



SENSORS & FIBERS

WET PROCESS

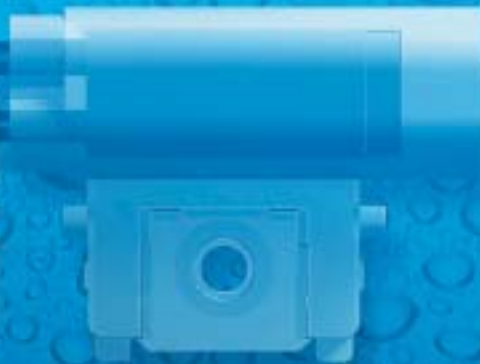
PRODUCTS

Fiber-optic liquid leak detectors

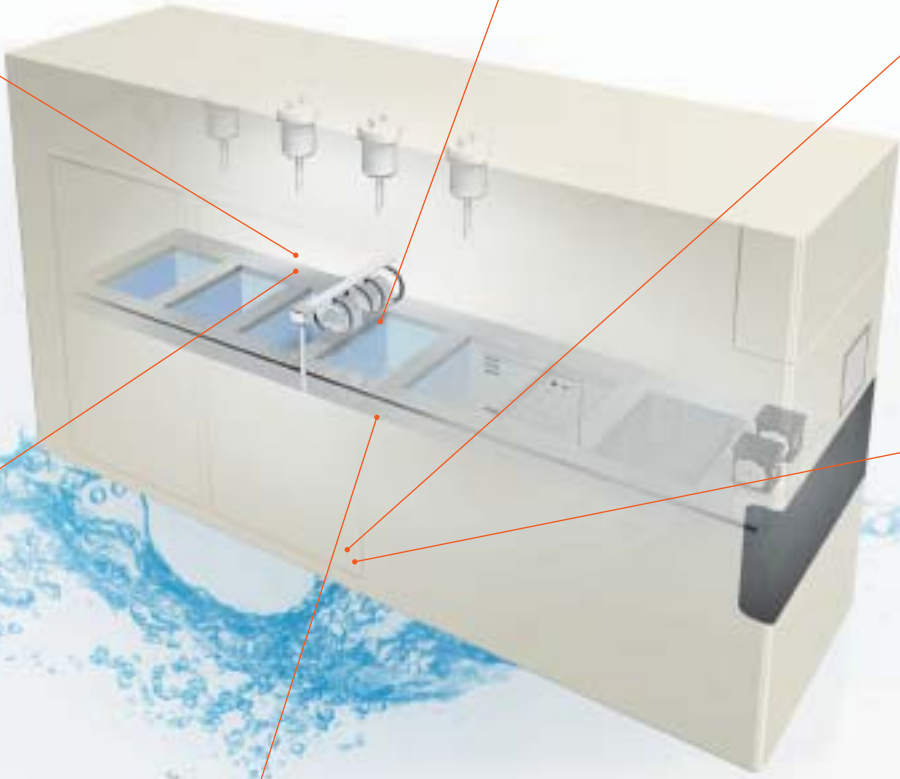
Pipe-mounted fiber-optic liquid-level sensors

Tank-level fiber-optic cables

Chemical-proof fiber-optic cables



A wide variety of options for liquid detection



▶ Pipe-mounted fiber-optic cable liquid-level sensors



HPF-TO34 HPF-TO32

Inherently safe product

Pipe dia. 8 to 19mm T034	Pipe dia. 3 to 13mm T032
--------------------------------	--------------------------------

PFA protection Cable

R4 5m
Cut to length

Array of 16 optical axes prevents error due to water droplets and air bubbles!

Details on page 4

▶ Pipe-mounted liquid-level sensors with self-contained amplifier



HPQ-T

LO selectable DO

CE

Liquid-level detection without adjustment!

Details on page 6

▶ Tank-level fiber-optic cables

HPF-DO27/DO33



Inherently safe product

PFA protection Cable

R40/30 5m
Cut to length

Tip structure prevents liquid cling, for reliable detection!

Details on page 7

▶ Chemical-proof fiber-optic cables HPF-TO29/TO35/DO14



Inherently safe product

PFA protection Cable

R20 2m
Cut to length

Minimum bend radius of 20mm (R20) for easy running of cables!

