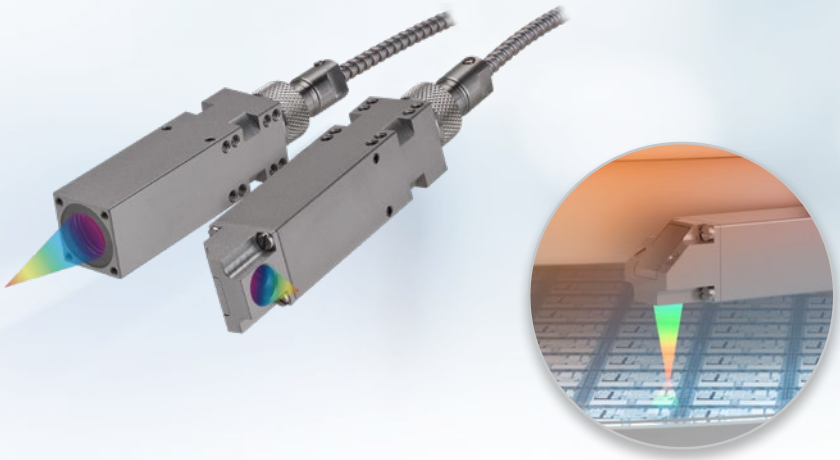
MICRO-EPSILON

More Precision

confocalDT // Confocal chromatic sensor system

Confocal high temperature sensors for environments up to 200 °C
confocalDT IFS2407-xHT/VAC

- Robust and compact sensor design
- Submicron resolution
- High temperature up to 200 °C
- Suitable for vacuum applications up to UHV
- For precise distance and thickness measurements



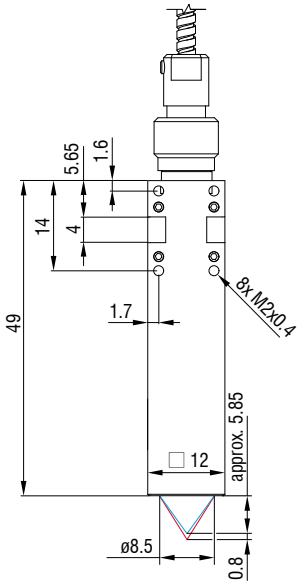
Model		IFS2407-0,8HT/VAC	IFS2407-2HT/VAC	IFS2407/90-2HT/VAC	IFS2407-4HT/VAC	IFS2407/90-4HT/VAC
Measuring range		0.8 mm	2 mm		4 mm	
Start of measuring range	approx.	5.85 mm	14.5 mm	8 mm [1]	14.5 mm	8 mm [1]
Resolution	Static [2]	< 6 nm	< 10 nm		< 24 nm	
	Dynamic [3]	< 45 nm	< 90 nm		< 180 nm	
Linearity [4]	Displacement and distance	< ±0.16 µm	< ±0.4 µm		< ±0.8 µm	
	Thickness	< ±0.35 µm	< ±0.88 µm		< ±1.76 µm	
Temperature stability [5]		<0.015 % FSO / K	<0.005 % FSO / K		<0.01 % FSO / K	
Light spot diameter		11 µm	19 µm		29 µm	
Maximum measuring angle [6]		±30°	±12°		±8°	
Numerical aperture (NA)		0.50	0.28		0.19	
Min. target thickness [7]		0.04 mm	0.1 mm		0.2 mm	
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)				
Connection		pluggable optical fiber via FC socket; for cable type and cable length, see accessories				
Mounting		Clamping / screw connection via four mounting holes M2x0.4				
Temperature range	Storage	-20 ... +200 °C				
	Operation	+5 ... +200 °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)		IP40 (vacuum compatible)				
Material		Stainless steel housing, glass lenses				
Weight [8]		approx. 40 g	approx. 40 g	approx. 50 g	approx. 40 g	approx. 50 g

[1] Start of measuring range measured from sensor axis
[2] Average from 2,048 values at 1 kHz, in the mid of the measuring range onto optical flat
[3] RMS noise relates to mid of measuring range (1 kHz)
[4] All data at constant ambient temperature (25±1 °C). Measurement on plane-parallel test glass. Acceptance report is enclosed with delivery
[5] Depending on the clamping position of the sensor
[6] Maximum sensor measuring angle up to which a usable signal can be achieved on reflective surfaces, with accuracy decreasing toward the limit values
[7] Glass sheet with refractive index n = 1.5 throughout the entire measuring range. In the mid of the measuring range, also thinner layers can be measured.
[8] Sensor weight without optical fiber

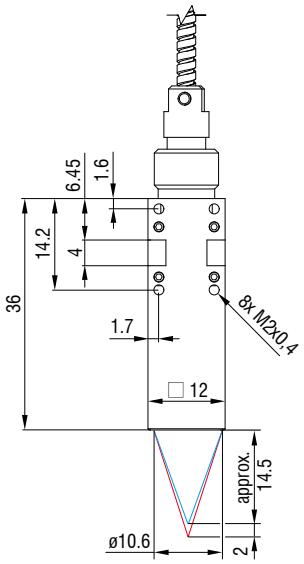
Dimensions

(in mm, not to scale)

