

## 2-pack solder resists of the series

# SD 2460/201 UV-FLEX

- application by screen printing
- suitable for flexible circuits and cross-over technology
- UV curing
- resistant to Hot-Air Levelling (HAL) and lead-free reflow soldering
- halogen-free according to JPCA-ES01-2003 and IEC 61249-2-21 (except **SD 2460/201 UV-FLEX**)
- UL approval for **SD 2460/201 UV-FLEX**: best flame class UL 94 V-0 (see item 3)

This technical report is valid for the following adjustments:

- **SD 2430/201 UV-FLEX-HF**, red transparent
- **SD 2440/201 UV-FLEX-HF**, black
- **SD 2450/201 UV-FLEX-HF**, blue transparent
- **SD 2460/201 UV-FLEX**, green transparent
- **SD 2460/201 UV-FLEX-HF**, green transparent
- **SD 2490/201 UV-FLEX-HF**, white transparent

Indices: **SD** = screen printing ink  
**/201** = mixing ratio 20 : 1  
**UV** = UV curing  
**FLEX** = for flexible circuits  
**HF** = halogen-free

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Please read this technical report, the corresponding material safety data sheet and the Technical Information sheets TI 15/10, 15/11 and 15/13 (see item 7) carefully before using the product.

## 1. General information

The 2-pack solder resists of the series **SD 2460/201 UV-FLEX** are solder masks in the sense of VDI/VDE 3710, sheet 4: "Fabrication of printed circuit boards; printing processes". They are permanent solder masks that are applied to those parts of the printed circuit board which are not to be tinned during subsequent soldering processes.

All symbols that are used in this technical data sheet and on our containers, such as **DIL**, are explained on our website [www.peters.de](http://www.peters.de) in the section "Service – Symbols on labels".


## 2. Application

The solder resists of the series **SD 2460/201 UV-FLEX** are UV curing screen printing inks that are distinguished by their high flexibility and excellent adhesion to all common base materials particularly to flexible base materials such as polyester, polyimide and polycarbonate foils and copper foil. They have proven especially suitable for the manufacture of flexible aerials, e. g. for mobile phones.

The white solder resist **SD 2490/201 UV-FLEX-HF** is particularly suitable as a reflective background for LED applications on flexible substrates, under white LEDs it prevents the substrate from having an undesirable effect on the colour of the lights. If all kinds of reflection should be avoided, the application of the black solder resist **SD 2440/201 UV-FLEX-HF** is recommendable.

## 3. Special notes

The solder resists of the series **SD 2460/201 UV-FLEX** are suitable as insulation lacquers in cross-over technology (as an under- and overcoat, see also section 7.5 "Schematic of cross-over technology"). Cross-over technology is used to render superimposed conductor planes possible and thus do without cost-intensive double-sided printed circuit boards. To this aim, a conductive paste, for instance silver-conductive paste or carbon-conductive ink, is applied to the double printed solder resist. For insulation purposes a further layer of a solder resist of the series **SD 2460/201 UV-FLEX** is printed over these conductors. Migration of the silver-conductive paste can be avoided by overprinting with a carbon-conductive ink that can then be optionally covered with a layer of solder resist from the **SD 2460/201 UV-FLEX** series.

**SD 2460/201 UV-FLEX** is UL-approved with the best flame class UL 94 V-0 (UL File No. E80315, Registered trademark of  Underwriters Laboratories Inc., Northbrook, Illinois 60062).

## 4. Safety recommendations

→ Please read the corresponding material safety data sheet where you will find detailed specifications of safety precautions, environmental protection, waste disposal, storage, handling, transport as well as other characteristics.

→ When using chemicals, the common precautions should be carefully noted.

