



**WKW**<sup>TM</sup>

Wisconsin Knife Works, Inc.

# FINGER JOINTS

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## REVERSIBLE

By far the most common joint. Requires two heads; one with thick cutter at top of stack and one with thick cutter at bottom of stack. This joint may also be achieved on a single head shaper by reversing alternate pieces of stock machined.

## MALE-FEMALE OR END MATCH

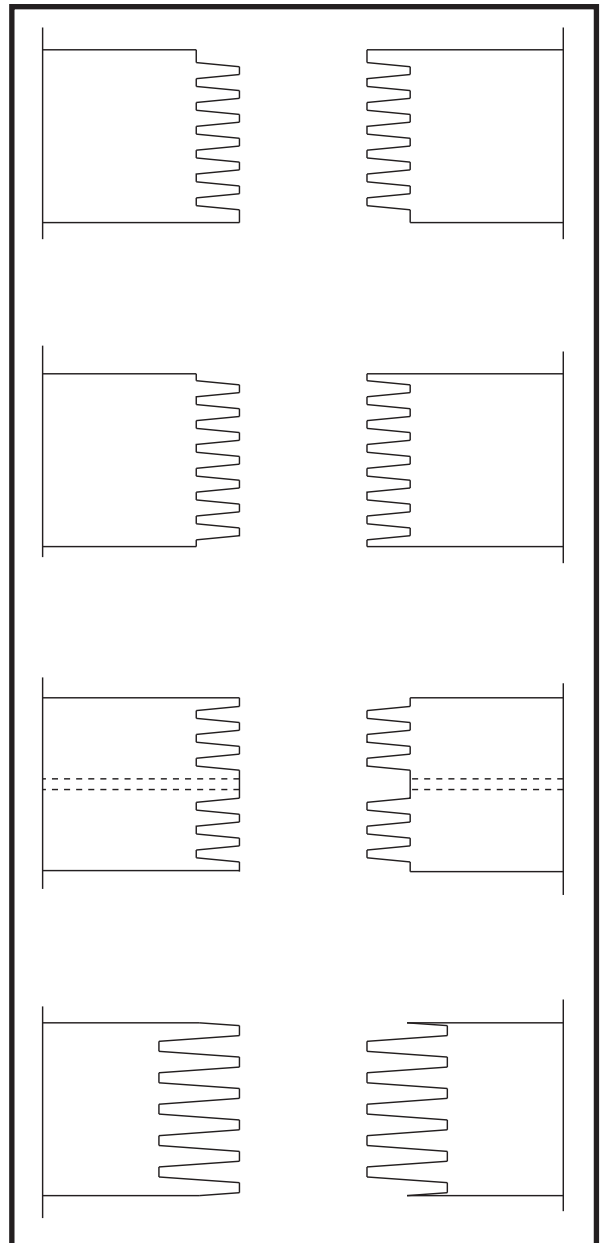
Less common joint than reversible. Always requires two heads; one with all thin cutters and one with a thick cutter at both top and at bottom of stack.

## RE-SAW

Special joint with thick cutter at center of stack to allow for finger jointed stock to be split or re-sawn into two pieces.

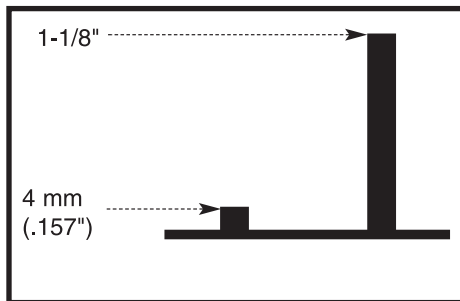
## SCARF OR FEATHER JOINT

Usually requires no thick cutters. Used when dimensions of stock will vary significantly.



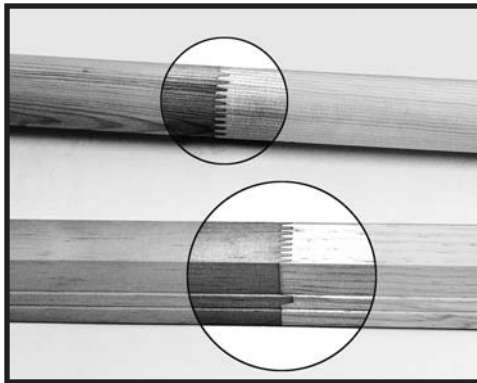


Finger joints are used in a wide variety of applications. The reasons for finger jointing may be varied. One goal is to remove knots and defects and then to produce usable long pieces of wood by finger jointing the short pieces. Another reason for finger jointing is to produce a finished component that has a greater strength than ordinary wood. A properly finger jointed length of wood will have a strength factor greater than the same piece of wood that has not been finger jointed.



