



More Precision

optoCONTROL 2700 // High-performance micrometer



High-performance micrometer for the highest demands **optoCONTROL 2700**

High precision and sampling rate

Angle measurement and active inclination correction of the measuring object

Six presets for common measurement tasks

Black-and-white image for easy alignment with the measuring object

High ambient light resistance up to 5000 lux in direct light

Excellent price/performance ratio

Large distance from the measuring object

10 nm
Digital resolution

≤ 0.5 μm
Linearity

15 kHz
Sampling rate

8.5 μs
Exposure time

Robust aluminum housing (IP67)

EtherCAT®

EtherNet/IP®

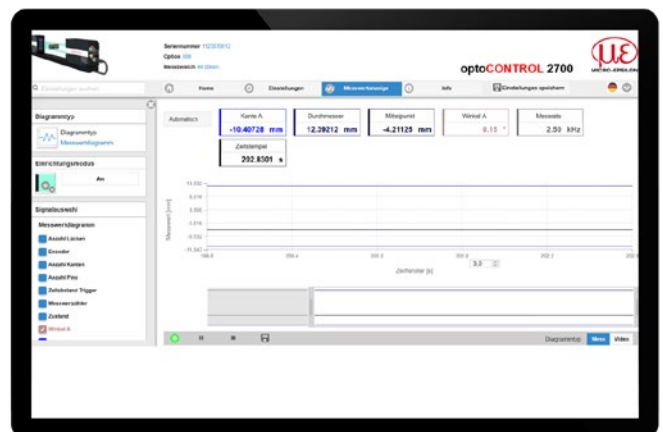
**PROFI
NET®**

The optoCONTROL 2700 is a compact LED micrometer for the precise measurement of diameter, gap, edge and segment. The micrometer is characterized by its high accuracy with measuring ranges of 10 and 40 mm and is used for inline quality assurance and machine monitoring. The micrometer works according to the shadow casting principle and has telecentric optics on both sides. The controller integrated in the receiver reduces the cabling and installation effort as no external control unit is required. The optoCONTROL 2700 offers a real-time inclination correction, which means that the measuring object does not have to be aligned exactly. The measured value for the diameter measurement is automatically adjusted to the inclination of the measuring object. In addition to the inclination correction, the micrometer detects angles up to 45° and outputs them via the integrated web interface and digital interfaces. The excellent price-performance ratio rounds off the performance package.

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

The entire configuration of the LED micrometer is carried out without additional software via a user-friendly web interface. The web interface is accessed via an Ethernet connection and enables quick and easy setting of, e.g., averaging or measuring rate and offers extensive parameterization options for every measurement task.

Six presets enable quick and easy set-up for the measurement task. The web interface also offers a scalable black-and-white image for easy alignment. This offers the graphical possibility to optimally position the micrometer or the measuring object.



Simple parameter set up via web interface

The entire configuration of the optoCONTROL 2700 is carried out without additional software via a user-friendly web interface.

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]		15.0 kHz	
Measuring rate ^[3]		5.0 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 ambient 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 2 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 and 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

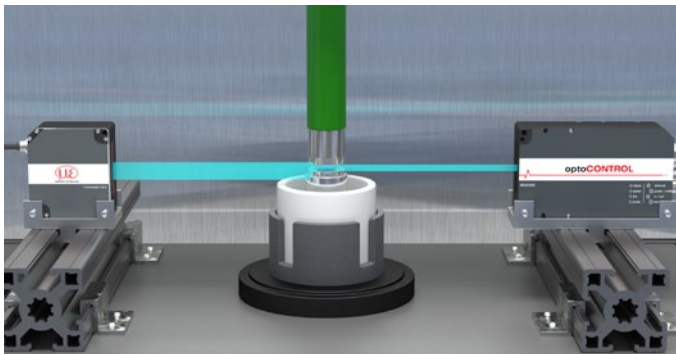
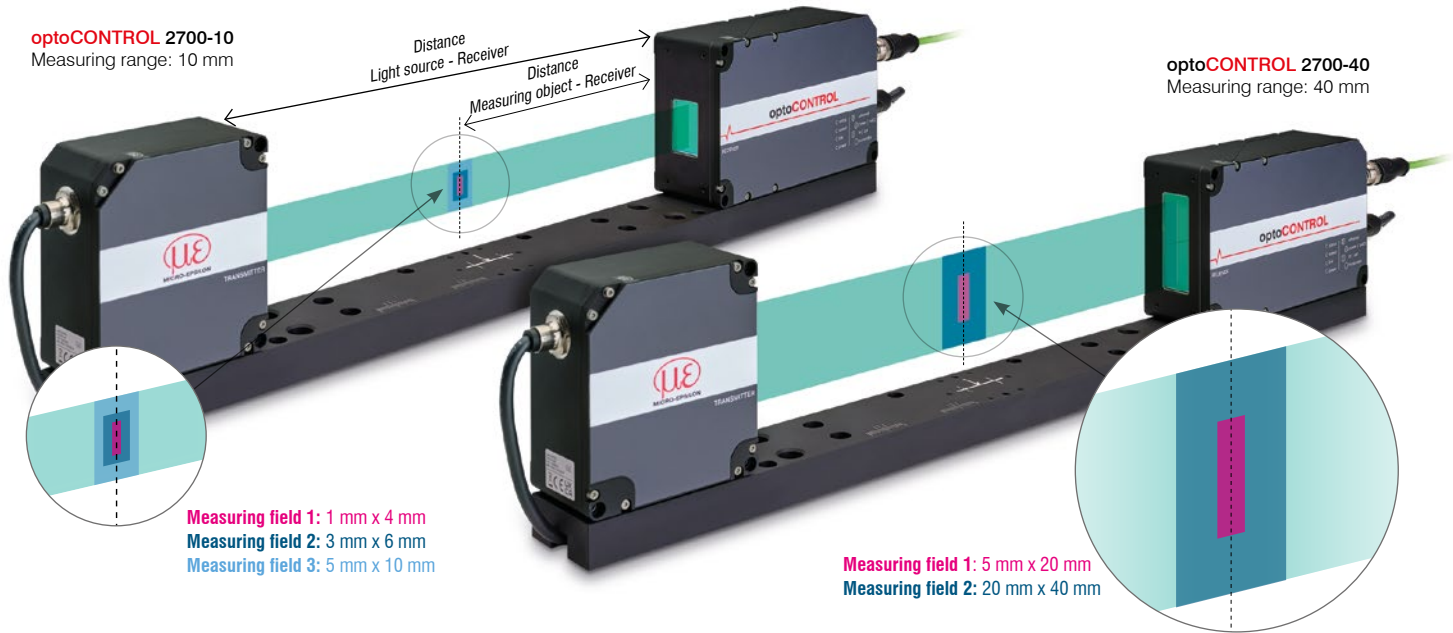
^[9] EtherCAT, PROFINET and EtherNet/IP: Connection via interface module (see accessories) directly in the sensor "on board"

