## Salt Bath Manual Index



## Statement of Use - Overview of Salt Bath Operation

The salt bath heat treating process involves heating solid heat treating salts to a given temperature which causes them to liquefy by heat (become molten). These salts are contained within a vessel that is commonly known as a salt pot. Once the salts become molten, and at the desired heat treat temperature, steel work-pieces (blades, receivers, tools, etc.) are immersed into the molten salts and are allowed to remain there for the desired time period. Once the desired time period has elapsed, the work-pieces are removed from the molten salt to undergo further processing as necessary.

Advantages of the salt bath heat treat process include a heat treat environment that is absent of oxygen. Oxygen oxidizes and decarburizes steel when taken to temperature: neither effect is generally preferred in the finished product. Also a salt bath, by its nature, tends to offer phenomenal temperature distribution throughout the work piece.

## SAFETY

Read and understand this installation and operating manual as well as the controls manual before operating your salt bath heat treat kiln. If you have any questions please contact Evenheat Kiln at 989-856-2281 or at evenheat-kiln.com.

**Warning Symbol Descriptions**

Warning symbols are used throughout this manual. These symbols alert the operator to certain hazards and important information. Pictured below are symbols used along with a description of each.

**Explosion/Pressure Release Hazard**

This symbol alerts you to potential explosion and pressure release hazards.

**Electric Shock Hazard**

This symbol alerts you to potential electric shock hazards.

**Burn Hazard**

This symbol alerts you to potential burn hazards.

**General Cautions and Information**

This symbol alerts you to particular cautions, hazards and information.

**Toxic Hazard**

This symbol alerts you to toxic hazards.

**Emergency Shut Off Provision**

The salt bath kiln power supply connection (electrical plug and receptacle) act as the emergency electrical power shut off. Access to these devices should be unobstructed and safe at all times. To remove electrical power from the salt bath kiln remove the salt bath power cord plug from the electrical power receptacle.

**Electrical Safety**

Model SB 709 electrical service requirements: The SB 709 consumes 18A at 120V and uses a NEMA 5-20 plug/receptacle configuration. A "fully rated" 20A breaker is required.

Model SB 718 electrical service requirements: The SB 718 consumes 18A at 240V and uses a NEMA 6-20 plug/receptacle configuration. A "fully rated" 20A breaker is required.

Model SB 818 electrical service requirements: The SB 818 consumes 30A at 240V and uses a NEMA 6-50 plug/receptacle configuration.

A licensed electrician should be used for all electrical installation and service. All applicable local, state and federal electrical codes must be followed.

Use correct voltage, wire size and fuse or breakers (fully rated 20A breaker required on the SB 709 and SB 718). Kiln electrical requirements are located on the kiln nameplate. Make sure all electrical connections are tight. Avoid using aluminum wire.

Always use the proper electrical receptacle. Never alter the kiln cordset or cordset plug. Alterations can be dangerous. Alterations will void any warranties.

The salt bath kiln electrical service must be properly grounded.

The salt bath process involves an electrically conductive salt pot, electrically conductive salt material, electrically conductive work-piece, electrically conductive work-piece holder, electrically conductive thermocouples and, most importantly, **an electrically conductive you!** Everything about the salt bath kiln is electrically conductive. It's for this reason that we provide and require electrical grounds on the kiln, salt pot and thermocouples. In the event of an electric short these grounding mechanisms safely dissipate the electrical energy. Pay attention to them, inspect them periodically and do not defeat them.

Evenheat recommends that a voltage check be performed before placing the kiln into service, ideally before actual purchase. Operating voltage varies. The kilns operating voltage (printed on the kilns nameplate) must match the applied voltage (actual electrical service voltage). If it does not, do not install or operate the kiln as potential electrical and fire hazards exist. Contact Evenheat for guidance in such cases.

Unplug or disconnect the kiln from the electrical service before accessing the chamber for servicing or vacuuming. Do not attempt to touch or replace the heating elements while the kiln is plugged in or connected to the electrical service. Electric shock may result in serious injury or death.

Never, ever use an extension cord to operate a kiln.

**Salt Bath Kiln Location Safety**

Do not place or use the kiln on a combustible surface.

Do not install the kiln closer than 12" (31cm) from wall surface or object or 36" from any ceiling surface. All wall and ceiling materials shall be made of non-combustible materials.

Place only on the metal stand provided by Evenheat Kiln, Inc.

The surface on which the kiln is placed shall be level and capable of safely supporting the combined weight of the kiln, kiln load and any operating personnel.

Observe all building, fire and safety codes when installing the kiln.

Install in a covered, well ventilated area.

Installation of a venting system may be necessary depending upon the type of heat treating salts you are or will be using. Consult with the manufacturer of the salts and the material safety data sheet for recommendations regarding ventilation.

Never place the kiln in a small, enclosed area such as a closet, cabinet or very small room. The room in which the kiln is placed into service shall be capable of safely dissipating all heat produced by the kiln.

Do not place the kiln in any structure resembling a carport or screened in porch. Avoid areas that are subject to outdoors weather.

Never install a kiln outside. Avoid moisture.

Do not use or install liquid based fire-fighting equipment such as water sprinklers or extinguishers. Carbon dioxide type fire extinguishers and sand are acceptable means of fire-fighting in and around the salt bath kiln location. It is recommended that these fire-fighting methods are present and are immediately available for use.

It is the user's responsibility to be knowledgeable regarding any and all contaminants, produced by during heat treat process and to take steps to properly and legally contain and dispose of these contaminants.

It is the user's responsibility to provide ventilation capable of removing all gases, fumes and other airborne contaminants produced by the heat treating salts from the work the area and building structure.

Do not store flammable or combustible products near or in the same room the kiln such as gasoline, paint, aerosol cans, paper, curtains, plastics, etc. Better yet, store these items in another separate structure designed for this purpose.

Position the power supply cable, thermocouples and other materials in such a way as not to create a tripping hazard around the kiln.

The area around the kiln should be free of obstructions that interfere with the proper and safe operation of the kiln.

Never place anything under or above the kiln for storage. Absolutely nothing should be propped against the kiln.

**Kiln Use Safety**

**Your work-piece(s) must be absolutely CLEAN. The steel work-piece, any steel work-piece holders and thermocouples you are immersing into the salt bath must be absolutely free of moisture, grease, oil or any other contaminants. Contaminants, when immersed into the salt bath, will vaporize and expand very quickly and violently. This violent expansion pushes the molten salts out of the top of the salt pot itself and into your work area. This presents a fire and burn hazard which may result in personal injury or death as well as building structure damage.**

Evenheat salt bath kilns are designed for the heat treatment **of carbon steels only**. Do not attempt to heat treat any material other **than carbon steels or stainless steels**. If you are unsure as to the composition of a particular piece, do not heat treat it.

Tools and/or work-piece holders may find their way into the molten salt during use therefore; any tools and/or work-piece **holders must be constructed of carbon steels or stainless steels.**

Do not attempt to heat treat any coated or plated steel. Coatings and plating's include, but are not limited to zinc (galvanized), aluminum (aluminized) and chrome.

When heating the salt bath salts from a solid to a liquid molten state do so at no greater than a 1000°F per hour heating rate (537°C per hour rate). Heating too quickly can result in a pressure buildup within the vessel that contains the salts (salt pot). This pressure buildup can result in the salts erupting from the salt pot and entering your work area. **This presents a fire and burn fire hazard which may result in personal injury or death as well as building structure damage.**

**DO NOT USE HEAT TREAT SALTS THAT CONTAIN CYANIDE**. Cyanide is toxic and presents sure death to human life.

**USE EXTREME CARE WHEN USING HEAT TREAT SALTS THAT CONTAIN NITRITES/NITRATES.** Nitrites/Nitrates are generally found in low temperature, tempering salts. Nitrite/Nitrate containing salts are toxic and can produce poisonous gases and/or explode if taken to too high of a temperature. If using nitrite/nitrate containing salts it is highly recommended that a suitable ventilation system be used to safely remove any fumes or gases from the work area. Follow all storage and use procedures.

**DO NOT** heat or re-heat any work-piece, work-piece holder or other work-piece devise that has been subjected to a nitrite/nitrate containing bath **without first removing all traces of the nitrite/nitrate salt from the work-piece or work-piece devices**. Failure to do so will cause the nitrite/nitrate based salts to exceed their safe working temperature and release poisonous gases.

Many hardening temperature salts are sodium chloride based. Sodium chloride is what we know generally as "salt". These heat treat salts do contain some degree of additives which may or may not represent a hazard. Know the salts you are using and take any additional, necessary and required precautions.

The Salt Bath kiln is designed for the heating of heat treating salts only. Do not attempt to heat oils, water or other substances. Failure to follow this instruction presents a possible fire and electrocution hazard which can result in property damage, injury or death.

Protective clothing shall include a full face shield along with goggles, comfortable heat resistant gloves and long sleeved clothing. Avoid synthetic clothing. When choosing gloves we feel it's important that you choose a pair that allows for well-controlled movement (articulation) of the hand.

The salt bath kiln is designed to provide electrical grounding for the salt pot (and by extension, the molten salt) and temperature sensing thermocouples. These grounds are protective measures designed to provide a safe dissipation of electrical energy in the event of an electrical failure (short circuit). All ground connections must be in place.

