LSB Series

Tension and Compression Sensor Family Manual

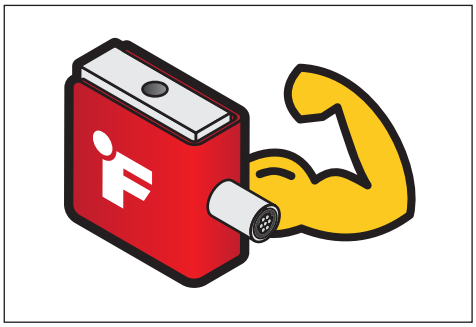
Sensor Solutions Source
Load · Torque · Pressure · Multi-Axis · Calibration · Instruments · Software

www.futek.com

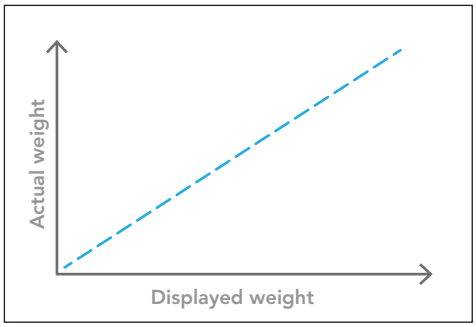
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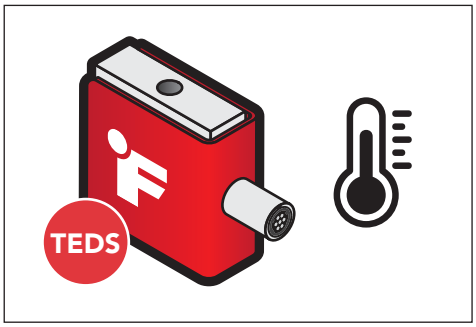
Key Features



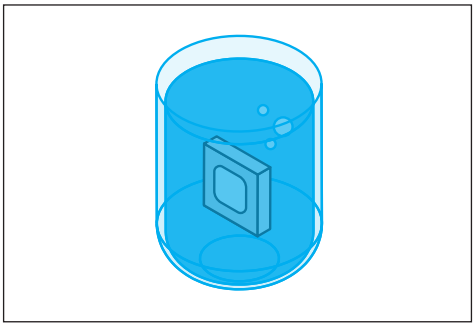
Lower capacities offer Miniature size while offering up to 10 times the overload protection



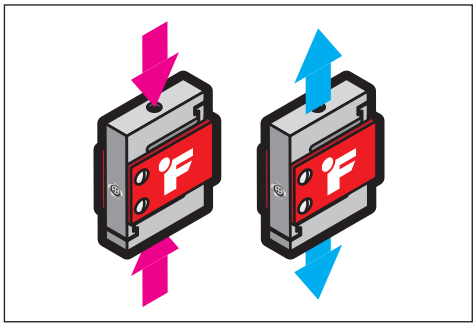
Notable nonlinearity



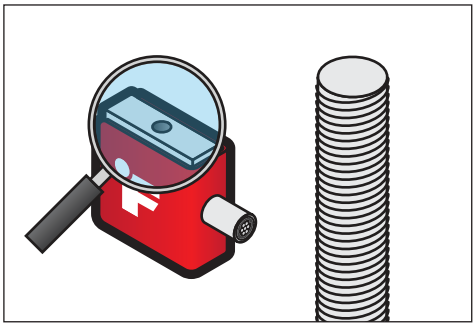
Integrated IEEE1451.4 TEDs calibration chip and PT-1000 temperature sensor in select models



Submersible versions



For in line use in both tension and compression



Metric threads available

Mechanical Installation

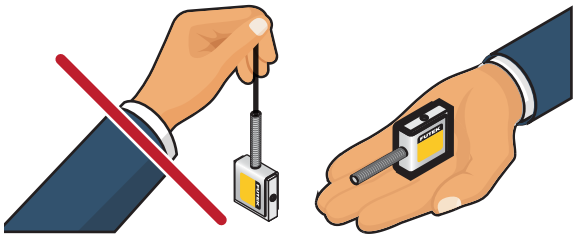
The following items should be observed to avoid damage to the LSB sensor during installation and usage:

- Avoid conditions that exceed the sensor's IP rating.
- Store in a dry area without fixtures.
- Sensors with overload protection wire cut gaps, if exposed, should be regularly cleaned to maintain a proper deflection path.

