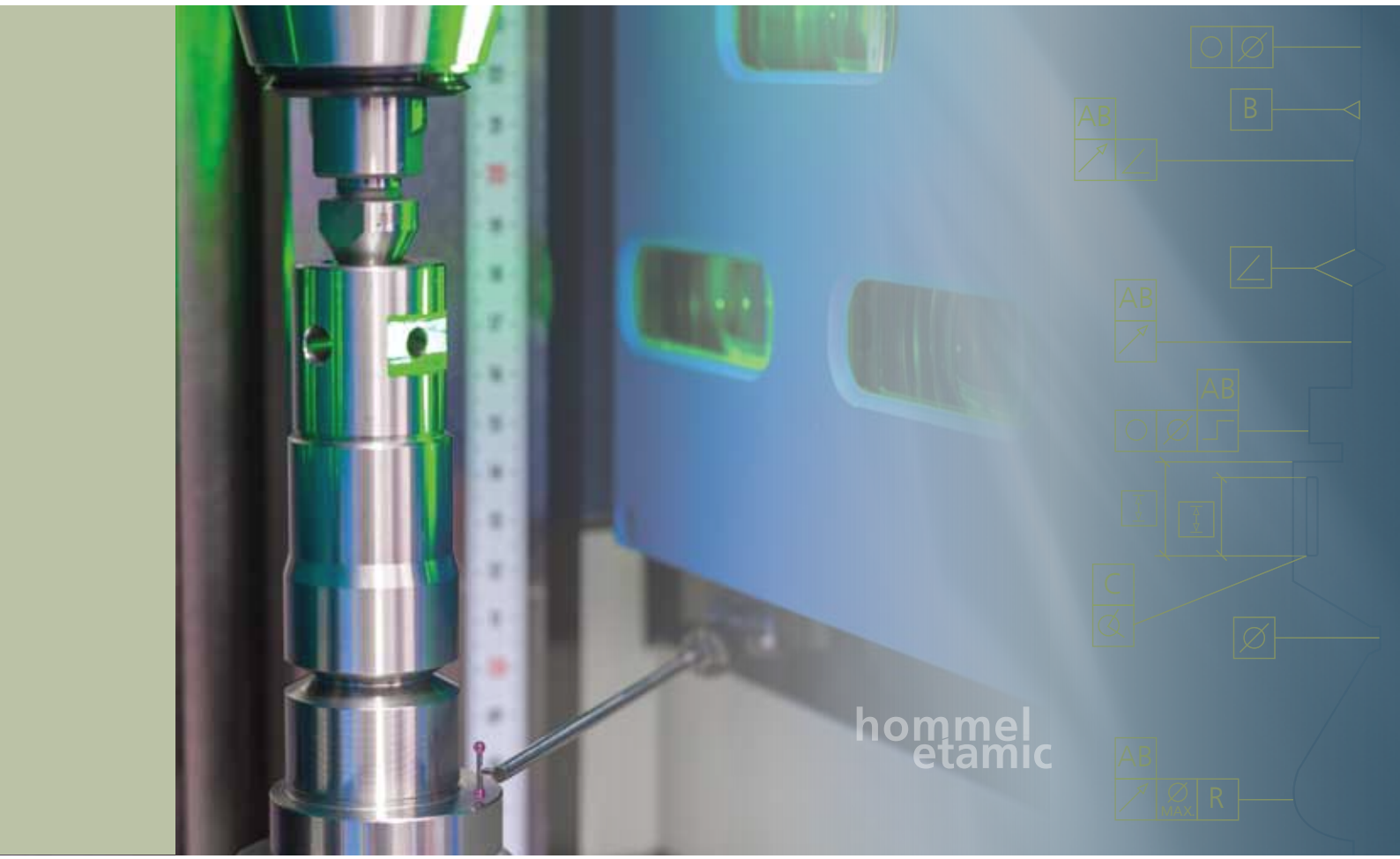
JENOPTIK

OPTICLINE

Optical Shaft Metrology



Efficient optical shaft measurement

We deliver solutions that help you optimize your manufacturing process regarding qualitative and economic objectives.

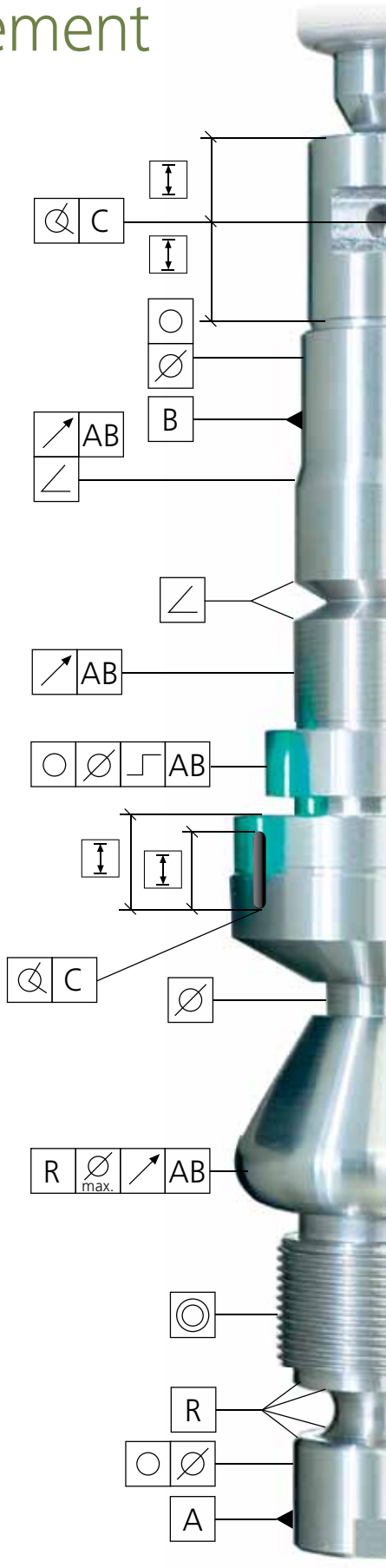
We are one of the leading international specialists in high-precision, tactile and non-tactile production metrology.

