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Fluororesin Products PURE PROCESS Series



Fluororesin Products

Pure Process Series

Among various plastic materials, fluororesin exhibits particularly superior chemical resistance, heat resistance, low friction, electrical insulation, low tackiness, weather resistance, and other features. This superior material is fabricated using micro-machining technology for PTFE products, and Koganei's independently developed injection molding method for PFA products, all under Koganei's rigorous quality control. These products are used in the semiconductor, liquid crystal, and other electronics sectors, as well as in chemicals, food products, medical equipment, chemical plants, and a wide variety of other industrial sectors.

Fluororesin Valve Series



- Compact series line-up suitable for control of small chemical flows now offers even more variety.
- In addition to diverse piping specifications and valve functions, the line-up offers a wide selection of options, such as automatic flow adjustment.
 - Air operated valves
 - Suck back valves
 - Air operated valves with suck back
 - Solenoid valve
 - Check valve
 - Drain valves



Fluororesin H Series Fittings



Simple construction eliminates the need for dedicated tools. Ease of operation during piping is boosted dramatically.

 Tapered seal type offers superior pressure resistance, sealing ability, and heat resistance.

- Straight type
- Elbow type
- T type
- Reducing type

Page 🕢

Fluororesin Tube Series



- Size variations for the field-proven fluororesin tube have expanded.
- The high-grade HG tube and NE tube that demonstrates effectiveness against anti-static charges, have been added to the line-up.
 - PFA tubes
 - PFA-HG tubes
 - PFA-NE tubes
 - BT tubes
 - RPL tubes

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 Before selecting and using products, please read all the Safety Precautions carefully to ensure proper product use. The Safety Precautions shown below are to help you use the product safely and correctly, and to prevent injury or damage to you, other people, and assets beforehand.

Follow the Safety Precautions for: ISO4414 (Pneumatic fluid power—Recommendations for the application of equipment to transmission and control systems), JIS B 8370 (Pneumatic system regulations).

The directions are ranked according to degree of potential danger or damage: "DANGER!", "WARNING!", "CAUTION!" and "ATTENTION!"

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Expresses situations that can be clearly predicted as dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in light or semi-serious injury. It could also result in damage or destruction of assets.
While there is little chance of injury, this content refers to points that should be observed for appropriate use of the product.

This product was designed and manufactured as parts for use in General Industrial Machinery.

- In the selection and handling of equipment, the system designer or other person with fully adequate knowledge and experience should always read the Safety Precautions, Catalog, User's Manual and other literature before commencing operation. Making mistakes in handling is dangerous.
- After reading the Instruction Manual, Catalog, etc., always place them where they can be easily available for reference to users of this product.
- If transferring or lending the product to another person, always attach the Instruction Manual, Catalog, etc., to the product where they are easily visible, to ensure that the new user can use the product safely and properly.
- The danger, warning, and caution items listed under these "Safety Precautions" do not cover all possible cases. Read the Catalog and User's Manual carefully, and always keep safety first.

<u> D</u>ANGER

- Do not use for the purposes listed below:
 - 1. Medical equipment related to maintenance or management of human lives or bodies.
 - 2. Mechanical devices or equipment designed for the purpose of moving or transporting people.
 - 3. Critical safety components in mechanical devices.

This product has not been planned or designed for purposes that require advanced stages of safety. It could cause injury to human life.

- Do not use solenoid valves in locations with or near dangerous substances such as flammable or ignitable substances. The products are not explosion-proof. They could ignite or burst into flames.
- Do not allow flammable gases or ignitable chemicals to flow the solenoid valves. Moreover, do not use the solenoid valve in atmospheres containing flammable gases. There is a chance of explosion or ignition.
- Persons who use a pacemaker, etc., should keep a distance of at least one meter [3.28ft.] away from the solenoid valve. There is a possibility that the pacemaker will malfunction due to the strong magnet built into the solenoid valve.
- Do not use any media other than those shown in the specifications table. Use of non-specified media could lead to early shutdown of function or a sudden drop in performance, and result in a reduced operating life. Media leakage on the outside of the product could pose a risk to human life.
- When using chemicals, always check compatibility with the structural materials of the product before use. Use of incompatible media could lead to early shutdown of function or a sudden drop in performance, and result in a reduced operating life. Fluid leakage on the outside of the product could pose a risk to human life.
- When attaching the product, always ensure that it is securely mounted in place. Dropping or falling the product or improper operation could result in injury.
- While the product is in operation, avoid touching it with your hands or otherwise approaching too close. In addition, do not make any adjustments to the interior or to the attached mechanisms (manual override, connecting and disconnecting of wiring connectors, disconnection or connection of piping

tubes or plugs, or adjustment of mounting locations) while in operation. The chemicals could leak out, possibly resulting in injury.

- Do not splash water on the product. Spraying it with water, washing it, or using it underwater could result in malfunction of the product leading to injury, electric shocks, fires, etc.
- Never attempt to remodel the product. It could result in abnormal operation leading to injury, electric shocks, fires, etc.
- Never attempt inappropriate disassembly, assembly or repair of the product relating to basic construction, or to its performance or to functions. It could result in injury, electric shocks, fires, etc.

<u> WARNING</u>

- Do not use the product in excess of its specification range. Such use could result in product breakdowns, function stop or damage or drastically reduce the operating life.
- Before supplying chemicals, gases, or pilot air to the product, and before beginning operation, check that the piping is connected correctly. Careless supply of chemicals, gases, or pilot air could result in chemicals, etc. flowing to an unintended location or leaking out, and causing injury.
- For repairs, inspections, maintenance, replacement, or any other operations related to the product (particularly when the media used are chemicals), check that the chemicals have been completely drained from inside of the equipment, and that pilot air has been shut off and pressure inside the piping completely released. Neglecting this check could lead to leaks of chemicals, etc., that could cause injury.
- When installing a fluororesin fitting, always perform a leak test before supplying chemicals or gases through it, to check that there are no leaks, and then start passing the media. Neglecting this check could lead to leaks of chemicals, etc., that could cause injury.
- Do not pull on tubes that are connected to the fittings. The tube(s) could pull out, leaking chemicals or gases.
- When using fittings and tubes, always use compatible screw sizes and tube sizes. Use of incompatible sizes could lead to leaks or disconnections.
- Always check the Catalog etc. to ensure that solenoid valve

wiring and piping is installed correctly. Errors in wiring and piping could lead to abnormal operation.

