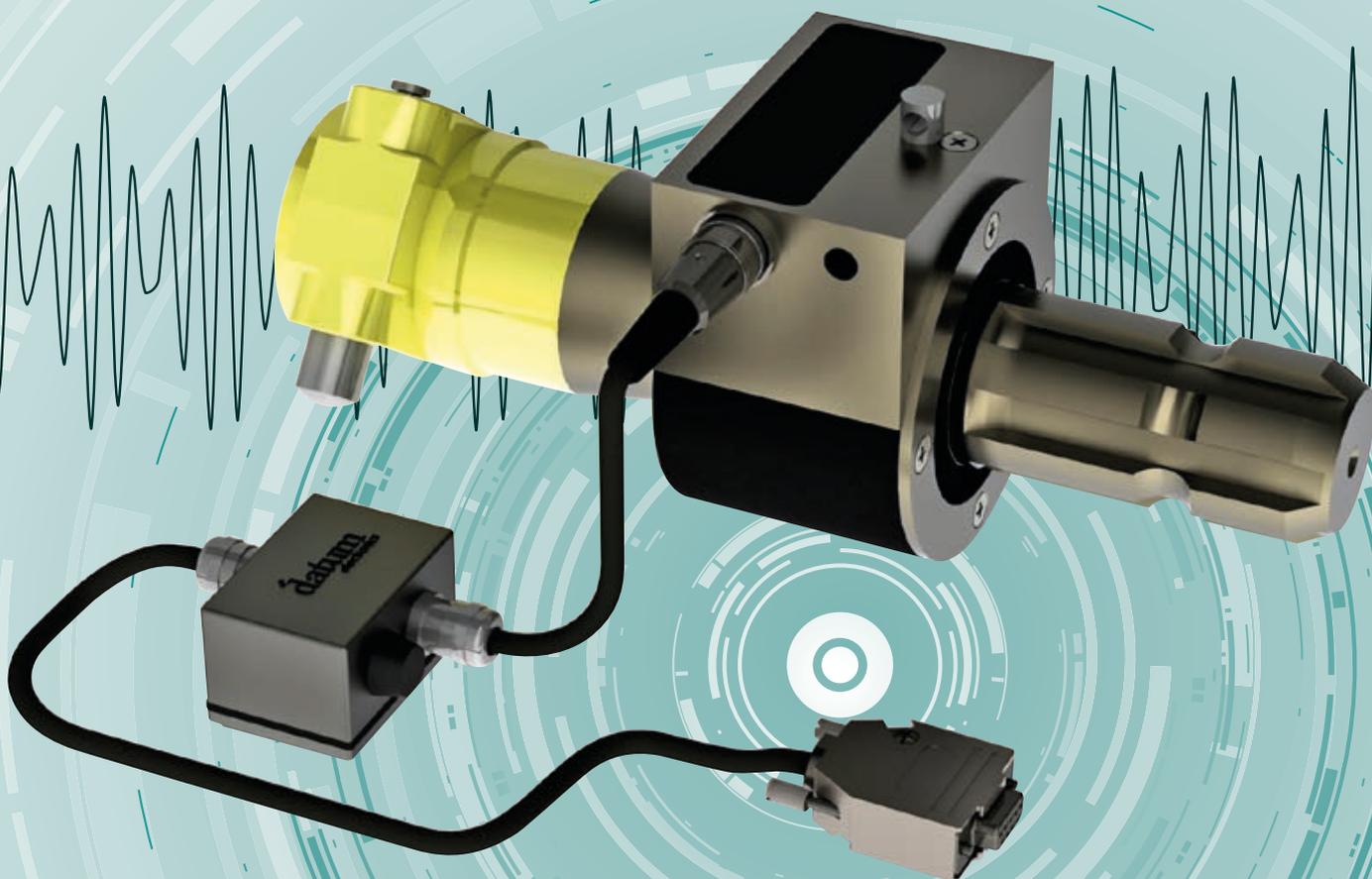


## DATUM ELECTRONICS

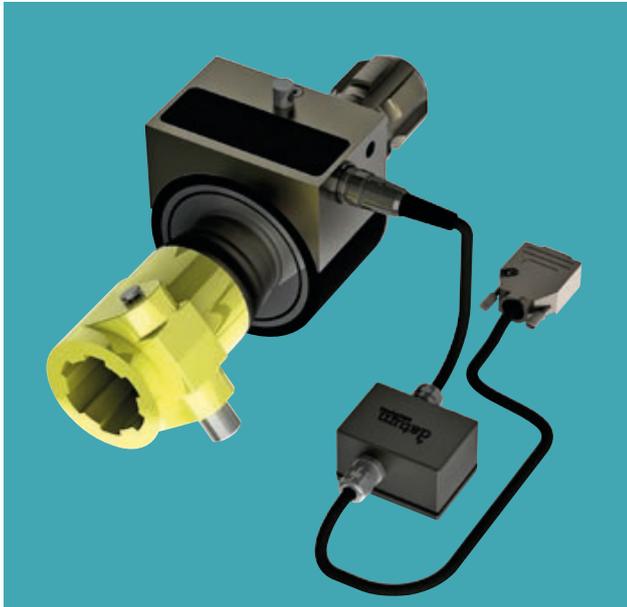
# PTO 420 SERIES SHAFT TORQUE & POWER MONITORING SYSTEM HANDBOOK AND INSTALLATION GUIDE



# CONTENTS

Introduction	3	Datum universal interface USB logging guide	11
System advantages	3	Logged file example	11
System outline	3	Unix time conversion	11
System items supplied	3	Power calculation	11
Familiarisation	4	Output data	12
Mechanical installation	5	Specifications	13-14
Anti-rotation point	5	Mechanical interface specifications	14
Installation	5	Pre-calibrated and tested	15
Safety - Ensure the PTO shaft is guarded	5	The interfaces and indicators	15
Calibration	5	Diagnostics	15
Operation	5	Incorrect torque	15
Input electrical connection	6	Zero offset	15
Output electrical RS485 connection	7	Maintenance	16
Output electrical RS232 connection	8	Serviceable items: bearings	16
System connections	9	Glossary of terms	16
User interfaces	10	Alternative solutions	17
Graphic user interface	10		

# PTO 420 SERIES SHAFT TORQUE AND POWER MONITORING SYSTEM



## What is it designed to do?

Datum Electronics Series 420 PTO (Power Take Off) Shaft Torque and Power Monitoring System will monitor and log the torque, shaft speed and transmitted power accurately when testing new systems driven from all standard PTO Shafts.

The tractor's PTO or stub shaft transfers power from the tractor to the PTO-driven machine or implement. Power transfer is accomplished by connecting a drive shaft from the machinery to the tractor's PTO stub shaft. Common examples include elevators, grain augers and silage blowers. The PTO and drive shaft rotates at 540 rpm (9 times/sec.) or 1,000 rpm (16.6 times/sec.) when operating at full recommended speed. At all speeds, they rotate in proportion to the speed of the tractor engine.

## Measurement and Monitoring

Efficient measurement and monitoring of this power can be a useful tool in research and analysis into the performance of a tractor transmission. It highlights efficiency savings measurement and control.

# SYSTEM ADVANTAGES

## PTO series 420 system performance and benefits:

Power Monitoring

Robust Design for use in field applications

IP 65

Easy Installation

Accurate Results (0.5% Accuracy)

Direct USB Interface into PC or laptop

# SYSTEM OUTLINE

## Non-contact transmission

The PTO series 420 is a contactless rotary torque transducer. The transducer measures torque strain in the shaft via an on-shaft microprocessor circuit, which also measures shaft rotational speed.

The torque and speed data is transmitted to the stationary part via a contactless method and is transmitted to the control unit. The control unit has an RS232 data connection which can be connected to a Laptop or PC running Datum Electronics test software which allows the display and logging of Torque, Speed and Power data.

The Series 420 PTO System has a non-contact transmissions system that provides a digital output directly proportional to Torque. Supplied as a complete transducer with bearings to support the stator unit, this robust design gives performance data by actual measurement on the rotating drive shaft. It is suitable for most power take off applications.

