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# DATUM ELECTRONICS

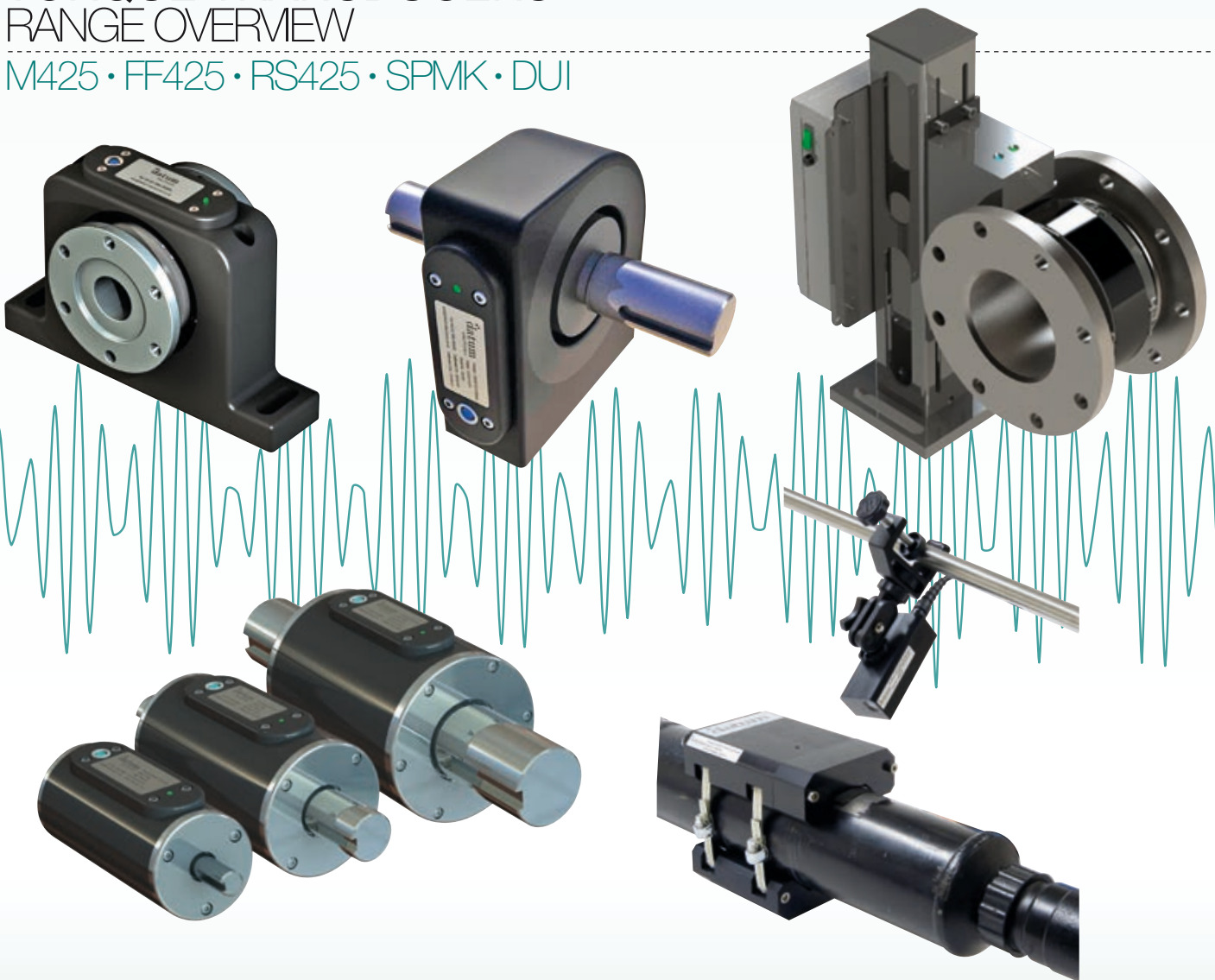
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## TORQUE TRANSDUCERS

### RANGE OVERVIEW

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M425 • FF425 • RS425 • SPMK • DUI



# THE M425 TORQUE TRANSDUCER



The latest technology Datum Electronics Series M425 non-contact rotary Torque Transducers have been designed to fit with most applications and solutions requiring rotary torque measurement. The Torque Transducer fits in line with the drive train or test bed, using standard keyway shafts.

A non-contact transmission system provides data directly proportional to torque. In this variant it is supplied as a complete transducer with bearings to support the stator unit on the rotating shaft. It is suitable for most general test rig applications.

The M425 Torque Transducer utilises a strain gauged shaft for accurate and reliable torque measurement and a set of rotating on-shaft conditioning electronics. The digital signals are transmitted to the non-rotating part of the system or stator providing a reliable and highly accurate torque measurement solution.

The M425 has a torque measuring element design with an optimum length to maximise overall accuracy and give a high degree of tolerance to mounting offset.

The M425 also has a legacy mode so that it can be used as a direct replacement for the previous M420 Transducer.

