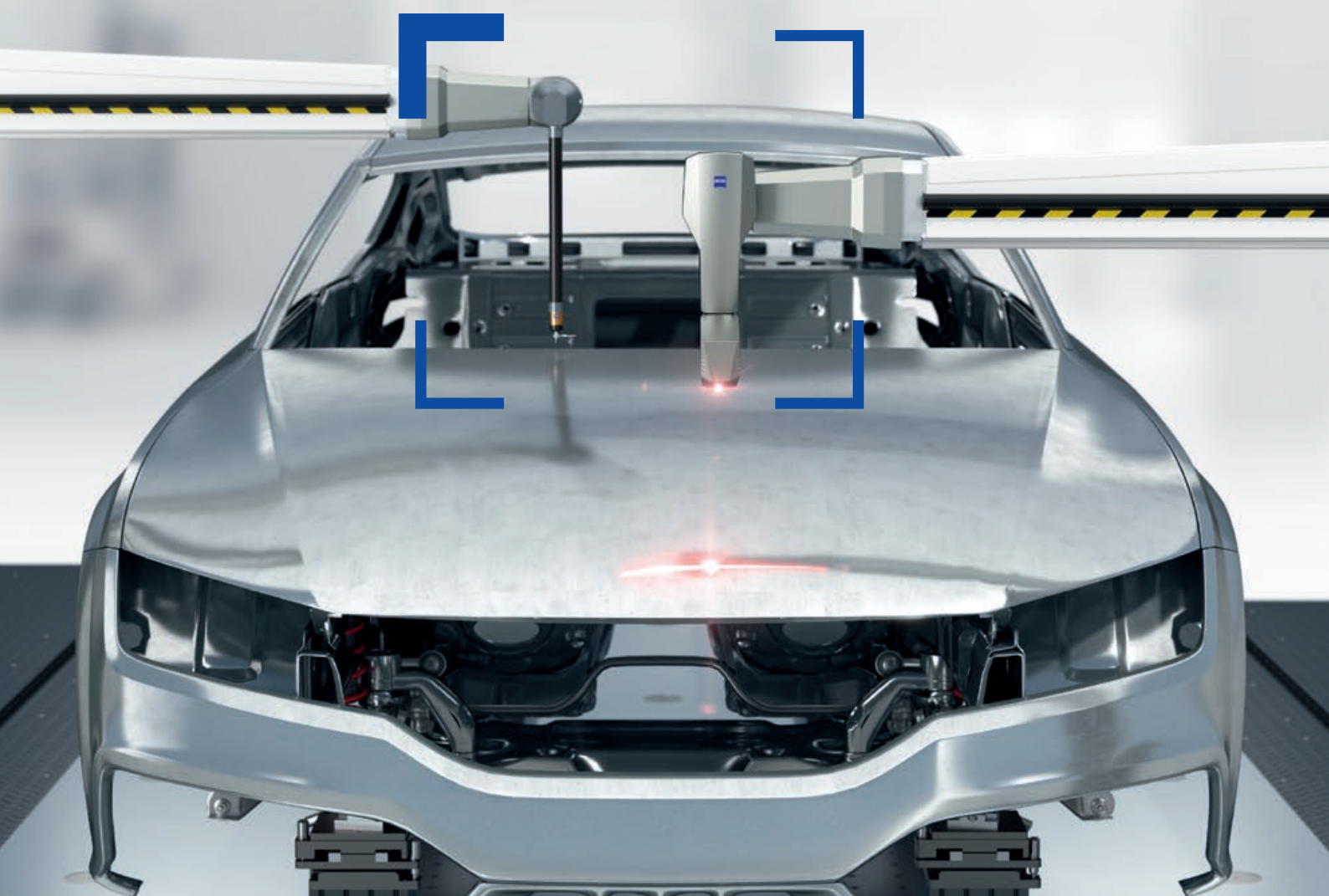


More than a robot. It's a Hambot.

