

# SPECTRUM®

## Specifications and performance features



**Carl Zeiss technology at an incredible value.**

- Proven ZEISS design features
- Small footprint
- C99 controller technology

Version: 2011-09



We make it visible.

# SPECTRUM. Incredible metrology value.

Carl Zeiss brings proven metrology technology to our new, affordable coordinate measuring machine. Years of experience in designing world-class CMMs is combined with the best high-tech materials and features to provide cutting-edge quality.

## Key features



### Machine design:

- Bridge-type measuring machine with fixed measuring table
- Measuring surface complies with DIN standards
- Rigid, lightweight bridge
- Integrated design for small footprint

### Accuracy and precision:

- CAA correction (Computer Aided Accuracy)
- Hard-coat aluminum parts ensure long-term stability of guideway behavior
- Glass-ceramic length measuring system



## Machine technology



### Carl Zeiss technology:

- Dynamic drive features with automatic drive control
- All axes with wrap-around air bearings
- Passive vibration damping with elastomer spring elements

### ZEISS C99L controller:

- PC-based controller with real-time operating system
- Modular design permits easy maintenance
- Upgradeability for future requirements
- Integrated into machine design for reduced CMM footprint

## Measuring range



### Designed for a variety of applications:

- Available in different sizes for small- and medium-sized measuring applications
- Choose from a mm measuring range of 700 x 700 x 600 or 700 x 1000 x 600
- Small footprint with integrated control systems on machine base

### Maximum workpiece weight:

- From 308 kg for the 700/700/600 model, up to 402 kg for the 700/1000/600 model

## Sensors

### Designed to work a range of sensor options.

SPECTRUM can be configured with the ZEISS RDS-C5 articulating probe holder that offers 5,184 angular position for the Carl Zeiss XDT multi-point sensor and the Renishaw TP20.

It can also be configured with the XDT directly for general prismatic applications.



## Operation

### Simple and easy to use:

- New standard control panel for motorized control
- Speed control for CNC measuring operations
- LCD display for coordinates, stylus, etc.

### Practical:

- Maintenance-friendly design
- Joysticks are shifted to top of panel for better usability

### Safe:

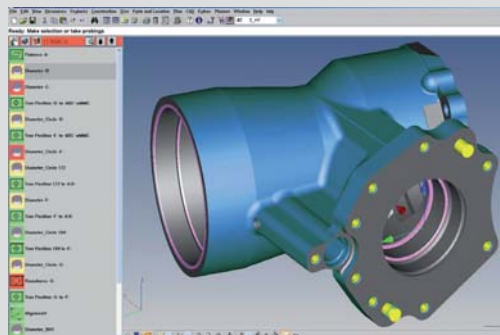
- Collision protection for styli
- Joystick security unlock buttons and locking state LEDs



## Software

### User-friendly CALYPSO metrology software from Carl Zeiss:

- Revolutionary CAD-based metrology software with Visual Metrology
- Create a measuring plan without programming a single line of code
- No time-consuming, structural programming or difficult code and text editing
- Concentrate on what's really important—the actual measuring task



## Precision

### Accuracy:

- Freely selectable temperature range (18-22°C) with the same accuracy
- For SPECTRUM, the length measuring error (MPE) based on DIN EN ISO 10360-2:  
2.1 + L/250 (0.082 + L/250) (XDT Sensor)  
2.4 + L/250 (0.095 + L/250) (TP20)
- For other sensor accuracy information and full specifications, please see page 10.



# Proven hardware technology.

Have confidence in your measuring results.

## Solid performance

Rigidity and stability are important at maximum speed and acceleration. SPECTRUM performance is significantly enhanced with the use of wrap-around air bearing construction in all guideways. The support from all four sides guarantees superior measuring capability.

## Advanced guideway materials

Hard-coat aluminum guideway elements offer a variety of benefits including corrosion resistance, hardness and wear resistance, electrical resistance, temperature resistance and a low friction coefficient.

## Sturdy and robust machine base

SPECTRUM offers no compromises on structural quality and is built upon a sturdy and robust machine base.

## Maintenance-friendly construction

The protective housing covers of the bridge can be removed and remounted in only a few steps. All parts are easily accessible, thus reducing servicing time and increasing machine availability.

## Precision movement controller

Our C99L controller is integrated into the SPECTRUM design reducing the need for additional floor space. It provides smooth, accurate, high-speed 3-axis CNC movement for all measuring tasks.