## M425 System Performance and Benefits:

Ranges 0-5Nm up to 0-60,000Nm

High resolution torque sampling

High data rate

Accuracy and resolution options

Non-contact data transmission

Static and rotary torque measurement

Operational stability

Magnetic speed sensor - not effected by dirt

Simple to integrate

Robust construction, Low power consumption

Sample rate selection 1-4000 samples per second

## M425 Performance Information

PERFORMANCE	
Non-Linearity	+/-0.1% FSD
Non-Repeatability	+/-0.05% FSD
Noise-free Resolution	20 bit to 13.5 bit (dependent on sample rate)
Sample Rate	1 to 4000 samples per second
Output Baud Rate	9600 to 3Mbaud

Transducer output interfaces:			
Serial data via RS485			
RS232 (option)			

Transducer output data:			
Torque	Shaft RPM	Shaft Temp.	Diagnostics

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

ENVIRONMENT	
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
Environmental Protection	IP54 (see RS425 for IP67/68)
Electromagnetic Compatibility	EN61326-1:2006 (IEC61000-4), IEC60945)

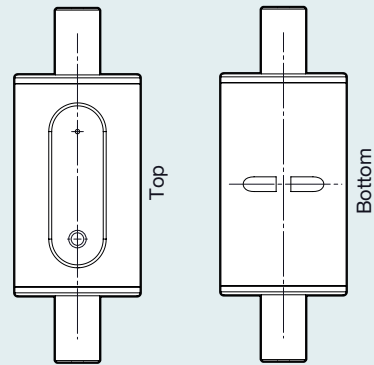
For signal output options including Ethernet, MODBUS, USB, RS485/232 and 4 analogue channels configured 4-20mA (4-12-20mA): +/-10Vdc, +/-5Vdc, 0-10Vdc or 0-5Vdc, refer to Document 1023 Datum Universal Transducer Interface.

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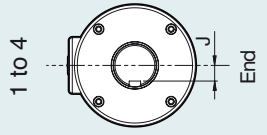
# M425 Specifications

M425 model size	Rated load (Nm)	Rated load (lb ft)	Rotational speed (RPM)	Body mass (Kgs)	Rotor mass (Kgs)	Overall length	Body length	Body dia.	Output module length	Output module height	Exposed shaft length	Shaft dia. G6 fit	Number of keyways	Keyway length (BS 4235-1:1972)	Keyway width (BS 4235-1:1972)	Keyway depth off centre
	A	B	C	D	E	F	G	H	I	J	K	L	M	N & O		
<b>Size 1 - A</b>	0-10	7.4	0-10,000	1.057	0.401	184	130	66	112	3.5	27	15	1 keyway	22.5	5	4.3
<b>Size 1 - B</b>	0-20	14.8	0-10,000	1.057	0.421	184	130	66	112	3.5	27	15	1 keyway	22.5	5	4.3
<b>Size 1 - C</b>	0-50	36.9	0-10,000	1.057	0.462	184	130	66	112	3.5	27	15	1 keyway	22.5	5	4.3
<b>Size 1 - D</b>	0-100	73.8	0-10,000	1.057	0.560	184	130	66	112	3.5	27	15	1 keyway	22.5	5	4.3
<b>Size 2 - A</b>	0-250	184	0-8,000	1.057	1.201	240	150	85	112	3.5	45	30	1 keyway	44	8	11
<b>Size 2 - B</b>	0-500	369	0-8,000	1.057	1.276	240	150	85	112	3.5	45	30	1 keyway	44	8	11
<b>Size 3 - A</b>	0-1,000	738	0-6,000	1.057	1.668	315	150	110	112	5.5	82.5	50	1 keyway	78.5	12	20
<b>Size 3 - B</b>	0-2,000	1475.1	0-6,000	1.057	2.149	315	150	110	112	5.5	82.5	50	1 keyway	78.5	12	20
<b>Size 4 - A</b>	0-5,000	3687.9	0-5,000	1.152	6.112	425	200	135	112	5.5	112.5	75	1 keyway	78.5	20	30
<b>Size 4 - B</b>	0-10,000	7375.7	0-5,000	1.152	12.162	425	200	135	112	5.5	112.5	75	1 keyway	78.5	20	30
<b>Size 5 - A</b>	0-15,000	11064	0-2,000	2.138	20.499	416	220	170	112	5.5	121	110	2 keyway	116	32	44
<b>Size 5 - B</b>	0-20,000	14751	0-2,000	2.138	22.318	416	220	170	112	5.5	121	110	2 keyway	116	32	44
<b>Size 5 - C</b>	0-25,000	18439	0-2,000	2.138	34.608	416	220	170	112	5.5	121	110	2 keyway	116	32	44
<b>Size 5 - D</b>	0-30,000	22127	0-2,000	2.138	40.969	416	220	170	112	5.5	121	110	2 keyway	116	32	44

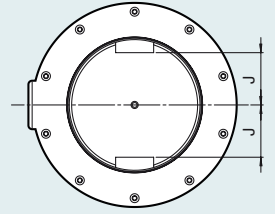
Alphabet key for M425



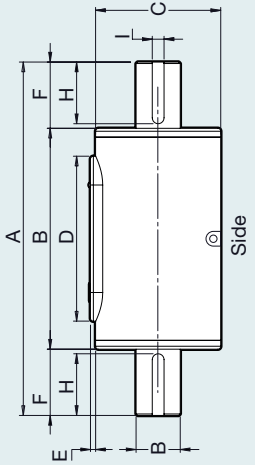
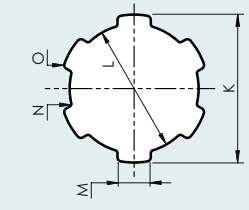
Model sizes 1 to 4



