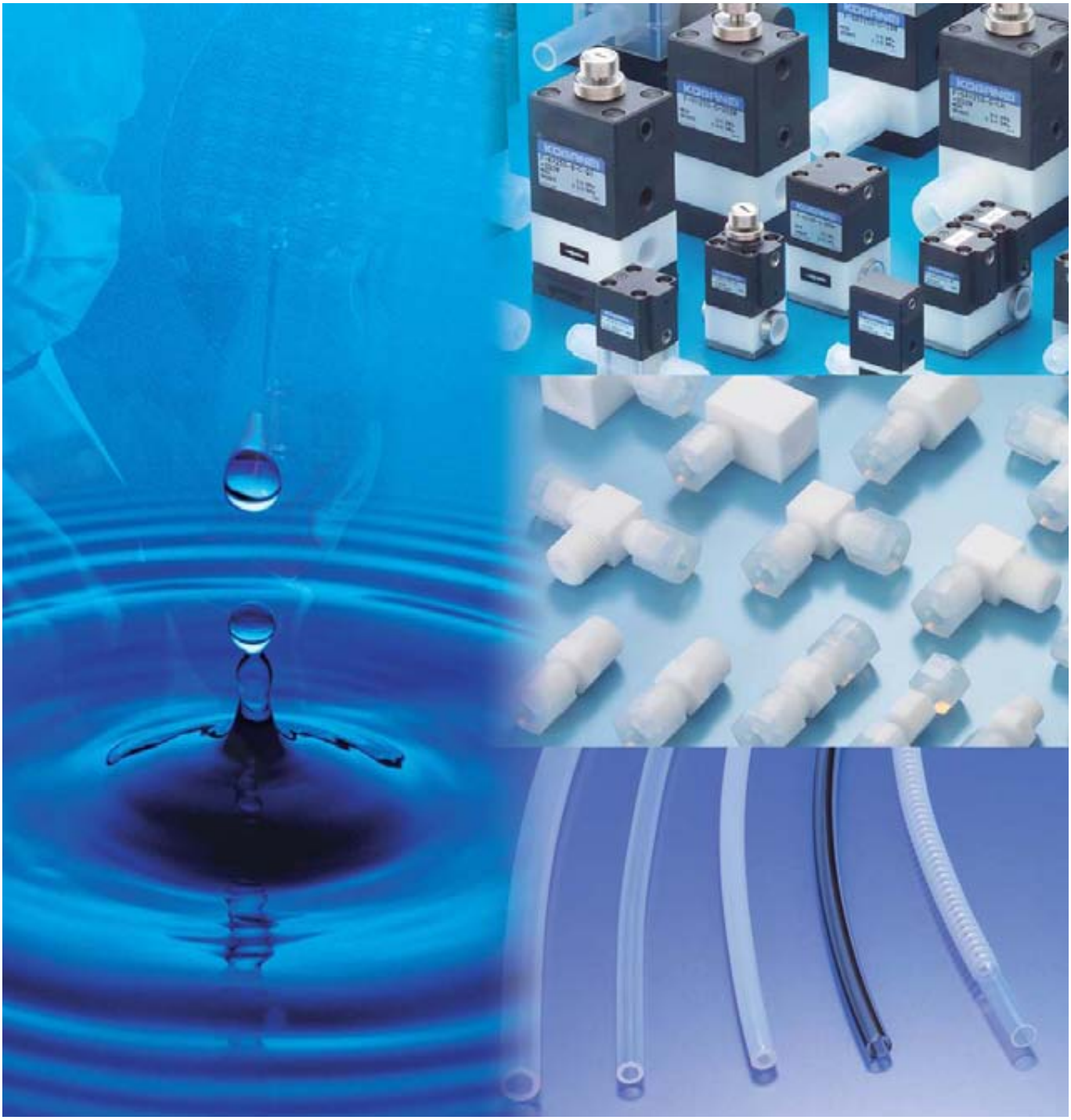
KOGANEI

Catalog No. BKF0003-②

http://www.koganei.co.jp

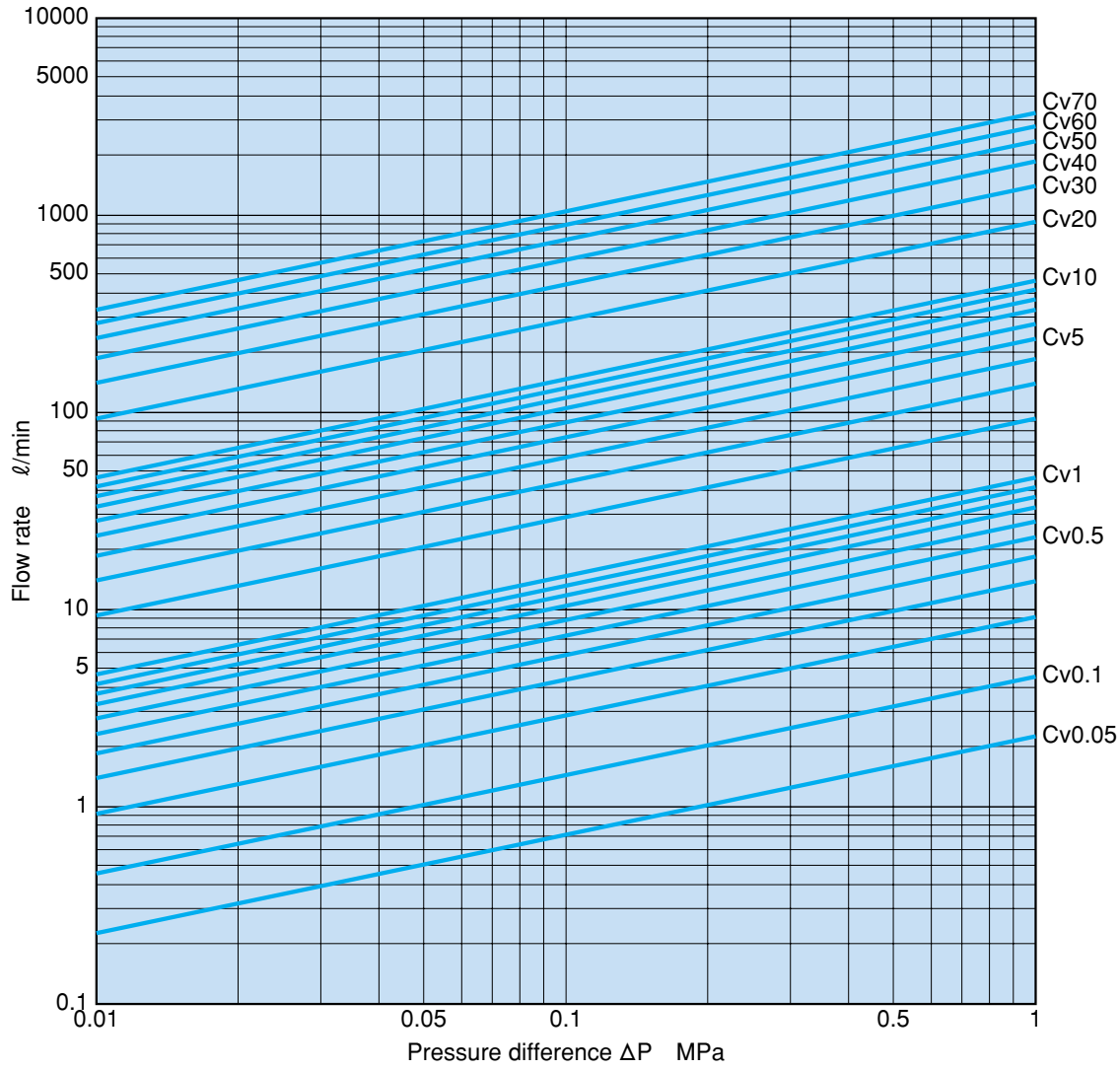
Fluororesin Products

Pure Process Series



Flow Rate Conversion Graph (water, air)

Water: Flow rate conversion graph



1 ℓ/min = 0.0353ft³/min.
1MPa = 145psi.

Note: The pressure difference ΔP in the graph shows the pressure difference between the primary (upstream) gauge pressure P1 and secondary (downstream) gauge pressure P2.
ΔP=P1−P2 (MPa)

