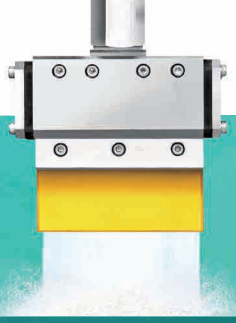


MACOHO WET BLAST

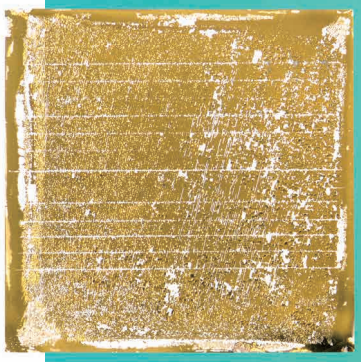
Plating / thin film / coating pretreatment

Improved Adhesion to Super Engineering Plastics, CFRP, and Glass

The anchor effect provided by nano-level fine unevenness having no time dependency, and the cleaning power, which scrapes a thin film with foreign matter from the surface, contribute to improved coating adhesion regardless of the base material such as super engineering plastic, CFRP, metal, and ceramic. This method is also suitable for plating, coating, painting, and pretreatment for automobiles and 5G products.

Ti coating film formation

Film type: Ti
Base material: Glass



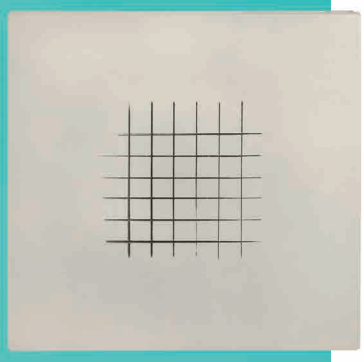
Without pretreatment

Film formed after wet blasting

Plating on PPS

Film type: Plating
Base material: Super engineering plastic (PPS)

Without pretreatment



Plated after wet blasting

The materials can be easily coated and plated.

POINT

Regardless of the material Suitable for any material such as resin, metal, or ceramic.

Nano-anchor effect Nano fine uneven surfaces are formed and the anchor effect is expected.

No chemicals needed No chemicals are used for physical etching.

No time dependency

There is no time dependency due to the wettability improved by surface area expansion.

No deterioration

Since processing heat is not generated, no deformation or deterioration occurs.

Fast batch processing

The etching rate is larger than that of other surface etching methods. The desired etching amount can be obtained in a short time.

No residues

There is almost no contamination by particles or no foreign matter residue.

Nano surface treatment

Surfaces are scraped at the nano level to completely remove foreign matter.

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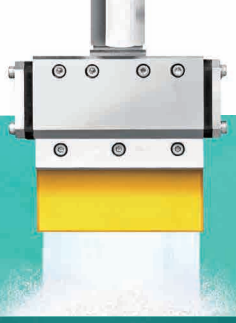


MACOHO WET BLAST

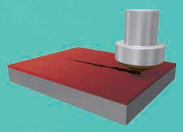
CFRP, Ti, SUS, and coatings

Adhesive Strength Between Different Materials : Twice or More

Adhesive strength between different materials can be greatly increased by wet blasting,
which cleans materials and forms fine uneven surfaces to expand adhesion areas and improve the wettability.

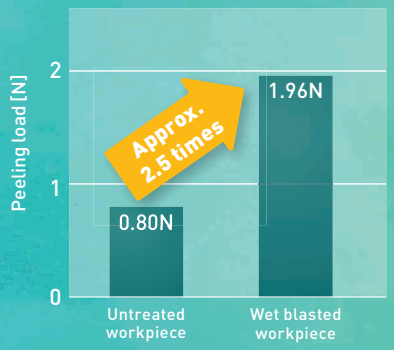
Results of scratch test

*What is the adhesion scratch test?



The adhesion scratch test is a method of measuring coating adhesion by scratching the test object with a diamond indenter while a load is being applied.

