



# **XEBEC Brush Surface (Regular Type / End Type)**

## **Instruction Manual**

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Thank you for purchasing the XEBEC Brush Surface.

Please read this instruction manual before using the product and keep it in a safe place for easy access whenever needed.

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# Safety Precautions

## Warning and Caution Logos

The meanings of the indications and symbols related to matters which must be observed in order to ensure the safety of this product are as detailed below.

### Warning and Caution Logos

 <b>WARNING</b>	<b>WARNING</b> indicates a hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION</b>	<b>CAUTION</b> indicates practices that may cause injuries and damages

### Symbols










Obey all safety messages that follow this symbol to avoid possible injury or death.



This is the safety alert symbol. It is used to alert you to potential physical injury hazards.

## Operator Safety Protection

	 <b>WARNING</b>
	<p>Using this product can result in severe injuries and damages. To prevent these, take safety measures and use the product with caution.</p> <ul style="list-style-type: none"> <li>• The product may break, fracture or fall off from the machine tool and cause operator injuries or loss of sight. It may also cause damages to the machine tool, jig, fixture or workpiece.</li> <li>• Dust and chips generated when using this product can cause blindness and injury.</li> <li>• Dust and particles generated by this product can cause lung damage, skin irritation, and allergies.</li> </ul>
	<p>If vibrations or any other abnormalities occur, discontinue use immediately.</p> <p>Continuing to use the product under these conditions may cause it to break or fall off, potentially resulting in injury or loss of sight.</p>
	<p>Do not use the product exceeding the maximum rotational speed and the Brush protruding length.</p> <p>If the product is used exceeding the standard parameters, it may break, fracture or fall off from the machine tool and cause operator injuries or loss of sight.</p>
	<p>The tip of the tool may become overheated when it is applied to a workpiece for a prolonged span of time, causing ceramic fiber bristles to break loose, which may possibly result in operator injuries or loss of sight. Adjust the machining time to prevent the workpiece from overheating. DO NOT touch the machined area of the workpiece with your hands.</p>
	<p>Ensure the product is used within the standard machining parameters.</p> <p>Exceeding these parameters may cause the product to break, fracture, or fall off the machine tool, leading to operator injuries or loss of sight.</p>
	<p>Ensure there is no interference between the product and the workpiece when setting the depth of cut.</p> <p>Otherwise, the bristles and other components of this product may break, fracture or fall off from the machine tool and cause operator injuries or loss of sight.</p>

### Wear protective gears

Wear protective gear such as goggles, a face mask, gloves, and earmuffs when using this product. Additionally, ensure your skin is covered with clothing.

## Safety Precautions

### Chips and Dust

Make sure to use a dust collector or other means to collect chips, dust, and other substances to prevent them from scattering into the surrounding.

### Attention to the Work Area



- Install an enclosure so that persons other than the operator do not enter the work area, and ensure that all persons, if any, in the work area are wearing protective gears.
- In particular be careful that children do not enter the work area.
- Keep the floor of the work area clean at all times to prevent the risk of slipping or tripping on chips, dust, cutting fluids, coolant, or other substances.
- There is the risk of fire caused by heating, sparks, or other factor resulting from use of the product. Do not use the product close to a flammable liquid or in an explosive atmosphere. Also be sure to enact fire prevention measures.

## Pre-Use Inspection

Perform a test run for at least one minute prior to operation, or at least for three minutes in case the Brush or the machine tool has been replaced, to make sure there is no looseness, vibration or any other abnormality.

[End Type] Make sure that the tip of the product is inside a bore with a diameter  $\Phi 20$  mm or smaller before rotating it.

## Notes for When Setting up This Product on the Machine

	 <b>WARNING</b>
	<b>Refer to the instruction manual of the machine when setting up the Brush on the machine.</b> If the product is not clamped properly, this product may fall off from the tool holder while in operation. It may cause operator blindness or injury.

- Dust and chips generated by using the product can affect the sliding parts of the machine tool. Make sure to remove dust and chips by using sludge collection systems, oil skimmer or other means.
- Make sure to use the product on a machine tool that can control the rotational speed.
- Make sure to use a tool holder that is the right size for the shank diameter of this product.

