LOTOS

Optical 3D measuring systems

KOCOS OPTICAL MEASUREMENT

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[ENG]

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LOTOS

Suitable solutions for every requirement profile

The automatic measuring systems LOTOS comprise a broad portfolio consisting of different system variants, tailored to the most diverse requirements. Depending on the area of application, highest measuring rates at second intervals up to highest accuracies in the sub-mircometer range can be realized. The LOTOS product line is characterized by measuring speeds from 4 seconds per part and measurements for a wide range of part dimensions up up to 400 mm.

Three-dimensional measurement with LOTOS

LOTOS automatic measuring systems can measure the full outer contours or individual areas of any measurement object quickly and precisely, irrespective of the shape. The three-dimensional, non-contact measurement is carried out using optical measurement sensors. The result is a representation of the measurement object as a 3D model.
Powerful, intuitive software allows the measurement results to be assessed extremely quickly. Easy integration into any data environment as well as traceability and reprocessing for all measurements make these measuring systems suitable for an extremely wide range of applications.

Measuring system for a wide range of applications

LOTOS systems make it possible to make a three-dimensional measurement of the entire contour or of a freely definable section of any measurement object. The object is turned on a rotary stage for the measurement. At the same time, a high-precision vertical measuring stage is used to move optical sensors along the measurement object to measure its entire outer contour. This contour can then be tested fully automatically for pre-defined geometrical properties. Because of the wide range of possible uses, applications for in-process testing and for quality testing exist in many areas, including the following:

- Machine / plant engineering
- Automotive / automotive parts industry
- Metal construction
- Metalforming industry
- Hardening plants or thermal processing industry
- Medical engineering
- Dental industry
- Plastics industry
- Electronics / electrical engineering
- Aerospace industry
- Watchmaking industry
- Hydraulics / pneumatics
- Ceramics industry
- Packaging industry
- Beverage industry
- Food industry
- Household goods industry
- Office equipment

LS LOTOS LS

LOTOS LS is characterized by an extremely robust design housing. It has an integrated operating touch screen and a high-performance evaluation unit for maximum measuring and evaluation speeds. Thanks to the high stability provided by the robust frame, the LOTOS LS defies external influences and is therefore suitable both for harsh manufacturing environments and for use in the measuring laboratory. The ergonomic design makes the system extremely service-friendly and easy to maintain due to the wide access to all components. In addition, LOTOS LS measuring systems offer a wide range of connection options and can therefore be quickly and easily expanded with peripherals such as code readers.

LSi LOTOS LSi

LOTOS LSi has a robust housing design optimized for inline measurements. The integrated operating touch screen is swivel and height adjustable. A high-performance evaluation unit also ensures maximum measuring and evaluation speeds. The design is optimized for integration into the production process and is therefore particularly suitable for in-process 100% inline testing. The generous free space above and around the measuring table ensures an extremely flexible test part loading via robot or portal loading. Thanks to the high stability provided by the robust frame, the LOTOS LSi defies external influences and is therefore especially suitable for harsh manufacturing environments. The ergonomic design makes the system extremely service-friendly and, thanks to the wide access to all components, extremely easy to maintain. In addition, LOTOS LSi measuring systems offer a wide range of connection options and can therefore be quickly and easily expanded with peripherals such as code readers.

