

## NITOFLON™ FLUOROPLASTIC PRODUCTS



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## Nitto Denko Corporation

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NITOFLO<sup>TM</sup> is the registered trade name of Nitto's fluoroplastic products.

Fluoroplastic have many advantages including excellent chemical resistance, heat resistance and electrical properties. Until recently, however, these characteristics have made fluoroplastics difficult to process and restricted its applications. Nitto solved these problems by applying its own processing technology such as surface treatment techniques, precision engineering technology, and composite technology with different materials.

Nitto's technologies have opened up a host of new possibilities for fluoroplastics, including meeting UL anti-flammability standards in the United States.

NITOFLO<sup>TM</sup> is now used as a material in an extensive range of applications from electronics to household products.



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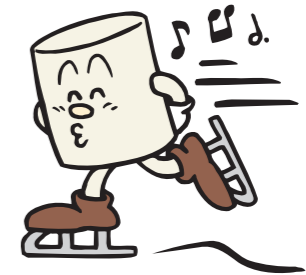
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1. Excellent Heat Resistance



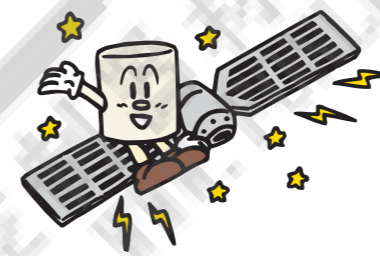
These materials offer outstanding heat and cold resistance. Continuous service temperature ranges from -100°C to +260°C with a melting point of 327°C.

2. Best Sliding Properties among All Solid Materials



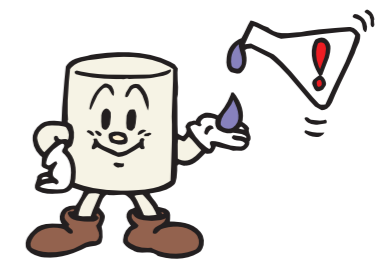
Fluoroplastics have the lowest friction coefficient among all solid matter, giving them excellent self-lubrication properties.

3. Characteristic electrical properties



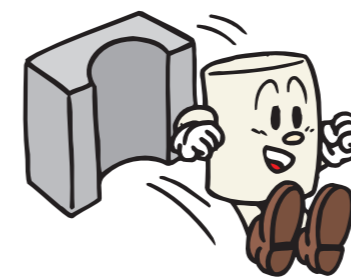
Fluoroplastics have the lowest dielectric constant and dissipation factors among all solid materials. They are stable in a wide range of frequencies and external environments, making them ideal as high-frequency insulation materials.

4. Excellent/Superior Chemical Resistance



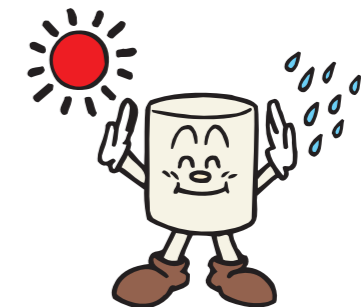
The stable molecular structure of NITOFLO means that fluoroplastics are unaffected by virtually all industrial chemicals and solvents.

5. Non-Adhesion Property



Adhesives do not stick easily to fluoroplastics, making them ideal for use in mold release applications.

6. Superior Weatherability



Fluoroplastics are virtually unaffected by visible and UV light as well as humidity, making them suitable for long-term outdoor use.

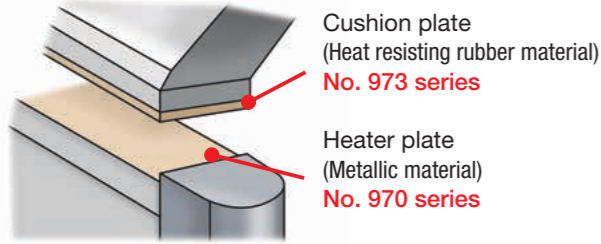
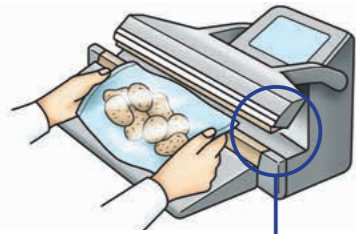
Video introducing the features of NITOFLO<sup>TM</sup>

By scanning the two-dimensional code on the right with a barcode reader on your smartphone or tablet, you will be able to access a video page introducing fluoroplastic features 1-6.

