MICRO-EPSILON

Setup Guide

confocalDT - Sensors

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1. Safety

System operation assumes knowledge of the operating instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions:

⚠ 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.

1.2 Warnings

⚠ CAUTION

Disconnect the power supply before touching the sensor surface.

> Risk of injury from static discharge

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 and controller

NOTICE

Avoid shocks and impacts to the sensor and controller.

> Damage to or destruction of the sensor and controller

The supply voltage must not exceed the specified limits.

> Damage to or destruction of the sensor and controlle

Protect the sensor cable against damage.

> Destruction of the sensor

Never fold the fiber optics and do not bend them in tight radii.

> Damage to or destruction of the fiber optics, failure of

measuring device

Do not bend more tightly than the (minimum) bending radius 1 of the fiber optics.

> Breaking of fiber optic fibers Protect the ends of the fiber optics against contamination

(use protective caps).

> Incorrect measurement

1.3 Notes on CE Marking

The following applies to the product:

- Directive 2014/30/EU (“EMC“)
- Directive 2011/65/EU (“RoHS“)

Products which carry the CE marking satisfy the requirements of the EU Directives cited and the relevant applicable harmonized European standards (EN). The product is designed for use in industrial and laboratory environments.

The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

1.4 UKCA Marking

The following applies to the product:

- SI 2016 No. 1091 („EMC“)
- SI 2012 No. 3032 („RoHS“)

Products which carry the UKCA marking satisfy the requirements of the directives cited and the relevant applicable harmonized standards. The product is designed or use in industrial and laboratory environments.

The UKCA Declaration of Conformity and the technical documentation are available to the responsible authorities according to the UKCA Directives.

1.5 Intended Use

- The measuring system is designed for use in industrial and laboratory applications.
- The system must only be operated within the limits specified in the technical data,
- The system/sensor/controller must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the system/sensor/controller.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.6 Proper Environment

- Protection class
  - Sensor: IP40 ... IP65
- Temperature range
  - Operation:
    - Sensor: +5 ... +200 °C, see „Technical Data“ on page 21
  - Storage: -20 ... +200 °C
- Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure / vacuum
- The space between sensor surface and target must have an unchanging dielectric constant.
- The area between sensor surface and target must not be soiled (for example water, abrasion, dust, etc.).

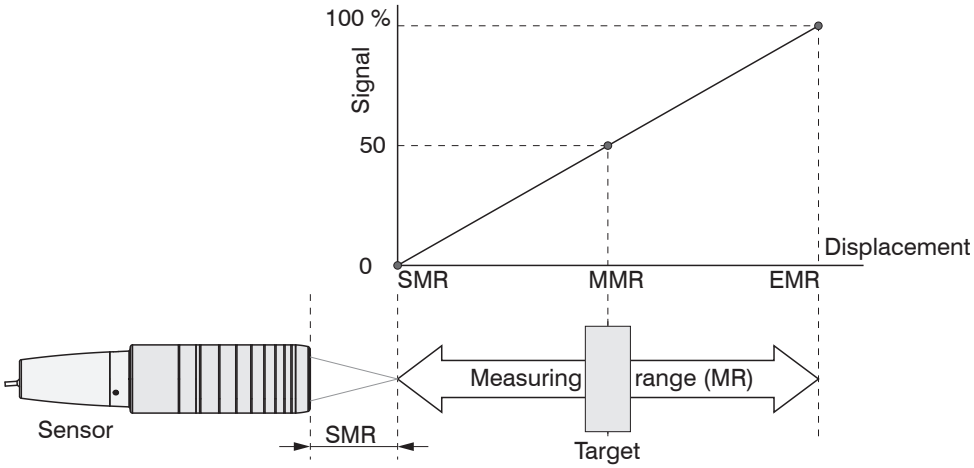
2. Sensors

The sensor is a passive element in the measuring system: it contains neither moving nor heat-generating parts which might affect measuring accuracy due to thermal expansion in the sensor.

i Protect the ends of the sensor cables (optical fibers) and the sensor lens from dirt and contamination.

2.1 Glossary

SMR	Start of measuring range. Minimum distance between sensor surface and target
MMR	Mid of measuring range
EMR	End of measuring range (start of measuring range + measuring range) Maximum distance between sensor face and target
MR	Measuring range



3. Sensor Cable, Optical Fiber

Sensor and controller are connected through an optical fiber.

- Do not shorten or lengthen the optical fibers.
- Do not pull or hold the sensor on the optical fiber.

Do not soil the connectors, because this would lead to particle deposition in the controller and therefore to strong loss of light, see „Cleaning Optical Components“ on page 35.

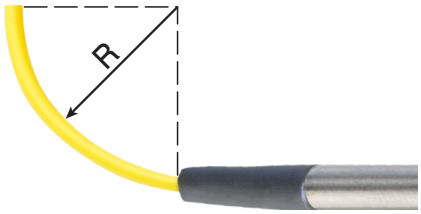
Basic Rules:

NOTICE

Avoid

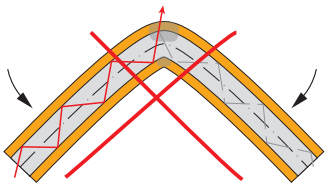
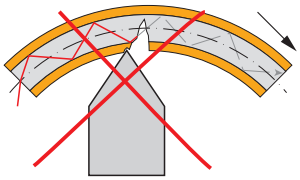
- any contamination of the connector, e. g. dust or finger prints, and frequent connecting and disconnecting
- any mechanical stress of the fiber (kinking, squeezing, pulling, twisting, knotting etc.)
- strong bending of the fiber. as the optical fiber is damaged thereby rapidly and this leads to permanent damage through micro-cracks

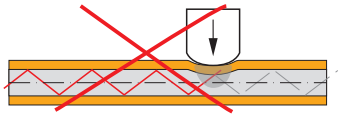
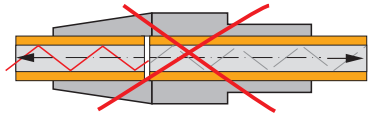
Please never underrun the allowed bending radius.



Fixed (static):
R = 30 mm or more, see „Technical Data“ on page 21

Flexible (dynamic):
R = 40 mm or more

Do not kink the sensor cable.	Please do not grind thesensor cable over sharp corners
	

Please do neither squeeze the sensor cable nor fix it by using cable ties.	Do not pull the sensor cable.
	

Miniature sensors IFS2402, hybrid sensors IFS2403
The optical fibers are fixed to the sensor and cannot be replaced. Repairs involve reducing the cable length and a new connector through the manufacturer only.

Standard sensors IFS2404, IFS2405, IFS2406, IFS2407
The sensor cable is connected to the sensor. Sensor cables may be up to 50 m long. Cables for drag chain use and cables with protective metal tubing are available, a damaged sensor cable can be replaced.

Connect sensor cable to sensor

- Remove the dummy plugs from the sensor and sensor cable.
- Insert the sensor cable into the optical fiber socket. Make sure that the sensor connector is properly oriented.
- Screw the sensor and sensor cable together with the knurled-head screw on the sensor cable.

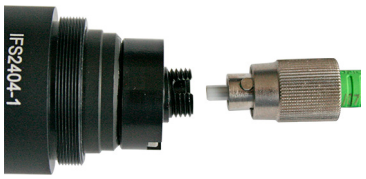


Fig. 1 Groove of the socket on the sensor (left) and guide lug of an FC sensor plug (right)

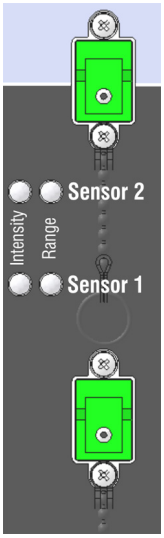
i Pay attention to the orientation of the socket and guide lug.

Unconnect sensor cable to sensor

- Open the knurled-head screw on the sensor cable. Disconnect the sensor cable from the sensor.
- Stop up the sensor and sensor cable with the dummy plugs.

Connecting the sensor cable to the controller

- Remove the dummy connector from the green optical fiber socket `Sensor 1/2`[1] on the controller.
- Plug the sensor cable (green connector, E2000/APC) into the optical fiber socket, and ensure that the sensor connector is aligned correctly.
- Push the sensor connector into the socket until it locks.



1) The sensor connector Sensor 2 is available on controller IFC2412, IFC2417, IFC2422 and IFC2466 only.

Disconnecting the sensor cable from the controller

- Push the sensor connector's release lever down, and pull the sensor connector out of the socket.
- Replace the dummy connector.

NOTICE Close the optical inputs and outputs with protective caps when no fiber cable is connected.

4. Dimensional Drawings Sensors

4.1 Overview of Sensors

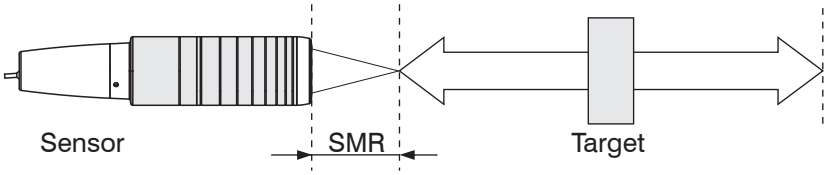
Model	Measuring range MR	Start of measuring range SMR approx.
IFS2402-0,5	0,5 mm	1,7 mm
IFS2402-1,5	1,5 mm	0,9 mm
IFS2402-4	3,5 mm	1,9 mm
IFS2402/90-1,5	1,5 mm	2,5 mm[1)]
IFS2402/90-4	2,5 mm	2,5 mm[1)]
IFS2403-0,4	0,4 mm	2,5 mm
IFS2403-1,5	1,5 mm	8 mm
IFS2403/90-1,5	1,5 mm	4,9 mm[1)]
IFS2403-4	4 mm	14,7 mm
IFS2403/90-4	4 mm	12 mm[1)]
IFS2403-10	10 mm	11 mm
IFS2403/90-10	10 mm	8,6 mm[1)]
IFS2404-2	2 mm	14 mm
IFS2404/90-2	2 mm	9,6 mm[1)]
IFS2404-2(001)	2 mm	14 mm
IFS2404/90-2(001)	2 mm	9,6 mm[1)]
IFS2404-1	1 mm	15 mm
IFS2404-3	3 mm	25 mm
IFS2404-6	6 mm	35 mm
IFS2405-0,3	0,3 mm	6 mm
IFS2405-1	1 mm	10 mm
IFS2405-3	3 mm	20 mm
IFS2405-6	6 mm	63 mm
IFS2405/90-6	6 mm	41 mm[1)]
IFS2405-10	10 mm	50 mm
IFS2405-28	28 mm	220 mm
IFS2405-28/VAC(001)	28 mm	220 mm
IFS2405-30	30 mm	100 mm
IFS2406-2,5/VAC(003)	2,5 mm	17 mm
IFS2406/90-2,5/VAC(001)	2,5 mm	12,6 mm[1)]
IFS2406-3	3 mm	74 mm
IFS2406-3/VAC(001)	3 mm	75mm
IFS2406-10	10 mm	27 mm
IFS2406-10/VAC(001)	10 mm	27mm
IFS2407-0,1	0,1 mm	1 mm
IFS2407-0,1(001)	0,1 mm	1 mm
IFS2407/90-0,3	0,3 mm	14,3 mm[1)]
IFS2407-0,8	0,8 mm	5,9 mm
IFS2407-1,5	3 mm	28 mm
IFS2407-3	1,5 mm	17 mm
IFS2407-6	6 mm	32 mm
IFS2407-0,8/HT	0,8 mm	5,58 mm
FS2407-2/HT	2 mm	14,5 mm
FS2407/90-2/HT	2 mm	8 mm[1)]
FS2407-4/HT	4mm	14,5 mm
FS2407/90-4/HT	4 mm	8 mm[1)]

[1)] Start of measuring range measured from sensor axis

4.2 Sensors

4.2.1 Start of Measuring Range

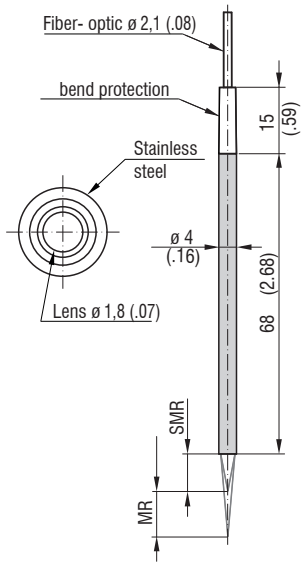
A base distance (SMR) must be maintained for each sensor.



