MICRO-EPSILON

Quick Manual

confocalDT IFD2410/2415

Ethernet

IFD2410-1
IFD2410-3
IFD2410-6

IFD2415-1
IFD2415-3
IFD2415-10

Contents

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You can find more information about the measuring system in the operating instructions. They are available online at:

https://www.micro-epsilon.com/download-file/man--confocalDT-IFC241x-Ethernet--en.pdf

Safety, Glossar

Symbols Used

The following symbols are used in this document:

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a situation that may result in property damage if not avoided.
➪	Indicates a user action.
i	Indicates a tip for users.
`Measurement`	Indicates hardware or a software button/menu.

Warnings

⚠ CAUTION

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.
> Risk of injury, damage to or destruction of the sensor

When all interfaces are used, the sensor surface heats up to more than 50 °C.
> Risk of injury

NOTICE

Avoid shocks and impacts to the sensor.
> Damage to or destruction of the sensor

The supply voltage must not exceed the specified limits.
> Damage to or destruction of the sensor

Protect the cables against damage.

> Failure of the measuring device

Intended Use

- The measuring system is designed for use in an industrial environment. It is used for
  - displacement, distance, movement and thickness measurement,
  - measuring the position of parts or machine components
- The measuring system must only be operated within the limits specified in the technical data.

➪ The measuring system must only be used in such a way that no persons are endangered or machines are damaged in the event of malfunction or total failure of the sensor.

➪ Take additional precautions for safety and damage prevention in case of safety-related applications.

Proper Environment

- Sensor protection class: IP64, front side
- Operating temperature range: +5 ... +50 °C
- Temperature range (storage): -20 ... +70 °C
- Humidity: 5 ... 95% (non-condensing)
- Ambient pressure: Atmospheric pressure
- 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

Glossary

SMR Start of measuring range

MR Measuring range

MMR Mid of measuring range

EMR End of measuring range

Minimum target thickness	see Technical Data, Operating Instructions
Maximum target thickness	Sensor measuring range x Refractive index of target

Mechanical Fastening

Preliminary Remarks

IFD241x optical sensors operate in the µm range. Observe the maximum tilt angle between sensor and target.

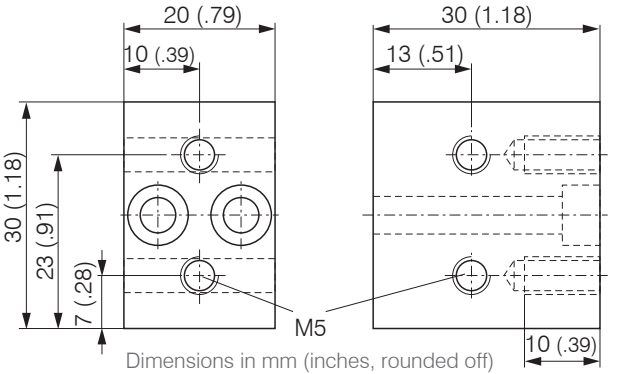
i Ensure careful handling during installation and operation!

Circumferential Clamping

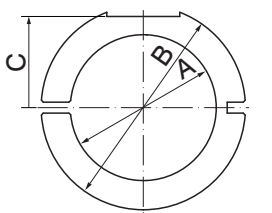
➡ Use an adapter to mount the IFD241x sensors.

Circumferential clamping with MA240x mounting ring, consisting of mounting block and mounting ring

i Micro-Epsilon recommends circumferential clamping



Dimensions in mm (inches, rounded off)

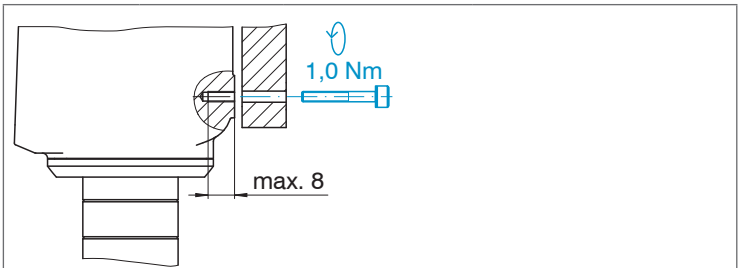


Mounting ring	Size A	Size B	Size C
MA2400-27	ø27	ø46	19.75 (.78)
MA2405-34	ø34	ø50	22 (.87)
MA2405-54	ø54	ø70	32 (1.26)

*Mounting block and MA240x mounting ring, d*imension in mm (inches)

Direct fastening

Mount the sensor via three M3 screws.



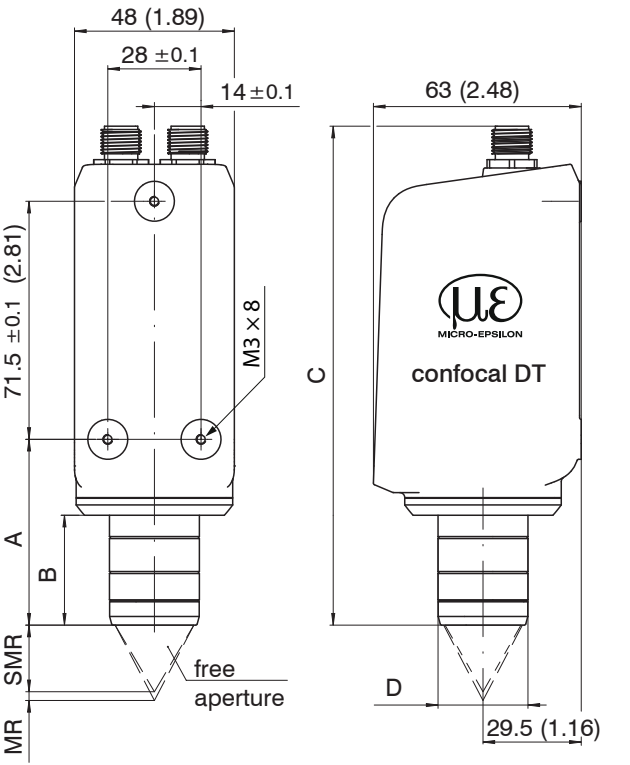
Screwing depth		Screw	Tightening torque
Minimum	Maximum	ISO 4762	
mm	mm	3 pc.	Nm
6	8	M3	1.0