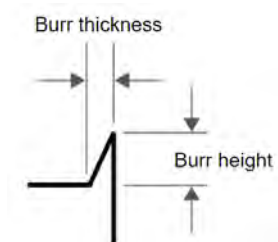
# Features

## Regular Type

- Removes burrs up to 0.2 mm in root thickness generated during machining. It can also remove cutter marks and polish surfaces.
- The Brush's capability to remove burrs and finish surfaces is limited to its tip.
- It can be used with equipment like machining centers and robots to automate deburring and cutter mark removal. (It is possible to be clamped with a collet chuck, milling chuck or drill chuck to be used with a machine)
- Its unique ceramic fiber brush material ensures consistent cutting and polishing performance without deformation. The Brush is made of ceramic fibers and contains no abrasive grain.
- It can be used with or without cutting coolant.
- Applicable burr size: Burr thickness 0.2 mm or less (Burrs this size can be bent by fingernails)

## End Type

- It is ideal for polishing and removing cutter marks on sealing surfaces and curved surfaces.
- The Brush's capability to remove burrs and finish surfaces is limited to its tip.
- Its unique ceramic fiber brush material ensures consistent cutting and polishing performance without deformation. The Brush is made of ceramic fibers and contains no abrasive grain.
- It can be used with or without cutting coolant.
- Applicable burr size: Burr thickness 0.1 mm or less (Burrs this size can be easily bent by fingernails)



# Product Specifications and Machining Parameters

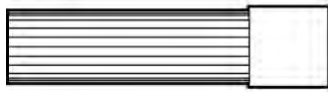
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## Product Specifications (Regular Type)

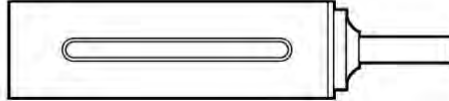
### Parts and Tool Included in the Product

The Brush is to be used with the separately available sleeve.

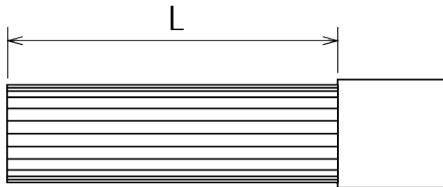
Brush







Sleeve



### Brush



Brush color	Product code	Brush diameter (mm)	Brush length L (mm)	Matching sleeve (Product code)
A13  (Pink)	A13-CB06M	Φ6	30	S06M
	A13-CB15M	Φ15	50	S15M-P
A11  (Red)	A11-CB06M	Φ6	30	S06M
	A11-CB15M	Φ15	50	S15M-P
	A11-CB25M	Φ25	75	S25M
	A11-CB40M	Φ40	75	S40M-SD10
	A11-CB60M	Φ60	75	S60M
	A11-CB100M	Φ100	75	S100M
A21  (White)	A21-CB06M	Φ6	30	S06M
	A21-CB15M	Φ15	50	S15M-P
	A21-CB25M	Φ25	75	S25M
	A21-CB40M	Φ40	75	S40M-SD10
	A21-CB60M	Φ60	75	S60M
	A21-CB100M	Φ100	75	S100M
A32  (Blue)	A32-CB06M	Φ6	30	S06M
	A32-CB15M	Φ15	50	S15M-P
	A32-CB25M	Φ25	75	S25M
	A32-CB40M	Φ40	75	S40M-SD10
	A32-CB60M	Φ60	75	S60M
	A32-CB100M	Φ100	75	S100M

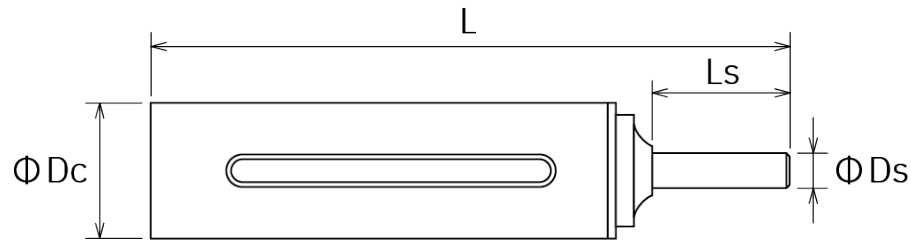
\*Bristle bundles are embedded in a single line on the periphery (except for Φ6 type).

