MICRO-EPSILON

More Precision

CFS // Sensor configuration

Sensor configuration
CFS sensor

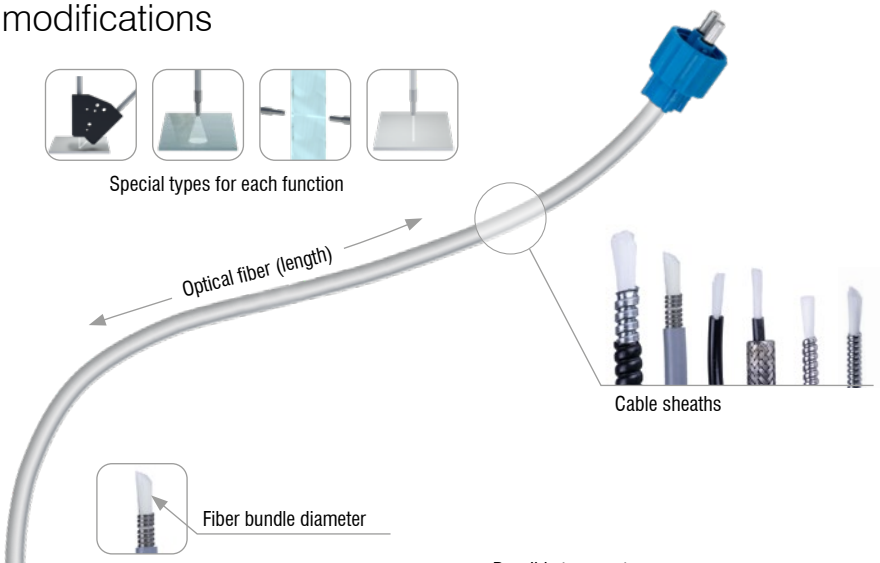
All sensors can be customized. We would be pleased to manufacture your sensor according to your specifications/requirements and your drawing. Please contact Micro-Epsilon Eltrotec directly for this.

Examples of customer-specific modifications

Function
- Special types for CFS4 reflex sensor
- Special types for CFS3 transmission sensor or CFS1 angle sensor
- Special types for CFS5 receiver sensor

Special types for each function

Optical fiber sheath
- Silicone-metal sheath
- VA stainless-steel sheath
- Metal sheath
- PVC metal sheath
- PVC special sheath
- BOA special sheath
- MA-radius-limiting special sheath



Fiber bundle diameter
- 0.6 / 1 / 1.5 / 2.5 / 3 mm

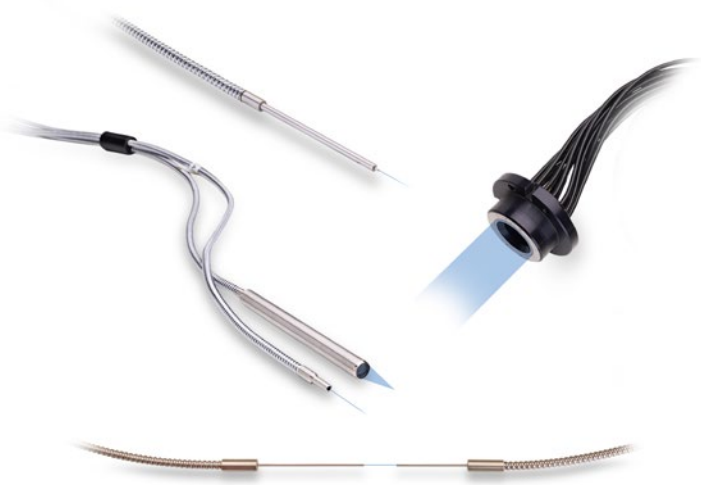
Optical fiber (length)
- Available from 300 mm
- Standard length 1,200 mm
- 600, 1,800 and 2,400 mm optionally available
- CFO: Individual lengths from 0.3 ... 2.4 m possible
- CLS: Individual lengths from 0.3 ... 10 m possible

Aperture angle
- Standard 67°
- Optional 22° / 35°

Ambient conditions
- Special versions with increased vibration resistance (VS)
- Special variants with special bonding for high temperatures (T250 / T400)
- Pressure-tight special variants with vacuum feedthrough (up to 10^{-5} mbar)
- Pressure resistance up to 10 bar


Mountable lenses

Mountable lenses
- Focusing for small light spots (> 0.8 mm)
- Large object distances (= distance between sensor and measuring object) up to 200 mm
- Distances > 300 mm with C-mount lens

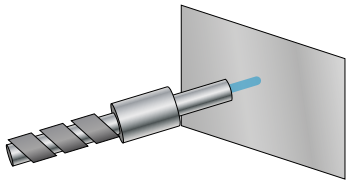


One of the strengths of Micro-Epsilon Eltrotec's fiber optic production is the manufacture of very complex, small and large probe heads, including those with several segments and special adapters.

