ELPEPCB®
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TR TECHNICAL REPORT

2-pack solder resists of the series

Elpemer® 2467

- **green transparent** in various colour adjustments and degrees of gloss as well as in many **special colour adjustments** (listed on www.peters.de)
- suitable for all common application processes such as curtain coating, screen printing and spraying
- photoimageable
- very high resolution even of finest details (e.g. 50 µm)
- aqueous-alkaline developable
- thermal cycling resistance:
  -65 up to +125 °C [-85 up to 257 °F], selected adjustments up to +175 °C [347 °F]
- excellent resistance to galvanic and electroless nickel/gold (ENiG), palladium, silver, tin baths and OSP processes (Organic Solderability Preservative)
- compatible with lead-free soldering processes
- fulfils/exceeds among others
  UL 94 V-0, UL File No. E80315
  IPC-SM-840E, Class H and T
  Siemens SN 57030
  Bosch Y 273 R80 029
  NASA outgassing test acc. to ASTM E595

LP 132911 E-3 / 0252503e.003

Please read this technical report, the corresponding material safety data sheet, the process data sheet, the technical information sheet TI 15/3 and the Application Information sheet AI 2/1 (see Item 2 and 3) carefully before using the product. These sheets are enclosed with the first shipment of product or sample.

1. Application

On account of their very high resolution alongside their excellent dielectric properties the 2-pack solder resists of the series **Elpemer® 2467** are used as insulating coatings for pcbs in fine and superfine line technology, SMD technology as well as for multilayers.

The black adjustments are particularly suitable for coating substrates in optoelectronics to avoid light reflection.

2. Special notes / application information

To complement this technical report you will find product-specific data such as characteristics and recommendations for process parameters in the process data sheets (PD) of each solder resist. Further and detailed general information and notes that need to be observed to achieve an optimum processing result are indicated in the **Application Information** sheet **AI 2/1** ”Processing information for photoimageable **Elpemer®** solder resists”.

3. 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.

→ Solvent vapours are heavier than air, thus when planning workplace ventilation arrangements, ensure that extractor units are positioned at worktop height.

→ Please also pay attention to national guidelines or directives concerning the handling of flammable liquids as for example the German TRbF (technical regulations for flammable liquids) or European directives.

→ Please read our **Technical Information sheet TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents“.** On our website, the technical information sheets can be accessed in the section “Service – Technical publications“.

4. Characteristics

On account of the different application processes for the solder resists the characteristics vary and are thus indicated in the product-specific process data sheets.

5. Properties

5.1 General properties

- high productivity due to short processing times
- a high solids content and an optimum thixotropy enable an excellent edge coverage at a low wet ink weight as well as a favourable ratio of lacquer to pad height
- broad processing window in the process step ”pre-drying”
- low exposure energy, thus short exposure times
- suitable for Laser Direct Imaging (selected adjustments)
- very high resolution power: virtually vertical side walls enable the representation of finest details. e.g. 50 µm ink dams between SMD pads
- generally, no holding time required after exposure, therefore suitable for in-line production
- high pencil hardness and excellent scratch resistance protect against mechanical damage during handling

- excellent resistance to galvanic and electroless nickel/gold (ENiG), palladium, silver, tin baths and OSP processes (Organic Solderability Preservative)
- excellent compatibility with no-clean and water-thinnable fluxing agents
- strongly solder-repellent ink surface thus minimum solder ball adhesion
- with a solder bath resistance of 20 s at 288 °C [550.4 °F] acc. to UL 94 fulfil the required temperature resistance for lead-free soldering
- multiple soldering and lead-free reflow soldering possible
- very low ionic contamination values after HAL
- excellent adhesion of subsequent coatings (marking inks, carbon-conductive inks, conformal coatings and others)
- suitable for laser ablation by means of CO2 lasers, e.g. to apply AOI legible markings (for instance, data matrix, barcodes), no solder adhesion to ablated areas
- excellent permanent temperature resistance at 150 °C [302 °F] in conjunction with a suitable pretreatment method
- thermal cycling resistance: -65 up to +125 °C [-85 up to 257 °F], partially up to +175 °C [347 °F] (100 cycles)
- best flame class UL 94 V-0 for all colour adjustments and degrees of gloss, UL File No. E80315, registered trademark of Underwriters Laboratories Inc., Northbrook, Illinois 60062
- free of halogenated flame retardants
- partially halogen-free acc. to JPCA-ES01-2003 / IEC 61249-2-21
- do not contain substances listed in the RoHS directive 2011/65/EU, EU End-Of-Life Vehicle directive 2000/53/EC and WEEE directive 2002/96/EC
- fulfil, among others, the specifications **IPC-SM-840E** (**Trace Lab Report** available on www.peters.de in the ”Service – Certificates” section), Bosch Y 273 R80 029 and Siemens SN 57030 with respect to electro corrosion
- various adjustments of the **Elpemer® 2467** series fulfil the NASA Outgassing Test acc. to ASTM E595 (for detailed information please see the outgassing certificates in the ”Service” section of our website www.peters.de or visit www.nasa.gov)
- suitable for being applied in connection with the photoimageable, aqueous-alkaline developable via hole fillers of the series **Elpemer® VF 2467.**

