

OBJET: SYSTEME ANTICORROSION D'ÉCHANGEURS DE CHALEUR A AILETTES ET MICRO-CANAL AVEC RESINE PHENOPLASTES MODIFIEE THERMODURCISSABLE HERESITE P413 – REVISION 7, 27/12/2018.

Avec le présent document nous avons le plaisir de vous soumettre une proposition technique en ce qui concerne l'application sur les échangeurs de chaleur à ailettes et micro-canal de la nouvelle version de **Heresite P413**, un revêtement à base de résine phénoplaste modifiée thermodurcissable à haute résistance et inertie chimique appliqué aussi épaisseurs basse (target sur surface d'échange : minimum 25 [µm]).

Avec l'occasion, nous présentons aussi le kit pour retouches **Heresite VR-554T Brown**.

A. DESCRIPTION DU SYSTEME HERESITE P413

- Dégraissage des surfaces avec un agent approprié de dégraissage ;
- Rinçage de la batterie avec de l'eau froide jusqu'à ce que l'élimination totale des agents utilisés ;
- Élimination de l'eau résiduelle avec de l'air comprimé et séchage subséquent ;
- Séchage dans le four à une température maximum de 190°C ;
- Nettoyage à sec des surfaces en cuivre avec du bicarbonate de dépolissage à basse pression;
- Élimination des résidus de cuisson avec utilisation d'air comprimé;
- Alignement des ailettes pour faciliter l'application du produit (le cas échéant) ;
- Fourniture et pose d'une couche de **Heresite P-413** épaisseur de 10 à 15 [µm] ;
- Prépolymerisation dans un four au moins 15 minutes à une température de 110°C ;
- Fourniture et pose d'une couche de **Heresite P-413** épaisseur de 10 à 15 [µm] ;
- Prépolymerisation dans un four au moins 15 minutes à une température de 110°C ;
- Fourniture et pose d'une couche de **Heresite P-413** épaisseur de 10 à 15 [µm] ;
- Prépolymerisation dans un four au moins 15 minutes à une température de 110°C ;
- Inspection avant polymérisation finale ;
- Polymérisation finale dans un four au moins 45 minutes à une température de 190°C.

Notes:

- **Protection UV Optionnelle:** fourniture et application d'une couche de finition polyuréthane en teinte RAL 8002 (marron signal) ou autre à concorder en fonction du projet et épaisseur 50-75 [µm].
- **CuCu échangeurs:** le nettoyage des surfaces sera étendu aux ailettes en cuivre.

B. KIT POUR RETOUCHES:



- Heresite P413 demande une polymérisation finale à 190° C et par conséquent il n'est pas adapté pour interventions de retouches.
- Pour ces travaux, Heresite conseille **VR-5547 Brown**, une résine phénoplaste qui polymérise à la température ambiante, fournie en bombes de 330 [gr] prêtes à l'emploi.
- **Heresite VR-5547 Brown** offre une bonne résistance à la corrosion et coloration similaire à celle-là du produit Heresite P413.



C. ANNEXES:

1. **Heresite P413** – Fiche technique avec la performance de revêtement et résumé des tests de laboratoire, y compris l'impact sur la perte de transfert de chaleur et les résultats des tests SWAAT ;
2. **Heresite P413** – Conformité à réglementation FDA CFR 175.300 et NSF ANSI 51 (contact indirect avec aliments);
3. **Heresite P413** – Résistance à températures basses (Standard MIL-STD-883 method 1011) ;
4. **Heresite P413** – Protocole de maintenance et lavage ;
5. **Heresite VR-554T Brown** – Documentation d'information ;
6. Galerie de photos.

Note: **Table de résistance chimique** détaillée des produits de la gamme Heresite est disponible sur demande.





Annex 1 – Heresite P413 Fiche technique avec la performance de revêtement et résumé des tests de laboratoire, y compris l'impact sur la perte de transfert de chaleur et les résultats des tests SWAAT



TECHNICAL DATA SHEET

Heresite P-413

Our 50 years of coating history speaks for itself.

In 1964, Heresite was the first company to apply coatings to aluminum-finned, copper-tubed heat exchangers. The Heresite coating became then, and still remains a standard in the industrial coatings industry. We provide the highest quality protective coatings for air conditioning and refrigeration systems that operate in moderate to severely corrosive environments, including both coastal and/or industrial applications. Our phenolic epoxy has an advantage of dense cross linking and can therefore be applied as a very thin film maintaining stable heat transfer.

We continue our focus on innovation and again have a new story to tell, as we introduce our updated P-413

- A high performance phenolic epoxy coating developed specifically for heat exchangers.
- The flexibility and corrosion resistance of Heresite P-413 appreciably increases the service life of your heat exchange equipment.
- It is specially suited for coating light gauge metals in equipment operating in severe corrosive environments.

