METIS SUPERSCAN PM3D®

UNIQUE AND UNMATCHED

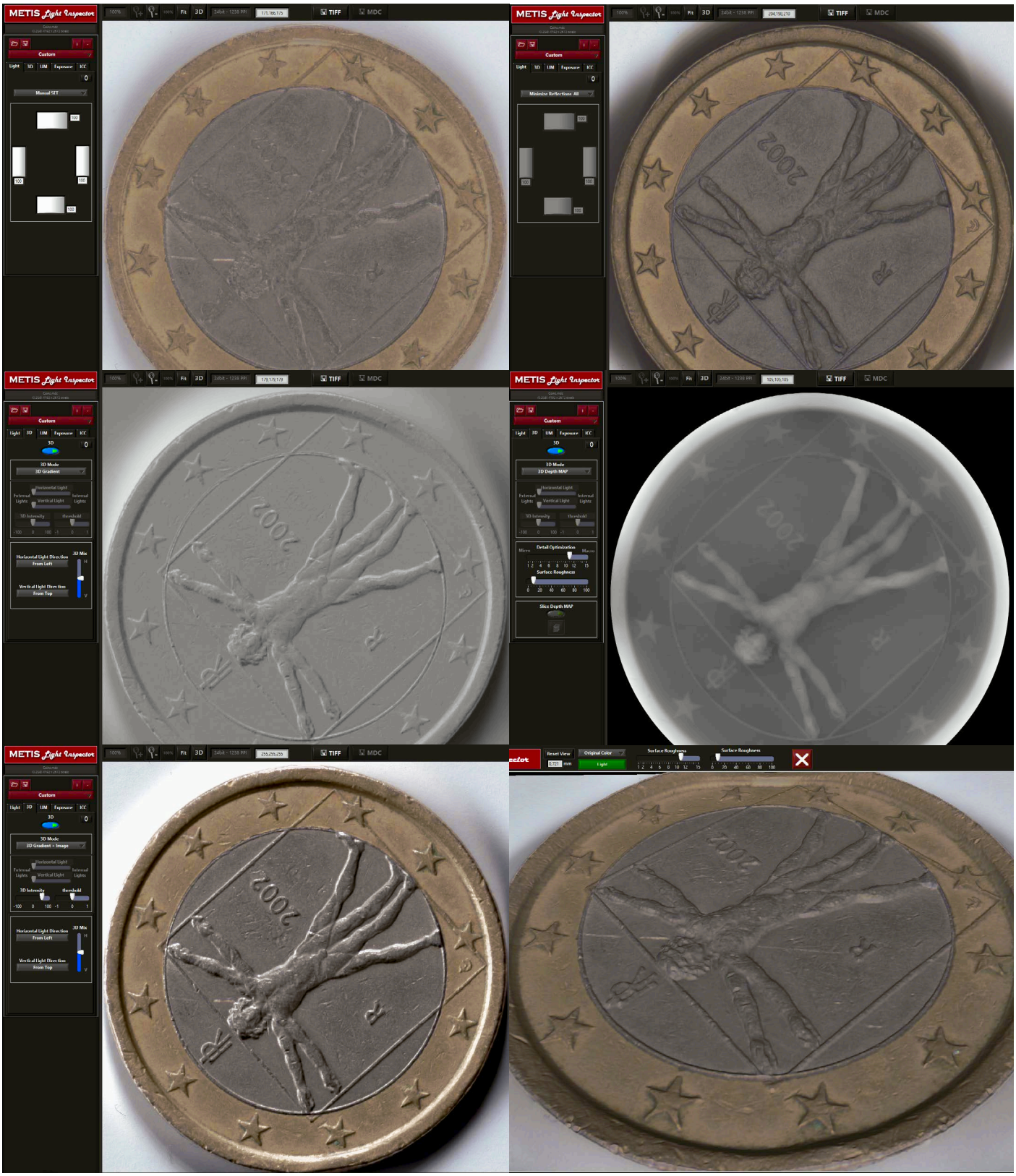
The first industrial scanner able to acquire Color and 3D surface embossing !