## Product Specifications and Machining Parameters

\*Brush diameter is approximate. Actual diameter varies as the tip expands with rotation.

\*Brushes larger than  $\Phi 100$  are available by special order.

## Sleeve



Product code	Brush diameter (mm)	Sleeve outer diameter Dc (mm)	Shank diameter Ds (mm)	Overall length L (mm)	Shank length Ls(mm)	Matching Brush (Product code)
S06M	$\Phi 6$	$\Phi 10$	$\Phi 6$	70	29	A13/A11/A21/A32-CB06M
S15M-P	$\Phi 15$	$\Phi 18.5$	$\Phi 6$	90	29	A13/A11/A21/A32-CB15M
S25M	$\Phi 25$	$\Phi 30$	$\Phi 8$	140	30	A11/A21/A32-CB25M
S40M-SD10	$\Phi 40$	$\Phi 45$	$\Phi 10$	140	30	A11/A21/A32-CB40M
S60M	$\Phi 60$	$\Phi 65$	$\Phi 12$	150	35	A11/A21/A32-CB60M
S100M	$\Phi 100$	$\Phi 110$	$\Phi 16$	162	40	A11/A21/A32-CB100M

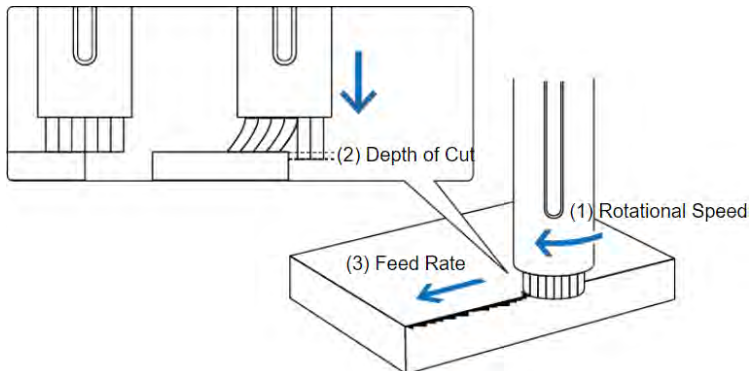
\*Overall length L is sleeve length not including brush protrusion. Brush protruding length is added to the overall length when in use.

\*S15M-P sleeve is made of fiber-reinforced plastic (FRP).



## Machining Parameters (Regular Type)

Different starting machining parameters are recommended for deburring, cutter mark removal and polishing. Machining parameters include (1) rotational speed (2) depth of cut and (3) feed rate.



Furthermore, different Brush protruding length is recommended for each Brush size and different rotational direction is recommended depending on the burr direction.

### Starting Machining Parameters

#### Deburring

Product code	(1) Rotational speed (min <sup>-1</sup> )		(2) Depth of cut (mm)		(3) Feed rate (mm/min)		Brush protruding length (mm)
	Recommended	Maximum	Vertical burrs	Horizontal burrs	Burr thickness 0.05 mm	Burr thickness 0.1 mm	Maximum rotational speed (min <sup>-1</sup> )
A13-CB06M A11-CB06M A21-CB06M	8000	10000	0.5	0.5	4000	2500	10
A32-CB06M	8000	10000	0.3	0.3	4000	2500	10
A13-CB15M	4800	6000	1	1	4000	2500	10
A11-CB15M A21-CB15M A32-CB15M	4800	6000	0.5	1	4000	2500	10
A11-CB25M A21-CB25M A32-CB25M	4000	5000	0.5	1	4000	2500	15
A11-CB40M A21-CB40M A32-CB40M	2400	3000	0.5	1	4000	2500	15
A11-CB60M A21-CB60M A32-CB60M	1600	2000	0.5	1	4000	2500	15
A11-CB100M A21-CB100M A32-CB100M	960	1200	0.5	1	4000	2500	15