Mounting conditions

IFD2410-	1	3	6
MR	1	3	6
SMR	15	25	35
A	56		
B	33		
C	150		
D	27		

IFD2415-	1	3	10
MR	1	3	10
SMR	10	20	50
A	82	85	118
B	59	62	---
C	176	179	212
D	27	34	54

Dimensions in mm

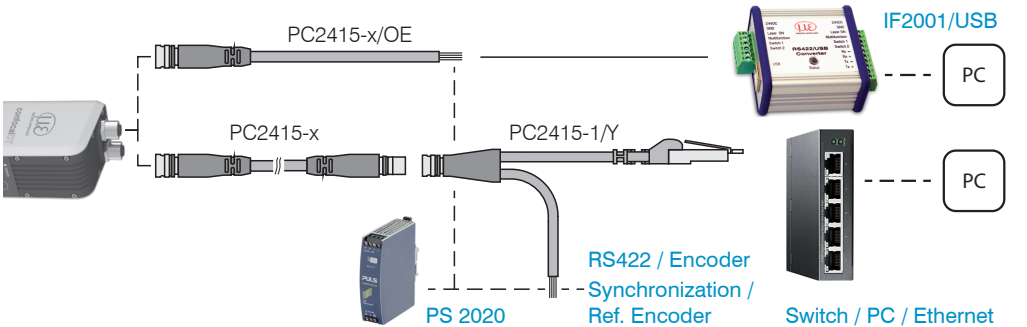


Dimensional drawing IFD2410 / IFD2415

Dimension in mm (inch)

The bearing surfaces surrounding the mounting holes are slightly raised.

Electrical Connections

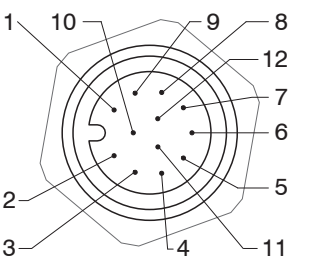


12-pin connector sensor			PC2415-x/OE	PC2415-1/Y		IF2001
Signal		Pin	Wire color	Wire color	RJ45, Pin	Signal
V_+		1	Red	Red	---	24VDC
Supply GND		2	Blue	Blue	---	GND
Data Rx+	Encoder 2A+ [1]	3	Brown	Brown	---	Tx+
Data Rx-	Encoder 2A-	4	White	White	---	Tx-
Data Tx+	Encoder 2B+	5	Green	Green	---	Rx+
Data Tx-	Encoder 2B+	6	Yellow	Yellow	---	Rx-
SYNC+	Encoder 2Ref+	7	Gray	Gray	---	---
SYNC-	Encoder 2Ref-	8	Pink	Pink	---	---
Ethernet		9	White/Green	---	3	---
		10	Green	---	6	---
		11	White/Orange	---	1	---
		12	Orange	---	2	---

The PC2415-1/Y cable is included in delivery.

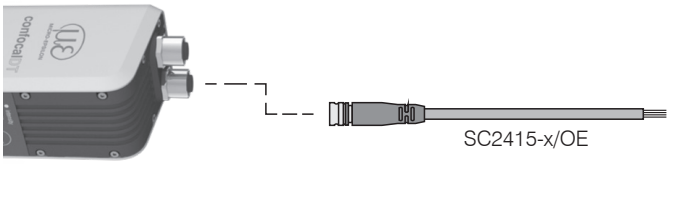
Characteristics PC2415-1/Y:
- Power supply
- Ethernet
- RS422 and synchronization or encoder

Other cables are available as optional accessory.



12-pin sensor connector, pin side

1) You can use the pins for
- serial communication TIA/EIA-422-B) and synchronization or
- for encoder signals.



17-pin connector sensor			SC2415-x/OE
Signal	Pin		Wire color
Analog output	1		White, internal
Analog GND	2		Black [1]
Switching output 2 GND	3		Black
Switching output 2	13		Purple
Multifunction input 1	5		Red
Multifunction input 2	14		Blue
Encoder 1B+	8		Gray
Encoder 1B-	15		Pink
Encoder 1Ref+	9		Green
Encoder 1Ref-	16		Yellow
Switching output 1 GND	10		Brown
Switching output 1	11		White
Encoder 1A-	12		Red/Blue
Encoder 1A+	17		Gray/Pink

1) Analog output in shielded cable area

Characteristics SC2415-x/OE:

- Analog output
- Switching outputs
- Encoder

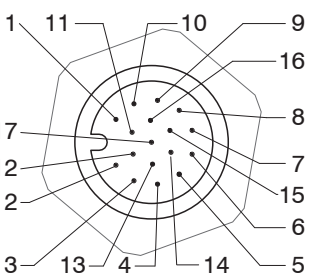
The SC2415-x/OE cable is optionally available.

The GND connections of the switching outputs are separated from supply GND by filters.

The GND connections of the switching outputs are separated from analog GND by filters.

The GND connections are not electrically separated.

i For reasons of interference immunity, use the associated GND connection for the analog output and the two switching outputs.

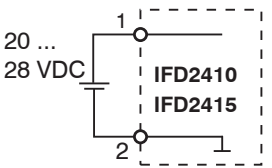


17-pin sensor connector, pin side

Supply Voltage

Nominal value: 24 V DC (20 ... 28 V, $P < 7$ W)

Sensor supply is via the PC2415-1/Y or PC2415-x/OE cable.



