

TECHNICAL INFORMATION
LIMBOPLAST D480 Y1/Y2 STRUCTURE



LIMBOPLAST D480 Y1/Y2 STRUCTURE

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1	Main characteristics / Fields of applications	3
2	Technical Data	3
3	Mixing ratios / Application techniques / Hardener	4
4	Processing Instructions.....	4
4.1	Preparation of material and application techniques	4
4.2	Optimizing of application properties of cold plastic	5
4.2.1	General information	5
4.2.2	Viscosity.....	5
4.2.3	Reactivity / curing time	5
5	Road surface / pretreatment.....	7
5.1	General information	7
5.2	Concrete or cement-bound surfaces	7
5.3	Bituminous surfaces	7
6	Application techniques	7
7	RPA-Test reports by BAST (German Road Institute).....	9

Important Information:

Please consider our General Terms and Conditions and the general notes of the Technical Information Sheet! No liability is accepted for any errors! The information is provided to our best knowledge and experience. This information is, however, no warranty for any properties of the material. We provide this information without obligation, also regarding the rights of third parties. The user has to make sure that the material is appropriate for the respective application.

1 Main characteristics / Fields of applications

LIMBOPLAST D480 Y1/Y2 STRUCTURE...

- belongs to the group of solvent-free, multi-component, reactive systems
- consists of two or more components which – in a chemical reaction – form a duroplastic compound and cannot be thermally plastified thereafter
- the yellow marking material is tired and tested and has been tested on the turntable simulator at the German Road Institute (BASt) as type II marking for construction zones
- is – depending on the construction progress – an economic alternative to other temporary markings
- has been tested at the Institute for Paints and Varnish (ILF) for compliance with Y1 / Y2 chromaticity range in line with DIN 1436 and TL-temporary markings 97
- is suitable for bituminous surfaces and concrete (primer needed)
- can be applied with common application equipment / machinery for random or uniform agglomerate markings (extruder / dispensing shoe)
- has an open structure (agglomerates) with excellent drain effect and good resistance against snow ploughs.
- causes noise when run over by cars, depending on agglomerate structure, therefore D480 Y1/Y2 Structure is not suitable for urban areas

2 Technical Data

Color	yellow Y1/Y2 (for construction zones)
Density	approx. 1.80 kg/l +/- 0.1
Pot life	5 - 10 minutes (depending on added hardener quantity, air- material- and surface temperature)
Solvent content	solvent-free, solvent must not added for processing
Solvent for cleaning	Special cleaner for marking machines, Art.-No.: 3086
Storage stability	6 months, unmixed in sealed original packaging and sheltered from frost and direct sun exposure.
Trafficability / curing time	Depends on climatic conditions (cf. table „Pot life / Curing times“). In general the marking's trafficability must be checked before exposing it to traffic.
Standard packaging	<p>2-C D480 Y1/Y2 structure: tin container with 15/25/40 kg filling weight. Container on request</p> <p>3-C D480 Y1/Y2 structure: white container – 40 kg filling weight – component A blue container – 40 kg filling weight – reactive component B container – for component A and B on request</p> <p>Hardener powder: PE-bags – filling weight corresponds to cold plastic quantity and mixing ratio</p> <p>Liquid hardener: plastic cans – 20 kg filling weight</p> <p>Attention: All hardener types are organic peroxides – they must be separately packaged, transported and stored away from the cold plastic in special containers (special cartons and boxes)</p> <p>Drop-on material: paper bags with PE-inlay – 25 kg filling weight</p>
Identification	The regulations and instructions concerning appropriate transport, handling, storage, first aid and measures, toxicology are stated in detail in our material safety data sheets! The instructions stated on the product label and in the MSDS must be followed.
Processing temperature	min. + 5°C
Surface temperature	+ 5°C to + 45°C

Relative humidity	max. 75% (dew point spreadsheet has to be regarded)
Theoretical consumption	2.2 - 2.8 kg/m ² , the minimum of material quantity of 2.2 kg/m ² must not be underrun. In areas with intensive winter service we recommend a material consumption of 2.5 kg/m ² - 3.0 kg/m ²
Agglomerate coverage	min. 60% by vertical treatment (see general information of the technical information)

