

HUNTSMAN

Enriching lives through innovation



Thermoplastic Polyurethanes

Shaping your world

Technical parts product overview



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 40 years' practical industry experience, we help our customers grow their market share and respond to new opportunities.

Worldwide our customers trust us to deliver:

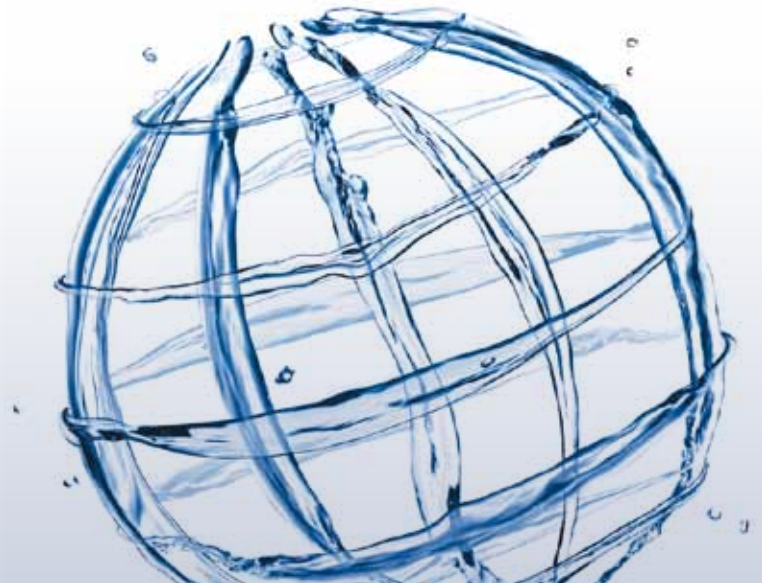
- Innovative TPU solutions that can be customized to individual needs
- Compatibility with key processing technologies
- First-class technical research, development and testing facilities
- Excellent support backed by a global supply network.

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



TPUs for specialist injection molding applications

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.

General benefits of TPUs:

- Excellent abrasion resistance
- High mechanical properties
- Flexibility at low temperature
- Wear and tear resistance
- Oil and grease resistance (ester)
- Hydrolysis resistance (ether)
- Perfect surface definition
- Excellent bonding strength to other plastics
- Recyclable
- Easy coloring

Applications in technical parts

• Automotive

Bumpers and buffers, bushings, arm rests, dashboards, cupholders, instrument panels, door handles

• Agricultural

Technical parts for tractors, ear tags, sowing disks

Sports and leisure

Golf ball covers, golf club inserts, spikes, outsoles, shoe inserts, goggle frames, skate wheels, protective equipment

• Furniture

Arm rests, table edging, seating structures, chair casters

• Engineering

Wheels, casters, rollers, seals, gaskets, handles of professional tools

• Electronics

Smartphone cases, earbuds, wearable active trackers

• Healthcare

Connectors and cases for devices



IROGRAN® TPU:

IROGRAN® is the trade name for our versatile range of injection molding polyurethane products. Particularly well suited to demanding applications, these high performance engineering materials are trusted worldwide to add value and deliver specific functional characteristics, wherever they are used.

Key performance features

Using our IROGRAN® TPU range, manufacturers of technical parts can achieve the highest levels of:

- Wear and tear strength
- Dimensional stability
- Oil resistance
- Low compression set
- Dynamic load performance
- Elasticity and flexibility
- Temperature performance
- Processing consistency.



Product portfolio characteristics

- | | |
|-----------------|--|
| E Series | Polyester-based TPUs with high crystallinity for faster setup and perfect demolding of thick parts |
| H Series | Specially selected raw materials for optimal performance and better moldability |
| P Series | Polyether-based TPUs for applications where microbial and hydrolysis resistance are required |
| K Series | Superior dynamic performance and low compression set in higher temperatures for sealing applications |



Product overview for technical parts

	Hardness	Hardness	Tensile strength @ break	Elongation @ break	Tensile stress @ 100% elongation	Tensile stress @ 300% elongation	Tear strength	Abrasion	Compression set 70 h @ 23°C	Compression sSet 24 h @ 70°C	Mould shrinkage*	Density	Bayshore rebound	TMA melt range
	ASTM D-2240	ASTM D-2240	ASTM D-412	ASTM D-412	ASTM D-412	ASTM D-412	ASTM D-624	DIN 53516	ASTM D-395	ASTM D-395	ASTM D-995	ASTM D-792	ASTM D-2632	Huntsman
	Shore A	Shore D	psi	%	psi	psi	pli	mm ³	%	%	in/in	kg/m ³	%	°C

E SERIES

IROGRAN® A 60 E 4612 N	65	18	3700	900	510	800	360	55	17	54	0.030	1.17	54	140-170
IROGRAN® A 70 E 4675	75	25	2200	650	570	950	300	80	35	58	0.016	1.15	25	150-190
IROGRAN® A 78 E 4588	80	30	6090	730	740	1270	500	25	30	40	0.016	1.20	48	160-175
IROGRAN® A 85 E 4607	85	34	5221	750	710	1600	570	25	35	43	0.010	1.19	34	160-175
IROGRAN® A 92 E 4246	92	44	7000	610	1050	2000	720	25	23	40	0.009	1.21	32	190-205
IROGRAN® A 95 E 4813	95	44	5400	410	1600	3500	750	30	31	40	0.008	1.21	35	170-200
IROGRAN® A 98 E 4066	97	49	6530	570	2010	2970	910	30	30	45	0.007	1.22	30	185-200
IROGRAN® D 60 E 4024	--	60	5800	610	2940	3670	1250	30	44	56	0.011	1.24	34	205-215

