

## Technical Data Sheet

### Wood & Specialty Adhesives

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## Prefere 4535

Liquid melamine-urea resin adhesive for finger joints.

### Use

Prefere 4535 is a liquid melamine-urea resin adhesive, which is used together with the liquid hardeners Prefere 5035 or Prefere 5046 in the manufacture of glued laminated timber structures and for finger jointing. When the gluing is carried out in accordance with the instructions in this Technical Data Sheet, Prefere 4535 gives water- and weatherproof, gap-filling bonds, conforming to Adhesive Type I of the European standards for adhesives for load-bearing wooden structures (EN 301 and EN 302). The glue lines are light-coloured and do not darken over time.

Nordisk Limtrenemnd (The Nordic Glulam Committee) has approved Prefere 4535 with hardeners Prefere 5035 and Prefere 5046 for use in the manufacture of load-bearing wooden structures for climate class 1, 2 and 3 (interior and exterior use) from coniferous woods.

Prefere 4535 with hardener Prefere 5035 and Prefere 5046 has been tested according to the German Standard DIN 68 141 by MPA, Otto-Graf-Institut, Stuttgart and found to be suited for gluing load-bearing wooden structures for indoor and exterior use in accordance with DIN 1052.

Prefere 4535 is approved for finger-jointing with separate application of hardener Prefere 5035 by DIBT (Deutsches Institut für Bautechnik, Allgemeine bauaufsichtliche Zulassung Z-9.1-615).

Prefere 4535 is approved for the use in production of load-bearing wooden structures by CTBA (France), KOMO (Holland) and BUTgb (Belgium). For details please contact our marketing department.

Prefere 4535 is also well suited for a number of other bonding operations. It can be used for hot and cold bonding and for bonding under radio frequency glue line heating conditions.

Prefere 4535 has low formaldehyde content and therefore offers the possibility to maintain a healthy working environment and at the same time achieve glue bonds exhibiting minimal formaldehyde emissions.

### Glued laminated timber structures

Prefere 4535 has proven very well suited for laminated timber structures. For more information on this subject, please refer to the separate technical data-sheet Prefere 4535 Laminating.

**Technical data for the resin**

Appearance	Milky white liquid
Solids content	63-65 %
Viscosity at 25°C	3000-3500 mPa.s
pH at 25°C	9.5-10.0
Density at 25°C	1.22-1.24 g/cm <sup>3</sup>

**Storage of the resin**

Depending on the storage temperature Prefere 4535 may be stored for up to 6 months. The table below shows the shelf life (from the date of production) for Prefere 4535 at different storage temperatures.

Storage temperature	Shelf life
5-10°C	Approx. 6 months
15°C	Approx. 5 months
20°C	Approx. 4 months
25°C	Approx. 3 months
30°C	Approx. 2 months

The optimal storage temperature is 10-15°C. Cold resin is high in viscosity and may be difficult to pump.

Customers who receive bulk supplies of Prefere 4535 to their own storage tank, are referred to our Technical Information Leaflet No. 5E "Bulk storage and handling of liquid resins" which contains useful advice on storage of resins and operation of storage tanks.

Prefere 4535 is not flammable.

**Technical data for the hardeners**

	Prefere 5035	Prefere 5046
Appearance	Greyish-white liquid	White liquid
Viscosity at 25°C	Approx. 3000 mPa.s	Approx. 3000 mPa.s
pH at 25°C	Approx. 1.0	Approx. 2.0
Density at 25°C	Approx. 1.3 g/cm <sup>3</sup>	Approx 1.1 g/cm <sup>3</sup>

**Hardener storage**

Prefere 5035 may be stored for up to 6 months in the original containers. It must not be allowed to freeze. Prefere 5046 has a shelf life of approximately 4 months when stored in original containers between 5 and 25°C.

**Glue mix preparation**

The reactivity of the glue mixture can be adapted to the production requirements (pot life, assembly time and pressing time). Resin and hardener can be used for finger jointing in the ratios given below.

Prefere 4535	100 pbw	100 pbw	100 pbw
Prefere 5035	15-60 pbw	20 pbw	-
Prefere 5046	-	-	15-60 pbw
Water	-	5 pbw	-

These glue mixtures are suited for automatic metering/mixing equipment. If resin and hardener are mixed by hand, one should be aware that the hardener has a different specific gravity from the resin. In order to obtain a homogeneous glue mix it is therefore advisable to stir from the bottom in order to ensure satisfactory mixing.

Heat is evolved when resin and hardener are mixed. More heat is evolved the higher the initial resin temperature is. By storing the resin at optimum storage temperature a longer pot life is obtained (see the below).

It must be demonstrated that automatic metering/mixing equipment to be used to mix Prefere 4535 and hardener is suitable for this special operation.

No fillers or extenders may be added to the glue mixes.

**Pot life**

Once resin and hardener are mixed, the curing reaction starts. This reaction proceeds until the resin is cured completely. How long this takes, depends on the temperature and the amount of hardener. Thus the pot life, i.e the time the glue mix is applicable, is shorter the higher the temperature is. Examples are given in the table below.

Resin :Hardener	Pot life in hours at			
	15°C	20°C	25°C	30°C
100:15	3 ¼	2 ¼	1 ⅓	¾
100:20	2 ½	1 ⅔	1	⅔
100:25	2 ¼	1 ⅓	¾	½
100:30	2	1 ¼	¾	⅓
100:35	1 ¾	1	½	¼
100:20:5 pbw water *	3	2	-	-

\* Only with Prefere 5035

### **Separate application of glue and hardener**

Prefere 4535 is approved with a hardener dosage from 15 to 60 pbw of Prefere 5035 and Prefere 5046. This makes the system well suited for separate application of glue and hardener.

