Measuring Technology in Production

Maximum measuring performance in production

ZEISS

When fluctuating temperatures do not affect precision.

ZEISS Production CMMs

// RELIABILITY
MADE BY ZEISS

The MaxLine

Maximum measuring performance in production

Production measuring machines from ZEISS enable you to maximize the performance and profitability of your quality inspection activities. Thanks to the scanning probe, MaxLine machines allow you to also check the form and location of features in addition to the accuracy of object dimensions. And, because the MaxLine is directly in production, you no longer have to take a trip to the measuring lab.

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ZEISS DuraMax

ZEISS DuraMax eliminates the need for fixed gauges. Equipped with the VAST XXT scanning sensor from ZEISS, it can even be used to capture contours and freeform surfaces. A rough production environment? No match for ZEISS DuraMax. This system simply brushes off any temperature fluctuations, dust and dirt it encounters in the course of the day.

DuraMax
Maximum measuring range
with a minimal footprint

Coordinate measuring technology for production

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

ZEISS VAST XXT scanning sensor

- Scanning and single-point measuring
- CNC-guided stylus change
- 25 mm adapter plate for optimal reproducibility
- Axial stylus length: 30 to 150 mm
- Radial stylus length: to 65 mm

Additional components

- Numerical control panel with two progressive joysticks
- Stylus rack for CNC-guided stylus change

Measuring software

- ZEISS CALYPSO

Excerpt from the specifications

Measuring range [mm]: 500 x 500 x 500		
Max. workpiece weight [kg]	100	
Sensor	VAST XXT	
Length measurement error [µm]	2.4 + L/300	at 18 – 22 °C
	2.7 + L/250	at 18 – 26 °C
	2.9 + L/200	at 18 – 30 °C

DuraMax
with shop floor base

Shop floor base
- Dust and moisture protection as per IP54
- Carrier arm for keyboard and monitor
- Lockable storage space for a PC
- Thermal shielding
- Movable with lifting truck or forklift

Optional software
- ZEISS CALYPSO PCM: menu-guided control of parameter-supported measuring runs
- ZEISS PiWeb reporting plus: display and analyze measured values with graphic and statistical options
- ZEISS FACS – editable automation program

Optional hardware
- Automatic temperature reader with two workpiece sensors
- Precision rotary table

DuraMax HTG
High Temperature Gradient

Temperature stability	from 15 °C to 40 °C
Max. temperature change	3 K/h

Would you like to expose ZEISS DuraMax to more extreme temperature conditions without sacrificing the specified accuracy? Then DuraMax HTG is right for you. Thanks to its enhanced, insulating housing panels, this system is particularly insensitive to temperature. DuraMax HTG can be used at temperatures from 15°C to 40°C and permits temperature fluctuations of up to 3 K/h.

Optional equipment
- Automatic temperature reader with two workpiece sensors


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ZEISS GageMax

ZEISS GageMax measures directly in production with enormous speed and precision. GageMax is unaffected by extreme temperature fluctuations and ground vibrations. This measuring machine can also measure unknown curves and freeforms via active scanning. Thanks to navigator technology and the Performance Kit, ZEISS GageMax is able to fully automatically scan the ideal line.

Coordinate measuring technology for production

- Three-sided loading and operation
- Temperature stability from +15°C to +40°C
- Compact dimensions, large measuring space
- Movable with a forklift
- Ram made of temperature-stable carbon-fiber
- Includes stylus rack with 4 slots

Temperature Variable Accuracy (TVA)

The accuracy of measuring machines is usually only given for the ideal temperature. Not with ZEISS GageMax: thanks to the TVA formula, the accuracy of this system can be exactly determined for different temperatures.

Measuring software

- ZEISS CALYPSO

navigator technology package

- Automatic generation of the ideal measuring strategy
- Tangential approach
- Helix scanning
- Dynamic stylus calibration

VAST Performance Kit

- FlyScan
- QuickChange

Options

- Touchscreen – unaffected by oil and dirt
- Pneumatic stylus rack
- Protective enclosure and safety technology

Available sensors	VAST XT gold	VAST XTR gold
Technology	active scanning	active scanning, rotatable stylus mount
Max. stylus length [mm]	500	350
Max. stylus weight [g]	600	500

Excerpt from the specifications

Measuring range [mm]:	750 x 500 x 500
Max. workpiece weight [kg]	250
Length measurement error [µm]	1.9 + L/300 at 20°C
TVA MPE_E [µm]	1.9 + (0.05a) + L/(300 – 5a)
	a = error of 20°C

Seamless integration
To ensure that ZEISS GageMax can be seamlessly integrated into a production environment or your workshop, we have designed its loading options and exterior dimensions similar to a processing center. It can be loaded and operated from three sides, and integrated into any environment. ZEISS GageMax also remains compact when peripheral devices are added.

