MICRO-EPSILON

More Precision

colorSENSOR // Colour Sensors, LED Analyzers

Fibre optics

- *For colorSENSOR*
- *High-quality fibre optics with polished and ground end-faces*
- *Fibres for visible, ultraviolet and infrared light*
- *For wavelengths from 190 – 2500nm*

Features:

- Temperature stability from –40°C to +400°C (special bonding)
- Various aperture angles available 68° (NA0.86), 22° (NA0.21), 121° (NA0.87)
- Maximum cable lengths of 30m available; default lengths: 600, 1200, 1800 or 2400mm
- Large selection of sensor mechanisms for different tasks

Standard versions

Micro-Epsilon fibre optics for colour sensors and fibre optic sensors for measurements and testing feature a high build and transmission quality.

Ground and polished end-faces ensure excellent optical integration with adapted sensors. A large selection of sensor mechanisms provides optimum flexibility for a great variety of tasks.

Special versions

Fibre optics with increased vibration protection

Fibre optics can be manufactured to include increased vibration protection for use with high mechanical loads, such as shock, acceleration, and movement. This special treatment minimises friction between fibres and reduces shocks.

Fibre optics with special bonding for high temperatures

Standard bonding is suitable for maximum temperatures of 80°C.
Special adhesives allow for temperatures of up to 250°C, even 400°C. These higher temperature ranges require the use of Type E stainless steel sheathing. Temperatures of up to 600°C can be reached with metallized fibres and with sapphire optics installed.

Customer-specific designs

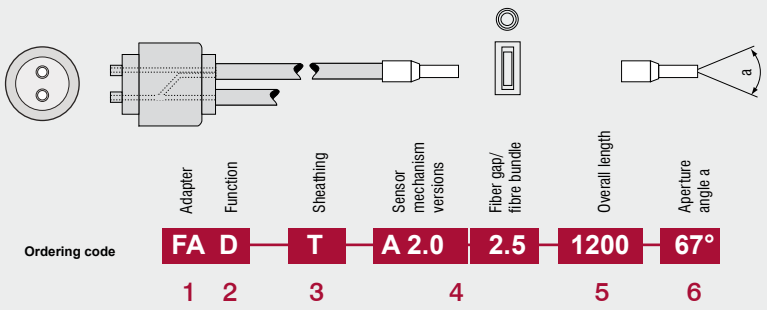
One of the advantages of Micro-Epsilon fibre optic manufacturing is the production of customer-specific designs for various complex sensor mechanisms.

Technical data			
Single fibre diameter	20, 30, 50, 70µm standard fibre (depending on structure)		
Aperture angle	standard fibres	67° (NA 0.56)	
	special fibres	22° (NA 0.21) 121° (NA 0.87 / wide angle) 22° UV (80/100µm) 22° IR (80/100/150µm)	
Material	optical glass (e.g. for UV / IR / in quartz glass)		
Dielectric strength	50kV/m with PVC protective sheath		
Sensor mechanism – temperature range, fibre bonding	standard	-20°C to + 80°C	
	T250	0°C to + 250°C	
	T400	-40°C to + 400°C	
	T600	0°C to + 600°C	
Permissible temperature range with sheathing that has appropriate fibre bonding	PVC	-20°C to +80°C	(P) (Z)
	metal	+40°C to +180°C	(M)
	metal with special bonding	-40°C to +400°C	(E)
	metal/silicone	-40°C to +180°C	(T)
Fibre transmission	usable for wavelengths from 190-2500nm of different types (we can provide the most suitable solution depending on the requirements) Transmission curves on request!		

Order code for fibre optics

You can see an overview of the Fasop fibre optic range on the following pages.

You can define your own individual fibre optic from the various components using the order key.



