LPinfos compact

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WEPURAN – individual – eyecatching – tailor-made – longlasting – easy to use

PETERS
Speziallacke für die Elektronik

Contents

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Indices

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Preface to the 6th edition of our *"LPinfos compact"*

To all friends of our company

Our world of electronics is colourful:
black or white, bright-coloured or clear-transparent – we live up to your expectations!

Lackwerke Peters is the only company in the world that, being a **full-service provider** of **coating materials,** has successfully served the world's markets for more than 40 years – both for the **manufacture of printed circuit boards** and the **protection of assembled printed circuit boards**.

Nowhere else, manufacturers and users of printed circuit boards will find such a broad and in-depth product variety for all process steps that a board undergoes on its way from the imaging of the conductive pattern to legend marking.

Besides the omnipresent, mostly green solder resists that undoubtedly make up the largest slice of the pie, our products on offer include etch and plating resists, peelable solder masks, carbon conductive inks and marking inks, as well as via hole fillers or plugging and heatsink pastes.

At first glance, this looks like a well-manageable product portfolio. However, there is actually a tremendous variety of adjustments within each of these product groups. All solder resist adjustments taken together alone – whether for rigid, flexible or rigid-flexible printed circuit boards – can first of all be divided into UV curing and thermal curing screen printing inks. They are complemented by the indispensable photoimageable lacquer systems, applied either by the curtain coating method or by horizontal or vertical screen printing, or even spraying. Among the solder resists also referred to as "photosensitive" solder resists, one would find the two camps of polyalcohol developable (**ELPEMER® 2469**) and aqueous-alkaline developable variants (such as **ELPEMER® 2467** or **ELPEMER® 2463 FLEX**). In this respect, too, we live up to our claims providing a full-fledged product range.

What is more, all products mentioned above that are developed for most different applications and coating methods are available in various colours. Besides several green colour adjustments on offer, one can choose among blue, red, black and other special colours, and again among several gloss grades from extra-mat to high-glossy.

Each product family of conformal coatings and casting resins or casting compounds covers a very large variety of products that contributes to the attractiveness of our full service portfolio, particularly serving in view of the value-added chain from the "naked" up to the fully assembled printed circuit board or conformal-coated flatpack.

But this is not all yet. For some time now, optical aspects have played an important role in our product development, driven by the newly emerged fascinating world of LED technology and its applications in the lighting and advertising industries.

In line with our claims as a specialist and full-service provider of coating materials for electronics, we have continuously developed and successfully introduced solder resists for strongly light-reflecting white or light absorbing black printed circuit boards. Since these products are already being demanded and applied for large series productions, we have adapted the white **ELPEMER®** solder resists to suit all methods of

lacquer application. Several customers have adapted their curtain coating equipment for this purpose.

In addition, we propose highly transparent and yellowing-resistant as well as opaque white or black coloured **ELPEGUARD®** conformal coatings which ensure the electrical insulation of LEDs on the assembly and create an additional optical effect or, respectively, intentionally avoid such an effect.

Should a high layer thickness be required for “embedding”, our absolute “best seller” of past years is a good choice: the **WEPURAN** casting resins of the series **VT 3402 KK.** These products see new customers each day from the lighting and advertising industries. The many possible applications based on a large number of especially formulated adjustments, the range of packing units and container sizes available for small or large consumption and, last but not least, our good service have got around well.

Our special product portfolio aimed at LED technology, of no doubt one of the mega trends in the decades to come, will continue to enjoy top priority in our company, because this trend can be stopped neither by technical nor by political barriers.

Regrettably, the economic outlook in the photovoltaics branch is different. The extreme boom experienced over the last years has sobered down: political decisions, or lack thereof, have shaken this branch to the core; many model-type companies presented over the last years had to give up or still suffer severely.

Individual **ELPEGUARD®** conformal coatings (of the series **SL 1306 N** and **SL 1307 FLZ**) and our **WEPURAN** casting compound **VU 4459/41-SV-HF** continue to account for some good business in the area of converters construction. Globally required, the level of demand will be maintained. However, the production of the extremely large wafer surfaces has dropped substantially in Germany and Europe, to the benefit of production in Asia.

Nowadays we are of course glad that at an early stage, we took the strategically correct decision not to orientate our company’s business towards photovoltaics, despite all supposed enticement. The serving of this market by well-proven and field-tested products from other areas is a good solution, and we will continue to follow this path.

In this sense I hope that you, dear readers, will discover many more new markets for your products in the future and will face us with new exciting projects and challenges.

Best regards

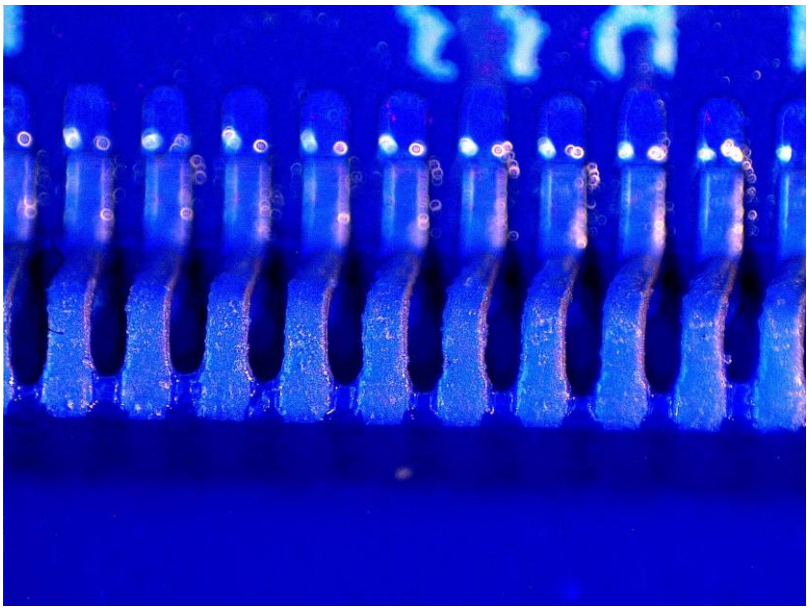
Ralf Schwartz ✉ ralf.schwartz@peters.de

New developments to be presented at SMT

New “sprinters” in the ELPEGUARD SL 1307 FLZ family of conformal coatings

Rapid drying at room temperature, simple repair and special adjustments for specific tasks – the conformal coatings of the series **ELPEGUARD® SL 1307 FLZ** have made a name for themselves as an allround solution. These yellowing-resistant conformal coatings for assembled pcbs can be simply soldered through for repair or be removed by means of its respective thinner. All products of this series fulfill the requirements of IPC-CC-830B and MIL-I-46058C; Underwriters Laboratories have listed them both as permanent coatings according to UL 94 and as conformal coatings according to UL 746E. The following new developments from this series shall receive special attention:

Good wetting results with the conformal coating ELPEGUARD® SL 1307 FLZ/203



Optimum edge coverage with **ELPEGUARD® SL 1307 FLZ/203**

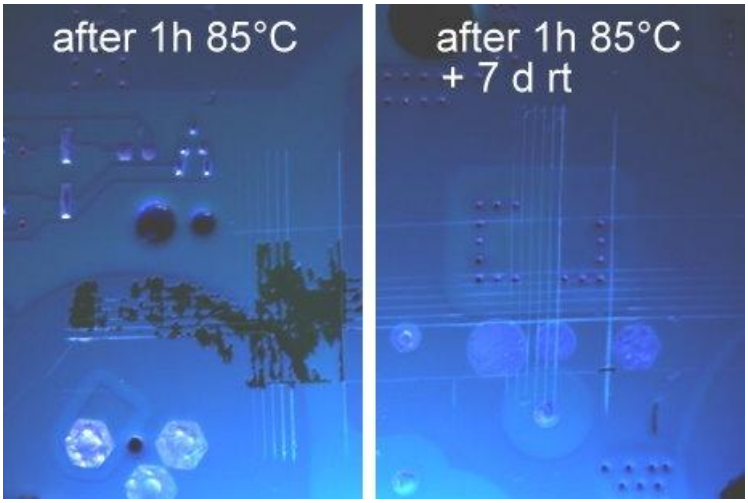
Slightly thixotropised, the colourless-transparent, fluorescent **SL 1307 FLZ/203** distinctly reduces edge loss on sharp-edged component legs. Through optimum edge coverage, it is possible to achieve a high resistance against climatic conditions.

Thanks to the ideal balance between edge coverage and flow due to capillary action, even those areas are wetted and protected that are difficult to access, such as the reverse sides of component legs or areas below components.

Good adhesion on critical substrates: conformal coating ELPEGUARD® SL 1307 FLZ/234

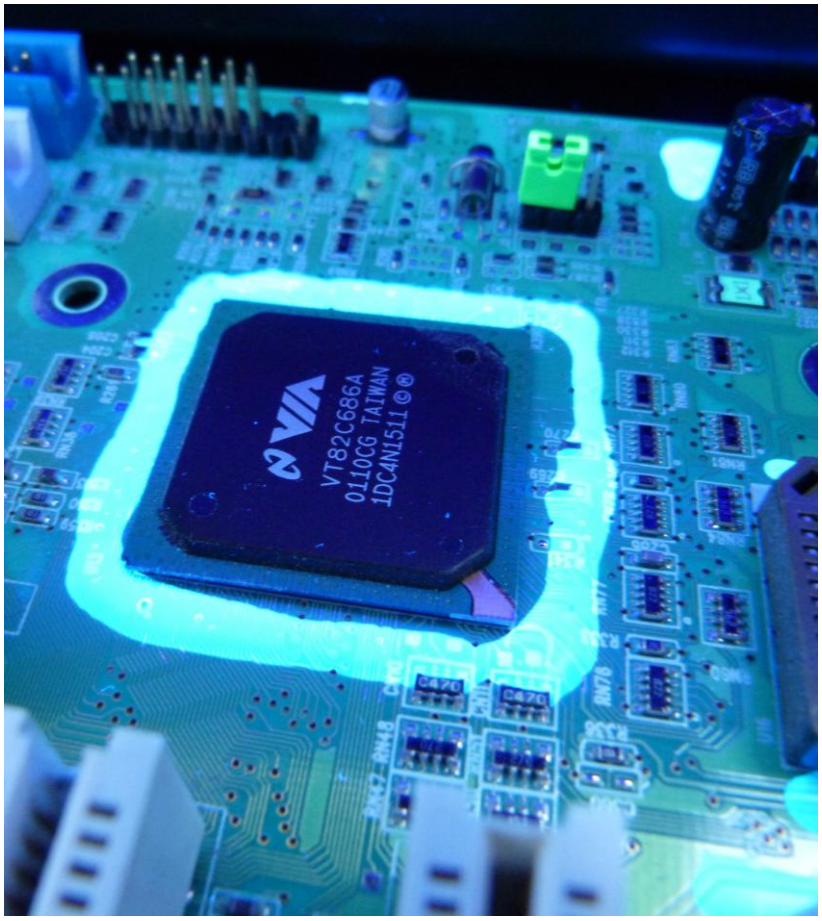
The colourless-transparent, fluorescent conformal coating **ELPEGUARD® SL 1307 FLZ/234** displays a good adhesion even on critical substrates, which is based on a chemical reaction with the substrate and gives excellent cross cut test results. This does not affect the ease of repair and removability by means of the respective thinner which is a specific feature of this product.

The improved adhesion is achieved after seven days of drying at room temperature and can be accelerated by heat storage.



Dam and fill and touch protection against accidental contact thanks to dam-and-cure gels of the series EH 13.401 FLZ-UV

These colourless-transparent, fluorescent gels are thixotropised, solvent-free, purely UV curing lacquer systems based on acrylic resins which can be applied in a simple and precise manner by means of dispensing.



This way, dams can be built around plugs, components and pads to prevent the penetration or spreading of a subsequently applied conformal coating (dam and fill).

EH 13.401 FLZ-UV slightly flows after being applied, whereas the highly thixotropic adjustment **FP 112-0702** does not flow and may therefore be used on critical plug connectors or components with high capillary action.

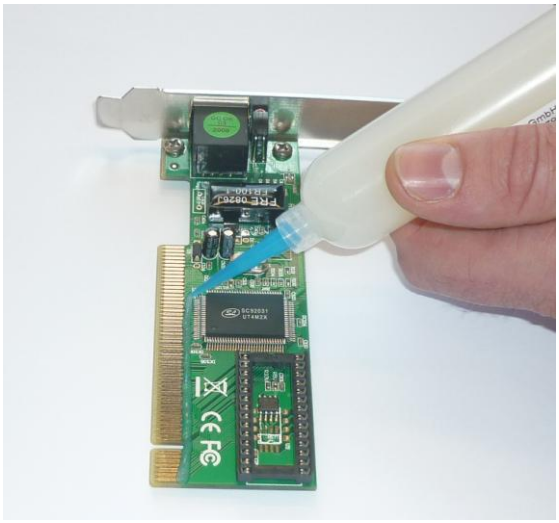
On non-assembled solder sides, a pointed coating of solder pins with a dam-and-cure gel of the series **EH 13.401 FLZ-UV** ensures reliable protection against accidental contact.

UV curing accounts for short curing times. When combined with our **ELPEGUARD®** thick film lacquers of the series **TWIN-CURE® DSL 1600 E-FLZ** one can dispense with an intermediate curing of this product.

Both lacquer systems may be cured simultaneously. For processing, it should be considered that the dam and cure gels of the series **EH 13.401 FLZ-UV** do not cure in shadow areas.

The lacquer films achieved with the UV gels of the series **EH 13.401 FLZ-UV** form a highly elastic dam, thus reducing the risk of cracking in thermal shock tests.

For repair purposes, these gels can be removed by using thinner **V 1307 FLZ/2**, and can be reapplied upon completion of the repair work.



Additional dam and fill materials are available:

- The physically drying conformal coatings **ELPEGUARD® SL 1307 FLZ-T** (thixotropic) and **SL 1307 FLZ-HT** (highly thixotropic) based on modified acrylic resins,
- the thixotropic 2-pack-casting compound **WEPURAN VU 4453/71 HE-T** based on polyurethane resins,
- the pasty 2-pack electro paste **EP 8012** based on epoxy resins applied by a putty knife.

WEPESIL silicone casting resin VT 3602 KK for high power LEDs

Withstanding high optical temperatures of up to 150 °C, the colourless and crystal-clear **WEPESIL** silicone casting resin **VT 3602 KK** is suitable for a use in optoelectronics, in particular when it comes to coating high power LEDs. Even when applied in high layers or when exposed to long-term thermal stress, this solvent-free 2-pack silicone elastomer displays a very high transparency in the entire wavelength range of visible light, as well as an excellent yellowing resistance.

In addition, the **WEPESIL** silicone casting resin **VT 3602 KK** is highly weather and UV resistant, besides its very high elastic and tear resistant properties. It is characterized by a shore A hardness of 35-45, and its coefficient of thermal expansion is 310 ppm/°C at temperatures above -50°C.

An optimum mixing ratio of 1:1 parts by volume or weight and a pot life of 4 to 5 hours ensure a simple processing of this product.

Curing is possible at room temperature but can be distinctly accelerated by applying heat (e.g. 15 min at 125 °C). The **WEPESIL** casting resin **VT 3602 KK** is addition cross-linking, thus preventing the separation of substances in the curing phase.

Additional highly transparent casting resins for optoelectronics are available:

- the thermo curing **WEPESIL** casting resin **FP 312-0503** with a temperature resistance > 150 °C,
- the **WEPURAN** casting resin **VT 3402 KK-NV** based on polyurethane resin with an optical temperature resistance of up to 100 °C.

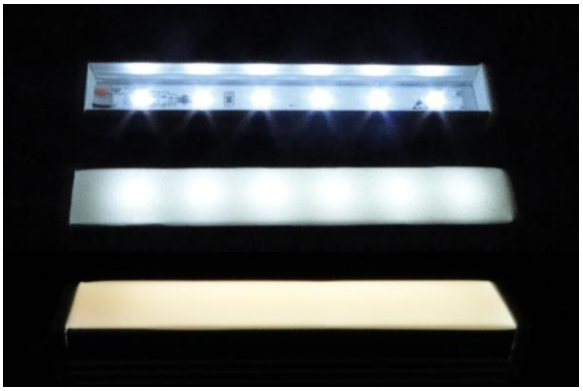
WEPESIL casting compound VU 4675 with high thermal conductivity

The grey solvent-free **WEPESIL** silicone casting compound **VU 4675** is a 2-pack silicone elastomer with a high permanent temperature resistance of up to 200 °C. It is characterized by a shore A hardness of 30-40, and its coefficient of thermal expansion is 200 ppm/°C at temperatures above -50°C.

Ceramic fillers contribute to its excellent thermal conductivity of approx. 1.2 W/m*K. **VU 4675** is applied wherever heat, such as generated by high power LEDs, must be dissipated on large surface areas in a rapid manner.

Thanks to an optimum mixing ratio of 1:1 parts by volume or weight and a good flowability, this product offers simple processing. Curing is possible at room temperature, but can be distinctly accelerated by applying heat (e.g. 15 min at 125 °C). The **WEPESIL** casting compound **VU 4675** is addition cross-linking, thus preventing the separation of substances in the curing phase.

WEPURAN casting resin FP 312 0813 as light diffuser on LED boards



The opaque **WEPURAN** casting resin **FP 312-0813** is suitable for a use as top coat on a surface which has already been potted with a crystal-clear casting resin of the series **VT 3402 KK**. This allows to diffuse the highly concentrated spotlight in an even manner.

The result is similar to that of our hazing paste **TP 3492 LS** which is combined with our **WEPURAN** casting resins of the series **VT 3402 KK**. The hazing paste **TP 3492 LS** allows to produce different levels of hazing effect based on the mixing ratio, however, it requires the mixing of three components in two steps (**TP 3492 LS** with component A and then component B of **VT 3402 KK**).

Based on polyurethane resins, the 2-pack **WEPURAN** casting resin **FP 312-0813** with a mixing ratio of 2:1 is easier to process. The intensity of light diffusion can be adapted through the thickness of layer applied.

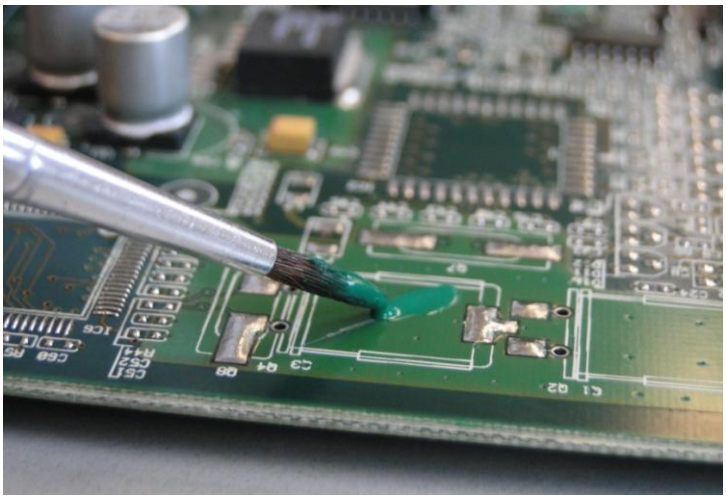
Adhesion promoter FP 1312 0319 for silicone LEDs

The colourless adhesion promoter **FP 1312-0319** improves the adhesion to critical substrates of a subsequently applied **WEPURAN** casting compound of the series **VT 3402 KK-NV**. Moreover, this adhesion promoter exhibits good wetting properties, even over critical surfaces. Thus, for example, it can be used to treat the silicone surfaces of an LED to achieve good wetting of the subsequent potting, ensuring an optimum adhesive bond. By this means, light displacements by delamination of the casting resin can be prevented.

FP 1312-0319 can be either sprayed or brushed on. The product contains solvents which must be allowed to evaporate completely before potting commences. The drying time is approx. 15 minutes and depends on the quantity applied.

Green opaque repair coating EH 13.767 for touching up damaged layers of solder resist

Small mechanically caused lacquer damages, such as scratches in the solder resist layer, can be easily removed by the mat green opaque repair lacquer **EH 13.767**, a physically drying lacquer system based on acryic resins curing at room temperature.

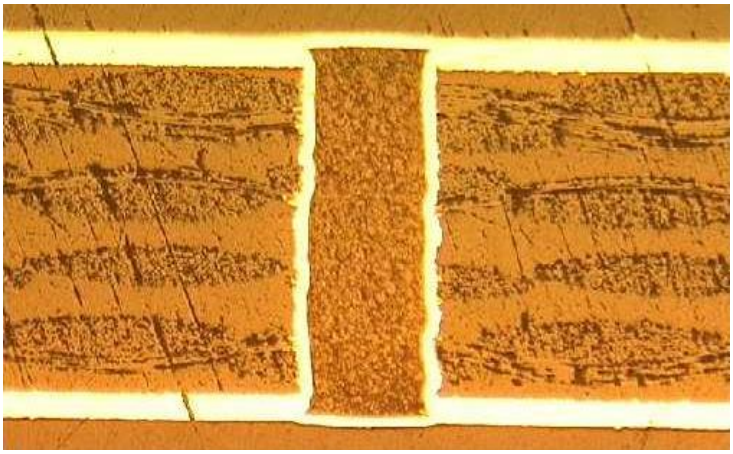


This product is of special benefit when it comes to repairing solder resist surfaces of assembled pcbs after completed soldering, since such pcbs, in most cases, cannot be passed through a UV tunnel or any other oven due to the assembled components.

Similar to a protective coating, the repair coating **EH 13.767** exhibits good electrical insulation properties. It can be processed in the condition supplied.

Plugging Pastes of the series PP 2793 for better reliability in High-Tg circuits manufacturing

One of the key processes in HDI technology is the creation and complete filling of vias followed by their metallization. Similar to many electronics fields, high-Tg materials are required here due to increasing operating temperature levels.

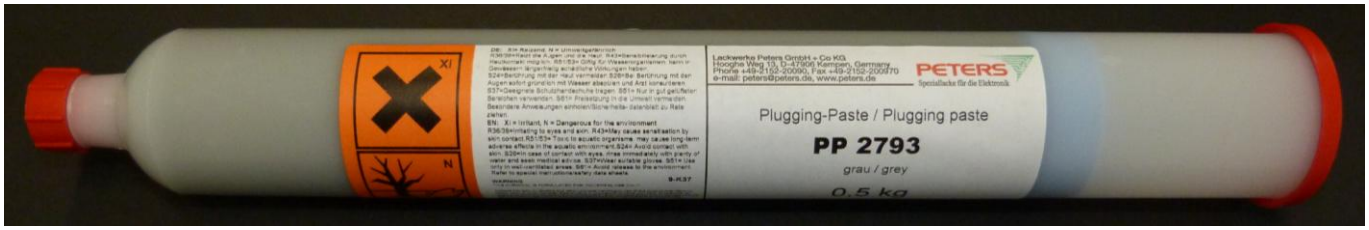


The plugging pastes of the series **PP 2793** and their thermomechanical properties were developed to particularly suit high-Tg circuits. Besides a high glass transition temperature (Tg) of 155 °C, they feature a very low thermal expansion coefficient (CTE) of 80-95 ppm/°C above Tg.

Another important factor implemented for achieving good results is an extremely low volume shrinkage when cured. Cracking or delamination of multiple layers are avoided even under high temperature loads.

These solvent-free 1-pack systems allow bubble-free, plane hole plugging of buried vias distinguished by a good adhesion, sandability and metallisability, as well as an outstanding chemical resistance in the desmear process.

Besides in standard containers, the plugging pastes of the series **PP 2793** are supplied in bubble-free filled cartridges which allow an easy and secure processing with all types of plugging machines available on the market, either by screen or stencil printing, or by the vacuum plugging process. **PP 2793 T** is particularly suitable for the screen and stencil printing methods.



As for all plugging pastes supplied by Lackwerke Peters, great value was placed on offering a sufficiently long shelf life of at least four months.

Listed in the Underwriters Laboratories UL file no. E80315, the plugging pastes of the series **PP 2793** were given the best flame class UL 94 V-0. Their solder bath resistance of 20 s at 288 °C included in the tests proves that the plugging pastes of the series PP 2793 fully comply with today's requirements regarding thermal stability in lead-free soldering processes.

Trace Laboratories Inc., an independent test institute, performed the NASA-approved outgassing test with **PP 2793** in accordance with ASTM E 595: the results measured for the total mass loss and the volatile condensable materials collected were by at least 80 % below the limits; for this reason, the plugging paste is also safe in aerospace applications.

By choosing the plugging pastes of the series **PP 2793**, you take another step towards a reliable and process-safe production of your high Tg circuits.

Carbon-conductive ink SD 2842 HAL suitable for sliding contacts

The carbon-conductive ink **SD 2842 HAL** is a mat black 1-pack screen printing ink that, depending on curing conditions, displays excellent conductive features of 14 to 20 Ohm/square based on a dry layer thickness of 25 µm, due to well-selected special carbon black and high quality graphite types. The carbon-conductive ink **SD 2842 HAL** can be cured in either circulating air ovens or IR curing units.

As a result of its high mechanical strength, its outstanding adherence and the good electrical conductivity, the carbon conductive ink **SD 2842 HAL** allows to substitute gold in contact areas, to cross conductors and to create printed resistors. Owing to its very smooth surface, this product is also suitable for the production of sliding contacts.

Its outstanding adhesion on flexible base material allows a use in static flex applications. **SD 2842 HAL** is resistant in hot air levelling processes (index HAL) as well as in lead-containing and lead-free wave and reflow solder processes while the level of resistance is maintained. **SD 2842 HAL** has a long shelf life of 6 months at room temperature.

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Products for the Fabrication of RFID (Radio Frequency IDentification) Antennas

To a growing extent, the Radio Frequency Identification (RFID) technology is introduced in logistics or similar fields where products must be identified in a rapid and low-cost manner throughout the entire process of production and distribution.

Most antennas used for this purpose should be light-weighted, flexible and low-priced. Film antennas where a metal structure, primarily copper or aluminum, is mounted on plastic films are best suitable here. In some applications, the antenna structure is sufficient for receiving a signal, while in other applications, a microchip was provided in addition on the film for storing specific information.

Within the manufacture of this type of antenna films, those products already applied in pcb manufacturing for similar purposes are a good solution, such as etch resists or insulating lacquers (solder resists).

Lackwerke Peters has looked into this matter and optimized several products from their circuit printing lacquers range for a use in antenna manufacturing.

Since many antennas are mass-produced and must be supplied rapidly and at low cost, reel-to-reel print solutions are suitable here. If the flatbed screen printing application still includes one of our standard etch resists of the series **SD 2059 UV-AL**, special viscosity adjustments may be necessary for rotary screen printing equipment.

With the two lacquers **RSP 2059 UV-AL** and **RPS 13.050 RFID**, Lackwerke Peters supply both a UV curing resist and a physically drying resist, i.e. a resist that dries through solvent evaporation for application by means of rotary screen printing.

The etch and plating resist **RSP 2059 UV-AL** withstands acid etch media and is alkaline-strippable (e.g. in 5 % NaOH solution).

The etch resist **RSP 13.050 RFID** withstands both acid and alkaline etch media and is strippable in solvents. Furthermore, this product is distinguished by a good adhesion on aluminum.

Besides our etch resists, the solder resist **SD 2460/201 UV FLEX** has proved to be a very good choice as an insulation print for bridging conductors.

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Everyone is talking about ELPEMER® PETERS

White solder resist ELPEMER® SD 2491 SG-TSW-R5

In LED technology applications, radiation characteristics and colour stability of the substrate play an important role: very high coverage and a very intense white colour giving high reflectivity ratings are essential requirements of white solder resists. By our photoimageable solder resists of the series **ELPEMER® 2491 TSW** we provide lacquer systems featuring a high yellowing resistance and very high reflectivity ratings, even after reflow processes and long-term thermal loads.

Until recently, **ELPEMER® SD 2491 SG-TSW-R4** and **SD 2491 SG-TSW-R4-B** ("snow white" meaning cold white / blue white) were the leaders of this family in terms of reflectivity ratings and colour stability. While the reflectivity of this product generation is no less than 92 %, the latest developement **ELPEMER® SD 2491 SG-TSW-R5** accounts for a reflectivity rate of approximately 95% (each based on 460 nm and 40 µm dry layer thickness). Like all other members of this family, **ELPEMER® SD 2491 SG-TSW-R5** has been listed by Underwriters' Laboratories.

"Snow white" vs. "warm white"

Viewed with the naked eye, the colder looking "snow white" lacquer surfaces of **ELPEMER® SD 2491 SG-TSW-R4-B** seem to be whiter than the **SD 2491 SG-TSW-R4** (or the **SD 2491 SG-TSW-R5** respectively); this effect is even more striking when both lacquers are viewed side by side.

A comparison of the reflectivity ratings proves that this cannot be fully acknowledged through measurements. In the respective wavelength range between 430 and 480 nm, both lacquers behave similarly while at wavelengths > 480 nm the "snow white" **ELPEMER® SD 2491 SG-TSW-R4-B** even displays a sharper drop in the reflectivity ratings.

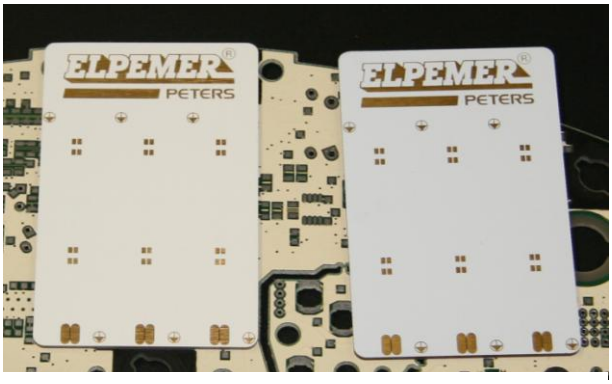

Fig. 1: **ELPEMER® SD 2491 SG-TSW-R4** (left) and **SD 2491 SG-TSW-R4-B**; **SD 2497 SM** in the background

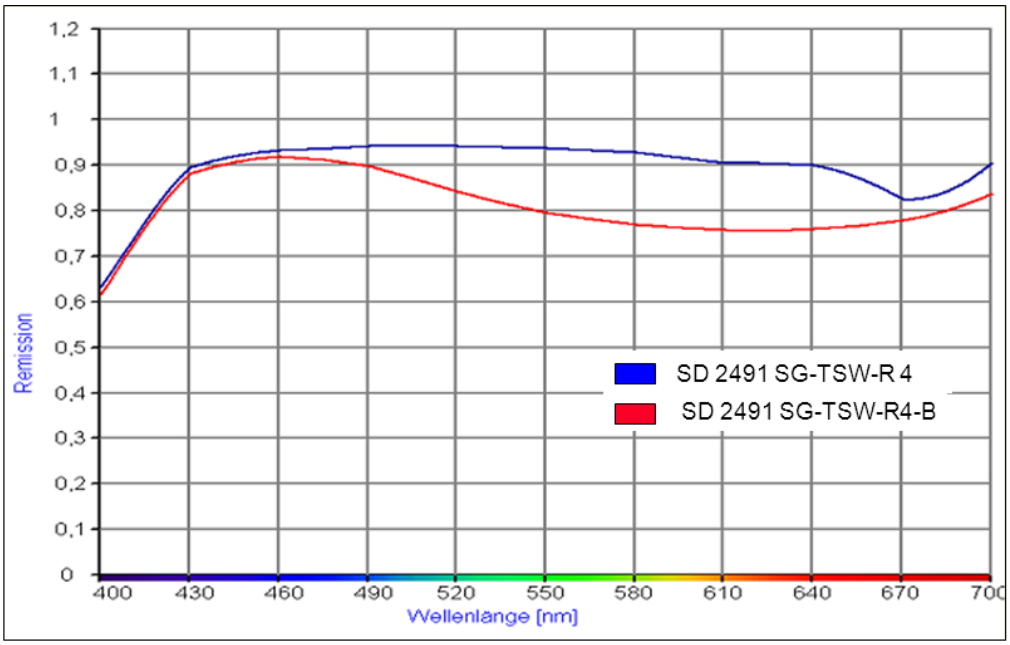

Fig. 2: Reflectivity of **ELPEMER® SD 2491 SG-TSW-R4** versus **SD 2491 SG-TSW-R4-B**

Particular requirements in the processing of white solder resists

The high covering power of white solder resists is achieved through the addition of white pigments that account for a stronger reflection of the light. However, since the UV light applied for exposure is also highly reflected, the representation of fine lacquer dams is a particular challenge when processing white solder resists. In any case, a much longer exposure time is needed. It still happens again and again that fine lacquer dams break away. This technical challenge can be solved by special exposure lamps and optimum development parameters.

Exposure process

For exposing photoimageable **ELPEMER®** photo resists, Fe-doped high pressure mercury lamps displaying a high light intensity in the range of 360 – 380 nm are commonly applied. In this range of wavelengths, the reactivity of the photoinitators is particularly high.

In connection with the white solder resists of the series **ELPEMER® 2491 TSW**, a far better stability of the dams can be reached by using Gallium-doped lamps. The maximum light emission of Ga-doped lamps is approx. 405/420 nm; the light of these longer wavelengths penetrates deeper into the lacquer film and is less reflected, thus activating and cross-linking additional UV-reactive components present in the bottom layers. As shown in the pictures below, the “foot” of the lacquer dam is much larger and more stable with a Ga-doped lamp.

Fig. 3: Exposure of **ELPEMER® SD 2491 SG-TSW-R4** (5 mil dam)
with Fe-doped lamp (left) and a Ga-doped lamp (right)

Development process

For the free development of vias, high pressures and quite often, nozzles adjusted to a certain angle are necessary, depending on the size of the via. If the pressure is too high or the spraying angle in the developer is too flat, this would facilitate the “undercut” effect in such way that the dams are more instable. It should be noted that the spraying angle in the developer incident on the board surface should not be less than 60°.

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“LED Competence Meeting” 2013

Again this year, the Lighting Group organizes a Germany-wide series of lectures and presentations that will inform you in detail on LED technology and the products available, as well as on the latest trends and developments of the LED market.

For the first time, presentations are organized that will take place in the Benelux countries and in Italy.

The Lighting Group is an association of leading companies involved in the LED production chain. It allows the customer to benefit from the close cooperation between these market leaders and the direct communication within the supply chain. This way, development times are short, problems are solved close to the market and technologies are exclusive and state-of-the art.

More details on the topics presented and a registration section will be available on our **website** shortly.

FELA GmbH relies on ELPEMER® GL 2467 and SD 2491

In order to meet increased requirements for solder resists, the pcb manufacturer and system provider **FELA GmbH** based in Villingen-Schwenningen, Germany, has recently chosen the youngest generation of the powerful high resolution solder resist ELPEMER® GL 2467 SM-GG and the yellowing-resistant white solder resist ELPEMER® SD 2491 SG-TSW-R5, both produced by Lackwerke Peters GmbH + Co KG.

The benefits of these lacquer systems in processing, their excellent final properties and the customer service offered by Lackwerke Peters have fully convinced **FELA.**

FELA GmbH is one of the leading system providers in the field of high quality data entry systems. Established in 1964 as a pcb manufacturing company, it employs 165 people in Germany today working at two sites. Furthermore, FELA is among the five largest pcb manufacturers in Germany as from its turnover and is the European market leader for IMS boards and customised solutions for LED technology.

Divided in three business units, this independent owner-managed enterprise reached a turnover of 24 million euros in the financial year 2012.

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EPN ELECTROPRINT GmbH changes over to ELPEMER® GL 2467 SM-GG

EPN ELECTROPRINT GmbH has recently approved the photoimageable solder resist **ELPEMER® GL 2467 SM-GG** and will rely on its high quality in the future. Thanks to the broad processing window, the safe processability and the high resolution of this product, EPN was able to considerably increase the production capacities in the field of solder resist.

Photo (from left): Cornelia Veit (technology manager of EPN), Henry Müller (curtain coating line operator at EPN), Peter Heuser (application technologist of Lackwerke Peters)

By changing over to **ELPEMER® GL 2467 SM-GG**, a new generation of photoimageable solder resists was introduced that is **free** from the the photoinitiator IRGACURE 907, a substance subject to marking much discussed in past months.

Lackwerke Peters' good customer service and a fruitful business partnership have convinced EPN for many years now.

EPN ELECTROPRINT GmbH based in Neustadt/Germany was established in 1990 and has grown from 12 employees in the beginning to 65 employees nowadays. In 2002, the company moved to a new location with modern production facilities where small and medium series of high quality printed circuit boards are produced, based on very short and reliable delivery times. Specialising in the production of multilayers even in HDI technology, EPN complements their product range by thick copper circuits and double-sided boards as well as customised products. A performant quality and environmental management system in accordance with DIN EN ISO 9001 and DIN EN ISO 14001 ensures that all the respective measures are observed in production.

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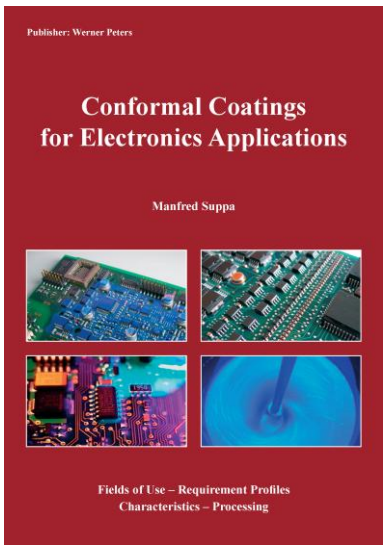
Reference book “Conformal Coating for Electronics Applications”



In recent years, the issue of protective coating of electronic assemblies has received increased attention within the electronics sector, becoming a more and more complex subject.

The topics range from chemical and physical characteristics of the polymers formulated in the coating materials, via the necessary assessment of application methods and drying processes up to the physical background of loads for the assembly either existing or to be expected, and their influence on the selection of coating materials and/or coating processes.

The reader can find an end-to-end view to guarantee the functionality of electronic assemblies with conformal coatings under defined operating conditions. Accordingly, the main focus lies on the complex interactions between the conformal coatings used, the manufacturing process employed, the quality control and reliability studies for conformal coatings.

Practically relevant chemical and physical backgrounds relating to corrosion and failure mechanisms of electronic assemblies are discussed and explained. Likewise, failure mechanisms and their causes are portrayed in detail and, by means of many examples, suggestions as to the choice of conformal coatings and assessment of protective lacquers given.

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German Edition	**100.- €**
English Edition	**130.- €**

This book is an enlightening piece of work for the reader and user, covering almost all aspects of the coating of electronic assemblies, a reference book for becoming acquainted with and consultation, as well as for initial or advanced professional training.

Its author Dr. Manfred Suppa, Head of Research and Development at Lackwerke Peters GmbH + Co KG since 1998, is responsible for the development of a large variety of special lacquers including coating materials for electronics.

Publisher: Werner Peters

329 illustrations and 112 tables

1. English Edition 2012
Price 164,- € plus postage and shipment
ISBN 978-3-00-039856-8

Order this book

„Schutzlacke für
elektronische Baugruppen”

2. German Edition 2010
Price 128,- € plus postage and shipment
ISBN 978-3-00-032764-3

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WepoxWepuranWepesil casting compounds PETERS

WEPURAN casting compound VU 4459/41 SV-HF ensures safe operation of junction boxes in PV modules

Winning electricity by means of photovoltaics in itself is a secure technology. In isolated cases, faults occurred which were mostly attributed to poor workmanship or badly made components. In extreme cases, poor workmanship can lead to the whole collector system catching fire. In particular, junction boxes are under close scrutiny.

Defective wires that have corroded over time generate a higher contact resistance between the clip and cell connector which, in turn, can cause arcing. This way, an insufficiently flame-proofed junction box can ignite.

Potting the junction boxes with a self-extinguishing casting compound ensures safe operation. The potting protects the junction box from environmental influences and thus prevents the contact points from corroding. In addition, the flame-retardant properties of such a material reduce the risk of fire.

Our **WEPURAN** casting compounds with their longstanding successful track record are now being demanded more and more to protect junction boxes. Especially the self-extinguishing **WEPURAN** casting compound **VU 4459/41 SV-HF** is well suited for photovoltaic applications. This product boasts UL's best flame class UL94 V-0.

A further key criterion is the DIN EN 61215 standard on the design qualification and type approval of crystalline silicon terrestrial photovoltaic modules. Amongst other things, this standard entails thermal cycling tests between –40 °C and +85 °C over 200 cycles alongside a heat/humidity test over 1000 hours at 85°C and 85% relative humidity. Our **WEPURAN** casting compound **VU 4459/41 SV-HF** meets all these requirements.

