simoni

INDUSTRIAL BRUSHES SINCE 1830

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Industrial brushes

Macrocomponents

Brushing machines

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Experience from a time-honoured tradition

Simoni has been manufacturing brushes for some six generations since the company was founded in 1830. The technical know-how gained over nearly two centuries of operations has been carefully handed down, resulting in the accumulation of an enormous range of experience.

MACHINES OF THE PAST

Simoni's very first brushmaking machines date back to the middle of the 19th century. These early systems were extremely rudimental, made entirely of wood and, needless to say, entirely hand-operated.

The machines presented here are those that we have managed to preserve: they were built between around 1870 and the beginning of the 20th century and were utilised to make various types of brushes and brooms. The brush filaments were hand assembled on pre-drilled wooden laths employing a procedure known as "sewing". Metal wire or hemp twine was used to fasten the tufts to the wooden lath. This method is still used today when the maximum guarantee of tuft anchorage is required.
In order to date our historic machines spectrometric techniques were used by a specialised laboratory to analyse small samples of wood. This means that the dates are reliable, with tolerance of just a few years each way.

"Mazzerini" brush machine

"Mazzerini" brush machine

The "Mazzerino" is a traditional biconical brush made of couch-grass (a vegetable root) tied with wire or hemp twine. These brushes were mainly employed in the kitchen to clean tableware and cooking utensils. The machine is composed of a bench, a reel for the metal wire, and a reel brake. The operator would grasp the couch-grass and bind it with the wire before releasing the brake to make another "mazzerino" brush - approx. 1870.

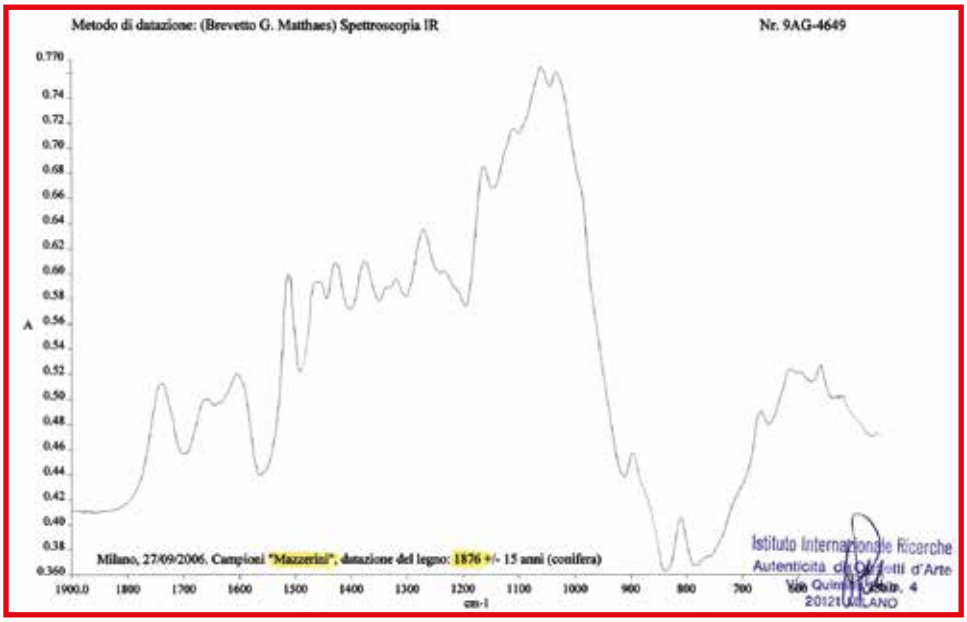
Mazzerino brush

Boring machine

This machine was used to drill conical thru-holes in the wooden laths so that the filaments could be sewn into them. The boring tools were hand-forged in a spoon shape. The tools were mounted on the spindle, which was driven by a waterwheel via a leather belt transmission. The height of the spindle crossbar was adjustable by means of wooden screws. The pedal control left the operator's hands free for higher productivity.
The boring machine spindle generally ran in bearings made of boxwood, renowned for its hardness - approximately 1880.

Boxwood bearings

MUSEO D'ARTE E SCIENZA
FONDAZIONE G. MATTHAES



Certificate attesting to the spectrometric analysis that allowed us to date the Mazzerini machine at around 1870

Experience from a time-honoured tradition

Boring Machine

Workbench

The workbench top has a series of holes for fixing of various tools, while the front of the bench is equipped with a vice with a wooden screw - approximately 1900.

Workbench

Broom making machine

The boss with an axial bore was used to insert the broom handle so that the sorghum (vegetable fibre) could be bound to it with wire. A specially shaped vice was utilised to impart the classic fan shape to the broom. Once it has assumed this position the broom was fastened by sewing the sorghum using large forged awls.

Broom making machine

Vice

The vice is made entirely of wood, including the large diameter screw. The vice was used mainly for gluing of wood laths, for grinding tools, and for carding horsehair.

Vice

Comb

This coarse-toothed iron comb was used to prepare the vegetable fibres before sewing them to the lath.

Shear

This shear was used to cut bunches of filaments and also to trim the brushes. After sewing, each individual row of tufts was cut to measure with the shear.

Awls

For more refined brushes, such as clothes or hair brushes, the tufts where attached by stapling into the lath rather than being fixed with thru-holes. This was performed using a special type of awl in a technique known as 'crochet' – approximately 1920.

Strain gauge, utilised as a scale for weights of up to 150 kg.

Forged tools

All tools were hand forged, from screwdrivers to gouges and drill bits. The drill bits of the time feature a conical spoon shape. The square section shank facilitated drive transmission by the spindle.

Experience from a time-honoured tradition

CORPORATE ETHOS

The number of different applications for brushes in industry is astonishing, and the modern brushmaker needs to be able to offer customers new solutions or better alternatives to existing techniques. It's easy to see that given the enormous variety of shapes, materials, and types of motion, customers often make "impossible" demands.
At Simoni we like to say that the more impossible the request, the more we enjoy the challenge. This statement is perhaps the best concise definition of our ethos. Although we insist on opting for the utmost simplification in all our solutions, we're always keen to listen to customers' suggestions. Frequently an "impossible" request leads to the development of a breakthrough solution with potential for use in completely different applications.

Aerial view of the plant

More generally, we believe in the importance of working closely with our customers so we can provide the best possible level of service - including competitive pricing. In this context, we often hear the idea that while Quality Certification is a guarantee of good product quality, prices will be inevitably higher because of the implicit extra costs. Quite the opposite: of course the Quality Assurance service must lead to top quality in products and services, but it must also drive a reorganisation process to optimise production and ensure that selling prices are able to compete with the lowest on the market.
This is the background to the certification, in 1999, of our Quality System in compliance with the current ISO 9001:2015 standards.

Now a qualified engineer occupies the full-time position of Quality Manager, promoting the concept of continual improvement in compliance with the latest version of the ISO quality standards.
We also take great care in our quality control process, with checks on incoming raw materials, on the production line by the line operators (own checks), and at the line end. Quality checks are performed using a comprehensive range of measuring and test instruments, all of which are periodically checked and calibrated.

Quality certificate

Production plant

Experience from a time-honoured tradition

Balancer to check and adjust dynamic imbalance of roller brushes

Measuring and calibration instruments

On the subject of checks, we have several long-standing customers who have been ordering small quantities of very high precision specialist brushes for many years. Let's call them "difficult" customers! But we're particularly grateful to these special customers, because their exacting demands have helped our company make big strides in the drive to maximise precision and quality throughout our entire product range.

Another key area of activity in the company concerns the concept of work safety, which we take extremely seriously, periodically checking and updating all our safety procedures.

Several years ago we acquired a comprehensive range of environmental measuring instruments so we can carry out all the relative checks in-house.

Our range of equipment in this area includes a sound level meter, luxmeter, hygrothermograph, recording barometer, electromagnetic field meter, and a globe thermometer to measure irradiation temperature. By monitoring the working environment we aim to make the surroundings as pleasant, safe and healthy as possible, because we know that a low stress workplace benefits our staff and consequently the company. We see quality not merely in terms of controls and documentation, but above all in the light of good relations between all the people in the company in a positive working atmosphere. Personally, I find it hard to accept the idea of people arriving at work in the morning already with the belief that they are about to enter a hostile or psychologically stressful environment. Work brings with it problems and conflict with the outside world, so we need to avoid creating any additional strain among the people working in the company. I believe that business people need to work in this direction, generating benefits for all and optimising industrial relations with unions and their representatives right from the word go.

I see these issues as one more aspect of the company's Social Responsibility programme.

Franco Simoni

Digital height gauge

Some of the instruments utilised to monitor workplace environmental conditions

Filaments

A brush is rather special artefact.
Considered in general terms, it has clearly defined geometrical properties and dimensions, while in local terms the work surface is composed of thousands or millions of tiny circles, i.e. the tips of the filaments making up the brush.
This characteristic means that a brush is radically different from all other mechanical devices utilised in the technical field. The work surface of a brush can be hard or soft, oriented or isotropic, locally variable, and can offer a very high level of adaptability to match the irregularities of the part to be cleaned. Each filament features an individual behaviour pattern, although overall it is part of a single working surface.
The filaments are therefore the basic component parts of a brush.

Filaments can be of three different types:

- Synthetic
- Natural
- Metal.

SYNTHETIC FILAMENTS

PA (nylon) 6 / 6.6 / 6.12

Nylon (polyamide) filaments are the most widely used in technical brushes. Thanks to its excellent elastic memory, polyamide can work under stress and return perfectly to its starting configuration.
Polyamide filaments are available straight or crimped, white or black, and in a wide range of diameters.

Straight and crimped nylon

PA 6.12 abrasive

Abrasive nylon is invaluable in a range of applications that call for a highly aggressive filament. This material is made by incorporating abrasive particles in a 6.12 nylon mass.
The abrasive particles can be of two types: Silicon carbide (SC) or Aluminium Oxide (AO), which impart two different types of abrasive nylon properties. The SC filament produces more pronounced cutting action and is suitable for applications that call for material removal. The abrasive particles in AO filaments feature a more rounded profile so this type of brush is more suitable for finishing and polishing operations.
The nylon contains 30% of abrasive particles on average.
Various different abrasive particle sizes are available (exactly like grit ratings for sandpaper) with different filament diameters (see table).

PA HT

This type of nylon is treated to resist temperatures of up to 160°C. Available in various diameters in straight and crimped versions.

PA 6.12 abrasive characteristics

Grit	Diameter (mm)	Cross-section and shape
46 SC	1.30	round crimped
60 SC	1.20	round crimped
80 SC	1.10	round crimped
80 SC	1.30	round crimped
80 SC	1.2x2.4	flat straight
120 SC	0.60	round crimped
120 SC	1.10	round crimped
120 SC	1.30	round crimped
120 SC	1.2x2.4	flat straight
180 SC	0.90	round crimped
180 SC	1.2x2.4	flat straight
240 SC	0.80	round crimped
320 SC	0.60	round crimped
320 SC	1.2x2.4	flat straight
500 SC	0.50	round crimped
80 AO	1.10	round crimped
80 AO	1.2x2.4	flat straight
120 AO	1.2x2.4	flat straight
180 AO	0.90	round crimped
180 AO	1.2x2.4	flat straight
320 AO	0.60	round crimped
320 AO	1.2x2.4	flat straight
500 AO	0.50	round crimped
600 AO	0.50	round crimped
600 AO	0.40	round crimped

PP

The elastic memory of polypropylene is not as developed as that of nylon, although the former material absorbs less water and features higher resistance to chemical agents so it is more compatible with aggressive environments. Polypropylene is available in a range of diameters from very fine to very coarse (2x3 mm oval), white, black, straight or crimped.

PE

Polyethylene offers optimal performance in terms of resistance to aggressive chemicals. PE filaments are available straight in the typical "X" cross section, which makes for delicate brushing action that can be accentuated by "flagging". Flagging refers to a process whereby the end of each filament is feathered using a special tool. Thanks to the capillary action exerted by the 4 grooves formed by the X section, PE filaments are able to retain liquids so brushes made with this material are suitable for providing wiping action when cleaning delicate products, such as fruit.

PBT

Polyester is a highly elastic material but it must not be subjected to high bending loads because it is sensitive to fatigue stress with the resulting loss of mechanical properties. This material offers high abrasion resistance and moderate chemical resistance.

PEEK

This is a hi-tech thermoplastic filament that is compatible with working temperatures of up to 200 °C.
It is also capable of supporting a high level of mechanical stress. Available in straight filaments of various diameters.

Thunderon®
(Conductive Acrylic)

Thunderon is a hi-tech filament. This acrylic base material is chemically bonded with copper sulphide. This makes it possible to obtain a product with the stiffness of a synthetic fibre that is electrically conductive. Brushes made from this material are therefore capable of eliminating electrostatic charges from surfaces.
Thunderon filaments offer several advantages over carbon fibres:

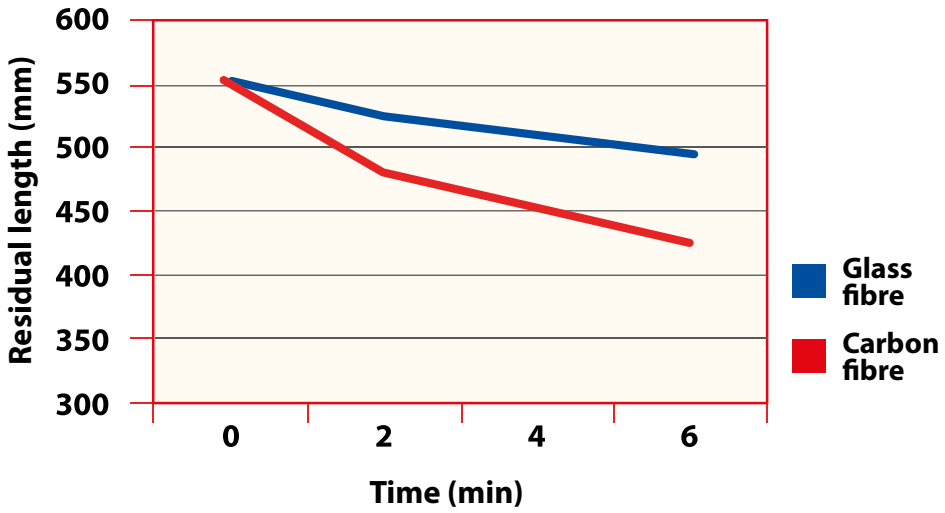
- Carbon fibre is insubstantial, while Thunderon can provide actual mechanical brushing action.
- The entire range of brush hardnesses can be obtained by blending Thunderon and nylon.
- While carbon fibre brushes are available exclusively in linear styles, Thunderon can be used to make brushes of all shapes, including rollers.

Conductive Thunderon

Glass fibre

Glass fibre is a highly rigid filament whose main characteristic is its excellent wear resistance. Available exclusively straight with diameters from 1 to 3 mm.
It is popularly believed that carbon fibre offers the highest possible wear resistance. To test this theory we tested the two fibre types in laboratory conditions, measuring wear on sandpaper versus time. The graph on this page shows that carbon fibre actually wears much faster than glass fibre.

Glass fibre – carbon fibre comparative wear test



Filaments

NATURAL FILAMENTS

Horsehair

This is the most traditional material and it has been used for centuries for brushmaking. Horsehair is highly flexible and delicate so it can clean parts thoroughly without damaging the surface. Horsehair is also compatible with high temperatures and can be used to apply liquid films to parts.

Pig bristle

Pig bristle is slightly heavier and therefore less delicate than horsehair. The original bristle is much shorter than horsehair so the maximum tuft length is approximately 30 mm.

Goat hair

Goat hair is a very fine and soft filament that is ideal for cleaning the most delicate surfaces. Goat hair brushes must be brought into only very light contact with the cleaning surface because the filaments are too soft to allow the application of loads.

Tampico fibre

This filament, which is also called "Mexico fibre", comes from the dried cactus-like Agave plant and takes its name from the Mexican port of Tampico from which the trade in Agave was once plied.
Tampico is a distinctive yellow coloured fibre that withstands high temperatures and also exerts a slightly abrasive action. Excellent blends can be created with nylon to obtain a broad range of different hardnesses.

METAL FILAMENTS

High Strength Steel (AR)

When steel is drawn, the crystalline structure of the metal is arranged in such a way as to impart tensile strength (R) that is far higher than that of normal barstock.
We usually use a filament with R=1900 N/mm^2.
Steel wire is available crimped, zinc plated, or black. The chemical composition of the steel is shown in the table.

Average chemical composition of AR steel

Element	%
C	0.520
Mn	0.623
P	0.004
S	0.010
Si	0.203

Very High Strength Steel (AAR)

This is a top quality filament with R=2300 N/mm^2. It is therefore capable of withstanding a high level of mechanical stress and, especially, fatigue cycles, as is the case of rotary brushes.
Very high strength steel wire is available crimped and is normally brass plated.

Stainless steel

Available in AISI 304 type or, to special order only, AISI 316.
Stainless steel filament brushes are widely used in the food sector and also for the surface treatment of stainless steel parts, where this type of brush eliminates the problem of "after-rust" deposits, i.e. deposits that could give rise to oxidation through time.

Hardened steel

This filament is particularly suitable for intensive scraping action. Hardened steel brush filaments must be brought into contact with the work at the tips, because this material will break easily when flexed.
Available only straight.

Mild Steel (Bessemer)

This is a very soft filament with almost zero elasticity. It is mainly employed in very fine diameters for the treatment of delicate metal surfaces.
Mild steel wire is available exclusively crimped.

Brass

Brass is used for cleaning metal surfaces - especially non-ferrous metal - when seeking a less aggressive action than that of steel.
Available in various diameters and in crimped style.

Phosphor Bronze

The applications of phosphor bronze are similar to those of brass, although unlike brass this material is suitable for chemically aggressive environments because of its excellent chemical resistance.
It is moreover used to avoid sparks during the contact with the surfaces.

The table on page 9 summarises the main properties of the filaments discussed here. Data were obtained from our suppliers and should be construed as average values.

Filament technical specifications

Material	D	PS	A	Tmax	Tmin	R	RE	RC	FDA	Principal application
PA 6	0.10 - 2.00	1.13	10	+100	-40	500	10^{11}	X	✓	Food industry, good elastic memory
PA 6.6	0.10 - 2.00	1.14	9	+120	-40	550	10^{11}	X	✓	Food industry, very good elastic memory
PA 6.12	0.07 - 2.00	1.06	3.0	+110	-40	440	10^{11}	X	✓	Food industry, very good elastic memory also with water
Abrasive PA 6.12	0.50 - 1.60	1.25	3.0	+110	-40	440	10^{11}	X		Polishing, satining, finishing
PA HT	0.20 - 0.80	1.18	3.7	+160	-20	400				High working temperatures
PP	0.15 - 3.00	0.89	0.1	+80	-20	470	10^{16}	XX	✓	Food industry, also with water, moderate mechanical stress
PE	0.30 - 1.00	0.92	0.1	+70	-50	170	10^{12}	XXX	✓	Chemically aggressive environments, delicate surfaces
PBT	0.20 - 3.00	1.31	0.35	+100	-40	420		XX	✓	Food industry, abrasion resistance also with water
PEEK	0.20 - 0.80	1.32	0.15	+200		720		XX		High working temperatures and high mechanical stress
FIBRE GLASS	1.00 - 3.00	1.91	0.25	+155		1450				Excellent wear resistance
THUNDERON	0.03	1.28	0.8	+150	-		$5x10^{-1}$			Dissipation of electrostatic charges
HORSEHAIR	0.12 med.	1.00	50	+150	-150	-	10^{16}			High temperatures and delicate surfaces
PIG BRISTLE	0.15 med	1.10	40	+150	-150	-	10^{16}			High temperatures, more aggressive action than horsehair
GOAT HAIR	0.05 med	1.06	60	+150	-150	-	10^{16}			Very delicate surfaces
TAMPICO FIBRE	0.25 med	0.86	35	+160	-150	-	10^{16}			High temperature, light abrasive action
HIGH STRENGTH STEEL	0.12 - 0.70	7.85	-	+300	-	1900	$1.7x10^{-5}$	X		Cleaning and satining of hard metals
VERY HIGH STRENGTH STEEL	0.12 - 0.70	7.85	-	+300	-	2300	$1.7x10^{-5}$	X		Treatment of metals with high mechanical stress
STAINLESS STEEL	0.12 - 0.50	7.90	-	+450	-	2000	$1.7x10^{-5}$	XXX	✓	Food industry, presence of moisture or aggressive environments
HARDENED STEEL	0.20 - 0.70	7.85	-	+350	-	2000	$1.7x10^{-5}$	X		Harsh mechanical scraping action
MILD STEEL	0.06 - 0.40	7.85	-	+200	-	650	$1.7x10^{-5}$	X		Cleaning and satining of soft metals
BRASS	0.06 - 0.30	8.50	-	+160	-	900	$7x10^{-6}$	XX		Non-aggressive treatment of metals
PHOSPHOR BRONZE	0.06 - 0.50	8.80	-	+160	-	950	$7.5x10^{-6}$	XXX		Non-aggressive treatment of metals, chemically aggressive environments. Anti-spark

D = Filament diameter (mm)
PS = Specific gravity (kg/dm^3)
A = Water absorption (%)
Tmax = Maximum working temperature (°C)

Tmin = Minimum working temperature (°C)
R = Tensile strength (N/mm^2)
RE = Electrical impedance (Ohm cm)
RC = Chemical Resistance (X = poor, XX = moderate, XXX = good)

FDA = Food grade material in compliance with US Food and Drug Administration norms. Ambient temperature only.

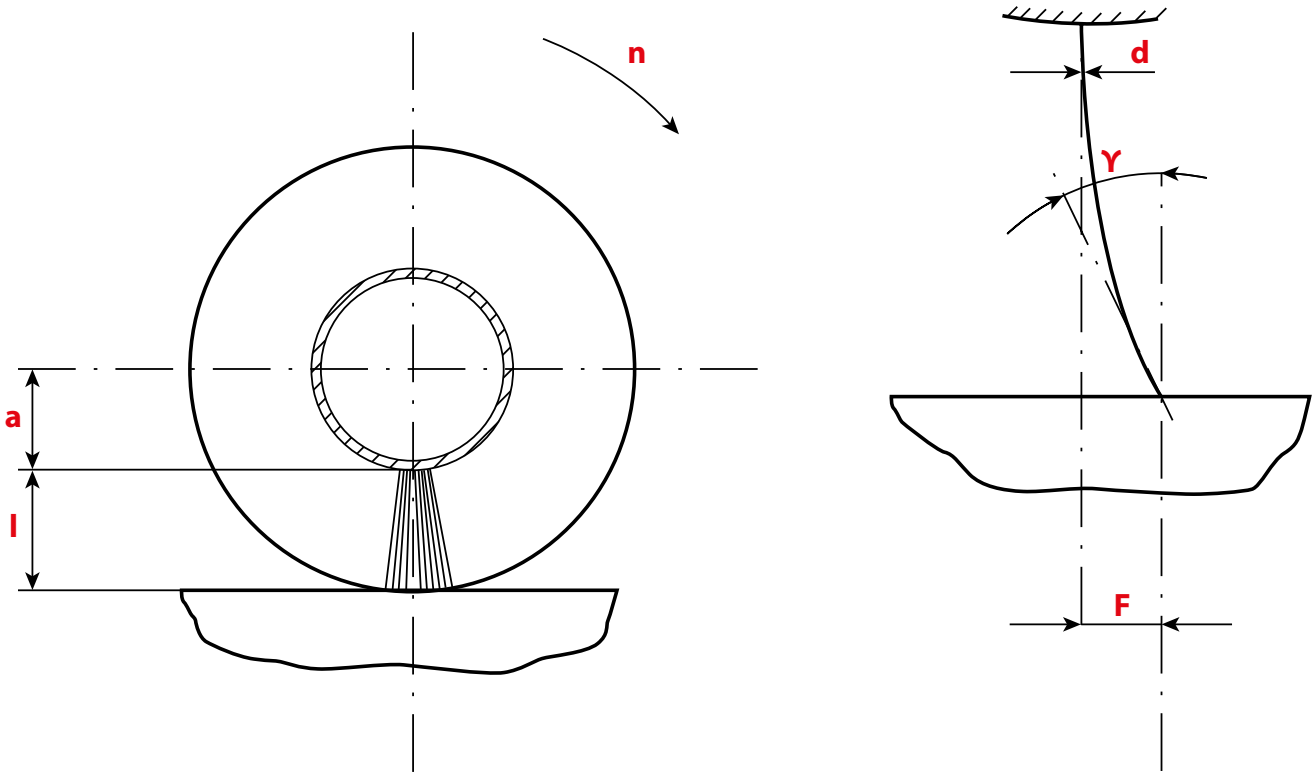
TECHNICAL NOTES

Users of wire brushes frequently request technical data describing the maximum working loads that the brushes can withstand.
This value varies in accordance with the use of the brush (reciprocating/rotary movement), the speed, and the geometry.
We have examined this problem from a theoretical standpoint basing our research on the most general possible working conjectures in order to arrive at a mathematical formula.
The figure shows the geometry of a rotary brush with the relative parameters.

