Small Part Tooling Solutions

FEATURED PRODUCTS

Molded Sharp Edge Chipbreakers
Large Lineup Providing Excellent Chip Control

EZ Bar Series Small Diameter Boring
Excellent Repeatability Easy Positioning Indexable Type Available

GBF Series Grooving
GL Molded Chipbreaker Provides Stable Chip Control (JCT Coolant Through Option Available)

KGD Small Parts Cut-Off
Wide Lineup Enables Long Tool Life on Various Workpiece Material (JCT Coolant Through Option Available)
Introduction

It can be difficult to control chips when machining 304 stainless steel. Due to the number of machining operations required, it is important to optimize the selection of tooling to improve productivity.

Our Tooling Advantages

1) Stable chip control with molded chipbreakers
2) Sharp cutting edge for high-quality surface finish
3) Long tool life with heat-resistant coated carbide "PR1535"

Insert Grade Selection

Use PR1535 insert grade for stainless steel machining. Achieve long tool life and stable stainless steel machining with the combination of a tough substrate and a specialized Nano coating layer.

DRA

High precision and high efficiency machining with the DRA replaceable insert tip drill

SS10-DRA080M-3
DA0800M-GM PR1535

Cutting Conditions
Vc = 230 sfm
f = 0.003 ipr

Molded Sharp Edge Chipbreakers

Molded chipbreaker combines sharpness and superior chip control

T3 SCLCR1212JX-09FF
CCGT3251MFP-GQ PR1535

T4 SDJCR1216JX-11-F15
DCGT32505MFP-SK PR1535

Cutting Conditions
Roughing (SK Chipbreaker)
Vc = 230 sfm, D.O.C. = 0.008” - 0.098
f = 0.004 ipr

Finishing (GF Chipbreaker)
Vc = 262 sfm, D.O.C. = 0.020”
f = 0.003 ipr

EZ Bar Series

Lineup from high precision adjustable solid bars to easy indexable type

EZH07019CT-120
C06X-SCLCR04 - 070EZ
CCGT040102MP-CF PR1535

T2 SDJCR1216JX-11-F15
DCGT32505MFP-SK PR1535

Cutting Conditions
Boring (EZ Bar PLUS: Indexable type)
Vc = 197 sfm, D.O.C. = 0.0098”
f = 0.0016 ipr

Back Facing (EZ Bar)
Vc = 197 sfm, D.O.C. = 0.008”
f = 0.0020 ipr

GBF GL Chipbreaker

Molded chipbreaker maintains smooth chip control

KGBFR1212JX-16F
GBF32R100-005GL PR1535

Cutting Conditions
Vc = 262 sfm
f = 0.003 ipr
Grooving Depth : 0.118”
TKFB GQ Chipbreaker

Tool for back turning with molded chipbreaker provides single-pass machining

SCLCR1212JX-09FF
CGT3251MFP-GQ PR1535

Cutting Conditions
Grooving: Vc = 262 sfm, D.O.C. = 0.018”, f = 0.001 ipr
External Turning: Vc = 262 sfm, D.O.C. = 0.118", f = 0.002 ipr

PR1535 MEGACOAT NANO

Fracture resistant with a tough substrate and high heat-resistant coating for stable machining of general steel, mold steel, and difficult-to-cut materials

1 An increase in cobalt content yields a substrate with greater toughness.

2 Fracture toughness values are improved by 23% over previous grades.

Cracking Comparison by Diamond Indenter (Internal Evaluation)

PR1535 Base Material

Conventional Material

Short Cracks

Long Cracks

MEGACOAT Layer Structure

PR1535 also shows superior performance in steel machining under unstable conditions

Wear Resistance Evaluation (Internal Evaluation)

Tool Life x 2

PR1535

Conventional C

Competitor D

Conventional A

PR1535

Stable Machining

Cutting conditions: n = 1,273 rpm (Vc = 262 sfm), f = 0.0015 ipr, Wet (Oil-based)
Workpiece: 304 (Ø20mm)

Fracture Resistance Evaluation (Internal Evaluation)

No Fractures

PR1535

Conventional C

Competitor D

Cutting conditions: n = 509 rpm (Vc = 262 sfm), f = 0.0047 ipr, Wet (Water Soluble)
Workpiece: 304

*Evaluated with KGD
**Issues**

Modern high precision machining requires tight coaxiality and circularity tolerances, which can be difficult to achieve.