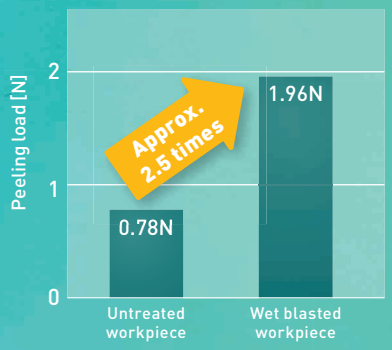
CFRP × Acrylic coating



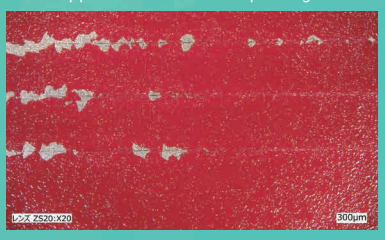
Untreated workpiece
Load: approx. 0.80 N (start of peeling)

Wet blasted workpiece
Load: approx. 1.96 N (the maximum load)

Ti × Urethane coating

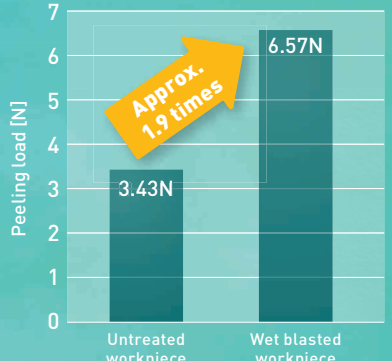


Untreated workpiece
Load: approx. 0.78N (start of peeling)

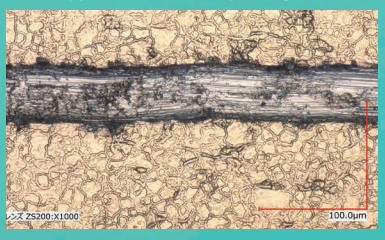


Wet blasted workpiece
Load: approx. 1.96 N (the maximum load)

SUS × TiN coating



Untreated workpiece
Load: approx. 4.27 N (with peeling)



Wet blasted workpiece
Load: approx. 4.27 N (without peeling)

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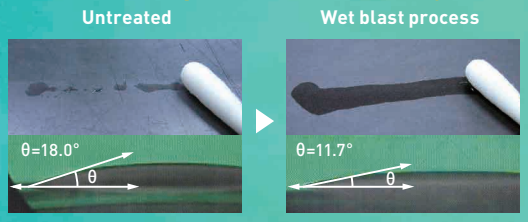
Wet blast surface processing applications

Principle of Improving Adhesive Strength

Complete removal of foreign matter

Improved wettability and retention

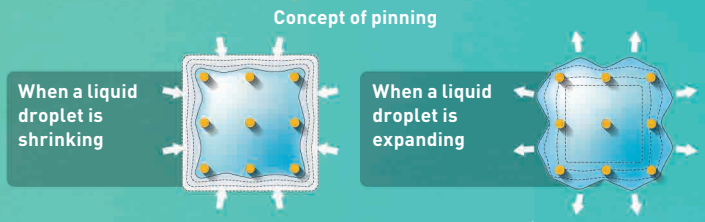
Comparison of wettability



Surface tension works and water droplets shrink.

Fine unevenness prevents liquid droplets from shrinking.

Principle of retention

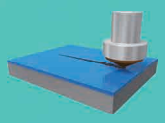


The pins retains the droplet and keep it from shrinking/expanding.

Pin on a plain (= mountain)

