InSitu™ Strain Link Machine Frame Sensor Mounting.

Process monitoring sensors:

Strain Links on the Uprights:

The Uprights of the machine are the LEAST DESIRABLE location for sensors. They are far from the point of operation and will exhibit heavy filtering due to the damping (or ringing) effects of the frame structure. The same effects also compromise the accuracy of peaks in the signature. This means that, while the signature can exhibit reasonable sensitivity to changes on the process, the displayed signature will, in all likelihood, not be capable of analysis since it will not change in any intuitive fashion.

Signature Technologies DOES NOT recommend Press frame mounting of sensors on any machine that operate in excess of 150 S.P.M. or in operations where blanking or other highly dynamic operations are performed on the work-piece.

Signature Technologies ABSOLUTELY DOES NOT recommend mounting sensors on ANY PART of a machine that exceeds 400 S.P.M. If it is desired to do general machine sensing, instrumented "Kiss Blocks" should be used since they will exhibit some sensitivity to what goes on in the die at higher speeds (as long as they contact each stroke). The press frame strains bear little or NO relationship to what's going on in the process due to their own resonance characteristics.

If you're installing the links in an area of the machine that is vulnerable to flying parts, or runaway lift trucks, then the Protective cover box is needed, and available from ST under special order.

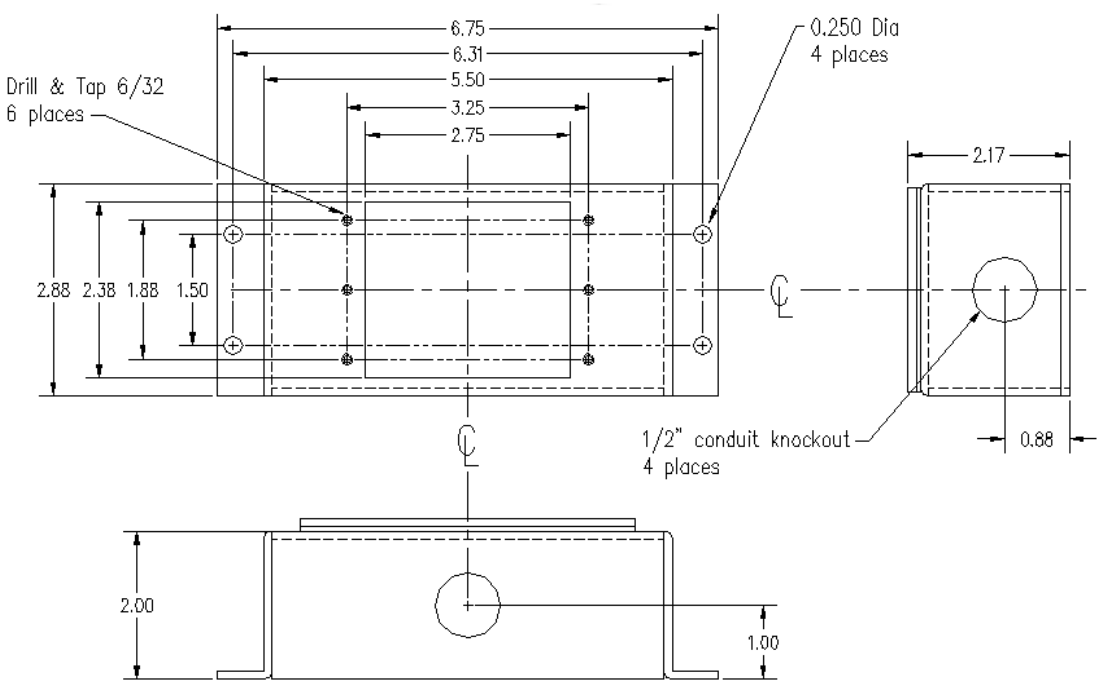

Figure # 1 - Strain Link Cover Box

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This enclosure IS NOT sealed against liquids, but the Strain Link does not require protection from oils or moisture normally encountered in the manufacturing environment. The cover can also be used as a strain relief for moving wiring.

