

Ströbel High Performance VCI Packaging Solutions



Your partner for
customized packaging



VCI Corrosion Protection

Anti-corrosion compounds with an unmatched track record

Your products may be exposed to temperature fluctuations, high humidity, water vapor formation, as well as dust and dirt during shipping, with the result that they may undergo corrosion more quickly than you'd like. This may result in product damage or defects that can cost you considerable time and money.

In order to ensure that your products reach their destination in a corrosion-free state, you need to be sure you're using exactly the right packaging. VCI compounds for durable protection against steel, iron, chrome, copper, brass and zinc corrosion have been used to good effect for decades.

Ease of use

VCI films actively protect against corrosion!

How these films work: Evaporation of the VCI compound coats the packaged products with a film that protects metallic elements and the like (including difficult to reach areas) against corrosion during all production, storage and shipping phases.

This also saves you time and money, because there's no need to oil or wax the parts – which of course also no longer have to be cleansed of oil or wax.

VCI film packaging also enables you to store spare parts for lengthy periods. Various VCI products can be used, depending on the size of your product.



An amazing fact ...

Research shows that damages caused by improper anti-corrosion measures each year amount to around 3 percent of Europe's gross domestic product.

VCI stands for:

Volatile Corrosion Inhibitors (VCIs) and is sometimes referred to as vapor corrosion inhibitors.

Durable corrosion protection

If products are carefully packed in VCI packaging, the packaging protects the packaged elements

- ✓ for six months when stored out of doors and
- ✓ for a minimum of up to 24 months when stored indoors,

and can even withstand brief opening of the packaging for checking purposes. The VCI packaging compound is deposited on the inside of the packaging, thus rendering the protective atmosphere self-regenerating.

How does VCI corrosion protection work?

The active chemical in a VCI is embedded in the carrier using special techniques. Once the protective atmosphere has been formed inside the packaging, VCI molecules are deposited on the metal surfaces of the packaged goods, including difficult to reach areas such as recesses, borings, threads, creases and the like.

The surface layer thus formed disrupts the chemical and electrochemical reactions that provoke corrosion. When VCI packaging is opened, the VCI film vaporizes without leaving any residue.

Sweaty fingers can cause corrosion

Although traces of perspiration from workers' fingers are not immediately visible, they can cause corrosion. That's why we recommend to always wear gloves when packing metallic elements.

When metallic elements are stored for brief periods such as overnight or over the weekend, they should be protected by a suitable VCI covering to prevent formation of a rust film..

! Caution ! Particular care should be taken in cases where packaging or storage is realized in a newly constructed building, since construction chemicals (oftentimes chloride) as well as other corrosive chemicals that are embedded in the building walls can vaporize and cause corrosion.

Corrosion can be caused by:

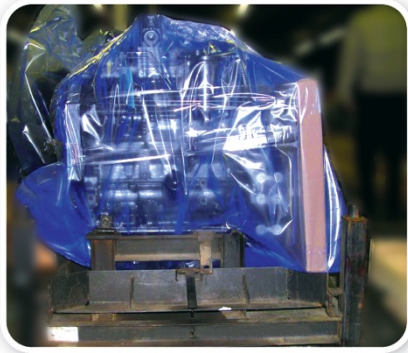
- ✓ **Air:** humidity; oxygen; industrial emissions; sulfur dioxide, nitrogen oxide.
- ✓ **Water:** seawater, chlorinated drinking water and the like.
- ✓ **Acids:** Caustic materials; mordants; grease and solder removal agents; free acids in box lumber; galvanic baths near packaging departments; and other acidic elements.
- ✓ **Dust:** Dust and dirt attract dampness and bind corrosive substances. Hardened oil and grease bind dampness.
- ✓ **Perspiration from hands,** which contains chlorides, sulfates, phosphates, as well as lactic acid, uric acid and fatty acid.

Packaging disposal

VCI packaging can be disposed of without any difficulty and is environmentally friendly.

Advantages of VCI corrosion protection

- ✓ **Easy to handle**
No oil coating or the like necessary.
- ✓ **Low cost**
Non-labor intensive; VCI packaging need not be disposed of separately; take up little space; etc.
- ✓ **Quick and easy application**
No need to degrease the application surface using solvent; surfaces can be treated immediately.
- ✓ **Easy to dispose of and environmentally friendly**
Recyclable; thermally recyclable.