Details on page 10

▶ Liquid leak detectors with self-contained amplifier HPQ-D



NO/NC NPN/PNP

CE

PFA protection Case | Cable

For leaks of acids and alkaline chemicals!

Details on page 8

▶ Liquid leak fiber-optic detector HPF-DO40



Inherently safe product

PFA protection Case | Cable

R20 5m
Cut to length

For leaks of organic solvents like IPA!

Details on page 8

Other contents	Page
Fiber-optic amplifiers	11
Handling precautions	12
Chemical resistance of PFA	13

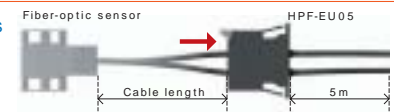
Note: Contact Yamatake Corporation for applications in explosive atmospheres.



“Extension cord” for fiber-optic cables

R4 5m
Cut to length

Cables can be extended 5m using the HPF-EU05 fiber-optic extender, sold separately.

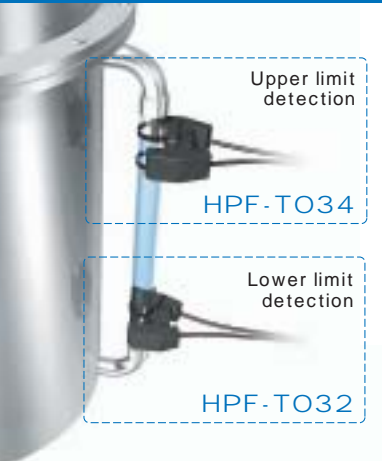


Pipe-mounted fiber-optic cable liquid-level sensors



HPF-T032 HPF-T034

Inherently safe product
 Pipe dia. 8 to 19mm T034
 Pipe dia. 3 to 13mm T032
 PFA protection Cable



Fail-safe detection uses 2 different sensing methods for detection of upper and lower limits of tank liquid level.

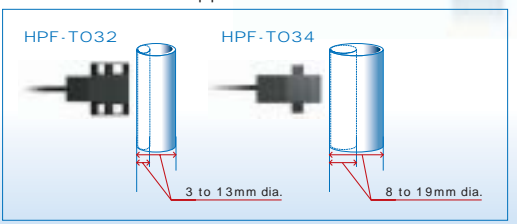
Array of 16 optical axes eliminates the effects of air bubbles and water droplets. Adverse effects from air bubbles and water droplets are reduced, resulting in reliable detection.



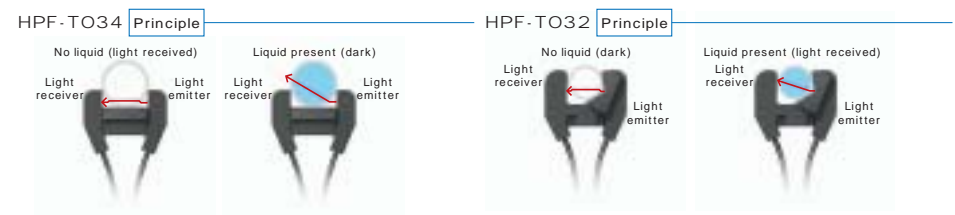
PFA-jacketed fiber
 Run fiber-optic cables through machines and equipment safely, thanks to complete protection by chemical-resistant resin.

Location of the optical axes is clearly marked. Recognize at a glance where the array of optical axes is located.

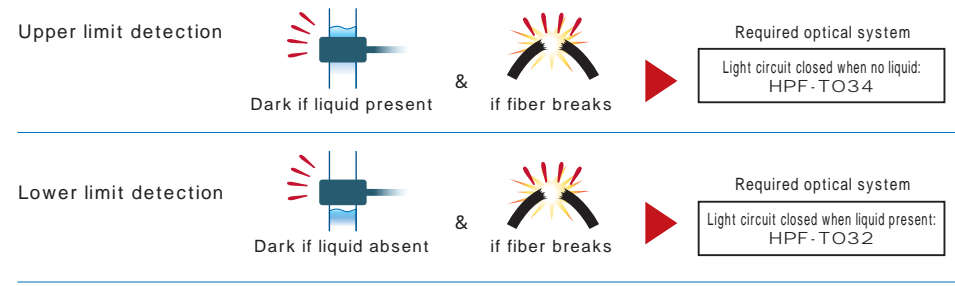
Usable with a wide range of pipe diameters. Suitable for 3 to 19mm dia. pipes



Refraction-based sensing ensures reliable operation.



