azbil

Fiber Unit Selection Guide

Model HPF-_ _ _ _

Extensive Product Lineup

Suitable for a Wide Variety of Applications

Please read “Terms and Conditions” from the following URL before ordering and use.

https://www.azbil.com/products/factory/order.html

Azbil Corporation
Advanced Automation Company

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: https://www.azbil.com

1st Edition : Jul. 2010-JBA
8th Edition : Apr. 2019-AZ

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Search by Type or Application

Select by Shape or Optical Type

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

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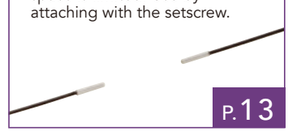
Cylindrical
Suitable for installation where space is limited. Use by attaching with the setscrew.

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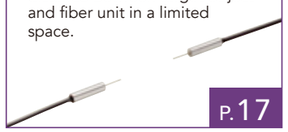
Coaxial
Used for target object positioning or in combination with spot lenses.

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

Heat-proof
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.

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Select by Application

Liquid Level Detection

P.33

Liquid Level Detection

P.35

Liquid Leak Detection

P.37

Accessories

Lens Unit Accessory

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Long-distance Lens / Side View Unit

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Other Accessories

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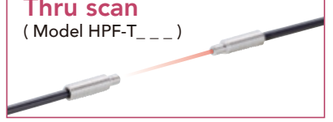
Search by Model Number

Thru scan
(Model HPF-T_ _ _)



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Diffuse scan
(Model HPF-D_ _ _)

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Introducing: Combination Amplifiers

Standard

Model HPX-EG00/01

<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>

CE UL LISTED

Long-distance

Model HPX-EG50/51

<Exterior view>

<Operation panel>

Typical models

Type	Model No.
Standard	HPX-EG50-1S
Remote-tuning	HPX-EG51-1S

- Long-distance detection
- Double digital display
- Built for usability

  (Sensitivity auto-change function, threshold value tracking function)

<Standards compliance>

CE

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 (below on page 43).

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

■ Change the sleeve length

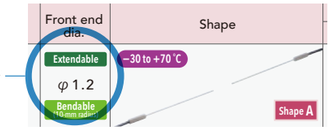
Various on-site services are available, such as emergency sensor additions and changes, and sample production evaluation.

Applicable models

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

<Sample catalog entry>

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

<Sample catalog entry>

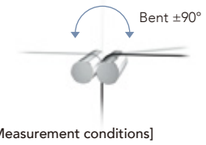
Cable			
Bend radius	Length	Amp	
1 mm	2 m	HPX-EG00/	
Unbreakable	Cuttable	HPX-EG50/	

Indicates element type.

■ Bend-tolerant fiber unit 4 mm

For use in moving environments

Cyclic bending test (reference)



[Measurement conditions]
Roller diameter: 8 mm (4 mm in radius)
Load: 500 g
For example, Model HPF-T008 and -T009 withstand 1,000,000 bends under these conditions without breaking.

■ Unbreakable fiber unit (stationary bend type) 1 mm / 2 mm

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.

Conventional fiber core structure

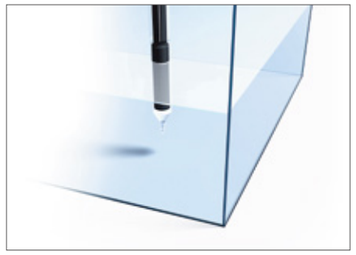
Unbreakable fiber core structure

Application Case Studies

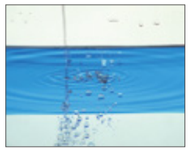
CASE 01 Liquid level detection

Liquid Level Detection: P.33

[Type] Specialized Use (Thru scan)
[Catalog listing] HPF-D027, HPF-D033



■ Target object



Water

Reference data Received light level display value

Combination amplifiers: Model HPX-EG00/01 (Sensing model: nL3)

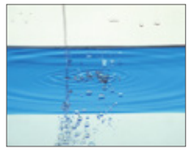
Catalog listing	Presence of liquid	Absence of liquid
HPF-D027	19.00	1.20
HPF-D033	6.60	4.95

CASE 02 Liquid level detection

Liquid Level Detection: P.35

[Type] Specialized Use (Thru scan)
[Catalog listing] HPF-T032_, HPF-T034_

■ Target object



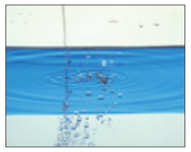
Water

CASE 03 Liquid leak detection

Liquid Leak Detection: P.37

[Type] Specialized Use (Diffuse scan)
[Catalog listing] HPF-D040

■ Target object



Water

Reference data Received light level display value

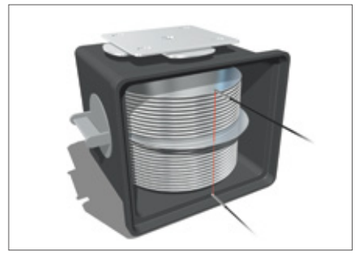
Combination amplifiers: Model HPX-EG00/01 (Sensing model: nL3)

Catalog listing	Presence of liquid	Absence of liquid	Sensor floating
HPF-D040	2.050	0.450	0.450

CASE 04 Wafer projection detection

Narrow View: P.21

[Type] Narrow View (Thru scan)
[Catalog listing] HPF-T020



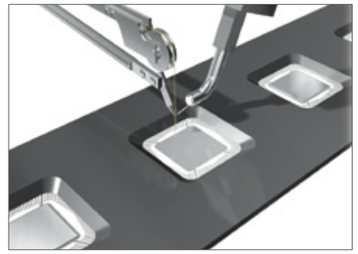
■ Target object

Silicon wafer (300 mm)

CASE 05 Gold wire detection

Coaxial: P.15

[Type] Coaxial (Diffuse scan)
[Catalog listing] HPF-D009



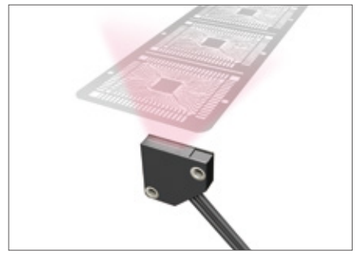
■ Target object

Gold wire (φ17 μm)

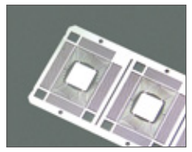
CASE 06 Lead frame detection

Area: P.25

[Type] Area (Diffuse scan)
[Catalog listing] HPF-D026



■ Target object



Lead frame size
35 mm×150 mm

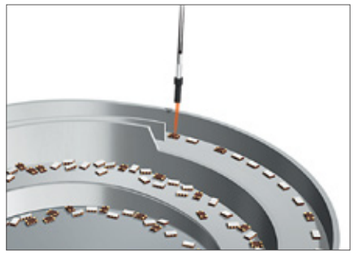
Note: The possibility of detection, as well as the measurement performance and degree of accuracy, are affected by the actual working conditions. Before using the fiber unit, carry out a careful operation check.

Application Case Studies

CASE 07 Chip face/back discrimination

Coaxial: P.15
Micro-Spot Lens: P.39

[Type] Coaxial (Diffuse scan)/ Micro-Spot Lens
[Catalog listing] HPF-D034、HPF-LU07



■ Target object

(Front)

(Back) Target size 1 mm × 0.5 mm

Reference data Received light level display value

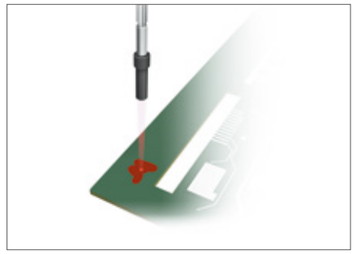
Combination amplifiers: Model HPX-EG50/51 (Sensing model: SF4)

Scanning distance	Front of component	Rear of component
-2 mm	2881	2101
-1 mm	5701	3901
Focal Distance	17501	12401
+1 mm	9201	6901
+2 mm	4301	2301

CASE 08 Substrate "Bad" mark detection

Coaxial: P.15
Micro-Spot Lens: P.39

[Type] Coaxial (Diffuse scan) / Micro-Spot Lens
[Catalog listing] HPF-D038, HPF-LU08



■ Target object

Gold pattern
Approx. 1 mm dia.

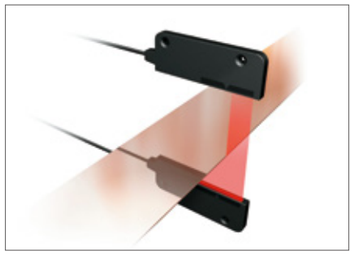
Reject mark

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

CASE 09 Detection of meandering

Area: P.25

[Type] Area (Thru scan)
[Catalog listing] HPF-T021T_



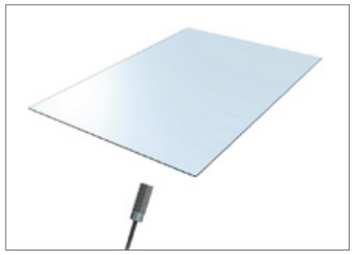
■ Target object

Opaque Sheet

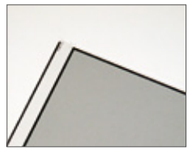
CASE 10 Glass detection

Screw: P.11

[Type] General-purpose screw (Diffuse scan)
[Catalog listing] Fiber: HPF-D002



■ Target object

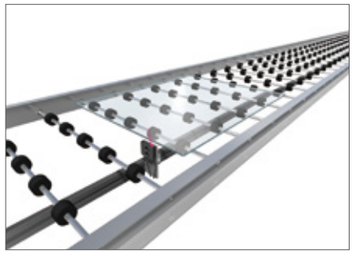


Black mask

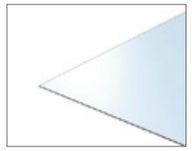
CASE 11 Glass detection

Selective Reflection: P.24

[Type] Selective reflection (Diffuse scan)
[Catalog listing] Fiber: HPF-D028T



■ Target object



Glass substrate

Note: The possibility of detection, as well as the measurement performance and degree of accuracy, are affected by the actual working conditions. Before using the fiber unit, carry out a careful operation check.

Screw < Thru scan >

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

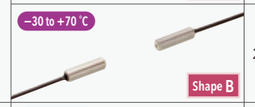
■ Straight type

■ Elbow type

■ Bolt type

Related pages
For compatible lenses, see P.41
For diffuse scan type, see page 11.

Thru scan

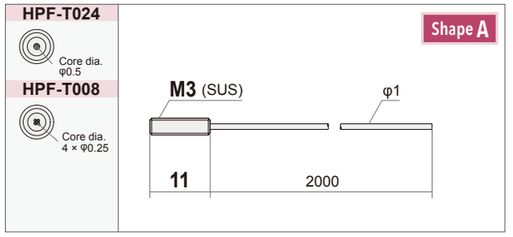
Type	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Straight	M3	−30 to +70 °C  Shape A	1 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	50	φ0.5	φ0.005	HPF-T024
						SF	42			
						Ft	29			
					HPX-EG50/51	HP	110			
						nL	95			
						Ft	41			
			4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	60	4×φ0.25	φ0.01	HPF-T008
						SF	50			
						Ft	38			
					HPX-EG50/51	HP	140			
						nL	120			
						Ft	50			
		−30 to +70 °C  Shape B	20 mm	2 m Cuttable	HPX-EG00/01	nL	220	φ0.75	φ0.005	HPF-T044
						SF	190			
						Ft	130			
					HPX-EG50/51	HP	520			
						nL	450			
						Ft	190			
	M4	Lens attachable −30 to +70 °C  Shape C	2 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	310	φ1.0	φ0.005	HPF-T025
						SF	260			
						Ft	180			
					HPX-EG50/51	HP	700			
						nL	600			
						Ft	260			
			20 mm	2 m Cuttable	HPX-EG00/01	nL	410	φ1.0	φ0.005	HPF-T003
						SF	350			
						Ft	240			
					HPX-EG50/51	HP	≫940			
						nL	800			
						Ft	350			
		−30 to +70 °C  Shape C	20 mm	2 m Cuttable	HPX-EG00/01	nL	770	φ1.4	φ0.01	HPF-T001
						SF	650			
						Ft	450			
					HPX-EG50/51	HP	≫1700			
						nL	≫1400			
						Ft	630			
		Lens attachable −30 to +70 °C  Shape D	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	280	16×φ0.25	φ0.01	HPF-T033
						SF	240			
						Ft	160			
					HPX-EG50/51	HP	700			
						nL	600			
						Ft	260			
Bolt	M4	Lens attachable −30 to +70 °C  Shape E	2 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	310	φ1.0	φ0.005	HPF-T025B
						SF	260			
						Ft	180			
					HPX-EG50/51	HP	700			
						nL	600			
						Ft	260			
Elbow	M4	Lens attachable −30 to +70 °C  Shape F	20 mm	2 m Cuttable	HPX-EG00/01	nL	300	φ1.0	φ0.005	HPF-T010
						SF	250			
						Ft	170			
					HPX-EG50/51	HP	660			
						nL	570			
						Ft	240			

Note:
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

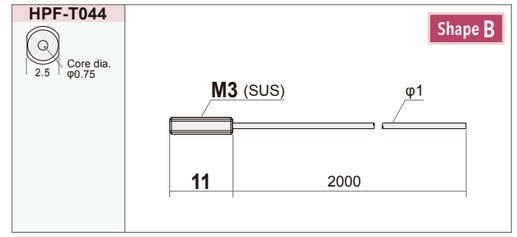
Outer dimensions (differs according to the model)

Unit: mm

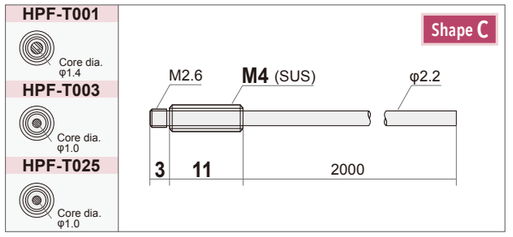
HPF-T024 / **HPF-T008** — Shape A



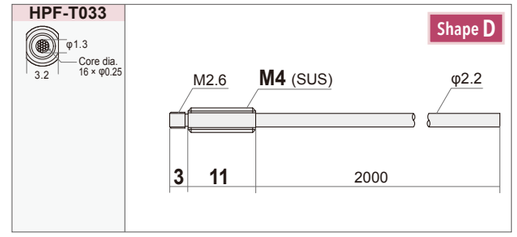
HPF-T044 — Shape B



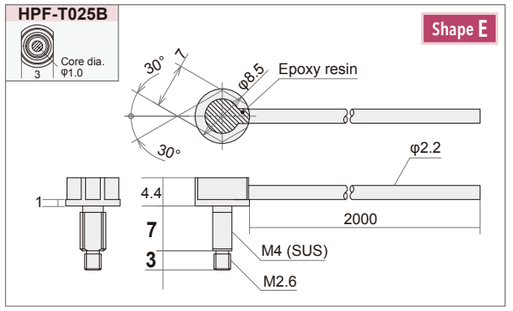
HPF-T001 / **HPF-T003** / **HPF-T025** — Shape C



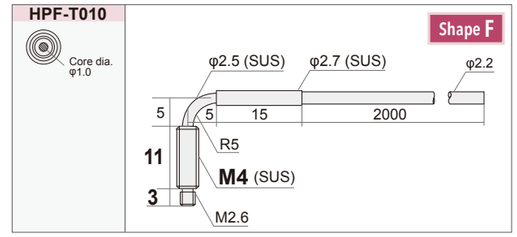
HPF-T033 — Shape D



HPF-T025B — Shape E



HPF-T010 — Shape F

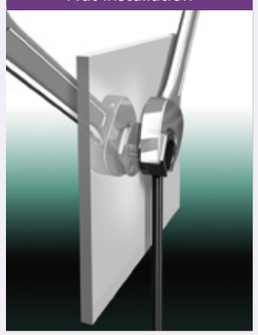


NOTEWORTHY

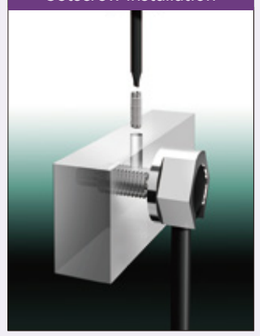
Products allowing either nut or setscrew installation are available for flexible operability, maintenance parts consolidation, and other considerations.