VCI create a molecular coating

The active ingredient in our VCI packaging vaporizes continuously and in so doing forms a protective atmosphere that is deposited on the packaged metallic elements. Condensation resulting from the temperature falling below the dew point is passivated thanks to the ionic bond formed by the active ingredient in the VCI.

When the condensate evaporates, this active ingredient remains as a molecular coating on the metal surface. If condensation recurs, the condensate is likewise passivated. Our VCI packaging, which is compliant with the EU RoHS directive and the German regulation known as TRGS-615, is non-hazardous and nontoxic. Safety data sheets for our VCI packaging are available on request.

VCI packaging obviates the need for an additional grease or oil coating, whether for ferrous or nonferrous metals.

Use of barrier layer in conjunction with VCI products provides additional protection

The amount of time the anti-corrosion effect lasts is mainly determined by the type of packaging. VCI packaging should be packaged in outer packaging that provides a barrier layer, so as to allow for establishment of an adequate VCI atmosphere.

It is essential that metallic VCI-packaged products that are shipped through climatic zones that promote corrosion are endowed with a condensation-proof barrier layer, which greatly increases the lifetime of VCI packaging corrosion protection.

VCI-packaged products, if packed in an approx. 100µm sealed PE shell, can be stored for around 12 months in a cool, dry place at an ambient temperature of up to 25 °C. Such packaging needs to be resealed immediately after use in order to prevent the VCI active ingredient from escaping.

Summary product information

- ✓ VCI's vaporize from the VCI carrier inside the packaging, where they form a molecular layer on metallic surfaces, thus preventing corrosion.
- ✓ VCI's even penetrate recesses, borings, creases and the like.
- ✓ VCI's are applied in various VCI carriers, namely:
 - VCI papers, VCI plastic films, VCI foams, VCI dispensers, and VCI chips.
- ✓ VCI's are recyclable.
- ✓ VCI's are easy to use, cost effective, and environmentally friendly.

Important notes:

Please note:

- ✓ Once products are clean and dry, package them as soon as possible.
- ✓ Always wear gloves when packaging metal parts, which should be clean and free of fingerprints prior to packaging.
- ✓ The lifetime of VCI protection is strongly affected by whether additional packaging is used, as well as by ambient conditions during the shipping and warehousing phases.
- ✓ The protective atmosphere normally forms inside the packaging within around 24 hours, depending on the ambient temperature.
- ✓ VCI packaging can be briefly opened for monitoring purposes, as the protective atmosphere regenerates from the VCI packaging compound.
- ✓ VCI-protected products can be used right out of the package; the protective film quickly vaporizes without leaving any residue.
- ✓ Metallic elements should be packaged in an airtight room that displays low humidity and a stable ambient temperature. The surface temperature of the metallic elements being packaged should be equal to or greater than the ambient temperature, since otherwise condensation will form on the metal surfaces and will end up in the packaging. Gas, dirt and galvanic vapor should not be allowed to exert any effect on the packaging process or the elements being packaged.

Usage tips:

- ✓ Maintain a maximum 30 cm clearance between VCI packaging and metal surfaces. Additional VCI products can be used for larger packaging units.
- ✓ In case of high bulk density additional VCI products should be placed in the centre of the bulk.
- ✓ Rule of thumb: One square meter of VCI provides protection for one to three square meters of metal surface or one cubic meter of packaging space.
- ✓ The temperature of the elements being packaged should be equal to the ambient temperature (condensation).
- ✓ The packaging must be closed and tight. Avoid contact with water.
- ✓ Avoid direct contact between metals and wood, paper or corrugated fiberboard, as these may contain corrosive substances.
- ✓ Never use more than one VCI compound in the same packaging, as this can result in chemical interactions.

How to store VCI products:

Keep them in a cool, dry place that is not exposed to direct sunlight. Do not store the products outside, at high humidity or at temperatures exceeding 25°C.

In case of doubt concerning the use of VCI products, feel free to contact us. We'll be more than happy to analyze your packaging process and provide you with advice on site.