Flow rate equation (in the equation, pressures Ph and Pl show absolute pressure)

$$Q=45.62Cv\frac{\sqrt{Ph-Pl}}{\sqrt{G}}$$

Q: Flow rate ℓ/min
Cv: Flow rate coefficient
Ph: Primary (upstream) absolute pressure (Mpa)
Pl: Secondary (downstream) absolute pressure (Mpa)
G: Specific gravity (for water, this equals 1)

$$Q'=0.1338Cv\frac{\sqrt{Ph'-Pl'}}{\sqrt{G}}$$

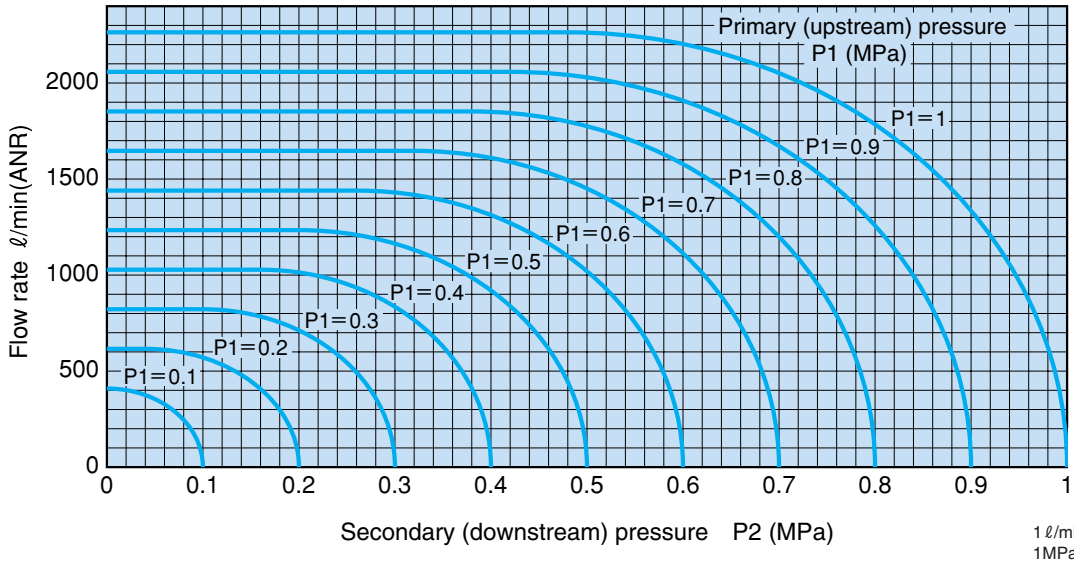
Q': Flow rate ft³/min.
Cv: Flow rate coefficient
Ph': Primary (upstream) absolute pressure (psi.)
Pl': Secondary (downstream) absolute pressure (psi.)
G: Specific gravity (for water, this equals 1)

How to use the graph

When there is no diagram for the valve flow rate coefficient (Cv) in the above graph:
Multiply the Cv of the valve being used to the flow rate at Cv = 1 read out from the graph to calculate the flow.

Example: At Cv = 1, value read out from the graph:
Q=20 ℓ/min [0.706ft³/min.] for the desired pressure difference
When flow rate coefficient for the valve being used is
Cv = 0.31
Seeking flow rate =Q×Cv=20×0.31=
6.2 ℓ/min [0.219ft³/min.]

Air: Flow rate conversion graph Cv=1



1 ℓ/min = 0.0353ft³/min.
1MPa = 145psi.

Note: Pressures P1 and P2 in the graph show the gauge pressure (MPa).

How to use the graph

The above graph shows the flow rate when the flow rate coefficient Cv = 1.
When Cv≠1, multiply the Cv of the valve being used to the flow rate read out from the graph to calculate the flow.

Example: Value read out from the graph:
Q=500 ℓ/min [17.7ft³/min.] (ANR) for the desired P1 and P2
When flow rate coefficient for the valve being used is Cv=0.31
Seeking flow rate =Q×Cv=500×0.31=
155 ℓ/min [5.47ft³/min.] (ANR)

Flow rate equation
(in the equation, pressures Ph and Pl show absolute pressure)

1) When Pl / Ph>0.5283

$$Q=4119Cv\frac{\sqrt{(Ph-Pl)Pl}}{\sqrt{G}}$$

2) When Pl / Ph≦0.5283

$$Q=2056CvPh\frac{1}{\sqrt{G}}$$

Q: Flow rate ℓ/min (ANR)
Cv: Flow rate coefficient
Ph: Primary (upstream) absolute pressure (Mpa)
Pl: Secondary (downstream) absolute pressure (Mpa)
G: Specific gravity (conversion specific gravity, when air is 1)