- Do not use the solenoid valves or the wiring to control them, at locations close to power lines where large electrical currents are flowing, or in locations subject to strong magnetic fields or power surges. Such applications could lead to unintended operation.
- Do not install solenoid valves inside control panels. Heat inside the control panels could cause leakage on the piping or other areas.
- When energizing the solenoid valve for long periods, provide heat radiation measures to ensure that ambient temperature of the solenoid valve always remain within the specified temperature range. When energizing the unit for long periods, consult us.
- The solenoid valve could generate surge voltage and electromagnetic waves when the switch is turned off, affecting the operations of surrounding equipment. Use solenoids with surge suppression, or take countermeasures in the electrical circuits for surges or electromagnetic waves.
- Always shut off the power when performing wiring work. Leaving the power on could result in electric shocks.
- After completing wiring work, always check to ensure that no wiring connection errors exist before turning on the power.
- Apply the specified voltage to the solenoid. Using the wrong voltage level will prevent the solenoid from performing its function, and could lead to breakage or burning damage of the product itself.
- Avoid scratching the solenoid valve lead wires. Letting the lead wires be subject to scratching, excessive bending, pulling, rolling up, or being placed under heavy objects or squeezed between two objects, may result in current leaks or defective continuity that lead to fires, electric shocks, or abnormal operation.
- Do not touch terminals and miscellaneous switches, etc., while the solenoid valve is powered on. There is a possibility of electric shocks and abnormal operation.
- Design devices so as to ensure safety even when equipment shuts down due to emergency stops, power outages, or other system problems, to prevent damage to the devices or personal injury.
- In the first operation after the equipment has been idle for 48 hours or more, or has been in storage, there is a possibility that contacting parts have been sticked, resulting in equipment operation delays or sudden movements. For these first operations, always run a test operation before use to confirm that the movement is normal.
- In low frequency use (more than 30 days between uses), there is a possibility that contacting parts have been sticked, resulting in equipment operation delays or sudden movements that could lead to personal injury. Run a test operation at least once every 30 days to confirm that movement is normal.
- Do not sit on the product, place your foot on it, or place other objects on it. Accidents such as falling and tripping over could result in injury. Dropping the product may result in injury, or also damage or break the product resulting in abnormal or erratic operation, or runaway, etc.
- Do not allow the product to be thrown into fire. The product could explode and/or release toxic gases.

- Do not use in locations that are subject to direct sunlight (ultraviolet rays), in locations with high temperatures or high humidity, in locations subject to dust, salt, or iron powder, or when the media or ambient atmosphere include components that are incompatible with the product structural materials. It could lead to early shutdown of function or a sudden degradation of performance, and result in a reduced operating life. For the material, see the Major Parts and Materials.
- When mounting the product, leave room for adequate working space around it. Failure to ensure adequate working space will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- For installing or transporting heavy products, use a lift, supporting tool, or several people, to provide firm support, and proceed with due caution to ensure personal safety.

- Always post an "operations in progress" sign for installations, adjustments, or other operations, to avoid accidental supply of chemicals, gases, pilot air, or electrical power, etc. Accidental supplying of chemicals, gases, pilot air, or electrical power, etc., could result in injury to operators due to sudden movement of the product, or to electrical shocks.
- Do not bring floppy disks or magnetic media, etc., within one meter [3.28ft.] of the product. There is the possibility that the data on the floppy disks will be destroyed due to the magnetism of the magnet.
- Do not use the solenoid valve in locations subject to large electrical currents or magnetic fields. It could result in erratic operation.
- If leakage current is occurring in the control circuit, there is a possibility of the product performing an unintended operation. Take measures against leakage current in the control circuit, to ensure that the leakage current value does not exceed the allowed range in the product specifications.
- Do not block the product's breathing holes. Pressure changes occur due to changes in volume during operation. Blocking the breathing holes destroys the pressure balance, and could cause failure of the intended operation, equipment damage, or personal injury.

- When considering the possibility of using this product in situations or environments not specifically noted in the Catalog or User's Manual, or in applications where safety is an important requirement, such as in an airplane facility, combustion equipment, leisure equipment, safety equipment and other places where human life or assets may be greatly affected, take adequate safety precautions such as application with enough margins for ratings and performance or fail-safe measures. Be sure to consult us with such applications.
- The properties of fluororesin products mean that they may sometimes not be used with certain acid, alkaline or toxic fluids due to penetration or permeation. For use in such applications, consult us.
- Always check the Catalog and other reference materials for product wiring and piping.
- Use protective covers, etc., to ensure that the operating parts of mechanical devices, etc., are isolated and do not come into direct contact with human bodies.
- When handling the product, wear protective gloves, safety glasses, safety boots, etc. to keep safety.
- When the product can no longer be used, or is no longer necessary, dispose of it appropriately as industrial waste.
- Fluororesin products can show deterioration in performance or function as operating span lengthens. Perform daily inspections of fluororesin products, to check that they satisfy the required functions for the system, and to prevent accidents.
- For inquiries about the product, consult your nearest Koganei sales office or Koganei overseas department. The address and telephone number is shown on the back cover of this catalog.



- Always observe the following items.
 - When using this product in fluid system or pneumatic systems for pilot, always use genuine KOGANEI parts or compatible parts (recommended parts). When conducting maintenance and repairs, always use
 - genuine KOGANEI parts or compatible parts (recommended parts). Always observe the required methods and procedure.
 - 2. Never attempt inappropriate disassembly or assembly of the product relating to basic construction, or to its performance or to functions.

