Collano Polyurethane Adhesive
The 21st century adhesive
Polyurethane adhesives in general

Polyurethane (PUR) adhesives are high performance adhesives. These reactive systems have made a name for themselves in applications where other adhesives fail. When used by a trained specialist in the right place, they are unbeatable.

Polyurethane adhesives are:
- Durable
- Strong
- Cured adhesive has neither health and safety nor ecological implications

Polyurethane adhesives are not for the hobbyist or do-it-yourselfer. They must be used according to exactly the same safety rules that a professional would observe with other tools (drills, routers, etc.). But a properly executed adhesive bond then also yields professional results: it is durable, strong, non-toxic and ecologically friendly.

PUR technology allows formula developers to adapt each adhesive very precisely to application requirements and customer needs. No other adhesive technology is as flexible. By intelligent selection of raw materials and variations in their proportions, among other variables, properties such as adhesive profile and elasticity can be matched exactly to the application. This kind of chemical «custom building» requires years of experience, expertise, and creativity.

Collano has more than 20 years of experience in the development and utilization of PUR adhesives in a wide range of application areas: flooring installation, wood processing, prefabricated element design, load-bearing timber structures, metal structures, production of laminated structural elements, and vehicle interiors.
Characteristics

Polyurethanes have very impressive properties. They are used whenever special criteria need to be met.

Excellent filling capability with fiber reinforcement and light foaming (1C-system)
- Fills assembly gaps
- Special fillers yield a fivefold increase in joint strength
- Consolidates porous materials at the adhesive interface

Repairs
Gluing in chair legs, gluing breaks in wood

Assembly
Mounting kitchen countertops, installing porous materials such as particleboard

Moisture resistant adhesive film
- The adhesive film does not dissolve in water
- Excellent resistance to repeated wet/dry cycles
- The bond line, although water resistant, is breathable and does not create a moisture barrier

Outdoor applications
Balcony and facade, facings, playground equipment, gazebos and window shutters, etc.

Indoor applications
Adhesive bonding in saunas and swimming pools
Characteristics

Heat resistance
- Excellent heat resistance up to 120 °C under long term conditions
- Much higher temperatures can be tolerated for shorter periods

Outdoor applications
If the sun strikes at the proper angle, solar radiation can create temperatures of up to +75 °C. This causes most PVA adhesives to soften and separate, but these problems do not occur with PUR.

Fire safety
Material selection is just as important as correct design when it comes to fire safety. Doors and walls can be certified as fireproof when PUR adhesives are used.

A hard but not a brittle adhesive film
The viscoelastic nature of the adhesive is enormously important, especially for contour bonding. In this type of application it is often possible to work only with a low level of pressure. This results in joints tending to be thicker than when flat surface pressure can be exerted. The fiber-like fillers have a very positive effect on the properties of the adhesive film in these instances.

Furniture facings
Adhesive bonding of thin support materials onto curved facings with any desired radius.

Stair stringers
Adhesive bonding of beech veneer onto spiral string-boards, usually in vacuum presses.
How do polyurethane adhesives work

Basic requirements of an adhesive
In order to joint two surfaces using an adhesive, two basic conditions must be met:
- The adhesive film must adhere to both surfaces (adhesion)
- The film must have an internal strength appropriate for the application (cohesion)

Wetting of the surface plays a pivotal role in creating optimum adhesion. The adhesive must therefore be applied in liquid form. The liquid can be a melt (hot melts), a solution (solvent or water-based dispersion), or a reactive precursor of a plastic (prepolymer).

The polymer component is responsible for subsequent cohesion. The rule of thumb is that the temperature resistance of a glued joint improves as the polymer chain length increases.

Polyurethane systems
In polyurethane adhesives, the modules of the polymer chains are tied together by a chemical linkage that chemists call a urethane bond. In reactive polyurethane systems, the polyurethane chains are not formed until the time of application, i.e. within the glue joint. With this approach, liquid, short-chain, low-molecular-weight precursors (or prepolymers) are applied onto the substrate and then cross-linked during the curing period to form actual plastics.

Moisture-curing 1C systems
Moisture-curing 1C systems are in fact 2C systems in disguise: during a preliminary reaction, water from the substrate (e.g. moisture in wood) converts a portion of the isocyanate into amines, releasing carbon dioxide (CO2). This can result, as in carbonated beverages, in slight foaming of the adhesive. The free amines then react very rapidly with isocyanate groups, forming a cross-linked structure just as it is the case in 2C systems.

