

Operating and Service Manual



BOLT FORCE SENSOR

• Model 3719 •

Cap. Bolt Size.

WARNING – SEE SAFETY NOTE BELOW TO AVOID THE POTENTIAL FOR PERSONAL INJURY.

INTENDED USE

The 3719 Bolt Force Sensor is designed for use in fastener testing where the compression loading of the sensor is induced by the tensile loading of the fastener. The bolt force sensor must be used with the size fastener for which it was designed.

SAFETY NOTE

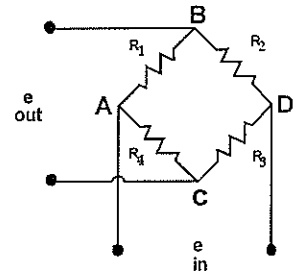
Personal injury to the operator, as well as damage to equipment, can result if the bolt force sensor is operated at more than 200% of its rated load.

When in doubt consult the factory.

To avoid non-catastrophic failure (degradation of specifications) of the bolt force sensor, the load must be limited to 150% of its rated load.

OPERATING PRINCIPLES

The Model 3719 bolt force sensor is a precision designed structure which has exceptional capability to withstand extraneous loads such as torque. Force applied to the sensor is translated into an electrical signal by means of changes in electrical resistance of strain gages bonded to the interior structure of the unit. The strain gages are connected in a 4 arm (Wheatstone bridge) configuration network. This arrangement allows temperature compensation as well as large cancelling signals caused by extraneous loading. A fixed excitation voltage is applied between A and D of the bridge. Load applied to the structure unbalances the bridge causing an output voltage to appear between B and C. This voltage is proportional to the applied load.

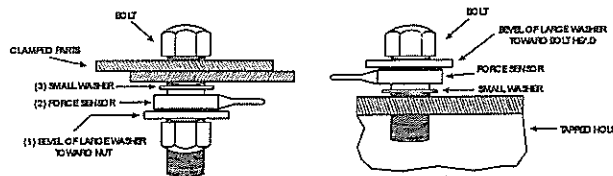


10 Volts Maximum

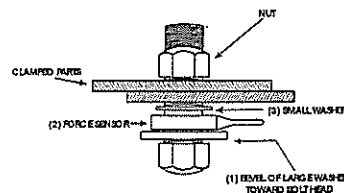
INSTALLATION

The bolt force is essentially a hollow compression strain gage load cell. It is designed to be used with any full bridge strain gage indicator. Excitation must be limited to 10 volts DC or RMS AC. If the connector must be removed from the sensor cable, the resistor mounted on the connector pins must be connected to the same load cell leads when the replacement connector is attached. The following figures illustrate normal installations:

WHEN BOLT IS TURNED



WHEN NUT IS TURNED



The use of both washers is mandatory. Use of washers other than those supplied can result in erroneous data. The three pieces are assembled for various applications as illustrated above. The larger washer isolates the sensor, provides clearance for the bolt head radius. When a torque wrench is used, a torque vs. clamp force curve can be generated.

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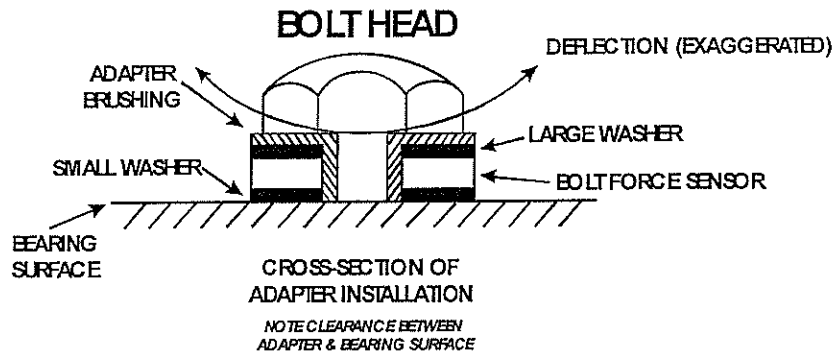
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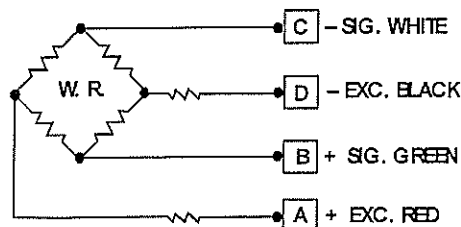
CAUTION: The mounting surface must be flat within .001" and the bolt must be perpendicular within .001 inches or damage to the washers and/or sensor may result. Data may also be inaccurate.

The flat washers must be used to prevent damage to the sensor. If the washers are substituted for those supplied with the sensor, it is imperative that the factory be consulted prior to implementation. Stress applied to the integral cable assembly will result in sensor damage. The installations illustrated are the recommended applications; other methods may result in reduced performance or damage to the sensor.

