# Texin 970 U

| | |
|---|---|
| **Characterization** | Texin 970U resin is an aromatic polyether-based thermoplastic polyurethane with a Shore hardness of approximately 70D*. It can be processed by injection molding, extrusion, or blow molding. |
| **Properties / Applications** | Texin 970U resin offers exhibits excellent tensile and tear properties, high stiffness characteristics, good resistance to fuels and oils, and inherent resistance to hydrolysis. It is stabilized against degradation due to heat and UV exposure. Typical applications include industrial screens and casters, bushings, housings, agricultural equipment components and marine equipment. As with any product, use of Texin 970U resin in a given application must be tested (including but not limited to field testing) in advance by the user to determine suitability. |
| **Storage** | Texin thermoplastic polyurethane resins are hygroscopic and will absorb ambient moisture. The presence of moisture can adversely affect processing characteristics and the quality of parts. Therefore, the resins should remain in their sealed containers and be stored under cool and dry conditions until used. Storage temperature should not exceed 86°F (30°C). Unused resin from opened containers, or reground material that is not to be used immediately, should be stored in sealed containers. |
| **Drying** | Prior to processing, Texin 970U resin must be thoroughly dried in a desiccant dehumidifying hopper dryer. Hopper inlet air temperature should be 200° –220°F (93° –104°C). To achieve the recommended moisture content of less than 0.03%, the inlet air dew point should be -20°F (-29°C) or lower. The hopper capacity should be sufficient to provide a minimum residence time of 2 hours. Additional information on drying procedures is available in the brochure - General Drying Guide. |

# Texin 970 U

## Injection Molding

Texin 970U resin may be easily processed on commercially available equipment suitable for injection molding of thermoplastic polyurethane elastomers. The recommended screw length-to-diameter (L/D) ratio is 20:1 with a compression ratio of 2.5 –3:1. Screws with a compression ratio greater than 4:1 should be avoided. Recommended shot weight is 40 –80% of rated barrel capacity. To obtain good clarity in parts, Texin 970U resin must be molded on tools with a highly polished chrome surface. Typical starting conditions are noted below. Actual processing conditions will depend on machine size, mold design, material residence time, etc.

### Typical Injection Molding Conditions

| | |
|---|---|
| Barrel Temperature: Rear | 410°–455°F (210°–235°C) |
| Barrel Temperature: Middle | 415°–460°F (213°–238°C) |
| Barrel Temperature: Front | 420°–460°F (216°–238°C) |
| Barrel Temperature: Nozzle | 425°–465°F (218°–241°C) |
| Melt Temperature | 425°–465°F (218°–241°C) |
| Mold Temperature | 60°–110°F (16°–43°C) |
| Injection Pressure | 6,000 - 15,000 psi |
| Hold Pressure | 4,000 - 8,000 psi |
| Back Pressure | 50 - 200 psi |
| Screw Speed | 40 - 80 rpm |
| Injection Speed | Moderate |
| Cushion | 1/8 - 1/4 in |
| Clamp | 3 - 5 ton/in$^2$ |

## Mold Shrinkage

Typical values for mold shrinkage are given below. For treatments such as postcuring, an additional 1 to 1.5 mil per inch should be added.

| Cross Section | Mold Shrinkage* |
|---|---|
| Less than 1/8 inch | 7 - 10 mils per inch |
| 1/8 to 1/4 inch | 10 - 15 mils per inch |
| Over 1/4 inch | 15 - 20 mils per inch |

## Additional Injection Molding Information

Additional information on injection molding may be obtained by consulting the publication - Texin and Desmopan Thermoplastic Polyurethanes — A Processing Guide for Injection Molding and by contacting a Covestro technical service representative.

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# Texin 970 U

**Extrusion**

Texin 970U resin possesses a satisfactory melt strength and can be controlled over a wide range of temperature conditions to produce tubing, sheet, and extruded profiles. Typical starting conditions are noted below. Actual processing conditions vary and are dependent on size of extruders, extrusion rate, part geometry, etc.

