Calibration certificate

Item	3D coordinate measuring machine
Manufacturer	Carl Zeiss
Type	CONTURA G2
Brand/Serial no.	221583
Customer	SSB ENGINEERS PRIVATE LIMITED NO.133, Malsya Industrial Area Rajasthan, India-301030

Installation site	Standard Room
Calibration certificate no.	221583
Number of pages in calibration certificate	12
Date of calibration	28/03/2024
Next Calibration (Recommendation)	27/03/2025

This calibration certificate documents the traceability to national standards to realize the units of measurement in accordance with the International System of Units (SI).

The Carl Zeiss IMT Measurement and Calibration Centre is a Dakks laboratory accredited for the measurands length and geometric optics according to DIN EN ISO 17025.
The user is responsible for observing an appropriate time interval for repeating calibration.

This calibration certificate may be circulated only in complete and unaltered form. Extracts or changes are subject to the express approval of the Measurement and Calibration Centre. Unsigned calibration certificates are not valid.

Date

28/03/2024

Calibrated by

ABHIJITH JOSEPH

Carl Zeiss India (Bangalore) Pvt.Ltd.
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560099 Bangalore

We make it visible.

1. Calibration task

The indication error E_0 for the length measurement were measured on the coordinate measuring machine.

The coordinate measuring machine had the following configuration at the time of calibration:

Control:	C99
Probe:	VAST XXT
Measuring software:	CALYPSO
Measuring ranges:	X = 700 mm Y = 1000 mm Z = 600 mm
CMM expansion coefficients:	X = 0.0 x 10^{-6} K^{-1} Y = 0.0 x 10^{-6} K^{-1} Z = 0.0 x 10^{-6} K^{-1}

2. Calibration method

Calibration of the metrological features of the coordinate measuring machine was performed according to DIN EN ISO 10360.

The calibration was performed at the installation site specified on page 1.

In order to trace the measurement results to 20°C, the temperature compensation in the measuring software was activated during the measurements and the temperatures of the coordinate measuring machine and the relevant test piece were recorded at the time of the respective measurements.

The standards used are specified in the relevant sections of the measurement result documentation. Copies of the certificates of the standards used are attached to the calibration certificate.

3. Measurement results

The measurement results are valid at the time of the measurement. Furthermore, they apply only to the respective installation site and the machine settings at the time of calibration.

3.1 Limit value(s) of the length measuring uncertainty E_0.

The following parallel and stepped gauge blocks are used to determine indication errors:

Serial no.: SE0500287

The determined indication errors E_0 and the maximum permissible indication error for length measurements $E_{0,MPL}$ are represented in the following diagrams.

The measurement records are attached to the calibration certificate.

The limit value of the length measuring error is:

$E_{0,MPE}$= (A + L/K) (L in mm)

$E_{0,MPE}$= +/- (1.8+ L/ 300) µm (L in mm)

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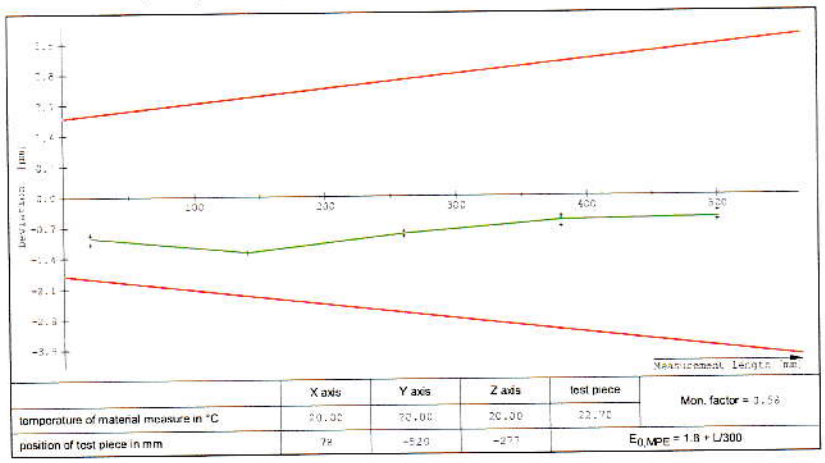
Indication error in pos. 1 (X Direction)



