**THERBAN®**

**PRODUCT PORTFOLIO**

Therban® our high performance elastomer HNBR. Excellent properties e.g. for engine components. Reliable resistance to aggressive fluids, oil and grease – able to function up to 165°C.

www.arlanxeo.com
Our committed team of experts will give you the necessary detailed advice. Our specialists from technical marketing will help you to find the grade that will best meet your needs.

**Therban** offers
- High resistance to oil and grease
- Ability to function at temperatures from -40°C to 165°C
- Superior performance in aggressive fluids such as power steering fluids, automatic transmission fluids, engine oils, diesel and brake fluids
- A unique range of thermally stable grades with both partial and full saturation, ranging from 17% ACN to 44% ACN
- Excellent abrasion resistance
- Excellent ozone resistance for fully saturated grades. For partially saturated grades only if properly compounded.

**The material which assures market success**

Better performance gives the competitive edge. For **Therban**, high performance is standard. And that means wherever and however it is used. The outstanding property profile ensures excellent vulcanizate properties. Our specialists from technical marketing will help you to find the **Therban** grade that will best meet your needs.

**Achievable **Therban** vulcanizate properties**

<table>
<thead>
<tr>
<th>Property</th>
<th><strong>Therban</strong></th>
<th><strong>AEM</strong></th>
<th><strong>ACM</strong></th>
<th><strong>FKM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness (Shore A)</td>
<td>30 – 95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile strength</td>
<td>15 – 38</td>
<td></td>
<td></td>
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<tr>
<td>Elongation at break</td>
<td>100 – 600</td>
<td></td>
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<tr>
<td>Modulus at 100 % elongation (MPa)</td>
<td>3 – 20</td>
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<tr>
<td>Modulus at 300 % elongation (MPa)</td>
<td>5 – 30</td>
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<td></td>
<td></td>
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<tr>
<td>“Resilience” (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>RT</td>
<td>30 – 55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70°C</td>
<td>55 – 65</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Compression set (examples)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 h/RT</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>70 h/150°C</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>70 h/200°C</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Abrasion (measured according to DIN 53516)</td>
<td></td>
<td></td>
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<tr>
<td>RT (mm² loss)</td>
<td>30 – 80</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>150 °C (mm³ loss)</td>
<td>50 – 80</td>
<td></td>
<td></td>
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<tr>
<td>Low-temperature properties</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Glass transition temperature (°C)</td>
<td>-19 to -40</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Brittle point (°C)</td>
<td>-70</td>
<td></td>
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</tbody>
</table>

**Comparison of **Therban** with other elastomers**

**Therban** is an adaptable high-performance elastomer that can replace many other specialty materials because **Therban** combines exceptional performance with cost-efficiency and versatility.

**Classification of elastomers with respect to heat and oil resistance**

- **FKM**
  - **Therban** is superior to FKM (fluorelastomer) in:
    - mechanical properties at operation temperature
    - chemical resistance to alkaline oil additives
    - low-temperature properties
    - adhesion

- **AEM**
  - **Therban** is superior to AEM (ethylene-acrylic elastomer) in:
    - oil and fuel resistance
    - processing properties
    - physical properties at high operating temperature
    - odor

- **ACM**
  - **Therban** is superior to ACM (acrylate elastomers) in:
    - processing behavior
    - Diesel resistance
    - low-temperature properties
    - physical properties
    - adhesion

**ECO/CO**
- **Therban** is superior to ECO/CO (epichlorohydin elastomers) in:
  - heat resistance
  - sensitivity to certain oil additives
  - corrosion resistance
  - sour gas resistance

**CM/CSM**
- **Therban** is superior to CM/CSM (chlorinated/chlorosulfonated polyethylene) in:
  - heat resistance
  - sensitivity to certain oil additives
  - corrosion resistance
  - sour gas resistance

**EVM**
- **Therban** is superior to EVM (ethylene-vinylacetate copolymers)/EAM (ethylene-acrylate copolymers) in:
  - physical properties
  - low-temperature behavior
  - oil swell

**In a class of its own**

**Therban** is an adaptable high-performance elastomer that can replace many other specialty materials because **Therban** combines exceptional performance with cost-efficiency and versatility.
**THERBAN® TYPICAL APPLICATIONS**

**A winning formula in practice**

Therban® is already indispensable in automotive systems, oil exploration, mechanical engineering and aerospace. Our research team is focused on extending this advantage.