Our services range from complete solutions for different measuring tasks such as the inspection of surface and form as well as determining dimensions, throughout every phase of the production process including final inspection or in the metrology lab.

Our decades of experience in tactile, optical and pneumatic measurement combined with our global sales and service support network brings us close to you, our customers, enabling us to provide optimal support as a reliable partner.

Our team is looking forward to your inquiry!

Jenoptik – Sharing Excellence



Model	Brief description	Page
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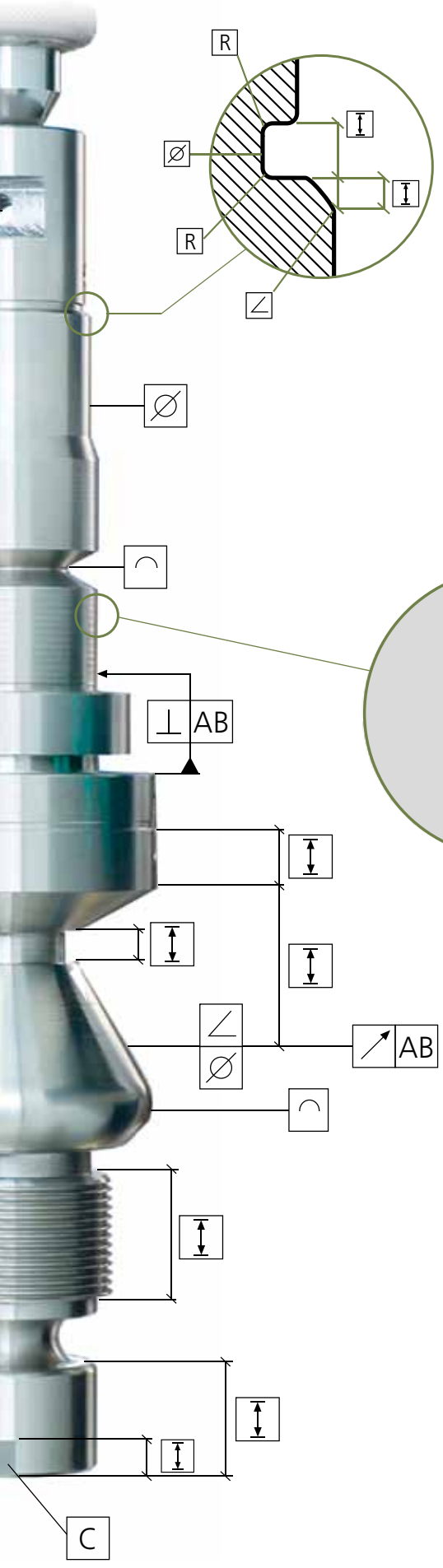
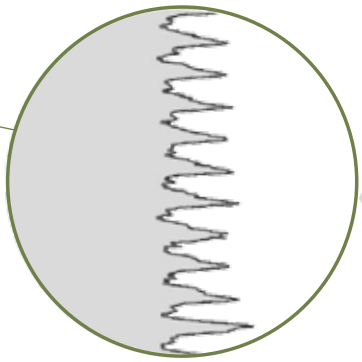


Measuring solutions for your applications

Products of the OPTICLINE range from Jenoptik offer you numerous application and evaluation options:

Successfully implemented worldwide

- Turned and precision turned parts
- Shafts from the automotive industry
- Blanks and pressed parts in metal processing
- Filigree workpieces used in medical technology
- Jets and injection technology
- Bearings
- Turbo-chargers
- Electric motor components, and many more



State-of-the-art camera technology with double the resolution (compared to predecessor) for maximum accuracy with the smallest structures and geometry elements.

OPTICLINE – characteristics measured

Dimensional measurements
- Length
- Diameter
- Radius
- Angle

Thread measurements
- Dimension
- Form

Form measurements
- Straightness
- Roundness
- Cylindricity
- Conicity
- Flatness

Profile forms
- Free form
- Tolerance range

Position measurements
- Radial run-out/total radial run-out
- Axial run-out/total axial run-out
- Straightness
- Symmetry
- Parallelism
- Concentricity
- Coaxiality
- Perpendicularity

Rapid and precise – quality assurance directly in the production process

OPTICLINE solutions are the result of our extensive expertise in optical and tactile shaft measuring technology. Our technologically innovative and pioneering systems have been impressing a broad range of users around the world for over 25 years.