> Special attention shall be made to the ground connection at the salt pot. The ground connection at the salt pot is prone to corrosion with use. Periodic inspection shall be made to ensure a sound electrical connection between the salt pot, salt pot grounding lug hardware and the salt pot grounding strap. The grounding surfaces of these items should be clean and free of corrosion. Remove any corrosion at these points or replace them if removal is not possible.

The salt bath process can produce fumes that are potentially harmful and corrosive. Ventilation should be provided to safely and legally remove fumes produced during the salt bath process.

The surface of the kiln is hot and burn injuries are possible. Keep all children and unsupervised personnel away.

Under no circumstances should you touch the heating elements with your body or any other devises like tools. Electrical shock may result in serious injury or death.

Do not operate the kiln over the maximum safe use temperature of your salt nor the maximum temperature rating printed on the nameplate.

It is the intention of our salt bath kiln design that you allow the salts to reach a molten state using the Chamber thermocouple for control. Once they reach molten state it is then the intention of the design that you insert the Immersion thermocouple into the salt bath and control from the Immersion thermocouple.

Never fire a kiln unattended.

Do not attempt to insert any thermocouples, or any other devices between the salt pot and lid. Doing so creates an electrocution hazard that may result in injury or death.

Never allow the power cord to touch the kiln. If the cord, plug or receptacle become damaged discontinue use and replace immediately.

It is the user's responsibility to have knowledge of the heat treat salts used and the material intended to be heat treated. If you are unsure as to the safety and proper use of the heat treat salts and/or material to be heat treated contact the materials supplier for guidance. **If you remain unsure as to the safety of the salts or particular material do not do it.** Hazards include materials that explode or produce toxic gases.

Heat treat all materials (work-pieces) according to the material manufacturer's instructions or material type. Improper use may result in damage to the kiln or material.

Do not use the kiln to prepare food, heat a living space, dry clothes or ice laden articles or use as a storage devise. The kiln is designed for one purpose and one purpose only: the heat treating of steel.

The salt bath kiln and salts will remain very hot long after the use is complete. All safety recommendations should be followed, even with the kiln unpowered, to avoid any burn injuries. Keep children and other unauthorized personnel away.

When use is complete, and during periods of non-use, remove power from the kiln by unplugging or by throwing the disconnect or breakers to the OFF position.

**Kiln Maintenance Safety**

Disconnect electrical power from the kiln before performing any kiln maintenance. Failure to disconnect the electrical power supply may result in electrical shock which can cause serious injury or death.

Replace any worn, damaged or defective parts immediately with Evenheat Kiln replacement parts only. Discontinue use until parts are replaced.

If vacuuming the kiln use only HEPA filters on the vacuum. Prolonged expose to brick dust and other refractory materials can cause lung injury.

Inspect all electrical service connections periodically for wear.

The salt bath kiln is designed to provide electrical grounding for the salt pot (and by extension, the molten salt) and temperature sensing thermocouples. These grounds are protective measures designed to provide a safe dissipation of electrical energy in the event of an electrical failure (short circuit). All ground connections must be in place and prior to use.

Special attention shall be made to the ground connection at the salt pot. The ground connection at the salt pot is prone to corrosion with use. Periodic inspection shall be made to ensure a sound electrical connection between the salt pot, salt pot grounding lug hardware and the salt pot grounding strap. The grounding surfaces of these items should be clean and free of corrosion. Remove any corrosion at these points or replace them if removal is not possible.

## Setting Up the Salt Bath Kiln

**Salt Bath Kiln Location**

Locate your salt bath kiln in accordance with the "**Salt Bath Kiln Location Safety"** information found on page 3 of this manual.

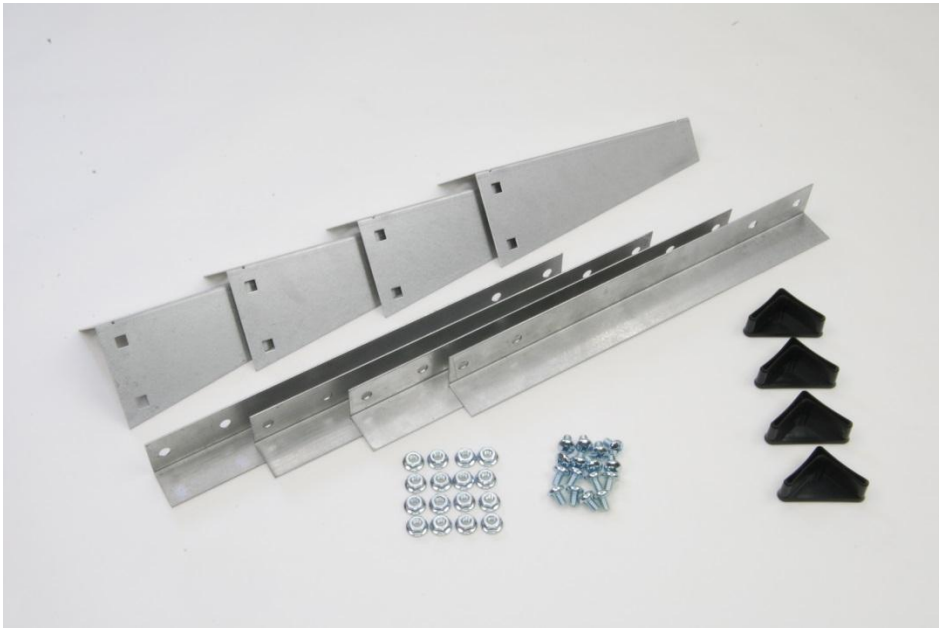
**Stand Assembly**

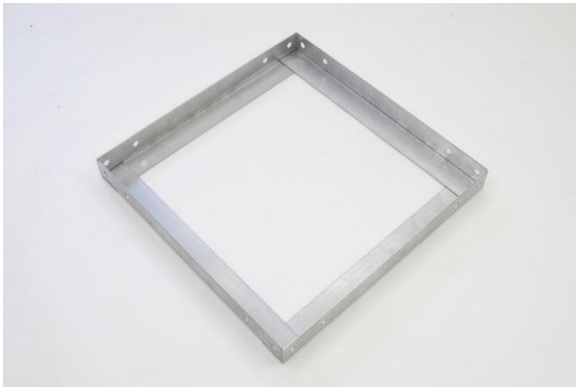
Tools Needed:

Phillips Screwdriver - #2 Point works good
7/16" Wrench

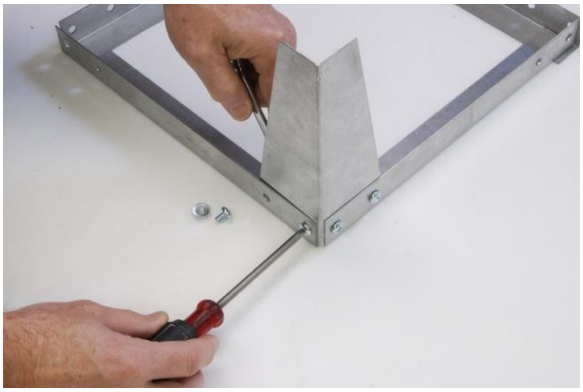
Stand Components include:

4 – 13" Frame Angles
4 – 8" Legs
16 – Nuts
16 – Bolts
4 – Plastic Stand Feet

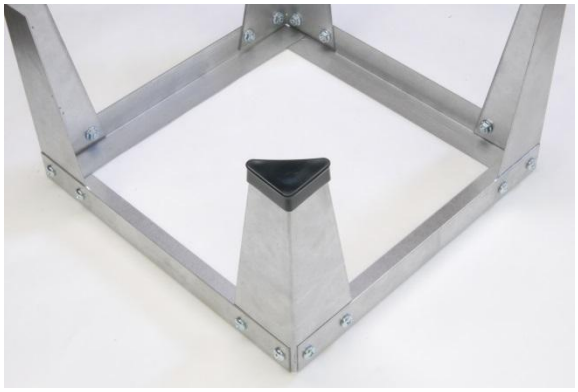




Make a Square by Placing Frame Angles as Shown



Attach Each Leg Using the Included Nuts and Bolts as Shown



Place Plastic Feet on Each Leg as Shown

Completed Stand


Place and Center the Kiln on the Stand as Shown

**Thermocouple Installation**

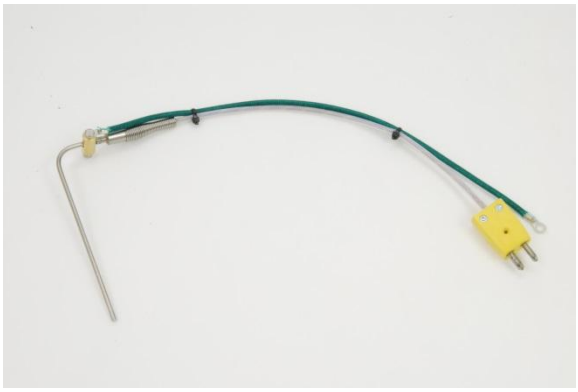
The Salt Bath kiln uses 3 thermocouples for control. The Over-Temp (high limit) has been installed at the factory. The Chamber and Immersion thermocouples must be installed.

**Over-Temp Thermocouple (#1, lower jack) – Installed at Factory**

The purpose of the over-temp thermocouple is to stop the heating process if the kiln chamber exceeds the programmed temperature by 300°F (149°C). The over-temp thermocouple is installed at the factory and remains in place at all times and is not movable.