P-413 Specifications

The coil will receive a uniform coating on all surfaces, including fin edges, with P-413, a thermoset, modified phenolic coating. Application of P-413 will be through multiple coats by immersion or flow coating to a film thickness of approximately 1.0 mil.

P-413 provides corrosion protection in a 6,000 hour salt spray test in accordance with ASTM B-117 and humidity resistance of >2,000 hours per ASTM D2247. Chemical resistance is demonstrated via 100+ acetone double-rubs per ASTM 5402. P-413 also exhibits superior hardness of 5-6H per ASTM D3363, adhesion of 5B per ASTM B3359 and impact resistance of 160 in/lbs (ASTM D2794). Color shall be brown with gloss of 20-60 — 60 degree. If the coils are to be subjected to direct ultraviolet (UV) exposure, a spray-applied UV-resistant topcoat is an option.

Effective date: 10/09/17

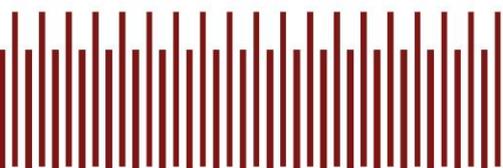
P-413 Typical Properties (@ 1 mil DFT)

- Salt Spray:** ASTM B-117: 6,000+ hours
- SWAAT:** ASTM G85-11 Section A.3: Passed 1,000 hours using pressurized coil (see page 2 for results)
- Cyclic Weathering:** ISO 20340 Offshore Standard: Passed (4,200 hours)
- Performance Testing:** ISO 12944-6 C5 I/M: Passed C5-M high durability and C5-I high durability
- Heat Transfer Reduction:** <1% as applied for heat transfer components
- Humidity:** ASTM D-2247: 2,000+ hours
- Simulated Sea Water Resistance:** 2,000 hours
- Solvent Resistance:** ASTM-D5402: 100 acetone double rubs
- Cross-hatch Adhesion:** ASTM D-3359: 5B
- Mandrel:** ASTM-D522: >1/4 inch
- Impact:** ASTM D-2794: 160 lb/inch steel; 40 lb/inch aluminum
- pH Range (14 day liquid spot test):** 2.4-12.6
- Temperature Cycling (4 hours at -75°C; 4 hours at 190°C):** 4B-5B adhesion after 5 cycles
- Dry Heat Resistance (4 hours at 200°C; 20 minutes at 232°C):** 4B-5B adhesion after 5 cycles
- Dry Film Thickness:** ~1 mils
- Hardness:** ASTM D3363: 5-6H
- Gloss:** 20-60 on 60 degree meter (topcoat dependent)
- Microchannel Compatible**
- Abrasion Resistance:** 30-40 mg loss per 1,000 cycles
- Meets FDA 175.300 for indirect food contact**
- Meets MIL Spec:** MIL-C-18467, MIL-E-480 and MIL-STD-883 Method 1101
- Meets Other Specs:** Honeywell MC 7200-01 and GE F50T17
- Thermal Conductivity:** At approximately 2 mils thickness, Thermal Conductivity is less than 1.0 w/mK
- Dielectric Strength [ISO2376:2010(e)]:** 286 volts per mil of thickness



NSF Certified – ANSI 51 Certification of Coatings for Food Zone – Non Contact

Heresite Protective Coatings LLC • 822 S. 14th St • Manitowoc, WI 54220
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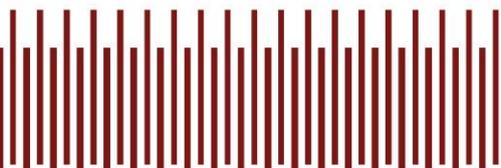
TECHNICAL DATA SHEET

SWAAT Results

	<p>Bare 1,000 hour SWAAT</p>
	<p>P-413 1,000 hour SWAAT</p>
	<p>P-413 + undercoat 1,000 hour SWAAT</p>

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Annex 2 Heresite P413 Conformité à réglementation FDA CFR 175.300 et NSF ANSI 51 (contact indirect avec aliments)



"A Tradition of Quality Since 1935"

January 25, 2017

To Whom it May Concern:

Heresite Coatings, P-413 is formulated to conform to FDA regulation 21 CFR 175.300. These coatings have undergone rigorous evaluation against this standard and meet the qualifications as listed in the standard. Therefore, P-413 meets this regulation.

The P-413 coating is appropriate for conditions with continuous temperatures up to 200°C, with short excursions (20 minutes) of temperature up to a maximum of 232°C.

