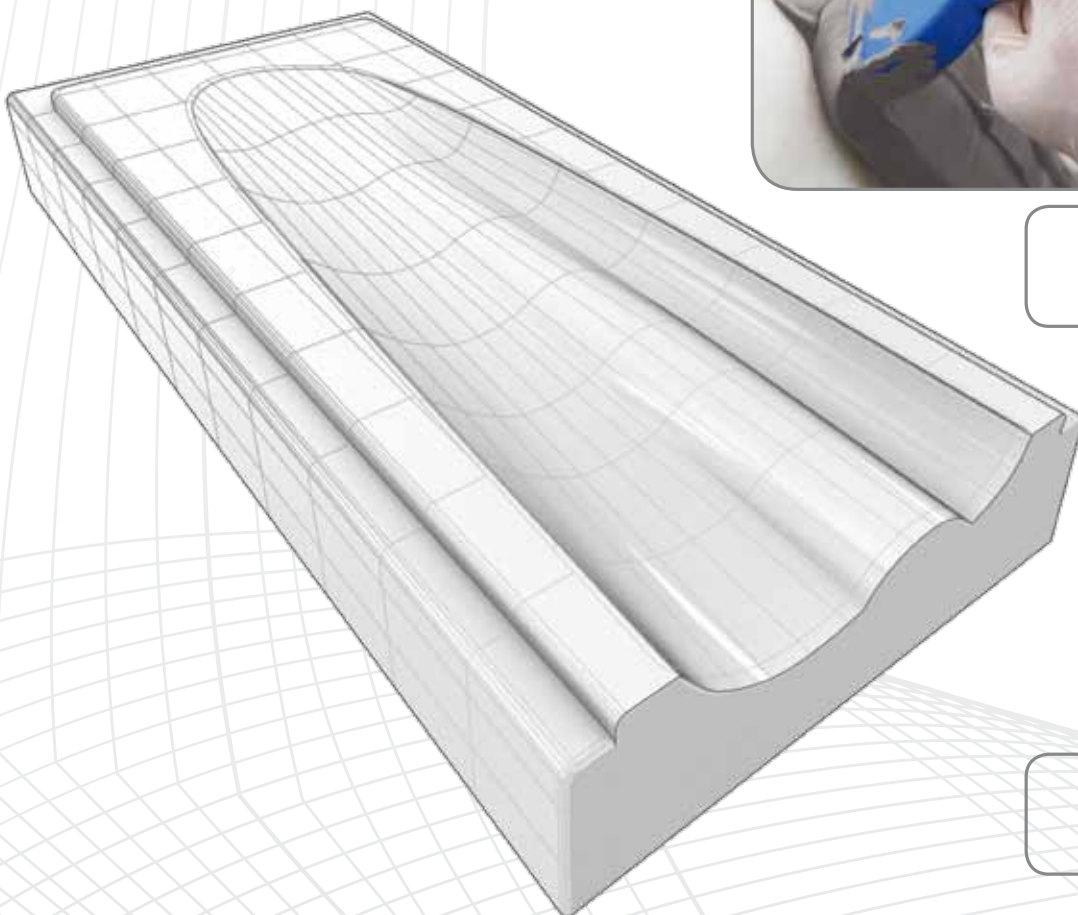
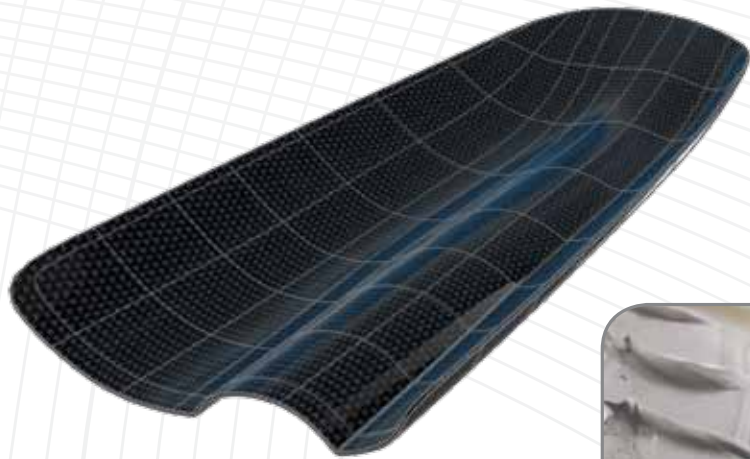


