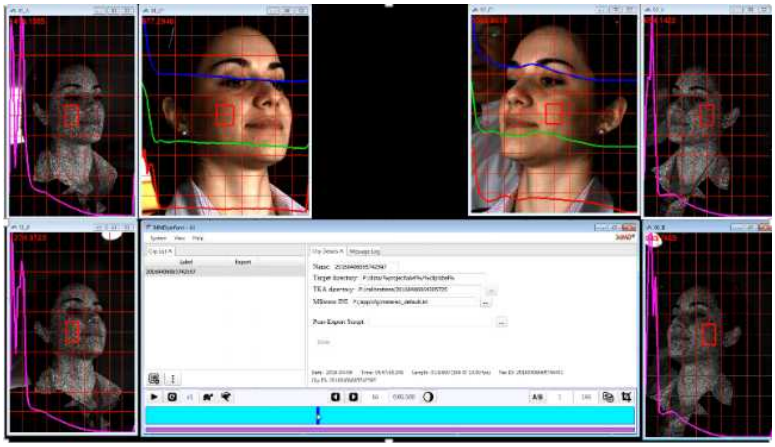
# 3dMD System & Software

# Product Specification Information

**System Model: Temporal 3dMDface.t System**
(single 3D capture to 10 colour 3dMD frames per second)

*Customer: Universitätsklinikum Freiburg, Germany*

**STANDARD CONFIGURATION**

| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. The system is also capable of capturing up to 10 3D fps without colour texture information, which is optimum for STL image analysis supported by a number of third-party software packages. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate facial expressions prior to 3D rendering. Only process the optimal image results. |
| Subject capture: | Generates a series of 190-degree facial models over a period of time. Captures facial expression, function, and smile, and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with two modular units of six machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.2mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal clinical and lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

**CAPTURES AT 10 3D FRAMES PER SECOND.**

# Product Specification Information

**System Model: Ultra-fast Temporal 3dMDface.u System (60fps)**

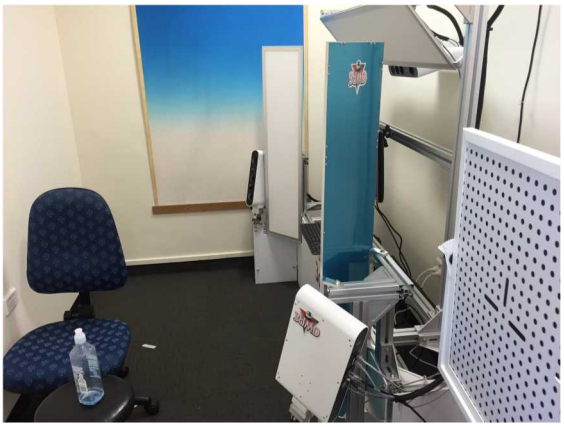
| | |
|---|---|
| Temporal-3D Capture: | 60 3dMD frames per second at highest resolution |
| Subject capture: | Generates a series of 180-degree facial models over a period of time. Captures facial expressions, functions, speech and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with two modular units of six machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.2mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Scalable: | Capture volumes from 1-25 3D camera viewpoints |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Rendering: | Server-based multiprocessor rendering |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