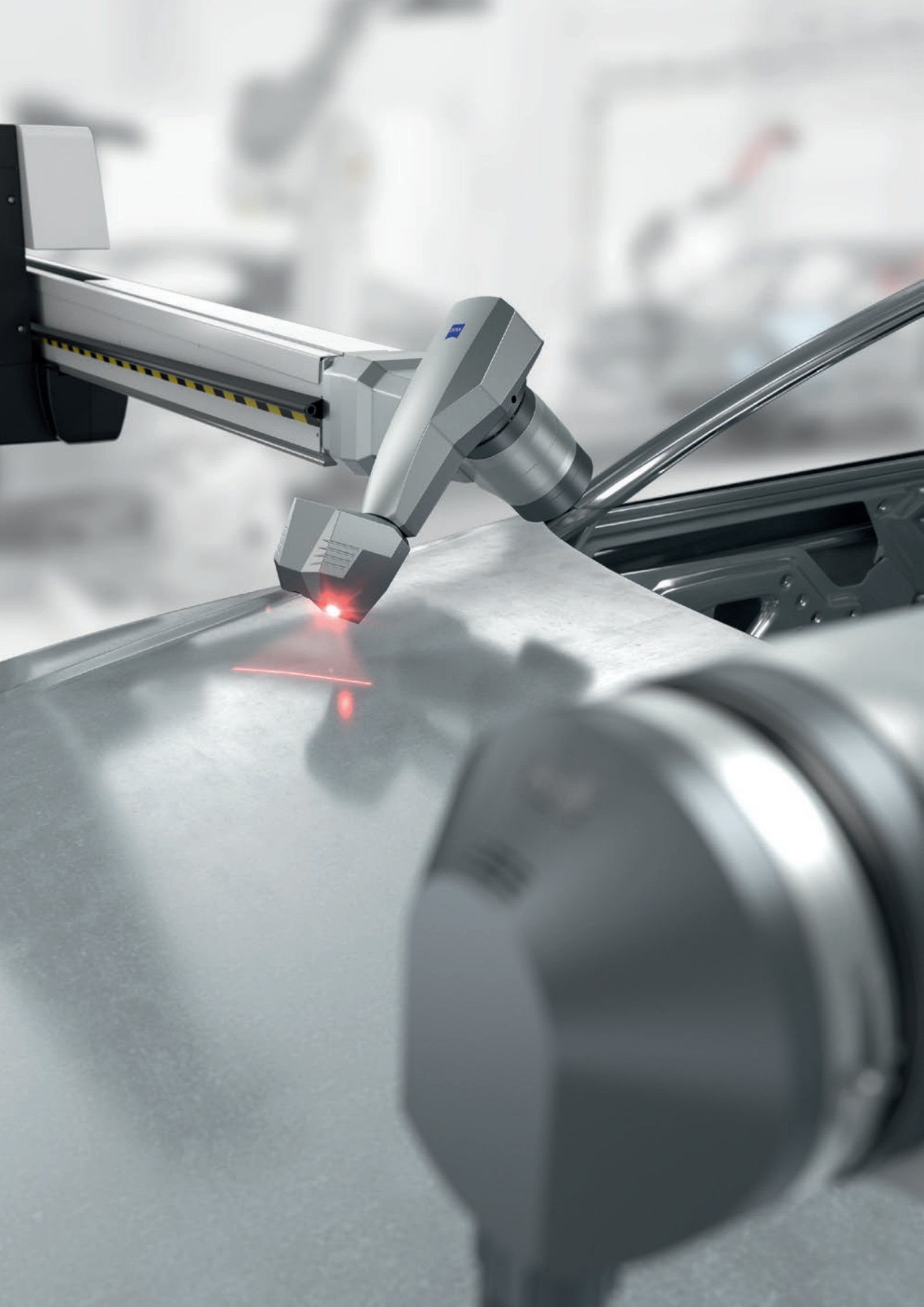


ZEISS CALENO Hambot



zeiss.com/caleno

Seeing beyond



Hambot

ZEISS CALENO

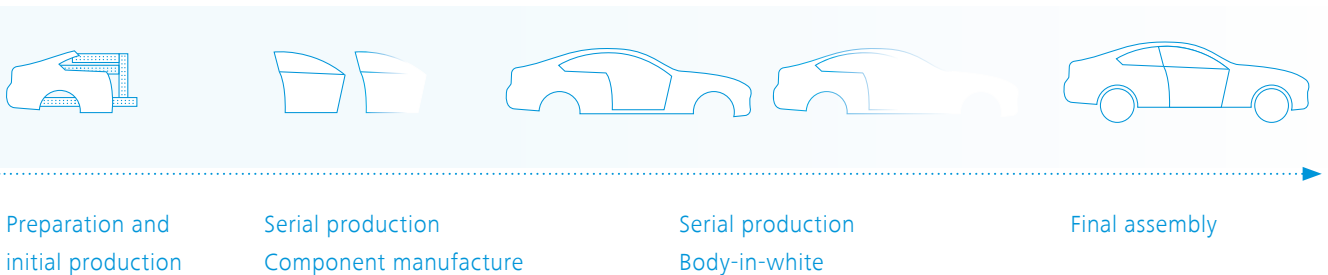
When it comes to capacity to complete as many car body measurement tasks as possible using just one system, ZEISS has a superior solution: new ZEISS CALENO Hambot. It offers maximum versatility and the highest performance capabilities in all measurement disciplines. With its combination of powerful optical and tactile sensors it ensures maximum productivity and precision – not only in the measurement room but also near production. In addition, due to multi-layer safety concept, the operator can work on ZEISS CALENO Hambot without any concerns.