## New standard control panel

The dual-joystick panel makes motorized control easy. It includes a monochrome LCD graphic display for coordinate and stylus information, repositioned joysticks for better usability, and improved mechanical deflection features.

## Designed for your application needs

SPECTRUM is available in two sizes for small and medium-sized measuring applications. Choose from a measuring range of 700 x 700 x 600 mm with a workpiece weight of 308 kg or a measuring range of 700 x 1000 x 600 mm with a workpiece weight of 402 kg.



*Easy-to-use dual-joystick control panel with display for motorized control.*


*Integrated C99L controller  
and accessible air supply.*



*Coated aluminum bridge elements.*







*SPECTRUM can be configured with the ZEISS RDS-C5 articulating probe holder that offers 5,184 angular position for the Carl Zeiss XDT multi-point sensor and the Renishaw TP20.*

*It can also be configured with the XDT directly for general prismatic applications.*

**Configure with articulating  
or direct.**



# CALYPSO.

The easy way to create part programs.



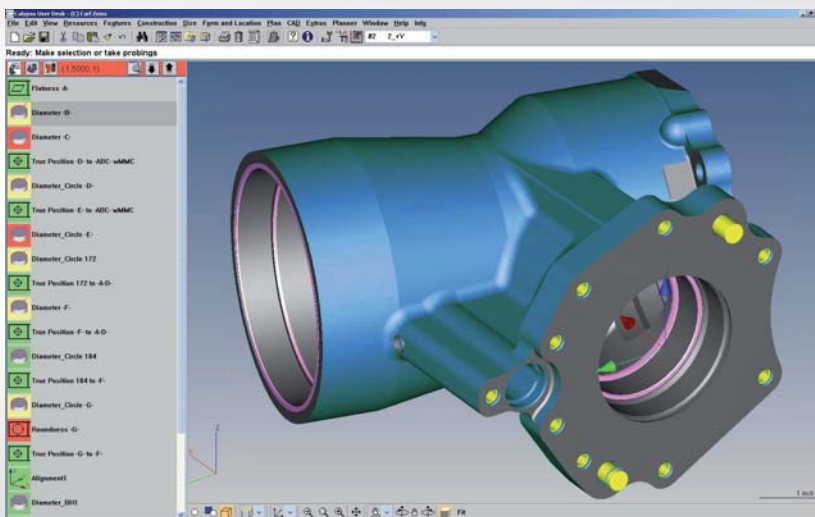


## CALYPSO

### Revolutionary CAD-based software.

Imagine measuring software that returns exactly the information you want within the shortest possible time; measuring software whose results can be understood by everyone involved in the manufacturing process; measuring software that frees you from time-consuming, routine activities. You select the tolerances from the drawing or the CAD model according to the requirements of the workpiece. You define the measuring elements to be evaluated. The integrated assistant helps you select the necessary references and, before you know it, your measuring plan is ready.

This method of creating and maintaining measuring plans – Visual Metrology – is the basis of CALYPSO. The advantages are at your finger tips: create a measuring plan without programming a single line! No time-consuming, structural programming. No difficult code or text editing. Concentrate on what's really important – the actual measuring task.



# Properties and performance data

## System description

<b>Design</b>	Bridge-type CMM with stationary machine table and lateral bridge drive
<b>Operating mode</b>	Motorized / CNC
<b>Sensor mount</b>	Fixed / RDS / Renishaw
<b>Software</b>	CALYPSO metrology software

## Dynamics

<b>Travel speed</b>	Motorized:	Axes:	0 to 70 mm/s
	CNC:	X axis:	max. 200 mm/s
		Y axis:	
		Z axis:	
		Vector:	
<b>Acceleration</b>		Axes:	max. 500 mm/s <sup>2</sup>
		Vector:	max. 866 mm/s <sup>2</sup>

## Sensors and speed

**RDS** XDT multi-point contact sensor direct or dynamic RDS-C5 articulating unit with XDT or TP20.



RDS-C5 lateral swivel axis provides advantages over articulating joints with front-to-back and lateral tilt axis; front-to-back and lateral tilt range of  $\pm 180^\circ$ , large measuring range, rotation increments of  $5^\circ$ , CAA correction for automatic calibration of all 5,184 angular positions for contact sensors.

