

# Polyurethane Basic Products

Isocyanates and polyols for versatile polymers



 **BASF**

We create chemistry

# Committed to the customer

**At BASF, our focus is on understanding and meeting our customers' needs: consistent quality, reliable supply and safe handling. BASF is in an ideal position to answer these imperatives.**

At BASF, we know our customers' requirements inside out. This means delivering the products you need and finding the right answers to your challenges, while ensuring the competitiveness of our offering.

To do this, we have the best team at your doorstep which has developed long-term expertise over many years, backed by BASF experts around the globe.



With sales representatives across Europe, the Middle East and Africa, there is always someone available to assist you and answer your questions. Our team is only a phone call away. With BASF, you are in safe hands.

# Consistent quality – each and every time

**We use cutting-edge technologies and leading expertise to deliver consistent quality – for your full peace of mind.**



If the raw materials you receive are not of a consistent quality, they pose a risk to health and safety, to equipment, and to your bottom line. At BASF, we understand how important it is that the ingredients you use are of the same high quality, each and every time. Which is why we consistently manufacture our isocyanates and polyols to the same high standards – so that our customers in all industries are guaranteed the required reliability for their processes, whatever the application.

How do we do this? By leveraging our state-of-the-art technologies, our extensive experience, and our in-depth expertise. Our highly skilled staff ensure quality at every stage of the production chain – from the moment the isocyanates and polyols are produced at our sites through to their transportation and processing in your plants. As a result, there are no surprises for you, your equipment, or your final product.

# Reliable supply – across all regions

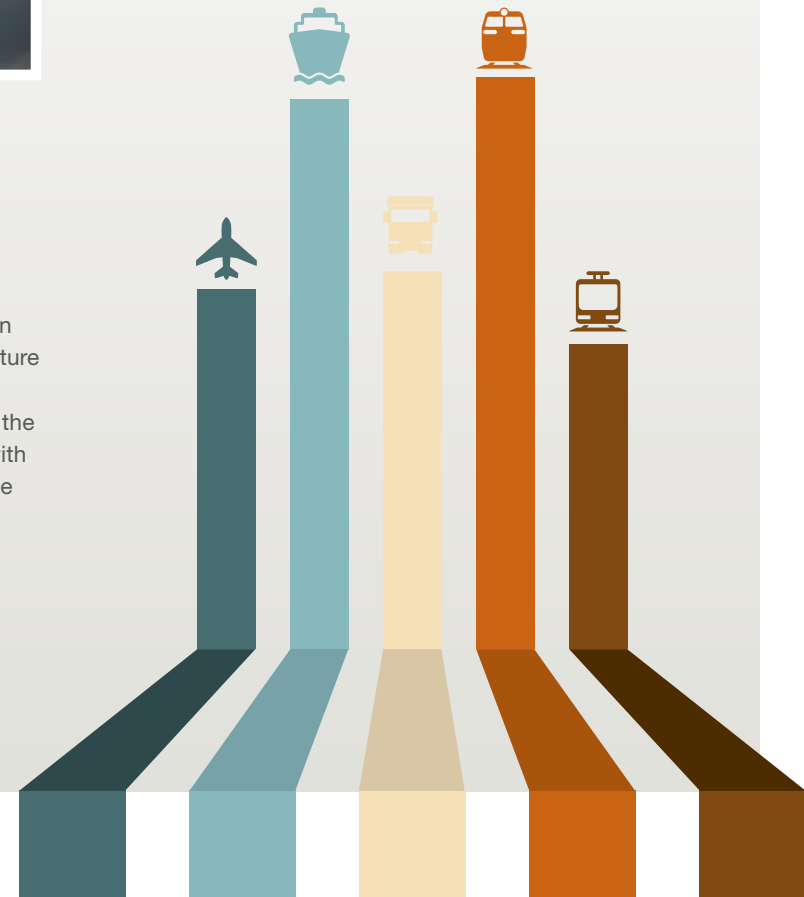


**At BASF, we are dedicated to ensuring a competitive and reliable supply, and to supporting your local needs – by leveraging our standing as a global leader, and our strong European presence.**

With BASF, you benefit from a strong partner with a global and local advantage. Our large-scale plants and international presence – including our six “Verbund” sites and around 380 production facilities – allow us to offer reliable, competitive products to our customers. So you can rely on the knowledge that you have a lean and dependable supplier, both now and in the years to come.