Model HPF-T025B

Nut installation



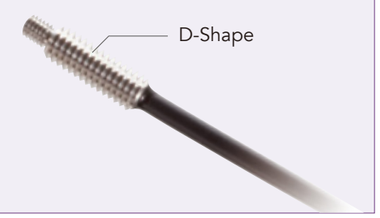
Setscrew installation



Attachment method selectable

Applicable model number

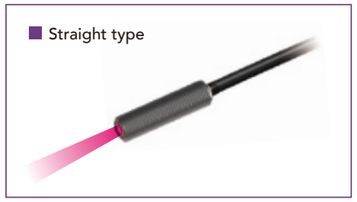
Form	Type	Model no.
Thru scan	Straight	**HPF-T033**
Thru scan	Straight	**HPF-T044**
Thru scan	Bolt	**HPF-T025B**



Screw < Diffuse scan >

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

■ Straight type



Related pages
For thru scan see page 9.

Diffuse scan

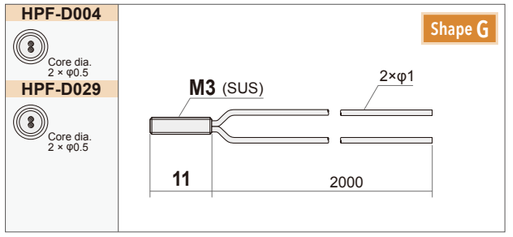
Type	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Straight	M3	−30 to +70 °C  Shape G	1 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	10	Receiver and emitter φ0.5	φ0.005	HPF-D029
						SF	8			
						Ft	5			
					HPX-EG50/51	HP	22			
						nL	19			
						Ft	8			
			15 mm	2 m Cuttable	HPX-EG00/01	nL	43	Receiver and emitter φ0.5	φ0.005	HPF-D004
						SF	36			
						Ft	25			
					HPX-EG50/51	HP	90			
						nL	80			
						Ft	35			
		−30 to +70 °C  Shape H	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	8	Receiver and emitter 2×φ0.25	φ0.005	HPF-D037
						SF	7			
						Ft	5			
					HPX-EG50/51	HP	17			
						nL	15			
						Ft	6			
	M4	−30 to +70 °C  Shape I	15 mm	2 m Cuttable	HPX-EG00/01	nL	75	Receiver and emitter φ0.75	φ0.005	HPF-D018
						SF	65			
						Ft	46			
					HPX-EG50/51	HP	170			
						nL	150			
						Ft	65			
	M6	−30 to +70 °C  Shape J	2 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	85	Receiver and emitter φ1.0	φ0.005	HPF-D030
						SF	70			
						Ft	50			
					HPX-EG50/51	HP	180			
						nL	160			
						Ft	70			
			4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	100	Receiver and emitter 16×φ0.25	φ0.005	HPF-D012
						SF	80			
						Ft	55			
					HPX-EG50/51	HP	220			
						nL	190			
						Ft	80			
			20 mm	2 m Cuttable	HPX-EG00/01	nL	210	Receiver and emitter φ1.4	φ0.005	HPF-D001
						SF	180			
						Ft	120			
					HPX-EG50/51	HP	470			
						nL	400			
						Ft	170			
			20 mm	2 m Cuttable	HPX-EG00/01	nL	150	Receiver and emitter φ1.0	φ0.005	HPF-D002
						SF	130			
						Ft	90			
					HPX-EG50/51	HP	350			
						nL	300			
						Ft	130			

Note:
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

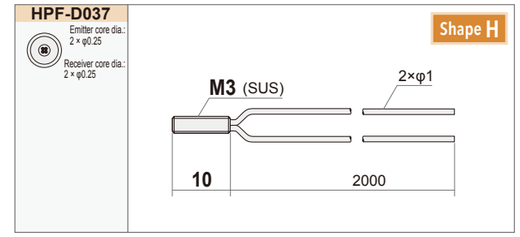
Outer dimensions (differs according to the model)

Unit: mm

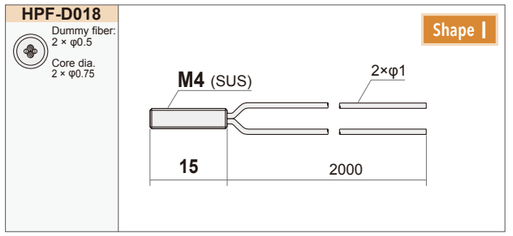
HPF-D004, **HPF-D029** — Shape G



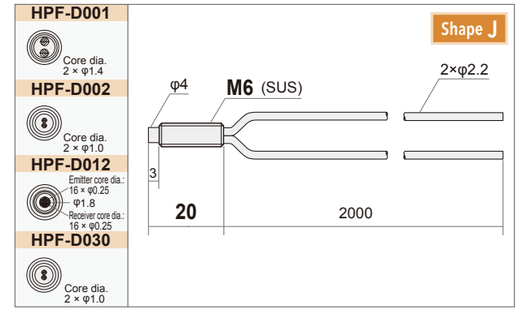
HPF-D037 — Shape H



HPF-D018 — Shape I



HPF-D001, **HPF-D002**, **HPF-D012**, **HPF-D030** — Shape J

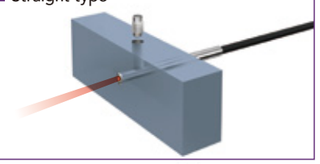


*: Dummy fiber is used for core positioning.

Cylindrical

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

■ Straight type



Related pages

Side-view sensors P.19 Compatible lenses P.41

For head dia. of less than φ1.0 mm (thru scan) or φ 1.5 mm (diffuse scan), select from sleeve-type sensors. P.17

Thru scan

Type	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Straight	φ1	−30 to +70 °C Shape A	4 mm	0.5 m	HPX-EG00/01	nL	12	φ0.25	φ0.005	HPF-T038
						SF	10			
						Ft	7			
					HPX-EG50/51	HP	29			
						nL	25			
						Ft	10			
	φ1.5	−30 to +70 °C Shape B	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	60	4×φ0.25	φ0.01	HPF-T009
						SF	50			
						Ft	38			
					HPX-EG50/51	HP	140			
						nL	120			
						Ft	50			
		−30 to +70 °C Shape C	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	60	4×φ0.25	φ0.01	HPF-T046
						SF	50			
						Ft	38			
					HPX-EG50/51	HP	140			
						nL	120			
						Ft	50			
		−30 to +70 °C Shape D	4 mm	0.5 m	HPX-EG00/01	nL	6	φ0.125	φ0.005	HPF-T036
						SF	5			
						Ft	3			
					HPX-EG50/51	HP	14			
						nL	12			
						Ft	5			
	φ2	−30 to +70 °C Shape E	15 mm	2 m Cuttable	HPX-EG00/01	nL	100	φ0.5	φ0.005	HPF-T043
						SF	80			
						Ft	55			
					HPX-EG50/51	HP	230			
						nL	200			
						Ft	85			
	φ3	−30 to +70 °C Shape F	2 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	310	φ1.0	φ0.005	HPF-T031
						SF	260			
						Ft	180			
					HPX-EG50/51	HP	700			
						nL	600			
						Ft	260			
		Lens attachable −30 to +70 °C Shape G	20 mm	2 m Cuttable	HPX-EG00/01	nL	410	φ1.0	φ0.005	HPF-T004
						SF	350			
						Ft	240			
					HPX-EG50/51	HP	940			
						nL	800			
						Ft	350			
		−30 to +70 °C Shape G	20 mm	2 m Cuttable	HPX-EG00/01	nL	770	φ1.4	φ0.01	HPF-T002
						SF	650			
						Ft	450			
					HPX-EG50/51	HP	1700			
						nL	1400			
						Ft	630			

Diffuse scan

Type	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Straight	φ1.5	−30 to +70 °C Shape H	4 mm Bend-tolerant	1m	HPX-EG00/01	nL	8	Receiver and emitter 2×φ0.25	φ0.005	HPF-D036
						SF	7			
						Ft	5			
					HPX-EG50/51	HP	17			
						nL	15			
						Ft	6			
	φ3	−30 to +70 °C Shape I	15 mm	2m Cuttable	HPX-EG00/01	nL	43	Receiver and emitter φ0.5	φ0.005	HPF-D005
						SF	36			
						Ft	25			
					HPX-EG50/51	HP	90			
						nL	80			
						Ft	35			

Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47–48).

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

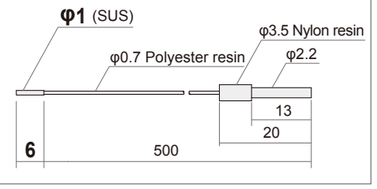
Response times for the sensing types: HP 5 ms, nL 1 ms, SF 50 µs, and FT 250 µs.

The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

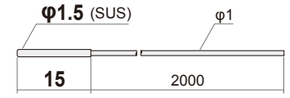
Outer dimensions (differs according to the model)

Unit: mm

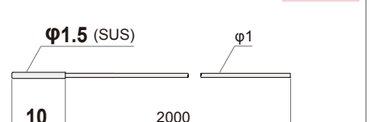
HPF-T038 — Core dia. φ0.25 — Shape A



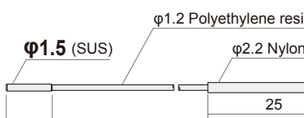
HPF-T009 — Core dia. 4 × φ0.25 — Shape B



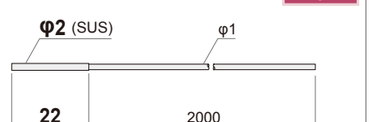
HPF-T046 — Core dia. 4 × φ0.25 — Shape C



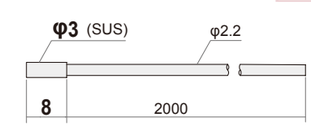
HPF-T036 — Core dia. φ0.125 — Shape D



HPF-T043 — Core dia. φ0.5 — Shape E

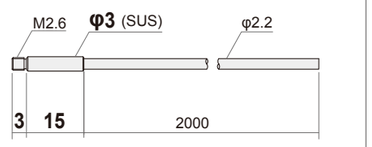


HPF-T031 — Core dia. φ1.0 — Shape F

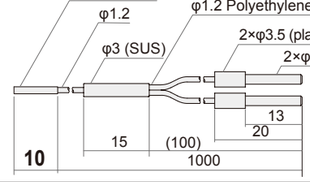


HPF-T004 — Core dia. φ1.0

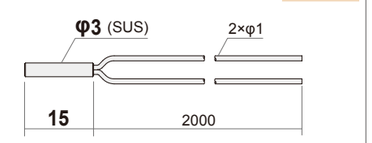
HPF-T002 — Core dia. φ1.4 — Shape G



HPF-D036 — Emitter core dia.: 2 × 0.25 dia. — Receiver core dia.: 2 × 0.25 dia. — Shape H



