ENGLISH

# MONTI




# INDUSTRIAL

**BLASTING WITHOUT GRIT.**

SURFACE ROUGHNESS up to 120µm (Rz)

**MONTI** `GREEN` SURFACE PREPARATION SYSTEMS

# INDUSTRIAL

# BRISTLE BLASTING – AN INNOVATION

Certain standards apply to the surface preparation of steel: normally on the usage of industrial coatings a level of surface cleanliness of SA 2.5 (or SSPC-SP10 or NACE 2) and a specific roughness are required.

The methods predominantly used for this purpose – mostly sandblasting with Aluminum Oxide or other blasting mediums – are not always suitable and not always cost effective. Above all, working on smaller areas, e.g. for ex. repair tasks or reworking tasks, and during the refinishing of weld seams or repairs due to transport damage, traditional methods are quickly challenged with the limits of cost-effectiveness. Renewed blasting of such repairs on material that has already been coated would require significant investments in terms of cost and time due to high preparatory costs, such as the transport of the equipment and the enclosure of the affected area.

Other methods used to work smaller areas (spot repairs), such as grinding using flap discs and roughing discs or manual working using wire brush hand tools, are not able to produce a surface profile suitable for the application of an industrial coating and typically cannot meet the surface cleanliness and roughness requirements.

Additionally, areas where grit blasting is prohibited (due to safety regulations or issues related to environmental protection) or in areas where it is not possible to use blasting media (ex. remote access). Historically, there was a lack of an alternative surface preparation method comparable to grit blasting. The Bristle Blaster® makes it possible.

## The alternative: Bristle Blasting

The newly developed Bristle Blasting method offers the ideal solution for all these cases:

The patented Bristle Blasting technology is able to produce a surface quality comparable with sand blasting:
• surface cleanliness of SA 2.5 or SSPC-SP 10
• roughness capability up to 120 µm $R_z$
(approx. 65-83 µm $R_z$ on API 5L steel)

The major advantage of Bristle Blasting compared to conventional blasting methods is its simplicity and cost effectiveness.
The surface is worked using a light, handheld machine – the Bristle Blaster®.

Bristle Blasting is ideally suited for portable usage as no protective suits with closed system respiratory equipment are required and no complex machinery or other grit media recovery equipment is needed. Only the application of standard personal protective equipment (PPE) is recommended for the eyes, face, hands and respiratory. (For additional PPE requirements, always refer to guidelines as set forth by applicable material suppliers, contractors and project owners.) Apart from the materials removed, no other additional or environmentally harmful waste products are produced.

Bristle Blasting is therefore ideally suited for spot repairs, however it can also be used for larger areas if the usage of other metal cleaning processes is not allowed or is impractical.

Conventional grit blasting

Bristle Blasting

## Advantages at a glance:

- **surface cleanliness of SA 2.5 (or SSPC-SP-10)**
- **surface texture / Anchor profile up to 120 µm ($R_z$) 4.72 mils – depending on the material**
- **lightweight, easy to transport equipment (weight of Bristle Blaster® Pneumatic 1.2 kg or 2.6 lbs)**
- **only compressed air or electrical power needed**
- **no need for complex abrasive blast equipment**
- **ATEX approved for use in zone I (Bristle Blaster® Pneumatic)**
- **does not use/produce hazardous materials**
- **no additional waste products: eliminates the need for containment, recycling or disposal of grit**
- **ideal for spot-repair and weld seam preparation**