However, we understand that a worldwide network means little without local support. Which is why we aim to meet your needs, wherever you are. Whether in Norway, South Africa, or anywhere in between – you can rely on us to deliver high-quality isocyanates and polyols and provide you with the support you require.

BASF operate global networks for TDI and MDI with plants in Europe, Asia and North America. Furthermore, we manufacture polyols in Schwarzheide, Antwerp, and Zingonia (Italy). Ludwigshafen is also home to one of our “Verbund” sites – the largest integrated chemical complex worldwide. Together with our sites in Asia and the US, these facilities ensure a reliable supply, right across Europe, the Middle East and Africa.



# Safe handling – every step of the way

**Hazardous chemicals require careful handling. At BASF, we are committed to promoting health and safety and enabling you to use your isocyanates and polyols safely.**

Like many reactive chemicals, isocyanates and polyols can be hazardous if handled improperly. For this reason, we commit significant resources to promoting the responsible use of our products – along the entire supply chain. Our aim is to ensure that each person transporting, storing or processing our isocyanates and polyols is fully aware of the potential dangers and the correct handling.



Our health and safety activities begin in our own factories – where we produce isocyanates and polyols at consistent quality. But our commitment doesn't stop there. We offer regular training courses, familiarizing customers with the recommended regular and emergency procedures. We supply dedicated material safety data sheets (MSDS) – available from the sales office. And should you require specific advice, your sales contact is on hand to help.

Moreover, we are dedicated to pooling our expertise on health and safety with other stakeholders, further enhancing the core structures and processes of the polyurethane industry. We are an active member of multiple industry associations, such as ISOPA, PU Europe, Europur and the IPVU.

# Monomeric MDI

Monomeric MDI (MMDI) refers to 4,4'- and 2,4'-isomers of methylene diphenyl diisocyanate. BASF offers two standard monomeric MDI grades: pure 4,4'-MDI and a blend of 4,4'-MDI and 2,4'-MDI. Besides the standard MMDIs, various MMDI

types with different stabilization and reactivity are available. Although pure 4,4'-MDI is a crystalline solid at room temperature, it is commercially available as a liquid but with a limited shelf life. Monomeric MDIs are either used as pure isocyanate, in

mixtures with polymeric MDI (PMDI) or in prepolymers for flexible foams, CASE applications, shoe soles or thermoplastic polyurethanes.

## Monomeric Methylene Diphenyl Diisocyanates (MMDI)

Product	NCO content [%]	Viscosity [mPa*s]	Viscosity Temperature [°C]	Description
Lupranat ME	33,5	5	42	Pure monomeric 4,4'-MDI. Solid at room temperature.
Lupranat MI	33,5	12	25	Blend of monomeric 4,4'-MDI and 2,4'-MDI isomers. Liquid at room temperature.
Lupranat MIP	33,5	12	25	Blend of monomeric 4,4'-MDI and 2,4'-MDI isomers with reduced 2,2'-MDI content. Liquid at room temperature.

# Carbodiimide Modified MDI

## Carbodiimide Modified Methylene Diphenyl Diisocyanate (MMDI)

Product	NCO content [%]	Viscosity [mPa*s]	Viscosity Temperature [°C]	Description
Lupranat MM 103	29,5	40	25	Carbodiimide modified 4,4'-MDI. Liquid at room temperature.

Given the handling and storage difficulties associated with pure 4,4'-MDI, carbodiimide chemistry is often used to modify and stabilize monomeric methylene diphenyl diisocyanate (MMDI). Carbodiimide modified isocyanates are liquids that are stable and clear at room temperature. These products contain a portion of MMDI that is reacted to give a tri-functional uretonimine species within the remaining difunctional MMDI.

