

## Comments on the accuracies

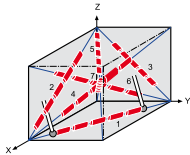
### MPE = Maxium Permissible Error

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  $MPE_P$  the probing tolerance.

Maximum permissible linear measuring tolerance

### $MPE_E$

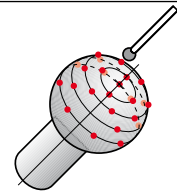
Calibrated gage blocks or stepper gage blocks are measured to determine linear measuring tolerance. 5 different lengths in 7 positions in the measuring range of the machine must be determined. Each length is measured three times. The determined values are compared with the calibrated values. The tolerance 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  $MPE_E=2.5+L/220$ .



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 specification.



## Carl Zeiss IMT: Measuring technology from the master

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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# SPECTRUM®

## Specifications and performance features



**The new SPECTRUM CMM**  
Carl Zeiss technology at an incredible value.

- Proven ZEISS design features
- Large measuring range
- Small footprint
- C99 controller technology
- Wide range of sensor options

Version: 2009-10



We make it visible.

# The new 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 879
- 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

#### Controller technology from Carl Zeiss:

- PC-based controller with real-time operating system
- Modular design permits easy maintenance
- Upgradeability for future requirements
- Controller 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 (in) measuring range of 700 (27.6) x 700 (27.6) x 600 (23.6) up to a max. of 1,000 (39.4) x 1,600 (63.0) x 600 (23.6)
- Small footprint with integrated C99L controller on machine base

#### Maximum workpiece weight:

- From 308 kg for the smallest 700 model, up to 825 kg for the largest 1000 model

## Sensors

**SPECTRUM is designed to work with most Renishaw sensors (standard 5-pin DIN socket), including:**

- **MH20i** manually indexable probe head with integrated TP20 probe body, enabling flexible stylus changing and repeatable probe re-orientation.
- **RTP20** semi-automated probe head offers low-cost machine-articulated head functionality with a TP20. The probe can be moved to 168 repeatable positions in 15-degree increments.
- **PH10** motorized indexing heads. They allow for flexible and repeatable probe re-orientation, each can carry a range of probes and extensions and can be orientated in 720 repeatable positions, giving access to difficult-to-reach features.



## 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:**

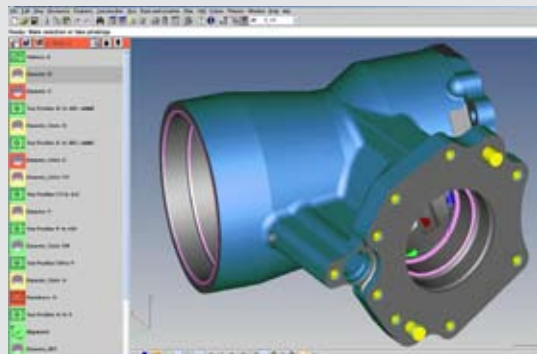
- Collision protection for styli
- Joystick security unlock buttons and locking state LEDs



## 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. No difficult code or 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 linear measuring tolerance (MPE) based on DIN EN ISO 10360-2 is:

2.4  $\mu\text{m}$  + L/250 (X = 700 mm)

2.7  $\mu\text{m}$  + L/250 (X = 1000 mm)



# Proven hardware technology.

**Have confidence in your measuring results.**

### **Small footprint and ergonomic design**

The compact CMM base takes up less space under the CMM and it provides plenty of leg room for machine operators. Motorized sensor controls (optional) are mounted to the base, conveniently tucked away for easy access and maintenance.

### **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 performance.

### **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.

### **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.

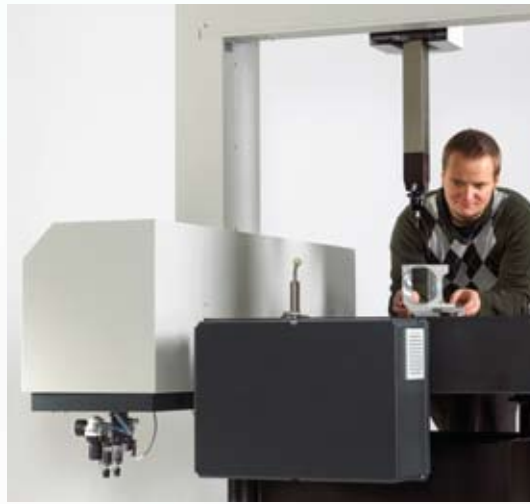
### **New standard control panel**

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 different 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 up to a measuring range of 1,000 x 1,600 x 600 mm with a workpiece weight of 825 kg.





