

# Datum Electronics

## RS425 Bearingless Torque Sensor User Guide



# Items Supplied

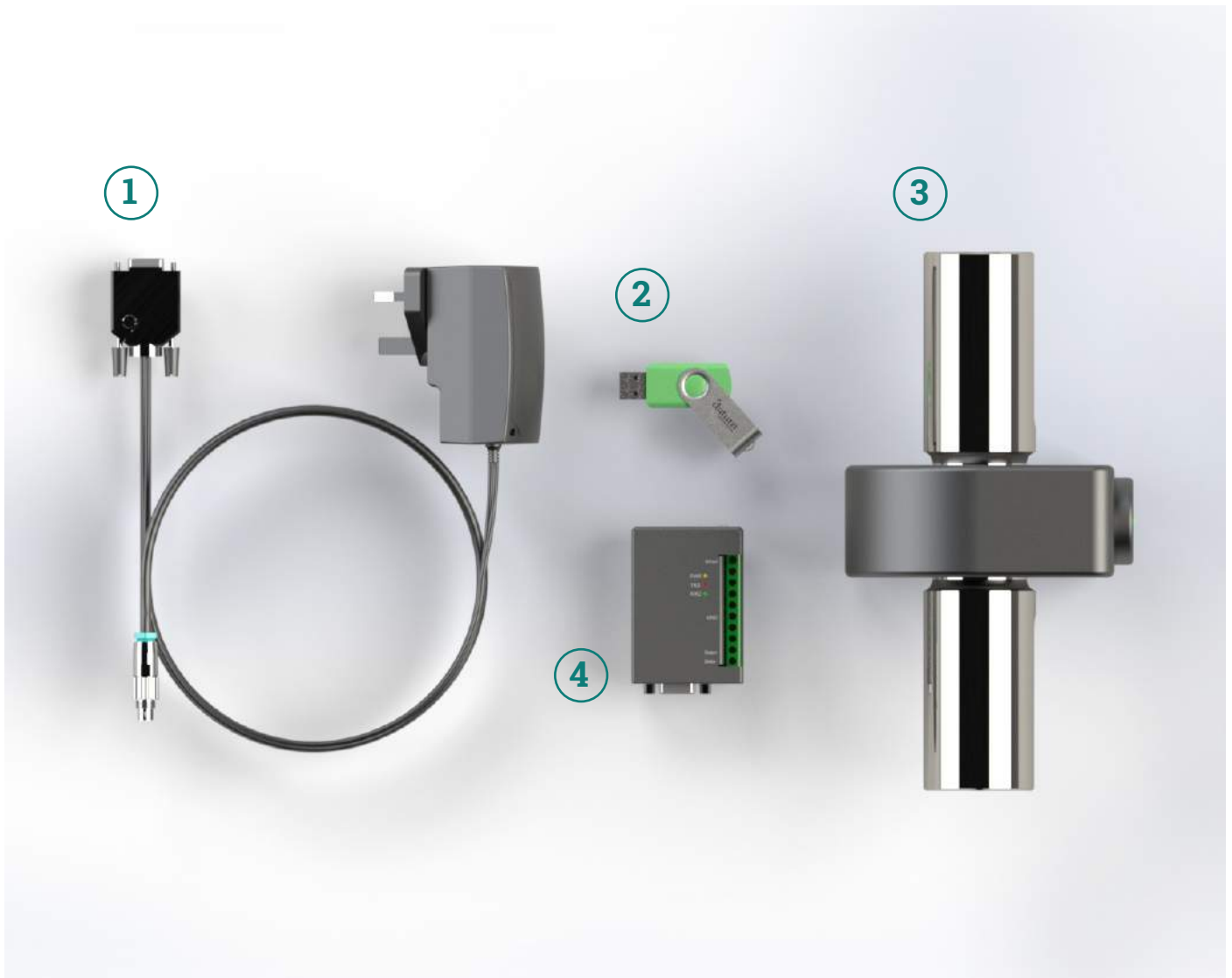
## RS425 Torque Transducer with DUI



- 1 USB Memory Stick with Software and User Guides
- 2 Datum Universal Interface (DUI)
- 3 USB A to USB Mini B Lead
- 4 DUI Power Supply
- 5 RS485 DUI to Transducer Lead
- 6 RS425 Torque Transducer
- + Certificates of Calibration

# Items Supplied

## RS425 Torque Transducer without DUI



- 1 RS485 Transducer Lead with Power Breakout
  - 2 USB Memory Stick with Software and User Guides
  - 3 RS425 Torque Transducer
  - 4 RS485 Serial to USB Adaptor with USB Type A to B Lead (in the Adaptor Box)
- + Certificates of Calibration

## Familiarisation with Equipment

Prior to Installation it is recommended that the transducer and any optional equipment is first set up on a bench.

