

### EEI Packaged Anodes - Product Description

The high cost of corrosion can be substantially reduced by installing a cathodic protection system to transfer the corrosion from the structure being attacked to an anode system.

Because magnesium is one of the least noble elements, it makes a superior sacrificial anode for the protection of underground steel pipelines and structures, and water heaters. By connecting a magnesium anode to a structure of a different metal, electrical current is generated that polarizes the structure, making the entire surface cathodic and protection complete.

The suppliers used by EEI exceed the chemistry industry standard for high potential anodes. The chemical composition of the magnesium metal is determined using the industry's most sophisticated computer controlled emission spectrometers. Samples are taken and analyzed at three points in the production process:

- Prior to Casting:** Primary metal is used which meets the low impurity levels specified.
- During Casting:** The alloy is checked to insure the optimum chemistry for anode efficiency.
- After Casting:** Test pieces made during pouring are analyzed to insure chemistry integrity.

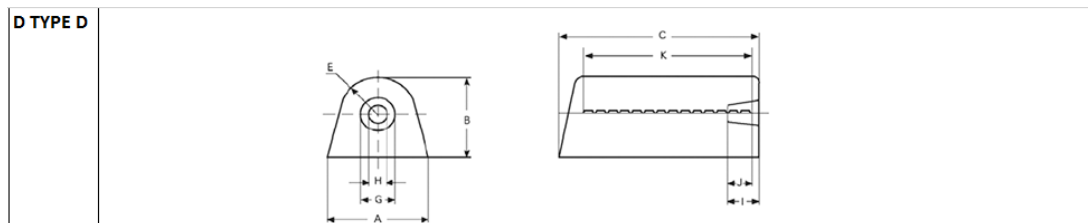
The casting parameters are continuously checked to control any variables that may occur in production. As the anodes come off the casting machine they are weighed to ensure they meet weight requirements. The anodes are then physically inspected for excessive shrink cavities, core security and general physical appearance to insure highest quality.

A #12 solid copper lead wire (10'-black is standard) is silver soldered to the ingot core, and this connection is sealed with tar. The magnesium ingots are then packaged in a cotton bag with a backfill mixture consisting of 75% gypsum, 20% bentonite, and 5% sodium sulphate. The packaged anode assembly is sealed in a plastic outer wrap (this must be removed prior to installation) to protect it from moisture and abrasion during shipment and storage.

NOTE - A packaged 3# magnesium anode has a shipping weight of approximately 13#. Pallet quantity = 100 3# Anodes

|                | Chemical Composition (%) |           |           |           |          |          |          |          |                  |       |
|----------------|--------------------------|-----------|-----------|-----------|----------|----------|----------|----------|------------------|-------|
|                | Mg                       | Al        | Zn        | Mn        | Si (max) | Cu (max) | Ni (max) | Fe (max) | Other Imp. (max) |       |
|                |                          |           |           |           |          |          |          |          | Each             | Total |
| High Potential | Balance                  | 0.01 max  | -         | 0.50-1.30 | 0.05     | 0.02     | 0.001    | 0.03     | 0.05             | 0.30  |
| AZ63-Grade A   | Balance                  | 5.30-6.70 | 2.50-3.50 | 0.15-0.70 | 0.10     | 0.02     | 0.002    | 0.003    | -                | 0.30  |
| AZ63-Grade B   | Balance                  | 5.30-6.70 | 2.50-3.50 | 0.15-0.70 | 0.30     | 0.05     | 0.003    | 0.003    | -                | 0.30  |
| AZ63-Grade C   | Balance                  | 5.0-7.0   | 2.0-4.0   | 0.15-0.70 | 0.30     | 0.10     | 0.003    | 0.003    | -                | 0.30  |

|                | Electrochemical Properties                       |  |                               |                           |
|----------------|--|--|-------------------------------|---------------------------|
|                | Open-Circuit Voltage<br>(-V Respect to Cu/CuSo4) | Closed-Circuit Voltage<br>(-V Respect to Cu/CuSo4) | Actual Capacity<br>(A • h/lb) | Current Efficiency<br>(%) |
| High Potential | 1.77-1.82  | 1.64-1.69  | ≥ 499.4                       | ≥ 50                      |
| AZ63           | 1.57-1.62  | 1.52-1.57  | ≥ 501.7                       | ≥ 50                      |



|      | Weight<br>(lb) | Anodes  |         |         |         | Concave Base |         |         |         |         | Steel Core<br>Shape |
|------|----------------|---------|---------|---------|---------|--------------|---------|---------|---------|---------|---------------------|
|      |                | A (in.) | B (in.) | C (in.) | E (in.) | G (in.)      | H (in.) | I (in.) | J (in.) | K (in.) |                     |
| 9D2  | 9              | 2 3/4   | 3       | 27      | 1 1/8   | 1 7/8        | 7/8     | 1       | 3/4     | 25 3/4  | Strip               |
| 14D2 | 14             | 2 3/4   | 3       | 41 7/8  | 1 1/8   | 1 7/8        | 7/8     | 1       | 3/4     | 40 1/2  | Strip               |
| 20D2 | 20             | 2 3/4   | 3       | 59 3/4  | 1 1/8   | 1 7/8        | 7/8     | 1       | 3/4     | 57 3/4  | Strip               |
| 9D3  | 9              | 3 1/2   | 3 3/4   | 13 7/8  | 1 1/2   | 1 7/8        | 7/8     | 1 1/2   | 1 1/2   | 10 1/2  | Wire                |
| 17D3 | 17             | 3 1/2   | 3 3/4   | 25 1/4  | 1 1/2   | 1 7/8        | 7/8     | 1 1/2   | 1 1/2   | 21 1/2  | Strip               |
| 32D5 | 32             | 5 1/2   | 5 3/4   | 19 7/8  | 2 7/16  | 1 7/8        | 7/8     | 1 1/2   | 1 1/2   | 16 1/2  | Strip               |
| 48D5 | 48             | 5 1/2   | 5 3/4   | 30 1/8  | 2 7/16  | 1 7/8        | 7/8     | 1 1/2   | 1 1/2   | 28 1/2  | Strip               |

| Anode Type | Bare Weight | Packaged Weight | Bare   |       |        | Packaged |         |
|------------|-------------|-----------------|--------|-------|--------|----------|---------|
|            |             |                 | A      | B     | C      | D        | E       |
| 3D3        | 3 lbs.      | 13 lbs.         | 3-1/2" | 3.75" | 4-3/4" | 4-3/4"   | 11-1/4" |

Magnesium Anode Diagrams