Find a location that is clear ON ALL the uprights in the same relative position. It doesn't have to be EXACTLY the same, but should be VERY close. Avoid locations where the "Section" of the uprights varies from corner to corner. Strive to get the links in the center of the "Window" areas of the uprights.

For example, let's say the right side of the machine has no feed mounting rails, but the left side does. The feed mounts will "stiffen" the left side of the machine. Consequently the links should not be mounted in an area of the upright where the feed mounts are located.

Mounting Locations:

Gap-frame Machine:

The choice is either to position on the front of the gap close to the die space, OR at the back of the gap either on the side wall of the machine or on the front / rear edge of the frame.

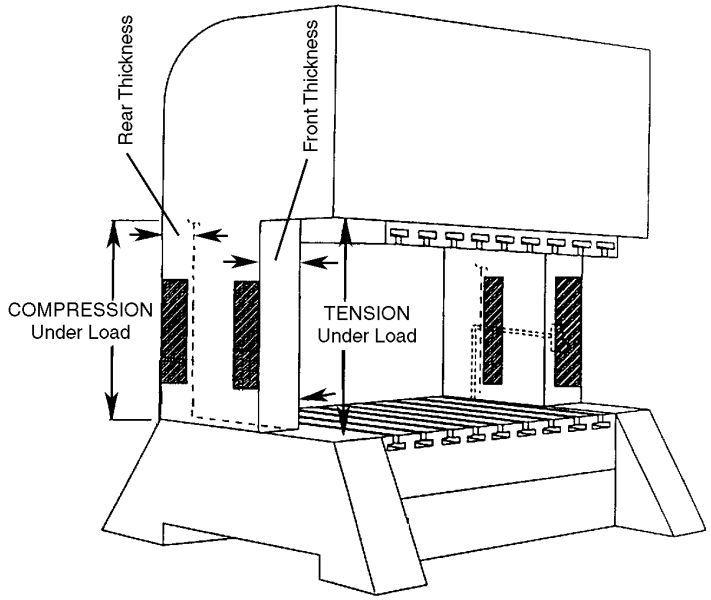

Figure # 2 - Gap frame press sensor locations

IF POSSIBLE, the best frame location is in the center of the gap on the edge of the frame facing the die-space using cover boxed for mechanical protection of the strain link. This tends to be the "truest" location for signatures. It's also quite an active area with heavy pieces moving around during die set operations, and may not be a practical location.

The next best location is at the front of the gap in the center of the gap on the side of the frame. If symmetrical locations on each side of the machine can be found, the units should be installed here using cover boxes for mechanical protection.

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On a Straight Side Machine:

You need to find the “Loaded” area of the upright in order to mount the link in an area that will “see” strain changes as the machine works.

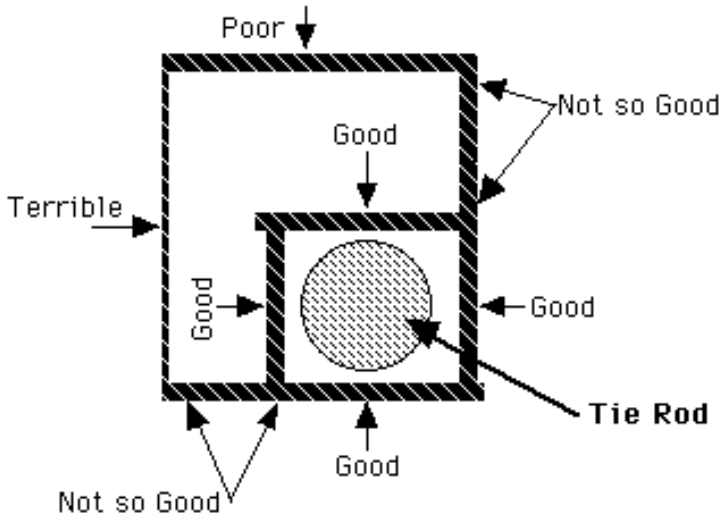

Figure # 3 - Upright sensitive areas.

