

**HUNTSMAN**

Enriching lives through innovation



**ADHESIVES**

Raw Materials for Reactive Hot Melts



**SUPRASEC® MDI**



### Adhesives

Adhesives based on Huntsman Polyurethanes' technology bond an extensive range of materials and resist a wide variety of adverse physical conditions and chemical environments. Their versatility makes them a raw material of choice for the formulation of sealants, rubbercrumb, panel laminating, flexible packaging or reactive hot melt adhesives.

### Reactive hot melt adhesives

Reactive hot melt adhesives combine the advantages of polyurethane hot melts with one-component polyurethane adhesives. They provide fast initial strength build-up and show excellent mechanical property retention at high temperatures, yet can be applied at intermediate temperatures. They have applications in the bookbinding, woodworking, packaging, automotive and construction industries.

Moisture curable hot melts, based on SUPRASEC®MDI\* and IROSTIC®M thermoplastic polyurethane (TPU) from Huntsman Polyurethanes, represent a class of high-performance adhesives. They combine the advantages of thermoplastic hot melts with fast strength development and the ability to crosslink liquid reactive systems. The hot melt character enables the end-user to achieve a fast processing of the laminated parts, whereas the cross-linking enhances the resistance against the environment and the surroundings.

The major raw materials for manufacturing reactive hot melts are polyester polyols, MDI or MDI-derivatives and thermoplastic resins. Huntsman Polyurethanes offers an extensive range of SUPRASEC® isocyanates and IROSTIC® M thermoplastic polyurethanes for the adhesives market.

Both product lines offer unique building blocks for tailoring moisture-curable adhesives. MDI and MDI-derivatives are needed to bring reactivity to the reactive hot melt, whereas the addition of IROSTIC® TPU enhances the green strength of the adhesive.

### SUPRASEC® isocyanates – pure and liquid-modified pure MDI

Huntsman's specific MDI and MDI-derivatives for manufacturing reactive hot melts are standard 4,4' MDI and liquid-modified pure MDI

SUPRASEC® isocyanate	1306	2020	1004	2385	2004	2386	
NCO - content	33.5	29.5	32.8	30.9	32.7	30.2	%
Functionality	2.00	2.13	2.00	2.06	2.00	2.07	
Typical viscosity at 25 °C	solid	55	15	25	13	40	mPa*s
Reactivity	very high	very high	low	medium	low	high	
Storage condition	liquid or frozen	15	15	20	15	15	°C

### Influence of pure MDI and liquid-modified MDI on physical properties

The reactive hot melt is based on an hexanediol adipate with a hydroxyl number of 30 mg KOH/g, reacted with the listed MDI and MDI-derivatives in a ratio OH:NCO = 1:2.4



**SUPRASEC® isocyanates - special soft and hard block prepolymers**

Specially designed prepolymers can also be used for the manufacture of reactive hot melts. The prepolymers are based on MDI and derivatives, reacted with soft block forming polyols. Used as the second component in the manufacture of reactive hot melts, they form block prepolymers.

SUPRASEC® isocyanate	1007	2008	2058	2980	2021	
NCO – Content	6.80	10.20	15.00	19.00	23.15	%
Functionality	2.1	2.0	2.0	2.0	2.0	
Typical viscosity at 25 °C	5500	1800	775	1100	975	mPa.s
Amount of soft block	75	65	50	40	10	%

**Influence of soft and hard block prepolymers on physical properties**

The reactive hot melt is based on an hexanediol adipate with a hydroxyl number of 30 mg KOH/g, reacted with the listed MDI and MDI-derivative in a ratio OH:NCO = 1:2.4

SUPRASEC® isocyanate	1007	2008	2058	2980	2021	
NCO content	1.3	1.9	2.3	2.1	2.9	%
Typical viscosity at 120 °C	6750	3700	6200	6350	6000	mPa.s
Melting point	60	60	53	61	53	°C
Open time	90/390	30/190	90/270	45/240	45/270	seconds

**Tensile strength, 500 µm bond line after 7 days at normal climate**

Wood/Wood	6.0 a	6.5 s	9.7 s	6.7 s	9.9 s	MPa
Steel/Steel	2.5 c	2.3 a	2.1 a	4.3 a	3.5 a	MPa
Aluminum/Aluminum	2.4 a	2.9 a	2.1 a	4.5 a	3.9 a	MPa
PP/PP	0.1 a	0.1 a	0.1 a	0.1 a	0.1 a	MPa
PVC/PVC	3.4 s	4.1 s	4.1 s	4.1 s	7.0 s	MPa

**New raw materials – SUPRASEC® 2344**

SUPRASEC®	Type	NCO	Viscosity @ RT and shelf live	Storage condition
1306	Pure MDI	33.5	Solid (14 days) or deep frozen (6 months)	Liquid @ 40°C
2344	Prepolymer	15.5	1250	Ambient (6 months)

