

TECHNICAL INFORMATION
LIMBOPLAST
TEXTURED / STRUCTURED PLASTIC R



LIMBOPLAST

TEXTURED / STRUCTURED PLASTIC R

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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 application

LIMBOPLAST textured/structured plastic R...

- belongs to the group of solvent-free, multi-component, reactive systems
- consists of two or more components which – through chemical interaction – form a duroplastic compound and cannot be thermally plastified thereafter
- is suitable for bituminous surfaces (e.g. mastic asphalt, asphaltic concrete) and also concrete pavements (priming required)
- has been tested on the wear simulator at the German Road Institute (BASt)
- can be applied as Type I marking (plain) as well as Type II rain safety marking (flat line and agglomerate marking) with enhanced nighttime visibility under wet conditions. Has been tested as marking system together with LIMBOROUTE 2-K K809 as paint base marking
- is appropriate for all common application machines for flat and agglomerate markings

2 Technical Data

Color	White
Density	Approx. 1.9 kg/l +/- 0.1
Pot life	5 - 10 minutes (depending on hardener quantity added and air, material and surface temperatures; cf. "Table Pot life / Curing time")
Solvent content	Solvent-free, do not add solvent while applying
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 the climatic conditions (cf. table "Pot life / Curing times"). In general the marking's trafficability must be checked before exposing it to traffic
Standard packaging	LIMBOPLAST textured-/structured plastic R: Tin container with 10/15/25/40 kg filling weight; Container upon request Hardener powder: PE-bags – filling weight corresponds to cold plastic quantity and mixing ratio Hardener beads 2000: paper bags - 20 kg filling weight Liquid hardener: plastic cans - 20 kg filling weight Attention: all hardener types are organic peroxides - they must be separately packaged, transported and stored from the cold plastics in special containers (special cartons and boxes). Drop-on material: paper bags with PE-inlay – 25 kg filling weight
Identification	The regulations and instructions concerning the appropriate transport, handling, storage, first aid and measures, toxicology and ecology 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	Agglomerate marking: Minimum material quantity (without drop-on material 2.2 kg/m ² , minimum material quantity mentioned by BASt test-report (quantity must be observed). In areas with intensive snow plough usage a material consumption of 2.5 kg/m ² - 3.0 kg/m ² is recommended Plain marking: ca. 5.7 kg/m ² (3 l/m ²), approx. 1.9 kg/m ² per 1.0 mm layer thickness. Actual consumption depends on applied layer thickness, application technique (extruder or screed box), type und shape of surface
Thickness to be applied	Approx. 3 mm (plain)
Coverage	min. 60% by vertical treatment (see general information to the technical information)

3 Mixture ratios / Application techniques / Hardener

Product name	Art.-No.	Technique	Hardener type
LIMBOPLAST textured / structured plastic R white summer formulation winter formulation LIMBOPLAST textured / structured plastic R colored	5086 5086W 58...(RAL...)	Open mixture technique 2-comp. marking machine (screed box technique), manual application (trowel...)	Hardener powder
Mixture ratio: base component B (textured- / structured plastic R) : Hardener powder (BPO) = 100 : 1			
LIMBOPLAST textured / structured plastic R white summer formulation winter formulation	5086HP 5086HPW	Open mixture technique 2-comp. marking machine (screed box)	Hardener beads 2000
Mixture ratio: base component B (textured- / structured plastic R) : Hardener beads 2000 = 100 : 4			
LIMBOPLAST textured / structured plastic R white summer formulation winter formulation	5086FI 5086FIW	Shielded mixture technique 2-comp. marking machine	Liquid hardener
Mixing ratio: base component B (textured- / structured plastic R) : Liquid hardener = 98 : 2			
Between October and April LIMBOPLAST textured / structured plastic R is delivered in winter formulation, due to weather conditions			

4 Processing Instructions

4.1 Preparation of material and application techniques

LIMBOPLAST textured / structured plastic R has to be homogeneously stirred in the original container. Use just the quantity needed for the next marking job. Then the preferred hardener type is added while stirring homogeneously.

It is important for 2-component marking machines with shielded mixture procedure (98:2 system) to ensure the machine is adjusted with the correct mixing ratio inside the mixing tube.

Cold plastic (reactive system) is solvent-free and must be applied without adding solvent (for material processability optimizing, see 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 done according to the manufacturer's instructions. Layer thickness and drop-on material need to be evenly distributed. Scattering losses on both line sides make modified machine adjustments necessary.

