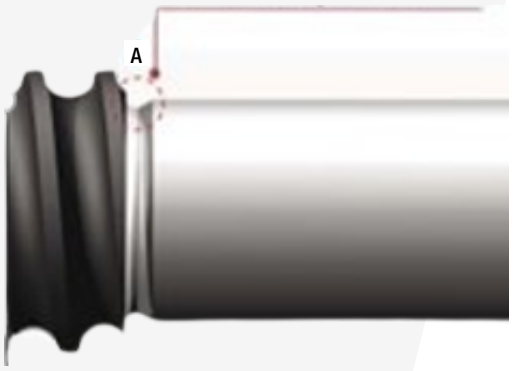
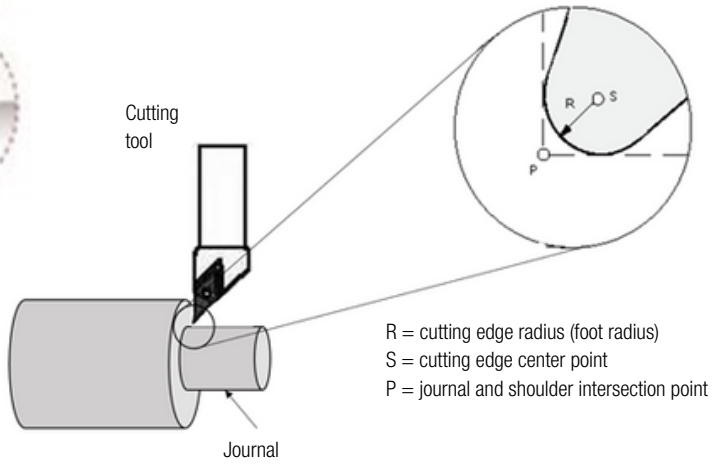
MACHINING CONSIDERATIONS FOR LEAD SCREWS, GUIDE RODS AND SHAFTS

This technical document provides guidance on typical Kerk machining processes. The standard designs outlined below allow us to manufacture your product most efficiently and cost effectively. Please consider the following as you determine the specifications for your lead screws, guide rods, and shafts.

What is an undercut?

In a machining process, an undercut is a recess in a diameter generally on the inside diameter of the part. On turned parts an undercut is also known as a neck or "relief groove." Undercuts are often used at the end of the threaded portion of a shaft or screw to provide clearance for the cutting tool, also referred to as thread relief in this context. Whenever a shaft changes diameter, an undercut or a radius is machined into the transition to minimize stress concentration.





The actual shape of the undercut will depend on manufacturing method and the specific tool being used to manufacture the features around the undercut. The “envelope” is pictured above in Detail A.

Undercuts are used to remove material where the bearing journal meets the bearing shoulder area to ensure the bearing seats properly on the journal.

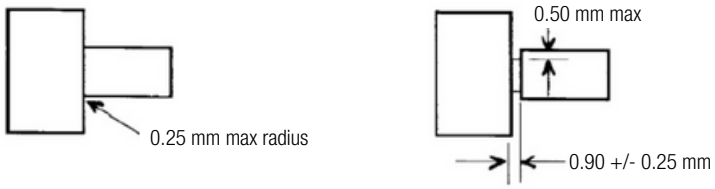
Undercuts are also used for thread relief, to eliminate incomplete threads where they terminate adjacent to a larger feature.

Where undercuts and thread reliefs are needed, but shown on the drawing without dimensions or tolerance, the following applies:

Simple journals

Standard undercuts depend on manufacturing method. Journals turned to size – as on a CNC machine – will have a .25 mm maximum radius. Journals that require a relief for outer diameter grinding will have an undercut no greater than .90 mm ± .25 mm and a maximum depth of .50 mm. Any contour within the area of the undercut is acceptable. See Figure 1.

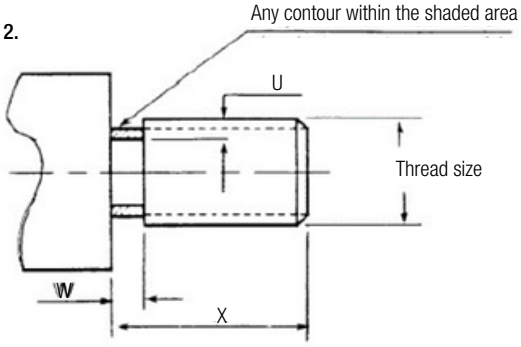
Figure 1.



Threaded journals

Standard thread relief will be an undercut to the thread depth ±.13 mm with a length not less than one full pitch and not to exceed three full pitches. Any contour within the undercut is acceptable. See Figure 2.

Figure 2.



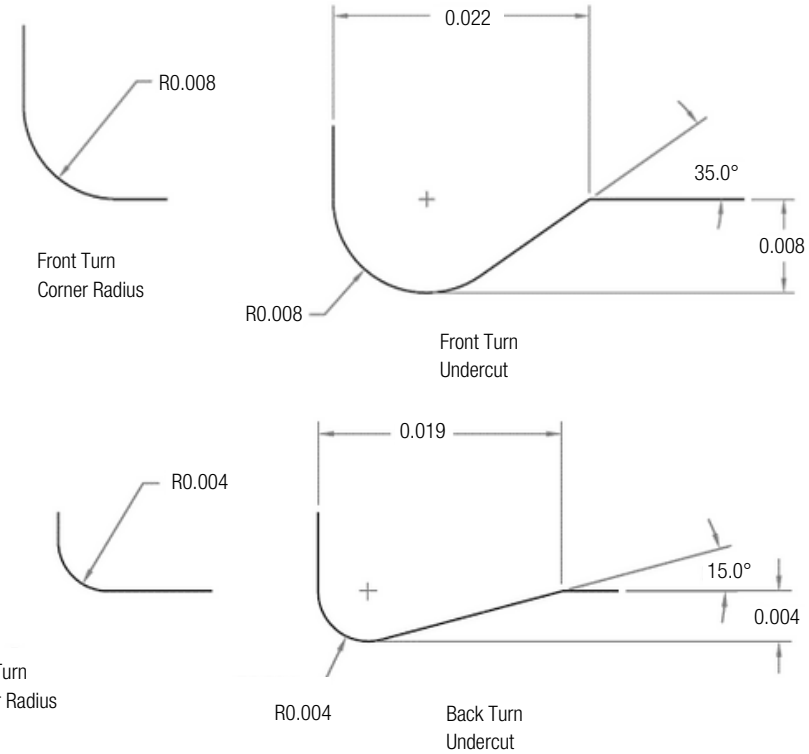
U = thread depth ± 0.13 mm
W = 1 pitch minimum, 3 pitches maximum
X = thread length

Standard undercut has the radii (inches) as shown in Figure 3

As part of the order process, you will be asked to specify "Kerk standard undercut and/or reliefs are permissible" on the drawing. A general allowance of "radius permissible" is an acceptable alternative if an undercut is not desired. If a specific radius is required, it must be stated. We recommend radii of +/-.005"[.15mm+/-.12mm]. Smaller radii must be confirmed with the factory.

If you have other specific reliefs, undercuts, and radii, please consult your applications or sales engineer on manufacturability. Such requests may raise the piece price and may also require a non-recurring charge for special tooling and/or fixtures.

Figure 3.



Note: The above two drawings represent the front turn tool with a .008" radius, and the back turn tool with .004" radius, are both typically used on the same part. HKP's default is to use undercuts over corner radii because we assume the customer wants to shoulder a bearing against the face perpendicular to the journal. The undercut assures there is never an interference in the corner preventing face-to-face contact.