

S1 SURVEY REPORT

Group 1

**Conformal coatings
 for printed circuits and
 assembled pcbs/flat packs**



This survey report gives a comprehensive overview of product group 1. For further information please refer to the technical reports (TR) and application information sheets (AI), in which the mentioned products are described in detail.

For more extensive advice, our application technology department (ATD) is at your disposal at any time.

The first column of this survey corresponds to the order in which our technical reports (TR) are filed in the report manual and/or supplements and new technical reports are to be added. Thus this survey also serves as a table of contents of product group 1.

The products mentioned in this survey do not contain substances listed in the RoHS directive 2002/95/EC, the EU End-of-Life Vehicle directive 2000/53/EC ("lead-free regulation") and the WEEE directive 2002/96/EC. Detailed information on these directives that restrict or prohibit the use of certain hazardous substances can be accessed in the "Service" section on our website www.peters.de – "Directives/restrictions of substances".



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characterises products that are particularly suitable for application in optoelectronics



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1. Application information sheets

Application Information sheets (AI) apply to various lacquers/lacquer series' and supplement the Technical Reports on these lacquers by giving detailed explanations of possible application procedures and individual process steps plus offering numerous practical tips and advice to safeguard the optimum processing of our products.

The associated Technical Reports provide – in a concise and clear manner – numerous characteristics and processing data in transparent diagrams, graphics and tables.

Currently the following application information sheets for group 1 are available:

AI 1/1 "Processing instructions for the conformal coatings of the series' **ELPEGUARD®SL 1300** to **SL 1309 N** as well as **SL 1400**"

AI 1/2 "Processing instructions for the **ELPEGUARD®** thick film lacquers of the series **TWIN-CURE®**".

2. Solder flux lacquer for non-assembled pcbs

2.1 General characteristics

- maintains the solderability of bare pcbs
- reliably prevents oxidation of copper conductors and is simultaneously a soldering aid
- fast drying already at room temperature
- already very good solderability at 215 °C [419 °F].

2.2 Product-specific characteristics

Product (series)	Special properties
Solder flux lacquer SL 1232 , yellowish transparent	<ul style="list-style-type: none"> • protective and preservative lacquer for bare pcbs based on modified colophonium resin • application by means of roller coating • completely clear transparent lacquer layer after curing




3. Conformal coatings for assembled pcbs




3.1 General characteristics




- excellent protection against corrosion (e.g. against electro corrosion and migration)
- extremely low risk of dissolving components and marking inks
- very good dielectric properties and very high tracking resistance
- suitable for coating flexible circuits ("flex-to-install", bend stress during assembly only)
- can be soldered-through at soldering iron temperature for repair purposes
- colourless transparent and/or fluorescent (index **FLZ**) adjustments enable the completeness of the coating to be easily controlled under day or UV light (black light)
- partially special adjustments (e.g. **ELPEGUARD® SL 1301 ECO-FLZ/23**) for the processing by means of selective coating units are available


Please observe the indications in our application information sheet AI 1/1 (see also Item 1).

3.2 Product-specific characteristics

Product (series)	Special properties
<p>Conformal coatings of the series ELPEGUARD® SL 1301 ECO-FLZ, colourless transp.</p> <p>SL 1301 ECO-FLZ SL 1301 ECO-FLZ/17 SL 1301 ECO-FLZ/20 SL 1301 ECO-FLZ/23 SL 1301 ECO-FLZ/40</p>	<ul style="list-style-type: none"> • base: modified polyurethane resins (PUR) • application: brushing, spraying, dipping, selective coating processes • index ECO = ecological • free of aromatic solvents, such as benzene, toluene, xylene and C9 aromates • do not contain substances listed in the United States' EPA 33/50 program* • approved and used by leading suppliers of the automotive industry • excellent wetting even of angular component leads • permanent temperature resistance of 140 °C [284 °F], test for 20,000 h, short term temperature resistance of 160 °C [320 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • tested by Trace Laboratories-East according to IPC-CC-830B** •  UL approval as permanent coatings: best flame class V-0 acc. to UL 94, UL File No. E80315 • index /20 = 20 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]), likewise /17, /23 and /40
<p>Conformal coatings of the series ELPEGUARD® SL 1301 ECO-BA-FLZ, colourless transparent</p> <p>SL 1301 ECO-BA-FLZ SL 1301 ECO-BA-FLZ/17 SL 1301 ECO-BA-FLZ/20 SL 1301 ECO-BA-FLZ/23 SL 1301 ECO-BA-FLZ/25</p>	<ul style="list-style-type: none"> • same as SL 1301 ECO-FLZ, but on account of their special solvent formulation (index BA = butyl acetate) particularly uncritical curing under components •  UL approval as permanent coatings: best flame class V-0 acc. to UL 94, UL File No. E80315 • index /17 = 17 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]), likewise /20, /23 and /25
<p>Conformal coatings of the series ELPEGUARD® SL 1331 N-LF-D</p> <p>SL 1331 N-LF-D, red transp. SL 1331 N-LF-D/17, red transp. SL 1331 N-LF-D/23, red transp. SL 1331 N-LF-D/40, red transp.</p>	<ul style="list-style-type: none"> • base: modified polyurethane resins (PUR) • application: brushing, spraying, dipping, selective coating processes • lead-free alternative to SL 1331 N, (index LF-D = lead-free directive), can be substituted without modification to the processing and curing parameters • excellent wetting even of angular component leads (index N = wetting agent) • permanent temperature resistance of 140 °C [284 °F], test for 20,000 h, short term temperature resistance of 160 °C [320 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • meet requirements of IPC-CC-830B •  UL approval as permanent coatings: best flame class V-0 acc. to UL 94, UL File No. E80315 • /17 = 17 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]); likewise /23 and /40

