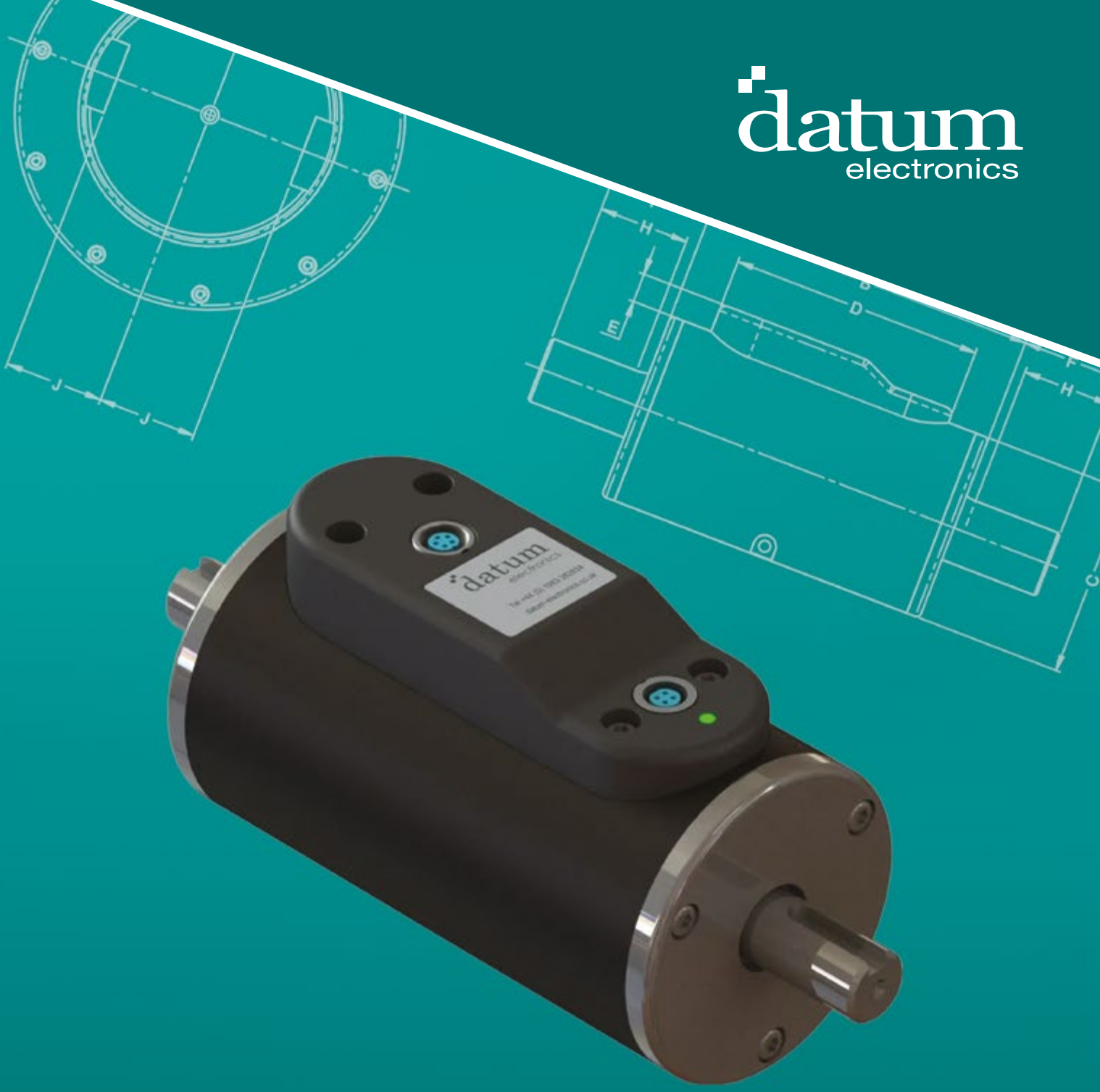
datum electronics



425 SERIES

M425 Torque Transducer

USER MANUAL

MADE IN BRITAIN

PRECISION. DATA. INNOVATION.

