MITSUBISHI PLASTICS, INC.

Thermoplastic, ultra heat-resistant Engineering Plastic Film
Polyetherimide film

# SUPERIO-UT

"SUPERIO-UT" a ultra heat-resistant engineering plastic film made of "ULTEM" (polyetherimide resin "PEI") developed by GE Plastics, Inc. (USA) employing Mitsubishi Plastics, Inc.'s technology.
There are two types of product, E and F type and especially F type is suitable for insulation material as it has an excellent heat resistance under stress and solvent resistance.

## Characteristics:

1. **Mechanical property:**
   It has an excellent mechanical property as an engineering plastics.

2. **Electrical property:**
   It has a stable electrical property having low dependability on the frequency and temperature.

3. **Heat resistance**
   Its glass transition temperature (Tg) is extremely high among thermo-plastics resin having a characteristic of law dimensional changes under heat up to 210 $^{o}$C. Especially type F has an excellent heat-resistance under stress and is able to hold elongation for long time at a high temperature.

4. **Chemical resistance**
   It has an extremely excellent solvent resistance against aliphatic hydrocarbons, acids and dilute alkalis. Especially type F has an excellent characteristics against poloar solvent.

5. **Flame resistance** There is a grade which has been recognized as UL-94-VTM-0 at the film thickness over 25μm. Also this product has a characteristic that the generation of fume is much less when it is burned in comparison to the average of all other resins.

6. **Heat molding property** It is possible to mold this product by heating.

## Applications:

**For insulation**
For general motors, freezer motors, transformers, generators, cable coating, etc.
**For substrates**
For membrane switches, plane thermal bodies, solenoids, variable resisters, etc.
**Others**
For speaker diaphragms, adhesive insulation tapes, heat resistant labels, composites, TAB spacer tapes, lead tapes, etc.

## Types and Sizes

| Types | Thickness (㎛m) | Standard width (mm) | Standard length (m) | Approximate weight (kg) | Remarks |
|---|---|---|---|---|---|
| E type | 38 | 530 | 850 | 21.74 | glossy type |
| | 50 | 530 | 850 | 28.61 | glossy type |
| | 75 | 530 | 850 | 42.91 | glossy type |
| | 100 | 530 | 450 | 30.29 | glossy type<br>non-gloss type |
| | 125 | 530 | 300 | 25.24 | glossy type<br>non-gloss type |
| F type | 7 | 480 | 2000 | 8.53 | glossy type |
| | 10 | 530 | 2200 | 14.81 | glossy type |
| | 13 | 530 | 2200 | 19.25 | non-gloss type |
| | 15 | 530 | 2100 | 21.20 | non-gloss type |
| | 25 | 530 | 2200 | 37.02 | non-gloss type |
| | 38 | 530 | 850 | 21.74 | non-gloss type |
| | 50 | 530 | 500 | 16.83 | non-gloss type |
| | 75 | 540 | 500 | 25.72 | non-gloss type |
| | 100 | 570 | 500 | 36.20 | non-gloss type |
| | 125 | 570 | 300 | 27.15 | non-gloss type |
| | 188 | 550 | 220 | 26.26 | non-gloss type |
| E type (BLACK) | 50 | 500 | 400 | 12.70 | non-gloss type |
| | 75 | 500 | 400 | 19.05 | non-gloss type |

## BASIC PROPERTIES

Film thickness: 50μm
(Described values are representative values but not guarantee by any means.)

