12. Basic Method of Operation

Up to four specimens can be loaded into the rotating fixture; this allows a single face of each specimen to be machined in a single operation.

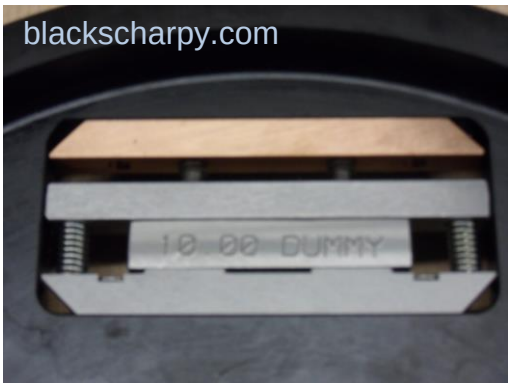
The machine is normally supplied with a single four pocket rotating fixture with two pockets fitted with clamps to machine the 1st and 2nd cut and two pockets fitted with 3rd and 4th cut clamps. See Section 18 for use of two rotating fixtures (optional extra).

The specimens to be machined are loaded into the rotating fixture; this is carried out with the rotating fixture positioned on the bench mounted bracket provided.

IMPORTANT:

Dummy specimens should be used in ALL empty pockets to ensure no loose items can become trapped or damaged during the machining operation.

Dummy specimen in 1st and 2nd cut pocket



Dummy specimen in 3rd and 4th cut pocket

Machine Operation

When the specimens have been loaded into the rotating fixture, the fixture is then mounted onto the drive shaft for milling the first face of the specimen (1st cut). After this operation is completed the machine comes to rest, the rotating fixture is removed and turned through 180 degrees so that the diametrically opposed face is present to the milling cutter (2nd cut).

After completion of the 1st and 2nd cut the specimens are removed from the fixture, they are then rotated through 90 degrees and remounted in the 3rd and 4th cut clamps. The procedure is then repeated to machine the remaining two faces.

Take care when handling, as machined specimens have very sharp edges. After removing the specimens, deburr the edges to prevent possible injury when re-loading and clamping.

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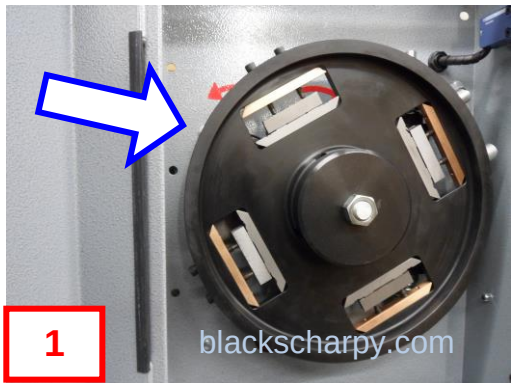
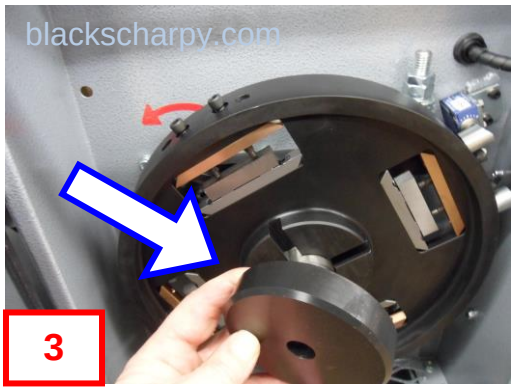
13. Removing Rotating Fixture from Machine



Open work area guard door to reveal rotating fixture.

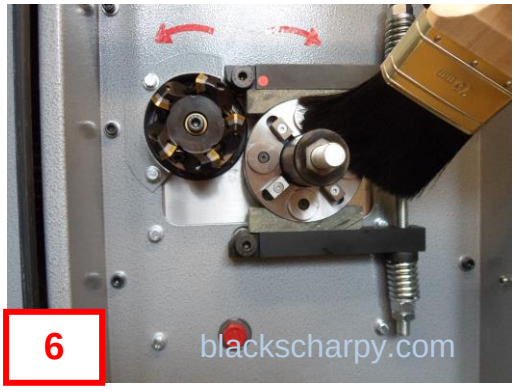
Remove the nut



Remove collar

Draw rotating fixture off machine spindle

Clean the fixture.



Clean the machine spindle ready for the next operation

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14. Selecting Rotating Fixture Clamp Jaws/anvils

Ensure the correct anvils are fitted in rotating fixture clamps for the specimens to be cut.
The length of the specimen should be 55mm

The specimens are clamped in special jaws depending upon which machining operation is being carried out, these operations are designated as:-

- 1st Cut
- 2nd Cut
- 3rd Cut
- 4th Cut

SPECIMEN	OPERATION	TYPE OF JAW	MAXIMIUM SPECIMEN SIZE
Square & Rectangular Rough Cuts	1st & 2nd CUT	Flat Serrated anvils	16mm
Round & Tube Rough Cuts	1st & 2nd CUT	Serrated 'V' anvils	15-18mm
ALL SPECIMENS	3rd & 4th CUT	Flat Smooth anvils	Square 16mm Round & Tube 15-18mm

A. 1st and 2nd Cut

Rectangular & Square Specimens

Flat serrated jaws should be used for 1st and 2nd cuts for rectangular and square rough cut blank specimens; the maximum size that can be accommodated is 16mm.