## 5. Characteristics

	<b>SD 2430/201 UV-FLEX-HF</b>	<b>SD 2440/201 UV-FLEX-HF</b>	<b>SD 2450/201 UV-FLEX-HF</b> <b>SD 2460/201 UV-FLEX</b> <b>SD 2460/201 UV-FLEX-HF</b>	<b>SD 2490/201 UV-FLEX-HF</b>
Colour / appearance	red transparent	black	blue transparent green transparent green transparent	white transparent
Solids content	100 %			
Viscosity* of mixture at 20 °C [68 °F], ISO 3219	10,500 ± 2,500 mPas			13,000 ± 2,000 mPas
Density of mixture at 20 °C [68 °F] ISO 2811-1	1.28 ± 0.05 g/cm <sup>3</sup>	1.25 ± 0.05 g/cm <sup>3</sup>	1.29 ± 0.05 g/cm <sup>3</sup>	1.34 ± 0.05 g/cm <sup>3</sup>
Pot life of mixture	2 weeks (while avoiding direct light and solar radiation)			

\* measured with Haake RS 600, C 20/1°, D = 50 s<sup>-1</sup>, viscosity measuring unit supplied by:  
 Thermo Electron (Karlsruhe) GmbH (formerly Haake-Messtechnik GmbH + Co)  
 Dieselstraße 4, 76227 Karlsruhe, Germany  
 Phone +49 (0) 721 - 40 94 - 0; Fax +49 (0) 721 - 40 94 - 300  
 www.thermo.com

## 6. Properties

The solder resists of the series **SD 2460/201 UV-FLEX** are particularly distinguished by the following properties:

### 6.1 General properties

- do not contain substances listed in the RoHS directive 2002/95/EC, EU End-Of-Life Vehicle directive 2000/53/EC and WEEE directive 2002/96/EC
- solvent-free, thus no irritation through odour, no drying on the screen (when using yellow filters/UV protective foils or yellow light), the wet film thickness nearly corresponds to the dry film thickness
- excellent adhesion to many substrates, especially to flexible base materials such as polyester, polyimide and polycarbonate foil as well as copper foil
- resistant to solder baths, Hot-Air Levelling and lead-free reflow soldering
- excellent flexibility
- halogen-free according to JPCA-ES01-2003 and IEC 61249-2-21 (except **SD 2460/201 UV-FLEX**)
- UL approval for **SD 2460/201 UV-FLEX** with the best flame class UL 94 V-0
- free of halogenated flame retardants
- suitable for use in cross-over technology.

### 6.2 Physical and mechanical properties

Due to the various colour adjustments slight differences in the indicated values may result.

Property	Test method	Result
Cross hatch	EN ISO 2409, ISO 2409 on copper on FR 4 ink on ink	Gt 0 Gt 0 Gt 0
Adhesion	IPC-TM-650, 2.4.1 IPC-TM-650, 2.4.1.6 (after cross hatch)	no delamination classification 5, no delamination
Pencil hardness	IPC-SM-840D, 3.5.1 acc. to Wolff-Wilborn	H B
Flexibility	Mandrel bend test acc. to DIN 53152 on polyester foil, thickness 200 µm on polyimide foil, thickness: 50 µm	2.5 mm mandrel 1.5 mm mandrel
Solvent resistance	IPC-SM-840D, 3.6.1.1 Isopropanol Isopropanol : water (75 : 25) D-Limonene 10% alkaline cleaning agents Monoethanolamine Deionised water	passed failed failed failed failed passed
Solder bath resistance (depending on the fluxing agent)	IPC-SM-840 D, 3.7.2 UL 94	passed: 10 s at 260 °C [500 °F] passed: 10 s at 260 °C [500 °F]

### 6.3 Electrical properties

Due to the various colour adjustments slight differences in the indicated values may result.

