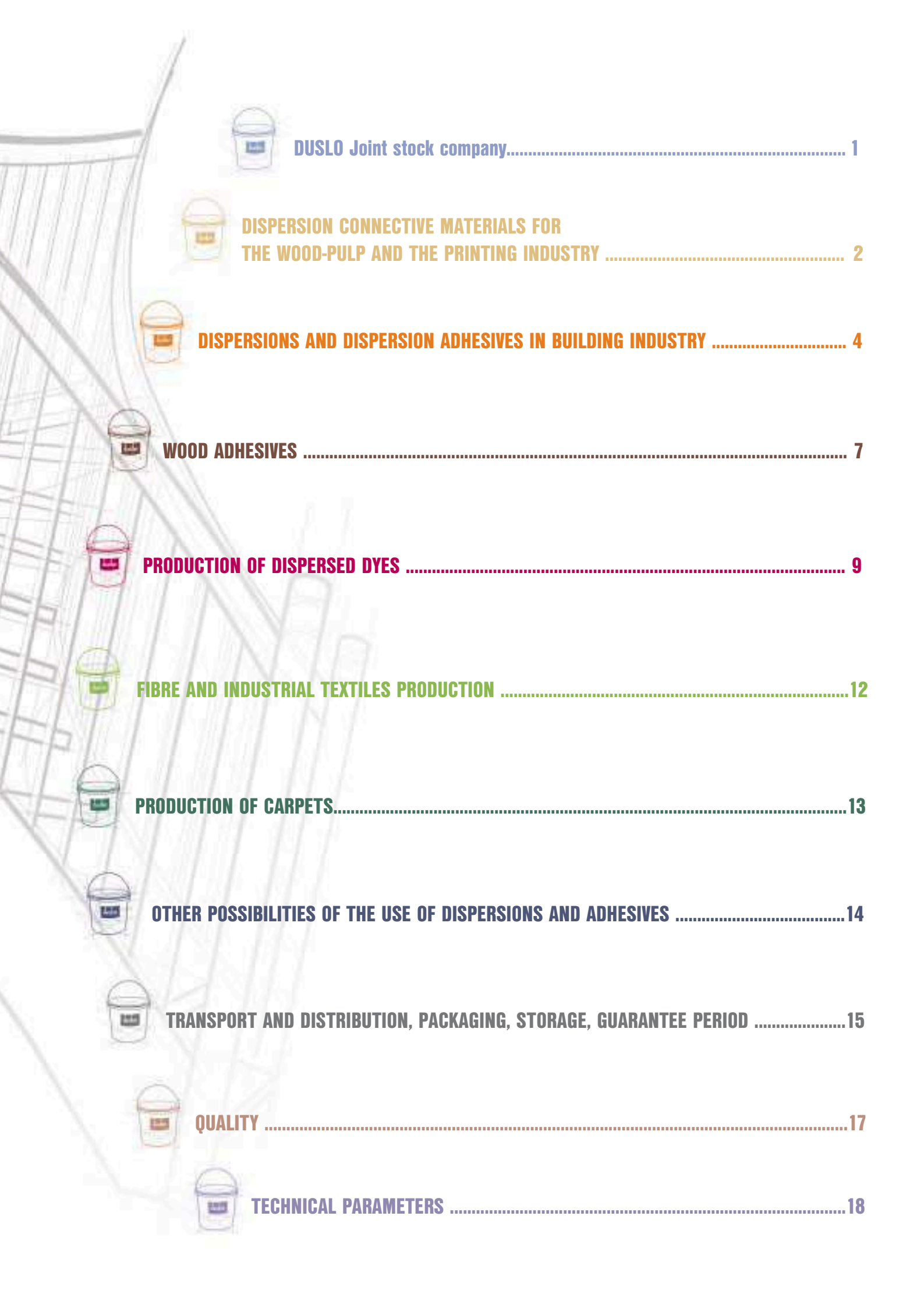




duvilax



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DUSLO, Joint stock company

To the north from the town Šaľa in the region of Nitra, an industrial combine, which was later called Duslo, had been founded in 1958. Thus the history of Duslo joint stock company has began and today it is an important company not only in Slovak, but also in European region.

Original production of industrial fertilizers and derivates of acetylene chemistry has gradually expanded to rubber chemical compounds, plants protection, dispersions and dispersion adhesives and products of magnesium chemistry. Duslo also produces other chemical products; these are, however, less important concerning the volume of production.

This publication is about dispersions and dispersion adhesives with commercial trade mark Duvilax®. This trade mark is related to all water dispersions and dispersing adhesives produced at Division of polymers, for which the essential raw material is monomer vinyl acetate.

First tones of Duvilax dispersions at Division of polymers were produced in 1969. Essential "B" homopolymers produced for building and timber industry, dye production and wood-pulp industry have gradually included new types intended also for other spheres of consumption depending on the market demands and not only on homopolymer base, but also on other comonomers (esters of acrylic, metacrylic acids etc.).

At present we produce 25 basic types of adhesives and dispersions. Other related modified products are often intended for individual customers. Number of products concerning their composition and quality is more than 60 at present. The production technology was transformed to the present modern production with super controlling system and final expedition. Through this system we are able to react immediately on customer's delivery requirements through a whole scale of qualitative and logistic demands.

The publication you hold in your hands describes the possibilities of use of dispersions and dispersion adhesives Duvilax. Our aim is to introduce them and our possibilities to you. We believe it can help you to orientate in separate segments of consumption and to learn how to use individual products. The publication naturally does not contain detailed descriptions and can even not include all specific features, to which a product must be adapted in individual clients. Therefore, do not hesitate and contact our workers at Division of polymers, who are ready to cooperate with you. Contacts are given at back page of this booklet.



Our business philosophy is expressed by a simple logic relation:

Satisfaction of a customer = prosperity of Duslo

DISPERSION CONNECTIVE MATERIALS FOR THE WOOD-PULP AND THE PRINTING INDUSTRY

The use of dispersion adhesives in the wood-pulp industry is one of the traditional possibilities of use. The advantages of dispersion adhesives are: a very good adhesive capacity in a wide range of use, immediate preparedness for use, easy application, high resistance of the spliced joint against ageing, heat and oils, very good treatment possibilities and ecological harmlessness.

Properties

Duvilax products intended for the wood-pulp industry are white liquids with little liquidity and a characteristic smell. They are non-explosive, incombustible and non-toxic. The film created after the drying process is appropriately elastic, soft and non-sticky.

From the chemical viewpoint we talk about water homopolymer polyvinyl acetate dispersions, treated with softening agents and other components or about water copolymer dispersions of vinyl acetate with other comonomers, which can be treated with other additives e.g. softening agent, filling agent, starch, antifoaming agent, biocide etc. The emulsion system is composed of a non-ionic emulsifier and polyvinylalcohol as a protective colloid.

In the process of the adhesive hardening it does not come to a chemical reaction or change. This is a physical process, in which the glued material - paper, paper board etc. takes off from the vinyl acetate adhesive gradually water and the surface is covered with a continuous film. There is no need to add an initiator, to neither dilute nor heat them.

Use

Duvilax dispersions in the wood-pulp industry are used for the production of a smooth - balanced and corrugated cardboard, of paper adhesion laminating, of paper tubes, of different packing materials of paper and for the production of different duplex wallpapers. Practically it is used for gluing of paper layers. Duvilax influences to a high degree the quality of the final product. It provides the products with cohesion, strength, flexibility and durability. The dispersion connective materials are used for direct gluing, without additional treatments or adding of other additives.

Duvilax adhesives in the printing industry are used in the book production - for gluing of book blocks into hardcover, textile book-marks, gluing boards of hardcover with foils, textiles etc.

Requirements on the technical parameters of the product

Technical parameters of dispersion connective materials in the wood-pulp industry are defined in accordance with the requirements resulting from the individual applications and the concrete equipments in the individual consumer facilities. In the case of a requirement to adapt the technical properties of the material, it is possible to define the needed quality.

Treatment of viscosity

The connective material for paper is predominantly applied by means of right circular cylinders. Less by means of sieve, spraying nozzles, alternatively brush. The liquidity of the material - viscosity, is fixed just in accordance with spreading apparatus, whereby the stress lies on the sufficient and even connective material coat on the glued layers. By the type of the machine and the quality of the paper, the viscosity can be low, eventually medium-high. By special requirements, we produce connective materials with high viscosity (15 000 - 20 000 mPa.s, Rheotest).

Dry substance treatment

The dry substance represents the content of the non-volatile part in the dispersion. The dry substance in the dispersion connective materials is about 50 %. But a dry substance of about 35% or on the other side about 60 % is also not an exception. The water content in the dispersion is proportional to the drying process time and to the watering degree of the glued paper, as well as to the surface lying on the effective ingredient of the adhesive which influences the speed of gluing.