# Polymeric MDI



Polymeric methylene diphenyl diisocyanate (PMDI) is a brown mixture of monomeric (2-ring) and polyaromatic (3-ring and higher species) methylene diphenyl diisocyanates, which is liquid at room temperature. A higher PMDI viscosity indicates a lower

content of monomeric and a higher content of polyaromatic components; that is, as PMDI viscosity increases, so does isocyanate functionality. BASF offers a range of PMDIs with different functionality and reactivity. PMDI is mainly used for

the production of rigid foam. PMDI grades are also used as a binder in the wood-working industry. In combination with MMDI grades, polymeric MDI is also used to produce various types of flexible foam and for CASE applications.

## Polymeric Methylene Diphenyl Diisocyanates (PMDI)

Product	NCO content [%]	Viscosity [mPa*s]	Viscosity Temperature [°C]	Description
Lupranat M 10 R	31,5	110	25	Polymeric MDI with lower functionality and higher reactivity.
Lupranat M 20 R	31,5	220	25	Polymeric MDI with average functionality and reduced reactivity.
Lupranat M 20 S	31,5	210	25	Polymeric MDI with average functionality and reactivity. Standard isocyanate for rigid foam and for use as a binder in the wood-working industry. In combination with monomeric MDI grades, it is also used for flexible foam.
Lupranat M 20 FB	31,5	210	25	Polymeric MDI with average functionality and higher reactivity. Lupranat M 20 FB is preferably used as a binder in the wood-working industry that allows faster processing.
Lupranat M 50	31,5	550	25	Polymeric MDI with higher functionality mainly for rigid foam applications.
Lupranat M 70 R	31,5	650	25	Polymeric MDI with higher functionality and lower reactivity for continuous production of rigid foams and insulation boards.

# MDI Prepolymers and Mixtures

In addition to the standard polymeric MDI (PMDI) and monomeric MDI (MMDI) grades, BASF offers isocyanate prepolymers and isocyanate mixtures optimized for certain applications.

Prepolymers are modified isocyanates accessible by a reaction of isocyanates or isocyanate mixtures with polyether polyols. BASF's isocyanate mixtures and prepolymers have been

designed to provide excellent processing performance combined with outstanding mechanical properties of the final product.

## Methylene Diphenyl Diisocyanate (MDI) Prepolymers and Mixtures

Product	NCO content [%]	Viscosity [mPa*s]	Viscosity Temperature [°C]	Description
Lupranat MP 102	22,9	660	25	4,4'-MMDI prepolymer for CASE applications. Provides excellent elongation.
Lupranat MP 105	28,5	120	25	PMDI prepolymer with higher functionality for CASE applications.
Lupranat MP 109/1	28,3	60	25	Prepolymer for the production of high resilience, viscoelastic and polyester slabstock foam.
Lupranat MP 111/1	20,5	395	25	MMDI prepolymer for the production of rebonded foam using the heated steam process.
Lupranat MX 118/1	32,8	30	25	Mixture of monomeric and polymeric MDI grades for the production of high resilience, viscoelastic and hypersoft slabstock foam.
Lupranat MX 119/1	33,5	10	35	Mixture of monomeric MDI grades for the preparation of prepolymers used for CASB (coating, adhesives, sealants and binder) applications.
Lupranat MX 121/1	33,0	19	25	Mixture of monomeric and polymeric MDI grades for the preparation of prepolymers used for CASB (coating, adhesives, sealants and binder) applications.



# TDI

BASF's Lupranat T 80 is a mixture of 80% 2,4-isomer and 20% 2,6-isomer of toluene diisocyanate (TDI). Lupranat T 80 is used for the production of slabstock and molded foam as well as for various CASE applications.



## Toluene Diisocyanate (TDI)

Product	NCO content [%]	Viscosity [mPa*s]	Viscosity Temperature [°C]	Description
Lupranat T 80 A	48,2	3	25	Mixture of 80% 2,4- and 20% 2,6-toluene diisocyanate.