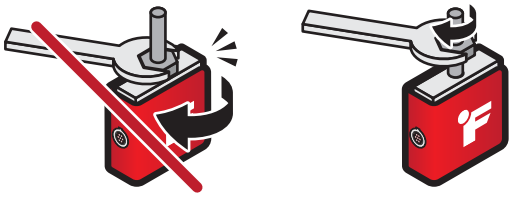
MAXIMUM MOMENTS AND OFF-AXIS LOADING

- Extraneous load information can be used to assist in determining if the sensor can withstand any unavoidable off axis loads and moments. Extraneous load information can be found at http://www.futek.com/extraneous-load-factor
- An Extraneous how to guide can be found at https://www.futek.com/guide-to-calculating-extraneous-loads

1. Do not pull on or carry sensor by cable.



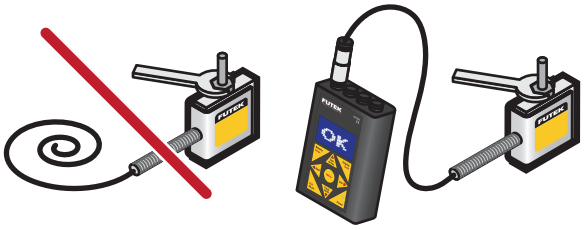
2. Avoid over torque during installation.



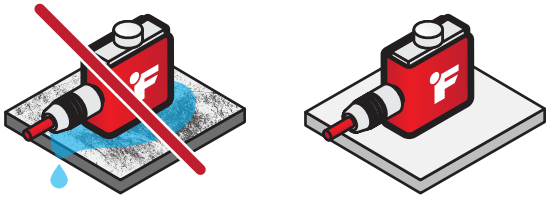
3. Thread the fixture into the sensor. Threading the sensor into the fixture can apply torque that may damage sensor.



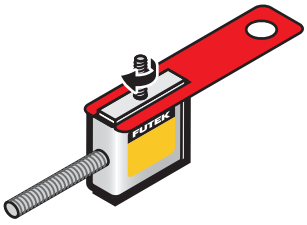
4. Monitor sensor output for effects on zero output during installation to avoid damage.



5. Install in a dry, clean environment.



5. Use the LSB200 installation tool for lower sensitive capacities to help reduce torque into the sensor. A video of the tool can be found here.



Maximum Installation Torque (in-lb)

LSB200											
CAPACITY ▶	**10g**	**50g**	**100g**	**250g**	**1 lb**	**2 lb**	**5 lb**	**10 lb**	**25 lb**	**50 lb**	**100 lb**
M3x0.5	0.88	1.17	1.46	2.14	0.94	0.99	1.05	1.11	5.03	5.21	6.34
4-40-2B	0.88	1.17	1.46	2.14	0.94	0.99	1.05	1.11	5.03	5.16	5.16

LSB205, LSB201 AND LSB206								
CAPACITY ▶	**250g**	**1 lb**	**2 lb**	**5 lb**	**10 lb**	**25 lb**	**50 lb**	**100 lb**
M3x0.5	4.31	4.31	5.63	8.14	10.26	12.83	12.72	13.72

LSB210							
CAPACITY ▶	**100g**	**2 lb**	**5 lb**	**10 lb**	**25 lb**	**50 lb**	**100 lb**
M3x0.5-6H	0.16	0.99	1.05	1.11	5.03	5.21	6.34
4-40-2B	0.16	0.99	1.05	1.11	5.03	5.16	5.16