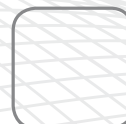
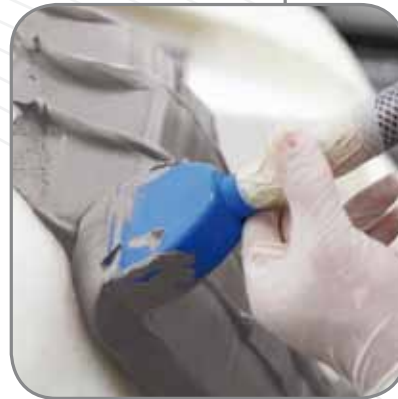


Advanced Materials

From design to parts manufacturing

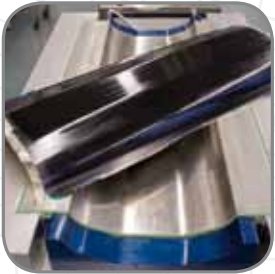


Tooling
solutions
selector guide





Rely on
us with
confidence



Ren
The brand
serving worldwide
tooling industry.

A global partner

As a global partner and innovator working in close collaboration with all major industries using tooling solutions : we offer our customers a unique and broad range of systems for the production of master models / plugs, PU casting and prototyping systems, two-component epoxy systems for the production of molds and tools combined with a strong technical support.

This comprehensive range is used throughout the world's manufacturing industries but particularly in the automotive, aerospace, marine, wind energy, as well as foundry.

We deliver more than just products

Our process know-how and over 60 years expertise help us to develop standard products as well as custom-made solutions formulated to answer project requirements.

Huntsman Advanced Materials has a worldwide team of experts

- > to identify with you and develop when needed the best solution meeting your needs
- > to reduce manufacturing and production costs through process time reduction
- > to help you to improve the quality, the durability and the performance of your products through flexibility, design freedom, user-friendliness, strength, toughness
- > to quickly bring your product to market through material and process optimization.



Solutions for standard tooling

Flexibility, toughness and durability

Our broad range of tooling solutions offers consistent product performance characteristics. Your molds, tools, prototypes and small series productions will exhibit outstanding life time and performance being therefore of utmost cost efficiency.

Seamless modeling pastes (SMP)

Gelcoats and coupling coats

Laminating systems and pastes

Casting systems

Prototyping and small series production systems

- 1 Seamless modeling paste (SMP)
- 2 Casting system
- 3 Composite tooling



Solutions for composite tooling

Cost efficiency, performance and durability

Our specific tooling solutions for composite helps the design engineers to combine materials and tool making techniques for cost-effective performance, increased design flexibility and easy handling.

Seamless modeling pastes (SMP)

- > Surface quality
- > Dimensional stability
- > Low dust
- > Density : 0.5 to 1.0
- > No bond lines

 **RenPaste® 4601-1**

 **RenPaste® 4503-1**

 **RenPaste® 4666**

 **RenPaste® 4688**

Laminating resins and gelcoats

- > Lightness and stiffness
- > Easy and fast processing
- > RT precure and demolding
- > Medium to high temperature resistance
- > Durable molds

 **RenLam® LY 113**

 **RenLam® LY 120**

 **RenLam® LY 5210**

 **Araldite® LY 8615**

 **RenGel® SW 18**

 **RenGel® XD 4615**

 **RenGel® SW 5200**

 This sign will help you to easily recognize our tooling solutions for composite.

