



Breakdown of Tooth Thickness

What is Tooth Width/Thickness?

API defines **tooth thickness** as the physical helical ridge constructed by the stab flank, load flank, and the crest on a thread screw. The variance in tooth thickness is commonly referred to as shave when measured closely to the pitch line. Tooth width or tooth thickness is essentially the thickness or diameter of the full thread tooth. Most tubing and casing threads are round threads with radii on both root and crest, but buttress threads are trapezoidal with flat roots and crests. You must control the tooth thickness or amount of shave on both internal and external buttress threads. In accordance with API spec 5B, there are multiple ways to measure to measure tooth width/thickness.

What's the difference between Tooth Thickness and Groove Width?

It is very common to mix up tooth thickness and groove width, but they are actually inverse of each other. A single pitch, the distance from a point on a thread to the corresponding point on the next thread, is a combination of **tooth thickness/width** and **groove width**. The **tooth thickness** is the thickness of the tooth of a thread including the stab flank, load flank and thread crest. While **groove width** is the physical helical valley constructed by the stab flank, load flank and the root of a thread screw. So, essentially tooth thickness is the diameter of the tooth while the groove width is the diameter between the teeth. They have an inverse relationship with each other. If the tooth thickness is narrow, then the groove width will be wide, and vice versa.

What are the API requirements?

API tubing and casing connections are covered in Spec 5CT and their threads are governed by Spec 5B. The newest addition has made changes recently, including mandating the inspection of tooth thickness on Buttress threads. This includes either the tooth thickness or the shave. The description of the inspection requirements and procedures in Spec 5B, are located sections 5.6 & 5.7. The buttress thread form and dimensions are seen in figures 2 and 3 in the same section; while the tolerances are located in table 2.

Spec 5B

- **5.6.4** - "For buttress threads, the thread form shall conform to the basic dimensions including the requirements of thread height, included flank angles, tooth thickness, or groove width. The following are examples of acceptable methods of measuring tooth thickness: single dial gauge, optical comparator, contour measuring machine, or cast molds."

How can I measure Tooth Thickness?

API Spec 5B gives you multiple ways to measure the tooth thickness of a Buttress thread. You can use a **single dial gauge, an optical comparator, contour measuring machine or cast molds**.

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Optical comparator – performing a first article inspection using an optical comparator with an overlay is always recommended. Ensure you have the correct overlay to match your Buttress thread as well as the magnification desired. Place your thread on the screen and adjust the height to adjust the focus. Next, align the orientation of the side you want to measure on the projected image with the orientation of the screen reference line, and adjust the value of the XY stage to 0. Compare your part to the overlay to ensure it is fully formed and within tolerance.

Contour measuring machine – place the part or sample piece within range of the contour tracer and adjust the machine to the thread location. Place the machine arm at the correct angle and adjust the speed as needed. Run the program and have the contour tracer trace your thread to show you the form. The programs will show you the thread form and all its dimensions.

Cast Molds – use a mold kit, mix together the solutions until the desired consistency or color is reached. Place the mold onto your part and ensure its inside the threads all the way to the root. Once the mold has dried, remove it from the part and cut off a sectional slice to compare against your product overlay.

Single Dial Gauge – using a gauge with a single dial indicator for a comparative measurement. Using this gauge with a special setting standard, you can get a true measurement of your tooth thickness compared to nominal. This gauge is outlined in spec 5B in section 5.7.

- **5.7.1 General** - This gauge is used for checking the actual tooth thickness (amount of shave) of both external and internal buttress casing threads near the pitch line. The contact points for the form gauge shall be ball pointers of 0.087” diameter truncated 0.023”. before use, the dial indicator shall be adjusted to zero using a setting standard.
- **5.7.2 Procedure** – After the gauges is properly verified against the setting standard, place the point of the gauge in the thread groove starting at the small diameter. With the anvil of the gauge contacting the thread root or crests (always over full crested threads), pivot the gauge on the rounded anvil edge through a small arc. Ensure that base in in a line parallel to the thread axis. Take the reading at the point where the indicator hand reaches the maximum indication (which may be the highest position). Check the remaining threads in the required intervals in the same axis line clock position (last perfect thread). If the threads have imperfect crests, shift to the last threads having a full crest. Buttress thread form gauge tolerances from zero setting are illustrated in Figure 47 and Figure 48, and a go-no/go-fixed limit gauge as shown in figure 49. With the anvil contacting shown in Figure 48, contacting the thread crests or the contacts when shown in Figure 47, contacting the roof.

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