XEBEC®
BEAUTIFUL DEBURRING

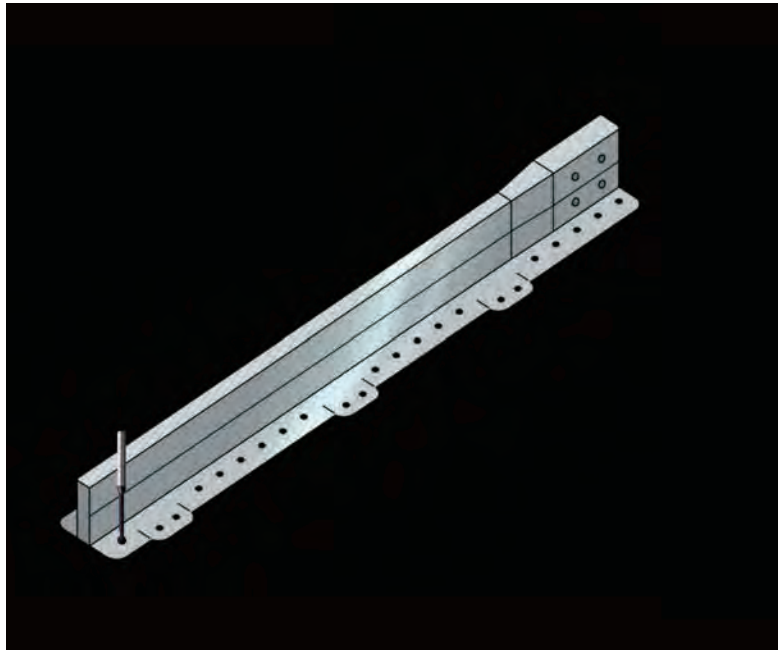
Advanced Deburring & Polishing Solutions

AEROSPACE

SEF Xebec

FLOOR PANEL

Applicaton



Workpiece information

Industry	Aerospace
Part name	Floor panel
Material type	Titanium
Cutting process	Drilling, end-milling

Processing conditions

Tool	XEBEC Back Burr Cutter & Path (XC-58-A)
Processing detail	Deburring hole (front and back side) and edges after milling
Rotational Speed (min^{-1})	6,000
Feed Rate (mm/min)	900
Depth of cut (mm)	–

Before

Tool — Chamfering cutter

Problem — Due to the wide dimensional tolerance of the cutter, chamfering amount was unstable.

After

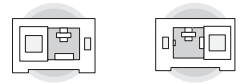
Tool — XEBEC Back Burr Cutter & Path (XC-58-A)

Result — The edges after XEBEC Back Burr Cutter are stable and uniform. High-quality finish is achieved.

Tool

XEBEC Back Burr Cutter and Path™

The tool can be mounted on machining center (XYZ-axis) or combined lathe (XZY or XZC-axis). 3-axis simultaneous control is required.



Machining Center | Combined Lathe

Brush Requires Brush Sleeve to Operate:

Spherical Cutting Tool **Custom Path Data**

Ideal for:

- Deburring Difficult Holes
- Inner and Outer Diameters

One Cutter size supports various edges in different sizes and shapes.

BLADE CASE

Applicaton

Workpiece information

Industry	Aerospace
Part name	Blade case
Material type	Titanium
Cutting process	Drilling

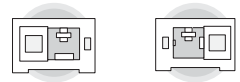
Processing conditions

Tool	XEBEC Back Burr Cutter & Path (XC-38-A/XC-58-A)
Processing detail	Deburring of hole (front and back) with angle head holder
Rotational Speed (min^{-1})	9,200/6,000
Feed Rate (mm/min)	1,200/900
Depth of cut (mm)	–

Tool

XEBEC Back Burr Cutter and Path™

The tool can be mounted on machining center (XYZ-axis) or combined lathe (XZY or XZC-axis). 3-axis simultaneous control is required.



Machining Center | Combined Lathe

Brush Requires Brush Sleeve to Operate:

Spherical Cutting Tool

Custom Path Data

Ideal for:

- Deburring Difficult Holes
- Inner and Outer Diameters

One Cutter size supports various edges in different sizes and shapes.

BEARING CAGE

Applicaton

Workpiece information

Industry	Aerospace
Part name	Bearing cage
Material type	Alloy steel
Cutting process	Turning and drilling

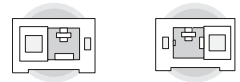
Processing conditions

Tool	XEBEC Back Burr Cutter & Path (XC-58-A)
Processing detail	Deburring hole (front and back side) and edges
Rotational Speed (min^{-1})	2,000
Feed Rate (mm/min)	250
Depth of cut (mm)	–

Tool

XEBEC Back Burr Cutter and Path™

The tool can be mounted on machining center (XYZ-axis) or combined lathe (XZY or XZC-axis). 3-axis simultaneous control is required.



Machining Center | Combined Lathe

Brush Requires Brush Sleeve to Operate:

Spherical Cutting Tool

Custom Path Data

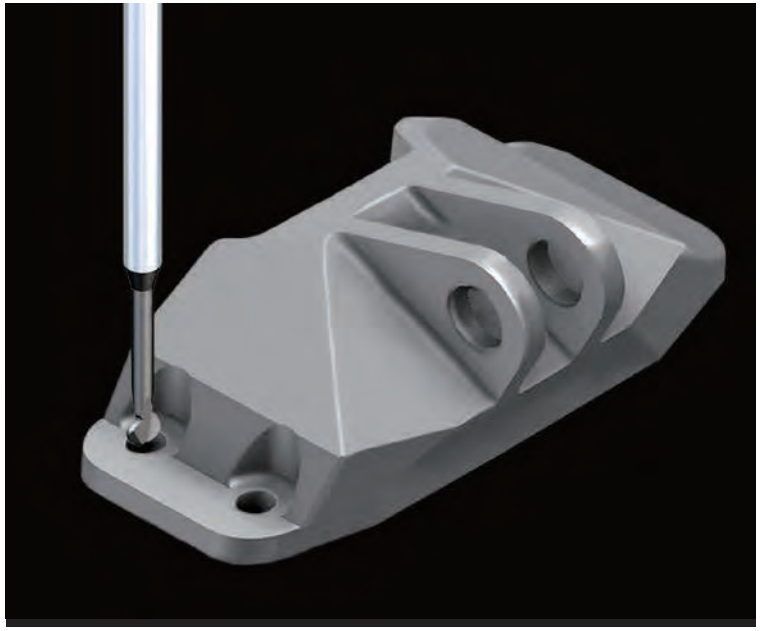
Ideal for:

- Deburring Difficult Holes
- Inner and Outer Diameters

One Cutter size supports various edges in different sizes and shapes.