Conventional 2C systems
Chemists creating an adhesive formula can draw on a wide spectrum of options. In conventional 2C systems, the reaction partners – an isocyanate and a polyol – are delivered separately to the processing location, where they are mixed together shortly before use and allowed to react in the joint. The desired processing parameters, such as open time and cure time, are adjusted to the processor's needs by careful selection of catalysts and additives.
2C polyurethane field of application

**Sandwich elements**

**Partition walls**
- Insulating elements
- Cladding (panels for interior and exterior applications)
- Floor panels

**Suitable for bonding**
- Steel, GNS, aluminium
- GRP
- Rigid foam
- High pressure laminates (HPL)
- Mineral fiber plates
- Wood-, cement- and hard plaster-based materials

**Sandwich constructions for transportation**
- Truck bodies (floor and wall elements)
- Cable car (interior cladding)
- Rail wagon construction (roof and wall elements)
- Yacht construction (interior fittings)
- Semi-finished products (honeycomb and sandwich elements)
Safety of isocyanate based adhesives

1. Chemical reaction during the hardening processing phase
   Isocyanate based adhesives which contain diphenylmethane
   disocyanate (MDI) belong to the polyurethane class of adhe-
   sives. During processing MDI is transformed into non hazardous
   polyurethane by absorbing humidity from the ambient air or
   substrate with which it comes into contact. In other words, as the
   unprocessed adhesive reacts with all forms of moisture it
   becomes immediately neutralized. This includes when coming
   into contact with the skin or sinuses through inhalation. The
   critical phase when working with isocyanate based adhesives is
   therefore the processing step. During this phase, and based on
   measurements made by the Swiss Federal Materials Testing and
   Research Agency (EMPA), there is a slight risk of sinus irritation
   and therefore allergic reactions can not be discounted where
   people are especially sensitive.

2. Polyurethane – a friendly reaction
   The polyurethane reaction described above offers a very safe
   way to neutralize the remaining unreacted isocyanate after
   processing. Simply ensure the availability of plenty of water. If
   unreacted monomers are still present after processing, they will
   react spontaneously with ambient humidity. It can therefore be
   said that the ambient air in the room will not contain any unreac-
   ted monomers after processing. Clean-up with water additionally
   diminishes the risk of remaining monomers. From these
   explanations it can be said that cured isocyanate adhesive is not
detrimental to human health. This is also the case for glued
   products that are incinerated: when burning polyurethane glued
   products, the resulting fumes are no more unfriendly than when
   burning untreated wood.

3. The question of formaldehyde release
   Polyurethanes have a chemical composition that makes them
   incapable of releasing any form of formaldehyde whether during
   processing, product life or decomposition. Formaldehyde based
   products have a long history of use, especially in the timber
   processing industries, and are known to be hazardous to the
   environment and human health. Collano polyurethane based
   products are completely formaldehyde free.
PUR Applico Vario
Convenient disposable nozzle

For manual application of highly viscous PUR adhesives in the wood and element construction, for staircase construction and processing of plain wood, PUR Applico Vario (EU-Patent pending) has been developed in cooperation with wood specialists. The new disposable nozzle is the ingenious enhancement of the existing multi-use nozzle PUR Applico.

Flexible application width
- Variable application width for work pieces from 20–160 mm width
- Individual number of adhesive beads: 1–4 holes by cutting off the protruding knobs
- Individual positioning of adhesive beads by manually drilled holes
- Suitable for flat surface bonding by cutting off the lateral guiding element

Security
- Precise, fast, homogeneous adhesive bead
- The well dosed and ideally located adhesive bead assures a secure adhesive joint

Economic, convenient, environmentally friendly
- For low viscosity 1C PUR adhesives in 500 g or 600 g bottle
- For the application of highly viscous 1C PUR adhesives in 600 ml aluminium bag, such as Semparoc I 12 BL, Semparoc I 12 HV and Semparoc I 13 HV
- Fits with delivered adapter on 600 ml aluminium bag for the use with compressed air and hand gun
- Adapter serves as opener of aluminium bag. No tedious opening procedure with pliers or knife
- Nozzle fits without adapter on Semparoc Rapid K and Collano BM 107 (310 ml cartridges)
- Disposable and multi-use nozzle in one product: the plastic nozzle (PE) may be disposed in domestic waste after use (no cleaning necessary). For multiple use, the nozzle may be immersed in PUR Applico Cleaner for a few days
PUR Applico Vario
Convenient disposable nozzle

Packaging
Plastic bags with 10 pieces, with adapter
Plastic bags with 10 pieces, without adapter

Collano products for the application with the disposable nozzle PUR Applico Vario

