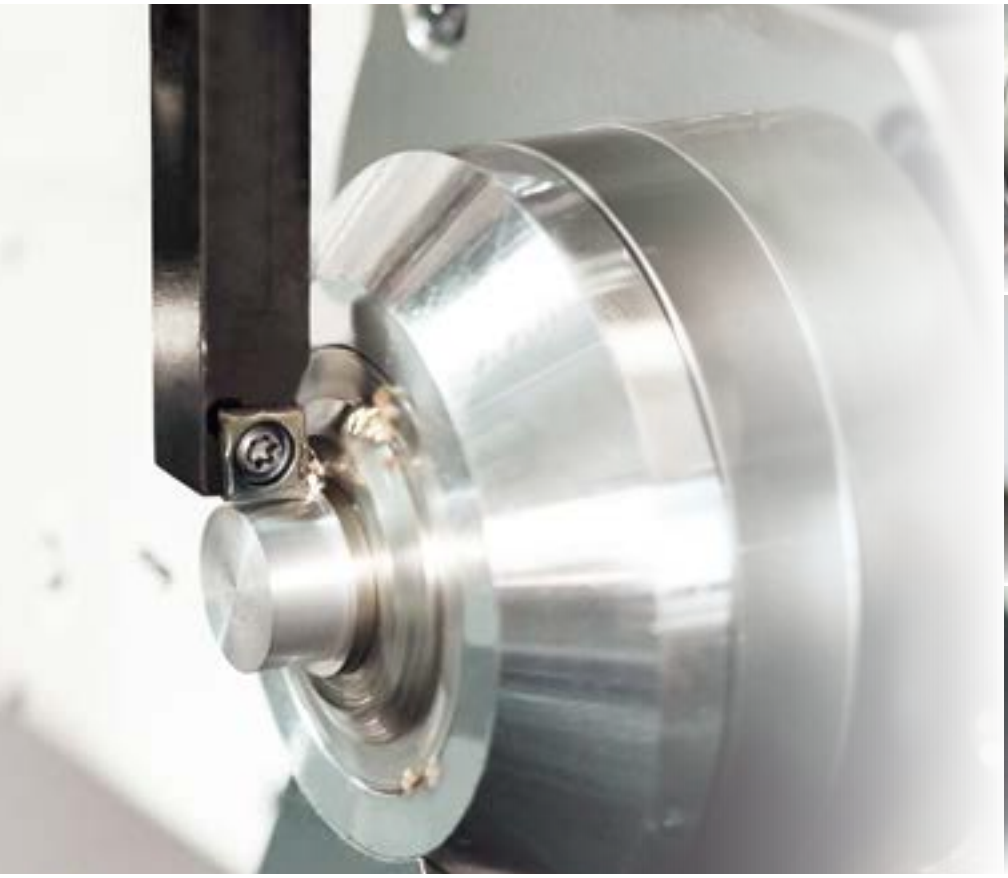
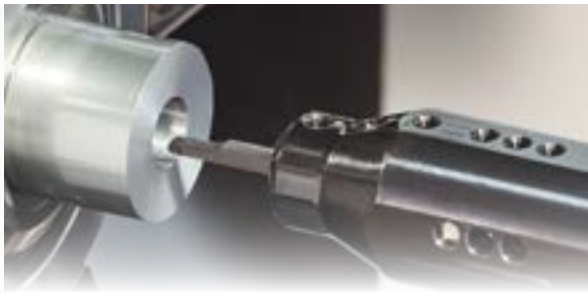
THE NEW VALUE FRONTIER

KYOCERA

Tooling solutions for small and automatic lathes





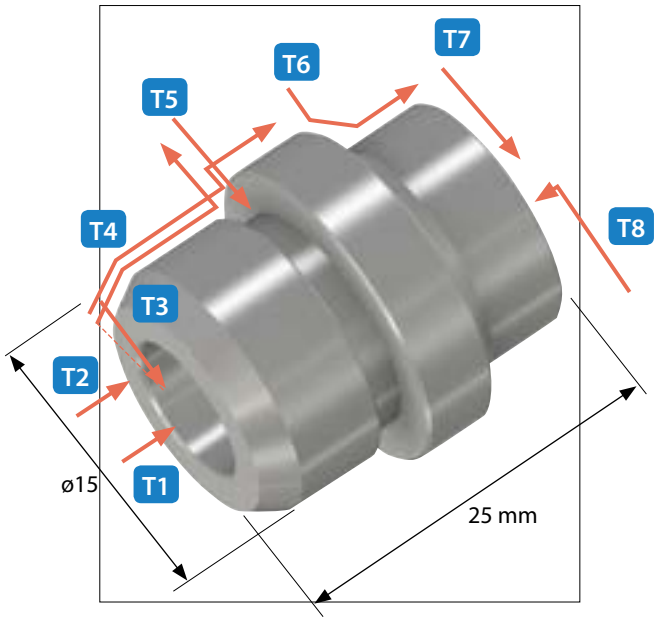
NEW PRODUCTS

3D molded sharp edge chipbreakers

Boring
EZ bar series

Grooving
GBF series

Cut-Off
KGD series



Introduction

Chip control by machining the material X5CrNi18-10 is very difficult. Optimizing tool selection for each machining is the key to productivity improvement since many processes are required.

Note for machining

1) Stable control with 3D molded chipbreaker
2) Sharp cutting edge enables high quality surface finish
3) Long tool life with heat-resistant coating "PR1535"

Grade selection

PR1535 is suitable for stainless steel machining. Achieve long tool life and stable stainless steel machining with the combination of a tough substrate and a special Nano coating layer.