**Solution**

It is important to select a drill with low cutting force. The DRA drills provide excellent hole accuracy with a low cutting force design.

Lineup includes a minimum cutting diameter Ø0.313" and 1.5D drill body which is great for small part machining applications.

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**1 Low Cutting Force Design Improves Hole Accuracy**

Special chisel edge with S-curve reduces thrust force and controls vibration

- Cutting Edge Image
  - **DRA**
  - **Standard Drill**

**2 Optimal Web Thickness Limits Deflection**

Special chisel edge with S-curve reduces thrust force and controls vibration

- Web Thickness Comparison
  - **DRA**
  - **Competitor A**

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**Solid Drills for Small Diameter Drilling**

- **ORION Drill from Ø0.039" Cutting Diameter**
- **2ZDK from Ø1mm Cutting Diameter**

*Using 2ZDK on Stainless Steel is not recommended

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**Roundness · Cylindricity Comparison**

(Internal Evaluation)

<table>
<thead>
<tr>
<th></th>
<th>DRA</th>
<th>Competitor D</th>
<th>Competitor E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundness</td>
<td>18.7 μm</td>
<td>31.1 μm</td>
<td>27.3 μm</td>
</tr>
<tr>
<td>Cylindricity</td>
<td>23.6 μm</td>
<td>34.3 μm</td>
<td>30.1 μm</td>
</tr>
</tbody>
</table>

Cutting Conditions: $V_c = 190$ sfm, $f = 0.012$ ipr
Drilling Diameter Ø0.551", Measurement Position 2.165", Wet Workpiece: 1049 Steel
Issues
Changing tools while boring can be tedious, and often sacrifices repeatable accuracy.

Solution
EZ Bar’s High Precision Solid Bar gives you the convenience of indexable inserts, cutting set-up time by 1/3 while offering higher repeatability and accuracy compared with conventional boring bars.

Carbide shank and steel shank available
Combining the sleeve with adjustable overhang length prevents dimensional variation and reduces set up time
Reduce costs with changeable, indexable inserts

1. Minimum Boring Diameter: Ø5mm
Carbide type and Steel type are available for various applications

Carbide Type
Steel Type

2. Shorten Time of Insert Change by 1/3

EZ Bar PLUS
Boring Bars (SCLC type)

*Average of 5 times

3. Superior Repeat Accuracy
EZ Adjust structure achieves better repeat accuracy than standard boring bars.

Repeat Accuracy Comparison (Internal Evaluation)
Issues
Continuous operation of small tool machines requires maintenance free operation.
Poor chip control can lead to part entanglement, poor surface finish, and decreased tool life.

Solution
Kyocera’s molded sharp edge chipbreakers allow for precise control in small part applications. Improve chip control, surface finish, and increase tool life by selecting the right chipbreaker for your job from Kyocera’s extensive chipbreaker lineup.

Resistance Oriented (Low Cutting Force)

**SK Chipbreaker : Low Cutting Force, Finishing**
D.O.C. : 0.019” ~ 0.118”
Molded chipbreaker combines sharpness and superior chip control

**CK Chipbreaker : Low Cutting Force, General Purpose**
D.O.C. : 0.039” ~ 0.098”
Smooth chip evacuation with large rake angle

Chip Control Oriented

**GQ Chipbreaker : Small~Large D.O.C.**
D.O.C. : 0.031” ~ 0.198” (Steel)
0.031” ~ 0.118” (Stainless Steel)
Chipbreaker for wide range of machining applications

**GF Chipbreaker : Finishing**
D.O.C. : 0.010” ~ 0.049”
Stable chip control during finishing

**CF Chipbreaker : Minute Depth of Cut**
D.O.C. : 0.001”~ 0.008”
Excellent chip control with minute depth of cut

Small Double-Sided Tooling for workpieces larger than Ø.63” / Lineup from 0.0039” Corner-R (minus tolerance)

**SK Chipbreaker : Finishing ~ Medium**
Useful chipbreaker for both sharpness and superior chip control

**TK Chipbreaker : Medium ~ Roughing**
Supports a wide range of cutting conditions with low cutting force design
Issues

Typical ground chipbreakers failure to control chip size can lead to chip entanglement on the workpiece.

Solution

The GBF GL molded chipbreaker improves chipbreaking capabilities allowing for precise and reliable grooving and traversing.

1 Excellent Chip Control Performance

Compared to ground chipbreakers, molded chipbreakers have more precise chip control.

