

- ▶ through-beam sensors
- ▶ diffuse reflection sensors
- ▶ accessories

**fiber optic through-beam and dif. reflection sensors**

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**NOTES**

A large grid area for taking notes, consisting of a 20x30 grid of small squares. The grid is empty and occupies the majority of the page below the 'NOTES' header.

through-beam sensor    operating range    **up to 14m**  
dif. reflection sensor    sensing range    **up to 600mm**

- ✓ small sensing heads with different lines of sight (axial, angular, flexible)
- ✓ trouble-free shortening of the plastic fiber optics
- ✓ small bending radius, low weight
- ✓ possible application in explosion-hazardous areas
- ✓ no interference by magnetic or high-frequency fields (welding plants, switchgear et al.)
- ✓ contactless detection, counting, controlling, positioning
- ✓ scanning of micro objects in processing stations, feed systems and automatic systems



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robust, flexible  
vibration-proof



**description**

The *ipf* plastic fiber optic systems consist of a flexible plastic fiber with a sensing head and an optoelectronic fiber optic amplifier.

The principle of operation is similar to a through-beam sensor or a diffuse reflection sensor. The optoelectronic fiber optic amplifier includes transmitter, receiver, evaluation electronics and amplifier. It uses e.g. visible red light (660nm), which is transmitted through the fiber by the principle of total internal reflection (see figure "reflection inside plastic fiber optics").

We offer a wide choice of sensing heads that can be adapted to suit varying field conditions, e.g. as a diffuse reflection sensor or as a through-beam sensor with axial or lateral light exit

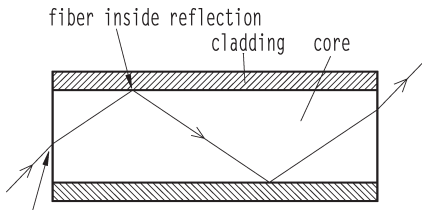
or with a 90mm flexible stainless steel sleeve which is even capable of "looking" around corners, if needed.

The advantages of plastic fiber optics are the small bending radii. The fiber optics are bendable in any directions within the stated bending radii. It is also possible to cut the fibers in the field to any desired length using the fiber cutter **AL000007**.

**application examples**

- ▶ contactless detection, counting, controlling, positioning
- ▶ scanning of micro objects at processing stations, feed systems and automatic systems

### reflection inside a plastic fiber

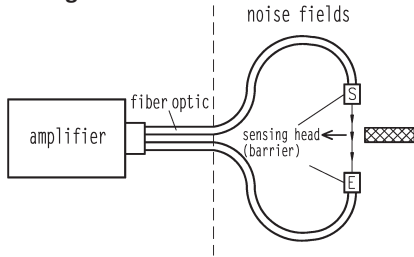


refraction of the light entering the fiber optic

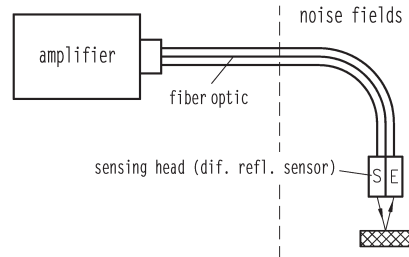
### application

The excellent optical and mechanical characteristics of *ipf* plastic fiber optics mean they are particularly well-suited to the sensing of small objects in production and automated systems, especially where difficult environmental and installation conditions exist (e.g. in environments with high levels of vibration). As no electrical energy is transmitted over the fiber optics it is possible to use them in applications with high magnetic fields and with high levels of electrical noise or in radioactive environments as well as in explosion-hazardous areas. In these cases it is necessary to mount the amplifier away from the hazardous area.

### through-beam sensor



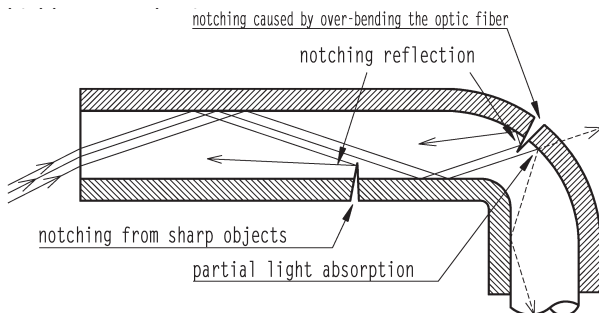
### diffuse reflection sensor



Plastic fiber optics can be found in a wide variety of industries including machine building, chemical, pharmaceutical, ceramics and plastics.

