

What are rotary torque transducers?

An in-depth look at rotary torque transducers, their purpose and where they are used in a variety of industries.

What is a rotary torque transducer?

A rotary torque transducer is a device used for measuring the torque on a rotating system such as the tightening torque applied by continuous and impulse power tools.

Torque transducers are a small but incredibly vital piece of kit for a whole host of industries. For example, in the automotive industry, on any given production or assembly line there can be upwards of two or three hundred power tools in use, constantly, over the course of one working shift.

These tools must apply the correct levels of torque for tightening important fasteners, joints and components such as car engines and brakes, otherwise this can result in product failure and potentially even graver circumstances.

In the automotive industry, torque transducers are used in the tool testing and fastener quality auditing processes to ensure that tightening torque levels are being applied correctly.

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During testing, the transducers are fitted on the output drive of a power tool where it measures the torque applied by the tool, to the fastener on a specific part of the assembly. This measurement provides important information about how the joint is being tightened by the tool, the actual tightening torque applied and can assist in establishing specifications for proper assembly.

The rotary torque transducer can also measure the angle of fastener rotation during tightening which is also an important indication of the joint's reliability.

Torque transducers can also provide key data to help assist manufacturers to flag problematic tools or particular joints on an assembly. This in turn helps to establish an outcome to resolve any issues that may arise in manufacturing, avoiding safety issues or recalls for example.

Where are rotary torque transducers used?

Rotary torque transducers are used across a variety of applications



The cabled UTA (Universal Torque Analyzer) and IS (Industry Standard) rotary torque transducers. (CheckStar and CheckStar Multi)



Rotary torque transducers are used in critically important assembly and quality auditing applications across a number of industries including automotive, aerospace and general manufacturing.

in a diverse range of industries but they are extensively used in fastener assembly applications to ensure the correct torque is being applied by both power and hand tools.

For example, torque transducers can be used to test and measure the level of torque that a power tool places on a fastener such as a nut on the wheel of a car or a bolt that secures a seatbelt, to ensure that it is tightened to a recommended and safe level.

As mentioned above, torque monitoring and measurement is an important parameter in the testing, inspection & quality auditing capacity of all machinery, vehicles and engines. Some of the more important applications for torque transducers lie within key industries such as aerospace, automotive, military & defence and heavy-duty construction equipment.

A torque transducer usually forms part of a company's quality auditing equipment and can be used solely with a torque tester or data collector, or they can form part of a complete torque measurement and management system such as a threaded joint rate simulator bench.

In all applications where they are utilised, torque transducers perform an extremely vital role in ensuring torque is measured accurately. This ensures the integrity of safety-critical fasteners and gives manufacturers peace of mind that products have been assembled correctly, at the first time of asking. The process of torque management helps reduce costs for manufacturers as they cut down on wasted materials and substantial reworking costs but also most critically, it can save companies from the fines and bad publicity that would arise from potentially severe safety failures.

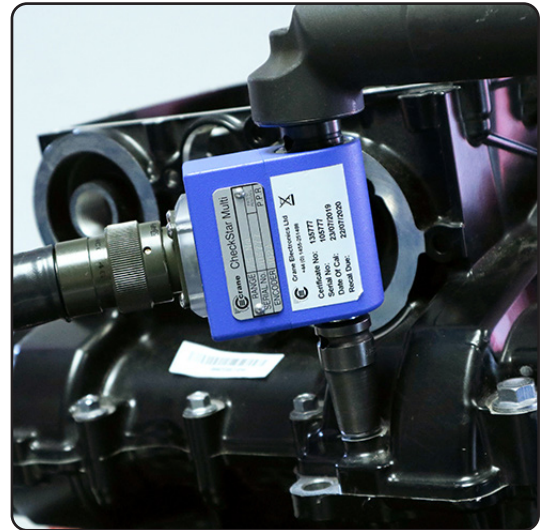
Within the automotive industry in particular, incorrectly tightened fasteners will produce joint failures and damage to a manufacturers reputation. If a cars interior trim panel screw was to fail, the result would be a quality issue leading to disappointment from their customers. If a seat belt bolt or wheel nut was to fail, a safety issue, the end result could mean end-user injury or even a fatality.

How does a rotary torque transducer work?

