# BONDERITE M-NT 4595
# CONVERSION COATING
## (KNOWN AS ALODINE 4595(US))

Issued 6/10/2013

### 1. Introduction:

BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) treatment is a chromium free product and specifically formulated for treating aluminum and its alloys. Spray or immersion application may be used. The process provides an excellent base for organic finishes.

### 2. Operating Summary:

| Chemical:* | Bath Preparation per 100 gallons: |
|---|---|
| BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) | 1 to 6 gallons |

| Operation and Control:* | |
|---|---|
| Concentration(points) | 22.4 to 4.6 |
| Concentration(%) | 1 to 6 |
| Fluoride Activity (Relative Millivolts) | -80 to -120 |
| Time(seconds) | 60 to 180 |
| pH | 3.5 to 4.5 |
| Temperature (°Fahrenheit) | 80° to 130° |
| Drying time (minutes) | 10 to 50 |
| Drying temperature (°Fahrenheit) | 200 to 400 |

Note:
* BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) may be used up to full strength without pH adjustment for Dry_In_Place applications.
** Actual control ranges are application specific and established through application testing.

### 3. The Process:

The complete process sequence normally consists of the following steps:

A. Cleaning
B. Water rinse

C. Water rinse
D. Deoxidizer
E. Water rinse – D.I. water (recommended)
F. Treating with BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) solution
G. Water Rinsing – D.I. water (recommended)
H. Drying

**4. Materials:**

BONDERITE M-NT 4595 (known as ALODINE 4595 (US))
BONDERITE M-AD 700 (known as PARCO NEUTRALIZER 700)
BONDERITE M-PT 95B (known as PARCOLENE® 95B Defoamer) (spray process only)
BONDERITE M-AD A (known as Additive A)
Testing Reagents and Apparatus

**5. Equipment**

Process tank, housing, pumps and piping should be fabricated from 316L or 304L stainless steel. The 316L being preferred for maximum tank life. A secondary choice is 316 or 304 stainless steel fabricated with approved welding techniques. In spray applications, nozzles fabricated from 316 stainless steel are preferred.

Heat exchanger plates or other heating devices should be polished 316L stainless steel. All process circulation pump seals, valve seats, door seals, etc., which come into contact with the process solution and occasional acid equipment cleaners, should be EPDM, FKM or PTFE.

Chemical feed pump parts and other elastomers which may come into contact with the concentrated replenishing chemical should be EPDM, FKM or PTFE.

Support equipment available from Henkel Technologies for this process includes: chemical feed pumps, level controls, transfer pumps and bulk storage tanks.

Your local sales representative should be consulted for information on Henkel Technologies automatic process control equipment for this process and any additional questions.

All equipment which will be in contact with BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) or processing solution should be thoroughly cleaned prior to use with the process. This includes such items as chemical metering pumps, solution tank, spray nozzles, spray zone shields and housings. Our representative will supply a recommended clean-out procedure which may be followed.

**6. Surface Preparation:**

Cleaning:
All metal to be treated with the processing solution must be free from grease, oil and other foreign matter before the treatment. A complete line of cleaners is available and our representative will recommend the proper one for each installation.

Water Rinsing:
After cleaning, the metal must be thoroughly rinsed with water. The rinse should be overflowed continuously at a rate which will keep it clean and free from scum and contamination. D.I. water is recommended prior to and following the BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) tank.

Deoxidizing:
Aluminum with surface corrosion products or heavy surface oxides should be conditioned with a deoxidizer prior to the conversion coating treatment. This deoxidizing step should follow the above water rinse and should itself be followed by a separate water rinse. A complete line of deoxidizers is available and our representative can recommend the correct material to be used.

### 7. Treating with the BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) Processing Solution:

Buildup:
Recommended buildup is 1 to 6 gallons of BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) per 100 gallons of processing solution volume.

Fill the tank about three-fourths full with D.I. water. Add the proper amount of BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) and then add sufficient D.I. water to bring the solution up to the working level. Mix thoroughly and heat to the operating temperature. BONDERITE M-PT 95B (known as PARCOLENE 95B (US)) Defoamer must be used in spray applications. If bath foams, add 0.1 ounce per 100 gallons of BONDERITE M-PT 95B (known as PARCOLENE 95B (US)) until foam subsides.

Operation:

| | |
|---|---|
| Time: | 60 seconds to 3.0 minutes. |
| Temperature: | 80° to 130° Fahrenheit. |

The solution concentration may be increased or reduced to meet specific line conditions. Our representative will assist in establishing the proper concentration.

Replenishment:
BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) will be used for replenishment, depending on the surface area of metal and type of work processed (the testing and control for both products are the same).

Our representative will recommend the proper replenisher for your system.

### 8. Testing and Control:

Never pipet by mouth, use a pipet filler.

Concentration:
The concentration of the treatment solution is determined by a simple titration.

Since this is a reverse titration, the treatment bath is used to titrate the solution prepared below.

Pipet (or discharge from a buret) exactly 10 ml of Titrating Solution 15 into a 150 ml beaker, add 50 ml of water, then 5 ml of Reagent Solution 44. The endpoint for this titration is reached when the purple color completely disappears resulting in a clear or slightly brown solution.