H SERIES

IROGRAN® A 70 H 4673 M	71	21	4450	790	600	1220	460	35	34	48	0.009	1.15	50	147-170
IROGRAN® A 80 H 4698	81	31	5080	690	1020	2330	590	30	19	40	0.006	1.19	42	155-165
IROGRAN® A 87 H 4615	85	35	5300	720	860	1680	600	25	25	43	0.011	1.20	40	135-185
IROGRAN® A 92 H 4656	93	40	5560	710	1420	2570	770	30	25	43	0.006	1.21	32	170-185
IROGRAN® A 95 H 4678	95	45	5800	690	1720	2810	860	30	24	43	0.007	1.23	30	180-190
IROGRAN® A 98 H 4661	96	53	6670	610	2390	2960	970	35	25	46	0.007	1.23	28	190-200

P SERIES

IROGRAN® A 65 P 4324 N	71	22	3050	900	650	1000	400	60	25	48	0.012	1.12	58	110-164
IROGRAN® A 80 P 5039	80	29	3500	760	700	1300	480	30	23	43	0.009	1.10	47	145-155
IROGRAN® A 85 P 4394	85	36	5075	610	1015	1740	574	25	20	40	0.008	1.12	36	150-170
IROGRAN® A 92 P 4207	92	40	5300	640	1400	2280	680	25	28	44	0.008	1.14	34	165-188
IROGRAN® A 92 P 4637	92	39	4870	670	1300	2050	660	30	25	41	0.009	1.13	34	160-170
IROGRAN® A 95 P 5044	95	52	8000	470	1600	4000	600	30	29	82	0.007	1.14	35	175-188
IROGRAN® A 95 P 4657	95	45	4250	560	2440	2890	750	40	31	65	0.006	1.13	37	185-215
IROGRAN® A 98 P 4535	96	51	5740	550	2260	3360	840	30	32	50	0.008	1.16	30	185-200
IROGRAN® D 64 P 4777	--	62	6180	400	3630	4840	1300	30	37	57	0.003	1.18	37	180-210
IROGRAN® D 74 P 4778	--	70	5420	310	4300	4960	1370	37	66	72	0.008	1.19	36	200-220

K SERIES

IROGRAN® A 92 K 4107	91	41	7100	580	1350	2340	660	25	12	25	0.007	1.18	40	190-200
IROGRAN® A 92 K 5031	92	46	5660	580	1660	2610	740	20	14	26	0.010	1.13	41	180-195
IROGRAN® A 95 K 5026	94	46	7500	450	2000	4000	780	30	25	38	0.010	1.20	30	178-195
IROGRAN® A 95 K 4977	94	46	5800	510	2000	3250	760	30	15	25	0.013	1.20	30	210-220
IROGRAN® A 95 BK 4922	94	45	6380	460	2030	4500	800	30	15	26	0.012	1.2	30	195-200

* Mold shrinkage is dependent on wall thickness and processing parameters.



AVALON® TPU's:

AVALON® is the trade name for our core 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.

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.



Product portfolio characteristics

B Series Polyester-based TPUs with improved hydrolysis resistance and good overmolding behavior

HT Series Specially formulated to achieve high transparency with excellent UV resistance while keeping high mechanical properties



AVALON® TPUs



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Shore A	Shore D	psi	%	psi	psi	pli	mm ³	%	%	in/in	kg/m ³	%	°C

B SERIES

AVALON® 65 AB	65	--	4300	700	360	730	350	60	25	45	0.018	1.18	--	--
AVALON® 80 AB	80	30	5700	640	800	1800	550	35	25	40	0.009	1.19	38	165-173
AVALON® 85 AB	85	37	6200	610	900	2200	630	35	25	40	0.006	1.2	38	174-180
AVALON® 90 AB	90	44	5600	560	2200	2700	670	35	25	45	0.007	1.2	40	170-190
AVALON® 95 AB	95	50	4900	570	1500	3100	850	35	25	45	0.011	1.18	37	180-205
AVALON® 98 AB	98	56	5800	400	2400	4200	940	35	30	50	0.012	1.23	40	190-200
AVALON® 60 DB	--	60	5800	475	3000	4700	1200	35	30	55	0.012	1.24	46	200-215
AVALON® 65 DB	--	65	5600	350	3500	5000	1300	35	35	69	0.010	1.23	40	200-205

HT SERIES

AVALON® 90 AHT	90	44	4300	530	1100	2000	850	30	30	45	0.010	1.21	35	--
AVALON® 95 AHT	95	48	4500	400	1800	3600	1040	35	30	45	0.011	1.21	34	--

* Mold shrinkage is dependent on wall thickness and processing parameters.





Technical parts product overview

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.

www.huntsman.com/tpu

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 meet the needs of consumers and manufacturers serving a broad range of end markets. We operate more than 75 manufacturing and R&D facilities in 30 countries and employ approximately 12,000 associates within our five distinct business divisions. For more information about Huntsman, please visit the company's website at: www.huntsman.com

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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. With locations around the world, our international network of specialists combine global reach with local knowledge – a powerful offering that can help solve complex challenges and ensure the highest levels of customer service.

Development center

To keep pace with modern formulating and manufacturing techniques, we make regular investments at our global and regional technical centers – 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.

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