azbil

WET PROCESS SENSORS & FIBERS

SELECTION GUIDE

Liquid detection in the semiconductor and FPD manufacturing processes

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Azbil Corporation
Advanced Automation Company

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

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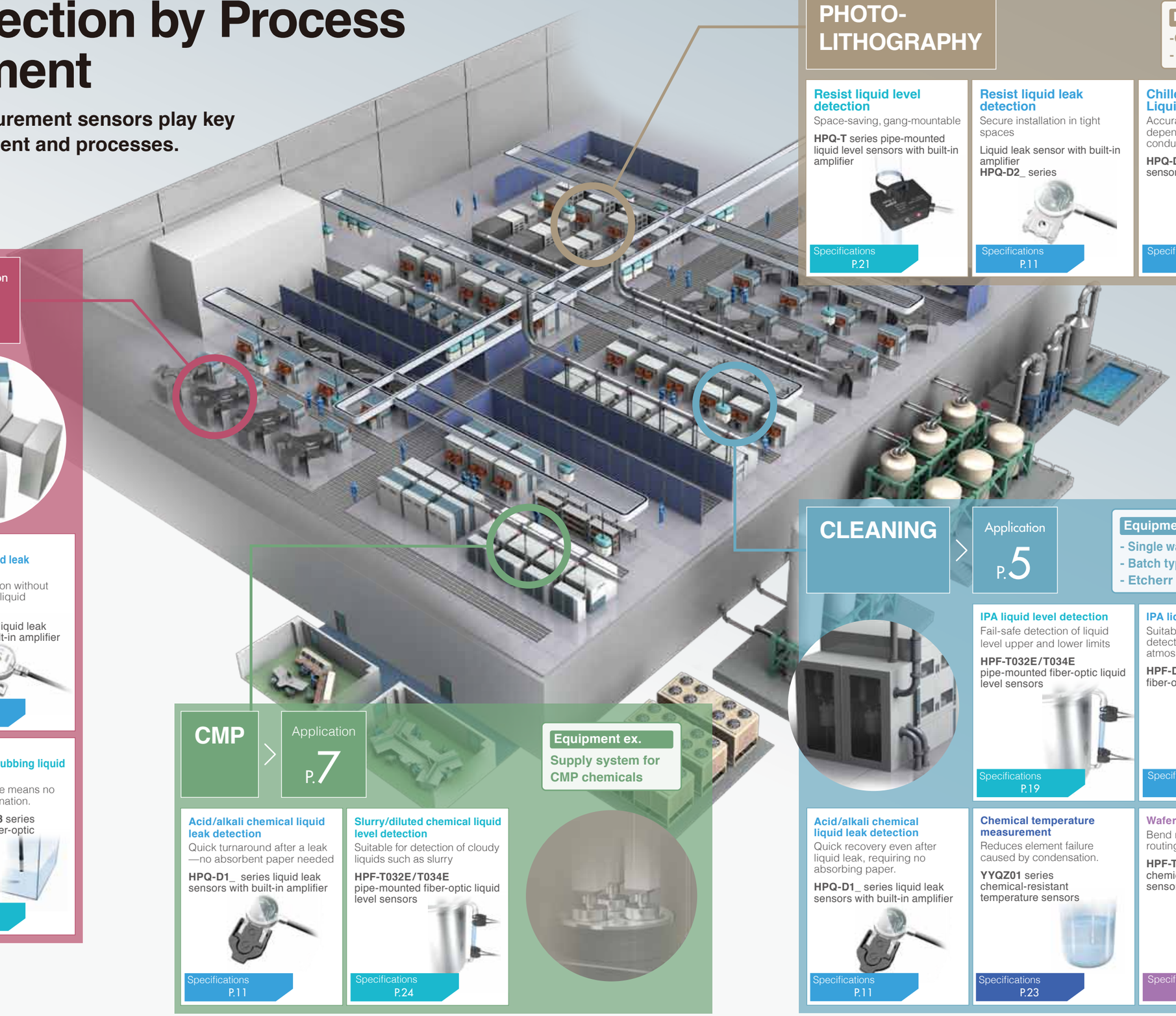
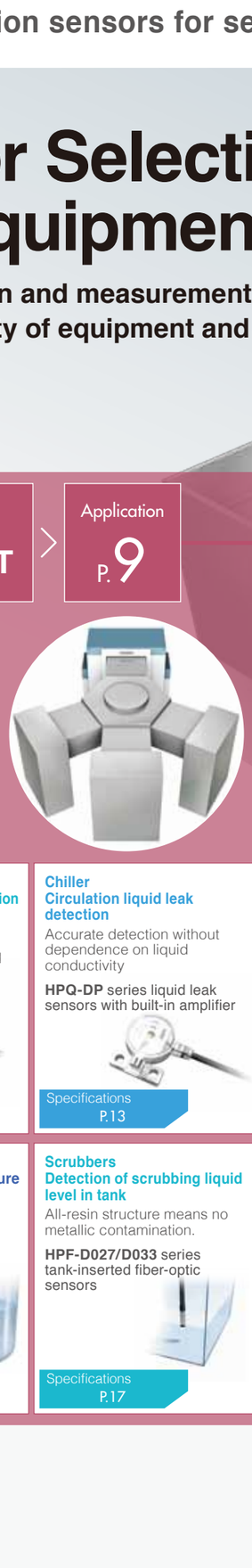
Sensor Selection by Process and Equipment

Liquid detection and measurement sensors play key roles in a variety of equipment and processes.



HEAT TREATMENT

Application P.9



Equipment ex.
- Chillers
- Scrubbers
- VMBs

Chiller
Circulation fluid level detection
Easy liquid level detection without adjustment work.

HPQ-T series pipe-mounted liquid level sensors with built-in amplifier

Specifications P.21

Chiller
Circulation liquid leak detection
Accurate detection without dependence on liquid conductivity

HPQ-DP series liquid leak sensors with built-in amplifier

Specifications P.13

Scrubbers
Scrubbing liquid temperature measurement
Chemical temperature measurement
Reduces element failure caused by condensation

YYQZ01 series chemical-resistant temperature sensors

Specifications P.23

Scrubbers
Detection of scrubbing liquid level in tank
All-resin structure means no metallic contamination.

HPF-D027/D033 series tank-inserted fiber-optic sensors

Specifications P.17

CMP

Application P.7

Equipment ex.
Supply system for CMP chemicals

Acid/alkali chemical liquid leak detection
Quick turnaround after a leak —no absorbent paper needed

HPQ-D1_ series liquid leak sensors with built-in amplifier

Specifications P.11

Slurry/diluted chemical liquid level detection
Suitable for detection of cloudy liquids such as slurry

HPF-T032E/T034E
pipe-mounted fiber-optic liquid level sensors

Specifications P.24

PHOTO-LITHOGRAPHY

Equipment ex.
-Coater/developer
- Stepper

Resist liquid level detection
Space-saving, gang-mountable

HPQ-T series pipe-mounted liquid level sensors with built-in amplifier

Specifications P.21

Resist liquid leak detection
Secure installation in tight spaces

Liquid leak sensor with built-in amplifier
HPQ-D2_ series

Specifications P.11

Chiller
Liquid leak detection
Accurate detection without depending on liquid conductivity

HPQ-DP series liquid leak sensors with built-in amplifier

Specifications P.13

CLEANING

Application P.5

Equipment ex.
- Single wafer cleaning system
- Batch type cleaning machine
- Etcherr

IPA liquid level detection
Fail-safe detection of liquid level upper and lower limits

HPF-T032E/T034E
pipe-mounted fiber-optic liquid level sensors

Specifications P.19

IPA liquid leak detection
Suitable for liquid leak detection in explosive atmospheres

HPF-D040 liquid leak detection fiber-optic sensors

Specifications P.15

Acid/alkali chemical liquid leak detection
Quick recovery even after liquid leak, requiring no absorbing paper.

HPQ-D1_ series liquid leak sensors with built-in amplifier

Specifications P.11

Chemical temperature measurement
Reduces element failure caused by condensation.

