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styrenics are a family of unique organic polymeric materials with a broad range of applications. These provide added quality and value to countless products worldwide – in everything from bike helmets, car trims, and toys to smart phones, refrigerators, and inhalers – making styrenics one of the world’s most important thermoplastics. Primarily because of properties like lower density, balanced performance, superior processing, excellent aesthetics and unsurpassed value for money, styrenics are also being used in an increasing number of applications in the healthcare sector.

As the worldwide leader in styrenics, INEOS Styrolution supports stakeholders in the healthcare sector in meeting the challenges of change. Based on a deep understanding of the medical industry, its applications, value chains and regulatory requirements, INEOS Styrolution continuously renews and improves its portfolio and services to generate further value for its customers.

With wide-reaching expertise and a dedication to unparalleled service, INEOS Styrolution offers a broad range of products dedicated to healthcare, top quality styrenic solutions for new applications, product co-development opportunities, and comprehensive assistance with strict regulatory requirements.

a wave of trends in global healthcare is raising the level for everyone involved. Major technological advancements in diagnostic monitoring and imaging are spurring smaller, more portable and lightweight devices, as well as a greater variety of safety devices for the protection of staff and patients. At the same time, a massive transformation of global healthcare systems is driving cost reduction through design optimization and processing selection. With a dramatic worldwide increase in the number of age and wealth-related diseases, such as diabetes, cardiovascular issues, and respiratory problems like chronic obstructive pulmonary disease (COPD) and asthma, demand for their treatment is growing exponentially. Greater competition, expanded regulation, and increasing price pressure are also contributing to the transformation of the market in every aspect: from raw materials to end products, from manufacturers to patients.

styrenics have proven to have a good to excellent chemical resistance against saturated hydrocarbons, ethanol, solutions containing alcohol, water, aqueous solutions of salts, detergents, mineral acids, glycerine, dilute acids and alkalis, and aliphatic amines and amides.
HEALTHCARE PACKAGES

Based on a deep understanding of the medical industry, its applications, value chains and regulatory requirements, INEOS Styrolution has a proven track record in supporting and working with our customers in the innovative use and application of its materials. Therefore, INEOS Styrolution offers various healthcare service packages, which vary according to customer requirements.

**FULL SERVICE HD PACKAGE (RISK CLASS 1 & 2)**
- Up to 36 months NOC*, with signed long term supply contract
- Locked formulations as defined in the Drug Master File (DMF)
- Enhanced quality control processes
- Food contact statements, USP Class VI, ISO 10993, DMF
- Security of supply, long-term and global availability
- Increased technical support (color & application development, design support etc.)

**ESSENTIAL HD PACKAGE (RISK CLASS 1 & 2)**
- Up to 12 months NOC*, with signed long term supply contract
- Food contact statements, USP Class VI, ISO 10993, DMF

**STANDARD FOOD CONTACT PACKAGE (RISK CLASS 1)**
- FDA and EU food contact statements available
- no NOC* guarantees

**HEALTHCARE PACKAGES**
- NOVODUR® HD & LUSTRAN® ABS
- TERLUX® HD
- LURAN® HD

* NOC: Notification of Change
Whether for vaccines, transfusions or nebulizers, the healthcare applications of styrenics are plentiful. It is not just cleanliness and safety that make styrenics attractive for healthcare solutions providers. They also exhibit great strength and resistance, easy processability, the highest quality standards and an attractive appearance. Here is a sampling:

<table>
<thead>
<tr>
<th>IV SYSTEMS &amp; FLUID DELIVERY</th>
<th>LABWARE</th>
<th>MEDICAL PACKAGING</th>
<th>SURGICAL INSTRUMENTS</th>
<th>MOBILE &amp; DIGITAL HEALTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV tubing, lumen tubes, co-ex tubes</td>
<td>Titre plates, petri dishes, pipettes</td>
<td>Medical trays</td>
<td>Handle grips</td>
<td>Medical monitoring</td>
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<td>IV bags</td>
<td>Sample spoons</td>
<td>Pouches</td>
<td>Vaginal specular</td>
<td>Diagnostic systems</td>
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<td>IV drip chambers</td>
<td>Cell growth bottles</td>
<td>Blister actuators</td>
<td>Electro surgical pencils</td>
<td>CT scanners</td>
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<td>Spikes</td>
<td>Cuvettes</td>
<td>Films</td>
<td>Trocars</td>
<td>Blood pressure monitors</td>
</tr>
<tr>
<td>Connectors (rigid/flexible, Y, valves)</td>
<td>Centrifuge tubes, caps and closures</td>
<td>Overwraps</td>
<td>Arthroscopes</td>
<td>Thermometers, pulse oximeters</td>
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<tr>
<td>Stopcocks</td>
<td>Anesthesia, blood analysis trays</td>
<td>Film/multi layer film applications</td>
<td>Endoscopes</td>
<td>Fitness devices</td>
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<td>Rollerlamps</td>
<td>Diagnostic test kits</td>
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<td>Microlaparoscopy instruments</td>
<td>Glucometers, AED</td>
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<td>Dialyzers</td>
<td>Retinal surgery cassette</td>
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<td>Anesthesia devices</td>
<td>Ultrasound instruments</td>
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<tr>
<td>Blood filters and reservoirs</td>
<td></td>
<td></td>
<td>Endoscopy tube and parts</td>
<td>Wireless-, remote devices</td>
</tr>
</tbody>
</table>