Treatment of the film's properties

The vinyl acetate dispersion which film is soft, flexible and elastic is proved in particular in the pulp technology. These properties are, in the case of the homopolymer types, influenced by the addition of plasticizer, eventually of other additives. In the case of copolymer dispersions the function of the plasticizer are realized by the copolymer component in the polymeric chain. The stretch, elasticity and hardness degree depends on the type of the used plasticizer and its amount.

The dispersion connective materials made on the vinyl acetate base are naturally slightly acid. Their pH is between 3 and 6. This attribute can be influenced on the basis of an agreement with the purchaser and increased up to 9.

Application

Duvilax can be applied practically in every way, which is used by gluing, that is barrels, roller coater or spray guns. It can be applied one sided or both-sided in accordance with the application type.

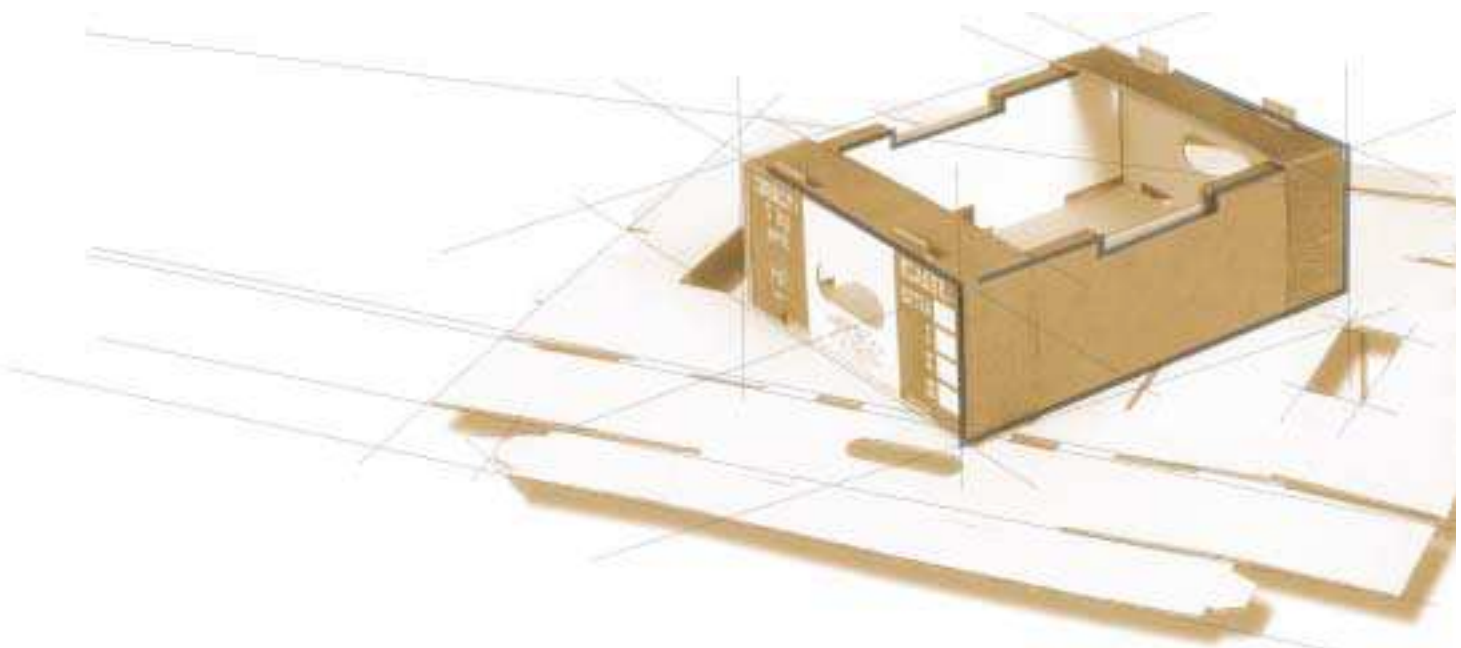
Cleaning the machines and working tools

The cleaning of the machines and the working tools is realized while the adhesive is still wet, and it is cleaned with lukewarm water. In the case of drying, it is recommended to leave the plugged surface watered, eventually covered with a wet rag for 30 - 60 minutes, until the dry film swells up. Then, the layer of film is mechanically removed.



Assortment

Type	Main field of use
Duvilax BD - 20 Medium-viscous	Universal, printing works, adhesie laminating, production of tubes, sachet gluing etc.
Duvilax BD - 20 Low-viscous	Paper adhesie laminating
Duvilax BD - 20 /46	Paper adhesie laminating
Duvilax KA - 11	Paper adhesie laminating
Duvilax BD - 20M	Duplex wallpaper production
Duvilax BD - 10/45	Production of smooth board
Duvilax BD - 10/36	Production of smooth board
Duvilax BD - 50	Printing industry
Duvilax BU	Production of hard paper tubes
Duvilax LM - 52U	Production of extra hard paper tubes
Duvilax BD - 2/50	Production of paper tubes, high adhesive capacity, the widest scale of paper tubes
Duvilax BP1 - 8/50	Universal use, production of paper bags
Duvilax KA - 18	Universal use, gluing of paper folding boxes
Duvilax KA - 22	High adhesive capacity, production of varnished paper folding boxes, bags, it also glues materials with limited absorption capacity
Duvilax LS - 50	Gluing of carton and cardboard boxes
Duvilax Expres LS	Gluing of carton boxes and paper folding boxes



DISPERSIONS AND DISPERSION ADHESIVES IN BUILDING INDUSTRY

Building industry is a traditional sphere in which Duvilax dispersions are used. They are principally used in three main spheres:

- **Polymer joints** - dispersions are added as one of the components of polymer cement mixtures (concretes, mortars, binders, maintenance materials etc.).
- **Penetrating materials** - used for soaking of absorbent grounds before gluing, under plasters, coats of paint, self leveling floors, under paint etc.
- **Dispersion building adhesives** - products intended for direct use, with high adhesive power and maximum ageing resistance of a joint.

POLYMER JOINTS

Polymer joints are substances, which considerably affect qualities of building mixtures.

- considerably improve processing level of mortar or concrete
- reduce content of batch water which results in decrease of cement-water ratio.
- reduce segregation and separating process of water from mixture (sweat)
- considerably increase coherence of a mixture
- improve adherence to ground
- make applying on ground, flushing and smoothing of surface easier
- a mixture with dispersing plasticizer shows adequate frost-resistance (minimum 10 freezing cycles)
- increase final rigidity of concrete or mortar
- reduce absorptivity of water
- improve permeability of water vapour
- reduce volume weight of mortar
- reduce rolling abrasion of concrete and mortar

Properties

Duvilax products used as polymer joints are white liquids with a characteristic smell. They are non-explosive, incombustible and non-toxic. A film, which appears after the adhesive dries off, is transparent, coherent, appropriately elastic, soft and not sticky.

Chemically taken, these are water homopolymer polyvinyl acetate dispersions processed by softener and other components or, respectively, water copolymer dispersions of vinyl acetate with other comonomer compounds, which can be processed by various admixtures such as plasticizer, filling mass, defoamer, etc. Emulsion system consists of non-ionogenous emulsifier and polyvinylalcohol as a protective colloid. They do not contain any organic solvents.

Use in polymer cement mortars and concretes

Duvilax BD-20, KA-31, VV and WME are used as polymer joints. The first one is recommended to be used especially in interiors. Other types are acceptable in exteriors too. Best results against climate stress resistance have been achieved by Duvilax WME. Minimum 2% of Duvilax dispersion's volume is usually added to a mixture with batch water (from 5% with Duvilax BD-20) relating to weight of cement (1 kg of dispersion for 50 kg of cement). Mortars with admixture of Duvilax dispersion achieve adequate frost-resistance, compression strength, tensile strength, bending strength and adherence to ground. Fresh mortar is easier to apply and even and has a smooth surface.

Procedure of preparing 125 l of mortar in mortar mixture:

1. You pour 2/3 out of calculated amount of water and Duvilax to mortar mixture.
2. Then you add cement or, respectively, cement and calcium hydrate and mix it.
3. Subsequently you add sand by constant mixing.
4. You can add water if necessary to achieve required processing level.

With regard to plasticizing effect of Duvilax, it is necessary to realize that to achieve required processing level of fresh mortar, we will need considerably lower amount of water compared to mortar without admixture. To improve adherence of mortar to ground - its penetration is recommended with water solution Duvilax (for detail see next part) before application of mortar.