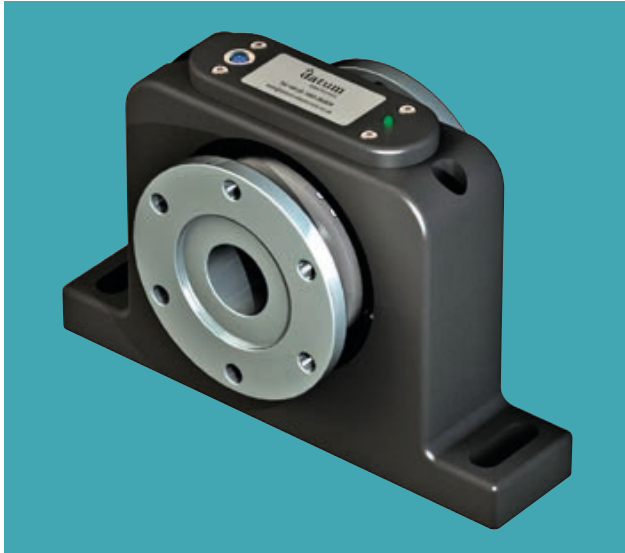
Model size 5



Model size 6



# THE FF425 NON-CONTACT FLANGED TORQUE TRANSDUCER



Using the latest technology manufactured and designed by Datum Electronics the Series FF425 non-contact rotary Flanged Torque Transducers fit directly as replacement drive line spacers and couplings.

The transducer utilises the Datum 425 Series state of the art electronics, offering very high accuracy, operational stability, high signal resolution and a wide range of signal output options.

The Torque Transducer can either be supplied from our standard range with DIN flanges up to 30KNm or as custom units up to any size with the flange and length dimension designed to fit an existing coupling spacer design. With the custom option drive lines can have a torque transducer integrated with a minimum of cost and disruption or need to find additional space.

The FF425 is a true non-contact torque transducer, the rotor runs inside the stator with a 2 to 5mm air gap. This ensures no long-term wear of bearings or frictional loads on the rotating drive shaft.

The FF425 Torque Transducers are ideal for test rigs and permanent machinery applications.

## FF425 System Performance and Benefits:

Ranges from 0-100Nm up to 30KNm as standard

Range up to any size, please contact Datum sales

High Accuracy, Low Power Consumption

High Torque Resolution

Fully Non-Contact Transmission and Hardware

Can be Supplied Custom to Your Driveline

Fast Data Sampling Rates

Robust Construction

Researched Design and Built in the UK

## FF425 Performance Information

### PERFORMANCE

Non-Linearity	+/-0.1% FSD
Non-Repeatability	+/-0.05% FSD
Noise-free Resolution	20 bit to 13.5 bit (dependent on sample rate)
Sample Rate	1 to 4000 samples per second
Output Baud Rate	9600 to 3Mbaud

### Transducer output:

Serial data via RS485 see Datum Universal Interface Specification for standard options including 4-20mA, +/-10Vdc, Ethernet, RS485, USB.

### Transducer output data:

Torque	Shaft RPM*	Shaft Temp.	Diagnostics
*Output of RPM based on 1 input pulse per revolution			

### POWER SUPPLY

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

### ENVIRONMENT

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
Environmental Protection	IP54 (or IP67 with Option ET)
Electromagnetic Compatibility	EN61326-1:2006 (IEC61000-4), IEC60945)

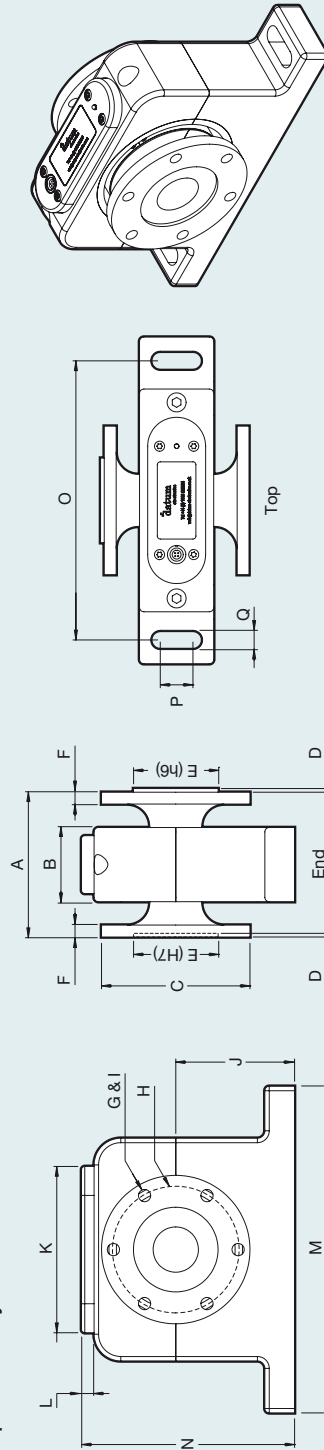
### FOR SIGNAL OUTPUT OPTIONS INCLUDING:

Ethernet, MODBUS, USB, RS485/232 and 4 analogue channels configured 4-20mA (4-12-20mA): +/-10Vdc, +/-5Vdc, 0-10Vdc or 0-5Vdc, refer to Document 1023 Datum Universal Transducer Interface.