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Warranty

We warrant this product against defects in materials or workmanship for a period of 12 months (1) year from the date of purchase despatch.

In the event of a defect during the warranty period, the buyer should inform the seller immediately, allowing the seller all potential possibilities to remedy the issue remotely. Failure to resolve the issue remotely, the unit should be returned, freight (and all duties and taxes) prepaid by the Buyer to the authorised distributor or seller from where the hardware was purchased.

The Distributor or seller, at their discretion will either repair or replace (where authorised to do so) the defective hardware, and provide a full investigation report. The remedy will be presented to the buyer and if in agreement the hardware will be returned to the buyer with freight charges paid by the distributor or seller.

Limitation of warranty

The foregoing warranty shall not apply to defects resulting from:

1. Improper or inadequate maintenance by the buyer.
2. Unauthorised modification or misuse.
3. Operation outside the environmental specification of the product.
4. Mishandling or abuse.

The warranty set forth above is exclusive and no other warranty, whether written or oral is expressed or implied. We specifically disclaim the implied warranties of merchantability and fitness for a particular purpose.

Exclusive remedies

The remedies provided herein are the buyer's sole and exclusive remedies. In no event shall we be liable for direct, indirect, incidental or consequential damages (including loss of profits) whether based on contract, tort or any other legal theory.

Introduction

Please contact us if you need help, if you have a complaint, or if you have suggestions to help us improve our products or services.

If you contact us about a product you already have, please tell us the full model number and serial number, so that we can give you accurate and fast help.

This product has a 1 year warranty. We will put right or replace any meter which is faulty because of bad workmanship or materials. This warranty does not cover damage caused by misuse or accident.

If you return a unit for repair, please include a detailed description of the problem, and the name of a contact who we can refer to for any questions. Please mark for the attention of the QA Department.

IMPORTANT

Warranty repairs or replacements are usually returned with a standard courier service. We do not offer compensation for losses caused by failure of this instrument.

If you do not agree with these conditions, please return this item in unused, condition, in its original packaging and we will refund the purchase price, excluding any carriage paid.

We always try to improve our products and services, so these may change over time. You should keep this manual safely, because future manuals, for new designs, may not describe this product accurately.

We believe these instructions are accurate, and that we have competently designed and manufactured the product, but please let us know if you find any errors.

Safety

Obey all safety warnings in this manual, and install the hardware according to local wiring and installation regulations. Failure to follow these guidelines may cause damage to the hardware, connected equipment, or may be harmful to personnel. Any moving mechanical device controlled by this equipment must have suitable access guards to prevent injury to personnel if the meter should fail.

Warnings

Please carefully read this manual and all warnings. Install the system ONLY when you are sure that you've covered all aspects.

Please ensure that ALL pre-requisites have been actioned prior to attempting installation of this hardware.

Check that the model number and supply voltage suit your application before you install the solution.

Connect the system according to current IEE regulations, IEC61010 & NFPA:70 National Electric Code in USA.

Power supplies to this equipment must have anti-surge (T) fuses.

Only clean the control panels front with a soft damp lint free cloth. Only lightly dampen with water. Do not use any other solvents.

Ensure glands are fully tightened following connection into controller.

Ensure correct spacing and positioning of hardware as per the below guidelines.

It is best practise to run separate power and data cables, do not run power and data along the same cable.

Caution: There is a risk of electrical shock if this system is not properly installed

Caution: Risk of danger: Read the whole manual before you install this meter

What is it designed to do?

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.

