

Precision is our business.



Precision – represented world-wide

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Performance range

- ROUGHNESS MEASUREMENT
- CONTOUR MEASUREMENT
- OPTICAL SHAFT MEASURING SYSTEMS
- FORM MEASUREMENT
- CRANK SHAFT AND CAM SHAFT MEASUREMENT
- OPTICAL SURFACE INSPECTION
- DIMENSIONAL MEASURING MACHINE
- MEASUREMENT STANDARDS
- SYSTEM SOLUTIONS
- DKD CALIBRATION SERVICE
- CONSULTING, TRAINING AND SERVICE

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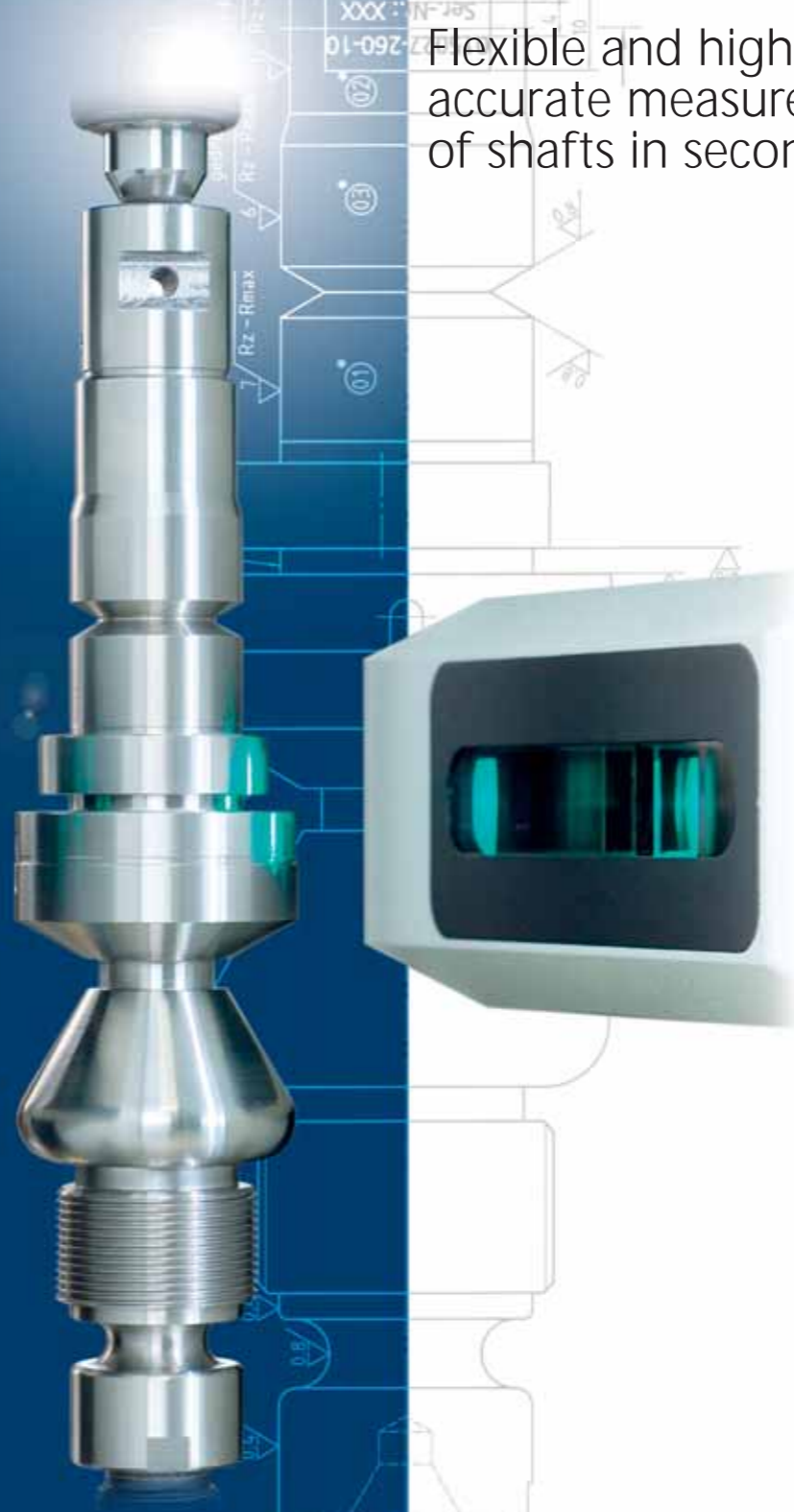
JENOPTIK-Gruppe.