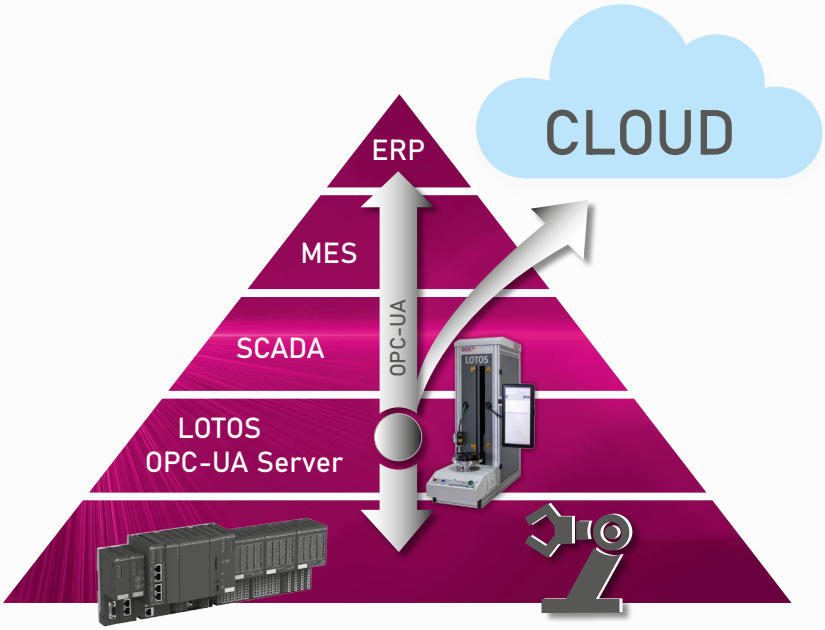
LC LOTOS LC

LOTOS LC is a flexibly applicable standard measuring system. It has a height-adjustable operating touch screen and an integrated evaluation unit. Thanks to the small footprint, this standard module is extremely space-saving. The integrated evaluation unit ensures fast and fully automatic measurement evaluations. Inside, the LOTOS LC has various connection options to extend it with peripherals such as code readers. The stand-alone device is suitable for use in a production environment as well as in laboratory or measuring room.

O LOTOS O

The open structured measuring system LOTOS O is ideal for use in the laboratory and measuring room, as well as in clean production environments. It is extremely flexible and can be configured to meet the corresponding requirements for accuracy, measuring speeds and evaluation options.

Furthermore, the LOTOS O systems are very cost-effective and economical. As an evaluation unit, a PC with monitor or notebook can be connected to the measuring system via ethernet. The integrated switch also offers the possibility to connect peripherals such as code readers.



Industry 4.0 and Industrial Internet of Things
LOTOS measurement systems as OPC-UA server

The central challenges of Industry 4.0 or the Industrial Internet of Things (IIoT) are security and standardized data and information exchange between machines, devices and services from a wide range of industries. LOTOS measurement systems as OPC-UA servers help to meet the high demands on industrial networks and to implement a standardized, secure information exchange.

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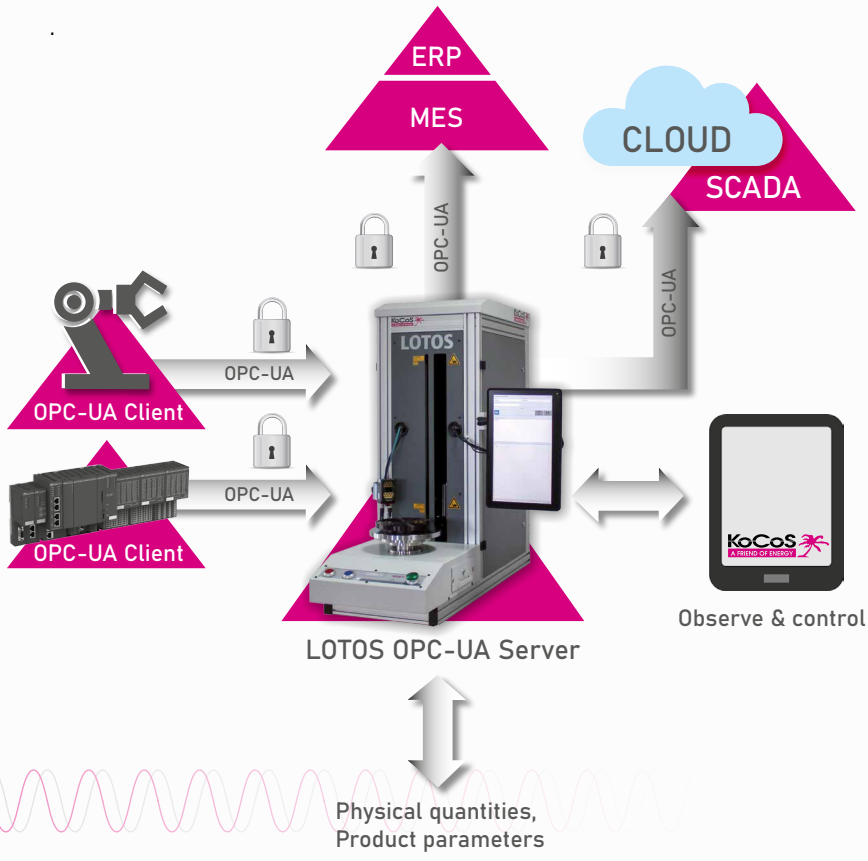
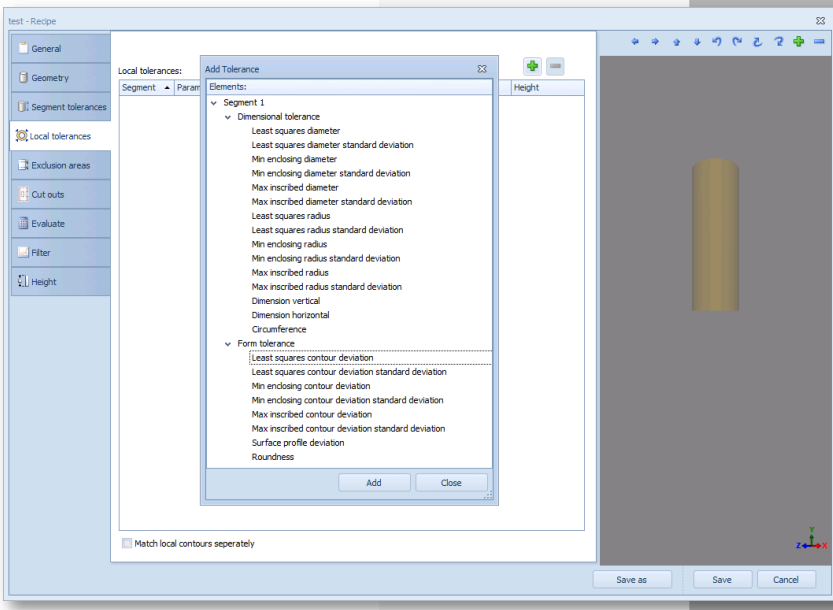


