



# Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

An ISO 9001  
Company

## ENQUIRY

### NOTICE INVITING TENDER

Phone: +91 431 257 76 53  
Fax : +91 431 252 00 31  
Email : [skaruna@bheltry.co.in](mailto:skaruna@bheltry.co.in)  
Web : [www.bhel.com](http://www.bhel.com)

### TWO PART BID

Tender to be  
submitted in two Parts

Enquiry Number:  
**2851300013**

Enquiry Date:  
**04.09.2013**

Due date for submission of quotation:  
**05.10.2013**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both **delayed offer** and **late offers** will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

| Item | Description      | Quantity | Delivery Required           | Delivery Terms Required  |
|------|------------------|----------|-----------------------------|--|
| 10   | Tube End Scarfer | 20 Nos.  | End<br>January<br>2015      | F.O.R, BHEL Stores,<br>POWER EQUIPMENT FABRICATION PLANT,<br>BHARAT HEAVY ELECTRICALS LIMITED,<br>Mundipar- 441804,<br>Sakoli Taluk,<br>Bhandara District,<br>Maharashtra State. |
| 20   | Tube End Scarfer | 30 Nos.  | 6 Months<br>from PO<br>date | F.O.R ,BHEL Stores,<br>HIGH PRESSURE BOILER PLANT,<br>BHARAT HEAVY ELECTRICALS LIMITED,<br>Tiruchirappalli- 620014,<br>Tamilnadu State.  |
| 30   | Tube End Scarfer | 05 Nos.  |                             |  |

The above items as per the technical specification & commercial conditions applicable (to be downloaded from web site [www.bhel.com](http://www.bhel.com) or <http://tenders.gov.in>)

#### Important points to be taken care during submission of offer:-

1. Checklist No. **IND 01A / IMP 01** as applicable to the vendor to be filled in and enclosed along with the offer failing which, their offer will not be considered for evaluation.
2. The offer shall be evaluated as Single Package basis consisting of the above three items (Sl. 10-30) i.e. overall L1. Hence the supplier has to quote for all the three items else the offer would not be considered for evaluation.
3. EMD for this Tender will be Rs. 2,00,000/-
4. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.
5. The Period required for completion of Erection & Commissioning of the above items shall be 10 days from the date of intimation from BHEL requesting supplier to depute Service Engineers about site readiness

BHEL's General guidelines / instructions (refer **MM / CE / GENL / 001 - EMD**) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "**2851300013**".

Tenders should reach us before 14:00 hours on the due date  
Tenders will be opened at 14:30 hours on the due date  
Tenders would be opened in presence of the tenderers who  
have submitted their offers and who may like to be present

Yours faithfully,  
For **BHARAT HEAVY ELECTRICALS LIMITED**

Sr. Manager / Capital Equipment / MM

**TECHNICAL SPECIFICATION FOR  
PORTABLE PNEUMATIC TUBE INSERT SCARFING MACHINE  
PART -A**

| S.No       | BHEL Specification  | Vendor's Offer |
|------------|---|----------------|
| <b>1.0</b> | <b>QUALIFYING CRITERIA</b>  |                |
| 1.1        | The BIDDER / VENDOR (OEM) shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture & Supply of Special Purpose / Custom Built Pneumatically operated portable machines for metalworking.  |                |
| 1.2        | Only those vendors ( <b>OEMs</b> ), who have supplied and commissioned <b>atleast TWO numbers of pneumatically operated heavy duty portable tube end chamfering machines</b> similar to the machine specified under Part B, in the past ten years (as on date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (as on date of opening of Tender) should quote. |                |
| 1.3        | Vendor has to submit atleast one Performance Certificate from their customers, for satisfactory performance of <b>pneumatically operated heavy duty portable tube end chamfering machines</b> similar to the machine specified under Part B, for a minimum period of one year (as on date of opening tender). For obtaining the Performance certificate, a suggestive format is provided.   |                |

|            |   |  |
|------------|---|--|
| <b>2.0</b> | <b>INFORMATION TO BE PROVIDED BY VENDOR</b>   |  |
| 2.1        | The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where Special Purpose / Custom Built Pneumatically operated portable machine (for metalworking) have been supplied in the past. |  |
| 2.2        | Details of Special Purpose / Custom Built Pneumatically operated portable machines for metalworking supplied to other BHEL units, if any. (Year of commissioning, Application, Type )   |  |
| 2.3        | Details on SERVICE-AFTER-SALES set-up in India including the Address of Agents /Service Centres in India.   |  |
| 2.4        | Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.   |  |

Suggestive Format of Performance Certificate:

The performance certificate should be produced **on Customer's Letter Head.**

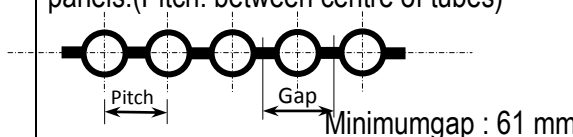
**PERFORMANCE CERTIFICATE**

- |   |  |   |
|---|--|---|
| 1 | Supplier of the machine  |   |
| 2 | Make & Model of the M/C  |   |
| 3 | Month & Year of Commissioning  |   |
| 4 | Application for which M/C is used                                      |   |
| 5 | a. Application<br>b. Machining capability                              |   |
| 6 | Performance of the Machine<br>(Strike off whichever is not applicable) | Satisfactory / Good / Average / NotSatisfactory |
| 7 | After sales service<br>(Strike off whichever is not applicable)        | Satisfactory / Good / Average / NotSatisfactory |
| 8 | Any Other remarks  |   |

