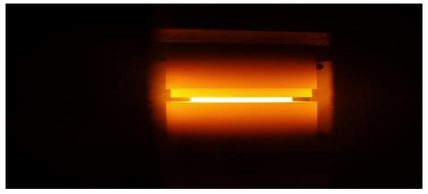
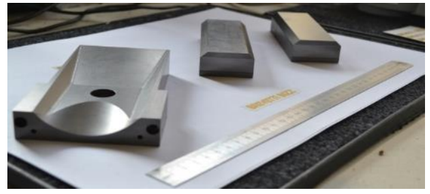
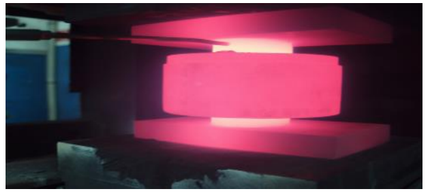
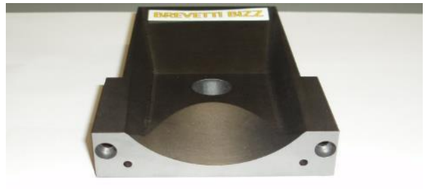
BREVETTI BIZZ

Production of novel and advanced materials: Molybdenum-graphite

Presentation of our manufacturing facilities and capabilities

J.Guardia on behalf of Stefano Bizzaro



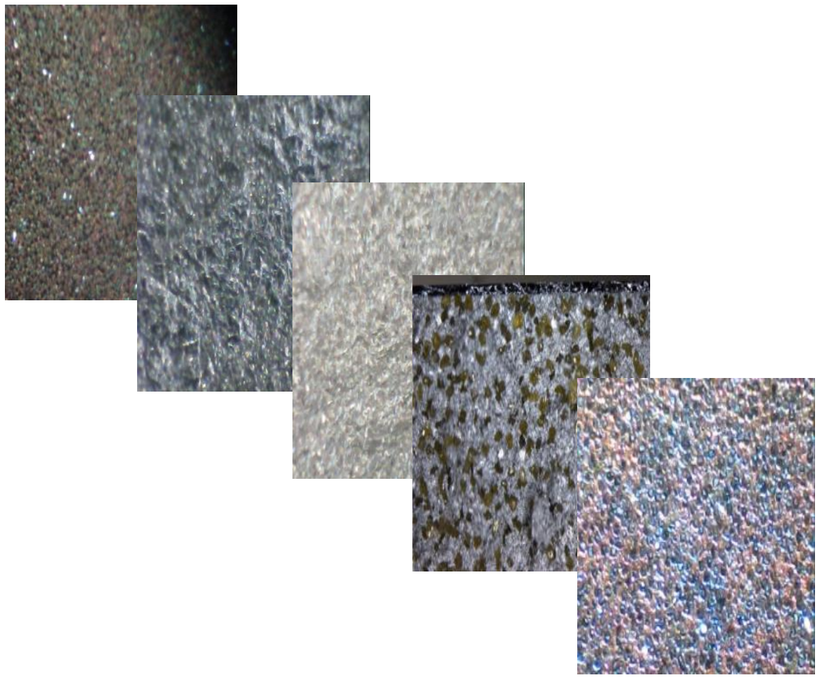
WP11 topical meeting
University of Malta, Valletta, Malta
27-28th April 2016

Outline

- Overview of the company
- Collaborations ongoing with CERN
- Material production
- Machining and testing capabilities

BREVETTI BIZZ

COMPANY PRESENTATION



Founded in year 2000 in the industrial area in San Bonifacio (Verona) in Italy, with an area of 1600 square meters, it represents a factory think up for design, research, development and production in technical/applied mechanical industry.

- **consultancy, design, research and development**
- **special machining (ceramic and graphitic materials)**
- **composite materials for high temperatures**
- **High temperature thermal treatment in high vacuum**

We collaborate with important suppliers, customers, laboratories, universities and research centers and we are involved in a continuous research for innovative solutions.