Micro-Epsilon Eltrotec can draw on many years of experience in the field of special fiber optics production. Tell us your task or send us a sketch with the necessary data. We will find the right solution together with you.

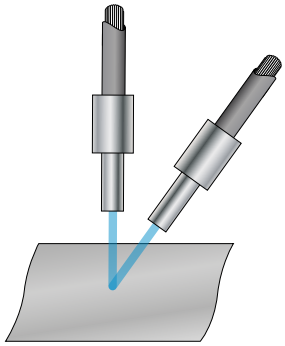
Notes on the function of the CFS sensors

Application instructions on selecting the appropriate function.



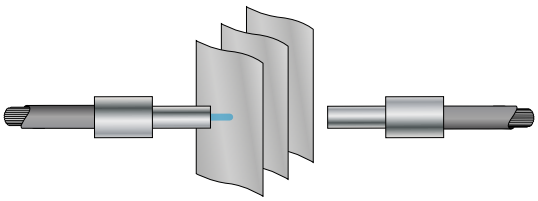
Reflex mode

- CFO: measurement distance max. 200 mm
- CLS: measurement distance max. 1200 mm
- Easy and fast installation
- Detection of smallest objects from 0.2mm
- Color evaluation to determine color, gloss level, gray value presence detection
- Ideal for parts recognition, sorting tasks, presence monitoring, color inspection



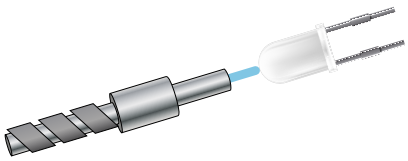
Reflex mode V arrangement

- CFO: Measurement distance max. 200 mm (for reflective surfaces)
- CLS: Measurement distance max. 1200 mm
- Easy adjustment due to mounting accessories
- Very precise positioning of the detection point possible
- Immune to dust and particles in the beam path



Transmitted light mode

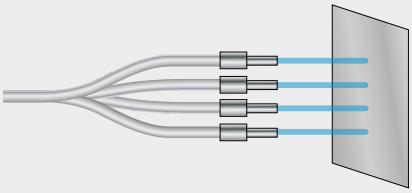
- CFO: Distance between receiver and sensor element up to 50 mm
- CLS: Distance between receiver and sensor element up to 2000 mm
- Color recognition of transparent objects
- Arbitrary point of light transmission
- Ideal for part detection, color inspection, sorting tasks, presence monitoring



Receiving mode self-luminous objects (for CFO)

- Max. measurement distance 30 mm
- Detection of the smallest color and intensity variations
- For color sensor with external illumination
- Ideal for testing LED, illumination and self-luminous objects

Available on request



Special types for multiple reflex mode

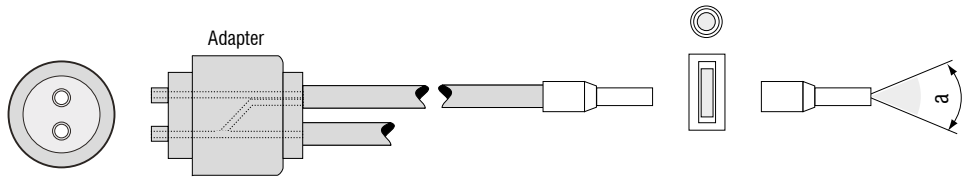
Transmitting and receiving units are statistically mixed in two or more separate sensor heads. Therefore, several positions can be detected using only one sensor.

Special types for multiple transmitted light mode

The light path of the axially opposite probe head ferrules is interrupted or attenuated by one or more objects.

Sensor types
Optical glass fibers

Order code for optical fibers



Function	Ferrule	Sheath	Fiber bundle Ø	Total length	Aperture angle	Max. Temp. range	Vibration protection	Drag chain suitability
CFS	3	A20	T	2.5	1200	67°	TXXX	VS	D

9 If available, specify suitability for drag chains
D=suitable for drag chains

8 If available, specify the vibration protection
VS = Vibration protection

7 If available, specify temperature bonding with the maximum possible temperature

6 Specification of aperture angle
Not applicable when standard aperture angle is 67°

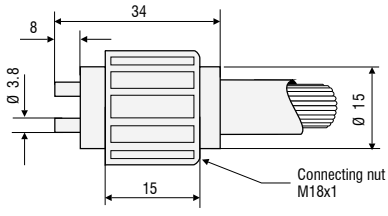
5 Length of optical fiber
Not applicable for standard length of 1200 mm

