

# Innovative Adhesive Systems for **Sandwich** Production





Competence **PUR**



**KLEIBERIT Your worldwide partner for industrial adhesives**

## **KLEBCHEMIE M. G. Becker GmbH & Co. KG**

KLEIBERIT Adhesives is modern and future oriented with special adhesives for industrial applications. In the meantime, approx. 60,000 tons of adhesives are produced at the production location in Weingarten/Karlsruhe Germany for use in the automotive - parquet - window - door - furniture - building and textile industries.

The company, founded in 1948 by the Dr. Werner Fred Klingele and Max Georg Becker families, now undertakes international challenges under the managing director and shareholder Klaus Becker-Weimann. As approx. 80% of the adhesives are exported worldwide, subsidiaries were founded in France, UK, USA, Canada, Singapore, China, Japan and Russia over the years. 550 employees are employed internationally. A network of 70 Engineers are available for technical advice.

Due to the shareholders willingness to invest, the site in Weingarten has been expanded to a modern production facility including a high rack warehouse containing 6,000 spaces. A modern new Technical Center, where the latest adhesive technologies are shared with international customers, was opened in May 2009.

# **FAST**team

**Filter-Automotive-Sandwich-Textile**



The KLEIBERIT FASTteam specialises in bonds for the Filter, Automotive, Sandwich and Textile field and is available to apply its expertise to the realisation of your complex projects.

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# ***Sandwich...***



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## **Overview**

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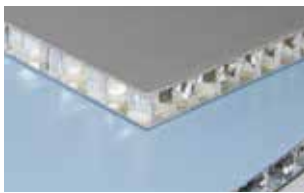
# Core Materials and Surface Layers...

## for Sandwich Panels and Lightweight Panels

### Materials and their characteristics

Together with the unique characteristics of the individual constructive elements, KLEIBERIT's innovative adhesive systems provide for highly flexible and durable bonds.

#### Core materials



Aluminium honeycomb



Plastic honeycomb



Foam core



Wood core



Paper honeycomb



Mineral wool

#### Surface Layers

Aluminium

Steel

Stainless Steel

GPR

GRP

HPL

Plexiglass

ABS

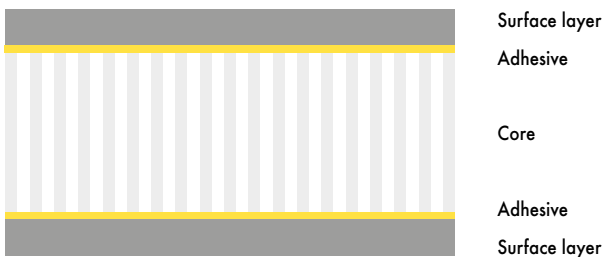
MDF

Plywood, etc.



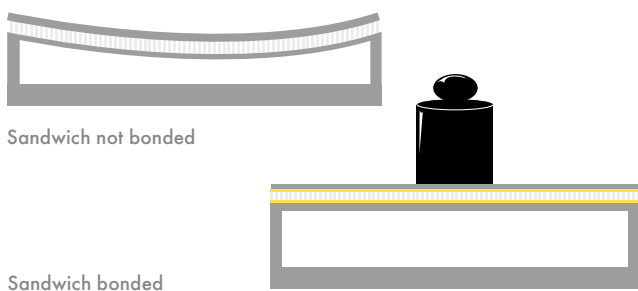
## Sandwich Panel Construction

Sandwich panels and lightweight panels are made up of multi-layer construction. Depending on the application, different core materials are bonded with different surface layers. The sandwich panel first gets its high load capacity and rigidity as a result of bonding the shear connected core with the surface layers.



Modern lightweight panels feature high strength, lightweight components, versatile design and are cost-effective. Their excellent form stability, torsional stiffness and high load capacity make it possible for use in transportation and construction as well as in machine and plant construction.

Together with the unique characteristics of the individual constructive elements, KLEIBERIT's innovative adhesive systems provide for highly flexible bond and guarantees long-lasting functionality.