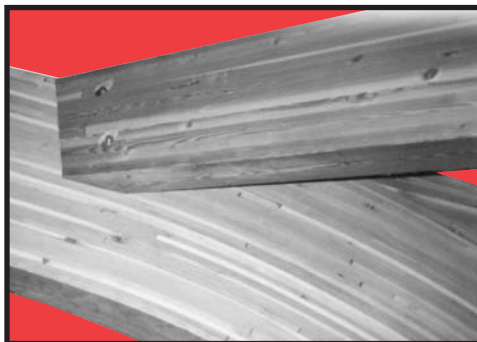
## LENGTHS OF JOINTS

Joint length will vary with the application. Increasing wood costs have necessitated the development of shorter joints. 4 and 5 mm joints are becoming more common in non-structural applications. Keep in mind that with very small joints, the finger joint machine and assembly components must be in top operating condition to facilitate the assembly of the joint.



## NON-STRUCTURAL JOINTS

Millwork, mouldings, trim, door, and window components are some of the main uses for these joints. Typically 1/4" or 3/8" joints have been used, however, many users are finding that 4 or 5 mm joints will save enough material to pay for the cost of tooling conversion in a short time. See formulas for calculating potential dollar savings in section entitled "Technical Information and Formulas".



## STRUCTURAL JOINTS

Laminated beam and I-beams utilize the strength of the finger joint to produce load bearing components for an industry where joint strength is closely monitored and tested. Typically a 1-1/8" or 7/8" joint is used.

For sub-structural joints such as finger jointed 2X4 studs, a 5/8" joint is used.



## FINGER JOINT CUTTERS

PART NUMBER	JOINT LENGTH	CUTTER RADIUS	TIP THICKNESS	TIP INDEX	THIN OR THICK	GRINDING TEMPLATE
BG 1394	.177(4.5mm)	1-1/2	.044	.121	THIN	T684
BG 1395	.177(4.5mm)	1-1/2	.250	.327	THICK	T684
BG 1258	.197(5mm)	1-1/2	.040	.118	THIN	T684
BG 1259	.197(5mm)	1-1/2	.250	.328	THICK	T684
BG 1137	.250	1-1/2	.045	.138	THIN	T684
BG 1138	.250	1-1/2	.250	.343	THICK	T684
BG 1515	.250	1-1/2	.047	.139	THIN	T1462
BG 1516	.250	1-1/2	.252	.344	THICK	T1462
BG 919	.375	1-1/2	.045	.169	THIN	T684
BG 920	.375	1-1/2	.250	.374	THICK	T684
BG 1420	.375	1-1/2	.046	.1685	THIN	T684
BG 1421	.375	1-1/2	.251	.3735	THICK	T684
BG 1079	.375	1-7/8	.049	.168	THIN	T683
BG 1080	.375	1-7/8	.254	.373	THICK	T683
BG 1305	.406	1-1/4	.045	.169	THIN	T981
BG 1306	.406	1-1/4	.250	.374	THICK	T981
BG 1315	.375	1-1/4	.394	.518	THICK	T981
BG 854	.500	1-7/8	.030	.152	THIN	T683
BG 855	.500	1-7/8	.343	.465	THICK	T683
BG 1434	.610	1-1/2	.046	.2085	THIN	T684
BG 1435	.610	1-1/2	.2124	.375	THICK	T684
BG 1204	.625	1-1/2	.044	.1685	THIN	T684
BG 1205	.625	1-1/2	.250	.3746	THICK	T684
BG 737	.625	1-7/8	.062	.214	THIN	T683
BG 738	.625	1-7/8	.343	.495	THICK	T683
BG 1244	.656	1-7/8	.029	.185	THIN	T683
BG 1245	.656	1-7/8	.160	.316	THICK	T685
BG 741*	1.113	2-1/8	.030	.248	THIN	T685
BG 742*	1.113	2-1/8	.343	.561	THICK	T685
BG 1101	1.113	2-1/8	.030	.264	THIN	T685
BG 1102	1.113	2-1/8	.343	.577	THICK	T685
BG 751*	1.113	2-3/8	.031	.243	THIN	T686
BG 752*	1.113	2-3/8	.283	.495	THICK	T686

**\*NOTE:** These cutters are used for producing joints for structural applications, and are used with spacer plates between the individual cutters. Please contact a Wisconsin Knife Works engineer for more information regarding these cutters.