Typically, somewhere in line with the center of the tie-rods will be a good location - see illustration above. In general, the farther from the tie-rod you get, the more questionable the results will be.

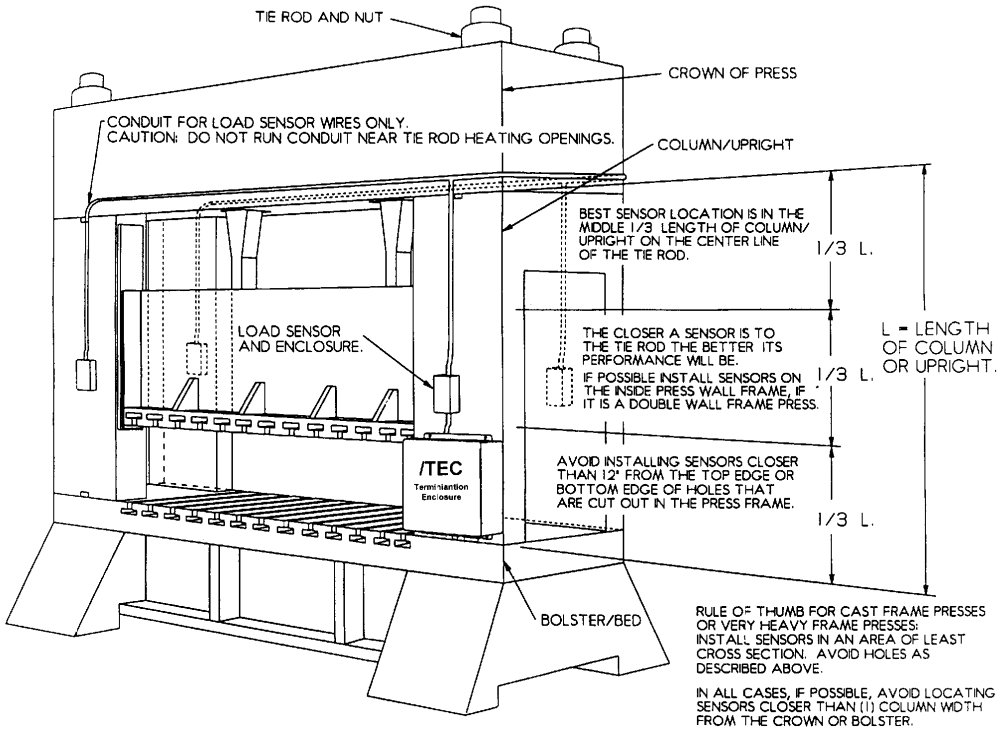

Figure # 4 - Upright sensing locations.

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Strain links on the Connection(s):

The connections of the machine will provide a superior signature with displayed force patterns much closer to the actual force signature at the point of operation. While Connection signatures will be inferior to actual, In-The-Die sensors, there's less mechanical filtration, and the signatures will be freer from "ringing" and drive noise. Connection signatures are useable at press speeds up to 300-400 S.P.M. with rapidly deteriorating performance as press speeds rise. If the machine runs in excess of 500 S.P.M., the likelihood of even seeing changes due to process variations becomes more remote. This is primarily due to the fact that the inertia of the slide itself does a greater percentage of the work, and the uprights may not actually experience any forces directly related to the process. **ST DOES NOT RECOMMEND** ANY Press frame sensor installation on high-speed machines.

Connection signatures can exhibit good sensitivity to changes on the process, and in some instances, the cause of the change can be derived for the signature changes.