# HOW IT WORKS

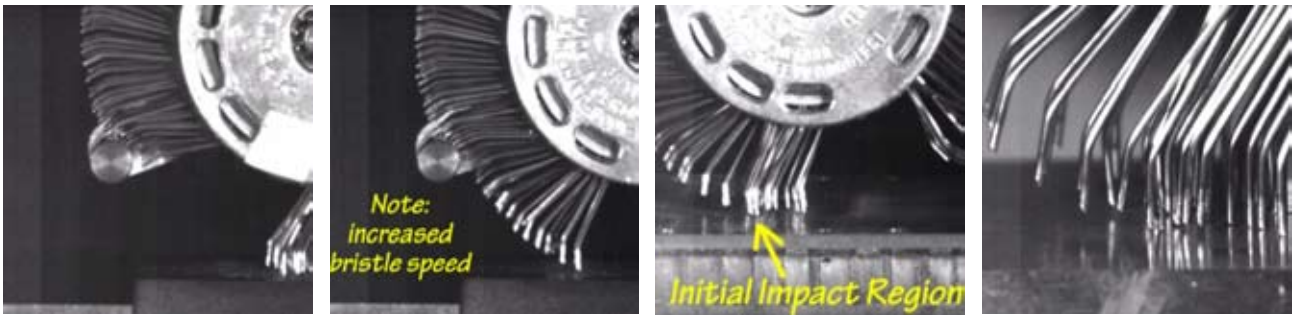
The Bristle Blasting process is a patented technology that is able to remove corrosion and/or coatings, clean the surface and simultaneously create a rough surface texture.

The surface quality achieved using the Bristle Blasting process is comparable to a surface produced using other blasting methods in relation to the level of cleanliness and roughness: surface cleanliness according DIN EN ISO 8501-1 of of SA 2.5 (or SSPC-SP10 or NACE 2) and anchor profile of up to 120 µm $R_z$ (4.72 mils).

## How does Bristle Blasting work?

A polyamide belt fitted with special wire bristles (the Bristle Blaster belt) is driven dynamically by the drive unit. During the rotation, the tips of the wire bristles are accelerated (via the accelerator bar design), as a result they impact the surface to be worked with additional kinetic energy and increased velocity.
Immediately after the impact the bristle tips spring back – during this process corrosion or the coating is removed and a tiny recess made in the surface.

A surface worked in this manner results in a surface profile and surface roughness similar to conventional blasting processes (e.g. sand blasting).



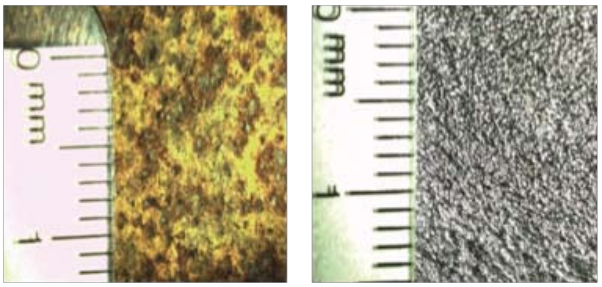

The bristles are obstructed (creating a tension), accelerated (released from the Accelerator Bar), impact the surface, and retract from the surface

Time-exposed high-speed photographs, taken with a frame-rate of 30,000 frames/sec
Hub speed: 2,500 RPM
Impact duration: 0.0003 sec
The video illustrates the approach, impact, and retraction of bristle tips from the steel surface

Find the video on our website:
**http://www.monti.de/flash/highspeedmovie.html**

Watch here the High-Speed video with your smartphone (youtube)

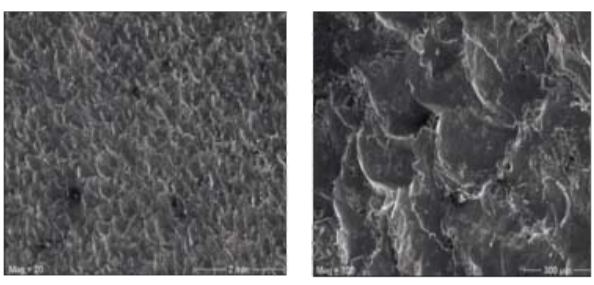
Corroded surface prior and after treatment with Bristle Blaster®