The Over-Temp thermocouple is a Type K thermocouple, 1/8" diameter Inconel sheath, bent at 90°. Supplied with standard sized male thermocouple connector.

Note the grounding wire connected to the Inconel sheath. This ground wire will be connected to the control panel.



Salt Bath Over-Temp (High Limit) Thermocouple Assembly
Over-Temp Thermocouple Assembly Replacement Part #11647.315

The Over-Temp thermocouple properly installed.

Note that the over-temp thermocouple is plugged into the #1 thermocouple jack (lower jack). Do not position the over-temp thermocouple at any other jack than the #1 jack.

The over-temp thermocouple should be inserted into the firing chamber as far as possible and should remain there.

Note also that the green ground lead for the over-temp thermocouple is secured to the labeled ground connection located on the control panel.

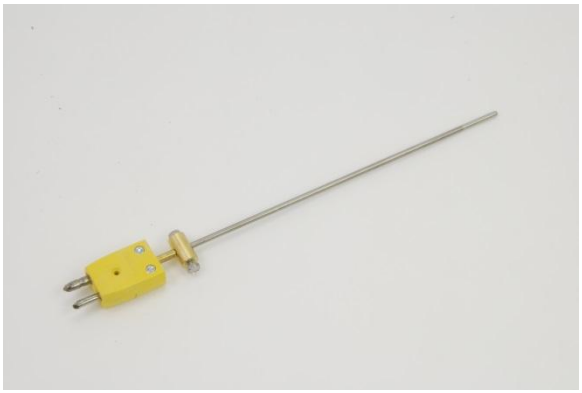
Over-Temp Thermocouple Properly Installed

**Chamber Thermocouple (#2, middle jack) - Installation**

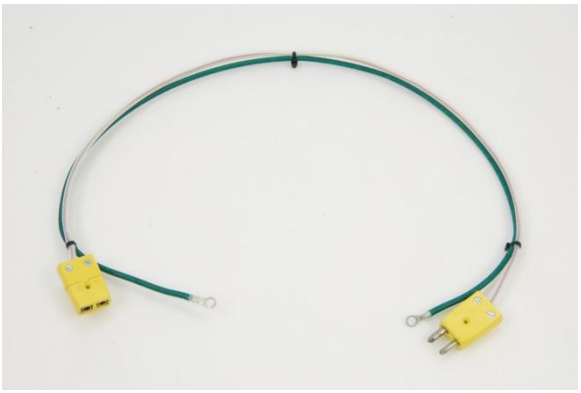
The purpose of the chamber thermocouple is to measure the temperature of the space between the firing chamber walls and the salt pot. It's not intended to be inserted into the salt bath. Generally, the chamber thermocouple is allowed to make contact with the salt pot or is positioned fairly close to it but no more than a 1/2" away. In this regard, it's movable.

The Chamber thermocouple consists of two items: Type K thermocouple, 8" long, 1/8" diameter Inconel sheath assembly and a 30", Type K lead assembly. Both assemblies are supplied with standard sized male and female connectors.

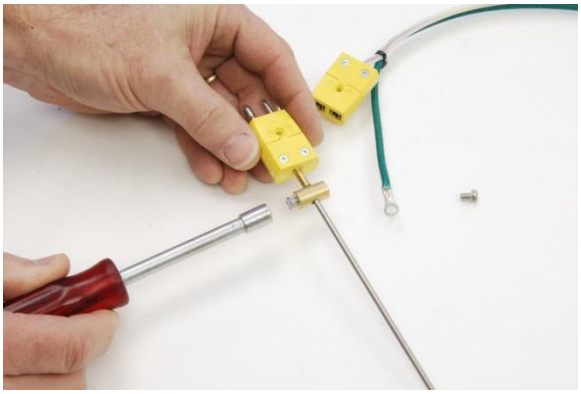
Note the grounding wire connector on the thermocouple assembly and the green grounding wire included with the lead assembly.



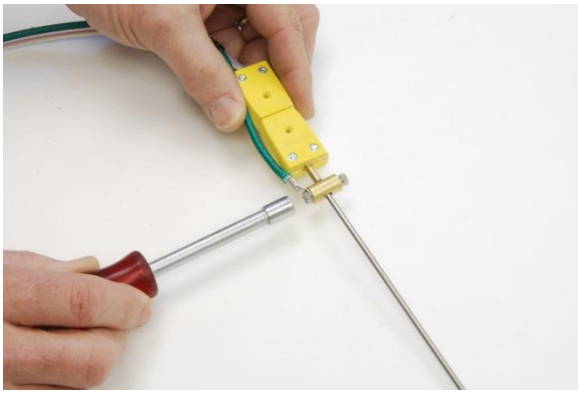
Salt Bath Chamber Thermocouple Assembly
Chamber Thermocouple Assembly Replacement Part #11647.305



Salt Bath Chamber Thermocouple Lead Assembly
Chamber Thermocouple Lead Assembly Replacement Part #11647.307



The thermocouple ground connector is installed at the factory. Double-check that it secured to the thermocouple sheath (jacket). Snug is good, do not over-tighten.



Plug the male thermocouple plug into the female lead plug. Attach the thermocouple lead assembly green ground wire to the thermocouple ground connector as shown. Tight is good.

Chamber thermocouple assemblies properly assembled.

Insert the Chamber thermocouple into the chamber through the left-rear corner as shown. An insertion hole has been provided.

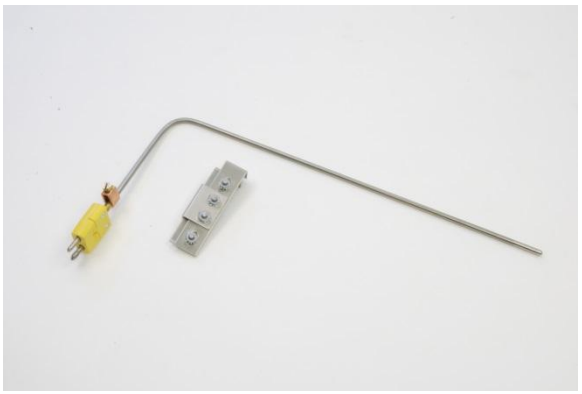

Plug the Chamber thermocouple into the #2 jack (middle jack) and attach the ground onto the ground stud as shown.

**Immersion Thermocouple (#3, upper jack) - Installation**

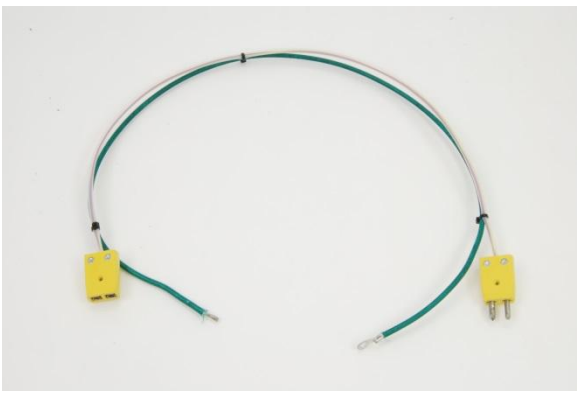
The purpose of the Immersion thermocouple is to measure the temperature of the salt bath itself. That is to say that the immersion thermocouple is immersed into the molten salts during operation. It is the Immersion thermocouple that you should use when performing your heat treating as it gives the actual temperature of the salt bath. The Immersion thermocouple is supplied with a mount.

The Immersion thermocouple consists of two items: Type K thermocouple, (13.75" long on SB 709 and 18" long on SB 718 and SB 818), 3/16" diameter Inconel sheath assembly and a 30", Type K lead assembly. Both assemblies are supplied with standard sized male and female connectors. Note the grounding wire connector on the thermocouple assembly and the green grounding wire included with the lead assembly.

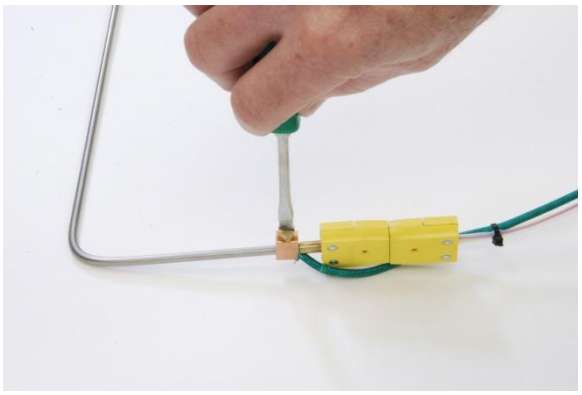
The immersion thermocouple is also supplied with thermocouple mount. The thermocouple mount properly places the immersion thermocouple within the pot and away from the pot wall. The thermocouple mount is designed to be easily removable from the pot lip.



Salt Bath Immersion Thermocouple Assembly & Mount
Immersion Thermocouple Assembly SB 709 Part #11647.310
Immersion Thermocouple Assembly SB 718 & SB 818 Part #11647.310
Immersion Thermocouple Mount Replacement Part #11647.320



Salt Bath Immersion Thermocouple Lead Assembly
Immersion Thermocouple Lead Assembly Replacement Part #11647.312



Plug the male thermocouple plug into the female lead plug. Attach the thermocouple lead assembly green ground wire to the thermocouple ground connector as shown. Snug is good.

