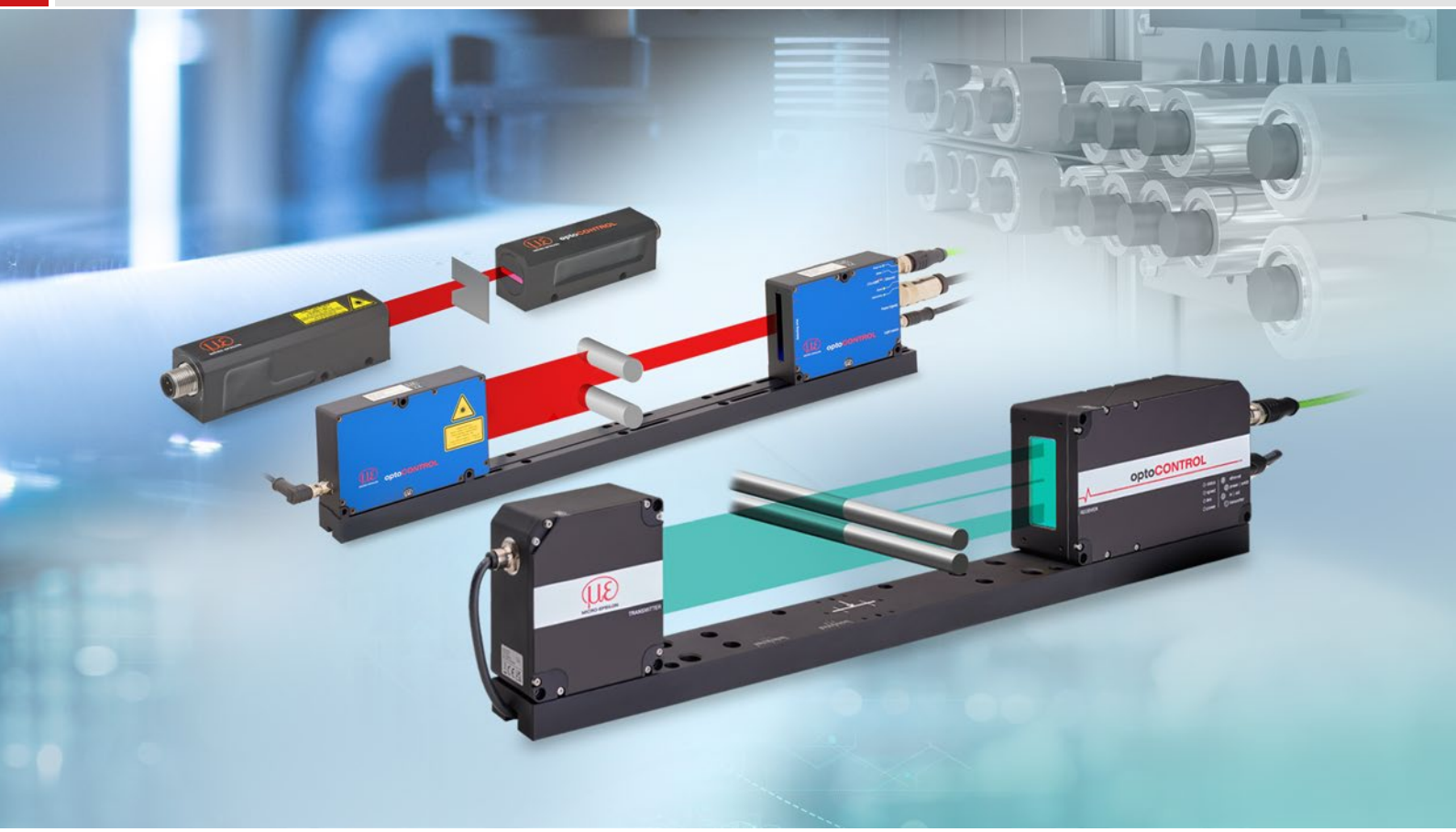
MICRO-EPSILON

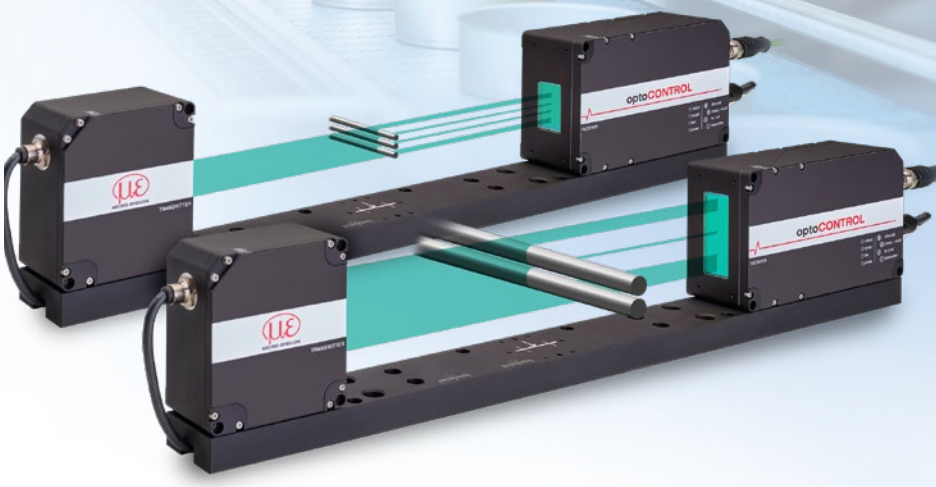
More Precision.

optoCONTROL // Optical precision micrometers



High-performance micrometer for the highest demands
optoCONTROL 2700

- Measuring ranges 10 | 40 mm
- High sampling rate of 15 kHz
- Linearity ≤ 0.5 µm
- Smallest measuring objects with diameters from 30 µm
- Angle measurement and active inclination correction of the measuring object
- Easy operation via web interface



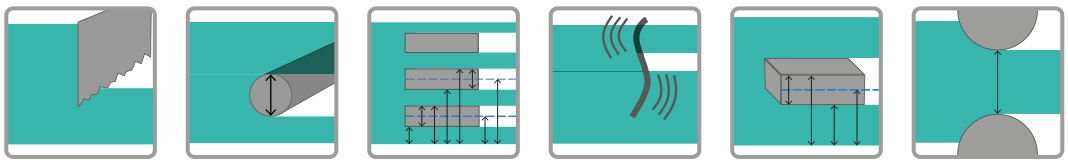
The optoCONTROL 2700 is a high-performance LED micrometer for precise measurement of diameter, gap, edge and segment. The micrometer offers the highest precision with measuring ranges of 10 mm and 40 mm and is used for inline quality assurance and machine monitoring.