LSB302					
CAPACITY ▶	**25 lb**	**50 lb**	**100 lb**	**200 lb**	**300 lb**
1/4-28-2B	62.56	78.02	92.42	108.01	111.25
M6x1-6H	62.56	78.02	92.42	N/A	N/A
M10x1.5-6H	N/A	N/A	N/A	108.01	115.79

LSB352		
CAPACITY ▶	**500 lb**	**1000 lb**
1/2-20-2B	1112.7	1124.7

LSB400		
CAPACITY ▶	**5000 lb**	**10000 lb**
3/4-16-2B	3633.0	3070.8
M16x2-6H	1797.1	1324.6

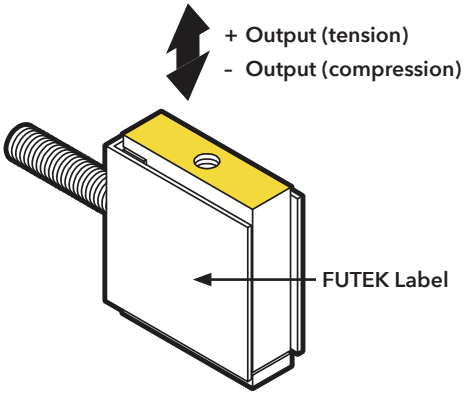
Mounting and Installation

- Refer to the sensor spec sheet for thread information and proper load cell orientation to maximize performance and limit cable interference.

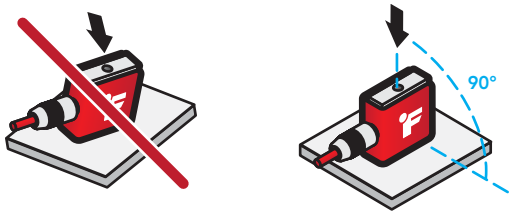
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Active end



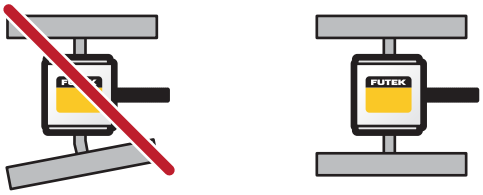
1. Load must be in-line and centered.



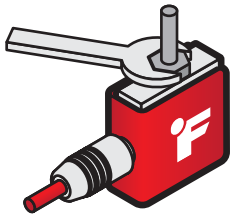
2. Loading must be flat and in-line when compensating linkages are not used.



