CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

3D Engineering Solutions, LLC
10597 Chester Road
Cincinnati, OH 45215

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

DIMENSIONAL MEASUREMENT and **CALIBRATION**

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 24 September 2021
Certificate Number: L2186

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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DIMENSIONAL MEASUREMENT & CALIBRATION

Valid to: **September 24, 2021** Certificate Number: **L2186**

DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Dimensional Measurement 1D [1]	(0 to 152) mm	(35) µm	Caliper utilized as a Reference Standard for Dimensional Inspection
	(0 to 305) mm	(58) µm	Caliper utilized as a Reference Standard for Dimensional Inspection
	(0 to 25) mm	(5.6) µm	Outside Micrometer utilized as a Reference Standard for Dimensional Inspection
	(25 to 51) mm	(6.4) µm	
	(51 to 102) mm	(44) µm	
	(0 to 152) mm	(47) µm	Depth Micrometer utilized as a Reference Standard for Dimensional Inspection
	(0 to 609) mm	(3 + 0.04*L*) µm	Height Gage

2 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Dimensional Measurement 2D	800 mm x 600 mm	(30 + 0.11*L*) µm	Zeiss O-Inspect; 0.5X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(26.4 + 0.10*L*) µm	Zeiss O-Inspect; 0.56X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(23 + 0.09*L*) µm	Zeiss O-Inspect; 0.65X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(19 + 0.07*L*) µm	Zeiss O-Inspect; 0.76X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(15.6 + 0.07*L*) µm	Zeiss O-Inspect; 0.93X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(12 + 0.06*L*) µm	Zeiss O-Inspect; 1.18X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(8.4 + 0.05*L*) µm	Zeiss O-Inspect; 1.61X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(6 + 0.04*L*) µm	Zeiss O-Inspect; 2.14X Magnification Camera utilized as a Reference Standard for Dimensional Inspection

2 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
	800 mm x 600 mm	(3.5 + 0.04*L*) µm	Zeiss O-Inspect; 3.2X Magnification Camera utilized as a Reference Standard for Dimensional Inspection
	800 mm x 600 mm	(1.3 + 0.04*L*) µm	Zeiss O-Inspect; 6.3X Magnification Camera utilized as a Reference Standard for Dimensional Inspection

3 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Dimensional Measurement 3D	(0 to 2.4) m	(51 + 0.01*L*) µm	8'/9' Faro Arm utilized as a Reference Standard for Dimensional Inspection[1]
	(0 to 2.4) m	(89 + 0.01*L*) µm	8'/9' Faro Arm with Laser Line Probe utilized as a Reference Standard for Dimensional Inspection[1]
	(0 to 2.4) m	(62 + 0.03*L*) µm	9' Faro Arm with HD Laser Line Probe utilized as a Reference Standard for Dimensional Inspection[1]
	(0 to 3.7) m	(75 + 0.03*L*) µm	12' Faro Arm utilized as a Reference Standard for Dimensional Inspection[1]
	(0 to 3.7) m	(93 + 0.15*L*) µm	12' Faro Arm with V4 Laser Line Probe utilized as a Reference Standard for Dimensional Inspection[1]
	(0 to 3.7) m	(98 + 0.04*L*) µm	12' Faro Arm with HD Laser Line Probe utilized as a Reference Standard for Dimensional Inspection[1]

3 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Dimensional Measurement 3D	(800 x 600 x300) mm^3	(1.7 + 0.04*L*) µm	Zeiss O-Inspect; VAST XXT Scanning Probe utilized as a Reference Standard for Dimensional Inspection
	(800 x 600 x300) mm^3	(2.21 + 0.04*L*) µm	Zeiss O-Inspect; Confocal White Light Distance Sensor utilized as a Reference Standard for Dimensional Inspection
	(45 x 38 x 30) mm^3	(10+.02*L*) µm	Zeiss L3D 5M 45mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(118 x 98 x 60) mm^3	(12.1+.01*L*) µm	Zeiss L3D 5M 100mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(255 x 211 x 140) mm^3	(24+.02*L*) µm	Zeiss L3D 5M 250mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(481 x 404 x 250) mm^3	(45.3+.08*L*) µm	Zeiss L3D 5M 500mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(80 x 60 x 40) mm^3	(8 + 0.05*L*) µm	Zeiss L3D 8M 75mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(140 x 105 x 80) mm^3	(11 + 0.04*L*) µm	Zeiss L3D 8M 150mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(325 x 240 x 200) mm^3	(13 + 0.09*L*) µm	Zeiss L3D 8M 300mm Lens Volume utilized as a Reference Standard for Dimensional Inspection

3 Dimensional

Parameter	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Dimensional Measurement 3D	(565 x 425 x 350) mm	(50 + 0.04*L*) µm	Zeiss L3D 8M 600mm Lens Volume utilized as a Reference Standard for Dimensional Inspection
	(2.5 x 2 x 1) m	(14 + 0.024*L*) µm	DEA Gantry 252010 CMM
	(Ø250 mm x 450 mm)	(8 + 0.29*L*) µm	Nikon/X-Tek 225kV MCT CT Scanner

CALIBRATION

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)[2]	Reference Standard, Method, and/or Equipment
Length & Diameter 1D – Fixtures, Functional Gauges	Up to 609 mm	(3 + 0.04*L*) µm	Height Gage
	Up to 25.4 mm	(5.6) µm	Outside Micrometer
	Up to 51 mm	(6.4) µm	Outside Micrometer

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)[2]	Reference Standard, Method, and/or Equipment
Length 2D - Fixtures, Functional Gauges	Up to 2.4m	(51 + 0.01*L*) µm	Faro Arm[1]
	Up to 3.7m	(75 + 0.03*L*) µm	Faro Arm[1]
	Up to 0.8m	(1.3 + 0.04*L*) µm	Zeiss O-Inspect; Discovery V12 Camera
	Up to 0.8m	(2.21 + 0.04*L*) µm	Zeiss O-Inspect; Confocal White Light Distance Sensor
	Up to 0.8m	(1.7 + 0.04*L*) µm	Zeiss O-Inspect; VAST XXT Scanning Probe
	Up to 2.5m	(14 + 0.024*L*) µm	DEA Gantry 252010 CMM
Length 3D - Fixtures, Functional Gauges	Up to 2.4m Up to 3.7m	(51 + 0.01*L*) µm (75 + 0.03*L*) µm	Faro Arm[1]
	(800 x 600 x 300) mm	(1.7 + 0.04*L*) µm	Zeiss O-Inspect; VAST XXT Scanning Probe
	(2.5 x 2 x 1) m	(14 + 0.024*L*) µm	DEA Gantry 252010 CMM

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = Length in millimeters.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L2186.

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