^[10] Relative humidity % 5 ... 95 (non-condensing)

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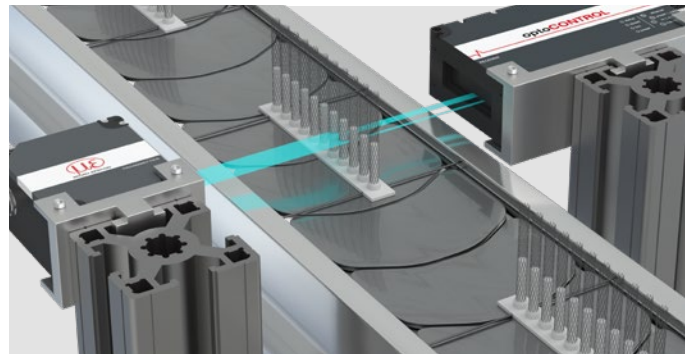
Highest linearity

The optoCONTROL 2700 offers two measuring ranges of 10 and 40 mm. The micrometer achieves its maximum precision in the mid of the measuring range. In measuring field 1, the ODC2700-10 provides an excellent linearity of $0.5\ \mu\text{m}$. The ODC2700-40 offers a linearity of $1\ \mu\text{m}$.



Brake gap measurement on the roller shutter motor

Brake gaps prevent uncontrolled closing of roller shutter motors. The brake gap is created mechanically after a punch has pressed the corresponding parts together. The resulting gap can be measured using the ODC2700-10 so that all quality and safety requirements are met.



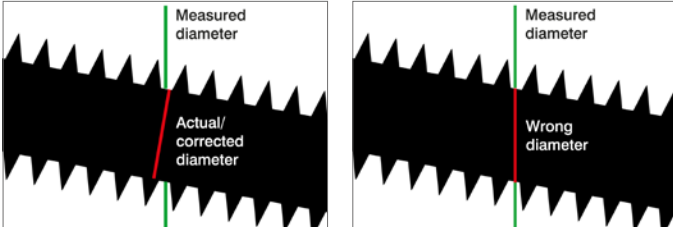
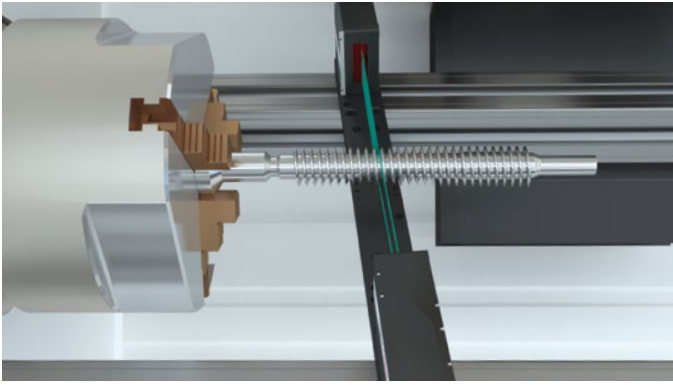
Measurement of the outer diameter of the stent

Stents are medical implants that are made of metal or synthetic fibers in a tubular form. An ODC2700-10 is used to determine the exact outer diameter of the non-dilated stent. The stent is attached to a glass or carbon tube and pushed into the beam path of the micrometer. The optimal outer diameter ensures that the stents function optimally during use.



