More Precision

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

**ConfocalDT IFS2405**

**Dimensions in mm, not to scale**

- One-sided thickness measurement
- Distance measurement
- Extremely small spot size
- Submicrometer resolution
- Large tilt angle

**Model**

<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</td>
<td>static ¹)</td>
<td>10 nm</td>
<td>28 nm</td>
</tr>
<tr>
<td></td>
<td>dynamic ²)</td>
<td>20 nm</td>
<td>52 nm</td>
</tr>
<tr>
<td>Linearity ³)</td>
<td>Displacement and distance</td>
<td>&lt; ±0.15 µm</td>
<td>&lt; ±0.25 µm</td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>&lt; ±0.3 µm</td>
<td>&lt; ±0.5 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 ⁴)</td>
<td>±34°</td>
<td>±30°</td>
<td>±24°</td>
</tr>
<tr>
<td>Numerical aperture (NA)</td>
<td>0.60</td>
<td>0.55</td>
<td>0.45</td>
</tr>
<tr>
<td>Min. target thickness ⁵)</td>
<td>0.015 mm</td>
<td>0.05 mm</td>
<td>0.15 mm</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>Installation</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>Storage</td>
<td>-20 … +70 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation</td>
<td>+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)</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. 140 g</td>
<td>approx. 125 g</td>
<td>approx. 225 g</td>
</tr>
</tbody>
</table>

---

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.
⁵) 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.
Confocal sensors with high precision

ConfocalDT IFS2405

One-sided thickness measurement
Distance measurement
Extremely small spot size
Submicrometer resolution
Large tilt angle

Robust sensors for various applications

Model IFS2405-6 IFS2405-10
Measuring range 6 mm 10 mm
Start of measuring range approx. 63 mm 50 mm
Resolution
  static $^{1)}$ 18 nm 60 nm
  dynamic $^{2)}$ 93 nm 386 nm
Linearity $^{3)}$
  Displacement and distance < $\pm$ 1.5 µm < $\pm$ 2.5 µm
  Thickness < $\pm$ 3 µm < $\pm$ 5 µm
Light spot diameter 31 µm 16 µm
Max. tilt angle $^{4)}$ ±10° ±17°
Numerical aperture (NA) 0.22 0.30
Min. target thickness $^{5)}$ 0.3 mm 0.5 mm
Connection pluggable optical fiber via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm; dynamic 40 mm
Installation Clamping, mounting adapter (see accessories)
Temperature range
  Storage -20 … +70 °C
  Operation +5 … +70 °C
Shock (DIN-EN 60068-2-27) 15 g / 6 ms in XY axis, 1000 shocks each
Vibration (DIN-EN 60068-2-6) 2 g / 20 … 500 Hz in XY axis, 10 cycles each
Protection class (DIN-EN 60529) IP64 (front)
Material Aluminum housing, glass lenses
Weight approx. 217 g approx. 500 g

$^{1)}$ 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.
$^{5)}$ 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.

Dimensions in mm, not to scale
### Model IFS2405-28 IFS2405-30

<table>
<thead>
<tr>
<th>Specification</th>
<th>IFS2405-28</th>
<th>IFS2405-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>28 mm</td>
<td>30 mm</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>220 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>static 1)</td>
<td>250 nm</td>
<td>180 nm</td>
</tr>
<tr>
<td>dynamic 2)</td>
<td>1420 nm</td>
<td>1040 nm</td>
</tr>
<tr>
<td>Linearity 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement and distance</td>
<td>&lt; ±7 µm</td>
<td>&lt; ±7.5 µm</td>
</tr>
<tr>
<td>Thickness</td>
<td>&lt; ±14 µm</td>
<td>&lt; ±15 µm</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>60 µm</td>
<td>50 µm</td>
</tr>
<tr>
<td>Max. tilt angle 4)</td>
<td>±5°</td>
<td>±9°</td>
</tr>
<tr>
<td>Numerical aperture (NA)</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td>Min. target thickness 5)</td>
<td>2.2 mm</td>
<td>1.5 mm</td>
</tr>
<tr>
<td>Connection</td>
<td></td>
<td></td>
</tr>
<tr>
<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>Installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-20 … +70 °C</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>+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>
</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>
</tr>
<tr>
<td>Protection class (DIN-EN 60529)</td>
<td>IP64 (front)</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium housing, glass lenses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 750 g</td>
<td>approx. 730 g</td>
</tr>
</tbody>
</table>

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.
5) 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 (KF flange)

Controller IFC24xx

IFS24xx/Vac

C2400/PT-x-Vac

C2401-x

Vacuum feed through
- C2405.../Vac (KF or CF flange)
- C2402.../Vac (KF flange)
Accessories

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)
Accessories

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 IFC2451/61/71-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

![Optical fiber diagram]
Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Optical micrometers and fiber optics, measuring and test amplifiers

Sensors and measurement devices for non-contact temperature measurement

Color recognition sensors, LED analyzers and inline color spectrometers

Measuring and inspection systems for metal strips, plastics and rubber

3D measurement technology for dimensional testing and surface inspection