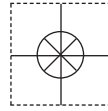


**1 YEAR**  
WARRANTY

MADE IN  
**USA**



# User's Guide



*Shop online at*

**omega.com<sup>®</sup>**

Ω OMEGA<sup>®</sup>

*omega.com*

*e-mail: info@omega.com*

*For latest product manuals:  
omegamanual.info*

**ISO 9001**  
CERTIFIED  
CORPORATE QUALITY  
STAMFORD, CT

**ISO 9001**  
CERTIFIED  
CORPORATE QUALITY  
MANCHESTER, UK

# TQ514

## Rotary Torque Sensor



<b>OMEGAnet® Online Service</b> <b>omega.com</b>	<b>Internet e-mail</b> <b>info@omega.com</b>
---	---

**Servicing North America:**

**U.S.A.:** ISO 9001 Certified Omega Engineering, Inc., One Omega Drive, P.O. Box 4047  
Stamford, CT 06907-0047 USA  
Toll Free: 1-800-826-6342 TEL: (203) 359-1660  
FAX: (203) 359-7700 e-mail: info@omega.com

**Canada:** 976 Bergar  
Laval (Quebec), H7L 5A1 Canada  
Toll-Free: 1-800-826-6342 TEL: (514) 856-6928  
FAX: (514) 856-6886 e-mail: info@omega.ca

**For immediate technical or application assistance:**

**U.S.A. and Canada:** Sales Service: 1-800-826-6342/1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378/1-800-622-BEST®  
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

**Mexico/  
Latin America:** En Español: 001 (203) 359-7803 FAX: 001 (203) 359-7807  
info@omega.com.mx e-mail: espanol@omega.com

**Servicing Europe:**

**Benelux:** Managed by the United Kingdom Office  
Toll-Free: 0800 099 3344 TEL: +31 20 347 21 21  
FAX: +31 20 643 46 43 e-mail: sales@omegaeng.nl

**Czech Republic:** Frystatska 184  
733 01 Karviná, Czech Republic  
Toll-Free: 0800-1-66342 TEL: +420-59-6311899  
FAX: +420-59-6311114 e-mail: info@omegashop.cz

**France:** Managed by the United Kingdom Office  
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00  
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

**Germany/Austria:** Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0  
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

**United Kingdom:** ISO 9001 Certified OMEGA Engineering Ltd.  
One Omega Drive, River Bend Technology Centre, Northbank  
Irlam, Manchester M44 5BD United Kingdom  
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611  
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

---

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification. The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.  
**WARNING:** These products are not designed for use in, and should not be used for, human applications.

## Thank You

Thank you for purchasing one of Omega Engineering's digital non-contact Rotary Torque Sensors. We know you will be satisfied with the performance and durability of our products.

## Intended Use

Model TQ514 is a line of shaft-to-shaft rotary torque sensors for measuring the performance of electric drive motors, small DC motors, clutches, fans, etc.

This line of sensors incorporates a Full Wheatstone Bridge and transmits the signal to a built-in receiver to produce a high level analog signal without the use of slip rings. Ball bearing supported shafts will provide long life and superior performance.

## Certificate of Conformance and Calibration Traceability

Omega certifies that the products described herein meet the specifications and performance requirements described in the pamphlet.

Calibration was performed with a test system utilizing a reference load cell or deadweights and an electronic indicator. The system was within current calibration requirements at the time of the test and is traceable to the National Institute of Standards and Technology (NIST).

Omega Engineering calibration laboratory is accredited to ISO9000-2008

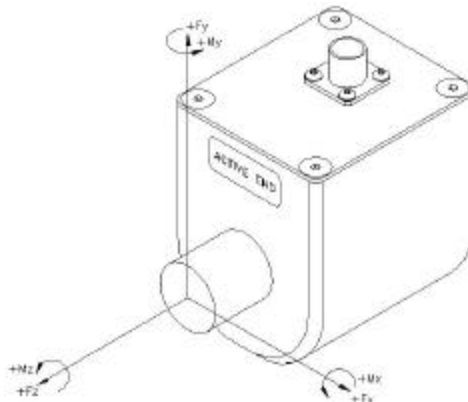
## Installation

Install the sensor so that the label "Active End" is facing the place where torque is to be measured, i.e., to measure the torque applied by a wrench to a bolt, the "Active End" should face the bolt.

**Important: The sensor's housing is NOT intended for use as a structural support. Do NOT place any loads on the housing.**

It is also important that the **total stress on the shaft does NOT exceed  $S_{max}$** . To calculate the total stress, use the following equation:

$$S = A * F_x + B * F_y + C * F_z + D * M_x + E * M_y + F * M_z$$



And:

Model #	Capacity	Extraneous Load Coefficients				Torsional Spring Rate (in #/RAD)	Shaft dia (inches)	Key Width (inches)	S <sub>max</sub> (psi)
		A & B	C	D & E	F				
TQ514-003	50 in-oz	1030.0	56.7	223.0	4300.0	182	.375"	Flats	18000
TQ514-006	100 in-oz	678.0	26.1	102.0	2060.0	556			
TQ514-012	200 in-oz	435.0	18.10	70.5	997.0	1660			
TQ514-030	500 in-oz	214.0	10.9	42.7	380.0	7120			
TQ514-062	1000 in-oz	104.0	7.3	28.5	175.0	22900			
TQ514-100	100 in-lb	724.0	79.5	517.0	431.0	6900	.749"	.1875"	84000
TQ514-200	200 in-lb	363.0	31.6	259.0	216.0	17300			
TQ514-500	500 in-lb	145.0	9.3	103.0	86.1	59000	.999"	.25"	
TQ514-1K	1000 in-lb	72.3	3.8	51.7	43.1	149000			
TQ514-1.5K	1500 in-lb	55.1	2.8	37.4	33.6	281000			
TQ514-2K	2000 in-lb	35.9	2.4	25.7	21.4	378000			