LOTOS software

Comprehensive software solutions for all fields of application

Depending on the system model and the field of application, different software modules are available for LOTOS measuring systems. They provide solutions for various fields of application, including the following:

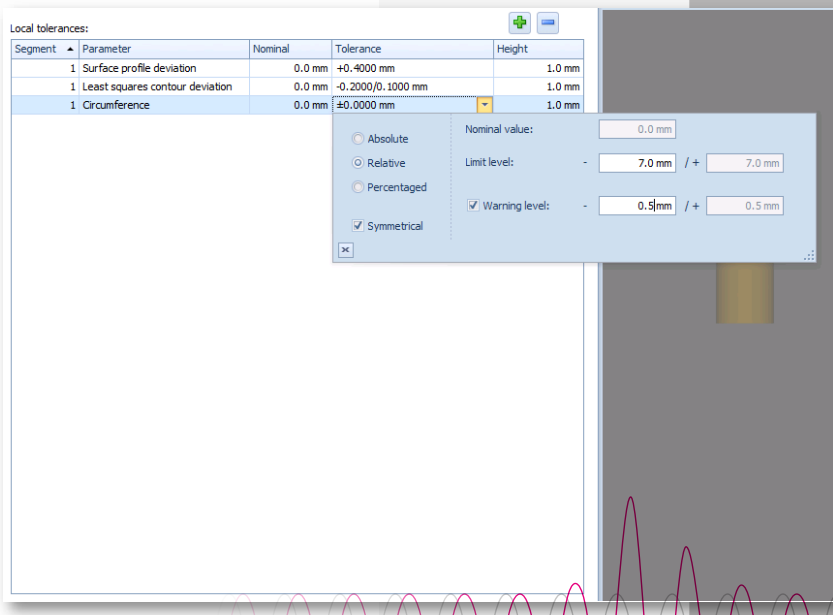
- Quality control in the production environment
- Production monitoring
- Process monitoring and optimisation
- Process analysis for development and prototype production

