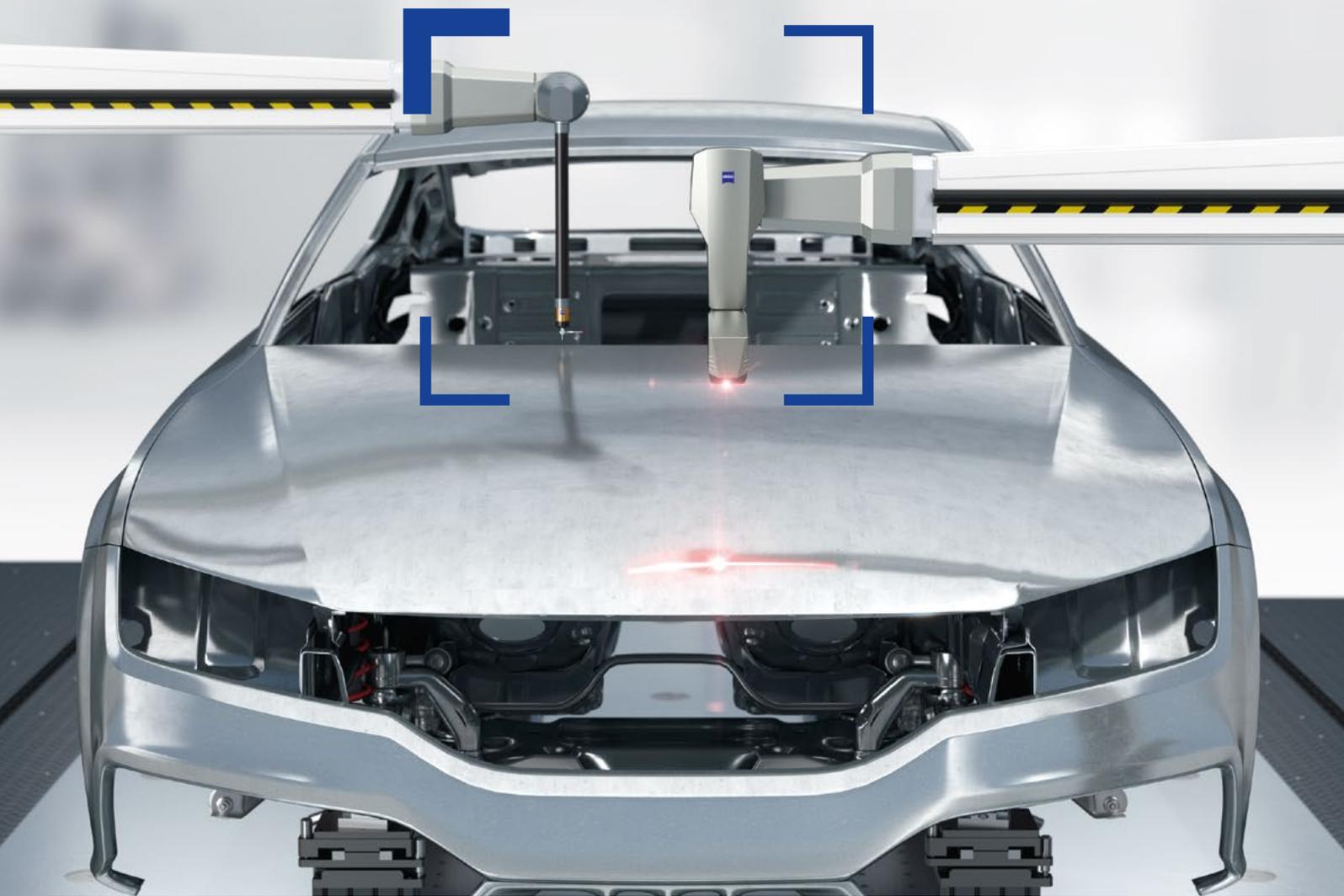


More than a robot. The Hambot.

