# SLIK- MEASUREMENT SYSTEM
# Installation Guide

## INTRODUCTION

This instruction manual contains information on the installation, operation, and maintenance of your SLIK Measurement system for non-hazardous area applications.

## SLIK MEASUREMENT SYSTEM

The silo level indication kit (SLIK) is a continuous level measurement system designed to monitor the product level in storage bins, silos and tanks. The unique system does this by measuring the strain on the support structure as the weight changes within vessel.

### Installation Components

CLI-100 Continuous Level Indicator :
The CLI-100 is a micro-processor based, continuous level indicator. The CLI-100 monitors strain sensor(s) located in the support legs of a bin or storage vessel and displays the level of material in them. The CLI-100 has adjustable low and high alarm set-points. In addition to the low and high adjustable alarms is a non-adjustable overflow alarm, factory set at 102 percent. And, a current output board (0-20mA, 4-20mA) is installed in the electronic package to provide remote level indication.

Strain sensor :
The typical continuous level system consists of up to eight strain sensors.

Junction box :
Each strain sensor comes with an individual junction box.

### Simplefied System Diagram


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## INSTALLATION

## INSTALLATION OF STRAIN SENSOR

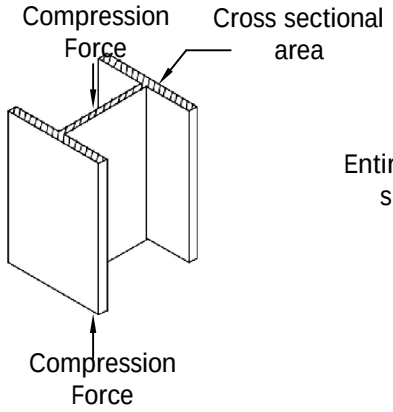
### Support Structure Stress Level Requirement

The strain sensor must see a kg's per square cm² (kg/cm²) stress change, between 0 and 100% bin full, of more than 105 kg/cm²(~1493psi) but less than 1000 kg/cm²(~14223psi). The sensor accuracy is limited if at least 100 kg/cm²(~1422psi) change is not seen. Damage due to overloading can occur on stress levels of more than 1000 kg/cm²(~14223psi).

1. Vertical Structure Stress Levels:
For vertically supported structures, normal stress is found using the following formula:

**Stress = P/ (Nx A)**

Where,
P = Total Bin Material Capacity (kg)
N = Total Number of Supports
A = Cross-Section Area for Each Leg ( $cm^2$)

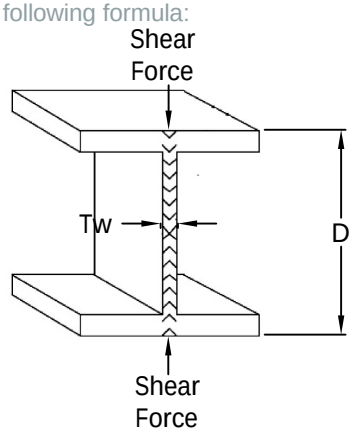



Entire cross sectional area supports the weight

2. Horizontal Structure Stress Levels:
For horizontally supported structures, shear stress is found using the following formula:

**Stress = P/(2 x N x D x Tw )**

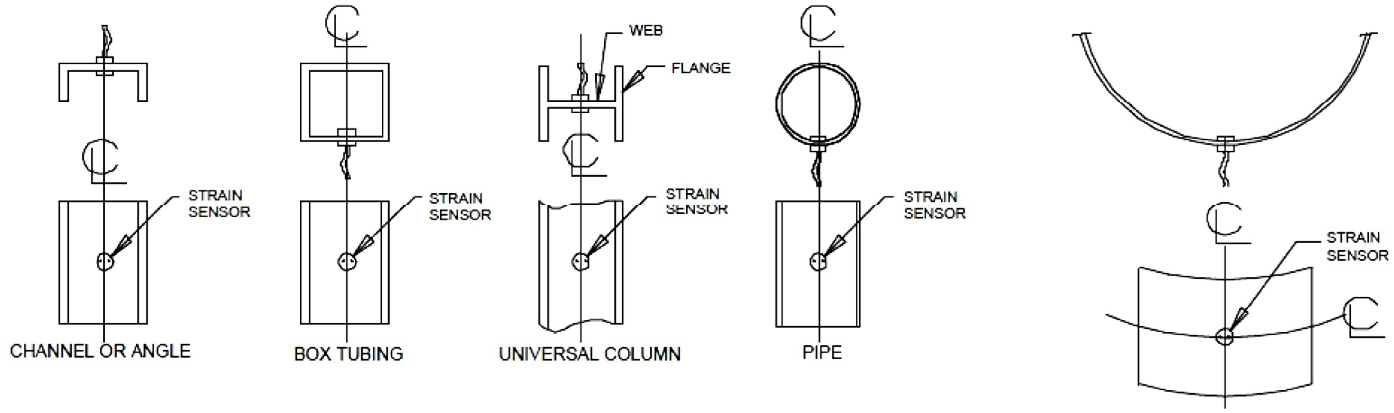
Where,
P = Total Bin Material Capacity (kg)
N = Number of Bin Support Gussets
D = Depth of Beam (cm)
Tw = Web Thickness (cm)