Precision is our business.



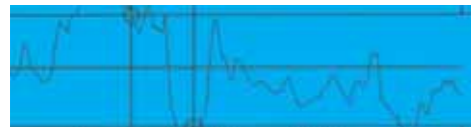
HOMMEL OPTICLINE
CONTOUR
Optical, non-contact
shaft measuring systems

Flexible and highly
accurate measurement
of shafts in seconds.



10026497 1/06 Subject to change without notice

JENOPTIK-Gruppe.



Competence in shaft metrology

High-precision shaft metrology has a long tradition at Hommelwerke. The products of the company's founder, Hermann Hommel, already set standards that revolutionised metrology. This power of innovation which has been perfected over 125 years makes HOMMELWERKE a benchmark for quality and precision. The company's competence in optical, non-contact shaft metrology for production is coupled with quality leadership and top class technological performance which provides excellent benefits to the customer.

An investment which will soon pay off whether using an SPC measuring station operated by workers in the shopfloor or in fully automatic systems for 100% inspection.

Metrology for production

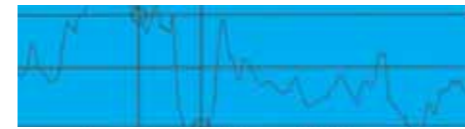
Metrology for use in the production environment makes very high demands on the technology and product quality. The OPTICLINE systems more than satisfy these demands. The hardware and software are optimised for use in a production environment and are able to offer gauging component capability with maximum reliability over long periods of time. The robust, durable system design satisfies the operating conditions in a production environment.

The use of worker self-inspection is supported by intelligent and user-friendly human-machine interfaces. Operating the measuring system is perfectly simple. Test plans are created based on solution-oriented procedure in minutes.

The user guidance can be adapted to the specific operating conditions if required. The calibration state of the measuring system is monitored automatically by integrated, high-precision artefacts and temperature sensors. These also provide the basis for the intelligent, integrated active temperature compensation.

The artefacts therefore replace an additional calibration master for use on a daily basis. The active temperature compensation takes place on a fully automatic basis with every measuring run.

Temperature compensation can be optionally taken into account. The measuring system also monitors itself for negative ambient influences.



This offers high safety and optimum comfort in production applications.

The OPTICLINE systems are a flexible solution for the future, ideally suited to cope with the increasing variety of applications in production.

Based on their uniform measuring principle, the products are optimised with regard to their purpose of use as an offline SPC measuring station or alternatively for 100% control in automation.