5.2 List of possible physical and mechanical properties

Lackwerke Peters largely verifies its own production range with regard to the products’ physical and mechanical properties. Please note that the values may slightly vary depending on the adjustment.

Property	Test method	Result
Adhesion	IPC-SM-840E, 3.5.2.1	class H and T
	IPC-SM-840E, 3.5.2.6 (ink on ink)	class H and T
Cross hatch	EN ISO 2409, ISO 2409 on copper on FR 4	 Gt 0 Gt 0
Pencil hardness	IPC-SM-840E, 3.5.1 acc. to Wolff-Wilborn	 6 H 6 H
Scratch hardness	Simex scratch resistance test device type RH 3, scoring needle with ball tip (1 mm diameter)	weight load: 1500 – 2000 g

Property	Test method	Result
Resistance to solvents/ cleaning agents	IPC-SM-840E, 3.6.1.1 Isopropanol Isopropanol : deionised water (75 : 25) D-Limonene 10% alkaline cleaning agents Monoethanolamine Deionised water	 passed passed passed passed passed passed
Resistance to solvents	test boards, dipped in dichloromethane (30 min at room temperature)	no swelling
Hydrolytic stability	IPC-SM-840E, 3.6.2 28 days/+97 ± 2 °C [+206.6 ± 35.6 °F] 90 to 98 % rel. humidity	passed
Solder bath resistance	IPC-SM-840E, 3.7.2 IPC-SM-840E, 3.7.3 (lead-free) IPC-TM-650, 2.6.8 UL 94* in acc. with IPC-TM-650, 2.6.8	20 s at 265 °C [509 °F] 10 s at 260 °C [500 °F] 10 s at 288 °C [550.4 °F] 20 s at 288 °C [550.4 °F] 10 s at 320 °C [608 °F]
Simulated lead-free reflow soldering	IPC-SM-840E, 3.7.3.1	5 x 10 s at 260 °C [500 °F]
Thermal shock	IPC-SM-840E, 3.9.3	class H and T
Thermal class	based on DIN IEC 60 085	F = 155 °C [311 °F]
TG_5 (5% mass loss)	Thermo gravimetric analysis (TGA)	approx. 370 °C [698 °F]
Resistance to acids	10 % H_2SO_4 at 20°C [68 °F], 30 min	no change
Resistance to alkalines/lies	10 % NaOH at 20°C [68 °F], 30 min	no change
Ionic contamination	Alpha ionograph M500	< 0.3 µg NaCl/cm²
4-part noxious gas test	DIN EN 60068-2-60 BMW GS 95003-4, item 6.10	no corrosion
Mould resistance	IPC-TM-650, 2.6.1 DIN IEC 60068-2-10	passed** passed**

* The solder resists of the series **Elpemer® 2467** fulfil the required temperature resistance for lead-free soldering.

** Representative of the solder resists of the series **Elpemer® 2467** the mould resistance of the curtain coating adjustment **Elpemer® GL 2467 SM-DG** acc. to IPC-TM-650 and of the screen printing adjustment **SD 2467 SM-DG** acc. to IEC 60068-2-10 were tested in accordance with the above mentioned test methods in an accredited laboratory. We would gladly supply a copy of the test certificates upon request.

5.3 List of possible electrical properties

Lackwerke Peters largely verifies its own production range with regard to the products' electrical properties. Please note that the values may slightly vary depending on the adjustment.

