

Shrink Fit System...

Thermal Induction

- *process-controlled heating*
- *no overheating on the tool*
- *quick and accurate shrinking, on and off*
- *for tools with carbide or steel shanks*
- *slim design of the chucks through absence of mechanical clamping elements*
- *higher concentricity ($<.0001$) through uniform clamping force*
- *higher clamping forces than conventional adapters*
- *optimum suitability for high-speed machining due to symmetrical shape*





Shrinking Technology

CV Shank

BT Shank

DV Shank

HSK Shank

Straight Shank

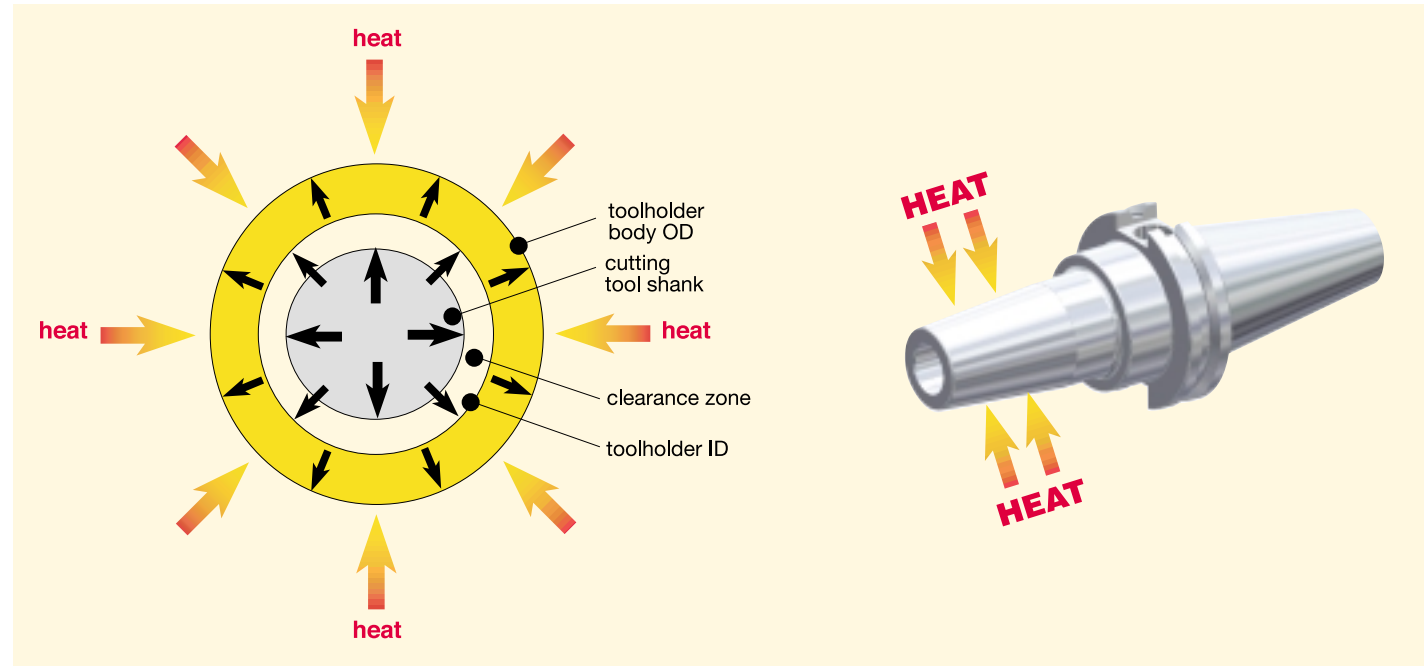
Collets/Sleeves

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The Concept:

Heat shrinking processes are not new in the machine tool industry. Only recently, however, has the concept been implemented as a quick-change toolholding mechanism for clamping cylindrical cutting tools that are used in high-speed machining applications. The internal bore of the Shrink Fit toolholder is manufactured slightly smaller than that of the cutting tool shank. A quick and precise heat source is applied to the holding end of the toolholder which causes the inside bore to expand. At this point, the cutting tool shank is able to slip inside the bore of the toolholder. As the toolholder cools, the bore shrinks with uniform pressure and grips the cutting tool shank 360° along the entire length of the bore, resulting in an evenly distributed clamping force.