# CASE and Molded Polyols

Linear polypropylene glycols (PPG) are difunctional polyols mainly used for CASE (coatings, adhesives, sealants, elastomers) applications and as for the production of binders and foams. BASF offers various polypropylene glycols with molar weights ranging from 500 to 4000 g/mol. PPGs with a low

molecular weight are produced by KOH catalysis. PPGs with a high molecular weight are also available as DMC catalyzed products or are solely produced by the latter technique, which lowers the content of unsaturated, monofunctional by-products to a minimum.

## Polypropylene Glycols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity at 25°C [mPa*s]	Description
Lupranol 1000/1	2	55	2,000	325	Linear polypropylene glycol. KOH catalyzed.
Lupranol 1000/2	2	55	2,000	365	Linear polypropylene glycol. DMC catalyzed.
Lupranol 1005/1	2	28	4,000	905	Linear polypropylene glycol. DMC catalyzed.
Lupranol 1100/1	2	104	1,100	155	Linear polypropylene glycol. KOH catalyzed.
Lupranol 1200	2	248	500	72	Linear polypropylene glycol. KOH catalyzed.
Lupranol 2004/1	3	42	4,000	660	Polypropylene triol. Produced by KOH catalysis.

BASF offers a series of reactive polyols for numerous applications. All reactive polyols have an ethylene oxide (EO) end-cap, creating a primary hydroxyl group. All reactive polyols are pro-

duced by KOH catalysis and contain an antioxidant package that is free of 2,6-di-tert.butyl-p-cresol (BHT), enabling their usage in applications where low emissions are important.

Reactive polyols are mainly used for molded applications like flexible foams, flexible integral foams, RIM and shoe soles, as well as for CASE applications.

## Reactive Polyether Polyols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity at 25°C [mPa*s]	Description
Lupranol 2007/1	3	27	6,000	1,225	Reactive polyols for molded and CASE applications.
Lupranol 2043	2	29	3,500	775	Diol. reactive polyol for molded applications and CASE.
Lupranol 2048	3	42	4,000	950	Cell opener polyol for flexible foam.
Lupranol 2090	3	28	6,000	1,100	Reactive polyol for molded applications and CASE.
Lupranol 2092	3	28	6,000	1,090	Reactive polyol for high resilience (HR) slabstock applications.
Lupranol 2095	3	35	4,800	850	Reactive polyol for molded applications and CASE.

# Slabstock Polyols

BASF's non-reactive polyether polyols are suitable for the continuous production of flexible polyurethane foam by means of the slabstock process. All non-reactive polyols are triols and have a propylene oxide (PO) end-cap, creating secondary hydroxyl groups. BASF's standard non-reactive polyether polyols Lupranol 2070, Lupranol 2074 and Lupranol 2074/2 are DMC catalyzed products with a low content of unsaturated,

monofunctional by-products while Lupranol 2072 is based on KOH technology. All non-reactive polyether polyols are free of 2,6-di-tert.butyl-p-cresol (BHT). Lupranol 2074 and Lupranol 2074/2 contains an antioxidant package that is optimized with respect to scorching, Lupranol 2070, Lupranol 2072 and Lupranol 2074/2 have an antioxidant package that enables production of foams with low emissions.



## Non-reactive Polyether Polyols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity at 25°C [mPa*s]	Description
Lupranol 2070	3	53	3,000	553	Slabstock polyol for combustion-modified (CME) foam. DMC catalyzed.
Lupranol 2072	3	48	3,500	540	Slabstock polyol with emission optimized antioxidant package. Produced by KOH catalysis.
Lupranol 2074	3	48	3,500	600	Conventional slabstock polyol with scorch-optimized antioxidant package. DMC catalyzed.
Lupranol 2074/2	3	48	3,500	600	Slabstock polyol with low-emission and scorch-optimized antioxidant package. DMC catalyzed.

# Amine-based Polyols

BASF offers a series of amine-based polyether polyols. The unique feature of this special designed polyether polyols is its autocatalytic activity. Amine-based polyols require less free catalyst while achieving the same reactivity, and thus enabling the application where low emissions or fast curing are important.

While Lupranol 3402 and Lupranol 3508/1 are only based on propylene oxide (PO), creating secondary hydroxyl groups, Lupranol 1002/1 has an ethylene oxid (EO) end-cap, creating primary hydroxyl groups. All amine-based polyether polyols are free of 2,6-di-tert.butyl-p-cresol (BHT).