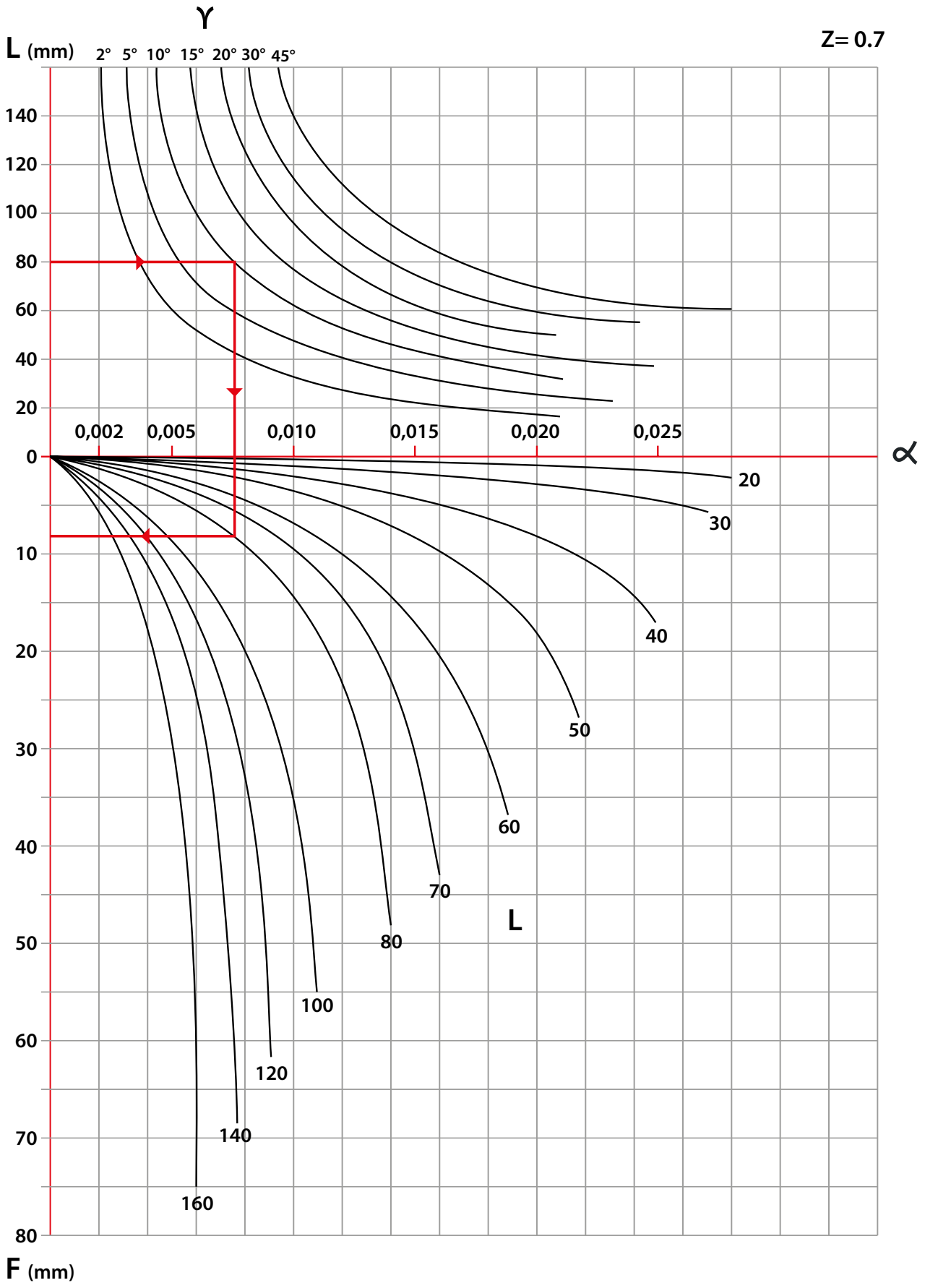
The values of a, l, d, and n are known. However, in order to establish deviation F several fairly complex equations must first be resolved.
The relations between the parameters are summarised in diagrams, such as the one on page 11.
The diagram refers to a friction coefficient between filament and metal surface of Z=0.7, this being a relatively common value. The formula was prepared in relation to a high strength steel. An inequation such as:

$$f(\alpha, d, F, l, a, n) \leq 1$$

can be employed to check whether or not working angle Y is acceptable. If the inequation is not observed this means that the load is too great and the filament will break rapidly (fatigue cycle). To solve this problem reduce Y. α is a filament loading coefficient.
Use the diagram on page 11 to find the deviation value F or the value of angle Y.
To ensure the overall efficiency of the brush note that it is advisable not to exceed a Y angle of 15°.
Please contact us for any design data you may need.



Geometry of a rotary brush and a loaded filament


γ
L (mm)
Z= 0.7
2° 5° 10° 15° 20° 30° 45°
140
120
100
80
60
40
20
0
0,002
0,005
0,010
0,015
0,020
0,025
α
20
30
40
50
60
70
80
100
120
140
160
L
10
20
30
40
50
60
70
80
F (mm)

FILAMENTS QUALITY CONTROL

On arrival in our warehouse all filament types are carefully checked, especially in relation to the diameter. We also check the workability of the filaments we receive from vendors. In particular, the elastic memory of synthetic filaments is specific to the type of polymer of which they are composed. When a shipment of filaments reaches the plant we also perform elasticity checks. For this type of check, several years ago we devised a standard measurement method using a test instrument (see photo) that loads the filament samples with a known weight and then measures the relative elastic return. Each material is associated with a range of acceptability, and if the tested material does not fall within this range the shipment is rejected.

This check eliminates defects caused by filament manufacturing defects, thus guaranteeing constant quality in the supply of brushes.

Filaments are also frequently examined under a microscope to check finish properties. This method can be employed, for example, to check the correct distribution of SC or AO particles within abrasive nylon filaments.

The same method is also used to check the trimming quality of a brush by examining the tips of individual filaments.

Elasticity test

Microscope for inspecting filaments

The filaments must be anchored to a rigid support that comprises the "brush body".
The materials used for this function are usually synthetic, although also natural materials and metals are utilised.

SYNTHETIC MATERIALS

All synthetic brush body materials are available in the form of sheets, solid bars and hollow bars and, in certain cases, specifically designed profile sections.

PVC hollow bars

PVC

PVC offers excellent workability and optimal dimensional stability at ambient temperature. This material is not compatible with hot environments and cannot be used with food. The deformability of PVC at higher temperatures however becomes a bonus in the assembly stage, when this property can be exploited for hot assembly of hollow PVC bars on a metal tube.

PA (Nylon)

The mechanical and elastic properties of polyamide (nylon) are excellent although the material is less workable than PVC and tends to deform during processing. Nylon is suitable for food applications (ambient temperature only).

PP

Polypropylene offers inferior mechanical properties to those of PA. This material is available also in the form of tubes so it is suitable for the manufacture of large size roller brushes, which would result in an unacceptable amount of waste if made with alternative materials.
PP is also compatible with the injection moulding process. This material offers excellent resistance to chemicals.

PE

Polyethylene is a soft material that allows fast machining and is relatively lightweight so it is suitable for making large size panel brushes. It also features a low friction coefficient.
This material offers excellent resistance to chemicals.

POM (Acetal Polyoxymethylene Resin)

POM is widely used to make hi-tech brushes because it combines excellent workability, dimensional stability and the ability to withstand high temperatures with food application compatibility. Available in versions H (homopolymer) and CO (copolymer).

PET

Polyethylene terephthalate has similar properties to POM plus good chemical resistance.

PUR

Thanks to its excellent deformability, polyurethane is frequently used to make belt brushes. This material is also used as a cladding for metal cores.

PUR brush bodies

PTFE (Teflon)

Polytetrafluoroethylene or Teflon is used to obtain temperature resistance and to reduce sliding friction in contact with metal shafts or surfaces.

PEEK

Polyetheretherketon is an engineering plastic that is utilised exclusively for its excellent ability to resist high temperatures.

NATURAL MATERIALS

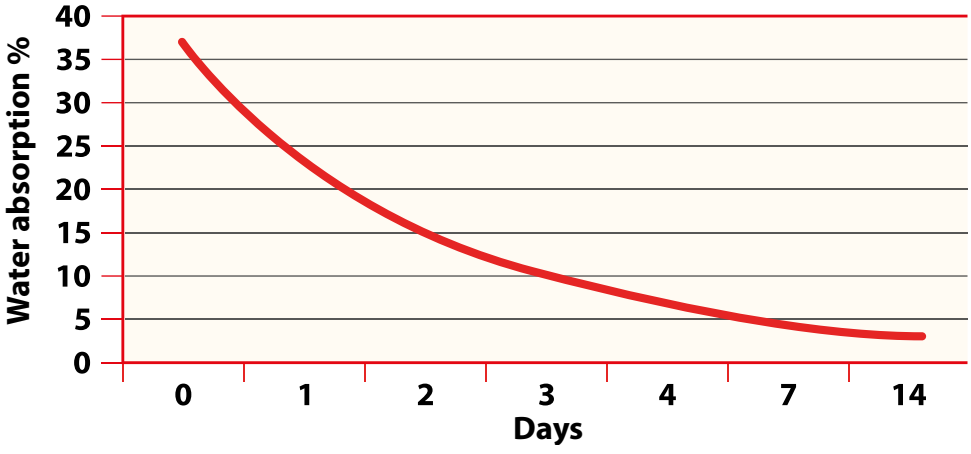
WOOD

Before the advent of plastics, wood was virtually the only material used for the manufacture of industrial brushes. Still today, thanks to its excellent ability to resist high temperatures and its light weight, wood continues to be used in technical applications.
It is essential to use exclusively well-seasoned wood laths to avoid warping and breakage during operation of the brush.

PLYWOOD

Plywood offers excellent dimensional stability and flatness, with the added benefit of the availability of sheets in a range of different thickness. The marine ply version is able to operate in water.
The graph describes the time it takes a plywood board to return to its natural moisture contents starting from a situation of maximum water absorption.

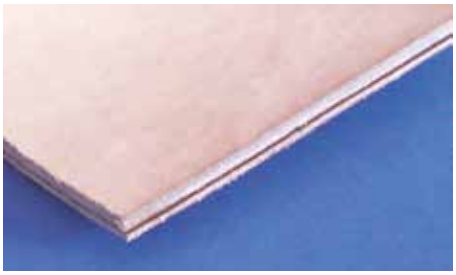
Plywood drying time



Brush Bodies

LEATHER

Leather is the natural alternative to PUR for the manufacture of belt brushes and it has approximately the same hardness as PUR. Leather backings can be used to manufacture very wide brushes, with the material frequently bonded to a sheet of nylon or PP to increase rigidity. The leather usually employed is subjected to a chromium tanning process.



Leather and nylon sandwich

METAL MATERIALS

ALUMINIUM

Aluminium is used to make very strong and lightweight brush bodies, although it is sufficiently soft and workable to allow tufting using automatic machines, although the relative cycle times are far longer than those associated with plastic bodies. Aluminium offers a high level of dimensional stability and is a good electrical conductor so it is used for the production of antistatic brushes.

BRASS

Brass offers excellent mechanical strength and high stability, even at very high temperature. It also features good workability.

STEEL

Steel is used mainly in the form of tube as a core for roller brushes, and for shafts, bushes and flanges. Alternatively it may be used as a body for hand-sewn brushes (see below). There are numerous steel types available for brush bodies, including AISI 304 stainless steel, in the form of barstock or sheet.

The following table summarises the main properties of the brush body materials we have described. Data were obtained from our suppliers and should be construed as average values.

Technical characteristics of brush bodies

Material	PS	A	T max	T min	R	RE	RC	D	FDA	Principal application
PVC	1.40	0.05	+ 60	- 5	55	10^{15}	XX	80		Brushes without specific technical requirements
PA	1.13	10	+ 95	- 30	70	10^{11}	X	75	✓	Food industry
PP	0.91	0.03	+ 100	0	35	10^{17}	XX	70	✓	Food industry, moist or chemically aggressive environments, large size roller brushes
PE	0.96	0.02	+ 80	- 50	28	10^{16}	XXX	65	✓	Large flat brushes, chemically aggressive environments
POM	1.41	0.50	+100	- 50	65	10^{15}	X	80	✓	Food industry, high precision machining applications
PET	1.34	0.50	+110	- 20	55	10^{14}	XX	80	✓	Food industry, high precision applications and aggressive environments
PTFE	2.18		+120		25	10^{18}	XXX		✓	Food industry, high temperature environments
PEEK	1.32	0.50	+180	- 20	95	10^{16}	XX			High working temperatures
PUR	1.30		+ 85	- 20	43		XXX	40		Belt brushes
WOOD	0.72	25	+300		130	10^{12}	X	60		High temperatures, lightweight brushes
PLYWOOD	0.67	37				10^{12}	X	65		High temperatures, linear brushes
LEATHER	0.85	60	+110	- 30		-	XX	40		Large size belt brushes
ALUMINIUM	2.70	-	+200		300	2.8×10^{-6}	XX	-		Rigid and antistatic brushes
BRASS	8.50	-	+ 280		420	7×10^{-6}	XXX	-		Brush bodies offering high mechanical strength
STEEL	7.85	-	+ 450		500	1.2×10^{-5}	X	-		Motorised brushes
STAINLESS STEEL	7.90	-	+ 600	- 150	515	1.2×10^{-5}	XXX	-	✓	Motorised brushes, food industry

PS = Specific gravity (kg/dm^3)
A = Water absorption (%)
Tmax = Maximum working temperature (°C)
Tmin = Minimum working temperature (°C)

R = Tensile strength (N/mm^2)
RE = Electrical impedance (Ohm cm)
RC = Resistance to Chemicals (X = poor, XX = moderate, XXX = good)

D = Hardness (ShD)
FDA = Food grade material in compliance with US Food and Drug Administration norms. Ambient temperature only.

BRUSH BODIES QUALITY CONTROL

Synthetic materials feature hardness that is characteristic of their constituent polymer. When a shipment of synthetic material in bars or sheets arrives at our plant we perform various checks, including hardness testing using a Shore "D" durometer (or Shore "A" for softer materials such as PUR). Hardness is also indirectly correlated with other properties such as tensile strength R for example. Each material is associated with a range of acceptability, and if test results do not fall within this range the shipment is rejected.
This check eliminates defects caused by material manufacturing problems, thus guaranteeing constant quality in the supply of brushes.

Shore A and Shore D durometers

Profilometer

Durometer for metals

Punched Brushes

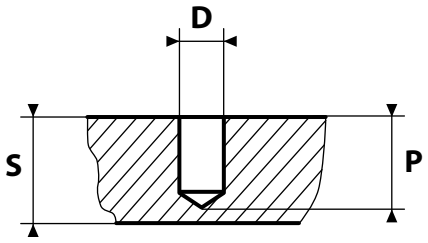
PUNCHED BRUSHES

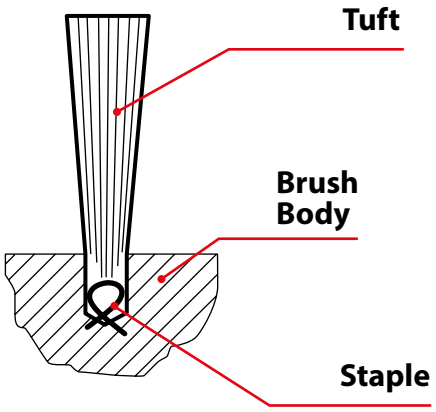
PUNCHED BRUSHES are composed of tufts of filament inserted in the body by means of a metal element or "staple" which is lodged fully in a preformed hole. Depending on the shape of the brushing surfaces punched brushes are available in FLAT, ROLLER or DISC styles. Punched brushes also include flexible BELT brushes and ANTISTATIC brushes designed to remove static charges. The main characteristic of punched brushes is their versatility.

Since the tufts are reciprocally independent they can be arranged in such a way as to impart both simple or highly complex geometries to the brush. That's why punched brushes are suitable for manufacture in any shape or size and are irreplaceable when the support performs also a mechanical function in the system in which the brush is installed.
For the above reasons, punched brushes are the most capable of ensuring dimensional precision and the maximum construction quality.

TUFTS DIAMETER

The diameter of the tufts is of key importance in the design of a technical brush. This parameter will determine the overall efficiency of the brush in operation. There exists a relationship between tuft diameter D and hole depth P, which is effectively limited by thickness S of the support. The table shows possible tuft diameters and relative P and S values.





When using thick supports the choice of tuft diameter is determined by non-dimensional considerations. For example, large diameter tufts are suitable for brushes subject to high stress (in which case the anchorage of the tufts must be very secure). Alternatively, small diameter tufts will produce a high density or very soft brush.

D (mm)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0	10.0	11.0	12.0
P (mm)	5.0	5.0	6.0	7.0	8.0	9.0	9.5	10.0	11.0	12.0	12.5	13.0	14.0	15.5	17.0	18.5	20.0
S≥ (mm)	6.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	15.0	16.0	18.0	20.0	22.0	24.0

TUFTS PATTERN

The tufts can be arranged in any pattern across the brush body. When the pattern is regular, it is referred to as a GRID. Although the number of different grid patterns is virtually infinite, the most popular layouts are shown below.
The most widely adopted solution is the STAGGERED grid model.

This is adopted for the following requirements:

a) very high density brushing surface
b) very uniform brushing surface.

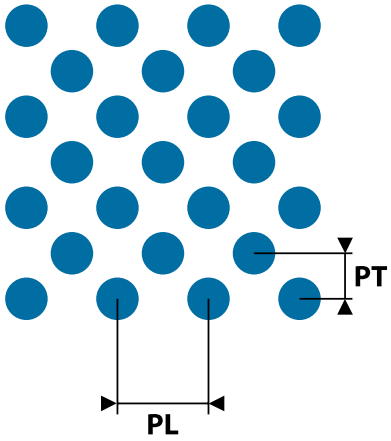
The PARALLEL grid is used in the following cases:

a) the brush must be able to discharge debris easily without becoming clogged
b) mechanical parts must be able to transit between the tufts
c) the brush must be cut into sections by the user.

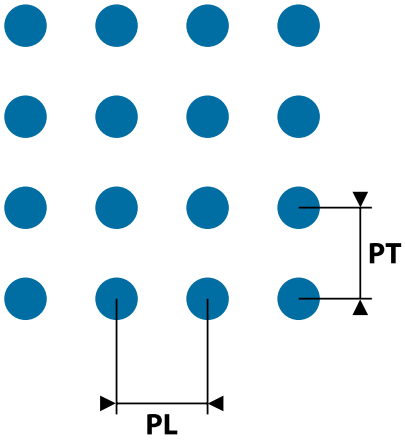
The SPIRAL grid pattern is used for roller brushes in the following cases:

a) the brush is required to route treated material to one side
b) the brush must come into contact with the workpiece surface gradually and delicately
c) it is important to remove all risks of scratching of delicate surfaces. The spiral pattern may be composed of several coils each of which composed of several rows of tufts.

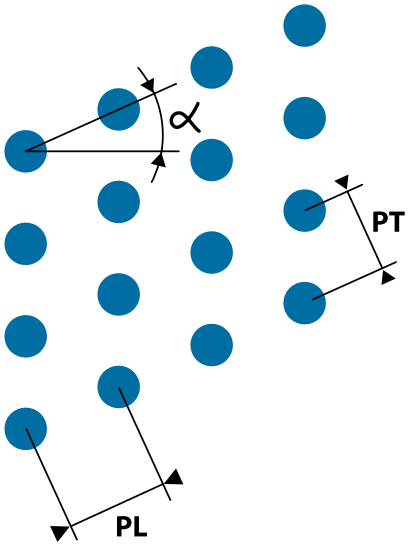
Staggered grid



Parallel grid



Spiral grid (rollers only)



PL = longitudinal pitch - centre-distance between two tufts on row parallel to the longer side of the brush

PT = cross pitch - centre-distance between two adjacent tuft rows

α = Inclination of spiral with respect to the brush axis (spiral grid only)

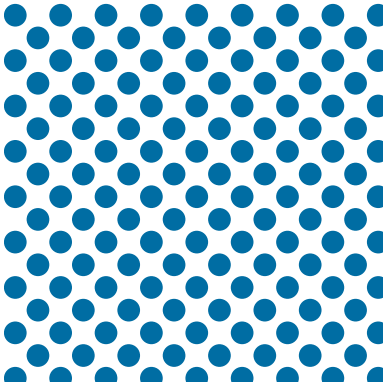
Punched Brushes

GRID PRACTICAL EXAMPLES

Our Engineering Department is at your disposal to recommend the most suitable tufts pattern in relation to the use of the brush. To give a clearer idea of our recommendations or to enable you to make your own choice, the following diagrams show the most widely used grid patterns in full scale. Of course various intermediate solutions and even more extreme solutions are all possible. The abbreviations are identical to the abbreviations on pages 16 and 17.