Due to the nature of the design, flatted, Weldon, and Whistle Notch cutting tool shanks can be used. Mechanical toolholding systems cannot compete, but to gain full benefit from the Shrink Fit technology, fully cylindrical tool shanks are recommended. As long as the heating processes are kept within the elastic range of the toolholder material, this clamping operation can be repeated for several thousand cycles.

Shrink Fit Tooling Advantages:

- Low runout – cutting tools are gripped 360° along the entire length of the cutting tool shank resulting in an evenly distributed clamping force.
- Clamping forces have been found to be greater than those created by collet or hydraulic chucks.
- During testing, cutting tool material properties break down and shear before slippage occurs.
- Slim and short toolholder profile designs are achievable because no mechanical moving parts are employed.
- Shrink Fit toolholders are more acceptable in high-speed operations because their absolute symmetry of form provides the best possible balance.
- No special sealing stop screws are required – the designed interference between the cutting tool and the Shrink Fit holder forms a seal that allows coolant to flow only through the designed passages.

With all of the above mentioned design features, the use of Shrink Fit technology allows for greater speeds and feeds, produces better finishes, delivers increased tool and spindle life, and results in greater productivity.

Heat Activating Systems:

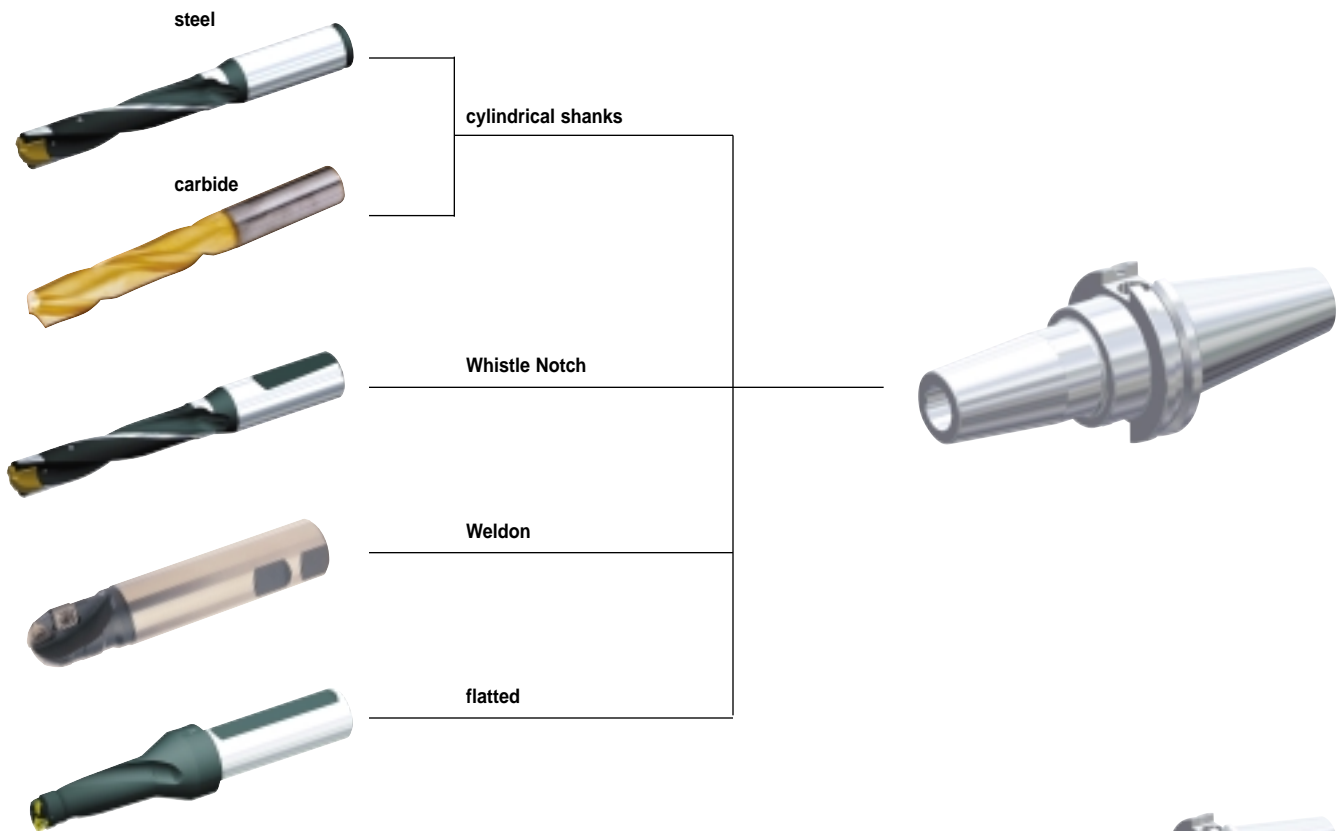
There are induction, hot-air and open flame heating systems on the market today, but the easiest and fastest is the induction method. Shorter cycle time, less cooling downtime, localized heating and integrated cooling systems are essential for a safe and simple system. Low noise, low cost, and an integral pre-setting option are advantages to be considered when deciding on a Shrink Fit system.