Case study

Composite mold for Airbus A350 - Lower panel section 11-12 of the fuselage

Produced by LOIRETECH (France)

Process Infusion

Product Araldite® LY 8615 / Aradur® 8615

Benefits **Easily processable and suitable for large molds production**

- > Long work life and infusion at low temperature (23-40°C)
- > Demolding after low temperature precure (35-40°C)

High performance

- > Tg > 180°C after post curing
- > Withstand more than 300 production cycles
(Airbus 10⁻⁴ mbar.l/s mold leak requirement / CETIM)





With courtesy of Loiretech


Systems for the production of master models / plugs

Seamless modeling pastes (machine applied)

Product designation	Typical application	Color	Mix ratio	Minimum cure schedule
Conditions				23°C
Norm				
Unit			pbv	
 Resin XD 4601-1 / Hardener XD 4601-1	styling model	light brown	100 : 100	machinable after 1 - 2 days
 RenPaste® SV 4503-1 / Ren® HV 4503-1	styling, master model and mold	brown	100 : 100	machinable after 1 - 2 days
 RenPaste® 4666 / Ren® 4666	styling, master model and mold	light grey	100 : 100	machinable after 1 day
 RenPaste® 4688 / Ren® 4688	prepreg lay-up tool	brown	100 : 40	machinable after 1 day

Modeling pastes (hand applied)

Product designation	Color	Mix ratio	Density	Pot life
Conditions				1 l, 25°C
Norm				
Unit		pbw	g/cm ³	min
 RenPaste® SV 427-2 / Ren® HV 427-1	brown	100 : 100	0.6	40
 RenPaste® SV 36 / Ren® HV 36	brown	100 : 100	0.5	60

 Selected and recommended products for COMPOSITE TOOLING




Density	Hardness	Coefficient of thermal expansion	Deflection temperature
		after 3 days at room temperature	
	ISO 868	ISO 11359	ISO 75
g/cm ³	Shore D	10 ⁻⁶ K ⁻¹	°C
0.52 - 0.57	40 - 45	95 - 105	45 - 50*
0.75 - 0.80	55 - 60	100 - 105	45 - 55*
0.95 - 1	60 - 65	75 - 80	50 - 80*
1	85 - 90	25 - 30	190 - 200*

Castable layer thickness	Deflection temperature*	Key characteristics / applications
	ISO 75	
mm	°C	
20	55 - 60	room temperature curing, general alteration or repair of models and patterns
40	55 - 60	no pin holes, light, easily machinable, hand applied, layer thickness 40 mm / light models, patterns and repairs


* Temperature resistance after post cure cycle

2-components epoxy systems for the production of molds / tools

Gelcoats

Product designation	Hardener	Mix ratio	Color	Density	Pot life	Deflection temperature*	Key characteristics / applications
Conditions					250 ml, 25°C		
Norm						ISO 75	
Unit		pbw	Unit	g/cm ³	min	°C	
RenGel® SW 10	Ren® HY 2404 Ren® HY 5159	100 : 10 100 : 8	white	1.5 1.5	20 60	60 - 80	easily machinable, polishable, low odor / working molds (ceramic), negatives, models, jigs
RenGel® SW 419-1	Ren® HV 2419	100 : 13	black	2.3	15 - 20	60 - 70	high compressive strength, abrasion resistant / metal-forming tools, foundry patterns, general model making
RenGel® SW 404	Ren® HY 2404 Ren® HY 5159	100 : 10 100 : 8	blue	1.8 1.8	15 50	80 - 100	abrasion resistant / foundry patterns, copy-milling models, foaming molds
 RenGel® SW 18	Ren® HY 2404 Ren® HY 5159	100 : 20 100 : 16	green	1.3 1.3	10 - 15 25	85 - 100	polishable, high chemical resistant / wet lay-up tools, vacuum forming tools, coupling coat RenGel® P 99 recommended
RenGel® SW 56	Ren® HY 2404 Ren® HY 5159	100 : 13 100 : 10	caramel	1.5 1.5	10 - 15 25 - 30	100 - 120	workable, polishable, chemical resistant / pressure-casting molds (ceramic), wet lay-up tools, coupling coat RenGel® P 99 recommended
 RenGel® XD 4615	Ren® HY 5159	100 : 15	black	1.3	25 - 30	120 - 130	highly polishable, high chemical resistant / mold for composite tooling, vacuum forming tools
 RenGel® SW 5200	Ren® HY 5211 Ren® HY 5212 Ren® HY 5213	100 : 20 100 : 20 100 : 16	black	1.6 1.5 1.6	18 h 10 h 4.5 h	195 - 200	high temperature resistant / prepreg tools, high temperature tooling applications

