

TECHNICAL INFORMATION
LIMBOPLAST KSP 120F AIRPORT



LIMBOPLAST KSP 120F AIRPORT

Art.-No.: 5173FR	(reactive component white)
5173F....(RAL)R	(reactive component colored)
5173FNR	(non-reactive component white)
5173F....(RAL)NR	(non-reactive component colored)

Version: 2021-08-12

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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 KSP 120F airport...

- belongs to the group of environmentally friendly, solvent-free, sprayable multi-component reactive systems
- consists of two or more components which – through chemical interaction – form a duroplastic compound which cannot be thermally plastified thereafter
- suitable for airfield runways and taxi ways with medium impact by aircrafts
- available in colors according to DIN 6171, standard colors for airfields
- has been tested on the turntable simulator at the German Road Institute (BASt) as TYPE I and TYPE II marking
- has been tested for resistance against kerosene according to DIN EN ISO 2812-3 and chemical resistance on basis of DIN 68861, part 1 / DIN EN 12720 (test report ILF Magdeburg)
- according to the requirements of chromaticity co-ordinates, luminance factor and resistance to chemicals of EASA (European Aviation Safety Agency) (confirmation is conformed to the DSGS certificates)
- is suitable for all bituminous and concrete surfaces
- is appropriate for universal use with all common application techniques for cold spray plastics (system 98:2, system 1:1)
- applicable with airless and air spray technique

2 Technical Data

Color	White, RAL-colors within limits of color co-ordinates according to Annex 14 ICAO and EASA* (without chromaticity co-ordinates of the color sky blue and grass-green)
Density	approx. 1.58 kg/l +/- 0.06
Potlife	2-5 min. (depending on the added amount of hardener, the air- and material temperature)
Solvent content	Solvent-free, do not add solvents for processing
Solvent for cleaning	Special cleaner for marking machines Art.-No.: 3086
Storage stability	6 months; unmixed in sealed original packaging and protected from frost and direct sun light
Trafficability / curing time	Depends on the climatic conditions (cf. table "Potlife / Curing times"). In general, the marking's trafficability must be checked before exposing it to traffic impact!
Standard packaging	<p>2-Comp. KSP 120F airport: Tin container of 10/15/25/40 kg filling weight Larger containers upon request</p> <p>3-Comp. KSP 120F airport: white container – 40 kg filling weight – non-reactive component Blue container – 40 kg filling weight – reactive component Container for reactive/non-reactive component: upon request</p> <p>Hardener powder: PE-bags, filling weight corresponds to cold spray plastic quantity and mixture 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 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.
Processing temperature	+ 5°C to + 45°C
Rel. humidity	max. 75% (dew point spreadsheet has to be regarded)
Layer thickness	0.3 - 0.6 mm depend on BASt report (dry layer thickness = wet layer thickness)

Theoretical consumption	0.47 – 0.95 kg/m ² (0.3 – 0.6 l/m ²), white, the actual consumption depends on the applied layer thickness and the type and state of the surface
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*In order to simplify color selectin: in practice RAL colors with color co-ordinates within limits of Annex 14 ICAO and EASA are used. The colors sky blue and grass-green are recommended due to improved recognizability.

3 Theoretical consumption of material

Product	RAL color	Density kg/l	Theoretical Consumption* / layer thickness		
			kg/m ²	kg/m ²	kg/m ²
			0.3 mm	0.4 mm	0.6 mm
LIMBOPLAST KSP 120F airport white	9016	1.58	0.47	0.63	0.95
LIMBOPLAST KSP 120F airport traffic yellow	1023	1.49	0.45	0.60	0.89
LIMBOPLAST KSP 120F airport traffic orange	2009	1.48	0.44	0.59	0.89
LIMBOPLAST KSP 120F airport traffic red	3020	1.47	0.44	0.59	0.88
LIMBOPLAST KSP 120F airport sky blue	5015	1.51	0.45	0.60	0.91
LIMBOPLAST KSP 120F airport grass-green	6010	1.52	0.46	0.61	0.91
LIMBOPLAST KSP 120F airport traffic black	9017	1.53	0.46	0.61	0.92

*rounded theoretical consumption

The actual consumption depends on the applied layer thickness and the type and state of the surface.

4 Mixture ratios / Application technique / Hardener

Product	Art.-no.:	Technique	Hardener
2-C LIMBOPLAST KSP 120F airport reactive component = base component	5173FR	Shielded mixture technique Marking machine for system 98 : 2	Liquid hardener
Mixture ratio: reactive component (KSP 120F) : Liquid hardener = 98 : 2			
3-C LIMBOPLAST KSP 120F airport reactive component = base component non-reactive component*	5173FR 5173FNR	Shielded mixture technique 3-component marking machine	Hardener powder
Mixture ratio: non-reactive component * + Hardener powder (BPO) : reactive component = 1 : 1 (2% to 4%)			
3-C LIMBOPLAST KSP 120F airport Reactive component = base component Non-reactive component*	5173FR 5173FNR	Shielded mixture technique 3-component marking machine	Liquid hardener
Mixing ratio: non-reactive component* + Liquid hardener : reactive component = 1 : 1 (2% to 4%)			

* Non-reactive component, mixed with hardener gets a limited storage stability / pot life. Any remaining quantity has to be removed out of the machine when the marking job is finished.

Between October and April LIMBOPLAST KSP 120F airport are delivered in winter formulation, due to weather conditions

5 Processing instructions

5.1 General information

In addition to ICAO-Annex 14 national guidelines / recommendations regarding markings for aircraft operations areas or airport ramps, taxiways, runways have to be observed.