Date:

Signature & Seal of the Authority  
Issuing the Performance Certificate

**TECHNICAL SPECIFICATION FOR  
PORTABLE PNEUMATIC TUBE INSERTSCARFING MACHINE  
PART - B**

| S.No | Description                                | BHEL Specification  | Vendors Offer |
|------|--|---|---------------|
| 1.0  | <b>PURPOSE/<br/>FUNCTION</b>               | The equipment is to be heavy duty portable machine used for the edge preparation of rough flame-cut TUBE Ends in between tubular panels/coils of High Pressure Boilers. The flame-cut ends will be of hardened and irregular in nature in the plane of cut. |               |
| 2.0  | <b>Tube end preparation - requirements</b> |   |               |
| 2.1  | Tube OD Chamfering                         | Outside Beveling on the tubes to get a 37.5° and 45.0° angle for welding. All the above styles shall have a land of 1.0 mm to 2.0 mm in the edge preparation.   |               |
| 2.2  | Facing                                     | End Facing of Tubes, i.e. to get a square cut face with smooth finish.  |               |
| 2.3  | I.D. Boring                                | Internal straight boring in the I.D. of tubes to a depth of 25mm from the tube end face with a merging taper of 30°   |               |
| 2.4  | Accuracy                                   | Face out : +/- 0.1 mm<br>Beveling Angle : +/- 0.5 degree  |               |
| 2.5  | Machining Mode                             | Any of the above two operations are to be done simultaneously.  |               |
| 3.0  | <b>Job Specification</b>                   |   |               |
| 3.1  | Jobs                                       | Tube ends of cut-outs made in Tubular Panels (see sketch in the last page)  |               |
| 3.2  | Tube ODx Th<br>Range of Tubes              | Tube OD: 38.1 x Th. 3.6 to 10.7<br>Tube OD: 41.3 x Th. 4.0 to 8.2<br>Tube OD: 42.4 x Th. 4.0 to 8.6<br>Tube OD: 44.5 x Th. 4.0 to 8.7<br>Tube OD: 51.0 x Th. 4.0 to 11.0<br>Tube OD: 54.0 x Th. 3.6 to 12.5<br>Tube OD: 63.5 x Th. 4.0 to 7.1               |               |
| 3.3  | Wall Thickness                             | 3.6 mm to 12.5 mm   |               |
| 3.4  | Tubular Panels                             | Tube dia. 38.1mm and Pitch 50.8mm,<br>Tube dia. 41.3mm and Pitch 54mm in tubular panels. (Pitch: between centre of tubes)<br>   |               |

| S.No       | Description   | BHEL Specification  | Vendor's Offer |
|------------|---|---|----------------|
| 3.5        | Material  | i) CARBON STEEL : SA 192, SA 209 Gr. T1, SA 210 Gr.A1/ Gr.C (ASTM)<br>ii) ALLOY STEEL: SA 213 Gr.T2, T11, T12, T22, T91,T92 (ASTM)<br>iii) STAINLESS STEEL: SA 213 304H, 316L, 347H (ASTM)  |                |
| 3.6        | Tube End Condition                                      | The tube ends of tubular panels are flame cut ends that will be of irregular and hardened in nature.  |                |
| 3.7        | Width at clamping area                                  | Equipment shall have uniform width from bottom of the clamping jaw to spindle top. The width shall not exceed 60 mm. The width to be suitable enough to insert within the minimum gap for performing tube end scarfing. Vendor to specify the width in the offered machine.   |                |
| <b>4.0</b> | <b>Cutting Tools, Tool Holders&amp; Job Clamp Sizes</b> |   |                |
| 4.1        | O D Clamping Sizes<br>(7 sizes)                         | The machine shall be capable of clamping tubes with OD 38.1mm /41.3mm /42.4mm / 44.5mm 51.0mm /54.0mm / 63.5mm  |                |
| 4.2        | Cutting Tool  | HSS Tool Bits (HSS3,HSS with COBALT inclusion)Tools should be suitable for machining gas cut ends of alloy steel tubes with maximum wall thickness 12.5 mm.<br><b>Cutting speed 15 to 20 m/min</b>  |                |
| 4.3        | Tool Bits configuration                                 | a) 37.5° for O.D bevelling<br>b) Facing<br>c) I.D straight boring for a depth of min. 25 mm from tube end face with merging taper of 30°  |                |
| 4.4        | Cutting Tool Bits Sample drgs.                          | The cutting tool bits to be offered as per the drawings given below:<br>Serrations for tool cutting bits for gripping in tool holder slots to be as per the drawings.<br>a) 40-T-36-24296-1 – 45° chamfer<br>b) 40-T-36-24168-0 – 37½° chamfer<br>c) 40-T-36-23975-0 – Facing tool<br>d) 40-T-36-23978-0 – ID boring tool |                |
| 4.5        | Tube Holding clamps                                     | a) 40-T-50-25962-0 – Top Clamp<br>b) 20-T-50-22846-4 – V Block  |                |
| 4.6        | Tool Holders  | 10-T-48-15163-1 – Tool Holder   |                |
| 4.7        | Cutting Tools   | Tool Holders, Tool Bits for Cutting Operations mentioned under 5.2, 5.3, 5.4, 5.5 to be offered Item wise with quantity.  |                |