In addition to telecentric optics on both sides, the micrometer features a controller integrated in the receiver, which reduces cabling and installation effort as no external control unit is required.

The optoCONTROL 2700 features real-time inclination correction of the measuring object, eliminating the need for exact alignment of the measuring object.

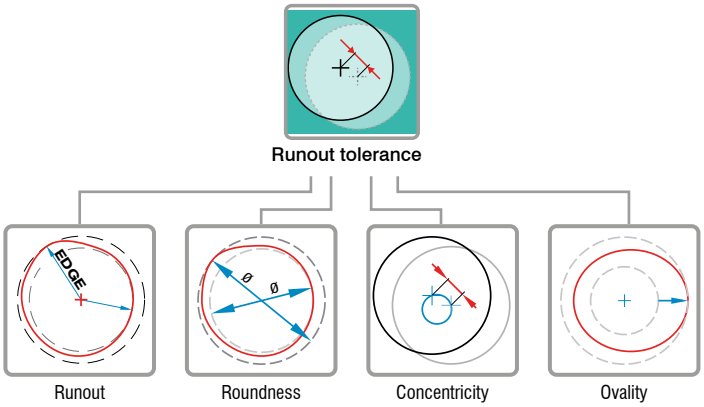
The optoCONTROL 2700 is suitable for all types of measuring objects, including transparent objects such as glass rods or glass fibers, and is highly insensitive to interfering influences such as ambient light.

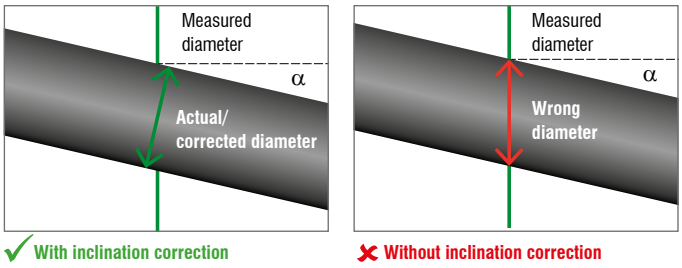
Presets – preconfigured measurement programs

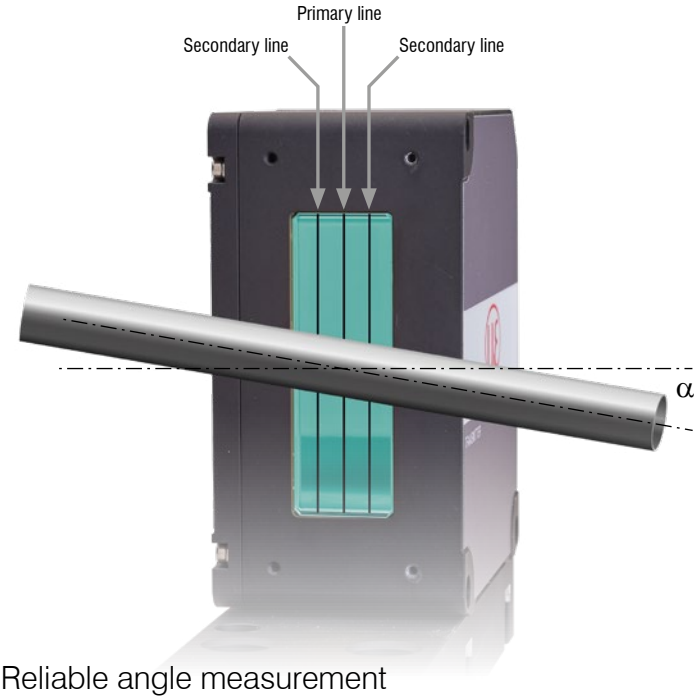


Runout tolerance measurement

Using the diameter preset, the following parameters can be measured:







Real-time inclination correction

The integrated image matrix captures the exact alignment of the measuring object using the primary and secondary lines. Based on this, the measured value is automatically corrected and tilt is reliably compensated. Inclination correction operates at the full measuring rate of 15 kHz and is available for all diameter and gap measurement programs. Inclination correction can also be used in real time for wire and contour measurement. The detected image can be displayed via the web interface.

