Product Data Sheet
Screen Printing Ink

SunChemical®
Coates Screen Inks

ZGM

Solvent Based Screen Printing Ink Range, 2-Component

APPLICATION

As screen printing inks ZGM can be processed with two different hardeners they show an exceptionally vast variety of possible applications.

Depending on hardener used ZGM inks are suitable for the following substrates:

- With hardener SVC/H:
  Glass (mainly sheet glass), ceramics, duroplastics, metals and chromium-plated surfaces.
- With hardener Z/H:
  Thermoplastics, especially pre-treated polyolefines, i.e. polypropylene (PP), polyethylene (HD-PE, LD-PE), PMMA (acrylic glass), polyamide (PA), cellulose acetate, various duroplastics as well as metal and coated surfaces.

PROPERTIES

- **In line with current safety requirements screen printing inks ZGM have been formulated with especially environmentally compatible raw materials. ZGM inks as well as the thinners and additives required for adjustment do not contain aromatics, butyl glycolate (GB-Ester), cyclo-hexanone, and also no polycyclic aromatic hydrocarbons (PAH). The ink system meets the criteria to obtain the GS mark (category 1) according to GS specification AfPS GS 2014:01 PAH.**
- ZGM inks are solvent based screen printing inks. They are processed as 2-component ink with hardener. Depending on application and substrate two different types of hardeners are used.
- ZGM dries physically/chemically-reactive and results in a satin gloss finish.
- The ink system shows an exceptionally easy and reliable printability and a very good screen openness.
- ZGM inks are formulated without silicone-containing flow agents. They are therefore also suitable for applications with following application of reflective or adhesive coatings. However, due to the variety of processing conditions, pre-tests are absolutely necessary.
- Especially when processed with hardener SVC/H this ink system shows an outstanding chemical resistance.
- Due to the binders (epoxy resin) ZGM inks are not weather resistant. They are suitable for indoor and short-term outdoor applications.
- Note: Because of the variety of substrates, pre-tests are essential. It is also advised to check efficiency of possibly required pre-treatment of substrates (cleaning/degreasing, flame/corona/plasma treatment) or maybe even post-treatment (flame-drying).

COLOUR SHADES - OVERVIEW

- Mixing System: C-MIX 2000 — 12 colour shades for mixing of RAL, PMS and HKS colours. In ZGM range with especially high colour intensity. **Further information in the section "Choice of Pigments".**
- Opaque: Standard HD — Highly opaque colour shades.
- Bronzes: MG — Gold, silver and copper shades.
- Special colour shades are available upon request.
- More information about available colour shades in the detailed tables in section Colour Shades.

CHOICE OF PIGMENTS AND LIGHT FASTNESS

Colour shades of ZGM ink range contain pigments with a high light fastness. Light fastness and weather resistance will reduce if thinner layers are applied or if base colours are mixed with a high ratio of white or varnish.

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- **ZGM C-MIX 2000 colours with extra high colour density:**
  The transparent or semi-transparent C-MIX 2000 colours of ZGM have about 50% higher pigmentation than the usual C-MIX 2000 shades.
  Therefore, very brilliant colours with a high intensity can be achieved, especially on transparent substrates such as glass or PMMA.
  If required, a mixture of 2 parts of C-MIX 2000 colour with 1 part varnish ZGM/E50 or ZGM/E50-MT (matt varnish) will result in the usual C-MIX 2000 colour density.

ADJUSTMENT FOR SCREEN PRINTING

- **Screen printing inks ZGM are not supplied in a ready-to-print adjustment.**
  Note: To avoid any undesirable introduction of aromatics, butyl glycolate or cyclohexanone only use the below-mentioned thinners, retarders and additives.
- 2-component inks ZGM have to be mixed with hardener at a specified ratio prior to processing.
- Thinner is added after addition of hardener.
- The mixed ink should be allowed to pre-react for approx. 15 minutes prior to processing (recommendation).
- Processing is then possible for a specified period of time (=pot life).

Hardener:
For ZGM inks we offer two different types of hardener.

- **Z/H:** **Mixing Ratio Ink : Hardener = 4 : 1**
  ➔ For printing of plastics and metal surfaces.
  The cured ink is quite flexible, therefore also suitable for edge-bending of coated metal sheets.
  Resistance against chemicals and solvents is very good.

- **SVC/H:** **Mixing Ratio Ink : Hardener = 10 : 1**
  ➔ Essential when printing on glass and ceramics.
  Compared to use of hardener Z/H the cured ink film is less flexible. Very suitable for printing on metals which will not be formed after printing. Chemical resistance is excellent.

Note:

- Hardeners are sensitive to humidity. Therefore, containers always have to be tightly closed.
- Especially for SVC/H humidity has to be avoided. Therefore, only small containers of SVC/H should be used. SVC/H is available in 100 g, 250 g and 1 litre containers.
- Because of their reactive properties shelf life of hardeners is limited:
  Z/H: 14 months SVC/H: 12 months.

