

## Prefere 4720

Liquid melamine adhesive for the wood industry

### Use

Prefere 4720 is a liquid melamine urea adhesive which is used together with the liquid hardener Prefere 5020 in the manufacture of load bearing timber structures. Prefere 4720 is well suited for radio frequency curing as well as for hot and cold curing. The glue lines of this adhesive system are light-coloured and will not darken over time.

When the gluing is carried out in accordance with the instructions in this Technical Data Sheet, Prefere 4720 gives water- and weather proof bonds, conforming to Adhesive Type 1 of the European standards for adhesives for load-bearing wooden structures (EN 301:2006).

Prefere 4720 with hardener 5020 has been tested by MPA (Otto-Graf-Institut, Stuttgart), as well as by NTI (Norsk Treteknisk Institutt, Oslo) according to DIN 68 141 and EN 301:2006, and fulfils the requirements for the gluing of load-bearing wooden structures according to EN 14080:2005 and DIN 1052.

Prefere 4720 is approved by NTI for finger jointing according to JAS MAFF.

Prefere 4720 with hardener Prefere 5020 is tested by TECO (USA) according to ASTM D2559-03 and fulfils the requirements in ANSI/AITC A190.1-1992 part 4.4.1.2 for the gluing of Scottish pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*) in the manufacture of load-bearing timber structures.

Prefere 4720 is approved for the use in production of load-bearing timber structures by FCBA (France) and KOMO (Netherlands).

Provided that Prefere 4720 is used according to the instructions in this technical data sheet, the end-products will exhibit minimal emissions.

### Technical data for the adhesive

Appearance	Light grey/white viscous liquid
Solids content	67-69 %
Viscosity at 25°C	4000-12000 mPa.s *
pH at 25°C	8,5-10,0
Density at 25°C/4°C	1,26±0,02 g/cm <sup>3</sup>

\*The viscosity is measured by Brookfield, RVT, spindle 4 at 20 rpm.

## Storage of the adhesive

The storage stability of the adhesive is temperature dependent. The adhesive can be stored at a temperature of 20°C for up to 4 months. If the adhesive is stored at higher temperatures the viscosity will increase rapidly and phase separation may occur. At lower temperature the adhesive will be thixotropic and it will have high viscosity and be difficult to pump.

Temperature (°C)	Storage stability (months)
15	1
20	4
25	3
30	1

Customers who receive bulk supplies of Prefere 4720 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 4547 is not flammable.

## Technical data for the hardener

	Prefere 5020
Appearance	White viscous liquid
Viscosity at 25°C*	3000-4000 mPa.s *
pH at 25°C	1,5-2,5
Density at 25°C/4°C	1,10±0,02 g/cm <sup>3</sup>

\*The viscosity is measured by Brookfield, RVT, spindle 4 at 20 rpm.

## Storage of the hardener

The optimal storage temperature is 5-25°C. At this temperature the storage time is 3 months. Higher and lower storage temperatures will result in a faster viscosity increase.

## The wood

The European standard EN 386 specifies requirements on wood to be used for laminated timber structures. The moisture content shall be 8-15 %. The maximum allowable difference in moisture content between two adherents to be bonded together is 4 %.

EN 386 also deals with the temperature during the curing of the glue mix. Most of the curing should take place at a temperature of at least 20°C if the wood temperature is above 18°C and at a temperature of at least 25°C if the wood temperature is above 15°C. Colder wood than 15°C may not be bonded. The wood should be planed less than 24 hours before bonding.

EN 385 specifies that the timber to be finger-jointed shall have moisture content between 8% and 18%. The difference of moisture content between two ends of timber to be jointed shall not exceed 5 %.

### Glue mix preparation

The following glue mixes (in pbw) are approved for laminated timber structures.

	Prefere 4720	Prefere 5020	Water
Laminating, mixed application	100	10-100	-
Laminating, separate application	100	20-100	-
Finger-jointing, mixed application	100	10-100	-
Finger-jointing, separate application	100	100±50	-
Finger-jointing, separate application	100	100	5 *

\*In case of adding water, the total amount of water can be varied up to 5 parts. The respective amount can be added to one of the components prior to gluing or can be divided between the components.

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

### Glue application

#### Separate application of glue and hardener

Prefere 4720 and hardener Prefere 5020 are preferably applied with sequential ribbon spreaders especially suited to this purpose. The principle is that the first extruder is used for the hardener and the second for the adhesive. Three ribbon spreaders, ECOTOP T350 from Oest GmbH & Co. Maschinenbau KG, IFA GM-2K from IFA Industrielle Wiegetechnik GmbH and Type Mixon 2800 from Mixon AB have proven to work very well. These ribbon spreaders ensure correct ratio between adhesive and hardener and keep the application rate of the two components constant.

By use of the separate application technique no glue mix is made. Consequently the pot life issue is completely removed. But as mixing and blending of the adhesive take place on the surface of the lamellas, it is very important to have strict control of the planing quality (maximum glue line thickness 0,3 mm) as well as the glue and hardener spread, the assembly time and the final pressure of the press.

#### Mix-in application of a glue and hardener

It must be demonstrated that automatic metering/mixing equipment to be used is suitable for this special operation.

If adhesive and hardener are mixed by hand, one should be aware that the adhesive has a different specific gravity than the hardener. In order to obtain a homogeneous glue mix it is therefore advisable to stir from the bottom.