Reliable angle measurement

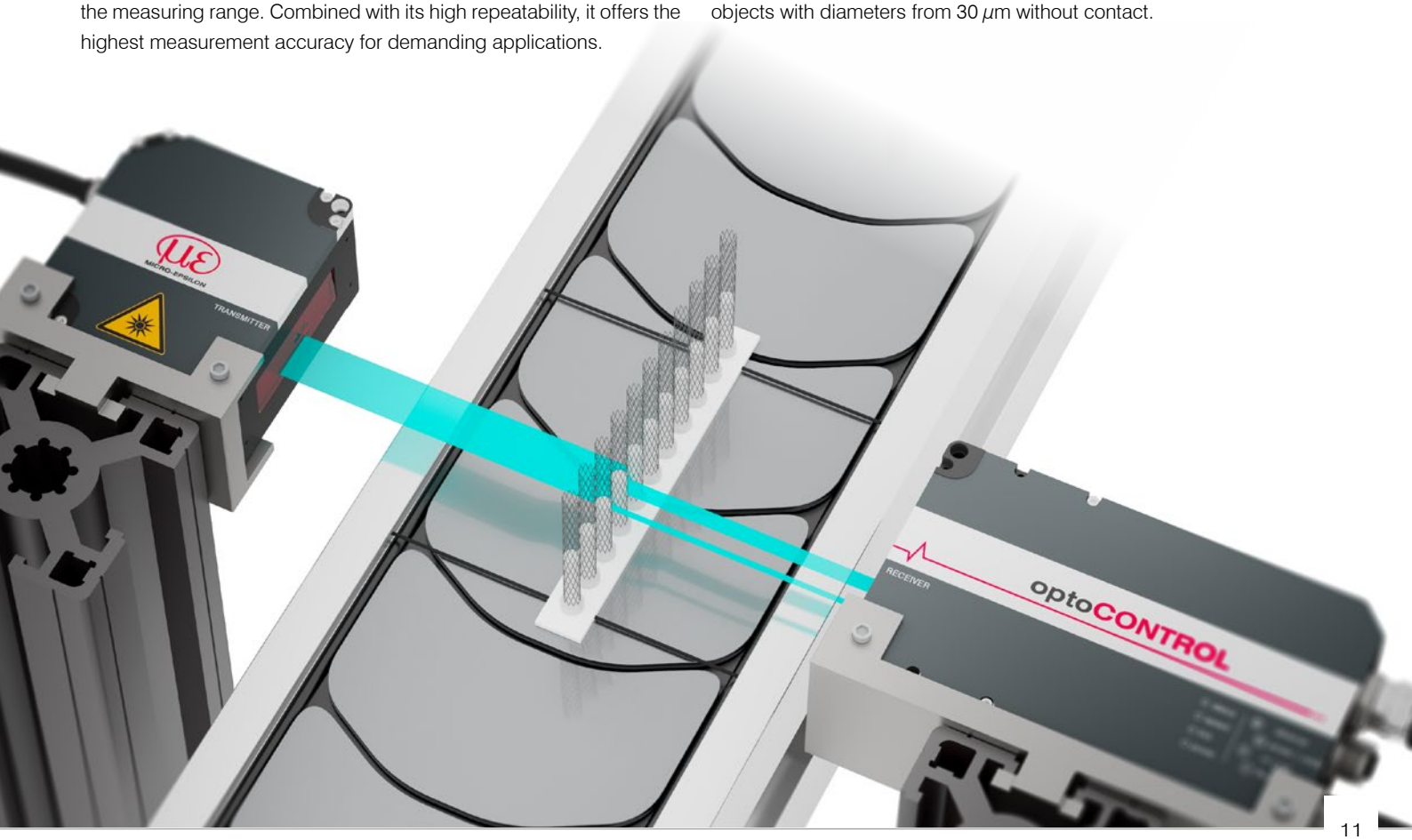
The optoCONTROL 2700 detects the inclination of the measuring object relative to the sensor. With integrated evaluation, the measured diameter is automatically corrected for the inclination of the measuring object. Corrected measurement values are output without reducing the measuring rate. Inclination correction is available for the diameter measurement programs.

Highest precision

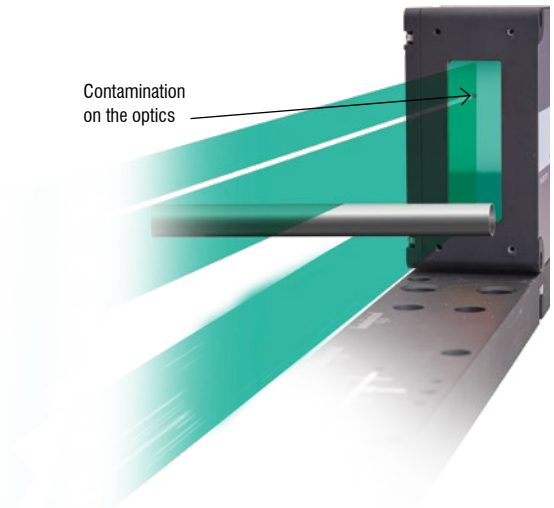
The optoCONTROL 2700 achieves a linearity of 0.5 µm at the mid of the measuring range. Combined with its high repeatability, it offers the highest measurement accuracy for demanding applications.

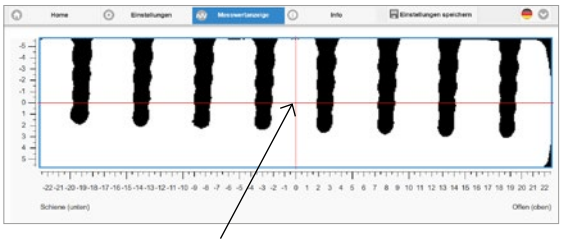
Reliable detection of the smallest objects

Thanks to their high precision, the optical micrometers reliably detect objects with diameters from 30 µm without contact.



