TECHNICAL INFORMATION

LIMBOPLAST D580

FOR PLAIN / STRUCTURE / PROFILE

swarco

Road Marking Systems

Road Marking Systems

LIMBOPLAST D580
FOR PLAIN / STRUCTURE / PROFILE

Art.-No.: 5060D580R (reactive component)
5060D580NR (non-reactive component)
5060D580RW (reactive component, winter formulation)

Version: 2020-03-31

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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 D580...

- 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
- has been tested and approved by several test reports on the turntable simulator at the German Road Institute (BASt) as TYPE I and TYPE II (rain safety marking) marking
- is suitable for bituminous surfaces and also concrete pavements (priming required)
- one formulation is suitable for all conventional cold plastic machines and for plain, structure and profile markings (shielded system), incl. dispensing shoe (open system) as well as for both agglomerate techniques (regular and irregular markings)
- as agglomerate marking (rain safety marking) provides an excellent drain effect and good resistance against snow ploughs. Causes noise while being driven over by cars, therefore the structure version is not suitable for urban areas
- targeted profile spacings create acoustic and vibratory effects when being driven over by car tyres and warn drivers who are running the risk of getting off the road. Profiled markings make dangerous zones less critical; not suitable for urban areas
- applied as plain marking LIMBOPLAST D580 is suitable for residential areas due to a low noise level as TYPE I or TYPE II (rain safety version) marking

2 Technical Data

Color	White (other colors on request)
Density	approx. 1.84 kg/l +/- 0.1
Potlife	5 - 10 min. (depending on hardener quantity added and air, material and surface temperatures; cf. “Table Potlife / Curing time”!)
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!
Trafficability / curing time	Depends on the climatic conditions (cf. table “Potlife / Curing times”). In general, the markings` over rollability must be checked before exposing them to traffic impact.
Standard packaging	**2-C D580:** Tin container with 10/15/25/40 kg filling weight; Container filling upon request **3-C D580:** white container, 40 kg filling weight, non-reactive component blue container, 40 kg filling weight, reactive component Container for reactive / non-reactive component **Hardener powder:** PE-bags, filling weight corresponds to cold plastic quantity and mixing ratio **Hardener beads:** PE-bags, 20 kg filling weight **Liquid hardener:** plastic cans, 20 kg filling weight **Attention:** all hardener types are organic peroxides. They must be packaged separately, transported and stored away from the cold plastic 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 appropriate transport, handling, storage, first aid & 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	**approx. 1.84 kg/m² per 1 mm layer thickness** **approx. 3.68 - 5.52 kg/m² for 2 – 3 mm layer thickness for plain marking** **approx. 5 - 6 kg/m² for profile marking** **approx. 2.2 - 2.8 kg/m² for structure marking** The **theoretical consumption** depends on the marking type (plain, structure, profile). The **actual consumption** depends on the applied layer thickness for plain, structure and profile markings, the application techniques (extruder or despensing shoe / screed box), and state of the surface (despensing shoe). The material consumption for agglomerate markings (without drop-on material) must not to be underrun. In areas with intensive snow plough impact we recommend a material consumption of 2.5 kg/m² - 3.0 kg/m
agglomerate coverage	min. 60% by vertical viewing (see general information to the technical information)

3 Mixing ratio / Application techniques / Hardener

Product	Art.-No.	Technique	Hardener type
2-C LIMBOPLAST D580 **reactive component = base component** summer formulation winter formulation	**5060D580R** **5060D580RW**	**Open mixture technique** spicked roller technique spring tension technique spicked roller technique	Hardener powder
Mixing ratio: reactive component (D580) **: hardener powder** (BPO) **= 100 : 1**			
2-C LIMBOPLAST D580 **reactive component = base component** summer formulation winter formulation	**5060D580R** **5060D580RW**	**Open mixture technique** 2-component applicators with spicked roller technique 2-component applicators with rotating spatula technique	Hardener beads 2000
Mixing ratio: reactive component (D580) **: hardener beads 2000 = 100 : 4**			
2-C LIMBOPLAST D580 **reactive component = base component** summer formulation winter formulation	**5060D580R** **5060D580RW** **5060D580R**	**Shielded mixture technique** 2-component applicators, prior-ranking spicked roller technique 2-comp. applicators, spring tension technique 2-component applicators with Spotflex-Silent-Technique; perforated plate technique ; extruder technique	Liquid hardener
Mixing ratio: reactive component (D580) **: liquid hardener = 98 : 2**			
3-C LIMBOPLAST D580 **reactive component -** summer formulation winter formulation **non-reactive component**	**5060D580R** **5060D580RW** **5060D580NR**	**Shielded mixture technique** 3-Comp. special machine 2-Comp. plus special machine	Liquid hardener
Mixing ratio: non-reactive component* + liquid hardener : reactive componente = 1 : 1 (2% to 4%)			
3-C LIMBOPLAST D580 **reactive component -** summer formulation winter formulation **non-reactive component**	**5060D580R** **5060D580RW** **5060D580NR**	**Shielded mixture technique** 3-Comp. special machine 2-Comp. plus special machine	Hardener powder
Mixing ratio: non-reactive component* + Hardener powder BPO : reactive component = 1 : 1 (2% to 4%)			