### notes

If there is too much of a kink in the fiber optics, or if they get nicked by sharp objects, then this will cause a dimming of the light in the fiber optics. In case of high mechanical stress (e.g. bending or squeezing for many times) the plastic fiber optics can be damaged at the



For the installation it must be considered that plastic fiber optics can only be used for applications within the temperature range -40 C to +80°C. For higher temperatures *ipf* uses glass fiber optics. Chemicals such as organic solvents or gasoline may damage plastic fiber optics.

### Notes on the fiber optics

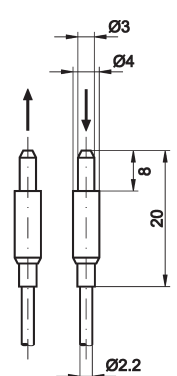
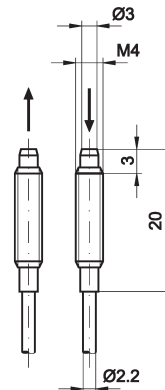
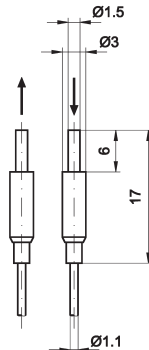
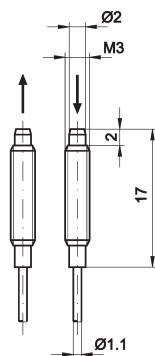
When using an OL10034x series amplifier, it is possible to set four different response speeds.

The light intensity of the transmitter LED changes with the response speeds. This in turn results in a change to the operating range.

The stated operating ranges correspond to those of the red light device OL100340 in the programmed mode „STD“.

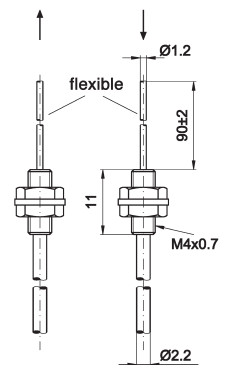
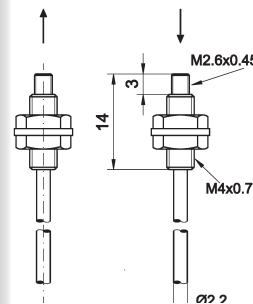
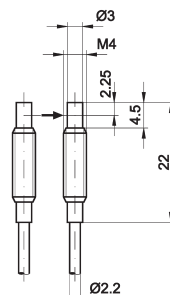
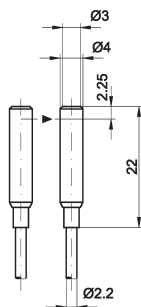
When using other amplifiers, it is possible that the achievable range (sensing range/operating range) may differ from the stated values!

article-no.	LS208959	LS208960	LS208161	LS208162
version	M3 / 2 round	Ø 3 / 1,5 round	M4 / 3 round	4 / 2 round
length	2000mm	2000mm	2000mm	2000mm
operating range	100mm	100mm	200mm	100mm
material	brass	aluminum	brass	brass
dimensions (sheathing)	2 x Ø 1.1mm	2 x Ø 1.1mm	2 x Ø 2.2mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 0.5mm	2 x Ø 0.5mm	2 x Ø 1mm	2 x Ø 0.5mm
bending radius (rigid/flexible)	25mm/-	25mm/-	25mm/-	25mm/-
light exit	axial	axial	axial	axial
operating temperature	-30 ... +70°C	-30 ... +70°C	-30 ... +70°C	-30 ... +70°C

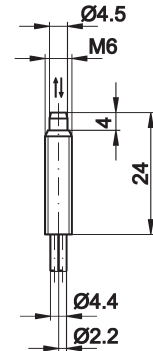
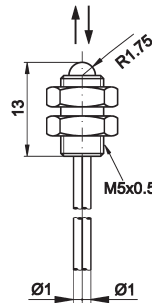
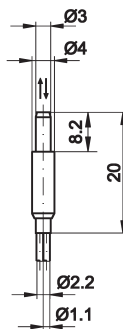
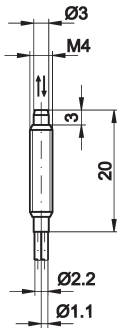