Fail-safe concept for pipe-mounted liquid-level sensors



Catalog Listing

Model	Shape	Pipe diameters	Features	Bend radius	Catalog listing
Liquid level detection		3 to 13mm	Receives light when liquid present	5m Cut to length	R4
		8 to 19mm	Receives light when liquid absent		

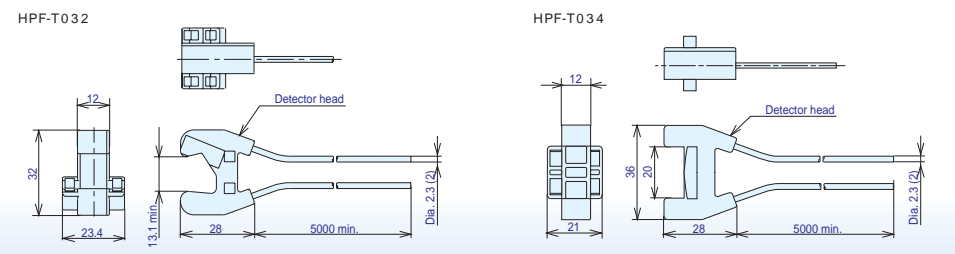
Specifications

Catalog listing	HPF-T032	HPF-T034
Detection method	Thru scan	
Applicable amplifier	HPX-NT_ (ultra long-distance mode, standard mode) / HPX-T_ / HPX-ETS / HPX-H_	
Applicable pipe	PFA transparent pipe, 1mm thick	
Standard target liquid	Water*	
Operating temperature	-30 to +70	
Material	Body: Polyester imide. Fiber: Polyethylene (PFA coating)	

*In some cases operation may not be reliable due to type of pipe, degree of liquid transparency, or liquid refractive properties. Be sure to confirm operation before actual use.

External Dimensions

(Unit: mm)



Pipe-mounted liquid-level sensors with self-contained amplifier



HPQ-T Series



Liquid is easily detected using a pipe-mounted sensor.

Operation panel is located on the side.

Indicator and operation selector switch are located on the side. Even when sensors are gang-mounted, adjustment while checking the indicator is easy.

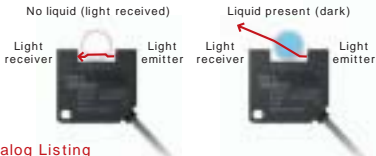
Stable detection

Refractive detection ensures sufficient gain between light-ON and dark ON light levels. This sensor is also suitable for liquids with poor light transmission (such as resist liquid and waste fluid).

Suitable for various pipe diameters

Made for pipe diameters from 8 to 13mm (1mm thick). Mount with a cable tie or M3 screw.

Principle



One model can detect both upper limit and lower limit.

Note: For pipe diameters of less than 8mm contact Yamatake Corporation, as adjustable sensitivity sensors are also available.

Catalog Listing

Detection method	Pipe diameter	Output mode	Catalog listing
Pipe-mounted liquid-level detection	8 to 13mm	Open collector NPN transistor	HPQ-T1
	1/8" or 1/4"		HPQ-T1-0.0.4
	8 to 13mm	Open collector PNP transistor	HPQ-T2
	1/8" or 1/4"		HPQ-T2-0.0.5

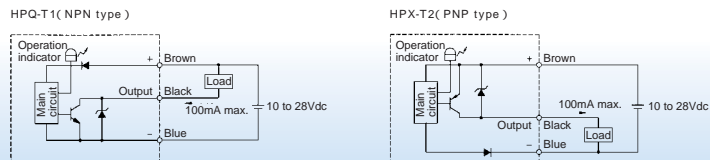
Note: Cord is 2m long.