Precise and fast

Innovative measuring system

- Complete measurements in seconds
- High-resolution and µm precise
- Automatic measurement runs
- Integrated tactile probing system (option)
- High-precision headstock for improved form measurement capability (option)

Safe and simple

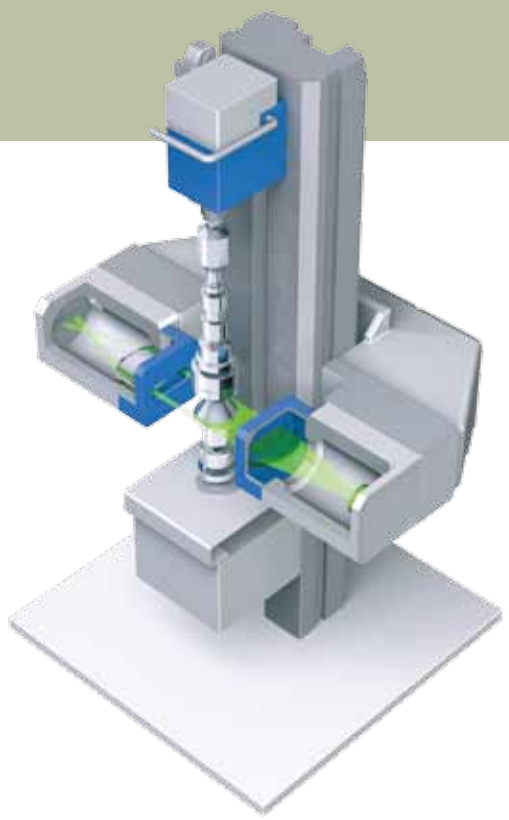
Machine design optimized for use in production

- Ergonomic design
- Optimized for operator-controlled inspections
- Light barriers for maximum safety
- Results display visible from a distance

Flexible and versatile

Simple workpiece change

- Tailstock with convenient functions for quick vertical adjustment and engaging
- Flexible clamping device attachment via Morse taper
- Open enclosure for fast loading
- Minimum set-up times



Ideal for production

Robust hardware and software

- Camera with IP52 protection
- Enclosure with thermal insulation
- Intelligent functions for compensating negative environmental influences
- Integrated roller shutter (optional)
- Integrated measuring computer (optional)

Durable and reliable

Long-term gaging component capability

- Intelligent, automatic monitoring of the measuring system
- Integrated, automatic temperature compensation
- No setting master needed for daily use

Intuitive and easy to understand

Operating and evaluation software

- Fast test plan generation
- Numerous tools and wizards
- Clear representation of results
- Easy mapping of complex test characteristics and tasks
- Quick and easy program change
- Very little training required

Get better measurements

… in the production area

Quality assurance starts in the production process, which is why our OPTICLINE systems are particularly robust and resistant. They offer numerous intelligent self-monitoring and compensation functions for lasting quality assurance. By deploying these systems in the actual production environment you can cut routes, bring outlay down to a minimum, save on rework and reduce the sources of errors.

… with speed

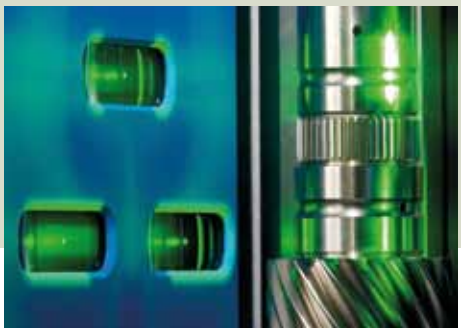
OPTICLINE solutions deliver absolute precision within the shortest test times. These systems probe the workpiece in a fully automatic process based on the shadow image principle with vectorial measurement. The precise rotational axis allows up to three rotations a second.

… with precision

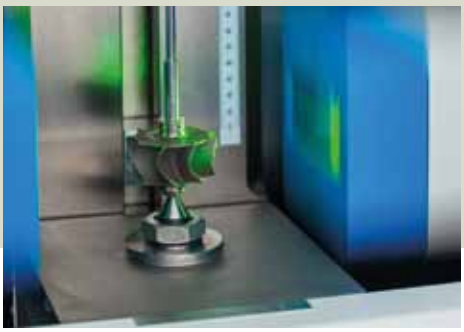
OPTICLINE solutions feature optimized camera systems that offer simultaneous bidirectional measurement for measuring even the smallest geometry elements with maximum resolution. The high number of measuring points per rotation ensures absolute precision in form measurement. The mechanical precision of the headstock and rotational axis also guarantees maximum repetitive precision and stability of measured values.

… with versatility

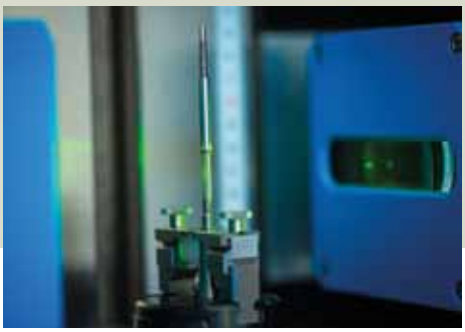
OPTICLINE solutions offer extensive measurement and evaluation options. Be it a compact standard measuring instrument or a project-specific solution, our optical shaft measuring systems are ideal for both operator-controlled and fully automatic use in complete inspections.



OPTICLINE measuring systems are safe and simple to use, and are suited to a broad range of measuring tasks for different shaft sizes and types.



Numerous geometry and form elements can be measured, even on the broken contours of a turbo-charger. The workpiece is held between tips.



Thanks to our decades of experience in designing special, workpiece-specific clamping devices, even small and smallest turned parts can be measured with repetitive accuracy.

Compact and robust systems for long-term gauge repeatability and reproducibility

Thanks to its simple user control, the ergonomic HOMMEL-ETAMIC C914 delivers measurement results within seconds

OPTICLINE shaft measuring systems offer the ultimate in gauge repeatability and reproducibility to ensure maximum quality and process control.

System highlights

- Optimum precision properties in µm delivering measurements within seconds
- An individual camera offers bidirectional measurement for workpiece diameters of up to 80 mm
- Unique scaling of the optical system for measuring diameters of up to 140 mm without loss of resolution or quality
- Special tailstock and headstock design for rapid workpiece changes and maximum precision
- Simple and automatic workpiece alignment
- Real-time processing and fastest possible data transfer
- Self-monitoring functions for reliable use in the measuring room or directly in the production process
- Low-maintenance, robust measuring system including camera with IP52 protection

Different variants for a wide range of measuring tasks

C series OPTICLINE shaft measuring systems are available in different variants, making it possible to handle a wide range of shaft types and measuring tasks with a consistently high level of quality.