1) When Pl' / Ph' >0.5283

$$Q'=1.0Cv\frac{\sqrt{(Ph'-Pl')Pl'}}{\sqrt{G}}$$

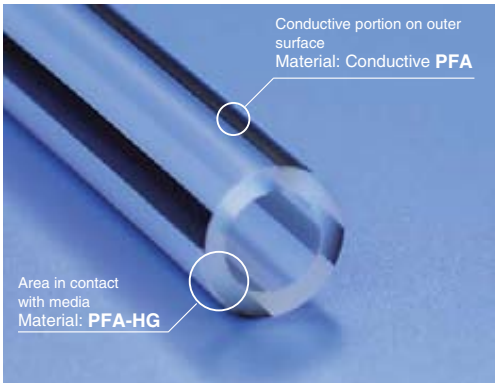
2) When Pl' / Ph' ≦0.5283

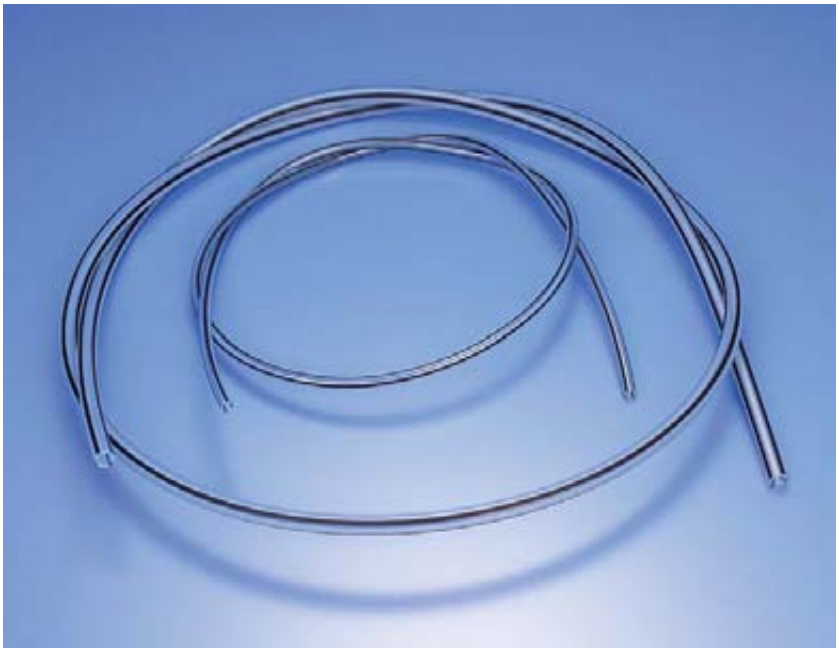
$$Q'=0.5CvPh'\frac{1}{\sqrt{G}}$$

Q': Flow rate ft³/min. (ANR)
Cv: Flow rate coefficient
Ph': Primary (upstream) absolute pressure (psi.)
Pl': Secondary (downstream) absolute pressure (psi.)
G: Specific gravity (conversion specific gravity, when air is 1)

Fluororesin PFA-NE Tubes — F-9003-PFA-NE

The F-9003-NE tubes incorporate striped conductive PFA areas onto the outer surface of Koganei's PFA-HG tubes.
The shielding effect of the conductive PFA is suitable for the prevention of accidental fires that could occur when flammable gas atmospheres spark fire onto the outer surface of the tubes.





Features

- Prevents sparks that could lead to fire risk.
- Prevents breakage of tube insulation due to electrical discharges from insulated atmosphere.
- No concerns about corrosion compared to metallic wires or meshes, etc.

Specifications (Reference)

- Maximum operating temperature: 200°C [392°F]
- Maximum operating pressure: Same as **PFA** tubes. See p.60, "Maximum Tube Operating Pressure."

Characteristics

Volume resistivity

Materials	Volume resistivity (Ω—cm [Ω—in.]
Conductive **PFA**	5.3×10^{2} [2.09×10^{2}]
PFA-HG	$>10^{18}$ [3.94×10^{17}]

- Sample: ϕ6.35×ϕ4.35
- Measurement method: Conforms to JIS K 7194.

Static charges removal characteristics

Unit: KV

Tube type	1m [3.3ft.] length tube: center	15m [49.2ft.] length tube: center	15m [49.2ft.] length tube: end
PFA-NE tube	0.5~0.7	0.5~0.7	0.5~0.7
PFA-HG tube	>2.0 (Measurement limit)	—	—

- Sample: ϕ6.35×ϕ4.35, Lengths: 1m [3.3ft.], 15m [49.2ft.]
- Measurement method: Ground one end, and rub across 20cm [7.9in.] in the center or opposite end of the sample with non-fiber paper 50 times, and then measure the surface potential of that section.
- According to the "Static Electricity Safety Guidelines" (issued by the Technology Institution of Industrial Safety), as a control index for static charges in non-conductors for prevention of explosions and fires, the static potential is regulated at 5KV or less when the minimum ignition energy of a flammable substance is at 0.1 to 1.0mJ range (equivalent to toluene or other solvents).