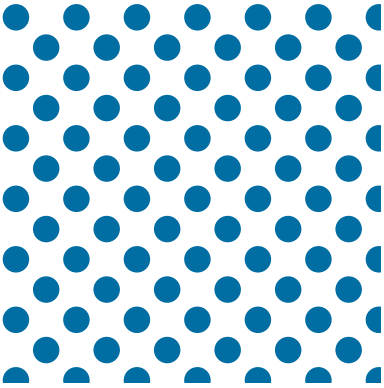
Example 1

R=S PL=6 PT=3 D=3



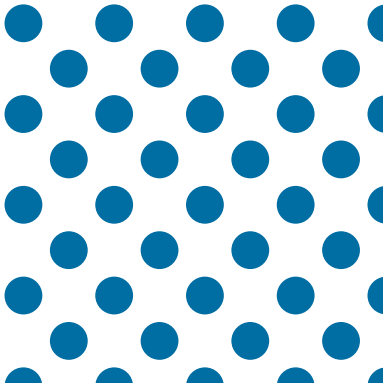
Example 2

R=S PL=8 PT=4 D=3.5



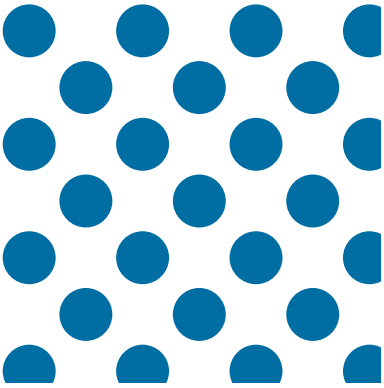
Example 3

R=S PL=12 PT=6 D=5



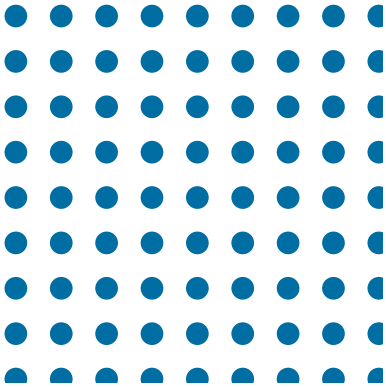
Example 4

R=S PL=15 PT=7.5 D=7



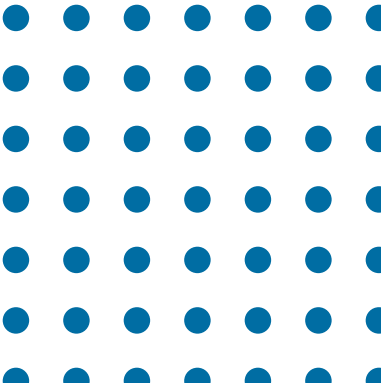
Example 5

R=P PL=6 PT=6 D=3



Example 6

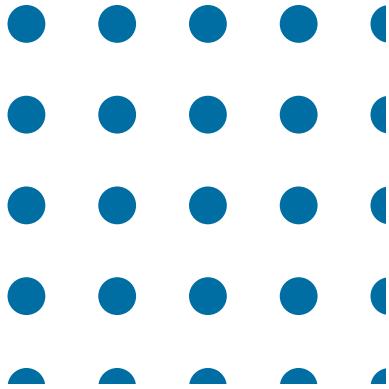
R=P PL=8 PT=8 D=3.5



R=Grid Pattern S=Staggered P=Parallel E=Spiral

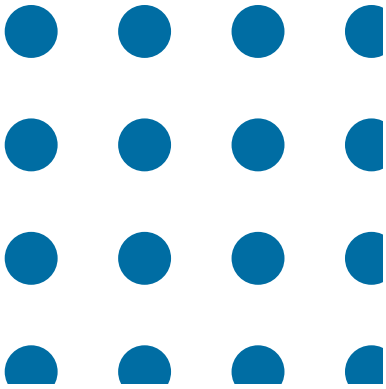
Example 7

R=P PL=12 PT=12 D=5



Example 8

R=P PL=15 PT=15 D=7

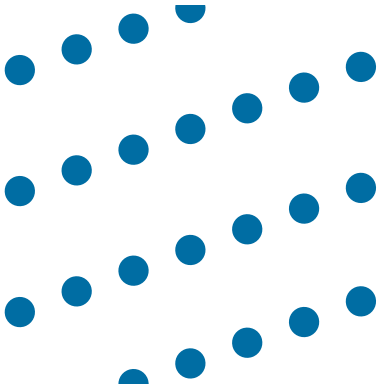


Example 9

R=E PL=6 PT=15 D=3.5 α=10

Example 10

R=E PL=8 PT=15 D=4 α=20

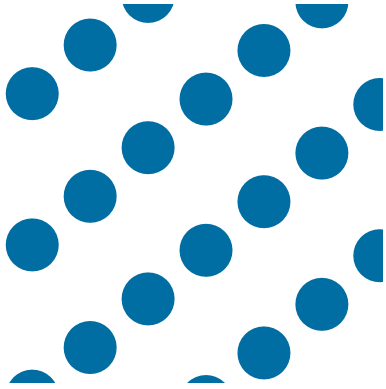


Example 11

R=E PL=10 PT=15 D=5 α=30

Example 12

R=E PL=10 PT=15 D=7 α=40



R=Grid Pattern S=Staggered P=Parallel E=Spiral

Punched Brushes

ROLLER BRUSHES

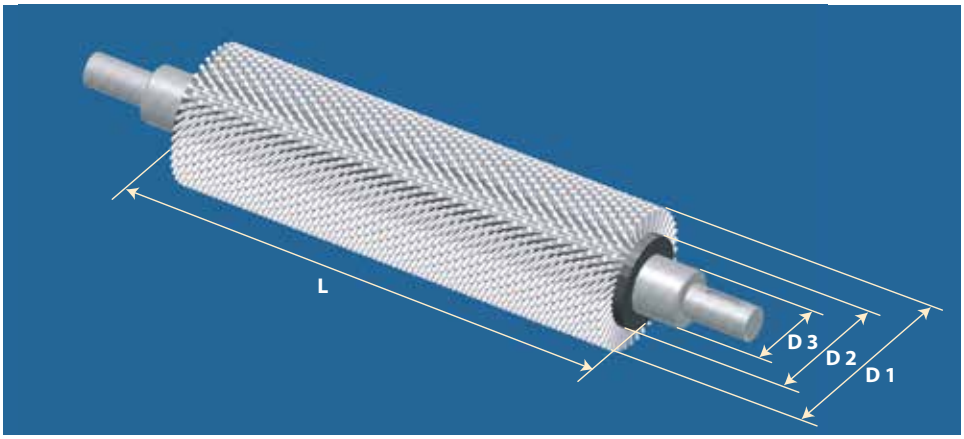
Roller brushes are the most widely used brush types in industry, where they can be found in a large number of manufacturing processes. Roller brushes are generally motor driven and hence equipped with a metal core suitably designed to withstand high torque loads.
Roller brushes can also be supplied however without a metal core.
The working surface can be continuous, divided by segments, spiral, conical, or profiled to specifications.
Large size brushes and brushes that rotate at high speed must be subjected to a dynamic balancing process that we carry out in house and in relation to which we can issue customers with a detailed balancing certificate.

Rollers are used for:

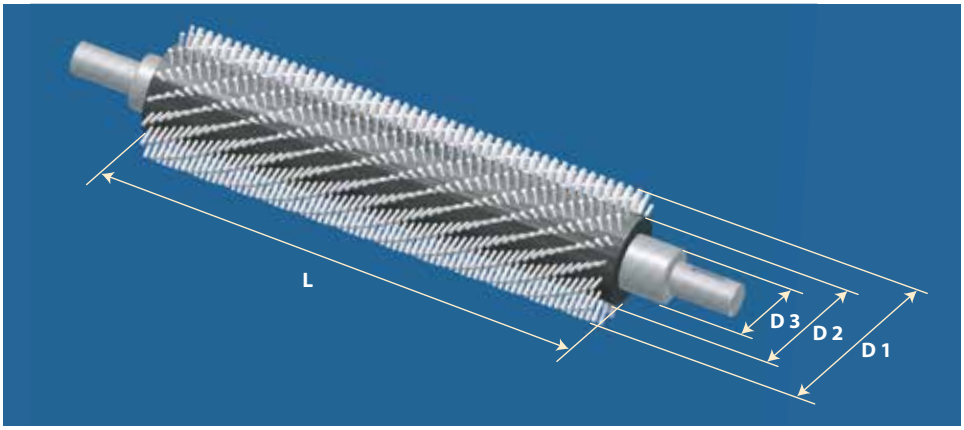
- High precision brushes
- Brushes with complex geometrical shapes
- Brushes with hybrid filaments or alternated sectors with different types of filaments
- Modular configurable brushes
- Soft and delicate brushes.

TRANSVERSE ANGLING OF THE TUFTS

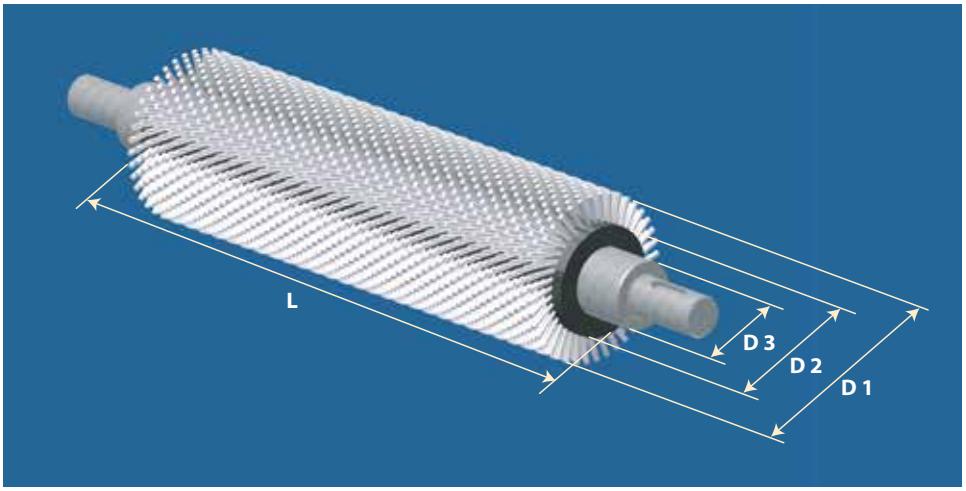
The tufts are usually radially positioned, although they can also be angled in a transverse direction as shown in the figure in such a way as to make the brush asymmetrical. This can be useful in order to make the action of the roller more delicate or to prevent the workpiece from moving in the direction opposite to the rotation direction. The α angle cannot generally exceed 30°.



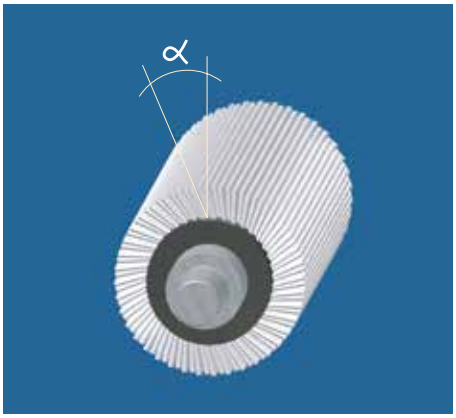
Staggered grid roller



Spiral grid roller



Angle filled roller



Angle filled roller
front view

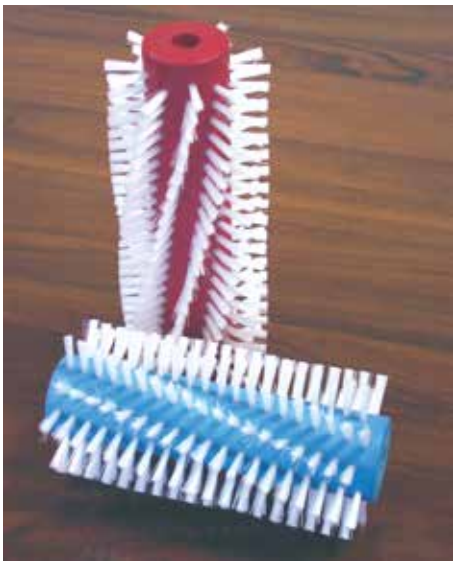
ASSEMBLY OF ROLLER BRUSHES

Roller brushes are invariably motor driven. For this reason, brush bodies are usually made of steel with hubs, flanges, keyways, etc. Sometimes the brush may be made with a body in composite material for technical reasons. Dynamic balancing is possible only on rollers with a metal body because these types are not subject to deformation.

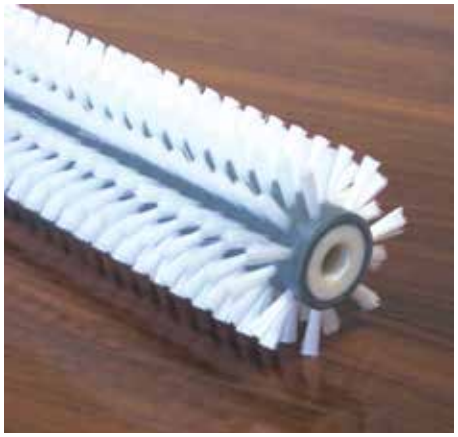
Coiled roller with steel hubs

Angled rings roller

Tampico fibre roller balanced for high speed



Rollers with painted wood body



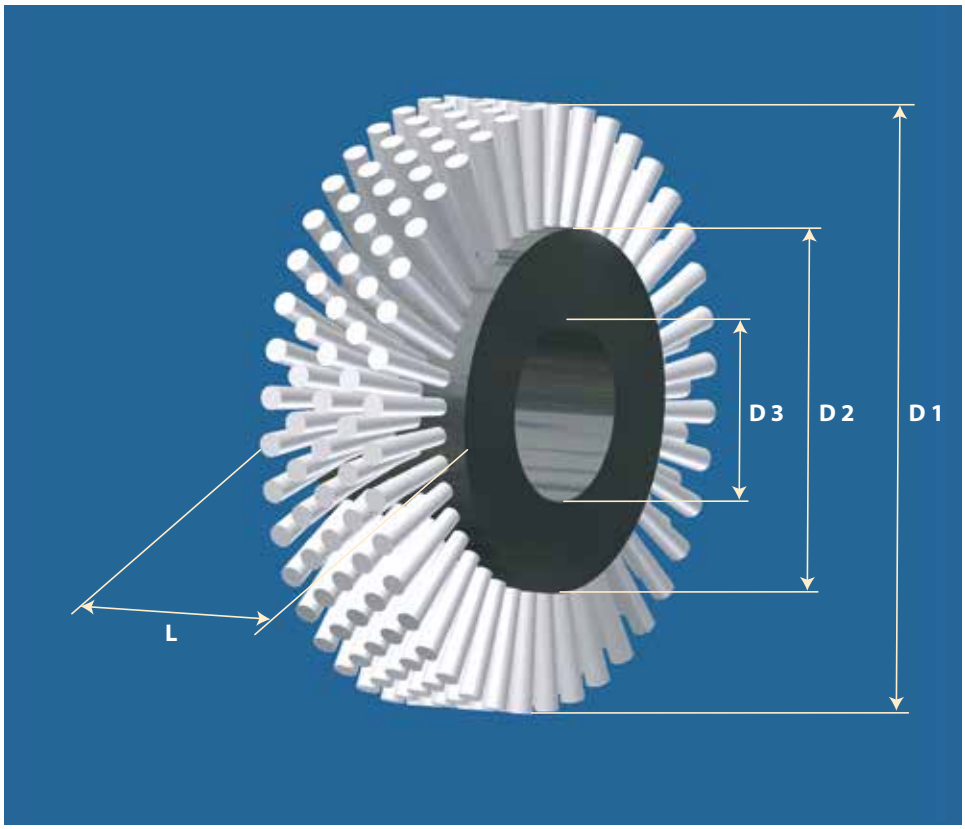
Roller with body in composite material

Profiled abrasive nylon roller brush

Punched Brushes

CIRCULAR BRUSHES

Roller brushes where D1>L are referred to as circular brushes.
These brushes can function in confined spaces and can be stacked together on the same shaft to obtain a roller, although continuity will not be equivalent to that of a one-piece brush.



Circular brush

For orders and requests for quotations please fill in table 1.5 on our website:
www.simoni.eu

MAXIMUM ROTATION SPEED OF ROLLER BRUSHES

One important parameter, the value of which is required from the design stage, is the maximum rotation speed of the roller. This depends on the materials, on the loads applied to the brush and the filament-surface friction coefficient.
We can calculate the permissible rpm 'n' of the brush with a function 'f' of static diameters and check the condition:

n < f (s, Ft, Pm, D1, D2, P)

where
s = safety coefficient, which must take account of applied load type
Ft = pull-out resistance of tufts [kg]
Pm = tuft weight [g]
P = tuft hole depth [mm]

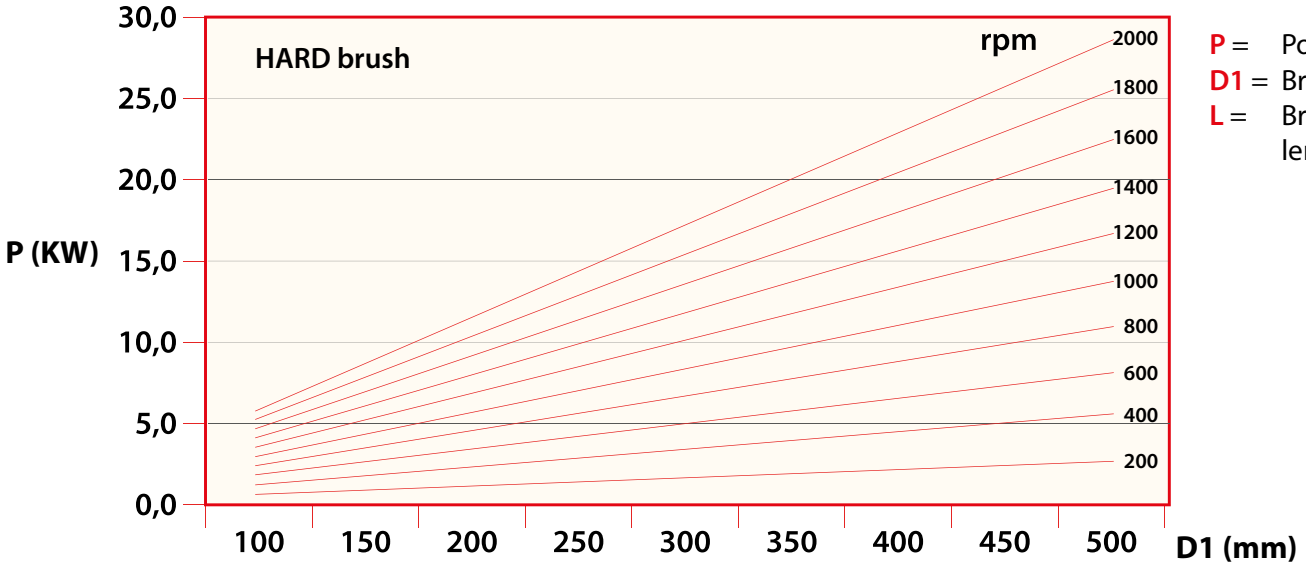
Please contact us for any design data you may need.

If the roller is to run at high speeds it is always necessary to make a prototype and test it in safe conditions.

SIZING OF THE MOTOR

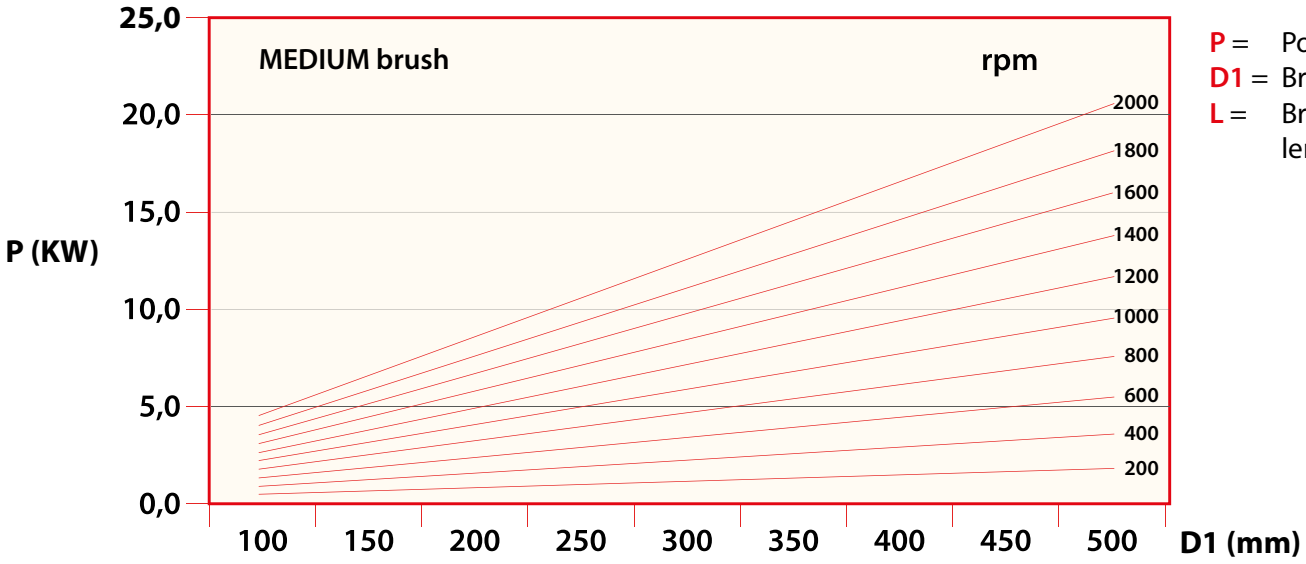
A suitably sized motor must be used to drive the roller brush. The motor power draw varies in relation to the brush diameter, rpm, working length, and hardness of the filaments. Power draw is also closely related to the pressure exerted on the brush. This situation means that motor power can generally be selected only as an average value as a rough approximation.
The diagrams on page 23 specify required motor power for a 1000 mm long brush. For different lengths follow the arithmetic proportion.

ABSORBED POWER
L=1000 mm



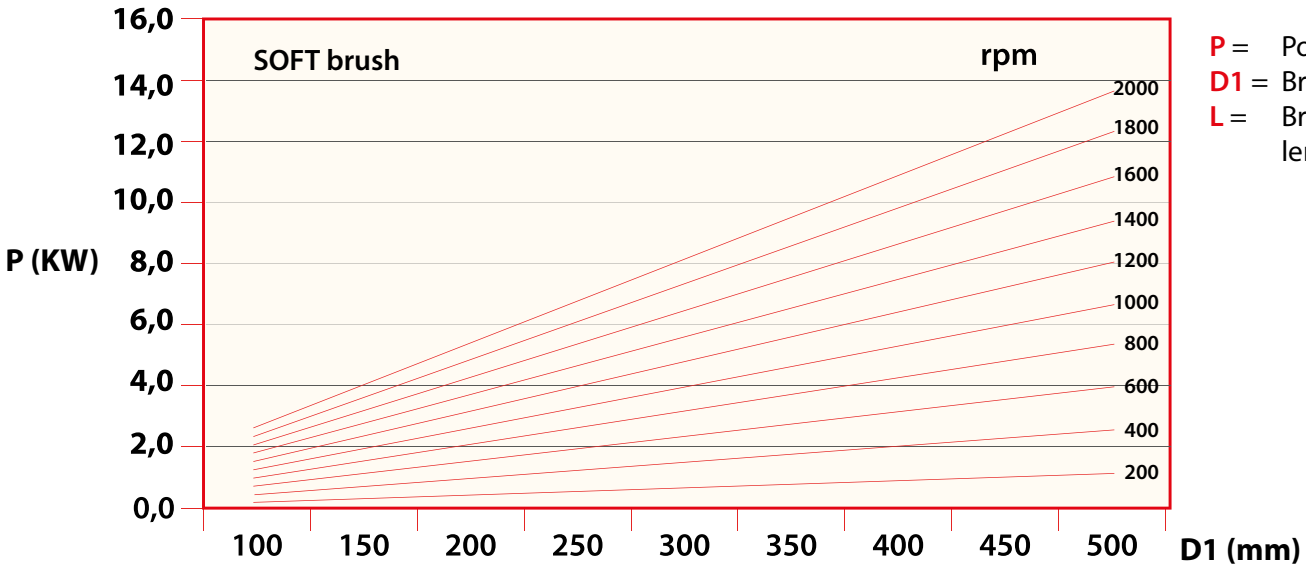
P = Power draw
D1 = Brush diameter
L = Brush effective length

ABSORBED POWER
L=1000 mm



P = Power draw
D1 = Brush diameter
L = Brush effective length

ABSORBED POWER
L=1000 mm



P = Power draw
D1 = Brush diameter
L = Brush effective length

Punched Brushes

MODULAR ROLLER BRUSHES

Roller brushes of the required length can be configured by using standard 100 mm long modules.
The modules are cylinders of various outside and inside diameters having a toothed rim on each side.

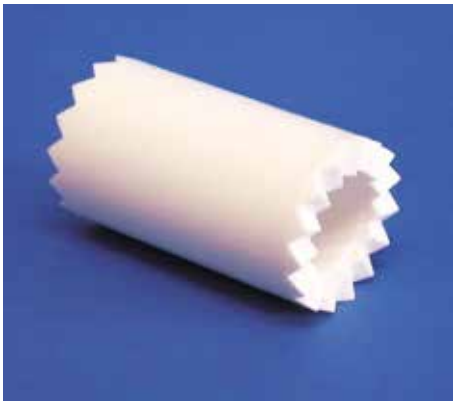
The teeth fulfil two functions:
1) drive transmission between two adjacent modules
2) provide a continuous brushing surface also at the position of joins between adjacent modules.

Each end of the thus-formed roller is equipped with a toothed collar having grub-screws to immobilise the brushes pack.

