

Z-PAK® VCI Diffuser Packets

Zerust® Z-PAK® is a product of Northern Technologies International Corporation (NTIC). It is an economical, effective, and easy-to-use volatile corrosion inhibitor (VCI) diffuser packet that can be used alone or more typically, with other Zerust® packaging products to provide robust temporary corrosion protection for ferrous metals during shipment, storage, or work-in-progress.

Z-PAK® VCI Diffuser user benefits:

- Safe and environmentally responsible design
- Minimal user training required
- Easy to apply and use
- Proven technology with 10+ years record
- Effective in mitigating corrosion issues
- Low cost minimizing impact on your bottom line
- Safe to dispose in industrial landfill and incineration



Zerust®/Excor® Corrosion Solutions

For over 40 years, the Zerust®/Excor® Corrosion Engineering Team has helped manufacturing organizations around the world implement corrosion management systems throughout their supply chains. With on-site support in over 70 countries and labs in three continents we can effectively provide point-to-point service and support. We ensure that parts stay rust and contaminant free. We understand your needs and the complexities of managing a global supply program. By implementing our Z-CIS® Deployment Methodology and Project Management Approach, we help pull the pieces of your supply program together – with guaranteed results! Our management system is certified to the ISO 9001:2015 Quality Management Standard.

Applications

How does Z-PAK® work?

Zerust® Z-PAK® VCI diffuser packets emit a specially formulated VCI chemistry that quickly saturates and lands on metal surfaces located in the enclosure/package with the Z-PAK®. This molecular thin, temporary layer of VCI chemistry protects the metal surfaces from corrosion. Since the VCI chemistry is gaseous, hard-to-reach areas of the metal components – such as unobstructed inner surfaces, are also protected from corrosion when a sufficient amount of the VCI chemistry lands on them. Once the metal components leave the enclosure/package, away from the Z-PAK®, the VCI chemistry on the metal surfaces volatilizes into the air. The molecular thin layer of VCI chemistry, even when present, will not affect the physical, chemical, or structural properties of the protected metal surfaces. Your customers can work on, painting, coating, welding, processing, and/or assembling the metal parts immediately upon receiving them at the facility from the shipment/storage.

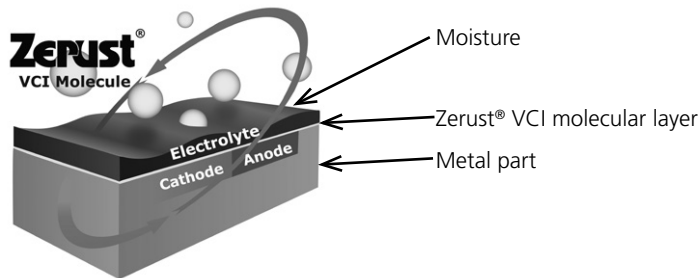
When to use Z-PAK®

Z-PAK® must be used inside an enclosure with limited airflow in order for the product to be effective. A few typical uses of Z-PAK® are:

- Use together with Zerust® ICT® plastic packaging for more robust corrosion protection – e.g. reduce corrosion risk for highly sensitive metals, provide better VCI diffusion in tightly stacked metal parts inside the packaging, etc.
- Inside sealed or obstructed voids that the Zerust® ICT® packaging is not able to protect.
- In enclosures of large equipment, that requires targeted corrosion protection for specific areas.

Note: Z-PAK® VCI diffuser chemistry is designed to be used for ferrous metal (Carbon Steel, Silicon Steel, Stainless Steel, Cast Iron) surfaces. In certain situations, Z-PAK® may be used for metal components containing limited yellow metal/parts but check with your Zerust® Account Manager before doing so.

Temporary corrosion protection explained



The chemistry that the Z-PAK® VCI Diffuser releases into an airspace actively preventing corrosion by forming strong temporary bonds with a metal surface, promoting and maintaining the natural and healthy passive oxide layer on the metal. The VCI layer that forms is invisible, dry, and does not affect the physical properties or functionality of the metal in any way. The protected metal can be painted, treated, and/or used straight out of the package containing the Z-PAK® without further cleaning.

How to Use

Zerust® Z-PAK® VCI diffuser packets emits VCI very quickly and starts working immediately when removed from its original packaging.

Z-PAK® must be used inside an enclosure in order for the product to be effective. The enclosure should not be vented or have constant moving air. Airtight enclosures are recommended but slight air leakage is fine. An enclosure can be anything that keeps the VCI chemistry from escaping into the environment – such as properly sealed plastic bag/container or plastic bags with opening end folded to limit airflow. For best result, always use Z-PAK® with Zerust® ICT® bags.