Only beam web part supports the weight

### Strain Sensor Mounting Location and Orientation

Mounting on Vertically Supported Structures :
Vertical structures transfer bin forces through columns to the foundation. Mount the sensor in the centre of the longest free-standing section of the column. If cross bracing or diagonal members are present, mount the sensor between the bracing connection on the column web. And, Always mount the strain sensor in the middle of the column web. Never place the sensor in the column flange.

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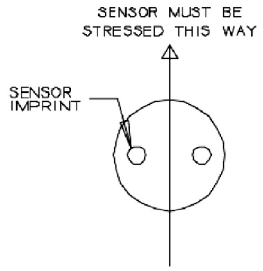
Vertical free standing bins should have the cells located mid-way in a connection free vertical leg section, which is a least twice as tall as it is wide. Closer to the bin is normally better than ground level, since it reduces forces of any horizontal beam stiffeners expanding from heat of sunlight.

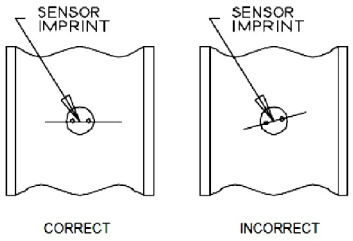
Mounting on Horizontal Supported Structures :
Horizontally supported structures have the cells located to measure the bending or shearing force caused by pressure down on the horizontal supports. The cells are installed centred in the horizontal support between the area of force down and the vertical support of the horizontal beam. The cells are oriented at 45 degrees with the dots always sloped the same direction as the cone of the bin.

Note : Using multiple sensors allows the sensor to average situations like uneven loads, wind, and greatly improves accuracy.

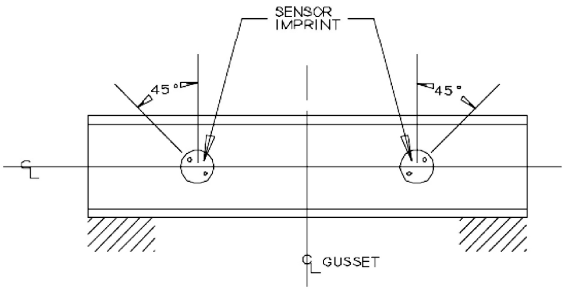
Sensor Orientation :
Proper orientation of sensor can be setup refering imprint marks on the sensor.

Vertical



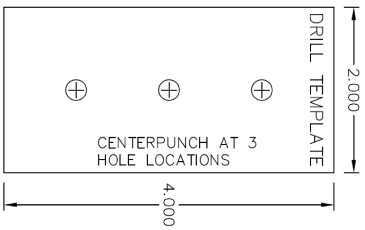

Horizontal



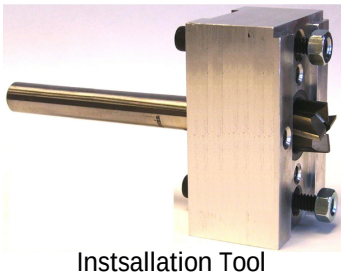

## Strain Sensor Installation

The universal installation kit is used to insert the strain sensor into a steel structure for the measurement of stress. The kit is both a guide for cutting the correct size hole and press fitting the cell the correct depth into the hole.

Installation Kit




Drill Template



Instsallation Tool

Surface Preparation :
Once the correct location has been determined, make sure the area of installation is free of corrosion. The mounting kit must be snug against the surface of the metal, so any imperfections that would prevent this must be removed.