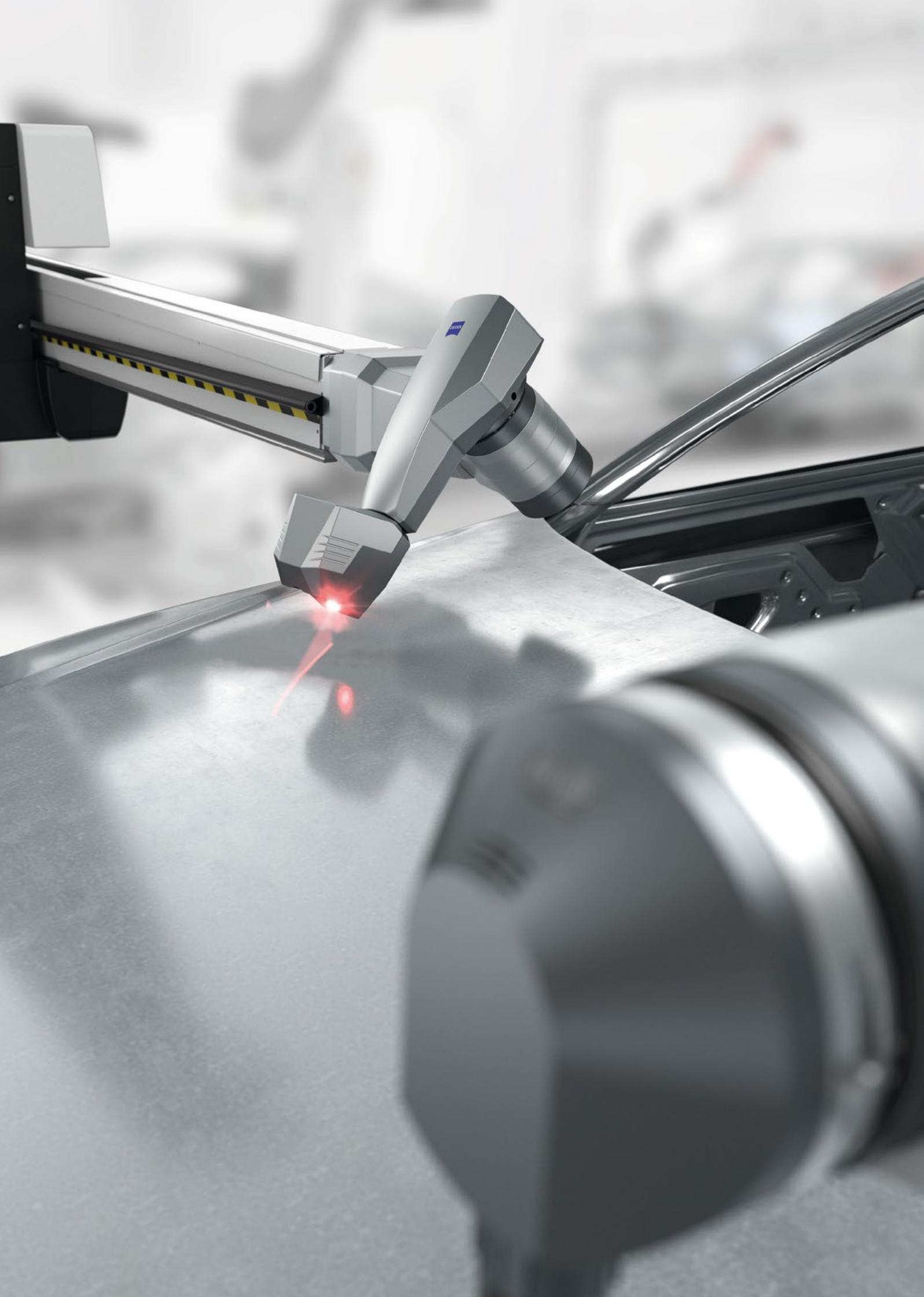


ZEISS CALENO Hambot



zeiss.com/caleno

Seeing beyond



Hambot

ZEISS CALENO

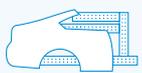
When it comes to completing as many car body measurement tasks as possible on one system, ZEISS has a superior solution: the new ZEISS CALENO Hambot. It offers maximum versatility and the highest performance levels in all measurement disciplines. Its combination of high-performance optical and tactile sensors ensures maximum productivity and precision – not only in the measuring room, but on the shop floor as well. Another important advantage is that because of the model safety equipment, operators can work without any concerns on or in the ZEISS CALENO Hambot.