*****non-reactive component mixed with hardener gets a limited storage stability / pot life. Remaining quantity should be removed out of the machine, (inclusive hoses) after finishing marking job.
Between October and April LIMBOPLAST D580 is delivered in winter formulation, due to weather conditions.

4 Processing instructions

4.1 Preparation of material and application techniques

LIMBOPLAST D580 must be **homogeneously stirred** in its original container before processing! Depending on machine or application technique the hardener (powder or liquid) is mixed with the defined component under adherence to the stated mixture ratio using an appropriate stirring device. Never prepare more material with hardener than is needed for the application (observe potlife).

When using 2-C marking machines with a shielded mixture technique it is important to ensure that base component and liquid hardener are mixed in the extruder in adherence to the stated mixture ratio.

Regarding the 3-component marking machines (mixing ratio 1:1) the following additional remarks are important:

- The non-reactive component is processed by homogeneously stirring 2 - 4 % hardener into it and filling it into the dedicated storage container for the non-reactive component. The container must then be sealed to avoid contamination with the reactive component. Subsequently the homogeneously stirred reactive component is filled into the dedicated storage container for the reactive component.
- 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 has a limited storage stability / potlife when combined with the hardener (powder or liquid). Therefore, residuals of the non-processed, premixed materials must be removed from the machine.

Cold plastics (reactive systems) are **solvent-free** and must be applied without adding solvent (optimizing of material processability, see 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 should be done 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 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
- 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 plastic

4.2.1 General information

The application properties, structure and reactivity of the material depends on temperatures of cold plastic, air and surface. Proper storage conditions improve application conditions partly (see Technical Data).

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.
Exceeding the determined quantities may lead to substantial changes in material processability and subsequently in a change of its traffic technological properties.

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 plastic (Art.-No.: 8060) or
b) increase hardener quantity up to max. weight 2%

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 weight 0.5%

Attention: for ensuring proper chemical reaction do not get below weight 0.5% and do not exceed weight 2% for hardener.

Different pot life and curing times depend on material, surface temperature, hardener quantities, addition of accelerator or retarder as shown in the spreadsheet.

Table 1: Pot life and curing times of 2-component cold plastic systems 98:2 with liquid hardener depending on material and surface temperature

Temp. (°C)	Hardener quantity (weight %)	Pot life (min.)	Curing time (min)	Relative air humidity (%)
0	2	40	90	-
5	2	28	65	-
10	2	17	50	-
15	2	15	46	70
20	2	14	30	70
25	2	12	26	70
30	2	10	21	70
40	2	6	15	70
45	2	5	12	70

Table 2: Pot life and curing times of 2-component cold plastic with varied powder hardener quantities depending on material and surface temperature

Temp. (°C)	Hardener quantity (weight %)	Pot life (min.)	Curing time (min)
0°	2	-	-
5°	2	31	48
10°	2	23	39
15°	2	12	30
20°	1	11	29
25°	1	9	25
30°	1	7	20
30°	0,5	10	26
40°	0,5	8	19
45°	0,5	6	14

Table 3: Pot life and curing times of 3-component cold plastic systems 1:1 with powder hardener depending on material and surface temperature

Temp. (°C)	Hardener quantity (weight %)	Pot life (min.)	Curing time (min)
0°	4	-	-
5°	4	21	60
10°	4	16	42
15°	4	11	30
20°	2	13	27
25°	2	10	23
30°	2	11	20
30°	1	13	23
40°	1	10	22
45°	1	8	21
*Related to non-reactive component			

Table 4: Pot life and curing times of 3-component cold plastic systems 1:1 with liquid hardener depending on material and surface temperature