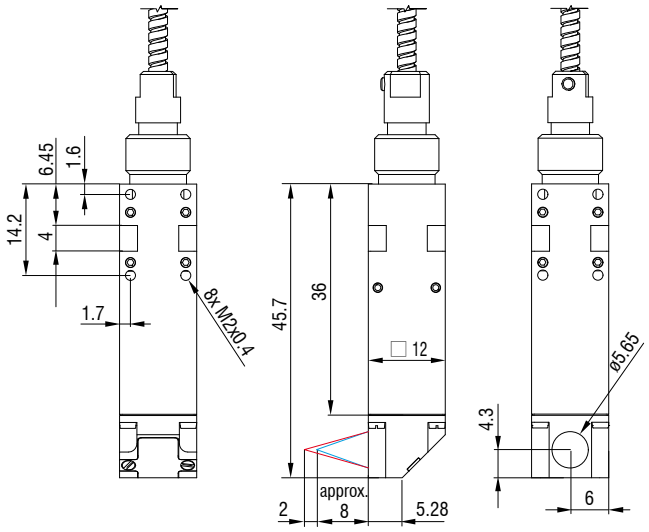
IFS2407-0,8HT/VAC



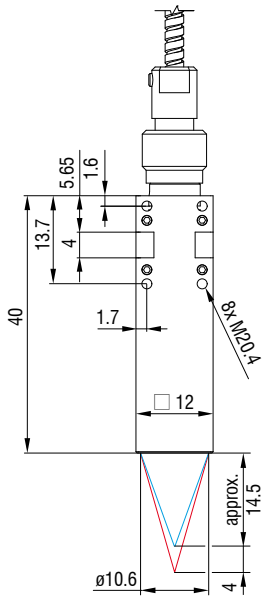
IFS2407-2HT/VAC



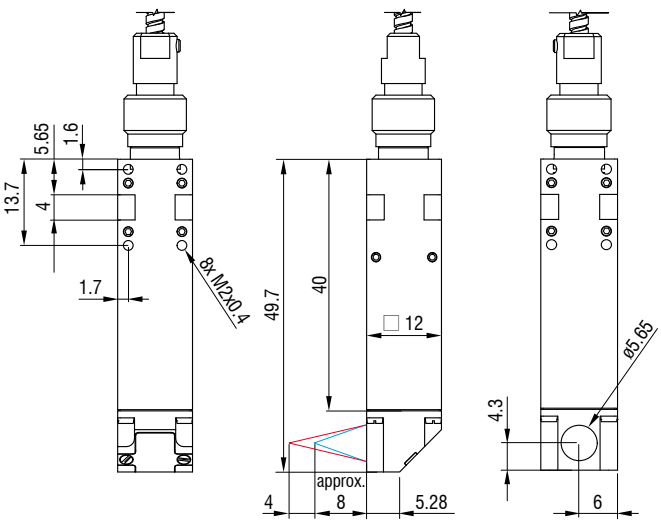
IFS2407/90-2HT/VAC



IFS2407-4HT/VAC

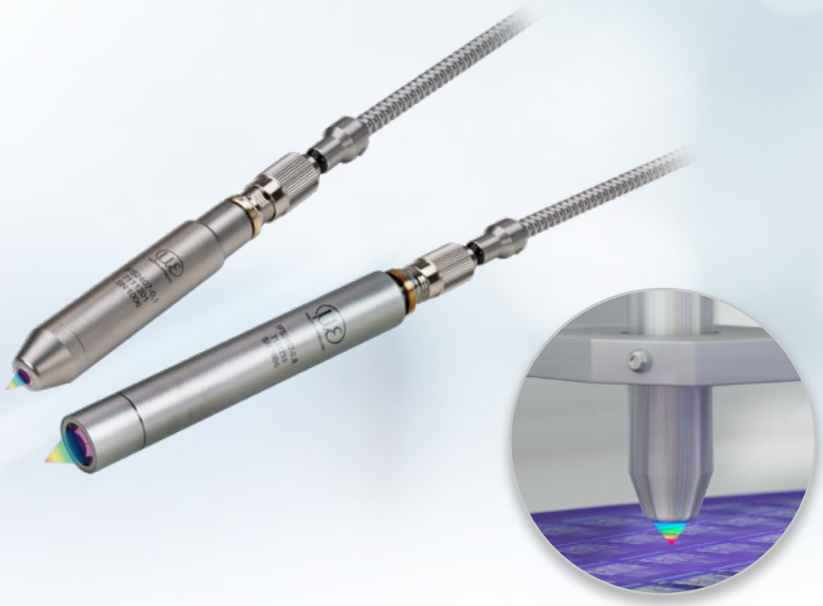


IFS2407/90-4HT/VAC



High precision sensors for displacement and thickness measurements
confocalDT IFS2407

- Compact sensors from ø12 mm
- Submicron resolution
- For one-sided thickness measurements
- Suitable for precise distance measurements
- Very small light spot
- Large tilt angle



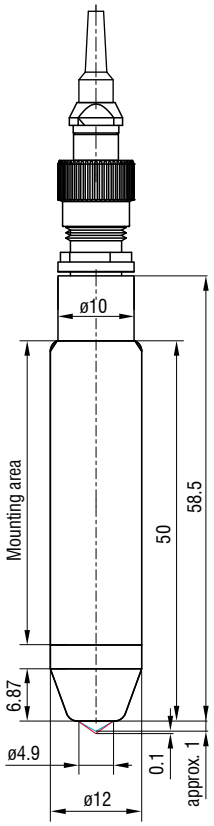
Model		IFS2407-0.1	IFS2407-0.1(001)	IFS2407-0.8
Measuring range		0.1 mm	0.1 mm	0.8 mm
Start of measuring range	approx.	1 mm	1 mm	5.9 mm
Resolution	Static [1]	< 1 nm	< 1 nm	< 9 nm
	Dynamic [2]	< 6 nm	< 6 nm	< 75 nm
Linearity [3]	Displacement and distance	< ±0.04 µm	< ±0.04 µm	< ±0.2 µm
	Thickness	-	-	< ±0.4 µm
Light spot diameter		3 µm	4 µm	6 µm
Maximum measuring angle [4]		±48°	±48°	±30°
Numerical aperture (NA)		0.80	0.70	0.50
Min. target thickness [5]		0.005 mm	0.005 mm	0.04 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		pluggable optical fiber via FC socket; for cable type and cable length, see accessories		
Mounting		Radial clamping (mounting adapter see accessories)		
Temperature range	Storage	-20 °C ... +70 °C		
	Operation	+5 °C ... +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)		IP65 (front)		
Material		Stainless steel housing, glass lenses		
Weight [6]		approx. 36 g	approx. 36 g	approx. 40 g
Special features		Sensor with high numerical aperture	Light-intensive sensor	-

[1] Average from 2,048 values at 1 kHz, in the mid of the measuring range onto optical flat
[2] RMS noise relates to mid of measuring range (1 kHz)
[3] All data at constant ambient temperature (25±1 °C). Measurement on plane-parallel test glass. Acceptance report is enclosed with delivery
[4] Maximum sensor measuring angle up to which a usable signal can be achieved on reflective surfaces, with accuracy decreasing toward the limit values
[5] Glass sheet with refractive index n = 1.5 throughout the entire measuring range. In the mid of the measuring range, also thinner layers can be measured.
[6] Sensor weight without optical fiber