Place the immersion thermocouple within the mount and place the mount on the lip of the salt pot as shown. Draw the mount ears tight to the pot and tighten the outer 2 nuts as shown.

Position the immersion thermocouple under the bracket and tighten the inner 2 nuts as shown. The immersion thermocouple is now set-up. To remove it from the pot lip just pull off the mount.


Plug the Immersion thermocouple into the #3 jack (upper jack) and attach the ground onto the ground stud as shown.
At this point all 3 thermocouple grounds are attached to the ground stud.

**Salt Pot Ground Strap Installation to Control Panel**

The salt pot is grounded to the control panel via a ground strap which must be installed. The salt pot ground is designed to safely dissipate any electrical energy finding its way to the salt pot itself. It must be connected during operation of the salt bath kiln.

Salt Pot Ground Strap – 18” eye to eye
Salt Pot Ground Strap Replacement Part #08298.235


Attach the salt pot ground strap to the upper ground lug on the rear of the control panel as shown.

**Prepare the Salt Pot Ground Lug**

Your salt pot must be at least 4" deeper than the chamber depth (9" chamber depth means minimum 13" pot depth, 18" chamber depth means minimum 22" pot depth) and be fitted with a grounding lug. Salt pots purchased from Evenheat will meet these specifications. If you intend to provide your own salt pot you must provide for an electrically conductive grounding lug.

The salt pot must also be clean as well. **Remove any grease, oils or other contaminants before using**.

Salt pots should include a 0.250" hole, 0.750" from the top of the pot. This hole is designed to fit ¼-20 hardware for the grounding lug.

Salt Pot grounding lug hardware attached.

Evenheat 4" and 6" salt pots, either 13" or 22" deep.

**Placing the Salt Pot into the Chamber**

Pull the Over-temp and Chamber thermocouples out of the chamber enough so that they're not visible as you look down into the kiln chamber. This just gets them out of harm's way as you place the salt pot within the chamber.

Carefully place the salt pot into the firing chamber taking care not to bang up the walls while doing so. Center the salt pot as best you can with the grounding lug facing the left.


Salt pot generally centered with grounding lug to the left.

**Placing the Lid onto the Chamber**

Your lid will have an access hole machined into it that will be slightly larger (or should be) than the salt pot. It will also have a notch that allows for clearance of the salt pot ground lug. You will also note a groove around the pot access hole, this is a locking ring of-sorts and is used to secure the refractory fiber gasketing material and should be placed up.

When placing the lid, you will most likely have to center the salt pot a little bit. When placed, the lid should match the outline of the chamber and most likely make contact with the drip shield attached to the control panel.

We like to rotate the salt pot so the grounding lug points to the left-rear corner. This position leaves the back portion of the salt pot open for the immersion thermocouple mount placement while keeping the left side of the pot clear for working and dragout.

Once the lid is placed and the pot is rotated and centered push the Over-temp and Chamber thermocouples back into the chamber. As noted earlier, you may elect to allow the chamber thermocouple to make contact with the salt pot or not. If not, pull it away from the pot no more than 1/2".

Salt Bath Kiln Lid
See page 29 for part numbers

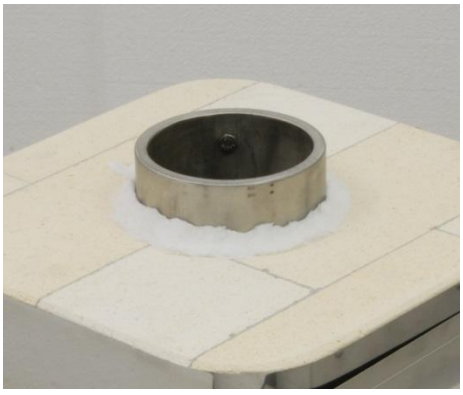

Lid Installed

**Installing the Fiber Gasketing Material Around Salt Pot**

When working with the refractory fiber use a dust mask and gloves. You'll be tearing the fiber a bit to make it fit and this will produce some dust so you'll want to be protected.

Your salt bath kiln is provided with two strips of refractory fiber that are used to seal off the gap and hole between the salt pot and lid. The main purpose of this fiber is to act as a catch for any molten salts (dragout) that may find its way out of the pot when pulling you work-piece. Place the fiber in the groove/locking ring and form it to create a seal between the salt pot and lid. Use any remaining portion of the fiber to seal up the grounding lug notch as well.

Refractory Fiber Strips – 14" x 1" x 1/2"
Fiber Strips Replacement Part #06423.305



Fiber placed in the groove/locking ring between the salt pot and lid.
Be sure to fill the notch in the lid, used for the grounding lug, as well.

**Installing the Lid Drip Shield**

Place the lid drip shield on the lid. The lid drip shield should be placed with the broken edge towards the control panel as shown.

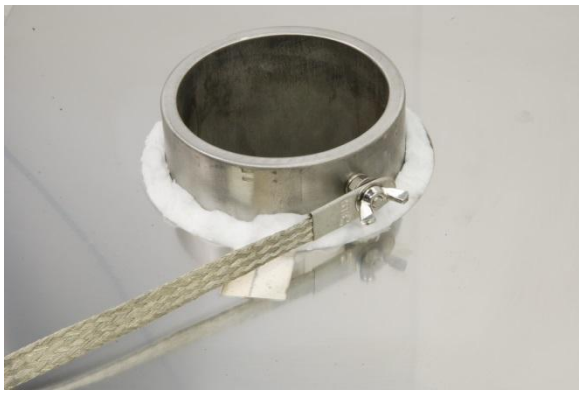
Lid Drip Shield
See page 29 for part numbers


Lid Drip Shield Installed

**Salt Pot Ground Strap Installation to Salt Pot Grounding Lug**

Connect the salt pot grounding strap to the salt pot ground lug as shown. The connection should be tight. We like to place the salt pot grounding lug pointing to the left-rear of lid. This tends to place it out of the way of the immersion thermocouple and dragout.

The salt pot ground strap connection must be inspected periodically, cleaned if necessary and replaced when it no longer provides a good ground connection.



Salt Pot Ground Strap Attached to the Salt Pot

**Salt Bath Kiln Set-up is Now Complete**

## Charging (Filling) Your Salt Pot

**Put on Your Personal Protective Equipment**

Before approaching and working with the salt bath kiln wear all personal protective gear which includes a face shield, goggles, gloves, long sleeves of cotton or leather (do not wear any synthetic clothing) and respirator (if required by salt choice).

**Turn on Any Ventilation Systems**

If you are using salts that require ventilation or are using a ventilation system for general purpose, turn it on now.

**Charge (Fill) the Salt Pot with Your Heat Treat Salts**

DO NOT MIX SALTS: Your salt pot should be charged (filled) with only one type of heating salts from the same source and ideally from the same container. Do not mix salts from various sources or of different type. Mixing salts can be dangerous.

Pour half of the expected volume of your room temperature heat treat salts into the salt pot. Listed below are approximate final volume weights, so fill your pot with half this amount to begin with.

Approximate Final Volume Salt Loads:
4” pot, filled to 18” depth will take about 17lb. (halve this for 9” fill on 13” pots)
5” pot, filled to 18” depth will take about 26lb. (halve this for 9” fill on 13” pots)
6” pot, filled to 18” depth will take about 38lb.

You will be heating up the half load to molten temperature and then adding additional salts to get the final volume. We recommend a final molten salt depth of no more than chamber depth. We want to keep the surface of the molten salt at or below the bottom of the lid. The pot does/should extend beyond the lid but keeping the molten salt level within the boundry of the heating chamber is what we’re after.

**Powering Up the TAP Control**

Plug the kiln in.

Throw the control power switch up to the On position. The control power switch is located at the top rear of the control panel.

The TAP control will illuminate, initialize and come to its home screen.

**Operating the TAP Control**

A separate TAP control manual has been supplied. Please refer to this manual for programming and use information.

TAP Control Manual Addendum

The TAP controller used on our salt bath models contains special software designed specifically for salt bath use. Chiefly, the ability to switch between the Chamber Thermocouple and Immersion Thermocouple during use and a special Over-Temp thermocouple circuit designed to abort the process in the event of over-temp (high limit). These items are not mentioned in the TAP control manual so we offer them here as an addendum.

You will note that the Execute (Run) screen display of the TAP control is slightly different than the description found in the TAP control manual. In order to allow for the switching action between the chamber and immersion thermocouples we have removed the “Schedule Summary” key from the Execute (Run) screen and have replaced it with a key named “Probe”. Probe is the key that you will press to select which thermocouple is being used as the controlling or active thermocouple. “Controlling Thermocouple” means the thermocouple that is being used by the TAP control to the temperature.

**Programming the TAP to Achieve Molten Salt**

You will program the TAP control to do 3 things: ramp-up (heat up) to your chosen molten temperature, heat to your chosen molten temperature itself and hold at your chosen molten temperature. Let's discuss these 3 things one at a time and in order:

**Temperature Rate (Speed)**: The TAP uses a degrees-per-hour format for controlling the speed at which the heat will increase. Evenheat recommends a heating rate of no faster than 1000°F per hour (537°C per hour).

**Setpoint Temperature:** The Setpoint is the actual temperature you are attempting to achieve for the heat treating process. Heat treat salts have working temperature ranges. The desired heat treat temperature of your material must be within the working range of your heat treat salts.