1 Adaption to FA-adapter

2 Function of the fibre optic (D = transmitted light mode, R = reflex mode)

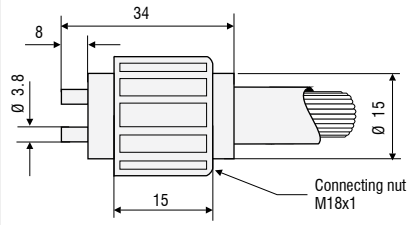
3 Sheathing e.g. silicone-metal sheath (T)

4 Sensor mechanism type, e.g. A2.0
Fibre bundle e.g. 2.5mm dia.

5 Overall length of e.g. 1200mm (standard length / bearing types)

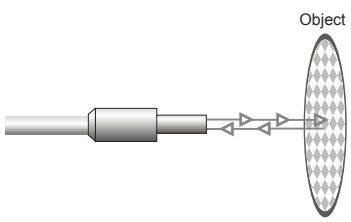
6 Aperture angle of the fibre, e.g. 67 °

1 Adapter version

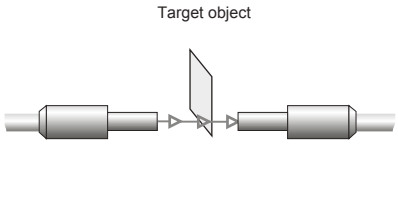


Adapter, FA System FASOP

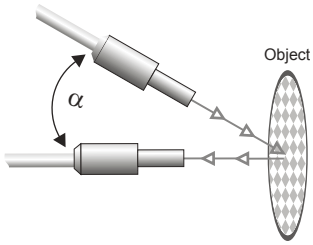
2 Functions



R Reflected light operation (button)*



D Transmitted light operation (barrier)*

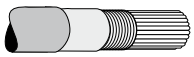


D Transmitted light operation (V arrangement) for reflective and shiny surfaces

* All functions can also be performed as mutliple reflex and transmitted light functions

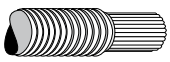
3 Sheathing

Silicone metal sheath
Metal wire-spiral-reinforced hose with glass fibre braiding and silicone rubber sheathing



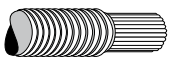
T Very flexible, highly resistant to bending, tension and torsion; temperature-stable to 180°C, liquid-tight

Stainless-steel sheath
Flexible stainless steel wire-spiral-reinforced hose [1)]



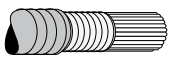
E Flexible, protection against mechanical stress, temperature-stable to 400°C

Metal sheath
Flexible brass wire-spiral-reinforced hose [1)]



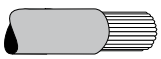
M Flexible, protection against mechanical stress, temperature-stable to 180°C

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



Z Flexible, protection against mechanical stress, temperature-stable to 80°C

PVC special sheath
Highly flexible plastic hose [2)]



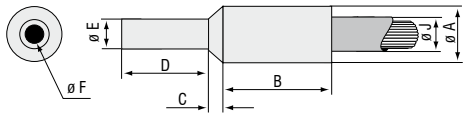
P Highly flexible, small sheath diameter, temperature-stable to 80°C

[1)] Bending radius corrresponds to three times the external diameter of the sheath.
[2)] Bending radius corrresponds to twice the external diameter of the sheath.

Details of sheath diameters can be found in Section 4:

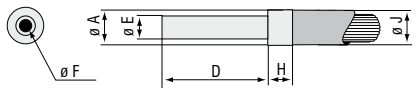
Please note: Every version can be supplied with increased vibration protection (VS).
See the „Special versions“ section for more information

4 Sensor mechanism variants and fibre bundles



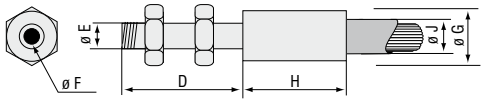
Type	A Ø	B	C	D	E Ø	F Ø	P	Ø J M	T
A 1.0	4.6	8	2	11	2.5	1.5	4	4	–
A 1.1	6.6	8	2	11	2.5	1.5	–	5	4.4
A 2.0	6.6	10	2	12	4.5	2.5	6	6	5.8
A 3.0	8.5	11	2	15	6	3	7	7	7.5

A Type A ferrule, stainless steel



Type	A Ø	D	E Ø	F Ø	H	Ø J P	Ferrule
B 1.1	2	30	1	0.6	2	2	stainless steel
B 1.2	2	10	1	0.6	2	2	stainless steel
B 2.0	3	10	2	1	2	3	alu
B 3.0	5	12	4	2.5	2	5	alu
B 4.0	8	12	6	3	2	8	alu

B Type B ferrule
(only suitable for PVC sheathing)



