interferoMETER // Ultra-precise white light interferometers

More Precision
Stable thickness measurement with submicrometer resolution

**InterferoMeter 5400-TH**

- Nanometer-accurate thickness measurement even with varying distances
- Stable measurement from a long distance
- Precise thickness measurement of up to 5 layers
- Measuring rate up to 6 kHz for high speed measurements
- Ethernet / EtherCAT / RS422 / PROFINET / EtherNet/IP

**Stable thickness measurement with varying distances**
The IMS5400-TH white light interferometer opens up new perspectives in industrial thickness measurement. The interferometer is used for highly accurate thickness measurements from a relatively large distance. The large thickness measuring range allows the measurement of thin layers, flat glass and films. Since the white light interferometer works with an SLED in the near infrared range, it is possible to measure the thickness of optically non-dense objects such as anti-reflective coated glass.

**Reliable even with fluttering material**
A decisive advantage is the distance-independent measurement, where a stable nanometer-accurate thickness value is achieved. This is how the target can move within the measuring range without influencing the accuracy.

**Multi-layer thickness measurement**
The thickness of transparent coated objects or laminated glass can be reliably measured thanks to the multi-layer thickness measurement. The controller outputs the thickness values with the highest stability regardless of their position.

With the multi-layer thickness measurement (IMS5400.../MP) up to 5 layers can be measured.

- The measuring range for air gap measurement (with refractive index ~1) is 50 µm to 2.1 mm and for glass thickness measurement (with refractive index ~1.5) 35 µm to 1.4 mm.