Applying Z-PAK®:

- Do not remove the Z-PAK® from or open the original packaging until you are ready to use the Z-PAK®.
- Only remove the required quantity of Z-PAK® from the original packaging. Close the original container with the remaining Z-PAK® pouches immediately and ensure the inner plastic bag is properly sealed for storage.
- Ensure the ferrous metal components needing corrosion protection are clean and dry.
- Exposed Z-PAK® should be utilized or put back in storage within 1 hour.
- Pack and secure the components in the enclosure (Zerust® ICT® bags, plastic bags, containers, etc.). Good general handling practice should be adopted to – **see appendix A**.
- Add the appropriate number of Z-PAK® packets into the enclosure – dispersing them evenly. Avoid direct contact with metal, if possible. See below for the dosage amount.
- Avoid leaving Z-PAK® in areas where sharp edges may potentially cut or damage the packet during storage and/or shipment.
- Seal or close the enclosure to restrict airflow. Whenever possible, airtight enclosures are preferred.
- Unused Z-PAK® packets should be placed back into the original container immediately and the inner plastic bag should be properly sealed for storage.

Z-PAK® Dosage

The data provided below is to be used as a guideline only. An actual field trial should be conducted prior to large-scale deployment of any products. Effective corrosion protection is dependent on multiple variables, such as the cleanliness of the metal surfaces, the metal surface roughness, geometry of the metal components, the airtightness of the enclosure, type of packaging used, environmental conditions during shipment, etc. Contact your Zerust® representative for help in conducting field trials.

Part Number	Product Name	Protected Metal Types	Volume of protection (Up to)	Radius of protection (Up to)	Duration of protection (Up to)
375-F-00100	Z-PAK®-01	Ferrous metals only*	3.5 ft ³ , 0.1 m ³	1 ft, 30 cm	Overseas shipments: 3 months Domestic shipments and/or storage: 6 months

* Z-PAK® VCI diffuser chemistry is designed to be used for ferrous (Carbon Steel, Silicon Steel, Stainless Steel, Cast Iron) metal surfaces. In certain situations, Z-PAK® may be used for metal components containing limited yellow metal/parts (Aluminum, Zinc (Galvanized Steel), Copper, Brass, Phosphorus Bronze), but check with your Zerust® representative before doing so.

Z-PAK® Recommendation

Examples*	Length	Width	Height	Loosely packed parts – recommended number of Z-PAK®-01	Densely packed parts – recommended number of Z-PAK®-01
Carton size	400 mm	300 mm	250 mm	1 or more	3 or more
Carton size	500 mm	350 mm	300 mm	1 or more	3 or more
Plastic transfer box	350 mm	250 mm	200 mm	1 or more	3 or more
Steel/wooden case	600 mm	600 mm	700 mm	3 or more	9 or more

* All non-plastic, non air-tight containers should be lined with a suitable Zerust® ICT®510-C bag for best result or with LDPE bag to create a suitable enclosure for the Z-PAK® to work.

Specifications

Performance: Passes NACE Standard TM0208 Test at Level 3

Part number: Z-PAK®-01: 375-F-00100

Description: VCI diffuser powder enclosed in sachet packet

Packaging: 1,000 sachet packets bulk packed in a large LDPE bag

Physical dimensions: approximately

Sachet material: Non-woven polypropylene blend

Case weight: 7 lbs (3.17 kg) (+/- 10%)

Case dimension: 12" x 10" x 8" (30 cm x 25 cm x 20 cm)

Safety

Safety Data Sheet

Zerust® Z-PAK® VCI diffuser Safety Data Sheet is available upon request from: nticsales@ntic.com

Z-PAK® in an unopened original container prior to use is not classified as hazardous waste according to 40 CFR 261 (no components listed on F, K, P, or U lists; not ignitable, not corrosive, not reactive, and not toxic).

Complies with Global Automotive Declarable Substance, TSCA, REACH, RoHS, TRGS615 requirements.

Handling

Please refer to Zerust® Z-PAK® Safety Data Sheet for details. Even though gloves and safety glasses are not necessary when handling Z-PAK®, we always recommend having clean dry gloves on when handling metal components to avoid leaving contaminants (such as fingerprints) that may cause corrosion. Do not disassemble, cut, tear, and puncture the Z-PAK® packet. Keep out of reach of children. Do not eat or place Z-PAK® in mouth.

Odor Concerns

Please refer to Zerust® Z-PAK® Safety Data Sheet for details. Although there is nothing hazardous emitting from the Z-PAK® VCI chemistry, some users with higher sensitivity to smell may detect the presence of ammonia-like odor when opening the original container of Z-PAK®. For such users, it is recommended to open the Z-PAK® container in a well ventilated room before use.