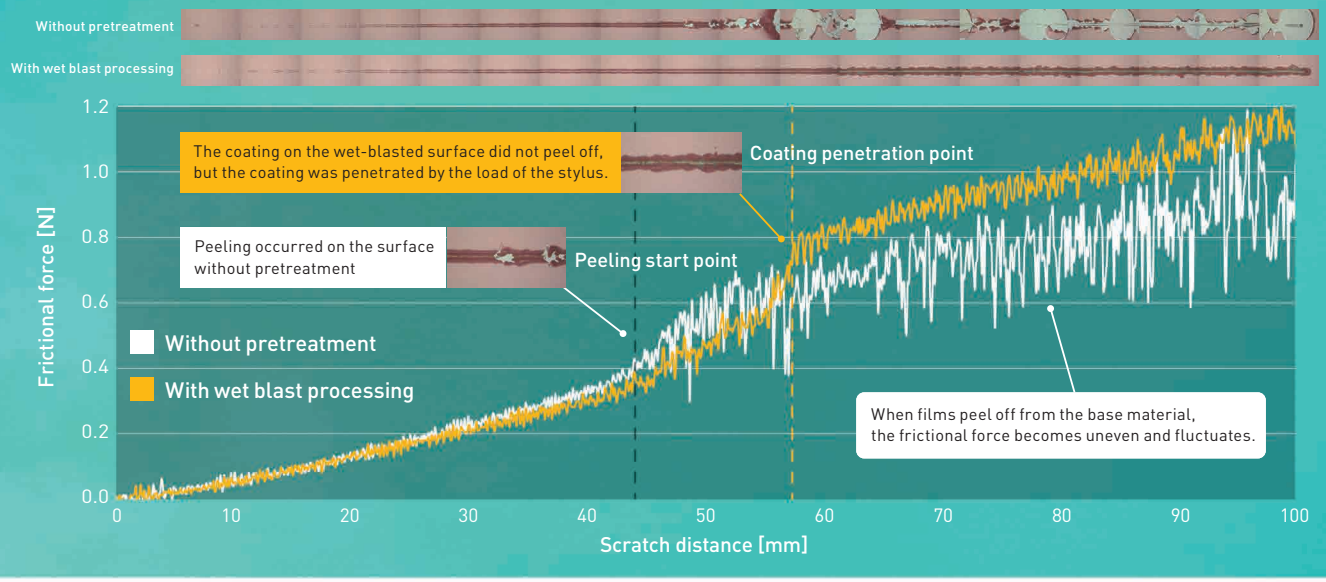
Example of improved adhesion: CFRP and coating

Measurement method: Scratch testing **Sample base material:** CFRP **Sample coating:** Acrylic resin coating
Wet blast process conditions: A#320 (abrasive), 0.2 MPa (air pressure)



***What is the adhesion scratch test?**

The adhesion scratch test is a method of measuring coating adhesion by scratching the test object with a diamond indenter while a load is being applied.



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MACOHO WET BLAST

Super Engineering Plastics (PPS)