The application of Duvilax dispersions essentially improves the level of processing of fresh mortars, their adherence to ground and possibilities of flushing and forming of smooth surfaces. From this point of view the optimal dose of dispersion is up to 10%. The application of dispersions results in aeration of fresh mortars. In case this effect would be adverse, it is desirable to add a defoamer to the mixture. As for rigidity we can consider acceptable a dose of dispersions up to 5%. Bigger doses would be reasonable only in the case we would want to achieve high adherence of mortars and high cohesion. Aeration of cement mortars caused by application of dispersions results in decrease of their compactness, volume weight and subsequently, increase of abrasability. Modified mortar, however, resists well abrasive wear. The application of Duvilax dispersion does not seem to increase the diffusion resistance during penetration of water vapour. Diffusion coefficient of modified mortar is higher than in case of standardized mortar. This fact can be explained by aeration of mortar, which results in increase of its "permeability". This influence is probably stronger than forming of a film or filling pores by dispersion. 5% dose of Duvilax dispersion out of the weight of cement practically does not affect frost-resistance of cement mortars.

PENETRATION OF GROUNDS BY POLYMER WATER SOLUTIONS

Penetration, i.e. soaking of grounds by dispersing water solutions is carried out to improve coherence of a ground, to increase rigidity of a joint during gluing floor materials or linings, to improve adherence before application of a self leveling overcoats, paints, etc. (it is used with cement or plaster grounds). Penetration is also used as partial protection against dampness on mineral grounds common in a sphere of floors before application of pugging stuff and as a preparatory paint before surface finish. The paint is applied on differently or strongly absorbent surfaces. Water solution after the drying process forms a polymer lattice in pores of a ground, effects of which seem positive in above given ways of use.

Ground

The ground must meet valid standards, must be rigid, volume stable, without loosening elements and similar dividing elements, rough enough. Fresh overcoats must be ripened enough. Anhydrite overcoats with cohesionless surface or, eventually, with foamy film on a surface, must be ground and sucked off. Penetrations made of Duvilax products are not suitable for metallic and plastic grounds. With grounds made to use it for grounds already built in a building structure (danger of swelling caused by water from Duvilax).



Use

For penetration we usually use Duvilax diluted with water of 1 : 4 ratio, which corresponds to cca 10% of content of polymer in solution. Some products are ready for direct use, others are provided by us as concentrates. Before using we strongly recommend to read the directions for use attentively. By soaking of plaster flushing coats of paint, we recommend to use in-depth penetration. It is necessary to mix the solution - a milky-white liquid thoroughly. By coating you can use roller, brush or some other tool. You can achieve demanded effect with one coating only. Consumption of Duvilax-water solution is between 80 - 130 kg/m². Thus, out of 1 kg of dispersion you can penetrate 40 - 60 kg/m².

Depending on the temperature of an environment and suction capacity of a penetrated material, the optimal time of drying process is 1-2 hours. Principally taken, the penetration is dry enough if the solution changes its colour from white to transparent and the penetrated surface is a bit sticky (when touched). Longer time of drying process of penetration coating does not affect quality of performed operation.

For penetration it is usual to use Duvilax BD-20. For in-depth penetration, due to small elements of polymer, the most suitable is Duvilax KA-31 VERTICAL PENETRATION. For soaking of grounds in exteriors (facades, heating systems, staircases, entrances to buildings, pavements etc.) we recommend to use Duvilax VV PRIMER PENETRATION (basic penetration) or Duvilax WME (for strongly climatically exposed places). Duvilax VV PRIMER PENETRATION (basic penetration) proved to be suitable for soaking of sandwich panels (building parts glued by wood, foamy polystyrene and plaster cardboard).

BUILDING ADHESIVES

This is a name of a group of Duvilax products, which are designed for gluing materials closely related to building structure itself. They are used for gluing plastic floor coverings, floor textiles, mosaic and lamella parquets, ceramic lining, pavements, textile wallpapers, cork etc. These are predominantly superficial materials with decorating and isolating function.

The main advantage of Duvilax building dispersion adhesives consists in achieving high values of rigidity, high ageing resistance of a joint and last but not least, no health and hygienic defectiveness. This advantage results from using water as a solvent in adhesive. No organic solvents or other noxious chemical substances evaporate during working with it. Cleaning of used tools or, eventually, other dirty spaces is carried out simply with lukewarm water before the adhesive is dry.

Ground

An important factor in gluing of superficial materials is preparatory work. We stress importance of processing of a ground before gluing. Ground must meet valid technical standards. These are especially cement and plaster flushing layers, plasters, plaster cardboard etc., which are highly or unevenly liquid-absorbing. Therefore, before gluing itself we recommend to apply penetration coating, which will balance suction capacity, strengthen glued surface and at the same time increase rigidity of a joint. The surface must be clean, with no oily stains or other defects. A very important requirement is to flatten the ground, which affects not only final visual effect, but also consumption of adhesive. It is also necessary to ensure that the dampness of a ground would not be more than 4 % (2 % in case of gluing parquets).

Table of use

Type	tiles	PVC-floor coverings	mosaic and frieze parquets	carpets	textile wallpapers	decorating wallpapers	cork
Duvilax L - 58	□	□		□			●
Duvilax LP			□	●			□
Duvilax BD - 20	●				□	●	
Duvilax KA - 4				●	●	●	

Legend: □ recommended use ● possible use

Duvilax L-58 - universal building adhesive

Duvilax L-58 is not diluted and is used for all kinds of PVC-floor coverings, linoleum, carpets, paving bricks, ceramic and polystyrene lining, with grounds of concrete, plaster, plaster cardboard and others. Generally, all kinds of materials can be glued with it, among of which at least one accepts dampness (for example fixing ceramic tiles on formica). As a rule, rigidity of a joint considerably exceeds rigidity of glued materials and therefore, approximately one hour after gluing it is impossible to carry out additional work without defect.

Procedure: You apply penetration coating before you start to glue (BD-20 and water mixed in 1 : 4 ratio, or Duvilax VV PRIMER PENETRATION). Duvilax LP adhesive is applied on clean and degreased surface with a special brush. Drying time is no more than 1 hour. Working temperature can not fall under 15 °C. If thickening is necessary, adhesive may be processed by cement. If it is necessary to increase the thickness of a joint, you can add sand or cement with sand to adhesive.

Duvilax LP - a special adhesive

It is used for gluing unvarnished mosaic and lamella parquets produced or hard wood species (except of beech) and unvarnished cork floor coverings and lining on clean and degreased ground. *The adhesive can be used for floor heating too. It meets conditions set in DIN 281.*

Directions for use: Before gluing you apply penetration coating (Duvilax LP or BD-20 and water mixed in ratio of 1 : 4). After it is dry, you apply Duvilax LP with a spatula. You lay the parquets with no gaps between them from 5 to 10 minutes after application of adhesive. The temperature must be not lower than 15 °C. Unevenness of a ground may be max. 2 mm for 2 m of the length and its dampness max. 2 %. You can process the surface of parquets after 48 hours.

DISPERSIONS AND DISPERSION ADHESIVES IN BUILDING INDUSTRY



Duvilax BD-20 - universal dispersion

Duvilax BD-20 is suitable for gluing wall papers made of glass fibres on walls and for gluing paper decorating wallpapers. It can be used for fixing tiles if necessary, but it must be modified by addition of cement and sand.

Directions for use: When you glue wallpapers, it is usually not necessary to modify the adhesive. However, if it seems not liquid enough for a concrete use, you can dilute it with water a little bit to achieve more fluid consistence. We do not, however, recommend adding more water than 2 - 3 %. Before gluing itself we recommend to soak (penetrate) a clean wall with Duvilax BD-20 diluted with water in ratio of 1: 4 (pour 1 kg of Duvilax to a bucket, add water up to 5 l and mix thoroughly). When the penetration is dry, the ground is ready for gluing wallpapers. The adhesive is suitable for usual plasters, coats of paint and others. Do not use materials, which do not accept water (are not absorbent).

Duvilax KA-4 - universal adhesive

It is typical for Duvilax KA-4 that it forms a transparent self-sealing film on various grounds, even on those which are not absorbent. Therefore, it can be used to fix carpets to floors, which are not absorbent (to avoid sliding on the ground), to glue textile wallpapers on ceilings and various lower ceilings (effect of immediate connection), to glue billboards and wallpapers in interiors, to glue various decorating objects and others. With regard to the fact, that Duvilax KA-4 is a pure dispersion without resin or other admixtures, it forms a thin transparent film and therefore it is necessary that the ground was completely flat before gluing.

Use: With regard to the type of a glued joint or, respectively, a kind of glued materials, it is necessary to decide whether to apply the adhesive on both sides of a glued joint or just one side. Application on both sides results in immediate strong contacting joint. Application on one side provides weaker joint, it is, however, sufficient for fixing carpets, gluing billboards etc.