The PTO system has a female coupling on one end and a male fitting on the opposite end. The female end is coupled to the male end of the application. The PTO system acts like an extension adaptor, with the male end replicating the male end of the application. The torque and speed signals are transmitted from the shaft to a static cover assembly.

## Clockwise/Anti-Clockwise Measurement

Measuring torque in both directions, clockwise and anti-clockwise the system provides accurate readings of Power, Torque and Speed logged to a Datum Universal Indicator. If required, the system can also be adapted to record and analyse the data onto a PC or laptop with our TorqueLog software.

# SYSTEM ITEMS SUPPLIED

## Included as standard with the PTO Transducer:

DESCRIPTION	QUANTITY
PTO Transducer	1
PTO Transducer connection cable	1
Datum Universal Interface - Optional	1
Universal Interface USB cable - Optional	1
Universal Interface Power Supply - 110-230Vac if req.	1
Universal Interface power lead 2mts with open cable ends for connection to a 24Vdc Aux supply. - Optional	1
Calibration Test Certificate	1

# FAMILIARISATION

## SIMPLE DIAGNOSTICS, TESTING AND CONNECTION

Before installing your PTO Transducer into the rig or vehicle we would advise you to familiarise yourself with its connections and operation by performing a bench test.

By connecting the Transducer directly to a Datum Universal Interface (example A below), or to a PC via the Datum Universal Interface (example B opposite), you will be able to rotate the shaft to generate an output signal of RPM. By applying a small torque by hand to the shaft you will also be able see the change in the torque signal output on the Universal Interface display or in the Datum PC software.

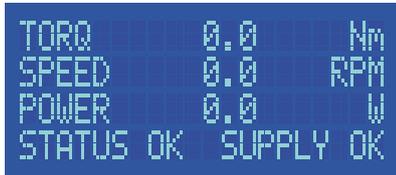
If you are connecting to a PC without a Datum Universal Interface and using your own instrumentation (example C opposite) you will be able to test your instrumentation in the same way by simulating a signal to the interface or indicator model you are using. The PTO Transducer supports a variety of universal interface models.

Once you are familiar with the PTO transducer and its outputs, continue to install as normal. If any questions arise at this stage please call our product support team for advice.

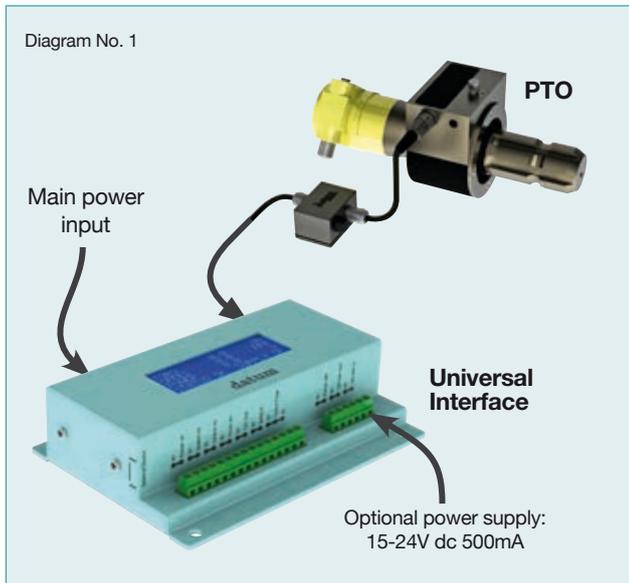
### The Datum Universal Interface display

The Datum Universal Interface has a built-in display which you can use for familiarisation with a direct connection to the PTO Transducer (diagram A below).

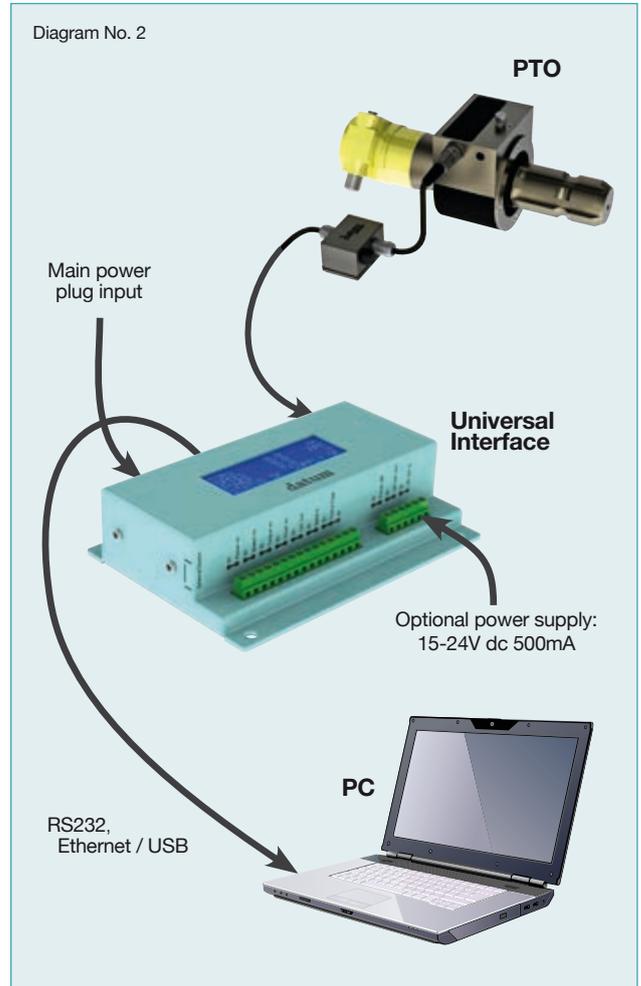
The Universal Interface display can show the following data from the PTO Transducer:



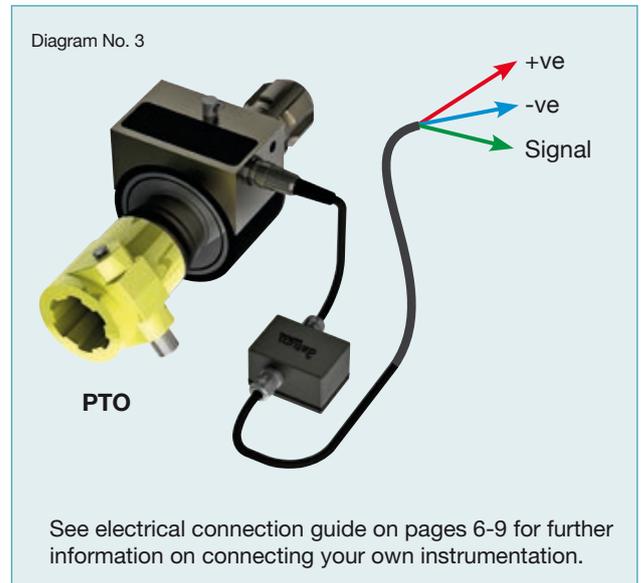
### Connection example (A) PTO Transducer to the Datum Universal Interface.



### Connection example (B) PTO Transducer to PC via the Datum Universal Interface.



### Connection example (C) Direct connection from PTO Transducer to an alternative interface or indicator.



See electrical connection guide on pages 6-9 for further information on connecting your own instrumentation.

# MECHANICAL INSTALLATION

## ANTI-ROTATION POINT

The body of the PTO transducer is suspended on bearings on the rotating shaft. An anti-rotation tether point is provided on the top of the body, adjacent to the cable connection, to prevent the transducer body from rotating with the shaft.

The bearings in the transducer are intended for supporting the body of the transducer only and should not be used to support the shaft or assembly to which the transducer is mounted.



## INSTALLATION

The Transducer should be attached to the PTO shaft output of the vehicle and a suitable tether arranged to a stationary part of the vehicle to prevent the outer body from rotating when the PTO shaft rotates. The connecting cable must NOT be used for this purpose. The connecting cable should be connected between the Transducer and Universal Interface if supplied, which should be mounted in a convenient location, away from rotating parts and protected from dirt and moisture.

The power cable (if supplied) should be connected (via a suitable connector) to the vehicle's battery supply. A DC supply in the voltage range 12.5 to 15V with a supply current capability of 1A is required for correct operation.

