

# Via fillers of the series PP 2795

The via fillers of the series **PP 2795** permit a blister-free planar filling/plugging of vias and a subsequent application of smooth insulation layers in HDI/SBU technology (high density interconnect/sequential build up).

- Solvent-free 1-pack systems with long processing time
- application by means of screen and stencil printing, vacuum plugging or roller coating processes
- also available in cartridges
- pluggable diameters of approx. 0.1 to 2 mm are very much depending on the "aspect ratio" of the vias to be plugged
- the highly viscous adjustment **PP 2795 HV** permits the filling of extremely thick printed circuit boards or of higher "aspect ratios"
- excellent metallisability
- very low volume shrinkage, no "dish down"
- no cracking or delamination of the metallised layer applied
- good adhesion
- good grindability
- UL approval: best flame class V-0 acc. to UL 94 (UL file no. E80315)
- **PP 2795**: tested in acc. with ASTM E595 (outgassing test recognised by NASA)
- **PP 2795**: listed in the NASA specification D-8208 "Spacecraft Design and Fabrication Requirements for Electronic Packaging and Cabling; Section 3.6, Printed Wiring Boards; Table 3.6-5: Acceptable Via Hole-Fill Material"
- long shelf life: up to 6 months

## Characteristics

	Colour/ appearance	Solids content	Viscosity* at 20 °C [68 °F], DIN EN ISO 3219	Density 20 °C [68 °F], DIN EN ISO 2811-1
PP 2795	white	100 %	22 000 ± 3 000 mPas	1.54 ± 0.05 g/cm <sup>3</sup>
PP 2795 HV	white		37 500 ± 3 000 mPas	1.53 ± 0.05 g/cm <sup>3</sup>

\* measured with Haake RS 600, C 1/1°, D = 50 s<sup>-1</sup>,  
viscosity measuring unit supplied by Thermo Fisher Scientific, [www.thermofisher.com](http://www.thermofisher.com)  
Index: HV = highly viscous

## Physical and mechanical properties


Property	Test method	Result
Glass transition temperature T <sub>g</sub>	TMA	≈ 120 °C [248 °F]
Coefficient of thermal expansion CTE	TMA	≈ 40 ppm/°C < T <sub>g</sub> ≈ 150 ppm/°C > T <sub>g</sub>
Adhesion	IPC-SM-840E, 3.5.2.1	passed
Pencil hardness	IPC-SM-840E, 3.5.1 acc. to Wolff-Wilborn	≈ 9 H ≈ 9 H
Solvent resistance	isopropanol, 20 °C [68 °F] 1h methyl ethyl ketone, 20 °C [68 °F], 1 h	passed passed
Resistance to acids	10 % by volume HCl, 20 °C [68 °F], 1 h	passed
Resistance to lyes	10 % by volume NaOH, 20 °C, [68 °F] 1 h	passed
Water absorption	DIN EN ISO 62 (24 h/23 °C [73.4 °F])	≈ 0.06 %
Solder bath resistance	IPC-SM-840E, item 3.7.2 IPC-TM-650, 2.6.8 UL 94	passed: 20 s at 265 °C [509 °F] passed: 10 s at 288 °C [550.4 °F] passed: 20 s at 290 °C [554 °F]

\* With a solder bath resistance of 20 s at 290 °C [554 °F], the via fillers of the series **PP 2795** meet the temperature resistance requirements for soldering processes with lead-free solder.

## Electrical properties

Property	Test method	Result
Surface resistance	VDE 0303, part 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	≥ 3.0 x 10 <sup>12</sup> Ohm
Volume resistivity	VDE 0303, part 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	≥ 1.2 x 10 <sup>16</sup> Ohm x cm
Moisture and insulation resistance	IPC-SM-840E, 3.9.1	class H and T
Comparative tracking index (CTI)	DIN EN 60112 on base material FR 4 with CTI 275	≥ CTI 500
Permittivity ε <sub>r</sub>	DIN 53483 1 kHz 1 MHz 1 GHz	≈ 2.8 ≈ 2.5 ≈ 2.8
Dielectric loss factor tan δ	DIN 53483 1 kHz 1 MHz 1 GHz	≈ 0.005 ≈ 0.010 ≈ 0.020

## 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.
<b>MSDS</b>	The corresponding material safety data sheet contains detailed information and characteristics on safety precautions, environmental protection, transport, storage, handling and waste disposal.
<b>TI</b>	<a href="#">Technical information TI 15/3</a> "Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents"
<b>TI</b>	<a href="#">Technical information TI 15/13</a> "Precogning in the pcb fabrication process"

The via fillers of the series **PP 2795** can be applied by means of all standard application methods. Please see the table below to find the suitable product adjustment for your application method.

	Screen and stencil printing	Vacuum plugging	Roller Coating
PP 2795	X	X	X
PP 2795 HV	X	X	—

The processing parameters specified are given for orientation purposes and, depending on the layout of the printed circuit board and the "aspect ratio" of the plated-through holes to be filled, must be optimised and adjusted to prevailing production conditions. The via fillers of the series **PP 2795** must be processed in the condition supplied.