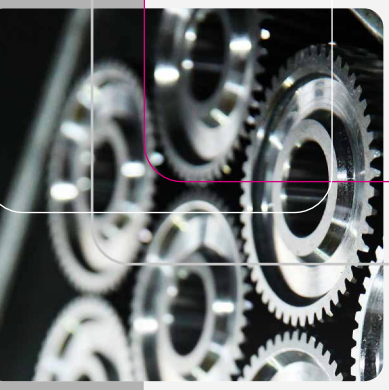


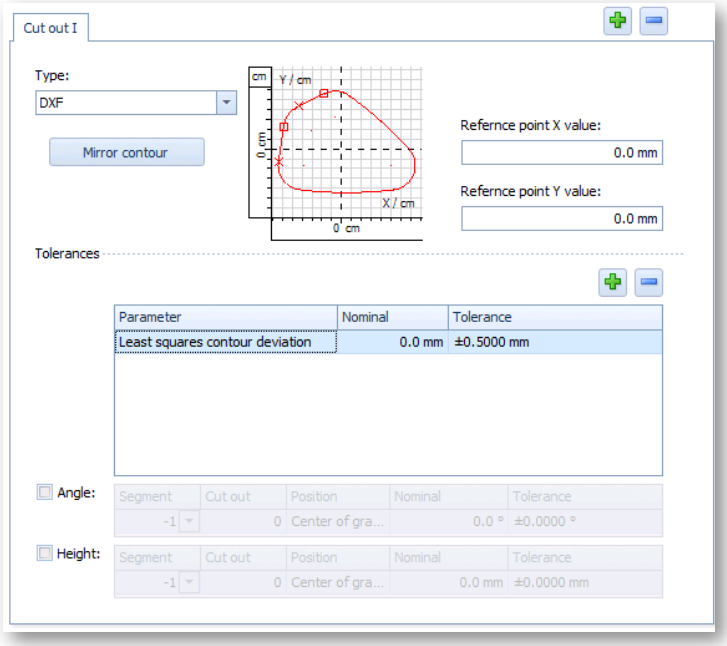
Intuitive creation of measurement recipes

The LOTOS software allows quick and easy setup of measurement recipes for the inspection of various dimensions and features of the measured object.

An intuitive configuration of appropriate tolerances for good/bad evaluation, as well as the possibility to define warning thresholds, facilitate the production testing and monitoring of many processes.