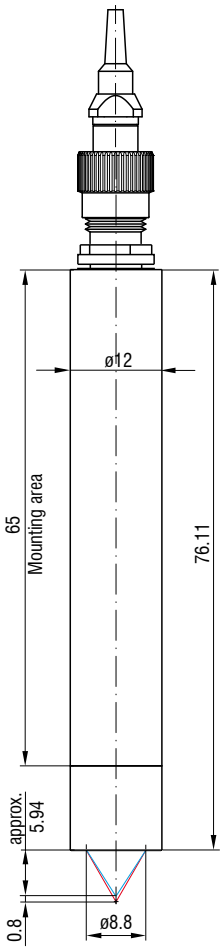
Dimensions

(in mm, not to scale)

IFS2407-0.1
IFS2407-0.1(001)



IFS2407-0.8



High precision sensors for displacement and thickness measurements
confocalDT IFS2407

- Compact sensors from ø12 mm
- Submicron resolution
- For one-sided thickness measurements
- Suitable for precise distance measurements
- Very small light spot
- Large tilt angle

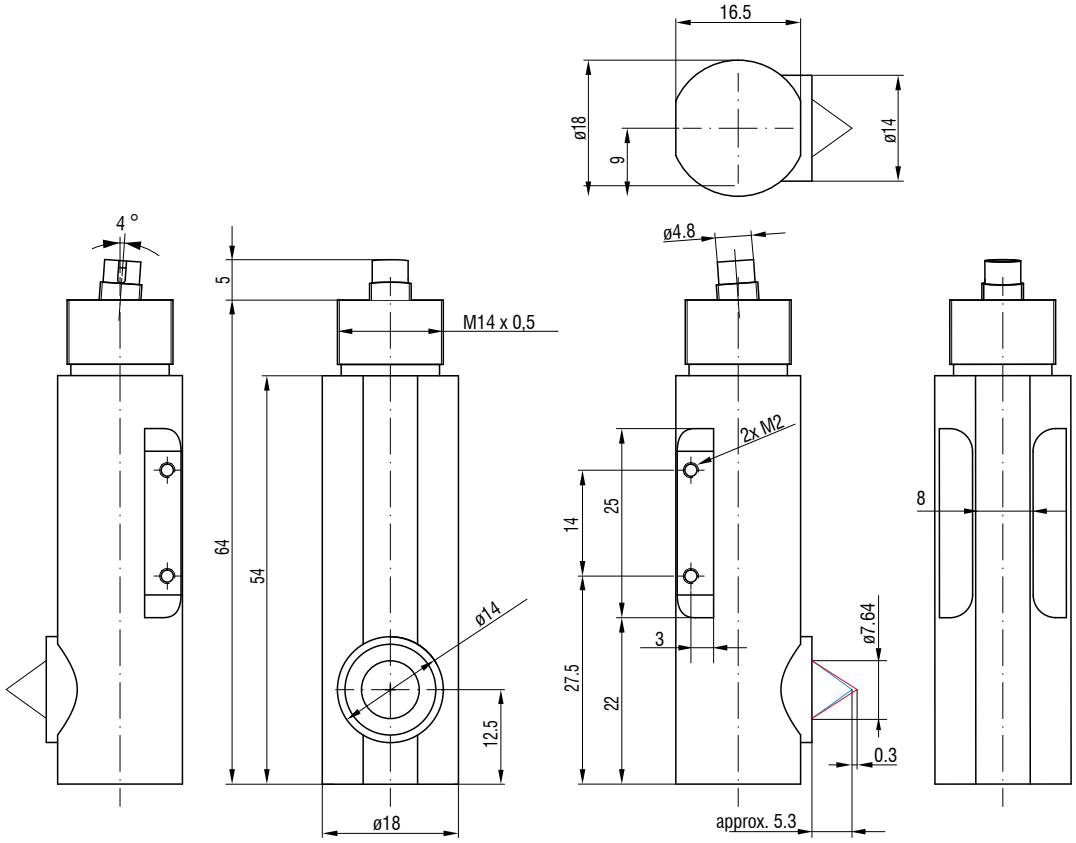
Model		IFS2407/90-0.3	IFS2407-1.5	IFS2407-3	IFS2407-6
Measuring range		0.3 mm	1.5 mm	3 mm	6 mm
Start of measuring range	approx.	5.3 mm	17 mm	28 mm	32 mm
Resolution	Static [1]	< 3 nm	< 3 nm	< 7 nm	< 8 nm
	Dynamic [2]	< 20 nm	< 36 nm	< 63 nm	< 90 nm
Linearity [3]	Displacement and distance	< ±0.10 µm	< ±0.16 µm	< ±0.45 µm	≤ ±0.9 µm
	Thickness	< ±0.20 µm	< ±0.4 µm	< ±0.9 µm	≤ ±1.8 µm
Light spot diameter		6 µm	5.5 µm	9 µm	14 µm
Maximum measuring angle [4]		±27°	±43° (±70°) [5]	±30°	±23°
Numerical aperture (NA)		0.50	0.70	0.53	0.45
Min. target thickness [6]		0.015 mm	0.075 mm	0.15 mm	0.3 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)			
Connection		pluggable optical fiber via FC socket; for cable type and cable length, see accessories			
Mounting		Mounting holes (2x M2)	Radial clamping (mounting adapter see accessories)		
Temperature range	Storage	-20 °C... +70 °C			
	Operation	+5 °C... +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)		IP65 (front)			
Material		Stainless steel housing, glass lenses	Aluminum housing, glass lenses		
Weight [7]		approx. 30 g	approx. 800 g	approx. 550 g	approx. 350 g

[1] Average from 2,048 values at 1 kHz, in the mid of the measuring range onto optical flat
[2] RMS noise relates to mid of measuring range (1 kHz)
[3] All data at constant ambient temperature (25±1 °C). Measurement on plane-parallel test glass. Acceptance report is enclosed with delivery
[4] Maximum sensor measuring angle up to which a usable signal can be achieved on reflective surfaces, with accuracy decreasing toward the limit values
[5] Maximum sensor measuring angle up to which a usable signal can be achieved on diffusely reflecting metallic surfaces, with accuracy decreasing toward the limit values
[6] Glass sheet with refractive index n = 1.5 throughout the entire measuring range. In the mid of the measuring range, also thinner layers can be measured.
[7] Sensor weight without optical fiber