## Applications

KLEIBERIT, an experienced adhesive supplier and source of ideas, develops individual and tailor made adhesives together with their customers.

### Application Fields



Automotive



Air-conditioning



Train interiors



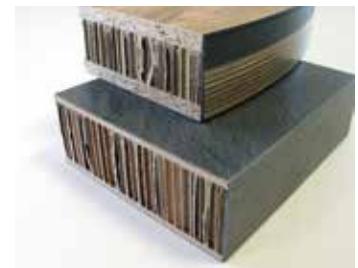
Shipbuilding



Interior partition walls



Building facades



Furniture parts

# KLEIBERIT® Adhesive-Systems

## Bonding Surface Layers with Core Materials

### 1C und 2C PUR-Adhesive Systems

KLEIBERIT is able to offer panel producers a complete range of products to satisfy the individual demands of customers. For sandwich panel production, the operator has the perfectly suited KLEIBERIT 1C or 2C PUR adhesive system available.

The KLEIBERIT range includes filled and unfilled systems, foaming and non foaming systems to suit the varying production lines supplied into this industry. Furthermore, KLEIBERIT continues to develop and investigate new formulations to maximise the adhesive and ultimately the finished panel's performance. The main 2C PUR systems that are used in this industry are:

**High foaming systems** - these rely on the foaming of the adhesive to penetrate into the core material and fill any voids between the surface layer and core material.

**Non-foaming or slightly foaming systems** - are used for non-permeable core materials or honeycomb material.

### KLEIBERIT PanelPUR A2

Since 1.10.2010, CE-labelling according to EN 14509 for self-supporting metal-sandwich insulation panels will be mandatory in the EU. Mineral-wool panel manufacturers will only have the opportunity to label their products according to EN 14509 Class A2 if the appropriate adhesive-systems are used.

For compliance with EN 14509 A2, KLEIBERIT has developed the new 1C and 2C PanelPUR A2 series with low calorific value (PCS).

- This allows the filled KLEIBERIT 577.1 good processing with spray application, e.g. jet stream, due to the low viscosity at room temp.
- Excellent and stable processing properties
- Increased application quantities possible due to low PCS values
- Excellent tensile strength
- DUR2 and Wedge tested



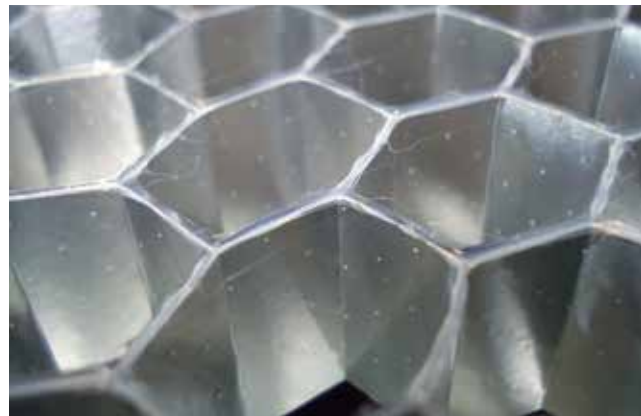
Tensile strength  
(material break  
mineral wool)



Mineral wool and coilcoating steel cover layers bonded with PanelPUR A2 KLEIBERIT 983.2.

**KLEIBERIT 983.2** has a very long open time, thermo-activating properties and a good bead positioning which allows for variability between adhesive application and the delivery of the metal surface layer, which is especially advantageous in discontinuous production and for variable double belt line speeds in continuous production, e.g. breaks, very slow operation or if there is a large distance from the portal where the adhesive is applied.

## Thermo-activated 2C PUR-Adhesive



Aluminium honeycomb bonded with aluminium cover layers with KLEIBERIT 543.8 2C PUR adhesive.

The advantage of thermo-activated adhesive is the long open time which is available when the adhesive is applied as a bead or with a roller with simultaneous short process cycles. The layers are pressed for approx. 5 minutes at 65°C. The finished panel can be further processed directly out of the press.

