

# PRISMO Navigator >>>

High-Speed CNC 3D Measuring Machine  
High Precision Under Various Environmental Conditions

## PRISMO Navigator

Maintaining high speed and consistently high precision under different temperatures, vibration, with contaminants and other environmental conditions is imperative. The machine must be able to flexibly handle all types of measuring requirements, and not require any specialized knowledge to operate. The PRISMO series effectively responds to all of these demands from the production line. It incorporates the wealth of expertise nurtured by CARL ZEISS over 20 years, superior precision technology and a full host of functions in order to provide high precision, speed, stability and ease of operation. This series features outstanding quality and cost performance.

### Features

- Adequate precision for production floor measurements:  
MPE<sub>E</sub>=1.4+L/333 μm  
(PRISMO Navigator 5/7 HTG VAST GOLD)  
Higher precision available: MPE<sub>E</sub>=0.9+L/350 μm  
(PRISMO Navigator 5/7 S-ACC VAST GOLD)
- Point measurement and scanning with VAST probe head
- High-speed scanning of 200 points per second (VAST)
- High precision maintained in wide range of ambient temperatures (HTG)
- Easy-to-use graphical user interface
- Extensive lineup responds to user requirements



PRISMO Navigator HTG VAST GOLD

Maintains high precision throughout a wide ambient temperature range.

PRISMO Navigator S-ACC VAST GOLD

Provides an even higher level of precision.



PRISMO Navigator 7



## Adequate Precision for Production Floor Inspections $MPE_E=1.4+L/333\mu m$

The design criteria for the PRISMO series were adequate precision for measurements on the production floor and maintaining this precision under virtually all environmental conditions. A variety of technological features have been implemented to guarantee the precision in the specifications is maintained under a wide range of ambient temperatures and other adverse environmental conditions, including floor vibration. VAST has an Active Scanning mechanism for high-level measurement of a wide variety of parameters.

### ■ Measurement Precision Guaranteed on Production Floor $MPE_E=1.4+L/333\mu m$ (PRISMO Navigator 5/7 HTG VAST GOLD)

For Higher Precision Requirements:

$MPE_E=0.9+L/350\mu m$  (PRISMO Navigator 5/7 S-ACC VAST GOLD)

Measuring accuracy is a very important factor in effectively utilizing the product dimension tolerance range. When selecting a measuring machine, the measuring accuracy must be 20% or less of the dimension tolerance for normal machining. For example, for a diameter value of 50 H7 (i.e. dimension tolerance of  $\pm 15\mu m$ ), the measuring accuracy must be within  $3\mu m$ . The PRISMO series features outstanding speed and acceleration, and precision that more than satisfies this standard under a wide range of ambient temperatures and various other measuring conditions.

### ■ Point Measurement and Scanning Measurement with VAST Probe Head

The VAST probe head that is incorporated as a standard feature on the PRISMO series combines two probing technologies: point-to-point measurement and high-speed scanning measurement. This enables the same machine to perform profile inspections and position inspections, in addition to dimension measurements.

VAST: Variable Accuracy and Speed Probing Technology

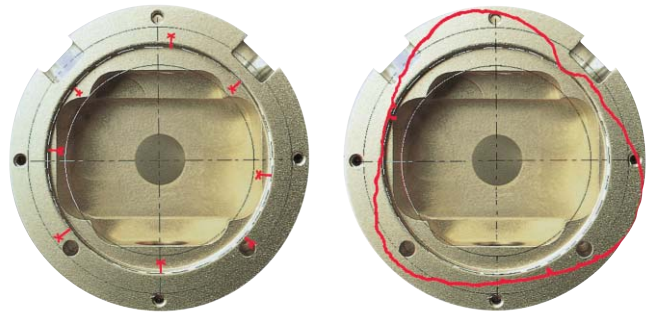


### ■ High-Speed Scanning Measurement

The VAST probe head achieves a high scanning measurement speed of 200 points per second.

