Technical Data Sheet

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Technical data sheet

®Aerodux 185

Liquid phenol-resorcinol resin adhesive for wood

Use

Aerodux 185 liquid phenol-resorcinol resin adhesive mixed with a powder hardener provides cold-setting weatherproof and gap-filling adhesives especially suited to the manufacture of exterior high hazard structural components as defined in BS 5268 : Part 2. The adhesives are also suited to the production of heat resistant composite structures, e.g., fire-resisting doors. Phenol-resorcinols have shown cold temperatures resistances to -40f in long term testing.

Aerodux 185 mixed with powder Hardener HRP.150 or HRP.155 meet the requirements of EN 301 - Type 1 and BS 1203 (Type WBP). Aerodux 185 with hardeners HRP.150 and HRP.155 has been tested according to the German Standard DIN 68 141 by the Otto-Graf-Institut (MPA) in Germany and found to suited for gluing load-bearing wooden structures for indoor and exterior use in accordance with DIN 1052.

Aerodux 185 with Hardener HRP.150 and HRP.155 is also approved by Luftfahrt-Bundesamt for the production of of glued wood products to be used in aeroplanes.

Aerodux 185 with HRP hardeners, when fully cured, is resistant to acids, weak alkalis, solvents and boiling water. Aerodux 185 is also suitable for bonding a wide range of materials to porous substrates. These materials include:

- Wood, improved or densified woods, e.g. 'Hydulignum'.
- Mineral fibre reinforced boards, brick, concrete, unglazed porcelain.
- Rigid expanded plastics, e.g., expanded polystyrene, polyurethane and PVC.
- Industrial and decorative laminates (phenolic resin-based or phenolic resin backed).
- Leather, cork, linoleum and nylon.

Aerodux 185 may also be used to bond natural and synthetic rubber (other than silicone rubber) and sheet metals to wood (see Preparation of Materials for Bonding).

Tecnical data

Appearance	Dark red liquid
Viscosity (25°C)	approx. 400 cP
Relative density (25°C)	1.135-1.160
Solids content (2h, 120°C)	55-61 (% w/W)
pH	approx. 7.5
Flashpoint	37°C (CC)

Storage

The resin and hardeners should be stored separately in a cool (ideally 5-20°C) dry place. In these conditions Aerodux 185 has a storage life of at least 18 months, and the powder hardeners HRP.150 and HRP.155 at least 3 years. At a temperature of 25° Aerodux has a storage life of 12 months.

Note In part used containers Aerodux 185 may form a skin which should be removed before use. Depending on storage conditions the resin may 'structure' slightly. This is easily dispersed by stirring and will not affect their overall performance of the adhesive.

Choice of hardener

Aerodux 185 must always be mixed with a hardner prior to use. To obtain bonds of maximal water resistance it is essential that the correct hardener dosage is used.
Hardener HRP.150 gives a high-viscosity glue mix (8000-10000 cP at 20°C) which dries out faster than mixes containing HRP.155. Its use is recommended for joints where a viscous mix is required to limit flow, e.g., for thick glue lines, uneven surfaces, etc.

Hardener HRP.155 provides a medium-viscosity glue mix (4500-6000 cP at °C), suitable for most gluing applications, especially timber structures. This glue mix tolerates longer assembly times than a mix using HRP.150.

Preparation of the glue mix

Prior to mixing, the mixing equipment must be cleaned of glue remainders.

Mixing ratio

	pbw
Aerodux 185	100
Hardener HRP.150 or HRP.155	20

Add the hardener to the resin and mix until the hardener is fully dispersed. Then, if required, add the filler, stirring it thoroughly into the resin-hardener mixture.

Use of extenders

Wood flour or some mineral fillers may be added according to the table below to increase the viscosity and reduce glue costs.

	Lightly-filled mix	Heavily-filled mix
Aerodux 185	100	100
HRP hardener	20	20
China clay	20	100

The lightly filled mix with HRP.155 still complies with the requirements of BS 1203 (Type WBP) and EN 301. It may be necessary to adjust the viscosity of the heavily filled mix with water but the water addition should be kept to a minimum. This mix is suitable for bonding uneven-surfaced boards, such as mineral fibre re-reinforced boards, and where maximum strength and full weatherproof properties are not required.

Pot life

Resin and hardener start reacting with each other once they are mixed, and the reaction will proceed until the glue is completely cured. How long this takes, depends on the temperature of the glue mix. Consequently, the temperature of the glue mix affects the pot life, i.e. how long the glue mix remains usable. The higher the temperature, the shorter the pot life.

Temperature of mixture	10°C	15°C	20°C	25°C	30°C
Pot life (time in hours)	8	5	3	2	1

Preparation of materials for bonding

Surface preparation

The surfaces to be bonded should be free from dust or other deposits. Wood, panels, laminates etc. should be of uniform thickness. Solid timber should be freshly machined, but does not usually require sanding. Smooth dense surfaces to be bonded, except expanded plastics and mineral fibre reinforced boards, should also be thoroughly sanded.

Metal surfaces should be abraded, degreased and coated with Primer L 62 before bonding to porous materials (such as wood). Directions are given in Instruction sheet No. AD4.

Moisture content

Satisfactory results may be obtained when the moisture content of the surfaces to be bonded is within the range 6 - 25% but for best results, 12 - 16% is preferred. Artificial drying will be required to reduce the moisture content to 16% or lower. Adjacent surfaces should not differ by more than 4% moisture content. EN 386 specifies requirements on wood to be used for laminated timber structures.