Although not recommended, it is possible to use a smaller size than specified for a given sensor if the application permits an increase in height. The figure below illustrates an adapter which can be used to accommodate a smaller size bolt. It is important to note that the deflection of the adapter must be approximately equal to that obtained with the specified size bolt for the sensor. This is the limiting factor in terms of performance of the sensor. For example, for a 3719-750 (3/4"), the adapter deflection should be approximately equal to that of a 3/4" bolt head.

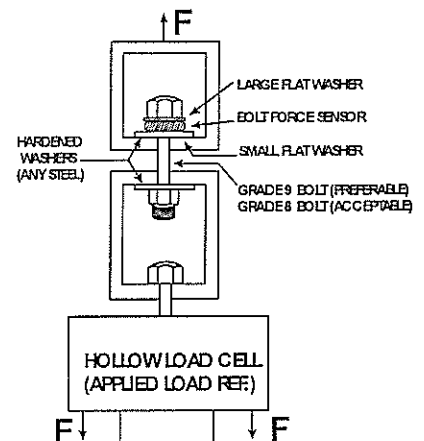


WIRING: When connected as shown, output goes up-scale (positive) for loads. Western Regional code.



CALIBRATION

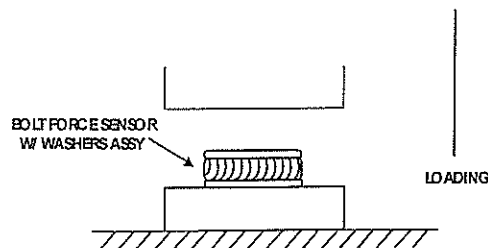
To obtain correlation between calibration data supplied and the data obtained by the users, a calibration set-up is described which illustrates a recommended testing method. The figure to the right partially illustrates a compression-tension testing machine set-up which applies compression load to the bolt force sensor. Note that the machine applies a tensile load to a test bolt and the inclusion of the factory-supplied large and small flat washers. The applied load is measured accurately by means of a hollow load cell which is loaded in compression.



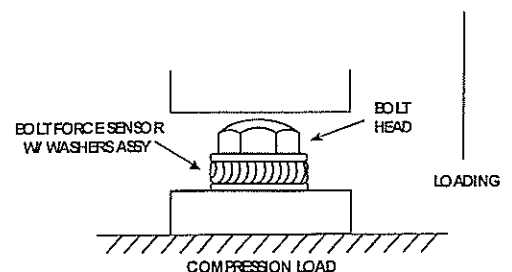
PARTIAL CROSS SECTION
FACTORY TEST MACHINE

CALIBRATION PROBLEMS:

A pure compression load applied equally across the large washer area will result in a different distribution of sensor internal stress, deflection and output signal. This is illustrated below. Note particularly that a high degree of flatness and parallelism of the machine load faces does not improve the validity of the method. A similar conclusion is arrived at in the case of the application of uniform load across the area of the bolt head; the bolt head deflection is restrained and the sensor output may not correlate satisfactorily.



Errors may also be caused by loading on the bolt head rather than placing the bolt in tension. Bolt head deflection will not match the deflection which occurs in normal use. This loading method is illustrated in the figure to the right.



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•Model 3719•****TROUBLE SHOOTING**

1. Check power and load cell connections to the indicator.
2. Check load cell cable for correct interconnection with indicator in use.
3. Verify the cell's excitation and signal resistance as shown.

CAUTION: Ohmmeter should not apply more than 6 volts to the load cell bridge.

4. Check bridge resistance to ground (case of cell) with a 50 volt megohmmeter (should be greater than 5000 megohms).

RETURN PROCEDURE

When returning a unit for service take care to package all material so as to prevent shipping damage. Please obtain an RMA number before shipping any products to us. RMA numbers can be obtained by visiting our website at:

www.sensotec.com/rmaform.asp

You may also contact us by phone at (614) 850-5000.

SPECIFICATIONS

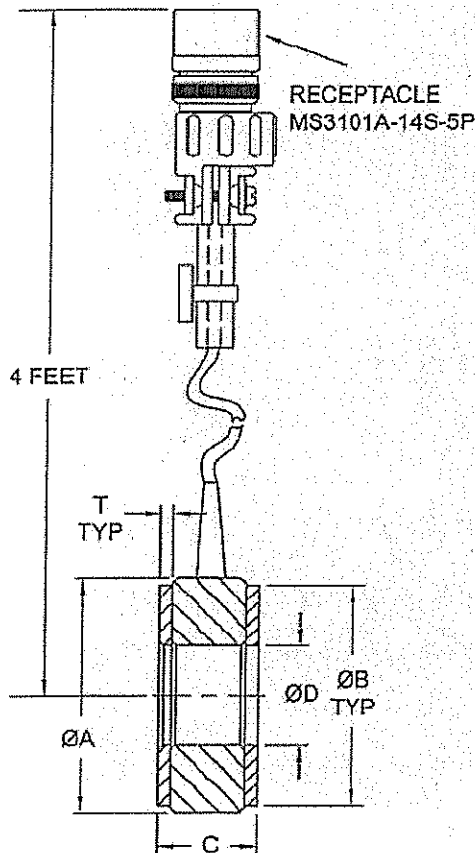
SENSOR: 4 arm strain Gage Bridge
EXCITATIONVOLTAGE: 10 VDC or VAC RMS Max.
ZERO BALANCE: Within 5% of rated output.
OVERLOAD: 150% of rated capacity.
EFFECT OF TEMP. OF ZERO: 0.007% of F.S./F°
EFFECT OF TEMP. ON OUTPUT: 0.0035% of reading/F°
USEABLE TEMP. RANGE: -65°F to 200°F Continuous
200°F Intermittent

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This load cell may be stored for an indefinite period at room temperature in a dry place. Recalibration should follow your normal instrument certification schedule.



