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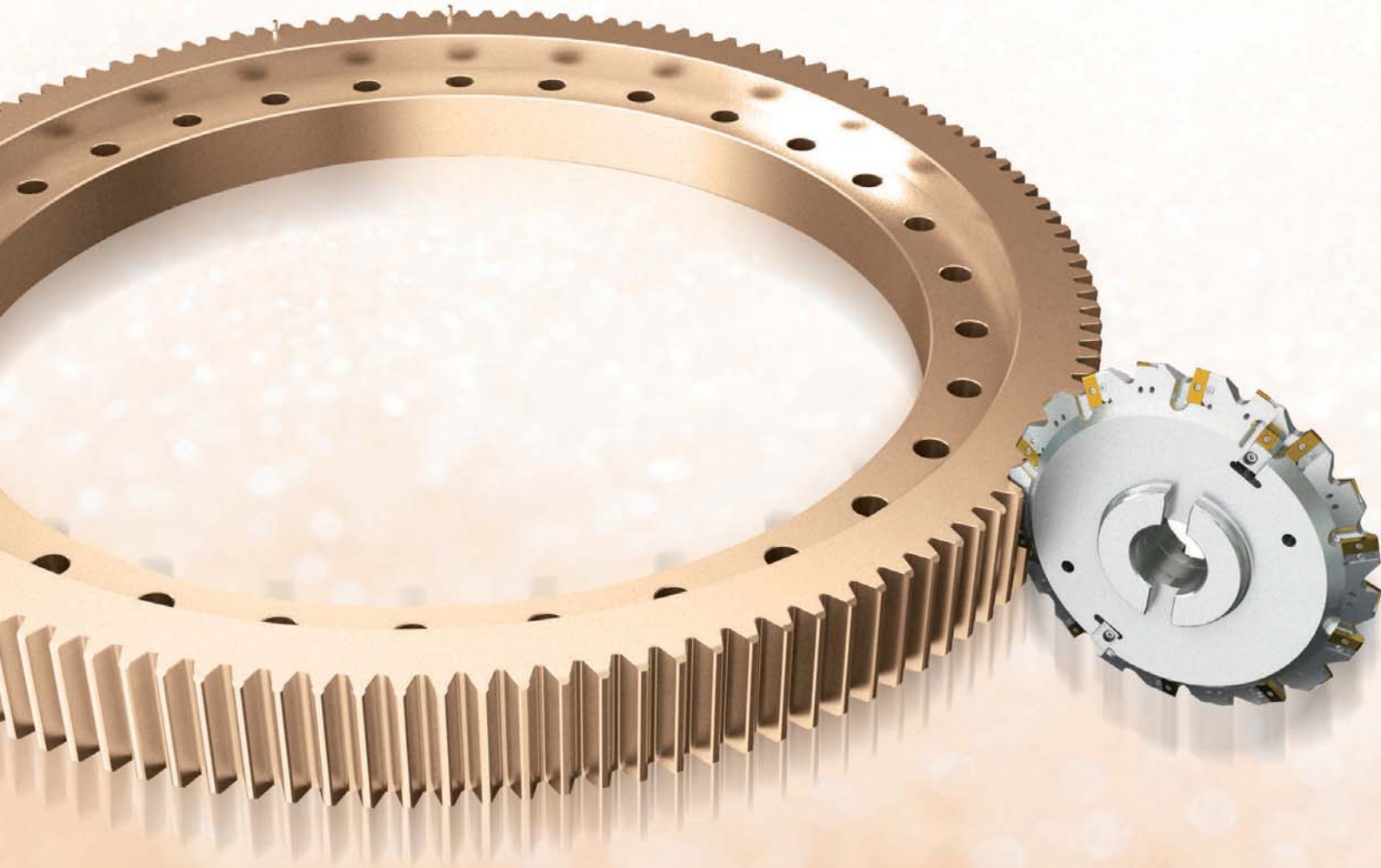
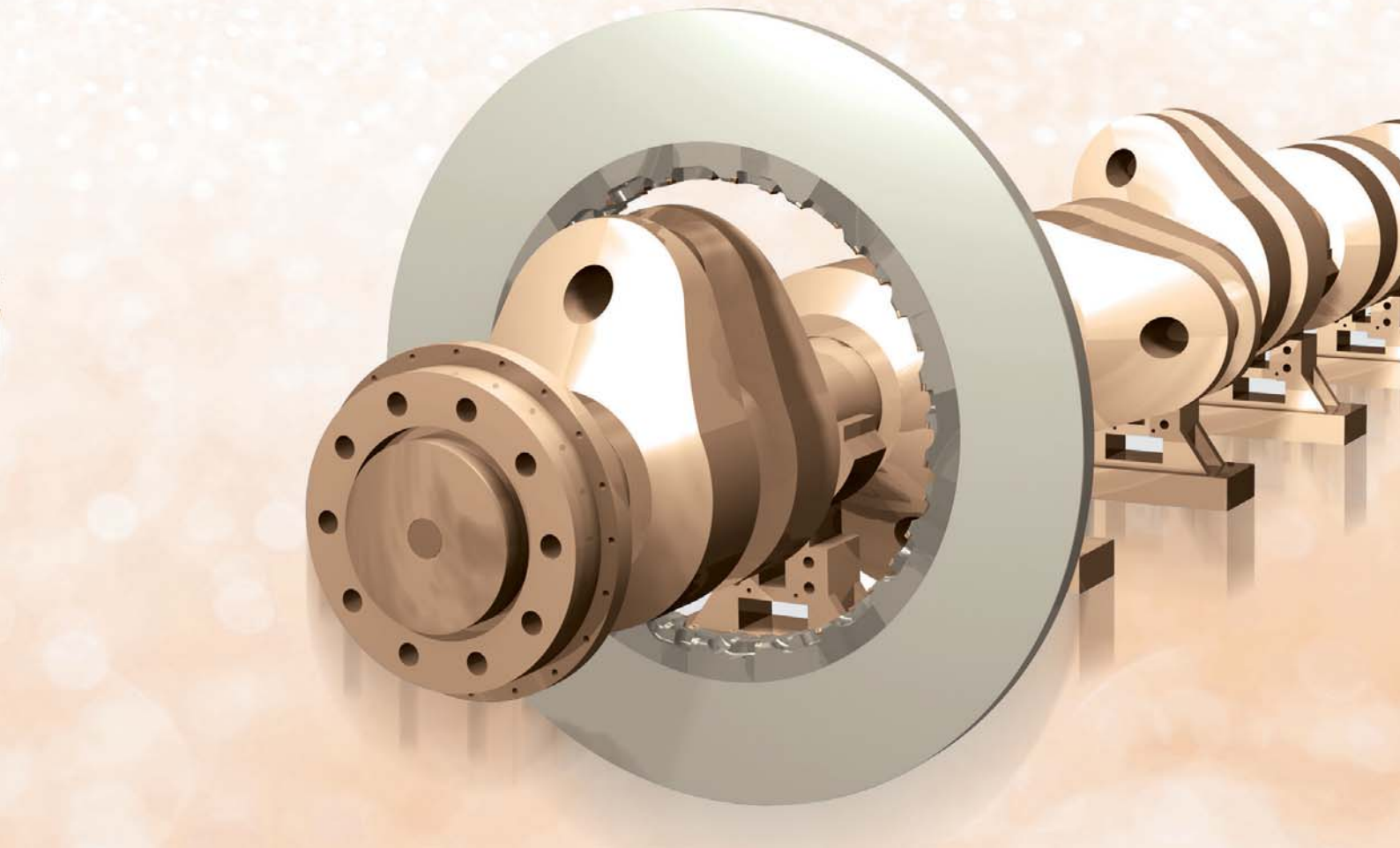
TOOLING EXAMPLES



Industrial Tooling Example

Automobile Tooling Examples



Gear machining (External Gear)

Cutter for roughing

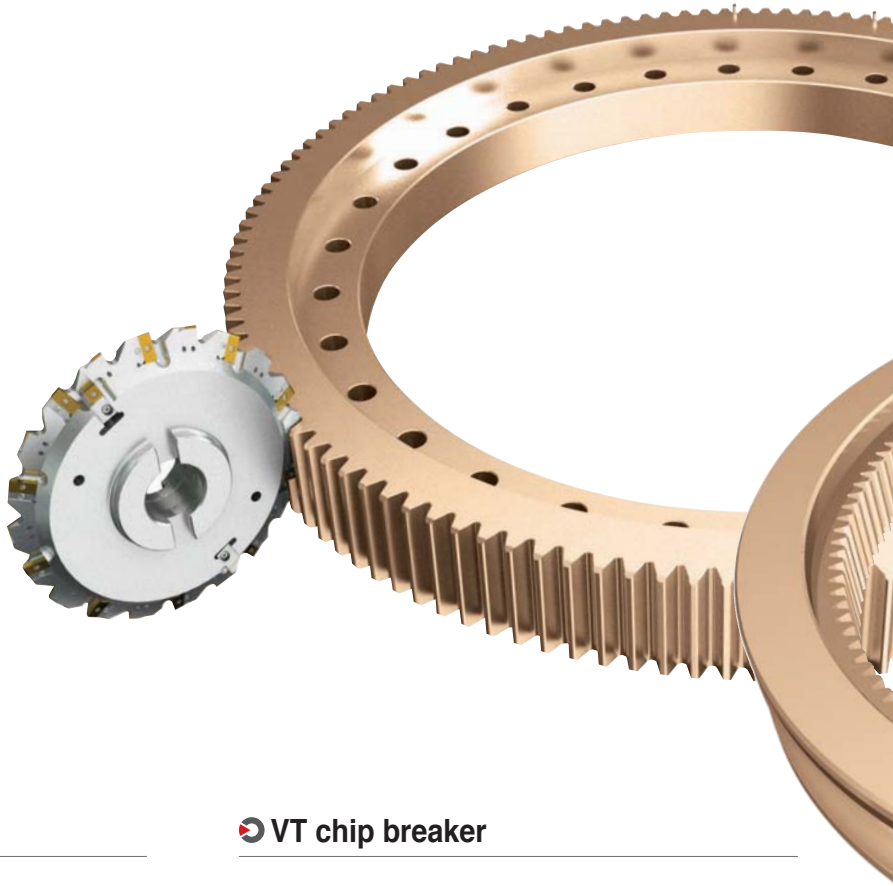
- Cutter diameter: Ø300
- The Number of Edges: 60
- Available for high speed working through ontrolled V-style edges to reduce cutting force

Cutter for medium

- Cutter diameter: Ø280
- The Number of Edges: 48
- Available for high efficiency and long life and high productivity through Korloy's own insert shape
- Made R part of gear by proper designed 'R'-shape of insert

Cutter for finishing: M20

- Cutter diameter: Ø400
- The Number of Edges: 20
- Gear cutter for medium is realized on the 4 grade of precision. (KS, JS)
- Chamfering system available for machining efficiency



Hob cutter

- Cutter diameter: Ø350
- The Number of Edges: 100
- Indexable hob for roughing worked by generating cutting action
- Available for customized producing by user

King Drill

Optimal indexable drill design

- Drill shape and chip breaker are optimized at the central and peripheral insert locations for better chip control and surface finish
- Grades, optimized for the central and peripheral insert locations in order to maximize cutting tool life.
- Grade: PC3500, PC5300

VT chip breaker

- Excellent rigidity on the high feed and depth
- Excellent impact resistance and long life based on stable structure and outstanding rigidity
- Type of SNMM/CNMM

TPDB

High precision and high efficiency indexable drill

- Highly efficient drilling in high speed and high feed machining
- Excellent surface roughness

VH chip breaker

- Innovative improved chip breaking on the medium working
- Provided good performance on the flange and continuous working
- Type of SNMM/CNMM

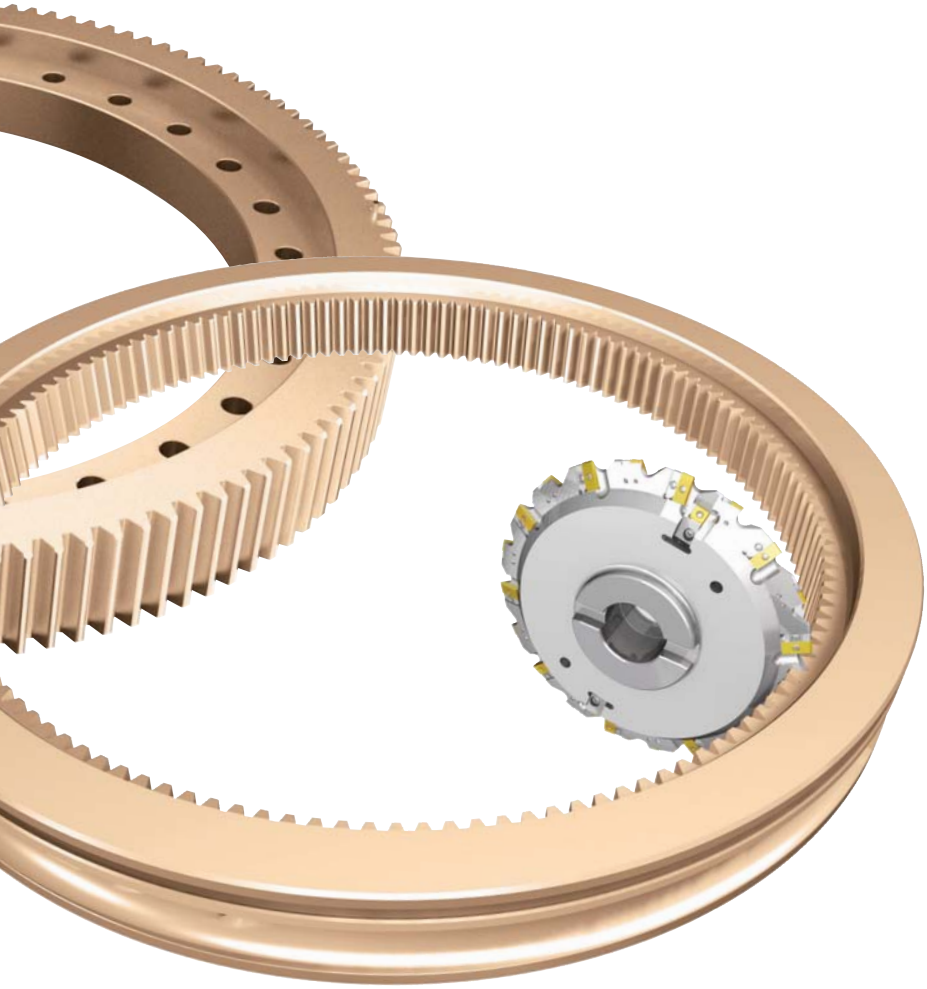
Gear machining (Internal Gear)

Cutter for roughing

- Cutter diameter: Ø560
- The Number of Edges: 140
- Available for all module gear working is caused by edges designed stair shape

Cutter for medium

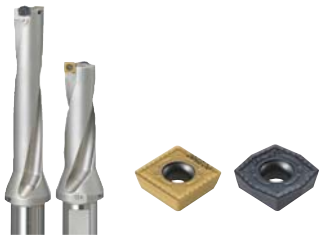
- Cutter diameter: Ø400
- The Number of Edges: 48
- Available for making involute curve shape of internal gear



Cutter for finishing

- Cutter diameter: Ø400
- The Number of Edges: 20
- Cutter for finishing available for 4 grades accuracy of internal gear
- Available for chamfering on the same time and unnecessariness of extra working

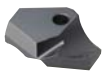
King Drill



Optimal indexable drill design

- Drill shape and chip breaker are optimized at the central and peripheral insert locations for better chip control and surface finish
- Grades, optimized for the central and peripheral insert locations in order to maximize cutting tool life
- Grade: PC3500, PC5300

TPDB



High precision and high efficiency indexable drill

- Highly efficient drilling in high speed and high feed machining
- Excellent surface roughness

Ship building (Engine block)

Roughing cutter for cylinder block

- Cutter diameter: Ø200
- Applicable insert: SNCF1507ANN-MF
- Economical concepts: 8 edge available insert, high feed available tool
- KORLOY exclusive latch clamping system provides quick change of insert

TPDB

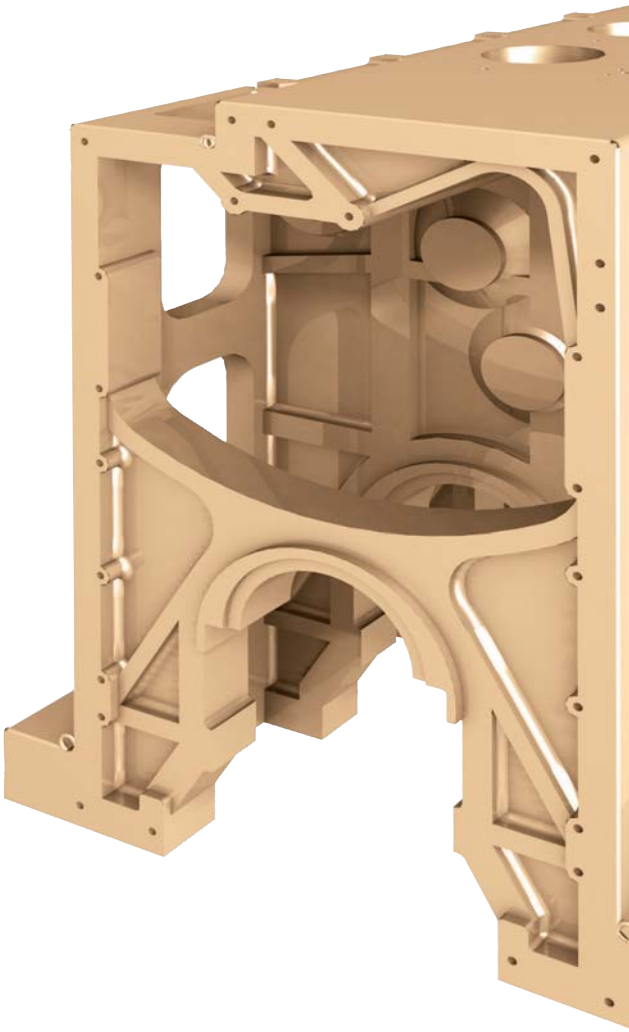
High precision and high efficiency indexable drill

- Highly efficient drilling in high speed and high feed machining
- Excellent surface roughness

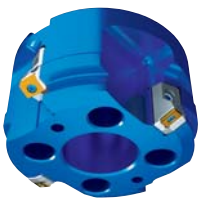
King Drill

Optimal indexable drill design

- Drill shape and chip breaker are optimized at the central and peripheral insert locations for better chip control and surface finish
- Grades, optimized for the central and peripheral insert locations in order to maximize cutting tool life
- Grade: PC3500, PC5300



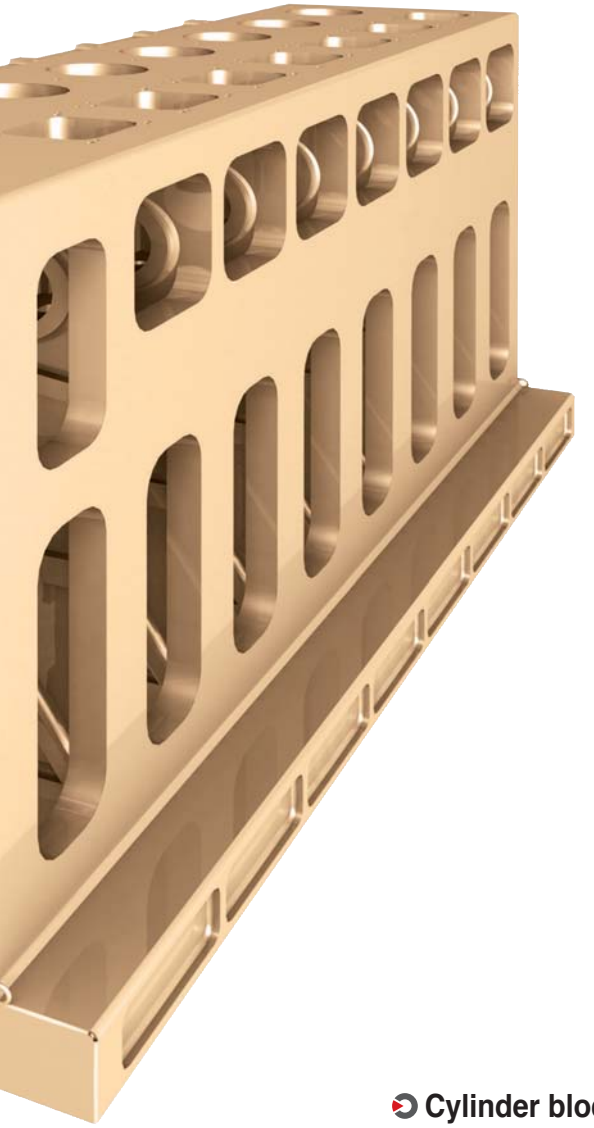
Cylinder block cam shaft boring cutter (Aluminum body cutter)



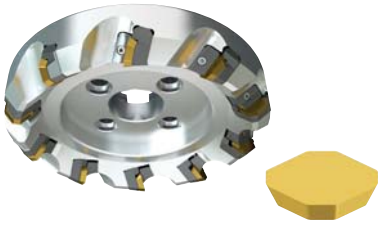
- Cutter diameter: Ø270
- Applicable insert: LNE434/SDKX1506
- Right-hand rotational aluminum cutter body, easy to handle, makes high precision boring

Cylinder block roughing and medium (Both)

- Cutter diameter: Ø200
- Applicable insert: LNE434 / LNCS1907-R3.0-WC
- Designs available for roughing and medium applications
- Available high efficiency working to chose LNE 434 insert for roughing and high reliability grade
- Good surface working through LNCS1907-R3.0-WC Wiper shape for medium

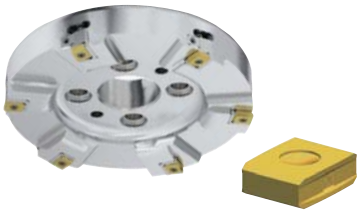


High rake-angle applied cylinder block roughing cutter



- Cutter diameter: Ø250
- Applicable insert: SECN2606AFN
- High rake angle cutter suitable for the machining applications that have the tendency to create chatter

Adjustable medium machining cutter

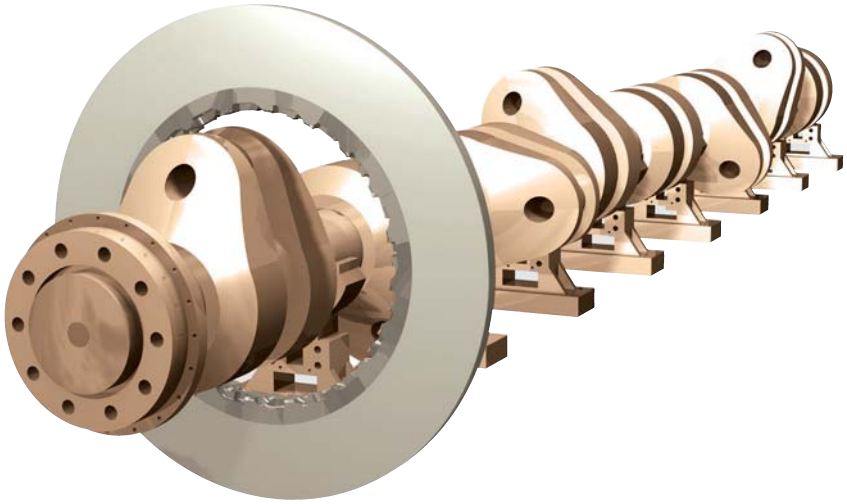


- Cutter diameter: Ø250
- Applicable insert: LNCS1907-C1.5-WC
- Cutting edge height adjustable device provides excellent surface finish

Cylinder block bearing cap seat machining cutter

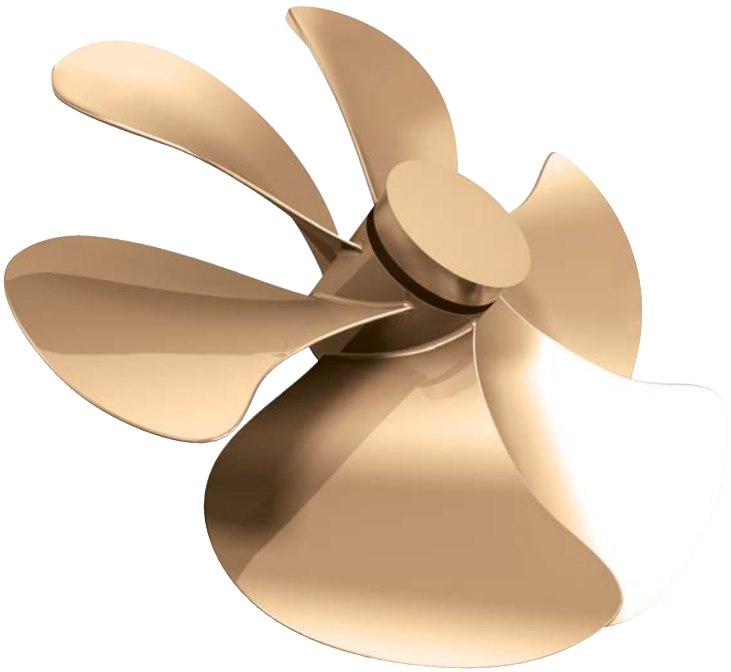
- Cutter diameter: Ø250
- Applicable insert: RDKT2006M0
- Several sizes of inserts are prepared to meet the radius requirement of work-piece
- Rigid inserts for high efficiency machining

Ship building (Crank shaft/Propeller)



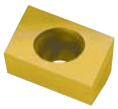
KORLOY exclusive screw-on type internal pin miller

- Cutter diameter: Over Ø2000
- Weight: 1.5 tons
- Pin miller for crank shaft of medium size ship engine
- Special segment assembly system developed by KORLOY makes it easy to handle and provides excellent cutting performance with good chip forming

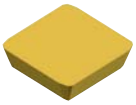


Periphery side of propeller machining tool

- Cutter diameter: Ø150
- Applicable insert: CDEW170708R
- Positive relief angle applied to get smooth cutting without chatter



Top face of propeller machining tool



- Cutter diameter: Ø250
- Applicable insert: SECN1904EER
- Double layer insert array provides big depth of cut

Role machining (Body/Shape/Parting-off)

Role machining (Body/shape/parting-off)

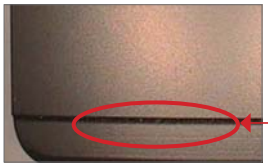
Competitor

NC6315

- Good chip evacuation even in deep grooving
- High hardness coating grade that has excellent wear resistance prevents damage from cutting load (Photo shows edge damage after machining same time under same conditions)

Application case

Competitor

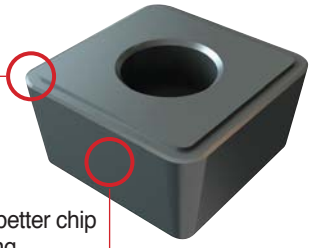


NC6315

- Equipped with wide chip breaker enough to prevent crater wear
- Better chip control from the beginning of the machining, together with high hardness coating grade provides 3 times longer tool life than conventional tool (especially at finishing)

The combination of high hardness coating grade (NC6315) and chip breaker shows better performance

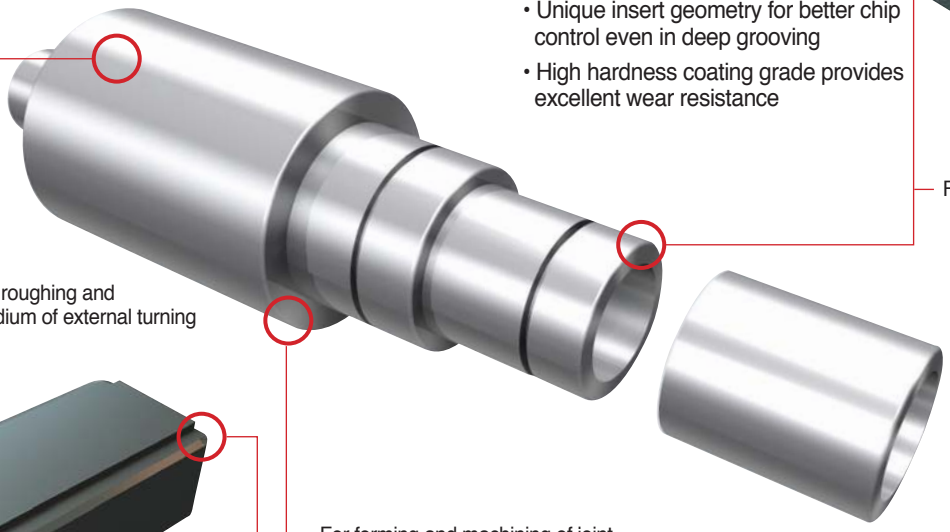
Closer chip breaker to the cutting edge provides better chip control even in deep grooving



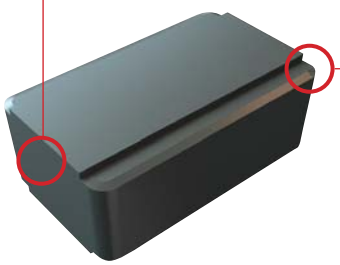
Parting-off roll

- Unique insert geometry for better chip control even in deep grooving
- High hardness coating grade provides excellent wear resistance

For parting-off



For roughing and medium of external turning



For forming and machining of joint

External turning of roll

- Match of high hardness coating grade (NC6315) with chip breaker provides longer tool life with smooth chip control
- Various cutting edge designs are applicable according to workpiece materials and cutting conditions

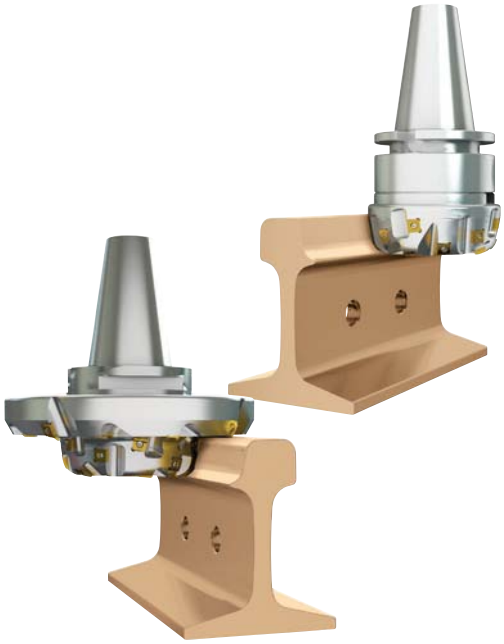
Forming and grooving of roll

- Special chip breaker focus on suitable chip forming (engineered chip breaker width and depth)
- Strong cutting edge treatment prevents un-expected fracture of insert

Railway Industry (Rail)

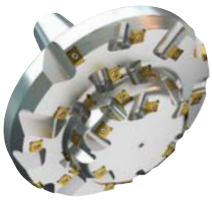
Cutter for turnout's joint plates

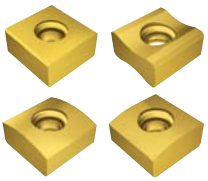
- Cutter diameter: Ø160
- The Number of Edges: 54
- Special customizing is available upon customer's requests



Cutter for upper parts of rails

- Cutter diameter: Ø160
- The Number of Edges: 16
- Precise forming of rail way is possible



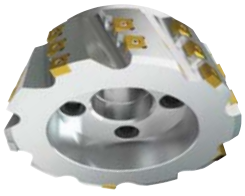


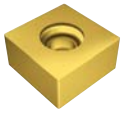
- Cutter diameter: Ø300
- The Number of Edges: 33
- One body design of cutter and arbor provides high rigidity

Cutter for upper tapers of rails

- Cutter diameter: Ø200
- The Number of Edges: 24
- Economical 8 edge available insert
- Special customizing is available insert
- Special customer's requests upon customer's requests

Cutter for upper flanks of rails





- Cutter diameter: Ø240
- The Number of Edges: 25

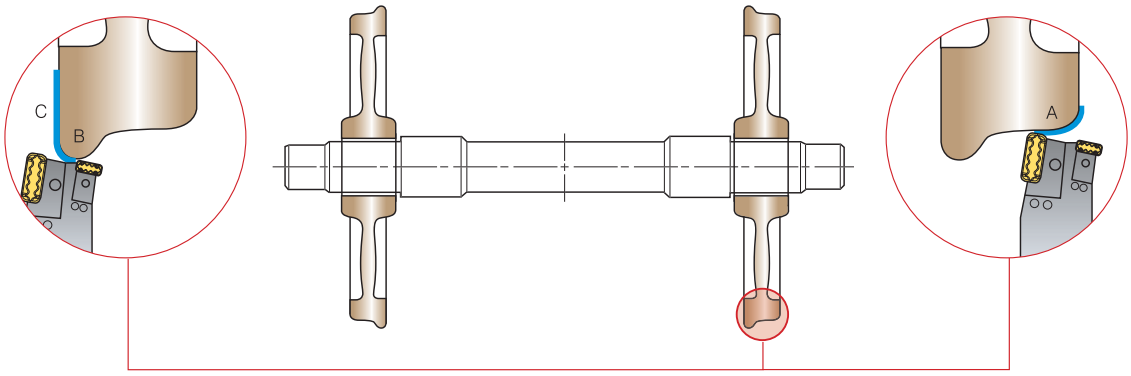
Cutter for rail repair

- Cutter diameter: Ø600
- The Number of Edges: 198
- Milling applicable on the rail of part requested repairing

Rail Industry (Wheel)

The type of LNUX for the working of wheel (Repair)

- Material: SSW2. Ø920~1000
- Cutting conditions: vc = 78 m/min (13~18min-1), fn = 1.0 mm/rev, ap = 3~4 mm
- Insert: LNUX301940-TM Grade: NC3215
- Result: good chip evacuation, stable structure and long life tool life

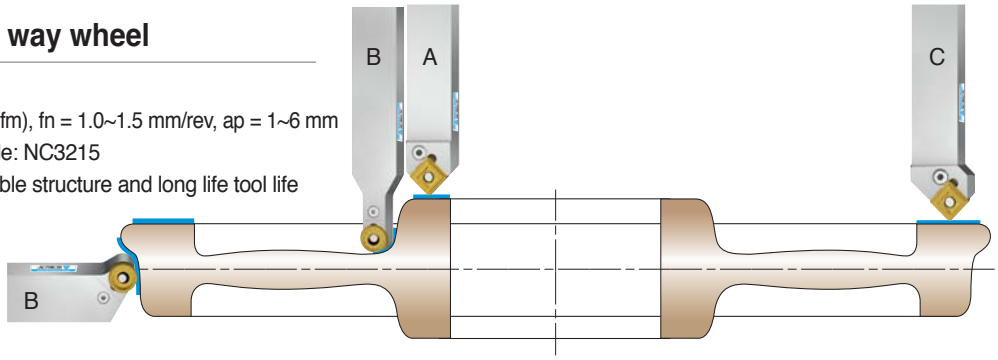


LNUX301940-TF	LNUX301940-TM
 • For light cutting, it generates a low load with good chips	 • Comprehensive design for general use, strong cutting edge with good chip forming (First recommendation)

Working procedure	A	B	C
Insert	LNUX301940-TF/TM	LNUX191940-25/22	
Grade	NC3215	NC3215	
Cutting condition	Decrease the speed on deep part of A	Increase the speed to get good chip evacuation	

RCMX insert for rail way wheel

- Material: SSW2. Ø840
- Cutting conditions: vc = 55~100 (sfm), fn = 1.0~1.5 mm/rev, ap = 1~6 mm
- Insert: RCMX3209M0-SL Grade: NC3215
- Result: good chip evacuation, stable structure and long life tool life



VT chip breaker

- Strong cutting edge for high feed and deep cutting depth
- Tough design of chip breaker provides excellent impact resistance
- SNMM type

SL chip breaker

- Comprehensive chip breaker covers wide application range
- Proper chip control with long tool life

B chip breaker

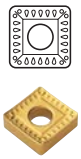
- Comprehensive roughing design having strong edge strength with long tool life

SB chip breaker

- Better chip control at low depth of cut machining

TM chip breaker

- Medium-finishing chip breaker, proper surface finish, superior wear resistance

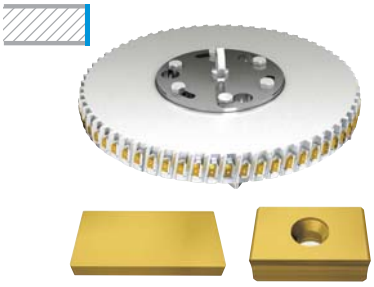
Working procedure	A	B	C
Applicable insert			
Holder	PSDNN5050-U25	PRDCN5050-U32 PRGCN5050-U32	PSSNR5050-S25
Insert	SNMM250724-GH	RCMX3209MO-SL	SNMM250724-VT
Grade	NC3215	NC3215	NC3215

Pipe Industry (Edge milling)

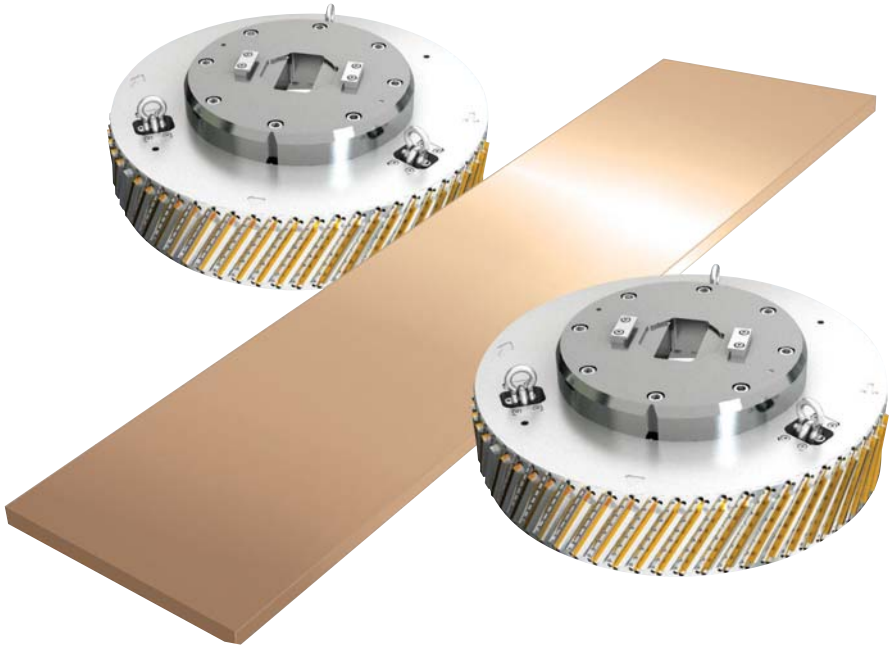
" X " shape machining

- A cutter to make the "X" shape on the both side-end of steel plate, to do bevel-end welding
- Locator wedge type clamping system applied for the cutter provides long durability of cutter as well as strong clamping power
- Grade: NC5340

" I " shape machining



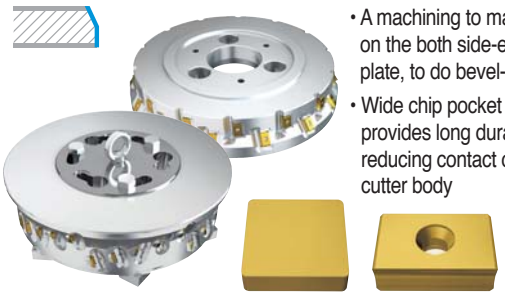
- A machining to make "I" shape on the both side-end of steel plate, to do bevel-end or plane-end welding
- Variety of inserts (with chip breaker or without chip breaker) are available according to your cutting conditions
- Grade: NC5340



A-1 ····▶ A-2 ····▶ A-3

B-1 ····▶ B-2 ····▶ B-3

" Y " shape machining

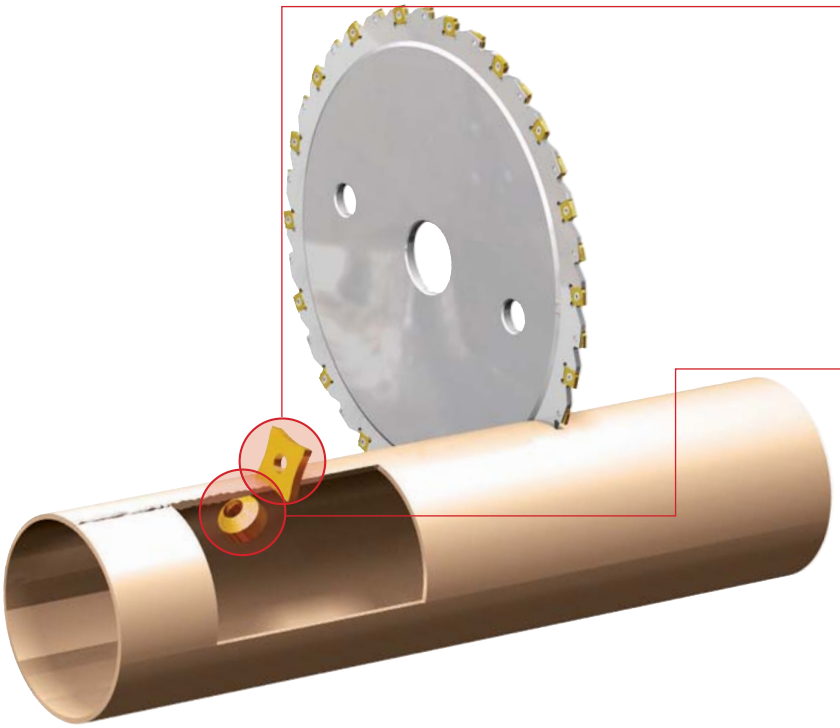


- A machining to make "Y" shape on the both side-end of steel plate, to do bevel-end welding
- Wide chip pocket on cutter provides long durability of it by reducing contact of chip with cutter body

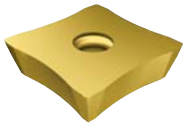
Special machining

- Special design of cutter as per side-end shape of steel plant upon customer's request is available

Pipe Industry (Bead removal/Parting-off/Chamfering)



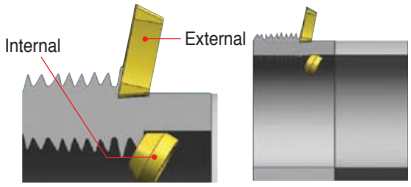
Bead removal insert: external

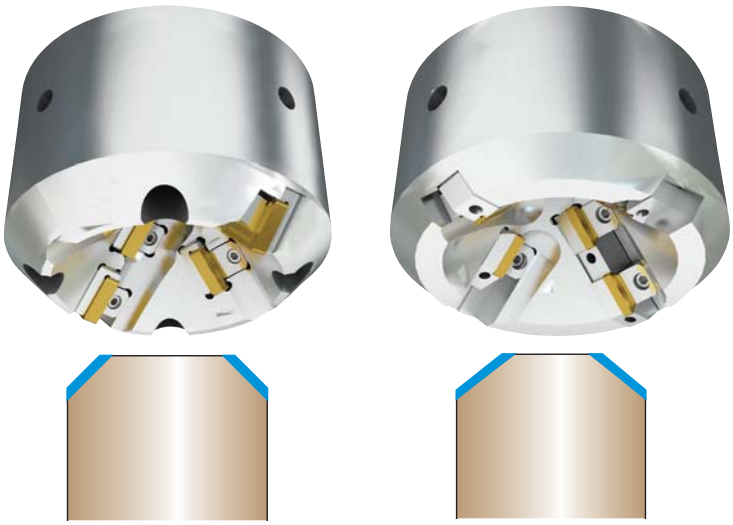


- Tool removing protruded part of melted welding material at outside of pipe
- Economical tool by using square insert, utilizing 4 cutting edges
- Grade: NC3030

Bead removal insert: internal

- Tool removing protruded part of melted welding material at inside of pipe
- Grade: NC5330

Working method	Application range	Applicable inserts	Cutter
	For external bead removal	SDMX80-R□□/SEGW54-R□□ SNMG150708-R□□/SNMN1207(SNU452)-□□R SNMN1507(SNU552)-□□R/SOET1906-254 SEGX2509-R□□	Customizing
	For internal bead removal	AR□□(AC)/SF□□R-□□	



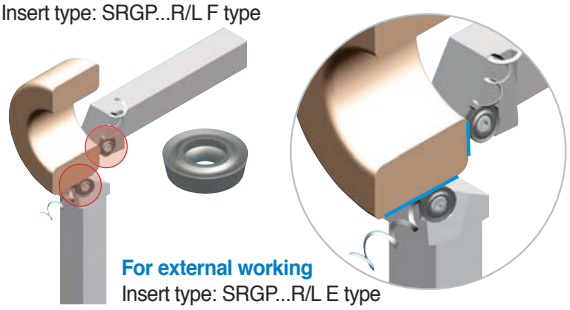
Chamfer tool

- Chamfering tool machining cut-off face of pipe
- Special chamfering angle design is possible upon customer's request
- Cost effective concept: Triangle and Square double sided insert provides 6~8 effective cutting edges
- Grade: NCM325, PC3500

Bearing

For external and facingworking

For facing
Insert type: SRGP...R/L F type

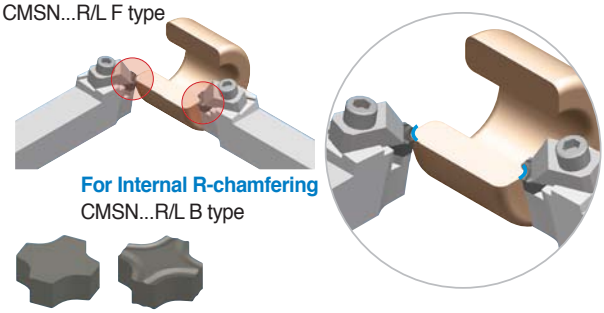


For external working
Insert type: SRGP...R/L E type

- Applicable on the internal, external and facing working

For internal and external r-chamfering

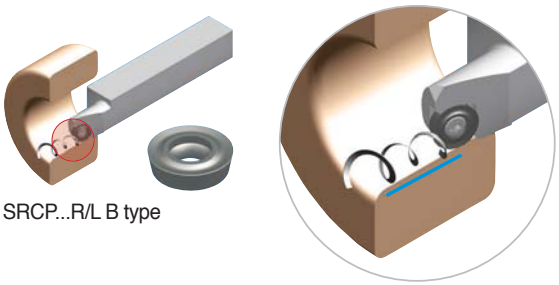
For R-chamfering
CMSN...R/L F type



For Internal R-chamfering
CMSN...R/L B type

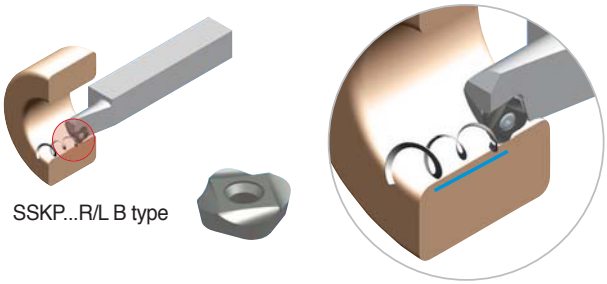
- Applicable 8 corner of insert
- R-shape is realized to internal and external part of corner

For internal working



SRCP...R/L B type

- Applicable over Ø12

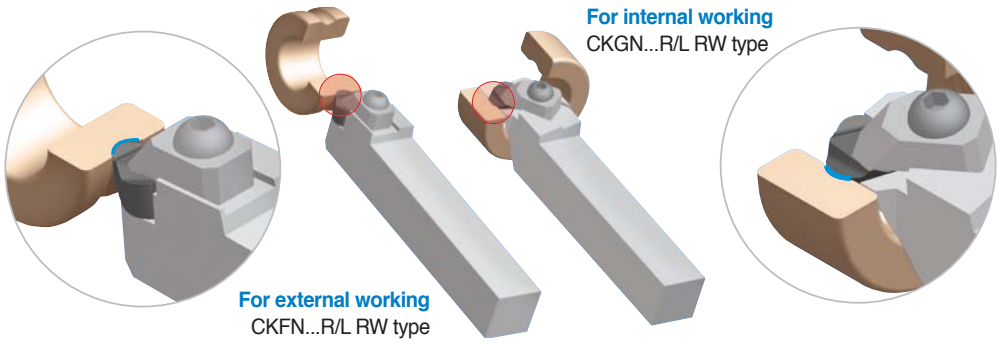


SSKP...R/L B type

- Applicable over Ø11.5 with 4-corner insert for internal and low working

For ray-way

- For Ray-way on internal and external bearing
- Applicable 3 corner insert
- Able to customize

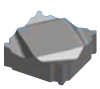


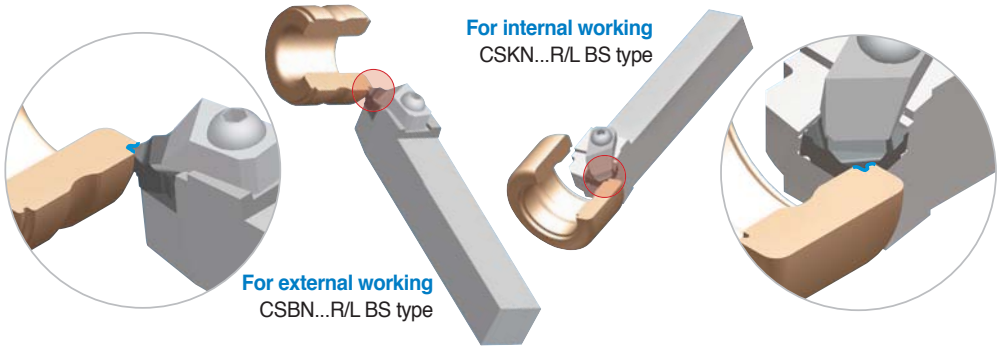
For internal working
CKGN...R/L RW type

For external working
CKFN...R/L RW type

For shield way

- For shield working on internal and external bearing
- Applicable 4 corner insert
- Able to customize





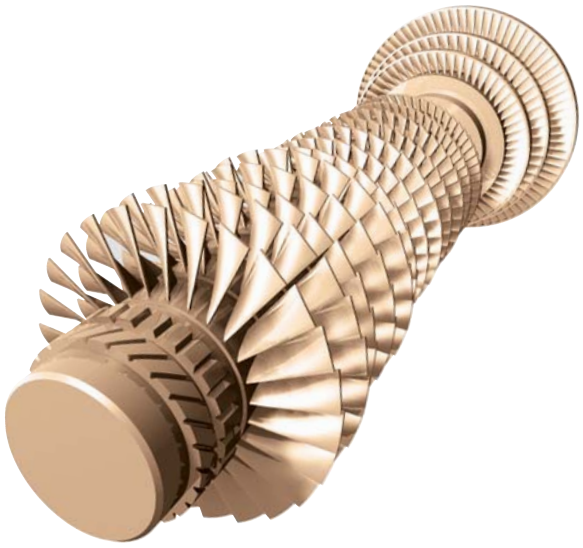
For internal working
CSKN...R/L BS type

For external working
CSBN...R/L BS type

Power Generation (Wind Power Generation Shaft/Tower Flange)

VH chip breaker

- Good chip control in heavy machining
- Excellent performance for flange machining
- Suitable for continuous cutting conditions
- SNMM/CNMM type



VT chip breaker

- Strong cutting edge for high feed and deep cutting depth
- Though design of chip breaker provides excellent impact resistance
- SNMM/CNMM type

TM (Thread milling)

- Thread milling indexable tools
- Various type of holder (standard, long, taper) and inserts
- Screw diameter: Ø9~Ø46 mm

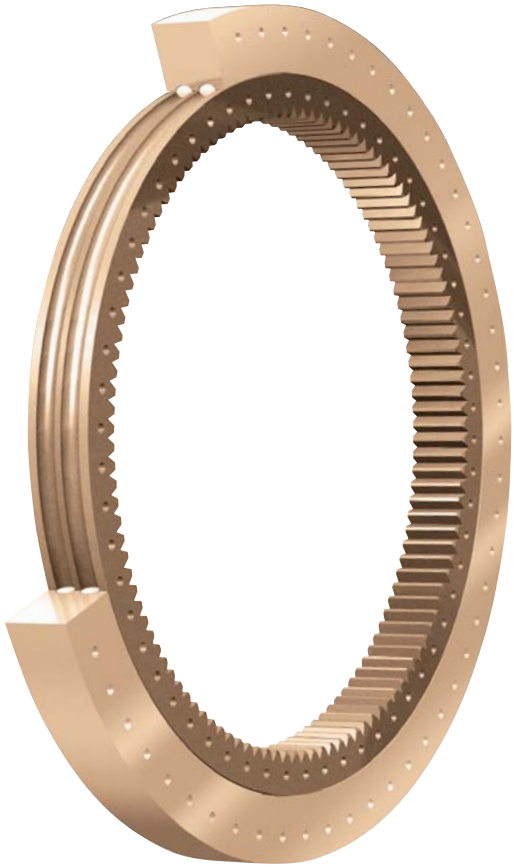
H Endmill

Endmill for high hardened steel machining at high speeds

- New grade (PC303S, PC310U) - Ultra fine substrate and AlTiSiN coating guarantee excellent wear resistance
- Special edge treatment - Special cutting edge design was applied for less chipping and longer tool life

RCMX type

- High quality machining
- Rigid insert ensures good surface finish and long tool life
- RCMX type



Vulcan Drills (VZD)

- Rigid body for high feed and precision machining
- Better chip evacuation from improved chip breaker
- Applicable for the drilling under poor cutting conditions

King Drill

Optimal indexable drill design

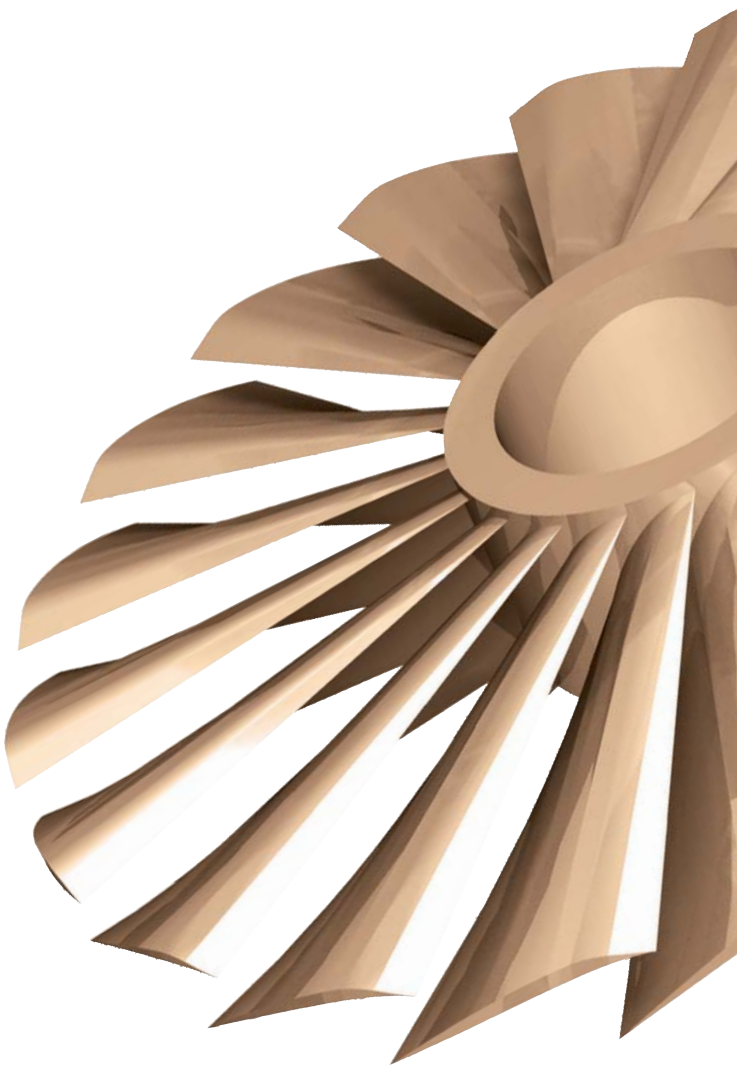
- Drill shape and chip breaker are optimized at the central and peripheral insert locations for better chip control and surface finish
- Grades, optimized for the central and peripheral insert locations in order to maximize cutting tool life
- Grade: PC3500, PC5300

Aviation Industry (Engine/Turbine)

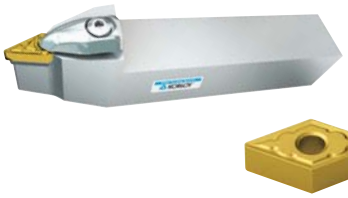
TPDB

High precision and high efficiency indexable drill

- Highly efficient drilling in high speed and high feed machining
- Excellent surface roughness



ISO turning

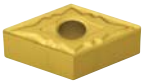


- Available to customize whole and special items for complicated and various shape

Boring Bar

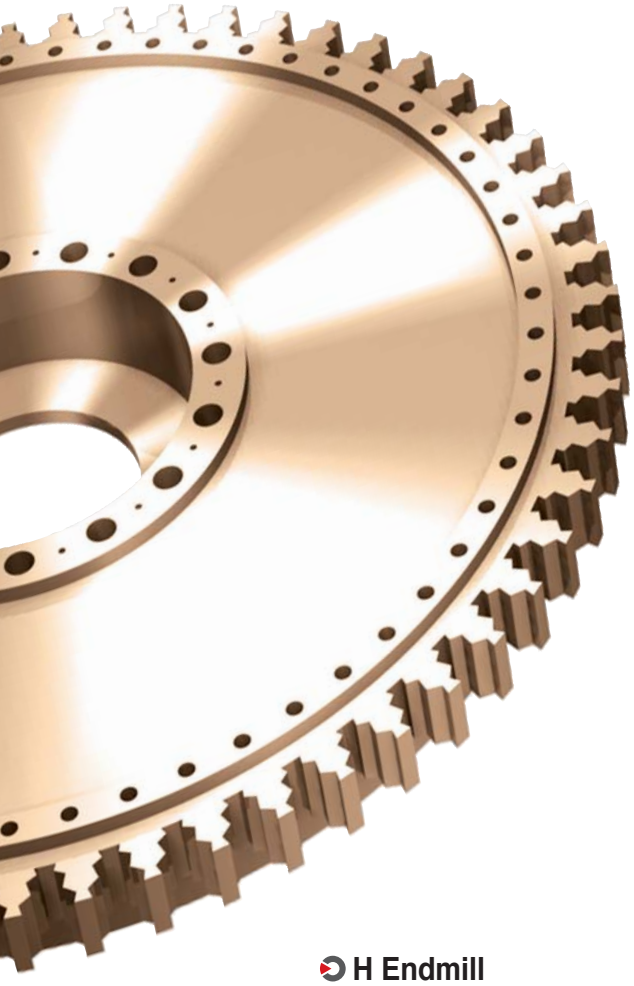
Internal turning

- ISO standard boring bar for internal machining



Rich Mill

- Increased number of edges and excellent tool life due to 8 corner edges
- Smooth cutting with low cutting load due to the unique geometry & high rake angle of cutting edge, this combination provides excellent tool life



MSD

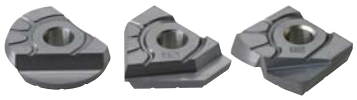
Long tool life with protecting material

- Good chip control with proper chip-pocket
- Decrease the chipping and increase the cutting ability due to applicable streamlined shape insert
- Increase impact resistance and lubrication due to apply PVD K Black coating on the sub-micron material

Laser Mill

Multi-functional indexable end-mill

- Extremely hard grade provides long tool life
- Easy and simple clamping of insert by using single screw
- Excellent quality for fine finishing due to its precise tolerance



H Endmill

Endmill for high hardened steel machining at high speeds

- New grade (PC303S, PC310U) - Ultra fine substrate and AlTiSiN coating guarantee excellent wear resistance
- Special edge treatment - Special cutting edge design was applied for less chipping and longer tool life

Aviation Industry (Landing Gear/Accessory)

HRMDouble

High efficient and cost effective tool utilizing a double sided insert

- Cost effective tool by using double sided insert with a total of 6 cutting edges
- Smooth cutting utilizing a high rake angle sharp cutting edge insert

MGT

For grooving, turning, profiling, cut-off

- Multi functional grooving tool can over variety of machining with multifunctional grooving tool and the chip breaker with excellent cutting perfomance and the ability to expand grooves

Pro-X Mill

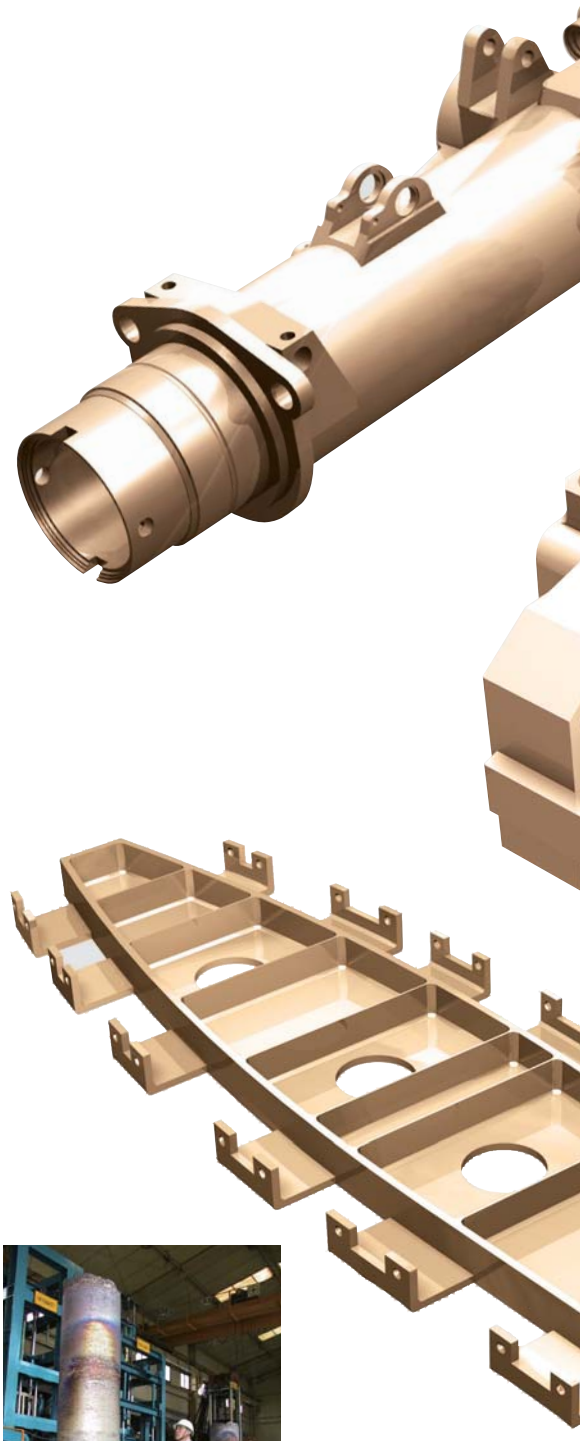
High-speed aluminum milling tool

- Unique mounting system of insert provides tight clamping of insert
- Mirror surface and high rake angle of insert provides excellent machined surface by reduced cutting load and edge build-up
- Grade: H01

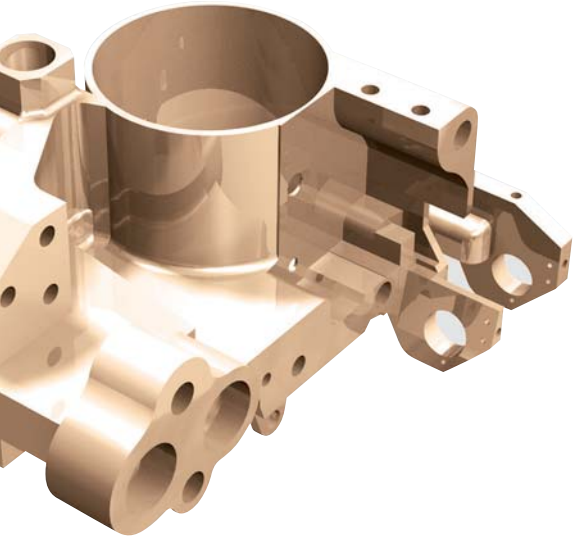
SSEA

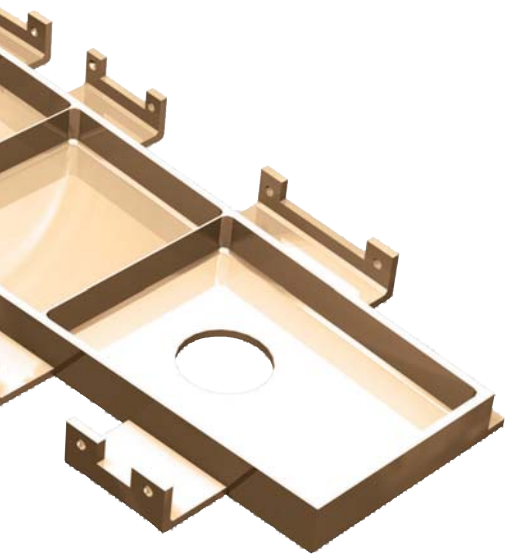
Solid carbide end-mill for aluminum machining

- Advanced geometry of end-mill refrains build-up-edge
- Superior surface machined
- DLC coated end-mills available



Titanium
Picture provided: KPC Inc





King Drill

Optimal indexable drill design

- Drill shape and chip breaker are optimized at the central and peripheral insert locations for better chip control and surface finish
- Grades, optimized for the central and peripheral insert locations in order to maximize cutting tool life
- Grade: PC3500, PC5300

MLD (Mach Long Drill)

- Direct drilling without separate operation (step drilling) over 20xD
- Wider flute space along with drill provides effective chip control
- Special design for rigid body provides smooth drilling without bending of drill

Alpha Mill

Multi functional milling tool

- Vast coverage of milling operation due to its variety of cutters and inserts
- 3 dimensional chip breaker design provides smooth cutting

Brazed Endmill

- Apply High Spiral Angle (over 40 degrees) able to get good sharpness
- Available high speed milling due to reduce the working temperature
- Expected long tool life by applying hardened carbide material.
- Economical welded tool due to available 2 or 3 times re-grinding

Slitter Knife

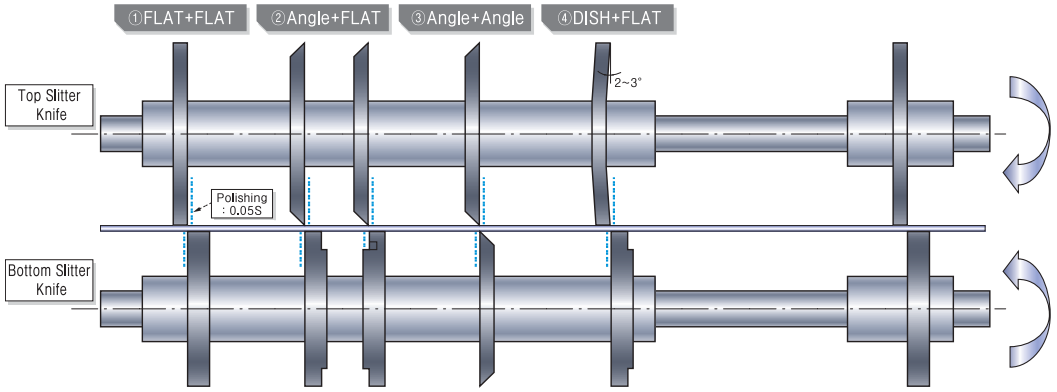
Application

- For video tape/For audio tape
- For mangetic tape/For brass plate, mobile battery

Tool selection

- Top slitter knife: Thickness: ±0.01~0.02 mm
- Bottom slitter knife: Thickness: ±0.001 mm / Flatness: under 0.0005 mm
  Polishing surface roughness: under 0.05 S

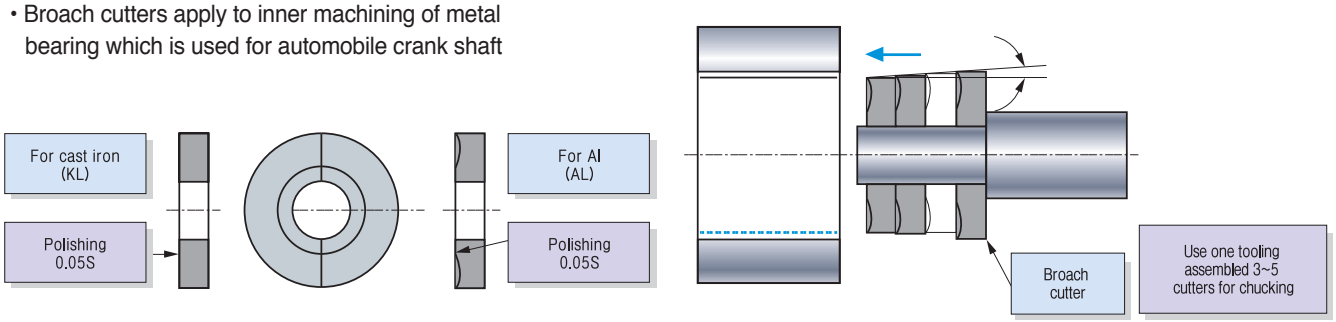
Machining example



Broach cutter

Application

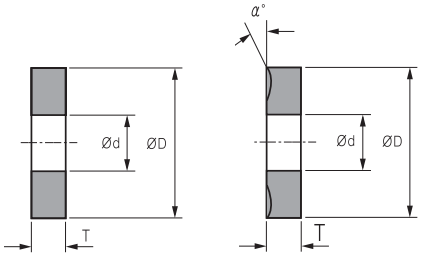
- Broach cutters apply to inner machining of metal bearing which is used for automobile crank shaft



Order

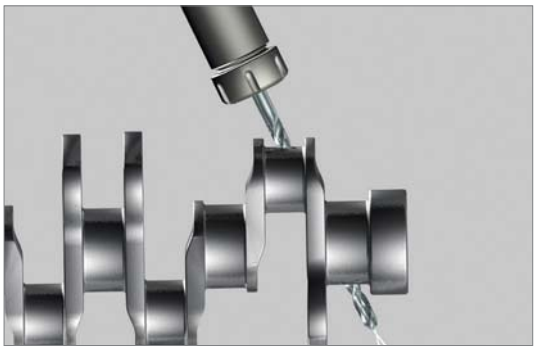
- Designation for cast iron: KL Ød×Ød×T
- Designation for Aluminium: AL Ød×Ød×T
  : AL Ød×Ød×T×α°

(If there is no mentioned any angle, α = 30°)



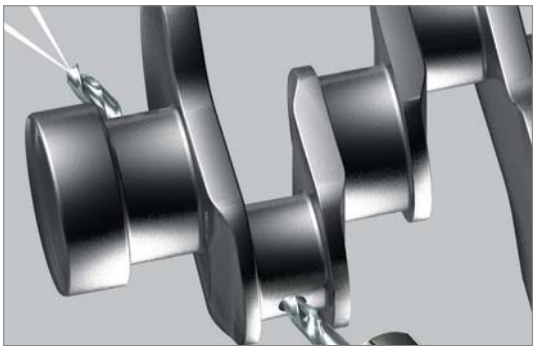
Automobile engine tooling example (Crank Shaft)

Oil Bore - Mach Long Drill (MLD)



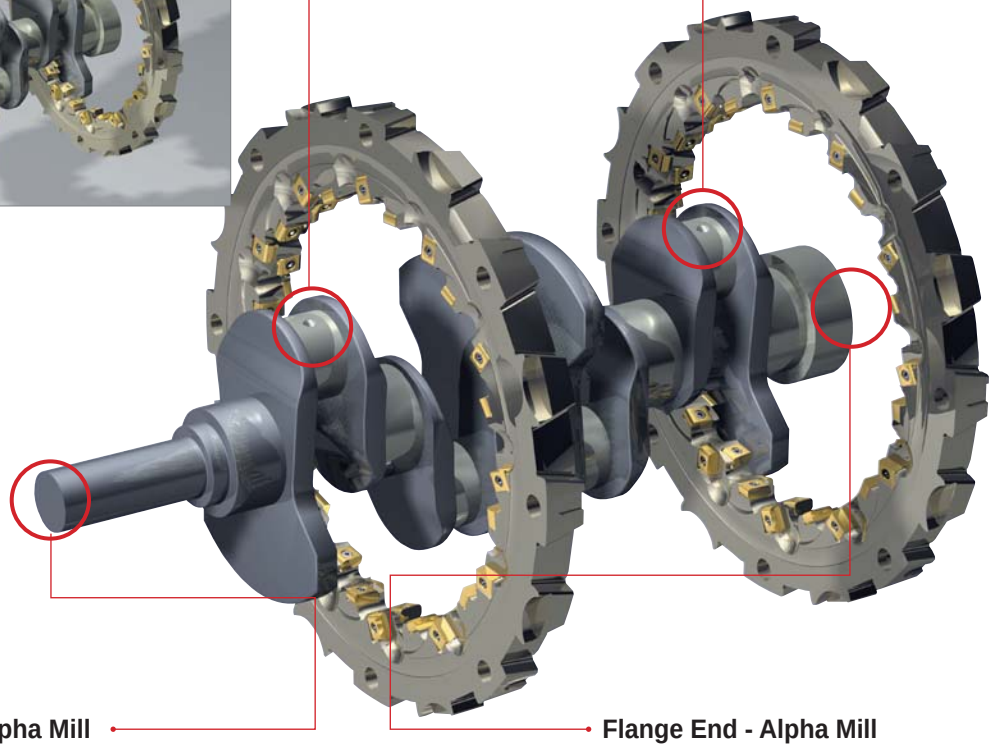
Taper Spline Structure
(Rigidity has been enhanced due to increased contact area)

Oil Bore - Mach Long Drill (MLD)

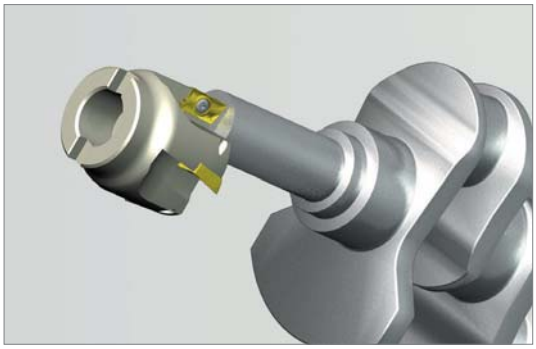


- Machining wihout step feed operation for deep hole drilling like 20D
- Optimal performance with MQL System

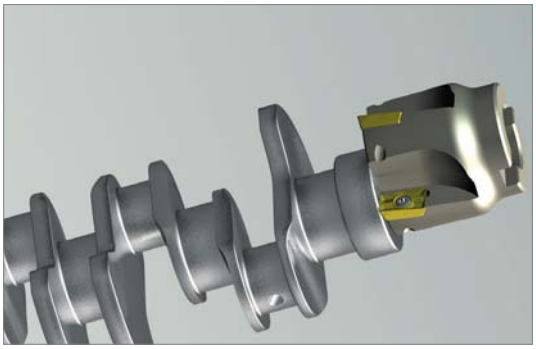
Pin & Journal - Crankshaft Cutter (Internal/External)



Post End - Alpha Mill



Flange End - Alpha Mill



Automobile tooling example (Knuckle)

Micro Boring bar

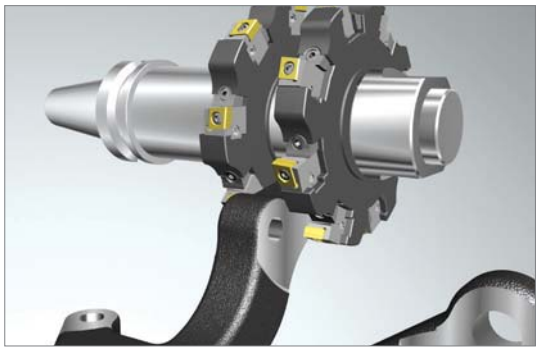
Mach Drill

Micro Boring bar

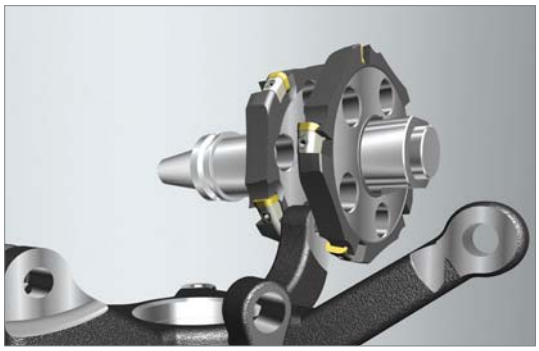
Indexable Side Cutter (SPB)

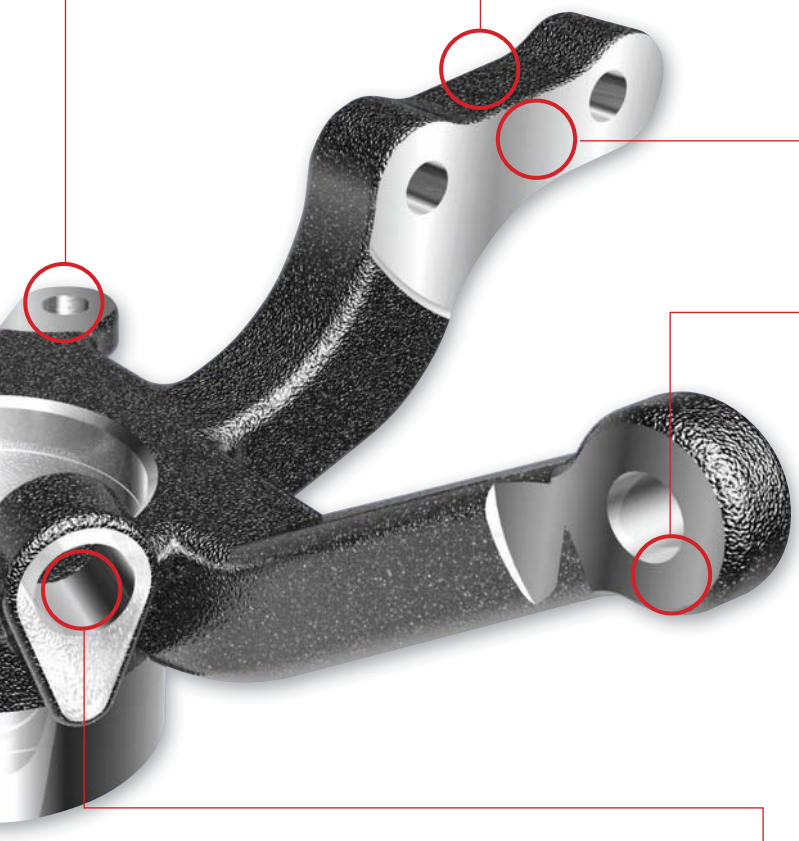
Future Mill (FMP)

Indexable Side Cutter (Tangential type)



Indexable Side Cutter (Radial type)





Future Mill (FMP)

Step Drill

Drill (King Drill)

Automobile break tooling example (Carrier)

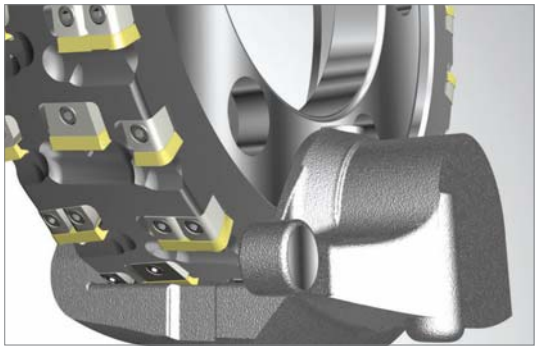
Drill

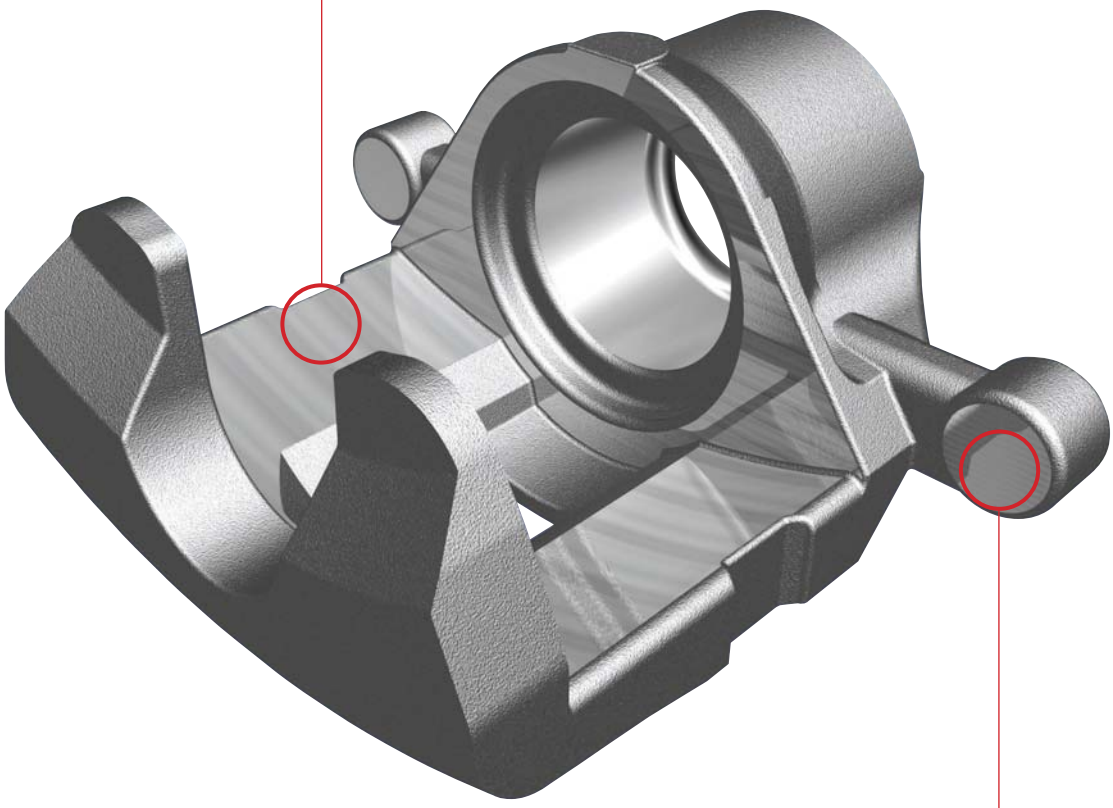
Drill

Side Cutter

Automobile break tooling example (Housing)

Side Cutter



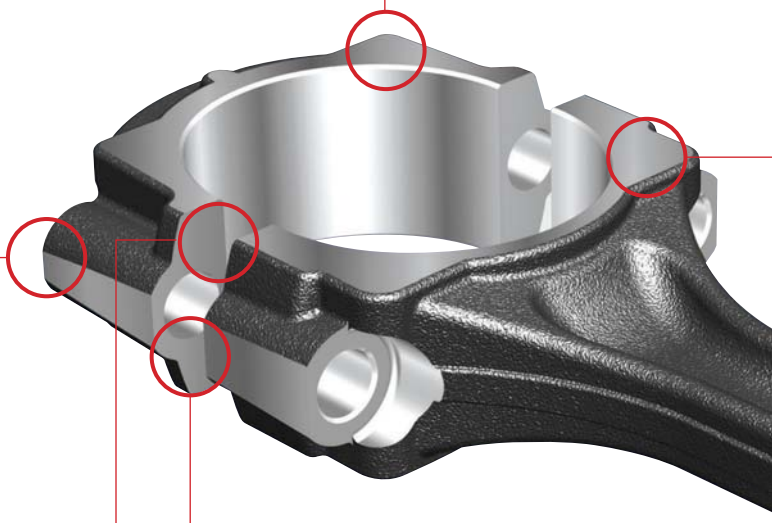


Side Cutter

Automobile tooling example (Connecting Rod)

Drill

Rich Mill (RM4)



Side Cutter

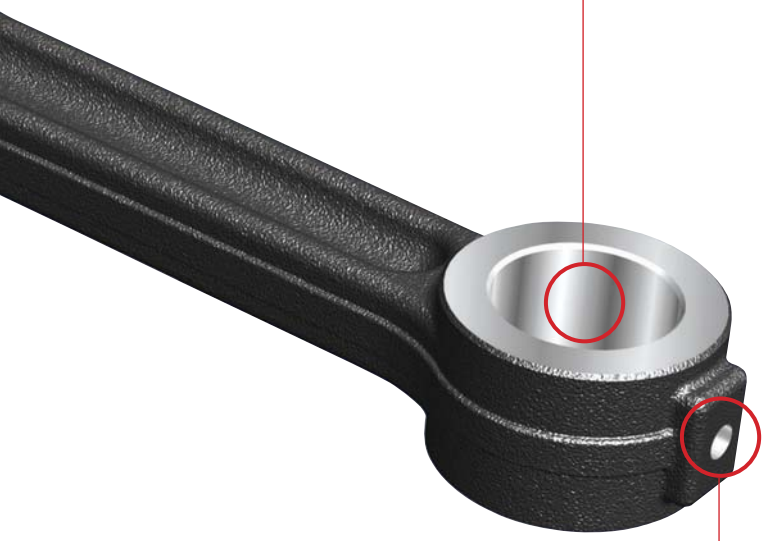
Side Cutter

Rich Mill (RM4)

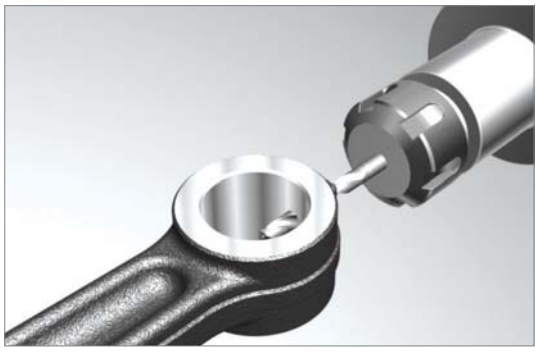
Rich Mill (RM8)

Drill (King Drill)

Step Drill

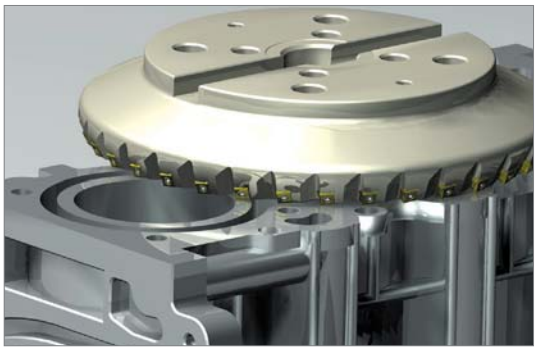


Drill



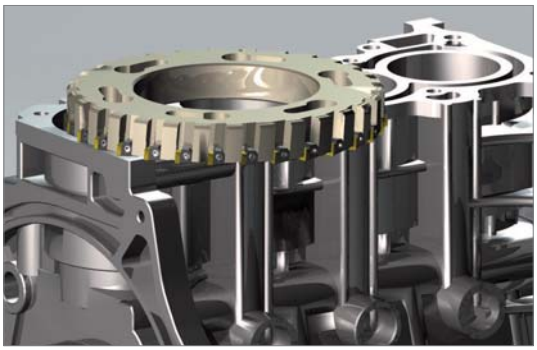
Automobile engine tooling example (Block)

Top Face (Roughing)