Premium Metal-Guard® VCI Film

Product information

Product materials and attributes

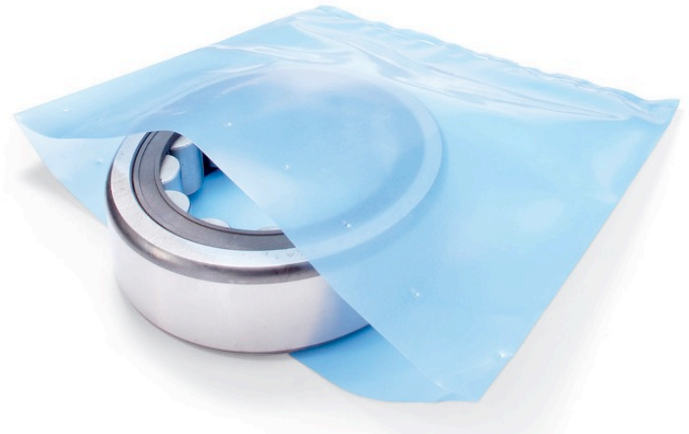
Premium Metal-Guard® VCI film protects valuable metallic components and accessories against corrosion, and is highly suitable for packaging and protection of ferrous and nonferrous metals. Premium Metal-Guard® contains a multi-faceted volatile corrosion inhibitor (VCI), which is mixed with low density polyethylene (LDPE), via extrusion, during the plastic film manufacturing process.

Usage

The packaged elements need not be oiled or greased prior to packaging. VCIs are attracted to the charged surface of clean and dry metal by virtue of their polar orientation. Some of the VCI molecules align on the surface of the metal. In order for the molecules to be robustly attracted to the metal surfaces, the clearance between the latter and the VCI film should not exceed 200 to 300 mm.

Rule of thumb: One square meter of VCI film provides protection for one to three square meters of metal surface or one cubic meter of packaging space.

For optimal effect, the metallic elements should be as close as possible to the VCI film.



The corrosion protection results from a surface neutralization mechanism. When a VCI layer is in a state of equilibrium, an active VCI ingredient adheres to the metallic surface on which it has been deposited until it is mechanically removed via compressed air or sprayed water. The VCI regenerates itself in that it draws upon the remains of the VCI atmosphere that was previously established inside the VCI film.

When a metal element is removed from its VCI packaging, the active VCI ingredient vaporizes without leaving any residue. Thus such metal elements can be used immediately. VCI packaging is mainly used to protect metal against corrosion during shipping (particularly for exported products), as well as during manufacturing and warehousing.

Product composition

Polyethylene film mixed with Premium Metal-Guard® VCI

Shelf life

VCI film should be stored sealed in its original packaging and utilized within 5 years from receipt. It must be kept in a cool, dry place away from direct sunlight.

Protection life

VCI film provides six months of protection when used out of doors, provided that the packaging is protected against dampness and other environmental factors. When used indoors, VCI film provides a minimum of 24 months of robust protection.

Type of metal	Corrosion protection
Mild steel	Full protection
Cast iron	Full protection
Zinc; white metal	Full protection
Copper	Full protection
Red or white brass	Full protection
Bronze and bronze alloys	Full protection
Cadmium and cadmium plated metal	Full protection
Chrome and chrome plated metal	Full protection
Stainless steel, all grades	Full protection
Lead; solder	Pre-usage testing recommended ¹
Silver and silver plated metal	Pre-usage testing recommended ¹
Aluminum	Pre-usage testing recommended ¹
Magnesium	Not recommended ²

¹ Although VCI film normally protects this type of metal against corrosion, for best results a pre-usage test should be conducted using the relevant type of metal.

² This means not that the product is incompatible with VCI film, but rather that products that are better suited for this application may be available. A pre-usage compatibility test should be conducted in all cases. Contact us for recommendations as to which of our products are most suitable for a particular application.

VCI film is non-hazardous and nontoxic...

...according to the *OSHA Hazard Communication Standard (29 CFR 1910.1200)*.

VCI film should be used in a well ventilated area. Product users should wash their hands after use and before eating. Do not store food together with VCI packaging products.

VCI Films

Product range

VCI films are available

- ✓ in thicknesses ranging from 50 to 200 μ ,
- ✓ as flat sheet films (supplied in rolls or sheets),
- ✓ as tubular films.

Depending on the size of your product, you can choose from our stock options.

The following stock options are available for individual products, small parts and spare parts:

- ✓ flat bags,
- ✓ flat bags with zipper, or
- ✓ perforated bags on rolls.

We always have a **wide range** of bags **on stock**.