**Typical applications**

**Seals**

Therban® superior line of fully saturated grades with high heat resistance is suited to seal applications in automotive systems and heavy equipment. Our fully saturated LT grade Therban® LT 2007 provides an excellent combination of high and low-temperature performance, ozone and oil resistance and is ideal for long-term performance in off-the-road vehicle and automotive seals which come into contact with oil and grease.

**Use Therban® for:**
- wheel bearing seals
- shock absorber seals
- camshaft seals
- power steering assembly seals
- O-rings
- water pump seals
- gearbox shaft seals
- air conditioning system seals
- fuel system seals for diesel and RME coolant seals

**Oil well specialties**

High ACN saturated grades are best for low swell and explosive decompression resistance. This also applies to fuel and refrigerant applications. No other supplier offers a line of fully saturated HNBR grades that equals Therban® for performance.

**Use Therban® for:**
- blow-out preventers
- packers
- drill-pipe protectors
- pump stators
- drill bit seals

**Roller coverings**

Therban® AT grades are especially suited to high hardness roll applications; they combine high modulus and good dynamic properties with low compound viscosity and high abrasion resistance. All partially saturated Therban® grades from ARLANXEO are ideal for these dynamic applications.

**Use Therban® for:**
- metal-working rolls
- paper industry rolls
- printing rolls
- elastomer components for looms
- textile rolls
- rolls for transport of containers in aircraft

**Belt, hoses, mountings**

Therban® LT grades are especially suitable for applications where cold flex cracking is a problem, as in snowmobile belts. Therban® partially hydrogenated grades are the right choice in these dynamic applications.

**Use Therban® for:**
- air conditioning hoses
- timing belts
- engine mountings
- oil-cooler hoses
- torsional vibration dampeners
- boots and bellows
- chain tensioning devices
- fuel hoses
- overflow caps
- power steering hoses
- ship couplings
- high-pressure hydraulic hoses
- applications with a high dynamic load

**Wire and cable**

Medium-high ACN fully saturated grades are ideal for wire and cable applications.

**Use Therban® for:**
- protective components for electrical systems
- protective jackets for electrical cables and wires
- blends with EVM/A(OH)₃ for FRNC cable jackets with excellent flame-retardant properties and excellent low temperature properties

**Examples**

Extremely high demands – extremely customized solutions

Therban® for covering the rollers of power drive units in the cargo-loading system of one of the world’s largest transport planes: top performance in all key criteria including dynamic strength, dimensional and thermal stability, abrasion resistance, resistance to technical fluids and chemicals. The basis for the success is the precisely adjustability of this high-performance elastomer from ARLANXEO to meet specific requirements.

Big in performance, small in size: outer diameter 74 mm, length 91 mm.

**Double load:**

- high vertical + high traction forces

* Tensile stress of 300 kg

**Camshaft absorbers with Therban® HNBR: longer lifetimes for timing belts and perfect engine management.**

**Diesel, oil, brake fluid or other aggressive substances – Therban® hoses for exceptional performance and cost-efficiency.**

Why not contact us to find out more?

We would be delighted to help you discover new applications and develop new projects.
**THERBAN® AT**
**ACCELERATE PROCESSING**

**Therban® AT for improved processability**
With the Therban® AT grades, research scientists at ARLANXEO have achieved a breakthrough in process technology resulting in outstanding benefits for both processing and product properties.

Through a unique process, a series of linear low-Mooney Therban® grades has been developed that avoids problems typically encountered during the mixing and compound processing process.

**Better flow, faster mold filling and shorter cycle times with Therban® AT**
In comparison to regular HNBR grades, the low Mooney viscosity of Therban® AT leads to better mixing at lower temperatures and therefore to overall cost reduction.

Rheovulcameter testing shows the beneficial effect of the significantly improved flow for injection molding. The use of Therban® AT may reduce mold filling cycle times by up to 50%. Alternatively, lower injection pressure or lower temperature can be applied. Extrusion rates can be increased by up to 40%. Benefits can also be observed for compression molding and transfer molding.

