



Fiber Unit Selection Guide

Model HPF-_____


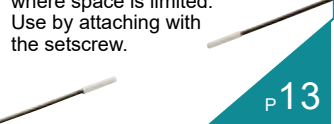

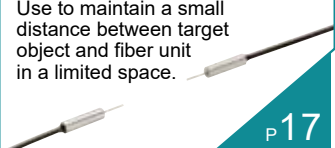






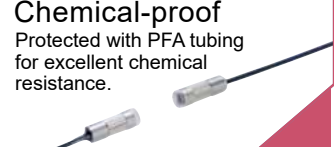
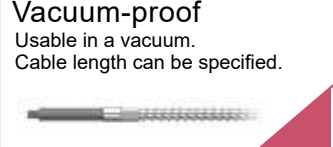




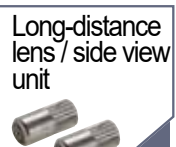


Table of Contents

Search by
type or application

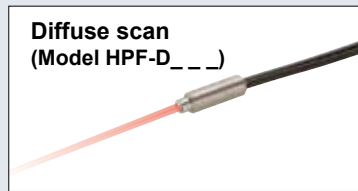
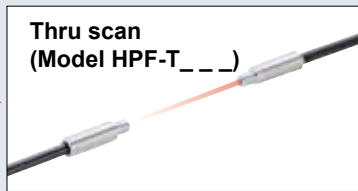
Search by
model number

| Search by type or application

Select by shape or optical type	Screw Most generally used. Use by attaching to a bracket, etc.  P.9	Cylindrical Suitable for installation where space is limited. Use by attaching with the setscrew.  P.13	Coaxial Used for target object positioning or in combination with spot lenses.  P.15		
	Sleeve Use to maintain a small distance between target object and fiber unit in a limited space.  P.17	Side view Light emitted to the side. Use to maintain a small distance between target object and fiber unit in a limited space.  P.19	Narrow view Light spread minimized. Use in a place where light intrusion is undesirable.  P.21		
	Flat/Vane Suitable for installation where space is limited. Attach directly to casing.  P.23	Limited reflective Resistant to ambient influences. Use for target object detection in a limited area.  P.24	Area Wide light beam. Use for target object with varying detection positions, detection of meandering, etc.  P.25		
	Select by environment	Heatproof Resistant to high temperatures. Use in environments up to 350 °C.  P.27	Chemical-proof Protected with PFA tubing for excellent chemical resistance.  P.29	Vacuum-proof Usable in a vacuum. Cable length can be specified.  P.31	
		Select by application	Liquid level detection  P.35	Liquid level detection  P.33	Liquid leak detection  P.37
			Accessories	Lens unit accessory  P.39	Long-distance lens / side view unit  P.41



Search by model number



Model No.	Page
HPF- T001	P9
HPF- T002	P13
HPF- T003	P9
HPF- T004	P13
HPF- T005	P17
HPF- T006	P17
HPF- T007	P19
HPF- T008	P9
HPF- T009	P13
HPF- T010	P9
HPF- T012	P27
HPF- T014	P27
HPF- T015	P17
HPF- T017	P27
HPF- T018	P27
HPF- T019	P21
HPF- T020	P21
HPF- T021	P25
HPF- T021T	P25
HPF- T021S	P25
HPF- T021WT	P25
HPF- T023	P21
HPF- T024	P9
HPF- T025	P9
HPF- T025B	P9
HPF- T026	P19
HPF- T028	P23
HPF- T029	P29
HPF- T029E	P29
HPF- T031	P13
HPF- T032	P35
HPF- T032E	P35
HPF- T032E-L02	P35
HPF- T033	P9
HPF- T034	P35
HPF- T034E	P35
HPF- T034E-L02	P35
HPF- T035	P29
HPF- T036	P13
HPF- T037	P19
HPF- T038	P13
HPF- T039	P17
HPF- T042	P19
HPF- T043	P13
HPF- T044	P9
HPF- T046	P13
HPF- T054-L05	P23
HPF- VT_ _	P31

Model No.	Page
HPF- D001	P11
HPF- D002	P11
HPF- D003	P17
HPF- D004	P11
HPF- D005	P13
HPF- D006	P17
HPF- D009	P15
HPF- D010	P15
HPF- D011	P19
HPF- D012	P11
HPF- D013	P27
HPF- D014	P29
HPF- D015	P27
HPF- D018	P11
HPF- D019	P17
HPF- D021	P17
HPF- D022	P27
HPF- D025	P21
HPF- D026	P25
HPF- D027	P33
HPF- D028	P24
HPF- D028F	P24
HPF- D028T	P24
HPF- D029	P11
HPF- D030	P11
HPF- D032	P15
HPF- D032B	P15
HPF- D033	P33
HPF- D034	P15
HPF- D035	P15
HPF- D036	P13
HPF- D037	P11
HPF- D038	P15
HPF- D039	P17
HPF- D040	P37
HPF- D041	P19
HPF- D042	P15
HPF- D043	P19
HPF- D045LF	P23
HPF- D049	P15
HPF- VD_ _	P31

Model No.	Page
FE- PA-F1	P42
PA-L1	P41
PA-S1	P41
HPF- AT10	P42
AT13	P42
EU05	P42
EU10	P42
LU01	P39
LU02	P39
LU07	P39
LU08	P39
VA01	P32
VJ03	P32
VL05	P32, 41
VL06	P32, 41
HPX- PA06	P42

- Screw
- Cylindrical
- Coaxial
- Sleeve
- Side view
- Narrow view
- Flat/ Selective reflection
- Area
- Heatproof
- Chemical -proof
- Vacuum -proof
- Specialized Use
- Lens unit
- Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Introducing: Combination Amplifiers

Standard

Model HPX-EG__

<Exterior view>



<Operation panel>



Typical models

Type	Model No.
Standard	HPX-EG00-1S
Space-saving (main unit)	HPX-EG00-3S
Space-saving (expansion unit)	HPX-EG00-5S

Double digital display
Built for usability
(Sensitivity auto-change function, threshold value tracking function)

<Standards compliance>



Introducing: Fiber Customization Services

► Change the cable length

If fiber length is insufficient, you can specify a cable length.

<Example model number>

HPF-T001-L05

Base model number L02: Fiber length 2 m
L05: Fiber length 5 m
L10: Fiber length 10 m

- Price: Determined by quantity
- Qty: No minimum (1 cable or more)

*For details on the scanning distances with a different cable length, see the Technical Guide (page 47).

*The cable cannot be lengthened on some models. For details, please contact our sales staff.

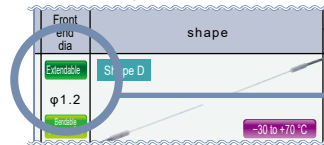
► Change the sleeve length

A range of on-site services are available, such as emergency sensor additions and changes, and sample production evaluation.

■ Applicable models

Thru scan	Diffuse scan
HPF-T005	HPF-D003
HPF-T015	HPF-D006
HPF-T037	HPF-D011

<List example>



Customizable models have this label.

■ Example model number

For an HPF-T005 with a 120 mm sleeve and 5 m fiber unit cable

HPF-T005-S120L05 is the model number.

The standard (base) model No.

"S" + 3-digit sleeve length.

Cable length. This can be omitted if length is standard.

- Price: Determined by quantity

Introducing: Element Types

Material of element Performance/Feature

Plastic

- General-purpose
- Bend tolerant
- Unbreakable
- Heatproof

Multi-component glass

- Heatproof Two types, 200 °C and 350 °C
- Vacuum 350°C

<List example>

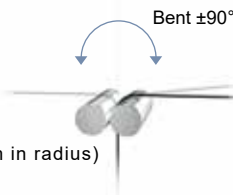
Cable			
Bend radius	Length	Amp	Material
R1	2 m	HPX-AG	Indicates element type.
Unbreakable	Free cut	HPX-EG	
		HPX-H	
		HPX-L	

■ Bend-tolerant fiber unit R4



For use in moving environments

■ Cyclic bending test (reference)



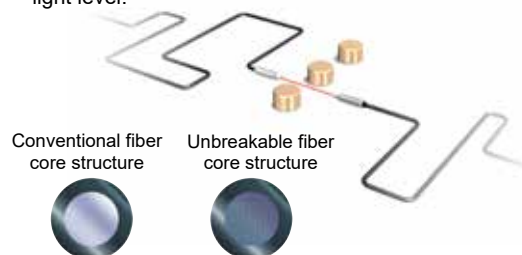
[Measurement conditions]
Roller diameter: 8 mm (4 mm in radius)
Load: 500 g

For example, HPF-T008 and -T009 withstand 1,000,000 bends under these conditions without breaking.

■ Unbreakable fiber unit (stationary bend type) R1/ R2

Even if the cable is bent at a small radius, the light level does not change.

Thanks to multi-core structure bundling several 100s of fiber elements, bending the cable does not attenuate the light level.

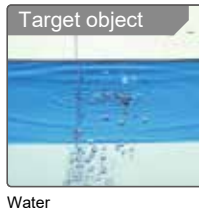


Case Studies

Liquid level detection

[Type] Specialized use (Thru scan)

[Catalog listing] HPF-D027, HPF-D033



Reference data Received light level display value

Combination amplifiers: HPX-EG series
(Sensing model : nL3)

Catalog listing	Presence of liquid	Absence of liquid
HPF-D027	1900	120
HPF-D033	550	45

Liquid level detection ▶ p33

Liquid level detection

[Type] Specialized use (Thru scan)

[Catalog listing] HPF-T032_, HPF-T034_



Liquid level detection ▶ p35

Liquid leak detection

[Type] Specialized use (Diffuse scan)

[Catalog listing] HPF-D040



Reference data Received light level display value

Combination amplifiers: HPX-EG series
(Sensing mode: nL3)

Catalog listing	Presence of liquid	Absence of liquid	Sensor floating
HPF-D040	2900	550	450

Liquid leak detection ▶ p37

Wafer projection detection

[Type] Narrow view (Thru scan)

[Catalog listing] HPF-T020



Target object
Silicon wafer (300 mm)

Narrow view ▶ P21

Gold wire detection

[Type] Coaxial (Diffuse scan)

[Catalog listing] HPF-D009



Target object
Gold wire ($\phi 17 \mu\text{m}$)

Coaxial ▶ P15

Lead frame detection

[Type] Area (Diffuse scan)

[Catalog listing] HPF-D026



Target object
Lead frame size
35 mm×150 mm

Area ▶ P25

Case Studies

Chip face/back discrimination

[Type] Coaxial (Diffuse scan) / Micro-Spot Lens

[Catalog listing] HPF-D034, HPF-LU07



(Back)
Target size 1 mm × 0.5 mm

Reference data Received light level display value

Combination amplifiers: HPX-EG series (Sensing model : nL3)

Scanning distance	Front of component	Rear of component
-2 mm	100	55
-1 mm	140	90
Focal Distance	430	310
+1 mm	230	120
+2 mm	100	50

Coaxial/Micro-Spot Lens

15
P/39

Substrate "Bad" mark detection

[Type] Coaxial (Diffuse scan) / Micro-Spot Lens

[Catalog listing] HPF-D038, HPF-LU08



Gold pattern
Approx. 1 mm dia.



Reject mark
*The reject mark is applied to the gold pattern using an oil-based red felt pen.

Coaxial/Micro-Spot Lens

15
P/39

Detection of meandering

[Type] Area (Thru scan)

[Catalog listing] HPF-T021T_



Opaque Sheet

Area P/25

Glass detection

[Type] General-purpose screw (Diffuse scan)

[Catalog listing] Fiber: **HPF-D002**

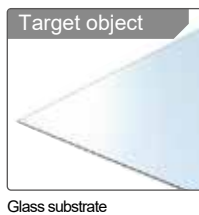


Screw ▶ P11

Glass detection

[Type] Selective reflection (Diffuse scan)

[Catalog listing] **HPF-D028T**



Selective reflection ▶ P24

Note: Detection availability, measurement performance, and accuracy also depend on actual working conditions. Use the fiber unit after carrying out in advance an operation check and evaluation.

Screw Thru scan

Most generally used.
Use by attaching to a bracket, etc.



[Related pages]
For combined lenses, see P41
For diffuse scan type, see page 11.

Thru scan

Type	Size	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.				
			Bend radius	Length	Amp	Mode				Distance			
Straight	M3	Shape A	R1	2m	HPX-EG	nL	50	φ0.5	φ0.005	HPF-T024			
			Unbreakable	Free cut		FT	29						
		R4	2m	HPX-EG	nL	60	4×φ0.25				φ0.01	HPF-T008	
		Bend tolerant	Free cut		FT	38							
	Shape B	R20	2m	HPX-EG	nL	220		φ0.75	φ0.005	HPF-T044			
		Free cut	FT		130								
	M4	Shape C	R2	2m	HPX-EG	nL	310				φ1.0	φ0.005	HPF-T025
			Unbreakable	Free cut		FT	180						
		R20	2m	HPX-EG	nL	410	φ1.0	φ0.005	HPF-T003				
		Free cut	FT		240								
Shape C		R20	2m	HPX-EG	nL	770				φ1.4	φ0.01	HPF-T001	
		Free cut	FT		450								
Shape D	R4	2m	HPX-EG	nL	280	16×φ0.25	φ0.01	HPF-T033					
	Bend tolerant	Free cut		FT	160								
Bolt	M4	Shape E	R2	2m	HPX-EG				nL	310	φ1.0	φ0.005	HPF-T025B
			Unbreakable	Free cut					FT	180			
Elbow	M4	Shape F	R20	2m	HPX-EG	nL	300	φ1.0	φ0.005	HPF-T010			
			Free cut	FT		170							

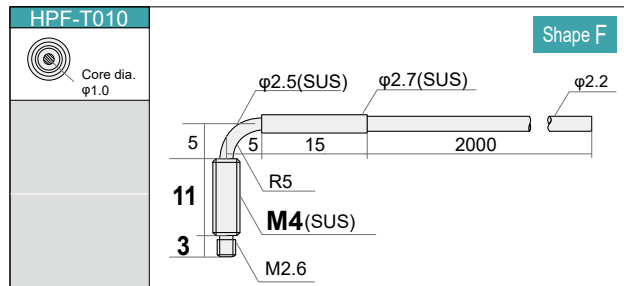
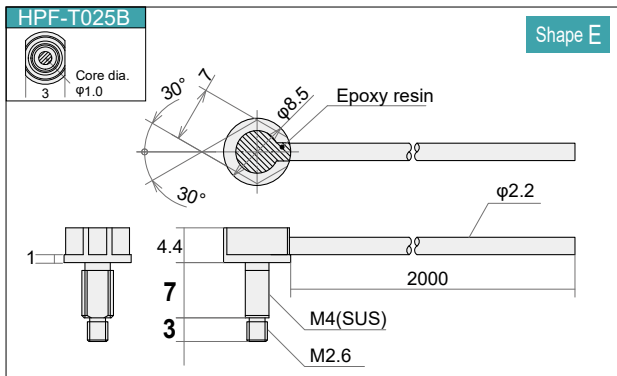
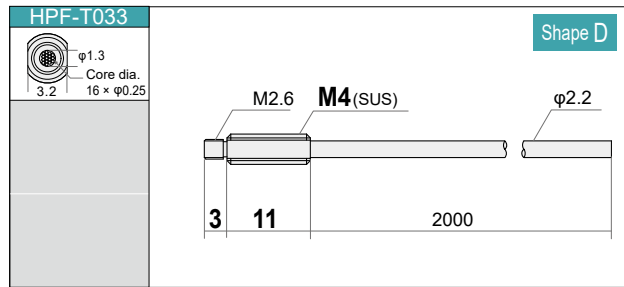
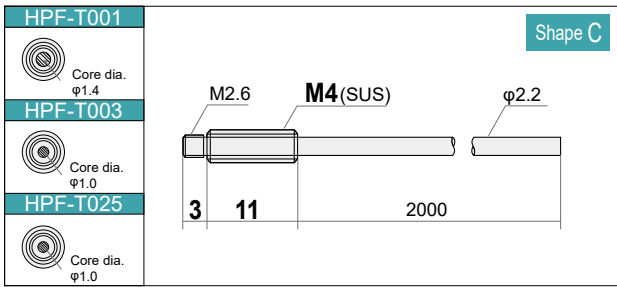
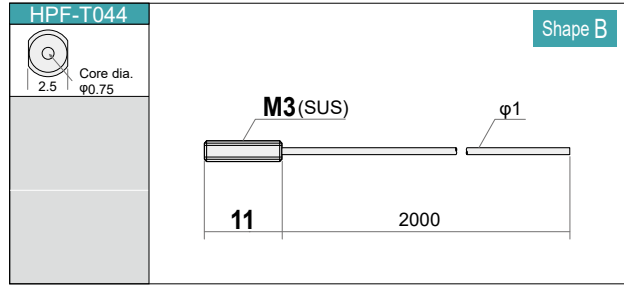
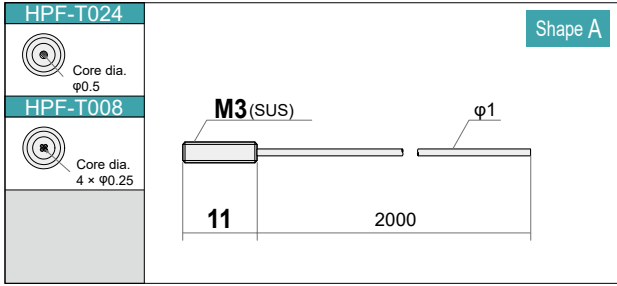
*For scanning distances of the sensing modes, see the Technical Guide (page 47).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions

Unit:mm



NOTEWORTHY

Products allowing either nut or setscrew installation are available for flexible operability, maintenance parts consolidation, and other factors.

Model HPF-T025B

Nut installation



Setscrew installation



Attachment method selectable

Applicable model number

Form	Type	Model no.
Thru scan	Straight	HPF-T033
Thru scan	Straight	HPF-T044
Thru scan	Bolt	HPF-T025B

D-Shape cutout

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Screw Diffuse scan

Most generally used.
Use by attaching to a bracket, etc.



[Related pages]
For thru scan see page 9.