	X axis	Y axis	Z axis	test piece	
temperature of material measure in °C	20.00	20.00	20.00	22.75	Mon. factor = 1.56
position of test piece in mm	78	-520	-271	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0014	20.0025	-0.0009	-0.0011	-0.0004
139.3751	139.3736	-0.0013	-0.0013	-0.0013
259.3434	259.3436	-0.0009	-0.0009	-0.0008
379.3871	379.3865	-0.0006	-0.0007	-0.0005
500.0154	500.0143	-0.0005	-0.0006	-0.0004

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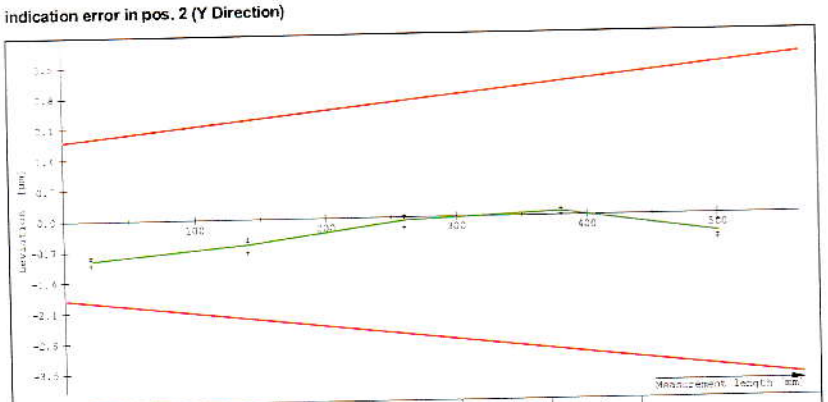
indication error in pos. 2 (Y Direction)



	X axis	Y axis	Z axis	test piece	Mon. factor = 0.64
temperature of material measure in °C	20.00	20.00	20.00	20.60	
position of test piece in mm	137	-844	-277	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0024	20.0025	-0.0009	-0.0010	-0.0008
139.9751	139.9748	-0.0006	-0.0008	-0.0004
259.9634	259.9633	-0.0001	-0.0002	0.0000
379.9871	379.9872	0.0001	0.0000	0.0001
500.0154	500.0149	-0.0004	-0.0006	-0.0002

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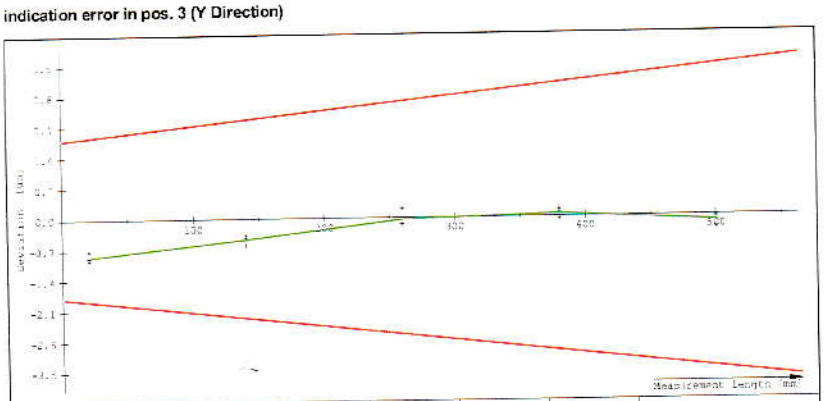
indication error in pos. 3 (Y Direction)



	X axis	Y axis	Z axis	test piece	
temperature of material measure in °C	20.00	20.00	20.00	22.00	Mon. factor = 0.50
position of test piece in mm	197	-828	-277	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0024	20.0005	-0.0008	-0.0009	-0.0007
139.9745	139.9746	-0.0005	-0.0006	-0.0004
259.9634	259.9636	0.0003	-0.0003	0.0002
379.9871	379.9872	0.0001	-0.0001	0.0001
500.0154	500.0152	-0.0001	-0.0003	0.0000