Coupling coat

Product designation	Hardener	Mix ratio	Color	Density	Pot life	Deflection temperature*	Key characteristics / applications
Conditions					250 ml, 25°C		
Norm						ISO 75	
Unit		pbw	Unit	g/cm ³	min	°C	
 RenGel® P 99	Ren® HY 5159	100 : 11	grey	1.5	30	120	coupling coat between gelcoat and backing / multipurpose coupling coat





Laminating pastes

Product designation	Hardener	Mix ratio	Color	Density	Pot life	Castable layer thickness	Deflection temperature*	Key characteristics / applications
Conditions					1 l, 25°C			
Norm							ISO 75	
Unit		pbw	Unit	g/cm ³	min	mm	°C	
RenLam® LV 573-2	Ren® HY 2959	100 : 15	grey	1.1	45 - 60	20	40 - 45	up to 20 mm layer thickness, hand applied / laminated shells and backing structures
RenLam® LV 06	Ren® HY 06	100 : 15	grey blue	1.1	90	15	70	up to 15 mm layer thickness, hand applied / laminated shells and backing structures
RenLam® LV 10	Ren® HY 97 blue	100 : 20	grey blue	0.75	60	10	125	light paste, hand applied / light, stiff laminated shells and backing structures

* Ultimate temperature resistance

 Selected and recommended products for COMPOSITE TOOLING

Laminating systems

Product designation	Hardener	Mix ratio	Color	Density	Pot life	Deflection temperature*	Key characteristics / applications
Conditions					500 ml, 25°C		
Norm						ISO 75	
Unit		pbw		g/cm ³	min	°C	
RenLam® CY 219	Ren® HY 5160 Ren® HY 5161 Ren® HY 5162	100 : 50 100 : 50 100 : 50	pale yellow	1.1 1.1 1.1	80 40 20	45 - 60	transparent, tack free with adjustable reactivity, room temperature curing / laminates and backfilling with a variety of fillers
RenLam® M-1	Ren® HY 956	100 : 20	pale yellow	1.1	30	50	transparent, room temperature curing, good impregnation / laminates and backfilling with a variety of fillers
 RenLam® LY 113	Ren® HY 98	100 : 30	pale yellow	1.1	90	120 - 125	temperature resistant, excellent wetting out properties / low viscosity laminating system with good thermal properties, precuring and demolding at room temperature (25±3°C)
 RenLam® LY 120	Ren® HY 99	100 : 23	clear liquid	1.1	3.5 - 4 h	150 - 155	low viscosity infusion system with high thermal properties, precuring and demolding at low temperature (40°C)
 RenLam® LY 5210	Ren® HY 5211 Ren® HY 5212 Ren® HY 5213	100 : 40 100 : 40 100 : 32	amber	1.1 1.1 1.1	24 h 12 h 3 h	180 - 210	long pot life / prepreg lay-up tools, parts and structures, high temperature tooling applications, recommended for wet lay-up process, precuring and demolding at 50°C
 Araldite® LY 8615	Aradur® 8615 XB 5173	100 : 50 100 : 38	pale yellow	1.13 1.14	14 - 16.5 h 5 - 6.5 h	210 - 220	long pot life, low viscosity / high temperature infusion system for composite tooling, precuring and demolding at 50°C