Sensor 12-pin connector	Power supply	PC2415-1/Y PC2415-x/OE
1	V_+	Red
2	GND	Blue

Voltage supply only for measuring devices, not to be used for drives or similar sources of impulse interference at the same time. MICRO-EPSILON recommends using an optional available power supply unit PS2020 for the sensor.

- Only turn on the power supply after wiring has been completed.
- Connect the inputs Pin 1 and Pin 2 at the sensor with a 24V power supply.

RS422 Connection with USB Converter IF2001/USB

In addition to Industrial Ethernet, the sensor also supports serial communication via RS422. Serial communication is possible with PC2415-1/Y or PC2415-x/OE cables. The IF2001/USB is available as an optional accessory.

Properties: Differential signals according to EIA-422, galvanically connected to the supply voltage.

- Use a shielded cable with twisted wires. Cable length less than 30 m.
- Connect the ground connections.

Sensor 12-pin connector	Signal	PC2415-1/Y PC2415-x/OE	IF2001/USB
3	RX +	Brown	TX +
4	RX -	White	TX -
2	Supply GND (Blue)		
5	TX +	Green	RX +
6	TX -	Yellow	RX -
Housing	Shield	Cable shield	---

Analog Output

The analog output (voltage or current) is connected to the 17-pin connector and is galvanically connected to the supply voltage.

IFD2410/2415, 17-pin connector			SC2415-x/OE
Signal	Pin		Wire color
Analog output	1		White, inside
Analog GND	2		Black [1]

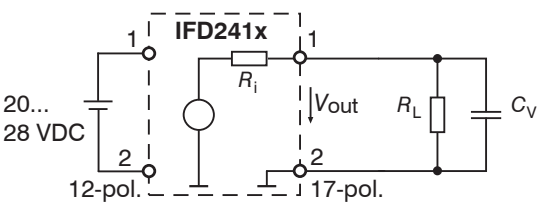
As an alternative, the output range can be set to the following values:

Voltage: 0 ... 5 V; 0 ... 10 V; Current: 4 ... 20 mA.

The measured values can only be output as voltage or current.

1) Analog output in shielded cable area.

Voltage: Pin *V*/I_{out} and Pin GND

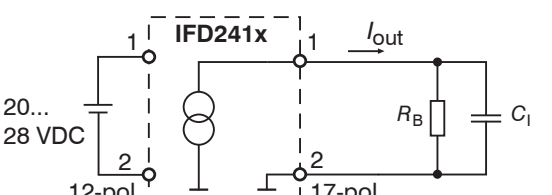


R_i approx. 50 Ohm, R_L > 10 MOhm

Slew rate (without C_V, $R_L \geq$ 1 kOhm) typ. 0.5 V/µs

Slew rate (with C_V = 10 nF, $R_L \geq$ 1 kOhm) typ. 0.4 V/µs

Current: Pin *U*/I_{out} and Pin GND



$R_B \leq$ 500 Ohm

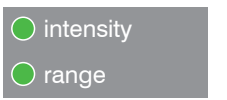
Slew rate (without C_I, R_B = 500 Ohm) typ. 1.6 mA/µs

Slew rate (with C_I= 10 nF, R_B = 500 Ohm) typ. 0.6 mA/µs

➡ Use a shielded cable. Cable length less than 30 m.

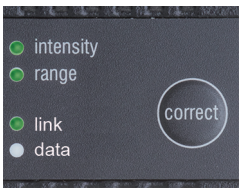
Sensor LEDs

LED	Color	Status	Meaning
Intensity	Red	flashes	Dark signal acquisition in progress
	Red	lights up	Signal saturated
	Yellow	lights up	Signal too low
	Green	lights up	Signal OK
Range	Red	flashes	Dark signal acquisition in progress
	Red	lights up	No target present, outside of measuring range
	Yellow	lights up	Target close to mid of measuring range
	Green	lights up	Measuring object within the measuring range



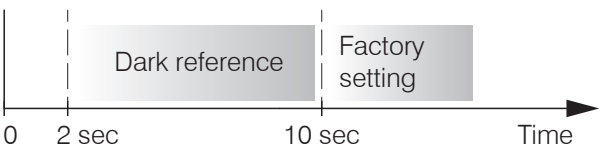
Correct Button

The Correct button is assigned multiple functions. As standard, the button is assigned the dark reference function.



Function	Dark reference	*Starts dark referencing*
	Factory setting	Reset the device and measurement settings to factory settings.

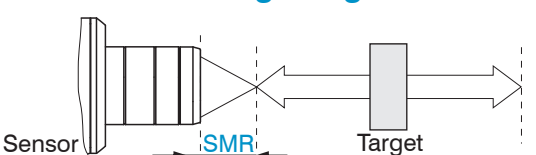
The selected function is indicated by the flashing/illuminated Range and Intensity LEDs.



Correct *button actuation time*

The Correct button is not assigned a key lock in the factory. Optionally, you can deactivate or lock the Correct button, see the operating instructions for the sensor.

Start of Measuring Range



An offset distance (SMR) between the sensor and the target must be kept.

Start of measuring range (SMR), the shortest distance between the front surface of the sensor and the target

Initial Operation

i The measuring system is ready for operation approx. 3 s after applying the supply voltage.
To ensure precise measurements, let the measuring system warm up for approx. 50 minutes.

Communication with the sensor

Ethernet-Setup-Mode

- Programming via web interface,
- Output of measurement data via Ethernet
- Programming on command level e.g. with Telnet,

➡ Connect the sensor and the PC with a LAN cable.

➡ Start your web browser and type the standard IP address 169.254.168.150 of the sensor into the address bar.

RS422 Communication

- Programming via web interface;
- programming on command level e.g. with Telnet,
- Output of measurement data via RS422

➡ Connect the sensor, e.g. via an IF2001/USB RS422 converter from Micro-Epsilon via USB to a PC.