**Typical Temperature Profile for Extrusion**

| | |
|---|---|
| Die | 420°–450°F (216°–232°C) |
| Zone 1 (Feed) | 415°–430°F (213°–221°C) |
| Zone 2 (Transition) | 420°–435°F (216°–224°C) |
| Zone 3 (Meter) | 420°–450°F (216°–232°C) |
| Melt | 410°–440°F (210°–227°C) |

**Additional Extrusion Information**

The preferred screw design should have a compression ratio of 3:1 and should feature a long, gradual transition zone and a long meter zone. The recommended length- to-diameter (L/D) ratio is at least 24:1. Typical recommendations for 3:1 compression ratio screws on various sizes of 24:1 L/D extruders are given in the table below. Additional information on extrusion may be obtained by consulting the publication - Texin and Desmopan Thermoplastic Polyurethanes - A Processing Guide for Extrusion and by contacting a Covestro technical service representative.

| Section | Number of Diameters | Depth ("h") in inches | | |
|---|---|---|---|---|
| | | 2 1/2-in Extruder | 3 1/2-in Extruder | 4 1/2-in Extruder |
| Feed | 5 | 0.375 | 0.450 | 0.525 |
| Transition | 7 - 13 | | | |
| Meter | 6 - 12 | 0.125 | 0.150 | 0.175 |

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# Texin 970 U

**Regrind Usage**

Where end-use requirements permit, up to 20% Texin resin regrind may be used with virgin material, provided that the material is kept free of contamination and is properly dried (see section on Drying). Any regrind used must be generated from properly molded/extruded parts, sprues, runners, trimmings, and/or films. All regrind used must be clean, uncontaminated, and thoroughly blended with virgin resin prior to drying and processing. Under no circumstances should degraded, discolored, or contaminated material be used for regrind. Materials of this type should be properly discarded.

Improperly mixed and/or dried regrind may diminish the desired properties of Texin resin. It is critical that you test finished parts produced with any amount of regrind to ensure that your end-use performance requirements are fully met. Regulatory or testing organizations (e.g., Underwriter's Laboratories) may have specific requirements limiting the allowable amount of regrind. Because third party regrind generally does not have a traceable heat history or offer any assurance that proper temperatures, conditions, and/or materials were used in processing, extreme caution must be exercised in buying and using regrind from third parties.

The use of regrind material should be avoided entirely in those applications where resin properties equivalent to virgin material are required, including but not limited to color quality, impact strength, resin purity, and/or load-bearing performance.

**Regulatory Compliance Information**

Some of the end uses of the products described in this bulletin must comply with applicable regulations, such as FDA, NSF, USDA, and CPSC. If you have any questions on the regulatory status of these products, contact your Covestro representative or Regulatory Affairs Manager in Pittsburgh, PA.

# Texin 970 U

**Typical Properties* for Natural Resin**

| Property | ASTM Test Method (Other) | Texin 970U Resin U.S. Units | Texin 970U Resin S.I. Units |
|---|---|---|---|
| **General** | | | |
| Specific Gravity | D 792 (ISO 1183) | 1.18 | 1.18 |
| Shore Hardness | D 2240 (ISO 868) | 70D | 70D |
| Taber Abrasion: H-18, 1,000-g Load, 1,000 Cycles | D 3489 (ISO 4649) | 75 mg Loss | 75 mg Loss |
| Bayshore Resilience | D 2632 | 50% | 50% |
| Mold Shrinkage, 100-mil thickness | D 955 (ISO 2577) | | |
| Flow Direction | | 0.008 in/in (mm/mm) | 0.008 in/in (mm/mm) |
| Cross-Flow Direction | | 0.008 in/in (mm/mm) | 0.008 in/in (mm/mm) |
| **Mechanical** | | | |
| Tensile Strength | D 412 (ISO 37) | 6,900 $lb/in^2$ | 47.6 MPa |
| Tensile Stress at 50% Elongation | D 412 (ISO 37) | 3,000 $lb/in^2$ | 20.7 MPa |
| Tensile Stress at 100% Elongation | D 412 (ISO 37) | 3,700 $lb/in^2$ | 25.5 MPa |
| Tensile Stress at 300% Elongation | D 412 (ISO 37) | 5,700 $lb/in^2$ | 39.3 MPa |
| Ultimate Elongation | D 412 (ISO 37) | 320% | 320% |
| Flexural Modulus: | D 790 (ISO 178) | | |
| 158°F (70°C) | | 17,000 $lb/in^2$ | 117 MPa |
| 73°F (23°C) | | 78,000 $lb/in^2$ | 538 MPa |
| -22°F (-30°C) | | 293,000 $lb/in^2$ | 2,020 MPa |
| Tear Strength, Die C | D 624 (ISO 34) | 1,100 lbf/in | 193 kN/m |
| Compression Set: | D 395-B (ISO 815) | | |
| As molded | | 90% | 90% |
| 22 Hours at 212°F (100°C) | | 75% | 75% |
| 22 Hours at 158°F (70°C) | | 40% | 40% |
| 22 Hours at 73°F (23°C) | | | |
| Post-cured[a]: | | 65% | 65% |
| 22 Hours at 212°F (100°C) | | 45% | 45% |
| 22 Hours at 158°F (70°C) | | 25% | 25% |
| 22 Hours at 73°F (23°C) | | | |

