

### Liquid one-component polyurethane adhesive for load-bearing structural wood bonding

**Application:** Jowapur® 681.60 is a joint-filling, fibre-reinforced one-component adhesive based on polyurethane. It cures with wood moisture and/or ambient humidity to create a water-insoluble resin, and is used for manufacturing bonded load-bearing timber structures.

**Characteristics/ Directions for Use:** Jowapur® 681.60 was tested by the Materials Testing Institute (MPA, Otto-Graf Institut) of the University of Stuttgart, Germany, and classified according to EN 15425:2017 as follows:

Adhesive Type: **EN 15425 – I – 70 – GP – 0.3 – w**

It has been established that Jowapur® 681.60 can be used for the manufacture of bonded load-bearing timber structures according to EN 14080:2013, EN 15497:2014, and EN 16351:2015 made of spruce, fir, or pine wood. In addition, the MPA Stuttgart has also determined the performance characteristics of the adhesive following EN 15416-4/5.

The manufacture of load-bearing timber structures is subject to the specifications in the applicable national and/or European regulations for the manufacture of the corresponding timber structures (e.g. EN 14080, EN 15497, EN 16351, diverse ETA, etc.). Beyond that, the information indicated on this this Technical Data Sheet is to be observed.

Appearance: beige to yellowish  
Density [g/cm³]: 1.15 (Jowat test method)

Our Application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate product for your requirements. Please observe the information in the section “Remarks”.

**General bonding requirements:** The properties (e.g. surface tension, plasticiser content...) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperature, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil, and grease, and be dry.

**Application parameters:**

Maximum assembly time:	60 minutes
Minimum pressing time (flat bonding):	100 minutes
Minimum pressing time (fingerjointing):	as specified in the standard
Minimum curing time (fingerjointing):	100 minutes
Maximum joint thickness allowed:	0.3 mm

All values indicated above refer to a processing temperature of 20 °C, humidity of 65 %, and a wood moisture content of 12 %, as well as a perfectly matching joint. For further information concerning the assembly time and the minimum pressing time, please refer to the processing guidelines on pages 3 – 5 of this Technical Data Sheet.

continued on page 2

11/20 All data indicated are characteristics represented as average values. Our technical data sheets are periodically revised to represent the latest state of technology. This edition is replacing and superseding all previous ones, and is valid on the date of compilation. Please refer to the last page of this technical data sheet for additional information.

<b>Specification:</b>	Viscosity at 20 °C [mPas]: (Brookfield, spindle 5, 20 rpm)	15,500 ± 2,500
	Solids content [%]: (Jowat test method)	99 ± 1
<b>Storage/ Transport:</b>	The product should remain stored in properly closed original containers, dry and cool (15 – 25 °C). At no time must the adhesive be exposed to temperatures below +5 °C. For best-before date, please see container label. After the elapse of the best-before date, it is essential that you again verify that the product is fit for your intended application.	
<b>Disposal:</b>	Cured adhesive can undergo disposal with the domestic waste disposal.	
<b>Packaging:</b>	Information about packaging types and units is available upon request.	
<b>Remarks:</b>	<b>For further information concerning safety, handling, transport and disposal, please refer to the Safety Data Sheet.</b> The information on this data sheet is based on test results from our laboratories as well as on reported experience gained in the field by our customers. It can, however, not cover all parameters for each specific application and is therefore not binding upon Jowat, nor should it be relied upon in lieu of your own required testing. The information given in this leaflet does not represent a performance guarantee. Unless otherwise agreed with our customers, the values stated in the section "Specification" shall be regarded as the finally agreed upon product properties. No liability may be derived from the information contained herein nor from the information provided by our free technical advisory service.	

**For the manufacture of load-bearing timber structures, observe the specifications in the applicable national and/or European regulations for the manufacture of the corresponding timber components (e.g. EN 14080, EN 15497, EN 16351, ETA, etc.), as well as the following points.**

**General information:** Jowapur® 681.60 is a ready-to-use adhesive for the wood-processing industry. Due to the content of isocyanate, any skin contact with uncured Jowapur® 681.60 must be prevented (please also observe the precautions below).

Due to the fact that the reactive groups react with moisture, the processing characteristics of the adhesive will undergo substantial changes after storage when preliminarily exposed to moisture. Containers with Jowapur® 681.60 must therefore be closed at all times. Containers with Jowapur® 681.60 that are used in production must be equipped with a moisture-absorbing air intake filter (silica gel), and the adhesive must be applied directly from a completely closed application system that is suitable for processing polyurethane adhesives.

