TRASER®

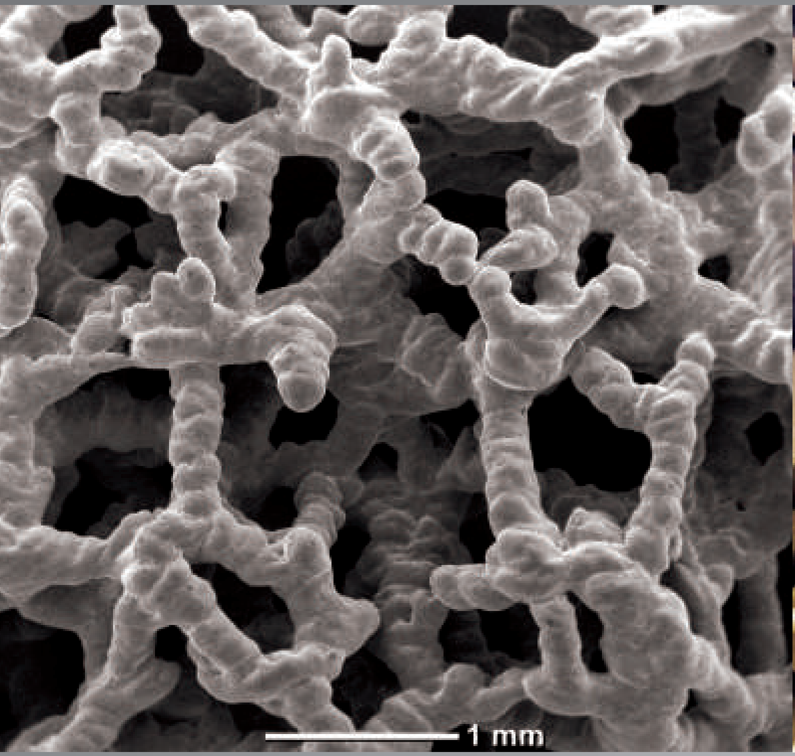
TRABECULAR LASER MELTED TITANIUM

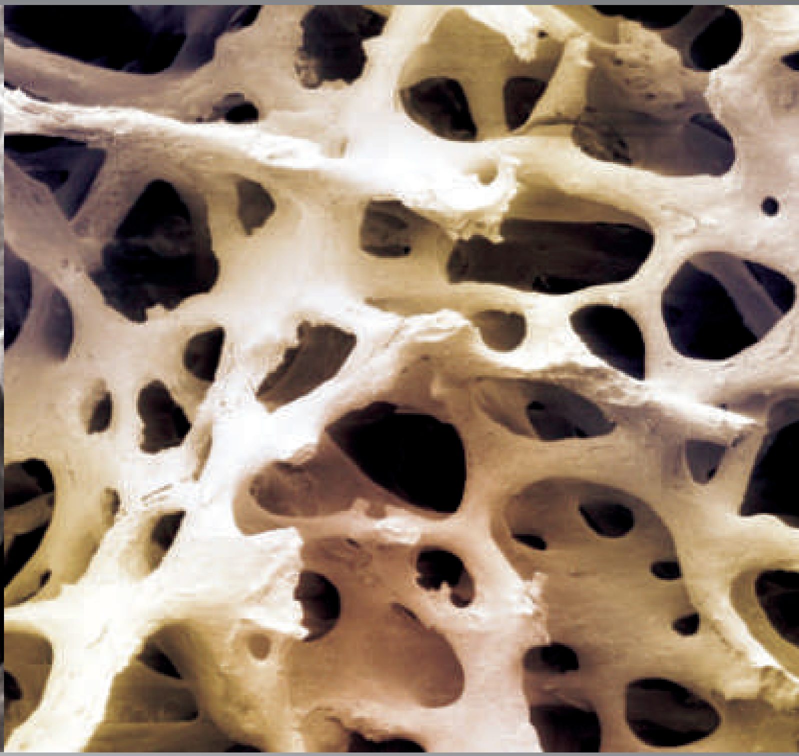
permedica
ORTHOPAEDICS

TRASER®

Trabecular Titanium
by Selective Laser Melting

TRASER® Trabecular lattice





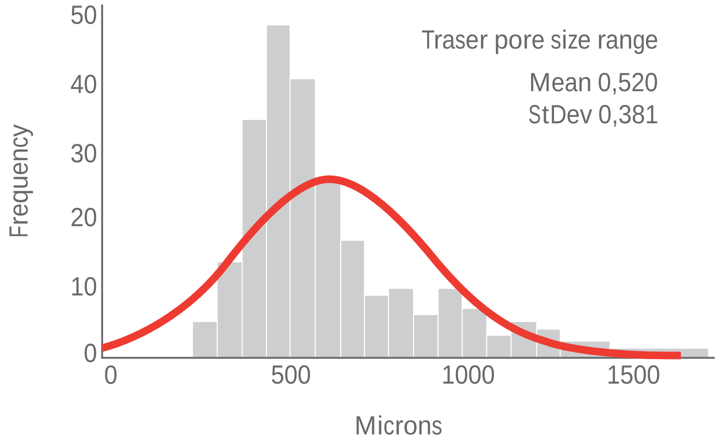
"Mimicking the nature of bone to provide bone ingrowth and osseointegration for long-term implant stability"

"Highly porous trabecular network characterized by open fully interconnected irregular pores to promote fast bone ingrowth"