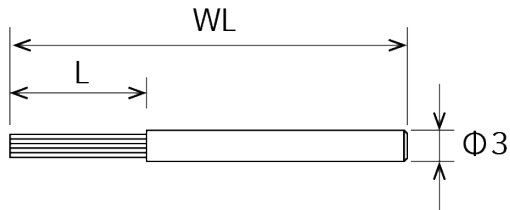
Cutter Mark Removal, Polishing

Product code	(1) Rotational speed (min <sup>-1</sup> )	(2) Depth of cut (mm)	(3) Feed rate (mm/min)	Brush protruding length (mm)
A13-CB06M A11-CB06M A21-CB06M	10000	0.3	250	10
A32-CB06M	10000	0.3	250	10
A13-CB15M	6000	0.5	450	10
A11-CB15M A21-CB15M A32-CB15M	6000	0.5	450	10
A11-CB25M A21-CB25M A32-CB25M	5000	0.5	700	10
A11-CB40M A21-CB40M A32-CB40M	3000	0.5	800	10
A11-CB60M A21-CB60M A32-CB60M	2000	0.5	850	10
A11-CB100M A21-CB100M A32-CB100M	1200	0.5	850	10



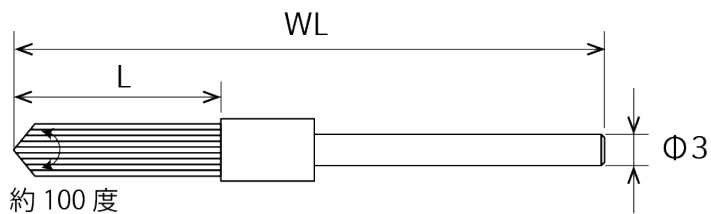
- Brush protruding length affects the flexibility of the bristle (The longer the protruding length, the more flexible the bristle and the shorter the protruding length, the less flexible the bristle).
- Do not use the Brush exceeding the maximum rotational speed and the Brush protruding length.
- Using this product on workpieces made of plastics may cause deformation or discoloration. If either proves to be an issue, it may be possible to improve the machining result by reducing the rotational speed to 10% of the starting machining parameter.

## Product Specifications and Machining Parameters (End Type)



Brush color	Product code	Brush diameter (mm)	Shank diameter (mm)	Brush length L (mm)	Overall length WL (mm)	Recommended rotational Speed (min <sup>-1</sup> )	Maximum rotational Speed (min <sup>-1</sup> )
A13 (Pink)	A13-EB01S	Φ1	Φ3	15	52	7000 - 12000	15000
	A13-EB015S	Φ1.5	Φ3	15	52	7000 - 12000	15000
	A13-EB02S	Φ2	Φ3	15	52	7000 - 12000	15000
	A13-EB025S	Φ2.5	Φ3	15	52	7000 - 12000	15000
	A13-EB03M	Φ3	Φ3	30	67	4000	6000
A11 (Red)	A11-EB01S	Φ1	Φ3	15	52	7000 - 12000	15000
	A11-EB015S	Φ1.5	Φ3	15	52	7000 - 12000	15000
	A11-EB02S	Φ2	Φ3	15	52	7000 - 12000	15000
	A11-EB025S	Φ2.5	Φ3	15	52	7000 - 12000	15000

\*Brush diameter is approximate. Actual diameter varies as the tip expands with rotation.

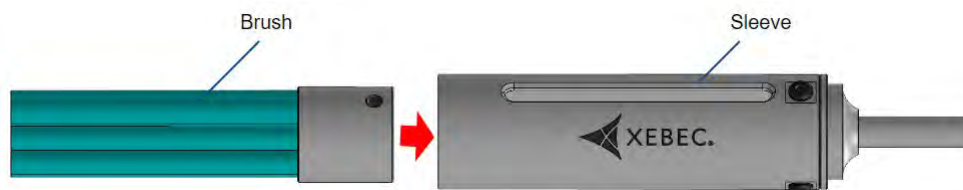


Brush color	Product code	Brush diameter (mm)	Shank diameter (mm)	Brush length L (mm)	Overall length WL (mm)	Recommended rotational speed (min <sup>-1</sup> )	Maximum rotational speed (min <sup>-1</sup> )
A11 (Red)	A11-EB06M	Φ5	Φ3	20	57	7000	12000
A21 (White)	A21-EB06M	Φ5	Φ3	20	57	7000	12000
A32 (Blue)	A32-EB06M	Φ5	Φ3	20	57	7000	12000

