Zaclon Galvanizing Fluxes
granular solid or aqueous solutions

Product Overview
Zinc ammonium chloride, also known as a galvanizing flux, is available from Zaclon for all hot-dip galvanizing operations. Zaclon fluxes have been formulated based on decades of experience in the manufacture and application of zinc ammonium chloride and ammonium chloride in the galvanizing industry.

Zaclon galvanizing flux has many uses and benefits including, providing the final cleaning step before the molten zinc kettle, reducing oxidation of steel once fluxed, helping control zinc oxide skims on the kettle, reducing dross formation, minimizing ammonium chloride fume loss, and insuring good galvanizing. Zaclon fluxes are economical and easy to use, and are available in both fine salt solid form and in convenient solution forms for most formulations.

Hot-Dip Galvanizing Process
Clean, oxide-free iron or steel is galvanized by coating it with a thin layer of zinc alloy. The zinc protects the iron or steel by shielding it from the atmosphere, as well as providing cathodic or sacrificial protection. Even if the zinc coating is scratched and the base metal is exposed, the more electronegative zinc is slowly consumed while the iron or steel base is protected.

The most important galvanizing method used is the hot dip process which is adaptable to the galvanizing of nearly all types of fabricated and non-fabricated products such as wire, tanks, sheets, strip, pipes and tubes, fittings, hardware, wire cloth, hollow ware, and structural assemblies.

Hot-dip galvanizing consists of the following fundamental steps:

Surface Preparation
The surface is degreased with caustic soda or acid degreasing products (such as Hydronet), rinsed, and then pickled in sulfuric or hydrochloric acid, which can contain additives to improve control of the acids (such as Ironsave or Antivapor). This step removes dirt, grease, and iron oxides (rust and scale).

Prefluxing
The steel or iron is immersed in a 10 to 25 Baume concentration solution of zinc ammonium chloride (flux) and water. This solution dissolves light oxides that may have formed after pickling and also protects against further oxidation. The material may then be dried and/or preheated in a furnace. Occasionally there may also be a molten top flux on the zinc kettle to accomplish the fluxing, either in combination with a preflux solution or simply by itself. Flux additives may also be used for additional benefits, such as minimizing spatter and better control of reactive steel.

Galvanizing
The material is then normally immersed in molten zinc or zinc alloy. The layer of flux releases, cleaning the last light iron oxides that have formed, while also preventing zinc oxide formation. A thin coating of zinc-iron alloys form on the base metal, creating a galvanized coating.

Finishing
Any excess zinc is removed. The material is quenched, possibly in water or a passivation solution. Finally the material is inspected.

Warning
Zinc chloride can cause skin burns, eye damage, nose and throat irritation. See “Personal Safety and First Aid” on page 5.
Zaclon Galvanizing Flux
The various Zaclon flux grades allow galvanizers to optimize flux performance for different galvanizing applications, such as,

- Aqueous preflux solution for hot-dip applications, either after fabrication or for continuous strip applications.
- Aqueous preflux solution for continuous wire line applications.
- Molten top flux on the galvanizing kettle.

Different levels of flux activity allow the selection of a Zaclon flux to meet specific operational requirements, such as,

- Higher activity fluxes facilitate high quality galvanizing. These fluxes should be considered especially when base metal surfaces can be given only a minimal amount of surface preparation or are difficult to prepare for galvanizing. They are also more sensitive to excess drying time or preheat temperatures.
- Intermediate activity fluxes, the most common fluxes, will allow high quality galvanizing in applications where the base metal has been given adequate surface preparation. They are more stable to drying or preheating than high activity fluxes.
- Lower activity or minimal fluming fluxes will make good quality galvanizing possible after painstaking base metal surface preparation has been provided or when “easy to galvanize” work is processed. They are also much more stable to high preheating temperatures. Please note that when minimal fume galvanizing is required, the galvanizer must provide careful preparation of the base metal surface to compensate for the lower activity of these fluxes.

Intermediate Activity Fluxes
Zaclon K
- Zaclon K is the preferred flux composition for “dry kettle” galvanizing, with the best balance of cleaning power and fuming available.

Zaclon F
- Zaclon F is the basic galvanizing flux used for “wet kettle” galvanizing, but can also be used for almost any galvanizing approach.
- Produces a top flux foam layer, which reduces generation of fumes, zinc skimmings, and zinc spatter. Also prolongs the flux life and lowers energy requirements.
- Improves prefluxing by faster activation of base metal and better dispersion of contaminants, such as oils or lubricants that can nullify preflux action.
- Improves the drainage of preflux solution and promotes faster drying, increased productivity, and reduced flux consumption.
- Solid form can be added directly to the kettle top flux with minimal smoking.
- Used as a preflux in combination with top flux, it assures uniform zinc coverage and continuous activation of kettle top flux through carry-over of preflux film on the material.