System highlights

- Compact measuring system for operator-controlled inspections in the production environment
- Multi-stage scaling for workpieces up to 900 mm in length and 140 mm in diameter
- User-friendly, clearly structured evaluation software for simple and individual definition of test plans (see software pages 18/19)
- Possibility to adapt to customer-specific applications

Product variants and options

- Tactile probing system for measuring additional lengths and form test characteristics
- High-precision headstock for higher form gauge repeatability and reproducibility and improved rotational measurements
- Integrated measuring and evaluation computer
- Roller shutter to protect against negative environmental influences
- Pneumatic clamping solutions for greater flexibility and workpiece variety
- Table racks for practical loading at working height and additional storage space
- Accessories such as clamping devices, barcode readers and workpiece temperature detection systems (see page 22)

Product portfolio C300-C900:
All models on optional gauge stand, C308 and C614 with integrated roller shutter

Measuring capacity	C203	C305	C308	C314	C605	C608	C614	C908	C914
max. diameter (mm)	30	50	80	140	50	80	140	80	140
Length (mm)	250	300	300	300	600	600	600	900	900

Simple loading of the measuring machine thanks to fast tailstock adjustment

Simple starting of measurements for fast and operator-independent measuring results with maximum ease of use

Results view visible from a distance for OK, NOK, warning limit and errors

Short routes – deployment directly in the production process

Using the system directly in the production process makes it possible to achieve significant cost and time savings compared to conventional measurements in the measuring room. Our OPTICLINE systems are therefore specially designed for use in tough environments:

- Maximum gauge repeatability and reproducibility in the lower µm range
- Intuitive and user-friendly operating software
- Simple programming in just a few steps

Highly robust system thanks to numerous compensation measures

- Hermetic and thermal insulation of key components
- Protected guides and scales
- Temperature compensation and supporting sensors
- Self-monitoring system
- Camera parking in secure home position

Ideal for operator-controlled inspections

- Widely accessible, open loading area
- Simple and fast shaft clamping between tips for repeatable measurements
- Ergonomic design for simple handling

HOMMEL-ETAMIC C914 with optional, mobile gauge enclosure for flexible use in production

Integrated light barrier to protect operators in accordance with international safety standards

Integrated roller shutter to protect against negative environmental influences (optional)

Flexible holder via MK2 morse taper for fast changing of the workpiece

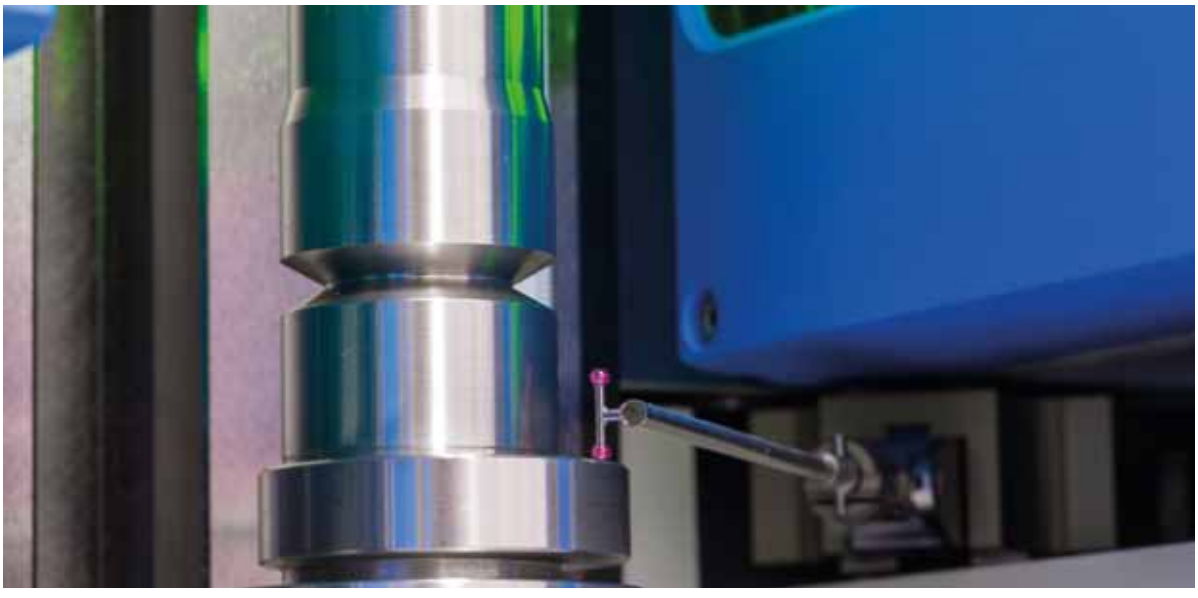
Maximum flexibility for various measuring requirements

System highlights

- Use in the measuring room or production environment
- Different designs: on the instrument table as a seated workstation, on a gauge stand as a standing workstation or on a mobile gauge enclosure as a complete solution for flexible production
- Standing workstations for the production area
- Roller shutter to protect against dirt and adverse environmental conditions when the device is not being used for measurements

Optional tactile probing system

- Tactile probing system for lengths, axial run-out, flatness and perpendicularity
- Tactile measurements are seamlessly integrated into the optical measurement run
- They complete the quality statements in a single measurement run



Optional tactile probing system for additional form measurements

User-independent measurement of large shafts

The shaft measuring systems of the opticline C1000 series offer you an ideal combination of precision, suitability for production, ergonomics and operator friendliness.

