List of general characteristics of fluorine resin

	Characteristic		Unit	ASTM Test Method	PTFE	PFA	FEP	PCTE	ETFE	ECTFE	PVDE
Physical	melting point		℃	—	327	310	275	220	270	220-245	156-178
	specific gravity		—	D792	2.14-2.20	2.12-2.17	2.12-2.17	2.03-2.2	1.70	1.68-1.69	1.75-1.78
Mechanical	tensile strength		Mpa	D638	13.7-34.3	27.5-29.4	18.6-21.6	30.9-41.2	45.1	41.2	24.5-50.0
	elongation		%	D638	200-400	300	250-330	80-250	100-400	200-300	12-430
	compressive strength		Mpa	D695	11.8	—	15.2	31.4-51.0	49.0	—	45.1-96.1
	Izot impact strength		J/㎡	D526A	160	no break	no break	133-144	no break	no break	160-374
	Rockwell hardness		—	D785	—	—	—	R75-112	R50	R93-95	R77-83
	Shore handness		—	D2240	D50-55	D64	D60-65	D75-80	D75	D55	D75-77
	flexural modulus		Gpa	D790	0.55	0.82	0.55-0.66	1.25-1.79	1.37	0.66-0.69	2.00-2.48
	tensile elasticity		Gpa	D638	0.40-0.55	—	0.34	0.049-2.06	0.83	1.65	1.00-2.94
	coefficient of dynamic friction		—	0.69Mpa 3m/min	0.1	0.2	0.3	0.37	0.4	—	0.39
Thermal	thermal conductivity		W/m·K	C177	0.25	0.25	0.25	0.20-0.22	0.24	0.16	0.10-0.13
	specific heat		102J/kg·K	—	1.0	1.0	1.2	0.92	1.9-2.0	—	1.4
	coefficient of thermal elongation		10-5/℃	D696	10	12	8.3-10.5	4.5-7.0	5.9	8	7-14
	ball pressure temperature		℃	—	180	230	170	170	185	—	—
	thermal displacement temperature	1.81Mpa	℃	D648	55	47	50	—	74	77	54-115
		0.45Mpa	℃	D648	121	74	72	126	104	116	138
	max. working temperature		℃	(no load)	260	260	200	120	150	150	150
Electrical	volume resistivity		Ω·cm	D257 (50%RH.23℃)	>1018	>1018	>1018	1.2×1018	>1018	>1015	2×1014
	strength of breakdown (short time)		WV/m(t3.2mm)	D149	19	<19	20-24	20-24	16	20	10-11
	permittivity	60Hz	pF/m	D150	<19	<19	<19	20-25	23	23	74
		10^3Hz	pF/m	D150	<19	<19	<19	20-24	23	23	68
		10^6Hz	pF/m	D150	<19	<19	<19	20-22	23	23	56
	loss tangent	60Hz	—	D150	<0.0002	<0.0002	<0.0002	0.0012	0.0006	<0.0005	0.049
		10^3Hz	—	D150	<0.0002	<0.0002	<0.0002	0.023-0.027	0.0008	0.0015	0.018
		10^6Hz	—	D150	<0.0002	<0.0002	<0.0002	0.009-0.017	0.005	<0.015	0.17
	arc-resistance		s	D495	>300	>300	>300	>360	75	18	50-70
Durability & others	water absorption(24h)		%	D570	<0.01	<0.01	<0.01	0.01	0.029	0.01	0.03-0.06
	combustibility(t3.2mm)		—	(UL-94)	V-0	V-0	V-0	V-0	V-0	V-0	V-0
	limited oxygen index		—	D2863	>95	>95	>95	>95	30	60	44
	sunlight affection		—	—	none	none	none	none	none	none	none
	weak acid affection		—	D543	none	none	none	none	none	none	none
	strong acid affection		—	D543	none	none	none	none	none	none	damaged by pyrosulfuric acid
	weak alcali affection		—	D543	none	none	none	none	none	none	none
	strong alcali affection		—	D543	none	none	none	none	none	none	none
	solution affection		—	D543	none	none	none	slightly swell by halogen compound	none	good durable	durable to most of solutions

※Above list is quoted from “Fluorine Resin Handbook” issued by Japan Fluorine Resin Industrial Association.

Feature of fluorine resin hose

Fluorine resin hose has unique feature which other resins do not have, and solves many problems. Among the features, heat resistance, chemical inactivity, electrical characteristic, low friction, non-viscosity, etc., are particular features based on molecular structure. Those are strong points.

01 Chemical Resistance
Fluorine resin hose is good for chemical and solution, but exceptionally invaded melted alkali metals, fluorine under high temperature and high pressure and some of halogen conductors. As it will not pollute the fluid, it is good for hoses such as acid/alkali lines, phamaceutical line, pure water line, and food line.

02 Purity
Fluorine resin does not have any stabilizer or anti-oxidant, etc., so it is very pure. Metallic ion or organic carbon, etc., will never come out.

