

**1. PRODUCT NAME**

**Belzona® 1311 (Ceramic R-Metal)**  
Repair system designed for rebuilding metals damaged by erosion-corrosion.

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.

**2. MANUFACTURER**

**Belzona Inc.,**  
2000 N.W. 88th Court  
Miami, Florida 33172

**Belzona Polymerics Ltd.,**  
Claro Road, Harrogate,  
HG1 4DS, England.

**3. PRODUCT DESCRIPTION**

A two-component, non-machinable grade material based on a silicon-steel alloy blended within high molecular weight reactive polymers and oligomers. The system is designed for rebuilding metals and offers protection against the effects of erosion-corrosion. Ideally suited to be overcoated with **Belzona® 1321 (Ceramic S-Metal)**.

Applications

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

**4. TECHNICAL DATA**

Base Component

Appearance Paste  
Color Very dark gray  
Gel strength  
at 77°F (25°C) 150 - 350 g/cm HF  
Density 2.6 - 2.8 g/cm<sup>3</sup>

Solidifier Component

Appearance Paste  
Color Gray  
Gel strength  
at 77°F (25°C) 70 - 150 g/cm QY  
Density 1.63 - 1.69 g/cm<sup>3</sup>

Mixed Properties

Mixing Ratio by Weight (Base : Solidifier) 5 : 1  
Mixing Ratio by Volume (Base : Solidifier) 3 : 1  
Mixed Form Paste  
Peak Exotherm Temperature 239 - 284°F (115 - 140°C)  
Time to Peak Exotherm 25 - 42 mins.  
Slump Resistance nil at 0.5 inch (1.27 cm)  
Mixed Density 2.36-2.52 g/cm<sup>3</sup>

• **Shelf Life:**

Separate base and solidifier components shall have a 5 year shelf life when stored between 32°F (0°C) and 86°F (30°C).

• **Working Life:**

Will vary according to temperature. At 77°F (25°C) the usable life of mixed material is 15 minutes.

• **Volume Capacity:**

The volume capacity of a 1 kg. unit of mixed **Belzona® 1311** is 25.2 in<sup>3</sup> (413 cm<sup>3</sup>).

• **Cure Time:**

Allow to solidify for the times shown in the chart below before subjecting it to the conditions indicated.

**5. PHYSICAL/MECHANICAL PROPERTIES**

Determined after 7 days cure at 77°F (25°C). Post curing the material with heat results in a more highly cross-linked polymer. For enhanced performance this material may be post-cured by heating to 212°F (100°C) for a period of up to 24 hours. This should be carried out following an initial cure period of 24 hours at ambient temperature.

• **Abrasion Resistance:**

**Taber**

The Taber abrasion resistance with 1 kg load is typically:  
H10 Wheels (Wet) 129 mm<sup>3</sup>  
CS17 Wheels (Dry) 48 mm<sup>3</sup>  
loss per 1000 cycles

• **Adhesion:**

**Tensile Shear**

When tested in accordance with ASTM D1002, using degreased substrates which have been grit blasted to a 3-4 mil profile, typical values will be,  
Mild steel 2,700 psi (18.6 MPa)  
Brass 2,270 psi (15.6 MPa)  
Copper 2,200 psi (15.2 MPa)  
Stainless steel 2,800 psi (19.3 MPa)  
Aluminium 2,000 psi (13.8 MPa)

• **Chemical Resistance:**

Once fully cured, the material will demonstrate excellent resistance to the following chemicals;  
carbonic acid  
10% hydrobromic acid  
10% hydrochloric acid  
10% nitric acid

*Continued . . .*

TEMPERATURE	CURE TIMES					
	41°F (5°C)	50°F (10°C)	59°F (15°C)	68°F (20°C)	77°F (25°C)	86°F (30°C)
Movement or use involving no loading or immersion	4 hrs	3 hrs	2¼ hrs	1¾ hrs	1 hr	¾ hr
Machining and/or light loading	6 hrs	4 hrs	3 hrs	2 hrs	1½ hrs	1 hr
Full electrical, mechanical or thermal loading	4 days	2 days	1½ day	1 day	20 hrs	16 hrs
Immersion in chemicals	5 days	4 days	3 days	2 days	1½ days	1 day