**DO NOT OVERHEAT YOUR SALTS** – You must know the acceptable, safe working range temperatures of your salts. Do not program or otherwise allow the salts to reach a temperature higher than the acceptable and safe working temperature range. Nitrite containing salts are prone to explosion if over-heated. KNOW YOUR SALTS and operate the salt bath accordingly!

**Hold Time:** Once the setpoint temperature has been achieved the salt bath is allowed to hold at that temperature for a period of time. It's during this hold time that you will perform your heat treating process. The amount of hold time depends upon the amount of time you expect your heat treat session to last. Keep in mind that you can always abort the heat treat process via the TAP control at any time.

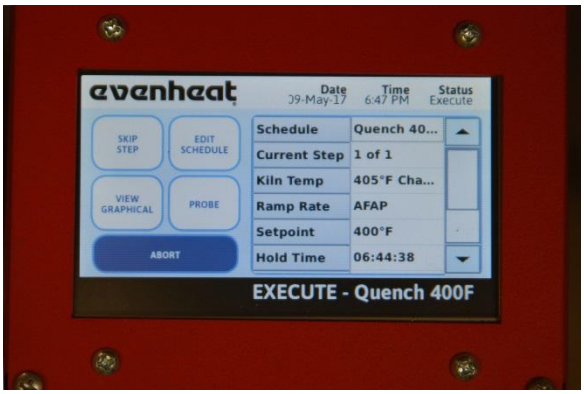
Using the above information, program your TAP control to ramp-up at no faster than 1000°F/hr. to reach your heat treat temperature and hold for a period of time. Given that you are heating your salts for the first time use a hold time of 6 hours. You shouldn't need this amount of time to complete the process and you can abort the process when you are complete.

Start the heating process per instructions found in the TAP control users manual.

**Chamber Thermocouple Controls Heat-up**

You will note that the TAP control indicates "Chamber" when the process is started, as will always be the case. This means that the TAP control is working from the Chamber Thermocouple for its control information. The reason is that chamber heat is a reliable measure of temperature at start-up when the salts are in a solid form. Sensing the direct temperature of the solid salt does not/would not accurately reflect the heat being exposed to the salt pot and could lead to a heating rate that is too fast.

Generally, you will allow the TAP to use the Chamber thermocouple to control up the molten, setpoint temperature.




You'll note in the Kiln Temp row that "Cha…" is displayed. This indicates that the Chamber thermocouple is being used for control.


After about 10 minutes of screen inactivity a large text screen appears and "Chamber" is prominently displayed.

**Adding Additional Salt to Make Final Volume**

As noted previously, as the TAP control heats the salts, the salts will become molten. Once molten, remaining salts needed to make the final volume can be added to the salt pot. We recommend adding additional salts in 1 to 2 cup volumes and allowing them to liquefy before adding additional. Continue adding these small amounts until the salt pot has reached its final volume. Final volume again should not exceed chamber depth. It can be less, just not more.

**Switching to the Immersion Thermocouple**

Once the salts are molten and the level begins to rise you may insert the Immersion Thermocouple into the salt bath and control from that thermocouple. Be sure at least 1" of the Immersion thermocouple is immersed within the molten salt. If it isn't yet, continue to add salts until it does and then proceed with this step.

As noted in the cautions and use data, be sure that any item you place into the molten salt is absolutely clean. This includes the Immersion thermocouple as well.

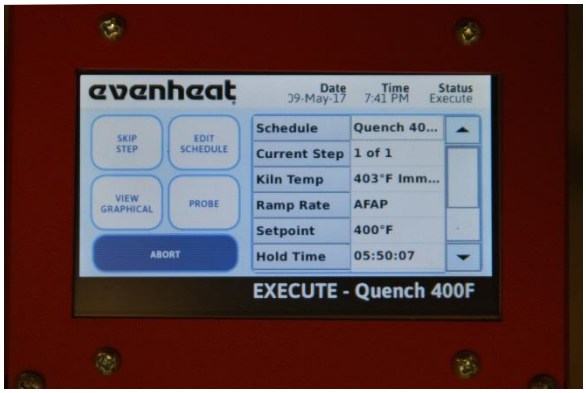
Immersion Thermocouple placed within the salt pot and held with mount

Once the Immersion thermocouple is inserted into the salt bath, press the "Probe" key on the TAP control and then press the "Immersion" key. This action causes the TAP control to now control the heating process via the Immersion thermocouple which is the actual temperature of the molten salts, and that's what we want.


Press the "PROBE" key to select Active Thermocouple


A dialogue box appears, press "Immersion" to select the Immersion Thermocouple. The dialogue box disappears and you are now controlling from the Immersion thermocouple.

The TAP display will indicate that you are using the Immersion thermocouple via the screen.




You'll note in the Kiln Temp row that "Imm…" is displayed. This indicates that the Immersion thermocouple is being used for control.


After about 10 minutes of screen inactivity a large text screen appears and "Immersion" is prominently displayed.

You may switch back and forth between the Chamber and Immersion thermocouple whenever and as often as you want. We would expect that you would leave it on Immersion during your process but the choice is there if you want it.

**Charging Complete**

Once all salts have been added the initial charging process is complete. You may at this point perform a heat treat process or shut the salt bath kiln down. If you do plan to perform a heat treat session please read the following section entitled Standard/Everyday Use for operational information.

**Proper Shutdown**

When shutting down the salt bath heat treat kiln we highly recommend that you remove the Immersion Thermocouple from the salt bath before the salt solidifies. Our testing indicated premature thermocouple failure if we left it in the salt as it cooled. It tended to fail (break) right at the level of the salt.

Throw the control power switch, located on the top rear of the control panel, to the Off position. The display on the TAP will go dark.

Keep in mind that the salt, salt pot and kiln will remain hot for some time following shutdown. Use care when working around the kiln.

Cover the top of the salt pot with the supplied 12" x 12" x 1" refractory fiber. Use a dust mask and gloves when handling the fiber as it will create some dust. The fiber prevents foreign material from entering the pot during periods of non-use.

Refractory Fiber Placed over the Salt Pot
Replacement Part #06423.300

## Standard/Everyday Use

**Wear Personal Protective Equipment**

Before approaching and working with the salt bath kiln wear all personal protective gear which includes a face shield, goggles, gloves, long sleeves of cotton or leather (do not wear any synthetic clothing) and respirator (if required by salt choice).

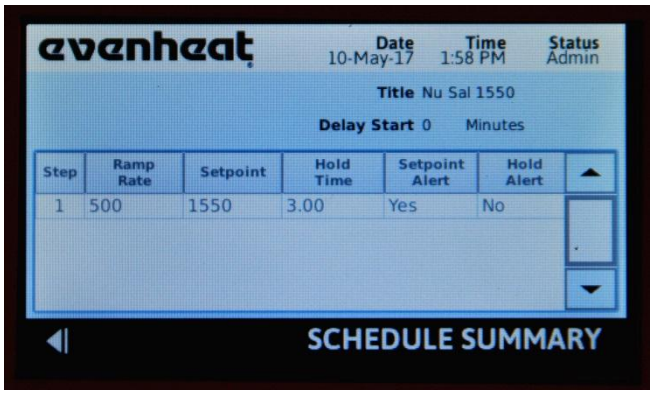
**Turn on Any Ventilation Systems**

If you are using salts that require ventilation or are using a ventilation system for general purpose, turn it on now.

**Power Up the TAP Control**

Power up the TAP control by throwing the control power switch located on the top rear of the control panel. The TAP control will illuminate, initialize and then go to its Home Screen.

Develop or choose your proper, existing heat treat program that matches your intended use and salts. We recommend that you review the intended program via the Schedule Summary function prior to starting. This gives you the opportunity to examine the firing data for correctness prior to committing to the process. When developing a heat treat program we recommend that you not create any heating rates faster than 1000°F per hour. Heating too quickly can cause pressure to build within the pot and lead to an eruption. See cautions section for details.




The Schedule Summary Function Allows You to Verify the Firing Data Prior to Committing to the Process
Note that the sample program shown above uses a heating rate (Ramp Rate) of 500°F/hr.
We Highly Recommend that You View the Intended Firing Data Prior to Use

**Verify Chamber Thermocouple Position**

Verify that the Chamber Thermocouple is fully inserted into the firing chamber. You may elect to have it contact the salt pot or not. If not, we recommend pulling it away from the pot no more than 1/2”.

**Start the Heat Treat Process**

Once you have developed or chosen a heat treat program, and have verified its firing data, press the Start key on the TAP control to begin the heating process. When a heat treat program is started the TAP control will always control from the Chamber Thermocouple. You do have the opportunity to switch it to the Immersion Thermocouple once the salts become molten.

**Inserting the Immersion Thermocouple into the Molten Salt Bath**

Once the salts have become molten immerse the clean Immersion Thermocouple into the salt bath and secure it to the salt pot with the mount. We have said it before in this manual, but we are going to say it again: any material that is placed into the molten salt bath must be absolutely clean and free of any grease, water, moisture or other contaminant. Failure to follow this instruction can result in a pressure build-up resulting in the molten salts being violently expelled out of the salt pot and into the surrounding area. This presents a burn and fire hazard as well as potential personal injury or death.