Jowapur® 681.60 bonds many materials and also bonds metals. To prevent the adhesive from coming into contact with metal, we recommend using a Jowat® separating agent suitable for PUR adhesives and/or a coated release paper.

**Wood:** The regulations governing the manufacture of load-bearing timber structures under the applicable product standards are to be observed.

The surface of the laminated timber must be planed or undergo a similar treatment before bonding. Planing must be carried out 24 hours or less before bonding, unless the wood species and the storage conditions are such that there will be no unacceptable changes to the surface. If wood species are used which are difficult to bond, e.g. wood with a high resin content, the surface has to be planed within 6 hours before bonding.

A minimum moisture content is decisive for the curing of PUR adhesives. Therefore, the lowest acceptable percentage of wood moisture of the surfaces to be bonded using Jowapur® 681.60 is 8 %. If wood moisture is less than 8 %, the necessary minimum moisture can be achieved by spraying additional water onto the surface. However, this must be coordinated in advance with the Application Technology Service of Jowat SE. If additional humidification is intended, the amount of water applied must not be more than 10 % of the adhesive application amount. The spraying and the amount of water applied are to be documented.

A minimum wood temperature of 18 °C needs to be maintained during the manufacturing process.

**Adhesive application:** The adhesive Jowapur® 681.60 is applied directly from the container it is supplied in, using a closed application system, under exclusion of air.

If fingerjoints are to be bonded, application can be one- or two-sided using either an applicator comb or contactless application systems. The requirements with regard to monitoring measures under the applicable technical regulations are to be observed.

The application amount chosen must be such that full-surface wetting of the substrates is ensured after pressing. When bonding fingerjoints, the guide value for the application amount is 120 – 160 g/m<sup>2</sup>.

When bonding flat surfaces, the adhesive is usually applied in bead form onto one of the two surfaces with an automatic application system. The guide value for adhesive application is 140 – 200 g/m<sup>2</sup>. The application amount must be chosen such that full-surface wetting of both surfaces is ensured after pressing. Unfortunately, it is not possible to specify an exact application amount in advance because the necessary application amount depends on the joint thickness, the uniformity of the application, and the structure of the surfaces to be bonded.

Any application amount below the aforementioned values is to be coordinated with and approved by the Application Technology Service of Jowat SE.

**Assembly time:** The assembly time covers the period from the start of adhesive application until full pressure is applied, and should be as short as possible. The assembly time is determined by several factors, e.g. by humidity, wood moisture, the temperature, and the adhesive application amount.

The maximum assembly time for Jowapur® 681.60 at a temperature of 20 °C, a wood moisture content of 12 %, and a relative humidity of 65 % is max. 60 minutes. Any increase in wood moisture and temperature will reduce the maximum assembly time.

It must be ensured that the parts to be bonded are pressed together within a time in which there has been no skin formation on the surface of the adhesive and its adhesive performance has not been affected. Still liquid adhesive being pressed out of the joint is a sign that the permissible assembly time was not exceeded.

**Pressing time:** If fingerjointing procedures are to be carried out, the prescribed pressure must be applied onto the joint for at least 1 or 2 seconds depending on the applicable product standard. After that, parts bonded with Jowapur® 681.60 are to be stored for a minimum curing time of 100 minutes (temperature 20 °C, wood moisture 12 %). Any increase in wood moisture and temperature will reduce the minimum pressing time, lower temperatures and less moisture will increase it.

During the curing time, it is imperative to prevent all mechanical load/stress on the bonded parts. Any moving of the not yet completely cured fingerjointed wood must be carried out such that the curing process will not be affected by deformation or vibrations.

If flat surfaces are bonded, the pressing time depends especially on the application amount, the temperature, the amount of moisture available, and the tensions acting on the bondline. At a temperature of 20 °C, a wood moisture of 12 %, and perfectly matching joints (approx. 0.1 mm), the minimum pressing time for parts bonded with Jowapur® 681.60 will be 100 minutes.

Any increase in temperature and moisture will reduce the minimum pressing time, lower temperatures and less moisture will increase it, as will higher application amounts and joint thicknesses.

If a perfectly matching joint (max. permissible thickness up to 0.3 mm) is not ensured, pressing time must be at least 180 minutes. The exact pressing time is to be determined separately in each individual case based on the given conditions.