## Amine-based Polyether Polyols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity at 25°C [mPa*s]	Description
Lupranol 1002/1	4	60	3,700	660	Autocatalytic polyol based on ethylenediamine with moderate reactivity for moulded and CASE applications.
Lupranol 3402	4	470	480	4975	Autocatalytic crosslinker based on ethylenediamine for flexible and rigid foams as well as CASE applications.
Lupranol 3508/1	4	753	300	42000	Autocatalytic crosslinker based on ethylenediamine with high reactivity for rigid foams and CASE applications.

# Polymer Polyols

BASF offers a series of polymer polyols (GRAFT polyols) for the production of high load bearing (HLB) and high resilience (HR) foams. All polymer polyols contain dispersed styrene/acrylonitrile (SAN) co-polymers. The dispersions are stable under standard storage conditions. All polymer polyols contain an antioxidant package that is free of 2,6-di-tert.butyl-p-cresol

(BHT) and all polymer polyols have low styrene emissions. The highly filled Lupranol 4002/1 and Lupranol 4003/1 are based on KOH technology and so can be used for the production of HR and HLB foams. The products in the non-reactive polymer polyol series Lupranol 4005/1/SC are blends of Lupranol 4002/1 with Lupranol 2072 (KOH polyol) and so are compatible

with standard HR polyols and can be used for high resilience (HR) or combustion-modified high resilience (CMHR) foams. Reactive polymer polyol series Lupranol 4010/1/SC are blends of Lupranol 4003/1 with Lupranol 2095 (KOH polyol), making them suitable for HR foam production.

## Non-reactive Polymer Polyols

Product	OH number [mgKOH/g]	Solid content [%]	Viscosity [mPa*s]	Viscosity [°C]	Description
Lupranol 4002/1	31	45	4,550	25	Highly filled polymer polyol for HLB and HR slabstock foam.
Lupranol 4005/1/SC10	44	10	730	25	Polymer polyol blend with Lupranol 2072 (KOH polyol) for production of HLB slabstock foam.
Lupranol 4005/1/SC15	42	15	860	25	Polymer polyol blend with Lupranol 2072 (KOH polyol) for production of HLB slabstock foam.
Lupranol 4005/1/SC25	38	25	1,300	25	Polymer polyol blend with Lupranol 2072 (KOH polyol) for production of HLB slabstock foam.

## Reactive Polymer Polyols

Product	OH number [mgKOH/g]	Solid content [%]	Viscosity [mPa*s]	Viscosity [°C]	Description
Lupranol 4003/1	20	45	7,400	25	Highly filled polymer polyol for HR slabstock foam.
Lupranol 4010/1/SC15	29	15	1,525	25	Polymer polyol blend for production of HR slabstock foam.
Lupranol 4010/1/SC25	26	25	2,280	25	Polymer polyol blend for production of HR slabstock foam.

# Rigid Polyols and Polyol Mixtures

Characteristic for rigid polyols is higher functionalities at lower molecular weights. Rigid polyols have secondary hydroxyl groups only. Mixtures of Lupranol 3300 and Lupranol 3422, Lupranol 3423 or Lupranol 3424 can be used to design rigid polyol functionality and viscosity in a wide range. Rigid polyols are used in foamed and solid applications or in combination with polyols with a higher

molecular weight to increase hardness of the final product. Lupanol 3504/1 and Lupanol 3505/1 are short-chain polyols of the crosslinker type. While Lupranol 3504/1 is based on propylene oxide (PO), creating secondary hydroxyl groups. Lupranol 3505/1 is based on ethylene oxide (EO), creating primary hydroxyl groups.



