GEAR SHAPER CUTTERS

Disk type and shank type shaping cutters for gear shapers.
DISC TYPE, SPUR AND HELICAL, INVOLUTE GEARS
The most common body type of gear shaper cutters, in the form of a disk with a precision central mounting hole. Disc type cutters are made either with a shoulder or a flat back.

DEEP COUNTERBORE
Similar in design to a disk type cutter, the deep counterbore has an increased height (or axial length). This design is typically made to “reach” a gear element without interfering with the fixture, or to keep the retaining nut nested behind the cutting face throughout the life of the cutter.

TAPER SHANK TYPE
A shaper cutter designed with an integral taper or straight shank which mounts directly in the machine cutter spindle, or in an adaptor to the machine cutter spindle.

NON INVOLUTE GENERATING

INTERRUPTED TOOTH SPACING

HELICAL TYPE

HUB TYPE
A design style, usually offered between standard shank and disk cutter diameter sizes, that can be mounted to a machine cutter spindle having no taper hole without the use of an adapter.
Fellows gear shaper cutters have been available since the development of the first Fellows gear shaping machine by E. R. Fellows in 1896. Fellows gear shaper cutters are now manufactured by Star SU, purchaser of the Fellows cutter division.

**UNIQUE DESIGN CAPABILITIES**

Star SU offers a unique computer design capability by integrating Fellows rich cutter design experience in modern computer systems. The system provides both customer and manufacturing data from a single input source reducing potential errors.

**SHAPING THE FUTURE**

Star SU has partnered with Bourn & Koch, purchaser of the Fellows machine division assets, to provide complete gear shaping application solutions worldwide. Star SU manufactures gear shaper cutters in the United States, Italy, France, and Brazil to better serve the market place.

**COMPLETE SHAPING TECHNOLOGY SOLUTION**
CUTTER TYPES

- Spur and helical, involute and non-involute
- Disc type
- Deep counterbore type

The above cutters are available in the following range of dimensions:
- Module (DP) range 0.5 - 8 mm (50 - 3.175")
- Min pitch diameter 20 mm (0.787")
- Max whole depth 19 mm (0.75")
- Max diameter 250 mm (9.84")

- Taper shank type

Available in four sizes:
- 1.0625" .6235" tp
- 0.700" # 2 Morse
- 0.475" # 1 Morse
- 0.250" # 2 Jarno

- Internal type
- Special cutters

For chain sprockets, cams, splines, timing gears and large module cutters

Star SU designs and manufactures special cutters for both involute and non-involute applications. Special cutters are available as precision ground cutters for finishing, pre-shaving, pre-grinding and roughing operations and as unground cutters for a variety of chain sprockets.

Our special cutters can be supplied with the following profile modifications:
- Chamfer or semi-topping
- Protuberance
- Modified flank for tip relief
- Modified pressure angle
- Full topping
- Combinations of modifications above

To order special cutters you may use the included order sheet
MATERIALS
We offer many types of high speed steels from stock. Depending on the application, standard or premium grade material is used. Our most popular grades are:

- M4
- CPM Rex 45, 54 and 76
- T-15
- ASP-steels can be supplied on request.

COATING/STRIPPING/RECOATING SERVICES
Our Blazer coatings reduce abrasion and can increase corrosion resistance and tool life up to 5-10 times depending on the application.

- TiN
- TiCN
- TiAIN
- Other coatings can be supplied on request.

RESHARPENING SERVICES
Our service centers in Michigan, Ohio, Illinois, South Carolina, and Saltillo provide you with what you really need: fast turnaround of high-precision sharpenings. In many areas pickup and delivery services are available.
When ordering special cutters, a detailed drawing of the part to be cut should be furnished. Your information MUST include the following data.

**CUSTOMER DATA**

Star SU Customer-No. (opt.): ______________________
Company name: _________________________
Department: _________________________
Request by (first/last name): _________________________
Tel: _________________________
Fax: _________________________
E-mail: _________________________

**PART DATA**

Star-SU part-ID-no. (opt.): ________________________
Workpiece drawing no: _________________________
Workpiece type
  - External
  - Internal
Number of teeth _________________________
Diametral pitch (DP) _________________________
  - Module
Pressure angle _________________________
  - Normal
  - Transverse
if helical, please specify
Major dia. ________Minor dia. _________
Helix angle Lead
Hand of helix
  - Right
  - Left
Depth of cut _________________________
T.I.F. diameter _________________________
Tolerance _________________________
Root fillet radius _________________________
Cutting operation
  - Rough
  - Finish
  - Pre-shave*
  - Pre-grind
  - Pre-finish
  - *supply pre-shave shape including undercut!
Chordal Addendum Tooth thickness _________________________
Measuring over pin/balls _________________________
Pin/ball diameter _________________________
Span reading ________ No of teeth ________
Material to be cut _________________________
Hardness at time of cutting ________ HBN __ HRC