# KLEIBERIT® Adhesive-Systems

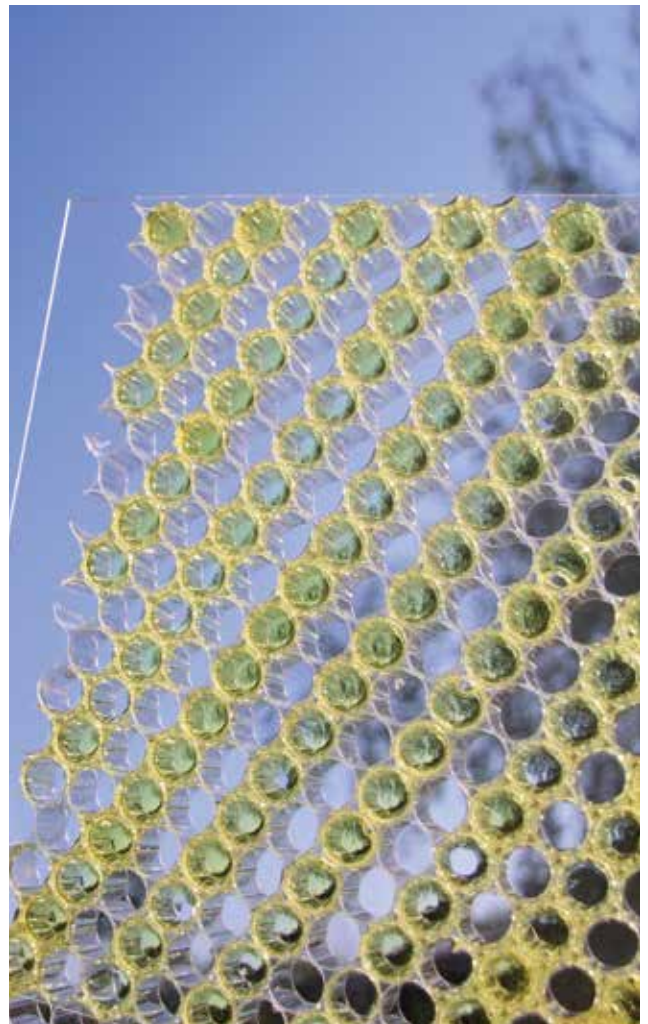
## Bonding Surface Layers with Core Materials

### UV Stable 2C PUR-Adhesive

- Numerous design possibilities through transparent, lightfast adhesive joints.
- Individual, decorative solutions through various colours. Elastic glue joints for good adhesion to a variety of substrates.



Transparent lightweight elements





## KLEIBERIT PUR-Hotmelts

With product group **706**, KLEIBERIT offers multiple application-oriented products.

**KLEIBERIT 706.0** is established in the market as a successful, universal PUR surface adhesive with a wide bondingspectrum.

**KLEIBERIT 706.2** shows especially good wetting on difficult to bond substrates.

**KLEIBERIT 706.5/706.8** or **706.6** can be used for applications with high memory effect.

The combination of good processing characteristics like smooth application texture, string free and roller stability is convincing.

**KLEIBERIT 706.9** is a product for bonding materials with high memory effect at high temperatures. Tolerances which often occur in the production of framed honeycomb panels are securely covered.

Numerous market requirements of particular types can be solved with KLEIBERIT flat lamination adhesives. Special products have the following characteristics:

- Fire retardant
- UV stable
- High temperature resistance

This is only a small extract from the comprehensive KLEIBERIT product range for flat lamination.

Realize innovation through working together with KLEIBERIT.



# Application Methods

## Continuous Production with 2C PUR-Adhesives

The choice of 2C PUR adhesive is influenced by the type of mixing and application method.

**Standard Bead Application:** Components A and B are mixed in a permanent static mixer and bead applied through a traversing head, the adhesive is applied to the skin on the bottom of the panel and to the core material for the top of the panel.



**Teflon Bead Head:** Components A and B are mixed in a disposable static mixer, the head is made from Teflon and is easily interchangeable thus allowing fast curing systems to be used.

**High Pressure Spray Application:** Components A and B are processed in a high pressure mix system and sprayed on the top and bottom cover layers.