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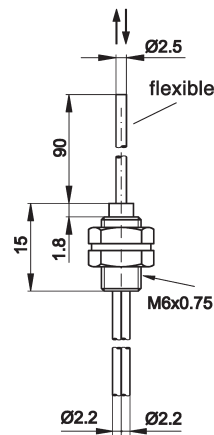
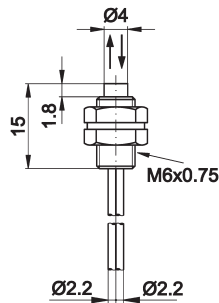
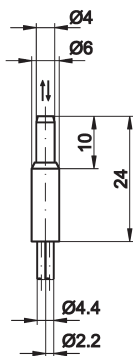
article-no.	LS208163	LS208164	LS208050	LS208051
version	Ø 4 / 90°	M4 / Ø 3 / 90°	M4 / M2.6	M4 / Ø 0.7
length	2000mm	2000mm	2000mm	2000mm
operating range	100mm	200mm	120mm	100mm
material	aluminum	aluminum	brass	brass
dimensions (sheathing)	2 x Ø 2.2mm	2 x Ø 2.2mm	2 x Ø 2.2mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 1.0mm
bending radius (rigid/flexible)	25mm/-	25mm/-	25mm/-	25mm/-
light exit	lateral	lateral	axial	axial
operating temperature	-30 ... +70°C	-30 ... +70°C	-25 ... +70°C	-25 ... +70°C



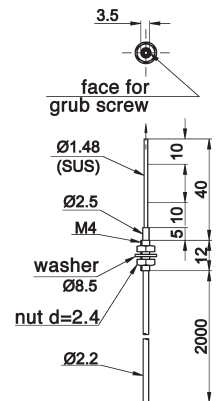
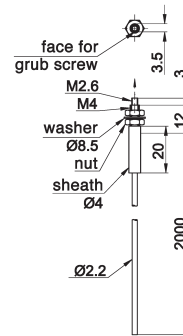
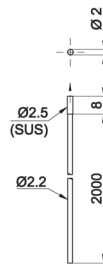
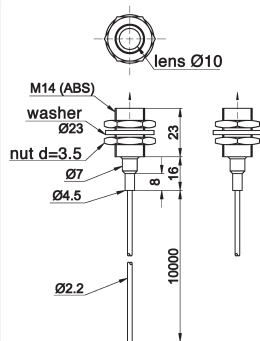
article-no.	LT208955	LT208956	LT208957	LT208157
version	M4 / $\varnothing$ 3.0	$\varnothing$ 4 / $\varnothing$ 3.0	M5x0.5	M6 / $\varnothing$ 4.5
length	2000mm	2000mm	2000mm	2000mm
sensing range	35mm	35mm	60mm	75mm
material	brass	aluminum	V2A	brass
dimensions (sheathing)	2 x $\varnothing$ 1.1mm	2 x $\varnothing$ 1.1mm	2 x $\varnothing$ 1.0mm	2 x $\varnothing$ 2.2mm
dimensions (fiber)	2 x $\varnothing$ 0.5mm	2 x $\varnothing$ 0.5mm	2 x $\varnothing$ 0.5mm	2 x $\varnothing$ 1.0mm
bending radius (rigid/flexible)	25mm/-	25mm/-	25mm/-	25mm/-
light exit	axial	axial	axial, cyl. light beam	axial
operating temperature	-30 ... +70°C	-30 ... +70°C	-25 ... +70°C	-30 ... +70°C



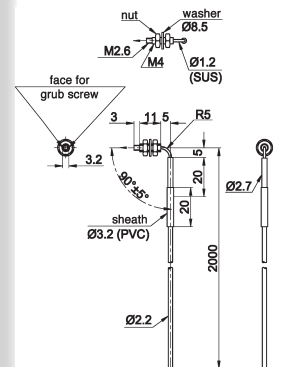
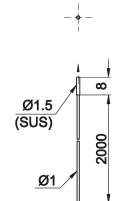
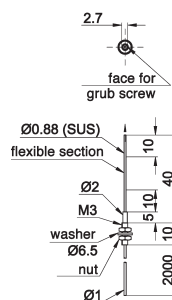
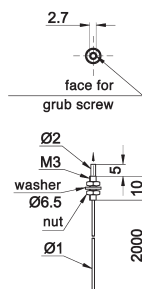
article-no.	LT208158	LT208052	LT208053
version	$\varnothing$ 6mm / $\varnothing$ 4mm	M6x0.75	M6x0.75
length	2000mm	2000mm	2000mm
sensing range	75mm	40mm	30mm
material	brass	brass	brass
dimensions (sheathing)	2 x $\varnothing$ 2.2mm	2 x $\varnothing$ 2.2mm	2 x $\varnothing$ 2.2mm
dimensions (fiber)	2 x $\varnothing$ 1.0mm	2 x $\varnothing$ 1.0mm	2 x $\varnothing$ 1.0mm
bending radius (rigid/flexible)	25mm/-	25mm/-	25mm/-
light exit	axial	axial	axial
operating temperature	-30 ... +70°C	-25 ... +70°C	-25 ... +70°C