YYQZ01 series chemical-resistant temperature sensors

Specifications P.23

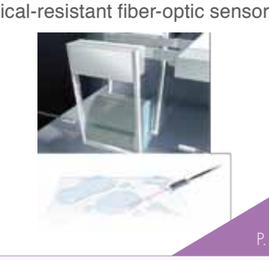
Wafer detection
Bend radius of 20 mm for easy routing

HPF-T029/T035/D014 chemical-resistant fiber-optic sensors

Specifications P.24

Sensor Selection by Chemical and Application

Liquid detection and measurement sensors for a variety of chemicals and uses

	Acid/alkali chemicals	IPA etc. organic solvents	Resist liquid	Circulation fluid/ pure water/water
Liquid Leak Detection P. 11–	**HPQ-D1_** series liquid leak sensors with built-in amplifier  P. 11	**HPF-D040** liquid leak detection fiber-optic sensor Explosion-proof  P. 13	**HPQ-D2_** series liquid leak sensors with built-in amplifier  P. 11	**HPQ-DP** series liquid leak sensors with built-in amplifier  P. 15
Liquid Level Detection P. 17–	**HPF-D027/D033** tank-inserted fiber-optic sensors  P. 17	**HPF-T032/T032E** **HPF-T034/T034E** pipe-mounted fiber-optic liquid level sensors Explosion-proof  P. 19	**HPQ-T** series pipe-mounted liquid level sensors with built-in amplifier  P. 21	**HPQ-T** series pipe-mounted liquid level sensors with built-in amplifier  P. 21
Temperature Measurement P. 23–	**YYQZ01** series chemical-resistant temperature sensors  P. 23		**YYQZ01** series chemical temperature sensors  P. 23	**YYQZ01** series chemical temperature sensors  P. 23
Object Detection P. 24–	**HPF-T029/T035/D014** chemical-resistant fiber-optic sensors  P. 24	**HPF-T029/T035/D014** chemical-resistant fiber-optic sensors  P. 24		

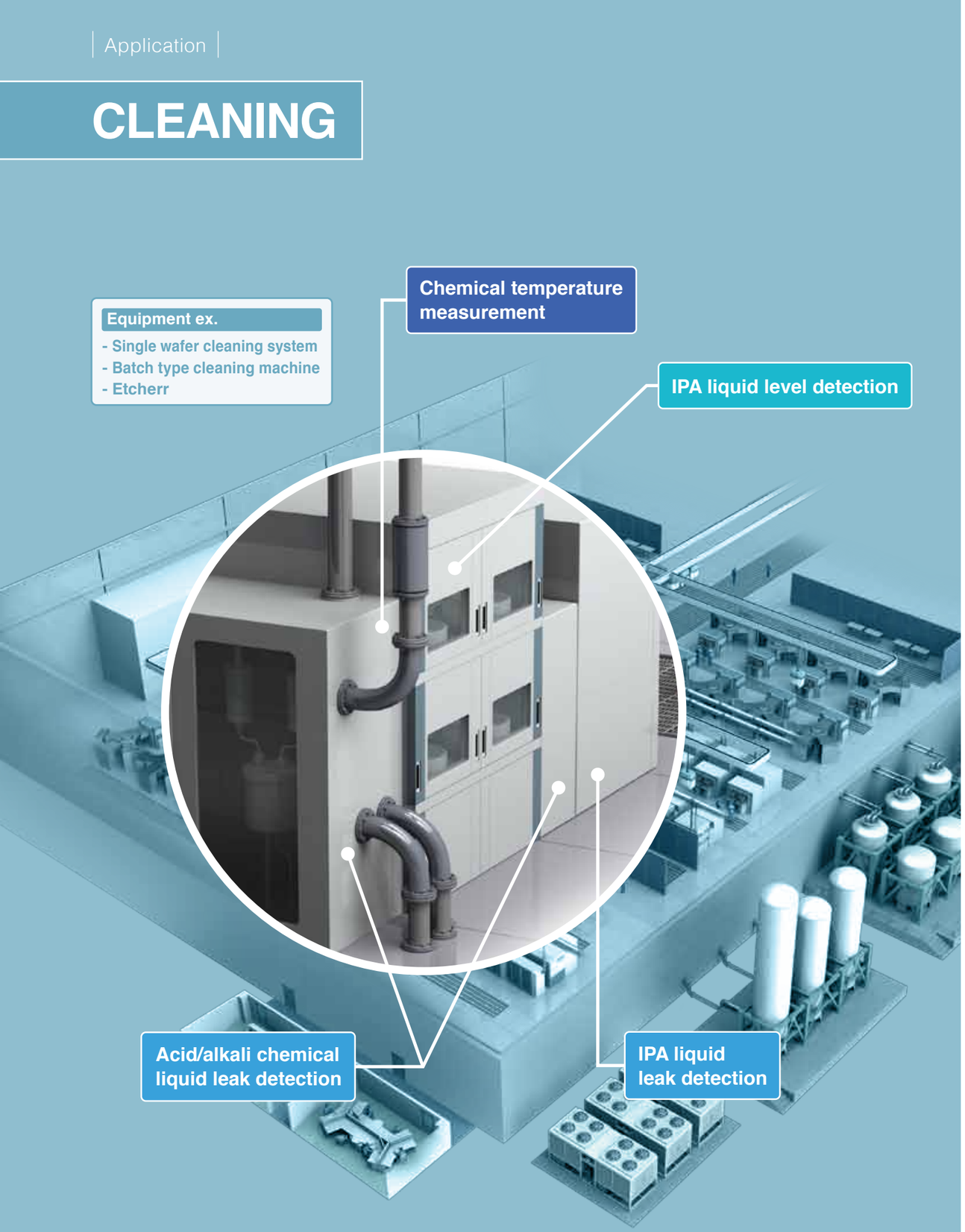
Note: Models for use with a standard SUS (etc.) sheath are also available.

INDEX

Selection

CLEANING

Equipment ex.
- Single wafer cleaning system
- Batch type cleaning machine
- Etcherr

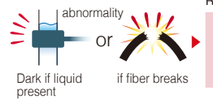


IPA liquid level detection

HPF-T032E/T034E pipe-mounted fiber-optic liquid-level sensor

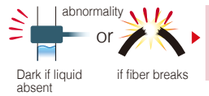
Fail-safe detection for upper and lower limits

Upper limit detection



Required optical system: Light circuit closed when no liquid: **HPF-T034 HPF-T034E**

Lower limit detection



Required optical system: Light circuit closed when liquid present: **HPF-T032 HPF-T032E**

16 light axes cancel the influence of water droplets and air bubbles, and achieve stable detection.

Acid/alkali chemical liquid leak detection

HPQ-D1_ series liquid leak sensors with built-in amplifier

Sensor: PFA
Mounting base: PVC

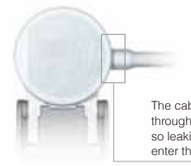
Quick turnaround after a leak, with no need for absorbent paper

Easy maintenance

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

PFA protection for sensor and cable

PVC bracket is available for acid/alkali detection, and PFA (with some SUS) for organic solvent detection.



IP67

The cable exits the case through a fused PFA tube, so leaking liquid cannot enter the sensor.

IPA liquid leak detection

Operating temperature ~70°C

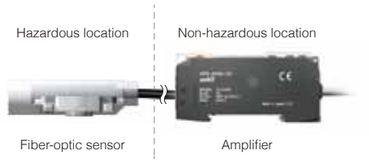
HPF-D040 liquid leak detection fiber-optic sensors

Sensor: PFA
Mounting base: PVC

Suitable for liquid leak detection in explosive atmospheres.

PFA protects the sensor and cable.

PFA protects the sensor and fiber-optic cable.
SUS is partially used on the mounting base.