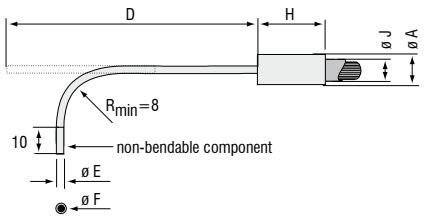
Type	D	E	F Ø	G Ø	H	P	Ø J M	T
C 1.0	30	M4	1.0	6	13	5	5	4.4
C 2.0	30	M6	2.5	8	15	6	6	5.8
C 3.0	30	M10	3	11	12	7	7	7.5

C Type C ferrule, stainless steel

Standard sensor mechanism, bonding
for -20°C to +80°C
Special designs available (T250, T400, T600)

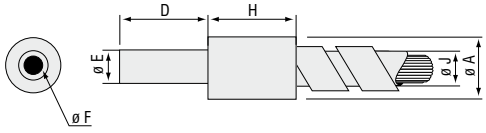
All details in mm
Tolerances: typ. +/- 0.1mm
Al ferrule, black anodised

Different sizes are possible by arrangement,
please ask our product specialists.
(see also the „Special versions“ section)



Type	A Ø	D	E Ø	F Ø	H .	P	Ø J M	T
O 1.0	2	100	1	0.6	10	2	–	–
O 1.1	7	100	1	0.6	20	–	5	4.4
O 2.0	3	100	1.3	1	10	3	–	–
O 2.1	7	100	1.3	1	20	–	5	4.4

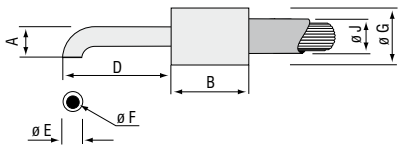
O Type O ferrule, bendable, to an extent



Type	A Ø	D	E Ø	F Ø	H	Ø J M	Ø J T	Ferrule
M 1.1	6	30	1	0.6	10	5	4.4	stainless steel
M 1.2	6	10	1	0.6	10	5	4.4	stainless steel
M 2.0	6	10	2	1	10	5	4.4	alu
M 3.0	7	12	4	2.5	12	6	5.8	alu
M 4.0	9	12	6	3.5	12	7	7.5	alu
M 5.0	12	16	7	5	16	9	9	alu
M 6.0	13	16	8	6	18	10	11.5	alu
M 8.0	16	20	10	8	20	13	13.5	alu
M10.0	18	20	12	10	20	15	–	alu

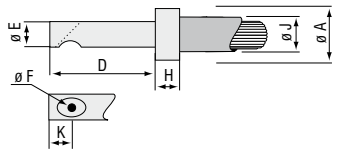
M Type M ferrule

4 Sensor mechanism variants and fibre bundles



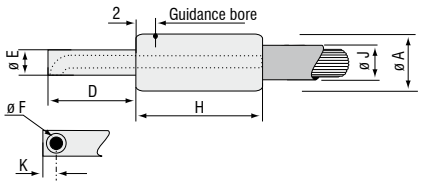
Type	A Ø	B	D	E Ø	F Ø	G Ø	r	P	Ø J M	T
D 1.0	2.5	10	20	1	0.6	3	1.5	2	–	–
D 1.1	2.5	13	20	1	0.6	6	1.5	–	–	4.4
D 2.0	6	13	20	2	1.5	6	4	5	5	4.4
D 3.0	15	17	20	5	2.5	9	10	7	7	6.5

D **Type D ferrule, stainless steel**
(* D1.0 only suitable for PVC sheathing)



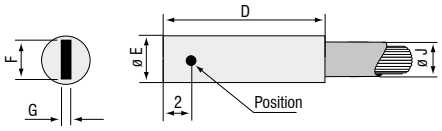
Type	A Ø	D	E Ø	F Ø	H	K	P	Ø J M	T
E 1.0	4	20	3	1.5	1.5	4	4	–	–
E 2.0	5	20	4	2.5	1.5	4	5	5	–
E 2.1	7	20	4	2.5	10	4	–	–	5.8
E 3.0	8	20	6	3	1.5	5	7	7	–

E **Type E ferrule, stainless steel**
(* E1.0 only suitable for PVC sheathing)