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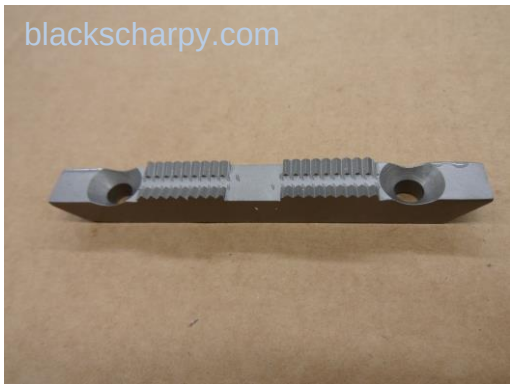
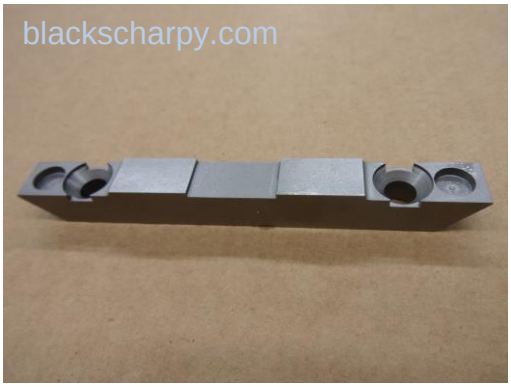
Round or tube specimens



Special serrated ‘v’ anvils are available for machining the 1st and 2nd cuts when producing specimens from round and tube specimens. The work holding fixture will accept and self-align 15mm to 18mm diameter rough cut specimens.

B. 3rd and 4th Cut



The anvils and clamp faces used for the 3rd and 4th cuts are flat and smooth as they clamp on the pre-machined 1st & 2nd cut faces of the specimen.

Changing Rotating Fixture Anvils/Jaws

Fixture clamps are factory assembled, specific to the individual rotating fixture. It is therefore not recommended that anvils are changed. It is recommended that separate fixtures are procured, factory set-up by RJW Ltd for the mix of specimens to be machined.

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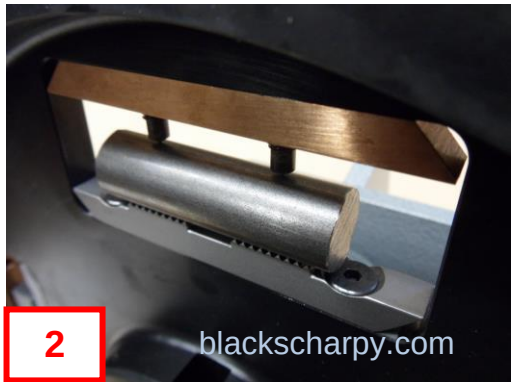
15. Loading Rotating Fixture – 1st & 2nd Cut

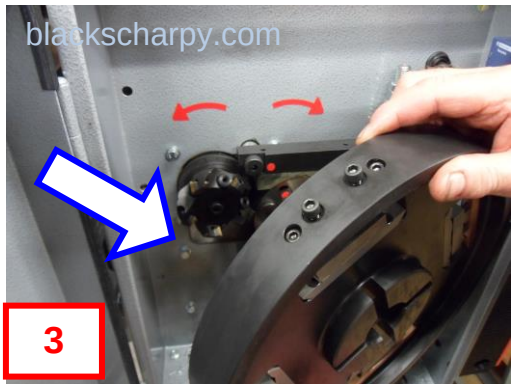
WARNING – Sharp Edges On Machined Specimens

The electrical supply must be connected to the machine to allow the Work Area Guard door to be opened. When the door is opened, electrical interlocks prevent the motors from being started.

The rough square specimen size should be 12mm-16mm x 55mm long.
The rough round specimen size should be 15-18mm x 55mm long.



Ensure the correct anvils are fitted in the fixture for the type of specimens being machined. See section 14.



Draw rotating fixture off the machine spindle. See section 13.

Mount rotating fixture onto the Bench mounted fixture stand and remove any specimens in the pockets, using the Tee bar key supplied.

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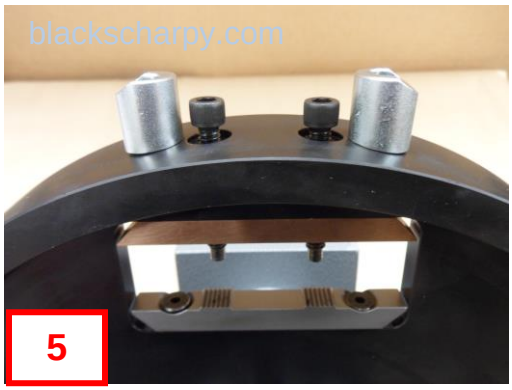
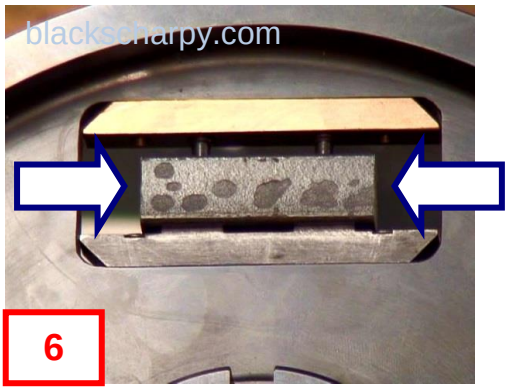
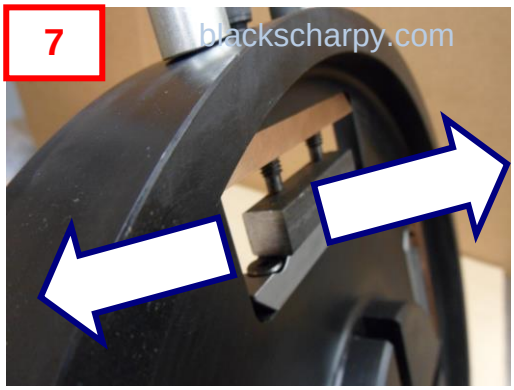


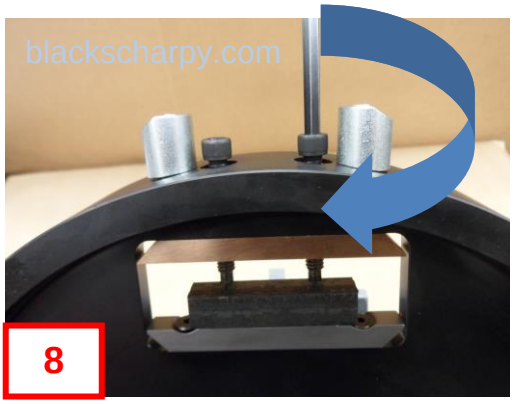
Select 1st & 2nd cut pockets and rotate the fixture so that an empty pocket is in the top position.



