



Raw materials for corrosion protection –
So steel lasts longer.

Bayhydrol® Bayhydur® Desmodur®
Desmophen® Pergut® Uralac®





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Building a circular future, together

The demand for more circular solutions is rising at a faster pace than ever before as the world collectively strives to tackle today's global challenges. Climate change, population growth, urbanization, digitalization and mobility are pushing players from every sector to find more sustainable solutions and lay the foundations for climate neutrality by driving a Circular Economy. The challenge is not only to create these circular solutions but also to maintain quality, durability and productivity.

Innovation is key to satisfying these demands and creating added value for customers, society and the environment by turning targets into realities. At Covestro, our long-standing expertise in aliphatic and aromatic polyisocyanates and more sustainable resins goes hand-in-hand with our purpose of constantly pushing boundaries in the search for future-oriented solutions. Through joint solutions, alternative raw materials, innovative recycling, and harnessing renewable energy, we're enabling coatings and adhesives producers to meet the circular challenge, here and now.

We're expanding our portfolio to include bio-based or recycled raw materials in coatings, adhesives, and specialty areas ranging from cosmetics to textiles to 3D printing. Thanks to our mass balancing approach, we're helping close the loop by gradually replacing fossil fuels with ISCC-certified renewable resources. Our drop-in solutions ensure the high quality, consistent performance and easy processing that keep your production running smoothly. And we're constantly working to provide the global support, facilities and supply chain security you need to forge yet more circular innovations in infrastructure, automotive, furniture and more.

Material solutions can help turn circular targets into realities. Let's make the world a brighter place, together.



The way ahead.

All kinds of steel constructions can be optimally protected against corrosion through the application of specific coatings. That is why corrosion protection coatings make an indispensable contribution to the long-term preservation of valuable capital investments. However, the precondition for achieving such long-term protection is the right choice of coating system. At Covestro we supply a wide range of raw materials for coating systems that make effective corrosion protection possible.

In a market segment specifically oriented to long-term perspectives it is particularly important to take into account long-term trends in the corrosion protection market:

- **Renewable energy sources:** As more and more countries strive to increase the share of primary energy supplies generated from renewable sources, there is an increasing demand for corrosion-protection solutions for onshore and, in particular, offshore wind turbines.
- **Aging infrastructure:** The corrosion protection market is also growing as a result of aging steel constructions in developed countries and infrastructure booms in emerging economies.
- **Increasing maintenance costs:** As maintenance costs rise, not least due to higher labor costs, there is also a growing demand for long-lasting, low-maintenance coatings to protect all kinds of steel constructions.







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Where corrosion protection makes all the difference.

Polyurethane-based protective coatings

At Covestro we develop and produce the raw materials used for protective coatings that are applied in a wide variety of fields:

- Oil and gas production, treatment and distribution
- Infrastructure
- Power generation
- Industrial processing

Whatever the application – industrial plants, cranes, wind turbines, power pylons, etc. – tried-and-tested polyurethane coating systems provide lasting protection against corrosion, aggressive chemicals, salts and solvents for all kinds of heavy steel constructions. Moreover, these coating systems bring the additional benefits of good adhesion on steel, speedy and efficient application, a high degree of weathering and chalking resistance, and long-lasting color and gloss fastness.

Specific advantages of Pasquick®

Covestro offers polyaspartic technology under the brand name **Pasquick®**. Polyaspartic acid esters not only offer the customary proven benefits of 2-component (2K) polyurethane coating systems but also make significantly higher productivity levels in the coating process possible since the number of coatings can be reduced. **Pasquick®** polyaspartic technology permits a higher film thickness than conventional 2K polyurethane coatings and cure two or three times faster than conventional systems at normal ambient temperatures. As a result, significant cost savings are possible in the protective coating process.

Marine coatings

Marine coatings have to offer long-term protection to steel hulls in a highly aggressive environment.

The outstanding protective properties of polyurethane systems mean they are the ideal solution for protective marine coatings since they cure quickly (even at low temperatures) and are resistant to sea- and freshwater, diesel oil and most chemicals. The raw materials we provide for primers, intermediate coatings and topcoats make long-lasting and reliable corrosion protection possible. These raw materials include aromatic and aliphatic polyisocyanates from the **Desmodur®** range and their co-reactants from the **Desmophen®** range. Aliphatic polyurethane systems are particularly suitable for marine coatings in view of their high degree of lightfastness and weathering resistance. Last but not least, coating systems based on **Pergut®**, Covestro's trade name for a group of chlorinated rubber-based raw materials, are frequently used for marine repairs as a result of their excellent water resistance and simple processability.