➡ Start the `sensorTOOL` program.

Download at https://www.micro-epsilon.com/download/software/sensorTOOL.exe.

➡ Click the `Sensor` button.

The program will now search for connected sensors.

➡ Select a desired sensor. Click the `Open Website` button.

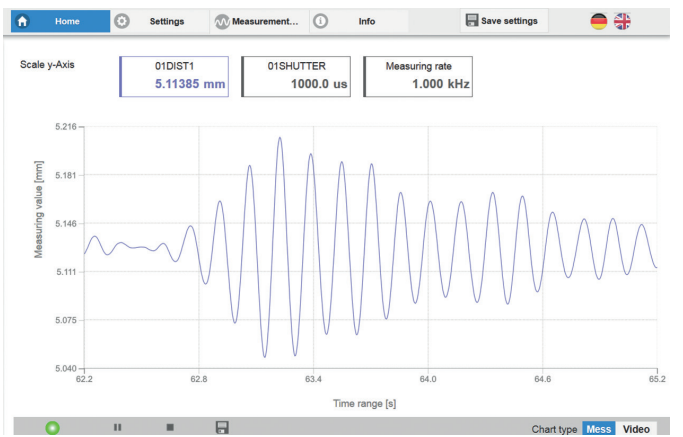
Saved settings remain in the sensor remanently across interfaces

1) The IFD2410/2415 sensors support the use of up to three encoders. A serial communication via RS422 is not possible if two or three encoders are going to be connected.

Access via Web Interface

Start the web interface of the sensor, see section *Initial Operation*.

Interactive web pages you can use to configure the sensor are now displayed in the web browser. The sensor is active and supplies measurement values. The web interface does not guarantee real-time measurements. The currently running measurement can be controlled using the function buttons in the `Chart type` section.



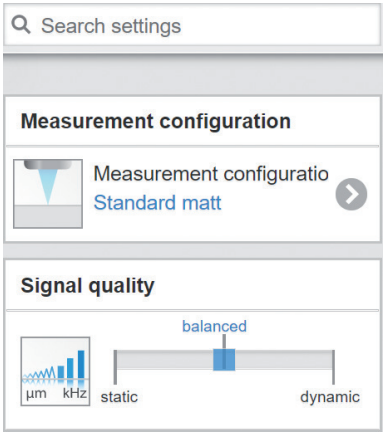
First page after web interface has been accessed

For configuration, you can switch between the video signal and a display of the measured values over time. The appearance of the websites depends on the functions. Dynamic help texts with excerpts from the operating instructions supports you during sensor configuration.

Depending on the selected measuring rate and the PC used, measured values may be reduced in the display. That is, not all measured values are transmitted to the web interface for display and saving.

The horizontal navigation includes the functions below:

- `Home`. The web interface automatically starts in this view with Measurement Chart, `Measurement configuration` and `Signal quality`.
- `Settings`. Sensor parameters configuration such as triggering, measuring rate and zero setting/mastering.
- `Measurement chart`. Measurement chart or video signal display.
- `Info`. Includes information about the sensor, such as measuring range, serial number and software status.

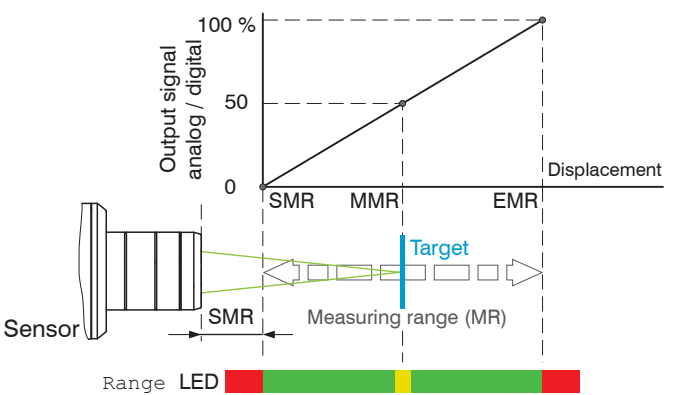


The vertical navigation is contextual to the selection in the horizontal navigation and contains the following functions for the `Home` menu:

- The `Search settings` function permits time-saving access to functions and parameters.
- `Measurement configuration`. Allows a selection of predefined measurement settings (presets).
- `Signal quality` By mouse click it is possible to switch between three predefined basic settings for the measuring rate and the averaging.

Positioning the Target

➡ Position the target as centrally as possible within the measuring range.



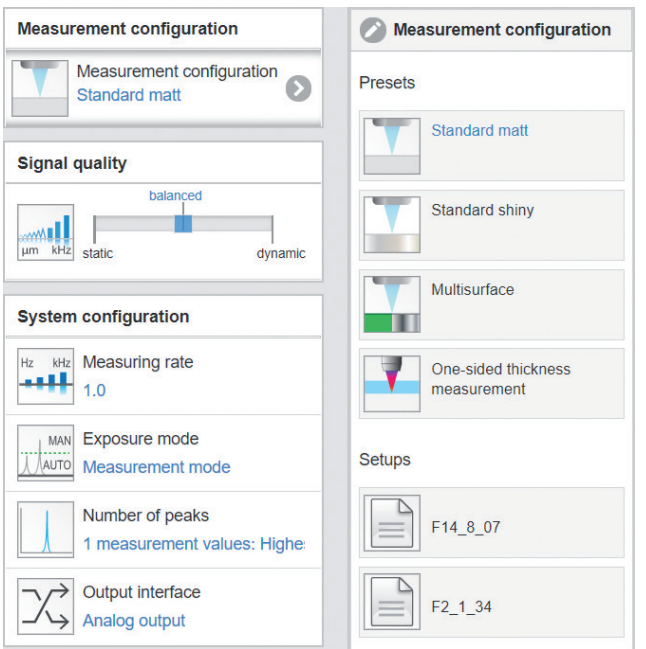
Range LED	
Red	No target present or target outside of measuring range
yellow	Target close to mid of measuring range
green	Measuring object within the measuring range

The `Range` LED on the front of the sensor indicates the position of the target relative to the sensor.

