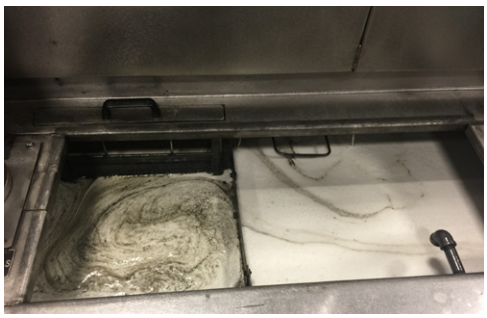
ZERUST® EXCOR®

ZERUST® Industrial Cleaners and Degreasers



ZERUST® Global Corrosion & Cleaning Management Solutions

How ZERUST® Works for You



For over 50 years, beginning with the invention of Vapor Corrosion Inhibiting (VCI) film packaging, ZERUST®/EXCOR® has led the market in quality corrosion solution products. We are dedicated to providing expert corrosion management services and broadening the range of corrosion solutions for our customers. In addition, ZERUST® users have access to on-site support from ZERUST®/EXCOR® representatives in more than 70 countries. As a result, our customers have peace of mind when they choose ZERUST® for corrosion control management.

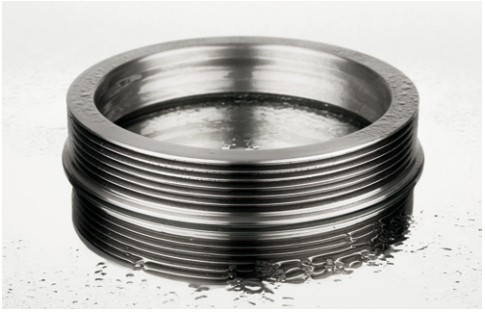
High-Performance Industrial Cleaners and Degreasers

In addition to ZERUST® VCI film and other packaging products, ZERUST® offers an increasing range of cost-effective, high-performance wash fluids and rust-preventative products. These products are formulated to work synergistically together to provide enhanced, comprehensive corrosion solutions for our customers. Backed by our global expert technical support and testing services, a comprehensive corrosion management program can be designed and deployed to meet each individual customer's needs.

- Application-specific products
- Overall cost reduction
- Reduction of corrosion issues associated with handling, packaging, and storage of precision machined, bare metal components
- Enhanced fluid maintenance and control procedures for extending the use life of wash fluids and rust-preventative products
- Customer and product-specific operating guides ZERUST® assured corrosion-free results from effectively cleaned and dried parts

Our Commitment to Quality, Safety, and the Environment

We are committed to making safe and effective products that reduce the industry's impact on the environment. ZERUST®/EXCOR® products are approved by many major companies' toxicology, engineering, and packaging departments and comply with health and safety regulations around the globe, including the following:

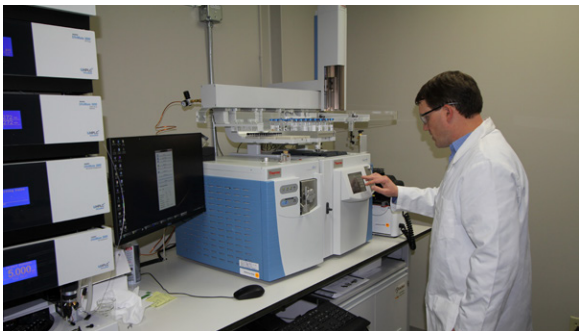


- REACH Regulation Compliant (EC No 1907/2006)
- European RoHS Directive Compliant
- Do not contain SVHC (Substances of Very High Concern)
- Labelled in accordance with GHS (Globally Harmonized System) and are compliant under UN GHS, EU CLP, US OSHA HazCom, and CA WHMIS