<table>
<thead>
<tr>
<th>GBF GL Chipbreaker</th>
<th>Competitor J (Ground Chipbreaker)</th>
<th>Competitor K (Ground Chipbreaker)</th>
</tr>
</thead>
<tbody>
<tr>
<td>f = 0.0020 ipr</td>
<td>f = 0.0024 ipr</td>
<td>f = 0.0028 ipr</td>
</tr>
<tr>
<td>Workpiece : 1045</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 Traversing Supported

Excellent Chip Control for Various Applications

<table>
<thead>
<tr>
<th>GBF GL Chipbreaker</th>
<th>Competitor L (Molded Chipbreaker)</th>
</tr>
</thead>
<tbody>
<tr>
<td>f = 0.0008 ipr</td>
<td>f = 0.0012 ipr</td>
</tr>
<tr>
<td>Workpiece : 1045</td>
<td></td>
</tr>
</tbody>
</table>

3 Long and Stable Tool Life

Fracture Resistant Cutting Edge Design for Stable Machining

Wear Resistance Comparison (Internal Evaluation)

Cutting Time (min)

<table>
<thead>
<tr>
<th>Cutting Condition</th>
<th>Workpiece</th>
<th>Chipbreaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>197 sfm, f = 0.0016 ipr</td>
<td>304</td>
<td>GBF GL Breaker/PR1535</td>
</tr>
</tbody>
</table>

Twin-bump Chipbreaker Design

Stable Chip Control

Chips are short, curled and broken evenly in low feed machining operations to prevent chip crunching.

Cutting conditions : 197 sfm, f = 0.0016 ipr
Workpiece : 304
Issues
Poor chip control can lead to work-hardened chips jamming between the work surface and the cutting tool. This can lead to inserts chipping out and not lasting through continuous machining cycles.

Solution
TKFB GQ Molded Chipbreakers allow for single-pass machining with both excellent surface finish and chip control for reliable continuous operation.

1 Prevents Chip Jamming and Clogged Chips
GQ Chipbreakers provide single-pass machining reducing cycle times and increasing surface finish quality

Surface Roughness of Flange Surface Comparison

<table>
<thead>
<tr>
<th>D.O.C.</th>
<th>0.157&quot;</th>
<th>0.118&quot;</th>
<th>0.079&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>GQ Chipbreaker</td>
<td><img src="image" alt="Rz = 2.63μm" /></td>
<td><img src="image" alt="Rz = 2.92μm" /></td>
<td><img src="image" alt="Rz = 2.41μm" /></td>
</tr>
<tr>
<td>Competitor O (Ground Chipbreaker)</td>
<td><img src="image" alt="Rz = 27.88μm" /></td>
<td><img src="image" alt="Rz = 31.23μm" /></td>
<td><img src="image" alt="Rz = 25.56μm" /></td>
</tr>
</tbody>
</table>

Cutting conditions: \( V_c = 328 \text{ sfm}, f = 0.0008 \text{ ipr}, \text{ Wet Workpiece: 1045} \)

2 Excellent Chip Control
Features of the GQ Chipbreaker:

Grooving
Prevents chip jamming

External
Stable Chip Control
Prevents Chip Entanglement

GQ Chipbreaker
(Internal Evaluation)
**Issues**

Parting off across the center where cutting speeds drop to zero can lead to short tool life.

**Solution**

Use the KGD Grooving and Cut-off system combined with the PR1535 insert grade, special chipbreakers, and an improved ridged clamping system for long tool life and reliable operation. *Now available in JCT Jet Coolant-Through styles.*

1. **Wide Chipbreaker Lineup for Various Machining Application**

   - **PG Sharpness**
     - Focused
     - F: 0.079"~
   - **PF Low Feed**
     - W: 0.051"~
   - **PQ Medium Feed**
     - W: 0.079"~
   - **PM Medium-High Feed**
     - W: 0.079"~

2. **Long and Stable Tool Life**

   **Wear Resistance Comparison** *(Internal Evaluation)*

   - **KGD (PR1535)**
   - Competitor R
   - Competitor S

   Cutting conditions: Vc = 197 sfm, f = 0.0016 ipr, (0.0008 ipr from 0.197" to the center)
   Wet Workpiece = 304