**STYRENICS APPLICATIONS**

**BUILDING A CLEAN, SAFE PATH TO GOOD HEALTH**
INEOS Styrolution offers the world’s largest styrenic specialties portfolio, reliable global supply and the commitment to collaborate with our customers to even create new grades with the exact properties required. This also includes a broad range of medical grade portfolios and top quality styrenic solutions for new applications.

**NOVODUR® HD (ABS)**
- Chemical Resistance
- Dimensional Stability
- Processability
- Bondability

**LUSTRAN® ABS**
- Heat Resistance
- Chemical Resistance

**TERLUX® HD (MABS)**
- Processability
- Surface Quality and Brilliance

**ZYLAR® (MBS)**
- Clarity
- Impact Toughness
- Stiffness
- Gloss
- Toughness
- Elasticity
- Clarity
- Bondability

**CLEARBLEND® (MBS)**
- Heat Resistance
- General Chemical Resistance

**STYROLUX® (SBC)**
- Clarity
- Color Consistency
- Processability

**K-RESIN® (SBC)**
- Heat Resistance
- Chemical Resistance
- Processability
- Bondability

**STYROFLEX® (S-TPE)**
- Heat Resistance
- Chemical Resistance
- Processability
- Bondability

**LURAN® SAN**
- Standard Food Contact Package

**LUSTRAN® SAN LURAN® HD (SAN)**
- Impact Toughness
- Stiffness

**NAS® (SMMA)**
- High Transparency

**STYROLUTION® PS**
- Easy Processing
- Colorable

**TERLURAN® (ABS)**
- Colorable
- General Chemical Resistance
- Processability
INTRODUCING
NEW HEALTHCARE GRADES

NOVODUR® HD
M203FC G3 (ABS)
FIRST GLASS FIBER REINFORCED
INJECTION MOULDING GRADE
WITH FULL SERVICE HD PACKAGE

KEY PROPERTIES
- Full service HD package
- High flowability
- Stiffness
- Dimensional stability

APPLICATIONS
- IV spikes
- Housings

STYROLUX®
4G60 (SBC)
SPECIFICALLY DESIGNED
FOR THE DEVELOPMENT OF
DRIP CHAMBERS IN IV SETS

KEY PROPERTIES
- Essential service HD package
- Excellent softness, elasticity and transparency
- Very good bonding properties

APPLICATIONS
- Drip chambers in IV sets

STYROFLEX®
4G80 (S-TPE)
SPECIFICALLY DESIGNED
FOR MEDICAL TUBING

KEY PROPERTIES
- Essential service HD package
- High transparency
- Chemical resistance, food contact compliancy
- Outstanding bonding properties

APPLICATIONS
- Medical tubes

© Fleima

noVodur®
HD
m203fc G3 (ABS)

STYROLUX®
4G60 (SBC)

STYROFLEX®
4G80 (S-TPE)
**NOVODUR® HD AND LUSTRAN® ABS**

INEOS STYROLUTION’S FULL SERVICE HD GRADES OF ACRYLONITRILE BUTADIENE STYRENE (ABS) RESINS DEMONSTRATE A GOOD BALANCE OF PHYSICAL AND MECHANICAL PROPERTIES. MOST GRADES EXHIBIT EXCELLENT CHEMICAL RESISTANCE TO COMMON HEALTHCARE CLEANERS AND DISINFECTANTS.

