Shop floor measuring technology

DuraMax

Professional quality inspection
for the workshop and production.

ZEISS

We make it visible.

// PERFECTION
MADE BY CARL ZEISS


The moment you know exactly
how to optimize your production quality.
This is the moment we work for.

DuraMax Overview

At home on the shop floor

- Completely covered guideways
- Temperature stability from +18°C to +30°C
- Three-sided loading
- Integrated passive damping system
- No compressed air required.
- Space-saving design

Sensors with scanning function

- VAST XXT sensor for single-point measurements and scanning
- CNC-guided stylus change

Shop floor base

- Lockable storage space for a PC, dust and moisture protected in accordance with IP54, thermally shielded
- Carrier arm for keyboard and monitor
- Can be moved with lifting truck or forklift

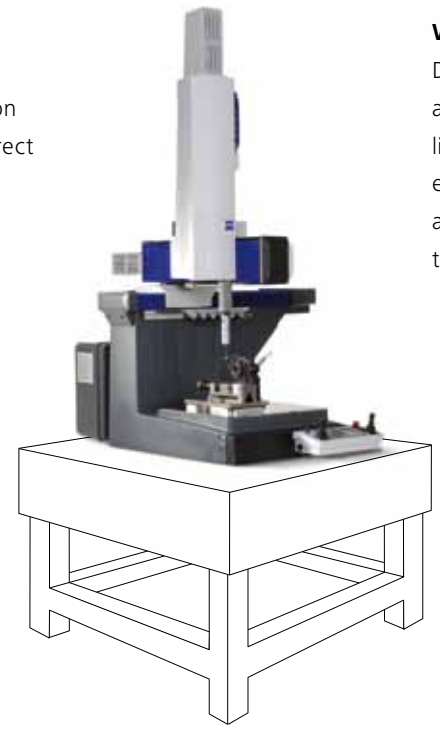
Flexible configuration
Regarding design, sensors and software, DuraMax can be specially configured to meet your needs, for example
- for in-line inspections in production
- to measure gear geometries

Our experts will put together a package that best meets your needs.

Measure with the reference software
With CALYPSO and its extensions, you have access to the leading measuring software from Carl Zeiss. It is the best of the best regarding user friendliness and functionality.

Basic data
Measuring range: 500 x 500 x 500 mm
Max. workpiece weight: 100 kg
Length measuring error [µm]: from 2.4 + L/300

Base standard
The massive metal base ensures reliable operation at an ergonomically correct height.



Without base
DuraMax is available without a base for those who would like to use it on a surface, e.g. a measuring table or a corresponding machine table.

Ready for production

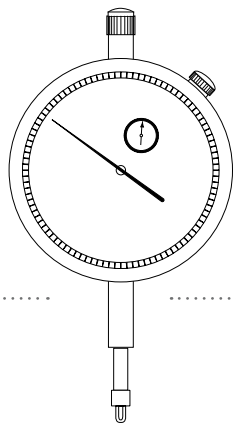
Temperature fluctuations, dust, contamination and a knock or two are commonplace in a production environment. DuraMax is designed to take the best that such environments have to offer. It can be reliably operated at a temperature range of +18°C to +30°C. Its enclosed guideways protect it against contamination. Its massive design ensures solid footing. Put the benefits of state-of-the-art coordinate measuring technology to work in your production environment.

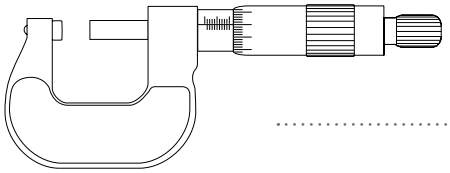
1. You are flexible
Inspect various workpieces and characteristics with a single system.

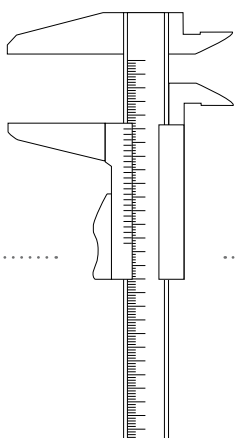
2. You receive more information
You can not only check single measured points, but you can also receive extensive information on the quality of your workpiece. The measuring results can be conveniently analyzed and documented with software from Carl Zeiss. This enables conclusions for production and reduces the number of rejections.

