be attached)

1. TorqView User Guide

Getting Started

Introduction

The **TORQSENSE** Rayleigh Wave Rotary Torque Transducer provides a method of precisely measuring bi-directional rotary or static torque. It can also be fitted with a speed sensor for monitoring in dynamic applications, enabling direct measurements of transmitted power.

The RWT series transducers require no external instrumentation and has its own built in test capability. Its compact size makes it ideal for use in applications where there is little space for any extra equipment. Analog voltage outputs are standard, with current outputs available as an option. The RWT320/340 series can also be connected to a PC via USB (optional) or RS232 so that its configuration can be changed, or by using TorqView to display torque, speed and power.

Unpacking the transducer

The following standard components are included:

- 1 x RWT Series Transducer
- 1 x RWT Electronics Module (Only if RWT330/340 ordered).
- 1 x User Manual.
- 1 x Calibration Certificate.

and for RWT320/340 series ONLY:

- 1 x TorqView program installation CD, RWT Configuration Software, Manuals & Appendices in PDF format, USB driver.

The following items may also be included:

- 12pin Lumberg (female) and/or 12pin Lumberg (male).
- 1 x 2.5m Analog Lead - 15 way 'D' type connector (female) to 12pin Lumberg (female).
- 1 x 2.5m Digital Lead - 15 way 'D' type connector (male) to 12pin Lumberg (male). (RWT320/340 series transducer ONLY).
- 1 x Digital Adaptor Lead (dc Jack with USB and/or RS232 connections, depending on options requested) (RWT320/340 series transducer ONLY).
- 1 x Transducer Display ETD
- 1 x AC Mains Adaptor Power Supply.
- 1 x Transducer Signal Breakout Unit.

CAUTION

The RWT series transducers should be installed using correct couplings rated for the maximum torque and speed for the operation.

CAUTION

The RWT series transducers should not be operated at any torque load greater or speed faster than that specified in the Product data sheet and on the Transducer.

CAUTION

The RWT series transducers should not be operated in an environment where that operation could be life threatening or a danger to personnel.

CAUTION

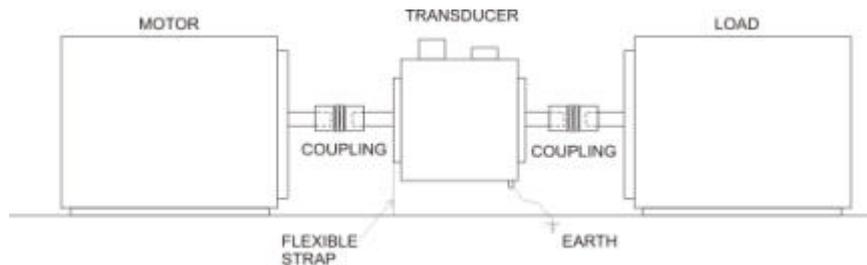
In electrically noisy environments, the RWT series transducers should be earthed using the earthing post located on the transducer.

Mechanical Installation

To obtain the best measurements from your torque transducer it is essential that it is correctly installed.

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

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 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.



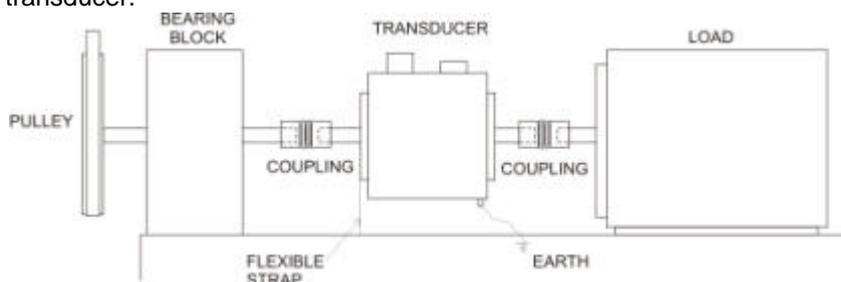
Single membrane coupling
(Flexible mounting)

Never use a solid coupling to connect a RWT series transducers Torque Transducer

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 sales department for advice **prior to ordering**.



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.



Double membrane coupling
(Rigid mounting)

Lastly, consider using a guard over the transducer and couplings

Whilst the transducer is resistant to EMC interference to BS EN 61326-1:2006, 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.

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.

Operating Principles

The shaft of the transducer should be connected to the mechanical system on which the measurements are to be made using appropriate couplings so it can rotate freely up to its maximum recommended speed, with relation to the transducers body and bearings fitted.

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 two Surface Acoustic Wave devices, resulting in a change to their resonating frequency. It is this change, which is processed to provide a torque reading.

The RWT series transducers can sense both polarity output signals. Torque applied in the clockwise sense along the transducer shaft axis produces a positive polarity output signal while torque applied in the anticlockwise sense produces a negative polarity output signal.

If an optical rotary speed sensor is fitted, a light beam is interrupted by the rotation of a disc consisting of alternate opaque and translucent segments attached to the shaft. Both 60 line and 360 line encoders are available.

The thermal characteristics of the steel shaft are compensated by having an infrared temperature sensor monitoring the shaft temperature at all times. This information is then used to correct the modulus of the steel.

Pre-load, note:-

All RWT310/320 transducers with a LED in the centre of the front label (connector side) have a bearing pre-load spring fitted internally at the left hand side (pre-load end) when viewing the front label of the transducer and with the earth stud bottom right hand corner.

All RWT330/340 transducers with a LED on the separate electronics module have a bearing pre-load spring fitted internally at the left hand side (pre-load end) of the transducer head when viewing the label of the transducer head and the connector and gland facing towards you.

If there is a possibility of an end load being applied to the transducer, the transducer should be orientated during installation such that the load is applied at the pre-load end (side with the internally fitted spring). Excessive end loads must be avoided and it is recommended that appropriate couplings be used to compensate for axial and radial misalignment.

Operation

Powering the transducer

To power the transducer a supply voltage of 12-32Vdc is required with a minimum current of 1 amp (to supply peak start-up current). If a Transducer Display ETD is used the ETD will provide power for the transducer. If a Transducer Signal Breakout Unit is used the power supply should be plugged into the dc jack on the box. If a Digital Adaptor Lead is used the power supply should be plugged into the dc jack on the lead.

If a Transducer Display ETD, Transducer Signal Breakout Unit or a Digital Adaptor Lead is not used, then the power supply can be provided by using either the 2.5m Analog or Digital Lead's 15 way 'D' type connector with a supply voltage of 12-32Vdc on Pin 1 and Ground on Pin 2. **Note: It is imperative that the voltage does not drop below 12v at any stage.**

CAUTION

Only provide power through either the Analog or Digital lead.
Do NOT provide power through both leads simultaneously.

Using the transducer

Step 1: Switch on the RWT series transducer by ensuring power is supplied.

Step 2: Allow the transducer to carry out its Built In Test (BIT) procedure (see details below).

Step 3: Allow five minutes for the equipment to reach thermal equilibrium before making any measurements.

Step 4: Zero the transducer (see page 7).

Step 5: Examples of reading/collecting data (see page 8).

Built In Test (BIT) procedure

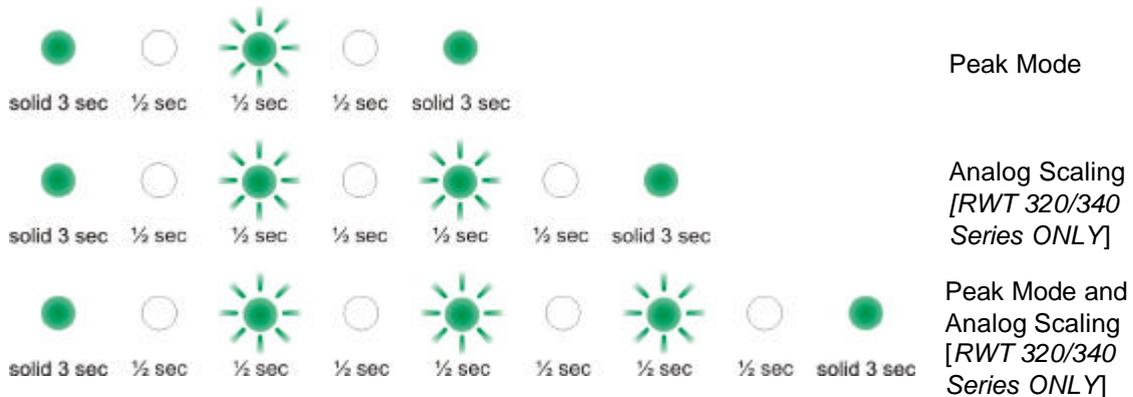
When the RWT series transducer is switched on it will carry out its Built In Test (BIT) procedure. While the BIT procedure is taking place there will be a series of red and green flashes from the LED followed by a steady green or a flashing green depending upon the operation mode when the test is complete.

If the transducer fails its BIT procedure there will be a quick succession of red flashes, followed by green and/or red flashes. If this occurs, restart the transducer. Contact the factory if problem continues.

Normal operation

A solid green LED indicates normal mode and working correctly.

If the transducer is in a non standard mode, the following LED sequences will occur.



Warning signals

A warning signal will always interrupt the normal operation mode lights by indicating alternating red/green flashes followed by a pause.



After the pause a sequence of green or red flashes will indicate which warnings messages are applicable by flashing red at the appropriate place in the sequence. This will continue until the warning has been corrected. The warning signal order is as follows:

Warning	Reason and Action required
Analog Fault CH0	In voltage output mode the analog pin is short circuit, in current output mode the analog output pin is open circuit. Check the analog connector wiring in Channel 0.
Analog Fault CH1	In voltage output mode the analog pin is short circuit, in current output mode the analog output pin is open circuit. Check the analog connector wiring in Channel 1.
Zero Offset High	There may be an offset applied to the correct torque applied value because the 'Zero Peaks' has been pressed while torque, greater than 10% of the fsd, has been applied.
Exceeded Temp	Shaft temperature has exceeded normal operating conditions. Temperature compensation may no longer be effective or calibration valid.
Over torque	Torque has been applied greater than the FSD.
Critical over torque	Torque has been applied greater than 120% of the FSD. Contact factory if warning continues.

For example, the following sequence would indicate warnings for 'Analog Fault CH0' and 'SAW Zero Offset High':



Error signal

A solid red LED indicates that an error has occurred. If this occurs restart the transducer. Contact the factory if problem continues.

Zeroing the transducer

The transducer can be zeroed by using:

- TorqView,
- Transducer Display ETD,
- The Transducer Signal Breakout Unit, or
- Ground Pin 7 on the analog 15 way 'D' type connector (female).

There are three ways to zero the transducer:

- Normal zero: Press the zero button once.
- Average zero: Pressing the zero button for 2 seconds. (Not possible with TorqView or Transducer Display ETD.)
- Save the average zero to the transducer (enables the transducer to recall the zero after a power cycle): Press and hold the zero button for 6 seconds. (Not possible with TorqView or Transducer Display ETD.)

Resetting transducer to factory default

To reset the transducer to factory default settings (i.e. the functions set by the factory on purchase):

Step 1: Turn off transducer.

Step 2: While holding in the zero button, power the transducer. The LED will stay solid green until the reset button is released.

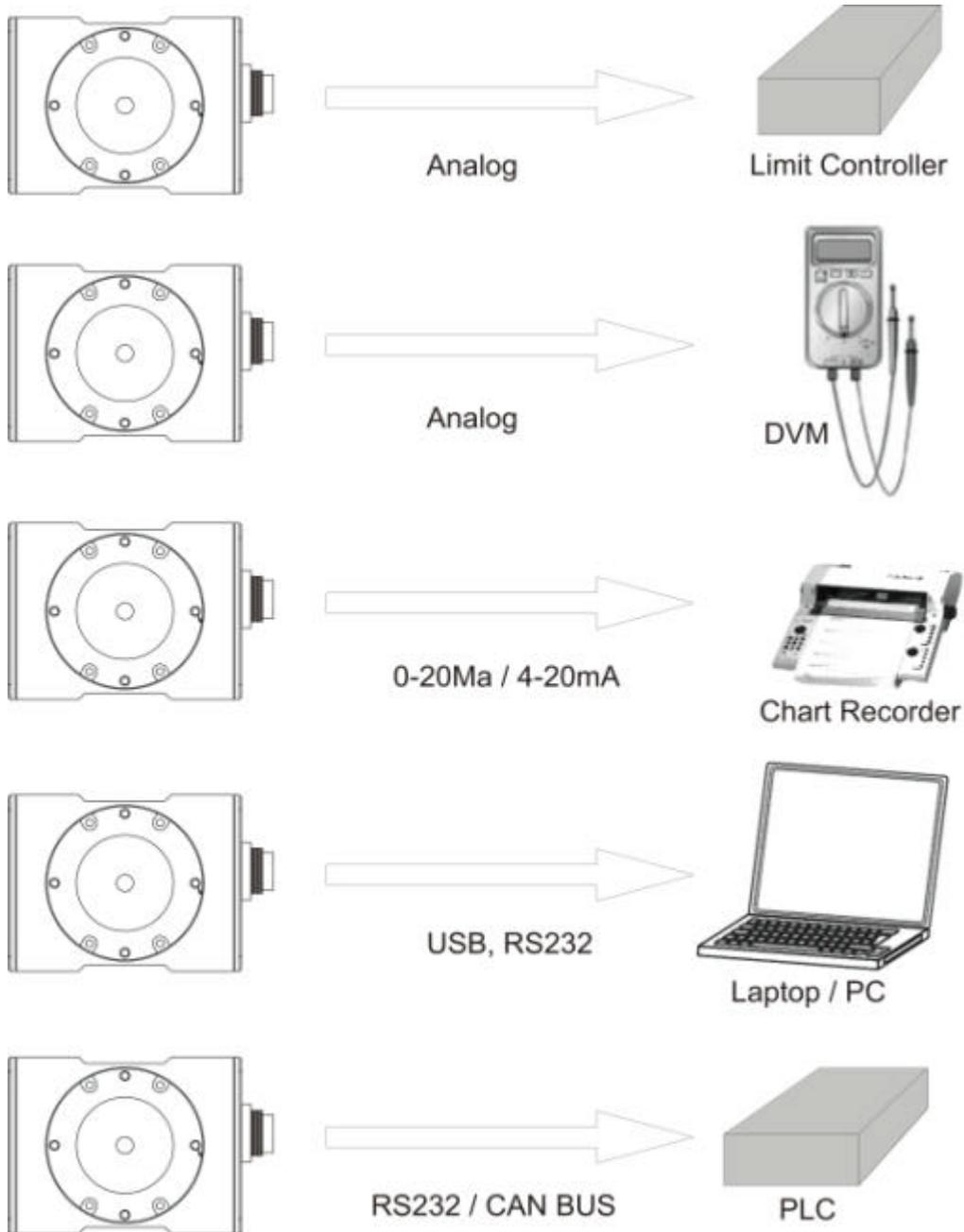
Step 3: Allow the transducer to carry out its BIT procedure.