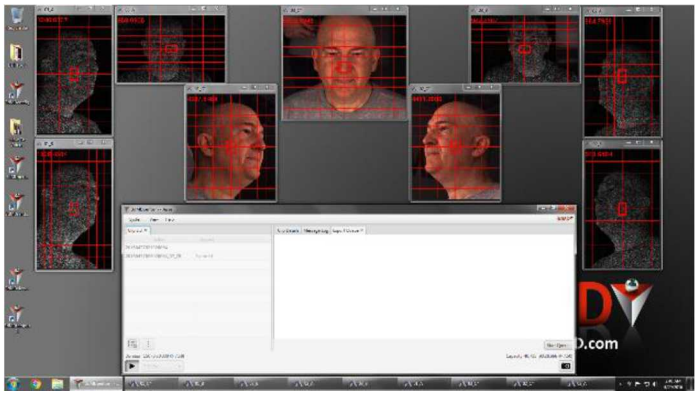
**Reference Papers**


- Statistical modelling of lip movement in the clinical context, H. Popat, A. I. Zhurov, A. M. Toma, S. Richmond, D. Marshall, P. L. Rosin. Orthodontics & Craniofacial Research, Volume 15, Issue 2, pages 92–102, May 2012.
- Efficient Groupwise Non-rigid Registration of Textured Surfaces, Kirill Sidorov, Stephen Richmond and David Marshall. Proceedings of the International Conference on Computer Vision and Pattern Recognition (CVPR) 2011, Colorado Springs, USA, June 21-23, 2011, pp 2401-2408.
- Assessing the Uniqueness and Permanence of Facial Actions for Use in Biometric Applications, L. Benedikt, D. Cosker, P.L. Rosin, D. Marshall. IEEE Transactions on Systems, Man and Cybernetics, Part A, vol. 40, no. 3, pp. 449-460, 2010.
- Quantitative analysis of facial movement—A review of three-dimensional imaging techniques, H Popat, S Richmond, L Benedikt, D Marshall, PL Rosin. Computerized Medical Imaging and Graphics, Volume 33, Issue 5, Pages 377-383, July 2009.
- Three-dimensional motion analysis – an exploratory study. Part 1: Assessment of facial movement, H Popat, S Richmond, R Playle, D Marshall, PL Rosin and D Cosker, University Dental Hospital, Cardiff UK and Cardiff University. Orthodontics & Craniofacial Research, Volume 11 Issue 4, Pages 216–223, November 2008.
- Three-dimensional motion analysis - an exploratory study. Part 2: reproducibility of facial movement, Popat H, Richmond S, Playle R, Marshall D, Rosin P, Cosker D., Department of Dental Health and Biological Sciences, University Dental Hospital, Cardiff, UK. Orthodontics & Craniofacial Research, Volume 11 Issue 4, Pages 224–8, November 2008.

# Product Specification Information

**System Model: Temporal 3dMDtrio.t System**
(single 3D capture to 10 colour 3dMD frames per second)





*Customer: University of Otago, New Zealand*

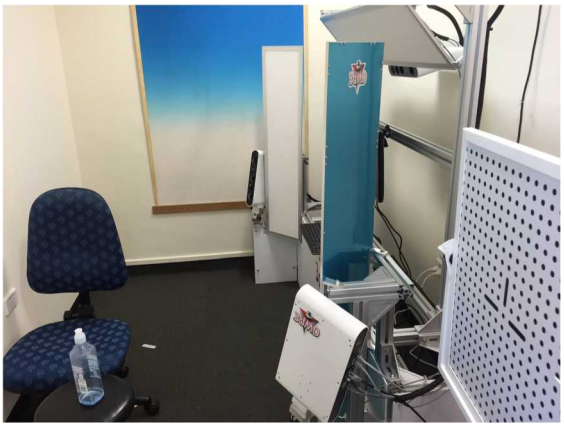
**STANDARD CONFIGURATION**

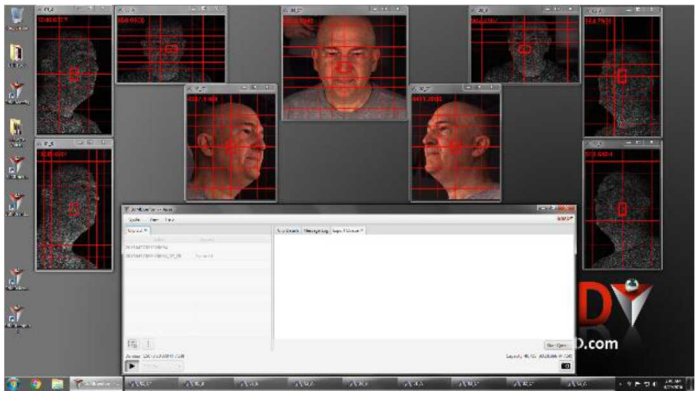
| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. The system is also capable of capturing up to 10 3D fps without colour texture information, which is optimum for STL image analysis supported by a number of third-party software packages. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate facial expressions prior to 3D processing. Only process the optimum results. |
| Subject capture: | Generates a series of 200-degree facial models over a period of time. Captures facial expression, function, and smile, and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with three modular units of nine machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.2mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal clinical and lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

