

TUBE DEBURRING



*A Guide to Understanding the Process
of Tube Deburring with Brushes*

BRUSH SELECTION

Most automated tube deburring processes employ two wide face brushes as shown in the schematic below. Since the tubes rotate as they are conveyed between the brushes, the entire circumference of each end is brushed. Not only is the position of the brushes adjustable, but the tube feed rate through the brushes is usually variable. This allows systems to be set-up to achieve an optimal combination of deburring action, throughput, and brush life.

BRUSH DIAMETER

is determined by the diameter of the tube to be processed. Since radius of curvature changes with brush diameter, larger brushes are required to deburr larger tubes, see Table 1. Weiler produces brushes with diameters from 6" to 16".

Table 1
Choosing a brush diameter

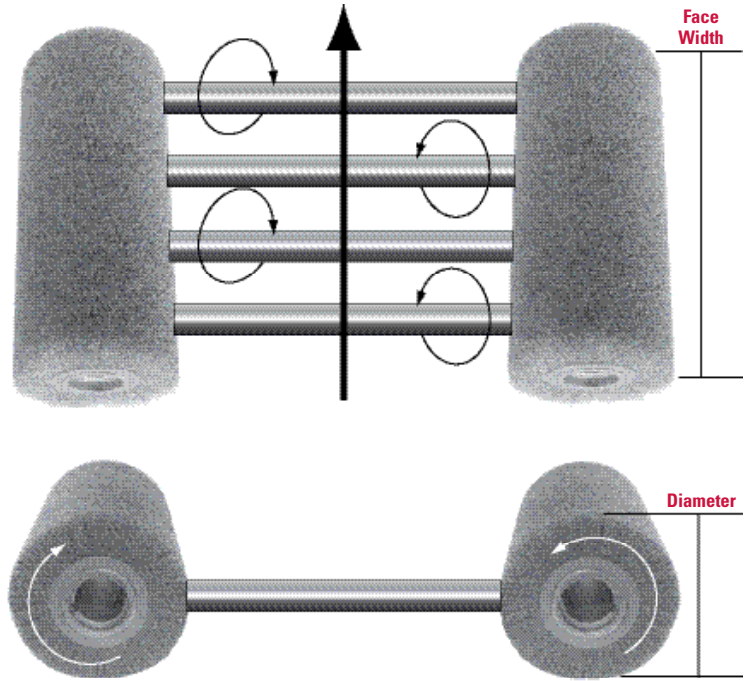
Tube O.D.	Brush O.D.
Less Than 1"	10"
1" - 3"	12"
Larger than 3"	15" or 16"

FACE WIDTH

should be selected based on the formula in Table 2. This allows the tube to make three full rotations in the brush. Weiler produces brushes with face widths from 1" to 30". Wider faces can be obtained by gang mounting multiple brushes.

Table 2
Face width formula

$$\text{Minimum Required Brush Face} = 3 \times \pi \times \text{Tube Diameter}$$



ADVANTAGES OF BRUSH DEBURRING

Safety

The sharp edges of cut tubing are dangerous. With workplace safety a paramount concern for all manufacturers, tube producers and their customers are keenly focused on issues which create unsafe working environments. Brush deburring is a low-cost means to address these safety concerns.

Assembly Consistency

Deburring is a practical necessity. Deburred parts fit together quickly and precisely. This lowers assembly costs and enhances process stability.

Production Cost

Cycle times of less than 5 seconds per tube can routinely be obtained by employing brush deburring solutions. Automated brushing systems can be integrated with cut-off operations to eliminate work-in-process and increase throughput.

Process Stability

Whether a tube has been deburred off-hand using a pedestal grinder, or in an automated process, it can be quickly and easily assembled into a finished product because brush deburring does not change the tube dimensions. Even thin-wall tubing can be deburred without altering concentricity. Unlike chamfering processes, brush deburring won't leave secondary burrs.

Process Flexibility

Brush deburring can be applied to many different types and sizes of tubing and extrusions. Brushes can deburr tubes of almost any shape, material, and end geometry. This flexibility coupled with the ability to quickly change from one tube configuration to another makes tube deburring machines a valuable capital asset.