Specifications

Catalog listing	HPQ-T1, HPQ-T1-0.0.4	HPQ-T2, HPQ-T2-0.0.5
Power supply voltage	10 to 28Vdc (ripple voltage 10% max.)	
Current consumption	25mA max.	
Applicable pipe types	PFA transparent pipe, 1mm thick	
Applicable medium	Transparent or opaque liquids	
Repetitive detection positional accuracy	1mm max.	
Operation mode	Light ON (L-ON) or dark ON (D-ON), selectable by switch Liquid detection: dark. Liquid non-detection: light	
Output mode	NPN transistor output, open collector	PNP transistor output, open collector
Control	Switching current: 100mA max. (resistive load)	
output	Output diodes strength: 30V	
	Voltage drop: 1V max. (at 100mA switching current)	
Response time	2ms max. (for operation and release)	
Light emitter	Red LED (peak emission wavelength 950nm)	
Indicator	Operation indicator: red (lit when output ON)	
Ambient light immunity	1,000 lux max. (incandescent lamp)	
Operating temperature range	-10 to +55	
Operating humidity range	35 to 85% (no condensation allowed)	
Sealing	IP50 (IEC 529)	
Circuit protection	Built-in reverse connection protection circuit, malfunction prevention circuit at power ON (approx. 20ms), output short-circuit protection	

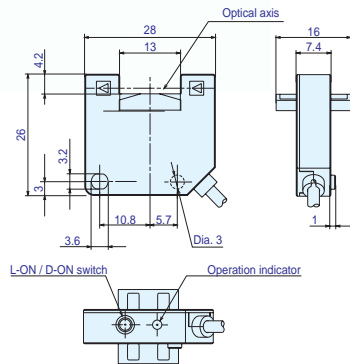
Note: Cord is 2m long.

Output Circuit Diagram



External Dimensions

(Unit: mm)



Tank-level fiber-optic cables



HPF-D027/D033 Series



All-resin structure ensures no metal contamination.

The HPF-D027 and -D033 are both made of PFA tubing with no metal parts, even inside.

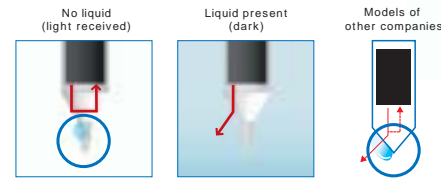
Heat-resistant to 105

R30 5mm Cut to length

4mm diameter allows easy running of cables.

The HPF-D033 uses space-saving 4mm dia. PFA tubing, making it easy to run fiber-optic cables. Note: The HPF-D027 uses 6mm dia. PFA tube.

Principle



Reliable detection by preventing liquid cling!

Proprietary tip structure prevents liquid from clinging to the tip, eliminating a cause of faulty operation.

Catalog Listing

Model	Shape	Features	Bend radius	Catalog listing	
Liquid level detection 6mm dia. type		Contact type Liquid cling prevention Heat-resistant to 105	Cut to length	R25/R40	HPF-D027
Liquid level detection 4mm dia. type			Cut to length	R15/R30	HPF-D033

Note: Fiber cables can be cut to the desired length.

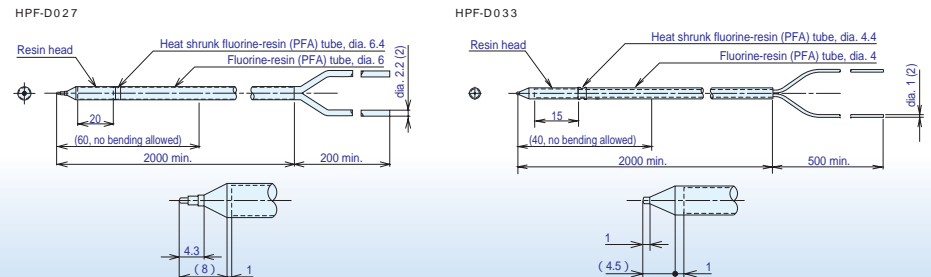
Specifications

Catalog listing	HPF-D027	HPF-D033
Detection method	Diffuse scan (liquid contacting type)	
Applicable amplifier	NPX-NT_ (long-distance mode) / HPX-T_ / HPX-ETS / HPX-H_	
Repetitive detection positional accuracy	1mm max. (water)	
Standard target liquid	Water*	
Pressure resistance	-49 to +490kPa	
Operating temperature range	-30 to +105	
Material	Polyethylene (PFA coating)	

*Detection may not be possible for some liquid colors and viscosities.