**The benefit of the 3dMDtrio option is that the subject has more space within the capture area so the positioning protocols do not have to be so rigid. It also provides more ear detail from side to side. A static-3D version of the 3dMDtrio.t System was used in The Science Museum London for the "Me in 3D" project where the team captured more than 12,000 subjects within a 3-month period.*

# Product Specification Information

**System Model: Ultra-fast Temporal 3dMDtrio.u System**
(single 3D capture to 60 colour 3dMD frames per second)





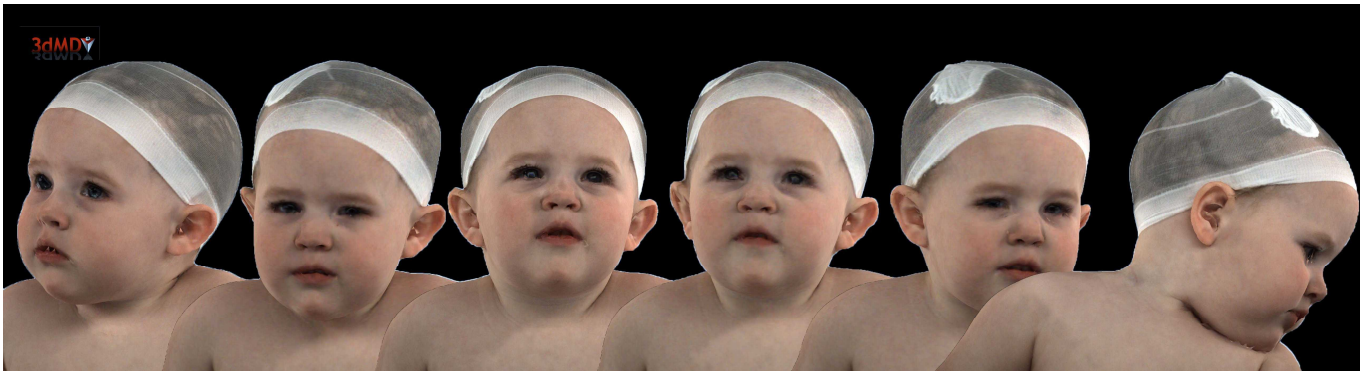
**STANDARD CONFIGURATION**

| | |
|---|---|
| Temporal-3D Capture: | 60 3dMD frames per second at highest resolution |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate facial expressions prior to 3D processing. Only process the optimum results. |
| Subject capture: | Generates a series of 200-degree facial models over a period of time. Captures facial expressions, functions, speech and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with three modular units of nine machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.2mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Scalable: | Capture volumes from 1-25 3D camera viewpoints |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Rendering: | Server-based multiprocessor rendering |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

**The benefit of the 3dMDtrio option is that the subject has more space within the capture area so the positioning protocols do not have to be so rigid. It also provides more ear detail from side to side. A static-3D version of the 3dMDtrio.u System was used in The Science Museum London for the "Me in 3D" project where the team captured more than 12,000 subjects within a 3-month period.*