Collaborations with CERN

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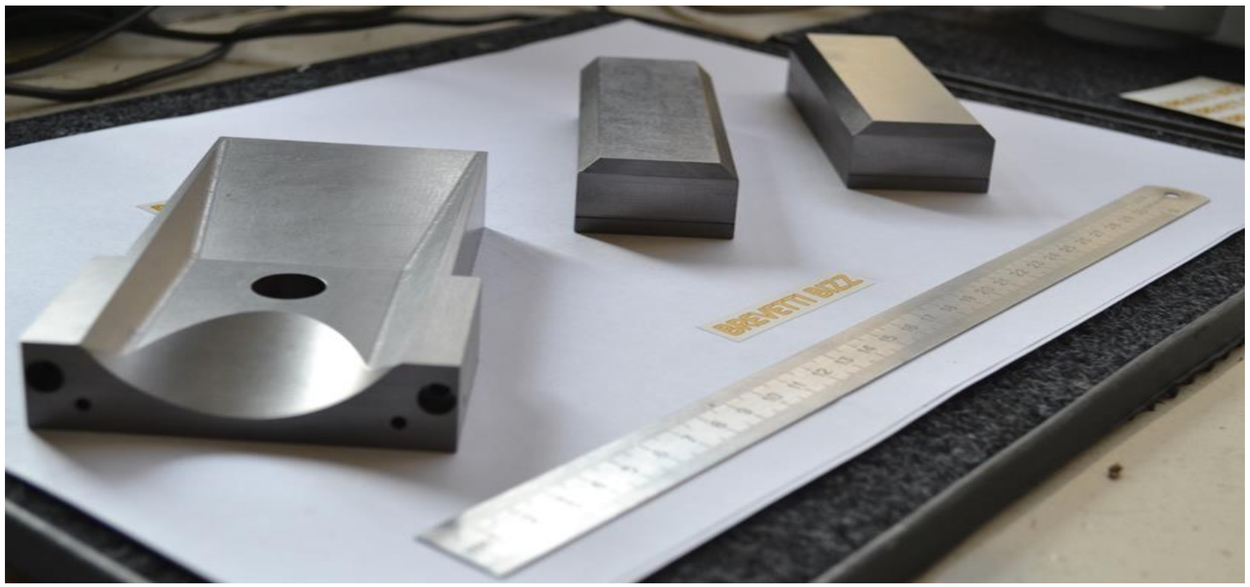
Collaborations with CERN

Absorber material for HL-LHC collimators

R&D on novel materials, on-demand processes and high-precision machining.

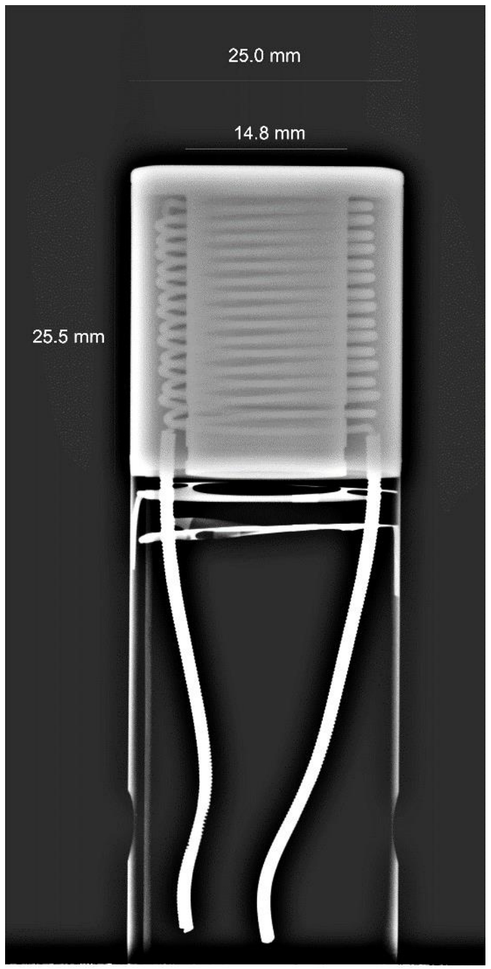
MG-6303Ga sintered plate.
Dimensions 100 x 150 x 30mm

Tapering and blocks
HRMT23 experiment



Cathode for CERN electron guns (HL-LHC hollow e-lens)

R&D on materials, density, doping elements and shape.