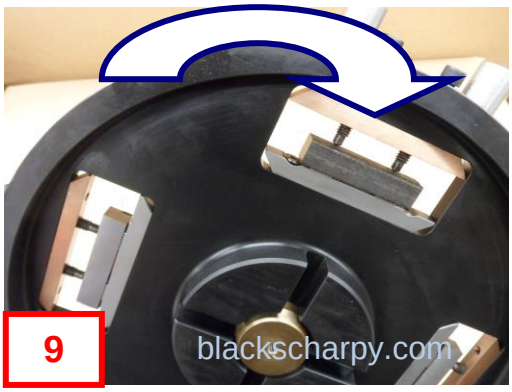
Place the rough cut specimen into the clamp and centralise the specimen in the fixture jaws.



Ensure that equal amounts of material protrude on either side of the clamp anvils. By finger touch is OK.



Tighten the two pointed clamping screws equally using the Tee bar key supplied.



Rotate the fixture to the next 1st & 2nd cut pocket and repeat the procedure.

When all four pockets are loaded, the fixture can then be transferred to machine. Remember to use dummy specimen, in any unused pockets.

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16. Loading Rotating Fixture - 3rd & 4th Cut

The pockets for 3rd and 4th cuts are fitted with smooth flat jaws, for clamping the specimens previously machined on the 1st and 2nd cut faces.

Mount the 1st and 2nd rotating fixture on to the bench mounted fixture stand.

Rotate the fixture to access the machined 1st and 2nd cut specimens. Release the clamping screws and remove the specimens from the 1st and 2nd cut clamps.

Take care as machined specimens have very sharp edges. After removing the specimens, deburr the edges to prevent possible injury when re-loading and clamping.

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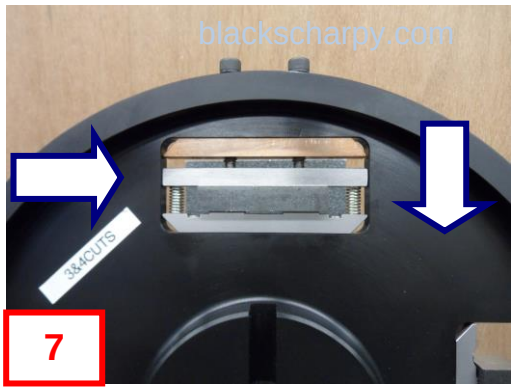
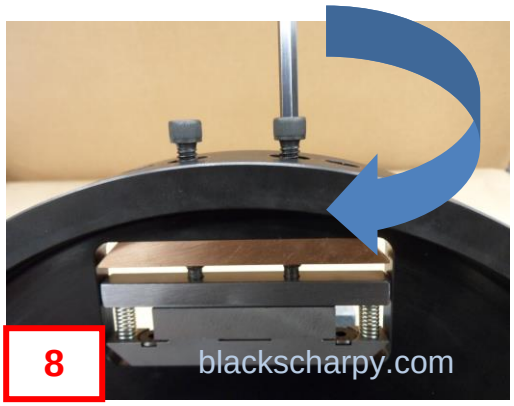
Once removed, rotate the 1st and 2nd cut specimens through 90 degrees so that the previously machined surfaces now become the clamping faces for the 3rd and 4th cuts.

Rotate the 3rd and 4th cut fixture, so that a pocket is in the top position.



Remove any specimen. Centralise the 1st and 2nd cut specimen equally in the 3rd and 4th pocket, as previously described for the 1st and 2nd cut operation. See Section 15.



Clamp the specimens, tightening the clamping screws equally. The two uncut faces are now positioned so they will be machined by the milling cutter.
Rotate the fixture to the next pocket and repeat the procedure.
Picture shows machined 3rd/4th cut face.

IMPORTANT:
When all four clamps are loaded the fixture can then be transferred to machine.
Remember to use dummy specimen, in any unused pockets.

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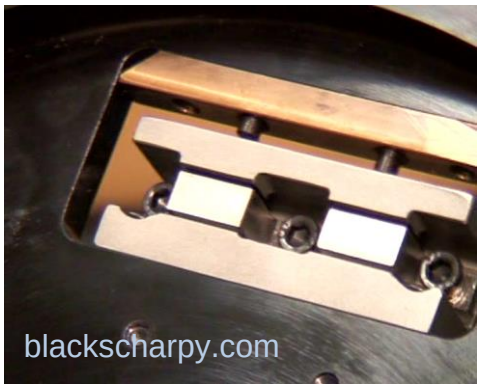
17 Sub-Size Fixture (optional extra)

Sub-size samples are produced on the RJW CNM using a special work holding fixture. The 10mm height is produced with our standard 1st & 2nd Cut Fixture.

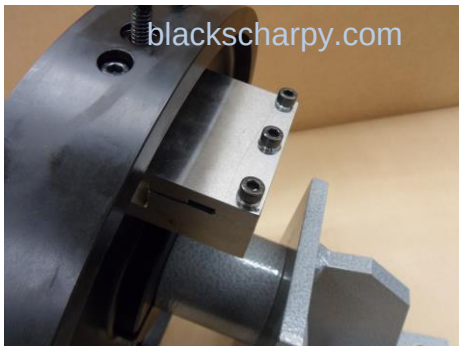
Sub-size Fixture

Specimen being loaded into a sub-size fixture pocket.



