



Technical Data Sheet

CHEMEON® eTCP® RTU

A patented ROHS, REACH, WEEE, ELV and OSHA PEL compliant enhanced chromium (III) conversion coating used for immersion, brush, and spray applications.

CHEMEON eTCP RTU is ready to use. The resultant conversion coating has a noticeable blue to purple color which provides visual verification that the coating has been applied. Corrosion resistance is improved as compared to conventional trivalent chromate pretreatments.

Approved and QPL-81706 listed for MIL-DTL-81706 and MIL-DTL-5541 Type II, Form III, Class 1A and Class 3, Methods A, B, and C. Approved for TT-C-490, Type VI.

Part or Identifying Number (PIN)	NSN	OEM P/N (CAGE 71D40)
M81706-2A3A	8030-01-722-2723	ETCPRTU-2A3A
M81706-2A3B	8030-01-722-1424	ETCPRTU-2A3B
M81706-2A3C	8030-01-722-1430	ETCPRTU-2A3C
M81706-2B3A	8030-01-722-2721	ETCPRTU-2B3A
M81706-2B3B	8030-01-722-1431	ETCPRTU-2B3B
M81706-2B3C	8030-01-722-1433	ETCPRTU-2B3C

Features include:

- Non-hexavalent chromium passivation on aluminum
- Noticeable color change
- Excellent bare metal corrosion protection on aluminum that is comparable to hexavalent chromium chemistry
- Produces an excellent adhesive substrate when used as a pretreatment for paint and powder coat applications, which results in extended corrosion resistance
- Can be used to re-coat stripped substrates, such as aircraft
- Can be used to repair or touch-up products used in the field
- Exceeds the performance requirements of MIL-DTL-81706B and MIL-DTL-5541F Type II, Form III, Class 1A and Class 3, Methods A, B, and C
- Seal for anodic coatings. Sealed surfaces surpass the requirements of MIL-PRF-8625
- U.S. Patent Number: 10,533,254, France: 3577172, Germany: 6020180397272
- eTCP RTU is a ready to use liquid for use in immersion, spray, and brush applications on bare aluminum, or as a post anodize seal

Operating Summary

Table I. Operating Parameters – conversion coating on bare aluminum or anodize seal

Parameter	Optimal ¹	Range ^{***}
Concentration	80 - 110%	60-120%
Operating pH	3.4-4.0*	same
Temperature	18.3 - 23.9 °C	18.3-37.8 °C
Contact Time	5 - 6 min (conversion coat immersion) <i>still bath</i> 8 - 10 min (conversion coat brush) 8 - 10 min (conversion coat spray) 2 - 5 min (anodize seal)**	1 – 15 minutes <i>still bath</i> 6 – 12 minutes 6 – 12 minutes
Drying Time	Ok to handle as soon as dry. Recommend > 4 hr. before primer. Wait 24 hours prior to salt spray, paint adhesion test (per MIL-DTL-5541). This recommendation does not supersede any specification requirements.	same
Drying Temperature	Room temp to 140 °F max (60 °C)	same
Coating Weight	>10 mg/ft ² (Class 1A) >107.5 mg/m ² (Class 1A)	

¹While relatively wide operating ranges are shown, best results for neutral salt fog are achieved with our recommended control limits

* If pH is in range 3.4-4.0, do not adjust.

** Adjust immersion time for seal so that the surface is not powdery.

*** If running outside optimal range, customer must adjust process and validate performance to meet their requirements.

Solution Makeup

CHEMEON eTCP RTU comes as a pre-diluted solution, simply fill the tank to volume with the solution. The makeup is the same for conversion coating and anodize seal. If the pH is below the optimal range, it must be adjusted.

pH adjustments:

Use dilute (5-10% by volume) sulfuric acid to lower the pH.

Use dilute (5-10% by volume) sodium hydroxide or potassium hydroxide to raise pH.

Note: pH adjustments should be made very slowly using continuous mixing.

pH should be measured regularly.

Do not let pH exceed 4.0.

Solution control:

Solution control by titration. See below.

Equipment

Tank material:

Polypropylene, PVC, Koroseal-lined, 316 Stainless Steel or Teflon lined tank.



Heater material:
pH probe:

Teflon coated heater recommended.
Use of a fluoride resistant pH probe is recommended.