XDT (TL3 module) allows stylus length = 30-150 mm; max. extension = 100 mm; max. stylus weight = 15 g; min. stylus tip diameter = 0.3 mm. See Renishaw sensor specifications for max. probe weight and extension lengths.

### Length measuring error <sup>2)</sup>

MPE complies with DIN EN ISO 10360-2:2001	for <b>E</b> in $\mu\text{m}$	<b>XDT:</b> 2.1 + L/250 <b>TP20:</b> 2.4 + L/250
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### Probing error

MPE complies with DIN EN ISO 10360-2:2001	for <b>P</b> in $\mu\text{m}$	<b>XDT:</b> 2.1 <b>TP20:</b> 2.6
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## Technical features

<b>Length measuring system</b>	Reflected light length measuring system, photoelectric 0.2 $\mu\text{m}$ resolution
<b>Special features</b>	Aluminum crossbeam and spindle. Pneumatically counterbalanced Z axis. Preloaded high-performance air bearings with wrap-around guideways in all axes. Passive anti-vibration system.
<b>Drives</b>	High-performance servo drives. Electronic monitoring of position control in all axes.
<b>Control</b>	Type: ZEISS C99L (CNC 3-axis vectorial control) Cooling system: Integrated Fan
<b>Accessories</b>	Standard control panel: 2 joysticks with progressive characteristics for manual control.

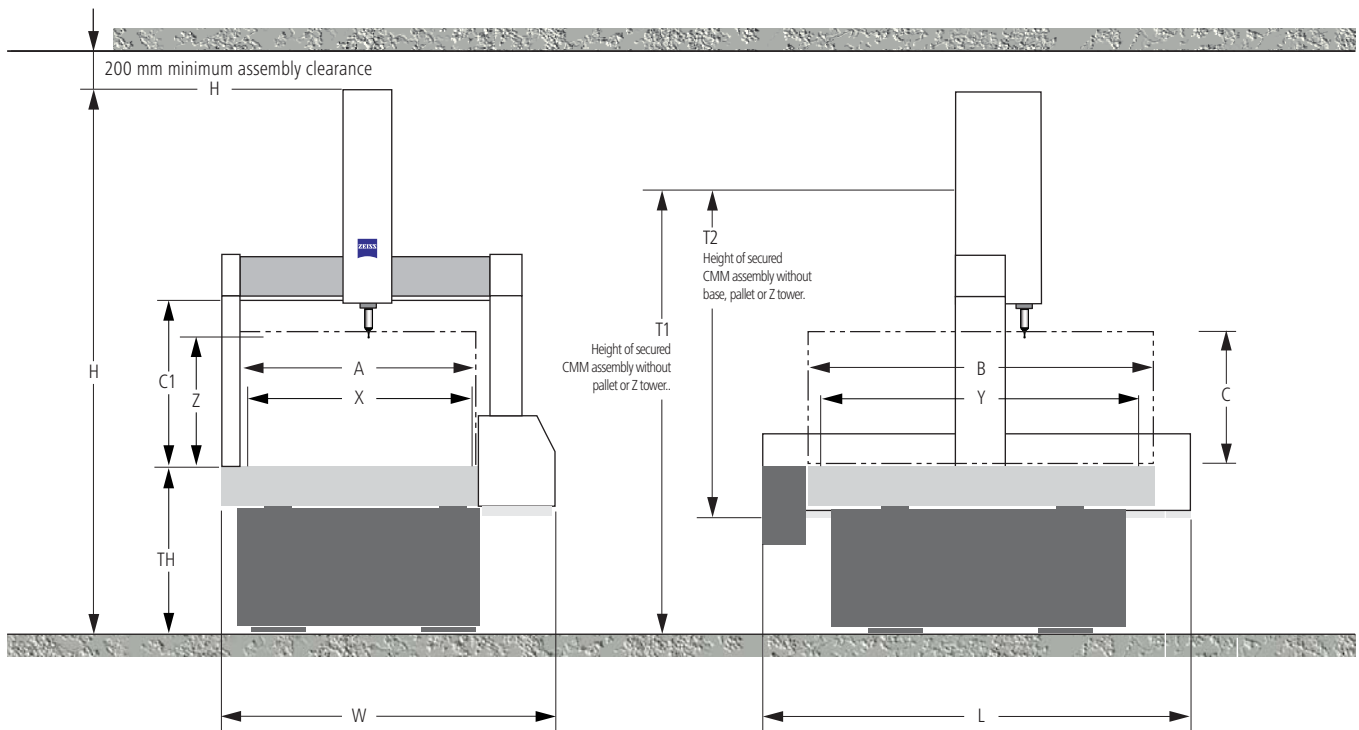
## Ambient requirements <sup>3)</sup>

<b>Relative humidity</b>	40 % to 60 %	
<b>Measuring reference temperature from</b>	<b>18°C to 22°C <sup>4)</sup></b>	
<b>Temperature fluctuations</b>	Per day:	1.5 K/d
	Per hour:	1.0 K/h
	Spatial:	1.0 K/m