**KEY FEATURES**

- **Reliability** – consistent products proven in numerous medical devices
- **Excellent property retention** after gamma-radiation, E-beam, NO₃, or EtO sterilization
- **Great ESCR** to common healthcare disinfectants and cleaners, including bleach, betadine (glutaraldehyde, lipids, and isopropyl alcohol)
- **Excellent balance of properties**
  - Impact strength
  - Flexural modulus and flexural strength
  - Tensile modulus (good stiffness and strength)
- **Dimensional stability**
- **Processability** – easy to mold, fast cycle times
- **Bondability** – ultrasonic, solvent, adhesive

Selected Novodur® HD and Lustran® ABS grades are available in the broadest range of colors for medical applications – off the shelf or custom colored.

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**Application Fields**

- Inhalers
- Instrument handles
- Drug delivery housings
- Insulin and injection pens

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**Property** | Test method | Units | Lustran® ABS | Novodur® HD | Novodur® HD | Novodur® HD | Novodur® HD | Novodur® HD
--- | --- | --- | --- | --- | --- | --- | --- | ---
Melt volume-flow rate | MVR 220 °C/10 kg | ISO 1133 | cm³/10 mm | 23 | 16 | 31 | 18 | 15
Melt-flow rate MFR 220 °C/10 kg | ASTM D 1238 | g/10 min | 21 | 14 | 28 | 14 | 14
Tensile modulus | ISO 527-11-2 | MPa | 2620 | 2660 | 2400 | 5600 | 2300
Chapry notched impact strength (23 °C) | ASTM D 612 | psi × 10³ | 330 | 330 | 325 | 830
Charpy notched impact strength (23 °C) | ISO 179-1aA | kJ/m² | 20 | 18 | 16 | 5 | 14
Izod notched impact strength (23 °C) | ASTM D 256 | ft-lb/in | 4.2 | 4 | 4 | 1
Vicat softening temperature VST & SO | ISO 306 | °C | 100 | 100 | 99 | 107 | 100
Vicat softening temperature B10 | ASTM D 648 | °F | 227 | 225 | 226 | 236

Novodur® HD and Lustran® ABS are part of the INEOS Styrolution Full Service HD Package which can be offered with Notification of Change (NOC) term up to 36 months when signing a long term supply contract. Full regulatory compliance (USP class VI, ISO 10993, EU and US food contact statements, Drug Master File (DMF)) can be provided with this package. Furthermore, Novodur® HD and Lustran® ABS grades are available in pre-colored versions, some of which are listed in the DMF and have been assessed according to the above mentioned regulations. For more information please contact your sales representative.
TERLUX® HD

INEOS STYROLUTION’S TERLUX® HD (MABS) PRODUCTS STAND OUT FOR THEIR BALANCED TOUGHNESS-TO-STIFFNESS RATIO AND HIGH OPTICAL CLARITY. THIS COMBINATION OF PROPERTIES AND EASE OF PROCESSING MAKES TERLUX® HD AN OPTIMAL CHOICE FOR UPScale AND DESIGN-ORIENTED HEALTHCARE APPLICATIONS.

KEY FEATURES
- Reliability – consistent products proven in numerous medical devices
- Injection molding/extrusion/blow-molding
- High impact strength
- Excellent transparency
- High heat resistance
- Good mechanical strength and stiffness
- Excellent chemical resistance and good environmental stress cracking resistance (ESCR)
- Outstanding surface quality, excellent feel and appearance
- Good processability
- Thermal stability
- Good solvent bonding to PVC

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit</th>
<th>Terlux® HD 2812 (Easy flow)</th>
<th>Terlux® HD 2802/2822 (Standard flow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melt volume-flow rate MVR</td>
<td>ISO 1133</td>
<td>cm³/10 min</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>220 °C/10 kg</td>
<td></td>
<td></td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Melt-flow rate MFR</td>
<td>ASTM D 1238</td>
<td>g/10 min</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>220 °C/10 kg</td>
<td></td>
<td></td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Tensile modulus</td>
<td>ISO 527-1-2</td>
<td>MPa</td>
<td>1500</td>
<td>2000</td>
</tr>
<tr>
<td>1 mm/min</td>
<td>ASTM D 638</td>
<td>psi x 10¹</td>
<td>275</td>
<td>295</td>
</tr>
<tr>
<td>Charpy impact strength (23 °C)</td>
<td>ISO 179/1/eJ</td>
<td>kJ/m²</td>
<td>110</td>
<td>120</td>
</tr>
<tr>
<td>Unnotched</td>
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<td></td>
<td>110</td>
<td>120</td>
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<tr>
<td>Notched</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Izod notched impact strength (23 °C)</td>
<td>ISO 180-1A</td>
<td>kJ/m²</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Vicat softening temperature VST B 50</td>
<td>ISO 306</td>
<td>°C</td>
<td>87</td>
<td>93</td>
</tr>
<tr>
<td>Vicat softening temperature B10</td>
<td>ASTM D 648</td>
<td>°F</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>Light transmission 4 mm thick</td>
<td>ASTM D 1003</td>
<td>%</td>
<td>89</td>
<td>90</td>
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</tbody>
</table>