Based on new METIS PM3D® technology (patent protected)

METIS

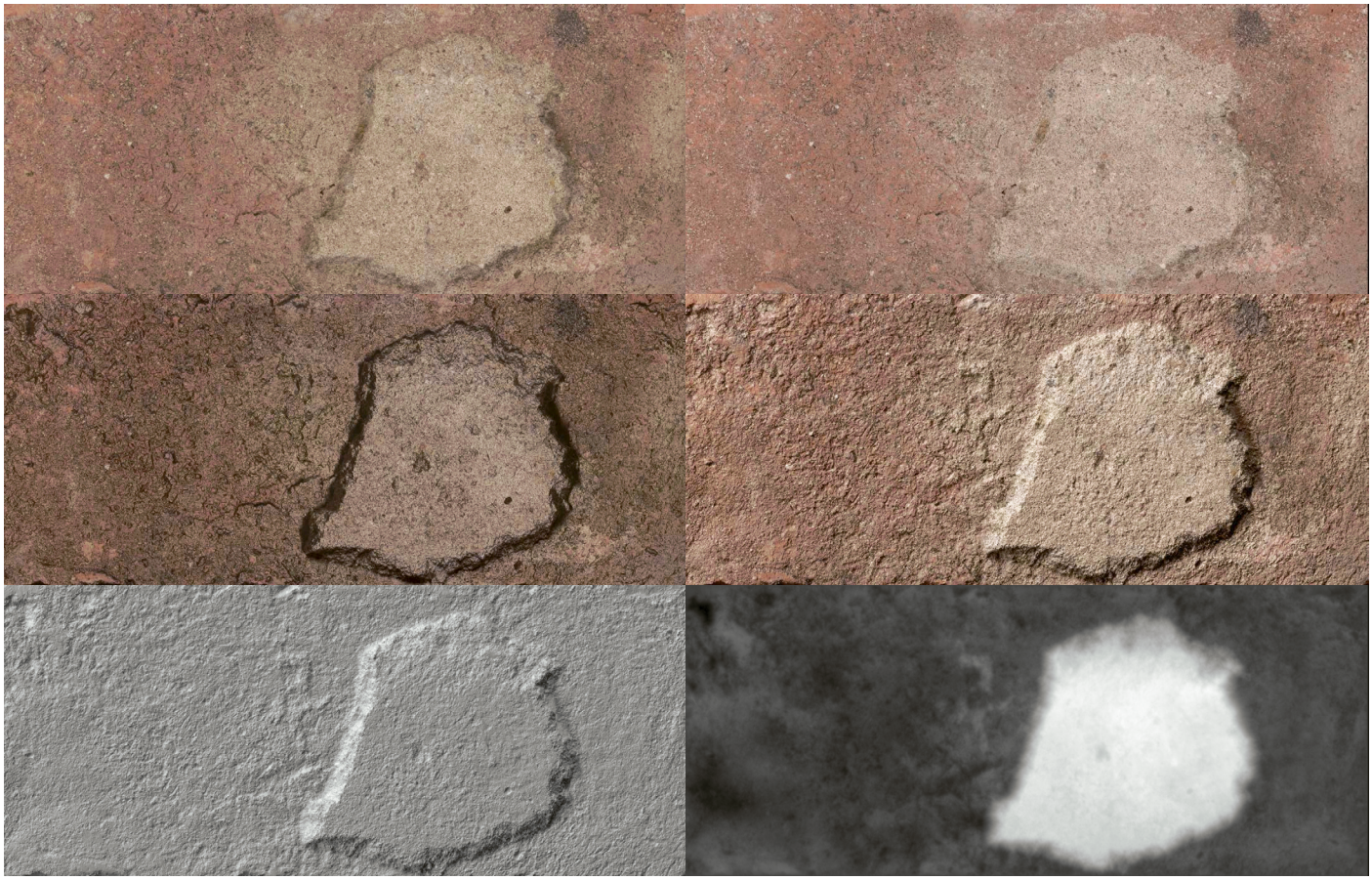
METIS SynchroLight, the PM3D® evolution

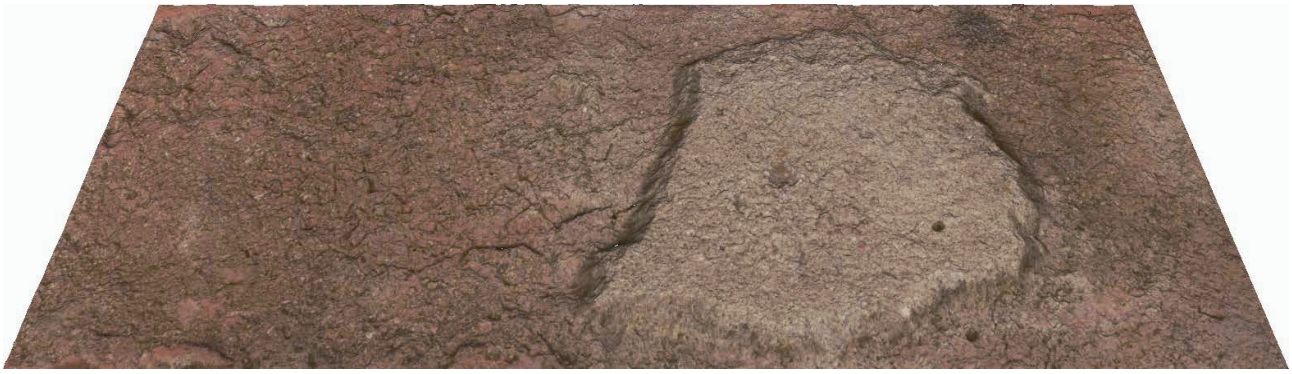
Lighting is one of the key element of the SuperScan PM3D®. Color, specular reflections, embossing effects and even 3D are all calculated from the information provided by the lighting system. And in fact since 2010 METIS filed 3 different patents mostly related to the scanner lighting. The SuperScan PM3D® integrates METIS latest SynchroLight design including innovative optical concepts, especially conceived for improving the 3D results for top industrial and decor applications. The SuperScan PM3D SynchroLight allows independently controlling up to 8 independent light sources (4 sharp and 4 soft type) from virtually any direction and intensity combination. Therefore the user can obtain thousands of different light schematic and thousands of possible results while scanning. Furthermore thanks to the METIS SuperScan, all possible light schematics are saved into a single file allowing re-processing the light at any moment or extracting 3D information.