5.2 Preparation of material and application techniques

LIMBOPLAST KSP 120F airport must be **homogeneously** stirred in its original container before processing! Never prepare more material with hardener than is needed for the application (observe potlife).

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) please also consider the following:

- When preparing the non-reactive component, the hardener is 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 / inter-mixings 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 the hardener. Therefore it is necessary to remove residuals of the non-applied, premixed material from the machine. Otherwise machine damage may occur as a result of polymerization.

Cold spray plastic (reactive systems) are solvent-free and must be applied without adding solvent (optimizing of material processability, see Ch. 5.3).

The cleaning must occur before the complete curing of the material has finished 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.

The theoretical consumption of material and drop-on materials are stated in:

- in the respective test reports by BAST
- in the table 1 "RPA – test reports by BAST" see point 8.1
- In the table "Theoretical consumption of material" see point 3
- 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

5.3 Optimizing of application properties of cold plastic

5.3.1 General information

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

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 in 5.3.2 and 5.3.3 regarding agent quantities. When exceeding the specified quantities and simultaneous usage of two or more methods (agents) may lead to poor application properties and traffic technological properties.

5.3.2 Viscosity

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

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

Attention: Add the needed agent quantity to the required amount of material for application only, otherwise viscosity or settle properties can change.

5.3.3 Reactivity / curing time

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

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

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

- add a maximum of 0.2% retarder (Art.-No.: 8050) or
- reduce hardener quantity but not below 0.5% by weight

Attention: To ensure a proper chemical reaction do not go below 0.5% by weight and do not exceed 2% by weight for hardener.

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

Curing time of 2-C KSP120F airport (with liquid hardener 98:2) depending on material and surface temperatures

Temp. (°C)	Hardener quantity Liquid / powder (weight %)	Curing 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

**Curing times of 3-C KSP 120F airport
depending on material and road surface
temperature**

**Curing times of 3-C KSP 120F airport depending on
temperature while adding accelerator or retarder**

Temp. (°C)	Hardener quantity liquid / solid (weight %)*	Curing time (min)	Temp. (°C)	Hardener quantity liquid / solid (weight %)*	Accelerator (weight %)	Retarder (weight %)	Curing time (min)
0°	4	35	0°	2	0.2	-	27
5°	4	30	5°	2	0.2	-	22
10°	4	15	10°	2	0.2	-	7
15°	4	10	15°	2	0.1	-	6
20°	2	6	20°	2	-	-	6
25°	2	5	25°	2	-	0.1	7
30°	2	5	30°	2	-	0.1	6
30°	1	8	30°	2	-	0.2	5
40°	1	5	40°	2	-	0.2	7
45°	1	5	45°	2	-	0.2	7

* non-reactive component

6 Road surfaces / pretreatment

6.1 General information

The surface must be dry, clean and free from grease, oil and loose gravel and other contaminations. The surface and potentially 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.

Colored marking materials may fade after some time of outside exposure. This is a normal effect caused by sun exposure, water, road salt, dew, condensed water and heat. Constant traffic impact reduces bleaching and shifting of color intensity, but is not able to prevent fading completely. See our elaborations on this topic in our "General notes on technical information sheets".

If necessary colored markings are to be renewed. Annex 14 ICAO describes under point 3, "Colors for markings, signs and panels", that color shade can fade, therefore specifications for paints are valid for freshly applied paint only.

Attention: LIMBOPLAST KSP120F airport is not suitable for large scale markings.

6.2 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 KSP 120F airport on 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 primer B71 for concrete (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 moisture of concrete must not exceed 4% during the application of 2-component primer B71 for concrete. Primers based on epoxy resins are suitable for residual moisture surfaces (see point a).

Primers diminish bubble formation which is likely to occur when concrete surfaces are not primed.

6.3 Bituminous surfaces

Any loose components such as chippings must be removed. Fluxoils, releasing agents for road rollers, are detrimental to good bonding of markings and can cause discoloration of the striping. Since airfields with new surfaces cannot be left unused and unmarked for 4–6 weeks, test markings and bonding checks are required prior to the application of the final marking.

6.4 Floor coatings

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

7 Application techniques

Application with 2-component or 3-component marking machines. Airless machines need airless products. The quality of cured cold spray plastic is independent of the chosen application technique and shows no differences. Powder or liquid hardener is chemically the same.

The 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 shielded mixing tube and finally applied with an airless device. The drop-on material must be evenly broadcast onto the fresh layer with the intended quantity.

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

Reactive component and the liquid hardener are mixed inside the shielded mixing tube and applied with airless or air spray technique. The drop-on material must be evenly broadcast onto the fresh layer with the intended quantity.

8 Test reports

8.1 RPA – test reports by BASt (German Road Institute)

Test report-no.	Layer thickness mm	consumption		Drop-on material (DOM) Identification (divergent identification possible - see relevant test report)	Traffic technological properties	
		Material kg/m ²	DOM kg/m ²		New condition	Used condition
Type I marking white						
2020 1DY 09.01	0.3	0.47	0.30	Airport beads Type I T18 M30	P7, S1, R5, Q5, T2	P7, S2, R5, Q5
Type I marking yellow						
2020 1VY 11.12	0,3	0,45	0,30	Airport beads Type I T18 GG30	P7, S1, R5, Q3, T2*; Y2	P7, S1, R4, Q3
2019 1VY 02.15	0.4	0.60	0.40	Airport beads Type I T18 GG30	P7*	P7*
Type II marking						
2012 1DY 08.10	0.6	0.95	0.50	Airport beads Type II T18 M25	P7, S1, R5,RW6, Q5,T2	P7, S1, R5,RW6,Q5

*only confirmation of testing the marking systems