**Standard Spray Application:** Components A and B are processed in a low pressure system and sprayed with air pressure on the top and bottom cover layers.

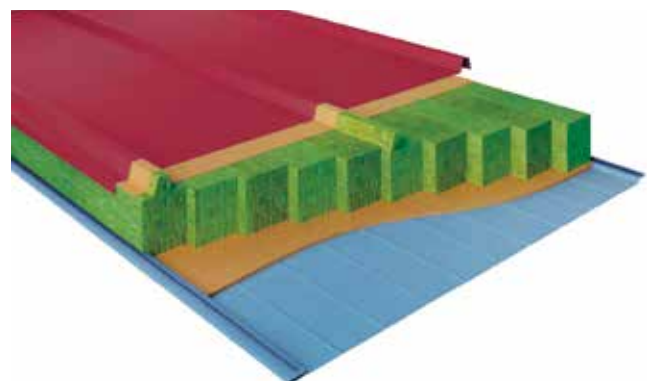
**Wiper:** Components A and B are bead applied onto the skin of the panel separately and mixed on the skin using a wiper.



After mixing and dosing it is essential that the cure speed is tuned to match ...

- The line speed and the length of line in order to ensure that the open time of the adhesive has not been expired.
- The pressing time and temperature, to ensure sufficient curing has taken place to allow the panel to be cut and handled without any delaminating.

Combined with the experience and laboratory data of the adhesive performance an adhesive recommendation can be made.



## Manual Application

When selecting the adhesive the following parameters must be considered to ensure the correct choice of adhesive for the production line:

- Adhesive mixing and dosing method
- Adhesive application temperature
- „A“ portal distance top
- „B“ portal distance bottom
- Maximum and minimum line speed
- Pressing temperature
- Temperature of cover layers
- Application amount/substrate



For manual application with a spatula, universal types with longer open time are available.



## Cleaning

**KLEIBERIT 820.0** for daily cleaning of non-cured adhesive in the hose and application unit.

**KLEIBERIT 825.0** for daily storage of application units with un-cured adhesive.

**KLEIBERIT 826.0** for cleaning components contaminated with cured material. Please note that the components must be heated up to 180 °C until all traces of the cured material has been removed.

# Application Methods

## Roller application with PUR-Hotmelt

### KLEIBERIT PUR-Hotmelts

Roller applicators are predominantly in use in bonding large areas and less flexible materials. Typical examples are all types of multi layer sandwich elements.

Flat laminating of large areas such as chipboard with more flexible materials such as foils and papers can be done using wide slot nozzles.



KLEIBERIT PUR-HM's are applied either with conventional equipment by heated roller applicator or applied in a foamed form by slot nozzle.

This foaming is achieved with specially designed application machinery which adds argon or nitrogen to the molten adhesive. The PUR-HM is then applied to the honey comb via slot nozzle and remains as a flange at the comb walls. This increases the bonding area and therefore the bonding strength.

### Advantages:

- economical consumption of the adhesive
- larger bonding surface, due to bulge formation
- even application to the honey comb, no leaking into the cells
- optimal adhesive application as excess spread is avoided

### Pressing:

The pressing of the elements is done via press calendars or roller presses. After pressing, the boards can be stacked immediately in the appropriate stacking systems.

### Application

The application temperature of reactive PUR hotmelts is usually between +120 °C and +140 °C.

The PUR-HM is melted in its original delivery container using special equipment and is then pumped through heated pipes to the application roller. The adhesive is applied to the substrate via direct contact with the application roller.





The covering substrate is then either applied by hand or machine and the required pressure is applied via the press rollers. This process is mainly used for very large areas using rigid materials.

With slot nozzle systems the adhesive is usually applied to the flexible rolled up material and the online pressing is done immediately afterwards via large area calendars.

The maximum line speed is max. 80 m/min.

### Cleaning

After completion of work the application rollers have to be cleaned completely with **KLEIBERIT 761.8 Cleaner** or **761.5**. Remaining hot melt in pipes and melting vessels should be kept under air and humidity tight condition.