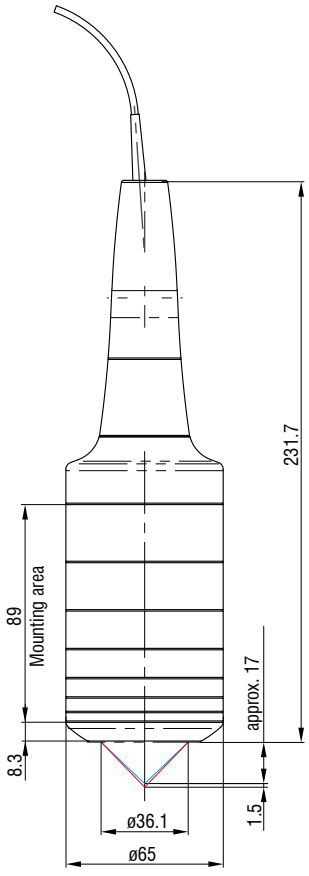
Dimensions

(in mm, not to scale)

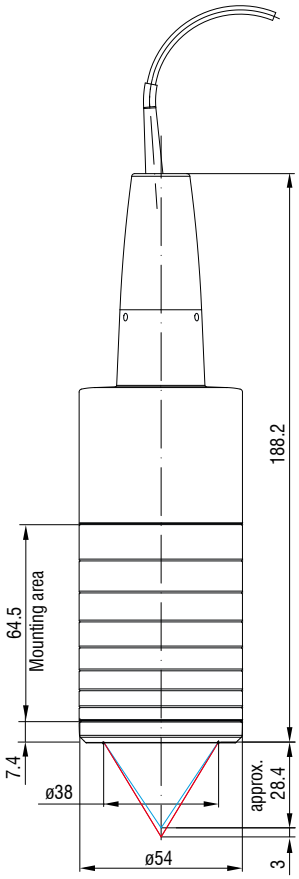
IFS2407/90-0,3



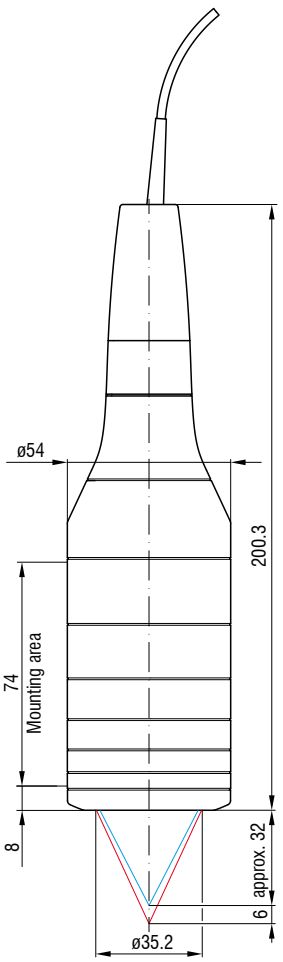
IFS2407-1,5



IFS2407-3

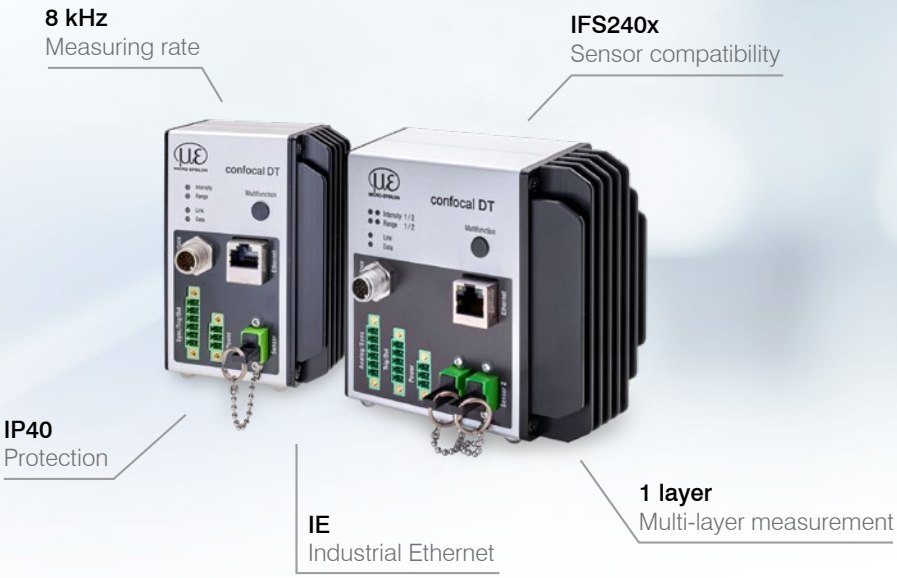


IFS2407-6



Compact confocal chromatic controllers for industrial series applications
confocalDT IFC2411 / IFC2412

- Most compact confocal controller on the market
- Nanometer resolution for precise distance and thickness measurements
- INTER FACE — Flexible integration via Ethernet, RS422 or analog output (U/I)
- Direct PLC connection due to Industrial Ethernet
- IP40 — Robust aluminum housing (IP40)
- Best price — Excellent price-performance ratio



Powerful confocal chromatic controllers

The IFC2411 and IFC2412 controllers set new standards in non-contact distance and thickness measurements. The most compact confocal chromatic controllers currently available deliver impressive results with high-precision measurements at high speeds. Their unique design makes these controllers ideal for easy integration into existing plants and systems. They can be quickly mounted on a DIN rail and fit into even the smallest control cabinets.