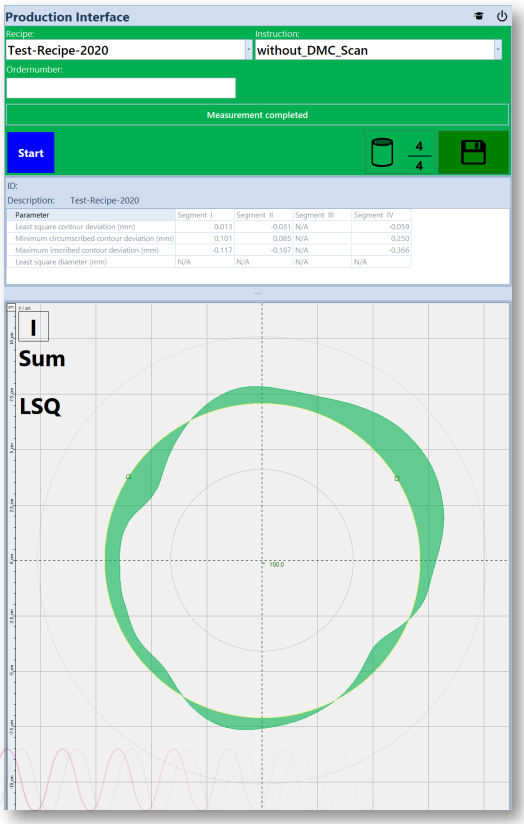






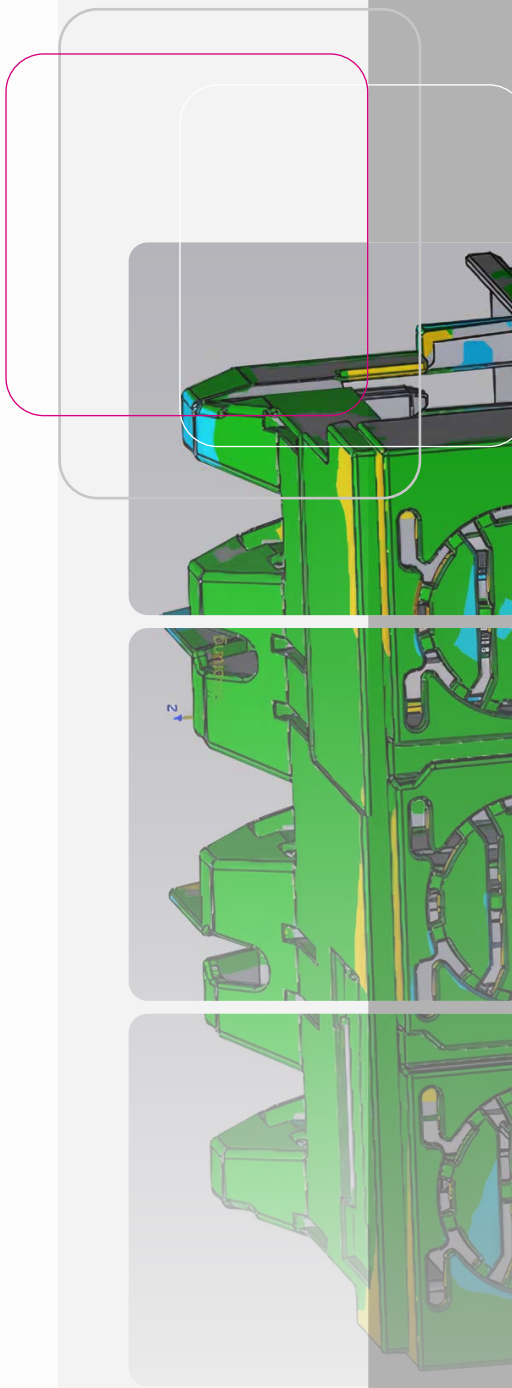
Testing of dimensions of complex bore geometries

Even the inspection of complex bore contours of measurement objects can be realized easily and reliably.



Clearly arranged user interface

The clear, easy-to-understand structure of the ergonomically designed user interface enables intuitive operation for workers. In addition to the automatic tolerance check, a comparative graphic with target and actual contour is displayed for immediate evaluation.



Cost-effective solution for development and production

LOTOS is extremely cost-effective because of the wide range of possible applications. Whether required for tasks connected with development and optimisation or for in-process testing and process control: a wide variety of measuring tasks can be carried out flexibly and efficiently with just one LOTOS measuring system.
Flexible holding fixtures completely eliminate changeover times or keep them very short for tests on a wide range of different products. Coupled with the large measuring range, this means that these systems can measure everything from very small parts to heavy machine components.

LOTOS measuring systems offer a wide range of functions for performing myriad tasks, such as

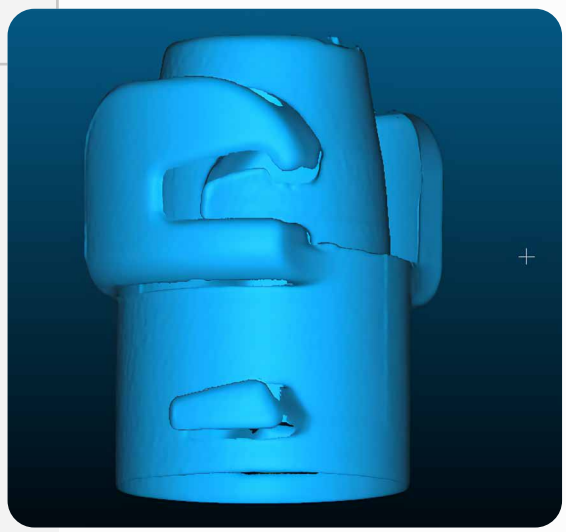
- geometrical measurements
- tolerance tests
- shape and position tests
- determination of change in shape and size
- volume determination
- defect identification
- surface inspection
- 3D-CAD comparison
- generation of a CAD model of the measurement object (reverse engineering)

