

Thick Layer Passivation SLOTOPAS HK 10

SLOTOPAS HK 10 is a passivating process for electroplated zinc and zinc-iron coatings and is free of Cr(VI). The conversion layers deposited by immersing show on zinc surfaces a slightly blue-yellow-greenish finish. On zinc-iron alloy coatings the conversion layers appear intensively yellowish-greenish. The achievable corrosion resistance is excellent and is equivalent to the protecting effects of a yellow chromating based on Cr(VI). Salt Spray Tests according to DIN EN ISO 9227 performed with repetition parts have affirmed a minimum corrosion resistance of 72 h for barrel parts and 168 h for rack parts until white rust.

Tempering of the protection layer up to temperatures of approx. 100 °C doesn't affect the corrosion protection quality, in contrast to yellow chromated chromium(VI) surfaces where the corrosion resistance decreases with increasing thermal load, starting already at temperatures of 80 - 90 °C. On the contrary, temperatures of about 100 °C actually improve the corrosion protection. Tests with SLOTOPAS HK 10 layers even showed that a brief tempering period at 150 °C doesn't result in decrease of the corrosion resistance.

Additional sealing with a product of our SLOTOFIN series gives a uniform transparent surface finish and increases the corrosion protection additionally.

The information in this data sheet is based on laboratory as well as practical experience. Figures quoted for operating limits and replenishment quantities are for guidance. Actual values necessary will depend on the components being plated (material and geometry), their application and plating plant conditions.

Important:

Please read these instructions carefully and follow recommendations given. We reserve the right to make technical changes as necessary. In the interests of safety, please pay attention to the R- and S- phrases on the labels of the containers. The minimum shelf life of the additives is printed on the label of the container. The current IMDS number of the layer deposited from the process can be found on the internet at www.schloetter.com/downloads.

For the storage of chemical products only the TRGS 514 and TRGS 515 regulations must be followed. The Hazardous Goods Regulation (ADR/GGVS) is only valid **for transportation** and must not be applied to storage.



1.0 TECHNICAL INFORMATION AND EQUIPMENT REQUIREMENTS

Tanks:	steel with fluoride- and acid resistant lining, suitable plastic tanks e.g. polypropylene
Local Exhaust Ventilation:	required
Part-/Electrolyte Agitation:	in order to optimize the movement of the solution around the parts air- or part agitation is recommended; barrel application 4 - 6 rpm.
Heating/Cooling:	PTFE immersion heaters

2.0 MAKE-UP AND OPERATING CONDITIONS

2.1 Product names

List of products required		
Product name	Article no. (AN)	SG
Passivation Concentrate SLOTOPAS HK 11	090422	1.32
Correction Additive SLOTOPAS HK 12	090426	1.14
Inhibitor SLOTOPAS ZB	090420	1.01
Nitric acid, conc.	supplied by user*	1.40

* The current product qualities respectively -specifications recommended by us can be found on the internet at www.schloetter.com/downloads.

2.2 Requirements for a 100 litre bath

Product name	AN	SG	Quantity	
Passivation Concentrate SLOTOPAS HK 11	090422	1.32	20	ltr.
Inhibitor SLOTOPAS ZB *	090420	1.01	if required**	
Nitric acid, conc.	supplied by user	1.40	150	ml

** see point 4.2

NB

Passivation Concentrate SLOTOPAS HK 11 may show small sediments. This doesn't have to be considered when making-up the electrolyte. **The effectiveness of the passivation respectively the result of the passivation isn't negatively influenced and so there's no need to be taken into consideration.**



2.3 Make-up sequence for a 100 litre bath

All tanks and equipment to be used should be thoroughly cleaned prior to use.

NB

Used tanks must always be properly cleaned due to the fact that a new make-up of Thick Layer Passivation SLOTOPAS HK 10 becomes inoperative when contaminated with chromium(VI) residues. Therefore, used tanks must be cleaned thoroughly, the best way is to leach out with sodium hydrogensulphite.

- fill tank with 40 litres of preferably deionised water
- add 150 ml of nitric acid
- mix thoroughly
- add the required amount of Passivation Concentrate SLOTOPAS HK 11
- mix thoroughly
- add Inhibitor SLOTOPAS ZB if required
- make up to final volume
- mix well
- check pH value and adjust if necessary

When the operating temperature is reached the electrolyte is ready for use.