4.2 Optimizing the 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 temperatures. Proper storage conditions partly improve application conditions.

Within a limited extend viscosity and reactivity / curing time can be adjusted to processing conditions.

Attention: use methods described in 4.2.2 and 4.2.3 regarding agent quantities. When exceeding the mentioned quantities and simultaneous usage of two or more methods (agents) grave consequence of application properties or traffic technological properties will occur.

4.2.2 Viscosity

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

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

Attention: Add the needed agent quantity only, otherwise viscosity or settle properties can change.

4.2.3 Reactivity / curing time

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

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

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

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

Attention: for ensuring proper chemical reaction don't come under 0.5% weight percentage for hardener powder and don't exceed 2% weight percentage for hardener powder. Different pot life and curing times depend on material- and surface temperatures, different hardener quantities, adding accelerator or retarder is shown in the spreadsheet.

Pot life and curing times of 2-C cold plastic in relation to material and surface temperatures

Temp. (°C)	Hardener quantity (Weight %)	Pot life (min)	Curing time (min)
0°	2	-	-
5°	2	17	22
10°	2	16	24
15°	2	8	20
20°	1	8	18
25°	1	7	17
30°	1	7	15
30°	0.5	8	18
40°	0.5	7	15
45°	0.5	6	13

Pot life and curing times of 2-component cold plastic depending on temperature while adding accelerator or retarder

Temp. (°C)	Hardener quantity (Weight %)	Accelerator (Weight %)	Retarder (Weight %)	Pot life (min)	Curing time (min)
0°	2	0.2	-	19	30
5°	2	0.2	-	18	26
10°	2	0.2	-	12	23
15°	2	0.1	-	7	19
20°	2	-	-	11	22
25°	2	-	0.1	13	27
30°	2	-	0.1	11	24
30°	2	-	0.2	19	28
40°	2	-	0.2	5	22
45°	2	-	0.2	6	25

5 Road surfaces / 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.

Information: LIMBOPLAST textured / structured plastic R is not appropriate for large surface applications.

For initial marking tried and tested LIMBOROUTE 2-C K809 is recommended. LIMBOROUTE 2-C K809 can be applied on humid surfaces and is a proven surface for cold plastic markings applied on top.

The BASt (German Road Institute) tested LIMBOROUTE 2-C K809 as a marking system together with LIMBOPLAST textured / structured plastic R (system test report available). Since LIMBOROUTE 2-C K809 is applied without drop-on material LIMBOPLAST textured / structured plastic R has to be applied immediately after LIMBOROUTE 2-C K809 application (see BASt test report No.: 2011 1DK 04.06).

5.2 Concrete and 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 waterjet, fine millcut or similar). We recommend conducting test applications.

Before applying LIMBOPLAST textured / structured plastic R concrete or cement-bound surfaces should be pretreated with primers:

- a. 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) or
- c. spray technique (paint spray machine) with LIMBOROUTE 2-C K809 (Art.-No.: 14809A)

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 the 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.

If an initial paint marking is applied without the above mentioned pretreatment, bonding tests have to be conducted before applying the permanent marking. In case of doubt, pretreatment and demarking of the initial paint marking may be necessary.

5.3 Bituminous surfaces

Any loose components such as chippings must be removed. Fluxoils, releasing agents for road rollers, are detrimental to good bonding of markings or can cause discoloration of the striping. Since a mechanical removal is hardly possible, the surface should be exposed to traffic for 4 – 6 weeks or an initial marking of paint has to be applied. It is recommended to use LIMBOROUTE 2-C K809, instead of a one-component paint, when applying an initial marking. A bonding check is required before applying the final marking.

5.4 Cobbled pavement

All kind of cobbled pavements are non-static surfaces. This can lead to crack formation or spalling on the marking. The Material is used without any manufacturer guarantee. Test applications and surface pretreatment are recommended. Ensure proper bonding on block paving. In case of doubt, test markings / bonding checks are required.

Compound concrete stone pavements:

Pavement has to be primed with 2-component B71 for concrete primer (Art.-No.: 8010), see Technical Information). Afterwards the cold plastic can be applied.

Natural – or cast stone pavement (basalt, granite...):

Marking surface is to be primed with 2-component Primer B55 for cobbled pavement (Art.-No.: 8011). Afterwards apply paving mortar (Art.-No.: 5232...) pay attention to get an even and flat surface. The overall dimensions should protrude 2 – 3 cm over the marking surface. Having cured cold plastic application follows. Consumption of primer and pavement mortar depends on shape of cobblestone pavement.