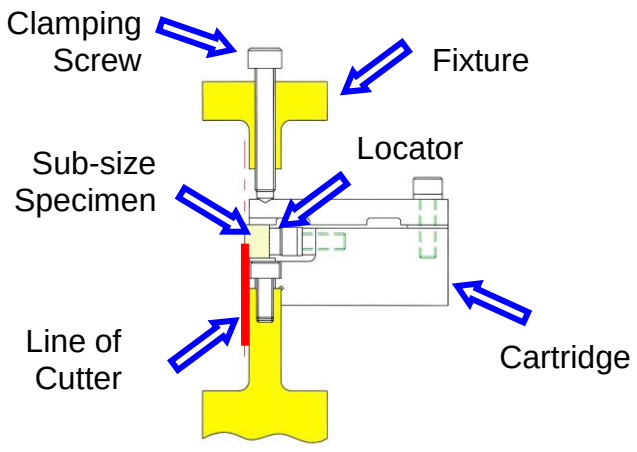
Sub-size pocket

The fixture is supplied fitted with sub-size work holding cartridges, to suit the sub-size specimen sizes required by the customer. Each pocket cuts either 3rd cut or 4th cut.



Work holding fixture cartridge

Note: this fixture has cartridges, which are factory set, to cut a certain size. This fixture is not rotated to machine 2 faces as per our standard fixture.



Section through Sub-size Fixture

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17A Sub-size Sample Sizes

Each fixture has four pockets which are factory set, to machine the sub-size heights. The Table below shows typical pocket sizes for the sub-size thickness.

SUB SIZE	3rd Cut size	4th Cut size	Maximum depth of CUT
7.5 mm	8.75 mm	7.5 mm	2.0 mm
6.7 mm	8.0 mm	6.7 mm	2.0 mm
5.0 mm	6.25 mm	5.0 mm	1.75 mm
3.3 mm	4.4 mm	3.4 mm	1.5 mm
2.5 mm	3.6 mm	2.6 mm	1.0 mm

Please note: for 3.3 & 2.5 mm sub-size specimens, 0.1mm has been added to their heights. These specimens must be ground to finish size.

17B Sub-size Pocket Combinations

OPTION	POCKET 1	POCKET 2	POCKET 3	POCKET 4
1	8.75	8.75	7.5	7.5
2	8.0	8.0	6.7	6.7
3	6.25	6.25	5.0	5.0
4	4.4	4.4	3.4	3.4
5	3.6	3.6	2.6	2.6
6	8.75	7.5	8.0	6.7
7	8.75	7.5	6.7	5.0
8	8.0	6.7	6.25	5.0
9	4.4	3.4	3.6	2.6

Please note: The options above are only examples, any configuration can be supplied, please contact RJW Ltd.

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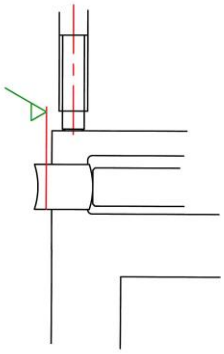
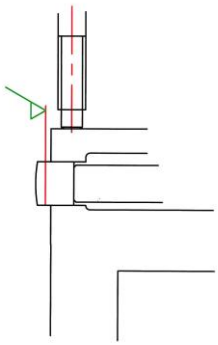
17C Tube and Pipe Sub-size Specimen, 3rd & 4th cut Operations



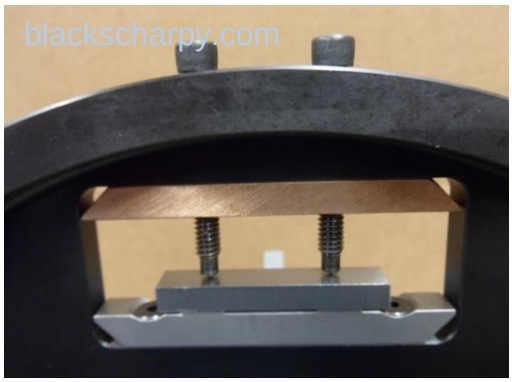
Machine 3rd cut pipe/tube specimen



Machine 4th cut pipe/tube specimen

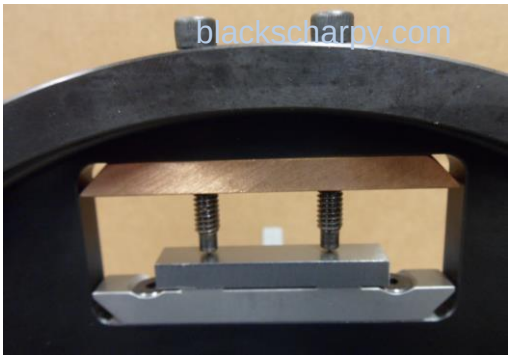
Tube and pipe sub-size specimens can also be accommodated. See 17B for size combinations.

17D Sub-size, 1st & 2nd cut Operations

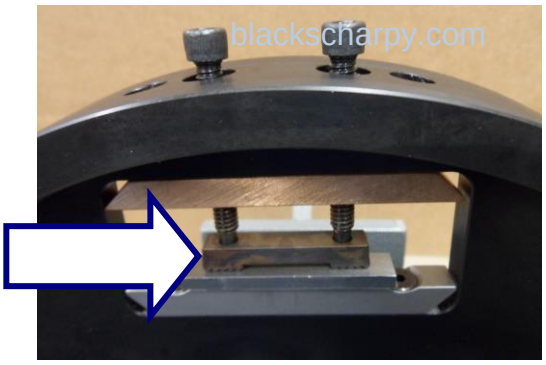


The 1st and 2nd cuts are produced using the standard 10mm work holding fixture.

Replace the standard length clamping screws with the long clamping screws CNM-169A4, which are supplied with sub-size fixtures.



Sub-size specimens 3.3mm to 7.5mm, can be clamped in the fixture & machined.



Sub-size specimens 2.5mm, require the use of Clamping bar CNM-222A4, which is supplied with 2.5mm sub-size fixtures.