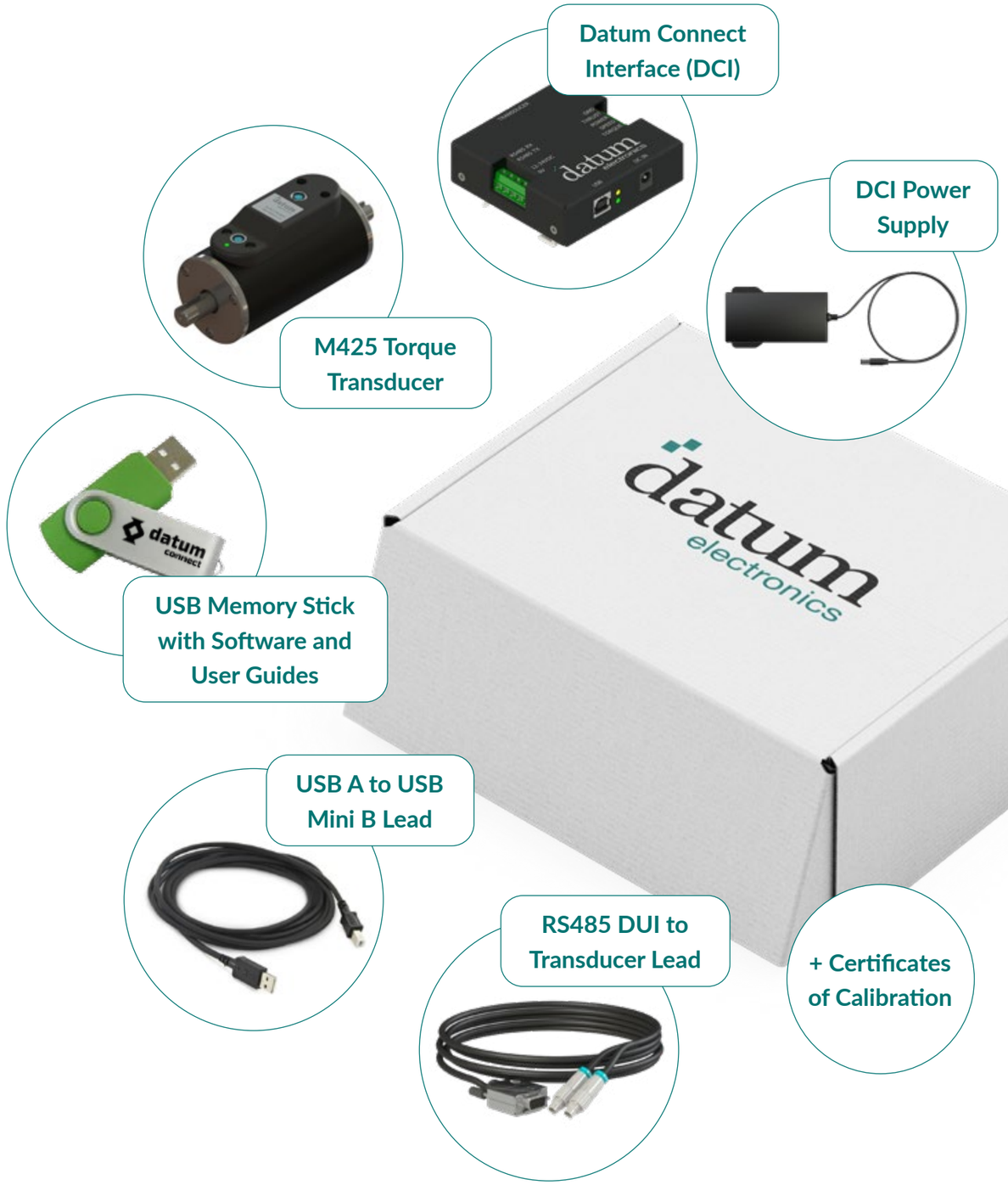
System Advantages

- Accuracy and resolution options
- High data rate
- Static and rotary torque measurement
- Operational stability
- Non-contact data transmission
- Magnetic speed sensor - not effected by dirt
- Simple to integrate
- Robust construction
- Torque transducer sensor
- Ranges 0-5Nm up to 0-30,000Nm
- High resolution torque sampling
- 100 samples per second standard – Speak to sales for higher sample rates
- For higher samples please speak to sales
- Low power consumption