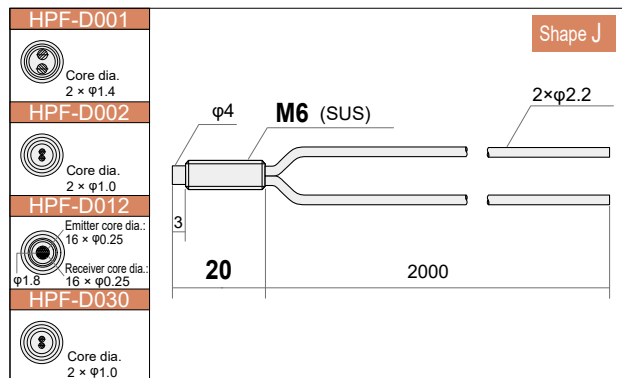
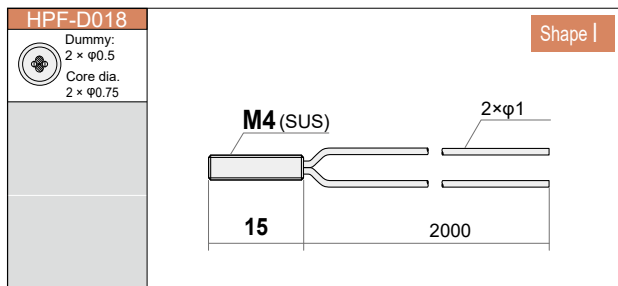
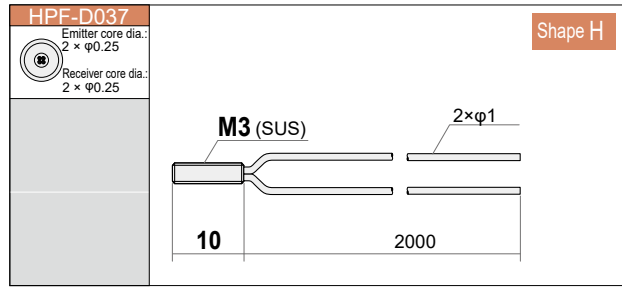
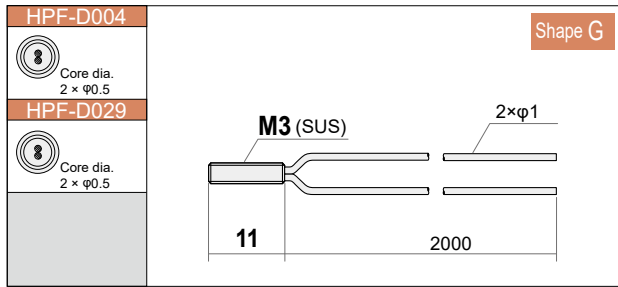
Diffuse scan

Type	Size	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Straight	M3	Shape G	R1	2m	HPX-EG	nL	10	Receiver and emitter $\phi 0.5$	$\phi 0.005$	HPF-D029
			Unbreakable	Free cut		FT	5			
		Shape H	R15	2m	HPX-EG	nL	43	Receiver and emitter $\phi 0.5$	$\phi 0.005$	HPF-D004
			-30 to +70 °C	Free cut		FT	25			
		Shape I	R4	2m	HPX-EG	nL	8	Receiver and emitter $2 \times \phi 0.25$	$\phi 0.005$	HPF-D037
			-30 to +70 °C	Bend tolerant		Free cut	FT			
	M4	Shape I	R15	2m	HPX-EG	nL	75	Receiver and emitter $\phi 0.75$	$\phi 0.005$	HPF-D018
			-30 to +70 °C	Free cut		FT	46			
	M6	Shape J	R2	2m	HPX-EG	nL	85	Receiver and emitter $\phi 1.0$	$\phi 0.005$	HPF-D030
						Unbreakable	Free cut			
			R4	2m	HPX-EG	nL	100	Receiver and emitter $16 \times \phi 0.25$	$\phi 0.005$	HPF-D012
						Bend tolerant	Free cut			
R20		2m	HPX-EG	nL	210	Receiver and emitter $\phi 1.4$	$\phi 0.005$	HPF-D001		
				Free cut	FT				120	
R20	2m	HPX-EG	nL	150	Receiver and emitter $\phi 1.0$	$\phi 0.005$	HPF-D002			
			Free cut	FT				90		

*For scanning distances of the sensing modes, see the Technical Guide (page 48).
 *Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).
 *Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μ s.
 *The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions

Unit:mm



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

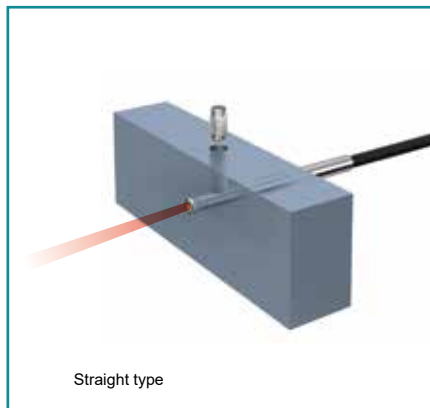
Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Cylindrical

Suitable for installation where space is limited.
Use by attaching with the setscrew.



[Related pages]

Side-view sensors

P19

Compatible lenses

P41

For head dia. of less than $\phi 1.0$ mm (thru scan) or $\phi 1.5$ mm (diffuse scan), select from sleeve-type sensors.

P17

Thru scan

Type	Size	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Straight	$\phi 1$	Shape A	R4	0.5 m	HPX-EG	nL	12	$\phi 0.25$	$\phi 0.005$	HPF-T038
						FT	7			
	$\phi 1.5$	Shape B	R4	2 m	HPX-EG	nL	60	$4 \times \phi 0.25$	$\phi 0.01$	HPF-T009
						FT	38			
		Shape C	R4	2 m	HPX-EG	nL	60	$4 \times \phi 0.25$	$\phi 0.01$	HPF-T046
						FT	38			
	Shape D	R4	0.5 m	HPX-EG	nL	6	$\phi 0.125$	$\phi 0.005$	HPF-T036	
						FT	3			
	$\phi 2$	Shape E	R15	2 m	HPX-EG	nL	100	$\phi 0.5$	$\phi 0.005$	HPF-T043
						FT	55			
$\phi 3$	Shape F	R2	2 m	HPX-EG	nL	310	$\phi 1.0$	$\phi 0.005$	HPF-T031	
					FT	180				
	Shape G	R20	2 m	HPX-EG	nL	410	$\phi 1.0$	$\phi 0.005$	HPF-T004	
					FT	240				
Shape G	R20	2 m	HPX-EG	nL	770	$\phi 1.4$	$\phi 0.01$	HPF-T002		
					FT	450				

Diffuse scan

Type	Size	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Straight	$\phi 1.5$	Shape H	R4	1m	HPX-EG	nL	8	Receiver and emitter $2 \times \phi 0.25$	$\phi 0.005$	HPF-D036
						FT	5			
	$\phi 3$	Shape I	R15	2m	HPX-EG	nL	43	Receiver and emitter $\phi 0.5$	$\phi 0.005$	HPF-D005
						FT	25			

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

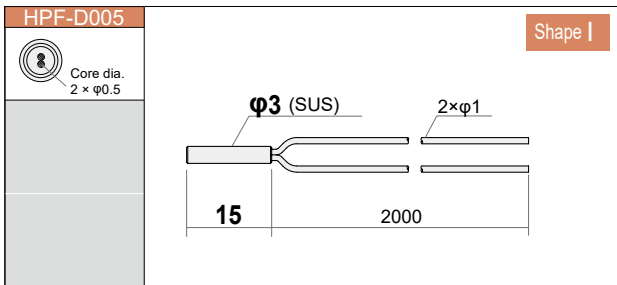
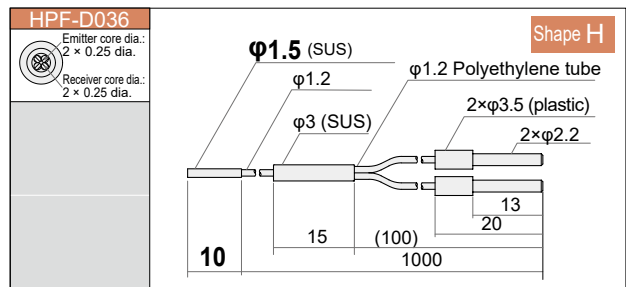
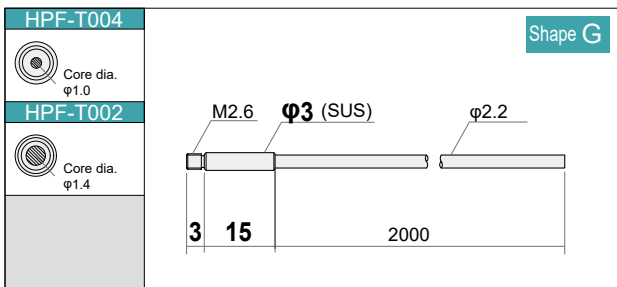
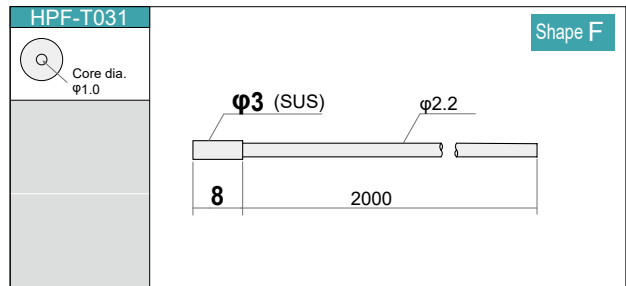
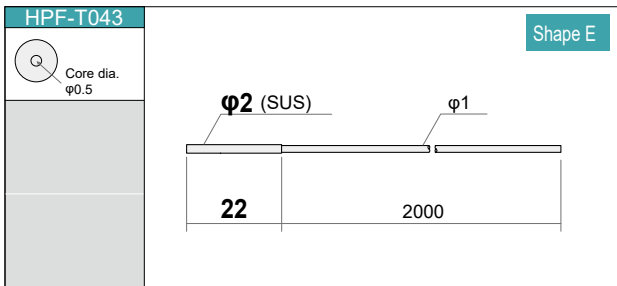
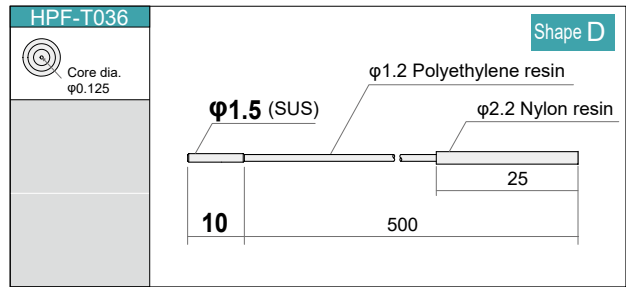
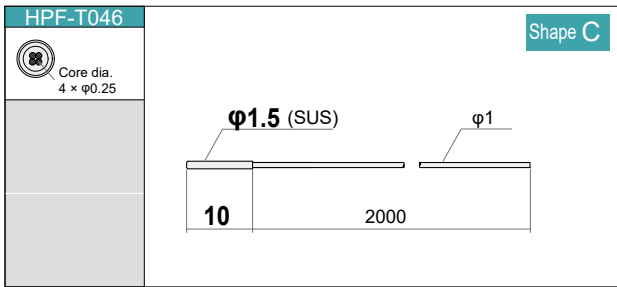
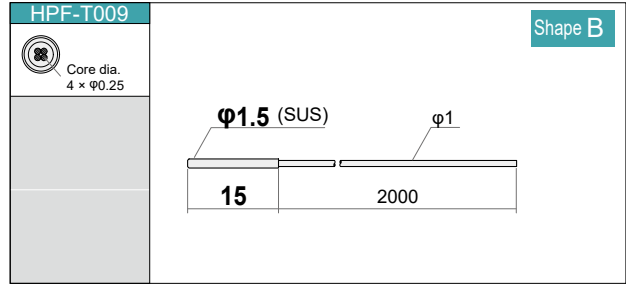
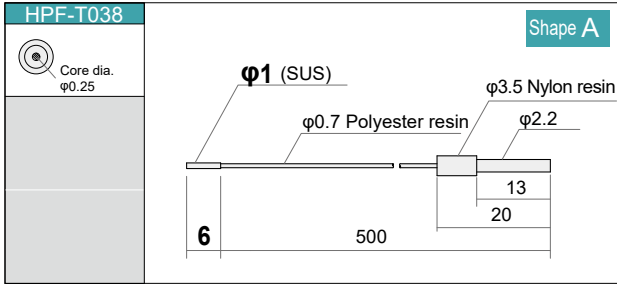
*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μ s.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions

Unit: mm



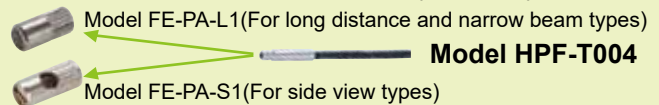
NOTEWORTHY

Smallest fiber unit head dia. (1.0 mm) in the industry

Model HPF-T038



Compatible lens units are available for cylindrical types



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/Selective reflection

Area

Heatproof

Chemical-proof

Vacuum-proof

Specialized Use

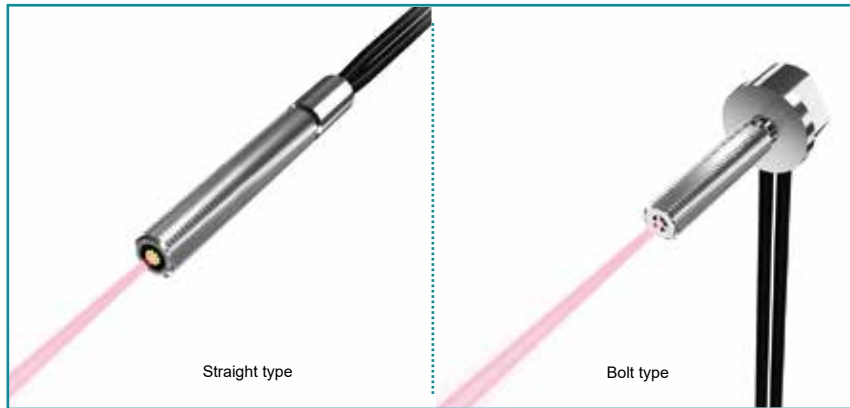
Lens unit

Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Used for target object positioning or in combination with spot lenses.



[Related pages]

For compatible micro-spot lenses

P41

Diffuse scan

Type	Size	Shape	Cable		Amp	Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.
			Bend radius	Length		Mode	Distance			
Straight	M3	Shape A Lens attachable -30 to +70 °C 	R4	0.5m	HPX-EG	nL 25 FT 15	Emitter: $\phi 0.25$ Receiver: $6 \times \phi 0.25$	$\phi 0.005$	HPF-D034	
		Shape B Lens attachable -30 to +70 °C 	Emitter: R1 Receiver: R4	2m	HPX-EG	nL 18 FT 10	Emitter: $\phi 0.5$ Receiver: $4 \times \phi 0.25$	$\phi 0.005$	HPF-D032	
		Shape C Lens attachable -30 to +70 °C 	R4	1m	HPX-EG	nL 60 FT 38	Emitter: $\phi 0.5$ Receiver: $9 \times \phi 0.25$	$\phi 0.005$	HPF-D049	
		Shape D Lens attachable -30 to +70 °C 	R15	2m	HPX-EG	nL 50 FT 29	Emitter: $\phi 0.5$ Receiver: $9 \times \phi 0.25$	$\phi 0.005$	HPF-D035	
		Shape E Lens attachable -30 to +70 °C 	Emitter: R1 Receiver: R4	1m	HPX-EG	nL 18 FT 10	Emitter: $\phi 0.5$ Receiver: $4 \times \phi 0.25$	$\phi 0.005$	HPF-D032B	
Straight	M4	Shape F Lens attachable -30 to +70 °C 	R15	2m	HPX-EG	nL 50 FT 29	Emitter: $\phi 0.5$ Receiver: $9 \times \phi 0.25$	$\phi 0.005$	HPF-D038	
	M6	Shape G Lens attachable -30 to +70 °C 	R20	2m	HPX-EG	nL 150 FT 90	Emitter: $\phi 1.0$ Receiver: $16 \times \phi 0.25$	$\phi 0.005$	HPF-D009	
	$\phi 2$	Shape H Lens attachable -30 to +70 °C 	R15	2m	HPX-EG	nL 35 FT 21	Emitter: $\phi 0.5$ Receiver: $4 \times \phi 0.25$	$\phi 0.005$	HPF-D042	

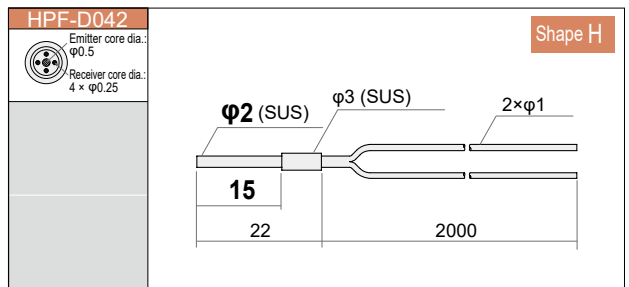
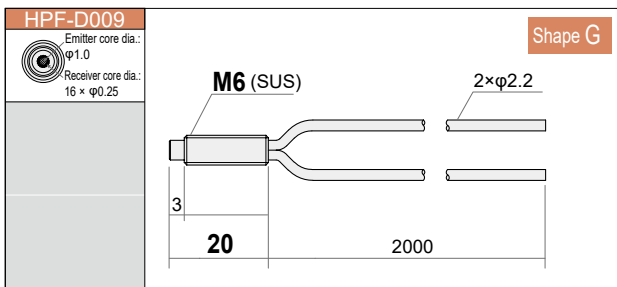
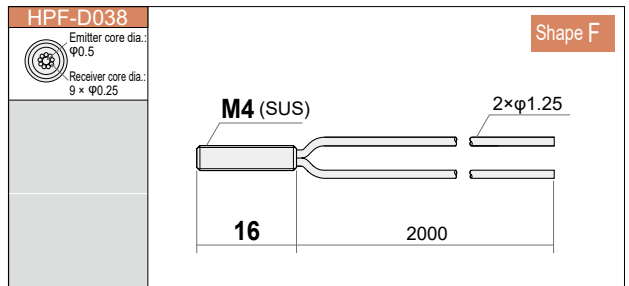
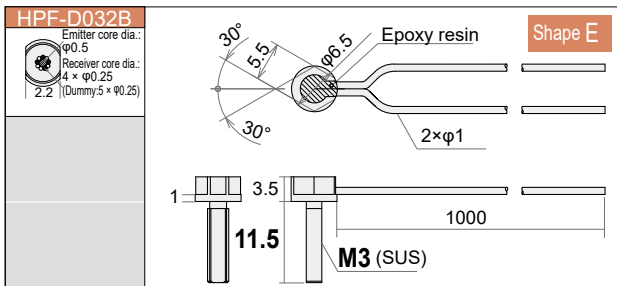
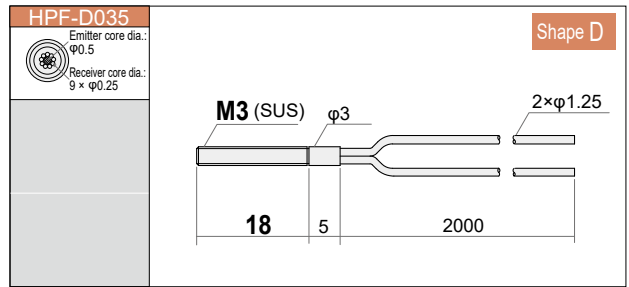
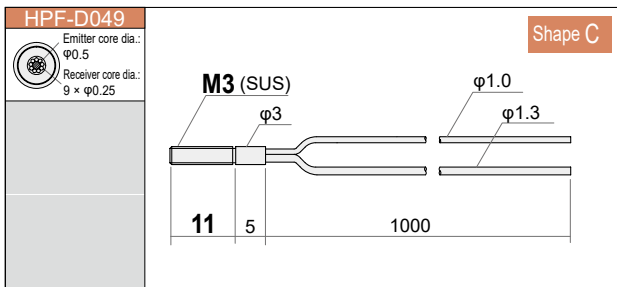
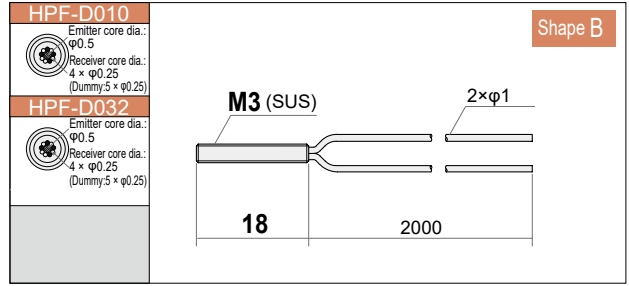
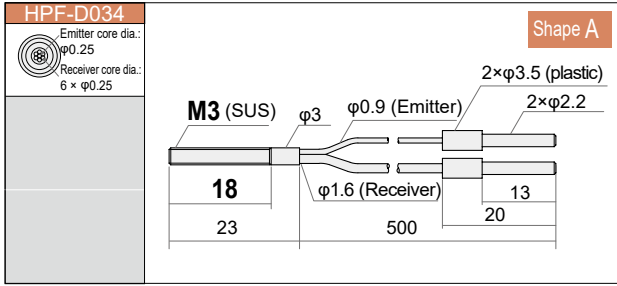
*For scanning distances of the sensing modes, see the Technical Guide (page 48).