# Product Specification Information

**System Model: Temporal 3dMDhead.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**

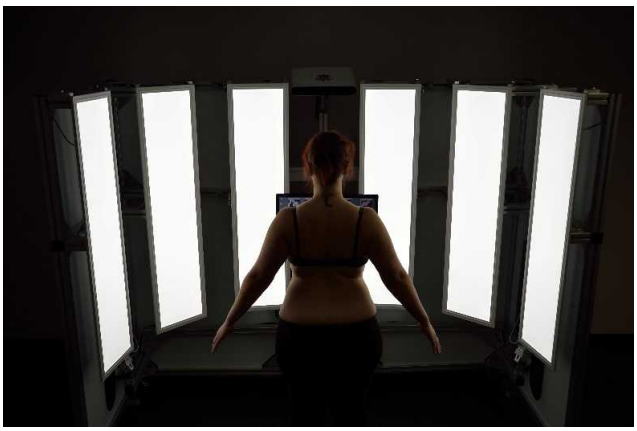


| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. The system is also capable of capturing up to 10 3D fps without colour texture information, which is optimum for STL image analysis supported by a number of third-party software packages. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate facial expressions prior to 3D processing. Only process the optimum results. |
| Subject capture: | Generates a series of 360-degree head models over a period of time. Captures facial expression, function, and smile, and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with five camera modular units of 15 machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.2mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal clinical and lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

*Customer: Chelsea & Westminster Hospital, London*

# Product Specification Information

**System Model: Temporal 3dMDtorso.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**

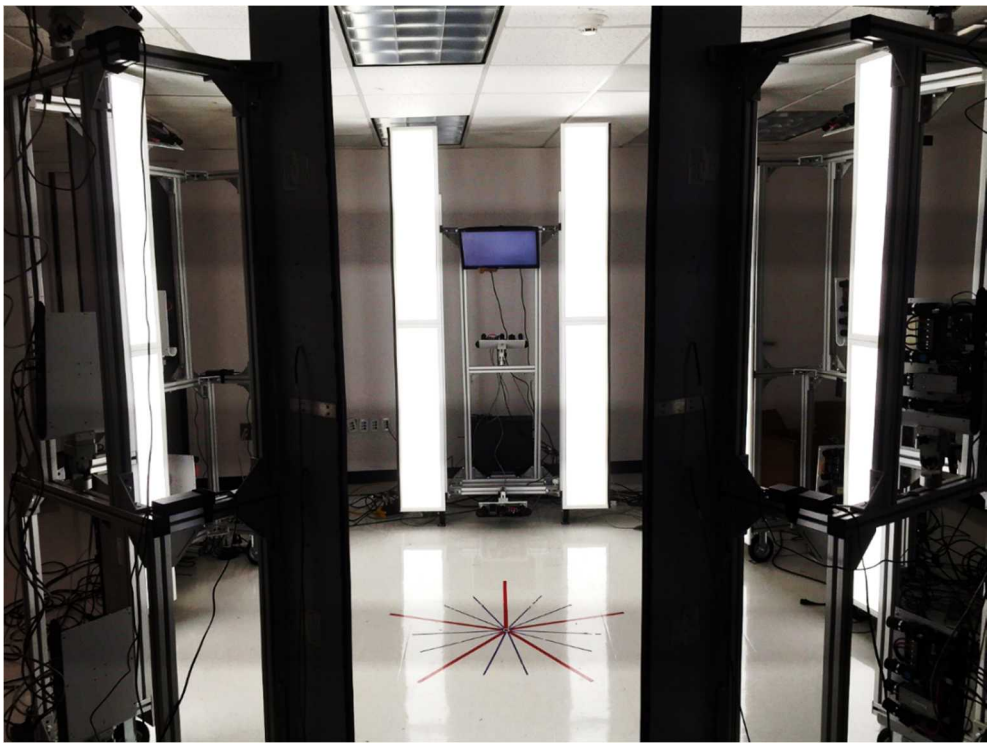


*Customer: Belfast City Hospital, UK*

| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. The system is also capable of capturing up to 10 3D fps without colour texture information, which is optimum for STL image analysis supported by a number of third-party software packages. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate pose or posture prior to 3D rendering. Only process the optimum results. |
| Subject capture: | Generates a series of 190-degree torso models over a period of time. Captures movement, breast dynamics, posture, pose, and freezes actual 3D instances of time for further analysis. |
| Configuration: | Optics-based system with four camera modular units of 12 machine vision cameras synchronized with a LED lighting system. |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of <0.5mm RMS or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal clinical and lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