Once the transducer is connected to an interface display it is possible to apply a small amount of torque by hand, rotate the transducer and observe these changes on the interface display.

When fitting rotor I the stator observe the orientation marks.

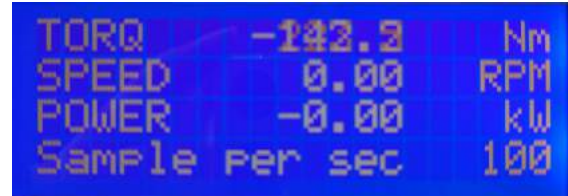
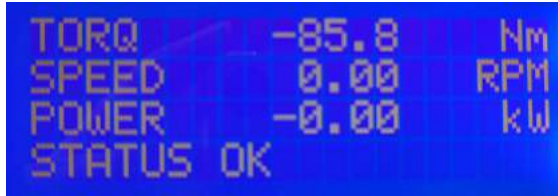
## Connecting the RS425 Transducer to a Datum Universal Interface (DUI)

Connect the transducer to the DUI, using the DUI to transducer lead and power on the DUI. The DUI will power the transducer, so no additional power supply is necessary.

When first powered on the DUI may display very high readings, these will slowly drop to zero.



When connected, the bottom line of the DUI display will alternate between 'STATUS OK' and, 'Sample per sec 100', as shown below.



Initially, when first connected there may be a small torque offset, which is normal and can be removed by holding the zero button on the rear of the DUI for 3 seconds, while observing the countdown on the display.

For more details about the DUI, including PC connection, please refer to the DUI and DUI config software user guides.

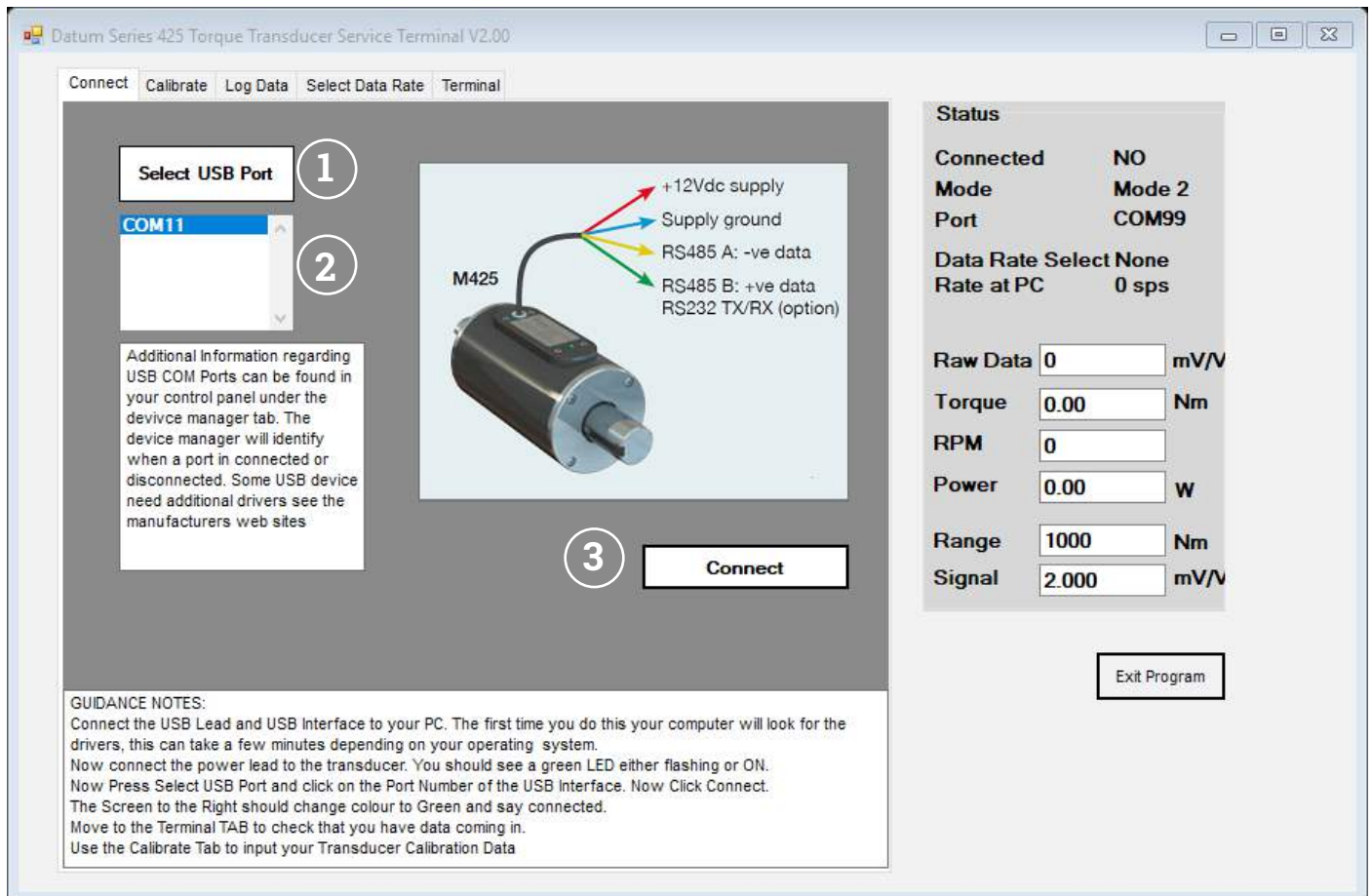
## Connecting the RS425 Transducer directly to a PC without a DUI