2.4 Concentrations and operating conditions

	Range	Optimum	
Passivation Concentrate SLOTOPAS HK 11 *	100 - 250	200	ml/l
Inhibitor SLOTOPAS ZB	see point 4.2		
Correction Additive SLOTOPAS HK 12	see point 4.3		
Treatment time	45 - 120	60	sec.
Temperature range	40 - 50	45	°C
pH value	1.8 - 2.2	2.0	

* To achieve the highest demands of corrosion protection the upper values must be maintained.

When starting a newly made-up thick layer passivation, refer to the upper limits relating to the treatment times. After a short initial phase the passivation becomes more active, which makes it necessary to reduce the treatment time by approx. 10 - 20 sec. in order to avoid the formation of a non adhesive conversion layer (stained, can be wiped)

The colour of the protection layer depends on the age of the electrolyte and the treatment time. A short treatment time results in a blue-yellowish colouration, a longer treatment in a more greenish colouration.

A subsequent rinsing in a static rinse with air agitation is recommended after the passivating process. Losses through evaporation may be compensated by replenishment of the passivating solution with solution of the static rinse. The static rinse may be used additionally for blue passivating (check pH and adjust to nominal values if necessary).



2.5 Consumption

Consumption is mainly due to drag-out and depends to a great extent on the type and surface geometry of the parts as well as on plant operation.

The content of Passivation Concentrate SLOTOPAS HK 11 can be monitored analytically.

3.0 PROCESS SEQUENCE

3.1 Pre-treatment

Perfect zinc-plating is essential for a good passivating finish. Parts to be passivated should have been recently zinc-plated and rinsed. Pre-dipping in strongly diluted nitric acid (5 - 10 ml/l of nitric acid, conc.) is only required if zinc is deposited from alkaline electrolyte solutions. Zinc deposits must keep their brightness, the colour may turn lighter but by no means may get darker. Darkening of the deposits is an indication for a contamination of the zinc electrolyte with foreign metal ions.

If an acidic zinc electrolyte has been used for zinc deposition, parts must be pre-dipped in a subsequent static rinse with an addition of 15 ml/l hydrochloric acid, conc.

3.2 Process sequence

Alkaline zinc electrolytes

- zinc plating
- rinsing, preferably triple cascade
- activating in diluted nitric acid (5 - 10 ml/l, pH 1.5)
- passivating
- rinsing, preferably triple cascade with regeneration
- drying

Acid zinc electrolytes

- zinc plating
- Static rinse acidified with hydrochloric acid (15 - 20 ml/l)
- rinsing, preferably double cascade
- passivating
- rinsing, preferably triple cascade with regeneration
- drying

Including the use of sealant

- passivating
- rinsing, preferably triple cascade with regeneration
- sealing
- draining off, preferably air blowing
- drying



3.3 Post-treatment

The passivated parts should be rinsed in cold water and preferably dried using warm air. The recommended temperature range for drying is 80 - 90 °C. Thick parts, or those that would have greater heat capacity, may be rinsed in warm water to speed up the drying process. Unnecessarily long rinsing times after passivation or insufficient drying will be detrimental to the conversion layer and can lead to a discolouration of the coating during storage.

Bulk articles may be dried using a centrifuge or barrel drying.

For sealing of the passivated surface a product from our SLOTOFIN series is recommended.

4.0 MAINTENANCE AND FUNCTION OF THE INDIVIDUAL BATH COMPONENTS

4.1 Passivation Concentrate HK 11

The concentration of Passivation Concentrate SLOTOPAS HK 11 may be monitored analytically and replenishment is made accordingly. The analysis description is provided upon request. The recommended concentration ranges between 100 and 250 ml/l. For highest corrosion protection the upper values should be maintained.

4.2 Inhibitor SLOTOPAS ZB

The Passivation Concentrate SLOTOPAS HK 11 already contains an adequate amount of Inhibitor SLOTOPAS ZB, which prevents the chemical dissolution of iron. In normal application the concentration is sufficient.

When processing hollow parts (like steel tubes, etc.) the chemical dissolution of iron may be further impeded by special addition of Inhibitor SLOTOPAS ZB. Dosing size should be 5 ml/l with a weekly post-dosing of 1 - 2 ml/l.

4.3 Correction Additive SLOTOPAS HK 12

The Corrector SLOTOPAS HK 12. is proportionately contained in the Passivation Concentrate SLOTOPAS HK 11. Extra replenishment is usually not required, but with increasing service life or increasing zinc concentration the achievable corrosion protection may decrease. Correction is made by special addition of 10 - 20 ml/l Correction Additive SLOTOPAS HK 12, which then allows operation with a zinc concentration of approx. 15 g/l without any losses in corrosion protection.