100 mm module

Locking collar

Modular roller



Food grade module

The brush body is made of PP and can be supplied also in a white food grade version.
The brushing surface can be continuous, in segments, or coiled.
The number of tufts derives directly from the number of teeth Z, so that brushes with variable fill densities can be configured in accordance with the table.
The main advantage of modular roller brushes is that they make it possible to configure brushes of variable length that are easy to replace and transport.

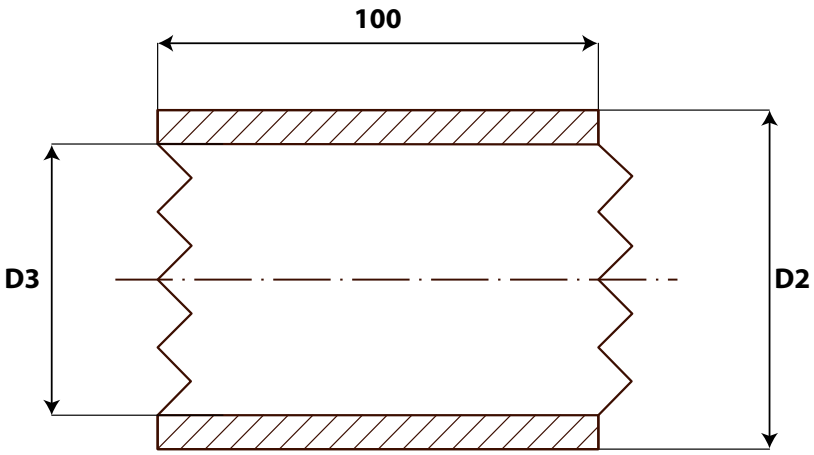
In contrast, they are fairly limited in terms of tufts diameter and pattern. This is because the foregoing parameters are tied to the characteristics of the brush body, which, since it is injection moulded, is not compatible with the full range of possibilities.
In other words, the modular method can replace the traditional one-piece roller brush only for the standard sizes shown in the table.

Modular brush bodies

L=100 mm

D2 (mm)	D3 (mm)	Z	R
31	20	6	B
31	20	8	M
31	20	10	A
45	25	8	B
45	25	12	M
45	25	16	A
50	30	10	B
50	30	12	M
50	30	16	A
57	35	10	B
57	35	15	M
57	35	18	A
65	40	12	B
65	40	17	M
65	40	20	A
75	50	12	B
75	50	18	M
75	50	30	A
86	60	12	B
86	60	20	M
86	60	30	A
100	75	14	B
100	75	18	M
100	75	22	A
125	100	18	B
125	100	24	M
125	100	28	A

Z = Number of teeth
R = Grid pattern
B = Low density
M = Medium density
A = High density



SUNNY BRUSH is particularly studied for cleaning the photovoltaic and the solar panels. These panels need a frequent cleaning to avoid the efficiency loss due to various dusts.
SUNNY BRUSH is modular, in order to fit itself to the different panels one can find on the market.
Its main parts are :

- Aluminium core, modules of 1.000 mm
- Brush D=200 mm in nylon, modules of 100 mm
- Connection bushes in POM-C with threaded inserts
- Locking collars for the ends.

The modular system allows the user to order a brush of the requested length (several meters too) and to easily mount it also on the roof, by using screws only.
Further advantages of the modular system (both core and brushes) are the economy and the easy transport.

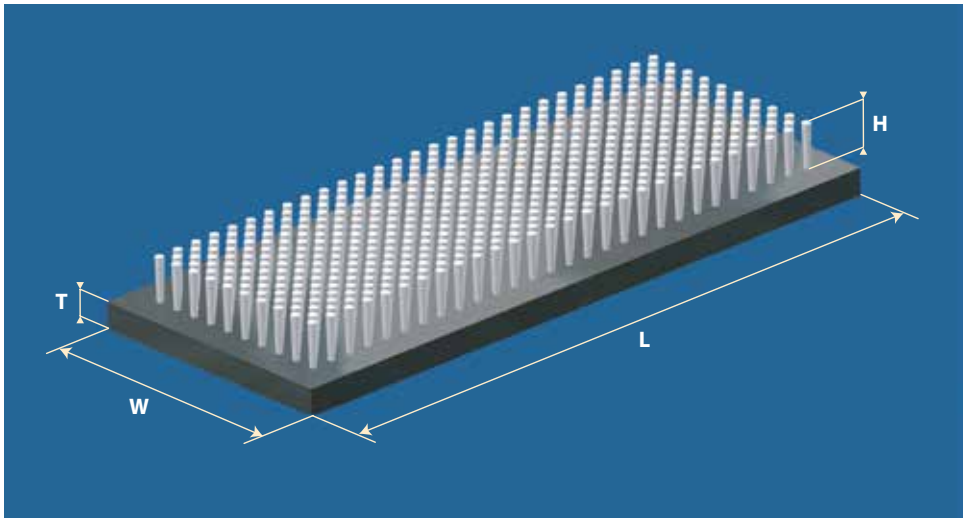
Sunny Brush

Brush module, connecting bush and side collar

Punched Brushes

FLAT BRUSHES

Flat brushes are generally installed on fixed parts of the machine, although they may also be installed on cylindrical drums to create a roller or on reciprocating slides.
The working surface can be continuous, divided by segments, or profiled to customer specifications.
The flatness of these brushes is frequently of critical importance, both in relation to the brush body and the trimming process that defines the shape of the working surface.



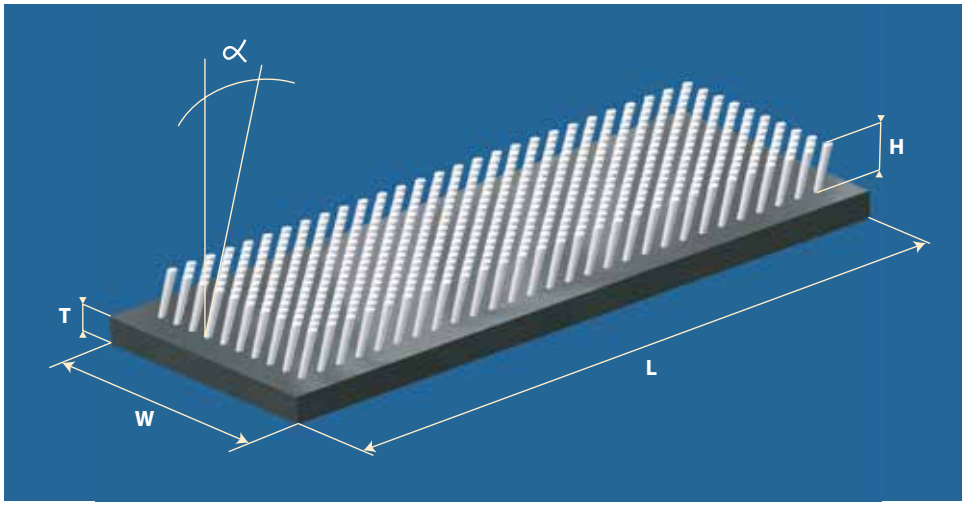
Flat brush

Flat brushes are utilised for:

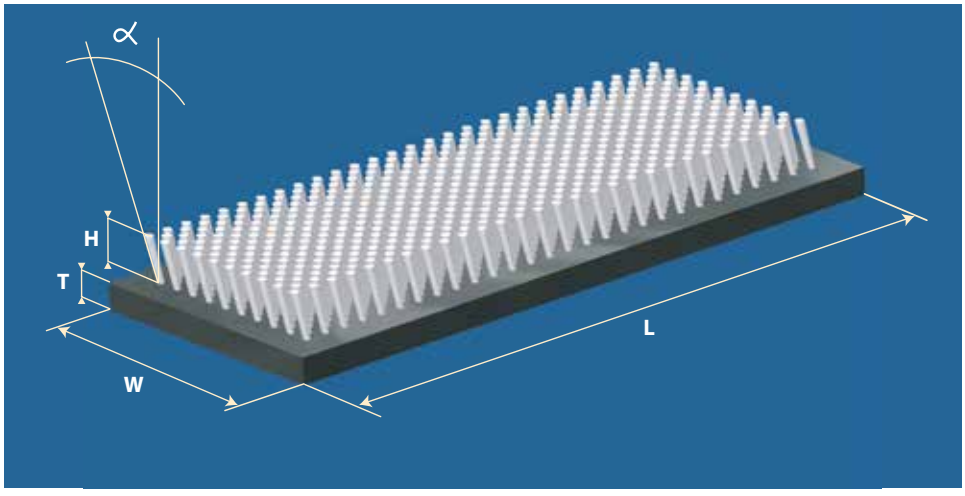
- High precision brushes
- Brushes with complex geometrical shapes
- Conveyor tables
- Product transit guides
- Complex shape barriers to exclude machining chips and dust.

TUFT ANGLING

The tufts are usually inserted vertically, although they can be angled as shown in the figure in such a way as to make the brush asymmetrical. This can be useful in order to make the action of the brush more delicate or to prevent the workpiece from moving in the opposite direction with respect to the movement direction. The ∝ angle cannot generally exceed 30°.



Flat brush with longitudinal tuft angle

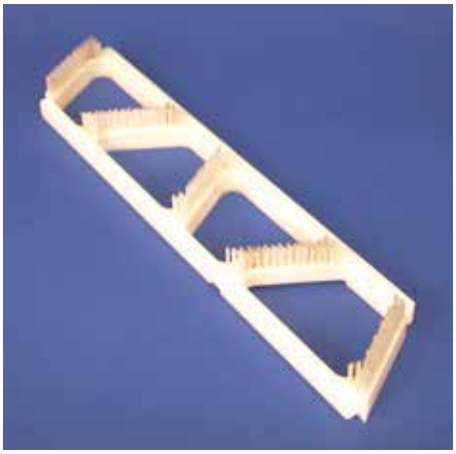


Flat brush with transverse tuft angle

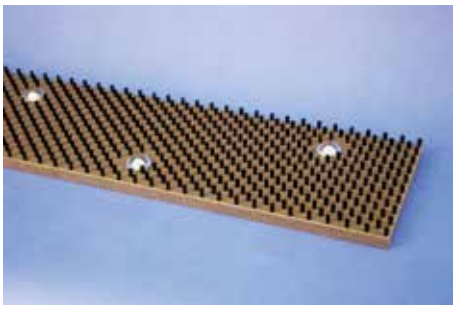
For orders and requests for quotations please fill in table 1.4 on our website: www.simoni.eu

Flat brush in horsehair

Brush on stainless steel base



Nylon brush
with specific mechanical functions

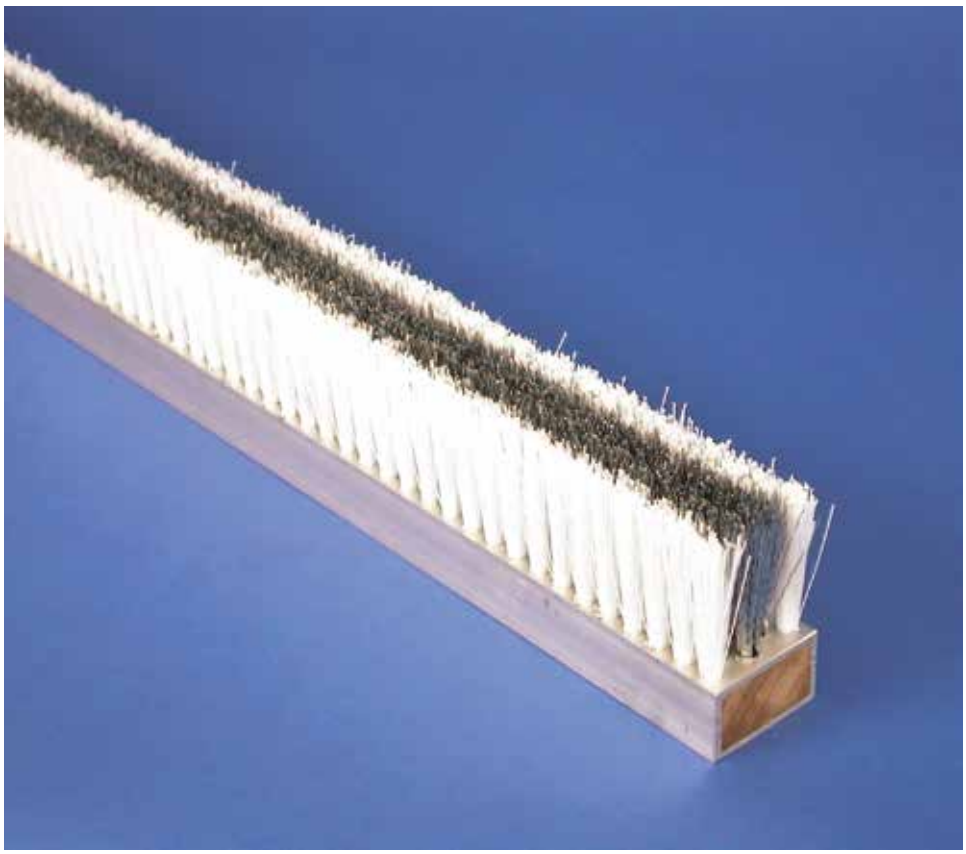


Brush with steel balls
for conveying panels

ASSEMBLY OF FLAT BRUSHES

The brush body is generally synthetic, although also aluminium may be used to comply with narrow flatness tolerance values.
The body may also be made of composite materials, for example wooden core and aluminium cladding to combine low weight and high rigidity.
We can also couple a synthetic base with a specially shaped metal plate to ensure solid assembly.

Brush on composite polyurethane
and steel body



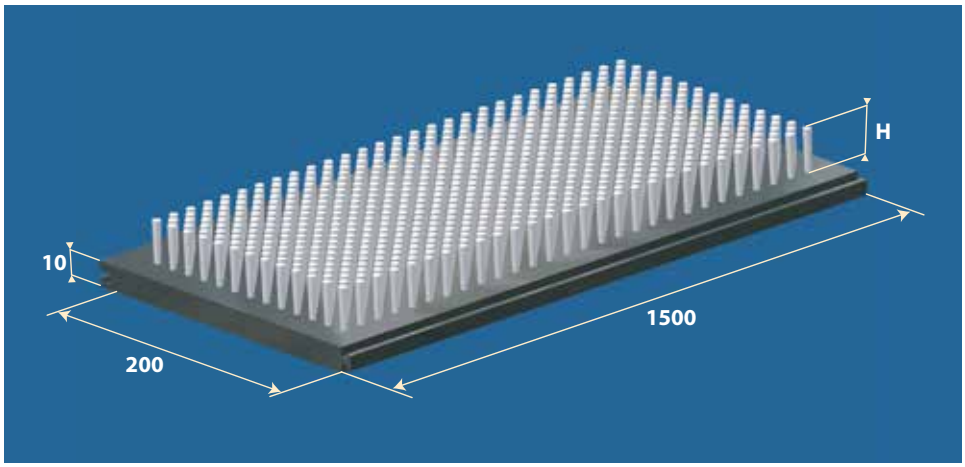
Brush on composite wood and aluminium body

Flat brushes are normally mounted on plates. For this purpose we can supply them with plain holes or threaded holes (exclusively in rigid materials such as PVC or aluminium).

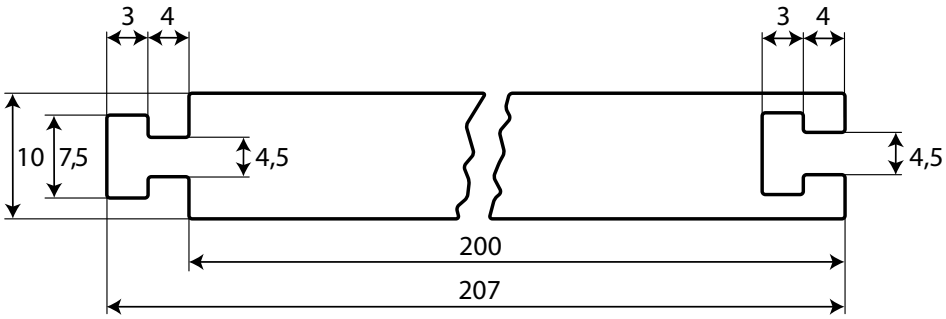
Another option is the installation of threaded metal inserts.
Aluminium brushes can be self-loading and can be equipped with interlocking features for mechanical parts.

MODULAR FLAT BRUSHES

To obtain large size panel brushes on which to handle or process sheet parts, several brushes can be installed side-by-side. For this purpose we have developed a modular product that is virtually unlimited in dimensional terms. The modular flat brush is a sheet of 10 mm thick PVC sized 200x1500 mm and equipped with interlocking features at the sides. The brushes are manufactured rapidly on this base and subsequently assembled and finally cut to customer specifications. This patented Simoni system allows us to manufacture very large and special brushes also in small quantities, while maintaining a competitive price.

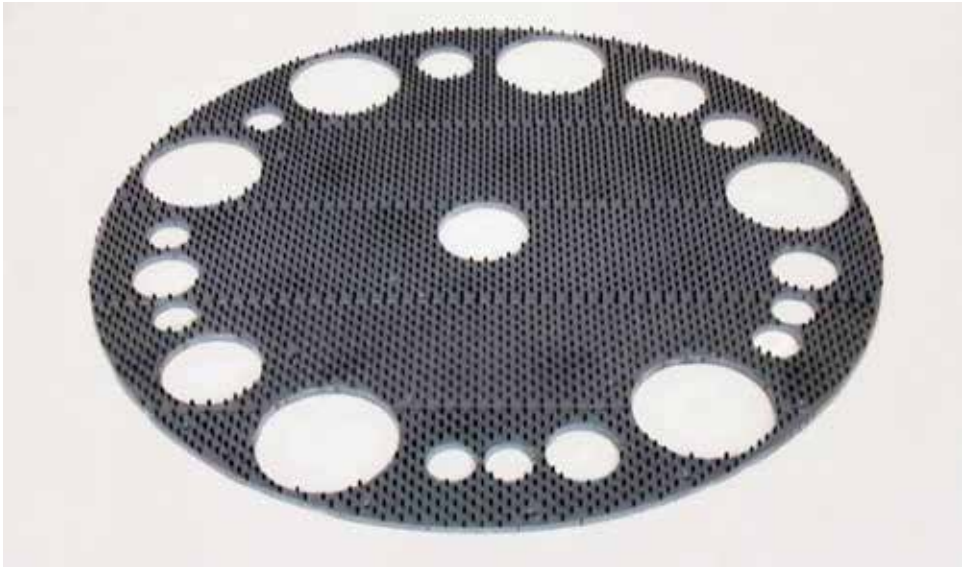


Modular flat brushes



Modular brush body

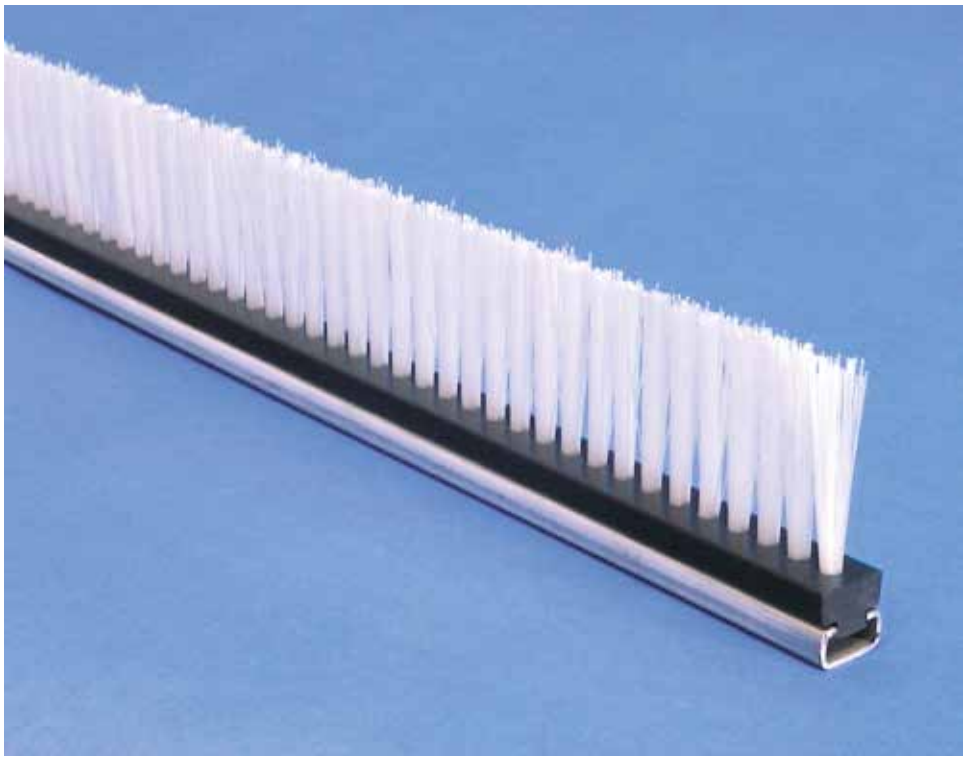
Patented System



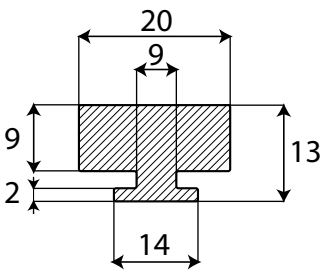
Large size brush for use with sheet metal, created using configurable modules

LATH BRUSHES WITH METAL PROFILE

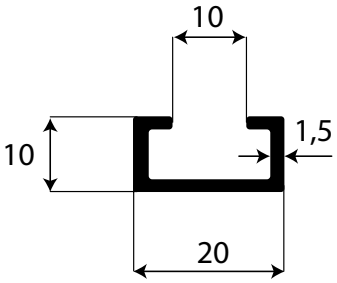
Linear brushes can be supplied with one or more rows of tufts, for fitting to metal profiles.
The metal profile imparts properties of rigidity and flatness to brushes with a synthetic body, and allows the customer to replace worn brushes without interfering with the assembly system.
These brushes are available with a stainless steel profile section on request.
The diagrams at the bottom of the page show the standard size of the brush body and relative profile. Alternative dimensions are available on request.



Lath brush on metal profile



Plastic lath

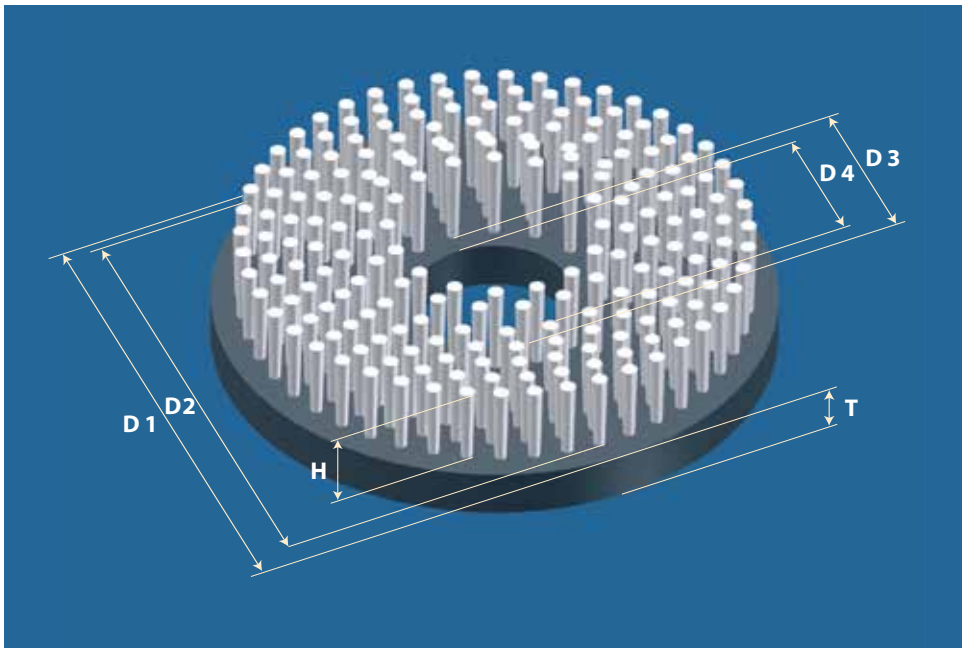


Galvanized steel profile

DISC BRUSHES

On disc brushes the working surface is perpendicular with respect to the axis of rotation so these styles, which are motor driven, are suitable for processing flat surfaces
The working surface can be continuous or in segments.