*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μ s.

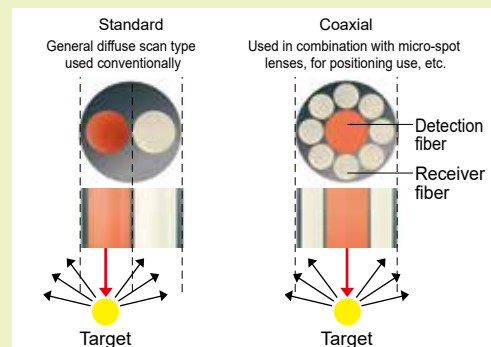
*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions



NOTEWORTHY

Coaxial fiber is recommended for use with micro-spot lenses and applications requiring highly precise positioning.



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

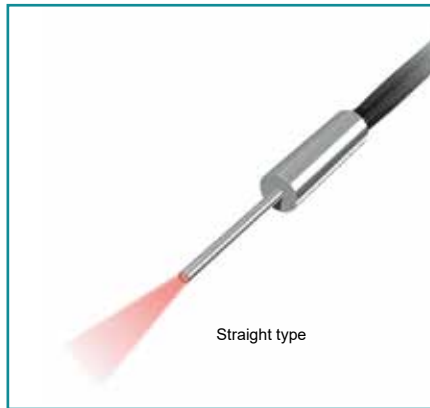
Lens unit

Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Use to maintain a small distance between target object and sensor in a limited space.



[Related pages]

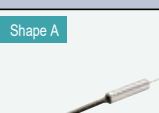



Sleeve-length customization

P4

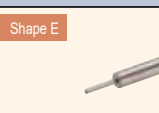
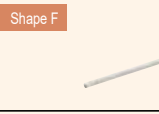
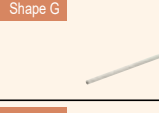

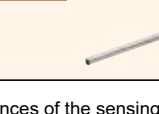
Side-view sensing

P19

Thru scan

Front end dia.	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.
		Bend radius	Length	Amp	Mode			
φ0.4	Shape A  -30 to +70 °C	R4	0.5m	HPX-EG	nL 5 FT 3	φ0.125	φ0.005	HPF-T039
Extendable φ0.5	Shape B  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 12 FT 7	φ0.25	φ0.005	HPF-T015
Extendable φ1.2 Bendable (10-mm radius)	Shape C  -30 to +70 °C	R20	2m Free cut	HPX-EG	nL 410 FT 240	φ1.0	φ0.005	HPF-T005
φ1.2 Bendable (10-mm radius)	Shape D  -30 to +70 °C	R20	2m Free cut	HPX-EG	nL 410 FT 240	φ1.0	φ0.005	HPF-T006

Diffuse scan

Front end dia.	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.
		Bend radius	Length	Amp	Mode			
φ0.82	Shape E  -30 to +70 °C	R4	0.5m Bend tolerant Free cut	HPX-EG	nL 4 FT 2	Receiver and emitter φ0.25	φ0.005	HPF-D039
φ0.82	Shape F  -30 to +70 °C	R15	0.5m Free cut	HPX-EG	nL 4 FT 2	Receiver and emitter φ0.25	φ0.005	HPF-D019
Extendable φ1.2 Bendable (10-mm radius)	Shape G  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 43 FT 25	Receiver and emitter φ0.5	φ0.005	HPF-D006
φ1.5	Shape H  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 35 FT 21	Receiver and emitter φ0.5	φ0.005	HPF-D021
Extendable φ2.5 Bendable (10-mm radius)	Shape I  -30 to +70 °C	R20	2m Free cut	HPX-EG	nL 150 FT 90	Receiver and emitter φ1.0	φ0.005	HPF-D003

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

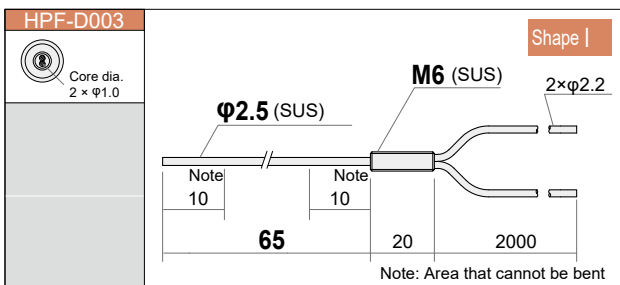
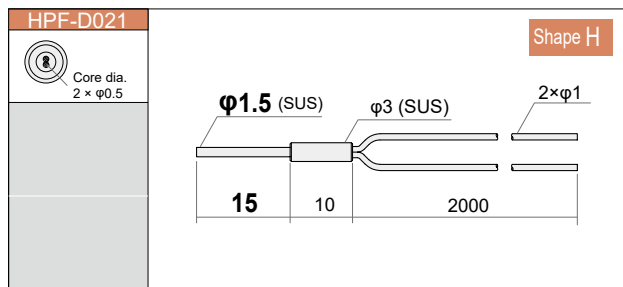
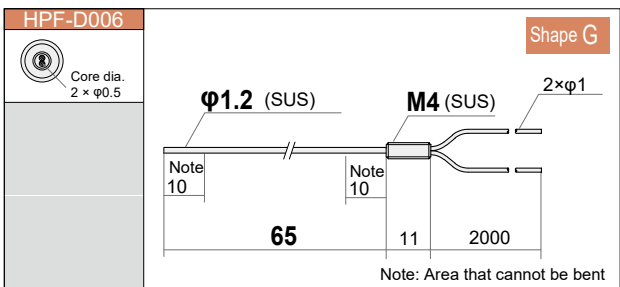
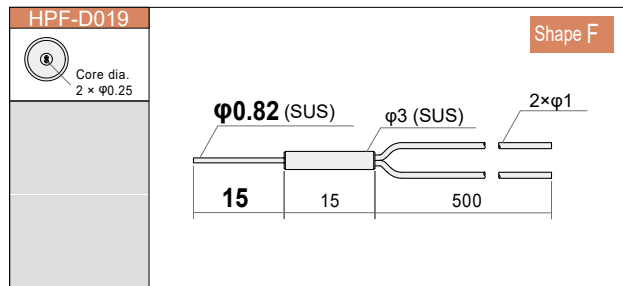
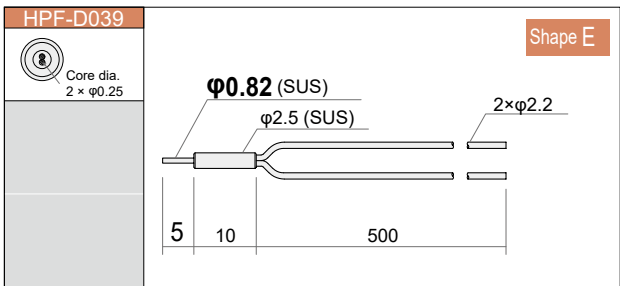
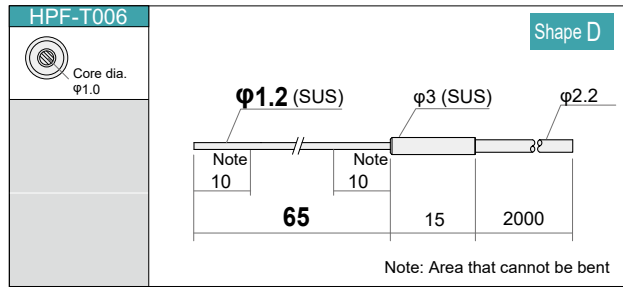
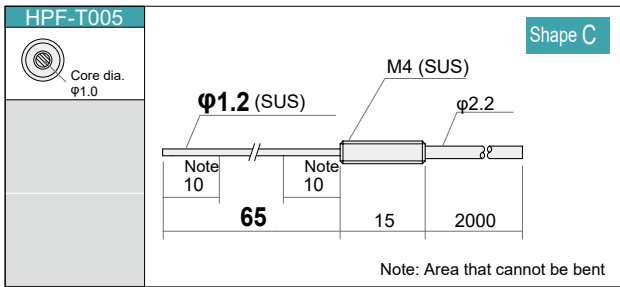
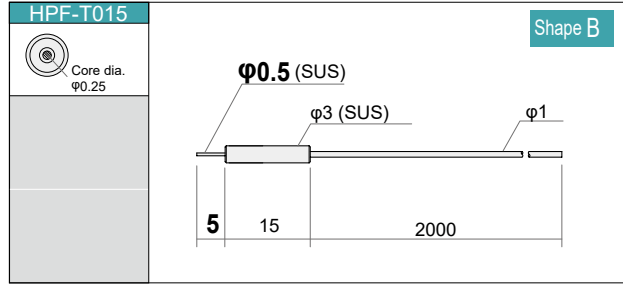
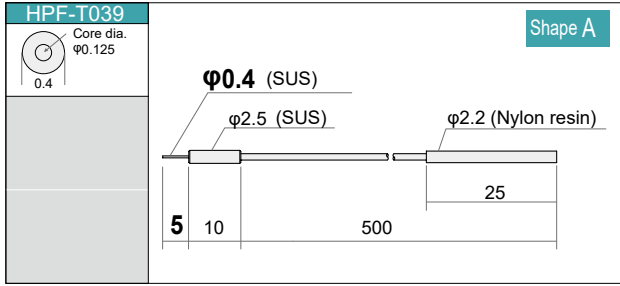
*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions

Unit: mm

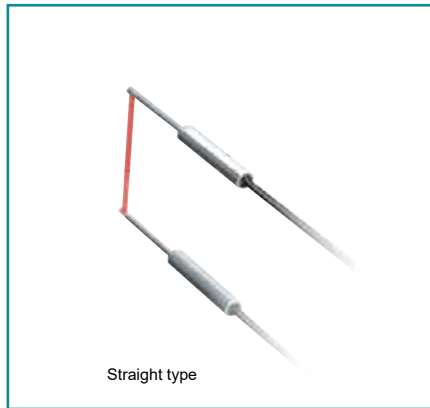


- Screw
- Cylindrical
- Coaxial
- Sleeve**
- Side view
- Narrow view
- Flat/Selective reflection
- Area
- Heatproof
- Chemical-proof
- Vacuum-proof
- Specialized Use
- Lens unit
- Other accessories

Side view

Light emitted to the side.

Use to maintain a small distance between target object and switch in a limited space.



[Related pages]

Narrow view sensing

P21

Sleeve-length customization

P4

Thru scan

Front end dia.	Center of optical axis (From front end)	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.
			Bend radius	Length	Amp	Mode			
Extendable φ0.88	0.6	Shape A -30 to +70 °C	R5	1m Free cut	HPX-EG	nL 20	φ0.5	φ0.005	HPF-T037
						FT 11			
φ1	1.5	Shape B -30 to +70 °C	R1	2m Unbreakable Free cut	HPX-EG	nL 20	φ0.5	φ0.005	HPF-T026
						FT 11			
φ1	1.5	Shape C -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 55	φ0.5	φ0.005	HPF-T007
						FT 33			
φ3	1.5	Shape D -30 to +70 °C	R5	2m Free cut	HPX-EG	nL 220	φ0.5	φ0.005	HPF-T042
						FT 130			

Diffuse scan

Front end dia.	Center of optical axis (From front end)	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.
			Bend radius	Length	Amp	Mode			
Extendable φ2	1.5	Shape E -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 17	Receiver and emitter φ0.5	φ0.005	HPF-D011
						FT 10			
φ2	1.5	Shape F -30 to +70 °C	R15	2m Free cut	HPX-EG	nL 17	Receiver and emitter φ0.5	φ0.005	HPF-D041
						FT 10			
φ6	1.5	Shape G -30 to +70 °C	R20	2m Free cut	HPX-EG	nL 65	Receiver and emitter φ1.0	φ0.005	HPF-D043
						FT 40			

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

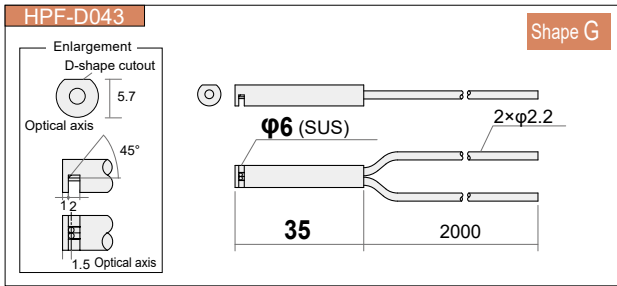
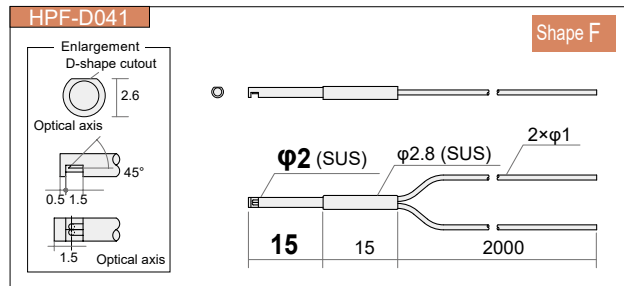
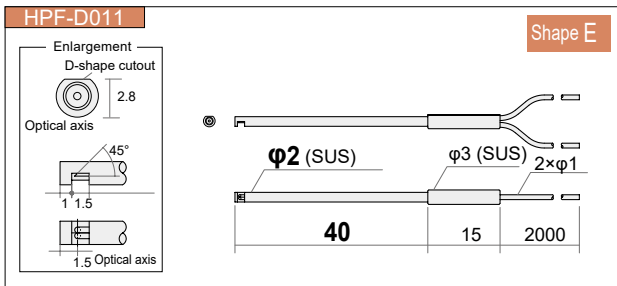
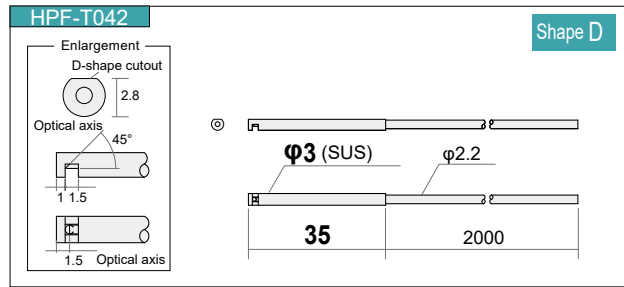
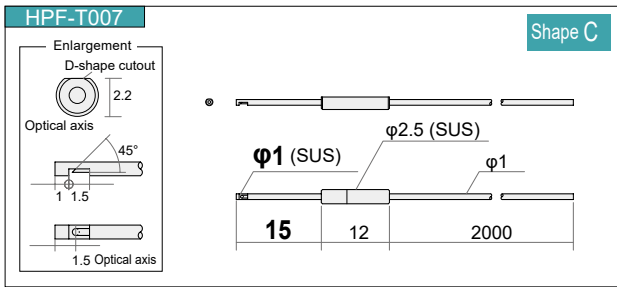
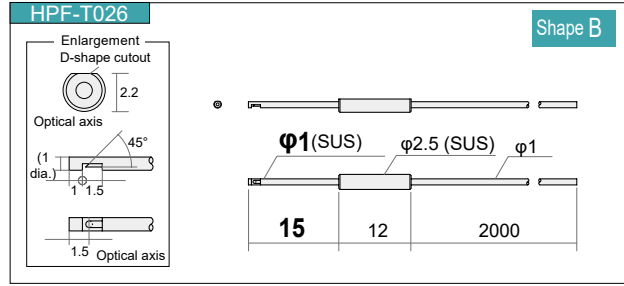
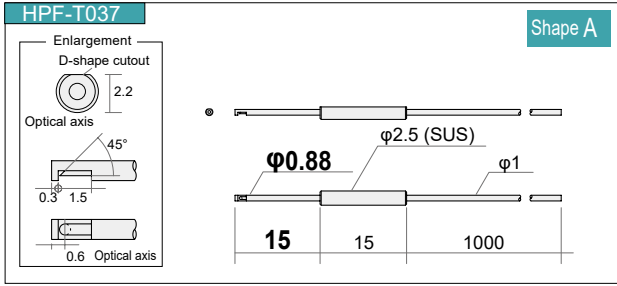
*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions

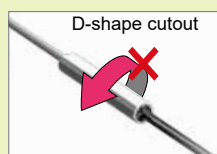
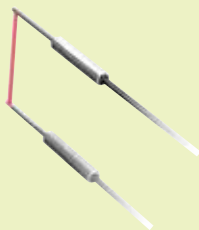
Unit: mm



NOTEWORTHY

Unique feature

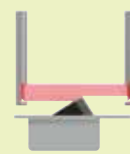
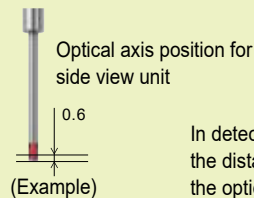
All side view types have D-shape cutout on the fiber unit head. This can greatly reduce adjustment man-hours during installation.



The D-shape cutout perpendicular to the optical axis facilitates alignment.

Selection point

The distance from the front end to the center of the optical axis depends on the product structure. Select the model that is suitable for your application.



In detection of small component dislocation, the distance from the front end to the center of the optical axis is important.