Stable measurement of vibrating measuring objects

The extremely short exposure time of $8.5\ \mu\text{s}$ easily enables precise measurements of objects that vibrate or move at high speed through the light curtain.

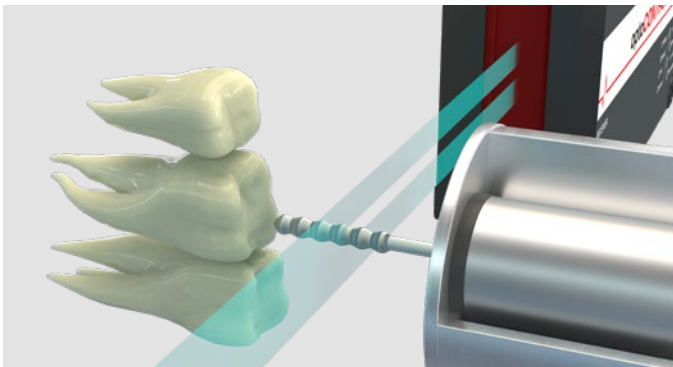


✓ With inclination correction

✗ Without inclination correction

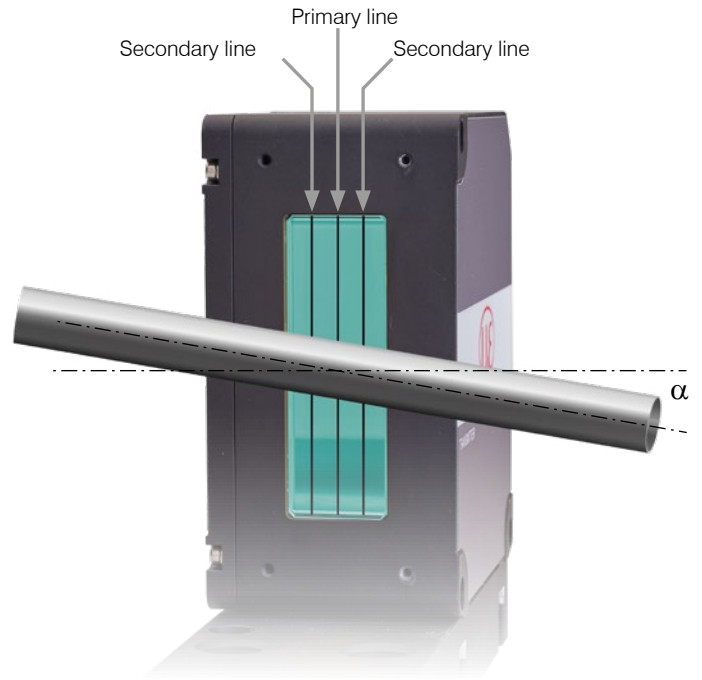
Active inclination correction of the measuring object in real time

The receiver's image matrix records the exact alignment and therefore the angle of the object in the light beam via the primary and secondary lines. The internal controller automatically adjusts the measured value to the inclination of the measured object. As a result, the exact measurement value is output and no measurement error occurs. The inclination correction applies for the entire measuring rate of 5 kHz and can be used in the measuring programs for outside diameter, web edge and contour measurement. In this case, the inclination of the object is corrected during the measurement. The detected image can be output and checked via the web interface. This makes the inclination correction immediately visible to the viewer.



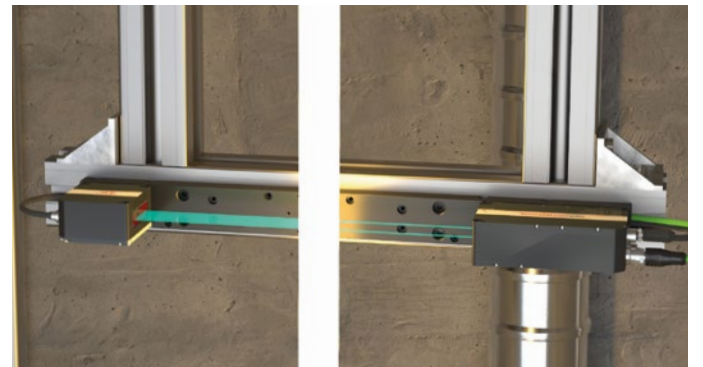
Measurement on the rotating dental drill

A micrometer can be used to measure the diameter of milling cutters while they are rotating in a machine. Two- or four-cutter blades can have a diameter of 0.5 mm, 1 mm and 2.5 mm. Due to its high measuring rate of 5 kHz, the ODC2700-10 is ideal for this measurement task. Accurate measurement is possible even when the milling cutter is rotating at a high speed. The cutter breaks through the light curtain of the ODC and casts a shadow on the receiver line of the ODC. An intelligent controller evaluates the amount of light received and outputs it in the form of an analog or digital value. These values can be used to draw conclusions about the diameters.



Reliable angle measurement of the measuring object to the XY plane

The optoCONTROL 2700 can be used to reliably measure objects in the light beam that are not positioned at an exact 90° angle to the light beam. In addition, the angle is precisely determined via the micrometer's image matrix and output via the integrated controller. This allows angle measurements up to 45°.