✉ peter.heuser@peters.de ℹ Request information/sample

Lucky winners of the book draw

On the occasion of the launching of the reference book

“Conformal Coatings for Electronics Applications”

(see page 14) we have drawn 3 free book copies among all book orders received until 28 November 2012. The winners are:

Continental
Olga Benavides Mejia
Tlajomulco de Zuniga Jalisco, Mexico

National Instruments
Gyorgy Dankai
4031 Debrecen, Hungary

Parker Hannifin Ltd Automation Group
Frances Peace
Littlehampton, Great Britain

Congratulations!

We report about us

PETERS Team Donates to Children's Home in Brestovitsa/Bulgaria

It was not by coincidence that the visit of Ralf Schwartz, managing director of Lackwerke Peters, to the Bulgarian customer SET, a PCB manufacturer and assembly company based in Rousse, was scheduled for the Christmas season, along with the second campaign of Lackwerke Peters to donate for a children's home in Brestovitsa.

Top: Staff members of Lackwerke Peters and MSG loading in-kind donations
Left: Welcoming of Ralf Schwartz (left) and Dr. Siegfried Steiner by the Manager Mrs. Nataliya Belcheva and a representative of the Regional Authority.
Right: Dedication of the newly furnished refectory

Dr. Siegfried Steiner, managing director and partner of the company SET, has been a sponsor of this children's home for some time already. In order to assist him, a first spontaneous call for donations had been addressed to the Peters' employees, which had yielded four large boxes full of clothing, toys and many other useful items that were handed over in August 2012, as a treat to the handicapped or orphaned children living in the scarcely equipped children's home.

This time, the donations of PETERS group' staff were more oriented towards the individual needs of the children, while the company management contributed basic pieces of furniture. All large boxes with collected goods, and with tables and chairs provided by the company to serve in the refectory, were delivered by the forwarder MSG at special rates from Kempen to Rousse.

The staff members and management have agreed to organise additional donation campaigns in the future, in order to brighten up the children's lives.

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4th Health Day and 10th Anniversary of Workplace Health Promotion Programme at Lackwerke Peters GmbH + Co KG

On November 14, 2012, the Lackwerke Peters Health Day took place for the fourth time; it was organised under the motto "10 years of Workplace Health Promotion Programme", in cooperation with the Institute of Occupational Health Promotion BGF GmbH, the German health insurer AOK, the company physician Dr. med. Jürgen Hoß, the local health club TC Training Center and Mrs. Jeanne van Lith (burnout prevention).

With the support of the health insurer AOK Rheinland/Hamburg, our company had introduced the structured Workplace Health Promotion Programme for its employees in July 2002, for the benefit of both the employees and the company. On the one hand, the health of each individual is a valuable commodity, and on the other, an efficient and motivated workforce is the prerequisite for a company's success, especially for medium-size companies faced with increasing global competition, rising prices and many more factors.

Ever since, the Workplace Health Promotion Programme and our Health Group have been an integral part of our corporate philosophy, dealing with matters such as work equipment, ergonomics, organisation, communication and management skills. Operational processes of the company are analysed and optimised, if necessary, with regard to their potential impact on health. Besides workplace-oriented groups there are complementary activities such as the "Lucky Runners", a recreational running group, and a partnership with the local health club TC Training Center Kempen which offers various activities in the area of health, wellness and fitness.

This recent Health Day, too, gave fresh impetus to the Workplace Health Promotion Programme followed by our company. All Peters' employees were given the opportunity to gather information on various health topics and to participate in different checks for assessing their health status, including a health check up. A blood parameter analysis allowed to identify the individual risk of heart attack by means of special software; the results could be discussed on the site with our physician Dr. Hoß. Within a muscle function test proposed by the BGF institute, the mobility of the main groups of muscles was tested. Finally, one could try appropriate exercises using the Dr. Wolff circle training equipment set up by the TC Training Center.

Another major topic of the Health Day was stress. Based on a cardio-scan i.e. a heart check with stress measuring, a coloured heart portrait was established followed by an evaluation and discussion on the site. Useful hints and advice for burnout prevention were given by Mrs. Van Lith during individual talks.

Healthy nutrition is essential if one wishes to stay healthy. For this reason, many visitors decided to take advantage of the individual nutrition counseling which was based on one's own eating habits recorded prior to the event.

We will continue and further extend our Workplace Health Promotion Programme to ensure, as a healthy company, our high quality service in the future, subject to the contribution of our employees' good health.

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Sales Conference for Germany and Central Europe

In March, the partners of our Germany and Central Europe based Service Centers met in Kempen with the Lackwerke Peters teams responsible for sale, research and development and application technology to coordinate further activities scheduled for 2013.

The participants of the Sales Conference

Besides lectures, discussions and practical exercises carried out in our labs, the conference included a presentation by a manufacturer of mixing and dosing equipment used for processing our casting resins and casting compounds.

These extensive product trainings that covered new developments in particular, will enable our local Lackwerke Peters contacts to continue their in-depth technical support and good service in the future.

Thanks to all participants of this event for their great commitment.

Known Consignor – Security in Air Transport

Whenever airfreight is loaded into a freight plane, or – as even more common – into a passenger plane, the consignment has to be given the status of "secure air freight". The regulations for the prevention of terrorism applicable in the past were amended, with the transition phase for the former regulations ending only on 28 April instead of 25 March 2013, as clarified by the EU Implementing Regulation 189/2013 dated 5 March 2013. All future consignments to be shipped in the European Sky will have to be verified by a certified company prior to loading, either by means of x-ray examinations or by the – much more costly – means of opening, inspecting and trace analysing the consignment with respect to explosive substances, followed by repackaging.

Alternatively, manufacturing companies may apply for the status of a "Known Consignor" with the German Office of Civil Aeronautics. For this purpose, they have to document their measures implemented for the controlling and protecting of air freight from the origin up to the loading process, and should have this process audited by the Office of Civil Aeronautics.

The consignment has to be shielded against access of non-trained or non-briefed personnel. A special security management is required, and all responsible employees will have to undergo checks and trainings as per determined regulations. Access has to be clearly regulated, and packaging has to be carried out in a tamper-proof manner. The transport chain has to be ensured by authorised forwarding agents or freight carriers until the goods have reached the secured area of the airline.

Should this chain be interrupted, the consignment is again "insecure" and must be re-checked at the airport, which will entail costs in the three-digit euros range. Included in the freight charges, such costs are calculated and invoiced for each individual consignment. In order to avoid exploding freight charges for the consignee and delayed deliveries due to additional external checks, **Lackwerke Peters** has applied for the status of "Known Consignor" with the German Office of Civil Aeronautics. Reorganisation of processes and preparations has been concluded, and we are just a few steps away from the auditing by the Office of Civil Aeronautics.