Casting systems

Product designation	Hardener	Mix ratio	Color	Density	Pot life	Castable layer thickness	Deflection temperature*	Key characteristics / applications
Conditions					1 l, 25°C			
Norm							ISO 75	
Unit		pbw		g/cm ³	min	mm	°C	
RenCast® CW 20	Ren® HY 49	100 : 5	blue	2	110	30	65 - 70	mineral filled, abrasion resistant / foundry patterns, copy-milling models, metal-forming tools, foaming molds
RenCast® CW 2418-1	Ren® HY 5160 Ren® HY 5161 Ren® HY 5162 Ren® HY 5118	100 : 15 100 : 15 100 : 15 100 : 20	black	2.3 2.3 2.3 2.2	120 60 30 80	80 20 10 40	50 - 65	metal filled, high compressive strength, cure: slow, medium, fast / metal-forming tools, casting of dowel bushes, general model making, full and face casting, foundry patterns
RenCast® CW 2215	Ren® HY 5160 Ren® HY 5161 Ren® HY 5162	100 : 20 100 : 20 100 : 20	ivory	1.6 1.6 1.6	120 45 25	80 20 10	50 - 65	easily machinable, pigmentable, cure: slow, medium, fast / suitable for a wide range of applications
RenCast® CW 5156-1	Ren® HY 5158	100 : 8	grey	1.6	80	80	130 - 140	chemical resistant, easily machinable / foam molds, vacuum forming tools
RenCast® CW 47	Ren® HY 33	100 : 15	grey	1.6	4.5 h	100	200 - 210	castable up to 100 mm, easily machinable / prepreg tools, vacuum forming tools, injection molds, high temperature tooling applications

* Ultimate temperature resistance

PU casting and prototyping systems

Net-size casting

Product designation	Density	Mix ratio	Pot life	Recommended cure schedule	Compressive strength	Compressive modulus	Hardness	Deflection temperature*
Conditions			3 kg, 25°C					
Norm					ISO 604	ISO 604	ISO 868	ISO 75
Unit	g/cm ³	pbw	min		MPa	MPa	Shore D	°C
RenCast® 5146 Polyol / RenCast® 5146 Isocyanate	1.2	100 : 80	30 - 40	7 days at 20 - 25°C or 14 h at 40°C	85 - 90	3 000	D 80	75 - 80
RenCast® 5146 Polyol / RenCast® 5146 Isocyanate / Filler DT 082	1.6	100 : 80 : 330	40 - 50	7 days at 20 - 25°C or 14 h at 40°C	90 - 95	9 500	D 85	75 - 80

Fast-cast polyurethanes

Product designation	Color	Mix ratio	Pot life	Hardness	Deflection temperature*	Demolding time	Key characteristics
Conditions			1 kg, 25°C			23°C	
Norm				ISO 868	ISO 75		
Unit		pbw	min	Shore D	°C	min	
RenCast® FC 50 Polyol / RenCast® FC 50 Isocyanate	off-white	100 : 20	4 - 5	D 65 - 80	95	30 - 45	filled, machinable, polishable
RenCast® FC 51 Polyol / RenCast® FC 51 Isocyanate	grey	100 : 100	4 - 5	D 65 - 80	80	20 - 40	filled, machinable, polishable
RenCast® FC 52 Polyol / RenCast® FC 52/53 Isocyanate / Filler DT 082	beige	100 : 100 : 300	10	D 80 - 85	85	3 h	low viscosity, usable with different fillers
RenCast® FC 53 Polyol / RenCast® FC 52/53 Isocyanate / Filler DT 082	beige	100 : 100 : 300	5 - 6	D 80 - 85	90	60 - 90	low viscosity, fast demold, usable with different fillers
RenCast® FC 54 Polyol / RenCast® FC 54 Isocyanate	blue	100 : 100	8	D 85 - 90	95	2 - 4 h	slower system for thick casting
RenCast® FC 55 Polyol / RenCast® FC 55 Isocyanate	beige	100 : 100	2 - 3	D 70 - 75	85	20 - 30	low viscosity, pigmentable