Chemical temperature measurement

YYQZ01 series chemical-resistant temperature sensors

Less element failure by condensation

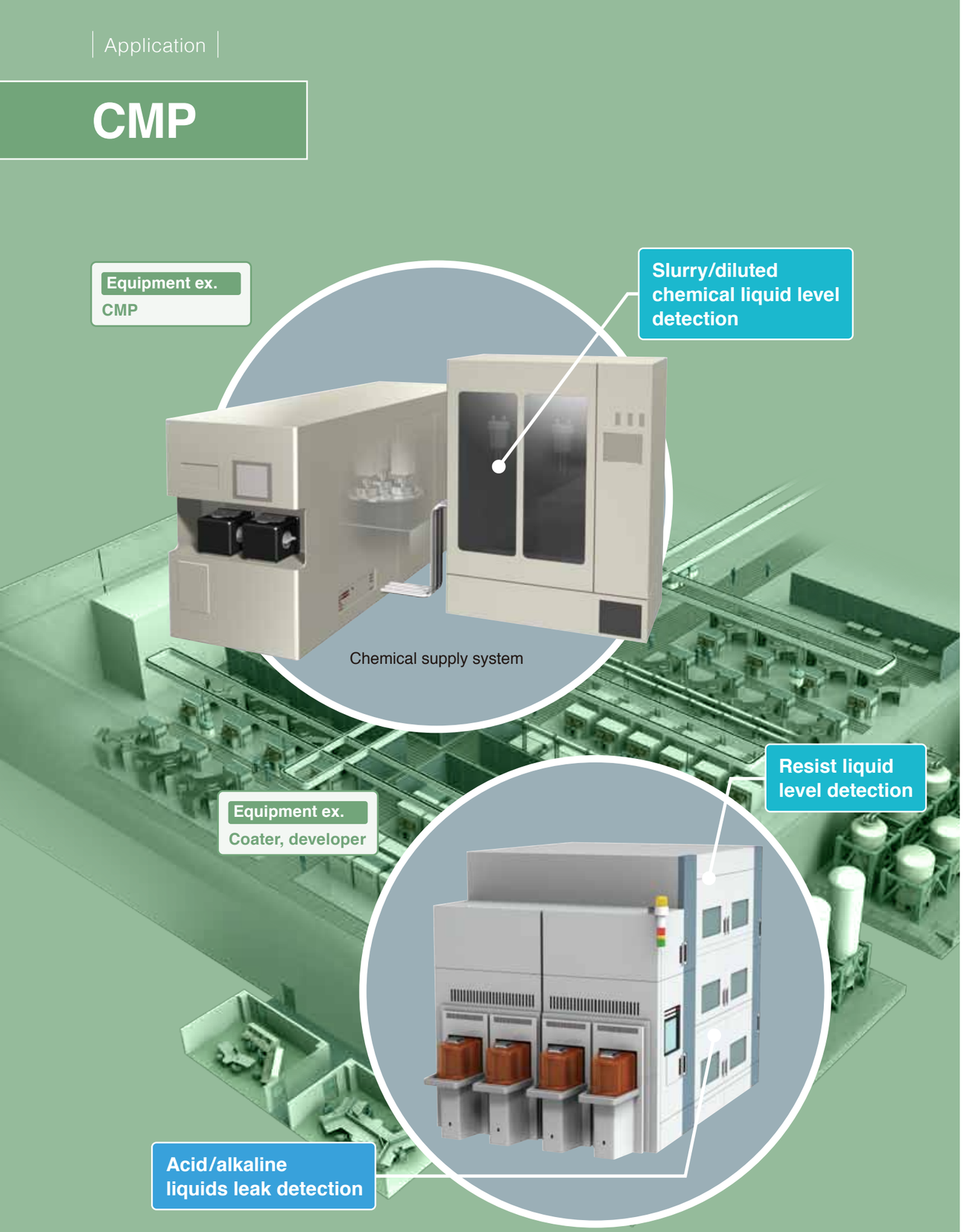
Two models with different materials are available.

Temperature measurement ranges

0 to 200˚C (FEP) 0 to 250˚C (PFA)

RTD element is embedded in Teflon resin to greatly reduce element failure caused by condensation.

CMP



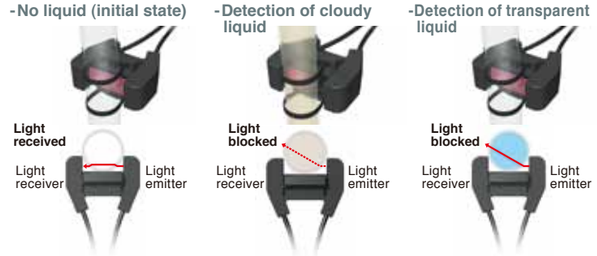
Slurry/diluted chemical liquid level detection

HPF-T034E pipe-mounted fiber-optic liquid level sensors

HPX-AG series

Suitable for detection of cloudy liquids such as slurry

Regardless of whether the target liquid is cloudy or transparent, light refracts in the same way, so there is no reversal of the sensor's operation. As a result, the same settings can be used for level detection of the slurry and of washing water.

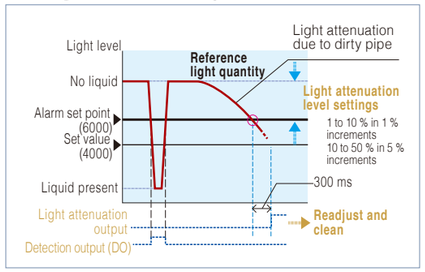


Alarm output -How light attenuation output works

In combination with the **HPX-AG02** digital fiber sensor

Alarm output if pipe wall is dirty

Before deposits from cloudy liquid, etc., on the inner wall of the pipe can cause a detection error, a warning is sent to an external device.



Resist liquid leak detection

HPQ-D2_ series liquid leak sensor with built-in amplifier

Sensor: PFA
Mounting base: PFA (SUS)

Secure installation in tight spaces

Equipped with locking mechanism

Secure installation is ensured by using the support lever on the sensor.

Note: Remember that the support lever requires space to move up and down.

Resist liquid level detection

HPQ-T series pipe-mounted liquid level sensors with built-in amplifier

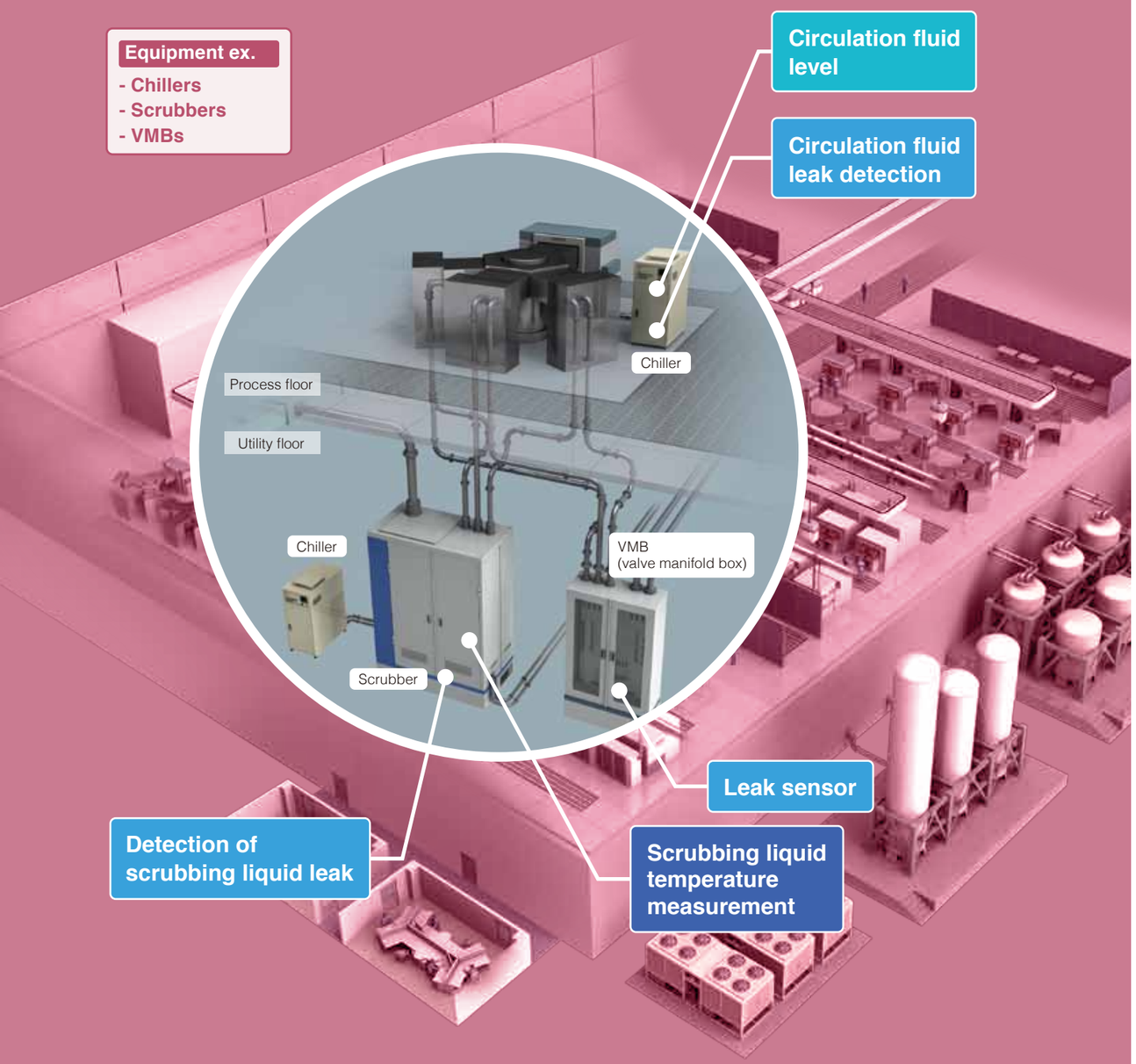
Space-saving and gang-mountable

Indicator and operation selector switch are on the side, so even when sensors are gang-mounted, it is easy to make adjustments while viewing the indicator.

Fits various pipe diameters

Sensors fit on pipe diameters of 8 to 13 mm, 3 to 7 mm, and 1/16 inch. They can be mounted using a cable tie or M3 screw.

HEAT TREATMENT



Detection of chiller circulation fluid level

HPQ-T series pipe-mounted liquid level sensors with built-in amplifier

Easy liquid level detection without tuning

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 fluids).