With separate application it must be controlled that both glue and hardener covers the finger surfaces. It must be demonstrated that automatic equipment to be used for separate application of Prefere 4535 and Prefere 5035/Prefere 5046 is suitable for this special operation.

### **The wood**

EN 385 specifies that the timber to be finger jointed shall have temperature of at least 15°C. The difference of moisture content between two ends of timber to be jointed shall not exceed 5 %. With Prefere 4535 the moisture content of the timber can be between 8 and 23%.

### **Glue spread**

EN 385 requires that the application method used in finger jointing shall ensure that all fingers are covered with the glue. This requirement can be assumed met if glue is squeezed out on all surfaces of the joint when the end pressure is applied. To ensure satisfactory glue coverage application of glue to both ends to be jointed is recommended.

### **Assembly time**

Assembly time is the time elapsing between glue application and pressure application. It can be subdivided in open (from glue application until assembly of the adherents) and closed assembly time (from assembly until pressure is established).

Open assembly time should be kept as short as possible.

The maximum closed assembly time at temperatures between 15-25°C will be 30-60 minutes. With RF preheating of the materials the assembly time will be significantly shorter and must be adjusted depending on the achieved temperature in the pre-heating zone. This applies to softwood when the relative humidity of the air is approx. 60 %.

Under all circumstances the adhesive must still be tacky when the pressure is applied. Adhesive being squeezed out of the glue line when the pressure is applied is an indication that the assembly time is not exceeded.

**Pressure**

In finger jointing the end (longitudinal) pressure should be adapted to the joint profile, wood species, the moisture content and the cross section of the timber. For most softwoods an end pressure in the order of 2-5 N/mm<sup>2</sup> will be sufficient for finger joints of 25 mm length. For shorter joints an end pressure of 5-10 N/mm<sup>2</sup> is necessary. If pre-heated wood is used, there is a risk that the pressure may cause compression fracture of the wood, in particular if the moisture content of the wood is high. In such cases the pressure must be reduced.

**Curing**

Finger joints can either be cured in a heated workshop, or the curing can be accelerated by means of hot dies, radio frequency heating or pre-heating of the wood. The curing is dependent on the achieved temperature of the glue-line. Below is a table with values that can be used as guidelines.

Glue line temperature	Curing time to full water resistance	
	20 pbw hardener	45 pbw hardener
20°C	72 hours	12 hours
25°C	15 hours	4 hours
30°C	7 hours	2 hours
35°C	3,5 hours	1 hours
40°C	1,5 hours	0,5 hours
45°C	50 minutes	18 minutes
50°C	30 minutes	12 minutes
55°C	17 minutes	8 minutes
60°C	10 minutes	5 minutes
65°C	7 minutes	4 minutes
70°C	5 minutes	3,5 minutes
75°C	3,5 minutes	2,5 minutes
80°C	2,5 minutes	1,75 minutes

At the lower temperatures the strength build-up will be faster than the time to 100% water resistance.

Glue line temperature	Curing time to full bending strength	
	20 pbw hardener	45 pbw hardener
20°C	16 hours	5 hours
25°C	6,5 hours	2,5 hours
30°C	3,5 hours	1 hour

With radio-frequency heating of the ends, the temperature in the glue-line will drop with 5-10°C/minute depending on the temperature of the materials and the achieved glue-line temperature. Experiments have shown that with a glue-line temperature of 75-80°C when pressure is applied the time to 100% water resistance will be 10 minutes. At 55-60°C the curing time will be 2 hours.

With RF pre-heating of the ends the lowest recommended temperature when pressure is applied is 55°C. With RF curing of the glue the glue-line temperature should be at least 60-70°C after the press.

### **Cleaning**

The mixing and spreading equipment should be cleaned at the end of each working day. If the glue mix thickens in the application equipment, the equipment must be immediately emptied and cleaned because otherwise there is a risk that the glue will cure. Cured glue is insoluble and must be scraped off.

Cleaning is most easily done with warm water (40-60°C). However, as this glue has very good washability, fresh glue mix can be washed with water with temperatures down to 25°C. Before flushing of the equipment is started, the water pipes should be drained of cold water.

Melamine-urea resins are potential water pollutants. Glue remainders and untreated wash water may not be discharged into public drains or watercourses unless a permit has been obtained from the appropriate authorities. Advice on safe handling of glue remainders and wash water can be found in our Technical Information Leaflet No. 2E "Glue waste disposal - Prevention of pollution".

### Safety precautions

Reference is made to the Safety Data Sheet for Prefere 4535 and hardeners Prefere 5035 and Prefere 5046.

When the adhesive and the hardener are mixed a chemical reaction will start. The pH of the mixture will be in between the value for the adhesive and the hardener. The free formaldehyde content for the adhesive will be reduced. The acid/salt concentration of the hardener will be diluted.

When handling the adhesive, the hardener and the gluemix it is recommended that certain precautions, normally taken when handling chemicals, is observed. Skin contact with the uncured glue should be avoided, since people with particularly sensitive skin may be affected. It is recommended to wear protective gloves, likewise eye protection where there is a risk of splashes. Hands and forearms should be thoroughly washed with soap and warm water at the end of the working day.

Adequate ventilation of the workshops should be maintained.

### Notice

The manufacture of laminated timber structures normally is subject to control procedures implemented by the authorities or other regulatory bodies. To satisfy these requirements, certain guidelines have to be followed in the production. These guidelines vary from country to country. They may, on some points, differ from the instructions given above. In such cases the manufacturer must obey the regulations applicable.

*The suggestions given in these notes are based on data gained from experience and tests. However, since operating conditions in the user's plant is beyond our control, we cannot assume responsibility for any risks or liabilities that may result from the use of our products.*

Replaces Prefere 4535 for finger jointing dated July 2007

EM/OJB/RB 10.2008.