- Ensure that the surface to be coated is clean, dry and grease-/oxide-free and that copper surfaces preferably have an average surface roughness of 2 µm.
- Store cartridges in an upright position. Prior to use, slightly depress plunger to expel potential air pocket at top. This will avoid the inclusion of extraneous air in the filling process.

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.

### Safety recommendation

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

## Auxiliary products recommended

- [ELPESPEC® screen opener HP 5200](#)  
highly active spray for dissolving dried screen printing inks from the screen; silicone- and grease-free, thus no surface defect/dewettings or smearing effects to be expected
- [ELPESPEC® anti-static spray HP 5500](#)  
prevents and eliminates electrostatic discharge occurring during screen printing; silicone- and grease-free
- [ELPESPEC® cleaning agent R 5899](#)  
for screen washing equipment, simply and safely to handle, no labelling in accordance with the German dangerous goods regulations required, extremely high flash point (> 100 °C [> 212 °F]), low vapour pressure < 0.1 hPa at 20 °C [68 °F], thus not affected by the EU-VOC regulation 1999/13/CE
- [ELPESPEC® cleaning agent R 5821](#)  
for the cleaning of equipment and work tools, high flash point (+32 °C [89.6 °F])
- [ELPESPEC® cleaning agent R 5817](#)  
for the manual cleaning of screens and tools

## Screen and stencil printing

### Screen printing parameters recommended

Screen fabric	Steel fabric: - 224/100 - 245/65 - 265/50
Screen printing stencil	free spaces in the screen fabric > hole diameter (0.3 – 0.5 mm larger depending on print format size) A high stencil build-up is not necessary as the ink should only be printed into the vias. As a rule, it is sufficient to close the screen mesh with a thin coat of emulsion or a thin capillary film.
Printing underlay	Base material of approx. 3 mm thickness that has been drilled with the same drill program but where the diameters of the holes are five times the size of the actual vias (the printing underlay enables the filling of the holes since there is no resistance caused by air pockets under the holes). An undergrid would also be acceptable provided it does not permit the printing substrate to spring.
Snap-off	Low
Flooding	Rubber squeegee 75 Shore A push stroke 70°
Printing	Rubber squeegee 75 Shore A, squeegee profile 30–45° printing angle 90° As high a squeegee pressure as possible (4 bar) and as low a printing speed as possible

## Vacuum plugging processes

The following parameters are meant for orientation purposes and may vary considerably.

### Parameters recommended

Vacuum	10–15 mbar
Print speed	2–8 mm/s
Paste pressure	4–8 bar
Head pressure	3–5 bar

## Roller coating process

For this application method, a roller is used to press the via filler, which is stored in a tank below, into the metallised holes. Transport speed and contact pressure of the squeegee strongly depend on the printed circuit board layout, in particular on the “aspect ratio”. Excess material is doctored by means of a follow-up squeegee.

When applying the roller coating method, the board should be at least 0.3 mm thick in order to ensure the stability of the inner layer. If boards are thicker than 2.1 mm it gets more difficult to fill the holes completely.

## Drying/curing

→ Cure the via fillers of the series **PP 2795** for at least **45 min at 150 °C [302 °F]**\*

\* Object holding time: The time is measured from the point where the panels reach the curing temperature.

Owing to the high thermal absorption of thick printed circuit boards the curing time may be longer.

A controlled curing by steps may improve cross-linking and increase the Tg. This must be verified by carrying out pre-trials.

In case of an application by roller coating a very thin film of via filler may remain on the copper surface. In this case, longer curing times and/or higher curing temperatures (as far as the base material can withstand them) must be foreseen since the via filler cures slower in thin layers than in thicker ones.

As a general rule, longer curing times and higher temperatures up to 180 °C [356 °F] do not provoke any negative effect in respect of the via filler’s functionality.

→ Store the pcbs vertically for curing to avoid dipping of the via filler **PP 2795** into the holes.

The via fillers of the series **PP 2795** are also suitable for being cured in IR conveyorised ovens.

The curing parameters are, among others, dependent upon the pcb thickness and the percentage of copper on the pcb.

→ Determine the appropriate curing parameters in pre-trials.

## Grinding/metallising

After curing, any remaining material is removed from the pcb by means of ceramic rollers or similar devices. Then the metallisation can be effected by means of the common methods practised in pcb production.

In between the desmear process for surface pre-treatment and the electro copper plating, a postbake of 30 min at 120 °C [248] is necessary. Metallisation can also be effected without previous desmearing.

If the via filler has been attacked too strongly by the desmear process, a longer curing time and/or higher curing temperature may be chosen to increase the resistance, or the desmear parameters can be adapted.

## 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 containers at least 6 months  
Store cartridges in upright position



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



Protect against frost

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.

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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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