High-performance micrometer for the highest demands
optoCONTROL 2700





Black and white image with visible measurement line

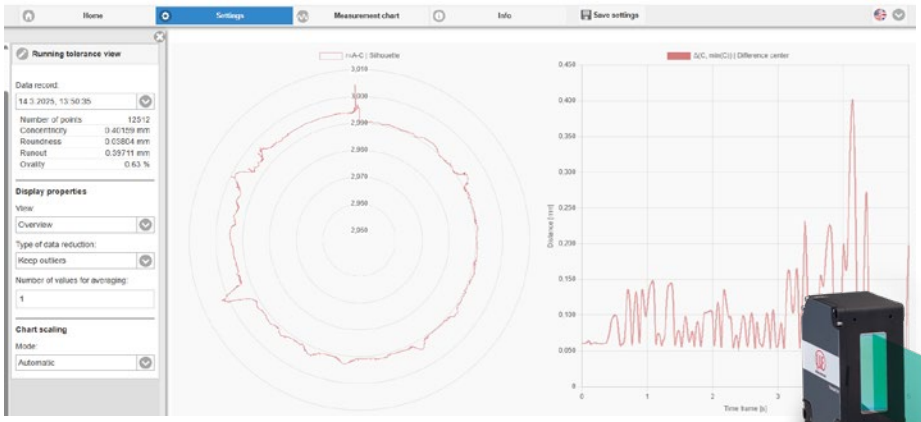
Intelligent contamination detection

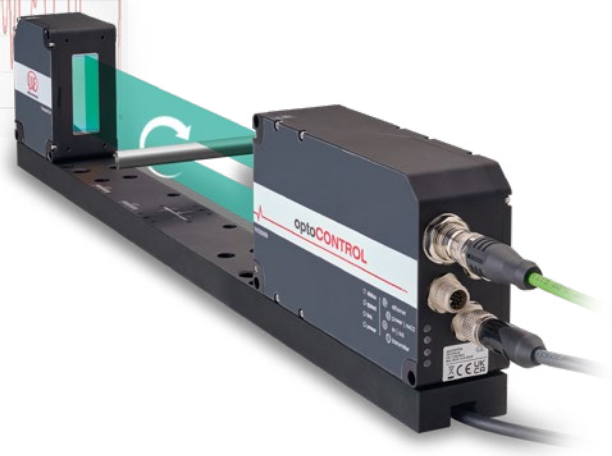
With integrated contamination detection, contamination of the optics – and the resulting measurement errors – can be detected early and compensated accordingly. This prevents failures or malfunctions of the micrometer. On request – for example during maintenance intervals – the optoCONTROL 2700 provides information on the level of contamination via the integrated interfaces. The intelligent evaluation detects even the smallest contaminants, both on the glass panes and in the measuring field. For example, dust particles or oil splashes that are invisible to the human eye can be reliably detected.

Easy set-up mode

The integrated set-up mode enables quick positioning of the measuring object. Using the set-up image in the XY plane, the alignment can be easily checked and optimized. The mid of the measuring range is shown on both axes as a red line and facilitates precise adjustment and placement of the measuring object at the optimal measuring position.

Runout measurements on rotating components





The optoCONTROL 2700 can perform a complete 360° inspection of rotating components. This allows four important form and positional tolerances to be precisely determined and visualized in a polar plot: Roundness, runout, concentricity and ovality.

Advantages:

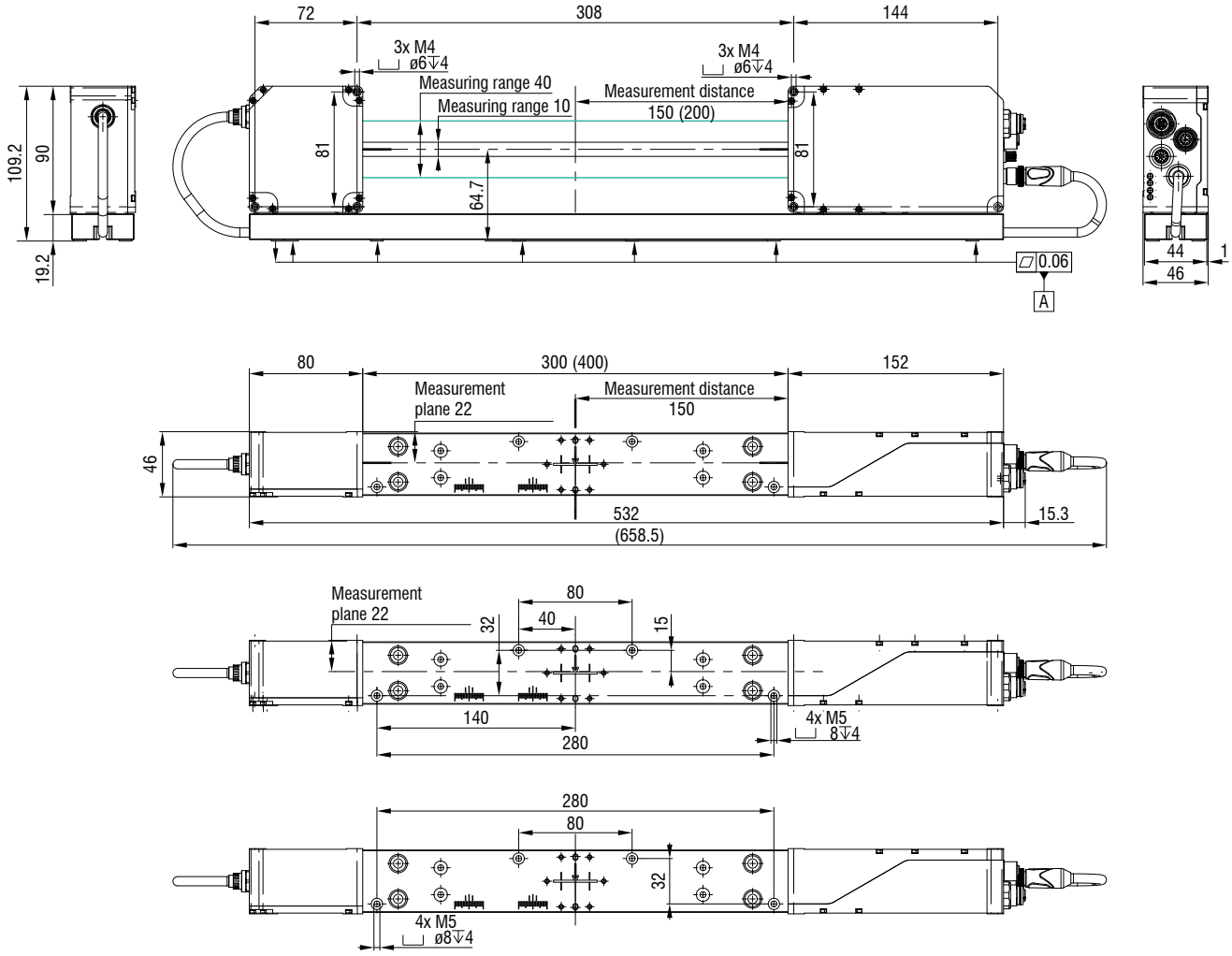
- Comprehensive 360° inspection of rotating components
- Reliable detection of shape and positional tolerances
- Precise inline evaluation for quality assurance

