GÜHRING

GROOVING SYSTEMS

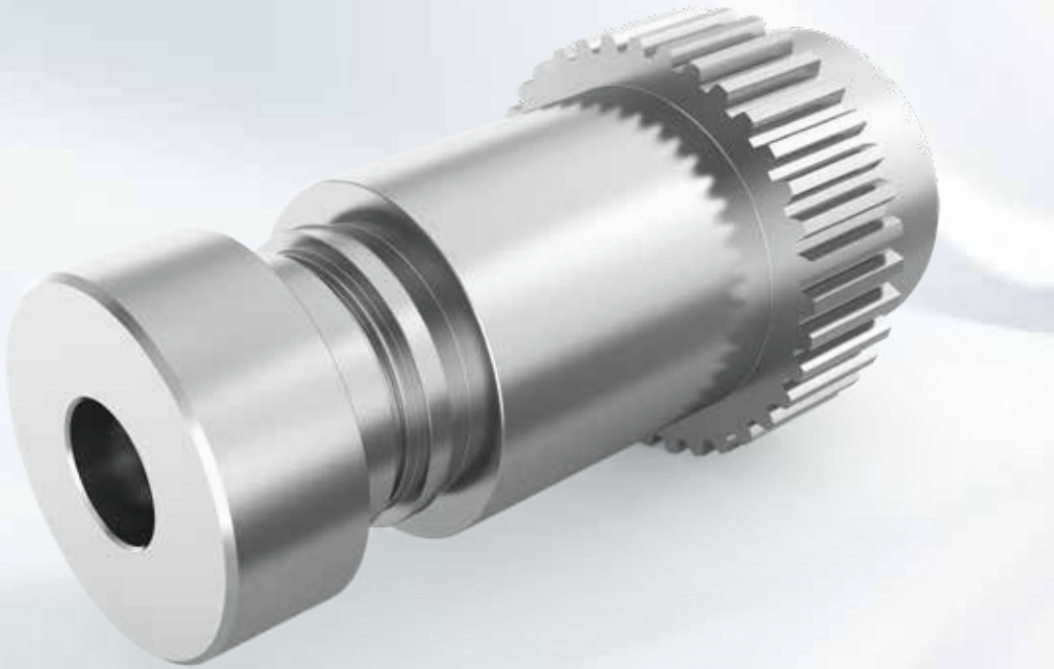
APPLICATION EXAMPLES

GROOVING SYSTEMS

Application example 1 – Drive shaft

GROOVING SYSTEMS

Contents



Drive shaft

GROOVING SYSTEMS

Component information

Component

- Material:
  42CrMo4
- Field of applications:
  see industries

Industries

- Automotive, automotive suppliers
- Powertrain applications
- Machines, engineering equipment

Machining

- Machine:
  turnmill machining centre
- Coolant:
  water soluble, 40 bar through the spindle
- Serial production:
  500-800 pieces per month

Specifications

- Tight tolerance for grooving:
  +/– 0.015 mm
- Required surface roughness:
  $r_z = 6$ µm
- Required tolerance for broaching:
  P9

Drive shaft

GROOVING SYSTEMS

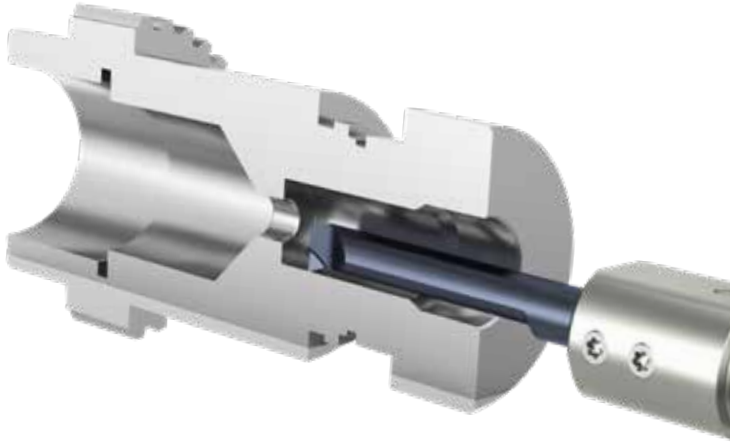
1. Machining – Boring of internal contour