Koganei cannot be responsible if these items are not properly observed.



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.

 $\Delta P = P1 - P2$ (MPa)

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

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

Q: Flow rate ℓ /min

- Ph: Primary (upstream) absolute pressure (Mpa)
- Pl: Secondary (downstream) absolute pressure (Mpa)
- *G*: Specific gravity (for water, this equals 1)

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

- *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: $Q=20 \ \ell/min \ [0.706ft^3/min.]$ for the desired pressure difference When flow rate coefficient for the valve being used is Cv = 0.31Seeking flow rate $=Q \times Cv = 20 \times 0.31 = 6.2 \ \ell/min \ [0.219ft_3/min.]$



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

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

$$2=2056 CvPh \frac{1}{\sqrt{G}}$$

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': Flow rate ft.3/min. (ANR)

Cv: Flow rate coefficient

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

Ph': Primary (upstream) absolute pressure (psi.)

Pl: Secondary (downstream) absolute pressure (psi.)

G: Specific gravity (conversion specific gravity, when air is 1)

Fluororesin Tube Series



Koganei uses our own independently developed advanced molding technology, in a clean environment, to manufacture all kinds of highquality fluororesin tubes. These can be used in semiconductors, liquid crystals, and other areas in the electronics sector, in biotechnology, in the medical and food-products sector, in fine chemicals, and in other advanced sectors, as well as in petrochemicals, and in a wide range of general industrial applications.

Because it is impossible to cover all possible uses or operation environment conditions, features, applications, specifications, data, etc., are relegated to "Reference" in the catalog. Read and understand the tube series safety precautions on p. before use.

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

Fluororesin Tube Features and Application Examples (Reference)

Chemical resistance Operating temperature range Non-tackiness (low friction) Withstands virtually all corrosive fluids available on the High level of non-tackiness -eatures ⁼eatures Usable over a broad temperamarket, including strong acids, means even highly viscous fluture range, from -40°~260°C alkalis, and solvents. ids flow virtually without [-40°~500°F] (PFA, PTFE). (Exceptions include fused alkaline sticking. metals, high-temperature fluorine gas, etc.) Urethane foam chemical liquid Acid and alkali cleaning lines transfer line in plating plants Highly corrosive waste fluid Paint transfer line Steam transfer line line Transfer of sticky powders Fuel transfer lines in aircraft, Protective sheathing for Transfer of adhesives or sticky automobiles, etc. wiring substances For applications under -40°C [-40°F], Sheathing for pipes, rollers, etc. consult us **Electrical insulation** Purity Weather resistance Contains no plasticizers or Exhibits excellent insulation ⁻eatures eatures Exhibits superior weather Features additives. In addition, it elutes properties, and is stable over a resistance, and does not extremely small amounts of wide range of temperatures degrade (deteriorate) over time. impurities into the media. and frequencies. Transfer line for high-purity chemicals Applications in which tube Tubes for electrical sheathing used in semiconductors Cooling tubes for electrical replacement should be Transfer of ultra-pure water equipment, power units, etc. avoided Juice manufacturing processes Medical product and food-product Insulation for lead wires and Applications near coastlines manufacturing processes heaters subject to severe salt dam-Transfer line for clean air Insulation sheathing for wiring age or ultraviolet radiation Tubes for liquid and gas analyzers

🚹 Warning

- This product is a fluororesin product. To maintain its performance and ensure safe use, strictly observe the following precautions:
- 1. Do not use for any purposes other than those listed in the catalog, etc.
- 2. Never use in contact with human tissue or fluids, etc.
- 3. Never ingest (accidental swallowing, etc.) products into the human body.
- 4. Do not use at temperatures in excess of the maximum operating temperature specified in the catalog.
- 5. Processing at temperatures above the maximum operating temperature can generate cracked fluorine gases. For this reason, always provide sufficient ventilation, and take measures to avoid inhaling the cracked gas.
- 6. When discarding, use the processes detailed in the waste management and public cleaning law.
- Do not incinerate the discarded product. If, however, incineration must be performed, always do it at an incineration facility equipped with neutralizing agents and other suitable disposal equipment.

Precautions for Product Handling

To avoid deteriorating the performance of this product, read and understand the precautions listed below before use:

- 1. All technical data in this catalog (items expressing product capabilities) are values obtained in actual testing, or are reference values, and are not intended to be guaranteed values.
- Careful investigation of the planned usage is recommended before use.
- 2. Careful investigation is particularly necessary for fluids that are strongly acidic, alkaline, or toxic. For such uses, consult us.
- 3. Due to properties of the material, there is a risk of repeated loads, excessive concentrated loads, or bending loads, having an effect on durability. For such uses, perform careful investigation before use.
- 4. While self-lubrication is a property of fluororesins, abrasive action is also progressive.
- For application in locations where repeated wear occurs, periodic replacement of the product is recommended.
- 5. Due to fluororesin characteristics, the fluid can penetrate or permeate the material, depending on the operating environment.
- In addition, because of the risk of product hardening or changes in dimensions, perform careful investigation before use.
- 6. Some products can be manufactured at specifications not listed in this catalog. In these cases, the products are available within a certain reasonable range of cost and delivery deadlines.
- 7. If some detail is not clear in the above items or elsewhere, consult us.

Maximum Tube Operating Pressure (Reference)

Use at or less than the Put pressure obtained in the below equation:





200

260

Tube Size and Flow Rate (Reference)

The relationship between the flow rate, flow velocity, and inner diameter of the tube is found as in the below equation:



 $\frac{\text{Tube inner diameter}}{2}^{2} [\text{in.}^{2}] = \frac{\text{Flow rate [in.}^{3}/\text{sec.}]}{\text{Flow velocity [in.}/\text{sec.}]}$

For a graphic expression of this relationship, a nomograph can be used to determine the relationship between the tube size and flow rate.