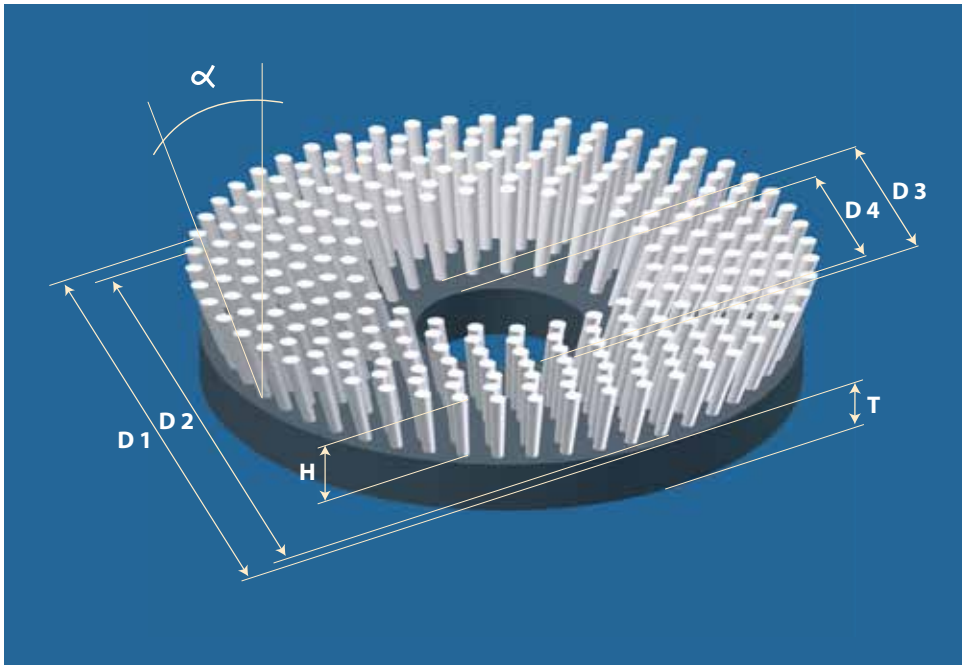
Disc brushes are utilised for:
- Mechanised cleaning of flat surfaces
- Mechanised polishing of flat surfaces
- Deburring of metal parts such as gears, etc.



Disc brush

ANGLING OF TUFTS

The tufts are usually straight, although they can be angled as shown in the figure. This may be helpful in order to increase the working surface without increasing the size of the brush body.
The ∝ angle cannot generally exceed 15°.



Angled tuft disc brush

SIZING OF THE MOTOR

With regard to the motor drive system, loading conditions of disc brushes are the most severe. For example, compared to a roller of equivalent length, in this type of brush all the tufts are constantly in contact with the worksurface. The following formula can be used to size the motor:

$$P = (n \times N \times F1 \times R) / 1000$$

where:
P is the required motor power [kW]
N is the number of tufts
R is the brush radius [m]
n is the brush rotation speed [rpm]
F1 is the maximum tangential force applicable to each tuft [kg] (experimental value)
Power varies from 0 to P depending on the pressure applied to the brush.

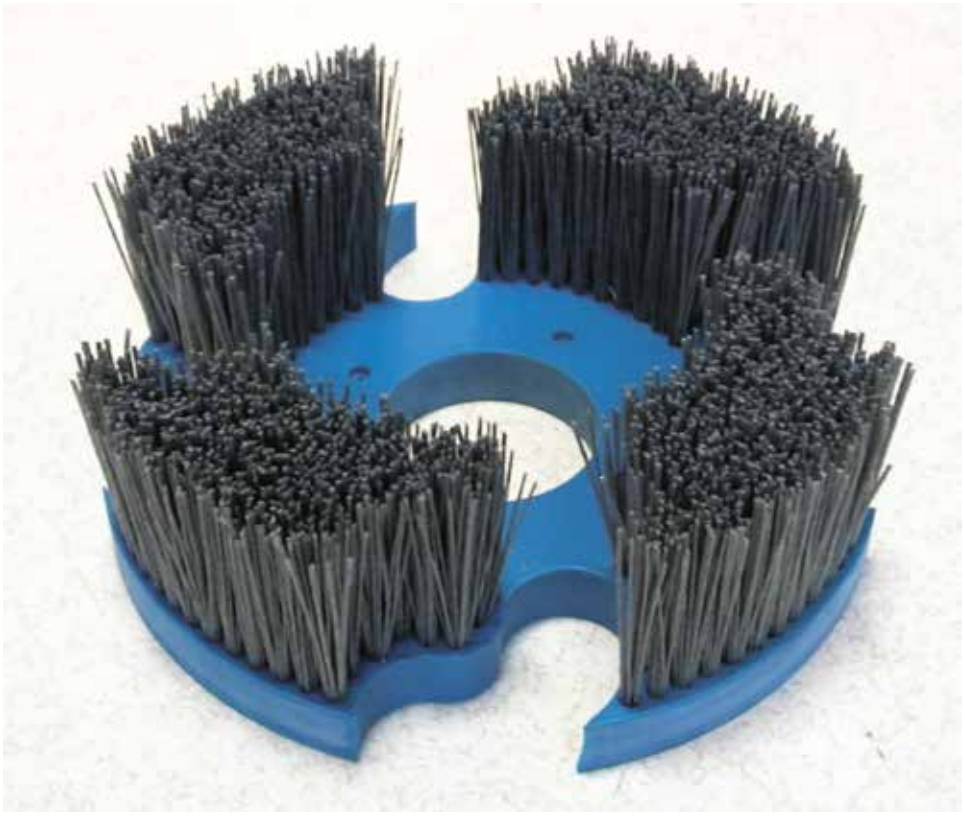
For orders and requests for quotations please fill in table 1.6 on our website: www.simoni.eu

INSTALLATION OF DISC BRUSHES

The brush body is generally synthetic, although also aluminium may be used to comply with narrow flatness tolerance values.

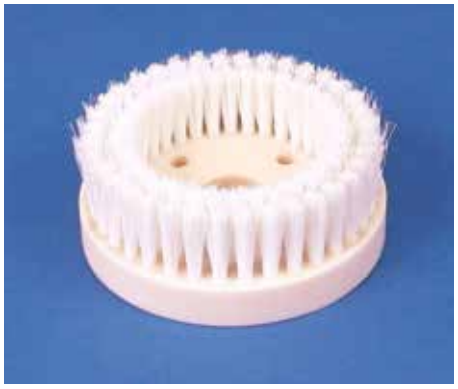
Disc brushes are normally mounted on a motorized shaft. For this reason a housing can be created to accommodate the locking nut and a keyway for a drive key.

The brush body may be fashioned with specific shapes for assembly and conveying functions on automatic machines. The body is usually machined, but for particularly complex geometries it can be made by means of a low pressure moulding process or, for large series, by means of injection moulding.

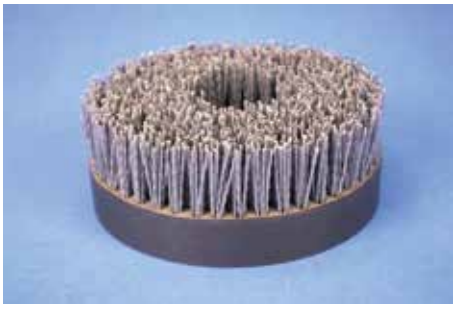


Disc brush with moulded body

Disc brush on plastic gear body



Disc brush with nylon filaments and assembly holes



Disc brush with abrasive nylon filaments for deburring of metals

Punched Brushes

BELT BRUSHES

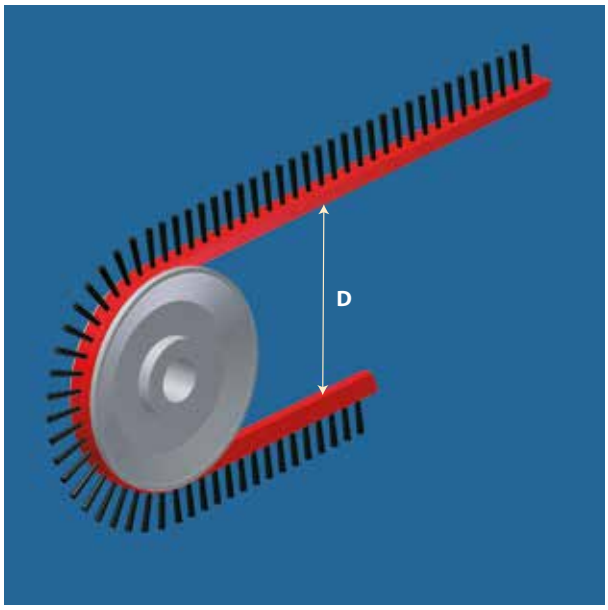
Fixing the tufts on a flexible backing produces a belt brush that can be motor driven by means of pulleys or rollers. Pulleys (vee or rectangular groove profile) are compatible exclusively with relatively narrow belts that usually have just one or two tuft rows. Rollers can carry far wider belt brushes with a large number of tuft rows.

Belt brushes are utilised for:

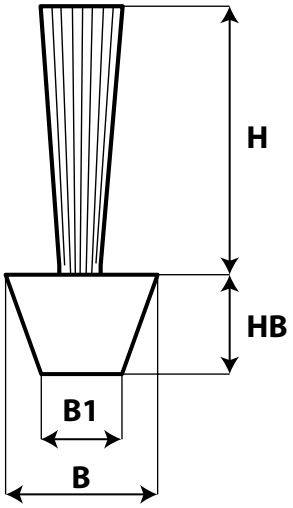
- Brushing of flat surfaces
- Conveying flat parts
- Conveying 3-D objects (caps, containers, etc.).

We can supply belt brushes with polyurethane (PUR), leather or felt backing. We can also tuft belts supplied by customers. In this case note that we can only manufacture brush belts on backing materials with hardness above 90 Shore A.

If the backing is made of PUR the belt brush is supplied by length in one piece (usually 30 metres). This greatly reduces wastage at the time of splicing and assembly.
The leather backing can be supplied bonded to a thin layer of synthetic material to impart anti-stretch properties.
The table shows standard measurements for belt brushes with PUR backing.
Alternative dimensions are available on request.



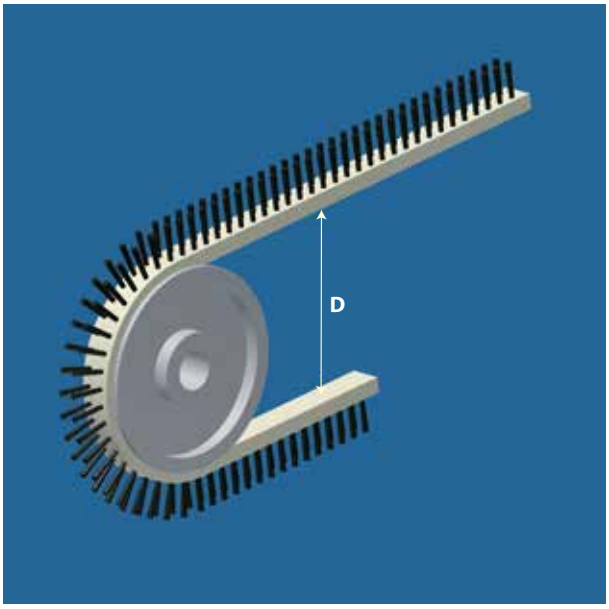
Belt brush with single tuft row on vee section backing



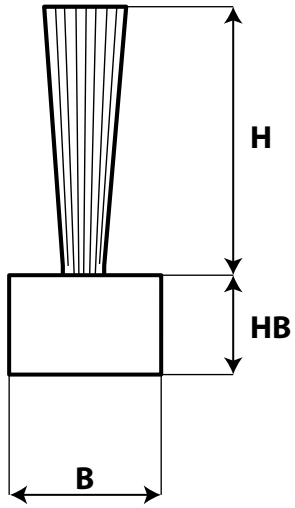
Vee section backing

Vee section PUR backing

B (mm)	13
B1 (mm)	8
HB (mm)	8
H (mm)	30
Filament	PA 0.30 - 0.40 - 0.50
No. of rows	1
D min (mm)	100



Belt brush with double tuft row on rectangular backing



Rectangular backing

Rectangular section PUR backing

B (mm)	10
HB (mm)	8
H (mm)	30
Filament	PA 0.30 - 0.40 - 0.50
No. of rows	1-2
D min (mm)	120

Belt brushes on felt backings can be produced in a wide range of sizes.
With respect to leather backings, these belts can be driven by smaller diameter rollers because the material is softer and more flexible. However, for the same reasons the mechanical anchorage of the tufts is less secure than that of a leather backing.

Brushes on felt belt

Brushes on PUR belt

SELF BRUSH 10 m roll

SELF BRUSH detail

SELF-BRUSH is a linear and flexible element, and by using it one can compose different kind of brushes. By winding SELF-BRUSH onto a tube or bar you can obtain a roller brush with variable pitch.
By cutting pieces of SELF-BRUSH and by placing them on a rigid base you can obtain a flat brush of the requested sizes. Also you can use SELF-BRUSH as a lining to close linear and curve gaps.
The base is polyurethane with cross section 7x7 mm, and the filament is nylon 0.30 black crimped height 30 mm (10 m roll).
To cut SELF-BRUSH you can use a normal cutting nipper. To lock the ends of the roller brush you must remove the last two tufts putting in the same place two self-tapping screws. Under the ends of the flat brush you must put a strip of adhesive tape to avoid that during the time the end can lift. In any case it is advisable to put a thin layer of glue onto the backing before the mounting.
SELF-BRUSH is useful in the following cases :

- Production by our own of technical tests and samples
- Urgency and no time to produce a traditional brush
- Production on particular brush bodies normally not used for traditional brushes (ex.soft materials).

SELF BRUSH roller bush

SELF BRUSH flat brush

ANTISTATIC BRUSHES

In production processes involving the treatment of films or non-conductive parts an electrostatic charge may be created with resulting impairment of the work cycle. In these cases antistatic brushes can be used to discharge static electricity from the surfaces. For example, an antistatic brush can remove dust from a film or discharge a surface prior to surface coating to avoid flaws of the finished product.

Operation of an antistatic brush is based on the "point effect". If the filament is electrically conductive, each filament tip is capable of attracting electrostatic charges from the surface to be treated.

The brush body (which must also be electrically conductive) is then connected to earth to keep the potential of the discharge system at zero.

The filament is thus essential in relation to the efficiency of an antistatic brush. The filaments must be conductive and very fine so that the brush offers a large number of discharge points.

The primary material used by Simoni is Thunderon, which offers several advantages over conventional carbon fibre. Sometimes however different types of filament are used for antistatic brushes, for example very fine brass wires are used for high temperature applications.

The maximum efficiency is achieved by setting a gap of approximately 2 mm between filament and surface. Despite this general rule, Thunderon filament brushes can be placed directly in contact with the part so that the antistatic effect is combined with brushing action.

We can manufacture antistatic brushes in all styles, including roller brushes, disc brushes, etc.

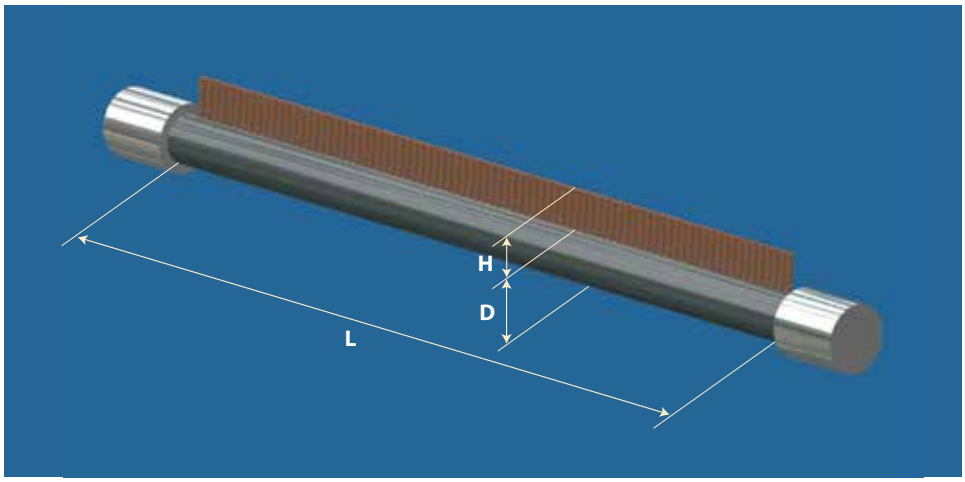
Thunderon filaments offer several advantages over carbon fibres:

- higher electrical conductivity
- carbon fibre is insubstantial, while Thunderon can provide actual mechanical brushing action
- the entire range of brush hardnesses can be obtained by blending Thunderon and nylon
- while carbon fibre brushes are available exclusively in linear styles, Thunderon can be used to make brushes of all shapes, including rollers.

Our internal standard SAB-1000 envisages D=20, H=27 and L=1000. Alternative L measurements can be supplied to order.

In terms of the materials employed, the precision manufacturing and the finishes, SAB-1000 brushes are mainly used for installation in hi-tech plants that call for excellent electrostatic discharge efficiency.

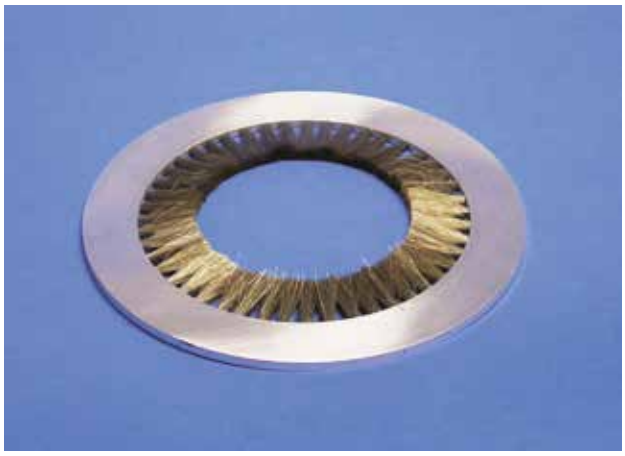
For other less complex applications we propose SAT-1000, which has Thunderon filaments and body made of a 5x30 L=1000 mm aluminium bar.



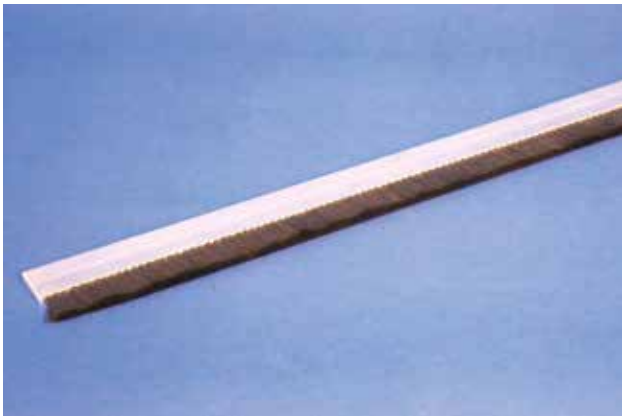
SAB type antistatic brush

SAB type antistatic brush

Thunderon filament roller brush



Ring for extruders and vertical packaging machines



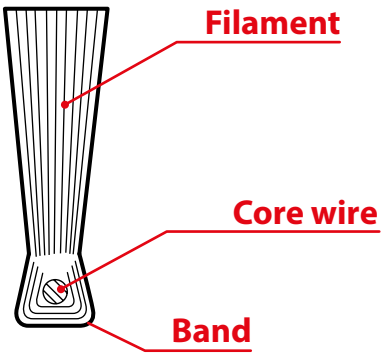
SAT type antistatic brush

Roller antistatic brush with gear

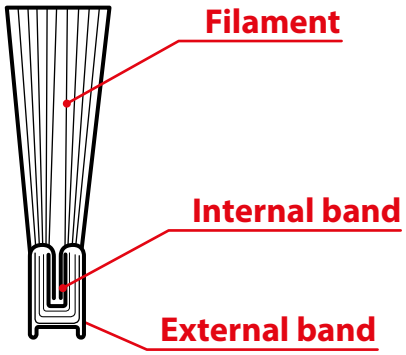
Strip Brushes

STRIP BRUSHES

STRIP BRUSHES are composed of a U-shaped metal profile (backing) in which the filament is lodged in a continuous row. There are two types of metal backings: single band and double band. In the more traditional single band backing the filaments are fastened between the U-shaped band and a core wire. In the double band backing the filaments are anchored between the external band (toothed) and the internal band. The single band style is far more common. Double band backings are used for very heavy-duty applications.



Single band



Double band

Strip brushes can be divided into three types:

SPIRAL - the brush is wound in a spiral shape and secured to a tube or shaft

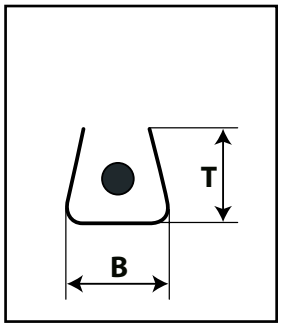
LINEAR - the brush is straight and is cut to length during production

INTERCHANGEABLE SEGMENTS - the brush is composed of a roller fitted with interchangeable linear strip brushes

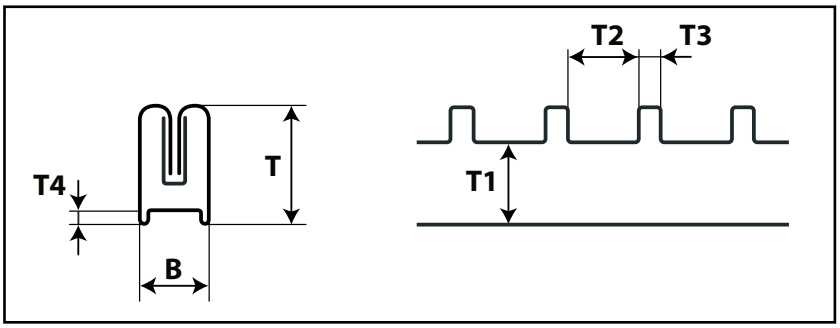
Because of their type of construction strip brushes are particularly suitable for making linear elements or medium/large size rollers.
Moreover, strip brushes are less versatile and less precise than punched brushes.

BACKING DIMENSIONS

Backing width B is a fundamental parameter in designing a strip brush. This factor defines several other parameters including the fill density and the level of stress that the brush will be able to withstand. The cross section of the metal backings and a side view of a double strip backing are shown in the figure. The table shows the relative dimensions in accordance with backing B.



Single band



Double band

Strip backing dimensions (mm)

	SINGLE BAND									DOUBLE BAND	
B	4	5	6	8	10	13	14	17	20	6	8
T	4	5	6	10	9	16	15	24	23	9	11
T1										5	8
T2										5	7
T3										2	3
T4										1	1.5

SPIRAL STRIP BRUSHES

A roller brush can be created by wrapping a strip around a cylindrical metal core in a spiral shape. If the spiral is disassembled from the metal core the result is a flexible brush (like a spring) called a 'free spiral'.

Spiral strip brushes are utilised for:

- High fill density rollers
- Very large size rollers
- All-metal rollers for high temperatures
- Auger brushes for material handling
- Large pitch coils for cleaning delicate surfaces.

