Hollow Milling

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An Efficient, Easy, and Economical Method to use a Landis Die Head to Turn, Groove, Form, Point, and Face

HOLLOW milling cutters are similar to chasers, except they have a cutting instead of a threading profile, and can be supplied for use with virtually any type of revolving or stationary head.

Benefits

1. They have the same mounting configuration and come in the same physical size as chasers.
2. Feed rates approximately equal to a single point tool, "multiplied by the number of hollow milling tools" can be realized. The number of cutters in a set will vary from four to eight depending upon style and model of the head. When using a Landis machine with leadscrew for hollow milling, 32 pitch gearing is generally used.
3. Allows one spindle to hollow mill to a given diameter, the second spindle to thread it.
4. Offers the same tool efficiency and economy as a Landis chaser. Cutters are usable for 80% of their original length and only the rake angle requires regrinding.
5. Tools can be uniformly advanced or retracted relative to the workpiece centerline to determine the cutting clearance that gives best machining results.

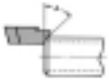
Profile Possibilities

Some of the types of operations that are possible include:


Full points can be produced on bar or partial points on sheared stock.


Turn and chamfer with a step cutter. Turn forgings to correct size for threading or turn bar stock or forgings to finish size.


Form radiuses or other special configuration.


Combination cutters to face and chamfer tubular stock in preparation for welding.


Double diameter turn with double diameter cutters or using two sets of cutters mounted in "piggy back" holders.

Cutter Profiles

The examples illustrated show some of the types of cutters available. Variations of these or cutters for special configurations can be supplied. To determine whether an application can be performed, submit complete details with a workprint or detailed sketch.

Operations Performed


Type 1
Turn to shoulder angle. When used to chamfer only, regular chaser holders can be used.


Type 2
Turn to square shoulder. When a radius is not permitted.


Type 3
A standard outline tool that is the most efficient cutter for turning. Used at a feed rate equal to 32TPI, the radiused Type 3 tool permits faster speed and better finish.


Type 4
Chamfer and face end of pipe to be welded.


Type 5
Special configuration cutter used for many types of turning and chamfering. Can be used to form and turn, turn and chamfer.


Type 6
Special configuration cutter used to form workpieces not possible to do with other types.

Type 7
A wedge type cutter used in receding chaser pipe machine head to taper turn oil tubular pipe.


Type 8A
Types 8A, 8B, 8C & 8D are supplied to cut four types of victaulic grooves in pipe. Used in stationary pipe die heads, the head is closed with the operating handle to effect cutting. Stop blocks applied to two cutters locate the tools to cut the groove at the required location.


Type 8B

Type 8C


Type 8D


Type 9
Type 9 Used to form grooves on hose couplings. Can be used with stationary pipe heads where the head is closed on diameter, or with an R type Lanco closed down by a hydraulically powered yoke assembly.

Types 2, 4, and 5 may require chaser holders having a helix angle of at least 5° for best results.

Application Requirements

Since hollow milling cutters do not generate self-lead, they generally require using positive feed, i.e. leadscrew, hydraulic, or cam.

When the head is used to mill on an automatic screw machine, the normal thread cam must be replaced with camming which will feed it for the full length of cut required.

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Suggested Means For Grinding LANDIS Hollow Milling Cutters

To obtain maximum tool life and optimum product surface finish, the proper techniques must be used when grinding hollow milling cutters.

The suggested grinding means given here pertain to the more popular cutter profiles. However, they can be adapted for other cutter styles.

THE ANGLES INVOLVED

Two angles are involved when regrinding cutters, the helix or lead angle ("H") and the rake or cutting angle ("R").

Angle "H" is ground to agree with the helix angle of the chaser holder in which the cutter is to be used. For example if the helix angle of the holders is 5°, the cutter is ground 85° from the front face.

RECOMMENDED RAKE ANGLES

MATERIAL	RAKE ANGLE
IRON & STEEL ALLOYS	
CAST IRON	15° POSITIVE
WROUGHT IRON	18° POSITIVE
MALLEABLE IRON	18° POSITIVE
LOW CARBON STEELS - free machining (B1112, C1117, etc.)	22° POSITIVE
LOW CARBON STEELS -- nonfree machining (C1010, C1018, etc.)	22° POSITIVE
ALLOY STEELS (SAE 2000 to 6000 series etc.) 160/200 Brinell	25° POSITIVE
ALLOY STEELS (SAE 2000 TO 6000 SERIES ETC.) 200/300 Brinell	18° to 22° POSITIVE
STAINLESS STEEL	25° POSITIVE
ALUMINUM & ALUMINUM ALLOYS	
ALUMINUM SHAPES, BARS AND CASTINGS	10° POSITIVE
ALLOY CASTINGS	10° POSITIVE
ALLOY BARS AND SHAPES	25° POSITIVE
COPPER & COPPER ALLOY	
GENERAL COPPER	28° POSITIVE
CAST BRASS	5° NEG. to 0°
CAST BRONZE	5° NEG to 0°
FORGED OR ROLLED BRASS (except free cutting)	22° POSITIVE
FREE CUTTING BRASS (bars and forgings)	10° POSITIVE
FORGED OR ROLLED BRONZE	10° POSITIVE
SPECIAL ALLOYS	
MANGANESE BRONZE	0° TO 10° POSITIVE
SILICON BRONZE (Everdur)	22° POSITIVE
ALUMINUM BRONZE (Ampco Metal)	18° to 22° POSITIVE
NAVAL BRONZE	0° to 10° POSITIVE
NON METALLIC MATERIALS	
PLASTICS & FIBER	0°
BAKELITE	0°
LUCITE	35° NEGATIVE

For most hollow milling operations, chaser holders having a helix angle of 5° are recommended. However, satisfactory results have been obtained in some instances with holders having a helix angle as low as 2°. Using and obtaining satisfactory results with holders of other than 5° will depend upon the material to be worked and the profile to be turned.

As with LANDIS Tangential Chasers, the degree of angle produced on the rake or cutting angle "R" will depend upon the material to be turned. The chart on page 74 lists recommended rake angles for most materials.

The suggested lead and rake angles given are not all inclusive. Depending upon various considerations such as turning speed, material, the condition of the equipment being used, etc., the best overall results may be obtained by deviating slightly from the recommended angles. This, of course, must be established by trial and error.

Grinding Instructions

After the correct degree of angle has been determined, grind "H" with 0 rake.* Generally, this angle should always be ground prior to producing "R". Then, grind "R" up to the cutting edge.

*Note: It is not always necessary to grind angle "H" prior to "R". As shown by the illustrations of popular profiles, it is possible, on certain profiles, to grind "H" and "R" simultaneously.

When grinding hollow milling cutters, the objective to remember is to produce a cutting edge that will coincide with the rotational centerline of the workpiece at the point of chaser tangency. Therefore, angle "H" should be ground as near perfect as possible to the required angle. Also, "R" should be ground only until it "trues out" at its intersection with "H". Undergrinding "R" will result in a poor cutting edge, overgrinding can destroy the relationship of angle "H" to the rotational centerline of the workpiece.