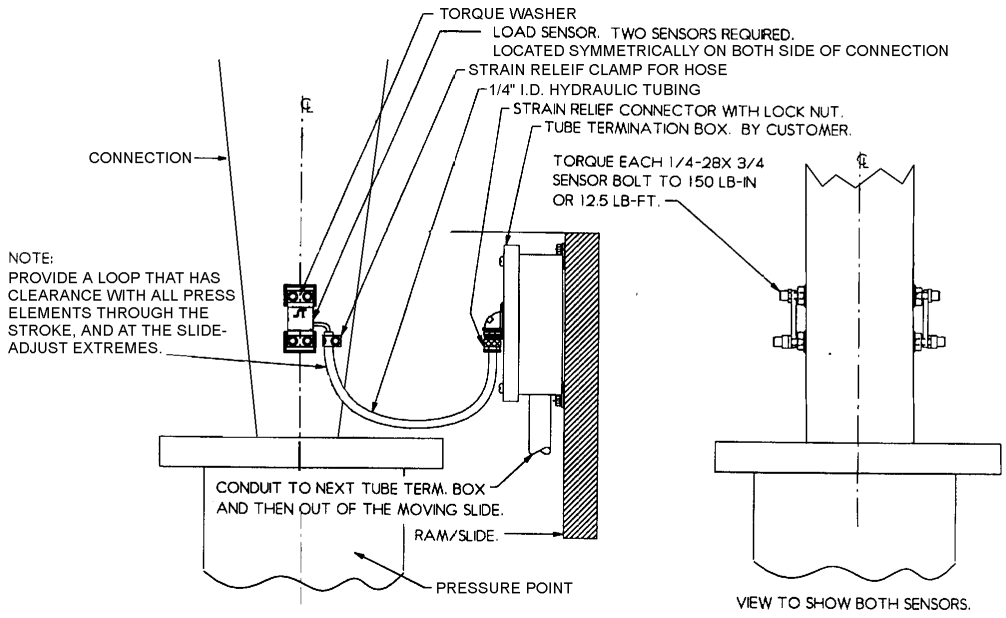

Figure # 5 - Connection mounting of Strain Links

Considerations about connecting EXISTNG Strain links:

If you will be using existing strain links on your machine and aren't totally sure of their configuration, do the following:

NOTE: Amplified strain links from Data Instruments will interface directly to the SA2000. Refer to the section in the **Appendix #9 "Interfacing Manual"** that deals with the special considerations for these sensors.

NOTE: Make sure that the Shield Braid is NOT connected to Ground at the Strain Link End!

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Measure from the shield braid of the Strain link cables to the machine frame with an OHMETER. There should be NO connection (very high resistance). If the Shield is connected to the machine frame, there will likely be noise problems in the signatures.

If the shield is grounded, you have two alternatives:

1) Change the strain links to ungrounded shield types of the same brand as the existing ones.
2) Strip back the cable jacket up close to the strain link (probably inside the cover box), and cut the shield away so it has no connection into the strain link, and then tape the cut portion so that it can't short against anything.

Either remedy will work equally as well, and (2) is generally cheaper.

Find out what the wire color code for the sensor is!

If you're not totally sure of the internal wiring of the strain link, then check, with an ohmmeter, between the four wires coming from the strain link. There should be TWO pairs of wires that will give a higher resistance than other pair combinations.

> For example, if the strain link is a 350 OHM bridge, two of the pairs (probably RED & WHITE / GREEN & BLACK) will give a resistance reading of 350 ohms (approximately) and any other pair (like GREEN & WHITE) will measure around 267 Ohms.

If you can't find two equal, relatively high resistance pairs, measure and record the combinations, and give ST a call. It could be that your link is damaged, or of a self amplified type (like Data Instruments - see the Interfacing Manual).

Sensor hookup:

Select one of the high resistance pairs to be the "Excitation" pair, and hook to the "EX+" and "Ex-" terminals on the TEC unit according to the wire list below.

With an non-amplified Whetstone Bridge type of strain link (also called "Full Bridge"), it does not matter which high resistance pair is connected to the Excitation and which high resistance pair is connected to the Signal. The other high resistance pair will go to the + and - Signal terminals.