T1 ▸▸ P3

DRA

High precision and high efficiency machining

SS10-DRA080M-3
DA0800M-GM PR1535

Cutting conditions
Vc = 70 m/min
f = 0.08 mm/rev

T3 **T4** ▸▸ P5

3D molded sharp edge chipbreakers

These chipbreakers combines sharpness and superior chip control

T3 SCLCR1212JX-09FF
CCGT09T304MFP-GQ PR1535

T4 SDJCR1216JX-11-F15
DCGT11T302MFP-SK PR1535

Cutting conditions

Roughing
SK chipbreaker
Vc = 80 m/min, ap = 0.2 - 2.5 mm
f = 0.1 mm/rev

Finishing
GF chipbreaker
Vc = 80 m/min, ap = 0.5 mm
f = 0.08 mm/rev

T2 **T8** ▸▸ P4/P9

EZ Bar series

Lineup from high precision solid bars to indexable type

T2 EZH07019CT-120
C06X-SCLCR04 - 070EZ
CCGT040102MP-CF PR1535

T8 EZH06019HP-120
EZVBR065060-010 PR1225

Cutting conditions

Boring
EZ bar PLUS: indexable type
Vc = 60 m/min, ap = 0.25 mm
f = 0.04 mm/rev

Back facing
EZ bar
Vc = 60 m/min, ap = 0.2 mm
f = 0.05 mm/rev

T5 ▸▸ P6

GBF GL Chipbreaker

3D molded chipbreaker enables smooth chip control

KGBFR1212JX-16F
GBF32R100-005GL PR1535

Cutting conditions
Vc = 80 m/min
f = 0.08 mm/rev
Grooving depth: 3 mm

T6 ▸▸ P7

TKFB – GQ chipbreaker

Back turning with 3D molded chipbreaker for single-pass machining

KTKFR1212JX-12
TKFB12R28005- GQ PR1535

Cutting conditions

Grooving
Vc = 80 m/min
ap = 0.3 mm
f = 0.02 mm/rev

External turning
Vc = 80 m/min
ap = 3.0 mm
f = 0.06 mm/rev

T7 ▸▸ P8

KGD for automatic lathe

Good chip control at low feed rate

KGDSR1616JX-2B
GDM2020N-015PF PR1535

Cutting conditions
Vc = 80 m/min
f = 0.04 mm/rev

MEGACOAT NANO PR1535

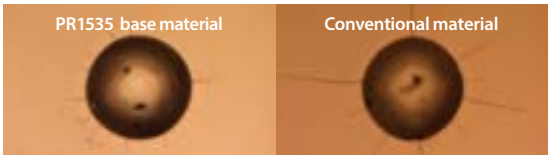
Achieves long tool life and stable stainless steel machining with the combination of a tough substrate and a special Nano coating layer

1. Toughening by a new cobalt mixing ratio
   *In-house evaluation
2. Improved stability by optimization and homogenization of grains in the base material
3. MEGACOAT NANO coating technology for long tool life and stable machining

23% Fracture toughness*

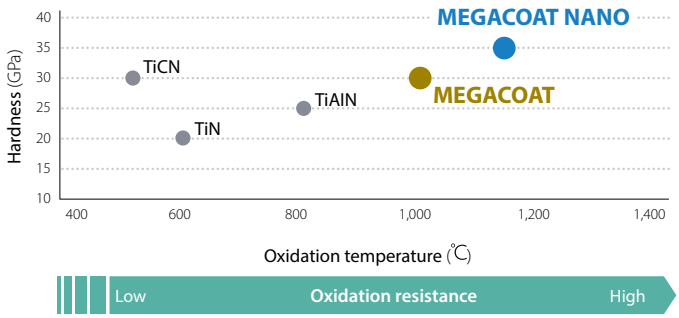
Cracking comparison by diamond indenter (In-house evaluation)

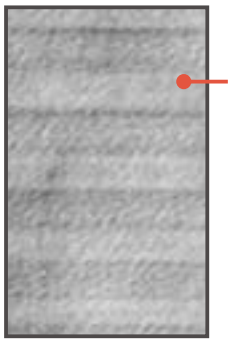
Impact resistance



Short cracks | Long cracks

Coating properties (In-house evaluation)



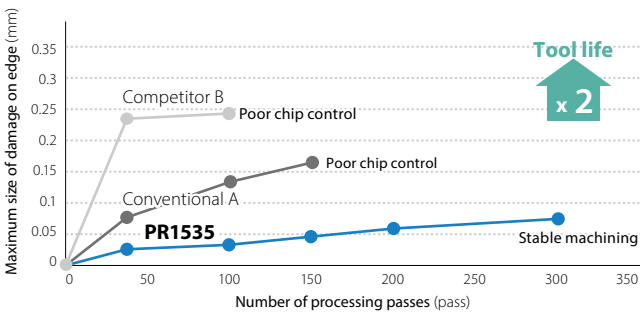


MEGACOAT base layer structure

Note

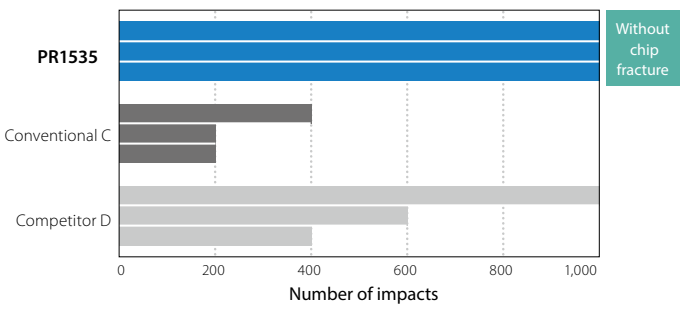
PR1535 shows superior performance in steel machining under unstable conditions, preventing early cracking and variation in tool life.

Wear resistance evaluation (In-house evaluation)



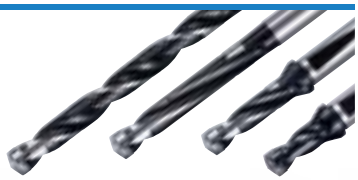
Cutting conditions: n = 1,273 min^{-1} (Vc = 80 m/min), f = 0.025 mm/rev, wet (Oil-based)
Workpiece : X5CrNi18-10 (ø20)

Fracture resistance evaluation (In-house evaluation)



Cutting conditions: n = 509 min^{-1} (Vc = 80 m/min), f = 0.12 mm/rev, wet (water soluble)
Workpiece : X5CrNi18-10 (ø50, 10 mm width x4)

* Evaluated with the KGD



Issues

There is a wide variety of requests for drilling such as coaxiality and circularity. It is important to achieve high-precision and stable drilling.

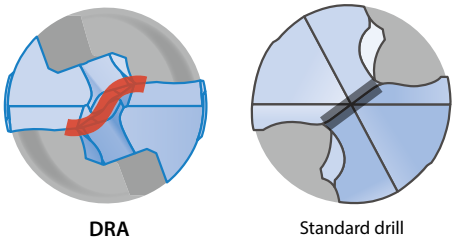
Solution

It is most important to select a drill with low cutting force.
Kyocera`s modular drill DRA provides excellent hole accuracy with a low cutting force design.
The lineup starts from cutting diameter ø 7.94 mm and 1.5D toolholder.

1.5D holder:
Suitable for automatic lathe machining

1 Low cutting force desgn improves hole accuracy

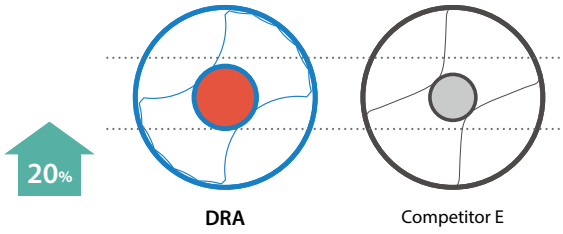
Special chisel edge with S-curve reduces thrust force and controls vibration.



2 Optimal web thickness limits deflection

Improved hole accuracy by controlling drill deflection with a 20 % thicker web compared with Competitor E.

Web thickness comparison



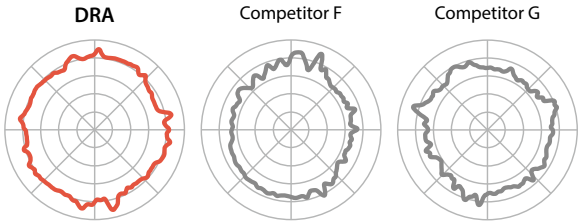
Small diameter drilling

From ø 0.5 mm cutting diameter GP108M

From ø 1 mm cutting diameter 2ZDK

*2ZDK is not recommended for stainless steel machining

Roundness · cylindricity comparison (In-house evaluation)



	DRA	Competitor F	Competitor G
Roundness	18.7 µm	31.1 µm	27.3 µm
Cylindricity	23.6 µm	34.3 µm	30.1 µm

Cutting conditions: Vc = 120 m/min, f = 0.3 mm/rev
Cutting diameter: ø 14 mm, measurement point 55 mm, wet
Workpiece: C50

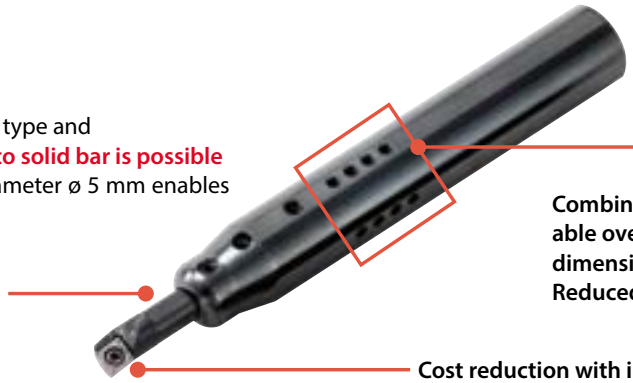
High precision and low-cost machining with EZ bar PLUS

Issues

It takes time to change tools at boring and the repeat accuracy is important.

Solution

Offering the convenience of indexable type and
machining with equivalent accuracy to solid bar is possible
Supporting from minimum cutting diameter ø 5 mm enables to reduce cost of tools.



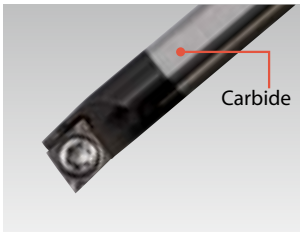
Carbide shank and steel shank available.

Combining the sleeve with adjustable overhang length prevents dimensional variation. Reduced setting time.

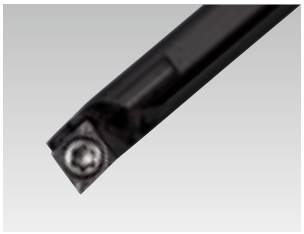
Cost reduction with indexable type.

1 Minimum boring diameter: ø 5 mm

Carbide type and steel type are available for various applications.



Carbide type

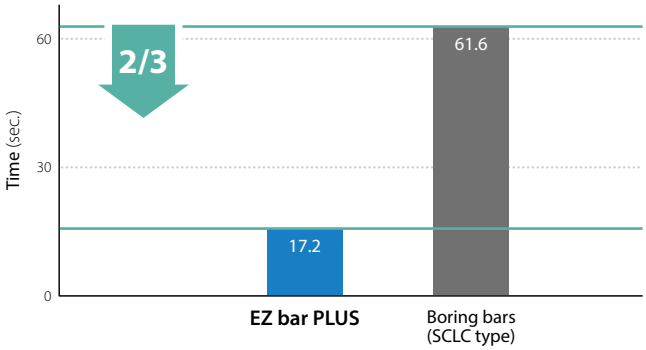


Steel type

2 Fast insert exchange

EZ adjust structure enables drastic shortening of the setting time compared to boring bars

Insert change time comparison (In-house evaluation)

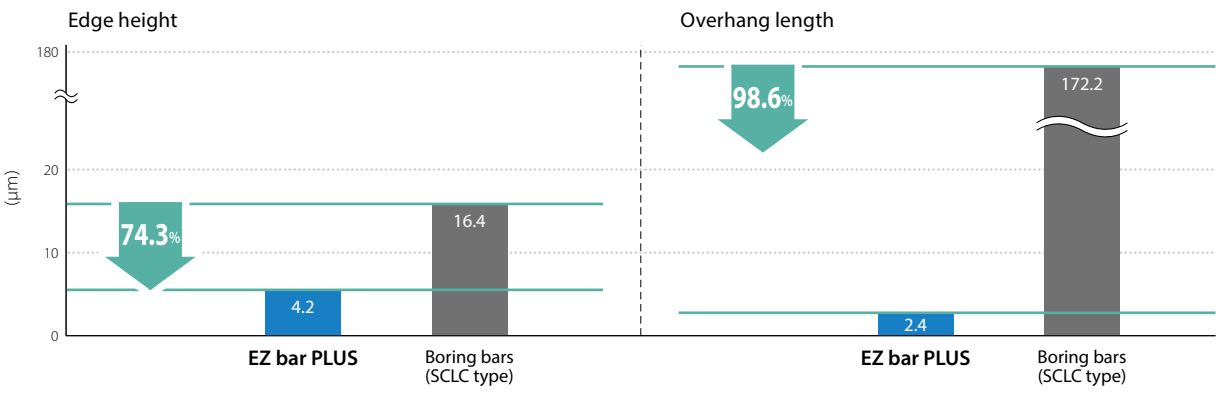


* Average of 5 times

3 Superior repeat accuracy

EZ adjust structure realizes higher repeat accuracy than boring bars

Repeat accuracy comparison (In-house evaluation)



3D molded sharp edge chipbreakers for stable chip control

Issues

A handed ground chipbreaker with sharp cutting edge easily allows chip entanglement.
Also bad finished surface of M grade by 3D molded chipbreaker's is a big trouble for automatic lathe which requires continuous machining.

Solution

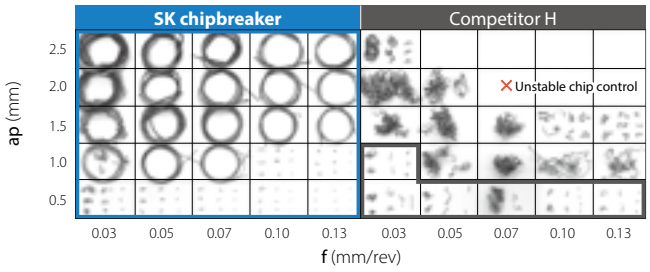
Kyocera offers a large lineup of 3D sharp edge chipbreakers.
By choosing an appropriate chipbreaker according to the ap, **it is possible to improve chip control and realize an excellent finished surface.**

Resistance oriented (Low cutting force)

SK chipbreaker: Low cutting force, finishing

ap: 0.5 mm – 3.0 mm
3D molded chipbreaker combines sharpness and superior chip control.

X5CrNi18-10

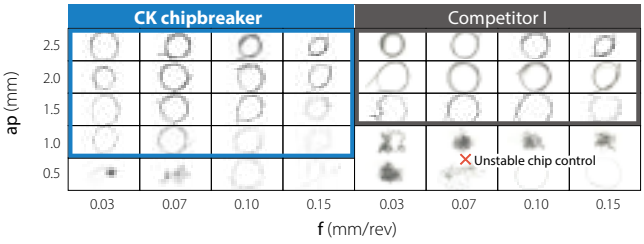


Cutting conditions : Vc = 100 m/min, wet, DCGT11T302 type

CK chipbreaker: Low cutting force, general purpose

ap: 1.0 – 2.5 mm
Smooth chip evacuation with large rake angle.

C45



Cutting conditions : Vc = 100 m/min, wet, CCGT09T302 type

Chip control oriented

GQ chipbreaker: Small – large ap

ap: 0.8 mm – 5.0 mm (Steel)
0.8 mm – 3.0 mm (Stainless steel)
Chipbreaker for wide range of machining applications.

GF chipbreaker: Finishing

ap: 0.25 mm – 1.25 mm
Stable chip control at finishing.

CF chipbreaker: Minute ap

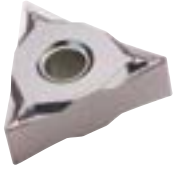
ap: 0.02 mm – 0.2 mm
Excellent chip control with minute ap.

Small double sided tooling

Applicable to workpiece larger than ø16 mm / Lineup from corner radius 0.1 mm (minus tolerance)

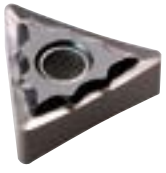
SK chipbreaker: Finishing – medium machining

Chipbreaker with both sharpness and superior chip control.



TK chipbreaker: Medium machining – roughing

Supports wide range of cutting conditions with low cutting force design.



Stable chip control with GBF GL molded chipbreaker

Issues

Ground chipbreaker easily allows chip entanglement on workpiece.

Solution

3D molded chipbreaker is available for grooving on automatic lathe.
Traversing is available as well.

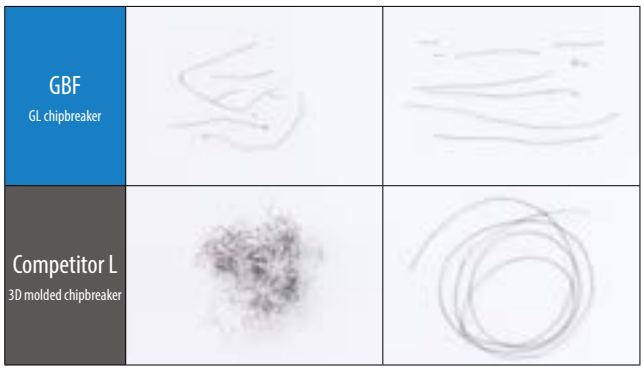
1 Excellent chip control

Switching from ground chipbreaker prevents short time breakdown.

f = 0.05 mm/rev f = 0.06 mm/rev f = 0.07 mm/rev
Workpiece: C45

2 Traversing available

Excellent chip control.

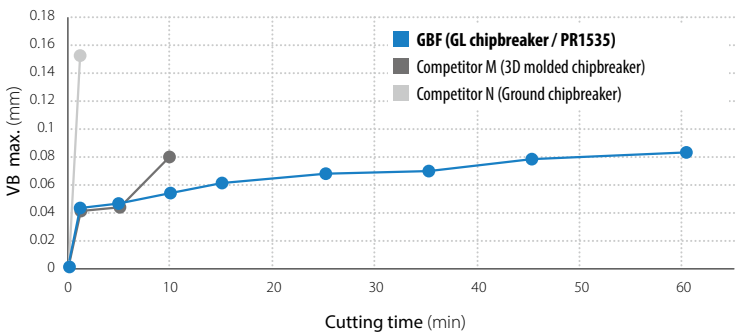


f = 0.02 mm/rev f = 0.03 mm/rev
Workpiece: C45

3 Long and stable tool life

Fracture resistant cutting edge design enables stable machining.