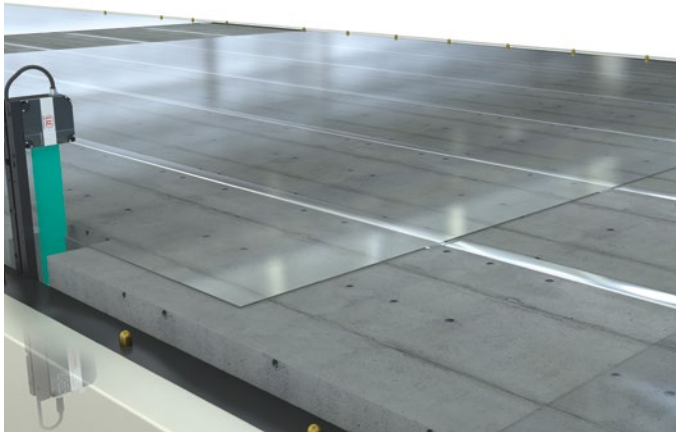


Turquoise LED instead of laser

The optoCONTROL 2700 uses a turquoise LED with a wavelength of 508 nm. The LED offers increased safety, as no laser protection class or laser safety measures are required. In addition, the turquoise LED light source offers significant advantages: The wavelength of 508 nm allows easy measurement of red, glowing red and red-hot objects. It is also possible to measure transparent and organic surfaces and measuring objects, as the short-wave LED light does not penetrate the measuring object, resulting in significantly better stability of the measurement signal.

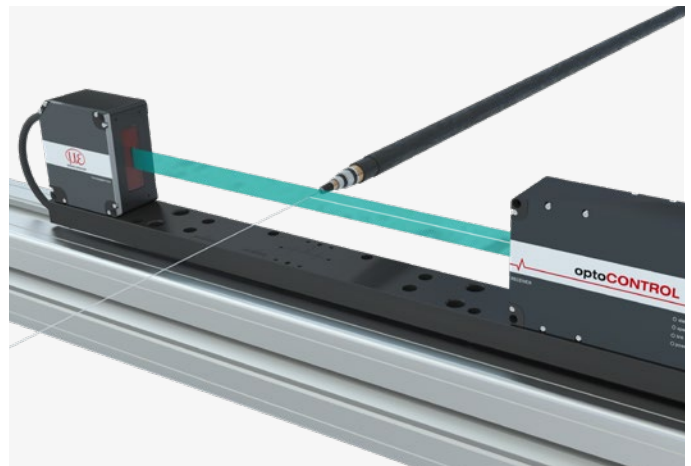
Applications

optoCONTROL 2700



Edge control of glass sheets

The exact positioning of glass sheets in the manufacturing process during separation is a prerequisite for the exact size of the glass pane. Two optoCONTROL 2700 micrometers measure the exact position on both sides of the glass pane and transmit the signal to the production control system. The control unit corrects the exact alignment of the glass sheet based on the position signal.



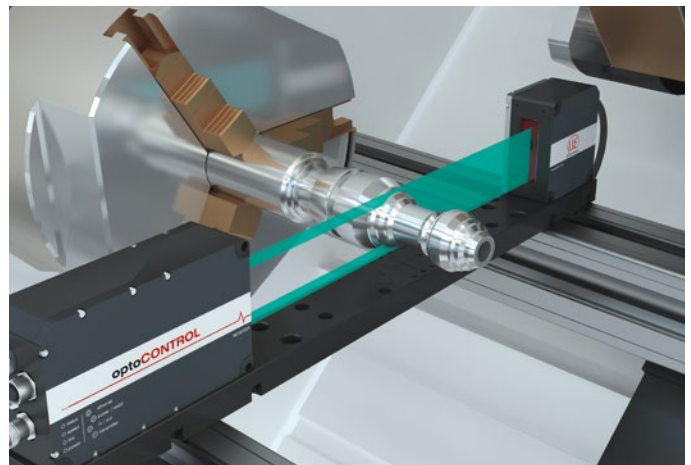
Glass fiber measurement

Glass fibers have extremely small diameters, for example between 30 and 125 μm . In numerous applications, e.g. as optical fibers for data transmission or as a construction material in the form of glass fiber-reinforced plastics, glass fibers must meet particularly high quality demands. The optoCONTROL 2700 micrometer detects individual fibers and determines their diameter in order to meet these high quality requirements.



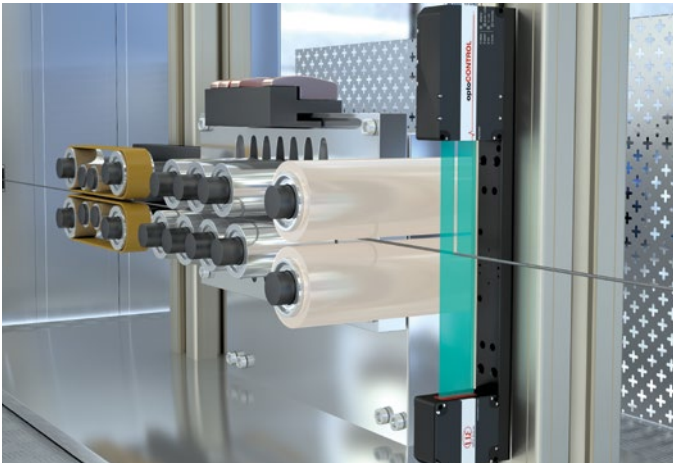
Diameter measurement of extruded products

The optoCONTROL 2700 inspects the thickness of the extruded material directly after the extrusion process. This enables continuous 100% quality inspection of continuous profiles and hoses with a diameter up to 40 mm.