3. You are fast
Scanning technology from Carl Zeiss allows you to measure a large number of points in one go. You can quickly evaluate contours and gear geometries, for example.

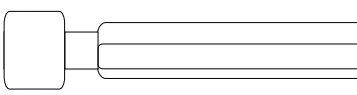
	Gage	DuraMax
Lifecycle costs	**High:** New gage for each measuring job	**Low:** One-time investment, no compressed air
Flexibility	**Low:** New requirements = low: new gage	**High:** One machine for all requirements
Temperature stability	**Low:** No temperature compensation and correction	**High:** Temperature stability up to +30°C, no measuring lab
Operator influence	**High:** Personnel required for measurement	**Low:** CNC

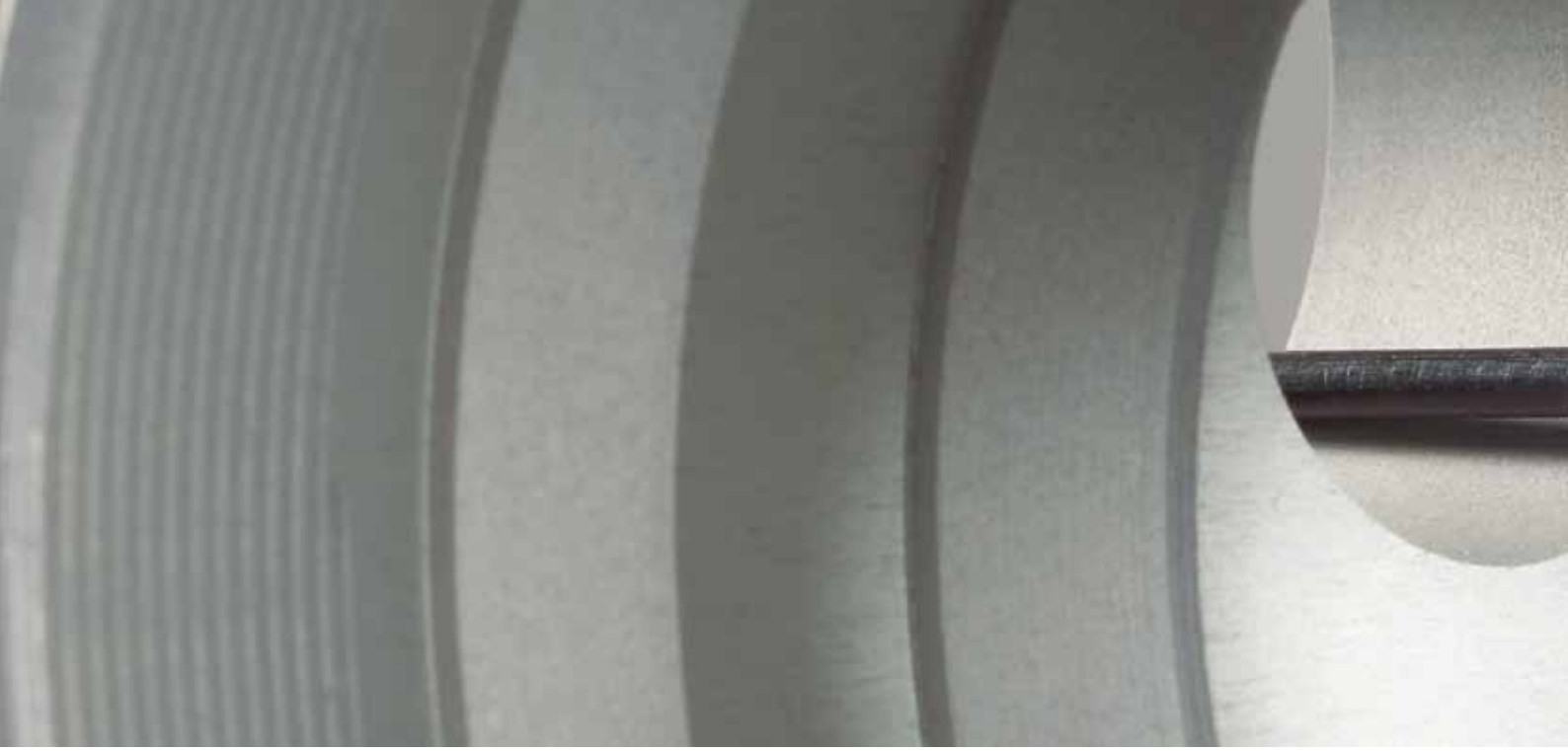






In the past, many different gauges and inspection tools were required to cover the range of jobs completed by DuraMax.





