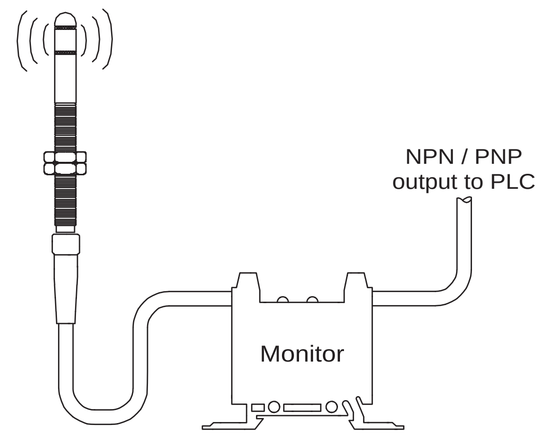
Series SNP Nut Detection / Thread Detection System

Theory of Operation

The Series SNP System functions like a radial inductive proximity switch. A sensing coil is embedded in the tip of the probe with its location indicated by scribed lines on the probe tip.

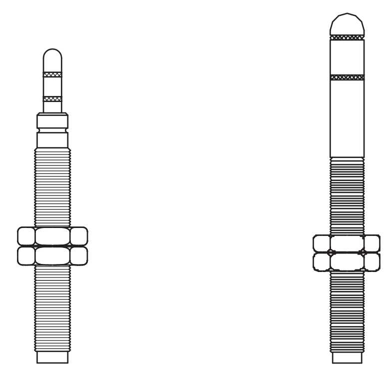
The remote monitor generates an oscillating signal that is sent to the sensing coil. Ferrous material that surrounds the sensing coil changes the operating frequency of the oscillator. This change in frequency is detected by circuitry in the monitor and the output is turned on. A 25 turn sensitivity potentiometer allows for field adjustment of the frequency change needed to produce an output from the monitor.



There are two sizes of probes. SNP50608 has a probe tip diameter of 4.0mm and is used on M5, M6 and M8 nuts.

SNP01012 has a probe tip diameter of 7.6mm and is used on M10 and M12 nuts.

There are the twelve different monitors that are selected based on nut size and output type. Each monitor runs at a slightly different oscillator frequency or the sensitivity adjustment circuitry has been maximized for the mass of the nut it was designed to detect.

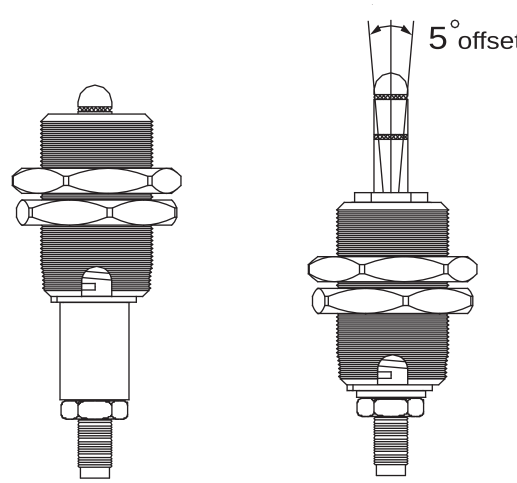


SNP 50608
for M5, M6, M8 nuts

SNP 01012
for M10 & M12 nuts

Most applications use the sensor probe spring mount #SAB30403. This mount allows the probe to retract if forced against a part with no hole and the probe tip can offset at up to a 5 degree angle to locate misaligned holes.

The sensor probe body is constructed of thin wall stainless steel tubing. It cannot withstand severe compression, side loading or continuous scraping along the side of a probe that is rigidly mounted.



Probe retracts up to 0.7" (17.8mm)

Probe offsets up to 5° offset

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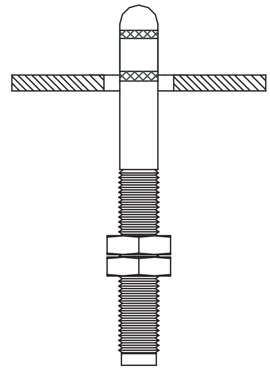
Nut Detection

The system was originally designed to detect the presence of weld nuts or cinch nuts attached to sheet metal parts. The probe can be used to verify nut presence prior to allowing the weld process to proceed or immediately after the attachment process to verify nut presence.

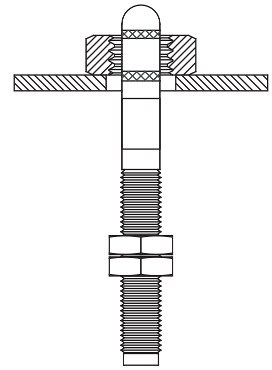
The probe and monitor are both selected directly from our published literature.

Calibration is done by inserting the probe into a sample part with nut properly attached. The sensitivity adjustment is turned counter clockwise until the "load on" LED on the monitor turns off. It is then slowly turned clockwise until the "load on" LED turns on. An Additional four turns clockwise is added to the adjustment to complete the calibration process.

