Operating Instructions

Important

Your Shefcut™ tool is pre-set at the factory. We strongly recommend that you verify the setting before using the tool.

Shefcut®

PRECISION REAMING & BORING SOLUTIONS

ACCURATE SIZE

FINE FINISH

SUPERIOR HOLE GEOMETRY

COGSDILL TOOL PRODUCTS, INC.

Shefcut® blade replacement and adjustment

Blade replacement

1. Loosen clamp screw(s) with hex wrench and remove blade.
2. Clean blade slot. Inspect clamping plate, clamping screw(s), adjusting screws, and seating faces. Replace worn or damaged parts as necessary.
3. Most Shefcut® blades have two cutting edges (see "Blade Options and Cutting Geometries," page 24). For an unused edge, rotate blade end for end.
4. If installing a new blade, make sure that cutting lead on blade to be installed matches cutting lead ground on pads (and marked on tool).
5. Loosen adjusting screws by one-quarter turn. Insert blade in slot firmly against blade stop pin.
6. Turn clamping screw(s) clockwise until snug, but **not tight**, in order to allow blade movement during setting.
7. Adjust blade as described.
8. Secure blade by tightening clamp screw(s).

Blade adjustment

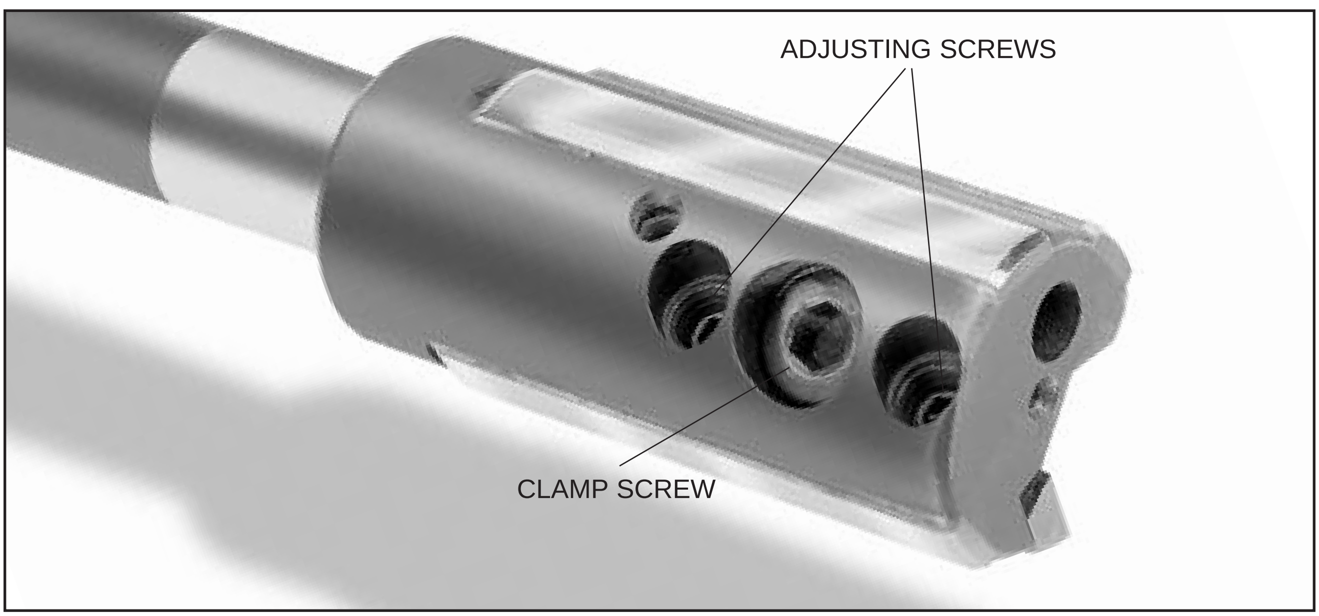
Shefcut tools are micro-adjustable within a limited range. This feature allows the tool to be set to an effective cutting diameter that the tool will produce accurately and consistently.