## PRECISION TOLERANCES

Due to the demanding nature of the finger joint and the scrutiny that the finished joint is often subjected to, there is no room for either a sloppy or poor fitting joint. Some joints are required to be of a paint grade, meaning that the joint itself must be invisible when the finished product is painted. Other joints are used in structural products that must be certified to demanding strength and pull-test specifications.

For these reasons, WKW cutters are produced to incredibly tight tolerances. Cutter thickness, tip centrality, tip thickness, flatness, cutter angles, and other critical dimensions for each cutter are unsurpassed in the industry. As the industry has evolved over the years, we have incorporated the best technologies available to continually improve the geometric specifications of our cutters.

You can rest assured that you will never have a tolerance problem with WKW cutters. Most cutters are held to an amazing thickness tolerance of plus or minus .0001, or one tenth of one thousandth of an inch. Whether your cutter stack is five cutters high or fifty cutters high, WKW cutters are held to exacting specifications that ensure you of an accurate joint with no significant accumulated dimensional variations.

## HIGH SPEED STEEL FINGER JOINT CUTTERS

Most solid wood finger jointing is accomplished using Molybdenum HSS (High Speed Steel) tool steels such as A.I.S.I. M-2. This tool steel is especially well suited for natural woods, and has been the standard choice at WKW for years. With the exception of a few custom applications, 95% of the steel cutters furnished by WKW are A.I.S.I. M-2.

A.I.S.I. M-2 is a very specific blend of tool steel that uses the alloying elements Molybdenum, Chromium, Vanadium, Tungsten, and Cobalt to produce a cutting tool that exhibits excellent wear resistance, ease of grinding and superior cutting edge retention. Other alloys are available and may be necessary in certain applications, however, M-2 remains the best choice of tool steels for natural wood finger jointing.



## OPTI® AND CARBIDE FINGER JOINT CUTTERS

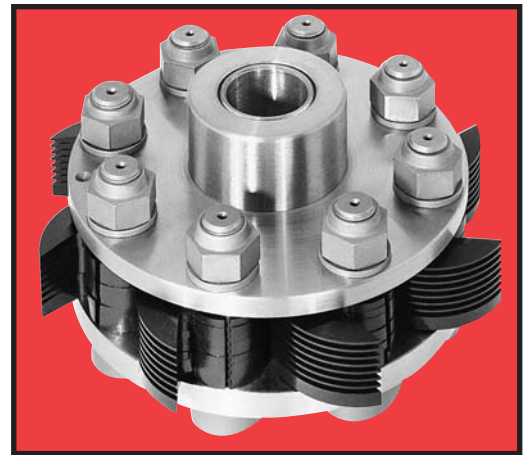
The normal cutting material for finger joint cutters is HSS (High Speed Steel). Usually a high Molybdenum tool steel such as M-2 is used. In some applications a different cutting material is required.

WKW pioneered the finger jointing of engineered lumber products such as LVL (laminated veneer lumber), and other man-made wood products. Exotic hardwoods and very abrasive woods have also been successfully finger jointed using WKW tooling.

### OPTI® FINGER JOINT CUTTERS

OPTI® finger joint cutters are specially-treated and designed primarily for natural woods. The extremely hard cutting surface of OPTI® cutters generally produces run times that are up to three times longer between sharpenings, as compared to conventional High Speed Steel cutters. OPTI® cutters have been used at several of the largest finger jointing facilities in the United States.

The OPTI® process is a patented process that produces an ultra-hard surface on the cutter. Unlike the coatings used by other manufacturers, OPTI® will not chip, peel, or flake off. Extremely long run times may be obtained under certain circumstances. Check with WKW for specifics as to whether these cutters are correct for you. The grinding process with OPTI® cutters is slightly different than the grinding of HSS M-2 cutters. The same abrasives are used, however, the grinding procedure is a little more demanding.