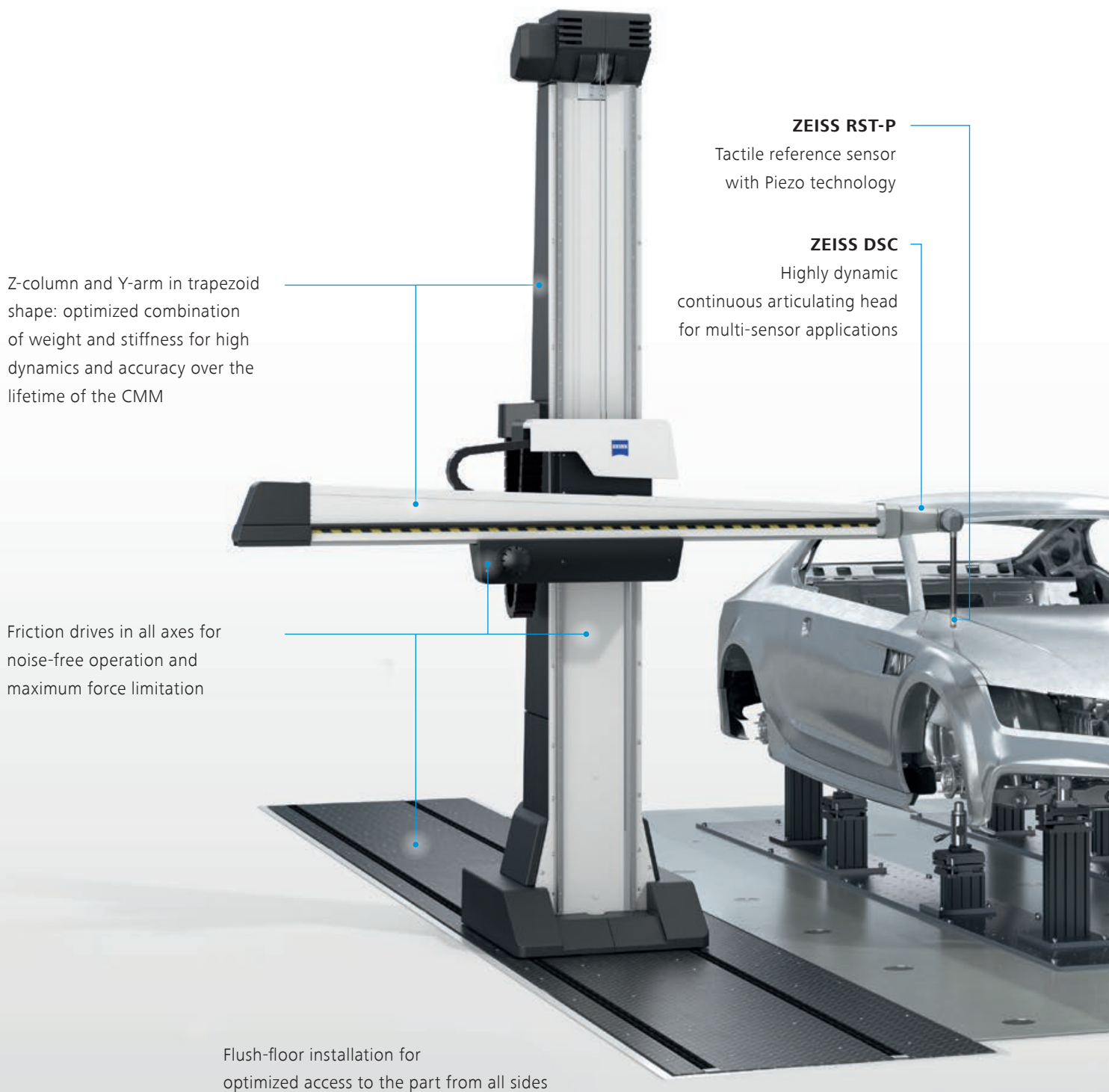
IN-LINE

AT-

OFF-LINE

Possible usage of ZEISS CALENO Hambot in Car Body Construction process





Z-column and Y-arm in trapezoid shape: optimized combination of weight and stiffness for high dynamics and accuracy over the lifetime of the CMM

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

Flush-floor installation for optimized access to the part from all sides

ZEISS RST-P
Tactile reference sensor with Piezo technology

ZEISS DSC
Highly dynamic continuous articulating head for multi-sensor applications

Overview

Technical data

Available measuring sizes up to:

	X [mm]	Y [mm]	Z [mm]
Single	7000	1600	3000
Duplex	7000	3086	3000



ZEISS EagleEye

Optical high-speed laser line sensor

ZEISS DSC

Articulating head

Removable full covers for high temperature stability, maintenance access and light weight

Safety edges as collision protection

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

Wireless control panel for manual sensor positioning

Length measurement error (single, size 16/25)

	Temperaturbereich	E in μm
Standard	bei 16°C –24°C	$27 + L/80 \leq 70$
Option	bei 16°C –24°C	$25 + L/100 \leq 60$
High accuracy	bei 18°C –22°C	$18 + L/125 \leq 50$

Maximum speed and acceleration

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

One measuring system

All tasks

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

Use the tactile sensor, which can be automatically exchanged, to perform accurate reference measurements, e.g. correlation measurements.