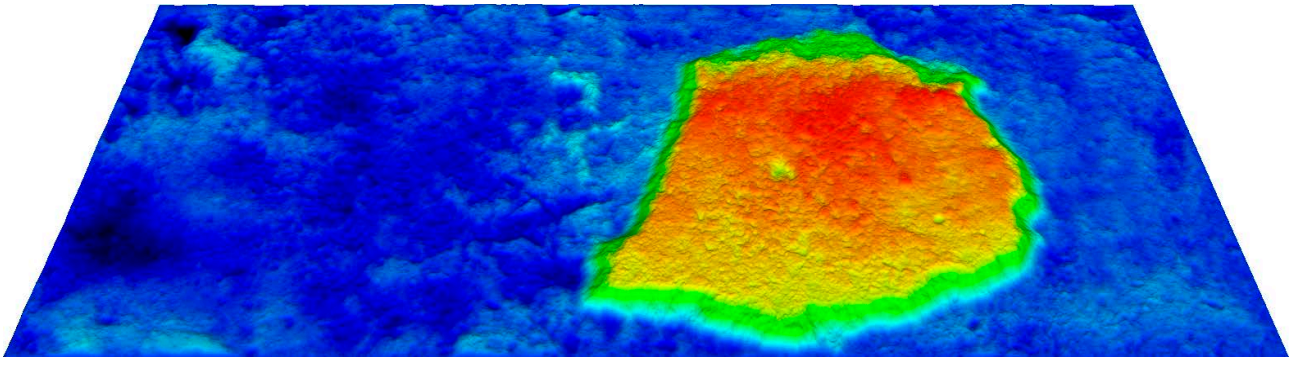


METIS SuperScan

The SuperScan is a sophisticated but completely automated acquisition mode, uniquely available in METIS scanners, which consist in scanning the original several times (from 2 to 6 passes are required depending on the original type and application). During the different SuperScan passes, light direction and intensity is finely modulated using specific irradiation schematics. The additional information provided in the SuperScan file allows: reprocessing the light schematic (changing the light direction and intensity at any time), calculating a reflectivity MAP which allows dealing with reflections and shadows in the images, extrapolating embossing information from the original surface, combining the embossing information with the color information in order to obtain results that cannot be achieved with traditional means, extrapolating 3D surface information for generating a Depth MAP that can be used for 3D printing/engraving.







Existing 3D technologies for surface/emboss scanning

Today many different technologies are available for the 3D scanning of objects but only a few can be effectively used for the 3D scanning of embossed surfaces (i.e. wood, stones, wallpapers, etc.). This is because 3D surface/emboss scanning for industrial or decorative applications require very high resolution levels (in X, Y and Z directions) and usually also a very large format that cannot be achieved using commercial 3D scanning technologies. Actually the best results are obtained using dedicated scanners based on a Laser sensor and by scanning the original one point after the other (the full scan may require hours or even days); but apart from the scanning time there are anyway limitations with those kind of 3D scanners as they usually cannot acquire color information too (only 3D), have limited depth of field and have also problem scanning glossy originals.
Attempts of building a 3D surface/emboss scanner based on the stereophotogrammetry technique (also called stereo matching) have not being succesful because of the well known limitations of this technology (limited resolution capability, inevitable stereo matching errors with lots of artifacts, inability to recognize non textured originals, etc.).
Attempts of using other 3D reconstruction techniques such as “structured light” or “focus stacking” have shown some potentiality but only on very small originals (the size of a coin) and therefore have very limited practical use in the industrial field.

