Product Specification Sheet
Belzona 1311 (Ceramic R-Metal)
FN10230

General Information

Product Description:
A two-component paste grade system designed for rebuilding metals damaged by erosion-corrosion. Based on silicon-steel alloy and ceramic particles blended within high molecular weight reactive polymers and oligomers. Specifically designed to be used with Belzona erosion-corrosion resistant coatings. 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:

- Centrifugal and turbine pumps
- Propellers
- Bow thrusters
- T-pieces
- Heat exchangers, water box ends, division bars and tube sheets
- Butterfly and gate valves
- Kort nozzles
- Pipe elbows

Application Information

Application Methods: Applicator, spatula

Application Temperature: The application should ideally occur from 41 °F to 77 °F (5 °C to 25 °C).

Working Life: The working life will vary according to 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: 24.4 in^3/kg (400 cm^3/kg)

Cure Time: 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
Colour	Dark grey
Gel strength at 77°F (25°C)	150 - 300 g/cm
Density	2.7 - 2.9 g/cm^3

Solidifier Component	
Appearance	Paste
Colour	Light Grey
Gel strength at 77°F (25°C)	40 - 150 g/cm
Density	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	203 – 232 °F (95 – 111 °C)
Time to Peak Exotherm	33 - 41 min
Mixed Density	2.4 - 2.6 g/cm^3
VOC content (ASTM D2369 / EPA ref. 24)	0.08% (1.93 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)	22 mm^3 loss per 1000 cycles
H10 Wheels (Wet)	563 mm^3 loss per 1000 cycles

Adhesion

Tensile Shear
When tested in accordance with ASTM D1002, the tensile shear of Belzona 1311 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:

Mild steel	3182 psi (21.9 MPa)
Brass	1489 psi (10.3 MPa)
Copper	2734 psi (18.9 MPa)
Stainless Steel	2253 psi (15.5 MPa)
Aluminum	2147 psi (14.8 MPa)

Pull off adhesion
When tested in accordance with ASTM D4541/ISO 4624, the pull-off adhesion of Belzona 1311 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:

4140 psi (28.5 MPa)	72°F (22°C)
6512 psi (44.9 MPa)	212°F (100°C)

Chemical Analysis

The mixed Belzona 1311 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)
Floride	35
Chloride	423
Bromide	<45
Sulfur	790
Nitrite	<6
Nitrate	<10
Zinc	15
Antimony, Arsenic, Bismuth, Cadmiun, Lead, Tin, Silver, Mercury, Galium, and Indium	ND (<5)

ND: Not Detected

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 (Maximum)

13073 psi (90.1 MPa)	72°F (22°C)
16051 psi (110.7 MPa)	212°F (100°C)

Compressive Strength (Yield)

12929 psi (89.1 MPa)	72°F (22°C)
15736 psi (108.5 MPa)	212°F (100°C)

Compressive Modulus

$5.1x10^5$ psi (3523 MPa)	72°F (22°C)
$4.5x10^5$ psi (3076 MPa)	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)	13372 psi (92.2 MPa) 20198 psi (139.2 MPa)	72 °F (22 °C) 212 °F (100 °C)
0.12 in. (3.0 mm)	20103 psi (138.6 MPa) 29955 psi (206.5 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)	16411 psi (113.1 MPa) 20525 psi (141.5 MPa)	72 °F (22 °C) 212 °F (100 °C)
0.12 in. (3.0 mm)	23875 psi (164.6 MPa) 32703 psi (225.4 MPa)	72 °F (22 °C) 212 °F (100 °C)

Corrosion Protection

Upon full curing at 72 °F (22 °C) for 7 days, Belzona 1311 will show no visible signs of corrosion after 5,000 hours of salt spray exposure in accordance with ASTM B117.

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Flexural Properties

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

Flexural Strength

8513 psi (58.7 MPa)	72°F (22°C)
11394 psi (78.5 MPa)	212°F (100°C)

Flexural Modulus

$1.15x10^6$ psi (7924 MPa)	72°F (22°C)
$1.13x10^6$ psi (7805 MPa)	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	34	35
935	85	88

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:

82	72°F (22°C)
84	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

4585 psi (31.6 MPa)	72°F (22°C)
7264 psi (50.1 MPa)	212°F (100°C)

Elongation

0.97%	72°F (22°C)
1.09%	212°F (100°C)

Young's Modulus

$7.4x10^5$ psi (5113 MPa)	72°F (22°C)
$7.6x10^5$ psi (5210 MPa)	212°F (100°C)

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:

155°F (68°C)	72°F (22°C)
215°F (101°C)	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)

Heat Distortion Temperature (HDT)
Tested to ASTM D648 (264 psi fibre stress), typical values obtained will be:

121°F (49°C)	72°F (22°C)
194°F (90°C)	212°F (100°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 (58.6 J/m)	72°F (22°C)
1.2 ft lb/in (65.0 J/m)	212°F (100°C)

Shelf Life

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

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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 1311 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
Harrogate HG1 4DS
United Kingdom

Belzona, Inc.
14300 NW 60th Ave,
Miami Lakes, FL, 33014, USA

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

Belzona products are manufactured under an ISO 9001 registered Quality Management System.