Pot life:

- Ink mixed with hardener may only be processed within a limited period of time (=pot life).
- **Pot life of ZGM + hardener is approx. 4 - 8 h (at 20°C).**
  Higher temperatures will reduce pot life.
- We do not recommend processing the inks for longer than the pot life as adhesion and resistance properties will then continually deteriorate, even if the ink still seems to be liquid and processable.

THINNERS / RETARDERS

Depending on local conditions ink is adjusted to printing consistency by addition of 10 % by weight of thinner or retarder.

Generally, the thinner suitable for ZGM inks is VD 60!

The additional products listed below should only be used if the required printing quality cannot be achieved using VD 60 (e.g. drying too slow or too fast). All products listed below can be mixed into the inks individually or as mixtures.

For adjustment of screen inks ZGM, the following products are available:

Thinner:	○	VD 45	Quick thinner
	■	**VD 60**	**Standard thinner**
Retarder:	○	VZ 35	Very slow retarder

■= Preferred ○= If required

Depending on printing conditions, the products listed above can be mixed into the inks individually or as mixtures. Please note that depending on evaporation rate of the thinner/retarder used drying times may be longer.
Thinner/retarder should be mixed into the ink thoroughly using a mixer or agitator. In addition, inks should be stirred well prior to each processing to obtain a homogeneous dispersion of all ingredients.

ADDITIONAL AUXILIARY AGENTS

Application	Product	Addition in % by weight	Additional Information
Viscosity increase	Thickening powder	Max. 3%	Stir with mixer
Matting	Matting powder	Max. 5%	Stir with mixer
Antistatic agent (paste)	STM-P1	Max. 10%	Possibly slightly reduced gloss
Flow agent	VM 41-SF	Max. 5%	Free of silicone

OVERPRINTING

Generally, it is not necessary to overprint ZGM inks with varnish. However, overprinting to achieve an enhanced protection of ink layers is possible with ZGM/E50.

BRONZE COLOURS

Bronze colours 75/MG to 79/MG (metal gloss) are available.
Note: When overprinting MG metal gloss colours with varnish or other colour shades it is essential to carry out pre-tests to check intermediate adhesion of the ink layers (fingernail test, tape test).

“B” bronze pastes, “B”-bronze powder and “AB” bronze colours are not available in ZGM ink range to avoid a possible introduction of aromatics and ensure compliance of PAH threshold values (e.g. AfPS GS 2014:01 PAH).

DRYING / HARDENER REACTION

Mixture of ZGM ink/hardener is a chemically-reactive system with a physical pre-drying.

- Ink dries physically by evaporation of solvents.
- Then the ink film cures by chemical cross-linkage reaction.
- **Drying and reaction temperature of hardener Z/H and SVC/H must always be more than 15°C!**

Drying
Drying times below are only approximate as drying properties depend on various factors:

- Type and amount of thinners/retarders used.
- Thickness of printed ink layer (single print, multi-layer print).
- Drying temperature.

Depending on local conditions, average drying time is approx. 10 – 15 minutes at room temperature (20 – 25° C).
Drying time with heat application (e.g. hot air fan) and air circulation is about 2 - 3 minutes.
Complete drying may take several hours, also depending on the substrate.

Drying with NIR or K-NIR radiators (=drying with short-wave infra-red)
ZGM inks in combination with hardener SVC/H are suitable for curing with high-energy NIR or K-NIR radiators. Drying time, depending on layer thickness and colour, is only a few seconds. After cooling the dried ink film shows good resistances. Drying parameter have to be determined by pre-trials under local conditions.

Hardener Reaction
Basically, the increased resistance properties of the printed ink film are only achieved after complete drying followed by chemical cross linkage reaction between ink and hardener. This cross linkage reaction depends on time and temperature.

The following are guide values only:

Temperature	Time approx.	Condition of ink	Additional information
<15°C air drying		Hardeners Z/H or SVC/H do not react!	Ink film will not achieve any resistance
20°C air drying	20 min.	"Touch-dry"	No resistance yet
	>72 h	High degree of cross-linkage	High resistances achieved
	>5 days	Hardener Z/H: Maximum degree of cross-linkage	Maximum resistances achieved
	>10 days	Hardener SVC/H: Maximum degree of cross-linkage	Maximum resistances achieved
80°C oven curing	approx. 5 min.	Dry enough for overprinting	No resistance yet
	60 min.	High degree of cross-linkage	High resistance values achieved
140°C oven curing	20 min.	Maximum degree of cross-linkage	Maximum resistances achieved.

Multiple Layer Printing – Overprintability / Intermediate Adhesion
Reliable overprinting of printed ink layers is only possible for a limited period of time - 12h/20°C. Higher drying temperatures will reduce this period. Oven curing at 140°C/20 min. to speed up the cross-linking process should only take place after printing of the last ink layer.