Terlux® HD belongs to the INEOS Styrolution Full Service HD Package which can be offered with Notification of Change (NOC) term up to 36 months when signing a long term supply contract. Full regulatory compliance (USP class VI, ISO 10993, EU and US food contact statement, Drug Master File (DMF)) can be provided with this package. For more information please contact your sales representative.
ZYLAR® AND CLEARBLEND®

INEOS STYROLUTION’S CLEAR IMPACT MODIFIED STYRENE ACRYLIC (MBS) COPOLYMERS OFFER PRACTICAL TOUGHNESS, EXCELLENT CLARITY, AND SUPERIOR PROCESSING. IN SPIRAL FLOW TESTS, ZYLAR® AND CLEARBLEND® RESINS FLOW THE SAME DISTANCE AS POLYCARBONATE AT SIGNIFICANTLY LOWER TEMPERATURES, LEADING TO HIGHER PRODUCTIVITY, LOWER ENERGY CONSUMPTION AND LESS MOLDED-IN STRESS.

KEY FEATURES
- Practical toughness and excellent clarity
- Lower moisture retention means little or no pre-drying
- Low processing temperatures
- Superior flow properties
- Outstanding property retention after gamma, E-beam, NO₂, or EtO sterilization
- Good chemical resistance: particularly to many detergents, cleaning solutions, and alcohols

APPLICATION FIELDS
- Transparent reservoirs
- Housings
- Urine containers
- Connectors
- Mouth pieces
- Enclosures

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit</th>
<th>Zylar® 245</th>
<th>Zylar® 550</th>
<th>Zylar® 631</th>
<th>Zylar® 650</th>
<th>Zylar® 785</th>
<th>Zylar® 960</th>
<th>Clearblend® 145</th>
<th>Clearblend® 155</th>
<th>Clearblend® 165</th>
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<tbody>
<tr>
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<td>5</td>
<td>4</td>
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<td>6</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Melt-flow rate MFR</td>
<td>ASTM D 1238</td>
<td>g/10 min</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>3.5</td>
<td>6</td>
<td>5</td>
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<tr>
<td>Tensile modulus 1 mm/min</td>
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<td>290</td>
<td>310</td>
<td>310</td>
<td>250</td>
<td>325</td>
<td>270</td>
<td>220</td>
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<tr>
<td>Charpy impact strength (23 °C)</td>
<td>ISO 179/1aeU</td>
<td>kJ/m²</td>
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<td>2</td>
<td>n.b.</td>
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<td>n.b.</td>
<td>40</td>
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<td></td>
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<tr>
<td>Izod notched impact strength (23 °C)</td>
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<td>ft-lb/in</td>
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<td>2</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td></td>
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<tr>
<td>Vicat softening temperature VST 8 50</td>
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<td>72</td>
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<td>60</td>
<td>82</td>
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<td>°F</td>
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<tr>
<td>Light transmission 4 mm thick</td>
<td>ASTM D 1003</td>
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Zylar® and Clearblend® are a part of the Essential HD Package that can be provided with EU and US food contact statements, USP Class VI, ISO 10993 compliance and a Drug Master File (DMF). Notification of Change (NOC) term up to 12 months can also be offered when signing a long term supply contract. For more information please contact your sales representative.
K-RESIN®

AS A PREMIER CLEAR RESIN, K-RESIN® STYRENE BUTADIENE COPOLYMER (SBC) IS KNOWN FOR ITS UNIQUE BLEND OF SPARKLING CLARITY, IMPACT TOUGHNESS, STIFFNESS AND EXCEPTIONAL GLOSS. K-RESIN® HAS BEEN USED IN VARIOUS APPLICATIONS FOR MORE THAN 40 YEARS. IT IS FEATURED IN FLEXIBLE AND RIGID PACKAGING APPLICATIONS AND CAN ALSO BE USED IN INJECTION MOLDED MEDICAL DEVICES.