Prerequisites for the use of workpieces

- oil-free, clean, burr-free
- dry

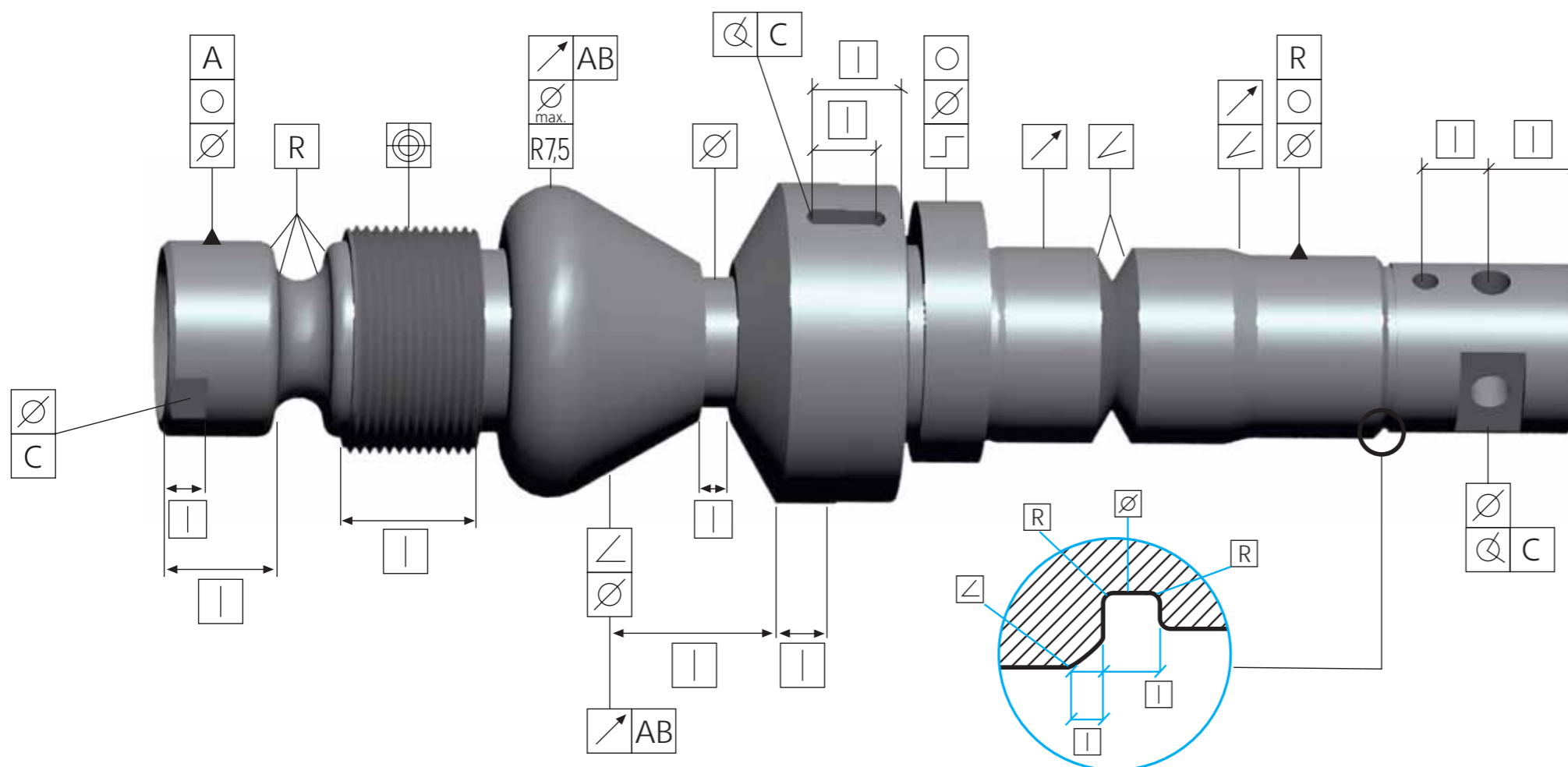
Clean, dry workpieces are an important prerequisite in metrology to ensure that it can unfold its full potential. Many solutions have been developed in the field of workpiece cleaning in recent years and are offered by a large number of innovative and specialised providers.

Evaluation possibilities

- Diameters and lengths
- Geometry elements
- Form and position tolerances
- Rotation angle
- external thread
- through hole contour

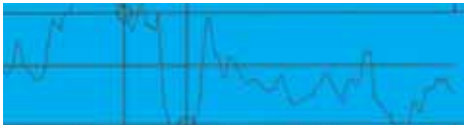
Automatic measuring runs

- static
- rotation angle-related
- dynamic



Advantage to your benefit

very fast	→ increased productivity
non contact	→ no operator influence, no costs caused by wear of probe
Silhouette scanning	→ replaces a range of measuring systems to assess geometry and dimension, form and position
Integrated artefacts	→ automatic monitoring of the measuring system for measurement integrity
Integrated temperature compensation	→ long-term gauging capability in a production environment
Robust Hardware	→ long life in rugged production applications
User-friendly software	→ easily accepted by operators, short set-up times
Flexible clamping device holders	→ short set-up times



Measuring principle and function principle, camera systems

The opto-electronic technology coupled with sophisticated and intelligent software has been developed at our Jena works for over 10 years and has produced an insensitive, high-precision, efficient measuring system for use in production. Our references with more than 1,000 successfully installed systems all over the world demonstrate how effective the OPTICLINE performs. The application emphasis is on operator self-inspection. In addition, many of our systems have proven their advantage over long years of fully automatic operation in 100% inspection installations.