If the ground is not even or is too absorbent, its preparation must be similar to proceeding one (penetration). Adhesive is applied with a roller or a brush on the ground and it is left almost to dry off (its colour changes from milky-white to transparent, i.e. 30 - 60 min. depending on temperature and dampness of environment). If you wish to achieve immediately high adherence, we recommend applying the adhesive on both glued surfaces. After you will have put and pushed the glued object, it will immediately be appropriately fixed to the ground.

NOTICE OF INTENTION!

All Duvilax adhesives in liquid state can be diluted with water, but after they dry off, they can practically not dissolve and it is difficult to remove them. Therefore, it is necessary to clean all dirty surfaces and tools with lukewarm water before they are dry. This rule is related especially to Duvilax L-58 and KA-4.



WOOD ADHESIVES



Vinyl acetate adhesives have been useful in wood production and joinery for some period of time, especially due to the high adherence to wood and penetration to wood mass. In comparison to other types of adhesives they have several important qualities, which are particularly useful in this sphere. First one is that the adhesive is ready for immediate use without any special processing. After the drying process, the adhesive is softer and more elastic than other wood adhesives and therefore it practically does not blunt the tools during working with parts stuck together. Working with the adhesive is harmless because it does not contain any harmful solvents. We shall not disregard universal use of relatively small number of types for all kinds of joints, various woods and materials.

General properties

Vinyl acetate adhesives are white liquids with low fluidity and a characteristic smell. They are non-explosive, incombustible and non-toxic. The film formed after the adhesive is dry, transparent, or eventually mats with a shade of white. It is coherent, relatively hard, a bit elastic and not sticky.

Chemically taken, these are water homopolymer polyvinyl acetate dispersions, processed by a softener and other components (standard adhesives) or, respectively, water copolymer dispersions of vinyl acetate with comonomers, which can be processed by various admixtures including hardener, plasticizer and others (express and water resistant adhesives). Adhesives do not contain organic solvents.

When a joint is formed during process of gluing, no chemical reaction or change occurs. It is a physical process by which wood gradually takes up water from dispersing adhesive and simultaneously forms coherent film on its surface.

No hardener is added to the adhesive (apart from water resistant adhesives), they are necessary to be diluted or warmed up.

Climatic stress resistance

Objects made of wood or other material produced on base of wood pulp are often in such places, which are exposed to high dampness, water, high or low temperatures, etc. For a joint to bear this stress, the adhesive must fulfill some criteria. Concrete conditions are defined in STN EN 204.

This norm divides wood adhesives to four groups of resistance:

- D 1 Interior, where temperature is only rarely or for a short period of time higher than 50 °C and dampness of wood is 15 % at most.
- D 2 Interior with rare short-term influence of water or condensate of air humidity and/or short-term high humidity of air, which results in increase of wood dampness up to 18 %.
- D 3 Exterior protected from climatic stress or interior with regular short-term influence of water or condensate of air humidity or long-term influence of high air humidity.

- D 4 Exterior exposed to climatic stress, but with adequate protection of surface, or interior with regular intense influence of water or condensate of air humidity.

Resistance tests of an adhesive are determined by methodic given in STN EN 205. Test is based on sticking of particles of beech wood together, exposing them to required climatic stress and subsequent measurement of joint rigidity in shear in MPa.

Assortment

Duslo joint stock company produces five types of dispersing adhesives for gluing of wood, which correspond to groups D 1, D 2 and D 3. With regard to use, they differ in various speed of joint forming. Duvilax LSD-1 belongs to group D 1, Duvilax Express LS, LS-50, LSR-12 to group D 2 and Duvilax D3 Rapid to group D 3. Apart from these adhesives, among wood adhesives are other special Duvilax VP, KA-18 and KA-22 adhesives.

Material processing

Surface of glued parts must be clean, with no dust and greasy and oily stains. Generally, it is required, that the sawn wood was dried on air for 8 - 12 months and subsequently artificially dried till final dampness is 8 - 12 %. Sawn wood should be stored in places with air conditioning to balance eventual differences of dampness. Second seasoning should follow gross dimension goods. Planning, milling or, respectively, sawing, storing and sticking together should be carried out in one day because thus it is possible to prevent prolonged hardening time and reducing of joint rigidity. It is important to keep precision in glued gaps and possibly in minimum thickness differences of individual boards for it is the only way how to achieve the shortest possible time of press working and the highest possible rigidity.

Application

Duvilax products can be applied practically by any kind of gluing i.e. using brushes, rollers, glue applications and spray guns. They can be applied on one or both sides depending on type of application.

Cleaning of tools

Cleaning of tools is simple. While the adhesive is still wet, it is cleaned in lukewarm water. After drying off, it is recommended to leave the tools in water for a few hours and when the adhesive gets swollen, it removes mechanically.

Food and toys

Thanks to favourable composition and health harmlessness Duvilax Express LS, LS-50 and D3 Rapid can be used for gluing of toys for children and in sphere of food industry.

Type	Dampness-resistance set in EN 204	Speed of film forming	Presswork time	Time of final rigidity achievement
Duvilax LSD - 1	D 1	standard	20 - 40 min.	24 hours
Duvilax LS - 50	D 2	standard	20 - 40 min.	24 hours
Duvilax LSR - 12	D 2	fast	20 - 40 min.	12 hours
Duvilax Express LS	D 2	Extra fast	1 - 20 min.	4 hours
Duvilax D3 Rapid	D 3	Extra fast	10 -20 min.	6 hours

Table of use

Use		DUVILAX							
		LSD - 1	LS - 50	LSR - 12	Expres LS	D3 Rapid	VP	KA - 18	KA - 22
Surface gluing	Layer material D2		●	●	□	●			
	Layer material D3					□			
Corpus fottig	Short press working time				□	●			
	Middle press working time			□	□	□			
	Long press working time	□	□	●	●	●			
	Frames fixing		□	●	□	□			
Glued boards and blocks	Soft and DTD	●	●	●	□	●			
	Hard wood		□	●	□	□			
	Hight-frequency		●	●	□	●			
Pegging	Low-pressure	□	□	●	□	●			
	High-pressure	□	□	●	□	●			
	Manual	□	□	●	□	●			
Gluing set in EN 204	Windows, doors, stairs				●	□			
	Parquets				□	□			
	Furniture	□	□	□	□	□			
Parquets	Mosaic						□		
	Large-surface				●	□			
Toys for children and food			□		□	□			
Handing with tapestry	Leatherette		●		●			□	□
	Textile		●		●			□	●
	PVC -foil								□

Legend: □ recommended use ● possible use



PRODUCTION OF DISPERSED DYES



One of the most important components in production of a dispersed dye is a dispersing joint. Type and quantity of dispersion affects resistance of paint to influences of environment including rubbing off and washing off. It also affects adherence to ground, UV resistance, resistance to absorption capacity and permeability of vapour, durability of a paint and last but not least, its covering capacity. One of the dispersing joints suitable for production of dispersed paints of high quality are vinyl acetate dispersions. Such dyes can be diluted with water, are not toxic, have no environmental and hygienic defects, do not contain any organic solvents.

General qualities

Vinyl acetate dispersions are white liquids with a low fluidity and a characteristic smell. They are non-explosive, incombustible and non-toxic. A film, which appears after the adhesive dries off is transparent, adequately soft, elastic and not sticky.

Chemically taken, these are water dispersions of homopolymer polyvinyl acetate in water, processed by a plasticizer and other components, or water copolymer dispersions of vinyl acetate with esters of acrylic acid, or vinyl ester of veratric acid.

Dispersed dyes

Paints have two basic functions: aesthetic and protective. Aesthetic function is naturally related to the fact, that paint determines looks of a building. Protective function is connected with superficial protection of masonry against physical, chemical and biological corrosion. Preference of one of given functions is determined by concrete conditions of paint application. With regard to difficulty of an application, it is possible to divide paints on interior and exterior.

Interior paints

For interior paints is typical application in such places, which are not exposed to weather conditions. Even if it might seem that the aesthetic function of paints prevails in interiors, there are all kinds of applications in which their protective function is important too. They are for example paints in public places (bus and railway stations, entrances to offices, restaurants etc.), storehouses, factory buildings, laundries etc.

One of the most important evaluated advantages of interior paints is their abrasion resistance and adherence to ground. Next, optical qualities (lustre) and application qualities are valued. An important criterion of dye quality is minimum application temperature. Generally it is required that a paint, applied at 5 °C and left to dry off at this temperature during 24 hours of maturation, provided coherent covering with no visible defect.

Exterior paints

In comparison with interior paints, these are exposed to weather conditions and must naturally meet higher demands. Higher requirements are reflected in a greater number of quality indicators examined in a state trial room TSUS including stricter demands on limiting values: (table 1).