Product (series)	Special properties
<p>Conformal coatings of the series ELPEGUARD® SL 1305 AQ-ECO, colourless transparent</p> <p>SL 1305 AQ-ECO SL 1305 AQ-ECO/25 SL 1305 AQ-ECO/55 SL 1305 AQ-ECO-FLZ SL 1305 AQ-ECO-FLZ/25</p> <p>FK 1335 AQ-ECO, red FK 1345 AQ-ECO, black FK 1355 AQ-ECO, blue FK 1365 AQ-ECO, green</p> 	<ul style="list-style-type: none"> • base: polyurethane resins (PUR) • application: brushing, spraying, dipping, selective coating processes • solvents are nearly completely replaced by water • index AQ = water borne (aqua), index ECO = ecological • no odour annoyance during coating and further processing • very fast drying at room temperature • do not contain substances listed in the United States' EPA 33/50 program* • good yellowing resistance, thus particularly suitable for application in optoelectronics • permanent temperature resistance of 130 °C [266 °F], test for 20,000 h, short term temperature resistance of 150 °C [302 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • meet requirements of IPC-CC-830B •  UL approval of the fluorescent adjustments (index FLZ) as conformal coatings according to UL 746E, UL File No. E80315 • index /25 = 25 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]), likewise /55 • index FK = dye concentrate to dye coatings of the series SL 1305 AQ-ECO, on account of the significant colour contrast to the substrate the coating can be easily controlled for completeness
<p>Conformal coatings of the series ELPEGUARD® SL 1306 N</p> <p>SL 1306 N, colourless transp. SL 1306 N-FLZ, " " SL 1306 N-FLZ/23, " "</p>	<ul style="list-style-type: none"> • base: modified acrylate resins • application: brushing, spraying, dipping selective coating processes • when using no-clean fluxes also suitable as protective lacquers for un-cleaned pcbs • excellent wetting even of angular component leads (index N = wetting agent) • low odour • excellent condensation and climatic resistance, especially with surface dewing • permanent temperature resistance of 130 °C [266 °F], test for 20,000 h, short term temperature resistance of 150 °C [302 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • meet requirements of IPC-CC-830B •  UL approval as permanent coatings: best flame class V-0 acc. to UL 94, UL File No. E80315 • index /23 = 23 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F])