Camera structure

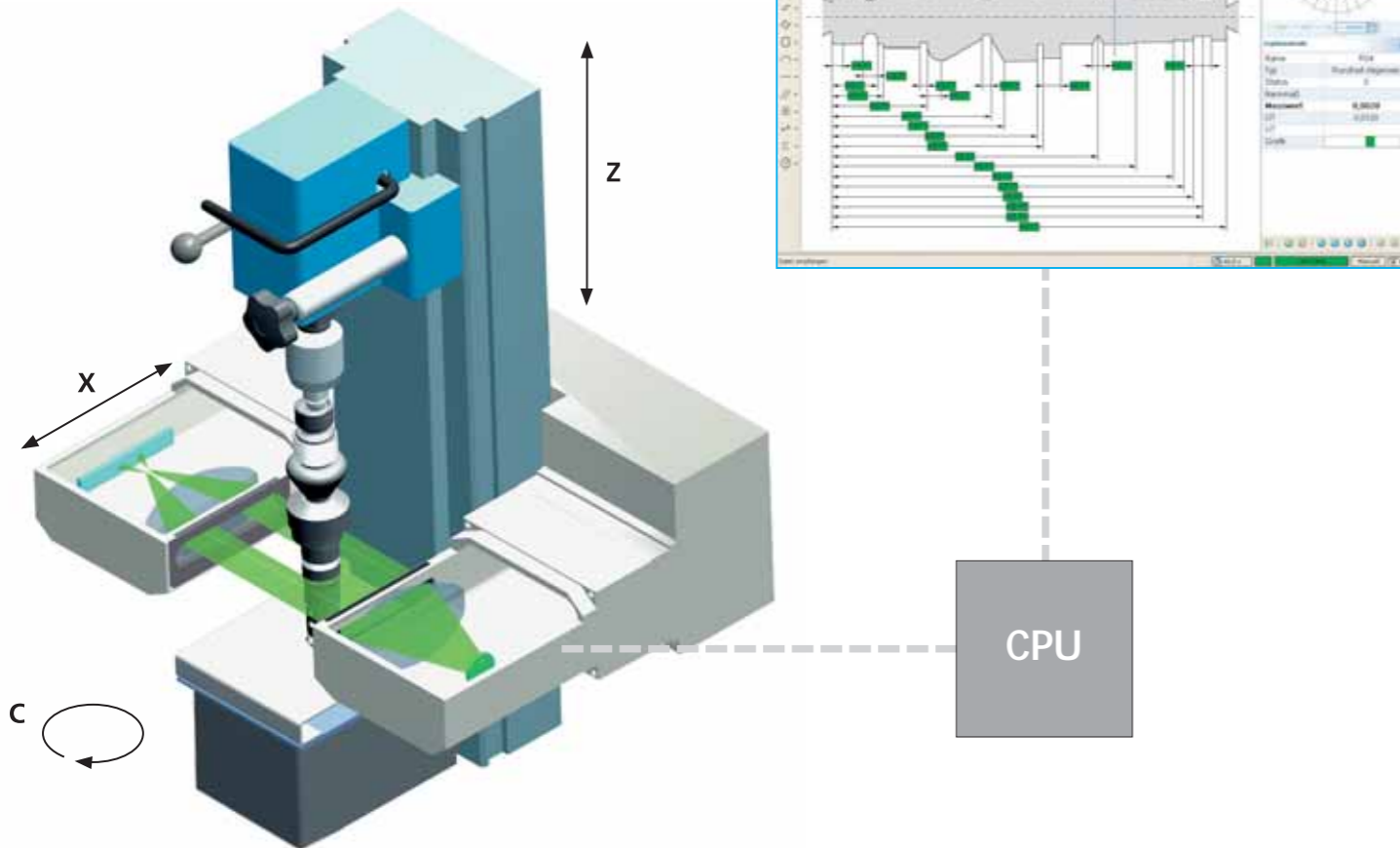
The camera system consists of at least one high resolution CCD line sensor, a semiconductor LED light source as well as top quality telecentric lenses adapted respectively to the complete system.

Sophisticated electronics and intelligent software ensure the desired, reliable flow of measured data. Rigorous adjustment and testing during camera assembly ensures a high quality and precision of the camera system.

Measuring principle

The workpiece is scanned opto-electronically according to the silhouette principle. The complete workpiece contour can be evaluated quickly and precisely due to the high resolution per measured value. Data of the outer contour are also recorded during rotational movement for dynamic measurements.

Any standard measuring functions can be combined depending on the measuring program and then follow an optimised, automatic measuring run.



CONTOUR 203

The low cost solution for small parts

The CONTOUR 203 is the low cost introduction to the high quality HOMMEL OPTICLINE CONTOUR product range. Here too, the robust machine structure is designed for the harsh production environment.

With the CONTOUR 203, workpieces up to 200 mm in length, 30 mm in diameter and with a part weight of 5kg are measured to the micrometer.

Different clamping devices can be accommodated by the flexible MK2 system. Fast conversion to different workpieces within a matter of minutes is therefore possible.

Optional motor controlled doors are also available.



Easy handling



CONTOUR 203
with optional instrument table

CONTOUR 300 series

Compact shaft measuring system for all cases

This equipment series offers a wide range of solutions with the three compact machine types CONTOUR 305, CONTOUR 310 and CONTOUR 314: From the SPC measuring station for engine valves through turbocharger shafts to short drive shafts.