Cathode pictures from Pascal Simon (CERN EN-MME)

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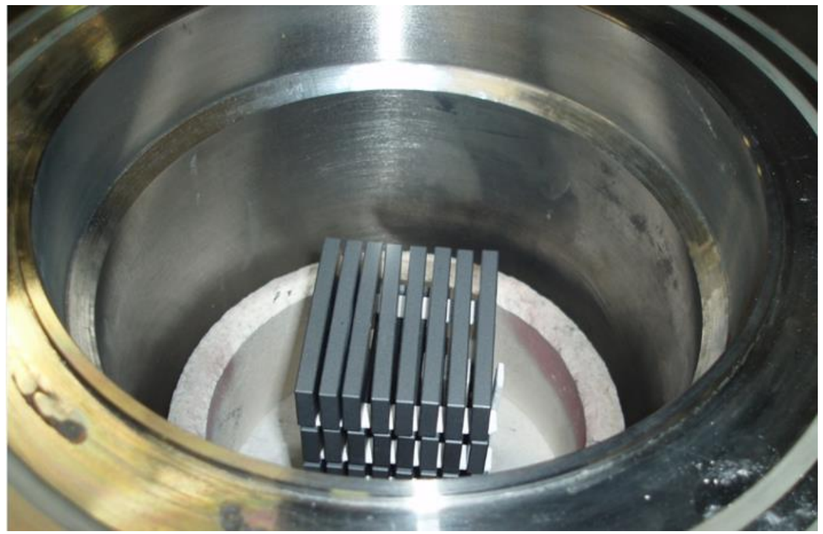
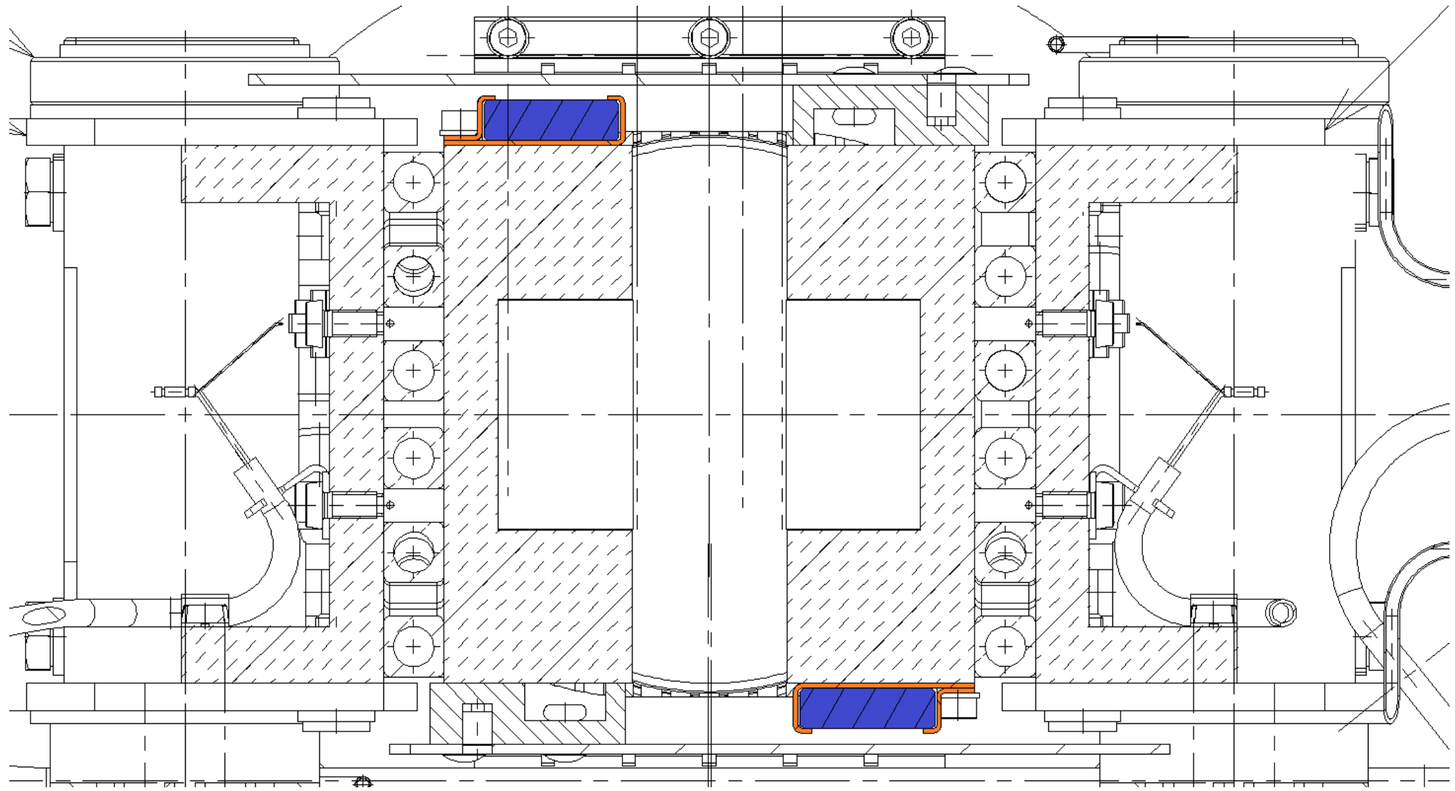
Collaborations with CERN

