



## Technical Information

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# K/R INDUX 98 INSTALLATION TIPS INSTALLATION AND BURN-IN PROCEDURES IN A CORELESS INDUCTION FURNACE

K/R INDUX 98 is a dry ram mix made with high purity periclase. It is uniquely suited for resisting molten metal while remaining unbonded behind the sintered hot face. Cracks in the lining will be stopped or blunted by the granular material. This property is important so that molten metal does not come into contact with the coil.

**MIXING:** K/R INDUX 98 should be dry-mixed prior to installation in case of any segregation during transit.

**RAMMING:** Use a rammer with a flat, round, steel head with about eight square inches of surface for the bottom. The face of the tool for the sidewall should be  $\frac{2}{3}$  the wall thickness wide by three to four inches long and should be curved to follow the contour of the coils and the mandrel form.

The shell floor should be filled initially with 4" of K/R INDUX 98. A forked or pronged tool should be used to de-air this layer of material. Spread out and level the material. If ground fault detectors are being used, make sure they are in position.

Use the rammer manually (turned off) to tamp material into place using an up and down motion. Then use the rammer lightly at first by working the head slowly, back and forth, half way into the loose material. Tamp lightly across the diameter of the furnace floor. Concentrate first in the center and then work towards the shell. Each pass with the tool head should overlap half of the previous pass and each series of passes should be at  $90^\circ$  to the previous series. As the density of the K/R INDUX 98 increases, more force should be applied until the tool head floats on top. At this point, force can be applied to achieve maximum density. The layer is satisfactorily compacted when you cannot penetrate your thumb more than  $\frac{1}{4}$ " to  $\frac{1}{2}$ " into the rammed surface.

Before adding more material, roughen up the compacted surface by scarfing the surface with a forking tool. Only a 4" to 6" layer of material should be installed at a time. Repeat de-airing, compaction, and scarfing operation. Add as many layers as necessary to reach the total bottom thickness recommended by the furnace manufacturer.

a A  $\frac{1}{16}$ " to  $\frac{1}{8}$ " layer of woven ceramic cloth/fiber is suggested against the coil grout to act as slip plane between the grout and the lining. The cloth will also allow for easier lining tear-out.

Level the bottom before installing the burnout form. This will help insure equal spacing of the form top to bottom. Wall thickness should follow the furnace manufacturer's specifications. The form should then be centered in the furnace. Centering of the form is critical to promote even sintering and to insure that the sidewall thickness does not vary. Small billets, scrap castings or other charge material can be used to anchor the form in place. This minimizes movement of the form when installing the sidewall.

After installing the form, the floor area around the form should be lightly forked. Add 1" of loose K/R INDUX 98 at base of liner and scarf this material well into the lower layer. This is an extremely important step that insures a good strong homogeneous mix between the floor and the sidewall of the furnace lining.

Add 3" of loose material evenly around the liner. The face of the tool for the sidewall should be  $\frac{2}{3}$  the wall thickness wide by three to four inches long and should be curved to follow the contour of the coils and the mandrel form. Ram the material using the curved tool. The layer



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is satisfactorily compacted when you cannot penetrate your thumb more than 1/4" to 1/2" into the rammed surface.

Before adding more material, roughen up the compacted surface by scarfing the surface with forking tool. Only a 4" to 6" layer of material should be installed at a time. Repeat de-airing, compaction, and scarfing operation. Add as many layers as necessary.

Inspect each layer carefully during the ramming operation for debris, removing any foreign material immediately. Use a strong light if necessary. Care must be taken not to scar or tear the ceramic fiber/cloth attached to the coil grout with either the forking tool or the rammer. The form should remain in the furnace.

**DRYING:** After the installation is completed heat can be applied to the furnace according to the following schedule:

1. Air dry for at least four hours minimum, or
2. Heat to 250°F (121°C) at 100°F (56°C) per hour and dry until all the moisture has escaped from the cap and spout.
3. After air setting or forced drying, remove the top form or extension if applicable.
4. The furnace is now ready for burn-in.

**SINTERING:** For better lining life a furnace should be burned-in using the following schedule:

1. Raise the temperature in the furnace to 400°F (204°C) at 100°F (56°C) per hour.
2. Hold at 400°F for one hour.
3. Raise the temperature to 1000°F (538°C) at 300°F (149°C) per hour. Make certain that the lining is at uniform temperature. There should not be a major temperature difference (>100°F or 56°C) between the top, center, or bottom of the furnace.
4. Hold at 1000°F (538°C) for one hour.
5. Raise the temperature uniformly to 2700°F (1482°C) at 300°F (149°C) per hour.
6. Hold at 2700°F (1482°C) for two hours.
7. Charge with molten or scrap metal and increase temperature slowly to completely melt the form. It may be desirable to make the first heat a wash heat. Try not to exceed normal operating temperatures by more than 150°F (66°C). The first heat should extend 1" - 2" (25 mm to 51 mm) above the normal metal line and have an extended soak time. The lining is now ready for normal use.

**OPERATION:** Whenever possible, it is a good practice to vary the metal line from heat to heat to reduce concentrated wear in this area.

Fine cracks may sometimes develop after the first few heats: these are normally not harmful. Minor repairs can be made to the lining using wet mixed K/R PATCHBOND. Dry well after repair before charging.