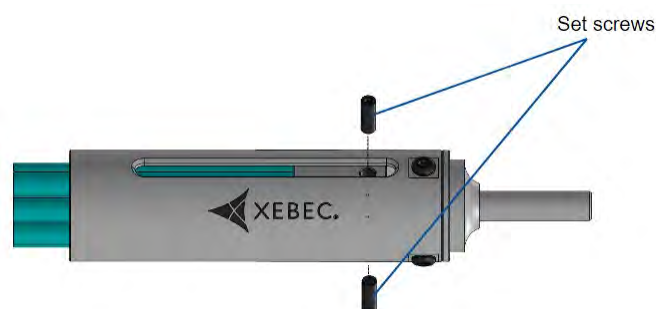
\*Brush diameter is approximate. Actual diameter varies as the tip expands with rotation.

# How to Assemble (Regular Type)

1. Insert the Brush into the sleeve.



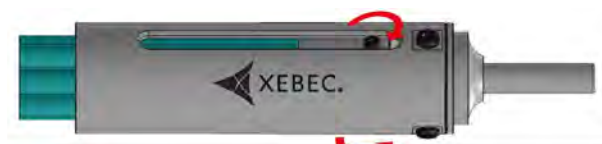
2. Insert the set screws into the threaded holes.



3. Adjust the Brush protruding length.

NoImage


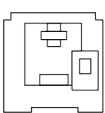
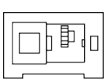
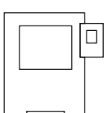
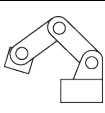
4. Tighten the set screws to the specified torque.



Product code	Tightening torque(Nm)
A**-CB06M	0.36
A**-CB15M	0.63
A**-CB25M	1.5
A**-CB40M	1.5
A**-CB60M	3
A**-CB100M	5.2

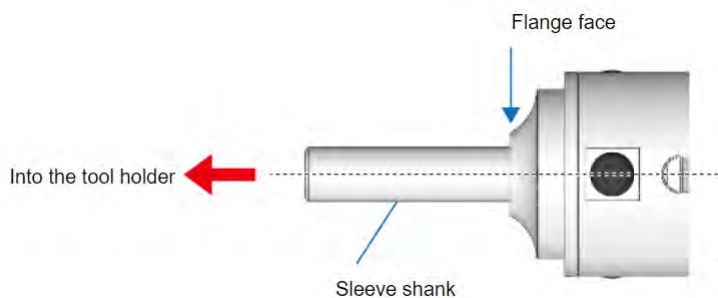
# How to Set up the Brush on the Machine

## Applicable equipment

Machine type	Regular Type	End Type
 Rotary tool (electric)	-	✓
 Machining center	✓	✓
 Turn-Mill machine	✓	✓
 Special machine	✓	✓
 Robot	✓	✓

## How to Set up the Brush on the Machine (Regular Type)

Insert the shank of the product completely into the tool holder, ensuring the flange face is pressed against the end surface of the tool holder.



If the shank of this product is not inserted completely, it can break due to the vibrations caused during machining. It may cause operator blindness or injury.

- Dust and chips generated by the product can affect the sliding parts of the machine tool. Make sure to remove dust and chips by using sludge collection systems, oil skimmer or other means.
- Make sure to use the Brush on a machine tool that can control the rotational speed and the depth of cut. The spindle must be capable of 4.0 kW or higher power output when using the Brush with diameter of  $\Phi 60$ , and must be capable of 6.0 kW or higher power output when using the Brush with diameter of  $\Phi 100$ .
- Make sure to use a tool holder that is the right size for the shank diameter of this product.




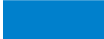
# How to Select the Brush Color

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## How to Select the Brush Color (Regular Type)

Refer to the charts below and select the brush color based on the workpiece material, burr thickness and achievable surface roughness.

