

HUNTSMAN

Enriching lives through innovation



Thermoplastic Polyurethanes (TPU)

Shaping your world





Huntsman: A strong TPU partner

Huntsman TPU: Shaping your world

Thermoplastic polyurethanes (TPUs) offer infinite possibilities to meet the manufacturing challenges of a fast-changing world. Tough, reliable and extremely versatile, our TPUs can meet injection molding, extrusion, adhesive, coating and film requirements to improve the production and performance of everything from shoes, technical parts, cables and films to conveyor belts and seals.

Commitment to customers

Combining a deep understanding of TPU chemistry with more than forty years' practical industry experience, we help our customers grow their market share and respond to new opportunities.

Worldwide our customers trust us to deliver:

- Innovative TPU solutions that can be customized to individual needs
- Compatibility with key processing technologies
- First-class technical research, development and testing facilities
- Excellent support backed by a global supply network.

Commitment to quality

Customers can be confident that our TPU solutions are underpinned by:

- Continuous investment in research and development
- Quality assurance and quality control accreditations
- State-of-the-art manufacturing methods and process controls
- World-scale production capacity and just-in-time delivery
- Rigorous environmental, health and safety (EH&S) protection.

Take your ideas from concept to commercialization with Huntsman TPU



General purpose TPUs for injection molding

In the world of technical parts production, our injection molding TPUs are renowned for their extreme adaptability. Scaled as far as creativity and ambitions allow they can be used to create microscopic mechanical parts or – at the opposite end of the manufacturing spectrum – large, bulky components.

AVALON® is the trade name for our standard range of injection molding polyurethane products. Particularly well suited to general purpose applications, these innovative engineering materials are well regarded worldwide for their quality and consistency.



AVALON® TPUs: The benefits

- Consistency in processing
- Good material uniformity
- High quality and durability
- Excellent slip resistance
- Perfect surface definition
- Transparency and translucency
- Compatibility with masterbatches





Technical parts: applications

Our AVALON® TPU products range from 60 Shore A to 60 Shore D hardness. With such a comprehensive span of resistance options available, we're confident that we have a grade of AVALON® TPU available to suit every general purpose technical parts project.

Key performance features

AVALON® injection molding products are trusted worldwide to deliver:

- Outstanding flex performance
- Excellent slip resistance
- Perfect surface definition
- Transparency and translucency
- Oil resistance
- Fast cycle times
- Outstanding abrasion and scratch resistance
- Perfect color match with masterbatches
- Rubber-like look and feel
- Excellent bonding.

Potential applications

The IROGRAN® high performance injection molding portfolio is mainly foreseen for:

- **Footwear**
Sports plates and heels for leisure and fashion shoes
Dual density soling for safety shoes
- **Wheels and rollers**
Conventional escalator wheels and rollers
- **Agriculture**
Agricultural parts such as potato sorter,
ear tags and sowing disc
- **Furniture**
Chair rollers, arm rests and table edging
- **Automotive**
Protection of parts during transportation.



AVALON[®] TPU product highlights

AVALON[®] AHT range – Transparent TPUs for consumer applications

AVALON[®] AHT TPUs are colorless, UV resistant and offer high transparency – even where parts need to be thick. With hardness levels ranging from 90 to 95 Shore A, AVALON[®] AHT is ideal for consumer applications such as footwear soles and protective covers for mobile phones and tablets.

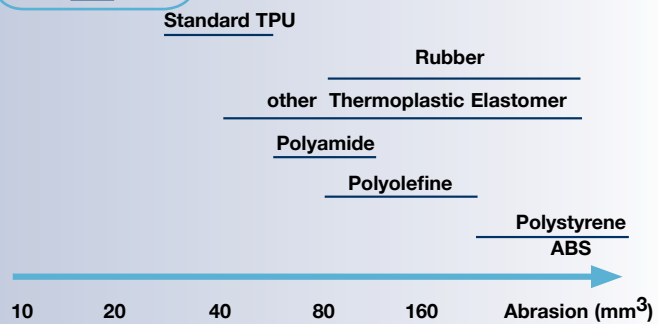


Product	Shore A	Shore D	Tensile strength (MPa)	Elongation @ break (%)	Tear strength (N/mm)	Abrasion (mm ³)	Density (g/cm ³)
AVALON [®] 90 AHT	90	44	50	580	97	30	1,21
AVALON [®] 95 AHT	95	48	47	390	118	28	1,21

AVALON[®] ABR range – High abrasion resistant TPUs

Products in the AVALON[®] ABR TPU range are suitable for applications who require the lowest possible abrasion loss such as escalator wheels and the soles of sports footwear. Hardness levels range from 85 to 95 Shore A.