IN LINE

AT LINE

OFF LINE

Possible uses of the ZEISS CALENO Hambot in the car body construction process



Preparation
and INITIAL
production phase



Series production
Attachment parts



Series production
Body-in-white



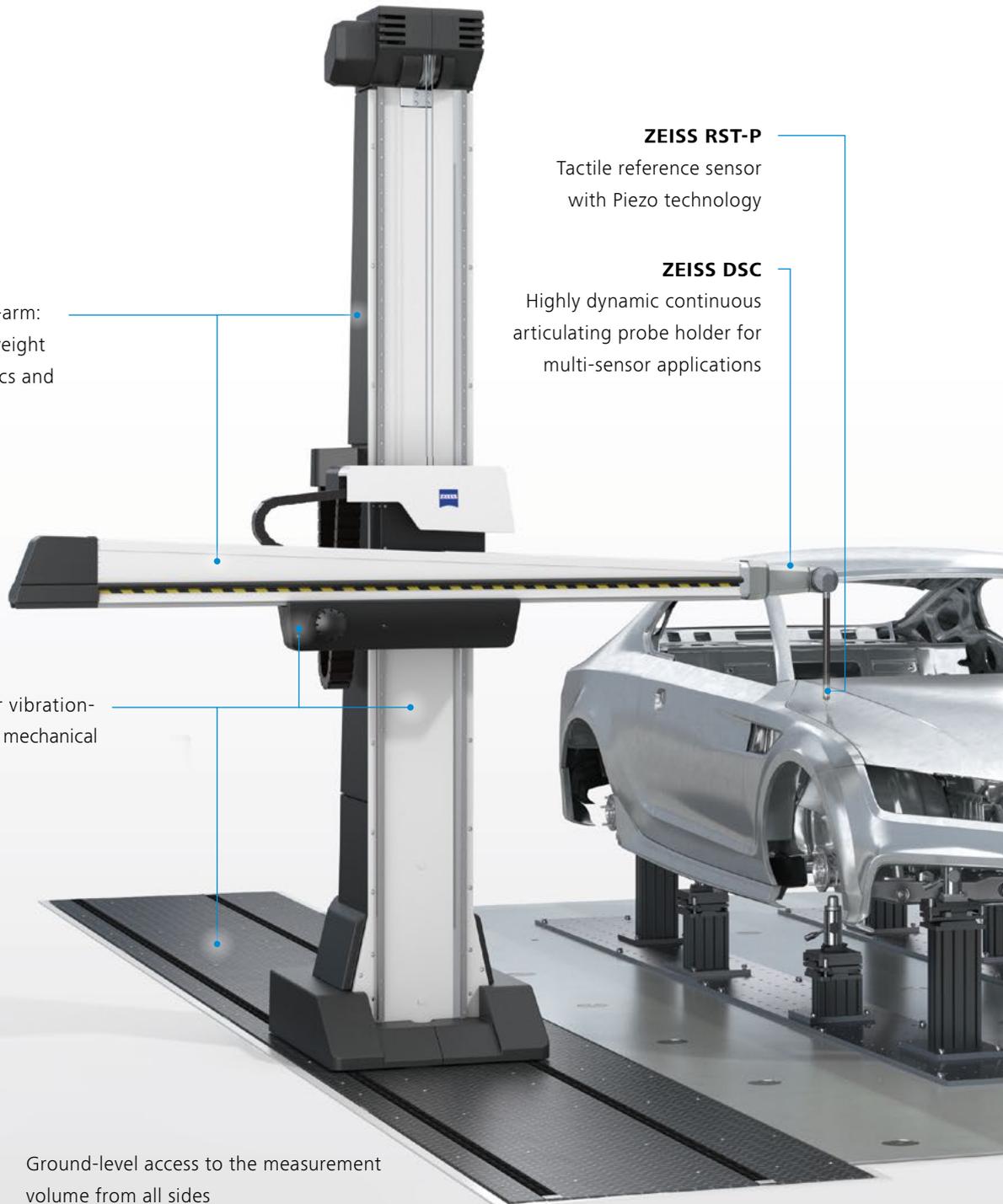
Analysis of the
finished vehicle

Overview

Features & highlights

Trapezoidal Z-column and Y-arm:
optimized combination of weight
and rigidity for high dynamics and
accuracy over the long term

Friction drives in all axes for vibration-
free operation and maximum mechanical
force limitation



ZEISS RST-P

Tactile reference sensor
with Piezo technology

ZEISS DSC

Highly dynamic continuous
articulating probe holder for
multi-sensor applications

Ground-level access to the measurement
volume from all sides



ZEISS EagleEye

Optical high-speed laser line sensor

ZEISS DSC

Articulating probe holder

Removable EPP full enclosure for high temperature stability, easy maintenance access, and low weight

Safety edges for collision protection on both sides of the Y-arm

Mobile terminal with keyboard and monitor for programming directly at the measurement site

Wireless control panel for manual sensor positioning

One measuring system

All tasks

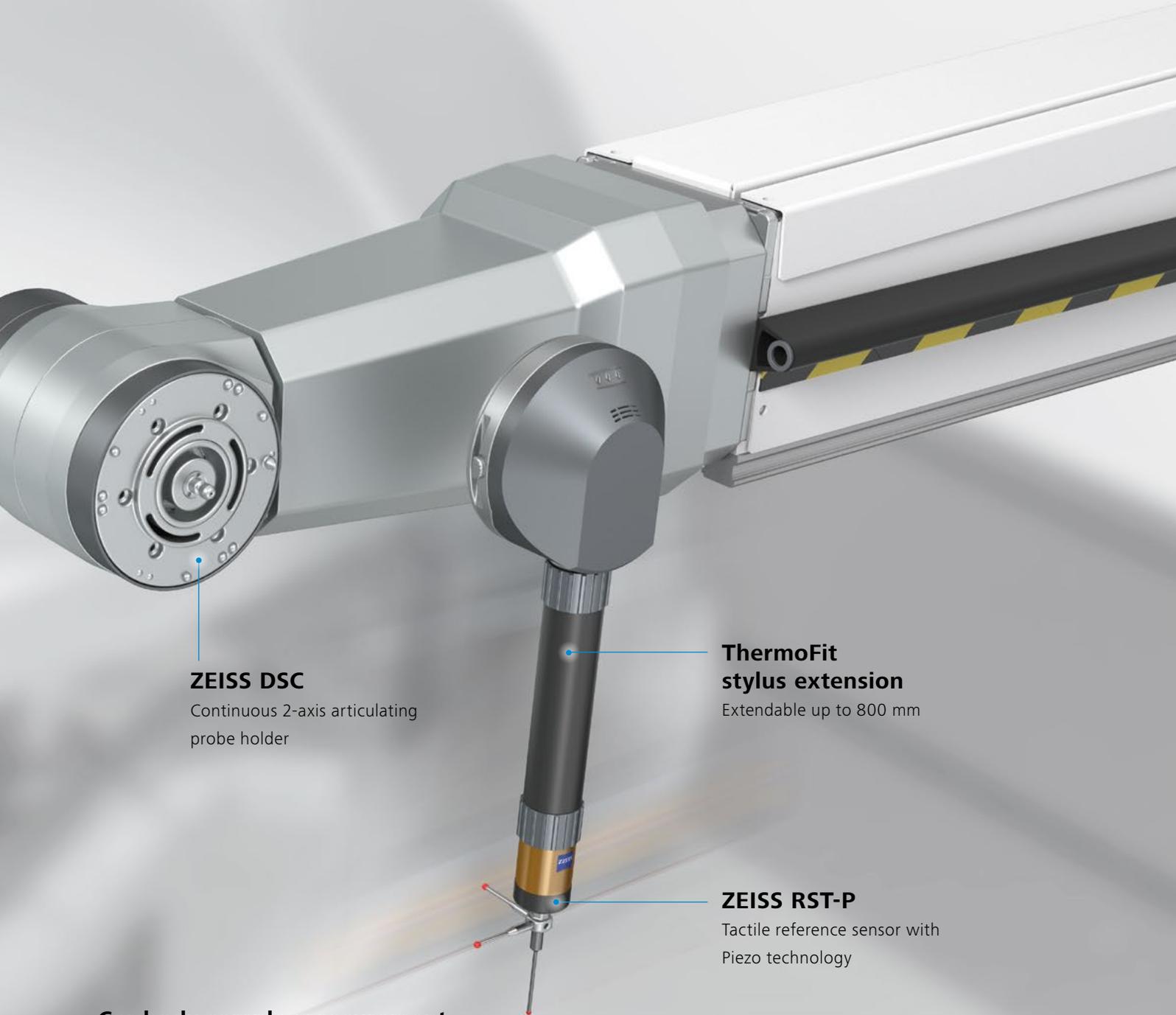
Measure geometrical features in record time with ZEISS EagleEye, then digitize large free-form surfaces using the same sensor.