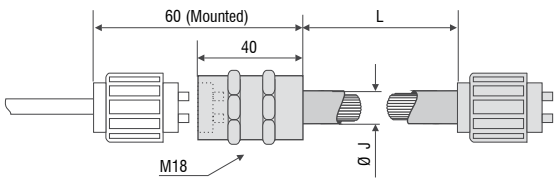
Type	A Ø	D	E Ø	F Ø	H	K	P	Ø J M	T
F 1.0	8	20	6	1.5	9	3	5	5	5.8
F 2.0	10	20	8	2.5	10	4	6	6	6.5
F 3.0	12	20	10	3	10	5	7	7	7.5

F **Type F ferrule, stainless steel**



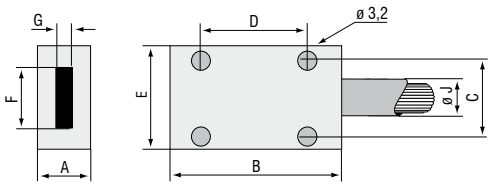
Type	D	E Ø	F	G max.	P	Ø J M	T
R 1.0	25	4	3	0.5	3	–	–
R 1.1	30	7	3	0.5	6	6	5.8
R 2.0	25	7	6	1	6	6	5.8**
R 2.1	30	10	6	1	–	7	7.5

R **Type R ferrule, aluminium**
* R1.0 only suitable for PVC sheathing
** at 6x1 mm², can be made to a length of 1200



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

LV **Type LV ferrule**
Fibre optic extension / feed-through



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

(F x G 3.5 mm² for CLS and IFA applications with FA adapter)

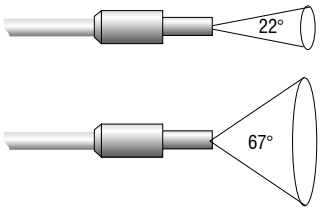
Q **Type Q, aluminium**
Also available in stainless steel

All details in mm
Attention: With angular sensor mechanism versions, a reduction in range can be expected compared to axially emerging versions.

5 + 6 Length and aperture angle

Standard lengths are: 600*, 1200*, 1800 and 2400mm.
* Bearing types
Length tolerance type: +/- 4%
Cable lengths of up to 30m can be supplied on request!

5



Dependent on the glass fibre material used the following aperture angles are included in the standard range: 22°, 67°, 121°

6

Detection areas, various sensor mechanisms

Fibre bundle ØF mm	Working distance mm	Light spot for 67° fibre approx. Ø mm	Light spot for 22° fibre approx. Ø mm
0.6	5	3	3
	10	5	4
	15	8[1)]	6
	20	12[1)]	8
1	5	3	3
	10	7	5
	15	11	8[1)]
	20	15[1)]	11[1)]
1.5	5	4	3
	10	7	5
	15	11	8
	20	19[1)]	11
2.5	5	5	4
	10	10	8
	15	13	10
	20	19[1)]	13
3	5	8	5
	10	12	7
	15	15	10
	20	18[1)]	13

Typical values were determined using colorSENSOR LT-2-ST
[1)] Can be realised only in certain conditions

Series KL-xx/xx

- Focussing of colour and fibre optic sensors

- Improving the efficiency of the application

- Many possible applications

Features:

- Working distances from 8mm to 200mm
- Scratch-resistant glass lens
- Robust aluminium housing (black anodised)
- Bundling to a small light spot
- Increasing the range
- Minimum colour change when the distance is altered
- High luminous efficiency
- Special designs possible, according to customer requirements
- Colour measurement on small objects at a relatively large distance (KI-3, KL-4)
- Recognising highly absorbent objects (KL-5, KL-14, KL-17)

