

# Magnesium Anode

**BORNA GODAZ** magnesium anodes have been specifically developed for cathodic protection of steel structures under fresh, brackish and sea water. They are manufactured in a comprehensive range of alloys, shapes and sizes to provide a wide selection for cathodic protection of buried underground structures and pipelines, submerged and marine structures, vessels, storage tanks, internal protection of water tanks, etc.

Anodes for buried pipelines, tanks and similar structures are normally supplied packaged in a cotton bag containing a rapid wetting, moisture retaining backfill which reduces the electrolyte resistivity adjacent to the anode and improves performance.

Our magnesium anodes are available in two different magnesium alloy chemical compositions:

- ◆ Standard Potential-SP
- ◆ High Potential-HP

## Typical Applications

### ◆ Temporary

- ◆ Temporary protection of pipelines
- ◆ Temporary protection of tank Bottoms

Anodes should be installed during the Construction period and prior to Energizing the permanent impressed current system

### ◆ Permanent

- ◆ permanent protection of well coated pipelines in low resistivity soils
- ◆ permanent protection of buried vessels and tanks
- ◆ Internal protection of water tanks
- ◆ Permanent protection of marine structures
- ◆ "Hot Spot" locations



| Magnesium chemical composition |           |                |
|--------------------------------|-----------|----------------|
| Element                        | Standard  | High Potential |
| Aluminum (%)                   | 5.3 - 6.7 | 0.05 max       |
| Zinc (%)                       | 2.5 - 3.5 | 0.03 max       |
| Manganese (%)                  | 0.2 - 0.5 | 0.5 - 1.0      |
| Copper (%)                     | 0.02 max  | 0.02 max       |
| Nickel (%)                     | 0.001 max | 0.002 max      |
| Iron (%)                       | 0.005 max | 0.03 max       |
| All Others (%)                 | 0.01 max  | 0.03 max       |
| Magnesium (%)                  | Remainder | Remainder      |

| Standards: | NACE-DNV | ASTM -IPS |
|------------|----------|-----------|
|------------|----------|-----------|

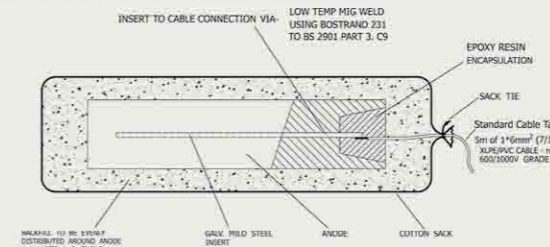
| Electrical Properties  | Standard | High Potential |
|--|----------|----------------|
| Electrochemical capacity (Ah/Kg)   | 1230     | 1230           |
| Closed circuit potential (V)<br>(Respect to Ag/AgCl reference electrode) | -1.55    | -1.75          |
| Efficiency (%)   | 58       | 49             |

The most widely specification for magnesium anodes is ASTM B275, ASTM G97, IPS-M-TP750/2, BS 7361, ASTM A283 grade C.

## Standard Backfill Composition

|          | Gypsum (CaSO4)%                    | Bentonite Clay % | Sodium Sulfate % | Approx. Resistivity in Ohm-cm |
|----------|------------------------------------|------------------|------------------|-------------------------------|
| Hydrated | Molding Plaster (Plaster of Paris) |                  |                  |                               |
| (A)      | 25                                 | 75               | ---              | 250                           |
| (B)      | 50                                 | 50               | ---              | 250                           |
| (C)      | ---                                | 50               | 50               | 250                           |
| (D)      | 75                                 | 20               | 5                | 50                            |

### ◆ Packaged Magnesium Anode

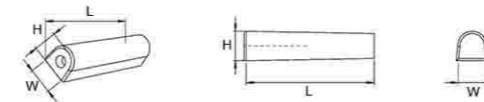


BORNA Godaz magnesium anodes are also used for protection of offshore structures quay walls, for marine applications in ballast tanks, external ships hulls, rudder and heat exchangers protection.

BORNA Godaz magnesium anodes can be made in various shapes & sizes to suit individual applications. They normally have steel-bar, rod core or wire for attachment to the structure by welding, cad-welding or either bolts & clamps.

The following drawings show typical magnesium anodes of BORNA Godaz. However we can supply other shapes and sizes to comply the customer's weight & Dimensions requirement.