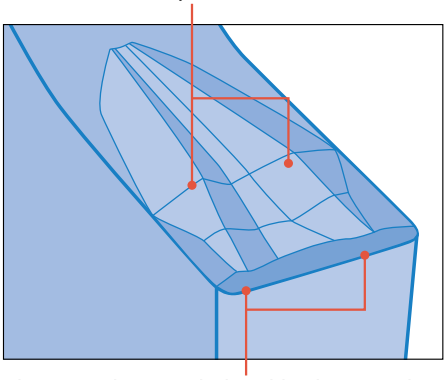
Wear resistance comparison (In-house evaluation)



Cutting conditions: Vc = 60 m/min, f = 0.04 mm/rev, wet
Workpiece : X5CrNi18-10

Twin-dotted chipbreaker

Stable chip control



Chips are short, curled and broken evenly in low feed machining operations.

Only Kyocera has the lineup of twin-dotted chipbreakers from edge width 0.75 mm.

TKFB GQ chipbreaker enables to cut at a shot

Issues

Many users may have the trouble of peeled surface caused by chip jamming. It is hard to keep continuous-machining stable at back turning since chip control at grooving is a big problem.

Solution

If you use the 3D molded chipbreaker at back turning, both excellent surface finish and chip control can be achieved.
Single-pass machining available. It also helps to reduce cycle time.

1 Prevents chip jamming and clogged chips

GQ chipbreaker provides single-pass machining. Enables to reduce cycle time.

Surface roughness comparison (In-house evaluation)

Comparison of surface roughness of flange surface

ap	4 mm	3 mm	2 mm
GQ chipbreaker	 Rz = 2.63 µm	 Rz = 2.92 µm	 Rz = 2.41 µm
Competitor O Ground chipbreaker	 Rz = 27.88 µm	 Rz = 31.23 µm	 Rz = 25.56 µm

Cutting conditions: Vc = 100 m/min, f = 0.02 mm/rev, wet workpiece : C45

2 Excellent chip control

Special 3D molded chipbreaker with two different functions.

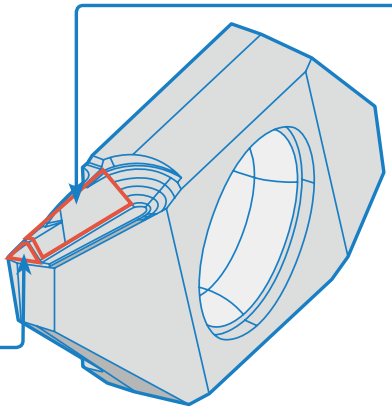
Grooving Superior surface finish

Supresses chip jamming

GQ chipbreaker

Competitor P
Ground chipbreaker

(In-house evaluation)



External Stable chip control

Preventing chip entanglement

GQ chipbreaker

Competitor Q
Ground chipbreaker

(In-house evaluation)

KGD for automatic lathe provides longer tool life

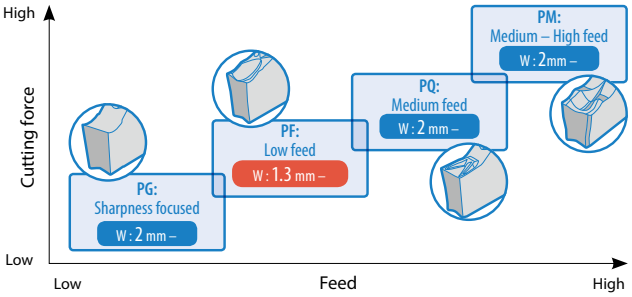
Issues

At cut-off, machining should be done up to the center of workpiece, where cutting speed is 0 m/min. Usually, long tool life at cut-off is hard to be achieved since cracking and wearing occur at low feed rate.

Solution

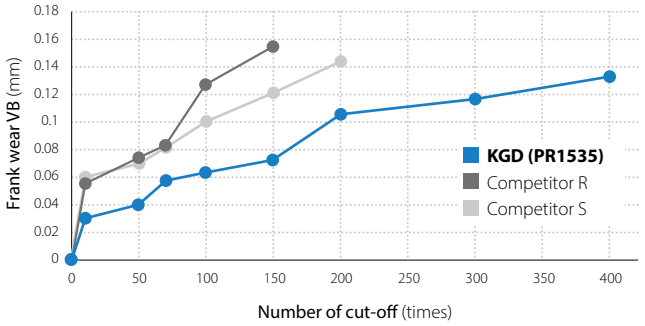
Combining special chipbreaker and PR1535 leads to long tool life and stable machining.
Good chip control and high clamping strength enable stable machining when using 1.3 mm width insert.

1 Chipbreaker lineup for various machining application



2 Long and stable tool life

Wear resistance comparison (In-house evaluation)

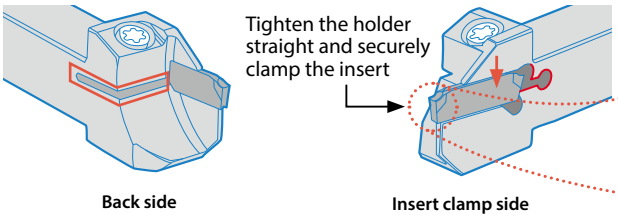


Vc = 60 m/min, f = 0.04 mm/rev (0.02 m/rev from ø 5 mm to the center)
Wet, workpiece = X5CrNi18-10

3 High clamping strength

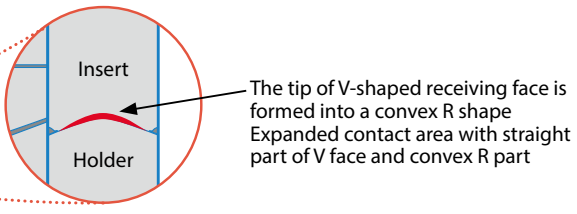
New slit shape

Improved clamping strength by firmly tightening the insert clamp side.



V-shaped contact area

Increasing the contact area between insert and holder improves clamping strength and the insert to be fit the holder



Cutting conditions : Vc = 80 m/min, ap =1 – 3 mm, f = – 0.3 mm/rev, wet (Oil-based)
Workpiece : Carbon tool steel (SK4) (ø 10 mm)

Clamping strength (Traversing)
(In-house evaluation)

ap	1 mm		1.5 mm		2 mm		3 mm	
f (mm/rev)	0.25	0.3	0.25	0.3	0.25	0.3	0.25	0.3
KGD	■	■	■	■	■	■	■ ×	Stable machining
Competitor T	■	■	×					
Competitor U	■	■	×					

Issues

Supporting various machining with one sleeve is required.