METIS PhotoMetric stereo 3D (PM3D®)

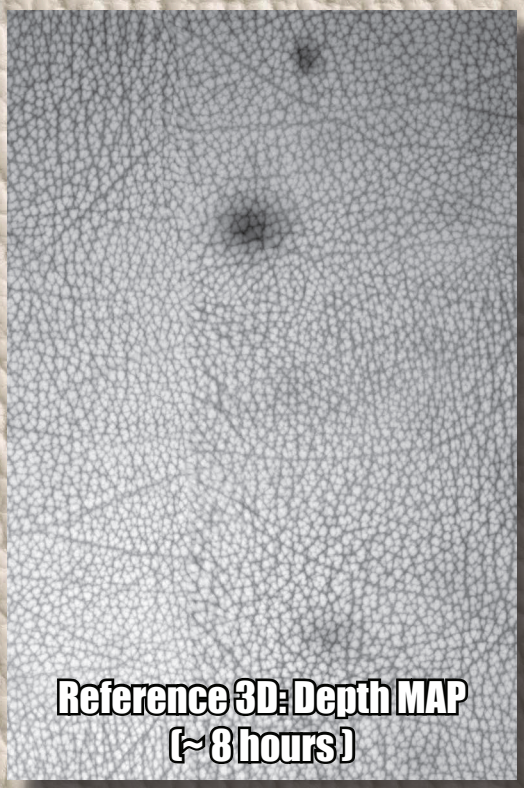
But METIS 3D is based on a completely different technology called PhotoMetric Stereo. The theory behind Photometric Stereo have been presented for the first time in the 1980, but no practical use was really possible at this time because the provided mathematical model was not adequate for dealing with real-life situation (things tend to be quite complicated in the real world). And in fact still today Photometric Stereo 3D have limited practical applications because of the very complicated math and because it poses strict design constrain and limitations that are very difficult to achieve (i.e. it requires a specific and extremely accurate control over the emitted light rays within the entire scanner optical path). But after a long development in METIS we have been capable of solving those issues by designing a special lighting system called SynchroLight DC and by writing our own algorithms to solve the PhotoMetric Stereo theoretical model (a modified model that perfectly fit our specific scanner design and therefore is also very effective). As a result, METIS is actually producing the only commercial scanners based on PhotoMetric Stereo that works !
Furthermore in the SuperScan PM3D the PhotoMetric Stereo technology (already present in the METIS DRS DCS line of scanners) have been further refined with an even more sophisticated SynchroLight lighting system and a special optical design (based on a new patent) that allows obtaining more accurate results, on larger formats and in a more automated manner.
Thanks to its unique characteristics METIS 3D provide many advantages over existing 3D laser scanners such as: color and 3D information perfectly match at the pixel level; scanning time require only a few minutes instead of hours; depth of field is much larger; can scan glossy originals; can scan very large originals (several meters long) while most laser scanner are limited to less than 1x1 meter.
And of course there are also some limitations in the METIS 3D as: optimal 3D reconstruction is achieved on continuous surfaces and a 3D absolute measurement scale cannot be provided; therefore in applications requiring to copy non-continuous surfaces and for absolute 3D measurement, laser scanners may still be required.

