



**SPECIFICATION FOR INDUCTION BRAZING MACHINE WITH  
WATER CHILLER.**

**PART A: TECHNICAL SPECIFICATION.**

**PART B: GENERAL CONDITIONS.**

**PART A: TECHNICAL SPECIFICATION.**

**1.0 INTRODUCTION:**

The equipment will be used for brazing copper conductors of various sections during hydrogenerator stator winding at site. The equipment shall be mounted on wheels for easy portability and lifting hooks are to be provided for lifting by overhead crane. The set shall be of robust construction to withstand the hazards of the site.

**2.0 TECHNICAL DATA**

- 2.1 Input Power – 3 Phase, 415 Volts, + 10%/- 15 % , 50 Hz, ± 10%
- 2.2 Current Rating – 95A
- 2.3 KVA at full load – 70 KVA
- 2.4 Fuse Rating – 110 A
- 2.5 Max. output power – 50 KW FOR 10 MIN.
- 2.6 Max. continuous output power – 45 KW
- 2.7 Output frequency – 20-30 KHz.
- 2.8 Power converter efficiency – better than 90%
- 2.9 Power Regulation – 0 to 100%
- 2.10 Max. DC current at 50% duty cycle (10 min.) 75A, DC
- 2.11 Max. continuous DC current - 70 A, DC
- 2.12 Cooling water flow rate – 40 to 50 LPM.
- 2.13 Cooling water temperature – Less than 35°C

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संशोधन :

हाइड्रोजेनरेटर इंजीनियरिंग विभाग  
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

तैयारकर्ता

DOLLY

जाँचकर्ता

K.V.AJANE

अनुमोदनकर्ता

J.K.BHATI

जारी करने  
की दिनांक

6/9/05



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- 2.14 Main Cable – Type HO7RN-F4G10-15 Metres each
- 2.15 (a) O/P Voltage-350V(Max.)  
(b) O/P Current – 150A(Max.)
- 2.16 Chiller Tank Capacity- 75 Litres  
Compressor- 3.5 Tons Refrigeration type
- 2.17 Heating Time to brazing temp.(cherry red)- 30 sec(Max),  
Total Brazing Time with filling – 55 to 65 sec (max)
- 2.17 Max. Dimensional of unit (L x B x H) 500 x 1200 x 1200 mm
- 2.18 Net weight To be furnished.
- 3.0 FEATURES OF INDUCTION BRAZING MACHINE**
- 3.1 Incoming moulded case circuit breaker
- 3.2 Compact, Economical Easy access construction
- 3.3 Output Power, Voltage, frequency meters & input voltage & current metres.
- 3.4 On/Off Reset push buttons for starting and stopping of heater power
- 3.5 Power Control Knob for setting the desired power level.
- 3.6 Provision for remote control of the power supply.
- 3.7 Indication lamps to show the operation of the equipment.
- 3.8 Diagnostic indicators which provides visual indication at the abnormal/overload/operating conditions of the equipment and internal fault conditions.
- 3.9 Brazing Heads/Coils/Tongues-3 Nos. of thick hollow cross section tube (To suit joint as per enclosed Sketch Annexure-I ). Universal or Adjustable brazing heads will be preferred. Coils shall be insulated type. Silicon / Amorphous sheet steel shall be used for induction on the coils. Laminations and insulation shall be placed such that they do not get dislodged during brazing. Breakable ferrites shall not be used.
- 3.10 Protective thermal switches and interlocking to prevent operation of the power supply without adequate/Normal cooling water flow established.
- 3.11 Water cooled capacitors with tapings to obtain desired operating frequency
- 3.12 Load matching transformers with tapings to facilitate optimum power delivery under varying load conditions.



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**4.0 MACHINE TYPE:**

Electro-brazing machine consisting of transformer of suitable rating @ 50% duty cycle. Transformer fitted inside the body of sturdy, all welded sheet steel fabrication, mounted on wheels, secondary terminals are to be brought for connection to cable to which the Electro-brazing tong is connected at the other end. To facilitate movement, the unit will be provided with a handle.

**5.0 TRANSFORMER:**

Transformer shall be of a special type conforming to ISS-4804 Part I, 1968 and to International standards applicable for this class of transformers suitable for portable use and to suit long length of secondary circuit. Water cooled, having core of high grade electrical steel, primary and secondary coils of solid electrolytic copper of ample section, heavy duty class 'F' insulated and impregnated suitable for withstanding continuously a temporary of 140°C

**6.0 CURRENT CONTROL BY TRANSFORMER TAPS:**

Transformer primary coil shall be provided with taps brought out to tap change switch for adjustment of current in 8 steps from 50 to 100%.

**7.0 ELECTROMAGNETIC CONTACTOR:**

Machine shall be provided with heavy duty electromagnetic contactor of 63 Amps.