Solution

Besides internal turning, internal copying, internal grooving, face grooving and threading are possible.
Easy adjustable special sleeve leads to high repeat accuracy and prevents cutting dimension variation.

1 Wide lineup

Internal turning

H chipbreaker
Parallel ground chipbreaker

Machining allowance: 0.2 mm or more

1st Choice/General purpose
Applicable to long overhang
(Description:..HP...-LT)
Uncoated carbide (GW05) available

F chipbreaker
With lead angle

Machining allowance: 0.2 mm or less

For finishing/Sharp cutting

NB
without chipbreaker

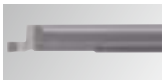
For Non-ferrous metals
PCD and CBN available

Internal copying
EZVB

Grooving / Threading

Internal grooving
EZG

Face grooving
EZFG



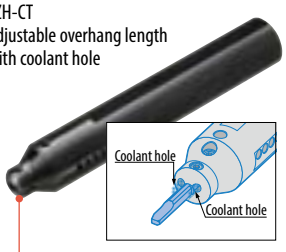
Threading
EZT

Min. dia. ø 3 mm
Applicable to M4 metric thread

How to select sleeves

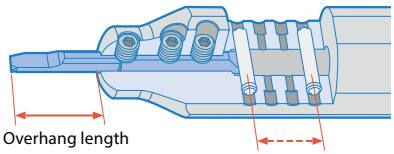
3 types of sleeve with internal coolant are available

EZH-CT
Adjustable overhang length
with coolant hole



EZH-HP
Adjustable overhang length

EZH-ST
Fixed overhang length



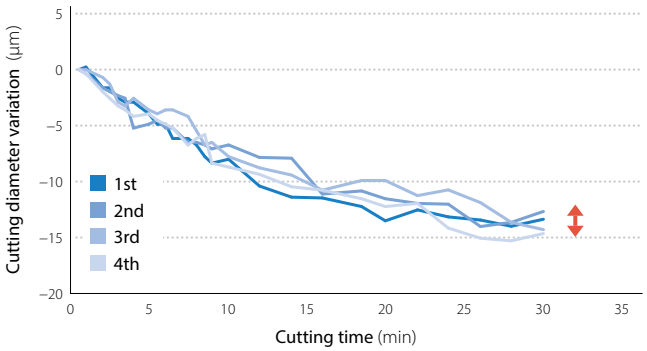
Special end-face shape of all 3 types enable smooth coolant supply.

2 Reduce dimensional variation

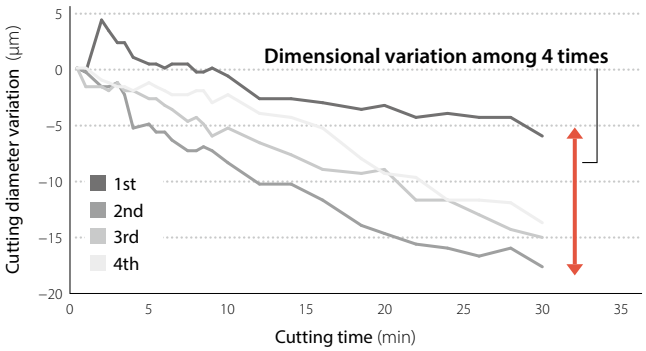
**High clamping strength is achieved by the inclined face of the insert rear face and positioning pin.
Suppress inserts displacement during machining.**

Cutting diameter variation comparison (In-house evaluation)

EZ bars



Competitor V

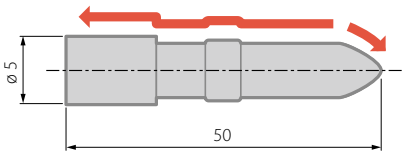


Cutting conditions: Vc = 66 m/min, ap = 0.1 mm, f = 0.02 mm/rev, wet (Oil-based) Workpiece : Carbon tool steel (SK4)

Turning
3D sharp edge chipbreaker for automatic lathe

Pin X5CrNiCuNb16-4

Vc = –55 m/min (n = 3,600 min^{-1})
ap = 0.1 mm – 0.7 mm
f = 0.03 mm/rev
Wet (Oil-based)
DCGT11T302MFP-GQ PR1535



Number of products

		Tool life
GQ chipbreaker (PR1535)	1,600 pcs / corner	1.3x
Competitor W	1,200 pcs / corner	

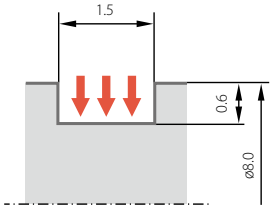
Competitor W 's tool life was unstable because of sudden cracking. GQ chipbreaker (PR1535) increased tool life by 1.3 times with stable machining; no cracking.

(User evaluation)

Grooving
GBF 3D molded GL chipbreaker

Part for nozzle stainless steel

Vc = 45 m/min
f = 0.05 mm/rev
Grooving depth 0.6 mm, wet
KGBFR1212JX-16F
GBF32R100-005GL PR1535



GL chipbreaker PR1535

Competitor X

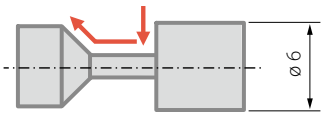
Competitor X's chips entangled with workpiece due to unstable chip control. GL Chipbreaker maintained stable chip control without entanglement.

(User evaluation)

TKFB GQ chipbreaker with 3D molded chipbreaker for back turning

Adapter X5CrNi18-10L

n = 8,200 min-1
f = 0.02 mm – 0.05 mm/rev
ap = 2.0 mm Max
Wet (Oil-based)
KTKFR1010JX-12
TKFB12R28005P-GQ PR1535



Tool life

		Tool life
GQ chipbreaker (PR1535)	2,700 pcs/ corner	1.5x
Competitor Y	1,800 pcs/ corner	

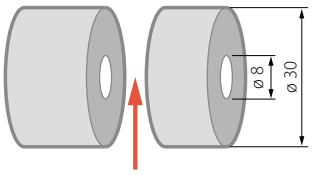
Chip control of competitor Y was unstable. GQ Chipbreaker (PR1535) showed stable chip control and improved tool life; up to 1.5 times longer.