System highlights

- Fast and reliable results for large and heavy workpieces
- Elaborate design for high demands on production suitability: air-conditioned cabinet for power electronics and measuring computers, height adjustable operating panel with TFT screen and a lockable cabinet with drawers for printer, tools and accessories
- Easy to set up and use thanks to simple tailstock positioning via a digital position indicator
- Fast loading and unloading of different workpieces combined with maximum operator safety through a light barrier
- Protected from negative environmental influence by closed and lockable housing with integrated motor-driven roller shutters

HOMMEL-ETAMIC opticline C1023 with safety light barrier and roller shutter

Adapted to your specific requirements

Tactile measurement of axial run-outs and lengths

The opticline C1000 shaft measuring systems can be optionally equipped with a tactile probing system. Tactile measurements can be seamlessly integrated into the optical measuring run and are ideal for axial run-out and special length measurements. These additional evaluation possibilities add to the evaluation functions of the optical measuring system as they complete the quality information within one single measurement run and offer higher flexibility.

Optimized for crank shaft measurement

The opticline C1023-75AE measuring system has a specially optimized camera system. It is also equipped with a high-precision C-axis combined with a high-resolution angle measuring system. The technical configuration enables the measurement of demanding pin bearing characteristics after grinding and during final processing. It can measure workpieces weighing up to 75 kg.

Optional tactile probing system for concentric lengths and axial run-outs

Measuring crank shafts with a HOMMEL-ETAMIC opticline C1023-75AE

Measuring capacity	opticline C1014	opticline C1023	opticline C1023-75AE
Diameter (mm)	140	230	230
Length (mm)	1000	1000	1000
Workpiece weight (N)	400	400	750

HOMMEL-ETAMIC opticline CA610H in automation

Production-integrated automatic measurement

The measurement systems of the opticline CA, VMS, AMV and WMS series are designed specifically for optional use in automated processes. Consistent improvements to the innovative measuring system with regard to the specific demands in automation enable the systems to deliver outstanding reliability and precision during continuous use in tough production environments.

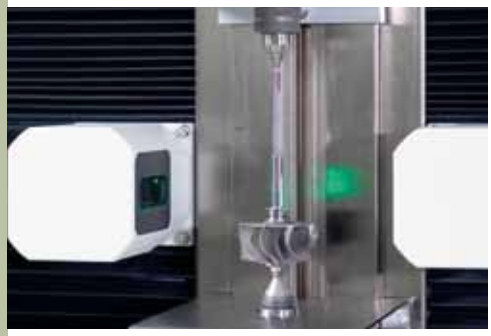
Ideal for concatenated use in production lines

Split-second measuring cycles coupled with intelligent hardware and software interfaces enable the seamless integration of these measuring systems in automated production processes and flexible manufacturing environments.

Tailored to your production processes

- Various features and designs depending on requirements (for instance lying horizontally, hanging or vertically)
- Fully automated use in post-processing or 100 % control in production lines
- Various interfaces for integration in production lines and handling systems: from inexpensive digital I/O lines to PLC and Profibus for implementing complex process integration
- Special software functions for automation and optional solutions for correction value control

Measuring a cylinder liner



Measuring a turbo-charger

HOMMEL-ETAMIC opticline CA618
for operator self-inspection

Flexible shaft measurement in production

These high-precision systems are ideal for SPC measuring stations with manual loading and automated production thanks to their special open machine concept.

System highlights

- Outstanding precision characteristics
- Excellent form measurement capacity
- Flexible in use, including for future workpieces and measuring tasks
- Ideal production suitability and reliability through long-term gaging component capability
- High-precision rotational axis with outstanding form measurement ability
- Automatic tailstock with a long stroke on precision guides
- Quick, easy and accurate workpiece clamping via a motorized tailstock

Ideal for your

- Turbo-chargers, engine valves, pistons
- Cam shafts and crank shafts
- Gear and drive shafts
- Electric motor shafts

Optimization of production processes with tight tolerances

HOMMEL-ETAMIC opticline CA305 with customer-specific housing; automated measuring of turbo-chargers

Optimized for use in production

- Split-second speed and low maintenance requirements for outstanding productivity
- Ideal accessibility for manual and automatic loading
- Software adapted to the production environment and processes
- Active temperature control and temperature compensation
- Simultaneous control of several production systems by a single operator
- Reduction of rejects and material consumption

Customized solutions for flexible use

- Horizontal or vertical system design
- Project-specific housing solutions
- Various options for automated loading and clamping
- Various interfaces for machine integration and control
- Optional, project-specific automation

Optional tactile probing system for measuring lengths and axial run-outs

Measuring lengths and axial run-outs

The optional tactile probing system enables the measurement of axial run-out and special lengths as a complement to the evaluation options of the optical measuring system.

Measuring capacity	opticline CA305	opticline CA310	opticline CA314	opticline CA605	opticline CA610	opticline CA614	opticline CA618
Diameter (mm)	50	100	140	50	100	140	180
Length (mm)	300	300	300	600	600	600	580

Tailored precisely to your workpieces

Precision crank shaft measurement

The AE variants of the opticline CA series are designed specifically for measuring crank shafts.

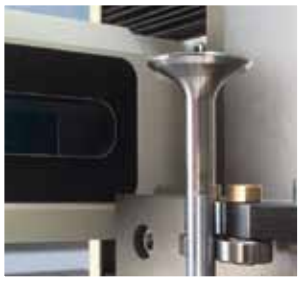
- Optimized solution for process stages downstream from grinding and final processing
- Special camera and high-precision angle measuring system

Fully automated engine valve measurement

The VMS systems based on the CA series are designed specifically for fully automated engine valve measurement.