External Dimensions

(Unit: mm)

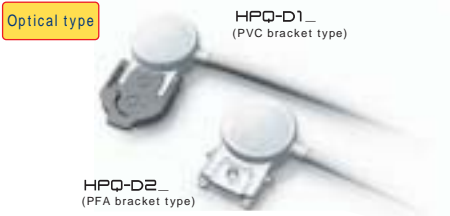


Liquid leak detectors with self-contained amplifier /
Liquid leak fiber-optic detector



HPQ-D Series

Built-in amplifier, liquid absorbing paper not needed, usable with various liquids.



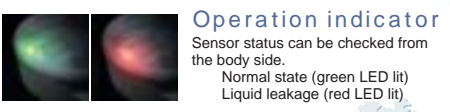
Acids or alkaline liquids, IPA (isopropyl alcohol), pure water, Fluorinert, Galden, etc.

Notes: For explosion-proof applications, be sure to select a suitable fiber type. Fluorinert and Galden are registered trademarks of 3M and Solvay Solexis respectively.

Body and cable are protected by PFA. PVC brackets are available for acidic or alkaline liquids. PFA (partially SUS) brackets are available for organic solvents.

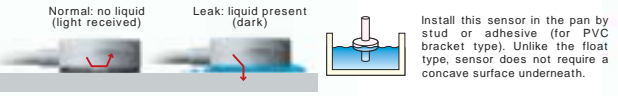
Easy maintenance

After leak detection, simply wipe the detector surface—a much easier process than with detection tape or a liquid-absorbing model.



Suitable for export equipment
CE marking, UL certified.
Wide variety of output modes and types are available.
NO/NC output NPN/PNP output

Principle



HPF-D040 Series

Body and cable are protected by PFA

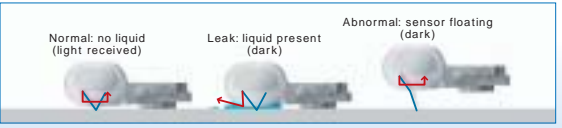
Sensor can be used even in environments like IPA and other organic solvents.
Note: SUS is partially used for bracket.

Saves space

Sensor head is only 9.9mm high.