Initial situation

- Long cycle time:
  f = 0.06 mm
- Inconsistent surface roughness:
  r_z = 5-10 µm

Tool selection

System:	110
Insert:	special tool
Tool holder:	standard item
Coating:	TiAlN nanoA
Geometry:	Wiper



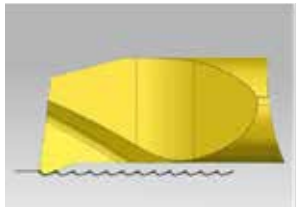
Cutting parameter

Cutting speed:	100 m/min
Feedrate:	0.10 mm/rev.
Depth of cut:	0.20 mm

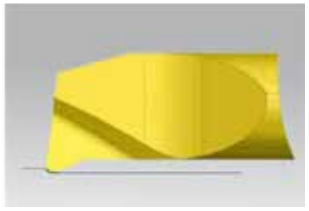
Customer benefit

- ✓ Reduction of cycle time by increasing feedrate to 0.10 mm
- ✓ Better chip forming/chip breakage
- ✓ Consistent tool life
- ✓ Consistent surface finish of r_z = 2-4 µm

without Wiper geometry



with Wiper geometry



Rigid solution for difficult tasks: No matter if long overhangs, large width of cuts or deep contouring. System 110 offers lots of options.

Drive shaft

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2. Machining – Gear Milling (according to DIN 5482)

Initial situation

Customer requirement:
reducing machining time through maximum number of teeth

v_c = 70 m/min
f_z = 0.04 mm

Tool selection

System:	305
Insert:	special tool
Width:	6 mm
Tool holder:	special tool
Coating:	FIRE

Milling cutter with internal coolant

Cutting parameter

Cutting speed:	100 m/min
Feed per tooth:	0.10 mm
Depth of cut:	2.20 mm
Number of cuts:	1

Customer benefit

- ✓ Reduced cycle time:
  z3 → z4
  v_c = + 40 %
  f_z = + 50 %
- ✓ thereby increase of productivity
- ✓ Improved surface finish from
  r_z = 6 µm to r_z = 4 µm

Drive shaft

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3. Machining – Multi contour grooving

Initial situation

- Customer is using 2 tools
- Inconsistent tolerances caused by tool change
- Burrs occur at contour transition

Tool selection

System:	128
Insert:	special tool
Width:	24 mm
Tool holder:	special tool
Coating:	FIRE

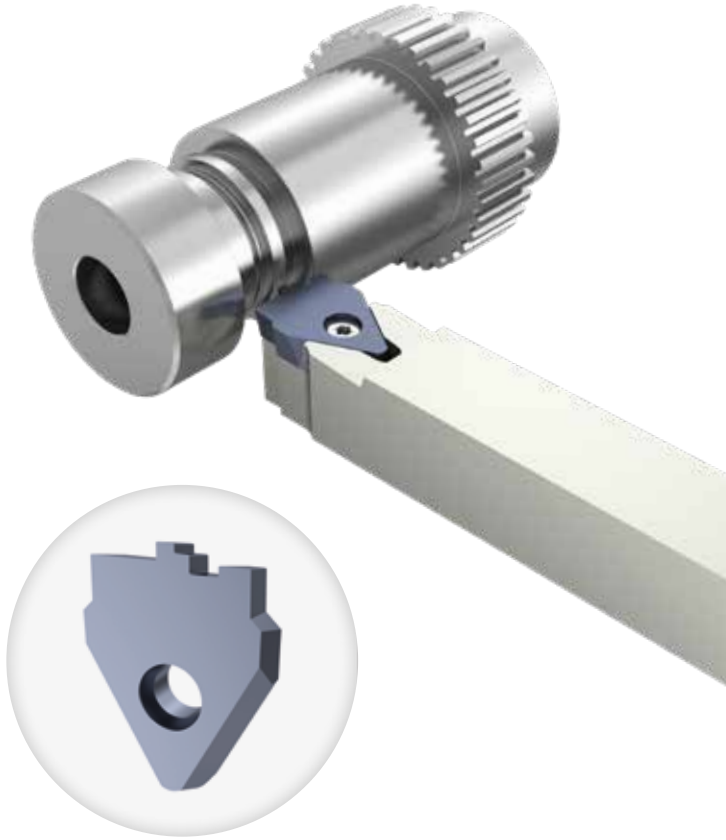
The insert covers the complete contour including chamfering

