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TR TECHNICAL REPORT

Wepuran casting compound

VU 4444/31 SB-WB

Base: Polyurethane resin (PUR)

- **black**
- elastic
- extremely resistant to weathering and UV radiation
- good adhesion
- low heat development and low shrinkage pressure
- provides excellent contrast to embedded LEDs
- corresponds to the best flame class V-0 in accordance with UL 94

Indices: **VU = casting compound, opaque**
/31 = mixing ratio 3:1
SB = hardly flammable
WB = weatherproof

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Please read this technical report, the corresponding material safety data sheet and the Technical Information sheets TI 15/2, TI 15/3 and TI 15/10 (see item 4 and 7) carefully before using the product.

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1. General information

The Wepuran casting compound **VU 4444/31 SB-WB** is a black, elastic, solvent-free 2-pack-casting compound based on polyurethane resin (PUR) that already cures at room temperature.

All symbols that are used in this technical data sheet and on our containers, such as , are explained on our website www.peters.de in the section "Service – Technical publications – Label symbols".

2. Application

The Wepuran casting compound **VU 4444/31 SB-WB** is electrically insulating, protects against corrosion caused by climatic and moisture influences as well as against mechanical attack and is temperature resistant to at least 90 °C [194 °F] (see also Item 6.2 "Physical and mechanical properties"). It was especially developed for the electronics/electrical engineering industries and is used to encapsulate, embed or cast electronic components, assemblies and electrical equipment.

On account of its high elasticity and very low volume and shrinkage pressure, the Wepuran casting compound **VU 4444/31 SB-WB** is particularly suitable for high-quality, temperature- and shock-sensitive electronic components (e. g. sensors, glass diodes, ferrite cores, etc.) due to the low heat development during curing and the fact that their elasticity in operation means that material tension resulting from temperature changes is reduced. Further applications are possible such as:

- Components for sensor technology, opto- and automotive electronics
- Heat sensors, heating elements, cup capacitors, mini and print transformers, cables and cable-end connections
- Ignition, induction and transformer coils
- TV picture tubes (implosion protection)
- Batteries and accumulator cases
- High voltage cascades and cables for TV technology
- HF parts, e.g. high frequency coils, interference filters.

3. Special notes

Owing to its unusually high weather and UV radiation resistance the casting compound **VU 4444/31 SB-WB** is particularly suitable for application in outdoor areas where it exhibits no reduction in gloss or adhesion even after longer periods.

VU 4444/31 SB-WB is frequently applied in optoelectroncs owing to its opaque black appearance which offers an excellent contrast to embedded LEDs.

It is particularly distinguished by a high flexibility and elasticity and very low shrinkage pressure and thus can replace the considerably more expensive silicone-rubber casting compounds in many applications if a high elasticity (e. g. sensor technology), but not a high temperature stability is required.

VU 4444/31 SB-WB can be used in a temperature range of -40 to at least +90 °C [-40 to at least 194 °F] (see also Item 6.2 "Physical and mechanical properties"); a use to -65 °C is possible. 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.

Besides the Wepuran casting compound **VU 4444/31 SB-WB** a whole range of casting compounds based on polyurethane resin, epoxy resin and silicone-rubber in various colour, viscosity and elasticity adjustments as well as with self-extinguishing properties (UL registered) are available. For exceptionally high demands on temperature stability a number of silicone-rubber casting compounds are available that meet the thermal class 200 = 200 °C [392 °F]. Special technical reports on these products are available on our website for download.

4. Safety recommendations

→ Please read the corresponding material safety data sheet where you will find detailed specifications of safety precautions, environmental protection, waste disposal, storage, handling, transport as well as other characteristics.

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

→ Please read our **Technical Information sheet TI 15/3 "Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents".** On our website, the technical information sheets can be accessed in the section "Service – Technical publications".

5. Characteristics

Colour/appearance		black
Viscosity * at 20 °C [68 °F] ISO 3219	Component A Component B Mixture	12,000 ± 1,000 mPas* 400 ± 50 mPas** 3,500 ± 500 mPas**
Density at 20 °C [68 °F] ISO 2811-1	Component A Component B Mixture	1.60 ± 0.05 g/cm³ 1.09 ± 0.05 g/cm³ 1.44 ± 0.05 g/cm³
Pot life of mixture at 18-23 °C [64.4-73.4 °F] (start-up temperature 20 °C [68 °F], set-up quantity 500 g) Double viscosity Tenfold viscosity		 approx. 45 min approx. 75 min