Model No.	CAP, LBS	Screw Size	"A"	"B"	"C" DIM	"D"	"T" DIM
3719-2000	300,000	2	3.6	3.5	1.65	2.041	0.2
3719-1750	280,000	1 3/4	3.2	3	1.3	1.787	0.15
3719-1500	190,000	1 1/2	2.8	2.6	1.125	1.533	0.125
3719-1250	125,000	1 1/4	2.4	2.25	1.125	1.279	0.125
3719-1125	90,000	1 1/8	2.2	1.9	1.065	1.151	0.095
3719-1000	80,000	1	2	1.8	0.815	1.024	0.095
3719-750	45,000	3/4	1.62	1.35	0.815	0.77	0.095
3719-562	25,000	9/16	1.23	0.99	0.66	0.58	0.08
3719-500	20,000	1/2	1.14	0.91	0.66	0.517	0.08
3719-437	12,000	7/16	0.95	0.72	0.495	0.454	0.06
3719-250	5,000	1/4	0.65	0.47	0.37	0.262	0.06
3719-875	60,000	7/8, 22MM	1.7	1.6	0.815	0.897	0.095
3719-625	30,000	5/8, 16 MM	1.35	1.15	0.66	0.644	0.08
3719-375	10,000	3/8, 10 MM	0.8	0.639	0.495	0.396	0.06
3719-312	7,000	5/16, 8 MM	0.78	0.55	0.495	0.326	0.06
3719-30 MM	110,000	30 MM	2.6	2.1	1.175	1.216	0.15
3719-4 MM	1,500	4 MM	0.45	0.28	0.33	0.159	0.04
3719-20 MM	50,000	20 MM	1.7	1.45	0.815	0.822	0.095
3719-18 MM	35,000	18 MM	1.45	1.25	0.785	0.738	0.08
3719-15 MM	28,000	15 MM	1.28	1.04	0.66	0.62	0.08
3719-14 MM	23,000	14 MM	1.25	1.02	0.66	0.561	0.08
3719-12 MM	15,000	12 MM	1.1	0.87	0.62	0.502	0.06
3719-9 MM	7,100	9 MM	0.8	0.6	0.495	0.356	0.06
3719-24 MM	75,000	24 MM	1.95	1.7	0.815	0.947	0.95
3719-7 MM	6,000	7 MM	0.66	0.48	0.495	0.278	0.06
3719-6 MM	3,800	6 MM	0.64	0.42	0.37	0.238	0.06
3719-17MM	30,000	17 MM	1.34	1.25	0.66	0.672	0.08
3719-190	2,400	#10 M.S.	0.52	0.35	0.33	0.192	0.04
3719-164	1,800	#8 M.S.	0.47	0.3	0.33	0.166	0.04
3719-138	1,200	#6 M.S.	0.42	0.25	0.33	0.14	0.04
3719-112	800	#4 M.S.	0.38	0.21	0.28	0.114	0.04
3719-86	500	#2 M.S.	0.38	0.18	0.28	0.088	0.04

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Limited Warranty
(Liability for Repair and Replacement Only)

The Company's products are warranted to be free from defects in material and workmanship for one year from date of shipment from the factory. The Company's obligation is limited to repairing, or at their option, replacing products and components which, on verification, prove to be defective, at the factory in Columbus, Ohio.

The Company shall not be liable for installation charges, for expenses of Buyer for repairs or replacements, for damages from delay or loss of use, or other indirect or consequential damages of any kind.

The Company extends this warranty only upon proper use of the product in the application for which intended and does not cover products which have been modified without the Company's approval or which have been subjected to unusual physical or electrical stress, or upon which the original identification marks have been removed or altered. Transportation charges for material shipped to the factory for warranty repair are to be paid by the shipper.

The Company will return items repaired or replaced under warranty prepaid. No item shall be returned for repair without prior authorization from the Company.

Whenever the design of the equipment to be furnished or the system in which it is to be incorporated originate with the buyer, manufacturer's warranty is United specifically to matters relating to furnishing of equipment free of defects in material and workmanship and assumes no responsibility for implied warranties of fitness for purpose or use.

CERTIFICATE OF CONFORMANCE AND TRACEABILITY

This is to certify that the products described herein meet the specifications and performance requirements described in this manual. Test reports and other pertinent information are on file and available for inspection by your representative and/or U.S. Government representative upon request.

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