Processing surface comparison

Appearance after shield plating

Surface condition of PPS before plating

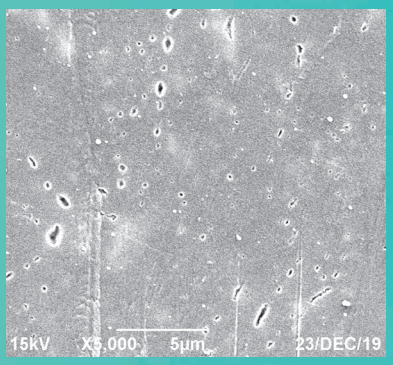
Without pretreatment

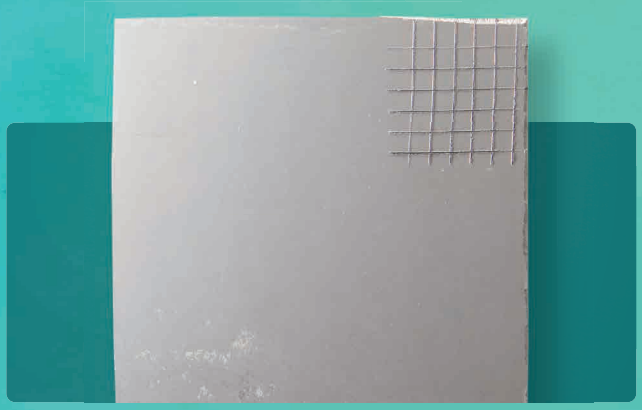
Surface roughness

Ra 0.048 μm

Rz 0.255 μm

Enlarged view of the surface





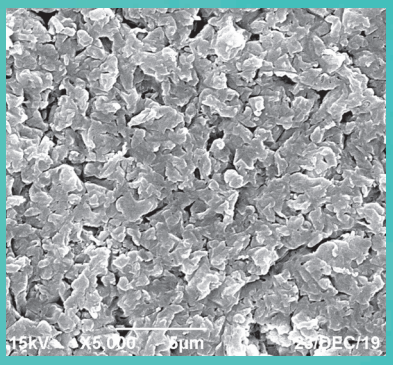
Processing by #2000

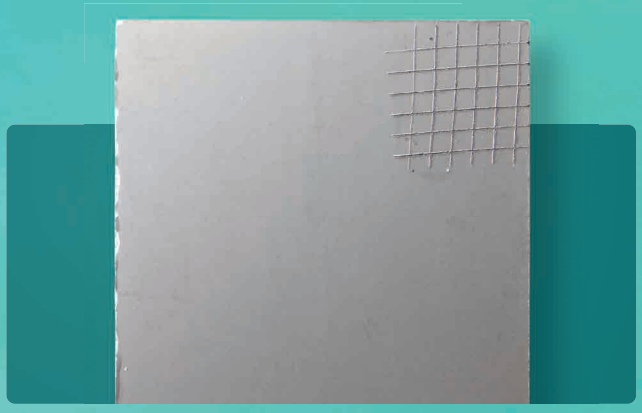
Surface roughness

Ra 0.040 μm

Rz 0.232 μm

Enlarged view of the surface





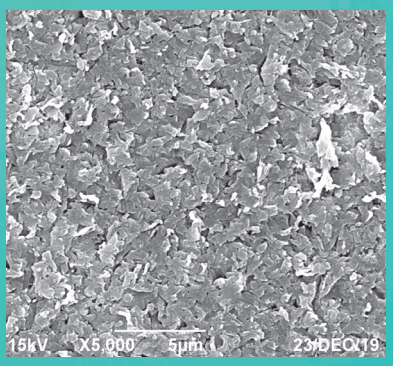
Processing by #4000

Surface roughness

Ra 0.039 μm

Rz 0.214 μm

Enlarged view of the surface



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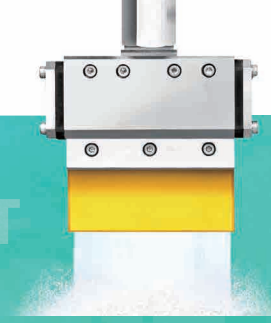

MACOHO WET BLAST

Equipment lineup

Automatic type

PFE 300／600

Wide gun 370 / 630mm | Full automatic | Conveyor type | Cleaning / Drying | Applicable to large workpieces | Applicable to roll-to-roll process

- Up to 630 mm wide guns are used for processing of large workpieces.
- The upper and lower guns can process the top and bottom surfaces at the same time.
- Perform all the processes up to cleaning/draining continuously and discharge workpieces in a clean state.

Size	2100(W)×1775(D)×1800(H)mm / 2125(W)×2125(D)×1800(H)mm
Processing range	Max. width 350/610 mm Length 200-700mm Thickness 0.2-2.0mm
Blast gun	Wide gun 370 / 630mm×1.0mm (One each at the top and bottom)
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	9.0 / 14.0m³/min (NTP at 0.2 MPa of preset blast air pressure)

mini PFE 100／200

Wide gun 110 / 220mm | Full automatic | Conveyor type | Cleaning/Drying | Applicable to strip workpieces

- Compact design ideal for strip and plate-shaped small workpieces.
- Realizing both sides processing of the front and back by mounting the gun up and down.
- Maintenance of the drive, blasting, and cleaning part is possible only by opening the cover.

Size	1200(W)×1250(D)×1600(H)mm / 1700(W)×1600(D)×1650(H)mm
Processing range	Width 20-100mm / 20-200mm Length 100-250mm Thickness 0.1-1.5mm
Blast gun	Wide gun 110 / 220mm×1.0mm (One each for top and bottom)
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	4.3 / 8.5m³/min (NTP at 0.2 MPa of preset blast air pressure)

For small and medium lot production

Sigma

Wide gun 600mm | X-axis | Automation | Applicable to large workpieces

- Capable of uniform processing (up to 800 × 600 mm surface) with 600 mm wide gun.
- When the door opens and closes it slides to the top, and no water drops on the floor.
- Allows easy programming of blast projection and gun operation.