An important function of exterior paints, apart from aesthetic, is protection of masonry against dampness. Accumulation of dampness in masonry is not wanted because it worsens its mechanic qualities, increases thermal losses of a building and fastens corrosion of masonry. Application of facade paints helps to solve the problem of dampness caused by rain and from interior. Two parameters determine their protective effect. First one is the ability to prevent rain from penetrating to masonry and second is the ability to enable di-

ffusion of water vapour from masonry outside.

Exterior paint is exposed to weather conditions such as: changing of high and low temperatures, freeze, solar radiation, dampness, acid rains, smog, dust and smut. In favourable environment for growth of mould, mushrooms and algae, the paint must resist these microorganisms. Apart from this it is also unintentionally or deliberately damaged by people. A good exterior paint should in spite of such long-term influences preserve its aesthetic and protective qualities as long as possible.

Tab. Br. 1: Required qualities of exterior paints

Quality	Required value
Abrasion - resistance	> 20 min
Adherence to ground	> 0.25 MPa
Changing temperatures resistance	> 0.25 MPa in 25 cycles
Frost-resistance	>0.25 MPa in 15 cycles
Water tightness	1.5 dm ³ .m ² /30 min
Diffusion resistance coefficient	see EN 1062-2

Generally taken, dispersing joint considerably affects given qualitative coefficients of a dye. Therefore, choice of a suitable joint is a demanding and responsible task. Naturally, by adding other components to the paint, it is possible to process even those parameters, which are slightly under required values. In this case it is usually price - quality compromise.

QUALITIES OF DISPERSING JOINTS AND THEIR INFLUENCE ON BUILDING PAINTS.

Minimum film forming temperature (MFFT)

Minimum film forming temperature is the lowest temperature at which dispersion produces transparent coherent film. At lower temperature coalescence of dispersing elements is not sufficient, i.e. film can either not be formed or it is dim and chapped. It determines the lowest temperature at which a paint can be applied. Facade paints requirements set minimum temperature of 5 °C. Therefore it is required, that MFFT of dispersing joint was between 0 - 5 °C. MFFT of dispersing joint is closely related to glass transition temperature (T_g). Glass transition temperature depends on monomers out of which a polymer is made and is typical for each homopolymer. It can be affected by composition of macromolecule substance or by adding a softener - a low-molecular substance (plasticizer, coalescent element).

Vitrescence temperature of copolymers depends on mutual ratio of comonomer units, which form copolymer. Regulation of vitrescence temperature and MFFT using this relation is called inside softening of polymer. Coalescent elements effect is temporal and when the film is formed, they evaporate. On contrary, plasticizers should affect quality of a film permanently and their evaporation or migration are not wanted.

Even if MFFT is related to glass transition temperature, it is often not the same. In dispersions of polar polymers it is caused by coales-

PRODUCTION OF DISPERSED DYES

cence influence of water. Following table shows comparison of vitrescence temperature, MFFT and other styrene-acrylic commercial dispersions:

Polymer dispersion	Tg [°C]	MFT [°C]	Film hardness	Film adhesive power
Duvilax B Polyvinyl acetate	34,0	17,0	14,3 %	100 g
Duvilax BD-20 Polyvinyl acetate softner	~	<2,0	1,7 %	0 g
Duvilax KA-11 Copolymer vinyl acetate - acrylate	11,0	<2,0	2,1%	0 g
Duvilax VV Copolymer vinyl acetate - vinyl versatate	24,0	9,0	8,7 %	5 g
Duvilax WME Terpolymer vinyl acetate - vinyl versatate- acrylate	6,5	4,5	2,1 %	0 g
Copolymer Styrene-acrylate	18,1	18,1	10,8 %	50 g
Copolymer Styrene-acrylate containing 6 % of butyl glycol	~	4,5	9,4 %	5 g

Data in table show that MFFT of strongly polar homopolymers and copolymers of vinyl acetate is about 15 - 17 °C lower than Tg. This difference is reduced with decreasing polarity.

Present trend in development of paints is to reduce emissions of organic substances including coalescent elements. Therefore, in formulation of paint substances, dispersions with low MFFT even without these admixtures are preferred. Duvilax KA-11 and Duvilax WME dispersions meet this requirement. To lower the MFFT in Duvilax VV dispersion, addition of 2 % butyl glycol acetate is necessary, which is three times less than in styrene acrylic dispersion. After the MFFT gets lower by inside or outside softening, some of the qualities of films of dispersions, which can negatively affect qualities of paints, change. With decreasing MFFT usually increases adhesive power of a film, which negatively affects resistance of paint to sticking and pollution. Reduced hardness can have negative effect on resistance of paints to mechanic damage.

Size of dispersing elements

Size of dispersing elements and its distribution depends on conditions of polymerization, under which the dispersion was formed. Choice of a type and quantity of used emulsifiers and protective colloids is important including the way of their addition to reaction mixture during preparation of dispersion. In dispersions based on homopolymers and copolymers of vinyl acetate is used especially the stabilization by protective colloids such as polyvinyl alcohol hydroxyethyl cellulose or polyvinyl pyrrolidone. Average sizes of dispersing elements are between 0.2 - 2 µm. Use of emulsifiers without protective colloids for stabilization of this type of dispersions is rare and demanding on optimization of polymerization conditions. Dispersions with bigger elements have the advantage of better rheological qualities of these dispersions and of paints made of them. In paints of dispersions with smaller elements arise problems with flocculation if hydroxyethyl cellulose is used as a thickener. They have the advantage of penetration of small elements to cholly layers of an old paint and thus improve adherence of a new paint to surface.

Alcaline resistance

Alcaline resistance is determined by chemical character of polymer, which forms it. It depends on reactivity of functional groups on polymer chain in reaction of hydrolysis. Reactivity of acetyl groups in homopolymer polyvinyl acetate is very high. Alcaline hydrolysis results in degradation of a joint of paint and in defects caused by worsened adherence and abrasion resistance. Alcaline hydrolysis is a danger to paints, which are exposed to dampness and alcaline surface at the same time. Therefore, homopolymer polyvinyl acetate dispersions can not be used for exterior paints whereas in interiors, where they are not exposed to dampness, is their quality adequate. Dispersions consisting of copolymers vinyl acetate - acrylates are more resistant to alkali than polyvinyl acetate ones. Rate constant of reaction is about 10 times lower compared to homopolymers of vinyl acetate.

Significant improvement of alcaline resistance is achieved by copolymerization of vinyl acetate with vinyl ester of versatic acid. Units containing branched voluminous alkyl groups are built into polymer. These groups form spherical hindrance which protects ester group from anions OH⁻ and thus makes hydrolysis impossible. With growing content of vinyl ester of veratric acid in copolymer, the rate constant might fall on 1000 times lower level than is the rate constant of hydrolysis of polyvinyl acetate, i.e. on level of acrylic copolymers.

Comparison of alcaline resistance of chosen dispersions proved following increase of resistance:

Duvilax BD-20 < Duvilax KA-11 < Duvilax VV < Duvilax WME

Climatic degradation resistance

Climatic degradation of polymer is a complicated process, which comprises photochemical and oxidative reactions. Due to them a gradual destruction of polymers appears - their colour change and mechanic qualities get worse. Degradation of a polymer which is a joint in paint substances results in worsened adherence, peeling and cracking of paint including change of a shade of its colour.

Climatic degradation is a danger especially to polymers, structure of which contains functional groups accelerating some of its partial actions, for example benzene, styrene and others. Dispersions made on basis of homopolymers and copolymers of vinyl acetate do not contain groups accelerating climatic degradation.

Duvilax WME dispersion is alcaline resistant and at the same time does not contain any functional groups, which would worsen resistance to photooxidative degradation.

It is necessary to observe, that resistance of a paint to climatic degradation does not depend exclusively on a joint, but also on a whole formulation of a paint (pigment concentration, type and quantity of filling mass and pigment, etc.).

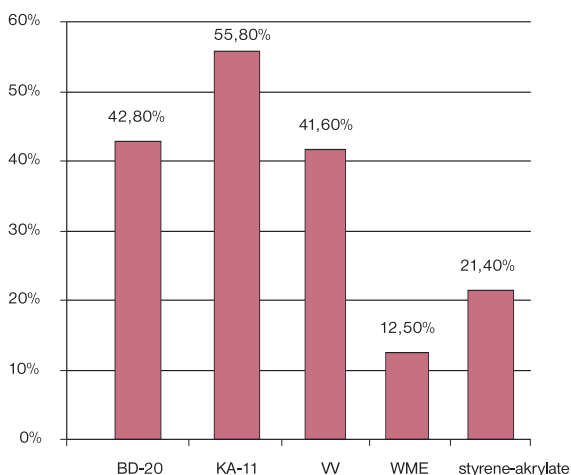
Absorptivity and permeability of vapour

The most important parameter, though not the only one, which affects water absorptivity to a film formed from polymer dispersion is the chemical composition of polymer, which forms dispersing elements.

