

# RUST PREVENTION

## CORROSION MANAGEMENT SOLUTIONS



## ARMOR POLY® FILM DEFENDER™ Film

### FEATURES AND BENEFITS

The **DEFENDER™** is an economical, co-extruded VCI film that provides a high level of protection, without the high costs. ARMOR film and its vapor corrosion inhibitor (VCI) Nanotechnology® sets industry standards for high performance and innovation. ARMOR's proprietary Bright Idea™ Technology provides visible proof under black light that VCI is present in all **ARMOR POLY®** products.

The **DEFENDER** utilizes three layers of film with specific characteristics used to prevent corrosion, provide additional barrier protection, and increase durability and puncture resistance over mono-extruded VCI films.

The **DEFENDER** multi-layer film system results in a 60% decrease in oxygen transmission (2.5x barrier protection) compared with standard film.

ARMOR'S **DEFENDER** saves money because unlike 99% of VCI bags in the packaging industry, the **DEFENDER** contains resin on the inside layer only, not on the outside layer where it's never utilized. This results in a 10-15% product savings.

*The proprietary ARMOR VCI Nanotechnology® comes with more than 40 years of industry experience. With service on four continents and in more than 25 countries, ARMOR is positioned to Eradicate Rust wherever and whenever you need them.*



### Approved By/Conforms:

- FDA for use in equipment packaging
- Global OEM companies
- RoHS – REACH Compliant
- NACE Std TM0208-2008

### WHY ARMOR?

Armor Protective Packaging® offers rust prevention and rust removal products that are clean, safe, easy, and that protect metals while in-process, in transport, or in storage. ARMOR combines its VCI (vapor corrosion inhibitor) Nanotechnology® with packaging materials such as paper and poly film to create products that displace moisture on metal and guard against rust. ARMOR also offers desiccants, emitters, foam pads and its Metal Rescue® Rust Remover Bath and Dry Coat™ Rust Preventative. For more than 40 years, ARMOR has worked with customers from around the globe to provide rust prevention and rust removal solutions and to Take the Work Out of Your Workday!



# TECHNICAL DATA

## ARMOR PROTECTIVE PACKAGING CORROSION MANAGEMENT SOLUTIONS

### THE DEFENDER™

#### Product Overview

All Armor Protective Packaging® products utilize our proprietary and time-proven ARMOR vapor corrosion inhibitor (VCI) Nanotechnology®. Oxidation occurs when an electrolyte (water, oxygen, etc.) is present on the surface of a metal. The corrosion process begins when electrons flow through the electrolyte from high energy areas (anode) to low energy areas (cathode) of the metal. ARMOR VCI blocks this reaction by passivating the surface and inhibiting the electrochemical current flow from anode to cathode. ARMOR VCI's protective vapors adhere to a metal surface to form an invisible film only a few molecules thick to protect metal from attack.

The DEFENDER™ poly film utilizes advanced polyethylene film extrusion to form a construction of three engineered layers that provide increased durability and outstanding corrosion inhibition. The DEFENDER is designed for long-term storage and is nitrite-free.

**Outside Layer:** Low density polyethylene with super hexene for added toughness and medium slip for proper feel and tape adhesion.

**Center Layer:** Proprietary high density polyethylene barrier resin provides superior strength and an excellent barrier to elements that cause corrosion.

**Inside Layer:** ARMOR POLY® VCI – Linear low density polyethylene with high concentration of multi-metal VCI.

#### Compatibility of ARMOR POLY with Metals

Metal to be Protected	ARMOR POLY® Films
Aluminum	★ ★ ★
Aluminum Bronze	★ ★
Aluminum Magnesium alloy	○
Brass	★ ★ ★
Bronze	★ ★
Cadmium	★ ★
Cast Iron	★ ★ ★
Chromium	★ ★
Constantan	★ ★
Copper	★ ★ ★
Galvanized	★ ★ ★
Lead	○
Molybdenum	○
Nickel	★ ★ ★
Nickel Silver (CU, Ni, Zn)	★ ★ ★
Silver	★
Solder (Pb, Sn)	○
Steel	★ ★ ★
Tin (Pure)	★ ★ ★
Tinned Steel	★ ★ ★
Zinc	○

#### Compatibility Key

- ★ ★ ★ Complete Protection
- ★ ★ Good Protection
- ★ This product will protect this metal from corrosion; however a more suitable formula may be available.
- Testing is recommended

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### **Shelf Life & Storage of ARMOR VCI Products**

ARMOR VCI Poly individual sheets or bags have a shelf life of two years from the date of manufacture when stored in original packaging. ARMOR VCI Poly rolled goods have a longer shelf life of three years from the date of manufacture when stored in original packaging.

For best results, do not leave ARMOR VCI packaging out in an open environment, either indoors or outdoors. Keeping it in its original packaging or enclosed inside a container ensures that the vapors remain in the packaging. As temperature and humidity levels increase, the rate of the volatilization of the chemicals contained in the packaging also increases, reducing the effectiveness and longevity of the product. Product should be stored in a dry environment with temperatures between 40° – 110° F (5° – 43°C).