4 Specification of fiber bundle diameter. Only if this deviates from the values listed in the tables.

3 Specification of sheath based on ambient conditions.
Not applicable for T-sheath, as it is a standard sheath

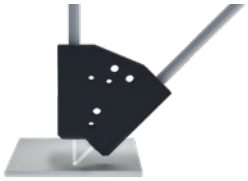
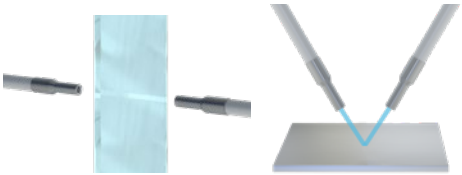
2 Specification of the ferrule.
Addition "/90" for 90° beam path

1 Specification of the function:
1 = angle sensor; 2= circular sensor; 3= transmission sensor;
4= reflex sensor; 5= receiver sensor



CFS: FA-Adapter System FASOP

1 Function

Series	Special features
1 **CFS1-Vxx** 	**Standard sensor** ▪ For high-gloss surfaces, diffuse reflection without gloss ▪ Ideally suited to solid colors, anti-reflective coating or chrome colors ▪ Max. working distance of 125 mm (with reflecting surfaces) ▪ Very precise positioning of the detection point
2 **CFS2-Mxx** 	**Circular sensor** ▪ For structured and metallic-effect surfaces ▪ Ideally suited for textile, paper, metallic paint, metallic nail polish, sand, granulate or masterbatch ▪ Homogeneous illumination of the measuring point ▪ Max. working distance of 100 mm (with reflecting surfaces) ▪ Very precise positioning of the detection point ▪ Measurement spot diameter up to 114 mm
3 **CFS3-Axx / CFS3-Cxx** 	**Transmission sensor** ▪ For transparent surfaces ▪ Ideally suited for films, glasses, translucent liquids (e.g., detergents), filters or PET bottles ▪ Max. working distance between receiver and transmitter unit 50 mm ▪ No exact positioning necessary ▪ Transmission sensor in reflex mode in V arrangement
4 **CFS4-Axx** **CFS4-Cxx** **CFS4-Dxx** **CFS4-Fxx** **CFS4-Jxx** **CFS4-Kxx** 	**Reflex sensor** ▪ For individual surfaces, direct reflection with gloss ▪ Ideally suited for metal (differentiation), plastic parts, thread locking, coating or packaging ▪ For detection of gloss and material differences ▪ Ideal for part recognition, sorting tasks, presence control, color inspections ▪ Detection of the smallest of objects from 0.8 mm ▪ Working distance 5 ... 200 mm and larger possible on reflective surfaces
5 **CFS5-Axx** **CFS5-Cxx** **CFS5-xx** 	**LED test sensor** ▪ Ideal for testing LED, illumination and self-luminous objects ▪ For color sensor with external illumination ▪ Max. measurement distance 30 mm ▪ Detection of smallest color and intensity variations ▪ For self-luminous, diffuse reflection incl. gloss

Sensor types
Optical glass fibers

2 Sensor variants and fiber bundles

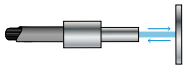
Please select the sensor variant and make sure that the sensor head is compatible with the fiber bundle diameter øF and the sheath (see 3).
Standard sensor bonding for -10 °C to +80 °C
For special variants (T250, T400) see technical data.
All data in mm; tolerances: typically ±0.1 mm
Black anodized aluminum sleeves
Customization is possible by arrangement, please contact us.

Detection ranges and CFO sensor variants

Fiber bundle ØF mm			Working distance	Measurement spot for 67° fiber; approx. Ø mm
CFS3	0.6	Start	5	0.6
		Optimal	10	
		End	15	
	1.5	Start	5	1.5
		Optimal	10	
		End	15	
	2.5	Start	5	2.5
		Optimal	10	
		End	20	
	3	Start	5	3
		Optimal	10	
		End	20	
CFS4	0.6	Start	5	8
		Optimal	5	8
		End	15	20
	1	Start	5	8
		Optimal	5	8
		End	15	20
	1.5	Start	5	8
		Optimal	5	8
		End	15	22
	2.5	Start	5	10
		Optimal	5	10
		End	20	28
	3	Start	5	10
		Optimal	5	10
		End	20	28

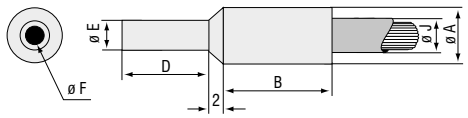
Typical values determined with colorSENSOR CFO200

Surface-dependent detection and operating ranges CLS

 **Range Transmission mode (typ.)**		90 mm	200 mm	500 mm	1700 mm	2000 mm
Min. object size (typ.)		0.05 mm	0.1 mm	0.1 mm	0.2 mm	0.3 mm
 **Range Reflex mode (typ.) ***	Copper	35 mm	76 mm	217 mm	820 mm	>1200 mm
	Raw aluminum	24 mm	61 mm	164 mm	514 mm	457 mm
	Stainless steel	21 mm	50 mm	135 mm	412 mm	415 mm
	White, rough plastics	13 mm	33 mm	84 mm	260 mm	260 mm
	Mat black cardboard	6 mm	16 mm	44 mm	130 mm	135 mm
Required fiber bundle øF		**0.6 mm**	**1 mm**	**1.5 mm**	**2.5 mm**	**3 mm**