The LOTOS software modules also offer

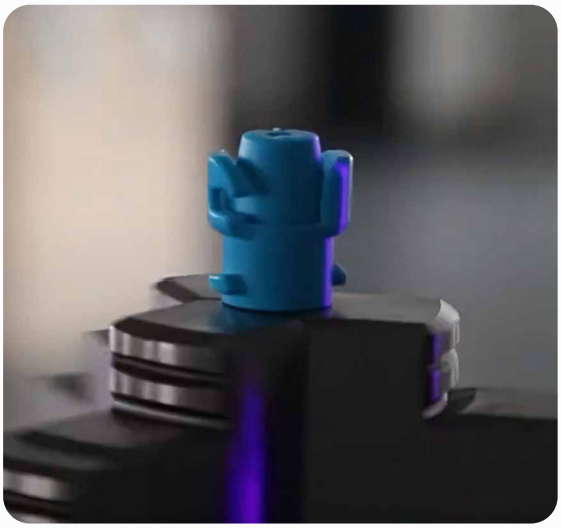
- software and hardware interfaces for integration in any manufacturing environment
- direct in-line production monitoring and statistical functions for process monitoring and control
- synchronous remote administration and monitoring of all measuring systems in use
- interfaces for manual, semi-automatic and automatic measurement (e.g. via OPC UA)
- automatic data export to various formats
- self-monitoring functions and temperature compensation
- poka-yoke functions which prevent any operator errors

3D measurement of various objects

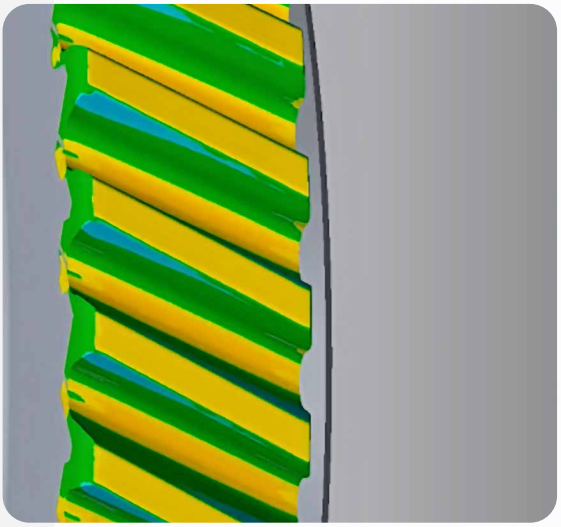
LOTOS helps to perform three dimensional inspection and process control for various parts.