METIS PM3D® vs reference 3D

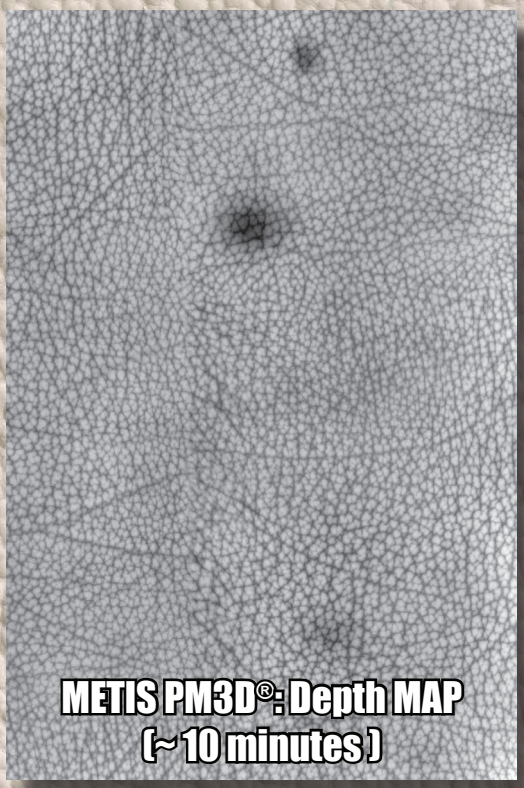
In the following pages we’ll compare the results obtained by scanning 2 originals (leather and wood) using METIS SuperScan PM3D® and a state of the art 3D scanner (based on a single-point laser sensor) We’ll use the results from the 3D scanner as a reference (ground truth) for evaluating the 3D provided by the METIS scanner *.

** METIS SuperScan PM3D also provided color information matching the 3D information in the Depth MAP while the reference 3D scanner only provided the 3D Depth MAP file.*