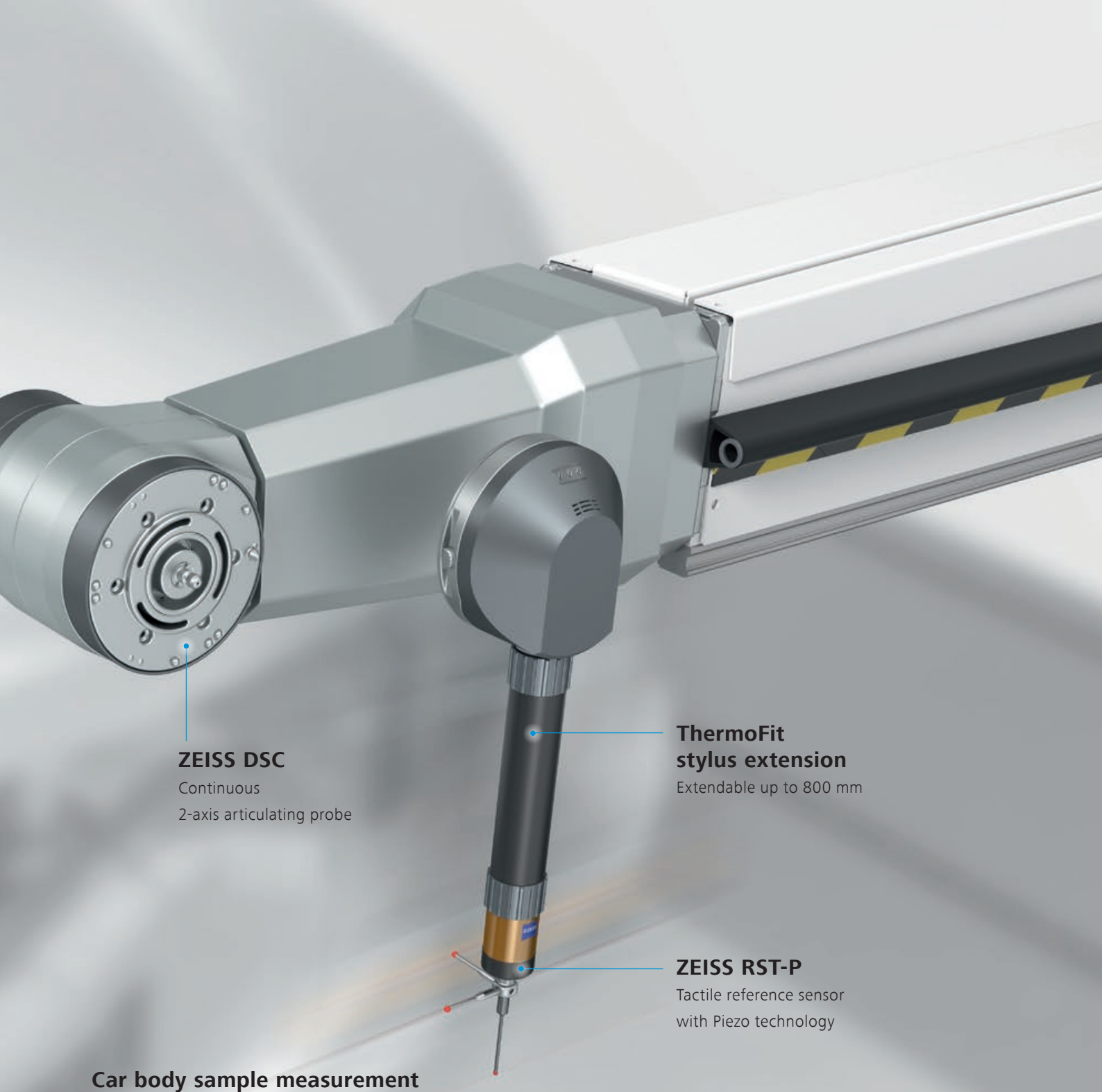
Capture features that are difficult to access using ZEISS ThermoFit extensions of up to 800 mm.

All these tasks can be executed on the same measuring system and without any time loss.