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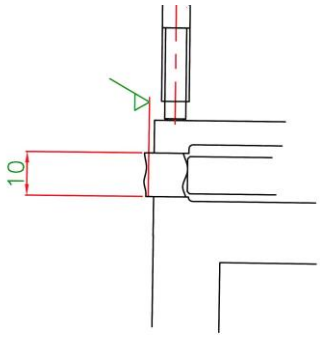
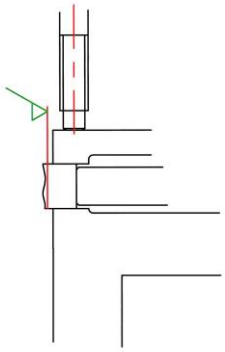
17E Sub-size, 3rd & 4th cut Operations



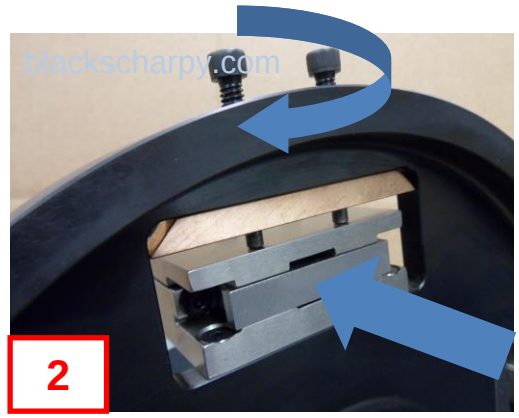
Machining 3rd cut



Machining 4th cut

After machining the 1st and 2nd cuts, the specimens are removed and then loaded into the sub-size rotating fixture to produce the 3rd & 4th cuts.
Note:
Only one face of the specimen can be machined in the sub-size fixture at each setting.

Mount the sub-size work holding fixture on the bench fixture. Then load each specimen into the correct fixture 3rd cut pocket.



With the specimen pressed up against the locator, it is clamped using the tee bar supplied, ensuring that both clamping screws are equally tightened.

When the specimens have been secured in the 3rd cut pockets, any remaining vacant clamps should be filled and clamped using dummy specimens. Ensure all clamping screws are tightly secured. When completed and all four pockets are loaded, the fixture can then be transferred to machine and the specimens machined, as described in Section 19.

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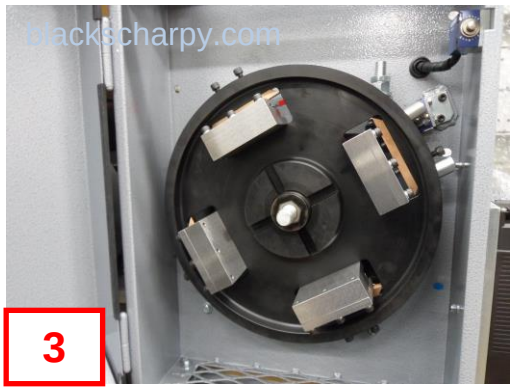

After completion of the 3rd cut machining cycle, remove the work holding fixture from the machine and mount onto the bench fixture. Remove the 3rd cut specimens, rotate 180 degrees and re-clamp in the appropriate 4th cut fixture pocket.

Re-mount the sub-size work holding fixture in the CNM machine and complete the 4th cut. Remember to fit dummy specimens in any pockets not being used.

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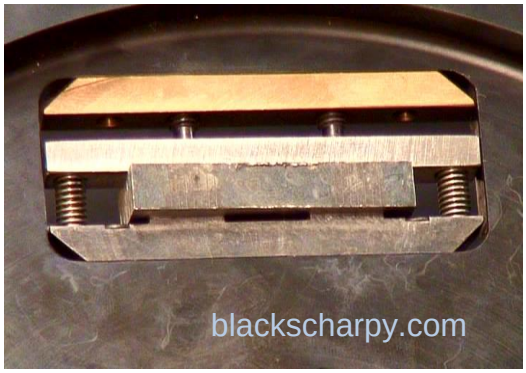
18. Using Two Rotating Fixtures

To reduce machine down time a second rotating fixture can be used (optional extra). This allows unloading and reloading of specimens in the second fixture ready for the next machining operation, whilst the first fixture is being machined. No time is lost unloading and reloading the fixtures with the machine not in operation.

The clamps in both fixtures are specially configured to allow 1st and 2nd cuts of four rough cut specimens to be machined on one fixture and the 3rd and 4th cuts to be machined using the second fixture.

Fixture 1:
Contains four pockets for the 1st and 2nd cuts.



Fixture 2:
Contains four pockets for the 3rd and 4th cuts.

Various combinations of clamps can be fitted into the rotating fixture, dependent upon the specimens being machined, as described in Section 14.

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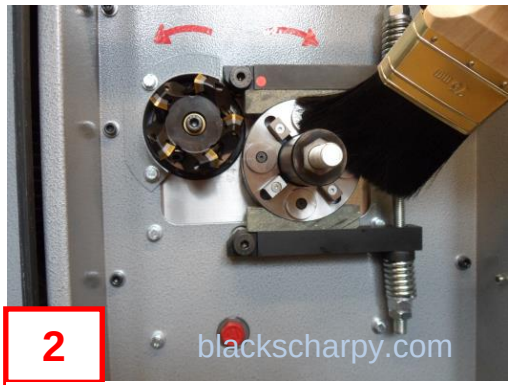
19. Loading Rotating Fixture into the machine

Before attempting to load the work holding fixture ensure cutting operations have been completed and the cutter and work holding fixture have come to rest and door timer has 'timed out'.

Wait for cycle to be completed & green light to go out. There will be a slight delay before the door can be opened.

Open Work Area Guard Door.



Clean the slow spindle pads and adjacent surfaces using the brush supplied.

Clean fixture before fitting to spindle.

Check the round red synchronised markers on the upper brake arm and one of the fixture keys are in line.

Locating keys on the fixture and machine spindle provide accurate location of the fixture. It is **important to thoroughly clean** the fixture, spindle, locating keys and clamping collar locating face to ensure accurate and secure location of the fixture.

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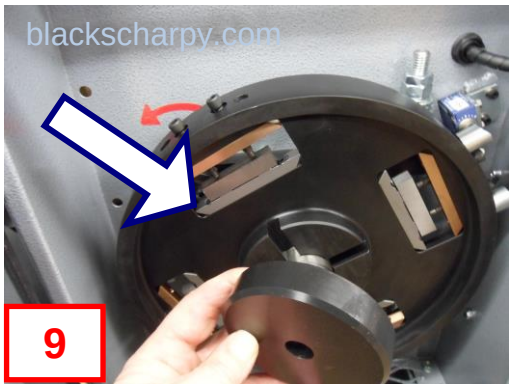
Check appropriate milling cutter inserts are fitted and undamaged before fitting fixture (see section 21).