Presets, Setups, Measurement Configuration, Signal Quality

Definition

- Preset: Manufacturer-specific program with settings for frequent measurement tasks; cannot be overwritten
- Setup: User-specific program with relevant settings for a measurement task
- Initial setup at boot (sensor start): a favorite can be selected from the setups, which is automatically activated at sensor start. If no favorite is determined from the setups, the sensor activates the `Standard` preset at startup.



Upon delivery of the sensor from the factory

- the presets `Standard matt`, `Standard shiny`, `Multisurface` and `One-sided thickness measurement` are possible
- for the IFD2415 sensor, the presets `Multilayer air gap` and `Multilayer laminated glass` are available.
- no setup is available.

You can select a preset in the tab

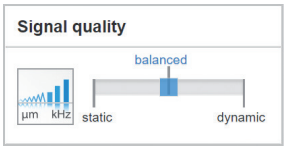
`Home > Measurement configuration`

You can select a setup in the tab

`Home > Measurement configuration` or `Settings` in the `System settings > Load & save` menu

A setup can be stored permanently in the sensor.

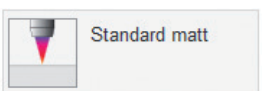
For all presets, the measurement task can be individually adapted via the `Signal quality` slider. Reducing the measuring rate increases the exposure time for the line and thus improves the measurement quality.



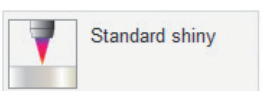
Measuring rate [1]	Averaging [1]	Description
0.2 kHz	Static Moving, 128 values	Three predefined basic settings (Static, Balanced and Dynamic); a change via mouse click is immediately visible in the diagram and the system configuration.
1 kHz	Balanced Moving, 16 values	
5 kHz	Dynamic Moving, 4 values	

i If the sensor starts up with a user-defined measurement setting (setup), the signal quality cannot be changed.

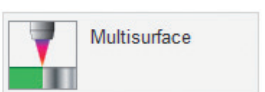
Presets allow a quick start into the individual measurement task. Basic features such as peak and material selection and the calculation functions are already set in the presets to match the target surface.



Distance measurement, e.g., for ceramic material, non-transparent plastics. Highest peak, averaging, distance calculation.

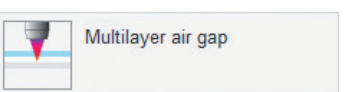


Distance measurement, e.g., for metal, polished surfaces. Highest peak, Median over 5 values, distance calculation.

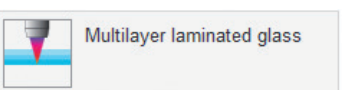


Distance measurement, e.g., for PCBs, hybrid materials. Highest peak, Median over 9 values, distance calculation.

One-sided thickness measurement, e.g., for glass, BK7 material. First and second peak, averaging, thickness calculation.



One-sided thickness measurement [2] against glass, 1st layer BK7, 2nd layer vacuum, first and second peak, 3 measured values, median over five values, moving averaging over 16 values, thickness calculation.



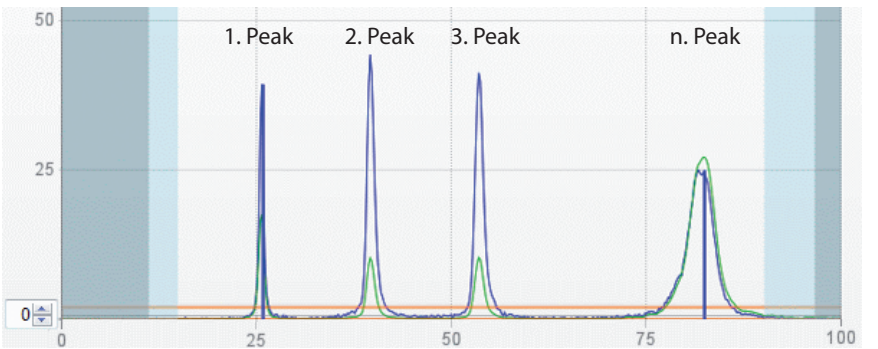
Layer thickness measurement [2] against laminated glass e.g. windshield, 1st layer BK7, 2nd layer PC, 3rd layer BK7, first and second peak, 4 measured values, thickness calculation, moving averaging over 16 values.

1) Values apply to the `Standard matt` and `One-sided thickness measurement` presets. 2) Possible in IFD2415

Checking the Video Signal, Peak Selection

The video signal shows the determined reflections at the measuring object as a raw signal. The peaks are counted starting at the start of the measuring range toward the end of the measuring range. The corresponding measured value is marked by a vertical line (peak marking).

➡ Go to the `Measurement chart` menu. Display the video signal with `Video`. Adjust the settings for the exposure mode and measuring rate parameters.



Video signal with four peaks in the measuring range

1 measurement	first peak / highest peak / last peak
2 measurement values	first and second peak / first and last peak / second to last and last peak / highest and second highest peak
3 up to 5 measurement values	All peaks above the intensity threshold are evaluated in ascending distance order.

Options for peak selection

The selection of peaks dictates which region in the signal is used for the distance or thickness measurement. For a measuring object consisting of several transparent layers, use the refractive index correction to compensate for the distance measurement errors caused by optical factors, see operating instructions.

The `Standard, Standard shiny` and `Multisurface` presets use the highest peak.