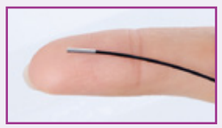
HPF-D005 — Core dia. 2 × φ0.5 — Shape I



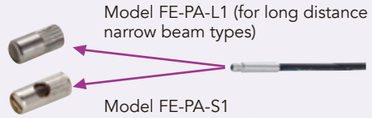
NOTEWORTHY

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

Model HPF-T038



- Compatible lens units are available for cylindrical types

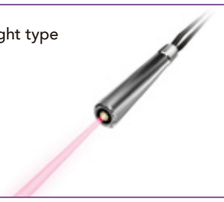


Model HPF-T004

Coaxial

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

■ Straight type



■ Bolt type

Related pages
For compatible micro-spot lenses
P.41

Diffuse scan

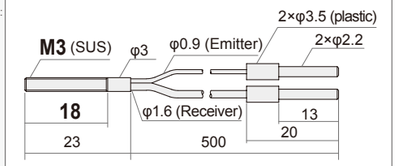
Type	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Straight	M3	Lens attachable, −30 to +70 °C, Shape A	4 mm, Bend-tolerant	0.5 m	HPX-EG00/01	nL	25	Emitter: φ0.25 Receiver: 6×φ0.25	φ0.005	HPF-D034
						SF	21			
						Ft	15			
					HPX-EG50/51	HP	50			
						nL	45			
						Ft	19			
		Lens attachable, −30 to +70 °C, Shape B	Emitter: 1 mm Receiver: 4 mm, Unbreakable	2 m, Cuttable	HPX-EG00/01	nL	18	Emitter: φ0.5 Receiver: 4×φ0.25	φ0.005	HPF-D032
						SF	15			
						Ft	10			
					HPX-EG50/51	HP	41			
						nL	35			
						Ft	15			
			15 mm	2 m, Cuttable	HPX-EG00/01	nL	35	Emitter: φ0.5 Receiver: 4×φ0.25	φ0.005	HPF-D010
						SF	30			
						Ft	21			
					HPX-EG50/51	HP	75			
						nL	65			
						Ft	28			
		Lens attachable, −30 to +70 °C, Shape C	4 mm	1 m, Cuttable	HPX-EG00/01	nL	60	Emitter: φ0.5 Receiver: 9×φ0.25	φ0.005	HPF-D049
						SF	55			
						Ft	38			
					HPX-EG50/51	HP	150			
						nL	120			
						Ft	55			
		Lens attachable, −30 to +70 °C, Shape D	15 mm	2 m, Cuttable	HPX-EG00/01	nL	50	Emitter: φ0.5 Receiver: 9×φ0.25	φ0.005	HPF-D035
						SF	42			
						Ft	29			
					HPX-EG50/51	HP	95			
						nL	95			
						Ft	43			
Bolt	M3	Lens attachable, −30 to +70 °C, Shape E	Emitter: 1 mm Receiver: 4 mm, Unbreakable	1 m, Cuttable	HPX-EG00/01	nL	18	Emitter: φ0.5 Receiver: 4×φ0.25	φ0.005	HPF-D032B
						SF	15			
						Ft	10			
					HPX-EG50/51	HP	41			
						nL	35			
						Ft	15			
Straight	M4	Lens attachable, −30 to +70 °C, Shape F	15 mm	2 m, Cuttable	HPX-EG00/01	nL	50	Emitter: φ0.5 Receiver: 9×φ0.25	φ0.005	HPF-D038
						SF	42			
						Ft	29			
					HPX-EG50/51	HP	95			
						nL	95			
						Ft	43			
	M6	−30 to +70 °C, Shape G	20 mm	2 m, Cuttable	HPX-EG00/01	nL	150	Emitter: φ1.0 Receiver: 16×φ0.25	φ0.005	HPF-D009
						SF	130			
						Ft	90			
					HPX-EG50/51	HP	≫ 350			
						nL	≫ 300			
						Ft	130			
	φ2	−30 to +70 °C, Shape H	15 mm	2 m, Cuttable	HPX-EG00/01	nL	35	Emitter: φ0.5 Receiver: 4×φ0.25	φ0.005	HPF-D042
						SF	30			
						Ft	21			
					HPX-EG50/51	HP	75			
						nL	65			
						Ft	28			

Note:
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

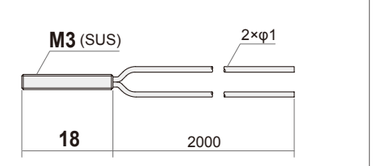
Outer dimensions (differs according to the model)

Unit: mm

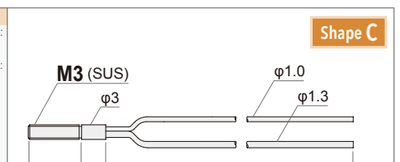
HPF-D034 — Emitter core dia.: φ0.25; Receiver core dia.: 6 × φ0.25 — Shape A



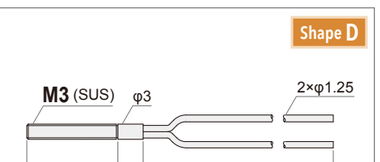
HPF-D010 — Emitter core dia.: φ0.5; Receiver core dia.: 4 × φ0.25 (Dummy fiber: 5 × φ0.25)
HPF-D032 — Emitter core dia.: φ0.5; Receiver core dia.: 4 × φ0.25 (Dummy fiber: 5 × φ0.25) — Shape B



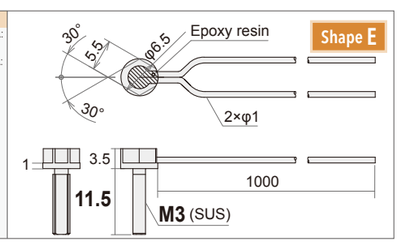
HPF-D049 — Emitter core dia.: φ0.5; Receiver core dia.: 9 × φ0.25 — Shape C



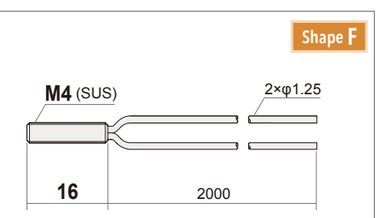
HPF-D035 — Emitter core dia.: φ0.5; Receiver core dia.: 9 × φ0.25 — Shape D



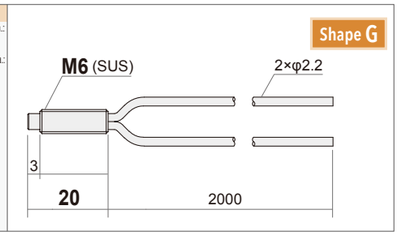
HPF-D032B — Emitter core dia.: φ0.5; Receiver core dia.: 4 × φ0.25 (Dummy fiber: 5 × φ0.25); 2.2 — Shape E



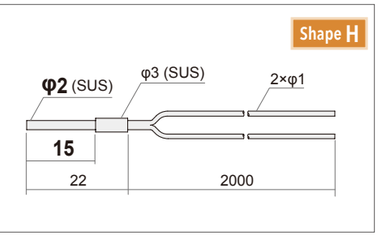
HPF-D038 — Emitter core dia.: φ0.5; Receiver core dia.: 9 × φ0.25 — Shape F



HPF-D009 — Emitter core dia.: φ1.0; Receiver core dia.: 16 × φ0.25 — Shape G



HPF-D042 — Emitter core dia.: φ0.5; Receiver core dia.: 4 × φ0.25 — Shape H

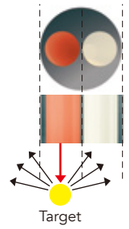


*: Dummy fiber is used for core positioning.

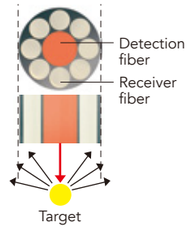
NOTEWORTHY

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

Standard
General diffuse scan type used conventionally



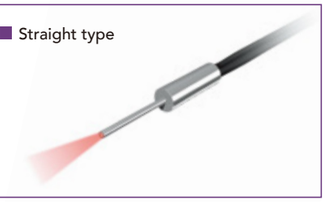
Coaxial
Used in combination with micro-spot lenses, for positioning use, etc.



Sleeve

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

■ Straight type



Related pages

Sleeve-length customization P.04

Side-view sensing P.19

Thru scan

Front end dia.	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
φ0.4	−30 to +70 °C, Shape A	4 mm	0.5 m	HPX-EG00/01	nL	6	φ0.125	φ0.005	HPF-T039
					SF	5			
					Ft	3			
				HPX-EG50/51	HP	14			
					nL	12			
					Ft	5			
Extendable, φ0.5	−30 to +70 °C, Shape B	15 mm	2 m, Cuttable	HPX-EG00/01	nL	12	φ0.25	φ0.005	HPF-T015
					SF	10			
					Ft	7			
				HPX-EG50/51	HP	29			
					nL	25			
					Ft	10			
Extendable, φ1.2, Bendable (10-mm radius)	−30 to +70 °C, Shape C	20 mm	2 m, Cuttable	HPX-EG00/01	nL	410	φ1.0	φ0.005	HPF-T005
					SF	350			
					Ft	240			
				HPX-EG50/51	HP	940			
					nL	800			
					Ft	350			
φ1.2, Bendable (10-mm radius)	−30 to +70 °C, Shape D	20 mm	0.5 m, Cuttable	HPX-EG00/01	nL	410	φ1.0	φ0.005	HPF-T006
					SF	350			
					Ft	240			
				HPX-EG50/51	HP	940			
					nL	800			
					Ft	350			

Diffuse scan

Front end dia.	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
φ0.82	−30 to +70 °C, Shape E	4 mm, Bend-tolerant	0.5 m, Cuttable	HPX-EG00/01	nL	8	Receiver and emitter φ0.25	φ0.005	HPF-D039
					SF	7			
					Ft	5			
				HPX-EG50/51	HP	18			
					nL	16			
					Ft	7			
φ0.82	−30 to +70 °C, Shape F	4 mm, Bend-tolerant	0.5 m, Cuttable	HPX-EG00/01	nL	8	Receiver and emitter φ0.25	φ0.005	HPF-D019
					SF	7			
					Ft	5			
				HPX-EG50/51	HP	18			
					nL	16			
					Ft	7			
Extendable, φ1.2, Bendable (10-mm radius)	−30 to +70 °C, Shape G	15 mm	2 m, Cuttable	HPX-EG00/01	nL	43	Receiver and emitter φ0.5	φ0.005	HPF-D006
					SF	36			
					Ft	25			
				HPX-EG50/51	HP	90			
					nL	80			
					Ft	35			
φ1.5	−30 to +70 °C, Shape H	15 mm	2 m, Cuttable	HPX-EG00/01	nL	35	Receiver and emitter φ0.5	φ0.005	HPF-D021
					SF	30			
					Ft	21			
				HPX-EG50/51	HP	75			
					nL	65			
					Ft	28			
Extendable, φ2.5, Bendable (10-mm radius)	−30 to +70 °C, Shape I	20 mm	2 m, Cuttable	HPX-EG00/01	nL	150	Receiver and emitter φ1.0	φ0.005	HPF-D003
					SF	130			
					Ft	90			
				HPX-EG50/51	HP	350			
					nL	300			
					Ft	130			

Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47-48).

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

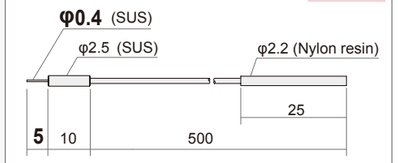
Response times for the sensing types: HP 5 ms, nL 1 ms, SF 50 µs, and FT 250 µs.

The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

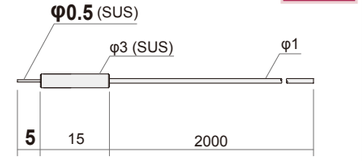
Outer dimensions (differs according to the model)

Unit: mm

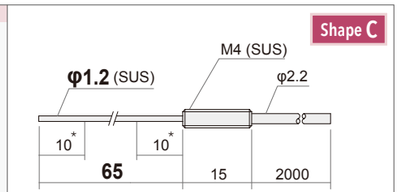
HPF-T039 — Core dia. φ0.125, 0.4 — Shape A



HPF-T015 — Core dia. φ0.25 — Shape B

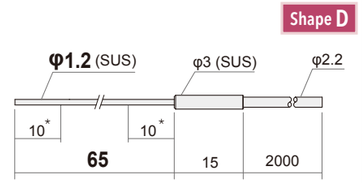


HPF-T005 — Core dia. φ1.0 — Shape C



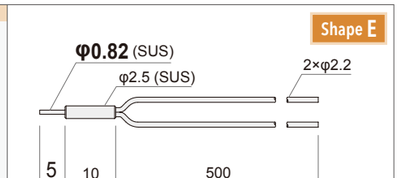
*Area that cannot be bent

HPF-T006 — Core dia. φ1.0 — Shape D

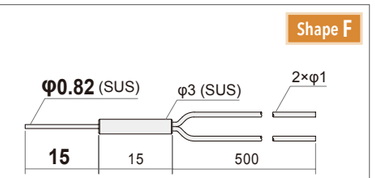


*Area that cannot be bent

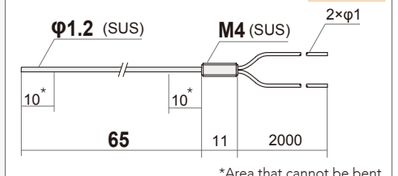
HPF-D039 — Core dia. 2 × φ0.25 — Shape E



HPF-D019 — Core dia. 2 × φ0.25 — Shape F

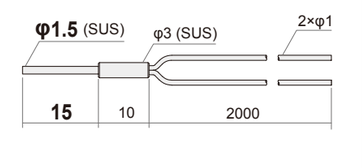


HPF-D006 — Core dia. 2 × φ0.5 — Shape G

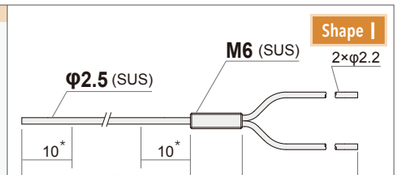


*Area that cannot be bent

HPF-D021 — Core dia. 2 × φ0.5 — Shape H



HPF-D003 — Core dia. 2 × φ1.0 — Shape I

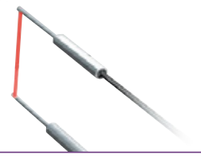


*Area that cannot be bent

Side View

- Light emitted to the side.
- Use to position the switch close to the target object in a limited space.

