Inspect machined surfaces fully and efficiently thanks to innovative technology.

SHARING EXCELLENCE
Your partner for measuring solutions

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

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.

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

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.

Optical surface inspection and profile measurement in bores and on plane surfaces

Master cylinder

Honed cylinder bore

Cylinder head gasket surface

Groove structure
Innovative, optical inspection of various surfaces

Our Visionline solutions provide you with a wide range of application options for optical surface inspection and profile measurement. The systems operate autonomously, can be integrated into automated production processes, and deliver reproducible, robust results.

Typical applications

Inspecting bores
- Master cylinders
- Cylinder liners
- Transmission housings
- Con rods
- Pistons
- Valve plate transmissions
- Hydraulic switching blocks

Inspecting plane surfaces
- Crank cases (sealing surface)
- Cylinder heads (sealing surface)
- Valve plates (sealing surface)
- Rough cast liners

Measuring (micro) structures
- Mechanically roughened surfaces in cylinder bores
- Dovetail structures

Reliably detect surface defects and structures

Surface inspection
- Cavities
- Pores
- Scratches
- Recesses
- Eruptions
- Ridges

Profile measurement in cylinder bores
- Groove width
- Groove base width
- Included angles
- Micro structures

<table>
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<th>Short description</th>
<th>Page</th>
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<tr>
<td>IPS B100, IPS B10 and IPS B5</td>
<td>Automatic inspection systems with 360° all-round lens for the inner surfaces of bores</td>
<td>6 – 10</td>
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<td>Workpiece-specific IPS systems</td>
<td>Inspection of valve seat gaps</td>
<td>11</td>
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<td>IPS F100 3D and IPS F200 3D</td>
<td>Automatic inspection systems with innovative image pickup technology for plane surfaces</td>
<td>12 – 13</td>
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<td>Evovis Vision</td>
<td>Software for controlling IPS systems with standardized algorithms for analyzing image processing</td>
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<td>CCS C100 and CCS R50</td>
<td>Optical measuring systems for determining structural and profile elements in cylinder bores</td>
<td>16 – 17</td>
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Get better measurements

... with innovative IPS technology

Visionline solutions are characterized by their innovative camera and lighting technology which allows for true, full inspection of surfaces. Surface defects are reliably detected and are automatically distinguished from non-genuine errors such as wash residues, for example.

... as part of the production process

Our systems are put to use exactly where they are needed. They can be seamlessly incorporated into manufacturing processes and thanks to the fact they pick up images while in motion, they deliver a very fast inspection speed within the production cycle.

... with multi-sensor technology

Various optical technologies are put to use in multi-sensor systems which allow components to be fully inspected. All sensors are moved by the machine’s CNC axes. This delivers reproducible, automated solutions in the production cycle.

... with expert project management

Benefit from our expertise in the management of international projects. We work in global teams so that our solutions can be individually tailored to fit the necessary local conditions.
Effective assurance of your product quality

Thanks to our comprehensive expertise, we deliver innovative and future-oriented systems. Surface inspection is fast and reproducible thanks to optical non-contact metrology. Depending on the inspection task, various technologies are put to use in order to achieve optimum results.

Operating principle

Optical bore inspection

A 360° all-round lens is moved into the bore and produces an image of the inner surface of the bore. The circumference lines in the bore are displayed as circle lines in the image plane of the sensor. This creates an undistorted, complete image of the inner surface of the bore (fly-over technology).

Optical plane surface inspection

The IPS F100 3D is moved over the plane surface and creates a high-contrast image of the machined surface. Thanks to the innovative image pickup technology, recesses and raised areas can be distinguished from dirt accurately and their topography determined.

Optical measurement of structures

The front lens with high chromatic aberration (strong diffraction of light) is guided into the cylinder bore. Only the focused light is sufficiently reflected and analyzed in the spectrometer. The distance information is coded in the wavelength (color) of the reflected light.
IPS B100. Internal inspection sensor for optical surface inspection in cylinder bores

The IPS B100 internal inspection sensor automatically scans the entire inner surface of cylinder bores and delivers high-resolution images of surface defects in the fast production cycle.