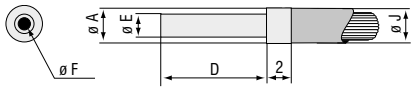
*Analog output 5 V and maximum amplification

A Type A ferrule, stainless steel



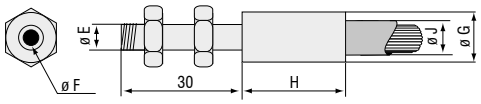
Ø F	Type	Ø A	B	D	Ø E	Ø J P	Ø J M	Ø J T
1.5	A10	4.6	8	11	2.5	4	4	–
1.5	A11	6.6	8	11	2.5	–	5	4.4
2.5	A20	6.6	10	12	4.5	6	6	5.8
3	A30	8.5	11	15	6	7	7	7.5

B Type B ferrule
(only suitable for PVC sheath)



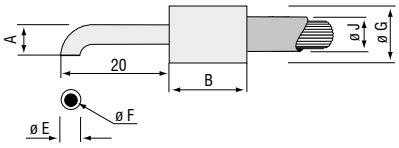
Ø F	Type	Ø A	D	Ø E	Ø J P	Ferrule
0.6	B11	2	30	1	2	Stainless steel
0.6	B12	2	10	1	2	Stainless steel
1	B20	3	10	2	3	Alu
2.5	B30	5	12	4	5	Alu
3	B40	8	12	6	8	Alu

C Type C ferrule, stainless steel



Ø F	Type	E	Ø G	H	Ø J P	Ø J M	Ø J T
1.0	C10	M4	6	13	5	5	4.4
2.5	C20	M6	8	15	6	6	5.8
3	C30	M10	11	12	7	7	7.5

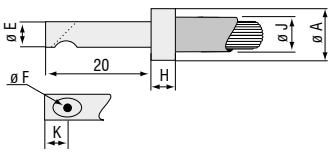
D Type D ferrule, stainless steel
With angular probe heads, a reduction in range can be expected compared to axially emerging versions.



Ø F	Type	Ø A	B	Ø E	Ø G	r	Ø J P	Ø J M	Ø J T
0.6	D10/90	2.5	10	1	3	1.5	2	–	–
0.6	D11/90	2.5	13	1	6	1.5	–	–	4.4
1.5	D20/90	6	13	2	6	4	5	5	4.4
2.5	D30/90	15	17	5	9	10	7	7	6.5

* D10/90 only suitable for PVC sheath

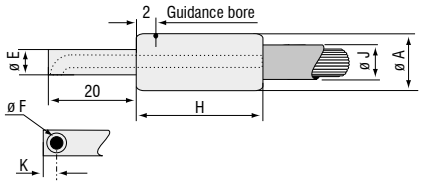
E Type E ferrule, stainless steel



Ø F	Type	Ø A	Ø E	H	K	Ø J P	Ø J M	Ø J T
1.5	E10/90	4	3	1.5	4	4	–	–
2.5	E20/90	5	4	1.5	4	5	5	–
2.5	E21/90	7	4	10	4	–	–	5.8
3	E30/90	8	6	1.5	5	7	7	–

* E10/90 only suitable for PVC sheathing

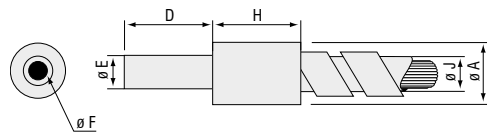
F Type F ferrule, stainless steel
With angular probe heads, a reduction in range can be expected compared to axially emerging versions.



Ø F	Type	Ø A	Ø E	H	K	Ø J P	Ø J M	Ø J T
1.5	F10/90	8	6	9	3	5	5	5.8
2.5	F20/90	10	8	10	4	6	6	6.5
3	F30/90	12	10	10	5	7	7	7.5

Sensor types
Optical glass fibers

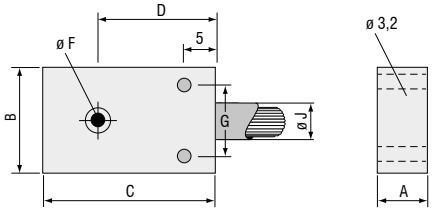
M Ferrule type M, aluminum / stainless steel