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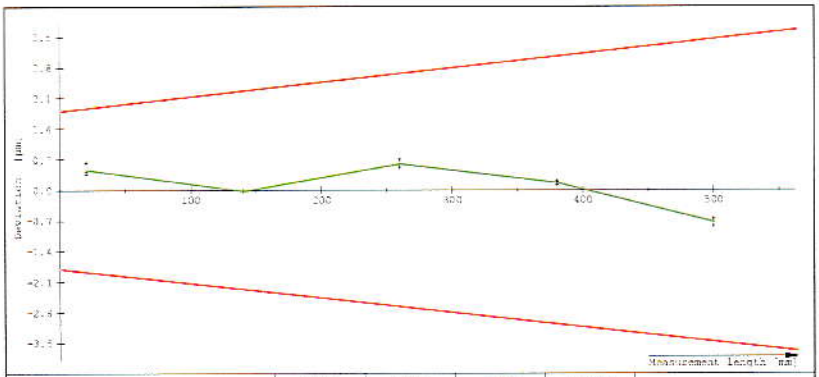
indication error in pos. 4 (Z Direction)



	X axis	Y axis	Z axis	test piece	Mon. factor = 0.34
temperature of material measure in °C	20.00	20.00	20.00	22.60	
position of test piece in mm	342	-845	-381	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0014	20.0019	0.0005	0.0004	0.0006
139.9751	139.9751	0.0000	0.0000	0.0000
259.9494	259.9500	0.0006	0.0005	0.0007
379.9873	379.9873	0.0000	0.0000	0.0000
500.0154	500.0146	-0.0007	-0.0008	-0.0007

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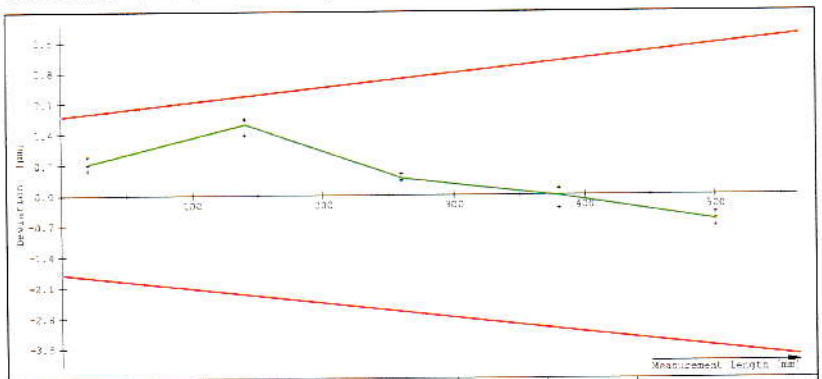
indication error in pos. 5 (R3d FL Direction)



	X axis	Y axis	Z axis	test piece	
temperature of material measure in °C	20.00	20.00	20.00	20.60	Mon. factor = 0.73
position of test piece in mm	250	-632	-399	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0014	20.0021	0.0007	0.0006	0.0009
139.9757	139.9767	0.0010	0.0004	0.0017
259.9698	259.9698	0.0004	0.0003	0.0005
379.9871	379.9871	0.0000	-0.0003	0.0003
500.0154	500.0148	-0.0006	-0.0007	-0.0004

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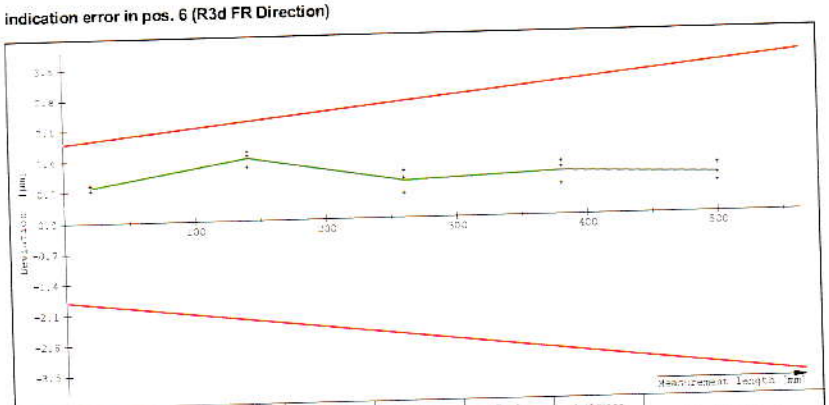
indication error in pos. 6 (R3d FR Direction)



	X axis	Y axis	Z axis	test piece	Mon. factor = 0.69
temperature of material measure in °C	20.00	20.02	20.30	22.60	
position of test piece in mm	815	-657	-199	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0014	20.0022	0.0008	0.0007	0.0009
139.9755	139.9769	0.0014	0.0013	0.0015
259.9634	259.9652	0.0018	0.0005	0.0031
379.9871	379.9881	0.0010	0.0008	0.0012
500.0154	500.0162	0.0008	0.0007	0.0011