Thermal treatment (firing) of ferrite plates for LHC collimators

1000ºC 48h in air + 1000ºC 48h in vacuum
Total duration ≈10days



TCTP Collimator RF system



Material production

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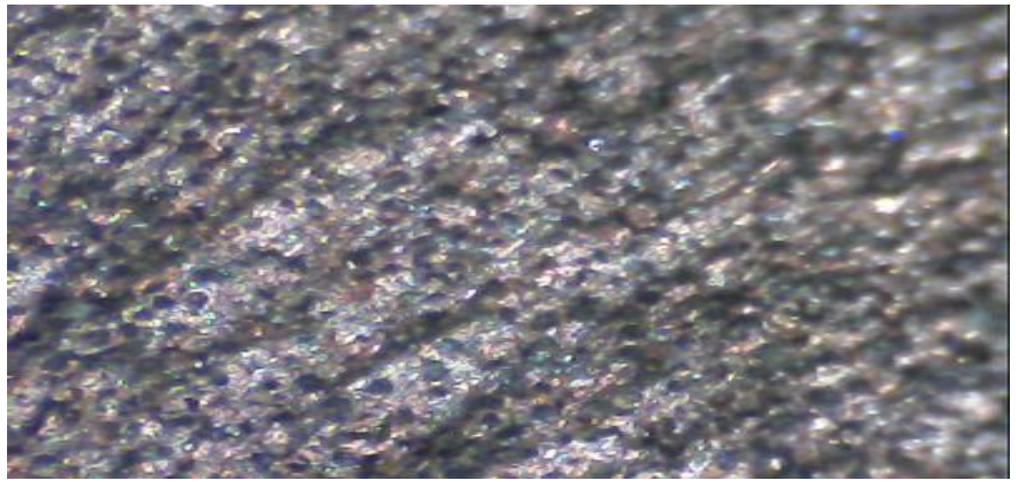
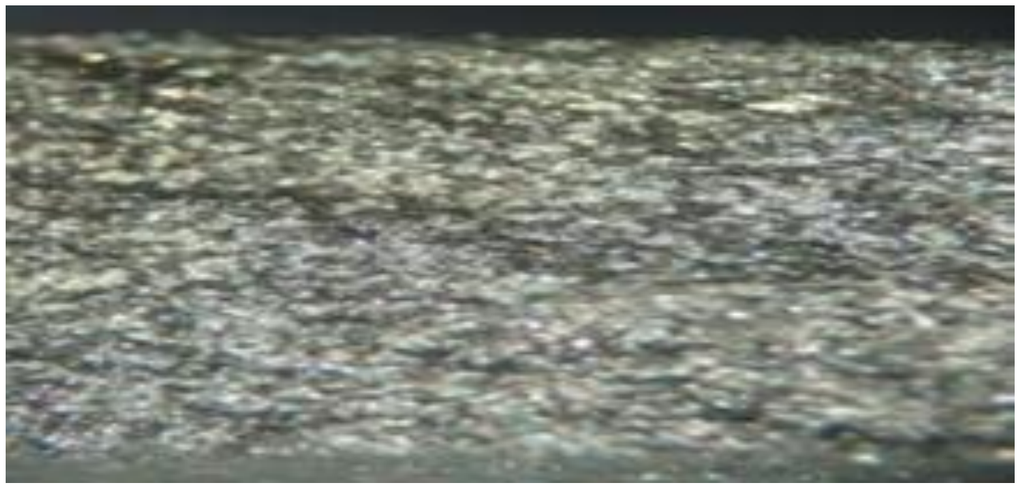
MATERIAL MG6530 Aa