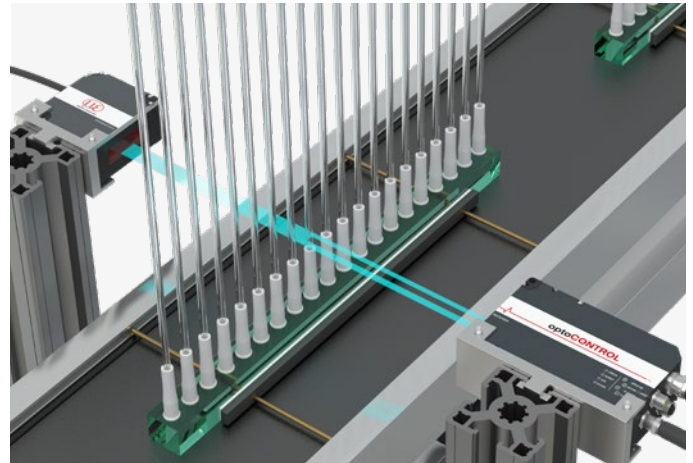
Inline contour measurement of turned parts

The optical and non-contact contour measurement of threads, undercuts or cones on turned shafts enables precise inspection without causing scratches or damage. Turned parts are measured directly in the machine after turning or milling. This makes it possible to analyze the shape and dimensions of all kinds of workpieces.



Wire measurement during wire drawing

Wire drawing is a drawing-by-sliding process in which larger wires are drawn through smaller drawing rings. This gives the wire the shape and cross-sectional dimensions of the drawing ring. The optoCONTROL 2700 checks the diameter of the drawn wire directly after the drawing die. The vibration and high speed of the wire pose no problems due to the high exposure time of $8.5 \mu\text{s}$. The smaller measuring range allows for the finest of wires ($< 50 \mu\text{m}$) to be measured reliably.



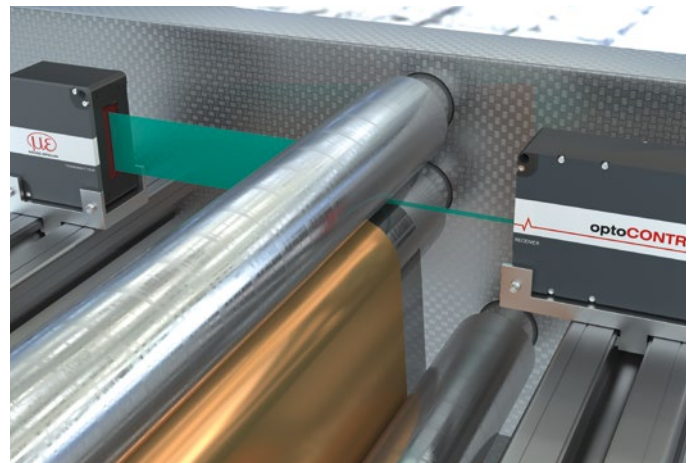
Catheter diameter measurement

Catheters are used in the medical sector to dilate constricted blood vessels. The catheters have different diameters depending on their intended use. The micrometer checks the diameter of the mostly transparent catheters to ensure high quality.



Multi-segment measurement on stainless steel belts

During the continuous slitting of thin cold-rolled aluminum and stainless steel strips with thicknesses of 0.1 and 0.5 mm in the processing line, the width tolerance of the individual steel strips is checked directly after the cutting roll using the optoCONTROL 2700. This enables a 100 % quality check in the production line.



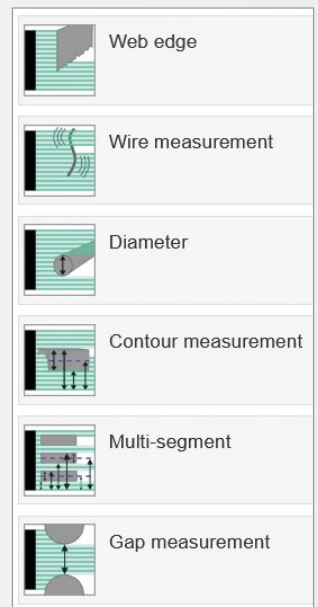
Gap measurement in calender rollers

The measurement of the roller gap is an important factor for controlling and monitoring production in the manufacture of strip and sheet products in calendering systems. The optoCONTROL 2700 optical micrometer can precisely measure the roller gap ($< 50 \mu\text{m}$) during the rolling process for distance control. The pair of rollers is between the light source and the receiver. Due to the automatic inclination correction and angle measurement, the position of the rollers in relation to each other is measured with just one micrometer. The micrometer thus contributes to high material accuracy in numerous rolling processes and avoids material waste.