5.5 Floor coatings

For markings on floor coatings our indoor one of our marking products should be used.

6 Application techniques

With common cold plastic application machines (extruder, dispensing shoe) and with special adapter kits. For large-scale marking jobs self-propelled marking machines are used. For manual markings (e.g. urban area markings) small machines for manual application are used.

Attention: Despite the exact layer thickness adjustment at the dispensing shoe, increased consumption may occur when applying the material on coarse surfaces. This is because the hollow parts of the surface are filled first before a measurable layer thickness is built up. That may also occur by manual application on coarse surfaces.

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)

A roller whose springs (off tension) stochastically spin off the unmixed (without hardener) material flowing from the dispensing shoe and immediately drops on the hardener beads 2000 for hardening (open system – no pot life).

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).

4. VisiDot® und VisiStrukt® from Grün GmbH

The material mixed with the hardener in a mixing tube is conveyed under pressure through a special marking unit "Air Jet". Regular agglomerate markings (VisiDot®) and stochastic agglomerates (VisiStrukt®) are applicable.

The detailed settings depend on the application conditions and machine type and have to be adjusted according to the instructions of the machine manufacturer. It is important to watch that material and drop-on materials are uniformly spread over the application surface and that the indicated quantities are respected.

There are no official indications so far about the ideal shape of the individual agglomerates. For manual templates application pot life and curing time has to be regarded. Immediately after cold plastic application broadcast drop-on material.

It is practice proven that no quality differences occur between using powder hardener or liquid hardener.

7 Test reports

7.1 Table 1: RPA – test reports by BASt (German Road Institute)

Test report-no.	Layer thickness	Consumption		Drop-on material (DOM)	Traffic technological properties	
		Material	DOM	Identification (divergent identification possible - see relevant test report)	New condition	Used condition
		kg/m²	kg/m²			
Plain marking Type I						
2002 1DK 07.08	3.0	5.7	0.32	Swarco P21 3 :1	P7, S2, R4, Q5, T3	P7, S1, R4, Q5
Plain marking Type II						
2001 1DK 03.14	3.0	5.7	0.50	Swarco P21 3:1	P7, S2, R5, RW3, Q5, T3	P7, S1, R4, RW2, Q5
2000 1DK 02.12	3.0	5.7	0.40	Megalux 600-1500 KT14 3:1	P7, S3, R5, RW5, Q5, T3	P7, S1, R4, RW5, Q5
2014 1DK 05.12	3.0	5.7	0.50	Swarcolux 50 S +10 212 – 1.400 T18 MK30	P7, S1, R5, RW6, Q5, T3	P7, S2, R5, RW4, Q5
2019 1DK 03.18	3.0	5.7	0.45	Swarco SOLIDPLUS 10 425 – 1.400 T18 MK 30	P7, S1, R4, RW5, Q5, T2	P7, S2, R4, RW4, Q5
Unregular agglomerate						
2004 1DK 08.05	1.5 – 3.0	2.2–2.8	0.40	Swarco P21 without anti-skid material	P7, R5, RW6, Q5, T3	P7, R5, RW5, Q5
2009 1DK 11.09	1.5 – 3.0	2.2–2.8	0.40	Swarcoflex 100-600 T18 without anti-skid material	P7, R5, RW6, Q5, T3	P7, R5, RW5, Q5
Unregular agglomerates with initial paint marking (2-C K809)						
2011 1DK 04.06 K809 textured plastic RP	0.3 1.5 – 3.0	0.447 2.4–2.8	- 0.40	- Swarcoflex 100-600 T18 without anti-skid material	T2 P7, R5, RW6, Q5, T3	P7, R4, RW4, Q5

7.2 Table 2: Field test reports by DSGS (German Road Marking Society)

Test report-no.	Stretch	Traffic exposure	Layer thickness	Bead type	Traffic technological properties
5495.3	B 253	13 months	3 mm, center line	Meg. 0.6-1.5 KT14	Q3, R5, RW3, S1
5555	A8	11 months	3,5 mm center line	Meg. 0.6-1.5 KT14	Q4, R4, RW3, S1, B2
7029	B 294	14 months	3 mm	Meg. 0.6-1.5 KT14	Q4, R5, RW3, S2
7110	B 294	25 months	3 mm	Meg. 0.6-0.8 KT14	Q4, R4, RW3, S2
7531	B 303	24 months	stoch. agglomerate	P21 without anti-skid-material	Q3-Q4, R3-R4, RW2-RW4