Product (series)	Special properties
<p>Conformal coatings of the series ELPEGUARD® SL 1307</p> <p>SL 1307, colourless transp. SL 1307 FLZ, colourless transp. SL 1307 FLZ/18, colourless transp. SL 1307 FLZ/23, colourless transp. SL 1307 FLZ/25, colourless transp. SL 1337, red transp. SL 1367, green transp. SL 1367 MS-FLZ-FE/22, green transp., fluorescent</p> 	<ul style="list-style-type: none"> • base: modified acrylate resins • application: brushing, spraying, selective coating processes, FLZ adjustments: also dipping • very fast physical drying at room temperature • approved and used by leading suppliers of the automotive industry • good yellowing resistance, thus particularly suitable for application in optoelectronics • permanent temperature resistance of 125 °C [257 °F], test for 20,000 h, short term temperature resistance of 150 °C [302 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • tested by Trace Laboratories-East according to IPC-CC-830B** •  UL approval of the colourless, fluorescent adjustments (index FLZ) as permanent coatings according to UL 94 and as conformal coatings according to UL 746E, UL File No. E80315 • SL 1307 FLZ is mould resistant acc. to IPC-CC-830B, SL 1367 MS-FLZ-FE/22 is mould resistant acc. to MIL-STD-810 E (index FE = fungicide adjustment) • can be completely removed for repair purposes with thinner V 1307 • index /18 = 18 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]), likewise /22, /23 and /25 • Index MS = moderate boiling solvent: retarded drying and simultaneously increased flow
<p>Conformal coating spray ELPEGUARD® SL 1307 FLZ-S, colourless transp., fluorescent</p> 	<ul style="list-style-type: none"> • same as SL 1307 FLZ, but in spray cans, index S = spray can (CFC-free) • ideal for pilot and low volume series' as well as for repair purposes
<p>Conformal coating ELPEGUARD® SL 1308 FLZ, colourless transp.</p>	<ul style="list-style-type: none"> • base: modified epoxy resins (EP) • application: brushing, spraying, dipping, selective coating processes • permanent temperature resistance of 150 °C [302 °F], test for 20,000 h, short term temperature resistance of 165 °C [329 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • meets requirements of IPC-CC-830B • corresponds to the best flame class V-0 according to UL 94 • fungicidal adjustment according to MIL-V-173 C for protection against mould formation, suitable for tropical climates
<p>Conformal coatings of the series ELPEGUARD® SL 1309 N</p> <p>SL 1309 N, colourless transp. SL 1309 N-FLZ, " SL 1309 N-FLZ/16, " SL 1309 N-FLZ/19, " SL 1309 N-FLZ/23, "</p>	<ul style="list-style-type: none"> • base: modified acrylate resins • application: brushing, spraying, dipping, selective coating processes • when using no-clean fluxes also suitable as protective coatings for un-cleaned pcbs • excellent wetting even of angular component leads (index N = wetting agent) • extraordinary adhesion to nearly all substrates • permanent temperature resistance of 130 °C [266 °F], test for 20,000 h, short term temperature resistance of 150 °C [302 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • meet requirements of IPC-CC-830B • correspond to the best flame class V-0 acc. to UL 94 • mould resistant acc. to MIL-STD-810 E • index /23 = 23 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F]); likewise /16 and /19

Product (series)	Special properties
Conformal coatings of the series ELPEGUARD® SL 1400 ECO-FLZ , colourless, fluorescent, humidity curing SL 1400 ECO-FLZ SL 1400 ECO-FLZ/20	<ul style="list-style-type: none"> • base: humidity curing polyurethane resins (PUR) • application: brushing, spraying, selective coating processes • index ECO = ecological • free of aromatic solvents such as benzene, toluene, xylene and C9 aromates • do not contain substances listed in the United States' EPA 33/50 program* • high solids content (SL 1400 ECO-FLZ: approx. 60%) • excellent wetting even of angular component leads • exhibit the excellent resistances of a 2-pack lacquer system • offer excellent climatic protection at high temperatures and atmospheric humidities • permanent temperature resistance of 140 °C [284 °F], test for 20,000 h, short term temperature resistance of 150 °C [302 °F], test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • tested by Trace Laboratories-East according to IPC-CC-830B** •  UL approval according to UL 94 as permanent coatings, UL File No. E80315 • index /20 = 20 s flow time (DIN 53 211, 4 mm at 20 °C [68 °F])

* The 33/50 program by the EPA (Environmental Protection Agency) aims for a reduction in the use of certain substances that are hazardous to the environment and health.

** Test reports can be accessed on our website www.peters.de by clicking on "Service" – "Certificates".



4. Thick-film lacquers TWIN-CURE®

4.1 General characteristics

- excellent corrosion protection of assembled pcbs/flat packs
- suitable for thick-film application, application of layers up to 500 µm in one pass (index DSL = thick-film lacquer)
- solvent-free 1-pack systems with the resistance of a 2-pack system
- short processing times in spite of high layers owing to optimally synchronised curing mechanisms: fast UV curing and chemical cross-linking reaction in shadow areas
- excellent mechanical, chemical and climatic resistance
- depending on the coating thickness also suitable for coating flexible circuits ("flex-to-install", bend stress during assembly only)
- the fluorescent adjustments (index **FLZ** = **fluorescent**) allow the coating to be controlled easily and reliably under UV light (black light).

Please observe the indications in our Application Information sheet AI 1/2 (see item 1).