# FF425 Specifications

FF425 Model Size	Rated load (Nm)	Rated load (lb ft)	Standard Rotational speed (RPM)	Body mass (Kgs)	Rotor mass (Kgs)	A Shaft length face to face (mm)	B Body width (mm)	C Flange Ø (mm)	D Male/Female flange coupling extrusion/ depth (mm)	E Male/Female flange coupling Ø H7/ h6 TOL (mm) (ISO 286)	F Flange thickness (mm)	G Number of holes	H PCD (mm)	I Hole Specification (ISO 4017 / DIN 933 / ISO 273)	J Base to shaft centre (mm)	K Output module length (mm)	L Output module height (mm)	M Base length (mm)	N Overall height (mm)	O Base fixing slot. Centre to centre (mm)	P Fixing slot length (mm)	Q Slot width (mm)
Size 1	0-100	73.8	10,000	1.057	0.560	97.5	50	100	2.5	57	8	8	101.5	M8	80	112	8.5	220	143.5	188	22	13
Size 2 - A	0-250	184	10,000	1.057	1.201	97.5	50	100	2.5	57	8	8	101.5	M8	80	112	8.5	220	143.5	188	22	13
Size 2 - B	0-500	389	10,000	1.057	1.276	97.5	50	100	2.5	57	8	8	155.5	M8	80	112	8.5	220	143.5	188	22	13
Size 3 - A	0-1000	738	10,000	1.057	1.668	97.5	50	120	2.5	75	8	8	155.5	M8	80	112	8.5	220	143.5	188	22	13
Size 3 - B	0-2000	1475.1	10,000	1.057	2.149	107.5	50	120	2.5	75	8	8	155.5	M8	80	112	8.5	220	143.5	188	22	13
Size 4 - A	0-5000	3687.9	8000	1.152	6.112	137	50	180	3	110	12	8	155.5	M12	100	112	8.5	220	190.5	188	22	13
Size 4 - B	0-10,000	7375.7	8000	1.152	12.162	157	60	185	3	110	15	8	155.5	M14	100	112	8.5	300	210.5	268	22	13
Size 5 - A	0-15,000	11064	6000	2.138	20.499	216	60	250	5.5	140	20	8	217	M16	100	112	8.5	300	210.5	268	22	13
Size 5 - B	0-20,000	14751	6000	2.138	22.318	216	60	250	5.5	140	20	8	217	M16	100	112	8.5	300	210.5	268	22	13
Size 5 - C	0-25,000	18439	6000	2.138	34.608	216	60	285	6	175	20	8	247	M18	100	112	8.5	300	210.5	268	22	13
Size 5 - D	0-30,000	22127	6000	2.138	40.969	216	60	315	6	190	22	8	275	M20	100	112	8.5	300	210.5	268	22	13

Alphabet key for FF425 model sizes 1 to 5



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

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## THE RS425 NON-CONTACT TORQUE TRANSDUCER



### Bearing-less Torque Sensor with completely separate rotor and stator

**The Datum Electronics Series RS425 non-contact rotary torque transducers have been designed to fit easily in line with any drivetrain or test bed using either a spline or keyway shaft.**

We are able to modify the ends of the transducer to best suit your requirements, and can even design bespoke ends to fit. This type of transducer has many advantages over other torque systems including: zero bearing friction, high speed and high torque applications.

### RS425 System Performance and Benefits:

Lightweight Torque transducer with completely separate rotor and stator set

No mechanical friction, long-term operation reduced maintenance

Ideal keyway shaft for easy fitting to test rigs and drive systems

Spline shafts are also available as an alternative to a keyway shaft

No bearings – ideal for high speed applications

Standard RS425 torque transducer range available from 0Nm-10,000Nm

Analogue Output available & compatible with LABVIEW software

Ideal for fully sealed or underwater applications (IP 68) system upgrade

### The RS425 Torque Sensor Range

The RS425 torque transducer utilises a strain gauged shaft for accurate and reliable torque measurement and a set of rotating on shaft conditioning electronics, the digital signals are transmitted to the non-rotating part of the system or stator providing a reliable and highly accurate torque measurement solution. The rotor is continuously powered enabling static torque measurement to be made. Not only does the RS425 Series offer great technical advantages but the range of torque sensors are competitively priced.

The RS425 series torque transducer is not limited by bearings; therefore it can be used at higher speeds, and places no bearing loads on to the shaft. The stator needs to be mounted in relation to the shaft within an operating envelope of +/- 3 to 5mm. The standard range can measure torque ranges from 0Nm up to 10kNm, the same modular elements have been applied to bespoke torque transducers for use down as low as 1Nm and up to 500kNm.

Using our new generation of electronics as found in our industry standard M425 Torque transducer, the RS425 gives customers the ability to choose the sample rate that they need from 1 up to 4000sps, with higher resolution using up to 24bit technology.

In many cases higher RPM ratings can be attained - please call our engineering team to discuss you applications

### The Competitive Edge

The Series RS425 transmits calibrated digital data as this is a cleaner and more defined method of transmitting data. The on-shaft signal from the strain gauge is converted to a digital signal and amplified on shaft. It is this signal that is taken off the shaft and processed by either with our DUI; Datum Universal Interface, or with our free of charge GUI software, providing the end user with clean and definitive data transmission.