Step 4: When the LED sets at solid green all user-adjusted parameters have been reset to the factory default setting.

Step 5: If appropriate reactivate TorqView (See About Screen in TorqView User Manual).

Examples of reading/collecting data

(for diagrammatic purposes only the RWT3 10/320 module is shown)



Optional Accessories

Analog Lead

The Analog Lead is a 2.5m length - 15 way 'D' type connector (female) to 12 pin Lumberg (female). It can be used for either RWT series transducers.

Digital Lead (RWT320/340 series ONLY)

The Digital Lead is a 2.5m length - 15 way 'D' type connector (male) to 12 pin Lumberg (male). It is used to configure the RWT320/340 series.

Digital Adaptor Lead (RWT320/340 series ONLY)

The Digital Adaptor Lead is an optional accessory and plugs into the 15 way 'D' type connector on the 2.5m Digital Lead to provide a dc jack for power and RS232 and/or a USB connection, depending upon the options requested. *Note USB specification limits the length of a cable between full speed devices to 5 meters. A USB Extender is required for distances greater than 5m, please consult factory for USB Extenders.*

Additional Related Products

Transducer Display ETD

The Transducer Display ETD is a readout suitable for all RWT transducers. Although it is primarily used to display torque and peak torque, it can also display speed and power, provide access to the analog outputs from the transducer and connect the transducer to a PC for use with TorqView and the Transducer Control Program.

Transducer Signal Breakout Unit

The Transducer Signal Breakout Unit, which when plugged in powers the transducer and keeps all of the inputs and outputs in one place. The Transducer Signal Breakout Unit provides 4mm sockets to output an analog torque and speed signal. It enables switching between dc volts, 0-20mA, 4-20mA, zero torque, angle and enable peak hold. The Transducer Signal Breakout Unit also allows communication with a PC via the built-in USB and RS232 ports. The Transducer Signal Breakout Unit is powered by a supply voltage of 12-32Vdc with a minimum current of 1 amp (to supply peak start-up current).

AC Mains Adaptor Power Supply

The AC Mains Adaptor Power supply is required to provide 12-32Vdc to the RWT series Transducer and Transducer Signal Breakout Unit.

TorqView (RWT320/340 series ONLY)

TorqView is an easy to use graphical front end Virtual Instrumentation Display PC Interface Software program for use with the RWT320/340 series transducers. It allows the Torque, Speed, Power and Temperature values to be displayed in charts, dials and digital bars and can be used to assist data recording. For further information on TorqView please refer to the TorqView User Manual.

Transducer Control Program (RWT320/340 series ONLY)

The Transducer Control Program is only applicable for Users with RWT320/340 series transducers who wish to alter the configuration of the Transducer to suit their application. Further information on the Transducer Control Program please see Appendix 1.

Transducer Communication Protocol (RWT320/340 series ONLY)

The Transducer Communication Protocol is only applicable for Users with RWT320/340 series transducers who wish to write their own software. It informs users of the protocols for communicating to the Transducer. Further information on the Transducer Communication Protocol is available from the factory or as a download from the website: www.sensors.co.uk

Transducer DLL Programmers Guide (RWT320/340 series ONLY)

The Transducer DLL Programmers Guide is only applicable for Users with RWT320/340 series transducers who wish to write their own software. It informs users how to use the DLL imbedded in the Transducer. Further information on the Transducer DLL Programmers Guide is available from the factory or as a download from the website: www.sensors.co.uk

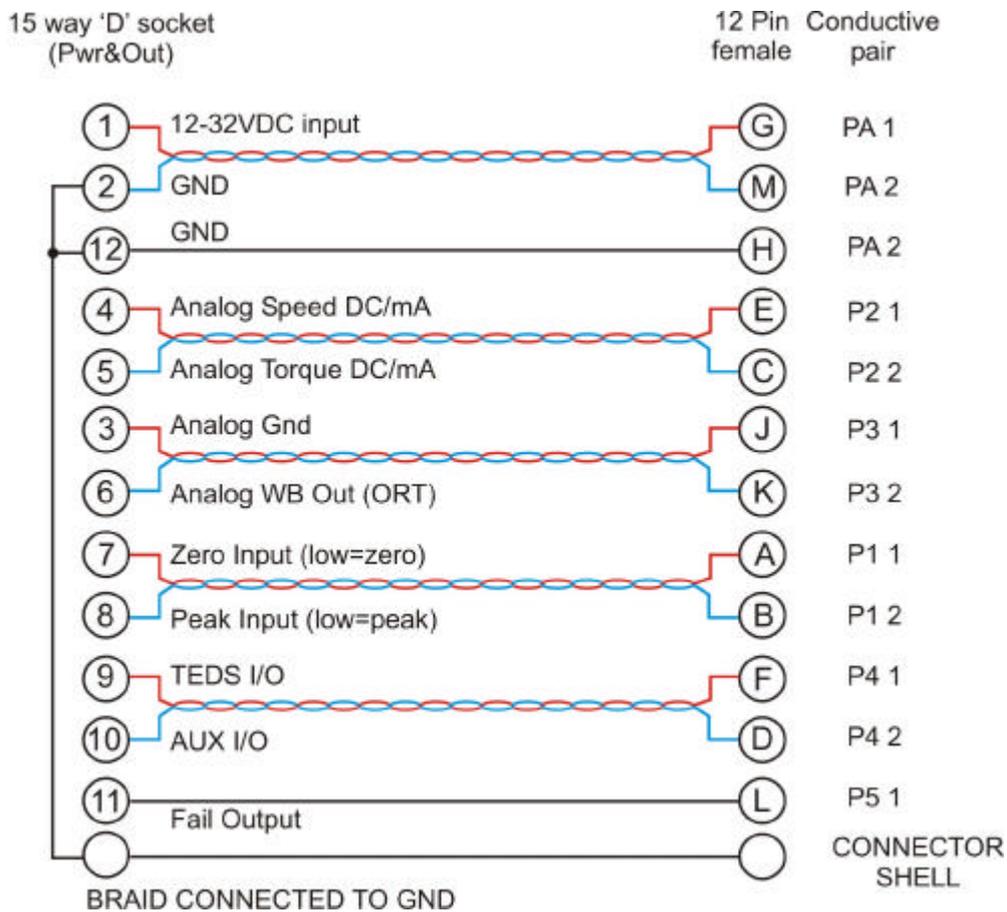
Leads

Analog Lead - Pin Out

2.5m length - 15 way 'D' type connector (female) to 12 pin Lumberg (female)

15way 'D' type connector (Pwr&Out)		12 Pin male on transducer*
Pin	Description	Pin
1	12-32VDC input	G
2	GND	M
3	Analog Gnd	J
4	Analog speed DC/mA	E
5	Analog torque DC/mA	C
6	Analog WB Out (ORT)	K
7	Zero Input (low = zero)	A
8	Peak Input (low=peak)	B
9	TEDS I/O	F
10	AUX I/O	D
11	Fail Output	L
12	GND	H

*Mating connector is Lumberg DIN45321 0322 12
BRAID CONNECTED TO GND



Female 15 way 'D'



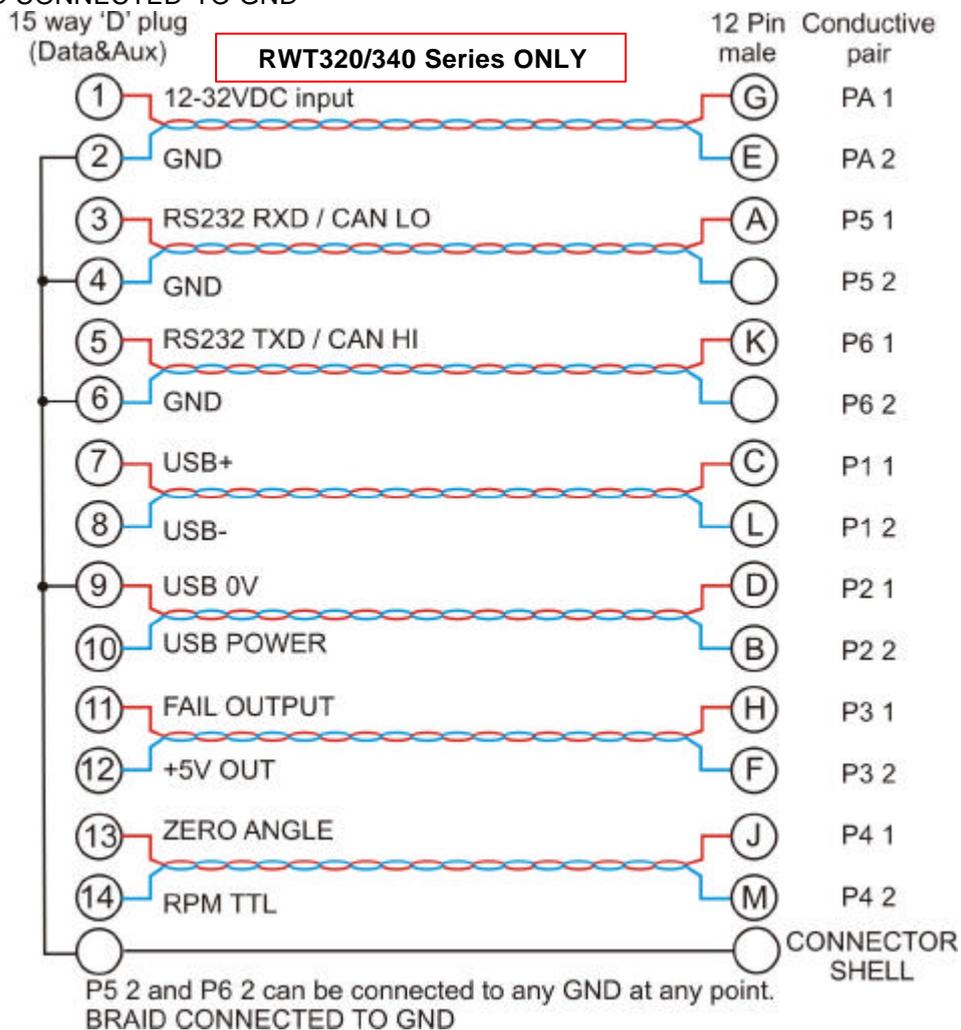
Female 12 way Lumberg

Digital Lead - Pin Out (RWT320/340 Series ONLY)

2.5m length - 15 way 'D' type connector (male) to 12 pin Lumberg (male)

15 way 'D' type connector (Pwr&Out)		12 Pin female on transducer*
Pin	Description	Pin
1	12-32VDC input	G
2	GND	E
3	RS232 RXD / CAN LO	A
4	GND	
5	RS232 TXD / CAN HI	K
6	GND	
7	USB +	C
8	USB -	L
9	USB 0V	D
10	USB POWER	B
11	Fail Output	H
12	+5V OUT	F
13	Zero Angle	J
14	RPM	M

*Mating connector is Lumberg DIN45321 0332 12
BRAID CONNECTED TO GND



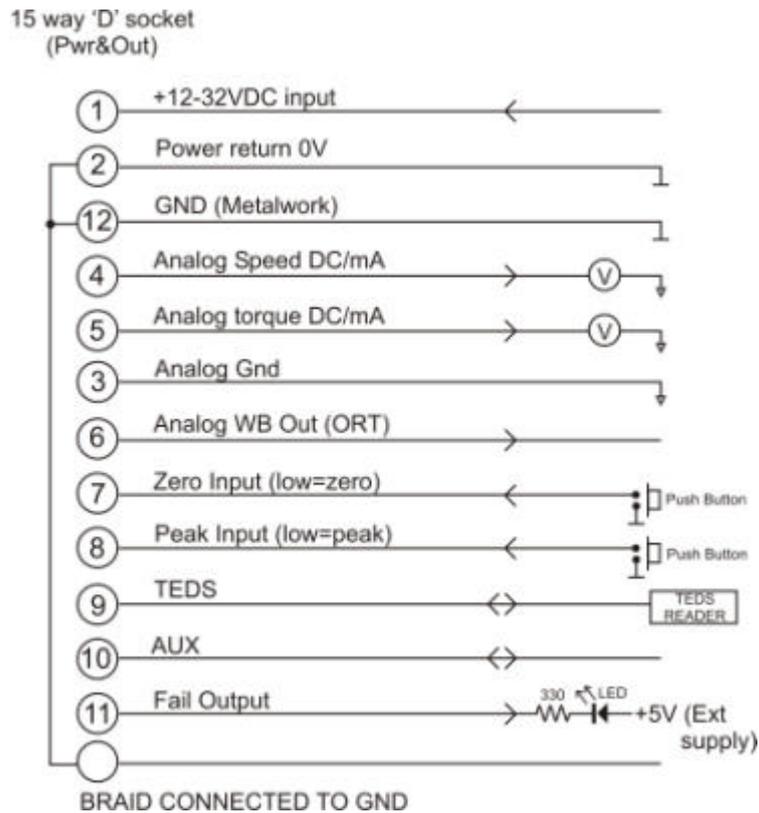
Male 15 way 'D'