Protection for the sensitive measuring technology
A measuring machine intended to work directly in the workshop or production must be able to take a beating. Dust, oil, ground vibrations and temperature fluctuations must be irrelevant. For this reason, we have packed the entire measuring equipment into a safe 3D enclosure that sits on the machine base and protects the more sensitive components of the coordinate measuring machine against environmental influences. The ram is a sturdy carbon-fiber unit that is unaffected by temperature changes.

Accessible from all sides

A measuring machine that works directly in production must feature maximum flexibility. Therefore, ZEISS GageMax can be loaded from all three sides without restrictions. Loading equipment or pallet changers directly connect it to the processing centers, thus eliminating time-consuming trips.


CenterMax
CenterMax

ZEISS CenterMax

ZEISS CenterMax can be directly integrated into a production line. Vibrations from processing centers are effectively damped. Its variable workpiece base makes it ideal for automated loading. Scanning with navigator technology and the VAST Performance Kit, as well as the highest accuracy in its class, are standard features on ZEISS CenterMax.

Coordinate measuring technology for production

- Machine design optimized for integration
- Temperature stability from +15°C to +40°C
- Pneumatic vibration insulation
- Robust machine design

Temperature Variable Accuracy (TVA)

The accuracy of measuring machines is usually only given for the ideal temperature. Not with ZEISS CenterMax: thanks to the TVA formula, the accuracy of this system can be exactly determined for different temperatures.

Measuring software

ZEISS CALYPSO

navigator technology package

- Automatic generation of the ideal measuring strategy
- Tangential approach
- Helix scanning
- Dynamic stylus calibration

VAST Performance Kit

- FlyScan
- QuickChange

Options

- Touchscreen – unaffected by oil and dirt
- Pneumatic stylus rack
- Safety equipment
- Rotary table

Available sensors	VAST gold	VAST XTR gold
Technology	active scanning	active scanning, rotatable stylus mount
Max. stylus length [mm]	800	350
Max. stylus weight [g]	600	500

Excerpt from the specifications

Measuring range [mm]:	1,100 x 1,200 x 900
Max. workpiece weight [kg]	1,000
Length measurement error [µm]	1.2 + L/280 at 20°C
TVA MPE_E [µm]	1.2 + L/(280 – 5a)
	a = error of 20°C

Maximum accuracy and speed

Gantry design with raised guideways
ZEISS CenterMax is designed as a processing center. This design ensures high rigidity with a measuring volume of more than one cubic meter. The raised guideways minimize the moving mass, which is a benefit to dynamic stability and precision. Furthermore, the sensitive guideway elements are outside the loading zone.

Invar steel carrier
The weight-bearing skeleton of ZEISS CenterMax is made of Invar steel, which features a very low expansion coefficient and thus makes it extremely temperature-stable.

Cast rock base
The cast rock base provides the required mass for stabilization. This material is known for its ideal thermal and dynamic damping properties.

ZEISS CenterMax with loading and operating station

Active vibration damping
ZEISS CenterMax comes standard with four active vibration dampers. Under and over-pressure are automatically compensated for.

Variable workpiece base
Without a lot of work, a granite plate or pallet carrier frame with feeding system can be installed via the variable workpiece base without sacrificing the measuring range.

Workshop-capable operating station
Ideal for the workshop and glover-wearers, the operating station is suitable for the shop floor (IP54) and can be moved as needed. A touchscreen, PC, printer and all control elements are integrated.