3 Mixing ratios / Application techniques / Hardener

Product	Art.-No.	Technique	Hardener type
2-C LIMBOPLAST D480 Y1/Y2 Structure reactive component B = base component summer formulation winter formulation	52D480Y1/Y2 52D480Y1/Y2W	Spiked roller / spring tension/ spinning spatula technique (SST)	Hardener powder
Mixing ratio: reactive component B (D480 Y1/Y2 Structure) : Hardener powder (BPO) = 100 : 1			
2-C LIMBOPLAST D480 Y1/Y2 Structure reactive component B = base component summer formulation winter formulation	52D480Y1/Y2No 52D480Y1/Y2NW	Shielded mixing system 2-component marking machines	Liquid hardener
Mixing ratio : reactive component B (D480 Y1/Y2 Structure) : Liquid hardener = 98 : 2			
3-C LIMBOPLAST D480 Y1/Y2 Structure reactive component B non-reactive component A	52D480Y1/Y2BFI 52D480Y1/Y2AFI	Shielded mixing system 3-comp- marking machines	Liquid hardener
Mixing ratio : component A * (non-reactive) + Liquid hardener (2% to 4%) : component B (reactive) = 1 : 1			

* Component A, mixed with hardener has a limited storage stability / pot life. Remaining quantity has to be removed from the machine (including hoses) after finishing the marking job.
Between October and April LIMBOPLAST D480 Y1/Y2 Structure is delivered in winter formulation, due to weather conditions.

4 Processing Instructions

4.1 Preparation of material and application techniques

LIMBOPLAST D480 Y1/Y2 Structure must be **homogeneously stirred** in its original container before processing! Then the hardener (powder or liquid) is mixed with the base component (LIMBOPLAST D480 Y1/Y2 Structure, component B – for 2-component systems, 100:1 and 98:2) at the indicated mixing ratio while using an appropriate stirring device. Never prepare more material with hardener than is needed for the application (observe pot life).

For 2-component marking machines with shielded mixture technique the correct mixing ratio must be ensured (extruder system).

Regarding **3-component LIMBOPLAST D480 Y1/Y2 Structure** (mixing ratio 1:1) the following additional information is important:

- The non-reactive component A is processed by homogeneously stirring 2 – 4 % hardener into it and filling it into the dedicated storage container A. The container must then be sealed in order to avoid contamination with component B. Subsequently the homogeneously stirred component B is filled into the dedicated storage container B.
- Extremely clean working conditions are essential when processing the components. Minimal contamination or intermixing of the components may lead to premature hardening. Therefore the use of different stirring devices or auxiliary tools for each component is recommended.
- Only merge the components in the mixing tube directly before application since even little intermixing leads to premature hardening with subsequent machine failure. Even with only short standstills of the machine it is necessary to rinse the mixing and application devices with special cleaner for marking machines (Art.-No.: 3086).

- The non-reactive component A has a limited storage stability / pot life when combined with the hardener (powder or liquid). Therefore residuals of the non-processed, premixed materials must be removed from the machine.

Cold plastic (reactive system) is solvent-free and must be applied without adding solvent (optimizing of material processability, point 4.2).

The cleaning must occur before the complete curing of the material takes place by using **special cleaner for marking machines** (Art.-No.: 3086).

The exact machine adjustments have to be made according to the manufacturer's instructions. Layer thickness and quantity of drop-on material need to be evenly distributed. Scattering losses on both line sides make modified machine adjustments necessary.

Theoretical material and drop-on material consumption are stated in:

- In the respective test reports by BAST
- In the table 1 "RPA-test reports by BAST" see point 7
- In the table "Theoretical consumption of material- and drop-on materials" on our website in kg/m² as well as in kg/km of line to be marked depending on typical line width

4.2 Optimizing of application properties of cold plastic

4.2.1 General information

The application properties and reactivity of the material depends on cold plastic, air and surface temperature. Proper storage conditions partly improve application conditions.

Attention: Use methods described in 4.2.2. and 4.2.3. regarding agent quantities. Exceeding the stated quantities and/or simultaneous usage of two or more methods (agents) will result in negative consequences regarding application properties and traffic technological properties.

4.2.2 Viscosity

Increase of viscosity (e.g. high material- air- and surface temperatures): add about a max. of 0.2 % thixotropic agent (Art.-No.: RH13700 solid or RH10459 liquid).

Reduction of viscosity (e.g. low material, air and surface temperatures): add about a max. of 1% condenser (Art.-No.: 3044).