ENGINE BRACKET

Applicaton



Workpiece information

Industry	Aerospace
Part name	Engine Bracket
Material type	Titanium Alloy
Cutting process	Crosshole Deburring

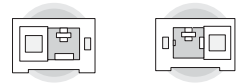
Processing conditions

Tool	XEBEC™ Back Burr Cutter (XC-98-A)
Processing detail	Deburring inside and outside edges of holes with chamfered edges.

Tool

XEBEC Back Burr Cutter and Path™

The tool can be mounted on machining center (XYZ-axis) or combined lathe (XZY or XZC-axis). 3-axis simultaneous control is required.



Machining Center | Combined Lathe

Brush Requires Brush Sleeve to Operate:

Spherical Cutting Tool

Custom Path Data

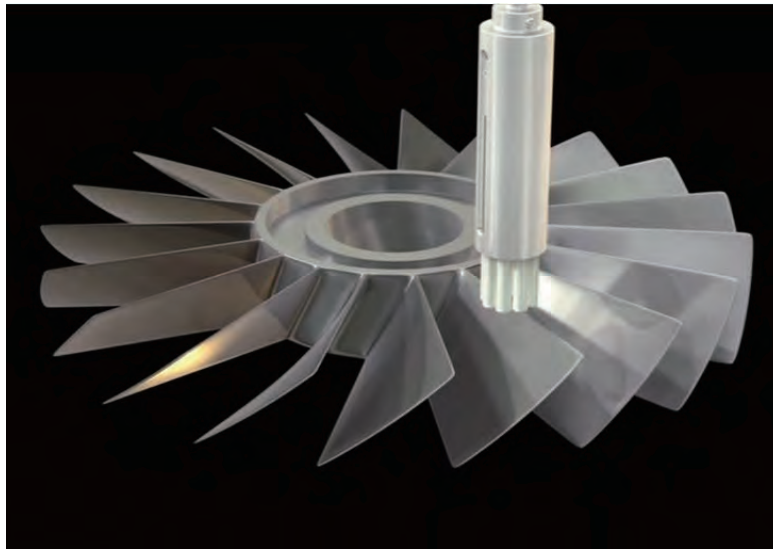
Ideal for:

- Deburring Difficult Holes
- Inner and Outer Diameters

One Cutter size supports various edges in different sizes and shapes.

BLISK

Applicaton



Workpiece information

Industry	Aerospace
Part name	Blisk
Material type	Inconel
Cutting process	Ball end mill processing

Processing conditions

Tool	XEBEC Brush Surface (A21-CB25M)
Processing detail	Deburring after ball-end milling process
Rotational Speed (min^{-1})	4,000
Feed Rate (mm/min)	2,400
Depth of cut (mm)	0.5

Before

Tool: Grindstone

Problem: It took time for deburring due to the complicated design of workpiece. Resulted in unstable edge quality.

After

Tool: XEBEC Brush Surface (A21-CB25M)

Result: By the introduction of automated deburring, 1 operator can operate the multiple machining centers.

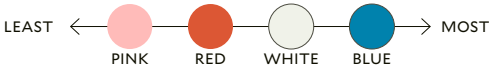
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

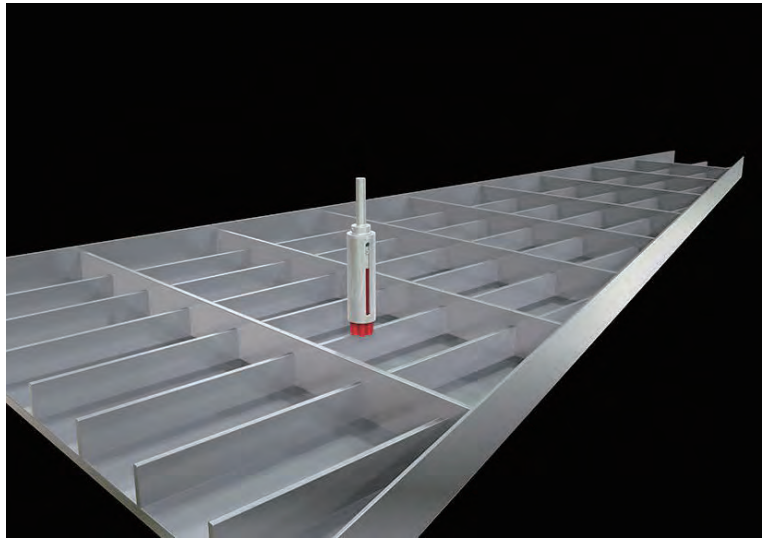
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

WING RIB

Applicaton



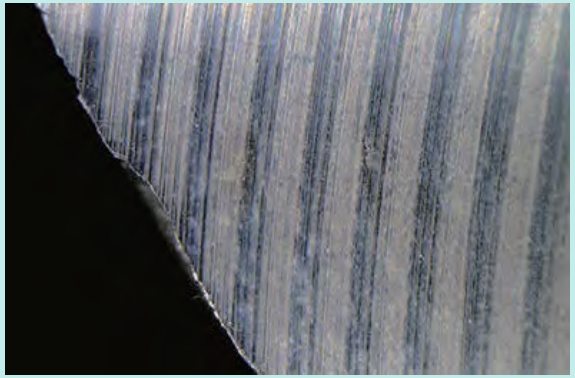
Workpiece information

Industry	Aerospace
Part name	Wing rib
Material type	Aluminum
Cutting process	End mill processing

Processing conditions

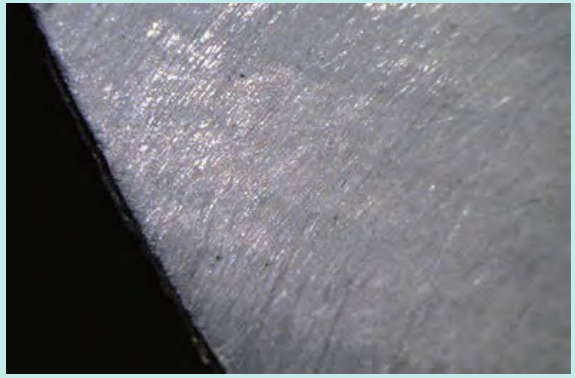
Tool	XEBEC Brush Surface (A11-CB25M)
Processing detail	Deburring after end milling process
Rotational Speed (min^{-1})	4,000
Feed Rate (mm/min)	800
Depth of cut (mm)	0.7

Before



Tool	Belt sander
Problem	It took time for deburring due to large workpiece.

