

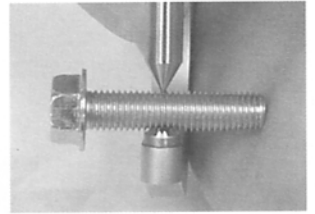
Thread Pitch

Micrometers Should Not

Be Used in Screw and

Bolt Production

► Screw and bolt manufacturers should measure the pitch diameter of their parts during threader set-up to assure proper die matching and the production of good quality product threads.



Many manufacturers are measuring thread pitch diameters with pitch micrometers. This is a bad practice because of the unreliable measurement performance of these instruments.

The escalating demands for higher quality levels over the past 15 years have forced industry to very rigorously scrutinize all measuring instruments. Until the mid-1980s, if an instrument was called a "gage", it was assumed to be accurate and precise. Every reading was assumed to be valid. Those assumptions were proven wrong when statistical process control (SPC) was employed.

The basic purpose of SPC is to help manufacturers identify and minimize all sources of variation within their operational processes. When SPC is successfully applied, the consistency and quality level of output will improve. As SPC was adopted on a widening scale within the fastener industry, it was soon learned that it was not sufficient to simply record data and manipulate that data in a series of statistical formula to learn about a process. The industry learned that all data is not good data. The age-old data processing adage "Garbage in - garbage out", became obvious in implementation of SPC.

The industry learned that two foundational evaluations had



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to be conducted before a manufacturer could use the results generated from SPC calculations to improve a process. The two analyses that must be done before valid data is collected are "machine capability" and "Gage Repeatability and Reproducibility (GR&R)".

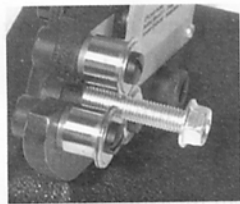
A "machine capability study" must always be conducted to determine if the machinery used in a process is capable of consistently producing parts within the product's specifications. If the machine is not "capable", the data collected from that piece of equipment is useless.

After the production machinery is proven to be "capable",

it must be determined if the selected measuring instruments can provide suitably reliable data. Measurement data from an instrument must be both "repeatable" and "reproducible". An instrument is considered "repeatable" if one person can measure the same parts several times and obtain similar results every time. An instrument is considered "reproducible" if two or more people can measure the same parts and obtain similar readings. A measuring instrument must be both repeatable and reproducible to provide valid data for both final inspection and SPC. The statistical analysis for determining an instrument's suitability is the Gage Repeatability and Reproducibility Study (GR&R).

An instrument's GR&R must be 30% or less to be suitable for use in a SPC system. Gages yielding GR&R results greater

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than 30% provide unreliable measurement data and should not be used.

Gage Repeatability and Reproducibility Studies conducted

with both a thread pitch micrometer and a Tri-roll gage measuring the pitch diameters of ten 1/4-28 2A threaded screws yielded the following results:

1. Pitch micrometer: GR&R of 67.41%
2. Tri-roll gage: GR&R 11.62%

The conclusions of these studies were:

1. The thread pitch micrometers do not provide reliable measurement data and should NOT be used for the inspection of externally threaded products.
2. Tri-roll gages provide very reliable measurement data and

SHOULD be used for the inspection of externally threaded products.

Screw and bolt manufacturers should be measuring thread pitch diameters during machine set-up and manufacturing. SPC should be used as an aid in producing consistently good quality products. Machine capability studies should be conducted on all manufacturing equipment to assure that they are able to produce consistently conforming product. GR&R studies should be conducted on all measuring

instruments to be confident that they provide reliable data. Gages yielding GR&R results over 30% should never be used because the data they provide is not reliable and frequently results in supplier-customer conflicts and rejected products.