Porosity

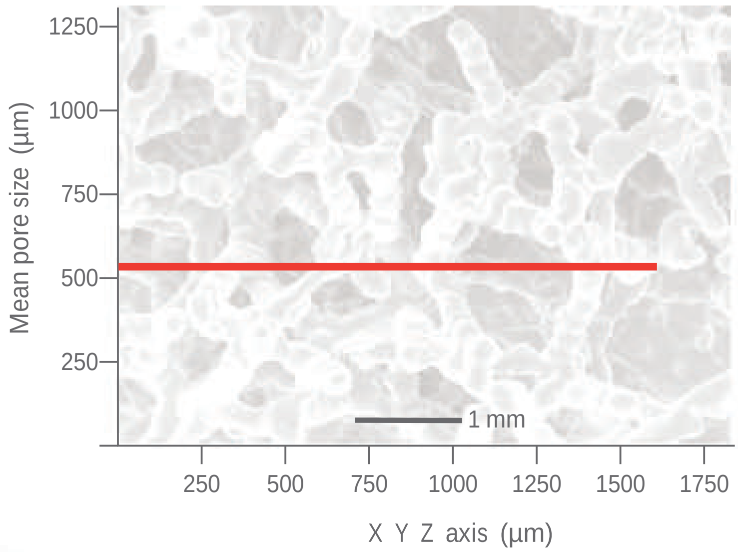
Void volume - Porosity: 70%.
Random irregular shaped pores.
Complete permeabily.
Pore interconnectivity: 100%.
Pore size range: 100-2000 µm.

Wide pore size range



Isotropy

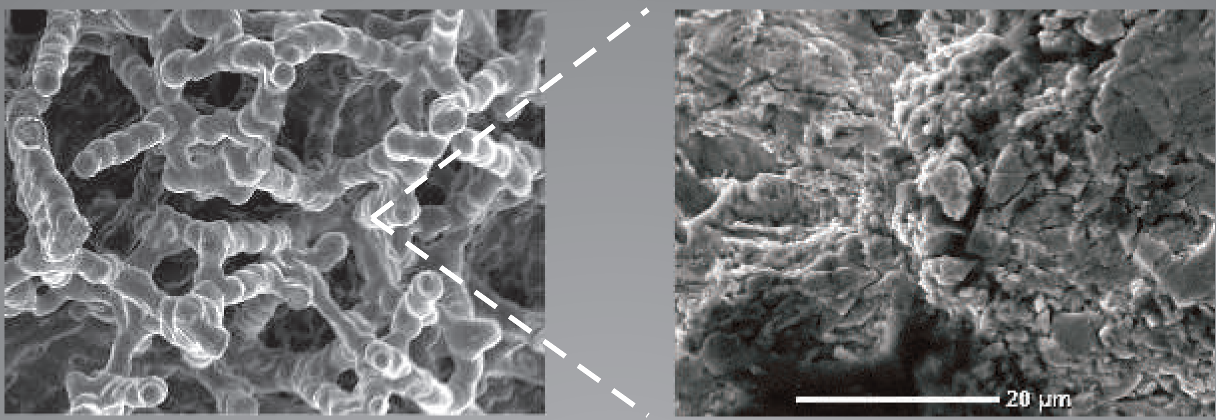
Random pore sizes and random irregular trabeculae orientation and distribution along the 3-dimensions.
Isotropic uniform highly-porous lattice.