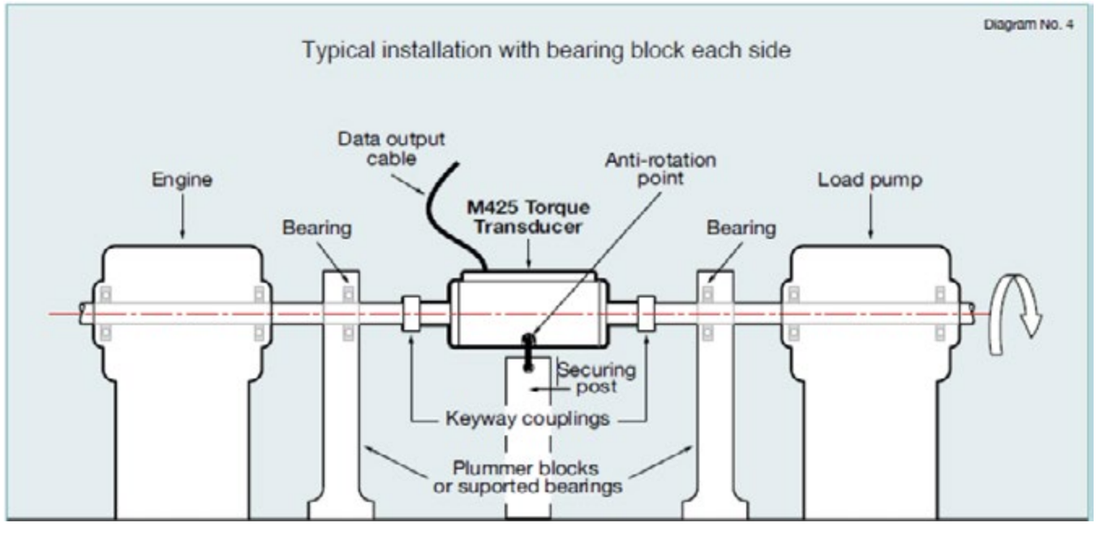
System Outline

- Complete torque transducer
- Designed to be mounted in line with the drivetrain
- Torque transducer body supported on rotary shaft with bearings
- Ideal for test rig applications
- Keyway shaft for easy fit and rig design
- Torque measurement available up to 30,000Nm in a range of model sizes
- Analogue output options

What's in the Box



Installation



The objective is to align the shaft of the M425 Torque Transducer (sensor) with the torque. The torque should where possible be driven through the centre line of the shaft.

Unlike Disk Transducers that require very fine alignment tolerances when mounting, the M425's longer shaft allows a greater degree of flexibility in terms of alignment.

Things to avoid

Overload = 150% the rating of the transducer. Loads at this level should be avoided as they will decrease the fatigue life of the Transducer. If you are likely to see large overloads at the same time as wishing to see high resolution data for much smaller torques please consult our sales team.

Ultimate Load = at the ultimate loads quoted for the Transducer shaft, the sensing element will be damaged and large offsets will occur. At this level the shaft will be well beyond its design limits and may mechanically fail. If you have loaded a Transducer above the Proof Load/Overload level it should be checked before continued use.

The series M425 Torque Transducers are designed to withstand a level of overload.

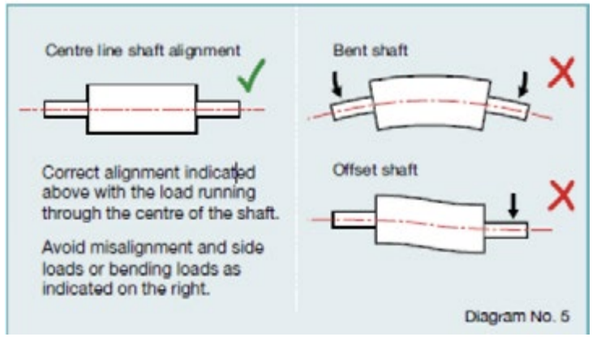
The load levels quoted within the M425 datasheet should not have any effect on the calibration or zero setting of the Transducers. Each Transducer has been subjected to the proof load level within its testing cycle.

Loading the Transducer above the proof level will offset the Transducer zero and will damage the Transducer. Regular loading beyond the proof level will start to show progressive zero movement and may effect both the gain and the hysteresis of the Transducer. The shaft absolute load is the maximum before the shaft will yield.

You should avoid any side loads or bending loads across the shaft. As the M425 Transducer series have relatively long shafts they are more tolerant to a small degree of misalignment than short flange transducers (sensors), however misalignment can change the loading on the internal bearings of the device and should be avoided where possible.

