

**HUNTSMAN**

Enriching lives through innovation

# Protecting connections

**TPU elastomers  
for Wire & Cable  
applications**





# Experts in elastomers

Our polyurethanes business division is a leading developer of polyurethane (PU) and thermoplastic polyurethane (TPU) materials. Combining global reach with decades of experience in material innovation, we are experts in urethane-based elastomers and have in-depth knowledge of their application across a vast range of industries.

## **A flexible partner for wire & cable producers**

We have a 20-year track record in delivering high quality TPU elastomers optimized to perform in a wide range of wire and cable applications. Fast and flexible when responding to customers' needs, we form long-lasting connections with wire and cable companies worldwide, who trust us to deliver:

- Special products for flame retardant (FR) applications
- Products that comply with halogen-free, RoHS and REACH regulations
- A range of materials with matt, glossy or transparent finishes
- FDA / FCM / NSF approved materials produced under strict good manufacturing practice (GMP) conditions
- TPU materials that are intrinsically recyclable.



# Protecting connections

Flexible and light, yet strong and durable, our polyether-based materials are designed to help protect connections in the most challenging conditions.

## General characteristics include:

- A wide processing window
- High extrusion speeds
- Ductile down to -50°C
- Stable and flexible from -50 to 120°C
- Consistent dimensional integrity
- Antimicrobial
- Resistance to abrasion, fatigue, cuts, tears, vibration impact and kinking
- Resistance to oil and hydrolysis even at high temperatures
- Easy to color.

## Specialty TPU grades

Our IROGRAN® TPU portfolio for the wire and cable industry includes specialty flame retardant, matt, transparent and high heat products as well as grades that are compliant with GMP procedures.

Recognizing the importance of offering flame retardancy, we've developed a family of high performance, halogen-free IROGRAN® FR TPUs with excellent reaction to fire, which can help overcome different design and performance challenges.

# Transportation & automotive

When it comes to testing mechanical performance, cabling materials must be wear resistant, tolerant to significant temperature fluctuations, and impervious to petrol, oil, moisture and acids.

To meet these criteria, we've developed an advanced range of IROGRAN® TPU elastomers for use in wire and cable applications across the transportation industry.

## Typical applications:

- Sensor cables for anti-lock braking systems (ABS)
- Cables for electronic stability program systems (ESP)
- Charger cables for hybrid and electric vehicles
- Cable harness / assembly
- Coiled cables
- Battery cables
- Cables for mass transportation.

## Benefits:

- Excellent gravel resistance
- Outstanding dynamic resistance under flexion and torsion
- Ductile over a broad range of temperatures
- Low bending radii
- Extremely tough with high overall mechanical properties.

# Industrial & automation

Industry 4.0 and the rise of automated production systems are changing the way things are made. Cables lie at the heart of intelligent manufacturing, powering smart factories, delivering commands to machines, and transmitting information.

Our IROGRAN® TPU elastomers for the wire and cable industry can support the digitization of manufacturing. Highly flexible yet incredibly robust, these innovative materials work equally well in static and dynamic equipment.

## Typical applications:

- Flame retardant power / sensor cables for robots
- Drag chain cables
- General electric and electronic wiring systems
- Cables for elevators, lifts and escalators
- High performance portable power and extension cables
- Telecommunications cables.

## Benefits:

- State-of-the-art flame retardancy
- Oil and chemical resistance
- Low-friction jacket surface to make cable replacement easy.

# Energy & offshore

We've channeled our knowledge of the wire and cable industry to develop a range of heavy duty IROGRAN® TPU elastomers for use across the world's energy markets - from offshore wind farms to oil platforms and mining environments.

## Typical applications:

- Geophysical cables and subsea umbilicals
- Control cables for windmills and turbines
- Power cables for mining and offshore equipment
- Solar panel cables.

## Benefits:

- Low temperature ductility
- Abrasion resistance
- Weathering and oil resistance
- Outstanding flame retardancy.

# Consumer goods

In our connected world, wires and cables need to deliver a continuous flow of information and power. These vital links are required 24 hours a day, seven days a week – so failure is not an option.

Our IROGRAN® TPUs can be used to create reliable, robust cable jackets for the transmission of data and audio signals.

## Typical applications:

- USB charging cables for smart phones
- Cables for headphones.

## Benefits:

- Stain resistant
- Weathering resistance
- Good reaction to fire
- Easy to color.

# Medical & healthcare

Across the medical and healthcare industry, power leads for non-invasive devices, such as imaging scanners and pulse sensors, must be resistant to cleaning liquids and antibacterial gels.