“Highly osteoconductive properties”

Superficial topography

A glimpse on the topography of the trabeculae reveals a uniform microroughned surface (Ra, 2 µm) which optimize osteointegration (bone on-growth).



Surface Roughness

It has been demonstrated that the bone response is influenced by the implant surface topography at the micrometer level. Surface roughness affects the physiological processes of bone tissue synthesis and osseointegration. Osteoblasts response in terms of cell adhesion, proliferation and osteosynthesis local factor production, as well as implant-to-bone direct contact have been proven to be increased by moderately-roughened surfaces (Ra, 1 to 6 µm) [1-11].

Fully interconnected open irregular-shaped pores

Cell/tissue ingrowth behavior depends on the pore size, porosity and pore interconnectivity in different ways. Pores have to be open and fully interconnected to allow cell migration and to permit vascularization for cell viability and proliferation. Formation of new bone into an interconnected network of pores provide mechanical interlocking between implant and the surrounding bone [9,10].

High porosity

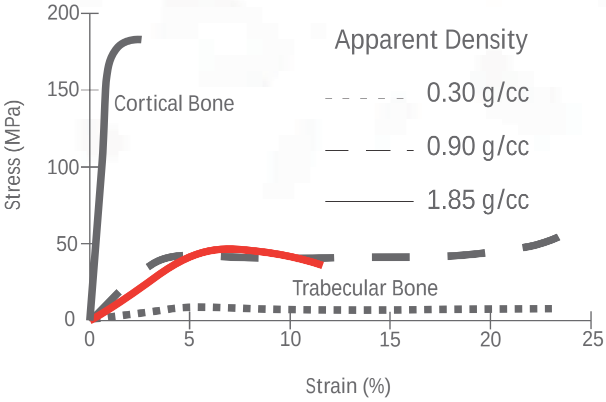
Higher porosity means higher bone ingrowth. A large consensus suggests a minimum porosity of 60% to maximize bone ingrowth while maintaining at the same time adequate mechanical properties of the porous structure [12,13,14].

Mean pore size of 500 micron

New bone formation is promoted by a pore size range of 150-500 µm. Smaller pore sizes leads to fibrous tissue ingrowth and prevent the mineralization of the osteoid matrix. Greater pore sizes lead to a slower bone ingrowth and incomplete pore filling [15-20].

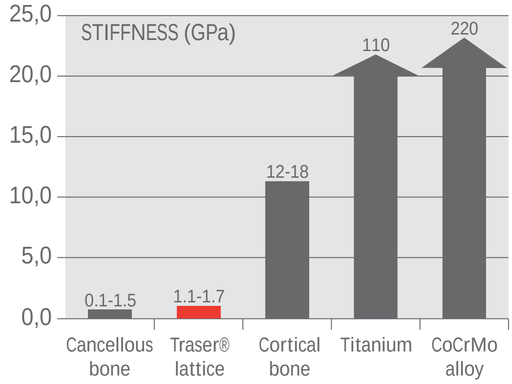
Mechanical Properties

Compressive strenght of
TRASER® lattice: 38 Mpa

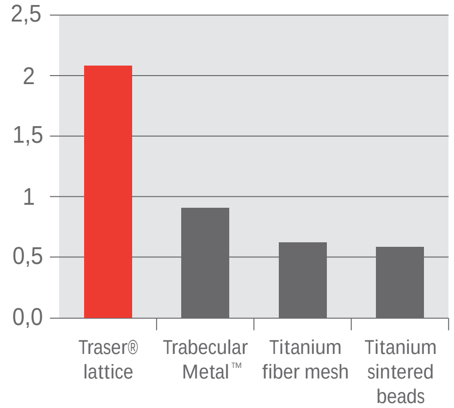


High friction coefficient of TRASER® lattice with cancellous bone to improve implant primary fixation [21-24].

