

# SQUIRREL CAGE ROTOR BRAZING

## BY INDUCTION HEATING

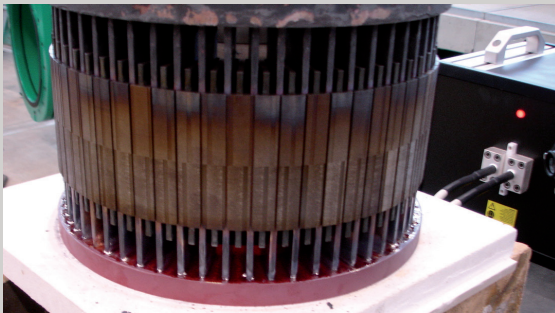
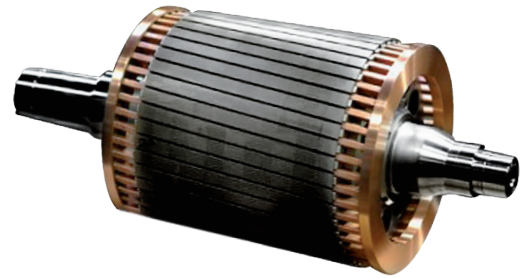
### INDUCTION BRAZING OF SQUIRREL CAGE ROTOR TECHNOLOGY

Induction Brazing of Squirrel Cage Rotor technology is used to join the short-circuit copper rings on both ends of the rotor to the longitudinal conductive bars. The brazing alloy used is a Copper-Phosphorous one, or a Silver based alloy.

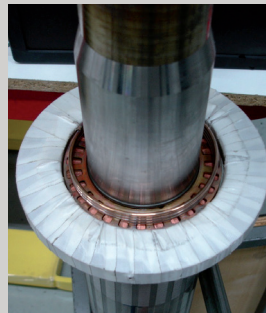
The typical brazing temperatures are in the range:

- 750÷850°C for Cu-P brazing alloys
- 630÷700°C for Ag brazing alloys

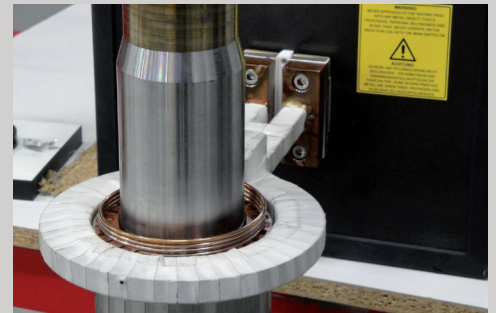
The Inductor (Heating Coil) can be designed to heat up the workpiece from outside, especially for small and medium size rings, or underneath the ring in case of large and massive sizes, as shown on the pictures below.



► HEATING COIL PLACED UNDER THE RING



► HEATING COIL PLACED AROUND THE RING



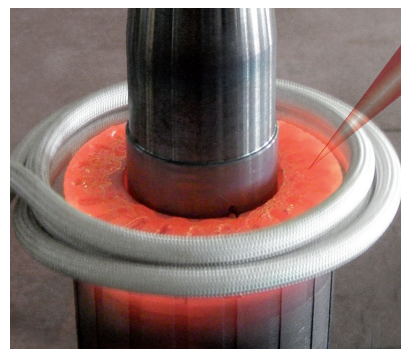
### ADVANTAGES

- **VERY FAST AND ACCURATE HEATING** - Unlike flame heating, induction allows a very localized and fast heating in order to minimize the heat transferred into the laminations and to the shaft, focusing the heating on the copper ring only.
- **ENERGY EFFICIENCY** - Due to the heat being generated within the component, energy transfer is extremely efficient. The induction heater heats only the part and not the atmosphere around it.
- **PROCESS CONSISTENCY** - The induction heating process produces extremely uniform consistent heat on the complete ring circumference, with therefore zero risk of deformation [ovality] and no needs of adding any rebalancing process of the copper ring.
- **THERMAL PROFILE CONTROL** - This function allows to heat up the ring with a specific temperature profile [linear ramp-up and holding at temperature] in order to get a high quality brazed joint with minimum oxidation, and therefore reduced clean up times.
- **SAFER AND IMPROVED OPERATOR WORKING CONDITION**: No naked flame, fumes or noises.