Wire the transducer to the PC via an RS485 Serial to USB adaptor, using the power breakout cable supplied and power on.



The free of charge, Datum Service Terminal software is provided for diagnostic and familiarisation purposes. It is recommended that the user create their own interface when using a 425 series transducer without the DUI. The transducer output protocol is provided on page 13.

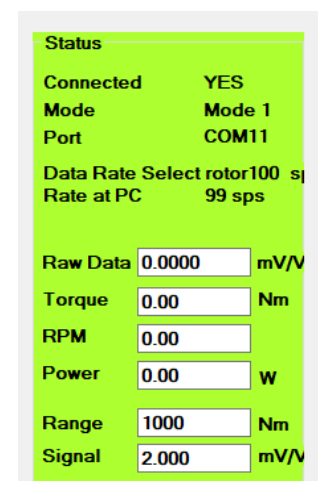
To connect to the transducer using the free software Datum Service Terminal, open Datum Service Terminal. For installation instructions please see the Datum Service Terminal User Guide.



1. Click on select USB Port
2. Select the correct COM port
3. Click on connect

The status area should now change as shown to the right. There may be a small offset in the Raw Data mV/V and torque output, this is normal and should match the raw mV/V at 0 Nm on the calibration certificate provided.

The software does not remove the zero offset, it will, therefore need to be calculated out during analysis. For Installation information and details about setting up the software to display the correctly calibrated torque, please refer to the Datum Service Terminal User Guide.



For any queries at this stage please refer to the Frequently Asked Questions section or email [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

## Installation Overview

In order to correctly transmit power and suitably protect the Datum Torque transducer, an appropriate coupling is required. Such a coupling can limit the effects of vibrations, misalignment and overloads. Sequentially, this can increase service intervals, reduce downtime and, save money.

The primary consideration when choosing a suitable coupling should be its torque rating. It must be ensured that the chosen coupling can withstand the expected torque load, including any anticipated overloads. Where dynamic torque measurement is required e.g. rapid variations in torque levels are to be observed, couplings that exhibit high torsional rigidity are required.

