

TECHNICAL SPECIFICATION SPECIFICATION

| SL.N O. | DESCRIPTION OF BHEL REQUIREMENT | | OFFERED | DEVIATION |
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| 1.0 | PURPOSE : | | | |
| | 100 KW Medium Frequency Induction Brazing Machine will be used for brazing of end connection of lower and upper stator winding bars with copper straps in wound cores of THRI Type & TARI Type Turbo generators. Refer Annexure-I for brazing joint. | Vendor to confirm | | |
| 2.0 | SCOPE OF SUPPLY : | | | |
| | The scope of supply includes design, manufacturing, supply, erection, commissioning and proving of the performance of the machine at BHEL Haridwar works. | Vendor to confirm | | |
| 3.0 | JOB DESCRIPTION AND TECHNICAL REQUIREMENT OF JOB : | | | |
| 3.1 | Job Description : Brazing of end connection of lower and upper stator winding bars with copper straps Turbo generator as per Annexure -I. | Vendor to note | | |
| 4.0 | TECHNICAL SPECIFICATION OF 100 KW MEDIUM FREQUENCY INDUCTION BRAZING MACHINE : | Vendor to confirm. | | |
| 4.1 | Main Parameters : Continuous output power : 100 KW or more Frequency Range : 10 to 30 KHz Medium frequency induction brazing machine should consist of following major items like Frequency Converter, Co-axial Transformer, Brazing Inductor, Chilling Unit, Mobile Trolley, Controller, Non contact type optical Pyrometer etc. as specified in sl no. 4.2 to 4.7.4 below. | Vendor to confirm & submit details | | |
| 4.2 | FREQUENCY CONVERTER : | | | |
| 4.2.1 | Frequency converter will vary the frequency range between 10 to 30 KHz automatically as per job requirement. | Vendor to confirm | | |
| 4.2.2 | Front display board should indicate the following parameters of the machine - DC voltage and current, output power, frequency, temperature of brazing joint through non contact type optical pyrometer etc. | Vendor to confirm and submit the details | | |
| 4.2.3 | Frequency converter should be cooled by forced cooling water | Vendor to confirm | | |

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| | <p>NOTE :- (1) Normal drinking water supply available at the shop floor, will be used for this purpose. Vendor shall furnish concurrence on this point. (2) Suitable partition / barrier must be provided between the water cooled items and non water cooled items in the cubicle of frequency converter so that under the event of water splash/ leakage, electrical items and other items are not drenched /affected with water.</p> | and submit the details | | |
| 4.3 | CO-AXIAL TRANSFORMER ; | | | |
| 4.3.1 | Light weight, cylindrical configuration , water cooled Co-axial Transformer easy to maneuvers on and around the brazing joint, shall be supplied. Co-axial Transformer will be connected to frequency converter by 10 meter long and light weight flexible cable. Size and weight of Co-axial transformer and arrangement for holding / hanging Co-axial Transformer shall be submitted in the offer. | Vendor to confirm and submit the details | | |
| 4.3.2 | Note : Normal drinking water available at shop floor, will be used for internal cooling purpose. Vendor shall furnish concurrence on this point. | Vendor to confirm | | |
| 4.3.3 | Suitable mobile stand with good quality, effective and operator friendly spring balancer shall be supplied for hanging the Co-axial Transformer. | Vendor to confirm and submit the details | | |
| 4.3.4 | For fixing the brazing inductor (sl no. 4.4) on the mouth of Co-axial Transformer (sl no. 4.3), screw type of joint will not acceptable. | Vendor to confirm and submit the details | | |
| 4.4 | BRAZING INDUCTOR : (Qty: 2 sets) Water cooled brazing inductor suitable for the joint as per attached Annexure-I shall be supplied with the machine. Refer sl no. 4.3.4 for fixing the brazing inductor at the mouth of co-axial transformer. Note: One set will consist of 2 Nos. inductors, one for THRI type TG & other one for TARI type TG (Refer Annexure-I) | Vendor to submit the sketch of brazing inductor | | |
| 4.4.1 | Brazing inductor must be leak proof and quick fitting arrangement for fixing the same at the mouth of Co-axial Transformer. In this regard Sl. no. 4.3.4 is also to be referred. | Vendor to confirm and submit the details | | |
| 4.4.2 | Note : Normal drinking water available at shop floor, will be used for internal cooling purpose. Vendor shall furnish | Vendor to confirm | | |