Mounting of Installation Kit :
A drill template with adhesive back is provided that should be attached to the surface of the steel as a guide to locating the three holes. Since these holes will also be used for the electrical junction box of the strain sensor, it is highly recommended that the 2 nos of 17/64" outside holes be as close to vertical or horizontal as possible.

Note : If a template is not available for some reason, one of the 17/64" holes can be used to mount the kit snugly to the beam and the other hole used as a guide for cutting the 2nd h ole.

Curved Note : If the steel member is hollow or the back of the beam not accessible, the holes should be drilled to #7 (.201) or 13/64 drill bit and thread with a 1/4-20 tap.

All holes should be perpendicular to the web of columns and beams or pipes.

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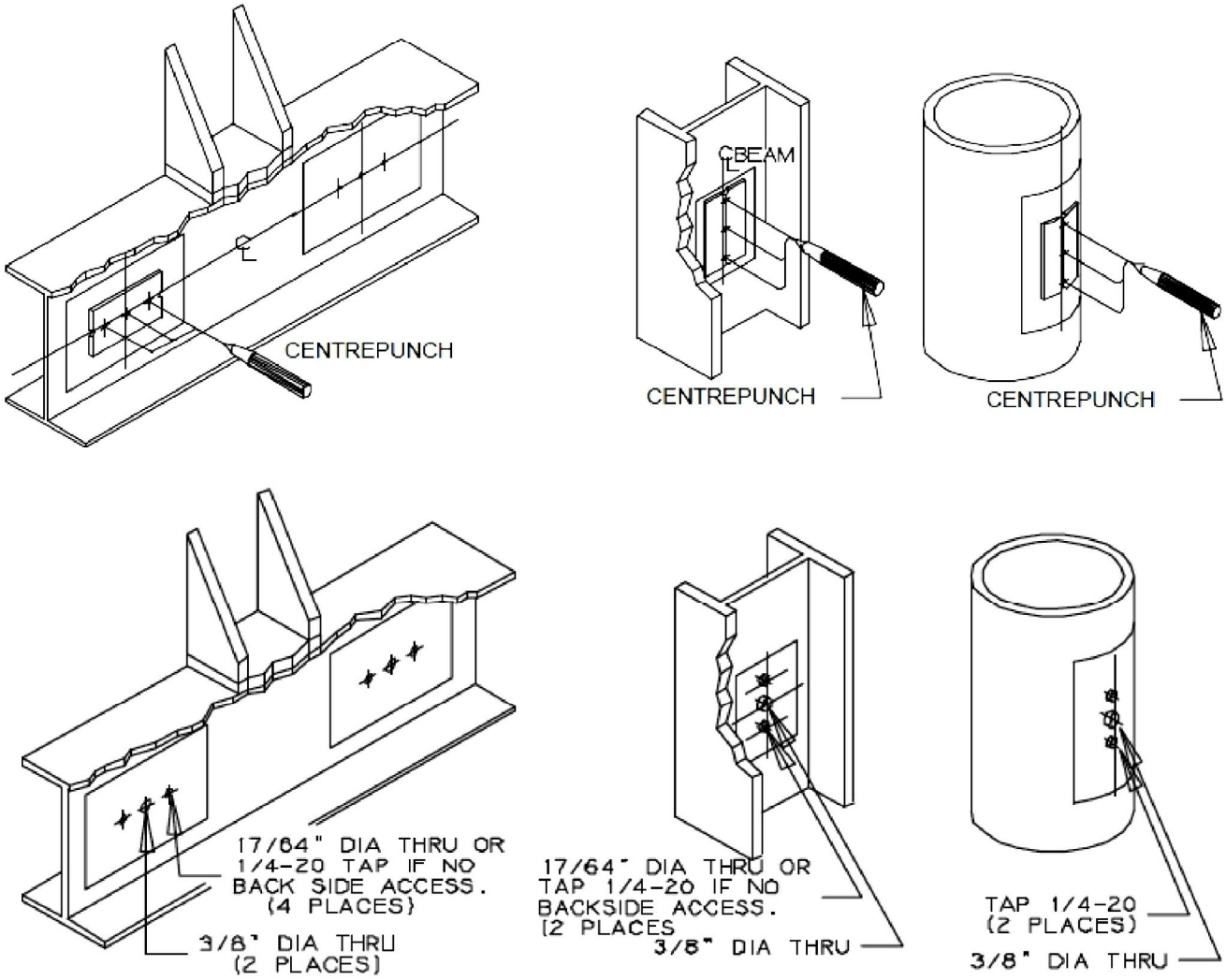
Drill Template Showing the Tool Mounting Holes