Consider large dynamic or transient torques when designing your test system.

When designing the test rig or test system that will use the M425 Transducer you should consider the effect of any large inertial / kinetic loads such as flywheels or brakes. If the system is to drive to a high level of torque, and then a brake is applied, the dynamic torque in the test rig can be much higher than that of the output of the drive motor. The fast deceleration torque may exceed the limits above causing damage.



Where the installation will see a larger degree of misalignment you should consider the use of flexible couplings in the drive line. If misalignment is very likely consider the Datum Electronics RS and FF ranges which are bearing-less transducers. Talk with our sales team who can advise on this type of installation.

Which way round to mount?

The M425 Transducer will operate in both a clockwise or anti-clockwise direction.

The M425 Transducer is calibrated to give a positive output for clockwise torque and a negative output for counter clockwise torque. The M425 Transducer will also output torque data while static.

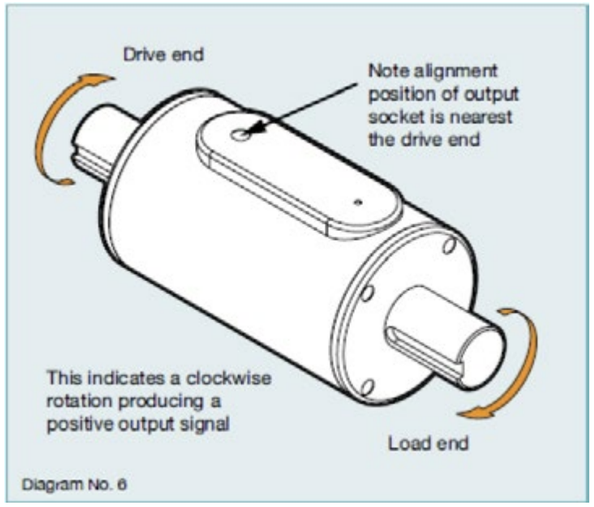


Diagram No. 6

Keyway fit size

Keyway sizes are generally in accordance with BS4235-2:1977.

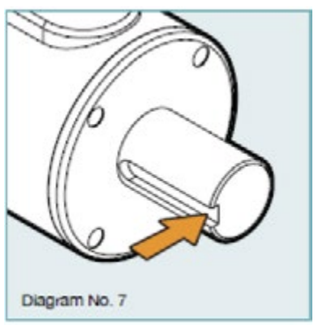


Diagram No. 7

Anti-rotation point

The M425 Transducers have an anti-rotation anchor point on the underside of their casing. This is to be used to secure the static body of the Transducer and prevent rotation during operation.

Pass a strong cable or tie through the hole in the anti-rotation anchor point and secure the tie to a solid structure on the test rig, ensuring the tie has clearance from the rotating drive shaft and moving parts to avoid snagging.

You should use the anti-rotation anchor point for this rather than the data cable as using the data cable may damage the connection. The data cable is not designed to take a load.

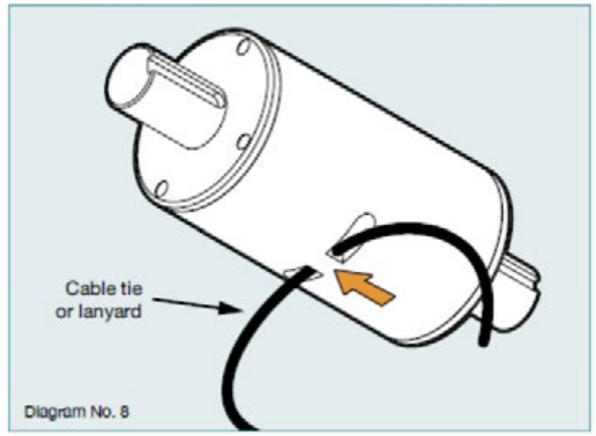


Diagram No. 8

Maintenance

Serviceable items: Bearings

The bearings are the only component on the M425 that may require servicing depending on operating conditions. The following provides information on the bearing life under load conditions.