### Correct Polarity Must be Observed:

**Red = +ve (Positive)**

**Blue = -ve (Negative)**

The RS232 output can be connected either to the Datum Universal Indicator (supplied) for a local display of Torque, Speed and Power, or can be connected to Laptop or PC (Windows) running the test software supplied.

## SAFETY - ENSURE THE PTO SHAFT IS GUARDED

A tractor power take-off (PTO) and the power take-off drive shaft of a machine are very dangerous if used and not correctly guarded. Every year people are killed or seriously injured in accidents involving PTOs and PTO drive shafts. Most of these accidents are preventable if the PTO and PTO drive shaft are fitted with guards of good design which are properly used and maintained.

Note: Broken, damaged or badly fitting guards can be just as dangerous as no guard at all.

Protect the tractor PTO with a shield covering the top and both sides of the PTO so that it stops anyone making contact with it, either with parts of their body or their clothes. Make sure this shield is well constructed and capable of supporting a downward load of at least 120 kg. When the PTO is not in use, it may be covered by a fixed cap. Guard PTO drive shafts by enclosing them along their full length, from the tractor to the first bearing on the machine.

Take care to route all the PTO Transducer cables safely away from the rotating PTO shaft and any moving mechanical components. Secure them with cable ties to ensure there is no possibility of fouling on the rotating shaft.

Further advice on guarding the PTO shaft is available from in the form of a PDF document on the Health and Safety Executive website at the following link:

[www.hse.gov.uk/pubns/ais40.pdf](http://www.hse.gov.uk/pubns/ais40.pdf)

## CALIBRATION

The Transducer is supplied with a calibration certificate for reference purposes. The output from the transducer is described in mV/V and related to the data transmitted via the RS232 output from the transducer.

If The Universal Interface is supplied pre-set to the transducer's calibration values and should not need to be adjusted other than a possible re-setting of the Transducer Zero Point.

The Datum software software, once installed, may need calibration values to be entered from the calibration certificate before correct values will be displayed.

(Both of these require a zero offset to be reset separately, see the relevant sections).

## OPERATION

The Datum Universal Indicator and Datum test software should show the Torque, Speed and Power measured by the transducer.

If the indicator shows "No Data from Transducer", or the Software shows '---' instead of a torque value, this indicates that no data is being received from the transducer. In this case check the connectors and cable between control unit and transducer, and between control unit and indicator or PC.

# INPUT ELECTRICAL CONNECTION

## (Universal Interface to PTO)

### CABLE AND SOCKET CONNECTORS WIRING GUIDE

The supplied cable length for the PTO Transducer is 4 metres, longer cables up to 10 meters can be supplied on request. This cable is terminated with a standard 9-way D connector to interface to any of the Datum Electronics Signal Interfaces or Indicators.

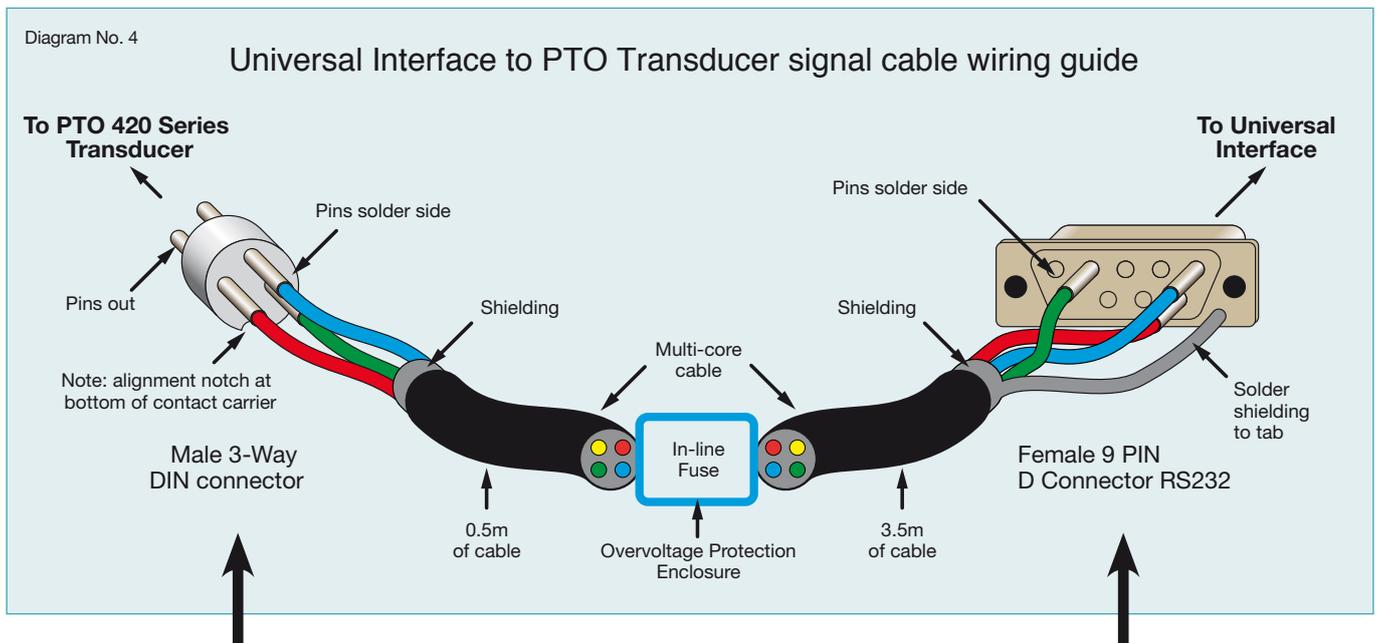
The connections within this cable are detailed below should you wish to connect the 420 series PTO Transducer directly into your own instrumentation and software.

The default signal output from the PTO Transducer is RS232 Serial Data. An In-line fuse is housed in the cable as additional protection from vehicle supplies (as there tends to be the occasional spike in current).

We have also provided the 3-way DIN and 9-way D plug wiring arrangement in diagram No. 4 below for the PTO Transducer end of the cable. On some occasions a cable may need to be assembled after laying through tight bulkhead access which may require the removal of the connectors. The maximum cable length for the PTO Transducer is normally 10 metres.

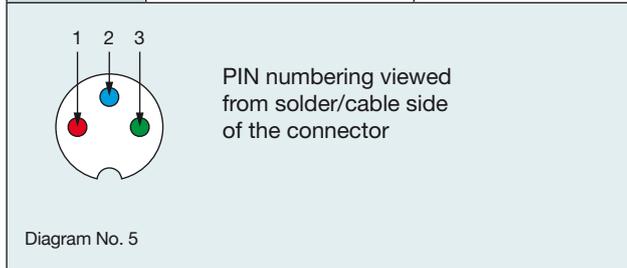
The data cable from the 420 series PTO Transducer to an interface must meet the following specification: **4 core wire, braided, screened, 7/02mm PVC Sheathed cable or equivalent.**

The 420 series PTO Transducer current consumption is less than 250mA with a 12Vdc supply. The 420 series PTO Transducer complete with its Universal Interface will consume below 450mA.