Operation panel located on the side

With the indicator and operation selector switch located on the side, even when sensors are gang-mounted, it is easy to make adjustments while checking the indicators.

Leak detection for chiller circulation fluid

HPQ-DP series liquid leak sensors with built-in amplifier

Sensor: PP
Mounting base: PP

Accurate detection regardless of liquid conductivity

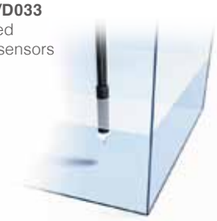
The sensor detects liquid leaks optically, so it does not rely on liquid conductivity.
Accessories for indirect detection of liquid leaks, such as liquid absorbing paper, are unnecessary.

Easy maintenance

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

Detection of scrubber liquid level in tank

HPF-D027/D033
tank-inserted
fiber-optic sensors



Detection of tank liquid level for scrubbers — all-resin structure means no chance of metallic contamination

No metal is used in **HPF-D027** or **-D033**, even on the inside, thanks to PFA tube structure.

4 mm dia. model for easy routing

HPF-D033's PFA tube has a space-saving outer diameter of 4 mm. Its structure also facilitates routing.

Stray drop protection for reliable detection

The sensor shape is designed so that drops accumulate at the tip, reducing malfunctions.

Temperature measurement for scrubber liquid

YYQZ01 series chemical-resistant temperature sensors

Less element failure by condensation

Two models with different materials are available.

Temperature measurement ranges

0 to 200˚C (FEP) 0 to 250˚C (PFA)

RTD element is embedded in Teflon resin to greatly reduce element failure caused by condensation.

Liquid leak detectors with built-in amplifier

HPQ-D series

Optical type

Built-in amplifier, no absorbent paper required, usable with various liquids.

NO / NC | NPN / PNP | PFA protection Case | Cable

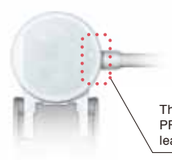
Acids or alkaline liquids, IPA (isopropyl alcohol), pure water, Fluorinert, Galden, etc.

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.

PFA protection for sensor and cable

PVC bracket is available for acid/alkali detection,
and PFA (with some SUS) for organic solvent detection.

IP67

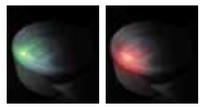


The cable exits the detector through a PFA tube fused to the case. Therefore, leaking liquid cannot enter the detector.

Operation indicator

Sensor status can be checked from the body side.

Normal state (green LED lit)
Liquid leakage (red LED lit)



Easy maintenance

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

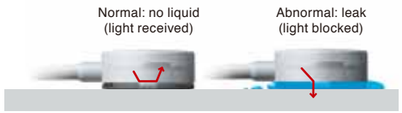
Equipped with locking mechanism

Suitable for export equipment

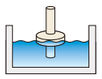
CE marking, UL certified.
Wide variety of output modes and types are available.

- NO/NC output
- NPN/PNP output

DETECTION PRINCIPLE



Float type



Install this sensor in the pan by stud or adhesive (for PVC bracket type). Unlike the float type, sensor does not require a concave surface underneath.

Note: This sensor is not explosion-proof. Do not use it where the use of an explosion-proof product is specified.

CATALOG LISTING

Detection method & shape	Bracket material	Operation mode	Output mode	Catalog listing
	PVC	NC	Open collector NPN	**HPQ-D11**
			Open collector PNP	**HPQ-D12**
			Open collector NPN	**HPQ-D13**
	PFA (SUS)		Open collector NPN	**HPQ-D21**
			Open collector PNP	**HPQ-D22**
			Open collector NPN	**HPQ-D23**

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 Azbil Corporation.

ACCESSORY

Mounting base material	Catalog listing
PVC bracket (10 units)	**HPQ-B01**
PFA (SUS) bracket (10 units)	**HPQ-B02**

SPECIFICATIONS

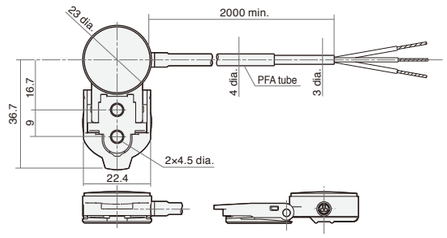
Catalog listing	Mounting base : PVC	HPQ-D11	HPQ-D13	HPQ-D12
	Mounting base : PFA	HPQ-D21	HPQ-D23	HPQ-D22
Detection method		Retroreflective		
Mounting surface		Polyvinyl chloride or stainless steel plate*		
Standard target object		Water*		
Light source		Infrared LED (peak emission wavelength 875 nm)		
Supply voltage		10.8 to 26.4 VDC (ripple voltage 10 % max.)		
Current consumption		30 mA or less		
Operation mode		Normally ON, when leak detected OFF	Normally OFF, when leak detected ON	Normally ON, when leak detected OFF
Output mode		Open collector NPN		Open collector PNP
Control output	Switching current	50 mA or less (resistive load)		
	Output withstand voltage	30 VDC		
	Residual voltage	1 V max. (at 50 mA switching current)		
Indicator		Normally green light ON, when leak detected orange light ON		
Operating temperature		-10 to +55 °C (without freezing)		
Storage temperature		-25 to +70 °C (without freezing)		
Operating humidity		30 to 85 % RH (without condensation)		
Dielectric strength		20 MΩ (at 500 VDC)		
Withstand voltage		1,000 VAC, 50/60 Hz for 1 min between all electrically live metal and case		
Vibration resistance		10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 h each in X, Y, and Z directions		
Shock resistance		500 m/s² 3 times each in X, Y, and Z directions		
Protective structure		IP67 (IEC standard)		
Protection circuits		Built-in reverse connection protection, malfunction prevention at power ON (approx. 20 ms), output short-circuit protection		
Connection method		Preleaded, 2 m cable		
Material		Body: PFA. Cable: PFA coating. Mounting base: PVC or PFA (SUS)		
Mass		Approx. 55 g (main unit with 2 m cable)		

*Operation may be unstable depending on the color and condition of the mounting surface or the liquid. Before use, carefully check sensor operation in the actual situation.

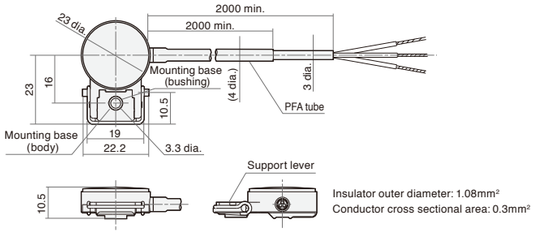
EXTERNAL DIMENSIONS

Unit: mm

■ **HPQ-D1_**

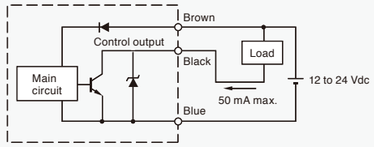


■ **HPQ-D2_**

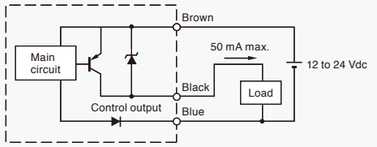


OUTPUT CIRCUIT DIAGRAM

■ **HPQ-D_1** (NPN type)



■ **HPQ-DP_2** (PNP type)



Liquid leak detectors with built-in amplifier

HPQ-DP series

Built-in amplifier, no absorbent paper required, usable with various liquids.

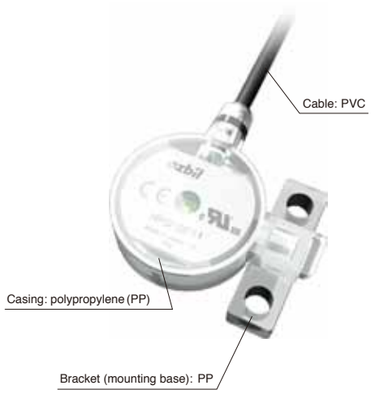
PP type | IP67 | Operating temperature −10 to +60°C

For pure water, industrial water, Fluorinert, Galden, etc.

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

Optical method detects liquid leakage directly

Detection is possible immediately after installation even without sensitivity adjustment.
Accessories used in indirect detection of leaks, such as absorbent paper, are unnecessary.
Detection performance does not depend on the conductivity of the target liquid.

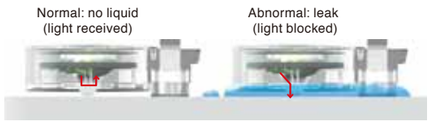


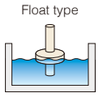
Operating temp. -10 to 60 °C

Fast and easy maintenance

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

DETECTION PRINCIPLE





Install this sensor in the pan by stud or adhesive (for PVC bracket type). Unlike the float type, sensor does not require a concave surface underneath.