Slot nozzle openings can be sealed airtight and therefore remaining hot melt can be left inside the system. Any other remaining PUR hot melt should be cleaned off with **KLEIBERIT 761.7 Cleaner**.

PUR hot melt, which is left to cross-link can only be removed mechanically.



## KLEIBERIT PUR-HM for Sandwich and Panel Production:

KLEIBERIT PUR-Hotmelts	Product	Viscosity at 120°C [mPa·s]	Viscosity at 140°C [mPa·s]	Open Time [min]	Shore A/D 1d	Shore A/D 7d	Wood based material panels	Solid wood	Veneer	Steel	Aluminium	Epoxy lacquers	Polyester fibre glass compounds	PVC / ABS	HPL / CPL Panels	Insulating material (polystyrene) hard foam	
	700.5	6.000	3.000	2,5	93/26	96/36	•	•	•	•	•	•	•	•	•	•	•
	705.1	18.000	9.000	1	90/20	90/30	•	•	•	•	•	•	•	•	•	•	•
	706.0 (ME)*	12.000	6.000	3-4	90/20	90/30	•	•	•	•	•	•	•	•	•	•	•
	706.1	12.000	6.000	4	49/<10	90/30	•	•	•	•	•	•	•	•	•	•	•
	706.2	12.000	6.000	10	45/<15	85/25	•	•	•	•	•	•	•	•	•	•	•
	706.4	35.000	15.000	3-4	85/15	95/35	•	•	•	•	•	•	•	•	•	•	•
	706.5	16.000	8.000	2-3	55/<15	90/35	•	•	•	•	•	•	•	•	•	•	•
	706.6	12.000	6.000	2	90/20	90/30	•	•	•	•	•	•	•	•	•	•	•
	706.7	16.000	8.000	3	74/15	94/40	•	•	•	•	•	•	•	•	•	•	•
	706.8	16.000	8.000	2-3	85/20	90/35	•	•	•	•	•	•	•	•	•	•	•
	706.9	30.000	20.000	5	65/<15	95/40	•	•	•	•	•	•	•	•	•	•	•
	709.1	11.000	5.000	6-7	72/<10	95/30	•	•	•	•	•	•	•	•	•	•	•
709.4	8.000	4.000	3-4	88/17	90/25	•	•	•	•	•	•	•	•	•	•	•	

\* All products also as microemission version available

**The technical data were determined according to KLEIBERIT's test procedures!**

During application, a minimum temperature of 18°C for the substrates as well as the working environment is necessary. Avoid drafts!