	Type LWL FASOP	Article number	Object distance (typ.)	Detection range (typ.)*	Dimensions
	KL-3-A2.0 [3]	10823012	8mm - 20mm	Ø 1mm - 5mm Ø 1mm at 10mm	L x Ø ap. 60mm x 15mm
	KL-M18-A2.0 [1]	10823020	20mm - 50mm	Ø 3mm - 10mm Ø 3mm at 20mm	L x Ø ap. 51mm x M18 x 1
	KL-M18-XL-A2.0 [1]	10824358	Pos1 50 - 120mm Pos2 10 - 180mm Pos3 10 - 160mm	Pos1 Ø 4-7mm Ø 4mm at 80mm Pos2 Ø 7-11mm Ø 7mm at 110mm Pos3 Ø 7-11mm Ø 7mm at 120mm	L x Ø ap. 90mm x M18x1 (L=50mm)
	KL-M34-A2.0 [1]	10823278	100mm - 180mm	Ø 15mm - 18mm Ø 15mm at 100mm	L x Ø ap. 85mm x M34 x 1,5
	KL-M34/62-A2.0 [1]	10824196	80mm - 200mm	Ø 3mm - 5mm Ø 3mm at 120mm	L x Ø ap. 170mm x 62mm
	KL-4-A1.1 [1]	10823262	8mm - 20mm	Ø 0,6mm - 3mm Ø 0,6mm at 10mm	L x Ø ap. 60mm x 15mm
	KL-M18-A1.1 [1]	10824140	10mm - 50mm	Ø 2mm - 7mm Ø 2mm at 10mm	L x Ø ap. 51mm x M18 x 1
	KL-D-40-A2.0 [2]	10824143	15mm - 25mm	Ø 3mm - 6mm Ø 3mm at 15mm	L x B x H ap. 43.4 x 49.5 x 12mm
	KL-D-28-A2.0 [2]	10824197	20mm - 30mm	Ø 5mm - 8mm Ø 5mm at 20mm	L x B x H ap. 31.7 x 40.5 x 15mm
	KL-D-20-A2.0 [2]	10823021	10mm - 50mm	Ø 4mm - 10mm Ø 4mm at 10mm	L x B x H ap. 21.4 x 33 x 12mm
	KL-D-17-A2.0 [2]	10823220	30mm - 80mm	Ø 8mm - 25mm Ø 8mm at 30mm	L x B x H ap. 36.5 x 25.5 x 15mm
	KL-D-14-A2.0 [2]	10823022	60mm - 120mm	Ø 10mm - 20mm Ø 10mm at 60mm	L x B x H ap. 37 x 50 x 20mm
	KL-D-6-A2.0 [2]	10823409	100mm - 200mm	Ø 15mm - 30mm Ø 15mm at 100mm	L x B x H ap. 31.1 x 45.1 x 20mm
	KL-5-R1.1 [1]	10824198	8mm - 20mm	Ø 2mm x 0,3mm to 15mm x 3mm 2x0.3mm at 10mm	L x Ø ap. 60mm x 15mm
	KL-8-R2.1 [1]	10823920	8mm - 20mm	Ø 4mm x 0,7mm to 30mm x 5mm 4x0.7mm at 10mm	L x Ø ap. 60mm x 15mm

* The smallest figure in the table relates to the smallest typical optical diameter that is generated.
This corrresponds to roughly the smallest detection area for colour or fibre optic sensors.

[1] Reflex fibre optic (FAR)

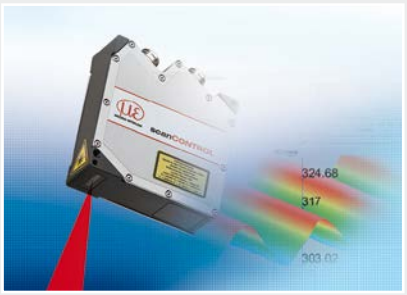
[2] Transmitted light mode fibre optic cables (FAD)

[3] Can be realised in conjunction with FAR-X-A2.0-0.6-XXXX-67° reflex mode fibre optical cable (FAR) measurement spot of approx. 0.2mm

High performance sensors made by Micro-Epsilon

Sensors and systems for displacement and position

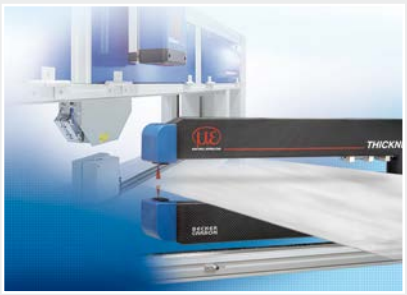
Sensors and measurement devices for non-contact temperature measurement



2D/3D profile sensors (laser scanner)

Optical micrometers, fibre optic sensors and fibre optics

Colour recognition sensors, LED analyzers and colour online spectrometer



Measurement and inspection systems

MICRO-EPSILON

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