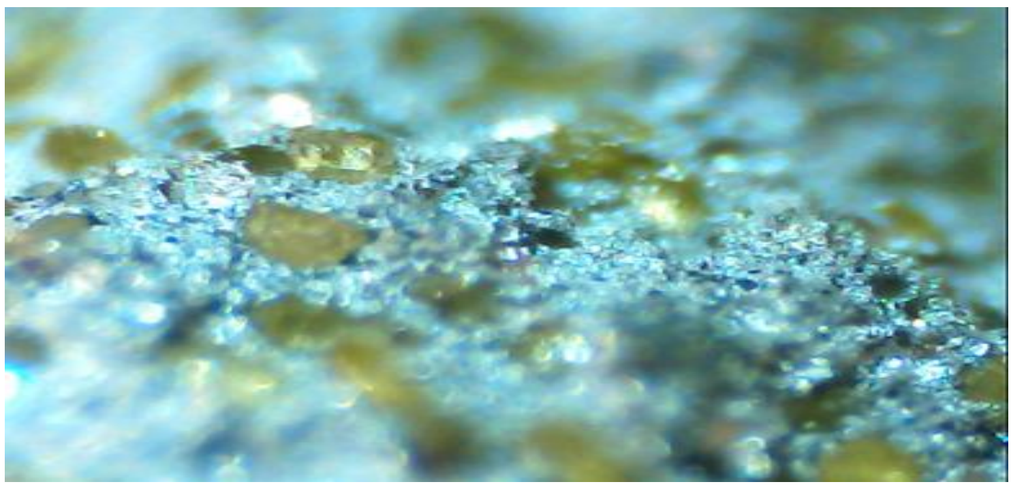


MATERIAL MG - 6403 Ga



MATERIAL ALUMINIUM GRAPHITE

MATERIAL ALUMINUM DIAMOND



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Metal/Ceramic Matrix Composites

Molybdenum-graphite:

Liquid Phase Sintering at ~2800°C and 35 MPa.

Reducing H_2-N_2 atmosphere at 10^{-6} mbar.

Liquid metal-carbon phase allowed to spill out of the moulds to enhance compaction and reduce final density.

Composition (Grade MG-6403-Aa)
- **95.3%vol. Natural Graphite (~45µm)**
- **4.5%vol. Molybdenum powder (~5µm)**
- **0.2%vol. Titanium powder (~5µm)**

Powders pre-cleaning under H_2-N_2 atmosphere

MG-6303-Ga dimensions 100 x 150 x 30mm

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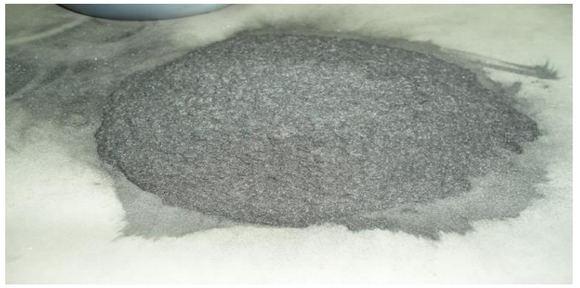
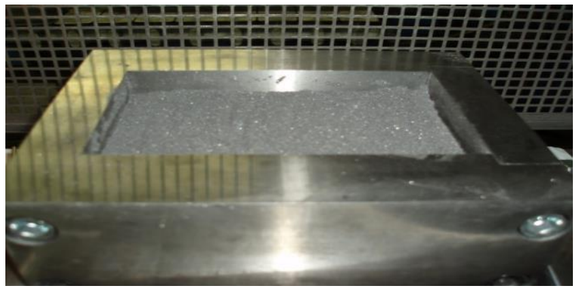
PRODUCTION PHASES OF THE COMPOSITES