Ø F	Type	Ø A	D	Ø E	H	Ø J		Ferrule
						M	T	
0.6	M11	6	30	1	10	5	4.4	Stainless steel
0.6	M12	6	10	1	10	5	4.4	Stainless steel
1	M20	6	10	2	10	5	4.4	Alu
2.5	M30	7	12	4	12	6	5.8	Alu
3.5	M40	9	12	6	12	7	7.5	Alu
5	M50	12	16	7	16	9	9	Alu
6	M60	13	16	8	18	10	11.5	Alu
8	M80	16	20	10	20	13	13.5	Alu
10	M100	18	20	12	20	15	-	Alu

Larger fiber cross-sections possible

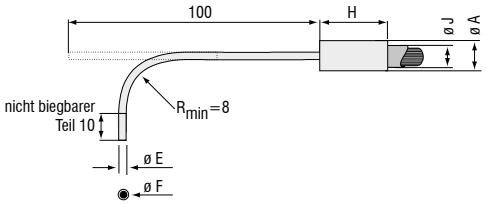
N End sleeve type N, aluminum



F	Type	A	B	C	D	G	Ø J		
							P	M	T
0.6	N10/90	6	15	25	20	9	4	5	4.4
1.5	N21/90	8	18	25	20	11	5	5	5.8
2.5	N31/90	12	20	25	20	13	6	6	6.5

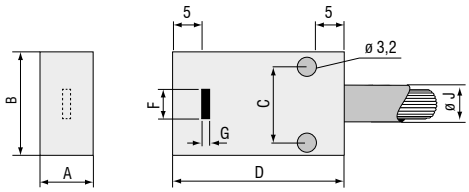
O Type O ferrule, bendable to a certain extent

With angular probe heads, a reduction in range can be expected compared to axially emerging versions.



Ø F	Type	Ø A	Ø E	H	Ø J		
					P	M	T
0.6	O10	2	1	10	2	–	–
0.6	O11	7	1	20	–	5	4.4
1	O20	3	1.3	10	3	–	–
1	O21	7	1.3	20	–	5	4.4

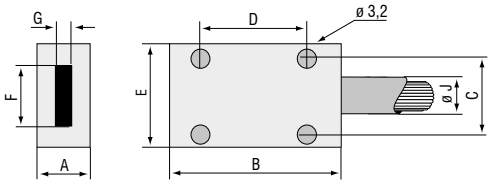
P Type P ferrule, aluminum



F	G	Type	A	B	C	D	Ø J		
							P	M	T
3	0.1	P10/90	8	15	9	25	4	5	4.4
6	0.3	P21/90	8	17	11	30	4	6	6.5
10	0.5	P31/90	12	17	11	30	6	6	6.5

Q Type Q, aluminum

Also available in stainless steel

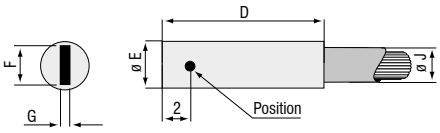


F	G	Type	A	B	C	D	E	Ø J
5	0.5	Q1	12	25	9	15	15	
10	0.3	Q2	12	30	14	20	20	
18	0.3	Q3	12	35	24	25	30	
28	0.2	Q4	12	55	34	40	40	
38	0.15	Q5	12	55	44	40	50	
48	0.15	Q6	12	55	54	40	60	
58	*	Q7	16	75	64	60	70	
68	*	Q8	16	75	74	60	80	
78	*	Q9	20	90	84	75	90	
88	*	Q10	20	90	94	75	100	

depends on fiber cross-section

FxG max. 9.62 mm²; F=3.5 mm as special variant
Q7 to Q10 only available as FAR special model

R Type R ferrule, aluminum



F	G max.	Type	D	Ø E	Ø J		
					P	M	T
3	0.5	R10*	25	4	3	–	–
3	0.5	R11	30	7	6	6	5.8
6	1	R20	25	7	6	–	–
6	1	R21	30	10	–	7	7.5

* R10 and R20 only suitable for PVC sheath

3 Sheath

Please determine the sheath and the bonding of the optical fiber based on the prevailing environmental conditions and mechanical stress. Please contact us for high-temperature applications or use under extreme mechanical stress.

Silicone-metal sheath
Metal spiral hose with glass-fiber braiding and silicone rubber sheath [1]

Characteristics:
- Very flexible, ideal for frequent bends
- Highly resistant to folding, tension and torsion;
- Temperature-stable from -60 °C to +180 °C
- Liquid-tight

T 

VA stainless-steel sheath
Flexible stainless steel spiral hose [1]

Characteristics:
- Flexible
- Protection against mechanical stress
- Temperature-stable to 400 °C
- Stainless

E 

Metal sheath
Flexible brass spiral hose, chrome-plated [1]

Characteristics:
- Flexible
- Protection against mechanical stress
- Temperature-stable to 300 °C

M 

PVC metal sheath
Flexible brass spiral-reinforced hose coated with PVC sheath [1]

Characteristics:
- Flexible
- Protection against mechanical stress such as pressure and tension
- Temperature-stable from -20 °C to +80 °C

Z 

PVC special sheath
Plastic hose [2]

Characteristics:
- For rigid installation
- Small sheath diameter
- Temperature-stable to 80 °C

P 

BOA special sheath
Corrugated tube with stainless steel braiding [3]

Characteristics:
- Protection against mechanical stress
- Ideal for drag-chain applications
- Temperature-stable from -50 °C to +600 °C

BOA 

[1] Bending radius corresponds to three times the outer diameter of the sheath.
[2] Bending radius corresponds to twice the outer diameter of the sheath.
[3] Bending radius corresponds to at least 80 - 100 mm, depending on the outer diameter of the sheath.