CATALOG LISTING

Detection method & shape	Bracket material	Operation mode	Output mode	Catalog listing
	PP	NC	Open collector NPN	**HPQ-DP11**
			Open collector PNP	**HPQ-DP12**

Note: Model with 5 m cable is also available.

SPECIFICATIONS

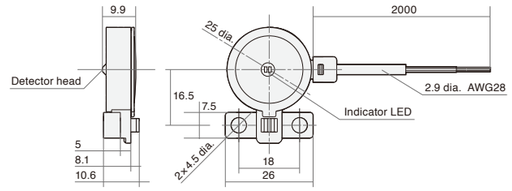
Catalog listing		HPQ-DP11	HPQ-DP12
Detection method			
Detection method		Retroreflective	
Mounting surface		Polyvinyl chloride or stainless steel plate*	
Standard target object		Water*	
Light source		Infrared LED	
Supply voltage		10.8 to 26.4 VDC (ripple voltage 10 % max.)	
Current consumption		10 mA or less	
Operation mode		Normal state: ON. State when leak detected: OFF	
Output mode		Open collector NPN	Open collector PNP
Control output	Switching current	50 mA or less (resistive load)	
	Output withstand voltage	30 VDC	
	Residual voltage	DP11: 1 V max. (at 50 mA switching current), DP12: 2 V max. (at 50 mA switching current)	
Indicator		Normally green light ON, when leak detected red light ON	
Operating temperature		-10 to +60 °C (without freezing)	
Storage temperature		-20 to +70 °C (without freezing)	
Operating humidity		30 to +85 % RH (without condensation)	
Dielectric strength		20 MΩ (at 500 VDC)	
Withstand voltage		1,000 VAC, 50/60 Hz for 1 min between all electrically live metal and case	
Vibration resistance		10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 h each in X, Y, and Z directions	
Shock resistance		490 m/s² 3 times each in X, Y, and Z directions	
Protective structure		IP67 (IEC standard)	
Protection circuits		Output short-circuit protection, output eddy current protection	
Connection method		Preleaded, 2 m cable	
Material		Casing: PP. Cable: PVC. Mounting base: PP.	
Mass		Approx. 30 g (main unit only with 2 m cable)	

*Operation may be unstable depending on the color and condition of the mounting surface or the liquid. Before use, carefully check sensor operation in the actual situation.

EXTERNAL DIMENSIONS

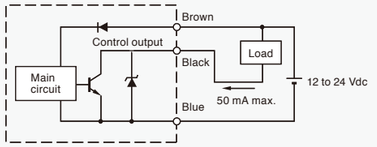
Unit: mm

■ HPQ-DP

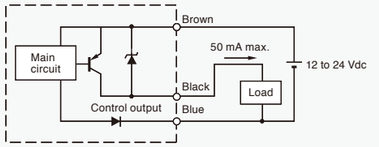


OUTPUT CIRCUIT DIAGRAM

■ HPQ-DP11 (NPN type)



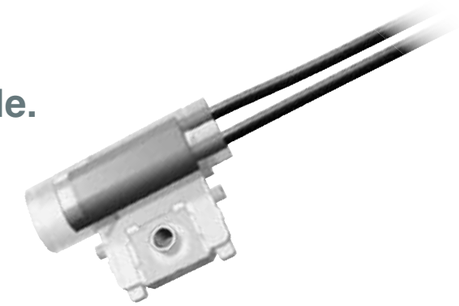
■ HPQ-DP12 (PNP type)



Liquid leak detection fiber-optic sensors

HPF-D040

Inherently safe product.
PFA protects sensor and cable.
Saves space.



Inherently safe product | PFA protection: Case, Cable | R20 | 5m: Free Cut | Operating temperature: −30 to +70°C

PFA protects sensor and cable.

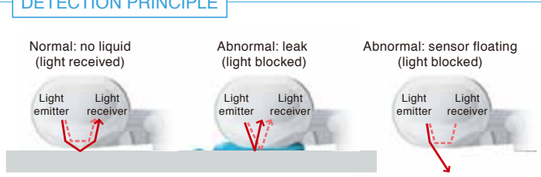
Usable in an atmosphere with organic solvents such as IPA.

Notes: SUS is partially used on the mounting bracket.

Saves space

Sensor head has a height of only 9.9 mm.

DETECTION PRINCIPLE



When a leak is detected, no light reaches the receiver. Since the same is true in a fiber cable break or disconnection, operation is fail-safe. Install in the pan with a stud.

Recommended compatible amplifier unit

HPX-AG04 (advanced function timer) model
<Exterior view>

Output latching function

Using the **HPF-D040** and the **HPX-AG04** amplifier together, output can be latched. This function is effective in detection of a small leak of volatile liquid and in early detection of a leak's location.

When the output is latched, the display seen below blinks.

The latch can be released by the operator or by an external input.

*Output latch remains even if sensor power is turned off.

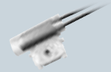
*The output latch is reset when the latch is released. To use output latching again, set the latch again.

CATALOG LISTING

Diffuse scan

Shape (mm)	Cable		Model No.
	Bend radius	Length	
 -30 to +70°C	R20	5m Free cut	**HPF-D040**

SPECIFICATIONS

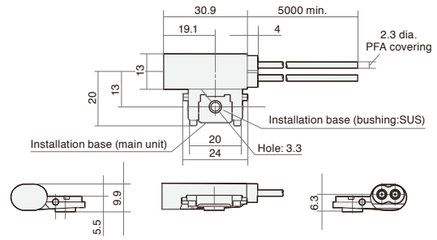
Catalog listing	HPF-D040
Appearance	
Detection method	Retroreflective (contact type)
Compatible amplifier	**HPX-AG/HPX-EG**
Standard target liquid	IPA (isopropyl alcohol)
Operating temperature	-30 to +70 °C
Material	Sensor: PFA. Cable: polyethylene (PFA coated). Bracket: PFA (and SUS)

Note: **Use of sensor in explosive atmosphere**
The fiber unit can be used in a hazardous location by installing the amplifier unit in a non-hazardous location. However, before using the fiber-optic sensor, carefully check the explosion-proof regulations for the facility and equipment

EXTERNAL DIMENSIONS

Unit: mm

■ HPF-D040



Tank-inserted fiber-optic sensors

HPF-D027
HPF-D033

All-resin structure ensures no metal contamination.

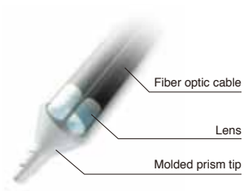
- 4mm diameter allows easy running of cables.
- Reliable detection by preventing liquid cling!

Inherently safe product | PFA protection: Case, Cable

Reliable detection by preventing liquid cling!

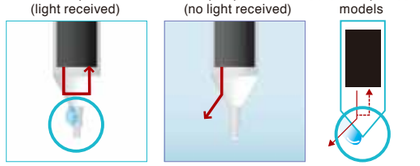
Proprietary tip structure prevents liquid from clinging to the tip, eliminating a cause of faulty operation.

Tip and internal structure



The molded prism fiber tip readily sheds water drops.

DETECTION PRINCIPLE



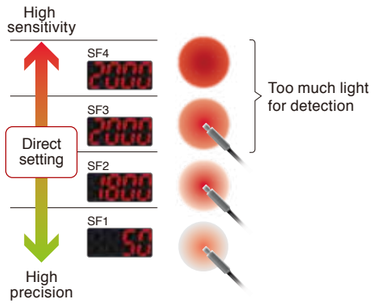
The principle uses the difference in the reflective index due to the presence of liquid.

Recommended compatible amplifier unit

HPX-EG Series
<Exterior view>

Auto sensitivity switch function

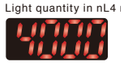
This function automatically optimizes the sensitivity setting during auto tuning, affording easy operation while delivering the highest detection performance.



Ex. of light quantity difference (with water)

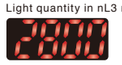
No liquid: 2,800
With liquid: 215
When combined with **HPX-EG** (nL3 mode)

Light quantity in nL4 mode



Since 4000 is the maximum in nL4 mode, the saturation point may have been reached.