(User evaluation)

Cut-off tool
KGD for automatic lathe

Machine parts X5CrNi18-10

Vc = 130 m/min
f = 0.04 mm/rev
Wet
GDM3020R-025PM-6D PR1535



Number of products

		Tool life
PR1535	400 pcs/ corner	2x
Competitor Z	200 pcs/ corner	

While the feed rate of PR1535 was increased higher than competitor Z (f = 0.03 mm/rev -> 0.04 mm/rev), tool life was doubled with good cutting edge condition.

(User evaluation)

Large tooling lineup with high precision and high efficiency for automatic lathe

Drills

Solid drill GP108M (ø0.5–)

Flat drill 2ZDK (ø1–)

Modular drill DRA (ø7.94–)

Indexable insert drill DRV (ø14–)

Boring bars

Indexable boring bar EZ bar PLUS

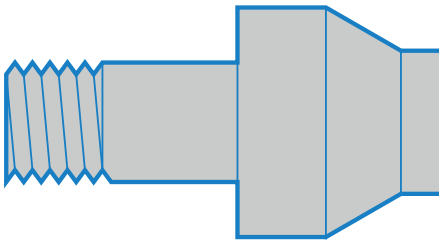
Solid boring EZ Bar series
(Boring, internal copying, internal grooving, face grooving, threading)

*Internal coolant holder available

Boring bars Dynamic bar series

3D molded TQ chipbreker for threading

Goose-neck holder



Back facing

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.

Back facing holder with center height adjustment function

External, grooving, threading

External sleeve holder series

Tools for external turning

Double sided tools

Large ap
LD chipbreaker

General purpose
SK chipbreaker

Small double
sided tools

3D sharpe edge
chipbreaker

Holders for high pressure coolant

External

KTKF-JCT for
cut-off

GBF-GL
chipbreaker

Grooving
3D molded
chipbreaker

KGBF

Grooving

KTKF

Back-turning

TKFB-GQ
chipbreaker

Back-turning
3D molded
chipbreaker

FESW for
automatic lathe

Solid endmill

KGD for
automatic lathe

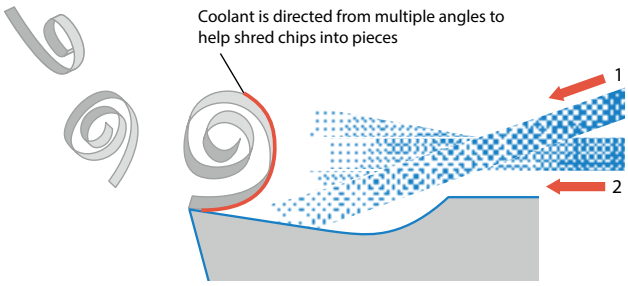
Cut-off

Pump pressure is supported up to 20 Mpa. Excellent performance even with a medium pressure pump of approx. 1.5 MPa.
Finely breaks chips into small pieces. Superior cooling action improves tool life.

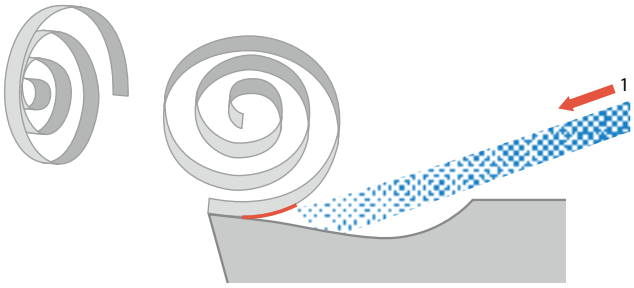
1 Stable chip control

Discharges coolant in two directions towards rake surface of insert.

Coolant discharge structure comparison



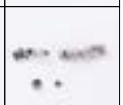
KTKF-JCT



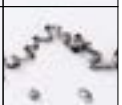
Competitor A

Chip control comparison (In-house evaluation)

X5CrNi18-10

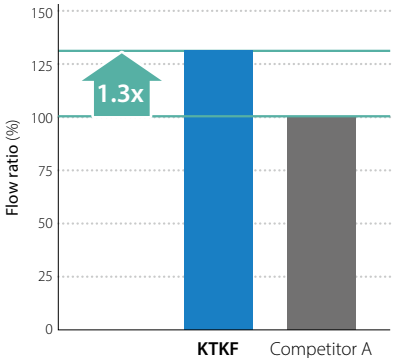
f (mm/rev)	0.01	0.02	0.03
KTKF-JCT			
Competitor A			

Ti-6Al-4V

f (mm/rev)	0.01	0.02	0.03
KTKF-JCT			
Competitor A			

Cutting conditions: Vc = 80 m/min, wet (Oil-based) Oil supply pressure : 1.5 MPa (Internal)
Workpiece: ø 12 mm

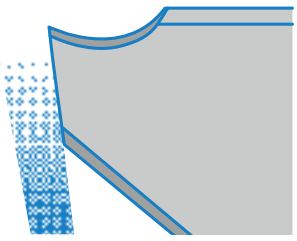
Coolant flow comparison (In-house evaluation)



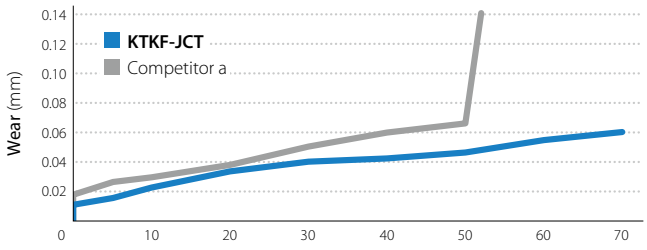
Oil supply pressure: 1.5 MPa (Internal)

2 Superior cooling effect improves tool life

Coolant is directed from the flank face of the insert as well. An ample supply of coolant to the tool edge area helps to suppress insert wear.



Comparison of wear resistance (In-house evaluation)



Cutting conditions: Vc = 100 m/min, f = 0.02 mm/rev, wet (Oil-based)
Oil supply pressure: 1.5 MPa (Internal) Workpiece : Ti-6Al-4v, ø 12 mm

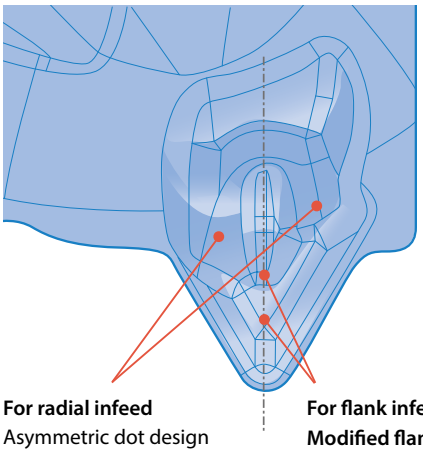
3D molded chipbreaker achieves stable chip control and continuous machining.
Applicable to automatic lathe machining with low cutting force design.