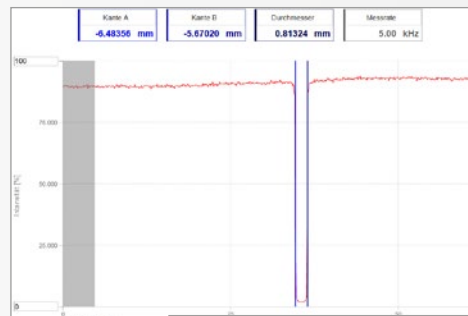
Ease of use via web interface

optoCONTROL 2700

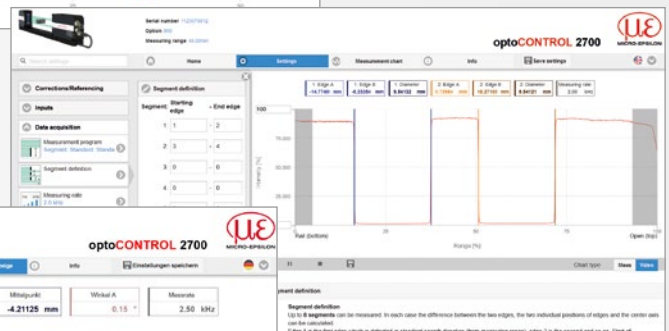
The entire configuration of the optoCONTROL 2700 is performed without additional software via a user-friendly web interface. The web interface is accessed via an Ethernet connection and enables quick and easy setting of, e.g., averaging, measuring rate or presets and offers extensive parameterization options for every measurement task.



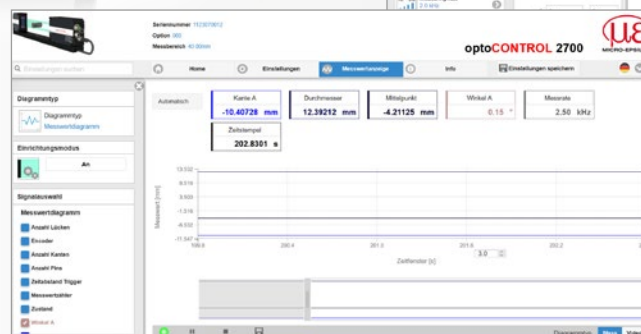
Presets for easy operation



Video signal display



Various parameterization options

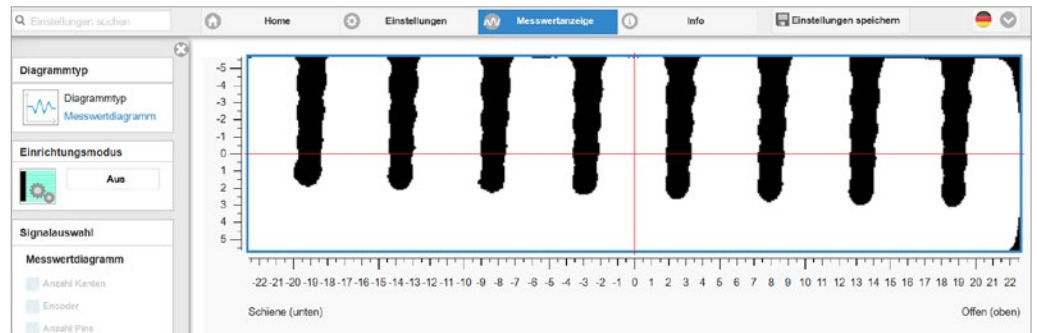


Measurement chart

Strip edge 	For controlling and measuring strip edges, such as paper, glass, sheet metal or film. The signal quality is simply adapted to the material.
Diameter 	For measuring the diameter of cylindrical objects (e.g. dowel pins, bolts, bar stock, pipes, hydraulic lines). The tilt angle of the object in relation to the measurement plane is compensated for in real time by the active inclination correction.
Multi-segment 	For simultaneous measurement of several objects in the beam path (e.g. strips or wires) or for targeted detection of segments selected by the user. The individual definition of user and application-specific segments is possible.
Wire measurement 	For measuring a thin, fast-moving object (e.g. wire). The measurement provides the current measurement value at all times and is therefore insensitive to vibrations.
Contour measurement 	For measuring component contours on a stepped turned part. The lower edge, upper edge, center axis, diameter and the encoder value are detected
Gap measurement 	For measuring the gap between two objects. The width of the gap and the angular deviation of the gap edge are output. Application in roller systems such as calender rollers.

Setup mode / black-and-white image for easy alignment on the measuring object with the aid of scaling

The exact positioning of the measuring object in the light beam is quick and easy due to the set-up mode. The measuring object can be set up via the XY plane using the integrated setup image. This saves the user time and effort when setting up and adjusting the exact position. The mid of the measuring range is shown in both axes by a red line.



Soiling detection

Due to the integrated real-time data analysis, soiling of the lens and distorted measurement results can be detected at an early stage and compensated for accordingly. This prevents micrometer failures or malfunctions.