*Note: While Shelf Life and Length of Protection are two separate characteristics of VCI packaging materials, they are somewhat interrelated. Shelf Life refers to how long the unused VCI packaging material can be stored prior to being put in use. Length of Protection refers to how long the VCI packaging materials provide protection once in use. In both cases the duration depends on the product's storage conditions.*

### **Reusability**

ARMOR POLY® is not recommended for re-use for three primary reasons:

1. The rate at which VCI chemical volatilizes out of the product into the surrounding environment when in use
2. The inability to properly track and monitor the amount of time the materials have been exposed to the environment
3. Potential contaminants on the packaging that can be transferred

For those instances when re-use is necessary, be sure the packaging is free of dirt, holes, or other contaminants. Once these factors appear, it is best to use new, clean ARMOR VCI packaging. It is also important to note that the length of time the packaging material has been exposed to the environment (especially high heat/humidity) will greatly impact the effectiveness of the product. Do not re-use VCI packaging more than two times. Please note, ARMOR cannot guarantee the amount of VCI that remains in the packaging upon re-use.

### **Length of Protection & Long-Term Storage**

ARMOR VCI products are used to cover or wrap metal parts and surfaces. The continuous vaporization of this chemically treated packaging creates a safe, protective environment that effectively blocks out rust, corrosion and oxidation. Typically, ARMOR VCI packaging will protect parts for approximately three years of corrosion-free storage when used properly in normal warehouse conditions. However, by following the guidelines below, it is possible to lengthen this time-frame considerably. The key element in protecting parts for long-term storage is that the part must be completely clean, prior to wrapping in ARMOR products. We recommend that parts be completely wrapped or enclosed in airtight packaging for best results and longest protection time.

ARMOR cannot control variable conditions such as temperature and humidity extremes, airflow, production and process methods, surface conditions of metal to be protected, customer employee training and other factors beyond our control, therefore it is impossible to guarantee a specific length of protection. Additionally, if warehouse conditions are expected to be severe (i.e. over 90° F and 75% RH) for any length of time, other methods of rust preventatives such as Dry Coat™ RP or desiccants, may be needed, in conjunction with VCI packaging. Successful long-term storage requires that all of these guidelines be met. It is important to test parts and packaging as extensively as possible, prior to conducting any long-term storage projects.

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### Guidelines for Successful Long-Term Storage

- It is necessary to wear gloves when coming in contact with metal, as fingerprints (which contain human oils and possibly contaminants) can cause a chemical reaction to the metal prior to wrapping in ARMOR packaging. Make sure that gloves are clean and as they become dirty or contaminated, be sure to replace them with a new supply.
- Be sure your product is free of fingerprints, machining oils and acid or alkali residue. Neutral oils or a light rust inhibitor may be left on metal surfaces, but may require laboratory testing to make sure there is compatibility between the VCI Packaging and the oils. Make sure that coolants, RP liquids and or other liquids used within the manufacturing process are tested regularly for concentration levels, pH, and are fully titrated regularly.
- Parts should be dry, clean and free from corrosion before packaging. Clean your product, preferably with a petroleum solvent or solvent emulsion cleaner. ARMOR VCI packaging will help *prevent* corrosion; however, it will not remove corrosion that has already occurred. To remove rust, ARMOR offers Metal Rescue® Rust Remover Bath.
- Package clean parts immediately after processing, manufacturing or cleaning.
- Make sure that the ARMOR POLY VCI Bag is not ripped or torn to ensure that VCI vapors are contained inside the package
- Place part or multiple parts inside a minimum 6 mil thick ARMOR POLY VCI Bag and seal tightly, preferably with a heat seal, for airtight storage.
- Store packaged parts in an area where the temperature and relative humidity are the most consistent possible. Do not store parts outside.
- While the parts are sitting in bins waiting to be repackaged or further processed, the VCI bag should be closed/folded over to protect parts from exposure to liquids, water, and moisture. A sheet of VCI paper can also be used by placing it on top, covering parts. Make sure that associates are using clean, dry gloves while packing parts.
- Pine, oak and corrugated are very acidic and can contribute greatly to corrosion issues. Avoid contact of metal with woods by placing ARMOR POLY between these materials.
- Provide frequent training to employees who are responsible for packaging or processing metal parts so that they understand how and why VCI is used in order for the employee to use these specialized products properly.

### Properties

Gauge (range available: .002" to .007") +/- 10%.

For complete details, see ARMOR Technical Bulletin #143 & #144.

Products are nitrite-free; contain no secondary amines.

ARMOR POLY® products comply with directive 2002/95/EC (RoHS and RoHS2 2011/65/EU) of the European Parliament and do not contain Sulfur or halide compounds (fluorides, chlorides, bromides, or iodides).

### Wash hands thoroughly after handling this product and before eating.

All products manufactured Armor Protective Packaging® are warranted to be first class products and free from defects in material and workmanship. Liability under this warranty is limited to the net purchase price of any of such products proven defective or at our option to the repair or replacement of said products upon their return to us transportation prepaid. All claims on defective products must be made in writing 30 days after the receipt of such products in your plant and prior to further processing or combining with other materials and products. We make no warranty, express or implied, as to the suitability of any of our product for any particular use, and we shall not be subject to liability from any damages resulting from their use in operations not under our direct control. This warranty is exclusive of all other warranties, express or implied, and no representative of ours or any other person is authorized to assume for us any other liability in connection with the sale of our products.

Revised 08/29/19