Light quantity in nL3 mode

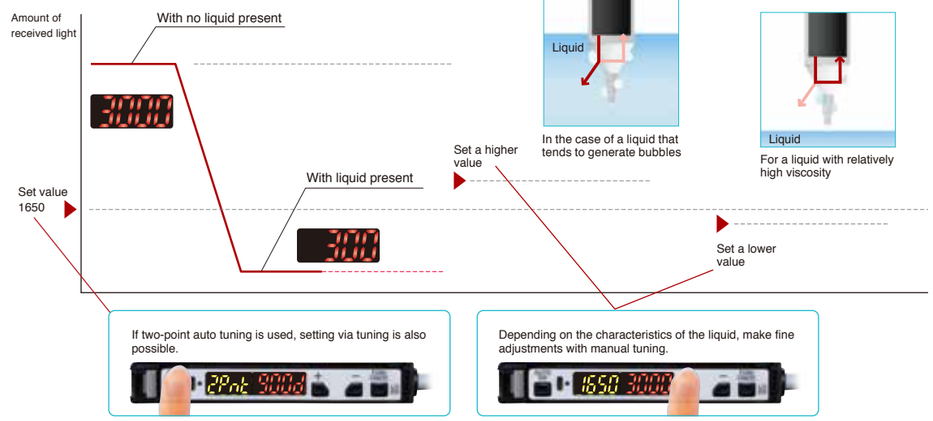


4000 is also the maximum in nL3 mode. Since the reading is now 2,800, you can be sure that the saturation point has not been reached.

Note: In some cases of saturation, it may not be possible to adjust the setting.
If the saturation point is reached for incoming light when no liquid is present, change the sensing type.

Setting the sensitivity

The fiber unit is used with an **HPX-EG** series amplifier.



CATALOG LISTING

Diffuse scan

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

SPECIFICATIONS

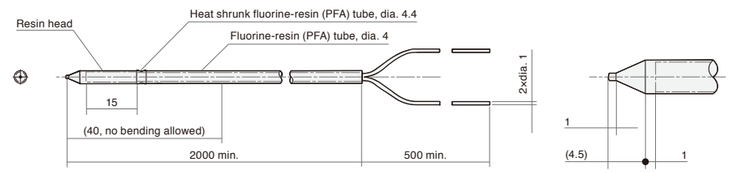
Catalog listing	HPF-D027	HPF-D033
Appearance		
Detection method	Retroreflective (contact type)	
Compatible amplifier	**HPX-AG/HPX-EG**	
Repeat accuracy	1 mm or less (for water)	
Standard target liquid	Liquid*	
Pressure resistance	-49 to 490 kPa	
Operating temperature	-30 to +105 °C	
Material	Polyethylene (PFA coated)	

*Depending on the color and viscosity of the liquid, detection may not be possible.

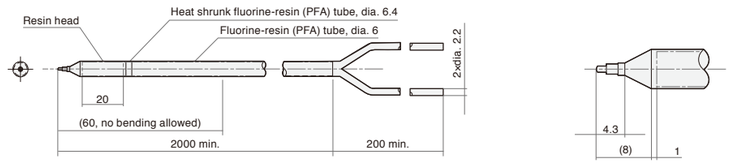
EXTERNAL DIMENSIONS

Unit: mm

■ **HPF-D033_**



■ **HPF-D027_**



Pipe-mounted fiber-optic liquid level sensorsr

HPF-T032/T032E
HPF-T034/T034E

Fail-safe detection of tank upper and lower liquid level limits

- 4 mm dia. type offers easy routing.
- Stray drop protection affords reliable detection

Inherently safe product | Pipe dia. 8 to 19 mm dia. (T034,T034E) | Pipe dia. 3 to 13 mm dia. (T032,T032E) | PFA protection Case | Cable | R4 | 5m Free Cut

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

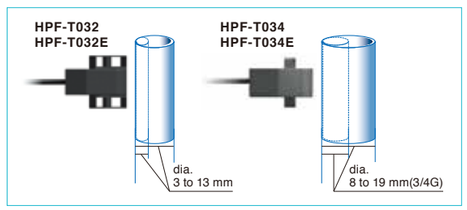
Adverse effects from air bubbles and water droplets are reduced, resulting in reliable detection.

PFA-jacketed optical fiber

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

Fits a variety of pipe diameters.

Designed for pipes 3 to 19 mm in dia.



Position of optical axes is marked

Position of the optical axis array is easily visible.

DETECTION PRINCIPLE

Operating principle of **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 detection.

Operating principle of **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.

Fail-safe detection for upper and lower limits

Upper limit detection

Required optical system: Light circuit closed when no liquid: **HPF-T034/T034E**

Lower limit detection

Required optical system: Light circuit closed when liquid present: **HPF-T032/T032E**

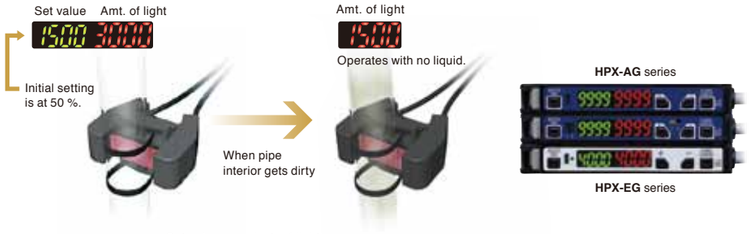
Setting the sensitivity

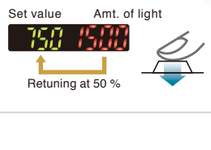
When used with **HPX-AG** or **HPX-EG** amplifier

Easy setup is done without the process liquid.

Tuning does not require liquid.

Identical setup by anybody, anytime.





Do percent tuning again with no liquid present.
Note: Explanation pertains to models that receive light when no liquid is present.

CATALOG LISTING Thru scan(Attached to pipe)

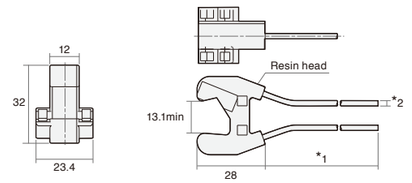
Type	Compatible pipe dia.	Shape	Cable: Bend radius	Cable: Length	Cable: Coating material	Model No.
Liquid-present received light	3 to 13mm dia.		R4 -30 to +105°C	5m Free cut	PFA	HPF-T032
				5m Free cut	Polyethylene	HPF-T032E
				2m Free cut		HPF-T032E-L02
Liquid-absent received light	8 to 19mm dia. (3/4B)		R4 -30 to +105°C	5m Free cut	PFA	HPF-T034
				5m Free cut	Polyethylene	HPF-T034E
				2m Free cut		HPF-T034E-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.

EXTERNAL DIMENSIONS

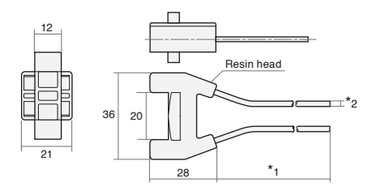
Unit: mm

■ **HPF-T032**
■ **HPF-T032E**
■ **HPF-T032E-L02**



Model No.	Cable length*1	Cable dia.*2
HPF-T032	5000 mm min.	2×2.3 mm dia.
HPF-T032E	5000 mm min.	2×2.2 mm dia.
HPF-T032E-L02	2000 mm min.	2×2.2 mm dia.

■ **HPF-T034**
■ **HPF-T034E**
■ **HPF-T034E-L02**



Model No.	Cable length*1	Cable dia.*2
HPF-T034	5000 mm min.	2×2.3 mm dia.
HPF-T034E	5000 mm min.	2×2.2 mm dia.
HPF-T034E-L02	2000 mm min.	2×2.2 mm dia.

Pipe-mounted liquid level sensors with built-in amplifier

HPQ-T series

Just by mounting the sensor on a pipe, the surface of the liquid can be easily detected.

- Reliable detection
- Operation panel is located on the side.
- Fits various pipe diameters
- The same model can be used for upper or lower limit detection.

CE NPN/PNP LO change DO

Reliable detection

Refraction-based 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 photoresist liquid and waste fluids).

Operation panel on the side

Indicator and operation selector switch are located on the side. Even when sensors are gang-mounted, they can be adjusted while viewing the indicator.

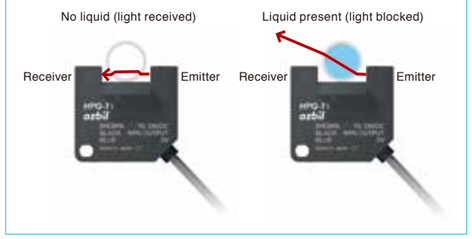
Fits various pipe diameters

Sensors fit on pipes with diameters of 1/16 inch, 3 to 7 mm, and 8 to 13 mm.
They can be mounted using a cable tie or M3 screw.

Same model handles upper or lower limit detection

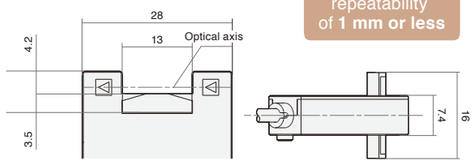
Note: For pipe diameters of 8 mm or less, please contact us.
Sensors with adjustable sensitivity are also available.