* measured with Haake RS 600, C 20/1°, D = 50 s^{-1}

** measured with Haake RS 600, C 35/1°, D = 100 s^{-1}, viscosity measuring unit supplied by:
Thermo Electron (Karlsruhe) GmbH (formerly Haake-Messtechnik GmbH + Co)
Dieselstraße 4, 76227 Karlsruhe, Germany
Phone +49 (0) 721 - 40 94 - 0; Fax +49 (0) 721 - 40 94 - 300
www.thermo.com

6. Properties

The Wepuran casting compound **VU 4444/31 SB-WB** is distinguished by the following properties:

6.1 General properties

- does not contain substances listed in the RoHS directive 2011/65/EU, EU End-Of-Life Vehicle directive 2000/53/EC and WEEE directive 2002/96/EC
- does not contain any substances listed in the United States' EPA 33/50 program [This 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.]
- solvent-free, therefore practically no attack of solvent-sensitive plastics like polystyrene and no danger of etching lacquer-coated wires, no nuisance caused by solvents
- already cures at room temperature with very low heat development
- very low volume shrinkage, thus low shrinkage pressure on cast components
- good adhesion to almost all substrates
- high elasticity to reduce material stress caused by thermal shocks
- excellent protection from shock, impact and vibration
- low water absorption, thus resistant to water, humidity and condensate
- good resistance to numerous chemicals, acids, lyes, oils and solvents
- good dielectric properties over a temperature range from -40 up to +90 °C [-40 – 194 °F]

- excellent resistance to weathering and UV radiation
- hardly flammable
- corresponds to best flame class V-0 according to UL 94
- free of halogenated flame retardants.

6.2 Physical and mechanical properties

These properties are reached after 14 days storage at room temperature (18–23 °C [64.4–73.4 °F]).

Property	Test method	Result	
Shore-A hardness	DIN 53 505	80 ± 5	
Shore-D hardness	DIN 53 505	30 ± 5	
Water absorption	ISO 62 24 h/23 °C [73.4 °F] 30 min/100 °C [212 °F] + 15 min/23 °C [73.4 °F]	approx. 1.1 % approx. 0.4 %	
Glass transition temperature Tg	TMA (thermomechanical analysis)	approx. -8 °C	
Coefficient of thermal expansion	TMA (thermomechanical analysis)	approx. 50 ppm/°C < Tg approx. 155 ppm/°C > Tg	
Thermal class	based on DIN IEC 60 085	Y = 90 °C [194 °F]	
Temperature index (TI)	based on DIN EN 60216 (IEC 60216), issue 2001 mass loss: 5 % 10% 20 % 50 %	after 20,000 h 80 °C [176 °F] 90 °C [194 °F] 105 °C [221 °F] 120 °C [248 °F]	after 5,000 h 105 °C [221 °F] 115 °C [239 °F] 130 °C [266 °F] 145 °C [293 °F]

6.3 Electrical properties

These properties are reached after 14 days storage at room temperature (18–23 °C [64.4–73.4 °F]).

Property	Test method	Result
Dielectric strength	VDE 0303, part 21/DIN EN 60 243-1	25 kV/mm
Surface resistance	VDE 0303, part 30/DIN IEC 60093	2 x 10^{14} Ohm
Specific volume resistivity	VDE 0303, part 30/DIN IEC 60093	3 x 10^{13} Ohm x cm
Comparative tracking index (CTI, tracking resistance)	DIN EN 60 112	CTI > 600

7. Processing

→ Read our **Technical Information sheet TI 15/2 "Selection criteria and processing advice for casting compounds/resins"** where you will find detailed recommendations on processing. On our website, you will find technical information sheets in the section "Service – Technical publications".

Stir before use

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

7.1 Mixing

The two components are already packed in the correct mixing ratio. The volume of the container of component A is sufficient to accommodate the total quantity of component B and to allow perfect mixing.

→ Mix both components in the specified mixing ratio (see also 7.4 ”Manual Processing"):

Component A : Component B = 3: 1 (parts by weight)

For stirring we recommend mechanical stirring equipment. For more detailed information on correct mixing please read our **Technical Information sheet TI 15/10: "Processing of 2-pack systems"** In our report manual this technical information sheet is filed under group 15. On our website, you will find application information sheets in the section "Service – Technical publications”.

To avoid penetration of moisture close opened containers carefully after use. Consume opened containers as soon as possible.

7.2 Viscosity adjustment

The Wepuran casting compound **VU 4444/31 SB-WB** must be processed in the condition supplied.