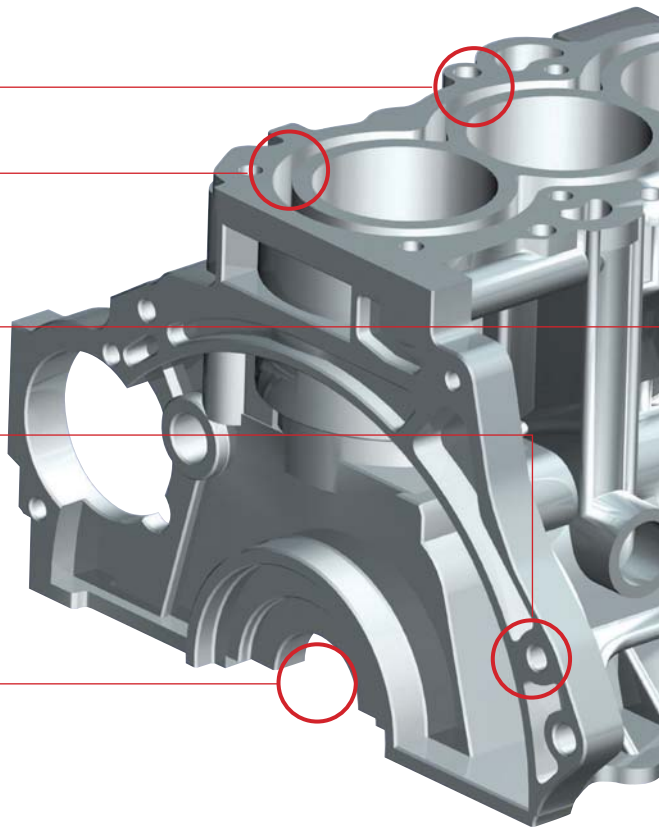


• Applied 8 corner edges of insert

Top Face (Finishing) - High feed Cutter

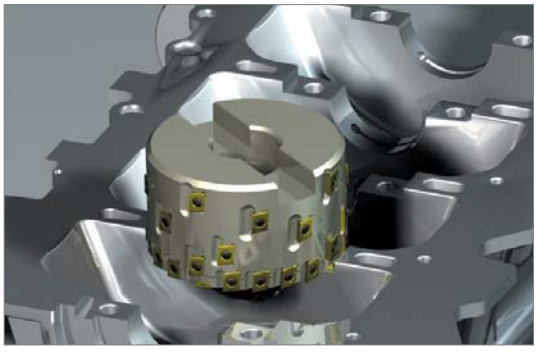


Bosses - Alpha Mill

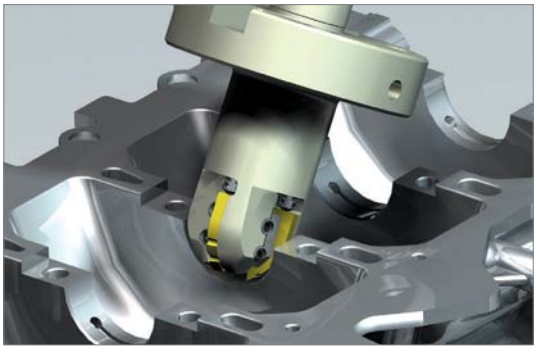


Line Boring Bar Reamer

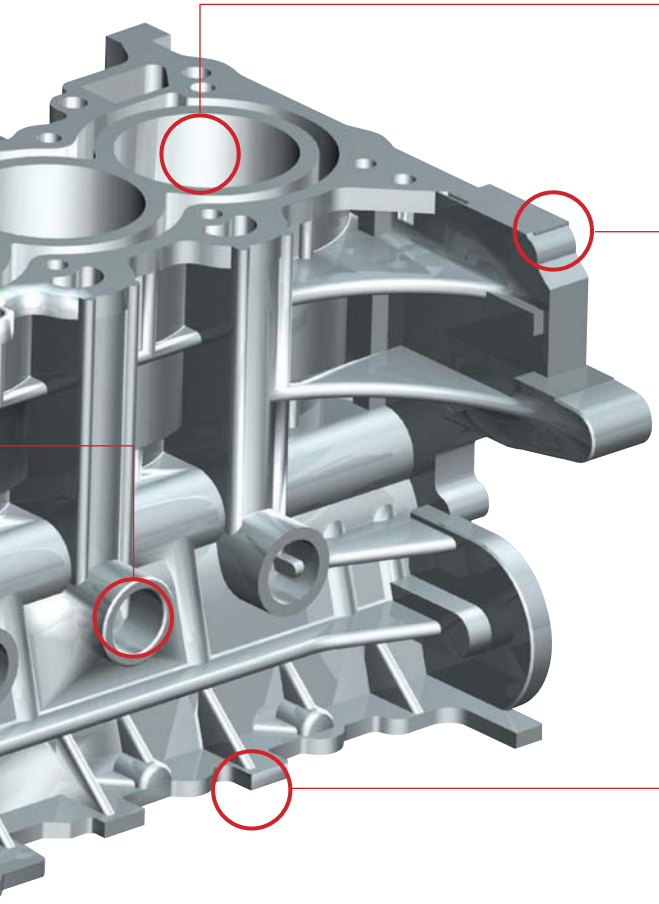
Bearing Cap Seat - Form Cutter



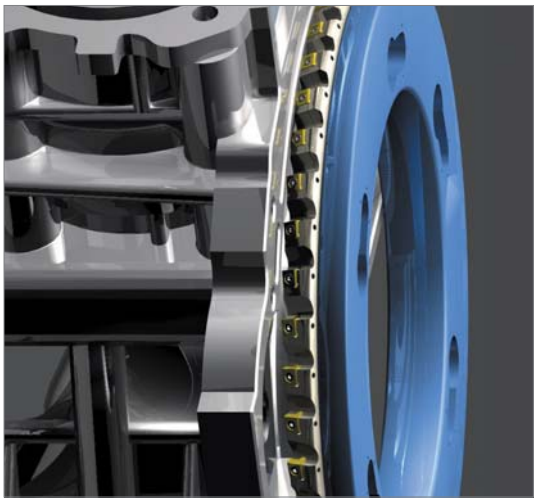
Crank Bore (Crankshaft Bearing Bore) - Form Cutter

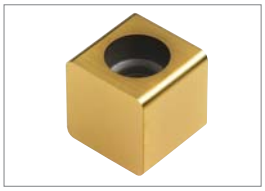


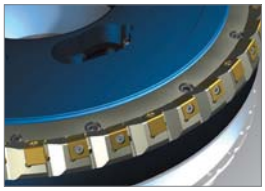
Cylinder Bore (Roughing) - Boring Cutter



Front & Rear Face - Cube Couple Mill

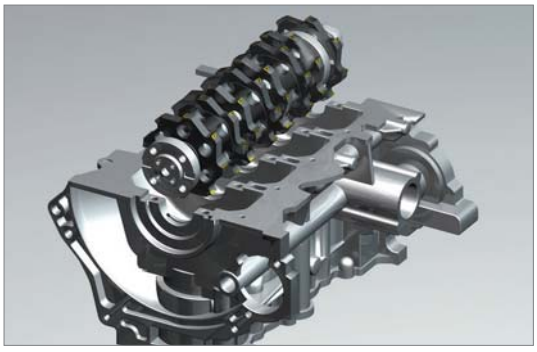




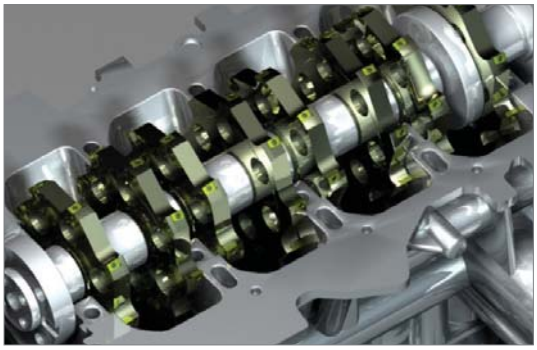


- High feed cutter made of aluminum
- Due to light weight, it s easy to handle & effective to prevent accident

Cheek Faces - Gang Cutter

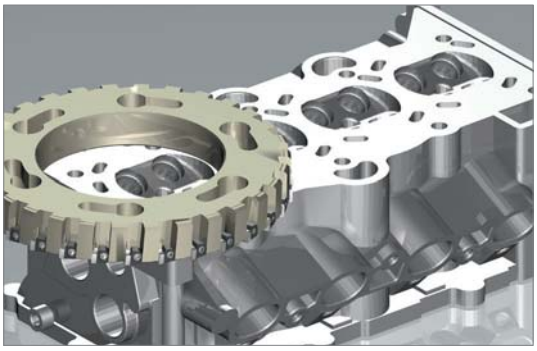


Cheek Faces - Gang Cutter



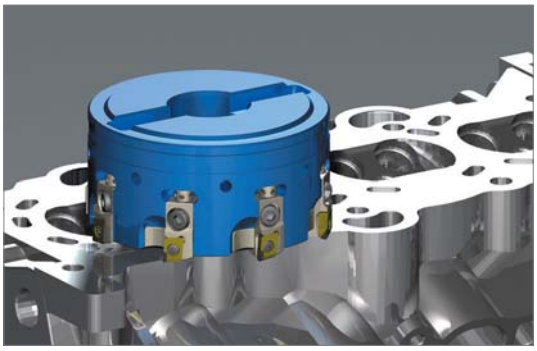
Automobile engine tooling example (Head)

Top Face (Roughing & Finishing) - High Feed Cutter



• Carbide insert, PCD insert

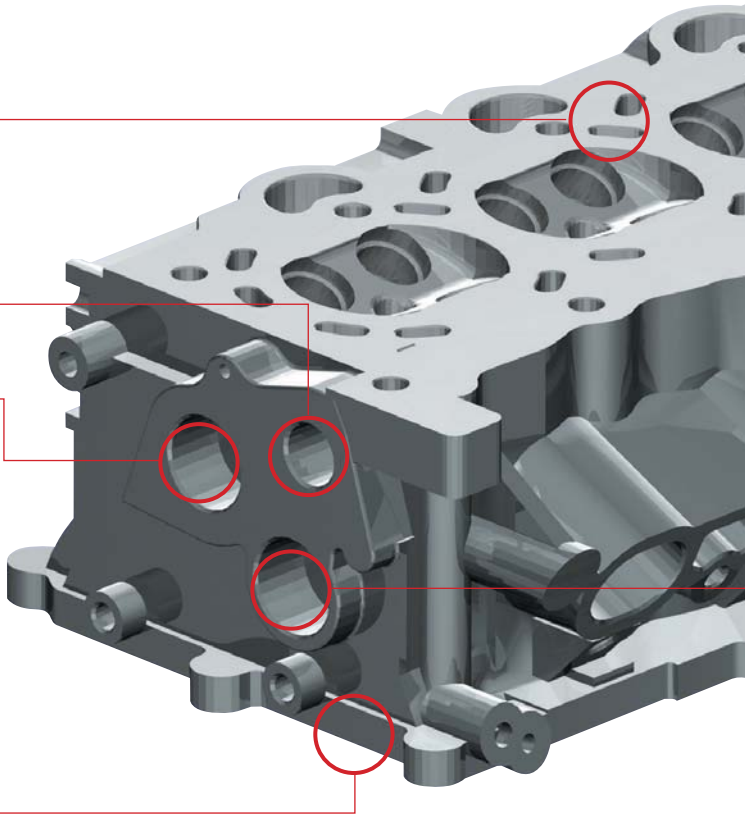
Top Face (Roughing & Finishing) - Aero Mill



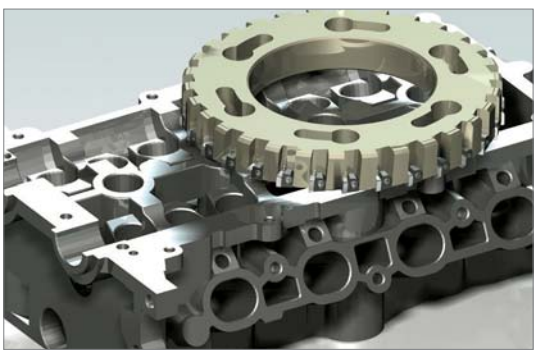
• Due to the light weight of aluminum body that about 50% of steel body, excellent cutting performance with high speed machining can be achieved

Step Burnishing Reamer

Straight Reamer

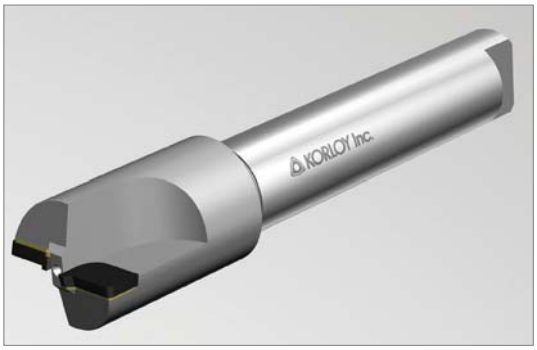


Bottom Face (Roughing & Finishing) - High feed Cutter

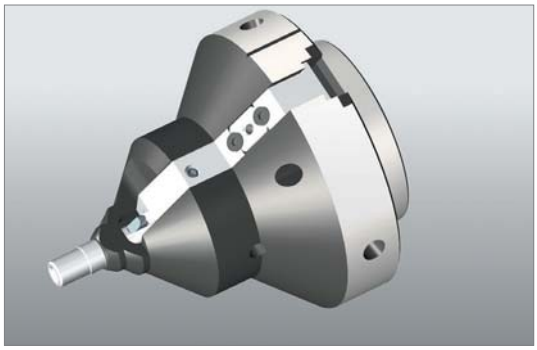


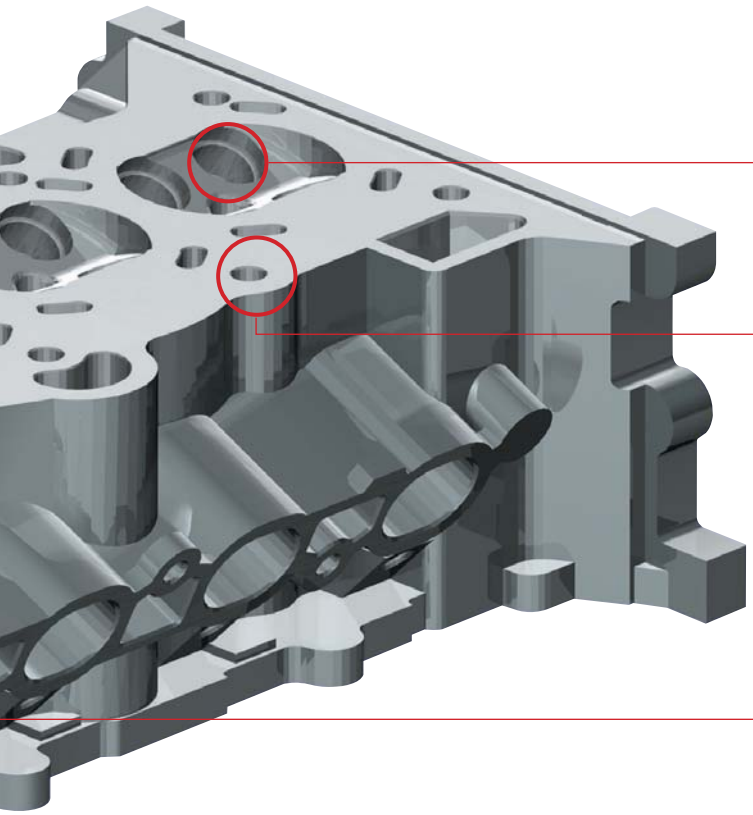
• Carbide insert, PCD insert

Counter Bore Tool

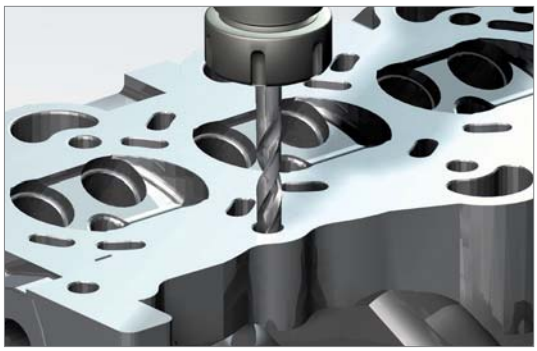


Valve Seat - Apolo Cutter (Special Boring Holder)

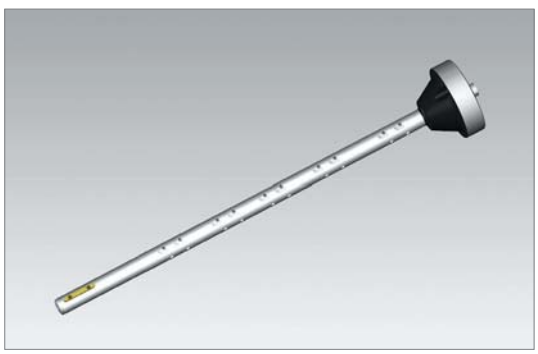




Top Face (Drilling) - Mach Drill



Cam Shaft Bearing Seat - Line Boring Bar



• Stable machining at high speed without chattering

Cam Journal Bore - High Speed Reamer

• Available for high speed machining
• Excellent surface finish & roundness