SPIRAL PITCH

The spiral pitch P (see figure) is the most critical parameter affecting the density of the strip brush. However a very densely filled brush is not always required. For example, if the brush is needed to remove debris and discharge the material easily the pitch must be sufficiently large to prevent the material from building up between the coils and clogging the brush. The minimum value of P is the same as the backing value B. The maximum value of P depends on the winding diameter D2: the greater dimension D2 the larger the maximum pitch. The following limits can be established:

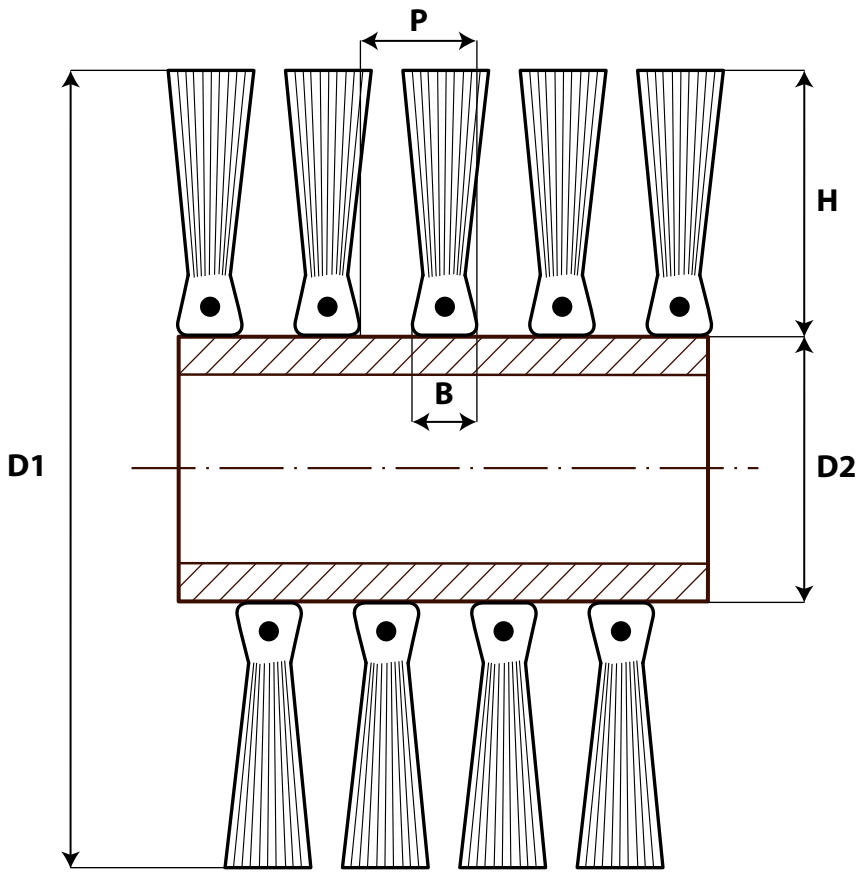
P min = B
P max = D2

Large size roller in PP

MINIMUM WINDING DIAMETER

There is a minimum D2 value below which the strip cannot be wound onto the core. This limit value depends on the backing B and is shown in the table (backing in galvanized low carbon steel). For stainless steel backings the tabulated values must be increased by 100%. With regard to the maximum brush diameter D1, it is generally impractical to exceed D1=1000mm.

Nylon roller with gear wheel for drive transmission



Minimum winding diameter (mm)

	SINGLE BAND									DOUBLE BAND	
B	4	5	6	8	10	13	14	17	20	6	8
D2 min	12	15	20	25	25	90	90	160	160	30	50

CALCULATING THE PITCH FOR AN AUGER BRUSH

In addition to defining the brush fill density, the winding pitch can be exploited to perform a mechanical transport function. If P is sufficiently large to accommodate all or a portion of the parts to be handled, the brush will function as an auger and its rotation will result in transverse movement of the material. It is therefore important in this case to specify whether the spiral should be right-handed or left-handed. Finally, the roller can be equipped with two spiral strips (right and left) converging in the centre of the brush, so that the material is shifted to the centre or towards the two outer extremities.
The brush-auger solution, which features very low noise operation, is particularly suitable for conveying very delicate materials.

In order to design an auger brush, first find the quantity of product to be conveyed and then apply the following formula.
To convey a volume of material V [l /min] with a brush rotating at n [rpm] the winding pitch should be maintained at least equivalent to:

$$P \geq \frac{4{\cdot}000{\cdot}000\ V}{\pi\ ne\ (D_1^2 - D_2^2)} + B\ [mm]$$

Where 'e' is the auger filling factor; with e ≃ 0 when the auger is empty and e=1 when it is full.

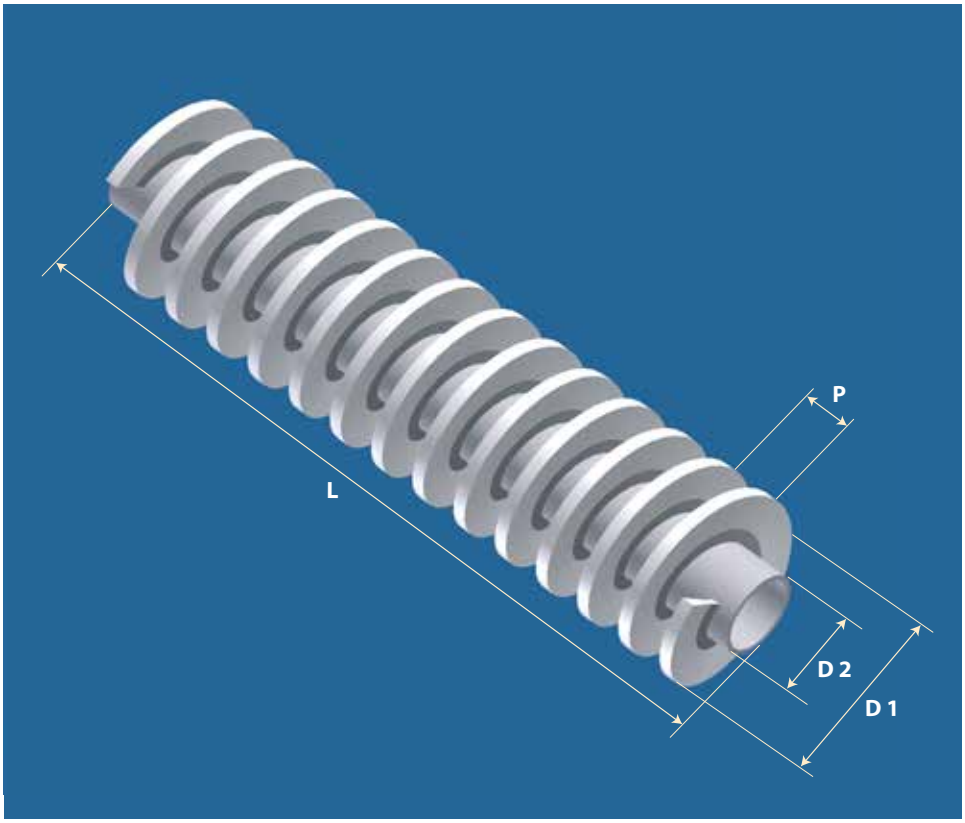
Very compact horsehair strip roller brush

Free spiral strip brush

MAXIMUM SPEED OF SPIRAL BRUSHES

Another important parameter that must be known from the design stage is the maximum rotation speed of the spiral strip roller brush. This depends on the materials, on the load applied to the brush and the filament-surface friction coefficient. The maximum speed must therefore be calculated on a time-by-time basis in accordance with the known parameter values. As a general rule a strip roller brush can rotate at higher speeds than a corresponding punched roller brush.
Please contact us for any design data you may need.

If the roller is to run at high speeds it is always necessary to make a prototype and test it in safe conditions



Strip brush installed on a tube

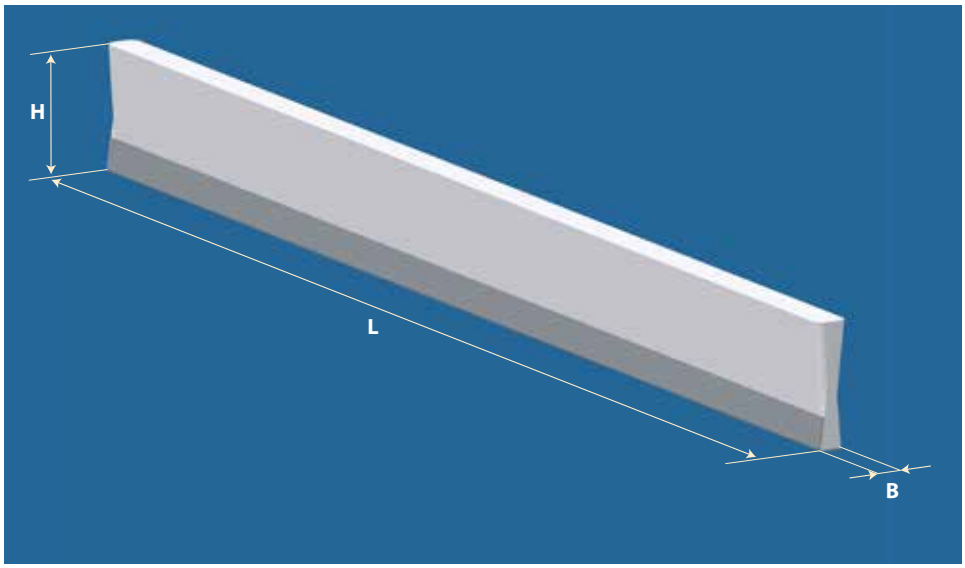
For orders and requests for quotations please fill in table 2.6 on our website:
www.simoni.eu

LINEAR STRIP BRUSHES

Linear strip brushes are utilised for:

- Operator safety barriers on machine tools
- Barriers to contain machining chips, dust and vapour
- Squeegees
- Scraping of surfaces
- Sound insulation of moving machine parts.

Linear strip brushes feature variable backing thickness B as shown in the table. Length L is unlimited because the brushes are made from a continuous strip. Total height H is restricted by the limit values shown in the table. Normally linear strip brushes are not produced with a double band.



Linear strip brush

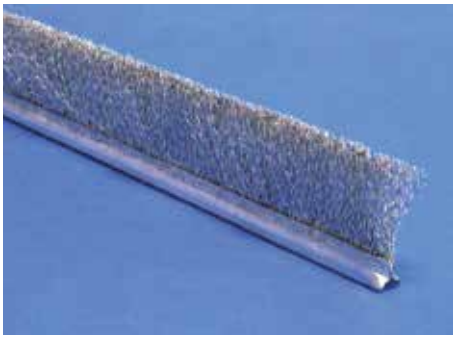
Linear strip dimensions (mm)

B	4	5	6	8	10	13	14	17	20
H max	100	150	150	200	200	400	400	400	400

Strip holders

Strip in PP + flat steel filaments

Strip in horsehair with flanged holder

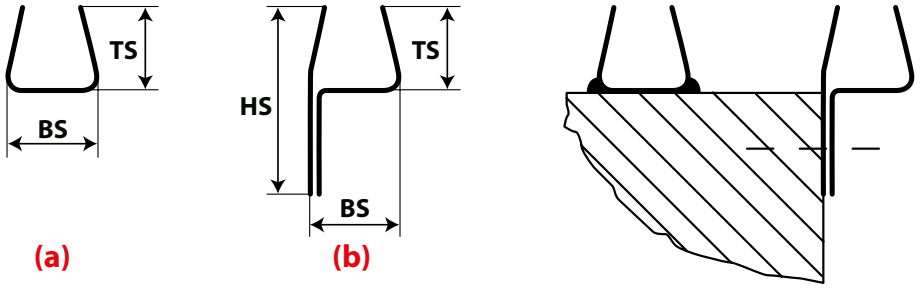


Strip in high strength steel

Strip Brushes

HOLDERS

For assembly of a linear single band brush two different types of profile section are available, both made of heavy gauge galvanized low carbon steel. Type (a) is designed for welding to the metal support, while type (b) is installed with screws.
Available dimensions are shown in the table. The standard length is 1000 mm.



MATERIALS:
A = Aluminium
AN = Black anodized aluminium
S = Galvanized steel
X = Stainless steel

Dimensions of holder type (a)

B	8	10	13	14	20
BS	13	14	19	19	24
TS	12	12	15	15	27
MAT.	S-X	S-X	S-X	S-X	S

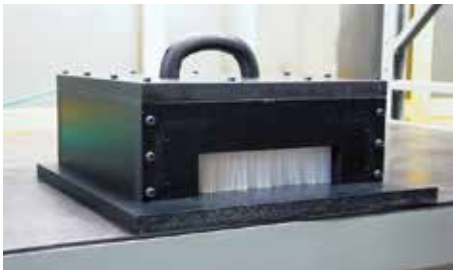
Dimensions of holder type (b)

B	4	5	8	10	13	14
BS	6.5	7.1	13	14	19	19
TS	6.5	8.8	12	12	17	17
HS	17.5	22.3	30	32	40	40
MAT.	A-AN	A-AN	A-S	S-X	S	S

NOISE BARRIER

Linear strips can be used also to reduce noise emissions on machines in situations where, because of their movement, parts cannot be shielded with rigid guards. To find the level of noise insulation of strip brushes we developed a specific test rig, in which the noise source is a compressed air nozzle. The test results are given in the table, where R is the level of noise insulation expressed in dB(A).

Note that the highest level of insulation is available with straight filaments, while crimped filaments provide lower insulation, irrespective of the material.
These results can be obtained only with careful installation of the brushes and ensuring that brush and machine surface are in contact.



Test rig for acoustic insulation capacity of linear strip brushes

Linear strip noise insulation [dB(A)]

FILAMENTS	R
PA 66 0.30 straight	8.2
PA 66 0.50 straight	7.1
PA 66 0.10 straight	5.7
Flat steelwire 1.1 x 0.25	5.1
PA 66 0.30 crimped	1.5
Brass 0.30 crimped	1.2
High Strength Steel 0.30 crimped	0.7
High Strength Steel 0.50 crimped	0.7

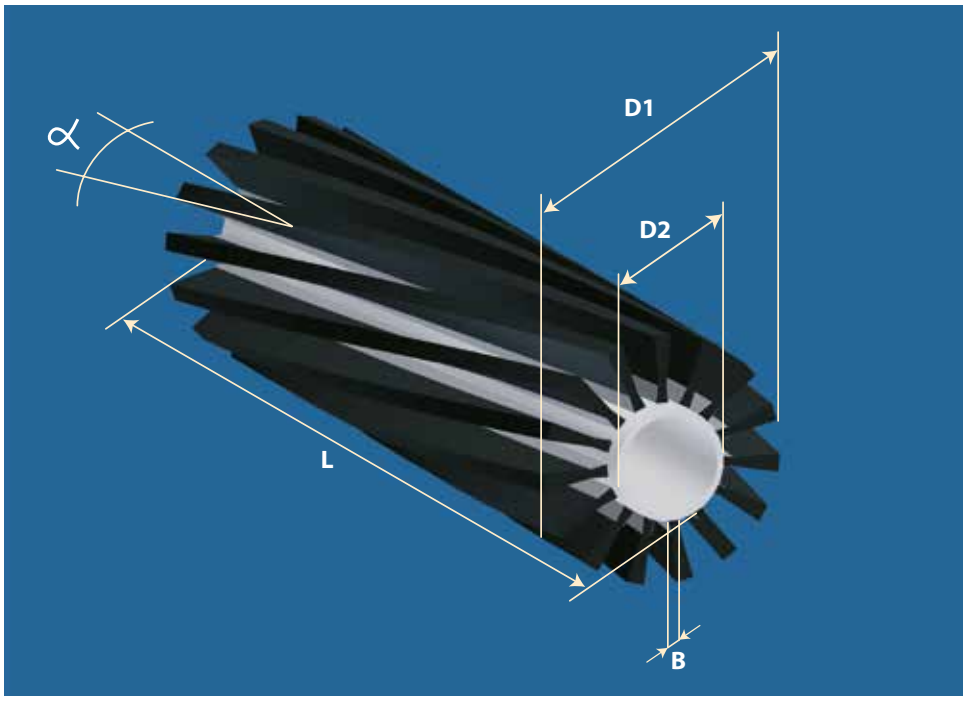
For orders and requests for quotations please fill in table 2.4 on our website:
www.simoni.eu

INTERCHANGEABLE SEGMENT STRIP BRUSHES

Segment type strip roller brushes are utilised for:

- Sanding wood and metal panels and door and window members
- Cleaning conveyor belts
- Brushing large surface areas (concrete formwork, etc.).

A segment strip brush is composed of a roller brush although in this case made of a plurality of linear strip brushes with variable backing dimension B. These strips can be replaced without having to disassemble the brush body, thus facilitating maintenance interventions. The strips are frequently installed in a slightly spiral pattern ∝ in order to make their action on the workpiece more progressive.
The classic configuration of a segment type strip roller brush is composed of a metal core with interchangeable strips mounted in welded holders. This is a highly rugged type of construction that is compatible with very heavy duty applications.



Segment type strip roller brush


Interchangeable strips on steel core

For orders and requests for quotations please fill in table 2.7 on our website:
www.simoni.eu

SANDY BRUSH

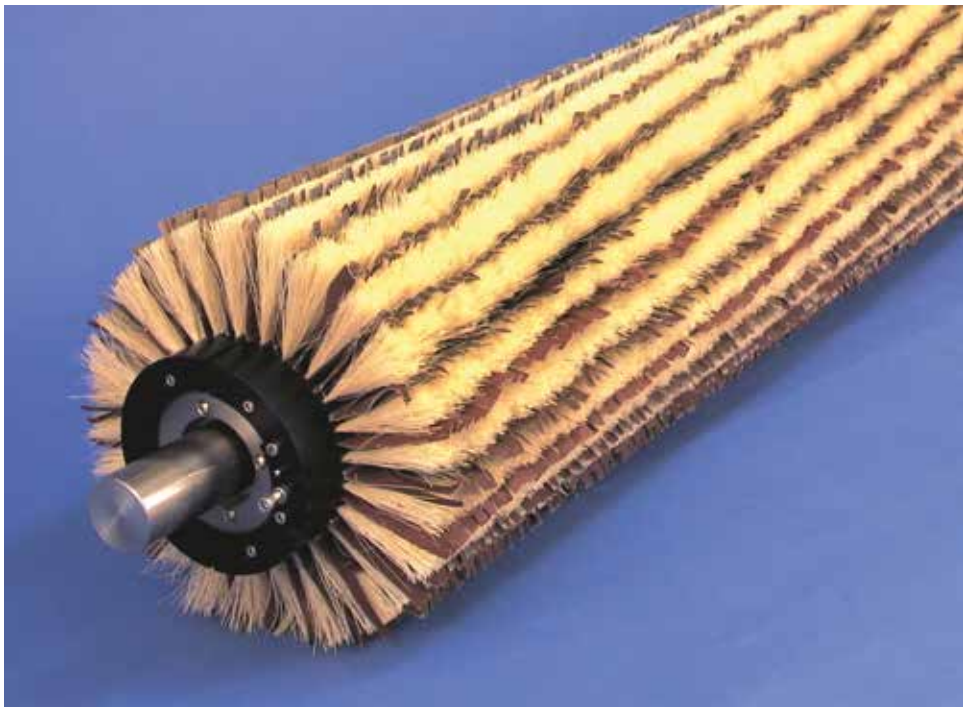
The roller with abrasive cloth shown in the photo (Sandy Brush) is particularly efficient for industrial sanding of wood, notably door leaves, windows and panels.
The element that sands the work is flagged abrasive cloth, the action of which is supported by a PP or tampico brush. The combination of abrasive cloth and brush provides exactly the right stiffness and adaptability to the shape of the workpiece.
With our segment system it is possible to change exclusively the abrasive cloth, exclusively the brushes, or both, very rapidly and without having to disassemble the roller body from the machine. It is also possible to impart a variable helical pattern to the strips.

This is allowed by means of a rotor, moved with a simple tool. In this way the user can set the Sandy Brush with the most suitable helical pattern, both right and left.
Under the length of 500 mm no rotor is mounted.
Sandy Brush can be fitted to any diameter of the driving shaft, as written in the table.

Sandy Brush specifications

N°. OF ABRASIVE ELEMENTS	24	36	54
BRUSH BODY DIAMETER D2 (mm)	120	180	280
BRUSH EXTERNAL DIAMETER D1 (mm)	250	310	410
GRIT	from 100 up to 320	from 100 up to 320	from 100 up to 320
FLAGGING (mm)	4.5 -7- 10 - 20	4.5 -7- 10 - 20	4.5 -7- 10 - 20
SUPPORT BRUSH	TAMPICO-PP	TAMPICO-PP	TAMPICO-PP
MAXIMUM BRUSH LENGTH (mm)	1500	1500	1500
MAXIMUM SHAFT DIAMETER (mm)	40	60	60

The brush body is made of synthetic material mounted on an aluminium tube. The configurations shown in the table are possible.
Alternative outside diameters and alternative abrasive grits can be supplied on request as special production runs.
Brushing length L can be freely chosen in steps of 10 mm.

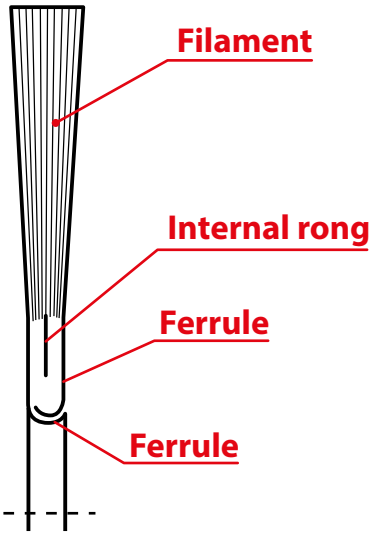


Roller with abrasive cloth and tampico strip brushes (Sandy Brush)

RING BRUSHES

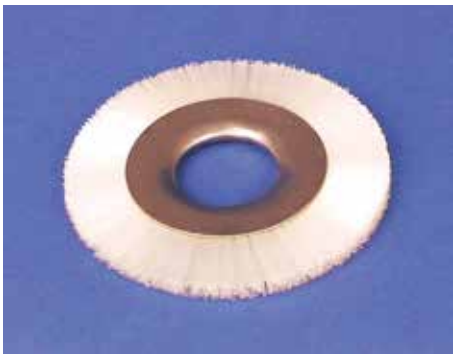
Ring brushes are composed of filaments arranged around an internal metal ring and pressed between two metal ferrules (see Figure). The result is a brush in the shape of a narrow disc with flange and circular bore. The main characteristic of the rings is their modular design. They can be used individually, although they are more frequently mounted in a stack on a shaft to form a roller brush. Density can be adjusted by inserting distance collars between each ring brush. Ring brushes are simple and very lightweight elements that are useful to create small diameter and highly compact rollers.
It should anyway be noted that the pressing operation is not compatible with the achievement of very close mechanical tolerances or absolute uniformity of filaments.
The dimensional precision of the ring is therefore inferior to that of a comparable punched roller brush.

Ring brushes are utilised for:
- Narrow brushing elements (4-7 mm)
- Small compact roller brushes
- Roller brushes that call for interchangeable brush elements.



RING DIMENSIONS

The outside diameter of the rings is theoretically unlimited. However it must be considered that since the ring has a relative small metal core, very long filaments will tend to flex unacceptably. In practice we can consider a maximum diameter of around 500 mm with very coarse filaments. The minimum diameter depends on ferrule dimension D3, which can be found in the table in reference to the Figure. The thickness values S are guideline.