03 Heat Resistance
Applicable is wide range of −80℃~+260℃. (It varies by pressure or fluid.)

04 Non-viscosity
It is hard to fix adhesive matters, excellent release characteristics, and good for applying adhesive fluids. Besides, easy to clean inside of the hose.

05 Electrical Characteristic
Among all solid insulators it has the smallest permittivity and dissipation factor, and is steady at wide range of frequency and temperature. Its volume and surface resistivity show the maximum value, and it has excellent electric isolation.

06 Weather Resistance
In outdoor use, it will not be affected semi-permanently.

07 Low friction feature
It has the smallest coefficient of friction among all resins. It is equivalent to friction value which ocurrs when two pieces of ice rubbed each other.

08 Hygroscopy
Water absorption rates of PTFE and PFA are slightly different, but fluorine resin absorbs almost no water.

STATIC ELECTRICITY

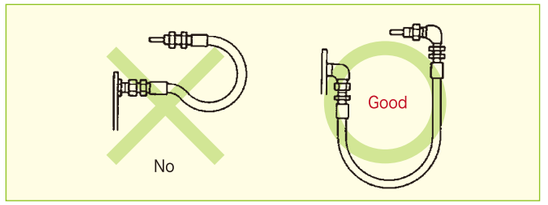
Fluorine resin hose is excellent in chemical resistance and heat resistance, and carries roll for transportation of various kinds of fluid or flour as almighty anti-corrosion pipe material. Fluorine resin hose which is applied on manufacturing lines of production equipments in many factories, will often be affected by static electricity depending on condition of actual fluid transportation.
In case of transportation of chemicals, fuel, gas, or steam, etc., it is necessary to take measures to discharge static electricity. When two different substances contact each other, electrons are attracted from one substance to the other and try to combine. These electrons have habit to form a line along contact surface. If those two substances have high conductivity, the positive pole and the negative pole will keep balance by going back and forth between the two substances.
However, if those substances are electrically isolated, electric current is disturbed and electricity is stored on the surface of one substance. When the stored electricity exceeds the durability, the stored substance will be broken.
Fluorine resin hose is electrically isolated and fits the above theory. For transportation of low conductive fluid or gas in high speed, you have to take measures to discharge static electricity. Quantity of the storing electricity will increase in proportion to fluid speed. Generally, high pressure means high speed.
Among various kinds of fluids, fuel and steam can incur the static electricity trouble even in low speed flow. Gasoline, hydrazine, or Jet JP-4 will often meet this trouble even in very slow flow. Also steam will invite trouble because of its character to easily store static electricity on inner surface of the hose.
We recommend to use anti-static type hose to discharge static electricity.

USE

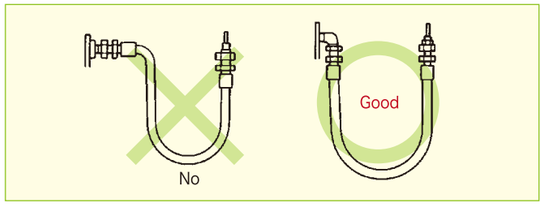
- Various equipments which need high isolation or high frequency trait.
- Pipe lines of super pure water for electronics or extra-super pure water.
- Seawater desalination plant for bio-technology industry.
- Transportation pipe lines in various kinds of manufacturing plants such as chemicals, food, pharmaceutical products, pulp, refrigeration, leather manufacturing, adhesive agent manufacturing, painting, rubber manufacturing, etc.
- Pipe lines of fuel, cooling water, air, lubricant, hydraulic system or steam, for airplane, automobile, ship, forged forming machine, machine tool, construction machine, etc.

Note for Application of hose

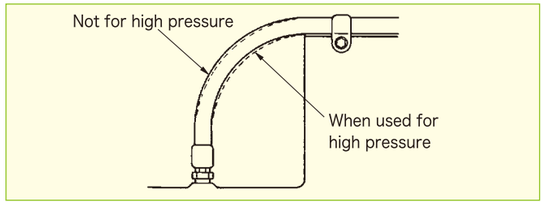
Even if hose has excellent efficiency, unless you use it correctly, it will not work in full efficiency. Followings are examples.



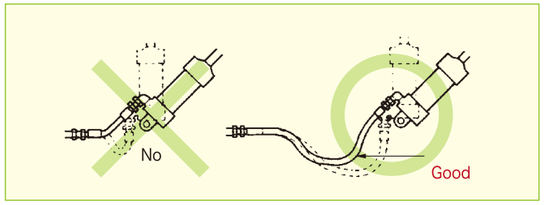
When using the hose in minimum bending radius, apply elbow as shown in the sketch to avoid sharp bending.



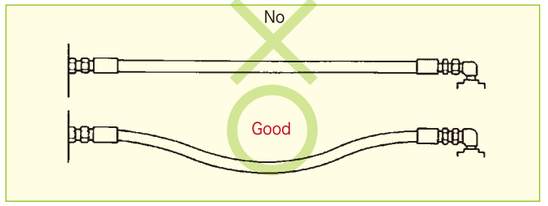
By applying elbow, please avoid extreme torsion or bending.