Corroded Surface

Bristle Blasted Surface

Scanning electron micrographs of the bristle blast surface



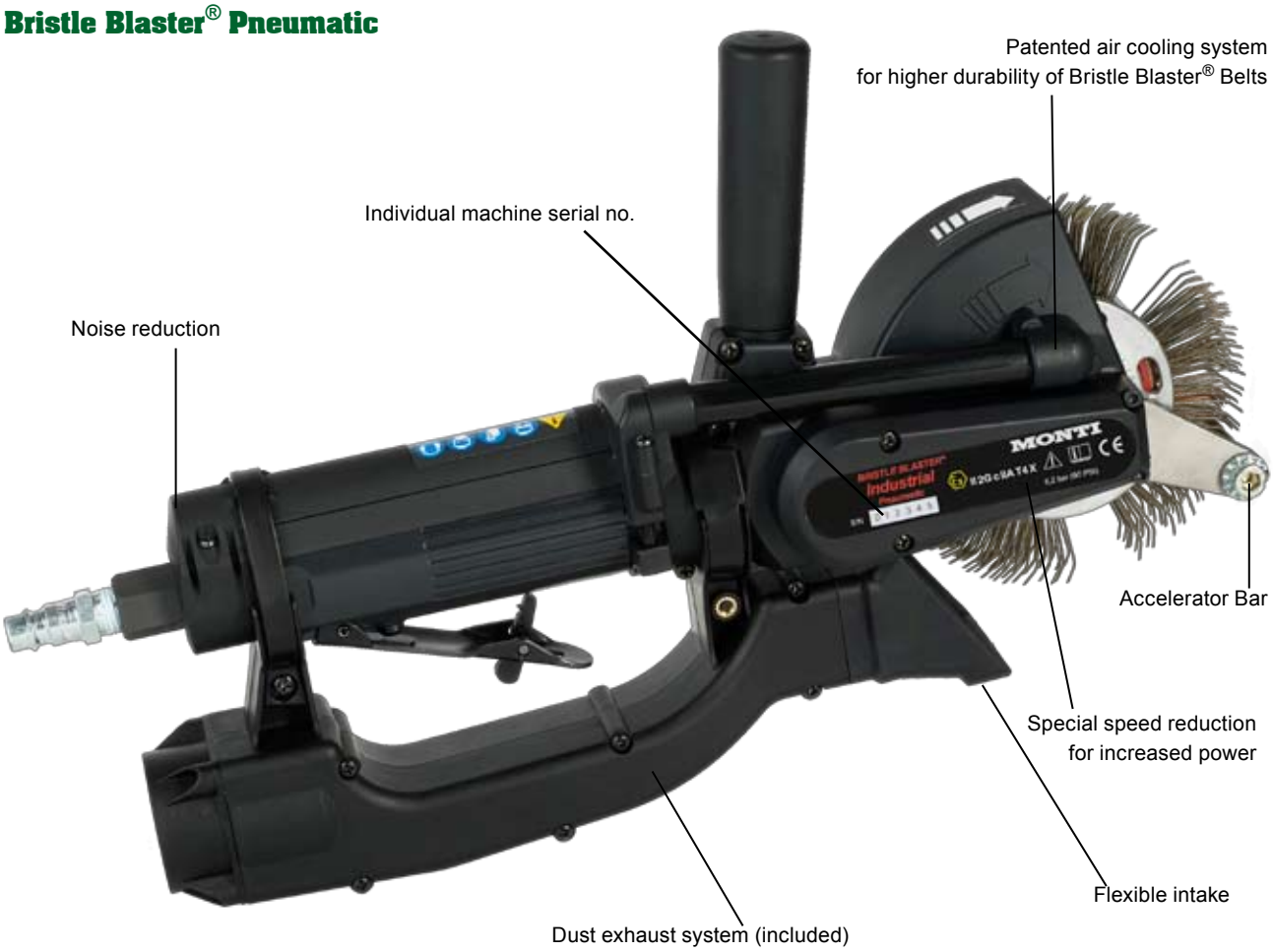
20 x

100 x

Bristle Blasted Surface

# BRISTLE BLASTER® – TECNICAL DATA

## Bristle Blaster® Pneumatic




| Bristle Blaster® Pneumatic | |
|---|---|
| Weight: | 1.2 kg / 2.6 lbs |
| Air pressure connection thread: | 1/4 “ PT |
| Required hose diameter: | 3/8 “ ID (9.5 mm) |
| Rotational speed: | 3500 RPM |
| Required flow pressure: | 6.2 bar / 90 psi |
| Average air consumption: | 17.5 CFM (500 l/min) |
| Vibration (EN ISO 8662-1; 8662-4): | 2 m/sec$^2$ |
| Sound pressure level (DIN 45635-21; ISO 3744): | 83 dB |