### SOLID CARBIDE/CARBIDE TIPPED CUTTERS

WKW Carbide finger joint cutters are often the solution to finger jointing very abrasive natural woods, as well as man-made and engineered lumber products containing glues. Plywoods and other laminated materials that were once impossible to finger joint are now being successfully finger jointed. WKW was the innovator of these types of cutters.

Man-made materials such as LVL (laminated veneer lumber), plywoods, particle board, M.D.F., and other products containing glues or other non-wood products are much too abrasive for tool steel or OPTI® cutters. Solid carbide and carbide tipped cutters are often the answer to these problems. In some cases, carbide cutters may be used to produce extremely long run times in solid woods, but generally speaking, the high cost of these cutters suits them for only the most extreme applications.

Solid carbide, as well as carbide tipped cutters, are available in a variety of joint configurations. Please contact WKW for assistance in determining the correct solution to your unique finger jointing application.



**CUSTOM PROFILES**

In addition to the stock cutters listed previously, WKW has designed and manufactured scores of other finger joint configurations. Our Engineering files contain hundreds of profiles. Many of these profiles were developed as the result of close work between a user and our engineers. From micro joints to large structural joints, if a standard profile is not suitable for your application, WKW engineers will assist in the development of a finger joint profile to get the job done.

**CUSTOM CUTTER MATERIALS**

M-2, Carbide, and OPTI® are used in the majority of applications, however, difficult and unusual applications are welcomed at WKW. D-2 tool steel, high cobalt alloys, and other materials may be the answer for you. As always, WKW engineers are your best source of information here.

Whether your needs are for a specific finger joint profile, a custom designed cutterhead to fit your machine, or a cutter material to machine a particularly hard or abrasive wood product, WKW has the technical support that you need.

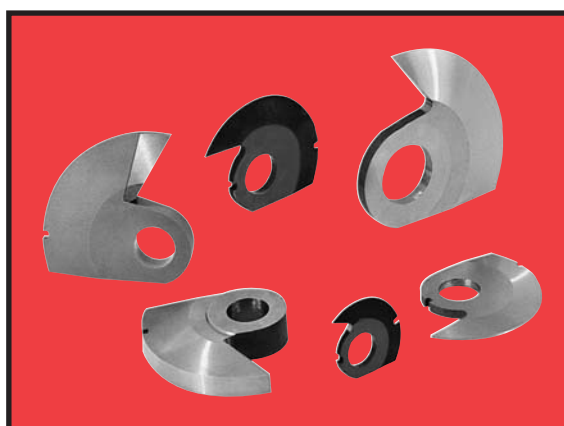
See the following chart for information on OPTI®, carbide, and other alternate cutting materials.

<b>MATERIAL</b>	<b>APPLICATIONS</b>	<b>COMMENTS</b>
HSS M-2	Normal woods	Very good run times and clean cut
OPTI®	Normal woods*	Extra long life
CARBIDE	Man-made materials*	Excellent life and performance
D-2 Karbo Krome®	Very wet woods*	Only used in difficult applications