One controller – two channels with full performance

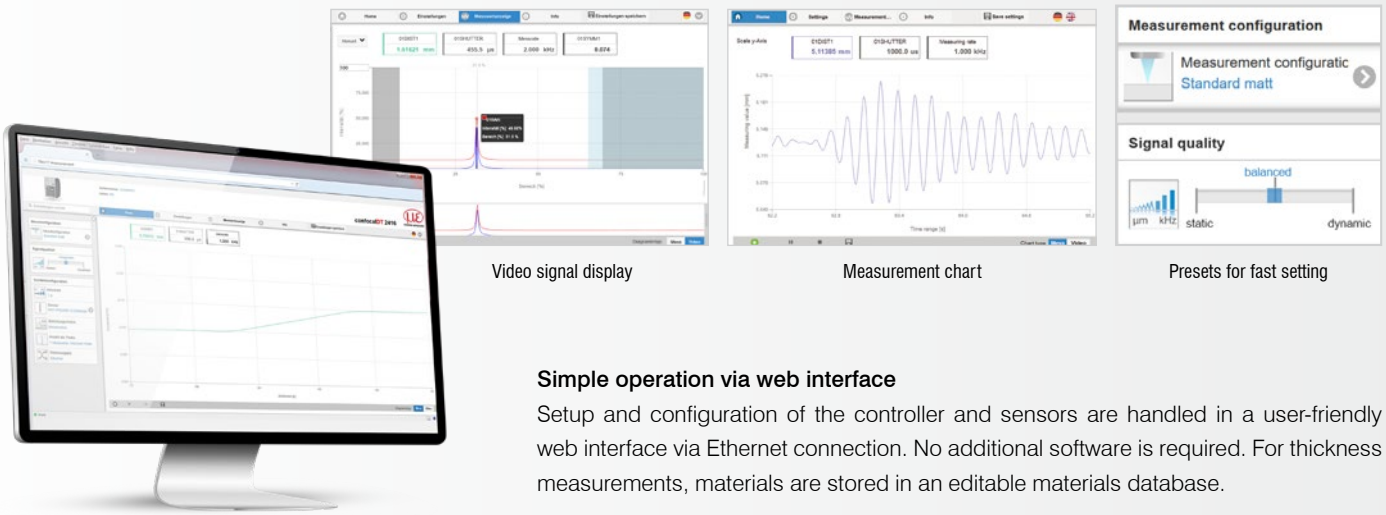
With the dual-channel version confocalDT IFC2412, integrated calculation functions enable the data combination of both channels, for example for thickness measurements of battery film. The measured values are recorded synchronously and at full measuring rate for both channels.

Maximum sensor variety, numerous application options

The flexible connection of various sensors enables measurements on almost all surfaces as well as one-sided thickness measurements on transparent objects. Micro-Epsilon's extensive sensor portfolio covers measuring ranges from 0.1 mm to 30 mm. In addition, the sensors are available for use in high-temperature environments and in a vacuum.

Developed for industrial production, OEMs and automation

Diverse interfaces enable flexible integration into machines and systems. The robust IP40 aluminum housing provides reliable protection in industrial environments for maximum precision and signal stability. These systems impress in series and OEM applications with their outstanding performance and excellent price-performance ratio.



Video signal display | Measurement chart | Presets for fast setting

Simple operation via web interface

Setup and configuration of the controller and sensors are handled in a user-friendly web interface via Ethernet connection. No additional software is required. For thickness measurements, materials are stored in an editable materials database.

Model		IFC2411	IFC2411/IE
Resolution	Ethernet	1 nm	-
	Industrial Ethernet	-	1 nm
	RS422	18 bit	
	Analog	16 bits (teachable)	
Measuring rate		Continuously adjustable from 100 Hz to 8 kHz	
Linearity [1]		typ. < ±0.02 % FSO (depends on sensor)	
Multi-peak measurement		1 layer	
Light source		Internal white LED	
No. of characteristic curves		up to 10 characteristic curves for different sensors per channel, selection via table in the menu	
Permissible extraneous light [2]		30.000 lx	
Synchronization		yes	
Supply voltage		24 VDC ±10 %	
Power consumption		< 7 W (24V)	
Signal input		sync-in / trig-in; 1x encoder (A+, A-, B+, B-, index)	
Digital interface [3]		Ethernet / RS422	EtherCAT / PROFINET / Ethernet/IP / RS422
Analog output		Current: 4 … 20 mA; voltage: 0 ... 5V & 0 … 10 V (16 bit D/A converter)	
Digital output		Sync-out	
Connection	Optical	pluggable optical fiber via E2000 socket, length 2 m ... 50 m, min. bending radius 30 mm	
	Electrical	3-pin supply terminal block; 6-pin I/O terminal block (max. cable length 30 m); 17-pin M12 connector for RS422, analog and encoder; RJ45 connector for Ethernet) (max. cable length 100 m)	3-pin supply terminal block; 5-pin I/O terminal block (max. cable length 30 m); 17-pin M12 connector for RS422, analog and encoder; RJ45 connector for Industrial Ethernet (max. cable length 100 m)
Mounting		free-standing, DIN rail mounting	
Temperature range	Storage	-20 … +70 °C	
	Operation	+5 … +50 °C	
Shock (DIN EN 60068-2-27)		15 g/6 ms on XYZ axis, 1000 shocks each	
Vibration (DIN EN 60068-2-6)		2 g / 20 ... 500 Hz in XYZ axis, 10 cycles each	
Protection class (DIN EN 60529)		IP40	
Material		Aluminum	
Weight		approx. 335 g	
Compatibility		compatible with all confocalDT sensors	
No. of measurement channels		1	
Control and indicator elements		Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for intensity, range, link and data	Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for Intensity, Range, RUN and ERR

[1] FSO = Full Scale Output
[2] Illuminant: light bulb
[3] The controller can also be parameterized via Ethernet

Compact confocal chromatic controllers for industrial series applications
confocalDT IFC2411 / IFC2412