The concentration may be determined from the following table:

| Titration (ml) | Concentration % by volume |
|---|---|
| 22.4 | 1.0 |
| 12.5 | 2.0 |
| 8.6 | 3.0 |
| 6.1 | 4.0 |
| 5.6 | 5.0 |
| 4.6 | 6.0 |

NOTE: The greater the concentration, the lower the number of mls (points) of titration.

pH Adjustment:
BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) is a rinsable coating. It is necessary to raise the pH of the bath to about 3.5 to prevent the treatment from etching the aluminum. It is normally required that BONDERITE M-AD 700 (known as PARCO NEUTRALIZER 700) be added initially at 500 ml to 2500 ml per 100 gallons of bath volume.

Fluoride Activity Control:
The method of measuring fluoride activity makes use of standardized Orion Fluoride Ion Electrode and an Orion Meter or an equivalent instrument capable of measuring relative Millivolts.

Immerse the Orion Fluoride Ion Electrode and the reference electrode or a Fluoride combination electrode into Standard Solution 120MC. Using the expanded relative millivolt scale, set the meter to zero.

Remove the electrodes from the activity Standard Solution 120MC, rinse with distilled water and dry.

After the concentration and the pH of the bath have been adjusted, cool a sample of the bath to the same temperature as the Standard Solution 120MC used for electrode standardization. Immerse the electrodes into the bath sample and record the relative negative Millivolt.

The bath must be maintained between -80 and -120 millivolts.

NOTE: The activity reading is dependent to a large extent on the pH of the solution. The activity reading is also affected by the temperature of the bath. All readings should be taken at room temperature, 75° to 80° Fahrenheit.

To increase activity by –10 millivolts, add approximately 1000 mL of Additive A to 1000 gallons of the working bath in small increments until the reading is in the desired range.

**9. After Treatment:**

Drying:
Parts coming from the coating bath should be dried in an indirectly fired oven or by other means which will not contaminate the metal with fumes, oil or partially burned gases.

Products with cavities or pockets which trap moisture should be blown dry with a jet of clean, compressed oil free air.

If handling of the dried, unpainted work is necessary, operators should wear clean cotton gloves.

Detecting coating on the surface by drop test:

After the pretreatment is finished and before any organic paint, e.g., powder clear coat is applied to the surface, a drop test can be carried out to determine if the coating is properly formed on the aluminum surface. The procedure of the drop test is as following:
Put one drop of Reagent Solution 49 (37% HCl) on the test surface. Once the bubbles are formed on the surface, immediately add one drop of 0.05 % Arsenazo III solution (see note in the Testing Reagents and Apparatus section) onto HCl solution on the test surface. If the coating is present, the color of the mixed solution will change from purple to green in a few second to minutes depending on the amount of the coating on the surface. If coating is not present, the color of the mixed solution will remain purple on the test surface.

## 10. Storage Requirements:

BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) should be protected from freezing. If the chemical is frozen, it will be irreversibly damaged and should not be used. BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) may precipitate if stored at temperatures below 40° or above 100° Fahrenheit. The product must be stored between 40° and 100° Fahrenheit. If exposed to temperatures outside that range for short periods, the product should be immediately returned to the proper temperature and stirred.

## 11. Waste Disposal Information:

Applicable regulations covering disposal and discharge of chemicals should be consulted and followed.

Disposal information for BONDERITE M-NT 4595 (known as ALODINE 4595 (US)) is given on the Material Safety Data Sheet for each product.

The processing bath is pH 3 to 5 and contains fluorides. Waste treatment and neutralization may be required prior to discharge to sewer.

## 12. Precautionary Information:

When handling the chemical product used in this process, the first aid and handling recommendations on the Material Safety Data Sheet for the product should be read, understood, and followed.

The processing solution is acidic and may be irritating to skin and may cause burns to eyes. Avoid contact with skin and eyes. In case of contact follow the recommendations for contact given on the Material Safety Data Sheet for BONDERITE M-NT 4595 (known as ALODINE 4595 (US)).

Testing Reagents and Apparatus
(Order only those items which are not already on hand)

| Code | Quantity | Item |
|---|---|---|
| 592462 | 2* | Beaker, 150-ml |
| 592477 | 1 | Buret Assembly, 25-ml Automatic |
| 592492 | 2* | Pipet, 10-ml Volumetric |
| 592494 | 1 | Pipet Filler |
| 592499 | 1 | Pitcher, Graduated, Plastic |
| 593846 | 2.5 L | Reagent Solution 44 (50% $H_2SO_4$) |
| 592428 | 1.0 L | Titrating Solution 15 (0.042N $KmnO_4$) |
| 592456 | 1.0 L | Standard Solution 120 MC |
| 592438 | 4.0 L | Reagent Solution 49 (37% HCl) |
| ..... | | . 0.05% Arsenazo III solution** |

* Includes one more than actually required, to allow for possible breakage.

** 0.05% Arsenazo III solution can be made by dissolving 0.05 g of Arsenazo III in 100 mL of D.I. water. Arsenazo III can be purchased from Sigma-Aldrich (catalog no. A92775. Please contact your local Sigma-Aldrich distributor to order this product. Sigma-Aldrich's web site contains the global contact numbers, www.sigmaaldrich.com . In North America you may also contact Sigma-Aldrich at: (800) 325-3010.

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