Temp. (°C)	Hardener quantity (weight %)	Pot life (min.)	Curing time (min)
0°	4	-	-
5°	4	33	80
10°	4	26	49
15°	4	16	31
20°	2	21	35
25°	2	16	26
30°	2	13	22
30°	1	21	35
40°	1	14	23
45°	1	11	17
*Related to non-reactive component			

Table 5: Pot life and curing times of 3-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	Powder hardener quantity (weight %)	Accelerator (% by weight)	retarder (% by weight)	Pot life (min.)	Curing time (min)
0°	2	0,2	-	-	-
5°	2	0,2	-	15	42
10°	2	0,2	-	12	29
15°	2	0,1	-	11	27
20°	2	-	-	11	29
25°	2	-	0,1	10	24
30°	2	-	0,1	8	20
30°	2	-	0,2	10	23
40°	2	-	0,2	7	17
45°	2	-	0,2	8	18
*Related to non-reactive component					

Table 6: Pot life and curing times of 3-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	**Liquid** hardener quantity (weight %)	Accelerator (% by weight)	retarder (% by weight)	Pot life (min.)	Curing time (min)
0°	4	0,2	-	-	-
5°	4	0,2	-	24	54
10°	4	0,2	-	18	38
15°	4	0,1	-	17	33
20°	4	-	-	16	33
25°	4	-	0,1	16	34
30°	4	-	0,1	13	27
30°	4	-	0,2	15	34
40°	4	-	0,2	10	24
45°	4	-	0,2	10	29
*Related to non-reactive component					

Table 7: Pot life and curing times of 2-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	**Liquid** hardener quantity (weight %)	Accelerator (% by weight)	retarder (% by weight)	Pot life (min.)	Curing time (min)
0°	2	0,2	-	-	-
5°	2	0,2	-	23	60
10°	2	0,2	-	17	34
15°	2	0,1	-	17	32
20°	2	-	-	15	30
25°	2	-	0,1	16	29
30°	2	-	0,1	13	27
30°	2	-	0,2	16	35
40°	2	-	0,2	11	22
45°	2	-	0,2	13	30

Table 8: Pot life and curing times of 2-component cold plastics as a function of temperature with addition of accelerator or retarder

Temp. (°C)	Powder hardener quantity (weight %)	Accelerator (% by weight)	retarder (% by weight)	Pot life (min.)	Curing time (min)
0°	1	0,2	-	-	-
5°	1	0,2	-	24	67
10°	1	0,2	-	19	36
15°	1	0,1	-	18	31
20°	1	-	-	15	31
25°	1	-	0,1	14	29
30°	1	-	0,1	13	26
30°	1	-	0,2	18	35
40°	1	-	0,2	14	26
45°	1	-	0,2	12	29

5 Road surface / pretreatment

5.1 General information

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

Attention: LIMBOPLAST D580 plain and profile is not appropriate for large area applications.

5.2 Concrete or cement bound surfaces

Parts on new concrete surfaces that prevent good bonding (fine mortar layer, concrete slurries) must be appropriately removed (e.g. with high pressure waterjet, fine millcuts or similar). We recommend conducting test applications.
Before applying the cold plastic concrete or cement bound surfaces should be pretreated 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.-No.: 8010)

It is essential to have a sufficient and uniform coverage with primer to obtain an optimum bonding of the cold plastic and the 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.

When applying an initial marking instead of conducting surface pretreatment it is import to check bonding properties before applying the final marking. Otherwise the initial marking has to be removed.

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. 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 pavement are moveable surfaces which can lead to crack formation or spallings on the marking. The material is used without any manufacturer's guarantee. Test applications, surface pretreatments are recommended. Ensure proper bonding on cobbled pavement.

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

Natural stone paving:
The 2-C Primer B55 for Cobbled Pavement (Art.-No.: 8011) should be applied. Subsequently apply paving mortar (Art.-No.: 5232…) smoothly and evenly. The area size should protrude the marking to be applied (line, pictogram) by 2 - 3 cm. After the curing of the paving mortar LIMBOPLAST D580 can be applied.
The actual consumption of primer and paving mortar depends on the state of the natural stone paving.

5.5 Floor coatings

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

6 Application techniques

With common self-driving cold plastic 2- or 3- component extruder or dispensing shoe machines (for large-scale applications) or manually with smaller equipment (for small-scale applications) including the various adaptive kits for the creation of agglomerate markings. Flat markings can be applied with dispensing shoes and trowels.
Attention, when using a dispensing shoe (screed box) manually or in combination with a marking machine:
Despite the exact layer thickness adjustment of a 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.
For manual stencil application or by means of tapes pot life and curing time should be regarded. Immediately after cold plastic application, the drop-on material needs to be broadcast. Otherwise the drop-on material will not be embedded properly which will have a negative effect on traffic technological properties and durability. The stated mixture ratios must be respected.