Attention: Only add the required agent quantity, otherwise viscosity or settle properties may change.

4.2.3 Reactivity / curing time

Acceleration of reactivity / curing time (e.g. spring/autumn application jobs with low temperatures)

- Add a max. of 0.2 % accelerator for cold plastic (Art.-No.: 8060) or
- increase powder hardener quantity by up to a max. of 2% weight percentage

Retarding of reactivity / curing time (e.g. high temperatures in the summertime)

- Add a max. of 0.2 % retarder (Art.-No.: 8050) or
- reduce hardener quantity but not below 0.5% weight percentage for hardener powder or 1% for liquid hardener.

Attention: To ensure a proper chemical reaction do not get below 0.5% weight percentage of hardener powder and don't exceed 2% weight percentage for hardener powder.

Pot life and curing times depend on material and surface temperatures, hardener quantities, added accelerators or retarders as shown in the table.

Table 1: Pot life and curing times of 2-component cold plastics depending on material and surface temperature

Temp. (°C)	Powder hardener (weight %)	Pot life (min)	Curing time (min)	Liquid hardener (weight %)	Pot life (min)	Curing time (min)
0°	2	-	-	2	-	-
5°	2	31	48	2	28	65
10°	2	23	39	2	17	50
15°	2	12	30	2	15	46
20°	1	11	29	2	14	30
25°	1	9	25	2	12	26
30°	1	7	20	2	10	21
40°	0,5	10	26	2	6	15
45°	0,5	8	19	2	5	12

Table 2: Pot life and curing times of 3-component cold plastics system 1:1 depending on material and surface temperature

Temp. (°C)	Powder hardener (weight %)*	Pot life (min)	Curing time (min)	Liquid hardener (weight %)*	Pot life (min)	Curing time (min)
0°	4	-	-	4	-	-
5°	4	21	60	4	33	80
10°	4	16	42	4	26	49
15°	4	11	30	4	16	31
20°	2	13	27	2	21	35
25°	2	10	23	2	16	26
30°	2	11	20	2	13	22
30°	1	13	23	1	21	35
40°	1	10	22	1	14	23
45°	1	8	21	1	11	17

*Related to non-reactive component

Table 3: Pot life and curing times of 3-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	Accelerator (weight %)	Retarder (weight%)	Powder hardener (weight %)*	Pot life (min)	Curing time (min)	Liquid hardener (weight %)*	Pot life (min)	Curing time (min)
0°	0,2	-	2	-	-	4	-	-
5°	0,2	-	2	15	42	4	24	54
10°	0,2	-	2	12	29	4	18	38
15°	0,1	-	2	11	27	4	17	33
20°	-	-	2	11	29	4	16	33
25°	-	0,1	2	10	24	4	16	34
30°	-	0,1	2	8	20	4	13	27
30°	-	0,2	2	10	23	4	15	34
40°	-	0,2	2	7	17	4	10	24
45°	-	0,2	2	8	18	4	10	29

*Related to non-reactive component

Table 4: Pot life and curing times of 2-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	Accelerator (weight %)	Retarder (weight %)	Powder hardener (weight %)	Pot life (min)	Curing time (min)	Liquid hardener (weight %)	Pot life (min)	Curing time (min)
0°	0,2	-	1	-	-	2	-	-
5°	0,2	-	1	24	67	2	23	60
10°	0,2	-	1	19	36	2	17	34
15°	0,1	-	1	18	31	2	17	32
20°	-	-	1	15	31	2	15	30
25°	-	0,1	1	14	29	2	16	29
30°	-	0,1	1	13	26	2	13	27
30°	-	0,2	1	18	35	2	16	35
40°	-	0,2	1	14	26	2	11	22
45°	-	0,2	1	12	29	2	13	30

5 Road surface / pretreatment

5.1 General information

The surface must be dry, clean and free from grease, oil and loose gravel and other contaminations. The surface and potential existing old markings must be checked for their carrying capacity and compatibility with the material to be applied. In case of doubt, test applications and adhesion tests are required. Ideally, old markings should be removed with appropriate mechanical procedures.

With passing of time color intensity may change (fading and decreased intensity) due to: sun exposure, especially UV-light, water, dew, warm weather conditions, road salt. This effect is state-of-the-art and known as "chalking". Constant traffic impact can reduce chalking but it is not possible to avoid chalking completely (see "General Information for Technical Information"). If necessary construction zone markings can be refreshed by applying LIMBOPLAST KSP 120 Y1/Y2.