1 Stable chip control

Stable chip control in a given direction with asymmetric chipbreaker design.

Chipbreaker geometry

Stable chip control regardless of cutting direction.

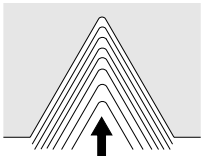


For radial infeed
Asymmetric dot design controls chip-flow direction.

For flank infeed / Modified flank infeed
Breaks chips easily with shallow chipbreaker depth.

Chip control comparison (In-house evaluation)

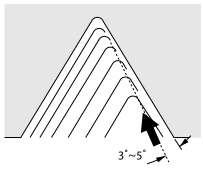
Radial infeed



TQ chipbreaker

Competitor B

Modified flank infeed



TQ chipbreaker

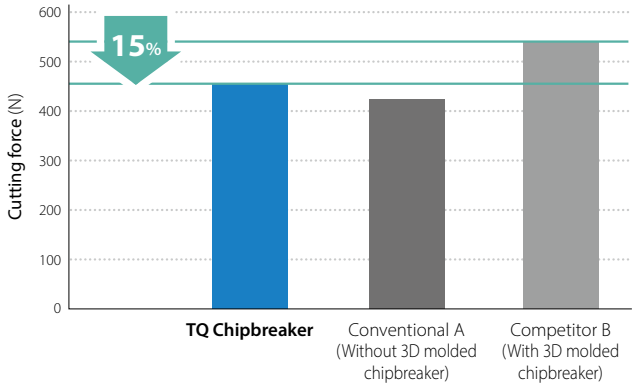
Competitor B

Cutting Condition: Vc = 150 m/min, ap = 0.12 mm (4th Pass), L = 25 mm, wet, 16ER150ISO type M45 × P1.5 Workpiece: 15CrMo4

2 Low cutting force to suppress vibration

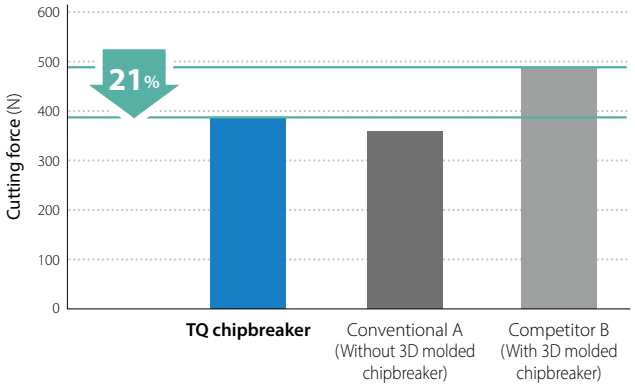
Strong edge and low cutting force

Cutting force comparison Radial infeed (In-house evaluation)



Cutting condition: Vc = 150 m/min, wet, 16ER150ISO type
Cutting force is average of total passes (6 passes), M35 × P1.5 Workpiece : 15CrMo4

Cutting force comparison Modified flank infeed (In-house evaluation)



Cutting condition: Vc = 150 m/min, Modified angle 5°, wet, 16ER150ISO type
Cutting force is average of total passes (6 passes), M35 × P1.5 Workpiece : 15CrMo4

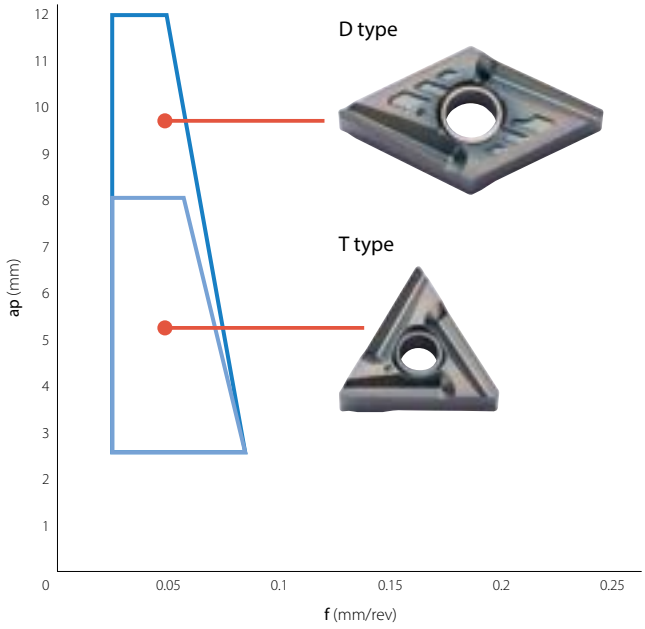
LD chipbreaker for large depths of cut

Maximum depth of cut is 12 mm. High-Precision machining in a single pass. Low-resistance cutting edge suppresses chattering. Stable chip control in a wide range of machining applications.

1 Suitable for large depths of cut with single pass machining

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

LD chipbreaker application map



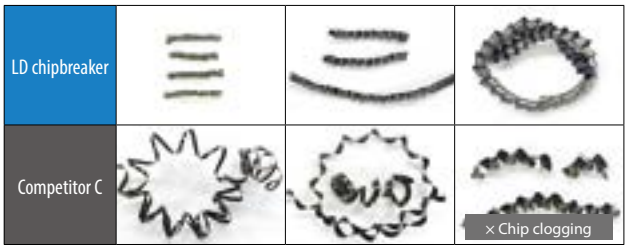
2 Superior chip control in a wide range of applications

Chipbreaker shape optimized for various depths of cut
Stable chip control in a wide range of machining applications.

Chip control comparison (In-house evaluation)

T Type (Workpiece diameter : ø 25 mm)

C45



Cutting conditions: Vc = 80 m/min, f = 0.05 mm/rev, wet (Oil-based), TNMG160404

X5CrNi18-10

Cutting conditions : Vc = 60 m/min, f = 0.03 mm/rev, wet (Oil-based), TNMG160404

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