Polyvinyl acetate is a hydrophilic polymer and therefore we can expect that dispersed films formed by polymers containig especially vinyl acetate elements, will absorb a great amount of water. This quality is taken by dispersing films from Duvilax BD-20, Duvilax KA-11 and Duvilax VV, as it is shown in a graph on following page.



Polymer film absorbability in water.

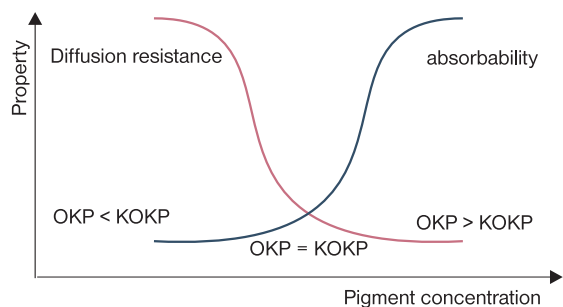


Hydrophobic versatate groups in Duvilax WME dispersion reduce absorbability practically the same way as styrene segments in styrene-acrylic dispersion.

Permeability of vapour as well as absorbability depend especially on structure of polymer. High permeability is observed in polymers with hydrophilic groups and also in polymers with hydrophobic, strongly branched groups. The more voluminous is the substituent, the higher is permeability of a polymer. This knowledge allows us to expect relatively high permeability of vapour in film made of Duvilax WME dispersion due to high content of voluminous hydrophobic groups of versatate comonomer. Presence of hydrophilic emulsifiers increases permeability of vapour on dispersing films. Washing them out therefore results in decrease of this constant and stable values measured by five cycles of dipping and drying were about 15 % lower than preliminary values.

Absorbability and permeability of vapour in paints is determined by volume concentration of pigment and filling masses (OKP). Both constants depend on a fact, to what extent a polymer joint fills all gaps between elements of mineral components of a paint. When the volume concentration of pigment is critical (KOKP), content of a joint is just sufficient to fill all gaps. If OKP is higher than KOKP, there remain gaps in a paint and with increasing OKP the paint becomes porous. It is logical to expect that the increase of OKP will result in big changes of permeability, absorbability of vapour and of other qualities of a paint.

These changes are schematically illustrated on following picture:



Diffusion resistance, which is in inverse proportion to permeability of vapour, steeply falls at values similar to KOKP. Absorbability, on contrary, starts to grow in these conditions. Around KOKP such conditions can be found, under which both permeability and diffusion resistance remain low. At this optimal value of OKP it makes sense to compare absorbability and permeability of vapour in paints formulated with different dispersing joint. Choice of a dispersing joint with low absorbability and high permeability of vapour and thus with low diffusion resistance, favourably affects these qualities in paints with optimal value of OKP.

Formulas

In formulas for interior dyes, quantity of used dye is about 10 %. This portion provides adequate abrasion resistance. By increasing the portion to 10 - 15 % it is possible to achieve washing out of a paint or, respectively, its plasticizing property (structural paints). In facade - exterior paints the portion of used dispersion is usually more than 30 %, in Duvilax WME, however, 20 % is enough. Wood paints require high adherence and high mechanical ruggedness. These qualities are provided by content of dispersion in formula of cca 50 %.

Content of dispersing components in formulation of universal paint substances is strictly determined by quality demands on resulting paint and therefore its definition is a result of laboratory research of a paint.

Table of use

DUVILAX	BD - 20	KA - 11	VV	WME	WME - AK
Interior paints	□	□	▲	●	
Exterior paints		●	□	▲	
Wood paints	●	□	□	●	
Anticorrosive dyes					▲
Universal/various	●	□	▲	□	

Legend: ▲ particularly recommended
 □ recommended use
 ● possible use

FIBRE AND INDUSTRIAL TEXTILES PRODUCTION



The production of glass fibre and textiles of glass, synthetic and natural fibre belongs to this consumption field.

- The production of glass fibre and textiles made of glass fibre is one of the most interesting application possibilities of the vinyl acetate dispersions. PVAc-dispersions are, in the technology of production of primary fibres and woven and non-woven textiles of glass fibres, one the main ingredients of the finishing bathes. Without them, the fibre would be fragmented, fragile, little resilient and difficult to treat. The finishing solution gives the fibre its utility properties.
- In the production of non woven textiles of synthetic fibres, eventually of other natural fibres of secondary raw materials, PVAs dispersions are used for a similar purpose than in the case of glass fibres, however we use them for refining of textiles, fibres` setting, reducing permeability for water, increasing of mechanical resistance etc.

General properties

Vinyl acetate dispersions are white liquids with little liquidity. They are non-explosive, incombustible and non-toxic. The film, which is created after the drying process, is transparent, relatively hard, non sticky and fragile.

From the chemical viewpoint we talk about water homopolymer polyvinyl acetate dispersions without softening agents or in the case of Duvilax KA-31 about water copolymer dispersions of vinyl acetate with acrylic ester.

Glass fibres

We produce four dispersion types for the glass fibre industry:

- Duvilax LM-52 is used as the main component of lubrication solution by the pulling of primary fibre and for finishing of some types of emulsion mats.
- Duvilax B with increased resistance against mechanical stress with the addition of starch and water repelling substances is set for the finishing of RECO-fibres, which are set for the production of asphalt paper boards used for insulation of flat roofs, heavy water proofing against ground-water, for the protection against underground steel tubing, lining of the heating medium on the basis of basalt wool or glass wool and for other technical purposes. It is compactable with bitumen.
- For the surface treatment of the fibre, which ensures its additional use in epoxy and polyester bitumen, we use the finishing solution made of Duvilax H, eventually KA-31.
- Duvilax KA-31 is used for the preparation of the finishing solution for emulsion mats. It can be added into the finishing solution with the purpose of increasing the solubility of the surface of the impregnated textile in the styrene.

Industrial textiles

The hardening of textiles of natural and synthetic fibres is in particular important from the viewpoint of their additional use (the production of non woven technical textiles and geotextiles). For this purpose Duvilax B proved to be the best.

Assortment

Type	Unit	Duvilax B*	Duvilax LM-52	Duvilax H	Duvilax KA-31
Dry substance content	%	minimum 48,5 %	minimum 50 %	minimum 51,5 %	minimum 51,5 %
Viscosity					
- Rheotest	mPa.s	1 000 - 4 000	300 - 2 000	10 - 70	10 - 70
- Brookfield	mPa.s	2 000 - 8 000	1 000 - 4 500	10 - 80	10 - 80
pH		3 - 5	3 - 5	4 - 6	4 - 6
Temperature of film formation	°C	minimum 17 °C	minimum 18 °C	min. 18 °C	minimum 5 °C
Element size	nm	300 - 3 000	350 - 550	190 - 250	190 - 250

* technical parameters refer to the standard Duvilax B and also for his modification with the increased resistance against mechanical stress.

PRODUCTION OF CARPETS



One of the important steps in the technology of carpet production is the so called back coating. Basically we talk about the application of polymer binding agents on the reverse side of the carpet web. In the case of woven carpets of unfilled connective materials, in the case of needled carpets, the connective material is filled with chalk or other inorganic filling agent. This treatment has several functions. It fixes the fibres of the carpet on the original place, facilitates a good adhesion to the surface and provides it with the necessary mass.

An advantage of the use of polyvinyl acetate dispersions Duvilax as a connective material for reverse side is, except of the high affinity to the carpet fibre and the filling capacity, its medical and hygienic harmlessness. Dispersion Duvilax used for this purpose do not contain agents which could impair the health, have no unpleasant smell and do not relieve toxic substances after running dry.

General properties

Vinyl acetate dispersions are white liquids with little liquidity and a characteristic smell. They are non-explosive, incombustible and

non-toxic. The film, which is formed after the drying process of the adhesive, is transparent, adherent, elastic and adequately soft.

From the chemical viewpoint we talk about homopolymer polyvinyl acetate dispersion in water, treated with plasticizer or about water copolymer dispersions of vinyl acetate with acrylic ester. The emulsion system is composed of non-ionogenous emulsifier and polyvinyl alcohol as a protective colloid.

Use

Duvilax products are universally usable for carpets made of poor wool or synthetic fibres (polypropylene, polyester). Their high adhesive capacity and the capacity of dilution with water enable the filling of dispersion with inorganic materials (chalk, kaolin, limestone etc.) up to 400 %, in the case of good adhesive capacity to the fibre.