Probe from the inventor of scanning

Scanning – the fast capture of measured values in one run – has become a firmly established element of measuring technology because it delivers better results in less time. Carl Zeiss invented scanning and, with DuraMax, offers the first system in its class to master scanning.

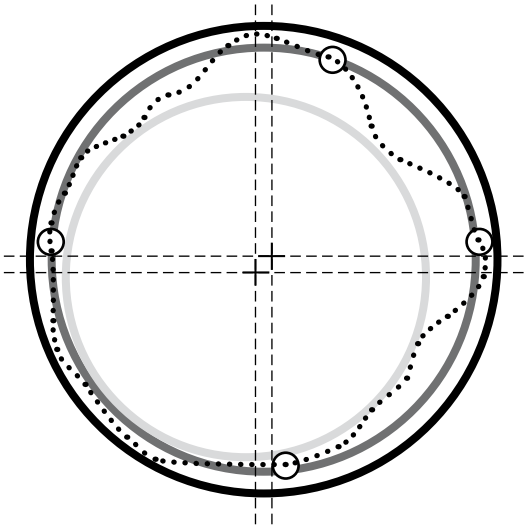
More productivity thanks to scanning

In general, DuraMax is positioned next to tool machines to control and monitor running production activities. As the number of generated measuring points increase, so too does the accuracy and quality of the measurement. This also benefits productivity: minimum circumscribed and maximum inscribed circles, for example, can be determined to arrange pairs of boreholes and waves. This enables you to achieve a higher number of matching pairs than with traditional measuring technology. The rejection rate is therefore reduced to a minimum.

Upper-class sensor: VAST XXT

VAST XXT is a sensor for single-point measurements and scanning. These types of sensors are used in numerous upper-class systems from Carl Zeiss. Different stylus systems from the rack can be exchanged under full CNC control to meet the needs of the measuring job.

- 25 mm adapter plate for optimal reproducibility
- Axial stylus length: 30 to 150 mm
- Radial stylus length: 30 to 65 mm



Minimum circumscribed circle determined using scanning values

Compensating circle calculated from the 4 single points

Maximum inscribed circle determined using scanning values

Form evaluation

Single point (4-point measuring)

Different center point coordinates for minimum circumscribed/ maximum inscribed circle

Single-point measuring

- Acquisition of single points
- Determination of single points
- Longer measuring times
- High dispersion
- Low repeatability
- Inaccurate information on position, practically none on the form of planes, curves and freeform surfaces

Scanning

- Acquisition of a point line
- Determination of the form
- Shorter measuring times
- Low dispersion
- Maximum reproducibility
- Precise statements on position and form, exact scanning of known contours and free-form surfaces, as well as unknown contours

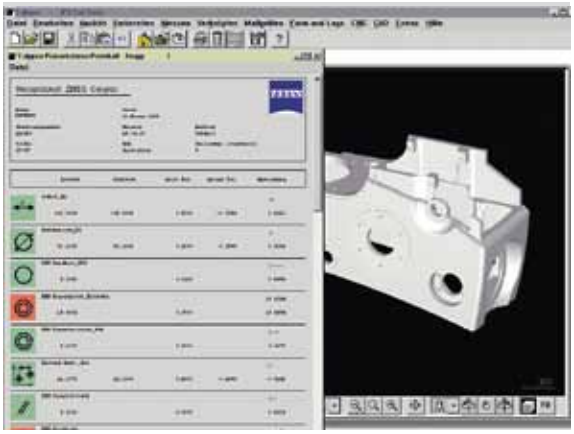
Easy measuring with CALYPSO

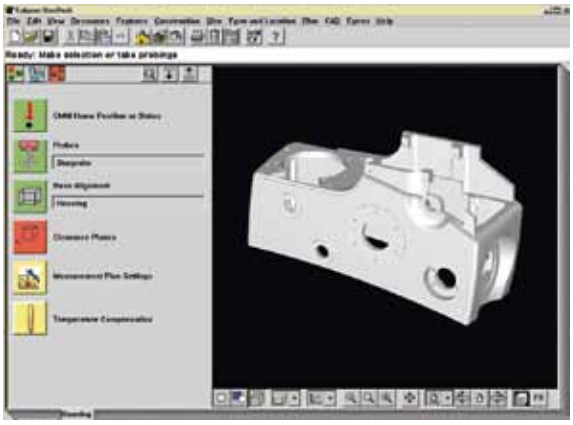
DuraMax runs under CALYPSO, the reference software from Carl Zeiss for standard geometries and freeform surfaces. CALYPSO combines enormous functionality and ease of use – to allow you to start measuring immediately.