*Reacted with hexanediol adipate polyester (OH = 30 mg/KOH) at ratio NCO:OH = 1:2.4*





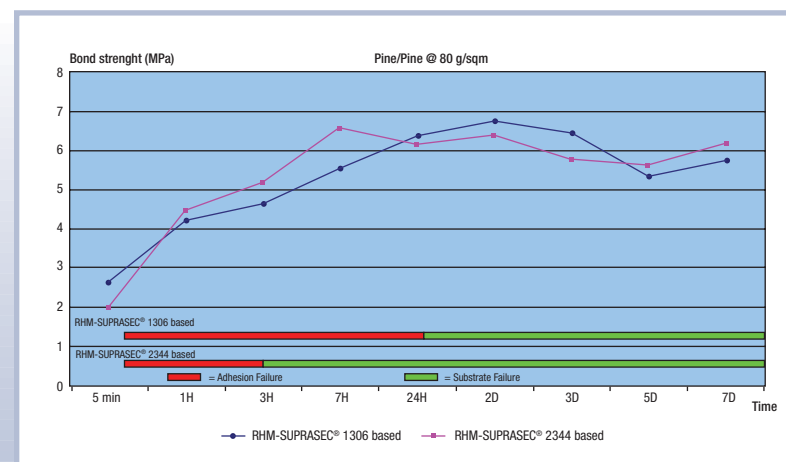
**Properties – reactive hot melt**

SUPRASEC® based	Viscosity @ 120°C	NCO	Melting point	Viscosity 120°C after 24h 120°C
1306	4000	3	65°C	6000
2344	6000	3	62°C	9000

Outcome:

- Minor influence on crystallinity
- Slight reduction of melting point
- Improved storage stability

**Properties – bond strength**



**IROSTIC® M TPU - specialty TPU to enhance green strength**

When the green strength of reactive hot melts is not sufficient to handle and alter the laminate of composites in the process, the adhesive can be modified by adding a high molecular weight resin. IROSTIC® M proved to be an excellent choice for this purpose.

	IROSTIC® 8304	IROSTIC® M 8520	
MVR Melt volume rate	60 - 90 at 170°C / 10kg	50 - 70 at 150°C / 2.16kg	cm3 / 10 min
Processing parameters	130 - 190	110 - 190	°C
Crystallisation rate	Fast	Fast	

IROSTIC® M is available as granules and can therefore easily be charged into the polyol melt. The granules' solubility in typical reactive hot melt polyol, as hexanediol adipate, is more than 50 percent. To demonstrate the efficiency of the IROSTIC® M grades, 20 percent were added to an hexanediol adipate, with a hydroxyl number of 30 mg.KOH/g, and reacted further with SUPRASEC® 1306 in a ratio OH:NCO = 1:2.4.

	IROSTIC® M 8304	IROSTIC® M 8520	
NCO content	2.5	2.0	%
Typical viscosity at 120 °C	3800	9000	mPa.s
Typical viscosity after 24 hours at 120 °C	5000	16500	mPa.s
Melting point	65	69	°C
Open time	45/250	20/200	seconds

**Strength development, 100 µm bond line, wood/wood**

1 minute	1.0 c	1.6 c	1.7 c	MPa
5 minutes	1.5 c	2.0 c	2.3 c	MPa
30 minutes	2.2 c	2.7 c	3.2 c	MPa
1 day	4.5 c	6.4 s	5.8 s	MPa
3 days	5.2 c	6.4 s	5.8 s	MPa
5 days	7.7 s	6.4 s	5.8 s	MPa

s = substrate failure, c = cohesive failure, a = adhesive failure

Available upon request :

- individual data sheets for SUPRASEC® isocyanate grades
- individual data sheets for IROSTIC® M grades
- procedure for preparation of reactive hot melts



# HUNTSMAN

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Huntsman Polyurethanes is committed to your business and can offer fast and flexible response to your needs

Believing in confidential dialogue, we offer direct links into the laboratories with full technical backup. Commercial support and dedicated customer service is available throughout Europe, Asia and the US.



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## The Huntsman story

Global resources for local needs

Huntsman Polyurethanes is a business division of Huntsman Corporation. Huntsman is a global manufacturer and marketer of differentiated chemicals. Its operating companies manufacture products for a variety of global industries including chemicals, plastics, automotive, aviation, textiles, footwear, paints and coatings, construction, technology, agriculture, health care, detergent, personal care, furniture, appliances and packaging. Originally known for pioneering innovations in packaging, and later rapid and integrated growth in petrochemicals, Huntsman today has 13,000 employees and 78 operations in 24 countries. The company had 2007 revenues of over \$ 10 billion.

Huntsman Polyurethanes warrants only that its products meet the specifications agreed with the buyer. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications.

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