 How to determine the required tube size for pure water flowing at 150 cm³/s, and a flow velocity of 2m/s

On the left side of the graph, use a discharge flow rate point of 150 cm³/s, and in the center, use the 2m/s flow velocity point. Draw a straight line through those two points, and then beyond to the right side of the graph, to intersect with the point showing the tube size, or in this case, a tube inner diameter of 3/8".

$$\label{eq:linear} \begin{split} & 1\ell/\text{min} = 0.0353\text{ft}^3/\text{min}. \\ & 1\text{cm}^3\text{/s} = 0.061\text{in}^3/\text{sec}. \\ & 1\text{m/s} = 3.28\text{ft}./\text{sec}. = 39.37\text{in}./\text{sec}. \\ & 1\text{cm}^2 = 0.155\text{in}^2. \end{split}$$

Nomograph



The **F-9003-PFA** tubes employ **PFA**, the most superior material among the fluororesins, and are molded by melting resin extrusion molding.

With its superior chemical resistance, heat resistance, weather resistance, and electrical characteristics, it is the most suitable piping for all kinds of chemicals.





Features

- Chemically inert, it can withstand virtually any chemical products.
- With little fluid permeability, it is suitable for hoses for chlorine gas and other halogen gases.
- A combination of strength and flexibility ensures strong resistance to bending fatigue.
- Offers superior low wear and non-tackiness characteristics.
- Electrical characteristics are extremely stable.
- Superior weather resistance ensures long-term durability in outdoor applications.
- Excellent transparency allows monitoring of fluids inside.

Specifications (Reference)

- Maximum operating temperature: 260°C [500°F]
- Maximum operating pressure: See p., "Maximum Tube Operating Pressure."

Applications

- Piping, etc., inside equipment capable of handling all kinds of chemicals, pure water, or ultra-pure water.
- Manufacturing available in straight type (1m, 2m, and 3m lengths).
- Consult us. Manufacturing also available in fluororesin PTFE. Consult us.

Order Codes



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

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

mm size

Size Note 1	Outer diam	eter mm [in.]	Thicknes	s mm [in.]	Length (n	ו)	Bursting pressure at room	Minimum bending
Outer dia.×Inner	r dia. Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	temperature ^{Note 2} MPa [psi.]	radius Note 2 mm [in.]
3× 2	3.0 [0.118]		0.5 [0.020]	±0.06 [±0.0024]			5.7 [827]	15 [0.6]
4× 2	4.0 [0.157]		1.0 [0.039]	±0.10 [±0.0039]			8.8 [1276]	15 [0.6]
4× 3	4.0 [0.157]		0.5 [0.020]	±0.06 [±0.0024]	10 00 50 100		4.1 [595]	20 [0.8]
△ 5× 3	5.0 [0.197]		1.0 [0.039]	±0.10 [±0.0039]	10, 20, 50, 100		6.9 [1001]	20 [0.8]
△ 5×4	5.0 [0.197]		0.5 [0.020]	±0.06 [±0.0024]	200		3.2 [464]	25 [1.0]
6× 4	6.0 [0.236]		1.0 [0.039]	±0.10 [±0.0039]			5.7 [827]	25 [1.0]
△ 6×5	6.0 [0.236]		0.5 [0.020]	±0.06 [±0.0024]			2.7 [392]	35 [1.4]
△ 7×5	7.0 [0.276]		1.0 [0.039]	±0.10 [±0.0039]	10, 20, 50, 100		4.8 [696]	40 [1.6]
△ 7×6	7.0 [0.276]	±0.10	0.5 [0.020]	±0.06 [±0.0024]	400		2.2 [319]	50 [2.0]
8× 6	8.0 [0.315]	[=0.0000]	1.0 [0.039]	±0.10 [±0.0039]	10 20 50 100		4.1 [595]	50 [2.0]
△ 8× 7	8.0 [0.315]		0.5 [0.020]	±0.06 [±0.0024]	10, 20, 30, 100		2.0 [290]	65 [2.6]
△ 9× 7	9.0 [0.354]		1.0 [0.039]	±0.10 [±0.0039]	250		3.6 [522]	60 [2.4]
△ 9× 8	9.0 [0.354]		0.5 [0.020]	±0.06 [±0.0024]			1.7 [247]	80 [3.1]
10× 8	10.0 [0.394]		1.0 [0.039]	±0.10 [±0.0039]			3.2 [464]	80 [3.1]
△ 10× 9	10.0 [0.394]		0.5 [0.020]	±0.06 [±0.0024]	10, 20, 50, 100		1.5 [218]	105 [4.1]
△ 11× 9	11.0 [0.433]		1.0 [0.039]	±0.10 [±0.0039]			2.9 [421]	100 [3.9]
12×10	12.0 [0.472]		1.0 [0.039]	±0.10 [±0.0039]			2.7 [392]	130 [5.1]
△ 12×11	12.0 [0.472]		0.5 [0.020]	±0.06 [±0.0024]			1.4 [203]	170 [6.7]
△ 13×10	13.0 [0.512]		1.5 [0.059]	±0.15 [±0.0059]	200	+1%	3.8 [551]	75 [3.0]
△ 13×11	13.0 [0.512]		1.0 [0.039]	±0.10 [±0.0039]		0	2.4 [348]	155 [6.1]
△ 14×12	14.0 [0.551]		1.0 [0.039]	±0.10 [±0.0039]			2.2 [319]	190 [7.5]
△ 15×12	15.0 [0.591]		1.5 [0.059]	±0.15 [±0.0059]			3.2 [464]	105 [4.1]
△ 15×13	15.0 [0.591]	10.10	1.0 [0.039]	±0.10 [±0.0039]			2.1 [305]	210 [8.3]
16×13	16.0 [0.630]	± 0.12 [±0.0047]	1.5 [0.059]	±0.15 [±0.0059]			3.0 [435]	125 [4.9]
16×14	16.0 [0.630]		1.0 [0.039]	±0.10 [±0.0039]	10 20 50		2.0 [290]	145 [5.7]
△ 17×15	17.0 [0.669]		1.0 [0.039]	±0.10 [±0.0039]	10, 20, 30		1.8 [261]	290 [11.4]
△ 18×15	18.0 [0.709]		1.5 [0.059]	±0.15 [±0.0059]			2.7 [392]	170 [6.7]
△ 18×16	18.0 [0.709]		1.0 [0.039]	±0.10 [±0.0039]			1.7 [247]	340 [13.4]
19×16	19.0 [0.748]		1.5 [0.059]	±0.15 [±0.0059]			2.5 [363]	200 [7.9]
19×17	19.0 [0.748]		1.0 [0.039]	±0.10 [±0.0039]			1.6 [232]	400 [15.7]
△ 21×18	21.0 [0.827]		1.5 [0.059]	±0.15 [±0.0059]			2.2 [319]	250 [9.8]
△ 22×19	22.0 [0.866]	10.45	1.5 [0.059]	±0.15 [±0.0059]	100		2.1 [305]	280 [11.0]
△ 22×20	22.0 [0.866]	±0.15 [±0.0059]	1.0 [0.039]	±0.10 [±0.0039]	10 20 50		1.4 [203]	560 [22.0]
25×22	25.0 [0.984]		1.5 [0.059]	±0.15 [±0.0059]	10, 20, 50		1.9 [276]	370 [14.6]
25×23	25.0 [0.984]		1.0 [0.039]	±0.10 [±0.0039]	100		1.3 [189]	740 [29.1]