**II 2G c IIA T4 X**

Approved for use in Zone 1 potentially explosive atmospheres according Ex II 2G c IIA T4 X

## Bristle Blaster® Electric

| Bristle Blaster® Electric, 230V | |
|---|---|
| Weight: | 2.3 kg / 5.1 lbs |
| Output: | 550 W |
| Voltage: | 230 V (±10 %) |
| Rotational speed: | 3200 RPM |
| Vibration (EN ISO 8662-1; 8662-4): | 2.8 m/sec$^2$ |
| Sound pressure level (DIN 45635-21; ISO 3744): | 82 dB |
| | |
| **Bristle Blaster® Electric, (120V)** | |
| Voltage: | 120 V (±10 %) |

# BELTS AND ADAPTOR SYSTEMS

## Performance and surface profile

In relation to the level of cleanliness and surface roughness, Bristle Blasting produces results that are equivalent to conventional blasting processes: after working with the Bristle Blaster® corroded and pitted surfaces have a level of surface preparation comparable to SA 2.5 (or SSPC-SP10 or NACE 2). This fact has been confirmed by tests undertaken by Marquette University, Milwaukee, Wisconsin, USA. During the tests a surface profile (anchor profile) between 65 µm and 83 µm ($R_z$) was achieved on API 5L steel, which is commonly used for oil pipelines.

The results of this study have been confirmed in other tests, for instance in a report issued by the Institut für Korrosionsschutz Dresden / Germany.
In comparative bonding tests undertaken by Société Electrique de L'Our in Vianden, Switzerland it was found that a coating on a surface prepared using Bristle Blaster® has the same high tensile strength values as a surface prepared using sandblasting.

The tests undertaken by Marquette University in Milwaukee also showed that Bristle Blasting produces material compaction over the surface worked, which in turn increases the resistance to cracks, fatigue and stress corrosion.

All reports can be found as pdf-data for download on our website : **www.monti.de/en/industrial**

## Service life of the Bristle Blaster® Belt

Normally a corroded surface can be worked thoroughly with a velocity of around 1.1 sqm (11.8 Ft Sq) per hour. Working an area of this size is well within the service life of a single belt. Depending on the characteristics, form and material of the surface to be machined, an even longer belt service life is also achievable.

## Bristle Blaster® Belts

Bristle Blaster® Belts are made of polyamide fabric, in which U-shaped wires are individually anchored.
Bristle Blaster® Belts are equipped with an inner ring (Red for carbon spring steel, White for stainless steel).

Bristle Blaster® Belts, Carbon Spring Steel, inner band Red
23mm: **Art. No. BB-033-10**
11mm: **Art. No. BB-034-10**
(10 pack)

Bristle Blaster® Belts, Stainless Steel, inner band White
23mm: **Art. No. BB-102-10**
11mm: **Art. No. BB-103-10**
(10 pack)

## MBX® Adaptor Systems

The MBX® Adaptor Systems for Bristle Blaster® Belts safely absorb the high centrifugal forces produced by rotation. They comprise a high-quality die-cast aluminum alloy.

Alternatively, the new patented Quick Add® can be used instead of the classic adaptor system made of aluminum. This feature makes it possible to change belts even faster without the need for additional tools. This aspect is of major advantage, for instance in the case of rope access. Due to the special material composition a significantly higher service life is achieved.