ZEISS EagleEye

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





ZEISS DSC

Continuous
2-axis articulating probe

**ThermoFit
stylus extension**

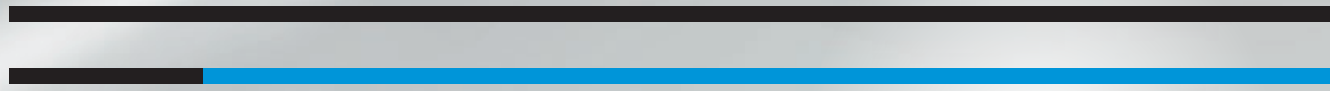
Extendable up to 800 mm

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

85 % time saving

Measurement with ZEISS EagleEye optical sensor:

<https://zeiss.com/EagleEye>



ZEISS articulating probe holders

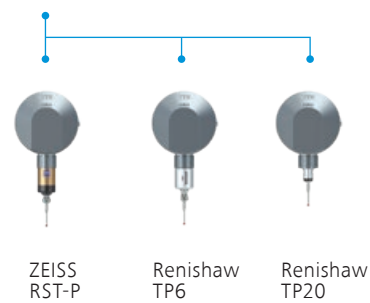
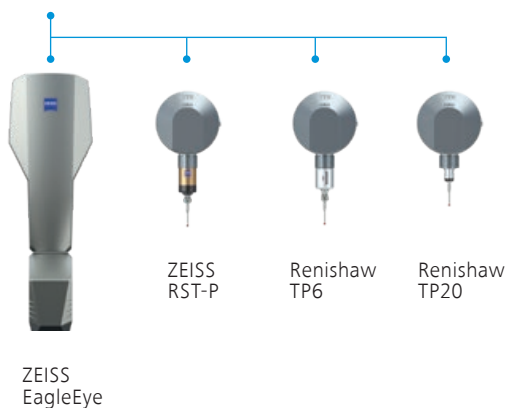
Fast and precise positioning



ZEISS DSC



ZEISS RDS-C6
CAA



ZEISS DSC

ZEISS non-indexing DSC head enables to change optical and tactile sensors automatically. Its' high dynamics, torque and excellent precision allow to perform a wide range of measurement tasks. The sensor carrier has a spring loaded collision protection for the sensor as a standard feature. As an option, there is an additional collision protection available for the sensor carrier itself. Passive probe changer does not require compressed air or electricity.

- Rotation axis A of $n \times 360^\circ$
- Up to 180°/s angular speed
- High torque with max. 3.0 Nm
- Suitable for stylus extensions of up to 800 mm
- Double collision protection for the sensor and optional protection for the articulating probe holder
- No compressed air and electricity are required for passive probe changer