Nylon ring brush with stainless steel ferrule

Ring brush dimensions (mm)

D2	10	16	25	28	30
D3	25	33	50	60	60
S	4	5	6	7	7
D1	< 100	< 200	< 300	< 400	< 500


Flagged polyethylene ring brush

For orders and requests for quotations please fill in table 3.2 on our website:
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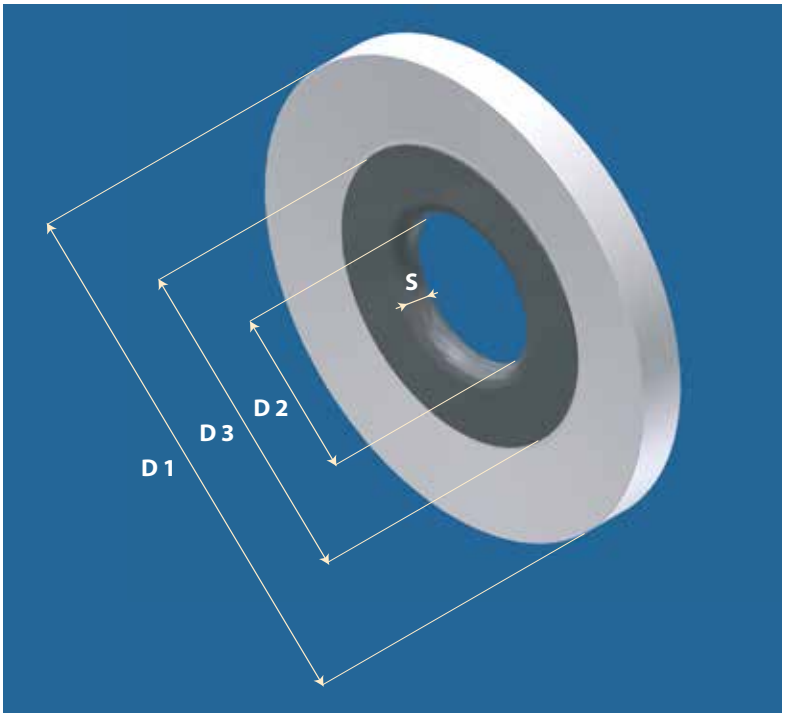


Ring brush

Twisted Brushes

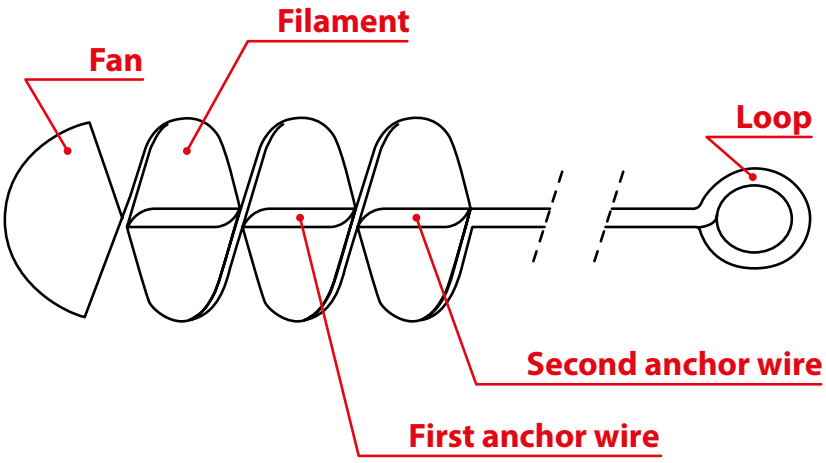
TWISTED BRUSHES

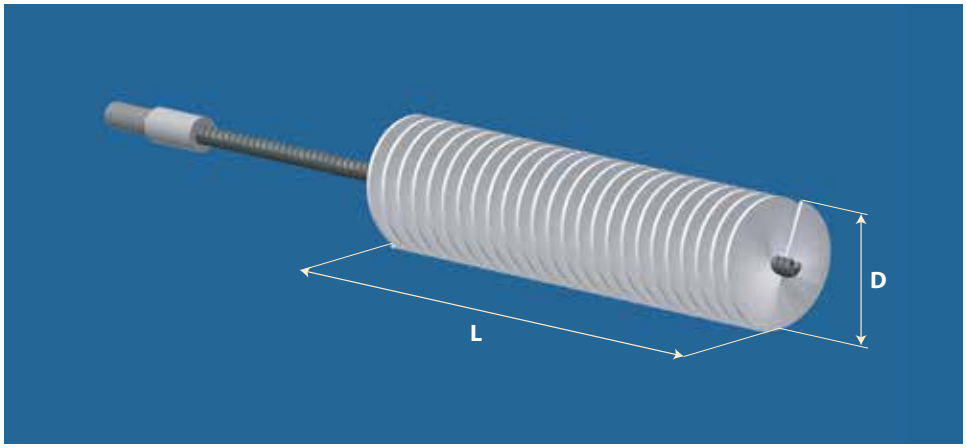
Twisted brushes are composed of a filament fastened between two twisted wires. This produces a helical shaped brush (see Figure). If the twisted brush is installed on a mechanical system the metal "stem" is usually severed at each end. If the brush is for use as a hand tool, one end of the twisted wire stem is left unfilled so that it can be used as a handle (usually terminating in a circular loop). The end of the twisted brush can be folded over to create a fan-shape ("fan") to prevent the severed stem from damaging workpieces. The main characteristic of twisted brushes is the small diameter of the core, making them ideal for internal cleaning of piping, grooves and channels, and hard-to-reach crevices.

Nylon twisted brush

Twisted brushes are used for:

- Cleaning and deburring holes, especially with inside diameter of less than 30 mm
- Cleaning curved channels, thanks to the flexibility of the wire core.





Twisted brush

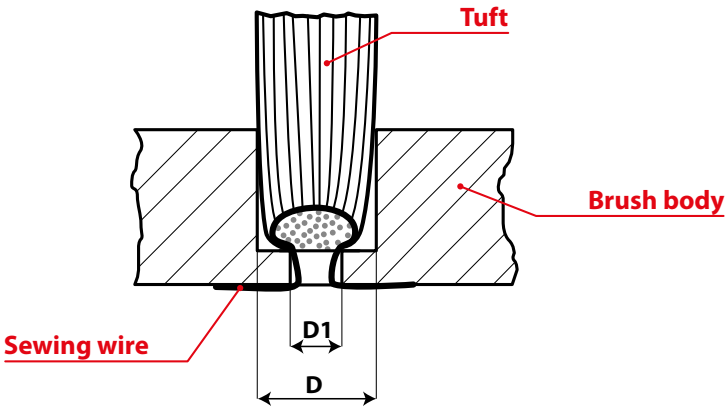
Conical twisted brush in brass wire

For orders and requests for quotations please fill in table 4.1 on our website:

www.simoni.eu

HAND-SEWN BRUSHES

Historically, in the days before the advent of brushmaking machines, all brushes were hand-made. The technique for hand sewing is to make two different diameter holes D and D1 in the brush body (see Figure). The tuft is lodged in diameter D, while the sewing wire responsible for fastening the tuft to the brush is inserted through diameter D1. The tufts are fastened by means of a continuous metal wire that engages all tufts on the brush.

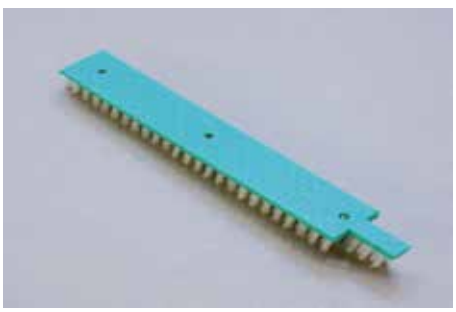


This technique is still utilised today, notably for:

- Brushes that call for guaranteed fastening of the tuft, because the strength of this type of anchorage is higher than alternative techniques
- Steel brush bodies into which tuft staples cannot be driven
- Special and complex configurations that are incompatible with the tufting machine.
- Thin brush body (no staple is allowed)

Clearly this construction technique is time consuming and it also calls for considerable skill and experience to maintain unvarying technical characteristics for the entire product lot.
In some cases the tufts can be sewn with a nylon cord rather than a metal wire for improved workability.
Hand-sewn brushes can be made in all the styles of punched brushes. In the case of rollers the core must be split longitudinally into two sections so that the tufts can be sewn on the interior of the roller.

Internal filament brush on steel body



Flat brush on thin and flexible body

Horsehair filled roller on PVC core split into two sections

Macrocomponents

BRUSH MACROCOMPONENTS

Industrial brushes are installed on machines and plants of varying levels of complexity. Whatever the application, the brushes must be supported, fixed, driven, etc. For these operations customers prepare suitable mechanical solutions to enable brushes to function efficiently on their machinery or systems.
However, an increasingly large number of customers now tend to ask Simoni to supply these mechanical components, which, when integrated with the brush, form an assembly of complex items without independent movement, known as macrocomponents.

The following are just a few examples of brush macrocomponents:

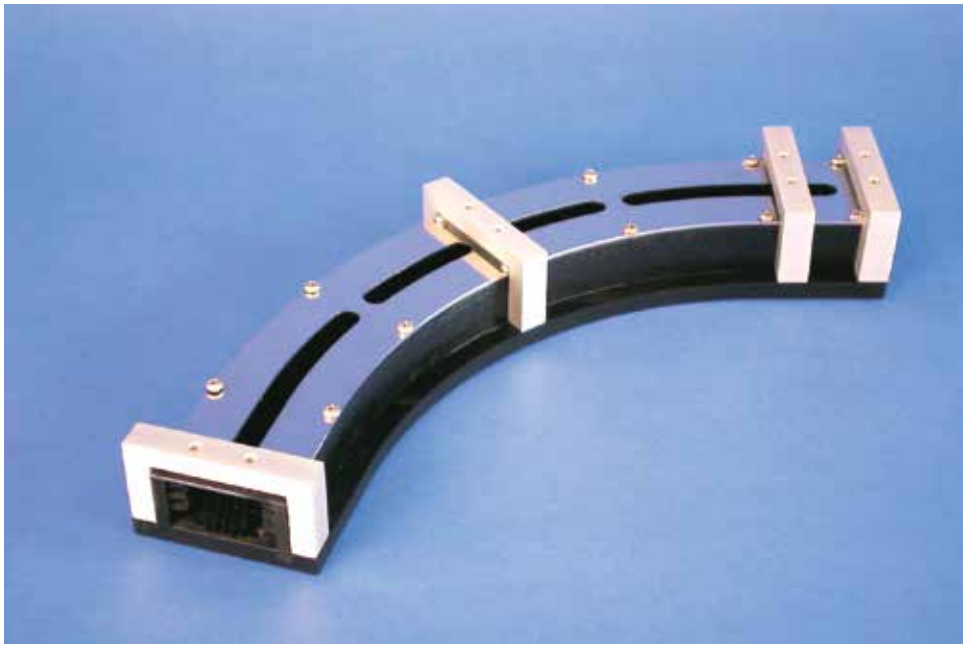
- Curves with brush tunnel for conveyance of objects
- Boot housings to contain machining chips, with integral sheet metal support
- Belt conveyors
- Panels for vibrating tables
- Material unscramblers with brush diverters.

Customers obtain several benefits when they order macrocomponents, for example:

- More practical to assemble with production time savings
- Reduced procurement times because the various parts are manufactured and assembled in parallel
- Smaller number of suppliers to manage
- Wider range of technical solutions available (e.g. pre-assembly of parts that could not otherwise be assembled downstream of the tufting operation).

The macrocomponent is an evolution of the brush, so a simple technical drawing from the customer is unlikely to provide sufficient information. The process involves a Simoni design project followed by a customer validation process and finally construction and assembly in compliance with organisational criteria based on the coordination of a large number of process stages.

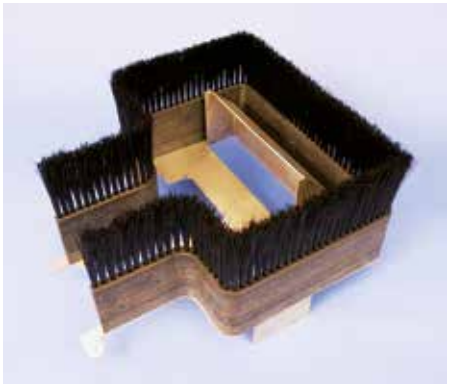
Modular elements for conveying flat panels



Curve for conveying objects

Low friction vibrating table for handling sheet metal

In order to offer customers really cost-effective brush macrocomponents it's also important to have a thorough knowledge of the materials. We need to take into account the method of handling of the product, the environmental conditions and the levels of mechanical stress. In addition, different materials are often combined, such as metal cores embedded in plastic, etc.
Our experience shows that brush macrocomponents constitute a valid solution for optimisation of our customers' processes while simultaneously guaranteeing reliable and responsive technical support.

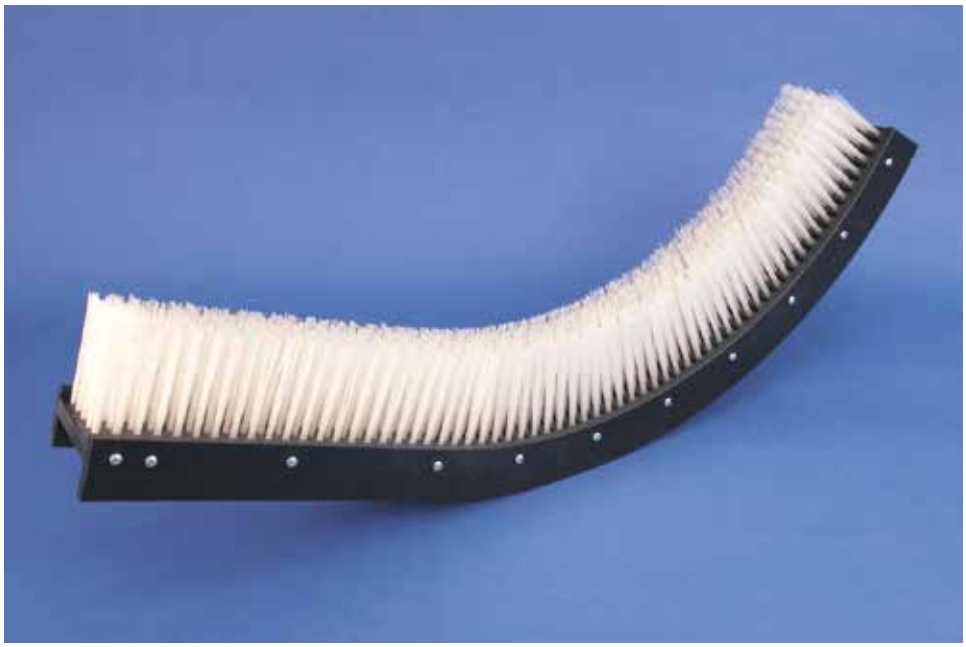


Protective boot with built-in suction hood

System for move down delicate objects

Linear conveyor

Driven brush for the cleaning of conveyor belts



Flexible brush on curved structure

BRUSHING MACHINES

A further development consists in driving brushes to enable them to perform automatic work cycles; this amounts to the manufacture of complete brushing machines.
In this context the design stage is of critical importance because the customer is supplied with a finished product and the machine manufacturer is responsible for its functional efficiency, productivity and safety. The project must always be validated by the customer before proceeding to the construction stage.
Also the coordination of outsourced processes is extremely demanding and calls for constant attention.
The checking and assembly stages are performed internally, as is the technical testing stage, usually using parts supplied by the customer.
Our company is certified to ISO 9001: 2000 also for its design activities.
The following section provides an overview of some of the main brushing machines that we have manufactured to date.

ORIENTATORS

Exploiting an extremely extensive knowledge of brushes and their technical characteristics, we have developed interesting applications that make it possible to orient objects such as bottle caps, coffee capsules, preforms, bottles, disc filters, etc.
In comparison to traditional orientators, the advantages are:

- Broad range of productivity, from the lowest to the highest, with the possibility of product exiting on multiple rows
- Mechanical adjustments with easy format change
- Low noise levels
- No compressed air consumption nor use of vibrations
- Extremely compact layout that saves considerable space
- Gentle treatment of workpieces without the risk of breaking or damaging them.

Our orientators are generally the first station in a complex filling (or bottling) and packaging line.

SORT-RAIL

SORT-RAIL

This is a particularly suitable automatic orientator for coffee capsules or objects with a neck such as preforms.
It is comprised of a collection tank, a brush lift, a row-based orientation unit, and a ventilated or brush conveyor on multiple rows.
The machine is equipped with PLC to control all of the functions and the materials are all certified as food-grade.

As mentioned above, orientation is on rows, up to sixteen or more on request.
Accessibility is excellent and the layout is very compact as the collection tank is set up under the machine. Additionally, the lift is vertical thereby occupying a minimum footprint.
With the brush technology, we have oriented very delicate products that would otherwise be broken or damaged with other systems.
The work rate varies based on the number of rows, reaching well over 500 workpieces/min.

SORT-RAIL Detail

Patented System

SORT-CAP

This is an orientator for plastic caps, made up of a collection tank, a lift, an inclined brush-based orientation unit, and a single-row belt conveyor. Orientation is brush-driven along the outfeed row.
This is a simple yet fast system, and by increasing the selection front, it is possible to achieve work rates of 1,500 caps/min.

Patented System

SORT-CAP

SORT-R

This is a plastic cap orientator that performs selection with roller brushes. In its simplest configuration, it adapts very well to low work rates, around 100-300 caps/min.
The caps are loaded directly into the hopper without a lift, and they come out in a row, already oriented.
Format change is very simple, it is achieved by adjusting the centre-distance between the brushes.

Patented System

SORT-R

SORT-R particular

Brushing Machines

SORT-L

This is an orientator for coffee capsules, which exploits the action of a moving brush belt that is inclined for object orientation.
It uses quite a broad selection front, making it possible to orient significant work rates, even on multiple rows.
This system is particularly efficient when the object being oriented has a smooth surface that can slide along the brush bed.

SORT-L

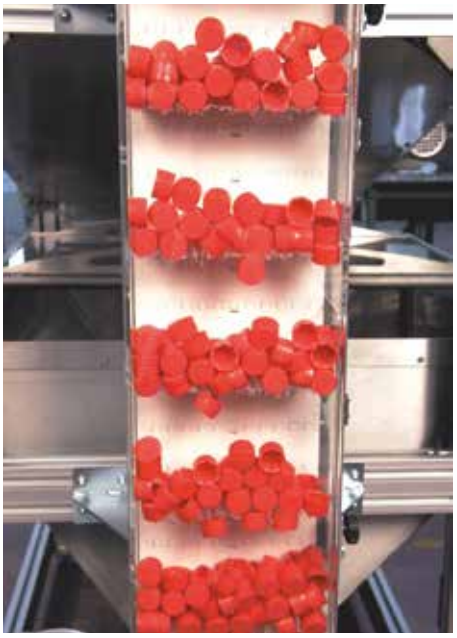
Patented System

ELEVATORS

With the brush technology, it is possible to lift any small-sized object. Exploiting the broad range in filament size, our lifts can adapt to objects of very diverse weights.
In comparison to traditional lifts, the advantages are:
• Vertical lifting with minimum footprint.
• Possibility of setting up the storage tank under our feeders, saving great amounts of space.
• Gentle treatment of workpieces without the risk of breaking or damaging them.

LIFT-S

This is a brush lift, which, through its slow movement, is particularly suitable for delicate workpieces, but can lift any type of product.
The diameter of the filament is chosen based on the material being lifted.
The filament is sufficiently stiff but locally fragile, it guarantees that the workpiece may never be crushed or damaged.
The lift may be combined with a storage tank of the requested size, also with a conveyor belt on the bottom.



LIFT-S

LIFT-C

This is an auger brush lift, particularly suited for simple pieces that are also not too delicate.
This lift can also work vertically thereby saving space, and can be combined with any type of tank.
Its simple construction design makes it economic and easy to service (the brush is replaced through quick disassembly).
It also offers extremely high work rates.

LIFT-C

CONVEYORS

Our machines are suited for conveying three-dimensional objects such as bottle caps, bottles, coffee capsules and preforms.
The conveying system is based on belt brushes, available in various configurations depending on the object. With brush technology, these conveyors do not use compressed air or vibration, and they handle the product gently and silently. The belt brush allows for a "friction-operated reservoir" that avoids the costly controls required by other systems.

In comparison to traditional conveyors, the advantages are:

- No compressed or ventilated air consumption nor use of vibrations
- Low noise levels
- High thrust, through the mechanical action of the brushes
- Friction-operated reservoir, with continuous brush operation
- No damage to workpieces, which move in the brush tunnel and not on a metal guide.

The "friction-operated reservoir" is a significant advantage, as it eliminates all of the controls that are normally required to manage the reservoir, crucial for the continuous operation of the machine downstream. Our system makes it possible to create the reservoir without modifying brush movement, which continues to apply its thrust without damaging the stationary workpieces.
For machines that work on multiple rows, we have ventilated air conveyors, which are particularly suited for high work rates.

CONV-2000

This is a brush conveyor that can use one or two brush belts.
The workpieces slide along a low friction surface, which is also bristled.
The format can be changed very easily by modifying the width of the conveyor channel.
With this system you achieve high work rates, over 1500 pieces/min - for each channel.

CONV-2000

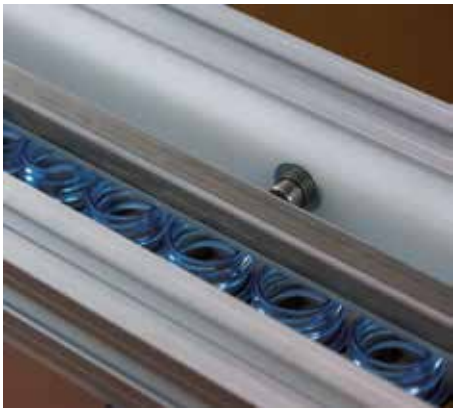
CONV-2000

Brushing Machines

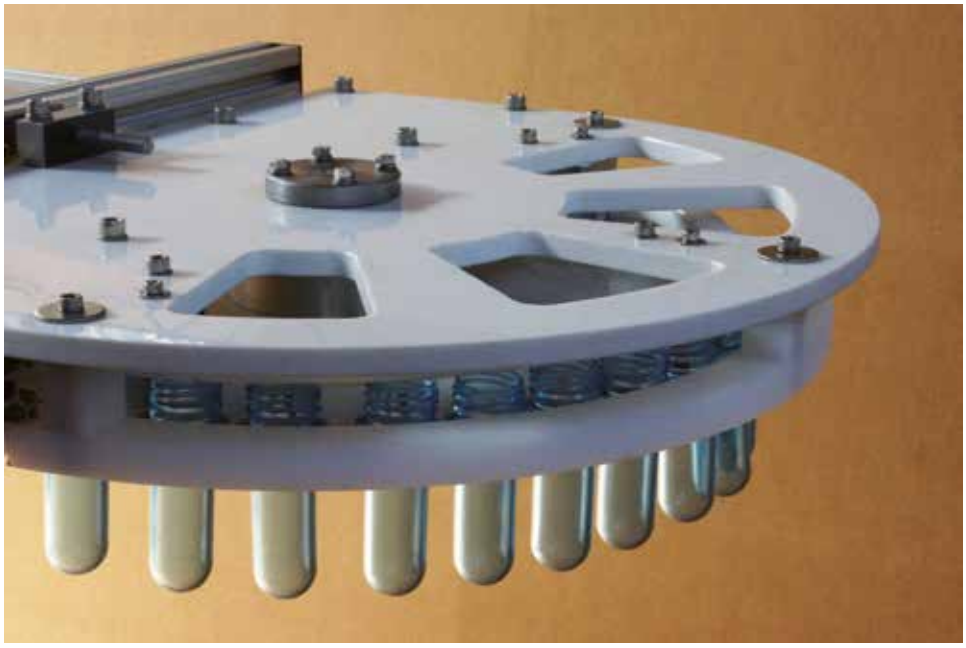
CONV-P

This is a brush conveyor with brush belt.
It is designed for objects with a neck, typically preforms, but also syringes, bottles, etc.
The brush guarantees excellent thrust with the possibility of upwards or downwards conveying, and with an excellent friction-operated reservoir.
The format change is very simple as it is carried out mechanically, with the adjustment of the conveyor channel width.

CONV-P



CONV-P
Preforms along the straight section
(also travelling upwards and downwards)



CONV-P
Preforms along the curve

CONV-A

The ventilated air conveyors are particularly suited when multiple parallel rows are required. The air is supplied through relative blowers sized according to the total work rate of the workpieces being conveyed. We have created air conveyors with 1 to 16 rows.
All controls are included: too full, too empty, blocked row, row down for maintenance.