| S.No       | Description                    | BHEL Specification  | Vendor's Offer |
|------------|--------------------------------|---|----------------|
| <b>5.0</b> | <b>Machine Output Ratings:</b> |   |                |
| 5.1        | Spindle cutting Speed          | Spindle RPM around 75 to 170 rpm for maximum power at an air inlet pressure of 60-70 psi.   |                |
| 5.2        | Feed                           | Feed for maximum thickness on Alloy steel tubes to be specified by Vendor   |                |
| 5.3        | Spindle Stroke                 | 25 mm.Spindle should be wobble free at maximum stroke position during working.  |                |
| 5.4        | Spindle Torque                 | Torque shall be sufficient to cut the above materials in gas cutting edges at an air inlet pressure of 60-70 psi.Vendor to specify  |                |
| 5.5        | Noise Level                    | Suitable silencers and mufflers to be provided to minimize the noise level.   |                |
| 5.6        | Productivity                   | Equipment to be capable of edge preparing not less than 12tube ends per hour on Tube OD 38.1mm x Thick 8.0mm / T11 or T22 – Gas cut ends with 5mm excess length.                    |                |
| <b>6.0</b> | <b>Machine Configuration:</b>  |   |                |
| 6.1        | Machine construction           | The equipment shall be of compact and robust construction with high output air-motor, to deliver a high cutting torque for a continuous duty, to meet the specific job application. |                |
| 6.2        | Machine Operation              | Pneumatically Operated  |                |
| 6.3        | Compressed Air Pressure        | 60 to 70 psi  |                |
| 6.4        | Machine Body                   | Steel Fabricated body   |                |
| 6.5        | All pneumatic piping& fittings | Metallic Pipes & fittings. Vendor to specify  |                |
| 6.6        | Lifting Hook                   | A suitably designed Lifting Hook shall be provided at the top of the machine, for handling by EOT Crane and ensure equilibrium of machine geometry.                                 |                |
| 6.7        | Tool Feed                      | Manual smooth tool feeding through a Hand Wheel without reverse load/Back force. The operator should be able to give feed effortlessly.   |                |

| S.No       | Description                            | BHEL Specification  | Vendor's Offer |
|------------|--|---|----------------|
| 6.8        | Job/Tube Clamping                      | Clamping of tubes shall be on O.D by pneumatic clamping and has to be actuated with a separate locking Lever. The clamping to be rigid enough to hold the tube without slipping while machining. The air pressure shall be at 60 to 70 psi. Vendor to specify the clamping force. |                |
| 6.9        | Tube clamps                            | Suitable base 'V' clamps for OD clamping for varying tube sizes given under SI.No. 4.1 as per Drg. No. 40-T-50-25962-0 – Top Clamp<br>Drg. No. 20-T-50-22846-4 – V Block  |                |
| 6.10       | Tube Centring                          | To be ensured by pneumatic clamping system by means of suitably hardened clamp blocks. Hardness level to be mentioned in the offer.   |                |
| 6.11       | Machine Spindle                        | Hardened and Ground.Vendor to Specify   |                |
| 6.12       | Location of Parts                      | Location of Air Motor, Silencer, FRL Unit, etc. shall be such that they do not interfere with the job surface, when the equipment is engaged. The arrangement shall be convenient for the operator.   |                |
| 6.13       | Silencers& Mufflers                    | The location of mufflers & silencers should be properly routed and positioned so that it does not hinder the operation. Vendor should submit the Line diagram for the same.   |                |
| 6.14       | Internal Construction of the equipment | All gears, Worm wheels, worm, bolts etc shall be made of high tensile strength to withstand the forces during operation. The assembly shall give a smooth performance. Vendor to provide details of the internal parts of the equipment.  |                |
| 6.15       | Weight of single unit                  | Around 225 kg.  |                |
| <b>7.0</b> | <b>Air Motor:</b>                      |   |                |
| 7.1        | Air Motor                              | Geared Multi Vane Air Motor   |                |
| 7.2        | Air Motor Power at Output shaft        | Air motor power not less than 4.0 kW at an air inlet pressure of 60-70 psi through a 3/4" air hose at the output shaft. Vendor to confirm.  |                |
| 7.3        | RPM                                    | RPM at max. power of output shaft to be specified by Vendor.  |                |
| 7.4        | Stall Torque                           | Not less than 500 Nm  |                |
| 7.5        | Power / Torque Characteristics         | Air Motor Power / Torque characteristics w.r.t rpm / air pressure to be provided with the offer.  |                |
| 7.6        | Gear Ratio                             | Reduction Gear Ratio – Vendor to specify  |                |