Toledo, and ST Strain Links are normally connected:
EX+ = GREEN
A+ (Signal) (in Compression) = RED (in Tension) = WHITE
A- (Signal) (in Compression = WHITE (in Tension) = RED
EX- = BLACK

Helm Strain Links are connected:

EX+ = RED
A+ (Signal) (in Compression) = BLACK (in Tension) = GREEN
A- (Signal) (in Compression = GREEN (in Tension) = BLACK
EX- = WHITE

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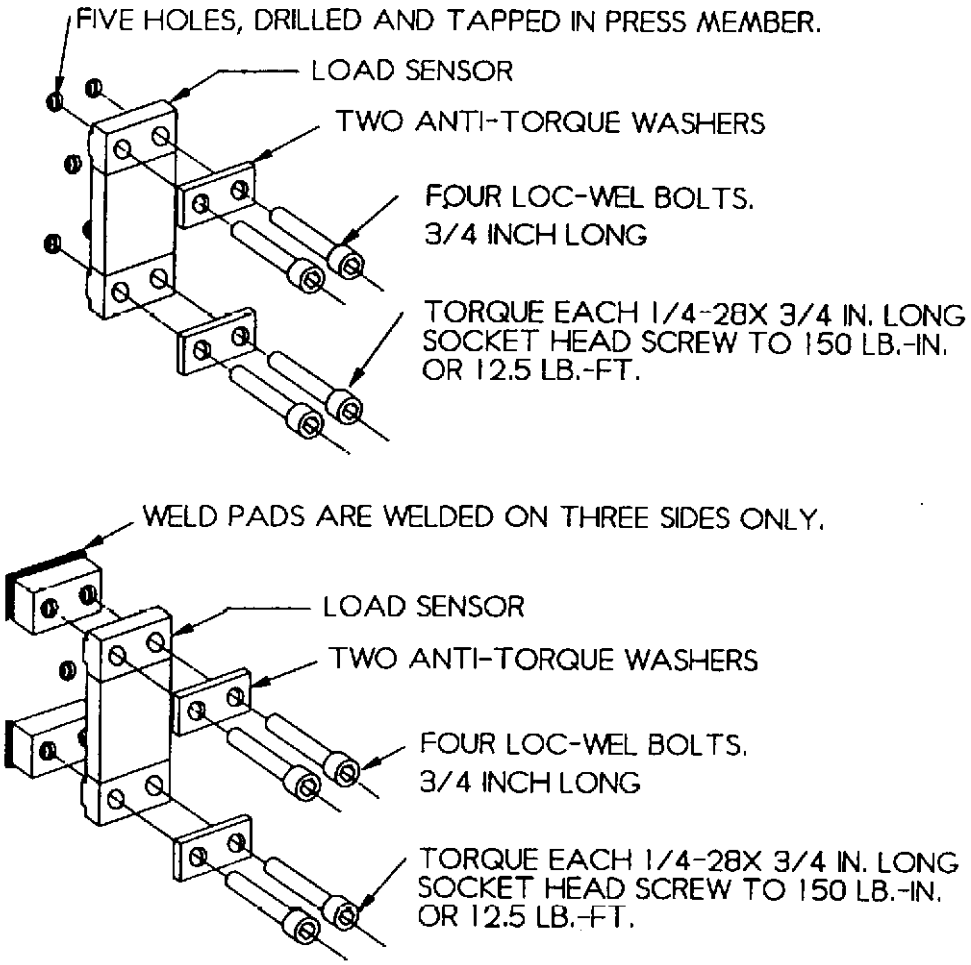