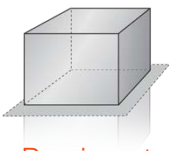
For covering or packaging larger products such as motors, you can use one of the following items:

Side gusset bags



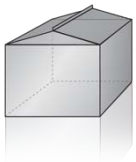
- ✓ can be used as box inserts
- ✓ for bulk items
- ✓ large filling volume
- ✓ also available as perforated bags on a roll

Box covers with bottom sheet



- ✓ ideal for heavy and bulky goods
- ✓ easy to handle: just cover your goods and seal the edges of your tailored packaging product

Box inserts



- ✓ ideal for filling and loading operations
- ✓ easy to seal thanks to horizontal seam (stretch closure)



VCI CLEAR PAK® BIO

Product information

Material

Clear Pak BIO is a new, innovative, corrosion inhibiting film that combines the familiar superior rust protection with the highest level of care for the environment and worker safety. Clear Pak BIO complies with the strictest occupational health, safety and environmental regulations while protecting your metal parts from corrosive elements during shipping and storage anywhere in the world.

Fully protects ferrous metals such as steel and iron, and is compatible with a wide variety of metals and alloys.

- Completely amine-free. Completely nitrite-free.
- Impregnated with volatile corrosion inhibitors that are all natural, derived from plants.
- Safe to handle and use.
- TRGS 615 and 900 compliant.
- TL 8135-0043 compliant. Strong and effective enough to pass the most rigorous corrosion tests. It passes TL 8135-0043 with the highest grade possible (3).
- Fully recyclable.
- Easy inspection of the parts inside without opening the package.
- Flexible, strong, puncture, and tear resistant.
- Technically proven to provide the best protection for ferrous metals.
- Tinted a unique shade of purple to identify it as a quality product of Daubert Cromwell and printed with the Clear Pak BIO name so your customer recognizes that you are protecting their parts to arrive corrosion-free.

Attributes

The Clear Pak BIO film, which is derived from plant extracts, is an alternative to conventional VCI products featuring outstanding mechanical properties. It protects metal parts and components from damage and contamination, even under the most adverse conditions.

Clear Pak BIO is an effective product that is free of sodium nitrites, amines or any other regulated substances, and provides thus a safe work environment.

Types

Available in multiple types and thicknesses to meet individual customer specifications:

- Flat sheet film; centre-folded film
- Tubular film
- Flat bags, side gusset bags and zip lock bags
- Coverings, box inserts or liners, Schutzabdeckungen etc.

Please do not hesitate to ask!



TRGS 615 & TL 8135

Premium Metal-Guard® XO Wrap

Product information

The **Premium Metal-Guard® XO Wrap** is a 250µ polyethylene film treated with a specifically developed mixture. The film is heat shrinkable, UV resistant and suitable for outdoor applications, for both ferrous and non-ferrous metals.

UV stable shrink wrap

Premium Metal-Guard® XO Wrap conforms to the shape of the packaged metal parts. The UVI stabilization feature provides extended life to the film, especially when the parts need to be stored outdoors. Additional VCI products (e.g. Daubrite® Emitter, VCI paper, VCI foam) can be added to the packaging to increase the corrosion protection.



Applications

Premium Metal-Guard® XO Wrap replaces standard non-VCI shrink wraps and tarps. The flexible barrier film protects metal against moisture, dust, and dirt while the VCI in the film proactively prevents corrosion. The UVI stabilization feature provides extended life to the film, especially when the parts need to be stored outdoors.

Protection life

Premium Metal-Guard® XO Wrap provides six months of protection when used out of doors, provided that the packaging is protected against dampness and other environmental factors. When used indoors, VCI film provides a minimum of 24 months of robust protection.

Shelf life

36 months, from date of shipping. This shelf life statement is only valid for product stored sealed in the original shipping container. It must be kept in a cool, dry place away from direct sunlight and not in high humidity and not at high temperatures. Storage outside these conditions voids this statement.

Detailed information about PowerShield® VCI Paper

Product description

The high quality PowerShield® paper was developed specially to protect metals that are stored over lengthy periods and/or that are shipped.

PowerShield® VCI paper packaging is ideal for car parts, heavy devices and machinery, and other finished metal components that need to be kept clean and rust free during cross-border shipping.

Our PowerShield® VCI paper packaging, which is made of kraft paper impregnated with an extremely high quality VCI, is available in the following forms:

- ✓ The FE series offers optimal VCI protection for ferrous metals
- ✓ The MM series is best suited as a VCI paper packaging for alloy components.