Mount rotating fixture onto the machine spindle.

Rotate the fixture to position cam stop in the top right hand corner.

Ensure the locating/drive keys are aligned. Push fixture onto the spindle until the drive dogs fully engage with fixture slots.



Fit the clamping collar.

Fit and tighten the nut, to secure the fixture.

Close work area guard door.

Ensure the swarf box is in place. Empty swarf box if required.

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20. Machine Sequence of Operation

Check that the 'clear lamp' is illuminated for electrical supply 'ON'.

Check the Emergency Stop Button is released.

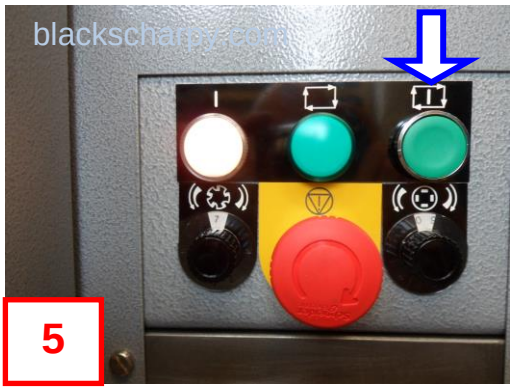
Set fixture feed rate

Variable Speed Machine only:

Set the Cutter Speed.

Always start with a slower feed rate/cutter speed and gradually increase the feed rate/cutter speed to determine the optimum setting for material to be cut and cutter insert tip life.

Check work area guard door is closed.



Press the 'Start' button to start the machine cycle.

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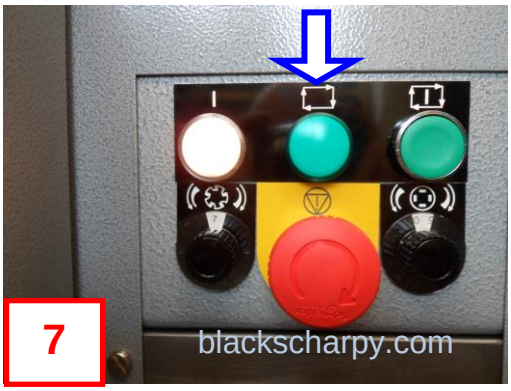
The green lamp will illuminate and the machining sequence will begin.



When the machining sequence is completed, the milling cutter and work holding fixture will stop rotating and the green cycle run lamp will go out.

Wait 3 seconds for work area guard door switch to release. Open the work area guard door and remove the fixture as per section 13.

Check size of specimen with GO/NOT GO gauge (optional extra)

Note: As cutter tips wear, the specimen size will increase in size.

When specimen will not enter the gauge, the cutter tips must be turned to present a new cutting edge.

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21. Cutter Tip Replacement

The milling cutter has five ISO renewable inserts with carbide anvils. A micro-adjustment mechanism is fitted behind the milling cutter which allows for fine adjustment of the depth of cut and tool wear, see Section 23 for cutter adjustment.

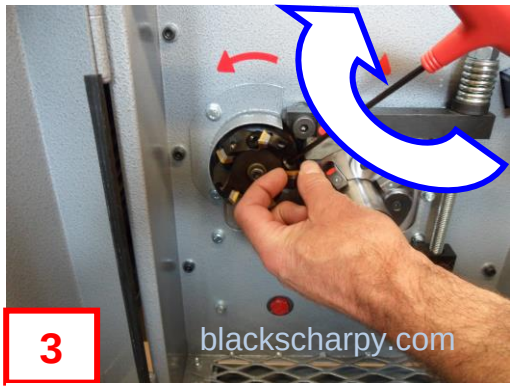
Note:-

If machine has recently been used the cutter will be hot & suitable hand protection must be worn.

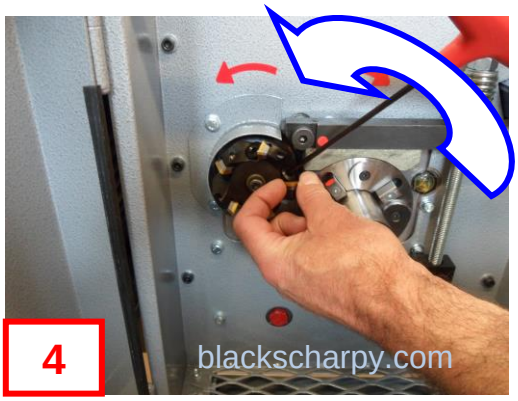
When the machine is delivered, no inserts are fitted in the cutter.

Remove the work holding fixture to gain access to the cutter

Position the cutter so that the key can be fitted into a tip securing screw.



Loosen the screw by turning in a clockwise direction.
Note left hand thread (CW).



Remove the tip, clean the tip seat & the tip insert. Turn the tip to present a new cutting edge and re-tighten.
Note left hand thread (CCW).

Repeat this procedure on remaining four tips.

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Suggested SECO Cutter Inserts for SECO Cutter

These are suggested starting options; we recommend our customers experiment with different grade inserts and manufacturer inserts to determine which are best suited for the material being cut.