**Storage time after bonding:**

When the curing time (fingerjointing) or the pressing time (flat bonding) has expired, the parts bonded with Jowapur® 681.60 must be stored for another 6 hours at a temperature of minimum 18 °C. If the bonded parts have a wood moisture content of less than 12 %, the storage time after bonding will increase accordingly. During the storage time after pressing, the bonded parts can already be processed further, but they are to be moved in such a way as to prevent deformation and/or vibrations that could affect the post-cure process. After that, the bonded parts can also be exposed to lower temperatures.

The bonded wood is only allowed to be exposed to the final load/stress after final strength is reached. At 20 °C and 12 % wood moisture, final strength is reached after approx. 24 hours.

**Pressure:**

In the manufacture of fingerjointed assemblies, the longitudinally applied pressure has to match the requirements of the respective technical regulations under consideration of the length of the fingerjoints. According to the standard, a pressure of approx. 7.5 – 10.0 N/mm<sup>2</sup>, depending on the profile used, is recommended to ensure a perfectly matching joint and correct tip gap.

In case of flat bonding, the pressure chosen has to be such as to ensure an optimum fitting of the parts to be joined and a bondline as thin as possible. If glulam or cross-laminated timber made of soft wood species is to be manufactured, the recommended pressure according to the standard is 0.6 – 1.0 N/mm<sup>2</sup>. If the product or the machine requires another pressure, this is to be coordinated in advance with the Application Technology Service of Jowat SE.

**Cleaning:**

Adhesive nozzles and applicator combs must be cleaned in regular intervals. If the applicator unit is not hermetically sealed, the adhesive inside it can react. Therefore, the applicator unit has to be emptied immediately and all parts be cleaned. Otherwise, there is a danger of the adhesive curing completely.

Completely cured adhesive is insoluble and has to be scraped off. Following this, the affected unit parts have to be immersed in Jowat® Cleaner 402.38.

Hose couplings and all machine parts that come into contact with adhesive, should be protected with a Jowat® separating agent suitable for PUR adhesives. It is recommended that at the end of the last daily shift, the orifices of the nozzles and the comb should be cleaned and sealed with the aforementioned Jowat® separating agent. This protects the adhesive from moisture during standstill.

**Precautionary measures:**

The adhesive Jowapur® 681.60 and the cleaner Jowat® 402.38 can be processed safely if the standard precautions for handling chemicals are observed.

For instance, any skin or eye contact of the cleaner or the uncured adhesive must be prevented. Therefore, using protective gloves and glasses is recommended when directly handling the adhesive. In addition, adequate ventilation should be in place during processing.

Beyond that, please refer to the Material Safety Data Sheets for Jowapur® 681.60 as well as for the corresponding Jowat® separating agents and Jowat® cleaners.

## **Jowat Information**

Gluing as one of the most efficient methods of bonding is constantly gaining importance and expanding into new areas of application. At the same time, the number of substrates to be bonded is also growing at an unprecedented rate. New methods and equipment to process adhesives are developed.

The in-house R & D departments of Jowat are responding with intensive efforts to keep pace with these constant changes. A highly qualified team of chemists and engineers is using the latest techniques and brightest ideas to provide the utmost in advice our customers and to make sure that they get the adhesive which meets their needs.

Our information is based on test results from our laboratories as well as on experience gained in the field by our customers. This advice, however, cannot cover all eventualities for each specific application and as such is not binding for us. Please, contact our technical service department in each case to find out what the actual technical state of development for the respective product is, and request the latest data sheet. Any use of our product without this precautionary measure would be your sole responsibility.

The processing company itself must therefore test the adhesives manufactured by us for suitability in each individual case. This applies to the first use of a sample as well as to modifications during an ongoing production.

We are therefore requesting all our new customers to test our adhesives for suitability on original parts at conditions equal to normal processing conditions. The bond has then to be subjected to the actual stress which it would undergo when in use and has to be assessed. This test is absolutely necessary.

Customers who undertake modifications during a running production are requested to pass this information on to us. Please notify us when machines are set to new parameters as well as when the substrates to be bonded are changed. Only then will Jowat be able to provide our most up-to-date information to the processor using our adhesives.

The information given in this leaflet is based on practical experience and on results of tests in our laboratory, and does in no way constitute any guarantee of properties. No liability may be derived from these indications nor from the recommendations made by our technical advisory service.