We can.

FURUKAWA POLYIMIDE TUBING

FURUKAWA ELECTRIC

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Never denatures in a range from -269℃ up to 400℃, FEP tubing era fades away.

The advent of polyimide has increased the design possibilities for electrical engineers all over the world who were previously restricted by the inferior performance of FEP. Yet polyimide, being infusible and nonflammable, needed to be laminated, spiralled and set with glue to make polyimide tubing. Regardless of the superior strength and resistance of polyimide, the mechanical strength of the tubing is restricted to that of the glue which deteriorates over time and causes the seam of the tubing to fail. Furukawa Polyimide Tubing is fabricated using a unique method -seamless and unitary forming.

Brings out its superiority over FEP Tubing

Here are contrastive properties 'Furukawa Polyimide Tubing vs FEP. The superior performance of seamless and unitary forming over spiralled will offer powerful solutions to a variety of problems. Here are some of the advantages of Furukawa Polyimide Tubing.

Highest Heat Resistance

No degradation occurs at 220℃ in continuous service or at 400℃ in a brief moment. Safety can hardly be threatened, owing to its flameless self-extinction without any poisonous fume.

FEP ; starts to decompose at about 200℃,softening at high temperature to emit a fluorine gas.

Spiral ; susceptible to glue.

FEP tubing softening after one minute in contact with 300℃ flame.

Seamless

A spiraled tubing threatens to start breaking off, as soon as the glue denatures, irrespective of its superlative heat resistance. On the contrary, the same can never occur in Furukawa Polyimide Tubing (seamless unitary forming).

Spiral ; vitally susceptible to glue.

Spiral tubing loosening in contact with 300℃ flame.

Thinner Wall Thickness

A minimum inside diameter of 0.2 mm is available ; and wall thickness of 0.04 mm is producible, on account of its high tensile strength. Compact, delicate wiring in electronic or other instruments can be laid out, without concern over space.

FEP ; unable to support a thickness of less than 0.2 mm or an inside diameter of less than 1 mm, extremely pliable and easy to fade away under tension.

Spiral ; unable to be made an inside diameter of less than 0.4 mm.

Comparison of space factor (left : polyimide tubing, right : FEP tubing - each shows 15 pieces of 1.0mm inside diameter) polyimide tubing has the superior space factor compared to FEP for 3 times.

Good Chemical & Radiation Resistance

Polyimide resin is outstanding in adhesion and remains unaffected in chemicals (except alkalis) or radiation. Consequently, new utilities can be offered in chemical or nuclear plant.

FEP ; incompatible with any glue, falling into decay in radiation.

Spiral ; resistance to chemicals or radiation within limits of glue.

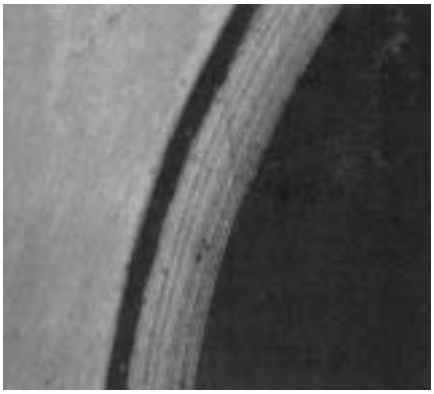
FEP is unlikely be glued, polyimide is compatible with most types of glue.

Good Flexibility

The elaborate layered structure, as shown in the microphotograph, guards against deterioration through shock forces, repeated bending or if used to form a moving part.

FEP ; surface threatening to separate in parts as shocked.

Spiral ; glued overlap likely to loosen.



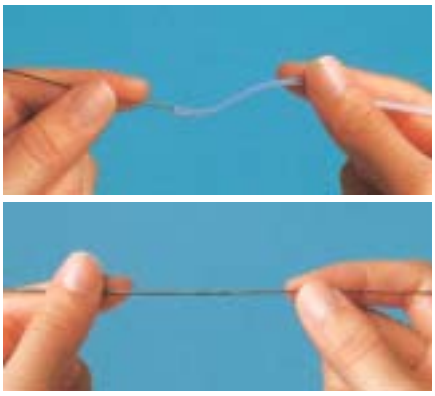
Cross section of Furukawa Polyimide Tubing (x 100)

Easy Installation

Unitary polyimide tubing, being drag free and fairly rigid, allows easy feeding of wire through the inside. Moreover, soldering work is easy, facilitating volume production through outstanding thermal reistance.

FEP ; slightly greater in frictional and rather thick in tubing wall.

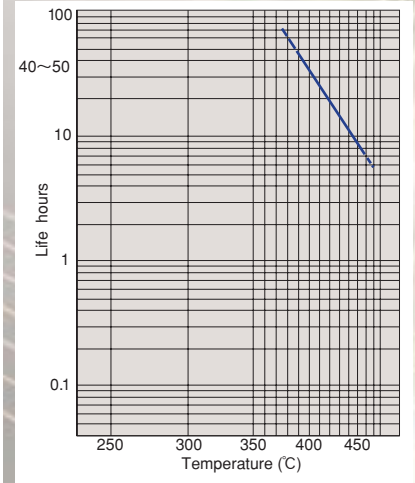
Spiral ; glued overlapped surface likely to be clogged.



Upper FEP tubing is less rigid, even harder to pass a conductor through.