CONV-A

CONV-A
6-row ventilated air conveyor

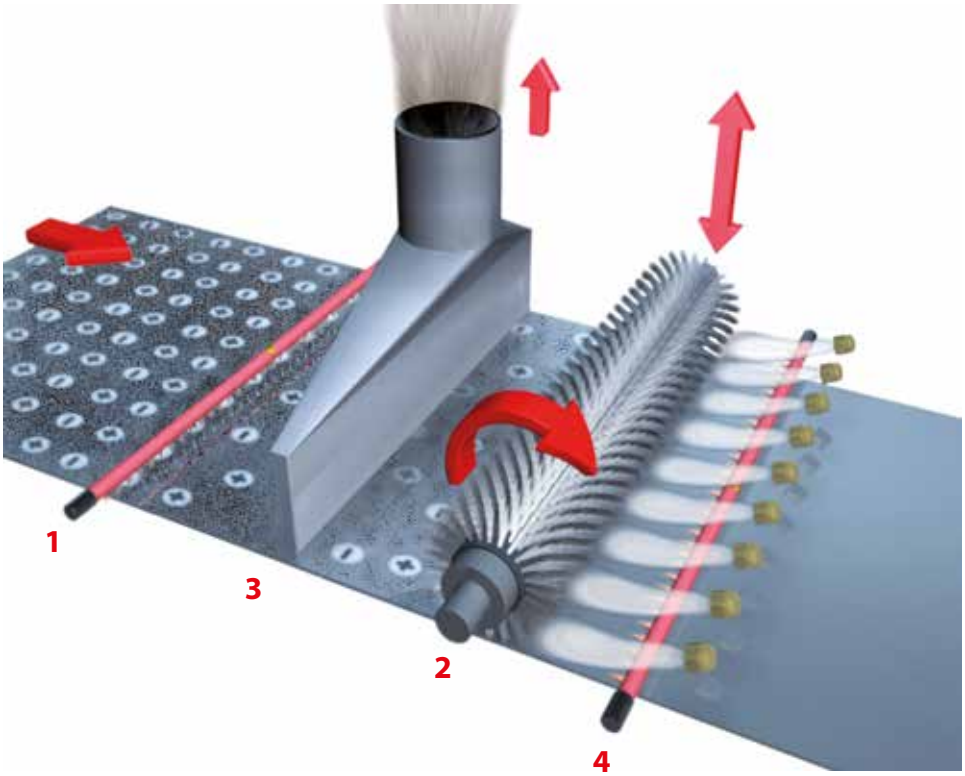
WEB CLEANERS

The production process often requires to eliminate the dust from the treated surfaces, particularly from the flat ones. The dust may adhere to the surface both mechanically and electrostatically. In the first case the action of a brush is sufficient, while in the second case an additional ionizing system is required, in order to eliminate the electrostatic charges. We have therefore developed several different web cleaners, possibly provided with the ionizing systems by HAUG, a German Company that is leader in electrostatics. SIMONI is the sole reseller in Italy for the HAUG products.

DEP120

This unit is a web cleaner designed to remove the dust from a flat surface. The operating principle, shown in the diagram, is as follows:

1. the dust is discharged by an ionizing bar connected to a high voltage power pack
2. a cylindrical brush removes the thus-discharged dust and conveys it through a suction hood built into the machine
3. the suction hood captures the dust and transfers it to a filter or collection system
4. a blast of ionized compressed air downline from the brush produces a barrier effect that intercepts any dust particles that have evaded the brush and simultaneously cleans the brush.



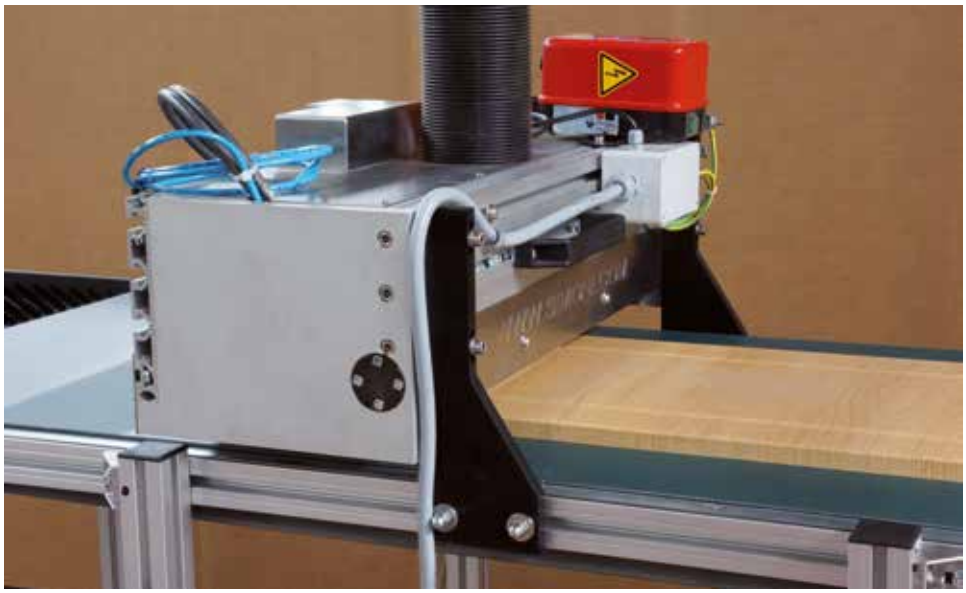
Operating diagram

The brush, diameter 120 mm, is composed of interchangeable 100 mm long modules (see page 24).
Different filament types may be used in accordance with the materials to be treated and the required results.

DEP120 is equipped with a PLC with keyboard and display for monitoring and adjustment of all functional parameters:

- brush working height (0 to 30 mm) for manual adjustment of contact pressure
- brush rotation speed, from 0 to 2000 rpm
- brush rotation direction - forward or reverse
- operation with/without brush
- automatic adaptation of the brush working height to the thickness of the workpieces, with wear recovery function
- setting of contact pressure from 0% to 100%.

DEP120 is therefore a highly versatile machine with a very compact cross section of just 210x270 mm.
The effective working length is from 200 to 2000 mm.
We normally use a 500 mm machine to perform a series of practical trials in the customer's plant.



DEP120 on conveyor belt

DEP120 – detail of brush and antistatic bars

OPERATING FEATURES	
BRUSH	D = 120 mm L = 500 – 2000 mm V = 0 – 1000 rpm
ELECTRIC MOTOR	230 V – 0,18 KW
POWER SUPPLIER FOR ANTISTATIC BARS	Inlet 230 V Outlet 7000 V
TREATING SPEED	max 200 m / min
DIMENSIONS	210x270x(L+210) mm
SUCTION (by the customer) for L=1000 mm	V = 1600 mc / h P = 2500 Pa
ELECTRIC PANEL	230 V
NOTE: the features for the suction are merely an indication. They can drastically vary with the dust material, its specific weight, the environmental humidity etc.	
Electric supply to antistatic bars and delivery of compressed air are automatically activated at the start.	

Brushing Machines

BRUSH GATE

Brush Gate is a compact web cleaner. Its cross-section is about 100x120 mm, so it can be easily inserted in any production line. A barrier of disc brushes collects and moves the dust, and in the meanwhile an integrated dust hood eliminates it. The machine works without liquids, and this is very important because the liquids used into the wet machines give several problems : costs, defecting parts when the liquid ends, wetting of the product.

The brush speed is easily adjustable from the control panel, adapting it to the line speed.

Brush Gate is made in a modular way, so it can clean also great size panels with the same little cross section.

The filaments of the brushes can be adapted to any situation and dust, to improve the system efficiency.

To clean both the surfaces of the panel, 2 machines can be easily installed on the line, by simply eliminating a couple of transport rollers to give place to the lower Brush Gate, as showed in figure.

In addition to the flat surface Brush Gate can also clean the sides of the panel thanks to the particular setting of its disc brushes.

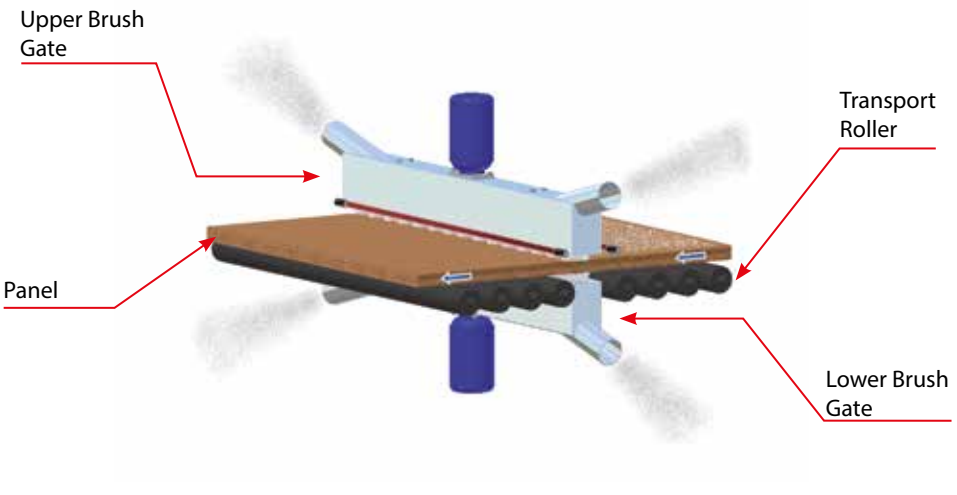
Brush Gate, differently from other systems that work only on a plane surface, due to its disc brushes with a particular setting can clean also the sides of the panel.

The customer can use the same suction system already existing on the line.

Due to its characteristics Brush Gate is particularly suitable for the treatment of wood panels, but it can be used also for plastic plates and, with the right filaments, for film processing.

It is possible to install, as optional, one/two antistatic bars, for the reduction of the static charges that often create problems in the dusting process.

We normally dispose of a 800 mm width machine, to be tested by the customer.



Operating diagram with two Brush Gates

BRUSH GATE

BRUSH GATE

On request we can supply an anti-crash safe system, that lifts the machine if the panel is oversized.

TECHNICAL FEATURES	
BRUSHES	D=60 mm L=500 – 4000 mm V=0 – 900 rpm
ELECTRIC MOTOR (1 EVERY METER)	380 V – 0,37 KW
PROCESSING SPEED	max 60 m / min
DIMENSIONS MM	100x120x(L+150)
ELECTRICAL PANEL	380 V
SUCTION (by the customer) FOR L=1000 MM	V=1600 mc / h P=2500 Pa
NOTE : the features for the suction are merely an indication. They can drastically vary with the dust material, its specific weight, the environmental humidity etc.	

MINI GATE

MINI GATE is an ultra-thin web cleaner, whose cross section is about 50x300 mm. For this reason it can be easily installed in all the production lines. A belt brush captures the dust and displaces it out of the panel.
The machine works without liquids, and this is very important because the liquids used into the wet machines give several problems : costs, defecting parts when the liquid ends, wetting of the product.
The filaments of the brush can be adapted to all situations and all kind of dust, for the best efficiency.
To clean both the surfaces of the panel, 2 machines can be easily installed on the line, by simply eliminating a couple of transport rollers to give place to the lower Mini Gate.
On the first pulley there is the driving shaft for the electric motor. On the second one there is the tensioning system for the belt.
The driving shaft can be used like a hinge, in order to easily lift the MINI GATE for cleaning and maintenance.

OPERATING FEATURES	
BRUSH	Belt Brush L=500 – 2000 mm
ELECTRIC MOTOR	380 V – 0,15 KW
TREATING SPEED	max 30 m / min
DIMENSIONS	50x300x(L+100)

MINI GATE

MINI GATE - detail

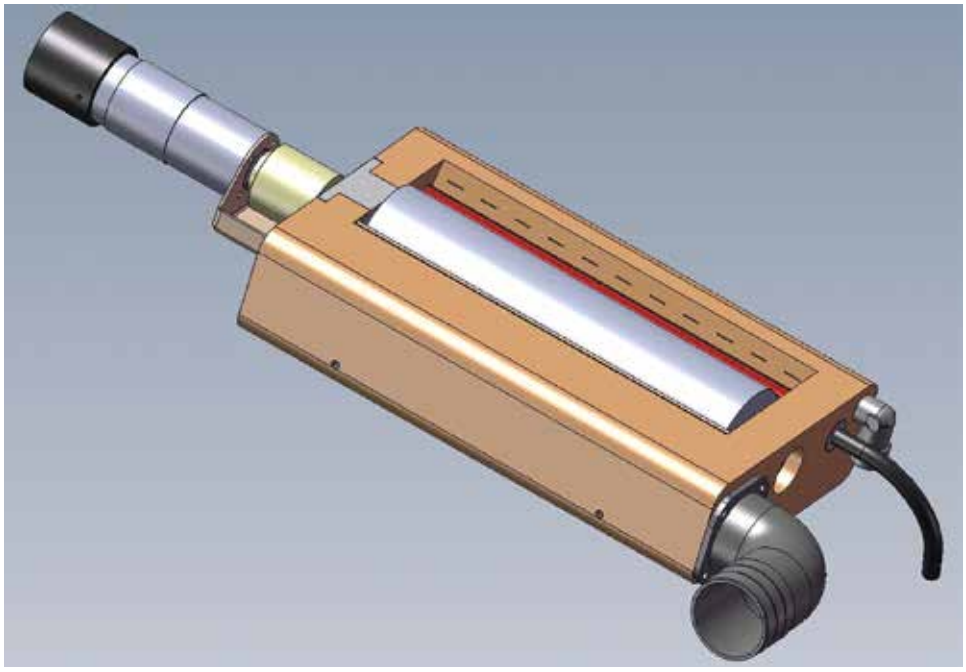
MINI GATE installed in a production line

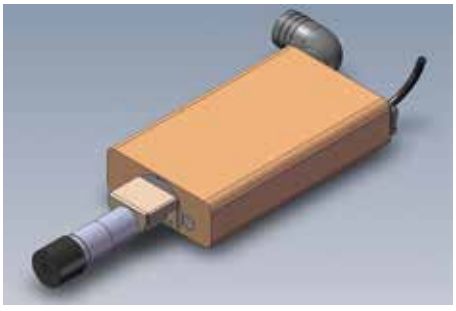
DEP 070

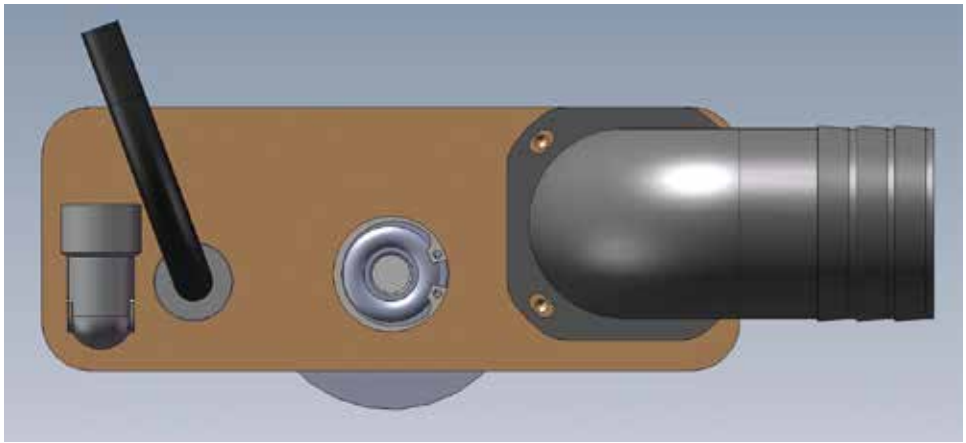
WEB CLEANER

DEP 070 is a very compact brushing machine. Its cross-section is 68x180 mm, so it can be easily inserted in any production line. The working length can vary from 100 mm up to 500 mm. Integrated into the body there are : Brush D=70 mm, ionizing bar D=20 mm, air nozzles and dust hood.
The brush is mounted onto a stainless steel shaft D=10 mm, driven by a 24V DC motor or a 220V-380V AC motor.
DEP 070 is completely food-compatible, both the body and the brush.
The brush can be easily substituted by using the extracting flange.

OPERATING FEATURES
Body dimensions: mm 68x180xL
Brush D = 70
Working length Lu=100-500 mm
Overall length= Lu+60 mm
Ionizing bar: HAUG EI-VS
Treating speed: up to 200 m/min
Suction: flow rate V = 250 mc/h
Head P = 1.600 Pa
Compressed air: 2-3 bar







MICRO CLEANER GUN

Micro Cleaner Gun is a manual de-dusting system suitable for cleaning three-dimensional pieces or complex surfaces, with corners, projections and holes.
The cleaning element, in olny one operation, blows ionized compressed air which removes the dust which is immediately sucked in.
The ergonomic handle has a switch that turns the compressed air on and off via a solenoid valve. The lightness makes Micro Cleaner Gun very comfortable and easy to use.

RINCIPLE OF OPERATION

The cleaning element is designed to reduce pressure drops and increase suction efficiency.
It has three inlets (ionizer, compressed air, solenoid valve signal) and one outlet (intake air).
The ionizing system consists of an OPI and a HAUG power supply.
The compressed air, controlled by the solenoid valve, exits from the lower part of the cleaning element, here it is ionized and reaches the surface to be cleaned. The suction folds the air flow and conveys it to the upper part where a tube leads it to the filter.
In the area where the flow is folded up, turbulence is formed which is very efficient in moving the dust, even in the most difficult points such as the inside of blind holes or edges.

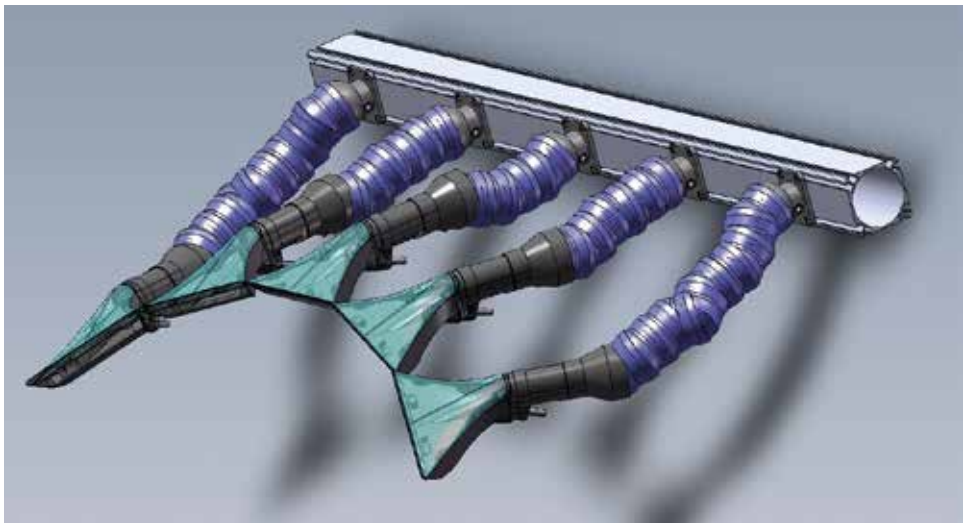
TECNICAL DATA
Cleaning element W=100mm / 200 mm
Weight 0,5 Kg (without tube)
Compressed air 2-3 bar
Suction 20 KPa
Ionizer: OPI by HAUG code 03.8510.000

EXAMPLES OF APPLICATIONS

Three-dimensional surfaces such as plastic bodies or painted sheet metal protections
Wooden panels with projections and blind holes
Smooth but curved surfaces that cannot be treated with an automatic line.

MICRO CLEANER BAR

Various cleaning elements can be mounted on the same blowing / suction bar, creating a system for the dedusting of panels in an automatic line.
Taking advantage of the many extractor hoods, Micro Cleaner Bar can be used to treat curved panels, adapting the extractor hoods by means of articulated ducts.



BRUSHING MACHINES

In addition to the standard machines that we presented in the previous pages, we can realize special machines on request.
They are machines for the brushing, polishing, cleaning, degreasing of several materials.
Here we present some examples of special machines.

SP400

Model SP400 is a brushing machine for burnishing and polishing flat metal parts.
The SP400 is effectively a machine tool that uses cylindrical steel brushes to machine the surface of the workpieces.
The machine is equipped with a conveyor belt on which the incoming parts from the upline process are placed. The work cycle is intermittent. A group of workpieces, of up to 400 mm in width, is brought to the working position, immobilised, processed by the rotary brush, and then discharged, all in an automatic cycle.

Possible adjustments are:

- brush rotation speed - inverter controlled
- brush rotation direction
- brush working height, with PLC
- effective working width, from 0 to 400 mm
- conveyor travel speed - inverter controlled
- number of brush passes.

The SP400 is a high precision high speed machine offering enormous versatility and straightforward size change procedures. To double productivity the machine is available in a dual version (SP400.2) having two conveyors and two brushes mounted on the same structural frame.

SP400.2

Brush for SP400

SC 300

Model SC 300 is a brushing machine for sanding curved parts, such as components in engineering ceramics, metal parts, etc.
Treatment of a concave or convex curved surface is possible thanks to the use of two Sandy Brush rollers equipped with abrasive cloth (see page 42). The machine can also process flat parts.
The workpiece is loaded (mechanically or manually) on the conveyor belt, where it transits under the first Sandy Brush, which processes the top face. A mechanical overturner then flips the part, which now transits under the second Sandy Brush for processing of the opposite face. The part is then unloaded.

Possible adjustments are:
- conveyor travel speed
- brush rotation speed
- brush working pressure.

SC 300

Sanding station by Sandy Brush

Brushing Machines

WET-DEG

The machines described above all function in dry conditions. In contrast WET-DEG is a wet brushing machine designed to remove dirt and traces of grease from flat surfaces.
The structural frame of WET-DEG is made entirely of stainless steel. The machine infeed features two motorised rubber-faced rollers to feed in the panel to be cleaned. The panel is now wetted with water and detergent by a series of spray nozzles. At this point the panel is fed through one or more cleaning stations composed of upper and lower roller brushes, while at the machine outfeed it is picked up again by a second set of motorised rubber-faced rollers for expulsion. A brush squeegee removes water from the panel surface leaving just a film of moisture. This residual moisture can be eliminated by installing an optional hot air drying station downline of the wet brushing machine.

Possible adjustments are:

- working pressure of brushes, by means of handwheel
- brush rotation speed - inverter controlled
- detergent metering, with compressed air regulator valve (or with pump if requested).

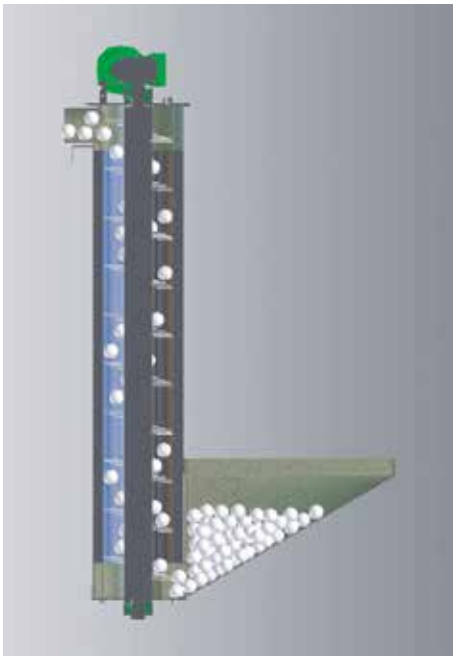
The detergent is subsequently collected in a stainless steel tank, filtered, and then returned to the cycle, thereby reducing the use of consumables and disposal of waste. The machine is protected by an enclosure that prevents the atomised fluid from entering the workplace.
With Europallet-size panels productivity is approximately 60 parts/hour.

WET-DEG

WALI

It is a machine that together washes and lifts spheric objects or similar. In particular WALI is often used to clean golf balls.
A spiral brush provides the lifting of the balls, while a cylindrical outer brush provides the washing with counter-current water.
WALI is to be installed on an automatic ball dispenser, improving the collecting operation in the practice stand.
The advantages compared with the traditional machines are :

- Two operations in one only machine
- Ergonomics
- Excellent washing
- Delicacy (no scratches, no chips)
- No jams into the machine
- 250 balls / min
- 500 balls into the hopper



Cross section of the WALI

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