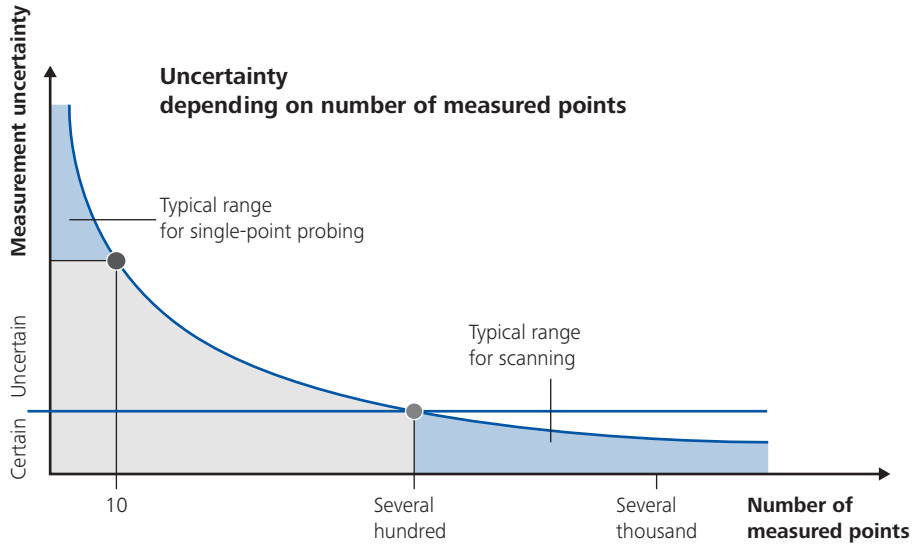
Scanning Technology from ZEISS

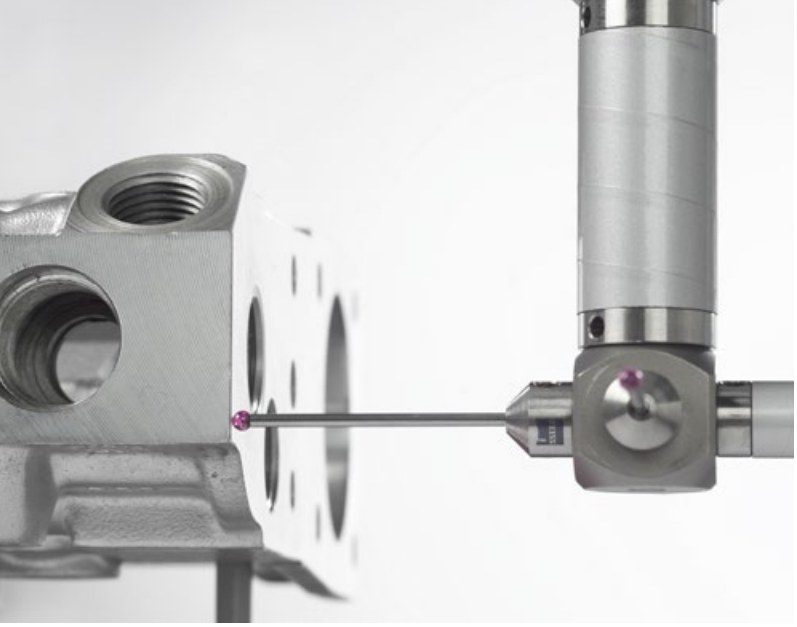
ZEISS introduced the first scanning system more than 30 years ago, a move that revolutionized measuring technology. Since then, we have been continually enhancing our scanning methods. With technologies such as active scanning and navigator technologies, ZEISS underscores its position as the innovation leader in coordinate measuring technology.

Inventor of contact scanning
In 1974, ZEISS used scanning in coordinate metrology in a precision measuring lab for the first time. With the presentation of the VAST probe in 1995, this technology became the new standard in industrial and shop floor measuring. No other manufacturer of coordinate measuring machines has more experience in its application. Around the globe, 75 percent of all installed scanning systems are made by ZEISS.

More points – more precision
Unlike single-point scanning with touch-trigger stylus systems, continuously probing the workpiece surface makes it possible to quickly capture a high number of measured points for a characteristic. Also in the workshop! Numerous scientific studies show that there is a clear connection between the uncertainty for a characteristic and the number of measuring points.

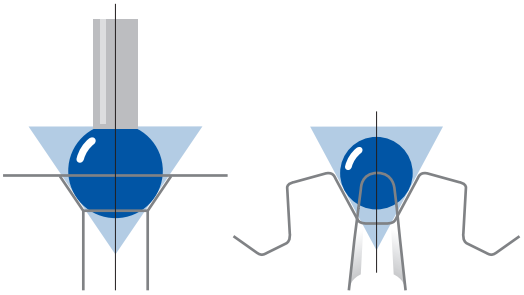
Form inspection
Highly accurate scanning enables retroactive processing through filtering, in which form inspections such as roundness, straightness, surface form, cylinder form, cone form, sphere form, etc. can be completed. In many cases, this can eliminate further expensive form inspection, contour and surface measuring machines.