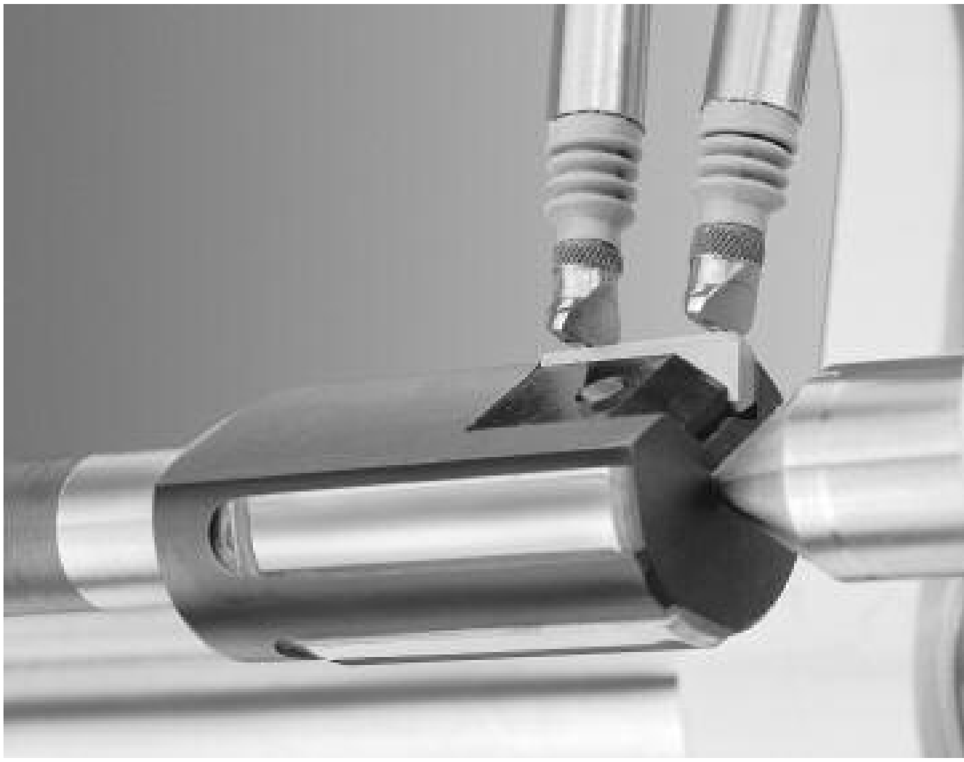
There are two **blade setting parameters**:

1. **Cut diameter**, defined as the distance from the apex of the blade (i.e., intersection of the two cutting lead angles) to the opposite guide pad.
2. **Back taper**, defined as the distance from the back of the blade to opposite guide pad. The back taper provides relief for the blade in the bore, and ensures that cutting is done from apex of lead intersection to front of blade, so that the tool acts as a single-point cutting tool.

There are several **methods for blade adjustment**:

- A **Cogsdill setting fixture** is the ideal method for highly efficient, consistently accurate tool settings, especially in high production applications (see "Setting Fixtures," page 34). Blade damage is minimized by use of the setting fixture. The tool is mounted securely between centers. As adjustments are made to the blade, readings are taken with probes and displayed on dial or electronic indicators.
- Alternative methods include:
  1. Bench centers mounted on a surface plate.
  2. Dial indicators; using a micrometer (preferably a pressure micrometer).





Two blade setting parameters:

1. Cut diameter, defined as the distance from the apex of the blade to the opposite guide pad.
2. Back taper, defined as the distance from the back of the blade to the opposite guide pad.

Using a Cogsdill setting fixture:

1. Identify difference in size between guide pad diameter and minimum cut diameter (also known as the "security zone," because it must be maintained in order to avoid tool damage).
2. Mount tool between centers.
3. Position front probe about 1mm (.039 in.) behind guide pad lead, with minimum pressure to avoid damaging blade edge.
4. Position rear probe at back of blade at the point furthest from cutting lead.
5. Set indicators on "zero," using guide pad diameter as the reference point.
6. Using front adjusting screw, rotate, adjust, and check reading until front of blade is higher than guide pads by the amount of the security zone, or approximately .008-.013mm (.0003-.0005 in.) above pad diameter. This will set the blade cut diameter.
7. Using rear adjusting screw, set rear of blade flush with pad diameter, or as much as .013-.020mm (.0005-.0008 in.) below pad diameter. This will set blade back taper.

Using a micrometer:

- A pressure micrometer is desirable, to ensure accurate setting and to reduce the possibility of chipping the blade.
- Blade edge should rest on anvil of micrometer while micrometer spindle is rocked gently over pad. To avoid blade damage, do not allow micrometer to move across blade edge.