3. **Increased Clamping Strength**

   - **New Slit Shape**
     - Increased clamping force by tightening the insert clamp side
     - Cutting conditions: Vc = 262 sfm, D.O.C. = 0.039"~0.118", f = 0.010 ipr
     - Wet (Oil-based) Workpiece: W1-9 (Ø0.39")
   - **V-shaped Receiving Face with Convex tip**
     - Increasing the contact area between insert and holder allows for a tighter fitting insert which increases clamping strength
     - The tip of V-shaped receiving face is formed into a convex shape. Expanded contact area with straight part of V face and convex part

   **Clamping strength (Traversing)** *(Internal Evaluation)*

<table>
<thead>
<tr>
<th>D.O.C.</th>
<th>0.039&quot;</th>
<th>0.059&quot;</th>
<th>0.079&quot;</th>
<th>0.118&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>0.010 ipr</td>
<td>0.012 ipr</td>
<td>0.010 ipr</td>
<td>0.010 ipr</td>
</tr>
<tr>
<td>KGD</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Competitor T</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Competitor U</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
</tbody>
</table>
Multiple Tools and sleeves are often required for Turning, Boring, Grooving, and Threading.

Solution

EZ Bar system uses an easily adjustable coolant through sleeve which now fits a variety of inserts to handle turning, boring, grooving and threading jobs.

1 Wide Lineup

Internal Turning

<table>
<thead>
<tr>
<th>Description</th>
<th>Machining allowance:</th>
<th>Machining allowance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>H Chipbreaker (Parallel ground chipbreaker)</td>
<td>0.2mm or more</td>
<td>0.2mm or more</td>
</tr>
<tr>
<td>F Chipbreaker (With lead angle)</td>
<td>0.2mm or more</td>
<td>0.2mm or more</td>
</tr>
<tr>
<td>NB (without chipbreaker)</td>
<td>0.2mm or more</td>
<td>0.2mm or more</td>
</tr>
</tbody>
</table>

1st Recommendation/General Purpose
Applicable to long overhang
(Description: -H; -F; -T)
Uncarborized (GW05) available

Machining allowance: 0.2mm or more

How to select sleeves

EZH-CT
Adjustable overhang length with coolant hole

EZH-HP
Adjustable overhang length

EZH-ST
Fixed overhang length

Special end-face shape of all 3 types enable smooth coolant supply

Grooving, Threading

<table>
<thead>
<tr>
<th>Description</th>
<th>Machining allowance:</th>
<th>Machining allowance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal copying (EZV)</td>
<td>0.2mm or more</td>
<td>0.2mm or more</td>
</tr>
</tbody>
</table>

For Short overhang
For Non-ferrous metals
PCD and CBN available

Minimum Diameter Ø3mm
Applicable to M4 Metric Thread

2 Reduce Dimensional Variation

Excellent clamping force is attained by the bars ability to be tightened with a moveable adjustment pin, which also prevents the bar from rotating during cutting.

Cutting Diameter Variation Comparison (Internal Evaluation)

Cutting conditions : Vc = 217 sfm, D.O.C. 0.004", f = 0.0008 ipr, Wet (Oil-based) Workpiece : W1-9

Cutting Diameter Variation Comparison (Internal Evaluation)
**Case Studies**

### Turning

**Molded Sharp Edge Chipbreaker for Small Parts**

**Pin:** 17-4 PH  
Vc = 180 sfm (n = 3,600 RPM)  
D.O.C. = 0.004" ~ 0.028"  
f = 0.001 ipr  
Wet (Oil-based)  
DCGT32505MFP-GQ PR1535

Number of products  
<table>
<thead>
<tr>
<th>Tool life</th>
<th>GQ Chipbreaker (PR1535)</th>
<th>Competitor W</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,600 pcs/ corner</td>
<td>Tool life 1.3 times</td>
<td>1,200 pcs/ corner</td>
</tr>
</tbody>
</table>

Competitor W’s tool life was unstable because of sudden cracking. GQ chipbreaker (PR1535) increased tool life by 1.3 times with stable machining, no cracking.  
(User Evaluation)

### Grooving

**GBF Molded GL Chipbreaker**

**Part for Nozzle:** 304  
Vc = 148 sfm  
f = 0.0020 ipr  
Grooving Depth 0.024", Wet  
GBF32R100-005GL PR1535

Number of products  
<table>
<thead>
<tr>
<th>Tool life</th>
<th>GQ Chipbreaker PR1535</th>
<th>Competitor X</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 pcs/ corner</td>
<td>Tool life 2 times</td>
<td>200 pcs/ corner</td>
</tr>
</tbody>
</table>