Very small geometry elements and hard-turned shafts can also be measured easily with the high resolution camera system. Workpieces with a total length of 300 mm, a diameter of 0.2 mm to 140 mm and a part weight of up to 10 kg can be measured.

A wide range of clamping devices ensures that the shafts are held according to requirements. Workpiece-specific solutions are possible at any time with flexible MT2 (morse taper 2) holders.



Workpiece-specific solution

CONTOUR 305 as SPC measuring station for measuring engine valves with flexible, pneumatic quick clamping device for valves.



CONTOUR 500 series

The measurement capacities of the instrument types CONTOUR 505, CONTOUR 510 and CONTOUR 514 make them ideal for workpieces such as gear shafts, cam shafts and drive shafts with a length of up to 500 mm, a maximum diameter of 140 mm and a part weight of up to 15kg.

Equipping the machine with a mobile workstation is a very useful configuration in the production environment. The measuring instrument can then be used in production for flexible applications at different sites. The workstation offers additional protection against negative ambient influences.

It also offers space and lockable storage facilities for accessories and clamping devices.

High resolution camera systems are also used in these systems which allow high-precision measurements on workpieces with narrow tolerances.



CONTOUR 514 with gear shaft application in the optional mobile workstation

CONTOUR 800 series

Fast measurement of shafts

The shaft measuring systems of the CONTOUR 800 series are suitable for workpieces with a diameter of up to 140 mm, a length of up to max. 850 mm and a part weight of up to 20 kg. They may be delivered as a stationary system or are available as options in connection with a mobile workstation.

Due to the large measuring capacity for long workpieces and the compact design, the instruments in this series are suitable for a large number of applications such as cam shafts and gear shafts.

Light barrier integrated safety equipment enables fast loading and unloading and at the same time guarantees maximum safety during the measurement run.



Drive shaft application



Cam shaft application



Gear shaft application

Freestanding CONTOUR 810 with light barrier

CONTOUR 1000 series

The solution for larger shafts

The shaft measuring systems CONTOUR 1014 and CONTOUR 1023 can measure workpieces up to a diameter of 140/230 mm, lengths up to 1000 mm and part weights up to 40 kg. The measuring systems are therefore very suitable for crank shafts, larger gear shafts and articulated shafts.

The measuring systems of the CONTOUR 1000 series are kept relatively compact despite their large measuring capacity. An optimum compromise between ergonomics, operating requirements and compact design.

The solution offers advantages such as: Air-conditioned cabinet with power electronics with measuring and evaluation computers, height adjustable operating panel with 19" TFT screen, lockable cabinet with drawers for printer, tools and accessories.

The systems are available in versions with a sliding door as well as with a light barrier and roller shutter door.

The workpiece is held by MT3 taper. The tailstock is manually adjustable and very easy to position with a digital position indicator.

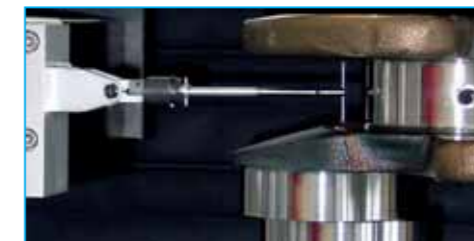
The tailstock is equipped with a quick clamping mechanism for manual loading. The version with the light barrier enables fast loading and unloading of different workpieces with maximum safety for the operator.

A closed, lockable enclosure can be created thanks to the integrated roller shutter door.

The CONTOUR 1000 systems can be optionally equipped with the tactile scanning system BTS 150 for axial face run-outs. The combination of optical and tactile measuring systems offers versatile application possibilities and high flexibility. The tactile measuring system can be used for measuring tasks at central measurement positions and on outer contours. It is an optimum addition to the performance capabilities of the optical sensor system for the measurement of axial run-outs.



CONTOUR 1023 with crank shaft application in version with safety light barrier and roller shutter

