Thread Dimensions Depend On How You Look At Them

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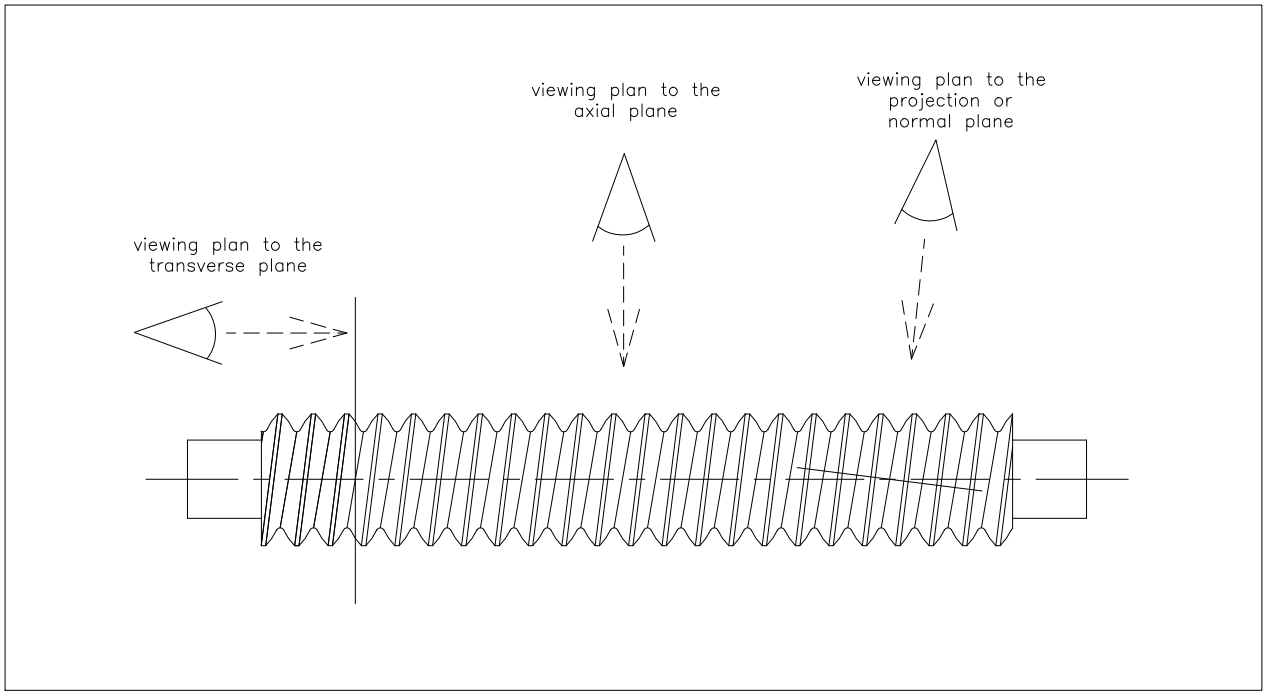
New and innovative machinery components often call for custom thread designs. The problem with custom threads, unfortunately, is that there are no standards readily available which describe their features. It is essential the designers, manufacturers and inspectors all interpret dimensions on drawings in exactly the same way. Questions and confusion and often bad parts arise, whether the subject is surface finish, geometry, or tolerances. How does one look at the part, interpret a dimension for a given process or measure the thread to using the given dimensions? The answer is not as easy as it seems.

For the common Unified National or Acme threads there are accepted standards published some of which can be found in handbooks and similar documents. But, when designing or manufacturing custom thread forms, if standards have been written, they are few and hard to find. There is a need for the thread design and manufacturing world to publish a set of comprehensive standards together in one source. Standards which are easily found and understood.

In the interim, one tool is the diagram and equations below. It is useful to companies and clients because it gives both parties common understandable terminology. Depending on the user's requirements, either the normal or axial plane dimensions are provided along with a note which defines the plane for the given dimensions.

- The **axial plane** contains the axis of the part. It is the plane used if the threads are being single point cut, milled, or ground with a profiled stone which is not turned to match the thread helix angle. (This plane is the one used for the Unified National Thread standards found in handbooks.)
- The **normal plane** is normal to the thread profile. It is the preferred dimensional plane for those who are thread grinding with a single profile stone which is held at the helix angle to the center line of the part.
- The **transverse plane** is viewed from the end of the part. It is included for clarity. Many people have heard the term "transverse plane", but may be using it incorrectly.



To convert dimensions between the axial and normal planes use the following relationships:

$\tan(PA_n) = \tan(PA_a) * \cos(\alpha)$

$rw_n = rw_a * \cos(\alpha)$

$cw_n = cw_n * \cos(\alpha)$

$\alpha \equiv$ helix angle of the thread

$PA_a \equiv$ pressure angle in the axial plane.

$PA_n \equiv$ pressure angle on the normal plane

$rw_a \equiv$ root width on the axial plane

$rw_n \equiv$ root width on the normal plane

$cw_a \equiv$ crest width on the axial plane

$cw_n \equiv$ crest width on the normal plane