Michigan Scientific TR3D- Three Directional Load Cell Series General Use Information

1 Transducer Configuration

All TR3D series Michigan Scientific Three Directional Load Cells have three separate straingage Wheatstone bridges, one for each load channel (X, Y, Z). The four leads (P+,S+,S-,P-) of each bridge are available for the user at the data-acquisition end of the shielded signal cable. The power sharing between bridges is not recommended.

Each bridge has been configured and precisely compensated to minimize thermal effects on the output. Each channel is calibrated to full-scale load under controlled load conditions with special fixturing . Complete, NIST traceable calibration reports are provided with each Load Cell.

2 Channel Cross-Talk

Every Michigan Scientific Three Directional Load Cell is precisely manufactured such that crosstalk between channels is minimized. Cross-talk is output in a given channel that results from loading in a different channel, or even applied loads that aren't measured. All cross-talk is recorded during the calibration process and is included in the calibration reports.

The larger cross-talk cases are very linear, and although not necessary, could be corrected for in post-processing for increased accuracy. For most load cases on a given model, the cross-talk from one channel into another is less than 0.5% of full-scale load. The cross-talk for some load cases on certain models can be in the 1.5-1.75% range. Due to these instances, our specification states that the cross-talk between channels will not exceed 2% of the full-scale load.

3 Transducer Configuration – Bending Moment Specification

One key specification is that the TR3D-A and TR3D-B series Load Cells are not intended to withstand large moment loads. Moment loads have the potential to damage the Load Cell. The maximum bending moment which can be applied is depicted below :

Model	TR3D -B- 100N	TR3D -B- 250	TR3D -B-1K	TR3D -B-4K	TR3D -B- 4500	TR3D-B- 5/5/10 K	TR3D -B- 16K
Momen t max (par axe) - Nm		16	65	220	220	520	1700

Even if damage does not occur, moment loads can induce cross-talk into the load channels. Depending on the mounting configuration and moment magnitude, this can approach 5%.

The TR3D-C and TR3D-D series' of Three Directional Load Cells have higher moment carrying capacities than their TR3D-A and TR3D-B counterparts due to their geometry.

For situations where large moments are expected, we recommend the use of two or three load-cells attached together in a single fixture. Not only does this allow you to design a system that will tolerate arbitrarily large moments (by increasing the moment arm distance between the load-cells), but it also makes it possible to actually measure the applied moments directly. Consult us with your specific application if moment loads are a concern.

4 Applications

Three Directional Load Cells can be use in many different applications. Basically, in any instance that three orthogonal loads are to be measured, a model with the appropriate size and/or load capacity can be adapted. Depending on the circumstances, the height of the Load Cell is not an issue and it can be bolted directly into the customer's fixturing or structure. In other instances, structure or fixturing needs to be modified such that the height of the Load Cell does not significantly alter the primary geometry.