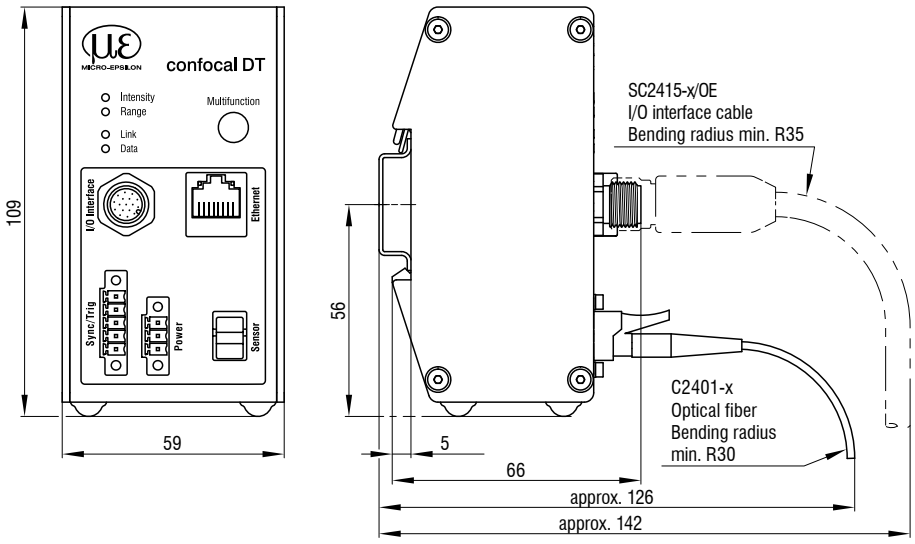
Model		IFC2412	IFC2412/IE
Resolution	Ethernet	1 nm	-
	Industrial Ethernet	-	1 nm
	RS422	18 bit	18 bit
	Analog	16 bits (teachable)	16 bits (teachable)
Measuring rate		Continuously adjustable from 100 Hz to 8 kHz	
Linearity [1]		typ. < ±0.02 % FSO (depends on sensor)	
Multi-peak measurement		1 layer	
Light source		Internal white LED	
No. of characteristic curves		Storage of up to 10 characteristic curves for different sensors per channel, selection via table in the menu	
Permissible ambient light [2]		30.000 lx	
Synchronization		yes	
Supply voltage		24 VDC ±10 %	
Power consumption		< 9 W (24V)	
Signal input		Sync-In / trig-In; 2 encoders (A+, A-, B+, B-, Index) | 3 encoders (A+, A-, B+, B-)	
Digital interface		Ethernet / RS422	EtherCAT / RS422
Analog output		2x freely selectable (16 bit D/A converter) Current: 4 … 20 mA; voltage: 0 … 5 V & 0 … 10 V	
Digital output		Sync-out	
Connection	Optical	pluggable optical fiber via E2000 socket, length 2 m ... 50 m, min. bending radius 30 mm	
	Electrical	3-pin supply terminal block; 5-pin terminal for Out/Trig; 6-pin I/O terminal block (max. cable length 30 m); 17-pin M12 connector for RS422, analog and encoder; RJ45 connector for Ethernet) (max. cable length 100 m)	
Mounting		free-standing, DIN rail mounting	
Temperature range	Storage	-20 … +70 °C	
	Operation	+5 … +50 °C	
Shock (DIN EN 60068-2-27)		15 g/6 ms on XYZ axis, 1000 shocks each	
Vibration (DIN EN 60068-2-6)		2 g / 20 ... 500 Hz in XYZ axis, 10 cycles each	
Protection class (DIN EN 60529)		IP40	
Material		Aluminum	
Weight		670 g	670 g
Compatibility		compatible with all confocalDT sensors	
No. of measurement channels		2	2
Control and indicator elements		Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for intensity, range, link and data	Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for Intensity, Range, RUN and ERR

[1] FSO = Full Scale Output
[2] Illuminant: light bulb

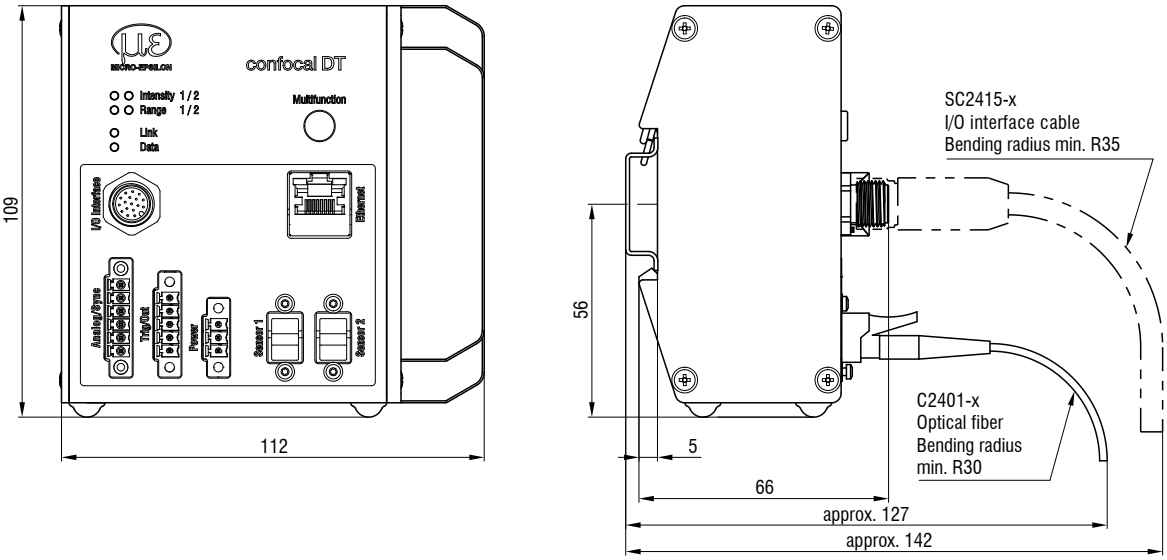
Dimensions

(in mm, not to scale)

confocalDT IFC2411



confocalDT IFC2412



Compact confocal controllers for precise and fast inline processes
confocalDT IFC2416 / IFC2417

- Nanometer resolution for highest precision
- Ideal for extremely fast distance and thickness measurements up to 25 kHz
- Multi-peak: up to 5 layers with one measurement
- Best signal quality and stability due to high light intensity
- Flexible integration via Ethernet, RS422 or analog output
- Compact design and robust IP40 aluminum housing

Compact housing – maximum speed & precision

The confocal chromatic controllers IFC2416 and IFC2417 feature a high measuring rate of 25 kHz and enormous light intensity. This enables stable and precise measurements at high speed on various materials and surfaces.

These compact controllers are used for high-resolution distance and thickness measurements in all areas of industry. Thanks to the multi-peak option, multi-layer measurements of transparent objects with up to 5 layers are possible.