**Integrated C99L controller and accessible air supply.**



**Easy access to and maintenance of sensor controls (optional).**



**Protective housing covers.**

**Coated aluminum bridge elements.**

**Available with a wide range of sensors.**

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

**Compact base provides small footprint and plenty of room for measuring while seated.**



# Choose the right sensor for your application.

SPECTRUM works with most Renishaw sensors (standard 5-pin DIN), including the MH20i manually indexable probe head with an integrated TP20 probe body enabling flexible stylus changing and repeatable probe re-orientation, the RTP20 machine-articulated head for low-cost automated

indexing of a TP20 to 168 repeatable positions in 15-degree increments, and PH10 motorized indexing heads that can carry a range of probes and extensions with automated probe re-orientation in 720 repeatable positions for access to difficult-to-reach features.



entry



performance



comfort





# CALYPSO.

The easy way to create part programs.

## myCALYPSO

### Just measure.

Faster and more efficient use of the software is required for ease of use. myCALYPSO makes it possible. The 50 most common measuring jobs are programmed in macros and can be combined to create individual measurement plans. The easy and intuitive user guidance throughout the measuring run with clear, context-related instructions enables fast measurement and evaluation.



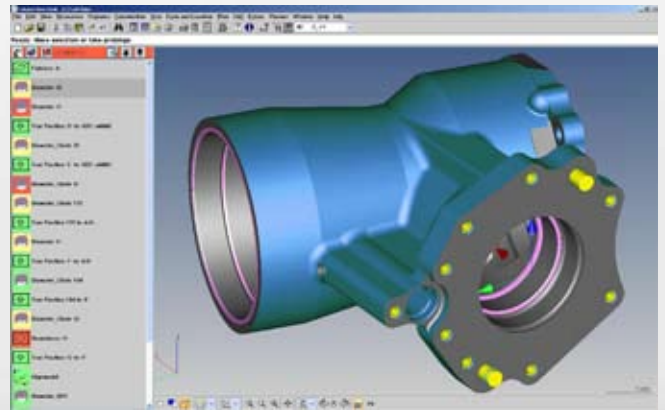
## CALYPSO

### 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.



## Measure in three steps with myCALYPSO.

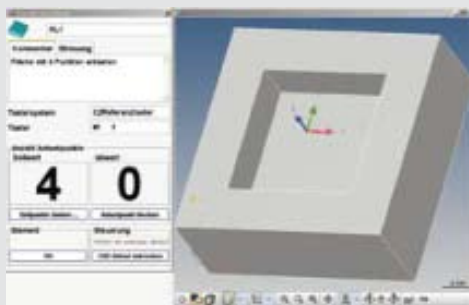
### Step 1:

Select the required macros with a simple click. Combine any number of macros to create an individual test plan.



### Step 2:

Easy and intuitive user guidance throughout the measuring run with clear, context-related instructions in the menu.



### Step 3:

myCALYPSO clearly displays the measuring results in automatically generated measurement logs.

Messwert	Schwank	Grenzwert	Lichtwert	Abweichung
D_1,1	30,0000	0,0000		30,0000
1_Messwert				
D_2,1	30,0000	0,0000		30,0000
2_Messwert				
S_0,0	10,0000	0,0000		10,0000
3_Messwert				