Use the automatically substituted tactile sensor to take optimally accurate reference measurements, e.g. for correlation measurements. Capture difficult-to-access features by tactile means using ZEISS ThermoFit extensions of up to 800 mm. All on the same system. All without wasting time.

ZEISS EagleEye

Optical high-speed laser-line sensor
with 6th axis





ZEISS DSC

Continuous 2-axis articulating probe holder

ThermoFit stylus extension

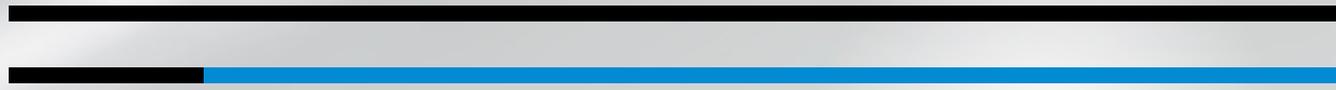
Extendable up to 800 mm

ZEISS RST-P

Tactile reference sensor with Piezo technology

Car body sample measurement

45 minutes using ZEISS RST-P tactile sensor



6:25 minutes using ZEISS EagleEye optical sensor

Save **85%** more time

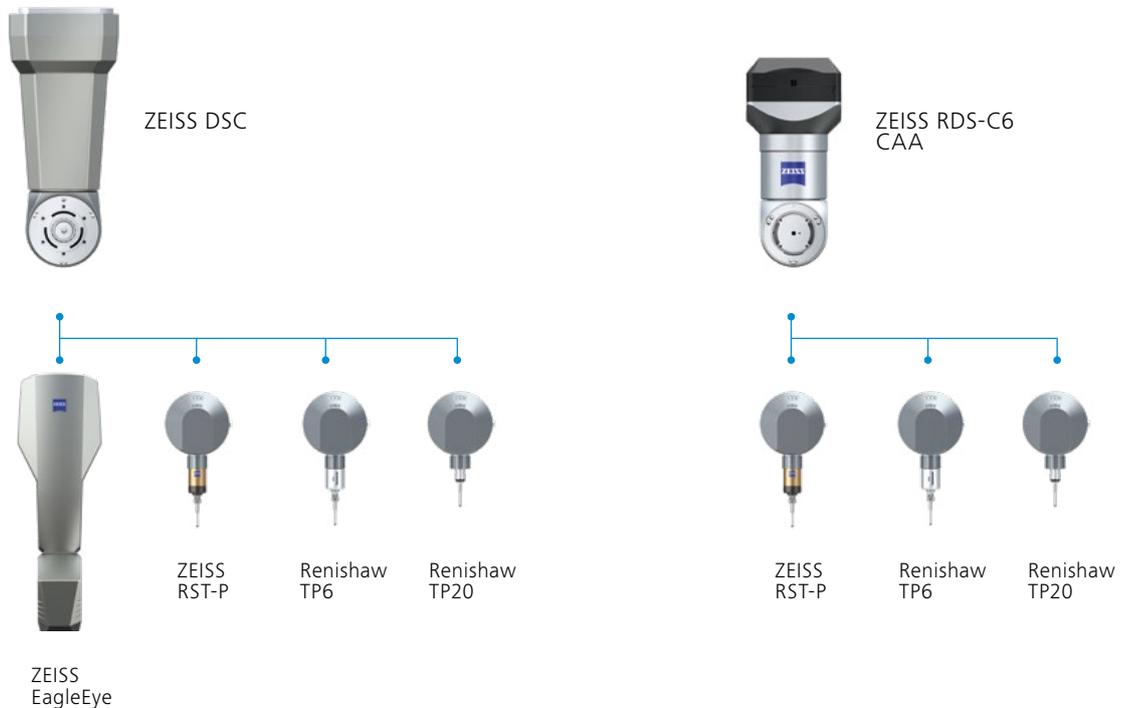
Video of taking a measurement with ZEISS EagleEye optical sensor:

<https://zeiss.com/EagleEye>



ZEISS articulating probe holders

Fast and precise positioning



ZEISS DSC

Both optical and tactile sensors can be changed over automatically using the ZEISS DSC articulating probe holder. Its high dynamics and torque as well as its excellent precision are the basis for a wide range of measurement tasks. The sensor carrier has spring-mounted collision protection for the sensor as standard. Optional additional collision protection of the articulating probe holder is also available. The passive probe changer requires neither compressed air nor electricity.

- Axis A rotates $n \times 360^\circ$
- Up to 180°/s angular speed
- High torque with max. 3.0 Nm
- Suitable for stylus extensions of up to 800 mm
- Dual collision protection for the sensor and optional protection for the articulating probe holder
- Passive sensor magazine requires neither compressed air nor electricity

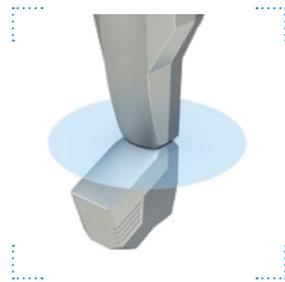
ZEISS RDS-C6 CAA

Will the ZEISS CALENO Hambot be used in an area where only tactile measurements are taken? Are stylus extensions of up to 400 mm sufficient? If so, ZEISS offers a high-performance and cost-effective alternative to the ZEISS DSC: the RDS-C6 CAA articulating probe holder.

- Computer-aided accuracy (CAA) for fast calibration
- 20,736 positions in 2.5-degree increments
- Suitable for maximum stylus extensions of up to 400 mm
- Collision protection for the sensor and optional protection for the articulating probe holder
- Passive sensor magazine requires neither compressed air nor electricity

ZEISS Sensors

The benchmark – optical and tactile



ZEISS EagleEye features a built-in automatic rotary axis for flexible laser-line alignment



The wide drive-over angle of 26° offers more safety reserves in the event of a collision

ZEISS EagleEye

Compared to measurements with a tactile sensor, the ZEISS EagleEye significantly shortens the measurement time. For example, in a realistic car body measurement task, ZEISS EagleEye reduced the measurement time by 85 percent. With ZEISS EagleEye, ZEISS LinLog image processing ensures that even difficult-to-capture shapes and surfaces are represented precisely. With just three settings – standard, bright, and dark – the exposure can be easily optimized to suit the material to be measured and the lighting conditions. And because the laser line in ZEISS EagleEye is generated using optical lenses, the measuring sensor manages without any moving parts at all.

- Additional rotation axis in the sensor for fast and flexible laser-line orientation (6th axis)
- High measuring performance: 220,000 measuring points per second
- CMOS imaging sensor with LinLog image processing for high contrast scope
- Simple exposure setting
- Robust construction with milled aluminum housings and no moving parts in the measurement sensors

ZEISS RST-P

ZEISS RST-P offers remarkable advantages over widespread standard measurement styli: more stable results quality, a service life up to five times longer, and greater safety reserves in the event of a collision. One of the reasons for this is its unique Piezo technology. Before the usual mechanical deflection of the stylus, a Piezo sensor has already captured the measurement impulse using minimum measurement force. Therefore, the scanning angle and scanning power have hardly any influence on accuracy, so ZEISS RST-P measures with equal accuracy under all scanning conditions.

- Measurement power below 0.01 N resulting in highly reproducible accuracy in all scanning directions
- Long service life: MTBF > 5 million scanning impulses
- Wide drive-over angle: 26°
- Integrated star element for building angled styli simply

Collaborate safely with ZEISS CALENO

No matter how careful people are, human error can never be completely ruled out in everyday measuring tasks. That is why the ZEISS CALENO Hambot features unique, multi-layered safety equipment. First and foremost, this protects operators. However, it also protects the valuable measuring sensors from damage.