| S.No       | Description                                    | BHEL Specification   | Vendor's Offer |
|------------|--|--|----------------|
| 7.7        | Lubrication oil consumption rate for Air motor | Lubrication oil consumption rate of the air motor should be minimum. Vendor to specify drops per minute. Vendor to also specify the lubrication oil specification. |                |
| 7.8        | Speed Regulation                               | Air motor shall be provided with an Air regulator to select suitable spindle speed.  |                |
| <b>8.0</b> | <b>Pneumatic Circuit:</b>                      |  |                |
| 8.1        | Air Connection                                 | Air connection through 3/4 inch hoses at a pressure of 60-70 psi shall be provided by BHEL. The equipment to be suitably designed.                                 |                |
| 8.2        | Air control valves                             | Control valve for air motor shall be separate from Control valve for clamping cylinder. Pneumatic circuit line diagram to be provided.                             |                |
| 8.3        | Air Consumption                                | Air consumption pattern shall be specified.  |                |
| 8.4        | Filter, Regulator & Lubricator (FRL Unit)      | A suitable capacity Air Filter, Regulator & Lubricator unit with metallic protective casing shall be mounted on the equipment.                                     |                |
| 8.5        | Air Couplings                                  | Two sets of quick dis-connect couplings (size 3/4 inch) are to be provided with the equipment, for air hose connection.  |                |
| <b>9.0</b> | <b>Makes of components:</b>                    |  |                |
| 9.1        | Geared Multi Vane Air Motor                    | Ingersoll Rand / San-ei Seiki Seisakushu Co. Ltd / Atlas Copco. Vendor to provide details.   |                |
| 9.2        | Bearings                                       | SKF/INA FAG/IKO/TIMKEN/NTN   |                |
| 9.3        | All pneumatic components                       | FESTO/SMC  |                |
| 9.4        | F R L Unit                                     | FESTO/SMC  |                |
| 9.5        | Silencer & Mufflers                            | FESTO/SMC  |                |
| 9.6        | Pneumatic Valves                               | FESTO/SMC  |                |
| 9.7        | SEALS  | SKF/PARKER/MERKEL/HALLITE/SMC/FESTO  |                |
| 9.8        | Pneumatic Hoses                                | Poly Urethane - FESTO/SMC  |                |
| 9.9        | General  | Makes of any other unspecified bought out items shall be specified by Vendor and such makes shall be acceptable to BHEL  |                |

| S.No        | Description                               | BHEL Specification  | Vendor's Offer |
|-------------|---|---|----------------|
| <b>10.0</b> | <b>Painting:</b>                          |   |                |
| 10.1        | Paint                                     | Poly Urethane   |                |
| 10.2        | Colour                                    | Apple Green Colour, RAL 6011  |                |
| <b>11.0</b> | <b>Spares:</b>                            |   |                |
| 11.1        | Main Equipment                            | Complete List of Spares including Air Motor Bearings, Seals, Bushes, Set of gears, Spindle, Air Cylinder, Air Valve for Clamping&Spindle rotation, Tool holders etc. for two years of trouble free maintenance may be listed item wise with quantity.   |                |
| <b>12.0</b> | <b>Operation and Maintenance Manuals:</b> |   |                |
| 12.1        | O & M Manual Details                      | Manuals shall contain the following details:<br>a) Blow-up details of assembly / dismantling, part numbers with part description (detailed sub drawings of machine parts) for Maintenance, Safety Instructions while using,<br>b) Operating Sequence for using the equipment.<br>Trouble Shooting Chart.<br>c) Catalogue of all bought out items.<br>d) Lubrication schedule.<br>e) Preventive Maintenance check list.<br>f) Tool holder drawings.<br>g) Tool insert details<br>h) Clamp bases drawings |                |
| 12.2        | No of Copies of Manuals                   | One Hard copy and One soft copy in CD/DVD for each machine  |                |
| 12.3        | Language                                  | English   |                |
| <b>13.0</b> | <b>Pre-dispatch Inspection:</b>           |   |                |
| 13.1        | Inspection at Vendor's works              | Equipment shall be offered for inspection before dispatch at Supplier's works. The inspection will be carried out by BHEL Engineers. The performance of the machine, makes, spares and The tubes shall be supplied by BHEL.   |                |
| <b>14.0</b> | <b>Commissioning:</b>                     |   |                |
| 14.1        | Commissioning at BHEL works               | Supplier's representative shall be deputed for commissioning and performance prove-out of the equipment at BHEL works.  |                |