### Deburring

Material	Plastics	Copper, Brass		
		Aluminum		
		Steel		
			Stainless steel	
			HRSA steel	
			Cast iron	
			Hard material	
Burr size	Micro fine burrs			
		Burr thickness (up to 0.1 mm)		
			Burr thickness (0.1 - 0.2 mm)	
Brush color	A13 (Pink) 	A11 (Red) 	A21 (White) 	A32 (Blue) 
Grinding power (Level) 1 (Low) → 4 (High)	1	2	3	4

### Cutter mark removal, polishing (improve surface roughness)

Material	Copper, Brass			
	Aluminum			
		Steel		
			Stainless steel	
			HRSA steel	
			Cast iron	
			Hard material	
Achievable surface roughness	~ Ra0.1μm			
		Ra0.1μm ~		
Brush color	A13 (Pink) 	A11 (Red) 	A21 (White) 	A32 (Blue) 
Grinding power (Level) 1 (Low) → 4 (High)	1	2	3	4

## How to Select the Brush Size

Select the brush size based on workpiece size and shape, and consider the max attachable tool length and desired cycle time, and make sure there is no interference with fixtures, jigs and other objects.





We recommend selecting the Brush diameter 1.5 to 2 times the workpiece surface width.

### Difference in Tool Path depending on the Brush Size



## How to Select the Brush Color (End Type)

Different Brush colors indicate different grinding powers.

<b>Material</b>	Plastics	Copper, Brass		
		Aluminum		
		Steel		
			Stainless steel	
			HRSA steel	
			Cast iron	
			Hard material	
<b>Burr size</b>	Micro fine burrs			
		Burr thickness (up to 0.1 mm)		
<b>Achievable surface roughness</b>	~ Ra0.1μm			
		Ra0.1μm ~		
<b>Brush color</b>	<b>A13 (Pink)</b> 	<b>A11 (Red)</b> 	<b>A21 (White)</b> 	<b>A32 (Blue)</b> 
<b>Grinding power (Level)</b> 1 (Low) → 4 (High)	1	2	3	4

# How to Use

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## How to Use (Regular Type)

### Brush in Use

### How to Use

#### Basics of Using the Brush

The Brush can only remove burrs and finish surfaces at its tip. The recommended depth of cut is 0.5 mm to 1.0 mm, with a maximum depth of 1.5 mm.

#### Appropriate Depth of Cut and Tool Load

Using the Brush with excessive depth of cut or tool load may prevent optimal results and cause significant tool wear, shortening tool life and breaking bristles.

#### Adjustment of Rotational Speed and Depth of Cut

- If burrs remain, increase the rotational speed and the depth of cut. If edge rounding is excessive, decrease the rotational speed and the depth of cut.
- As the length of the bristle becomes shorter as a result of tool wear, the bristle stiffness and grinding power increase, and conformability decreases. Adjust the grinding power and conformability by reducing the rotational speed and the depth of cut.

### Brush Rotational Direction and Deburring

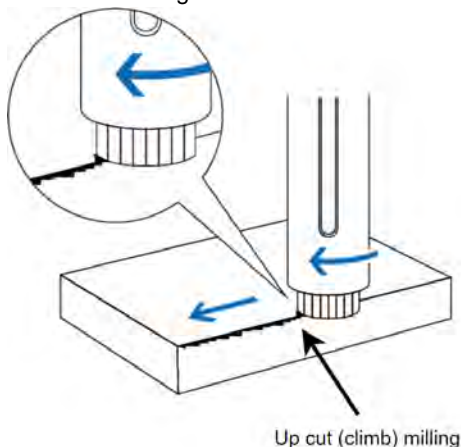
The rotational direction of the Brush significantly affects deburring performance.

#### Vertical burrs:

For vertical burrs generated by drilling and end milling, deburring capability is not affected significantly by rotational direction.

#### Horizontal burrs:

For horizontal burrs generated by face milling, the Brush should be applied in a way that it pushes burrs upward and up cut (climb) milling ensures this. On the other hand, down cut (conventional) milling may only push or bend burrs down without removing them.



Up / Down Cut Milling

### Dry and Wet Machining

The Brush can be used with or without cutting coolant (oil-based and water-soluble), and you can use the same coolant as the one you are using for other cutting processes.

Using coolant may improve surface roughness and extend tool life.

## Tool Holder

Use a collet chuck or a milling chuck as the tool holder.