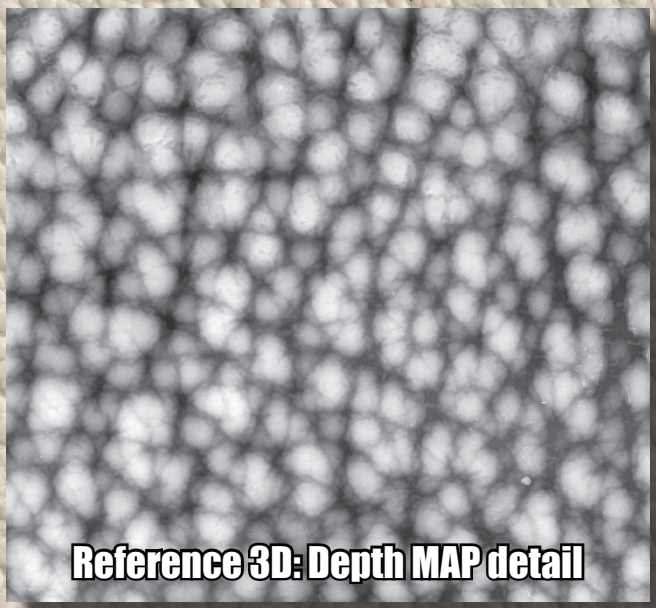
Case 1 : Leather like surface



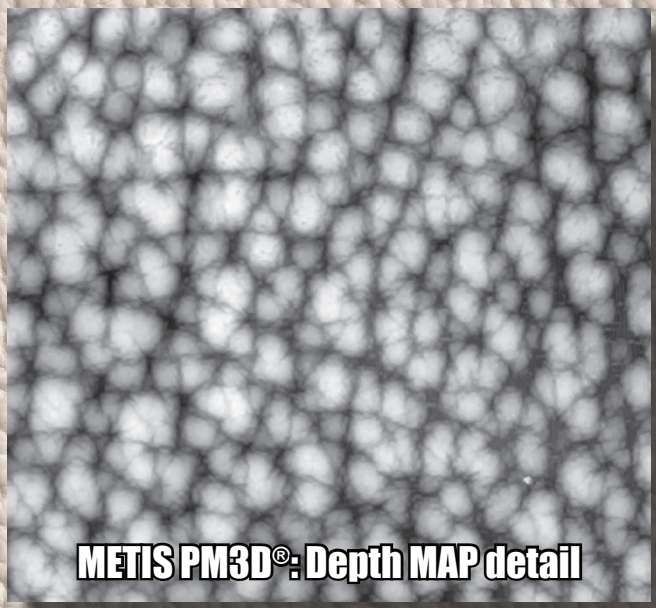
Reference 3D: Depth MAP
(~ 8 hours)



METIS PM3D®: Depth MAP
(~ 10 minutes)