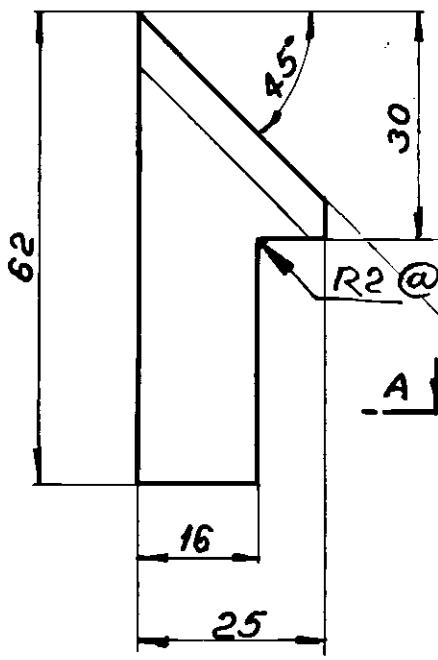
| S.No        | Description       | BHEL Specification   | Vendor's Offer |
|-------------|-------------------|--|----------------|
| 14.2        | Prove out Trials  | Capability: Tube OD: 51mm x Th. 11mm – Alloy steel (T22) with gas cut edges – 45° chamfer.   |                |
| 14.3        | Prove out Trials  | Productivity:12 tube ends per hour on Tube OD 38.1mm x Thick 8.0mm / T11 or T22 – Gas cut ends with 5mm excess length for three hours.     |                |
| <b>15.0</b> | <b>Training:</b>  |  |                |
| 15.1        | Training          | Training on Operation and Maintenance of the equipment shall be provided for a minimum period of two days                                  |                |
| <b>16.0</b> | <b>Guarantee:</b> |  |                |
| 16.1        | Guarantee         | The equipment shall be guaranteed for a minimum period of 12 months from the date of commissioning or 18 months from the date of dispatch. |                |
| <b>17.0</b> | <b>General:</b>   |  |                |
| 17.1        | Technical Details | All technical details of the bought out items, circuit diagrams, general arrangement drawings to be provided with the offer.               |                |
| 17.2        | Drawing approval  | Drawings to be submitted by supplier for approval prior to manufacturing, in case of on order.   |                |

## Enclosures:

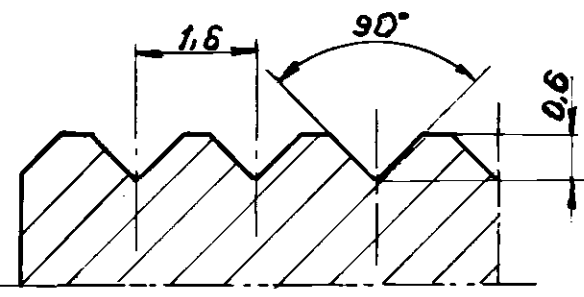
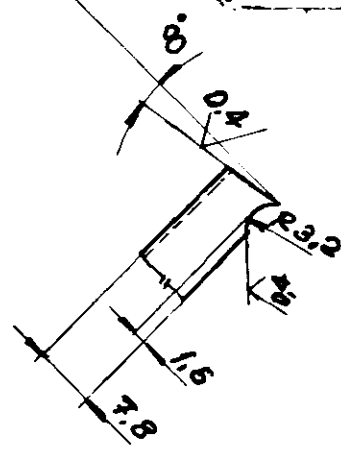
1. 40-T-36-24296-1 – 45° chamfer
2. 40-T-36-24168-0 – 37½° chamfer
3. 40-T-36-23975-0 – Facing tool
4. 40-T-36-23978-0 – ID boring tool
5. 40-T-50-25962-0 – Top Clamp
6. 20-T-50-22846-4 – V Block
7. 10-T-48-15163-1 – Tool Holder

|          |          |            |
|----------|----------|------------|
| <b>A</b> | DATE     | ALTERED    |
|          | 12.3.86  | <i>BKR</i> |
| ZONE     | CHECKED  |            |
| @        | R2-ADDED |            |

1.5/ D.4/



| TOLERANCE FOR UNTOLERANCED DIMENSIONS |             |
|---------------------------------------|-------------|
| UPTO 6 MM                             | = ±0.1 MM   |
| > 6 UPTO 120 MM                       | = ±0.2 MM   |
| MORE THAN 120 MM                      | = ±0.3 MM   |
| ANGULAR TOLERANCE                     | = ±0.5 DEG. |
| CHAMFER                               | = ±0.5 MM   |



SECTION: 'A-A'  
SCALE: 10:1

HARDEN AND TEMPER TO 62<sup>±1</sup> HRC

TOOL No : 36-10333-00  
45°

| 7.8 x 25 x 62                 |             | IS 1570 T 75 W18 Co6<br>Cr 4 V 1 Mo 75 |                      | 0.08              |            |                |               |             |          |
|-------------------------------|-------------|--|----------------------|-------------------|------------|----------------|---------------|-------------|----------|
| NO. OF PIECES                 | DESCRIPTION | SEM. PRO./SEQ. NO.                     | INT. MAT. / SEQ. NO. | FINAL MATERIAL    | SCRAP SORT | NET wt (kg)    | GROSS wt (kg) | DRAWING NO. | ITEM NO. |
| FIRST ANGLE                   | SCALE       | DRAWN                                  |                      | TOTAL NET wt (kg) |            |                |               |             |          |
|                               | 1:1         | CHECKED                                |                      | TYPE              |            |                |               |             |          |
| ALL DIMENSIONS IN MILLIMETRES |             | APPROVED                               |                      | COMPNT. No.       |            | 2-29.04-04-001 |               |             |          |
|                               |             | DATE                                   |                      | W.C. 5999         |            | /OLD DRG. NO.  |               |             |          |

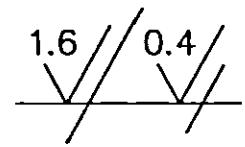


**CAUTION**  
THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD., BOILER PLANT UNIT, TIRUCHY-14 AND SHALL NOT BE USED WITHOUT THEIR EXPRESS WRITTEN PERMISSION IN ANY FORM OR PART THEREOF FOR ANY OTHER PURPOSE THAN FOR WHICH IT IS SENT TO YOU.