Do not add solvents or thinners to reduce the viscosity.

7.3 Auxiliary products

- **Accelerator B 4402**
  The accelerator reduces not only the curing time but also the processing time. For this reason, it should only be used in mixing and dispensing units. The accelerator is stirred into component A and then mixed with component B.
- **Sealing mastic EH 13.271**
  The solvent-free, self-adhesive, permelastic, easily formed and temperature resistant sealing mastic **EH 13.271** is suitable for the sealing of casting moulds and cable outlets.
- **Mould release agent EH 13.650**
  Polyurethane resins show an excellent adhesion to nearly all substrates. To ensure easy, residue-free removal of the potting after curing, even from complicated moulds, the surfaces of the parts to be potted should be treated with the mould release agent **EH 13.650** prior to potting. **EH 13.650** is solvent-, silicone- and grease-free.
- **Adhesion promoters EH 13.950/EH 13.951**
  Adhesion promoters to improve the adhesion of casting compounds and casting resins based on polyurethane or epoxy resin and electropastes. **EH 13.950** is applied thinly to the parts that will come into contact with the casting compound. After the solvent has evaporated potting can be immediately effected. **EH 13.951** is mixed thoroughly with the casting compound prior to potting. Concentration: 1–3%.

- **Cleaning agent R 13.780**
  For the cleaning of work place and tools we recommend the cleaning agent **R 13.780**. Cleaning should be effected immediately after processing as cleaning becomes increasingly difficult the further the curing process progresses and is impossible after final curing.

Do not use cleaning agent as a thinner or for washing hands since solvents remove the natural grease from skin.

Special technical reports on these products are available on our website for download.

7.4 Manual processing

→ Choose compound quantity only as large as can be processed within the pot life (see Item 5 “Characteristics”).

→ While mixing, ensure that no air is stirred in since air inclusions influence the final properties of the casting compound.

→ Mix components A and B thoroughly.

→ In order to remove potential air inclusions, if possible evacuate the casting compound before or after potting.

7.5 Mechanical processing

When using mixing and dispensing equipment the pot life is irrelevant.

For volumetric mixing and dispensing equipment:

→ Since the mixing ratio is indicated in parts by weight, the corresponding quantities to be dispensed must be converted by means of the densities. Note that the densities indicated in item 5 are valid for a temperature of 20 °C [68 °F].

Reliable manufacturers of such equipment can be named upon request.

8. Drying/Curing

The casting compound is cured after approx. 24 hours to such an extent that it is no longer liquid or sticky and the item can be processed. However, the final hardness only is attained after 14 days.

Curing can be accelerated considerably by applying heat. However, when choosing the temperature, the heat-sensitivity of the item in question must be taken into account.

The following specifications for a quantity of 25 g serve as a guideline:

	Room temperature (18 - 23°C [64.4 – 73.4 °F])	**80°C [176 °F]**	**125°C [257 °F]**
Tack-free	24 h	1 h	20 min
Final hardness	14 days	2 h	1 h

9. Standard packaging

The Wepuran casting compound **VU 4444/31 SB-WB** is packed for delivery as follows:

Component A	**Component B**	**Selling unit**
4 tins of 3 kg	4 cans of 1 kg	16 kg

Partial lots of the selling unit may be ordered, but will entail surcharges to cover repackaging costs.

10. Shelf life and storage conditions

Labels on containers show 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

Protect against frost (component B)

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.

11. Further literature/Technical publications

In addition to the recommendations given in this technical report, we can provide technical papers and information sheets written and compiled by members of our staff. Visit our website **http://www.peters.de** and see the section “Service – Technical publications”.

We also recommend for further reading:
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

12. Further products for the production of pcbs

We offer a wide range of **etch resists (photoimageable, UV curing, conventional curing), plating resists, solder resists (photoimageable, UV curing, conventional curing) as well as peelable solder masks, marking inks (photoimageable, UV curing, conventional curing), carbon-conductive inks, via hole fillers (purely thermal curing), thick film fillers, plugging pastes, heatsink pastes, special strippers for solder resists and further auxiliary products for screen printing (e. g. cleaning agents, thinners).**

Special technical reports for these products are available on our website for download

13. Further products for electronics/electrical engineering industries

We boast a wide range of **conformal coatings, thick film lacquers, casting compounds, casting resins, electro pastes, insulating lacquers, impregnating varnishes, adhesive lacquers and auxiliary products for electronics.**

Special technical reports for these products are available on our website for download

Any questions?

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

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