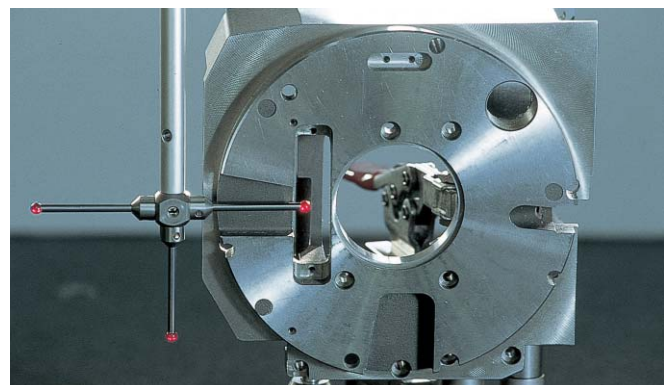
### ■ Bore Profile Measurement Completed in One Operation

Bore and cylinder inspection consists of one of the most frequently performed set of measurements. The revolutionary VAST performance exhibits its true value in this inspection where profile tolerance is the foremost problem. Since VAST scanning features multi-point measurement, all types of plug and ring gage dimensions can be evaluated, and dimensions can be displayed at the tolerance limit. Naturally, multi-point scanning measurement has higher reliability and repeatability for judgment of diameters and position dimensions than point-to-point measurements. A variety of evaluations can be performed with only one VAST measuring operation.



Portion of surface cannot be determined with point-to-point measurement

Overall profile can be determined with VAST scanning multi-point measurement



High-speed precision measurement of tools, thin-plate parts, dies and molds

### ■ High Speed for High Tolerances, High Precision for Low Tolerances

The VAST probe head allows the scanning speed/precision to be selected according to the measuring job and dimension tolerance. There are two levels of VAST scanning; One for rough machining and the other for finish machining.

#### ■ VAST Scanning Level 1: High Precision

- Effective for high precision measurement and profile evaluation
- Highly precise evaluation of diameter (dimension), position and roundness

#### ■ VAST Scanning Level 2: High Speed

- Enables high speed measurement when tolerance is high (Measuring error increases at this level)
- Reduces measuring time when reproducing diameter and center point position

### ■ Temperature Management by Multi-Function Interface (option)

With this option, the VAST probe head automatically measures the workpiece temperature. The probe changer magazine loads the ZEISS temperature sensor, and the machine program instructs the machine to measure/record the workpiece temperature at precisely determined positions. The results are transmitted in real time, enabling compensation for thermal expansion of the workpiece in the measured data.

## High-Speed and High Efficiency Short Stop Time Boosts Measuring Efficiency

A high speed in the specifications does not necessarily mean that the machine has the high-speed measuring capability that leads to enhanced productivity. Other factors such as a short stop time at each probing location and ease of setup are important. The PRISMO series was designed with all of these requirements of the production floor in mind to provide high speed and high precision measurement. A wealth of unique expertise has been incorporated to satisfy these two conflicting objectives.

### Automatic Probe Change System Reduces Setup Time

One probe combination is adequate for the inspection of a small number of workpieces. However, when multiple probes are required for workpieces with many measuring locations or many types of workpieces, the provision of an automatic probe changing system dramatically enhances measuring efficiency. Extremely high reproducibility when changes are performed eliminates the necessity of recalibration.



### Unique Design Concepts Provide High Speed and High Precision

The ZERODUR scale with a resolution of  $0.2 \mu\text{m}$  has been adopted for each axis. In addition, the machine has powerful control technology and bridge movement weight has been minimized. These unique design concepts provide the stability necessary to achieve high speed and high precision measurements.

### Single RDS Probe Capable of Measurements in All Directions

A newly developed RDS two-axis rotating probe holder is capable of pointing the probe at virtually any spatial angle direction by moving in  $2.5^\circ$  increments ( $144 \times 144$  for total of 20,736 positions). This reduces the trouble of using different probes for different spatial orientations.



Measurement with VAST probe



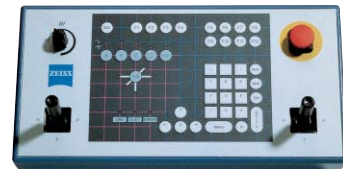
Measurement with RDS/RST-P probe

### Accuracy Guaranteed Without Temperature Compensation

The adoption of the ZERODUR scale that is free from thermal expansion/contraction, bridge structure/material that have stable thermal characteristics (simple expansion/contraction without distortion) and Thermo-fit stylus featuring no thermal expansion/contraction enable accuracy to be guaranteed over a wide temperature range without temperature compensation. This minimizes uncertainty in measurements due to compensation.