Model		ODC 2700-10 Ethernet	ODC 2700-40 Ethernet
Measuring range		10 mm	40 mm
Min. target size [1]		0.05 mm (0,03 mm)	0,3 mm (0,1 mm)
Distance light source - receiver		300 mm	300 mm (Option002 = 400 mm)
Measuring distance target - receiver		150 (±2,5) mm	150 (±10) mm (Option002 = 200 (±10) mm)
Sampling rate [2]		15 kHz	
Measuring rate [3]		15 kHz	
Exposure time [4]		8.5 µs	
Resolution [5]		10 nm	
Linearity [6]		≤ 0.5 µm [7]	≤ 1 µm [8]
Repeatability [6]		≤ 0.03 µm	≤ 0.1 µm
Light source		LED turquoise 508 nm (blue-green)	
Laser class		no laser, LED according to DIN EN 62471 risk group 1	no laser, LED according to DIN EN 62471 risk group 0
Permissible extraneous light		30,000 lx indirect; 5000 lx direct irradiation	
Supply voltage		11 … 30 VDC	
Max. current consumption		≤ 1 A	
Signal input		3x inputs optionally for encoder, zero point, reset, trigger; light on/off (can be switched off via menu)	
Digital interface [9]		Ethernet, RS422 (up to 8 MBaud) EtherCAT, EtherNet/IP, PROFINET	
Analog output		0 ... 10 VDC / 4 ... 20 mA (16 bit, freely scalable within the measuring range)	
Switching output		3 outputs, optionally for errors and 2x limit values, not electrically separated 24V logic (HTL), high level depends on operating voltage Switchable TTL level	
Digital output		Synchronization	
Connection	Light source	integrated cable 0.8 m, with 8-pin M8 socket for power supply	
	Receiver	8-pin M12 plug for light source supply, 12-pin M12 socket for power supply, sync. and RS422, 4-pin M12x1 socket for Ethernet or fieldbus, 17-pin M12 plug for analog, outputs (errors, limit values) - inputs (trigger/encoder)	
Mounting		integrated mounting rail with mounting holes	
Temperature range [10]	Storage	-20 ... +70 °C	
	Operation	0 ... +50 °C	
Shock (DIN EN 60068-2-27)		15 g / 6 ms in XY axis, 100 shocks each	
Vibration (DIN EN 60068-2-6)		2 g / 20 … 500 Hz in XY axis, 10 cycles each	
Protection class (DIN EN 60529)		IP67	
Material		Aluminum housing	
Weight	Light source	approx. 400 g	approx. 500 g
	Receiver	approx. 900 g	approx. 1400 g
	Mounting rail	approx. 1000 g	approx. 1000 g
Measuring programs		Diameter / gap / segment measurement / edge measurement with rising or falling edge / search and measurement direction / additional detection of edge positions and center axes	
Presets		Strip edge / wire measurement / (outer) diameter incl. inclination correction / contour measurement incl. encoder value / Multi-segment as well as roller, gap and angle measurement	
Control and indicator elements		4x LED (power, status, link, speed) Website: Tilt angle correction, contamination display, 6 application-specific presets, freely selectable averaging, data reduction, 8 editable user programs, measured value time diagrams, measured value display in mm / inch, video signal, set-up mode with measuring line and measuring object; menu language German, English an others	
Special features		Including "sensorTOOL" software for data acquisition and processing, "MedaQLib" programming database	