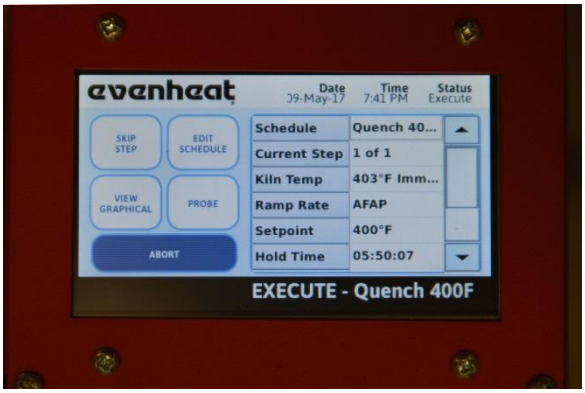
Immersion Thermocouple placed within the salt pot and held with mount

Once the Immersion thermocouple is inserted into the salt bath, press the “Probe” key on the TAP control and then press the “Immersion” key. This action causes the TAP control to now control the heating process via the Immersion thermocouple which is the actual temperature of the molten salts, and that’s what we want.


Press the “PROBE” key to select Active Thermocouple


A dialogue box appears, press “Immersion” to select the Immersion Thermocouple. The dialogue box disappears and you are now controlling from the Immersion thermocouple.

The TAP display will indicate that you are using the Immersion thermocouple via the screen.




You'll note in the Kiln Temp row that "Imm…" is displayed. This indicates that the Immersion thermocouple is being used for control.


After about 10 minutes of screen inactivity a large text screen appears and "Immersion" is prominently displayed.

You may switch back and forth between the Chamber and Immersion thermocouple whenever and as often as you want. We would expect that you would leave it on Immersion during your process but the choice is there if you want it.

Once the salt bath temperature has come up to your heat treating temperature you are free to begin the heat treating process.

**Inserting Work-Pieces for Heat Treating**

Before immersing any work-piece, hangers, tools etc. into the salt bath be sure that all items are entirely clean and free of any grease, oil, water, moisture or other contaminants. Eruption of the molten salt is possible if contaminants are introduced into the molten salt. This eruption/explosion presents fire and burn hazards as well as potential injury or death. Playing safe and making cool stuff is the goal.

Generally work-pieces are suspended within the salt bath via various hanging methods. The most common appears to be steel wire. Whatever suspension method you do decide on it must be made of steel. We would mention that we are not aware of any useful technique that simply places the work piece into the salt bath without a secured means to retrieve it. Work-pieces may be fully immersed or partially immersed depending upon your heat treating needs. We recommend using a suspension method that prevents the work piece from falling to the bottom of the salt pot.

Your heat treat process will determine the amount of time the work-pieces remain in the salt bath. The TAP control features an elapsed time clock that is very useful in keeping track of your immersion time.

Below are some images taken during our design and testing process in cooperation with Tim Zowada of Tim Zowada Custom Knives in Boyne Falls Michigan that illustrate his preferred suspension technique.

**Pulling Your Work-Piece from the Salt Bath**

Once your work-piece has remained in the salt bath for the desired period of time it is then removed for further processing. Keep in mind that the items removed from the salt bath are very hot as they are the temperature of the molten salt.

Before pulling your work piece, it's best to have the TAP control rotated down to the vertical position. When the TAP control is at the vertical position it is protected from dragout by the control panel drip shield.

When removing your work-piece you will get a bit of dragout. Dragout is basically some molten salts that remain on the work piece. This dragout will tend to drip off as the work-piece is removed. It's for this reason that we provide the drip shields on both the lid and control panel.

Dragout is very hot and if allowed to drip onto a combustible surface it creates a fire hazard. As mentioned in the cautions, the supporting surface of the salt bath kiln should be constructed of a non-combustible material.

We would suggest that you use care to avoid allowing dragout to run down the outside of the salt pot. The refractory fiber gasketing material tends to stop the salts from reaching the chamber but it can only do so much. The issue is that molten salt within the chamber tends to destroy the firebrick over time. The floor and walls are replaceable in this event.

**Shutting Down the Process**

When shutting down the salt bath heat treat kiln we highly recommend that you remove the Immersion Thermocouple from the salt bath before the salt solidifies. Our testing indicated premature thermocouple failure if we left it in the salt as it cooled. It tended to fail (break) right at the level of the salt.

Throw the control power switch, located on the top rear of the control panel, to the Off position. The display on the TAP will go dark.

Keep in mind that the salt, salt pot and kiln will remain hot for some time following shutdown. Use care when working around the kiln.

Cover the top of the salt pot with the supplied 12" x 12" x 1" refractory fiber. Use a dust mask and gloves when handling the fiber as it will create some dust. The fiber prevents foreign material from entering the pot during periods of non-use.

Refractory Fiber Placed over the Salt Pot
Replacement Part #06423.300

## Evenheat Salt Bath Kiln Features

**Two Control Thermocouples**

Evenheat salt bath kilns are equipped with two control thermocouples: Chamber (#2) and Immersion (#3).

The Chamber thermocouple measures the temperature present within the firing chamber itself. That is to say that it measures the temperature in the space between the firebrick chamber walls and the outside of the salt pot. We use the chamber thermocouple to control the heating process up to the working temperature as measurement of the solid salt (at start up) within the salt pot would be unreliable and potentially dangerous. *The Chamber Thermocouple is a Type K thermocouple and plugs into the thermocouple jack #2 (middle jack) located at the back of the control panel.*

The Immersion thermocouple measures the temperature of the salt bath itself. That is to say it is placed (immersed) into the salt bath and measures the molten salts directly. It is the immersion thermocouple that you will use to determine proper salt bath temperature. *The Immersion Thermocouple is a Type K thermocouple and plugs into the thermocouple jack #3 (upper jack), located at the back of the control panel.*

When starting the salt bath process via the control, the Chamber thermocouple is automatically chosen as the controlling thermocouple. Once the chamber reaches temperature, or once the salts become liquid, the Immersion thermocouple can be placed within the salt bath and temperature control can be switched over to work from the immersion thermocouple. Switching between the Chamber and Immersion thermocouples is accomplished by a dedicated key on the temperature controller itself.

**Immersion Thermocouple Mount**

The Immersion thermocouple includes a mount that holds and positions the immersion thermocouple within the salt pot. This mount is adjustable to fit a variety of salt pot diameters and wall thicknesses and thermocouple diameters from 1/8” to 3/16”.

The immersion thermocouple mount allows you to position the thermocouple where you desire within the salt pot. Generally it’s better to try to keep it off the wall and surrounded with molten salt.

**Over-Temp Thermocouple Circuit**

Salt bath kilns include a dedicated over-temperature thermocouple circuit. The role of this thermocouple is to monitor the firing chamber and abort the process if the chamber exceeds 300°F of the programmed process temperature. Over-temping salts can be hazardous, particularly with nitrate (Nitrate) containing salts usually found in tempering salts.

Please keep in mind that this over-temp thermocouple is a mechanical/digital device and can fail. While its function is to abort the process on a sensed over temperature condition, it is not a safety device. It is included as a back-up to your attention to the process. *The Over-Temp Thermocouple is a Type K thermocouple and plugs into the thermocouple jack #1 (lower jack) located at the back of the control panel.*

**Grounded Salt Pot and TC’s**

Evenheat salt bath kilns produce heat electrically via heating elements placed into the firing chamber walls. The nature of the salt bath process exposes the user to electrically conductive features such as the salt pot, molten salts and thermocouples. Each of these features extend into and out of the electrically charged firing chamber. Any fault within the heating element causing it to make contact with any of these features will cause them to conduct electricity.

To protect you against any electrical faults Evenheat has provided electrical grounds on the salt pot and all thermocouples. If a fault (short circuit) occurs the grounding of these features safely dissipates electrical energy.

Evenheat does offer salt pots for sale that are equipped with grounding hardware included. If you intend to provide your own salt pot we require that a grounding mechanism be included in your design. Please see the end of this manual for design specifications.

**TAP Control**

We wanted the salt bath kilns to include special features not found in standard temperatures controls such as the Chamber/Immersion thermocouple selection and over-temp thermocouple. The designers of the TAP control were happy to incorporate our design requirements into their control with great success. The TAP control is our premium control and features a touchscreen that offers absolute simplicity and clarity in programming and use.

**Solid State**

The salt bath kilns are standard equipped with our Quiet Drive Solid State relay system. The salt bath process can be a lengthy process with a whole lot of on-and-off action controlling the heating elements. Hard-contact, mechanical relays tend to fail early under these circumstances, and always at the wrong time. The solid state relays have no moving parts and are expected to last the life of the kiln.

Solid state also offers the benefit of tighter temperature control as they can be switched on and off very, very quickly. Hard-contact relays, on the other hand, tend to be limited to one on-off cycle every ten seconds or so. It's a major improvement in performance and reliability.

Lastly, our solid state relays will only turn on and off when the AC voltage is at 0V. While this is designed to help keep the solid state relay running cool it offers a specific benefit to heating element life. Heating elements love to be turned on and off at 0V and they show that love by offering greater life!

**Replaceable Drip Shields**

Pulling work-pieces from the molten salt inevitably will bring along some molten salts with it, called dragout. Our salt bath kilns are equipped with replaceable drip shields designed to protect both the firebrick lid, control panel and TAP control.