Notes: 1. Sizes shown by the triangle mark △ cannot be used with H series fittings.
2. The above figures are reference values, and cannot be considered to be specified values.

Inch size

Size	Outer diame	eter mm [in.]	Thicknes	s mm [in.]	Length (n	ר)	Bursting pressure at room	Minimum bending
Outer dia.×Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	temperature ^{Note} MPa [psi.]	radius Note mm [in.]
3.17× 1.59	3.17 [0.1248]		0.79 [0.0311]	±0.10 [±0.0039]			8.8 [1276]	15 [0.6]
6.35× 3.17	6.35 [0.2500]	±0.10	1.59 [0.0626]	±0.15 [±0.0059]	10, 20, 50,		8.8 [1276]	20 [0.8]
6.35× 3.96	6.35 [0.2500]	[±0.0039]	1.20 [0.0472]	±0.12 [±0.0047]	100, 200		6.5 [943]	20 [0.8]
6.35× 4.35	6.35 [0.2500]		1.00 [0.0394]	±0.10 [±0.0039]			5.3 [769]	30 [1.2]
9.52× 6.35	9.52 [0.3748]		1.59 [0.0626]	±0.15 [±0.0059]		+1%	5.7 [827]	40 [1.6]
9.52× 7.52	9.52 [0.3748]	±0.12	1.00 [0.0394]	±0.10 [±0.0039]	10, 20, 50,	0	3.4 [493]	70 [2.8]
12.70× 9.52	12.70 [0.5000]	[+0.0047]	1.59 [0.0626]	±0.15 [±0.0059]	100		4.1 [595]	75 [3.0]
12.70×10.70	12.70 [0.5000]	[=0.0017]	1.00 [0.0394]	±0.10 [±0.0039]			2.5 [363]	150 [5.9]
19.05×15.88	19.05 [0.7500]		1.59 [0.0626]	±0.15 [±0.0059]	10 00 50		2.6 [377]	200 [7.9]
25.40×22.22	25.40 [1.0000]	±0.15 [±0.0059]	1.59 [0.0626]	±0.15 [±0.0059]	10, 20, 50		2.0 [290]	370 [14.6]

10m = 32.8ft.

Note: The above figures are reference values, and cannot be considered to be specified values. 10m = 32.8ft. The F-9003-PFA-HG tubes are PFA tubes that use a NEW PFA-type material with a low level of elution of fluorine ions, having a smooth tube internal surface obtained by controlling the high degree of polymerization (microcrystalline of spherulite) of PFA. Suitable for applications in the semiconductor and liquid crystal industrial sectors with demand for ultra-clean conditions.





Features

The following features are achieved in addition to the performance of conventional PFA tubes:

- The tube interior surface is smooth (Rt = 0.2μ m).
- Reduced residual particulates and chemicals
- Reduced cleaning time
- Reduced chemical solution penetration volume, due to reduced tube internal surface area
- Improved transparency
- Improved dielectric strength
- Uses NEW PFA type material.
- Reduced elution of fluorine ions
- Improved stress crack resistance in stressed environments
- (i.e., sulfuric acid hydrogen peroxide, fuming sulfuric acid, etc.)

Specifications (Reference)

- Maximum operating temperature: 260°C [500°F]
- Maximum operating pressure: Same as PFA tubes. See p.@, "Maximum Tube

Operating Pressure."



%Photo shows transparency comparison between regular PFA tubes and PFA-HG tubes (comparison by Koganei).

Characteristics

Metal ion elution results

Item	Elution weight μ g [n oz.]
K	<0.02 [0.71]
Na	<0.01 [0.35]
Ca	<0.01 [0.35]
AI	<0.02 [0.71]
Cr	<0.01 [0.35]
Ni	< 0.01 [0.35]
FE	< 0.02 [0.71]
Cu	< 0.01 [0.35]

* Analysis method:

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- Fill the sample tube with about 70m ℓ [4.27in3] (tube length: 900mm [35.4in.]) of hydrofluoric acid, and perform an elution test at room temperature for 6 days.
- After completion of the elution test, evaporate the elution solution, add nitric acid to the effluent, then reduce it with pure water, and make a determination of the elements included in the elution solution by frameless atomic absorption spectrophotometry.

% The above figures are measurement values, and cannot be considered to be specified values.

Comparison of PFA tube internal surface roughness

	Unit	PFA-HG tube	Company A product	Company B product	PFA tube
Surface roughness (Rt)	(<i>μ</i> m)	0.2	0.8	0.8	0.8

Note: % The above figures are measurement values, and cannot be considered to be specified values. % Rt=Rmax

* The Company A and Company B products are conventional PFA tubes.

