

CALIBRATION CERTIFICATE



General Information

Product	HandySCAN BLACK™ Elite	Condition	As left
Manufactured by	Creaform Inc.	Certificate number	01-24365-4571
HandySCAN 3D S/N	9271228	Calibration date	2024-12-31
Calibration plate S/N	9351224	Ambient temperature	Min 19.4 ° C ; Max 19.4 ° C
Customer	V3D Technologies Inc 6033 Shawson Drive, Unit 23 Mississauga, Canada, L5T 1H8	Calibration center	Creaform - Head Office Lab 4700, rue de la Pascaline Lévis, Québec, G6W 0L9, Canada



Acceptance Test Procedure

The performance testing procedures¹ used for this calibration are based on the VDI/VDE 2634 Part 3 standard.

5 ballbars of 3 different lengths are used to perform this procedure (see *Equipments* for details). The 10 spheres of the 5 ballbars are measured in different locations and orientations² throughout the system working volume of 0.58 m x 0.58 m x 0.74 m. The top hemisphere of the measured data is used for sphere fitting. Deviations of the test parameters between measured and nominal values are reported (see *Calibration Results* for details). The acceptance limits are defined as a constant value for the probing size error test and as a variable value for the sphere spacing error test dependent on the length of the artefact (0.0200 mm + 0.0400 mm/m).

Note 1 : Refer to procedure ATP927-01 for more details.
Note 2 : For more details concerning positions and orientations, refer to the drawings in the following pages of this certificate.

Calibration Results

Test	Specification	Limits +/-	Result	Status
Probing Size Error (Max. dev.)	Accuracy	0.0250	0.0127	Passed
Sphere Spacing Error (Max. dev.)	Volumetric Accuracy (0.650 m)	0.0459	0.0261	Passed
	Volumetric Accuracy (0.520 m)	0.0408	0.0143	Passed
	Volumetric Accuracy (0.395 m)	0.0357	0.0027	Passed

Equipments

Apparatus	Type	Serial number	Certificate number	Calibration date
Ballbar #1	Ballbar 650 mm	BB650_002	58020	2023-06-20
Ballbar #2	Ballbar 520 mm	BB520_003	58018	2023-06-20
Ballbar #3	Ballbar 520 mm	BB520_004	58019	2023-06-20
Ballbar #4	Ballbar 395 mm	BB395_003	58016	2023-06-20
Ballbar #5	Ballbar 395 mm	BB395_004	58017	2023-06-20
Comet System	Thermometer	SC2-1	E24-SC2-HSB01	2024-06-04

These calibration results are traceable to the International System of Units (SI) through Euramet laboratories for Europe (LNE, NPL, PTB, etc.), the NIST or NRC for North America, ISO/IEC 17025 accredited calibration laboratories or National Metrology Institutes that are signatories to the International CIPM MRA (Mutual Recognition Arrangement). The scope of accreditation for ISO/IEC 17025 :2017 is granted by A2LA, a signatory of ILAC MRA (Mutual Recognition Arrangement).

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This certificate invalidates all other certificates generated before : 2024-12-31, 11:20
The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

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approved by :



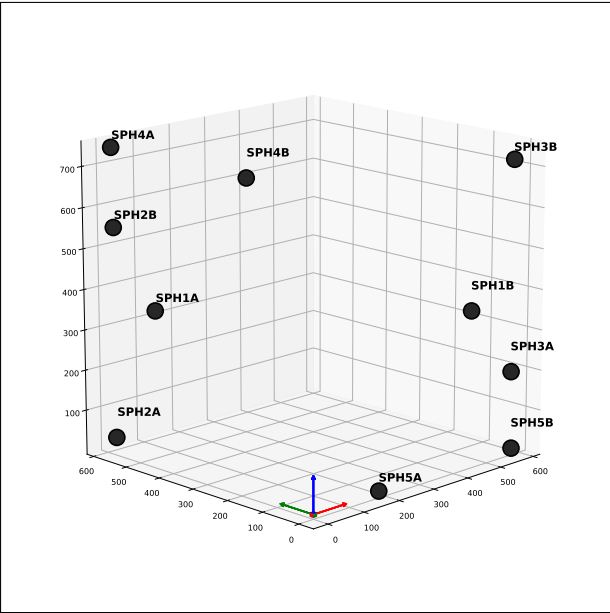
Probing Size Error

Summary

Specification	Limits +/-	Status	Max. Deviation (Result)
Accuracy	0.0250	Passed	0.0127

Uncertainty ($k = 2$) : 0.0040
Statements of compliance, where applicable, are based on test results falling within specification limits with no reduction by the uncertainty of the measurement.

Positions in volume



Isometric view

Probing Size Error

Detailed Results

Position	Size Deviation	Diameter (Nominal)	Diameter (Measured)	Form (Range of deviation) ³	Form (Sigma) ³
SPH1A	-0.0085	38.1055	38.0970	0.0313	0.0038
SPH1B	-0.0089	38.1004	38.0915	0.0364	0.0043
SPH2A	-0.0087	38.1016	38.0929	0.0328	0.0037
SPH2B	-0.0090	38.1025	38.0935	0.0314	0.0037
SPH3A	-0.0084	38.1065	38.0981	0.0304	0.0039
SPH3B	-0.0127	38.1037	38.0910	0.0348	0.0040
SPH4A	-0.0046	38.1038	38.0992	0.0323	0.0038
SPH4B	-0.0034	38.1042	38.1008	0.0347	0.0039
SPH5A	-0.0053	38.1015	38.0962	0.0318	0.0039
SPH5B	-0.0050	38.1054	38.1004	0.0321	0.0038