**8.0 BRAZING INITIATION:**

By means of foot operated switch and Electromagnetic contactor. The foot switch connections are made to low voltage (110V) for safe initiating circuit.

**9.0 MAIN SUPPLY:**

Main suitable for connection to 2 lines of 3 phase 415 + 10%/- 15 % Volts, 50 ± 10% Hz. supply.

**10.0 SECONDARY CABLES:**

Two single core water cooled secondary cables of suitable cross section to suit the machine and tong shall be provided.

**11.0 COOLING SYSTEM:**

Transformer, electro holders shall be water cooled. Internal water cooling piping with wheel valves for each circuit shall be provided with the machine. The equipment shall be suitable for cooling water of 2 to 5 kg/cm<sup>2</sup> and 30°C maximum available at works.

**12.0 WATER FLOW SWITCH:**

Water flow switch shall be provided with the machine to ensure adequate water while operating the machine. When adequate water flow is not established, the control circuit shall trip the machine.



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**13.0 PAINTING:**

All parts shall be given a minimum of two coats of paints and all bright steel components shall be coated with rust preventive paint before dispatch.

**14.0 SERVICE REQUIREMENTS:**

**14.1 POWER SUPPLY:**

415 + 10%/- 15 % Volts, single phase, 50 ± 10% cycles, machine is suitable for connection to two lines of a 3 phase supply. Main supply cable two core type, disconnect switch with fuses of suitable size recommended to be provided by the supplier.

**14.2 COOLING WATER SYSTEM: Closed circuit with Chiller.** Refrigeration type.

Cooling water at 2 to 5 kg/cm<sup>2</sup> pressure and temperature below 30°C at recommended flow rate and system shall be closed circuit with water Chiller for cooling the water.

**15.0 OTHER ACCESSORIES.(FOLLOWING ACCESSORIES SHALL ALSO BE SUPPLIED)**

**15.1 STAND FOR BRAZING** - This stand shall be suitable for brazing on stator winding at a height of 0 to 5 m and stator dia of 3 to 6 m shall include swivel arm, centre pillar, rotating arm and other necessary components. Drawing and description of stand shall be given in offer.

**15.2 TOOLS :** - All tools and devices like tongs, pliers, clamps, 'C'-clamps etc required for holding the joint together during brazing shall be supplied. Any other tool required for brazing shall also be supplied. A list of such tools and devices shall be given in offer.  
**4(FOUR) SETS OF SUCH TOOLS SHALL BE SUPPLIED.**

**16.0 TEST AND INSPECTION**

- Supplier to submit his QA plan alongwith offer.
- Testing shall be done as per relevant standards. Inspection will be done at supplier's works by BHEL representative. Internal testing and QC reports alongwith one copy instruction manual shall be furnished for BHEL's approval before giving call for inspection.

**17.0 INSTRUCTION MANUAL**

**17.1** The instructional manual shall consists of following sections. The instruction manual shall be made on good quality paper ( At least 90 gsm) and shall be made in bound volumes suitable for long term usage in shop.

- Introduction.
- Photograph of all items of equipment.
- Description of equipment.



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- GA drawings.
- Schematic diagram./ Circuit diagrams.
- Test certificate.
- Detailed procedure to operate the equipment ( written in easy language for understanding of operators)
- Dos and Donts
- FAQ(Frequently asked Questions ) and answers
- Trouble shooting flow chart.

### 18.0 JOINTS DETAIL:

Details / crosssection of the joints, to be brazed by the induction brazing machine, are to be enclosed with enquiry as ANNEXURE-I. These details are specific to each project. An example of these details is enclosed with the product standard.



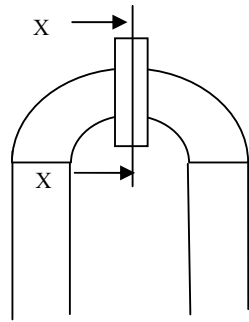
**PART B: GENERAL CONDITIONS**

- 1.0 Spares & Consumables** – 1 set of Bulbs, fuses, water filters, contactor, coils, carbon brushes etc. shall be quoted for each machine. Suppliers shall also recommend additional spares required for 5 years operation.
- 2.0 Guarantee** – Equipment is to be guaranteed for reliable & trouble free operation for 48 months from supply or 24 months from commissioning which ever is earlier.
- 3.0 Instructions to supplier**
- 3.1 Suppliers to indicate for each machine the maximum size of joint (Total Cross Section) that can be brazed with each machine.
- 3.2 Supplier to describe the de-brazing/repair procedure of brazed joints in the operation instruction manual.
- 3.3 Supplier to furnish the methods for testing the efficiency/solidity of brazed jointed.
- 3.4 Supplier to train BHEL winders for making joints on actual job for 3 days.
- 3.5 Supplier to indicate the type of brazing materials viz ROD/foil and its grade to be used for brazing for best joint efficiencies.
- 4.0 Documentation**
- 4.1 **With Offer**  
3 sets complete with drawings/leaflets/catalogue and technical information giving full description, operation, dimensions, weight etc. etc.
- 4.2 **With Supply:**  
10 sets of drawings and O&M manuals giving Introduction, main data, maintenance, Tech. Installation Description, Handling, Storage Instruction, Operation, Maintenance Instructions Instruments, spare part list etc. shall be supplied and in electronic form on 4 nos. compact Computer Discs compatible with latest PCs.
- 5.0 Completeness of Offer**  
Supplier to confirm compliance of specifications clause-by-clause in first instance itself. Any deviation shall be clearly brought out in the offer, without this the offer will not considered and will be rejected