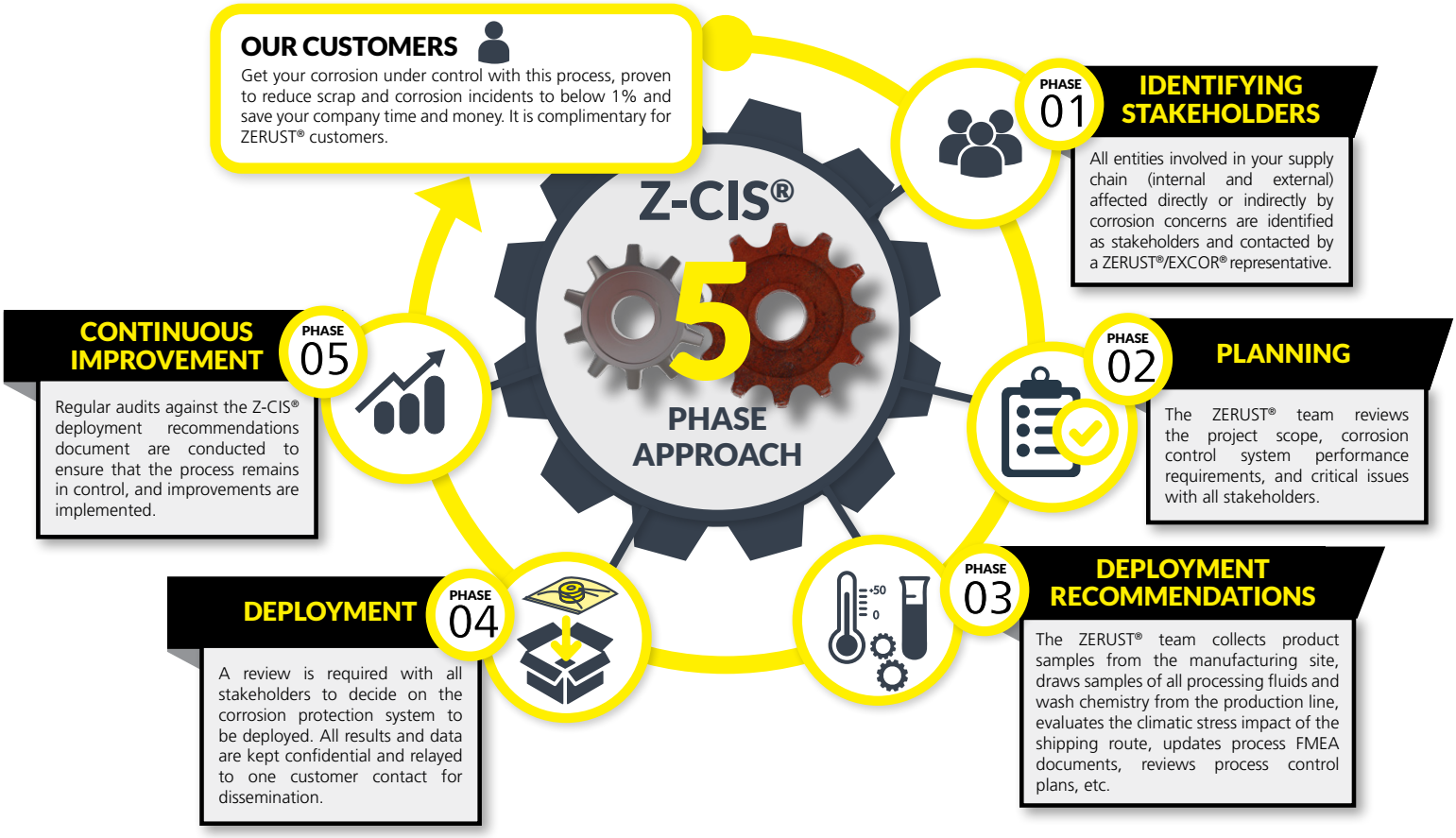
ZERUST® is a business unit of Northern Technologies International Corporation (NASDAQ: NTIC), Headquartered in Minnesota, USA. The management system of ZERUST® products is ISO 9001:2015 certified.