**Improved sealing force retention with Therban® AT**
Due to the low Mooney viscosity of Therban® AT, the use of plasticizers can be reduced or – particularly for crucial compounds – even completely omitted. Thus significantly improved sealing force retention upon aging can be achieved.

Discover the advantages of Therban® AT as the raw material of choice, either applied alone or in a blend with another standard or specialty Therban® grade!

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**Injection molding**

- **Therban® AT 3404**
- **Standard HNBR**

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**Extrusion rate**

- **Therban® AT**
- **Standard HNBR**

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**Compound properties**

<table>
<thead>
<tr>
<th></th>
<th>Therban® AT 3404 40 phr / 50 phr N330</th>
<th>Standard HNBR 40 phr N330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulus (100%) (MPa)</td>
<td>5.6 / 7.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Ultimate tensile strength (MPa)</td>
<td>26.6 / 27.8</td>
<td>27.4</td>
</tr>
<tr>
<td>Ultimate elongation (%)</td>
<td>273 / 256</td>
<td>237</td>
</tr>
<tr>
<td>Shore A hardness (pts)</td>
<td>64 / 69</td>
<td>66</td>
</tr>
<tr>
<td>Compound Mooney</td>
<td>57 / 69</td>
<td>101</td>
</tr>
</tbody>
</table>

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**Faster production, smoother surfaces and sharper edges with Therban® AT**
The charts on the right show the significant benefits of Therban® AT for injection molding and extrusion. Besides time and energy savings in processing, Therban® AT improves the quality of the finished article. Improved flow results in smoother surfaces and sharper edges.

**Adjustments of recipe and crosslinking agent to enhance vulcanizate properties for Therban® AT applications**
The comparison of various compound properties shows only minor differences, which can be handled simply and safely. A possible slightly lower crosslink density can be compensated by a minor adjustment of the crosslinking agent.
The acrylonitrile (ACN) content is a crucial factor determining the properties of Therban® compounds. High levels of ACN result amongst others in excellent oil and media resistance. However, at the same time low temperature flexibility is reduced due to the increase of the glass transition temperature caused by the higher ACN content.

For several low temperature applications the flexibility and excellent compression set at temperatures below -30 °C are more important than volume swell in oil. The Therban® LT grade range has been developed for these applications.

The Therban® LT portfolio has been expanded from 25% ACN over 20% ACN to 17% ACN to meet all requirements. The optimal product for volume swell and low temperature properties can be chosen from this broad range.

The answer to your needs when low temperature flexibility is key for the product performance

- A broad range of Therban® grades for usage at temperatures below -30 °C
- Balanced properties between oil resistance and low temperature flexibility
- Full or partial saturation at 5.5%
- Mooney viscosity ML1+4 100 °C from 39 to 80 MU
- Optimal material available for every requirement

Higher swell of Therban® LT 1707 VP and LT 1757 VP in IRM 903 reflects lower ACN content
**Fully and partially saturated grades**