Assortment

Type	Unit	Duvilax BD-5	Duvilax KA-12/50	Duvilax BD-20
Carpet type		woven	needled	needled, woven,
Dry substance content	%	50 ± 1	min. 50 %	min. 53,5 %
Viscosity				
- Rheotest	mPa.s	2 000 - 3 000	200 - 500	3 000 - 7 000
- Brookfield	mPa.s	3 500 - 5 000	200 - 600	4 000 -19 000
pH		7 - 8	7 - 8	3 - 5
Temperature of film formation	°C	min. 8 °C	min. 5 °C	min. 2 °C
Chalk filling	%	up to 200 %	up to 400 %	up to 200 %

OTHER POSSIBILITIES OF THE USE OF DISPERSIONS AND ADHESIVES



Production of synthetic starch

In this chemistry branch we use Duvilax B, with the addition of antistatic and brightening agent, aromatic substance and artificial preservatives, to produce high quality synthetic starch for starching linen, cotton and synthetic web (decoration fabrics, working clothes, embroideries, curtains etc.).

Textile and textile fibre hardening

Some sorts of textile and industrial textiles (felt etc.) are arranged by hardening in a water solution Duvilax BD-20, Duvilax B or possibly in both. The decision which sort to use, eventually establishing the mutual proportion depends on the requisite final "hardness", sort of web and fibre.

Production of adhesives

A part of the Duvilax types are suitable for the preparation of special dispersion adhesives. Adding different bitumen, aggregates, plasticizing agents, softening agents, biocides etc. it is possible to develop adhesives usable for adhesions in the building industry, printing industry, eventually in furniture making.

Duvilax B, BD-20, LS-50, KA-11, KA-18 and KA-4 can be used for such modification.

Motorcar industry

Duvilax KA-4 and its derived modification with a higher adhesive capacity Duvilax KA-4+ enable on different surfaces the creation of a permanently adhesive film. This property is used for textiles stuck in car interiors, under the bonnet in the luggage boot. In particular, we apply Duvilax KA-4 or KA-4+ on the reverse side of the textile and let it dry up. Afterwards we cover the adhesive layer with a greasy paper and the product can be delivered to the car producer. Then, after having unstuck the release paper, it must be stick on the assigned place in the car.

Tobacco industry

The production of cigarettes requires absolutely harmless materials. Duvilax B, which is used for the gluing of filters, is one of them. Duvilax BD-20 is used for gluing the boxes together.

Household

A good adhesive must be able to glue as many joints as possible. At the same time it must be harmless and non-toxic, so that children could use it, too (we do not recommend the using of adhesives by children under the age 7 at all).

Most of all Duvilax Expres LS in 280 gr. tubes with an application cap meets the given criteria. It can be used for sticking of wood, paper, cardboard etc. In case of necessity damaged wallpapers, tiles, broken chairs, books, unglued arch supporter can be repaired with these Duvilax products. In general, they can be used for all materials which can absorb water.

Duvilax BD-20, L-58, eventually LS-50 in 1 kg or in 5 kg packing have also wide possibilities of use, but the possibilities in this case are a bit more specific and require a certain skill and routine.



TRANSPORT AND DISTRIBUTION, PACKAGING, STORAGE, GUARANTEE PERIOD



TRANSPORT AND DISTRIBUTION

The products are distributed in standard packing, in pallets or in tanks. None of the Duvilax types are subject to ARD or RID regulations. However they are sensitive to freeze and therefore it is important especially during the winter months to ensure a safe transport.

Smaller multitude of products can be bought directly from the manufacturer in Sala, or in one of the shops of the distribution network in every bigger Slovak town and at the same time the prices do not vary too much from the prices in the factory.

Bigger amounts of deliveries are ensured by the producer after an agreement with the client. In this case too, the client can use the distribution network.

For more informations contact our sales department:

Duslo, a.s.

Dispersions and Adhesives sales department

927 03 Šaľa, Slovak republic

Tel: +421/31/775 30 64, 775 41 80, 775 28 32

Fax: +421/31/775 30 78

e-mail: duvilax@duslo.sk

PACKAGING

We put products of a gross weight up to 15 kg into packing suitable for small consumers. These have wide application possibilities

- Plastic tubes - 250 g
Duvilax Expres LS
Tubes are packed in boxes up to 25 pieces. In the pallet there are 54 boxes - 1 350 pieces of tubes (378 kg net)
- Plastic pots with a volume of 1 liter - 1 kg net
Duvilax BD-20, L-58, Expres LS, LS-50, D3 Rapid, basic and in-depth penetration
Pots are packed in boxes a 8 pieces. In the pallet there are 54 boxes - 432 pieces pots (432 kg net)
- Plastic bucket with a volume of 5 liter - 5 kg net
Duvilax BD-20, VV, WME, L-58, LP, Expres LS, LS-50, D3 Rapid, basic and in-depth penetration
Buckets are packed in pallets in 5 lines a 20 pieces, that is 100 pieces in a pallet (500 kg net)

TRANSPORT AND DISTRIBUTION, PACKAGING, STORAGE, GUARANTEE PERIOD



All types of dispersions and adhesives are delivered in the following packing:

- Plastic barrels with detachable cover and a polyethylene filler - 35 kg net
The barrels are put in pallet in two lines a 6 pieces (420 kg net) or in 3 lines a 6 pieces (630 kg net).
- Plastic barrel with detachable cover and a polyethylene filler - 125 kg net
The barrels are put in lines a 4 pieces (500 kg net)
- Steele barrels with detachable cover and a polyethylene filler - 200 kg net
Barrels are transported unattached on the vehicle
- Plastic containers with a spherical release valve of 80 mm - 1 000 kg net
Containers are transported unattached on the vehicle

The products are delivered in unpacked tanks

- Road tank car - ca. 22 000 kg net
- Railway tank - ca. 21 000 kg net

On the basis of the agreement with the customer deliveries can be realized also in different packing.

STORAGE

Dispersions and adhesives are stored in original, undamaged and closed packaging, in heated warehouses by temperatures from 5 °C to 40 °C. Duvilax may not be exposed to sun.

The products delivered in tanks are stored in special storage bins protected against corrosion caused by acid medium (pH from 3 to 6). The access of fresh air from the surroundings (e.g. water valve) must be avoided. It is necessary to avoid mixing with other medias and harmful microbiological materials. After emptying the tank we recommend to ensure its cleaning and the disinfection with a biocide agent.

GUARANTEE PERIOD

The guaranteed period for the product delivered in packing (up to 15 kg gross) is 12 months. For the rest of the products it is 6 months, in the case of keeping the storage conditions mentioned above.



QUALITY



Duslo, Joint stock company manufactures its products in accordance with the applied system of quality ISO 9001. We respect all environmental requirements. The introduction of the system of running the company in accordance with the requirements ISO 14001 is its proof.



The individual types of dispersions and dispersion adhesives are produced in accordance with the appropriate technical norms. The individual qualitative indexes are defined in accordance with the application purpose of the concrete type and the requirements of the costumers, in accordance with the general requirements of similar products, eventually of technical trial rooms. The evaluation of the parameters is carried out in accordance with the appropriate STN, ISO, DIN 's etc.

There was given a product certificate of agreement by the technical trial room Lignotesting Bratislava, Technical and experimental institute of builders Bratislava (Technickým a skúšobným ústavom stavebným, Bratislava) and Experimental institute of light industry, Prague (Skúšobným ústavom ľahkého priemyslu, Praha) for all Duvilax products.

Another awards, certificates and prizes

Duvilax Express LS	Slovak Gold 2002, Blue Planet award (ocenenie Modrá planéta), fulfils all requirements of the Codex Alimentarius of the Slovak Republic - can be used for the sticking of toys and items which are in contact with food
Duvilax D3 Rapid	Protocol IFT Rosenheim, Slovak Gold 2002, Honourable mention Incheba, fulfils the requirements of the Codex Alimentarius of the Slovak Republic - can be used for the sticking of toys and items which are in contact with food
Duvilax LS-50	Slovak Gold 1995, Gold medal - Jugoslavia 1999, environmentally suitable product 2000, fulfils the requirements of the Codex Alimentarius of the Slovak Republic - can be used for the sticking of toys and items which are in contact with food
Duvilax LP	Environmentally suitable product 2000, Award CONEX Nitra 1996
Duvilax L-58	Environmentally suitable product 2000

TECHNICAL PARAMETERS

Dispersions for production of paint substances

Type	Unit	Duvilax BD -20	Duvilax KA -11	Duvilax VV	Duvilax WME	Duvilax WME -AK
Content of dry substance	%	min. 53,5 %	min. 51,5 %	min. 51,5 %	min. 50 %	min. 50 %
Viscosity - Rheotest	mPa.s	3 000 - 7 000	800 - 2 800	600 - 1 800	1 000 - 4 500	1 000 - 4 500
- Brookfield	mPa.s	4 000 - 19 000	3 000 - 10 000	3 000 - 8 000	2 000 - 12000	2 000 - 12000
pH		3 - 5	4 - 6	4 - 6	4 - 6	4 - 6
Film forming temperature	°C	min. 2 °C	min. 5 °C	min. 5 °C	min. 5 °C	min. 5 °C
Glass transition temperature (Tg)	°C	~	11 °C	23,5 °C	6,5 °C	6,5 °C
Film hardness	%	1,7 %	2,1 %	8,7 %	2,1 %	2,1 %
Water absorptivity	%	42,8 %	55,8 %	41,6 %	12,5 %	12 %