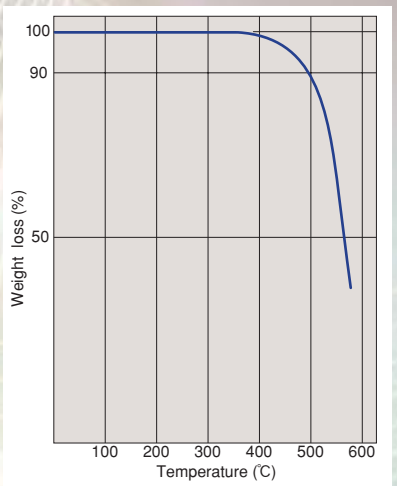
Thermal Endurance

Test method;
Sample : 1.0mm polyimide enamelled wire
Applied Voltage : 165VAC



Thermogravimetric Analysis

Test method ; Specimen : polyimide Film 3mg
Heating rate : 5℃/min.



Chemical Resistance

Test sample : PIT-S 0.5mm×0.06mm(0.5mm inside diameter, 0.06mm of wall thickness)
Test condition ; Dipping in each chemical for 30 days at room temperature.

Chemical	Tensile Strength (N)	Breakdown Voltage (kV)
Original	24	10.0
Tap Water	24	9.5
Hydrochloric Acid	22	7.6
Sulfuric Acid	22	6.4
Xylene	21	7.0
Cresol	21	5.6
NMP	20	5.0
Methanol	23	5.9

Heat Cycle (cold-heat) Test and Continuous Cooling Test

Sample : PIT-S 0.5mm×0.06mm
Test condition
(1) Heat Cycle test - 1 cycle : Dipping in liquid nitrogen(-196℃) for 5 minutes → 90℃ for 10minutes → 25℃ for 3 minutes.
(2)Continuous Cooling Test - Dipping in liquid nitrogen(-196℃) for 20 hours

Item of Test		Cold-Heat Cycle Test				Continuous Cooling Test
Test condition		non heat	10 cycles	20 cycles	30 cycles	20 hours
BDV (kV)	max.	13.6	14.0	16.2	12.8	14.0
	min.	11.8	12.8	11.4	11.1	12.6
	average	12.4	13.8	12.4	11.8	13.8

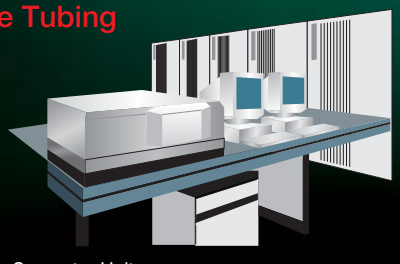
Resistance to Radiation

Samples : PIT-S 0.5mm×0.06mm, 1.0mm×0.06mm

Diameter \ Exposure Dose / Property		0 M rad	1 M rad	10 M rad	100 M rad
0.5 mm	Tensile Strength(N)	24	22	23	22
	Breakdown Voltage(kV)	10<	10<	10<	10<
1.0 mm	Tensile Strength(N)	52	53	52	50
	Breakdown Voltage(kV)	10<	10<	10<	10<

Widespread Use of Furukawa Polyimide Tubing

- Insulation of peripheral wiring circuitry for thermocouples or thermistors.
- Insulation of internal, heat-spot wiring or circuitry for electric / electronic instruments.
- Covering of wiring in need of chemical resistance (except alkalis).
- Covering / insulation of circuitry in a nuclear plant or its peripheral facilities.
- Insulation of wiring or circuitry in need of fire resistance.



Computer Unit

Automobile

Hair Dryer

Photocopier

Aircraft

●Standard Product Type and Dimensions

Designation of Product: PIT-S inside diameter(in mm) × Wall thickness(in mm)
(Example: PIT-S 0.5mm× 0.06mm)

Model	Nominal Inside Diameter(mm)	Tolerance of Inside Diameter(mm)	Standard Wall Thickness(mm)	Standard Outside Diameter(mm)
Type FS	0.12	±0.009	0.02	0.16
	0.13	±0.009	0.02	0.17
	0.14	±0.009	0.02	0.18
	0.15	±0.009	0.02	0.19
	0.16	±0.009	0.02	0.20
	0.17	±0.009	0.02	0.21
	0.18	±0.009	0.02	0.22
	0.19	±0.009	0.02	0.23
Type S	0.20	±0.03	0.04	0.28
	0.25	±0.03	0.04	0.33
	0.30	±0.03	0.04	0.38
	0.35	±0.03	0.04	0.43
	0.40	±0.03	0.04	0.48
	0.50	±0.04	0.06	0.62
	0.60	±0.04	0.06	0.72

Model	Nominal Inside Diameter(mm)	Tolerance of Inside Diameter(mm)	Standard Wall Thickness(mm)	Standard Outside Diameter(mm)
Type S	0.70	±0.04	0.06	0.82
	0.80	±0.05	0.06	0.92
	0.90	±0.05	0.06	1.02
	1.00	±0.06	0.06	1.12
	1.20	±0.06	0.06	1.32
	1.40	±0.06	0.06	1.52
	1.60	±0.08	0.06	1.72
	1.80	±0.08	0.06	1.92
	2.00	±0.10	0.06	2.12
Type LS	2.50	±0.10	0.06	2.62
	3.00	±0.10	0.06	3.12

note : Standard length unit : 1m

[WARNING]
This product is not designed for medical appliances. This product shall not be applicable to the usage which includes direct contact or potential direct contact to human bodies, human body fluid or medicines.

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