OPTIMIZE OPERATION

High Brush Speed and Low Operating Pressure are critical to the application success. Wire brushes work by delivering millions of wire tips to the burred edge each minute. These wire tips have a hardness of approximately 60 Rc and a striking velocity of more than 60 MPH. This high impact action separates the burr from the tube and leaves a smooth edge. Excessive pressure and penetration prevents the wire tips from contacting the edge and causes filament breakage. The result is a reduction in brush life and deburring action. Table 3 provides recommended speeds for various brush diameters.

PENETRATION OF THE TUBE ENDS

into the brush face should be limited to less than 1/8". If the brushes are unable to remove the burrs when used at the recommended speed and penetration, a more aggressive brush is required.

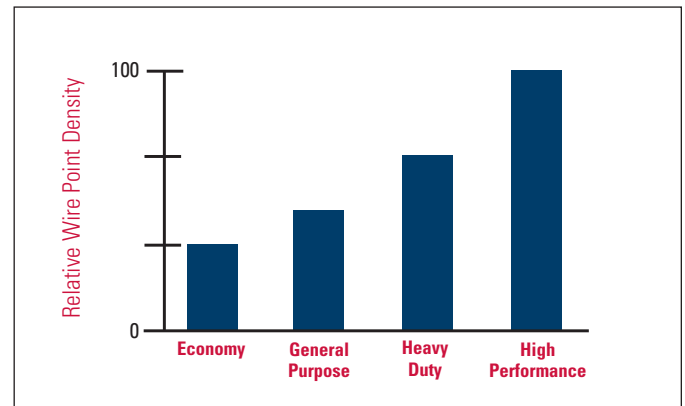
Table 3
Recommended brush speeds

Brush O.D.	Recommended Speed
6" - 8"	3,450
10" - 12"	2,750
14" - 16"	1,750

BRUSH DENSITY

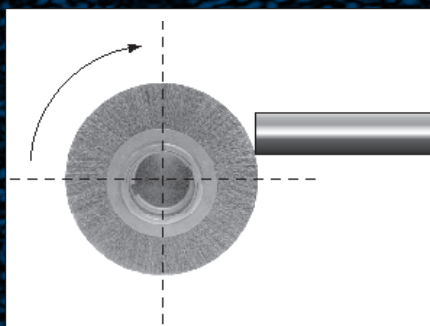
determines the number of wire tips which contact the tube. Higher brush density increases brush life and deburring action. Weiler offers the broadest range of brush densities in the industry. This allows customers to optimize the economics of their specific process. The four densities available from Weiler and the relative wire point densities are shown in Table 4.

Table 4
Higher wire point density increases brush life and deburring action

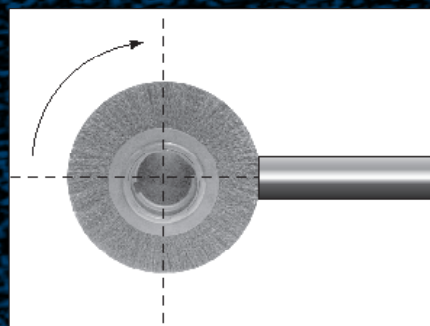


BRUSH-TUBE ORIENTATION

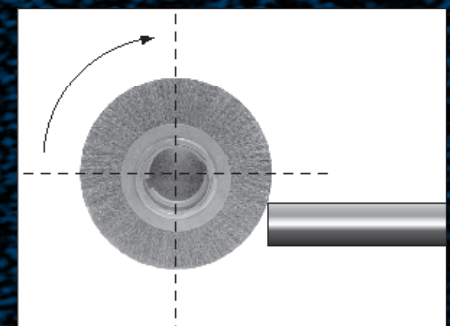
Brush-tube orientation determines which edges of the tube are deburred. The illustrations below show three orientations and the target edge.



Deburring Tube I.D.



Deburring Tube I.D. and O.D.