■ Straight type



Related pages

Narrow view sensing P.21

Sleeve-length customization P.04

Thru scan

Front end dia.	Center of optical axis (from front end)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Extendable φ0.88	0.6	−30 to +70 °C Shape A	5 mm	1 m Cuttable	HPX-EG00/01	nL	20	φ0.5	φ0.005	HPF-T037
						SF	16			
						Ft	11			
					HPX-EG50/51	HP	41			
						nL	35			
						Ft	15			
φ1	1.5	−30 to +70 °C Shape B	1 mm Unbreakable	2 m Cuttable	HPX-EG00/01	nL	20	φ0.5	φ0.005	HPF-T026
						SF	16			
						Ft	11			
					HPX-EG50/51	HP	41			
						nL	35			
						Ft	15			
φ1	1.5	−30 to +70 °C Shape C	15 mm	2 m Cuttable	HPX-EG00/01	nL	55	φ0.5	φ0.005	HPF-T007
						SF	48			
						Ft	33			
					HPX-EG50/51	HP	120			
						nL	110			
						Ft	48			
φ3	1.5	−30 to +70 °C Shape D	5 mm	2 m Cuttable	HPX-EG00/01	nL	220	φ0.5	φ0.005	HPF-T042
						SF	190			
						Ft	130			
					HPX-EG50/51	HP	510			
						nL	440			
						Ft	190			

Diffuse scan

Front end dia.	Center of optical axis (from front end)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Extendable φ2	1.5	−30 to +70 °C Shape E	15 mm	2 m Cuttable	HPX-EG00/01	nL	17	Receiver and emitter φ0.5	φ0.005	HPF-D011
						SF	14			
						Ft	10			
					HPX-EG50/51	HP	35			
						nL	30			
						Ft	13			
φ2	1.5	−30 to +70 °C Shape F	15 mm	2 m Cuttable	HPX-EG00/01	nL	17	Receiver and emitter φ0.5	φ0.005	HPF-D041
						SF	14			
						Ft	10			
					HPX-EG50/51	HP	35			
						nL	30			
						Ft	13			
φ6	1.5	−30 to +70 °C Shape G	20 mm	2 m Cuttable	HPX-EG00/01	nL	65	Receiver and emitter φ1.0	φ0.005	HPF-D043
						SF	55			
						Ft	40			
					HPX-EG50/51	HP	140			
						nL	120			
						Ft	50			

Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47–48).

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

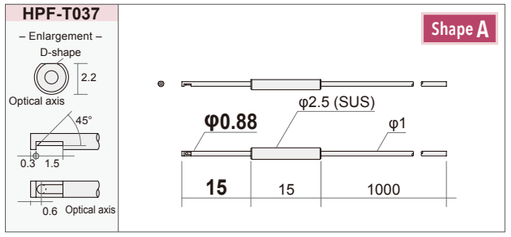
Response times for the sensing types: HP 5 ms, nL 1 ms, SF 50 µs, and FT 250 µs.

The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

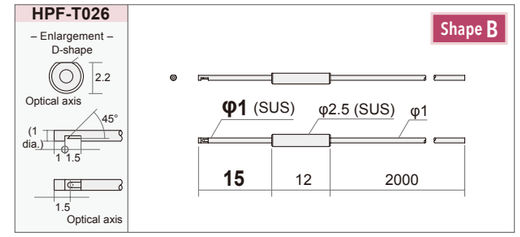
Outer dimensions (differs according to the model)

Unit: mm

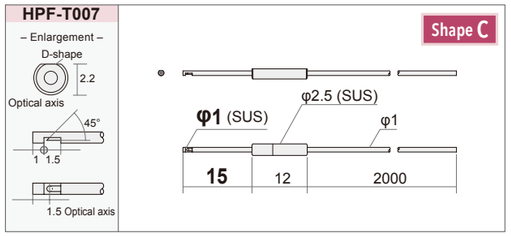
HPF-T037 – Enlargement – D-shape — Shape A



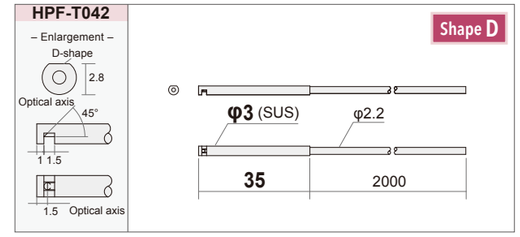
HPF-T026 – Enlargement – D-shape — Shape B



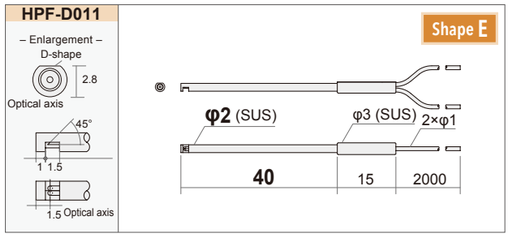
HPF-T007 – Enlargement – D-shape — Shape C



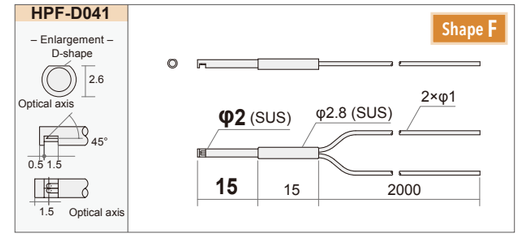
HPF-T042 – Enlargement – D-shape — Shape D



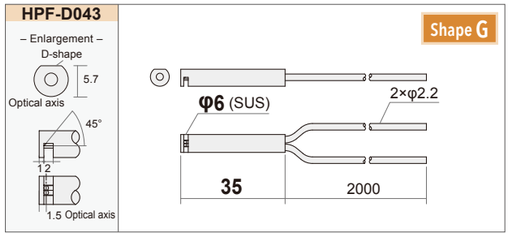
HPF-D011 – Enlargement – D-shape — Shape E



HPF-D041 – Enlargement – D-shape — Shape F



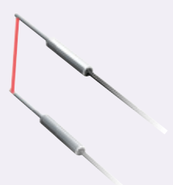
HPF-D043 – Enlargement – D-shape — Shape G

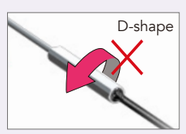


NOTEWORTHY

Unique feature

The fiber unit head of all side-view sensors has a D-shape. This can greatly reduce adjustment man-hours during installation.

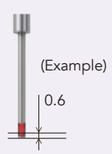




The flat part of the D-shape perpendicular to the optical axis facilitates alignment.

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.



Optical axis position for side-view unit

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

Narrow View

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

■ Light direction: top

■ Light direction: side

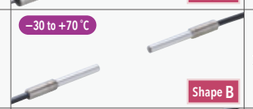
Related pages

If a narrow beam is not required:

Sleeve-type units P.17

Side-view units P.19

Thru scan

Light emitter	Directional angle (half angle)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Effective lens diameter	Minimum detectable size (mm)	Model No.
Top	1.5°	−30 to +70 °C  Shape A	15 mm	2 m Cuttable	HPX-EG00/01	nL	1200	φ1.7	φ0.1	HPF-T023
						SF	1000			
						Ft	730			
					HPX-EG50/51	HP	2800			
						nL	2400			
						Ft	1000			
Top	2.5°	−30 to +70 °C  Shape B	20 mm	2 m Cuttable	HPX-EG00/01	nL	1400	φ2.1	φ0.1	HPF-T019
						SF	1200			
						Ft	840			
					HPX-EG50/51	HP	3200			
						nL	2700			
						Ft	1200			
Side	3°	−30 to +70 °C  Shape C	20 mm	2 m Cuttable	HPX-EG00/01	nL	1500	φ2.6	φ0.1	HPF-T020
						SF	1300			
						Ft	920			
					HPX-EG50/51	HP	3500			
						nL	3000			
						Ft	1300			

Diffuse scan

Light emitter	Directional angle (half angle)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Effective lens diameter	Minimum detectable size (mm)	Model No.
Top	–	−30 to +70 °C  Shape D	15 mm	2 m Cuttable	HPX-EG00/01	nL	20	–	φ0.005	HPF-D025
						SF	20			
						Ft	20			
					HPX-EG50/51	HP	20			
						nL	20			
						Ft	20			

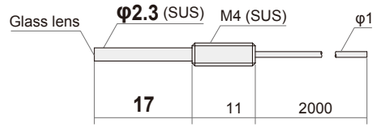
Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47–48).
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

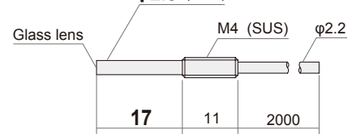
Outer dimensions (differs according to the model)

Unit: mm

HPF-T023 — Shape A

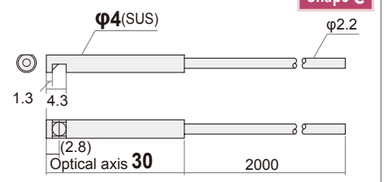


HPF-T019 — Shape B

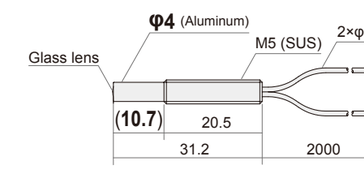


HPF-T020 — Shape C

–Enlargement –
D-shape
3.8



HPF-D025 — Shape D



NOTEWORTHY

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

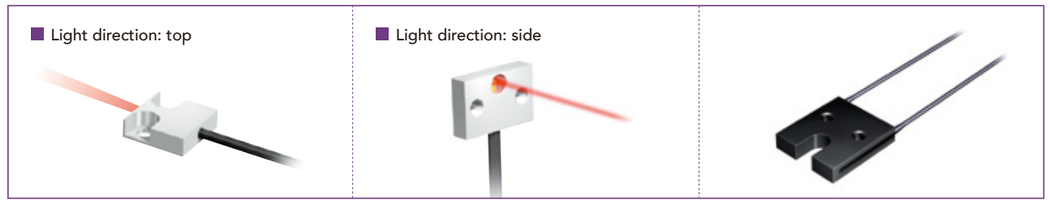
(Typical examples)

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.

Flat / Vane

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



Thru scan

Type	Light emitter	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Flat	Top	−30 to +70 °C, Shape A	1 mm, Unbreakable	2 m, Cuttable	HPX-EG00/01	nL	50	φ0.5	φ0.005	HPF-T028
						SF	42			
						Ft	29			
					HPX-EG50/51	HP	110			
						nL	95			
						Ft	41			
Vane type	–	−30 to +70 °C, Shape B	15 mm	5 m, Cuttable	HPX-EG00/01	nL	6	φ0.5	φ0.005	HPF-T054-L05
						SF	6			
						Ft	6			
					HPX-EG50/51	HP	6			
						nL	6			
						Ft	6			

Diffuse scan

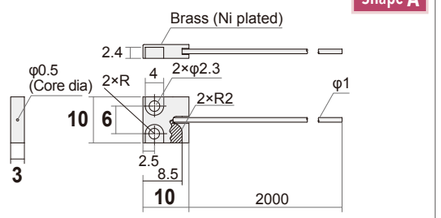
Type	Light emitter	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Core	Minimum detectable size (mm)	Model No.
Flat	Flat	−30 to +70 °C, Shape C	2 mm, Unbreakable	2 m, Cuttable	HPX-EG00/01	nL	37	Receiver and emitter φ1.0	–	HPF-D045LF
						SF	31			
						Ft	21			
					HPX-EG50/51	HP	80			
						nL	70			
						Ft	30			

Note:
For scanning distances of the sensing modes, see the Technical Guide (page 47–48).
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

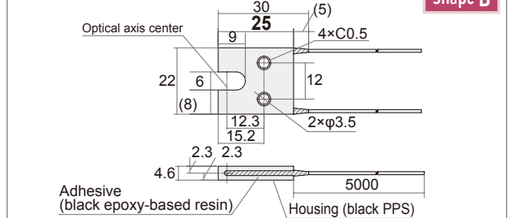
Outer dimensions (differs according to the model)

Unit: mm

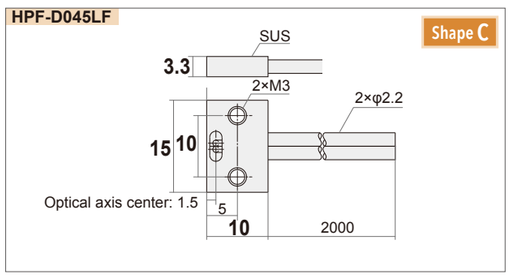
HPF-T028 — Shape A



HPF-T054-L05 — Shape B



HPF-D045LF — Shape C



Limited Reflective

- Resistant to interference from the background.
- Use for target object detection in a limited area.

Diffuse scan

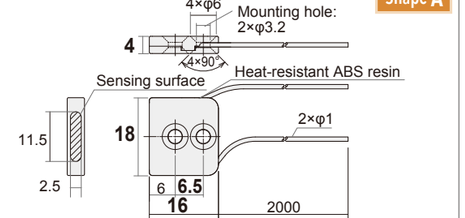
Light emitter	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Minimum detectable size (mm)	Model No.
Top	−30 to +70 °C, Shape A	15 mm	2 m, Cuttable	HPX-EG00/01	nL	7.4±1.2	φ0.005	HPF-D028T
					SF			
					Ft			
				HPX-EG50/51	HP	7.4±1.6		
					nL	7.4±1.6		
					Ft			
Flat	−30 to +70 °C, Shape B	15 mm	2 m, Cuttable	HPX-EG00/01	nL	2.5±0.5	φ0.005	HPF-D028
					SF	2.5±0.5		
					Ft			
				HPX-EG50/51	HP	2.5±0.5		
					nL	2.5±0.5		
					Ft	2.5±0.5		
	−30 to +70 °C, Shape C	15 mm	2 m, Cuttable	HPX-EG00/01	nL	5.2±1.0	φ0.005	HPF-D028F
					SF			
					Ft			
				HPX-EG50/51	HP	5.2±1.6		
					nL	5.2±1.6		
					Ft			

Note:
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

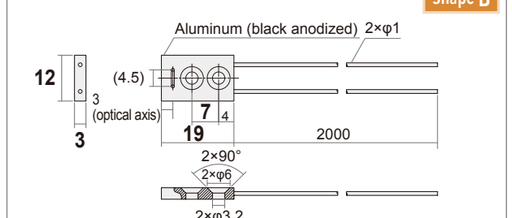
Outer dimensions (differs according to the model)

Unit: mm

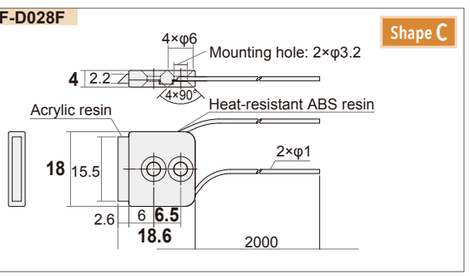
HPF-D028T — Shape A



HPF-D028 — Shape B



HPF-D028F — Shape C

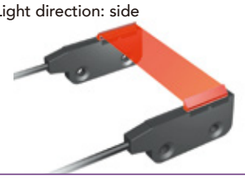


Area

- Wide light beam.
- Use for target object with varying detection positions, detection of meandering, etc.