## Rigid Polyether Polyols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity at 25°C [mPa*s]	Description
Lupranol 3300	3	400	420	373	Standard rigid polyol based on glycerine.
Lupranol 3422	5	490	570	22,775	Standard rigid polyol. Used to adjust hardness in combination with Lupranol 3300.
Lupranol 3423	5	490	500	8,450	Rigid polyol based on sucrose. Excellent balance between viscosity and curing properties.
Lupranol 3424	4	403	560	2,175	Rigid polyol based on sucrose with good crosslinking activity but low viscosity.
Lupranol 3504/1	3	860	200	5,900	Crosslinker based on trimethylolpropane with secondary hydroxyl groups.
Lupranol 3505/1	3	935	180	2,900	Crosslinker based on trimethylolpropane with primary hydroxyl groups.

For the production of special MDI slabstock foam grades BASF designed polyol blends that are tuned to optimize the properties

of the desired foam qualities. The portfolio includes both types of viscoelastic foam (pneumatic and chemical). All polyol blends

are intended to be used with Lupranat MX 118/1 and are designed to achieve low MDA values and to suppress scorching effectively.

## Polyol Mixtures

Product	OH number [mgKOH/g]	Viscosity at 25°C [mPa*s]	Description
Lupranol 2012/1/PX/PVE	53	980	Polyol blend designed to produce pneumatic viscoelastic slabstock foam.
Lupranol 2014/1/PX/CVE	177	180	Polyol blend designed to produce chemical viscoelastic (temperature-sensitive) slabstock foam.

# Polyester Polyols

BASF offers a series of polyester polyols for the production of flexible foam as well as for CASE and footwear applications. For flexible foam, especially for slabstock foam, a series of polyester

polyols with different properties is available. The portfolio includes a standard polyester polyol but also special grades providing reduced reactivity, optimized scorching properties

or reduced emissions. For CASE and footwear applications, BASF offers polyester polyols for optimized mechanical properties and hydrolysis resistance of the final product.

## Polyester Polyols

Product	Functionality	OH number [mgKOH/g]	Molecular weight [g/mol]	Viscosity [mPa*s]	Description
Lupraphen 1600/4	2	56	2,000	670 (at 75°C)	Linear polyadipate based on butanediol for CASE applications and TPU. Provides excellent mechanical properties. Solid at room temperature.
Lupraphen 1608/4	2	55	2,040	580 (at 75°C)	Linear polyadipate based on monoethyleneglycol for CASE applications. Provides excellent mechanical properties. Solid at room temperature.
Lupraphen 1622/1	2	56	2,000	575 (at 75°C)	Linear polyadipate for CASE applications. Improves resistance against hydrolysis. Liquid at room temperature.
Lupraphen 1901/1	3	328	470	3,300 (at 25°C)	Aromatic polyester polyol for rigid foam applications. Used to improve high temperature performance and fire resistance.
Lupraphen 2600/2	3	60	2,390	20,200 (at 25°C)	Branched polyadipate with reduced reactivity for production of slabstock foam.
Lupraphen 2601/1	2	53	2,400	18,100 (at 25°C)	Slightly branched polyadipate with improved scorch resistance for the production of slabstock foam.
Lupraphen 2602/1	3	59	2,470	21,650 (at 25°C)	Branched polyadipate with reduced emissions for production of slabstock foam.
Lupraphen 2901/1	3	223	650	20,250 (at 25°C)	Branched polyester for improved cutting of slabstock foams.
Lupraphen 5606/1	2	47	2,400	750 (at 75°C)	Linear polyadipate based on monoethyleneglycol and diethyleneglycol for CASE and footwear applications. Provides balanced mechanical and excellent flexural properties at lower temperature. Liquid at room temperature.
Lupraphen 5608/1	2	56	2,000	525 (at 75°C)	Linear polyadipate based on monoethyleneglycol and diethyleneglycol for CASE and footwear applications. Provides balanced mechanical and flexural properties. Liquid at room temperature.
Lupraphen 5619/1	3	60	2,500	1,150 (at 75°C)	Branched polyadipate based on monoethyleneglycol and diethyleneglycol for CASE and footwear applications. Preferably used in prepolymers. Liquid at room temperature.
Lupraphen 6601/3	2	55	2,040	625 (at 75°C)	Linear polyadipate based on monoethyleneglycol and butanediol for CASE applications. Provides excellent mechanical properties. Liquid at room temperature.

**Please contact us to  
discuss your requirements.**

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We create chemistry

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