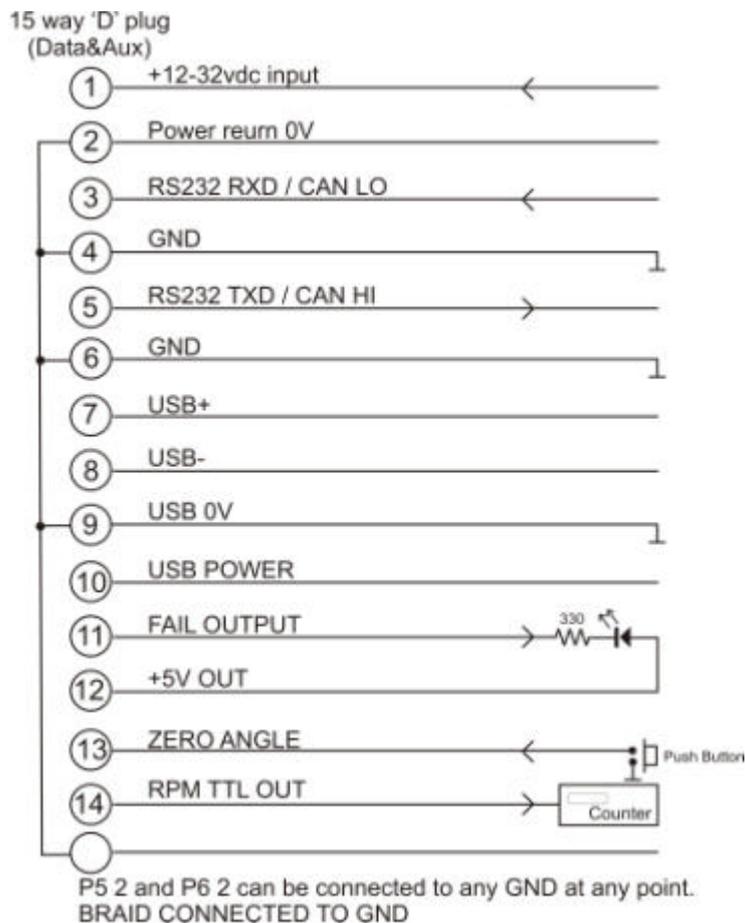
Male 12 way Lumberg

Transducer Connections

Analog



Digital



Declaration of Conformity

EC Directives

We, Sensor Technology Ltd, hereby declare that the products named below, to which this Declaration of Conformity relates, is in conformity to the requirements of EC Council Directives and Standards as listed:

- 2004/108/EC (Electromagnetic compatibility).
- BS EN 61326-1:2006, (Electrical equipment for measurement, control and laboratory use).

Type of Product	Rotary Torque Transducer
Product Name(s)	RWT310, RWT311, RWT313, RWT320, RWT321, RWT330, RWT331, RWT333, RWT340, RWT341, RWT342.
Intended use:	Measurement of rotary torque within the rated torque and speed limits as described on the transducer.



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Managing Director
Sensor Technology Ltd

9th June 2008



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RWT310/320 Series Torque Transducers - Data Specification

Parameter	Condition	Data								Units	
RWT310/320 Torque measurement system											
Measurement method	Strain Dependent Surface Acoustic Wave Resonators (interrogated by an incremental electronic scanning method)										
Torque range	(See Notes 1 & 2 below)	0 – 1	0 – 1.1 to 0 - 20	0 – 21 to 0 - 100	0 – 101 to 0 - 500	0 - 501 to 0 - 2000	0 – 2001 to 0 - 10000			Nm	
		[0 - 10]	[0 - 11 to 0 - 200]	[0 - 201 to 0 - 1000]	[0 - 1001 to 0 - 5000]	[0 - 5001 to 0 - 20000]	[0 - 20001 to 0 - 100000]			[lbf·in]	
Shaft size (diameter)		6	12	20	30	50	75			mm	
Rotation speed/angle of rotation measurement system											
Measurement method	Opto switch through slotted disc										
Direct output signal	Pulse output direct from opto switch (TTL, 5V square wave), output is independent of any analog or digital processing.										
Digital Processing Techniques	Processing Method	Update rate for analog and digital outputs									
		Mode 1 (Slow Method) Frequency Count	1								Hz
Processing modes run simultaneously and can be applied to either analog channel or accessed individually via a digital connection.	Mode 2 (Fast Method) Period Count	0 – 2000 RPM				RPM / 2					
		2000 – 4000 RPM				((RPM – 2000) x 0.3227) + 650				Hz	
		4000 – 8000 RPM				((RPM – 4000) x 0.196) + 800					
		8000 – 16000 RPM				((RPM – 8000) x 0.1117) + 850					
		16000 – 32000 RPM				((RPM – 16000) x 0.058) + 900					
Rotational speed (max)	(See Note 3)	30,000	20,000	15,000	12,000	9,000	6,000			RPM	
Temperature											
Measurement method	IR temperature sensor monitoring actual shaft temperature										
Temperature accuracy										±1	°C
Reference temperature, T _{RT}										20	°C
Operating range, ΔT _O										-10 to +50	°C
Storage range, ΔT _S										-20 to +70	°C
Temperature drift (FS)	Max									0.05	%FS/°C
Specifications											
Linearity										±0.25	%FS
Hysteresis										<0.1	%FS
Resolution										0.1	%FS
Repeatability										0.1	%FS
RWT310 Series Transducers ONLY											
Frequency response										101	Hz
Accuracy	20°C, SM (See Note 4)									±0.25 (±0.5 for 2Nm and below)	%FS
RWT320 Series Transducers ONLY											
Frequency response		1620	810	405	202	101	50	25	12	Hz	
Accuracy	20°C, SM (See Note 4)	±1	±0.7	±0.5	±0.4	±0.25	±0.25	±0.25	±0.25	%FS	
Digital averaging	(See Note 5)	1	2	4	8	16	32	64	128	N	
Analog output											
Output voltages (Torque/Speed/Power)	Options available: ±1 / ±5 / ±10 / Unipolar (RWT310 Series default setting is ±5Vdc) (RWT320 Series output voltages are user selectable)									Vdc	
Load impedance	Maximum 1									KΩ	
Output currents (Torque/Speed/Power)	Options available: 4-20mA, 0-20mA and 12±8mA (RWT320 Series output currents are user selectable)									mA	
4-20mA Loop resistance	Should not exceed 400									Ω	
Digital output (RWT320 Series Transducers ONLY)											
Output type	RS232 (Standard), USB 2.0 full speed 12 Mbps (optional), CANbus (optional)										
Sampling rate										1.62	ksps
Power supply											
Nominal voltage, V _S										12 to 32 (max)	V
Current consumption, I _S										500 (max)	mA
Power consumption, W _S										6	W
Allowed residual ripple of excitation voltage, V _{ripple}										500 (above nominal supply voltage)	mVp-p
Electromagnetic compatibility											
EMC compatibility	EN 61326:2006										

Note 1. Any torque/FSD is possible between ranges – please specify max rated torque.

Note 2. Max rated torque should not be exceeded.

Note 3. Please consult factory for applications requiring rotational speeds that exceed maximum figures given. Transducers fitted for IP65 will have running speeds considerably reduced, increased drag torque and accuracy can be affected.

Note 4. SM – Static Mode. Dynamic values will depend upon user application and has to be adjusted accordingly.

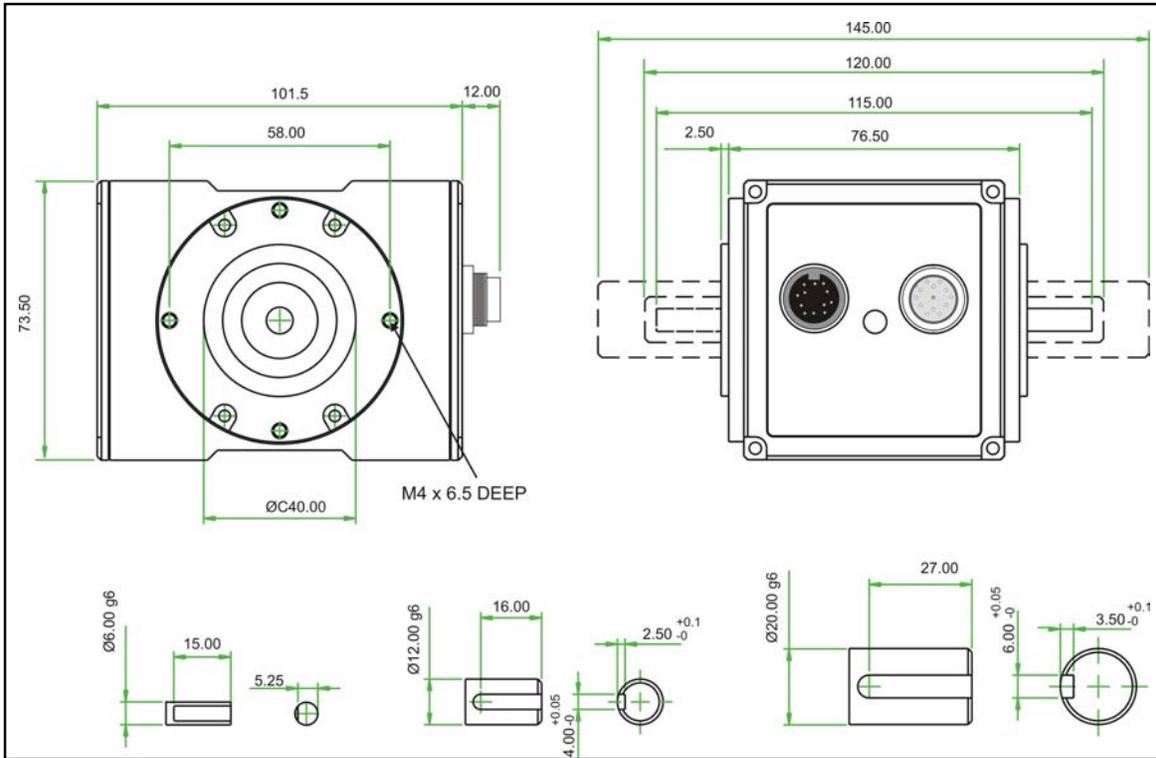
Note 5. Digital averaging can be configured by user to optimise accuracy/frequency response for specific user applications. Digital averaging default setting is N=16. For details see User Manual.

Data parameters measured at +20°C

Sensor Technology Ltd reserves the right to change specification and dimensions without notice.

RWT310/320 Series Torque Transducers

Dimensions (1Nm to 100Nm)

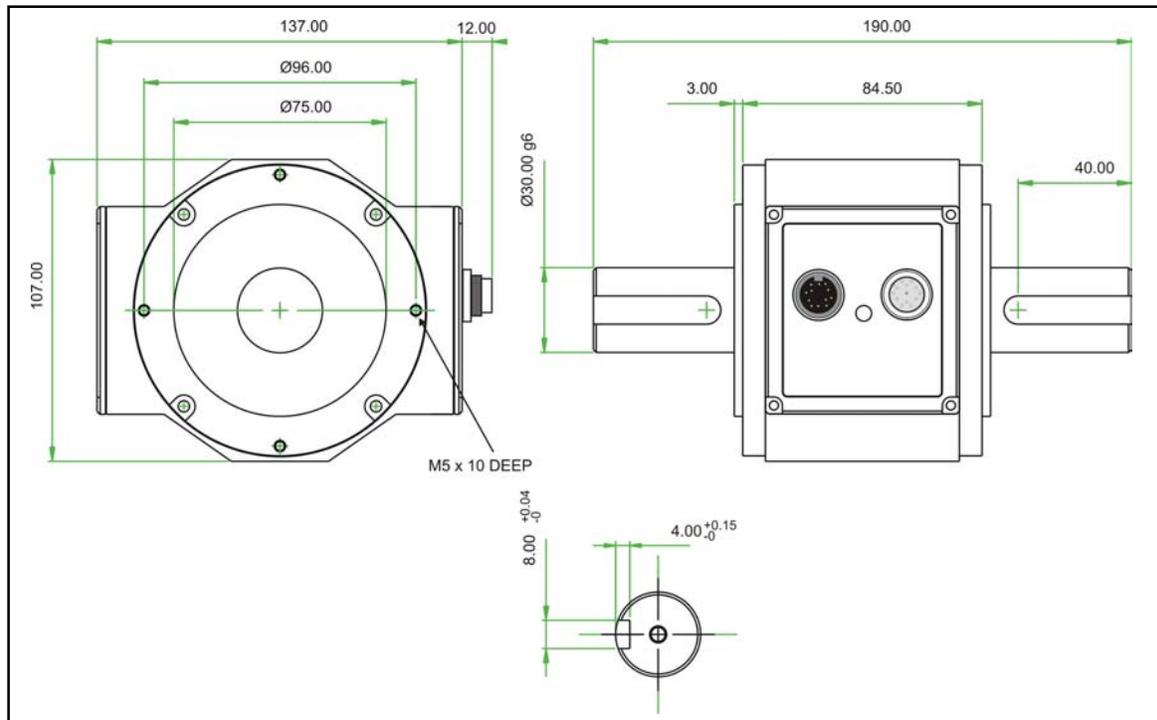


Parameter	Data												Units
Mechanical Properties													
Torque (Max)	1	2.5	3.9	6	8.5	13	17.5	20	30	55	85	100	Nm
Shaft Code	CF	DA	DF	DB	DC	DG	DD	DE	EB	EC	ED	EE	
Shaft Size (Diameter)	6	12						20					mm
Torsional Stiffness	0.23	1.28	1.3	1.32	1.6	1.7	1.8	1.9	4.1	6.4	8.1	9.2	KNm/rad
Mass moment of inertia, I_y	0.45	5.96	6.00	6.04	6.13	6.18	6.24	6.42	22.9	23.9	25.4	27.2	$\times 10^{-6}$ kg m ²
Max measurable load limit	120 (of rated torque)												%
Static safe load breaking	200 (of rated torque)												%
Shaft weight, approx	0.03	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.36	0.37	0.40	0.41	kg
Transducer with shaft weight, approx	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.1	1.1	kg

Data parameters measured at +20°C
 Sensor Technology Ltd reserves the right to change specification and dimensions without notice.