Do not use the following types of tool holders:

- Shrink-fit holder:  
The sleeve shank is made of stainless steel, not solid carbide, and this may prevent its removal from a shrink-fit holder.
- Hydro chuck:  
The sleeve shank may slip off from a hydro chuck since the shank diameter of the sleeve is made only to h7 dimensional tolerance preventing the chuck from holding it properly.
- Side lock holder:  
The sleeve shank is made of stainless steel and it may deform when it is fixed in a side lock holder with a screw, and this may prevent its removal from the holder.

## How to Use (End Type)

### Brush in Use

The Brush can only remove burrs and finish surfaces at its tip. Apply the tip flatly to surfaces and bottoms of grooves.

### How to Use

#### Basics of Using the Brush

The Brush can only remove burrs and finish surfaces at its tip. The recommended depth of cut is 0.5 mm to 1.0 mm, and the maximum tool load is 2N.

#### Appropriate Depth of Cut and Tool Load

- When polishing flat surfaces, the depth of cut should be 1 mm or less and when using this product manually, the tool load needs to be 2N or less. Do not use this product with excessive depth of cut or tool load.
- Do not apply the Brush to edges with excessive force. It may cause the Brush to bounce around and break.

#### Adjustment of Rotational Speed and Depth of Cut

- If burrs remain, increase the rotational speed and tool load. If edge rounding is excessive, decrease the rotational speed and tool load.
- As the length of the bristle becomes shorter as a result of tool wear, the bristle stiffness and grinding power increase, and conformability decreases. Adjust the grinding power and conformability by reducing the rotational speed and the tool load.

### Dry and Wet Machining

The Brush can be used with or without cutting coolant (oil-based and water-soluble), and you can use the same coolant as the one you are using for other cutting processes.

Using coolant may improve surface roughness and extend tool life.

### Applicable Rotary Tool

Use with an electric rotary tool that allows control of the rotational speed.

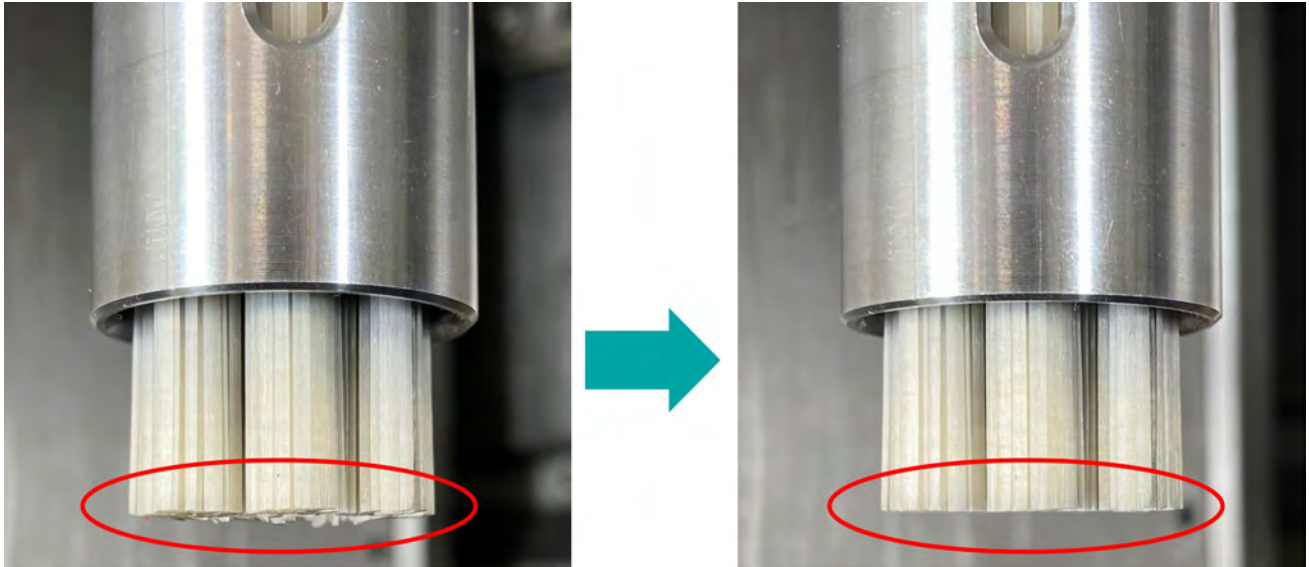
Do not use with pneumatic rotary tools as the Brush may break.