After



Tool	XEBEC Brush Surface (A11-CB25M)
Result	By the introduction of automated deburring, stable quality realized in a shorter cycle time.

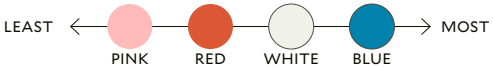
Tool

XEBEC Brush™ Surface

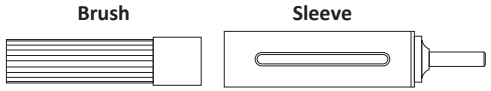
Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:



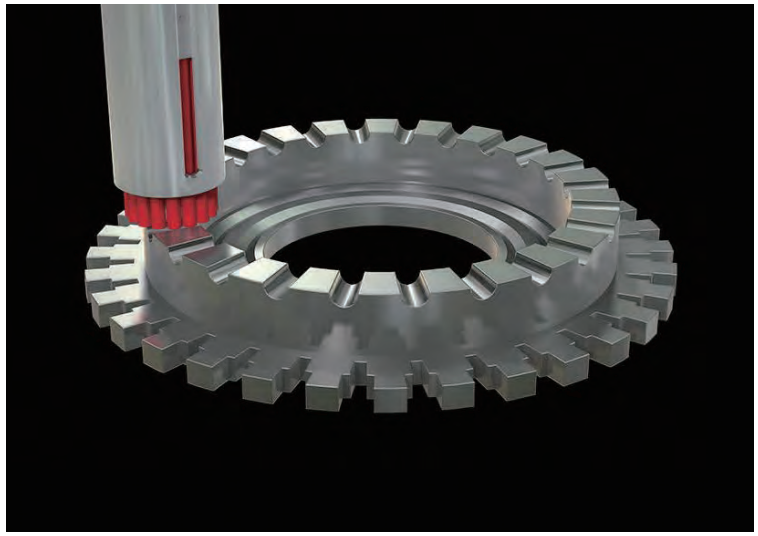
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

TURBINE DISK

Applicaton



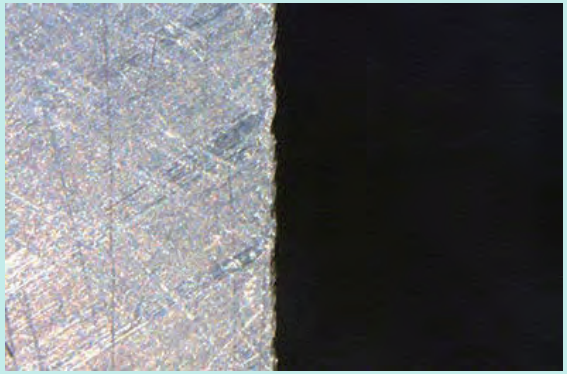
Workpiece information

Industry	Aerospace
Part name	Turbine disk
Material type	Inconel
Cutting process	Others

Processing conditions

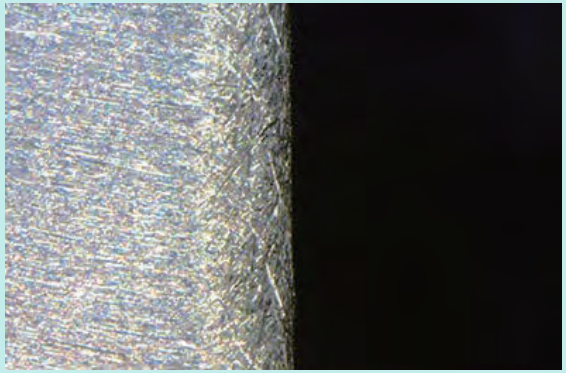
Tool	XEBEC Brush Surface (A11-CB40M)
Processing detail	Deburring after grinding process
Rotational Speed (min^{-1})	1,500
Feed Rate (mm/min)	2,400
Depth of cut (mm)	0.5

Before



Tool	Grindstone
Problem	Burrs remained and edge quality was inconsistent.

After



Tool	XEBEC Brush Surface (A11-CB40M)
Result	Achieved full automation with machining center. No burrs left and quality stabilized.

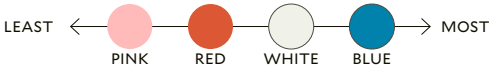
Tool

XEBEC Brush™ Surface

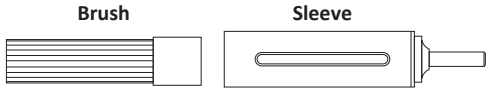
Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:



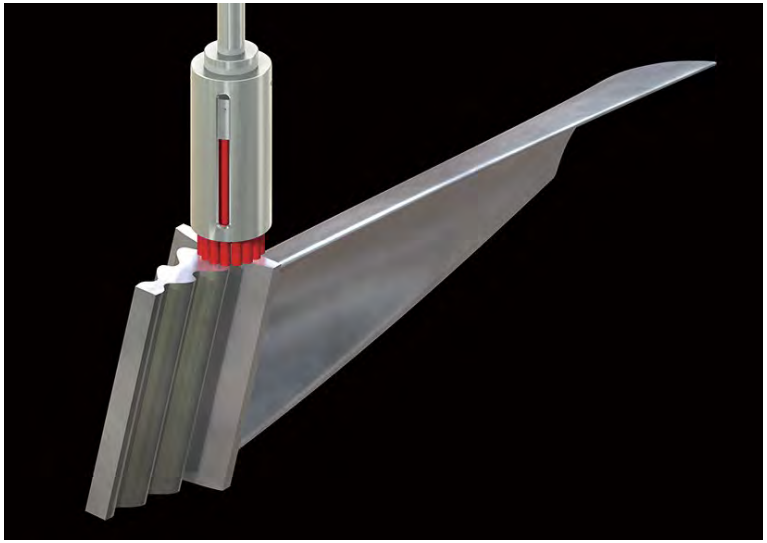
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

TURBINE BLADE

Applicaton



Workpiece information

Industry	Aerospace
Part name	Turbine blade
Material type	SUS316
Cutting process	Ball end mill processing

Processing conditions

Tool	XEBEC Brush Surface (A11-CB25M)
Processing detail	Deburring after ball-end milling process
Rotational Speed (min^{-1})	1,000
Feed Rate (mm/min)	1,000
Depth of cut (mm)	0.3

Before

Tool	File
Problem	Deburring caused unstable edge quality. Recovering process was required.