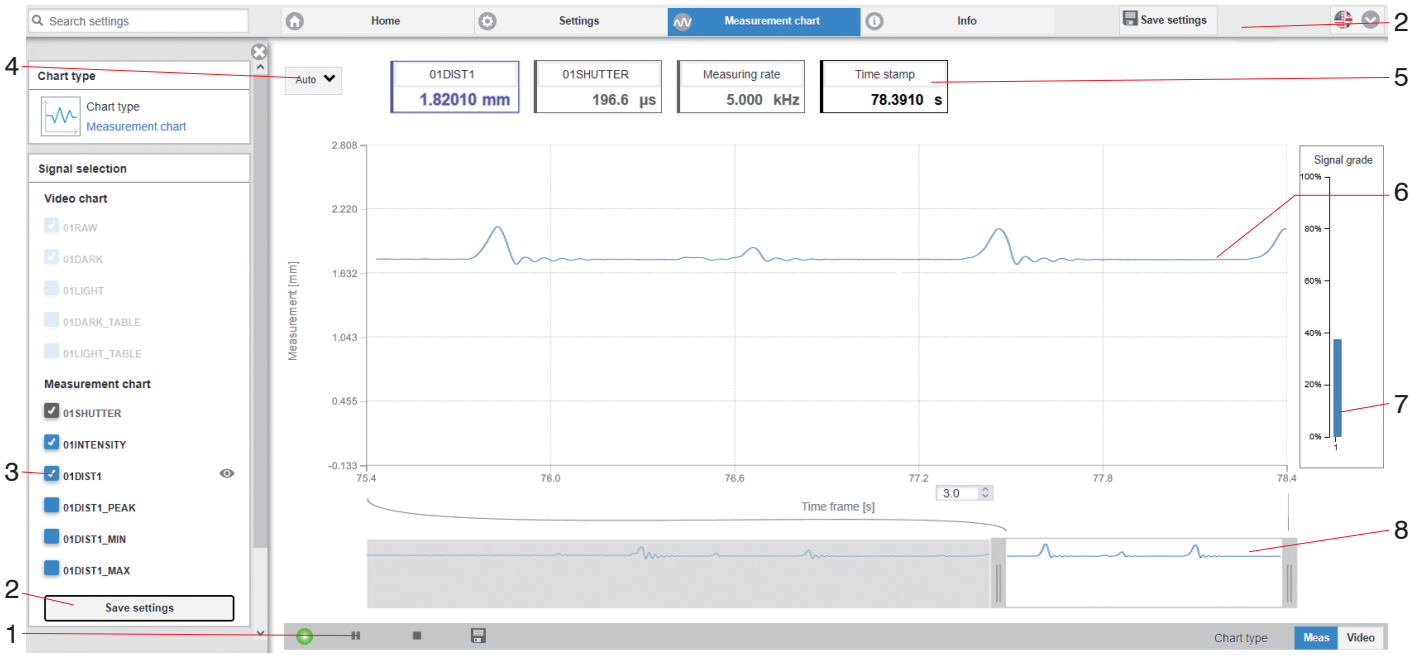
The preset `One-sided thickness measurement` uses the 1. and 2. peak for the calculation of the measured value.

➡ Go to the `Data Recording > Settings > Peak selection` menu to select a different peak.

Distance Measurement with Website Display

- Align the sensor perpendicularly to the object to be measured.
- Then, move the sensor (or the target) closer and closer to the start of the measuring range of the relevant sensor.

As soon as the object is within the measuring field of the sensor, the sensor's `Range` LED lights up (green or yellow). Alternatively, you can watch the video signal.



`Measurement` *(distance measurement) web page*

1 `Stop` pauses the chart; you can still use the data selection and zoom functions. `Save` opens a Windows selection dialog for the file name and storage location to save the last 10,000 values in a CSV file (separation using semicolon).

2 All changes only become effective when you click on the `Save settings` button.

3 In the left-hand window, the signals to be displayed can be switched on or off during or after the measurement. Inactive curves are grayed out and can be added by clicking on the check mark. The changes become effective when you save the settings.
You can show or hide the individual signals using the eye symbols. The calculation continues in the background.

- 01SHUTTER: exposure time
- 01xINTENSITY: Signal quality of the underlying peak in the video signal
- 01DIST: Distance signal curve over time

4 To scale the axis in the graph for the measured values (y-axis), you can use `Auto` (= automatic scaling) or `Manual` (= manual scaling).

5 The current values for distance, exposure time, current measuring rate and time stamp are shown in the text boxes above the graph. Errors are also displayed.

6 Mouseover function. When the chart has been stopped and you move the mouse over the graph, points on the curve are marked with a circle and the associated values are displayed in the text boxes above the graph. The intensity bars are also updated.

7 The peak intensity is displayed as a bar chart.

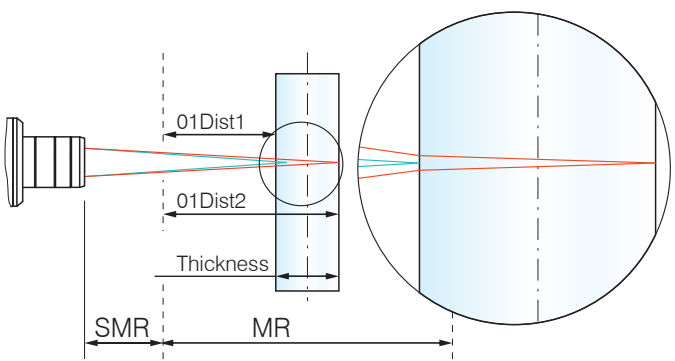
8 Scaling the x-axis: During an ongoing measurement, you can use the left-hand slider to enlarge the entire signal (zoom). The time range can also be defined using an input field under the time axis. When the chart has been stopped, the right-hand slider can also be used. You can also move the zoom window with the mouse in the center of the zoom window (four-sided arrow).

One-Sided Thickness Measurement, Transparent Target

The sensor evaluates two signals reflected on the surfaces. Based on these two signals, the sensor calculates the distances from the surfaces and, from this, derives the thickness.