Property	Test method	Result
Dielectric strength	VDE 0303, part 21 DIN EN 60243-1	120 kV/mm
	IPC-SM-840D, 3.8.1	passed
Surface resistance	VDE 0303, part 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	$2.0 \times 10^{14}$ Ohm
Volume resistivity	VDE 0303, part 30/ DIN IEC 60093 IPC-TM-650, 2.5.17.1	$1.3 \times 10^{13}$ Ohm x cm
Moisture and insulation resistance	IPC-SM-840D, 3.9.1	Class H and T
Comparative tracking index (CTI, tracking resistance)	DIN EN 60112 on base material with CTI 250 with CTI 600	CTI 250* CTI 600*

\* The CTI value of the coating also depends on the tracking resistance values of the base material, etc. The CTI value of the base material is maintained when the 2-pack solder resists of the series **SD 2460/201 UV-FLEX** are used.

**Note:** Optimum electrical insulation values can only be achieved if all flux residues are removed thoroughly from the printed circuit boards.

## 7. Processing

The 2-pack solder resists of the series **SD 2460/201 UV-FLEX** are applied by means of screen printing. Since UV inks do not contain any solvents there is no drying on the screen, but the presence of UV radiation (sun-light or fluorescent lamps) leads to a drying of the ink in the printing screens. The use of yellow light and/or yellow filters/UV protective foils is mandatory.



**Protect from UV light**



**Stir component A before use**



Since the many different permutations make it impossible to evaluate the whole spectrum (parameters, reactions with materials used, chemical processes and machines) of processes and subsequent processes in all their variations, the parameters we recommend are to be viewed as guidelines only. We advise you to determine the exact process limitations within your production environment, in particular as regards compatibility with your specific follow-up processes, in order to ensure a stable fabrication process and products of the highest possible quality.

The specified product data is based upon standard processing/test conditions of the mentioned norms and must be verified observing suitable test conditions on processed printed circuit boards.

Feel free to contact our application technology department (ATD) if you have any questions or for a consultation.

### 7.1 Mixing

The two components are already packed in the correct mixing ratio. The volume of the container of component A is sufficient to accommodate the total quantity of component B and to allow perfect mixing.

→ Mix both components in the specified mixing ratio:



**Component A : Component B = 20 : 1 (parts by weight)**

For stirring we recommend mechanical stirring equipment. For more detailed information on correct mixing please read our **Technical Information sheet TI 15/10: "Processing of 2-pack systems"**. On our report manual CD and on our website you will find technical information sheets in the "Service" section.

The lacquer can be processed immediately after thorough mixing.

## 7.2 Adjustment of viscosity

The 2-pack solder resists of the series **SD 2460/201 UV-FLEX** are adjusted in such a manner that they normally can be processed in the condition supplied. If necessary, their viscosity can be reduced for processing purposes by adding the reactive thinner **VR 5008**. The quantity to be added should not exceed max. 2 %.

**DIL**

**To be thinned with reactive thinner VR 5008**



**As the reactive thinner VR 5008 participates in the curing process, it is not possible to use any other solvents.**

## 7.3 Auxiliary products

- **Anti-static spray HP 5500**

The anti-static spray **HP 5500** prevents and eliminates any electrostatic discharge that occurs during screen printing. **HP 5500** is silicone- and grease-free.

- **Cleaning agents R 5899, R 5821 and R 5817**

The cleaning agent **R 5899** does not have to be marked according to German dangerous goods regulations and can be handled simply and safely. Owing to its high flash point (> 100 °C [> 212 °F]) it is especially suitable for use in screen washing equipment. The cleaning agent **R 5899** is particularly distinguished by a low vapour pressure (< 0.1 hPa at 20 °C [68 °F]) and thus is not affected by the EU-VOC regulation 1999/13/EG which judges solvents by their percentage of volatile organic compounds (VOC = volatile organic compounds).

Furthermore, the cleaning agent **R 5821** is available which, owing to its high flash point of +32 °C [89.6 °F], is also suitable for use in screen washing equipment as well as for cleaning work tools. For the manual cleaning of screens and tools we recommend our cleaning agent **R 5817** with its fast and thorough cleaning properties.