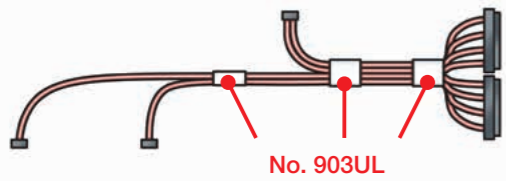


## Major Applications of NITOFLO<sup>TM</sup>

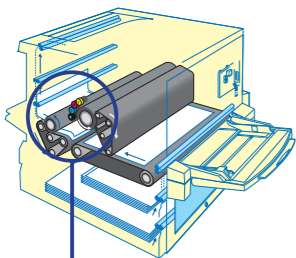
### Heel Sealing Machine



### Binding & Electrical Insulation of Heat-Resistance Cables around Car Engine



### Sliding Assistance at Paper-Feeding Blade for Printers (LBP)

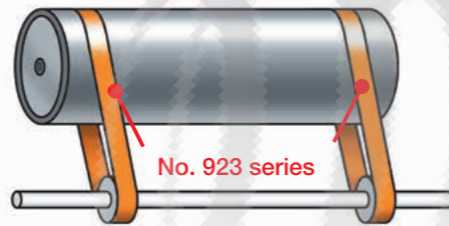
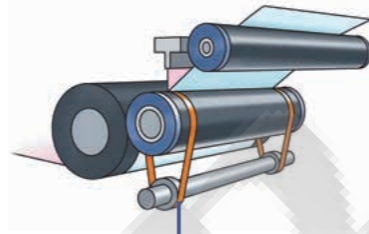


**No. 903UL**

### Wire Binding & Electrical Insulation inside Notebook PCs



### Protection of Pressure Bonding Roll for Extruding Laminators

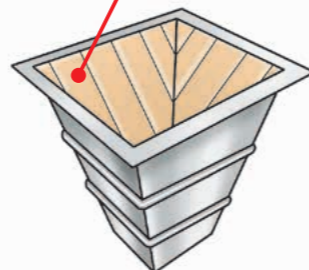


### Sliding Assistance for Conveyor Guides



**No. 903UL**

### Sliding Assistance for Hoppers



## NITOFLO<sup>TM</sup> List of Sizes

Product name	Product No.	Total thickness (mm)	Width (mm)												Length (m)	Page	
			10	13	19	25	30	38	40	50	75	100	150	200			
NITOFLO <sup>TM</sup> films	<b>No. 900UL</b>	0.03	10	13	19	25	30	38	40	50	75	100	150	200	10-30	5	
		0.038	100	150	200	250	300	500								10	5
			10	13	19	25	30	38	40	50	75					30	5
		0.05	100	150	200	250	300	500	600	1,000						10	5
			5	6	7	8	9	10	13	19	25	30	38	40		30	5
		0.08, 0.10, 0.13, 0.18, 0.20	100	150	200	250	300	500	600	1,000						10	5
			5	6	7	8	9	10	13	19	25	30	38	40		30	5
		0.25	100	150	200	250	300	500	600	1,000						10-30	5
		0.30, 0.40, 0.50														10	5
		0.70, 0.80, 1.00	300	500	600											10	5
1.50	100	200	300											10	5		
NITOFLO <sup>TM</sup> high-strength films	<b>No. 901UL</b>	0.05, 0.08, 0.10, 0.13, 0.18, 0.20	100	150	200	250	300	500							10-30	5	
		0.30, 0.40, 0.50, 0.80, 1.00													10	5	
NITOFLO <sup>TM</sup> adhesive tapes	<b>No. 902UL</b>	0.05, 0.08, 0.10, 0.13, 0.18, 0.20	10	13	19	25	30	38	40	50	100	150	200	250	10	5	
		0.30, 0.40, 0.50, 0.80	300	500											10	5	
NITOFLO <sup>TM</sup> adhesive tapes	<b>No. 920UL</b>	0.02, 0.025, 0.03, 0.04, 0.05, 0.06, 0.10	10	13	19	25	30	38	50	75	100	150	200	250	30-50	6	
	<b>No. 903UL</b>	0.08, 0.13, 0.18, 0.23	5	9	10	13	15	18	19	20	22	25	30	38	10	7	
	<b>No. 903-T</b>	0.08, 0.13, 0.18, 0.23	25	50	75	100	150	200	250						10	7	
NITOFLO <sup>TM</sup> adhesive tape using high-strength film as substrate	<b>No. 903UT</b>	0.06	5	9	10	13	15	18	19	20	22	25	30	38	10	7	
	<b>No. 923UL</b>	0.10	10	13	19	25	38	50	75	100	125	150	200		10-33	8	
	<b>No. 923S</b>	0.10	25	38	50	75	100	125	150	200					10-33	8	
	<b>No. 923SL</b>	0.17	10	13	19	25	38	50	75	100	125	150	200		10-33	8	
NITOFLO <sup>TM</sup> PTFE impregnated glass cloth	<b>No. 923UT</b>	0.04	10	13	19	25	30	38	50	75	100	125	150	200	5-10	8	
	<b>No. 970-2UL</b>	0.03, 0.05, 0.07, 0.10, 0.13, 0.18	300	400	500	550	600	1,000							10	9	
	<b>No. 970-4UL</b>	0.05, 0.07, 0.10, 0.13, 0.18	300	500	600	1,000									10	9	
NITOFLO <sup>TM</sup> adhesive tape using PTFE impregnated glass cloth as substrate	<b>No. 9700UL</b>	0.05, 0.07, 0.10, 0.13, 0.18	300	500	600	1,000									10	9	
	<b>No. 973ZR-S</b>	0.13	10	13	19	25	30	38	50	100					10	10	
	<b>No. 973UL-S</b>	0.13	10	12	13	14	15	19	20	25	30	35	38	40	10	10	
	<b>No. 973UL</b>	0.15, 0.18	50	60	70	75	80	100	150	200	250	300	350	400	10	10	
<b>No. 973SC</b>	0.18	10	13	19	25	38	50	75	100	200	300	450		10	10		