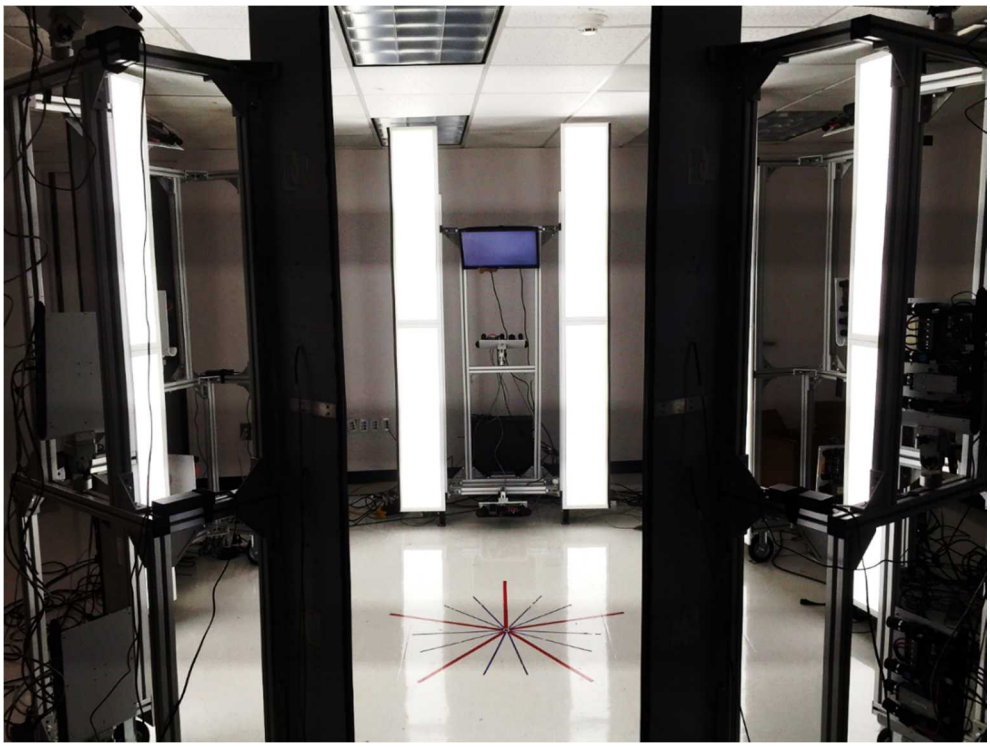
**System Model: Temporal 3dMDbody10.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**



| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate posture and pose prior to 3D rendering. Only process the optimum results. |
| Subject capture: | Generates a series of 360-degree body models over a period of time. Captures posture, function, pose, etc., and freezes actual 3D instances of time for further analysis. |
| Configuration: | **Optics-based system with 10 modular units of 30 machine vision cameras synchronized with a LED lighting system. *This configuration captures the standard A-pose*.** |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.6mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