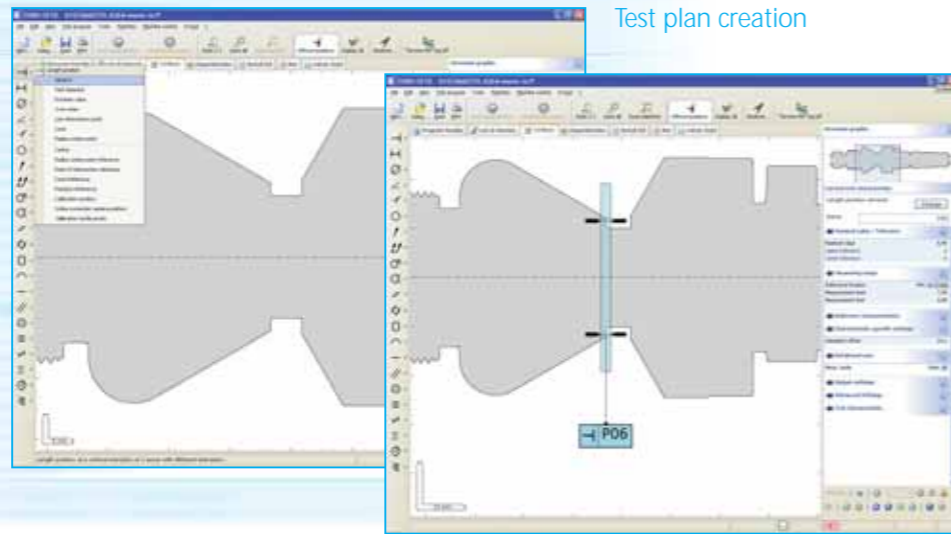


Optional, tactile scanning system BTS 150 for central lengths and axial run-outs

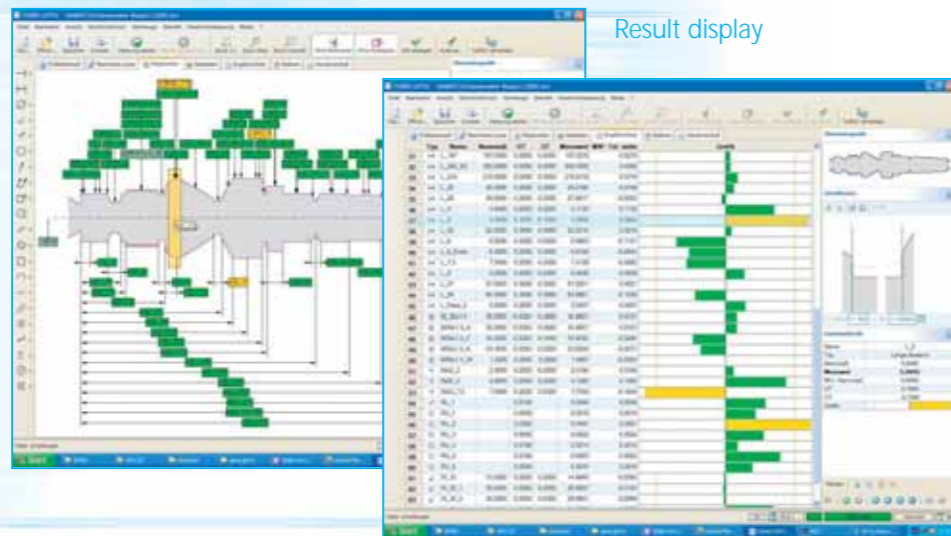
Easy creation of test plans

The creation of test plans, display and further processing of the measurement results is performed simply and intuitively by a graphical user interface under Windows XP.

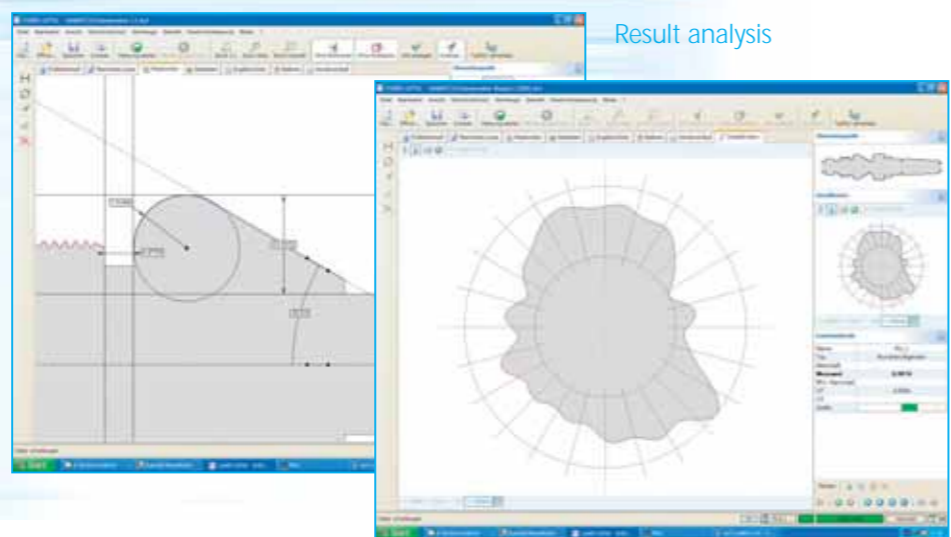
Depending on the measuring task, any standard measuring functions can be combined in an automatic, optimised measuring run. If no measuring program is available yet, the workpiece is loaded, then scanned completely or user-defined and saved in the program memory. This only takes a few seconds. Every desired test characteristic can then be selected by clicking with the cursor. Characteristics are then defined according to the production specifications such as nominal value and tolerances. A normal new test plan with about 20 characteristics can be created very quickly within 5 minutes.



