Adhesive systems for industrial applications
Adhesive solutions
BODO MÖLLER CHEMIE is a specialist for adhesive systems and applications in many industrial areas, especially in the automotive, railway, aerospace, medical and electronics industries. We offer a wide range of solutions specifically tailored to structural, semi-structural or elastic bonding of different materials like metal, glass, composites, wood and plastic.

We support customers with individual services such as design of adhesive joints and testing in our adhesive laboratory, process testing and troubleshooting, customer-specific training as well as preparation and implementation of certification audits in accordance with DIN 6701 and DIN 2304.

for various industries
Adhesive solutions

Epoxy resin adhesives (EP)

Araldite® Epoxy resin adhesives (1C / 2C)
Araldite® Epoxy core and edge fillers (2C)*
BETAMATE™ Epoxy resin adhesives (1C / 2C)
Epibond® Epoxy resin adhesives (2C)
Epocast® Epoxy core and edge fillers (1C / 2C)*
LOCTITE® Epoxy resin adhesives (2C)
* partially with FR/FST fire properties

Polyurethane adhesives (PUR)

Araldite® Polyurethane structural adhesives (2C)
BETAFILL™ Polyurethane sealants (1C)
BETAFORCE™ Polyurethane structural adhesives, high modulus (2C)
BETALINK™ Polyurethane semi-structural adhesives (1C / 2C)
BETAMATE™ Polyurethane structural adhesives (1C / 2C)
BETASEAL™ Polyurethane adhesives for direct glazing (1C / 2C)
Uralane® Polyurethane adhesives (2C)

Methyl methacrylate adhesives (MMA)

Agomet® Methyl methacrylate adhesives (No-Mix / 2C)
Araldite® Methyl methacrylate adhesives (2C)

Anaerobic adhesives
Anaerobic adhesives and sealants

Cyanoacrylate adhesives

LOCTITE® Cyanoacrylate

Phenolic resins & polycondensation adhesives

Araldite® Phenolic polycondensation adhesives

Hybrid adhesives & sealants

BETAMATE™ Silane-modified polymer adhesives (1C)
LOCTITE® Hybrid adhesives (2C)
L&L Seal® Silane-modified polymer adhesives (1C)
PACTAN® Silane-modified polymer adhesives (1C)

Silicone adhesives & high temperature silicones

Bluesil™ RTV silicones (2C)
CAF® Silicone adhesives (1C / 2C)
Dowsil™ Silicone adhesives and sealants
PACTAN® Silicone adhesives and sealants (1C / 2C)

UV-curing adhesives

LOCTITE® UV-Alkoxy silicones
LOCTITE® UV-Cyanoacrylate
LOCTITE® Acrylate
LOCTITE® Acrylate Urethane

Not all products are available in all countries. Please contact our sales representatives for more information.
Hotmelt & packaging adhesives

Aquence® Water-based adhesives
Euromelt® Polyamide hotmelt adhesives
Technomelt® Hotmelts

Sealants

BETAFILL™ Polyurethane sealants
BETAFILL™ Polyurethane seam sealer (1C)
BETAGUARD™ Rubber-based sealants, relining adhesives
Bluesil™ RTV silicones (2C)
CAF® Silicone adhesives (1C / 2C)
CeraPur® Polyurethane foam gasket (1C)
Dowsil™ Silicone adhesives and sealants
L&L Acoustic sealants
L&L Core splice adhesives
L&L Hybrid sealants
L&L Room temperature curing sealants/adhesives
PACTAN Silicone and hybrid sealants
RTF Silicone foam gasket (2C)

Products for pretreatment & posttreatment of adhesive surfaces

BETACLEAN™ Surface cleaners
BETAPRIME™ Primer
BETAWIPE™ Activators
BONDERITE® Cleaners
BONDERITE® Pretreatment technologies
LOCTITE® Activators & cleaners
LOCTITE® Polyolefin primer for pretreatment

Not all products are available in all countries. Please contact our sales representatives for more information.
For any application

The construction with adhesives joints has several advantages compared to conventional joining technologies. Adhesives are suitable for bonding a variety of different materials. With the correct surface treatments most metallic, glass, plastic and polymer composite materials can all be joined to either themselves or each other with joint strengths superior to other joining techniques.

Due to the continuous nature of adhesive bonding, it helps reducing high stress concentrations that occur in mechanical fastening systems and results in stiffer joints and structures. Superior fatigue resistance can be achieved compared with welded or riveted joints. A continuous bead of adhesive can also provide sealing properties. In addition to the mechanical properties, bonding also brings aesthetic advantages. Compared to welding or mechanical fasteners, the adhesive seam can be applied invisibly.

