

Appendix D: 3D scanning systems

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The following table lists 3D scanning and digitizing (CMM, touch probe, and other) systems from around the world. This table is exclusive to the readers of *Wohlers Report 2020* and is not published elsewhere. All company information and product specification data are subject to change. Please refer to the company websites for additional information. The company websites were live as of February 2020.

The following abbreviations are used in the table.

acc	accuracy	h	height	obj	object
acq	acquisition	horiz	horizontal	ppm	parts per million
approx	approximately	in	inch(es)	pt(s)	point(s)
CMM	coordinate measuring machine	lp	line pairs	pts/s	points per second
config	configuration	IR	infrared	res	resolution
CT	computed tomography	m	meter	rot	rotation(al)
D	depth	M	million	s, sec	second(s)
DOF	depth of field	max	maximum	sec/scan	seconds/scan
DOV	depth of view	meas	measure, measuring	SO	stand-off distance
dia	diameter	min	minimum or minutes (speed column)	std	standard
diag	diagonal	min/scan	minutes/scan	TOF	time of flight
dist	distance	mm	millimeter	typ	typical
dpi	dots per inch (resolution)	MP	megapixel	uncal	uncalibrated
ext	extended	MPE	maximum permissible error	µm	micron, micrometer (10 ⁻⁶ m)
feat	feature	ms	millisecond (1/1000 second)	vert	vertical
ft	feet	mult	multiple	vol	volume
FOV	field of view	n/a	not applicable, not available	w/	with
fps	frames per second	nom	nominal	W	width

Company	Product	Technology	Work volume	Accuracy ¹	Speed
Artec3D Palo Alto, California artec3d.com	Artec Eva	structured light triangulation	0.4–1 m	0.1 mm	2,000,000 pts/s
	Artec Space Spider	structured light triangulation	0.2–1 m	0.05 mm	2,000,000 pts/s
	Artec Leo	structured light triangulation	0.35–1.2 m	0.1 mm	4,000,000 pts/s
	Artec Ray	phase-based	up to 110 m	<0.7 mm @ 15 m	3,000,000 pts/s
	Artec Micro	structured light triangulation	90 mm x 60 mm x 60 mm	0.01 mm	1,000,000 pts/s
Automated Precision, Inc. Rockville, Maryland apisensor.com	Radian RapidScan API Arm	laser ranger structured light 7-axis articulated arm	– – up to 4.5 m	better than ± 0.5 ppm not specified to 0.022 mm	–
Creaform 3D Lévis, Québec, Canada creaform3d.com	METRAscan HANDYscan, Black, Elite GO!Scan SPARK	self-positioning laser triangulation	225–250 mm 310–350 mm 390–390 mm	± 0.08 mm to 0.025 mm to 0.10 mm	205,000 pts/s to 1,300,000 pts/s 550,000 pts/s
Faro Technologies Lake Mary, Florida faro.com	FaroArm (Quantum) ScanArm Laser Tracker Focus3D Scanner Cobalt Design Freestyle	6-, 7-axis articulated arms 7-axis arm with laser scanner, ultra-precise laser beam, TOF phase-shift structured light IR-structured light	varies based on arm varies based on scan arm horiz ± 270, vert +75 to -50, max range 110 m dia 120–350 m range (varies based on model) 500 x 350 x 300 mm FOV 8m ³ /286 ft ³	0.013 mm 2σ: 50 µm to 0.015 mm at 2 m ± 2 mm at 10 m and 25 m 0.225 mm resolution <1.5mm	varies 19,200 pts/s angular velocity 180°/s 976,00 pts/s 5M pts/image up to 88,000 pts/s
Geodetic Systems Melbourne, Florida geodetic.com	V-STARS S, M, D, N Pro-Spot	photogrammetry light projection	varies	to 5 µm + 5 µm per m	–