Order Codes

F - 9003 - PFA - NE - 6×4 - 10

- **F** — Series
- **9003** — Tube code
- **PFA** — Tube material
- **NE** — Tube type
- **6×4** — Tube size (outer dia.×inner dia.)
- **10** — Length (See p.65, basic dimension.)

Caution: The fluororesin tube series cannot be used with quick fittings.

Precautions for Use

- **The F-9003-NE is a tube that requires grounding. Always ensure tubes are grounded when in use. For grounding, Koganei's dedicated conductive Ground Strap is available.**

Ground Strap
Order code: **F-9021**
Sales unit: 1 bag (100 pcs.)

PFA-NE Tubes Standard Dimensions/Bursting Pressure at Room Temperature and Minimum Bending Radius

mm size

Size	Outer diameter mm [in.]		Thickness mm [in.]		Conductive portion thickness mm [in.]		Conductive portion width mm [in.]		Number of stripes	Length (m)		Bursting pressure at room temperature Note MPa [psi.]	Minimum bending radius Note mm [in.]
Outer dia.× Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance		Basic dimension	Tolerance		
3× 2	3.0 [0.118]	+0.15 −0.10 [+0.0059 −0.0039]	0.50 [0.0197]	±0.07 [±0.0028]	0.03 [0.0012]	+0.04 −0.01 [+0.0016 −0.0004]	0.6 [0.024]	±0.3 [±0.012]	4	10 50 100	+1% 0	5.7 [827]	15 [0.6]
4× 2	4.0 [0.157]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	0.8 [0.031]	±0.3 [±0.012]				8.8 [1276]	15 [0.6]
4× 3	4.0 [0.157]		0.50 [0.0197]	±0.07 [±0.0028]	0.03 [0.0012]	+0.04 −0.01 [+0.0016 −0.0004]	0.8 [0.031]	±0.3 [±0.012]				4.1 [595]	20 [0.8]
6× 4	6.0 [0.236]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	1.4 [0.055]	±0.4 [±0.016]				5.7 [827]	25 [1.0]
8× 6	8.0 [0.315]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	1.8 [0.071]	±0.4 [±0.016]				4.1 [595]	50 [2.0]
10× 8	10.0 [0.394]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	2.3 [0.091]	±0.4 [±0.016]				3.2 [464]	80 [3.1]
12×10	12.0 [0.472]	+0.25 −0.10 [+0.0098 −0.0039]	1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	2.6 [0.102]	±0.6 [±0.024]	8	10 50		2.7 [392]	130 [5.1]
19×16	19.0 [0.748]		1.50 [0.0591]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	3.8 [0.150]	±0.8 [±0.031]				2.5 [363]	200 [7.9]
25×22	25.0 [0.984]		1.50 [0.0591]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	4.9 [0.193]	±0.8 [±0.031]				1.9 [276]	370 [14.6]

Note: The above figures are reference values, and cannot be considered to be specified values.

10m = 32.8ft.

Inch size

Size	Outer diameter mm [in.]		Thickness mm [in.]		Conductive portion thickness mm [in.]		Conductive portion width mm [in.]		Number of stripes	Length (m)		Bursting pressure at room temperature Note MPa [psi.]	Minimum bending radius Note mm [in.]
Outer dia.× Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance		Basic dimension	Tolerance		
3.17× 2.17	3.17 [0.1248]	+0.15 −0.10 [+0.0059 −0.0039]	0.50 [0.0197]	±0.07 [±0.0028]	0.03 [0.0012]	+0.04 −0.01 [+0.0016 −0.0004]	0.8 [0.031]	±0.3 [±0.012]	4	10 50 100	+1% 0	5.3 [769]	15 [0.6]
6.35× 4.35	6.35 [0.2500]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	1.5 [0.059]	±0.4 [±0.016]				5.3 [769]	30 [1.2]
9.52× 6.35	9.52 [0.3748]		1.59 [0.0626]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	2.4 [0.094]	±0.4 [±0.016]				5.7 [827]	40 [1.6]
9.52× 7.52	9.52 [0.3748]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	2.2 [0.087]	±0.4 [±0.016]				3.4 [493]	70 [2.8]
12.70× 9.52	12.70 [0.5000]	+0.25 −0.10 [+0.0098 −0.0039]	1.59 [0.0626]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	2.6 [0.102]	±0.6 [±0.024]	8	10 50		4.1 [595]	75 [3.0]
19.05×15.88	19.05 [0.7500]		1.59 [0.0626]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	3.8 [0.150]	±0.8 [±0.031]				2.6 [377]	200 [7.9]
25.40×22.22	25.40 [1.0000]		1.59 [0.0626]	±0.12 [±0.0047]	0.06 [0.0024]	+0.06 −0.03 [+0.0024 −0.0012]	4.9 [0.193]	±0.8 [±0.031]				2.0 [290]	370 [14.6]