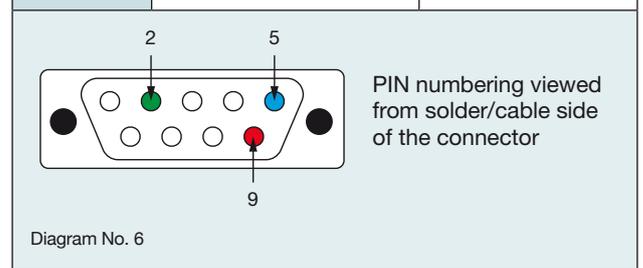
#### 3-way DIN connector wiring guide

Pin Out	Function	Cable Colour
Pin 1	+ve	RED
Pin 2	-ve	BLUE
Pin 3	Signal	Green



#### 9-way D connector RS232 wiring guide

Pin Out	Function	Cable Colour
Pin 2	Signal	GREEN
Pin 5	Supply ground	BLUE
Pin 9	+ve	RED



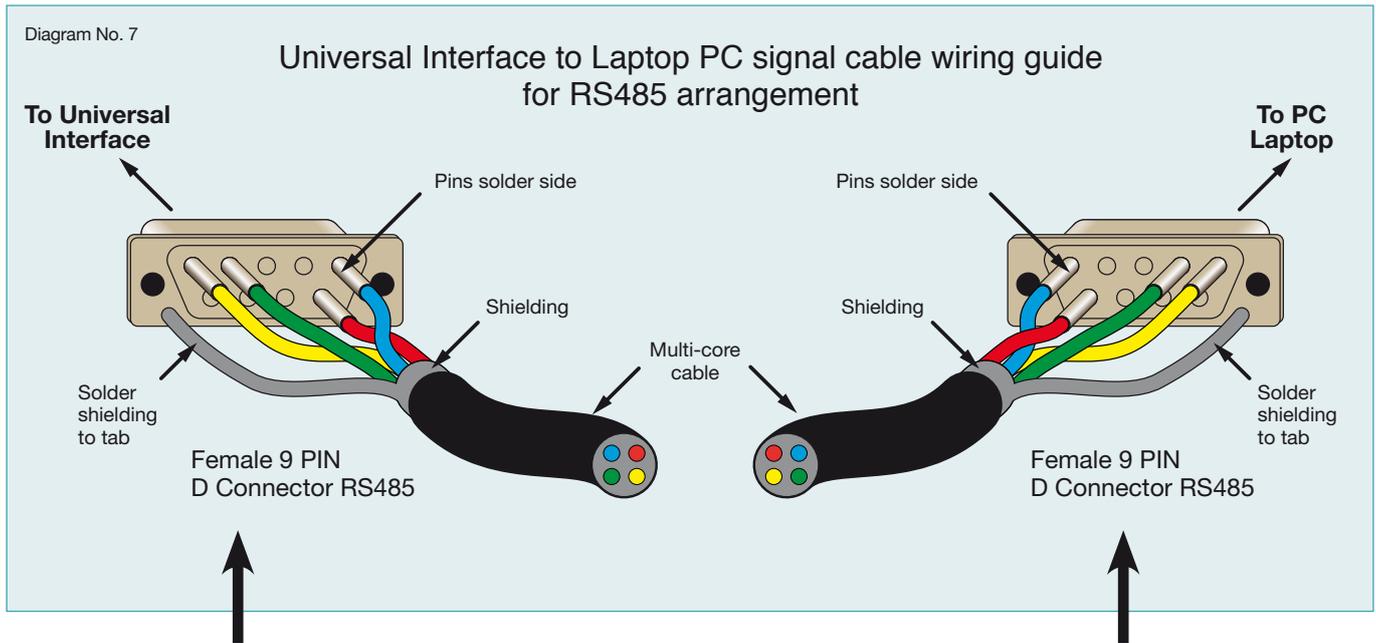
# OUTPUT ELECTRICAL RS485 CONNECTION

## (Universal Interface to Laptop PC)

### CABLE AND SOCKET CONNECTORS WIRING GUIDE

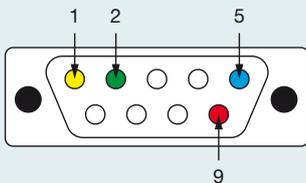
The Datum Universal Interface can also connect to a Laptop or PC by USB or 9 way RS485 or RS232 serial D connector.

The connections for a RS485 serial D connector are detailed below should you wish to assemble your own cable to connect the 420 series PTO Transducer. Please note these are not supplied with the transducer



#### 9-way D connector RS485 wiring guide

Pin Out	Function	Cable Colour
Pin 1	RS485A	YELLOW
Pin 2	RS485B	GREEN
Pin 5	Supply ground	BLUE
Pin 9	12V Output (disabled when the Serial Output is being used for connection to a PC)	RED

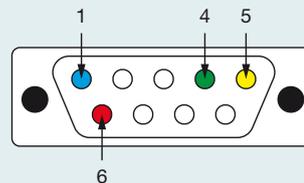


PIN numbering viewed from solder/cable side of the connector

Diagram No. 8

#### 9-way D connector RS485 wiring guide

Pin Out	Function	Cable Colour
Pin 1	Supply ground	BLUE
Pin 4	RS485B	GREEN
Pin 5	RS485A	YELLOW
Pin 6	12V Output (disabled when the Serial Output is being used for connection to a PC)	RED



PIN numbering viewed from solder/cable side of the connector

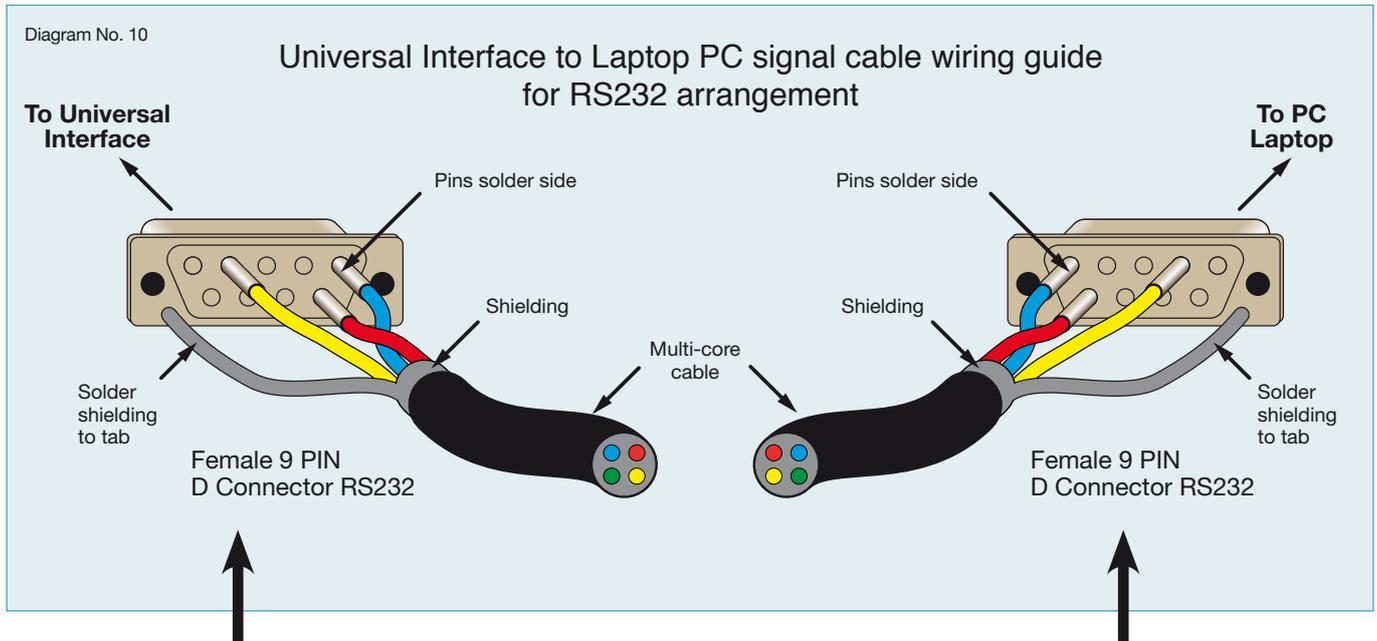
Diagram No. 9

# OUTPUT ELECTRICAL RS232 CONNECTION

## (Universal Interface to Laptop PC)

Unless requested the standard output from the Datum Universal Interface module is RS232, this can be changed in the Datum Software

The connections for a RS232 serial D connector are detailed below should you wish to assemble your own cable to connect the 420 series PTO Transducer.