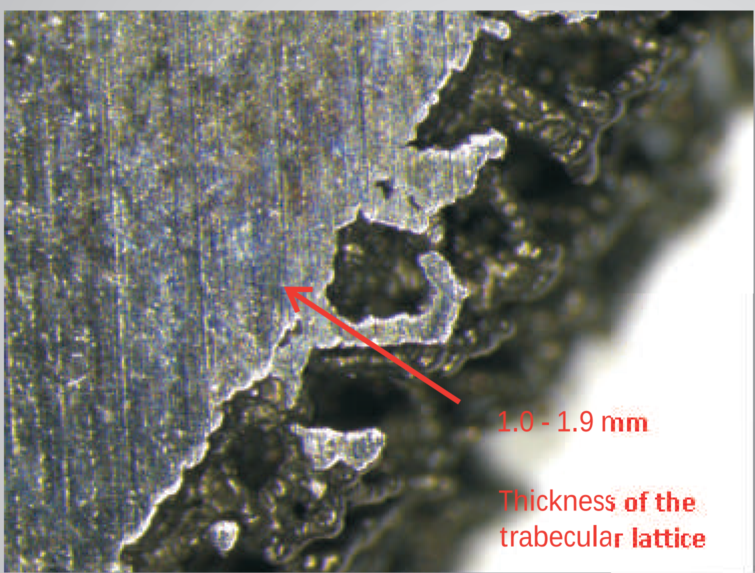
Elastic modulus [Gpa]: 1.4 [1.1-1.7]