Figure # 6 - "Strain Link" installation kit options

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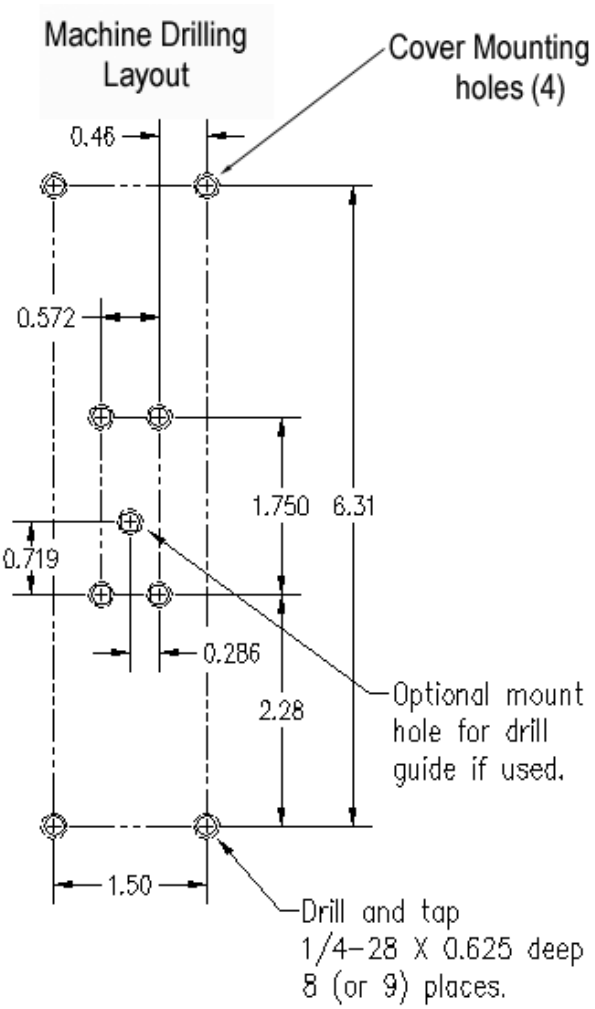

Figure # 7 - Strain Link Drilling layout

The Key to proper Connection mounting is the application of TWO strain links mounted SYMMETRICALLY on opposite sides of the connection. The illustration shows links mounted on the SIDES of a connection, but a front-back mounting is just as good if the physical layout of the machine seems to dictate that as a choice. Make sure the location is symmetrical as accurately as you can. 1/8" difference won't make much of a difference, but 1" probably will.

BOTH strain links should be hooked in parallel color to color. (Red to Red, Green to Green etc.) The paralleling can be done right at the connection if there's room, or in the junction.

MAKE SURE to check the cable for interference with other press elements through the stroke with the adjustment all the way up, and all the way down. Be careful of the clearance of the links with the crown openings and oil control apparatus.

WATCH the cable in the hydraulic tubing for signs of localized bending and adjust so there is a smooth rolling action to the cable as the press strokes. A properly dressed cable will last for YEARS.

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WELD PAD METHOD FOR MOUNTING SENSORS

Step No. 1 Remove all paint, grease, or rust from surface to be welded. (Surface should be flat T.I.R. 1/32 of an inch)

Step No. 2 Bolt the weld pads to the fixture with the socket head cap screws provided. (The user may want to drill and tap for the center holding screw. The center hole may be used to hold the fixture down flat and tight while welding the weld pads to the press member.)

Step No. 3 Hold the fixture flat and tight. Weld the weld pads to the press member. (BE SURE TO ONLY WELD THE WELD PADS ON THREE SIDES, AS SHOWN.) A single pass is sufficient. Do not remove fixture until slag is removed and or assembly has cooled. The 4 screws may be discarded. Do Not Use Screws To Assemble Sensor. When welding to cast iron use a dry nickle rod such as: Lincoln Electric "Soft Weld" Hobart "NI Cast 99" MB Weld Prod. "MG 210" Strike arc on steel then puddle into the cast iron.

Step No. 4 Remove weld fixture. Do Not Weld After Fixture Is Removed. Weld Pad surface must be clean - no weld bumps, scratches, etc. Be sure tapped holes are clean and Bottom of Holes Are Free of Weld Flash.

Step No. 5 Mount the sensor with raised rib to the press. The anti-torque washers should go between the screw and the sensor body.