DETECTION PRINCIPLE



Optical axis position

Detection repeatability of **1 mm or less**



Note: The slit width is 1 mm, and therefore repetitive detection is possible at an accuracy of that width or less.
This varies depending on the condition of the liquid.

Example of fail-safe setup

Example of recommended settings

	LO/DO setting	Liquid present	Liquid absent	Abnormal condition	Sensor failure "open"
Upper limit	LO	OFF	ON	Liquid present	OFF
Lower limit	DO	ON	OFF	No liquid	OFF

CATALOG LISTINGS

Detection method, shape	Bracket	Mode (LO/DO)	Output mode	Catalog listing
Thru-scan 	8 to 13mm dia.	-	Open collector NPN transistor	**HPQ-T1**
		-	Open collector PNP transistor	**HPQ-T2**
		○	Open collector NPN transistor	**HPQ-T1-002**
		○	Open collector NPN transistor	**HPQ-T1-003**
	3 to 7mm dia.	-	Open collector NPN transistor	**HPQ-T1-004**
		-	Open collector PNP transistor	**HPQ-T2-005**

HPQ-T1/T2 models are also available with a 5 m cable. For models that fit 1/16-inch diameter pipes, please contact a sales representative.

SPECIFICATIONS

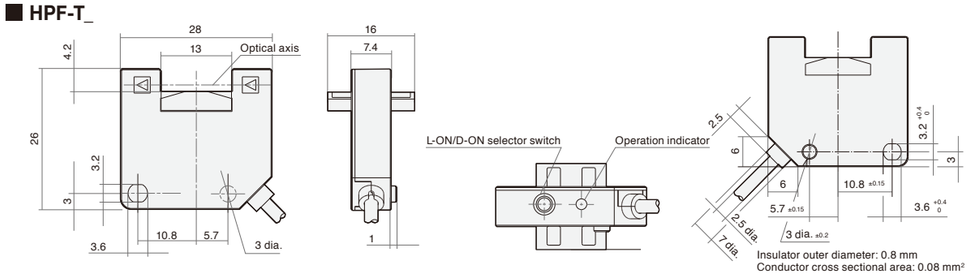
Catalog listing		HPQ-T1	HPQ-T1-002	HPQ-T1-003	HPQ-T1-004	HPQ-T2	HPQ-T2-005
Detection method		Thru-scan					
Applicable pipe sizes	8 to 13 mm dia. 1 mm thick	○	○	○	-	○	-
	3 to 7 mm dia. 0.6 to 1 mm thick	-	-	-	○	-	○
Applicable pipe material		Transparent PFA pipe					
Standard target object		Water*					
Repetitive detection positional accuracy		1 mm or less					
Light source		Infrared LED (peak emission wavelength 950 nm)					
Supply power		10 to 28 VDC (ripple voltage 10 % max.)					
Current consumption		25 mA or less					
Operation mode	Light-on (LO)	-	○	-	-	-	-
	Dark-on (DO)	-	-	○	-	-	-
	LO/DO switching	○	-	-	○	○	○
Output mode	Open collector NPN	○	○	○	○	-	-
	Open collector PNP	-	-	-	-	○	○
Control output	Switching current	100 mA or less (resistive load)					
	Output withstand voltage	30 VDC					
	Residual voltage	1 V or less (at 100 mA switching current)					
Response time		2 ms or less (operation and return)					
Sensitivity adjustment		-	○	○	-	-	-
Indicator		Operation indicator: red (lit when output ON)					
Ambient light immunity		1,000 lux max. (incandescent lamp)					
Operating temperature range		-10 to +55 °C (without freezing)					
Storage temperature range		-25 to +70 °C (without freezing)					
Operating humidity range		30 to 85 % (without condensation)					
Dielectric strength		20 MΩ (at 500 VDC)					
Withstand voltage		1000 VAC, 50/60 Hz for 1 min between all electrically live metal and case (500 VAC for LO/DO selector switch and sensitivity adjustment potentiometer)					
Vibration resistance		10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 h each in X, Y, and Z directions					
Shock resistance		500 m/s² 3 times each in X, Y, and Z directions					
Protective structure		IP50 (IEC standard)					
Protection circuits		Built-in reverse connection protection, malfunction prevention at power ON (approx. 20 ms), output short-circuit protection					
Connection method		Preleaded, 2 m cable (HPQ-T1/T2 with 5 m cable also available)					
Material		Case: polycarbonate resin. Cable tie: nylon. Tube: silicone					
Mass		Approx. 25 g (main unit only with 2 m cable)					

*Depending on the pipe used, as well as the degree of transparency and the refractive index of the liquid, reliable detection may not be possible.
Before use, carefully check sensor operation in the actual situation, especially if the pipe type, material or thickness differs from the specification.

EXTERNAL DIMENSIONS

Unit: mm

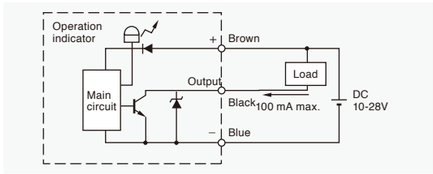
■ **HPF-T_**



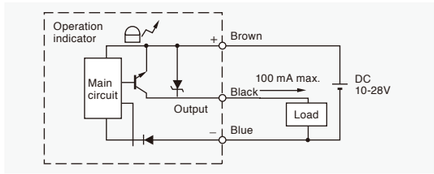
Insulator outer diameter: 0.8 mm
Conductor cross sectional area: 0.08 mm²

OUTPUT CIRCUIT DIAGRAM

■ **HPQ-T1**(NPN type)



■ **HPQ-T2**(PNP type)



Chemical-resistant temperature sensors

YYQZ01 series

Ideal for temperature control in wet process treatment tanks and piping!

Explosion -proof | PFA-protected Cable

Two models with different temperature ranges of 0 to 200 °C (FEP) and 0 to 250 °C (PFA) are available.

RTD element is embedded in Teflon resin to greatly reduce element failure caused by condensation.

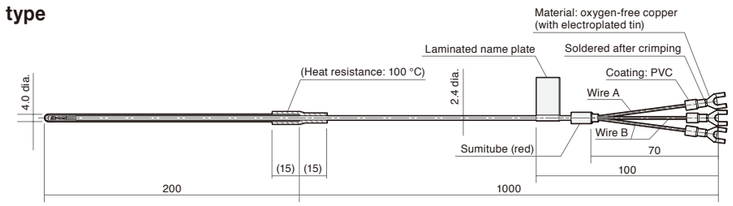
SPECIFICATIONS

Protection tube			Lead		Temperature measurement range	Rated current	Tolerance	Terminal size	Catalog listing
Size	Material	Length	Connection method	Length					
4mm dia.	FEP	200mm	3-wire method	1m	0 to 200°C	1mA	Class B	M3.5	YYQZ01BF420010B0
	PFA				0 to 250°C				YYQZ01BP420010B0
6mm dia.	FEP				0 to 200°C				YYQZ01BF620010B0
6mm dia.	PFA				0 to 250°C				YYQZ01BP620010B0

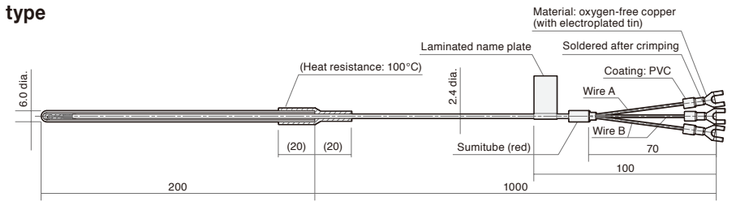
EXTERNAL DIMENSIONS

Unit: mm

■ **4 mm dia. type**



■ **6 mm dia. type**



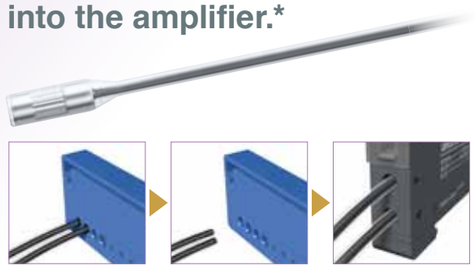
Customizing service

We offer customized cables with protection tube lengths of 100 to 1000 mm and lead lengths of 1 to 10 m.
Please contact a sales representative for details.

Chemical-resistant fiber-optic sensors

HPF-T029/T035/D014

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



Bend radius of R20mm with 2.2mm tube diameter*

*HPF-D014 is excluded.