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| | concurrence on this point. | | | |
| 4.5 | CHILLING UNIT : | | | |
| 4.5.1 | Chilling unit will consist of effective and reputed make chiller, high performance circulating pump, leak proof and quick end fitting coupling for incoming and outgoing water connection between the chiller and frequency converter. Make and Technical specification of chiller unit and pump, shall be furnished in the offer. Note : Normal drinking water available at shop floor, will be used for this purpose. | Vendor to confirm and submit the details | | |
| 4.5.2 | Suitable end fitting complete with leak proof stop cock and nozzle shall be supplied for the following utilities : (1) First filling and make up water. (2) Overflow connection. (3) Complete draining out water from storage tank. | Vendor to confirm and submit the details | | |
| 4.5.3 | Water level indicator with marking for minimum and maximum level of water, shall be provided. | Vendor to confirm | | |
| 4.5.4 | The complete chilling unit along with all joints and fittings must be sealed hermetically to eliminate leakage of water. | Vendor to confirm | | |
| 4.5.5 | The Chilling Unit should be equipped with a Chilled Water Flow Switch. | Vendor to confirm | | |
| 4.5.6 | The Condenser Coil and Fan should be at the top of the Chilling Unit for easy monitoring of the Unit/Compressor during running condition and to avoid the short cycling of Air through Condensor. | Vendor to confirm | | |
| 4.5.7 | The side covers of the Chilling Unit should be detachable. | Vendor to confirm | | |
| 4.6 | MOBILE TROLLEY : | | | |
| 4.6.1 | Separate mobile trolley for frequency converter (Sl. no. 4.2) and chilling unit (Sl. no. 4.5) shall be supplied. Each mobile trolley shall be complete with minimum 4 nos. good quality nylon wheels and suitable handle to steer the frequency converter and chilling unit, at shop floor as and when required. Size of the Mobile trolley shall be furnished in the offer. | Vendor to confirm and submit the details | | |
| 4.6.2 | Suitable eye bolt / other arrangement shall be provided on the top base of the Mobile trolley (4.6.1) to shift and transport the frequency converter (Sl. no. 4.2) and chilling unit (Sl. no. 4.5) without water, inside the work shop, with the help of overhead | Vendor to confirm and submit the details | | |

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| | crane. | | | |
| 4.7 | CONTROLLER : | | | |
| 4.7.1 | One main controller with programmable temperature control for setting of time during heating mode, soaking mode, total time for brazing operation, etc. shall be provided on the front panel of the cubicle of frequency converter. Make, model and specification details of the controller shall be submitted in the offer. | Vendor to confirm and submit the details | | |
| 4.7.2 | NON CONTACT TYPE OPTICAL PYROMETER : Make, Model and Specification details of non contact type optical pyrometer shall be submitted in the offer. Suitable arrangement is to be provided for fixing the non contact type optical pyrometer on outer body of Co-axial Transformer (Sl. no. 4.3) for the indication and control of the temperature of the brazing joint during entire brazing process. | Vendor to confirm and submit the details | | |
| 4.7.3 | Switch button arrangement clamped on the Co-axial Transformer (sl no. 4.3) shall be provided, for making the power circuit ON and OFF by the operator as and when required. | Vendor to confirm | | |
| 4.7.4 | FOOT PEDAL SWITCH : Additionally one number foot pedal switch is to be provided for switching ON and OFF the power circuit for brazing operation, in case the controller is not used. | Vendor to confirm and submit the details | | |
| 5.0 | GENERAL ARRANGEMENT DRAWING AND LAYOUT OF 100 KW MEDIAM FREQUENCY INDUCTION BRAZING MACHINE : | | | |
| 5.1 | General arrangement drawing of the offered 100 KW Medium Frequency Induction Brazing machine incorporating the schematic sketch / technical leaflet of the main machine, chilling unit, mobile stands for hanging the Co-axial transformer, sketch / drawing of brazing inductor (sl no.4.4) to braise the component as per Annexure-I, total plan area, overall size and weight of the frequency converter and chiller unit, total power requirement etc. shall be submitted by the vendor along with the offer. | Vendor to submit the details | | |
| 5.2 | General Arrangement Drawing and layout as referred in sl. no. 5.1, shall also be submitted by the vendor for BHEL approval, within 4 weeks after placement of Purchase Order. | | | |