# Maintenance (Regular Type)

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## Truing

Use a diamond disc blade to true the Brush when it wears unevenly.



Shown below are other truing methods:

Truing with a Drilling Machine

Truing with a Lathe

Apply a diamond disc blade as shown in the video to cut the Brush.

# How to Adjust (Regular Type)

If there is any issue using this product, refer to the methods described below.

## If Burrs Remain

If burrs remain, try the following adjustments even if the burr thickness is below 0.2 mm and the recommended depth of cut is used.

### ■ Rotational Speed

Increase the rotational speed to the maximum.

### ■ Rotational Direction

For horizontal burrs, the Brush should be applied in a way that it pushes burrs upward and up cut (climb) milling ensures this.

### ■ Brush Color (Grinding Power)

Grinding power: A32 (Blue) > A21 (White) > A11 (Red) > A13 (Pink)

Make sure to select appropriate Brush color based on the workpiece material and burr thickness.

## If the Edge Rounding is Excessive

The Brush cannot remove burrs without rounding edges to some extent.

You can reduce excessive rounding by making the following adjustments.

### ■ Increase the Feed Rate

Increase the feed rate in 1,000 mm/min increments while making sure that burrs are removed.

It is also possible to reduce the cycle time by increasing the feed rate.

### ■ Reduce the Rotational Speed

Reduce the rotational speed in 10 - 20 % increments while making sure that burrs are removed.

### ■ Select a Different Brush Color (Grinding Power)

Effectiveness for reducing excessive edge rounding: A13 (Pink) > A11 (Red) > A21 (White) > A32 (Blue)

It may be possible to reduce excessive edge rounding by selecting a different Brush color.

## To Improve the Surface Finish

It may be possible to improve surface finish by making following adjustments.

### ■ Select a Different Brush Color (Grinding Power)

Surface finish: A13 (Pink) > A11 (Red) > A21 (White) > A32 (Blue)

Select the appropriate Brush color based on the workpiece material and desired surface roughness.

## To Improve Surface Roughness

It may be possible to improve surface finish by making following adjustments.

### ■ Select a Different Brush Color (Grinding Power)

Achievable surface roughness: A13 (Pink) > A11 (Red) > A21 (White) > A32 (Blue)

Select the appropriate Brush color based on the workpiece material and desired surface roughness.

### ■ Wet Machining

The Brush can be used with or without cutting coolant (oil-based and water-soluble), and using coolant may improve surface roughness.

### - Increase the Number of Passes

For the same cycle time, increasing the number of passes is more effective than decreasing the feed rate for improving surface roughness.

## To Extend Tool Life

Try making adjustments listed below if the tool life is short even if the burr thickness is below 0.2 mm.

### ■ Increase the Feed Rate

Increase the feed rate in 1,000 mm/min increments while making sure that burrs are removed.

### ■ Reduce the Rotational Speed

Reduce the rotational speed in 10 - 20 % increments while making sure that burrs are removed.

### Reference Data: Tool Life

Below are two examples of tool life measured under conditions shown

Workpiece material	Die cast aluminum
Prior process	Face milling
Burr thickness	0.1 mm
Cutting distance	1000 mm / workpiece
Tool	A11-CB25M
Rotational Speed	4000 min <sup>-1</sup>
Feed Rate	2400 mm/min
Depth of cut	1.0 mm
Brush length consumed	50 mm out of 75 mm
<b>Tool life</b>	<b>10,000 workpieces (cutting distance 10km)</b>

Workpiece material	Carbon Steel (JIS S45C)
Prior process	End milling
Burr thickness	0.1 mm
Cutting distance	200 mm / workpiece
Tool	A21-CB25M
Rotational Speed	4000 min <sup>-1</sup>
Feed Rate	2000 mm/min
Depth of cut	0.5 mm
Brush length consumed	50 mm out of 75 mm
<b>Tool life</b>	<b>15,000 workpieces (cutting distance 3 km)</b>



MEMO

Tool life varies significantly depending on the workpiece material and machining parameters. The above data is a guide and tool life is not guaranteed.



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