We produce a range of IROGRAN® TPU elastomers under strict GMP conditions, which are suitable for medical device cabling applications. Soft, and with a rubber-like feel, these materials are easy to clean and are ideal for creating sensor, control and power cables.

## Typical applications:

Cables for non-invasive medical devices such as:

- Fingertip oximeters
- Barcode scanners
- Heart monitors
- Defibrillators.

## Benefits:

- Resistant to disinfectants, hygiene gels and sprays
- Easy to clean
- Flexible
- A soft touch and good grip.

# Infinite scope for innovation

## IROGRAN® TPU: Key products



| Physical properties              | Norm           | Unit    | IROGRAN® ether-based       |             |             |             |             |             |             |             | IROGRAN® ether-based |              |             |                |                |         |            |                                  | Unit  | Norm | Physical properties |
|----------------------------------|----------------|---------|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------------|--------------|-------------|----------------|----------------|---------|------------|----------------------------------|-------|------|---------------------|
|                                  |                |         | A 80 P 5039                | A 80 P 4699 | A 85 P 4394 | A 85 P 4441 | A 92 P 4637 | A 92 P 4851 | A 95 P 5044 | A 85 P 4350 | A 85 P 4380          | A 78 P 4766* | A 85 P 4854 | A 91 P 5015 FR | A 92 P 5016 FR |         |            |                                  |       |      |                     |
| <b>FLAMMABILITY</b>              |                |         | <b>FLAMMABILITY</b>        |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| UL 94                            | IEC60695-11-10 | -       | HB*1                       | HB*1        | HB*1        | HB*1        | HB*1        | HB*1        | HB*1        | HB*1        | V2                   | V2           | V0          | V0             | V0             | V0      | -          | IEC60695-11-10                   | UL 94 |      |                     |
| LOI                              | ASTM D 2863    | %       | N/A                        | N/A         | N/A         | N/A         | N/A         | N/A         | N/A         | N/A         | 25                   | 26           | 26          | 25             | 25             | 26      | %          | ASTM D 2863                      | LOI   |      |                     |
| <b>GENERAL</b>                   |                |         | <b>GENERAL</b>             |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| Hardness                         | ISO 7619       | Shore A | 80                         | 80          | 85          | 87          | 92          | 93          | 95          | 86          | 87                   | 82           | 83          | 92             | 93             | Shore A | ISO 7619   | Hardness                         |       |      |                     |
| Hardness                         | ISO 7619       | Shore D | 29                         | 31          | 36          | 38          | 39          | 42          | 48          | 35          | 36                   | 30           | 33          | 44             | 44             | Shore D | ISO 7619   | Hardness                         |       |      |                     |
| Density                          | ISO 1183-1     | g/cm³   | 1,1                        | 1,1         | 1,12        | 1,11        | 1,13        | 1,13        | 1,14        | 1,15        | 1,14                 | 1,16         | 1,14        | 1,27           | 1,30           | g/cm³   | ISO 1183-1 | Density                          |       |      |                     |
| <b>MECHANICAL</b>                |                |         | <b>MECHANICAL</b>          |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| Tensile strength                 | DIN 53504      | MPa     | 32                         | 34          | 45          | 40          | 45          | 45          | 55          | 40          | 35                   | 30           | 25          | 30             | 25             | MPa     | DIN 53504  | Tensile strength                 |       |      |                     |
| Elongation @ break               | DIN 53504      | %       | 720                        | 670         | 640         | 650         | 600         | 600         | 500         | 680         | 600                  | 700          | 670         | 500            | 470            | %       | DIN 53504  | Elongation @ break               |       |      |                     |
| Tensile stress @ 100% elongation | DIN 53504      | MPa     | 4,6                        | 4           | 7           | 7,3         | 9,1         | 10          | 12,3        | 6,5         | 6,5                  | 5,2          | 3,5         | 9              | 9              | MPa     | DIN 53504  | Tensile stress @ 100% elongation |       |      |                     |
| Tensile stress @ 300% elongation | DIN 53504      | MPa     | 8,7                        | 7           | 12          | 11          | 15,9        | 16,1        | 30,7        | 10,2        | 10                   | 8            | 7,5         | 13             | 13             | MPa     | DIN 53504  | Tensile stress @ 300% elongation |       |      |                     |
| Tear strength                    | ISO 34-1       | N/mm    | 45                         | 76          | 60          | 60          | 74          | 75          | 115         | 50          | 50                   | 40           | 35          | 70             | 70             | N/mm    | ISO 34-1   | Tear strength                    |       |      |                     |
| Compression set 70h @ 23°C       | ISO 815        | %       | 23                         | 24          | 20          | 24          | 25          | 27          | 29          | 22          | 25                   | 20           | 30          | -              | -              | %       | ISO 815    | Compression set 70h @ 23°C       |       |      |                     |
| Compression set 24h @ 70°C       | ISO 815        | %       | 43                         | 42          | 40          | 42          | 41          | 45          | 82          | 42          | 45                   | 36           | 46          | -              | -              | %       | ISO 815    | Compression set 24h @ 70°C       |       |      |                     |
| Abrasion                         | ISO 4649       | mm³     | 30                         | 40          | 25          | 35          | 30          | 35          | 30          | 35          | 35                   | 40           | 40          | 30             | 35             | mm³     | ISO 4649   | Abrasion                         |       |      |                     |
| <b>THERMAL</b>                   |                |         | <b>THERMAL</b>             |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| TMA low melt range               | Huntsman       | °C      | 145                        | 125         | 150         | 155         | 160         | 160         | 175         | 170         | 160                  | 165          | 125         | 160            | 165            | °C      | Huntsman   | TMA low melt range               |       |      |                     |
| TMA high melt range              | Huntsman       | °C      | 155                        | 155         | 170         | 175         | 170         | 170         | 187         | 190         | 180                  | 190          | 160         | 175            | 185            | °C      | Huntsman   | TMA high melt range              |       |      |                     |
| <b>OTHER FEATURES</b>            |                |         | <b>OTHER FEATURES</b>      |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| Glossy/matt finish               |                |         | Glossy                     | Matt        | Glossy      | Matt        | Glossy      | Matt        | Glossy      | Glossy      | Matt                 | Glossy       | Matt        | Matt           | Matt           |         |            | Glossy/matt finish               |       |      |                     |
| Transparent                      |                |         | x                          |             | x           |             | x           |             | x           |             |                      |              |             |                |                |         |            | Transparent                      |       |      |                     |
| Milky                            |                |         |                            |             |             |             |             |             |             | x           |                      | x            |             |                |                |         |            | Milky                            |       |      |                     |
| Non-sticky                       |                |         |                            | x           |             | x           |             | x           |             |             | x                    |              | x           | x              | x              |         |            | Non-sticky                       |       |      |                     |
| Available as FCM grade           |                |         | x                          |             | x           | x           | x           |             |             |             |                      |              |             |                |                |         |            | Available as FCM grade           |       |      |                     |
| <b>MARKET APPLICATIONS</b>       |                |         | <b>MARKET APPLICATIONS</b> |             |             |             |             |             |             |             |                      |              |             |                |                |         |            |                                  |       |      |                     |
| Industrial                       |                |         | x                          | x           | x           | x           | x           | x           | x           | x           | x                    | x            |             | x              | x              |         |            | Industrial                       |       |      |                     |
| Transportation                   |                |         |                            |             | x           | x           | x           | x           | x           | x           | x                    |              |             |                |                |         |            | Transportation                   |       |      |                     |
| Energy                           |                |         |                            |             | x           | x           | x           | x           |             | x           | x                    |              |             | x              | x              |         |            | Energy                           |       |      |                     |
| Consumer goods                   |                |         |                            |             |             |             |             |             |             |             |                      |              | x           | x              | x              |         |            | Consumer goods                   |       |      |                     |