### Portable Operation Panel

The most important functions and frequently used measuring programs can be directly called from the portable operation panel during measuring operation.



## Designed with the Production Floor in Mind Measuring Accuracy Guaranteed Between 15 and 30°C (PRISMO Navigator 5/7 HTG VAST GOLD) (see specifications)

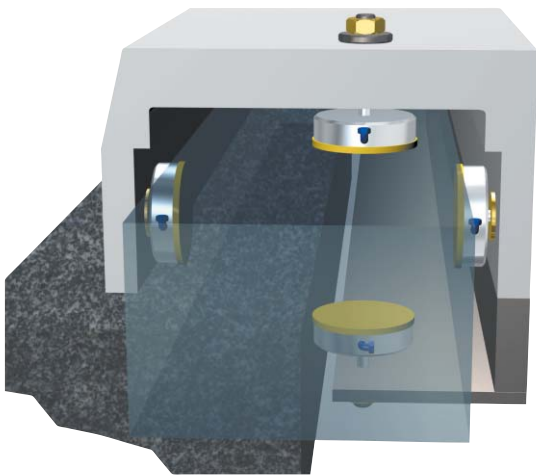
Temperature change, floor vibration, oil mist and various other problems must be taken into consideration for measurements made on the production floor. The PRISMO series incorporates a number of features that effectively address these problems in this type of environment. These include the use of a material with a low coefficient of thermal expansion, covers on the guides and reference scales, heat source insulation and absorption of floor vibration. This eliminates the necessity of providing air conditioning or a separate compartment on the production floor, reducing cost.

### ■ Comprehensive Ambient Temperature Measures

Constant accuracy can be guaranteed between an ambient temperature of 15 to 30°C (PRISMO Navigator 5/7 HTG VAST GOLD). The PRISMO series uses the ZERODUR scale that has zero thermal expansion for practical purposes. In addition, two temperature sensors are provided to measure the workpiece temperature.

### ■ High Rigidity Air Bearings

Eight air bearings are used for the Y axis guides to boost rigidity with respect to torsion. The air bearing structure surrounds the guides from four directions, guaranteeing accuracy even when moving at high speeds.

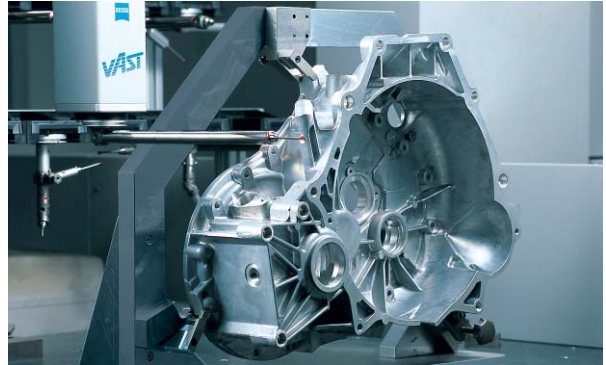


### ■ Protection from Contamination/Scratches

The guide surfaces and reference scales have covers to protect against contaminants and scratches. The X axis and Y axis guides are protected on the PRISMO.



Y axis left side guide protective cover



### ■ Bridge Has Superior Rigidity

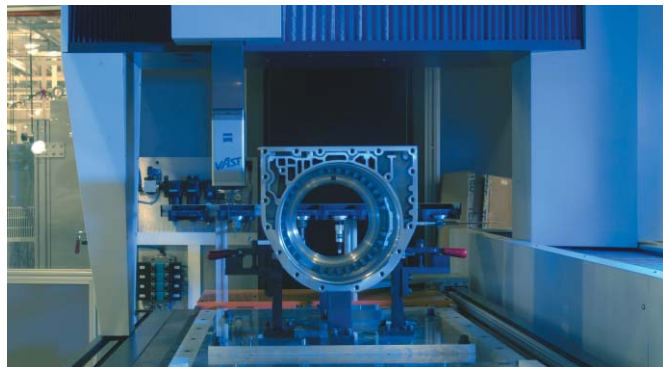
The bridge is lightweight and the finite element method has been used in its design to provide superior static and dynamic rigidity. In addition, state-of-the-art material is used at important locations.