4.4 pH value

The pH should be between 1.8 and 2.2 with the optimum at 2.0. The pH should be controlled using pH indicator paper with pH range 1.0 - 2.8. The pH should be adjusted with either nitric acid or sodium hydroxide solution (200 g/l, aqueous).

4.5 Contamination

Parts, which fall off jigs in the passivating solution accidentally, must be removed without delay to prevent from a reduction of the service life by metallic impurities.



4.5.1 Chromium(VI)

Even tiniest impurities of Cr(VI) turn the Thick Layer Passivation SLOTOPAS HK 10 unserviceable.

4.5.2 Zinc

As a result of the deposits from the Thick Layer Passivation SLOTOPAS HK 10 zinc enrichment is unavoidable. Zinc concentrations up to 10 g/l don't affect the corrosion protection or appearance of the deposits. The Corrector SLOTOPAS HK 12 should be used when the zinc concentration is > 10 g/l (compare point 4.3).

4.5.3 Iron

Iron contamination results in yellowish discolouration of the conversion layer and impairs corrosion resistance as well. The operating temperature is decisive for the quantity of iron being ablated. The ablation rate increases as the temperature rises. The content of Inhibitor SLOTOPAS ZB in the thick layer passivation clearly prevents the ablation of iron. For determination of the concentration an iron rapid analysis by analysis rods is recommended e.g. from Merck

4.5.4 Lead

Even small quantities of lead interfere with the process and result in dark stained coatings. For this reason lead weights shouldn't be used in the weighting of air agitation systems.



5.0 TROUBLE SHOOTING

5.1 Fault finding chart

Fault	Cause	Correction
pale-yellowish passivated finish (weakly passivated)	immersion time, too short or pH value, too high	increase immersion time, adjust to pH 1.9
	concentration of SLOTOPAS HK 11, too low	analyze and adjust to optimum
	temperature of the electrolyte, too low	adjust the temperature of the electrolyte to optimum (approx. 45 °C)
formation of an non adhesive conversion layer, stained	immersion time, too long or pH value, too low	decrease immersion time, adjust pH value to 1.9
	temperature of the electrolyte, too high	decrease electrolyte temperature to 40 - 45 °C
	high iron impurity	decrease iron content with appropriate means
insufficient corrosion protection	conversion layer, too thin	adjust treatment time to optimum (45 - 90 sec.)
		adjust concentration and temperature of the electrolyte to optimum
	zinc concentration, too high	Addition of Correction Additive SLOTOPAS HK 12 (see 4.2)
	foreign metal impurity, e.g. iron, lead, Cr(VI), etc.	remove foreign metals with appropriate means
	insufficient rinsing	improve rinsing
	insufficient drying	adjust drying- or object temperature to > 80 °C



6.0 EFFLUENT

Legal regulations must be observed for disposal of the Thick Layer Passivation SLOTOPAS HK 10. Different regulations normally apply for the additives and the ready-made electrolyte. Please refer to section 13 of the appropriate Material Safety Data Sheet for disposal code and recommendations.

The following detoxification sequence is only considered to be an aid:

SLOTOPAS HK 10. does not contain any Cr(VI) and the solution can therefore be fed directly to the neutralization step. In order to precipitate the fluorides, the neutralisation needs to be carried out using lime milk solution.

The pH of the effluent must be adjusted between 8.5 and 9.5 and the resulting chrome hydroxide filtrated through a filter press.

7.0 SAFETY

Reasonable care is required when handling Schlötter chemical products. Only personnel specially trained on working with chemicals should be deployed with their handling.

EC Material Safety Data Sheets must be made available to all personnel dealing with the chemicals to ensure they have all required information about product composition, hazards identification, first-aid measures, handling and storage, exposure controls, toxicological and ecological information, etc. It is required to ensure the supply and use of suitable protective clothing and -equipment.

The user must verify the designated purpose of the electrolyte. Previous experience has shown that not all metal surfaces are suitable for a trouble-free electroplating.

The above mentioned data are made according to our best knowledge. Consistent operation of the working solution requires appropriate maintenance. Thick Layer Passivation SLOTOPAS HK 10 is a process of Dr.-Ing. Max Schlötter GmbH & Co KG. It can only be operated with the products described in this technical data sheet. Use of other chemicals (also partly) will impair quality and invalidates our service- and quality commitments (quality assurance).