Effective pipeline coatings

Effective corrosion protection for the steel pipelines used to transport oil, gas or water is of great economic significance. Liquid polyurethane systems are particularly suitable for this kind of application because they can be applied directly to the substrate in a single layer up to 2 mm thick without a primer. Our **Desmodur®** and **Desmophen®** raw materials are particularly suitable for solvent-free polyurethane pipeline coatings. As these coatings systems offer the advantages of fast, pore-free curing, even at low temperatures, excellent long-lasting elasticity, high impact resistance and good cathodic protection, they are even suitable for field joints and repair coatings. What's more, 2K polyurethane systems are ideal for use in even the toughest conditions, e.g., permanent wet stress, service temperatures above 80°C, and extremely salty soils.

Industry-leading technologies

Our outstanding binders are particularly suitable for use in heavy corrosion protection systems. This is particularly important if the longevity and safety of steel structures are to be significantly improved.

Depending on the application area and technology required, we provide a range of solutions for heavy corrosion protection.

APPLICATION AREAS	TECHNOLOGIES				
	WATER-BASED SYSTEMS BAYHYDUR®/ BAYHYDROL®	SOLVENT-BASED AND NEAR ZERO VOC SYSTEMS			
		DESMODUR®/ DESMOPHEN®	DESMODUR® E MOISTURE-CURING PU	PERGUT® CHLORINATED RUBBER	PASQUICK® POLY-ASPARTICS
	2K PU 	2K PU 			
Protective coatings	●	●	●	●	●
Marine coatings	To some extent	●	●	●	●
Pipeline coatings		●			To some extent



Solvent-based 2K polyurethane raw materials for heavy corrosion protection.

Solvent-based 2K polyurethane systems are extremely popular for heavy corrosion protection applications. This is particularly true of topcoats, where these solutions are currently state of the art. They offer long-term protection at an excellent price-performance ratio, are lightfast, resistant to

wind, weather and atmospheric pollutants, can be applied in almost any weather conditions, and are impact-resistant. The systems most frequently used are based on hydroxyacrylates in combination with polyisocyanates.

A selection of polyisocyanates for 2K solvent-based corrosion protection coatings is listed below:

PRODUCT	SOLID CONTENT [%]		VISCOSITY AT 23°C [mPa · s]		CHARACTERISTICS
	TYPE		NCO ON SOLIDS [%]		
Desmodur® N 75 MPA/X	HDI biuret	75	16.5	250	Chemical and weather resistant, good mechanical resistance.
Desmodur® ultra N 3390 BA/SN	HDI trimer	90	19.6	550	Good chemical and weather resistance, high mechanical resistance; suitable for high-solid coatings.
Desmodur® ultra N 3300	HDI trimer	100	21.8	3,000	100% solids; otherwise the same characteristics as N 3390.
Desmodur® ultra N 3600	HDI trimer	100	23.0	1,200	Good chemical and weather resistance, high mechanical resistance; suitable for high-solid coatings.
Desmodur® eco N 7300	PDI trimer	100	21.5	9,500	Bio-based hardener, performance similar to N 3300.

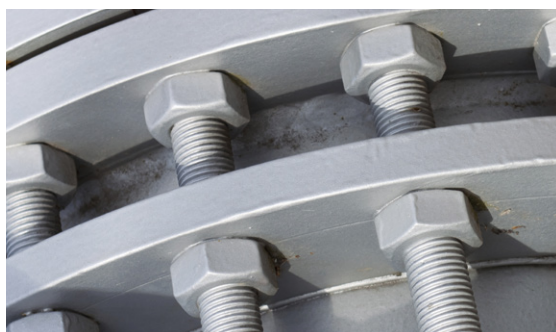
The combination partners mainly used with these **Desmodur® N** grades are hydroxyacrylates. However, hydroxypolyesters may also be used as co-reactants when particularly high chemical resistance is required.