Choosing a Corrosion Management System

Z-CIS® is the ZERUST® Corrosion Inhibiting System and the proven methodology for deploying our comprehensive corrosion management solutions. It addresses the causes of corrosion at each stage in manufacturing processes, product handling, and in transit around the world. The Z-CIS® method is designed to meet both the rust-free and contaminant-free requirements of various OEMs sourcing from a global supply base. After implementing Z-CIS®, companies generally reduce costs related to corrosion by 10% or more and realize as high as 100% rust-free shipment yields. To get started, visit www.zerust.com/tellus.



Our GC/LC Mass Spectrometry is just one of the tools we use in our lab for testing a customer's process fluids and the effectiveness of recommended corrosion solutions.



ZERUST® ICT®630 Industrial Cleaners & Degreasers

ZERUST® ICT®630 Industrial Cleaners & Degreasers

ZERUST® AxxaWash™ Cleaner and Degreaser series consist of low foaming⁺ water cleaner and degreaser products that are specifically designed to quickly and effectively remove light to heavy-duty hydrocarbon soils typically encountered in metalworking and metal finishing operations. This series will include alkaline and neutral pH products uniquely formulated to suit customer and part-specific requirements based on substrate type, soil type, methods, and parameters of application, as well as cleanliness levels and corrosion inhibition requirements.

ZERUST® Axxatec™ DA (Dual-Action) series consists of low to no foaming⁺ water-based rust inhibitor products that also contain limiting cleaning designed to quickly and effectively remove light-duty hydrocarbon soils. Axxatec™ DA products protect bare metal surfaces during assembly and in situations where water-based spray-on, in-line production, or dipping applications are desired. Additionally, Axxatec™ DA products form clear, thin, dry-to-touch coatings that help prevent rust and corrosion for up to 3 months‡, protecting in-between production processes and for short-term shipment and storage periods.

	Metal Compatibility*											Contains			Application		Removal						Rust Protection‡			
																	Soils									
ZERUST® Product Name	Ferrous/ Stainless**	Aluminum	Copper	Brass	Galvanized	Operating Temperature	Dilution Rate	pH*** (Conc)	pH*** (5%)	Foam⁺	Rinse Required	Chelants	Silicates	Phosphates	Spray	Immersion	Light-Duty	Medium-Duty	Heavy-Duty	Chloride neutralization	Oil Splitting	Hard Water Stable	Flash-Rust‡	Extended Flash-Rust‡	Up to 3 Months‡	Hazmat
AxxaWash™ KF-121	✓					115 – 135°F (46 – 57°C)	1 – 10%	13 – 14	12 – 13	Low	✓	✓	✓		✓	✓	✓	✓				✓				✓
AxxaWash™ KF-122	✓					120 – 150°F (49 – 66°C)	1 – 10%	13 – 14	13 – 14	Low	✓	✓	✓		✓	✓		✓	✓			✓				✓
AxxaWash™ KF-123	✓		✓	✓	✓	135 – 150°F (57 – 66°C)	1 – 10%	11 – 12	10 – 11	Low		✓			✓	✓	✓	✓		✓		✓	✓			
AxxaWash™ KF-124	✓		✓	✓	✓	120 – 145°F (49 – 63°C)	1 – 10%	9.5 – 10.5	9.0 – 9.5	Low		✓			✓	✓	✓	✓		✓		✓	✓			
AxxaWash™ KMS-220	✓		✓	✓	✓	105 – 165°F (41 – 74°C)	1 – 10%	9 – 10	8.5 – 9.5	Low		✓			✓		✓				✓	✓	✓			
AxxaWash™ KMS-305	✓	✓			✓	115 – 140°F (46 – 60°C)	1 – 10%	12 – 13	10 – 11	Low	✓		✓		✓		✓	✓			✓					✓
AxxaWash™ KMS-310	✓	✓				120 – 140°F (49 – 60°C)	1 – 10%	11 – 12	10 – 11.5	Low	✓	✓	✓		✓	✓		✓	✓			✓				✓
AxxaWash™ NW-10C	✓					77 – 140°F (25 – 60°C)	1 – 10%	11 – 12	11 – 12	High		✓			✓	✓	✓	✓	✓	✓		✓	✓			
AxxaWash™ NW-12C	✓					77 – 140°F (25 – 60°C)	1 – 10%	10 – 11	10 – 11	High		✓			✓	✓	✓	✓	✓	✓		✓	✓	✓		
Axxatec™ DA-23C	✓					72 – 140°F (22 – 60°C)	3 – 20%	9 – 11	8 – 10	No Foam					✓	✓	✓				✓	✓	✓	✓	✓	
Axxatec™ DA-24C	✓		✓	✓		72 – 140°F (22 – 60°C)	3 – 20%	9 – 11	8 – 10	No Foam					✓	✓	✓				✓	✓	✓	✓	✓	
Axxatec™ DA-40AL	✓	✓	✓	✓	✓	72 – 140°F (22 – 60°C)	3 – 10%	8.5 – 9.5	8 – 9	Low		✓			✓	✓	✓					✓	✓	✓	✓	
Axxatec™ 30C	✓		✓	✓		≥72°F (22°C)	2 – 10%	9 – 10	9 – 10	Low		✓			✓	✓	✓					✓	✓	✓	✓	