Details about sheath diameters can be found in section 2.

Special variants

VS

Fiber optics with increased vibration protection - VS option
For mechanical stresses such as impacts, accelerations and movements, the fiber optics can be manufactured with increased vibration protection.
This special treatment reduces the friction between the fibers and absorbs shocks. The fibers are embedded in a gel cushion.

Sensor types
Optical glass fiber

All sensors can be customized. We would be pleased to manufacture your sensor according to your specification/requirements.
Please contact us directly for more information!

4 Fiber bundle

Specification of the fiber bundle diameter. Only specified if this deviates from the values listed in the table

5 Length

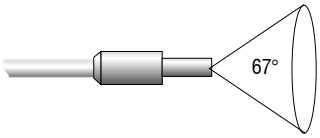
Standard lengths are: 600*, 1200*, 1800 and 2400 mm.

* Bearing types

For CLS also > 2400 mm possible.
Length tolerance typ.: ±4 %
Cable lengths from 200 mm are available on request.

Recommended maximum cable length:
CFO up to 2,400 mm; CLS up to a maximum of 10,000 mm

6 Aperture angle



The standard aperture angle is 67°.

Other opening angles such as 35° or 122° are also available on request.

7 Bonding temperature range

The glass fibers can be bonded in several stages for high temperature ranges.
Standard bonding is suitable for temperatures up to 80 °C.

With special adhesives, temperatures of up to 250 °C can be reached in the first stage and up to 400 °C in the second stage. Special versions with temperature ranges of up to 600 °C are also possible.

T250 T400 T600

Technical data // Optical fibers		
5 Length	Standard lengths: 600, 1200, 1800 and 2400 mm, up to 30 m on request	
6 Aperture angle	Standard fiber	67° (NA 0.56)[1]
	Special fibers on request	22° (NA 0.21/ glass fibers) 80° (NA 0.64/ glass fibers) 120° (NA 0.86/ glass fibers) 25° (NA 0.22/ quartz fibers UV-VIS and VIS-IR) 14° (NA 0.12/ quartz fibers UV-VIS and VIS-IR)
Material	Optical glass; quartz glass or sapphire glass on request	
Dielectric strength	50 kV/m with PVC protective sheath	
7 Ferrule temperature range Fiber bonding	Standard	-10 °C to +80°C
	T250	-40 °C to +250°C
	T400	-40 °C to +400°C
	T600 special model	0 °C to +600°C
	T2000 special model	0 °C to +2000°C
3 Permissible temperature range with sheath that has appropriate fiber bonding	PVC (Type P / Type Z)	-20 °C to +80 °C
	Metal (type M)	-40 °C to +300°C
	Metal with special bonding (Type E)	-40 °C to +400 °C
	Metal/silicone (Type T)	-60 °C to +180°C
	Corrugated tube with stainless steel braiding (type BOA)	-50 °C to +600°C
Fiber transmission	Different types for wavelengths from UV 180nm to IR 3500nm. We can provide the most suitable solution depending on your requirements. Transmission curves on request.	
8 Increased vibration protection (VS option)	Especially for fiber optics that are exposed to difficult conditions, there is the option of increased vibration protection. A special treatment minimizes the friction of the glass fibers and shocks are cushioned. This results in a longer service life.	
9 Cable drag chain / energy guiding chain	Fiber optic sensors from Micro Epsilon can be used, among other things, wherever permanent linear movement or moving guidance by drag chains or energy guiding chains is required.	

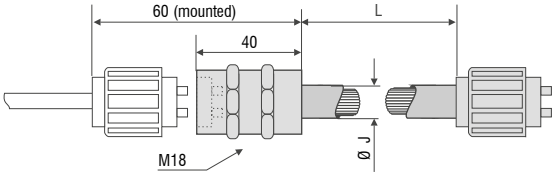
[1] Fiber transmission standard fiber 390 - 1390 nm

Sensor types
Optical glass fibers

Extensions / feedthrough

For extension or feedthrough of the optical fibers please use the Type LV ferrule.