### RS425 Analogue Options

If an analogue signal is required, our Series 425 torque transducers are able to provide either 4-20mA or 0-10VDC output with our DUI; by converting the digital data signal from the torque transducer to an analogue signal. However, the effect of external or electrical noise can impact upon signal strength and definition in this instance. Other commercial applications may use slip rings or analogue signals to transmit data, but the Datum Electronics series 425 outputs digital as standard.

If your requirements dictate anything above our standard torque sensor range of 10,000Nm we can and have engineered torque measurement transducers up to 500,000Nm.

## Instrumentation

The Series RS425 transducer is compatible with our new DUI; Datum Universal interface which gives a range of digital and analogue outputs as well as a digital display of the torque speed and power. It can also be set in a legacy mode to work with our older range of indicators and displays

A popular option is to view data from the transducer on a PC or laptop for torque data analysis. Our GUI software has been developed to allow the user to view the torque data in real time with optional data analysis for performance monitoring and control. Using a simple USB interface, or Ethernet connection the transducer data can be displayed and logged at the touch of a button with our GUI.

## RS425 Performance Information

RS425 SERIES	Size 1	Size 2	Size 3	Size 4
Torque range	0-100Nm	0-500Nm	0-2,000Nm	0-10,000Nm
Accuracy class	0.1%FSD	0.1%FSD	0.1%FSD	0.1%FSD
Mechanical connection	Keyway or Spline Shaft			
Signal outputs	RS485 as standard			
Optional outputs with DUI	DIGITAL: USB, Ethernet, RS485/232 and USB memory logging. ANALOGUE: 3 Channels of Torque, Speed and Power as 0-10V/4-20mA.			
Transmission	Strain gauge signal, digital on-shaft with inductive loop			
Max speed (rpm)	22,000rpm	20,000rpm	16,000rpm	10,000rpm
Output data	1-4000sps			

## RS425 System Advantages

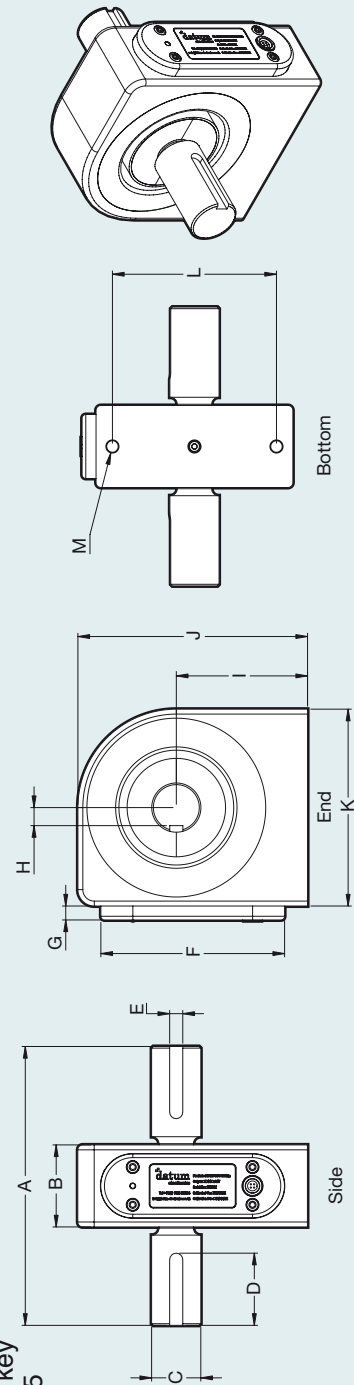
- Accurate On Shaft Torque Measurement
- Flexible shaft fittings (Spline or keyway shaft)
- Modular System Assembly
- Non-contact Signal Transmission
- Proven Technology
- Low Maintenance
- Simple Linear Calibration
- Engineered to fit most drive components
- Rotary and Static Torque Measurement
- Optional Analogue Data Output
- LABVIEW compatible



## RS425 Specifications

RS425 Model Size	Rated load (Nm)	Rated load (lb ft)	Rotational speed (RPM)	Body mass (Kgs)	Rotor mass (Kgs)	A Shaft length to face (mm)	B Body width (mm)	C Shaft $\phi$ g6 TOL (ISO 286-2)	D Keyway length (BS 4235-1 : 1972)	E Keyway width (BS 4235-1 : 1972)	F Output module length (mm)	G Output module height (mm)	H Keyway depth off axial centre (BS 4235-1 : 1972)	I Base to shaft axial centre (mm)	J Overall height (mm)	K Base length (mm)	L Base fixing holes. Centre to centre (mm)	M Fixing holes (DIN 933)
Size 1 - A	0-10	7.4	10,000	1.057	0.401	97.5	50	15	22.5	5	112	8.5	4.3	80	140	220	100	M8
Size 1 - B	0-20	14.8	10,000	1.057	0.421	97.5	50	15	22.5	5	112	8.5	4.3	80	140	220	100	M8
Size 1 - C	0-50	36.9	10,000	1.057	0.462	97.5	50	15	22	5	112	8.5	4.3	80	140	220	100	M8
Size 1 - D	0-100	73.8	10,000	1.057	0.560	97.5	50	15	22	5	112	8.5	4.3	80	140	220	100	M8
Size 2 - A	0-250	184	10,000	1.057	1.201	97.5	50	30	45	8	112	8.5	11	80	140	220	100	M8
Size 2 - B	0-500	369	10,000	1.057	1.276	97.5	50	30	45	8	112	8.5	11	80	140	220	100	M8
Size 3 - A	0-1000	738	6000	1.057	1.688	97.5	50	50	80	12	112	8.5	20	80	140	220	100	M8
Size 3 - B	0-2000	1475.1	6000	1.057	2.149	107.5	50	50	80	12	112	8.5	20	80	140	220	100	M8
Size 4 - A	0-5000	3687.9	5000	1.152	6.112	137	50	75	80	20	112	8.5	30	80	140	220	100	M8
Size 4 - B	0-10,000	7375.7	5000	1.152	12.162	157	50	75	80	20	112	8.5	30	80	140	220	100	M8
Size 5 - A	0-15,000	11064	2000	2.138	20.499	216	60	110	110	32	112	8.5	44	120	160	300	110	M10
Size 5 - B	0-20,000	14751	2000	2.138	22.318	216	60	110	110	32	112	8.5	44	120	160	300	110	M10
Size 5 - C	0-25,000	18439	2000	2.138	34.608	216	60	110	110	32	112	8.5	44	120	160	300	110	M10
Size 5 - D	0-30,000	22127	2000	2.138	40.969	216	60	110	110	32	112	8.5	44	120	160	300	110	M10