PVC foil	Sanding paper	Honeycomb panels	Flame retardant material	Impermeable Materials HPL - Alu - PVC	Application-methods	Characteristics Advantages	Application fields
•		•		•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Nozzle</li> </ul>	<ul style="list-style-type: none"> <li>• Extremely tacky</li> <li>• Good wetting even of difficult substrates</li> </ul>	Polystyrene, wood and wood based materials, PVC, aluminium, sheet metal
•		•		•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Nozzle</li> </ul>	<ul style="list-style-type: none"> <li>• Highly resilient bond</li> <li>• Low process temperature</li> <li>• Very high green strength</li> </ul>	Veneer on wood based materials, carpet on Baypreg®-panels, trunk flooring
•		•		•	<ul style="list-style-type: none"> <li>• Roller</li> <li>• Doctor blade</li> <li>• Nozzle</li> </ul>	<ul style="list-style-type: none"> <li>• Very resilient</li> <li>• Suitable slot nozzle, very good doctor blade, can be applied with roller</li> </ul>	Microemission, universal PUR
•					<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Nozzle</li> </ul>	<ul style="list-style-type: none"> <li>• Long open time</li> <li>• Very resilient</li> <li>• Suitable slot nozzle, very good doctor blade, can be applied with roller</li> </ul>	Carton-honeycomb and porous materials
•	•	•			<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• Very high green strength</li> <li>• Long open time</li> <li>• Long stability on roller</li> <li>• Low odor</li> <li>• Minimal stringing</li> </ul>	Thin laminates, low viscosity
•				•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• Very high green strength</li> <li>• Highly heat resistant, water resistant very cold resistant,</li> <li>• Highly resilient bond</li> </ul>	Thick laminates, high viscosity
•	•	•			<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• Very high green strength</li> <li>• High strength, low creep</li> <li>• Long stability on the roller</li> <li>• Low odor</li> <li>• Minimal stringing</li> </ul>	Foaming PUR for wood and porous materials
•	•	•		•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• Very high green strength</li> <li>• High strength</li> <li>• Highest creep resistance</li> <li>• For high requirements</li> <li>• High memory force</li> </ul>	Door panels
•	•	•		•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• High strength</li> <li>• Low process temperature</li> <li>• Very high green strength</li> <li>• Highly creep resistant</li> </ul>	Door panels
•	•	•			<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> <li>• Doctor blade</li> </ul>	<ul style="list-style-type: none"> <li>• Very high green strength</li> <li>• High strength; highly creep resistant</li> <li>• Long stability on the roller</li> <li>• Low odor</li> <li>• Minimal stringing</li> </ul>	Fast 706.5, i.e. for sponges
•	•	•		•	<ul style="list-style-type: none"> <li>• Roller</li> <li>• Nozzle</li> </ul>	<ul style="list-style-type: none"> <li>• High strength also in warm ambient temperature</li> <li>• Long stability</li> <li>• For very high memory effect</li> </ul>	Honeycomb and thick laminates, high viscosity
•				•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> </ul>	<ul style="list-style-type: none"> <li>• Long open time</li> <li>• High green strength</li> </ul>	Metal
•				•	<ul style="list-style-type: none"> <li>• Spray</li> <li>• Roller</li> </ul>	<ul style="list-style-type: none"> <li>• Low process temperature</li> <li>• Very high green strength</li> <li>• Homogenous application characteristics</li> <li>• Excellent roller stability</li> </ul>	High gloss

**Before application, acquire and observe the individual data sheet!**

The statements made herein are based on field experience and our own tests. The information is no characteristic assurance in sense of the newest BGH legal requirements. As we have no influence on the variety of materials nor their processing, we can not accept liability for the above statements or our free advice given by our technical team. We recommend in any case to conduct individual tests to establish suitability.

## KLEIBERIT 1C PUR for Sandwich and Panel Production

KLEIBERIT 1C PUR-Adhesives	Product	Colour	Viscosity [mPa·s]	Density [g/cm <sup>3</sup> ]	Open time [min]	Pressing time [h]	Properties	Application fields
	502.1	transparent	6.600	1,07	50	2 - 4	Elastic transparent glue line	Laminate bonding of wooden materials, sandwich panels
	502.2	transparent	6.600	1,07	65	2,5 - 4	Very short pressing time	Laminate bonding of wooden materials, sandwich panels
	502.5	amber	6.000	1,10	120	6 - 8	Elastic whitish glue line, long open time	Laminate bonding of wooden materials, sandwich panels
	502.6	transparent	3.600	1,08	55	2 - 3	Elastic transparent glue line	Laminate bonding of wooden materials, sandwich panels
	502.9	transparent	3.500	1,08	120	4 - 6	Elastic transparent glue line	Laminate bonding of wooden materials, sandwich panels
	503.5	amber	6.800	1,10	120 60 (humidified)	5 - 7 2,5-3 (humidified)	Elastic, glue line	Laminate bonding of wooden materials, sandwich panels
	503.6	amber	7.000	1,10	50	2	Elastic, glue line	Laminate bonding of wooden materials, sandwich panels
	503.9	amber	6.800	1,10	18	1	Elastic glue line	Laminate bonding of wooden materials, sandwich panels
	505.9	amber	4.600	1,12	7	8 min (40% humidified)	Medium hard glue line, Extreme short pressing time	Sandwich panels, EPS
506.6	amber	4.000	1,14	50	2	Medium hard glue line	Sandwich panels, OSB and EPS	