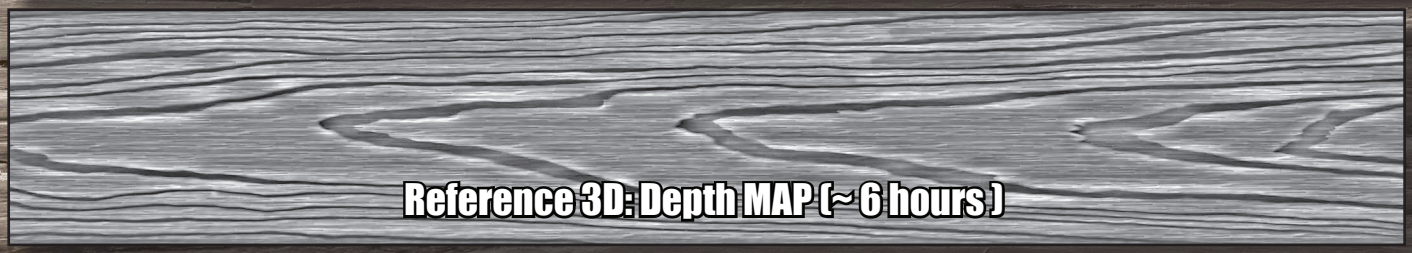
Reference 3D: Depth MAP detail



METIS PM3D®: Depth MAP detail

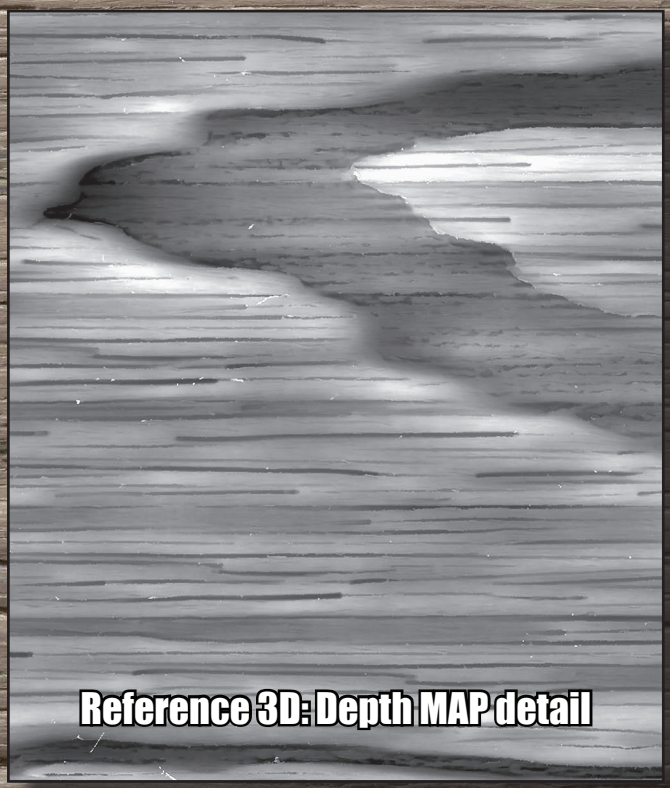
** Acquiring the leather (31x20cm at 1250PPI) with the SuperScan PM3D® required less then 10 minutes. Generating the 3D Depth MAP and the required color images requested an additional 3-4 minutes. Reference 3D scanner required about 8 hours to acquire the Depth MAP at about 1000PPI.*

Case 2 : Wood



Reference 3D: Depth MAP (~ 6 hours)

METIS PM3D®: Depth MAP (< 3 minutes)



Reference 3D: Depth MAP detail

METIS PM3D®: Depth MAP detail

** Acquiring the wood (78x13cm at 600PPI) with the SuperScan PM3D® required less then 5 minutes. Generating the 3D Depth MAP and the required color images requested an additional 2-3 minutes. Reference 3D scanner required about 6 hours to acquire the Depth MAP at about 600PPI.*

About METIS

In METIS we continue a family tradition of industrial designers that started almost 1 century ago. This translates into high engineered and innovative products with unique characteristics and performances always at the top respect to current technology.

1965 — Start operating in the photographic domain for industrial and scientific applications

1975 — Start operating in the digital imaging domain for "remote sensing" applications from Landsat satellites (NASA/Telespazio)

1978 — First system for the "high geometrical accuracy" restitution of satellite imagery

1990 — First commercial applications of digital imaging systems for the private sector and cultural heritage

1998 — First "SynchroLight" application

2000 — First DMC (3.3 GigaPixel digital camera) based on patented technology

2002 — First DRS 2A0 large format scanner and DRC digital camera

2004 — First DRS A1+ for books & maps

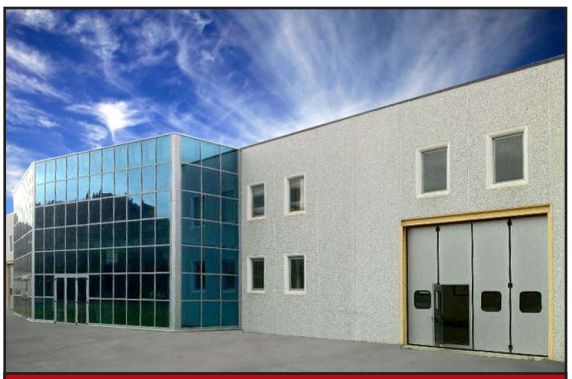
2006 — First DRS 5070 for antique/fragile originals integrating a sophisticated electronic book cradle integrating with pressure sensors

2010 — DCS Patent (DC SynchroLight)

DRS 1300 DCS, DRS 750 DCS, DRS 2000 DCS; DMS (Multi-Spectral scanner); EDS Alpha; EDS Gamma; Light Inspector Software, Color Profiler Software, etc.