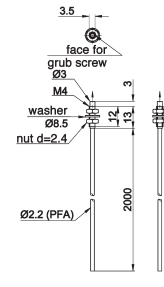
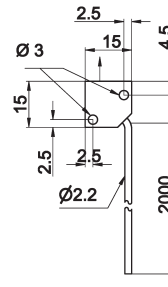
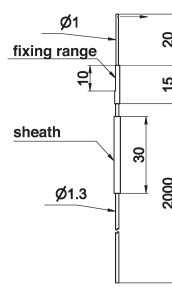
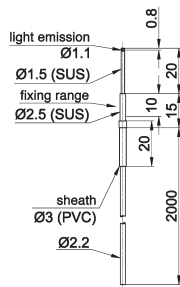
article-no.	LSA07001	LS207002	LS207003	LS207006
version	M14mm	Ø 2.5mm / Ø 2.0mm	M4 / M2.6	M4 / Ø 1.48mm
length	10000mm	2000mm	2000mm	2000mm
operating range	14000mm	800mm	530mm	400mm
dimensions (sheathing)	2 x Ø 2.2mm	2 x Ø 2.2mm	2 x Ø 2.2mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 1.0mm
bending radius (rigid/flexible)	4mm/10mm	10mm/-	4mm/10mm	4mm/10mm
light exit	axial	axial	axial	axial
operating temperature	-40 ... +70°C	-40 ... +70°C	-55 ... +80°C	-55 ... +80°C
degree of protection (EN 60529)	IP67	IP40	IP67	IP67



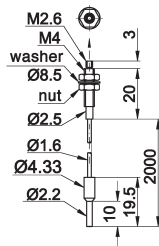
article-no.	LS207009	LS207011	LS207012	LS207013
version	M3 / Ø 2.0mm	M3 / Ø 0.88mm	Ø 1.5mm	M4 / M2.6
length	2000mm	2000mm	2000mm	2000mm
operating range	140mm	140mm	140mm	230mm
dimensions (sheathing)	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 0.5mm	2 x Ø 0.5mm	2 x Ø 0.5mm	2 x Ø 1.0mm
bending radius (rigid/flexible)	2mm/10mm	2mm/10mm	2mm/10mm	4mm/10mm
light exit	axial	axial	axial	axial
operating temperature	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C
degree of protection (EN 60529)	IP67	IP67	IP67	IP67



article-no.	LS207014	LS207022	LS207023	LS207031
version	Ø 2.5mm / Ø 1.5mm	Ø 2.0mm / Ø 1.0mm	Ø 2.5mm / Ø 1.0mm	M4 / Ø 3.0mm
length	2000mm	2000mm	2000mm	2000mm
operating range	200mm	180mm	80mm	440mm
dimensions (sheathing)	2 x Ø 2.2mm	2 x Ø 1.5mm	2 x Ø 1.0mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 1.0mm	2 x Ø 1.0mm	2 x Ø 0.5mm	2 x Ø 1.0mm
bending radius (rigid/flexible)	4mm/10mm	4mm/10mm	2mm/10mm	25mm/25mm
light exit	axial	axial	axial	axial
operating temperature	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C	-60 ... +130°C
degree of protection (EN 60529)	IP30	IP30	IP40	IP40