RWT310/320 Series Torque Transducers

Dimensions (101Nm to 500Nm)

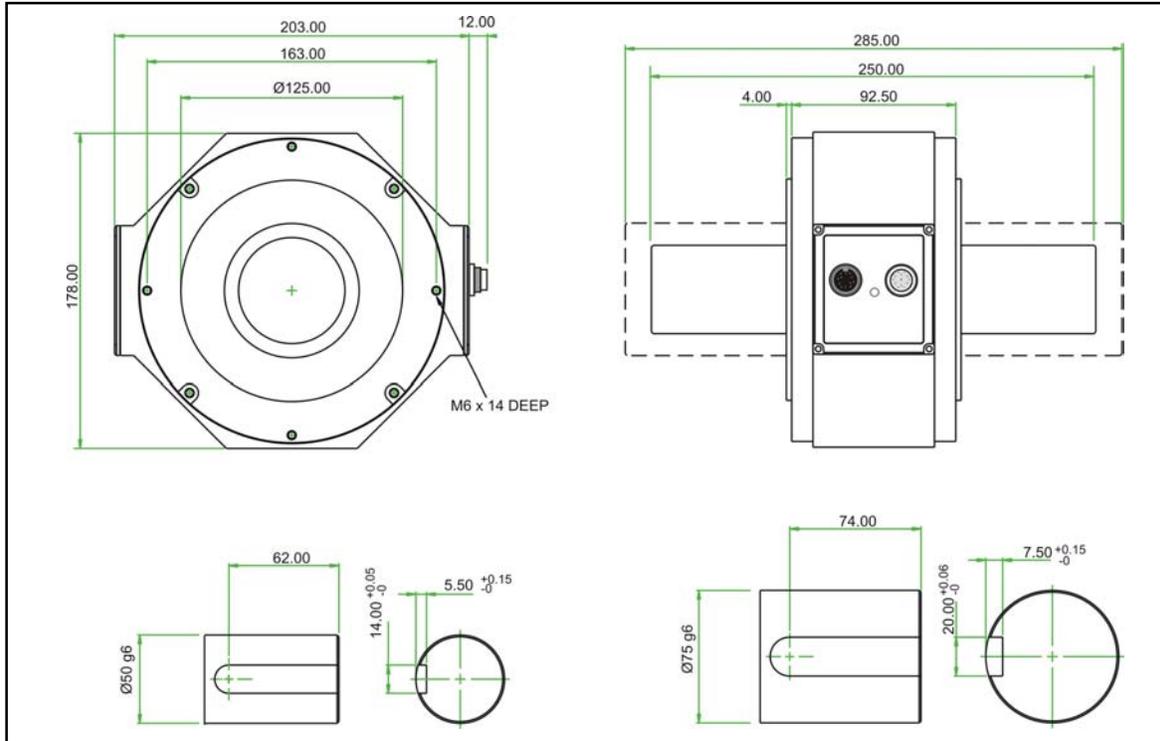


Parameter	Data					Units
Mechanical Properties						
Torque (Max)	175	225	265	350	500	Nm
Shaft Code	FA	FB	FC	FD	FE	
Shaft Size (Diameter)	30					mm
Torsional stiffness	32.9	35.6	37.2	37.9	39.8	kNm/rad
Mass moment of inertia	138.9	143.1	147.7	151.9	174.2	$\times 10^{-6} \text{ kg m}^2$
Max measurable load limit	120 (of rated torque)					%
Static safe load breaking	200 (of rated torque)					%
Shaft weight, approx	1.1	1.1	1.1	1.2	1.2	kg
Transducer with shaft weight, approx	2.4	2.4	2.4	2.5	2.5	kg

*Data parameters measured at +20°C
Sensor Technology Ltd reserves the right to change specification and dimensions without notice.*

RWT310/320 Series Torque Transducers

Dimensions (501Nm to 10000Nm)



Parameter	Data									Units
Mechanical Properties										
Torque (Max)	650	850	1100	1350	2000	3000	4000	6000	10000	Nm
Shaft Code	GE	GA	GB	GC	GD	HA	HB	HC	HF	
Shaft Size (Diameter)	50					75				mm
Torsional Stiffness	TBC	TBC	199.2	TBC	214.1	TBC	TBC	914.4	945.5	kNm/rad
Mass moment of inertia	TBC	TBC	1330	TBC	1497	TBC	TBC	7932.7	9407.1	$\times 10^{-6}$ kg m ²
Max measurable load limit	120 (of rated torque)									%
Static safe load breaking	200 (of rated torque)									%
Shaft weight, approx	TBC	TBC	3.9	TBC	4.1	TBC	TBC	10.2	10.6	kg
Transducer with shaft weight, approx	TBC	TBC	7.1	TBC	7.3	TBC	TBC	13.4	13.8	kg

*Data parameters measured at +20°C
Sensor Technology Ltd reserves the right to change specification and dimensions without notice.*

RWT310/320 Series Torque Transducers - Standard Range

- – Standard feature ◇ – Optional feature

	RWT310/320 Series		Option Code	Remarks
	RWT310	RWT320		
Torque, Speed, Power Outputs				
Torque only	310	320		
Torque & Speed (60 pulses/rev)	311			User to specify RPM/FSD when ordering
Torque & Speed (360 pulses/rev)	312			Not yet available
Torque & Power (60 pulses/rev)	313			User to specify Power/FSD when ordering
Torque & Speed (60 pulses/rev) or Power		321		Outputs are user selectable
Torque & Speed (360 pulses/rev) or Power		322		Not yet available
Standard features				
Keyed Shaft Ends	●	●	K	1Nm will have flats
Voltage output ±5v FSD (Fixed)	●		B	
Voltage outputs from ±1v to ±10v FSD and unipolar (Variable)		●		Output is user selectable
RS232 output		●		
Torque Averaging and Torque Peak		●		
Self Diagnostics	●	●		
Internal temperature measurement	●	●		Value available on RWT320 series only
Deep grooved shielded bearings with oil lubrication	●	●		
Ingress Protection (IP) 54	●	●		
Optional features				
Plain Shaft Ends	◇	◇	P	Shaft length will be longer than keyed end shafts – consult factory for length
Voltage output ±1v FSD (Fixed)	◇		A	In place of Option B
Voltage output ±10v FSD (Fixed)	◇		C	In place of Option B
Unipolar voltages (Fixed)	◇		U	In place of Option B. User to specify range/scale when ordering
Current output 0-20mA (Fixed)	◇		D	In place of Voltage output options
Current output 4-20mA (Fixed)	◇		E	In place of Voltage output options
Current output 12±8mA (Fixed)	◇		V	In place of Voltage output options
Current output 0-20mA, 4-20mA & 12±8mA (Variable)		◇	F	Current output is user selectable and in place of Voltage output. However user can reselect a Voltage output, if required. (Note 6)
USB 2.0 full speed 12 Mbps Digital output		◇	G	
CANbus output		◇	H	In place of RS232 output
High Speed Bearings (See Note 7 below)	◇	◇	J	Consult factory for maximum speed allowance.
Sealed Bearings	◇	◇	S	
Ingress Protection (IP) 65 (See Note 8 below)	◇	◇	L	

Note 6. 2 x analog channels available. Default settings are Channel 1 (voltage/current) – torque. Channel 2 (voltage/current) – speed or power, if ordered.

Note 7. At very high speeds, for better balance the factory recommend plain or splined shafts.

Note 8. Transducers fitted for IP65 will have running speeds considerably reduced, increased drag torque and accuracy can be affected.

Data parameters measured at +20°C

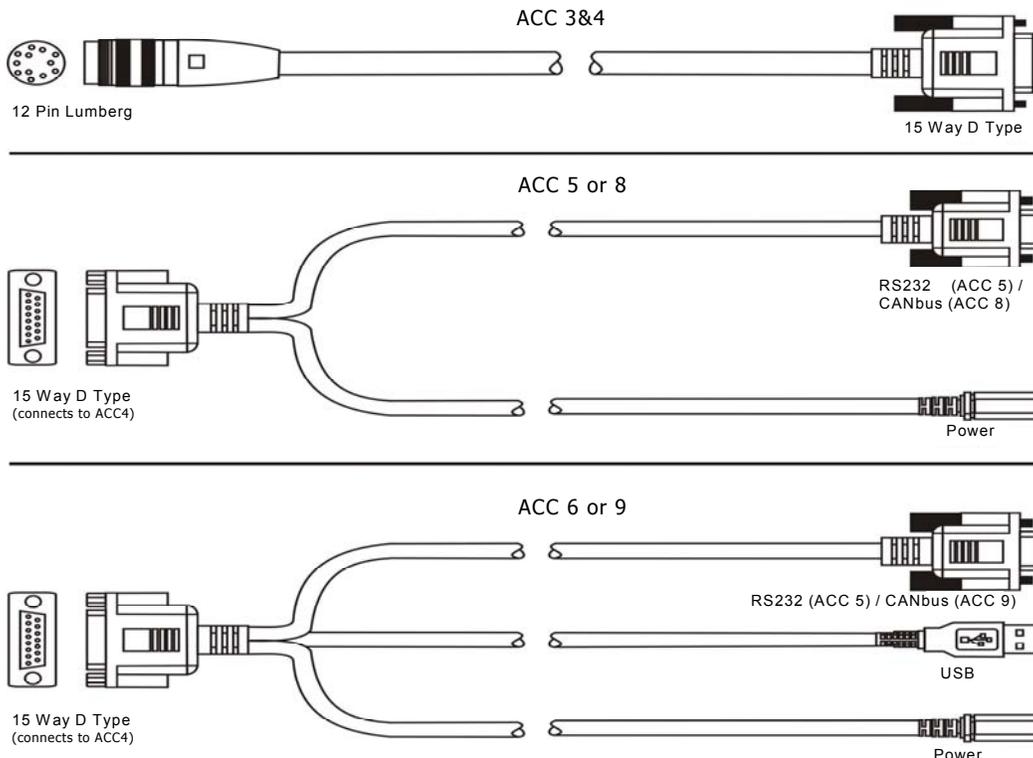
Sensor Technology Ltd reserves the right to change specification and dimensions without notice.

RWT310/320 Series Torque Transducers – Connector and Lead Options

Connectors & Leads	RWT310/320 Series		Option Code	Remarks/Purpose
	RWT310	RWT320		
Analog Connector 12 Pin Lumberg (female)	◇	◇	ACC 1	For user to self wire
Digital Connector 12 Pin Lumberg (male)		◇	ACC 2	For user to self wire
Analog Lead (Length 2.5m) 12 Pin Lumberg (female) to 15 way 'D' type connector (female)	◇	◇	ACC 3	For connecting RWT to user's system via 15 pin 'D' connector
Digital Lead (Length 2.5m) 12 Pin Lumberg (male) to 15 way 'D' type connector (male)		◇	ACC 4	For connecting RWT to user's system via 15 pin 'D' connector
Digital Lead Adapter (Length 1m) 15 Way 'D' type (female) to RS232 and Power Connectors		◇	ACC 5	For connecting RWT to PC via RS232 [Also needs Digital Lead (ACC4) to connect to RWT]
Digital Lead Adapter (Length 1m) 15 Way 'D' type (female) to RS232, USB and Power Connectors		◇	ACC 6	For connecting RWT to PC via USB (Option G) or RS232 [Also needs Digital Lead (ACC4) to connect to RWT]
Digital Lead Adapter (Length 1m) 15 Way 'D' type (female) to CANbus and Power Connectors		◇	ACC 8	For connecting RWT to PC via CANbus (Option H) [Also needs Digital Lead (ACC4) to connect to RWT]
Digital Lead Adapter (Length 1m) 15 Way 'D' type (female) to CANbus, USB and Power Connectors		◇	ACC 9	For connecting RWT to PC via USB (Option G) or CANbus (Option H) [Also needs Digital Lead (ACC4) to connect to RWT]

RWT310/320 Series Torque Transducers – Additional related products

	Code	Remarks/Purpose
Transducer Display ETD	ETD	Display readout
AC Mains Adapter Power Supply	PSU 1	For providing 12-32Vdc
Transducer Signal Breakout Unit	SBU 1	
TorqView	TV	Torque Monitoring Software



Data parameters measured at +20°C

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When ordering a Torque Transducer please note that any torque/FSD is possible between ranges – please specify rated torque and options using the following format:

For example: RWT	311 - 15Nm -	K-CL	A 'basic' transducer with torque and speed outputs, rated and calibrated to 15Nm FSD with keyed ends, ±10v and IP65 protection.
Your transducer requirement: RWT			
Max speed (if applicable)		RPM	
Connector & Lead options		(if applicable) <i>See over</i>	
Additional related products		(if applicable) <i>See over</i>	