The following table lists a selection of polyesters for 2K solvent-based corrosion protection coatings:

PRODUCT	OH CONTENT [%]		VISCOSITY AT 23°C [mPa · s]		CHARACTERISTICS/ APPLICATIONS
	SOLID CONTENT [%]				
Desmophen® 650	65	5.3	20,000		Suitable for weather-resistant topcoats with high chemical resistance.
Desmophen® 670 BA	80	3.5	3,000		Co-binder for the flexibilization of hard Desmophen® products.
Uralac® SY944	96	8.3	5,500		High solid binder/co-binder to increase solid content, sprayability, overspray pick-up, high gloss, chemical resistance.



Pasquick® for highly productive coating processes



A frequent challenge facing protective coating manufacturers is to increase the productivity of coating operations. This is especially true for the fast-growing market of direct-to-metal (DTM) coatings. The answer to this challenge is **Pasquick®**, our new brand for polyaspartic technology. **Pasquick®** technology is suitable for high-quality aliphatic 2K topcoats based on the **Desmophen® NH** and **Desmodur® N** ranges.

Since **Pasquick®** technology can be applied at high film thicknesses, the number of layers can be reduced. Moreover, **Pasquick®** technology cures fast at normal ambient temperatures. All this helps to achieve greater productivity in coating operations, which makes the coating process more economical. Last but not least, **Pasquick®** technology is also suitable for formulating ultra-high solids. In recent years, numerous practical examples of protective coating applications made possible by our **Pasquick®** technology have shown the benefits this technology brings:

- Increased productivity through high film thickness, fewer coating layers and shorter curing times
- Suitable for ultra-high solid coatings

The most suitable Pasquick® raw materials we offer are listed in this table:

PRODUCT	EQUIVALENT WEIGHT		VISCOSITY AT 25°C [mPa · s]	REACTIVITY/ CHARACTERISTICS
	SOLID CONTENT [%]			
Desmophen® NH 1520	100	290	1,400	Low reactivity.
Desmophen® NH 1523 LF	100	280	2,000	Similar to NH 1520 with improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%).
Desmophen® NH 1420	100	276	1,450	Medium reactivity.
Desmophen® NH 1423 LF	100	274	1,500	Medium, better gloss retention than NH 1420 and improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%).
Desmophen® NH 1220	100	234	90	High reactivity.
Desmophen® NH 1720	100	295	100	Flexibilisation in combination with NH1420.
Desmophen® NH 1723 LF	100	290	110	Similar to NH 1720 with improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%).

The most suitable polyisocyanate crosslinkers are listed in this table:

PRODUCT	SOLID CONTENT [%]		VISCOSITY AT 23°C [mPa · s]	CHARACTERISTICS/ APPLICATIONS	
	TYPE	NCO CONTENT [%]			
Desmodur® ultra N 3390 BA	HDI biuret	90	19.6	550	Good chemical and weather resistance, high mechanical resistance.
Desmodur® ultra N 3600	HDI trimer	100	23.0	1,200	Good chemical and weather resistance, high mechanical resistance; suitable for high-solid coatings.
Desmodur® ultra N 3900	HDI polyisocyanate	100	23.5	730	Suitable for ultra-low VOC coatings.
Desmodur® NZ 486 BA	HDI/IPDI blend	86	10.2	2,300	Longer pot life and extended recoat window.
Desmodur® N 3800	HDI trimer	100	11.0	6,000	Flexibilization in combination with N 3600 or N 3900.
Desmodur® E 30700	HDI prepolymer	100	11.0	1,350	Lower viscosity and higher elongation than N 3800.

Raw materials for moisture-curing 1K corrosion protection coatings



Moisture-curing polyurethane systems are well-proven coating solutions, in particular for primers and intermediate coats, and offer a number of benefits:

- Long-lasting corrosion protection
- Simple processability as no mixing is required
- Curing even at cold ambient temperatures

The most suitable products we offer are listed in this table:

PRODUCT	TYPE	SOLID CONTENT	VISCOSITY AT 23°C		CHARACTERISTICS/ APPLICATIONS
		[%]	NCO CONTENT	[mPa · s]	
			[%]		
Desmodur® E 1361 MPA/X	TDI pre-polymer	61	6.8	500	Fast curing, blistering-proof; suitable for primers and intermediate coats
Desmodur® E 21	MDI pre-polymer	100	16.0	5,400	Slower curing than E 1361, higher solids content; suitable for primers and intermediate coats
Desmodur® E 23	MDI pre-polymer	100	15.4	1,800	Slower curing than E 21, higher solids content than E 1361; suitable for primers and intermediate coats
Desmodur® E 14	TDI pre-polymer	100	3.3	6,800	Co-resin for flexibilization
Desmodur® MT	MDI pre-polymer	100	16.8	900	Stabilizer for pigmented moisture-curing aromatic 1K polyurethane coatings
Desmodur® ultra E 3370	HDI pre-polymer	70	10.0	1,400	Suitable for weather-proof topcoats
Desmodur® LD	HDI pre-polymer	100	12.0	75	Stabilizer for pigmented moisture-curing aliphatic 1K polyurethane topcoats