Via the integrated interfaces, the optoCONTROL 2700 provides information on the degree of soiling on request, e.g. at maintenance intervals. The intelligent evaluation detects even minor soiling, both on the glass panes and in the measuring field. Dust particles or oil splashes, for example, which are invisible to the human eye, are reliably detected. Three types of soiling can be output:

- Clean: no soiling detected in the entire measuring range
- Restricted: detected soiling is in the ignored area
- Contaminated: detected soiling in the relevant area



Integrated controller with integrated Industrial Ethernet in one housing

The light source and receiver of the optoCONTROL 2700 have a compact IP67-certified housing. As no external control unit is required, space is saved in the control cabinet. The wiring and installation work is reduced to a minimum. The micrometer is connected directly to the machine or production environment.

The optoCONTROL 2700 will soon also be equipped with integrated Industrial Ethernet. The micrometer can be integrated directly into Industrial Ethernet systems via EtherCAT, EtherNet/IP and PROFINET without the need for an additional interface module. Signal conversion takes place directly in the integrated controller without additional interface modules.

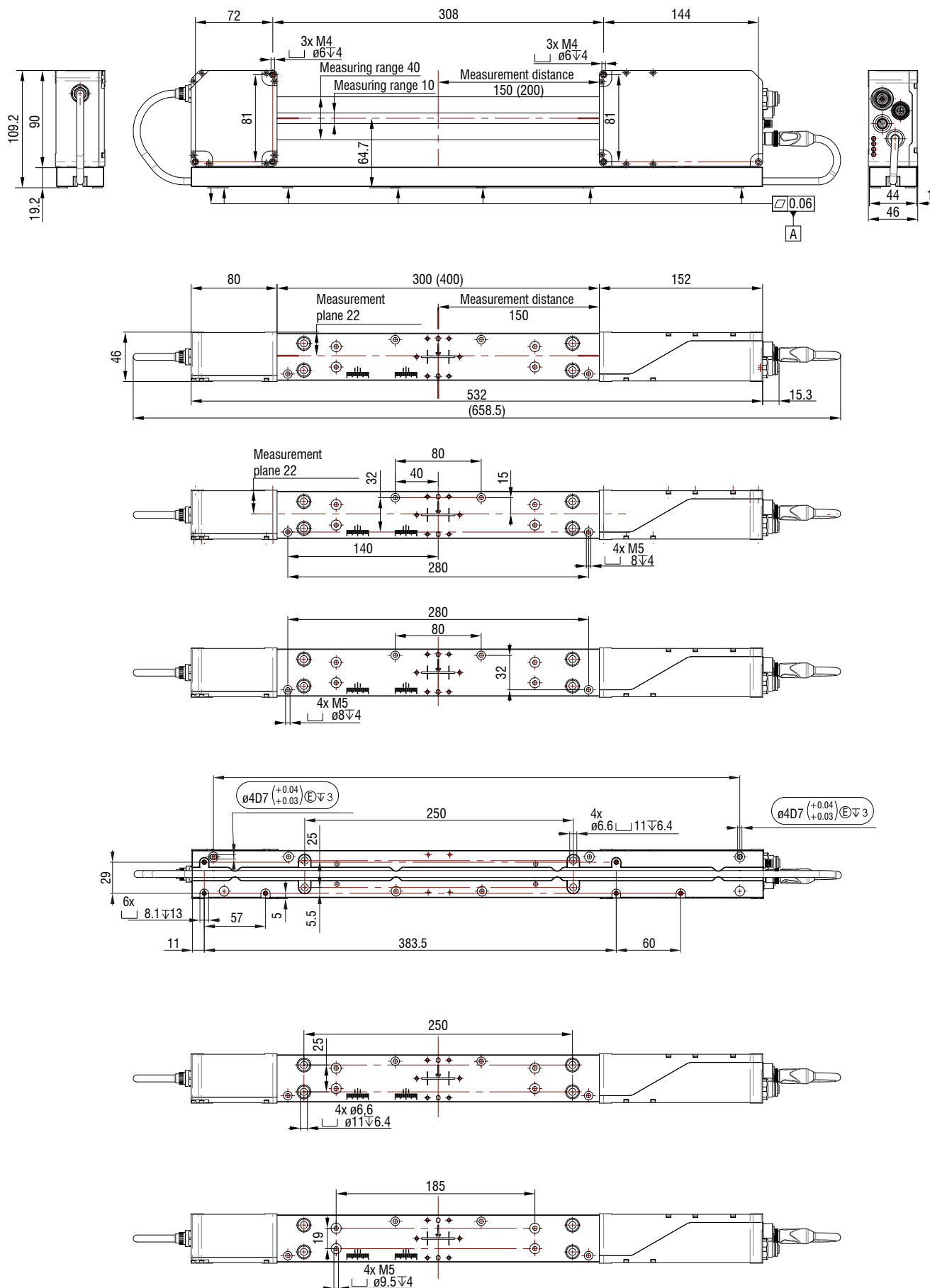
PROFI[®]
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EtherCAT[®]
EtherNet/IP[®]