Fluorine ion elution results

	Unit	PFA-HG tube	Regular PFA tube
Elution concentration	(ppm)	1.6	4.2

Analysis method:

- **1.** Cut up a tube (outer diameter ϕ 25.4 \times inner diameter ϕ 22.2) into pellets.
- Soak the tube test sample in 20mℓ[1.22in3] extract. Leave at room temperature for 24 hours, and then use fluororine ion measurement equipment (Expandable Ion Analyzer EA940, made by Orion Research) to measure the fluorine ion concentration (contents ratio of the extract: water, methanol, TISAB (II) = 1:1:2).

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

mm size

Size	Outer diame	eter mm [in.]	Thicknes	s mm [in.]	Length (m)		Bursting pressure at room	Minimum bending
Outer dia.×Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	temperatureNote MPa [psi.]	radius ^{Note} mm [in.]
3×2	3.0 [0.118]		0.5 [0.020]	±0.06 [±0.0024]			5.7 [827]	15 [0.6]
4×2	4.0 [0.157]		1.0 [0.039]	±0.10 [±0.0039]	10, 20, 50,		8.8 [1276]	15 [0.6]
4×3	4.0 [0.157]		0.5 [0.020]	±0.06 [±0.0024]	100, 200		4.1 [595]	20 [0.8]
6×4	6.0 [0.236]	±0.10	1.0 [0.039]	±0.10 [±0.0039]			5.7 [827]	25 [1.0]
8×6	8.0 [0.315]	[±0.0039]	1.0 [0.039]	±0.10 [±0.0039]	10 20 50	+1%	4.1 [595]	50 [2.0]
10× 8	10.0 [0.394]		1.0 [0.039]	±0.10 [±0.0039]	10, 20, 50,	Ū	3.2 [464]	80 [3.1]
12×10	12.0 [0.472]		1.0 [0.039]	±0.10 [±0.0039]	100		2.7 [392]	130 [5.1]
19×16	19.0 [0.748]	±0.12 [±0.0047]	1.5 [0.059]	±0.15 [±0.0059]	10 20 50		2.5 [363]	200 [7.9]
25×22	25.0 [0.984]	±0.15 [±0.0059]	1.5 [0.059]	土0.15 [土0.0059]	10, 20, 50		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 diame	eter mm [in.]	Thicknes	s mm [in.]	Lengt	:h (m)	Bursting pressure at room	Minimum bending
Outer dia. XInner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	temperatureNote MPa [psi.]	radius ^{Note} mm [in.]
3.17× 2.17	3.17 [0.1248]		0.50 [0.0197]	±0.06 [±0.0024]			5.3 [769]	15 [0.6]
6.35×3.96	6.35 [0.2500]	±0.10 [±0.0039]	1.20 [0.0472]	±0.12 [±0.0047]	10, 20, 50,		6.5 [943]	20 [0.8]
6.35×4.35	6.35 [0.2500]	[_0.0000]	1.00 [0.0394]	±0.10 [±0.0039]	100, 200		5.3 [769]	30 [1.2]
9.52×6.35	9.52 [0.3748]		1.59 [0.0626]	±0.15 [±0.0059]		+1%	5.7 [827]	40 [1.6]
9.52× 7.52	9.52 [0.3748]	±0.12	1.00 [0.0394]	±0.10 [±0.0039]	10, 20, 50,	0	3.4 [493]	70 [2.8]
12.70× 9.52	12.70 [0.5000]	[±0.0047]	1.59 [0.0626]	±0.15 [±0.0059]	100		4.1 [595]	75 [3.0]
19.05×15.88	19.05 [0.7500]		1.59 [0.0626]	±0.15 [±0.0059]	10 20 50		2.6 [377]	200 [7.9]
25.40×22.22	25.40 [1.0000]	±0.15 [±0.0059]	1.59 [0.0626]	±0.15 [±0.0059]	10, 20, 50		2.0 [290]	370 [14.6]

Note: The above figures are reference values, and cannot be considered to be specified values. 10m = 32.8ft.

Order Code



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. , "Maximum Tube Operating Pressure."

range (equivalent to toluene or other solvents).

Characteristics

Volume resistivity

Materials	Volume resistivity $(\Omega$ —cm [Ω —in.]
Conductive PFA	5.3×10² [2.09×10²]
PFA-HG	>10 ¹⁸ [3.94×10 ¹⁷]

Sample: $\phi 6.35 \times \phi 4.35$

Measurement method: Conforms to JIS K 7194.

Static charges r	emoval 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: \$\$\phi 6.35\$ 15m [49.] Measurement met across 2 opposite fiber pap the surfa 	\$ \$\phi \$ 4.35\$, Lengths: 1m [3.3ft.], 2ft.] hod: Ground one end, and rub 20cm [7.9in.] in the center or end of the sample with non- er 50 times, and then measure ce potential of that section.	According to the "S Guidelines" (issued by the Industrial Safety), as charges in non-cond explosions and fires regulated at 5KV or less energy of a flammable s	tatic Electricity Safety ne Technology Institution of a control index for static uctors for prevention of , the static potential is when the minimum ignition ubstance is at 0.1 to 1.0mJ