Note: The thickness of impregnated glass cloth and ultrahigh-molecular-weight polyethylene products of NITOFLO<sup>TM</sup> is the backing thickness.

## NITOFロン™ Films No. 900 Series



### Features

- Outstanding chemical resistance to acids, alkalis, etc.
- Offers high insulating performance and can be used in a wide temperature range (-100°C to 260°C).
- Has an extremely low friction coefficient and strong non-adhesion (separating) property.

### Structure



### Applications

- Thrust washers
- Insulation for motor and transformer coils
- FRP and CFRP molding release agent
- Elastomer composites
- Compression release agent for anisotropically conductive films (ACF)
- Chain tensioners
- Elevator sliding guide shoes

### Properties

Item	Unit	Characteristic values							
		No. 900UL/No. 901UL/No. 902UL							
Thickness	mm	0.05	0.08	0.10	0.13	0.18	0.30	0.50	1.00
Tensile strength	MPa	50	50	50	50	50	50	45	40
Elongation	%	300	300	310	320	330	330	370	400
Dielectric breakdown voltage	kV	6.0	8.3	9.6	11.6	14.1	19.5	26.7	37.7
Dielectric constant (1MHz)	—	2.1							
Volume resistivity	$\Omega \cdot \text{cm}$	$1 \times 10^{17} \leq$							
Arc resistance	sec	$180 \leq$							
Water absorption	%	0							
Heat resistance (weight loss upon heating)	%	0							
Chemical resistance	Nitric acid (60%)	0							
	Sodium hydroxide (40%)	0							
	Acetone	0							
Specific gravity	—	2.1 ~ 2.3							
Kinematic friction	—	0.1							
Flame resistance	—	VTM-0 (0.02 ~ 0.24mmt) / V-0 (0.25mmt $\leq$ )							
Melting point	°C	327							

\*The above values are sample observed values, not the guaranteed performance.

## NITOFロン™ High-Strength Films No. 920 Series



### Features

- Higher in tensile strength and insulating performance compared to NITOFロン™.
- The minimum product thickness is as small as 0.02 mm, contributing to the miniaturization of parts.
- Has strong non-adhesion property and extremely low friction coefficient.

### Applications

- Insulation for motor and transformer coils
- Insulation of heat resistance wires
- Insulation of capacitors

### Structure



### Properties

Item	Unit	Characteristic value	
		No. 920UL	
Thickness	mm	0.02	0.05
Tensile strength	MPa	Longitudinal	77
		Average	80
Elongation	%	Longitudinal	111
		Average	120
Dielectric breakdown voltage	kV	5.4	11.3

\*The above values are sample observed values, not the guaranteed performance.

### Size

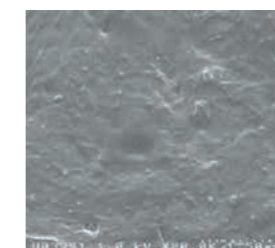
Product No.	Type	Thickness (mm)	Width (mm)										Length (m)
			10	13	19	25	30	38	50	75	100	150	
No. 920UL	Untreated	0.02											30 · 50
		0.025											
		0.03											
		0.04											
		0.05											
		0.10											

◆ For single surface treated items, other sizes, please consult a Nitto representative.

