



Technical Data Sheet

Product Advantages

- Designed specifically for dip (immersion) systems
- Deposits high quality zirconium films at low application temperatures
- Prepares surfaces for optimum paint adhesion
- Specially formulated for multi metal applications
- No post-rinse sealer is required

Product Description

The **XBOND 4000DM** system is a zirconium-based thin-film pretreatment formulated to provide excellent corrosion resistance for steel, galvanized steel and aluminum substrates.

The **XBOND 4000DM / XBOND 4000DR** system is designed to provide performance that are equivalent to iron phosphates.

XBOND 4000DR is the preferred replenisher.

Technical Properties

	<u>XB4000DM</u>	<u>XB4000DR</u>
Composition:	Liquid	Liquid
Appearance:	Clear	Clear
Recommended Concentrations:	3% by volume	As Needed
Recommended Temperature:	60 – 115°F	NA
pH (Concentrate):	1.2 - 1.8	1.3 - 1.8
pH (Working Solution):	4.4 - 5.2	NA

Caution

- The application of this technology requires the use of suitable process equipment.
- Proper cleaning and rinsing prior to application of **XBOND 4000** should be confirmed for optimum performance.
- Customers should evaluate, on an experimental basis, all metals to be coated to confirm **XBOND 4000** conforms to all relevant specifications. The process used for experimental validation of **XBOND 4000** should be representative of the process used on a production basis.



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Use & Control Instructions:

Operating Ranges

pH:	4.4 - 5.2
Concentration:	2.0 - 4.0 % by volume
Temperature:	60 - 115°F (15 - 46°C)
Contact Time:	90 - 180 seconds
Application:	Dip (Immersion)

Normal Operating Parameters

pH:	4.6 - 4.8
Concentration:	3.0 % by volume
Temperature:	75 - 95°F (24 - 35°C)
Contact Time:	120 seconds

Note

Specific process conditions may require operating the above parameters outside of the normally specified ranges. For example, short dwell times may require operating at higher chemical concentrations. Please consult your PPG representative to establish the optimum operating parameters.

Typical Process Sequence

- STAGE 1 – CHEMKLEEN, MAGNUSPRAY, GILLITE or ULTRAX ALKALINE CLEANER #
- STAGE 2 – CITY WATER RINSE
- STAGE 3 – CITY WATER RINSE
- STAGE 3 – **XBOND 4000DM/DR**
- STAGE 4 – CITY WATER RINSE
- STAGE 5 – DEIONIZED or REVERSE OSMOSIS WATER RINSE

Cleaner recommendation will be based on the metal mix, soils and application equipment.

Process Equipment

Process equipment should be constructed of 304 or 316 stainless steel. Mild steel equipment should be lined with an appropriate corrosion resistant coating. Process piping and pumps should also be constructed of 304 or 316 stainless steel. Pump seals and gaskets should be compatible with acidic solutions, for example, Teflon™.



Charge Instructions

Fill the tank $\frac{3}{4}$ full with fresh water (deionized or RO water is recommended over hard water). For each 100 gallons (378 L) of working volume, add 3.0 gallons (11.3 mL) of **XBOND 4000DM** and then mix thoroughly. Bring the solution level close to the working level and check the pH. While mixing, add 13 fluid ounces (390 mL) of CHEMFIL BUFFER to 100 gallons (378 L) of bath. Check the pH. Slowly add additional CHEMFIL BUFFER to bring the pH within the operating range of 4.4 - 5.2. (The target pH for most operations is 4.6 - 4.8.)

NOTE: The amount of CHEMFIL BUFFER necessary for pH adjustments will vary for each installation due to water quality and initial pH. Water hardness exceeding 150ppm (as calcium carbonate) should be replaced by deionized or reverse osmosis water.