■ Light direction: flat

■ Light direction: side



Thru scan

Type	Optical configuration	Area width (mm)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Minimum detectable size (mm)	Model No.
Array	Flat	5.25	−30 to +70 °C Shape A	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	270	φ0.2	HPF-T021
							SF	220		
							Ft	160		
						HPX-EG50/51	HP	610		
							nL	520		
							Ft	220		
Screen	Flat	15	−30 to +70 °C Shape B	15 mm	2 m Cuttable	HPX-EG00/01	nL	1200	φ0.2	HPF-T021T
							SF	1000		
							Ft	710		
						HPX-EG50/51	HP	2800		
							nL	2400		
							Ft	1000		
	Flat	30	−30 to +70 °C Shape D	15 mm	2 m Cuttable	HPX-EG00/01	nL	2000	φ0.4	HPF-T021WT
							SF	1600		
							Ft	1100		
						HPX-EG50/51	HP	4800		
							nL	4100		
							Ft	1700		
	Side	15	−30 to +70 °C Shape C	15 mm	2 m Cuttable	HPX-EG00/01	nL	1100	φ0.2	HPF-T021S
							SF	960		
							Ft	670		
						HPX-EG50/51	HP	2700		
							nL	2300		
							Ft	1000		

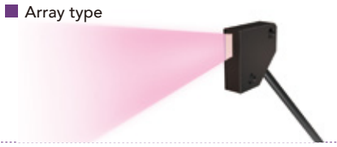
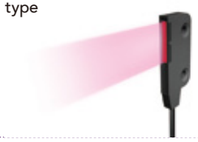
Diffuse scan

Type	Optical configuration	Area width (mm)	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Minimum detectable size (mm)	Model No.
Array	Flat	10.85	−30 to +70 °C Shape E	4 mm Bend-tolerant	2 m Cuttable	HPX-EG00/01	nL	100	φ0.005	HPF-D026
							SF	90		
							Ft	60		
						HPX-EG50/51	HP	230		
							nL	200		
							Ft	85		

Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47–48).
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, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

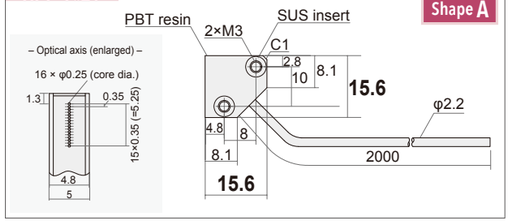
NOTEWORTHY

	■ Array type	■ Screen type
Type		
Features	Small diameter fibers are aligned in a row. Smaller and slimmer sensor heads are also available.	Light is collimated by the lens. This increases the scanning range and makes the light uniform.

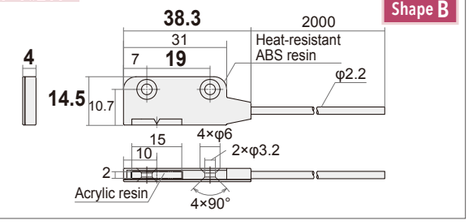
Outer dimensions (differs according to the model)

Unit: mm

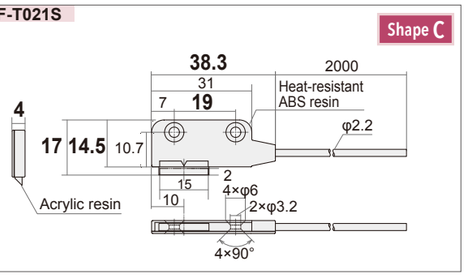
HPF-T021 Shape A



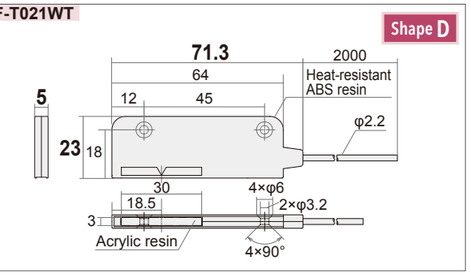
HPF-T021T Shape B



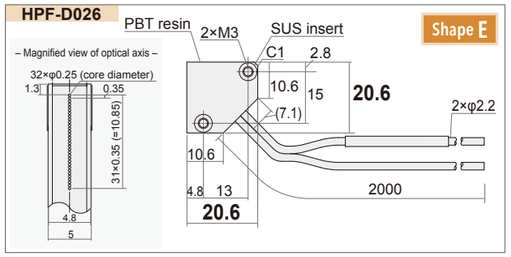
HPF-T021S Shape C



HPF-T021WT Shape D

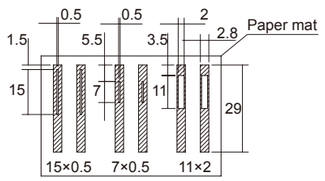


HPF-D026 Shape E



Accessory

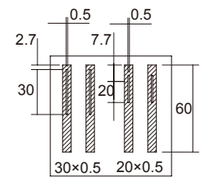
■ Model HPF-T021T



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 HPF-T021WT



Material: Transparent polyester film (black print on back)

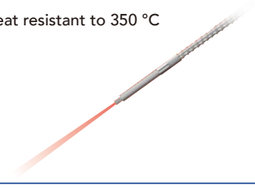
Model HPF-T021WT comes with slits. Use the appropriate slit with the unit to achieve the desired scanning distance and resolution.

Heat-proof

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

■ Heat resistant to 200 °C

■ Heat resistant to 350 °C



Related pages
Compatible lenses
P.45

Thru scan

Heatproof	Type	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Element	Minimum detectable size (mm)	Model No.
105 °C	Straight	Lens attachable, −30 to +105 °C, Shape A	25 mm	2 m, Cuttable	HPX-EG00/01	nL	240	φ1.0	φ0.005	HPF-T012 *1
						SF	200			
						Ft	140			
					HPX-EG50/51	HP	540			
						nL	460			
						Ft	200			
150 °C	Straight	−60 to +150 °C, Shape B	35 mm	2 m, Cuttable	HPX-EG00/01	nL	410	φ1.5	φ0.01	HPF-T017 *1
						SF	350			
						Ft	240			
					HPX-EG50/51	HP	940			
						nL	800			
						Ft	350			
200 °C	Straight	Lens attachable, −30 to +200 °C, Shape C	15 mm	1 m	HPX-EG00/01	nL	210	φ1.0	φ0.005	HPF-T018
						SF	180			
						Ft	120			
					HPX-EG50/51	HP	480			
						nL	410			
						Ft	170			
350 °C	Straight	Lens attachable, −30 to +350 °C, Shape D	15 mm	2 m	HPX-EG00/01	nL	220	φ1.0	φ0.005	HPF-T014
						SF	190			
						Ft	130			
					HPX-EG50/51	HP	510			
						nL	440			
						Ft	190			

Diffuse scan

Heatproof	Type	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Element	Minimum detectable size (mm)	Model No.
105 °C	Straight	−30 to +105 °C, Shape E	25 mm	2 m, Cuttable	HPX-EG00/01	nL	100	Receiver and emitter φ1.0	φ0.005	HPF-D013 *1
						SF	80			
						Ft	55			
					HPX-EG50/51	HP	190			
						nL	190			
						Ft	85			
150 °C	Straight	−60 to +150 °C, Shape F	35 mm	2 m, Cuttable	HPX-EG00/01	nL	150	Receiver and emitter φ1.5	φ0.005	HPF-D022 *1
						SF	130			
						Ft	90			
					HPX-EG50/51	HP	350			
						nL	300			
						Ft	130			
350 °C	Straight	−30 to +350 °C, Shape G	25 mm	2 m	HPX-EG00/01	nL	85	φ1.5	φ0.005	HPF-D015
						SF	70			
						Ft	50			
					HPX-EG50/51	HP	160			
						nL	160			
						Ft	75			

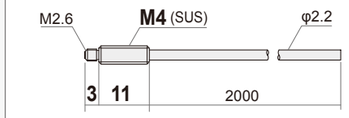
Note:
For scanning distances of the sensing modes, see the Technical Guide (page 47–48).
Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).
Response times for the sensing types: HP 5 ms, nL 1 ms, SF 50 µs, and FT 250 µs.
The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings.

*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.

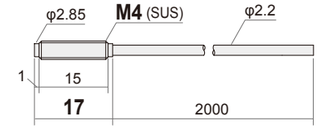
Outer dimensions (differs according to the model)

Unit: mm

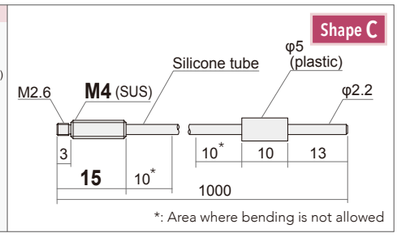
HPF-T012 — Shape A
Effective dia.: φ1.0



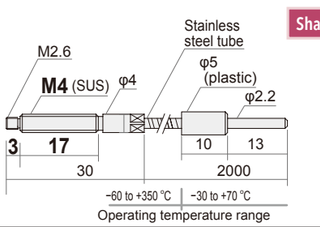
HPF-T017 — Shape B
Core dia. φ1.5



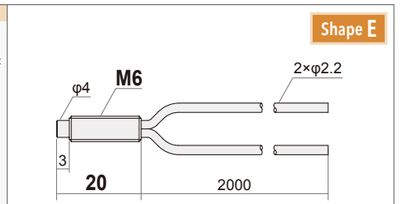
HPF-T018 — Shape C
Glass fiber: φ1.0 (φ0.05 × 320)



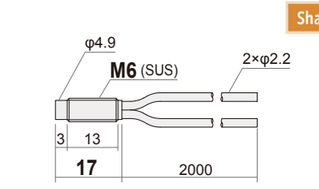
HPF-T014 — Shape D
φ0.05 × 370 (Glass fiber)



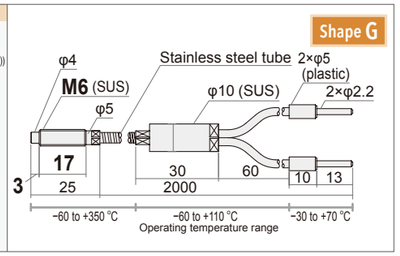
HPF-D013 — Shape E
Effective dia.: 2 × φ1.0



HPF-D022 — Shape F
Core dia. 2 × φ1.5
2 × φ2.2



HPF-D015 — Shape G
φ1.5(2×(φ0.05×370)) (Glass fiber)



NOTEWORTHY

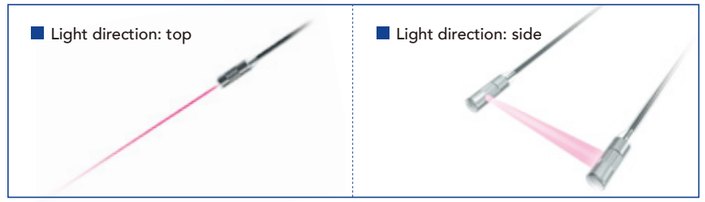
Use the lens unit appropriate for your application.
Select a lens with the desired heat resistance.*

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

*Compatible lens units: p.41, 45

Chemical-proof

- Protected with PFA tubing for excellent chemical resistance.



Related pages

Wet process sensors for level & leak detection

P.33 P.35 P.37

Usage notes P.44

Thru scan

Light emitter	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Minimum detectable size (mm)	Model No.
Top	φ4.7	−30 to +70 °C, Shape A	20 mm	2 m, Cuttable	HPX-EG00/01	nL	1500	φ0.1	HPF-T029
						SF	1200		
						Ft	880		
					HPX-EG50/51	HP	3500		
						nL	3000		
						Ft	1300		
Top	φ4.7	−30 to +70 °C, Shape B	20 mm	2 m, Cuttable	HPX-EG00/01	nL	280	φ0.1	HPF-T029E
						SF	230		
						Ft	160		
					HPX-EG50/51	HP	640		
						nL	550		
						Ft	240		
Side	φ4.7	−30 to +70 °C, Shape C	20 mm	2 m, Cuttable	HPX-EG00/01	nL	350	φ0.1	HPF-T035
						SF	300		
						Ft	210		
					HPX-EG50/51	HP	810		
						nL	690		
						Ft	300		

Diffuse scan

Light emitter	Size	Shape	Cable: Bend radius	Cable: Length	Scanning distance (mm): Amp	Mode	Distance	Minimum detectable size (mm)	Model No.
Top	φ6	−30 to +70 °C, Shape D	PFA area: 80 mm, Cable area: 20 mm	2 m, Cuttable	HPX-EG00/01	nL	50	–	HPF-D014
						SF	50		
						Ft	50		
					HPX-EG50/51	HP	50		
						nL	50		
						Ft	50		

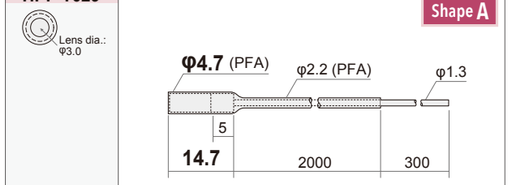
Note:

For scanning distances of the sensing modes, see the Technical Guide (page 47–48).
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, SF 50 µs, 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.

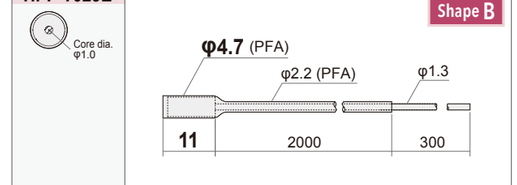
Outer dimensions (differs according to the model)

Unit: mm

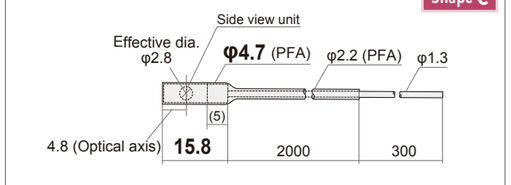
HPF-T029 — Shape A



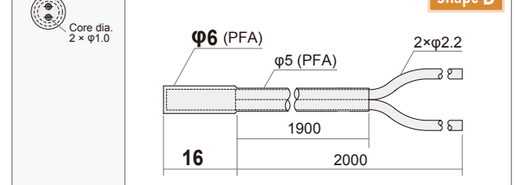
HPF-T029E — Shape B



HPF-T035 — Shape C



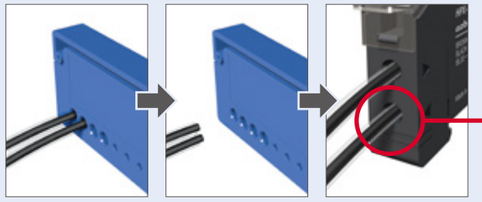
HPF-D014 — Shape D



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.