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| 6.0 | OPERATIONAL & MAINTENANCE MANUAL OF 100 KW MEDIUM FREQUENCY INDUCTION BRAZING MACHINE : | | | |
| 6.1 | 4 sets of following documents in English language, will be supplied with 100 KW medium frequency induction brazing machine. Out of these 4 sets, one set of manual is to be supplied on CD. | Vendor to confirm | | |
| 6.2 | NOTE : In addition to other information, these documents should contain the following also : | Vendor to confirm | | |
| 6.2.1 | Erection Manual | Vendor to confirm | | |
| 6.2.2 | Detail Operation Manual | Vendor to confirm | | |
| 6.2.3 | Electrical wiring diagram indicating the layout of the cables, plugs, junction box, terminal strips etc. with proper identification numbers. | Vendor to confirm | | |
| 6.2.4 | Alarm list and fault diagnostic manual having Description, Cause and Remedy. | Vendor to confirm | | |
| 6.2.5 | Operation & maintenance manual of all auxiliary systems / installation/ equipments. | Vendor to confirm | | |
| 6.2.6 | Electrical wiring circuit of all auxiliary system / equipments along with the part list/ bill of materials of all the components used in the machine. | Vendor to confirm | | |
| 7.0 | POWER SUPPLY AND ENVIRONMENT CONDITION : | | | |
| 7.1 | BHEL will provide input power supply 3 phase, 3 wire, 415 + / - 15% volt, 50 + / - 3% Hz to Isolator switch (BHEL scope) nearby control panel of 100 KW Medium Frequency Brazing Machine. Complete machine should work trouble free and efficiently under these power supply conditions. Cable connection from the Isolator switch to the control panel and remaining cabling / wiring for 100 KW Medium Frequency Brazing Machine and other auxiliaries / equipment, will be in the scope of the vendor. There will be no neutral wire and earthing will be provided through shop structure column. | Vendor to confirm | | |
| 7.2 | Environment Condition : | | | |
| | 100 KW Medium Frequency Brazing Machine and other accessories and equipments etc. should be suitable to operate under tropical condition with ambient temperature from 0 to 45 degree Centigrade and relative humidity maximum 95 % | Vendor to confirm | | |
| 7.3 | Noise Level : | | | |

