

NPT Thread Tolerances

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During the past few years, Swagelok has seen the emergence of piping procurement specifications that require NPT pipe threaded products with more stringent gauging tolerances. These tolerances have been established as a means to ensure adequate thread engagement in coupled assemblies.

Swagelok has completed an extensive study of thread tolerances. We wish to share the following results with you.

Thread Size

ANSI/ ASME B 1.20.1, general-purpose pipe thread standard, requires threads be gauged for basic size. This is normally accomplished by using conventional plug and ring gages, which measure the position of a set pitch diameter from a prescribed location/gage plane.

The ANSI thread gauging tolerance is a total of 2 turns (± 1 turn from a prescribed location /gage plane). Swagelok recognizes that products conforming to the extremes of this ANSI tolerance may be assembled and result in minimal, yet conforming, amounts of thread engagement.

In reviewing our process capability, we determined that compliance was achievable to a standard tighter than that required by ANSI.

We therefore adopted the following requirements for standard Swagelok products, in order to provide more thread engagement than required by ANSI:

- A) Male NPT: ring gage face shall thread between $\frac{1}{2}$ turn short of gage plane, to 1 turn beyond gage plane
- B) Female NPT: plug gage notch shall thread between flush with gage plane, to 1-1/2 turns beyond gage plane

Gage Accuracy

Another factor which can affect thread engagement is gage accuracy. Conventional plug and ring gages exhibit significant variances, resulting in up to a 1-turn reduction in engagement of assembled products, with further reduction in engagement occurring through the use of sealing tape. This reduction in the number of threads engaged creates potentially serious concerns.

Swagelok has designed and incorporated the use of special thread gages during the production process to significantly reduce the inaccuracies associated with conventional gages.

How Does Swagelok Address These Concerns?

- ◆ As noted previously, gauging tolerances tighter than the ANSI standard are being maintained. In addition, these tolerances are applied in a manner which will ensure increased engagement of threaded assemblies.
- ◆ These controls result in thread engagement of assemblies beyond what can be expected from products produced to ANSI standards alone.

Product Performance

To verify the integrity of products manufactured to the Swagelok standard, numerous stainless steel assemblies were subjected to hydraulic burst testing. Results of this testing indicate bursting or failure does not occur until far in excess of three times the catalog working pressure of the components, even at minimum levels of resulting thread engagement.

Also, numerous assemblies with minimum threads of engagement were subjected to a one million-cycle vibration test. This test was conducted to verify that assemblies would not loosen or leak under vibrating conditions. All assemblies passed.

Many additional controls and techniques are required to ensure leak free and worry free connections. Swagelok takes pride in attention to these details to ensure our customers receive the highest quality products.

Conclusion

This report confirms that products manufactured to Swagelok standards exceed ANSI/ASME B 1.20.1 performance requirements, resulting in a highly reliable piping system.

As a recognized world leader in the manufacture of fluid system components, Swagelok has confidence in its product consistency and reliability as evidenced by the Lifetime Warranty provided on all our products.

Please direct your questions to the appropriate technical services representative at Perth Valve & Fitting.