Material Being Cut	Insert
Medium carbon steels	SEKR1203 AFTN-ME10 F40M
Hardened steels	SEKN1203 AFTN-M14 T250M
Stainless steels	SEKR1203 AFTN-M14 F40M
Copper / Aluminium	SEKR1203 AFN-E07 F30M
Cast iron	SEKN1203 AFTN-M14 T150M

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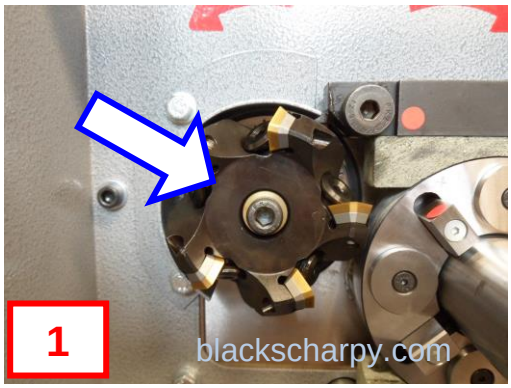
22. Adjusting Depth of Cut and Cutter Replacement

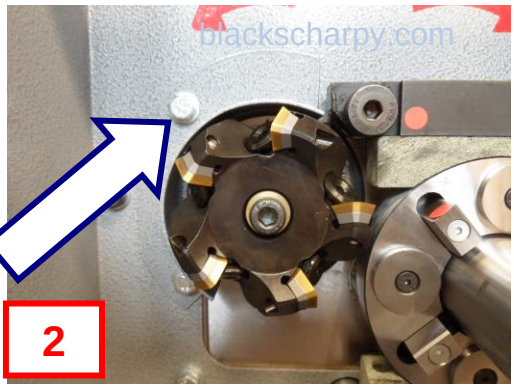
The micro-adjustment collar is used to adjust the depth of cut, for setting initial specimen size and for new cutter inserts. The micro-collar adjusting ring is fitted behind the cutter; it is factory set to produce specimens with new inserts in the cutter body. As the cutting edge wears the specimen size increases until the upper limit is reached. At this point it is recommended the inserts are rotated to present new cutting edges.
For adjustment to the micro-adjusting ring, to alter the specimen size,
see drawing CNM-217A2.

IF THE CUTTER IS CHANGED THE MICRO-COLLAR ADJUSTING RING WILL REQUIRE RESETTING AS OUTLINED.

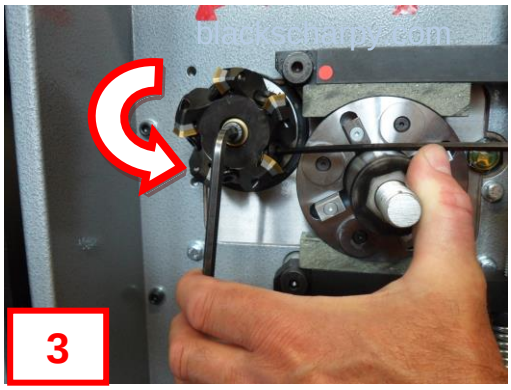
Resetting Micro-collar Adjusting Ring
As machine guards are removed for this operation, resetting the micro-collar adjusting ring for a new cutter must be carried out by authorised, fully trained personnel only.
Ensure cutter has come to rest before undertaking any of this procedure.



Remove rotating fixture to reveal milling cutter.



Remove cutter guard to gain access to the adjusting ring.



Remove cutter retaining screw.

Remove cutter from drive spindle to gain access to adjusting collar.

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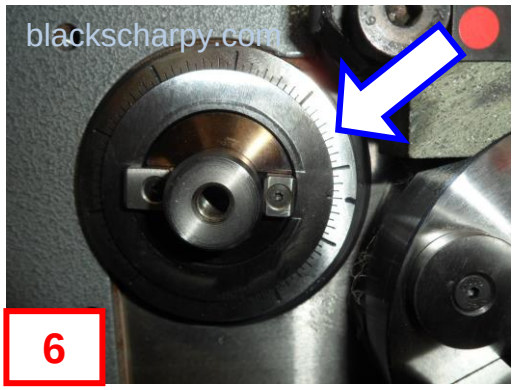
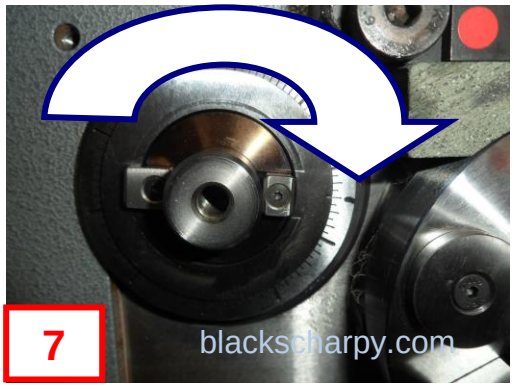
Note the position of the adjusting collar datum line relative to its position of the graduations on the outer micro collar (mark with permanent pen).



Clean cutter and adjusting collar, leaving the permanent mark.

Each graduation on the micro-collar affects the finish size of the component by 0.02mm.



Adjust micro-collar head.
Rotate micro-collar head clockwise to reduce specimen thickness.
Increases: the depth of cut.

Rotate micro-collar head counter clockwise to increase specimen thickness.
Decreases: the depth of cut.

Note:
Always adjust the size from one direction to eliminate effects due to slight backlash in adjusting ring threads. *Please see CNM-217A2 on next page.*