Solution form or small particle size allow for fast tank make-up.
- Referred to as a “triple salt” flux based on the zinc and ammonia ratio.
- Zaclon K is the highest purity zinc ammonium chloride available, with no additives for wetting or top flux viscosity control.
- Creates a flux layer that tolerates preheating temperatures of up to 300°F (149°C) without damage.
- Assures uniform zinc coverage and wetting in the galvanizing kettle.
- Solid form can produce a thin fluid top flux layer when added directly to the kettle as a top flux.
- Available also in a special formulation, called Zaclon K-6, which has a slightly lower ratio (0.6) for galvanizers desiring a slightly more active preflux.
High Activity Fluxes

**Zaclon Ammonium Chloride**
- High purity ammonium chloride containing no additives.
- Used for adjusting activity of the flux, especially in top flux operations where it can be added directly to molten top flux blankets.
- Three different granular forms are offered in unique shapes that allow the material to not cake together and thus does not contain an anticake additive.
- Solution form is also available for use in preflux adjustments.

Lower Activity Flux

**Zaclon C**
- Zaclon C is a lower fuming flux, formulated for use in an aqueous preflux.
- Zaclon C is referred to as a “double-salt” flux based on the zinc and ammonia ratio.
- Zaclon C creates a flux layer that tolerates preheating temperatures of up to 375°F (190°C) without damage.
- Zaclon C is particularly useful for wire and strand galvanizing. It is also used for blending of brazing fluxes and similar products.

Special Purpose Fluxes

**Zaclon Sulfate Control Flux**
- A solution flux designed for galvanizers with filtered preflux and sulfuric acid pickling.
- Has similar activity to Zaclon K, but with an additive to precipitate sulfate as it is carried into the tank.
- Assists in the control of black mark defects caused by sulfate.

**Zaclon AB**
- Zaclon AB is available only in a dry salt form.
- Normally used in molten applications, such as top flux, and can be used as an aqueous preflux or molten salt bath preflux.
- Particularly useful for working of skimmings to remove zinc metal from the oxides.
- Provides a thin fluid top flux layer, which is useful for sealing and insulating the kettle during extended downtime during the work day.

**Zaclon W**
- Zaclon W is specially formulated as an aqueous solution for use as a preflux in continuous sheet galvanizing.
- Zaclon W is sometimes referred to as a “single-salt” flux based on the zinc and ammonia ratio of 2.5.
- Contains a superior wetting system that levels out the coverage of preflux solution, improved drainage and faster drying as sheet exits the preflux bath, increased productivity, and reduced flux consumption.
- Protects steel against oxidation at the higher preheat temperatures that are required in continuous galvanizing, which can be up to 500°F (260°C).
- Available also in a special formulation, called Zaclon W-HT, which is designed for preheat stability of up to 600°F (1112°C).

**Zaclon High Speed**
- Zaclon High Speed flux formulations are available for Terne and Tinning operations.
- Formulated for the lower temperature release needed for continuous galvanizing, Terne, and Tinning operations.
### Zaclon Galvanizing Fluxes Quick Reference Chart

<table>
<thead>
<tr>
<th>Zaclon Flux</th>
<th>Primary Use</th>
<th>Preheating Maximum</th>
<th>Activity/Smoke (Scale 1-10, 10 High)</th>
<th>Available Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zaclon K</td>
<td>Preflux</td>
<td>300° F (149° C)</td>
<td>6/6</td>
<td>Fine Salt &amp; Solution</td>
</tr>
<tr>
<td>Zaclon F</td>
<td>Top Flux</td>
<td>300° F (149° C)</td>
<td>6/6</td>
<td>Fine Salt &amp; Solution</td>
</tr>
<tr>
<td>Zaclon C</td>
<td>Preflux (w/preheat)</td>
<td>350° F (177° C)</td>
<td>4/4</td>
<td>Fine Salt &amp; Solution</td>
</tr>
<tr>
<td>Zaclon Sulfate Control</td>
<td>Preflux</td>
<td>300° F (149° C)</td>
<td>6/6</td>
<td>Solution</td>
</tr>
<tr>
<td>Zaclon W</td>
<td>Continuous galvanizing preflux</td>
<td>400° F (204° C)</td>
<td>3/3</td>
<td>Solution</td>
</tr>
<tr>
<td>Zaclon W-HT</td>
<td>Continuous preflux</td>
<td>600° F (316° C)</td>
<td>3/3</td>
<td>Solution</td>
</tr>
<tr>
<td>Zaclon High Speed Special</td>
<td>Continuous Terne/Tin Coat or Galvanizing</td>
<td>400° F (204° C)</td>
<td>3/3</td>
<td>Solution</td>
</tr>
<tr>
<td>Zaclon High Speed Regular</td>
<td>Continuous Terne/Tin Coat Galvanizing</td>
<td>400° F (204° C)</td>
<td>3/3</td>
<td>Solution</td>
</tr>
<tr>
<td>Zaclon AB</td>
<td>Skimmings Reduction</td>
<td>N/A</td>
<td>0/1</td>
<td>Fine Salt</td>
</tr>
<tr>
<td>Zaclon Ammonium Chloride (C, G, or R grades)</td>
<td>High Purity Activity</td>
<td>210° F (99° C)</td>
<td>10/10</td>
<td>Granular &amp; Solution</td>
</tr>
</tbody>
</table>