* Ultimate temperature resistance

Abrasion and impact resistant parts (DeDDM-free polyurea) / Foundry applications

Casting systems

Product designation	Mix ratio	Pot life	Hardness	Elongation at break	Tear propagation	Demolding time	Key characteristics
Conditions		1 kg				23°C	
Norm			ISO 868	ISO 527-2	DIN 53356		
Unit	pbw	min	Shore	%	kN/m	h	
RenCast® 6425 A / RenCast® 5425 B	100 : 24	15 - 20	D 60 - 65	130 - 170	28 - 30	20 - 24	high abrasion resistance, high impact strength
RenCast® 6427 A / RenCast® 5427 B	100 : 20	35 - 40	A 70 - 75	200 - 250	5 - 6	16 - 20	flexible, high tear strength

Gel coat

Product designation	Mix ratio	Pot life	Hardness	Color	Abrasion	Demolding time	Key characteristics
Conditions		1 kg			4000 cycles, 1kg load	23°C	
Norm			ISO 868		Taber		
Unit	pbw	min	Shore		mg	h	
RenCast® 6429 A / RenCast® 5429 B	100 : 80	15 - 20	D 60 - 65	green	1 400	20 - 24	high abrasion resistance, high impact strength

Parts in minutes® – rapid prototyping

Product designation	Color	Density	Mix ratio	Tensile strength	
Conditions					
Norm				ISO 527	
Unit		g/cm ³	pbw	MPa	
RenPIM® 5213-1 Polyol / RenPIM® 5213-1 Isocyanate	brown / cream	1.2	100 : 65	35 - 40	
RenPIM® 5215 Polyol / RenPIM® 5215 Isocyanate	black	1.2	100 : 80	30 - 40	
RenPIM® 5216 Polyol / RenPIM® 5216 Isocyanate	translucent	1.2	100 : 80	30 - 35	
RenPIM® 5217 Polyol / RenPIM® 5217 Isocyanate	black	1.2	100 : 80	35 - 40	
RenPIM® 5218 Polyol / RenPIM® 5218 Isocyanate	black	1.2	100 : 80	40 - 45	
RenPIM® 5219 Polyol / RenPIM® 5219 Isocyanate	white	1.2	100 : 80	60 - 70	
RenPIM® 5222 Polyol / RenPIM® 5222 Isocyanate	black	1.2	70 : 100	25 - 30	

Shore D hardness comprised between 75 and 80 for all products mentioned except for RenPIM® 5222 (55 – 65) - * Isocyanate

Parts in minutes® – vacuum casting systems for rapid prototyping

Product designation	Color	Mix ratio	Pot life	Hardness	
Conditions			100g, 25°C		
Norm				ISO 868	
Unit		pbw	min	Shore	
RenPIM® VG 5281 Polyol / RenPIM® VG 5281 Isocyanate	light amber	100 : 25	5 - 10	A 40	
RenPIM® VG 5281 Polyol / RenPIM® VG 5281 Isocyanate	light amber	100 : 30	5 - 10	A 50	
RenPIM® VG 5281 Polyol / RenPIM® VG 5283 Polyol / RenPIM® VG 5281 Isocyanate	light amber	60 : 40 : 45	5 - 10	A 80	
RenPIM® VG 5281 Polyol / RenPIM® VG 5283 Polyol / RenPIM® VG 5281 Isocyanate	light amber	40 : 60 : 55	5 - 10	A 90	
RenPIM® VG 5283 Polyol / RenPIM® VG 5281 Isocyanate	white	100 : 70	5 - 10	D 55	
RenPIM® VG 5234 Polyol / RenPIM® VG 5234 Isocyanate	white	30 : 100	7 - 11	D 80	
RenPIM® VG 5285 Polyol / RenPIM® VG 5285 Isocyanate	black	80 : 100	5 - 12	D 80	
RenPIM® VG 5286 Polyol / RenPIM® VG 5286 Isocyanate	black	100 : 150	5 - 15 (40°C)	D 80	
RenPIM® VG 5289 Polyol / RenPIM® VG 5289 Isocyanate	brown	100 : 90	5 - 10 (40°C)	D 80	