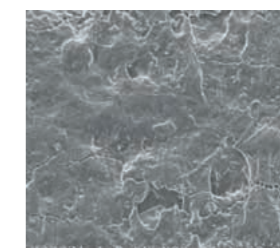
## Surface Treatment Method

In general, PTFE repels water and has low wettability, so surface treatments to increase wettability are necessary for adhesive processing or bonding. At Nitto, we provide products such as adhesive tapes to customers using a chemical treatment called sodium treatment, which involves using metallic sodium on fluoroplastic films.

### Comparison of Film Surface by SEM Images



Untreated



Surface chemical treatment by sodium

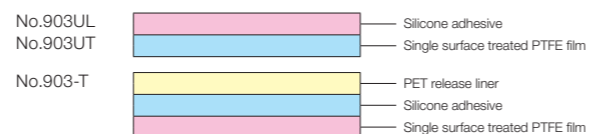
## NITOFロン™ Adhesive Tapes No. 903 Series



### Features

- With polytetrafluoroethylene resin film as its base material, has excellent heat resistance, chemical resistance, electrical characteristics, weather resistance, waterproof (water repellent) performance and strong non-adhesion properties.
- A silicone-based adhesive enables continuous use in a wide temperature range from -60°C to 200°C.

### Structure



### Applications

- Insulation of electric wires, cables, and coils (for Class H electrical insulation)
- Friction control in the sliding section of a mobile phone or digital camera
- Battery insulation in storage devices such as secondary batteries
- Insulation and lubrication of linear-motor-driven systems
- Heat-resistant lubrication in the paper-feeding section of a printer (jamming control)
- Solder masking (heat-resistant masking)
- Friction noise control inside automobiles or friction control in sliding sections

### Properties

Item	Unit	Characteristic value									
		No. 903UL				No. 903-T				No.903UT	
Thickness	mm	0.08	0.13	0.18	0.23	0.08	0.13	0.18	0.23	0.06	
Tensile strength	N/19mm	55	93	160	210	55	93	160	210	44	
Adhesive strength	N/19mm	5.6	7.1	7.4	8.7	5.6	7.1	7.4	8.7	4.3	
Unwinding force	N/19mm	4.4	5.8	7.1	8.9	-				3.8	
Dielectric breakdown voltage	kV	8	11	14	15	8	11	14	15	6.4	
Temperature range	°C	-60~200°C									

\*The above values are sample observed values, not the guaranteed performance.

### Size

Product No.	Type	Total thickness (mm)	Width (mm)												Length (m)
No. 903UL	-	0.08/0.13/0.18/0.23	5	9	10	13	15	18	19	20	22	25	30	38	10
No. 903-T	With PET release liner	0.08/0.13/0.18/0.23	25	50	75	100	150	200	250	300	350	400	450		
No.903UT	Thin type	0.06	5	9	10	13	15	18	19	20	22	25	30	38	5
			40	50	75	80	100	150	200	250	300	350	400	450	

◆For other sizes, please consult a Nitto representative.

## NITOFロン™ Adhesive Tape Using High-Strength Film as Substrate No. 923 Series



### Features

- With polytetrafluoroethylene resin film as its base material, has excellent heat resistance, chemical resistance, electrical characteristics, weather resistance, waterproof (water repellent) performance and strong non-adhesion properties.
- Possesses high tensile strength.

### Structure



### Applications

- Wrapping of polyethylene laminated rolls (protection and adhesion prevention)
- Bundling of wires for mobile devices
- Insulation of electric wires, cables, and coils (for Class H electrical insulation)
- FRP and CFRP molding release agent

### Properties

Item	Unit	Characteristic value			
		No. 923UL	No. 923S	No. 923SL	No. 923UT
Thickness	mm	0.10	0.10	0.17	0.04
Tensile strength	N/19mm	100	128	280	65
Adhesive strength	N/19mm	6.4	6.5	7.9	3.7
Unwinding force	N/19mm	5.3	6.0	7.1	0.7
Dielectric breakdown voltage	kV	11.2	11	19	5.3
Temperature range	°C	-60~200°C			

\*The above values are sample observed values, not the guaranteed performance.

### Size

Product No.	Type	Thickness (mm)	Width (mm)												Length (m)
No. 923UL	High-strength adhesive	0.10	10	13	19	25	38	50	75	100	125	150	200	10 · 33	
No. 923S	Super high-strength adhesive		25	38	50	75	100	125	150	200					
No. 923SL	Super high-strength adhesive	0.17	10	13	19	25	38	50	75	100	125	150	200	5 · 10	
No. 923UT	Ultra-thin high-strength adhesive	0.04	10	13	19	25	30	38	50	75	100	125	150		200

◆For other sizes, please consult a Nitto representative.