After

Tool	XEBEC Brush Surface (A11-CB25M)
Result	By the introduction of automated deburring, stable quality with even edge shape realized.

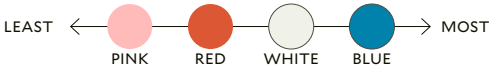
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

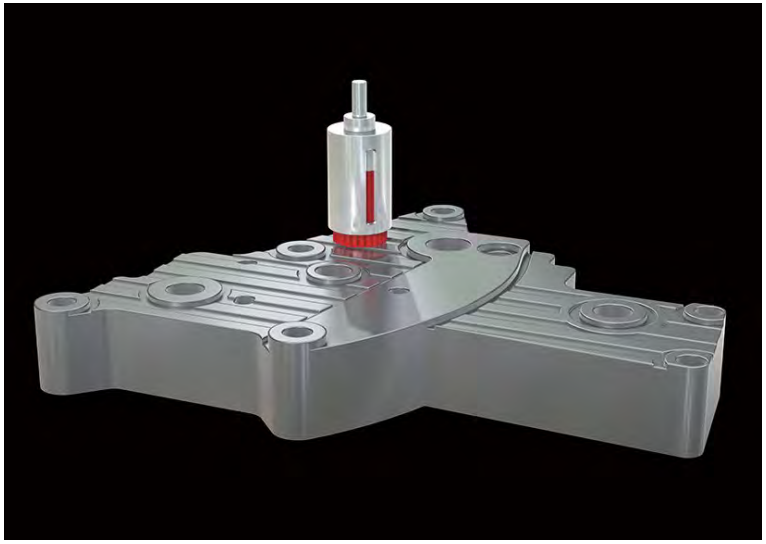
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

LANDING GEAR

Applicaton



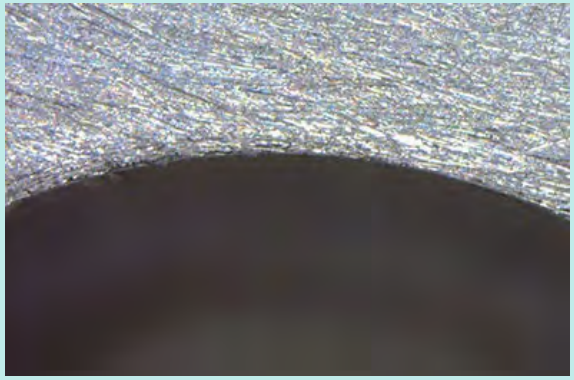
Workpiece information

Industry	Aerospace
Part name	Landing gear parts
Material type	Aluminum
Cutting process	Front cutter processing

Processing conditions

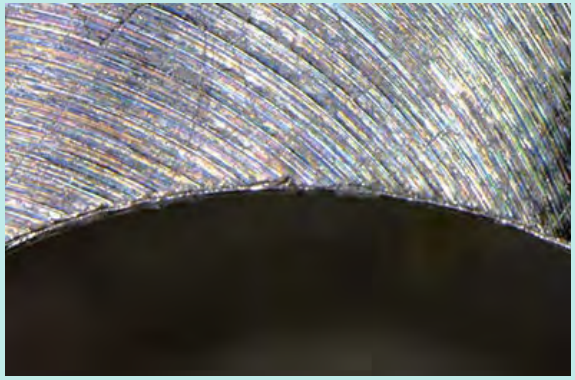
Tool	XEBEC Brush Surface (A11-CB100M)
Processing detail	Deburring the edge face after milling process
Rotational Speed (min^{-1})	3,000
Feed Rate (mm/min)	2,000
Depth of cut (mm)	0.7

Before



Tool	File
Problem	Manual deburring caused unstable quality and long processing time required.

After



Tool	XEBEC Brush Surface (A11-CB40M)
Result	Deburring is fully automated and consistent finish achieved.

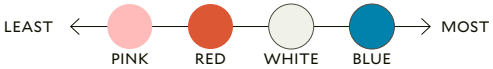
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

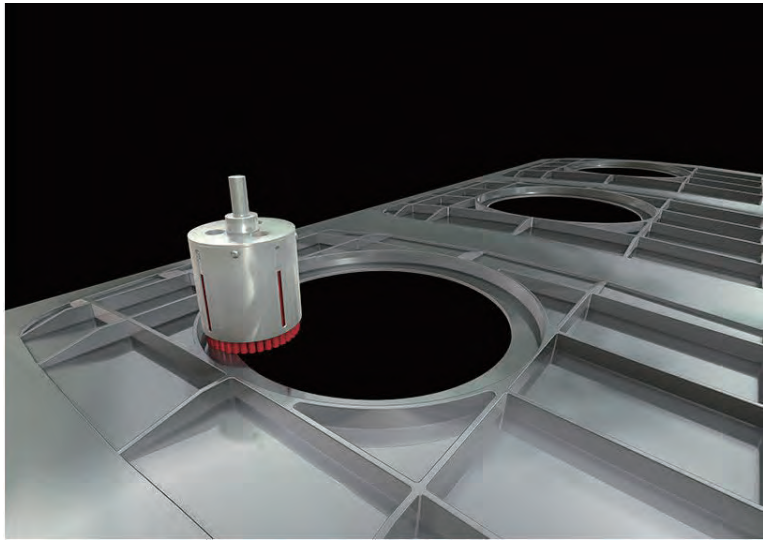
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