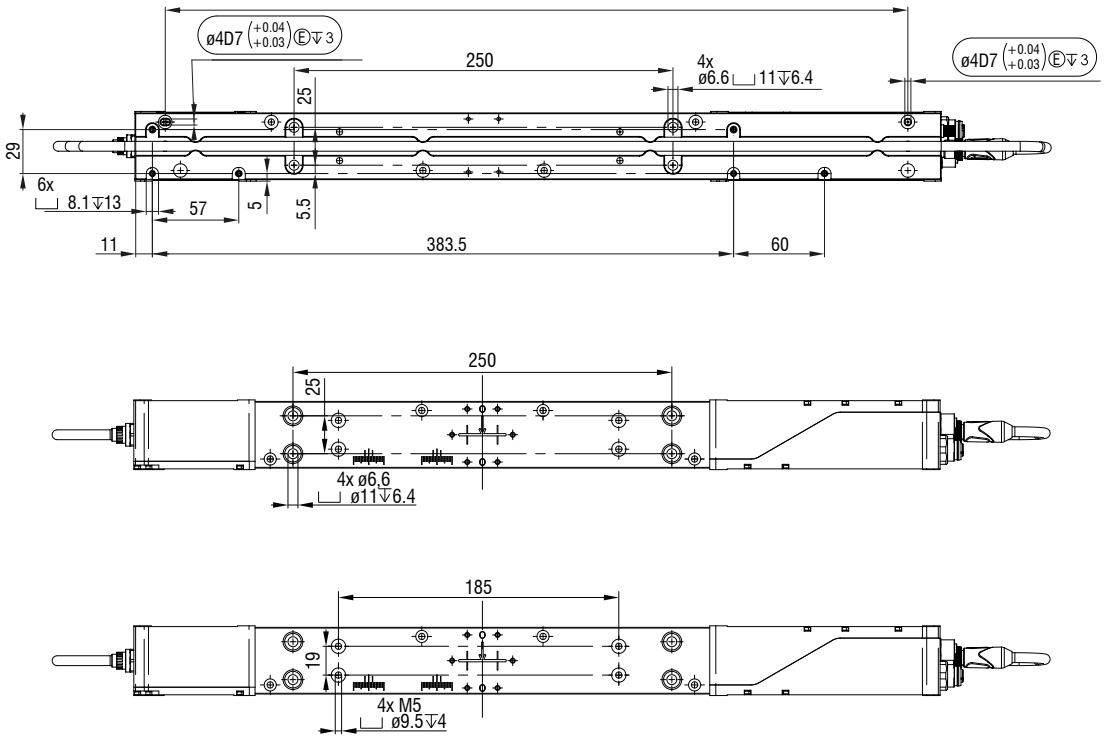
[1] Value in brackets related to the mid of the measuring range
[2] Number of measurements taken per second
[3] Number of measured values that are output at the sensor interface
[4] With video averaging switched on = 3 x 8.5 µs exposures per measurement
[5] Numerical resolution of the output measured values
[6] The data applies to a 95% confidence interval for diameter measurements with an average of 1024 values over a period of 5 minutes in a temperature-stabilized environment after a warm-up time of 45 minutes.
[7] Measured with 2 mm testing pin at a measurement distance of 150 mm in measuring field 1 (Z=±0.5 mm) linearity ≤ 0,5, in measuring field 2 (Z=±1.5 mm) linearity ≤ 1 µm, in measuring field 3 (Z=±2.5 mm) linearity ≤ 2,5 µm
[8] Measured with 2 mm testing pin at a measurement distance of 150 mm in measuring field 1 (Z=±2.5 mm). In measuring field 2 (Z=±10 mm) linearity ≤ 3 µm - 95% confidence interval
[9] EtherCAT, PROFINET and EtherNet/IP: Connection via interface module (see accessories) directly in the sensor "on board"
[10] Relative humidity % 5 ... 95 (non-condensing)

High-performance micrometer for the highest demands
optoCONTROL 2700

optoCONTROL 2700-10 / 2700-40



(dimensions in mm, not to scale)



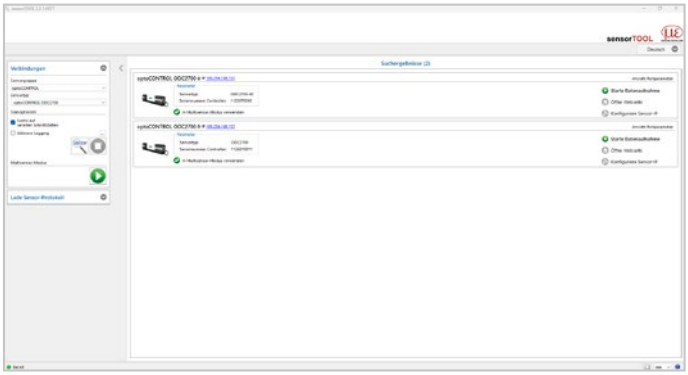
(dimensions in mm, not to scale)

Interface modules and accessories
optoCONTROL

XFrame2520-46 set for 2-axis measurements
ODC2520-46 micrometers for diameter measurement and XY position determination of round stock

- 2-axis frame for X-arrangement of 2 sensors
- Compressed-air cleaning of the optics via an air purge system
- e.g., for wires, cables, tubes, rods or flat steel
- Objects up to 46 mm in diameter can be measured
- Measuring range 46 × 46 mm

The multi-sensor function in sensorTOOL enables multiple optoCONTROL ODC sensors to be connected simultaneously and their measurement values to be viewed together. This enables measurement data from different sensors to be displayed, compared, recorded, and exported within a single interface. This is especially useful for multi-channel or combined measurement tasks, because all relevant values can be clearly displayed in a single chart.



Interface modules

Module	ODC1200	ODC2520	ODC2700
IF2001/USB RS422/USB converter to transform a digital signal to USB	⊘	✔	✔
IC2001/USB Single-channel RS422/USB converter cable	⊘	✔	✔
IF2004/USB RS422/USB converter for converting up to 4 digital signals to USB	⊘	✔	✔
IF2008/ETH Interface module for Ethernet connection for up to 8 sensors	⊘	✔	✔
IF2008PCIE Interface card for processing multiple sensor signals; analog and digital interfaces	✔	✔	✔
IF2035-EtherCAT Interface module for Industrial Ethernet connection (EtherCAT)	⊘	✔	✔
IF2035/PROFINET Interface module for Industrial Ethernet connection (PROFINET)	⊘	✔	✔
IF2035/EtherNetIP Interface module for Industrial Ethernet connection (EtherNet/IP)	⊘	✔	✔
IF1032/ETH Interface module for connecting the analog interface to Ethernet or Industrial Ethernet (EtherCAT)	✔	⊘	⊘
Dual Processing Unit Controller for D/A conversion and processing of up to 2 sensor signals	⊘	✔	✔

Interface modules and accessories
optoCONTROL

IF2001/USB: RS422-to-USB converter

The RS422/USB converter converts the digital signals from an optical micrometer into a USB data packet. To do this, the sensor is connected to the converter's RS422 interface. The data are output via the USB interface; additional signals and functions such as Laser On/Off, switching signals, and the function output are passed through by the converter. The converter and the connected sensors can be parameterized via software.

Special features

- Robust aluminum housing
- Easy sensor connection via screw terminals (Plug & Play)
- RS422-to-USB conversion
- Supports baud rates from 9.6 kBaud to 12 MBaud

IC2001/USB: Single-channel converter cable RS422/USB

The IC2001/USB single-channel converter cable is used to connect optoCONTROL sensors with an RS422 interface to USB. The cable is easy to install and therefore also suitable for integration into machines and systems.