KEY FEATURES
• Excellent clarity and transparency
• Good toughness
• Dimensional stability
• High surface gloss
• Outstanding property retention after gamma, E-beam, NO₂ or EO sterilization
• Consistant low color shift post high doses of radiation

APPLICATION FIELDS
• IV drip chambers
• Containers, oxygenators
• Filter housings
• Respiratory devices
• Packaging

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit</th>
<th>K-Resin® KR01</th>
<th>K-Resin® KR03, KR05, DK11</th>
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<tbody>
<tr>
<td>Melt volume-flow rate MVR</td>
<td>ISO 1133</td>
<td>cm³/10 min</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>200 °C/5 kg</td>
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<td></td>
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<tr>
<td>Melt-flow rate MFR</td>
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<td>g/10 min</td>
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<td>7.5</td>
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<tr>
<td>200 °C/5 kg</td>
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<td>Tensile modulus</td>
<td>ISO 527-1-2</td>
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<td>1600</td>
<td>1500</td>
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<tr>
<td>1 mm/min</td>
<td>ASTM D 638</td>
<td>psi x 10⁵</td>
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<td>240</td>
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<tr>
<td>Tensile strength at yield</td>
<td>ISO 527-1/2</td>
<td>MPa</td>
<td>33</td>
<td>25</td>
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<td>ASTM D 638</td>
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<td>Tensile elongation at break</td>
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<td>180</td>
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<td></td>
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<td>%</td>
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<td>200</td>
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<td>Charpy impact strength (23 °C)</td>
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<td>ISO 179/1eu</td>
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<td>0.3</td>
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<td>Izod notched impact strength 23 °C</td>
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<td>ft-lb/in</td>
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<td>0.3</td>
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<tr>
<td>Light transmission</td>
<td>ASTM D 1003</td>
<td>%</td>
<td>92</td>
<td>92</td>
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<tr>
<td>4 mm thick</td>
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K-Resin® is a part of the Essential HD Package that can be provided with EU and US food contact statements, USP Class VI, ISO 10993 compliance and a Drug Master File (DMF). Notification of Change (NOC) term up to 12 months can also be offered when signing a long term supply contract. For more information please contact your sales representative.
**STYROLUX®**

**KEY FEATURES**
- Clarity
- Toughness
- Ease in processing
- Low density (1020 kg/m³)
- Cost performance
- Excellent bonding performance
- Can be used as a modifier to GPPS and SMMA
- Outstanding retention after gamma, E-beam, NO₂, or ETO sterilization
- Excellent color consistency after gamma and E-beam, sterilization

**STYROLUX® IS INEOS STYROLUTION’S BRAND OF CRYSTAL-CLEAR THERMOPLASTIC STYRENE BUTADIENE COPOLYMERS (SBC). IT HAS VERY HIGH TRANSPARENCY AND IMPACT RESISTANCE, AND ITS PERFECT MISCELLIBILITY WITH STANDARD POLYSTYRENE (PS) GIVES IT AN EXTREMELY WIDE APPLICATION FIELD.**

**APPLICATION FIELDS**
- Containers for IV and dialysis fluids
- Rigid extruded luers and containers
- Infusion drip chambers
- Cabinets
- Oxygen delivery equipment
- Filter housings
- Drainage containers

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**Keypoints**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit</th>
<th>Styrolux® SG46</th>
<th>Styrolux® 656C</th>
<th>Styrolux® 684D</th>
<th>Styrolux® 4G60</th>
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<tbody>
<tr>
<td>Multi volume-flow rate MVR 200 °C/5 kg</td>
<td>ISO 1133</td>
<td>cm/10 min</td>
<td>14</td>
<td>16</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Multi-flow rate MFR 200 °C/5 kg</td>
<td>ASTM D 1238</td>
<td>g/10 min</td>
<td>11</td>
<td>15</td>
<td>10</td>
<td>14</td>
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Styrolux® is a part of the Essential HD Package that can be provided with EU and US food contact statements, USP Class VI, ISO 10993 compliance and a Drug Master File (DMF). Notification of Change (NOC) term up to 12 months can also be offered when signing a long term supply contract. For more information please contact your sales representative.
**STYROFLEX®**

STYROFLEX® IS INEOS STYROLUTION’S UNIQUELY DESIGNED STYRENE THERMOPLASTIC ELASTOMER (S-TPE) THAT COMBINES TRANSPARENCY, ELASTICITY AND EXCELLENT PROCESSABILITY. DUE TO ITS OUTSTANDING THERMAL STABILITY, STYROFLEX® IS SUITABLE FOR BOTH FILM EXTRUSION AND INJECTION MOLDING.