Application Procedure - Details

Video instruction is found at <https://chemeon.com/p/video-instructions/>

Conversion Coating – Application on Bare Aluminum

The application consists of the following general steps:

1. Solvent (acetone or isopropyl alcohol) wipe if needed, remove all inks/oils
2. Clean
3. Rinse
4. Acid activate or deoxidize
5. Rinse
6. Treatment with eTCP RTU solution per Table I
7. Rinse
8. Dry, at ambient temperature

The work is ready to continue to the next manufacturing step after drying. Maximum neutral salt spray performance is achieved with a minimum 24-hour cure after drying.

To achieve best results, the bare aluminum surface must be degreased and/or cleaned prior to treatment with CHEMEON eTCP RTU. Excellent results have been obtained using a mild alkaline cleaner. Typically, etching cleaners do not perform as well in applications where corrosion resistance is paramount. If in doubt contact DitrimeX or CHEMEON.

After cleaning, the surface is activated with 50% v/v concentrated nitric acid (i.e., a 1:1 mixture of concentrated nitric acid and water) or an aluminum deoxidizer. Contact CHEMEON for a list of compatible deoxidizers.

Rinse water should be clean and clear, preferably made from DI (deionized) or RO (reverse osmosis) water.

Dry the fresh coating gently with low pressure compressed air, or simply allow to air dry. High pressure air may damage the uncured coating layer.

eTCP RTU Operation - Immersion

Example Immersion Process:

1. Inhibited Alkaline Clean - per manufacturer's directions, verify that water-break free surface is achieved upon rinsing
2. Rinse – 1-2 minutes, ambient temperature, DI or reverse osmosis water recommended
3. Acid activation – 1-2 minutes, 50% v/v concentrated nitric acid or deoxidize (iron based, no/low fluoride) per manufacturer's directions.
4. Rinse – 1-2 minutes, ambient temperature, DI or reverse osmosis water recommended
5. Treatment with eTCP RTU solution per Table I. The tank should not be agitated while parts are being treated.
6. Rinse – ambient temperature, DI or reverse osmosis water recommended
7. Dry – air dry or low pressure compressed dry air, at ambient temperature

Troubleshooting

Powdery surfaces after application are often the result of one or more of these conditions:

- Immersion (coating) time too long
- Bath temperature too high
- pH too low

Lack of coating is often due to:

- Agitation of bath during immersion
- Immersion time too short
- Temperature too low

Performance on Bare Aluminum:

When using the recommended process, corrosion resistance beyond 336 hours salt spray is obtainable.

The enhanced trivalent coating has a noticeable color (yellow/red, blue or violet tint) depending on the preparation steps, the alloy, and the processing parameters.

eTCP RTU Operation – Spray and Brush

Operating parameters for spray and brush are found in Table I.

For spray and brush application, the objective is to apply the eTCP RTU to the surface so that it can react and form the conversion coating. The surface must stay wet but should remain relatively undisturbed during application. Details are provided below.

To ensure NADCAP and customer compliance, first verify if the customer specification has a required method for spray or brush application. In the absence of customer direction, a preparatory solvent wipe, soap clean, activation, and rinse will produce acceptable results with eTCP RTU.

Preparatory Steps for Spray and Brush Cleaning:

For brush and spray operations where immersion is not possible or desirable, the surface must be chemically or mechanically cleaned such that a water break free surface is obtained after rinsing. Do not use iron containing abrasives such as steel wool or a wire brush. If in doubt contact DitrimeX or CHEMEON.

Activation: If the area to be sprayed cannot be activated by chemical means (deoxidizer or nitric acid) then mechanically remove the oxides. A mechanical surface preparation method has been optimized. See the Appendix for details. This mechanical prep may take the place of the cleaning and activation steps above.

Rinsing: Rinse the area thoroughly after cleaning to remove chemicals and debris. A water break free surface is a good indicator that the surface is sufficiently clean to coat with CHEMEON eTCP RTU. Be sure to rinse the work gently after eTCP application as well.

Application by Spray

Operating parameters for spray and brush are found in Table I. CHEMEON eTCP may be sprayed using a simple misting spray bottle, garden sprayer, etc. The purpose of the sprayer is to simply wet the surface with eTCP. Spray the surface, allow the eTCP to sit on the surface (dwell) and repeat until the desired total contact time is achieved.