Disposal

Used or unused Z-PAK® can normally be disposed of as non-hazardous waste. Z-PAK® may be disposed of in the general solid waste trash. Since Z-PAK® generates ammonia it is best practice to notify your solid waste hauler especially if a large volume of unused Z-PAK® pouches needs to be disposed of. Check with your waste hauler and local regulations to determine the acceptable disposal method.

Storage

Zerust® Z-PAK® VCI diffuser packet should be stored in the original container until ready to use. Z-PAK® packets emit VCI quickly the moment it leaves its original packaging.

- Check that there is no damage, especially to the inner plastic liner of the Z-PAK® container when you receive them.
- Store in cool, dry place and away from sunlight in original container.
- Shelf-life: up to 2 years from date of shipment for unopened product.
- Avoid damaging the original container or over stacking.
- Unused product should be placed back into original container immediately and inner plastic bag sealed for storage.

Frequently asked questions

The following are a few typical questions about Z-PAK® that customers asked. If you cannot find the answer, please contact us and we will be glad to help you.

Can I use Z-PAK® with desiccants?

Yes, but we recommend placing and securing the desiccants away from the Z-PAK®s. There should always be more Z-PAK® than desiccants in the same enclosure as some types of desiccant may reduce the efficacy of the Z-PAK® depending on the location, type, and amount of desiccant used.

Can I use Z-PAK® with non-Zerust® VCI bags?

Z-PAK® has been tested with Zerust® VCI bags to ensure that they are compatible during use. While it is possible to use Z-PAK® with non-Zerust® VCI bags, we do not recommend doing so due to concerns about compatibility between VCI chemistries. Always test before use if you intend to use Z-PAK® with other non-Zerust® VCI products. We would also highly recommend using both Z-PAK® and Zerust® VCI bags concurrently, as this will provide a more robust corrosion

protection for the metal components you are protecting. Note that the Z-PAK® is a short term (up to 3 or 6 months depending on application) fast-acting VCI while the Zerust® VCI bag provides a longer-term protection (for many months to years). If your company decides to use non-VCI bags, such as plain LDPE bag, with Z-PAK®, be sure to check the dosage level and increase the number of Z-PAK® whenever necessary to ensure ample corrosion protection for your application.

Can I use Z-PAK® with components that are coated with a rust preventative oil or coating?

Z-PAK® has been extensively tested to be compatible with our Zerust® family of rust preventative oils and coatings. We however, cannot claim the same for non-Zerust® branded oils and coatings. We highly recommend that you test before use with non-Zerust® products. For use of Z-PAK® with oils/coatings, precautions must be taken to ensure that the Z-PAK® is not soaked, stained, or covered with rust preventative oil as this will prevent the VCI from diffusing out of the Z-PAK®.

Can I paint or weld on the metal surface immediately (no waiting) after removal from the packaging containing Z-PAK®?

Yes. Z-PAK® VCI does not interfere with the physical, chemical, or structural properties of the metal protected.

What happens when I use more Z-PAK® packets than prescribed?

In general, we may prescribe using more Z-PAK® than usually needed in order to provide better ferrous (Carbon Steel, Silicon Steel, Stainless Steel, Cast Iron) metal protection – especially when there are concerns of process fluid contaminants or high risk of corrosion.

Why are there white crystals forming on metal parts around the Z-PAK®?

Under certain extremely humid conditions in the enclosure, the use of an excessive amount of Z-PAK®s may lead to the formation of white crystals on the Z-PAK® packet and/or on surrounding areas near the Z-PAK®. The white crystals are from an excessive amount of the Z-PAK® VCI chemistry condensing and collecting with moisture. An excessive amount of Z-PAK® may also discolor yellow metals (such as Brass, Copper) present in the metal component. These white crystals are not corrosive and can be wiped away with alcohol/solvent. Trials should be conducted to find the optimum number of Z-PAK® to use for the condition of the enclosure and application.

How much time do I need to wait before the Z-PAK® starts protecting the metal component in the enclosure?

It depends on the size of the package, the amount of Z-PAK® used, the temperature, and humidity. Typically after a few hours, the VCI is detectable in the package.

The dosage table provided states that it's only a guide – what are other reasons why I may need to add more Z-PAK®?

We may prescribe using more Z-PAK® than usually needed in order to provide better ferrous metal protection – especially when there are concerns of process fluid contaminants, high metal surface roughness, tightly packed components in the enclosure, high corrosion risk concerns, air leakage in enclosure, challenging environment, etc.