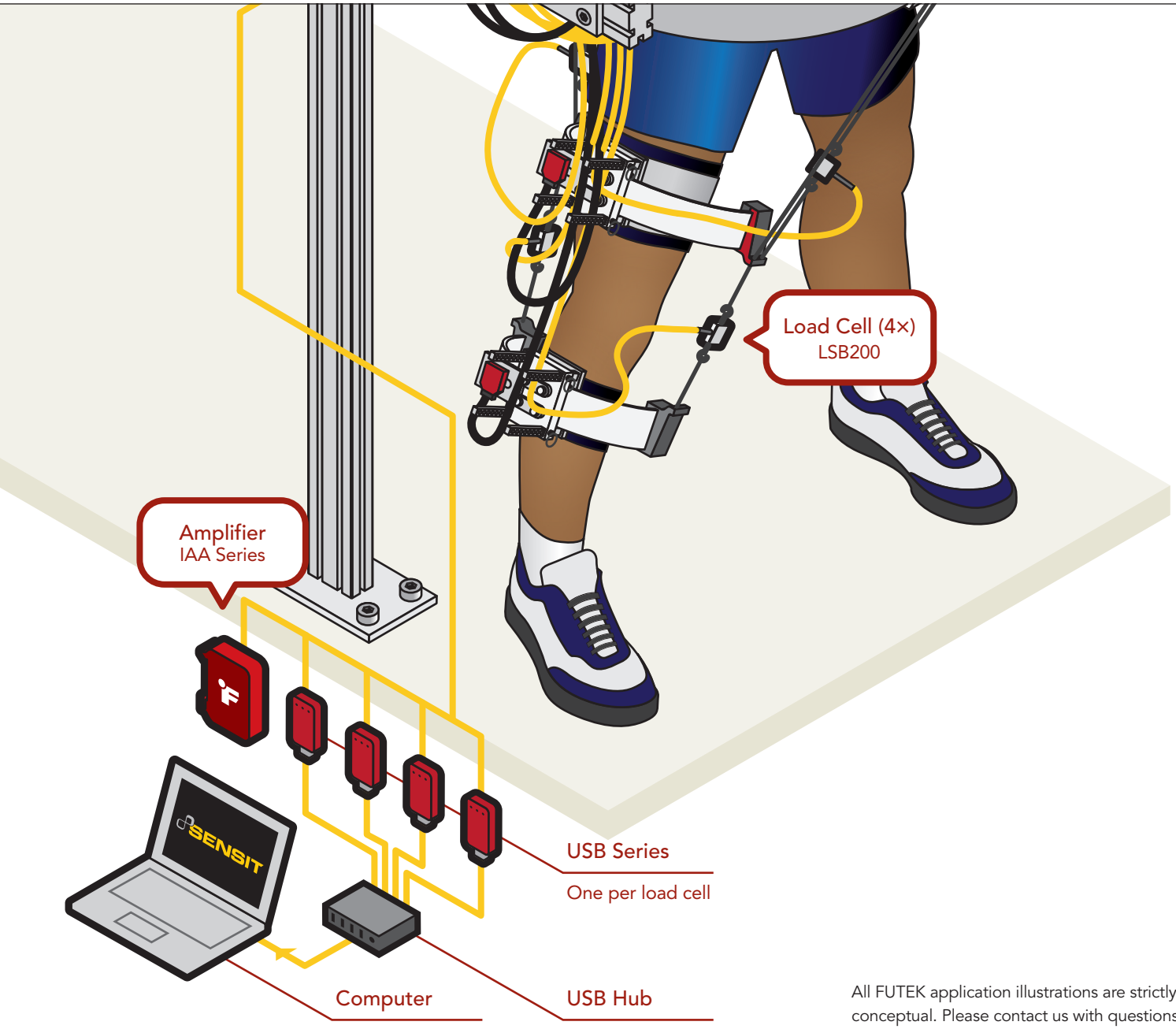
3. Support sources must be flat and in-line.



4. Locknut/jamnut can be used to help limit torque. Additionally, this improves repeatability by distributing the load in the thread joint.



Further mounting suggestions



All FUTEK application illustrations are strictly conceptual. Please contact us with questions.

APPLICATION SUMMARY

Gait training and rehabilitation are not modern concepts, but through modern technologies, engineers and researchers are working on developing exoskeletons to help rehabilitate a patient at a more accelerated pace. Critical measurements are gathered during development of motor-assisted exoskeletons to ensure that proper assistance is given at different stages of treatment.

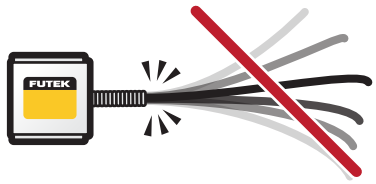
PRODUCTS IN USE

JR S-Beam Load Cell (LSB200) paired with instrumentation (USB220 and IAA Series analog amplifiers).

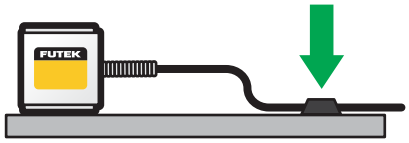
Cable Care and Routing

- Cable material type and length can be found online in the sensor description page.

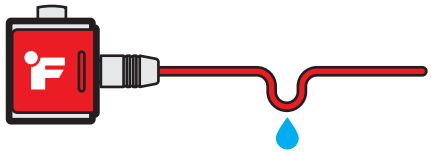
1. Avoid stress and movement on cable to avoid damage.



