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TR TECHNICAL REPORT

2-pack solder resists
of the series

SD 2462 NB and SD 2462 NB-M

Base: epoxy resin (EP)

- application by screen printing
- excellent edge definition and conductor edge coverage
- exceptionally strong adhesion
- outstanding chemical resistance
- selected adjustments UL-approved with the best flame class UL 94 V-0, UL File No. E80315 (see also Section 3), registered trademark of Underwriters Laboratories Inc., Northbrook, Illinois 60062

This technical report is valid for the following adjustments:

- **SD 2462 NB**, green transparent
- **SD 2442 NB-M**, black, mat
- **SD 2452 NB-M**, blue transparent, mat
- **SD 2462 NB-M**, green transparent, mat
- **SD 2462 NB-M/550**, green transparent, mat

Indices: **SD = screen printing**
NB = no bleeding
M = mat surface
550 = viscosity 550 dPas (higher viscosity)

Contents

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

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1. General information

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** 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 in the section ”Service – Symbols on labels”.

2. Application

The thermal curing 2-pack solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** are applied by screen printing. They are distinguished by their excellent edge definition, superior conductor edge coverage and outstanding chemical resistance. Due to their exceptionally strong adhesion and "no bleeding" properties they have proven ideal for masking copper printed circuit boards during the hot-air solder levelling process.

Moreover, in combination with the thick film fillers **DSF 2706 UV** and **DSF 2707 UV-1**, **SD 2462 NB-M** is especially suitable as a "top coat" in thick copper technology (400 µm technology).

SD 2442 NB-M can be used for substrate coating in LED applications in order to prevent light reflecting off the background and to increase the contrast to the LEDs.

3. Special notes

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** – **with the exception of SD 2452 NB-M** – have been awarded the best flame class V-0 per UL 94 (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.

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

5. Characteristics

	Colour/ Appear-ance	**Solids content of mixture** ISO 3251 1 h, 125 °C [257 °F], 1 g weighed quantity	**Viscosity* of mixture at 20 °C [68 °F]** ISO 3219	**Density of mixture at 20 °C [68 °F]** ISO 2811-1	**Pot life of mixture** at 18–23 °C [64.4-68 °F], set-up quantity 500 g
SD 2462 NB	green transp.	76 ± 2 % by weight	40 000 ± 5 000 mPas	1.23 ± 0.05 g/cm³	approx. 3 days
SD 2442 NB-M	black	81 ± 2 % by weight	35 000 ± 5 000 mPas	1.53 ± 0.05 g/cm³	approx. 8 h
SD 2452 NB-M	blue transp.	82 ± 2 % by weight	30 000 ± 5 000 mPas	1.57 ± 0.05 g/cm³	approx. 8 h
SD 2462 NB-M	green transp.	82 ± 2 % by weight	35 000 ± 5 000 mPas	1.57 ± 0.05 g/cm³	approx. 8 h
SD 2462 NB-M/550**	green transp.	80 ± 2 % by weight	42 000 ± 5 000 mPas	1.49 ± 0.05 g/cm³	approx. 8 h

* measured with Haake RS 600, C 20/1°, D = 50 s^{-1}, 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

The index **/550 originates from an old measuring method with the Haake VT 02 gauge. However, this method does not comply with the international ISO 3219 standard and thus is no longer specified in technical data sheets. The viscosity using the VT 02 is 550 dPas at 20 °C [68 °F].

6. Properties

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** are 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
- high solids content, the formulated high-boiling solvents cause hardly any odour annoyance
- excellent printing properties, even over high conductors
- thixotropic adjustment, thus excellent edge definition and conductor edge coverage
- long screen open time allows economical processing; even short breaks / interruptions in the workflow do not disrupt production
- virtually no drying on the screen during printing
- suitable for rigid and "static flex" circuits
- exceptionally strong adhesion to almost all printing substrates
- good resistance to soldering processes and Hot-Air Solder Levelling
- excellent resistance to chemical and electroplated finish processes (see also Section 7.4 "Screen printing")
- selected adjustments UL-approved with the best flame class UL 94 V-0 (see also Section 3)
- free of halogenated flame retardants.

6.2 Physical and mechanical properties

The following values refer to **SD 2462 NB** and **SD 2462 NB-M**. For the other colour adjustments the values are approximately within the same range.

Property	Test method	SD 2462 NB	SD 2462 NB-M
Adhesion	IPC-SM-840D, 3.5.2.1	Class H and T	Class H and T
Cross hatch	DIN EN ISO 2409 on copper on FR 4	 Gt 0 Gt 0	 Gt 0 Gt 0
Pencil hardness	IPC-SM-840D, 3.5.1	3 H	2 H
Thermal cycling test	5 cycles comprising 15 min boiling water 2 min iced water	passed	passed
Resistance to solvents	IPC-SM-840D, 3.6.1.1 Isopropanol Isopropanol : deionised water (75 : 25) D-limonene 10% alkaline cleaner Monoethanolamine Deionised water	 passed passed passed passed passed passed	 passed passed passed passed passed passed