Special features

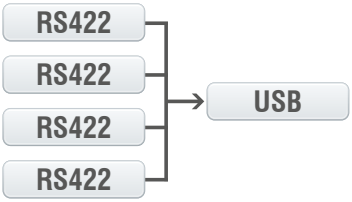
- 5-core interface cable without outer shield
- RS422-to-USB conversion
- Easy sensor connection via USB
- Supports baud rates from 9.6 kBaud to 1 MBaud

IF2004/USB: 4-channel RS422/USB converter

The RS422/USB converter converts the digital signals from up to 4 optical precision micrometers into a USB data packet. The converter features 4 trigger inputs and a trigger output for connecting additional converters. The data are output via a USB interface. The converter and the connected sensors can be parameterized via software. The COM interfaces can be used individually and switched as required.

Special features

- 4 digital signals via RS422
- 4 trigger inputs, 1 trigger output
- Synchronous data acquisition
- Data output via USB



IF2008/ETH

IF2008/ETH interface module for Ethernet connection for up to 8 sensors

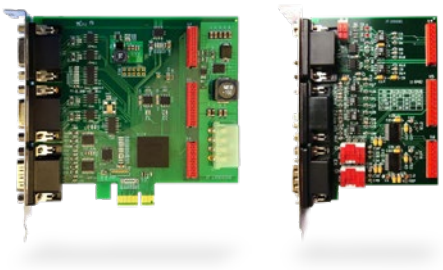
The IF2008/ETH integrates up to eight sensors and/or encoders with an RS422 interface into an Ethernet network. Four programmable switching inputs/outputs (TTL and HTL logic) are available.

Both the channel and the device status can be read directly on the module via the ten indicator LEDs. Data acquisition and output via Ethernet are also performed at a high speed of up to 200 kHz. Parameter setting of the interface module can be easily done via the web interface.

IF2008PCIe/IF2008E

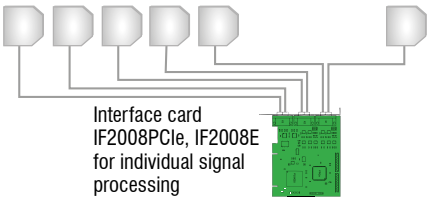
Interface card for synchronous data acquisition

Fully synchronous data acquisition is critical when measuring deflection or straightness with multiple optical micrometers. The IF2008PCIe interface card is designed for installation in PCs and enables the synchronous capture of 4 digital sensor signals and 2 encoders. The data are stored in a FIFO memory to enable resource-efficient block processing on the PC. With the IF2008E expansion card, an additional 2 digital sensor signals, 2 analog sensor signals and 8 I/O signals can be captured.



Special features

- IF2008PCIe – Basic board: 4 digital signals and 2 encoders
- IF2008E – Expansion board: 2 digital signals, 2 analog signals and 8 I/O signals



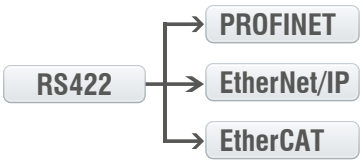
IF2035

Interface module for Industrial Ethernet connection

The IF2035 series interface modules were developed for easy connection of Micro-Epsilon sensors to Ethernet-based fieldbuses. The IF2035 is compatible with sensors that output data via an RS422 or RS485 interface and supports the common Industrial Ethernet protocols EtherCAT, PROFINET and EtherNet/IP.

EtherNet/IP
PROFINET
EtherCAT

The modules operate on the sensor side with up to 4 MBaud and have two network connections for different network topologies. In addition, the IF2035-EtherCAT offers a 4-fold oversampling function, which enables faster measurements than permitted by the bus cycle when required. Installation in control cabinets is via a DIN rail.



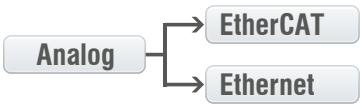
IF1032/ETH

With the IF1032/ETH interface module, the proven operating concept with web interface is now also available for optical micrometers with analog interfaces. Measurement data can be conveniently displayed on a PC via the Ethernet interface. In addition, optical micrometers can be connected to an EtherCAT bus. The existing RS485 interface allows connection of new optical precision micrometers that use the Micro-Epsilon-specific RS485 protocol.

EtherCAT

Interfaces

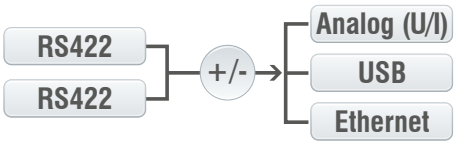
- Ethernet/EtherCAT
- 1x RS485 (ME proprietary protocol)
- 2x analog-in (14 bit, max. 4 ksps), voltage
- 1x analog-in, (14 bit, max. 4 ksps), current
- Inputs for supply voltage
- Trigger input
- EtherCAT synchronization output
- Output for sensor power supply



Interface modules and accessories
optoCONTROL

Dual Processing Unit: Controller for D/A conversion and processing of up to 2 sensor signals