Glossary of terms and definitions used in this datasheet

- **Surface Acoustic Wave (SAW)** - An acoustic wave travelling along the surface of a material having some elasticity, with amplitude that typically decays exponentially with the depth of the substrate.
- **Strain dependent SAW resonators** – A type of elastic SAW device, which changes its resonant properties when it is subjected to axial strain/compression. TorqSense uses this principle, which is protected by a number of patents.
- **Incremental Electronic Scan (IES)** – The most successful and precise method for interrogating strain dependent SAW resonators. The IES interrogation method uses a processor controlled frequency synthesiser to excite the SAW resonators over a defined range of frequencies and measure the reflected signal. TorqSense uses this patented method.
- **Resolution of the IES method** - The minimum measurable number corresponding to the stress/strain sensitive resonance point of the SAW resonator. The value is limited by following the factors:
 - frequency resolution of the synthesiser, which is 1000 times greater than overall resolution of the system.
 - relationship between frequency response and resolution. Increments of the resolution will proportionally decrease the system's frequency response. TorqSense systems are optimised for the best performance that suits most applications. However, on the RWT320 series models customers do have the capability to adjust the system performance.
- **Frequency response of the IES method** – The measure of the TorqSense system's response at the output to a signal of varying frequency at its input. The frequency response is typically characterised by the magnitude of the system's response, measured in dB. There are two ways of characterising the system's frequency response:
 - 0.1dB frequency range, where the output magnitude of the signal is different to the input magnitude of the signal by not more than 0.1dB (practically absolutely identical).
 - 3dB frequency range, where the output magnitude of the signal is 0.707 of the input signal. This is a common standard for most applications, unless it specifically says otherwise. This standard is also used to characterise the TorqSense system's frequency response.
- **Accuracy** - The degree of conformity of a measured or calculated quantity, which will show the same or similar results. Accuracy of the overall TorqSense system is limited by the combined error of several factors such as linearity, hysteresis, temperature drifts and other parameters affecting measurements. If errors in the system are known or can be estimated, an overall error or uncertainty of measurement can be calculated.
- **Digital averaging** – The application of algorithms to reduce white noise. In any electronic system, electronic white noise is mixed with the signal and this noise usually limits the accuracy. To reduce the influence of white noise and increase the accuracy of the system different averaging algorithms can be applied. In the TorqSense system a flying digital averaging technique is applied to reduce the white noise commensurate with the level of accuracy required. However, as any averaging algorithm works as a low pass filter, the more averaging that is applied the lower the frequency response. Therefore, each TorqSense system should be optimised to the customer's requirements by choosing the right combination of accuracy/frequency response. Please see relevant part of the Datasheet and User Manual.

Data parameters measured at +20°C

Sensor Technology Ltd reserves the right to change specification and dimensions without notice.

RWT320/340 Transducer Control Program

Introduction

The Transducer Control Program is an all-round application to unlock the advanced functionality of the RWT320/340 Series Transducer. The Transducer Control Program enables users to exploit the flexibility of the RWT320/340 Series and to configure the transducer's parameters to better suit their application.

Users can configure many parameters affecting the Transducer, such as the Analog scaling, Analog channel data assignment, RS232 baud rate and internal data filtering.

As well as configuring the transducer, the program can also be used as a transducer readout, where almost all of the user's available data is displayed.

Transducer Requirements

- RWT320/340 series Torque Transducer. Any other model will not be recognised.
- RS232 or USB connection to a PC

PC Requirements

Operating System: Microsoft Windows 2000/XP/Vista*
 CPU: 500 MHz CPU (133 MHz Minimum).
 RAM: 128MB (64MB Minimum).
 Hard Drive Space: 10MB + 280MB for Microsoft .NET Framework runtime.

*Previous versions of Windows are not supported. The Transducer Control Program should run satisfactorily but has not been tested.

CAUTION

If planning to use a USB connection please read the USB Driver Instruction Guide before installing TorqView or Transducer Control Program.

Installation

To install the Transducer Control Program:

1. Insert the Sensor Technology Installation CD into your CD-ROM drive. The following screen will be displayed.



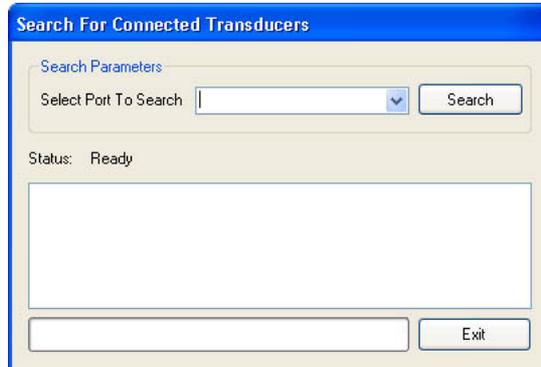
2. Click the 'Install' button opposite 'Transducer Control'.
3. Follow the guidance.
4. The Transducer Control Program will now be installed and be ready for use.

Running The Transducer Control Program & Connecting To Transducers

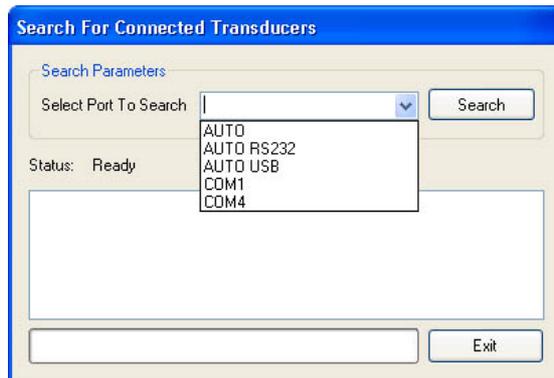
To run the Transducer Control Program and connect to a Transducer:

1. Ensure power is supplied to the Transducer(s).
2. Connect the Transducer(s) to the computer either via RS232 or USB.
3. Run the Transducer Control Program by clicking on the 'Start' button, then 'Programs' > 'Sensor Technology' > 'Transducer Control V3' > 'Transducer Control V3'.

When Transducer control starts, the 'Search For Connected Transducers' dialog box will be displayed. This aids the user in identifying what transducers are attached to the system. Before the program can be used it must identify a transducer.



Before pressing the 'Search' button, select a search filter from the 'Select Port To Search' combo box. The items in the list correspond to the default search options and ports discovered in your system. The filter reduces the time taken to search for devices, by only looking in the chosen area.



The options starting with 'AUTO', will search for multiple transducers, whereas the COMx options will search for a single transducer on a specific port.

AUTO will search for transducers connected on all ports. Use AUTO if more than one transducer is connected. Search time may be longer if multiple COM ports exist.

AUTO RS232 will search for transducers connected only on RS232 ports.

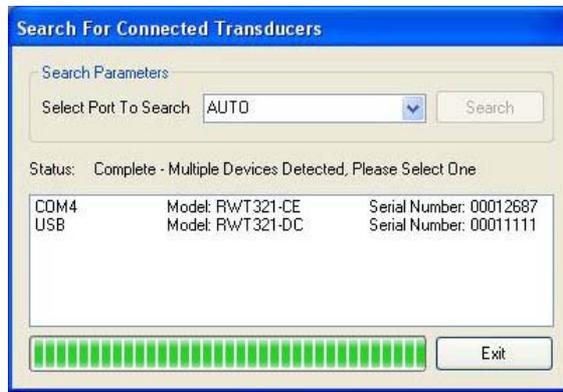
AUTO USB will search for transducers connected only on USB ports.

COM1 etc will search for transducers connected only on COM1 etc ports.

If it is known which port the transducer is connected, then select it from the list and click it.

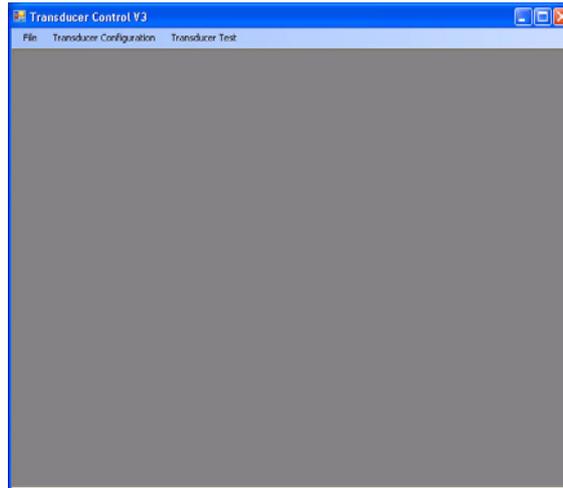
Once an option has been selected, click on the 'Search' button. Transducer Control will then detect compatible transducers using the filter supplied. During this process the window will show devices as they are found and indicate the search progress in the progress bar at the bottom of the page.

If a single transducer is detected the program will automatically initialise the transducer and load the main window. If multiple transducers are detected, the dialog box will wait until a selection is made. To select a transducer, click on the transducer from the list. The transducer will then be initialised and used by the program.

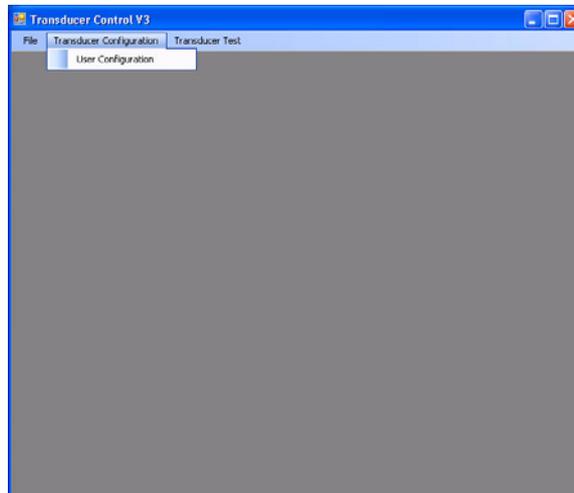


Using Transducer Control

The main screen will be displayed once a transducer has been selected.



To configure your own parameters for the transducer click on 'Transducer Configuration' and then 'User Configuration'.



Analog Setup

The 'Analog Setup' section of the configuration allows the user complete control of the Transducer's analog outputs.

All transducers have dual analog outputs with equal capability and settings available on both outputs.



Channel 1 / 2 Analog Data Select

The Analog Data select section allows the user to assign an internal data variable to the output, and select a data range to be applied to the Analog Scaling.

The following list details the available internal data variables that can be assigned to the output. Speed and Power items are dependant the relevant options being fitted:

Torque – Auto Assign

Torque value, or the Peak Torque, selection is based on the position of the external peak input (see Transducer Manual for pin out and control information). If the Peak input is switched ON, Peak Torque is selected and output, otherwise Torque is output.

Torque – Actual

The last captured torque value.

Torque – Peak

Highest torque value captured since the last reboot or reset.

Torque – Auto Reset

Peak Torque value with an auto reset capability.

Torque – Peak CW

Peak Torque value in the CW direction.

Torque – Peak CCW

Peak Torque value in the CCW direction.

Torque – Min

Lowest numerical Torque value captured.

Torque – Max

Highest numerical Torque value captured.

Speed (Fast) / Speed (Slow)

Last captured speed value.

Speed (Fast) – Peak / Speed (Slow) – Peak

Highest speed value captured since the last reboot or reset.

Speed – Rotations

Number of shaft rotations recorded from the fitted angle device or speed pickoff.

Power (Fast) / Power (Slow)

Power is computed from the last torque and speed values captured. The Slow/Fast descriptor refers to the speed value used.

Power (Fast) – Peak / Power (Slow) – Peak

Peak power is computed from the highest recorded torque (both directions) and speed value. The Slow/Fast descriptor refers to the speed value used.

Temperature – Shaft

Temperature captured from the shaft IR sensor.
Temperature – Internal
Temperature captured from the internal body sensor.

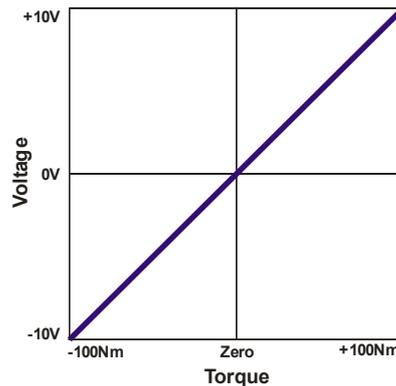
Data Ranges

The data range refers to how data from the selected internal variable is taken and rescaled by using the low and the high range values. This feature is useful for a specific measurement area and expanding the area to see a greater change in output.

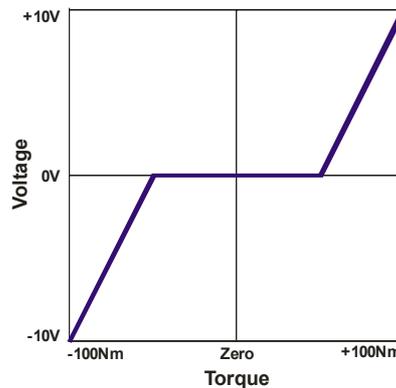
The low and the high range values effectively rescale to the Zero and FSD voltage set in the voltage scaling section. Values that fall below or above the range are masked off; the range selection applies to both negative and positive sides.

The following graphs illustrate some examples of how the range selection works.

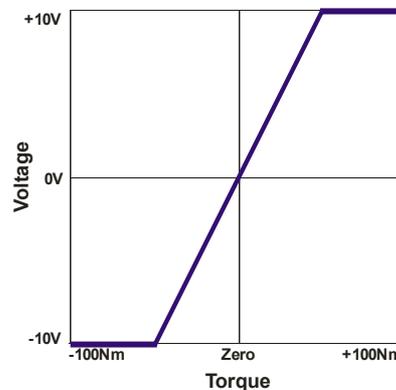
- Torque (100Nm FSD), Standard Range (0 Nm - 100 Nm), $\pm 10\text{v}$ Scale.