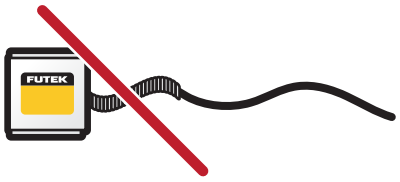
2. Properly secure sensor cable to limit cable movement influence.



3. In an environment with a high amount of moisture or humidity, create a drip loop on the cable to prevent any water from flowing into the sensor.



4. Avoid bending the strain relief. For dynamic (moving) applications, bends in the cable should not exceed a radius of 10 times the diameter of the sensor cable. Bends should never exceed a one-time, static, permanent bend of two to three times the diameter of the cable.



CABLE JACKET REFERENCE

MATERIAL	TEMP	CHEMICAL EXPOSURE	TARGET APPLICATION	HANDLING	NOTES
Teflon	Excellent	Excellent	Industrial, medical, aero-space	Robust, slick	
PVC (polyvinyl chloride)	Good	Good	General	Soft, flexible, easy to use	Not suitable for cold applications
Silicone	Average	Fair	Automation	Soft, flexible, easy to use	
Polypropylene	Good	Good	Automation	Soft, flexible, easy to use	
Polyester	Good	Good	General	Soft, flexible, easy to use	
Polyurethane	Average	Good	Automation	Soft, flexible, easy to use	Not suitable for thermal chambers

Electrical Installation

WIRING AND CONNECTIONS

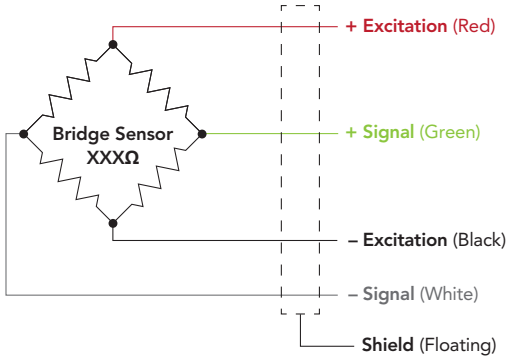
- The LSB load cell series utilizes a four wire bare lead connection, a six wire bare lead connection, a four pin Lemo connection, and a six pin Bendix connection.
- Standard four wire connections are + Excitation, – Excitation, + Signal, and – Signal. The standard coloring code for the above listed connections are Red, Black, Green, and White.
- Six wire connections offer additional + Sense and – Sense connections or TEDS data and TEDS return connections. Additional connection standard colors are Orange and Blue.

LSB EXCITATION POWER LEVELS

SENSOR FAMILY	MAX. EXCITATION
LSB200	10 V
LSB205	10 V
LSB210	10 V
LSB300	20 V
LSB302	20 V
LSB303	18 V
LSB350	20 V
LSB352	18 V
LSB400	20 V

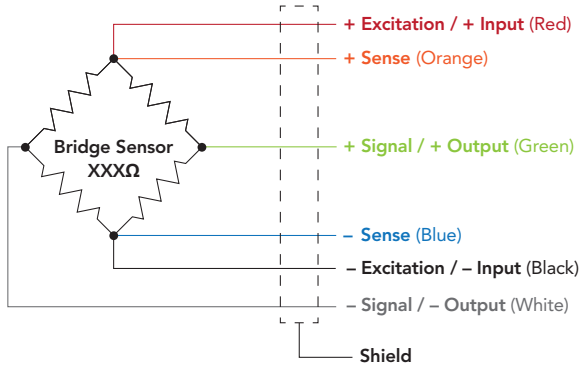
WC1

STANDARD 4-WIRE

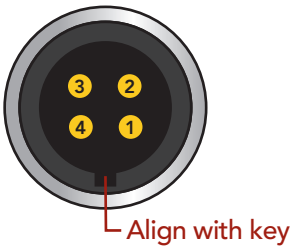


WC4

FUTEK STANDARD 6-WIRE



CC4



Sensor Receptacle
View

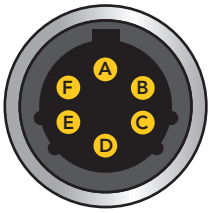
LEMO 4-PIN

PIN	COLOR	DESCRIPTION
1	Red	+ Excitation
2	Green	+ Signal
3	White	– Signal
4	Black	– Excitation