Size	1550(W)×1530(D)×2100(H)mm
Processing range	800×600mm
Blast gun	Wide gun 600mm
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	6.2m³/min (NTP at 0.2 MPa of preset blast air pressure)

Lambda Type II

Wide gun 320mm | X-axis | Automation

- Drives a wide gun with the X-axis to batch process a range of up to 600 x 300 mm.
- Cope with various types of workpieces by changing the jig or gun bracket.
- Allows easy programming of blast projection and gun operation.

Size	1350(W)×1525(D)×1930(H)mm
Processing range	600×300mm
Blast gun	Wide gun 320mm
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	5.0m³/min (NTP at 0.25 MPa of preset blast air pressure)

For R&D

Robot Blast

Wide gun 180 mm | robot | Automation

- Capable of processing workpieces of complex shape by using a 6-axis articulated robot and rotary table.
- Equipped with a wide gun capable of uniformly processing the entire surface.
- Allows easy programming of blast projection and gun operation.

Size	1100(W)×1500(D)×1950(H)mm
Processing range	400(W)×400(D)×300(H)mm
Blast gun	Wide gun 180mm
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	3.8m³/min (NTP at 0.25 MPa of preset blast air pressure)

Jr. Type II

Wide gun 160 mm | X-axis | Automation

- Easy to introduce because of its compact design and very little dust.
- Uniform surface processing with 1-axis drive and a wide gun.
- Allows easy programming of blast projection and gun operation.

Size	850(W)×920(D)×1450(H)mm
Processing range	300×160mm
Blast gun	Wide gun 160mm
Power supply	200 V AC, 50/60 Hz, 3 phases
Air consumption	2.0m³/min (NTP at 0.25 MPa of preset blast air pressure)

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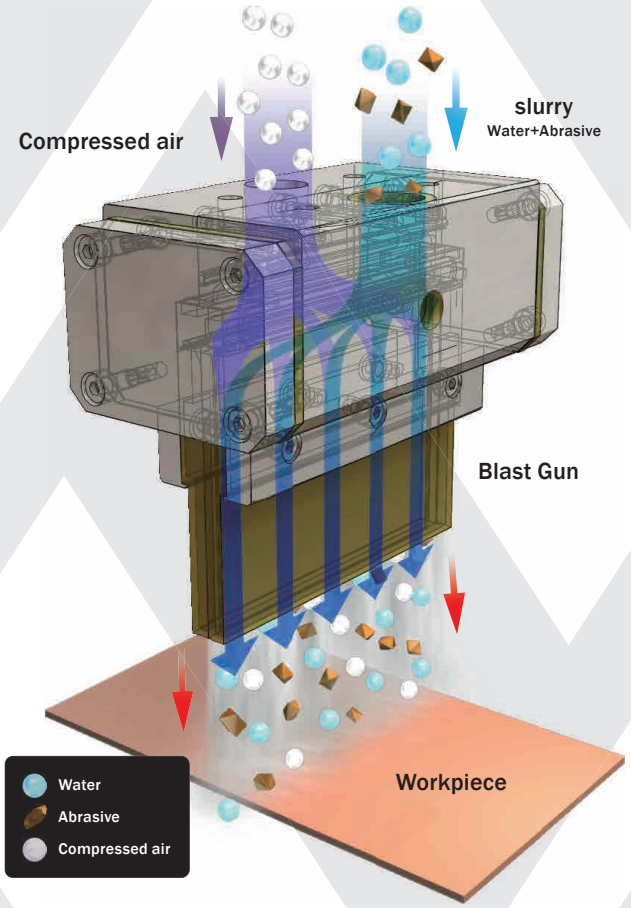
Surface Etching Using Water, Abrasives, and Compressed Air

What is wet blasting?



Wet blasting is a non-chemical etching method that accelerates slurry, which is a mixture of abrasive and water, with compressed air and projects it against the target object to process its surfaces.