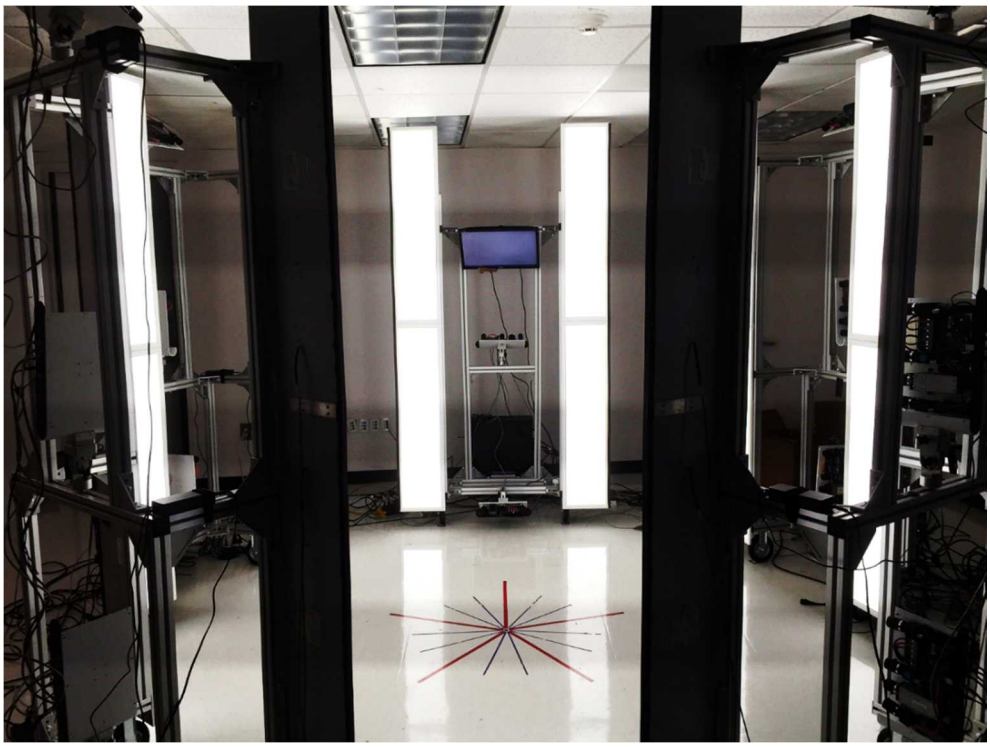
**System Model: Temporal 3dMDbody14.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**



| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate posture and pose prior to 3D rendering. Only process the optimum results. |
| Subject capture: | Generates a series of 360-degree body models over a period of time. Captures posture, function, pose, etc., and freezes actual 3D instances of time for further analysis. |
| Configuration: | **Optics-based system with 14 modular units of 42 machine vision cameras synchronized with a LED lighting system.** |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.6mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

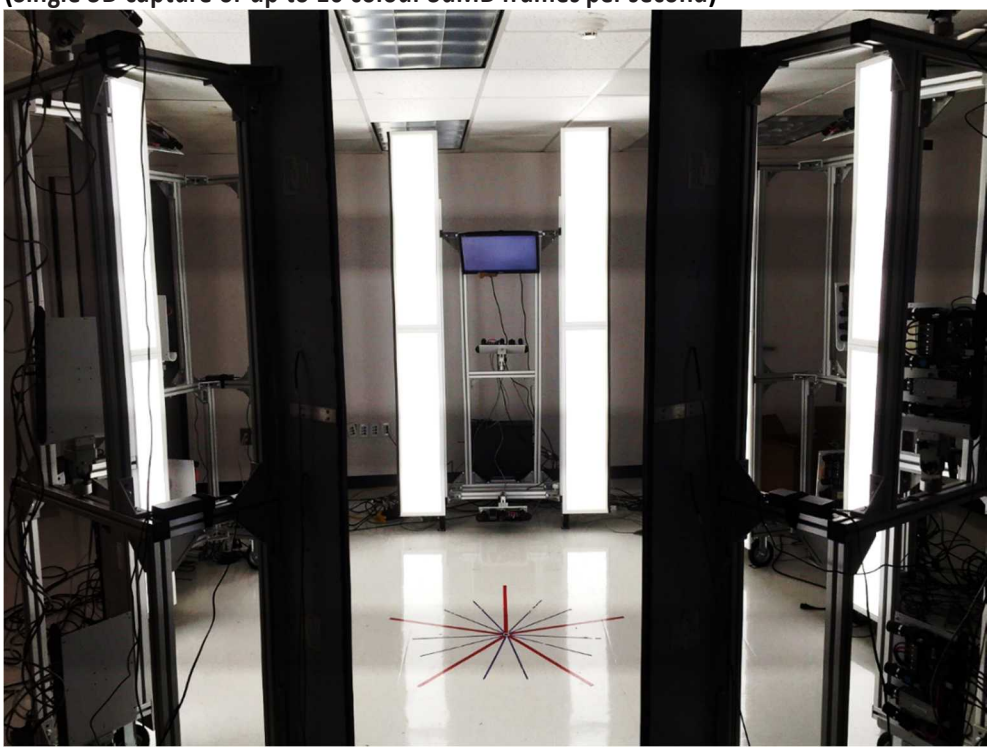
**System Model: Temporal 3dMDbody18.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**



| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate posture and pose prior to 3D rendering. Only process the optimum results. |
| Subject capture: | Generates a series of 360-degree body models over a period of time. Captures posture, function, pose, etc., and freezes actual 3D instances of time for further analysis. |
| Configuration: | **Optics-based system with 18 modular units of 54 machine vision cameras synchronized with a LED lighting system.** |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.6mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

**System Model: Temporal 3dMDbody22.t System**
**(Single 3D capture or up to 10 colour 3dMD frames per second)**



| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 10 colour 3dMD frames per second at highest resolution. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate posture and pose prior to 3D rendering. Only process the optimum results. |
| Subject capture: | Generates a series of 360-degree body models over a period of time. Captures posture, function, pose, etc., and freezes actual 3D instances of time for further analysis. |
| Configuration: | **Optics-based system with 22 modular units of 66 machine vision cameras synchronized with a LED lighting system.** |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.6mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

**System Model: Ultra-Fast Temporal 3dMDbody22.u System (60 3D fps)**


Web link for Max Planck project: [http://ps.is.tuebingen.mpg.de/dynamic_capture](http://ps.is.tuebingen.mpg.de/dynamic_capture)

| | |
|---|---|
| Temporal-3D Capture: | Single 3D capture or up to 60 colour 3dMD frames per second at highest resolution. |
| Temporal Selection: | Enables the operator to select the best positioned images of the subject with the most appropriate posture and pose prior to 3D rendering. Only process the optimum results. |
| Subject Capture: | Generates a series of 360-degree body models over a period of time. Captures posture, function, pose, etc., and freezes actual 3D instances of time for further analysis. |
| Configuration: | **Optics-based system with twenty-two (22) modular units of 66 machine vision cameras synchronized with a LED lighting system.** |
| Automated Mesh Generation: | Automatic generation of a 3dMD model from all viewpoints per frame (no manual stitching or registration) |
| Geometry (3D frame) | One continuous point cloud or textured mesh per frame |
| Geometry Accuracy: | High-precision dense surface with a linear accuracy range of 0.75mm or better (same level of frame-by-frame accuracy as 3dMD static capture) |
| Lighting: | Safe and comfortable subject illumination even during prolonged sessions (100% LED lighting) |
| Precision: | Temporal precision with no 3D jitter on playback |
| Colour: | High-quality texture maps that exceed full-HD densities |
| Environment: | Utilized in normal lab/studio environments |
| Integrity: | Data point reliability algorithm with user-defined options for addressing artefacts |

# Product Specification Information

## 3dMDvultus Software

**Basic 3dMDanalysis Platform**

- Advanced landmarking, measurement, & analysis systems
- Surface/caliper distance and surface area measurement
- Advanced volume calculations
- Angle, proportion, and circumference measurement
- Symmetry assessment
- Automated surface registration for 3D image comparison
- Proven support for 3D printing
- Automatic generation of standard sets of 2D profiles
- 3D file export formats: .obj, .stl, .dxf, .wrl, .raw (x,y,z, ASCII)
- Automated 3D model animation