Coefficient of friction of TRASER® lattice with cancellous bone: 2.1

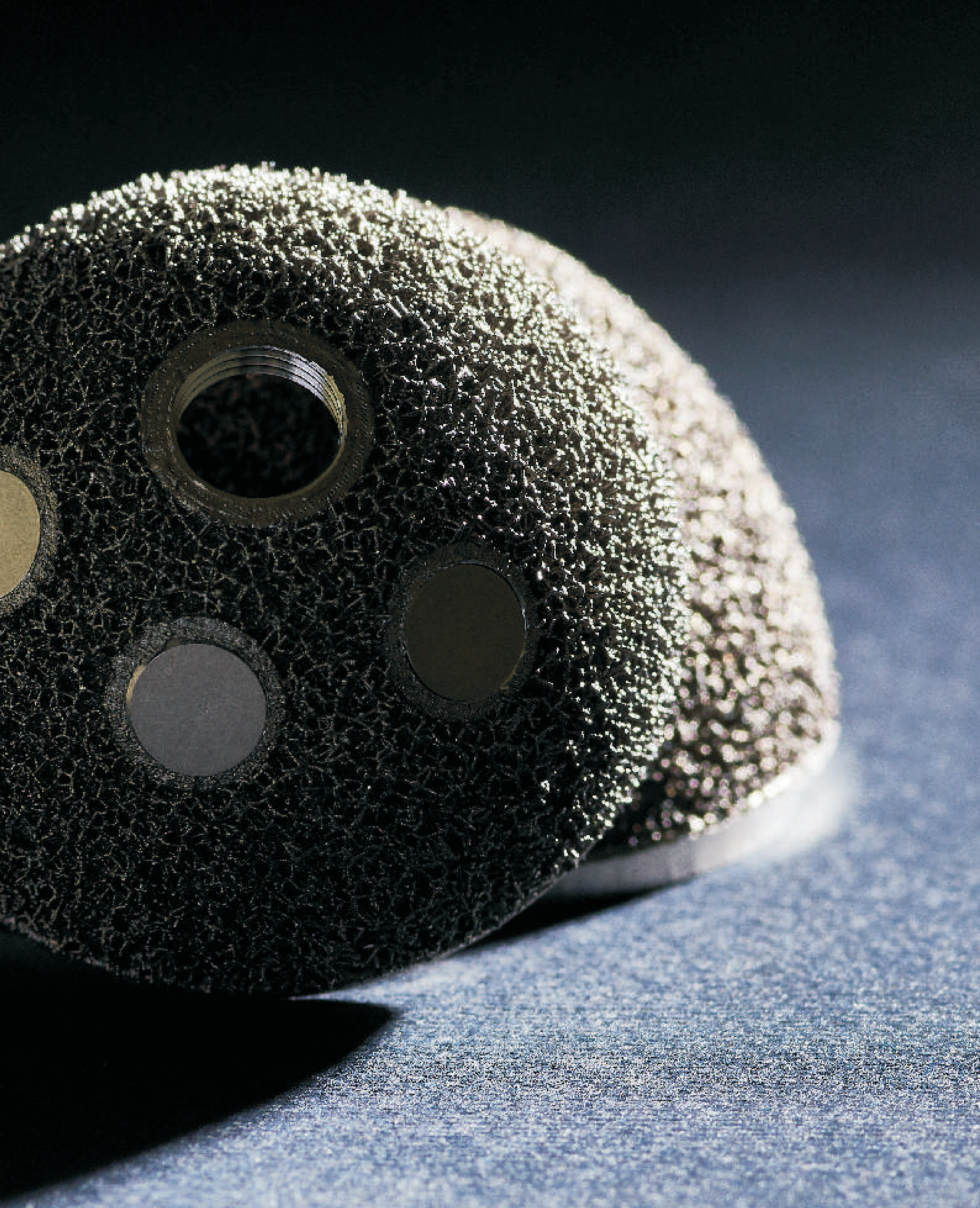


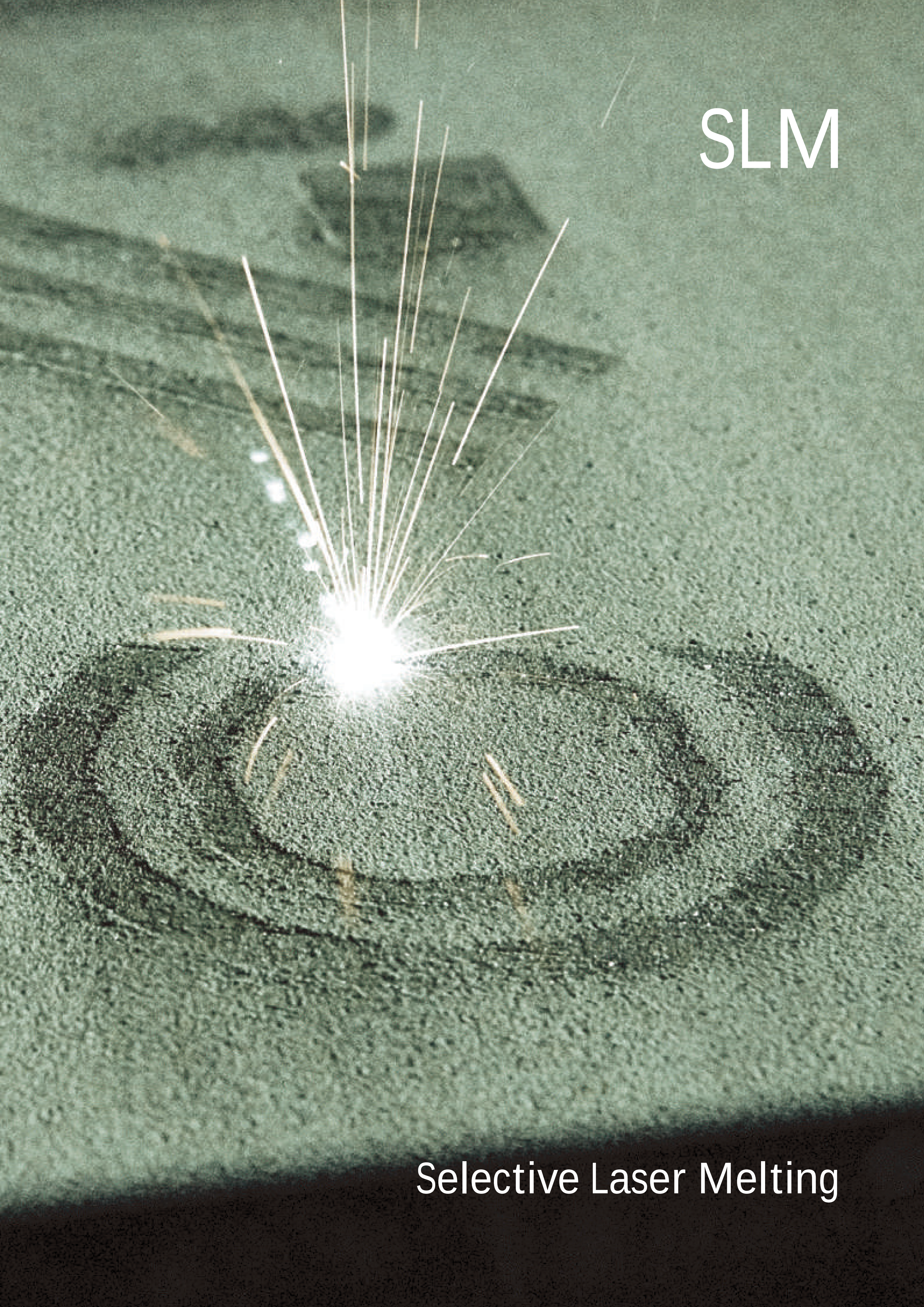
TRASER® is not a coating



Traser® is not a porous coating. The solid and the porous portions of the cup are built up in a one continuos process, thus creating a single piece without interface layers between different portions and, consequently, without shear forces.