- Torque (100Nm FSD), User Defined Range (50 Nm - 100 Nm), $\pm 10\text{v}$ Scale.



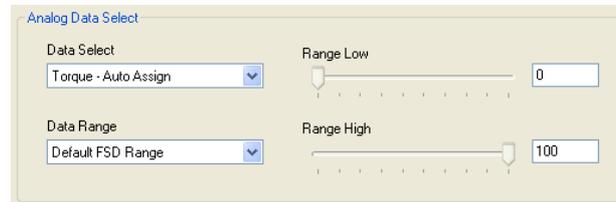
- Torque (100Nm FSD), User Defined Range (0 Nm - 50 Nm), $\pm 10\text{v}$ Scale.



Data Range

The Data Range combo box gives two options, the first, 'Default FSD Range', sets the low and high range values to the default 0 – FSD of the appropriate type. The FSD values are set by the factory, having been specified when purchased. The 'Range Low' and 'Range High' slide bars will change to reflect the range for the selected Data variable.

The second option, 'User Defined', enables users to modify the selected range. Once selected the 'Range Low' and 'Range High' slide bars will be enabled and user modifiable.



Range High / Range Low

The 'Range High' and 'Range Low' slide bars set a percentage of FSD, the current slide bar value is shown in the box to the right. The value shown is in the appropriate unit for the selected data type, i.e. Torque = Nm or the configured unit, Speed = RPM, Power = Watts.

To change the high or low range adjust the slide bar to the left or right until the number in the box equals the desired value. The difference between the high or low range must be greater than 10%.

Range Effects On Resolution

The range selection will in no way effect the resolution of the transducer. The value expansion is artificial and aids only to give the user a greater change in measured value.

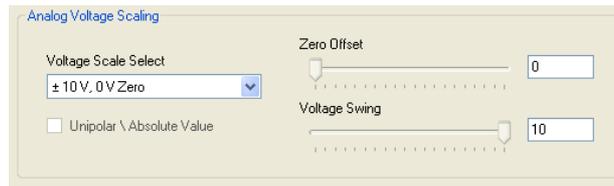
Analog Voltage Scaling

The Analog scaling section allows users to define how the data and range selected are scaled on the Analog output.

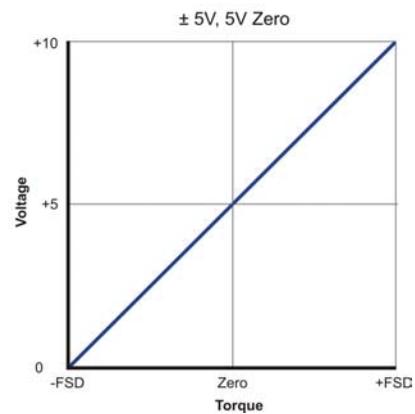
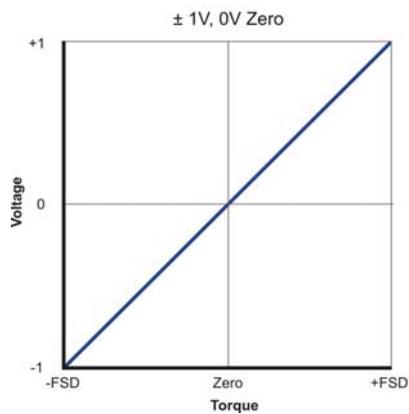
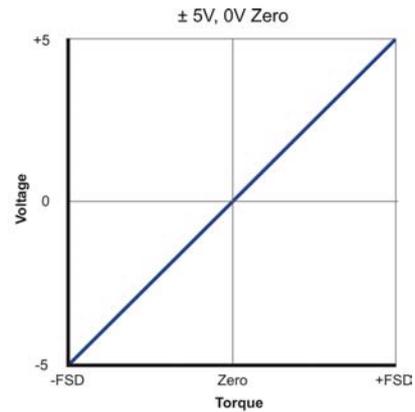
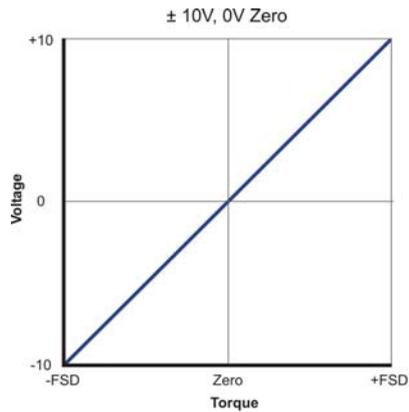
Users can either select from a list of common predefined scales or select a custom scale using the slide bar adjustments.

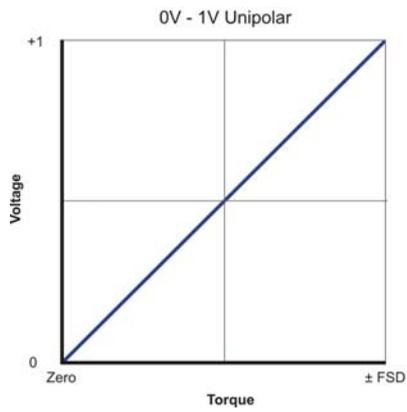
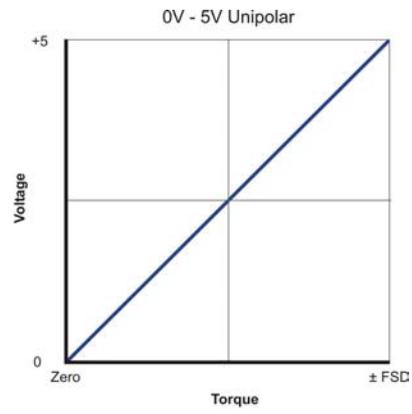
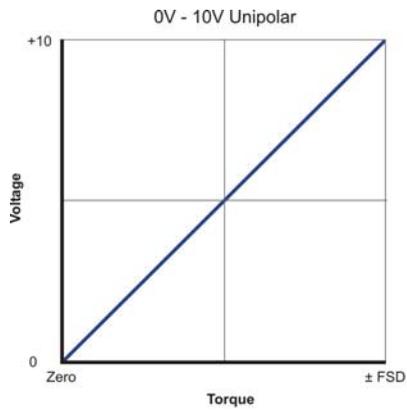
Voltage Scale Select

The 'Voltage Scale Select' combo box lists the available predefined scales and user select modes. When a selection is made the slide bars will adjust to reflect the selection and illustrate the scaling.

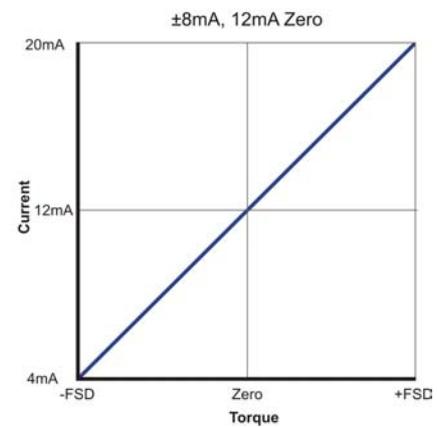
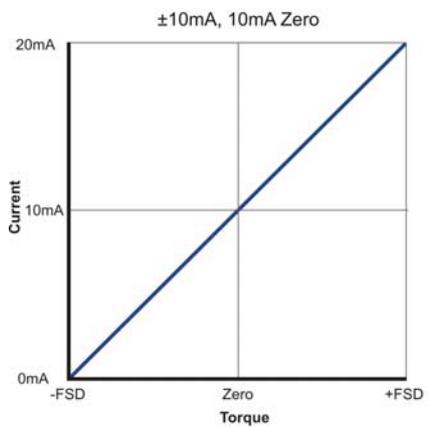
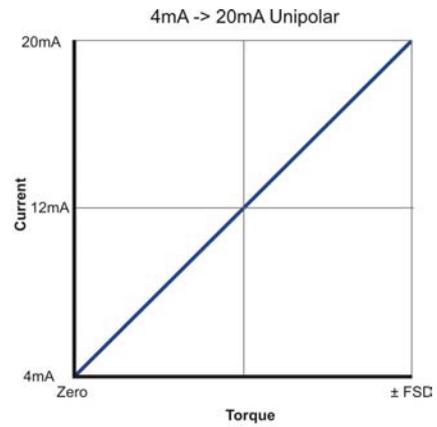
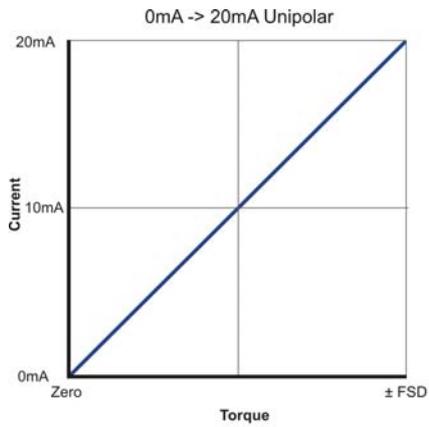


The following graphs illustrate the predefined scales that are available. The graphs are scaled against Torque with a standard 0 – FSD Range.





(Current settings only available with option 'F' - Current Output.)



User Defined Voltage

The 'User Defined Voltage' option selection allows users to customise the voltage scaling. Once selected the 'Zero Offset' and 'Voltage Swing' slide bars will be enabled and user adjustable. The box to the right of the respective slide bar will reflect the current voltage selection.

To change the 'Zero Offset' or 'Voltage Swing' adjust the slide bar to the left or right until the number in the box equals the desired value.

Zero offset

The 'Zero Offset' allows the user to change the zero point voltage between 0 and +9.5v. As the 'Zero Offset' is increased, the 'Voltage Swing' will be adjusted. It is not possible to exceed the +10v output.

This feature is useful if users have an Analog capture device that does not support negative voltages (unipolar only), but requires to know the direction of torque.

Voltage Swing

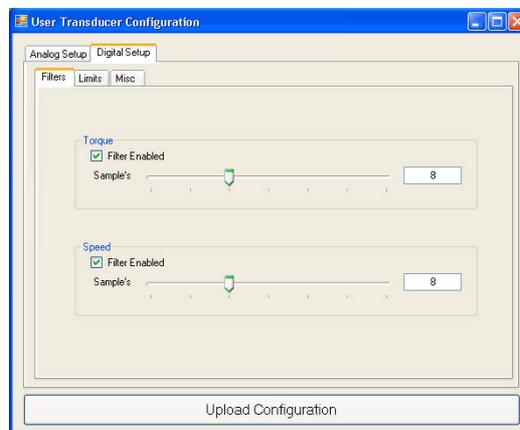
The 'Voltage Swing' sets the Full Scale voltage of the Analog output. The Voltage can be stepped in 0.1v increments and can be scaled between +0.5v and +10v. The maximum voltage will be restricted if the Zero Offset has been changed from 0v.

Unipolar / Absolute value

The "Unipolar / Absolute value" checkbox sets the Analog output to a positive only voltage. All input values will be made absolute, so all negative input values will be made positive, i.e. -5Nm value will become +5Nm. This has the effect of removing the torque direction from the voltage output.

Digital Setup

The 'Digital Setup' section of the configuration allows the user complete control of the Transducer's digital outputs.



Filters

The torque and speed filters provides data smoothing for conditions where there may be erratic torque and speed readings. The filters also affect all internal data, so Analog and Digital data will be smoothed.

The filtering algorithms can be enabled, disabled and adjusted via digital commands sent via the RS232 and USB. This enables the user to change the filtering characteristics of the transducer as required.

Limits

The 'Limits' process built into the transducer will trigger an output when a specific condition occurs. This output can be used to shut down machines should a condition be met.

The 'Limits' section sets up the parameters and trigger limits for the transducer.

To enable/disable the 'Limits' section click on the 'Enable Limits' checkbox.

Channel Select

The 'Channel Select' options allow users to select which data is monitored against the given conditions.

Output Mode

The 'Output Mode' options allow users to set the output state when a trigger is met.

Active High

Output state is high on triggered, low when not.

Active Low

Output state is low on triggered, high when not.

Low / High Limits

The 'Low' and 'High' limits set the trigger conditions for the limit signal output; the 'Low' and 'High' conditions can be used together or singularly. Adjust the condition value by adjusting the slide bars until the required value is shown in the box to the right. The slide bar scale is – FSD to +FSD for Torque, and 0 to FSD for Speed.

Samples Required Before Trigger

The 'Samples Required Before Trigger' sets the number of continuous samples that need to exceed condition before the output is triggered.

The screenshot shows a software window titled 'Limits' with three tabs: 'Filters', 'Limits', and 'Misc'. The 'Limits' tab is active. Inside the window, there are three main sections:

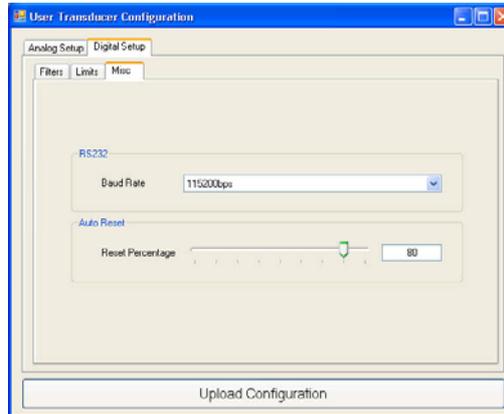
- Enable Limits:** A checkbox that is checked.
- Channel Select:** Three radio button options: 'Torque' (selected), 'Speed (Fast)', and 'Speed (Slow)'.
- Output Mode:** Two radio button options: 'Active High' (selected) and 'Active Low'.

Below these sections are two limit settings:

- Low:** A checked checkbox, a horizontal slider bar, and a text box containing '-100'.
- High:** A checked checkbox, a horizontal slider bar, and a text box containing '100'.