Features

1 Curved surfaces and three-dimensional objects can be processed

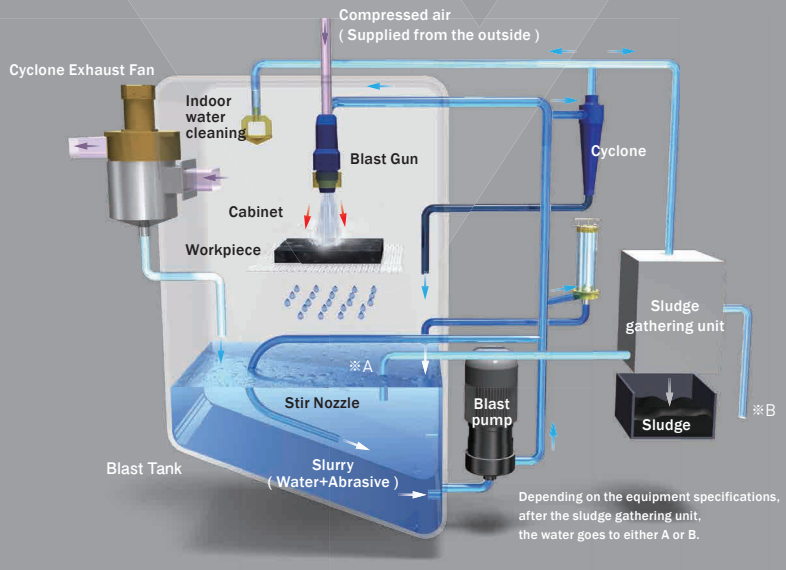
Since the rotating tool is not pressed against the workpiece, it is possible to process not only curved surfaces but also steps and cavities.

2 Fine abrasives can be used

3 to 100 μm abrasives can be used because of the water transport effect. The fine abrasive makes processing with submicron precision possible.

3 High productivity

Wet blasting provides batch processing of a large area using a wide gun.



MACOHO's Wet Blast System

This system pumps up the slurry, mixes it with compressed air using the blast gun, and then projects the slurry, which is accelerated and dispersed.
The slurry is circulated and reused to reduce waste liquid.
Thanks to the system's advanced automation, the only task required during continuous operation is to supply the abrasive.

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Base treatment for adhesion

Comparison of surface processing methods

process	Wet Blast	Dry blast	Chemical etching	Atmospheric pressure plasma cleaning	Low pressure plasma cleaning
	Accelerates water and an abrasive with compressed air and projects the mixture against workpieces to be processed or cleaned.	Projects an abrasive against workpieces with compressed air to process them.	Chemically processes workpieces in a chemical solution.	Projects high-energy electrons and ions against work pieces to generate new substrate and remove dirt.	
Uniformity of treated surface	○ Good	× Large areas are processed unevenly because the nozzle opening is narrow.	○ Good	○ Possible with wide gun	○ Possible with large area electrodes
Wettability	◎ Good	△ Depends on the surface state before processing.	△ Good	○ Temporarily good, but performance rapidly deteriorates.	○ Temporarily good, but performance rapidly deteriorates.
Presence of residue	△ Very few abrasive residues remain.	× Abrasive residues remain.	◎ None	◎ None	◎ None
Fine processing	◎ Good	△ Abrasives less than 50 μm are difficult to use.	○ Good	○ Good	◎ Excellent
Material selectivity	○ Materials and types of contamination do not matter because of physical treatment.	○ Materials and types of contamination do not matter because of physical treatment.	△ For some materials there are no suitable chemicals.	△ Organic substances only	○ Both inorganic and organic substances can be used depending on the reaction gas to be used.
Processing time	◎ Fast	◎ Fast	○ Fast	○ Fast	× Slow
Dust	○ Little dust generation	× Dust work	◎ None	◎ None	◎ None
Equipment cost	○	◎ Low	△	△	× High

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The benefits of Wet Blast

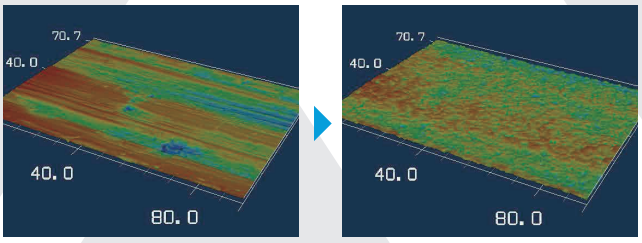
Roughness

Create fine and controllable dimples

Create a wide range of dimples using fine abrasives and controlled fluid

Wet Blast creates dimples on the surface by peeling soft parts of its material using the blasting power and transcribing abrasive shapes. A wide range of abrasives between #60 ～#4000 are available which enables easy controll of roughening.