Alphabet key for RS425





# THE 430 SPMK (SHAFT POWER MEASURING KIT)

**The Datum Electronics Series 430 Shaft Power Measurement Kit is designed to measure the on-shaft torque for trials applications on rotating shafts. It can be used for simple testing of power levels or as a key tool within extended trials to assess fuel efficiency or performance improvements.**

The SPMK system is designed for measuring power and torque on drive shafts, applications including marine ship shafts, prop shafts and vehicle drive shafts. The trials kit measures the on-shaft torque and wirelessly sends this data to the off shaft receiver which is also an optical speed sensor. The data is outputted via USB to a laptop/netbook running our free software, PowerKit. The Torque, Speed and Power can then be viewed or logged as required.

## Measurement and Analysis

**The Datum Electronics Shaft Power Measurement Kit does more than just measure Torque.**

The SPMK can be used to verify power outputs from engines and motors. The following data can also be measured and analysed.



- Power Transmission
- Torque Trials
- Vibration and Torsional Acceleration
- Power Transients
- Peak Torque Levels
- Power Delivery
- Shaft Vibration

## System Advantages

**The main advantage of the Shaft Power Measurement Kit is the simple and easy installation process and ease of operation.**

The Kit comes in three main components making this application easy enough install, set up, test and operate and re-use where necessary.

With the aid of its installation disk; the software can be simply installed onto all modern Microsoft operating systems. The free software that is supplied provides live Torque, Speed and Power as standard which can be imported into Microsoft programs such as Excel for future data logging.

Measures Shaft Power, Shaft Torque & Shaft Speed as a basic function	Portable and lightweight design
Easy to install with a step-by-step guide	User Friendly software which is included free of charge
Logs, records and displays 'real time' data	Compatible with 2 data channels and shaft speed
	To Fit Shafts From 30mm - 1100mm



## SPMK Specifications

	Compact SPMK	Standard SPMK
Shaft fit dimensions	30 - 500mm	90 - 1100mm
Electronics accuracy	0.1%	0.1%
IP rating	IP67	IP67
Operating temperature	0-70°C	0-70°C
Data sampling rate	10 SPS as standard For faster rates please discuss	10 SPS as standard For faster rates please discuss
Data output	RS485 & USB for Torque and Speed (Analogue available as an extra)	RS485 & USB for Torque and Speed (Analogue available as an extra)
Battery life	4 Days as Standard	30 Days as Standard
Battery type	PP3 (N.B. faster sample rate reduces battery life)	Rechargeable Hot Swap (N.B. faster sample rate reduces battery life)
Cable length	4m as Standard	4m as Standard

# THE DATUM UNIVERSAL TRANSDUCER INTERFACE

The Datum Universal Transducer Interface has been designed to accept signal from all of the Datum Electronics range of Rotary and Static Torque Sensors.

The sensor ranges supported include:

M425 Rotary Torque Transducers

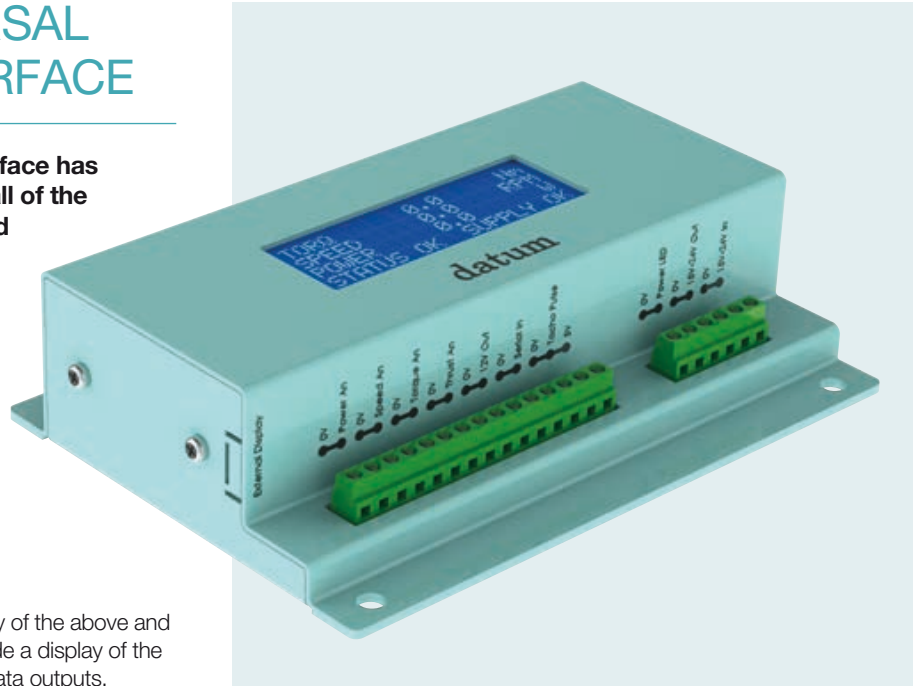
RS/FF425 Rotary Torque Transducers

SPS Marine and Heavy Industrial Torsionmeter Systems

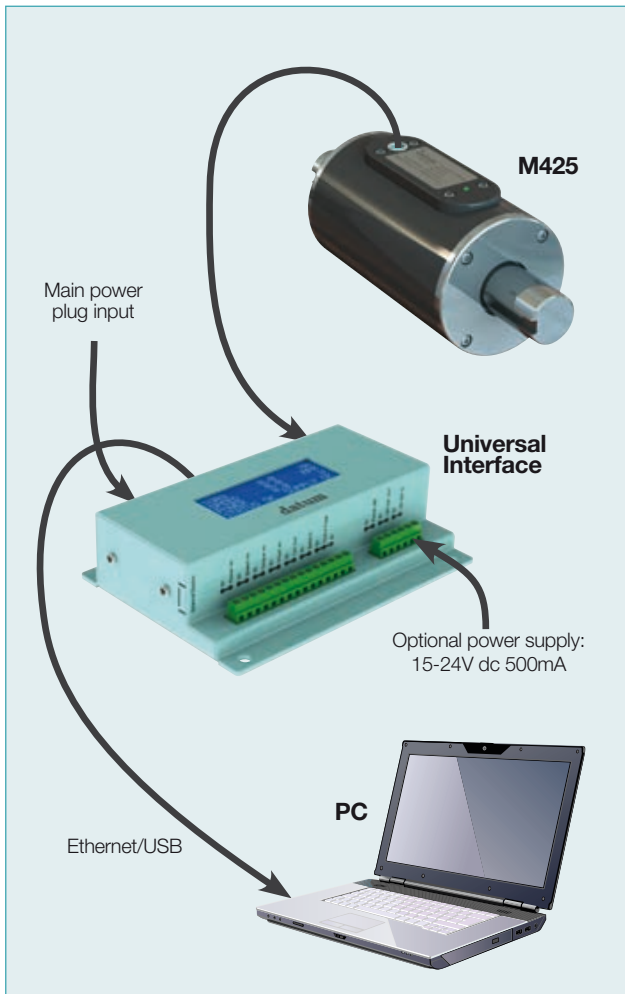
NTM Naval Marine Torsionmeter Systems

RS/FF410 Static Torque Transducers

The interface will accept the serial data from any of the above and most of the earlier Datum products. It will provide a display of the data and a wide range of analogue and serial data outputs.



## Typical Configuration



## Outputs Provided

**Output power** - for the M425, RS/FF425, RS/FF410 and the SPS Marine System

**Ethernet** - data output and main configuration interface

**Mini USB Type B** - data output and configuration interface

**USB Type A** - logging to memory stick

**RS485/RS232 Serial** - data output

**4 channels of analogue** - user configurable to 4-20mA 4-12mA, +/-5Vdc, +/-10Vdc, 0-5Vdc and 0-10Vdc

The data used for these outputs can be user selected from the Torque, RPM and Power data plus an additional strain input (often used for shaft bending or thrust).

### Additional Input

The Datum Universal Transducer Interface will also accept an input from an external shaft speed tacho.