4.2 Product-specific characteristics

Product (series)	Special properties
<p>ELPEGUARD[®] thick-film lacquers TWIN-CURE[®] of the series DSL 1600 E-FLZ, colourless transparent</p> <p>DSL 1600 E-FLZ DSL 1600 E-FLZ/75 DSL 1600 E-FLZ/150 DSL 1600 E/500</p> 	<ul style="list-style-type: none"> • base: copolymerisate of polyurethane (PUR) and polyacrylate (AY) • application: brushing, selective coating processes, dispensing • do not contain substances listed in the United States' EPA 33/50 program* • permanent temperature resistance of 130 °C [266 °F] (125 °C [257 °F] for the low viscosity adjustments /75 and /150); test for 20,000 h, short term temperature resistance of 150 °C [302 °F] (145 °C [293 °F] for the low viscosity adjustments /75 and /150); test for 5,000 h, acc. to DIN EN 60216-1 2001 (IEC 60216) • tested by Trace Laboratories-East according to IPC-CC-830B** •  UL approval as permanent coatings: best flame class V-0 acc. to UL 94, UL File No. E80315 • DSL 1600 E-FLZ (index E = elastic) is also resistant in case of fast and extreme temperature changes (Cold Check Test) in layers up to 500 µm, DSL 1600 E-FLZ/75, DSL 1600 E-FLZ/150 and DSL 1600 E/500 in layers up to 300 µm • with the low viscosity adjustments /75 and /150 minimal coating thicknesses of approx. 10 µm are achievable depending on the equipment technology • DSL 1600 E/500: without fluorescent additive; particularly suitable for the coating of LEDs owing to the fact that false colours of the light source caused by the fluorescent indicator are excluded • index /75 = viscosity of 75 mPas, likewise /150 and /500

* The 33/50 program by the EPA (Environmental Protection Agency) aims for a reduction in the use of certain substances that are hazardous to the environment and health.




** Test reports can be accessed on our website www.peters.de by clicking on "Service" – "Certificates".

5. Silicone thick-film lacquers

5.1 General characteristics

- excellent corrosion protection of assembled pcbs/flat packs
- highly elastic, thus also suitable for coating flexible circuits
- have a stress-compensating effect during thermal shocks and vibration
- excellent protection against moisture and other aggressive environmental conditions
- high resistance to weathering and UV radiation, thus particularly suitable for application in optoelectronics
- very good chemical and thermal resistance (up to 200 °C [392 °F])
- permanent temperature resistance of 180 °C [356 °F] according to DIN EN 60216-1 2001 (IEC 60216), test for 20,000 h
- good adhesion to all common substrates even without additional adhesive agents (self-priming)
- excellent dielectric performance: the dielectric constant as well as the dissipation factor $\tan \delta$ are virtually independent of frequency and temperature
- on account of the fluorescent adjustment (index **FLZ** = fluorescent) the coating can be controlled easily and reliably under UV light (black light)
- can be simply removed mechanically for repair purposes.

5.2 Product-specific characteristics

Product (series)	Special properties
Silicone thick-film lacquer ELPEGUARD® DSL 1705 FLZ , colourless transparent 	<ul style="list-style-type: none"> • base: polyorganosiloxane • application: brushing, dipping, selective coating processes • solvent-free • for thick-film application up to 3000 µm (index DSL = thick-film lacquer) • addition cross-linking, thus suitable for use in an encased environment • fast thermal curing (15 min at 110 °C [230 °F]) • does not contain substances listed in the United States' EPA 33/50 program* •  approval as conformal coating according to UL 746E: flame class V-1 acc. to UL 94, UL File No. E80315
Silicone thick-film lacquers of the series ELPEGUARD® DSL 1706 FLZ , colourless transparent DSL 1706 FLZ DSL 1706 HV-FLZ DSL 1706 NV-FLZ 	<ul style="list-style-type: none"> • base: polyorganosiloxane • application: brushing, spraying, selective coating processes • various viscosity adjustments: index HV = high viscosity adjustment index NV = low viscosity adjustment • solvent-free • for thick-film application up to 300 µm (index DSL = thick-film lacquer) • condensation cross-linking • fast cross-linking at room temperature • do not contain substances listed in the United States' EPA 33/50 program* • correspond to the best flame class V-0 acc. to UL 94

* The 33/50 program by the EPA (Environmental Protection Agency) aims for a reduction in the use of certain substances that are hazardous to the environment and health.

For loads/stress to which a 1-pack conformal coating is not sufficiently resistant, as for instance in case of aggressive industrial atmosphere, solvent exposure, wetness, or similar, 2-pack casting compounds for the protection of electronics are available.

Special technical reports on these products are available upon request. In our report manual these products are filed under groups 3 and 4.

Please also note group 9 “**Insulating and encapsulating varnishes, colourless and coloured transparent**” (including 2-pack lacquers) as well as group 10 “**Insulating and engine casing varnishes, coloured opaque**”.

Any questions?

We would be pleased to offer you advice and assistance in choosing the right product and solving your problems. Free samples and technical literature are available upon request.

The above information as well as advice given by our Application Technology Department whether in verbal or written form or during product evaluations is provided to the best of our knowledge, but must be regarded as non-binding recommendations, also with respect to possible third-party proprietary rights.

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

The advisory service does not exempt you from performing your own assessments, in particular of our material safety data sheets and technical information sheets, and of our products as regards their suitability for the applications intended. The application, use and processing of our products and of the products manufactured by you based on the advice given by our Application Technology Department are beyond our control and thus entirely your responsibility. The sale of our products is effected in accordance with our current terms of sale and delivery.

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