20% nitrous acid  
5% phosphoric acid  
10% sulfuric acid  
20% ammonia solution  
lime water  
20% potassium hydroxide  
20% sodium hydroxide  
propanol  
butanol  
ethylene glycol  
diethanolamine  
methylamine (25% in water)  
hydrocarbons  
mineral oils  
inorganic salts

\* For a more detailed description of chemical resistance properties, refer to relevant Chemical Resistance chart.

• **Compressive Strength:**

When tested in accordance with ASTM D695, typical values obtained will be 13,000 psi (89.6 MPa).

• **Corrosion Resistance:**

Once fully cured, will show no visible signs of corrosion after 5,000 hours exposure in the ASTM B117-73 salt spray cabinet.

• **Electrical Properties:**

**Dielectric Constant**

Tested to ASTM D150 is typically 3.29 at 1000Hz

**Dielectric Strength**

Tested to ASTM D149 is typically 32 volts/mil (1280 volts/mm).

**Dissipation Factor**

Tested to ASTM D150 is typically < 0.0005 at 1 MHz

**Surface Resistivity**

Tested to ASTM D257 is typically  $5.76 \times 10^{13}$  ohm.

**Volume Resistivity**

Tested to ASTM D257 is typically  $1.03 \times 10^{15}$  ohm cm.

• **Flexural Strength:**

When tested to ASTM D790, typical values obtained will be 10,000 psi (68.9 MPa).

• **Hardness:**

**Shore D**

The hardness of the material when tested to ASTM D2240 is typically 89.

**Barcol**

Tested to ASTM D2583 the Barcol hardness will typically be:  
89 - ambient cure  
92 - post cure.

• **Heat Distortion Temperature:**

Tested to ASTM D648 (264 psi fiber stress), typical values obtained will be 136°F (58°C).

• **Heat Resistance:**

For many typical applications, the product is thermally stable to 392°F (200°C) dry and 200°F (93°C) wet.

• **Impact Strength:**

Reverse notched impact strength is typically 0.93 ft.lb./in. or 50 J/m.

• **Shrinkage:**

0.0% minimum  
0.005% maximum

• **Thermal Expansion:**

Tested to ASTM E228 the coefficient of thermal expansion is typically 35.5 ppm/°C.

## 6. SURFACE PREPARATION AND APPLICATION PROCEDURES

For proper technique, refer to the Belzona® Instructions for Use leaflet which is enclosed with each packaged product. Areas rebuilt with **Belzona® 1311** may be overcoated with **Belzona® 1321** (Ceramic S-Metal)

## 7. 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.

## 8. WARRANTY

Belzona® guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona® Instructions for Use leaflet. Belzona® further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognised standards (ASTM, ANSI, BS, DIN, etc.). Since Belzona® has no control over the use of the product described herein, no warranty for any application can be given.

## 9. TECHNICAL SERVICES

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

## 10. HEALTH AND SAFETY

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

## 11. APPROVALS/ ACCEPTANCES

U.S.D.A.  
ABS  
CATERPILLAR  
NATO  
GENERAL MOTORS  
TOYOTA  
YORK INTERNATIONAL  
FORD  
RUSSIAN REGISTER OF SHIPPING  
KOREAN REGISTER OF SHIPPING  
CHINA CLASSIFICATION SOCIETY  
BUREAU VERITAS

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.

Copyright © 2013 Belzona International Limited. Belzona® is a registered trademark.



ISO 9001:2008  
Q 09335  
ISO 14001:2004  
EMS 509612

Manufactured under an ISO 9000  
Registered Quality Management System