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| 7.3.1 | Maximum noise level of the Brazing machine at normal operating condition should be below 85dB(A) one meter away from the machine with correction factor for background noise. | Vendor to confirm | | |
| 7.3.2 | Vendor will demonstrate the noise level as per international standard like DIN 45636-16, if asked for. | Vendor to confirm | | |
| 8.0 | OTHER ESSENTIAL ITEMS : | | | |
| 8.1 | Full description along with the quantity and price (in Price Bid) not covered at Sl. No. 4.1 to 4.7.4 above but are essential for operation & control, installation, commissioning of 100 KW Medium Frequency Induction Brazing Machine and its auxiliaries, shall be offered. Vendor shall submit the details of such items in the offer, if any. | Vendor to confirm and submit the details | | |
| 9.0 | PAINTING : | | | |
| 9.1 | Machine shall be painted with RAL 7038 Grey paint or mutually agreed. | Vendor to confirm | | |
| 9.2 | NOTE : Vendor will repair the paint with original paint in case the same is damaged in transit / erection, before commissioning 100 KW Medium Frequency Induction Brazing Machine. | Vendor to confirm | | |
| 10.0 | PRE-ACCEPTANCE OF 100 KW MEDIUM FREQUENCY INDUCTION BRAZING MACHINE, AT VENDOR'S WORKS : | | | |
| 10.1 | During Pre-despatch inspection of 100 KW Medium Frequency Induction Brazing Machine, BHEL engineers deputed for training (Sl. No. 11.0) at vendor's works will witness brazing operation on test pieces as mutually agreed. | Vendor to confirm | | |
| 10.2 | NOTE : Test Samples required for brazing operation during pre-acceptance test at vendor's works, shall be arranged by the vendor. The test samples should be of dimensions similar to Annexure-I. | Vendor to confirm | | |
| 10.3 | Verification of the items of Spares as per Purchase Order. | | | |
| 10.4 | Completeness of Operational and Maintenance manual as per 6.1 to 6.2.6 | | | |
| 10.5 | Dimensions of all the features of the machine. | | | |
| 11.0 | TRAINING : | | | |
| 11.1 | Training of 2 BHEL engineers at Vendor works for 5 working days, each covering following fields. | Vendor to confirm | | |
| 11.1.1 | One engineer for the operation of 100 KW Medium Frequency Induction Brazing Machine and other supplied items/ | Vendor to confirm | | |

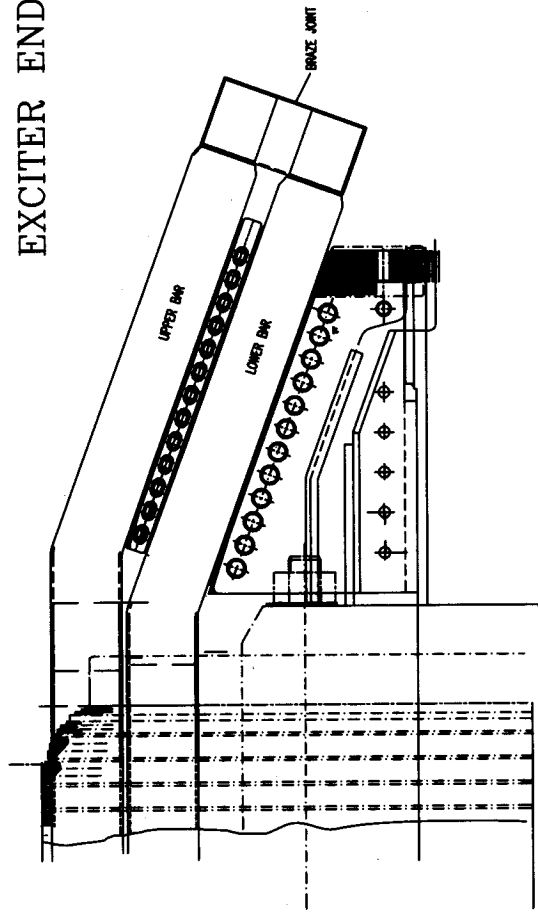
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| | auxiliaries. | | | |
| 11.1.2 | One engineer for Electrical/Electronics maintenance of various items of 100 KW Medium Frequency Induction Brazing Machine and other supplied items/ auxiliaries. | Vendor to confirm | | |
| 11.1.3 | Pre despatch inspection of the machine shall also be carried out by BHEL team during their stay at vendor's works for the training. Vendor should specify no. of days required for pre-despatch inspection. | Vendor to confirm | | |
| 12.0 | ERECTION & COMMISSIONING OF 100 KW MEDIUM FREQUENCY INDUCTION BRAZING MACHINE : | | | |
| 12.1 | Vendor shall take full responsibility for carrying out the erection, start up, Commissioning , testing of each item of 100 KW medium frequency induction brazing machine including all other supplied items /auxiliaries etc. | Vendor to confirm | | |
| 12.2 | Service requirement like unskilled man power compressed air and water shall be provided by BHEL during erection and commissioning of 100 KW medium frequency induction brazing machine and other supplied items / auxiliaries etc. Details of these requirements should be informed / discussed by the vendor and agreed with BHEL in advance. | Vendor to confirm | | |
| 12.3 | EOT crane 2 Ton capacity is available in the shop where 100 KW medium frequency induction brazing machine will be installed. In case, higher capacity of crane is required, vendor shall hire higher capacity mobile crane from local source. | Vendor to confirm | | |
| 12.4 | Erection & commissioning of chilling unit and other accessories & Equipments etc. with all electrical & mechanical connections shall be the responsibility of vendor. | Vendor to confirm | | |
| 12.5 | Compressed air pressure available in BHEL shop, is approximately 4.0 kg/square centimeter, the same can be provided for the erection purpose, if required. | Vendor to note | | |
| 13.0 | JOB PROVING AND FINAL ACCEPTANCE OF THE 100 KW MEDIUM FREQUENCY INDUCTION BRAZING MACHINE AT BHEL HARIDWAR WORKS : | | | |
| 13.1 | Complete and successful brazing operation of minimum 4 nos. brazing joints as per attached Annexure-I, shall be taken up under the presence of vendor's expert deputed for commissioning the machine at BHEL works. | Vendor to confirm | | |