IPS B100 system features

- Automatically inspects the inner surfaces of bores using a 360° all-round lens
- Detects common surface defects such as cavities, pores, scratches, etc.
- Image pickup within the required cycle time
- Integrated collision protection
- Utilizes the latest CMOS image sensor technology

System integration

- Offline with manual loading
- In-line with automated workpiece handling
- Flexible robot system
- Innovative multi-sensor machine capabilities

Application examples

- Crank cases
- Cylinder liners
- High-pressure housings
- HGV con rods
- Steering boxes

Crack detected on water-blasted cylinder surface
Inspection system for small series manufacturing and prototype manufacturing

- Manual loading
- Automatic run of the inspection sequence
- Rotation-free scanning of the entire inner surface
- Motor-driven focusing and built-in collision protection

Inspection system for series production

- Above conveyor belt
- Automatic workpiece feed
- Automatic run of the inspection sequence
- Full inspection
- Motor-driven focusing and built-in collision protection for superior reliability

Robotic inspection system for engine blocks

- Fully automatic system
- Possible to integrate into the production line for full control
- Easy to parameterize the robot
- Flexible use
IPS B10. Internal inspection sensor for optical surface inspection of bores

The IPS B10 inspection sensor enables precise inspection of bore surfaces. This means that even the tiniest imperfections are detected reliably and within the required cycle time.

IPS B10 system features

- Automatically inspects interior surfaces within bores using a 360° lens
- Detects common surface defects such as cavities, pores, scratches, etc.
- Image pickup whilst in motion and within the required cycle time
- Protects against head-on collision
- Utilizes the latest CMOS image sensor technology

System integration

- Offline with manual loading
- In-line with automated workpiece handling
- Flexible robot system
- Innovative multi-sensor machine capabilities

Application examples

- Master cylinders and wheel brake cylinders
- Pump housings
- Con rods
- Injection pump housings
- Hydraulic/pneumatic valve housings
Visionline IPS B10

Manual inspection system for master cylinders

- IPS B10 inspection station with manual loading
- IPS B10 is automatically moved from below into the master cylinder
- Automatic run of the inspection sequence
- Rotation-free scanning of the inner surface
- Motor-driven focusing and built-in collision protection
IPS B5. Optical internal inspection systems for reliably detecting defects in small bores

The IPS B5 internal inspection sensor scans the entire surface of a bore. The sensor delivers high-resolution and distortion-free images of the surface in order to reliably detect small defects.

IPS B5 system features

- Automatically inspects interior surfaces within bores using a 360° lens
- Detects common surface defects such as cavities, pores, scratches, etc.
- Image pickup whilst in motion and within the required cycle time
- Integrated collision protection
- Utilizes the latest CMOS image sensor technology

System integration

- Offline with manual loading
- In-line with automated workpiece handling
- Flexible robot system
- Innovative multi-sensor machine capabilities

Application examples

- Valve control plates
- Control slide bores
- Injection pump housings
- Hydraulic valve housings
IPS Gap. Specific solution for measuring gaps on the valve seat insert

We develop individually tailored solutions for our customers for specific workpieces based on our optical inspection systems. Measuring the gap on the valve seat inserts presents a specific set of challenges for image pickup and processing.

IPS Gap system features

- Measures at four positions at the same time (0°, 90°, 180° and 270°)
- Determines the maximum gap width on the periphery accurately and completely
- Fully automated inspection
- Gap width from 30 µm
- Microscopic resolution (nominal 2.5 µm/pixel)
- Measuring time approx. 2 seconds per valve seat
- Suitable for applications with robot control systems and fully automated production lines
IPS F100/F200 3D. Optical inspection systems for automatic inspection of plane surfaces

As a result of their fast speed, the IPS F100/F200 3D systems are used for full inspections of plane surfaces. Innovative camera and lighting technology and adaptive, dynamic masking are used to distinguish between genuine surface defects and contamination with a high level of process reliability. The systems are used in conjunction with optical bore inspection as a complete solution for full inspection of crank cases, for example.