Property	Test method	SD 2462 NB	SD 2462 NB-M
Resistance to solvents	Test boards dipped in di-chloromethane (methylene chloride) for 30 min at room temperature	OK	OK
Solder bath resistance	IPC-SM-840D, 3.7.1/3.7.2 UL 94 / IPC-TM-650, 2.6.8	passed: 20 s at 265 °C [509 °F] passed: 20 s at 288 °C [550.4 °F]	passed: 20 s at 265 °C [509 °F] passed: 20 s at 288 °C [550.4 °F]
Glass transition temperature Tg	TMA (thermo mechanical analysis, tension mode)	approx. 110 °C [230 °F]	approx. 115 °C [239 °F]
Coefficient of thermal expansion CTE	TMA (thermo mechanical analysis, tension mode)	approx. 80 ppm/°C < Tg approx. 180 ppm/°C > Tg	approx. 50 ppm/°C < Tg approx. 145 ppm/°C > Tg
Thermal class	based on DIN IEC 60 085	F = 155 °C [311 °F]	F = 155 °C [311 °F]

* With a solder bath resistance of 20 s at 288 °C [550.4 °F] the solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** fulfil the required temperature resistance for lead-free soldering.

6.3 Electrical properties

The following values refer to **SD 2462 NB** and **SD 2462 NB-M**. For the other colour adjustments the values are approximately within the same range.

Property	Test method	SD 2462 NB	SD 2462 NB-M
Dielectric strength	VDE 0303, part 21 DIN EN 60243-1	143 kV/mm	136 kV/mm (SD 2442 NB-M: 86 kV/mm)
	IPC-SM-840D, 3.8.1	passed	passed
Surface resistance	VDE 0303, part 30 DIN IEC 60093 IPC-TM-650, 2.5.17.1	1.6×10^{10} Ohm	1.2×10^{10} Ohm
Specific volume resistivity	VDE 0303, part 30 DIN IEC 60093 IPC-TM-650, 2.5.17.1	8.8×10^{14} Ohm x cm	1.3×10^{15} Ohm x cm
Moisture and insulation resistance	IPC-SM-840D, 3.9.1	Class H and T	Class H and T
Electromigration	IPC-SM-840D, 3.9.2	Class H and T	Class H and T
Comparative Tracking Index (CTI, tracking resistance)	DIN EN 60112, on base material with CTI 300 with CTI 600	 CTI 200 CTI 375	 CTI 275 CTI 550

* The CTI value of the coating also depends on the tracking resistance values of the base material, etc.

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

7. Processing

The 2-pack solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** are applied by screen printing.

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 following mixing ratio:

	**Parts by weight Component A : Component B**
SD 2462 NB	3 : 1
SD 2442 NB-M SD 2452 NB-M SD 2462 NB-M SD 2462 NB-M/550	5 : 1

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.

After thorough mixing, the ink can be processed immediately.

7.2 Adjustment of viscosity

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** 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 following products:

- Universal thinner **UV 5000** (addition of max. 5 %)
- Universal retarder **UZ 5100** (addition of max. 3 %)
  The thinning effect of **UZ 5100** is somewhat less than that of **UV 5000**, but a slightly longer screen open time will be achieved.

DIL = to be thinned with universal thinner UV 5000 or universal retarder UZ 5100

Special technical reports for these products are available upon request. On our report manual CD you will find technical reports in the "Products" section.

7.3 Auxiliary products

- **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 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 **t**echnical **i**nformation **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 and on our website, 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 43-80 to 54–64 (acc. to old nomenclature polyester 43-55 T [lines/cm]) or corresponding steel fabric
Screen tension	at least 25 N/cm or according to the instructions of the screen mesh manufacturer
Stencil material	"direct/indirect" photopolymer film approx. 30-40 µm thick
Snap-off	as low as possible
Squeegee	75-80 Shore-A hardness
Squeegee profile	right angled
Squeegee angle	approx. 75°

Once cured the ink film takes on an almost insoluble state. Because the ink film cannot be dissolved even with strippers, ensure you examine the printing result carefully after proofing.

8. Drying/Curing

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** are cured at the following rates:

- in a convection dryer: **45 min at 130 °C [266 °F]** (object holding time*)

or

- in an IR dryer: **4–6 min at 160–180 °C [320-356 °F]**.

* Object holding time: The curing time starts when the panels reach the curing temperature.

→ Perform appropriate pre-trials to determine the optimum temperature profile.

9. Standard packaging

The solder resists of the series **SD 2462 NB** and **SD 2462 NB-M** are packed for delivery as follows:

	Component A	Component B	Selling unit
SD 2462 NB	10 tins of 0.9 kg	10 plastic bottles of 0.3 kg	12 kg
SD 2442 NB-M SD 2452 NB-M SD 2462 NB-M SD 2462 NB-M/550	10 tins of 1.0 kg	10 plastic bottles of 0.2 kg	12 kg
UV 5000 UZ 5100	Can of 25 kg	—	25 kg

Partial lots of the selling units / smaller quantities 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 9 months, 6 months for SD 2442 NB-M

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

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/ Techncal 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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