Once the 2 nos of 17/64" holes or tapped holes are finished the tool should be mounted to the beam with the notched side of the tool against the beam. The kit is held snug to the surface of the steel by the 2 nos of 1/4-20 x 2.5" (Thick Beams) or the 2 nos of 1/4-20 x 2.0" Socket Head Cap Screws, which must be snug to prevent any movement of the kit during the drilling of the final hole for the sensor. Once the kit is attached, a 3/8" (10mm) pilot hole should be drilled directly in the centre of where the sensor is to be located.

Some structures over 1/4"(6mm) thick will require enlarging the pilot to reduce the amount of time and energy to ream the final hole. If you need to do this, it is suggested that the tool be in place to prevent off centre placement of the pilot hole and the maximum size be 5/8" (.625" or 16mm).

Final Cut :

Now a slow speed drill is highly recommended (300-500 RPM). Cutting oil or compound should be applied as the final cut is made with the reamer provided. The oil will assist with the cut, reduce the heat, and extend the life of the reamer. If the amount of drill filings becomes inhibitive, the reamer should be removed and the hole cleaned before finishing the hole. The reamer can be used on up to 8 holes before it starts to become dull and the reaming process is slowed down. When the hole is finished the tool should be removed and the excess filings cleaned.

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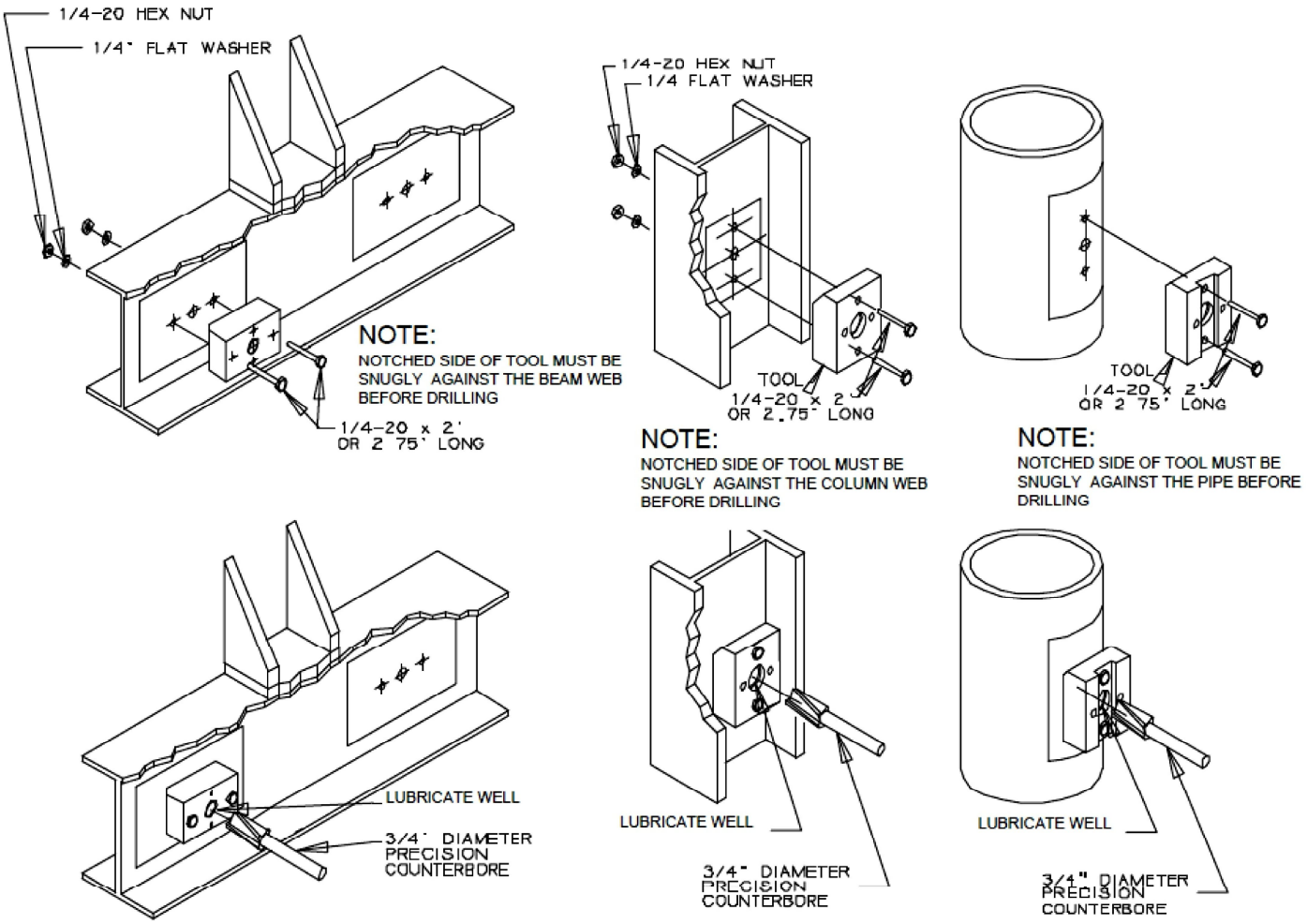