### ■ Innovative Design Minimizes Thermal Influence

All granite plate surfaces except for the top are covered to insulate against heat. The operation panel is installed on the front cover.

### ■ Table Enhances Ease of Work

The table surface where measuring is performed has been designed to make it easy to clamp workpieces.



### ■ Highly Functional Design

The design facilitates operation, easy clamping/removal of workpieces, maintenance and inspection. Of course, all mechanical and electrical safety standards are satisfied.

### ■ Reduced Facility Costs

Since the PRISMO does not require air conditioning, a separate measuring room or special foundation, substantial savings in facility costs are realized.

# PRISMO Navigator achieves higher precision and faster scanning measurement than the conventional PRISMO.



PRISMO Navigator incorporates the Navigator system which, in addition to standards compensation (straightness and orthogonality of each axis, deflection of styluses, etc.) is capable of real-time compensation of deformation of styluses and measuring instruments caused by fluctuating force (acceleration) during movements while measuring. These features drastically improve the accuracy of high-speed scanning and greatly shorten measurement times. Measurement efficiency has been improved by up to 76% (30% or more average) over the conventional PRISMO.

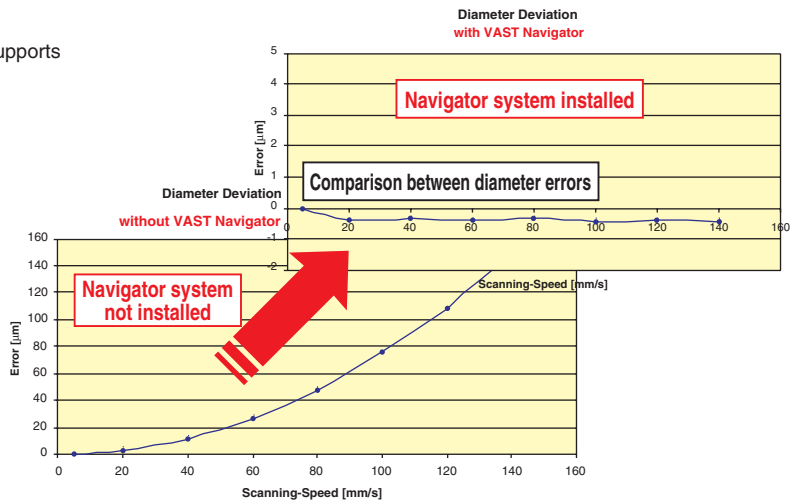
## Active Scanning Probe VAST GOLD

This probe is more rigid than the conventional VAST probe and supports longer and heavier styluses.

Max. stylus length: 800mm

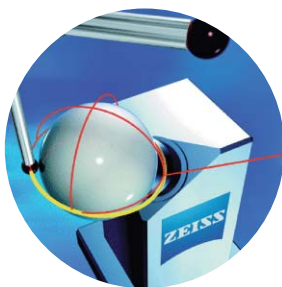
Max. stylus weight: 600g

Min. stylus tip diameter:  $\phi 0.3\text{mm}$



## Dynamic Probe Calibration

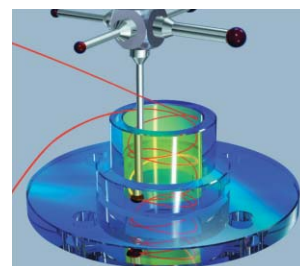
The amount of change caused by acceleration of the stylus and measuring machine is compensated by scanning the calibration ball under varying measurement speeds. (D-CAA: dynamic deflection compensation)



## Measurement Path Auto-generation Software

(tangential approach)

This software makes the probe approach non-stop along a spiral entry path to start scanning measurement. This way, the measurement time can be made shorter than the conventional approach method that involves a pause before the start of measurement.