Order Codes



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

Size	Outer diam	eter mm [in.]	Thicknes	s mm [in.]	Conducti thicknes	ve portion s mm [in.]	Conductive mm	portion width [in.]	Number	Length (m)		Bursting pressure at	Minimum
Outer dia.× Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	of stripes	Basic dimension	Tolerance	room tem- perature ^{Note} MPa [psi.]	radius ^{Note} mm [in.]
3× 2	3.0 [0.118]		0.50 [0.0197]	±0.07 [±0.0028]	0.03 [0.0012]		0.6 [0.024]	±0.3 [±0.012]	- 4			5.7 [827]	15 [0.6]
4× 2	4.0 [0.157]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]		0.8 [0.031]	±0.3 [±0.012]		10		8.8 [1276]	15 [0.6]
4× 3	4.0 [0.157]	$\begin{bmatrix} +0.15 \\ -0.10 \\ [+0.0059] \\ [-0.0039] \end{bmatrix}$	0.50 [0.0197]	±0.07 [±0.0028]	0.03 [0.0012]		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]		1.4 [0.055]	±0.4 [±0.016]		50		5.7 [827]	25 [1.0]
8× 6	8.0 [0.315]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]		1.8 [0.071]	±0.4 [±0.016]		100	+1% 0	4.1 [595]	50 [2.0]
10× 8	10.0 [0.394]		1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]		2.3 [0.091]	±0.4 [±0.016]				3.2 [464]	80 [3.1]
12×10	12.0 [0.472]	10.05	1.00 [0.0394]	±0.07 [±0.0028]	0.06 [0.0024]		2.6 [0.102]	±0.6 [±0.024]	8			2.7 [392]	130 [5.1]
19×16	19.0 [0.748]	+0.25 -0.10 [+0.0098] [-0.0039]	1.50 [0.0591]	±0.12 [±0.0047]	0.06 [0.0024]		3.8 [0.150]	±0.8 [±0.031]		10		2.5 [363]	200 [7.9]
25×22	25.0 [0.984]		1.50 [0.0591]	±0.12 [±0.0047]	0.06 [0.0024]		4.9 [0.193]	±0.8 [±0.031]		50		1.9 [276]	370 [14.6]
Note: The above figures are reference values and cannot be considered to be specified values 10m = 32.8ft.													

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

Inch size

Size	Outer diame	eter mm [in.]	Thicknes	s mm [in.]	Conducti thickness	ve portion s mm [in.]	Conductive mm	portion width [in.]	Number	Lengt	Length (m)		Minimum
Outer dia.× Inner dia.	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	of stripes	Basic dimension	Tolerance	room tem- perature ^{Note} MPa [psi.]	radius ^{Note} mm [in.]
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]	$^{+0.04}_{\begin{array}{c}-0.01\\[+0.0016\\-0.0004\end{array}]}$	0.8 [0.031]	±0.3 [±0.012]	4	4 10 50 100		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]	$^{+0.06}_{-0.03} \\ \left[^{+0.0024}_{-0.0012} \right]$	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]			0	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]	$^{+0.06}_{-0.03}\\ \left[^{+0.0024}_{-0.0012} \right]$	2.2 [0.087]	±0.4 [±0.016]			+1% 0	3.4 [493]	70 [2.8]
12.70× 9.52	12.70 [0.5000]		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]				4.1 [595]	75 [3.0]
19.05×15.88	19.05 [0.7500]	+0.25 -0.10 $\left[+0.0098\\-0.0039\right]$	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]	8	10	10 50	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]		50		2.0 [290]	370 [14.6]
Note: The above fic	ote: The above figures are reference values, and cannot be considered to be specified values. 10m = 32.8ft.												

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

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 Can be used to bundle **PFA-NE** tubes up to an outer
- diameter of ϕ 19.05(3/4B size). It enables removal of static charges on the outer surfaces of the tubes by grounding

- Operating temperature range: -40°~85°C [-40°~185°F]
- Chemical resistance: Acid: good, Alkaline: excellent, Organic solvent: good
- Volume resistivity (material): 10³Ω cm
 Surface resistivity (material): 10^{4~5}Ω cm
- Applicable tube sizes: Up to ϕ 19.05 (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.] Ground Strap 10m PFA-NE tube

- Number of Ground Straps that Screw 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.



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

5. Mounting method

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- Use a ϕ 3.5 [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 43.5 [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

- 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.

The F-9003-BT fluororesin BT tubes are a thick type of fluororesin PTFE tube with superior flexibility and transparency. With a small bending radius that prevents buckling or crushing, this tube is convenient for piping in tight spaces, while its thickness and transparency ensure safety and check monitoring on interior flows.





Features

- A small bending radius prevents buckling or crushing even if sharply bent.
- Allows checks on interior media flows.
- Resists virtually all chemical products.
- Superior non-tackiness makes cleaning easy.

Specifications (Reference)

- Maximum operating temperature: 260°C [500°F]
- Maximum operating pressure: See p.⁽¹⁰⁾, "Maximum Tube **Operating Pressure.**"

F-9003-BT Tubes Standard Dimensions/Bursting Pressure at Room Temperature and Minimum Bending Radius

mm size

Size	Outer diameter	Inner diameter	Outer diameter mm [in.]		Thickness mm [in.]		Length (m)		Bursting pressure at room temperature ^{Note}	Minimum bending radius Note	
	mm	mm	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	MPa [psi.]	mm [in.]	
4A	4	2	4 [0.157]		1.0 [0.039]	±0.10 [±0.0039]		+2%	11.8 [1711]	10 [0.4]	
6A	6	3	6 [0.236]	±0.10	1.5 [0.059]	土0.15 [土0.0059]	10		11.8 [1711]	10 [0.4]	
8A	8	5	8 [0.315]	[±0.0039]	1.5 [0.059]		20		7.4 [1073]	25 [1.0]	
10A	10	7	10 [0.394]		1.5 [0.059]		30		5.0 [725]	40 [1.6]	
12A	12	9	12 [0.412]	±0.15 [±0.0059]	1.5 [0.059]				3.9 [566]	55 [2.2]	

Note: The above figures are reference values, and cannot be considered to be specified values. 10m = 32.8ft.