Installation of Strain Sensor :
Place the cell into the hole until the knurls prevent any further penetration. Rotate the cell to the proper orientation for your application. Tap the cell gently with a rubber hammer until the knurls grab enough that the cell stays in place.

Then reinstall the kit with the notch (countersunk) side out and the wire threaded through the centre hole. Check the orientation of the cell again. The cell cable is then threaded through the 3/4" driver and the driver placed into the hole until the driver rests again the cell. This will happen before the driver is flush with the kit.

Attach the push block to the tool using the 1/4-20x1.25 Hex Head Cap Screws and following the rules below:

1. If the steel surface is round attach the push block in the slot parallel to the tool.

2. If the steel surface is flat attach the push block perpendicular to the tool.

Once the push block is flush with the driver, use alternating 1/4 turns of the two (2) bolts until the bolts bottom out. The cells are now installed the correct distance into the steel. On some beams that are thicker than 1/2" an additional step is recommended as follows, one SAE 1/4" flat washer should be placed between the driver and the push plate and used to insert the cell a little further.

At this point, remove the kit. The back side and the front side orientation should be checked. Then a thin layer of silicon spray or paint can be applied around the cell to prevent any exposed metal of the steel from corrosion. The cell itself is stainless steel and requires no protection.

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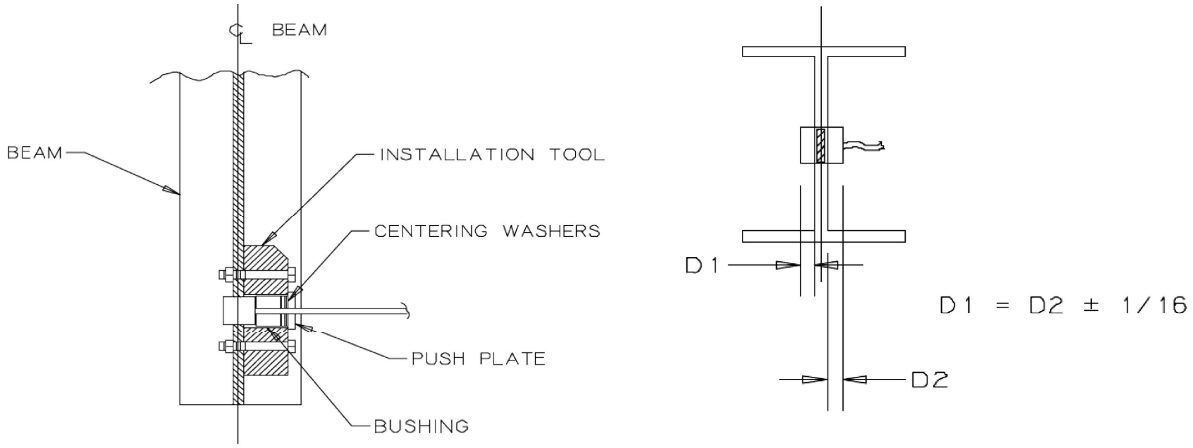
Strain Sensor Centering