Measure intuitively
CALYPSO is based on the principle of visual metrology: you measure what you see – without complicated code and text input. All part features from a drawing or a CAD model are stored as icons in CALYPSO. Select the desired features and your measurement plan is finished. CALYPSO automatically calculates the ideal measuring run and travel paths.

Only measure what you need to know at the moment
In CALYPSO, you can quickly run any number of sequences from a complete measuring run as a partial measurement. This quickly provides you with the results you need for the current production segment.

Autorun: operator errors ruled out
The autorun function initiates programmed measuring runs at the push of a button. This enables untrained personnel to make perfect measuring runs.





The ideal package

With its variable software and hardware, DuraMax can be tailored to your needs. Our specialists will put together a package that best meets your needs, for example, to measure on the shop floor with DuraMax In-Line or to check spur gears with RT GEAR.

In-Line

For shop floor integration

Shop floor base
With storage room to protect the PC in accordance with IP54 and a practical carrier arm to mount a monitor and keyboard tray.

Automatic temperature reader with two workpiece sensors

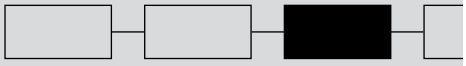
DuraMax safety position

Digital E/A box with 12 ports

CALYPSO PCM
Menu-guided control of parameter-supported measuring runs.

CALYPSO Flex Reporter
Display and evaluate measured values with graphic and statistical options.

FACS light
Automation software to connect automation systems with coordinate measuring technology from Carl Zeiss.



RT GEAR

To inspect spur gears

GEAR PRO involute
The GEAR PRO involute extension enables the convenient measurement and analysis of spur gears. The analytical 3D gear tooth model and the graphic-supported input windows make measuring with GEAR PRO involute highly effective. The software is suitable for the following gear geometries:

- Straight and slanted-tooth spur gears
- Conically corrected gears
- Bevel gears
- Splines

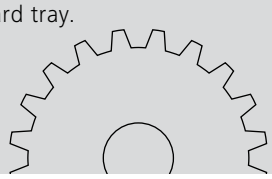
CALYPSO measuring software

Stylus set
Different sizes for inner and outer spur gears.

Precision rotary table
Precision rotary table with jaw chuck to expand the rotary axis.

Reference sphere
8 mm reference sphere to calibrate the stylus system.

Shop floor base
With storage room to protect the PC in accordance with IP54 and a practical carrier arm to mount a monitor and keyboard tray.



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ZEISS DuraMax®

Specifications

Version: 2023-05

Seeing beyond

System description

Type according to ISO 10360-1:2000	Fixed table cantilever CMM			
Operating mode	Motorized / CNC			
Sensor mounts	Fixed installation			
Sensor	ZEISS VAST XXT (tactile) Scanning and single point sensor. Measuring speed with ZVp (ZEISS VAST probing) appr. 1.2 seconds per single point and 1.8 seconds per single point without ZVp.			
Software	ZEISS CALYPSO, ZEISS GEAR PRO			
Travel speed	Motorized	in mm/s	Axes	0 to 100
	CNC	in mm/s	Axes	max. 300
		in mm/s	Vector	max. 520
Acceleration		in m/s²	Axes	max. 1
		in m/s²	Vector	max. 1.7

Optional equipment

	DuraMax	**DuraMax HTG**
Customer-specific base	Optional accessory	Not available
ZEISS standard base	Optional accessory	Not available
ZEISS shopfloor base	Optional accessory	Mandatory accessory
ZEISS rotary table	Optional in combination with a ZEISS standard or shopfloor base	Not available
ZEISS VAST XXT TL1 / TL4	Not available	Not available
CMM safety position	Optional accessory	Optional accessory
Automatic workpiece temperature sensor	Optional accessory	Mandatory accessory

Sensors and accuracy

The functionality of the device and its specifications are only achievable when using original accessories by ZEISS. The specified parameters are observed in the application of the internal test instructions for acceptance testing and in the use of the released standards in accordance with the ISO 10360 series.