The measurement results are available seconds after starting the fully automatic measuring run. The measured values can now be displayed on the screen in different views, printed or exported via the integrated interfaces. An integrated database tool for measurement results allows simple management and storage of measurement results.



The TURBO OPTIC software contains practical tools for analysing measurement results and data. The measurement results gained from the system can be analysed if necessary.



Precise results in seconds

Performance characteristics

- Intuitive user guidance
- Simple test plan creation
- Clear display of results
- Storage and management of measurement results

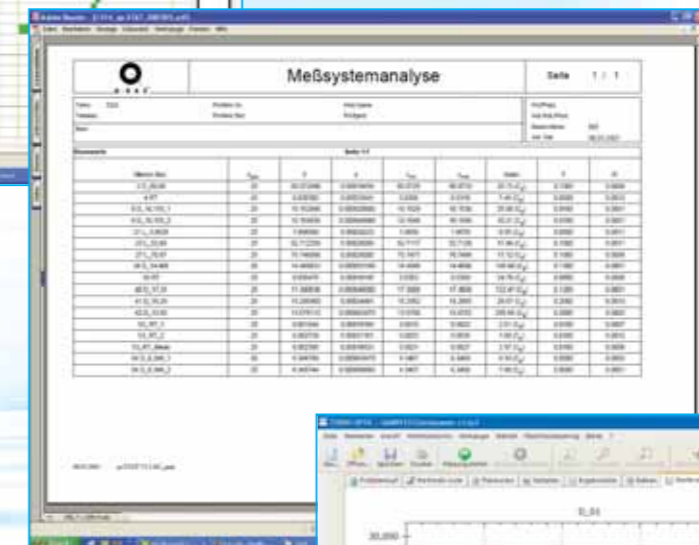
- Analysis tools for result tracing
- Certified Q-DAS interface
- Software interfaces such as CSV, Sesame, Sumeq, Lighthouse

- Connection of additional, external gauging components by gauging component interface box possible
- Simple generation of individual measurement logs



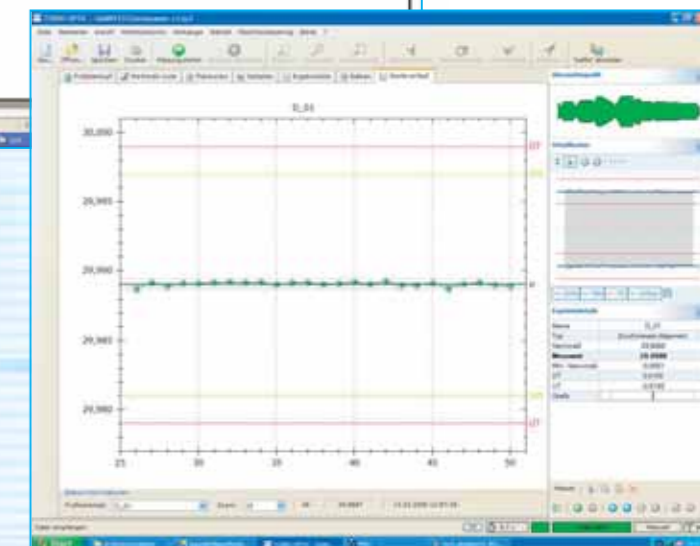
Report printout

Very simple, flexible customised arrangements can be implemented in addition to predefined standard logs for printing measured data.



Statistical evaluation by optional statistic software

Measured results can be displayed graphically on the screen and as a printout. A run chart is also integrated for the individual test characteristics.



Integrated control chart display

Production-integrated, automatic measurement

The CONTOUR AUTOMATIC measuring systems are designed specifically for use in automation. They can be integrated flexibly in the automatic production process by intelligent hardware and software interfaces.

The systems offers high flexibility in combination with very fast measurement cycles. They are particularly suitable for use in production lines and ideally meet very high demands regarding future safety and reliability in flexible production.

The CONTOUR AUTOMATIC series is perfectly equipped for fully automatic operation for 100% inspection in the production line. The systems can be delivered in different versions and designs such as horizontal, suspended or vertical depending on requirements. A wide variety of types similar to the SPC measuring stations are also available.