XBOND 4000DM Control

The **XBOND 4000DM** bath is best controlled by pH. Automated control is the best way to replenish the **XBOND 4000** bath. This method continuously maintains the optimum bath pH. When pH rises only slightly, the controller activates a pump to feed **XBOND 4000DR** (the replenisher) into the bath. The use of a pH controller provides the best method to minimize chemical consumption and to maintain uniform process conditions. **XBOND 4000DR** and CHEMFIL BUFFER should be added in different areas of the tank.

Equipment Needed

- pH Controller
- Metering Pump (24 gal/day or 44 gal/day)

Reagents Needed

- pH 4 buffer solution
- pH 7 buffer solution

The pH controller needs to be calibrated prior to use and periodically according to the Manufacturer's instructions. The pH of the **XBOND 4000DM/DR** bath should be maintained in the desired range of 4.4 - 5.2, however, for optimum quality a target pH of 4.6 - 4.8 is recommended. In general, the pH probe tip needs to be cleaned at least once per week. This can be accomplished using a tooth brush and a mild alkaline cleaner. Thoroughly rinse the probe tip with fresh water and recalibrate before reintroducing the probe into the **XBOND 4000DM/DR** bath. The metering pump setting depends on the combination of square footage throughput and tank size.

pH Adjustments

- To raise the pH approximately 0.1 units, add 11 mL of CHEMFIL BUFFER per 100 gallons (378 L) of operating solution.
- XBOND ADDITIVE LPH** should normally be used to lower the pH. In certain circumstances, **XBOND 4200DM/DR** or **XBOND ADDITIVE ZR** can also be used to lower pH.

Zirconium Concentration Adjustments

The zirconium concentration can be increased by 10 ppm using one of the following options:

- 520 mL of **XBOND 4000DR** per 100 gallons (378L) of bath. Additions of **XBOND 4000DR** will also increase the phosphate level; or
- 190 mL of **XBOND ADDITIVE ZR** per 100 gallons (378 L) of bath will only increase the Zirconium concentration.



Iron Control

XBOND 4000 baths are usually white and cloudy when processing steel. However, if the solution starts to turn yellow, the iron level has begun to increase beyond recommended levels. This can be confirmed by using iron test strips (e.g., from Fisher Scientific, cat# M100041).

To reduce the iron level, add ZIRCOBOND ADDITIVE P.

Contact your PPG representative to determine how much additive to use.

Note: Ensure good mixing when using this additive.

XBOND 4000DM/DR Concentration

The **XBOND 4000DM/DR** concentration can be monitored using a colorimetric technique to measure the soluble zirconium concentration in an operating XBOND bath.

Equipment and Supplies

- Hach DR890 Colorimeter, Hach catalog # 4847000
- 2 – 30 mL Sample Cells (cuvette) for DR890, Hach catalog # 2401906
- Test Solution #4, (0.1N Sulfuric Acid (H_2SO_4)), Reagents Inc. catalog # TS4-4L
- Reagent XO (Xylenol Orange, 0.05 %), Reagents Inc. catalog # 83050-1L
- Reagent C (ascorbic acid, 1 %), Reagents Inc. catalog # 83055-500ML
- 100 mL volumetric flask, Fisher Scientific catalog # 10-200C
- 2 – 20 mL pipettes (class A), Fisher Scientific catalog # 13-646-59
- 4 mL pipette (class A), Fisher Scientific catalog # 13-646-51
- Pipette bulb, Fisher Scientific catalog # 13-681-51
- 0.5 mL pipette, Fisher Scientific catalog # 11-382-33E
- Accuwipes or Kim wipes for wiping off glassware, Fisher Scientific catalog # 06-666-A
- 30 mL syringe, Fisher Scientific catalog # 03-377-25
- 5 μ m syringe filter, Fisher Scientific catalog # DDR50T3050
- Various beakers
- Deionized water

Hach: 1-800-227-4224 / Reagents, Inc.: 1-800-732-8484 / Fisher Scientific: 1-800-766-7000

Note

1. The meter must be calibrated prior to use for this test by PPG-Euclid Technical
2. The lab ware used should be clean, dry, and stain free prior to use. The lab ware should be cleaned immediately after use to prevent staining.
3. Do not use the syringe to measure accurate volumes, use pipettes only.
4. Baths with Zirconium content below 40 ppm and above 300 ppm will require a different or additional dilution; contact your PPG representative for information.