Resistance Tests
Resistances should not be checked before the ink has fully cured/cross-linked.
After oven curing allow a cooling time of at least 30 minutes.

SCREEN FABRIC / STENCILS
ZGM inks have been formulated for printing with fabrics ranging from 77 to 120 threads/cm. Suitability for printing with coarser or finer fabrics should be determined by corresponding pre-trials.
All copy emulsions and capillary films suitable for solvent based screen inks can be used, such as our program of SunCoat or Murakami products.

CLEANING
The longer the inks dry on stencils and tools the harder will be their removal due to the chemical cross-linkage reaction. Therefore, always clean stencils and tools with our universal cleaning agents URS, URS 3 or thinner VD 40 as soon as possible.
Note: When producing prints for end products to be evaluated for compliance with PAH threshold values (e.g. AfPS GS 2014:01 PAH) we recommend to clean with our products VD 45 or VD 60.

PACK SIZE

Screen printing inks ZGM are delivered in 1 litre containers. Other pack sizes are available upon request.

SHELF LIFE

In closed original containers, ZGM inks generally have a shelf life of 3 years from date of production. Hardener Z/H has a shelf life of 14 months and SVC/H has a shelf life of 12 months from date of production, also in closed original containers.
For exact date of expiry, please refer to the label.

SAFETY DATA SHEETS

Read safety data sheet prior to processing
Safety data sheets comply with Regulation (EC) No. 1907/2006 (REACH), Appendix II.

CLASSIFICATION AND LABELLING

Hazard classification and labelling comply with Regulation (EC) No. 1272/2008 (CLP/GHS).

CONFORMITY

Coates Screen Inks GmbH does not use any of the substances or mixtures for the production of printing inks, which are banned according to the EUPIA (European Association of the Printing Inks Industry) exclusion policy. Screen printing inks range ZGM C-MIX 2000 colour shades, standard, highly opaque standard colours (HD), process colours, silver, fluorescent colours and transparent colours comply with the requirements of toy standard „EN 71-3:2019 Safety of toys – Migration of certain elements (category III: scraped off material).
Further compliance confirmations are available upon request.

ADDITIONAL INFORMATION ABOUT OUR PRODUCTS

Product data sheets:	Auxiliary Agents for Screen Printing HM
Brochures:	Solvent Based Screen Printing Inks
Internet:	Various technical articles are available for download on www.coates.de, section “SN-Online”; e.g. processing of 2 component inks

FOR COLOUR RANGES, PLEASE REFER TO NEXT PAGE.

COLOUR SHADES

C-MIX 2000 BASE COLOUR SHADES

Mixing system for matching of PMS, HKS, RAL colours (on white substrates)

C-MIX 2000 Colours of ZGM range have a 50% higher pigmentation than the usual C-MIX shades. Mixing ZGM C-MIX 2000 colours at a ratio of 2:1 with ZGM/E50 will result in the "usual" colour densities of the C-MIX 2000 range.

Start formulations available in data base „Formula Management C-MIX 2000"
According to colour card C-MIX 2000-P

primrose	ZGM/Y30	red	ZGM/R50	green	ZGM/G50
golden yellow	ZGM/Y50	magenta	ZGM/M50	black	ZGM/N58
orange	ZGM/O50	violet	ZGM/V50	white	ZGM/W50
scarlet	ZGM/R20	blue	ZGM/B50	varnish	ZGM/E50

STANDARD Colour Range HD (high opacity)

According to colour card STANDARD HD-P
Availability of further standard HD shades upon request

citric yellow, highly opaque	ZGM 10/HD	carmine red, highly opaque	ZGM 22/HD
medium yellow, highly opaque	ZGM 11/HD	light blue, highly opaque	ZGM 30/HD
dark yellow, highly opaque	ZGM 12/HD	violet, highly opaque	ZGM 37/HD
orange, highly opaque	ZGM 15/HD	light green	ZGM 40/HD
light red, highly opaque	ZGM 20/HD	white, highly opaque	ZGM 60/HD
bright red, highly opaque	ZGM 21/HD	black, highly opaque	ZGM 68/HD

SPECIAL PRODUCTS: Special Colour Shades, Varnishes, Pastes

Information about availability upon request

Matt varnish, blend	ZGM/E50-MT		

4 COLOUR PROCESS INKS (CMYK)

According to colour card STANDARD 2 for screen printing inks or TP 218/ TP 300 ….

Upon request	

MG – METAL GLOSS INKS

According to Bronze Colour Card

rich gold	ZGM 75/MG	copper	ZGM 78/MG
rich pale gold	ZGM 76/MG	silver	ZGM 79/MG
pale gold	ZGM 77/MG		

Note: For technical reasons AB Bronze Inks are not available in ZGM range.

Matching of PMS, RAL, NCS colours and special shades upon request.

Coates Screen Inks GmbH
Wiederholdplatz 1 90451 Nürnberg
Tel.: 0911 6422 0 Fax: 0911 6422 200
http://www.coates.de