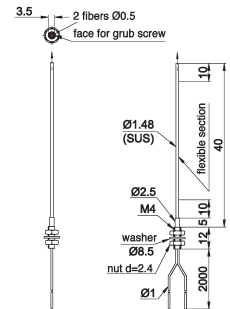
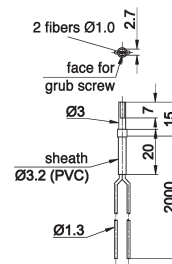
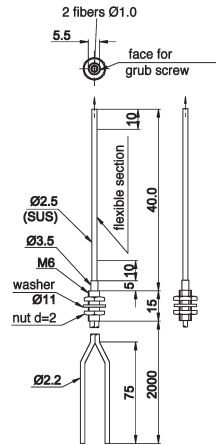
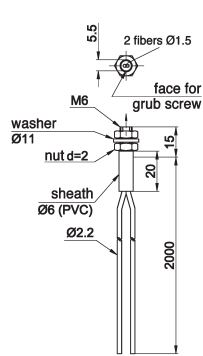
article-no.	LS207032
version	M4 / M2.6
length	2000mm
operating range	140mm
dimensions (sheathing)	2 x 2.2mm round
dimensions (fiber)	2 x 1mm
bending radius (rigid/flexible)	10mm/10mm
light exit	axial
operating temperature	-60 ... +200°C
degree of protection (EN 60529)	IP40



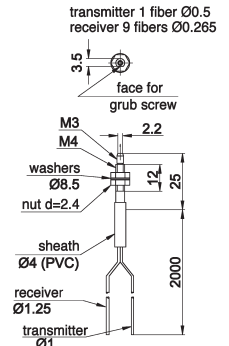
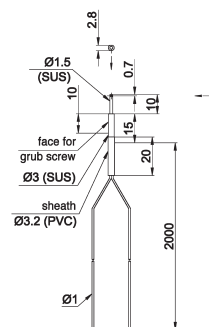
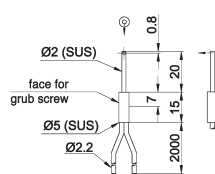
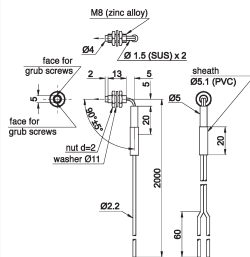


article-no.	LS207101	LS207102	LS207106	LS207115
version	5 x 20 x 69mm	4.2 x 13.5 x 31mm	∅ 4mm	M4 / M2.6
length	2000mm	2000mm	2000mm	2000mm
operating range	350mm	1500mm	700mm	290mm
dimensions (sheathing)	2 x ∅ 2.2mm	2 x ∅ 2.2mm	2 x ∅ 2.2mm	2 x ∅ 2.2mm
dimensions (fiber)	2 x ∅ 1.1mm	2 x ∅ 1.1mm	2 x ∅ 1.1mm	2 x ∅ 1.1mm
bending radius (rigid/flexible)	1mm/-	1mm/-	1mm/-	1mm/-
light exit	lateral, row 32mm	lateral, row 11mm	axial	axial
operating temperature	-40 ... +55°C	-40 ... +55°C	-40 ... +60°C	-40 ... +60°C
degree of protection (EN 60529)	IP40	IP40	IP30	IP67
article-no.	LS207203	LS207204	LS207205	LS207209
version	3 x 8 x 12mm	3 x 8 x 12mm	8.5 x 12 x 3mm	∅ 1.0mm
length	2000mm	2000mm	2000mm	500mm
operating range	1400mm	800mm	400mm	40mm
dimensions (sheathing)	2 x ∅ 1.25mm	2 x ∅ 1.25mm	2 x ∅ 1.25mm	2 x ∅ 1.0mm
dimensions (fiber)	2 x ∅ 0.5mm	2 x ∅ 0.5mm	2 x ∅ 0.5mm	2 x ∅ 0.5mm
bending radius (rigid/flexible)	2mm/10mm	2mm/10mm	2mm/10mm	2mm/10mm
light exit	axial	lateral	crosswise	axial
operating temperature	-40 ... +60°C	-40 ... +60°C	-40 ... +60°C	-55 ... +80°C
degree of protection (EN 60529)	IP40	IP40	IP40	IP67