English nut sizes will use the probe and monitor of the closest metric size shown on our selection literature.



No nut,
no output



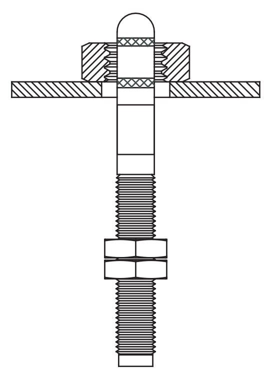
Nut present,
output turns on

Thread Detection in Nuts or Sheet Metal

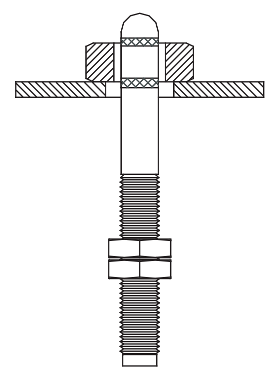
The probe and monitor are selected directly from our published literature based on thread size.

Calibration requires a sample part with threads and a sample part without threads. The probe is first inserted into the part with threads. The sensitivity adjustment is turned counterclockwise until the "load on" LED on the monitor turns off. It is slowly turned clockwise to find the point at which the LED just turns on and further rotation is stopped.

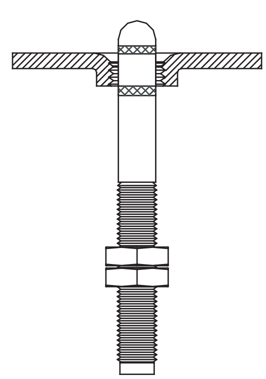
The probe is then inserted into a part without threads. The "load on" LED will be off. The sensitivity adjustment is slowly turned clockwise while counting the number of rotations until the "load on" LED turns on. Divide the number of rotations counted by two and turn counter clockwise that number of turns to set sensitivity half way between sensing a thread and no thread condition. The typical number of turns between sensing threads and no threads will be 4 to 6 turns.



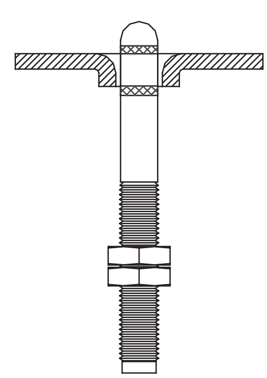
Threads in nut,
output from sensor



No threads in nut,
no output from sensor



Threads in sheet metal,
output from sensor

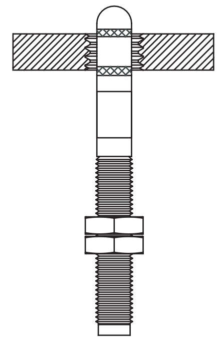


No threads in sheet metal,
no output from sensor

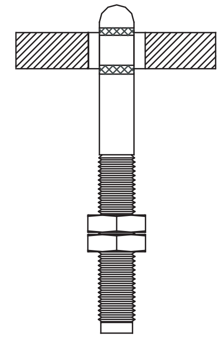
Thread Detection in Steel Plate or Casting

Thread detection in steel plate or castings require the trial and error testing of various combinations of probe and monitor. Our field experience with these applications has not resulted in consistent results that allow firm recommendations from Syron.

A threaded part and a part without threads are used to calibrate the system using the same sequence as outlined under thread detection in nuts. Various combinations of probe and monitor modules are run through the calibration process to find the combination that provides the largest number of turns between turning on for good threads and turning on when there are no threads. A recent application detecting M10 threads in a brake component casting ended up with the M10 probe and M6 monitor as the best combination. Syron will test samples sent to the factory and make recommendations based on the results.



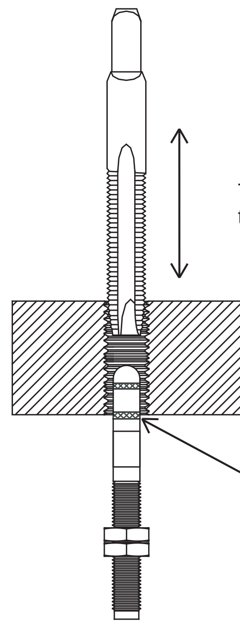
Threads in plate, output from sensor



No threads in plate, no output from sensor

The system monitors threads that are surrounding the scribed sensing area at the tip of the probe. This limits total thread depth to the 6.3mm (.25") or 10.0mm (.39") sensing area of the two probe sizes.

We do have installations where threaded through holes are monitored at the exit hole assuming that good threads there indicate good threads over the full length of the hole.

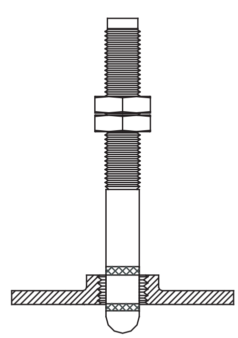


Good Thread / Bad Thread / Partial Thread Detection

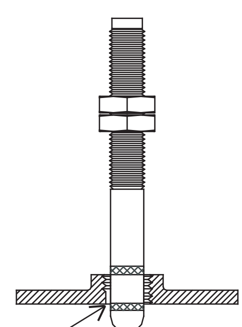
One stamper of small brackets with punched threaded holes reported that they were able to tune the monitor to detect the point at which tap wear resulted in threads that were not to specification.