**KEY FEATURES**
- Good processability
- Rubber-like mechanics
- Outstanding toughness
- Extremely high tear and perforation resistance
- Low density (~1002 kg/m³)
- Excellent bonding to other polymers
- Sterilizable
- High oxygen and water vapor permeability
- Great transparency and low yellowness index
- Toughness modifier and compatibilizer (improved mechanics)
- Higher polarity due to randomized soft phase:
  - Good compatibility with other polymers
  - Great compatibility with styrenics as well as polyolefins

**APPLICATION FIELDS**
- Drip chambers
- Catheters*
- Connectors
- Tubes
- Collection bags
- Infusion bags*
- Film applications
- Soft touch (2K molding)

* Pure or as additives

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**Styroflex®** is a part of the Essential HD Package that can be provided with EU and US food contact statements, USP Class VI, ISO 10993 compliance and a Drug Master File (DMF). Notification of Change (NOC) term up to 12 months can also be offered when signing a long term supply contract. For more information please contact your sales representative.
LURTRAN® SAN AND LURAN® HD

LURTRAN® SAN AND LURAN® HD ARE INEOS STYROLUTION’S BRANDS OF STYRENE ACRYLONITRILE (SAN). THEY HAVE A UNIQUE BALANCE OF COST/PERFORMANCE PROPERTIES, DEMONSTRATING TRANSPARENCY WITH HIGH RIGIDITY AND OUTSTANDING RESISTANCE TO HEAT DEFORMATION, SCRATCHING, AND CHEMICAL ATTACK.

**KEY FEATURES**
- High stiffness
- Heat resistance
- Transparency – allows easy visual, automated inspection
- Processability – high flow, fast cycle time
- Dimensional stability – rigidity and tensile strength
- Sterilizability – EtO, Gamma, E-beam, NO₂
- Bondability – ultrasonic, solvent, or adhesive
- Excellent light transmission
- Parts are printable
- Chemical resistance – saline, bleach, betadine, glutaraldehyde, lipids
- Cost effectiveness with proven performance

**APPLICATION FIELDS**
- Cell growth bottles
- Cuvettes
- Centrifuge tubes
- Caps and closures
- Anaerobic boxes
- Diagnostic test kits
- Blood analysis trays
- Labware

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**LURAN® HD**, as a part of Full Service HD Package, is offered with Notification of Change (NoC) term up to 36 months when signing a long term supply contract. **Lustran® SAN** belongs to Essential HD Package and can be offered with NoC term up to 12 months under the same conditions. **Lurtran® HD** and **Lustran® SAN** can be provided with full regulatory compliance (USP class VI, ISO 10993, EU and US food contact statement, Drug Master File (DMF)). For more information please contact your sales representative.

---

**PROPERTY OF STYRENE ACRYLONITRILE**

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**KEYS FEATURES**

- High stiffness
- Heat resistance
- Transparency – allows easy visual, automated inspection
- Processability – high flow, fast cycle time
- Dimensional stability – rigidity and tensile strength
- Sterilizability – EtO, Gamma, E-beam, NO₂
- Bondability – ultrasonic, solvent, or adhesive
- Excellent light transmission
- Parts are printable
- Chemical resistance – saline, bleach, betadine, glutaraldehyde, lipids
- Cost effectiveness with proven performance
INEOS STYROLUTION’S BEST-IN-CLASS TRANSPARENT STYRENE-METHYL-METHACRYLATE-COPOLYMERS (SMMA) ARE A PREMIUM CHOICE FOR APPLICATIONS DEMANDING A STRONG, STIFF, WATER-CLEAR PLASTIC. NAS® IS HYDROPHOBIC, PROVIDES EXCELLENT THERMAL STABILITY, AND VERY GOOD ALCOHOL RESISTANCE.

**KEY FEATURES**
- Extreme clarity and transparency
- Excellent flow properties
- Hydrophobic (no pre-drying)
- Virtually no molded-in stress
- Outstanding property retention after sterilization: ETO, Gamma, E-beam, NO2
- High chemical resistance to alcohols
- Clarity and color consistency/neutrality
- Ease of processing

**APPLICATION FIELDS**
- Filters
- Connectors
- Adapters
- Nebulizer housings
- Specimen holders

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<td>14</td>
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STANDARD FOOD CONTACT PACKAGE

INEOS Styrolution also provides FDA and EU food contact compliant grades, such as general-purpose polystyrene, high impact polystyrene, and ABS Standard grades, which can be suitable for specific medical devices and pharmaceutical packaging applications. Moreover, other specialty products are also available for Risk Class 1 applications.

STYROLUTION® PS & TERLURAN®

Please note there are some grades within the same product family (ex. Terlux®, Novodur®) that are offered with various packages. Only those specific products marked with the “Hd” nomenclature come with the Full Service HD Package.