**Do not use cleaning agent as a thinner or for washing hands since solvents remove the natural grease from skin.**

Special technical reports for these products are available upon request. Further information regarding the content and consequences of the EU-VOC regulation can be found in our **technical information sheet TI 15/110 E "EU-VOC regulations – Content and consequences for the PCB industry"**. On our report manual CD you will find technical reports in the "Products" section and technical information sheets in the "Service" section.

## 7.4 Screen printing

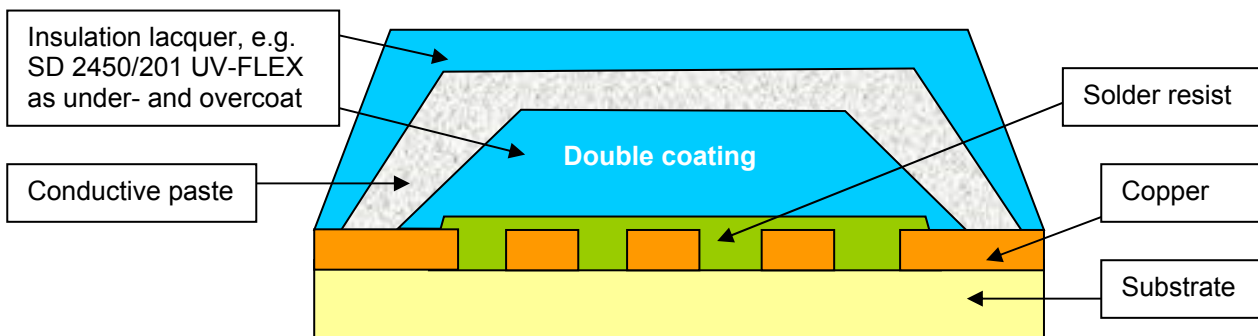
→ Please read our **Technical Information sheets TI 15/11 "The screen printing stencil in the pcb industry"** and **TI 15/13 "Precleaning in the pcb fabrication process"**. On our report manual CD, technical information sheets can be accessed in the "Service" section.

→ Ensure that the surface to be coated is clean, dry and grease-/oxide-free and that copper surfaces preferably have an average surface roughness of 2 µm.

**recommended screen printing parameters**

Screen fabric	polyester 68-55 up to 120-37 [according to old nomenclature 68 – 120 T (lines/cm)] or corresponding steel fabric
Screen tension	at least 25 N/cm or as specified by the screen mesh manufacturer
Squeegee	75–80 shore A hardness
Squeegee profile	right angled
Squeegee angle	approx. 75°

**7.5 Schematic of cross-over technology**



Model process parameters:

	Process step	Product	Drying/curing	Screen fabric
1.	UV solder resist	<b>SD 2368 UV-HF</b>	UV curing: 1500 mJ/cm <sup>2</sup>	100-40 (old: 100 T)
2.	Undercoat #1	<b>SD 2450/201 UV-FLEX-HF</b>	UV curing: 1500 mJ/cm <sup>2</sup>	120-37 (old: 120 T)
3.	Undercoat #2	<b>SD 2450/201 UV-FLEX-HF</b>	UV curing: 1800 mJ/cm <sup>2</sup>	120-37 (old: 120 T)
4.	Conductive paste	Silver-conductive paste	according to the manufacturer's specifications	according to the manufacturer's specifications
5.	Overcoat	<b>SD 2450/201 UV-FLEX-HF</b>	UV curing: 2500 mJ/cm <sup>2</sup>	120-37 (old: 120 T)

**8. Drying/Curing**

The solder resists of the series **SD 2460/201 UV-FLEX** are cured by means of UV radiation. High pressure mercury vapour lamps with a power rating of 80-100 Watt/cm arc length are suitable.

- Cure the solder resists of the series **SD 2460/201 UV-FLEX** with a UV light energy of min. 2500 mJ/cm<sup>2</sup> at a pcb surface temperature of approx. 60 °C [140 °F].
- In case of multiple printing of the solder resist, cure each of the intermediate layers with an energy of 1500-2000 mJ/cm<sup>2</sup> and the top layer with an energy of 2500 mJ/cm<sup>2</sup>. This way you achieve a better ink on ink adhesion. Please observe that multiple printing considerably reduces the flexibility of the solder resist.



