

TECHNICAL INFORMATION
LIMBOPLAST KSP 140



LIMBOPLAST KSP 140 UNIVERSAL

Art.-No.: 51720R (reactive component)
 51720NR (non-reactive component)
 51720RW (reactive component, winter formulation)

Version: 2020-04-06

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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 applications

LIMBOPLAST KSP 140...

- belongs to the group of environmentally friendly, solvent-free, sprayable multi- component reactive systems
- consists of two or more components that chemically react with each other
- is suitable for both bituminous (e.g. mastic asphalt, asphaltic concrete) and concrete surfaces
- has been tested on the wear simulator at the German Road Institute (BASt)
- is appropriate for universal use with all common application techniques for cold spray plastics (system 98:2, system 1:1)
- is generally processed by airless technique

2 Technical Data

Color	White, other colors upon request
Density	approx. 1.39 kg/l +/- 0.06
Potlife	min. 2-5 min. (depending on the added amount of hardener, the air- and material temperature)
Solvent content	Solvent-free
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!
Overrollability / curing time	Depends on the climatic conditions (cf. table "Potlife / Curing times"). In general, the markings' overrollability must be checked before exposing them to traffic impact.
Standard packaging	<p>2-C KSP 140: Tin foil container of 35 kg filling weight. Container upon request</p> <p>3-C KSP 140: white container – 35 kg filling weight – non-reactive component blue container – 35 kg filling weight – reactive component Container for non-reactive and reactive component: upon request</p> <p>Hardener powder: PE- bags, filling weight corresponds to cold spray plastic quantity and mixture ratio</p> <p>Reactive glass beads Type I/II: paper bags – 25 kg filling weight</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 from the cold spray plastics 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 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.
VOC (according to ASTM 2369 – 10)	27.1 +/- 0.5 (g/l) (Test Report no. 180013236)
Processing temperature	Min. + 5°C
Surface temperature	+5°C to +45°C
Rel. humidity	Max. 75% (dew point spreadsheet has to be regarded)
Layer thickness	0.3 - 1.2 mm (dry layer thickness = wet layer thickness)
Theoretical consumption	0.41 – 1.66 kg/m ² (0.3 – 1.2 l/m ²) The actual consumption depends on the applied layer thickness and the type and state of the surface.

3 Mixture ratios / Application techniques / Hardener

Product	Art.-No.:	Technique	Hardener type
2-C LIMBOPLAST KSP 140 reactive component = base component summer formulation winter formulation	51720R 51720RW	Shielded mixture procedure, Marking machine for system 98:2	Liquid hardener
Mixture ratio: reactive component (KSP 140) : liquid hardener = 98 : 2			
3-C LIMBOPLAST KSP 140 reactive component = base component non-reactive component*	51720R 51720NR	Shielded mixture procedure, 3-comp. special marking machines	Hardener powder
Mixture ratio: non-reactive component* + Hardener powder (BPO) : reactive component = 1 : 1 (2% - 4%)			
3-C LIMBOPLAST KSP 140 reactive component = base component non-reactive component*	51720R 51720NR	Shielded mixture procedure, 3-comp. special marking machines	Liquid hardener
Mixture ratio: non-reactive component* + Liquid hardener : reactive component = 1 : 1 (2% - 4%)			

*non-reactive component, mixed with hardener gets a limited storage stability / pot life. Remaining quantity has to be as removed out of the machine after finishing marking job.
Between October and April LIMBOPLAST KSP 140 are delivered in winter formulation, due to weather conditions

4 Processing Instructions

4.1 Preparation of material and application techniques

LIMBOPLAST KSP 140 has to be homogeneously stirred in the original container. Use just the quantity needed for the next marking job. Then the wanted hardener type is added under homogeneous stirring.

It is important for 2-component marking machines with shielded mixture procedure (98:2 system) to ensure the machine is adjusted with the correct mixture ratio inside the mixing tube. Even with only short standstill times of the machine it is necessary to rinse the mixing and spray devices with **special cleaner for marking machines** (Art.-No.: 3086).

For **3-comp. marking machines** (mixture ratio 1:1) is additionally to consider:

- When preparing the non-reactive component hardener are added under homogenous stirring and then filled into the dedicated reservoir for the non-reactive component. Then the reservoir must be sealed.
- Extremely clean working conditions are essential when processing the components. Smallest contaminations / intermixing of the components can lead to premature curing. Therefore, it is advisable to use different stirring devices and auxiliaries for different components.
- Even with only short standstill times of the machine it is necessary to rinse the mixing and spray devices with special cleaner for marking machines (Art.-No.: 3086).
- Non-reactive component has a limited storage stability / potlife when mixed with hardener. Therefore, it is necessary to remove residuals of the non-applied, premixed material from the machine. Otherwise machine damage can occur in consequence of polymerization.

Cold spray plastics (reactive systems) are 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 done according to the manufacturer` 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 consumption of paint and drop-on material is listed:

- in the respective test reports by BAST
- in the Table 1 “RPA – test reports by BAST” see point 7.1
- in the table “Theoretical consumption of material and drop-on materials” on our homepage in kg/m²

4.2 Optimizing of application properties of cold spray plastic

4.2.1 General Information

The application properties and reactivity of the material depends on temperatures of cold spray plastic, air- and surface. Proper storage conditions improve application conditions partly. In a limited context, the viscosity and reactivity / curing time of cold spray plastics can be adapted to the specific local processing conditions.

Attention: Use methods described with 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 temperatures): addition of max. 0.2% thixotropic agent (Art.-No.: RH13700 solid or RH10459 liquid).

