

Product Specification Sheet

Belzona 1111 (Super Metal)

FN10229



General Information

Product Description:

A two-component paste grade system for repairing and rebuilding machinery and equipment. Based on a silicon steel alloy blended with high-molecular weight reactive polymers and oligomers. When cured, the material is durable yet fully machinable. Also used as a high-strength structural adhesive for bonding or for creation of irregular load bearing shims with good electrical insulation characteristics. For use in Original Equipment Manufacture or repair situations.

Application Areas:

When mixed and applied as detailed in the Belzona Instructions for Use (IFU), the system is ideally suited for application to the following:

- Shafts,
- Hydraulic rams
- Bearing housings
- Keyways
- Engine blocks
- Casings
- Piping, pipeline, and pipework
- Tanks
- Flange faces

Application Information

Application Methods: Applicator, spatula

Application Temperature: The application should ideally occur from 41 °F to 86 °F (5 °C to 30 °C).

Working Life: The working life will vary according to application temperature. The usable life of mixed material will typically be 15 minutes at 77 °F (25 °C). Consult the Belzona IFU for specific details.

Volume Capacity: 25 in³/kg (408 cm³/kg)

Cure Times:

Cure times will vary depending on the ambient conditions and will be reduced for thicker sections and extended for thinner applications. Consult the Belzona IFU for specific details.

Base Component

Appearance	Paste
Color	Dark grey
Gel Strength (4 cm ² paddle) at 22 °C	110 – 180 g/cm
Density	0.043 – 0.044 kg/in ³ (2.6 – 2.7 g/cm ³)

Solidifier Component

Appearance	Paste
Color	Light grey
Gel Strength (4 cm ² paddle) at 22 °C	40 - 150 g/cm
Density	0.026 – 0.028 kg/in ³ (1.6 – 1.7 g/cm ³)

Mixed Properties

Mixing Ratio by Weight (Base: Solidifier)	5: 1
Mixing Ratio by Volume (Base: Solidifier)	3: 1
Mixed Form	Paste
Peak Exotherm Temperature	210 - 230 °F (99 – 110 °C)
Time to Peak Exotherm	30 - 40 min.
Mixed Density	0.039 – 0.041 kg/in ³ (2.4 – 2.5 g/cm ³)
Slump Resistance	Nil at 1.0 in. (2.5 cm)
VOC Content (ASTM D2369/EPA Ref. 24)	0.09% (2.38 g/L)

The above application information serves as introductory guide only. For full application details including the recommended application procedure/technique, refer to the Belzona IFU which is enclosed with each packaged product.

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Abrasion

Taber

When tested in accordance with ASTM D4060 (1-kg load), the sliding abrasion of samples cured at 72 °F (22 °C) for 7 days will typically be:

CS17 Wheels (Dry)	25 mm ³ loss per 1,000 cycles
H10 Wheels (Wet)	616 mm ³ loss per 1,000 cycles

Adhesion

Tensile Shear

When tested in accordance with ASTM D1002, the tensile shear of Belzona 1111 applied onto abrasive-blasted strips to an average surface profile of 3 mil (75 µm) and cured at 72 °F (22 °C) for 7 days will typically be:

Aluminum	2,080 psi (14.3 MPa)
Brass	1,320 psi (9.1 MPa)
Copper	2,670 psi (18.4 MPa)
Mild steel	3,170 psi (21.8 MPa)
Stainless steel	2,340 psi (16.1 MPa)

Tensile Shear Fatigue

When tested in accordance with ASTM D3166, the tensile shear fatigue of samples of Belzona 1111* subjected to 653 psi (4.5 MPa) applied static tensile stress at 72 °F (22 °C), will typically be greater than 1M cycles.

* FN10132 tested

Pull Off Adhesion

When tested in accordance with ASTM D4541/ISO 4624, the pull-off adhesion of Belzona 1111 applied onto steel samples blasted to an average surface profile of 3 mil (75 µm) and cured under the conditions stated below for 7 days will typically be:

4,350 psi (30 MPa)	72 °F (22 °C)
6,070 psi (42 MPa)	212 °F (100 °C)

All samples were tested at 72 °F (22 °C).