The M425 Transducer has a balanced rotor running between your couplings. The body of the Transducer is supported by two bearings. The life of the bearings at normal running RPM of half the rated RPM is 10 years continuous use. Bearing life may be a concern due to other external loads, ask our sales 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 service by return to Datum Electronics.

Datum Connect

The Datum Connect Interface has been designed to complement the following Datum Electronics range of Rotary and Static Torque Sensors.

Outputs provided

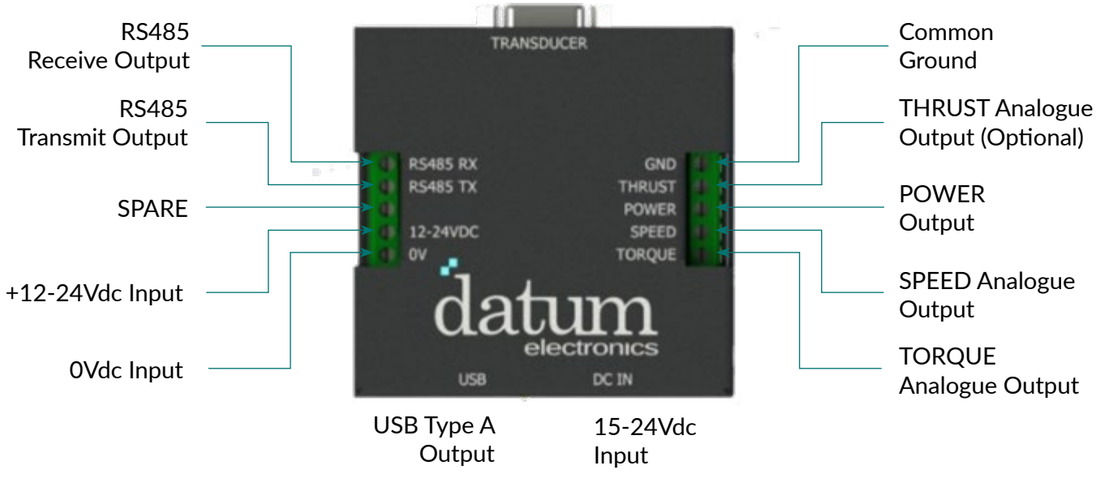
Output power for all supported sensors
USB Type B
RS485 Terminals Rx/Tx

4 configurable analogue outputs for Torque, Speed*, Power and Thrust.

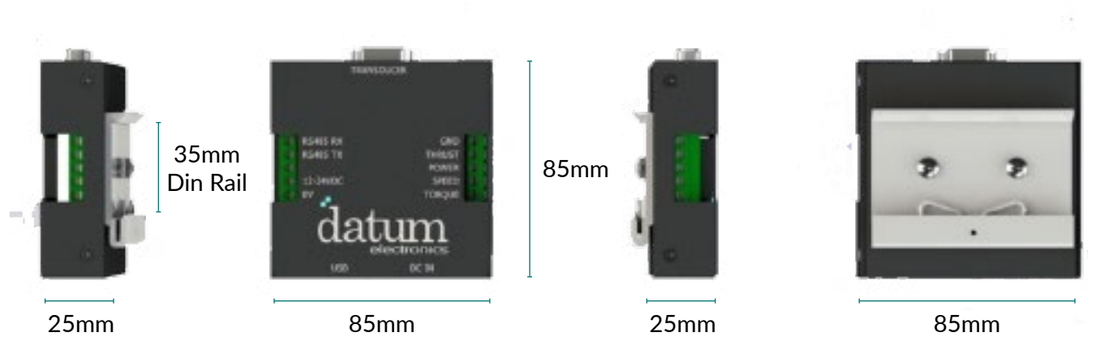
Unipolar	**Bipolar**
4-20mA	4-12-20mA
0-5Vdc	+/-5Vdc
0-10Vdc	+/-10Vdc

* Note: Speed is unipolar only.

Datum Connect Interface connections guide



Dimensions



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 in 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 design 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:

Torque [Nm] = (raw data [mV/V] - zero offset [mV/V]) x (rated torque [Nm]) ÷ (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 M425 Torque Transducer 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.

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V1.3

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