* Some cleaners may be safe to use on other substrates at lower concentrations, temperatures, and times. Contact a ZERUST®/EXCOR® representative to discuss your specific application.
** For cast iron/ductile/sintered metal parts, test before use.
*** Typical pH values.
⁺Foaming propensity and degree of foaming depend on several factors such as temperature, surfactant type, spray application pressure, air entrainment, and type of soil/contaminant.

AxxaWash™ and Axxatec™ DA Cleaning Capabilities



ZERUST® ICT®630 Industrial Cleaners & Degreasers

AxxaWash™ KF-121 Cleaner



AxxaWash™ KF-121 is a low-foaming, alkaline, water-based cleaner compatible with hard water in a wide range of operating temperatures. AxxaWash™ KF-121 is a high-performance cleaner designed to remove light to medium-duty hydrocarbon soils on ferrous substrates and maintain low foaming under spray conditions. AxxaWash™ KF-121 does not contain alkylphenol ethoxylates, boron salts, phosphates, or solvents, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, and RoHS requirements.

AxxaWash™ KF-122 Cleaner



AxxaWash™ KF-122 is a low-foaming, heavy-duty alkaline, water-based cleaner compatible with very hard water in a wide range of operating temperatures. AxxaWash™ KF-122 is a high-performance cleaner designed to remove medium to heavy-duty hydrocarbon soils on ferrous substrates and maintain low foaming under spray conditions. AxxaWash™ KF-122 does not contain solvents or phosphates, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, SVHC, RoHS, and REACH requirements.

ZERUST® ICT®630 Industrial Cleaners & Degreasers

AxxaWash™ KF-123 Cleaner/Flash-Rust Inhibitor



AxxaWash™ KF-123 is a low-foaming, mildly alkaline, high-performance water-based cleaner compatible with hard water that offers flash-rust inhibition. Furthermore, AxxaWash™ KF-123 is designed to remove light to medium-duty hydrocarbon soils on ferrous substrates while offering chloride mitigation. AxxaWash™ KF-123 does not contain alkylphenol ethoxylates, boron salts, phosphates, silicates, or solvents, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, and RoHS requirements.

AxxaWash™ KF-124 Cleaner/Flash-Rust Inhibitor



AxxaWash™ KF-124 is a low-foaming, mildly alkaline, water-based cleaner compatible with hard water in low operating temperatures. AxxaWash™ KF-124 is a high-performance cleaner with flash-rust inhibition designed to remove light to medium-duty hydrocarbon soils on ferrous substrates while offering chloride mitigation. AxxaWash™ KF-124 does not contain alkylphenol ethoxylates, boron salts, phosphates, silicates, or solvents, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, and RoHS requirements.

ZERUST® ICT®630 Industrial Cleaners & Degreasers

AxxaWash™ KMS-220 Cleaner/Flash-Rust Inhibitor



AxxaWash™ KMS-220 is a low foam, low temperature, mildly alkaline water-based cleaner compatible with hard water and offers excellent oil-splitting capabilities and flash-rust inhibition. AxxaWash™ KMS-220 is an ideal cleaner for removing light-duty hydrocarbon soils and particulates on ferrous substrates. AxxaWash™ KMS-220 does not contain alkylphenol ethoxylates, boron salts, phosphates, silicates, or solvents, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, and RoHS requirements.