Shefcut® operating requirements

Coolant

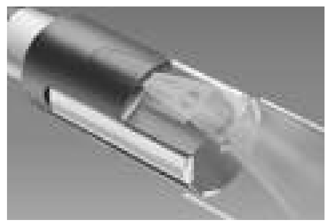
Coolant usage and selection is a critically important factor in maximizing Shefcut tool performance. As a general rule, Shefcut tools should not be run dry. A flood of clean coolant should be directed along the blade for lubrication and clearing of chips (swarf). (NOTE: Special Shefcut dry-cutting tools, and tools for spray-mist applications, are designed and built to order. Contact Cogsdill to discuss your application.)

We strongly recommend using a coolant with good lubricity, especially when machining nonferrous materials. Refer to the Coolant Selection and Coolant Flow Rate charts on this page for guidance in selecting the appropriate coolant for your material type.

Internal coolant is available for both through-bore and blind-bore applications (see "Internal Coolant Options," above). Internal coolant is recommended where the following conditions exist:

1. When machining blind bores where the depth of the bore is more than twice the diameter.
2. Where guide bushings or fixtures are used, or in applications where chip clearance problems are likely to occur.
3. When machining at high cutting speeds.
4. When machining long through-bores.

Internal coolant options



For through-hole tools with internal coolant, the coolant flows through the center of the tool and exits above the blade and pads, flushing chips out of the bore ahead of the tool.

For blind-bore tools with internal coolant, the coolant exits at the end of the cutting head, flushing the chips back and out of the entrance of the blind bore.

COOLANT SELECTION	
MATERIAL TYPE	COOLANT RECOMMENDATION
Steel	Soluble 12%
Nickel chrome steel	Soluble 12%
Stainless steel	Soluble 12-14%
Cast iron	Soluble/Synthetic
Aluminum	Soluble 12-14%
Zinc alloys	Soluble 12%
Copper	Soluble 10-12%
Brass	Soluble 10-12%

INTERNAL COOLANT FLOW RATE					
REAMER DIAMETER		PRESSURE		VOLUME	
mm	In.	bar	psi	Liters/min	Gal/min
6-20	.236-.787	6-20	87-290	6-20	1.5-5.3
>20	>.787	3-10	44-145	20-100	5.3-26.4

Machining allowance

The bore size and finish prior to reaming must allow sufficient depth of cut for the reamer to remove all tool marks from the pre-machined hole. Refer to the charts on pages 26–29 for recommended machining allowances when using standard cutting leads.

NOTE: A maximum allowance of 0.15mm (.006 in.) on diameter is recommended when machining stainless steel.

Alignment

Shefcut reaming or boring requires accurate alignment of machine spindle to workpiece. Misalignment will reduce tool performance and bore quality, and may result in blade damage.

In Shefcut reaming applications, a floating holder may correct misalignment problems. Precision boring operations performed with a Shefcut tool may require the use of an adjustable holder (see "Tool Holders," page 30).

Power feed

Power feed is essential for consistent cutting pressure on the Shefcut tool. Hand-feeding the tool could result in poor tool performance and probable tool damage.

Lathe applications

Position the blade in the "up" position when using a Shefcut reamer on a lathe or in any application where the tool is held stationary in the horizontal position while the workpiece rotates. Use of a floating holder will correct any turret indexing errors.

Machining Guide for Shefcut® reaming applications

The information below is intended as a starting point for selecting the spindle speed and feed rate that will produce optimum results in Shefcut® precision reaming applications, when factors such as material type, blade lead, blade rake, and coolant are taken into consideration. The wide range in the recommendations reflects the fact that each application is unique and is influenced by these and other variables, such as the type of machine on which the tool is run, the manner in which the tool is held in the spindle, etc.