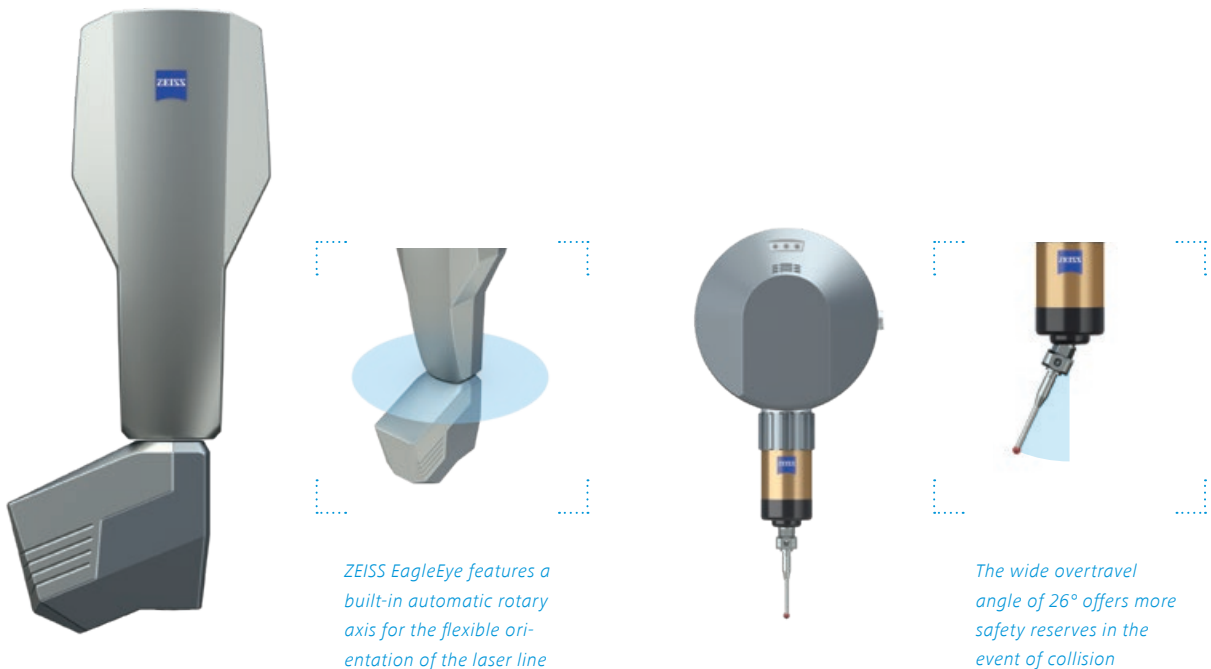
ZEISS RDS-C6 CAA

In case ZEISS CALENO Hambot is used in an area of application with tactile measurements only and there is no need for a stylus extension of more than 400mm, ZEISS offers a high-performance and cost-effective alternative to the non-indexing ZEISS DSC head: RDS-C6 CAA articulating probe holder.

- Fast calibration due to Computer Aided Accuracy (CAA)
- 20,736 positions in 2.5-degree steps
- Suitable for maximum stylus extensions of up to 400 mm
- Collision protection for the sensor and optional protection for the articulating probe holder
- No compressed air and electricity are required for passive probe changer

ZEISS sensors

The Maßstab – optical and tactile



ZEISS EagleEye

The usage of ZEISS EagleEye system significantly shortens the measurement time. For example, in a realistic car body measurement task the measurement time was reduced by 85 percent. In ZEISS EagleEye, ZEISS LinLog image processing ensures that even difficult-to-capture shapes and surfaces are captured precisely. Mapped with just 3 settings – standard, bright and dark – the exposure can be easily optimized based on material characteristics and exposure situation. The laser line is generated by optical lenses, which enables a design without any moving parts.

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

ZEISS RST-P

Compared to standard probes, ZEISS RST-P offers more stable results, up to five times longer service life and more extensive safety features in the event of collision. Unique Piezo technology makes it all possible: before the usual mechanical deflection of the stylus, a Piezo sensor already captures the measurement impulse with minimum measurement force. Therefore, probing angle and probing force have almost no influence on the accuracy, making it possible for ZEISS RST-P to measure with equal accuracy under all probing conditions.

- Measurement force below 0.01 N enabling high accuracy in all probing directions
- Long service life:
MTBF > 5 million probing impulses
- Wide drive-over angle: 26°
- Integrated star element to build angled styli in a simple way

Collaborate safely with ZEISS CALENO

Regardless the level of caution, human factor can never be completely ruled out in everyday measuring tasks.

ZEISS CALENO features unique, multi-layered safety. This protects the operator in the first place. Moreover, it also protects valuable measuring sensors from damage.

Safety equipment on the coordinate measuring machine

Friction drives

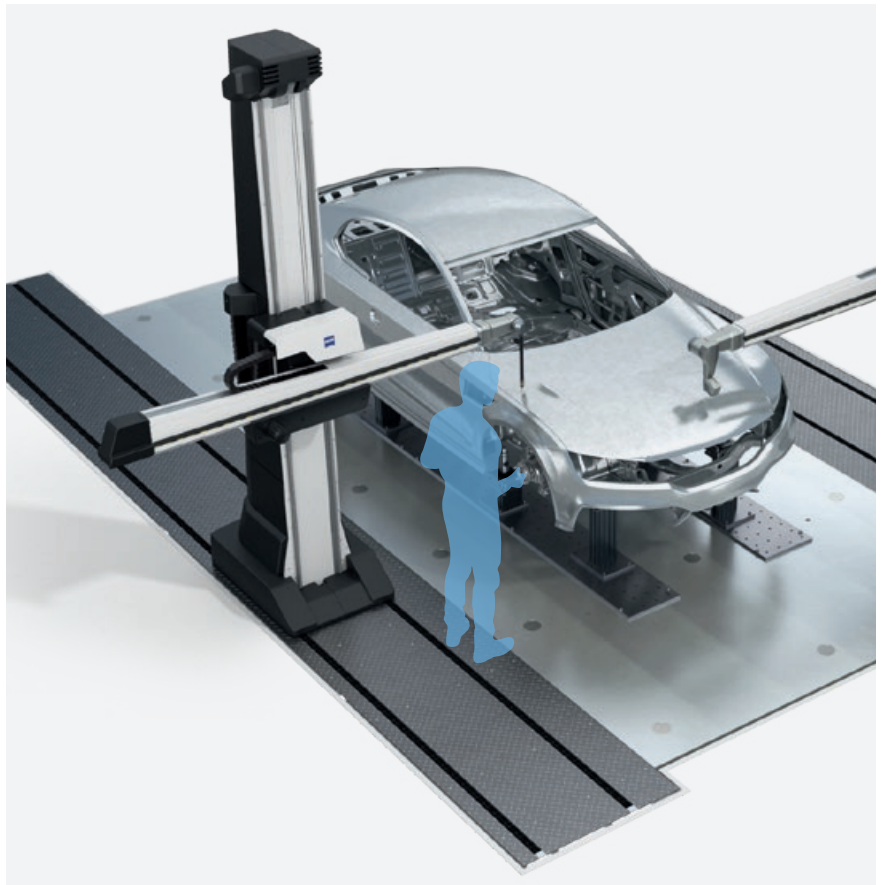
ZEISS CALENO is equipped with friction drives on all axes. If the traverse path of the machine is blocked, the corresponding friction wheel slips through. Thus, the potential impacting force in a collision is mechanically limited. The registered position error leads to an immediate shut-down of the system.