Cutting parameter

Cutting speed:	70 m/min
Feedrate:	0.05 mm/rev.

Customer benefit

- ✓ Time saving of approx 20 sec. per component = increase of productivity
- ✓ Burr free contour



- Insert can be reground
- Rigid M6 clamping screw in combination with the dovetail insert seat offers good rigidity

Drive shaft

GROOVING SYSTEMS

4. Machining – Broaching of keyway

Initial situation

- Poor and inconsistent surface finish caused by vibrations
- Burrs occur at the exit of the keyway, time consuming manual deburring is required

Tool selection

System:	128
Insert:	special tool
Tool holder:	special tool
Coating:	FIRE
Width:	12P9

Special design with internal coolant

Cutting parameter

Feedrate:	6,000 mm/min
Depth of cut per stroke:	0.06 mm

Customer benefit

- ✓ Big improvement in chip removal due to approaching the cutting edge with the coolant right from the front
- ✓ Special tool body designed for maximum rigidity
- ✓ Significant reduction of manual deburring

Innovative design of special "coolant flaps" to direct the coolant right onto the cutting edge.

Drive shaft

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5. Machining – Parting off into bore

Initial situation

- Inconsistent tool life: 500-800 cuts
- Inconsistent surface finish: r_z = 8-15 µm
- Poor chip forming

Tool selection

System:	222
Insert:	standard item
Blade:	standard item
Coating:	FIRE

Cutting parameter

Cutting speed:	170 m/min
Feedrate:	0.05 mm/rev.

Customer benefit

- ✓ Consistent tool life: 900-950 cuts
- ✓ Very good chip forming
- ✓ Improved surface finish: r_z = 3-6 µm

- Standard program available
- Parting off blade: width 3 mm

Application example 2 – Connector

GROOVING SYSTEMS

Contents

Connector

GROOVING SYSTEMS

Component information

Component

- Material:
  1.4301
- Field of applications:
  see industries

Industries

- Automotive, automotive suppliers
- Machines, engineering equipment
- Electrical-/electronical industry
- General installation applications

Machining

- Machines:
  multi spindle machines
- Coolant:
  60 bar internal coolant with oil
- Serial production:
  10,000 pieces per month

Specifications

- Reduction of cycle time
- Improving chip forming in grooving operations
- Burr free
- Improving the surface finish of the thread

Connector

GROOVING SYSTEMS

1. Machining – Internal boring (combination tool boring into solid and turning)

Initial situation

- Inconsistent tool life
- Tool breakage caused by chip clogging
- Current tool is also capable of boring and turning

Tool selection

System:	108
Insert:	special tool with internal coolant
Tool holder:	special tool with internal coolant
Coating:	TiAlN nanoA