Principle



	HPQ-D Series	HPF-D040 Series													
Catalog Listing	Body	Type / Shape													
	Detection method	Specifications / Catalog listing													
	Optical refraction system	NC, NPN, PVC bracket type	HPQ-D 1.1												
		NC, PNP, PVC bracket type	HPQ-D 1.2												
		NC, NPN, PFA bracket type	HPQ-D 2.1												
		NC, PNP, PFA bracket type	HPQ-D 2.2												
NO, NPN, PVC bracket type	HPQ-D 1.3														
NO, NPN, PFA bracket type	HPQ-D 2.3														
Accessory	Specifications / Catalog listing	Features / Bend radius / Catalog listing													
	PVC bracket (10 units)	HPQ-B 0 1													
	PFA bracket (10 units)	HPQ-B 0 2													
Notes: For HPQ-D11/12/21 models, a sensor with 5m cable (2m PFA tube) is also available, specially produced for the U.S. market (-L05). Normally open type: no UL certification. Some UL-certified models are available. For details, contact Yamatake Corporation.		<table border="1"> <tr> <td>5m Cut to length</td> <td>R20</td> <td>HPF-D 0 4 0</td> </tr> </table>	5m Cut to length	R20	HPF-D 0 4 0										
5m Cut to length	R20	HPF-D 0 4 0													
Specifications	Catalog Listing	HPQ-D_1	HPQ-D_2												
	Power supply voltage	12 to 24Vdc (ripple voltage 10% max.)													
	Current consumption	30mA max.													
	Mounting face	Polyvinyl chloride plate, stainless steel plate, etc. (see note 1)													
	Standard target liquid	Water (see note 2)													
	Operation mode	Normal state: ON. State upon leak detection: OFF													
	Output mode	NPN transistor output, open collector / PNP transistor output, open collector													
	Control	Switching current: 50mA max. (resistive load)													
	output	Output diodes strength: 30V, with an output short-circuit protection circuit													
	output	Voltage drop: 1V max. (at 50mA switching current)													
	Light emitter	Infrared LED													
	Indicator	Green light ON in normal state. Orange light ON when leak detected.													
Operating temperature range	-25 to +50														
Operating humidity range	35 to 85% RH (no condensation allowed)														
Sealing	IP67 (IEC standard)														
Circuit protection	Built-in reverse connection protection circuit, malfunction prevention circuit at power ON (approx. 20ms).														
Material	Body: PFA. Cable: PFA coating. Bracket: PVC or PFA (SUS).														
Notes: 1. Operation may be unstable with some mounting surface colors or conditions. 2. If the target liquid is other than the one specified, verify the device's operation or contact Yamatake Corporation in advance.		<table border="1"> <tr> <td>Catalog listing</td> <td>HPF-D 0 4 0</td> </tr> <tr> <td>Detection method</td> <td>Diffuse scan (contact type)</td> </tr> <tr> <td>Applicable amplifier</td> <td>HPX-ET_ / HPX-NT_</td> </tr> <tr> <td>Standard target liquid</td> <td>IPA (isopropyl alcohol)</td> </tr> <tr> <td>Operating temperature range</td> <td>-30 to +70</td> </tr> <tr> <td>Material</td> <td>Body: PFA. Cable: polyethylene (PFA coating). Bracket: PFA (SUS).</td> </tr> </table>		Catalog listing	HPF-D 0 4 0	Detection method	Diffuse scan (contact type)	Applicable amplifier	HPX-ET_ / HPX-NT_	Standard target liquid	IPA (isopropyl alcohol)	Operating temperature range	-30 to +70	Material	Body: PFA. Cable: polyethylene (PFA coating). Bracket: PFA (SUS).
Catalog listing	HPF-D 0 4 0														
Detection method	Diffuse scan (contact type)														
Applicable amplifier	HPX-ET_ / HPX-NT_														
Standard target liquid	IPA (isopropyl alcohol)														
Operating temperature range	-30 to +70														
Material	Body: PFA. Cable: polyethylene (PFA coating). Bracket: PFA (SUS).														
External Dimensions and Wiring Diagrams	<p>HPQ-D1 External Dimensions (Unit: mm)</p>	<p>HPF-D040 External Dimensions (Unit: mm)</p>													
	<p>HPQ-D2 External Dimensions (Unit: mm)</p>	<p>HPQ-D_1 (NPN type) Wiring Diagrams</p> <p>HPQ-D_2 (PNP type) Wiring Diagrams</p>													

Chemical-proof fiber-optic cables



HPF-T029/T035/D014

Inherently safe product
PFA protection Cable



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



Bend radius of R20mm with 2.2mm tube diameter



Conventional model HPF-T029 HPF-T035

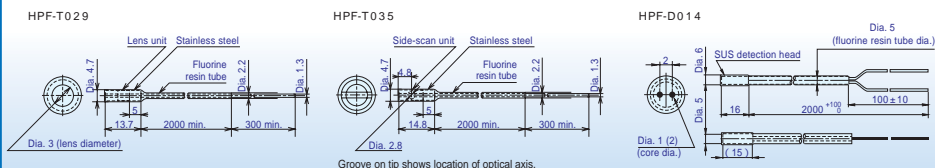
Catalog Listing

Model	Shape	Combination mode	Scanning distance (mm) (Note 1)		Features	Bend radius	Catalog listing
			nL	HP			
Thru scan Oil and chemical-proof Small diameter	4.7 mm dia.	HPX-NT	nL	3,000	Cut to length	R20	HPF-T029 (Note 2)
			HP	5,250			
			HS	600			
Thru scan Oil and chemical-proof Side view Small diameter	4.7 mm dia.	HPX-ET	nL	690	Cut to length	R20	HPF-T035 (Note 2)
			HP	1,200			
			HS	130			
Diffuse scan Oil and chemical-proof	6 mm dia.	HPX-NT	nL	130	Cut to length	R80	HPF-D014
			HP	220			
			HS	22			
		HPX-ET		50			

Notes: 1. Values indicate capability. Actual scanning distance is limited by fiber length (standard 2m x 2-4m).
2. HPF-T029/HPF-T035: Standard length is 2m. However, 5m type is also available. For details, contact Yamatake Corporation.