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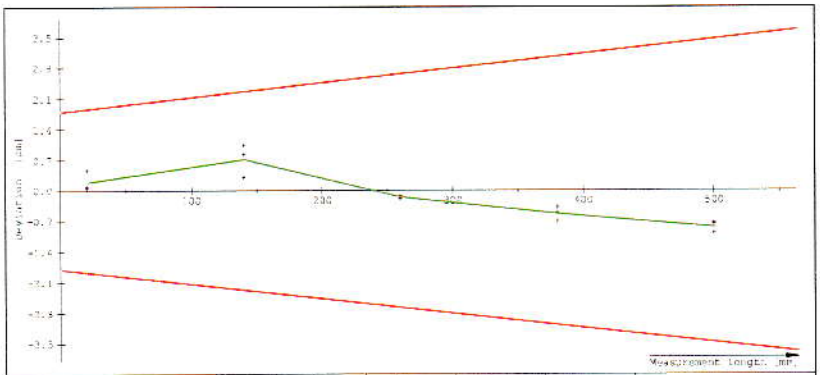
indication error in pos. 7 (R3d RL Direction)



	X axis	Y axis	Z axis	test piece	
temperature of material measure in °C	20.00	20.00	20.00	22.40	Mon. factor = 0.46
position of test piece in mm	61.5	-657	-399	$E_{0,MPE}$ = 1,6 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
20.0014	20.0016	0.0002	0.0001	0.0003
139.9752	139.9758	0.0007	0.0003	0.0013
259.9494	259.9493	-0.0002	-0.0002	-0.0001
379.9872	479.9866	-0.0005	-0.0007	-0.0004
500.0154	500.0145	-0.0008	-0.0010	-0.0007

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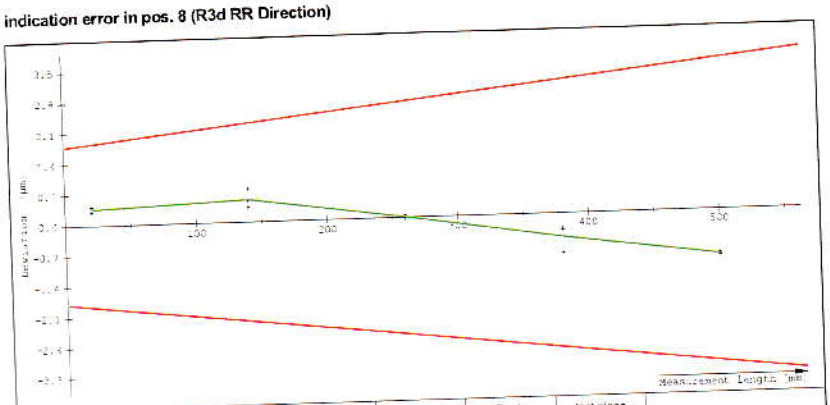
indication error in pos. 8 (R3d RR Direction)



	X axis	Y axis	Z axis	test piece	Mon. factor = 0.33
temperature of material measure in °C	20.00	20.00	20.00	22.60	
position of test piece in mm	915	-657	-338	$E_{0,MPE}$ = 1.8 + L/300	

Measuring length L in mm		Deviations in mm		
nominal value	actual value	mean value	minimum	maximum
[illegible]	99.0018	0.0004	0.0003	0.0004
139.975[illegible]	139.9736	0.0006	0.0003	0.0008
259.9494	259.9494	0.0000	0.0000	0.0000
379.9871	379.9865	-0.0006	-0.0009	-0.0004
500.0134	500.0143	-0.0010	-0.0011	-0.0010

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4. Calibration of measuring devices and traceability of measurement results

The measuring devices used are calibrated in metrology labs accredited according to ISO 17025. For more details, please refer to the attached copies of the individual calibration certificates.

5. Attachments

The following documents are attached to the calibration certificate:

- Measurement records of indication errors for length measurements E
- Copy of certificates for standards used

6. Certificate of conformity

The coordinate measuring machine meets the specifications of the manufacturer's test certificate. The performance of the coordinate measuring machine has been confirmed.