The protection period of Z-PAK® in use is stated as “up to 3 months for international shipment and up to 6 months for domestic shipment and storage” – what affects the protection period?

There are many reasons that affect the duration of the protection but a few common ones are: the amount of Z-PAK® used in a specific enclosure, the air tightness of the enclosure, temperature fluctuations during shipment/storage,

relative humidity on the metal surface inside the enclosure, cleanliness of the metal surface, etc. International shipment applications typically undergo much harsher conditions (higher corrosion risk) than domestic shipment and storage. With multiple factors affecting the rate of corrosion of metal surfaces, it is always recommended to conduct field trials to determine the optimum amount of Z-PAK® to use and setting manufacturing control plans to reduce process variabilities.

Can Z-PAK® protect beyond its stated protection period?

For corrosion protection requirement beyond the indicated Z-PAK® protection period, use Z-PAK® with other Zerust® products (such as Zerust® VCI bags, Zerust® Axxanol™ A35CD-32, and Zerust® Axxanol™ 33CD) as part of the total corrosion protection system.

What is considered normal when doing a visual inspection of the product when it arrives?

Not acceptable for use: Wet/damp material, sachets stuck together, material leaking out of sachet, or broken seal.

Acceptable for use: Due to anti-oxidants present in the outer packaging, slight discoloration of sachet material might occur. Z-Pak® material might harden over time.

What causes Z-PAK® sachet to appear hardened? Is it still safe to use?

When Z-PAK® VCI Diffusers are stored incorrectly, such as in very humid warehouse, excessive moisture may cause the Z-PAK® sachets to appear/feel harden. This physical change will not affect the efficacy of the product and is still safe for use.

Why is an "airtight" enclosure needed for Z-PAK®?

In order for the Z-PAK® VCI diffuser to work, the Z-PAK® must be allowed ample time to diffuse and saturate the inside of the enclosure with its VCI chemistry. This chemistry temporarily bonds to the surfaces of the metal inside the enclosure in order to protect them from corrosion. An enclosure that restricts or has no air movement/leakage will allow the Z-PAK® to reach the equilibrium saturation concentration inside the enclosure faster and start protecting the metal surface. If air leaks out of or into the enclosure, the Z-PAK® will have to diffuse and re-establish the equilibrium concentration inside the enclosure to start protecting again. Excessive air leakage will also deplete the Z-PAK® sooner (thereby shortening the protection period) as VCI escapes into the environment outside the enclosure. It is ideal to keep the enclosure airtight (no air leakage) such as heat sealing the plastic bag opening or using hermetically sealed containers. When this is not possible, folding over and taping the plastic bag opening shut to create the airtight enclosure or adding tape to seal any openings or gaps in a rigid container will improve results significantly.

Can I leave Z-PAK® in contact with metals over time?

It will depend on the metal surface and the condition, in general, we advise for the pack not to be placed in direct contact, if possible.

What if the conditions inside the enclosure is very humid (above 80%RH) constantly?

At constant high humidity in the enclosure for extended period of time, the Z-PAK® VCI diffuser may become drenched with water condensation. This will affect the Z-PAK® effectiveness as water soaks the VCI chemistry out of the sachet and holds on to it – depleting the Z-PAK® therefore leaving less VCI chemistry for protecting the target metal surfaces. Never soak or immerse Z-PAK® in any type of liquid (oils, water, solvent, etc.).

What is “ferrous” metal?

A metal with the descriptor “ferrous” means that it has iron in its composition. When the term ferrous metal is used, it also usually implies that iron is a large percentage of the elemental composition. If it’s not the most abundant element, it would probably be the second or third most prolific. If a metal only contains trace amounts of iron, as many metals do, then that small amount is not considered enough to declare the metal ferrous. Some common ferrous metals include carbon steel, silicon steel, stainless steel, and cast iron.

What if I have some yellow metal (e.g. brass) on the components. Can I still use Z-PAK®?

Yes, but do not use more than prescribed amount, do not put in direct contact and testing before use is recommended.

What is the ammonia smell emitting out of the Z-PAK®? Is it safe?

The VCI diffusing from the Z-PAK® has an “ammonia” smell. The amount of VCI diffused is within acceptable US Occupational Safety and Health Administration (OSHA) limit. Please review the Z-PAK® SDS for details. As a precaution to users who are particularly sensitive to certain odor, newly received Z-PAK® VCI Diffuser (in the box of 1000) should be opened in well ventilated areas of the factory/warehouse before transferring for use beside assembly/work station. The initial accumulation of the Z-PAK® VCI inside the box may be overwhelming for some people – especially if stored in a warm warehouse or rack.