Note: The above figures are reference values, and cannot be considered to be specified values.

10m = 32.8ft.

F-9021 Ground Strap Handling Instructions

1. Product

- The Ground Strap is a tie strap for **PFA-NE** tubing, providing heat and chemical resistance due to employment of polypropylene, and also providing the anti-static charge function.
- Can be used to bundle **PFA-NE** tubes up to an outer diameter of ϕ19.05(3/4B size). It enables removal of static charges on the outer surfaces of the tubes by grounding.

2. Specifications

- Size: 6W × 195L (Bundling portion length: 88L, Hole for M3 grounding screw: ϕ3.5 × 1 place)
- Material: Polypropylene with carbon
- Operating temperature range: −40°~85°C [−40°~185°F]
- Chemical resistance: Acid: good, Alkaline: excellent, Organic solvent: good
- Volume resistivity (material): $10^3\Omega \cdot cm$
- Surface resistivity (material): $10^{4\sim5}\Omega \cdot cm$
- Applicable tube sizes: Up to ϕ19.05 (3/4B size)

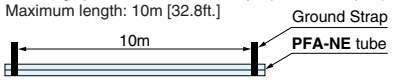
3. Product inspections and checks

When the product is delivered, check the following characteristics:

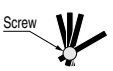
- Quantity and outward appearance (Molding failure: mottles, sink, burning, deformation)
- Can tubes be smoothly inserted and secured while tying tubes? If you find a smaller quantity and/or damage to the product, immediately contact us.

4. Mounting span of the Ground Straps

- Mounting span of the Ground Straps (maximum span) Maximum length: 10m [32.8ft.]

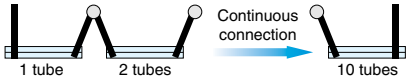


- Number of Ground Straps that can be overlaid for grounding: Maximum of 10 pcs.



10 pcs.

- Number of tubes that can be bundled together when connecting several tubes tied by Ground Straps for grounding: Maximum of 10 pcs.

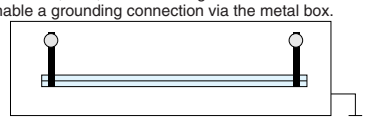


Note: The mounting span of the Ground Straps, which is based on the Static Electricity Safety Guidelines (Ministry of Labour, Research Institute of Industrial Safety), uses a leakage resistance of 100MΩ or less as the basis for restricting the surface electrical potential of major flammable materials to the minimum ignition energy or less.

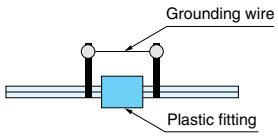
5. Mounting method

Use a ϕ3.5 [0.138in.] hole for M3 screws to install as shown below:

- Use a M3 screw to directly secure the Ground Strap to a metal box, etc., or attach a ground lead to the box to enable a grounding connection via the metal box.



- When using insulation type plastic fittings, use Ground Straps with ϕ3.5 [0.138in.] holes to connect 2 Ground Straps placed on both sides of the fitting with a grounding wire. When using metallic fittings, a Ground Strap is not required, since grounding can be performed directly from the metal fitting.



6. Precautions for safety use

- After attaching the Ground Strap, check that there is no looseness.
- After the Ground Strap has been grounded, use a volt-ohm-milliammeter, etc., to check for proper grounding with leakage resistance of 100Ω or less.
- If the leakage resistance is not adequate even after the Ground Strap has been grounded, wrap the **PFA-NE** tube with conductive tape (aluminum tape, etc.), and then tie the tubes with the Ground Strap.
- In the cases in which Ground Strap chemical resistance is suspected because of spattering chemicals, soaking in chemicals, etc., it is recommended that a detailed investigation into the planned application be performed beforehand.