All of our PowerShield® VCI paper packaging products are easy and safe to use, are recyclable and comply with recognized standards such as the German TRGS-615. When a component is wrapped in PowerShield® VCI paper, the VCI chemicals are attracted to the metal surface, where they form a protective shield that prevents deposits on the metal elements such as dampness, salt, dirt, oxygen and other fouling agents that can cause corrosion. A component wrapped in our PowerShield® VCI paper packaging remains clean, dry and rust free until use, and needs no further treatment.

Features

- ✓ Proven chemical anti-corrosion properties.
- ✓ Recyclable (RESY).
- ✓ Easy and safe to use; no special handling required.
- ✓ Obviates the need for oil, grease and other conventional corrosion protection measures.
- ✓ Components wrapped in PowerShield® VCI paper packaging remain clean and dry and are ready to use.
- ✓ Complies with the EU RoHS directive and with the German TRGS-615 regulation.

Product range

- ✓ 50 - 130 grams / square meter
- ✓ Available in rolls or sheets (according to customer's specifications)

Application domains

- ✓ Large and irregularly dimensioned machines
- ✓ High tech microcomponents
- ✓ Long term indoor storage
- ✓ As a packaging material for export shipments

Usage tips

- ✓ Always wear gloves when packaging metal parts, which should be clean and free of fingerprints prior to packaging.
- ✓ Once products are clean, package them as soon as possible. The distance between metal part and VCI product should not exceed 30 cm. The closer the VCI product is to the metal part, the better is the corrosion protection.
- ✓ Rule of thumb: One square meter of VCI provides protection for one to three square meters of metal surface or one cubic meter of packaging space
- ✓ Keep the product in a cool, dry place that is not exposed to direct sunlight. Do not store the products outside, at high humidity or at temperatures exceeding 27°C.

Detailed information about MasterShield® VCI Paper

Product materials and attributes

MasterShield FE VCI paper packaging was developed specially to protect ferrous metals against corrosion and is intended for use for packaging and corrosion protection of steel and cast iron. MasterShield FE VCI paper packaging is made of VCI-impregnated kraft paper, which can then also be coated with polyethylene.

How it works

The corrosion protection results from a surface neutralization mechanism. When a VCI layer is in a state of equilibrium, an active VCI ingredient adheres to the metallic surface on which it has been deposited until it is mechanically removed via compressed air or sprayed water. The VCI regenerates itself in that it draws upon the remains of the VCI atmosphere that was previously established inside the VCI paper packaging.

The packaged elements need not be oiled or greased prior to packaging. VCIs are attracted to the charged surface of clean and dry metal by virtue of their polar orientation. Some of the VCI molecules align on the surface of the metal. In order for the molecules to be robustly attracted to the metal surfaces, the clearance between the latter and the VCI film should not exceed 200 to 300 mm.

When a metal element is removed from its VCI packaging, the active VCI ingredient vaporizes without leaving any residue. Thus such metal elements can be used immediately.

VCI packaging is mainly used to protect metal against corrosion during shipping (particularly for exported products), as well as during manufacturing and warehousing.

Hybrid packaging solutions are also available involving the concurrent use of paper, polyethylene film, and other VCI products. In such cases, the compatibility of each envisaged type of packaging with the product being packaged should be tested.

VCI paper is non-hazardous and nontoxic...

...according to the *OSHA Hazard Communication Standard* (29 CFR 1910.1200).

Important note:

VCI film should be used in a well ventilated area. Product users should wash their hands after use and before eating. Do not store food in VCI packaging products.



Detailed information about Daubrite® Disk VCI Emitters

Product description

Daubrite® 5 and Daubrite® 10 disk emitters are corrosion-preventive VCI devices designed for use inside packaging environments and enclosures. The protective vapors emitting from the disk volatilize inside the space to form an invisible layer on the surface of the metal and prevent moisture, salt, dirt, oxygen and other contaminants from depositing on the metal and causing corrosion.

Corrosion protection

- ✓ Daubrite® 5 protects up to 0.14 cubic meter of packaging space for up to 24 months
- ✓ Daubrite® 10 protects up to 0.28 cubic meter of packaging space for up to 24 months

Features

- ✓ These thin, lightweight disks can be positioned inside tight or restrictive spaces.
- ✓ Adhesive tape on the back sticks to metal cabinets, containers, walls, etc.
- ✓ Proven chemical anti-corrosion properties.
- ✓ Protects even in the presence of moisture.
- ✓ Provides effective corrosion protection for steel, copper, zinc and multi-metal elements.
- ✓ Safe and easy to use; no special handling required.
- ✓ Provides clean and dry corrosion protection.
- ✓ Provides corrosion protection for up to two years.