# Properties and performance data

## SPECTRUM 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 / Renishaw
<b>Software</b>	CALYPSO Metrology Software

## SPECTRUM dynamics

		700		1000	
<b>Travel speed</b>	Motorized:	Axes:	0 to 70 mm/s (2.8 in/s)	0 to 70 mm/s (2.8 in/s)	
	CNC:	X axis:			
		Y axis:	max. 200 mm/s (7.9 in/s)	max. 175 mm/s (6.9 in/s)	
		Z axis:			
		Vector:	max. 346 mm/s (13.6 in/s)	max. 303 mm/s (11.9 in/s)	
<b>Acceleration</b>		Axes:	max. 500 mm/s <sup>2</sup> (19.7 in/s <sup>2</sup> )	max. 500 mm/s <sup>2</sup> (19.7 in/s <sup>2</sup> )	
		Vector:	max. 866 mm/s <sup>2</sup> (34.1 in/s <sup>2</sup> )	max. 866 mm/s <sup>2</sup> (34.1 in/s <sup>2</sup> )	

## SPECTRUM sensors and speed

		700		1000	
<b>Renishaw sensors</b> <sup>1)</sup> :	SPECTRUM is designed to work with a wide range of Renishaw sensors, including the TP6, TP20, and TP 200 and with the RTP20 automated probe head for low-cost machine-articulated head functionality, the MH20i manually indexable probe head with integrated TP20 probe body, and PH10 motorised indexing heads. Available with the MCR 20 and SCR 200 probe changer magazines depending on sensor configuration.				
<b>TP6, TP20, TP200 as examples</b>	See Renishaw sensor specifications for max. probe weight and extension lengths.				
	<b>Linear measuring tolerance</b> <sup>2)</sup>				
	MPE complies with DIN EN ISO 10360-2:2001	for <b>E</b> in µm (in./1000)	2.4 + L/250 (0.095 + L/250)	2.7 + L/250 (0.106 + L/250)	
	<b>Probing tolerance</b>				
	MPE complies with DIN EN ISO 10360-2:2001	for <b>P</b> in µm (in./1000)	2.4 (0.095)	2.7 (0.106)	

## SPECTRUM technical features

<b>Length measuring system</b>	Reflected light length measuring system, photoelectric 0.2 µm (0.000008 in) 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>Data technology</b>	The SPECTRUM CMM series comes with a fully equipped workstation.
<b>Accessories</b>	Standard control panel: 2 joysticks with progressive characteristics for manual control.

## SPECTRUM ambient requirements

<b>Relative humidity</b>	40 % to 60 %	
<b>Measuring reference temperature from</b>	18°C to 22°C (64.4 - 71.6°F) <sup>4)</sup>	
<b>Temperature fluctuations</b>	Per day:	1.5 K/d (2.7 °F/d)
	Per hour:	1.0 K/h (1.8 °F/h)
	Spatial:	1.0 K/m (0.5 °F/ft)

## SPECTRUM requirements for operational readiness

<b>Ambient temperature</b>	+17 to +35°C (63 - 95°F)
<b>Power rating</b>	100-240 V VAC ~ (+10%, -15%); 50-60 Hz (±3.5%), Power consumption: max. 750 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

