



Technical data sheet

Brandenburger Liner BB^{2.5} VERTICAL

Version 09/23 DST (Rev.5)
Ersetzt Version 02/23 PDU (Rev. 4)

1. Technical data

The product technology is covered by the BB^{2.5} approval.

Material properties	Standard	Brandenburger Liner BB ^{2.5} VERTICAL
Short-term circumference-e-module	EN 1228	14,200 N/mm ²
Long-term circumference-e-module	EN 1228	11,180 N/mm ²
Short-term bend-e-module	ISO 178	11,800 N/mm ²
Long-term bend-e-module	ISO 178	9,290 N/mm ²
Material code group	DWA-M 144-3	22
Density	ISO 1183	1.54 g/cm ³
Short-term bending stress	ISO 178 ISO 11296-4	200 N/mm ²
Long-term bending stress	ISO 178 ISO 11296-4	157 N/mm ²
Long-term reduction factor (50 years)	EN 761	1.27

2. Wall thickness / statics

The Brandenburger Liner BB^{2.5} VERTICAL is ordered by the executing company from Brandenburger Liner GmbH & Co. KG according to specified requirements based on structural design. At the Landau plant, the liner is manufactured with an average wall thickness that meets the static specifications. The wall thicknesses are average values due to the winding technology.

The wall thickness after installation results from the initial wall thickness, the expansion during installation and the volume constancy. The design of this product is to be defined in close consultation with our sales department.

3. Material certificates

The GRP liner is produced endless, ready for installation, protected inside and outside by special air-tight and water-tight films and packed in a UV-proof film.

DIN 16869, Part 2 "Pipes made of glass-fibre-reinforced polyester resin (UP-GF)" is taken into account when using the individual materials.

4. Material certificate for resin

Unsaturated polyester (UP) or vinyl ester (VE) resin equipped with a UV-light initiator that causes curing. The reactive resin compound is produced in a processing method developed by Brandenburger for this purpose, so that it can be used for exceptionally uniform waterproofing.

UV light-curing resins

(selected resin properties):

Resin	UP resin	VE resin
Type acc. to DIN 16946	1140	1310
Group		
acc. to DIN 18820 part 1	3	5
acc. to EN 13121	4	7A
Density	1.1 g/cm ³	1.1 g/cm ³
Glass transition temperature		
DIN 53445	140°C	132°C
Resin E-module		
DIN 53457	4000 N/mm ²	3700 N/mm ²

5. Material certificate for reinforcing material

A laminate of a specially developed glass-fibre complex is used, which has a glass-bonded pure resin wear layer of 0.1 mm and an extraordinary glass structure part. In accordance with EN 14020, the chemically high-quality textile glass-fibre quality Advantex® with a basis weight of approx. 730 g/m² is used. The Brandenburg Liner **BB^{2.5} VERTICAL** has no seams, as it is bonded seamlessly to the glass complex laminates in a specially developed patented process.

6. Protection films

The Brandenburg Liner **BB^{2.5} VERTICAL** is manufactured including the outer and inner protection films:

- The styrene-resistant inner film/calibration tube, (polyamide (PA)/ polyethylene (PE) - composite film), is removed again after curing.
- The fleece-laminated outer film is UV-proof and styrene-proof. The outer film does not protect the liner against water penetration into the manhole.

7. Resistance to chemical attack as well as high (wastewater) temperatures (acc. to ATV M 143-3; DIN 18820-1)

For waterproofing of the Brandenburg Liner **BB^{2.5} VERTICAL**, a UP resin (type 1140, DIN 16946 and group 3, DIN 18820) is used, which meets the high required resistance to municipal wastewater according to DIN 19550. In the case of very aggressive wastewater as well as higher continuous temperatures (> 30°C to approx. 70°C) a vinyl ester resin can be used. (An overview regarding selected chemical resistances to a wide range of substances is available on request) In each individual case, the chemical durability of the resin type must be checked by means of individual water analysis.

8. Leak test

The liner is leak-proof according to DIN EN 1610.

9. Transportation and storage of the liners

The liners come standard with sturdy wooden packaging and are packed in a UV-proof film. If necessary, intermediate packing layers are used. They can be shipped both on the ground by shipping agencies and by air or sea freight. The liner is approved for transport by IATA.

The UP resin liner can be stored at a temperature between +5°C and +30°C for up to 12 weeks and at a storage temperature between +12°C and +20°C for up to 26 weeks after the date of manufacture.

The VE resin liner can be stored between a minimum of +5°C and a maximum of +30°C for a maximum of 6 weeks and at a storage temperature of +12°C to +20°C for up to 12 weeks after the date of manufacture.

It is essential to note that the storage period begins from the moment of completion of the liner. Basically, it is recommended to store the liners in the wooden boxes in temperature-controlled warehouses until installation, as they must not be exposed to direct weather influences (sun, moisture, frost) and, if possible, to temperature fluctuations. Mechanical damage must be avoided under all circumstances. Deviations from the prescribed storage and transport conditions, may affect or prevent the durability of the liner and proper installation. In the course of any warranty claims, the storage conditions must be complied with completely and demonstrably.

It should also be noted that the storage temperatures do not correspond to the recommended installation temperatures. The minimum installation temperature measured on the laminate starts at +15°C. Before installation, the liners must be brought to the recommended minimum installation temperature.

10. Quality assurance

The Brandenburg group of companies owes its international competitiveness to its innovative strength and its own high standards for the products it manufactures. This is expressed in a lived quality concept and the successful certification according to DIN EN ISO 9001:2015. The focus of all processes is product safety for our customers as well as the safety of our employees and the environment.

The products of the Brandenburger group of companies are produced under the supervision of the quality management system implemented in 1994, which is certified by TÜV Rhineland according to DIN EN ISO 9001:2015 and has international validity. Also the Brandenburger Liner **BB²⁻⁵ VERTICAL** is also manufactured under strict supervision of these specifications, thus meeting the high quality demands of our customers.

We reserve the right to make changes within the scope of further technical developments. The reference values listed in this data sheet are not contractual data.

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