<table>
<thead>
<tr>
<th>Art. No.</th>
<th>Product</th>
<th>Packaging</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>801311</td>
<td>PUR Applico Cleaner</td>
<td>1 l plastic bottle</td>
<td>Cleaning agent</td>
</tr>
<tr>
<td>801312</td>
<td>PUR Applico Cleaner</td>
<td>10 l plastic can</td>
<td>Cleaning agent</td>
</tr>
<tr>
<td>803202</td>
<td>PUR Release Paste</td>
<td>1 kg tin</td>
<td>Release paste</td>
</tr>
<tr>
<td>201231</td>
<td>Compressed air gun</td>
<td>1 piece</td>
<td>For aluminium bag</td>
</tr>
<tr>
<td>201231</td>
<td>Hand gun</td>
<td>1 piece</td>
<td>For aluminium bag</td>
</tr>
<tr>
<td>805061</td>
<td>PUR Applico Vario</td>
<td>10 pieces with adapter</td>
<td>For aluminium bag</td>
</tr>
<tr>
<td>805062</td>
<td>PUR Applico Vario</td>
<td>10 pieces without adapter</td>
<td>For cartridge</td>
</tr>
</tbody>
</table>
Technical information 1C PUR adhesives

<table>
<thead>
<tr>
<th>Product</th>
<th>Open time (skin formation)</th>
<th>Density g/ml</th>
<th>Viscosity mPa·s at 20°C</th>
<th>Press time at 20°C</th>
<th>Application quantity</th>
<th>Colour</th>
<th>Properties/Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semparoc Rapid S</td>
<td>5 min.</td>
<td>1.1</td>
<td>Approx. 5000 mPa·s (5/20)</td>
<td>Approx. 15–20 min.</td>
<td>100–300 g/m²</td>
<td>Transparent</td>
<td>High joint strength and short press time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brookfield at 20°C</td>
<td></td>
<td></td>
<td>colorless</td>
<td></td>
</tr>
<tr>
<td>Semparoc Rapid K</td>
<td>10 min.</td>
<td>1.2</td>
<td>Thixotropic, non-sagging</td>
<td>Approx. 20 min.</td>
<td>100–500 g/m²</td>
<td>Light brown</td>
<td>Paste-like, with high filling capacity</td>
</tr>
<tr>
<td>Semparoc Rapid V</td>
<td>15 min.</td>
<td>1.15</td>
<td>Approx. 11500 mPa·s (5/20)</td>
<td>Approx. 45 min.</td>
<td>100–300 g/m²</td>
<td>Yellowish</td>
<td>Adhere to wide range of substrates</td>
</tr>
<tr>
<td>Semparoc 112 NV</td>
<td>15 min.</td>
<td>1.25</td>
<td>Approx. 8500 mPa·s (4/20)</td>
<td>Approx. 45 min.</td>
<td>100–300 g/m²</td>
<td>Yellowish</td>
<td>High joint strength, particularly for hard wood</td>
</tr>
<tr>
<td>Semparoc 112 HV</td>
<td>15 min.</td>
<td>1.2</td>
<td>Thixotropic, non-sagging</td>
<td>Approx. 45 min.</td>
<td>100–300 g/m²</td>
<td>Yellowish</td>
<td>High joint strength, particularly for wood construction</td>
</tr>
<tr>
<td>Semparoc 112 BL</td>
<td>60 min.</td>
<td>1.2</td>
<td>Thixotropic, non-sagging</td>
<td>Approx. 3–4 h</td>
<td>100–300 g/m²</td>
<td>Yellowish</td>
<td>High joint strength, particularly for wood construction</td>
</tr>
<tr>
<td>Collano BM 107</td>
<td>5 min.</td>
<td>1.43</td>
<td>Thixotropic, non-sagging</td>
<td>Approx. 1 ± 5–25 min.</td>
<td>100–300 g/m²</td>
<td>White</td>
<td>Paste-like, with high filling capacity, particularly for assembly</td>
</tr>
<tr>
<td>Semparoc 60</td>
<td>60 min.</td>
<td>1.25</td>
<td>Approx. 8500 mPa·s (5/20)</td>
<td>Approx. 3–4 h</td>
<td>100–300 g/m²</td>
<td>Yellowish</td>
<td>High joint strength and long open time</td>
</tr>
<tr>
<td>Collano RP 2530</td>
<td>100 min.</td>
<td>1.10</td>
<td>Approx. 5000–8000 mPa·s (5/20)</td>
<td>Approx. 5–6 h</td>
<td>100–300 g/m²</td>
<td>Light brown</td>
<td>For non load bearing construction elements</td>
</tr>
</tbody>
</table>