ZEISS VAST XXT [1]
Modul TL3

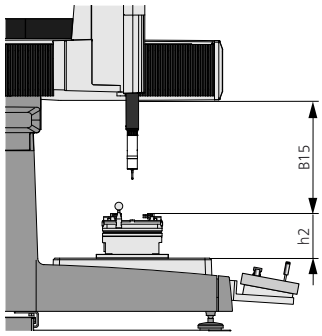
Scanning and multi-point sensor.
Scanning measuring rate up to 500 points/s.
Stylus length with module:
TL3 = 30 - 150 mm (axial), up to 65 mm radial
Maximum stylus weight = 15 g
Minimum stylus tip diameter = 0.3 mm

			DuraMax		**DuraMax HTG**	
Length measurement error [2) 4) 6)] MPE complies with ISO 10360-2: 2009	E0/E40	in µm	2.4 + L/300	18°C - 22°C	2.2 + L/300	18°C - 22°C
Extended temperature range (ZEISS TVA 1)	E0/E40	in µm	2.7 + L/250	18°C - 26°C	2.5 + L/250	18°C - 26°C
Extended temperature range (ZEISS TVA 2)	E0/E40	in µm	2.9 + L/200	18°C - 30°C	2.7 + L/200	18°C - 30°C
Extended temperature range (ZEISS TVA 3)	E0/E40	in µm	Not available		3.9 + L/100	15°C - 40°C
Repeatability range of E0 MPL complies with ISO 10360-2:2009	R0	in µm	1.7		1.7	
Scanning error [7)] MPE complies with ISO 10360-4:2000	THP	in µm	2.9	18 °C - 22 °C	2.9	18 °C - 22 °C
Required measuring time MPT	τ	in s	55		55	
Form measurement error [3) 7)] MPE for roundness complies with ISO 12181 (VDI/VDE 2617 sheet 2.2)	RONt (MZCI)	in µm	2.4		2.4	
Single stylus form probing error [7)] MPE complies with ISO 10360-5:2010	PFTU	in µm	2.4		2.4	
Multi-stylus form probing error [5) 7)] MPE complies with ISO 10360-5:2010	PFTM	in µm	3.9	18 °C - 22 °C	3.9	18 °C - 22 °C
Multi-stylus dimension probing error [5) 7)] MPE complies with ISO 10360-5:2010	PSTM	in µm	1.2	18 °C - 22 °C	1.2	18 °C - 22 °C
Multi-stylus location probing error [5) 7)] MPL complies with ISO 10360-5:2010	PLTM	in µm	2.7	18 °C - 22 °C	2.7	18 °C - 22 °C

1) Acceptance test with TL3 module; stylus length of 70 mm and stylus tip diameter of 8 mm.
2) Measuring length L in mm.
3) Filter used: 50 W/U; scanning speed for roundness: 5 mm/s.
4) Measuring length on ZEISS DuraMax based on typical feature sizes.
5) Measuring location near the calibration position to document sensor properties.
6) In accordance with the given temperature behavior and not volatile temperature changes.
7) All accuracy specifications of the sensors can be increased by + 0.3 µm for TVA 1 and + 0.5 µm for TVA 2/4 and 1,7µm for TVA 3/5.

Temperature behavior					
Temperature range			18°C - 22°C	18°C - 30°C	15°C - 40°C
Temperature gradient	Per day	in K/d	4.0	5.0	5.0
	Per hour	in K/h	2.0	2.0	2.0
	Spatial	in K/m	1.0	1.0	1.0

ZEISS rotary table [1] for ZEISS DuraMax				
Dimensions and weight				
Weight for rotary table / rotary box		in kg		ca. 8 /12
Measuring system	Interpolated resolution	in ″		0.07
Working range	B15 [2]	in mm		350
Height	h2	in mm		150
Faceplate	Diameter	in mm		190
Dynamics				
Max. angular velocity		in °/s		50
Rotation speed		in min^{-1}		8.3
Load/torques				
Torque		in Nm		max. 40
Max. central load capacity [3]		in kg		max. 9
Tilt rigidity		in Nm/ ″		1
Max. permissible tightening torque	M	in Nm		3
Accuracy [4]				
Repeatability of angular position		in ″	18°C - 22°C	± 2
Axial four-axis error MPE complies with ISO 10360-3:2000	FA	in µm	18°C - 22°C	6
Radial four-axis error MPE complies with ISO 10360-3:2000	FR	in µm	18°C - 22°C	6
Tangential four-axis error MPE complies with ISO 10360-3:2000	FT	in µm	18°C - 22°C	6