Reduction of viscosity (e.g. low material- air- and surface temperatures) addition of max. 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 spray plastic (Art.-No.: 8060) or
- b) increase hardener quantity up to max. 2% weight percentage

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

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

Attention: for ensuring proper chemical reaction don't come under 0.5% weight percentage and don't exceed 2% weight percentage for hardener.

Different potlife- and curing times depend on material- and surface temperatures, different hardener quantities, adding accelerator or retarder is shown in the spreadsheet.

Table: Curing times of 2-C cold spray plastic system 98:2 with liquid hardener in relation to material and surface temperatures

Temp. (°C)	hardener quantity liquid (weight %)	Hardener time (min)
0°	2	23
5°	2	15
10°	2	13
15°	2	10
20°	2	9
25°	2	7
30°	2	5
40°	2	4
45°	2	3

Potlife and curing times of 3-component cold spray plastics depending on material and road surface temperatures

Temp. (°C)	Hardener quantity liquid / solid (weight %)*	Hardener time (min)
0°	4	35
5°	4	30
10°	4	15
15°	4	10
20°	2	6
25°	2	5
30°	2	5
30°	1	8
40°	1	5
45°	1	5

Potlife and curing times of 3-component cold spray plastics depending on temperature while adding accelerator or retarder

Temp. (°C)	Hardener quantity liquid / solid (weight %)*	Accelerator (weight%)	Retarder (weight%)	Hardener time (min)
0°	2	0.2	-	27
5°	2	0.2	-	22
10°	2	0.2	-	7
15°	2	0.1	-	6
20°	2	-	-	6
25°	2	-	0.1	7
30°	2	-	0.1	6
30°	2	-	0.2	5
40°	2	-	0.2	7
45°	2	-	0.2	7

* non-reactive component

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.

Information: LIMBOPLAST KSP 140 is not appropriate for large surface applications.

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 waterjet, fine millcut or similar). New washed concrete pavements (with chip seal surface) can still cause adhesion problems that are not due to the marking material / primer. We recommend conducting test applications.

Before applying cold spray plastic concrete or cement-bound surfaces should be pretreated with primers:

- by spray technique (paint spray machine) with 2-component EP-primer (Art.-No.: 8609000) or
- manual (roller) with 2-component B71 for concrete primer (Art.-No.: 8010)

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

Primers diminish formation of bubbles that are likely to occur when concrete surfaces are not primed.

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 is to be applied.

5.4 Cobbled pavement

All kind of cobbled pavements are moveable surfaces. That can lead to crack formation or spillings on the marking. Material is used without any manufacture guarantee. Test applications, surface pretreatments are recommended. Cobbled pavement must ensure proper bonding.

Compound concrete stone pavements:

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

Natural or cast stone pavements (basalt, granite....):

Marking surface must be primed with 2-C primer B55 for cobbled pavement (Art.-No.: 8011). Afterwards apply paving mortar (Art.-No.: 5232...) and pay attention to get an even and flat surface. The overall dimensions should protrude 2 – 3 cm over the marking surface. After curing coldplastic application follows. Consumption of primer and pavement mortar depends on shape of paving.

5.5 Floor coatings

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

5.6 Worn agglomerate markings for refurbishment

Worn agglomerate markings which have to be refurbished regarding structure or traffic technological properties, can be remarked with LIMBOPLAST KSP 140.

In practice there are basically three different possibilities for the refurbishment of agglomerate markings:

- a) Agglomerate structure in good repair, traffic-technological properties are below the minimum requirements – it is recommended to refurbish with 0.3 to max. 0.4 mm KSP 140 with type I drop-on material.
- b) Agglomerate heavily worn, road surface to be renewed – it is recommended to refurbish with 0.6 mm KSP 140 with type II drop-on material.
- c) Agglomerate heavily worn, no road surface renewal is planned – recommendation regarding the refurbishment – mark over with new agglomerate marking. Milling the worn agglomerate marking without damaging the road surface is optional.

6 Application techniques

Application with 2-component or 3-component marking machines. Airless products need airless machines.

The quality of cured cold spray plastic is independent of chosen application technique and shows no differences. Powder or liquid hardener is chemically equivalent.

Following application techniques are used:

1. 3-component marking machine, 1 : 1 technique

Non-reactive component (mixed with 2-4% liquid or powder hardener) and the reactive component are conveyed from separate containers with mixture ratio 1 :1, then constantly mixed in a mixing tube and finally airless applied. The drop-on material is eventually broadcasted with the wanted quantity into the fresh layer.

2. 2-component marking machine, 98 : 2 technique

Reactive component and the liquid hardener are stirred up inside the mixing tube and applied by airless – or air spray technique. The drop-on material is eventually broadcasted with the wanted quantity into the fresh layer.

7 Test reports / Field test reports

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

Test report-no.	Layer thickness mm	consumption		Drop-on material (DOM)	Traffic technological properties	
		Material kg/m ²	DOM kg/m ²	Identification (divergent identification possible – see relevant test report)	New condition	Used condition
Type I marking						
2019 1DY 02.13	0.3	0.417	0.30	SWARCO SOLIDPLUS 10 P21 T18 M25	P7, S1, R5, Q5, T2	P7, S2, R5, Q5
2019 1DY 02.14	0.4	0.556	0.40	SWARCO SOLIDPLUS 10 P21 T18 M25	P7, S1, R5, Q5, T2	P7, S2, R5, Q5
Type II marking						
2018 1DY 01.11	0.6	0.834	0.50	SWARCOLUX 50 425–1400 T18 MK30	P7,S1, R5, RW6, Q5, T3	P7,S1, R5, RW5, Q5
2019 1DY 03.09	0.7	0.973	0.70	SWARCO SOLIDPLUS 10 425–1400 T18 MK30	P7,S1, R5, RW4, Q5, T2	P7,S1, R5, RW5, Q5