Safety equipment on the coordinate measuring machine

Friction drives

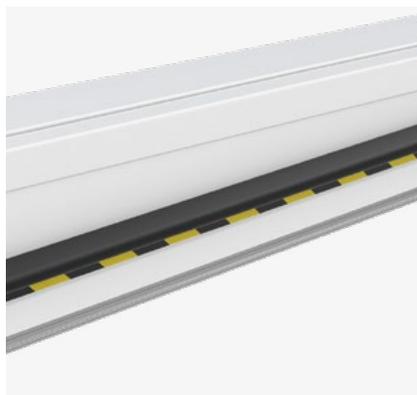
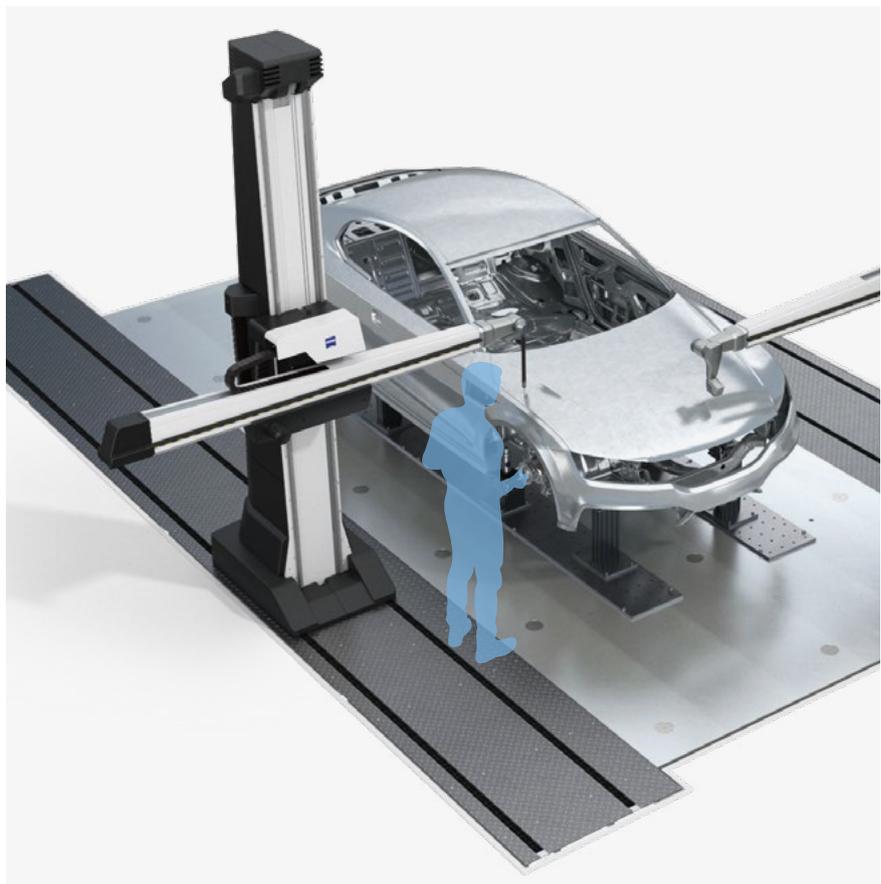
ZEISS CALENO is equipped with friction drives on all axes. If an obstacle is blocking the machine, the corresponding friction wheel slips through. This mechanically pre-limits the potential impacting force in a collision. Registered slip errors lead to an immediate shutdown of the system.

Overcurrent cut-out

If an obstacle is blocking the path of ZEISS CALENO, it results in higher current consumption. When the defined limit values are exceeded, the machine shuts down. The protective effect of the overcurrent cut-off operates in parallel with the friction wheel principle.

Safety edges for collision protection

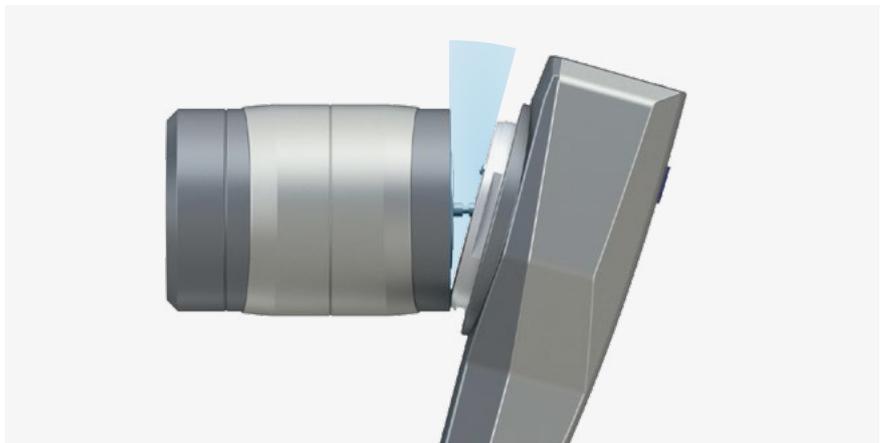
Both sides of the Y-arm are at a particularly high risk of collision. Sensor strips are therefore attached along the full length of this part of the ZEISS CALENO as standard. If the narrow elastic pipes are deformed during contact, the machine immediately shuts down. And since the smart sensors take up hardly any space, they do not cause any disruption during measuring.



Protective equipment on the sensor carrier

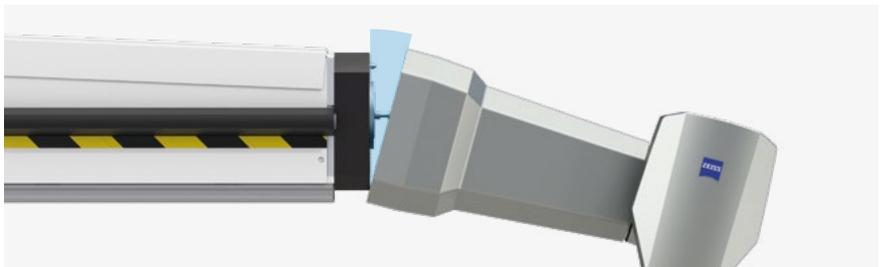
Collision protection for the sensor

In ZEISS DSC and ZEISS RDS-CAA, the connection point to the sensor is spring-mounted. In the event of a collision, the sensor can bend, thus protecting it from damage. At the same time, the bending leads to an immediate shutdown of the measuring machine.