Company	Product	Technology	Work volume	Accuracy ¹	Speed
GOM Braunschweig, Germany gom.com	ATOS Compact Scan ATOS Core ATOS II Triple Scan ATOS 5	structured light (fringe)	40 x 30 to 1200 x 900 mm 500 x 380 mm 170 x 130 to 810 x 610 mm	not specified	2 x 5 MP/frame 5 MP/frame 2 x 16 MP/frame
Hexagon Manufacturing Intelligence Cobham, Surrey, UK hexagonmi.com	ROMER Absolute Arm WLS Leica Laser Tracker Leica T-Scan AICON StereoScan neo AICON PrimeScan AICON SmartScan	articulating arm w/laser scanner structured light triangulation laser ranger laser ranger and triangulation miniaturized projection technique (structured light triangulation)	5–15 ft measuring range (varies by model) 500 x 500 x 230 mm 80 m range (depending on model) 30 m 75–1100 mm 50–800 mm 60–1550 mm	± 0.079–0.214 mm n/a to 25 µm to 50 µm for <8.5 m (2σ) min 12 µm pt spacing 28 MP 5 & 8 MP	n/a >1 s/frame up to 3,000 pts/s 14,400 pts/s <1 s/frame <1 s/frame
HP Palo Alto, California hp.com	HP 3D Scanner	structured light	60–500 mm	to 0.05 mm	2.3 million pts in 2 sec
Innovatia Metrology Alava, Spain innovatia-metrology.com	OptiScan 1015L OptiScan 1040L OptiScan 2080L M3 Arm	laser line scanner laser line scanner laser line scanner 7-axis articulated arm	SO 100 mm, DOV 10 mm, FOV 15 mm SO 100 mm, DOV 40 mm, FOV 40 mm SO 200 mm, DOV 4060 mm, FOV 80 mm	± 0.006 mm ± 0.010 mm ± 0.050 mm	60,000 pts/s 60,000 pts/s 60,000 pts/s
Kreon Technologies Limoges, France kreon3d.com	Ace Baces Zephyr II Aquilon Solano	articulating arm articulating arm laser line scanner	2 m to 4.5 m length (varies by model) 2.6 m to 4.6 m length (varies by model) varies by implementation	to 0.026 mm to 0.052 mm 10 µm 5 µm 25 µm	n/a n/a up to 250,000 pts/s up to 1,000,000 pts/s 50,000 pts/s
Laser Design Minneapolis, Minnesota laserdesign.com	CyberGage 360	structured light	200 mm x 100 mm cylinder	to 7 µm	< 3 min/cycle (typ)
Nextec Tirat Hacarmel, Israel nextec-wiz.com	WizProbe	confocal laser probe	varies by implementation	6.5 µm MPE	up to 40 pts/s
NextEngine Santa Monica, California nextengine.com	Ultra HD	multi-stripe laser triangulation	130 x 97 mm (macro mode at 400 dpi) 343 x 257 mm (wide mode at 150 dpi)	± 0.127 mm (macro mode) ± 0.381 mm (wide mode)	50,000 processed pts/s
Nikon Metrology Leuven, Belgium nikonmetrology.com	MCAx XC65D LC15DX LC60Dx MV331/351 Model Maker Kscan MMDx	articulating arm laser line scanner (cross) laser line scanner laser line scanner laser radar arm-mounted laser scanner handheld scanner	up to 4.5 m 150 x 150 mm FOV 18 x 18 mm FOV 60 x 60 mm FOV 1–50 m range varies on arm length	to 0.023 mm 15 µm (1 σ) 8 µm (1 σ) 9 µm (1 σ) 24 µm at 2m 12–34 µm	n/a 19,200 pts/s 19,200 pts/s 75,000 pts/s 150,000 pts/s 30,000 pts/s
Northern Digital Inc. Waterloo, Ontario, Canada ndigital.com	Pro CMM with ScanTRAK II	optically tracked laser line	1.5–7.5 m FOV	to 20 µm	up to 458,400 pts/s
North Star Imaging, Inc. Rogers, Minnesota 4nsi.com	X Series	X-ray scanner	6 in x 9 in to 60 in x 60 in	to 0.5 µm	varies
Occipital Boulder, Colorado occipital.com	Structure	IR-structured light	varies by use	not specified	not specified
OGP Rochester, New York ogpnet.com	Shapegrabber Ai Series	laser line scanner systems	300 x 150 x 150 mm to 1750 x 750 x 900 mm	to 0.04 mm	18,000–100,000 pts/s