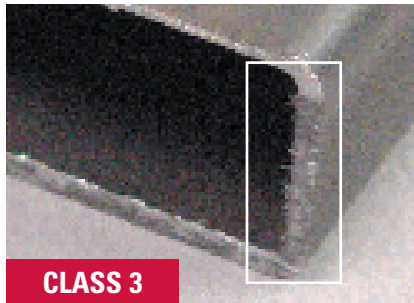
Deburring Tube O.D.

BURR CLASSIFICATION

Filament size is dictated by burr size. The pictures below illustrate three different burr conditions. Average cut-off burrs such as the Class Four burr can normally be removed with 0.014" wire. Large burrs, such as the Class Five burr, can sometimes be removed with 0.020" wire. However, in some cases, these burrs must be removed using a metal removal operation like chamfering. Class Three burrs can normally be removed by finer wire sizes like 0.008 or 0.0118. These fine wires are more expensive than coarser products, but they offer significantly better fatigue resistance and brush life. In addition, they are more suitable for soft materials like aluminum, copper and bronze.

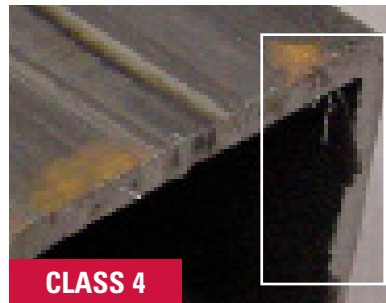
All of Weiler's brushes are made with premium wire which maximizes deburring action and minimizes fatigue failure. Most wire sizes are available in steel and stainless. Stainless steel wire brushes are recommended for applications on stainless, aluminum and other non-ferrous tube materials. Using steel brushes on these materials will cause "after-rust" which results from contamination of the worked area with ferrous particles.

Class One and Two burrs typically result from grinding and machining processes and are not shown here.



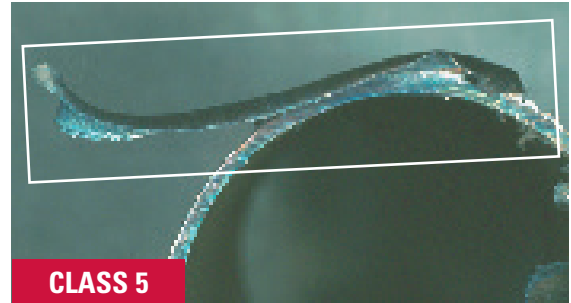
CLASS 3

Burrs in this group are characterized by moderate size and thin roots. They are easily removed by wire brushes.



CLASS 4

Class Four burrs are well attached by thick roots. As a result, large wire tips are needed to remove them.



CLASS 5

Class Five burrs are very large with thick, rigid roots. Burrs in this class are different than conventional burrs because they are comprised of displaced base material which is still fully-attached to the parent part. Brushes can sometimes remove Class Five burrs, but often a stock removal operation is required for complete removal.

ORDERING THE BEST REPLACEMENT TUBE DEBURRING BRUSHES ON THE MARKET

BRUSHES FOR BURRMASTER™ MACHINES

Item No.	Brush Dia.	Face Width	Arbor Hole*	Wire Size	Brush Density
07340	10"	18"	3-1/4"	.014	General Purpose
07341	10"	18"	3-1/4"	.014	High Performance
07286	12"	18"	3-1/4"	.014	General Purpose
07342	12"	18"	3-1/4"	.014	High Performance
07343	12"	18"	3-1/4"	.014	General Purpose
07344	12"	18"	3-1/4"	.014	High Performance

* The most common arbor hole sizes are 3-1/4" and 2" with 1/2" x 1/4" keyways. Other arbor holes are available upon request.

These brushes represent just a few of the most common replacement brushes available from Weiler. Brushes for other tube deburring equipment are also available. In addition, Weiler can design and produce custom brushes with nearly any combination of dimension, density and fill type. Custom brushes can normally be produced in 2-3 weeks.

APPLICATION SOLUTIONS

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or complete the electronic Application Assistance form on our website at: weilercorp.com