Cleavage strength

When tested in accordance with ASTM D1062, the cleavage strength of Belzona 1111 applied onto abrasive-blasted strips to an average surface profile of 3 mil (75 µm) and cured at 72 °F (22 °C) for 7 days will typically be:

Carbon steel	1,174 lbf/in. (21 kgf/mm)
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Chemical Analysis

The mixed Belzona 1111 has been independently analyzed for halogens, heavy metals, and other corrosion-causing impurities in accordance with ASTM D4327 and ASTM E1479. Typical results are displayed as follows:

Analyte	Total Concentration (ppm)
Fluoride	49
Chloride	430
Bromide	< 47
Sulfur	854
Nitrile	< 6
Nitrate	< 10
Zinc	11

Antimony, Arsenic, Bismuth, Cadmium, Lead, Tin, Silver, Mercury, Gallium, and Indium ND (< 3)

ND: Not Detected

Chemical Resistance

When fully cured, the material will demonstrate excellent resistance to a broad range of chemicals. For a more detailed description of chemical resistance properties, refer to relevant Chemical Resistance chart.

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Compressive Properties

When tested in accordance with ASTM D695, the compressive properties of samples cured under the conditions stated below for 7 days will typically be:

Compressive Strength	
12,800 psi (88.2 MPa)	72 °F (22 °C)
17,950 psi (123.8 MPa)	212 °F (100 °C)

Proportional Limit	
12,730 psi (87.8 MPa)	72 °F (22 °C)
16,260 psi (112.1 MPa)	212 °F (100 °C)

Compressive Modulus	
3.3 x 10 ⁵ psi (2.3 GPa)	72 °F (22 °C)
4.1 x 10 ⁵ psi (2.8 GPa)	212 °F (100 °C)

When determined using a modified version of ASTM D695, at thicknesses more representative of in-service applications, typical values will be:

Thickness	Proportional Limit	Cure Temperature
0.24 in. (6.0 mm)	12,320.0 psi (84.9 MPa) 17,296.6 psi (119.3 MPa)	72 °F (22 °C) 212 °F (100 °C)
0.12 in. (3.0 mm)	17,148.3 psi (118.2 MPa) 28,139.8 psi (194.0 MPa)	72 °F (22 °C) 212 °F (100 °C)

Bonded to grit blasted carbon steel (single side)

Thickness	Proportional Limit	Cure Temperature
0.24 in. (6.0 mm)	16,383.6 psi (113.0 MPa) 21,940.9 psi (151.3 MPa)	72 °F (22 °C) 212 °F (100 °C)
0.12 in. (3.0 mm)	22,171.1 psi (152.9 MPa) 30,533.7 psi (210.5 MPa)	72 °F (22 °C) 212 °F (100 °C)

Corrosion Protection

Upon full curing at 72 °F (22 °C) for 7 days, Belzona 1111 will show no visible signs of corrosion after 5,000 hours of salt spray exposure in accordance with ASTM B117.

Electrical Properties

Typical electrical properties of samples of Belzona 1111* will be:

Dielectric Constant (Relative Permittivity)

When tested at 1 V and 10 kHz in accordance with ASTM D150, the dielectric constant is 8.0.

Dissipation factor (Tan Delta/Dielectric Loss)

When tested at 1 V and 10 kHz in accordance with ASTM D150, the dissipation factor is 0.09.

Dielectric Strength

When tested at 2,000 V/s in accordance with ASTM D149, the dielectric strength is 2.2 kV/mm.

Surface Resistivity

When tested at 500 V for 1 min. in accordance with ASTM D257, the surface resistivity is 2.3 x 10¹⁰ MΩ.

Volume Resistivity

When tested at 500 V for 1 min. in accordance with ASTM D257, the volume resistivity is 2.6 x 10⁹ MΩ-mm.

* FN10132 tested

Flexural Properties

When tested in accordance with ASTM D790, the flexural strength and strain-at-break of samples cured under the conditions stated below for 7 days will typically be:

Flexural Strength

10,280 psi (70.9 MPa)	72 °F (22 °C)
12,080 psi (83.3 MPa)	212 °F (100 °C)

Flexural Modulus

1.2 x 10 ⁶ psi (8.6 GPa)	72 °F (22 °C)
1.1 x 10 ⁶ psi (7.8 GPa)	212 °F (100 °C)

Hardness

Barcol

When tested in accordance with ASTM D2583, the Barcol hardness of samples cured at the conditions stated below for 7 days will typically be:

Barcol Model	72 °F (22 °C)	212 °F (100 °C)
934-1	23	24
935	84	85

Shore D

When tested in accordance with ASTM D2240, the Shore D hardness of samples cured at the conditions stated below for 7 days will typically be:

81	72 °F (22 °C)
81	212 °F (100 °C)

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Heat Resistance

Glass Transition Temperature (T_g)

When tested to ISO 11357-2, T_g of samples cured at the conditions stated below for 7 days will typically be:

156 °F (63 °C) Cured at 72 °F (22 °C)
216 °F (102 °C) Cured at 212 °F (100 °C)

Service Temperature Limits

For many applications, the product will be suitable for use at the following service temperatures:

Type of Service	Temperature
Lower temperature limit	-40 °C (-40 °F)
Upper temperature limit (dry)	80 °C (176 °F)
Upper temperature limit (wet)	60 °C (140 °F)

Dry Heat Resistance

The indicated degradation temperature in air based on Differential Scanning Calorimetry (DSC) operated in accordance with ISO 11357 is typically 392 °F (200 °C).

Impact Resistance

Izod Pendulum

When tested in accordance with ASTM D256, the impact (reverse notched) resistance of samples cured under the conditions stated below for 7 days will typically be:

1.1 ft-lb/in (57.61 J/m) 72 °F (22 °C)
1.3 ft-lb/in (68.44 J/m) 212 °F (100 °C)

Tensile Properties

When determined in accordance with ASTM D638, typical values of samples cured under the conditions stated below for 7 days will be:

Tensile Strength at Break

4,596.9 psi (31.7 MPa) 72 °F (22 °C)
6,351.4 psi (43.8 MPa) 212 °F (100 °C)

Strain-to-failure

0.41% 72 °F (22 °C)
0.59% 212 °F (100 °C)

Young's Modulus

1.38 x 10⁶ psi (9.5 GPa) 72 °F (22 °C)
1.36 x 10⁶ psi (9.4 GPa) 212 °F (100 °C)

Approvals

American Bureau of Shipping (ABS)

Belzona 1111 holds "Product Type Approval" by ABS under certificate number 22-2219785-1-PDA.

Direct Food Contact (FDA)

Belzona 1111 meets extraction requirements as set out in 21 CFR 175.300 for a broad range of food types in Conditions of Use D, E, and F.

Incidental Food Contact (USDA)

USDA compliant as an incident food contact surface.

Potable Water – NSF/ANSI/CAN 61

Belzona 1111 has been tested and certified by WQA against NSF/ANSI/CAN 61.

Belzona 1111 has met the extraction limits of NSF/ANSI/CAN 600 and NSF/ANSI/CAN 372.

For product use restrictions, visit www.wqa.org.



Contact Belzona for more details on these approvals or any other approvals or certifications not stated herein.

Shelf Life

Separate base and solidifier components shall have a shelf life of five (5) years from date of manufacture when stored in their original unopened containers between 41 °F (5 °C) and 86 °F (30 °C).

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Warranty

Belzona guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information for Use (IFU) leaflet.

Belzona further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.).

Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Availability and Cost

Belzona 1111 is available from a network of Belzona Distributors throughout the world for prompt delivery to the application site. For information, consult the Belzona Distributor in your area.

Health and Safety

Prior to using this material, please consult the relevant Material Safety Data Sheets.

Manufacturer/Supplier

Belzona Limited
Claro Road
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United Kingdom

Belzona, Inc.
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Technical Service

Complete technical assistance is available and includes fully trained Technical Consultants, technical service personnel and fully staffed research, development, and quality control laboratories.

The technical data contained herein is based on the results of long-term tests carried out in our laboratories and to the best of our knowledge is true and accurate on the date of publication. It is however subject to change without prior notice and the user should contact Belzona to verify the technical data is correct before specifying or ordering. No guarantee of accuracy is given or implied. We assume no responsibility for rates of coverage, performance or injury resulting from use. Liability, if any, is limited to the replacement of products. No other warranty or guarantee of any kind is made by Belzona, express or implied, whether statutory, by operation of law or otherwise, including merchantability or fitness for a particular purpose. Nothing in the foregoing statement shall exclude or limit any liability of Belzona to the extent such liability cannot by law be excluded or limited.

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