- Super-fast complete measurements with cycle times of less than 5 seconds
- Specially designed, customized clamping devices

HOMMEL-ETAMIC opticline CA618-AE; designed specifically for measuring crank shafts



HOMMEL-ETAMIC opticline VMS305; specifically for measuring engine valves; integrated in a production line

Measuring capacity	opticline CA614–AE	opticline CA618–AE	opticline VMS305
Diameter (mm)	140	180	50
Length (mm)	600	580	300

Professionals for concatenated use in production

HOMMEL-ETAMIC opticline AMV923V with robot loading

These opticline AMV measuring systems designed specifically for concatenated use in production are available in horizontal and vertical designs depending on your requirements. They are ideal for the automated handling of large workpieces.

System highlights

- Short measuring times for complex workpiece geometry
- Concatenated use in production; the integrated PLC connects to the superordinate loading system
- Fast correction of one or more processing machines with the help of intelligent software for tool correction

Loading system

Loading system

HOMMEL-ETAMIC opticline AMV923H for concatenated post-process work sequence measurement

Measuring capacity	opticline AMV923H	opticline AMV923V
Diameter (mm)	230	230
Length (mm)	900	900

Precision for particularly large and heavy workpieces

The machine design of the optical measuring systems opticline WMS enables them to handle above-average workpiece sizes weighing up to 120 kg.

System highlights

- Top resolution and measurement accuracy across the entire range thanks to a unique, cascaded camera system for workpieces with diameters of up to 320 mm
- Adaptation to your integration requirements – horizontal or vertical design
- Split-second measurements, even with very large workpieces
- Available for operator self-inspection and fully-automated use

Use in production, loading a crank shaft with operator self-inspection

HOMMEL-ETAMIC opticline WMS, solution with a horizontal design and a crank shaft application

HOMMEL-ETAMIC opticline WMS1332V in a vertical design

Measuring capacity	opticline WMS1032	opticline WMS1332
Diameter (mm)	320	320
Length (mm)	1000	1300

Simple test plan generation

Intuitive operation

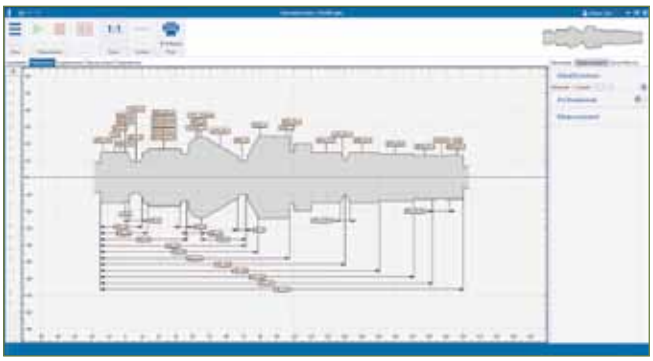
- User-friendly, clearly structured graphical user interface
- Wizards for easy creation of test plans and setting of test characteristics
- Clear presentation and subsequent processing of measurement results
- "Live" mode for direct feedback when creating test plans
- Scan of the part contour in different views

Optimized measuring runs

- Easy selection of new characteristics by clicking with the cursor; workpiece contour definition in accordance with drawing specifications
- Scanning and evaluation of workpiece contours in the shortest possible time
- Fast combination of any measurement functions in one test plan
- Fully automated measurement process with results displayed within seconds

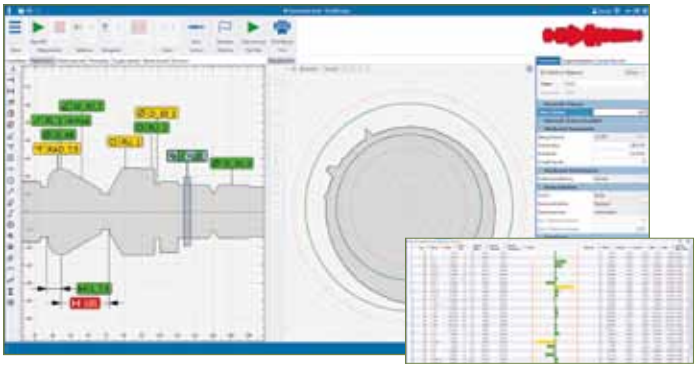
Clear presentation and reliable analysis of measurement results

- Various views for displaying measurement values on screen
- Extensive analysis functions
- Documentation of measurement values in customizable reports
- Various export options for subsequent data processing or documentation
- Database tool for convenient saving and managing measurement results
- Fast and reliable analysis and interpretation of measurement results by the operator
- Comprehensible and practice-oriented result tracing