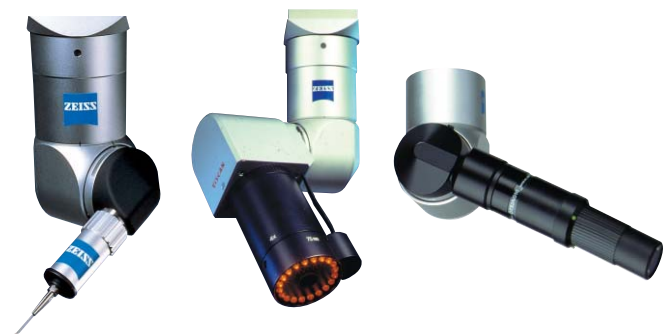
## Calypso software

The Navigator system is run by the Calypso software, which features an outstanding scanning analysis function.



## Multi-probe System

PRISMO Navigator supports a variety of probes thanks to the MPS-V multiple-probe interface option.



3D Coordinate Measuring Machines

## Specifications

Model		PRISMO 5		PRISMO 7				PRISMO 10(X:1200)				PRISMO 10(X:1600)			PRISMO 14(X:1600)				
		7/9/5	7/9/7	9/12/7	9/15/7	9/18/7	9/24/7	12/18/10	12/24/10	12/30/10	12/42/10	16/24/10	16/30/10	16/42/10	16/24/14	16/30/14	16/42/14		
Measuring Range (mm)	X	700	700	900				1200				1600			1600				
	Y	900	900	1200	1500	1800	2400	1800	2400	3000	4200	2400	3000	4200	2400	3000	4200		
	Z	500	650				1000				1000			1300					
S-ACC	Maximum Permissible Indication Error	MPE_E(μm)		0.9+L/350				1.3+L/350		1.5+L/350		1.7+L/350		2.5+L/300			3.2+L/300		
	Maximum Permissible Probing Error	MPE_P(μm)		1.0				1.3		1.5		2.1		2.7			3.0		
VAST	Maximum Permissible Scanning Error	MPE_THP(μm)		1.9				2.1		2.1		3.3			3.6				
GOLD	Temperature Conditions	Ambient Temperature (°C)		19 to 21°C				18 to 22°C				18 to 22°C			18 to 22°C				
		Temperature Change		1.0°C/hour, 2.0°C/day, 1.0°C/m high				1.0°C/hour, 2.0°C/day, 1.0°C/m high				1.0°C/hour, 2.0°C/day, 1.0°C/m high			1.0°C/hour, 2.0°C/day, 1.0°C/m high				
HTG	Maximum Permissible Indication Error	MPE_E(μm)		1.4+L/333 (1.9+L/300)				1.8+L/300 (2.4+L/300)		2.0+L/300 (2.4+L/300)		2.9+L/300 (3.4+L/270)			3.2+L/300 (3.7+L/270)				
	Maximum Permissible Probing Error	MPE_P(μm)		1.4				1.7		1.7		2.9			3.2				
VAST	Maximum Permissible Scanning Error	MPE_THP(μm)		2.4 (3.0)				3.0 (3.5)		3.0 (3.5)		3.5			3.8				
GOLD	Temperature Conditions	Ambient Temperature (°C)		18 to 22 (15 to 30)°C				18 to 22 (18 to 28)°C				18 to 22 (18 to 28)°C			18 to 22 (18 to 28)°C				
		Temperature Change		1.0 (2.0)°C/hour, 2.0 (5.0)°C/day, 1.0 (1.0)°C/m high				1.0 (2.0)°C/hour, 2.0 (5.0)°C/day, 1.0 (1.0)°C/m high				1.0 (2.0)°C/hour, 2.0 (5.0)°C/day, 1.0 (1.0)°C/m high			1.0 (2.0)°C/hour, 2.0 (5.0)°C/day, 1.0 (1.0)°C/m high				
S-ACC+HTG Options RDS	Maximum Permissible Indication Error	MPE_E(μm)		Note 1) 2.2+L/333 (2.2+L/300)				Note 2) 2.9+L/300 (2.9+L/250)		Note 2) 3.9+L/250 (3.9+L/200)		Note 2) 4.5+L/250 (4.5+L/200)			Note 2) 4.5+L/250 (4.5+L/200)				
	Maximum Permissible Probing Error	MPE_P(μm)		Note 1) 2.0 (2.3)				Note 2) 3.0 (3.3)		Note 2) 3.0 (3.3)		Note 2) 4.0 (4.0)			Note 2) 5.0 (5.0)				
	Temperature Conditions	Ambient Temperature (°C)		18 to 22 (18 to 24)°C				18 to 22 (18 to 24)°C				18 to 22 (18 to 24)°C			18 to 22 (18 to 24)°C				
Measuring Scale		ZERODUR scale				ZERODUR scale				ZERODUR scale			ZERODUR scale			ZERODUR scale			
Scale Resolution (μm)		ZERODUR scale				ZERODUR scale				ZERODUR scale			ZERODUR scale			ZERODUR scale			