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| 13.2 | Demonstration of all features of 100 KW Medium Frequency Induction Brazing Machine, chilling unit and other supplied accessories, by the vendor's representative, to satisfaction of BHEL. | Vendor to confirm | | |
| 13.3 | Training of BHEL operators in the operation & maintenance of 100 KW medium frequency induction brazing machine including other supplied accessories etc. shall be provided by the vendor's commissioning experts during commissioning and proving of 100 KW medium frequency induction brazing machine , at BHEL works. | Vendor to confirm | | |
| 14.0 | GUARANTEE : | | | |
| 14.1 | Guarantee for complete 100 KW medium Frequency Induction Brazing machine including other supplied accessories for 24 months from the date of final acceptance (sl. no. 13.0) of machine at BHEL works. | Vendor to confirm | | |
| 14.2 | Any spare required during guarantee period shall have to be arranged by the vendor free of cost (up to BHEL Haridwar stores) and duty levied have to be borne by the vendor. | Vendor to confirm | | |
| 15.0 | PACKING: | | | |
| 15.1 | Sea worthy (in case of Foreign vendor) and rigid packing shall be provided for all the items of 100 KW medium frequency induction brazing machine including other supplied items in wooden boxes to avoid any damage/loss in transit. All small and loose items and spares, should also be suitably packed in separate wooden boxes with proper identification tag. | | | |
| 16.0 | GENERAL INFORMATION : | | | |
| | All the information attached with tender document are exclusive property of BHEL Haridwar. Under any circumstances these information as stated above, must not be passed on to any third party without prior permission of BHEL Haridwar and must not be used directly or indirectly detrimental to the interest of BHEL. | Vendor to confirm | | |
| 17.0 | SPARES: | | | |
| 17.1 | Set of recommended spares indicating the category of essential / optional along with part no./identification no. and quantity of the items required and other accessories of 100 KW medium frequency induction brazing machine , shall be | Vendor to confirm and submit the details | | |