Applications

Cylindrical Shank Options

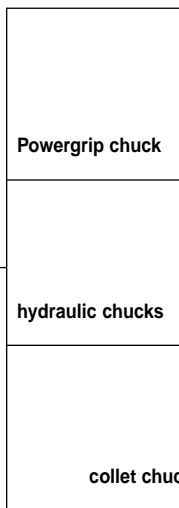
- Full cylindrical shanks are recommended.
- Flatted, Weldon, and Whistle Notch designed cutting tool shanks can be used.



Shrink Fit extension



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Technical Information – Shrink Fit



Heat-up Your Profits . . . Shrink Your Costs with Kennametal's New Induction Heating (Shrink Fit) System

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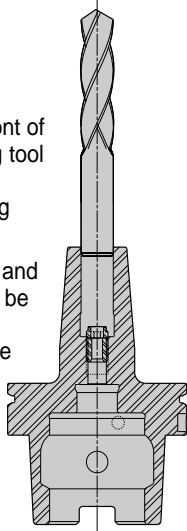


Heater Unit

- The table top design is (24" x 24") (610 x 610 mm), and weighs less than 95 lbs (45 kgs).
- Induction coil generator produces concentrated, alternating magnetic fields which, in turn, initiate the quick, precise heating source.
- Just two quick-change coils extend the clamping diameter range from 1/8" to 2" (3 to 50 mm).
- Unit is processor controlled - eliminates unnecessary overheating which could result in damage to the toolholder material structure.
- Controlled, localized heating reduces heat soak. This eliminates the need to remove coolant supply pipes from HSK shanks, coolant O-rings from KM shanks, and/or tool management chips.
- Quick, precise "shrink-in" and "shrink-out" process
- Heating time is less than 10 seconds.
- Cooling time is less than 60 seconds.
- Design safety has been given top priority; heat protecting cooling shields are used.
- Programmed for both carbide and steel cutting tools

Toolholders

- Slim design
- Balanced
- Small counterbore in front of toolholder allows cutting tool to be held in position before the heat/shrinking process is activated.
- Weldon, Whistle Notch, and flatted-style shanks can be gripped successfully, however, best results are obtained with smooth cylindrical shank cutting tools (without flats and notches).



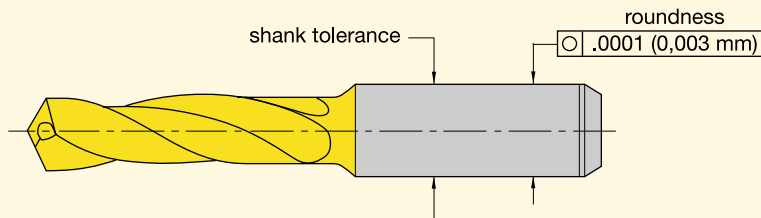
- Concentricity less than .0001 (0,003 mm) can be achieved.
- Strong gripping forces...one of the strongest cutting tool clamping systems available today
- Excellent rigidity
- Great for roughing and finishing operations
- Best toolholder design for high-speed machining
- Axial adjustment with through-coolant capability
- If the Kennametal induction heater unit is used properly, one toolholder with 1/4" (6 mm) bore and higher can withstand over 5,000 cutting tool changes.