AIRCRAFT BODY

Applicaton



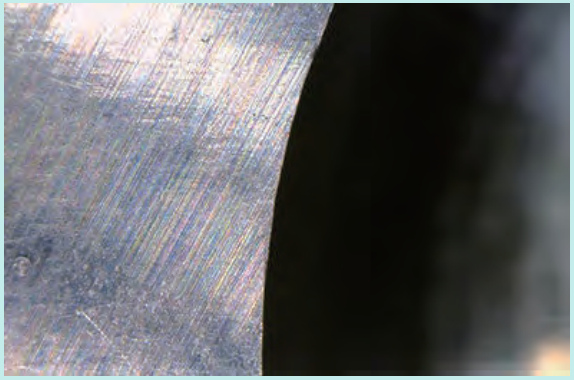
Workpiece information

Industry	Aerospace
Part name	Aircraft body
Material type	Aluminum alloy
Cutting process	Front cutter processing

Processing conditions

Tool	XEBEC Brush Surface (A11-CB100M)
Processing detail	Deburring the edge face after milling process
Rotational Speed (min^{-1})	960
Feed Rate (mm/min)	500
Depth of cut (mm)	0.3

Before



Tool	Belt sander
Problem	It took time for deburring due to the large workpiece.

After

Tool	XEBEC Brush Surface (A11-CB100M)
Result	Deburring is fully automated. Consistent finish and cut-down of machining time achieved.

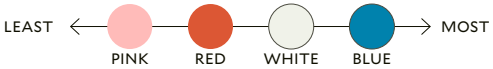
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

ENGINE SHELL NOZZLE

Applicaton

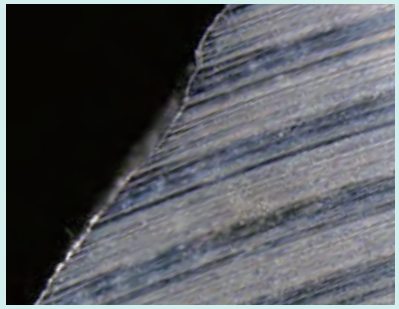
Workpiece information

Industry	Aerospace
Part name	Nozzle
Material type	Aluminum Alloy
Cutting process	Surface Finishing

Processing conditions

Tool	XEBEC™ Brush Surface Extra-Large (A32-CB200M)
Processing detail	Deburring and finishing of edges and large surface area
Rotational Speed (min^{-1})	550
Feed Rate (mm/min)	2,500

Before



After

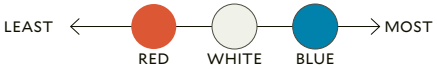
Tool

XEBEC Brush™ Surface Extra-Large

Available in Diameters:

125, 165, 200 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing

For large parts with surface widths greater than 100mm. Deburring & finishing following face-milling, end-milling & drilling.

ENGINE COMPRESSOR SHAFT

Applicaton

Workpiece information

Industry	Aerospace
Part name	Engine Compressor Shaft
Material type	Hastelloy
Cutting process	Surface Finishing

Processing conditions

Tool	XEBEC™ Brush End Type (A11-EB06M)
Processing detail	Deburring and finishing of curved surface features and radial edges..
Rotational Speed (min^{-1})	550
Feed Rate (mm/min)	2,500

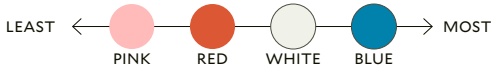
Tool

XEBEC Brush™ Surface End Type

Available in Diameters:

1, 1.5, 2, 2.5, 3, 5 mm

Aggressiveness indicated by Color:



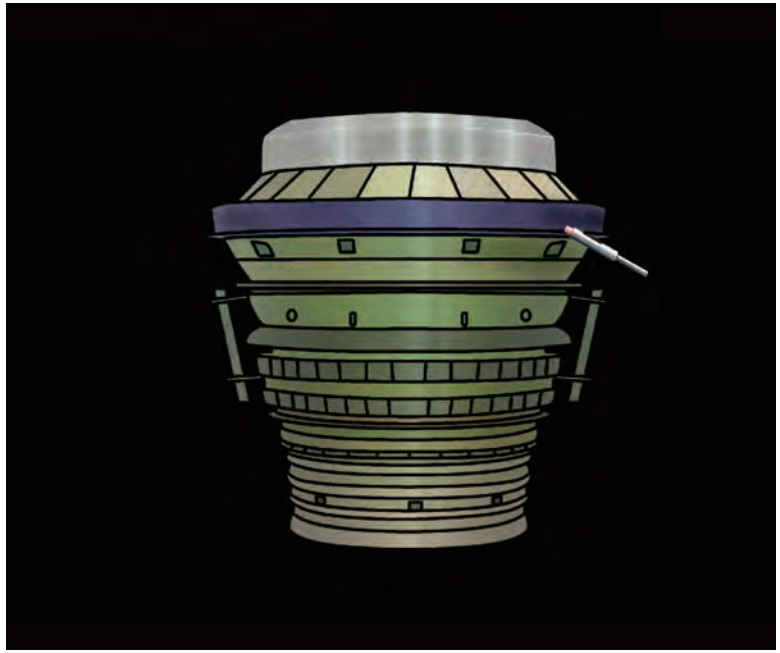
Ideal for:

- Detailed, Intricate Parts
- Surface Deburring
- Cutter Mark Removal
- Polishing

Cutter-mark removal, polishing and finishing of parts with narrow features.