Due to their extremely compact size, these sensors can also be integrated into restricted spaces.
<table>
<thead>
<tr>
<th>Model</th>
<th>IMS5400-TH45</th>
<th>IMS5400MP-TH45</th>
<th>IMS5400-TH70</th>
<th>IMS5400MP-TH70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working distance</td>
<td>45 mm ±3.5 mm</td>
<td>45 mm ±3.5 mm</td>
<td>70 mm ±2.1 mm</td>
<td>70 mm ±2.1 mm</td>
</tr>
<tr>
<td>Measuring range (thickness)</td>
<td>0.035 ... 1.4 mm 1)</td>
<td>0.035 ... 1.4 mm 1)</td>
<td>0.035 ... 1.4 mm 1)</td>
<td>0.035 ... 1.4 mm 1)</td>
</tr>
<tr>
<td>Resolution 2)</td>
<td>&lt; 1 nm</td>
<td>&lt; 1 nm</td>
<td>&lt; 100 nm</td>
<td>&lt; 100 nm</td>
</tr>
<tr>
<td>Measuring rate</td>
<td>continuously adjustable from 100 Hz to 6 kHz</td>
<td>continuously adjustable from 100 Hz to 6 kHz</td>
<td>continuously adjustable from 100 Hz to 6 kHz</td>
<td>continuously adjustable from 100 Hz to 6 kHz</td>
</tr>
<tr>
<td>Linearity 3)</td>
<td>&lt; ±100 nm</td>
<td>&lt; ±100 nm</td>
<td>&lt; ±200 nm</td>
<td>&lt; ±200 nm</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>Sensor: Linearity valid for the entire temperature range</td>
<td>Controller: temperature compensated, stability &lt; 10 ppm between +15 ... +35 °C</td>
<td>Sensor: Linearity valid for the entire temperature range</td>
<td>Controller: temperature compensated, stability &lt; 10 ppm between +15 ... +35 °C</td>
</tr>
<tr>
<td>Multi-layer measurement</td>
<td>1 layer up to 5 layers</td>
<td>1 layer up to 5 layers</td>
<td>1 layer up to 5 layers</td>
<td>1 layer up to 5 layers</td>
</tr>
<tr>
<td>Light source</td>
<td>NIR-SLED, wavelength 840 nm</td>
<td>Pilot laser: laser LED, wavelength 635 nm</td>
<td>NIR-SLED, wavelength 840 nm</td>
<td>Pilot laser: laser LED, wavelength 635 nm</td>
</tr>
<tr>
<td>Laser class</td>
<td>Class 1 according to DIN-EN 60825-1: 2015-07</td>
<td>Pilot laser: Class 1, power (~ 0.2 mW)</td>
<td>Class 1 according to DIN-EN 60825-1: 2015-07</td>
<td>Pilot laser: Class 1, power (~ 0.2 mW)</td>
</tr>
<tr>
<td>Light spot diameter 4)</td>
<td>10 µm</td>
<td>10 µm</td>
<td>5 µm</td>
<td>5 µm</td>
</tr>
<tr>
<td>Measuring angle 5)</td>
<td>±2°</td>
<td>±2°</td>
<td>±4°</td>
<td>±4°</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24 VDC ±15 %</td>
<td>24 VDC ±15 %</td>
<td>24 VDC ±15 %</td>
<td>24 VDC ±15 %</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 10 W (24 V)</td>
<td>approx. 10 W (24 V)</td>
<td>approx. 10 W (24 V)</td>
<td>approx. 10 W (24 V)</td>
</tr>
<tr>
<td>Signal input</td>
<td>Sync in, trigger in, 2x encoders (A+, A-, B+, B-)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital interface</td>
<td>Ethernet / EtherCAT / RS422 / PROFINET / EtherNet/IP 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>4 ... 20 mA / 0 ... 10 V (16 bit D/A converter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching output</td>
<td>Error1-Out, Error2-Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output</td>
<td>sync out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Optical</td>
<td>pluggable optical fiber via E2000 socket (controller) and FC socket (sensor); standard length 3 m, 5 m and 10 m; other cable lengths on request; bending radius: static 30 mm, dynamic 40 mm</td>
<td>3-pin supply terminal strip; encoder connection (15-pin, HD-sub socket, max. cable length 3 m,30 m with external encoder supply); RS422 connection socket (9-pin, Sub-D, max. cable length 30 m);</td>
<td>3-pin output terminal strip (max. cable length 30 m); 11-pin I/O terminal strip (max. cable length 30 m); RJ45 socket for Ethernet (out) / EtherCAT (in/out) (max. cable length 100 m)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Sensor</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td>Clamping, mounting adapter (see accessories)</td>
</tr>
<tr>
<td>Controller</td>
<td>free-standing, DIN rail mounting</td>
<td>free-standing, DIN rail mounting</td>
<td>free-standing, DIN rail mounting</td>
<td>free-standing, DIN rail mounting</td>
</tr>
<tr>
<td>Temperature range</td>
<td>Storage</td>
<td>-20 ... +70 °C</td>
<td>-20 ... +70 °C</td>
<td>-20 ... +70 °C</td>
</tr>
<tr>
<td>Operation</td>
<td>Sensor: +5 ... +70 °C; Controller: +15 ... +35 °C</td>
<td>Sensor: +5 ... +70 °C; Controller: +15 ... +35 °C</td>
<td>Sensor: +5 ... +70 °C; Controller: +15 ... +35 °C</td>
<td>Sensor: +5 ... +70 °C; Controller: +15 ... +35 °C</td>
</tr>
<tr>
<td>Shock (DIN EN 60068-2-27)</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</td>
<td>15 g / 6 ms in XY axis, 1000 shocks each</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>2 g / 20 ... 500 Hz in XY axis, 10 cycles each</td>
<td>2 g / 20 ... 500 Hz in XY axis, 10 cycles each</td>
<td>2 g / 20 ... 500 Hz in XY axis, 10 cycles each</td>
</tr>
<tr>
<td>Controller</td>
<td>IP40 (option / VAC)</td>
<td>IP40 (option / VAC)</td>
<td>IP40 (option / VAC)</td>
<td>IP40 (option / VAC)</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Optional UHV (cable and sensor)</td>
<td>Optional UHV (cable and sensor)</td>
<td>Optional UHV (cable and sensor)</td>
<td>Optional UHV (cable and sensor)</td>
</tr>
<tr>
<td>Controller</td>
<td>Aluminum housing, passive cooling</td>
<td>Aluminum housing, passive cooling</td>
<td>Aluminum housing, passive cooling</td>
<td>Aluminum housing, passive cooling</td>
</tr>
</tbody>
</table>

Control and indicator elements
- Multifunction button: two adjustable functions as well as reset to factory settings after 10 s;
- web interface for setup: selectable presets, freely selectable averaging, data reduction, setup management;
- 6 x color LEDs for intensity, range, SLED, pilot laser, status and power;
- pilot laser: switchable for sensor alignment (laser LED 635 nm, laser class 1, power < 0.2 mW)