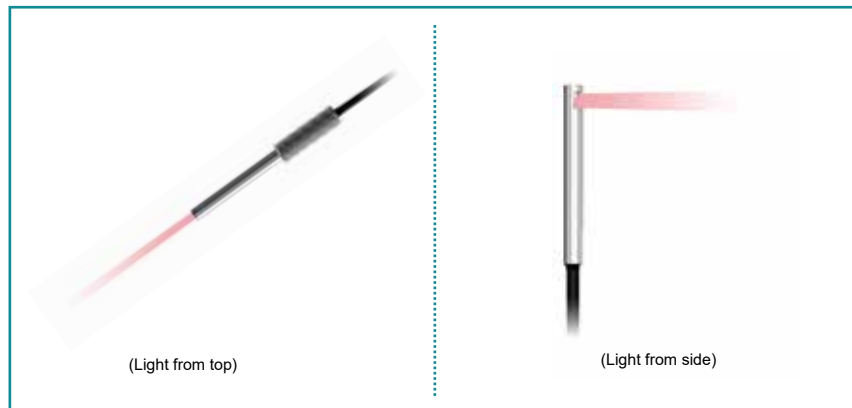
- Screw
- Cylindrical
- Coaxial
- Sleeve
- Side view
- Narrow view
- Flat/Selective reflection
- Area
- Heatproof
- Chemical-proof
- Vacuum-proof
- Specialized Use
- Lens unit
- Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Narrow view

Light spread minimized.
Use in a place where light intrusion is undesirable.



[Related pages]

If a narrow beam is not required:

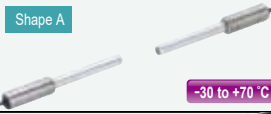


Sleeve-type units

[P17](#)


Side-view units

[P19](#)

Thru scan

Light emitter	Directional angle (half angle)	Shape	Cable		Scanning distance (mm)		Effective lens diameter	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Top	1.5°	Shape A 	R15	2m	HPX-EG	nL	1,200	φ1.7	φ0.1	HPF-T023
						FT	730			
Top	2.5°	Shape B 	R20	2m	HPX-EG	nL	1,400	φ2.1	φ0.1	HPF-T019
						FT	840			
Side	3°	Shape C 	R20	2m	HPX-EG	nL	1,500	φ2.6	φ0.1	HPF-T020
						FT	920			

Diffuse scan

Light emitter	Directional angle (half angle)	Shape	Cable		Scanning distance (mm)		Effective lens diameter	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Top	—	Shape D 	R15	2m	HPX-EG	nL	20	—	φ0.005	HPF-D025
						FT	16			

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

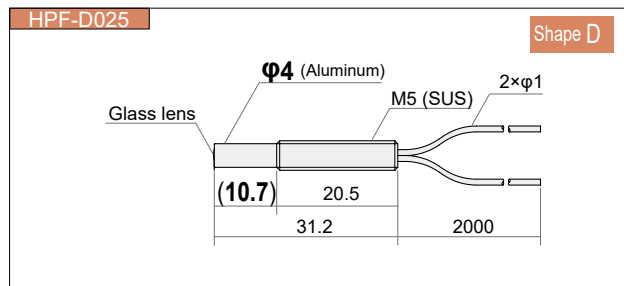
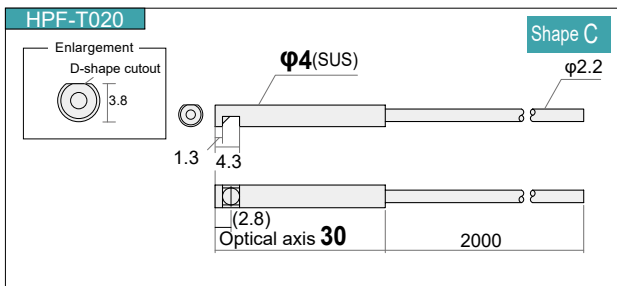
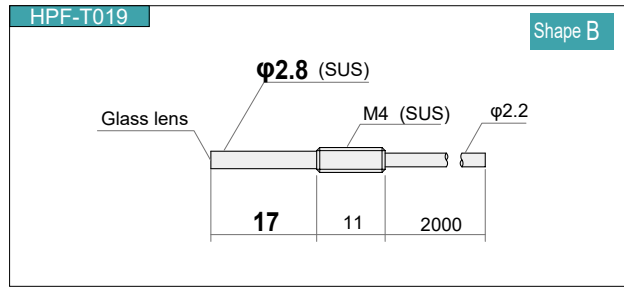
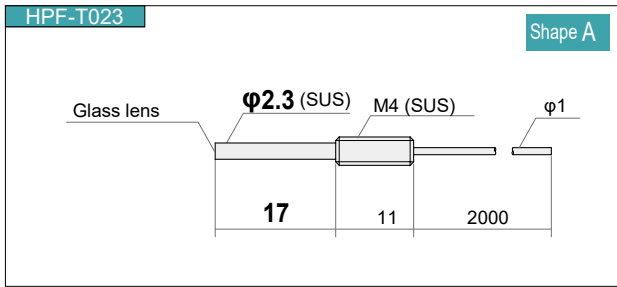
*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).



Outer dimensions

Unit: mm



NOTEWORTHY

Narrow view types are available also by combination with long-distance lenses and side-view lenses.

(Typical examples)

Optical configuration	Lens unit (Model No.)	Fiber unit (Model No.)	Directional angle (half angle)
Top	FE-PA-L1	HPF-T003	Approx. 3°
Top	HPF-VL06	HPF-T003	Approx. 3°
Side	FE-PA-S1	HPF-T003	Approx. 10°
Side	HPF-VL05	HPF-T003	Approx. 8°

For lens units, see page 41.

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

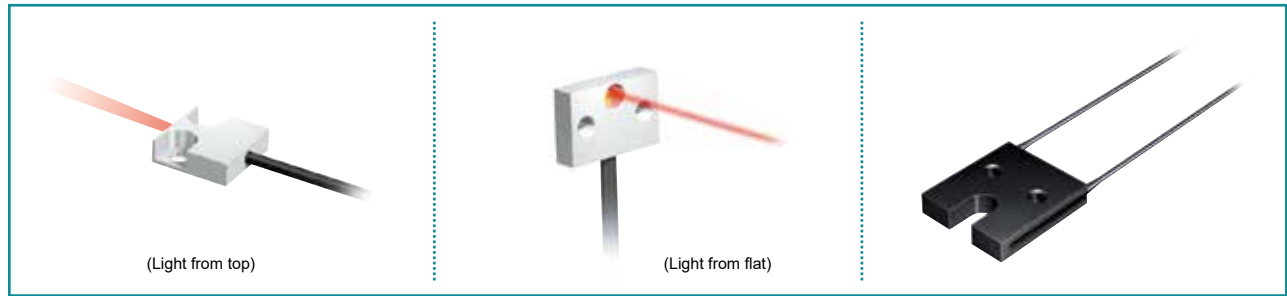
Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Flat/Vane

Suitable for installation where space is limited.
Attach directly to casing.



Thru scan

Type	Light emitter	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Flat	Top	Shape A	R1	2m	HPX-EG	nL	50	φ0.5	φ0.005	HPF-T028
						FT	29			
Vane type	—	Shape B	R15	5m	HPX-EG	nL	6	φ0.5	φ0.005	HPF-T054-L05
						FT	6			

Diffuse scan

Type	Light emitter	Shape	Cable		Scanning distance (mm)		Core	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
Flat	Flat	Shape C	R2	2m	HPX-EG	nL	37	Receiver and emitter φ1.0	—	HPF-D045LF
						FT	21			

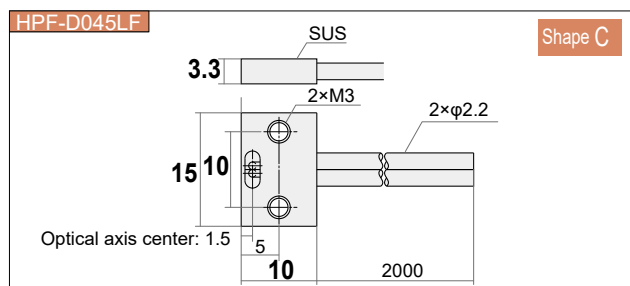
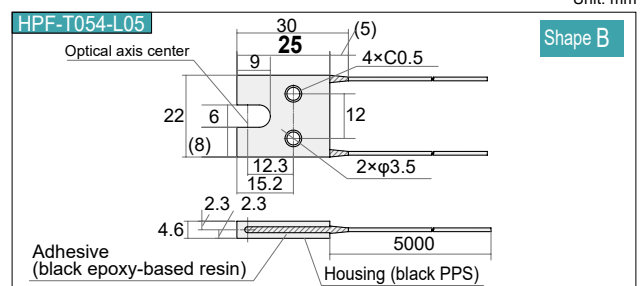
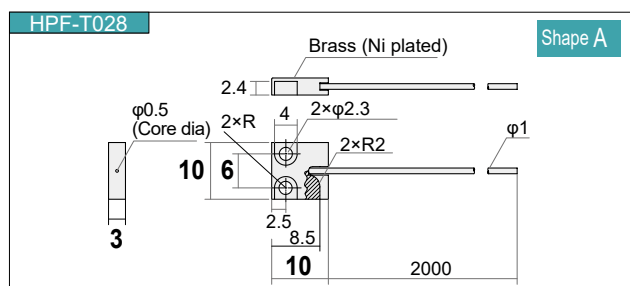
*For scanning distances of the sensing modes, see the Technical Guide (page 47).

*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

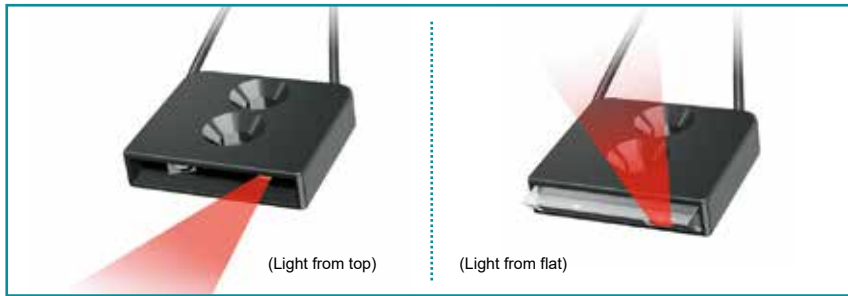
*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions






Limited reflective

Resistant to ambient influences.
Use for target object detection in a limited area.



Diffuse scan

Light emitter	Shape	Cable		Scanning distance (mm)		Min. detectable size (mm)	Model No.
		Bend radius	Length	Amp	Mode		
Top	Shape A  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL	7.4±1.2	HPF-D028T
Flat	Shape B  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL	2.5±0.5	HPF-D028
	Shape C  -30 to +70 °C	R15	2m Free cut	HPX-EG	nL	5.2±1.0	HPF-D028F

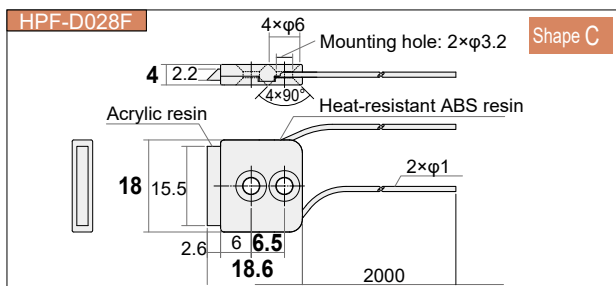
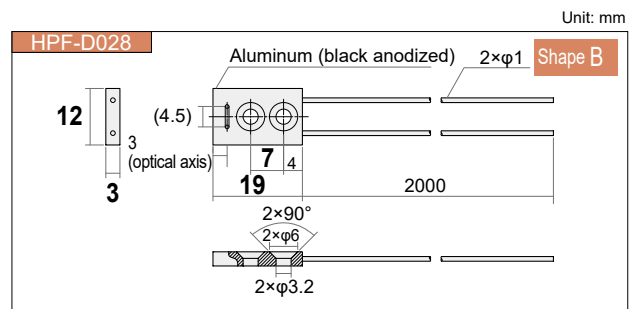
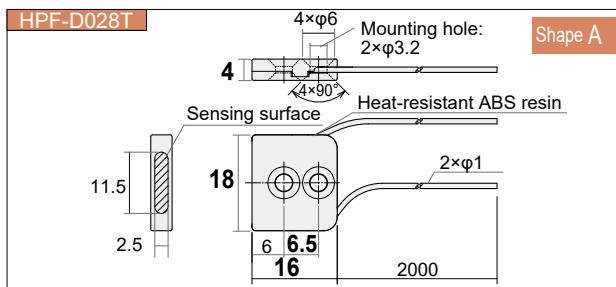
*For scanning distances of the sensing modes, see the Technical Guide (page 48).

*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 µs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

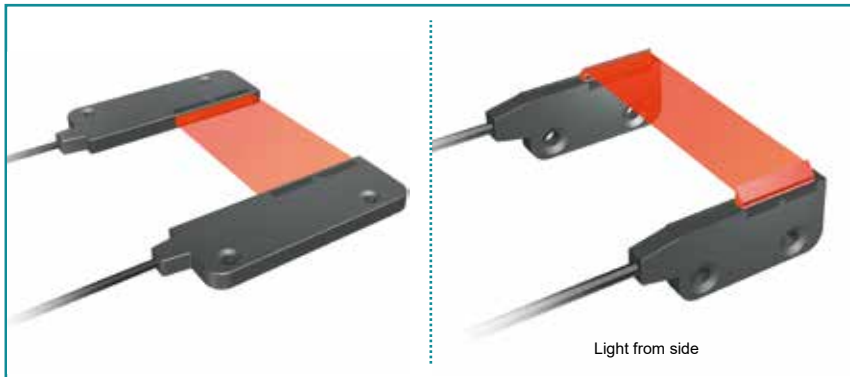
Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Wide light beam.

Use for target object with varying detection positions, detection of meandering, etc.



Thru scan

Type	Optical configuration	Area width (mm)	Shape	Cable		Scanning distance (mm)			Min. detectable size (mm)	Model No.
				Bend radius	Length	Amp	Mode	Distance		
Array	Flat	5.25	Shape A	R4	2m	HPX-EG	nL	270	φ0.2	HPF-T021
							FT	160		
Screen	Flat	15	Shape B	R15	2m	HPX-EG	nL	1,200	φ0.2	HPF-T021T
							FT	710		
Screen	Flat	30	Shape D	R15	2m	HPX-EG	nL	2,000	φ0.4	HPF-T021WT
							FT	1,100		
Screen	Side	15	Shape C	R15	2m	HPX-EG	nL	1,100	φ0.2	HPF-T021S
							FT	670		

Diffuse scan

Type	Optical configuration	Area width (mm)	Shape	Cable		Scanning distance (mm)			Min. detectable size (mm)	Model No.
				Bend radius	Length	Amp	Mode	Distance		
Array	Flat	10.85	Shape E	R4	2m	HPX-EG	nL	100	φ0.005	HPF-D026
							FT	60		

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

NOTEWORTHY

Type

Array type



Features

Small diameter fibers are aligned in a row. Smaller and slimmer sensor heads are also available.

Screen type

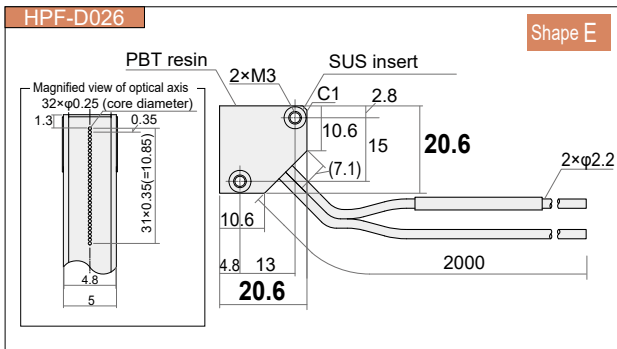
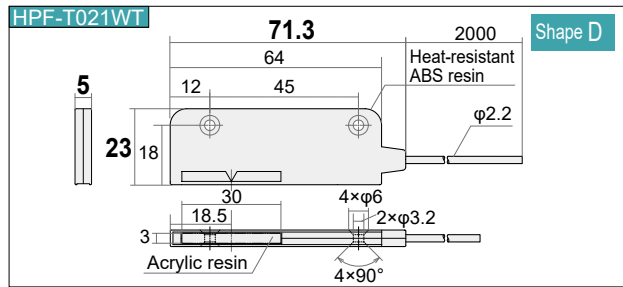
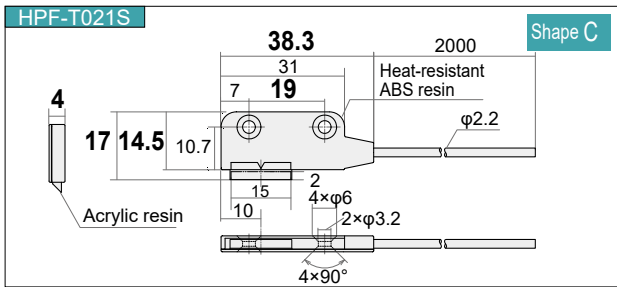
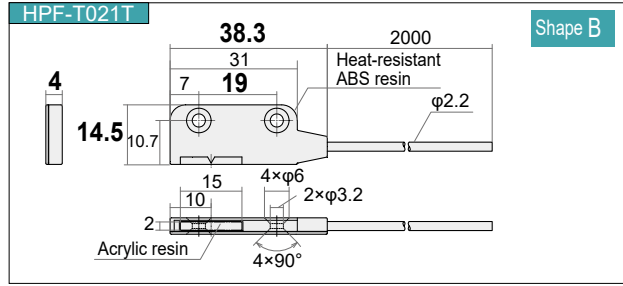
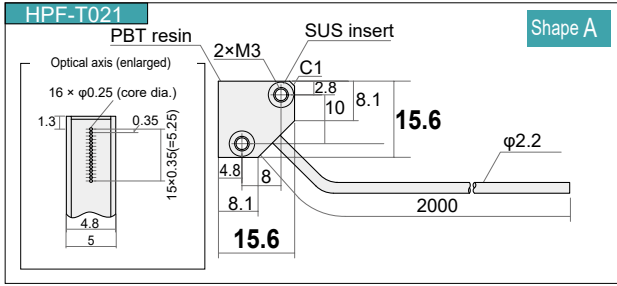


Light is collimated using the lens. This increases the scanning range and makes the light uniform.

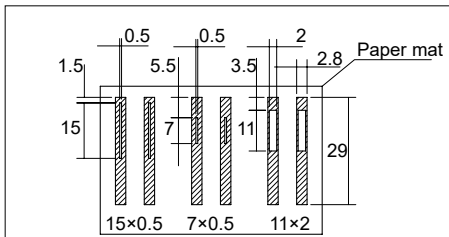


Outer dimensions

Unit: mm



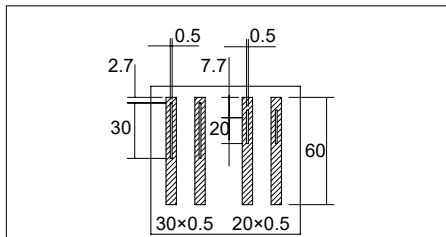
Accessory (Model HPX-T021T)



Note
 Material: Transparent polyester film (black print on back)

Model HPF-T021T comes with slits.
 Use the appropriate slit with the unit to achieve the desired scanning distance and resolution.
 The slits can be bought as parts.
 Model No : HPX - PA07

(Model HPX-T021WT)



Note
 Material: Transparent polyester film (black print on back)

Model HPF-T021WT comes with slits.
 Use the appropriate slit with the unit to achieve the desired scanning distance and resolution.