BUILDING ADHESIVES					
Type	Unit	DUVILAX L-58	DUVILAX LP	DUVILAX BD -20	DUVILAX KA-4
BASIC PARAMETERS					
Content of dry substance	[%]	min. 58 %	min.60 %	min.53,5 %	min.50 %
Viscosity - Rheotest	[mPa.s]	3 000 – 6 000	5 000 – 10 000	3 000 – 7 000	4 000 – 8 000
- Brookfield	[mPa.s]	13 000 – 25 000	15 000 – 25 000	4 000 – 19 000	8000 – 18 000
pH		4 – 6	4 – 6	3 – 5	4 – 6
Film forming temperature	[°C]	min. 8 °C	min. 12 °C	min. 2 °C	min. 0 °C
Open time	[minutes]	2 – 15	5 - 15	5 - 15	min. 5
FIXING CONDITIONS					
Working temperature	[°C]	min. 15 °C	min. 15 °C	min. 10 °C	min. 5 °C
Relative dampness	[%]	40 – 75 %	40 – 75 %	40 – 75 %	40 – 75 %
Evenness of ground	[mm/2m]	± 1 mm	± 2 mm	± 1 mm	± 1 mm
Dampness of ground	[%]	max. 4 %	max. 2 %	max. 4 %	max. 4 %
Consumption of adhesive	[g/m ²]	350 – 500	800 – 1 000	90 - 160	90 - 160
Drying time at 20 °C	[hours]	min. 1	min. 48	min. 12	min. 1



TECHNICAL PARAMETERS

Basic parameters of polymer joints and penetrating substances

Type	Unit	Duvilax BD -20	Duvilax VV	Duvilax WME	Duvilax KA -31 VERTICAL PENETRATION	Duvilax VV PRIMER PENETRATION
Recommended use		To building mixtures, penetrations	To building mixtures, penetrations	To building mixtures, penetrations	Penetrations	Penetrations
Content of dry substance	%	min. 53,5 %	min. 51,5 %	min. 50 %	16 ± 1 %	10 ± 1 %
Viscosity - Rheotest	mPa.s	3 000 - 7 000	600 - 1 800	1 000 - 4 500	5 - 50	10 - 100
- Brookfield	[mPa.s]	4 000 - 19 000	3 000 - 8 000	2 000 - 12 000	5 - 80	10 - 200
pH		3 - 5	4 - 6	4 - 6	4 - 6	4 - 6
Film forming temperature	°C	min. 2 °C	min. 5 °C	min. 5 °C	min. 5 °C	min. 5 °C



DISPERSIONS AND ADHESIVES FOR WOOD-PULP INDUSTRY AND PRINTING INDUSTRY

Type	Unit	DUVILAX BD-20 low viscosity	DUVILAX BD-20 medium viscosity	DUVILAX BD-20/46	DUVILAX BD-20M	DUVILAX BD-10/45	DUVILAX BD-10/36	DUVILAX BD-2/50	DUVILAX BD-50 standard
Dry substance content	%	minimum 53,5 %	minimum 53,5 %	45 ± 1	46 ± 1	45 ± 1	36 ± 1	minimum 51%	minimum 57 %
Viscosity - Rheotest	mPa.s	2 000 - 4 000	4 000 - 6 000	2 000 - 3 000	100 - 1 000	300 - 800	300 - 800	3 500 - 6 000	3 000 - 13 000
- Brookfield	mPa.s	4 000 - 8 000	8 000 - 12 000	4 000 - 7 000	500 - 2 000	300 - 1 000	300 - 1 000	9 000 - 12 000	5 000 - 30 000
pH		3 - 5	3 - 5	7,0 - 8,5	3 - 5	8,0 - 9,5	8,0 - 9,5	7 - 9	3 - 5
Film formation temperature	°C	minimum 2 °C	minimum 2 °C	minimum 2 °C	minimum 2 °C	minimum 4 °C	minimum 4 °C	minimum 10 °C	minimum 0 °C

Type	Unit	DUVILAX BU	DUVILAX LM -52U	DUVILAX BP1-8/50	DUVILAX KA -11	DUVILAX KA -18	DUVILAX KA -22	DUVILAX LS-50	DUVILAX EXPRES LS
Dry substance content	%	minimum 42 %	minimum 36 %	minimum 49 %	minimum 48,5 %	minimum 51 %	minimum 50 %	minimum 48 %	minimum 50 %
Viscosity - Rheotest	mPa.s	300 - 1 300	300 - 1 300	4 000 - 5 000	1 500 - 2 800	1 000 - 4 000	1 000 - 3 500	3 000 - 6 500	4 000 - 8 000
- Brookfield	mPa.s	600 - 3 000	600 - 3 000	8 000 - 15 000	2 500 - 12 000	4 000 - 10 000	3 000 - 10 000	6 000 - 25 000	6 000 - 15 000
pH		6 - 8	6 - 8	3 - 5	4 - 6	4 - 6	4 - 6	4 - 6	4 - 6
Film formation temperature	°C	minimum 18 °C	minimum 18 °C	minimum 5 °C	minimum 5 °C	minimum 5 °C	minimum 5 °C	minimum 12 °C	minimum 10 °C

* The attributes for the individual types, can be treated on the basis of concrete conditions for the individual customers within the meaning of the information mentioned on the preceding pages.

Type	Unit	ADHESIVES FOR WOOD-WOOD FIXING						SPECIAL ADHESIVES		
		DUVILAX LSD - 1	DUVILAX LS - 50	DUVILAX LSR - 12	DUVILAX EXPRES LS	DUVILAX D3 RAPID	DUVILAX VP	DUVILAX KA - 18	DUVILAX KA - 22	
BASIC PARAMETERS										
Content of dry substance	[%]	minimum 49 %	minimum 48 %	minimum 50 %	minimum 50 %	minimum 49 %	minimum 59 %	minimum 51 %	minimum 50 %	
Viscosity - Rheotest	[mPa.s]	1 000 - 3 000	3 000 - 6 500	3 000 - 8 000	4 000 - 8 000	4 000 - 8 000	2 500 - 5 000	1 000 - 4 000	1 000 - 3 500	
- Brookfield	[mPa.s]	7 000 - 10 000	6 000-25 000	10 000-17 000	6000-15000	7000-20000	4000-10000	4000-10000	3000-10000	
pH		3 - 5	4 - 6	5 - 7	4 - 6	3 - 4	4 - 6	4 - 6	4 - 6	
Film forming temperature	[°C]	minimum 8 °C	minimum 12 °C	minimum 10 °C	minimum 10 °C	minimum 10 °C	~	minimum 5 °C	minimum 5 °C	
Minimum joint rigidity in shear (beech)	[MPa]	10 MPa	10 MPa	10 MPa	10 MPa	10 MPa	0,6 MPa	0,8 MPa	0,5 MPa	
Time of minimum joint rigidity achievement	[hours]	24 hours	24 hours	12 hours	4 hours	6 hours	~	~	~	
Joint rigidity in shear after 20 min. (beech)	[MPa]	0,1	0,1	0,2 - 0,3	6,0 - 8,0	4,5 - 6,0	~	~	~	
Open time	[minutes]	maximum 5 minutes	maximum 5 minutes	maximum 5 minutes	maximum 8 minutes	maximum 6 minutes	~	maximum 6 minutes	maximum 8 minutes	
Group of stress EN 204		D 1	D 2	D 2	D 2	D 3	~	~	~	
FIXING CONDITIONS										
Working temperature	[°C]	Minimum 15 °C, in heated fixing - maximum 100 °C								
Dampness of fixed particles	[%]	8 - 12 %								
Adhesive consumption	[g/m ²]	120 - 200	120 - 200	100 - 150	120 - 180	100 - 150	Depends on the machine		80 - 160	80 - 160
Press power	[MPa]	Minimum 0,7 MPa								
Press working time	[minutes]	20 - 40	20 - 40	20 - 40	1 - 20	10 - 30	~	~	~	~





duvilax

telephone: +421 - 31 - 775 22 75, - 775 41 80, - 775 30 64

fax: +421 - 31 - 775 30 78, - 775 30 57, -775 30 40

e-mail: duvilax@duslo.sk, duslo@duslo.sk

internet: www.duslo.sk

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Duslo, a.s.
927 03 Šaľa
Slovak republic