POWDER PREPARATION

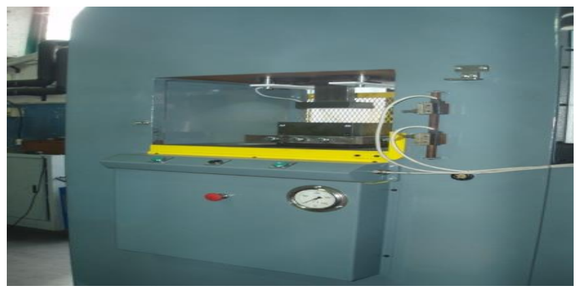
MIXER



MIXED POWDER

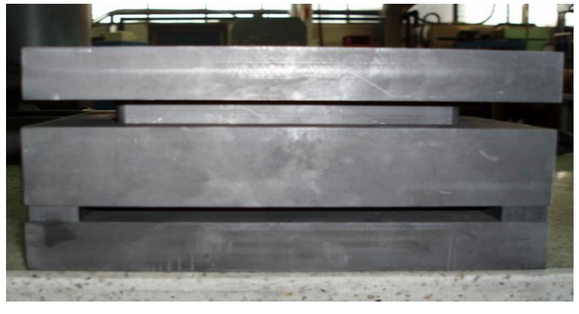


MOLD FOR GREEN POWDER

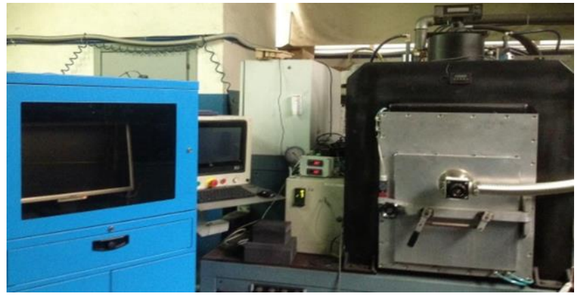


500 TON PRESS FOR GREEN BODY

GREEN BODY



MOLD GRAPHITE



VACUUM HOT PRESSING 150 TON

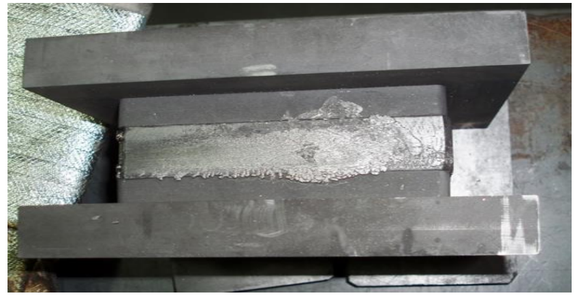
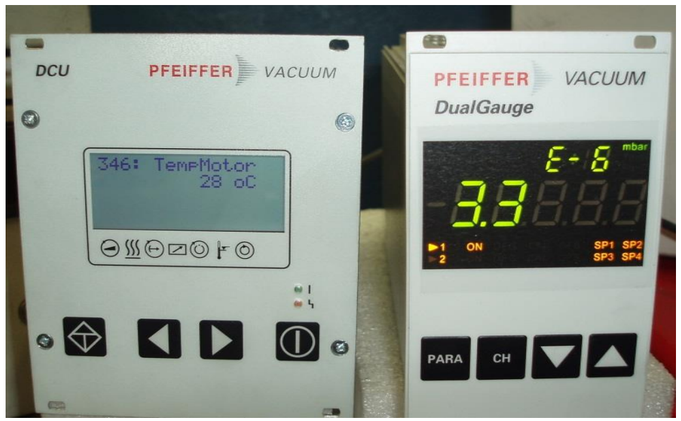


PLATE WITH DIE AFTER VACUUM HOT PRESSING 2800 ° C 35 MPa 25 minutes.