Loading can be performed by a pick and place station, gantry loader or robot as required.

Various interfaces are available for connecting to the production line and for communicating with the handling system. For simple, low-cost tasks, the connection is made by single, digital IO cables. For more complex tasks, the communication takes place via PLC and Profibus.

Special software functions for automation as well as optional software for correction value control are used for successful operation of the measuring systems in automation.



CONTOUR AUTOMATIC 810H, cam shaft application



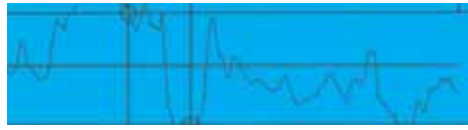
CONTOUR AUTOMATIC 305, turbocharger application



CONTOUR AUTOMATIC 310, cylinder liner application



CONTOUR AUTOMATIC 405, engine valves application



Other products



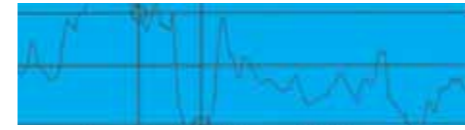
WMS 2548,
applications up to
D = 480 mm and L = 2500 mm,
application possibility:
Aero engine shafts



AMV 923H,
crank shaft application,
for concatenated post-process work
sequence measurement



AMV 923V, crank shaft application with robot loading



Accessories and clamping devices

The wide range of clamping devices and accessories corresponds to the wide scope of possible applications. Standard clamping devices such as tips but also application-specific solutions can be used by means of Morse taper clamping device holders. Below is a selection of the most frequently used clamping device solutions.



Different fixed tips



Moving tips and inserts



Chucks and plates

CONTOUR – Technical Data

CONTOUR	203	305	310	314	505	510	514	805	810	814	1014	1023
Measuring capacity [mm]												
Diameter	0.2–30	0.2–50	6–100	0.2–140	0.2–50	6–100	0.2–140	0.2–50	6–100	0.2–140	0.2–140	0.2–230
Length ¹⁾	200	300	300	250	550	550	500	850	850	800	1000	1000
Workpiece capacity												
Diameter [mm]	150	150	150	150	150	150	150	150	150	150	300	300
Length ¹⁾ [mm]	200	300	280	280	550	530	530	850	830	830	1000	1000
Gewichtskraft Objekt [N]	50	100	100	100	150	150	150	200	200	200	400	400
Resolution												
Diameter	0.2 µm			0.1 µm			0.1 µm	0.1 µm	0.1 µm	0.1 µm	0.1 µm	0.2 µm
Length	0.5 µm			0.1 µm			0.1 µm	0.1 µm	0.1 µm	0.1 µm	0.1 µm	0.1 µm
Rotation	0.018°			0.018°			0.0018°	0.018°	0.018°	0.0018°	0.018°	0.0018°
Accuracy / MPE²⁾	Maximum permissible length measurement deviation according to DIN EN ISO 10360 / VDI/VDE 2617											
Diameter	(2 + D [mm])/100 µm											
Length	(5 + L [mm])/100 µm											
Repeated precision³⁾	Typical clamping length over 25 repeat measurements on ground part surfaces											
Diameter	0.5 µm											
Length	3 µm											
Speed	Automatically optimised measurement: 10 – 80 mm/s											
Measurement	1 rps											
Measurement rotation	200 mm/s											
Positioning	1 rps											
Positioning rotation	dependent on type and number of test characteristics – typical 3... 30s											
Measuring time												
Dimensions [mm]												
Measuring system [B x T x H]	774 x 630 x 782	780 x 650 x 912	780 x 650 x 1152	780 x 650 x 1152	780 x 650 x 1152	780 x 650 x 1152	780 x 650 x 1152	780 x 875 x 1420	780 x 875 x 1420	780 x 875 x 1420	1785 x 1700 x 2650	1785 x 1700 x 2650
Weight												
Measuring system [N]	1300	1400	1450	1550	1700	1750	1850	2700	2750	2850	20000	20000
Clamping device holder												
Morse taper	MK2											
Clamping stroke tailstock	20 mm											
												MK3
												40 mm

¹⁾ between tips from standard scope of delivery. Length may be reduced depending on the clamping devices.

²⁾ ground part surface, ambient and workpiece temperature = 20 °C ± 1K, ambient temperature change < 0.5K/h, according to DIN EN ISO 10360 or VDI/VDE 2617.

³⁾ according to VIM, International Dictionary of Metrology