Scale Resolution (μm)		ZERODUR scale				ZERODUR scale				ZERODUR scale			ZERODUR scale			ZERODUR scale			
Table (mm)	Material	Gabbro				Gabbro				Gabbro			Gabbro			Gabbro			
	Usable Width	895	895	1070				1416				1700			1700				
	Usable Depth	1220	1220	1520	1820	2120	2720	2420	3020	3620	4820	3020	3620	4820	3020	3620	4820		
	Floor-to-Table Height (including table thickness of 30mm)	880		880				620		670		670			670				
Workpiece Measured	Max. Height (mm)	595		705				1079				1379			1379				
	Max. Weight (kg)	1200	1200	1300	1500	2000	2000	2000	3500	3500	3500	3500	3500	3500	3500	3500	3500		
Guide System		Air bearing																	
Drive Speed (mm/s)		Joystick mode: 0 to 70, CNC mode: 300 max. in each axis direction, 520 max. in vector direction, scanning mode: 100 max.																	
Drive Acceleration (mm/s <sup>2</sup> )		Axis Direction 1400 max. Vector Direction 2400 max.				Axis Direction 0800 max. Vector Direction 1400 max.				Axis Direction 0600 max. Vector Direction 1000 max.			Axis Direction 0600 max. Vector Direction 1000 max.						
Air Source		Supply pressure: 0.6 to 1.0 MPa; Usage Pressure: 0.5 MPa; Consumption: 60 NR/min.																	
Power Requirements		Supply voltage: Single-phase 100V AC ±10%, Frequency: 50/60 Hz ±3.5%, Max. power consumption: 1900 VA (including data processor)																	
Machine Dimensions (mm)	Width	1558	1558	1733				2050				2450			2450				
	Depth	1740	1740	2040	2340	2640	3240	2940	3540	4140	5340	3540	4140	5340	3540	4140	5340		
	Height	2930		3030				3540		3590		3890			4285				
Machine Weight (kg)		1650	1720	2250	2900	3410	4740	6000	7250	9500	12500	11000	13000	17000	11000	13000	17000		
Required Ceiling Height for Installation (mm)		3130		3230				3740		3790		4090			4485				
Delivery Clearance Height (+200) (mm)		1950		2100		2150		2900				3200			3200				

\* MPE\_E (Maximum Permissible Indication Error) and MPE\_P (Maximum Permissible Probing Error) are based on the ISO 10360-2-2001 (JIS B 7440-2-2003) evaluation method for 3D coordinate measuring machines.

\* MPE\_THP (Maximum Permissible Scanning Error) is based on the ISO 10360-4-2001 (JIS B 7440-4-2003) evaluation method for scanning measurement.

\* The above accuracies apply when a standard stylus is used. L (mm) is any measurement distance.

Standard stylus VAST GOLD probe head : tip φ 8, length 63.5 mm

RDS+RST probe system : tip φ 3, length 40 mm

RDS+TP200 probe system : tip φ 3, length 10 mm

\* Values in parentheses ( ) for the above accuracies correspond to the temperature condition values in parentheses ( ).

\* The RDS+RST and RDS+TP200 probe system is optional.

\* Note 1) Accuracy annotation on RDS+RST probe system

\* Note 2) Accuracy annotation on RDS+TP200 probe system