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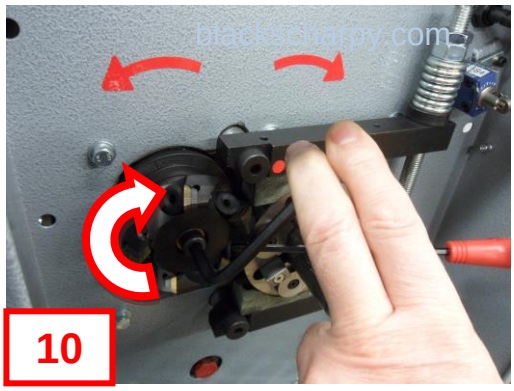
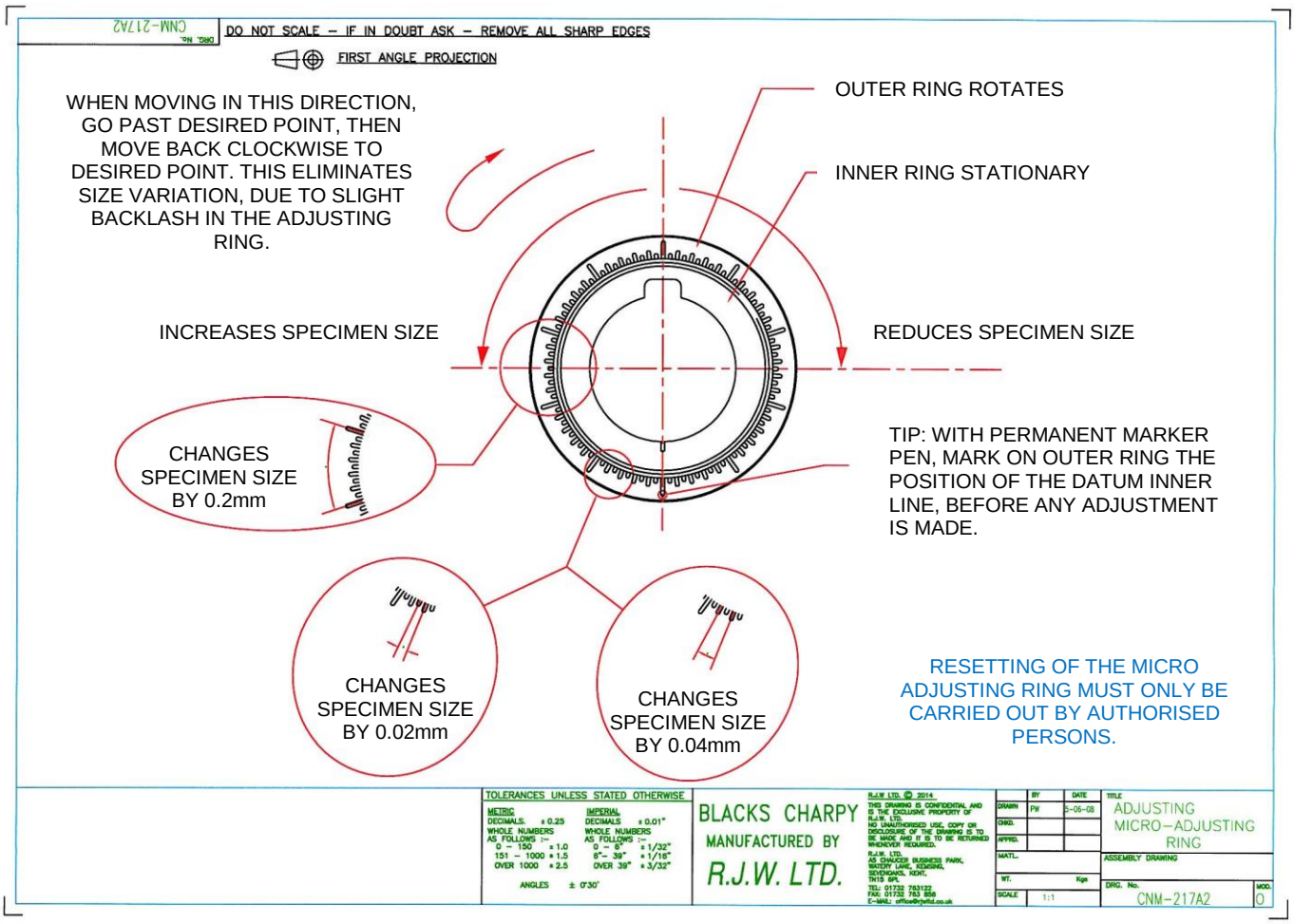
When adjustment has been carried out, refit the cutter



Replace and tighten cutter retaining screw, to 24Nm. This is the maximum achievable with the 6mm standard length hexagon key supplied with the machine.



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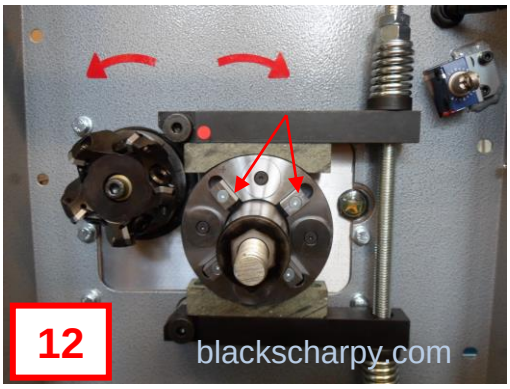
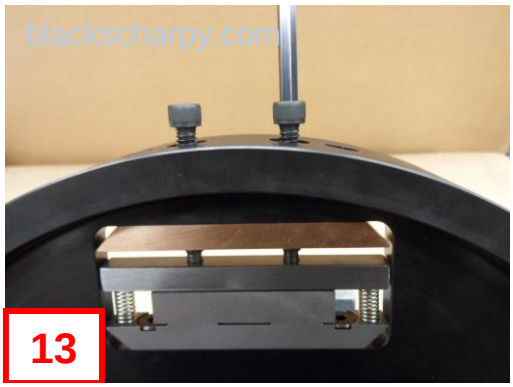
Fit the fixture to the machine ensuring the cutter tips DO NOT touch the fixture.
Note: -If they DO, then loosen the cutter clamping screw and rotate the Micro-collar anti-clockwise half a turn, Retighten and re-check.
Tip: If the drive keys are removed from the fixture shaft you can rotate the fixture to feel if it is touching the cutter.



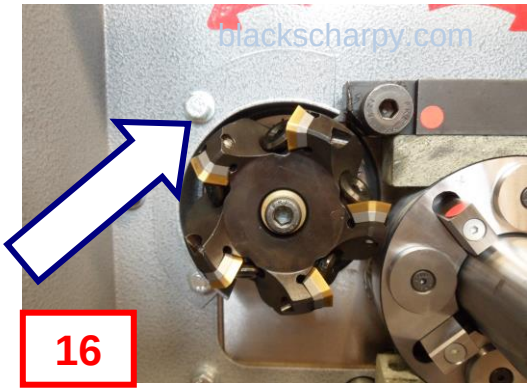
Remember to re-fix keys before operating the machine.



Cut both sides of a specimen.

Remove and measure the specimen size comparing the actual size with the required size.

If required remove the cutter and adjust the micro-collar head as previously described.



When the specimen has been machined to the correct size, refit the cutter guard.

BEWARE! Ensure the cutter inserts are not touching the fixture or specimen as damage may occur to the cutter and/or rotating fixture.

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