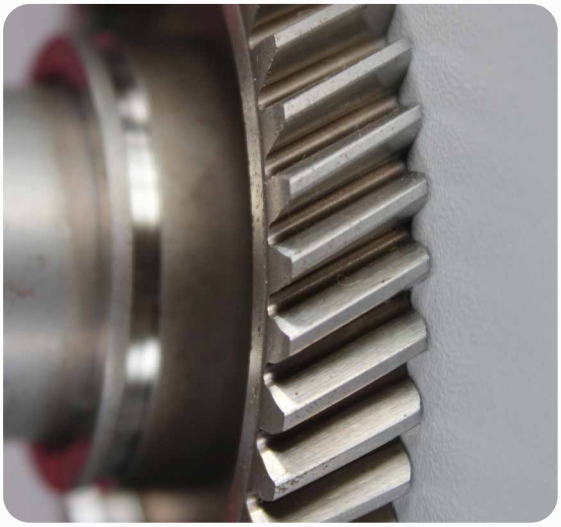
3D scan result



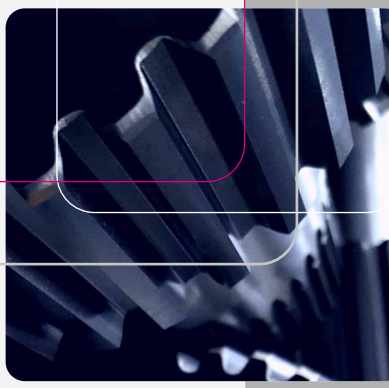
Measurement object

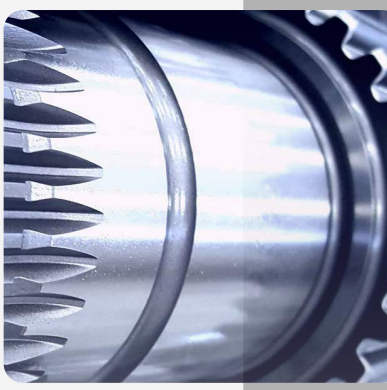


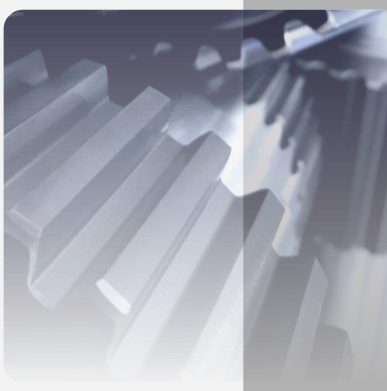
3D scan result with CAD comparison



Measurement object







Extremely high accuracy over a wide measuring range

The use of high-precision mechanical and optical components guarantees high measurement accuracy in the µm range. The measurement sensor has a high resolution and its functioning is not affected by the surface of the measurement object. The use of low-maintenance, durable hardware from leading manufacturers and the enormous measuring range for measurement objects up to 400 mm in diameter guarantee excellent measurement capability to ensure optimum quality and process monitoring.

Fast, maintenance-free stages

Fast, high-accuracy positioning and the direct response characteristic of the stepper motors are key features of the stages. The rotary stage with direct coupling guarantees precise positioning even with heavy measurement objects. In combination with the lifetime lubrication, this makes the stages maintenance-free.

High productivity due to automated measurements

Fast stages for positioning the measurement object and sensor, a powerful internal evaluation and control processor and an additional real-time processor allow fast, fluent operation because processes run in parallel. A full measurement and assessment of a component can take less than 5 seconds to complete. Test plans can be chosen in a matter of seconds or can be read in automatically to perform a wide range of measurement tasks efficiently.

Temperature compensation and self-monitoring

Several internal sensors and multi-level, decentralized temperature compensation guarantee that precise measurement results are delivered consistently, even when the ambient temperature varies. In addition, self-monitoring functions provide the ability to monitor machine capability continuously.

Poka-yoke for guaranteed process stability

Various poka-yoke measures are available for the immediate detection and prevention of errors during operation of the measuring systems. Attempts to manipulate measurements and operator errors are reliably identified by the software and a correction message is displayed. In order to continue the measurement process, only the erroneous step must be corrected and not the entire measurement.

Simple, reliable calibration

Calibration as may be required after an SPC measurement, for example, can be carried out quickly and easily. The use of just one calibration piece guarantees clear-cut results and drastically reduces the probability of calibration errors. If there are deviations, the adjustment is carried out automatically with no need for manual intervention or settings.

Codes for orientation and tracking

Measurement objects can be identified and tracked by reading in different codes. To guarantee maximum flexibility within the production process, the functions for the code scanners can be freely assigned using the measurement recipe. LOTOS therefore complies with the requirements stipulated in the 008-06-17 OEM standard.

LOTOS-Automate: the solution for automated manufacturing

LOTOS-Automate has been developed in order to integrate the full range of features of the LOTOS measuring systems in an automated manufacturing process. LOTOS-Automate makes it possible to use external automation systems, such as PLCs, to control the measurement process. The configuration of the measuring systems and creation of recipes are also performed using commands in the control protocol.

LOTOS-Expert: detailed analyses and evaluations

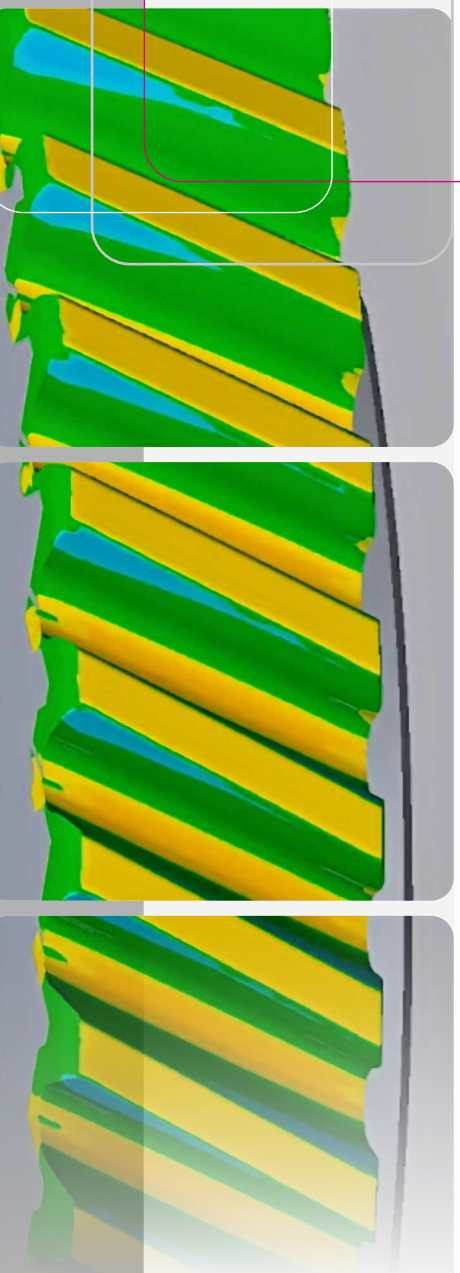
The Expertsoftware featurescomprehensive analytical, statistical and graphical tools and is recommended for use in development, process optimisation, quality assurance and the technological preparation of the manufacturing process. The software can be installed on every PC if required in order to evaluate measurement data on screen during serial production or create recipes during the work preparation process without tying up the measuring system, for example.