Optimal collision protection for the sensor carrier

The Y-arm connection point on ZEISS DSC and ZEISS RDS-CAA can be equipped with a spring-mounted bending point for collision protection.



Protective equipment on the ZEISS RST-P sensor

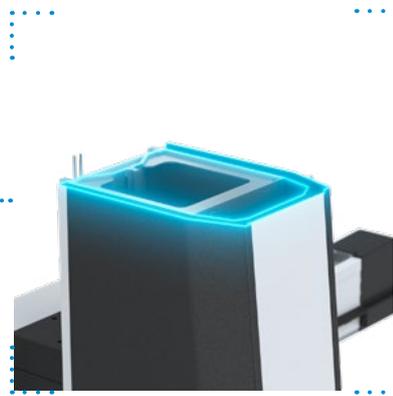
Drive-over protection for ZEISS RST-P

To avoid damage from collision with the stylus, the drive-over angle of the stylus in the ZEISS RST-P is an exceptionally wide 26°.



Perfectly equipped for your tasks

In every respect, ZEISS CALENO is designed for top performance and, even with only the basic equipment, satisfies the highest expectations of a ZEISS HAM system. You can also configure the system to meet your individual requirements. In this way, you achieve maximum performance tailored to your use.



The Z-column features all-around temperature insulation: on three sides with removable thermo panels and at the front with a hollow-body structure

High temperature stability in any environment

Each ZEISS CALENO has a lightweight, removable full enclosure in a modern design that ensures thermal insulation and protects against soiling. For all structurally relevant components, ZEISS consistently uses steel, which also even allows for thermal expansion. The combination gives ZEISS CALENO extraordinarily high temperature stability, making the system also appropriate for use in production environments. All machine axes and the component can be optionally equipped with linear temperature compensation.

Precision and dynamics

Both the Z-column and horizontal arm of ZEISS CALENO are trapezoidal in shape. Compared to square-shaped components, the trapezoid shape enables higher rigidity at lower weight. That benefits both the device's precision and its dynamics.

Measuring beam with large cross section

The measuring beam (X-axis) establishes the critical connection to the foundation. In ZEISS CALENO, the measuring beams have integrated, patented length compensation for thermal decoupling from the foundation. The large cross section of the measuring beam gives it high inner rigidity, which benefits its long-term stability.

Linear guideways with ball chain

ZEISS uses linear guideways with a ball chain in all axes. They feature high rigidity, smooth operation, and low maintenance.

Designs

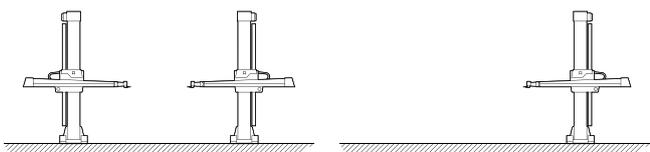
The environment determines the design

ZEISS CALENO flush-to-floor



Flush-to-floor installation

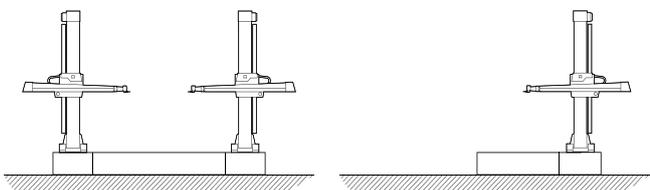
In the flush-to-floor design, ZEISS CALENO is optimally accessible and can be moved with floor-level conveyors such as ZEISS eMOBEE. For all work on and with the measuring system, the floor-level variant offers the best possible ergonomics and productivity – ideal for high measuring volumes and short time frames. A dedicated foundation is required for installation.



ZEISS CALENO flush-to-floor as a duplex and a single-arm system

On-floor installation

To satisfy special requirements, the ZEISS CALENO flush-to-floor design is also suitable for on-floor installation.



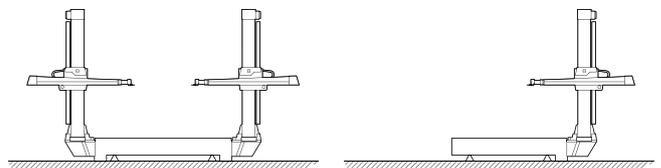
ZEISS CALENO on-floor as a duplex and a single-arm system

ZEISS CALENO T



ZEISS CALENO T tabletop construction

The ZEISS CALENO T tabletop construction usually does not require any work on the foundation and is less expensive than the flush-to-floor variant – with the same outstanding precision. The measuring table and the measuring columns form an intrinsically rigid unit in the table construction. This makes the measuring system more robust with regard to its installation site. That is why ZEISS CALENO T is ideal as a retrofit installation for shop-floor use. With optionally available air damping, the system is also simple to decouple from the foundation.