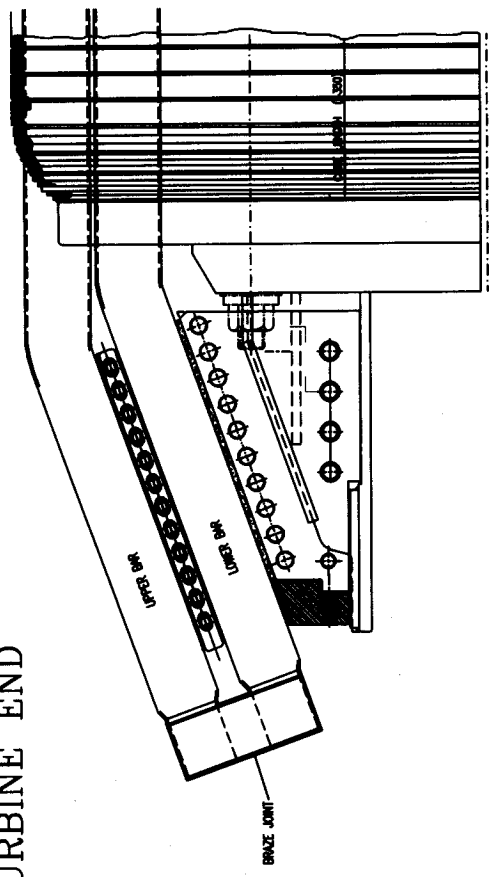
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| | <p>submitted in the offer.</p> <p>Following items shall also be included in the above referred list.</p> <ol style="list-style-type: none"> 1. Main controller card of converter side: 1 no. 2. Power devices of converter: 4 nos. (IGBT, TRANSISTOR or whichever is applicable) 3. Main controller card of inverter side: 1 no. 4. Power devices of inverter: 4 nos. (IGBT, TRANSISTOR or whichever is applicable) 5. Set of Fuses: 1 set <p>FOR CHILLING UNIT-</p> <ol style="list-style-type: none"> 6. Fan motor with blade-complete set (same as installed in the unit): 1 no. 7. Chiller (same as installed in the unit): 1 no. 8. Digital Temperature Controller with probe (same as installed in the unit): 1 no. 9. Chilled Water Flow Switch: 1 no. | | | |
| 17.2 | Price of each item unit wise, listed under the Spares, shall be furnished in Price Bid. | Vendor to note | | |
| 18.0 | QUALIFYING CONDITIONS : | | | |
| 18.1 | <p>Only those vendors (OEMs) will be qualified who have commissioned at least one Medium Frequency Induction Brazing Machine for brazing of copper items, of capacity 100 KW or more in last Fifteen years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender).</p> <p>The following information should be submitted by the vendor about the companies where similar machines(s) have been supplied. This is required from all the vendors for qualification of their offer.</p> | Vendor to submit the details | | |
| 18.1.1 | Name of the customer / company where referred machine is installed. | Vendor to submit the details | | |
| 18.1.2 | Complete postal address of the customer. | Vendor to submit the details | | |

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| 18.1.3 | Month and year of commissioning. | Vendor to submit the details | | |
| 18.1.4 | Medium Frequency Induction Brazing Machine for brazing of copper items, of capacity 100 KW or more. | Vendor to submit the details | | |
| 18.1.5 | Name and designation of the contact person of the customer. | Vendor to submit the details | | |
| 18.1.6 | Phone, FAX no. and email address of the contact person of the customer. | Vendor to submit the details | | |
| 18.1.7 | Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original certificate or through E-mail directly from the customer). The original performance certificate may be returned after verification by BHEL, if required. | Vendor to submit the details | | |
| 18.1.8 | BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false / incorrect, the offer shall be rejected. | Vendor to note | | |