9-way D connector RS232 wiring guide

Pin Out	Function	Cable Colour
Pin 2	Rx / Tx	YELLOW
Pin 5	Supply ground	BLUE
Pin 9	12V Output (disabled when the Serial Output is being used for connection to a PC)	RED

Diagram No. 11

9-way D connector RS232 wiring guide

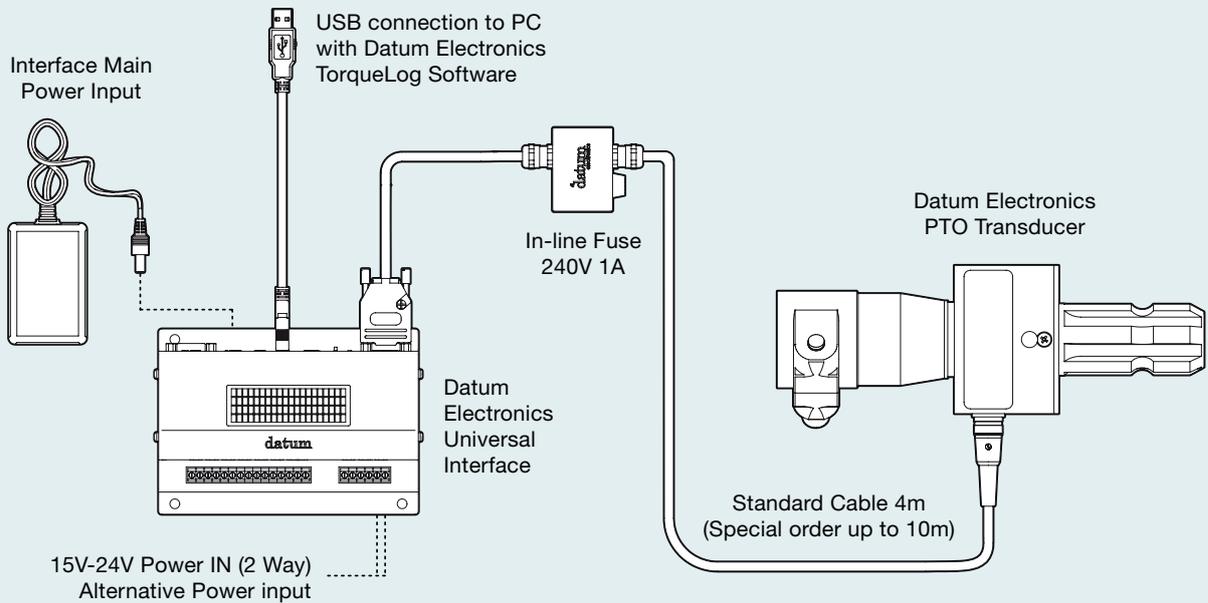
Pin Out	Function	Cable Colour
Pin 1	Supply ground	BLUE
Pin 4	Rx / Tx	YELLOW
Pin 6	12V Output (disabled when the Serial Output is being used for connection to a PC)	RED

Diagram No. 12

# SYSTEM CONNECTIONS

## Series 420 PTO Transducer connections guide

Diagram No. 13



For information on connecting up rechargeable battery block supplied as an optional extra please contact [web@datum-electronics.co.uk](mailto:web@datum-electronics.co.uk)

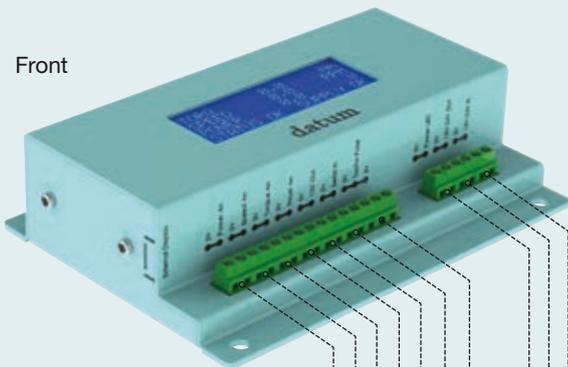
## Universal Interface connections guide

When supplied with the Universal Transducer Interface the Datum PTO Transducers provide simple connections to logging, monitoring and control system through both analogue and serial interfaces. Software is provided to access the primary Ethernet setup interface for the PTO Transducer.

\*The **12V Output** and the **Serial IN Copy** are screw terminals that duplicate the connections for the serial torque sensor 'D' connector.

\*\*Alternative power input terminal.

Front



- Power Analogue (2 way)
- Speed Analogue (2 way)
- Torque Analogue (2 way)
- Thrust Analogue (2 way)
- \*12 Volts OUT (2 way)
- \*Serial IN copy (2 way)
- Tacho Pulse IN (3 way)
- Power LED (2 way)
- 15V - 24V OUT (2 way)
- \*\*15V - 24V Power IN (2 way)

Back



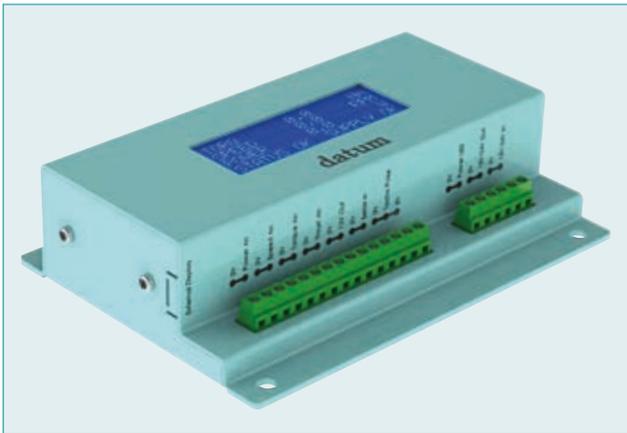
- Serial Torque Sensor
- Factory Reset
- Zero Reset
- Ethernet
- USB Type A - Data Logging
- USB Mini B - Primary USB to PC
- Interface Main Power Input
- Serial Output

Diagram No. 14

# USER INTERFACES

## Datum Electronic's Universal Interface provides options for different operating environments.

Datum Electronics can provide the universal interface package for either control enclosure application or heavy industrial applications.



## UNIVERSAL INTERFACE

The universal interface will connect directly to the PTO Torque Transducer. It supplies 12Vdc to power the Transducer and converts the torque and RPM signal into the outputs you require.

### The outputs that can be configured are:

4 analogue outputs as either 4-20mA (4-12-20mA):  
+/-10Vdc, +/-5Vdc, 0-10Vdc or 0-5Vdc, for shaft torque, RPM, Power and Spare

RS485/RS232 serial data

Ethernet

MODBUS

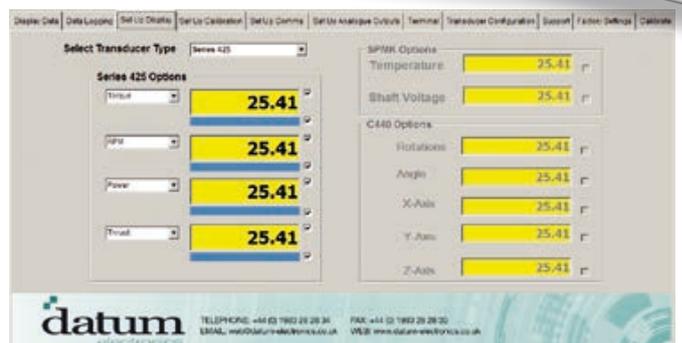
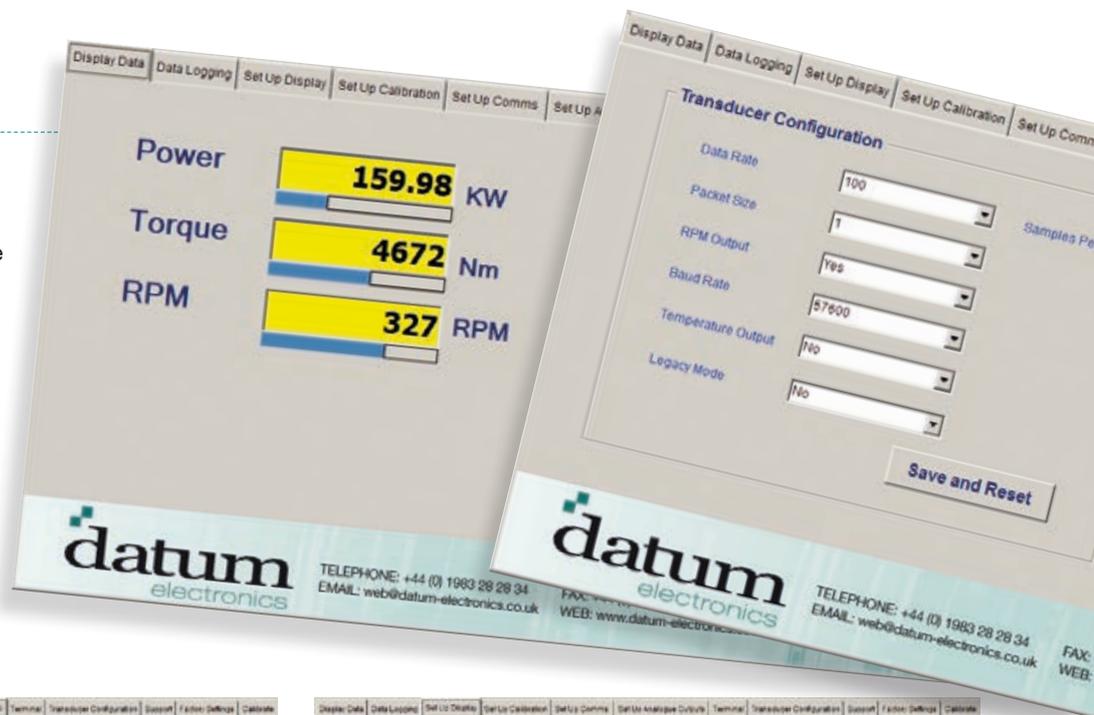
USB Type Mini B