Overcurrent protection

If some obstacle blocks the path of ZEISS CALENO Hambot, this leads to a higher current admission. If defined limit values are exceeded, the machine switches off. The protective effect of the overcurrent protection works in parallel to the detection of position errors and the friction drives.

Safety edges as collision protection

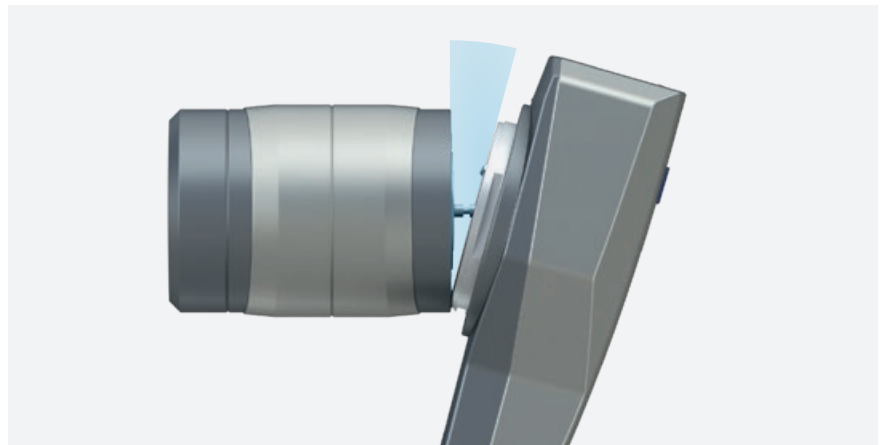
Both sides of the Y-arm are at high risk of collision. Therefore, as a standard feature, sensor strips are attached along the full length of ZEISS CALENO. If narrow elastic pipes are deformed during contact, the cut-off happens immediately afterwards. Also, since smart sensors take up hardly any space, it does not cause any disruption during measuring process.



Safety equipment on the sensor carrier

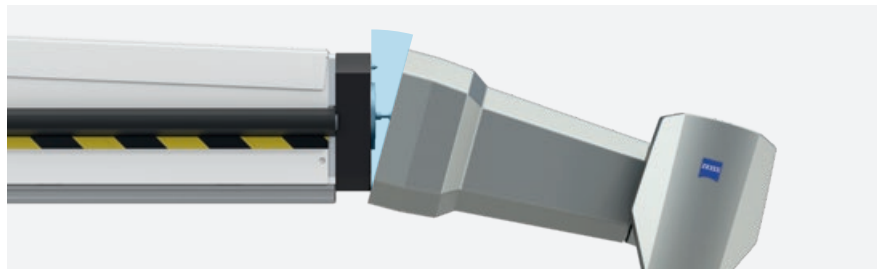
Collision protection for the sensor

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



Optional collision protection for the sensor carrier

Additionally, a spring-mounted bending point may optionally be fitted between the Y-arm connection point and the sensor carrier DSC or RDS-C6 for collision protection.



Safety equipment on ZEISS RST-P sensor

Overtravel protection for ZEISS RST-P

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



Digital Solutions

ZEISS Software

ZEISS supports you in the transition to increasingly digitized, data-based, networked production by offering software products that work with your ZEISS measuring systems in a highly efficient way.

ZEISS digital solutions help you discover new areas for enhanced quality and productivity.



**Measuring software with reporting
for Car Body Construction
including reporting
ZEISS CALIGO**

ZEISS CALIGO is a measuring software for 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 whole car bodies. The highly-developed ZEISS feature extraction enables secure optical evaluation of the most difficult elements such as threaded bolts. The user is supported in the digitization of complete components through functions such as the curvature-dependent thinning of the point cloud. The wide-ranging simulation enables optimi-

zation of multi-sensor measurements without using real CMM and generation of test plans that are robust and measurement time-optimized. Thanks to detailed simulation, collisions may be already recognized and eliminated during offline programming. ZEISS PiWeb reporting which is contained in ZEISS CALIGO is the scalable solution in order to generate professional measurement reports. ZEISS CALIGO also features interfaces that enable



**Networked
quality data management
ZEISS PiWeb**

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

crete internet connection. This means that quality data from a large number of measuring machines from different manufacturers is available on a global scale. With ZEISS PiWeb app, you also have remote access to your measurement data anytime.