**IPS F100/F200 3D system features**

- Automatically inspects plane faces
- Detects common surface defects such as cavities, pores, scratches, etc.
- Image pickup whilst in motion and within the required cycle time (fly-over technology)
- Short inspection times thanks to a fast scan rate
- Adaptive, dynamic masking for reliable edge inspection
- Fast inspection speed
- Powerful 3D technology

**System integration**

- Offline with manual loading
- In-line with automated workpiece handling
- Innovative multi-sensor machine capabilities

**Application examples**

- Crank cases
- Cylinder heads
- Valve plates
- Rough cast liners

**Dynamic masking**

The adaptive, dynamic masking reliably establishes the position of edges. This results in a robust system capable of detecting flaws on complex components, both on surfaces and near edges.

![Evaluation of surface defects](image1)

![Dynamic masking on a valve plate](image2)

![Red: edge flaw, green: contamination](image3)
Inspection system for small series manufacturing and prototype manufacturing

- Manual loading
- Automatic run of the inspection sequence
- Complete and automated scanning of the entire plane surface
- Large working distance to the workpiece for easy integration into your inspection process

Inspection system for series production

- Above conveyor belt
- Automatic workpiece feed
- Automatic run of the inspection sequence
- Full inspection
- Large working distance to the workpiece for easy integration into your production line

Multi-sensor system for bores and plane surfaces

- Various optical technologies used to inspect cylinder bores and plane surfaces
- Cylinder head gasket surfaces, oil sump sides, machined side faces
- Especially robust against residual dirt on the workpiece thanks to special image pickup technology
- Line cycle time of 25 seconds per cylinder block
Evovis Vision. Software with clear user guidance for reliable inspection results

The graphical, function-oriented user interface of the Evovis Vision inspection and analysis software guarantees that you can operate the IPS systems for bores or plane surfaces simply and accurately. Numerous functions and wizards simplify the use of the software. It takes just a few simple steps to tailor the inspection system to a specific workpiece. This means that Evovis Vision ensures full quality control of each workpiece in accordance with the specified cycle time of the production line.

Highlights Evovis Vision

- Clear user interface and easy-to-understand icons
- Numerous wizards make it easy to create inspection plans
- Full evaluation and analysis functions for full quality control of manufactured parts
- Can be used for semi-automatic or fully automatic systems
- Interface to the line control system for integration in the production process control system

System features

- For all IPS systems
- Records and evaluates pores, recesses, scratches, cavities, etc.
- Evaluates regular and irregular structures
- Dimensions of cross bores and chamfers
- Determines relevant inspection zones with individual classification
- Measures surfaces in the image plane, e.g. edges or bore edges
**Customer-oriented operation**

- Intuitive operation with minimal training
- Display windows can be moved and placed in other positions
- Can use two or more monitors

**Built-in inspection sequences**

- "Live" mode for the fastest combination of processes to create an inspection plan and display results
- Wizard for creating an inspection plan and specifying test characteristics
- Categorized and clear presentation of errors for fast fault detection

**Reporting**

- Clearly documented results and detailed displays for an optimized quality assurance process
- Inspection results are provided to the production line for further processing
- Automated system self-examination

**Edge inspection**

- Adaptive dynamic masking to reliably detect edges
- Positional tolerance of components permitted
- Detection of errors on edges
CCS C100 & CCS R50. Optical measuring systems for determining structures in cylinder bores

Thanks to chromatic-confocal point sensors, the optical measurement systems deliver high-precision surface measurement in cylinder bores.

**CCS C100 system features**
- Automatically measures dovetail profiles in cylinder bores
- Automatically composes and evaluates the profile that has been measured
- Measures profile at four peripheral positions
- Measures the groove geometry across the entire length of the bore

**System integration**
- Offline with manual loading

**CCS R50 system features**
- Automatically measures micro-structures in cylinder bores
- Can be integrated into fully automated systems
- Possible to carry out 3D topography measurements

**System integration**
- Offline with manual loading
- In-line with automated workpiece handling
- Innovative multi-sensor machine capabilities
Visionline CCS R50 and CCS C100

CCS C100 measuring system for inspecting samples
- Offline work station with manual loading
- Automatic run of the inspection sequence
- Records and evaluates the groove geometry
- Evaluates the overall profile

Combined cylinder inspection using IPS B100 and CCS C100

CCS R50 measuring system in series production
- Interlinked full inspection system with automatic loading
- Automatic run of the inspection sequence
- Evaluates the recorded micro-profile