### Adhesive family properties comparison

<table>
<thead>
<tr>
<th></th>
<th>Speed</th>
<th>Substrate diversity</th>
<th>Stability</th>
<th>Safe handling</th>
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<tbody>
<tr>
<td>1C-Epoxy resin adhesives (EP)</td>
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<td>2C-Epoxy resin adhesives (EP)</td>
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<td>Polyurethane adhesives (PUR)</td>
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<td>Methyl methacrylate adhesives (MMA)</td>
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<td>Phenolic resins &amp; polycondensation adhesives</td>
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<tr>
<td>Silicone adhesives &amp; high temperature silicones</td>
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<tr>
<td>Hybrid adhesives &amp; sealants</td>
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<tr>
<td>Cyanoacrylate adhesives</td>
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<tr>
<td>Hotmelt adhesives</td>
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<tr>
<td>Anaerobic adhesives</td>
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</tbody>
</table>

* = good, ▼ = medium, ▲ = bad
Advantages and applications of adhesive systems

<table>
<thead>
<tr>
<th>Type of Adhesive System</th>
<th>Advantages</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C-Epoxy resin adhesives (EP)</td>
<td>High strength, crash-stable</td>
<td>Automotive, General Industry</td>
</tr>
<tr>
<td>2C-Epoxy resin adhesives (EP)</td>
<td>High strength, very versatile, environmental resistance, cure speed</td>
<td>General Industry, Aerospace, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>1C-Polyurethane adhesives (PUR)</td>
<td>High flexibility, perfect strength too, elongation ratio, easy to use, humidity cure</td>
<td>Glass Bonding, General Industry, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>2C-Polyurethane adhesives (PUR)</td>
<td>High flexibility, perfect strength too, elongation ratio, humidity independent cure</td>
<td>Glass Bonding, General Industry, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>No-mix Methyl methacrylate adhesives (MMA)</td>
<td>Snap cure after open time, long pot life due no-mix process</td>
<td>General Industry, Aerospace, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>2C-Methyl methacrylate adhesives (MMA)</td>
<td>Snap cure after open time, very versatile, good adhesion properties without pretreatment</td>
<td>General Industry, Aerospace, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>Phenolic resins &amp; polycondensation adhesives</td>
<td>Very high temperature resistance</td>
<td>Automotive, Brake Bonding</td>
</tr>
<tr>
<td>Silicone adhesives &amp; high temperature silicones</td>
<td>Flexible and high temperature resistant, easy to use</td>
<td>General Industry, Aerospace and many other industries</td>
</tr>
<tr>
<td>Hybrid adhesives &amp; sealants</td>
<td>Flexible, easy to use, EHS friendly, very wide adhesion properties</td>
<td>General Industry, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>Cyanoacrylate adhesives</td>
<td>Very fast adhesion built up, extremely versatile</td>
<td>General Industry, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>UV-curing adhesives</td>
<td>«On demand» cure possible, very fast cycle times possible</td>
<td>Medical, Glass &amp; PC, PMMA Bonding</td>
</tr>
<tr>
<td>Hotmelt adhesives</td>
<td>Very fast cycle times</td>
<td>Electronics, Packaging</td>
</tr>
<tr>
<td>Sealants</td>
<td>High flexibility, easy to use</td>
<td>General Industry, BTR, Automotive and many other industries</td>
</tr>
<tr>
<td>Anaerobic adhesives</td>
<td>Unlimited open time on air, only reacts when in contact with reactive surfaces</td>
<td>Threadlocker in every industry</td>
</tr>
<tr>
<td>Products for pretreatment &amp; posttreatment</td>
<td>High guarantee of bonding quality</td>
<td>Should be checked in every bonding process</td>
</tr>
</tbody>
</table>

Do you need support in selecting a suitable product for your application? Please contact our technical consultants for detailed product information, samples and process advice. We will be pleased to support you.
Designing strong bonds

**Loading of adhesive joints** – The strength of an adhesive bonding strongly depends on the direction and distribution of the stresses formed in the joint as a result of the loads applied to it. Typical forces are illustrated below. In practice, a bonded structure has to simultaneously sustain a combination of forces.

Strong bonded joints need to be designed that the loading stresses will be directed along the lines of the adhesive's greatest strengths. A poorly designed joint can lead to high-stress concentrations in the joint itself and/or in the substrates connected. Adhesives are more resilient under shear, compression and tension stresses. Cleavage and peel loading are the most severe as they concentrate the applied force into a single line of high stress.