METRIC UNITS

MATERIAL (TENSILE STRENGTH)	COOLANT STYLE AND BLADE LEAD							RADIAL RAKE ON BLADE	
	External Flood Coolant	Internal Coolant							
	C0.6, C1.3 & C3.0	C3.0	C1.3	C0.6	GR	GD	GDR		
	Cutting Speed (m/min) Feed (mm/rev)	Cutting Speed (m/min) Feed Rate (mm/rev)						Preferred	Option
Steel (<400 Mpa)	12-50 0.05 - 0.4	25-100 0.05-0.4			Not Recommended			12°	6°
Steel (400-750 Mpa)	8 - 35 0.05 - 0.4	25-100 0.05-0.4			Not Recommended			12°	6°
Steel (>750 Mpa)		25-80 0.05-0.4			Not Recommended			12°	6°
Nickel Chrome Steel		15-60 0.05-0.3			Not Recommended			12°	6°
Stainless Steel	5-16 0.05 - 0.3	8-40 0.05-0.3			Not Recommended			12°	6°
Grey Cast Iron	20-50 0.1 - 0.4	20-80 0.05-0.4	30-110 0.05-0.4					0°	6°
Nodular Cast Iron	20-50 0.1 - 0.3	20-90 0.05-0.3						12°	6°
Aluminum	20-70 0.05 - 0.4	Not Recommended	50-400 0.03-0.3			100-1200 0.05-0.15		12°	0°
Aluminum with high Silicon	20-70 0.05 - 0.4	Not Recommended	50-200 0.05-0.3		80-320 0.03-0.1			12°	6°
Zinc Alloy	20-70 0.05 - 0.4	Not Recommended	50-150 0.05-0.3		80-800 0.05-0.15			12°	0°
Brass - short chipping	10-50 0.05 - 0.4	25-80 0.05-0.4	25-150 0.03-0.4					0°	6°
Brass - long chipping	8-25 0.05 - 0.3	20-50 0.1-0.4	20-100 0.05-0.4					12°	6°
Copper - hard	10-30 0.05 - 0.4	15-60 0.1-0.4	20-100 0.03-0.4					0°	6°
Copper - soft		15-60 0.1-0.3	20-60 0.05-0.3		30-100 0.03-0.15			12°	6°
Phosphor Bronze	12-50 0.05 - 0.4	25-80 0.05-0.4	30-100 0.03-0.4					6°	12°

In general, you will find that the following guidelines will hold true:

1. Power feed should always be used when running a Shefcut tool.
2. Start at the middle of the recommended speed range, and at the lower side of the recommended feed range, for Shefcut precision reaming applications. Then adjust both rates as necessary to achieve optimum results and production rates.
3. Shefcut precision boring tools are often run at higher speeds and lower feeds than shown below.
4. Tools with coated blades can be operated at higher speeds than shown.
5. Run the tool at reduced speeds when through-tool coolant feed is not available.

INCH UNITS

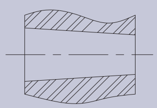
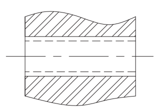
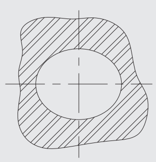
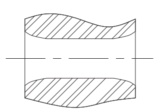
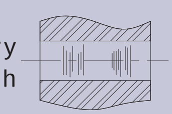
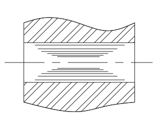
<table>
<tr><th rowspan="4">MATERIAL (TENSILE STRENGTH)</th><th colspan="7">COOLANT STYLE AND BLADE LEAD</th><th colspan="2" rowspan="3">RADIAL RAKE ON BLADE</th></tr>
<tr><th>External Flood Coolant</th><th colspan="6">Internal Coolant</th></tr>
<tr><th>C0.6, C1.3 & C3.0</th><th>C3.0</th><th>C1.3</th><th>C0.6</th><th>GR</th><th>GD</th><th>GDR</th></tr>
<tr><th>Cutting Speed (s.f.m)
Feed (in/rev)</th><th colspan="6">Cutting Speed (s.f.m)
Feed Rate (in/rev)</th><th>Preferred</th><th>Option</th></tr>
<tr><td>Steel - (<57k psi)</td><td>40-170
0.002 - 0.016</td><td colspan="3">80-330
0.002-0.016</td><td colspan="3">Not Recommended</td><td>12°</td><td>6°</td></tr>
<tr><td>Steel - (57k to 107k psi)</td><td rowspan="3">30 - 120
0.002 - 0.016</td><td colspan="3">80-330
0.002-0.016</td><td colspan="3">Not Recommended</td><td>12°</td><td>6°</td></tr>
<tr><td>Steel - (>107k psi)</td><td colspan="3">80-260
0.002-0.016</td><td colspan="3">Not Recommended</td><td>12°</td><td>6°</td></tr>
<tr><td>Nickel Chrome Steel</td><td colspan="3">50-200
0.002-0.012</td><td colspan="3">Not Recommended</td><td>12°</td><td>6°</td></tr>
<tr><td>Stainless Steel</td><td>20-50
0.002 - 0.012</td><td colspan="3">30-130
0.002-0.012</td><td colspan="3">Not Recommended</td><td>12°</td><td>6°</td></tr>
<tr><td>Grey Cast Iron</td><td>70-170
0.004 - 0.016</td><td>70-260
0.002-0.016</td><td colspan="5">100-360
0.002-0.016</td><td>0°</td><td>6°</td></tr>
<tr><td>Nodular Cast Iron</td><td>70-170
0.004 - 0.012</td><td colspan="6">70-300
0.002-0.012</td><td>12°</td><td>6°</td></tr>
<tr><td>Aluminum</td><td>70-230
0.002 - 0.016</td><td>Not Recommended</td><td colspan="3">160-1310
0.001-0.012</td><td colspan="2">330-3940
0.002-0.006</td><td>12°</td><td>0°</td></tr>
<tr><td>Aluminum with high Silicon</td><td>70-230
0.002 - 0.016</td><td>Not Recommended</td><td colspan="2">160-660
0.002-0.012</td><td colspan="3">260-1050
0.001-0.004</td><td>12°</td><td>6°</td></tr>
<tr><td>Zinc Alloy</td><td>70-230
0.002 - 0.016</td><td>Not Recommended</td><td colspan="2">160-490
0.002-0.012</td><td colspan="3">260-2630
0.002-0.006</td><td>12°</td><td>0°</td></tr>
<tr><td>Brass - short chipping</td><td>30-170
0.002 - 0.016</td><td>80-260
0.002-0.016</td><td colspan="5">80-490
0.001-0.016</td><td>0°</td><td>6°</td></tr>
<tr><td>Brass - long chipping</td><td>30-80
0.002 - 0.012</td><td>70-160
0.004-0.016</td><td colspan="5">70-330
0.002-0.016</td><td>12°</td><td>6°</td></tr>
<tr><td>Copper - hard</td><td rowspan="2">30-100
0.002 - 0.016</td><td>50-200
0.004-0.016</td><td colspan="5">70-330
0.001-0.016</td><td>0°</td><td>6°</td></tr>
<tr><td>Copper - soft</td><td>50-200
0.004-0.012</td><td colspan="2">70-200
0.002-0.012</td><td colspan="3">100-330
0.001-0.006</td><td>12°</td><td>6°</td></tr>
<tr><td>Phosphor Bronze</td><td>40-170
0.002 - 0.016</td><td>80-260
0.002-0.016</td><td colspan="5">100-330
0.001-0.016</td><td>6°</td><td>12°</td></tr>
</table>