| Items | | Unit | SUPERIOR-UT Type E | SUPERIOR-UT Type F | Polyester | Polyimide | Test method |
|---|---|---|---|---|---|---|---|
| Thermal property | Glass transition point | °C | 216 | 226 | 69 | - | DSC |
| | Continuous service temp. | °C | (170) | 180 | 105 | 220 | UL-746B |
| | Continuous service temp.(Mechanical) | °C | (150) | 160 | 105 | 220 | UL-746B |
| | Linear expansion coefficient | cm/cm·°C | $4.9 \times 10^{-5}$ | $5.2 \times 10^{-5}$ | $2.0 \times 10^{-5}$ | $2.0 \times 10^{-5}$ | UL-746B |
| | Heat shrinkage factor | % | 0.2 | 0.2 | | | 200°C x 30M |
| Mechanical property | Tensile strength | KPa | 117.7 | 122.6 | 215.7 | 235.4 | JIS C-2318 |
| | | ($Kgf/mm^2$) | (12) | (12.5) | (22) | (24) | IS C-2318 |
| | Elongation at breakage | % | 120 | 100 | 120 | 70 | JIS C-2318 |
| | Modulus of elasticity in tension | MPa | 3138 | 2844 | 4903 | 3923 | ASTM D-638 |
| | | ($Kgf/mm^2$) | (320) | (290) | (500) | (400) | ASTM D-638 |
| Electrical property | Dielectric breakdown voltage | KV | 10.0 | 10.5 | 9.0 | 10.8 | JIS C-2318 |
| | Volume resistively | Ω·cm | $10^{17}$ | $10^{17}$ | $10^{17}$ | $10^{18}$ | JIS C-2318 |
| | Dielectric constant (1 KHz) | - | 3.5 | 3.0 | 3.4 | 3.5 | JIS C-2318 |
| | Dielectric loss tangent (1 KHz) | - | $1.3 \times 10^{-3}$ | $1.8 \times 10^{-3}$ | $4.0 \times 10^{-3}$ | $3.0 \times 10^{-3}$ | JIS C-2318 |
| Others | Density | $g/cm^3$ | 1.27 | 1.27 | 1.40 | 1.42 | ASTM D-1505 |
| | Water absorption | % | 0.4 | 0.6 | 0.3 | 2.9 | ASTM D-570 |
| | Flammability | (25um) | VTM-0 | VTM-0 | - | V-0 | UL-94 |

(Note) The above physical values are the typical values, not warranted ones. Film thickness: 50um

## SOLVENT RESISTIVITY

| | | Stress 58 Kpa | | | | Stress 215 KPa | | | |
|---|---|---|---|---|---|---|---|---|---|
| Classification | Solvent | Type E | | Type F | | Type E | | Type F | |
| Hydrocarbons | Toluene | 6 Min. | Breakage | 100 Hrs | 16.7% | 3 Min. | Breakage | 3 Min. | Breakage |
| | Xylene | 15 Min. | Breakage | 100 Hrs | 57.9% | 78 Sec. | Breakage | 100 Hrs. | 28.5% |
| | Ethyl benzene | 100 Hrs. | 53.2% | 100 Hrs | 56.5% | 5.3 Hrs | Breakage | 100 Hrs. | 24.6% |
| | Toluene(50) / Xylene(50) | 5 Hrs. | Breakage | 100 Hrs | 32.8% | 30 Sec. | Breakage | 1 Hr. | Breakage |
| Ketones | MEK | 15 Min. | Breakage | 50 Hrs. | 6.7% | 15 Sec. | 5.6% | 20 Hrs. | 1.5% |
| | Acetone | 20 Hrs. | 30.5% | 50 Hrs. | 6.5% | 2 Hrs. | 5.6% | 5 Hrs. | 3.4% |
| | Isophrone | 3.4 Hrs. | Breakage | 1 Hr. | Breakage | 48 Sec. | Breakage | 23 Min. | Breakage |
| Alcohols | Methanol | 20 Hrs. | 5.3% | 10 Hrs. | 13% | 20 Hrs. | 16.9% | 20 Hrs. | 17% |
| Esters | Ethyl acetate | 100 Hrs. | 13.6% | 100 Hrs. | 41.1% | 50 Hrs. | 4.7% | 20 Hrs. | 1.9% |
| Others | In the air | 100 Hrs. | 60.2% | 100 Hrs. | 62.2% | 100 Hrs. | 62.9% | 100 Hrs. | 65.9% |

(Note) the values in the above table are the evaluation of the soaking test under a static condition, not the warranted values. When using, make your evaluation and judgment based on the actual solvent condition.