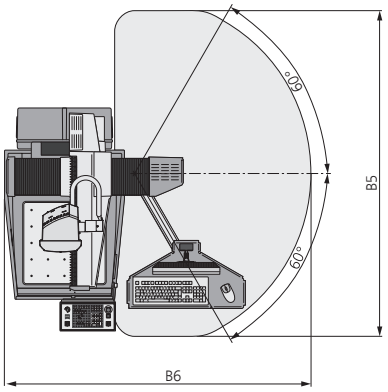


Note: the given dimensions and weights are approximate values. Dimensions in mm. Subject to change. Dimensioning based on DIN 4000-167:2009.

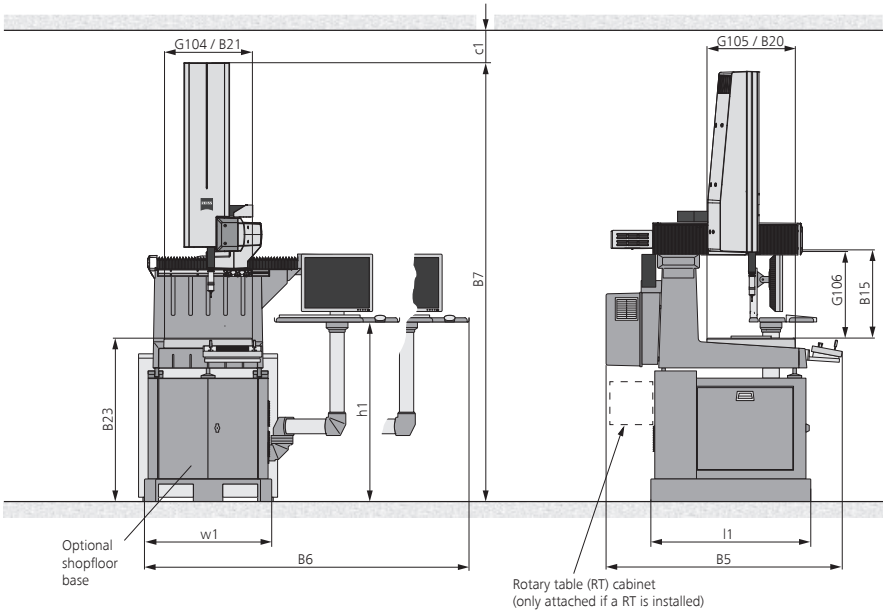
1) Available as an option. We offer it as retrofit of DuraMax with part number 636510-9280-000.
2) Dependent on the selected clamping equipment.
3) Load including exchangeable plate, clamping equipment and workpiece.
4) The rotary table specifications only apply when using original ZEISS 3D Alpha-Check for RT-RB-10-n, Δ h = 25 mm, r = 25 mm. A standard according to the specifications. of ISO 10360-3:2000 is not possible due to its design.