Standard Food Contact Package is offered for Risk Class 1 applications where customers do not require biocompatibility data, Drug Master File entry and/or locked formulation.

APPLICATION FIELDS

- **Styrolution® PS**
  - Risk Class 1 medical devices and pharmaceutical packaging applications such as:
    - Labware
    - Packaging
    - housings
    - Diagnostics devices
    - Petri-dishes
    - roller-clamps

- **Terluran®**
  - Risk Class 1 medical devices and pharmaceutical applications such as:
    - Monitor housings
    - housings
    - Diagnostics/measuring devices
    - Sanitary appliances

1) Risk Class 1 and other applications reviewed and acknowledged as low risk.

KEY FEATURES

- **GPPS**: General purpose or crystal polystyrene
  - Transparent, stiff, easy processing
- **HIPS**: High impact polystyrene
  - Opaque, impact resistant, easy processing
- **Terluran®**: Excellent colorability, high flowability, good impact resistance
  - Good heat distortion resistance
- **Outstanding surface quality, excellent gloss, feel and appearance**
- **Amorphous structure provides excellent dimensional stability**
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<td>Melt Volume-Flow Rate MVR 220 °C/10 kg ISO 1133 cm3/10 min</td>
<td></td>
<td>31</td>
<td>18</td>
<td>15</td>
<td>23</td>
<td>16</td>
<td>2</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Melt Flow Rate MFR 200 °C/5 kg</td>
<td>ISO 1133 cm3/10 min</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
<td>4.00</td>
<td>6.00</td>
<td>12.00</td>
<td>15.00</td>
<td>16.00</td>
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<tr>
<td>Ball Indentation Hardness (H 350/30)</td>
<td>MPa</td>
<td>107</td>
<td>145</td>
<td>102</td>
<td>70</td>
<td>75</td>
<td>60</td>
<td>35</td>
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<tr>
<td>Impact Strength (23 °C) ISO 180-1a kJ/m2</td>
<td></td>
<td>16.00</td>
<td>6.00</td>
<td>16.00</td>
<td>4.00</td>
<td>4.00</td>
<td>7.00</td>
<td>7.00</td>
<td>2.00</td>
</tr>
<tr>
<td>HDT B (0.45 MPa) ISO 75-1/2 °C</td>
<td></td>
<td>98</td>
<td>107</td>
<td>99</td>
<td>102</td>
<td>102</td>
<td>94</td>
<td>93</td>
<td>85</td>
</tr>
<tr>
<td>Heat Deflection Temperature; Hardness Shore D</td>
<td></td>
<td>60 - 80</td>
<td>60 - 80</td>
<td>45 - 65</td>
<td>45 - 65</td>
<td>50 - 75</td>
<td>50 - 75</td>
<td>10 - 55</td>
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<tr>
<td>Charpy Notched Impact Strength (23 °C) ISO 180-1u kJ/m2</td>
<td></td>
<td>16</td>
<td>6.00</td>
<td>16.00</td>
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<td>HDT A (1.80 MPa) ISO 75-1/2 °C</td>
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<td>104</td>
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<td>99</td>
<td>99</td>
<td>90</td>
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<td>Thermal Properties</td>
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<td></td>
<td></td>
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<tr>
<td>Iso 527-1/-2 %</td>
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<td>&gt; 15.00</td>
<td>2.50</td>
<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
<td>20.00</td>
<td>50.00</td>
<td>40.00</td>
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<tr>
<td>Strain at Break</td>
<td></td>
<td>2.60</td>
<td>1.70</td>
<td>1.50</td>
<td>2.80</td>
<td>2.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strain at Yield (Stress at Yield)</td>
<td></td>
<td>46</td>
<td>70</td>
<td>48</td>
<td>52</td>
<td>51</td>
<td>48</td>
<td>42</td>
<td>37</td>
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<tr>
<td>Melt Flow Rate MFR 200 °C/5 kg</td>
<td>ISO 1133 cm3/10 min</td>
<td>2400</td>
<td>5600</td>
<td>2300</td>
<td>2620</td>
<td>2660</td>
<td>2000</td>
<td>1900</td>
<td>2300</td>
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<tr>
<td>Molding Region</td>
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<td></td>
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<tr>
<td>HD Package</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Properties