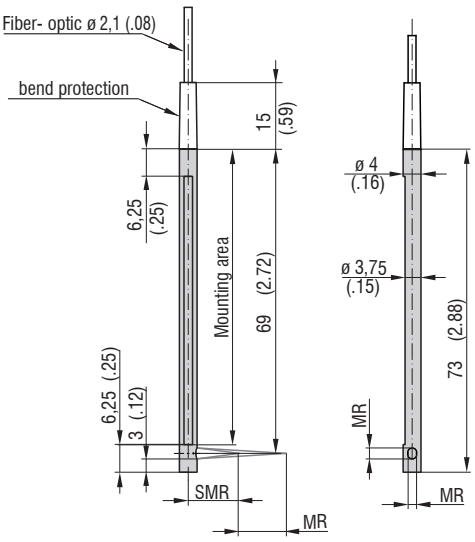
Start of measuring range (SMR), the smallest distance between the sensor surface and the target.

4.2.2 Sensor Series IFS 2402

IFS2402-0,5/1,5/4

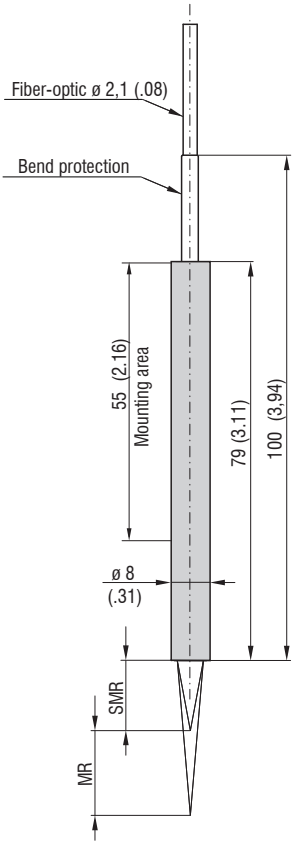


IFS2402/90-1,5/4

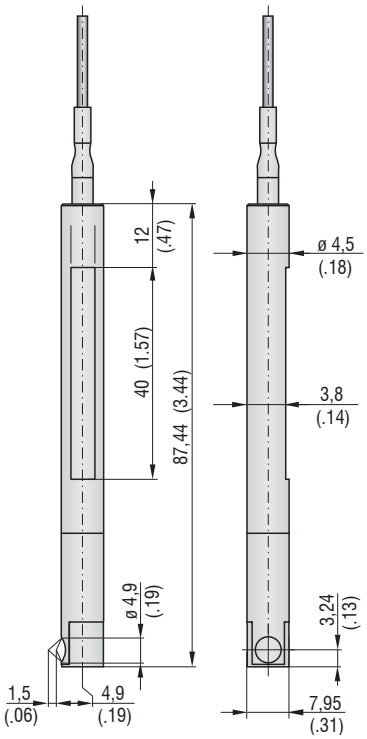


4.2.3 Sensor Series IFS 2403

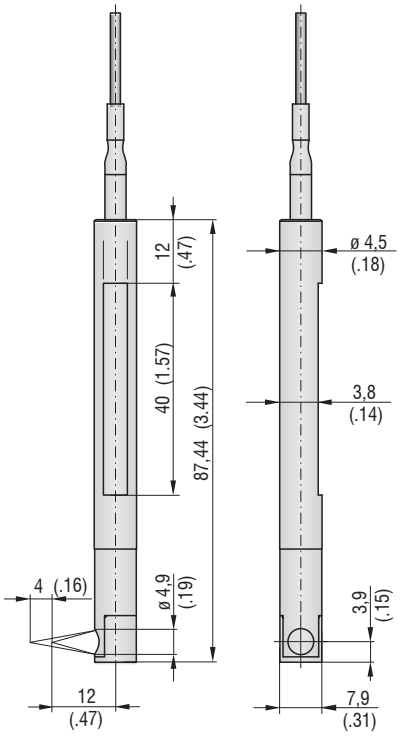
IFS2403-0,4/1,5/4/10



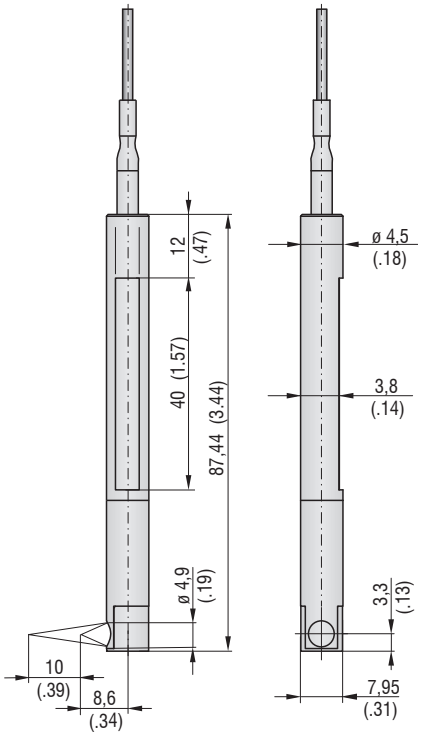
IFS2403/90-1,5



IFS2403/90-4

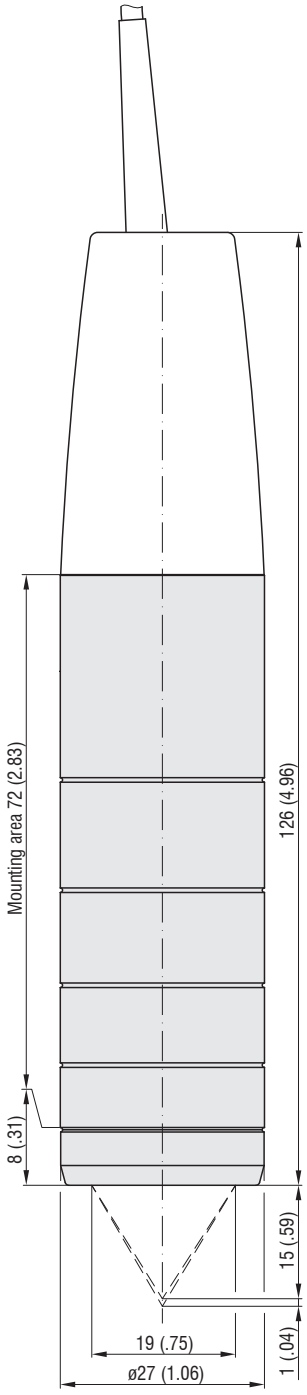


IFS2403/90-10

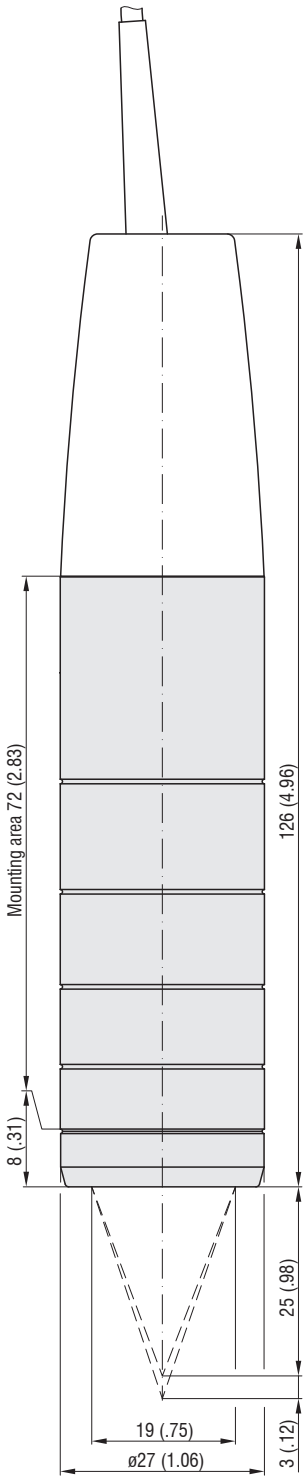


4.2.4 Sensor Series IFS 2404

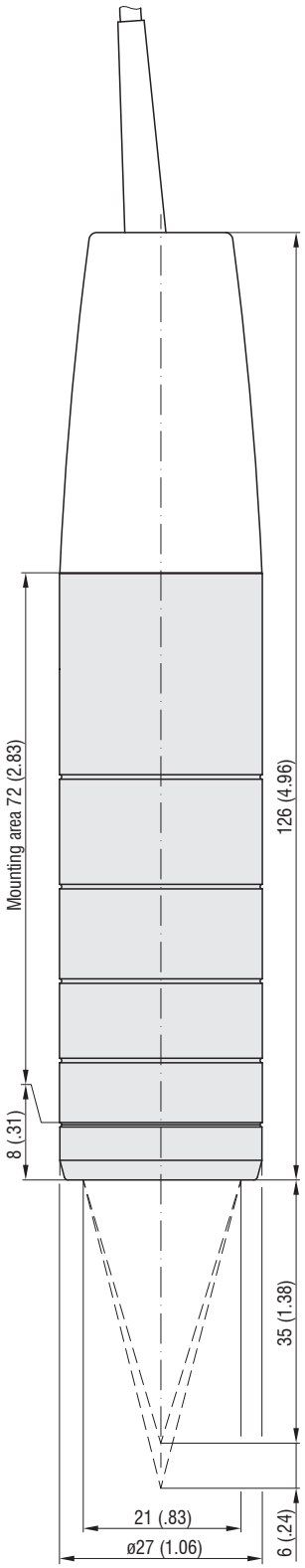
IFS2404-1



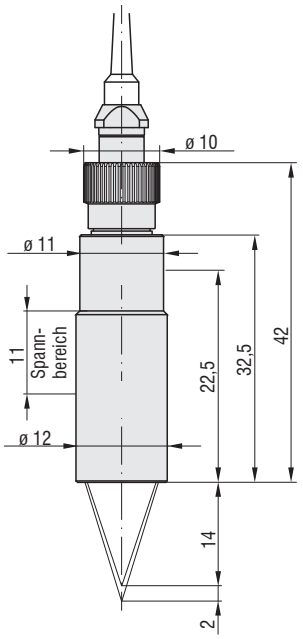
IFS2404-3



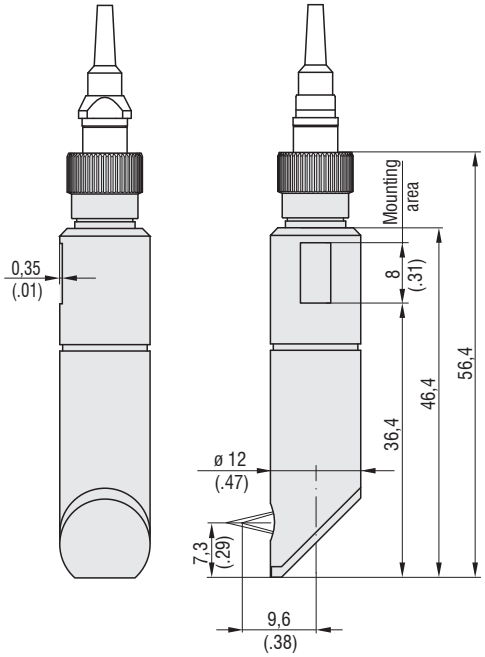
IFS2404-6



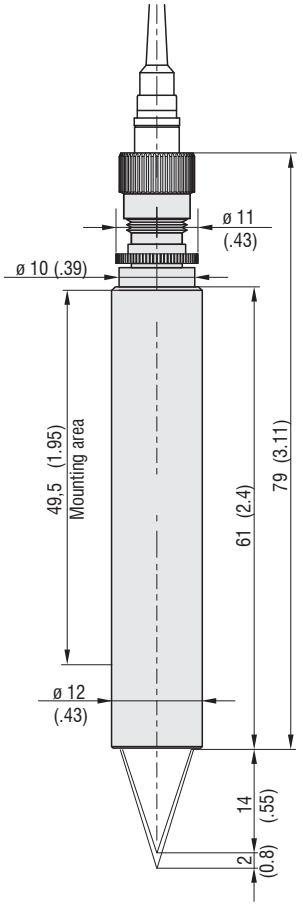