The interface will also accept an input from an external tachometer sensor. The output from this sensor can be directly linked into the torque and power data.

## GRAPHIC USER INTERFACE

### Datum data logging software

The Datum data logging and configuration software provides a wide range of control functions of the PTO including set-up and configuration options plus data logging.



# DATUM UNIVERSAL INTERFACE USB LOGGING GUIDE

If the USB memory stick logging functionality is required please ensure that you discuss your requirement with Sales prior to dispatch to ensure that the DUI is sent with the correct functionality

The Datum Universal Interface Module can log the basic test data direct onto a USB memory stick as a .CSV File - see example below.

The DUI can use USB memory sticks up to 64GB memory capacity.

To log test data to a USB stick please ensure you insert the memory stick before you power the DUI. If your USB stick has a data connection LED this will pulse quickly to show that the memory stick is logging. Please note if you insert USB Stick into the DUI after this then the system will not log. Once this is confirmed and you are ready to log test data please insert the USB memory stick into the USB port on the

DUI and the system will immediately start to log. You do not have to press any buttons etc. it is automatic. When you are ready to finish logging please remove the USB stick and the log file will be automatically closed.

Please note that the log file will not have the headers as seen below these are for guidance purposes only.

## LOGGED FILE EXAMPLE

UNIX TIME	Torque Nm	Speed RPM	mV/V
1421414333	1.96787	0	0.00155
1421414333	0.96787	0	0.00155
1421414333	0.57154	0	0.00045
1421414333	0.31767	0	0.00025
1421414333	-0.0632	0	-0.00005
1421414333	1.20624	0	0.00095
1421414333	-2.2211	0	-0.00175
1421414333	-1.3325	0	-0.00105
1421414333	-0.5709	0	-0.00045
1421414333	0.4446	0	0.00035
1421414333	-0.317	0	-0.00025
1421414333	-1.714	0	0.00135
1421414333	-1.8403	0	-0.00145
1421414333	-0.0632	0	-0.00005
1421414333	-0.6978	0	-0.00055
1421414334	1.96787	0	0.00155
1421414334	-0.1901	0	-0.00015
1421414334	0.82542	0	0.00065

## UNIX TIME CONVERSION

### Explanation/Methodology

Unix time is the number of seconds since January 1, 1970.

Excel doesn't contain built-in functions for working with Unix dates so they must be calculated.

Excel allows you to add a number of days to a date by using the "+" operator.

First convert the number of seconds to number of days (by dividing by 60\*60\*24) and then add the result to the date "1/1/1970".

The formula will look like:

=CELL/(60\*60\*24)+"1/1/1970"

The quotes around the date are required. If they are not present, Excel will treat 1/1/1970 as an expression. On Linux (or any other OS that uses coreutils), you can type:

date +%s

- to see the current unix time.

**Summary =CELL/(60\*60\*24)+"1/1/1970"**

## POWER CALCULATION

To calculate the power in Watts, you will need to use the Torque in Nm and the Speed in RPM values.

The formulae is below:

Torque = Power / Shaft RPM (radians/sec = RPM \* 2 \* pi / 60) Power in W, Shaft speed in radians/sec, torque in Nm.  
radians/sec = RPM \* 2 \* pi / 60

Excel Formulae is: **Nm\*RPM\*2\*PI()/60**

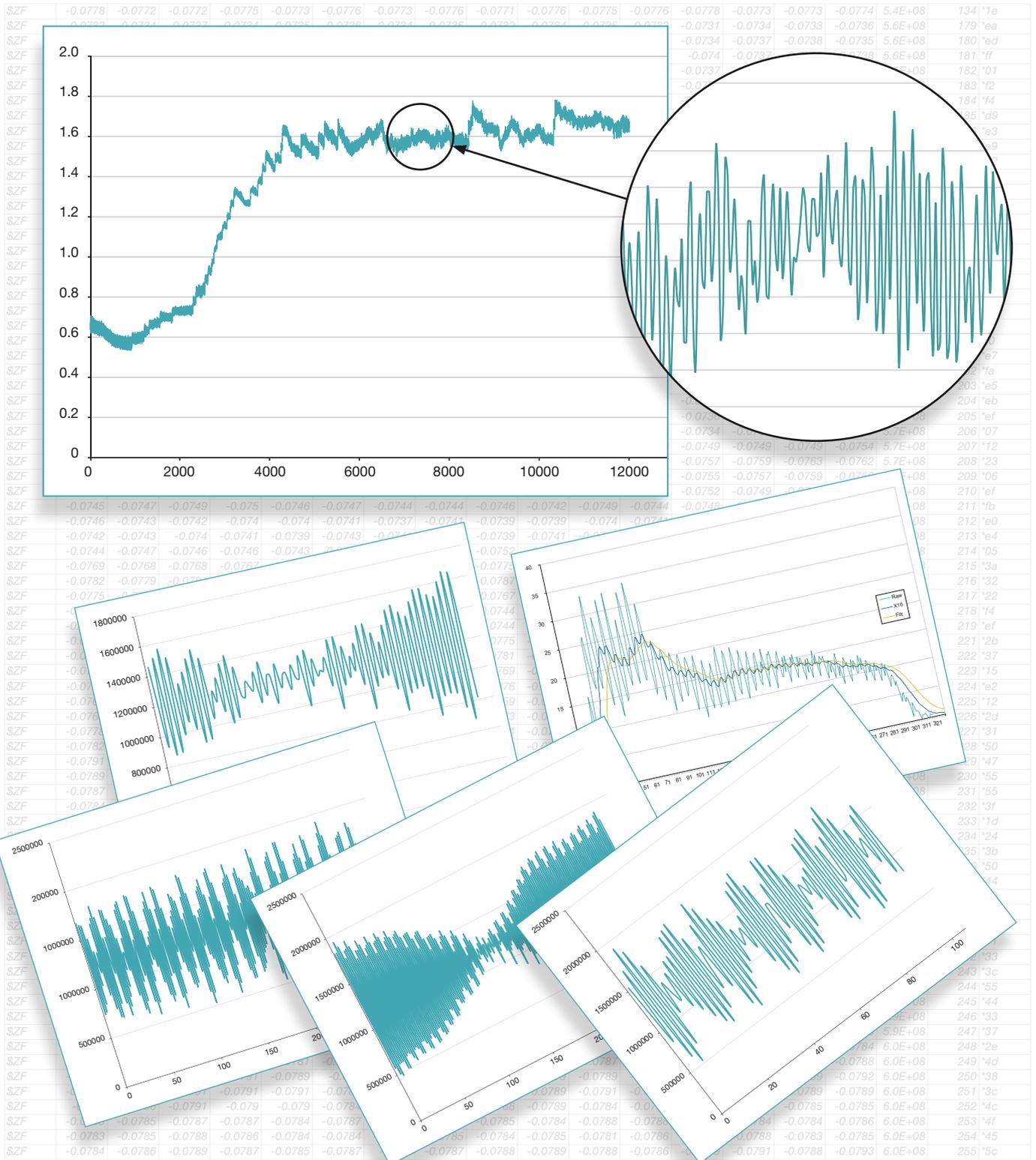
For anymore questions about your Datum products please contact support: [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk) or call +44 (0) 1983 282834

# OUTPUT DATA

## READ MORE FROM YOUR DATA

The 420 Series PTO will provide you with accurate torque data. The following graphs show examples of some data output possibilities of the 420 Series PTO's Transducer.