## KLEIBERIT 2C PUR for Sandwich and Panel Production

KLEIBERIT 2C PUR-Adhesives	Product Comp. A	Colour	Viscosity [mPa·s]	Density [g/m <sup>3</sup> ]	Product Comp. B	Mix-ratio A-B [pbw] [pbw]	Pot life (50g)	Shore Hardness	Properties	Application fields
	541.6	beige	30.000	1,59	541.7	4 : 1	45 min	D 82	Long pot life for manual application	Moulding material and adhesive
	542.6	beige	12.000	1.50	542.7	5 : 1	5 h	A 90	Flexible glue line	Laminate bonding of coated metal or plastic layers onto insulation cores
	542.8	beige	10.000	1.47	542.9	5 : 1	7 h	A 85	Flexible glue line	Sandwich-Elements
	543.8	beige	6.600	1.42	543.9	100 : 25	50 min	D 70	Thermo-activated	Sandwich-Elements Alu-Honeycomb
	578.8	transparent	4.000	1,08	578.0	100 : 170	50g Start time: 30 sec Adhesion-free: 38 sec		Foamed adhesive	Continuous Sandwich panel production
596.6	beige	11.000	1,45	596.7	100 : 25	60 min	D 76	For roller application	Galvanized metal layers to wood particle boards	



## PanelPUR<sup>A2</sup> Series

KLEIBERIT 2C PUR-Adhesives for continuous lamination of mineral wool panels class A2 according to EN 13 501-1

Comp. A	Type	Application Technology	Mixing Ratio (A/B) by weight	PCS Calorific Value [MJ/kg]	Viscosity at @20°C (A/B) [mPas]	Application Temperature (A/B) [°C]	Start Time (80 g mixture at 20°C) [sec]	Tack-free Time (80 g mixture at 20°C) [sec]	Press Time* [min]
508.9	1C PUR	spray or bead system	n.a. (10% water mist)	21,5	10,000	20-30	n. a.	n. a.	6 at 45°C
570.2	2C PUR	spray system (e.g. PUMA / Robor)	100:40	16,5	9,500/300	20-30	20	90	3-4 at 45°C
570.5	2C PUR	bead system	100:36	17	6,000/300	20-30	18	120	3-4 at 45°C
570.9	2C PUR	spray system (e.g. PUMA / Robor)	100:56	17	3,000/300	20-30	20	47	3-4 at 45°C
577.1	2C PUR	jet stream application head (high pressure system)	100:62	17,5	2.400/300	20-30	18	50	3-4 at 45°C
577.9	2C PUR	spray system (e.g. PUMA / Robor)	100:40	18	14.000/300	20-30	33	110	4 at 45°C
578.1	2C PUR unfilled	spray or wiper system	100:115	27.2	350/300	20-30	10	25	3-4 at 45°C
578.5	2C PUR unfilled	jet stream application head (high pressure system)	100:140	26.8	170/1,000	20-30	29	63	3-4 at 45°C
983.2	2C PUR thermo activated	spray system (e.g. PUMA / Robor)	100:48	17	7.000/300	20-30	90	270	4 at 60°C

\* Presstime depends on machine setup and processing conditions

## Notes

## Notes



## **KLEIBERIT® Adhesives worldwide**

### **KLEIBERIT Adhesives (Head Office)**

KLEBCHÉMIE M. G. Becker GmbH & Co. KG  
Weingarten/Germany

### **KLEIBERIT Adhesives UK**

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### **KLEIBERIT AUSTRALIA Pty Ltd.**

Sydney, Australia

### **KLEIBERIT Russia**

Moscow, Russia

### **KLEIBERIT Adhesives Japan**

Osaka, Japan

### **KLEIBERIT Adhesives Beijing Co., Ltd.**

Beijing, China

### **KLEIBERIT Adhesives Asia Pte. Ltd.**

Singapore, Singapore

### **KLEIBERIT Adhesives India Private Ltd.**

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### **KLEIBERIT Kimya San. ve Tic. A.Ş.**

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### **KLEIBERIT Bel**

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### **KLEIBERIT do Brasil Comércio de Adesivos e Vernizes Ltda.**

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