### ▶ BAMD1



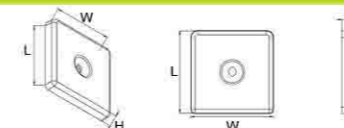
| Code No.  | Approx Weight (kg) | W (mm) | L (mm) | H (mm) | Total Weight Of Anode With Backfill (kg) |
|-----------|--------------------|--------|--------|--------|--|
| BAMD10023 | 2.3                | 89     | 203    | 92     | 7.3                                      |
| BAMD10041 | 4.1                | 90     | 350    | 90     | 10                                       |
| BAMD10077 | 7.7                | 114    | 650    | 114    | 20                                       |
| BAMD10100 | 10                 | 122    | 559    | 122    | 23.6                                     |
| BAMD10145 | 14.5               | 140    | 540    | 140    | 30                                       |
| BAMD10232 | 23.2               | 159    | 662    | 164    | 57.3                                     |
| BAMD10273 | 27.3               | 108    | 1524   | 102    | UN PACKED                                |
| BAMD10218 | 21.8               | 140    | 820    | 140    | UN PACKED                                |

### ▶ BAMR1



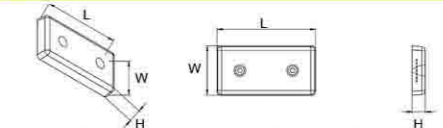
| Code No.  | Approx Weight (kg) | D (mm) | L (mm) | Total Weight Of Anode With Backfill (kg) |
|-----------|--------------------|--------|--------|--|
| BAMR10076 | 7.6                | 90     | 690    | 18                                       |
| BAMR10100 | 10                 | 108    | 622    | 23.6                                     |
| BAMR10160 | 16                 | 114    | 920    | 30                                       |
| BAMR10227 | 22.7               | 200    | 425    | 56.3                                     |

### ▶ BAME1



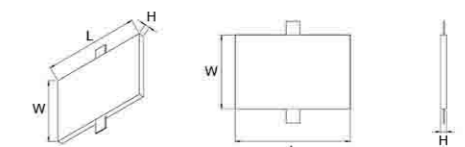
| Code No.  | Approx Weight (kg) | W (mm) | L (mm) | H (mm) |
|-----------|--------------------|--------|--------|--------|
| BAME10003 | 0.3                | 100    | 100    | 20     |
| BAME10005 | 0.5                | 100    | 100    | 30     |
| BAME10007 | 0.7                | 100    | 100    | 40     |
| BAME10002 | 0.2                | 100    | 60     | 20     |
| BAME10004 | 0.4                | 75     | 70     | 40     |
| BAME10012 | 1.2                | 150    | 150    | 30     |
| BAME10016 | 1.6                | 150    | 150    | 40     |
| BAME10028 | 2.8                | 200    | 200    | 40     |

### ▶ BAME2



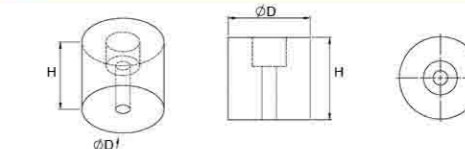
| Code No.  | Approx Weight (kg) | W (mm) | L (mm) | H (mm) |
|-----------|--------------------|--------|--------|--------|
| BAME20007 | 0.7                | 100    | 200    | 20     |
| BAME20010 | 1                  | 100    | 200    | 30     |
| BAME20014 | 1.4                | 100    | 200    | 40     |
| BAME20009 | 0.9                | 100    | 130    | 40     |
| BAME20016 | 1.6                | 150    | 300    | 20     |
| BAME20020 | 2                  | 150    | 300    | 25     |
| BAME20024 | 2.4                | 150    | 300    | 30     |
| BAME20032 | 3.2                | 150    | 300    | 40     |
| BAME20026 | 2.6                | 150    | 250    | 40     |
| BAME20004 | 0.4                | 75     | 150    | 20     |
| BAME20006 | 0.6                | 75     | 150    | 30     |
| BAME20003 | 0.3                | 70     | 150    | 20     |
| BAME20005 | 0.5                | 70     | 150    | 30     |
| BAME20007 | 0.7                | 70     | 150    | 40     |
| BAME20056 | 5.6                | 200    | 400    | 40     |

### ▶ BAME3



| Code No.  | Approx Weight (kg) | W (mm) | L (mm) | H (mm) |
|-----------|--------------------|--------|--------|--------|
| BAME30048 | 4.8                | 420    | 270    | 22     |

### ▶ BAMR2



| Code No.  | Approx Weight (kg) | D (mm) | L (mm) |
|-----------|--------------------|--------|--------|
| BAMR20031 | 3.1                | 90     | 300    |