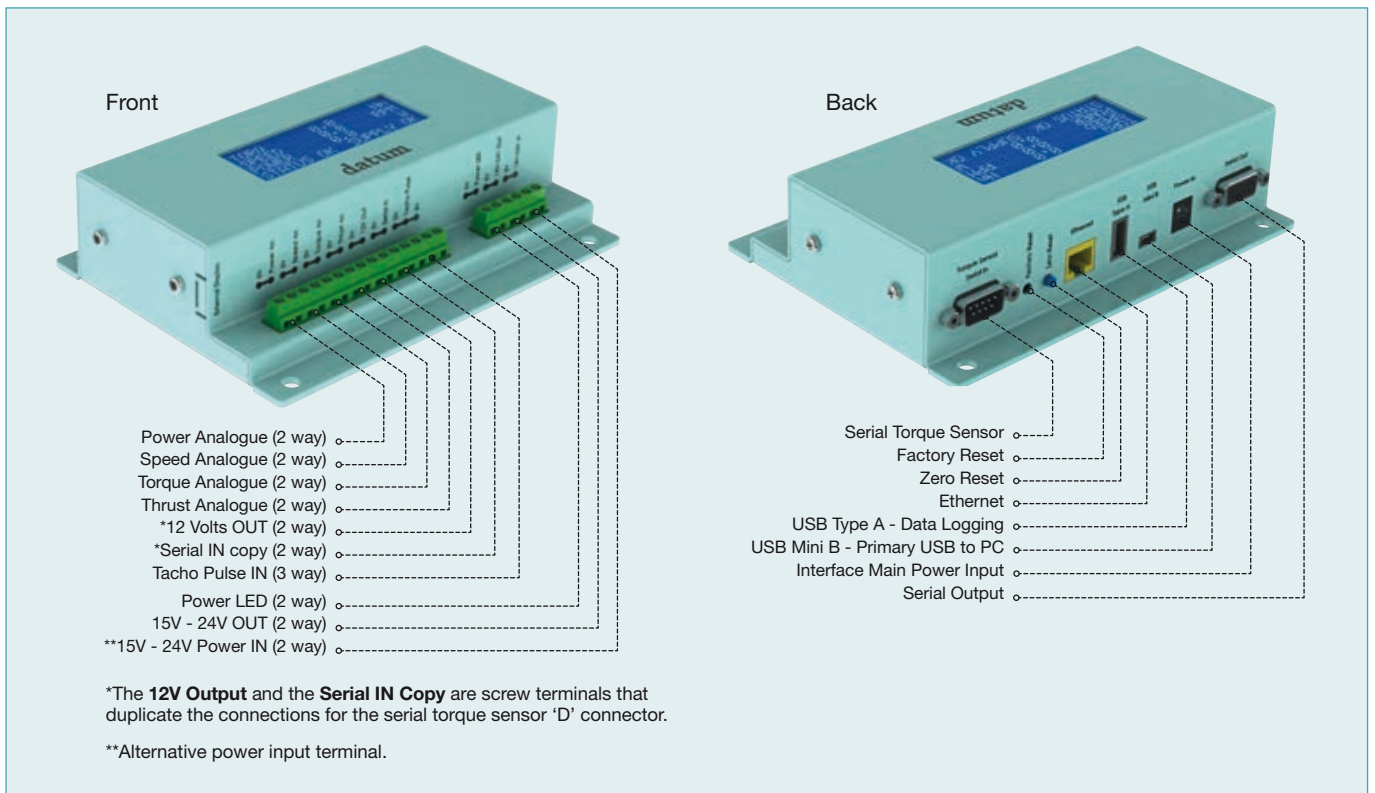
Power Supply 15-24Vdc.

## Interface Display

The Universal Interface display can show the following data from the M425 Torque Transducer:



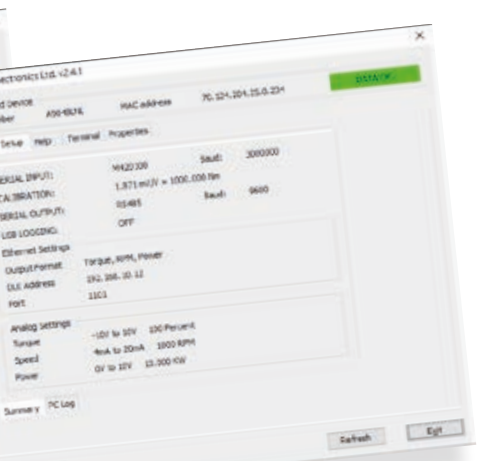
# Datum Universal Interface Connections Guide



## Graphic User Interface

### Datum data logging software

The Datum data logging and configuration software provides a wide range of control functions of the M425 including set-up and configuration options plus data logging.



# Datum Universal Interface Specifications

## SIGNAL INTERFACE OUTPUTS

Digital:	
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

## Analogue:

All four of the M425 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:

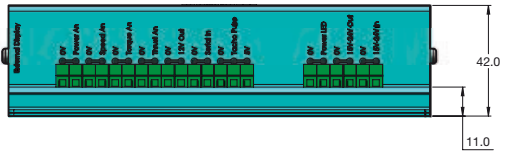
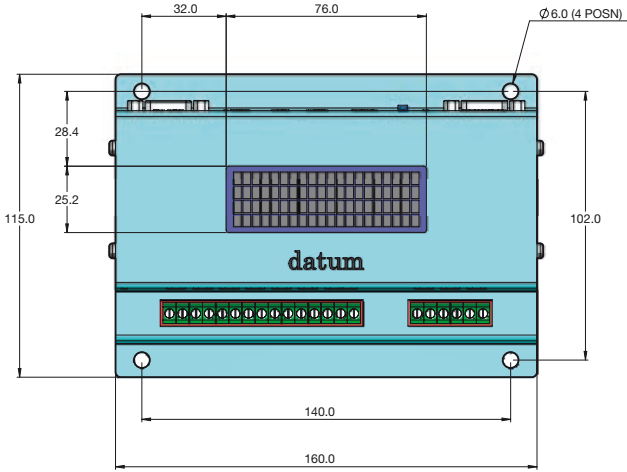
Channel 1 - Torque	from 0-500Nm as 4-20mA
Channel 2 - Speed RPM	from 0-100-rpm as 0-5Vdc
Channel 3 - Power	from 0-5000W as 4-20mA
Channel 4 - Spare	

## Display:

Torque	Speed RPM	Power	Status
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## ENVIRONMENT

Normal Specification Range	10 to 60°C
Operating Range	-10 to +70°C
Storage Range	-35 to +75°C
Environmental Protection	IP54 (see RS425 for IP67/68)
Electromagnetic Compatibility	EN61326-1:2006 (IEC61000-4), IEC60945)



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