External Dimensions

(Unit: mm)



Fiber-optic amplifier

Patent pending

Configuration for fiber type is easy.

HPX-NT and ET amplifiers are recommended for use with fiber-optic sensors.

High function and high performance
HPX-NT

The HPX-NT can be tuned in the absence of liquid by an external input signal.



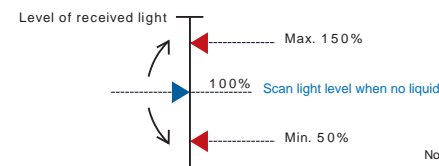
Gang-mounted distributed fiber-optic sensors
HPX-ET

The HPX-ET can tune gang-mounted units or 16 (max.) remotely connected units as one set, in the absence of liquid.



Set all at once

Tuning in the absence of liquid (Ph tuning)



A threshold can be determined without liquid. It will be set at the selected % point.

Note: Other tuning methods or adjustment functions can be used, depending on the application environment and equipment.

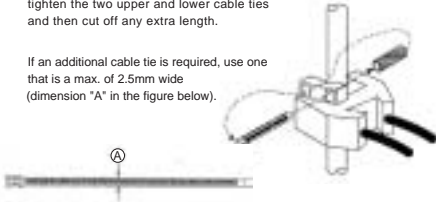
Handling precautions

HPF-T032/T034

Mounting method

As shown below, mount the fiber unit using the included cable ties and anti-slip tubes. Firmly tighten the two upper and lower cable ties and then cut off any extra length.

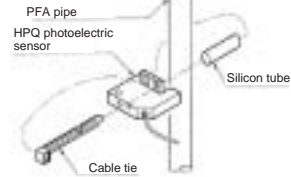
If an additional cable tie is required, use one that is a max. of 2.5mm wide (dimension "A" in the figure below).



HPQ-T

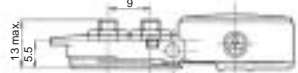
Mounting method

This photoelectric sensor is pipe-mounted using either an M3 screw or cable tie. When mounting the sensor with a cable tie, be sure to secure the sensor by passing the cable tie through the silicon tube to prevent the sensor from slipping.



HPQ-D

HPQ-D1



Mounting method

Mount the sensor horizontally. After locking the mounting base in position, insert the sensor body onto the mounting base and fix it in place by tilting down the locking clasp of the sensor.

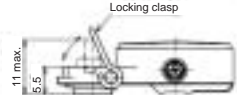
Fastening with screws

Remove the knock-out holes of the mounting base and place the sensor on two stainless steel (etc.) M4 stud bolts welded on the metal pan. Secure with two M4 nuts. For the PFA type, mount similarly with one M3 stud bolt.

Mounting with adhesives

The PVC bracket type can be mounted with adhesive. If the mounting surface is PVC (vinyl chloride), the same material as the bracket, the use of monomeric adhesives for vinyl chloride is recommended. However, be sure to check the specifications of the adhesive to be used, taking into consideration the material of the other mounting surfaces.

HPQ-D2



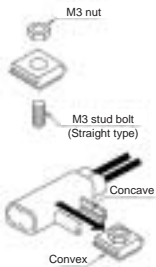
(Unit: mm)

HPF-D040

Mounting method

When using an SUS mounting base, insert the welded M3 stud bolt into the hole of the mounting base, and then fasten with an M3 nut (not supplied).

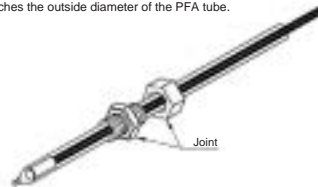
Put the ridges of the dedicated mounting base into the grooves of the fiber-optic sensor, and then slide the base forward until it is in place.



HPF-D027/D033

Mounting method

To install the fiber-optic sensor, use a commercially available fluorine-resin joint that matches the outside diameter of the PFA tube.