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

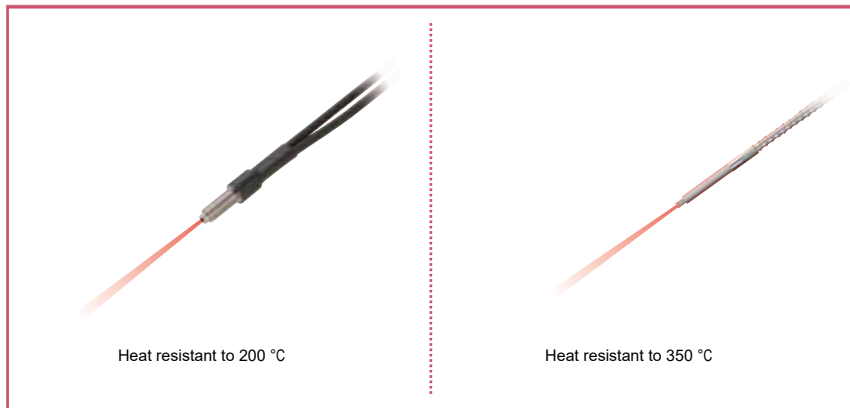
Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Heatproof

Resistant to high temperatures.
Use in environments up to 350 °C.



[Related pages]

Compatible lenses

P41

Thru scan

Heatproof	Size	Shape	Cable		Scanning distance (mm)		Element	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
105 °C	Straight	Shape A Lens attachable -30 to +105 °C	R25	2m Free cut	HPX-EG	nL	240	φ1.0	φ0.005	HPF-T012 ^{*1}
						FT	140			
150 °C	Straight	Shape B -60 to +150 °C	R35	2m Free cut	HPX-EG	nL	410	φ1.5	φ0.01	HPF-T017 ^{*1}
						FT	240			
200 °C	Straight	Shape C Lens attachable -30 to +200 °C	R15	1m	HPX-EG	nL	140	φ1.0	φ0.005	HPF-T018
						FT	80			
350 °C	Straight	Shape D Lens attachable -30 to +350 °C	R15	2m	HPX-EG	nL	220	φ1.0	φ0.005	HPF-T014
						FT	130			

Diffuse scan

Heatproof	Size	Shape	Cable		Scanning distance (mm)		Element	Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode				Distance
105 °C	Straight	Shape E -30 to +105 °C	R25	2m Free cut	HPX-EG	nL	100	Receiver and emitter φ1.0	φ0.005	HPF-D013 ^{*1}
						FT	55			
150 °C	Straight	Shape F -60 to +150 °C	R35	2m Free cut	HPX-EG	nL	150	Receiver and emitter φ1.5	φ0.005	HPF-D022 ^{*1}
						FT	90			
350 °C	Straight	Shape G -30 to +350 °C	R25	2m	HPX-EG	nL	85	φ1.5	φ0.005	HPF-D015
						FT	50			

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

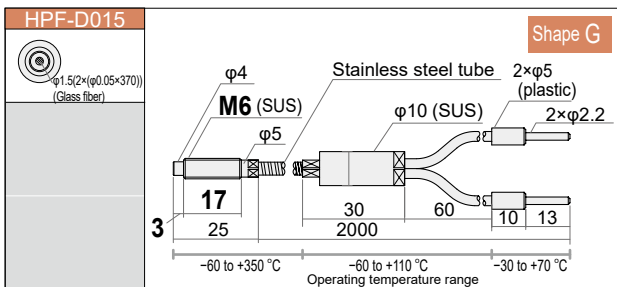
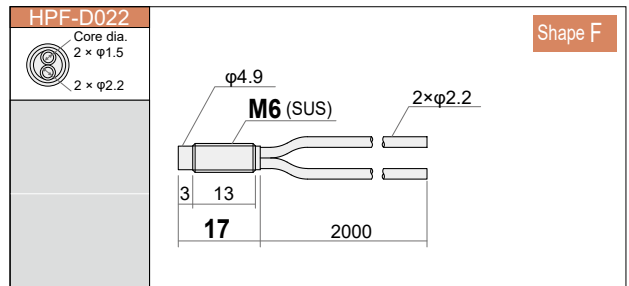
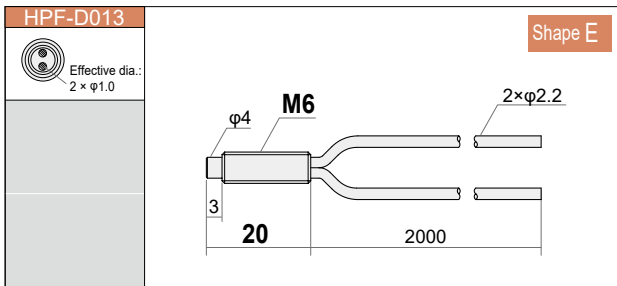
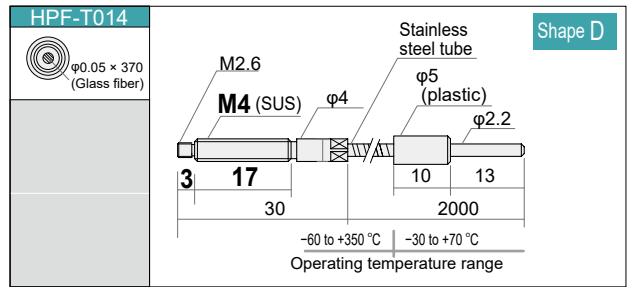
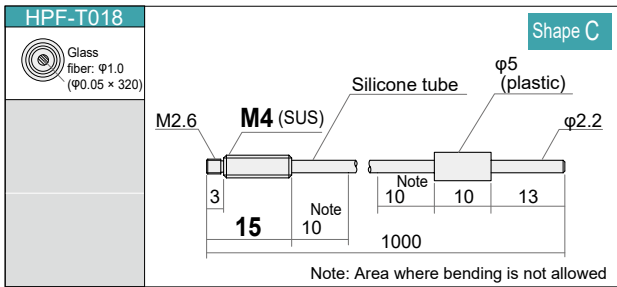
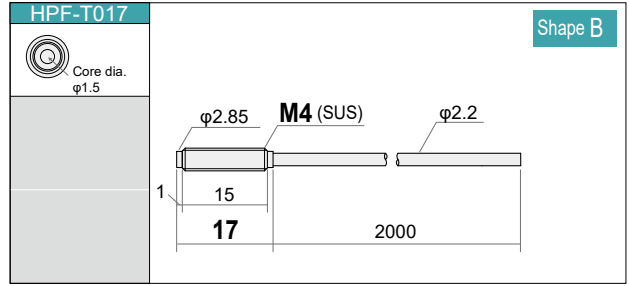
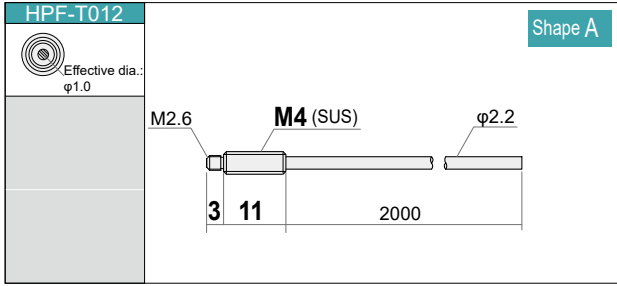
*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

- *1. If a fiber unit is continuously used in an environment where it is at the upper limit of the operating temperature range, the detection distance will decrease. When selecting a fiber unit, be sure to take the ambient temperature into account so that the sensor is not continuously operating near its limits.

Outer dimensions



NOTEWORTHY

Use the lens unit appropriate for your application.
*Select a lens with the desired heat resistance.

Heatproof temp.	Lens (Model No.)	Type	Sensitivity
200 °C	FE-PA-L1	Long distance	Approx. $\times 6$
200 °C	FE-PA-S1	Side view	—
350 °C	HPF-VL06	Long distance	Approx. $\times 10$
350 °C	HPF-VL05	Side view	—

*Compatible lens units P. 41

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective reflection

Area

Heatproof

Chemical-proof

Vacuum-proof

Specialized Use

Lens unit

Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Chemical-proof

Protected with PFA tubing for excellent chemical resistance.



[Related pages]

Wet process sensors for level & leak detection

P33

P35

P37



Usage notes

P44

Thru scan

Light emitter	Size	Shape	Cable		Scanning distance (mm)		Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode			Distance
Top	φ4.7	Shape A	R20	2m	HPX-EG	nL	1,500	φ0.1	HPF-T029
						FT	880		
Top	φ4.7	Shape B	R20	2m	HPX-EG	nL	280	φ0.1	HPF-T029E
						FT	160		
Side	φ4.7	Shape C	R20	2m	HPX-EG	nL	350	φ0.1	HPF-T035
						FT	210		

Diffuse scan

Light emitter	Size	Shape	Cable		Scanning distance (mm)		Min. detectable size (mm)	Model No.	
			Bend radius	Length	Amp	Mode			Distance
Top	φ6	Shape D	PFA area: R80 Cable area: R20	2m	HPX-EG	nL	70	-	HPF-D014
						FT	42		

*For scanning distances of the sensing modes, see the Technical Guide (page 47).

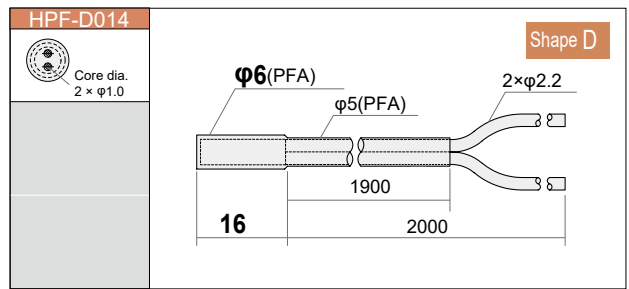
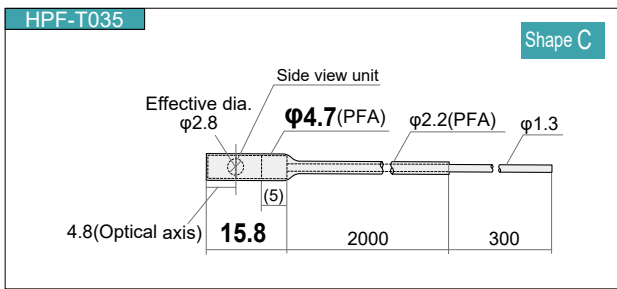
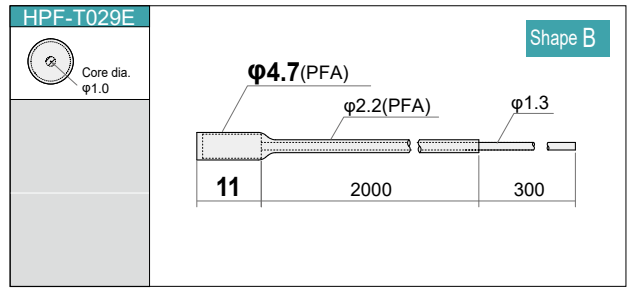
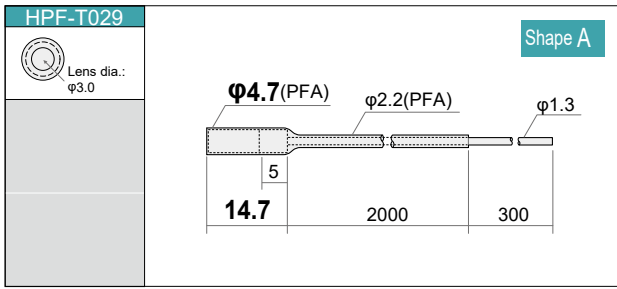
*Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).

*Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.

*For chemical resistance of fluorine-resin, see the Technical Guide (page 45).

*The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (HPX-AG).

Outer dimensions



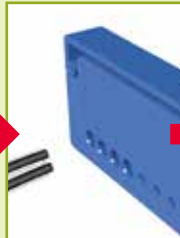
NOTEWORTHY

Installation man-hours greatly reduced

Simply cut the PFA-jacketed cable to length and insert as is into the amplifier.



Simply cut the PFA-jacketed cable.



Conventionally



PFA tube must be stripped off before inserting fiber.



Insert as is into the amplifier. The insertion area requires no PFA working.

After improvement



Fiber cut with a cutter can be directly connected to an amplifier.

Saves space



Tube has small outside diameter of 2.2 mm, which can save considerable space compared with previous models.

Bend radius is also greatly improved.

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

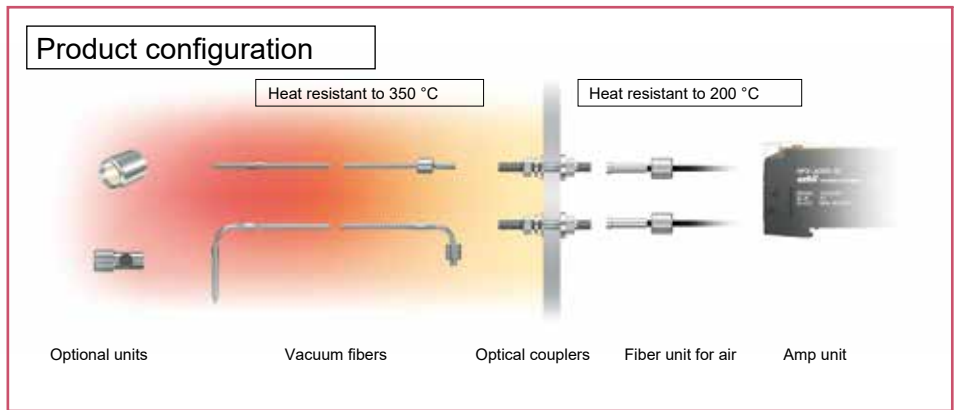
Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Vacuum-proof

Usable in a vacuum.
Cable length can be specified.

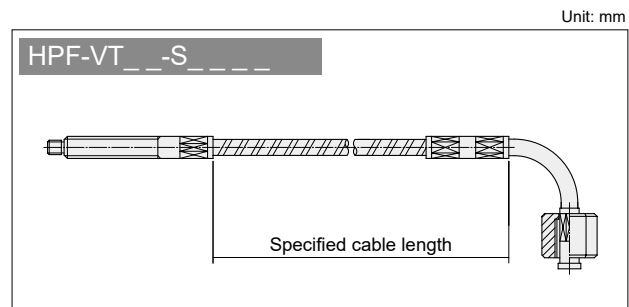
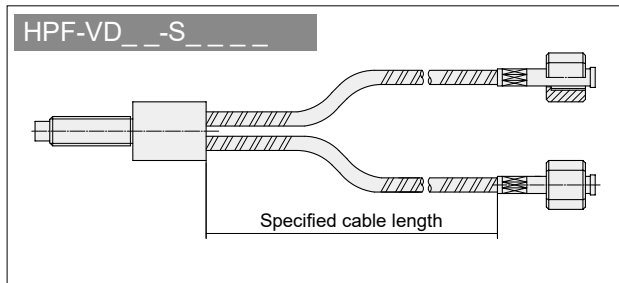


[Related pages]
Usage notes
P46

Configuration of vacuum fiber model numbers

HPF	-VT	0	S	-S1000	(Typical examples)	
Base model No.	Model	Head shape	Coupler side shape	Cable length	Description	
HPF	-VT				Thru scan	
	-VD				Diffuse scan	
		0			Straight	
		1			Elbow (VT type only)	
			S		Straight	
			E		Elbow	
					Cable length	Ordering increment
				- S	25mm to 500mm	25mm
				- S	550mm to 1500mm	50mm
				- S	1600mm to 5000mm	100mm

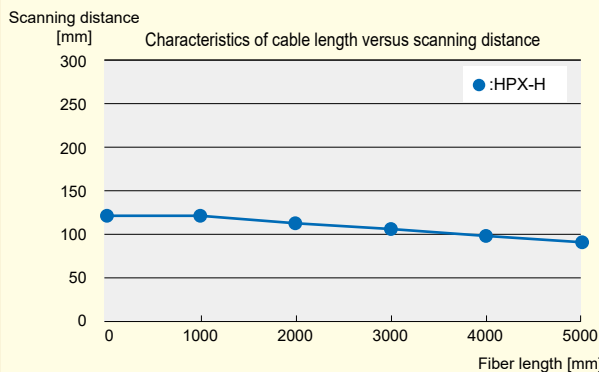
Cable drawing



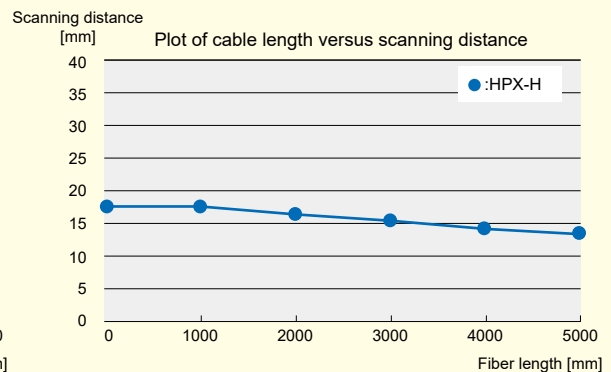
CHART

◇ Scanning distance characteristics

Thru scan



Diffuse scan



*For fiber units for air, HPF-VA01 is used for calculation.

*Scanning distances for diffuse-scan were obtained using a standard target object (plain white paper).