IFS2404-2



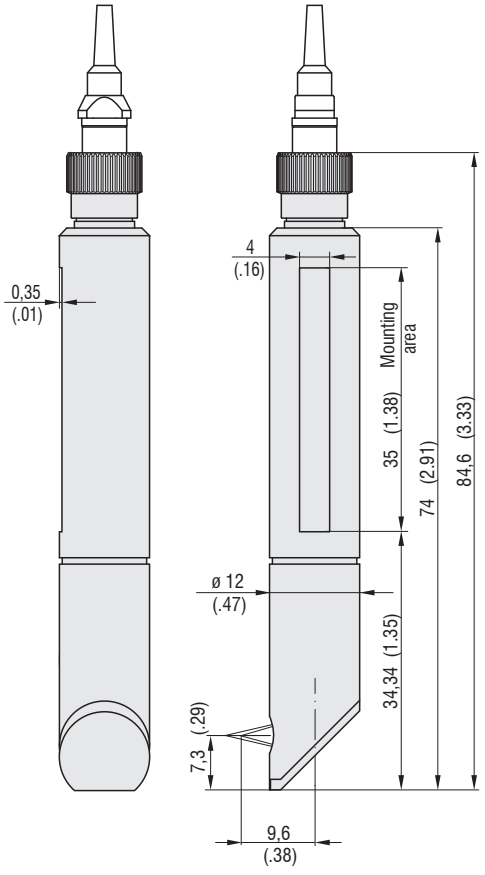
IFS2404/90-2



IFS2404-2(001)

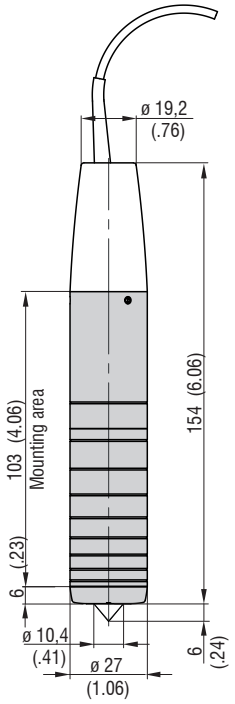


IFS2404/90-2(001)

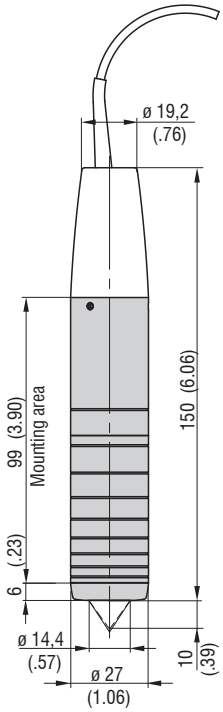


4.2.5 Sensor Series IFS 2405

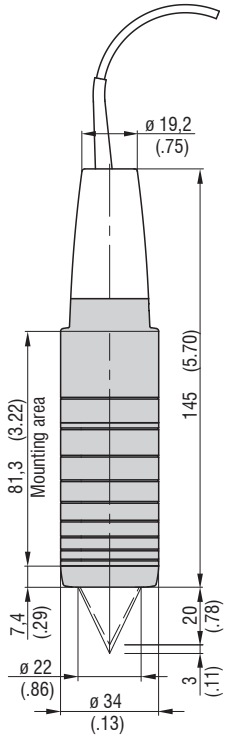
IFS2405-0,3



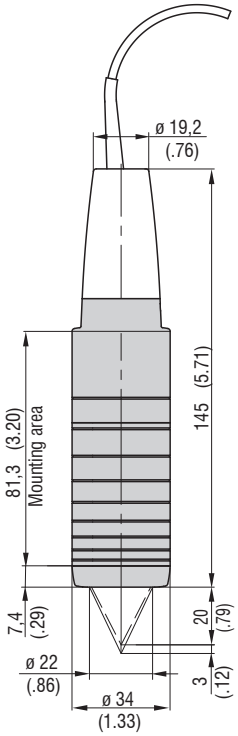
IFS2405-1



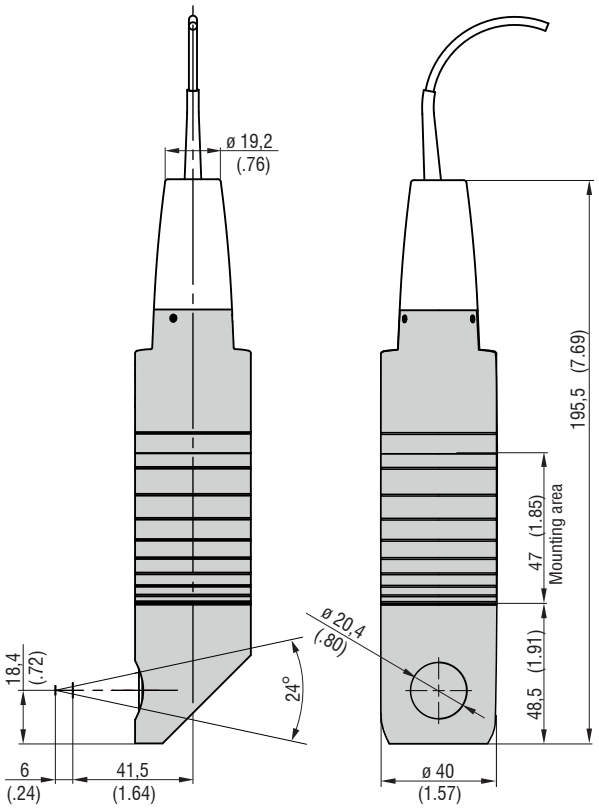
FS2405-3



FS2405-6

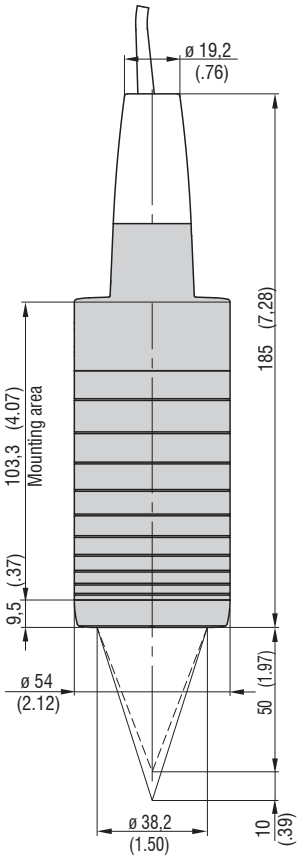


IFS2406/90-6

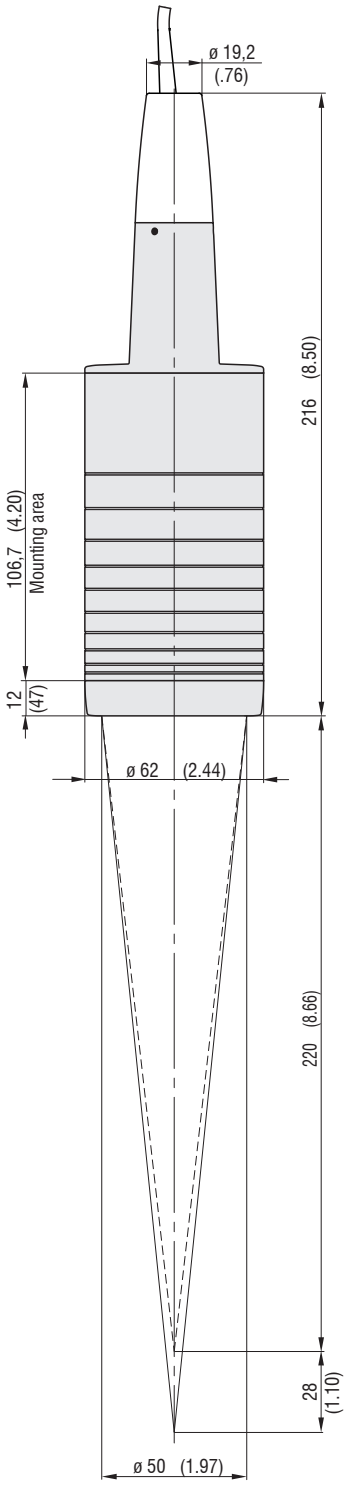


4.2.6 Sensor Series IFS 2405

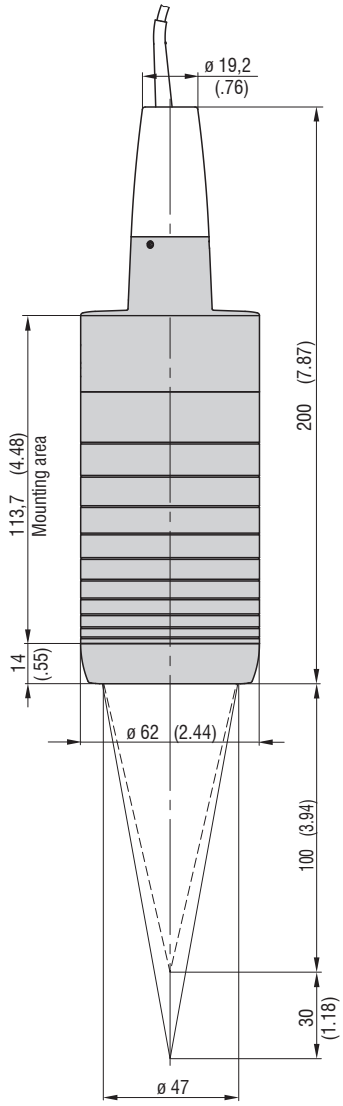
IFS2405-10



IFS2405-28

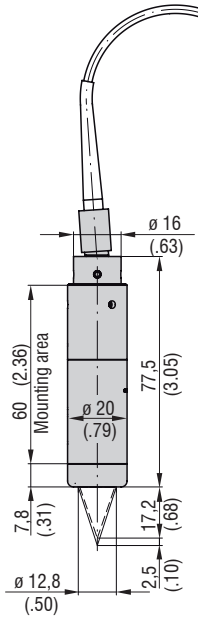


IFS2405-30

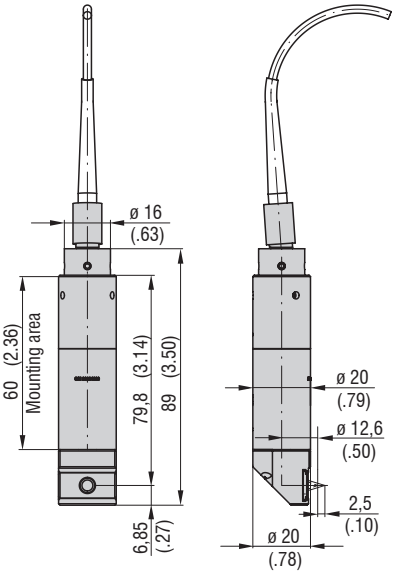


4.2.7 Sensor Series IFS 2406

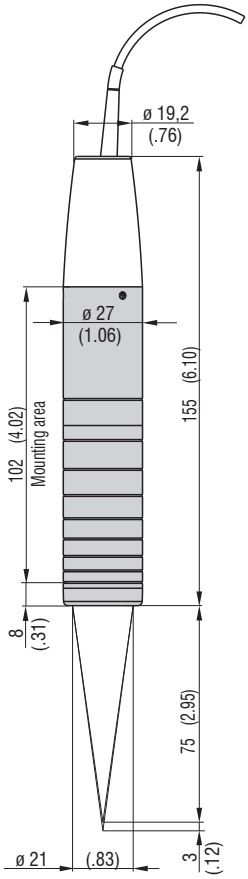
IFS2406-2,5/VAC(003)