**Surface preparation and pretreatment** are decisive factors for the strength and fatigue performance of an adhesive bond. In order to ensure an optimum wetting on the substrate, a thorough surface preparation is required to remove contaminations, offer a clean surface and increase the bonding area and surface energy of the substrate. Common surface preparation methods are degreasing, abrading and special pretreatments. BODO MÖLLER CHEMIE offers a wide range of cleaners and surface technologies to provide adhesive joints an optimum strength and reliability.

**Degreasing**
The removal of oil or greases residues from the surface is essential but should be combined to other surface preparation like mechanical abrasion followed by loose particle removal or chemical pretreatment for optimizing the bonding.

Degreasing methods: Vapor degreasing, solvent immersion, brush or wipe with degreasing agent, detergent degreasing, alkaline degreasing, ultrasonic degreasing

**Abrading**
Lightly abraded surfaces provide better anchoring to adhesives than highly polished surfaces. After abrading the surface further treatment methods are required to ensure complete loose particles removal, like degreasing operation, lightly brushing with a clean soft brush or vacuum cleaning.

Abrading methods: Grit blasting, wire brush, abrasive cloth, abrasive paper

**Special pretreatments**
Degreasing and abrading methods are sufficient for most adhesive joints. In order to obtain maximum strength, reproducibility and long-term resistance to deterioration, a chemical or electrolytic pretreatment may be required.

*Metal*:
- Acid etching, anodising, primer applications

*Plastics/composites*:
- Low pressure plasma, atmospheric plasma, corona treatment, flame treatment
### Shear strength and elongation at break comparison

<table>
<thead>
<tr>
<th>Adhesive Type</th>
<th>Lap Shear Strength (MPa)</th>
<th>Elongation at Break (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy resin adhesives</td>
<td>20–35</td>
<td>1–10%</td>
</tr>
<tr>
<td>Phenolic resins &amp; polycondensation adhesives</td>
<td>10–20</td>
<td>1–5%</td>
</tr>
<tr>
<td>Cyanoacrylate adhesives</td>
<td>15–25</td>
<td>1–30%</td>
</tr>
<tr>
<td>Methyl methacrylate adhesives</td>
<td>15–33</td>
<td>5–100%</td>
</tr>
<tr>
<td>Polyurethane adhesives</td>
<td>6–15</td>
<td>30–600%</td>
</tr>
<tr>
<td>Hybrid adhesives &amp; sealants</td>
<td>3–6</td>
<td>100–600%</td>
</tr>
<tr>
<td>Silicone adhesive &amp; high temperature silicones</td>
<td>1–5</td>
<td>250–600%</td>
</tr>
</tbody>
</table>

The specialists of our **Adhesive Competence Center** support customers in the design and construction of adhesive joints with extensive product and application know-how, FEM calculation and application tests in our Adhesive Laboratory.

[www bm chemie com](http://www.bm-chemie.com)
With our **Adhesive Competence Center**, we offer full service in all matters related to adhesive application technology – from product selection all the way to product validation, process simulation and engineering data.

The Adhesive Competence Center is certified for the designing of bonding joints according to DIN 2304 S1 and DIN 6701-2 A1 and our Adhesive Laboratory has a Competence Approval for DIN 2304 S1 and DIN 6701-2 A1. All measurements are carried out in accordance with international DIN, EN and ISO standards.

**Determination of construction data**
- Long-term laboratory tests to determine the technical properties of adhesives as a basis for the calculation of adhesive joints

**Design & construction of adhesive joints**
- Calculation of structural and elastic adhesive joints
- Preparation of construction drawings

**Process design, process testing & troubleshooting**
- Support in setting up bonding processes
- Examination of existing bonding processes, fault analysis
- Optimization of bonding processes

**Laboratory tests**
- Testing of adhesive joints according to all common test methods
- Reference measurements
- Diagnosis of adhesion problems on the substrate

**Implementation & auditing according to DIN 6701/DIN 2304**
- Support for the qualification of production sites
- Preparatory audits, valid as independent pre-audit

**Seminars & training**
- Customer-specific seminars and laboratory trainings
- Trainings for production, quality control, construction
QUALITY & SAFETY

ISO 9001  Quality management
ISO 14001  Environmental management
ISO 45001  Occupational health & safety

EN 9120  Distribution and repacking for aviation industry
DIN 6701  Adhesive bonding of railway vehicles (laboratory)
DIN 2304  Quality requirements for adhesive bonding processes (laboratory)

AN EXCERPT OF OUR LONGTIME PARTNERS

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State 08/2020
Regional offices

<table>
<thead>
<tr>
<th>Region</th>
<th>Office Name</th>
<th>City</th>
<th>Phone</th>
<th>Email</th>
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</thead>
<tbody>
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