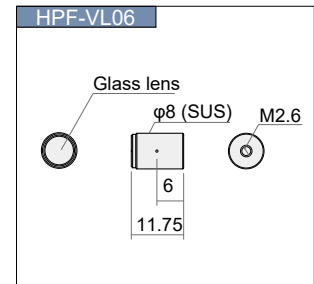
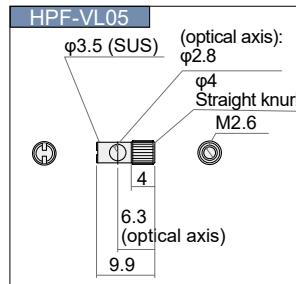
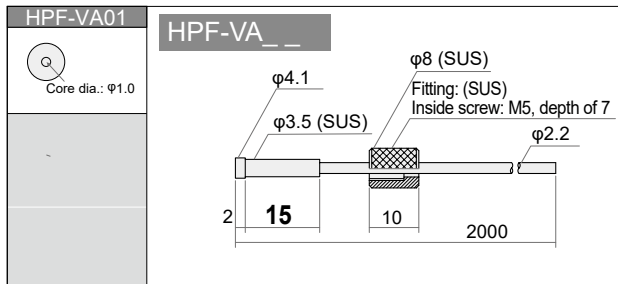
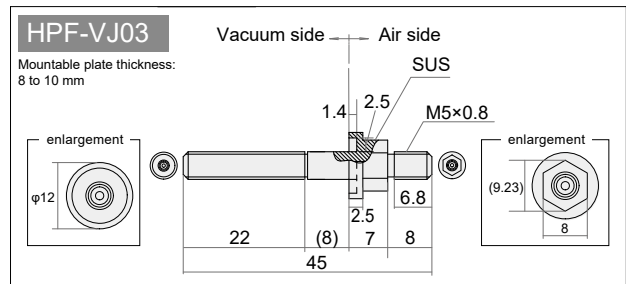
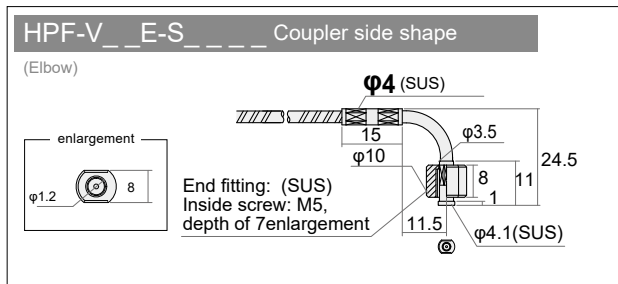
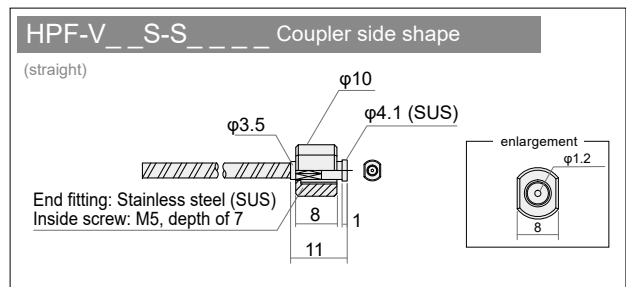
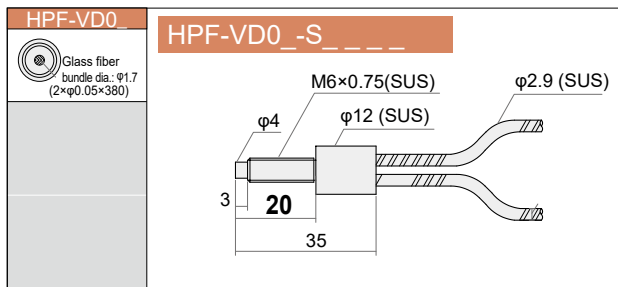
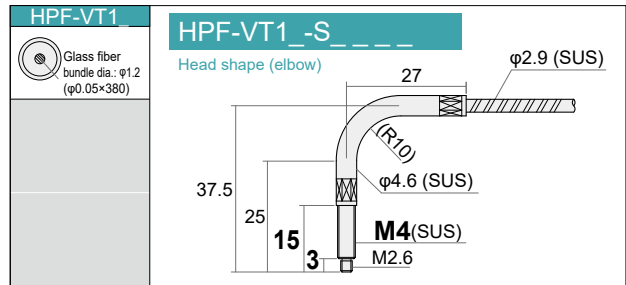
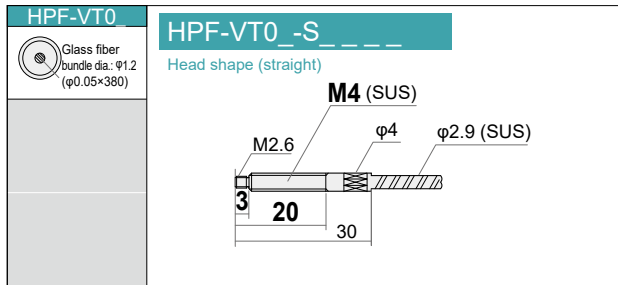


Options for vacuum fiber unit

Product name	Shape	Heatproof	Other specifications	Model No.
Optical coupler (two units)		200 °C	-	HPF-VJ03
Fiber unit for air (two units in a pair)		70 °C	Cable length: 2 m Bend radius: R20 Free cut	HPF-VA01
Long-distance lens unit (two units)		350 °C	Scanning distance: ×10	HPF-VL06
Side-view unit (two units)		350 °C	-	HPF-VL05

Outer dimensions

Unit: mm



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/ Selective reflection

Area

Heatproof

Chemical-proof

Vacuum-proof

Specialized Use

Lens unit

Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Specialized Use Contact-Type Liquid Level Fiber Units

All-resin structure ensures no metal contamination.



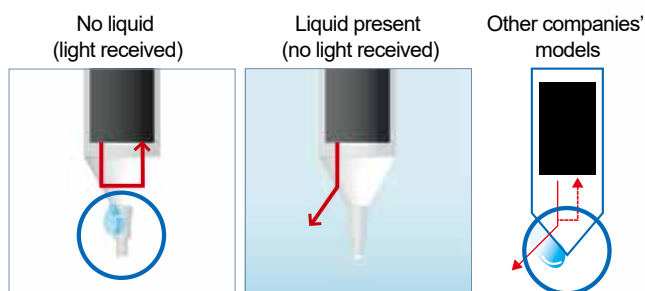
Problems due to liquid accumulation are reduced by Azbil corporation's innovative front end structure.

Product lineup includes a small-diameter model ($\phi 4$) for easier cable routing.

Principle of detection

Reliable detection is achieved by the proprietary structure of the fiber tip

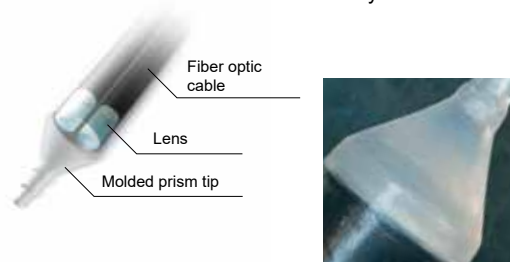
The proprietary structure provided at the tip of the fiber reduces malfunction due to liquid clinging. The lens built into the tip of the fiber ensures a large difference in light quantity between the conditions when liquid is present and absent.



The principle uses the difference in the reflective index due to the presence of liquid.

Tip and internal structure

The molded prism fiber tip readily sheds water drops.



Recommended compatible amplifier unit

Model HPX-EG

<Exterior view>



<Operation panel>

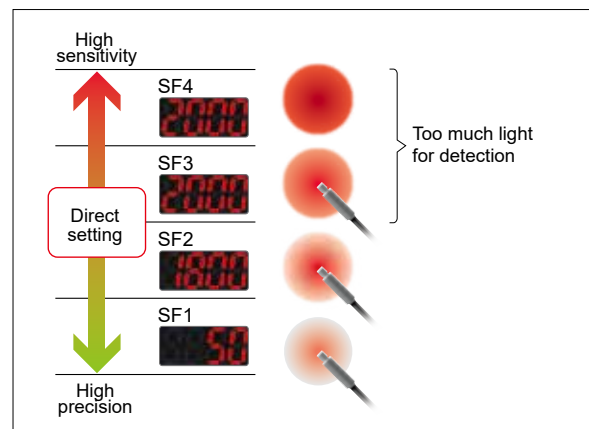


<Typical models>



Model No.	Output
HPX-EG00-1S	NPN
HPX-EG00-2S	PNP

Auto sensitivity switch function

This function automatically optimizes the sensitivity setting during auto tuning, affording easy operation while delivering the highest detection performance.

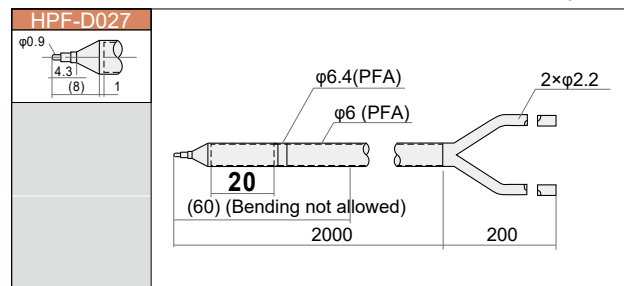
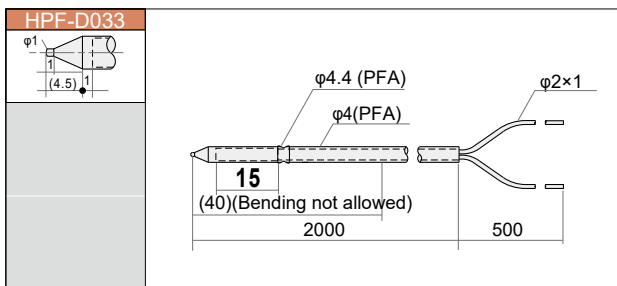


Diffuse scan

Type	Shape	Cable		Model No.
		Bend radius	Length	
φ4	 -30 to +105 °C	PFA area: R30 Cable area: R15	2m Free cut	HPF-D033
φ6	 -30 to +105 °C	PFA area: R40 Cable area: R25	2m Free cut	HPF-D027

Outer dimensions

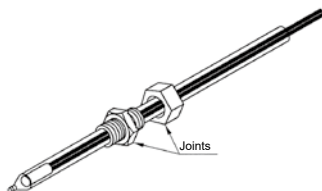
Unit: mm



Usage Notes (type-specific)

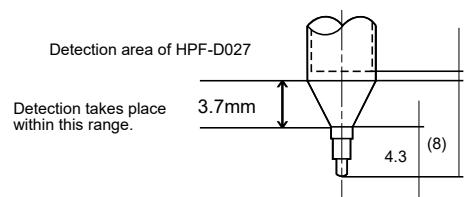
■ Contact-type liquid level detection

When installing the unit, use commercially available fluorine-resin joint that matches the outside diameter of the PFA tube.



- Operation may be unstable with the following conditions:
 - 1 Air bubbles adhering to the conical part of the sensing head
 - 2 Chemical precipitate on the conical part of the sensing head
 - 3 Liquids of high viscosity
- Some liquid properties, such as milky white color, may make the liquid undetectable.

- Be careful not to bump the fiber unit tip (especially the conical part). Operation may be unstable due to scratches or deformation of the sensing head.
- If chattering occurs due to liquid dripping or bubbles, use a timer.



Liquid level detection positions vary depending on the surface tension of the liquid and the wet condition of the fiber unit's detection area.

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective reflection

Area

Heatproof

Chemical-proof

Vacuum-proof

Specialized Use

Lens unit

Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

Specialized Use Pipe-Mounted Liquid Level Fiber Units

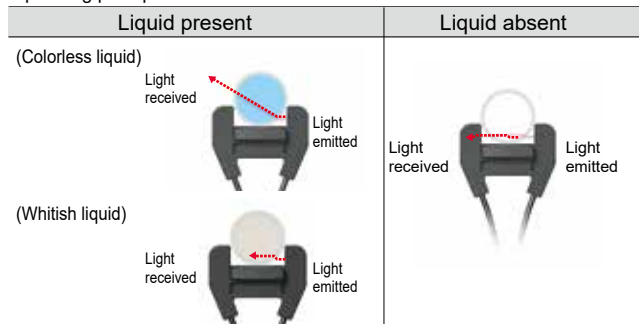
A 16-axis array of light beams greatly eliminates interference from water droplets and air bubbles.



- Product lineup includes differing detection methods for fail-safe detection.
- Can be used for pipe diameters of 3 to 19 mm.

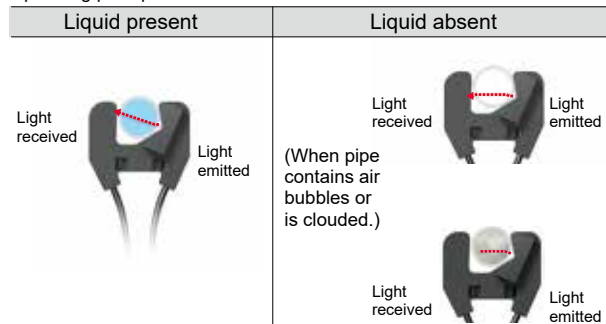
Principle of detection

Operating principle of Model **HPF-T034 and T034E**



Light reception is blocked when liquid is present, which prevents false detection due to a change in the liquid's color.

Operating principle of Model **HPF-T032 and T032E**



Clouding and bubbles reduce the level of received light, but thanks to the operating principle (light = liquid present) they do not increase the risk of false detection.

Product features

Array of 16 optical axes eliminates the effects of air bubbles and water droplets



Adverse effects from air bubbles and water droplets are reduced, resulting in reliable detection.

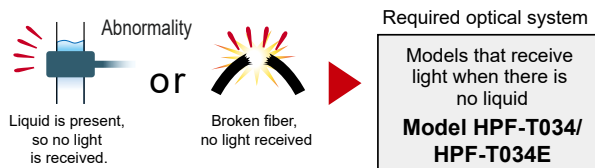
PFA-jacketed optical fiber



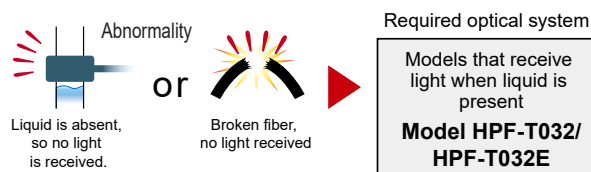
Fiber-optic cables protected by chemical-resistant resin can be run through machines and equipment safely (Model HPF-T032 and HPF-T034 only).

Fail-safe concept

Upper limit detection





Lower limit detection





Thru scan

(Attached to pipe)

Type	Compatible pipe dia.	Shape	Cable			Model No.
			Bend radius	Length	Coating material	
Liquid-absent received light	φ8 to φ19mm (3/4B)	 -30 to +70 °C	R4	5m Free cut	PFA	HPF-T034
				2m Free cut	Polyethylene	HPF-T034E
						HPF-T034E-L02
Liquid-present received light	φ3 to φ13mm	 -30 to +70 °C	R4	5m Free cut	PFA	HPF-T032
				2m Free cut	Polyethylene	HPF-T032E
						HPF-T032E-L02

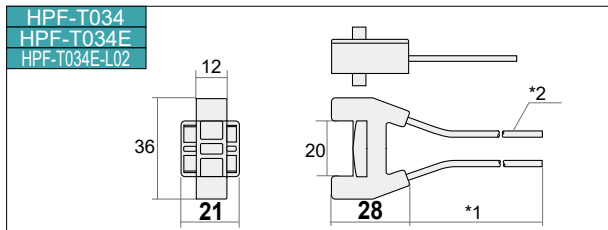
Use with PFA transparent pipe with wall thickness of 1 mm.

Depending on the pipe actually used, as well as the liquid thru scan and refractive ratios, fiber unit detection may not be reliable, so be sure to test the operation before use.

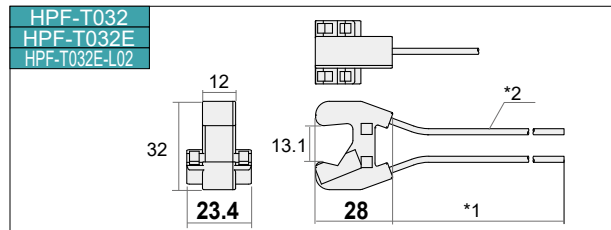
If the fiber unit is used with other than the recommended pipe, material, or wall thickness, please test before use or consult our sales staff.

Outer dimensions

Unit: mm



Model No.	Cable length*1	Cable dia.*2
HPF-T034	5000 mm min.	2×φ2.3
HPF-T034E	5000 mm min.	2×φ2.2
HPF-T034E-L02	2000 mm min.	2×φ2.2



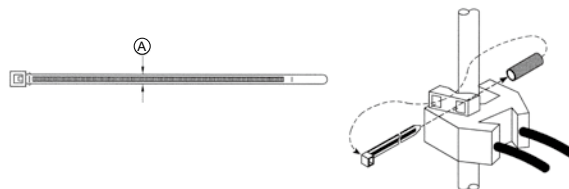
Model No.	Cable length*1	Cable dia.*2
HPF-T032	5000 mm min.	2×φ2.3
HPF-T032E	5000 mm min.	2×φ2.2
HPF-T032E-L02	2000 mm min.	2×φ2.2

Usage Notes (type-specific)

■ Pipe-mounted liquid level detection

Attach the unit using the supplied cable ties and non-slip tubes as shown here. Securely fasten both the upper and lower cable ties and cut off any excess. Where additional cable ties are required, use ones which are no more than 2.5 mm wide (dimension A in the figure).

* The supplied cable ties (with non-slip tubing) can also be purchased separately.
Model: SZ-A01 (5 sets)



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/Selective reflection

Area

Heatproof

Chemical-proof

Vacuum-proof

Specialized Use

Lens unit

Other accessories

Technical Guide

List of Scanning Distance by Amplifiers Model

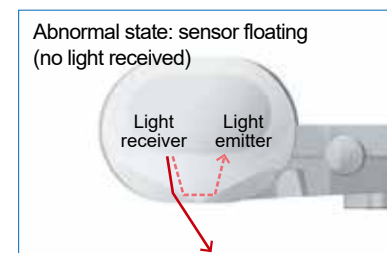
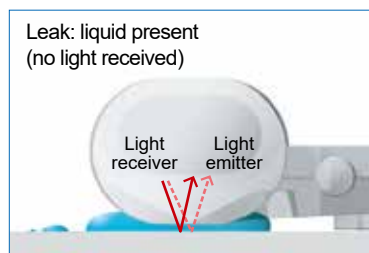
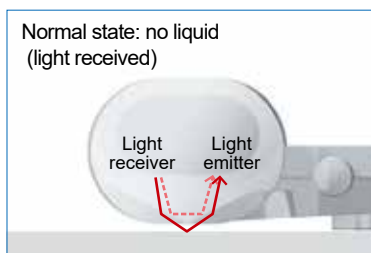
Specialized Use Liquid Leakage Fiber Units

PFA jacket affords outstanding ease of routing.



- Space-saving switch head height of only 9.9 mm
- Can be used in explosion-proof atmospheres because the cable is optical fiber.

Principle of detection




When there is a leak, no light reaches the receiver. This is the same result as when the fiber cable breaks or is disconnected, ensuring fail-safe operation. (When using the unit in a pan, remember to secure it with a stud.)



