More Precision

confocalDT // Confocal chromatic measuring system
### High precision sensors for displacement and thickness measurements

**confocalDT IFS2407**

<table>
<thead>
<tr>
<th>Feature</th>
<th>IFS2407-0.1</th>
<th>IFS2407-0.1(001)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring range</strong></td>
<td>0.1 mm</td>
<td>0.1 mm</td>
</tr>
<tr>
<td><strong>Start of measuring range</strong></td>
<td>approx. 1 mm</td>
<td>1 mm</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>3 nm</td>
<td>3 nm</td>
</tr>
<tr>
<td><strong>Linearity a)</strong></td>
<td>Displacement and distance</td>
<td>Thickness</td>
</tr>
<tr>
<td></td>
<td>$\leq \pm 0.05 \mu m$</td>
<td>$\leq \pm 0.1 \mu m$</td>
</tr>
<tr>
<td><strong>Light spot diameter</strong></td>
<td>3 $\mu m$</td>
<td>4 $\mu m$</td>
</tr>
<tr>
<td><strong>Max. tilt angle b)</strong></td>
<td>$\pm 48^\circ$</td>
<td>$\pm 48^\circ$</td>
</tr>
<tr>
<td><strong>Numerical aperture (NA)</strong></td>
<td>0.80</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Min. target thickness</strong></td>
<td>0.005 mm</td>
<td>0.005 mm</td>
</tr>
<tr>
<td><strong>Connection</strong></td>
<td>pluggable optical fiber via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm; dynamic 40 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>$-20 \ldots +70 ^\circ C$</td>
<td></td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>$+5 \ldots +70 ^\circ C$</td>
<td></td>
</tr>
<tr>
<td><strong>Shock (DIN-EN 60068-2-29)</strong></td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
<td></td>
</tr>
<tr>
<td><strong>Vibration (DIN-EN 60688-2-6)</strong></td>
<td>2 g / 20 ... 500 Hz in XY axis, 10 cycles each</td>
<td></td>
</tr>
<tr>
<td><strong>Protection class (DIN-EN 60529)</strong></td>
<td>IP65 (front)</td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Stainless steel housing, glass lenses</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>approx. 36 g</td>
<td>approx. 36 g</td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td>Sensor with high numerical aperture</td>
<td>Light-intensive sensor</td>
</tr>
</tbody>
</table>

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*a* Average from 512 values at 1 kHz, near to the midrange onto optical flat.

*b* All data at constant ambient temperature ($25 \pm 1 ^\circ C$) against optical flat; specifications can change when measuring different objects.

*c* Maximum sensor tilt angle that produces a usable signal on reflecting surfaces. The accuracy decreases when approaching the limit values.

*d* Glass with refractive index $n = 1.5$ throughout the entire measuring range. In the mid of the measuring range, also thinner layers can be measured.
<table>
<thead>
<tr>
<th>Model</th>
<th>IFS2407/00-0.3</th>
<th>IFS2407-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0.3 mm</td>
<td>3 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 5.3 mm</td>
<td>28 mm</td>
</tr>
<tr>
<td>Resolution ³</td>
<td>10 nm</td>
<td>20 nm</td>
</tr>
<tr>
<td>Linearity ²</td>
<td>Displacement and distance: &lt; ± 0.15 µm</td>
<td>&lt; ± 0.75 µm</td>
</tr>
<tr>
<td></td>
<td>Thickness: &lt; ± 0.3 µm</td>
<td>&lt; ± 1.5 µm</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>6 µm</td>
<td>9 µm</td>
</tr>
<tr>
<td>Max. tilt angle ³</td>
<td>± 27°</td>
<td>± 30°</td>
</tr>
<tr>
<td>Numerical aperture (NA)</td>
<td>0.50</td>
<td>0.53</td>
</tr>
<tr>
<td>Min. target thickness ⁴</td>
<td>0.015 mm</td>
<td>0.15 mm</td>
</tr>
<tr>
<td>Connection</td>
<td>pluggable optical fiber via FC socket, type C2407-x; standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm</td>
<td>pluggable optical fiber via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm</td>
</tr>
<tr>
<td>Installation</td>
<td>Mounting holes (2x M2)</td>
<td>Clamping, mounting adapter (see accessories)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>Storage: -20 … +70 °C</td>
<td>Operation: +5 … +70 °C</td>
</tr>
<tr>
<td>Shock (DIN-EN 60068-2-29)</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
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<tr>
<td>Vibration (DIN-EN 60068-2-6)</td>
<td>2 g / 20 … 500 Hz in XY axis, 10 cycles each</td>
<td></td>
</tr>
<tr>
<td>Protection class (DIN-EN 60529)</td>
<td>IP65 (front)</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Stainless steel housing, glass lenses</td>
<td>Aluminum housing, glass lenses</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 30 g</td>
<td>approx. 550 g</td>
</tr>
</tbody>
</table>