Optimised shape and position ot the coolant supply

Cutting parameter boring

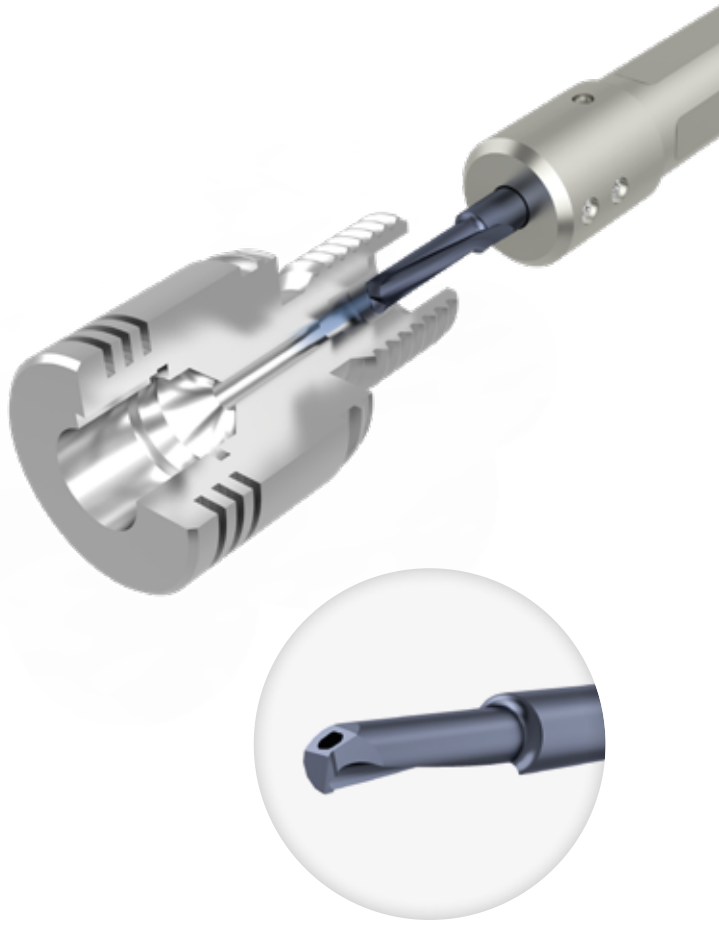
Cutting speed:	120 m/min
Feedrate:	0.03 mm/rev.

Cutting parameter contouring

Cutting speed:	120 m/min
Feedrate:	0.08 mm/rev.
Depth of cut:	1.00 mm

Customer benefit

- ✓ Very good chip removal
- ✓ No longer tool breakage
- ✓ Very effective coolant supply benefits surface finish
- ✓ 10% Increase of tool life



Connector

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2. Machining – External thread turning (pitch = 1.5 mm)

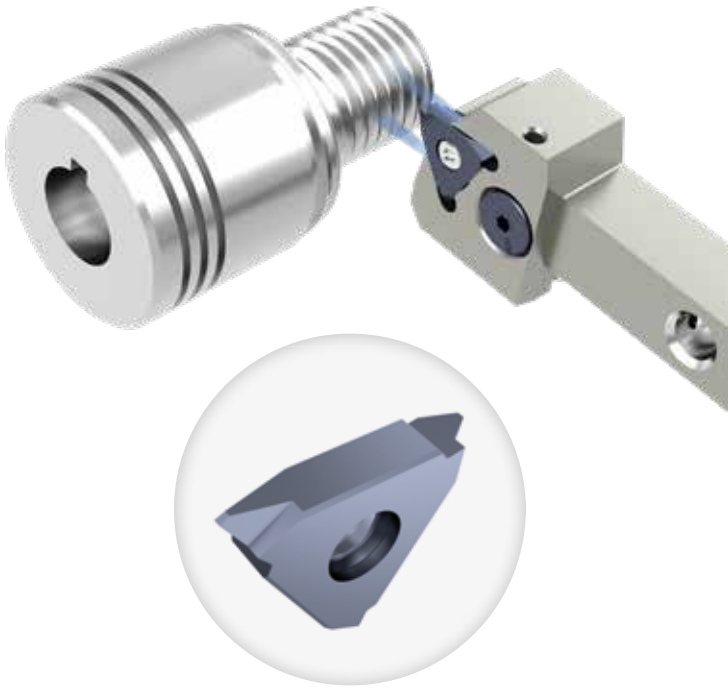
Initial situation

- Customer is using ISO inserts
- Burrs occur during machining
- Poor surface finish

Tool selection

System:	305
Insert:	standard item
Tool holder:	standard item with internal coolant
Coating:	FIRE