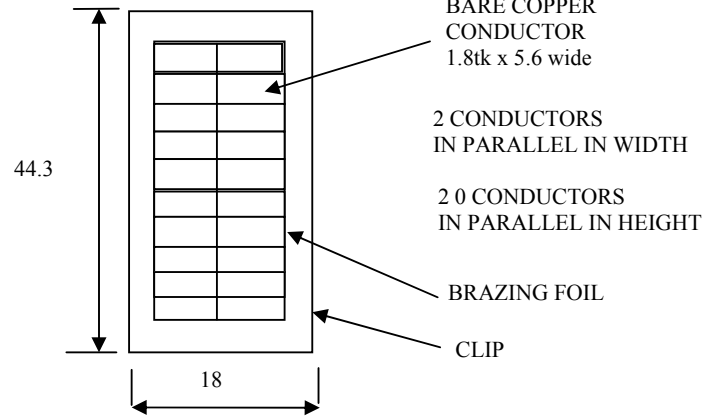
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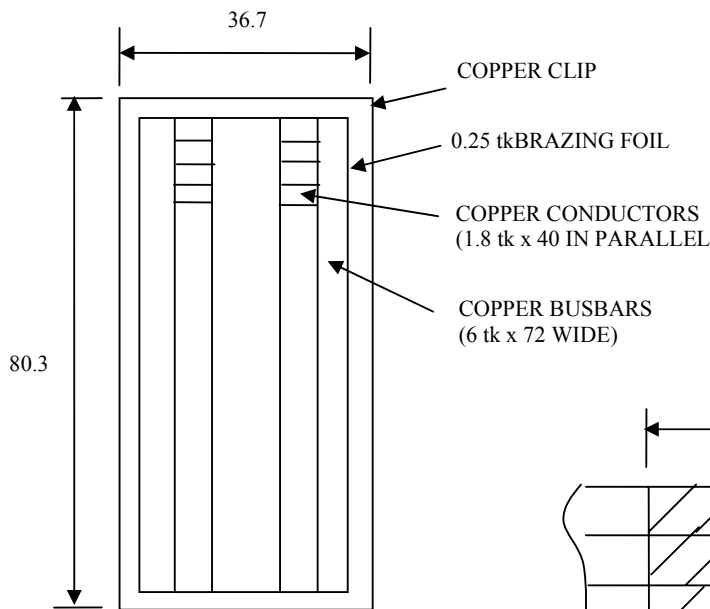
**EXAMPLE**



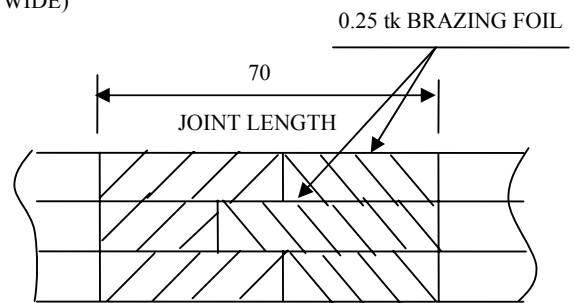
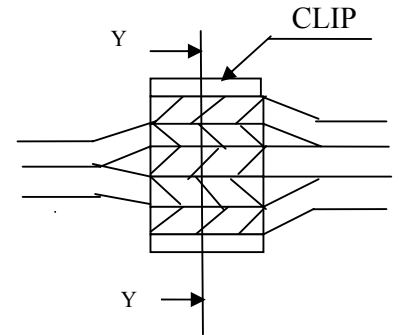
**JOINT -1**



**SECTION XX**



**JOINT-2**  
SECTION - YY  
(C.S AREA OF  
JOINT-2 = 2947 mmsq)



**JOINT - 3**  
6tk X 80 WIDE COPPER BUS BARS  
(3 IN PARALLEL)  
C.S.AREA = 1480 MMSQ

**JOINT - 1 : BAR TO BAR**  
**JOINT - 2 : BAR TO BUSBAR**  
**JOINT - 3 : BUSBAR TO BUSBAR**

**DETAILS OF BRAZED JOINTS**  
 CHD: A.DIXIT  
 APPD: J.K.BHATI  
 (PARBATI)