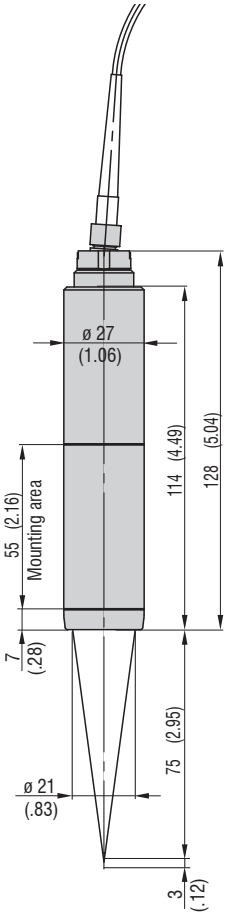
IFS2406/90-2,5/VAC(001)



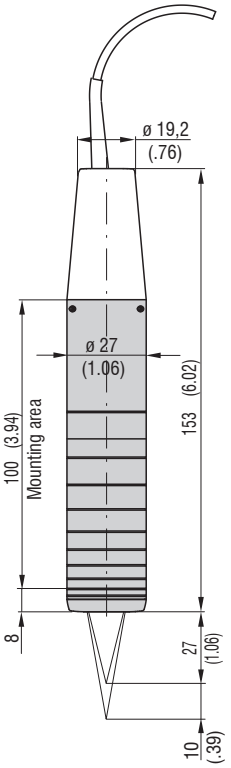
FS2406-3



IFS2406-3/VAC(001)