* Ultimate temperature resistance

	Flexural modulus	Deflection temperature*	Demolding time	Key characteristics
			23°C	
	ISO 178	ISO 75		
	MPa	°C	min	
	1 300 - 1 500	90	15 - 30	ABS type, flame retardant (UL 94 approved), high impact strength, high thermal resistant
	1 000 - 1 200	130 - 140	10 - 15	PP, ABS type, high temperature resistant
	1 100 - 1 300	80	15 - 20	PP, ABS type, high impact resistant, good dimensional stability
	1 100 - 1 400	85 - 90	10 - 15	PP, ABS type, high impact resistant, good dimensional stability
	1 800 - 2 000	90 - 100	20 - 30	PP, ABS type with longer gel time, high flexural modulus, good dimensional stability
	2 700 - 2 900	70 - 75	16 - 18 h	suitable for hand or machine processing, slow curing, usable to blend with other fast PIM systems
	600 - 800	75	20 - 30	HDPE, PR-like system, very tough, high impact system, good flexibility

	E modulus	Elongation at break	Deflection temperature*	Key characteristics
			23°C	
	ISO 527	ISO 527-2	ISO 75	
	MPa	%	°C	
	-	80	-	rubber type, pigmentable, easy to process
	-	70	-	rubber type, pigmentable, easy to process
	-	100	-	rubber type, pigmentable, easy to process
	-	140	-	rubber type, pigmentable, easy to process
	-	130	-	PE PP type, pigmentable, easy to process
	1 700 - 1 800	10	90	PE PP type, pigmentable
	1 200 - 1 300	30	120	PE PP type, high flexural strength, high heat resistant
	1 700 - 1 900	15	140	ABS type, high heat resistant
	3 400 - 3 600	3	85	ABS type, flame retardant (UL 94 VO approved)



With innovation

Every day, all over the world, our Technical Competence centers engage in intensive research and development focusing on one goal : to deliver innovative solutions by working hand-in-hand with our business partners. Together through a continual exchange of ideas, supported by an experienced team of sales and technical specialists, we strive to deliver innovative solutions.

We track both new market expectations and changing regulations. Protection of the environment, as well as health and safety are paramount concerns, playing an integral part in our development projects.

By providing certified technologies, combined with high quality and reliability, our chemists and experts bring enhanced value to our customers, ensuring their success.

With customer intimacy

We market a unique product portfolio and a broad range of forward-looking solutions for our customers. Customers and partners benefit from an advanced level of service in:

- > product development and quality
- > product trials in-house and with customers
- > customer seminars and training
- > trouble-shooting and problem-solving

Partnership with our customers is more than simply «putting them first». It requires long-term commitment to forging close relationships that create synergies of knowledge, security and adaptability to create a successful, shared future.

With care

Sustainability is a fundamental part of our corporate and business strategy. We see a better world in which our innovations help reduce consumption of natural resources and improve the quality of life for people everywhere. We are identifying the long-term trends that affect our markets and looking to see how products and applications can play a part in supporting and providing solutions to the challenges those markets face.





We value
your
challenge

Huntsman Advanced Materials

Our Advanced Materials division is a leading global chemical solutions provider with a long heritage of pioneering technologically advanced epoxy, acrylic and polyurethane-based polymer products.

Our capabilities in high-performance adhesives and composites, delivered by more than 2300 associates, serve over 3000 global customers with innovative, tailor-made solutions and more than 1500 products which address global engineering challenges.

HUNTSMAN

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Ref. No. AdlMat Tooling solutions selector guide 10.12_EN_EU



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