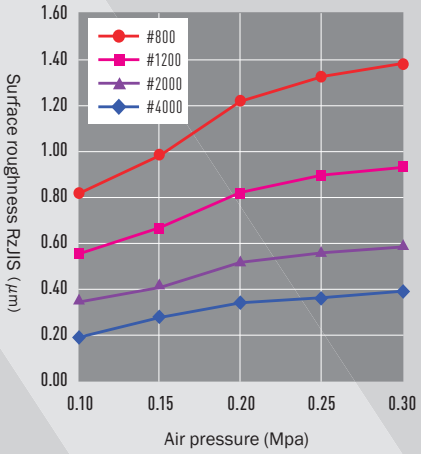
Glass roughening sample



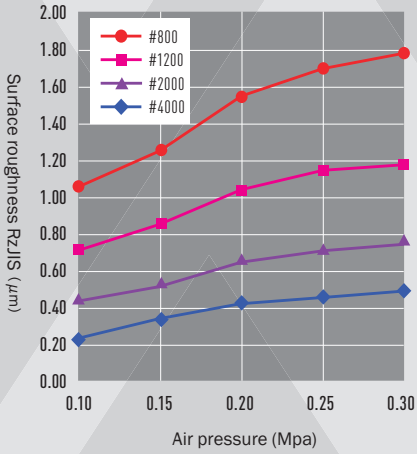
Before processing　　After wet blast processing

Processing data by materials using fine abrasives　Roughness

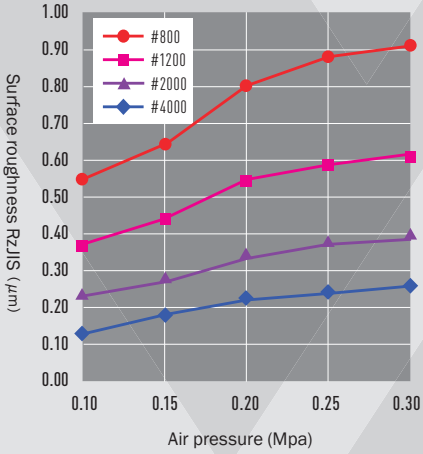
Roughness of Cu surface



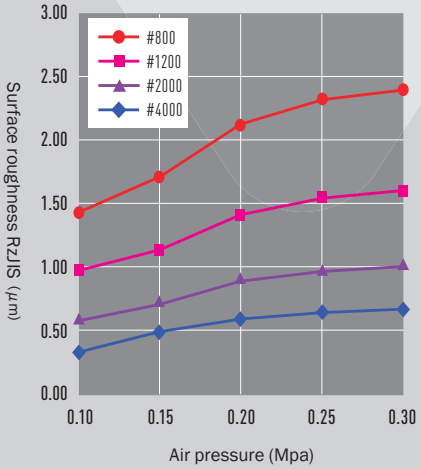
Roughness of AL surface



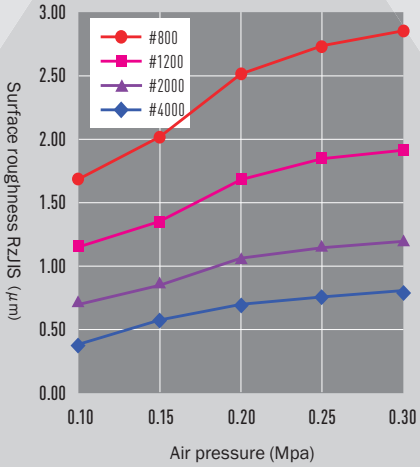
Roughness of SUS surface



Roughness of PI surface



Roughness of glass surface



Particle diameter

- #800 = 14μm
- #1200 = 9.5μm
- #2000 = 6.7μm
- #4000 = 3.0μm

Processing condition

- Wide gun applied
- Air pressure：0.20MPa
- Processing speed：20mm/s
- Projection distance：20mm
- Projection angle：90°

Note

The data above may differ depending on processing condition of roughness of undone surface or hardness of material

*There is a certain variation in roughness (±5 ～ 7%)

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