

## SELECTION & SPECIFICATION DATA

<b>Generic Type</b>	Modified Epoxy Phenolic
<b>Description</b>	Thermaline 440 (formerly Thermaline 400 EU) is a high performance, heat resistant epoxy phenolic that specializes in providing color for uninsulated piping and equipment. This immersion-grade coating which has excellent resistance to wet/dry cycling conditions at elevated temperatures when using dry grind pigments. This formulation allows for use on hot steel substrates under insulation operating continuously up to 400°F (204°C). It has excellent chemical resistance properties to handle the corrosive effects of wet insulation under thermal cycling conditions.
<b>Features</b>	<ul style="list-style-type: none"> <li>• Versatile use from <i>cryogenic temperatures</i> of -320°F (-196°C) up to 400°F (204°C) exposures</li> <li>• Very good flexibility</li> <li>• Excellent overall chemical resistance</li> <li>• Very good abrasion resistance</li> <li>• Easily applied by spray</li> <li>• Acceptable for use over stainless steels</li> <li>• Rapid Tint System Colors available *</li> </ul> <p>* Contact your Carboline Representative for availability</p>
<b>Color</b>	<p>A wide range of colors is available upon request using Carboline's Rapid Tint System (RTS). Contact your Carboline representative for RTS color availability.</p> <p>Rapid tint colors are not recommended for CUI and/or immersion service. <i>Coating discoloration can be expected when exposed to elevated temperatures in excess of 200°F (93°C). This discoloration does not affect performance.</i></p>
<b>Finish</b>	Semi-Gloss
<b>Dry Film Thickness</b>	<p>5 - 6 mils (127 - 152 microns) per coat</p> <p>Dry film thickness above 10 mils (250 microns) per coat, is not recommended.</p>
<b>Solid(s) Content</b>	Solids by volume: 52 ± 2%
<b>Theoretical Coverage Rates</b>	<p>166 sq.ft/gallon at 5.0 mils DFT (4.0 sq.m/liter at 125 µm) 139 sq.ft/gallon at 6.0 mils DFT (3.4 sq.m/liter at 150 µm)</p> <p>Mixing and application losses will vary and must be taken into consideration when estimating project requirements.</p>
<b>VOC Values</b>	<p><b>As Supplied</b> : 3.50 lbs/gal (420 g/l) Thinner 236 E : 3.50 lbs/gal (420 g/l) Thinner 2 : 3.68 lbs/gal (441 g/l) Thinner 33 : 3.69 lbs/gal (443 g/l)</p> <p>The use of Thinner 2 or Thinner 33 may exceed your local allowances for VOC. Please check your local regulations before using. Thinner 236 E is a US EPA VOC exempt solvent</p>
<b>Under Insulation Resistance</b>	<p>Continuous: 400°F (204°C) Non-Continuous: 450°F (232°C)</p>

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<b>Limitations</b>	Discoloration will occur when exposed to temperatures in excess of 200°F (93°C), however product will perform as intended. Not recommended for exposure to strong mineral or organic acids. For CUI & immersion projects use only factory made material in special colors.
	Epoxies may lose gloss, discolor and eventually chalk in sunlight exposure.

### SUBSTRATES & SURFACE PREPARATION

<b>General</b>	Surfaces must be clean and dry. All surfaces must be thoroughly cleaned to remove dirt, grease, and any other contaminants that can reduce adhesion per SSPC-SP1 solvent cleaning with recommended surface preparation.
<b>Steel</b>	Abrasive blast to SSPC-SP10 (ISO 8501-1 Sa 2½) to obtain a 1.5 - 3.0 mil (35 - 75 µm) anchor profile. For previously prepared substrates that have an existing anchor profile, High Pressure Water Jetting (HPWJ) to a minimum WJ-1 standard is acceptable.
<b>Stainless Steel</b>	Surface profile should be a dense angular 1.0 - 2.0 (25 - 50 µm) mils and is best achieved through abrasive blasting (non-metallic abrasive) per SSPC-SP16. Remove all contaminants that would interfere with the performance of stainless steel for the intended service such as, but not limited to, embedded iron or chlorides.

### MIXING & THINNING

<b>Mixing</b>	Power mix components separately; then combine and mix thoroughly for a minimum of two minutes. <b>DO NOT MIX PARTIAL KITS</b>
<b>Thinning</b>	Maybe be thinned up to 5% by volume with Thinner 236 E, Thinner 2* or Thinner 33* for spray application. Use of thinners other than those supplied or approved by Carboline may adversely affect product performance and will void product warranty whether express or implied.
	* The use of these thinners may exceed your local allowances for VOC. Check your local regulations before using.
<b>Ratio</b>	2:1 by volume (A to B)
<b>Pot Life</b>	4 hours at 75°F (24°C) and less at higher temperature. Pot life ends when coating loses body and begins to sag.

### APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

<b>General</b>	Thermaline 440 may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.
<b>Conventional Spray</b>	Pressure pot equipped with dual regulators, 3/8" ID minimum material hose, conventional spray gun using a 0.055-0.070" fluid tip with appropriate air cap.

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<b>Airless Spray</b>	<p>Pump Ratio: 30:1 (min)* GPM Output: 3.0 (min) Material Hose: 3/8" ID (min) Tip Size: 0.017-0.021" Output PSI: 2000-2500 Filter Size: 60 mesh</p> <p>*PTFE packings are recommended.</p>
<b>Brush &amp; Roller (General)</b>	<p>Recommended for touch-up, striping of weld seams, and hard-to-reach areas in addition to larger surface areas. Multiple coats will be required for larger areas to obtain the desired appearance and required dry film thickness. Application by roller to large surface areas should be holiday tested. Apply in full strokes, avoid re-brushing or re-rolling. Use a natural bristle brush and short nap mohair roller with a phenolic core.</p>
<b>Roller</b>	Use a short nap (3/8" - 1/2") mohair roller with a phenolic core

## APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	55°F (13°C)	41°F (5°C)	41°F (5°C)	0%
Maximum	95°F (35°C)	167°F (75°C)	104°F (40°C)	85%

Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Do not apply when the surface temperature is less than 5F above the dew point. High substrate temperatures may lead to faster curing and porous film. Special thinning and application techniques may be required above or below normal conditions.

## CURING SCHEDULE

Surface Temp.	Dry to Recoat	Final Cure Immersion
41°F (5°C)	24 Hours	NR
50°F (10°C)	15 Hours	4 Days
59°F (15°C)	10 Hours	3 Days
77°F (25°C)	6 Hours	2 Days

These times are based on the recommended dry film thickness. Excessive film thickness or inadequate ventilation conditions after application require longer dry times and will cause premature failure in extreme cases. Maximum recoat time is 60 days at 75°F (24°C), 50% relative humidity, and protected from UV. If exceeded and depending on curing time and exposure, pretreatment may be required prior to overcoating. Contact Carboline for further information.

**EXCESSIVE HUMIDITY OR CONDENSATION ON THE SURFACE DURING CURING MAY RESULT IN SURFACE HAZE OR BLUSH; ANY HAZE OR BLUSH SHOULD BE REMOVED BY WASHING WITH WATER BEFORE RECOATING.**

## CLEANUP & SAFETY

<b>Cleanup</b>	Use Carboline Thinner 2. In case of spillage, absorb and dispose of in accordance with local applicable regulations.
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### CLEANUP & SAFETY

<b>Safety</b>	Read and follow all caution statements on this product data sheet and on the SDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.
<b>Ventilation</b>	When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved supplied air respirator.
<b>Caution</b>	This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

### PACKAGING, HANDLING & STORAGE

<b>Packaging</b>	<b>North America</b> Part A & B available in both 1 and 5 gallon kits <b>Outside North America</b> Part A 3.5 gallon (13,3 liters) Part B 1.76 gallon (6,7 liters) or Part A 1.76 gallon (6,7 liters*) Part B 0.871 gallon (3,3 liters*)  * Not available in all locations.
<b>Shelf Life</b>	24 months when stored at 75°F (24°C) and in original, unopened containers.
<b>Storage Temperature &amp; Humidity</b>	40°-110°F (4°-43°C) 0-95% Relative Humidity
<b>Storage</b>	Store indoors and out of direct sunlight
<b>Shipping Weight (Approximate)</b>	<b>North America</b> 1 Gallon Kit - 15 lbs (6.8 kg) 5 Gallon Kit - 75 lbs (34 kg) <b>Outside North America</b> 10 liter kit - 18.1 kg 20 liter kit - 36.2 kg
<b>Flash Point (Setaflash)</b>	Thermaline 440 Part A: 64°F (18°C) Thermaline 440 Part B: 80°F (27°C)

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## WARRANTY

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance, injuries or damages resulting from use. Carbolines sole obligation, if any, is to replace or refund the purchase price of the Carboline product(s) proven to be defective, at Carbolines option. Carboline shall not be liable for any loss or damage. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. All of the trademarks referenced above are the property of Carboline International Corporation unless otherwise indicated.