*\*Contact WKW's engineers for assistance in these applications.*

**COATED FINGER JOINT CUTTERS**

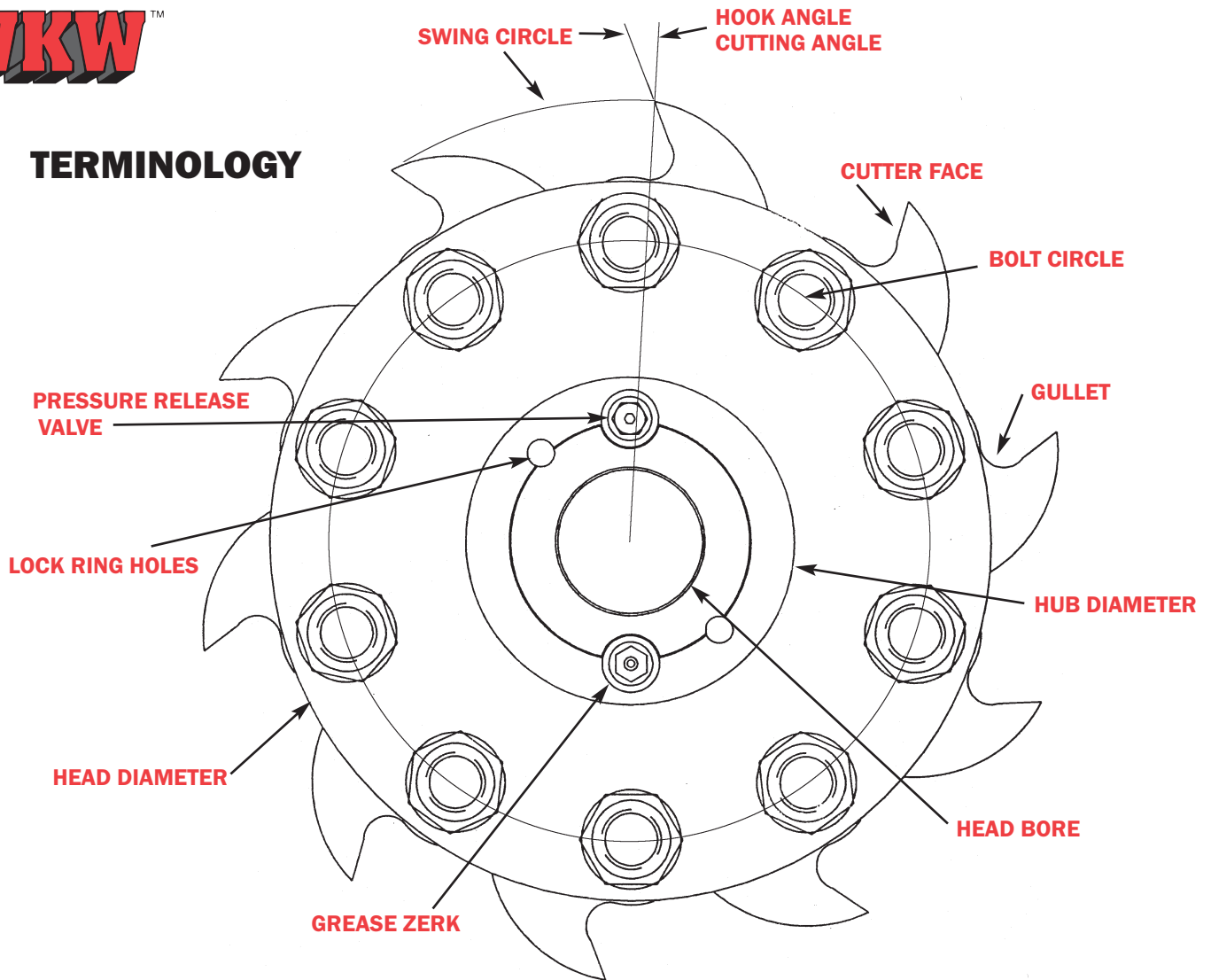
Various coatings are available for enhanced performance. Please contact WKW for more details.



FINGER JOINTS



## TERMINOLOGY



## ORDERING INFORMATION

Machine make and model number

Head Number\* (if re-ordering same heads, use number engraved on head)

Swing Circle or maximum diameter

Bore diameter and type (i.e. Hydro-Loc™, Quick-Loc™, collet style, etc)

Number of bolts or wings

Bolt length (if known) or number of thick and thin cutters per bolt

Joint length or cutter number desired

Type of joint (i.e. reversible, end match, etc) and species of wood.

Wood Thickness

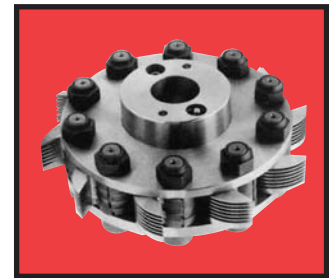
If assembled, number of cutters per bolt, and assembly configuration

*\*Note: Always provide the part number engraved on head or cutters when re-ordering the same items.*



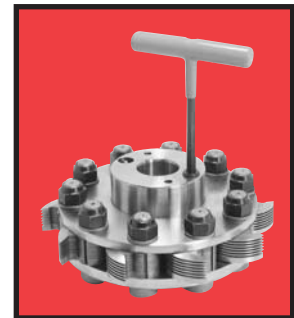
## HYDRO-LOC™ BORE

WKW Hydro-Loc™ cutterheads are affixed to the machine spindle by means of a pressurized inner sleeve. The inner sleeve is compressed onto the spindle by charging or pressurizing the sleeve with a special high pressure grease gun. Locking collars are always recommended as an additional measure of safety. See Accessories and Set Up sections for more information.