Within this data we can often see valuable characteristics at higher sample rates that show Torsional information that will indicate system wear, vibration and changes in efficiency. The raw data can also be viewed in a spreadsheet as columns.



# SPECIFICATIONS

## STANDARD SPLINE CONFIGURATIONS Table No. 1

Male / Female	1" 3/8 x 6 spline
Male / Female	1" 3/8 x 21 spline
Male / Female	1" 3/4 x 6 spline
Male / Female	1" 3/4 x 20 spline

## OPERATING SPEED Table No. 2

540 / 1,000 rpm as standard (up to 3,000rpm if required)
--

## POWER RATING (MIN)

### Standard 1"3/8 shaft configurations Table No. 3

Measures Power 135HP or 101kW at 540rpm
Measures Power 253HP or 188kW at 1000rpm

### Standard 1"3/4 shaft configurations Table No. 4

Measures Power: 190HP or 141kW at 540rpm
Measures Power: 350HP or 261kW at 1000rpm

## PERFORMANCE Table No. 5

Non-Linearity	+/-0.1% FSD
Non-Repeatability	+/-0.05% FSD
Sample Rate	1 to 100 samples per second
Output Baud Rate	9600 baud

### Transducer output interfaces: Table No. 6

Serial data via RS232
-----------------------

### Transducer output data: Table No. 7

Torque	Shaft RPM	Shaft Temp.	Diagnostics
--------	-----------	-------------	-------------

## POWER SUPPLY Table No. 8

Transducer	10-24Vdc 250mA
Transducer and Interface	15-24Vdc 400mA

## TORQUE RATING Table No. 9

Measures Torque up to a maximum of 1,800Nm on all standard 1"3/8 shafts
Measures Torque up to a maximum of 2,500Nm on all standard 1"3/4 shafts

## SIGNAL INTERFACE OUTPUTS WITH DUI

### Digital: Table No. 10

RS485	Serial data
RS232	Serial data
Ethernet	Data and configuration
MODBUS UDP	Serial data
USB Type Mini B	Serial data
USB Type A	Data logging

### Analogues: Table No. 11

All four of the PTO Transducer's analogue output channels can be configured for any of the following settings by the user:  
 4-20mA configured 4-20mA (4-12-20mA):  
 +/-10Vdc, +/-5Vdc, 0-10Vdc or 0-5Vdc

A typical configuration arrangement would be as follows:

Channel 1 - Torque	from 0-500Nm as 4-20mA
Channel 2 - Speed RPM	from 0-100-rpm as 0-5Vdc
Channel 3 - Power	from 0-5000W as 4-20mA
Channel 4 - Spare	

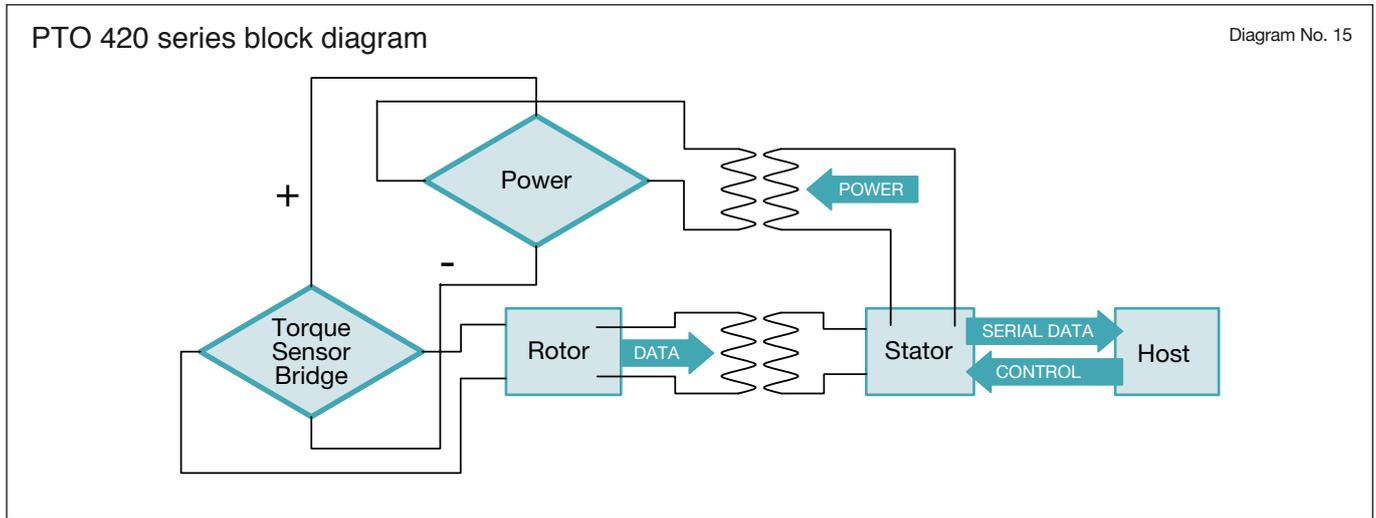
### Display: Table No. 12

Torque	Speed RPM	Power
--------	-----------	-------

## ENVIRONMENT Table No. 13

Thermal Stability of Gain per 10°C	0.02%
Thermal Stability of Zero per 10°C	0.02%
Normal Specification Range	10 to 60°C
Operating Range	-10 to +70°C
Storage Range	-35 to +75°C
Transducer Environmental Protection	IP65 (see RS425 for IP67/68)
Electromagnetic Compatibility	EN61326-1:2006 (IEC61000-4), IEC60945)

# SPECIFICATIONS



## MECHANICAL INTERFACE SPECIFICATIONS

420 Series PTO Transducer compatible spline configurations.

Splined Power Take Off Shaft Profiles:

- A** - Male / Female 1" 3/8 x 6 spline
- B** - Male / Female 1" 3/8 x 21 spline
- C** - Male / Female 1" 3/4 x 20 spline
- D** - Male / Female 1" 3/4 x 6 spline

3D models and STEP files are available from Datum Electronics to assist project planning. Please contact Datum Electronics for more information.

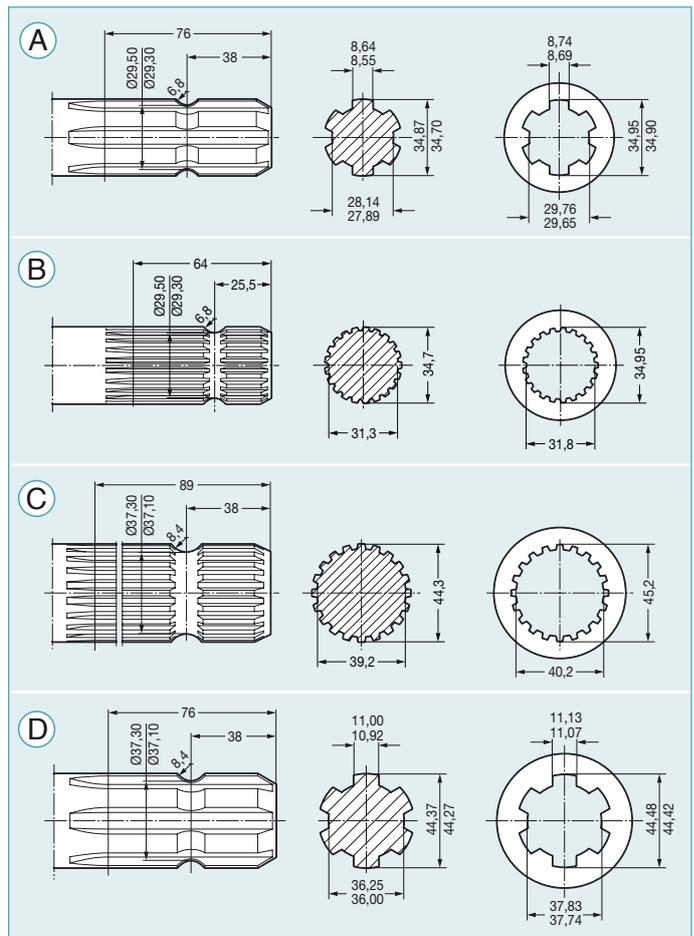


Diagram No. 16

# PRE-CALIBRATED AND TESTED

## TEST CERTIFICATE

### The 420 Series PTO Shaft Torque and Power Monitoring System is calibrated on test rigs traceable to UK National Standards

The PTO Transducers will be subjected to a series of test cycles starting with a proof load cycle(s) and then followed by a series of calibration cycles.