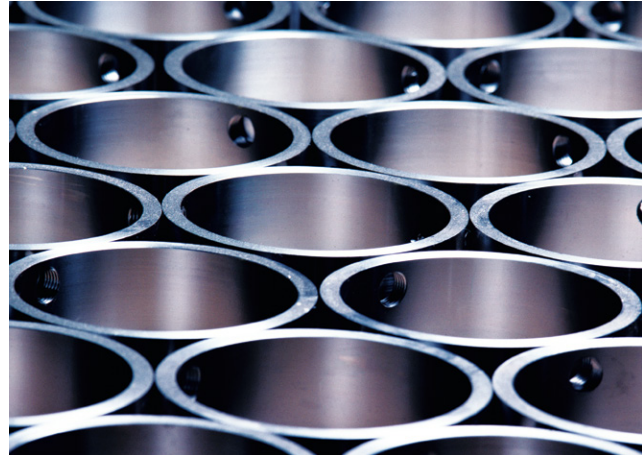
100% solids aromatic 2K polyurethane raw materials

100% solids aromatic 2K polyurethane raw materials are mainly used for pipeline coatings, with a clear focus on repair and field joint coatings. The broad range of raw materials we offer allows properties such as flexibility, adhesion, cathodic

corrosion protection, and abrasion resistance to be customized to meet your specific requirements. The raw materials used are mainly polyethers and MDI-based isocyanates.

The following table shows a selection of suitable polyethers for 100% solids aromatic 2K polyurethanes:

PRODUCT	OH CONTENT [%]	VISCOSITY AT 23°C [mPa · s]	CHARACTERISTICS
Desmophen® 1400 BT	12.1	370	Rigid to flexible properties, very good chemical resistance and very good impact resistance in combination with Desmophen® 2061 BD .
Desmophen® 1380 BT	11.7	600	Good adhesion, very good chemical resistance and very good impact resistance with Desmodur® VL as a hardener.
Desmophen® 4050E	18.8	19,200	Very good adhesion and impact resistance and very good cathodic disbonding properties at $\geq 80^{\circ}\text{C}$ in combination with Desmophen® 2061 BD or Desmophen® 1400 BT .
Desmophen® 4051B	14.2	5,400	Very good adhesion and very good cathodic disbonding properties at $\geq 80^{\circ}\text{C}$ with Desmodur® E XP 2753 as a hardener.
Desmophen® 2061 BD	1.7	345	Co-resin with flexibilization properties.



The following table shows a selection of suitable isocyanates for 100% solids aromatic 2K polyurethanes:

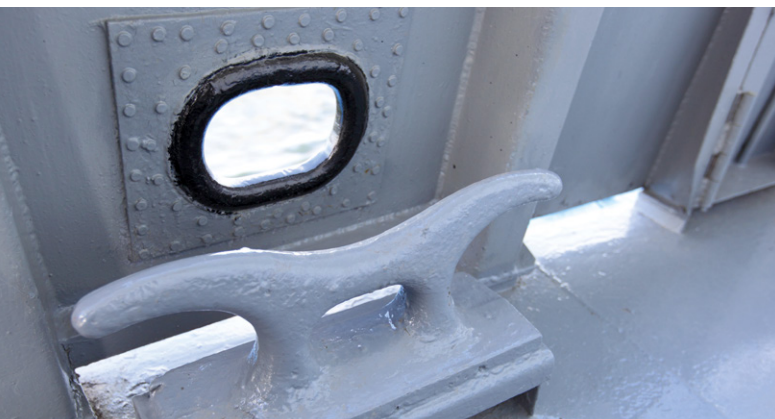
PRODUCT	TYPE	NCO CONTENT [%]		CHARACTERISTICS
			VISCOSITY AT 23°C [mPa · s]	
Desmodur® VLR 20	MDI	31.5	200	Higher reactivity than VL
Desmodur® VL	MDI	31.5	90	Standard type

Pergut® chlorinated rubber – simple and good

As a binder in premium corrosion protection coatings, **Pergut®** displays an impressive combination of properties, such as good adhesion to numerous substrates, easy processing, and high resistance. The various **Pergut®** grades are suitable for a broad range of primer, intermediate coat and topcoat applications in solvent-based, fast-curing corrosion protection coatings.