## Requirements for operational readiness

<b>Ambient temperature</b>	+17 to +35°C
<b>Power rating</b>	100-240 V VAC $\sim$ (+10%, -15%); 50-60 Hz ( $\pm 3.5\%$ ), Power consumption: max. 600 VA
<b>Compressed air supply</b>	Supply pressure 6 - 10 bar, pre-cleaned. Maximum consumption: 25 l/min at 5 bar pressure. Air quality according to ISO 8573 part 1: class 4

CMM sizes	Measuring range in mm			Max. workpiece weight kg	Measuring machine weight kg	Dimensions in mm									
	X axis	Y axis	Z axis			Machine overall dimensions			Working area			Assembly space	Table	Transport	
	X	Y	Z			Width	Length	Height	Width	Length	Height	Height	Height	Height	Height
	W	L	H			A	B	C	C1	TH	T1	T2			
717/6	700	700	600	308	1180	1430	1560	2800	930	1041	725	845	850	2200	1600
7110/6	700	1000	600	402	1430	1430	1860	2800	930	1346	725	845	850	2200	1600



## Safety

### Regulations

SPECTRUM is designed and built to EC machine directive 2006/42/EC and EMC directive 2004/108/EEC.

**DIN EN ISO 9001**

### Disposal

CZ products and packaging returned to us are disposed of in accordance with applicable legal provisions.

- 1) Acceptance test with a stylus length of 25 mm and sphere diameter of 8 mm.
- 2) Measuring length L in mm.
- 3) To ensure specified accuracies.
- 4) At a measuring lab temperature that has remained constant for 48 hours.

Notes: Given dimensions and weights are approximate values. Subject to change. Dimensioning based on DIN 4000-167:2009. Measuring range in Z and working area height C may vary depending upon probe configuration.

## Comments on accuracy information

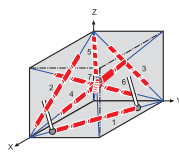
### MPE = Maxium Permissible Error

As per DIN EN ISO 10360, every specification for accuracy is noted as Maximum Permissible Error (MPE). MPE defines a maximum value that a measuring deviation must not exceed for a certain measuring task. Measuring tasks are marked by an index.  $MPE_E$  describes the linear measuring tolerance and  $MPE_P$  describes the probing tolerance.

Maximum permissible linear measuring tolerance

### $MPE_E$

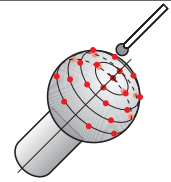
Calibrated gage blocks or stepper gage blocks are measured to determine linear measuring tolerance. 5 different lengths in 7 positions in the measuring range of the machine must be determined. Each length is measured three times. The determined values are compared with the calibrated values. The tolerance must not exceed the specification. The specification depends on the length in most cases and is written  $MPE_E=A+L/K$ . L refers to the measuring length. The formula is occasionally written  $MPE_E=A+F \cdot L/K$ . In such cases, it must be converted in order to compare it to the first variation. For example, these values are identical:  $MPE_E=2.5+1.5 \cdot L/333$  and



Maximum permissible probing tolerance

### $MPE_P$

A sphere (10-50 mm diameter) with minimal form error is measured at 25 positions recommended by ISO 10360-2 in order to determine probing tolerance. A Gaussian least squares sphere is calculated from the measured values. The range of radial distances from the sphere must exceed the



## Measuring technology from an industry leader

Reliable, high-quality measuring technology consists primarily of the coordinate measuring machine, well-engineered software and customer service and support. We develop all components vital to the functionality of our measuring technology in house. This is the only way to ensure that our measuring machines consistently provide maximum quality – from sensor integration to the controller electronics to the software. Only when all components are built to work together, when materials are matched for both compatibility and functionality can they work in perfect harmony.

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