COMPRESSOR CASE

Applicaton



Workpiece information

Industry	Aerospace
Part name	Intermediate compressor case
Material type	Titanium
Cutting process	End-milling

Processing conditions

Tool	XEBEC Brush Surface (A11-CB06M)
Processing detail	Robot arm grips Brush and moves along the edges
Rotational Speed (min^{-1})	3,600
Feed Rate (mm/min)	1,800
Depth of cut (mm)	0.5

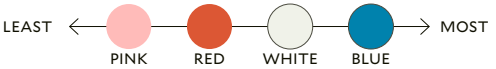
Tool

XEBEC Brush™ Surface

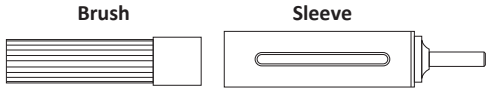
Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:



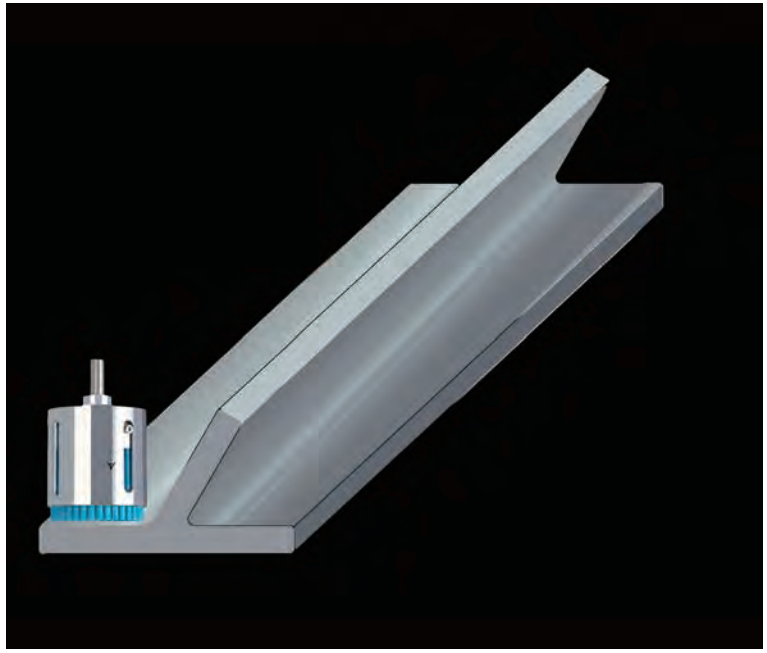
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

WING COMPONENT

Applicaton



Workpiece information

Industry	Aerospace
Part name	Component of wings
Material type	Aluminum
Cutting process	End-milling

Processing conditions

Tool	XEBEC Brush Surface (A32-CB60M/ A32-CB100M)
Processing detail	Cutter mark removal and removal of mismatches
Rotational Speed (min^{-1})	2,000/1,200
Feed Rate (mm/min)	850
Depth of cut (mm)	0.5

Before

Tool Disc grinder

Problem It took an hour per part to remove tool marks and mismatches. Only the experienced worker handled the task. Due to his retirement, there was an urgent need to semi-automate the manual process.

After

Tool XEBEC Brush Surface (A32-CB60M/A32-CB100M)

Result Flat surfaces are now processed in CNC but some parts including R-shaped corner still require manual finishing but time for manual process is reduced by half.

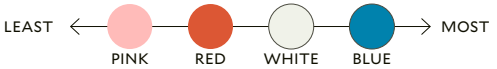
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

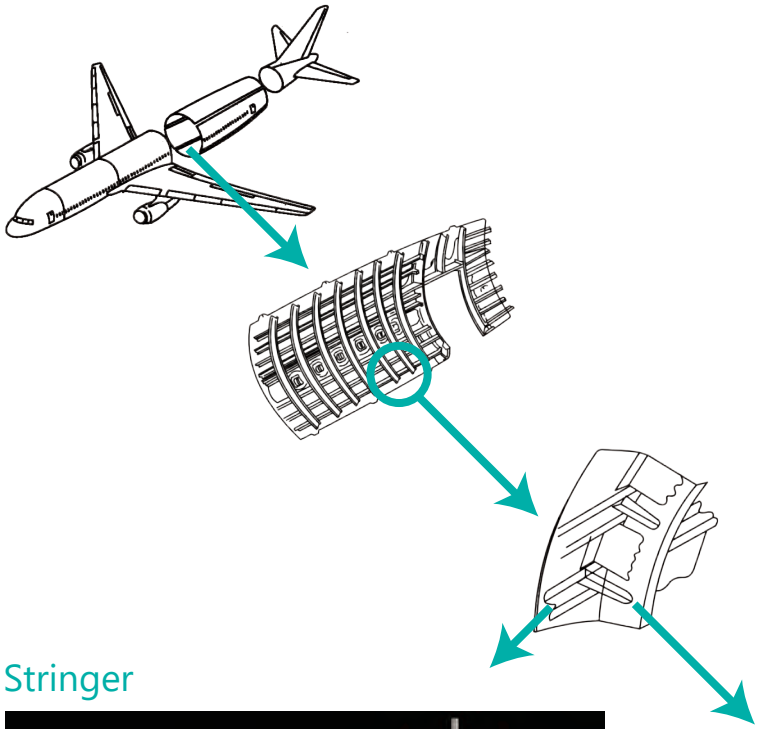
Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

STRINGER, STRINGER CLIP

Applicaton



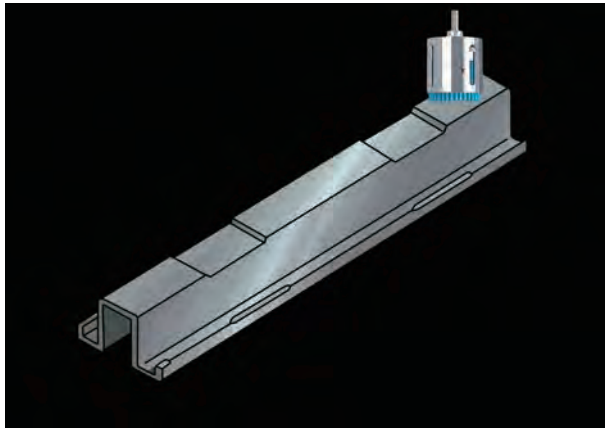
Workpiece information

Industry	Aerospace
Part name	Compressor case
Material type	Aluminum
Cutting process	End-milling

Processing conditions

Tool	XEBEC Brush Surface (A32-CB60M/ A21-CB25M)
Processing detail	Deburring after end milling and scratch removal
Rotational Speed (min^{-1})	1,600/4,000
Feed Rate (mm/min)	1,800/2,500
Depth of cut (mm)	0.5

Stringer



Stringer clip

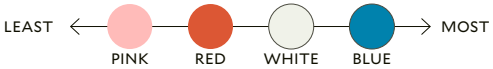
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