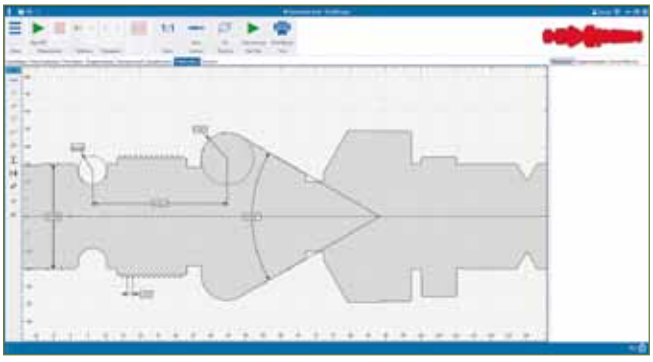


User interface: optimized view for operators

Setting of test characteristics



Results display with detailed contour, results list



Display functions

Precise results in seconds

Practice-oriented evaluation software

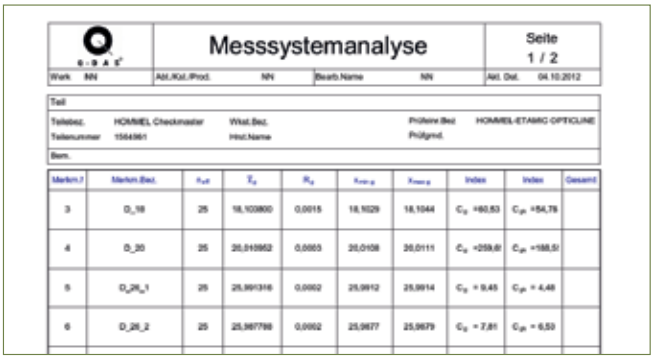
- Display and operating controls adapted to the requirement profiles of test plan designers and operators
- Simple and comprehensible evaluation software with numerous help functions and error-free workpiece control – even by untrained operators
- Quick and easy software adaptation to specified work processes

Convincing performance features

- Intuitive user guide
- Individual arrangement of software windows on one or more monitors
- Clear display of results
- Storage and management of measurement results
- Analysis tools for result tracing
- Certified interfaces (Q-DAS, AQDEF)
- Software interfaces via CSV and Script
- Connection of additional, external gaging components via interface box
- Simple generation of individual measurement logs
- Clear presentation of measurement results for comprehensive analysis and quality assurance

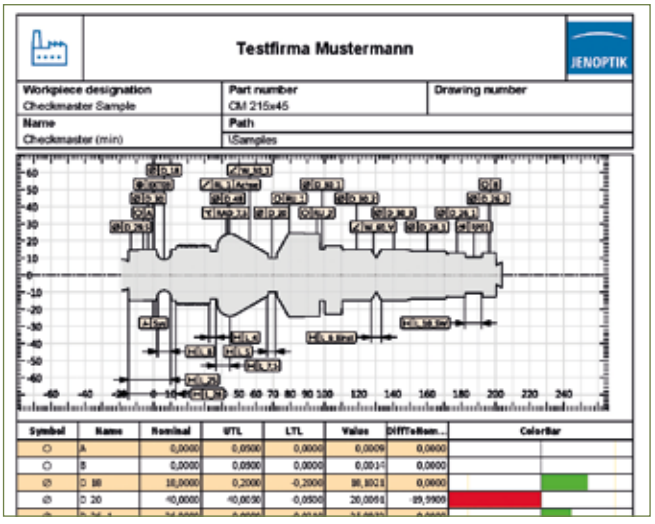
Documented quality

- Automated reporting
- Result reports customizable via an Editor function
- Output of graphic contour details
- Sampling reports
- Simultaneous single or multiple value pattern display for individual test characteristics



Statistical evaluation via optional statistic software

Report and template editor



Result printing

Technical data

HOMMEL-ETAMIC (opticline)[1]	C203	C305	C308	C314	C605	C608	C614	C908	C914	C1014	C1023	C1023–75AE
Measuring capacity [mm]												
Max. diameter	30	50	80	140	50	80	140	80	140	140	230	230
Length[2]	250	300	300	300	600	600	600	900	900	1000	1000	1000
Workpiece capacity												
Diameter [mm]	150	150			150			150		300		300
Length[2] [mm]	250	300			600			900		1000		1000
Workpiece weight[3] [N]	100	200			200			200/300[4]		400		750
Resolution												
Diameter	0.1 µm									0.1 µm		0.1 µm
Length	0.1 µm									0.1 µm		0.1 µm
Rotation	0.0006°									0.0018°		0.0005°
Accuracy / MPE[5]												
Diameter	(1.5+D[mm]/200) µm									(2+D[mm]/100) µm		
Length	(4+L[mm]/200) µm									(5+L[mm]/100) µm		
Repeatability (4s)[6]												
Diameter	0.3 µm									0.5 µm		
Length	1.2 µm									3 µm		
Speed												
Measuring	automatically optimized 10 – 80 mm/s											
Measuring rotation	1 rps											
Positioning	200 mm/s											
Positioning rotation	1 rps											
Measuring time	dependent on type and number of test characteristics – typically 3 ... 30 s											
Dimensions [mm]												
Measuring system [W x D x H]	700 x 840 x 1055	700 x 840 x 1055			700 x 840 x 1355			700 x 840 x 1655		1785 x 1700 x 2650		
Weight [kg]												
Measuring system[8]	250 – 270	250 – 290			300 – 340			320 – 360		2200		
Clamping tool interfaces												
Morse headstock	MK2									MK3		MK4
Morse taper	MK2									MK3		MK3
Clamping stroke tailstock	manual, 20 mm									manual, 40 mm		pneum., 40 mm
Power supply												
Connection	AC-PH, N, PE									AC-PH, N, PE		3PH, PE
Voltage	200-240/100-120 V (127 V on demand)									200-240/100-120 V		400/480 V
Power frequency	50/60 Hz									50/60 Hz		50/60 Hz
Max. power consumption	1.5 kVA									2 kVA		3 kVA
Fuse	16 A									16 A		16 A
Optional tactile probing	–	TSP								BTS		BTS
Accuracy[5][11]												
Axial run-out	–	1.5 µm								3 µm		1.5 µm
Length[10]	–	4 µm L [mm]/200								(8+L [mm]/100) µm		(8+L [mm]/100) µm
Repeatability (4s)												
Length	–	1.5 µm								–		–

[1] Environmental conditions: not chemically aggressive, not explosive, not radioactive. Temperature range from +10° C to +40° C, max. relative humidity 85 % without condensation. Dust aerosol values: according to TRGS 900 (Industrial safety regulations and technical rules for workplace environment and hazardous substances).