Competitor X’s chips entangled with workpiece due to unstable chip control. GL Chipbreaker maintained stable chip control without entanglement.  
(User Evaluation)

### TKFB GQ Chipbreaker with Molded Chipbreaker for Back Turning

**Adapter:** 304L  
n = 8,200 RPM  
f = 0.0008 ~ 0.002 ipr  
D.O.C. = 0.079" Max  
Wet (Oil-based)  
TKFB12R280005P-GQ PR1535

Number of products  
<table>
<thead>
<tr>
<th>Tool life</th>
<th>GQ Chipbreaker (PR1535)</th>
<th>Competitor Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,700 pcs/ corner</td>
<td>Tool life 1.5 times</td>
<td>1,800 pcs/ corner</td>
</tr>
</tbody>
</table>

Chip control of Competitor Y was unstable. GQ Chipbreaker (PR1535) showed stable chip control and improved tool life to 1.5 times longer.  
(User Evaluation)

### Cut-Off Tools

**KGD for Small Parts**

**Machine Parts:** 304  
Vc = 427 sfm  
f = 0.0016 ipr  
Wet  
GDM3020R-025PM-6D PR1535

Number of products  
<table>
<thead>
<tr>
<th>Tool life</th>
<th>PR1535</th>
<th>Competitor Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 pcs/ corner</td>
<td>Tool life 2 times</td>
<td>200 pcs/ corner</td>
</tr>
</tbody>
</table>

While the feed rate of PR1535 was increased higher than Competitor Z (f = 0.0012 ipr -> 0.0016 ipr), tool life was doubled with good cutting edge condition.  
(User Evaluation)
**Precision Tooling for Small Parts Machining**

**Drills**

- **DRA Replaceable Insert Tip Drill** (inch) (Ø0.313” –)

- **DRV Indexable Insert Drill** (inch) (Ø0.5” –)

**Boring Bars**

- **EZ Bar PLUS Indexable Boring Bar**

- **EZ Bar Solid Boring Series**
  (Boring, Internal Profiling, Internal Grooving, Face Grooving, Threading)

  *Internal coolant holder available

**Back Facing Holder with Center Height Adjustment Function**

**External Sleeve Holder Series**

- **Flange Holder for Back Facing**
- **Sleeve Type**

  *Standard products are specially designed for Star Precision Co., Ltd. Special orders are available for machines of other makers.

**Tools for External Turning**

- **Molded TQ Chipbreaker for Threading**
- **Goose-neck Holder**

**Solid Round Tools**

- **ORION Drill**
  Inch Ø0.047” – Metric Ø1mm –

- **HYDROS Mini Coolant Drill**
  Inch Ø0.047” – Metric Ø1mm –

- **2ZDK Flat Drill**
  Inch Ø0.047” – Metric Ø1mm –

- **HYDROS Coolant Drill**
  Inch Ø0.125” – Metric Ø3mm –
Double Sided Tools for Small Parts
- Large D.O.C.
- LD Chipbreaker
- General Purpose
- SK Chipbreaker
- Small Double
- Sided Tools for Small Parts
- Sharp Edge
- Chipbreaker

Tools for External Turning
- External
- KTKF-JCT for Cut-Off

Grooving Tools with Molded Chipbreaker
- GBF-GL Chipbreaker
- GBF
- Grooving

Back-Turning Tools with Molded Chipbreaker
- KTFB-GQ Chipbreaker
- TKF
- Back-Turning

KGD / KGD-JCT for Small Parts
- Cut-off with Jet Coolant-Thru Option for Small Parts Now Available

Holders for High Pressure Coolant
- External
- GBF-GL Chipbreaker
- KGBF
- Chipbreaker
- KTKF
- TKFB-GQ Chipbreaker
- FESW for Small Parts
- Solid Endmill
Supports Pump Pressure up to 2900 psi. Excellent Performance even with a Medium Pressure of around 217 psi. Superior Cooling Action Improves Tool Life.

1 Excellent Chip Control Performance

The new Jet Coolant Thru tools discharge coolant in two directions towards rake surface of insert and breaks chips into small pieces.

Coolant Discharge Structure Comparison

Coolant is directed from multiple angles to help shred chips into pieces.