MBX® Adaptor Systems
for 23mm-Belts
**Art.No. AS-009**

for 11mm-Belts
**Art.No. AS-012**

Quick Add®
for 23mm-Belts
**Art.No. AS-015-23**

for 11mm-Belts
**Art.No. AS-015-11**

# EQUIPMENT

## Sets

Everything you need for Bristle Blasting fits in one handy case.

Depending on the application and situation on-site, we offer different sets: with pneumatic or electric drive unit, with carbon spring steel or stainless steel belts.

You will only need an appropriate supply of energy and PPE including gloves, eye protection and (if required) a respiratory mask to begin application of the tools.



**Bristle Blaster® Set Pneumatic**

Consisting of:
- drive unit Bristle Blaster® 3500X with air cooling system, noise reduction, dust exhaust and special gear reduction
- MBX® Adaptor Systems for 23mm- and 11mm-Belts
- Accelerator Bars for 23mm- and 11mm Belts
- Air Pressure Regulator for 23mm- and 11mm-Belts including couplings and nipples
- 5 Bristle Blaster® Belts, 23 mm
- 5 Bristle Blaster® Belts, 11 mm
- packed in a blow mould case

**Art.No. SP-647-BMC**

As set for stainless steel and aluminum surface preparation incl. stainless steel belts and stainless steel Accelerator Bar

**Art.No. SP-649-BMC**

**Bristle Blaster® Set Electric**

Consisting of:
- drive unit Bristle Blaster® Electric (230V resp. 120V) with special gear reduction
- MBX® Adaptor System 23mm
- Accelerator Bar for 23mm belts
- 10 Bristle Blaster® Belts, 23mm
- packed in a blow mould case

230V **Art.No. SE-677-BMC**
120V **Art.No. SE-667-BMC**

As set for stainless steel and aluminum surface preparation incl. stainless steel belts and stainless steel Accelerator Bar

230V **Art.No. SE-678-BMC**
120V **Art.No. SE-668-BMC**

## Optional Accessories

**Swivel Connector**
For pneumatic units:
permits a less restrictive flexible connection of compressed air hose and therefore makes work easier

**Art. No. ZU-073**

# PERFORMANCE OF THE BRISTLE BLASTER®

## Corrosion, mill scale, and coating removal

Restores the surface to near white visual standard (SSPC-SP-10) or NACE 2 or SA 2.5

## Surface texture / Anchor Profile

Roughness capability from 40 to 120 µm $R_z$ (1.5 - 4.7 mils) depending on the material; also on weld seams

## Eco-friendly

A „Green“ surface treatment, does not use/produce hazardous materials

## Improved integrity of treated surfaces

Generates compressive residual stress along treated surface for crack growth resistance, improved fatigue life, and improved corrosion resistance

## Negligible heat generation

Surfaces free of thermal damage/heat marking.

## Simple and economical

Eliminates the need for complex and costly abrasive blast equipment


Corroded pipeline surface, API 5L steel

Measured roughness after Bristle Blasting: 83 µm $R_z$ (3.27 mil)

## Comparison Bristle Blasting with grinding

On working using a grinding machine the result is uneven and incomplete cleaning of the material, hardly any surface roughness

Surface preparation with Bristle Blaster®, result: thoroughly cleaned surface, also in pits, roughness 80 to 90 µm $R_z$ (3.1-3.5 mils)

# AREAS OF APPLICATION

Bristle Blasting is appropriate wherever the usage of conventional blasting methods is not efficient or is not possible.

In particular, the application of the Bristle Blaster® technology is particularly appropriate for repairing or reworking steel structures (spot repairs) and for finishing (cleaning and roughening) weld seams.

Also wherever the usage of classic blasting methods is not allowed due to safety regulations (e.g. working in potentially explosive atmospheres) or due to issues related to the protection of the environment, Bristle Blaster® technology is an unrivalled alternative.

The patented Bristle Blaster® technology is used in many sectors: including the oil and gas industry, the petrochemical industry, steel construction, hydromechanical steel construction and ship building, as well as during maintenance work, e.g., on bridges, offshore installations and wind turbines.