Can I throw the used Z-PAK® with industrial waste/trash?

Yes, but always consult local and state regulations before disposal as policies may differ between cities or change over time.

Where is the Z-PAK® made?

Zerust® Z-PAK® is proudly made in Circle Pines, U.S.A.

Contact

The following are a few typical questions about Z-PAK® that customers asked. If you cannot find the answer, please contact your Zerust® representative or:

nticsales@ntic.com

Phone: +1 (763) 225-6600

Toll-Free: +1 (800) 328-2433

Declaration and Limited Warranty

HEAVY METALS DECLARATION

Zerust® Rust Preventive products do not contain Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent Chromium (Cr6), Polybrominated biphenyls (PBB), Polybrominated di-phenyl ethers (PBDE), Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), Diisobutyl phthalate (DIBP) complying with the restricted substances listed by RoHS legislation (Directive 2011/543/EU, amended 863/2015/EU). Zerust® Rust Preventive Oils are also REACH Compliant for exports to the European Union.

DECLARATION

This Data sheet and information it contains is considered to be accurate at the date of printing. No representation or warranty, expressed or implied is made as to the accuracy or completeness of the data and information contained in this publication. It is the User's obligation to evaluate and use products safely and within the scope advised in the data sheet and to comply with all applicable laws and regulations.

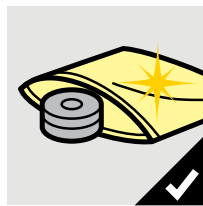
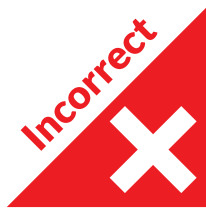
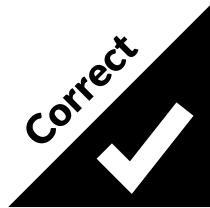
LIMITED WARRANTY

All statements, technical information and recommendations contained herein are based on validations and tests conducted by Northern Technologies International Corporation/Zerust® or its partners and are believed to be reliable, but the accuracy or completeness thereof is not guaranteed. We warrant our products will be free from defects when shipped to customer. Our obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Northern Technologies International Corporation/Zerust® or its partners or agent of the claimed defect within 3 months after shipment of product to customer. Customer shall pay all freight charges for replacement products. We shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products. And any financial claims shall be limited to the value of the products sold.

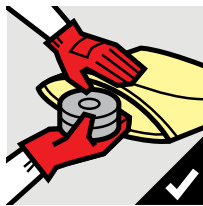
Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. No representation or recommendation not contained herein shall have any force or effect unless in a written document signed by an officer of the company. The foregoing warranty is exclusive and in lieu of all other warranties, express, implied or statutory, including without limitation any implied warranty of merchantability or of fitness for a particular purpose. In no case shall Northern Technologies International Corporation/Zerust® be liable for incidental or consequential damages.

For full warranty and disclaimer information visit, www.zerust.com/warranty.

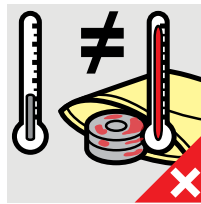
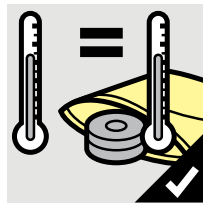
Zerust® VCI Packaging Guidelines



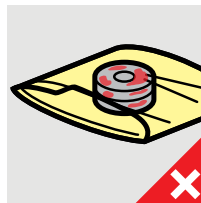
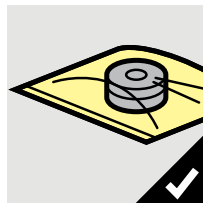
- Pack only clean and dry parts.



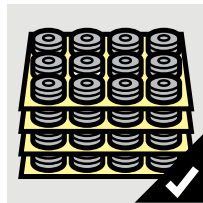
- Always wear clean and dry gloves when handling metal parts to protect them from corrosion causing fingerprints.



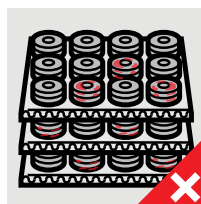
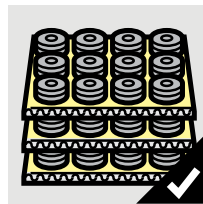
- When packing, the temperature of the parts should be about the same as the room temperature to avoid condensed moisture.



- Tightly close packages with tape, heat seal, zip ties or by folding over. Reseal after every use.



- Insert additional Zerust® materials as interleave for added protection in larger and tightly packed or layered packages.



- Avoid direct contact of metal with wood, paper or cardboard (sources of moisture and acid).