³ Average from 512 values at 1 kHz, near to the midrange onto optical flat

² All data at constant ambient temperature (25 ± 1 °C) against optical flat; specifications can change when measuring different objects.

⁴ Maximum sensor tilt angle that produces a usable signal on reflecting surfaces. The accuracy decreases when approaching the limit values.

⁶ Glass with refractive index n = 1.5 throughout the entire measuring range. In the mid of the measuring range, also thinner layers can be measured.
System design

The confocalDT system consists of:
- Sensor IFS240x
- Controller IFC24xx
- Fiber optic cable C24xx
Customer-specific modifications
Application examples are often found where the standard versions of the sensors and the controllers are performing at their limits. To facilitate such special tasks, it is possible to customize the sensor design and to adjust the controller accordingly. Common requests for modifications include changes in design, mounting options, customized cable lengths and modified measuring ranges.

Possible modifications
- Sensors with connector
- Cable length
- Vacuum suitability up to UHV
- Specific lengths
- Customer-specific mounting options
- Optical filter for ambient light compensation
- Housing material
- Measuring range / Offset distance

Vacuum feed through
C2405.../Vac (KF or CF flange)
C2402.../Vac
IFS24xx / Vac
C2400/PT-x-Vac C2401-x
Controller IFC24xx
Accessories: mounting adapter
MA2402 for sensors 2402

Accessories: mounting adapter
MA2403 for sensors 2403

Accessories: mounting adapter
MA2404-12 for sensors IFS2404-2 / IFS2404/90-2 / IFS2407-0,1

Accessories: mounting adapter
MA2400 for sensors IFS2405 / IFS2406 / IFS2407 (consisting of a mounting block and a mounting ring)

Mounting block

Mounting ring

MA 2405-34 for sensors IFS2405-3
MA 2405-40 for sensors IFS 2405-6
MA 2405-54 for sensors IFS2405-10 / IFS2407-3
MA 2405-62 for sensors IFS2405-28 / -30
**Accessories**

**Software**
- **IFD24xx-Tool** Software demo tool included

**Accessories light source**
- **IFL2422/LE** Lamp module for IFC2422
- **IFL24xx/LED** Lamp module for IFC24xx
- **IFL2451/LED(003)** Lamp module for IFC2451(003)

**Cable extension for sensors**
- **CE2402** cable with 2x E2000/APC connectors
- **CE2402-x** Extension for optical fiber (3 m, 10 m, 13 m, 30 m, 50 m)
- **CE2402-x/PT** Extension for optical fiber with protection tube for mechanical stress (3 m, 10 m, customer-specific length up to 50 m)

**Cable for IFS2404 sensors**
- **C2404-x** Optical fiber with FC/APC and E2000/APC connectors
  - Fiber core diameter 20 µm (2 m)

**Cables for IFS2405/IFS2406/2407-0,1 sensors**
- **C2401** cable with FC/APC and E2000/APC connectors
  - **C2401-x** Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2401/PT-x** Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2401-x (01)** Optical fiber core diameter 26 µm (3 m, 5 m, 15 m)
  - **C2401-x (10)** Drag-chain suitable optical fiber (3 m, 5 m, 10 m)
- **C2400** cable with 2x FC/APC connectors
  - **C2400-x** Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2400/PT-x** Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2400/PT-x-Vac** Optical fiber with protection tube suitable for use in vacuum (3 m, 5 m, 10 m, customer-specific length up to 50 m)