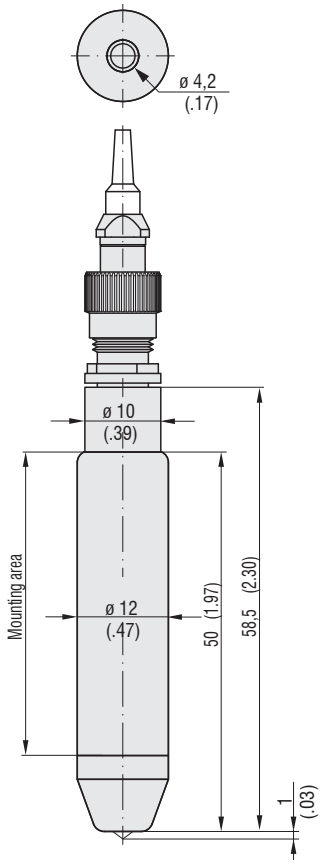


FS2406-10

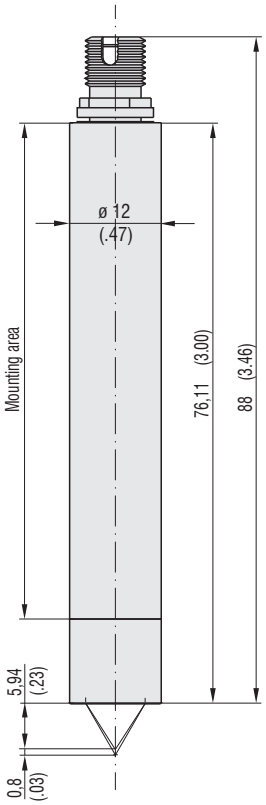


4.2.8 Sensor Series IFS 2407

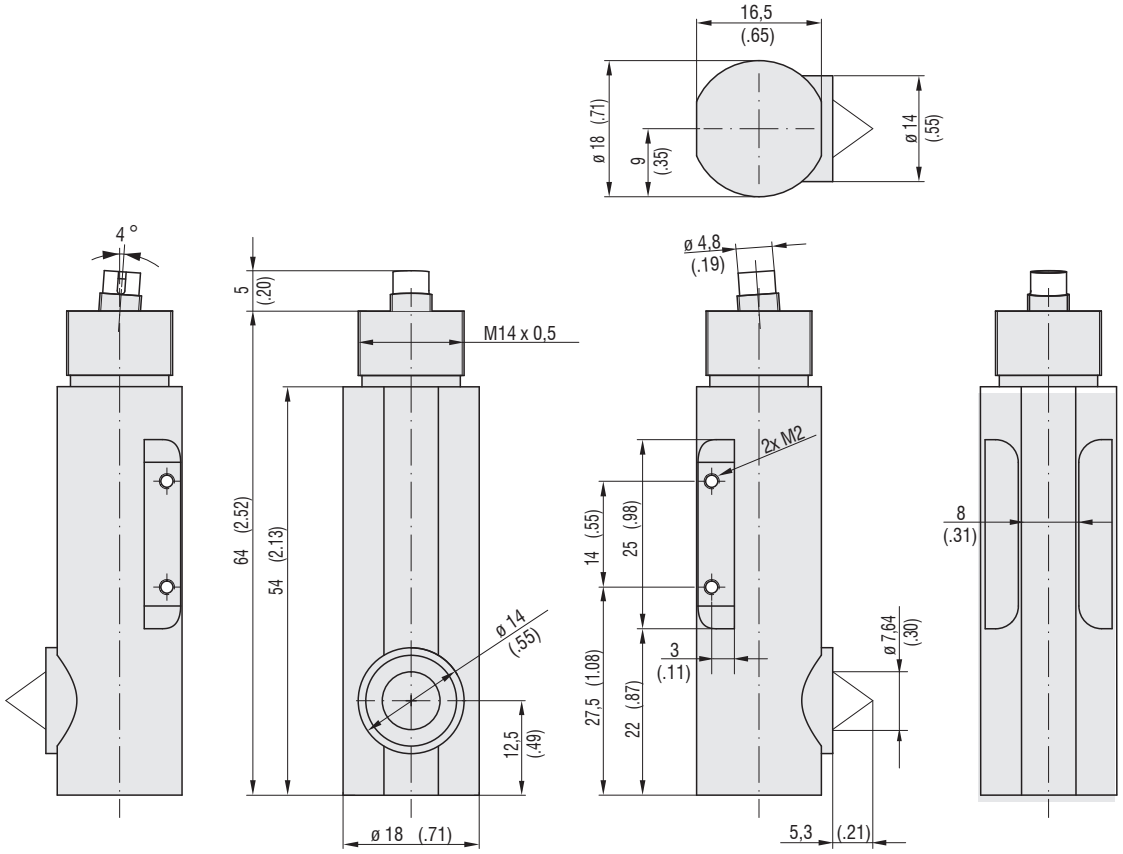
IFS2407-0,1



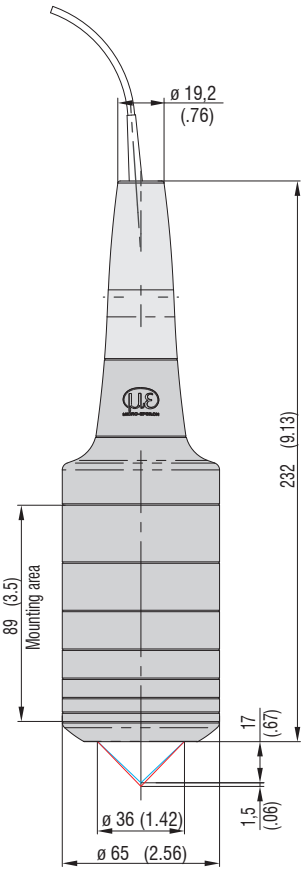
IFS2407-0,8



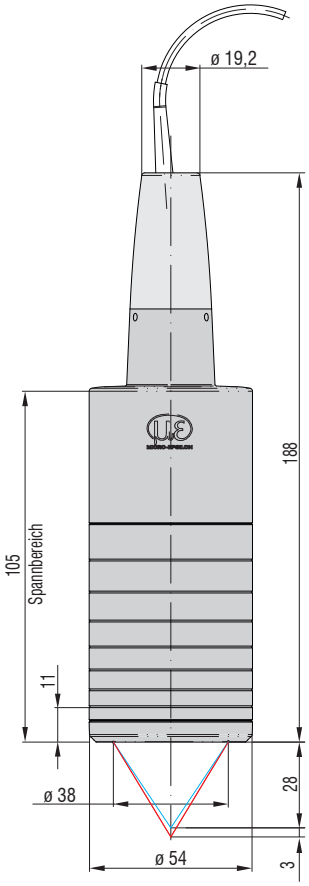
IFS2407/90-0,3



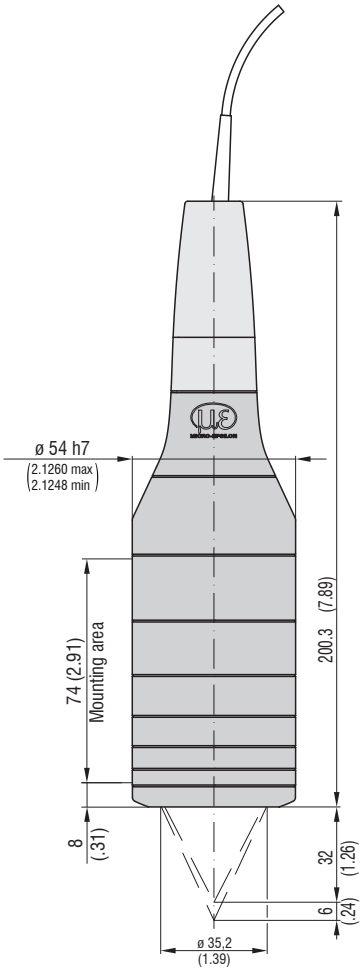
IFS2407-1,5



IFS2407-3

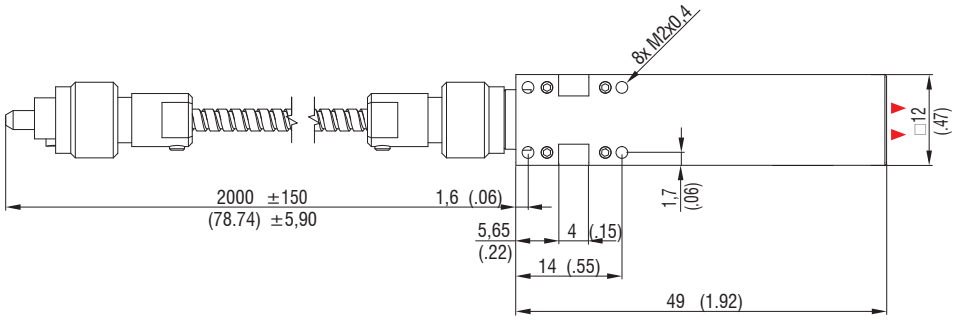


IFS2407-6

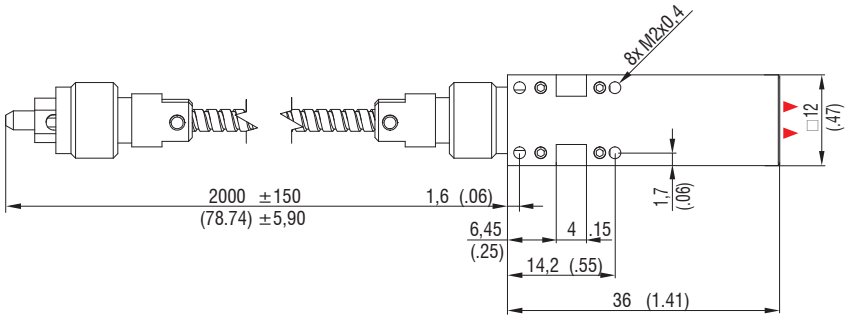


4.2.9 Sensor Series IFS 2407H

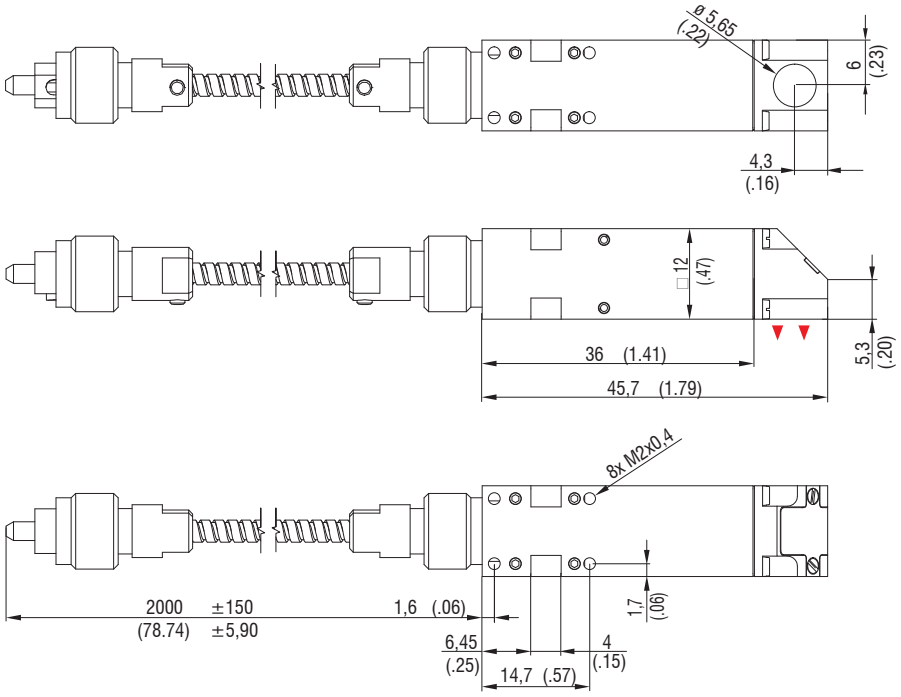
IFS2407-0,8/HT



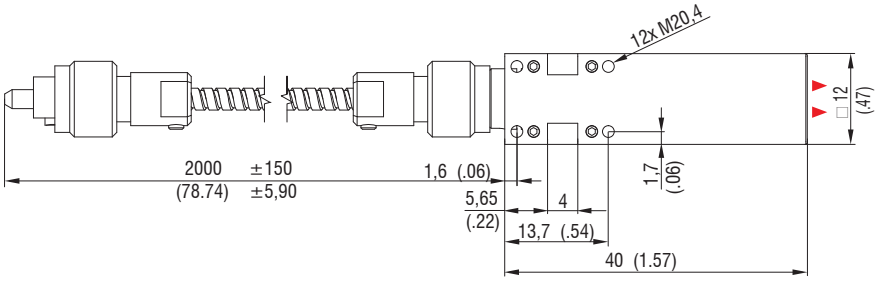
IFS2407-2/HT



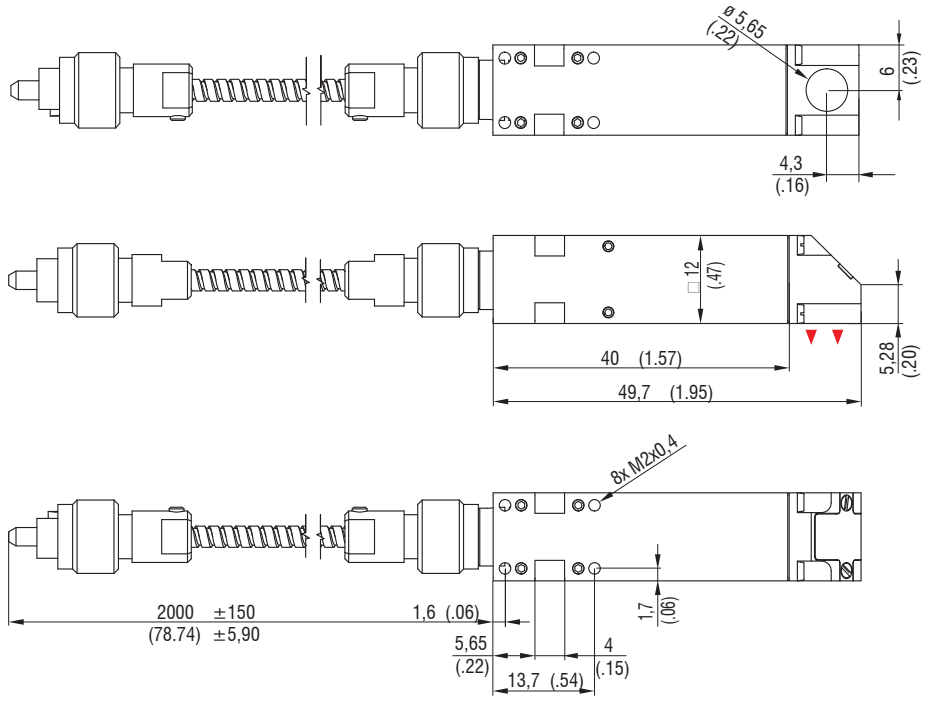
FS2407/90-2/HT



IFS2407-4/HT



IFS2407/90-4/HT



5. Technical Data

Model		IFS2402-0.5	IFS2402-1,5	IFS2402-4
Measuring range		0.5 mm	1.5 mm	3.5 mm
Start of measuring range	approx.	1.7 mm	0.9 mm	1.9 mm
Resolution	Static [1]	16 nm	60 nm	100 nm
	Dynamic [2]	48 nm	192 nm	480 nm
Linearity [3]	Displacement and distance	< ±0.15 µm	< ± 1.2 µm	< ±3 µm
Light spot diameter		10 µm	20 µm	20 µm
Maximum measuring angle [4]		±27°	±5°	±3°
Numerical aperture (NA)		0.40	0.20	0.10
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass) [5]		
Connection		integrated optical fiber 2 m with E2000/APC connector; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64 (front)		
Material		Stainless steel housing, glass lenses		
Weight		approx. 186 g (incl. optical fiber)		

[1]) Average from 512 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]) No thickness measurement possible. Distance measurement only possible if thickness of glass > measuring range. Measurements on metal only possible to a limited extent.

Model		IFS2402/90-1,5	IFS2402/90-4
Measuring range		1.5 mm	2.5 mm
Start of measuring range	approx.	2.5 mm [1]	2.5 mm [1]
Resolution	Static [2]	60 nm	100 nm
	Dynamic [3]	192 nm	480 nm
Linearity [4]	Displacement and distance	< ±1.2 µm	±3 µm
Light spot diameter		20 µm	20 µm
Maximum measuring angle [5]		±5°	±3°
Numerical aperture (NA)		0.20	0.10
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass) [6]	
Connection		integrated optical fiber 2 m with E2000/APC connector; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm	
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each	
Protection class (DIN EN 60529)		IP40	
Material		Stainless steel housing, glass lenses	
Weight		approx. 186 g (incl. optical fiber)	

[1]) Start of measuring range measured from sensor axis
[2]) Average from 512 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]) Maximum sensor measuring angle up to which a usable signal can be achieved on reflective surfaces, with accuracy decreasing toward the limit values
[6]) No thickness measurement possible. Distance measurement only possible if thickness of glass > measuring range. Measurements on metal only possible to a limited extent.

Model		IFS2403-0.4	IFS2403-1.5	IFS2403-4	IFS2403-10
Measuring range		0.4 mm	1.5 mm	4 mm	10 mm
Start of measuring range	approx.	2.5 mm	8 mm	14.7 mm	11 mm
Resolution	Static [1]	16 nm	60 nm	100 nm	250 nm
	Dynamic [2]	47 nm	186 nm	460 nm	1250 nm
Linearity [3]	Displacement and distance	< ±0.3 µm	< ±1.2 µm	< ±3 µm	< ±8 µm
	Thickness	< ±0.6 µm	< ±2.4 µm	< ±6 µm	< ±16 µm
Light spot diameter		9 µm	15 µm	28 µm	56 µm
Maximum measuring angle [4]		±20°	±16°	±6°	±6°
Numerical aperture (NA)		0.50	0.30	0.15	0.15
Min. target thickness [5]		0.06 mm	0.23 mm	0.6 mm	1.5 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)			
Connection		integrated optical fiber 2 m with E2000/APC connector; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm			
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each			
Protection class (DIN EN 60529)		IP64 (front)			
Material		Stainless steel housing, glass lenses			
Weight		approx. 200 g (incl. optical fiber)			

[1]) Average from 512 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]) -Pane of glass with refractive index n = 1.5 in mid of measuring range

Model		IFS2403/90-1.5	IFS2403/90-4	IFS2403/90-10
Measuring range		1.5 mm	4 mm	10 mm
Start of measuring range	approx.	4.9 mm [1]	12 mm [1]	8.6 mm [1]
Resolution	Static [2]	60 nm	100 nm	250 nm
	Dynamic [3]	186 nm	460 nm	1250 nm
Linearity [4]	Displacement and distance	< ±1.2 µm	< ±3 µm	< ±8 µm
	Thickness	< ±2.4 µm	< ±6 µm	< ±16 µm
Light spot diameter		15 µm	28 µm	56 µm
Maximum measuring angle [5]		±16°	±6°	±6°
Numerical aperture (NA)		0.30	0.15	0.15
Min. target thickness [6]		0.23 mm	0.6 mm	1.5 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		integrated optical fiber 2 m with E2000/APC connector; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64 (front)		
Material		Stainless steel housing, glass lenses		
Weight		approx. 200 g (incl. optical fiber)		

[1] Start of measuring range measured from sensor axis
[2] Average from 512 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] Maximum sensor measuring angle up to which a usable signal can be achieved on reflective surfaces, with accuracy decreasing toward the limit values
[6] Pane of glass with refractive index n = 1.5 in mid of measuring range

Model		IFS2404-1	IFS2404-3	IFS2404-6
Measuring range		1 mm	3 mm	6 mm
Start of measuring range	approx.	15 mm	25 mm	35 mm
Resolution	Static [1]	< 12 nm	< 40 nm	< 80 nm
	Dynamic [2]	< 50 nm	< 125 nm	< 250 nm
Linearity [3]	Displacement and distance	< ±0.3 µm	< ±0.9 µm	< ±1.8 µm
	Thickness	< ±0.6 µm	< ±1.8 µm	< ±3.6 µm
Light spot diameter		12 µm	18 µm	24 µm
Maximum measuring angle [4]		±25°	±19°	±10°
Numerical aperture (NA)		0.45	0.35	0.18
Min. target thickness [5]		0.05 mm	0.15 mm	0.3 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		Pluggable fiber optic cable via FC socket; cable type see accessories; standard length 2 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
Mounting		Radial clamping (mounting adapter see accessories)		
Temperature range	Storage	-20 ... +70 °C		
	Operation	5 ... 70 °C		
Shock (DIN EN 60068-2-27)		15 g/ 6 ms in XY axis, 1000 shocks each		
Vibration (DIN EN 60068-2-6)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64		
Material		Aluminum housing, glass lenses		
Weight [6]		approx. 100 g	approx. 100 g	approx. 100 g

[1]) Average from 512 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 deliver
[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

Model		IFS2404-2	IFS2404/90-2	IFS2404-2(001)	IFS2404/90-2(001)
Measuring range		2 mm	2 mm	2 mm	2 mm
Start of measuring range	approx.	14 mm	9.6 mm[1]	14 mm	9.6 mm[1]
Resolution	Static [2]	40 nm	40 nm	40 nm	40 nm
	Dynamic [3]	125 nm	125 nm	125 nm	125 nm
Linearity [4]	Displacement and distance	< ±0,6 µm	< ±0,6 µm	< ±0,6 µm	< ±0,6 µm
	Thickness	< ±1,2 µm	< ±1,2 µm	< ±1,2 µm	< ±1,2 µm
Light spot diameter		10 µm	10 µm	10 µm	10 µm
Maximum measuring angle [5]		±12°	±12°	±12°	±12°
Numerical aperture (NA)		0.25	0.25	0.25	0.25
Min. target thickness [6]		0.1 mm	0.1 mm	0.1 mm	0.1 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)			
Connection		Pluggable fiber optic cable via FC socket; cable type see accessories; standard length 2 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		Pluggable fiber optic cable via FC socket; cable type see accessories; standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm	
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each			
Protection class (DIN EN 60529)		IP64			
Material		Stainless steel housing, glass lenses			
Weight [7]		Approx. 20 g	Approx. 30 g	Approx. 40 g	Approx. 40 g