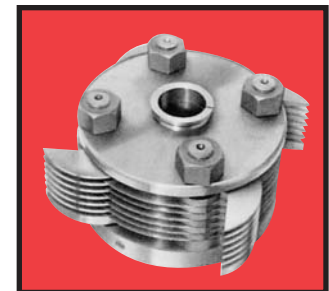
## QUICK-LOC™ BORE

These heads are similar to the Hydro-Loc™ heads above except that they do not require the use of a grease gun to pressurize them. The head is pressurized by merely tightening a screw with an allen wrench.



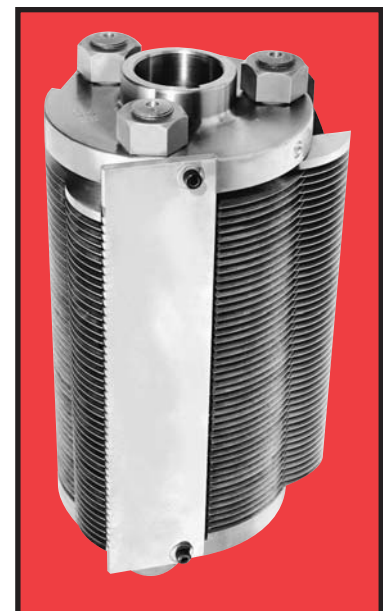
## STRAIGHT BORE COLLET HEADS

Although not as common as they once were, these heads rely on self-centering tapered collets (or cones) to center the head on the spindle when the spindle nut is tightened.



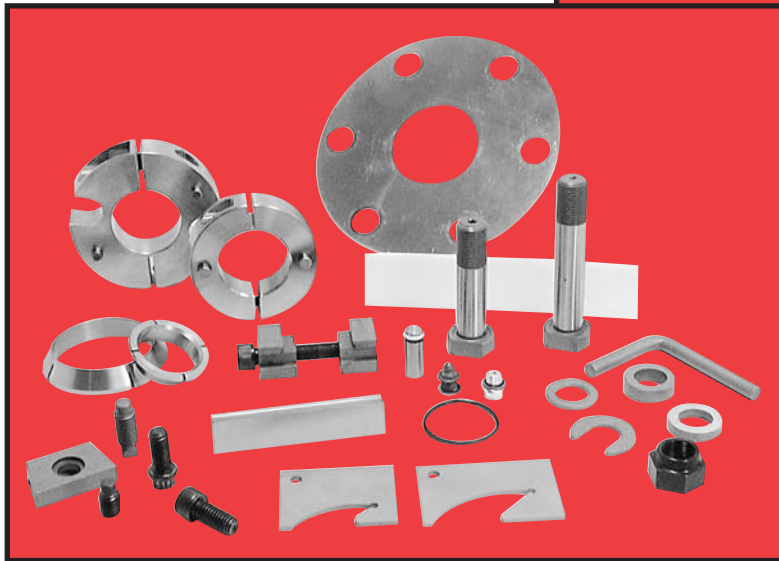
## LAMINATED BEAM CUTTERHEADS

The production of structural joints, as used in laminated beams, (see pg. F-3) requires very sophisticated tooling. Cutter stacks of up to twelve inches demand that the cutter thickness and tip centrality on each individual cutter be held to a very high degree of accuracy and consistency. WKW has produced the tooling used by the major producers of structural beam products. Three and four wing heads are used to produce joints 1 inch or longer. In most cases, these applications require special spacer plates (shown) between each cutter. For information on spacers, see Accessories section.





Ten post set up fixture.



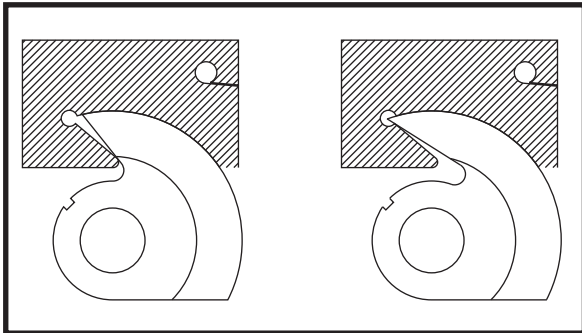
Accessories.