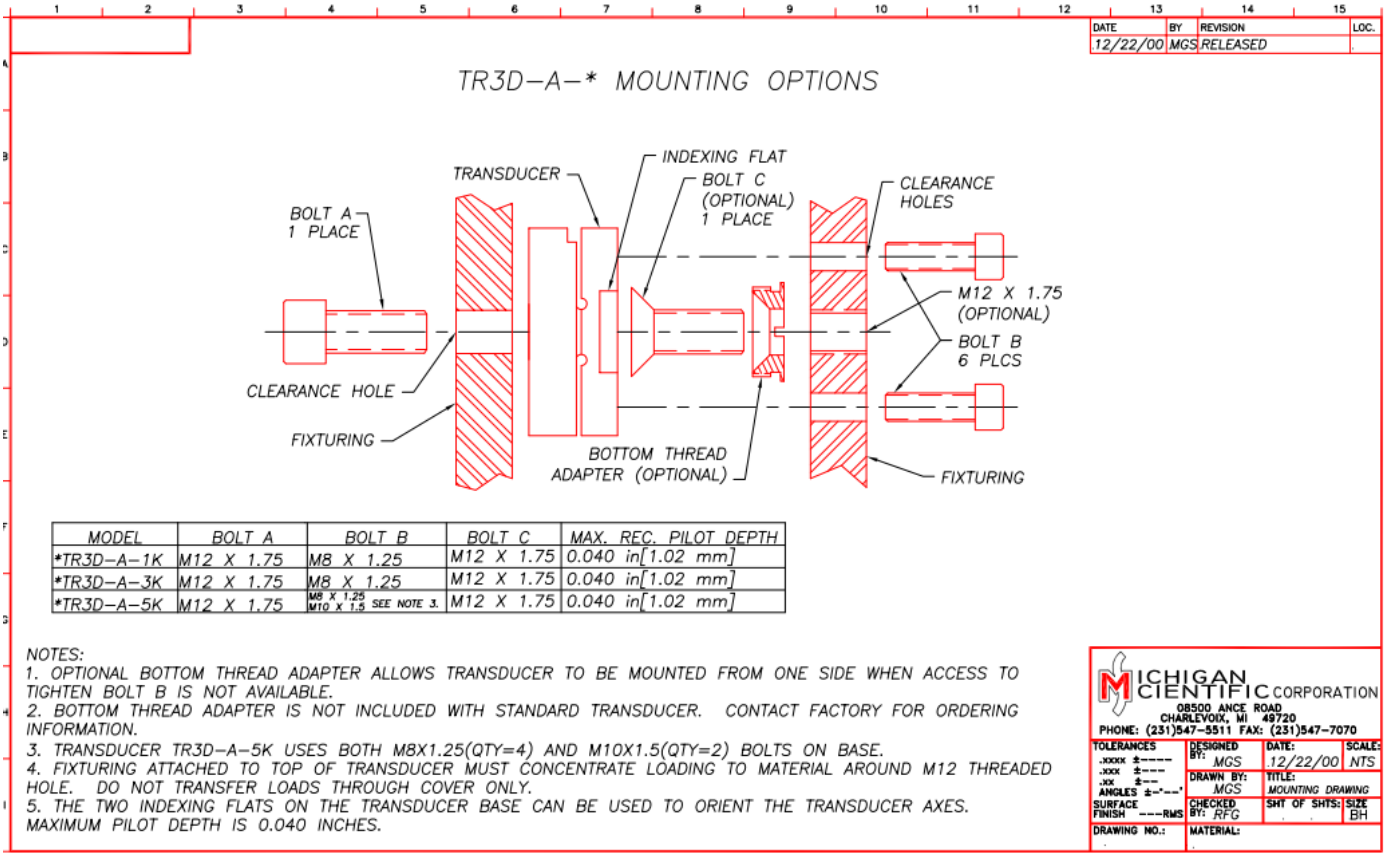
5 Using Several TR3D- Units in an Array

For some measurement applications, an array of Load Cells, mounted between two stiff fixtures, is more appropriate than using a single Load Cell. Arrays are especially useful when moment loads would be imparted on a single unit. By using an array of Load Cells, then the moment loads are essentially translated into vertical loads at a distance from where the moment is applied to the structure.

If the user wishes to know the applied moment, it can be calculated in the postprocessing by taking advantage of the known geometry. Another instance where using an array of Load Cells would be necessary is if the combined loading is larger than the load capacity of a single Load Cell. Load Cells placed in a parallel arrangement have a cumulative load capacity equal to the sum of each Load Cell capacity along a given axis.

6 TR3D-A or TR3D-B Mounting Configurations

In the standard mounting arrangement, a single bolt mounts the top portion of a TR3D-A or TR3D-B model to the fixturing or structure that mates to the top portion of the Load Cell. Four bolts are used to mount the bottom fixturing to the base of the Load Cell. This is the preferred mounting method since the base boundary conditions are well fixed.



MODEL	BOLT A	BOLT B	BOLT C	MAX. REC. PILOT DEPTH
*TR3D–A–1K	M12 X 1.75	M8 X 1.25	M12 X 1.75	0.040 in[1.02 mm]
*TR3D–A–3K	M12 X 1.75	M8 X 1.25	M12 X 1.75	0.040 in[1.02 mm]
*TR3D–A–5K	M12 X 1.75	M8 X 1.25 / M10 X 1.5 SEE NOTE 3.	M12 X 1.75	0.040 in[1.02 mm]

NOTES:
1. OPTIONAL BOTTOM THREAD ADAPTER ALLOWS TRANSDUCER TO BE MOUNTED FROM ONE SIDE WHEN ACCESS TO TIGHTEN BOLT B IS NOT AVAILABLE.
2. BOTTOM THREAD ADAPTER IS NOT INCLUDED WITH STANDARD TRANSDUCER. CONTACT FACTORY FOR ORDERING INFORMATION.
3. TRANSDUCER TR3D–A–5K USES BOTH M8X1.25(QTY=4) AND M10X1.5(QTY=2) BOLTS ON BASE.
4. FIXTURING ATTACHED TO TOP OF TRANSDUCER MUST CONCENTRATE LOADING TO MATERIAL AROUND M12 THREADED HOLE. DO NOT TRANSFER LOADS THROUGH COVER ONLY.
5. THE TWO INDEXING FLATS ON THE TRANSDUCER BASE CAN BE USED TO ORIENT THE TRANSDUCER AXES. MAXIMUM PILOT DEPTH IS 0.040 INCHES.

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TOLERANCES	DESIGNED BY: MGS	DATE: 12/22/00	SCALE: NTS
.XXXX ±----- .XXX ±--- .XX ±-- ANGLES ±-'--'	DRAWN BY: MGS	TITLE: MOUNTING DRAWING	
SURFACE FINISH ---RMS	CHECKED BY: RFG	SHT OF SHTS:	SIZE BH
DRAWING NO.:	MATERIAL:		

In cases where access is not available to mount the Load Cell base with four bolts, an optional Bottom Thread Adapter should be used. This Adapter threads into the base of the Load Cell and “captures” a flat-head socket cap screw. The tightening “key” for this screw is accessed through the top mounting hole of the Load Cell.

By tightening this screw first, the Load Cell base is mounted to its mating structure. The top mating structure can now be mounted in the standard configuration. There are two opposing flats on the base of the TR3D-A series load cells that should now be used to index the Load Cell axes to the measurement axes.

7 TR5D Arrangements

Most TR3D models can be configured as a TR5D unit. This customized configuration adds Mx and My measurement bridges.

8 Custom TR3D Assemblies

In some instances, a standard TR3D model doesn't quite fit the arrangement, fixturing, capacity requirements or any combination thereof. In many such cases, Michigan Scientific has tailored a standard model to the specific application. Please contact Michigan Scientific with your custom application requirements.