Inherently safe product | PFA protection Cable | R20 | 2m Free Cut

SPECIFICATIONS

Thru scan

Type	Size	Shape	Cable		Scanning distance (mm)			Core (mm)	Model No.
			Bend radius	Length	Amp	Mode	Distance		
Top	4.7 mm dia.	Shape A -30 to +70°C	R20	2m Free cut	HPX-AG	HP	1,310 4,500	0.1 dia.	HPF-T029
						FT			
					HPX-EG	nL	1,500		
						FT	880		
					HPX-H		1,500		
					HPX-A		750		
Top	4.7 mm dia.	Shape B -30 to +70°C	R20	2m Free cut	HPX-AG	HP	825	0.1 dia.	HPF-T029E
						FT	240		
					HPX-EG	nL	280		
						FT	160		
					HPX-H		270		
					HPX-A		130		
Side	4.7 mm dia.	Shape C -30 to +70°C	R20	2m Free cut	HPX-AG	HP	1,030	0.1 dia.	HPF-T035
						FT	300		
					HPX-EG	nL	350		
						FT	210		
					HPX-H		340		
					HPX-A		170		

Diffuse scan

Type	Size	Shape	Cable		Scanning distance (mm)			Core (mm)	Model No.
			Bend radius	Length	Amp	Mode	Distance		
Top	6 mm dia.	Shape D -30 to +70°C	PFA area R80 Cable area R20	2m Free cut	HPX-AG	HP	170	—	HPF-D014
						FT	55		
					HPX-EG	nL	70		
						FT	42		
					HPX-H		50		
					HPX-A		50		

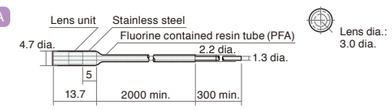
Note: • Scanning distances for diffuse scan are obtained with a standard target object (plain white paper).
• Response times for the sensing types: HP 5 ms, nL 1 ms, and FT 250 μs.
• For chemical resistance of fluorine-resin, see the Technical Guide (page 26).
• The values shown in the Minimum detectable size column were obtained with optimal scanning distance and sensitivity settings (**HPX-AG**).

EXTERNAL DIMENSIONS

Unit: mm

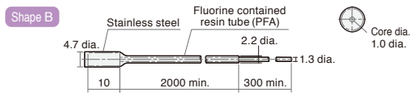
■ **HPF-T029**

Shape A



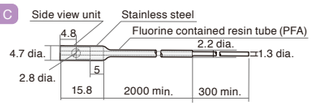
■ **HPF-T029E**

Shape B



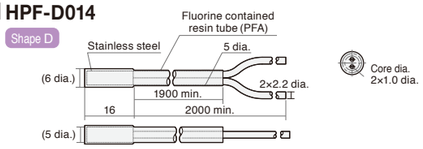
■ **HPF-T035**

Shape C



■ **HPF-D014**

Shape D

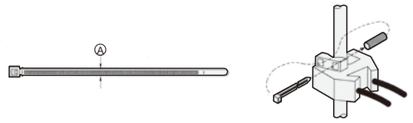


PRECAUTIONS FOR HANDLING (Installation)

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 no more than 2.5mm wide. Recommended pipe material is PFA, 1mm thick. For pipe diameter, see information on **HPX-T032/T034** in this brochure.



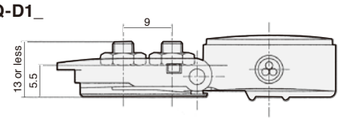
HPQ-D

Installation

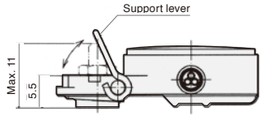
- Install this sensor on a horizontal surface.
  After attaching the mounting base, insert the sensor into the mounting base and push the support lever on the body down to fix the sensor.
- Screw mounting
  In the case of a PVC mounting base, punch out the knockout holes in the base, put two stud bolts with M4 thread that are stud-welded to a stainless steel (etc.) metal pan through the holes, and secure the sensor with two M4 nuts. For a PFA mounting base, install in the same manner but with a single M3 stud bolt.
- Mounting with adhesive
  The PVC type bracket can also be adhesive-mounted. If the surface on which the sensor will be mounted is made of PVC (polyvinyl chloride), which is the same material as the mounting base, we recommend a monomer-based adhesive. However, regardless of the type of surface material, be sure to check the specifications of the adhesive to make sure that it is appropriate.

* For use in explosive atmosphere
Since this product is not an explosion-proof type, it cannot be used in an explosive atmosphere.

HPQ-D1_



HPQ-D2_

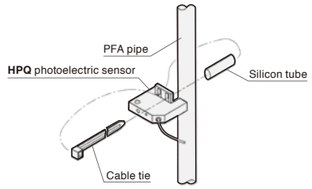


Unit: mm

HPQ-T

Mounting method

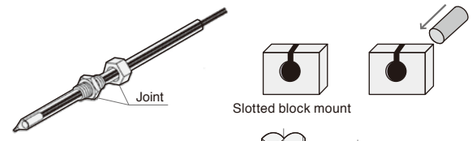
- The **HPQ-T** is pipe-mounted using either an M3 screw or cable tie. When mounting the sensor with a cable tie, be sure to secure the sensor by passing the cable tie through silicone tube to prevent the sensor from slipping.
  Sensitivity adjustment is not required.

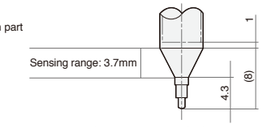


HPF-D027/ D033

Mounting method

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





The level at which liquid is detected differs according to surface tension and leakage situation where the fiber unit is located.

- The following may cause unstable sensing:
  1) Bubbles on conical portion of sensing head.
  2) Chemical precipitate on conical portion of sensing head.
  3) High density liquid-Some liquid properties, such as milky white color, may be undetectable.
- Do not scratch or deform the fiber unit tip. Doing so may cause unstable sensing. Protect it (esp. the conical part) from impact.
- In case dripping causes output chattering, use a timer.

HPQ-DP

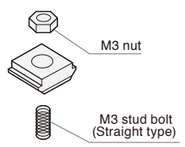
Mounting method

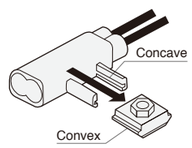
- Attaching the mounting base
  Use two M4 screws or stud bolts to fix the mounting base so that it does not wobble. The recommended tightening torque is 0.5 N·m or less.
- Mounting the sensor on the base
  Align the square hole in the mounting part of the sensor with the protrusion in the mounting base, and push the sensor until the detector head in the center of the sensor casing makes contact with the surface where leakage is to be detected.
- Removing the sensor from the mounting base
  While squeezing the mounting base at both ends with one hand, grasp the mounting part of the sensor casing with the other hand and pull the detector up to remove it.
  For details, refer to the instruction manual.

HPQ-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.
- Precaution for use in explosive atmospheres
  The fiber unit can be used in a hazardous location if the amplifier unit is installed in a non-hazardous location. However, before using the sensor, carefully check the explosion-proof regulations required for the facility and the equipment.

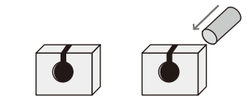


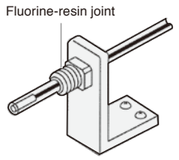


HPF-T029/T035/D014

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.
- Do not apply excessive tension to the fiber-optic cable.

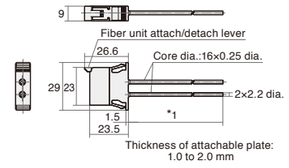




Before use, thoroughly read the instruction manual and product specification for this sensor.

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

HPF-EU05
HPF-EU10



Unit: mm

Model No.	Cable length*1
HPF-EU05	5000mm min.
HPF-EU10	10000mm min.

Product name	Shape	Description	Other specifications	Model No.
Fiber-optic extender		Use to extend fibers by linking them.	Cable length: 5 m. Bend: 4 mm in radius — Free cut	HPF-EU05
			Cable length: 10 m. Bend: 4 mm in radius — Free cut	HPF-EU10

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

	Type	Model No.	Scanning distance and cable length when combined with fiber extender: HPX-AG (HP mode: 5 ms in response time)*1		
			No extender	HPF-EU05 (5m)	HPF-EU10 (10m)
Thru scan	Pipe-mounted liquid level 	HPF-T032, T032E HPF-T034, T034E	Available*2	Available*2	Unavailable
			Cable length: 5 m	Cable length: 10 m	Cable length: 15 m
Diffuse scan	Liquid leakage 	HPF-D040	Available*2	Available*2	Unavailable
			Cable length: 5 m	Cable length: 10 m	Cable length: 15 m
	Contact liquid level 	HPF-D027	Available*2	Available*2	Unavailable
			Cable length: 5 m	Cable length: 10 m	Cable length: 15 m

*1 For combinations other than with **HPX-AG**, please contact us.
*2 Even where availability is indicated, detection may not be possible depending on the liquid. Please check operation before use.

PFA Chemical Proof

Substance		PFA chemical proof
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_3COOH	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 chemical proof
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	$FCCl_3$	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).