



# SUNNEN<sup>®</sup> HONING TECHNIQUES

DATA FILE: #101

HONING BORES WITH KEYWAYS AND SPLINES



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## HONING BORES WITH KEYWAYS, SPLINES, CROSS HOLES, AND OTHER INTERRUPTIONS

### GENERAL

Occasional honing problems are encountered where bores have keyways, splines, cross-holes or other such interruptions. Standard type-honing tool, with its narrow stone, may "hang up" in parts of this nature. Honing Tools designed to handle these bores are available from stock. Called Keyway Tooling, this design comprises a wide, rigid Y-Type stone assembly and wide guide shoe, which bridge these interruptions. This tooling should be used only in bores presenting particular problems where use of Standard type tooling is not practical.

As noted in illustration, Keyway type tooling utilizes a wide, rigid, Y-Type stonholder (see Figure 1). Stone on one leg of Y supports honing tool while other leg crosses Keyway or interruption. Each of two-mandrel guide shoes is wider than those of standard type mandrel series and is placed closer together, so that these shoes, too, bridge and slide over Keyway. These tools have been designed to bridge interruptions as large as Standard SAE width keyways as well as standard splines.

### SUITABLE FOR A VARIETY OF APPLICATIONS

The most common use for this Keyway type tooling is for bores with keyways, splines or side ports. It is also sometimes desirable for honing bores relatively short in relation to diameter. Once trued in to a specific diameter and used for small stock removal, it will minimize any tendency for work to cock because of an uneven stroking thrust. The wedge supports on Keyway type of stonholder are out beyond ends of stone, reducing possibility of any end for end stone tilting caused by stroking short length work partly over ends of stone.

Where parts have large ports or cross-holes, use of Keyway Tooling will often prevent "wash-out" at edge of cross-hole. Double stone and wide shoes distribute cutting pressure over a wider area, resulting in less unit pressure increase when contact area is reduced because of a large port.

For a similar reason frequently a very thin walled part can be successfully honed, without distortion, because cutting pressure is applied over a larger area.

### ALTERATION FOR BLIND HOLE WORK

It is quite rare that a blind hole is encountered with a Keyway or other interruption. Because of the design of this Keyway type tooling, a factory alteration is necessary to adapt it for blind hole work. As it is necessary to cut off the front end of the mandrel and stonholder, a pin is inserted to provide a retainer for the stone. Consult your Sunnen Field Engineer or the Honing Lab in St. Louis on these problems.

### A WORD OF CAUTION

Because of the necessity to deviate slightly from proven design of standard type honing tool, the Keyway type does have some limitations. It will not produce as accurate a hole as Standard type tooling when a substantial amount of stock is removed. As stock is removed from bore, work radius increases. The relatively soft stone will conform readily to changing work radius. However, guide shoes wear more slowly, causing contact area of each shoe to move toward center of mandrel. On standard type tooling guide shoes are narrow and widely spaced, conform more readily to work radius, maintain stability and accuracy. When used for a final finishing operation (small stock removal), Keyway tooling will generate and maintain accuracy. Stock removal should be limited to .003 to .005 on the diameter.

As already noted, when removing large amounts of stock, stones will readily conform to work radius. Guide shoes, however, wear more slowly and do not conform to work radius. As shown in illustration, the leading edge of guide shoe will tend to drop in Keyway (see Figure 2).

For bores without keyways the standard type tooling is always preferable. There are many advantages in the use of these standard types, narrow-stone honing tools. The use of narrow stone permits a design based on a wide, unequally spaced, three-point contact. This

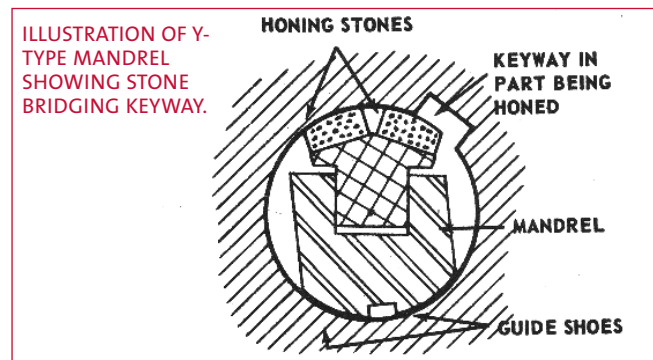


Figure 1, Y-Type Mandrel

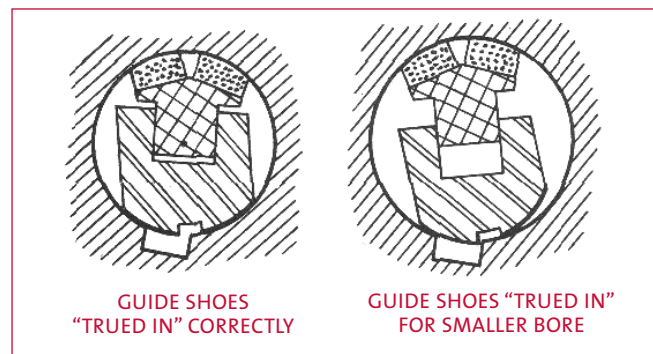


Figure 2, Truing Mandrel

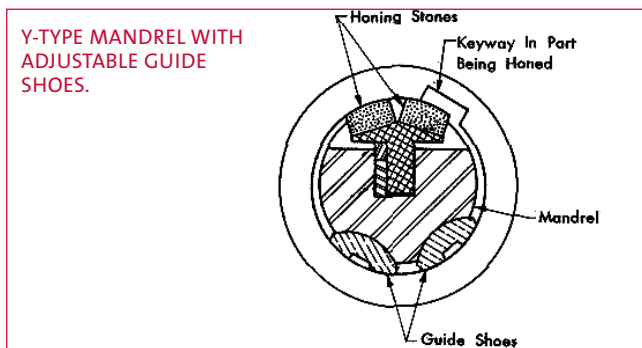
design, exclusive with Sunnen, assures utmost accuracy in honing and with a minimum of stock re-removal necessary to true up a bore. The radius on cutting face of narrow stone can change rapidly and conform to ever changing work radius with relatively little stone wear, while the wide spacing between shoes maintains three point stability. This narrow stone contact also permits the most effective flow of honing oil, washing out chips and effectively cooling work. Standard type tooling should always be used unless conditions in bore require Keyway Type Tools.