➨ Align the sensor perpendicularly to the object to be measured. Make sure that the target is approximately in the mid of the measuring range (SMR + 0.5 x MR).

i The light beam must strike the surface of the object at a perpendicular angle. Otherwise, measurements might be inaccurate.



One-sided thickness measurement for a transparent target

Preset Selection

➨ Switch to the `Home` menu.

➨ Select `One-sided thickness measurement` in the `Measurement configuration` menu.

This presetting prompts the sensor to use the first and second peak in the video signal for the thickness calculation.

Material Selection

Specifying the material is essential for calculating a correct thickness value. To compensate for the spectral change of the index of refraction, at least three refractive indices at different wavelengths or a refractive index and the Abbe number must be known.

The material table includes predefined materials.

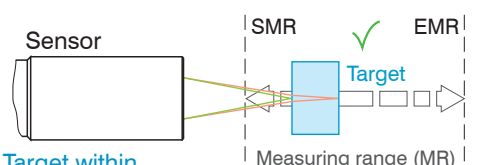
➨ Switch to the `Settings > Data recording > Material selection` menu.

➨ Select the material of the target for Layer 1.

Video Signal

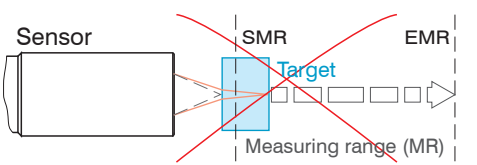
If a surface of the target lies outside the measuring range, the sensor will send only one signal for the displacement, intensity and center of gravity. This may also occur if a signal is below the detection threshold. Two boundary surfaces are active when the correct thickness of a transparent material is measured. As a result, two peaks are visible in the video signal.

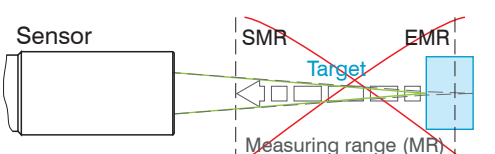
`Video signal` *(thickness measurement) web page*



Target within measuring range with two active boundary areas

Measurement arrangement thickness measurement





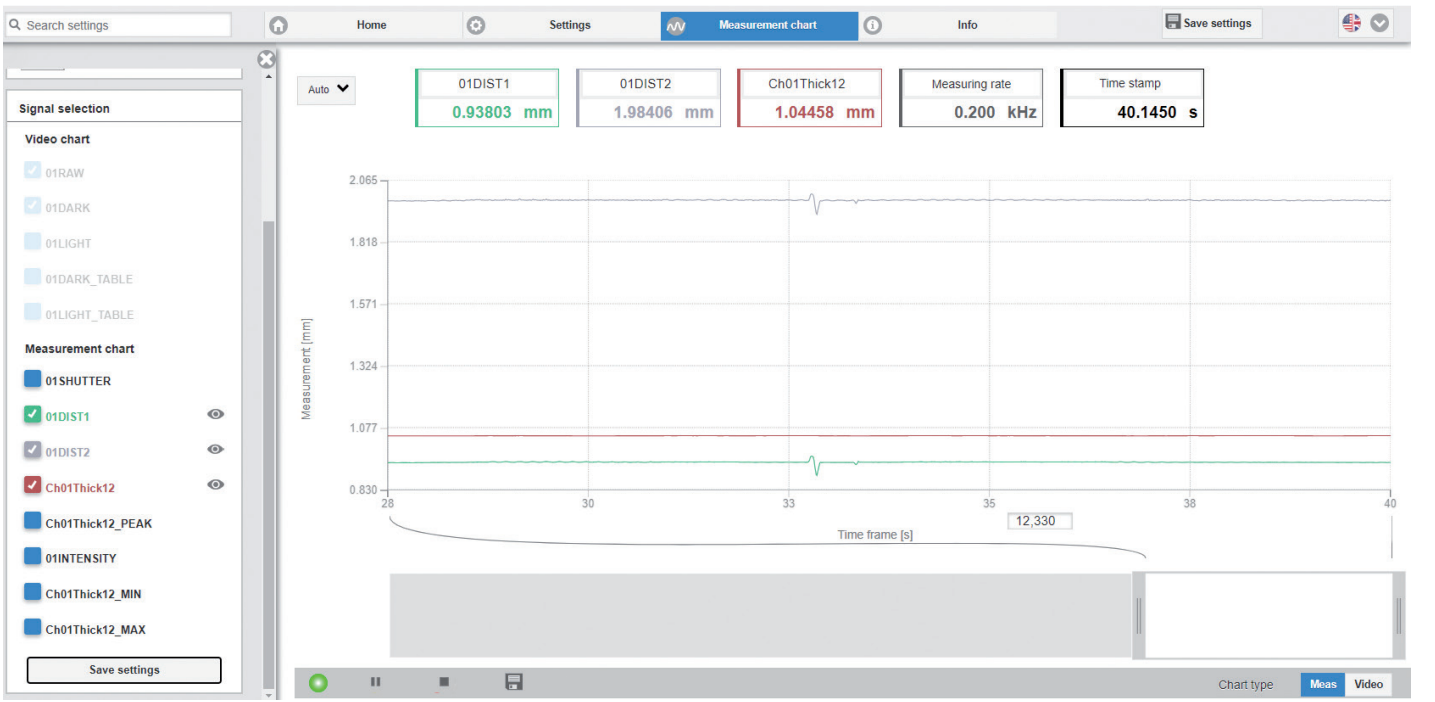
Measuring object only partially in the measuring range

No thickness measurement possible

Measurement Chart for Thickness Measurement

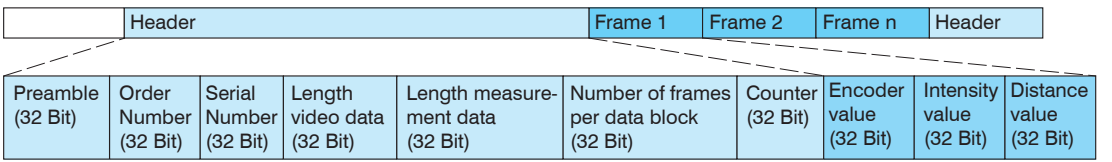
Switch to the `Measurement chart` tab and select `Mess` as the chart type.

