confocalDT // Confocal chromatic measuring system
Confocal sensors with high precision

**confocalDT IFS2405**

- Robust sensors for various applications
- One-sided thickness measurement
- Distance measurement
- Extremely small spot size
- Submicrometer resolution
- Large tilt angle

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>IFS2405-0.3</th>
<th>IFS2405-1</th>
<th>IFS2405-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0.3 mm</td>
<td>1 mm</td>
<td>3 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 6 mm</td>
<td>10 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>Resolution (^1)</td>
<td>10 nm</td>
<td>28 nm</td>
<td>36 nm</td>
</tr>
<tr>
<td>Linearity (^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement and distance</td>
<td>&lt; ± 0.15 µm</td>
<td>&lt; ± 0.25 µm</td>
<td>&lt; ± 0.75 µm</td>
</tr>
<tr>
<td>Thickness</td>
<td>&lt; ± 0.3 µm</td>
<td>&lt; ± 0.5 µm</td>
<td>&lt; ± 1.5 µm</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>6 µm</td>
<td>8 µm</td>
<td>9 µm</td>
</tr>
<tr>
<td>Max. tilt angle (^3)</td>
<td>± 34°</td>
<td>± 30°</td>
<td>± 24°</td>
</tr>
<tr>
<td>Numerical aperture</td>
<td>0.6</td>
<td>0.55</td>
<td>0.45</td>
</tr>
<tr>
<td>Connection</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>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-20 ... +70 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>+5 ... +70 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock (DIN-EN 60068-2-23)</td>
<td>15 g / 6 ms in XY axes / 1000 shocks per axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration (DIN-EN 60068-2-6)</td>
<td>2 g / 20 Hz ... 500 Hz in XY axes / 10 cycles per axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection class (DIN-EN 60529)</td>
<td>IP65, 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>140 g</td>
<td>125 g</td>
<td>225 g</td>
</tr>
</tbody>
</table>

\(^1\) 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 materials.

\(^3\) Maximum sensor tilt angle that produces a usable signal on reflecting surfaces. The accuracy decreases when approaching the limit values.
Confocal sensors with high precision

**confocalDT IFS2405**

<table>
<thead>
<tr>
<th>Model</th>
<th>IFS2405-6</th>
<th>IFS2405-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>6 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 63 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>Resolution 1)</td>
<td>18 nm</td>
<td>60 nm</td>
</tr>
<tr>
<td>Linearity 2)</td>
<td>Displacement and distance: $&lt;\pm 1.5 , \mu m$</td>
<td>$&lt;\pm 2.5 , \mu m$</td>
</tr>
<tr>
<td></td>
<td>Thickness: $&lt;\pm 3 , \mu m$</td>
<td>$&lt;\pm 5 , \mu m$</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>31 , \mu m</td>
<td>16 , \mu m</td>
</tr>
<tr>
<td>Max. tilt angle 3)</td>
<td>$\pm 10^\circ$</td>
<td>$\pm 17^\circ$</td>
</tr>
<tr>
<td>Numerical aperture</td>
<td>0.22</td>
<td>0.3</td>
</tr>
<tr>
<td>Connection</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>Mounting</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></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 axes / 1000 shocks per axis</td>
<td></td>
</tr>
<tr>
<td>Vibration (DIN-EN 60068-2-6)</td>
<td>2 g / 20 Hz … 500 Hz in XY axes / 10 cycles per axis</td>
<td></td>
</tr>
<tr>
<td>Protection class (DIN-EN 60529)</td>
<td>IP65, front operated</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Aluminum housing, glass lenses</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>217 g</td>
<td>500 g</td>
</tr>
</tbody>
</table>

1) 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 materials.
3) Maximum sensor tilt angle that produces a usable signal on reflecting surfaces. The accuracy decreases when approaching the limit values.
**Model** | IFS2405-28 | IFS2405-30
--- | --- | ---
Measuring range | 28 mm | 30 mm
Start of measuring range | approx. 220 mm | 100 mm
Resolution | 250 nm | 180 nm
Linearity | Displacement and distance: ± 7 µm; Thickness: ± 14 µm | ± 7.5 µm; ± 15 µm
Light spot diameter | 60 µm | 50 µm
Max. tilt angle | ± 5° | ± 9°
Numerical aperture | 0.1 | 0.2
Connection | pluggable optical fiber via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm; dynamic 40 mm
Mounting | Clamping, mounting adapter (see accessories)
Temperature range | Storage: -20° to +70 °C | Operation: +5° to +70 °C
Shock (DIN-EN 60068-2-29) | 15 g / 6 ms in XY axes / 1000 shocks per axis
Vibration (DIN-EN 60068-2-6) | 2 g / 20 Hz … 500 Hz in XY axes / 10 cycles per axis
Protection class (DIN-EN 60529) | IP65, front operated
Material | Aluminum housing, glass lenses
Weight | 750 g | 730 g

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1) 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 materials.
3) 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

EtherCAT, Ethernet
RS422
Controller
IFC242x
IFC2451
IFC2461
IFC2471 HS
Analog output
(option)
Encoder
(option)
Digital I/O
Vacuum feed through (optional)
Power supply
Sensor IFS240x
Customer-specific modifications
Application examples are often found where the standard versions of the sensors and the controller 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

Accessories: mounting adapter
MA2402 for sensors 2402

Accessories: mounting adapter
MA2403 for sensors 2403

Accessories: mounting adapter
MA2404-12 for sensors IFS2404-2

Accessories: mounting adapter
MA2400 for sensors IFS2405/IFS2406 (consisting of a mounting block and a mounting ring)
Software
IFD24n1-Tool Free demo software 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 (01) Optical 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, 3m

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

Multimode core 50 µm / 26 µm / 20 µm
Casing 125 µm
Acrylate <250 µm
PVC: polyvinyl chloride
PVDF: polyvinylidene fluoride

FC/APC standard connector
DIN connector
E2000/APC standard 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