LV **Type LV ferrule**
Fiber optic extension / feedthrough



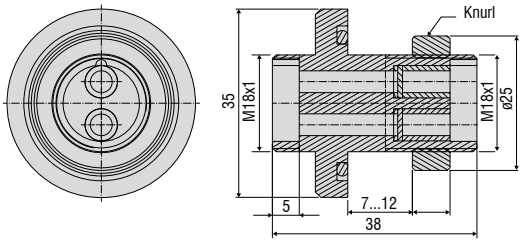
Fiber bundle Ø	P	Ø J M	T	L
(3 mm) / channel	12	13	13.5	variable

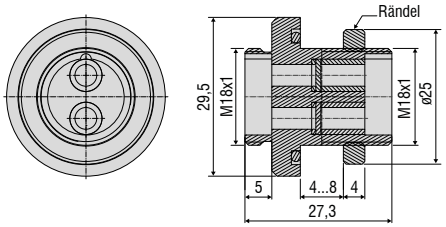
Available on request

- **Pressure density feed-through up to 10 bar** [2) 3)]
- **Housing feed-through**
- **Adapter fiber optics CFS to CFS**
- **Suitable for use in vacuums**
- **For use with drag cable**
- **Vibration protection**
- **Single channel**
- **Multi-channel**
- **Adaptation for C-mount lenses**
- **Special fiber optics according to customer requirements/drawing**

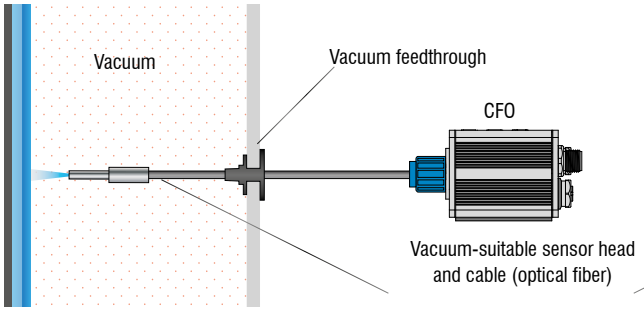
[2)] In conjunction with adapter fiber optics CFS3-CFS3
[3)] Also for use with vacuum up to [10-5]

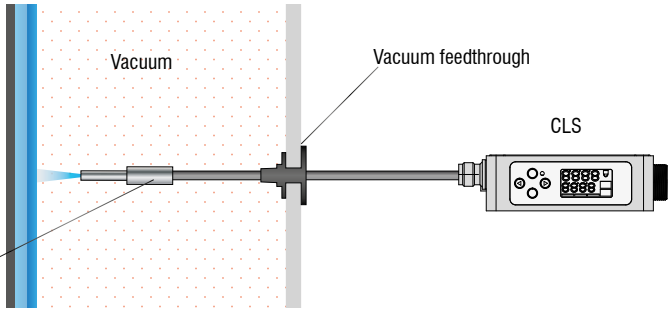
Pressure-proof feedthrough





Vacuum suitability





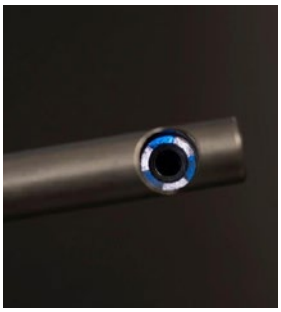
The fiber optic sensors, color sensors and optical fibers are constructed with passive components and do not emit any heat to the environment.

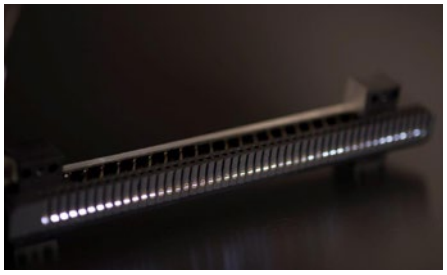
In vacuum, sensors (temperature bonding T250), optical fibers (stainless steel sheath), and the vacuum feedthrough up to 10-5 mbar can be used.

Special sensors
CFS-SL

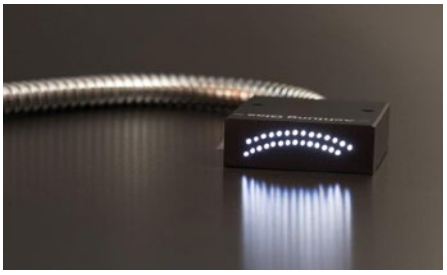
A wide variety of applications and installation situations require a sensor that is perfectly matched to the application. On request, we can manufacture individual sensors with special fiber optics and probe heads according to your specifications and dimensions.

In addition to a wide range of standard sensors, we work directly with our customers to create complex fiber optic components for the respective application. Whether in conjunction with evaluation electronics, for object illumination or special applications - the full spectrum of possibilities offered by fiber optic technology is demonstrated here.





Special sensors from standardized applications
In cooperation with our customers, we have manufactured a large number of special sensors in recent years.



