interferoMETER // Ultra-precise white light interferometers

More Precision
Absolute distance measurements with nanometer resolution

The IMS5400-DS white light interferometer opens up new perspectives in industrial distance measurement. The controller has an intelligent evaluation feature and enables absolute measurements with nanometer resolution at a relatively large offset distance. Compared to other absolute measuring optical systems, the IMS5400-DS offers an unsurpassed combination of accuracy, measuring range and offset distance.

Small light spot for the smallest of details and structures

The sensors generate a small light spot over the entire measuring range. The light spot diameter is only 10 µm and allows the detection of small details such as structures on semiconductors and miniature electronic components.

Multi-peak distance measurement

With multi-peak distance measurement, up to 14 distance values can be evaluated. This allows the distance between the glass and the mask to be determined. If required, the controller can calculate the glass thickness based on the peaks.

Absolute measurement of step profiles

Unlike interferometers based on relative measurements, the IMS5400-DS also enables the measurement of step profiles. Thanks to the absolute measurement, the scanning is performed with high signal stability and precision. When measuring on moving objects, the differences in height of heels, steps and depressions can thus be reliably detected.

Multi-peak distance measurement

With multi-peak distance measurement on transparent objects, up to 14 distance values can be evaluated. For example, the distance between the glass and the mask can be determined. If required, the controller can calculate the glass thickness based on the peaks.

Due to their extremely compact size, these sensors can also be integrated into restricted spaces.

Due to the absolute thickness measurement, step profiles are detected with high signal stability and subnanometer resolution.
<table>
<thead>
<tr>
<th>Model</th>
<th>IMS5400-DS19</th>
<th>IMS5400MP-DS19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>Distance</td>
<td>2.1 mm</td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>-</td>
</tr>
<tr>
<td>Start of measuring range</td>
<td>approx. 19 mm</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>&lt; 1 nm</td>
<td></td>
</tr>
<tr>
<td>Measuring rate</td>
<td>continuously adjustable from 100 Hz to 6 kHz</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ±0.5 nm</td>
<td>&lt; ±0.5 nm for the first distance</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>Sensor: Linearity: typ. 0.1 nm / K (without offset displacement)</td>
<td>Controller: temperature compensated, stability &lt; 10 ppm between +15 ... +35 °C</td>
</tr>
<tr>
<td>Multi-layer measurement</td>
<td>-</td>
<td>up to 13 layers</td>
</tr>
<tr>
<td>Light source</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 (&lt; 0.2 mW)</td>
</tr>
<tr>
<td>Light spot diameter</td>
<td>10 µm</td>
<td></td>
</tr>
<tr>
<td>Measuring angle</td>
<td>±2°</td>
<td></td>
</tr>
<tr>
<td>Target material</td>
<td>Glass, reflecting or diffuse surfaces</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24 VDC ±15 %</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 10 W (24 V)</td>
<td></td>
</tr>
<tr>
<td>Signal input</td>
<td>Sync in, trigger in, 2x encoders (A+, A-, B+, B-, index)</td>
<td></td>
</tr>
<tr>
<td>Digital interface</td>
<td>Ethernet / EtherCAT / RS422 / PROFINET / EtherNet/IP</td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>4 ... 20 mA / 0 ... 10 V (16 bit D/A converter)</td>
<td></td>
</tr>
<tr>
<td>Switching output</td>
<td>Error1-Out, Error2-Out</td>
<td></td>
</tr>
<tr>
<td>Digital output</td>
<td>sync out</td>
<td></td>
</tr>
<tr>
<td>Connection 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></td>
</tr>
<tr>
<td>Connection Electrical</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); 3-pin output terminal strip (max. cable length 30 m); RJ45 socket for Ethernet (out) / EtherCAT (in/out) (max. cable length 100 m)</td>
<td></td>
</tr>
<tr>
<td>Mounting Sensor</td>
<td>Clamping, mounting adapter (see accessories)</td>
<td></td>
</tr>
<tr>
<td>Mounting Controller</td>
<td>free-standing, DIN rail mounting</td>
<td></td>
</tr>
<tr>
<td>Temperature range Storage</td>
<td>Sensor: +5 ... +70 °C; Controller: +15 ... +35 °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) Sensor</td>
<td>IP65</td>
<td>IP40 (option / VAC)</td>
</tr>
<tr>
<td>Protection class (DIN EN 60529) Controller</td>
<td>IP40</td>
<td></td>
</tr>
<tr>
<td>Vacuum</td>
<td>Optional UHV (cable and sensor)</td>
<td></td>
</tr>
<tr>
<td>Material Sensor</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>Material Controller</td>
<td>Aluminum housing, passive cooling</td>
<td></td>
</tr>
<tr>
<td>Control and indicator elements</td>
<td>Multifunction button: two adjustable functions and 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: can be switched on for sensor alignment</td>
<td></td>
</tr>
</tbody>
</table>

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

1) Measuring rate 0.5 kHz, moving average over 64 values, measured differentially between the front and back of a thin glass plate in the mid of the measuring range (2 sigma)

2) Maximum deviation from reference system over the entire measuring range, measured on front surface of ND filter

3) In the mid of the measuring range

4) Maximum sensor tilt angle that produces a usable signal on polished glass (n = 1.5) in the mid of the measuring range. The accuracy decreases when approaching the limit values.

5) Non-transparent materials require optically dense surface at a wavelength of 840 nm

6) Optional connection via interface module (see accessories)
Dimensions
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IMS5400-DS sensor

IMS5400-TH45 sensor

IMS5400-TH70 sensor

IMS5400-DS / IMS5400-TH / IMS5600-DS controllers
Accessories
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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)
C5401-3(010) Optical fiber, length 3 m
C5401-5(010) Optical fiber, length 5 m
C5401-10(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

Mounting block

Mounting ring
(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
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