BREVETTI BIZZ

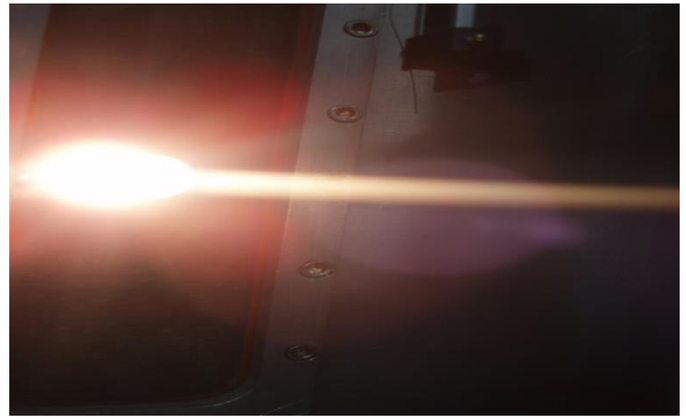
VACUUM HOT- PRESSING 150 TON

VACUUM HOT-PRESSING C°1200



VACUUM

FURNACE CHAMBER

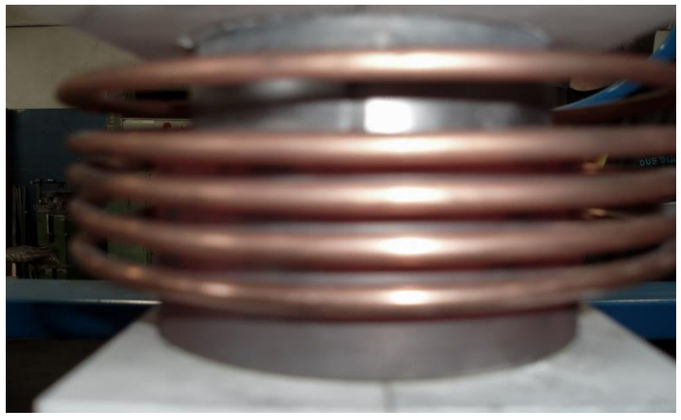


VACUUM HOT-PRESSING C°2800

COMPOSITE FINISHED

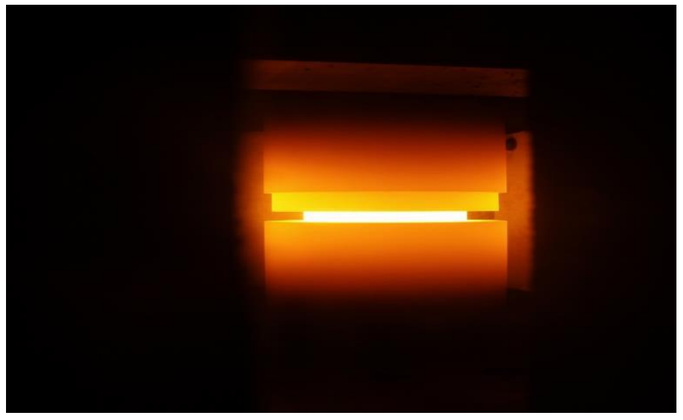
BREVETTI BIZZ

INDUCTIVE VACUUM HOT- PRESSING 150 TON 1500 C°



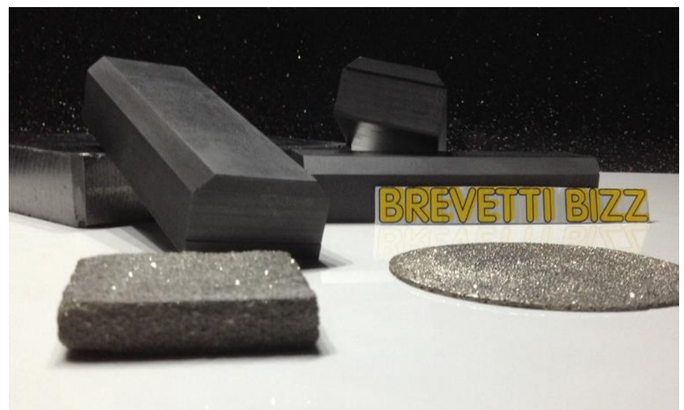
INDUCTION SPIRAL

FURNACE CHAMBER



INDUCTIVE VACUUM HOT PRESSING 900 C°

INDUCTIVE VACUUM HOT PRESSING 1500 C°



MATERIAL

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MACHINES FOR PREPARING POWDER COMPOSITES

SIEVES CALIBRATED

ASPIRATED BENCH

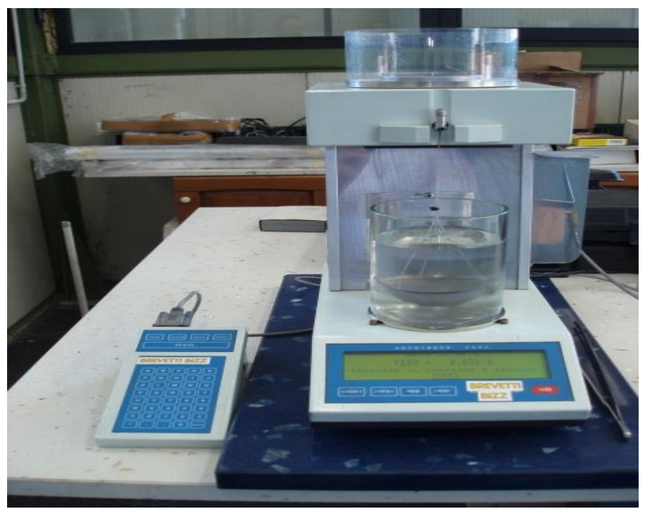
MACHINE FOR POWDER COATING PAUDAL