Straight Shank

Colllets/Sleeves

Accessories

Cutting Tool Requirements



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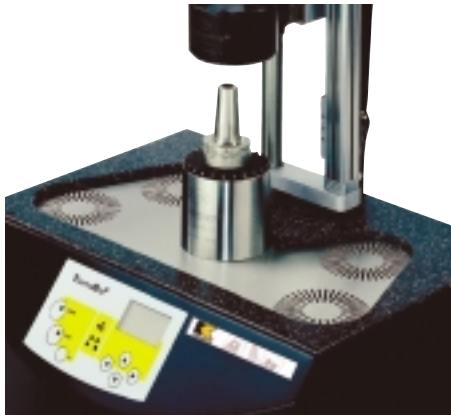
inch (industry standard)			
cutting tool shank diameters			tolerance
1/8	.1249	.1247	-0.0001/-0.0003
3/16	.1874	.1872	-0.0001/-0.0003
1/4	.2499	.2496	-0.0001/-0.0004
5/16	.3124	.3121	-0.0001/-0.0004
3/8	.3749	.3746	-0.0001/-0.0004
7/16	.4375	.4371	0.0000/-0.0004
1/2	.5000	.4996	0.0000/-0.0004
9/16	.5625	.5621	0.0000/-0.0004
5/8	.6250	.6246	0.0000/-0.0004
11/16	.6875	.6871	0.0000/-0.0004
3/4	.7500	.7495	0.0000/-0.0005
7/8	.8750	.8745	0.0000/-0.0005
1	1.0000	.9995	0.0000/-0.0005
1 1/4	1.2500	1.2495	0.0000/-0.0005
1 1/2	1.5000	1.4995	0.0000/-0.0005
2	2.0000	1.9995	0.0000/-0.0005

metric (ISO standard)				
cutting tool shank diameters			tolerance	
3 mm	2,997	3,000	h4	0,000/-0,003
4 mm	3,996	4,000	h4	0,000/-0,004
5 mm	4,995	5,000	h5	0,000/-0,005
6 mm	5,992	6,000	h6	0,000/-0,008
8 mm	7,991	8,000	h6	0,000/-0,009
10 mm	9,991	10,000	h6	0,000/-0,009
12 mm	11,989	12,000	h6	0,000/-0,011
14 mm	13,989	14,000	h6	0,000/-0,011
16 mm	15,989	16,000	h6	0,000/-0,011
18 mm	17,989	18,000	h6	0,000/-0,011
20 mm	19,987	20,000	h6	0,000/-0,013
25 mm	24,987	25,000	h6	0,000/-0,013
32 mm	31,984	32,000	h6	0,000/-0,016
40 mm	39,984	40,000	h6	0,000/-0,016
50 mm	49,984	50,000	h6	0,000/-0,016



Cooling Adapters

Heat absorbing adapters are used to reduce cooling time. When contact is made with the hot clamping diameter of the toolholder, heat energy is quickly transferred to the cooling ribs. The ribs on the surface of the cooling adapters are, in turn, cooled by electric fans that disperse heat up to ten times more effectively than similar cooling systems.