Loads are applied from zero torque to the maximum working torque of the Transducer.

### The data shown on the test certificate:

- The test equipment used
- Calibration date
- A table of the actual loads applied against the output
- The output is described in either:
  - mV/V - this is the raw strain signal from the torque shaft
  - Nm/Lbft - this is the calibrated output of the transducer

Some PTO Transducers are supplied with a raw output that is processed and displayed in the instrumentation or user software.

Other Transducers store their calibration settings and have an output in the units required, Nm/Lbft. These Transducers can also output the raw mv/V values where required.

- Example of cal sheet annotated
- RPM - Calibration

### The Interfaces and Indicators

Where supplied with an indicator or a signal interface the outputs of the interface and the PTO's Transducer will both be calibrated and detailed on a systems test certificate.

The outputs calibrated will be the +/-10Vdc, +/-5Vdc and the 4-20mA signals.

The indicators and serial data outputs for the Ethernet, USB and MODBUS ports are directly sent from the Transducer. Interface options allow a scaling factor(s) for these signals to be entered into the Interface. For MODBUS and Ethernet output please ensure that you discuss your requirement prior to order.

# DIAGNOSTICS & SUPPORT

## INCORRECT TORQUE

Check the scaling of the output device.

If using the user software on a PC look at the torque calibration tab.

The certificate issued with the transducer will have a value for its output signal in mV/V at a given torque. The software set up should match this (i.e. 1.756mV/V = 250Nm).

If supplied with the DUI then you can connect this to a PC and check in the supplied test software that the calibration values match your test certificate.

Check the torque reading with no torque applied. If the Transducer output is showing a torque reading at zero this will be added to all readings. The torque calibration tab of the software has an option to zero the torque reading. The Universal Interface also has a torque zero button. Pressing and holding this for 10 seconds will take the current torque reading as zero.

When checking or setting the zero check to see if any torque is locked into the transducer by the machine or rig on which it is used. It is ideal to check the zero with the transducer disconnected from the rig.

## ZERO OFFSET

The factory zero of the PTO Power Monitoring System will be declared on the calibration sheet. If the reading you have at zero differs from this value, look at the raw signal value from the PTO's Transducer (either using the user interface software or the detail command). Small offsets can be removed using the zero command on the software interface or the zero button on the Universal Interface. If the offsets continue to appear refer back to the original offset value on your certificate to check that you are not applying an ongoing series of small offsets.

If the offset is large (greater than 0.2mV/V) it is likely that the Transducer has been subjected to a significant torque overload and has a permanent offset. If this is the case and repeated overloads are applied, the Transducer will become inaccurate and may ultimately mechanically fail. You should review your application and consider a higher rating of Transducer.

If the keyways of the Transducer are visually out of line this is a very good indicator that the Transducer has suffered a significant and damaging overload.

# MAINTENANCE

It is recommended that your PTO transducer is calibrated regularly to ensure that the Torque signal is accurate. Datum Electronics recommend that transducers are calibrated at least once every 12 months. Regular calibration also allows for maintenance checks to be made on the condition of your transducer to ensure longevity.

## MAINTENANCE

### SERVICEABLE ITEMS: BEARINGS

**The bearings are the only component on the 420 series PTO Power Monitoring System that may require servicing depending on operating conditions. The following provides information on the bearing life under load conditions.**

The body of the Transducer is supported by one bearing. The life of the bearings at normal running RPM of half the rated RPM is 10 years continuous use.

If you have requirements for high duty sensors where bearing life may be a concern due to other external loads, ask our support team for additional information on our bearing less RS425 and FF425 ranges. These RS/FF designs provide a high degree of flexibility with regard to mounting tolerances and maintenance free operation.

If the shaft of the Transducer is bent the balance of the Transducer will be disturbed and the bearing life will be greatly reduced. Excessive load or mounting misalignment will also effect the life of the bearings. Bearings can be serviced by return to Datum Electronics.

## GLOSSARY OF TERMS

### Engineering Units

The transducers/sensors are calibrated in engineering units of either Nm or Lbft.

### Full Scale Output

The mV/V is the output from the transducer when the rated load is applied.

### mV/V

To measure torque we use a bridge network of resistive strain gauges. These change resistance with the applied strain. The output they give is a ratio of the voltage applied and the mV change in signal from the bridge.

This mV/V ratio is normally quoted in the form 1.55mV/V = 1000Nm. The mV/V value is established at calibration by applying a known torque to the shaft. This ratio will remain constant for the life of the transducer/sensor unless damaged.

### Noise

Irregular fluctuations that accompany a transmitted electrical signal but are not part of the data generated from the sensor.

### Proof Load

The proof load is the load to which the transducer/sensor has been tested - occasional loading to this level should not damage the transducer. Repeated loading to this level will reduce the fatigue life of the transducer and may cause small zero offset over time (usually measured in either Nm or lbft).

### Rated Load

The Rated Load is the designed full load of the transducer/sensor (measured in either Nm or lbft).

### Raw Data

Raw data is the raw strain level from the torque shaft. It will include any zero offset.

The scaling of the raw data will require:

$\text{Torque [Nm]} = (\text{raw data [mV/V]} - \text{zero offset [mV/V]}) \times (\text{rated torque [Nm]}) \div (\text{full scale output [mV/V]})$

### Sensor

A sensor measures a physical quantity and converts this into a signal. The physical quantity is torque or torsional strain, this is converted into serial data.

**NOTE:** The words transducer and sensor are often used in this context to mean the same thing.

### Span

This is the value of output at the rated load. Either given in terms of mV/V signal or Nm or lbft when in engineering units.

### STEP files

A STEP file is a widely adopted CAD file format used to share 3D models between users with different CAD systems.

### Torque

The twisting force on the shaft created by the driving force (motor) and the resisting force (brake or gear).

### Transducer

A transducer is defined as a device that converts one form of energy to another. In terms of the PTO Power Monitoring System the transducer converts torque into serial data.

**NOTE:** The words transducer and sensor are often used in this context to mean the same thing.

### Zero

This is the value of the signal when the shaft is completely unloaded. Normally quoted in mV/V.

## ALTERNATIVE SOLUTIONS

### THE DATUM M425, RS & FF425 RANGES

**In addition to the PTO range Datum Electronics Limited manufacture a wide range of complimentary torque sensors.**

The M425, RS and FF425 ranges are non-contact and non-bearing sensors that can be tailored to fit a test rig or drive application.

Within these ranges the Series 425 Electronics are engineered to fit a shaft coupling of a section of an existing drive shaft. These are fitted by Datum Electronics in the factory. They have advantages where space is at a premium and a standard transducer cannot replace an existing component without major engineering work. They have further advantages in that they can operate at higher speeds for longer duty cycles. When used in harsh environments the RS/FF425 ranges can be supplied full encapsulated.

With the sensor added to an existing shaft the dynamics of the drive line will remain substantially the same.

M425 Series Transducer



FF 425 Series Transducer



RS425 Series Transducer





DATUM ELECTRONICS LIMITED  
TELEPHONE: +44 (0) 1983 28 28 34  
FAX: +44 (0) 1983 28 28 35  
EMAIL: [support@datum-electronics.co.uk](mailto:support@datum-electronics.co.uk)  
WEB: [www.datum-electronics.co.uk](http://www.datum-electronics.co.uk)

DESIGNED BY [WWW.PEPPERCREATIVE.CO.UK](http://WWW.PEPPERCREATIVE.CO.UK)