Electrical Installation (continued)

CC1

mV/V

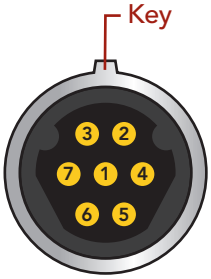


Sensor Receptacle View

BENDIX 6-PIN		
PIN	**COLOR**	**DESCRIPTION**
A	Red	+ Excitation
B	Black	– Excitation
C	Green	+ Signal
D	White	– Signal
E	Orange	+ Sense
F	Blue	– Sense

CC18

WIRING CODE FUTEK 7-PIN CONNECTOR

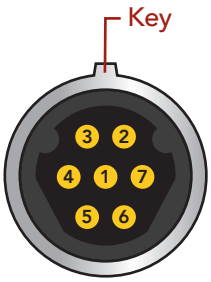


LOAD CELL CONNECTIONS		
PIN	**COLOR**	**DESCRIPTION**
1	Black	– Excitation
2	Green	+ Signal
3	Red	+ Excitation
4	White	– Signal
TEMPERATURE CONNECTIONS		
PIN	**COLOR**	**DESCRIPTION**
5	Blue	Temperature + TEDS Ground
6	Brown	Temperature Data
TEDS		
PIN	**COLOR**	**DESCRIPTION**
5	Blue	Temperature + TEDS Ground
7	Orange	TEDS Data

Electrical Installation (continued)