Company	Product	Technology	Work volume	Accuracy ¹	Speed
Optimet Jerusalem, Israel optimet.com	ConoLine ConoPoint Smart ConoProbe	conoscopic holography (line) conoscopic holography (line) conoscopic holography (point)	45 mm DOF 160 x 150 x 100 mm 1.8–120 mm range	2–25 µm 1–15 µm 1–60 µm	18,000 pts/s 50 mm/s 3,000 pts/s
Polhemus Inc. Colchester, Vermont polhemus.com	FastScan II	laser scan with magnetic tracking	up to 500 mm	1 mm	50 lines/s
Polyga Vancouver, CA polyga.com	HDI	white light triangulation	225–600 mm	to 50 µm	5.2 MP in 1.2 s
Reware Raleigh, North Carolina reware.com	MicroScribe Skiron Laser	articulating arm laser line stripe	up to 1676 mm 75 mm	to 0.051 mm to 0.002 mm	n/a up to 45,000 pts/s
Shining3D Hangzhou, China shining3d.com	OptimScan FreeScan	structured light	100 x 75, 200–150, 400–300 mm ² 200 x 200 x 200 mm 230 x 250 mm	0.005–0.15 mm <0.1 mm 0.03 mm max	<2 sec <3 min 240,000 pts/s
Solutionix Seoul, Korea solutionix.com	C500 & D-Series	phase-shifting optical triangulation	90 x 500 mm 120 mm	to 0.028 mm to 0.056 mm	5 MP 2 MP
Surphaser Seattle, Washington surphaser.com	Model 10 100HSX Model 400 75USR	phase-shift laser	1–110 m range, 360° H x 270° V 1–50 m range, 360° H x 270° V 1–300 m range, 360° H x 270° V 0.25–2.5 m range, 360° H x 270° V	<0.12 mm @ 15 m <0.07 mm @ 5 m <0.2 mm @ 30 m <0.025 mm @ 0.3–2 m	up to 1,000,000 pts/s up to 1,000,000 pts/s up to 832,000 pts/s
Thor3D Moscow, Russia thor3dscanner.com	Calibry Drake	structured light triangulation	280 mm–650 mm 50 x 64 mm to 857 x 1142 mm	to 0.1 mm to 0.04 mm	up to 3,000,000 pts/s up to 1,200,000 pts/s
Trimble Sunnyvale, California trimble.com	TX6 TX8 X7	time-of-flight	1–120 m range, 360° H x 317° V 1–120 m range, 360° H x 317° V 0.6–80 m range, 360° H x 282° V	<2 mm from 2 m to 80 m <1 mm from 2 m to 120 m <2.5 mm @ 30 m	up to 500,000 pts/s up to 1,000,000 pts/s up to 500,000 pts/s
Vialux Chemnitz, Germany vialux.de	zSnapper (in three configurations: portable, multiple, OEM scanner)	structured light triangulation	350 mm FOV	300,000 or 80,000 (xyz) coordinates per single sensor scan	scan time: 0.022 s
Wenzel Greding, Germany wenzelamerica.com	exaCT	computed tomography	100–250 mm dia x 300 h	20–100 µm pixel size	1.5–4 M pixels/scan
YXLON International X-Ray Hamburg, Germany yxlon.com	Y.CT Precision Y.CT Compact	fan beam CT	450 mm x 750 mm 450 mm x 750 mm	<254 µm slice pitch <254 µm slice pitch	15 s/slice 15 s/slice
Zeiss Optotechnik Neurbeuern, Germany optotechnik.zeiss.com	Comet 6 Comet L3D 2 T-Scan CS & LV	light projection light projection optical-tracked laser scanner	86 x 64 x 40 to 1235 x 823 x 600 mm 45 x 38 x 30 to 481 x 404 x 250 mm up to 3700 x 2600 mm	16–252 µm resolution 18–196 µm resolution 0.075 mm	1.2 sec/scan 1.0 sec/scan 210,000 pts/s

Table created by Michael Raphael and Spike Milligan in cooperation with Wohlers Associates, Inc.

Footnote:

1 Accuracy as reported by vendor in technical specifications. Vendors that publish only repeatability or resolution are identified. For more information, contact the vendor directly.