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# Texin 970 U

**Typical Properties* for Natural Resin (CONT'D.)**

| Property | ASTM Test Method (Other) | Texin 970U Resin U.S. Units | Texin 970U Resin S.I. Units |
|---|---|---|---|
| **Mechanical (cont'd.)** | | | |
| Compressive Load: | D 575 | | |
| 2% Deflection | | 150 lb/in$^2$ | 1.0 MPa |
| 5% Deflection | | 800 lb/in$^2$ | 5.5 MPa |
| 10% Deflection | | 1,900 lb/in$^2$ | 13.1 MPa |
| 15% Deflection | | 2,400 lb/in$^2$ | 16.5 MPa |
| 20% Deflection | | 2,800 lb/in$^2$ | 19.3 MPa |
| 25% Deflection | | 3,300 lb/in$^2$ | 22.8 MPa |
| 50% Deflection | | 7,000 lb/in$^2$ | 48.3 MPa |
| **Thermal** | | | |
| Deflection Temperature Under Load: | D 648 (ISO 75) | | |
| 264 psi | | 113°F | 45°C |
| 66 psi | | 155°F | 68°C |
| Coefficient of Linear Thermal Expansion | D 696 | 6.4 E-05 in/in°F | 11.5 E-05 mm/mm°C |
| Low Temperature Brittle Point | D 746 (ISO 974) | < -94°F | < -70°C |
| Glass Transition Temperature (Tg) | (DMA)[b] | 32°F | 0°C |
| Vicat Softening Temperature, Rate A | D 1525 (ISO 306) | 284°F | 140°C |

**These items are provided as general information only. They are approximate values and are not part of the product specifications.*

*a Postcured for 16 hours at 230°F (110°C).*

*b DMA — Dynamic Mechanical Analysis.*

# Texin 970 U

**Property Changes after Aging Texin 970U Resin**

| Property | ASTM Test Method (Other) | 70 Hours | 7 Days | 14 Days | 21 Days |
|---|---|---|---|---|---|
| **Hot Air at 257°F (125°C)** | D 573 (ISO 216) | | | | |
| Tensile Strength | | 0% | -17% | -24% | -32% |
| Tensile Stress at 100% Elongation | | +6% | -8% | -10% | -15% |
| Tensile Stress at 300% Elongation | | +4% | -16% | -19% | -25% |
| Ultimate Elongation | | +12% | +33% | +33% | +17% |
| Hardness, Shore D | | -2 | -2 | -2 | -1 |
| **Hot Air at 212°F (100°C)** | D 573 (ISO 216) | | | | |
| Tensile Strength | | -6% | -32% | -4% | -9% |
| Tensile Stress at 100% Elongation | | -7% | +1% | +1% | -10% |
| Tensile Stress at 300% Elongation | | -4% | +6% | -5% | -12% |
| Ultimate Elongation | | +18% | +15% | +22% | +18% |
| Hardness, Shore D | | -2 | -3 | -4 | -5 |
| **ASTM Oil #1 at 212°F (100°C)** | D 471 (ISO 175) | | | | |
| Tensile Strength | | +3% | +3% | +15% | +9% |
| Tensile Stress at 100% Elongation | | +6% | +11% | +12% | +11% |
| Tensile Stress at 300% Elongation | | +4% | +10% | +19% | +18% |
| Ultimate Elongation | | +13% | +10% | -7% | -11% |
| Hardness, Shore D | | 0 | +1 | 0 | 0 |
| Volume | | -1% | -1% | -2% | -2% |
| **ASTM Oil #3 at 212°F (100°C)** | D 471 (ISO 175) | | | | |
| Tensile Strength | | +6% | +9% | +14% | +5% |
| Tensile Stress at 100% Elongation | | -1% | -70% | -2% | +2% |
| Tensile Stress at 300% Elongation | | +2% | -4% | 0% | +8% |
| Ultimate Elongation | | +15% | +18% | -5% | -12% |
| Hardness, Shore D | | +2 | +1 | 0 | +3 |
| Volume | | +3% | +5% | +4% | +5% |