Full ground thread turning insert



Cutting parameter

Cutting speed:	80 m/min
Feed	= pitch
Depth of cut per stroke:	0.06 mm

Customer benefit

- ✓ 50% Improved surface finish due to full ground insert
- ✓ Less burrs
- ✓ Optimised chip removal due to the adjustable coolant supply

→ **exclusively at Gühring**

Connector

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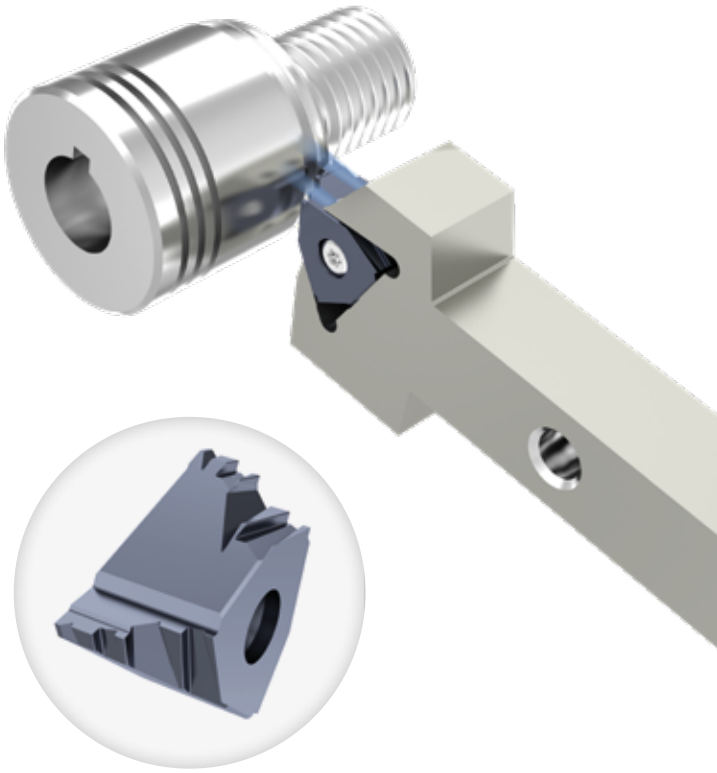
3. Machining – External profile grooving

Initial situation

- Currently customer is machining the complex contour with various tools
- This leads into long machining time with high production costs involved

Tool selection

System:	308
Insert:	special tool
Tool holder:	special tool with internal coolant
Coating:	FIRE



Cutting parameter roughing

Cutting speed:	150 m/min
Feedrate:	0.09 mm/rev.

Cutting parameter finishing

Cutting speed:	200 m/min
Feedrate:	0.04 mm/rev.

Customer benefit

- ✓ Pre-grooving and finish grooving with one tool means no tool change needed
- ✓ Chamfering included in the ground contour means no burrs
- ✓ Reduced machining costs due to significantly reduced machining time

Connector

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4. Machining – External grooving (3 grooves width 1.5 mm)

Initial situation

- Customer unhappy because of poor chip removal what occasionally leads to insert breakage
- Inconsistent surface finish

Tool selection

System:	305
Insert:	special tool with suitable chip breaker
Tool holder:	standard item with internal coolant
Coating:	FIRE

Cutting parameter

Cutting speed:	180 m/min
Feedrate:	0.08 mm/rev.
Depth of groove:	5.00 mm

Customer benefit

- ✓ High process reliability due to save chip removal
- ✓ Occasionally insert breakage stopped
- ✓ Good surface finish: r_z = 3-5 µm

Connector

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5. Machining – Keyway broaching (width = 5C11, depth = 5 mm)

Initial situation

- Current tool is a standard item
- Very limited space available

Tool selection

System:	106
Insert:	special item
Tool holder:	standard item with internal coolant
Coating:	TiAlN nanoA

Cutting parameter

Feedrate:	7,000 mm/min
Depth of cut per stroke:	0.07 mm

Customer benefit

- ✓ Individually designed special insert with optimised rigidity
- ✓ Rigid insert allows high feed rate
- ✓ Improved tool life

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EINSTECH SYSTEME

MANY THANKS

FOR YOUR ATTENTION