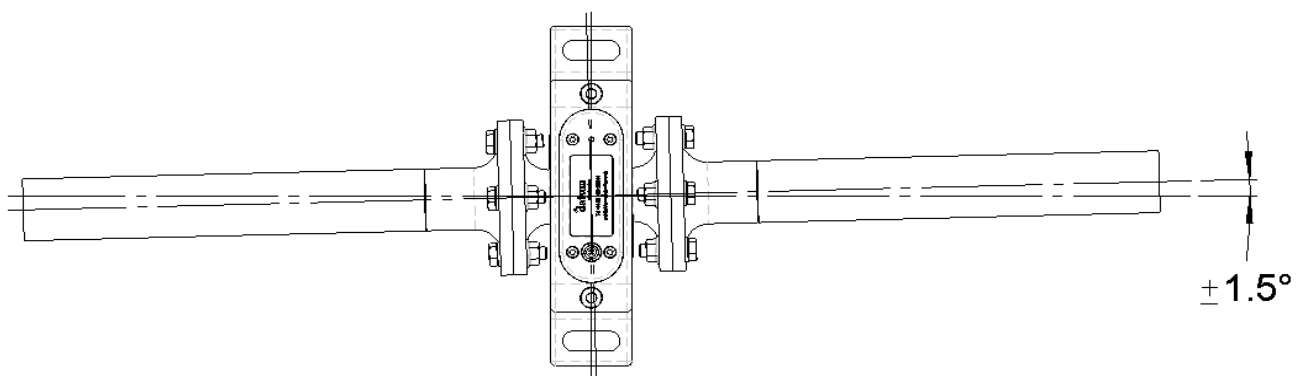
Where static torque measurement is required e.g. only average torque levels are to be observed, a coupling with a level of compliance would be more suitable.

Where a transducer is to be used at the upper ends of its respective speed range, couplings with a low moment of inertia must be selected.

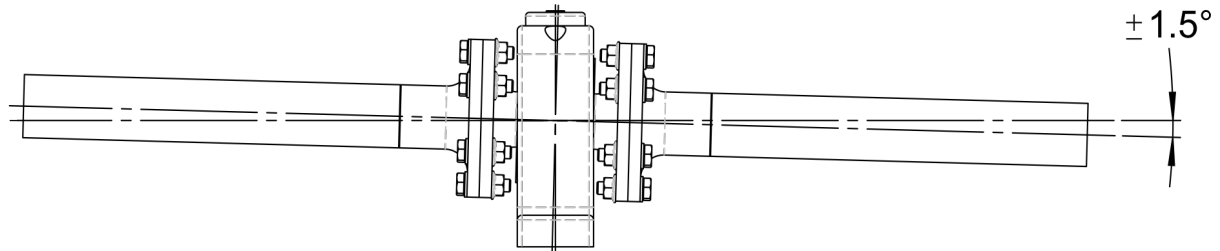
Along with expected torque and speeds, misalignment (see below) within a rig must also be considered when selecting appropriate couplings. Ideally such misalignments should be kept to an absolute minimum.

Due to their bearing-less designs the RS425 and FF425 transducers are tolerant a moderate amount of misalignment, see below.