**Swing View**

The TAP temperature control is fitted within our Swing-View control enclosure. The Swing-View allows for swiveling between a comfortable programming and use angle to a vertical position well suited for viewing at a distance across the shop.

We recommend placing the TAP control at the vertical position when running the salt bath. This puts the TAP and its touchscreen, safely under the control panel drip shield.

**Lid Design**

The design of the salt bath kilns requires a hole be placed in the lid to allow access to the salt pot. We offer lids with a variety of hole diameters for this purpose.

We do offer a lid with "no hole". We expect individuals to fabricate their own salt pots (please see end of manual for specs). In these cases the "no hole" lid allows the user to create the hole to fit their salt pot. The lid's firebrick material is easily cut and shaped with simple tools like hacksaw blades and sandpaper. If you do cut your lid to fit your pot wear respiratory protection and clean up with a HEPA filtered vacuum.

**3" Brick**

Our salt bath kilns are built using premium Thermal-Ceramics K-23, 3" firebrick. This particular brick is a thicker version of the standard and offers excellent thermal properties. We use this firebrick in all of our "high-fire" designs including our KO Series of heat treat ovens. Thermal-Ceramics firebrick is made in the USA from some very special Georgia ground. It's the best firebrick available.

**Chamber and Floor Easily Replaced**

We've designed the chamber of the salt bath kilns to be easily disassembled. As much as we never want to see it happen damage to your chamber can occur, particularly with a salt pot that has "sprung a leak". Each section of the chamber and floor is secured to each other through the use of stainless plates.

## Salt Bath Maintenance

**Thermocouples**

Evenheat Salt Bath models contain 3 thermocouples: Immersion, Chamber and Over-Temp. If any of these thermocouples fail operation of the salt bath unit is impossible.

The Immersion thermocouple, by the nature of its use, is expected to fail before the chamber or over-temp thermocouples. We suggest having a spare at-the-ready. The immersion thermocouple is held in place with the Immersion Thermocouple Mount. This mount is reusable, for the most part, but may need replacing at some point.

> Technically, the Immersion thermocouple is a Type K, 3/16" Inconel sheath, 18" long, bent at 90° with standard size male quick connect, Evenheat part #11647.310. It is supplied with a grounding-wire lug. It is not supplied with the lead or ground wire running back to the control panel.
>
> Immersion Thermocouple Mount part #11647.320.

Chamber and Over-Temp thermocouples are capable of failing as well although given their use within the firing chamber we don't expect it to be soon or often.

> Technically, the Chamber thermocouple is a Type K Thermocouple, 1/8" Inconel sheath, 8" long, straight with standard size male quick connect, Evenheat part #11647.305. It is supplied with a grounding-wire lug. It is not supplied with the lead or ground wire running back to the control panel.
>
> Technically, the Over-Temp thermocouple is a Type K Thermocouple, 1/8" Inconel sheath, 6" long, bent at 90° with standard size male quick connect, Evenheat #11647.315. It is supplied with the ground wire, grounding lug hardware, and lead which connects to the back of the control panel.

**Grounding Circuit**

Salt Bath models are designed with dedicated grounding paths for electrical safety. These dedicated ground paths include the ground strap on the salt pot itself and the ground wires fitted to each thermocouple. These grounds shall be inspected periodically for proper placement and circuit integrity.

The salt pot ground consists of a braided ground strap that is attached at both the salt pot and control panel. Keep a close eye on the end that is connected to the salt pot. Look for any loose connections, tighten if necessary. Also look for corrosion at this connection as it will corrode with use. Replace damaged ground strap and hardware.

> We use plated, braided, 18" (eye-to-eye) x ½" ground strap, Evenheat part #08298.235.

*We have mentioned this at various points in this manual but it bears repeating: Molten salt is electrically conductive (as in it will carry electricity). Because of this it is vitally important that the salt pot and thermocouples be connected to the ground circuit of the salt bath model. If an electrical fault occurs, such as a heating element coming into contact with the salt pot, the ground connection safely shorts out the circuit and causes protective breakers or fuses to open (which is what we want).*

**Vacuuming Salt Pot Scale**

Evenheat supplies salt pots fabricated from 316 Stainless. Salt pots can be made from a variety of other metals as well. During use the salt pot with oxidize and produce scale. This scale will fall away from the pot and find its way to the floor and interior walls of the chamber. Evenheat recommends that you vacuum away this scale on a periodic basis, perhaps every 15 to 20 times of use (depending upon pot material).

**Fiber Gasketing at Pot Rim**

Our salt bath lids are designed with a groove that allows the user to insert a section of fiber between the pot and lid itself. This gasket is intended to act as a thermal barrier or seal. Typically this fiber can be used repeatedly. At some point you will need to replace it. This fiber is a useful and needed aspect of the salt bath design and we highly recommend that you use it and continue to keep it in good condition.

> Replacement fiber gasketing material is Evenheat part #06423.305

**Drip Shields**

Evenheat salt bath models include "drip shields" that help protect the firebrick from salt drag-out during use. These drip shields are stainless and we expect them to last quite some time. However, if they do begin to fail and allow molten salt to reach the firebrick lid they should be replaced.

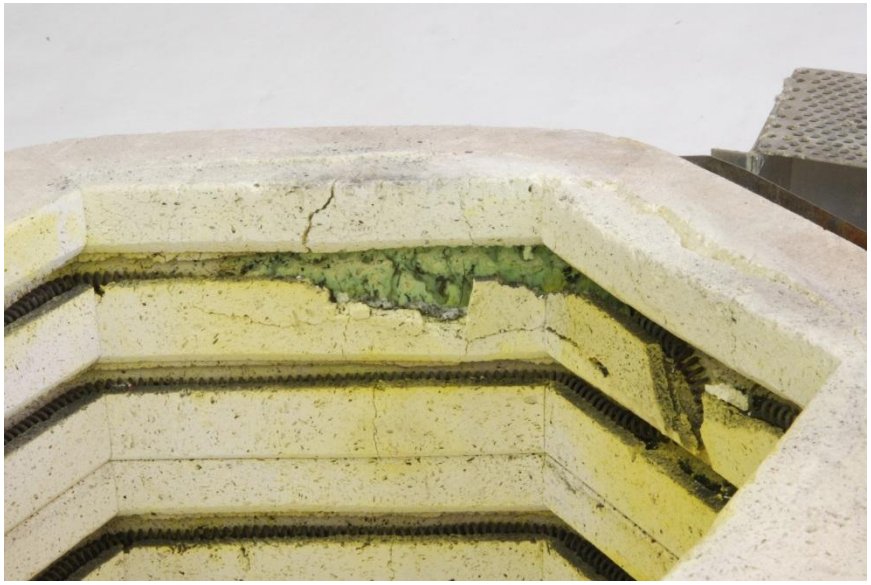
**Salt Pot Inspection and Salt Leaks**

It's possible that your salt pot may fail to a point where molten salt is leaking from it. This generally occurs with high use but can also be related to pot material. If a leak does occur the molten salt has the effect of destroying the firebrick in short order.

Our salt bath models are designed for sectional disassembly which makes replacing damaged sections fairly easy.

Please note that molten salts are electrically conductive and a salt pot leak may result in a short circuit with a corresponding trip of breakers or fuses. It's for this reason that we supply grounds on the entire kiln chamber, control panel, thermocouples and salt pot. We've said it in this manual a number of times but it bears repeating: make sure the kiln is grounded at the plug and make sure that the salt pot and thermocouples are grounded. Below is an image of a salt pot failure and its subsequent destruction of the kiln firing chamber and heating element.

Evenheat cannot be responsible and does not warrant for damage caused by salt pot leaks.



Yikes! Molten salts from a leaky pot can destroy the kilns firebrick and heating elements quickly.
***This is why we provide and require electrical grounding on all items protruding from the kiln.***

**Replacement Parts List**

| | |
|---|---|
| Immersion Thermocouple Assembly SB 709 | #11647.309 |
| Immersion Thermocouple Assembly SB 718 & SB 818 | #11647.310 |
| Chamber Thermocouple Assembly | #11647.305 |
| Over-Temp Thermocouple Assembly | #11647.315 |
| Immersion Thermocouple Lead Assembly | #11647.312 |
| Chamber Thermocouple Lead Assembly | #11647.307 |
| Immersion Thermocouple Pot Mount | #11647.320 |
| | |
| Refractory Fiber Gasketing Strips – 14” x 1” x 1/2" | #06423.305 |
| Refractory Fiber Pot Cover – 12” x 12” x 1” | #06423.300 |
| | |
| Salt Pot Ground Strap | #08298.235 |
| Salt Pot Grounding Hardware | #11647.325 |
| | |
| Heating Element for models SB 709 and SB 718 | #00349.900 |
| Heating Element for model SB 818 | #00349.905 |
| | |
| Drip Shield for Control Panel for models SB 709 and SB 718 | #07453.004 |
| Drip Shield for Control Panel for model SB 818 | #07454.006 |
| Drip Shield for Lid for models SB 709 and SB 718 with for 4” Pot | #07453.000 |
| Drip Shield for Lid for models SB 709 and SB 718 with for 5” Pot | #07453.002 |
| Drip Shield for Lid for model SB 818 with for 4” Pot | #07454.000 |
| Drip Shield for Lid for model SB 818 with for 5” Pot | #07454.002 |
| Drip Shield for Lid for model SB 818 with for 6” Pot | #07454.004 |
| | |
| Floor for models SB 709 and SB 718 | #00342.208 |
| Floor for model SB 818 | #00342.209 |
| Elemented Brick Section for models SB 709 and SB 718 – “Repair Ring” | #07276.000 |
| Elemented Brick Section for model 818 – “Repair Ring” | #07276.005 |
| | |
| Lid for models SB 709 and SB 718 – No Hole | #00342.300 |
| Lid for models SB 709 and SB 718 for 4” Pot - Hole cut to 4.75” dia. | #00342.210 |
| Lid for models SB 709 and SB 718 for 5” Pot - Hole cut to 5.813” dia. | #00342.215 |
| Lid for model SB 818 – No Hole | #00342.305 |
| Lid for model SB 818 for 4” Pot - Hole cut to 4.75” dia. | #00342.220 |
| Lid for model SB 818 for 5” Pot - Hole cut to 5.813” dia. | #00342.225 |
| Lid for model SB 818 for 6” Pot - Hole cut to 6.875” dia. | #00342.230 |

**Salt Pot Design Details**

Evenheat salt pots are fabricated from 316 stainless steel. 316 is chosen for its relatively better corrosion resistance. If you provide your own pot we would suggest this material as well. Any material that you chose for your salt pot must be made of an electrically conductive material.