The type of application technique and the type of hardener (liquid or powder hardener) used do not influence the quality of the final marking. The traffic technological properties will be the same.

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 onto the road surface.

2. **Spring tension technique**

   A roller whose pretensioned springs tear off the material and distribute it mechanically.

3. **Spinning spatula technique (SST)**

   A roller whose unpretensioned springs scatter the unmixed (without hardener) material flowing from the dispensing shoe stochastically and cures after immediately broadcasting hardener beads 2000 (open system – no pot life) onto the material.

4. **Perforated plate technique**

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

5. **Air pulsed methods**
   a) Spotflex® -Technique, Hofmann GmbH
      The material mixed with hardener in a mixing tube is applied under pressure through a block with an integrated pin system (pins abruptly open and close electropneumatically). Irregular agglomerates can be applied by mounting a spiked roller underneath the extruder.
   b) VisiDot® und VisiStrukt®, Grün GmbH
      The static mixing tube is fixed with the special application unit „Air Jet“.
      Cold plastic is pressured without any moving parts through the “Air Jet”. Regular agglomerates (VisiDot®) or irregular agglomerates (VisiStrukt®) are applicable.

Besides regular and irregular agglomerates different techniques can create various shapes of single agglomerates like compartmentalized or large-scaled blots, drop-shaped dots etc.
At present, it is not obvious which shape is the ideal agglomerate to get the best traffic technological properties.
Practical experience shows that the traffic technological properties of all agglomerate markings and their useful life depends on the following influencing factors:

- optimal structure with well-formed flanks
- agglomerate coverage > 60% (vertical viewing)
- processing properties, adapted to weather conditions (see 4.2.2 and 4.2.3), machine and application technique
- optimal bead distribution and embedment, especially at the sides
- adjustment of machine and application device according to the manufacturer’s instructions

1. **Agglomerate with thin plain marking**

- LIMBOPLAST KSP as thin plain marking and agglomerate as second layer. System can be applied with “fresh in fresh” technique by one single machine or by two machines
- LIMBOROUTE 2-Comp. K809 as thin plain marking and agglomerate as second layer. System can be applied as initial marking with time-shifted agglomerate application

2. Refreshing of agglomerate markings that no longer fulfil traffic technological requirements with

- LIMBOPLAST KSP with 0.3 – 0.4 mm layer thickness or
- LIMBOROUTE 2-K K809 with 0.3 – 0.4 mm layer thickness

Prerequisite is that the old agglomerate structure has a refreshable shape and after refreshment a Type II marking (night visibility under wet conditions) is attainable.

7 RPA – Test Reports by BASt (German Road Institute)

Test report-no.	Layer thick-ness	consumption		Drop-on material (DOM)	Traffic technological properties	
	mm	Material	DOM	Identification (divergent identification possible - see relevant test report)	New condition	Used condition
		kg/m²	kg/m²			
Structure marking						
Regular agglomerates type II						
2019 1DK 03.15	1.5 – 3.0	2.6 – 2.8	0.50	SWARCO SOLIDPLUS 10 P21 T18	P7, S0, R5, RW6, Q5, T3	P7, S0, R5, RW5, Q5
Irregular agglomerates type II						
2019 1DK 03.14	1.5 – 3.0	2.6 – 2.8	0.50	SWARCO SOLIDPLUS 10 P21 T18	P7, S0, R5, RW6, Q5, T3	P7, S0, R5, RW4, Q5
Plain marking						
Type I marking						
2019 1DK 03.02	2.0	3.68	0.45	SWARCO SOLIDPLUS 10 P21 T18 M25	P7, S1, R4, Q5, T3	P7, S1, R5, Q5
2019 1DK 03.04	3.0	5.52	0.45	SWARCO SOLIDPLUS 10 P21 T18 M25	P7, S1, R5, Q5, T3	P7, S1, R5, Q5
Type II marking						
2019 1DK 03.01	2.0	3.68	0.45	SWARCO SOLIDPLUS 10 425–1400 T18 MK30	P7, S1, R4, RW4, Q5, T3	P7, S1, R4, RW4, Q5
2019 1DK 03.06	3.0	5.52	0.45	SWARCO SOLIDPLUS 10 425–1400 T18 MK30	P7, S1, R4, RW5, Q5, T3	P7, S1, R4, RW4, Q5