CC18T

WIRING CODE FUTEK 7-PIN CONNECTOR

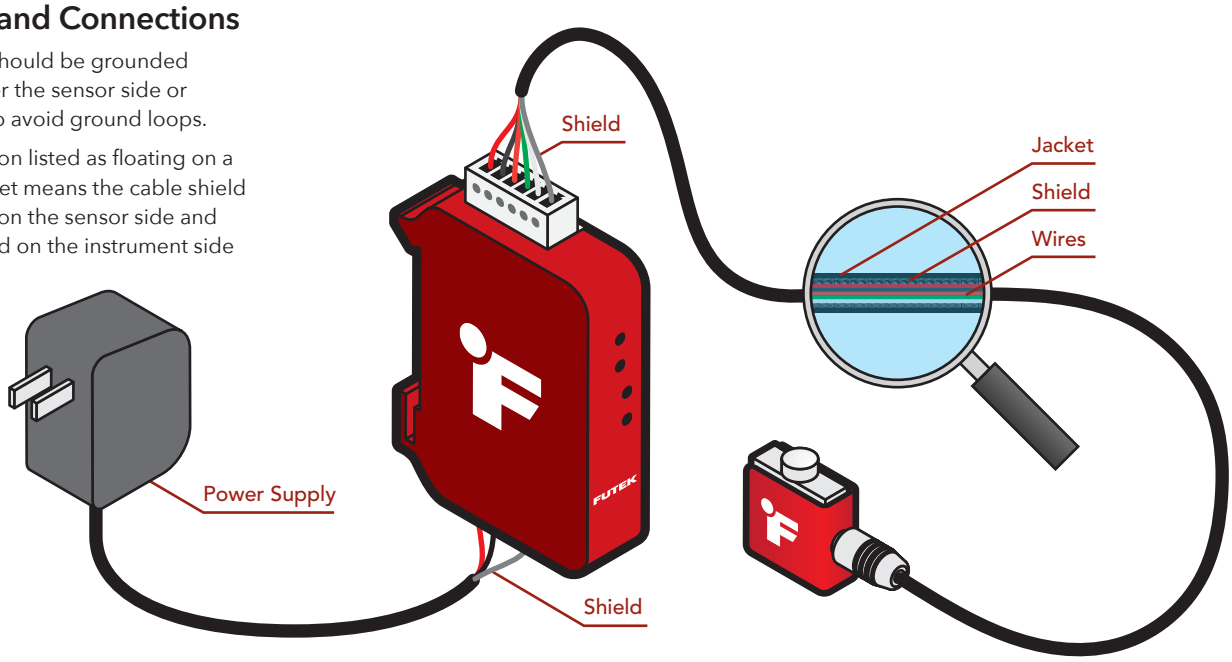


SENSOR RECEPTACLE SIDE

LOAD CELL CONNECTIONS		
PIN	**COLOR**	**DESCRIPTION**
1	Black	– Excitation, TEDS Return (Ground)
2	Green	+ Signal
3	Red	+ Excitation
4	White	– Signal
TEMPERATURE CONNECTIONS		
PIN	**COLOR**	**DESCRIPTION**
5	Blue	RTD –
6	Brown	RTD +
TEDS		
PIN	**COLOR**	**DESCRIPTION**
7	Orange	TEDS Data

Shield Usage and Connections

- Cable shielding should be grounded on one end, either the sensor side or instrument side to avoid ground loops.
- A shield connection listed as floating on a sensor's spec sheet means the cable shield is not connected on the sensor side and may be connected on the instrument side to ground.



Calibration

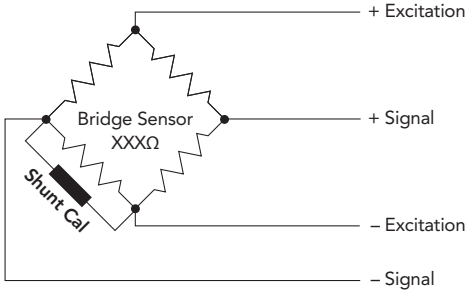
- A yearly calibration is recommended. Verification and calibration period shall be defined based on application, conditions, endurance and usage.
- For more information on available calibration types visit FUTEK calibration web page at: https://www.futek.com/store-calibration
- For recalibration orders visit the FUTEK recalibration page at: https://www.futek.com/recalibration
- An online summary of calibration results is available at: https://www.futek.com/support/calibrationdata

SHUNT

A shunt is an external resistance applied across two points on the load cell's Wheatstone bridge to generate a known, fixed output from the sensor.

Shunt results can be used to set up instruments as well as compare changes to the load cell output over time and usage.

When selecting the appropriate shunt resistance for your load cell, we recommend a resistance that generates an output of about 80% of the sensor's rated output. It is important to have a shunt resistance that results in an output that is less than the full output of the load cell.



TEDS

Transducer Electronic Data Sheet (TEDS) standard is available for FUTEK sensors and is utilized by select FUTEK instruments.

Through the use of TEDS load cell calibration information can be stored with sensor, or sensor cable, for use with TEDS capable instruments.

FUTEK utilizes the Bridge Sensor template 33 for the LSB family.

The following FUTEK instruments are TEDS and LSB compatible:



IPM650
Panel Mount Display



IHH500
Handheld Instrument

Troubleshooting

When troubleshooting, we recommend that the sensor be removed from any fixtures. In order to confirm that that sensor is operating correctly, we suggest placing the sensor on a firm surface, and to apply a known load.

We also recommend using a volt meter with a clean power supply to confirm the sensor is operating correctly.