AxxaWash™ KMS-305 Cleaner



AxxaWash™ KMS-305AL is a low foam, low temperature, alkaline water-based cleaner designed for use with aluminum and ferrous metals in spray systems with its excellent oil-splitting capabilities. AxxaWash™ KMS-305AL is an ideal cleaner for removing light to medium-duty hydrocarbon soils and particulates on aluminum heat exchanger components. AxxaWash™ KMS-305AL contains no chelating agents and low silicate levels for ease of waste treatment. In addition, AxxaWash™ KMS-305AL does not contain alkylphenol ethoxylates, boron salts, phosphates, or solvents, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, SVHC, RoHS, and REACH requirements.

AxxaWash™ KMS-310 Cleaner



AxxaWash™ KMS-310AL is a low-foaming, alkaline, water-based cleaner compatible with hard water that's designed to remove medium to heavy-duty soils from aluminum and ferrous alloys. AxxaWash™ KMS-310AL does not contain alkylphenol ethoxylates, boron salts, phosphates, solvents, or VOCs, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, and RoHS requirements. AxxaWash™ KMS-310AL does contain low levels of silicate.

ZERUST® ICT®630 Industrial Cleaners & Degreasers

AxxaWash™ NW-10C Cleaner/Flash-Rust Inhibitor



AxxaWash™ NW-10C is a mildly alkaline, water-based cleaner compatible with hard water in a wide range of operating temperatures. AxxaWash™ NW-10C is a high-performance cleaner with flash-rust inhibition designed to remove and deactivate sources of corrosion such as chlorides, oils, and contaminants. AxxaWash™ NW-10C does not contain alkylphenol ethoxylates, boron salts, phosphates, or silicates, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, RoHS, and REACH requirements.

AxxaWash™ NW-12C Cleaner/Extended Flash-Rust Inhibitor



AxxaWash™ NW-12C is a mildly alkaline, water-based cleaner compatible with hard water in a wide range of operating temperatures. AxxaWash™ NW-12C is a high-performance cleaner designed to remove oily contaminants and deactivate corrosion-inducing inorganic anions while providing extended flash-rust inhibition. AxxaWash™ NW-12C does not contain alkylphenol ethoxylates, boron salts, phosphates, or silicates, is non-flammable, and complies with Global Automotive Declarable Substance, TSCA, RoHS, and REACH requirements.

ZERUST® Axxatec™ Dual-Action Cleaners/Rust Inhibitors

Axxatec™ DA-23C Dual-Action Cleaner/Rust Inhibitor



Axxatec™ (Dual-Action) DA-23C is a water-based, low or no foam, liquid concentrate rust preventative and light-duty cleaner designed to provide up to 3 months‡ of indoor storage and in-transit protection for ferrous alloys. In addition to the corrosion protection offered, Axxatec™ DA-23C is compatible with hard water and provides superb oil-splitting performance. However, a well-maintained oil skimmer or splitter is essential for clean and contaminate-free parts, as it removes the oil layer (contaminants) from the bath.

Axxatec™ DA-24C Dual-Action Cleaner/Rust Inhibitor



Axxatec™ (Dual-Action) DA-24C is a water-based, low or no foam, liquid concentrate rust preventative and light-duty cleaner designed to provide up to 3 months‡ of indoor storage and in-transit protection for ferrous-based alloys, while also being compatible with yellow metals. In addition to the corrosion protection offered, Axxatec™ DA-24C is compatible with hard water and provides superb oil-splitting performance. However, a well-maintained oil skimmer or splitter is essential for clean and contaminate-free parts, as it removes the oil layer (contaminants) from the bath.