Inch size

Size	Outer diameter	Inner diameter	Outer diame	eter mm [in.]	Thicknes	s mm [in.]	Lengt	:h (m)	Bursting pressure at room temperature ^{Note}	Minimum bending radius Note			
	mm	mm	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	MPa [psi.]	mm [in.]			
1/8B	3.17	1.59	3.17 [0.1248]		0.79 [0.0311]	±0.10 [±0.0039]	10		11.7 [1697]	5 [0.2]			
1/4B	6.35	3.17	6.35 [0.2500]	±0.10	1.59 [0.0626]			+2%	9.8 [1421]	10 [0.4]			
3/8B	9.52	6.35	9.52 [0.3748]	[_0.0000]	1.59 [0.0626]	±0.15 [±0.0059]	± 0.15 [± 0.0059]	±0.15 [±0.0059]	[±0.0059]	20	0	3.0 [435]	30 [1.2]
1/2B	12.70	9.52	12.70 [0.5000]	±0.15 [±0.0059]	1.59 [0.0626]				4.0 [580]	55 [2.2]			
Note: The al	Note: The above figures are reference values, and cannot be considered to be specified values. 10m = 32.8ft.												

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

Order Code



The F-9003-RPL tubes are PTFE tubes equipped with a helical groove. Endowed with extreme flexibility, they offer a small bending radius, as well as excellent low friction and nontackiness. The result is a tube with low fluid pressure loss, and a low chance for fluid adherence to the inner surface of the tube.

In addition, the tube's resistance to bending fatigue has been improved greatly over the properties of the F-9003-PL conventional pliable tube.



Features

Resistance to bending fatigue

Inner diameter basis tube (1)



Specifications (Reference)

- Material: PTFE
- Maximum operating temperature: See the table at the bottom of this page.
- Maximum operating pressure: See the table at the bottom of this page.

F-9003-RPL Tubes Standard Dimensions/Bursting Pressure at Room Temperature and Minimum Bending Radius

Size	Inner diameter at end mm [in.]	Helical outer dia. mm [in.]	Bursting pressure at room temperature MPa [psi.]	Minimum bending radius mm [in.]	Available length m [ft.]
6A	6 [0.236]	8.5 [0.335]	1.8 [261]	6.0 [0.24]	3.0 [9.8]
8A	8 [0.315]	10.5 [0.413]	1.4 [203]	7.0 [0.28]	3.0 [9.8]
10A	10 [0.394]	13.0 [0.512]	1.0 [145]	10.0 [0.39]	3.0 [9.8]
12A	12 [0.472]	16.0 [0.630]	0.9 [131]	15.0 [0.59]	3.0 [9.8]
1/4B	6.4 [0.252]	8.5 [0.335]	1.8 [261]	6.0 [0.24]	3.0 [9.8]
3/8B	9.5 [0.374]	13.0 [0.512]	1.0 [145]	10.0 [0.39]	3.0 [9.8]
1/2B	12.7 [0.500]	16.0 [0.630]	0.9 [131]	15.0 [0.59]	3.0 [9.8]

Outer diameter basis tube (O)

Size	Inner diameter at end mm [in.]	Helical outer dia. mm [in.]	Bursting pressure at room temperature MPa [psi.]	Minimum bending radius mm [in.]	Available length m [ft.]	
6A	6 [0.236]	8.5 [0.335]	1.8 [261]	6.0 [0.24]	3.0 [9.8]	
8A	8 [0.315]	9.5 [0.374]	1.6 [232]	7.0 [0.28]	3.0 [9.8]	
10A	10 [0.394]	12.0 [0.472]	1.3 [189]	9.0 [0.35]	3.0 [9.8]	
12A	12 [0.472]	14.5 [0.571]	1.0 [145]	10.0 [0.39]	3.0 [9.8]	
1/4B	6.4 [0.252]	8.5 [0.335]	1.8 [261]	6.0 [0.24]	3.0 [9.8]	
3/8B	9.5 [0.374]	12.0 [0.472]	1.3 [189]	9.0 [0.35]	3.0 [9.8]	
1/2B	12.7 [0.500]	14.5 [0.571]	1.0 [145]	10.0 [0.39]	3.0 [9.8]	

* The dimensions shown above are standard values. For items with lengths of 3m [9.8ft.] or more, consult us separately.

* The above figures are measurement values, and cannot be considered to be specified values.

Maximum Tube Operating Pressure (Reference)



Caution: Set the operating temperature upper limit at 200°C [392°F]. This is a design data based on actual test values, and is not intended to be guaranteed values. Use this data as reference data when selecting a product. For determination of actual use, careful evaluation is recommended before use.

Use the product at pressures at or below the **PU.T** determined in the below equation:

\mathbf{P} U.T = $\mathbf{S} \times \mathbf{a} \times \mathbf{P}$ R.T

- **S** : Safety factor (take safety factor of 1/3 to 1/5 or more.)
- **a** : Bursting pressure reduction coefficient for the operating temperature, read from the diagram at left
- PR.T : Tube bursting pressure at room temperature

Tube Types

Depending on application, there are 2 types of end dimensions available, the inner diameter basis (1) and the outer diameter basis (0).

Inner diameter basis tube (1)

Use this type when using pipes, etc., inserting inside the tube to form joints. Glass, metal, or plastic pipes can be used as joints.

Outer diameter basis tube (O)

Use this type when using tube fittings, etc. The shape of the end is available in 3 different types, depending on applications. When using the fluororesin tube fitting, use types B or C.



Type C with welded straight portions on both ends



Order Codes



Limited Warranty KOGANEI CORP. warrants its products to be free from defects • KOGANEI CORP. shall in no way be liable or responsible for in material and workmanship subject to the following provisions. injuries or damage to persons or property arising out of the use or operation of the manufacturer's product. Warranty Period The warranty period is 180 days from the date • This warranty shall be void if the engineered safety devices of delivery. are removed, made inoperative or not periodically checked for Koganei If a defect in material or workmanship is found proper functioning. Responsibility during the warranty period, KOGANEI CORP. • Any operation beyond the rated capacity, any improper use or will replace any part proved defective under application, or any improper installation of the product, or any normal use free of charge and will provide the substitution upon it with parts not furnished or approved by service necessary to replace such a part. KOGANEI CORP., shall void this warranty. Limitations This warranty is in lieu of all other warranties,

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