<table>
<thead>
<tr>
<th></th>
<th>ACN cont. (%)</th>
<th>Mooney viscosity*(1) 100°C</th>
<th>Residual double bond content (%)</th>
<th>Density (g/cm³)</th>
<th>Standard packaging</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fully saturated</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therban® 3406</td>
<td>34</td>
<td>63</td>
<td>max. 0.9</td>
<td>0.95</td>
<td>similar to Therban® 3407, but with improved flow behavior for lifetime belts, O-rings, gaskets and seals requiring maximum heat resistance and dynamic performance</td>
<td></td>
</tr>
<tr>
<td>Therban® 3407</td>
<td>34</td>
<td>70</td>
<td>max. 0.9</td>
<td>0.95</td>
<td>lower swelling compared to Therban® 3407</td>
<td></td>
</tr>
<tr>
<td>Therban® 3607</td>
<td>36</td>
<td>66</td>
<td>max. 0.9</td>
<td>0.96</td>
<td>further improved oil swelling resistance compared to Therban® 3607, excellent for fuel-resistant hoses, belts, seals, O-rings and gaskets</td>
<td></td>
</tr>
<tr>
<td>Therban® 3907</td>
<td>39</td>
<td>70</td>
<td>max. 0.9</td>
<td>0.96</td>
<td>very high temperature resistance combined with minimal swelling in oils and fuels; ideal for severe application conditions in hoses, diaphragms, O-rings and seals for automotive and oil field applications</td>
<td></td>
</tr>
<tr>
<td>Therban® 4307</td>
<td>43</td>
<td>63</td>
<td>max. 0.9</td>
<td>0.96</td>
<td>similar to Therban® 4307 for special compounds with high filler and plasticizer loads</td>
<td></td>
</tr>
<tr>
<td>Therban® 4309</td>
<td>43</td>
<td>100</td>
<td>max. 0.9</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Partially saturated</strong></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Therban® 3446</td>
<td>34</td>
<td>61</td>
<td>4.0</td>
<td>0.95</td>
<td>optimal combination of heat resistance, dynamic properties and processing</td>
<td></td>
</tr>
<tr>
<td>Therban® 3467</td>
<td>34</td>
<td>68</td>
<td>5.5</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therban® 3496</td>
<td>34</td>
<td>55</td>
<td>18.0</td>
<td>0.96</td>
<td>recommended standard grade for sulfur cure; excellent dynamic properties</td>
<td></td>
</tr>
<tr>
<td>Therban® 3627</td>
<td>36</td>
<td>66</td>
<td>2.0</td>
<td>0.96</td>
<td>optimal compromise between low-temperature compression set and oil swell resistance; especially suited for rolls and dynamic oil field components</td>
<td></td>
</tr>
<tr>
<td>Therban® 3629</td>
<td>36</td>
<td>87</td>
<td>2.0</td>
<td>0.96</td>
<td>special low RDB type, comparable to Therban® 3607</td>
<td></td>
</tr>
<tr>
<td>Therban® 3668 VP+</td>
<td>36</td>
<td>80</td>
<td>6.0</td>
<td>0.95</td>
<td>special low RDB type, similar to Therban® 3627 for higher filler load capacity; (peroxide cure recommended)</td>
<td></td>
</tr>
<tr>
<td>Therban® 4367</td>
<td>43</td>
<td>61</td>
<td>5.5</td>
<td>0.98</td>
<td>high RDB, high Mooney grade similar to Therban® 3607 for higher filler and plasticizer load capacity; similar to Therban® 3607 in case improved dynamic and bonding properties are required</td>
<td></td>
</tr>
<tr>
<td>Therban® 4498 VP+</td>
<td>44</td>
<td>78</td>
<td>9.0</td>
<td>0.98</td>
<td>High ACN and high RDB grade, primarily designed for dynamic application requiring excellent resistance to heat and non-polar hydrocarbon fluids</td>
<td></td>
</tr>
</tbody>
</table>

(1) unweathered (DIN 53522; ASTM D 1646)  
(2) see Therban® AT for maximum flow  
* Trial product (VP=Versuchsprodukt)