[1]) Start of measuring range measured from sensor axis
[2]) Average from 512 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]) Maximum sensor measuring angle up to which a usable signal can be achieved on reflective 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

Model		IFS2405-0.3	IFS2405-1	IFS2405-3
Measuring range		0.3 mm	1 mm	3 mm
Start of measuring range	approx.	6 mm	10 mm	20 mm
Resolution	Static [1]	4 nm	8 nm	15 nm
	Dynamic [2]	18 nm	38 nm	80 nm
Linearity [3]	Displacement and distance	< ±0.1 µm	< ±0.25 µm	< ±0.75 µm
	Thickness	< ±0.2 µm	< ±0.5 µm	< ±1.5 µm
Light spot diameter		6 µm	8 µm	9 µm
Maximum measuring angle [4]		±34°	±30°	±24°
Numerical aperture (NA)		0.60	0.55	0.45
Min. target thickness [5]		0.015 mm	0.05 mm	0.15 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		Pluggable fiber optic cable via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64 (front)		
Material		Aluminum housing, glass lenses		
Weight [6]		Approx. 140 g	Approx. 125 g	Approx. 225 g

[1]) Average from 512 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

Model		IFS2405-6	IFS2405/90-6	IFS2405-10
Measuring range		6 mm	6 mm	10 mm
Start of measuring range	approx.	63 mm	41 mm [1]	50 mm
Resolution	Static [2]	34 nm	34 nm	36 nm
	Dynamic [3]	190 nm	190 nm	204 nm
Linearity [4]	Displacement and distance	< ±1.5 µm	< ±1.5 µm	< ±2 µm
	Thickness	< ±3 µm	< ±3 µm	< ±4 µm
Light spot diameter		31 µm	31 µm	16 µm
Maximum measuring angle [5]		±10°	±10°	±17°
Numerical aperture (NA)		0.22	0.22	0.30
Min. target thickness [6]		0.3 mm	0.3 mm	0.5 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		Pluggable fiber optic cable via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64 (front)		
Material		Aluminum housing, glass lenses		
Weight [7]		Approx. 260 g	Approx. 315 g	Approx. 500 g

[1]) Start of measuring range measured from sensor axis
[2]) Average from 512 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]) Maximum sensor measuring angle up to which a usable signal can be achieved on reflective 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

Model		IFS2405-28	IFS2405-28/VAC(001)	IFS2405-30
Measuring range		28 mm		30 mm
Start of measuring range	ca.	220 mm		100 mm
Resolution	Static [1]	130 nm		93 nm
	Dynamic [2]	747 nm		530 nm
Linearity [3]	Displacement and distance	< ±7 µm		< ±6 µm
	Thickness	< ±14 µm		< ±12 µm
Light spot diameter		60 µm		50 µm
Maximum measuring angle [4]		±5°		±9°
Numerical aperture (NA)		0.10		0.20
Min. target thickness [5]		2.2 mm		1.5 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)		
Connection		Pluggable fiber optic cable via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each		
Protection class (DIN EN 60529)		IP64 (front)	IP40 (vacuum compatible)	IP65 (front)
Material		Aluminum housing, glass lenses	Burnished stainless steel housing	Aluminum housing, glass lenses
Weight [6]		Approx. 750 g		Approx. 730 g

[1]) Average from 512 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

Model		IFS2406-2,5/VAC(003)	IFS2406/90-2,5/VAC(001)
Measuring range		2.5 mm	2.5 mm
Start of measuring range	approx.	17.2 mm	12.6 mm [1]
Resolution	Static [2]	18 nm	18 nm
	Dynamic [3]	97 nm	97 nm
Linearity [4]	Displacement and distance	< ±0.75 µm	< ±0.75 µm
	Thickness	< ±1.5 µm	< ±1.5 µm
Light spot diameter		10 µm	10 µm
Maximum measuring angle [5]		±16°	±16°
Numerical aperture (NA)		0.30	0.30
Min. target thickness [6]		0.125 mm	0.125 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)	
Connection		Pluggable fiber optic cable via FC socket, type C240x-x (01); standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm	
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each	
Protection class (DIN EN 60529)		IP40 (vacuum compatible)	
Material		Stainless steel housing, glass lenses	
Weight [7]		Approx. 105 g	Approx. 130 g

[1]) Start of measuring range measured from sensor axis
[2]) Average from 512 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]) Maximum sensor measuring angle up to which a usable signal can be achieved on reflective 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

Model		IFS2406-3	IFS2406-10	IFS2406-10/ VAC(001)	IFS2406-3/ VAC(001)
Measuring range		3 mm	10 mm		3 mm
Start of measuring range	approx.	75 mm	27 mm		75 mm
Resolution	Static [1]	32 nm	38 nm		50 nm
	Dynamic [2]	168 nm	207 nm		168 nm
Linearity [3]	Displacement and distance	< ±1.5 µm	< ±2 µm		< ±1.5 µm
	Thickness	< ±3 µm	< ±4 µm		< ±3 µm
Light spot diameter		35 µm	15 µm		35 µm
Maximum measuring angle [4]		±6.5°	±13.5°		±6.5°
Numerical aperture (NA)		0.14	0.25		0.14
Min. target thickness [5]		0.15 mm	0.5 mm		0.15 mm
Target material		reflective, diffuse as well as transparent surfaces (e.g. glass)			
Connection		Pluggable fiber optic cable via FC socket, type C240x-x (01); standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm			Pluggable fiber optic cable via FC socket, type C240x-x/VAC(01); standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm
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)		2g/ 20 ... 500 Hz on XY axis, 10 cycles each			
Protection class (DIN EN 60529)		IP65 (front)		IP40 (vacuum compatible)	IP40 (vacuum compatible)
Material		Aluminum housing, glass lenses		Stainless steel housing, anodized aluminum housing	Stainless steel housing (1.4305), glass lenses
Weight [6]		Approx. 99 g	Approx. 128 g		Approx. 250 g

[1]) Average from 512 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

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]	3 nm	3 nm	24 nm
	Dynamic [2]	6 nm	6 nm	75 nm
Linearity [3]	Displacement and distance	< ±0.05 µm	< ±0.05 µm	< ±0.2 µm
	Thickness	< ±0.1 µm	< ±0.1 µm	< ±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 fiber optic cable via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm		
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)		2g/ 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 512 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

Model		IFS2407/90-0,3	IFS2407-1,5	IFS2407-3
Measuring range		0.3 mm	1.5 mm	3 mm
Start of measuring range	approx.	5.3 mm	17 mm	28 mm
Resolution	Static [1]	6 nm	6 nm	13 nm
	Dynamic [2]	20 nm	36 nm	63 nm
Linearity [3]	Displacement and distance	< ±0.15 µm	< ±0.3 µm	< ±0.5 µm
	Thickness	< ±0.3 µm	< ±0.6 µm	< ±1 µm
Light spot diameter		6 µm	5.5 µm	9 µm
Maximum measuring angle [4]		±27°	±43° (±70°) [5]	±30°
Numerical aperture (NA)		0.50	0.70	0.53
Min. target thickness [6]		0.015 mm	0.075 mm	0.15 mm
Target material				
Connection		Pluggable fiber optic cable via DIN socket, type C2407-x; standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm	Pluggable fiber optic cable via FC socket, standard length 3 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm	
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)		2g/ 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

[1] Average from 512 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] Maximaler Messwinkel des Sensors, bis zu dem auf diffus reflektierende metallische Oberflächen ein verwertbares Signal erzielt werden kann, wobei die Genauigkeit zu den Grenzwerten abnimmt
[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

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
Resolution	Static [2]	< 6 nm	< 10 nm		< 24 nm	
	Dynamic [3]	< 45 nm	< 90 nm		< 180 nm	
Linearity [4]	Displacement and distance	< ±0.18 µm	< ±0.44 µm		< ±0.8 µm	
	Thickness	< ±0.36 µm	< ±0.88 µm		< ±1.6 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, type C2404; standard length 2 m; extension up to 50 m; bending radius: static 30 mm, dynamic 40 mm				
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 2048 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

6. Mounting, Installation Bracket

6.1 General

The sensors of series IFS240x are optical sensors that operate in micrometers.

i Please ensure careful handling during installation and operation!

Mount the sensors with an outer clamp. This type of sensor installation ensures the highest level of reliability because the sensor's cylindrical cover is clamped over a relatively large area. It must be used in complex installation environments, such as machines, production systems etc.

6.2 IFS2402 Sensors

➪ Use an installation bracket MA2402 to mount IFS2402 sensors.

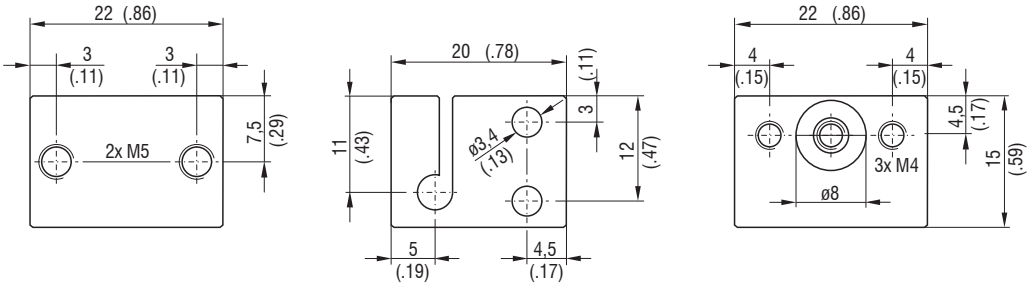


Fig. 2 MA2402-4 installation bracket

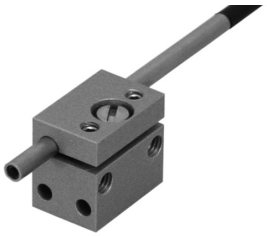


Fig. 3 Outer clamps with MA2402 for IFS2402 sensors

6.3 IFS2403 Sensors

➪ Use an installation bracket MA2403 to mount IFS 2403 sensors.