- Fast D/A conversion (16-bit, up to 100 kHz) of 2 digital input signals or processing of 2 digital sensor signals
- Averaging functions and calculation of thickness, step, diameter, ovality and runout
- Trigger input
- Multi-function output
- Output of measurement values via Ethernet, USB, analog output 4 ... 20 mA/ 0 ... 5 V / 0 ... 10 V / ±5 V / ±10 V (scalable via the web interface)
- 2 x switching outputs for sensor or Dual Processing Unit status
- Parallel data output via three output interfaces
- Two filter options
- Post-linearization of measurement values or calculated values
- Simple parameterization via web interface (controller and sensors)



optoCONTROL 1200/1201

Connection	Interface modules	Connection cables	Mounting	Accessories
Power supply Power supply PS2031 2420096 Power supply unit PS2020 2420062 		**Power supply and signal cables** PC1200/90-5 (5 m) (90°) 2901261 PC1200-5 (5 m) 2901260 PC1200-10 (10 m) 2901483		**Adjustment plate** <u>Receiver</u> JU1200-HR (horizontal) 2966018 JU1200-VR (vertical) 2966019 <u>Transmitter</u> JU1200-VT (vertical) 2966020 JU1200-HT (horizontal) 2966021 (for 1200 and 1200/90)
Digital output / Ethernet / EtherCAT 	IF1032/ETH 2420066 max. 4 kSps 			
PLC analog Connection via 0 … 10 V 	Direct 0–10 VDC		**C-frame mounting rail** ODC1202-L100 (L = 0.4 m) 2966006 ODC1202-L200 (L = 0.5 m) 2966007 ODC1202-L500 (L = 0.8 m) 2966008 (for 1200 and 1200/90)	**Bracket for C-frame mounting** BR1200L220 (L=220 mm) 2966024 BR1200L320 (L=320 mm) 2966025

Interface modules and accessories
optoCONTROL
optoCONTROL 2700

<table>
<tr><th>Connection</th><th>Interface modules</th><th>Connection cables</th><th>Mounting</th><th>Accessories</th></tr>
<tr>
<td>Power supply
2420096 (24 V; 1 A)
2420062 (24 VDC / 2.5 A)
Power supply
Power supply
PS2031 2420096

Power supply
PS2020 2420062
 </td>
<td></td>
<td>Power supply, interface and signal cables with open ends
PC/SC2700-3 (3 m) 29011452
PC/SC2700-5 (5 m) 29011453
PC/SC2700-10 (10 m) 29011454
PC/SC2700-20 (20 m) 29011455
 </td>
<td rowspan="11"> </td>
<td rowspan="11">Demo prism ODC2700-10
9335585
Demo prism ODC2700-40
9335556

Optional:
Diameter of testing pins
- 20 mm
- 10 mm
- 6 mm
- 3 mm</td>
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<tr>
<td>PLC PROFINET / EtherNet/IP
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<td>IF2035-EtherCAT 2211036
IF2035-PROFINET 2211039
IF2035-EtherNetIP 2211038
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<tr>
<td>Serial RS422</td>
<td>Direct RS422 OE to PC</td>
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<tr>
<td rowspan="3">Digital output / USB / Ethernet
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<td>IC2001/USB 2213041
Converter cable
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<tr>
<td>IF2001/USB 2213025
Converter
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<td>Serial RS422</td>
<td>Direct RS422 to PC</td>
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<tr>
<td rowspan="6">Analog 0 … 10 V</td>
<td>Direct 0 ... 10 VDC</td>
<td rowspan="2"></td>
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<tr>
<td>IF2004/USB 2213024
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<tr>
<td>IF2008PCIE 2213032
 </td>
<td>Interface and power supply cables
for IF2008;
PC/SC2700-3/IF2008 (3 m) 29011508

IF2008-Y adapter cable, additionally required for connecting a 3rd or 4th sensor (0.1 m)
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<tr>
<td>IF2008E 2213018
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<tr>
<td>DPU 2420120
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<td>Power supply and output cable
for DPU connection;
PC/SC2700-3/DPU (3 m) 29011543
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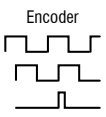
<tr>
<td>Direct 0–10 VDC
Encoder
  </td>
<td>Output cables
SCA2700-3 (3 m) 29011448
SCA2700-5 (5 m) 29011449
SCA2700-10 (10 m) 29011450
SCA2700-20 (20 m) 29011451
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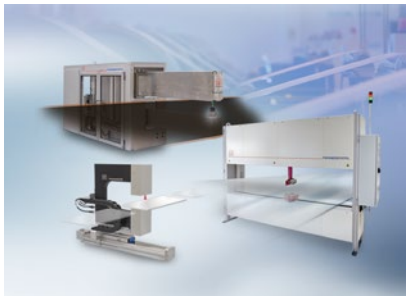
<tr>
<td>Ethernet</td>
<td>Direct to PC via Ethernet via RJ45</td>
<td rowspan="2">Digital output cables
SCD2700-3 (3 m) 29011456
SCD2700-5 (5 m) 29011457
SCD2700-10 (10 m) 29011458
SCD2700-20 (20 m) 29011459
 </td>
</tr>
<tr>
<td>EtherCAT, EtherNet/IP, PROFINET
 </td>
<td>Direct via RJ45</td>
</tr>
<tr>
<td></td>
<td>via EtherCAT switch using M12</td>
<td>SCD2700-5 M12 (5 m) 29011460</td>
</tr>
<tr>
<td>Digital output Ethernet
 </td>
<td>IF2008ETH 2213018
 </td>
<td>Power supply and output cable
PCE2700-3/M12 (3 m) 29011541
 </td>
<td>For extension:
Transmitter-receiver connection cable extension
CE2700-1/E (1 m) 29011483
CE2700-2/E (2 m) 29011484
CE2700-5/E (5 m) 29011485</td>
<td></td>
</tr>
</table>

Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

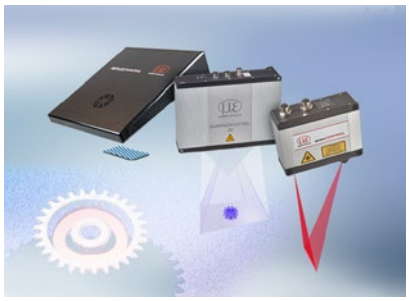
Sensors and measurement devices for non-contact temperature measurement



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

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eltrotec@micro-epsilon.de · **www.micro-epsilon.com**