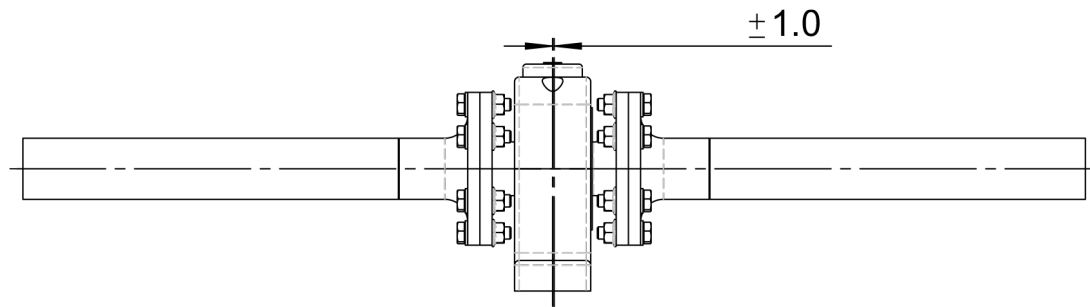
### Angular Horizontal



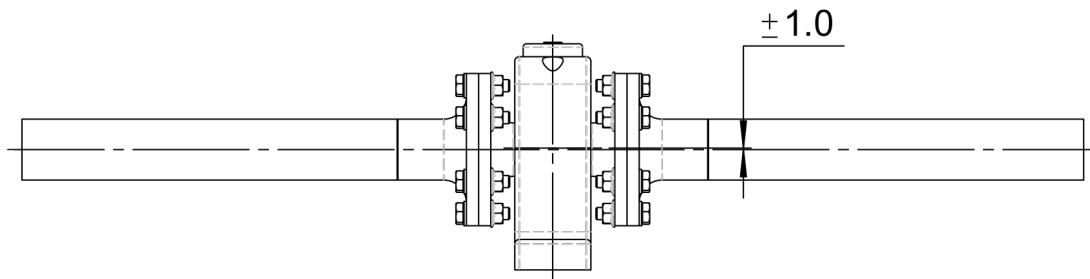
## Angular Vertical



## Parallel Horizontal



## Parallel Vertical





# Calibration Overview

For accuracy, the 425 series transducers are calibrated statically and then subject to a separate RPM test. Prior to calibration, the transducer is exercised to 80%-110% of full load at least three times in each direction. During calibration loads are applied in increments from zero to the maximum rating of the transducer.

## Data shown on the Certificate of Calibration

Please see the example certificate on the next two pages.

- 1) Equipment used to calibrate the transducer
- 2) Calibration date and recommended re-calibration date based on average usage. If the transducer is often used at its highest rating, earlier re-calibration is recommended.
- 3) A table of the load applied against the output
  - a) For size 1 transducers the load applied is shown as weight (g or Kg) and Nm. For all other sizes load applied is shown as Ft Lb and Nm
  - b) Raw mV/V output is the transducer output, including any offset
  - c) Normalised mV/V is the transducer output, with any offset removed
- 4) Torque Calibration Values. The clockwise torque calibration values are used to calculate the torque in Nm from the transducer output. This will be set in the DUI if supplied but will need to be entered into other display interfaces.

# Certificate of Calibration

<b>CERTIFICATE OF CALIBRATION</b>	
<b>Serial Number:</b> 135790	<b>Date Issued:</b> 12/5/2017



Datum Electronics Limited  
 Castle Street  
 East Cowes  
 Isle of Wight, PO32 6EZ

Tel: 01983 282834  
 Fax: 01983 282835  
 Email: [web@datum-electronics.co.uk](mailto:web@datum-electronics.co.uk)  
 Web: [www.datum-electronics.co.uk](http://www.datum-electronics.co.uk)

---

<b>Client:</b>	Datum Electronics
<b>Order Reference:</b>	P1234
<b>Date of Calibration:</b>	12/5/2017
<b>Recommended Re-Calibration:</b>	12/5/2018
<b>Calibration Temperature: (°C)</b>	22.8

1

Calibration Equipment	Serial Number
Torque Beam Rig - Calibration Arm Rig	BHC 1846
Weights - Calibrated to M1 by Blake & Boughton	Cert 19663

2

Items Calibrated	Serial Number
5104-400601A - M425 S1 0-10Nm	135790

The Item detailed has been calibrated in accordance with the relevant instruction as laid down by Datum Electronics Ltd. Calibration is normally recommended on an annual basis depending on the application in order for sustained and accurate measurement. All calibrations undertaken by Datum Electronics fully adhere to the industry Standard BS7882. Your Calibration Certificate includes a recommended re-calibration date.

Calibration completed on behalf of Datum Electronics LTD: \_\_\_\_\_

Calibration approved on behalf of Datum Electronics LTD: \_\_\_\_\_

QL0020-Issue 2

# Certificate of Calibration

<b>CERTIFICATE OF CALIBRATION</b>	
Serial Number: 135790	Date Issued: 12/5/2017



## Torque Calibration - Clockwise (CW)

3c

3a

Load Information		Clockwise Torque Calibration		
Weight Applied (grams)	Load Applied (Nm)	CW Calibration (Raw mV/V)	CW Calibration (Normalised mV/V)	CW Non-Linearity (%FSD)
0	0.000	0.001	0.000	0.00%
200	0.981	0.200	0.199	-0.04%
400	1.962	0.400	0.399	-0.04%
600	2.943	0.600	0.599	-0.03%
800	3.924	0.800	0.799	-0.03%
1000	4.906	1.000	0.999	-0.02%
1200	5.887	1.200	1.199	-0.02%
1400	6.868	1.400	1.399	-0.01%
1600	7.849	1.600	1.599	-0.01%
1800	8.830	1.800	1.799	0.00%
2000	9.811	2.000	1.999	0.00%