**Cable for IFS2407/90-0,3 sensors**
- **C2407-x** Optical fiber with DIN connector and E2000/APC (2 m, 5 m)

**Vacuum feed through**
- **C2402/Vac/KF16** Vacuum feed through with optical fiber, 1 channel, vacuum side FC/APC
  - non-vacuum side E2000/APC, clamping flange KF 16
- **C2405/Vac/1/KF16** Vacuum feed through on both sides FC/APC socket, 1 channel, clamping flange type KF 16
- **C2405/Vac/1/CF16** Vacuum feed through on both sides FC/APC socket, 1 channel, flange type CF 16
- **C2405/Vac/6/CF63** Vacuum feed through FC/APC socket, 6 channels, flange type CF 63

**Other accessories**
- **SC2471-x/USB/IND** Connector cable IFC2451/61/71, 3 m, 10 m, 20 m
- **SC2471-x/IF2008** Connector cable IFC2451/61/71-IF2008, 3 m, 10 m, 20 m
- **PS2020** Power supply 24V / 2.5A
- **EC2471-3/OE** Encoder cable, 3 m

**Optical fiber**
- Temperature range: -50 °C to 90 °C
- Bending radius: 30/40 mm

**E2000/APC standard connector**

**FC/APC standard connector**

**DIN connector**

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**Software**

IFD24xx-Tool Software demo tool included

**Accessories light source**

- **IFL2422/LE** Lamp module for IFC2422
- **IFL24xx/LED** Lamp module for IFC24xx
- **IFL2451/LED(003)** Lamp module for IFC2451(003)

**Cable extension for sensors**

- **CE2402** cable with 2x E2000/APC connectors
- **CE2402-x** Extension for optical fiber (3 m, 10 m, 13 m, 30 m, 50 m)
- **CE2402-x/PT** Extension for optical fiber with protection tube for mechanical stress (3 m, 10 m, customer-specific length up to 50 m)

**Cable for IFS2404 sensors**

- **C2404-x** Optical fiber with FC/APC and E2000/APC connectors
  - Fiber core diameter 20 µm (2 m)

**Cables for IFS2405/IFS2406/2407-0,1 sensors**

- **C2401** cable with FC/APC and E2000/APC connectors
  - **C2401-x** Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2401/PT-x** Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2401-x (01)** Optical fiber core diameter 26 µm (3 m, 5 m, 15 m)
  - **C2401-x (10)** Drag-chain suitable optical fiber (3 m, 5 m, 10 m)
- **C2400** cable with 2x FC/APC connectors
  - **C2400-x** Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2400/PT-x** Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
  - **C2400/PT-x-Vac** Optical fiber with protection tube suitable for use in vacuum (3 m, 5 m, 10 m, customer-specific length up to 50 m)

**Cable for IFS2407/90-0,3 sensors**

- **C2407-x** Optical fiber with DIN connector and E2000/APC (2 m, 5 m)

**Vacuum feed through**

- **C2402/Vac/KF16** Vacuum feed through with optical fiber, 1 channel, vacuum side FC/APC
  - non-vacuum side E2000/APC, clamping flange KF 16
- **C2405/Vac/1/KF16** Vacuum feed through on both sides FC/APC socket, 1 channel, clamping flange type KF 16
- **C2405/Vac/1/CF16** Vacuum feed through on both sides FC/APC socket, 1 channel, flange type CF 16
- **C2405/Vac/6/CF63** Vacuum feed through FC/APC socket, 6 channels, flange type CF 63

**Other accessories**

- **SC2471-x/USB/IND** Connector cable IFC2451/61/71, 3 m, 10 m, 20 m
- **SC2471-x/IF2008** Connector cable IFC2451/61/71-IF2008, 3 m, 10 m, 20 m
- **PS2020** Power supply 24V / 2.5A
- **EC2471-3/OE** Encoder cable, 3 m

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**Optical fiber**

- Temperature range: -50 °C to 90 °C
- Bending radius: 30/40 mm

**Casing**
- 125 µm

**Acrylate**
- <250 µm

**Coating/buffer**
- PVC: polyvinyl chloride

**Strain relief**
- PVDF: polyvinylidene fluoride

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**Connector**

- **FC/APC standard connector**
- **DIN connector**
Sensors and Systems from Micro-Epsilon

- Sensors and systems for displacement, distance and position
- Sensors and measurement devices for non-contact temperature measurement
- Measuring and inspection systems for metal strips, plastics and rubber
- Optical micrometers and fiber optics, measuring and test amplifiers
- Color recognition sensors, LED analyzers and inline color spectrometers
- 3D measurement technology for dimensional testing and surface inspection