**Due to its light reflective properties, cure the white solder resist SD 2490/201 UV-FLEX-HF at a much higher UV light energy of approx. 3500 mJ/cm<sup>2</sup>. Ascertain the optimum energy by means of pre-trials.**

Higher temperatures on the pcb surface accelerate the polymerisation so that a lower UV light energy may be sufficient.

The indicated light energy was measured with a Beltron\* UV Integrator. Equipment of other manufacturers may show different values.

→ Replace the UV lamps regularly according to the manufacturer's instructions, as the emission spectrum of the lamps changes in the course of their life span.

→ Install operating time counters to be able to control the operation period.

\* Beltron GmbH  
 Siemensstraße 6-8  
 63322 Rödermark, Germany  
 Phone: +49 - 60 74 – 8 91 99-0  
 Fax: +49 - 60 74 – 8 91 99-29

## 9. Standard packaging

The solder resists of the series **SD 2460/201 UV-FLEX** are packed for delivery as follows:

Component A in 1 carton	Component B in 1 carton	Selling unit
10 tins of 1 kg	10 plastic bottles of 0.05 kg	10.5 kg

The reactive thinner **VR 5008** is available in cans of 10 kg.

Partial lots of the selling units may be ordered, but will entail surcharges to cover repackaging costs.

## 10. Shelf life and storage conditions

Labels on containers show shelf life and storage conditions.



**Shelf life: In sealed original containers at least 6 months**



**Storage conditions: +5 °C to +25 °C [+41 °F to +77 °F]**



**Protect from UV light**



**Protect against humidity**

For warehousing reasons, isolated cases may occur where the shelf life upon shipment is less than the shelf life indicated in this technical report. However, it is ensured that our products have **at least** two-thirds of their shelf life remaining when they leave our company.

## 11. Further literature/ technical publications

In addition to the recommendations given in this technical report, we can provide technical papers and information sheets written and compiled by members of our staff. Visit our website at <http://www.peters.de> or click on the "Service" section on our report manual CD.

## 12. Further products for the production of pcbs

We offer a wide range of **etch resists (photoimageable, UV curing, conventional curing), plating resists, solder resists (photoimageable, UV curing, conventional curing) as well as peelable solder masks, marking inks (photoimageable, UV curing, conventional curing), carbon-conductive inks, via hole fillers (purely thermal curing), thick film fillers, plugging pastes, heatsink pastes, special strippers for solder resists and further auxiliary products for screen printing (e. g. cleaning agents, thinners).**

Special technical reports are also available for these products and can be provided on request. On our report manual CD you will find technical reports in the "Products" section.

### **13. Further products for the electronics/electrical engineering industries**

We boast a wide range of **conformal coatings, thick film lacquers, casting compounds, casting resins, electro pastes, insulating lacquers, impregnating varnishes, adhesive lacquers and auxiliary products for electronics.**

Special technical reports are also available for these products and can be provided on request. On our report manual CD you will find technical reports in the "Products" section.

#### **Any questions?**

We would be pleased to offer you advice and assistance in solving your problems. Free samples and technical literature are available upon request.

The above information as well as advice given by our Application Technology Department whether in verbal or written form or during product evaluations is provided to the best of our knowledge, but must be regarded as non-binding recommendations, also with respect to possible third-party proprietary rights.

The products are exclusively intended for the applications indicated in the corresponding technical data sheets.

The advisory service does not exempt you from performing your own assessments, in particular of our material safety data sheets and technical information sheets, and of our products as regards their suitability for the applications intended. The application, use and processing of our products and of the products manufactured by you based on the advice given by our Application Technology Department are beyond our control and thus entirely your responsibility. The sale of our products is effected in accordance with our current terms of sale and delivery.

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