**HONING TECHNIQUES**

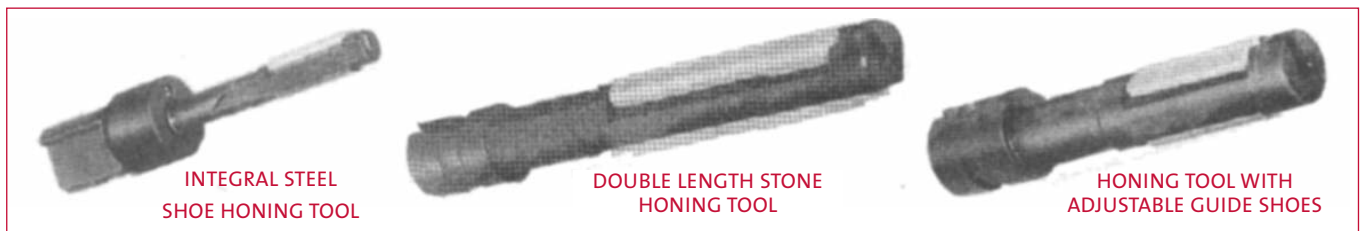
In starting a new job, it is always best to try it out by revolving work clockwise by hand to be sure nothing projects into Keyway, which might cause part to "hang up" during honing operation.

To work satisfactorily in bores containing keyways, honing tool must be the correct size for work diameter and guide shoes and stones must be trued in to within .005 of work diameter. It is important that shoes and stones have the same radius as work, so as to provide stability, produce roundness and to bridge gaps.

Integral shoe, solid steel type Keyway tools come with their guide shoes radiused in to their minimum starting diameter range but must be re-trued to exact work diameter. In sizes above 1 inch, adjustable type guide shoes are provided (see Figure 3). These shoes are "adjusted" to approximate work radius, shortening truing in time and increasing guide shoe life. Keyway type stones are now factory-radiused to the most popular diameter within their particular size range. This simplifies truing operation so that in most cases, the workpiece will fit right onto honing tool and final radius truing of stones and shoes can be completed with a minimum of effort.



**Figure 3, Y-Type Mandrel**



**Figure 3, Y-Type Mandrel**

Now, to true in mandrel shoe and stone, first, dab on a little honing oil (not a stream) - - just enough to barely dampen stone. Leaving motor turned off, expand honing unit into work or truing sleeve and turn work or sleeve by hand clockwise on stationary mandrel, (in operation spindle revolves counter-clockwise). This will spot-mark stone (also guide shoe). File spots, repeating until both stone and guide shoe have contact widths broader than Keyway. The tooling will then true in quickly by use. Keyway type tooling is said to be "trued in" when stones and guide shoes are radiused to within .005 of work diameter.

**ALTERNATE POSSIBILITIES**

Occasional odd jobs, with bores containing slots can be handled in emergencies with standard narrow tooling. If of short length, such as thin gear blanks with flat end surfaces they can often be stacked and honed in multiple with keyways staggered, using standard narrow stone tooling. In longer work a hardwood key can be utilized to fill a Keyway. Make this key to fit slot tightly and tap it down to bottom. Then rough off top flush with work surface with a half-round file. Now go ahead and hone bore with your regular narrow stone tooling. If you have more than one part to hone you can use the same wooden key, to do several parts. Each time you transfer key to a new part keep adding paper or metal shims beneath it to keep key's upper surface flush with bore's surface.

DIAMETER OF BORE	STONE	GUIDE SHOE MATERIAL	GUIDE SHOE TYPE
1/4 to 1"	Single Length	Hard Steel or Soft Steel	Integral with mandrel
1 to 3-7/8"	Single Length	Aluminum Bronze or Zinc Alloy	Adjustable and replaceable
3/4 to 1-1/4"	Double Length	Hard Steel or Soft Steel	Integral with mandrel
1-1/4 to 2-1/4"	Double Length	Aluminum Bronze or Zinc Alloy	Non-adjustable but replaceable

**SIZE RANGE OF KEYWAY TOOLING**

**KEYWAYS & INTERRUPTIONS IN LARGE BORES**

Keyway Type stone sets are available for use with Sunnen Portable Hones covering diameter range of 2-1/2 to 28 inches. *Request Sunnen Sales Bulletin "Keyway Stone Sets for Portable Hones."*



## data files

- 101 - Honing Bores With Keyways And Splines
- 102 - Honing Short Bores
- 103 - Honing Blind Holes
- 104 - Obtaining Specified Finishes By Honing
- 105 - Choosing the Right Stone
- 106 - Honing Tandem Holes
- 107 - Making Manual Honing Easier With Workholders
- 108 - Fixturing Parts For Power Stroking
- 109 - Vertical Hone Fixture
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- 111 -
- 112 - External Honing
- 113 - Fixturing Design Considerations For Automatic Krossgrinding® Machines

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The fully equipped Automotive and Industrial Technical Service Centers in St. Louis is available to help with any honing problem at any time without cost or obligation. Sunnen factory-trained Field Service Engineers cover the entire country and are always at your service - again, no cost or obligation. Call us whenever you have a bore-sizing problem.

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