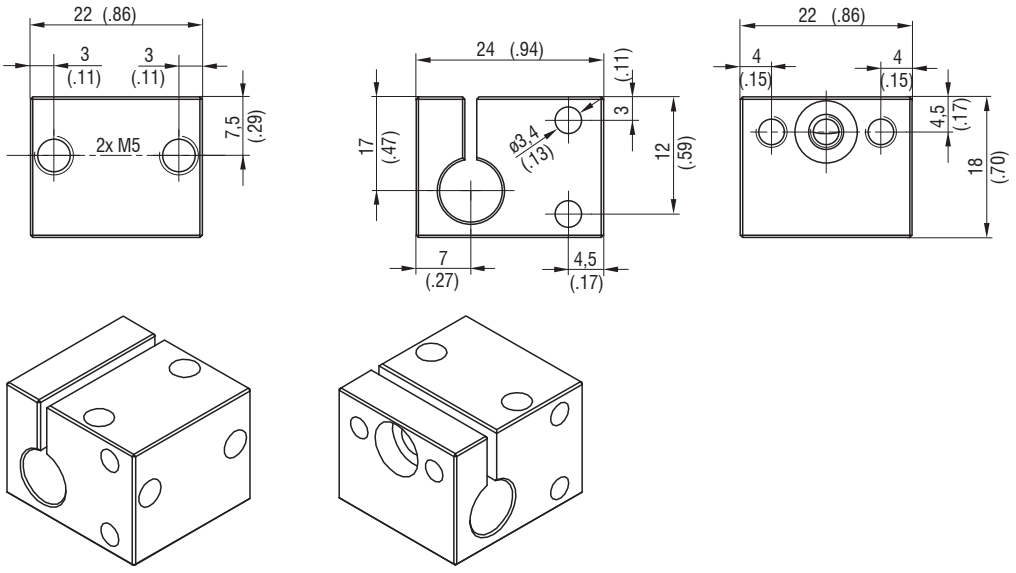
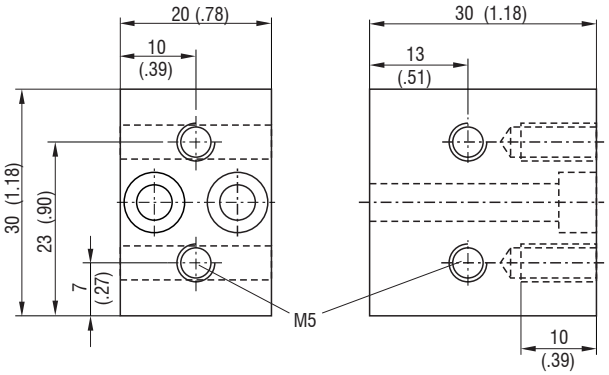


Fig. 4 MA2403 installation bracket

Dimensions in mm (inches, rounded off)

6.4 IFS2404, IFS2405, IFS2406 and IFS2407 Sensors

Use an installation bracket MA240x to mount IFS2404, IFS2405, IFS2406 and IFS2407 sensors.



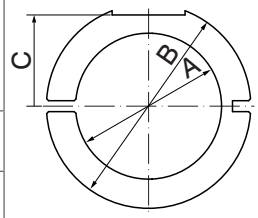
Mounting ring		Dimension A	Dimension B	Dimension C	Sensor
MA2400-27		ø27	ø46	19.75	IFS2404-1 IFS2404-3 IFS2404-6 IFS2405-0.3 IFS2405-1 IFS2406-3 IFS2406-10
MA2405-34		ø34	ø50	22	IFS2405-3
MA2405-40		ø40	ø56	25	IFS2405-6
MA2405-54		ø54	ø70	32	IFS2405-10 IFS2407-3
MA2405-62		ø62	ø78	36.5	IFS2405-28 IFS2405-30
MA2406-20		ø20	ø36	14.5	IFS2406-2,5
MA2407-65		ø65	ø81	18	IFS2407-1,5

Fig. 5 MA240x mounting block and ring

Fig. 6 Outer clamps with installation bracket MA240x for IFS2404, IFS2405, IFS2406 and IFS2407 sensors, consisting of mounting block and mounting ring

6.5 IFS2404 and IFS2407 Sensors

➨ Use an installation bracket MA2404-12 to mount IFS2404-2, IFS2404/90-2, IFS2407-0,1 and IFS2407-0,8 sensors.

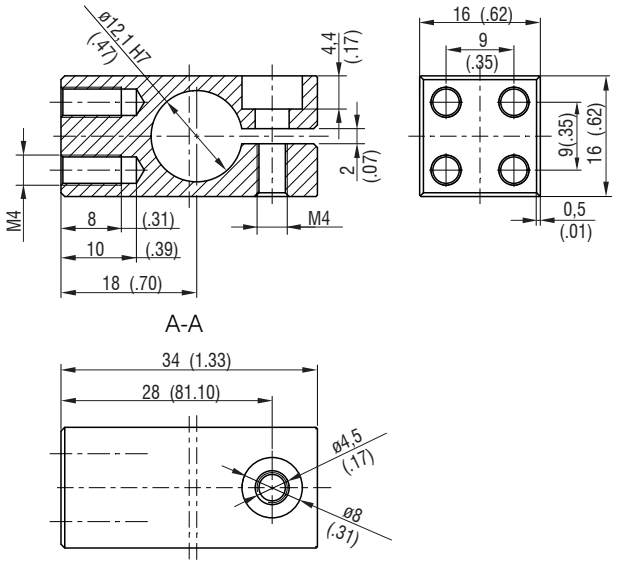


*Fig. 7 Outer clamps with installation bracket MA2404-12 for IFS2404-2, IFS2404/90-2, IFS2407-0,1 and IFS2407-0,8 sensors, d*imension in mm (Inch)

➨ Use the mounting area and two screws M2 or the mounting thread M14x0,5 to mount IFS2407/90-0,3 / IFS2407-HT sensors.

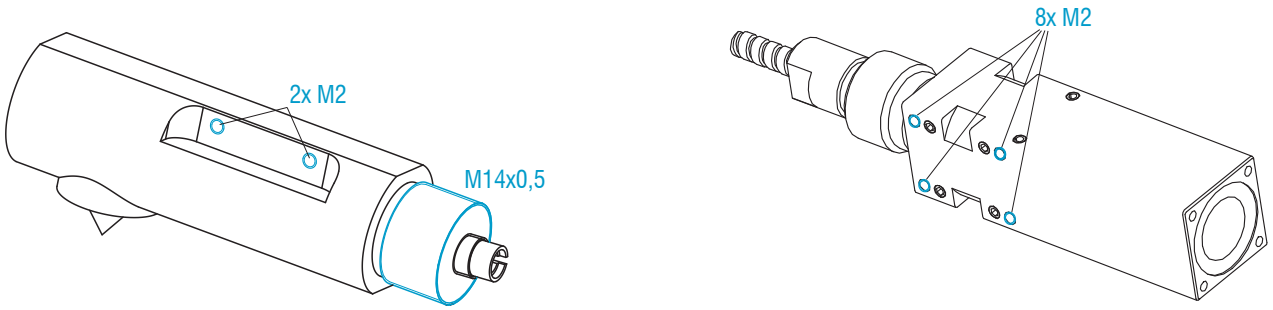


Fig. 8 Mounting for series IFS2407/90-0,3 / IFS2407-HT sensors

Dimensions in mm (inches, rounded-off)

6.6 Adjustable Mounting Adapter JMA-xx

6.6.1 Functions

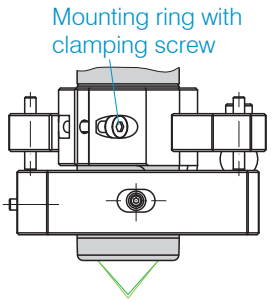
- Supports optimal sensor alignment for best possible measurement results
- Manual adjustment mechanism for easy and fast adjustment
  - Shift in X/Y: ±2 mm
  - Tilt angle: ±4°
- High resistance to shocks and vibrations due to radial clamping allows integration into machines
- Compatible with numerous confocalDT and interferoMETER sensor models

6.6.2 Sensor Mounting, Compatibility

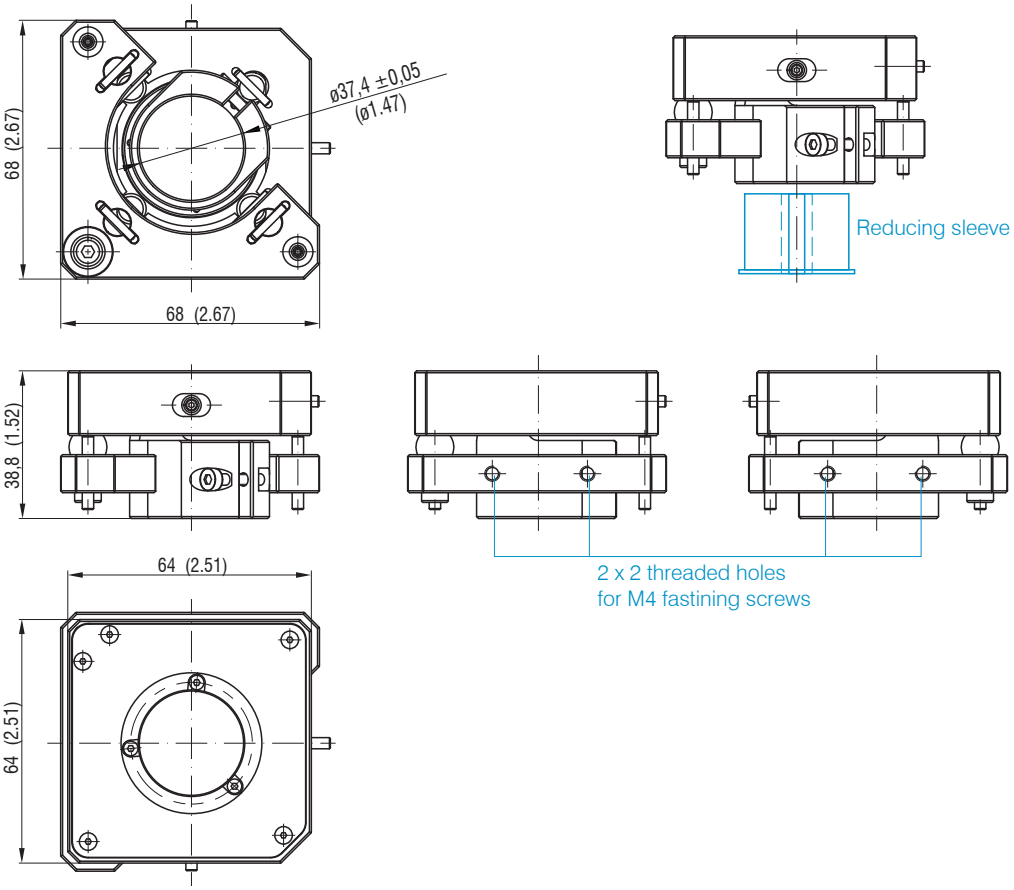
Radial clamping for sensors with				
ø 8 mm	ø 12 mm	ø 20 mm	ø 27 mm	
Reducing sleeve				
D27-D8 adapter	D27-D12 adapter	D27-D20 adapter		
confocalDT: IFS2403 series	confocalDT: IFS2404-2 IFS2407-0,1 IFS2407-0,8	confocalDT: IFS2406-2,5/VAC	confocalDT: IFS2404-1 IFS2404-3 IFS2404-6	confocalDT: IFS2405-0,3 IFS2405-1 IFS2406-3 IFS2406-10

6.6.3 Assembly

- Mount the sensor in the mounting ring, see figure.
- Use reducing sleeves for sensors with an outer diameter of less than 27 mm.
- Mount the mounting adapter with screws type M4, see dimensional drawing.



6.6.4 Dimensional Drawing of Mounting Adapter



6.6.5 Perpendicular Alignment of Sensor

With the light source switched on, align the sensor with the measuring object.

Horizontal shift ±2 mm

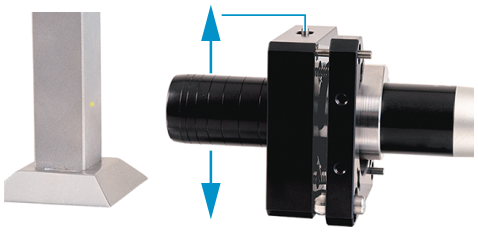
Shift to the left:

Turn the hexagon socket screw clockwise

Shift to the right:

Turn the hexagon socket screw counterclockwise

Vertical shift ±2 mm



Shift downwards:

Turn the hexagon socket screw clockwise

Shift upwards:

Turn the hexagon socket screw counterclockwise

Horizontal tilt angle ±4°

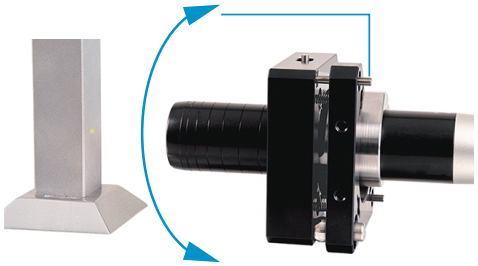
Tilt to the left:

Turn the hexagon socket screw clockwise

Tilt to the right:

Turn the hexagon socket screw counterclockwise

Vertical tilt angle ±4°



Tilt downwards:

Turn the hexagon socket screw clockwise

Tilt upwards:

Turn the hexagon socket screw counterclockwise

7. Cleaning Optical Components

7.1 Contamination

Contaminated boundary surfaces and components can cause an increase in dark value and will affect sensitivity and accuracy. To avoid this, it is necessary to clean the optical components and record the dark value. The dark value refers to the interfering reflections at boundary surfaces along the optical signal path. At each boundary surface or material transition, the light waves are reflected to a certain extent at the transition and travel back in the fiber optics. The interfering signal overlaps with the useful signal and forms a kind of signal noise.