ZEISS CALENO T as a duplex and a single-arm system





The table construction ZEISS CALENO T is suitable for shop-floor use

Technical specifications

Top performance in any form

ZEISS CALENO flush-to-floor

Many sizes for measuring volumes up to

	X [mm]	Y [mm]	Z [mm]
Single	7000	1800	3000
Duplex	7000	3086	3000

Other measuring ranges on request

Length measurement error (size 16/25, single arm)

	Temperature range	E in μm
Standard	16–24 °C	$27 + L/80 \leq 70$
High-accuracy option	18–22 °C	$18 + L/125 \leq 50$

Maximum speed and acceleration

	V in space	A in space
Standard	260 mm/s	1000 mm/s ²
Performance option with light barrier	866 mm/s	1500 mm/s ²

The CMM specifications only apply when using original ZEISS accessories. 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 CALENO T

Many sizes for measuring volumes up to

	X [mm]	Y [mm]	Z [mm]
Single	7250	1800	2500
Duplex	7000	2800	2500

Other measuring ranges on request

Length measurement error (size 16/25, single arm)

	Temperature range	E in μm
Standard	16–24 °C	$27 + L/80 \leq 70$
High-accuracy option	18–22 °C	$18 + L/125 \leq 50$

Maximum speed and acceleration

	V in space	A in space
Standard	260 mm/s	1000 mm/s ²
Performance option with light barrier	866 mm/s	1500 mm/s ²



Upgrade from ZEISS PRO T

The quick switch to the new ZEISS premium system

Would you like to upgrade the sensors of your ZEISS PRO T? We recommend a complete upgrade to the new ZEISS CALENO T premium system.

The new ZEISS CALENO T was designed to ensure compatibility between its improved Z-columns and the ZEISS PRO T measuring table. By replacing the column, a ZEISS PRO T can be upgraded to a ZEISS CALENO T with the latest ZEISS sensors. With the upgrade, you receive the most precise and efficient ZEISS horizontal arm measuring system ever.

The reason: the new Z-column of the ZEISS CALENO T ensures high rigidity, first-class temperature insulation as standard, and minimized maintenance costs. Not to mention they are the future-proof basis for future advances in articulating probe holders and sensors.

Digital transformation made by ZEISS

ZEISS software

ZEISS supports you in the transition to increasingly digital, data-based, networked production: with software products that harmonize with your ZEISS measuring systems in a highly efficient way. With digital solutions that open up new areas of potential for advanced quality and productivity.



The efficient measuring software for car body construction – including reporting
ZEISS CALIGO

ZEISS CALIGO is our measuring software for the car body and free-form surface measurement areas of application. The modern software architecture enables efficient processing of large volumes of data such as optical scans of entire car bodies. The highly developed ZEISS feature extraction function enables reliable optical evaluation of the most difficult elements such as threaded bolts. Users are supported in the digitization of complete components by functions such as curvature-dependent point cloud thinning. The extensive simulation enables

multi-sensor measurements to be optimized without using real CMMs as well as the creation of test plans that are robust and measurement time-optimized. Thanks to detailed simulation, collisions can be recognized and eliminated during offline programming. ZEISS PiWeb reporting is contained in ZEISS CALIGO. It is the scalable solution for generating professional measurement reports. ZEISS CALIGO also features interfaces that enable connection to automation tools.



Networked quality data management
ZEISS PiWeb

ZEISS PiWeb is a scalable IT solution for quality data management. The database-supported versions ZEISS PiWeb sbs and ZEISS PiWeb enterprise save quality data on a central server. The data can be accessed in real time from any location and displayed in the form of reports via

a secure Internet connection. This makes quality data from a wide range of measuring machines from different manufacturers available on a global scale. And with the ZEISS PiWeb app, you also have remote access to your measurement data at all times.



Full transparency in production
ZEISS GUARDUS

As a manufacturing execution system (MES), ZEISS GUARDUS enables the monitoring and control of production in real time. In quality assurance, use ZEISS GUARDUS to analyze connections between data from various sources in order to predict the reliability of the production process.

For example, quality data may be contextualized with data from production. For each individual component, this makes it easier to track things like: Which material batch was used? How was the component produced? By whom? On which machine? And with what parameters?



The PiWeb app enables measurement value progress analyses to be carried out remotely

Before, during, and after the project

The best support for you – worldwide and personal

Product-neutral advice

From a product-neutral standpoint, ZEISS advises you on which measuring systems are ideally suited to your applications. In the process, we take our incomparably broad product portfolio into account and draw on a deep knowledge of metrology in car body applications.

Careful project management

When installing your measuring system, we collaborate closely with you. We check beforehand if all prerequisites are fulfilled so that your goals for precision and measuring throughput can be reached. In a horizontal arm

measuring machine, this includes, for example, static inspections of the load-bearing capacity as well as the rigidity and vibration resistance of the foundation. We can also support you during construction of the foundation as necessary.

Life cycle services

High-performance ZEISS Service is available to you worldwide to maximize the availability and service life of your measurement systems. As your first port of call, make phone contact with the ZEISS Customer Interaction Center, which offers you the following services:

- Initial error diagnosis
- Assigning a suitable contact to your issue
- Establishing a teleservice connection for remote diagnosis and remote maintenance
- Commissioning ZEISS specialists for maintenance
- Sale of styli, accessories, software options, and maintenance agreements

Find your country-specific support hotline here: zeiss.de/imt

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