For example:

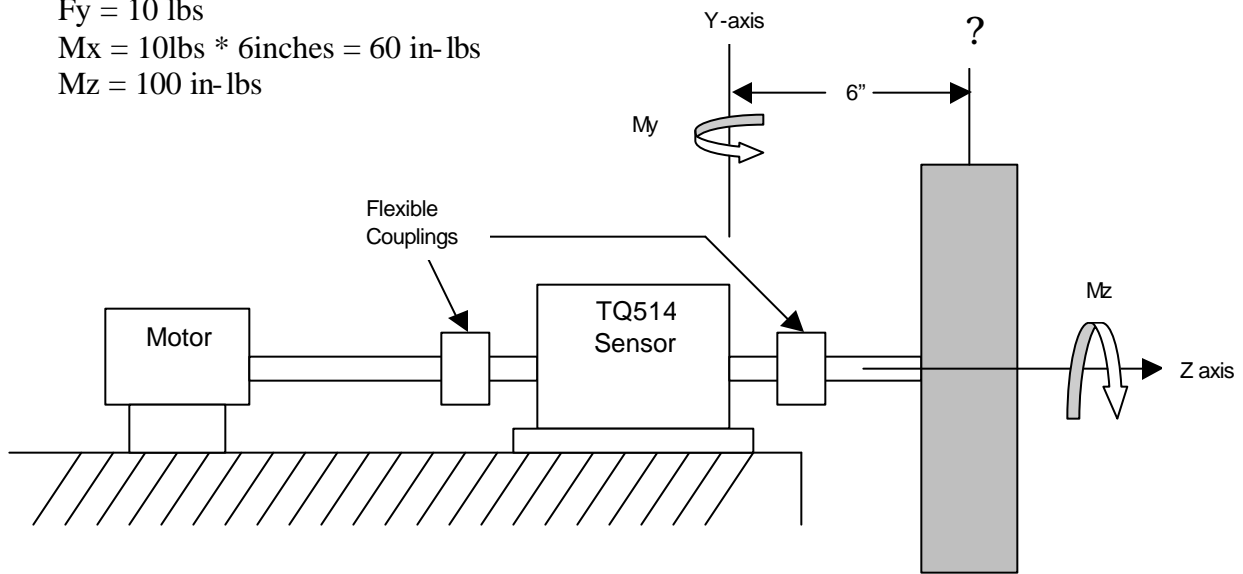
If you are using a 200 in-lb. sensor to measure 100 in-lb. of torque applied by a 10 lb. fan six inches from the sensor,

$$F_x = F_z = M_y = 0,$$

$$F_y = 10 \text{ lbs}$$

$$M_x = 10 \text{ lbs} * 6 \text{ inches} = 60 \text{ in-lbs}$$

$$M_z = 100 \text{ in-lbs}$$



The total stress on the shaft would be:

$$\sigma = B * F_y + D * M_x + F * M_z$$

$$\sigma = 363 * 10 + 259 * 60 + 216 * 100 = 40,770 \text{ psi}$$

since  $\sigma_{max}$  for this model is 84,000 psi, this is acceptable.

## Wiring

The sensor is supplied with a 10 pin mating connector. When wired, it will contain power in, encoder (when optioned), and analog signal output connections. Therefore, it is recommended that a cable that provides a shield around the analog signal wires be used. For example, a cable that provides shielded pairs would suffice, so that the analog signal wires can be shielded from the power supply and encoder wires. Ground the shield at the DAQ system that is monitoring this sensor.

The signal output is electrically isolated from the power supply. This is done to prevent ground loops when the signal is fed into a single ended input. This may cause trouble for a differential input due to common mode drift. When using differential inputs, ground the negative input to an analog signal ground on the measuring DAQ system.

Function	Connector	Description
+12-15Vdc	A	Power Input
+SIG	B	Torque signal (nominally $\pm 5V$ at fullscale)
-SIG (COM)	C	Torque signal ground
GND	D	Power ground
GND	E	Encoder ground
+5V	F	Encoder power
CW LEAD	G	Encoder lead
CW TRAIL	H	Encoder trail
GND	J	Shunt calibration
SHUNT	K	Shunt calibration

## Shunt Calibration

When the shunt pins on the sensor connector are shorted, the sensor electronics will apply a shunt to the strain gage bridge, and shift the voltage output from it's current position. This is a real shunt of the bridge, not the star bridge shunt that so many rotary transformer systems use. Reference the calibration sheet for the shunt calibration value. Remove this short to return the sensor to normal operation.

## Cleaning:

The TQ514 is a brushless sensor, and therefore, the only wearing parts are the bearings. For the very low capacities, TQ514-003 and -006 units, these have oiled bearings and will periodically require a drop of high quality light machine oil on each. Only a drop is required. Clean environments will require a drop every 360 straight hours of use. Dirty or otherwise harsh environments may require more frequent oiling. All other capacities have bearings that are permanently lubricated. Do NOT immerse the assembly in the solvent. This may damage the electronics inside the housing.

## Recalibration:

To guarantee accuracy, all sensors should be recalibrated on an annual basis.



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2010 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop online at [omega.com](http://omega.com)<sup>SM</sup>*

## **TEMPERATURE**

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

## **PRESSURE, STRAIN AND FORCE**

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

## **FLOW/LEVEL**

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Data Logging Systems
- ☑ Recorders, Printers & Plotters

## **HEATERS**

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments