# The ELPEGUARD® conformal coating family SL 1307 FLZ

Here the technical reports of the ELPEGUARD® conformal coatings of the series **SL 1307 FLZ** are available for an overall download.
To receive individual technical reports please send your request to peters@peters.de

There is a variety of special adjustments available for different coating methods and fields of application; we will gladly assist you in finding the right adjustment for your application.

| **Series** | **Properties / special characteristics**<br>Base: Acrylate resins (AR)<br>fast drying at room temperature<br>good yellowing resistance<br>can be completely removed for repair purposes with the corresponding thinner | **Colour** | | **Application** | | | | | **Standards** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | colourless, fluorescent | colourless | selective coating | dip coating | brushing | spray coating | spray can | UL 94 | UL 746 | IPC-CC-830B | MIL-I-46058C | IEC 61086-2 | IEC 60664-3 |
| SL 1307 FLZ/2 | the “allround“ solution | X | X | X | X | X | X | | | X | X | X | | X |
| SL 1307 FLZ/3 | thixotropised adjustment to ensure optimum edge coverage even on sharp-angled component leads for higher climatic resistance | X | | X | | X | X | | X | | X | X | | |
| SL 1307 FLZ/4 | very good adhesion even on critical substrates | X | | X | | X | X | | | X | X | X | X | |
| SL 1307 FLZ/S | conformal coating spray supplied in spray cans, ideal for pilot and low-volume series or for repair | X | | | | | | X | | X | X | X | | |

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TR TECHNICAL REPORT

# Conformal coatings of the series ELPEGUARD® SL 1307 FLZ/2

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/2** are used to protect and insulate electronic assemblies so that they can fulfil higher requirements regarding quality, reliability and service life. Owing to their very good resistance against moisture and condensation an excellent protection against corrosion (such as electrochemical corrosion and migration) is possible.

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/2** are distinguished by a special solvent composition which results in prolonged processing/drying times and a higher flash point (>40 °C [104 °F]). They may therefore be processed at higher temperatures which is especially useful in dip coating units.

- Base: acrylate resins (AR)
- fast physical drying
- SL 1307 FLZ/& tested by Trace Laboratories-East according to **IPC-CC-830B** and **MIL-I-46058C**
- UL recognised component according to **UL 746E** (UL file no. E80315, SL 1307 FLZ/&2)
- fulfils the requirements according to IEC 60664-3
- can be soldered-through at soldering iron temperature for repair purposes or removed with the help of thinner V 1307 FLZ/2 and reapplied after repair
- used by leading automotive suppliers
- very good ageing and yellowing resistance
- temperature range from -65 up to +125 °C [-85 up to 257 °F]
- very good TCT resistance (thermal cycling test): -40 to +150 °C [-40 to 302 °F] or -65 to +125 °C [-85 to 257 °F] respectively
- resistant in 4-part noxious gas test according to DIN EN 60068-2-60 or BMW GS 95003-4 respectively
- best resistance class GX against noxious gases according to ISA 71.04-2013
- “ready-to-use“ viscosity adjustments available for all common coating methods
- suitable for coating flexible circuit boards („flex-to-install“, exposure to bend stress limited to the time of assembly)
- the adjustments free from fluorescent agents are particularly suitable for lighting electronics/LED technology

LP 222012 E-4 / 301390e_001

# Characteristics

| | **Colour/ appearance** | **Solids content** DIN EN ISO 3251 1 h, 125 °C, [257 °F], 1 g weighed qty. | **Viscosity at 20 °C [68 °F] (flow time)** | | **Density** at 20 °C [68 °F] DIN EN ISO 2811-1 |
|---|---|---|---|---|---|
| | | | **DIN 53211** 4 mm DIN flow cup | **DIN EN ISO 2431** ISO flow cup (diameter of nozzle given in brackets) | |
| SL 1307/182 | colourless | 23 ± 2 % by weight | 18 ± 2 s | 38 ± 4 s (4 mm) | 1.00 ± 0.02 g/cm³ |
| SL 1307 FLZ/2 | colourless, fluorescent | 32 ± 3 % by weight | 55 ± 5 s | 73 ± 7 s (5 mm) | 1.00 ± 0.02 g/cm³ |
| SL 1307 FLZ/182 | | 23 ± 2 % by weight | 18 ± 2 s | 38 ± 4 s (4 mm) | 1.00 ± 0.02 g/cm³ |
| SL 1307 FLZ/232 | | 27 ± 2 % by weight | 23 ± 2 s | 60 ± 5 s (4 mm) | 1.00 ± 0.02 g/cm³ |
| SL 1307 FLZ/342 | | 29 ± 3 % by weight | 34 ± 3 s | 46 ± 5 s (5 mm) | 1.00 ± 0.02 g/cm³ |

Indices: SL = conformal coating, FLZ = fluorescent, /2 = special solvent composition with flash point > 40 °C, /182 = viscosity of 18 s acc. to DIN 53211, likewise /232

# List of possible physical and mechanical properties

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

| **Property** | **Test method** | **Result** |
|---|---|---|
| Flexibility | IPC-CC-830B, 3.5.5 | passed |
| Glass transition temperature Tg | DMA<br>TMA | ≈ -4 °C [24.8 °F]<br>≈ 45 °C [113 °F] |
| Coefficient of thermal expansion (CTE) | TMA | ≈ 160 ppm/°C ≤ RT |

# List of possible electrical properties

Lackwerke Peters largely verifies its own production range with regard to the products' electrical properties. Please note that the values may slightly vary depending on the adjustment. These values are reached after 7 days of storage at room temperature.

| **Property** | **Test method** | **Result** |
|---|---|---|
| Dielectric strength | IPC-TM-650, 2.5.6.1 | ≥ 60 kV/mm |
| | IPC-CC-830B, 3.6.1 | passed |
| Specific volume resistivity | DIN EN 62631-3-1 | ≥ 1.5 x $10^{15}$ Ohm x cm |
| Surface resistance | DIN EN 62631-3-2 | ≥ 2.0 x $10^{14}$ Ohm |
| Moisture and insulation resistance | IPC-CC-830B, 3.7.1<br>(65 °C [149 °F]/90 % r. h.) | passed |
| | 85/85 test (3 d, 85 °C [185 °F], 85 % R.H.) | ≥1.0 x $10^{9}$ Ohm |
| Thermal shock | IPC-CC-830B, 3.7.2<br>-65 to +125 °C [-85 to 257 °F] | passed |
| Hydrolytic stability | IPC-CC-830B, 3.7.3 | passed |
| Comparative tracking index (CTI) | DIN EN 60112<br>on FR4 base material with<br>CTI 275<br>CTI 600 | <br><br>CTI ≥ 600<br>CTI ≥ 600 |

| Property | Test method | Result |
|---|---|---|
| Resistance to condensation | according to DIN EN ISO 6270-2 (BIAS 12 V, 40 °C [104 °F], 100% r. h.) | ≥ 1.0 x $10^{10}$ Ohm |
| Salt spray test | BMW GS 95003-4 | passed |
| Permittivity $\varepsilon_r$ | VDE 0303, part 4 | 50 Hz: ≈ 3.8<br>1 MHz: ≈ 3.2 |
| Dielectric loss factor tan δ | VDE 0303, part 4 | 50 Hz: ≈ 0.052<br>1 MHz: ≈ 0.036 |
| TI (temperature index) | DIN EN 60216 (IEC 60216) issue 2001 | ≥ 125 °C [257 °F] (20 000 h)*<br>≥ 150 °C [302 °F] (5 000 h)* |

* can be used in a temperature range of **-65 up to at least + 125 °C** [-85 up to at least 257 °F]. Both at the lower and upper ends of this range the performance and reliability of the material can be negatively affected in some applications. In these cases, additional pre-trials and tests are required. Limit values for classification were a 25 % loss in mass and/or dielectric strength in comparison to the appropriate reference values.

# Processing

| | |
|---|---|
|  | 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. |
| **AI** | Application information AI 1/1 ”Processing instructions for ELPEGUARD® conformal coatings (thin film coatings)“ |
| **TI** | Technical information TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents“ |

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/2** can be applied by dipping, brushing, spraying or by means of automatic selective coating units.

Before the coating process, either the (highly) thixotropic conformal coating **ELPEGUARD® SL 1307 FLZ-T** or the **SL 1307 FLZ-HT** can be applied for building dams around connectors, components and pads easily and precisely, in order to prevent the penetration or spreading of the subsequently applied conformal coating (dam and fill).

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

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

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

### Viscosity adjustment

➔ Adjust the processing viscosity for each application process by means of thinner **V 1307 FLZ/2** (see also “Adjustment of the processing viscosity” in the Application information sheet **AI 1/1**).

DIL to be thinned with thinner V 1307 FLZ/2

### Auxiliary products recommended

- **Thinner V 1307 FLZ/2**
  for removing the conformal coating within repair jobs
- **ELPESPEC® cleaning agent R 5817**
  for the cleaning of work place and tools/equipment
- **ELPESPEC® cleaning agent R 5888**
  water-soluble, biodegradable cleaning agent for product carriers and tools

### Double coating

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/2** are suitable for double coating to a limited extent since they are dissolved by the solvent contained in the lacquer.

### Drying/curing

Drying is finished after complete evaporation of the solvents. The drying parameters depend, among others, on the geometry of the assemblies, the population and ink layer thickness. In case of oven drying they depend on the oven loading etc. The following data serves as a guideline:

| | **At room temperature (approx. +23 °C [73.4 °F])** | **in circulating hot air units** |
|---|---|---|
| Drying (tack-free) according to DIN EN 60464 (IEC 60464) | 20-30 min | — |
| Drying time before packaging | approx. 1.5 h | 10-20 min at 80 °C [176 °F] |

## Packaging

The packing units available are indicated in our offer which we will send you upon request.

## Shelf life and storage conditions

Shelf life: In sealed original containers at least 18 months


Storage conditions: +5 °C to +35 °C [+41 °F to 95 °F]

Protect against humidity

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

# Disclaimer

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

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

# Conformal coating
# ELPEGUARD® SL 1307 FLZ/203

The conformal coating **ELPEGUARD® SL 1307 FLZ/203** is used to protect and insulate electronic assemblies so that they can fulfil higher requirements regarding reliability and service life. Owing to its very good resistance against moisture and condensation, an excellent protection against corrosion (such as electrochemical corrosion and migration) is possible.

This product is a thixotropic adjustment which permits an optimum edge coverage even on sharp-edged component leads for a high resistance in extreme climatic conditions.

- Base: acrylate resins (AR)
- rapid physical drying
- SL 1307 FLZ/& tested by Trace Laboratories-East in acc. with **IPC-CC-830** and **MIL-I-46058C**
- UL recognised component according to UL 94 (UL file no. E80315)
- can be soldered through at solder iron temperature for repair purposes, or removed with thinner **V 1307 FLZ/2,** and reapplied after repair
- used by leading automotive suppliers
- very good ageing and yellowing resistance
- operating temperature range from -65 to at least +125 °C [-85 to 257 °F]
- very good TCT resistance:
  -40 to +150 °C [-40 to 302 °F] and -65 to +125 °C [-85 to +257 °F]
- resistant in 4-part noxious gas test acc. to DIN EN 60068-2-60 and BMW GS 95003-4
- suitable for coating flexible circuits (”flex-to-install“, exposure to bend stress limited to time of assembly)

## Characteristics

| | |
|---|---|
| Colour / appearance | colourless, fluorescent |
| Solids content, DIN EN ISO 3251, 1 h, 125 °C [257 °F], 1 g weighed quantity | 30 ± 2 % by weight |
| Viscosity* at 20 °C [68 °F], DIN EN ISO 3219 | 200 ± 50 mPas |
| Density at 20 °C [68 °F], DIN EN ISO 2811-1 | 1.01 ± 0.05 g/cm³ |

* measured with Haake RS 600, C 35/1°, D = 100 $s^{-1}$,
viscosity measuring unit supplied by Thermo Fisher Scientific, www.thermofisher.com

Indices: SL = conformal coating, FLZ = fluorescent, /203 = from the series /3 having a viscosity of 20 dPas

LP 250705 E-2 / 301382e_001

# Physical and mechanical properties

| Property | Test method | Result |
|---|---|---|
| Flexibility | IPC-CC-830B, 3.5.5 | passed |
| Glass transition temperature Tg | TMA | ≈ 50 °C [122 °F] |
| Coefficient of thermal extension (CTE) | TMA | ≈ 160 ppm/°C ≤ Tg |

# Electrical properties

| Property | Test method | Result |
|---|---|---|
| Dielectric strength | IPC-TM-650, 2.5.6.1 | ≥ 60 kV/mm |
| | IPC-CC-830B, 3.6.1 | passed |
| Specific volume resistivity | DIN EN 62631-3-1 | ≥ 5 x $10^{12}$ Ohm x cm |
| Surface resistance | DIN EN 62631-3-2 | ≥ 1 x $10^{14}$ Ohm |
| Moisture and insulation resistance | IPC-CC-830B, 3.7.1<br>(65 °C/90 % R.H.) | passed |
| | 85/85-Test (3 d, 85 °C, 85 % R.H.) | ≥ 1.0 x $10^{9}$ Ohm |
| Thermal shock | IPC-CC-830B, 3.7.2<br>-65 to +125 °C | passed |
| Hydrolytic stability | IPC-CC-830B, 3.7.3 | passed |
| Comparative tracking index (CTI, tracking resistance) | DIN EN 60112<br>on FR4 base material with<br>CTI 275<br>CTI 600 | <br><br>CTI ≥ 600<br>CTI ≥ 600 |
| Resistance to condensation | based on DIN EN ISO 6270-2<br>(BIAS 12 V, 40 °C [104 °F],<br>100% R.H.) | ≥ 1,0 x $10^{9}$ Ohm |
| Salt spray test | BMW GS 95003-4 | passed |
| Permittivity $\varepsilon_r$ | VDE 0303, part 4 | 50 Hz: ≈3.8<br>1 MHz: ≈3.2 |
| Dielectric loss factor tan δ | VDE 0303, part 4 | 50 Hz: ≈0.052<br>1 MHz: ≈0.036 |
| TI (temperature index) | DIN EN 60216 (IEC 60216)<br>issue 2001 | ≥ 125 °C [257 °F] (20 000 h)*<br>≥ 150 °C [302 °F] (5 000 h)* |

***** can be used in a temperature range of -**65 up to at least +125 °C** [-85 up to at least 257 °F]. Both at the lower and upper ends of this range, the performance and reliability of the material can be negatively affected in some applications. In these cases, additional pre-trials and tests are required. Limit values for classification were a 25 % loss in mass and/or dielectric strength in comparison to the appropriate reference values.

# Processing

| | |
|---|---|
| | 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. |
| AI | Application information AI 1/1 "Processing instructions for ELPEGUARD® conformal coatings (thin film coatings)" |
| TI | Technical information TI 15/3 "Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents" |

The conformal coating **ELPEGUARD® SL 1307 FLZ/203** has to be processed in the condition supplied. It can be applied by means of all common spray coating methods.

Stir before use

Prior to conformal coating, the (highly) thixotropic conformal coatings **ELPEGUARD® SL 1307 FLZ-T** and **SL 1307 FLZ-HT** can be used to easily and precisely build dams around connectors, components and pads, to prevent the penetration and spreading of the subsequently applied conformal coating (dam and fill).

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

The specified product data is based upon standard processing conditions/test conditions of the mentioned norms and must be verified 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.

## Auxiliary products recommended

- Thinner V 1307 FLZ/2
  for the removal of the coating within repair work
- ELPESPEC® cleaning agent R 5817
  for the cleaning of work place and tools/equipment
- ELPESPEC® cleaning agent R 5888
  water-soluble, biodegradable cleaning agent for product carriers and tools

## Double coating

The conformal coating **ELPEGUARD® SL 1307 FLZ/203** is suitable for double coating only to a limited extent since it is dissolved by the solvent contained in the ink.

### Drying/curing

Drying is finished after complete evaporation of the solvents. The drying parameters depend, amongst others, on the geometry of the assemblies, the population and layer thickness. In case of oven drying, it depends on the oven loading, etc. The following data serves as a guideline:

| | **At room temperature (approx. +23 °C [73.4 °F])** | **In circulating hot air units with exhaust air** |
|---|---|---|
| Drying (tack-free) in acc. with DIN EN 60464 (IEC 60464) | 20-30 min | — |
| Drying time prior to packaging | approx. 1-2 h | 10-20 min at 80 °C [176 °F] |

To ensure a bubble-free coating, it is recommended to dry at room temperature.

## Packaging

The packing units available are indicated in our offer which we will send you upon request.

## Shelf life and storage conditions

Shelf life: In sealed original containers at least 6 months


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

Protect against humidity

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

## 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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# Conformal coatings of the series ELPEGUARD® SL 1307 FLZ/4

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/4** are used to protect and insulate electronic assemblies so that they can fulfil higher requirements regarding quality, reliability and service life. Owing to their very good resistance against moisture and condensation an excellent protection against corrosion (such as electrochemical corrosion and migration) is possible.

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/4** are distinguished by a very good adhesion even on critical substrates. Achieved through a chemical reaction with the substrate, the improved adhesion gives excellent results in the cross hatch test according to DIN EN ISO 2409 that is uncommon for conformal coatings.

- Base: modified acrylate resins
- fast physical drying
- very good adhesion to critical substrates
- tested by NTS acc. to **IPC-CC-830C** and **MIL-I-46058C**
- fulfils the requirements according to **IEC 61086-2** (class II for “high reliability”)
- UL recognised component according to **UL 746E** (UL file no. E80315, SL 1307 FLZ/&4)
- can be soldered-through at soldering iron temperature for repair purposes or removed with the help of thinner **V 1307 FLZ/2** and reapplied after repair
- used by leading automotive suppliers
- very good ageing and yellowing resistance
- can be used in a temperature range of **-65 to +125 °C** [-85 to 257 °F]
- very good TCT resistance (thermal cycling test): –40 to +150 °C [-40 to 302 °F] resp. –65 to +125 °C [-85 to 257 °F]
- resistant in 4-part noxious gas test according to DIN EN 60068-2-60 or BMW GS 95003-4
- “ready-to-use“ viscosity adjustments available for all common coating methods
- suitable for flexible circuits (”flex-to-install“, bend stress during assembly only)

LP 242401 E-5 / 301396e_001

# Characteristics

| | SL 1307 FLZ/184 | SL 1307 FLZ/234 |
|---|---|---|
| Colour/appearance | colourless, fluorescent | colourless, fluorescent |
| Solids content, DIN EN ISO 3251<br>1 h, 125 °C [257 °F], 1 g weighed quantity | 24 ± 2 % by weight | 29 ± 2 % by weight |
| Viscosity at 20 °C [68 °F], flow time acc. to DIN 53211, 4 mm DIN flow cup | 18 ± 2 s | 23 ± 2 s |
| Viscosity at 20 °C [68 °F], flow time acc. to DIN EN ISO 2431, 4 mm ISO flow cup | 38 ± 6 s | 60 ± 10 s |
| Density at 20 °C [68 °F], DIN EN ISO 2811-1 | 1.00 ± 0.02 g/cm³ | 1.00 ± 0.02 g/cm³ |

Indices: SL = conformal coating, FLZ = fluorescent, /184 = of the series /4 with a viscosity of 18 s acc. to DIN 53211, likewise /234

# List of possible physical and mechanical properties

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

| Property | Test method | Result |
|---|---|---|
| Flexibility | IPC-CC-830C, 3.5.5 | passed |
| Glass transition temperature Tg | DMA<br>TMA | ≈ -4 °C [24.8°F]<br>≈ 45 °C [113 °F] |
| Coefficient of thermal expansion (CTE) | TMA | ≈ 160 ppm/°C ≤ RT |

# List of possible electrical properties

Lackwerke Peters largely verifies its own production range with regard to the products' electrical properties. Please note that the values may slightly vary depending on the adjustment. These values are reached after 7 days of storage at room temperature.

| Property | Test method | Result |
|---|---|---|
| Dielectric strength | IPC-TM-650, 2.5.6.1 | ≥ 100 kV/mm |
| | IPC-CC-830C, 3.6.1 | passed |
| Specific volume resistivity | DIN EN 62631-3-1 | ≥ 6.4 x $10^{15}$ Ohm x cm |
| Surface resistance | DIN EN 62631-3-2 | ≥ 2.0 x $10^{14}$ Ohm |
| Moisture and insulation resistance | IPC-CC-830C, 3.7.1<br>(65 °C [149 °F]/90 % r. h.) | passed |
| | 85/85 test (3 d, 85 °C [185 °F], 85 % R.H.) | ≥ 1.0 x $10^{9}$ Ohm |
| Thermal shock | IPC-CC-830C, 3.7.2<br>-65 to +125 °C [- 85 °F to 257 °F] | passed |
| Hydrolytic stability | IPC-CC-830C, 3.7.3 | passed |
| Comparative Tracking Index (CTI = tracking resistance) | DIN EN 60112<br>on FR4 base material with CTI 225 | CTI ≥ 600 |

| Property | Test method | Result |
|---|---|---|
| Resistance to condensation | based on DIN EN ISO 6270-2 (BIAS 12 V, 40 °C [104 °F], 100% r.h.) | ≥ 1.0 x $10^9$ Ohm |
| Salt spray test | BMW GS 95003-4<br>IEC 61086 | passed<br>passed |
| Permittivity $\varepsilon_r$ | VDE 0303, part 4 | 50 Hz: ≈ 3.8<br>1 MHz: ≈ 3.2 |
| Dielectric loss factor tan δ | VDE 0303, part 4 | 50 Hz: ≈ 0.052<br>1 MHz: ≈ 0.036 |
| TI (temperature index) | DIN EN 60216 (IEC 60216) issue 2001 | ≥ 125 °C [257 °F] (20 000 h)*<br>≥ 150 °C [302 °F] (5 000 h)* |

* can be used in a temperature range of **-65 up to at least + 125 °C** [-85 up to at least 257 °F]. Both at the lower and upper ends of this range the performance and reliability of the material can be negatively affected in some applications. In these cases, additional pre-trials and tests are required. Limit values for classification were a 25 % loss in mass and/or dielectric strength in comparison to the appropriate reference values.

# Processing

| | |
|---|---|
|  | 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. |
| **AI** | Application information AI 1/1 ”Processing instructions for ELPEGUARD® conformal coatings (thin film coatings)“ |
| **TI** | Technical information TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents“ |

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/4** can be applied by automatic selective coating units or by brushing.

 Protect against humidity

Before the coating process, either the (highly) thixotropic conformal coating **ELPEGUARD® SL 1307 FLZ-T** or the **SL 1307 FLZ-HT** can be applied for building dams around connectors, components and pads easily and precisely, in order to prevent the penetration or spreading of the subsequently applied conformal coating (dam and fill).

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

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

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

### Adjustment of viscosity

→ Adjust the processing viscosity for each application process by means of thinner **V 1307 FLZ/2** (see also Application information sheet **AI 1/1** „Adjustment of the processing viscosity“).

**DIL** to be thinned with thinner V 1307 FLZ/2

On account of the special solvent composition processing temperatures of 20-35 °C [68-95 °F] are possible.

### Auxiliary products recommended

- **Thinner V 1307 FLZ/2**
  for removing the conformal coating within repair work
- **ELPESPEC® cleaning agent R 5817**
  for the cleaning of work place and tools/equipment
- **ELPESPEC® cleaning agent R 5888**
  water-soluble, biodegradable cleaning agent for product carriers and tools

### Double coating

The conformal coatings of the series **ELPEGUARD® SL 1307 FLZ/4** are suitable for double coating to a limited extent since they are dissolved by the solvent contained in the lacquer.

### Drying/curing

Drying is finished after complete evaporation of the solvents. The drying parameters depend, among others, on the geometry of the assemblies, the population and ink layer thickness. In case of oven drying it depends on the oven loading etc. The following data serves as a guideline:

| | **At room temperature (ca. +23 °C [73.4°F])** | **in circulating hot air units** |
|---|---|---|
| Drying (tack-free) based on DIN EN 60464 (IEC 60464) | 20-30 min | — |
| Drying time until packaging | ca. 1.5 h | 10–20 min at 80 °C [176 °F] |

The maximum adhesion is achieved after temperature storage of 30 min at 80 °C [176 °F].

## Packaging

The packing units available are indicated in our offer which we will send you upon request.

## Shelf life and storage conditions

Shelf life: In sealed original containers at least 4 months


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

Protect against humidity

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

# Disclaimer

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

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

ELPEGUARD®
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TR TECHNICAL REPORT

# Conformal coating sprays of the series ELPEGUARD® SL 1307 FLZ/S

The conformal coating sprays of the series **ELPEGUARD® SL 1307 FLZ/S** 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 electrochemical corrosion and migration) is possible.

- Base: acrylate resins (AR)
- fast physical drying
- practical spray can: ideal for pilot and low-volume series or for repair
- SL 1307 FLZ/& tested by Trace Laboratories-East acc. to **IPC-CC-830B** and **MIL-I-46058C**
- UL approval of SL 1307 FLZ/& acc. to **UL 746E** (UL file no. E80315)
- SL 1307 S fulfils the requirements of IPC-CC-830B, MIL-I-46058C and UL 746E (fluorescence excluded)
- can be soldered through at soldering iron temperature for repair or removed with the help of thinner **V 1307 FLZ** and reapplied afterwards
- very good ageing and yellowing resistance
- temperature range from -65 to at least +125 °C [-85 to at least +257 °F]
- very good TCT (thermal cycling test) resistance:
  -40 to +150 °C [-40 °F to +302 °F] or -65 to +125 °C [-85 to +257°F]
- resistant to the 4-part noxious gas test acc. to DIN EN 60068-2-60 and BMW GS 95003-4
- suitable for coating flexible circuits (“flex-to-install“, exposure to bend stress limited to time of assembly)
- SL 1307 S (no fluorescent agent) particularly suitable for lighting electronics/LED technology

## Characteristics

Colour/appearance: SL 1307 FLZ/S: colourless, fluorescent
~~SL 1307 S: colourless~~

Indices: SL = conformal coating, FLZ = fluorescent, S = spray can

LP 242302 E-4 / 301386e_000

# Physical and mechanical properties

| Property | Test method | Result |
|---|---|---|
| Flexibility | IPC-CC-830B, 3.5.5 | passed |
| Glass transition temperature Tg | DMA<br>TMA | ≈ -4 °C [24.8 °F]<br>≈ 45 °C [113 °F] |
| Coefficient of thermal expansion (CTE) | TMA | ≈ 160 ppm/°C ≤ RT |

# Electrical properties

These values are reached after 7 days' storage at room temperature.

| Property | Test method | Result |
|---|---|---|
| Dielectric strength | IPC-TM-650, 2.5.6.1 | ≥ 60 kV/mm |
| | IPC-CC-830B, 3.6.1 | passed |
| Specific volume resistivity | DIN EN 62631-3-1 | ≥ 4.3 x $10^{14}$ Ohm x cm |
| Surface resistance | DIN EN 62631-3-2 | ≥ 2.0 x $10^{14}$ Ohm |
| Moisture and insulation resistance | IPC-CC-830B, 3.7.1<br>(65 °C [149 °F]/90 % R. H.) | passed |
| | 85/85 test (3 d, 85 °C [185 °F], 85 % R.H.) | ≥ 1.0 x $10^{9}$ Ohm |
| Thermal shock | IPC-CC-830B, 3.7.2<br>-65 to +125 °C [-85 to 257 °F] | passed |
| Hydrolytic stability | IPC-CC-830B, 3.7.3 | passed |
| Comparative Tracking Index (CTI, tracking resistance) | DIN EN 60112<br>on FR4 base material with<br>CTI 250<br>CTI 600 | <br><br>CTI ≥ 600<br>CTI ≥ 600 |
| Resistance to condensation | based on ISO 6270-2<br>(BIAS 12 V, 40 °C [104 °F], 100% R. H.) | ≥ 1.0 x $10^{9}$ Ohm |
| Salt spray test | BMW GS 95003-4 | passed |
| Permittivity $\varepsilon_r$ | VDE 0303, part 4 | 50 Hz: ≈ 3.8<br>1 MHz: ≈ 3.2 |
| Dielectric loss factor tan δ | VDE 0303, part 4 | 50 Hz: ≈ 0.052<br>1 MHz: ≈ 0.036 |
| TI (temperature index) | DIN EN 60216 (IEC 60216) issue 2001 | ≥ 125 °C [257 °F] (20 000 h)*<br>≥ 150 °C [302 °F] (5 000 h)* |

* can be used in a temperature range of **-65 up to at least +125 °C** [-85 up to at least 257 °F]. Both at the lower and upper ends of this range the performance and reliability of the material can be negatively affected in some applications. In these cases, additional pre-trials and tests are required. Limit values for the classification of the TI were a 25 % loss in mass and/or dielectric strength in comparison to the appropriate reference values.

# Processing

| | |
|---|---|
|  | 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. |
| **AI** | Application information AI 1/1 "Processing instructions for ELPEGUARD® conformal coatings (thin film coatings)" |
| **TI** | Technical information TI 15/3 "Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents" |

➔ Follow the instructions given on the spray can.

The yield of the conformal coating sprays of the series **ELPEGUARD® SL 1307 FLZ/S** depends on the population density of the electronic assembly and the thickness of the coating layer applied; experience has shown that one spray can is sufficient for coating 3-3.5 m².

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

The specified product data is based upon standard processing conditions/test conditions of the mentioned norms and must be verified 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.

## Auxiliary products recommended

- **Thinner V 1307 FLZ**
  for removing the coating within repair
- Cleaning agent R 5817
  for the cleaning of work place and tools/equipment

## Drying/curing

Drying is finished after complete evaporation of the solvents. The drying parameters depend, amongst others, on the geometry of the assemblies, the population and ink layer thickness. In case of oven drying it depends on the oven loading, etc. The following data serves as a guideline:

| | **At room temperature (approx. +23 °C [73.4 °F])** | **In hot exhaust air units** |
|---|---|---|
| Drying (tack-free)<br>acc. to DIN EN 60464 (IEC 60464) | approx. 25 min | — |
| Drying time prior to packaging | 1-2 h | 5-20 min at 50-80 °C<br>[122–176 °F] |

# Packaging

The packing units available are indicated in our offer which we will send you upon request.

# Shelf-life and storage conditions

Shelf life: In sealed original containers at least 18 months


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

Protect against humidity

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

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