ELPEGUARD®
peters

AI APPLICATION INFORMATION

AI 1/2: Processing instructions for the ELPEGUARD® thick film coatings of the series Twin-Cure®

This application information sheet contains detailed and extensive information that is paramount for a safe and reliable processing of our **ELPEGUARD® thick film coatings of the series Twin-Cure®** in order to achieve an optimum coating result.

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LP 162311 E-6 / ai1-2e_006

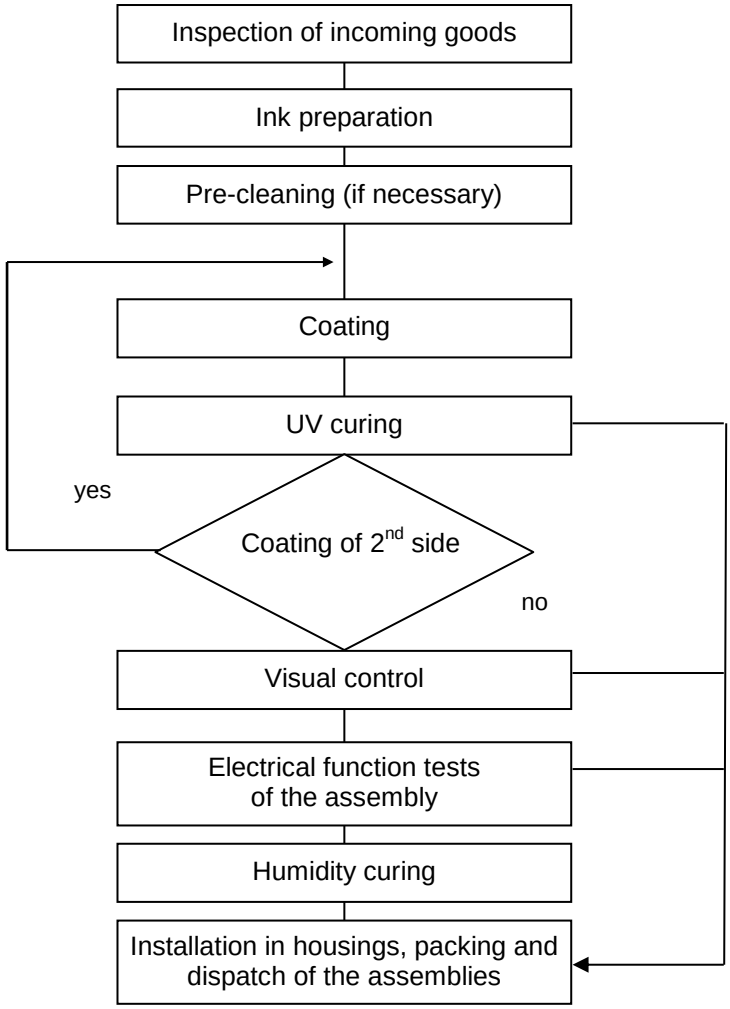
General information

The **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** are used to protect and insulate electronic assemblies so that they can fulfil higher requirements regarding reliability and service life. Owing to their very good resistance against moisture and condensation an excellent protection against corrosion (such as electro corrosion and migration) is possible even under harsh climatic conditions.

The complete production and application process of an assembly – not only the protective coating – has to be regarded critically and optimised so that it provides a functional reliability over a long service life under the required conditions. The choice of the base material as well as the solder resist, the pcb layout and the soldering process already have a partly considerable effect on the climatic resistance of an assembly.

Protective coating is an essential process step: the removal of residues that may lead to poor adhesion and insulating properties, the reliable, faultless processing and complete curing to achieve optimum insulating properties are some of the essential factors when realising a high-performance protective coating.

Schematic view of the basic process flow



When qualifying a coating material, the assemblies must be tested under the later operating conditions in order to ensure the suitability of the conformal coating for the specific application. Please follow the advice given in the section "Pre-cleaning".

The conformal coating must be completely dried/cured before qualification tests are performed.

Ink preparation

Prior to processing an **ELPEGUARD®** thick film coating of the series **Twin-Cure®** it has to be brought to room temperature. For this purpose, the respective containers with ink should be brought the day before to a room where the temperature is the same as that of the processing room.

Pre-cleaning

Uncleaned pcbs which have not been provided with a conformal coating may show failures under climatic conditions in later use since fluxing agent/solder paste residues or other contaminations can form a system of electrical conductivity under the influence of moisture / condensing moisture. Protective coating of these pcbs distinctly improves the climatic resistance provided the following points are observed:

- → Optimise the soldering process as regards the quantity of fluxing agent and/or solder paste residues that remain on the pcb.
- → As far as possible, choose a solder paste where the softening point of the residues is higher than the maximum operating temperature of later use

In order to achieve an exceptionally efficient protective coating and therefore the climatic resistance of the assemblies, a thorough cleaning of the pcb surface is recommended before starting the conformal coating process.

Any type of ionic contamination can affect the electrical properties, especially under harsh climatic conditions. Fluxing agent/solder paste residues and other contaminations can cause wetting problems, impair adhesion to the substrate and in the long run cause delamination of the conformal coating.

Like all polymers, the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** are permeable to water vapour, and thus water vapour can diffuse through the ink layer. This process is intensified by hygroscopic contaminations on the pcb surface. In bubbles, under components or in areas where the conformal coating exhibits poor adhesion, the water vapour can condensate. In combination with water, residues of fluxing agents form a system of electrical conductivity. Depending on the pcb layout (e.g. differences in potentials between adjacent conductors), electrochemical migration, corrosion or corrosion-induced tracking under the conformal coating may result. In any case, moisture absorbed by contaminations decreases the surface resistance and thus the insulation resistance.

Compared to solvent-based conformal coatings the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** are more sensitive to fluxing agent/solder paste residues, especially to those from solder pastes as they cannot be dissolved by solvents and/or expelled from the system.. Fluxing agent/solder paste residues can accumulate on or around solder joints. In particular when exposed to temperature loads during thermal (cycling) stress, these resin residues can lead to fusing, discolouration or even cracks in the resin. Cracks are potential weak points when exposed to condensation. The protective coating and thus the protective effect can also be impaired. It is mandatory to perform appropriate tests to verify the compatibility in potential thermal stress scenarios.

- → Therefore, if necessary remove all fluxing agent/solder paste residues and other contaminations from the assembly to achieve an optimum wetting and adhesion and to ensure the insulating properties of the thick film coating, or verify that you achieve the required properties without cleaning by performing corresponding trials, especially regarding expected moisture and electrical loads under field conditions.

Among the compatibility tests that are suitable, there are the rapid temperature shock tests and climatic tests at high temperatures and high air humidity, whereby, if possible, assemblies should be tested under conditions of practical operation (i. e. operating voltage, dissipation loss, position). With both tests the maximum temperatures should be chosen to which the assemblies may be subjected. In addition, an uncoated assembly should be tested at the same time. Following the climatic tests, the surfaces of the pcbs are checked for damage from corrosion.

➔ Always remove fluxing agent residues and other contaminations on critical applications.

➔ Always check the assembly produced in your series production environment after coating and drying/curing in the application conditions to which it will ultimately be subjected.

Sometimes dewettings on SMD components may occur despite pre-cleaning. These dewettings are caused by residues from mould release agents with a low surface tension (e.g. silicones) that are used in the production of the components.

➔ In this case please contact the manufacturer of the SMD component.

Upon request, we will provide you with the addresses of competent partners for pre-cleaning processes and climatic tests.

Special notes for the coating of solder resist surfaces

Sometimes we receive enquiries from users of our **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** who report about voids in the conformal coating on solder resist surfaces that in these cases are described as ”fish-eyes", ”frog-eyes” or in case of a strong accumulation even as a ”hammered effect”. As a rule, such “voids” can be attributed to the presence of silicone-containing additives in the solder resist. An intensive pre-cleaning programme is often of help.

Coating

	Please read this technical report and the publications listed below carefully before using the product. These sheets are enclosed with the first shipment of product or sample
MSDS	The corresponding material safety data sheet contains detailed information and characteristics on safety precautions, environmental protection, transport, storage, handling and waste disposal
TR	Technical Reports on the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®**
TI	Technical information TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents““

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.

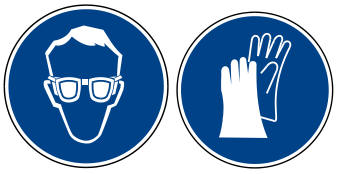
The product data specified in the technical reports is based upon standard processing conditions/test conditions of the mentioned norms and must be verified if necessary while observing suitable test conditions on processed products.

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

Safety recommendations

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

➔ Ensure that the equipment you use is in conformity with the requirements given in the material safety data sheet.



- **Wear protective gloves and goggles!**
- **Avoid skin contact!**
- **Ensure workplace is sufficiently ventilated with appropriate equipment.**
- **Observe general hygienic measures (wash hands, etc.).**

The guidelines of your national statutory accident insurance may provide more details on safety in the coating process and the type of equipment to be used in the workshop.

Measures for shielding Twin-Cure® against moisture and UV light

The **ELPEGUARD**® thick film coatings of the series **Twin-Cure**® cure by exposure to moisture and UV radiation. They are highly sensitive to sun light and unfiltered light (also from UV inspection lamps) found in operating areas.

➔ When processing, take appropriate measures to ensure that the ELPEGUARD® thick film coatings are not subjected to these influences, e.g. by using dried air and yellow light/yellow filters or UV cover foils.

Partially used containers must be filled up with dried air and then tightly closed. By turning the closed container upside down you may ensure that the coating material seals the lid tightly. When the containers are opened frequently one should fill them with dried air. Repeated openings will reduce shelf life.

Protect from UV light

Protect against humidity

Owing to the UV sensitivity and moisture sensitivity of the **ELPEGUARD**® thick film coatings of the series **Twin-Cure**® the use of work tools made of stainless steel and metal-wrapped, Teflon® coated hoses is highly recommended.

Application of Twin-Cure®

The **ELPEGUARD**® thick film coatings of the series **Twin-Cure**® can be applied by means of automatic selective coating units, by brushing or by means of a dispenser. They have to be processed in the condition supplied.

The conventional blanket dipping method is not recommended for the application of the **ELPEGUARD**® thick film coatings of the series **Twin-Cure**®: Due to the material's sensitivity to moisture the dip tank must be protected by filling with dried air. Furthermore, there is the risk that the assemblies transfer moisture into the dip tank.

The **ELPEGUARD**® thick film coatings of the series **Twin-Cure**® are suitable for the application and curing of thick layers > 80 µm in one pass.

In general, the maximum film thickness strongly depends on the assembly layout and later operating conditions.

On bare areas, the layer thickness must not be less than 20 µm to avoid the risk of an incomplete coating film.

The following applies to the thick film coatings of the series **Twin-Cure® DSL 1600 E-FLZ:** Without exposure to thermal stress, e.g. temperature shocks in later operation, films up to 1 mm can also be applied and cured without difficulty. The higher the ink film the more resistant it is, although the elasticity will suffer. For this reason, thicker layers may crack when subjected to thermal cycling stress (TCT). The lower the viscosity of a **Twin-Cure®** thick film coating, the more elastic it is and the easier it reduces material tension caused by thermal stress even when applied in thicker layers.

The ELPEGUARD® thick film coatings of the series Twin-Cure® are not suitable for double coating.

Suitable coating thickness gauges are based on the eddy current method. Upon request, we will gladly provide you with the addresses of manufacturers of such gauges.

→ Ensure that the surface to be coated is clean, grease-free and dry (also see Section “Pre-cleaning”).

→ Apply the ink evenly and bubble-free to the - preferably - horizontally positioned assembly.

Optimal underfilling of spaces between pcb and components, e.g. ICs:

→ Apply the thick film coating by means of a dispenser on two diagonally opposite sides.

Owing to its capillary active behaviour **Twin-Cure®** will run out between the pins on the opposite side after a short standing time.

→ Dispense the ink on all four sides again.

Protection, e.g. of connectors:
For those parts of the pcb where the capillary active behaviour of the coating is unwelcome, e.g. on connectors and plug contacts, various dam an fill materials are available. Please see our website www.peters.de for more information.

We recommend to proceed as follows when using **Twin-Cure®**:

→ Position the assembly at such an angle that the coating cannot flow into the critical area.

→ Apply and immediately cure a narrow strip of ink that forms a barrier for the later coating process. Cure must be effected via a UV flash, i.e. by a very short UV cure.

→ Coat and cure the remaining area.

Transport of Twin-Cure® in coating units

Because some of the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** are highly viscous, high feed pressures can arise in automatic coating units. Pressure applied on the storage tank may cause gas in the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** to dissolve, which after application, will escape from the ink in the form of bubbles ("champagne" effect).

We recommend the use of piston, gear or membrane pumps or similar to transport the ink.

→ Use one of the pump types mentioned above or take appropriate measures to prevent the ink from coming into direct contact with compressed air.

→ Use dry oxygen-containing gases, such as dried air, to transport the ink.

Automatic selective coating

The use of automatic selective coating units makes it possible to apply a uniform ink film to defined areas of the assembly on a reproducible basis. Areas such as edge connectors, for example, that must be saved out from coating require no masking.

There are two application methods available for selective coating:

- **Selective coating by means of spray/curtain coating or dispensing**
  A computer-controlled coating head coats a desired layout on a printed circuit board, or the printed circuit board is moved under a fixed coating nozzle – also computer-controlled – in such a manner that only predefined areas are coated. A selective, uniform and exact coating is achieved with no need for marking or sealing, and with a very low material consumption.
- **Selective coating by means of dip/flood coating**
  (only applicable to the series DSL 1600 E-FLZ)
  Within this method contact areas, connectors, mechanical components, etc. are saved out and left uncoated by using individual moulding tools. This method combines the advantages of dip coating with those of selective coating by means of curtain coating. As an individual moulding tool has to be produced for each pcb layout this process is only profitable upwards of a certain volume.
  During work breaks, the form cups should be filled to a maximum and then covered.
  Processing by means of standard selective dip coating equipment currently on the market is possible without any foreseeable problems. If necessary, heating the ink may give better coating results.

Optimum equipment parameters depend upon the component geometry, the final properties required, etc. It is therefore preferable to determine them in cooperation with the equipment manufacturer, **Lackwerke Peters GmbH + Co KG** and the end user.

Application by brush coating/spreading

Application by brushing/spreading is particularly suitable for repair work and small series since the coating can be applied selectively. However, uneven, hardly reproducible layer thicknesses may result.

Application by means of a dispenser

The highly viscous **ELPEGUARD®** thick film coatings of the series **Twin-Cure® DSL 1600 E-FLZ** and **Twin-Cure® DSL 1707 FLZ** are suitable for application by means of a dispenser (e.g. for the selective coating of critical areas).

Contract coating

Numerous companies perform contract coating with our coating materials. Upon request, we will gladly provide a list of such companies.

Drying/curing

Curing occurs via two differently fast, complementary chemical cross-linking mechanisms: UV curing and humidity curing. The thick film coating can already be loaded after UV curing. The humidity curing cycle leads to a complete cross-linking in the shadow zones where UV radiation cannot initiate cross-linking.

It is absolutely essential to perform UV curing down to the substrate with suitable UV lamps. It is impossible to achieve anywhere near the final properties specified in the technical report by means of humidity curing alone.

Suitable lamps for UV curing

The sensitizers contained in the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** show the best reactivity at the following wavelengths which must be covered by the UV lamp to ensure optimum curing:

210 nm – 270 nm (UV-C range)
350 nm – 390 nm (UV-A range)

Hand-held lamps are often equipped with a protective plate in front of the bulb. This protective plate must be made of pure quartz glass since other types absorb a large proportion of the UV light.

Medium/high-pressure lamps must definitely be used. Low-pressure lamps, such as sterilisation lamps, are not suitable at all.

There are three lamp types available that differ as to their radiation spectrum:

- **Non-doped mercury lamps (Hg lamps, also H lamps)**
  These lamps are best suited for curing **Twin-Cure®** due to their high proportion of UV-C light and a high intensity in the UV-A range between 360 nm und 380 nm. The radiation energy details given in the Section “UV curing” or in the Section “Drying/Curing” of the technical report refer to an Hg lamp.
- **Iron-doped mercury lamps (D lamps, also F or Fe lamps)**
  D lamps are **also suitable** but a pure mercury lamp is to be preferred. D lamps have a lower proportion between 210 nm and 270 nm but a high one in the UV-A range. Consequently, other values may result for the required radiation energy.
- **Gallium-doped mercury lamps (Ga lamps, also G lamps)**
  Owing to the small share in both required wavelengths gallium-doped lamps are **not suitable** for curing **Twin-Cure®**.

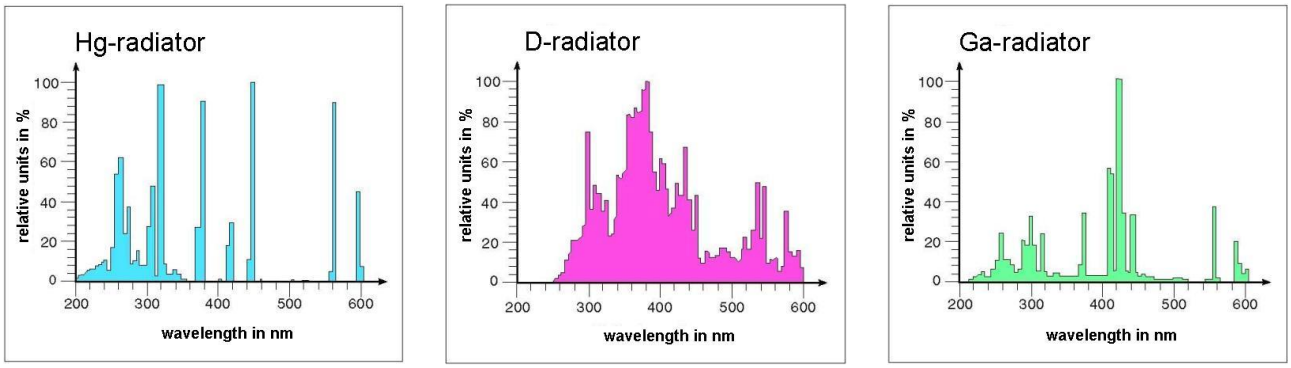


Figure 1: Spectrums of different lamps (Source: arccure technologies gmbh, Lippstadt)

➔ Since the emission spectrum of the lamps changes over time (shift into the long wave range), replace the UV lamp regularly in accordance with the manufacturer's instructions. Ageing is accelerated by frequent ignitions.

➔ Install an operating hour counter in order to control the length of operation.

➔ Regularly control the energy output of the lamp, e.g. by means of a UV integrator.

Distribution of the radiation energy

In case of an irregular distribution of the radiation energy, stress may build up in the ink film because the various areas cure at different rates.

In order to avoid an uneven distribution, the lamps/curing units should be conceived in such a manner that the radiation is distributed almost the same in all areas. The best solution to achieve this are conveyorised UV curing units. A good dispersion of the UV radiation by means of reflectors is advantageous (see fig. 2) in order to avoid shadowing next to the components as well as to ensure sufficient curing of the component sidewalls.

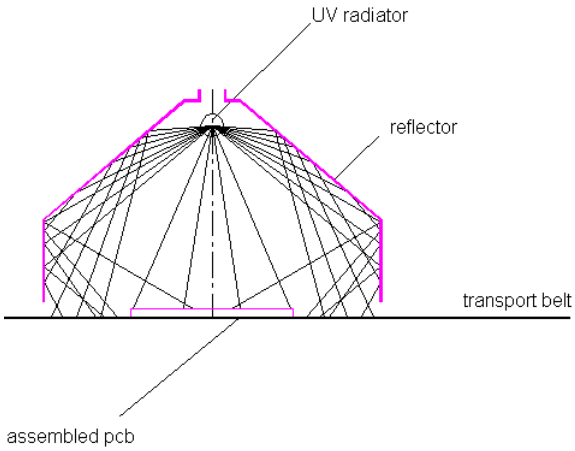


Figure 2: Distribution of UV radiation in UV curing units

UV curing

➔ When using UV radiation sources pay special attention to the information given by the manufacturer on potential risks and suitable protective measures.

➔ Comply with the relevant safety precautions when using UV radiation sources.
In particular, protect eyes and uncovered areas of skin with protective clothing and cream.

To ensure operating personnel is not exposed to UV radiation when curing pilot series' with a hand-held lamp, it is recommended to encapsulate the UV radiation source and component assembly to be exposed.

➔ Cure the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** based on the following UV radiation energy (based on a pure mercury lamp):

DSL 1600 E-FLZ **DSL 1600 E-FLZ/70** **DSL 1600 E-FLZ/75** **DSL 1600 E-FLZ/150**	3000 ± 500 mJ/cm²
DSL 1600 E-FLZ/500 **DSL 1600 E/500**	4000 ± 500 mJ/cm²
DSL 1707 FLZ	minimum 3000 mJ/cm^2

Applying less than the radiation energy indicated will result in insufficient curing that may cause, for example, flaking off of the coating (see also the Section ”Troubleshooting”). Exceeding the indicated radiation energy (overradiation) will cause tension in the coatings of the series **Twin-Cure® DSL 1600 E-FLZ**.

➔ Therefore, it is imperative to keep within the indicated tolerances.

Curing must be effected down to the substrate otherwise the so-called “cauliflower” effect may occur (see the Section “Cauliflower” effect).

The specified radiation energy was measured with a Beltron* UV integrator. Devices from other manufacturers may indicate different values.

* Beltron GmbH, Siemensstraße 6-8, 63322 Rödermark, Germany
Phone +49 6074 89199-0, Fax +49 6074 89199-29
www.beltron.de, info@beltron.de

Highly dosed lamps must be measured by means of specific measuring devices. A manufacturers’ list for this type of equipment is available upon request.

Indicating the lamp in Watt/cm² is not meaningful since this gives the radiation energy of the lamp and **not** the energy actually falling on the components. However, the latter is decisive.

Directly after UV curing the surface of the **ELPEGUARD**® thick film coatings of the series Twin-Cure® **DSL 1600 E-FLZ** is still tacky. The tackiness disappears after 1-3 hours. Then the coated assemblies can already be packed or encapsulated.

After UV curing of **ELPEGUARD®** thick film coating **Twin-Cure® DSL 1707 FLZ** a strong odour may develop. When cured at 80 °C for 30 min the coating will be odourless. The UV cured assemblies can be packed directly after UV curing has been completed, or after they have cooled down to room temperature. The coated components may only be encapsulated/mounted into housings after humidity curing is completed since **DSL 1707 FLZ** needs air humidity for the curing process and splits off alcohol.

UV curing with hand-held lamps

For safety reasons we advise against using a hand-held lamp for UV curing.

UV curing in UV curing units

For later production we recommend the use of conveyorised UV curing equipment with corresponding UV lamps.

- ➔ Check the suitability of the unit for the assemblies you wish to cure as regards the height of the components and shadowing.
- ➔ Note that UV curing may increase the temperature in such a way that the viscosity may be lowered and the ink will run off.

Electrical tests after UV curing

After UV curing, electrically insulating properties are immediately present (see also the respective Section of the technical report “Electrical properties immediately after UV curing”) so that functional tests can already be carried out. Any coating that is still liquid in shaded areas, e.g. under components, is unproblematic as it already affords insulating properties. Penetrating moisture is equally uncritical since it is intercepted by the reaction with the liquid ink. However, the final properties are only achieved after humidity curing.

Humidity curing

In areas that cannot be exposed to UV light (e.g. under components and in very narrow, high spaces) the coating cures by reaction with atmospheric humidity. Depending on the layout and assembly of the printed circuit board, at room temperature and an air humidity of approx. 50–70 % r. h. (relative humidity) this reaction lasts approx. **8 to 14 days** (series **DSL 1600 E-FLZ**) or 7 days respectively (**DSL 1707 FLZ**). It can be accelerated by slightly increased temperatures up to 40 °C [104 °F] and high air humidity. However, the component assembly must not be exposed to dewing conditions.

Humidity curing stops if the presence of air and associated moisture is prevented by hermetical encapsulation of the assembly. Subsequent exposure to air, e.g. by opening the casing, causes the reaction to continue until curing is completed or there is no more moisture in the air.

Incomplete curing in shadow zones is relatively uncritical since even an uncured coating exhibits insulating properties. However, it should be noted that uncured material expands at higher temperatures and therefore may squeeze out from under the components.

Cleaning equipment

When different inks are processed on the same equipment cleaning is of special importance, both with respect to the choice of cleaning medium as well as to the cleaning sequence. The reason for this are potential incompatibilities between the inks and the cleaners or thinners used.

The **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** react with water and alcohol, for example. If an alcohol-based cleaner such as our **R 5817** is left in the coater, any **Twin-Cure®** material that is subsequently filled into the unit will clump.

Therefore the equipment must be rinsed with the reactive thinner **VR 1600** before it is restocked with **Twin-Cure®** of the series **DSL 1600 E-FLZ**.

When processing **Twin-Cure® DSL 1707 FLZ** the cleaning agent **R 5807** must be used for rinsing. In general, it is difficult to fully remove the remaining silicone when **DSL 1707 FLZ** has been used. In general, we recommend against processing both silicone containing and silicone-free products on one unit.

Cleaning agents/solvents that do not contain alcohols must be removed from the equipment prior to start-up as they will change the viscosity and flow of the **ELPEGUARD®** thick film coatings **Twin-Cure®** and most importantly affect the first coating results. Moreover, the solvents can get trapped in the ink after UV cure and lead to incomplete moisture cure.

We recommend the following procedure to clean equipment:

1. Drain ink last used from unit.
2. Rinse unit thoroughly with thinner of ink last used. Drain (If **DSL 1707 FLZ** was used last, the cleaning agent **R 5807** has to be used for rinsing instead).
3. (Optional: Repeat Step 2)
4. Clean unit thoroughly with cleaning agent **R 5817**. Drain. (Tip: When using fluorescent inks rinse unit with **R 5817** until no fluorescence is detected under black light.)
5. Rinse unit thoroughly with thinner of ink to be processed next. Drain. (If **DSL 1707 FLZ** is to be used next, the cleaning agent **R 5807** has to be used for rinsing instead)
6. (Optional: Repeat Step 5)
7. Fill unit with new ink.

→ **Observe explosion protection guidelines!**

→ **Verify the resistance of the materials used, in particular of gaskets.**

Tools can be cleaned with cleaning agent **R 5817**.

Troubleshooting

The defects described below were noticed primarily in connection with the **ELPEGUARD®** thick film coatings of the series **Twin-Cure® DSL 1600 E-FLZ,** but they may also appear with **DSL 1707 FLZ** in a less distinctive manner.

Curing of liquid Twin-Cure® in a nitrogen atmosphere

There is the possibility that the **Twin-Cure®** may cure in a nitrogen atmosphere. UV-reactive systems form radicals even without UV radiation. These radicals are captured/inhibited by oxygen and the ink remains stable. When using dried air as protective gas, no curing will take place. Even if smallest amounts of oxygen are missing, the radicals can polymerize with the binding agent until curing takes place.

Flaking after curing without loading

Mostly, flaking is caused by the following:

- Fluxing agent residues preventing adhesion to the substrate (see Section ”Pre-cleaning”)
- Insufficient curing (wrong lamp, too much or too little energy (see Section “Drying/Curing”).

Flaking after loading, e.g. thermal cycling

Besides the reasons listed above flaking may also occur after stress such as thermal cycling, due to

- too high layer thicknesses (see Section ”Coating”)
- fusing of fluxing agent residues (see Section “Pre-cleaning”).

”Cauliflower” effect

The so-called “cauliflower” effect can occur with incomplete UV-cured inks, for instance with inks that are **not** cured down to the substrate in visible areas. In case of an incomplete UV curing long molecule chains evolve that can barely ”move” or ”swing” in the ink backbone, but are not long enough to build a sufficient structure like in the cured coating.

Thus, the mobility of the ”moisture catchers” in the **ELPEGUARD®** thick film coatings of the series **Twin-Cure® DSL 1600 E-FLZ** is restricted in the incompletely cured coating resulting in moisture latching on to the isocyanate groups instead of to the ”moisture catchers”. When this happens, carbon dioxide molecules emerge that can join together to form gas bubbles which then exhibit an effervescent effect (”cauliflower” effect). This effect is accentuated by moisture shocks (e.g. large quantities of moisture, or even lower quantities of moisture at high temperatures). In order to avoid this “cauliflower” effect a complete curing of the thick film coating is mandatory.

In the fully UV-cured coating the bubble formation is so widespread/the structure of the film is so dense that the gas cannot unite to form bubbles but can easily escape through the ink backbone.

However, in shadow zones the ink reacts off with moisture in a controlled manner.

Conformal coating of BGAs

Prior to conformal coating, it is recommended to "underfill" the BGAs. The mismatch of the CTEs between the conformal coating, printed circuit board and component can cause the component to lift during thermal stress.

→ If necessary, perform practice-oriented tests to verify whether the use of a conformal coating on BGAs is possible without underfilling. Besides thermal cycling tests to check the mechanical compatibility, appropriate dewing and climatic conditions should also be considered.

We would gladly provide a list of manufacturers of underfill products upon request.

Removal of the coating for repair purposes

The thick film coating **DSL 1707 FLZ** can be easily removed.

Just after UV curing the **ELPEGUARD®** thick film coatings **Twin-Cure® DSL 1600 E-FLZ** are also still soft enough for being removed mechanically in an relatively easy manner.

Due to the high degree of cross-linking with resultant excellent resistances, the **ELPEGUARD®** thick film coatings of the series **Twin-Cure® DSL 1600 E-FLZ** are very difficult to remove once they are fully cured. The lower their original viscosity, i.e. the higher their elasticity, the easier they are to remove. By means of the sand-blasting method, the coating can be removed from individual components. In this case, the thick film coating is removed by abrasive materials which are applied under pressure to the surface of the coating.

After repair work is completed and the surface has been cleaned (removal of loose particles and rinsing with suitable cleaning agent) **Twin-Cure®** can be reapplied.

Removal of the coating with cleaning agents/strippers is not advised as these, given the good resistance of **Twin-Cure®** , would have to be so aggressive that they would attack/destroy other materials on the assembly such as the solder mask and components.

Visual control

The optimum insulating properties of a protective coating can only be achieved when the coating is homogeneous and sealed. Dewettings and voids provide surfaces of attack for corrosion. To enable an easy and reliable control of the protective coating for completeness, the **ELPEGUARD®** thick film coatings of the series **Twin-Cure®** have been given a fluorescent adjustment indexed by **FLZ**.

The fluorescent coating can be made visible under UV light to facilitate distinguishing between coated and uncoated areas. Weak UV sources or “black light” lamps with a UV-A share at 350-380 nm are suitable. The maximum emission (radiation) is in the wavelength range of 425-460 nm (**Twin-Cure® DSL 1600 E-FLZ**).

Suitable lamps are available, e. g. from Carl Roth (www.carl-roth.de).

➔ Follow the instructions given by the manufacturer as regards any necessary protective measures.

By means of suitable AOI systems it is possible to discover defects, pinholes or bubbles.

Further literature

Dr. Manfred Suppa, Publisher Werner Peters: “Conformal Coatings for Electronics Applications”, 1st edition 2012, Lackwerke Peters GmbH + Co KG, ISBN 978-3-00-039856-8

Disclaimer

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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 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.

Any questions? We would be pleased to offer you advice and assistance in solving your problems. Samples and technical literature are available upon request.

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