MIXER IN VACUUM AND HEAT

MIXER

Material testing and machining

BREVETTI BIZZ



DENSITY

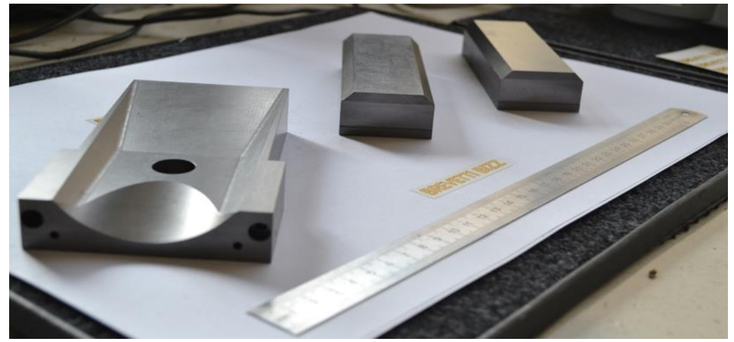
ROUGHNESS

DUROMETER

ELETRICAL CONDUCIVITY

BREVETTI BIZZ

PROCESSING WITH CNC GRAPHITE



TAPERINGS - BLOCK HRMT23

Mastercam

DYNAMIC MOTION

PROGRAM FOR MACHINE 3D CNC

MOLD GRAPHITE

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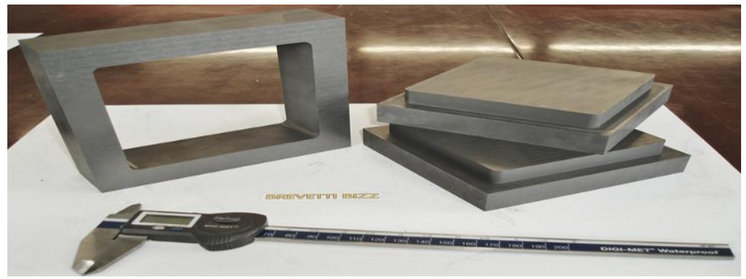
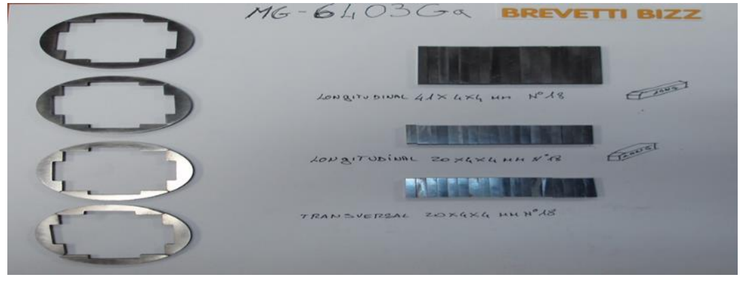
PROCESSING WITH CNC GRAPHITE



MOLD GRAPHITE

MOLD GRAPHITE

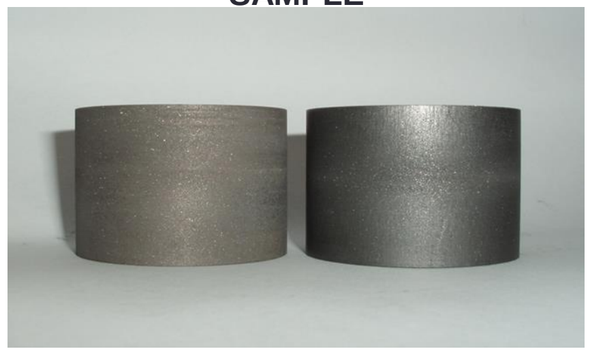


SAMPLE BNL GRADE MG – 6403 Ga

BREVETTI BIZZ

PROCESSING WITH CNC GRAPHITE

SAMPLE



SAMPLE

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