More Precision.

boreCONTROL
Non-contact internal wall inspection
Sensor system for internal wall inspection

**boreCONTROL** has been designed for the inspection of small bore holes. The measuring system consists of a sensor with an integrated rotation drive and an exchangeable sensor lance that is loaded on a magnet flange. Due to the rotation of the sensor lance the measurement is effected in a circular way. The non-contact and wear-free sensor verifies different parameters in bore holes and depressions such as diameter, roundness, concentricity, conicity and straightness. Due to the absolute measurement principle, fluctuating diameters in the measuring range in a measuring process do not pose any problems. A complex attached precision ball bearing system with integrated optical coupling and servo motor provides the necessary rotation stability. Measured data conditioning is performed using a compact controller that allows a data acquisition of up to 5kHz. An additional compact controller controls the movements of the servo motor.

**Precise detection of diameters, defects, notches and hollows**

**Typical applications**

- Diameter
- Steps
- Ovality
- Roundness
- Depressions
- Concentricity
- Coaxiality
- Conicity
- Straightness

**Special features**

- Completely non-contact and wear-free measurement
- High speed sampling rate 5kHz
- Intensity information for surface inspection
- Active temperature compensation
- High repeatability and measurement stability
Confocal chromatic measurement principle

Polychromatic light (white light) is focused onto the target surface by a multi-lens optical system. The discharge of the light is aligned at an angle of 90° to the sensor axis. The lenses are arranged in such a way that the light is broken down by controlled chromatic aberration into monochromatic wavelengths dependent on the displacement. A defined distance point is assigned to each wavelength by a factory calibration. In the sensor system that wavelength of light is used for the measurement that is exactly focused on the target. The light reflected from this point is imaged by an optical arrangement onto a light sensitive sensor element on that the associated spectral colour is detected and evaluated.

Displacement and intensity measurement

boreCONTROL data packet that includes values regarding displacement, angle and intensity. The displacement values are generated by evaluating the wavelength. The respective angle position is determined by the integral encoder. Signal intensity is used to evaluate the intensity. The intensity data is used for visualisation of defects.

Optical temperature compensation

Temperature fluctuations that occur in industrial environments can affect the measurement results, particularly if high accuracies are required. To achieve the best possible repeatability, Micro-Epsilon has developed a unique, patented technology for optical temperature compensation. A reference peak, which is used for temperature compensation, is generated via the sensor. Compensation is achieved dynamically in real time, enabling high measurement precision.
System design

boreCONTROL consists of a sensor with an integrated rotational unit, and an exchangeable sensor probe. The rotational drive is operated by a motor controller, which is connected to the sensor controller. The sensor controller enables set up, configuration and signal processing of the measurement task. The sensor probe can be easily installed and replaced. Precision mounting greatly simplifies sensor replacement, as the sensor probe is centred automatically. Due to the exchange of both probes, the system can be easily reset for both measuring ranges.

Easy exchange of the sensor lance.

Interfaces

The data packet with the displacement measurement values, angle and intensity is output via the Ethernet interface on the sensor controller and can be used for further processing. For this purpose, the DLL is enclosed, which can be used to integrate boreCONTROL in the customer’s own applications.
### Sensor lance

<table>
<thead>
<tr>
<th>Sensor lance</th>
<th>BCS2410/4/10/50</th>
<th>BCS2410/10/16/80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter that can be measured approx.</td>
<td>4-10mm</td>
<td>10-16mm</td>
</tr>
<tr>
<td>Sampling rate max.</td>
<td>max. 5kHz</td>
<td>max. 5kHz</td>
</tr>
<tr>
<td>Diameter measurement spot</td>
<td>20µm</td>
<td>20µm</td>
</tr>
<tr>
<td>Dynamic repeatability</td>
<td>0.6µm</td>
<td>0.6µm</td>
</tr>
<tr>
<td>Deviation from the measured value</td>
<td>&lt;2µm</td>
<td>&lt;2µm</td>
</tr>
<tr>
<td>Angle accuracy</td>
<td>0.04°</td>
<td></td>
</tr>
</tbody>
</table>

### Rotation mechanics

**Dimensions**
- ø45mm, length approx. 162mm (without lance)

- **Rotation speed max.**
  - 3000rpm

- **Total weight (without sensor lance)**
  - 1000g

- **Operating temperature**
  - 10...40°C

- **Power supply**
  - 24VDC

- **Cable length**
  - 3 / 5 / 10 m

Specified accuracy to the following general conditions:
- 100 repetitions; sampling rate 2.5kHz; engine speed 120 rpm; temperature drift: <1K/h; calibration ring DIN 2250 7mm/13mm
- As accuracies can vary with different surfaces and characteristics, we kindly ask you to contact us.
- We will be pleased to check the technical feasibility of the measurement task.

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**System components**

- **BCR2410**
  - Rotation drive, comprising
  - BCC2410 Motor controller
  - BCM2410 Rotation mechanics
  - S2410-x Sensor cable (3m/10m)
  - SC2410-x Data cable (3m/5m/10m)
  - DSC2410-0,25 Synchronisation cable
  - Mounting ring

- **BCS2412/4/10/50**
  - Sensor lance for ø 4-10mm
  - Immersion depth max. 50mm

- **BCS2412/10/16/80**
  - Sensor lance for ø 10-16mm
  - Immersion depth max. 80mm

- **IFC2451 Sensor controller**
Sensors and systems from Micro-Epsilon

- Sensors and systems for displacement, position and dimension
- Sensor for non-contact temperature measurement
- Measurement and inspection systems
- Optical micrometers
- Sensors for colour recognition
- Technical endoscopes