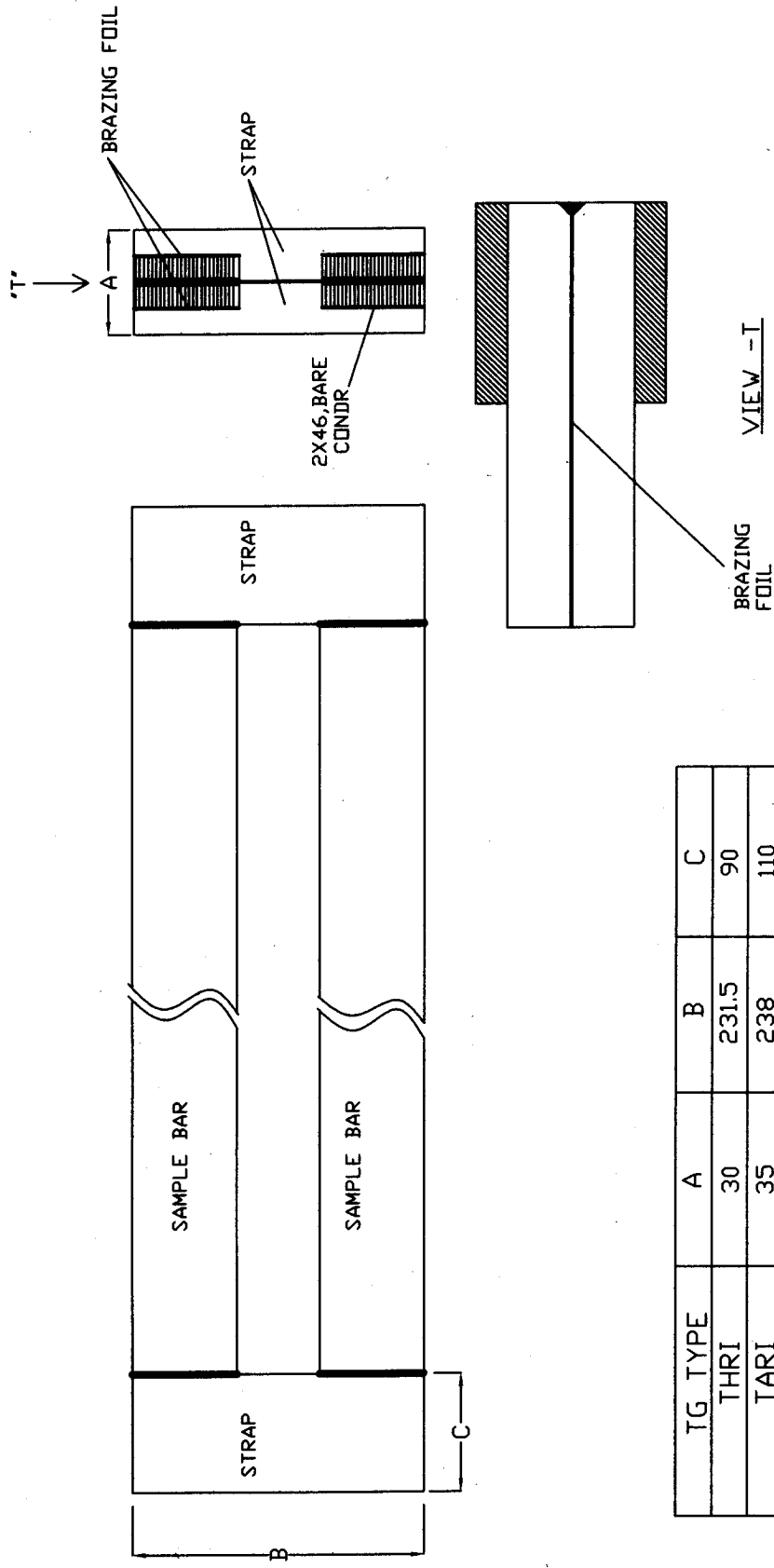
EXCITER END



TURBINE END



DETAILS OF BRAZE JOINT



| TG TYPE | A | B | C |
|---------------|----|-------|-----|
| THRI | 30 | 231.5 | 90 |
| TARI | 35 | 238 | 110 |
| All Dim in mm | | | |

NOTE:-Dim 'A' only Represents copper cross-section.
 1 mm mica sheet on each side of joint
 and 4 mm assly allowances may be
 considered separately.