Jump System *TRASER*® Cup





SLM

Selective Laser Melting

Additive Manufacturing

Additive manufacturing (or 3D printing) is a technology that allows to produce three-dimensional solid objects from a digital model using as a raw material metal powder.
Does not replace completely but rather complements the traditional machining processes.
The objects are created by adding the material in successive layers one over the other up to completion of the object.
This differs from traditional machining process with machine tools, in which the object is obtained by subtracting material from the raw material.

Selective Laser Melting is an additive manufacturing technology that selectively melts and sinterizes by means of the thermal energy from a laser beam specific portions of titanium powder layer to create 3D solid parts

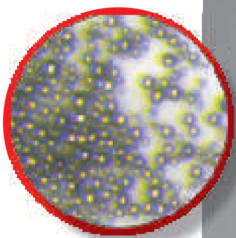
Selective Laser Melting process take place in an inert atmosphere (Argon) in order to avoid any titanium powder oxidation.

TRASER® Raw material

Titanium powder - Ti6Al4V (ISO 5832/3)

CHEMICAL ANALYSIS

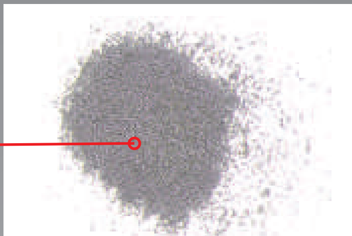
Element	Result (Wt %)
Aluminium	6.13
Carbon	0.01
Iron	0.21
Hydrogen	0.002
Nitrogen	0.034
Oxigen	0.09
Titanium	Balance
Vanadium	3.82



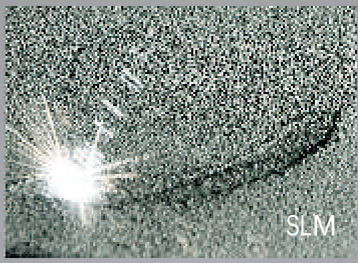
power diameter range: 16 - 76 µm

Production flow

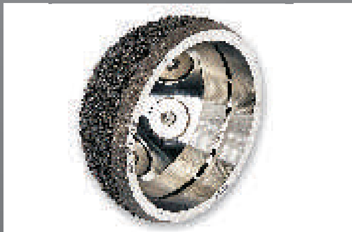
3D - CAD Model



Titanium Powder



Thermal Treatment
Sandblasting



Traditional milling and
turning processes

Customization

A clinical case with custom made components

HISTORY
During the first consultancy in November 2015 in the hospital, 32y old male patient; dwarfism; 1.08m/30 kg of bodyweight.
In the anamnesis continuous daily pain in the right hip with restricted range of movement. Important limitation in QDL (quality of daily living). Pain killers dipendent.

CLINICAL EXAM
Walk : limping right side; Duchenne/Trendelenburg negative; ROM : F/E 30-10-0, ER/IR 20-0-10, ABD/ADD 10-0-20.
Radiologically : secondary osteoarthritis of the right hip (Crowe II, Paprovsky IIb).

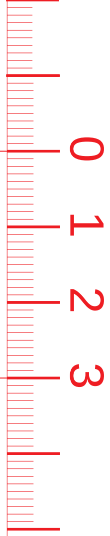
SURGERY
April 17th, 2016, total hip replacement is performed, using an allograft out of the femoral head, fixed with several screws to build up the lateral acetabular rim. Then a TRASER® Trabecular Titanium custom made cup (Permedica Orthopaedics, Merate, Italy) is inserted.
On the femoral side, a customized selective laser melted femoral stem is implanted; reposition with a metal femoral head.

The final result is stable with a perfect covering of the cup implant and central seating of the TRASER® custom made cup.

FOLLOW UP
4 months after surgery perfect walk. No crutches since the second month postoperatively; no limping.
Joint function : F/E 120-0-20, ER/IR in 90° of flexion 40-0-30. Radiologically the implant is stable; bone graft is stable, the cup is integrated.

“Freedom of design to meet patient/surgeon requirements.”

Actual Size!



Pre-Op

Post-Op

6-Months

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