# Texin 970 U

**Property Changes after Aging Texin 970U Resin (CONT'D.)**

| Property | ASTM Test Method (Other) | 70 Hours | 7 Days | 14 Days | 21 Days |
|---|---|---|---|---|---|
| **Fuel A at 73°F (23°C)** | D 471 (ISO 175) | | | | |
| Tensile Strength | | +1% | -1% | +13% | +9% |
| Tensile Stress at 100% Elongation | | -2% | -7% | -1% | -1% |
| Tensile Stress at 300% Elongation | | +2% | +1% | +21% | +31% |
| Ultimate Elongation | | +1% | -2% | -14% | -23% |
| Hardness, Shore D | | +2 | +2 | +2 | +1 |
| Volume | | 0% | 0% | 0% | 0% |
| **Fuel C at 73°F (23°C)** | D 471 (ISO 175) | | | | |
| Tensile Strength | | +5% | +2% | -12% | -10% |
| Tensile Stress at 100% Elongation | | -31% | -34% | -45% | -46% |
| Tensile Stress at 300% Elongation | | -10% | -12% | -23% | -15% |
| Ultimate Elongation | | 0% | -1% | -5% | -13% |
| Hardness, Shore D | | -9 | -10 | -16 | -11 |
| Volume | | +6% | +10% | +14% | +16% |

** This table shows property changes for Texin 970U resin after exposure to hot air, oil, and fuel. As is the case with any compatibility test, the results are dependent on variables, such as concentration, time, temperature, part design, and residual stresses, and should serve only as a guideline. It is imperative that production parts be evaluated under actual application conditions prior to commercial use.*

**Humid Aging**

| Humid Aging at 100% RH | ASTM Test Method (Other) | 248°F (120°C) | 212°F (100°C) | 158°F (70°C) |
|---|---|---|---|---|
| Tensile Half Life | D 471 (ISO 175) | 48 Hours | 42 Days | > 100 Weeks |

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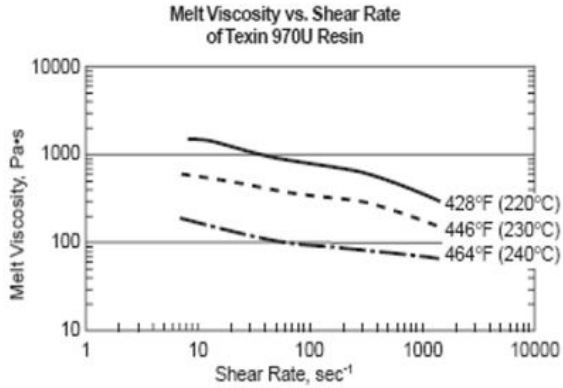
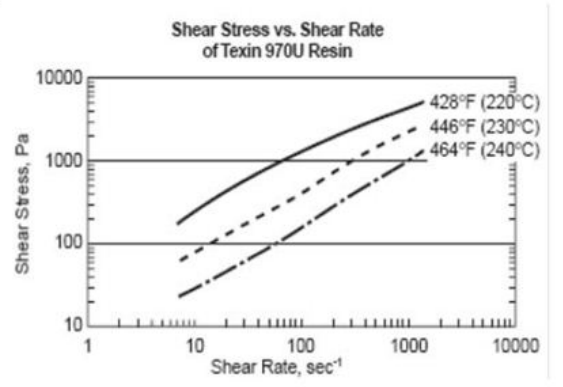
# Texin 970 U

**Health and Safety Information**

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling this product. Before working with this product, you must read and become familiar with the available information on its risks, proper use, and handling. This cannot be overemphasized. Information is available in several forms, e.g., safety data sheets and product labels. For further information contact your Covestro LLC representative or the Product Safety and Regulatory Affairs Department in Pittsburgh, PA.

**Chart/Graph**

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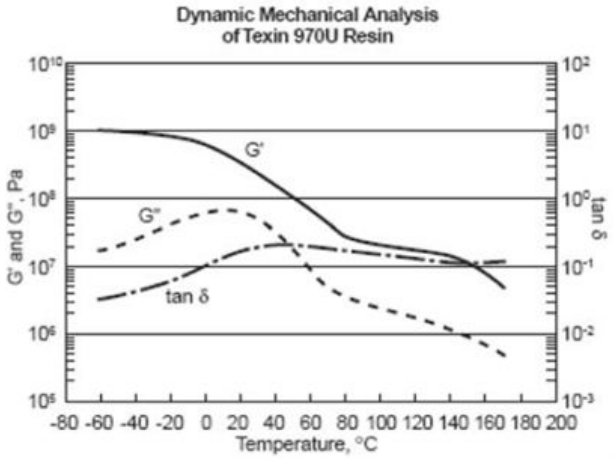
# Texin 970 U




| | |
|---|---|
| **Note** | ***The purchaser/user agrees that Covestro LLC reserves the right to discontinue this product without prior notice.*** |

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