Loading of containers into an MD-11F of Lufthansa Cargo
(Source: Wikipedia, GNU Free Documentation License, Author LCAG)

Our investment for obtaining the "Known Consignor" status will thus contribute to maintaining the short delivery times our customers are used to. Additional costs of protection and security become more calculable, as the extent of checking a repacking the goods need not be decided at the airport anymore.

To guarantee this process, a continuous chain from the manufacturer and packer as "Known Consignor" via the freight carrier as "Regulated Agent" is required until the consignment has been loaded into the aircraft. **Lackwerke Peters** has successfully cooperated with several "Regulated Agents" for many years. If the customer specifies the forwarding agent/freight carrier to use, further costs may arise if the agent/carrier does not hold this status. In this case, the "secure air freight" status of the consignments handed over by **Lackwerke Peters** will no longer be valid; the consignments have to be rechecked prior to loading, subject to charge. To avoid deliveries behind schedule in the transition phase, a timely planning is indispensable.

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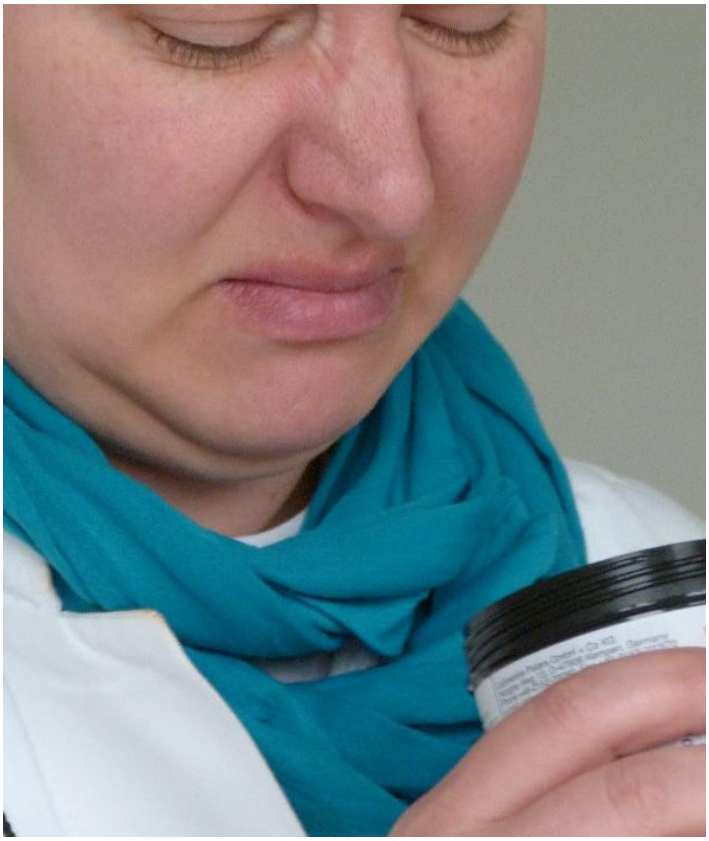
Work safety

Good noses are not always right – odour is never a secure warning

The odour of coating materials and casting compounds is determined by the substances formulated in these materials. Not only solvents, but almost all other organic components such as basic resins, reactive thinners (= monomers), photoinitiators or additives have their own distinct odour, and so may sometimes even the cured lacquer.



Odours – of whatever kind – may be a nuisance for the employee.

As far as solvents are concerned, the sensory perception of odour depends on an individual's sensation. Depending on our habits and culture, we may perceive odours as pleasant that others would describe as unpleasant or even disgusting. Asian customers, for example, may consider the odour of our products containing different glycol ethers as unpleasant, while they will readily accept the smell of aromatic solvents that is unsavoury for most Europeans.

Applied as reactive thinners in radiation curing lacquers, monomeric compounds are another source of odour. Photoinitiators, too, may have a typical odour due to their chemical structure of the compounds. These odours are also perceived differently from one person to another.

Cured conformal coatings may also have a characteristic own smell (similar to "wet paint"), resulting from the intense odour of medium-chain aldehydes that are not classified hazardous. These substances are highly concentrated after oxidative curing. Neither Lackwerke Peters nor our Manufacturers' Association know of any harmful exposure through these products during oxidative curing.

The odour of product components may, but need not be, an indicator of dangerous substances. On the one hand, it is the personal sensation of a scent that is pleasant or unpleasant; on the other, many substances do not have any olfactory warning properties at all, or their odour level may be so high that it is only perceivable upon the concentration reaching dangerous levels. Our olfactory senses do not allow us to assess the concentration. Odour is not a reliable indicator for the hazard of a compound since there is no well-defined relationship between the odour and the level of hazard.

As a general rule, a technical ventilation unit should be provided on the workplace, extracting the vapours away from the operator. The suction opening should be positioned at worktop height or slightly lower, since common organic solvents such as hydrocarbon propellants of spray cans are heavier than air.

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New Symbols for the Labelling of Hazardous Substances

Until May 31, 2015 at latest, packages which include dangerous components may be labelled, inside the European Union, by using the common orange-coloured hazard symbols in accordance with the Dangerous Preparations Directive 1999/45/EC, whereas dangerous raw materials (pure substances) in the EU had to be provided with labels in accordance with the CLP directive 1272/2008 EC ever since December 1, 2010, in view of implementing the international labelling system GHS (Globally Harmonized System of Classification).

In a continuing series, we will explain some new hazard pictograms.

For the hazard pictogram GHS 04 (gas cylinder), there is no equivalent among the hazard pictograms provided under the Dangerous Preparations Directive 1967/548/EEC, just as with the symbols GHS 07 (exclamation mark) and GHS (torso) described in the first and second parts of this series.

The symbol of this pictogram alone, the gas cylinder, is a warning for the hazard to be expected. It is used for gases under pressure (liquefied gases, compressed gases, deep-frozen liquefied gases and dissolved gases) and is always associated with the signal word “Warning”. This symbol is already known from the Dangerous Goods Regulations and the hazard label of class 2.2.

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Indices

For easy legibility, the product indices used in this issue are explained below and not in the text.

AL	alkaline soluble/strippable
DSL	thick film lacquer
E	elastic
EH	electro auxiliary products
EP	electropastes
FLEX	for flexible printed circuits
FLZ	fluorescent
GG	grass-green
GL	curtain coating lacquers
HAL	hot-air levelling
HE	highly elastic
HF	halogen-free
HT	highly thixotropic
KK	crystal-clear
LS	light diffusing
N	wetting agent
NV	low viscous
PP	plugging paste
R4	reflectivity of the light
RFID	for the manufacture of RFID structures
RSP	rotary screen printing
SD	screen printing
SG	silk-glossy
SL	conformal coatings
SM	silk-mat
SV	self-extinguishing
T	thixotropic
TP	hazing paste
TSW	thermally stable white
UV	UV curing
V	thinners
VT	casting compounds, transparent
VU	casting compounds, opaque
/21	viscosity 21 s, 4 mm DIN flow cup or mixing ratio 2:1