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

PFA tube must be stripped off before inserting fiber.

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

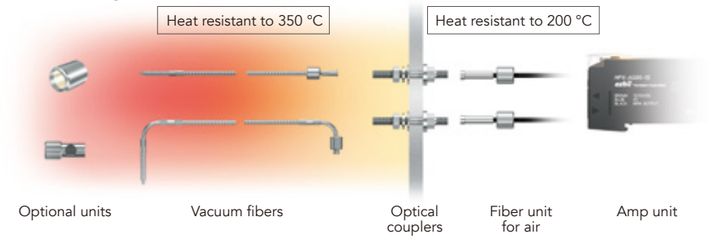
Saves space

Tube has small outside diameter of 2.2 mm, which can save considerable space compared with previous models. Bend radius is also greatly improved.

Vacuum-proof

- Usable in a vacuum.
- Cable length can be specified.

■ Product configuration



Related pages
Usage notes
P.46

Configuration of vacuum fiber model numbers

HPF –VT 0 S –S1000 (Typical examples)

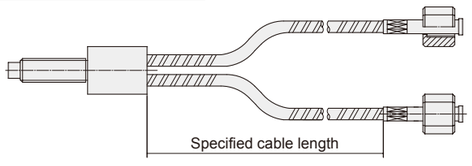
Base model No.	Model	Head shape	Coupler side shape	Cable length	Description
HPF					
	–VT				Thru scan
	–VD				Diffuse scan
		0			Straight
		1			Elbow (VT type only)
			S		Straight
			E		Elbow

	Cable length	Ordering increment
- S_ _ _	25 mm to 500 mm	25 mm
- S_ _ _	550 mm to 1500 mm	50 mm
- S_ _ _	1600 mm to 5000 mm	100 mm

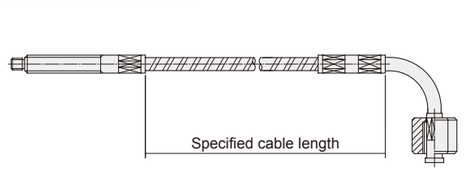
Cable drawing

Unit: mm

HPF-VD_ _-S_ _ _ _

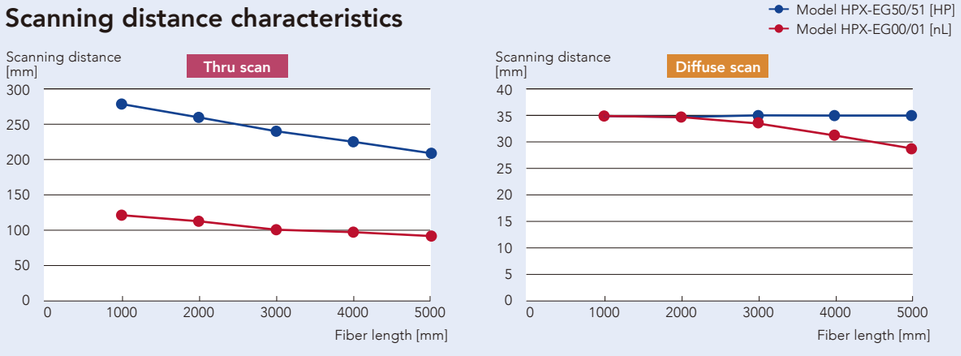


HPF-VT_ _-S_ _ _ _



CHART

Scanning distance characteristics



*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: 20 mm Cuttable	**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 (differs according to the model)

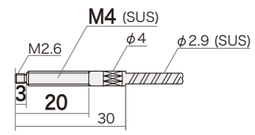
Unit: mm

HPF-VT0_

Glass fiber bundle dia.: φ1.2 (φ0.05×380)

HPF-VT0_-S_ _ _ _

Head shape (straight)

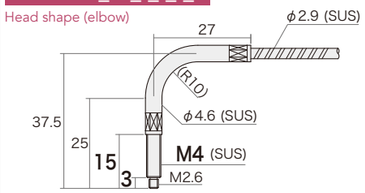


HPF-VT1_

Glass fiber bundle dia.: φ1.2 (φ0.05×380)

HPF-VT1_-S_ _ _ _

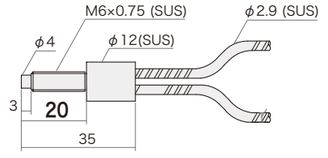
Head shape (elbow)



HPF-VD0_

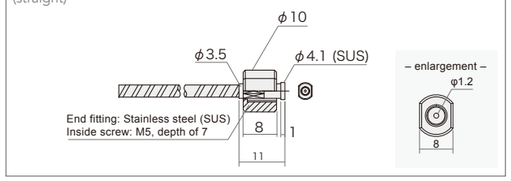
Glass fiber bundle dia.: φ1.7 (2×φ0.05×380)

HPF-VD0_-S_ _ _ _



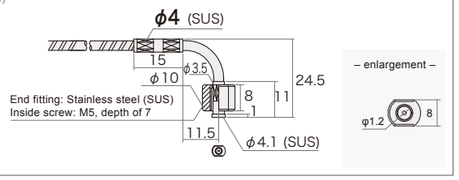
HPF-V_ _S-S_ _ _ _ Coupler side shape

(straight)



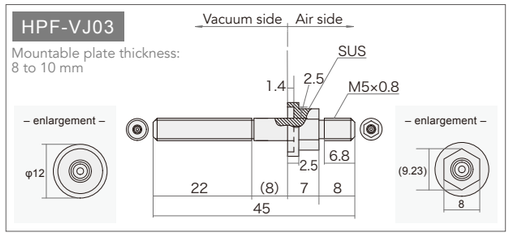
HPF-V_ _E-S_ _ _ _ Coupler side shape

(Elbow)



HPF-VJ03

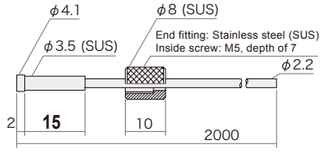
Mountable plate thickness: 8 to 10 mm



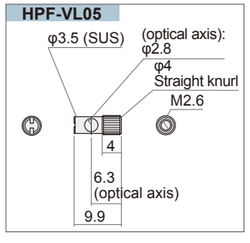
HPF-VA01

Core dia.: φ1.0

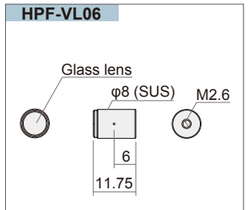
HPF-VA_ _



HPF-VL05



HPF-VL06



Specialized Use < Contact-Type Liquid Level Fiber Units >

• All-resin structure ensures no metal contamination.

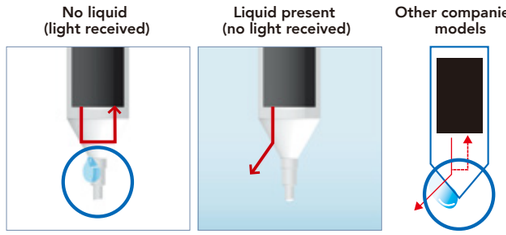
Problems due to liquid accumulation are reduced by Azbil Corporation's innovative front end structure.

Product lineup includes a small-diameter model (φ4) for easier cable routing.

Principle of detection

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

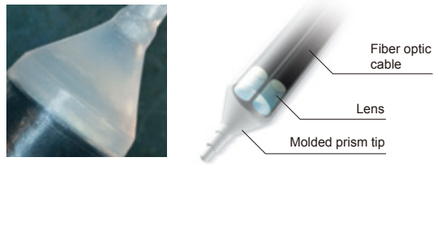
The proprietary structure provided at the tip of the fiber reduces malfunction due to liquid clinging. The lens built into the tip of the fiber ensures a large difference in light quantity between the conditions when liquid is present and absent.



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-EG00/01

<Exterior view>

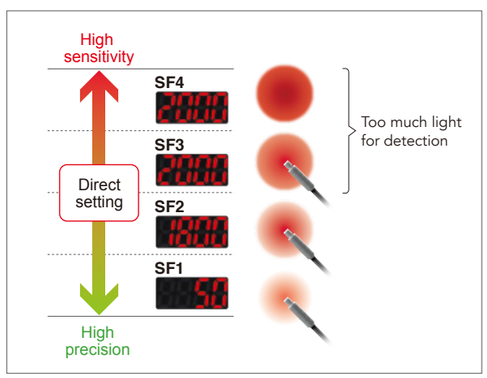
<Operation panel>

<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.



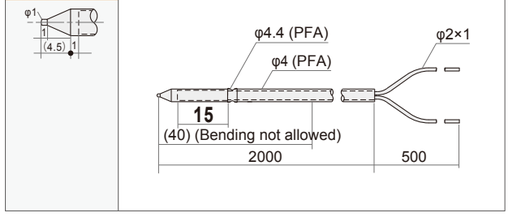
Diffuse scan

Type	Shape	Cable		Model No.
		Bend radius	Length	
φ4	−30 to +105 °C	PFA area: 30 mm Cable area: 15 mm	2 m Cuttable	HPF-D033
φ6	−30 to +105 °C	PFA area: 40 mm Cable area: 25 mm	2 m Cuttable	HPF-D027

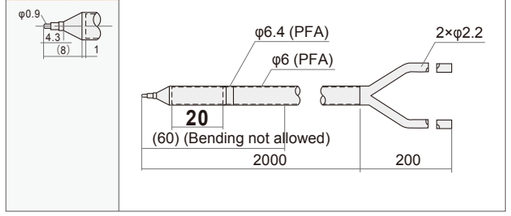
Outer dimensions (differs according to the model)

Unit: mm

HPF-D033



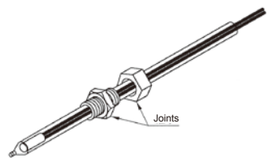
HPF-D027



Usage Notes

■ Contact-type liquid level detection

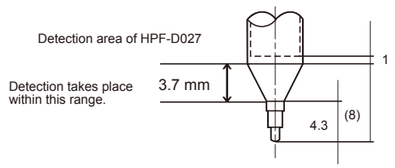
When installing the unit, use a commercially available fluorine-resin joint that matches the outside diameter of the PFA tube.



- Operation may be unstable under 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 on or deformation of the sensing head.
- If chattering occurs due to liquid dripping or bubbles, use a timer.



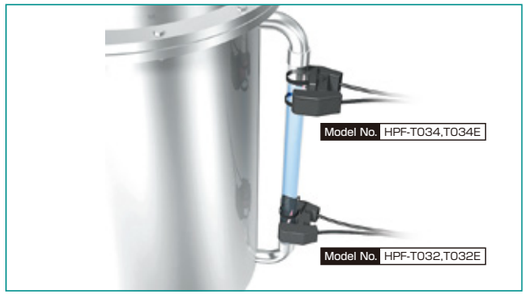
Liquid level detection positions vary depending on the surface tension of the liquid and the wet condition of the fiber unit's detection area.

■ Chemical resistance of PFA

See the Technical Guide (page 45).

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 to19 mm.

Principle of detection

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

Liquid present	Liquid absent
(Colorless liquid) Light received → Light emitted (Whitish liquid) Light received → Light emitted	Light received → Light emitted

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

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

Liquid present	Liquid absent
Light received → Light emitted	(When pipe contains air bubbles or is clouded.) Light received → Light emitted Light received → Light emitted

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 delection.

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

Abnormality: Liquid is present, so no light is received.
or: Broken fiber, no light received

Required optical system: Models that receive light when there is no liquid — **Model HPF-T034/ HPF-T034E**

Lower limit detection

Abnormality: Liquid is absent, so no light is received.
or: Broken fiber, no light received

Required optical system: Models that receive light when liquid is present — **Model HPF-T032/ HPF-T032E**

Thru scan

(Attached to pipe)

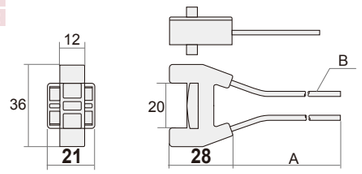
Type	Compatible pipe dia.	Shape	Cable: Bend radius	Cable: Length	Cable: Coating material	Model No.
Liquid-absent received light	φ8 to φ19 mm (3/4B)	−30 to +70 °C	4 mm	5 m Cuttable	PFA	HPF-T034
					Polyethylene	HPF-T034E
				2 m Cuttable		HPF-T034E-L02
Liquid-present received light	φ3 to φ13 mm	−30 to +70 °C	4 mm	5 m Cuttable	PFA	HPF-T032
					Polyethylene	HPF-T032E
				2 m Cuttable		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 (differs according to the model)

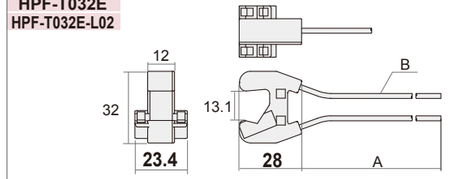
Unit: mm

HPF-T034
HPF-T034E
HPF-T034E-L02



Model No.	Cable length (A)	Cable dia. (B)
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

HPF-T032
HPF-T032E
HPF-T032E-L02

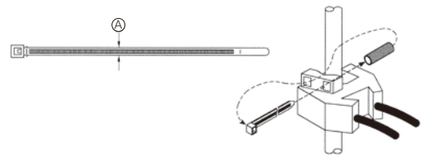


Model No.	Cable length (A)	Cable dia. (B)
HPF-T032	5000 mm min.	2×φ2.3
HPF-T032E	5000 mm min.	2×φ2.2
HPF-T032E-L02	2000 mm min.	2×φ2.2

Usage Notes

■ 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)

Specialized Use < Liquid Leakage Fiber Units >

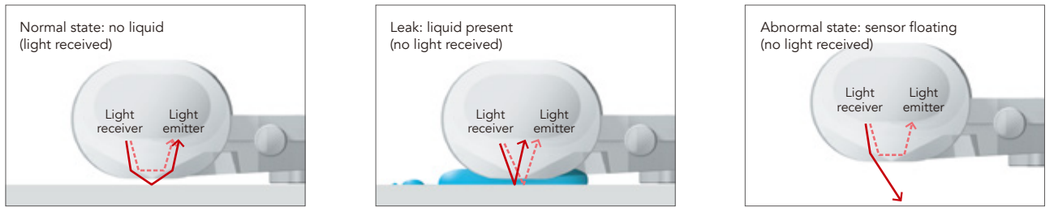
• PFA jacket affords outstanding ease of routing.