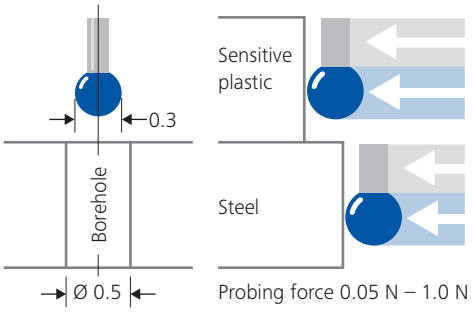
Self-centering

With the DT, VAST XT gold and VAST gold sensors from ZEISS, self-centering enables fast, easy and exact measurements in depressions, gearing, 2D and 3D corners, etc., thus considerably expanding the measuring possibilities. ZEISS VAST XT gold and ZEISS VAST gold also allow self centering and scanning of known and unknown geometries and curves.



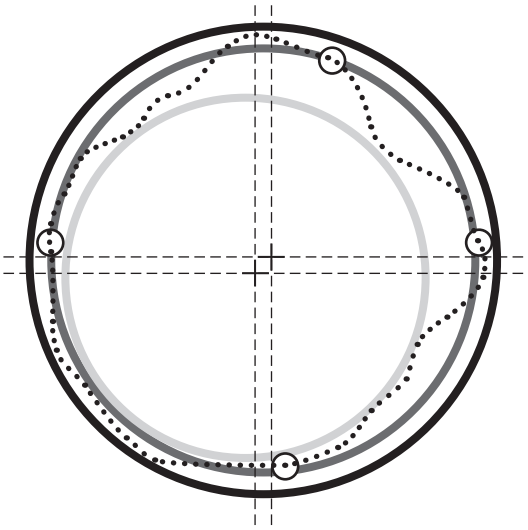
Adjustable measuring force

The adjustable measuring force allows the operator to measure different unstable workpieces made of various materials without the known measuring problems caused by deformation. Furthermore, the measuring force in a part program can be changed depending on the stylus and workpiece stability.



Better reproducibility

The high density of measured points also allows better reproducibility of the measurements. If a workpiece is removed from the equipment and reinserted, it is not necessarily in the same position. A repeat measurement with a single-point sensor can return different values. Thanks to its in-depth measurement, a scanning sensor delivers a differentiated analysis of location and form.



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

Uniquely ZEISS: active scanning

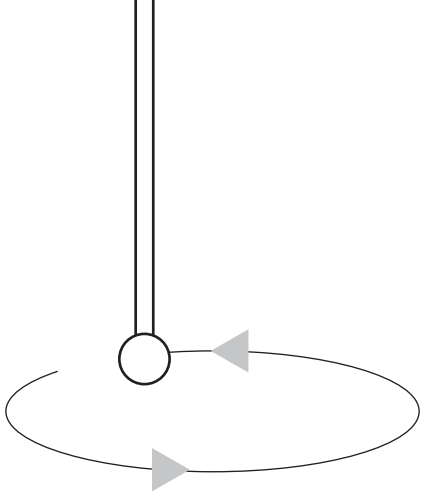
Most scanning systems are passive. Their measuring force is generated by a spring parallelogram. Because the control range of the passive sensors is small, changing forces constantly affect them which leads to relatively strong stylus bending and high probing error. This results in decreasing precision as the dynamics increase. ZEISS, on the other hand, works with active scanning probes – and is the only manufacturer to offer active sensors. The ZEISS VAST XT gold sensor, for example, continually measures its own probe deflection. A low, constant measuring force is actively applied electronically in the opposite direction. For example, the stylus is moved in the direction in which the bridge is accelerating. Dynamic influences are therefore practically ruled out. The low measuring force remains constant and the measuring results are more precise.

Capture unknown contours

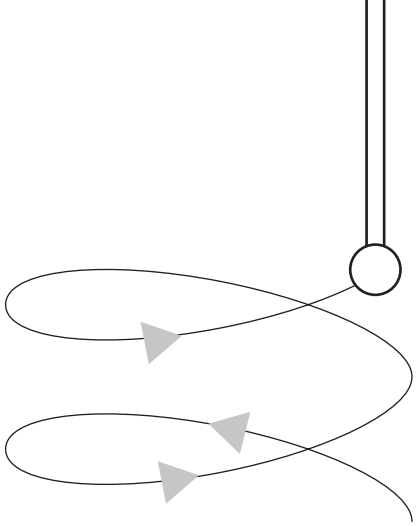
Unlike scanning with passive sensors, active scanning can be used to measure unknown contours. Digitization of the contour before scanning is not necessary. Therefore, active scanning also enables reverse engineering.

Measuring with very small stylus tips

Very small stylus tips are required, e.g. to measure the tooth flanks of an interior borehole. Because these are often on thin shafts, a steady minimal measuring force is needed to keep the shaft from bending. The active VAST sensors are therefore the ideal solution for precision measurements with very small stylus tips.