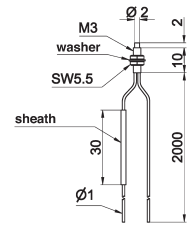
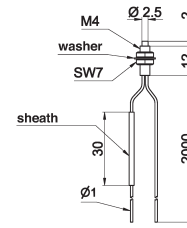
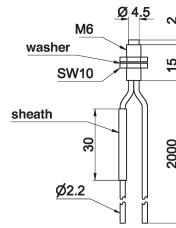
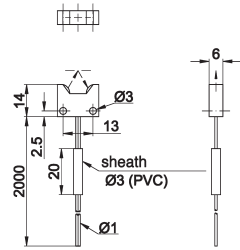
article-no.	LT207001	LT207004	LT207007	LT207012
version	M6 / Ø 5.5mm	M6 / Ø 2.5mm	Ø 3.0mm	M4 / Ø 2.5mm
length	2000mm	2000mm	2000mm	2000mm
sensing range	220mm	110mm	110mm	45mm
dimensions (sheathing)	Ø 2.2mm	Ø 2.2mm	2 x Ø 1.3mm	2 x Ø 1.0mm
dimensions (fiber)	Ø 1.1mm	Ø 1.1mm	2 x Ø 1.0mm	2 x Ø 0.5mm
bending radius (rigid/flexible)	4mm/10mm	4mm/10mm	4mm/10mm	2mm/10mm
light exit	axial	axial	axial	axial
operating temperature	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C	-55... +80°C
degree of protection (EN 60529)	IP67	IP67	IP67	IP67



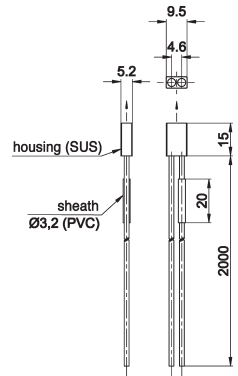
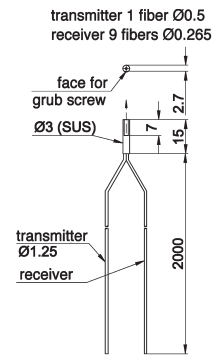
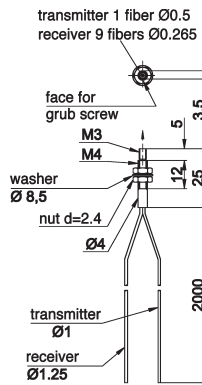
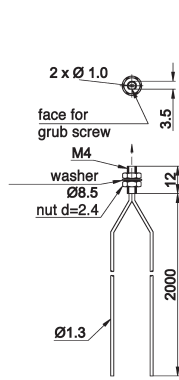
article-no.	LT207014	LT207015	LT207016	LT207017
version	M6 / Ø 4.0mm	Ø 5.0mm / Ø 2.0mm	Ø 3.0mm / Ø 1.5mm	M4 / M3
length	2000mm	2000mm	2000mm	2000mm
sensing range	85mm	45mm	25mm	55mm
dimensions (sheathing)	2 x Ø 2.2mm	2 x Ø 2.2mm	2 x Ø 1.0mm	Ø 1.0 / Ø 1.25mm
dimensions (fiber)	2 x Ø 1.0mm	2 x Ø 1.1mm	2 x Ø 0.5mm	2 x Ø 0.5mm
bending radius (rigid/flexible)	4mm/10mm	4mm/10mm	2mm/10mm	2mm/10mm
light exit	axial	lateral	lateral	axial
operating temperature	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C	-55... +80°C
degree of protection (EN 60529)	IP67	IP30	IP30	IP40



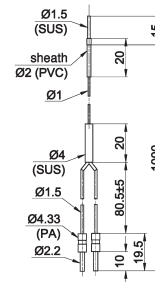
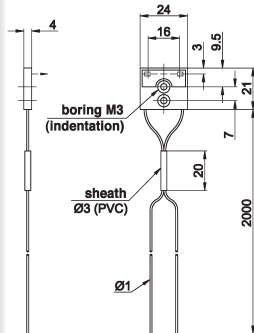
article-no.	LT207018	LT207021	LT207022	LT207023
version	18 x 14 x 6mm	M6 / Ø 4.5mm	M4 / Ø 2.5mm	M3 / Ø 2.0mm
length	2000mm	2000mm	2000mm	2000mm
sensing range	12mm	400mm	125mm	125mm
dimensions (sheathing)	2 x Ø 1.0mm	2 x Ø 2.2mm	2 x Ø 1.0mm	2 x Ø 1.0mm
dimensions (fiber)	2 x Ø 0.5mm	2 x Ø 1.0mm	2 x Ø 0.5mm	2 x Ø 0.5mm
bending radius (rigid/flexible)	2mm/10mm	2mm/10mm	2mm/10mm	2mm/10mm
light exit	axial	axial	axial	axial
operating temperature	-40 ... +70°C	-55 ... +80°C	-55 ... +80°C	-55 ... +80°C
degree of protection (EN 60529)	IP40	IP40	IP67	IP67