Effect of preservative treatment

Before bonding timber that has been treated with a preservative, it is necessary to machine or sand the surfaces. Also the joint moisture content should be checked since this can be increased beyond acceptable level by water borne preservatives and may need to be reduced before gluing. Further advice on the gluing of preservative treated timber is available on request.

Where preservative treatment is applied after bonding. Beams and components should be conditioned for at least 7 days at not less than 15°C before being subjected to water borne preservative treatment in pressure cylinders.

Fire retardant treated timber

When bonding FR grades of wood based materials such as MDF or particleboard it is possible that the treatment will affect the cure of the Aerodux adhesive. Advice on the bonding of fire retardant timber is available on request.

Glue spread

Apply an even coating of mixed adhesive to both the surfaces to be bonded. Under average conditions (65% r.h. and 18°C), a spread rate of 150-250 g/m^2 to each face of a joint is sufficient. The defect known as drying-out is influenced mainly by relative humidity, temperature, glue spread rate, wood species and circulation of the air in the workshop. In conditions of high ambient temperature and low relative humidity, higher spreads may be necessary to limit drying-out.

Assembly time

Assembly time is the time elapsing between glue application and pressure application. It can be divided 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. On the other hand, 5-10 minutes closed assembly may be beneficial, in particular when dense woods are being bonded.

Under all circumstances the glue must still be tacky when the pressure is applied. Glue being squeezed out of the glue line when the pressure is applied indicates that the assembly time was not exceeded.

Assembly time for glue mixes based on HRP.155

Glue line temperature	10°C	15°C	20°C	25°C	30°C
Closed assembly time	2 ½	1 ½	1	½	¼

Note: These times are assessed at 20°C and 65% RH and at a spread rate of 225g/m^2 to each face of a joint, i.e. total glue spread of 450 g/m^2. Under hot dry conditions they will be reduced, but this may be compensated for by increasing the spread rate.

Although the adhesive has gap-filling properties, it is important to bring surfaces into firm contact. It is essential that the joint should be made before the adhesive gels.

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/mm² with softwoods and 0.8-1.2 N/mm² 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 2-5 N/mm² will be sufficient for finger joints over 25 mm in length. For shorter joints an end pressure of 5-10 N/mm² 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 to ca 5 N/mm² for timber with 22% MC and to ca 7 N/mm² for timber with ca 15% MC.

Pressing time

a) Laminated timber structures

The minimum times for application of pressure is as follows for softwood.

Glue line temperature	10°C	15°C	20°C	25°C	30°C	40°C
Pressing time in hours	12	6	4	3	2 ¼	1

Note For dense or high moisture content timbers where a component is impermeable, or if the joint is liable to be strained immediately after removal of pressure (e.g. as in the manufacture of curved laminated beams) the above times should be increased. Aerodux 185 will continue to gain strength but full water resistant properties are developed only after several days.

b) Hot bonding

The press should be loaded and closed as quickly as possible in order to avoid pre-curing.

Basic setting times in hot bonding.

Glue line temperature	50°C	60°C	70°C	80°C	90°C	100°C
Basic setting time in minutes	30	10	6	3	2	1

High density woods and panel products such as MDF and moisture resistant particleboard may require longer pressing times due to their higher heat capacity and slower rate of water absorption. All pressing times should be used as a guide and not taken as a specification.

Heat penetration

The basic setting times stated refer to glue-line temperatures only and allowance must be made for the heat to travel from the press platen. Heat penetration time will vary according to density of the wood, moisture content, and distance to the farthest glue line. The table below is a guide to the additional time required for low and medium density timbers.

Heat penetration

Distance to the glue line	Heat penetration time in minutes per mm distance to the glue line at				
	80°C	90°C	100°C	110°C	120°C
Less than 5 mm	1.2	1.0	0.9	0.8	0.8
5 - 10 mm	1.7	1.4	1.2	1.1	1.0
More than 10 mm	2.0	1.7	1.4	1.3	1.2

The pressing times apply when bonding absorbent materials such as low and medium density wood. The pressing time must be considerably extended when bonding less absorbent material.

c) RF Heating

Resorcinol adhesives heat up more slowly under glue line or stray field heating than UF adhesives but curing may be accelerated by the addition of common salt (sodium chloride) at a rate of 1-2 parts by weight of salt to 100 parts by weight of resin. Precautions should be taken against arcing which may lead to tracking and burning in the glue line. Arcing can be avoided by low spread, low moisture content and good jig design to ensure no air gaps between the electrode and glue line and sufficient and even pressure on the joint during curing.

Staining on absorbent boards

Light coloured absorbent boards, e.g. mineral fibre reinforced cement boards, bonded with resorcinol phenol formaldehyde adhesives may tend to show signs of staining when subjected to exposure to weather or very wet conditions. This is because certain soluble materials in the uncured resin are absorbed and retained by the board and may subsequently be leached out by soaking. These materials appear as dark stains on the surface of the board, but disappear with further weathering.

Cleaning

The mixing and spreading equipment must be cleaned at the end of the working day. If the glue 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. Warm water (50-60°C) is recommended for cleaning.

Phenol-resorcinol glue is a potential water pollutant. 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".

Dynea ASA has developed a special method for the treatment of spillage and wash water containing phenol-resorcinol glue and delivers complete treating units utilising this method.

Safety precautions

Reference is made to the Safety Data Sheet for Aerodux 185 and for the hardeners HRP.150 and HRP.155.

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 hardener and the free phenol content of the resin will be reduced.

When handling the adhesive, 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 underarms 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

Normally, control procedures implemented by the authorities or other regulatory bodies apply to the manufacture of laminated timber structures. 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 Aerodux 185 with Hardeners
HRP.150 and HRP.155 dated November 2000. EB/OJB 03.2004