## Classic application areas

- Oil and gas industry, e.g. on offshore platforms, in refineries, pump stations
- Pipeline construction and renovation
- Renovation of bridges, building constructions etc.
- Harbor installations, piling walls, locks, weirs
- Ship building and ship repair
- Repair of tanks, tank coating removal
- Renovation of railway rolling stock
- Maintenance of wind turbines, in hydroelectric, coal or nuclear power stations


Wind turbines


Offshore

Weld seams


Harbor installations


Pipeline construction

# REPORTS, STUDIES, REFERENCES

## Studies and Test-Reports (extract)

- **NACE Paper No. 11417, 2011:**
  **Bristle Blast Surface Treatment of Welded Joints Fabricated from Commercial Ship Construction Steel**
  Professor Robert J. Stango, Ph.D., Professor Raymond A. Fournelle, Ph.D., and Jorge A. Martinez, Mechanical Engineering Department Marquette University, Milwaukee, USA

- **NACE Paper No. 10385, 2010:**
  **Surface Preparation of Ship-Construction Steel / (ABS-A) via Bristle Blasting Process**
  Professor Robert J. Stango, Ph.D., Professor Raymond A. Fournelle, Ph.D., Jorge A. Martinez, and Piyush Khullar, Mechanical Engineering Department, Marquette University, Milwaukee, USA

- **NACE Paper No. 09191, 2009:**
  **Fundamentals of Bristle Blasting**
  Process for Removing Corrosive Layer
  Robert J. Stango, Ph.D., and Piyush Khullar, Mechanical Engineering Department, Marquette University, Milwaukee, USA

- **NACE Paper No. 09004, 2009:**
  **Bristle Blasting Surface Preparation Method for Maintenance**
  Neil Wilds, International Paint Ltd., Protective Coatings, United Kingdom

- **ATEX approval, test report by GEXCOM**
  The Bristle Blaster® Pneumatic is ATEX approved according Ex II 2G c IIA T4 X for use in zone 1 potentially explosive atmospheres by inflammable gases, vapor or mists.

- **Test report by the Institut für Korrosionsschutz Dresden, Germany, 2008**
  IKS Dresden investigated the quality of the surface preparation of steel using Bristle Blasting in comparison with other methods and found Bristle Blasting produced a level of surface preparation comparable with blasting of SA 2.5.

- **Vibration test**
  Low vibration figures mean the tool can be used continuously for several hours per day. There is no risk to the health due to Hand Arm Vibration Syndrome (HAVS).

- **Bonding test**
  In comparative bonding tests undertaken by Société Electrique de L'Our in Vianden/ Switzerland it was found that the coating on a surface prepared using Bristle Blasting has the same high tensile strength values as a surface roughened using sandblasting.

## Certifications and Specifications (extract)

- Aramco Overseas Company B.V.
- Exxon Mobil (structural specification)
- Mexican Marina (Secretaria de Marina, Dirección General de Construcciones Navales)
- specified for project Tanajib Offshore Plant (Saudi Aramco)
- PEMEX
- Total
- Berry Plastics

**Ex** = Examination certificate according to RL 94 / 9 / EG (examination done by GEXCON. The meaning is Ex-proof equipment for non-mining applications.
**II 2G** = the equipment is category 2 equipment (zone 1) allowed to be used in potentially explosive atmospheres caused by flammable gases, vapor or mists.
**c** = stands for non-electric tools, constructional safety
**IIA T4** = the explosion subgroup is IIA and the temperature class is T4 (max. surface temperature 135°C). It is also allowed to work in explosion subgroups IIB and IIC making sure not violating the temperature class. This implies that the equipment must not be used for gases with auto-ignition temperatures below 135°C.
**X** = indicates that the equipment is subject to special conditions for safe use specified in the schedule to the certificate / declaration of conformity (these are, i.e. the materials excluded in the declaration of conformity)



You will find this report as well as other reports as pdf files on our website:
www.monti.de/en/press-release/industrial/press-release

# HANDLING

## Service

The correct usage of the Bristle Blaster® is crucial to obtain the required result in relation to surface cleanliness and surface roughness.
We therefore offer our customers an introduction to the technology and user training during an on-site visit.