article-no.	LT207102	LT207106	LT207107	LT207108
version	M4	M4 / M3	Ø 3.0mm	5.2 x 9.5 x 15mm
length	2000mm	2000mm	2000mm	2000mm
sensing range	90mm	32mm	32mm	230mm
dimensions (sheathing)	2 x Ø 1.3mm	Ø 1.0 / Ø 1.25mm	Ø 1.0 / Ø 1.25mm	2 x Ø 2.2mm
dimensions (fiber)	2 x Ø 0.5mm	2 x Ø 0.5mm	2 x Ø 0.5mm	2 x Ø 1.1mm
bending radius (rigid/flexible)	1mm/-	1mm/-	1mm/-	1mm/-
light exit	axial	axial	axial	axial, glass lens
operating temperature	-40 ... +60°C	-40 ... +60°C	-40 ... +60°C	-25 ... +55°C
degree of protection (EN 60529)	IP67	IP40	IP40	IP40

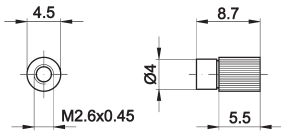


article-no.	LT207109	LT107205
version	24 x 21 x 4mm	Ø 4.0mm / Ø 1.5mm
length	2000mm	1000mm
sensing range	12mm	25mm
dimensions (sheathing)	2 x Ø 1.0mm	2 x Ø 1.5mm
dimensions (fiber)	2 x Ø 0.5mm	2 x Ø 1.1mm
bending radius (rigid/flexible)	1mm/-	2mm/10mm
light exit	lateral	axial
operating temperature	-40 ... +60°C	-55 ... +80°C
degree of protection (EN 60529)	IP40	IP40

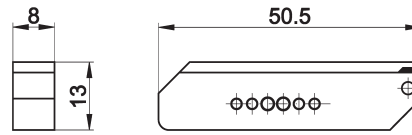


accessories

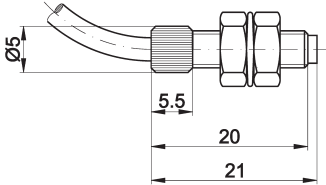
AL000001



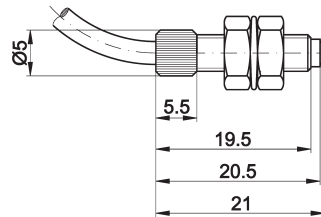
AL000007



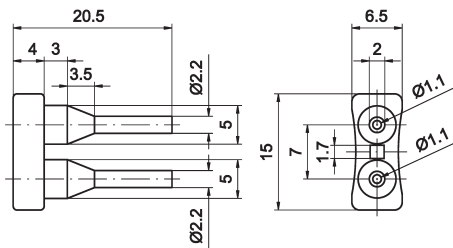
AL000008



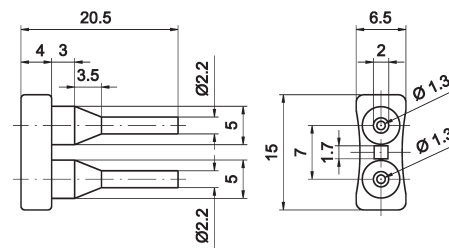
AL000009



AL000016



AL000027



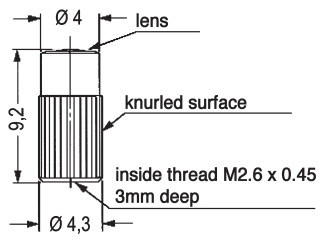
**ACCESSORIES**

article-no.	design	comment	material	miscellaneous
AL000001	M2,6x0.45	optics	brass	for LS208050
AL000007	8x13x50.5	fiber cutter	plastic	for plastic fiber
AL000008	M4/21mm	end piece	brass	without lens, for plastic fiber
AL000009	M4/21mm with lens	end piece, x3	brass	with lens, for plastic fiber
AL000003	1x2.2Ø, simplex	optic fiber	fiber diameter 1mm	custom made
AL000006	2x2.2Ø, duplex	optic fiber	fiber diameter 2x1mm	custom made
AL000016	reduction sleeve 2.2/1.1		plastic	
AL000027	reduction sleeve 2.2/1.3		plastic	