2014 — First SuperScan PM3D® (Color+3D)

2015 — New Scan Director software
New 3D Light Inspector software
New Merge & Combine Tools



New factory (January 2016)

In METIS we are already thinking to the future and developing new technologies that will be implemented in the next generation scanner, digital camera, lighting and software

METIS SUPERSCAN PM3D®

The SUPERSCAN PM3D® is based on new scanning concepts invented by METIS and aimed to respond to the special needs of the fine-art, industrial and decoration markets. The SUPERSCAN PM3D® in fact integrate innovative technologies (patent protected) that allows to scan color and calculate 3D surface embossing information from it, and at very high resolution even on large originals.
The scanner extends the lighting and Superscan capabilities of the Metis DRS-DCS series providing the ability to enlighten the original with 8 different and independent light sources, each aimed to a specific result. In particular the SUPERSCAN PM3D® can enlighten the original with sharp or soft light sources from virtually any direction including also the possibility to control specular reflections (i.e. for gold/ glossy materials). Thousands of different light schematics are possible and achieved automatically through sophisticated software and hardware controls.
Furthermore, the new SUPERSCAN PM3D® now allows to scan a wood plate orientated in any direction on the scanning table thanks to the new lighting system.
3D emboss scanning (depth MAP generation) is calculated based on the information provided by the different lightings and using unique algorithms developed by METIS that allows a dense and detailed 3D reconstruction of the original surface. Different kinds of embossed surfaces can be scanned with optimal results (wood, wallpapers, tiles, stones, etc.) and even glossy materials.
The SUPERSCAN PM3D® is the first scanner to breach the resolution limits caused by the number of pixels in the imaging sensors thanks to an innovative optomechanical design that allows a native optical resolution of 1200PPI on the full scanning area (200x130cm). And thanks to the Scan Merge tool scanning very large originals (exceeding the scanning area) is now also possible with perfect results.
The SUPERSCAN PM3D® adopt the new METIS Scan Director software that have been designed especially to fulfill the requirements of the industrial, fine-arts and decorative markets and for handling 3D data.

SUPERSCAN PM3D® main features and specifications

- Maximum scan format: 200x130cm (extend to larger size thanks to the Scan Merge tool that allows perfectly and automatically stitching different scans)
- Maximum thickness: ~10cm
- Optical Resolution: 1200PPI (adjustable from 100 to 3600 PPI)
- Image sensor: Tri-linear - High Dynamic Range
- Scanning technology: X,Y microscanning
- Scanning modes: scan, Superscan, direct Superscan
- Auto-focus positioning (table height automatically adjust based on original thickness set in the scanning software)
- Lighting spec: 8 light sources (4 sharp and 4 soft) that can be dimmed independently and combined into thousands of different light schematics; sophisticated cooling and temperature monitoring allows constant light emissions during time and always perfect results
- Light source Type: High CRI LEDs (typical 92), IR/UV free
- Scanning Time (i.e. 200x50cm at 400PPI) : ~5 min. for a normal scan and ~20 min. for a Superscan with 3D
- 16bit per channel (3x16bit) image processing
- METIS software run natively at 64bit on Windows 10 Professional 64bit
- Perfect colorimetric results with full ICC support
- Integrate METIS Scan Director software for controlling the scanner and acquisition process (see Scan Director documentation for further details)
- Integrate METIS 3D Light Inspector software for editing Superscan file and for 3D Depth MAP generation (see Light Inspector documentation for further details)
- Holding Table: 230x140cm, can hold up to 200Kg, vertically motorized (software controlled), integrate pressure sensors
- METIS Vacuum Table is also available optionally
- High grade precision/reliable mechanic and optics
- Sizes: 333cm width, 227cm depth, 170cm height
- Weight: ~1.800 Kg

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