Space-saving switch head height of only 9.9 mm

Can be used in explosion-proof atmospheres because the cable is optical fiber.

(Be sure to check the explosion-proof stipulations for your equipment or device before use.)

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.)

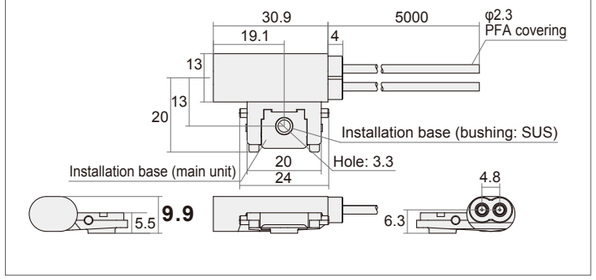
Diffuse scan

Shape (mm)	Cable		Model No.
	Bend radius	Length	
−30 to +70 °C	20 mm	5 m Cuttable	HPF-D040

Outer dimensions (differs according to the model)

Unit: mm

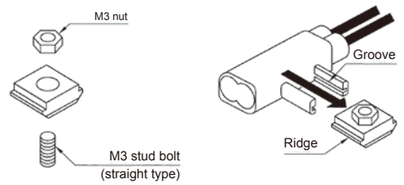
HPF-D040



Usage Notes

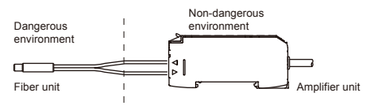
■ Liquid leakage detection

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.



■ Use in explosive 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.

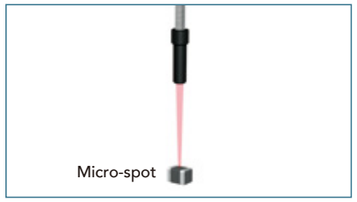


■ Chemical resistance of PFA

See the Technical Guide (page 45).

Lens Units < Micro-Spot Lens >

- Lens units that produce a micro-spot by combination with a coaxial fiber unit.
- Lenses can be selected according to the target object size.



Related pages
Compatible fiber units
P.15 (Coaxial)

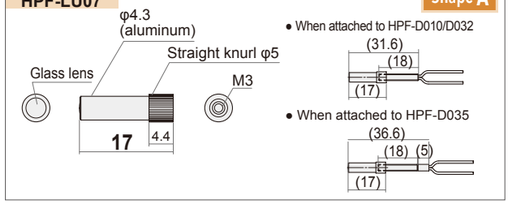
For diffuse scan type

Type	Shape	Minimum spot dia.	Focus distance	Combined fiber		Model No.
				Model No.	Spot dia.	
Micro-spot	−30 to +70 °C Identification mark Shape A	Approx. 0.1 mm • Spot dia. image	4.6 mm ± 0.2 mm	HPF-D034	Approx. 0.1 mm	HPF-LU07
				HPF-D010	Approx. 0.2 mm	
				HPF-D032	Approx. 0.2 mm	
				HPF-D035	Approx. 0.2 mm	
	−30 to +70 °C Shape A	Approx. 0.2 mm • Spot dia. image	7.0 mm ± 0.5 mm	HPF-D034	Approx. 0.2 mm	HPF-LU01
				HPF-D010	Approx. 0.4 mm	
				HPF-D032	Approx. 0.4 mm	
				HPF-D035	Approx. 0.4 mm	
	−30 to +70 °C Shape B	Approx. 1.0 mm ● Spot dia. image	19 mm ± 1.0 mm	HPF-D034	Approx. 1.0 mm	HPF-LU02
				HPF-D010	Approx. 2.0 mm	
				HPF-D032	Approx. 2.0 mm	
				HPF-D035	Approx. 2.0 mm	
	−30 to +70 °C Shape C	Approx. 1.0 mm ● Spot dia. image	33 mm ± 2.0 mm	HPF-D038	Approx. 1.0 mm	HPF-LU08

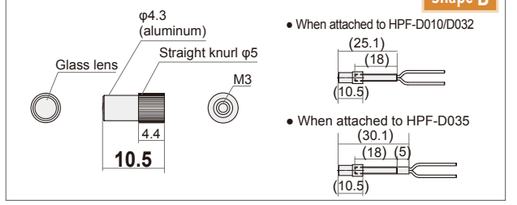
Outer dimensions (differs according to the model)

Unit: mm

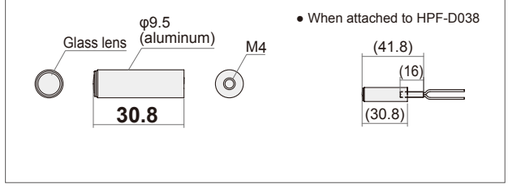
HPF-LU01
HPF-LU07
Shape A



HPF-LU02
Shape B

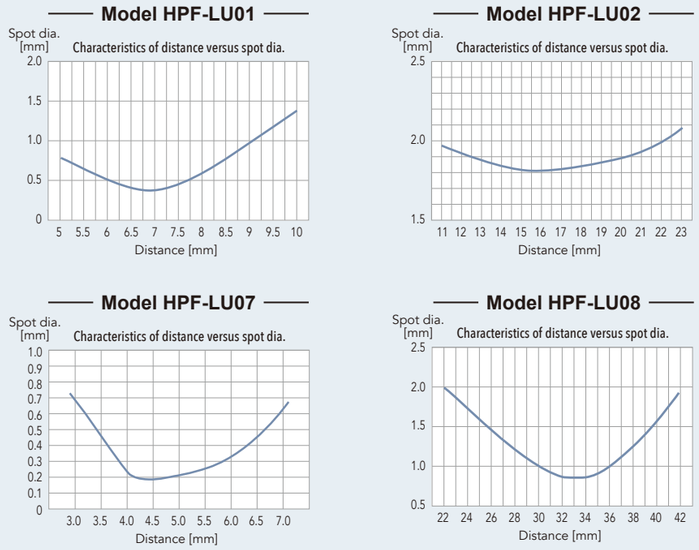


HPF-LU08
Shape C



CHART

Characteristics of distance versus spot dia. (typical example)



*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 %.)

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.

Problems due to scratches on the lens are greatly reduced.

Micro-spot lenses are 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.

Lens Units < Long-Distance Lens / Side View Unit >

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

■ Long-distance lens

■ Side view

Related pages

For combined fiber units:

P.09 (Screw)
P.13 (Cylindrical)
P.27 (Heatproof)
P.31 (Vacuum-proof)

For use with thru scan

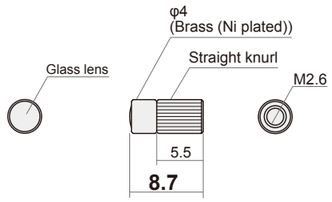
Type	Shape	Scaling	Directional angle (half angle)	Fiber unit: Model No.	Fiber unit: Element type	Scanning distance (mm): HPX-EG00/01 nL	Scanning distance (mm): HPX-EG50/51 HP	Model No.
Long-distance lens	−40 to +200 °C (Two units) Shape A	×6	3°	HPF-T003	Standard	2,460	5,640	FE-PA-L1
				HPF-T018	Heatproof	1,260	2,880	
				HPF-T025	Unbreakable	1,860	4,200	
	−40 to +350 °C (Two units) Shape B	×10	3°	HPF-T003	Standard	4,100	9,400	HPF-VL06
				HPF-T014	Heatproof	2,200	5,100	
				HPF-T025	Unbreakable	3,100	7,000	
Side view	−40 to +200 °C (Two units) Shape C	–	10°	HPF-T003	Standard	410	940	FE-PA-S1
				HPF-T018	Heatproof	210	480	
				HPF-T025	Unbreakable	310	700	
	−40 to +350 °C (Two units) Shape D	–	8°	HPF-T003	Standard	410	940	HPF-VL05
				HPF-T014	Heatproof	210	480	
				HPF-T025	Unbreakable	310	700	

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-EG50/50, the scanning distance shown is for HP mode (response time: 5 ms).
For HPX-EG00/01, 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.

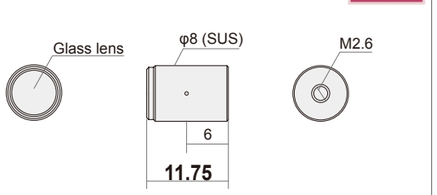
Outer dimensions (differs according to the model)

Unit: mm

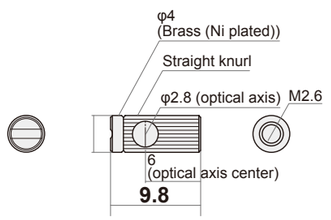
FE-PA-L1 Shape A



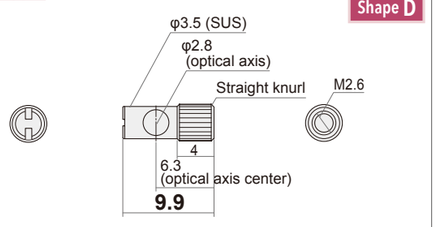
HPF-VL06 Shape B



FE-PA-S1 Shape C



HPF-VL05 Shape D



Other Accessories

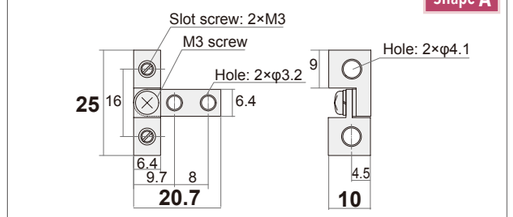
• Use in combination with various fiber units.

Product name	Shape	Description	Other specifications	Model No.
Angle adjustment bracket	 Shape A	Use with a thru-scan fiber unit to limit reflection, or use as side view type brackets.	Used for M4 and M3 heads, φ4 and φ3	HPX-PA06
Fiber-optic extender	 Shape B	Use to extend fibers by linking them. For scanning range see p.48.	Cable length: 5 m Cuttable Bend radius: 4 mm	HPF-EU05
			Cable length: 10 m Cuttable Bend radius: 4 mm	HPF-EU10
Small-diameter attachments (2)		Use in combination with small-dia. fiber units (supplied with applicable fiber units).	For fiber units with dia. of φ1.0	HPF-AT10
			For fiber units with dia. of φ1.3	HPF-AT13
Fiber cutter		Use to cut fiber units (supplied with applicable fiber units).	Used for cuttable fiber units.	FE-PA-F1

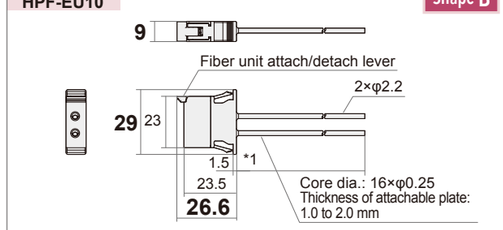
Outer dimensions (differs according to the model)

Unit: mm

HPX-PA06 Shape A



HPF-EU05
HPF-EU10 Shape B

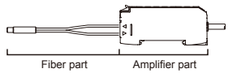


Model No.	Cable length*1
HPF-EU05	5,000 mm min.
HPF-EU10	10,000 mm min.

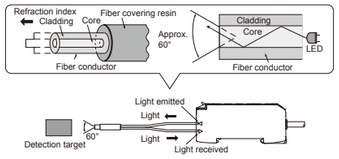
Technical Guide

Detection Method

Optical fiber sensor



An optical fiber is composed of a central core and circumferential cladding with a low refractive index. 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

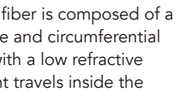
	Stationary bend type (multi-core)	Standard type (single core)	Bend-tolerant type (bundle)
Cross-section			
Structure	 (The inner elements are grouped into one.)		 (The internal elements are not attached to each other.)
Features	•Bending causes only a small variation in the light level. •Allowable bend radius: 1 or 2 mm	•Good light transmission efficiency (relatively long scanning distance) •Allowable bend radius: 10 or 20 mm	•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: •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 breaks 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

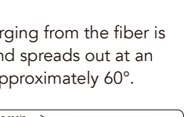
Attach the amplifier unit to the dedicated bracket (model HPX-PA04, supplied or sold separately) or to the DIN rail.

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 (model 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.

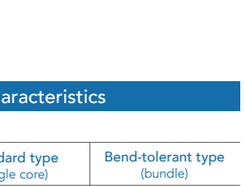


Expansion unit attachment to the main unit for reduced-wiring models (model HPX-EG)

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 (model HPX-PA03, sold separately) to hold the expansion units in place. To remove expansion units, slide off one by one.

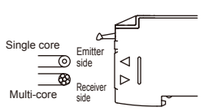
Attaching the fiber unit to an amplifier

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 attach 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 bend attach 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.

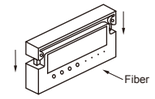
Scanning distances and display readouts may differ depending on variations in individual unit characteristics, installation states and fiber unit types.

Cutting of fibers

To cut optical 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 desired 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.



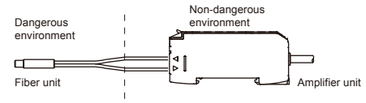
- The scanning distance may be reduced approximately 20% depending on how the fiber is inserted into the amplifier unit and how the fiber is cut.
- For specifications, usage notes and other information for the fiber unit, see the product specifications.

⚠ Caution

Never disassemble the cutter. The blade may cause injury.