PIPE FITTING

Applicaton

Workpiece information

Industry	Aerospace
Part name	Pipe Fitting
Material type	Titanium Alloy
Cutting process	Crosshole Deburring

Processing conditions

Tool	XEBEC™ Brush Crosshole (CH-A33-7L)
Processing detail	Deburring and finishing inner wall diameter
Rotational Speed (min^{-1})	8,000
Feed Rate (mm/min)	300

Tool

XEBEC Brush™ Crosshole

Available in Diameters:

1.5, 3, 5, 7, 11, 15, 20, 25 mm

Aggressiveness indicated by Color:

Length:

Standard and Extended Lengths

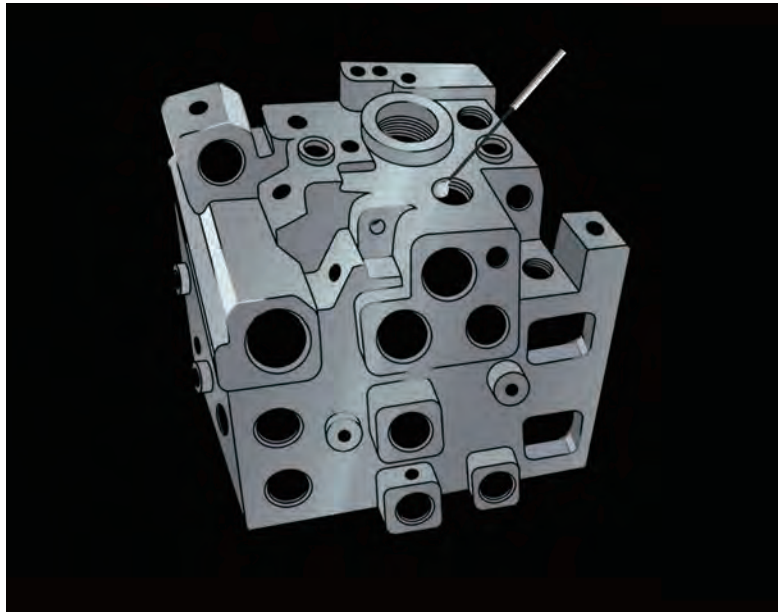
Ideal for:

- Cross Hole Deburring
- Inner Walls of Cylinders

Brush tip flares under centrifugal force to remove burrs along inner walls of the hole.

HYDRAULIC PARTS

Applicaton



Workpiece information

Industry	Aerospace
Part name	Hydraulic parts
Material type	Aluminum
Cutting process	Drilling

Processing conditions

Tool	XEBEC Stone Flexible Shaft CH-PM-3B/4B/5B/6B/10B CH-PO-4B/5B/6B CH-PB-4B/5B/3R CH-PM-3B-L CH-PM-6B-L
Processing detail	Deburring after end milling and scratch removal

Before

Tool — Cutting tool

Problem — Manual deburring took 11 hours per workpiece. Due to roughness requirement, scratches by cutting tool were not allowed. The workers had to process it delicately and it was inefficient.

After

Tool — XEBEC Stone Flexible Shaft

Result — Secondary burrs are not generated. Efficiency is significantly improved.

Tool

XEBEC Stone™ Flexible Shaft

Head Styles:

Cylinder **Sphere**

Available in Diameters:

3, 4, 5, 6, 10 mm

Stone color and grit:

Blue #800 **Orange** #400 **Gray** #220

Ideal for:

- Deburring Cross Holes
- Soft Contact
- Suppresses Vibrations

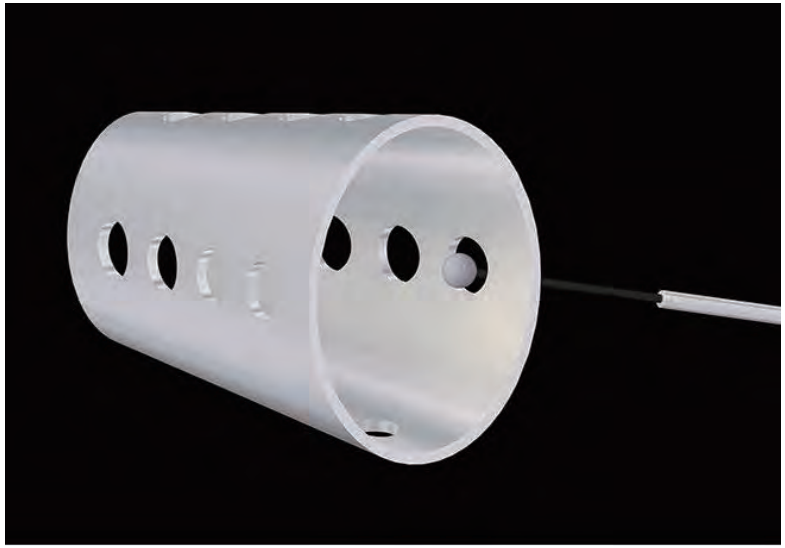
Available styles:

- Extended Flexible Shaft
- Cylinder or Sphere Heads

Deburring both the front and back of a drilled hole.

PIPE PART

Applicaton



Workpiece information

Industry	Aerospace
Part name	Pipe parts for aircrafts (Cross hole)
Material type	SUS
Cutting process	Drilling

Processing conditions

Tool	XEBEC Stone Flexible Shaft Type (CH-PM-6B)
Processing detail	Cross hole deburring (back burr) after drilling process
Rotational Speed (min^{-1})	2,000
Feed Rate (mm/min)	—
Depth of cut (mm)	—
Machining time (sec)	30sec/hole

Before

Tool — Rubber grindstone in the rotating tool

Problem — Finish quality varied from the skill of workers. It took around 40 minutes to deburr 16 holes (150 seconds/hole).

After

Tool — XEBEC Stone Flexible Shaft Type (CH-PM-6B)

Result — Insert the spherical grinding stone with the cross hole and contour the edge while pulling the tool lightly. Stable quality with shorter cycle time realized.