### HIGH ACCURACY AND VERY REPEATABLE HEATING PROCESS

CEIA offers a series of infrared optical sensors, for non-contact temperature measurements, which cover a wide operating temperature range. Using the CEIA Master Controller, with the Thermal Profile working mode and the integrated Data Logger, the operator is able to set specific temperature profiles and temperature tolerances for quality control, monitor and to certify the heating process of each production item.

Furthermore the reduced overall dimensions and the small footprint of the equipment allow an easy integration of the pyrometer in automatic production systems.



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## SQUIRREL CAGE ROTOR BRAZING BY INDUCTION HEATING

### APPLICATION

- Brazing of Copper Ring

### RING INFORMATIONS

- Material: Copper ►  $\varnothing_{ext}$ =340mm ►  $\varnothing_{int}$ =210mm
- Height =20mm ► Weight= 9,5kg ► Weight of the complete rotor= 150kg

### PROCESS

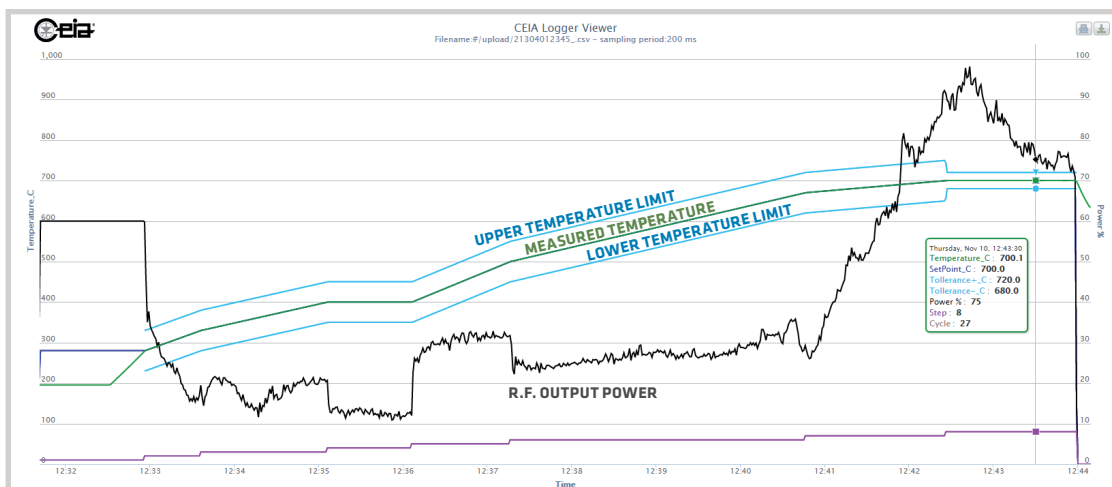
- The test has been carried out using a 3 loops coil, [Coil-1735] made with square copper tube 8x8mm.
- The coil has been integrated into a refractory.
- The rotor has been placed over the refractory plate.

### TEST RESULTS

- The temperature has been controlled in feedback loop by optical pyrometer, following the specific 8 steps thermal profile shown in the picture below.
- Total Brazing Time: 12 minutes and 17 seconds



► Test #1547 Set Up



**POWER CUBE 75-SA/80**  
GENERATOR



EQUIPMENT	MODEL	FEATURES
CEIA Induction Heating Generator	PW3-75-SA/80	Output Power: 75kW Working Frequency: 20÷100 kHz Solid State IGBTs Transistor and microprocessor controller
Network Matching (Heating Head)	PWH-5000-19/80	Capacitance: 19 uF Flexible Cable Length: 5 meters
Integrated Controller	Master Controller V3+	Embedded Controller with Web Server, Thermal Profile Option and Fieldbus Interface
Infrared Pyrometer with close-up lens	SH15/SLE-550-D3	Temperature Reading Range= 200÷1600 °C Close Up Lens: focus=240mm, spot diameter=Ø0,6mm

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