Shefcut® tool performance guide

The Shefcut® tool is capable of consistently producing straight, round, and accurately sized holes with fine surface finishes. There are, however, many application variables that can influence tool performance. Coolant, alignment, and blade adjustment are often the most critical factors. Other variables include spindle run-out, feeds and speeds, and blade edge quality. Trials and adjustments may be necessary in order to arrive at the correct operating parameters for your application.

These tips may enhance the performance of your Shefcut tool. Contact us for assistance.

TOOL PERFORMANCE GUIDE

BORE CONDITION	CORRECTIVE ACTIONS
Tapered bore 	1. Check workpiece-to-spindle alignment. Correct alignment. Use floating holder if necessary in lathe applications. 2. Check tool runout. Guide pads should be within 0.005mm (.0002 in.) TIR. Adjust runout. Use an adjustable holder if necessary. 3. Reduce blade back taper. Minimum back taper is 0.007mm (.0003 in.). 4. Consider a witness bore for reaming applications.
Bore too large 	1. Check blade setting. Adjust to proper cut diameter. 2. Check workpiece-to-spindle alignment and tool runout.
Bore not round 	1. Tool too small for bore size being cut. Use correct size tool. 2. Reduce blade back taper if necessary. Normal blade back taper is 0.02mm (.0008 in.). 3. Ensure bore distortion is not being caused by part fixturing.
Conical entrance or exit 	1. Check workpiece-to-spindle alignment and tool runout. 2. Check blade back taper (normal setting is 0.02mm (.0008 in.). 3. Reduce machine feed rate. 4. Tool may need repairing if excessive pad wear exists or if tool is bent. Pads should be inspected for material build-up; clean if required. Check straightness of tool.
Unsatisfactory surface finish 	1. Machine feed rate may be too fast; reduce feed. 2. Vary cutting speed. Some experimentation may be required to establish the optimum cutting speed. 3. Check chip evacuation and chip form. Adjust coolant volume and pressure. Use chipbreaker blade if necessary. 4. Increase lubricity of coolant. 10:1 or richer mixture is normally required. 5. Check for clean, filtered coolant. 6. Check blade for wear or damage and replace if necessary.
Chattered bore 	1. Check workpiece-to-spindle alignment and tool runout. 2. Check blade back taper and increase if necessary. Normal setting is 0.02mm (.0008 in.). 3. Increase coolant lubricity. Consider more stock allowance and/or increased feed rate. Change cutting rake.

Refer to *Shefcut catalog no. 600* for more information.

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