All data at constant ambient temperature (24 ± 2 °C)

1) Measuring range with n=1.5; for air gap measurement between two glass plates (n~1) the measuring range is 0.05 ... 2.1 mm.
2) The measuring object must be within the working distance.
3) Measuring rate 0.5 kHz; moving averaging over 64 values, measured on an approx. 1 mm thick BK7 optical flat (2 sigma)
4) Maximum thickness deviation when measuring on an approx. 1 mm thick BK7 optical flat (n=1.5) when passing through the measuring range
5) With a working distance of 45 mm (TH-45) or 70 mm (TH-70)
6) Maximum sensor tilt angle that produces a usable signal on an approx. 0.6 mm thick BK7 optical flat in the mid of the measuring range.
7) The accuracy decreases when approaching the limit values.
8) Optional connection via interface module (see accessories)
**IMS5400-DS sensor**

Measurement object:
- 50 µm ... 2.1 mm (air gap with refractive index ~1)
- 35 µm ... 1.4 mm (glass with refractive index ~1.5)

**IMS5400-TH45 sensor**

Measurement object:
- 50 µm ... 2.1 mm (air gap with refractive index ~1)
- 35 µm ... 1.4 mm (glass with refractive index ~1.5)

**IMS5400-TH70 sensor**

Measurement object:
- 50 µm ... 2.1 mm (air gap with refractive index ~1)
- 35 µm ... 1.4 mm (glass with refractive index ~1.5)

**IMS5400-DS / IMS5400-TH / IMS5600-DS controllers**

(Foot parts are removable)
Accessories

Cables
Standard E2000/APC (controller) and FC/APC connector (sensor)
- C5401-2: Optical fiber, length 2 m
- C5401-3: Optical fiber, length 3 m
- C5401-5: Optical fiber, length 5 m
- C5401-10: Optical fiber, length 10 m

Other lengths up to 20 m on request

Drag chain E2000/APC (controller) and FC/APC connector (sensor)
- C5401-1-3(010): Optical fiber, length 3 m
- C5401-5-1(010): Optical fiber, length 5 m
- C5401-10-1(010): Optical fiber, length 10 m

Other lengths up to 20 m on request

Vacuum cable FC/APC connector
- C5400-1/VAC: Optical fiber, length 1 m
- C5400-2/VAC: Optical fiber, length 2 m
- C5400-5/VAC: Optical fiber, length 5 m

Flange for vacuum feed through
- C5405/VAC/1/CF16: CF flange
- C5405/VAC/1/KF16: KF flange

Mounting Adapter
- MA5400-10: Mounting adapter for IMP-DS19/TH45
- MA5400-20: Mounting adapter for IMP-TH70

Other accessories
- SC2471-x/IF2008: IMC5400/5600 connector cable + IF2008/PCIE, length 3 m / 10 m
- SC2471-x/RS422/OE: IMC5400/5600 interface cable + IF2001/USB, length 3 m / 10 m
- IF2001/USB: RS422/USB converter
- IF2008/PCIE: Interface card
- IF2030/PNET: Interface module for PROFINET integration
- PS2020: Power supply 24V / 2.5A
- EC2471-3/OE: Encoder cable, 3 m
Accessories
interferoMETER

Sensor mounting adapter

For DS19/TH45:
MA5400-10

For TH70:
MA5400-20

(dimensions in mm, not to scale)
**Adjustable mounting adapter**

The adjustable JMA mounting adapter simplifies the alignment and fine adjustment of interferometric sensors. You can integrate the sensors with the adapter directly into the machine and then align them directly on site. This corrects, e.g., minor deviations caused by mounting and compensates for tilted measuring objects. With two-sided thickness measurements, the mounting adapter supports the fine alignment of the two measuring points.

**Scope of supply**

- Adjustable mounting adapter
- Sensor holder for sensors Ø10 and Ø20 mm
- Screwdriver for positioning
- Assembly instructions

**Sensor holder**

Sensor holder for JMA-10

- Ø27.4 ±0.05
- 2 x 2 Threaded holes for M4 mounting screws

Sensor holder for JMA-20

- Ø20.05 ±0.05
- Screws for adjusting the position in the x-y axis

A-A

Sensor holder

for M4x6 grub screw, 0441074
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