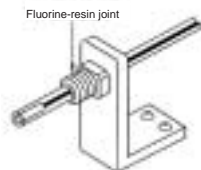


HPF-T029/T035/D014

Mounting method

To install the fiber-optic sensor, 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 more than the minimum bend radius specified for each fiber unit. If it is less than the minimum bend radius, it may damage the fiber unit.



Combination with the HPF-EU05 (5m extender), applicability by amplifier

Catalog	Total combined distance	HPX-NT		HPX-ET	HPX-H	HPX-A	Description	
		nL	HP					
HPF-T032	10m	OK	OK	NG	OK	NG	Detection may not be possible depending on the chemical nature of the liquid. Be sure to check operation before actual use.	
HPF-D040	10m	OK	OK	OK	OK	NG		
HPF-D027	7m	OK	OK	NG	OK	NG		
HPF-D033	7m	OK	OK	NG	NG	NG		
HPF-T029	7m	Approx. 1/4 distance decrease						Use the decrease amount as a rough guideline only.
HPF-T035	7m	Approx. 1/4 distance decrease						
HPF-T014	7m	Approx. 1/4 distance decrease						

Chemical resistance of PFA (fluorocarbon polymer)

Substance		PFA	Substance		PFA
Acetone	(CH ₃) ₂ CO		Gasoline		
Acrylonitrile	C ₂ H ₃ CN		Glycerin	C ₃ H ₅ (OH) ₃	
Ammonia	NH ₃		Heavy oil A, B, C		
Ammonium chloride	NH ₄ Cl		Isobutyl alcohol	i-C ₄ H ₉ OH	
Ammonium sulfate	(NH ₄) ₂ SO ₄		Isobutyl methyl ketone	C ₄ H ₉ COCH ₃	
Aniline	C ₆ H ₅ NH ₂		Isooctane	i-C ₈ H ₁₈	
Asphalt			Kerosene		
Barium chloride	BaCl ₂		Lactic acid		
Barium hydroxide	Ba(OH) ₂		Light oil		
Barium nitrate	Ba(NO ₃) ₂		Methanol	CH ₃ OH	
Benzene			Methyl violet	C ₇ H ₁₆	
Calcium chloride	CaCl ₂		Mineral oil		
Carbon tetrachloride	CCl ₄		Naphtha		
Chlorine	Cl ₂		Natural volatile oil		
Chloroform	CH ₃ Cl		Nitrobenzene	C ₆ H ₅ NO ₂	
Citric acid	C ₃ H ₄ (OH)(COOH) ₃		Phenol	C ₆ H ₅ OH	
Cresol	C ₆ H ₄ (OH)(CH ₃)		Propyl alcohol	C ₃ H ₅ (OH) ₃	
Dilute acetic acid	CH ₃ COOH		Propylene glycol	C ₃ H ₂ (OH) ₂	
Dilute caustic soda	NaOH		Silicone oil		
Dilute hydrochloric acid	HCl		Sodium dichromate	Na ₂ Cr ₂ O ₇	
Dilute nitric acid	HNO ₃		Sodium carbonate	Na ₂ CO ₃	
Dilute sulfuric acid	H ₂ SO ₄		Sodium chloride	NaCl	
Enamel paint			Thinner		
Ethanol	C ₂ H ₅ OH		Toluene	C ₆ H ₅ CH ₃	
Ether	(CH ₃) ₂ O		Trichloroethane	C ₂ H ₃ Cl ₃	
Ethylene glycol	C ₂ H ₄ (OH) ₂		Trichloroethylene	C ₂ HCl ₃	
Ferrosilicon			Turbine oil		
Fluorine	F ₂		Turpentine oil		
Freon-11	FCCl ₃		Vegetable oil		
Frit			Water	H ₂ O	

Note: = resistant. The table does not imply guarantee of detection for each substance. Contact Yamatake Corporation regarding fluorine.

Memo

A large rectangular area filled with a grid of dashed lines, intended for writing a memo.A large rectangular area filled with a grid of dashed lines, intended for writing a memo.

A wide variety of options for liquid detection



<http://www.yamatake.com>

⚠ RESTRICTIONS ON USE

These products have been designed, developed and manufactured for general-purpose application in machinery and equipment. Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use these products in applications where human safety may be put at risk.

YAMATAKE

Specifications are subject to change without notice.

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