Evenheat salt pots are designed to extend at least 1-1/2” above the top surface of the kiln lid. This added length allows for placement of the salt pot ground. If you provide your own salt pot please make sure your design includes this feature.

Evenheat salt pots include a 1/4" hole, drilled 3/4" down from the lip of the pot to provide a mounting point for salt pot grounding hardware. Salt pot grounding hardware is all stainless steel and consists of a ¼-20 x 1” bolt, lockwasher, nut, flatwashers and a wingnut. As the salt pot ground is subject to corrosion, and replacement when necessary, this hardware is very common and readily available from local sources.

**Du-Bois Chemicals Co. gives the following melting point and working temperature range for Nu-Sal as:**

**Melting Point: 1230°F (665°C)**

**Working Temperature Range: 1300-1650°F (704-899°C)**

**Safety Data Sheet for Nu-Sal Heat Treat Salt**

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# SAFETY DATA SHEET

Recd 2-20-2017

NU-SAL

DuBois

## Section 1. Identification

| | |
|---|---|
| **GHS product identifier** | : NU-SAL |
| **Product code** | : Not available. |
| **SDS #** | : NUSAL |
| **Other means of identification** | : Not available. |
| **Product type** | : Solid. |

**Relevant identified uses of the substance or mixture and uses advised against**

| | |
|---|---|
| **Identified uses** | : Industrial |
| **Supplier/Manufacturer** | : DuBois Chemicals, Inc.<br>3630 E. Kemper Road<br>Cincinnati, Ohio 45241<br>Phone: 1-800-438-2647<br><br>DuBois Chemicals Canada, Inc.<br>1 First Canadian Place<br>100 King Street West, Suite 1600<br>Toronto, Ontario, M5X 1G5 Canada<br>Phone: 1-866-861-3603 |
| **Emergency telephone number** | : 1-866-923-4919 (US and Canada)<br>01-651-523-0314 (Int'l and Mexico) |

## Section 2. Hazards identification

| | |
|---|---|
| **Classification of the substance or mixture** | : Not classified. |

**GHS label elements**

| | |
|---|---|
| **Signal word** | : No signal word. |
| **Hazard statements** | : No known significant effects or critical hazards. |

**Precautionary statements**

| | |
|---|---|
| **Prevention** | : Not applicable. |
| **Response** | : Not applicable. |
| **Storage** | : Not applicable. |
| **Disposal** | : Not applicable. |
| **Supplemental label elements** | : Avoid contact with eyes. May cause irritation to the eyes. In case of contact with eyes, rinse immediately with plenty of water. If irritation persists, get medical attention. |
| **Hazards not otherwise classified** | : None known. |

## Section 3. Composition/information on ingredients

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

## Section 4. First aid measures

**Description of necessary first aid measures**

| | |
|---|---|
| **Eye contact** | : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs. |
| **Inhalation** | : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur. |

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## Section 4. First aid measures

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

**Ingestion** : Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

**Eye contact** : May cause slight transient irritation.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Ingestion** : Ingestion may cause gastrointestinal irritation and diarrhea.

**Over-exposure signs/symptoms**

**Eye contact** : pain or irritation
watering
redness

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**Ingestion** : No specific data.

**Indication of immediate medical attention and special treatment needed, if necessary**

**Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

**Specific treatments** : No specific treatment.

**See toxicological information (Section 11)**

## Section 5. Fire-fighting measures

**Extinguishing media**

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : No specific fire or explosion hazard.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
halogenated compounds
metal oxide/oxides

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

**Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment.

**Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

**Methods for cleaning up**

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## Section 6. Accidental release measures

**Small spill** : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

**Large spill** : Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

**Handling** : Put on appropriate personal protective equipment (see Section 8).

**Storage** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

## Section 8. Exposure controls/personal protection

**Control parameters**

**Occupational exposure limits**

None.

**Engineering measures** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal protection**

**Respiratory** : Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

**Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. Recommended: splash goggles

**Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

**Personal protective equipment (Pictograms)** :

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## Section 9. Physical and chemical properties

| | |
|---|---|
| **Appearance** | |
| **Physical state** | : Solid. |
| **Color** | : White. |
| **Odor** | : Odorless. |
| **Odor threshold** | : Not available. |
| **pH** | : Not available. |
| **Melting point** | : Not available. |
| **Boiling point** | : Not available. |
| **Flash point** | : Closed cup: Not applicable. |
| **Burning time** | : Not available. |
| **Burning rate** | : Not available. |
| **Evaporation rate** | : Not available. |
| **Flammability (solid, gas)** | : Not available. |
| **Lower and upper explosive (flammable) limits** | : Not available. |
| **Vapor pressure** | : Not available. |
| **Vapor density** | : Not available. |
| **Relative density** | : Not available. |
| **Solubility** | : Easily soluble in the following materials: cold water and hot water. |
| **Solubility in water** | : Not available. |
| **Partition coefficient: n-octanol/water** | : Not available. |
| **Auto-ignition temperature** | : Not available. |
| **Decomposition temperature** | : Not available. |
| **Viscosity** | : Not available. |
| **Elemental Phosphorus** | : Not available. |
| **VOC content** | : Not available. |

## Section 10. Stability and reactivity

| | |
|---|---|
| **Reactivity** | : No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | : The product is stable. |
| **Possibility of hazardous reactions** | : Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | : No specific data. |
| **Incompatible materials** | : Reactive or incompatible with the following materials: oxidizing materials and acids. |
| **Hazardous decomposition products** | : Under normal conditions of storage and use, hazardous decomposition products should not be produced. |
| **Storage** | : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. |

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## Section 11. Toxicological information

**Information on toxicological effects**

**Information on the likely routes of exposure** : Dermal contact. Eye contact. Inhalation.

**Potential acute health effects**

**Eye contact** : May cause slight transient irritation.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Ingestion** : Ingestion may cause gastrointestinal irritation and diarrhea.

**Symptoms related to the physical, chemical and toxicological characteristics**

**Eye contact** : pain or irritation
watering
redness

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**Ingestion** : No specific data.

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

**Long term exposure**

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

**Potential chronic health effects**

Not available.

**General** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

**Numerical measures of toxicity**

**Acute toxicity estimates**

| Route | ATE value |
|---|---|
| Oral | 2833.5 mg/kg |

## Section 12. Ecological information

**Ecotoxicity** : Not available.

**Aquatic ecotoxicity**

Not available.

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## Section 13. Disposal considerations

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

## Section 14. Transport information

**IATA/IMDG/DOT/TDG: Please refer to the Bill of Lading/receiving documents for up to date shipping information.**

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 12(b) one-time export**: No products were found.
**TSCA 12(b) annual export notification**: No products were found.
**United States inventory (TSCA 8b)**: All components are listed or exempted.

**EPA Registration Number** : Not available.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**SARA 302/304**

**Composition/information on ingredients**

No products were found.

**SARA 304 RQ** : Not applicable.

**SARA 311/312**

**Classification** : Not applicable.

**State regulations**

**Massachusetts** : None of the components are listed.

**New York** : None of the components are listed.

**New Jersey** : None of the components are listed.

**Pennsylvania** : None of the components are listed.

**California Prop. 65**

Not available.

**Canada**

**Canadian lists**

**Canadian NPRI** : None of the components are listed.

**Canada inventory** : All components are listed or exempted.

**Canadian PCP/DIN Number** : Not available.

**International regulations**

**International lists** : **Australia inventory (AICS)**: All components are listed or exempted.
**China inventory (IECSC)**: All components are listed or exempted.
**Japan inventory**: All components are listed or exempted.
**Korea inventory**: All components are listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: All components are listed or exempted.
**Philippines inventory (PICCS)**: All components are listed or exempted.
**Taiwan inventory (CSNN)**: All components are listed or exempted.

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## Section 16. Other information

History

| | |
|---|---|
| Date of printing | : 1/30/2017. |
| Date of issue/Date of revision | : 1/30/2017. |
| Date of previous issue | : 11/9/2015. |
| Version | : 2 |

Notice to reader

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**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**