One controller – two channels with full performance

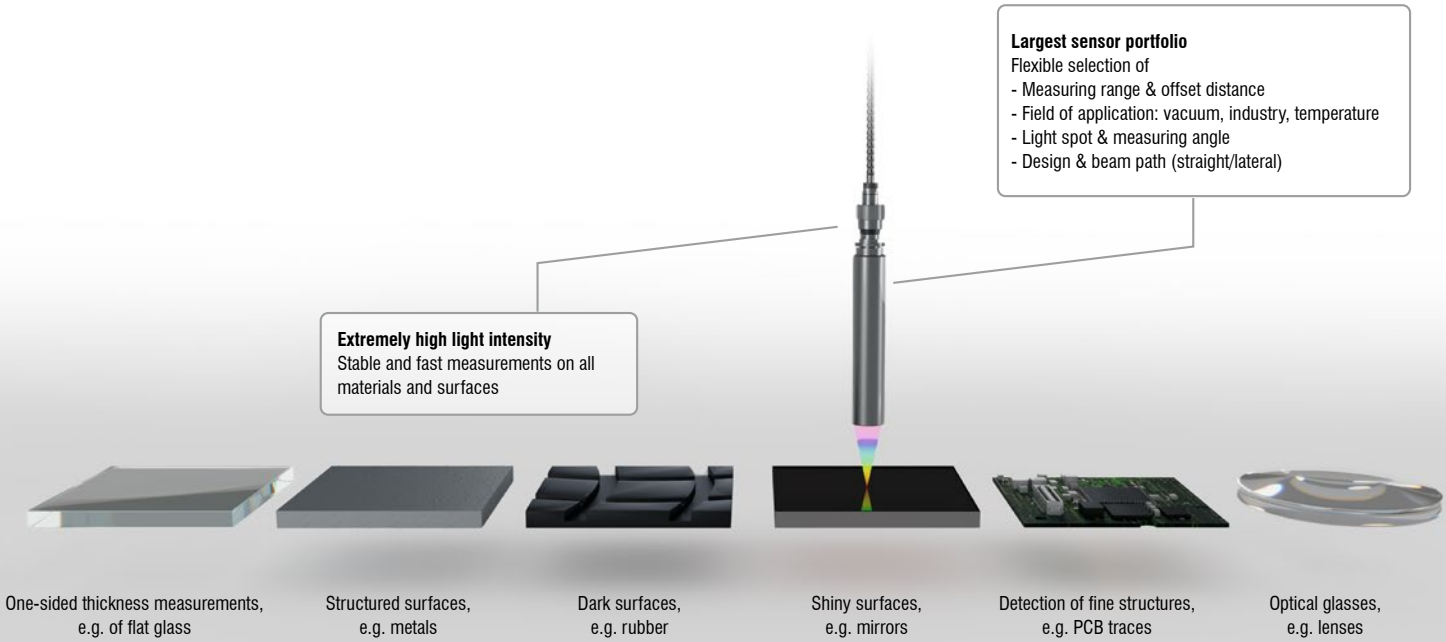
With the dual-channel version confocalDT IFC2417, integrated calculation functions enable the data combination of both channels, for example for thickness measurements of battery film. The measured values are recorded synchronously and at full measuring rate for both channels.

Flexible choice of sensor for a wide range of applications

The flexible connection of various sensors enables measurements on almost all surfaces as well as one-sided thickness measurements on transparent objects. Micro-Epsilon's extensive sensor portfolio covers measuring ranges from 0.1 mm to 30 mm. In addition, sensors are available for use in high-temperature environments and in a vacuum.

Robustness and ease of integration

The powerful controllers are optimally protected in a compact IP40 aluminum housing for easy integration into machines and production lines. Several interfaces are available for integration purposes. In addition to Ethernet and RS422, analog signals can be output as current or voltage values. In addition, encoder inputs as well as a synchronization and switching output support optimal process control.



Model		IFC2416
Resolution	Ethernet	1 nm
	RS422	18 bit
	Analog	16 bits (teachable)
Measuring rate		Continuously adjustable from 100 Hz to 25 kHz
Linearity [1]		typ. < ±0.02 % FSO (depends on sensor)
Multi-peak measurement		5 layers
Light source		Internal white LED
No. of characteristic curves		up to 10 characteristic curves for different sensors per channel, selection via table in the menu
Permissible ambient light [2]		30.000 lx
Synchronization		yes
Supply voltage		24 VDC ±10 %
Power consumption		< 9 W (24V)
Signal input		Sync-In / trig-In; 2 encoders (A+, A-, B+, B-, Index) | 3 encoders (A+, A-, B+, B-)
Digital interface		Ethernet / RS422
Analog output		Current: 4 … 20 mA; voltage: 0 ... 5V & 0 … 10 V (16 bit D/A converter)
Digital output		Sync-out; error-out
Connection	Optical	pluggable optical fiber via E2000 socket, length 2 m ... 50 m, min. bending radius 30 mm
	Electrical	3-pin supply terminal block; 6-pin I/O terminal block (max. cable length 30 m); 17-pin M12 connector for RS422, analog and encoder; RJ45 connector for Ethernet) (max. cable length 100 m)
Mounting		free-standing, DIN rail mounting
Temperature range	Storage	-20 … +70 °C
	Operation	+5 … +50 °C
Shock (DIN EN 60068-2-27)		15 g/6 ms on XYZ axis, 1000 shocks each
Vibration (DIN EN 60068-2-6)		2 g / 20 ... 500 Hz in XYZ axis, 10 cycles each
Protection class (DIN EN 60529)		IP40
Material		Aluminum
Weight		approx. 460 g
Compatibility		compatible with all confocalDT sensors
No. of measurement channels		1
Control and indicator elements		Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for intensity, range, link and data

[1] FSO = Full Scale Output
[2] Illuminant: light bulb

Compact confocal controllers for precise and fast inline processes
confocalDT IFC2416 / IFC2417