### Pot life

Heat is evolved when adhesive and hardener are mixed. More heat is evolved the higher the initial adhesive temperature is. Once adhesive and hardener are mixed, the curing reaction starts. This reaction will cause increased viscosity and proceeds until the glue mix is cured completely. The reaction rate will increase with temperature and amount of hardener. The pot life (the time to unusable viscosity) for the different glue mixes is given in the table below.

Dosage (pbw)	Pot life at 20°C in minutes
100:10	130
100:20	75
100:40	45
100:60	30
100:80	25
100:100	20

### Glue spread

In the manufacture of laminated timber structures the adhesive should be applied to one surface only at a rate of 250-500 g/m<sup>2</sup> if a ribbon spreader is used, and at a rate of 125-250 g/m<sup>2</sup> coated surface (application to both surfaces) if a roller spreader is used. Application to both surfaces is advantageous when bonding difficult-to-bond wood species. Lower glue spread can be sufficient depending on production technique, planing quality, required assembly time and pressing process. This should only be done after seeking technical advice from Dynea.

### 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 and should not exceed 5 min. On the other hand, 5 -15 minutes closed assembly is beneficial, in particular when dense wood is being bonded.

Maximum closed assembly time depends first of all on the glue spread rate and hardener dosage, further on wood species, temperature and moisture content of the wood, temperature, relative humidity and air circulation in the workshop. The lower the spread rate, the higher the temperature and the drier the air, the shorter will the assembly time be. Provided the lamellas are assembled immediately after glue application, the maximum assembly times for given hardener dosages are stated in the tables below.

Maximum closed assembly time in minutes at 20 °C for separate application		
Dosage (pbw)	250 g/m <sup>2</sup>	350 g/m <sup>2</sup>
100 : 20	120	150
100 : 50	90	120
100 : 100	45	60

Maximum closed assembly time in minutes at 20 °C for mix-in application		
Dosage (pbw)	250 g/m <sup>2</sup>	350 g/m <sup>2</sup>
100 : 10	120	150
100 : 50	75	105

The times apply to softwood at a relative air humidity of 65% and a room temperature of 20°C.

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

The pressure is dependent on the wood species (softwood or hardwood) and on the type of bonding operation.

In the manufacture of laminated timber structures the pressure should be 0.6-1.0 N/mm<sup>2</sup> with softwoods and 0.8-1.2 N/mm<sup>2</sup> with hardwoods. In other bonding operations a lower pressure may be sufficient.

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, thus it should therefore be determined accordingly. For most softwoods an end pressure of the order of 5-8 N/mm<sup>2</sup> will be sufficient for finger joints over 25 mm in length. For shorter joints an end pressure of 8-12 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.

### Pressing properties

#### Cold curing

In the table below, the minimum pressing times when manufacturing straight beams with a maximum glue line thickness of 0,1 mm are given. In the case of thicker glue lines additional pressing time is required. Curved structures require extended pressing times. The smaller the radius of curvature, the longer pressing times are required.

Dosage (pbw)	Pressing time in minutes				
	15°C	20°C	25°C	30°C	40°C
100:100	260	95	75	35	15
100:60	-	120	-	-	-
100:50	-	150	85	40	15
100:40	-	180	-	-	-
100:20	-	260	105	75	20
100:10	-	380	220	-	-

If the bonding is accomplished at elevated temperature in curing chambers, the time to reach the desired temperature in the glue line must be added to the pressing times above. This additional time depends on the chamber temperature, the initial temperature of the wood and, in particular, on the width of the laminations. Prefere 4720 also works perfectly with the *Dynea Curesafe* system to determine the correct pressing and assembly times at different temperatures.

Our Technical service Department will assist in calculating the necessary pressing time.

#### Radio frequency curing

Prefere 4720 is very well suited for curing under radio frequency heating conditions.

Since the necessary pressing times depend on a number of factors, such as the shape of the adherents, the position of the electrodes, the effect of the generator, etc. it is recommended to optimise the pressing times by trials.

Our Technical services Department can advise on establishing press times and how to make glue line temperature measurements when radio frequency heating is employed. A typical glue line temperature will be in the range 60-80°C in combination with a wood temperature of 35-40°C. It can be either higher or lower depending on the type and settings of the press.

## Post curing

After expiration of the above pressing times the adhesive is sufficiently cured to allow for machining. Full water resistance of the bonds will however only be reached after some time. The necessary time for post curing depends on the glue mix, glue line thickness, pressing time and the temperature during pressing and post curing. The following table shows minimum post curing times for a glue line thickness of 0,1 mm at an application amount of 250 g/m<sup>2</sup> and at a storage temperature of 20°C.

Dosage (pbw)	Time to water resistance at 20°C in hours
100 : 100	2
100 : 30	18
100 : 10	48

If the curing takes place by means of radio frequency curing, in curing chambers at elevated temperatures or by hot curing, the post curing time will be reduced. Our Technical service Department will assist in establishing the necessary post curing times. During the post curing period the structures should not be exposed to strains which may weaken the glue bond.

## Cleaning

With Dynea Washless System the need for cleaning is reduced significantly compared to mixed application systems since there is no glue-mix and the system is protected from dry-out. If the application equipment needs to be cleaned, the individual components can easily be washed with warm water (40-60°C).

With mixed application systems, the mixing and application equipment must 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 of the glue mix is most easily done with warm water (40-60°C). Before flushing of the equipment is started, the water pipes should be drained of cold water.

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 4720 and hardener Prefere 5020.

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 glue mix, 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

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The manufacture of laminated timberstructures 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.

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