5. The XBOND bath should be filtered prior to testing the solution for zirconium. Sludge particles can interfere with the Zirconium reading.

Procedure

1. Filter 25 mL of the bath to be tested using a syringe and a 5 µm syringe filter.
2. Pipette 20 mL of the filtered XBOND bath into a 100 mL volumetric flask and dilute to the 100 mL mark with DI water. Place a stopper onto the flask and invert several times to thoroughly mix the sample.
3. Turn on the DR890 and select program 106 by pressing **PROGRAM** then **1 0 6** then **ENTER**.
4. Pipette 20 mL of Test Solution #4 (0.1N H₂SO₄), 0.5 mL Reagent C, and 4.0 mL of Reagent XO into a clean cuvette. This will be the blank and should be orange in color. Cover; shake vigorously for 5 seconds, wipe clean, and place the cuvette into the meter, and place the meter cover over the sample.
5. Press **TIMER**, then **2 0** then **ENTER**. This will start a 20 second timer. When 20 seconds has elapsed, a beep will sound. At this time, press **ZERO** (0.0 should be displayed on the readout).
6. Remove the blank from the meter, uncap the cuvette, and add 0.5 mL of previously diluted sample (from step 2) to the blank. Cap the cuvette, shake vigorously for 5 seconds, and place the cuvette into the meter, place the meter cover over the sample.
7. Press **TIMER**, then **2 0** then **ENTER**. This will start a 20 second timer.
8. When 20 seconds has elapsed, a beep will sound. At this time press **READ**. The displayed value is the actual Zirconium concentration expressed as mg/L or ppm.

Free Fluoride Determination

Free fluoride will continually rise in the XBOND bath while processing work. The zirconium coating can be adversely affected at high *free fluoride* levels. The desired target range for *free fluoride* is 50-100 ppm. At all times the concentration of *free fluoride* should be maintained less than 125 ppm.

Free fluoride determinations require the use of a pH/mV meter or ion specific electrode meter (ISE) in conjunction with a fluoride specific *electrode*.

Procedure

1. The ISE meter should be calibrated according to the manufacturer's instructions using 100, 1000, and 10,000 ppm fluoride standards. Also, follow the manufacturer's recommendations for the proper use, maintenance and storage of the fluoride specific electrode.
2. Place fluoride electrode in the XBOND bath sample at ambient temperature without dilution.
3. Stir the bath sample using a magnetic stirrer.
4. The reading on the ISE divided by 26 gives the *free fluoride* of the bath.



Reducing Free Fluoride

1. When the *free fluoride* exceeds 125ppm, add an appropriate amount of XBOND ADDITIVE FCA or FCN to bring the value below 100ppm.
2. Adding 12.8 ounces (378 mL) of XBOND FCA or FCN will lower the *free fluoride* in a 1000 gallon (3780 L) bath by 9 ppm.
3. XBOND ADDITIVE FCA or FCN should be mixed into the bath using agitation; avoid adding the fluoride control additive near the replenishment point for the **XBOND 4000DR**.
4. If the *free fluoride* reaches 40 ppm, the feed of XBOND ADDITIVE FCA or FCN should be turned off.

Replenishment Guide

Use the following table to determine product additions based on bath samples at 4.4 - 5.2 pH.

Zirconium Concentration	Amount of XB4000DR to add per 100 gal (378 L) bath	
	Ounces	Liters
ppm		
175	--	--
165	17	0.5
155	34	1.0
145	51	1.5
135	68	2.0
125	85	2.5

Example for 100 gallon Tank

If the measurement indicates 125 mg/l of zirconium, slowly add 85 ounces (2.5 L) of **XBOND 4000DR** to reach 175 ppm of zirconium.

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