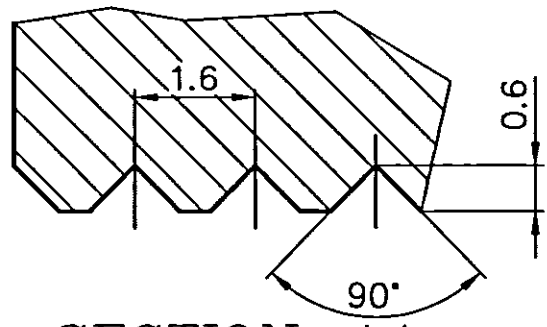
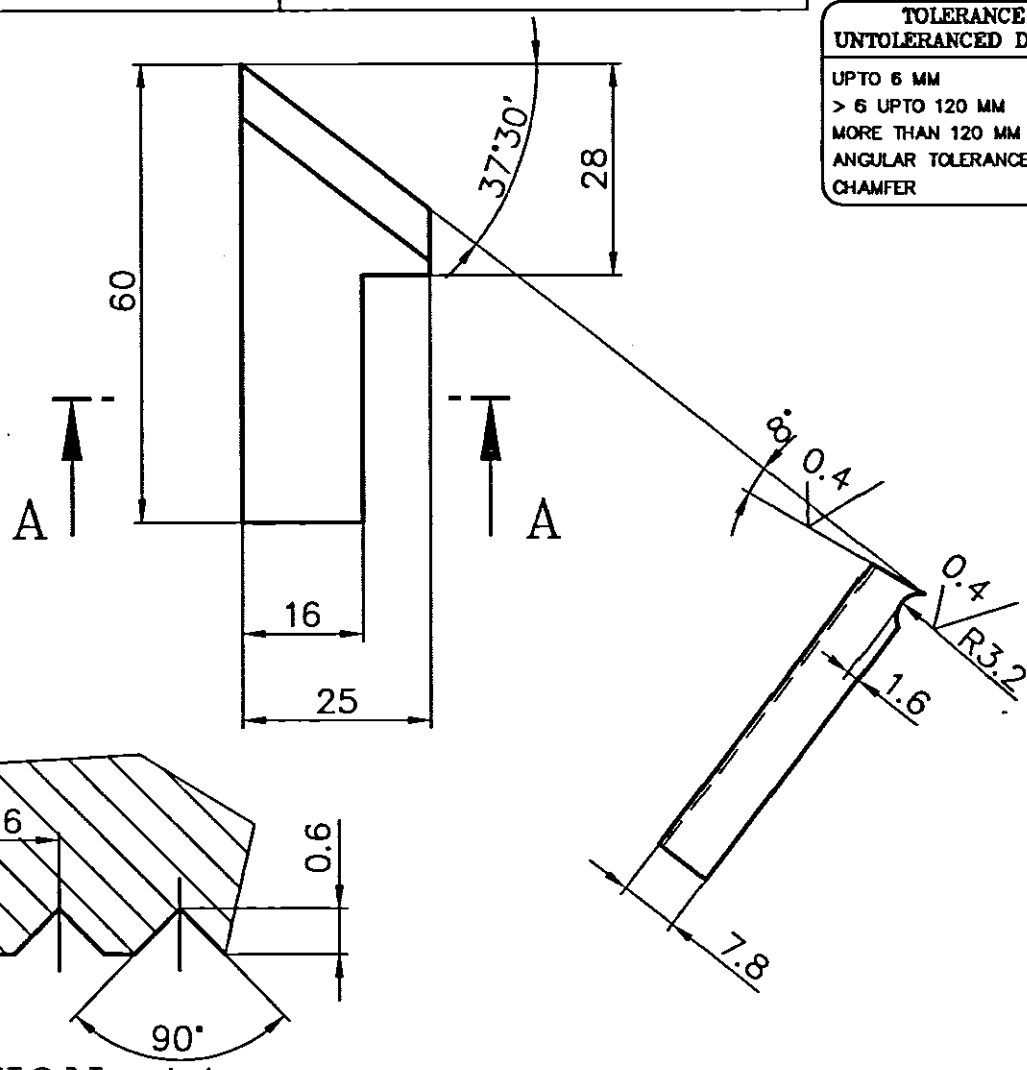
TITLE  
**CHAMFERING TOOL**  
FOR PORTABLE ENDCUT SCARFING MACHINE

|                      |          |
|----------------------|----------|
| DRAWING NO.          | REVISION |
| <b>40.T.36.24296</b> | <b>A</b> |

HARDEN & TEMPER TO  
 $\pm 1$   
 62 HRC.



| TOLERANCE FOR UNTOLERANCED DIMENSIONS |                 |
|---------------------------------------|-----------------|
| UPTO 6 MM                             | = $\pm 0.1$ MM  |
| > 6 UPTO 120 MM                       | = $\pm 0.2$ MM  |
| MORE THAN 120 MM                      | = $\pm 0.5$ MM  |
| ANGULAR TOLERANCE                     | = $\pm 0.5$ Deg |
| CHAMFER                               | = $\pm 0.5$ Deg |