Another current application involves a fuel tank pump mounting ring with eight punched and tapped holes around its circumference. Variations in the tapping operation result in some holes losing the thread on one side at the exit end of the hole. An automated test fixture is being used to reliably detect this thread quality issue. The difference between a good thread and bad thread is only one turn of the sensitivity adjustment. This small differential was a concern but the system has reliably checked thousands of parts.

Most good / bad / partial thread applications require trial and error testing of various probe and monitor combinations



Good threads over complete length of hole. Monitor tuned to provide an output.

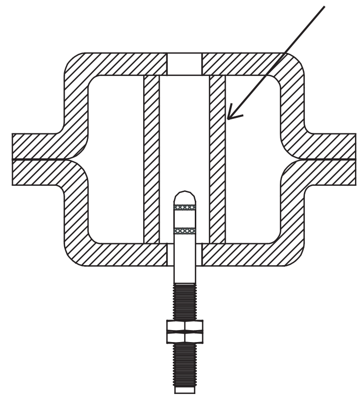


Threads missing on one side at exit end. Monitor tuned to provide no output indicating a bad part.

Other Applications

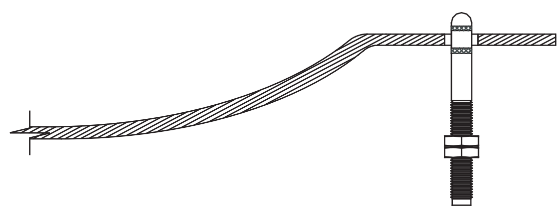
This system can be tuned to detect small differences in the mass surrounding the probe. Here are a few examples of current applications that have nothing to do with nuts or thread quality:

A) Verification of support tube presence in enclosed automotive engine cradle assemblies.

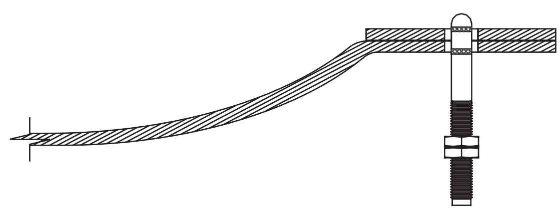


Probe verifies support tube presence. M12 probe and M12 monitor adjusted for maximum sensitivity detects tube with 19mm (.75") I.D.

B) Verification of reinforcement plate presence on automotive fuel tank mounting strap.

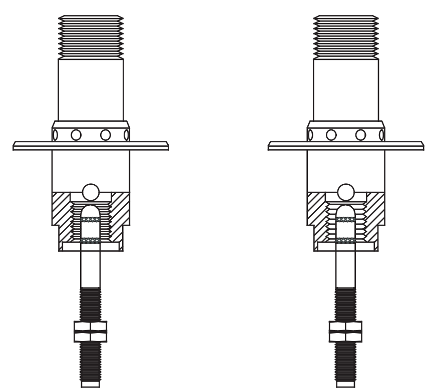


No reinforcing plate, no output from sensor.



Reinforcing plate present, output from sensor.

C) Part sorting / correct part verification. An automotive brake part manufacturer builds two versions of a machined hydraulic part. Both look identical except for a minor difference in the threaded hole in one end. The ID of these two threads are different by less than 1mm making them hard to sort visually. A probe with monitor is tuned to provide an output when inserted in a part with the slightly smaller thread size and not provide an output when inserted into the part with the larger thread size.



Smaller thread, output turns on.

Larger thread, no output.

General Application Considerations

1) The bare probe should not be used as a locating pin. It is constructed from thin wall stainless steel tubing and cannot withstand severe compression or shear forces. Probe spring mount #SAB30403 is recommended for most installations. It allows the probe to retract if no hole is present and the tip can offset up to 5 degrees off center to find holes not perfectly aligned. Protective probe sheaths can be machined from 316 stainless steel to act as locating pins. Contact the factory for concept drawings.

2) The probe can be used in very close proximity to the welding operation. Probe or monitor circuitry will not be damaged but the output from the monitor may not be stable during the weld. Use the probe to verify part presence prior to the weld or verify presence after the weld.

3) Probe temperature must not exceed 100^{o}C. The sensing coil insulation will be damaged by temperatures exceeding 100^{o}C. Shop air directed at the probe tip can often keep probe tip temperature below 100^{o}C.

4) Sensitivity adjustment to detect minor differences like good thread / partial thread must be done using a good and bad part that are exactly the same as the parts being monitored in process. One recent installation did not work properly because sensitivity adjustment was being done with sample parts that were anodized. The in-process part was not anodized during inspection by the probe. Everything worked fine after sensitivity calibration with a part that was not anodized.