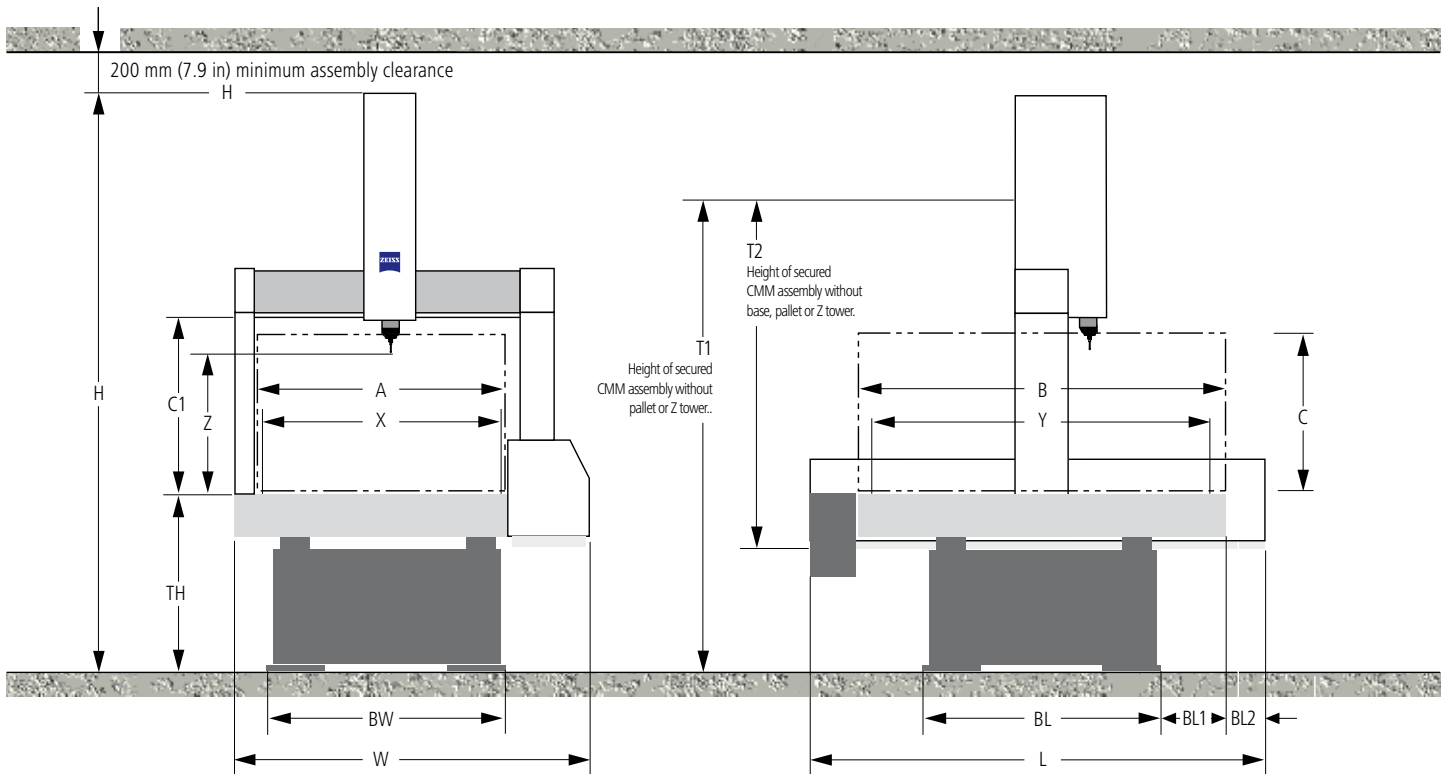
1) Acceptance test with a stylus length of 25 mm (0.98 in) and sphere diameter of 8 mm (0.31 in).

2) Measuring length L in mm (in).

3) To ensure specified accuracies.

4) At a measuring lab temperature that has remained constant for 48 hours.

CMM sizes	Measuring range in mm (in)			Max. workpiece weight kg (lbs)	Measuring machine weight kg (lbs)	Dimensions in mm (in)														
	X axis	Y axis	Z axis			Machine overall dimensions			Working area			Assembly space	Machine base dimensions				Table	Transport		
	X	Y	Z			Width	Length	Height	Width	Length	Height	Height	Width	Length	Length	Length	Height	Height	Height	
	W	L	H			A	B	C	C1	BW	BL	BL1	BL2	TH	T1	T2				
7/7/6	700 (27.6)	700 (27.6)	600 (23.6)	308 (679)	1180 (2601)	1430 (56.3)	1560 (61.4)	2800 (110.2)	930 (36.6)	1041 (41.0)	725 (28.5)	845 (33.2)	890 (35.0)	705 (27.8)	228 (9.0)	206 (8.1)	850 (33.5)	2200 (86.6)	1600 (63.0)	
7/10/6		1000 (39.4)		402 (886)	1430 (3153)		1860 (73.2)			1346 (53.0)				896 (35.3)						
10/12/6	1000 (39.4)	1200 (47.2)		633 (1396)	2310 (5092)	1740 (68.5)	2060 (81.1)		1546 (60.9)	1230 (48.4)			1546 (60.9)	995 (39.2)	1025 (40.1)					340 (13.4)
10/16/6		1600 (63.0)		825 (1819)	2830 (6239)		2460 (96.9)		1946 (76.6)				1270 (50.0)							



## SPECTRUM safety

### Regulations

SPECTRUM is designed and built to EC machine directive 98/37/EC, including low-voltage directive 2006/95/EEC 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.

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