Use in explosive atmospheres

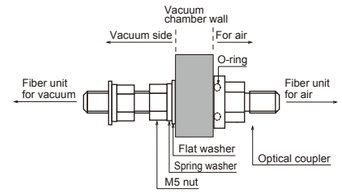
Generally, the fiber unit is structured only to transmit light and so cannot cause electrical explosions or ignite fires. Therefore, the fiber and amplifier units can be used with the fiber unit placed in a dangerous place, and the amplifier unit in a non-dangerous place. Nevertheless, check the explosion-proof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



Cautions (type specific)

Vacuum fiber

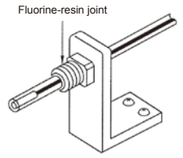
- **Vacuum fiber model HPF-V**
  The flange, vacuum-side fiber unit, and the lens unit are cleaned with IPA, but baking treatment etc. should be carried out before use.
- **Cautions for attaching the optical coupler**
  The optical coupler uses an O-ring as shown below. Do not weld it to the vacuum chamber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



Attachable plate thickness: 8 to 10 mm
Recommended mounting hole: 5 dia.$^{+0.2}_{-0.1}$ mm
Recommended surface roughness for O-ring's contact area: 1.6 Ry

Chemical proof

- When installing the unit, use a 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 the 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.



Technical Guide

PFA Chemical-Proof Characteristics

Substance		PFA use
Heavy oils A/B/C		OK
Aniline	$C_6H_5NH_2$	OK
Acrylonitrile	C_2H_3CN	OK
Asphalt		OK
Acetone	$(CH_3)_2CO$	OK
Methanol	CH_3OH	OK
Ammonia	NH_3	OK
Isooctane	$i\text{-}C_8H_{18}$	OK
Isobutyl alcohol	$i\text{-}C_4H_9OH$	OK
Isobutyl methyl ketone	$C_4H_9COCH_3$	OK
Ethanol	C_2H_5OH	OK
Ether	$(CH_3)_2O$	OK
Ethylene glycol	$C_2H_4(OH)_2$	OK
Enamel paint		OK
Ammonium chloride	NH_4Cl	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_3CO0H	OK
Dilute nitric acid	HNO_3	OK
Dilute sulfuric acid	H_2SO_4	OK
Citric acid	$C_3H_4(OH)(COOH)_3$	OK
Glycerin	$C_3H_5(OH)_3$	OK
Cresol	$C_6H_4(OH)(CH_3)$	OK
Chloroform	CH_3Cl	OK

Substance		PFA use
Light oil		OK
Paraffinum liquidum		OK
Sodium dichromate	$Na_2Cr_2O_7$	OK
Barium nitrate	$Ba(NO_3)_2$	OK
Silicone oil		OK
Plant oil		OK
Thinner		OK
Barium hydroxide	$Ba(OH)_2$	OK
Phenol	C_6H_5OH	OK
Turbine oil		OK
Sodium carbonate	Na_2CO_3	OK
Turpentine		OK
Natural volatile oil		OK
Kerosine petroleum		OK
Trichloroethane	$C_2H_3Cl_3$	OK
Trichlorethylene	C_2HCl_3	OK
Toluene	$C_6H_5CH_3$	OK
Naphtha	C_7H_{16}	OK
Acidum lacticum		OK
Nitrobenzene	$C_6H_5NO_2$	OK
Hydrofluoric acid (hydrogen fluoride)	HF	*
Ferrosilicon		OK
Freon 11	CCl_3F	OK
Propyl alcohol	$C_3H_5(OH)_3$	OK
Propylene glycol	$C_3H_2(OH)_2$	OK
Benzene	C_6H_6	OK
Methyl violet		OK
Water	H_2O	OK
Carbon tetrachloride	CCl_4	OK
Ammonium sulfate	$(NH_4)_2SO_4$	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.

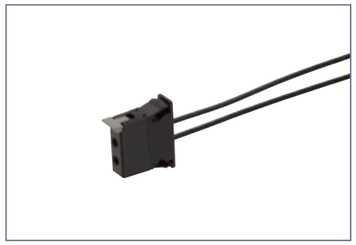
■Standard fiber element

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
φ0.25	4 mm	100%	62%	28%	12%	Unavailable	Unavailable	Unavailable
φ0.5	1 mm	100%	66%	33%	17%	Unavailable	Unavailable	Unavailable
	15 mm	100%	85%	64%	49%	37%	28%	21%
φ0.75	15 mm	100%	85%	64%	49%	37%	28%	21%
φ1	2 mm	100%	76%	48%	30%	19%	12%	Unavailable
	5 mm	100%	50%	16%	Unavailable	Unavailable	Unavailable	Unavailable
	20 mm	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 in Combination with Fiber Extender (typical values)



Thru scan

Type	Model No.	Scanning distance and cable length when combined with fiber extender: HPX-EG50/51 (HP mode: 5 ms in response time)*1		
		No extender	HPF-EU05 (5 m)	HPF-EU10 (10 m)
Standard fiber 	**HPF-T003** Related pages P.09	940 mm Cable length: 2 m	230 mm Cable length: 7 m	90 mm Cable length: 12 m
Heatproof 	**HPF-T018** Related pages P.27	480 mm Cable length: 1 m	100 mm Cable length: 6 m	43 mm Cable length: 11 m
Area 	**HPF-T021T** Related pages P.25	2800 mm Cable length: 2 m	620 mm Cable length: 7 m	160 mm Cable length: 12 m
Unbreakable fiber 	**HPF-T024** Related pages P.09	110 mm Cable length: 2 m	10 mm Cable length: 7 m	2 mm Cable length: 12 m

Diffuse scan

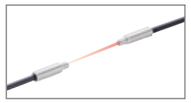
Type	Model No.	Scanning distance and cable length when combined with fiber extender: HPX-EG50/51 (HP mode: 5 ms in response time)*1		
		No extender	HPF-EU05 (5 m)	HPF-EU10 (10 m)
Standard fiber 	**HPF-D002** Related pages P.13	350 mm Cable length: 2 m	65 mm Cable length: 7 m	27 mm Cable length: 12 m
Heatproof 	**HPF-D015** Related pages P.27	160 mm Cable length: 2 m	31 mm Cable length: 7 m	12 mm Cable length: 12 m
Unbreakable fiber 	**HPF-D029** Related pages P.11	22 mm Cable length: 2 m	3 mm Cable length: 7 m	1mm Cable length: 12 m
Contact type liquid level 	**HPF-D027** Related pages P.33	Available Cable length: 2 m	Available Cable length: 7 m	Unavailable Cable length: 12 m

*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.

Technical Guide

List of scanning Distance by Amplifier Model

Thru scan



(mm)

Amp	Model HPX-EG00/01			Model HPX-EG50/51			Page
Model No.	nL	SF	Ft	HP	nL	Ft	
HPF-T001	770	650	450	1700	1400	630	09
HPF-T002	770	650	450	1700	1400	630	13
HPF-T003	410	350	240	940	800	350	09
HPF-T004	410	350	240	940	800	350	13
HPF-T005	410	350	240	940	800	350	17
HPF-T006	410	350	240	940	800	350	17
HPF-T007	55	48	33	120	110	48	19
HPF-T008	60	50	38	140	120	50	09
HPF-T009	60	50	38	140	120	50	13
HPF-T010	300	250	170	660	570	240	09
HPF-T012	240	200	140	540	460	200	27
HPF-T014	220	190	130	510	440	190	27
HPF-T015	12	10	7	29	25	10	17
HPF-T017	410	350	240	940	800	350	27
HPF-T018	210	180	120	480	410	170	27
HPF-T019	1400	1200	840	3200	2700	1200	21
HPF-T020	1500	1300	920	3500	3000	1300	21
HPF-T021	270	220	160	610	520	220	25
HPF-T021S	1100	960	670	2700	2300	1000	25
HPF-T021T	1200	1000	710	2800	2400	1000	25
HPF-T021WT	2000	1600	1100	4800	4100	1700	25
HPF-T023	1200	1000	730	2800	2400	1000	21
HPF-T024	50	42	29	110	95	41	09
HPF-T025	310	260	180	700	600	260	09
HPF-T025B	310	260	180	700	600	260	09
HPF-T026	20	16	11	41	35	15	19
HPF-T028	50	42	29	110	95	41	23
HPF-T029	1500	1200	880	3500	3000	1300	29
HPF-T029E	280	230	160	640	550	240	29
HPF-T031	310	260	180	700	600	260	13
HPF-T033	280	240	160	700	600	260	09
HPF-T035	350	300	210	810	690	300	29
HPF-T036	6	5	3	14	12	5	13
HPF-T037	20	16	11	41	35	15	19
HPF-T038	12	10	7	29	25	10	13
HPF-T039	6	5	3	14	12	5	17
HPF-T042	220	190	130	510	440	190	19
HPF-T043	100	80	55	230	200	85	13
HPF-T044	220	190	130	520	450	190	09
HPF-T046	60	50	38	140	120	50	13
HPF-T054-I05	6	6	6	6	6	6	23

Diffuse scan

(mm)

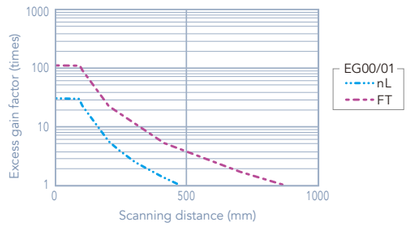
Amp	Model HPX-EG00/01			Model HPX-EG50/51			Page
Model No.	nL	SF	Ft	HP	nL	Ft	
HPF-D001	210	180	120	470	400	170	11
HPF-D002	150	130	90	350	300	130	11
HPF-D003	150	130	90	350	300	130	17
HPF-D004	43	36	25	90	80	35	11
HPF-D005	43	36	25	90	80	35	13
HPF-D006	43	36	25	90	80	35	17
HPF-D009	150	130	90	350	300	130	15
HPF-D010	35	30	21	75	65	28	15
HPF-D011	17	14	10	35	30	13	19
HPF-D012	100	80	55	220	190	80	11
HPF-D013	100	80	55	190	190	85	27
HPF-D014	50	50	50	50	50	50	29
HPF-D015	85	70	50	160	160	75	27
HPF-D018	75	65	46	170	150	65	11
HPF-D019	8	7	5	18	16	7	17
HPF-D021	35	30	21	75	65	28	17
HPF-D022	150	130	90	350	300	130	27
HPF-D025	20	20	20	20	20	20	21
HPF-D026	100	90	60	230	200	85	25
HPF-D028	2.5±0.5	2.5±0.5	—	2.5±0.5	2.5±0.5	2.5±0.5	24
HPF-D028F	5.2±1.0	—	—	5.2±1.6	5.2±1.6	—	24
HPF-D028T	7.4±1.2	—	—	7.4±1.6	7.4±1.6	—	24
HPF-D029	10	8	5	22	19	8	11
HPF-D030	85	70	50	180	160	70	11
HPF-D032	18	15	10	41	35	15	15
HPF-D032B	18	15	10	41	35	15	15
HPF-D034	25	21	15	50	45	19	15
HPF-D035	50	42	29	95	95	43	15
HPF-D036	8	7	5	17	15	6	13
HPF-D037	8	7	5	17	15	6	11
HPF-D038	50	42	29	95	95	43	15
HPF-D039	8	7	5	18	16	7	17
HPF-D041	17	14	10	35	30	13	19
HPF-D042	35	30	21	75	65	28	15
HPF-D043	65	55	40	140	120	50	19
HPF-D045LF	37	31	21	80	70	30	23
HPF-D049	60	55	38	150	120	55	15

Characteristic diagrams (typical examples)

Excess gain

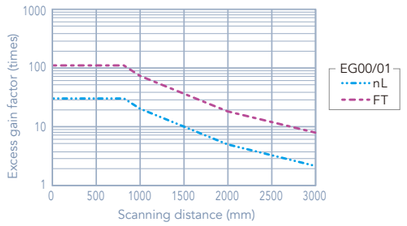
HPF-T003

Related pages P.09



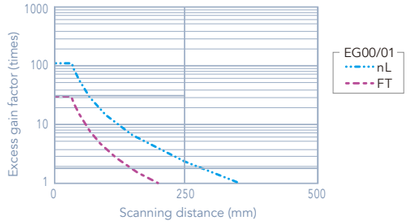
HPF-T003/ FE-PA-L1

Related pages P.09 P.41



HPF-D002

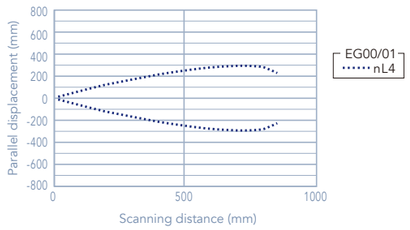
Related pages P.11



Parallel displacement

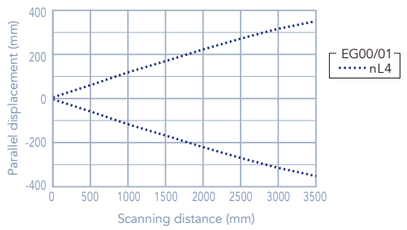
HPF-T003

Related pages P.09



HPF-T003/ FE-PA-L1

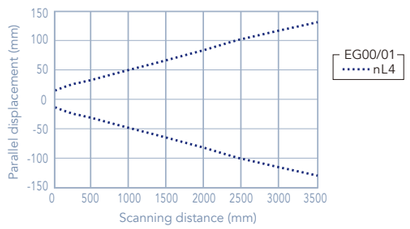
Related pages P.09 P.41



HPF-T021T

(Right and left detection)

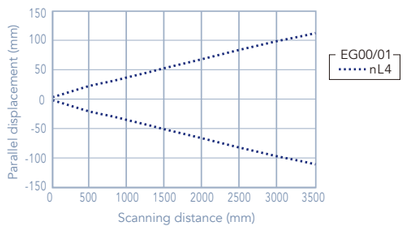
Related pages P.25



HPF-T021T

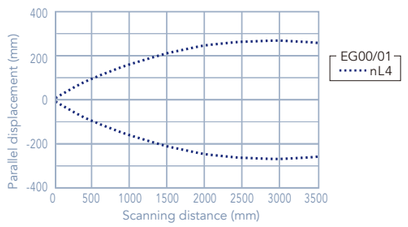
(Up and down detection)

Related pages P.25



HPF-T029

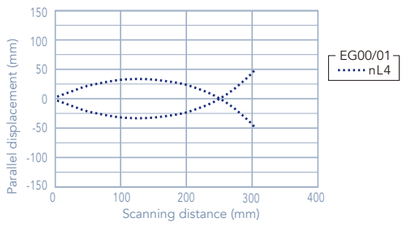
Related pages P.29



Detection area characteristics

HPF-D002

Related pages P.11



HPF-D025

Related pages P.21