At the bottom, there is a 'Samples Required Before Trigger' section with a horizontal slider bar and a text box containing '0'.

Misc



RS232

The RS232 settings effect how the transducer communicates with this program (if connected via RS232) as well as other devices that utilise the Transducer protocol to extract data.

Baud Rate

There are three different speed settings that the transducers RS232 link can be configured to run. It is suggested that the fastest setting is used, as lowering the speed may affect the samples per second that can be captured.

However, some systems, especially embedded devices, may not be able to generate high baud rates. Long cable lengths may also cause problems with high baud rates. For these reasons three speed settings (Low, Middle and High) are available which should cater for all requirements.

The following baud rates are available. To change/select the speed, click on the combo box and select the desired setting.

- 9600bps
- 38400bps
- 115200bps

Auto Reset Point

The 'Auto Reset Point' configures the percentage at which the Peak Torque resets when using Peak Torque Auto Reset mode. The percentage value can be set between 5% and 95%. To change the values adjust the slider or type into the Text box.

Update Transducer

The 'Update Transducer' button will upload the settings to the Transducer. Before doing so check all data is validated and correct as this will cause the transducer to malfunction. If an error is detected a message will be displayed indicating the fault.

If all tests pass the validation a progress bar will be displayed to show the progress of the upload process, a message will be shown to indicate 'Success' or 'Fail'.

Transducer Test Output monitor

Click on 'Transducer Test' and then click on 'Output Monitor'. The 'Output Monitor' displays all the data coming out of the transducer. Zero's can also be applied to the data and peaks can be zeroed using this page.

The 'Min' and 'Max' torque variables are used to indicate extents at which the torque is changing and shows the band in which the transducer operating.

The screenshot shows the 'Output Monitor' software interface with the following data fields and controls:

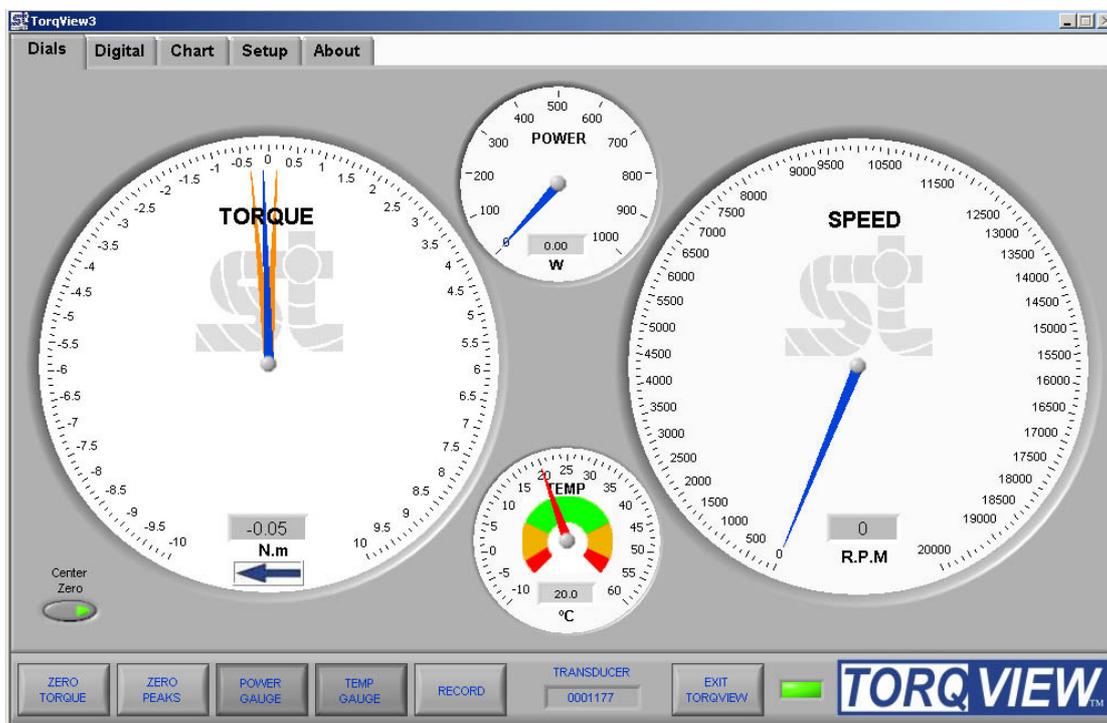
- Torque Values:**
 - Current: -0000.05 (Buttons: Zero, AV Zero)
 - Peak: +0000.20 (Button: Reset Peaks)
 - Peak CCW: -0000.15
 - Peak CW: +0000.20
 - Peak Auto Reset: -0000.05
 - Min: -0000.15
 - Max: +0000.20
- Speed Values:**
 - Fast: Current 000000, Peak 000000 (Button: R)
 - Slow: Current 000000, Peak 000000 (Button: R)
- Angle:**
 - Rotations: 0
 - Degrees: 0
- Temperature Values:**
 - Ambient: 20
 - Shaft: 20
- Power Values:**

	Speed - Fast Capture Current	Speed - Fast Capture Peak	Speed - Slow Capture Current	Speed - Slow Capture Peak
Watts	0000.00	0000.00	0000.00	0000.00
HP	0000.00	0000.00	0000.00	0000.00

TORQVIEW™

Version 3

USER MANUAL



TorqView3 Software

TorqView, version3, can be installed as a Demo (if a full program has not yet been purchased) and as a Full purchased program. The demo program allows for 10 hours use and all functions are available except the save to file function.

If TorqView was purchased with the transducer, the transducer will be enabled to run TorqView. If TorqView was purchased at a later date then an activation key is required to convert the program from Demo to Full. The factory will send the activation key and details of how to convert are on the About Screen towards the end of this manual.

Recommended minimum system requirements

Sensor Technology recommends a PC running Windows 2000, XP or Vista with a minimum of 256 MB of RAM; a minimum screen resolution of 1024 x 768 pixels; a Pentium III, Celeron 600MHz or equivalent processor; and a minimum of 200MB free disk space.

CAUTION

If planning to use a USB connection please read the USB Driver Instruction Guide before installing TorqView or Transducer Control Program.

Installing TorqView

Step 1: Insert the TorqView installation CD into any CD drive. The program will auto run and display the following screen:



Step 2: Click on the 'Install' button opposite TorqView.

Step 3: Follow the guidance.

Step 4: On completion TorqView is ready to run.

The default install directory is C:\Program Files\Sensor Technology\TorqView3\Torqview3.exe

Running TorqView

To avoid any communication errors it is advised that all torque transducer cables and leads are correctly plugged in and the instrument is turned on before running TorqView.

TorqView can be run from:- Start - Programs - Sensor Technology – TorqView3. A shortcut can also be found in the Start Bar menu.



When TorqView starts a screen will be displayed to enable users to select which port the transducer is connected to.



Click on the left hand side drop down menu to show all available ports found on the computer.

AUTO will search for transducers connected on all ports. Use AUTO if more than one transducer is connected.

AUTO RS232 will search for transducers connected only on RS232 ports.

AUTO USB will search for transducers connected only on USB ports.

COM1 etc.. will search for transducers connected only on COM1 etc ports.

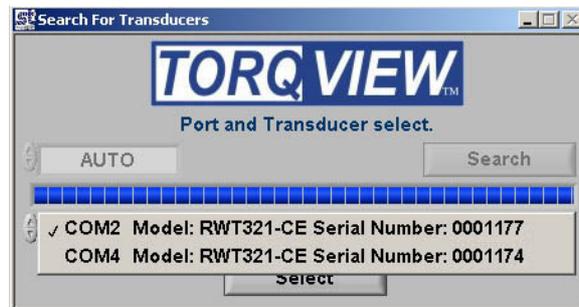
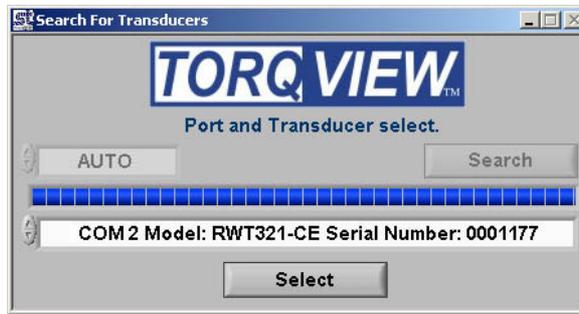
If it is known which port the transducer is connected, then select it from the list and click it.



Next, click on the 'Search' button. TorqView will now search for transducers connected on the selected port.



A 'Searching' text will flash blue and an indicator will show the progress. This may take a few minutes depending on the number of ports. When the transducer connected to its port has been found, it will be displayed in a drop down menu. If more than one transducer has been found it will display all of them in a drop down menu. Select which transducer to use.



The selected transducer will now be connected and the 'Search For Transducers' screen will disappear and be replaced by the Dials Screen.

See the Setup Screen for more information on how to change between transducers when using TorqView. For ease of use, the next time TorqView is run it will default to the previously selected port a transducer was connected.

TorqView Function Bar

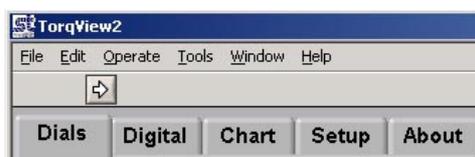
The TorqView Function Bar, located at the bottom of all the screens, shows all the relevant TorqView buttons. The LED, illuminates green when connected to show that the transducer is working correctly. If any warnings or errors occur with the transducer while running TorqView, the LED will change its colour from Green to Yellow (Warning) or to Red (Error). To diagnose the warning or error see the About Screen to diagnose.



The Function Bar also shows the serial number of the currently active transducer. If two transducers are connected they can be changed using the Setup Screen.

Click "EXIT TORQVIEW" to exit the program. Choose, "Shutdown" to close the program or "Standby" to disconnect the transducer and leave the screen showing so the program can be run again.

To run the program from "Standby", click on the white arrow button at the top left hand corner of the screen.



Click "ZERO TORQUE" to zero the torque value. Care should be taken when using the "ZERO TORQUE" function because an offset could be created if there is any torque already applied.

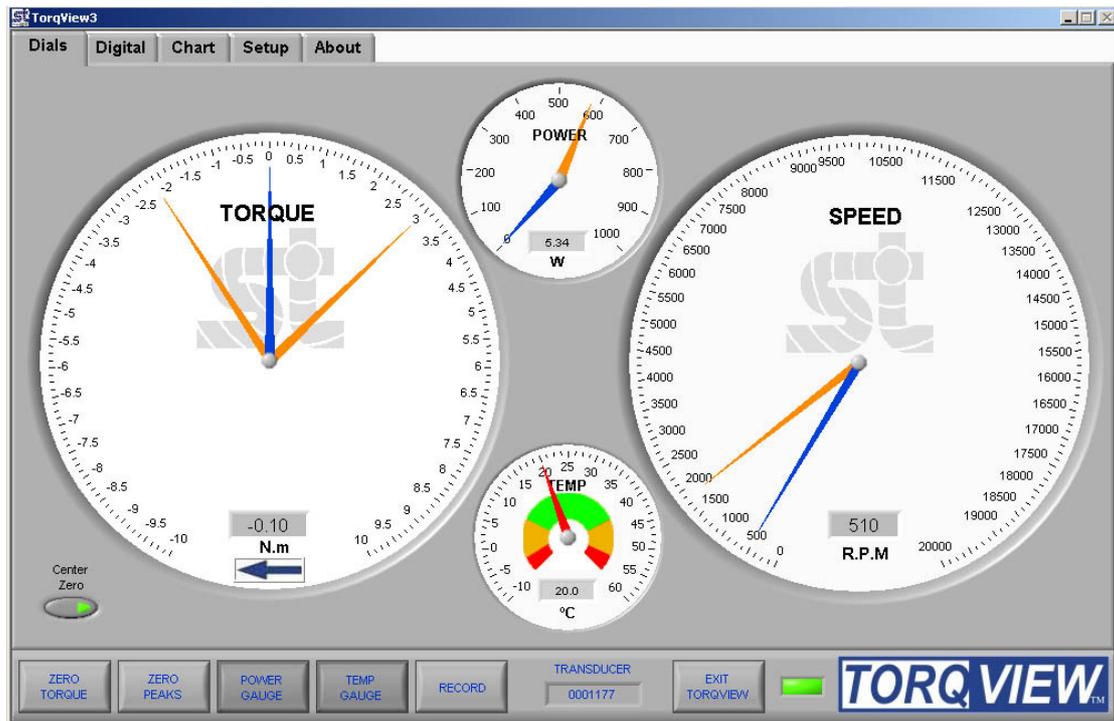
Click "ZERO PEAKS" to zero the peaks of the Torque, Speed and Power values.

Click "POWER GAUGE" and "TEMP GAUGE" to select power and shaft temperature dials.

Click "RECORD" to start recording data. (See Setup Screen for details on how to set parameters and record/save a file).

Function buttons will change to a darker grey when switched on.

Dials Screen



The Dials Screen is the main TorqView screen and displays torque, speed, power and temperature.

The torque dial is automatically scaled to the FSD of the connected transducer. Units and full scale are displayed on the dial and can be user configured via the Setup Screen.

The torque dial can be set to display Center Zero (zero at the top centre) or Normal (zero at bottom). The blue needle displays the torque applied value.