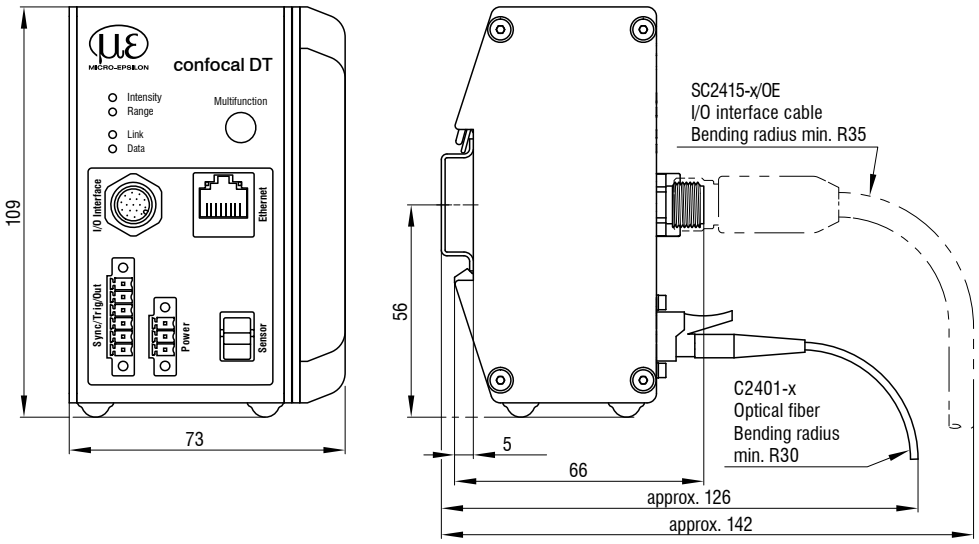
Model		IFC2417	IFC2417/IE
Resolution	Ethernet	1 nm	-
	Industrial Ethernet	-	1 nm
	RS422	18 bit	18 bit
	Analog	16 bits (teachable)	16 bits (teachable)
Measuring rate		Continuously adjustable from 100 Hz to 25 kHz	
Linearity [1]		typ. < ±0.02 % FSO (depends on sensor)	
Multi-peak measurement		5 layers	
Light source		Internal white LED	
No. of characteristic curves		Storage of up to 10 characteristic curves for different sensors per channel, selection via table in the menu	
Permissible ambient light [2]		30.000 lx	
Synchronization		yes	
Supply voltage		24 VDC ±10 %	
Power consumption		< 12 W (24V)	
Signal input		Sync-In / trig-In; 2 encoders (A+, A-, B+, B-, Index) | 3 encoders (A+, A-, B+, B-)	
Digital interface		Ethernet / RS422	EtherCAT / RS422
Analog output		2x freely selectable (16 bit D/A converter) Current: 4 … 20 mA; voltage: 0 … 5 V & 0 … 10 V	
Digital output		Sync-out; error-out	
Connection	Optical	pluggable optical fiber via E2000 socket, length 2 m ... 50 m, min. bending radius 30 mm	
	Electrical	3-pin supply terminal block; 5-pin terminal for Out/Trig; 6-pin I/O terminal block (max. cable length 30 m); 17-pin M12 connector for RS422, analog and encoder; RJ45 connector for Ethernet) (max. cable length 100 m)	
Mounting		free-standing, DIN rail mounting	
Temperature range	Storage	-20 … +70 °C	
	Operation	+5 … +50 °C	
Shock (DIN EN 60068-2-27)		15 g/6 ms on XYZ axis, 1000 shocks each	
Vibration (DIN EN 60068-2-6)		2 g / 20 ... 500 Hz in XYZ axis, 10 cycles each	
Protection class (DIN EN 60529)		IP40	
Material		Aluminum	
Weight		670 g	670 g
Compatibility		compatible with all confocalDT sensors	
No. of measurement channels		2	2
Control and indicator elements		Web interface for setup and settings; Multifunction button: interface selection, adjustable functions and reset to factory settings after 10 s; 4x color LEDs for intensity, range, link and data	

[1] FSO = Full Scale Output
[2] Illuminant: light bulb

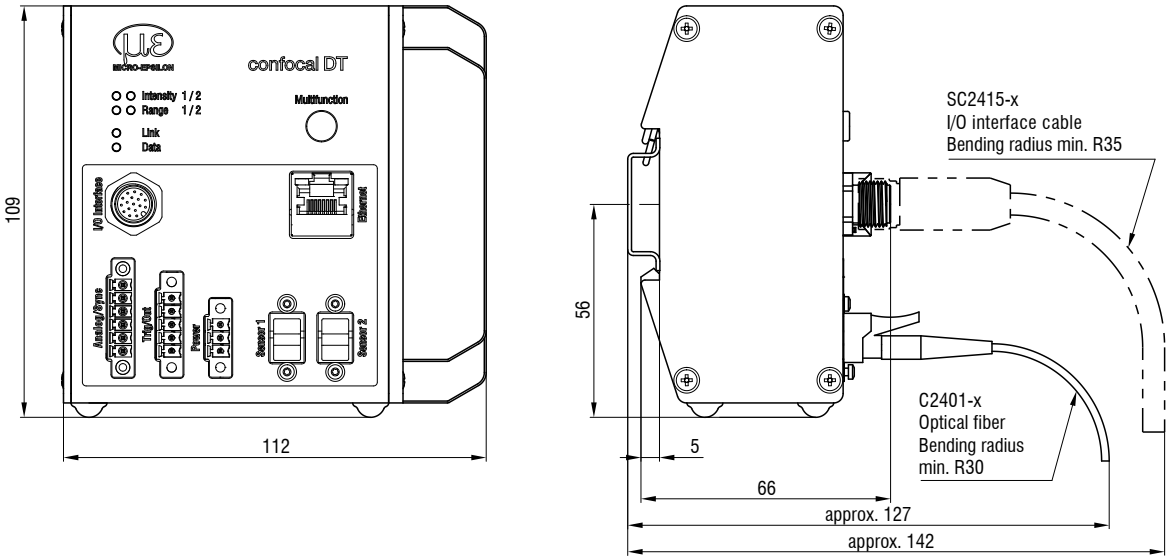
Dimensions

(in mm, not to scale)

confocalDT IFC2416



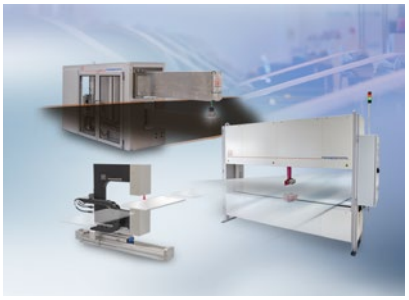
confocalDT IFC2417



Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

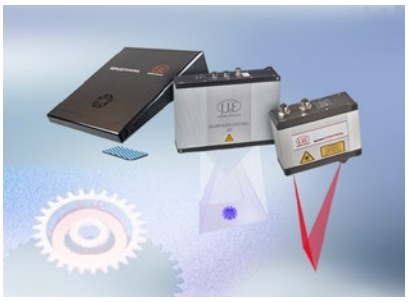
Sensors and measurement devices for non-contact temperature measurement



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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