KTKF with JCT

Competitor A

Chip Control Comparison (Internal Evaluation)

<table>
<thead>
<tr>
<th>304</th>
<th>KTKF-JCT</th>
<th>Competitor a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ti-6Al-4V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f (ipr)</td>
<td>0.0004</td>
<td>0.0008</td>
</tr>
</tbody>
</table>

Cutting Conditions: Vc = 262 sfm, Wet (Oil-based) Oil Supply Pressure: 217 psi (Internal)
Workpiece: Ø0.472"

Coolant Flow Comparison (Internal Evaluation)

JCT Tools

Oil Supply Pressure: 217 psi (Internal)

2 Superior Cooling Effect Improves Tool Life

The ample supply of coolant at the tool edge area significantly reduces insert wear.

Comparison of Wear Resistance (Internal Evaluation)

Cutting conditions: Vc = 328 sfm, f = 0.0008 ipr, Wet (Oil-based)
Oil Supply Pressure: 217 psi (Internal) Workpiece: (Ti-6Al-4v) Ø0.472"
1st Recommendation for Steel Machining
Excellent Surface Finish and Long Tool Life
Great Performance in Small Parts Machining Applications

**MEGACOAT NANO PLUS**

AITIN/AICrN Nano laminated film with superior wear resistance and adhesion resistance. Excellent surface finish and long tool life.

**REduces Cracking**

Reduces abnormal damage such as chipping because of increased lamination layer with a thinner gap than conventional coatings.

**Special Surface Layer**

- High lubricity
- High aluminum content AITIN layer
- High hardness/Oxidation resistance
- Optimized AICrN layer
- Superior adhesion resistance
- Tough micro-grain carbide substrate
- High stability

**Wear Coefficient Comparison**

<table>
<thead>
<tr>
<th>PR1725</th>
<th>Conventional A</th>
<th>Conventional B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear Coefficient (Internal evaluation)</td>
<td>0.8</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Superior Wear and Chipping Resistance**

High hardness with nano laminated film layer properties Internal stress optimization reduces chipping.

**Applicable to Various Workpiece Materials**

Excellent oxidation resistance and superior high temperature properties maintain good performance in steel, stainless steel and free-cutting steel.

**Excellent Surface Finish**

Special surface layer with great lubricity reduces adhesion.

**High Machining Stability**

Tough micro-grain carbide substrate provides stable machining.

Cutting Conditions: \( V_c = 490 \text{ sfm}, \text{D.O.C.} = 0.020", f = 0.004 \text{ ipr}, \text{Wet Workpiece: } 304 \)

**Applicable to a Wide Range of Machining Applications**

Great performance in both steel and stainless steel from low to high speed machining.

**Steel**

PR1725 : 1st Recommendation for Steel

**Stainless Steel**

PR1725 : For general purpose high-speed machining

PR1535 : 1st Recommendation for stainless steel machining with long tool life and high-quality surface finish

**Molded Sharp Edge Chipbreaker Series**

A wide variety of chipbreakers provides better chip control

Cutting Force and Surface Finish Oriented (Low Cutting Force)

Pr1725 : For general purpose high-speed machining

PR1535 : 1st Recommendation for stainless steel machining with long tool life and high-quality surface finish
Molded Chipbreakers Achieve Stable Chip Control and Continuous Machining Applicable to Small Part Machining with Low Cutting Force Design

**Stable Chip Control**

Stable chip control in a given direction with asymmetric chipbreaker design

**Chipbreaker Geometry**

Stable chip control regardless of cutting direction

For Radial Infeed

Asymmetric dot design controls chip-flow direction

For Flank Infeed / Flank Compound Infeed

Breaks chips easily with shallow chipbreaker depth

**Chip Control Comparison**

(Internal Evaluation)

Radial Infeed

Cutting Condition: Vc = 492 sfm, D.O.C. = 0.0047” (4th Pass), L = 0.97”, Wet, 16ER150ISO Type M45 × P1.5 Workpiece: 4118

Flank Compound Infeed

TQ Chipbreaker

Competitor B

**Featured Products**

**LD Chipbreaker** Large Depths of Cut

Suitable for Large Depths of Cut Machining in a Single Pass

Max Depth of Cut is 0.47”. LD Chipbreakers achieve high-precision machining in a single pass. Low-resistance cutting edge suppresses chattering offering stable chip control in a wide range of machining applications.

Large rake angle and slanted cutting edge for low-resistance, smooth machining

**LD Chipbreaker Application Map**

KYOCERA Precision Tools

102 Industrial Park Road
Hendersonville, NC 28792
Customer Service | 800.823.7284 - Option 1
Technical Support | 800.823.7284 - Option 2

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