Mountable lenses for optical fibers (CFO)
KL-xx/xx series

- Focusing of color and fiber optic sensors
- Improving the efficiency of the application
- Many possible applications

Features:

- Working distances from 8 mm to 200 mm
- Scratch-resistant glass lens
- Robust aluminum housing (black anodized)
- Bundling to a small light spot
- Increased range with C-mount lens > 300 mm distance
- Minimum color change when the distance is altered
- High luminous efficiency
- Special designs according to customer requirements
- Color measurement on small objects at a relatively large distance (Kl-3, KL-4)
- Detection of highly absorbent objects (KL-5, KL-14, KL-17)

	Type probe LWL	Article number	Object distance (typ.)	Detection range (typ.)*	Dimensions
	KL-3-A2.0 [3]	10823012	8 mm - 20 mm	Ø 1 mm - 5 mm Ø 1 mm at 10 mm	L x Ø approx. 60 mm x 15 mm
	KL-M18-A2.0 [1]	10823020	20 mm - 50 mm	Ø 3 mm - 10 mm Ø 3 mm at 20 mm	L x Ø approx. 51 mm x M18 x 1
	KL-M18-XL-A2.0 [1]	10824358	Pos1 50 - 120 mm Pos2 10 - 180 mm Pos3 10 - 160 mm	Pos1 Ø 4 - 7 mm Ø 4 mm at 80 mm Pos2 Ø 7 - 11 mm Ø 7 mm at 110 mm Pos3 Ø 7 - 11 mm Ø 7 mm at 120 mm	L x Ø approx. 90 mm x M18x1 (L=50 mm)
	KL-M34-A2.0 [1]	10823278	100 mm - 180 mm	Ø 15 mm - 18 mm Ø 15 mm at 100 mm	L x Ø approx. 85 mm x M34 x 1.5
	KL-M34/62-A2.0 [1]	10824196	80 mm - 200 mm	Ø 3 mm - 5 mm Ø 3 mm at 120 mm	L x Ø approx. 170 mm x 62 mm
	KL-4-A1.1 [1]	10823262	8 mm - 20 mm	Ø 0.6 mm - 3 mm Ø 0.6 mm at 10 mm	L x Ø approx. 60 mm x 15 mm
	KL-M18-A1.1 [1]	10824140	10 mm - 50 mm	Ø 2 mm - 7 mm Ø 2 mm at 10 mm	L x Ø approx. 51 mm x M18 x 1
	KL-D-40-A2.0 [2]	10824143	15 mm - 25 mm	Ø 3 mm - 6 mm Ø 3 mm at 15 mm	L x W x H approx. 43.4 x 49.5 x 12 mm
	KL-D-28-A2.0 [2]	10824197	20 mm - 30 mm	Ø 5 mm - 8 mm Ø 5 mm at 20 mm	L x W x H approx. 31.7 x 40.5 x 15 mm
	KL-D-20-A2.0 [2]	10823021	10 mm - 50 mm	Ø 4 mm - 10 mm Ø 4 mm at 10 mm	L x W x H approx. 21.4 x 33 x 12 mm
	KL-D-17-A2.0 [2]	10823220	30 mm - 80 mm	Ø 8 mm - 25 mm Ø 8 mm at 30 mm	L x W x H approx. 36.5 x 25.5 x 15 mm
	KL-D-14-A2.0 [2]	10823022	60 mm - 120 mm	Ø 10 mm - 20 mm Ø 10 mm at 60 mm	L x W x H approx. 37 x 50 x 20 mm
	KL-D-6-A2.0 [2]	10823409	100 mm - 200 mm	Ø 15 mm - 30 mm Ø 15 mm at 100 mm	L x W x H approx. 31.1 x 45.1 x 20 mm
	KL-5-R1.1 [1]	10824198	8 mm - 20 mm	2 x 0.3mm up to 15 x 3 mm 2 x 0.3 mm at 10 mm	L x Ø approx. 60 mm x 15 mm
	KL-8-R2.1 [1]	10823920	8 mm - 20 mm	4 x 0.7 mm up to 30 x 5 mm 4 x 0.7 mm at 10 mm	L x Ø approx. 60 mm x 15 mm

*The smallest specification in the table refers to the typ. smallest optical diameter that is generated.
This corresponds approximately to the smallest detection area for color or fiber optic sensors.

[1] Fiber-optic reflex mode cable (FAR)

[2] Transmitted-light optical fiber (FAD)

[3] In conjunction with FAR-X-A2.0-0.6-XXXX-67° fiber-optic reflex mode cable, measurement spot of approx. 0.2 mm possible

Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Sensors and measurement devices for non-contact temperature measurement

Measuring and inspection systems for metal strips, plastics and rubber

Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers

3D measurement technology for dimensional testing and surface inspection

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