Furthermore, Heresite P-413 coating has recently become NSF Certified – ANSI 51 Certification of Coatings for Food Zone – Non Contact.

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Technical Director

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4/11/2017

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The Public Health and Safety Organization

NSF Product and Service Listings

These NSF Official Listings are current as of **Saturday, November 04, 2017** at 12:15 a.m. Eastern Time. Please [contact NSF International](#) to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
<http://info.nsf.org/Certified/food/Listings.asp?Standard=051&Company=C0321398&>

NSF/ANSI 51 Food Equipment Materials

Heresite Protective Coatings, LLC

822 South 14th Street
Manitowoc, WI 54220
United States
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920-684-6646

Facility : Manitowoc, WI

Trade Designation	Color	Type of Food	Maximum Temperature of Use in °F
Phenolic-Epoxy Coating for Non Contact Food Zone			
P-413	Brown	N/A	450°
P-413PX	Red Brown	N/A	450°

Number of matching Manufacturers is 1

Number of matching Products is 2

Processing time was 0 seconds

<http://info.nsf.org/Certified/Food/Listings.asp?Company=C0321398&Standard=051>

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"A Tradition of Quality Since 1935"

July 27, 2011

**LAB COATING REPORT
(Thermal Cycling)**

Objective: Determine if there is any detrimental effect on the coating when subjected to extreme cold then to extreme hot in a relatively short time period.

Coatings Tested: CSE-6008, CSE-6106, CSE-6206, CSE-6208, EB-6817, P-403L, P-413C, P-413C1, and VR-514

Test: Mil-STD-883 method 1011. The basics of this method is rapid change from hot to cold and a brief, ½ -2 minute equilibrium in the medium before going in the opposite direction. This method is suggested for -65°F to 200°F.

Results: For the extreme cold I used Dry Ice and acetone resulting in a temperature of -60 to -65°C (on average -80°F). Boiling water 100°C (212°F) was the hot end. Panels cycled 5 times between both the hot and cold. None of the panels displayed any damage to the coating. Visual observations were made under the stereoscope.

I can state the tested coatings will withstand 5 cycles from -80°F to 212°F

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Annex 4 – Heresite P413 Protocole de maintenance et lavage



Recommended Maintenance and Cleaning Procedures for Heresite Coated Coils

Proper maintenance and cleaning will help preserve the performance of Heresite coated coils and avoid corrosion over the length of the product life. Two important factors for slowing corrosion are:

- Keeping the coils clean
- Keeping the coils dry

CLEANING FREQUENCY

At a minimum, coils should be inspected and cleaned at least once per year. In extreme environments, where the coils are exposed to high concentrations of salt air (within 25 miles of any seacoast), or where they are installed near engine exhausts, plumbing or manufacturing vents, or regularly exposed to corrosive chemicals, you may need to clean coils more often, up to 4 times per year.

CLEANING PROCESS

1. Turn off electrical power to the unit using lock-out system.
2. Flush the coil with water to rinse off loose residue. Allow the water to soak for 10–20 minutes to loosen surface residue.
3. Flush the coil thoroughly with any mild liquid detergent and warm water (~100°F) until all signs of residue are eliminated. If harsher cleaners are required for your environment, please contact Heresite for advice.
4. Rinse the unit thoroughly with clean water (it should not be brackish or contain excessive dissolved minerals).
5. Allow the unit to dry completely prior to turning the electrical power on or returning the unit to service.

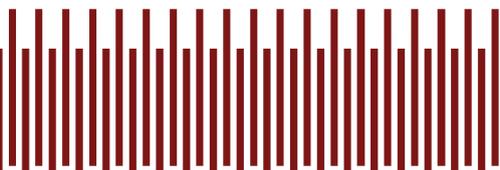
TOUCH UP

If coils require a touch up to protective coatings, contact Heresite for information about onsite application options.



AVOID

- Water under high pressure, such as a high-pressure washer. Fins may fold under high pressure causing the coating to crack
- Abrasive products or processes to scour or remove dirt
- Striking the coil with a tool to dislodge or remove soil or residue
- Corrosive, caustic or alkaline cleaners (with a pH < 5.5 or > 8.5) as these may permanently damage the coating and void the warranty. If you have questions about the cleaner that you are using, please contact Heresite.