SYMPTOM	POSSIBLE CAUSE	CHECK	REPAIRABILITY
High zero output	• Sensor is under preload. • Sensor has been overloaded from too much load, off axis load, or moment.	• Fixtures or bolting stress for causes of pre-load. • Loading and support placement for off axis loads. • Avoid excessive moments during installation.	• Overload shift would not be repairable. • If zero offset is stable it may be possible to use sensor by use of Tare or subtracting zero from sequential readings.
Non-responsive zero output	• Sensor or instrument is not powered. • Sensor is not properly connected. • Load is not displaced properly onto sensor. • Sensor is not supported correctly and not allowing deflection to occur to measure load. • Internal disconnect or short.	• Power and wiring to sensor and instrument. • Sensor bridge resistance for possible opens or shorts. • Perform continuity test on cable. • Load is placed correctly on sensor loading surface. • Sensor loading surface is not obstructed or supported and able to flex under load. • Sensor support is not giving while sensor is loaded.	• Internal disconnections or shorts would not be available for repair. • Sensor cable repair may be available if disconnect or short is not too close to sensor.
Non-responsive high output	• Sensor is disconnected from instrument. • An opening has occurred in sensor or cable connection. • Sensor has been overloaded and deformed causing permanent high stress on internal gauges. • Fixture, applied load, or mounting is causing a high pre-load on sensor.	• Power and wiring to sensor and instrument. • Sensor bridge resistance for possible opens or shorts. • Perform continuity check on cable. • Sensor zero output to see if sensor returns to zero or has a high zero load output due to overloading. • Remove load and loosen mounting bolts or fixtures to check if sensor is being preloaded.	• Overload shift would not be repairable. • Internal disconnections or shorts would not be available for repair. • Sensor cable repair may be available if disconnect or short is not too close to sensor.
Incorrect output for applied load	• Load is not applied correctly to sensor loading surface or is off axis. • Fixtures are not secure or obstruct loading. • Sensor loading surface is not able to deflect with applied load. • Sensor support is not ridged and firm. • Incorrect sensor output is utilized.	• Placement of load on sensor. • Fixtures are not impeding ability to load. • Support surface is not giving with applied load. • Calibration verified outputs are being used.	• Recalibration is available for confirmation of sensor performance.

SYMPTOM	POSSIBLE CAUSE	CHECK	REPAIRABILITY
Zero output drift	• Unstable power supply, or noisy power supply, to sensor. • Sensor exposed to temperature change. • Sensor exposed to pre-load from fixture or mounting. • Sensor exposed to liquid or humidity.	• Stability of power supply and noise levels. • For temperature changes or unevenly distributed temperature changes. • Possible loose fixtures and bolts.	• Internal damage from liquid exposure is not repairable. • Recalibration is available for confirmation of sensor performance.
Creep in output while under load	• Load or fixtures are not stable. • Power supply is unstable or noisy. • Sensor is exposed to temperature change. • Sensor support is not rigid and firm. • Sensor exposed to liquid or humidity.	• Stability of power supply and noise levels. • Fixtures for stability. • For temperature changes or unevenly distributed temperature changes. • Confirm support surfaces are not giving while under load.	• Internal damage from liquid exposure is not repairable. • Recalibration is available for confirmation of sensor performance.
Noisy or unstable output	• Power supply is noisy. • Load is not stable. • Sensor or cable is placed close to high power equipment. • Sensor or instrument is exposed to ground loop with other equipment grounds.	• Power supply stability. • Load is stable and fixtures are secure. • Reroute cables away from high power equipment. • Confirm wiring and grounds are not connected to unintended equipment ground.	• There are no active electronics in a load cell, such as capacitors or IC chips that may contribute to noise.

Further Support Resources

- Tips on noise reduction can be found at: https://media.futek.com/content/futek/files/pdf/Manuals_and_Technical_Documents/how-to-reduce-electrical-noise-in-your-system.PDF
- More information about the sensor can be found online at the FUTEK website at https://www.futek.com/store/load-cells/s-beam-load-cells
- A one year recalibration is recommended. But verification and calibration period shall be defined based on application, conditions, endurance and usage. Calibration data may be available online at https://www.futek.com/support/calibrationdata
- To send in your sensor or system for recalibration visit our FUTEK calibration web page at: https://www.futek.com/recalibration
- FUTEK Technical Support may be reached at: https://www.futek.com/contact/technical-request
- To send in your sensor or system for evaluation and repair visit our FUTEK RMA web page at: https://www.futek.com/rma
- FUTEK contact information can be found online at: http://www.futek.com/contact
- Warranty information can be found online at https://media.futek.com/content/futek/files/pdf/ExtendedWarranty.pdf