Typical applications

Exposed metals in junction boxes and control panels; electronic and telecommunication equipment; steel enclosures; utility boxes; tool boxes; gun cabinets; mechanical control elements; alarm devices.

Usage tips

- ✓ Packaging personnel should always wear gloves while handling metal parts.
- ✓ Parts should be clean and free of fingerprints prior to packaging.
- ✓ Package your clean products as quickly as possible.
- ✓ The distance between metal part and VCI product should not exceed 30 cm.
- ✓ The closer the VCI product is to the metal part, the better is the corrosion protection.



As a rule, 0.09 square meter of VCI should be used for each 0.09-0.28 square meter of metal surface. Use at least one Daubrite® 5 disk emitter for each 0.14 cubic meter of empty space in the relevant element.

Physical properties

Property	Typical Value	Typical Value
	Daubrite® 5 disk emitter	Daubrite® 10 disk emitter
Corrosion inhibitor weight	6 g (minimum)	12 g (minimum)
Protection volume	0.14 cubic meters	0.28 cubic meters
Total product weight	9.3 grams (avg.)	15.3 grams (avg.)
Diameter	5.6 cm (around)	5.6 cm (around)
Thickness	0.5 cm	1.0 cm

Storage

Store unused Daubrite® disk emitters in original packaging in a cool, dry place, away from direct sunlight.

De-Rusting Solution

Why rust removal matters?

The military, manufacturing, automotive and metal working industries are often confronted with the problem of rust removal, which necessitates a labor intensive and high cost mechanical removal process whose aggressiveness can actually alter surface properties and that thus frequently leaves traces on the treated product.

De-rusting and corrosion protection?

Protective shipping and storage packaging solutions normally do not provide full corrosion protection on their own; because if a metal surface displays even a minute amount of corrosion (which may or may not be visible to the naked eye), the packaging will not be able to halt the corrosion process. In such cases, every last trace of rust, as well as oil or dirt residues, must be removed from the metal surface.

Thus de-rusting products and anti-corrosion packaging represent two completely different elements that nevertheless both serve a protective purpose and that together comprise a complete corrosion protection system – providing that the relevant surfaces are thoroughly de-rusted prior to being placed in protective packaging.

The advantages for manufacturers of combining these two technologies is that product damage resulting from the use of auxiliary cleaning processes is avoided, and both labor time and costs are reduced.

RUSTREVENGE – the ideal de-rusting solution

Treat your products with RUSTREVENGE, the nontoxic and biodegradable rust removal product, prior to placing them in protective packaging.

Detailed information about RUSTREVENGE Rust Remover

Product description

RUSTREVENGE is a liquid rust remover. The new acid-free, pH neutral, water based formula makes rust removal extremely easy. Made in the EU.

Attributes

- ✓ Water based – reusable.
- ✓ Reliably removes rust from a wide range of surfaces.
- ✓ No toxic VOCs or HAPs.
- ✓ Non-toxic and biodegradable.
- ✓ Contains no acids or bases.
- ✓ pH neutral – no special handling required.
- ✓ Easy to use and to dispose of.
- ✓ Conforms to REACH.



Typical applications

Engines • Automotive • Turbines • Tools • Manufacturing • Paint Prep • Marine/Boat Parts • Ship Yards • Construction • Machine Shops

Environmentally friendly technology

Derusts without dismantling. The product will not harm copper, brass, aluminum, plastic, rubber, wood or vinyl. It will not remove non-oxide coatings, such as paint or chrome, that are still adhered to the surface.

Usage tips

- ✓ Pre-clean items to remove oil and dirt.
- ✓ Rinse items and immerse fully in RUSTREVENGE.
- ✓ Check progress periodically.
- ✓ Works best when the solution is at 15.50C or higher.
- ✓ Submersion time varies with severity of rust.
- ✓ Light surface rust will require 5-30 minutes, moderate rust up to 4 hours.
- ✓ Deeply rusted parts may require overnight soaking.
- ✓ To prepare a surface for coatings, once rust is removed, rinse item with water, dry it, and apply the coating according to the manufacturer's instructions.