The web page shows the two distances and the thickness `Ch01Thick12` (difference between `01DIST2` and `01DIST1`) graphically and numerically. Optionally, the intensities of both peaks (Peak 1 = near, Peak 2 = far) can also be displayed.



Data Format Ethernet Interface

All measurement data and the header are transmitted in the little Endian format. A data packet consists of at least one measurement data frame and typically includes several.



Example for data transmission with Ethernet

Value	Ethernet, min	Ethernet, max	Scaling	Unit	IFD2410	IFD2415
0xRAW (512 x 16Bit)	0	4095	value / 4096 * 100	%	X	X
0xSHUTTER	0	UINT32_MAX	value / 36	µs	X	X
0xENCODER1	0	UINT32_MAX	value	Encoder Ticks	X	X
0xENCODER2	0	UINT32_MAX	value	Encoder Ticks	X	X
0xENCODER3	0	UINT32_MAX	value	Encoder Ticks	X	X
0xINTENSITY[1..6]	0	0x3fffffff	(value & 0x7ff) / 1024 * 100	%	X	X
0xDIST[1..6]	INT32_MIN	0x7ffffeff	value / 1000000	mm	X	X
MEASRATE	4500	360000	36000 / value	kHz	X	-
MEASRATE	1440	360000	36000 / value	kHz	-	X
TIMESTAMP	0	UINT32_MAX	value	µs	X	X
COUNTER	0	UINT32_MAX	value		X	X
_MIN	INT32_MIN	0x7ffffeff	identical 0xDIST*	mm	X	X
_PEAK	INT32_MIN	0x7ffffeff	identical 0xDIST*	mm	X	X
_MAX	INT32_MIN	0x7ffffeff	identical 0xDIST*	mm	X	X

Excerpt output values with Ethernet

Data Format RS422 Interface

The output of distance and other measurements via RS422 requires subsequent conversion into the corresponding units. If requested, the measurement data always follows a video frame.

Output value 1:

	Preamble		Data bits					
L-Byte	0	0	D5	D4	D3	D2	D1	D0
M-Byte	0	1	D11	D10	D9	D8	D7	D6
H-Byte	1	0	D17	D16	D15	D14	D13	D12

Output value 2 ... 32:

	Preamble		Data bits					
L-Byte	0	0	D5	D4	D3	D2	D1	D0
M-Byte	0	1	D11	D10	D9	D8	D7	D6
H-Byte	1	1	D17	D16	D15	D14	D13	D12

An overview of all output values is provided in the operating instructions.

Value	RS422, min	RS422, max	Scaling	Unit	IFD2410	IFD2415
0xRAW (512 x 16Bit)	0	4095	value / 4096 * 100	%	X	X
0xSHUTTER	0	262143	value / 9	µs	X	X
0xENCODER1	0	262143	value	Encoder Ticks	X	X
0xINTENSITY[1...6]	0	2048	value / 1024 * 100	%	X	X
0xDIST[1...6]	0	262071	(value - 98232) / 65536 * MB	mm	X	X
MEASRATE	2250	180000	18000 / value	kHz	X	-
MEASRATE	720	180000	18000 / value	kHz	-	X
TIMESTAMP_HI	0	65535	value * 65536	µs	X	X
TIMESTAMP_LO	0	65535	value	µs	X	X
_MIN	0	262071	identical 0xDIST	mm	X	X
_PEAK	0	262071	identical 0xDIST*	mm	X	X

Excerpt output values with RS422

Service, Repair

If the sensor is defective:

- If possible, save the current sensor settings in a parameter set to reload them into the sensor after the repair.
- Please send us the affected parts for repair or exchange.

If the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Koenigbacher Straße 15
94496 Ortenburg / Germany

Tel. +49 (0) 8542 / 168-0
Fax +49 (0) 8542 / 168-90
info@micro-epsilon.com
www.micro-epsilon.com

Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to MICRO-EPSILON or to your distributor/retailer.

MICRO-EPSILON undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage, e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product, repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable).

MICRO-EPSILON is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, MICRO-EPSILON reserves the right to modify the design.

In addition, the General Terms of Business of MICRO-EPSILON shall apply, which can be accessed under Legal details | Micro-Epsilon https://www.micro-epsilon.com/legal-details/.

Decommissioning, Disposal

In order to avoid the release of environmentally harmful substances and to ensure the reuse of valuable raw materials, we draw your attention to the following regulations and obligations:

- Remove all cables from the sensor.
- Dispose of the sensor, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.
- You are obliged to comply with all relevant national laws and regulations

For Germany / the EU, the following (disposal) instructions apply in particular:

- Waste equipment marked with a crossed garbage can must not be disposed of with normal industrial waste (e.g. residual waste can or the yellow recycling bin) and must be disposed of separately. This avoids hazards to the environment due to incorrect disposal and ensures proper recycling of the old appliances.

- A list of national laws and contacts in the EU member states can be found at https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Here you can inform yourself about the respective national collection and return points.
- Old devices can also be returned for disposal to MICRO-EPSILON at the address given in the imprint at https://www.micro-epsilon.com/legal-details/.
- We would like to point out that you are responsible for deleting the measurement-specific and personal data on the old devices to be disposed of.
- Under the registration number WEEE-Reg.-Nr. DE28605721, we are registered at the foundation Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg, as a manufacturer of electrical and/or electronic equipment.

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