[2] Intermediate tips from the standard scope of delivery. Length may be reduced depending on the clamping device. When using the optional tactile probing system, the length (workpiece capacity) is reduced depending on type (with the exception of C203-C914).

[3] Workpiece positioning without knocks or strong lateral forces. Max. mass moment of inertia: 0.04 kg/m². Improper workpiece positoning may damage the headstock or bearings.

[4] Available with high-precision headstock (optional HpSS).

[5] Maximum permissible error according to EN ISO 10360 / VDI/VDE 2617. Ground parts surfaces; ambient and workpiece temperature = 20 °C ±1K, ambient temperature change < 0.5K/h in accordance with EN ISO 10360 or VDI/VDE 2617. Mechanical ambient conditions in accordance with EN 60721-3-3 Class 3M1.

[6] Typical range over 25 repeat measurements on ground part surfaces. In accordance with VIM, International Dictionary of Metrology.

CA305	CA310	CA314	CA605	CA610	CA614	CA618	CA614-AE	CA618-AE	VMS305	AMV923H	AMV923V	WMS1032	WMS1332
50 300	100 300	140 300	50 600	100 600	140 600	180 580	140 600	180 580	50 300	230 900	230 900	320 1000	320 1300
149 300 200			149 600 200			199 600 200	149 600 200	199 600 200	150 250 50	270 900 300		320 1000 750	320 1300 1200
0.1 µm 0.1 µm 0.0018°							0.1 µm 0.1 µm 0.0005°		0.1 µm 0.1 µm 0.018°	0.1 µm 0.1 µm 0.0018°		0.1 µm 0.1 µm 0.0005°	
(2+D[mm]/100) µm (5+L[mm]/100) µm													
0.5 µm 3 µm													
automatically optimized measurement: 10 – 80 mm/s 1 rps 200 mm/s 1 rps dependent on type and number of test characteristics – typically 3 ... 30 s													
1900 x 1600 x 2350 (incl. housing and switching cabinet)									780 x 650 x 912	2760 x 1000 x 2100[7]	1250 x 1250 x 2265[7]	1500 x 1500 x 2900[7]	1500 x 1500 x 3200[7]
540	550	560	560	570	580	640	580	640	270	2000		3000	
MK2 MK2 stroke variable over complete clamping range[9]									special	MK3 MK3 analog CA		MK4 MK3 analog CA	
AC–PH, N, PE 200-240/100-120 V 50/60 Hz 1,5 kVA 16 A									3PH, PE 400/480 V 50/60 Hz 2 kVA 16 A	3PH, PE 400/480 V 50/60 Hz 4 kVA 16 A		3PH, PE 400/480 V 50/60 Hz 3 kVA 16 A	
–	TSP	–	TSP						–	BTS		BTS	
– –	1.5 µm (5+L [mm]/100) µm	– –	1.5 µm (5+L [mm]/100) µm						– –	3 µm (8+L[mm]/100) µm		1.5 µm (8+L[mm]/100) µm	
–	–	–	–						–	–		–	

[7] Rough guideline dimensions excluding switching cabinet. Exact dimensions depend on the project.

[8] Weight depends on configuration in terms of variants and options.

[9] Motorized positioning and clamping. Optional: tailstock with motorized positioning and manual clamping. Measuring stroke 20 mm.

[10] Distance between end faces.

[11] Verification with standard(s) from Jenoptik.

Accessories and clamping devices

Clamping devices

Extensive program for a wide range of uses. Tips and application-specific solutions are easily installable via Morse tapers. Below is a selection of the most frequently used clamping devices:

Various fixed tips

Rotating tips and inserts

Chucks and plates

Standard accessories, various special clamping devices and housing variants

Clamping devices and tools included in standard scope of delivery

Chucks and plates, manual or pneumatic

Mobile or stationary workstations and enclosures

Optional accessories for data input and interfaces for integrating additional measuring equipment

Barcode scanner for test plan selection and data input

Workpiece temperature detection

Interface box for external gaging components

Excellent industrial metrology

WAVELINE
Roughness and Contour Metrology

Mobile, manual and automated measuring instruments for determining roughness, contour, topography and twist; combined systems for roughness and contour measurements; optical surface inspection for cylinder bores and customized solutions.

FORMLINE
Form Metrology

Manual and CNC-controlled systems for measuring form, position and twist, combined form and roughness instrumentation, form measurement systems for cylinder bores, spindle measuring machines, crank shaft and cam shaft measuring machines and workpiece-specific solutions.

OPTICLINE
Optical Shaft Metrology

Optical measuring systems for determining dimensions, form, position and geometric elements on concentric workpieces. Can be used offline, or as an automated SPC measuring station within the production chain and as a customized solution for workpiece-specific requirements.

GAGELINE
Dimensional Metrology

Pre-process, in-process and post-process measuring systems for measuring dimensions via tactile, pneumatic or optical technologies, including manual, semi and fully automatic systems, final inspection machines and individual in-line systems, plus systems for optical surface inspection.

MOVOLINE
In-Process Metrology

Digital measuring heads, control devices and accessories for tactile in-process measurements of diameter, position and length in machine tools, all aimed at controlling the machining process of machine tools.

SERVICELINE
Services Worldwide

Metrological services including training, application studies and start-up support, relocation services, production monitoring, (remote) services and calibration, repairs and spare parts/replacement service, measuring program generation and measurement process optimization.

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