- **Processing Aid:**
  - **Novodur® HD**
  - **M203fc**
  - **Novodur® HD M203fc G3**
  - **Novodur® ABS**
  - **248fc**
  - **Lustran® ABS**
  - **Zylar® ABS**
  - **Teryl® HD 2802**
  - **Teryl® HD 2812**
  - **Zylar® 550**
  - **Zylar® 631**
  - **Zylar® 650**
  - **Zylar® 765**
  - **Zylar® 960**
  - **Clearblend®**
  - **Styrolux® 346**
  - **Styrolux® 4G60**
  - **Styrolux® 656c**
  - **Styrolux® 684D**
  - **Styrolux® 960**
  - **Styroflex® 2G66**
  - **Styroflex® 4G80**
  - **Luran®**
  - **Lustran® SAN**
  - **Styroflex® SAN SPARKLE NAS® 21**
  - **Nas® 90**
  - **K-Resin®**
  - **K-Resin® KR01**
  - **K-Resin® KR03, KR05, DK11**
  - **K-Resin® TERLUX® HD 2822**

### Method

- **Injection Molding (M)**
- **Extrusion (E)**
- **Blow**

### Manufacturing Region

- **Europe (EMEA)**
- **Americas**
- **Asia Pacific**

### Notes

- **n.b.** indicates not available.
INEOS Styrolution is the only global company focused solely on styrenics with a broad product portfolio and proven customized approach to co-development. INEOS Styrolution delivers innovation and professional support with an experienced, personal touch.
Sterilization of medical tools and devices is an absolutely essential process that is required for many medical procedures to prevent infections and contamination. Several sterilization procedures, such as steam sterilization, EtO treatment, NO₂, as well as beta and gamma irradiation, have been established in the industry to guarantee the complete removal of microorganisms, including bacterial and fungal spores from medical devices. While the complete removal and destruction of all living organisms is not always apparent to the naked eye, the aesthetics of a device can help create a sense of safety and cleanliness for both healthcare professionals and patients.

Today one of the most economic procedures for medical device sterilization is the use of e-beam or gamma ray irradiation. Not all materials are equally suited for these high energy treatments as they can result in a yellowing of the product or even the impairment of physical and mechanical properties. While the yellowing tends to be temporary, depending on the material, the extent and duration of color recovery differs significantly and can take up to several weeks (Figure 1).

### YELLOWNESS INDEX AFTER GAMMA IRRADIATION (25 KGY)

![Yellowness Index Chart](chart.png)

<table>
<thead>
<tr>
<th>Material</th>
<th>PC Natural</th>
<th>Luran® HD</th>
<th>Terlux® HD</th>
<th>PC Gamma Grade</th>
<th>NAS®</th>
<th>Zylar®/Clearblend®/Styrolux®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days after irradiation</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>21</td>
<td>90</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

Figure 1: Color recovery of various materials after sterilization with gamma irradiation. Styrolux®, and Zylar®/Clearblend® show a favorable low yellowing and hardly change in color in dark storage. Natural PC shows strong yellowing with hardly any color correction.

### COMBINING STERILIZATION AND AESTHETICS WITH STYRENICS

While additives or blue tints can be incorporated into the material to allow for color correction over time, a poor color compensation results in increased costs and logistical challenges due to prolonged inventory hold times for many manufacturers. Devices that are tinted yellow simply do not offer the aesthetic appeal or create the sense of confidence and cleanliness necessary for the healthcare industry. Also a good physical-, mechanical retention after gamma irradiation (Table 2) or ETO sterilization (Table 3) is a key requirement for the medical industry.

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Polymer</th>
<th>Gamma</th>
<th>E-beam</th>
<th>EtO</th>
<th>NO₂</th>
<th>Steam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terlux® HD</td>
<td>MABS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Zylar®/Clearblend®</td>
<td>MBS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Styrolux®/Styrelflex®/K-Reasin®</td>
<td>SBC</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>NAS®</td>
<td>SMMA</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Luran® HD/Lustran® SAN</td>
<td>SAN</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Novodur® HD/Lustran® ABS</td>
<td>ABS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Table 1: Overview of sterilization techniques for styrenics

### TENSILE STRENGTH BEFORE AND AFTER ETO STERILIZATION

![Tensile Strength Chart](chart2.png)

% Retention 25 kGy
% Retention 50 kGy

Table 2: Tensile retention before and after ETO sterilization
INEOS STYROLUTION AT A GLANCE

INEOS Styrolution is the global leader in styrenics. The company provides products for many everyday applications across a broad range of industries, including healthcare, automotive, electronics, household, construction, toys/sports/leisure, and packaging.

LET’S COLLABORATE

If you would like further details, need assistance in creating your applications, or are curious to explore new possibilities with styrenics, please contact us!

www.ineos-styrolution.com/industry/healthcare.html

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