**Specialty grades**

<table>
<thead>
<tr>
<th></th>
<th>ACN cont. (%)</th>
<th>Mooney viscosity*(1) 100°C</th>
<th>Residual double bond content (%)</th>
<th>Density (g/cm³)</th>
<th>Standard packaging</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Temperature Technology – LT</strong></td>
<td></td>
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<tr>
<td>Therban® LT 1707 VP+</td>
<td>17</td>
<td>74</td>
<td>max. 0.9</td>
<td>0.96</td>
<td>Low ACN grade for optimal flexibility and excellent compression set at very low temperature, designed for extreme service conditions (peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® LT 1757 VP+</td>
<td>17</td>
<td>70</td>
<td>5.5</td>
<td>0.96</td>
<td>designed for excellent compression set at low temperatures (sulfur and peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® LT 2157</td>
<td>21</td>
<td>70</td>
<td>5.5</td>
<td>0.96</td>
<td>optimal low-temperature flexibility balanced with good oil resistance for use in low-temperature belts, seals, O-rings and gaskets</td>
<td></td>
</tr>
<tr>
<td>Therban® LT 2007</td>
<td>21</td>
<td>74</td>
<td>max. 0.9</td>
<td>0.96</td>
<td>similar to Therban® LT 2157 with optimal combination of heat and low-temperature resistance, designed for extreme service conditions (peroxide curable), outstanding low mold fouling</td>
<td></td>
</tr>
<tr>
<td>Therban® LT 2057</td>
<td>21</td>
<td>67</td>
<td>5.5</td>
<td>0.96</td>
<td>similar to Therban® LT 2157 with outstanding low mold fouling properties (sulfur and peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® LT 2568 VP+</td>
<td>25</td>
<td>80</td>
<td>5.0</td>
<td>0.97</td>
<td>similar to Therban® LT 2157 low mold fouling grade with improved oil resistance</td>
<td></td>
</tr>
<tr>
<td><strong>Low Mooney – Advanced Technology – AT</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Therban® AT 3404</td>
<td>34</td>
<td>39</td>
<td>max. 0.9</td>
<td>0.95</td>
<td>similar to Therban® 3408 with extra low Mooney viscosity for outstanding processing properties for use in O-rings, seals, spread compounds or as viscosity modifier for high viscosity compounds (peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® AT 3443 VP+</td>
<td>34</td>
<td>39</td>
<td>4.0</td>
<td>0.95</td>
<td>similar to Therban® 3448 combined with processing advantages of Advanced Technology (sulfur and peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® AT 3904 VP+</td>
<td>39</td>
<td>39</td>
<td>0.9</td>
<td>0.96</td>
<td>similar to Therban® 3907 combined with processing advantages of Advanced Technology (peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® AT 4364 VP+</td>
<td>43</td>
<td>39</td>
<td>5.5</td>
<td>0.98</td>
<td>similar to Therban® 4367 combined with processing advantages of Advanced Technology (sulfur and peroxide curable)</td>
<td></td>
</tr>
<tr>
<td>Therban® AT LT 2004 VP+ (Low Temperature/ Low Mold Fouling)</td>
<td>21</td>
<td>39</td>
<td>max. 0.9</td>
<td>0.95</td>
<td>similar to Therban® LT 2007 combined with processing advantages of new Advanced Technology (peroxide curable)</td>
<td></td>
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<tr>
<td><strong>Carboxylated Technology – XT</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Therban® XT VP+</td>
<td>33</td>
<td>77</td>
<td>3.5</td>
<td>0.97</td>
<td>maximum wear resistance and adhesive properties; in combination with Therban® ART strong synergies observed; use for belts, rolls, oil field applications and as adhesive promoter for fabrics and cords (sulfur and peroxide curable)</td>
<td></td>
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<tr>
<td><strong>Acrylate Reinforced Technology – ART</strong></td>
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</tr>
<tr>
<td>Therban® ART 3462</td>
<td>34/3/17</td>
<td>22/15/10/14</td>
<td>5.5/3/1</td>
<td>1.14</td>
<td>enhanced stiffness, abrasion and load bearing properties, excellent adhesion to metal; use where extreme dynamic performance is warranted e.g. lifetime belts, paper and steel rolls (peroxide curable)</td>
<td></td>
</tr>
</tbody>
</table>

(1) unweathered (DIN 53522; ASTM D 1646)  
(2) of base polymer  
(3) compound Mooney  
* Trial product (VP=Versuchsprodukt)
Trial product:
(VP = Versuchsprodukt = trial product). The information contained herein is merely preliminary. Testing as to properties and applications is not final. Further information, including data which could change or add hazards with use, may be developed by the manufacturer, the user or a third-party institute. Such information may be needed to properly evaluate or use this product. Use is undertaken at the sole risk of the user.

Quality & Environmental Management:
Therban® is produced under strict control regarding safety, environmental protection and quality. The whole supply chain, from production to customer service, is covered by ISO 9001 and ISO 14001 certification.

Product Safety:
Relevant safety data and references as well as the necessary hazard warning labels can be found in the Material Safety Data Sheet.

Health and Safety Information:
Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the ARLANXEO products mentioned in this publication. For materials mentioned which are not ARLANXEO products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be followed. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper use and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets and product labels. Consult us through your ARLANXEO representative or the Health, Safety, Environment and Quality Department (HSEQ) of ARLANXEO.

Regulatory Compliance Information:
Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, BfR, NSF, USDA and CPSC. If you have any questions on the regulatory status of these products, contact your ARLANXEO representative. The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale, which can be found at the ARLANXEO homepage. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and information.

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