Average Deviation

Max. dev. (Result)

Limits +/-

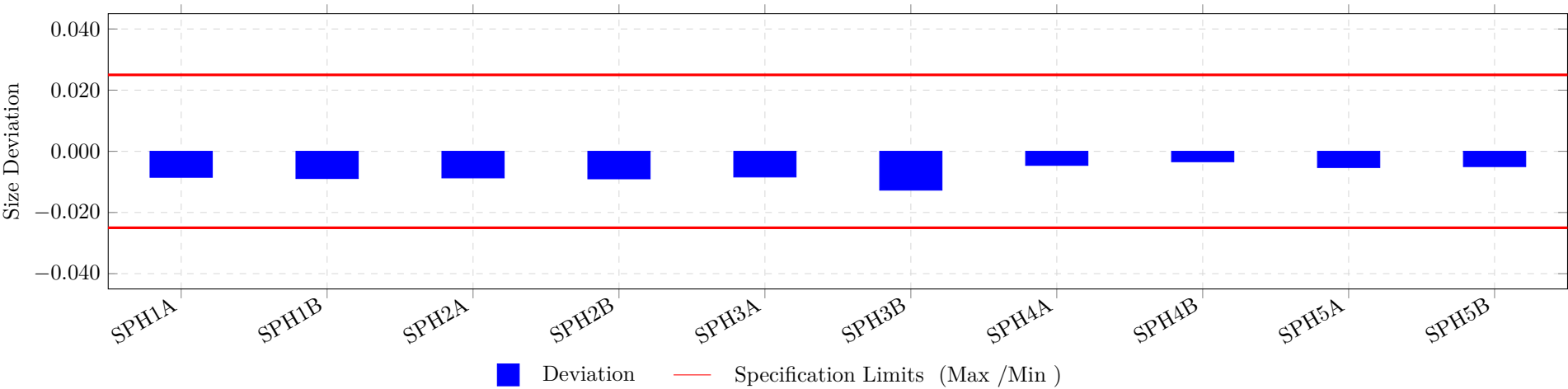
-0.0075

0.0127

0.0250

Passed

Graph



Note 3 : Not included in the scope of accreditation to ISO/IEC 17025 :2017

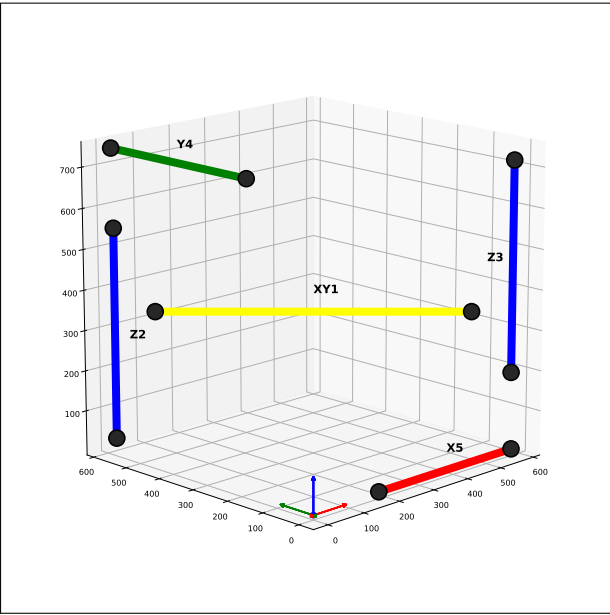
Sphere Spacing Error

Summary

Specification	Limits +/-	Status	Max. Deviation (Result)
Volumetric Accuracy (0.650 m)	0.0459	Passed	0.0261
Volumetric Accuracy (0.520 m)	0.0408	Passed	0.0143
Volumetric Accuracy (0.395 m)	0.0357	Passed	0.0027

Uncertainty ($k = 2$) : 0.0120
Statements of compliance, where applicable, are based on test results falling within specification limits with no reduction by the uncertainty of the measurement.

Positions in volume



Isometric view

Sphere Spacing Error

Detailed Results

Position	X _a	Y _a	Z _a	X _b	Y _b	Z _b
XY1	4.9393	457.6054	375.2226	460.8621	-3.2360	367.4930
Z2	7.9217	578.5492	-6.4089	11.4027	577.7824	513.9929
Z3	579.0828	-0.0131	227.7083	576.9160	1.3849	747.7287
Y4	10.0033	585.2898	740.2337	5.7105	191.5687	741.7938
X5	187.8847	0.7639	-0.0918	581.7830	-0.3571	-0.0537

Position	Limits +/-	Sphere Spacing Deviation	Sphere Spacing (Nominal)	Sphere Spacing (Measured)	Length Measurement Deviation (Method C) ³
XY1	0.0459	0.0261	648.2796	648.3057	0.0152
Z2	0.0408	0.0073	520.4066	520.4139	0.0041
Z3	0.0408	0.0143	520.0125	520.0268	-0.0055
Y4	0.0357	0.0027	393.7449	393.7476	0.0016
X5	0.0358	-0.0002	393.9001	393.8999	-0.0172
Average Deviation		0.0100			
Max. dev. L=0.650 m (Result)		0.0261	Passed		
Max. dev. L=0.520 m (Result)		0.0143	Passed		
Max. dev. L=0.395 m (Result)		0.0027	Passed		

Note 3 : Not included in the scope of accreditation to ISO/IEC 17025 :2017

Sphere Spacing Error

Graph