## NITOFLO<sup>TM</sup> PTFE Impregnated Glass Cloth No. 970 Series



### Features

- With a composite of polytetrafluoroethylene resin and high-strength glass cloth as its base material, has excellent heat resistance, chemical resistance, weather resistance, waterproof (water repellent) performance, strong non-adhesion properties and mechanical strength.

### Structure

No.970-2UL  PTFE impregnated glass cloth  
 No.970-4UL  
 No.9700UL

### Applications

- Heat-resistant release agent for bag-making heat sealing
- Conveying belts for food processing
- Heat-resistant lubrication of fixing belts for printers
- Compression release agent for anisotropically conductive films (ACF)
- Compression release agent for solar cell backsheets

### Properties

Item	Unit	Characteristic value								
		No. 970-2UL			No. 970-4UL			No. 9700UL		
Substrate thickness	mm	0.05	0.10	0.13	0.05	0.10	0.13	0.05	0.10	0.13
Total thickness	mm	0.07	0.12	0.17	0.08	0.13	0.18	0.08	0.13	0.18
Tensile strength	Longitudinal	200			200			200		
	Lateral	160			160			160		
Friction coefficient	—	0.08	0.08	0.10	0.08	0.08	0.10	0.08	0.08	0.10

\*The above values are sample observed values, not the guaranteed performance.

### Size

Product No.	Type	Substrate thickness (mm)	Total thickness (mm)	Width (mm)						Length (m)
No. 970-2UL	Standard	0.03	0.045	300	400	500	550	600	1,000	10
		0.05	0.07							
		0.07	0.09							
		0.10	0.12							
		0.13	0.17							
		0.18	0.22							
No. 970-4UL	High-impregnated type	0.25*	0.34	300	500	600	1,000	10		
		0.05	0.08							
		0.07	0.10							
		0.10	0.13							
		0.13	0.18							
No. 9700UL	High-impregnated and surface-smooth type	0.18	0.22	300	500	600	1,000	10		
		0.25	0.34							
		0.05	0.08							
		0.07	0.11							
		0.10	0.13							
		0.13	0.18							
		0.18	0.23							
		0.25	0.34							

◆ For single surface or double surface treated films, other sizes, please consult a Nitto representative.  
 \* For No. 970-2UL thickness 0.25 mm products, 1,000 mm width does not correspond.





## NITOFLO<sup>TM</sup> Adhesive Tape Using PTFE Impregnated Glass Cloth as Substrate No. 973 Series



### Features

- With a composite of polytetrafluoroethylene resin and high-strength glass cloth as its base material, has excellent heat resistance, chemical resistance, electrical characteristics, weather resistance, waterproof (water repellent) performance, strong non-adhesion properties and mechanical strength.
- A silicone-based adhesive agent enables continuous use in a wide temperature range from -60°C to 200°C.

### Structure

No.973ZR-S  Silicone adhesive  
 No.973UL-S  PTFE impregnated glass cloth  
 No.973UL  
 No.973SC  Silicone adhesive  
 Semiconducting PTFE impregnated glass cloth

### Applications

- Heat-resistant release agent for bag-making heat sealing
- Conveying belts for food processing
- Heat-resistant lubrication in the heated portions of a printer
- Lubrication of shooters or hoppers
- Conveying process of liquid crystal panels (No. 973SC)

### Properties

Item	Unit	Characteristic value				
		No.973ZR-S	No. 973UL-S	No. 973UL		No. 973SC
Thickness	mm	0.13	0.13	0.15	0.18	0.18
Tensile strength	N/19mm	250	240	590	530	610
Adhesive strength	25°C	N/19mm	6.2	6.8	9.0	9.7
Unwinding force	N/19mm	5.5	5.9	5.9	7.5	7.2
Temperature range	°C	-60~200°C				

\*The above values are sample observed values, not the guaranteed performance.

### Size

Product No.	Type	Thickness (mm)	Width (mm)												Length (m)
No.973ZR-S	—	0.13	10	13	19	25	30	38	50	100				10	
No. 973UL-S	—	0.13													10
No. 973UL	—	0.15	10	12	13	14	15	19	20	25	30	35	38	40	
		0.18	60	70	75	80	100	150	200	250	300	350	400	450	
No. 973SC	Semiconducting adhesive tape	0.18	10	13	19	25	38	50	75	100	200	300	450	10	

◆ For other sizes, please consult a Nitto representative.