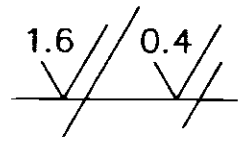
**SECTION-AA**

SCALE: -10:1

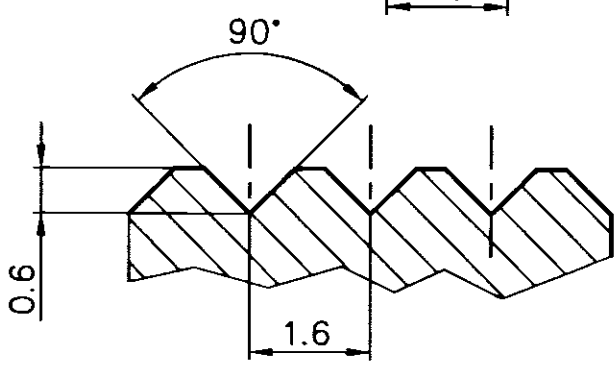
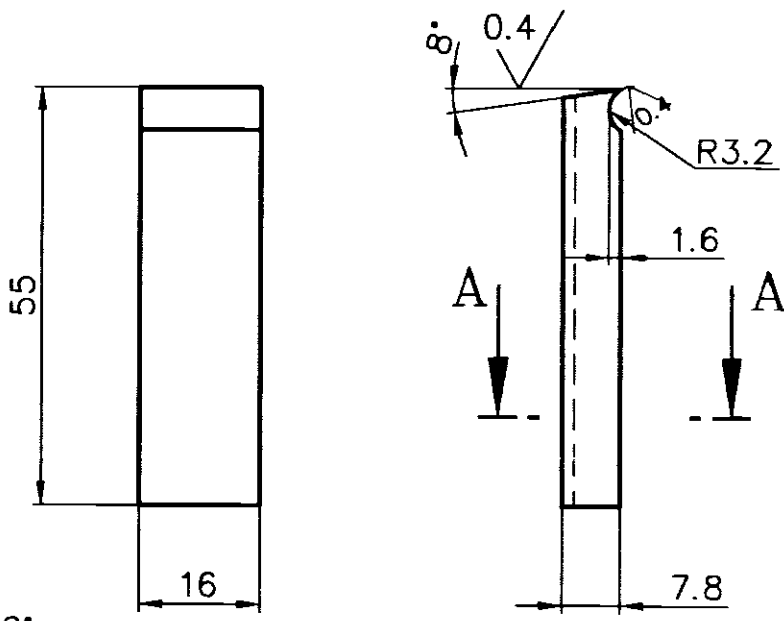
|                      |                 |                        |                |                             |            |             |               |                  |          |
|----------------------|-----------------|------------------------|----------------|-----------------------------|------------|-------------|---------------|------------------|----------|
| COMP.DRG.NO          |                 | -                      |                | <b>TOOL NO: 36-63005-00</b> |            |             |               |                  |          |
| COMP.DESC            |                 | TUBES                  |                |                             |            |             |               |                  |          |
| TYPE/GROUP           |                 | 11                     | W.C: -4393     | USE WITH: 48-14110-00       |            |             |               |                  |          |
| 7.8x25x60            |                 | T75 W18                |                | IS 1570                     |            |             | 0.1           |                  |          |
| NO. OF PIECES        | NAME-DIMENSIONS | SEMI-PRODUCT           | FINAL MATERIAL | INITIAL MATERIAL            | SCRAP SORT | NET WT (KG) | GROSS WT (KG) | DRAWING NO.      | ITEM NO. |
| REMARKS KSR/SSP/G    |                 |                        |                | TOTAL NET WT(kg)            |            |             |               |                  |          |
| SCALE<br>1:1<br>10:1 | DRAWN           | R.VINODH KUMAR         |                | ALTERATIONS                 |            | DATE        | SIGNATURE     | ALTERATION INDEX |          |
|                      | CHECKED         | <i>N. S. S.</i>        |                |                             |            |             |               |                  |          |
|                      | APPROVED        | <i>S. Subramanian</i>  |                |                             |            |             |               |                  |          |
|                      | STDS. OFFICER   |                        |                | TRANS. COPY NO.             |            |             |               |                  |          |
| DATE                 |                 | 10.05.05               |                |                             |            |             |               |                  |          |
| TYPE                 |                 | GROUP                  |                | OLD DRG. RETRACED           |            |             | NEW DRG.      |                  |          |
| TITLE                |                 | CHFR TOOL 0375D08161NT |                | DRAWING No.                 |            |             | 40-T-36-24168 |                  |          |



HARDEN & TEMPER TO  
 $\pm 1$   
**62** HRc.



| TOLERANCE FOR UNTOLERANCED DIMENSIONS |                 |
|---------------------------------------|-----------------|
| UPTO 6 MM                             | = $\pm 0.1$ MM  |
| > 6 UPTO 120 MM                       | = $\pm 0.2$ MM  |
| MORE THAN 120 MM                      | = $\pm 0.5$ MM  |
| ANGULAR TOLERANCE                     | = $\pm 0.5$ Deg |
| CHAMFER                               | = $\pm 0.5$ Deg |



**SECTION-AA**  
 SCALE: -10:1

|             |               |  |
|-------------|---------------|--|
| COMP.DRG.NO | -             | <b>TOOL NO: 36-10315-00</b><br>M/C PORTABLE END CUT SCARFING |
| COMP.DESC   | TUBES         |  |
| TYPE/GROUP  | 11 W.C: -4395 |  |