FR TPU range for the most stringent FR applications

(UL 1581, IEC 60332-1, EN 13501-6 cable tests)

\* IROGRAN® A 78 P 4766 is also available as a low migration version (NM)

Further technical data about individual products plus best practice advice for handling and processing our elastomers is available by contacting your local sales representative or by visiting our online product finder tool:

<http://www.huntsman-tpu.com/>

# Global elastomers experts

**Committed to customers:** We build partnerships with our customers and work across an international network of R&D and manufacturing locations to help solve complex challenges and deliver the highest levels of technical support and customer care.

**Committed to quality:** Wherever we are, whatever we are doing, we prioritize environmental, health and safety protection, and we are always rigorous about quality control and assurance.

**Committed to innovation:** We keep pace with the most innovative trends in plastics processing by using the latest equipment and making regular investments in our formulation, manufacturing and R&D capabilities.

**Committed to sustainability:** We create solutions that contribute to a more sustainable society by helping to conserve energy, preserve natural resources and reduce our overall carbon footprint.



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### About Huntsman:

Huntsman Corporation is a publicly traded global manufacturer and marketer of differentiated and specialty chemicals with 2018 revenues of more than \$9 billion. Our chemical products number in the thousands and are sold worldwide to manufacturers serving a broad and diverse range of consumer and industrial end markets. We operate more than 75 manufacturing, R&D and operations facilities in approximately 30 countries and employ approximately 10,000 associates within our four distinct business divisions.

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