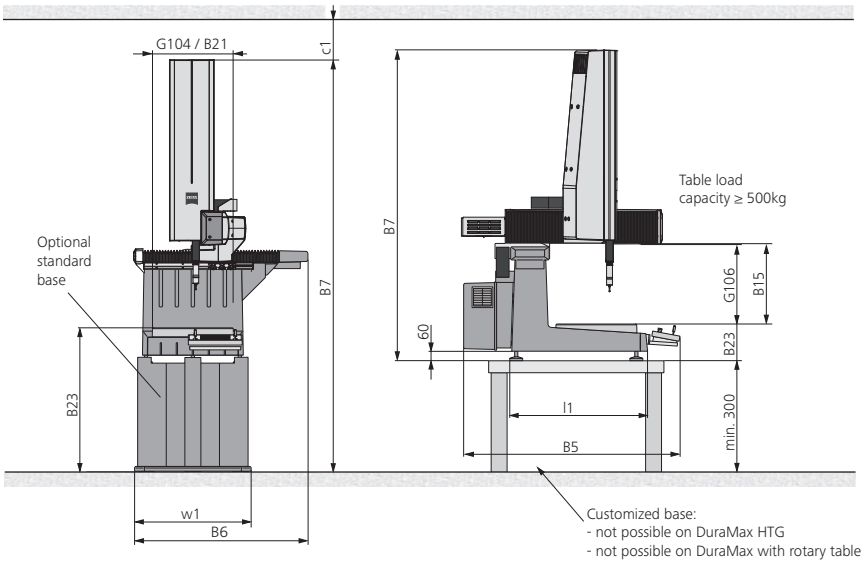
	Dimensions in mm								Weight in kg
ZEISS DuraMax	**Measuring range**			**Working range (max. workpiece size)**					**Max. load**
	X axis	Y axis	Z axis	Width	Length	Height			
	G104	G105	G106	B21	B20	B15			
	500	**500**	**500**	**500**	**500**	**500**			**100**
	Overall CMM dimensions			**Footprint**		**Working height**		**Assembly space**	**Measuring machine**
	Width	Length	Height	Width	Length	Height	Height	Height	
	B6	B5	B7	w1	l1	B23	h1	c1	
Basic model	**1080**	**1360**	**1803**	**670**	**870**	**230**	**-**	**≥200**	**350**
With standard base	1089	1360	2478	732	910	905	-	≥200	445 / 465 [1]
With shopfloor base	1870	1988	2511	732	920	940	1038	≥200	515 / 535 [1]

1) When using a ZEISS rotary table on the ZEISS DuraMax, including rotary table box.



Top view also for ZEISS DuraMax
with optional rotary table





Note: the given dimensions and weights are approximate values. Dimensions in mm. Subject to change. Dimensioning based on DIN 4000-167:2009.
If customers use their own base, then a locking mechanism must be used to prevent the DuraMax from slipping!
If the ZEISS base is used, a locking mechanism is already integrated.

ZEISS DuraMax HTG
with shopfloor base

Dimensions in mm						Weight in kg
Measuring range			**Working range (max. workpiece size)**			**Max. load**
X axis	Y axis	Z axis	Width	Length	Height	
G104	G105	G106	B21	B20	B15	
500	**500**	**500**	**500**	**500**	**500**	**100**

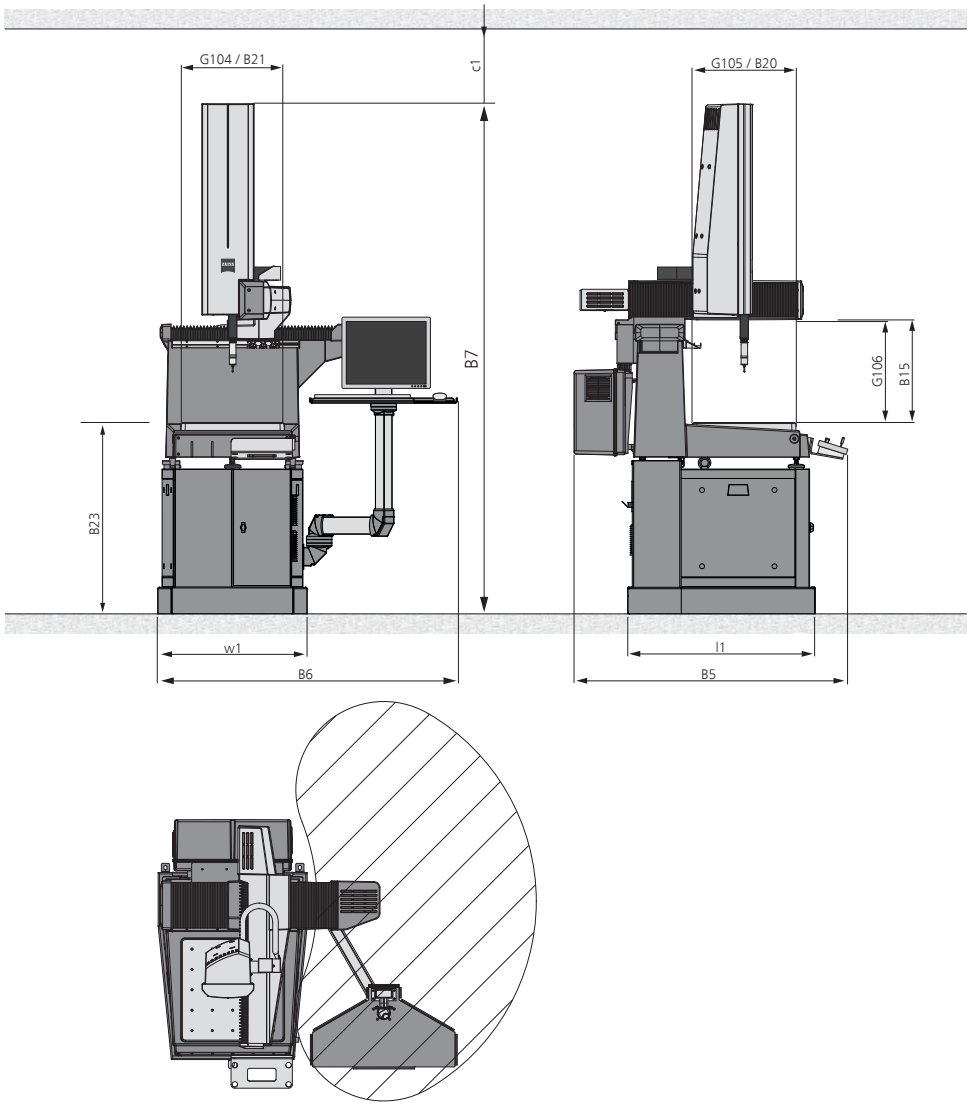
Overall CMM dimensions			**Footprint**		**Working height**		**Assembly space**	**Measuring machine**
Width	Length	Height	Width	Length	Height	Height	Height	
B6	B5	B7	w1	l1	B23	h1	c1	
1870	**1988**	**2511**	**732**	**920**	**940**	**1038**	**≥200**	**545 (incl. shopfloor base)**