If the interference signal is sufficiently high and the useful signal is relatively weak, the useful signal can no longer be clearly identified. This may cause the controller to confuse a dark value peak with the measurement signal. The calculated distance of the measuring object therefore does not match the actual one.

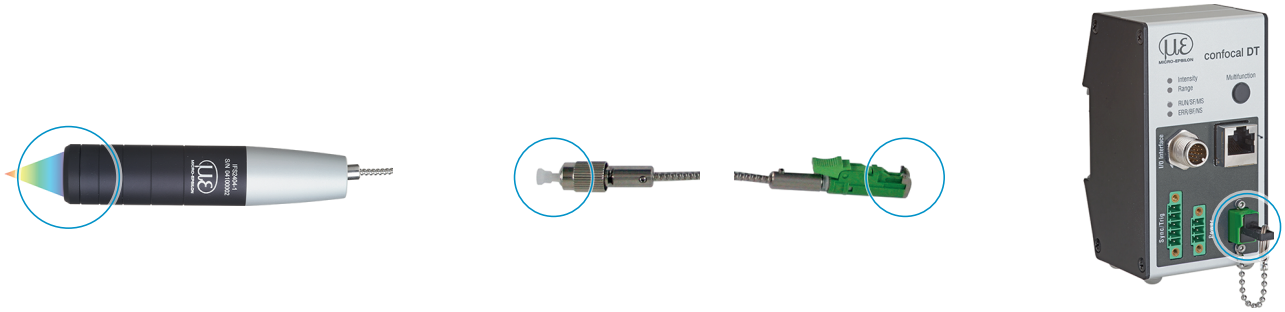


Fig. 9 Optical boundary surfaces of a confocal measuring system

7.2 Tools and Cleaning Agents

One-Click™ cleaner	Isopropyl alcohol	Q-Tip, suitable for clean rooms	Pressurized gas, dry and oil-free
			
For FC or E2000 type plug or socket	For the protective glass of the sensor	Use with isopropyl alcohol for protective glass of the sensor	Removes loose particles

7.3 Protective Glass of Sensor

Loose particles

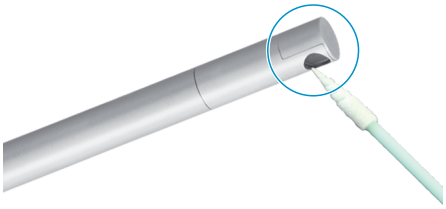
- Blow off loose particles with dry, oil-free pressurized air.

Stuck particles

- Clean the protective glass with a clean, soft, lint-free cloth or lens cleaning paper and pure alcohol (isopropyl alcohol).

For sensors with a small protective glass, e.g., the IFS2403 series:

- Soak a Q-Tip in isopropyl alcohol. Slowly rub the Q-Tip with a circular motion on the protective glass.

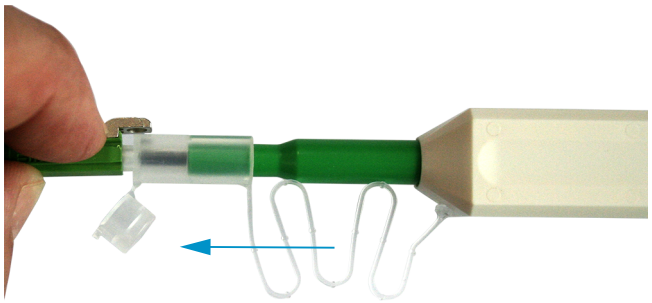


7.4 Interface between Controller and Sensor Cable

- Disconnect the sensor cable (fiber optic cable) from the controller.
- Remove the protective cap of the One-Click™ cleaner.
- Put the One-Click™ cleaner into the fiber optic connector of the controller, see figure.
- Press the outer sleeve of the One-Click™ cleaner onto the fiber optic connector until a click noise signalizes the end of cleaning.

Fig. 10 One-Click™ for cleaning E2000 optical fiber transitions

- Insert the protective cap on the controller into the fiber optic connector.
- Remove the protective front cap of the One-Click™ cleaner.
- Put the One-Click™ cleaner into the fiber optic cable, see figure.
- Press the outer sleeve of the One-Click™ cleaner onto the fiber optic cable until a click noise signalizes the end of cleaning.

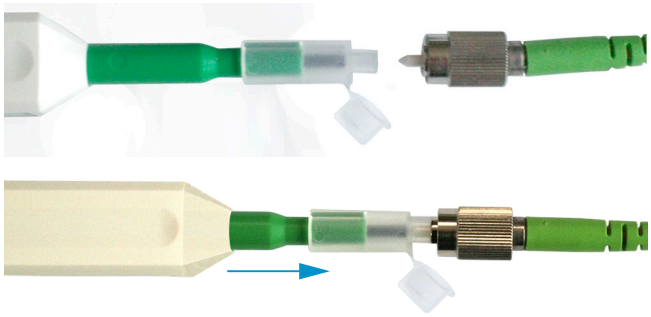


- Plug the sensor cable into the controller.
- Perform dark referencing.

If the video signal corresponds to the condition before the dark reference, you must clean the boundary surface within the measuring system.

7.5 Interface between Sensor Cable and Sensor

- Remove the sensor cable (fiber optic cable) from the sensor.
- Remove the protective front cap of the One-Click™ cleaner.
- Put the One-Click™ cleaner into the fiber optic cable, see figure.
- Press the outer sleeve of the One-Click™ cleaner onto the fiber optic cable until a click noise signalizes the end of cleaning.



- Put a protective cap on the fiber optic cable.

Sensors with fiber optics, e.g. IFS2407 series:

- Remove the protective cap of the One-Click™ cleaner.
- Put the One-Click™ cleaner into the sensor, see figure.
- Press the outer sleeve of the One-Click™ cleaner onto the sensor until a click noise signalizes the end of cleaning.

- Connect the sensor cable to the sensor.
- Perform dark referencing.

If the video signal corresponds to the condition before the dark reference, you must clean the boundary surface within the measuring system.

7.6 Preventive Protection

Sensors and controllers of a confocal chromatic sensor system are supplied with protective caps. This prevents dust or similar contaminants from being deposited at the optical boundary surfaces.

- Cover all optical fiber connections immediately when replacing sensors or disconnecting a sensor cable from the controller.

NOTICE

After successful cleaning, perform a dark calibration.
You can find information on performing a dark calibration in the system's operating instructions.

8. Repair Sensor / Sensor cable

8.1 Changing the Sensor Cable for IFS2404, IFS2405, IFS2406 and IFS2407

- Disconnect the protective sleeve from the sensor. Remove the damaged sensor cable.
- Guide the new sensor cable through the protective sleeve.
- Remove the protective cap on the sensor cable and keep it.
- Guide the locking pin of the sensor cable into the connector cavity.
- Screw together the sensor's connector and socket ends.
- Screw the protective sleeve back onto the sensor.
- Run the dark reference

8.2 Changing the Protective Glass for IFS2405 and IFS2406 Sensors

Changing the protective glass is required for

- irreversible pollution.
- scratches.

Do not use the sensor without a protective glass, because this leads to a lower measurement accuracy.

8.2.1 IFS2405/IFS2406

- Loose the front socket with the protective glass from the sensor.

- Remove the seal and place the O-ring into the frame groove of the new socket.
- Screw the new socket with the protective glass back onto the sensor.

8.2.2 IFS2406/90-2,5

- Loose the grub screws on the sensor and slide the protective glass aside.

Fig. 11 View on sensor from above

Fig. 12 View on sensor from below

- Slide the new protective glass flush back and clamp the protective glass with the two grub screws again firmly.

9. Accessories, Services

Accessories IFS2402, IFS2403

CE2402-x	Sensor cable extension for IFS2402 sensors, length x = 3 m, 10 m, 30 m, 50 m
CE2402-x/PT	Sensor with protective tubing, length x = 3 or 10 m, costumer-specific up to 50 m

Accesories IFS2404-2, IFS2404/90-2

C2404-x	Sensor cable IFS2404-2, IFS2404/90-2 sensors, length x = 2 m 0,3 m, 1 m, 2 m, 3 m, 5 m

Accessories IFS2404-1, IFS2404-3, IFS2404-6, IFS2405, IFS2406, IFS2407-0,1

C2401 cable with FC/APC and E2000/APC connectors

C2401-x	Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
C2401/PT-x	Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
C2401-x(01)	Optical fiber core diameter 26 µm (3 m, 5 m, 15 m)
C2401-x(10)	Drag-chain suitable optical fiber (3 m, 5 m, 10 m)

C2400 cable with 2x FC/APC connector

C2400-x	Optical fiber (3 m, 5 m, 10 m, customer-specific length up to 50 m)
C2400/PT-x	Optical fiber with protection tube for mechanical stress (3 m, 5 m, 10 m, customer-specific length up to 50 m)
C2400/PT-x.Vac	Optical fiber with protection tube suitbale for use in vacuum (3 m, 5 m, 10 m, customer-specific length up to 50 m)

Installation bracket

MA2400-27	Installation bracket for IFS2404-1, IFS2404-3, IFS2404-6, IFS2405-0,3 / IFS2405-1 / IFS2406-3 / IFS2406-10 sensors
MA2402-4	Installation bracket for IFS2402-x sensors
MA2403-8	Installation bracket for IFS2403-x sensors
MA2404-12	Installation bracket for IFS2404-x / IFS2407-0,1 / IFS2407-0,8 sensors
MA2405-34	Installation bracket for IFS2405-3 sensors
MA2405-40	Installation bracket for IFS2405-6 / IFS2405/90-6 sensors
MA2405-54	Installation bracket for IFS2405-10 / IFS2407-3 sensors
MA2405-62	Installation bracket for IFS2405-28 / IFS2405-30 sensors
MA2406-20	Installation bracket for IFS2406-2,5 sensors
MA2407-65	Installation bracket for IFS2407-1,5 sensors
JMA-xx	Adjustable Mounting Adapter

Accessories IFS2407/90-0,3

C2407-x	Optical fiber with DIN connector and E2000/APC (2 m, 5 m)

Accessories light source

IFL2422/LED	Lamp module for IFC2422 / IFC2466
IFL24x1/LED	Lamp module for IFC24x1
Optical fiber reflector	Reflector for E2000/APC

Vacuum feed trough

C2402/Vac/KF16	Vacuum feed trough for optical fiber, 1 channel, vacuum side FC/APC non-vacuum side E2000/APC, clamping flange type KF 16
C2405/Vac/1/KF16	Vacuum feed through on both sides FC/APC socket, 1 channel, clamping flange type KF 16
C2405/Vac/1/CF16	Vacuum feed through on both sides FC/APC socket, 1 channel, flange type CF 16
C2405/Vac/6/CF63	Vacuum feed through for optical fiber, on both sides FC/APC socket, 6 channels, flange type CF 63

10. Operation and Maintenance

Please take care of the following:

- Make sure that the sensor surface is always clean.
- Switch off the power supply before cleaning.
- Clean with a damp cloth; then rub the sensor surface dry.

Changing the target or very long operating times can lead to slight reductions in the operating quality (long term errors). These can be eliminated by recalibration.

⚠ CAUTION

Static discharge, danger of injury.

- Disconnect the power supply before touching the sensor surface.

11. Service, Repair

If the sensor or sensor cable 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 Str. 15
94496 Ortenburg / Deutschland

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

12. 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 and/or controller.
- Dispose of the sensor and/or the controller, 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 legal details 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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