Your partner for
customized packaging

Your notes:



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Your notes:

WE  PACKAGING



We also provide:

Export packaging that meets DIN/TL requirements
ESD packaging that complies with IPC/JEDEC standard

EMI shielding bags
Shielding bags
Aluminum composite bags

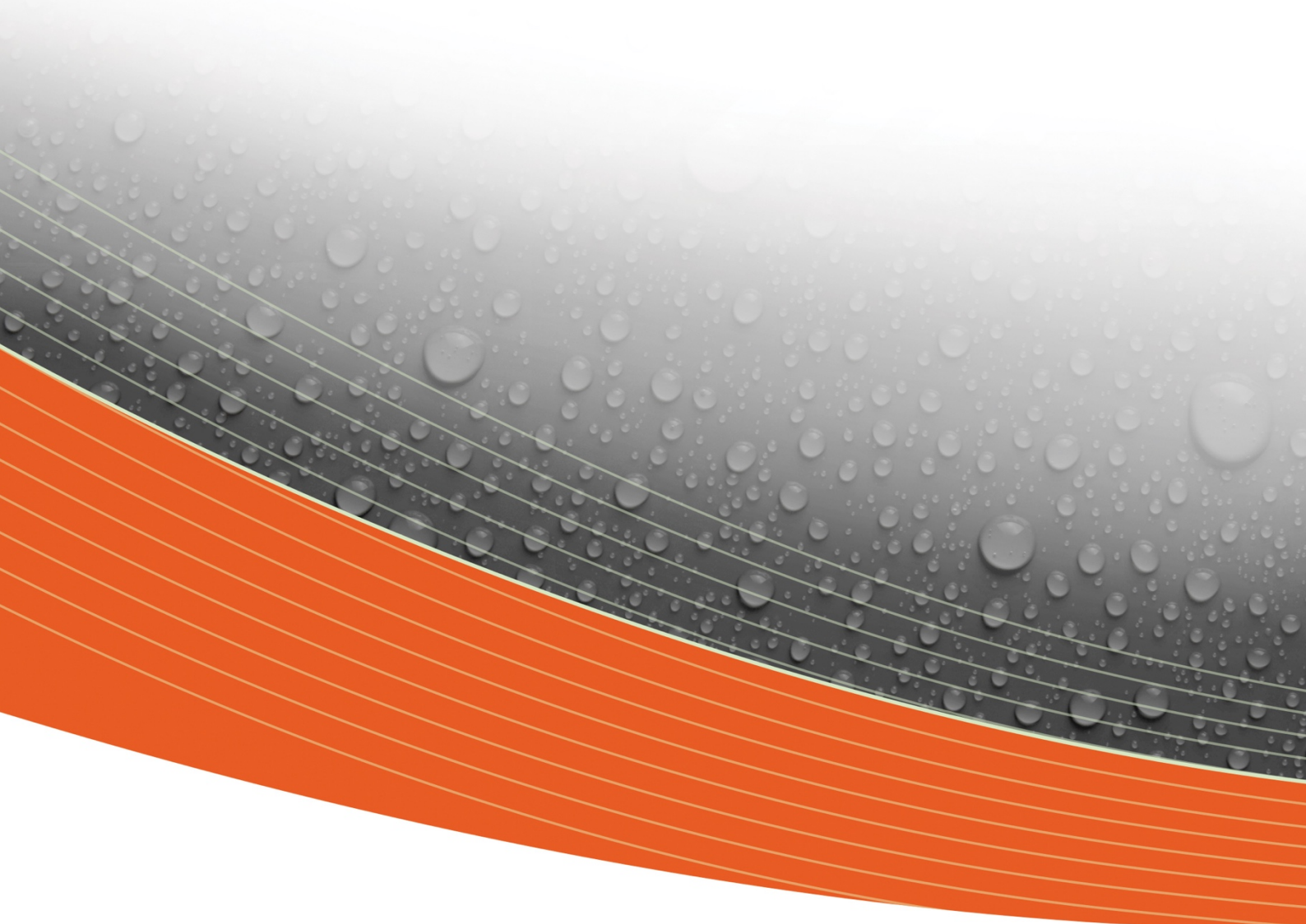
Aluminum composite film
coverings for
large appliances and machines
Humidity indicator cards

Heat sealing tongs
Desiccants
Humidity indicator cards

Please do not hesitate to get in touch!



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