**Full Transparency
in production
ZEISS GUARDUS**

As a Manufacturing Execution System (MES), ZEISS GUARDUS enables the monitoring and control of production in real-time. Use ZEISS GUARDUS in quality assurance to analyze connections between data from various sources in order to predict the reliability of the production process. For example, quality data can be utilized in the con-

text of the production. Thus, for each individual component, it becomes easier to understand, which material batch was used, by whom and on which machine the component was produced and what the parameters were.



The PiWeb app means that measurement value progress analyses can also be carried out remotely

Before, during and after the project

The best customized support for you – worldwide

Product-neutral advice

ZEISS advises on measuring systems that are ideally suited to your needs. We take into account an incomparably broad product portfolio and draw on a wealth of metrology knowledge in car body construction to provide you with relevant expertise and suggestions.

Careful project management

We collaborate closely with you while installing your measuring system. We check beforehand whether all prerequisites are fulfilled, so that your goals of precision and measuring throughput can be reached. In a horizontal

arm measuring machine this includes, for example, static inspections for the load capacity, the rigidity and vibration resistance of the machine. We can also support you during assembly process of the foundation, if needed.

Lifecycle services

High-performance ZEISS Service is available to you worldwide to maximize the availability and service life of your measurement systems. You can always reach ZEISS Customer Interaction Center, which offers you the following services:

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

To find your country-specific support hotline, visit zeiss.com/metrology.

Your one-stop partner

ZEISS Car Body Solutions

ZEISS offers solutions for all measurement and inspection tasks in the car body construction process: in the production line, in the measuring room and in between. Thus, you get an efficiently customized system based on your specific needs. With ZEISS you can be sure that all the products and services in car body construction are compatible with each other for maximum quality and productivity.



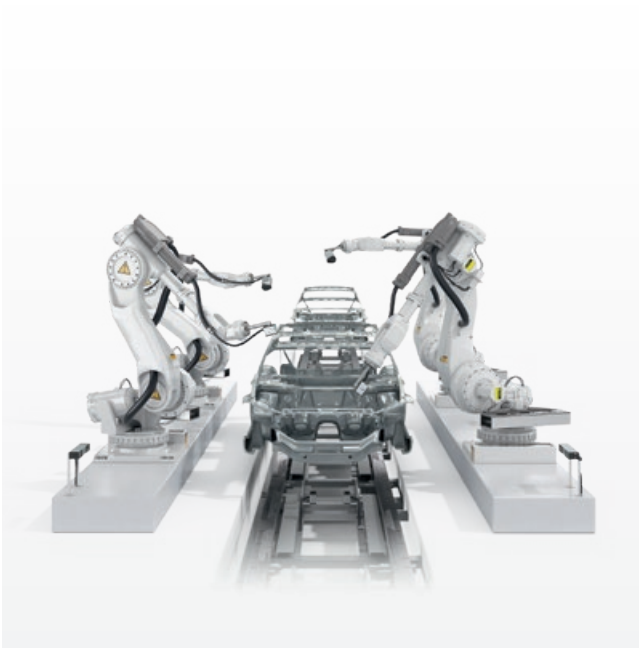
Mobile systems

Wherever something has to be measured – simply take your measuring machine with you. Digitize 3D free-form surfaces efficiently and get high-quality data using optical measuring systems such as ZEISS COMET, ZEISS COMET 6 or ZEISS T-SCAN. To achieve this, ZEISS combines latest sensor technology and ZEISS colin3D project-oriented software for data capturing and processing. All ZEISS mobile systems are characterized by intuitive and easy-to-use interface.



Robot-led at-line systems

At-line measuring systems deliver high-precision measurement results close to the production line. Led by robot, ZEISS high-performance 3D sensors ensure extremely short measurement times and precision – even outside the quality room. Thus, main data is available quickly and the system's high measuring throughput enables to get a high number of measurements.



Stationary and robot-led in-line systems

Inspection technology in the production line must be highly resistant and should keep up with the production cycle. Nevertheless, the non-compromising reliability of the results is a must. Through innovative robot-led and stationary inline sensors such as ZEISS AIMax cloud and ZEISS AIMax BestFit, ZEISS offers solutions for deep quality control in the production line.



Multi-sensor Hambots

Due to their outstanding precision, ZEISS horizontal arm measuring machines (Hambots) offer definitive certainty in car body manufacturing in the measuring room and near production. ZEISS multi-sensor technology enables Hambots to provide users with highly accurate tactile and optical measurement. With an extensive portfolio of ZEISS CARMET, ZEISS CALENO and ZEISS PRO, ZEISS offers the right Hambot based on customer needs and requirements.

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