Traditional scanning



Helix scanning

ZEISS VAST navigator – the next level of active scanning

ZEISS VAST navigator

The ZEISS VAST navigator technology package fully utilizes the potential of active scanning. A key element of navigator technology is the automatic generation of measuring strategies: depending on the measured part, the system automatically measures at the highest possible speed with which the desired accuracy is guaranteed. The machine accelerates and slows independently.

Tangential approach

A tangential approach ensures continuous motion from the probing path to the probing process without the intermediate stops and maneuvering required by conventional methods. Depending on the job, this can result in time savings of 15 to 65 minutes with a level of quality that corresponds to the measuring error of gauges.

Helix scanning

Thanks to intelligent measuring strategies, VAST navigator technology enables exact measuring results for a cylinder measurement in an unparalleled short time. Unlike standard scanning methods, this process scans the cylinder with a continuous scroll line. This helix scanning delivers precise, optimal and reproducible results in one measuring run.

Easy stylus calibration

The calibration of different styli is amazingly simple with ZEISS VAST navigator: the measuring machine scans the reference sphere in the fringe ranges: once at 5 mm/s and once at 50 mm/s. This enables dynamic and static influences from the high accuracy to high-speed range to be recorded and corrected at the same time. This dynamic stylus calibration is so flexible that it applies to all workpieces. Time-consuming calibration with a number of different gauges is not necessary.

VAST Performance Kit
FlyScan & QuickChange

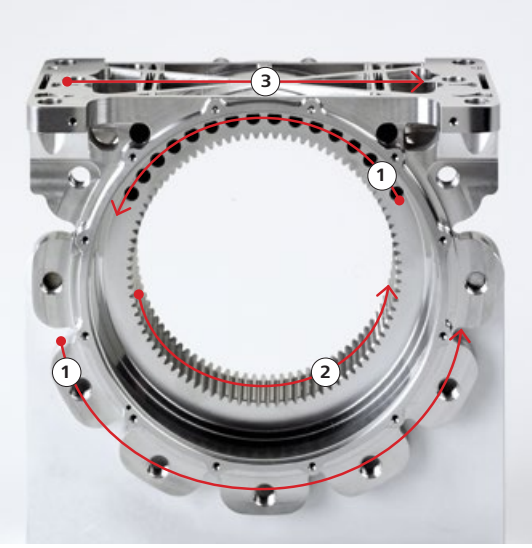
The Performance Kit is comprised of the new technologies FlyScan and QuickChange. The short travel path on FlyScan results in time savings of up to 40 percent. The QuickChange function accelerates the automatic change out of measuring styli by up to 60 percent.

Faster measurements, more measured points
FlyScan enables you to directly scan where recesses had to be avoided in the past. The quality of the measuring result is not affected. FlyScan allows you to also capture the measuring points in edge areas to provide a more detailed statement on the quality of the object.

Easier programming
FlyScan also speeds up programming. Instead of multiple segments, users now only have to determine a single measuring path. ZEISS CALYPSO measuring software automatically controls the measurement.

Benefits
- Up to 40 percent time savings during a measurement
- Easier programming
- More measured points in edge areas

Process optimization for fast stylus change-out
QuickChange is the result of an entirely new process of approaching, dropping and mounting a stylus. It enables time savings of up to 60 percent.



Area of application
FlyScan reduces the programming and measuring work for many tasks, including:

1 Scanning over boreholes
2 Scanning over a gearwheel
3 Scanning an interrupted plane

Stylus systems

Original accessories from the technology leader

As the technology leader, we deliver more than just products; we are also your partner for complete stylus systems. Our unique ThermoFit® has proven its worth time and time again around the world – in measuring labs and on the shop floor.

ThermoFit®

ThermoFit® stylus extensions are made of highly rigid titanium end caps and thermally stable carbon-fiber tubes, which are made using a wrapping technique specially developed for measuring technology. This combination of materials and the cementing/cutting technique developed by ZEISS produce outstanding results.

ThermoFit® Pro

ThermoFit® Pro is the solution for complex stylus systems. You now receive complete, pre-aligned modules comprised of interchangeable extensions and rotary mounts where multiple single components had to be mounted in the past. For use in production, we will also fix the alignment, e.g. through laser welding. Upon request, we will quickly and accurately machine prefabricated blank angle pieces and blank dihedral angles. Our blanks also allow you to manufacture these parts yourself.

System Stylus Creator

The Stylus System Creator offline stylus kit software (e.g. in ZEISS CALYPSO planner, ZEISS CALIGO and iDA) enables you to easily assembly stylus systems. This considerably reduces the start-up phase of your measurement plans.

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