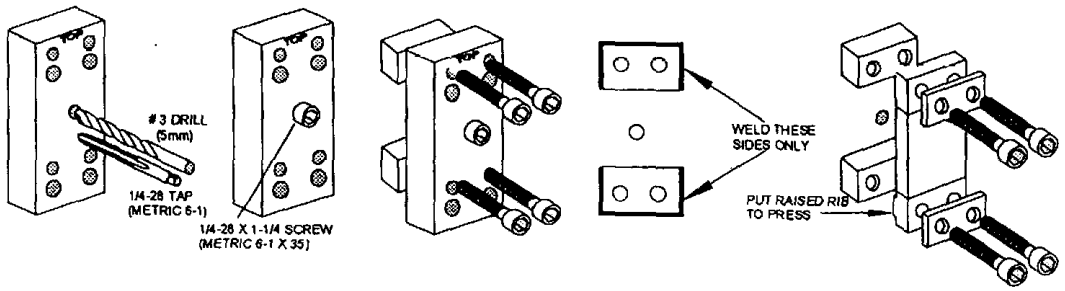

Figure # 8 - WELD PAD mounting method for Strain Links.

Weld pad mounting is used wherever the machine surface is not particularly flat, and can't be evened out practically. There is no penalty either in loss of sensitivity or accuracy with this method that is generally the most common way to install on running presses.

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DRILL AND TAP METHOD FOR MOUNTING SENSORS

Step No. 1 Paint must be sanded off and or grease removed from sensor mount area. If the machine surface is flat (total indicated reading of .002") and smooth (125 µ in.) the load sensor can be bolted directly to the surface.

Step No. 2 Drill and tap the center hole for mounting the fixture to the press member. This hole should be 1/2 of an inch deep.

BE SURE THE SENSOR LOCATION FOLLOWS THE BEST LOCATION DESCRIBED ON THE PRINT.

Step No. 3 Bolt the drill guide to the press member using the 1/4-28 by 1-1/4 inch (M6-1 X 35) long socket head cap screw in the center of the guide.

Step No. 4 Insert the number 3 drill (5mm) into the smaller hole and drill out all four holes to a depth of 3/4 of an inch.

Step No. 5 Loosen the drill guide. Rotate the drill guide 180 degrees such that the larger holes line up with the fresh drilled holes in the press member. Insert a tap to be sure the holes line up. Lock the drill guide by tightening the center socket head screw.

Step No. 6 Insert the tap into the larger tap guide holes and tap each hole.

(BE SURE TO USE PLENTY OF TAPPING FLUID.)

Step No. 7 Remove the tap guide and continue with more holes where needed.

Step No. 8 Mount the sensor with raised rib to the press. The anit-torque washers should go between the screw and the sensor body.

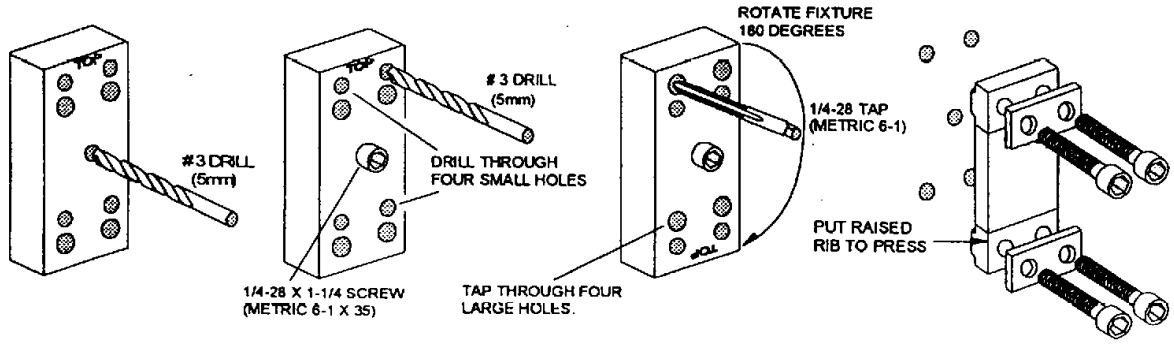

Figure # 9 - Direct Bolting method of Strain Gage Mounting

In cases where the press is apart, OR you're gauging to an existing machined surface, go ahead and drill/tap the Links on.

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