More Precision

confocalDT // Confocal chromatic sensor system
## Confocal chromatic miniature sensors

**confocalDT IFS2402**

- **Miniature sensors ø4mm with axial or radial (90°) measuring direction**
- **Submicrometer resolution**
- **Distance measurement**
- **Extremely small spot size**

### Table: Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>IFS2402-0,4</th>
<th>IFS2402-1,5</th>
<th>IFS2402-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0.4 mm</td>
<td>1.5 mm</td>
<td>3.5 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 1.5 mm</td>
<td>0.9 mm</td>
<td>1.9 mm</td>
</tr>
<tr>
<td>Resolution</td>
<td>static 1) 16 nm</td>
<td>60 nm</td>
<td>100 nm</td>
</tr>
<tr>
<td></td>
<td>dynamic 2) 48 nm</td>
<td>192 nm</td>
<td>480 nm</td>
</tr>
<tr>
<td>Linearity 3)</td>
<td>Displacement and distance</td>
<td>&lt; ±0.3 µm</td>
<td>&lt; ±1.2 µm</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>10 µm</td>
<td>20 µm</td>
<td>20 µm</td>
</tr>
<tr>
<td>Max. tilt angle 4)</td>
<td>±8°</td>
<td>±5°</td>
<td>±3°</td>
</tr>
<tr>
<td>Numerical aperture (NA)</td>
<td>0.25</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>Connection</td>
<td>integrated optical fiber 2 m with E2000/APC connector; extension up to 50 m; bending radius: static 30 mm; dynamic 40 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>Storage -20… +70 °C</td>
<td>Operation +5… +70 °C</td>
<td></td>
</tr>
<tr>
<td>Shock (DIN-EN 60068-2-27)</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration (DIN-EN 60068-2-6)</td>
<td>2 g / 20 … 500 Hz in XY axis, 10 cycles each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection class (DIN-EN 60529)</td>
<td>IP64, front operated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Aluminum housing, glass lenses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 186 g (incl. optical fiber)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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1) Average from 512 values at 1 kHz, near to the midrange onto optical flat
2) RMS noise relates to mid of measuring range (1 kHz)
3) 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.
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<tr>
<th>Model</th>
<th>IFS2402/90-1.5</th>
<th>IFS2402/90-4</th>
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<tbody>
<tr>
<td>Measuring range</td>
<td>1.5 mm</td>
<td>2.5 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 2.5 mm</td>
<td>2.5 mm</td>
</tr>
<tr>
<td>Resolution</td>
<td>static (^{ii}) 60 nm</td>
<td>100 nm</td>
</tr>
<tr>
<td></td>
<td>dynamic (^{ii}) 192 nm</td>
<td>480 nm</td>
</tr>
<tr>
<td>Linearity (^{iv}) Displacement and distance</td>
<td>&lt; ±1.2 µm</td>
<td>&lt; ±3 µm</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>20 µm</td>
<td>20 µm</td>
</tr>
<tr>
<td>Max. tilt angle (^{v})</td>
<td>±5°</td>
<td>±3°</td>
</tr>
<tr>
<td>Numerical aperture</td>
<td>0.20</td>
<td>0.10</td>
</tr>
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<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>IP40</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Aluminum housing, glass lenses</td>
<td></td>
</tr>
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<td>Weight</td>
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</tr>
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</table>

\(^{i}\) Start of measuring range measured from sensor axis.

\(^{ii}\) Average from 512 values at 1 kHz, near to the midrange onto optical flat.

\(^{iii}\) RMS noise relates to mid of measuring range (1 kHz).

\(^{iv}\) All data at constant ambient temperature (25 ± 1 °C) against optical flat, specifications can change when measuring different objects.

\(^{v}\) Maximum sensor tilt angle that produces a usable signal on reflecting surfaces. The accuracy decreases when approaching the limit values.
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 setup
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)
**Software**

IFD24xx-Tool Software demo tool included

**Accessories light source**

IFL2422/LE Lamp module for IFC2422
IFL24x1/LED Lamp module for IFC24x1
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/IF2008, 3 m, 10 m, 20 m
PS2020 Power supply 24V / 2.5A
EC2471-3/OE Encoder cable, 3m
IF2030/PNET Interface module for PROFINET connection
IF2030/ENETIP Interface module for EtherNet/IP connection

**Optical fiber**

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

**FC/APC standard connector**

**DIN connector**
Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers

Sensors and measurement devices for non-contact temperature measurement

3D measurement technology for dimensional testing and surface inspection

Measuring and inspection systems for metal strips, plastics and rubber

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