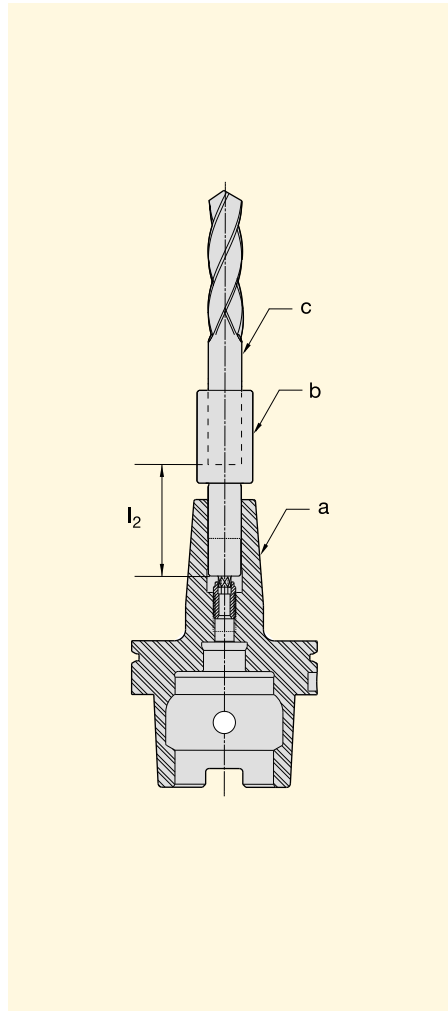


Four fan-cooling ports are located in the heat/shrinking unit. The ports are used to cool the toolholders to room temperature after the heat/shrinking procedure. Placing the cooling adapters in the cooling ports automatically starts a fan. In 30 to 40 seconds, toolholders reach a temperature at which they can be safely handled. After two minutes, the fans switch off automatically.

While a completed tool is cooling in the adapter, the next tool can be heated and changed. With this procedure, it is possible to change three or four tools per minute. When a large number of shrink tools need to be changed, this unit provides a practical, safe, and cost-effective solution.

Axial Adjustment Gages

Cutting tool length adjustment is performed using a special axial adjusting gage (b) before shrinking the cutting tool into the toolholder.



An axial adjustment gage (b) is placed in the Kennametal toolholder (a) along with the cutting tool (c). The length difference of the setting gage (l_2) is calculated into the required tool assembly length. The whole assembly can then be placed into a length pre-setter for adjustment. Rotating of the gage moves the axial stop screw and pre-sets the assembled tool to the required length. After removing the gage, the cutting tool can then be shrunk into the toolholder.



Gripping forces of the Kennametal toolholders are greater than the gripping forces of other well-known toolholding systems. This method of heat/shrinking is not permanent (cutting tools can be removed). Yet, the clamping force is so great that the complete tool assembly reduces vibrations and becomes almost a mono-block tool. In addition, the concentricity of the toolholder with the cutting tool fitted in this manner equals that of an integral tool. Pull-out of milling cutters on high-speed machines, a well-known problem with other clamping systems, will no longer be a problem with this heat/shrinking system.



Kennametal's heat/shrinking toolholders and heat/shrinker unit were designed to shrink fit and release both high-speed steel and carbide shank cutting tools. The tool being shrunk into the toolholder has no time to heat up because of the short, localized heating times, even when materials have the same coefficient of expansion. Toolholders are made from a special heat-resistant tool steel and a self developed hardening process. The 1/4" (6 mm) bore and higher toolholders will maintain their high concentricity and elasticity after as many as 5,000 heat/shrink cycles when used in the correct manor, with no traces of coolant contamination. Controlled shrinking temperatures, 572° F to 644° F (300° C to 340° C), are far below the temperature that could cause a microstructure change in the tool material. Typically, temperatures only reach 392° F (200° C).

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Shrink Fit Shrinking Service

This service focuses on Kennametal standard Shrink Fit toolholders only. However, cutting tools can come from most manufacturers that are compatible with, and meet the specifications as stated in this catalog, see page S332.

BT Shank

Please contact your Kennametal representative for more details on the programs available.

DV Shank

Kennametal's Service and Repair Department will meet your Shrink Fit toolholder shrinking requirements with qualified Kennametal service technicians.

Phone: 800-999-6385

Fax: 724-539-6881

HSK Shank

Ship / Mail:

Kennametal Service & Repair Dept.

1600 Technology Way

Latrobe, PA 15650

Straight Shank

Shrink Fit Toolholder Return Policy

Once the Shrink Fit toolholder has been heated, it cannot be returned.

Collets/Sleeves

Technical Support

Please contact our Customer Applications Support group for your technical support and tool application needs!

Accessories

1-800-835-3668, then select 2

Video

Shrink Fit procedures are explained in our Kennametal Shrink Fit video, item VID-90.

Phone 724-539-5329 to request your FREE copy.

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