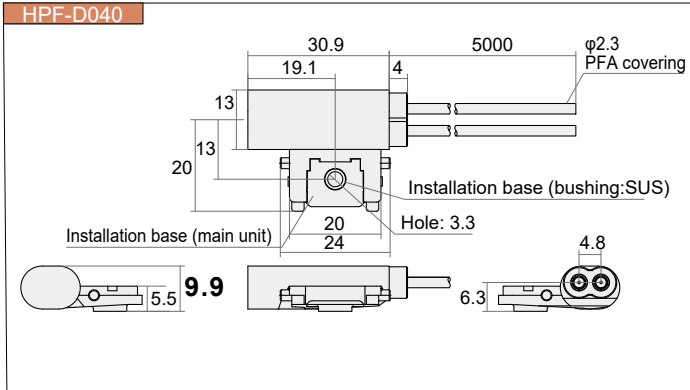
Screw
Cylindrical
Coaxial
Sleeve
Side view
Narrow view
Flat/ Selective reflection
Area
Heatproof
Chemical -proof
Vacuum -proof
Specialized Use
Lens unit
Other accessories

Diffuse scan

Shape (mm)	Cable		Model No.
	Bend radius	Length	
	R20	5m Free cut	HPF-D040

Outer dimensions

Unit: mm



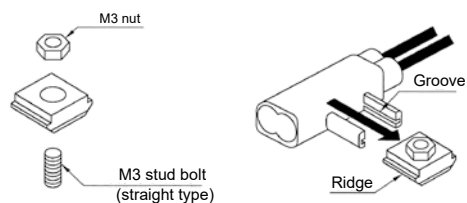
Usage Notes (type-specific)

■ Liquid leakage detection

When using an SUS mounting base, insert the welded M3 stud bolt into the base's mounting hole and fasten it with an M3 nut (not supplied). Then put the ridges of the mounting base into the grooves of the fiber unit, and slide the base forward until it is in place.

● Chemical resistance of PFA

See the Technical Guide (Page 44).



Technical Guide

List of Scanning Distance by Amplifiers Model

Lens unit Micro-Spot Lens

Lens unit achieving a micro-spot by combination with the coaxial type.
Lenses can be selected according to the target object size.



[Related pages]

Compatible fiber units

P15 (Coaxial)

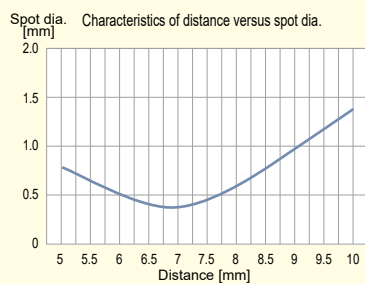
For diffuse scan type

Type	Shape	Minimum spot dia.	Focus distance	Combined fiber		Model No.
				Model No.	Spot dia.	
Micro-spot	Shape A 	Approx. 0.1 mm 	4.6 mm ± 0.2 mm	HPF-D034	Approx. 0.1mm	HPF-LU07
				HPF-D010	Approx. 0.2mm	
				HPF-D032	Approx. 0.2mm	
				HPF-D035	Approx. 0.2mm	
	Shape A 	Approx. 0.2 mm 	7.0 mm ± 0.5 mm	HPF-D034	Approx. 0.2mm	HPF-LU01
				HPF-D010	Approx. 0.4mm	
				HPF-D032	Approx. 0.4mm	
				HPF-D035	Approx. 0.4mm	
	Shape B 	Approx. 1.0 mm 	19 mm ± 1.0 mm	HPF-D034	Approx. 1.0mm	HPF-LU02
				HPF-D010	Approx. 2.0mm	
				HPF-D032	Approx. 2.0mm	
				HPF-D035	Approx. 2.0mm	
Shape C 	Approx. 1.0 mm 	33 mm ± 2.0 mm	HPF-D038	Approx. 1.0mm	HPF-LU08	

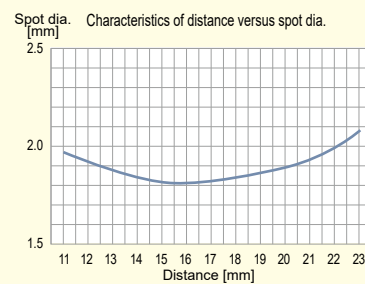
CHART

◇ Characteristics of distance versus spot dia. (typical example)

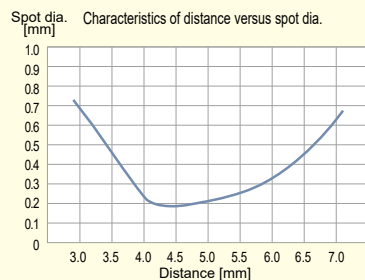
Model HPF-LU01



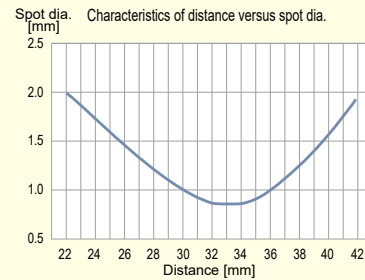
Model HPF-LU02



Model HPF-LU07



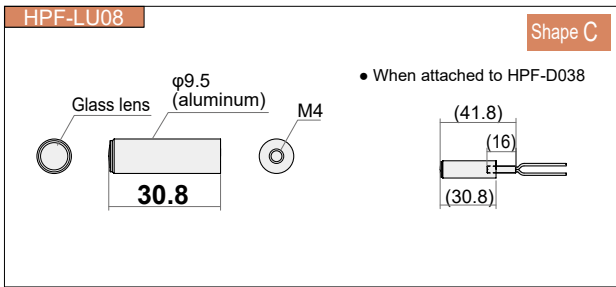
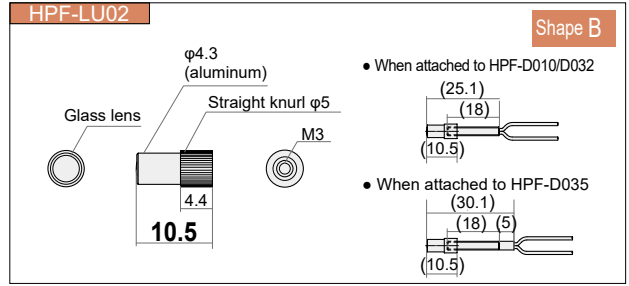
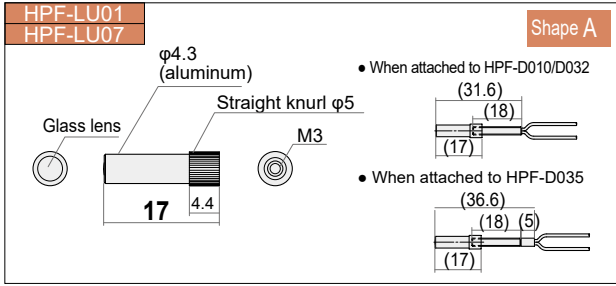
Model HPF-LU08



*Values are for the lens combined with an HPF-D035 fiber unit.
*Measured values are calculated at 13.5 % of the peak light level.
(Only HPF-LU07 is calculated at 50 %.)



Outer dimensions



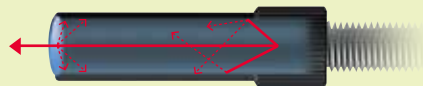
NOTEWORTHY

- Improving detection performance yields many positive results

Because of irregular reflection inside a lens, some light is returned even when no workpiece is present, but it is a small amount compared with the light reflected when there is a workpiece.

In HPF-LU sensors, the internal wall of the lens has a special feature that keeps this internal reflection to a minimum, so there is an increased amount of difference in light level when a workpiece is actually present.

Light actually used for detection



- Problems due to scratches on the lens are greatly reduced.

The micro-spot lens is made of hard glass, so problems caused by a drop in light level due to lens scratches made by collisions with workpieces can be greatly reduced.



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

Other
accessories

Technical
Guide

List of Scanning
Distance by
Amplifiers Model

Lens unit Long-Distance Lens / Side View Unit

Longer distances and alternate optical configurations are available by combination with thru-scan sensors.



[Related pages]

For combined fibers:





P9 (screw)

P13 (cylindrical)

P27 (heatproof)

P31 (vacuum proof)

For use with thru scan

Type	Shape	Scaling	Directional angle (half angle)	Fiber unit		Scanning distance (mm)	Model No.
				Model No.	Element type		
Long-distance lens	Shape A  (Two units) -40 to +200 °C	×6	3°	HPF-T003	Standard	2,040	FE-PA-L1
				HPF-T018	Heatproof	690	
				HPF-T024	Unbreakable	240	
	Shape B  (Two units) -40 to +350 °C	×10	3°	HPF-T003	Standard	3,400	HPF-VL06
				HPF-T018	Heatproof	1,150	
				HPF-T024	Unbreakable	410	
Side view	Shape C  (Two units) -40 to +200 °C	—	10°	HPF-T003	Standard	340	FE-PA-S1
				HPF-T018	Heatproof	115	
				HPF-T024	Unbreakable	41	
	Shape D  (Two units) -40 to +350 °C	—	8°	HPF-T003	Standard	340	HPF-VL05
				HPF-T018	Heatproof	115	
				HPF-T024	Unbreakable	41	

The scanning distances shown are nominal values. The actual scanning distances are limited by the fiber length (approx. 2 m × 2 ≐ 4 m in the case of standard type).

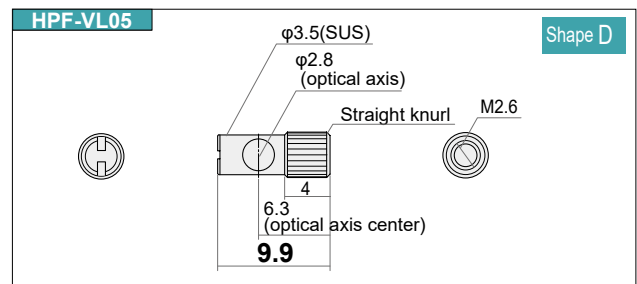
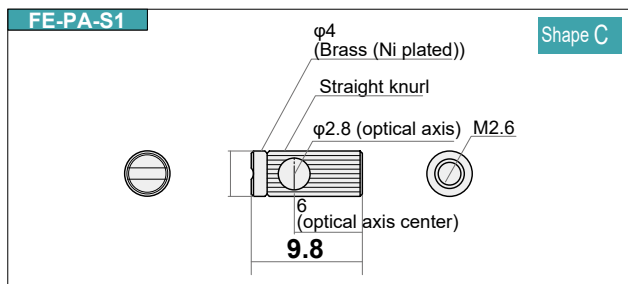
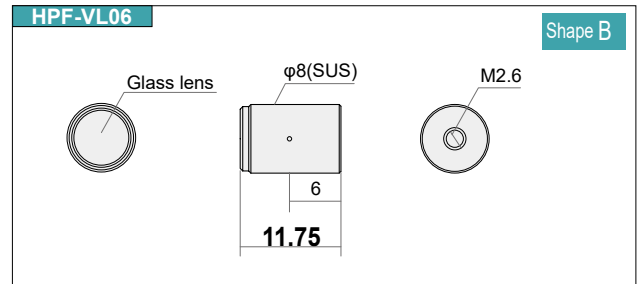
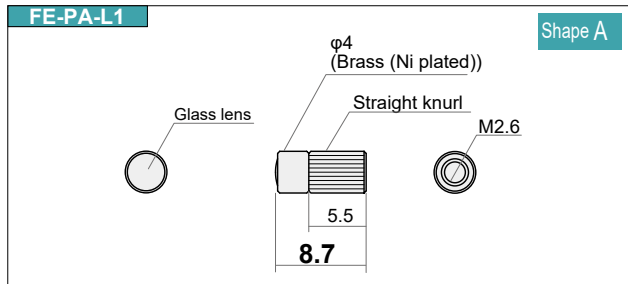
For HPX-AG, the scanning distance shown is for HP mode (response time: 5 ms).

For HPX-EG, the scanning distance shown is for nL mode (response time: 1 ms).

The directional angles shown are typical examples obtained when the lens is combined with an HPF-T003.





Outer dimensions

Unit: mm

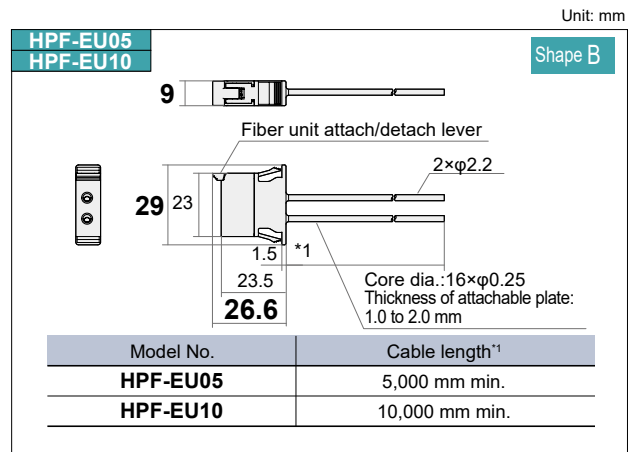
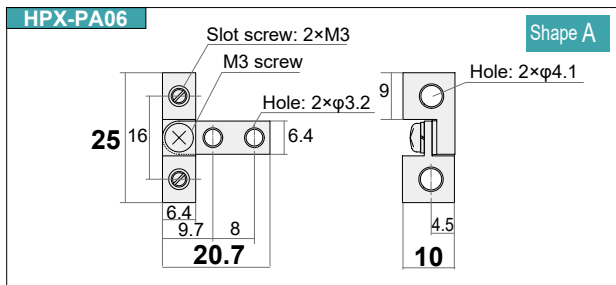


Other accessories

Use in combination with various fiber units.

Product name	Shape	Description	Other specifications	Model No.
Angle adjustment bracket		Use with a thru-scan fiber unit to limit reflection, or use as side view type brackets.	Used for M4 and M3 heads, $\phi 4$ and $\phi 3$	HPX-PA06
Fiber-optic extender		Use to extend fibers by linking them. For scanning range see p. 48.	Cable length: 5 m. Bend: 4 mm in radius Free cut	HPF-EU05
			Cable length: 10 m. Bend: 4 mm in radius Free cut	HPF-EU10
Small-diameter attachment (Two units)		Use in combination with small-dia. fiber units. *Supplied with applicable fibers.	For fibers with dia. of $\phi 1.0$	HPF-AT10
			For fibers with dia. of $\phi 1.3$	HPF-AT13
Fiber cutter		Use to cut fibers. *Supplied with applicable fibers.	Used for freehand cuttable fibers	FE-PA-F1

Outer dimensions



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

Lens unit

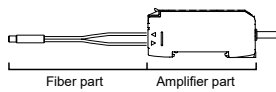
Other
accessories

Technical
Guide

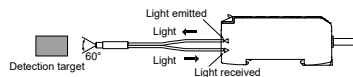
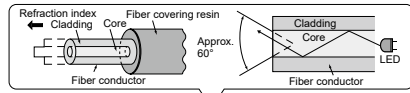
List of Scanning
Distance by
Amplifiers Model

Detection Method

Optical fiber sensor



A fiber is composed of a central core and circumferential cladding where the refraction index is low. Light travels inside the core, with repeated total reflection along the boundaries between the core and the cladding. Light emerging from the fiber is emitted and spreads out at an angle of approximately 60°.



- The optical fiber does not have any electrical properties and so is excellent in an environment where reduced electrical noise is required.
- Different fiber variations allow for various applications.

Optical Fiber Types and Characteristics

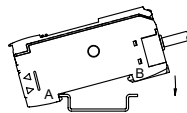
	Stationary bend type (multi-core)	Standard type (single core)	Bend-tolerant type (bundle)
Cross-section			
Structure			
Features	<ul style="list-style-type: none"> • Bending causes a small variation in the light level. • Allowable bend radius: 1 or 2 mm 	<ul style="list-style-type: none"> • Good light transmission efficiency (relatively long scanning distance) • Allowable bend radius: 10 or 20 mm 	<ul style="list-style-type: none"> • Good bend tolerance Bend repetition of one million times or more (typical) • Allowable bend radius: 4 mm
Useful applications	Comparison with the previous standard type: <ul style="list-style-type: none"> • Soft and capable of cabling like electric wires • No worries about bend radius • Touching the fiber does not affect the light level. 	Used frequently for general purposes. Low price.	Resistant to break even when used in a moving environment
Typical model number	Thru scan: HPF-T025 Diffuse scan: HPF-D030	Thru scan: HPF-T003 Diffuse scan: HPF-D002	Thru scan: HPF-T008 Diffuse scan: HPF-D037

Usage Notes (general)

How to attach the amplifier unit

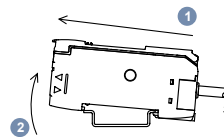
Attach the amplifier unit to the dedicated bracket (HPX-PA04, supplied or sold separately) or to the DIN rail.

- 1 Insert one rail of the bracket or DIN rail into the slot at point A.
- 2 Push the unit downwards until the second rail clicks into place at point B. When attaching the amplifier to a DIN rail, be sure to secure both ends with the end plate (HPX-PA03, sold separately).



How to remove the amplifier unit

Push the amplifier forward firmly (1) so that the front lock releases. Lift the unit as shown in the figure (2) to remove the unit.

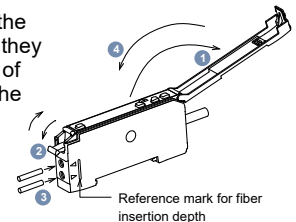


Expansion unit attachment to the main unit for reduced-wiring models (HPX-EG)

- 1 Remove the stickers affixed to the connectors of the units to be attached.
- 2 Mount the expansion units side by side on the DIN rail.
- 3 Slide the expansion units together so that the connectors connect.
- 4 Use end plates (HPX-PA03, sold separately) to hold the expansion units in place. To remove expansion units, slide off one by one.

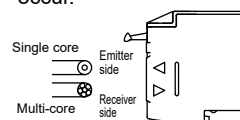
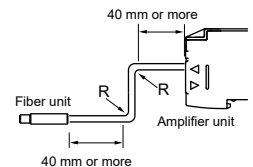
Attaching the fiber unit to an amplifier

- 1 Open the cover.
- 2 Tilt the fiber clamp lever forwards to the release position.
- 3 Firmly insert the fiber tips into the holes in the amplifier as far as they will go. For the insertion depth of the fiber, refer to the mark on the side of the unit.
- 4 Close the cover.



Caution

- if the fiber is thin, first insert it into the thin fiber adapter so that the fiber projects approximately 0.5 to 1 mm from the top of the adapter. Then insert the adapter into the hole in the amplifier as far as it will go, and then fix it firmly.
- Because a cable break tends to easily occur around the fiber unit's sensing head and junction with the amplifier unit, do not bend the cable within 40 mm (10 mm for a thin fiber unit). In other cabling areas, use the fiber cable at the allowed bending radius or more specified for each product. If the cable is bent beyond the allowed bend radius, the rated scanning distance may be unavailable or a cable break may occur.



When attaching a coaxial diffuse scan fiber unit to a main unit, attach the single-core fiber cable to the insertion hole's emitter side, and attach the multi-core fiber cable to the receiver side.

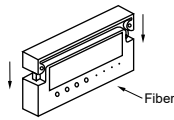
Scanning distances and display readouts may differ depending on variations in individual unit characteristics, installation states and fiber unit types.

■ Cutting of fibers

To cut a fiber, use the dedicated cutter (supplied with the fiber unit). Note that cold-proof and heatproof fibers cannot be cut.