AVALON[®] ABR



Product	Shore A	Shore D	Tensile strength (MPa)	Elongation @ break (%)	Tear strength (N/mm)	Abrasion (mm ³)	Density (g/cm ³)
AVALON [®] 85 ABR	85	37	25	400	80	20	1,20
AVALON [®] 90 ABR	90	44	28	400	80	20	1,21
AVALON [®] 95 ABR	95	49	30	350	90	20	1,22

AVALON[®] ESD range – Antistatic TPUs for footwear applications

Our AVALON[®] ESD range are soft TPUs that deliver the improved bonding strength and mechanical properties required to produce high-quality footwear on roundtable machines – specifically safety shoes that must demonstrate anti-static (ESD) properties.

The AVALON[®] ESD products combine softness with flexural strength. The result is shoes and boots that are comfortable yet hard wearing enough to withstand challenging conditions.



Product	Shore A	Shore D	Tensile strength (MPa)	Elongation @ break (%)	Tear strength (N/mm)	Abrasion (mm ³)	Density (g/cm ³)
AVALON [®] 60 AE-ESD	60		16	1000	40	80	1,20
AVALON [®] 65 AK-ESD	65		30	800	40	100	1,18



AVALON[®] TPUs

Product overview for technical parts

Physical properties	Norm	Unit	Grade															
			60 AE-ESD	65 AB	65 AK-ESD	80 AB	85 AB	85 ABR	90 AB	90 ABR	90 AHT	95 AB	95 ABR	95 AHT	98 AB	60 DB	65 DB	
Hardness	ISO 7619	Shore A	60	67	65	80	85	85	90	90	90	95	95	95	98	-	-	
Hardness	ISO 7619	Shore D	-	-	-	30	37	37	44	44	44	50	49	48	53	60	65	
Tensile strength	DIN 53504	MPa	16	30	30	50	50	25	45	28	50	45	30	47	45	60	60	
Elongation @ break	DIN 53504	%	1000	700	800	600	600	400	550	400	580	500	350	390	500	470	450	
Tensile stress @ 100% elongation	DIN 53504	MPa	2.4	2.5	2.5	5.8	5.8	5.7	8.8	7.7	8.0	13.0	10.3	12.0	16.0	19.0	25.0	
Tensile stress @ 300% elongation	DIN 53504	MPa	3.8	5.0	5.0	10.9	11.9	14.4	18.4	18.9	19.0	24.0	23.9	31.0	28.0	31.0	42.5	
Tear strength	ISO 34-1	N/mm	40	40	40	85	85	80	100	80	97	120	90	118	140	175	200	
Abrasion	ISO 4649	mm ³	80	60	100	25	25	20	25	20	30	30	20	28	30	30	30	
Density	ISO 1183-1	g/cm ³	1.20	1.18	1.18	1.19	1.20	1.20	1.21	1.21	1.21	1.22	1.22	1.21	1.23	1.23	1.23	
Compression set, 70h 23°C	ISO 815	%		20	20	20	20	20	25	20		30	20		30	35	35	
Compression set, 24h 70°C	ISO 815	%				35	38		45			50			50	60	65	
Mold shrinkage	ISO 294-4	%				0.85	0.6		0.6			0.7			0.7	0.8	0.9	
Ester**			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Electrical resistance	ICE 93	MOhm	<100		<35													
Opaque								●		●			●					
Transparency			amber	amber	transparent	semi transparent	semi transparent		semi transparent		highly transparency	semi transparent		highly transparency	semi transparent	semi transparent	semi transparent	
Others			Plasticizer free	Phthalate free	Phthalate free													

Other grades available, please consult your Huntsman representative for further material requirements

AVALON[®] 90 A BR

Hardness:

Shore A
Shore D

Chemistry:

B : improved performance in hydrolysis resistance
E : general purpose grade
K : transparent
BR: improved performance in abrasion resistance
HT: high transparency in thick parts, UV resistance

Global offering with local support

Technical support

At Huntsman we build partnerships with our customers based on knowledge, trust and experience. This commitment means that comprehensive levels of technical support are always assured. As standard we offer:

- Access to a network of international specialists at locations around the world
- Global reach combined with local knowledge
- Innovative solutions to help solve complex challenges
- The highest levels of customer service.

Development center

To keep pace with modern formulating and manufacturing techniques, we make regular investments at our global technical center – purchasing the very latest processing equipment. This approach ensures our work remains current and relevant. Using industry standard machines to test new products and create prototypes or customer samples, we can respond rapidly to emerging trends with practical solutions that are ready to go straight into production – a major benefit for customers.

Alongside our customers we work closely with industry associations, universities and research centers around the world to keep ahead of the latest innovations and market developments.



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Huntsman Polyurethanes is committed to working closely with its customers and can offer a fast and flexible response to your needs. We offer direct links to our laboratories with full technical backup. Commercial support and dedicated customer service is available throughout Europe, the Middle East, Asia-Pacific and the Americas.

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About Huntsman:

Huntsman Corporation is a publicly traded global manufacturer and marketer of differentiated chemicals with 2012 revenues of over \$11 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 and R&D facilities in over 30 countries and employ approximately 12,000 associates within our 5 distinct business divisions. For more information about Huntsman, please visit the company's website at www.huntsman.com

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AVALON® Shaping your world

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