Rotary torque transducers measure in-line torque which is basically the measurements taken by the torque transducer in between the 'agent of rotation' (the power tool for example) and the object being rotated (e.g. the fastener or bolt).

A typical torque transducer utilises the 'Wheatstone bridge' arrangement. The unit houses components called strain gauges which convert strain in the shaft into a measurable electrical output by changing their electrical resistance. This change in electrical resistance can be converted into a signal and amplified to generate an external reading.

The electrical connection must pass between the stationary and rotational components of the rotary torque transducer. This is done via slip rings. This is comprised of two sets of components, a



A torque transducer being used with a nutrunner assembly tool to test the tightening torque levels of a fastener on a car engine block.



A rotary torque transducer and torque data collector being used during a quality audit test of a joint and fastener within the automotive industry.

number of conductive bands that are positioned around the rotating shaft of the transducer and a group of stationary brushes.

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When the transducer is dormant and has no load on it, the voltage is measured as zero. As movement is initiated, the voltage, and therefore the measurement of torque, increases.

The contact with the stationary brushes allows the generated electrical signal to be transmitted which can then be transformed into a digital torque reading, usually amplified via a PCB (printed circuit board) which can then be converted into a torque reading. This is measured in a Nm (Newton Metre) reading via software in a torque tester or data collector for example.

To measure torque effectively it is key to understand the elements involved in the creation of torque and what can affect the torque measurement, as this will have an impact on the correct selection of torque transducer required.

At Crane Electronics, we offer unrivalled expertise in torque measurement and management and are one of the pioneering companies in the production and development of the rotary torque transducer.

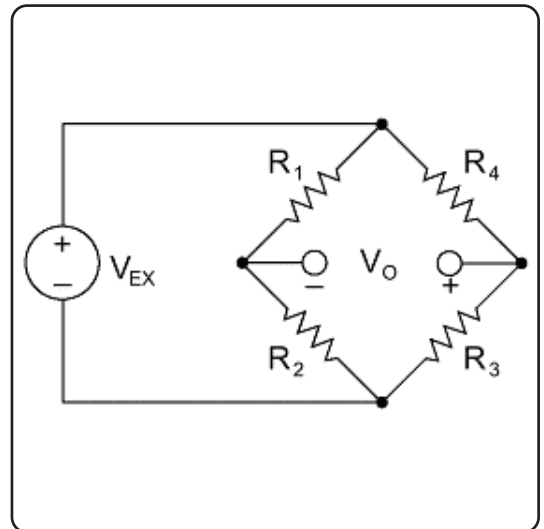
Who are Crane Electronics and what do they know about rotary torque transducers?

Established in 1971, Crane Electronics has been delivering solutions to torque management and control problems for over 50 years. Crane offer a variety of different rotary torque transducers which have helped revolutionise and shape the industry standard for torque transducers.

The original ‘smart’ torque transducers, the UTA (Universal Torque Analyser) transducer, was first introduced by Crane Electronics in 1978 and allowed the transducer to ‘talk’ to a connected readout device, eliminating typical set-up errors. These transducers incorporated a ‘plug and play’ system, long before this became a household term. Many of these original transducers are also still in use today.

The next step up in the development of rotary torque transducers was introduced with the IS (Industry Standard) transducer which was launched in 1986 becoming the world’s first in-line transducer capable of the repeatable measurement of impulse tools.

The CheckStar rotary torque transducer, as it became known, set the standard for dynamic torque and angle measurement of all continuous drive and impulse tools. A testament to the proven reliability and performance of the CheckStar, they are utilised in thousands of applications worldwide.



The Wheatstone bridge electrical circuit used to measure an unknown electrical resistance by balancing two legs of a bridge circuit.



An internal view of a typical standard rotary torque transducer.

In 2014, Crane released an upgraded version of the CheckStar, the CheckStar Multi. The 'Multi' version incorporates an LED light ring giving visual feedback when torque and angle targets are hit and also offers a complete improvement on performance and durability. Our torque transducers can be connected to our range of data collectors, such as the TorqueStar, for complete traceability of vital assembly and quality auditing data.

For more information about how we can provide a solution for your business, please contact us online at www.crane-electronics.com or alternatively, email us at sales@crane-electronics.com.



The CheckStar Multi rotary torque transducer from Crane incorporating an LED light ring for instant measurement status indication.



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