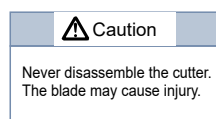
- 1 Insert the fiber into the cutter hole and set the fiber to the specified length.
- 2 Press the blade straight down in a strong smooth motion.
- 3 Cut one fiber cable at a time and do not reuse the blade on another optical fiber.

- When the detecting surface of the fiber unit gets dirty, gently wipe it with a soft clean cloth. Do not use organic solvents such as benzine or thinner.



- The scanning distance may be reduced approximately 20% depending on how the fiber is inserted into the amplifier unit and how the fiber is cut.

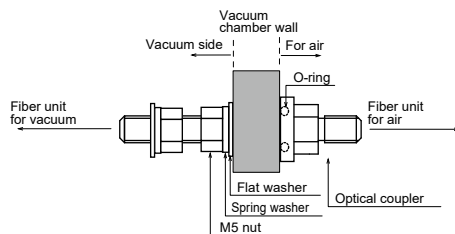
- For specifications, usage notes and other information for the fiber unit, see the product specifications.



Use Cautions (type specific)

■ Vacuum fiber

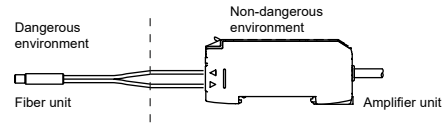
- Vacuum fiber HPF-V series
The flange, fibers for vacuum and the lens unit are cleaned with IPA, but baking treatment etc. should be carried out before use.
- Cautions for attaching the optical coupler
The optical coupler uses an O-ring as shown below. Do not weld it to the vacuum chamber wall, as this may cloud the inside glass rod.



Attachable plate thickness: 8 to 10 mm
Recommended mounting hole: 5 dia. ± 0.1 mm
Recommended surface roughness for O-ring's contact area: 1.6 Ry

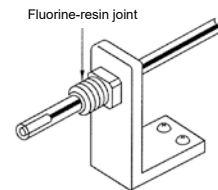
■ Use under explosion-proof atmospheres

Generally, the fiber unit is structured only to transmit light and so cannot cause electrical explosions or ignite fires. Therefore, the fiber and amplifier units can be used with the fiber unit placed in a dangerous place, and the amplifier unit in a non-dangerous place. Nevertheless, check the explosion-proof regulations required for the equipment used before using the sensor.



■ Chemical proof

- When installing the unit, use commercially-available fluorine-resin joint that matches the outside diameter of the PFA tube.
- The bend radius of the protective tube must be greater than the bend radius specified for each fiber unit. If the bend radius is below the specified value, the fiber unit may break.
- Do not apply excessive tension to the fiber-optic cable.



Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/ Selective reflection

Area

Heatproof

Chemical proof

Vacuum proof

Specialized Use

Lens unit

Other accessories

PFA Chemical Proof

Substance	PFA chemical proof
Heavy oils A/B/C	OK
Aniline	C ₆ H ₅ NH ₂ OK
Acrylonitrile	C ₂ H ₃ CN OK
Asphalt	OK
Acetone	(CH ₃) ₂ CO OK
Methanol	CH ₃ OH OK
Ammonia	NH ₃ OK
Isooctane	i-C ₈ H ₁₈ OK
Isobutyl alcohol	i-C ₄ H ₉ OH OK
Isobutyl methyl ketone	C ₄ H ₉ COCH ₃ OK
Ethanol	C ₂ H ₅ OH OK
Ether	(CH ₃) ₂ O OK
Ethylene glycol	C ₂ H ₄ (OH) ₂ OK
Enamel paint	OK
Ammonium chloride	NH ₄ Cl OK
Calcium chloride	CaCl ₂ OK
Sodium chloride	NaCl OK
Barium chloride	BaCl ₂ OK
Chlorine	Cl ₂ OK
Gasoline	OK
Glass ingredients	OK
Dilute hydrochloric acid	HCl OK
Dilute sodium hydroxide	NaOH OK
Dilute acetic acid	CH ₃ COOH OK
Dilute nitric acid	HNO ₃ OK
Dilute sulfuric acid	H ₂ SO ₄ OK
Citric acid	C ₃ H ₄ (OH)(COOH) ₃ OK
Glycerin	C ₃ H ₅ (OH) ₃ OK
Cresol	C ₆ H ₄ (OH)(CH ₃) OK
Chloroform	CH ₃ Cl OK

Substance	PFA chemical proof
Light oil	OK
Paraffinum liquidum	OK
Sodium dichromate	Na ₂ Cr ₂ O ₇ OK
Barium nitrate	Ba(NO ₃) ₂ OK
Silicone oil	OK
Plant oil	OK
Thinner	OK
Barium hydroxide	Ba(OH) ₂ OK
Phenol	C ₆ H ₅ OH OK
Turbine oil	OK
Sodium carbonate	Na ₂ CO ₃ OK
Turpentine	OK
Natural volatile oil	OK
Kerosine petroleum	OK
Trichloroethane	C ₂ H ₃ Cl ₃ OK
Trichlorethylene	C ₂ HCl ₃ OK
Toluene	C ₆ H ₅ CH ₃ OK
Naphtha	C ₇ H ₁₆ OK
Acidum lacticum	OK
Nitrobenzene	C ₆ H ₅ NO ₂ OK
Hydrofluoric acid (hydrogen fluoride)	HF *
Ferrosilicon	OK
Freon 11	CCl ₃ F OK
Propyl alcohol	C ₃ H ₅ (OH) ₃ OK
Propylene glycol	C ₃ H ₂ (OH) ₂ OK
Benzene	C ₆ H ₆ OK
Methyl violet	OK
Water	H ₂ O OK
Carbon tetrachloride	CCl ₄ OK
Ammonium sulfate	(NH ₄) ₂ SO ₄ OK

*For information on hydrofluoric acid, contact our sales staff.

Additional Notes

- The above table is not a guarantee that the product can be used with the indicated substance.
- Substances such as strong acids and ammonia may penetrate PFA (fluororesin).

Fiber Length vs. Scanning Distance Characteristics

Note that extending fiber length reduces scanning distance.

◇ Standard fiber element

Element type		Distance change ratio for each element length						
Core dia.	Bend radius	2 m	5 m	10 m	15 m	20 m	25 m	30 m
0.25	R4	100%	62%	28%	12%	Unavailable	Unavailable	Unavailable
	R1	100%	66%	33%	17%	Unavailable	Unavailable	Unavailable
0.5	R15	100%	85%	64%	49%	37%	28%	21%
	R15	100%	85%	64%	49%	37%	28%	21%
1	R2	100%	76%	48%	30%	19%	12%	Unavailable
	R5	100%	50%	16%	Unavailable	Unavailable	Unavailable	Unavailable
	R20	100%	85%	64%	49%	37%	28%	21%





◇ Heatproof fiber element

Element type	Distance change ratio for each element length							
Heatproof	1 m	2 m	5 m	10 m	15 m	20 m	25 m	30 m
105 °C	–	100%	57%	22%	Unavailable	Unavailable	Unavailable	Unavailable
150 °C	–	100%	50%	16%	Unavailable	Unavailable	Unavailable	Unavailable
200 °C	100%	93%	76%	54%	38%	27%	19%	13%
350 °C	–	100%	81%	58%	41%	29%	20%	14%



Characteristics of Scanning Distance by Combination with Fiber Extender (typical values)



Thru scan

Type	Model No.	Scanning distance and cable length when combined with fiber extender: HPX-EG (nL mode: 1 ms in response time)*1		
		No extender	HPF-EU05(5 m)	HPF-EU10(10 m)
 Standard fiber	HPF-T003 Related pages P9	410 mm	200 mm	150 mm
		Cable length: 2 m	Cable length: 7 m	Cable length: 12 m
		100%	49%	37%
 Heatproof	HPF-T018 Related pages P27	140 mm	50 mm	40 mm
		Cable length: 1 m	Cable length: 6 m	Cable length: 11 m
		100%	42%	32%
 Area	HPF-T021T Related pages P25	1200 mm	500 mm	380 mm
		Cable length: 2 m	Cable length: 7 m	Cable length: 12 m
		100%	42%	32%
 Unbreakable fiber	HPF-T024 Related pages P9	50 mm	13 mm	10 mm
		Cable length: 2 m	Cable length: 7 m	Cable length: 12 m
		100%	27%	20%

Diffuse scan

Type	Model No.	Scanning distance and cable length when combined with fiber extender: HPX-EG (nL mode: 1 ms in response time)*1		
		No extender	HPF-EU05(5 m)	HPF-EU10(10 m)
 Standard fiber	HPF-D002 Related pages P11	150 mm	60mm	45 mm
		Cable length: 2 m	Cable length: 7 m	Cable length: 12 m
		100%	43%	32%
 Unbreakable fiber	HPF-D029 Related pages P27	10 mm	3 mm	2 mm
		Cable length: 2m	Cable length: 7m	Cable length: 12 m
		100%	33%	25%

*1 For combinations other than with HPX-EG, please contact us.

*2 Even where availability is indicated, detection may not be possible depending on the liquid. Please check operation before use.

Screw

Cylindrical

Coaxial

Sleeve

Side view

Narrow view

Flat/
Selective
reflection

Area

Heatproof

Chemical
-proof

Vacuum
-proof

Specialized
Use

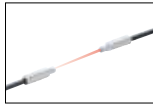
Lens unit

Other
accessories

Technical Guide

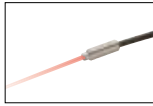
List of scanning Distance by Amplifiers Model

Thru scan



Model No.	Scanning distance (mm)			Page
	HPX-EG			
	nL	SF	FT	
HPF-T001	770	650	450	P9
HPF-T002	770	650	450	P13
HPF-T003	410	350	240	P9
HPF-T004	410	350	240	P13
HPF-T005	410	350	240	P17
HPF-T006	410	350	240	P17
HPF-T007	55	48	33	P19
HPF-T008	60	50	38	P9
HPF-T009	60	50	38	P13
HPF-T010	300	250	170	P9
HPF-T012	240	200	140	P27
HPF-T014	220	190	130	P27
HPF-T015	12	10	7	P17
HPF-T017	410	350	240	P27
HPF-T018	140	120	80	P27
HPF-T019	1,400	1,200	840	P21
HPF-T020	1,500	1,300	920	P21
HPF-T021	270	220	160	P25
HPF-T021S	1,100	960	670	P25
HPF-T021T	1,200	1,000	710	P25
HPF-T021WT	2,000	1,600	1,100	P25
HPF-T023	1,200	1,000	730	P21
HPF-T024	50	42	29	P9
HPF-T025	310	260	180	P9
HPF-T025B	310	260	180	P9
HPF-T026	20	16	11	P19
HPF-T028	50	42	29	P23
HPF-T029	1,500	1,200	880	P29
HPF-T029E	280	230	160	P29
HPF-T031	310	260	180	P13
HPF-T032	-	-	-	P35
HPF-T032E	-	-	-	P35
HPF-T033	280	240	160	P9
HPF-T034	-	-	-	P35
HPF-T034E	-	-	-	P35
HPF-T035	350	300	210	P29
HPF-T036	6	5	3	P13
HPF-T037	20	16	11	P19
HPF-T038	12	10	7	P13
HPF-T039	5	4	3	P17
HPF-T042	220	190	130	P19
HPF-T043	100	80	55	P13
HPF-T044	220	190	130	P9
HPF-T046	60	50	38	P13
HPF-T054-L05	6	6	6	P17

Diffuse scan



Model No.	Scanning distance (mm)			Page
	HPX-EG			
	nL	SF	FT	
HPF-D001	210	180	120	P11
HPF-D002	150	130	90	P11
HPF-D003	150	130	90	P17
HPF-D004	43	36	25	P11
HPF-D005	43	36	25	P13
HPF-D006	43	36	25	P17
HPF-D009	150	130	90	P15
HPF-D010	35	30	21	P15
HPF-D011	17	14	10	P19
HPF-D012	100	80	55	P11
HPF-D013	100	80	55	P27
HPF-D014	70	60	42	P29
HPF-D015	85	70	50	P27
HPF-D018	75	65	46	P11
HPF-D019	4	3	2	P17
HPF-D021	35	30	21	P17
HPF-D022	150	130	90	P27
HPF-D025	20	20	16	P21
HPF-D026	100	90	60	P25
HPF-D027	-	-	-	P33
HPF-D028	-	-	-	P24
HPF-D028F	5.2±1.0	-	-	P24
HPF-D028T	7.4±1.2	-	-	P24
HPF-D029	10	8	5	P11
HPF-D030	85	70	50	P11
HPF-D032	18	15	10	P15
HPF-D032B	18	15	10	P15
HPF-D033	-	-	-	P33
HPF-D034	25	21	15	P15
HPF-D035	50	42	29	P15
HPF-D036	8	7	5	P13
HPF-D037	8	7	5	P11
HPF-D038	50	42	29	P15
HPF-D039	4	3	2	P17
HPF-D040	-	-	-	P37
HPF-D041	17	14	10	P19
HPF-D042	35	30	21	P15
HPF-D043	65	55	40	P19
HPF-D045LF	37	31	21	P23
HPF-D049	60	55	38	P15

- Screw
- Cylindrical
- Coaxial
- Sleeve
- Side view
- Narrow view
- Flat/ Selective reflection
- Area
- Heatproof
- Chemical -proof
- Vacuum -proof
- Specialized Use
- Lens unit
- Other accessories

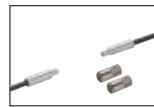
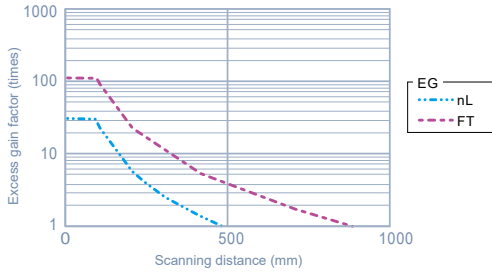
Characteristics diagrams (typical examples)

Excess gain



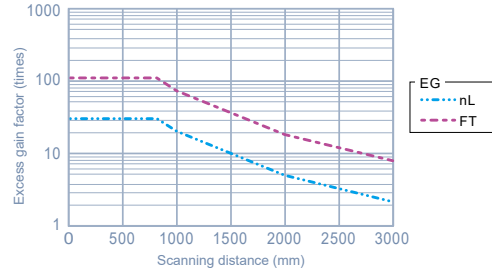
HPF-T003

Related pages [P9](#)



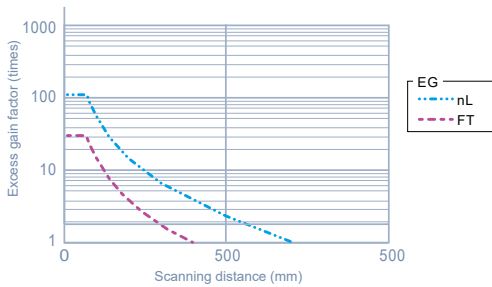
HPF-T003/ FE-PA-L1

Related pages [P9](#) [P41](#)



HPF-D002

Related pages [P11](#)

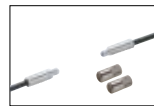
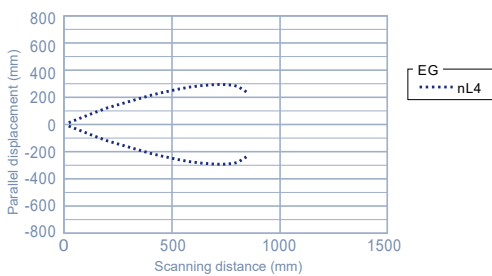


Parallel displacement



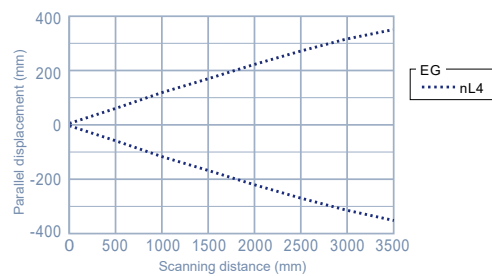
HPF-T003

Related pages [P9](#)



HPF-T003/ FE-PA-L1

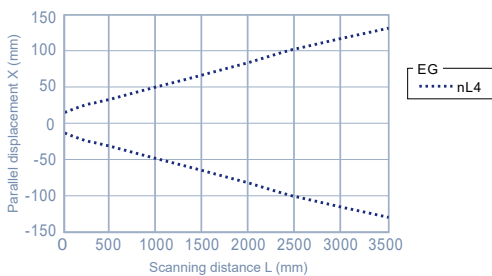
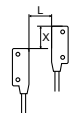
Related pages [P9](#) [P41](#)



HPF-T021T

(Right and left detection)

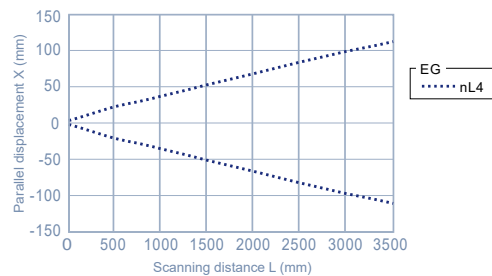
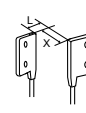
Related pages [P25](#)



HPF-T021T

(Up and down detection)

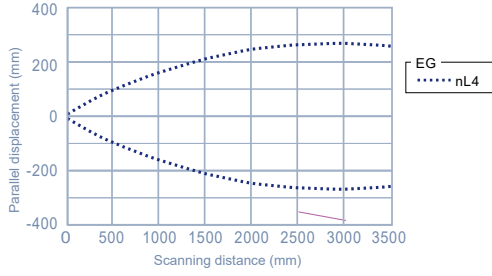
Related pages [P25](#)





HPF-T029

Related pages **P29**

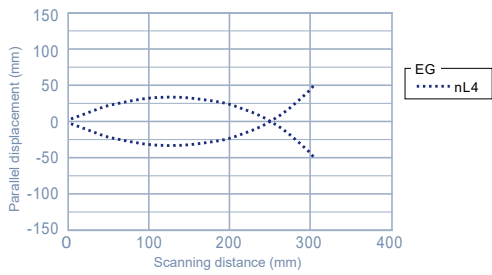


Detection area characteristics



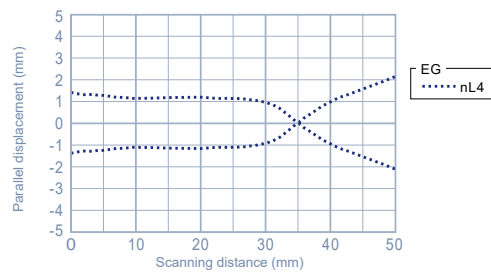
HPF-D002

Related pages **P11**



HPF-D025

Related pages **P21**



- Screw
- Cylindrical
- Coaxial
- Sleeve
- Side view
- Narrow view
- Flat/ Selective reflection
- Area
- Heatproof
- Chemical -proof
- Vacuum -proof
- Specialized Use
- Lens unit
- Other accessories

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