*The various grades of Zaclon galvanizing flux offered are based on zinc ammonium chloride, but differ in fluxing activity and additive content. Some grades used as molten top fluxes are available with and without foaming agents and at differing viscosities in use. Foaming top fluxes versus non-foaming, offer benefits to the galvanizer, such as energy conservation and reduced evolution of flumes or smoke.*
Storage and Handling
All dry solid grades of Zaclon galvanizing flux should be stored in a manner to avoid moisture pickup. Zinc ammonium chloride by its chemical nature is prone to absorb moisture and harden (or “cake”). To help minimize “caking”, it is recommended to maintain an inventory of 2 months of material or less.

Unheated solutions of Zaclon flux slowly corrode steel. Rubber-lined steel tanks or fiber glass reinforced polyester tanks are recommended for storage. Drums and tote tanks are polymer plastic. If there is material precipitating due to temperatures below 35°F (2°C), gentle agitation will redissolve material once it reaches 45°F (7°C) or warm water can be used to dissolve.

Personal Safety and First Aid
Health Hazards
Zaclon solution galvanizing fluxes are acidic materials and can cause severe skin or eye injury. The principal hazard is to the eye. Brief contact to the eye with undiluted flux may produce permanent damage. Both flux and ammonium chloride can cause skin and eye burns.

When flux is heated to high temperatures, irritating zinc chloride fumes and gaseous hydrogen chloride may be released. Severe exposures may cause pulmonary edema. Heating may also release zinc oxide fumes that may cause metal fume fever.

The U.S. Department of Labor has ruled that an employee’s exposure to zinc chloride fumes in any eight-hour work shift of a 40 hour week, shall not exceed a time weighted average of 1 mg/m³ of air (29 CFR 1910.1000) Air Contaminants. The limit for zinc oxide is 5 mg/m³ and for hydrogen chloride it is 5 ppm or 7 mg/kg.

Safety Precautions
All persons handling flux should avoid direct contact with the flux. Do not get in eyes, on skin or on clothing. Avoid breathing dusts, mists or fumes. Wash thoroughly after handling. Contaminated clothing should be washed before reuse. Adequate ventilation should be provided.

Personal Protective Equipment
To prevent any possibility of eye contact or reasonable probability of skin contact, wear appropriate equipment such as, chemical splash goggles, rubber gloves, boots, apron, long-sleeve shirt, and pants. If considerable contact is likely, wear impervious (rubber) clothing or an acid suit. Neoprene or PVS are recommended for the rubber items and accessories. If air concentrations exceed exposure limits, OSHA permissible respiratory equipment.

Site Facility
The following safety facilities should be readily accessible in all areas where Zaclon galvanizing fluxes are handled and stored,

Safety showers or water hoses connected to spigots with quick-opening valves that stay open.

Eye wash fountains or other means of washing the eyes with a gentle flow of filtered, tepid tap water.

First Aid
In the event of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes, while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse.

If inhaled, remove to fresh air immediately. If not breathing, give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. Call a physician.

If swallowed, give large quantities of water or milk. Do not induce vomiting. Call a physician. Never give anything by mouth to an unconscious person.
Shipping Containers
Zaclon ships Zaclon C, F, K and Zaclon Ammonium Chloride C in 50 lb. bags.

Zaclon AB is shipped in 55 gallon steel drums.

Zaclon galvanizing solutions are shipped in tank cars, tank trucks, non-returnable 275 gallon intermediate bulk container totes, and in non-returnable 55 gallon polyethylene drums.

Zaclon galvanizing flux granular is classified a corrosive material (UN 2331) by the Department of Transportation (DOT). Zaclon galvanizing flux solutions are classified a corrosive material (UN 3264) by DOT.

Due to changing governmental regulations, such as those of the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency and the Food and Drug Administration, references herein to governmental regulations may be superseded. You should consult and follow the current governmental regulations, such as Hazardous Classification, Labeling, Food Use Clearances, Worker Exposure Limitations and Waste Disposal Procedures for the up-to-date requirements for the products described in this literature.

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Sales & Services
For placing orders or requesting additional product information, please use our convenient toll-free telephone number at (800) 356-7327 or visit our website at www.zaclon.com

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