5.2 Concrete or cement-bound surfaces

The pavement components in new road surfaces that prevent good bonding (fine mortar layer, concrete slurries) must be appropriately removed (e.g. with high pressure water jet, fine mill cut or similar). We recommend conducting test applications.

Before applying LIMBOPLAST D480 Y1/Y2 structure, concrete or cement-bound surfaces should be pre-treated with primers:

- a) Using spray technique (paint spray machine) with 2-component EP-primer (Art.-No.: 8609000) or
- b) manually (roller) with 2-component B71 for concrete primer (Art.-Nr.: 8010).

It is essential to have a sufficient and uniform coverage with primer in order to obtain an optimum bonding of cold plastic and concrete. Primer consumption may vary depending on the concrete's porosity. The humidity of concrete must not exceed 4% during the application of 2-component B71 for concrete primer. Primers based on epoxide resins are suitable for residual damp surfaces.

5.3 Bituminous surfaces

Any loose components such as chippings must be removed. Flux oils, releasing agents from road rollers or other asphalt components are detrimental to good bonding of markings or can cause discoloration of the striping. In such a case, test markings have to be applied before applying other construction zone marking products.

6 Application techniques

Applied with common self-driving cold plastic extruder or dispensing shoe machines (for large-scale applications) or manually with smaller equipment (for locally limited applications) including various adaptive kits for the creation of agglomerate markings. Currently the following techniques are used to apply agglomerate markings:

1. Spiked roller technique

A spiked roller rotating under the dispensing shoe stochastically distributes the material on the road surface.

2. Spring tension technique

A roller whose springs with pressure and tension tear off the material flow and distribute it mechanically.

3. Spinning spatula technique (SST)

The material is distributed stochastically through the dispensing shoe via a perforated plate.

4. Agglomerate technique controlled by air impulses

a) Spotflex® – Technique by HOFMANN GmbH

The material mixed with the hardener in a mixing tube is applied under pressure through a block with an integrated pin system (pins abruptly opened and closed electro-pneumatically). With this technique regular or profiled structures can be applied. Stochastic agglomerates are achieved by mounting a spiked roller below the extruder exit.

b) VisiDot® and VisiStrukt® by Grün GmbH

By means of pressure cold plastic is pressed directly from a mixing device to the special application unit "Air Jet" without any moveable parts. Regular (VisiDot) and stochastic agglomerates (VisiStruct) can be applied with this technique.

Different application techniques create agglomerates of different shapes (e.g. spots, drops, etc.). The intensity of structure forming can be influenced both by machine adjustment (gap width of dispensing shoe, spring tension, speed, etc.) and material adjustment. There are no official indications so far about the ideal shape of the individual agglomerates. It is important to observe that material and drop-on materials are spread uniformly over the application surface and that the indicated quantities are respected.

Technique and material adjustment for the drop-on materials must be harmonized to ensure an optimum bead embedment also on the edges of the individual agglomerates.

Practical experience shows that the traffic technological properties of all kinds of agglomerates and their expected useful life depend on the following factors:

- The processing of the specified material quantity in the BASt-report (including drop-on material)
- An optimal structure with a good shoulder formation
- An agglomerate coverage >60% by vertical treatment
- The process ability of the material conforms to the concrete weather conditions (see point 4.2.2 and 4.2.3) and to the machine and application technique
- An optimal spreading and embedding (mainly on the shoulder) of the specified quantity / type of drop-on materials
- An optimal configuration of the marking machines and application aggregates in accordance with the technical requirements of the producer

7 RPA-Test reports by BAST (German Road Institute)

Test report – no.	Layer thickness mm	Consumption		Drop-on material (DOM) Identification	Traffic technological properties	
		material kg/m ²	DOM kg/m ²		New condition	Used condition
Type II marking						
2002 1VK 06.07	1.5 – 3.0	2.2 – 3.0	0.50	MEGALUX-BEADS 600-800 T18 K25	P6, S1, R4, RW6, Q3, T3	P6, S2, R4, RW5, Q3
2011 1VK 04.05	1.5 – 3.0	2.2 – 2.8	0.40	SWARCO SOLIDPLUS 100 212-850 T18	P7, S0, R5, RW6, Q3, T2; Y2	P7, S0, R5, RW5, Q3