The benefits include:

- Easy processing and fast curing
- Good adhesion to metals such as steel, iron and zinc
- Excellent repaintability even after many years
- High corrosion resistance
- Resistant to chemicals, acids and alkali, water and saline solutions
- Resistant to environmental influences
- Suitable for anti-fouling coatings
- Soluble in many solvents
- Good compatibility with numerous resins, polymers, plasticizers, pigments and fillers
- High paint storage stability in closed containers
- 1K application
- Resistant to bacteria, mold and fungi



The most suitable Pergut® grades are listed in this table:

PRODUCT	VISCOSITY AT 23°C [mPa · s] (18.5% solution in toluol)		IODINE COLOR VALUE ₁	CHARACTERISTICS/ APPLICATIONS
	MOLECULAR WEIGHT (g/mol)			
Pergut® S 5	60,000	5	≤ 7	Suitable for fast-curing, weather-, water- and chemical-resistant coatings.
Pergut® S 10	85,000	11	≤ 7	Suitable for fast-curing, weather-, water- and chemical-resistant coatings.
Pergut® S 20	135,000	20	≤ 7	Suitable for fast-curing, weather-, water- and chemical-resistant coatings; combination partner for alkyd resins.
Pergut® S 40	165,000	42	≤ 7	Suitable for fast-curing, weather-, water- and chemical-resistant coatings; improves curing and resistance to inorganic acids.

Polyurethane raw materials for water-based corrosion protection coatings

Water-based 2K polyurethane systems are suitable for coatings that provide light to moderate corrosion protection, and are mainly used as topcoats for in-shop applications. Water-based

2K polyurethane systems can significantly reduce the VOC content of coatings while largely maintaining the performance properties of conventional 2K polyurethane systems.

The most suitable polyurethane dispersions for water-based 2K systems are listed in this table:

PRODUCT	TYPE	SOLID CONTENT	VISCOSITY AT 23°C		CHARACTERISTICS/ APPLICATIONS
		[%]	OH CONTENT	[mPa · s]	
			[%]		
Bayhydrol® A 145	Polyacrylic dispersion	45	3.3	950	Good pigment wetting, high shear stability; suitable for high-gloss topcoats with good adhesion and solvent and water resistance.
Bayhydrol® A 2695	Polyacrylic dispersion	40–43	5.0	2,000–3,500	Superior chemical resistance.
Bayhydrol® A 2542	Polyacrylic dispersion	48–51	3.8	1,000–3,500	Suitable for low-VOC water-based coatings.

The most suitable polyisocyanate crosslinkers for water-based 2K systems are listed in this table:

PRODUCT	TYPE	SOLID CONTENT	VISCOSITY AT 23°C		CHARACTERISTICS/ APPLICATIONS
		[%]	NCO CONTENT	[mPa · s]	
			[%]		
Bayhydur® ultra 304	HDI polyisocyanate	100	18.2	4,000	Hardener that can be easily emulsified in the aqueous phase.
Desmodur® ultra N 3600	HDI trimer	100	23	1,200	High gloss, good chemical and weather resistance, high mechanical resistance.
Desmodur® N 3900	HDI polyisocyanate	100	23.5	730	Same characteristics as N 3600, but more easily emulsified in the aqueous phase.

Fast-lane access to polyurethane innovations.

At Covestro, innovation is in our DNA. Ever since Otto Bayer discovered polyurethanes in 1937, we have been driving polyurethane innovations in coatings and adhesives as well as in other application areas. As our partner, you enjoy fast-lane access to polyurethane innovations, and can help us in developing the next generation of polyurethanes to meet the industry's upcoming challenges and needs. What can we offer you?

- Powerful know-how on both established and new polyisocyanates, as well as on new polyurethane hybrid technologies.
- The prospect of new application technologies to enable efficient processes.
- More sustainable, biomass- or CO₂-based materials that do not sacrifice high performance.

Join us to shape the future!







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¹) Please see the "Guidance on Use of Covestro Products in a Medical Application" document.

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