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VR-514T and VR-554T Aerosol Air Dry Phenolics

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VR-514T and VR-554T Air Dry Phenolics are available in easy-to-use aerosol spray cans

- For those small touch-up jobs such as Solder and Brazed Joints, Fin Tube Coil touch-up, Fans, Duct Work, Copper Tubing, and other maintenance projects. Perfect for service personnel performing field work.
- Protects against fumes from Salt Air Environments, Dilute Acids, Dilute Alkalies, Solvents, and more.
- Minimal surface preparation needed
- 1-year shelf life
- Contains no fluorocarbons

When thoroughly cured, the VR-514T and VR-554T coating produces a hard corrosion resistant film. It is recommended as a heavy duty maintenance coating for exposures to splash, spillage and fumes. Some of the outstanding properties are excellent durability, good adhesion, flexibility and good film building characteristics.

VR-514T and VR-554T Specifications

Temperature limitation: Accepts dry heat temperatures up to 200°F (94°C)

Colors: VR-514T and VR-554T, only dark brown available in spray cans. Other colors are available in 1 and 5 gallon liquid cans



VR-554T
Brown



VR-514T
Red Brown

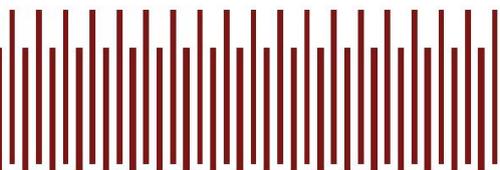
Coverage: Theoretical coverage for spray cans 27 square feet per spray can at 1 mil. For heat transfer surfaces 2 mils recommended. For all other applications 4–6 mils recommended in 2 to 3 coats.

Storage conditions: Shelf life: 1 year @ 70°F (21°C). Storage above 80°F (27°C) may shorten shelf life



page 1 of 2

Effective 10/09/17



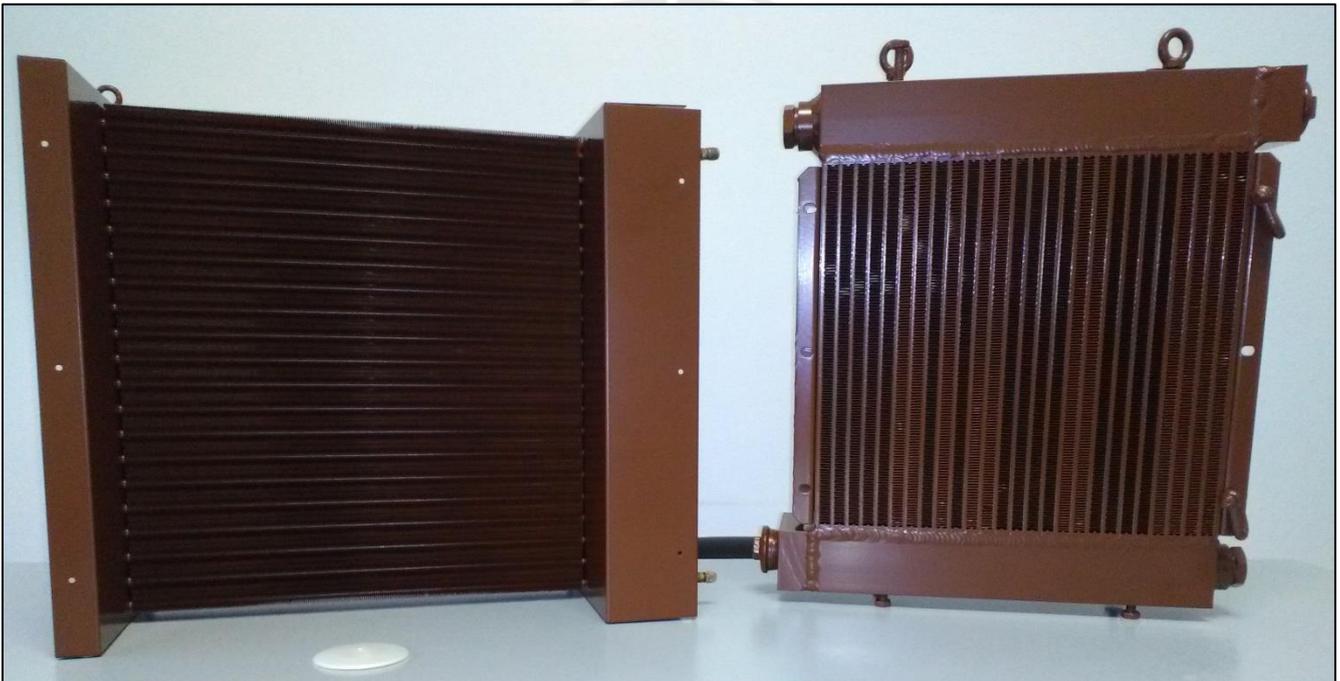
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Annex 6 – Galerie de photos



Echangeurs de chaleur à ailettes et micro-canal pendant la production.



Echangeurs de chaleur à ailettes et micro-canal à travaux terminés.