Spray Example:

1. Clean, activate, and rinse as described above
2. Spray CHEMEON eTCP onto the area of interest until wetted
3. Wait 30 – 60 seconds while the liquid reacts with the surface. Do not allow the surface to dry
4. Gently re-spray and wait as above
5. Repeat for a total of 8 - 10 minutes contact time
6. Rinse gently
7. Dry, ambient temperature

Note: The coating may be allowed to dry in place (no rinse) rather than rinsing and drying at completion.

Application by Brush

CHEMEON eTCP RTU may be brushed or swabbed onto the surface. Operating parameters for spray and brush are found in Table I. Wet the surface, allow the eTCP to sit on the surface (dwell) and repeat until the desired total contact time is achieved. **It is important that the reapplication of eTCP is done gently.** Do not forcefully brush the surface or the uncured coating may be disturbed and damaged.

Video instruction is found at <https://chemeon.com/p/video-instructions/>

Brush Example:

1. Clean, activate, and rinse as described above
2. Brush CHEMEON eTCP onto the area of interest until wetted
3. Wait 30 – 60 seconds while the liquid reacts with the surface. Do not allow the surface to dry
4. Gently reapply and wait as above
5. Repeat for a total of 8 - 10 minutes contact time
6. Rinse gently
7. Dry, at ambient temperature

Note: The coating may be allowed to dry in place (no rinse) rather than rinsing and drying at completion.

Do not allow the surface to dry during application.

Performance on Bare Aluminum:

CHEMEON eTCP meets the electrical conductivity and adhesion test specifications in accordance with MIL-DTL-81706B and MIL-DTL-5541F (revision of MIL-C-5541E).

When using the recommended process, corrosion resistance well beyond 336 hours salt spray is obtainable.

eTCP RTU Operation - Anodize Seal

Anodized coatings sealed with CHEMEON eTCP RTU exceed the requirements of MIL-PRF-8625. The sealed coating will be a strong purple color. The bath chemistry (concentration, pH, temperature) used for anodize sealing may be the same as that used for conversion coatings, however the user may find it beneficial to adjust the concentration or immersion time depending upon their application. Operating parameters for anodize sealing are found in Table I.

Application as a Seal:

- After anodization, rinse the parts thoroughly (2-5 minutes) to remove remaining acids from the oxide. A counter-flowing DI rinse is recommended.
- Immerse the parts in eTCP RTU per Table I. The tank should not be agitated during sealing.
- After seal, rinse the parts in DI water. A 30-60 second rinse should be sufficient.
- Gently blow dry or allow to air dry. Ambient temperature

Powder formation on the coating can be a result of:

- Immersion time too long
- Concentration too high
- Temperature too high

For Type IIB anodize, the best corrosion performance is found when the anodic coating weight is in the upper third of the allowed range.

Post Conversion Coating Processes: Paint, Powder Coat, etc.

CHEMEON eTCP coated parts may be handled immediately after drying and are ready to mask or prime within 2 hours.

CHEMEON eTCP coated panels have been painted with epoxy primer as long as 4 weeks after application of eTCP. The panels met all adhesion (wet tape, dry tape) requirements.

Certain individual specifications state minimum and/or maximum times between conversion coat and paint – the guidance in this technical data sheet does not supersede the times in the governing specifications.

Solution Control

Bath Maintenance:

- The pH of the bath should be checked regularly. It is important that the pH of the bath does not exceed 4.0.
- Use of a fluoride resistant pH probe is recommended. To clean staining off the probe, dilute nitric acid or a commercially available ink cleaning solution are recommended. Light scrubbing with a Kimwipe might be required to remove stains.
- Measurement of the bath concentration may be performed by titration.

Solution Control by Titration:

The solution concentration may be accurately measured by titration. The trivalent chromium in the solution is oxidized to hexavalent chromium using hydrogen peroxide. The hexavalent chromium content is then measured using a redox titration.

Video instruction is found at <https://vimeo.com/915713290>

Required Materials

- Stirring hotplate
- 50 mL pipette
- Pipette bulb
- 50 mL burette
- 50 mL graduated cylinder
- Filter funnel
- Fine porosity filter paper (8 µm pore size recommended)
- 250 mL Erlenmeyer flask
- 10% w/w sodium hydroxide
- 35% hydrogen peroxide
- 17% v/v hydrochloric acid
- 99+% Potassium iodide
- 1% w/v Starch indicator solution

Method:

1. Pipette 50 mL CHEMEON eTCP RTU into a 250 mL Erlenmeyer flask
2. Bring to 100 mL total volume with DI water
3. Add approximately 40 mL sodium hydroxide solution
4. Add approximately 5 mL hydrogen peroxide, stirring for 5 minutes
5. Add another 5 mL hydrogen peroxide, stirring for an additional 5 minutes
6. Boil the solution for 40 to 50 minutes to decompose excess hydrogen peroxide
 - a. The solution will be highly effervescent at first
 - b. Be careful to avoid boiling the solution over
 - c. Do not allow the solution to evaporate below 50 mL, add DI water back as necessary
7. Allow the solution to cool. The solution will be bright yellow and cloudy with precipitate
8. Filter the solution through a fine-grained (8 µm) filter paper
 - a. Rinse the filter paper and precipitate using a wash bottle filled with deionized water until the precipitate is colorless
 - b. Retain the filtered solution (“filtrate”)
 - c. Important: the solution must not be cloudy
 - d. If the solution is cloudy, it must be filtered again with a finer grade filter paper
9. Add DI water as necessary to bring the solution volume to approximately 100 mL
10. Prepare the titration apparatus. The burette should be prepared with 0.1N sodium thiosulfate
11. Add 80 mL hydrochloric acid to the filtrate. The filtrate will turn from yellow to orange
12. Add 2 g potassium iodide. The filtrate will turn red. Mix until completely dissolved
13. Immediately titrate the solution with 0.1N sodium thiosulfate until the solution is pale red-yellow
14. Add 2 mL of starch solution and titrate to endpoint (clear blue/gray)
15. The endpoint must persist for approximately 30 seconds. If the endpoint is not stable for 30 seconds, add additional sodium thiosulfate dropwise until the endpoint persists

Concentration Calculation:

CHEMEON eTCP RTU (% by vol.) = (volume in mL of 0.1N sodium thiosulfate used) x 3.12

Bath Additions:

- Bath replenishment may be accomplished by adding CHEMEON eTCP RTU to the tank.
 - Allow the tank level drop by evaporation as necessary and add CHEMEON eTCP RTU



- directly.
- Bring back to level with DI water.
 - Contact CHEMEON Technical Support for further assistance techsupport@chemeon.com
 - Bath replenishment by addition of eTCP Powder
 - An addition of 1 g/L CHEMEON eTCP Powder to an eTCP RTU tank raises the concentration by 10% RTU.

SAFETY AND HANDLING

Prior to handling and use of any of the materials referenced in this document, the Safety Data Sheets should be read and understood by all personnel in contact with these materials. Eyes and skin should be protected with appropriate personal protective equipment. Do not ingest. Having eyewash fountains and emergency showers in close proximity is recommended.

KEEP OUT OF REACH OF CHILDREN

STORAGE

Store CHEMEON eTCP RTU in dry, indoor storage at temperatures between 1.7 °C and 35.0 °C. Do not allow to freeze. Keep the product away from any incompatible materials referenced in the Safety Data Sheets. All containers should be tightly closed when not in use.

SHELF LIFE

Product shelf life is 2 years from date of manufacture.

DISPOSAL

Any disposal of the materials referenced in this document should be in accordance with all applicable federal, state, and local regulations. The process solution can contain components other than those present in the materials as supplied. Analysis of process solutions may be required prior to disposal.

MILITARY PROCUREMENT DETAILS

Part or Identifying Number (PIN)	OEM P/N (CAGE 71D40)	Item Name	NONDEFINITIVE SPEC/STD DATA	National Stock Number (NSN)
M81706-2A3A	ETCPRTU-2A3A	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 1A, FORM III, APPLICATION SPRAY - COLORIZED	8030-01-722-2723
M81706-2A3B	ETCPRTU-2A3B	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 1A, FORM III, APPLICATION BRUSH - COLORIZED	8030-01-722-1424
M81706-2A3C	ETCPRTU-2A3C	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 1A, FORM III, APPLICATION IMMERSION - COLORIZED	8030-01-722-1430
M81706-2B3A	ETCPRTU-2B3A	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 3, FORM III, APPLICATION SPRAY - COLORIZED	8030-01-722-2721
M81706-2B3B	ETCPRTU-2B3B	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 3, FORM III, APPLICATION BRUSH - COLORIZED	8030-01-722-1431
M81706-2B3C	ETCPRTU-2B3C	Colorized Conversion Coating	MIL-DTL-81706 TYPE II, CLASS 3, FORM III, APPLICATION IMMERSION - COLORIZED	8030-01-722-1433