**MATING PART**

Part number _________________________
Number of teeth _________________________
Major dia. ________minor dia. _______
Center Distance _________________________
Backlash _________________________

**CUTTER DATA**

Star SU-tool-ID-no. (opt.): _________________________
Tool drawing no: _________________________
Type of cutter
  - Disc
  - Deep counterbore
  - Shank*
  - Internal**
  - Special profile***
Diameter _________________________
Hole size _________________________
Type of keyway _________________________
*If shank cutter, specify
  - Taper size
  - Tapped hole
  - Flange
**If internal cutter, specify _________________________
Face width _________________________
Clearance required for clamping fixture _________________________
Depth of recess, if teeth are recessed _________________________
below top surface of blank _________________________
***If special cutter specify application (e.g. chain sprockets, cams, splines, timing gears, etc.) ________
Profile modifications
  - Corner radius
  - Chamfer or semi-topping
  - Protuberance
  - Modified flank for tip relief
  - Modified pressure angle
  - Full topping
Specify special quality: _________________________
Material:
  - M4
  - Rex45
  - Rex54
  - Rex76
  - T-15
Other materials are available on request.
Coating:
  - TiN
  - TiCN
  - TiAlN
Specify other coating: _________________________
Number of pieces: _________________________
Remarks: ______________________________________
___________________________________________
___________________________________________
___________________________________________
Please send the completed form to:
Fax: 847-649-0112
Tel: 847-649-1450 E-mail: sales@star-su.com
DEFINE YOUR CUTTER REQUIREMENTS

CUTTER TYPES

DISC TYPE
The most common type, normally installed directly on the cutter spindle.

DISC TYPE ON ADAPTER
Disc type cutters are also used on adapters, especially when the size required is between a disc and taper shank cutter.

DEEP COUNTERBORE TYPE
Similar to disk type, except the blank thickness is increased to position the cutter holding nut or screw above the cutter's lifeline. Normally used for cutting internals, cluster or shoulder gears.

TAPE SHANK TYPE
Generally used in cutting small pitch diameter internal parts. The cutter length below the taper must be adequate for the face width of the gear to be cut, plus the required overtravel at the bottom of the machine stroke and available life in the cutter. The workholding fixture or a recess of the gear teeth in the blank may require extra length. Taper shank type cutters are made in four taper sizes, as measured at the large end of the taper:

<table>
<thead>
<tr>
<th>Taper diameter</th>
<th>Taper type</th>
</tr>
</thead>
<tbody>
<tr>
<td>.10625&quot;</td>
<td>.6235&quot; tpf</td>
</tr>
<tr>
<td>.700&quot;</td>
<td># 2 Morse</td>
</tr>
<tr>
<td>.475&quot;</td>
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</tr>
<tr>
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<td># 2 Jarno</td>
</tr>
</tbody>
</table>

Pitch diameter of the cutter should approximate the diameter of the taper. Flutes can be added to long cutters of small pitch diameter to minimize deflection when cutting.

PROFILE MODIFICATIONS (SHAPER CUTTER TOOTH SHOWN)

CORNER RADIUS
Corners of cutter teeth are radiused to produce a controlled fillet in the root corners of the gear being generated - adds strength to gear and improves tool life.

CHAMFER OR SEMITOPPING
Root of cutter is filled in to generate a sharp corner break or chamfer on the tips of the gear - minimizes tip build-up during heat treatment due to nicks incurred during handling.

PROTUBERANCE
Cutter tooth profile is built up on the cutter tip to provide an undercut near the root of the gear being generated - provides relief for subsequent finishing operations.

MODIFIED FLANK FOR TIP RELIEF
Root of cutter is filled more gradually than chamfering cutter - removes a small amount of profile form tops of gear teeth - often desirable in high speed gears to minimize noise and tip bearing resulting from tooth deflection under loads.

MODIFIED PRESSURE ANGLE
The cutter tooth profile is ground to a slightly lower pressure angle to provide for a constantly increasing amount of stock from root to tip of the gear generated - another method of providing relief for subsequent finishing operations.

FULL TOPPING
The cutter tooth is ground equal to the whole depth (WD) of the gear tooth. The outside diameter of the gear is “topped” to size when the teeth are cut.

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