## SET UP FIXTURES

SWING CIRCLE	CUTTER RADIUS	BORE	SINGLE POST	6 POST	8 POST	10 POST
9"	1-1/2	1-1/2	36442	TF1818-B	TF1834-B	—
9"	1-1/2	1-13/16	36446	TF1818-A	TF1834-A	—
9"	1-7/8	1-1/2	TF1344-B	TF1963-B	—	—
9"	1-7/8	1-13/16	TF1344-A	TF1963-A	—	—
9"	2-1/8	1-1/2	TF1598-B	—	—	—
9"	2-1/8	1-13/16	TF1598-A	—	—	—
10-1/2"	1-1/2	1-1/2	TF1964-B	TF1965-B	TF1966-B	TF1967-B
10-1/2"	1-1/2	1-13/16	36444	TF1965-A	36448	36450
10-1/2"	1-7/8	1-1/2	TF1968-B	TF1969-B	TF1886-B	—
10-1/2"	1-7/8	1-13/16	TF1968-A	TF1969-A	TF1886-A	—
10-1/2"	2-1/8	1-1/2	TF1970-B	TF1971-B	—	—
10-1/2"	2-1/8	1-13/16	TF1970-A	TF1971-A	—	—



### GRINDING TEMPLATES (HOOK GAUGES)



Use of a grinding template will prevent incorrect bevels (above) that lead to poor-fitting joint. See troubleshooting section for correct grinding.

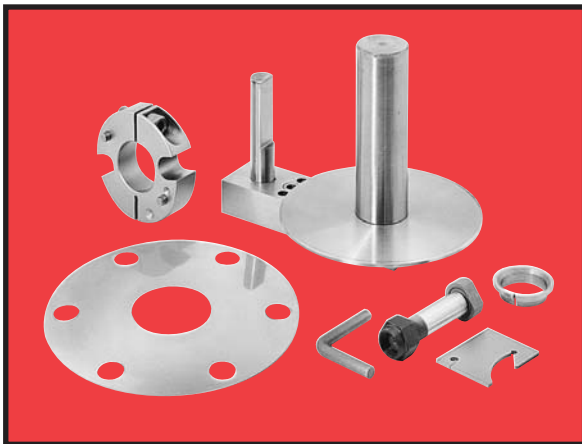
PART NUMBER	CUTTER RADIUS
T683	1-7/8
T684	1-1/2
T685	2-1/8
T686	2-3/8
T981	1-1/4

### COLLETS (OR CONES)

PART NUMBER	BORE & TAPER
SB 536	1-1/2 X 5/16-20°
SB 755	1-13/16 X 5/16-20°

### CLOSE TOLERANCE SPACING WASHERS

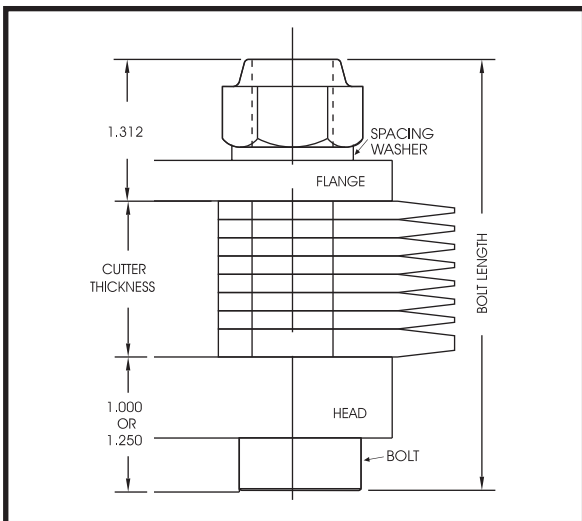
Available in various thicknesses. Used for replacing cutters or for stacking between cutters. Call for info.



### LOCK RINGS

PART NUMBER	Bore	Pin Spacing
SE 1624-A	1-1/2	2.56
SE 1590	1-13/16	3.14
SE 1646	1-13/16	2.56

### FINGER JOINT BOLTS, NUTS & WASHERS



Length	RH Thread	LH Thread
4-3/4	DC503-J	DC591-C
4-1/2	DC503-H	DC591
4-1/4	DC503-G	DC591-G
4	DC503-F	DC591-A
3-3/4	DC503-E	DC591-F
3-1/2	DC503-D	DC591-B
NUT	NB207	NB207-C
1/8 Washer	W405	
1/4 Washer	W405B	
3/8 Washer	W405C	
1/2 Washer	W405D	
C Washer	W329-A	

\*Please refer to drawing at left to determine length of bolt.

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