Tool

XEBEC Stone™ Flexible Shaft

Head Styles:

Cylinder **Sphere**

Available in Diameters:

3, 4, 5, 6, 10 mm

Stone color and grit:

Blue #800 **Orange** #400 **Gray** #220

Ideal for:

- Deburring Cross Holes
- Soft Contact
- Suppresses Vibrations

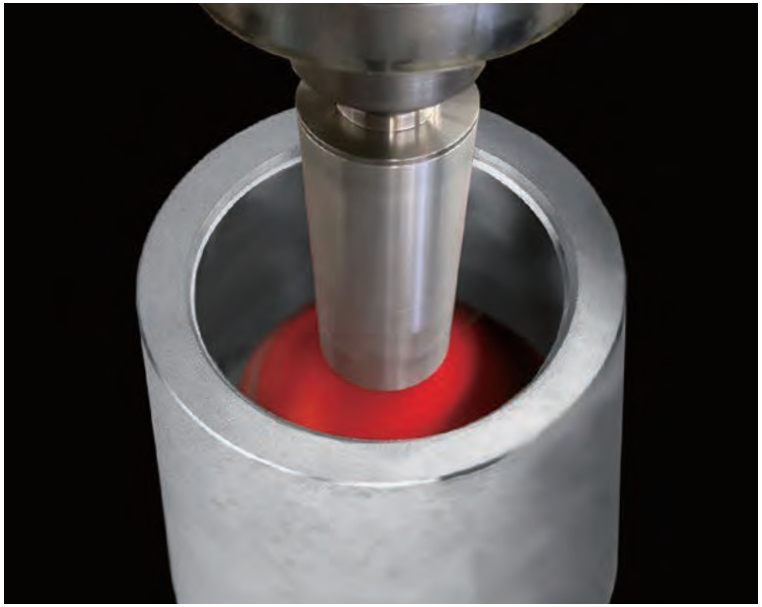
Available styles:

- Extended Flexible Shaft
- Cylinder or Sphere Heads

Deburring both the front and back of a drilled hole.

LARGE INNER DIAMETER

Applicaton



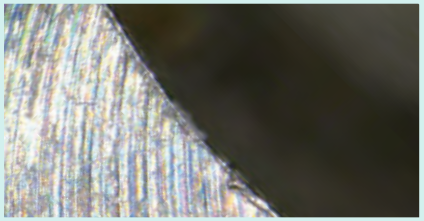
Workpiece information

Industry	Aerospace
Part name	Large Diameter Cross Hole
Material type	17-4 Stainless Steel
Cutting process	Deburring ID Hole

Processing conditions

Tool	XEBEC™ Brush Surface (A11-CB25M)
Processing detail	Deburring of large inner diameter of hole.
Rotational Speed (min^{-1})	2,800
Brush Projection Specified for Inner Diameter Application	80mm
Flared Target Diameter	115mm

Before



After

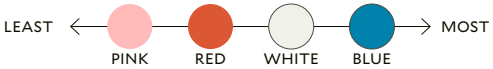
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

Ideal for:

- Surface Deburring
- Cutter Mark Removal
- Edge Radius
- Surface Finishing
- Polishing

Deburring & finishing following face-milling, end-milling & drilling.

THREADED DIAMETER

Applicaton

Workpiece information

Industry	Aerospace
Part name	Threaded Diameter
Material type	Aluminum Alloy
Cutting process	Surface Finishing

Processing conditions

Tool	XEBEC™ Wheel Brush (W-A11-75)
Processing detail	Deburring and finishing of threaded diameter of inner wall.
Rotational Speed (min^{-1})	1,900
Feed Rate (mm/min)	3,000

Tool

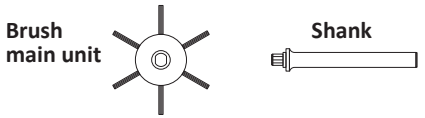
XEBEC Brush™ Wheel Type

Available in Diameters:

50, 75 mm

Requires reusable Shank to operate

70 or 150 mm Shank lengths



Available Colors (Aggressiveness):

Red

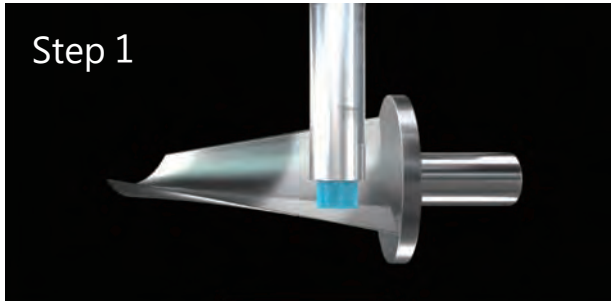
Ideal for:

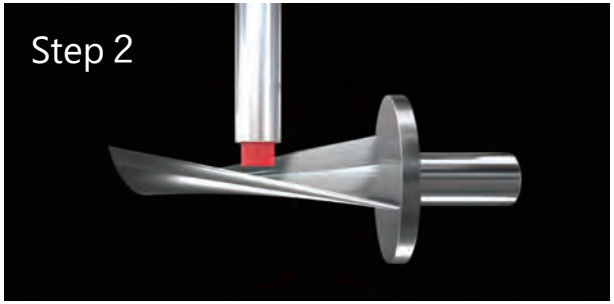
- Deburring and Polishing
- Side Surfaces
- Inner and Outer Diameters

Can be used in CNC and robotic machines.

TURBINE BLADE

Applicaton





	Step 1	Step 2
Processing details	XEBEC Brush Surface（A32 Blue） Ra5.0 ⇒ Ra0.34	XEBEC Brush Surface（A11 Red） Ra0.34 ⇒ Ra0.16
Machining time	4.5min	

Effect

	After ball end milling	After semi finishing	After finishing
convex surface	Ra 4.912 Rz 21.181	Ra 0.336 Rz 2.974	Ra 0.159 Rz 1.557
concave surface	Ra 5.024 Rz 20.763	Ra 0.245 Rz 2.180	Ra 0.100 Rz 0.856

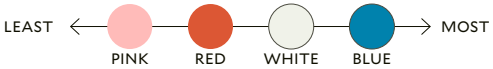
Tool

XEBEC Brush™ Surface

Available in Diameters:

6, 15, 25, 40, 60, 100 mm

Aggressiveness indicated by Color:



Brush Requires Brush Sleeve to Operate:

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Deburring & finishing following face-milling, end-milling & drilling.

XEBEC®
BEAUTIFUL DEBURRING

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