The following applications are examples of the comprehensive possibilities of LOTOS-Expert:

- Flexible measurements by executing individual measuring steps
- Automated multiple measurements and recording of changes
- Detailed examination of individual contours
- Determination of local measured values or the curvature in certain areas
- Overlay of the contours of different measurements
- Statistical functions like trend analysis and histograms
- Inclusion of measurement data from external sensors such as temperature and humidity
- Direct display of all measured values

LOTOS-Vision: operation via touch screen

LOTOS-Vision is optimized for operation and control of the measuring systems via touch screen and function keys especially for use in production. The clear, easy to understand structure of the ergonomically designed user interface allows intuitive working for workers. For immediate evaluation, a comparative graphic with nominal and actual contour is displayed in addition to the automatic tolerance check.



Admin module for LOTOS-Expert

The Admin module allows full administration of all LOTOS measuring systems from a central location using a network.This makes it ideal for operators with a number of measuring systems which may even be located at different sites. With LOTOS-Admin, these measuring systems can be configured for scheduled measurement tasks, serviced and monitored in various ways via remote access. This also includes the upload of updates and recipes. Monitoring plant and production parameters provides effective support for the preparation of production reports and statistics as well as for direct production monitoring

Intuitive user interface

The intuitive and easy-to-understand user interface of all software modules guarantees easy operation and minimizes the time it takes to become familiar with the measuring system. Guided data entry in the recipe generator and data plausibility testing ensure reliable configuration and automatic fault detection. Nominal contours can be created directly or read in via CAD files. The results are displayed on the monitor clearly and appropriately for the specific application.

Reliable and comprehensive storage of results

The data is securely stored in a database which is insusceptible to manipulation. A highly efficient database system allows the storage of at least 2 million data sets in the measuring system with consistent access times. The data sets contain the complete measurement results, including the plant and recipe parameters, enabling repeat measurements and further analyses to be carried out. Remote access for analysis and statistics is protected by a password and certificates.

In-process data interface

All measurement, adjustment and SPC data can be published regularly and automatically in different data formats and using different interfaces. This makes it possible for data to be imported and further processed as required by the customer for the purposes of quality management and mandatory documentation.

Technical data

Device name	**LOTOS LS / LOTOS CR**	**LOTOS LSi**
Sample representation		
Measuring range Dimension from ... to ... [1)]	Different variants from 0 mm to 400 mm	Different variants from 4 mm to 248 mm
Repeatability [2)]	Different variants between 0.3 µm to 4 µm	Different variants between 2 µm to 4 µm
Measuring height range (with one component rotation)	up to 75 mm	up to 75 mm
Throughput related to object height 75 mm [3)]	from 4.5 s	from 4.5 s
Device name	**LOTOS LC / LOTOS LT**	**LOTOS O**
Sample representation		
Measuring range Dimension from ... to ... [1)]	Different variants from 10 mm to 420 mm	Different variants from 0 mm to 400 mm
Repeatability [2)]	Different variants between 6 µm to 16 µm	Different variants between 0.3 µm and 16 µm
Measuring height range (with one component rotation)	up to 120 mm	up to 120 mm
Throughput related to Object height 75 mm [3)]	from 4.5 s	from 4.5 s

1) specified values = double radial dimension seen from the center of the measured object
2) The mean value determined at the reference distance after 4096 measurements on the KoCoS reference standard
3) Examples with rotation speed of 360°/s

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