### accessories

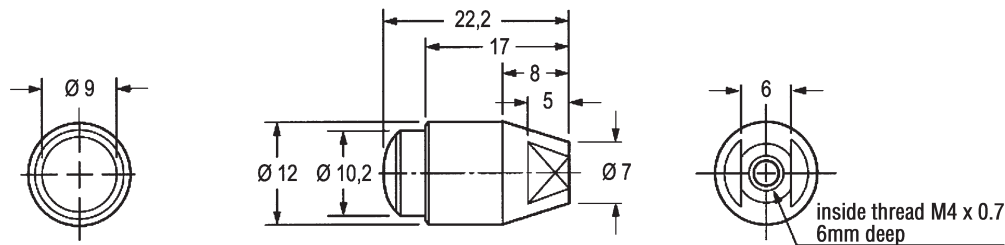
#### AL000019



achievable operating ranges [mm] (lens mounted on both sides)

	LONG	STD	FAST	S-D
LS207003	3500	2500	2000	1000
<b>LS207007</b>	3500	3500	2500	1300
LS207013	3500	2300	1600	800
<b>LS207108</b>	3500	2900	2000	1000
LS207206	3500	3500	2500	1100

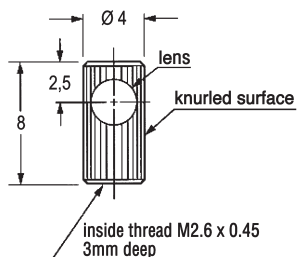
#### AL000020



achievable operating ranges [mm] (lens mounted on both sides)

	LONG	STD	FAST	S-D
LS207003	3500	2500	2000	1000
<b>LS207007</b>	3500	3500	2500	1300
LS207013	3500	2300	1600	800
<b>LS207108</b>	3500	2900	2000	1000
LS207206	3500	3500	2500	1100

#### AL000021

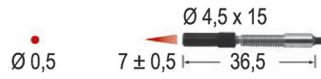


achievable operating ranges [mm] (lens mounted on both sides)

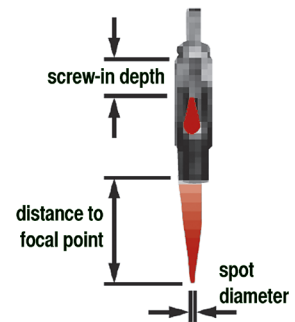
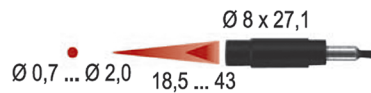
	LONG	STD	FAST	S-D
LS207003	1100	530	400	180
<b>LS207007</b>	1200	600	440	210
LS207108	900	450	330	160
<b>LS207206</b>	1200	600	440	210

accessories

**AL000023** spot lens

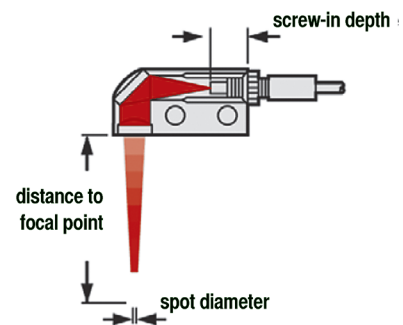
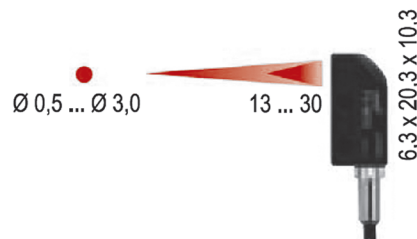


**AL000024** zoom lens (straight)



screw-in depth	distance to focal point	spot diameter
7mm	approx. 18.5mm	Ø 0.7mm
12mm	approx. 27.0mm	Ø 1.2mm
14mm	approx. 43.0mm	Ø 2.0mm

**AL000025** zoom lens (angular)



screw-in depth	distance to focal point	spot diameter
5mm	approx. 13mm	Ø 0.5mm
10mm	approx. 15mm	Ø 0.8mm
14mm	approx. 30mm	Ø 3.0mm

**Warning:** Never use these devices in applications where the safety of a person depends on their functionality.



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**NOTES**