Property	Test method	Result
Dielectric strength	VDE 0303, part 21 DIN EN 60243-1	160 - 190 kV/mm
	IPC-SM-840E, 3.8.1	passed
Surface resistance	VDE 0303, part 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	2.0 x 10^{14} Ohm
Specific volume resistivity	VDE 0303, part 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	1.0 x 10^{16} Ohm x cm

Property	Test method	Result
Insulation resistance	IPC-SM-840E, 3.8.2	class H and T
Moisture and insulation resistance	IPC-SM-840E, 3.9.1	class H and T
Electromigration	IPC-SM-840E, 3.9.2 85 °C [185 °F] , 85 % r. h., 168 h, 10 V DC	class H and T
Electrocorrosion	Siemens Norm SN 57 030 40 °C [104 °F], 95 % r.h., 21 d, 100 V DC	passed
Comparative Tracking Index (CTI, Tracking resistance)	DIN EN 60 112 on FR 4 base material with CTI 250 with CTI 600	 CTI 275* CTI 600*
Dielectric constant ε_r	based on IPC 4101 A at 1 MHz	approx. 3.7
Dissipation factor tan δ	based on IPC 4101 A 1 – 100 MHz	approx. 0.029

* 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 usually maintained when the 2-pack solder resists of the series **Elpemer 2467** are used.

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

6. Processing

→ Please observe the product-specific processing parameters recommended in the corresponding process data sheets for each solder resist as well as the **Application Information** sheet **AI 2/1** "Processing information for photoimageable **Elpemer®** solder resists".

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 that were determined in laboratory conditions. 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 conditions/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

Protect opened containers from UV light

6.1 Auxiliary products recommended

- **Cleaning and deoxidising agent HP 5625 for conveyorised spraying units**
  for the pre-treatment of Cu pcbs prior to ink/resist application, deoxidises and degreases without copper degradation; minimum foaming.

- **Screen opener HP 5200**
  The screen opener **HP 5200** is a highly active spray for dissolving dried screen printing inks immediately and safely from clogged screens. **HP 5200** is silicone-free and does not contain oils or oily substances, so that no smearing occurs.
- **Anti-Static Spray HP 5500**
  The anti-static spray **HP 5500** prevents and eliminates any static charge that occurs during screen printing. **HP 5500** is silicone- and grease-free.
- **Special stripper HP 5707**
  in its concentrated form **HP 5707** can be used to remove exposed and possibly cured photoimageable solder resists (e.g. in case of mis-exposures); diluted with water it is also suitable for cleaning ink developer and resist stripping units.
- **Defoamant HP 5911**
  for fast and safe defoaming of aqueous-alkaline developing media, silicone-free, completely biologically degradable, quantity to be added 0.02 up to 0.05%.
- **Touch-up lacquer SD 2369 UV-ABL**
  yellow-green transparent lacquer to touch up small mechanical damages, application by means of screen printing or brushing, UV curing.
- **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.

7. Drying/curing

Information regarding drying/curing can be found in the corresponding process data sheets of each solder resist.

8. Standard packaging

	Component A	Component B	Selling unit
AS 2467	1 bucket of 8 kg	1 top container of 2 kg	10 kg
ES 2467	1 bucket of 10 kg	1 top container of 2 or 2.5 kg*	12 or 12.5 kg*
GL 2467	1 bucket of 8 kg	1 top container of 2 kg	10 kg
SD 2467	10 buckets of 4.8 kg	10 tins of 1.2 kg	60 kg
	10 tins of 0.8 kg	10 tins of 0.2 kg	10 kg

* depending on the respective mixing ratio

The corresponding thinner is available in cans of 15 kg or barrels of 160 kg.

Partial lots of the selling unit / smaller quantities against surcharge.

9. Shelf life and storage conditions

The shelf life / minimum shelf life and storage conditions are indicated in the product-specific product data sheets (PD) and shown on the container labels.

10. Disclaimer

All descriptions and images of our goods and products contained in our technical literature, catalogues, flyers, circular letters, advertisements, price lists, websites, data sheets and brochures, and in particular the information given in this literature are non-binding unless expressly stated otherwise in the Agreement. This shall also include the property rights of third parties if applicable.

The products are exclusively intended for the applications indicated in the corresponding technical data sheets. They do not exempt the customer from performing own assessments, in particular as regards the 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.

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

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