## Prior to placing in operation:

- Read the operating instructions on the sticker and watch the video tutorial on the CD provided with each set.

- Pay attention to the correct air pressure (for Bristle Blaster® Pneumatic) and use the air pressure regulator recommended for the related belt (23mm belts – silver, 11mm belts – blue)

- Pay attention to the correct direction of movement of the belt

## Usage:

- Only apply light contact pressure to the machine while working. Excessive contact pressure will prevent the belt working optimally. This situation will reduce the performance and result in the premature wear or damage to the Bristle Blaster® Belt.

- Hold the machine at the correct working angle. To be able to utilize the full energy in the bristles accelerated by the accelerator bar, it is important to maintain the accelerator bar at the correct distance from the sur face: this distance should be the equivalent of around the width of a finger. This situation is, as a rule, achieved, if the machine is held at an angle of around 0° to 20° in relation to the surface worked.

- Hold the machine such that the Bristle Blaster® Belt is perpendicular to the surface. In this way the full working width of the belt is utilized and longer service life ensured.

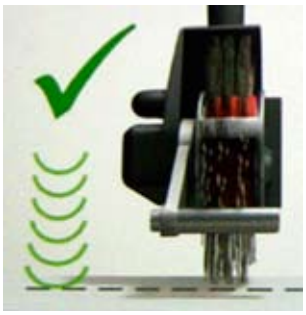
- Always work from left to right and from top to bottom. Do not move machine from bottom to top or in circles over the surface worked! The incorrect movement would result in the closing of impact pores already made and therefore the smoothing of the existing surface roughness.

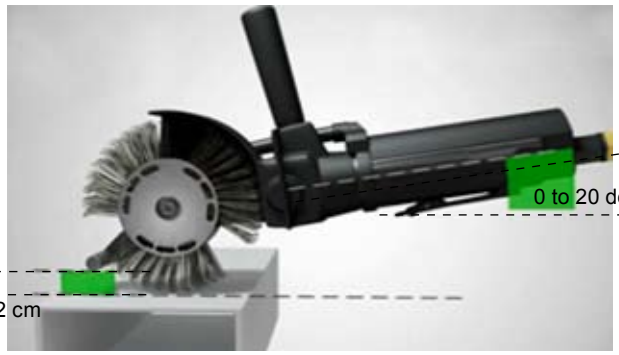
- Guide the machine over the surface at the correct speed. The working speed should be such that every square centimeter of the area machined can be worked optimally by the bristles. Moving the machine too quickly can result in an inadequate level of surface preparation. Normally approx. 1 - 1.1 qm (11.8 Ft Sq) can be thoroughly treated per hour.

Watch the video „How to operate“
on your Smartphone or on our website
**www.monti.de/flash**

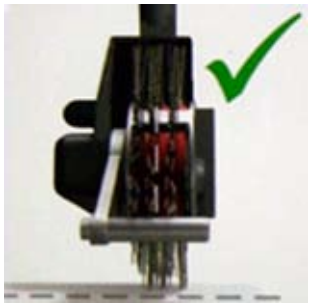
Use correct pressure

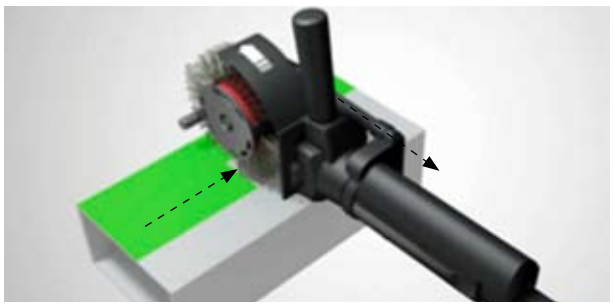

Pay attention to direction of movement



Do not apply too much pressure



Pay attention to correct working position



Work perpendicular to the surface


Work from top to bottom and left to right

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