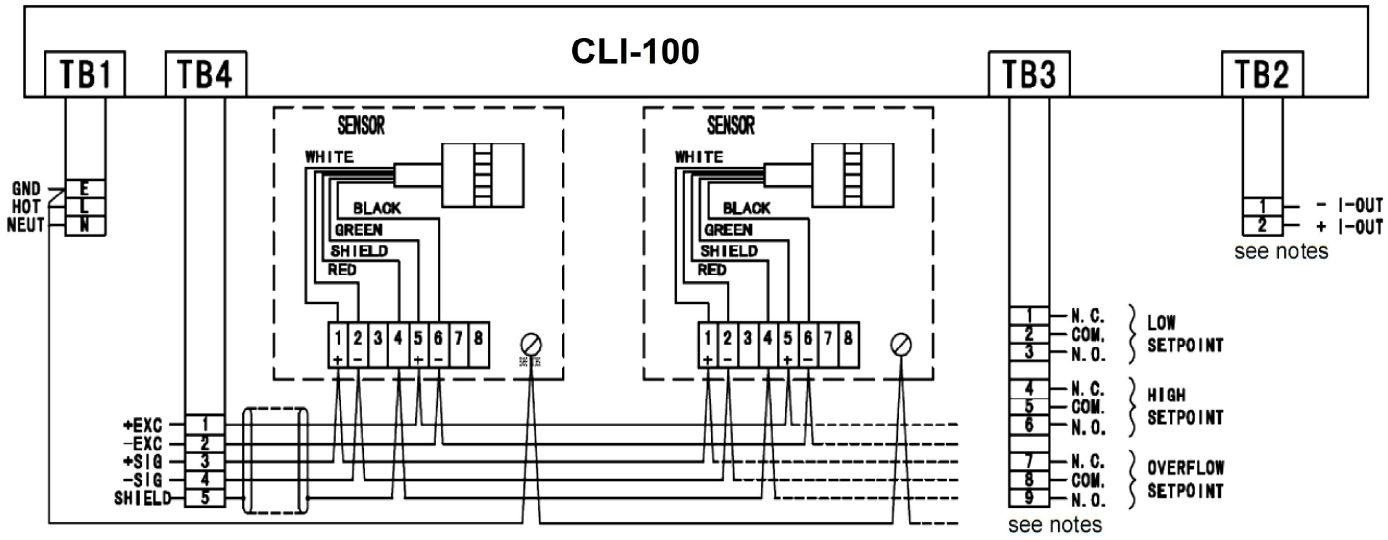



## INSTALLATION OF JUNCTION BOX

The installation kit is removed and the junction box is mounted directly over the cell using the same 2 holes that held the mounting kit. The gasket should be attached to the beam side of the junction box before mounting it to the beam. Once the box is mounted inspect that the junction box is sealed to the beam, if there is a chance that water could enter the junction box from the beam side, caulking should be used to seal the back side of the box. This is especially important on curved surfaces. The wires from the cell can be attached to the floating terminal strip according to the wiring diagram. Always have the conduit entrance located so that any condensation in the conduit lines stays below the j-box level.

## WIRING

Use the field wiring diagram below as a guide if you do not have a specific wiring diagram for your system. Follow local electrical codes and regulations for minimum wire size and routing. Four (4) Conductors are required on all installations with 18 gauge wire unless the distance from the last sensor to the CLI-100 is less than 30 meters (100 ft), when 22 gauge wire is acceptable.




Notes :
Stranded wire should be used inside the enclosure of the CLI-100. The wiring should be sufficiently long enough, and routed to allow for free movement of the enclosure door.
- Make sure that the power is off.
- Do not route signal cables in the same conduit with power lines.
- Terminate the cable shields only where illustrated.

Main Power Wiring : Main power connections are made to the terminal strip TB1 located on the power slide switch. The terminals are labelled L, N, and E signifying the normal hot, neutral and earth ground, respectively, of most systems. Please select the appropriate voltage prior to first powering up the Indicator.

Strain sensor/ Junction box wiring : The sensors are wired in parallel using the terminal strip provided with the junction box kit (See attached wiring diagram). If the junction box is mounted on curved or rough surfaces, a sealant should be applied to the back in addition to the gasket provided to prevent moisture entry.



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