Detailed view of the CCS R50 measuring system

Overall view of the CCS R50 measuring system
## Technical data

### IPS – Image Processing Systems for optical surface inspection

<table>
<thead>
<tr>
<th>Model</th>
<th>IPS B5</th>
<th>IPS B10</th>
<th>IPS B100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test diameter</td>
<td>5 – 12 mm</td>
<td>14 – 50 mm</td>
<td>68 – 110 mm</td>
</tr>
<tr>
<td>Image sensor</td>
<td>CMOS technology</td>
<td>integrated, LED</td>
<td>integrated</td>
</tr>
<tr>
<td>Object illumination</td>
<td></td>
<td>integrated</td>
<td></td>
</tr>
<tr>
<td>Front collision protection</td>
<td></td>
<td>integrated</td>
<td></td>
</tr>
<tr>
<td>Typical line cycle time</td>
<td>15 s (control plate)</td>
<td>6 s (con rod)</td>
<td>22 s (4-cylinder block)</td>
</tr>
<tr>
<td>Flaw detection limit</td>
<td>100 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surfaces</td>
<td>matt to high-gloss finishes and textured surfaces</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### IPS F100 3D

<table>
<thead>
<tr>
<th>Model</th>
<th>IPS F100 3D</th>
<th>IPS F200 3D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scan width</td>
<td>100 mm, scalable</td>
<td>200 mm, scalable</td>
</tr>
<tr>
<td>Working distance</td>
<td>170 mm</td>
<td>380 mm</td>
</tr>
<tr>
<td>Image sensor</td>
<td>CCD technology</td>
<td></td>
</tr>
<tr>
<td>Object illumination</td>
<td>integrated, multi LED</td>
<td></td>
</tr>
<tr>
<td>Line cycle time</td>
<td>up to 600 mm/s</td>
<td></td>
</tr>
<tr>
<td>Flaw detection limit</td>
<td>up to 100 µm</td>
<td></td>
</tr>
<tr>
<td>Surfaces</td>
<td>matt to high-gloss finishes and textured surfaces</td>
<td></td>
</tr>
</tbody>
</table>

### CCS – Confocal Chromatic Sensors for optical profile measurement

<table>
<thead>
<tr>
<th>Model</th>
<th>CCS C100</th>
<th>CCS R50</th>
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</thead>
<tbody>
<tr>
<td>Measurement technology</td>
<td>confocal-chromatic</td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>1,200 µm</td>
<td>600 µm</td>
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<tr>
<td>Resolution</td>
<td>0.1 µm</td>
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</tr>
<tr>
<td>Measurement rate</td>
<td>4 kHz</td>
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</tr>
<tr>
<td>Profile evaluation</td>
<td>structural elements</td>
<td>micro structures</td>
</tr>
</tbody>
</table>

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*Note: The technical data provided is for reference and should be verified with the manufacturer for accuracy and up-to-date information.*
Our range of products and services offers solutions for the most demanding measuring tasks: we can work with you to determine the ideal measuring strategy and configure the appropriate system to meet even your most stringent requirements. In doing so, we take all the important considerations into account, such as the required level of automation, or the ability to integrate the measuring process into the production chain.

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
CNC-controlled systems for measuring form, position and twist, combined form and roughness instrumentation, form measurement systems for cylinder bores, 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.

Visionline – Optical Surface Inspection & Profile Measurement
Systems for automatic, optical surface inspection of inner and outer surfaces, optical measuring systems for determining structural elements in cylinder bores, as well as innovative multi-sensor systems for inspecting components in their entirety.

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.

Gageline – Dimensional Metrology
Pre-, in- and post-process measuring systems for measuring dimensions via tactile or pneumatic technologies, including manual, semi and fully automatic systems, final inspection machines as well as individual in-line systems.

Serviceline – Services Worldwide
Metrological services that help our customers use their measuring systems to optimum effect, ensure the availability of these systems and maximize their performance.
Our qualified employees are available to assist you across the globe. We have subsidiaries and distribution partners in key industrial nations, meaning that we are always close by to offer you optimum support as a reliable partner.