ELPEGUARD®
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TR TECHNICAL REPORT

Silicone thick film coating ELPEGUARD® DSL 1705 FLZ

The silicone thick film coating **ELPEGUARD® DSL 1705 FLZ** 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 even under harsh climatic conditions.

- Base: Silicone (SR)
- solvent-free/VOC-free (Volatile Organic Compounds)
- standard dry layer thickness > 80 µm
- addition cross linking, thus also suitable for a use in encapsulated environment
- fast thermal curing
- good adhesion to many common substrates even without additional adhesive agents (self-priming)
- excellent chemical resistance
- UL Recognised Component acc. to UL 746E, flame class V-1 acc. to UL 94, UL file No. E80315
- temperature range from -40 °C to +200 °C [392 °F]; a use down to -65 °C [-85 °F] is possible*
- highly elastic, thus suitable for coating flexible circuits
- stress-compensating in case of thermal shock and vibration
- resistant against weathering and UV radiation
- high transparency and yellowing resistance, thus particularly suitable for lighting electronics/LED technology
- excellent dielectric properties: the dielectric constant and the dissipation factor tan δ are almost independent of frequency and temperature
- thanks to the fluorescent adjustment, the coating can be easily and reliably checked under UV light (black light)
- can be easily removed mechanically or soldered through for repair purposes, and be reapplied to the previously cleaned substrate after the repair work.

* 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.

LP 201412 E-3 / 300092e_000

Characteristics

Colour/appearance	colourless, fluorescent (slightly turbid in liquid condition)
Solids content	100 %
Viscosity* at 20 °C [68 °F], ISO 3219	1 000 ± 200 mPas
Density at 20 °C [68 °F], ISO 2811-1	1.00 ± 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: DSL = thick film coating, FLZ = fluorescent

Physical and mechanical properties

Property	Test method	Result
Coefficient of thermal expansion (CTE)	TMA (measuring range -70 to 150 °C [-94 to 302 °F]	≈ 290 ppm/°C
Flexibility	IPC-CC-830C, 3.5.5	passed

Electrical properties

Property	Test method	Result
Dielectric strength	IPC-TM-650, 2.5.6.1 DIN EN 60243-1	≥ 57 kV/mm
Dielectric strength	IPC-CC-830C, 3.6.1	passed
Specific volume resistivity	VDE 0303, part 30/DIN IEC 60093, IPC-TM-650, 2.5.17.1	≥ 2.1 x 10^{14} Ohm x cm
Surface resistance	VDE 0303, part 30/ DIN IEC 60093, IPC-TM-650, 2.5.17.1	≥ 2 x 10^{14} Ohm
Moisture and insulation resistance	IPC-CC-830C, 3.7.1 (65 °C [149 °F]/90 % r. h.)	passed
Moisture and insulation resistance	85/85 test; ramp formed storage at high air moisture and high temperature, amongst others 3 days at 85 °C [185 °F] and 85 % r. h.	≥ 5 x 10^{9} Ohm
Thermal shock resistance	IPC-CC-830C, 3.7.2 -65 to +125 °C	passed
Hydrolytic stability	IPC-CC-830C, 3.7.3	passed
Comparative Tracking Index (CTI, Tracking resistance)	DIN EN 60112 on base material with CTI 300	CTI > 600
Resistance to condensation	based on DIN EN ISO 6270-2 (BIAS 12 V, 40 °C [104 °F], 100% r. h.)	≥ 1.4 x 10^{10} Ohm
Permittivity ε_r	based on ASTM D 150 at 100 Hz at 100 kHz	≈ 2.64 ≈ 2.66
Dissipation factor tan δ	based on ASTM D 150 at 100 Hz at 100 kHz	≈ 0.001 < 0.001

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.
TI	Technical information TI 15/3 ”Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents“
TI	Technical information TI 15/18 “Handling of silicones“

The silicone thick film coating **ELPEGUARD® DSL 1705 FLZ** can be applied by dipping, brushing, or by means of automatic selective coating units.

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.

Generally an even, bubble-free not too thick coating layer should be aimed for when processing **ELPEGUARD® DSL 1705 FLZ**. To achieve higher layer thicknesses in one step, an enclosure around the area to be coated may have to be created to prevent the coating from dripping off on account of its low viscosity. Alternatively, double coating is also possible in this case.

➔ Ensure that the surface to be coated is clean, grease-free and dry.

Grease, moisture and contamination of the surface, as for instance due to organic tin compounds, sulphur and sulphur compounds, amides, amines, azides, urethanes, may lead to problems during curing such as bubbles and voids. Characteristic for such kinds of contamination is liquid, non-cured material at the interface between substrate and coating after thermal curing. Contaminations also have a negative effect on the adhesion so that water may deposit between the pcb and conformal coating and thus lead to corrosion/failure.

 Protect against humidity

➔ Therefore, clean the assembly of fluxing agents and other contaminations or ensure that the properties you require can be achieved by performing corresponding tests.

➔ Make sure you check the assembly manufactured under series-production conditions after its coating and curing, subject to later operating conditions.

Safety recommendations

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

Auxiliary products recommended

- ELPESPEC® cleaning agent R 5817
  for the cleaning of work place and tools/equipment

Manual processing

The silicone thick film coating **ELPEGUARD® DSL 1705 FLZ** can be applied by means of brushing. This process is especially suitable for repair work and small series' as the ink can be applied selectively. But in this case, uneven layer thicknesses may result.

Mechanical processing

Dip coating

→ Determine the optimum dipping parameters for your application purposes by performing pre-trials. Reduce the emersion velocity or adjust a dwell time in the dip tank if air-bubbles form between pcb and components.

→ Keep the temperatures in the dip tank < 30 °C [86 °F] to extend the processing time.

The achieved layer thickness is dependent upon the component geometry and emersion velocity. Emersion velocities of 2 - 4 mm/s usually effect good coating results.

→ If necessary, reduce the emersion velocity so that less coating drips off and the layer thickness becomes more even.

→ Let excess coating drip off after emersion by turning and tilting the pcb at an angle of 30° if possible. This way a draining tip results so that drip residues only form there.

Ensure the dip tank is protected against contamination/moisture:

→ Use clean tools only.

→ Close or seal the dip tank when not in use, even in case of shorter breaks.

→ Clean the dip tank completely at regular intervals.

Automatic selective coating

The use of automatic selective coating units makes it possible to coat defined areas of the assembly with a uniform ink film.

Optimum equipment parameters depend upon the assembly geometry, the required final properties etc. and thus should be determined in co-operation with the corresponding unit manufacturer, Lackwerke Peters GmbH & Co. KG as well as the end user.

Drying/curing

ELPEGUARD® DSL 1705 FLZ is cured at 100 °C [212 °F] for 10 min.

* The curing time is dependent upon the layer thickness as well as the heat absorption of the assembly and thus must be extended if necessary.

The silicone thick film coating **ELPEGUARD® DSL 1705 FLZ** can be cured when encapsulated; this way it is protected against volatile contaminations from the oven that may have an inhibiting effect on the curing reaction.

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 9 months

Storage conditions: +5 °C to +10 °C [+41 °F to +50 °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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