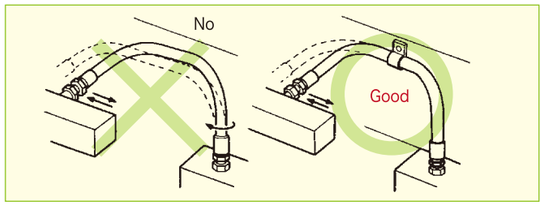
When the hose has inner pressure by fluid, hose length will slightly change. But do not fix the bending portion to suppress the change.



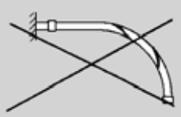
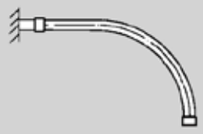
Hose length need proper allowance. It will make hose movement smooth and avoid sudden bending.



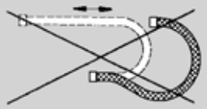
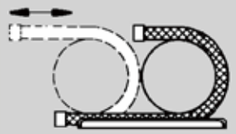
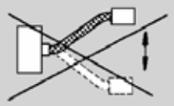
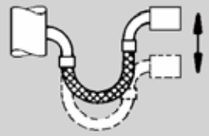
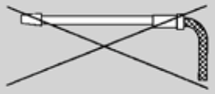
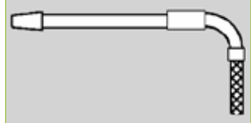
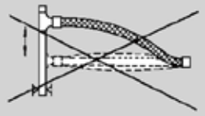
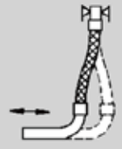
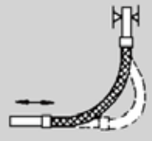
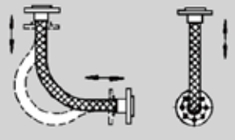
When the hose is used for high pressure, length will change in range of +2% and -4%. So, it must have sufficient looseness.

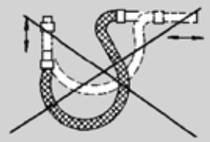
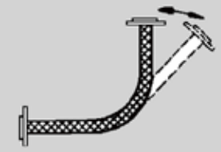


When two ends of the hose are installed in different faces as shown in the sketch, please fix the hose in another face to avoid torsion.

Error		Correct
	When extend coiled hose, do not twist.	
	When install a hose, adjust the position of joint fitting to avoid twisting. (Static)	
	Please avoid to install a short hose, but apply a longer hose to make circle. (Static)	

Note for Application of hose

Error		Correct
	For many curves, apply elbows to avoid burden to a hose. Please keep the hose with only one curve.	
	Too much burden to a hose reduces its endurance. Hold the hose by support like a rail.	
	For short distance of connecting pipe line with vertical movement, please apply elbows to make a hose U-shape. (Dynamic)	
	Do not hang a hose at a part. Please apply a pulley or round support to avoid burden to the hose. (Static)	
	When installing a hose to horizontal outlet of the line, please apply elbow joint. (Static)	
	When a hose is installed horizontally and one end of the hose moves vertically, we recommend to locate the other end in the center of vertical movement. (Dynamic)	
	For horizontal movement, please install a hose vertically. (Dynamic)	
	If horizontal movement is big, it might damage the hose. Please apply longer hose to draw 90˚curve. (Dynamic)	
	In case there are vertical movement and horizontal movement in the connection of vertical line and horizontal line, please locate both joint points and the hose to make straight line. (Dynamic)	

Error		Correct
	In case horizontal side is in upper position in the connection of vertical line and horizontal line, please apply elbow. (Dynamic)	
	In the connection of two horizontal lines with same distance, we recommend to apply a hose with suitalbe length to the distance. (Dynamic)	
	In case one end of a hose moves sideways, it will cause twist. So, you must adjust direction of pipe line.	

Others:

1. The hose is made of soft materials. So, when some sharp-edged objects get inside, inner surface of the hose might be damaged. Please be careful to avoid such objects or outer damage.
2. In the pipe line where water hammer shock may occur, please absorb shock by applying elbows or change hose installing location.

Request when you order Please place order by confirming the followings.

No.	Item	Note
1	N.B.	Nominal Bore of pipe
2	Pressure	Necessary for selecting hose and designing structure
3	Kind of fluid	Necessary for selecting hose and designing structure
4	Temperature	Necessary for selecting hose and designing structure
5	Condition of installation	Min. bending radius, frequency of bending, or displacement of pipe line, etc.
6	Face to face distance	Necessary for designing hose length
7	Kind of joint fitting	Thread, flange, or others
8	Materials of tube and fitting	When special materials are needed due to surrounding atmosphere
9	Vibration, etc.	Frequency of vibration

Notes on this catalog. When you refer to this catalog, please note the followings.

1. Please do note use the hose for other applications than shown in this catalog.
2. Physical properties shown in this catalog are typical ones. Unless otherwise specified, peculiar data are based on either our own test results or actual records of general use.
3. Even if you use the hose for applications shown in this catalog, conditions could be different. So, we recommend you to make test operation under the actual condition.
4. Contents in this catalog could be changed without notice.