Axxatec™ DA-40AL Dual-Action Cleaner/Rust Inhibitor



Axxatec™ (Dual-Action) DA-40AL is a hard water compatible, water-based, low-foaming liquid concentrate rust preventative and light-duty cleaner designed to provide up to 3 months‡ of indoor storage and in-transit protection. In addition to ferrous metal protection, Axxatec™ DA-40AL is also compatible with yellow metals and aluminum alloys.

Axxatec™ 30C Rust Inhibitor/Light-Duty Cleaner



Axxatec™ 30C is a hard water compatible, water-based low-foaming liquid concentrate rust preventative designed to provide up to 3 months‡ of indoor storage and in-transit protection. In addition to the corrosion protection offered, Axxatec™ 30C may also be used as a light-duty cleaner-rust preventative combination product, depending on the situation or application.

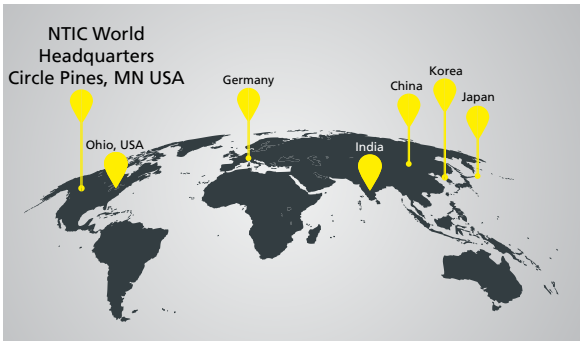
Worldwide Technical Support

Our internationally recognized scientists and field engineers work closely with customers to design and implement comprehensive corrosion management systems. Then, ZERUST®/EXCOR® representatives located across the globe provide on-site technical support to ensure the efficacy of these solutions. Our application engineers will assist with the on-site preparation and packaging of test shipments. At its destination, the shipment may be inspected and evaluated by a global ZERUST®/EXCOR® representative.



Lab and Test Facilities Across the Globe

The effectiveness of the proposed corrosion management system can be evaluated under simulated extreme climatic conditions in one of our multiple worldwide regional ZERUST®/EXCOR® technical support centers.



Testing and Services Offered

Performance Testing	
Cyclic Chamber Test	QUV / Accelerated Weathering
Salt Spray Chamber Test	Cast Iron Chip Test
Humidity Chamber Test	Water Drop Test
Hydrogen Sulfide & Sulfur Dioxide Chamber Test	VCI Standard Test
Environmental Chamber - Pallet load or walk-in	
Chemical Analysis	
Gas-Chromatography Mass-Spectrometry (GC-MS)	Bacteria Testing
Ion-Chromatography	Coulometric Karl Fischer
Liquid-Chromatography Mass-Spectrometry (LC-MS)	TAN & TBN
Fourier Transform Infrared Spectroscopy (FTIR)	
Mechanical Testing	
Mechanical Property Test	Thermal Gravimetric Analysis (TGA)
Differential Scanning Calorimetry (DSC)	
Services	
Data Logger Analysis	Problem Solving, Shipment Inspection Site Visit
Basic Corrosion Prevention Training	

ZERUST® EXCOR®

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‡ DECLARATION
Corrosion protection claims are based on Northern Technologies International Corporation (NTIC) internal laboratory testing performed under controlled parameters on contaminate-free substrates. Real-world application corrosion protection duration on different substrates will vary and depends on factors such as, but not limited to, the application or use, environmental / storage conditions, surface cleanliness, type of substrates, and coating thickness (where applicable). The use of the term "Up to" in reference to time is defined as any time duration from zero up to a specified time frame, but in no event beyond the specified time frame. The use of the term "for years" is based on NTIC's experience with its products but is in no way guaranteed. The use of the term "Up to" in reference to volume is defined as any volume from zero up to a specified volume but in no event beyond the specified volume of protection. It is the customer's / user's obligation to evaluate product performance, corrosion protection duration, safety, and suitability for intended use within the scope advised in the data sheet and to comply with all applicable laws and regulations. **LIMITED WARRANTY/DISCLAIMER** Warranty is limited to the replacement of a product that fails to meet specifications. For full warranty and disclaimer information, visit www.zerust.com/warranty.

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