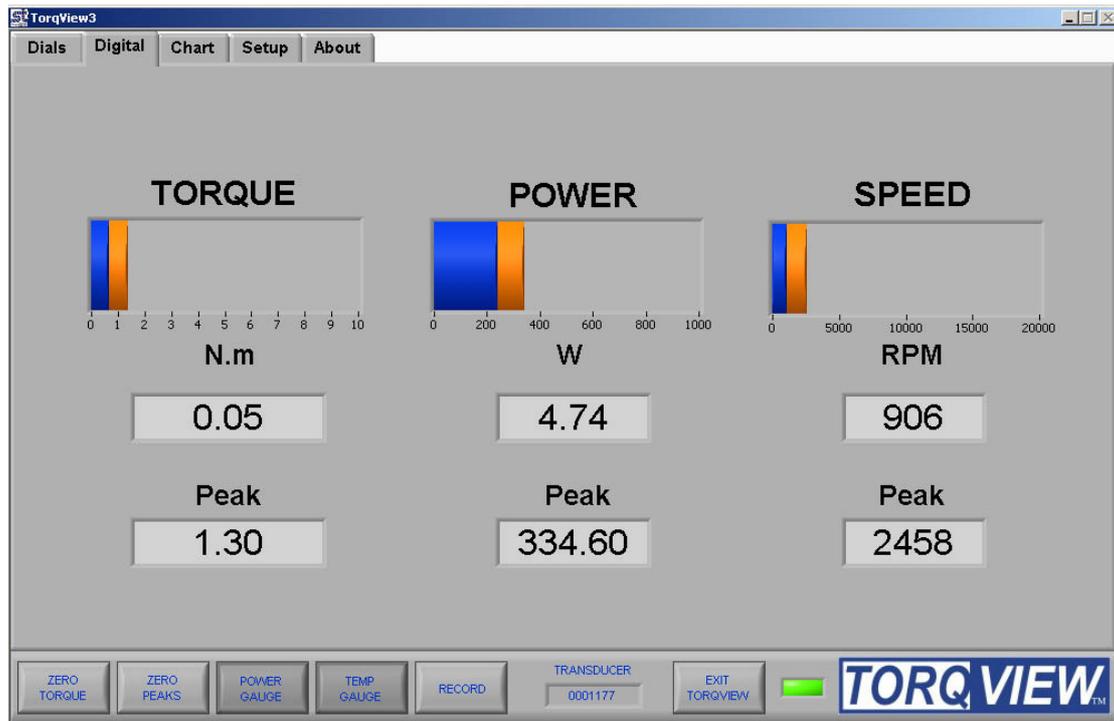
Peak Torque is displayed in two ways. If the dial is in Center Zero mode, orange needles will display the peak value for both the CC and CCW directions. If the dial is in Normal mode one orange needle will display the highest peak from either the CC or CCW direction.

The Speed dial scale is automatically adjusted depending on the value, e.g. if the speed rises above 1000 rpm, the scale will auto adjust to 5000 rpm. The blue needle displays actual speed values whereas the orange needle displays the peak speed value.

The Temp dial displays the temperature inside the transducer. See the Data sheet for limitations.

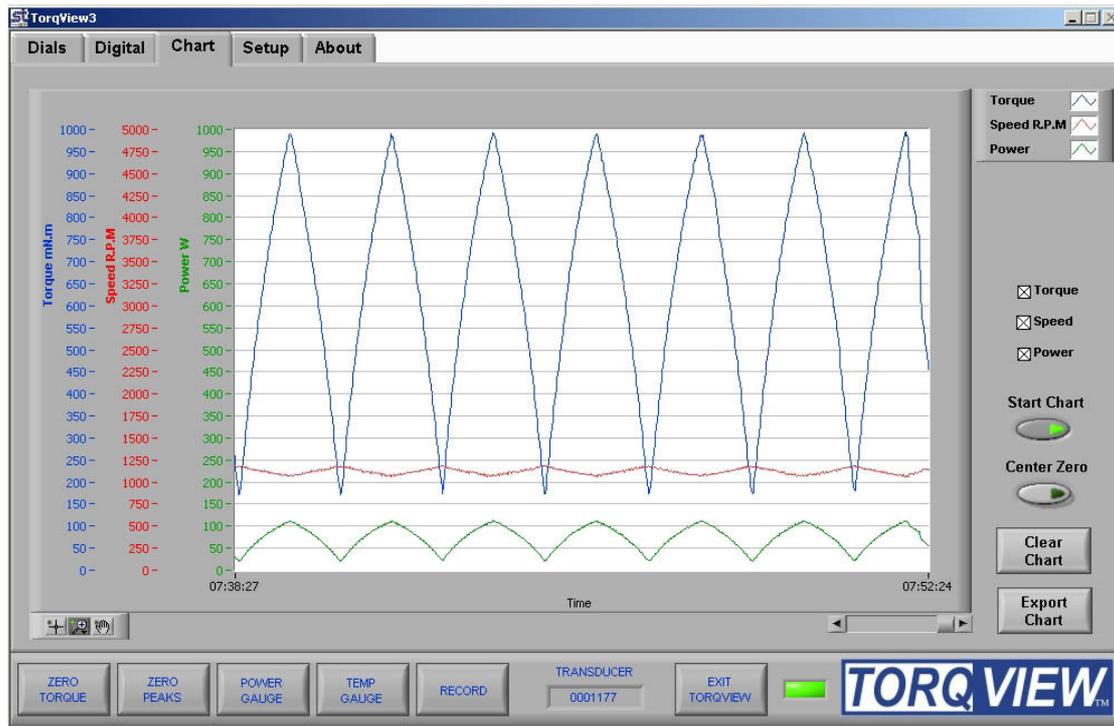
The Power dial displays the power as a function of the torque and speed applied.

Digital Screen



The Digital Screen displays the same data, less temperature, as the Dials Screen but as digital bars. The blue coloured bar displays the actual data, whereas the orange coloured bar, as an underlay of the blue coloured bar, displays peak value. Actual and Peak values are also displayed as numeric values under the coloured display bars.

Chart Screen



The Chart Screen displays the data onto a chart. Scales are automatically set at initialisation or user set via the Setup Screen.

Check the Torque, Speed, Power boxes to select which channels to display. Any combination is possible. Only the selected channel scales will be visible.

The "Start Chart" button starts and stops the chart with the green light illuminated to indicate that the chart has started and no light illuminated to indicate that the chart has stopped. With the chart is stopped, the horizontal slider can be used to analyse the data.

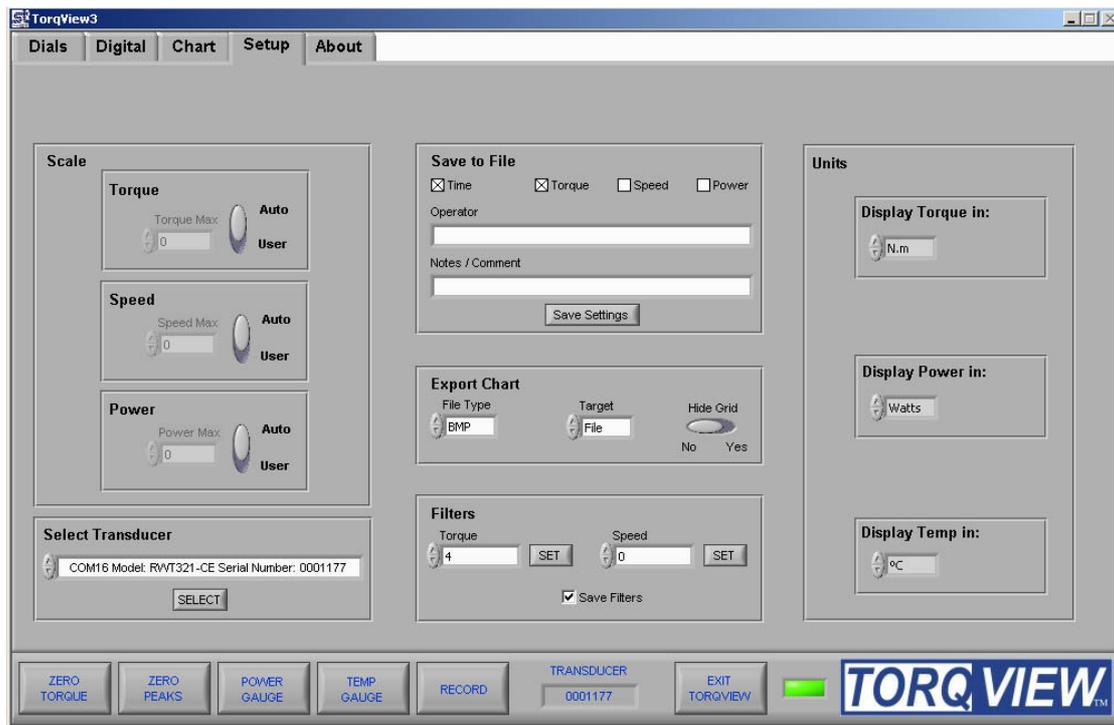
The "Clear Chart" button deletes data from the chart.

The "Center Zero" button allows the torque chart go through zero to show bi-polar torque.

Zoom tools are available at the bottom left of the chart.

The "Export Chart" button allows the chart's current data to be exported as several picture formats or to the clipboard. These settings are adjustable on the Setup Screen. Use the Zoom tools to export a specific section of the chart.

Setup Screen



The Setup Screen is used to select the scales and units displayed on other screens as well as to select other options.

Scale: The Scale section has functions to override the default Torque, Speed and Power scales. To change the scale, toggle the Auto/User button to User and enter the scale by typing or toggling the "Torque", "Speed" and Power.

Units: The Units section has functions to select the units displayed on other screens by clicking the drop downs. Changes between different units of Torque, Power and Temperature Eg: Nm to lbf.in are possible.

Save to file: (not available on the Demo program) The Save to File section has functions to record the selected data into a text file. The channels to be recorded are selected by using the check boxes. There is also the option to add an operators name, notes or comments. These details will form the header of the text file containing the date, serial number of the active transducer and, if applicable, the operator and comments. Once these details are entered, click 'Save Settings'. Chose the destination of the file and its name. Next, click "RECORD" on the TorqView Function Bar to start recording data to the specified text file. Note: ***SAVE SETTINGS' BUTTON MUST BE CLICKED BEFORE CLICKING 'RECORD'.***

To view saved files, double click file at saved destination. The file will open in 'Notepad' or a related text viewer. Data will be displayed in columns in the order of the boxes checked. E.g. if Torque and Power are checked then Torque will be column 1.

Export Chart: The Export Chart section has functions to setup which file type to export the picture of the chart, whether to save it as a file or copy it to the clipboard. It also enables grid lines to be selected.

Filters: The Filters section has functions to smooth any erratic data. The frequency response will reduce depending on the filter factor. Check 'Save Filters' to store the filter value in the transducer so that it can be remembered after a power cycle. If 'Save Filters' is unchecked when 'SET' button is pressed then the value will return to the last saved value after a power cycle.

Select Transducer: If more than one transducer is connected, select one from the drop down menu and click on 'Select' for it to be active and connected.

About Screen



The About Screen displays the TorqView version and whether it is a Demo or Full program. The Demo program will display how many minutes remain. Both programs will also display the Serial No. of the active transducer, the date of its last calibration, its manufactured date the firmware version and the Transducer Status Lights diagnostic box.

Convert to Full program: To convert the program from Demo to Full, enter an Activation key (supplied at a later date only on purchase of a full program) in the box and the press the 'Activate' button. Next exit TorqView and restart the program.

Factory default reset: If a factory default reset (details in User Manual) has been carried out and TorqView was purchased with the transducer then TorqView reactivation is not required. However, if a factory default reset has been carried out and TorqView was purchased at a later date then reactivation is required.



Transducer Status Lights: The rectangular transducer status lights box illuminates appropriate lights to enable diagnostics. An appropriate 'Warnings' light will illuminate if the TorqView Function Bar LED changes colour from Green to Yellow. Likewise, an appropriate 'Errors' light will illuminate if the TorqView Function Bar LED changes colour from Green to Red.

If, while using TorqView on the other screens, the TorqView Function Bar LED changes colour from Green to Yellow or from Green to Red, then always refer to the About Screen and, in particular, the Transducer Status Lights for more information. See the table below for an interpretation and possible actions.

Transducer Status Lights - Interpretation and actions:

Mode	Warnings	Errors
<p>Peak mode One of the peak options has been selected in either the transducer control software or by using the analog lead contact closure on pin 8.</p> <p>Analog Scaling The full scale of the analog out has been changed to a user-selected scale in the transducer control program.</p>	<p>Analog Fault CH0 In voltage output mode the analog output pin is short circuit, in current output mode the analog output pin is open circuit. Check the analog connector wiring on Channel 0.</p> <p>Analog Fault CH1 In voltage output mode the analog output pin is short circuit, in current output mode the analog output pin is open circuit. Check the analog connector wiring on Channel 1.</p> <p>Zero Offset High There may be an offset applied to the current torque applied value because the 'Zero Peaks' has been pressed while torque, greater than 10% of the fsd, has been applied.</p> <p>Exceeded temp Shaft temperature has exceeded normal operating conditions. Temperature compensation may no longer effective or calibration valid.</p> <p>Over torque Torque has been applied greater than the specified FSD.</p> <p>Critical over torque Torque has been applied greater than 120% of the FSD. Contact factory if warning continues.</p>	<p>Capture Board The DSP has failed to initialise. Power cycle the transducer. Contact factory if error continues.</p> <p>SAWS A SAW device has failed. Contact factory if error continues.</p> <p>Irregular Voltage One or more of the internal voltages is not within specification. Check the input power supply is within specification of the data sheet. Contact factory if error continues.</p> <p>Failed Temp sensor The infrared temperature sensor has failed. Temperature compensation is ineffective. Contact factory if error continues.</p>

Additional Information

There is no requirement to install LabVIEW because TorqView is a self-running executable file.

However, if LabVIEW is installed and there is a requirement to make unique programs or allow TorqView to communicate with other LabVIEW programmes, VI's are available from Sensor Technology on the website www.sensors.co.uk at: <http://sensors.co.uk/products/pages/labvi.html>