DuraMax HTG with extended temperature gradients

Length measurement error [1) 2) 3)]	Extended temperature range ZEISS TVA 4)	E0 / E40	in µm	2.7 + L/30	18 °C - 30 °C
	Extended temperature range ZEISS TVA 5)	E0 / E40	in µm	3.9 + L/30	15 °C - 40 °C

Temperature behavior

Temperature range			18 °C - 30 °C	15 °C - 40 °C
Temperature gradient	Per day	in K/d	10.0	10.0
	Per hour	in K/h	3.0	3.0
	Spatial	in K/m	1.0	1.0



1) Measuring length L in mm.
2) Measuring length on ZEISS DuraMax based on typical feature sizes.
3) In compliance with the given temperature behavior and not volatile temperature changes.

Technical features

	DuraMax	DuraMax HTG
Length measurement system	Glas ceramic, resolution 0.2 µm, carrier material: Robax	Glas ceramic, resolution 0.2 µm, carrier material: Zerodur
Controller	Based on ZEISS C99L	Based on ZEISS C99L
	Protection class IP53	Protection class IP53
Clamping device	Material: cast iron, mounts: 25 M10 threads, 100 mm hole spacing, flatness: in accordance with DIN 876-III	

Ambient conditions

	DuraMax	DuraMax HTG
Relative humidity	40% - 70% (without condensation)	40% - 70% (without condensation)
Ambient temperature	18°C - 30°C	15°C - 40°C
Floor vibrations	ZEISS DuraMax, ZEISS DuraMax RT and ZEISS DuraMax HTG with passive vibration damping.	

Requirements for operational readiness

	DuraMax	DuraMax HTG
Humidity	max. 70% (without condensation)	max. 70% (without condensation)
Ambient temperature	15°C - 35°C	15°C - 40°C
Electrical power rating	1/N/PE 100 - 240 V~ (±10%); 50-60 Hz Power consumption: max. 600 VA Typical power consumption: 150W / 160 W with rotary table Amount of heat generated: max. 2160 kJ/h	1/N/PE 100 - 240 V~ (±10%); 50-60 Hz Power consumption: max. 600 VA Typical power consumption: 150W Amount of heat generated: max. 2160 kJ/h

Approvals

Regulations	ZEISS DuraMax complies with EC machine directive 2006/42/EC, the EMC directive 2014/30/EU and the RoHS directive 2011/65/EU. CE DEKRA C SP US EAC (for Russia)
Disposal	ZEISS products and packaging returned to us are disposed of in accordance with applicable legal provisions.

Certifications/accreditations

Quality management system	ISO 9001:2015
Environmental management system	ISO 14001:2015
Occupational health & safety management systems	ISO 45001:2018
Accredited	ISO/IEC 17025

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