Technical drawings

optoCONTROL 2700

Dimensional drawing optoCONTROL ODC2700-10 / ODC2700-40

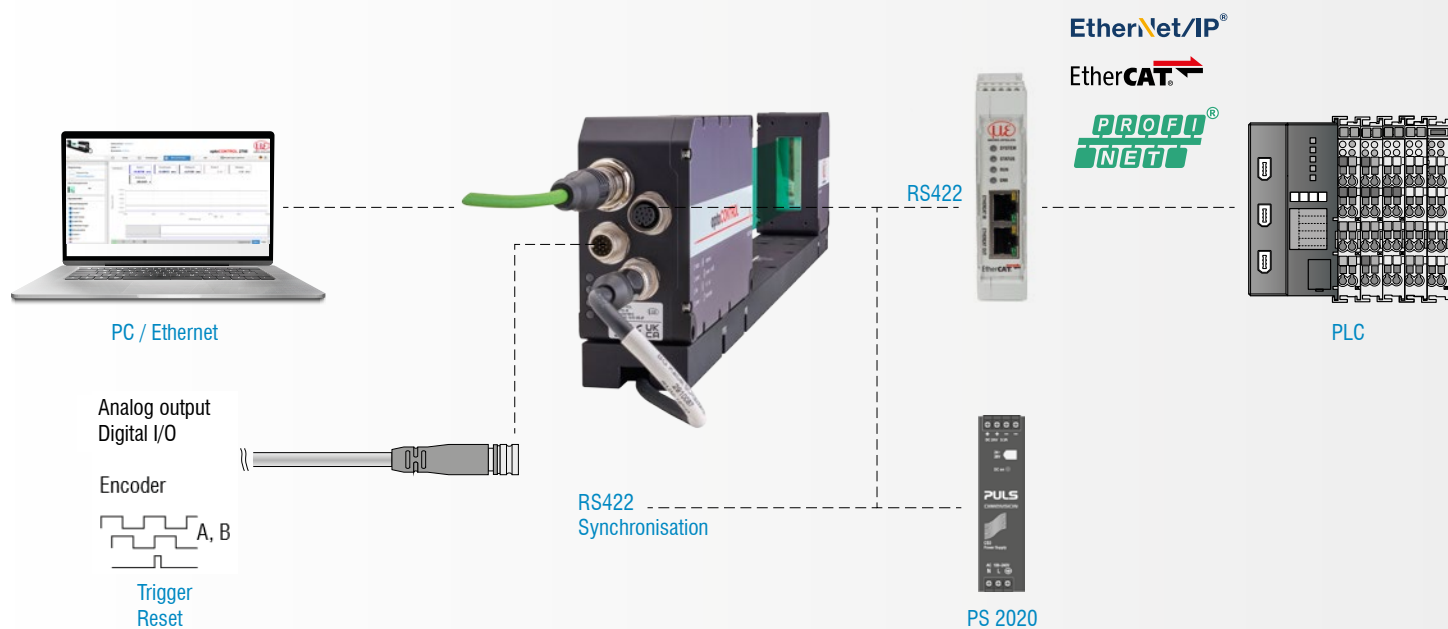


(Dimensions in mm, not to scale)

System structure & accessories

optoCONTROL 2700

System design



Accessories

Art. no.	Designation
29011460	SCD2700-5 M12 Digital output cable EtherCAT, 5 m long
29011457	SCD2700-5 Digital output cable, 5 m long
29011456	SCD2700-3 Digital output cable, 3 m long
29011459	SCD2700-20 Digital output cable, 20 m long
29011458	SCD2700-10 Digital output cable, 10 m long
29011449	SCA2700-5 Output cable, 5 m long
29011448	SCA2700-3 Output cable, 3 m long
29011451	SCA2700-20 Output cable, 20 m long
29011450	SCA2700-10 Output cable, 10 m long
29011453	PC/SC2700-5 Supply, interface and signal cable, 5 m long
29011452	PC/SC2700-3 Supply, interface and signal cable, 3 m long
29011455	PC/SC2700-20 Supply, interface and signal cable, 20 m long
29011454	PC/SC2700-10 Supply, interface and signal cable, 10 m long
2211039	IF2035-PROFINET Interface module for Profinet with top-hat rail housing
2211036	IF2035-EtherCAT Interface module for EtherCAT with top-hat rail housing
2211038	IF2035-EtherNet/IP Interface module for EtherNet/IP with top-hat rail housing

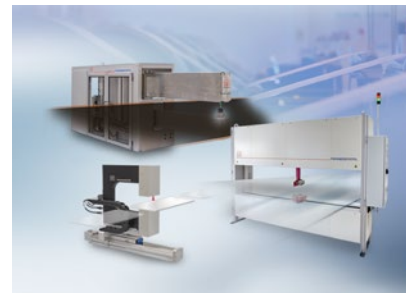
Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



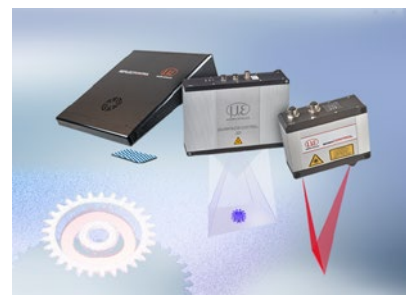
Measuring and inspection systems for metal strips, plastics and rubber



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