## Torque Calibration - Counter Clockwise (CCW)

3b

Load Information		Clockwise Torque Calibration		
Weight Applied (grams)	Load Applied (Nm)	CCW Calibration (Raw mV/V)	CCW Calibration (Normalised mV/V)	CCW Non-Linearity (%FSD)
0	0.000	0.001	0.000	0.00%
200	0.981	-0.199	-0.200	0.00%
400	1.962	-0.400	-0.401	0.04%
600	2.943	-0.600	-0.601	0.03%
800	3.924	-0.800	-0.801	0.03%
1000	4.906	-1.000	-1.001	0.02%
1200	5.887	-1.200	-1.201	0.02%
1400	6.868	-1.399	-1.400	-0.03%
1600	7.849	-1.600	-1.601	0.01%
1800	8.830	-1.800	-1.801	0.00%
2000	9.811	-2.000	-2.001	0.00%

### Torque Calibration Values:

10Nm (CW)	2.0375	(mV/V)
-10Nm (CCW)	-2.0395	(mV/V)

4

QL0020-Issue 2

# Data Output Protocol

Baud Rate 3,000,000

Format ASCII, 8 Data bits, 1 Stop bit, No parity

\$ZR,0.1234,56.78,\*2e

Where

\$ZR is the string identifier,  
0.1234 is the Torque mV/V value from the sensor,  
56.78 is the speed in RPM,  
\*2e is an example of the check sum

A CheckSum8 Modulo 256 is implemented. The calculation uses all bytes of the string up to the final comma, but not including it (i.e. "\$ZR,0.1234,56.78"). The value, represented in hex, is the remainder of the sum of the string bytes (converted from ASCII) divided by 256.

The torque can be calculated by dividing mV/V by the calibration figure (e.g. 1.7560) and multiplying by the calibration range value (e.g. 500Nm)

For the string shown above the torque will be:  $[0.1234 \div 1.7560 \times 500] \text{ Nm} = 35.1367\text{Nm}$

## FAQ

### No Data From Transducer

Status LED is illuminated and constantly on

The transducer is powered and transmitting data.  
Check all connections and the correct COM port on the PC has been selected.

Status LED is flashing on and off

The transducer is powered, but not sending data.  
The rotor must be correctly aligned within the stator.  
Although designed to reject electrical noise, and designed / tested to EMC standards, the transducer may be affected by large varying electrical fields. Review all local switching, generating or drive machinery.

Status LED is off

The transducer is not powered.  
Check all connections and the supply to the transducer is correct or the DUI is powered on.

If the problem persists please contact [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

### Zero Offset

The transducer reads 0 while static but has an offset while spinning with no load.

Although not applying a direct load in your drive train there will actually be a small amount of torque generated in order to rotate the drive train. This is because it has to overcome resistance from several sources including; friction from any bearings and the mass of the unloaded equipment being driven. As Datum Transducers are highly sensitive measuring devices it will register this small amount of torque.

The transducer does not return to zero after use.

Ensure the system has returned to the same state as prior to use i.e. any brakes have been released, or there is no back pressure on a pump.  
If the offset is large (greater than 0.2mV/V) and remains after all possible loads have been removed it is likely the transducer has been subject to a significant overload and has been damaged, please contact [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

## FAQ

### Fluctuating Readings

The 425 transducers are very sensitive with a high sample rate and show any variations in torque applied. The noise level from the transducer is less than 1 part in 16,000.

Plotting logged output data will help differentiate between noise and true torque readings. High sample rate analysis can show potential issues with a system, even identify changes over time, which can help with preventative maintenance and fault prediction.

If the fluctuations are true readings, but a steady display is required the DUI averaging can be changed using the DUI config software. Please see the DUIcfg software user guide for details. Lowering the sample rate can also give a steady reading, for instructions please contact [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

If you are unsure of the status of the measurement fluctuations, please contact [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

### Incorrect Torque Readings

With no torque in the system, ensure there is no zero offset.

If there is no zero offset or this does not account for the error in readings check the calibration values used to scale the output match the calibration certificate provided. Please see the appropriate software user document for details.

If the problem persists please contact [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)

## **Datum Electronics Limited**

Datum World HQ  
Castle Street  
East Cowes  
Isle of Wight  
PO32 6EZ  
United Kingdom

Telephone: +44 (0) 1983 282834  
Fax: +44 (0) 1983 282835  
Email: [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)  
Website: [www.datum-electronics.co.uk](http://www.datum-electronics.co.uk)