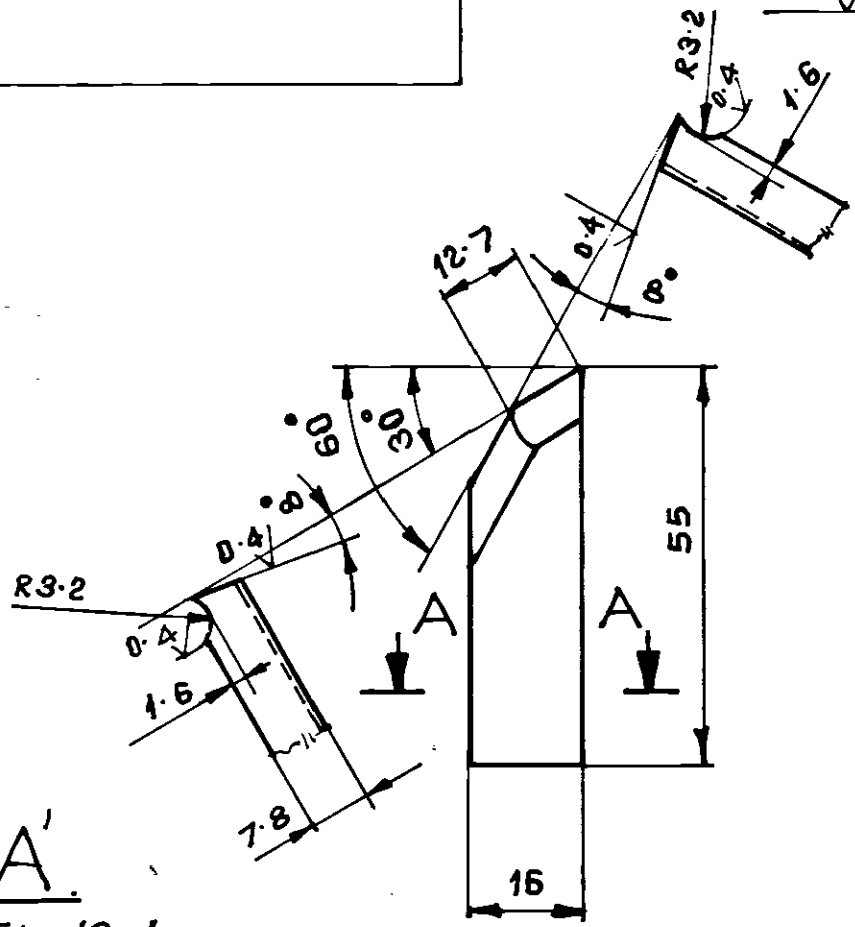
| 7.8x16x55     | IS 1570<br>T75 W18Co6Cr4 | V1 Mo75     | 0.06           |                  |            |             |               |             |          |
|---------------|--------------------------|-------------|----------------|------------------|------------|-------------|---------------|-------------|----------|
| NO. OF PIECES | NAME-DIMENSIONS          | SEM-PRODUCT | FINAL MATERIAL | INITIAL MATERIAL | SCRAP SORT | NET WT (KG) | GROSS WT (KG) | DRAWING NO. | ITEM NO. |

|                      |               |                |  |                  |                |  |      |           |                  |
|----------------------|---------------|----------------|--|------------------|----------------|--|------|-----------|------------------|
| REMARKS              |               |                |  | TOTAL NET WT(KG) |                |  |      |           |                  |
| SCALE<br>1:1<br>10:1 | DRAWN         | R.VINODH KUMAR |  |                  | ALTERATIONS    |  | DATE | SIGNATURE | ALTERATION INDEX |
|                      | CHECKED       |                |  |                  |                |  |      |           |                  |
|                      | APPROVED      |                |  |                  |                |  |      |           |                  |
|                      | STDS. OFFICER |                |  |                  | FRAME COPY NO. |  |      |           |                  |
| DATE                 | 10.05.05      |                |  |                  |                |  |      |           |                  |

|             |             |       |               |                   |
|-------------|-------------|-------|---------------|-------------------|
| <br>293-092 | TYPE        | GROUP | OLD DRG.      | NEW DRG. RETRACED |
|             | TITLE       |       | DRAWING No.   |                   |
|             | FACING TOOL |       | 40-T-36-23975 |                   |

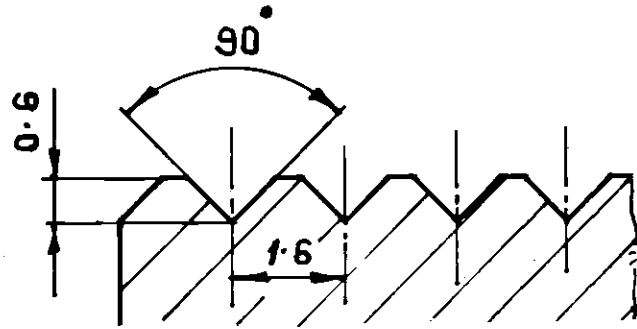
HARDEN & TEMPER TO 61 $\pm$ 1 HRC.

1.6 / 0.4



SEC.-A-A'

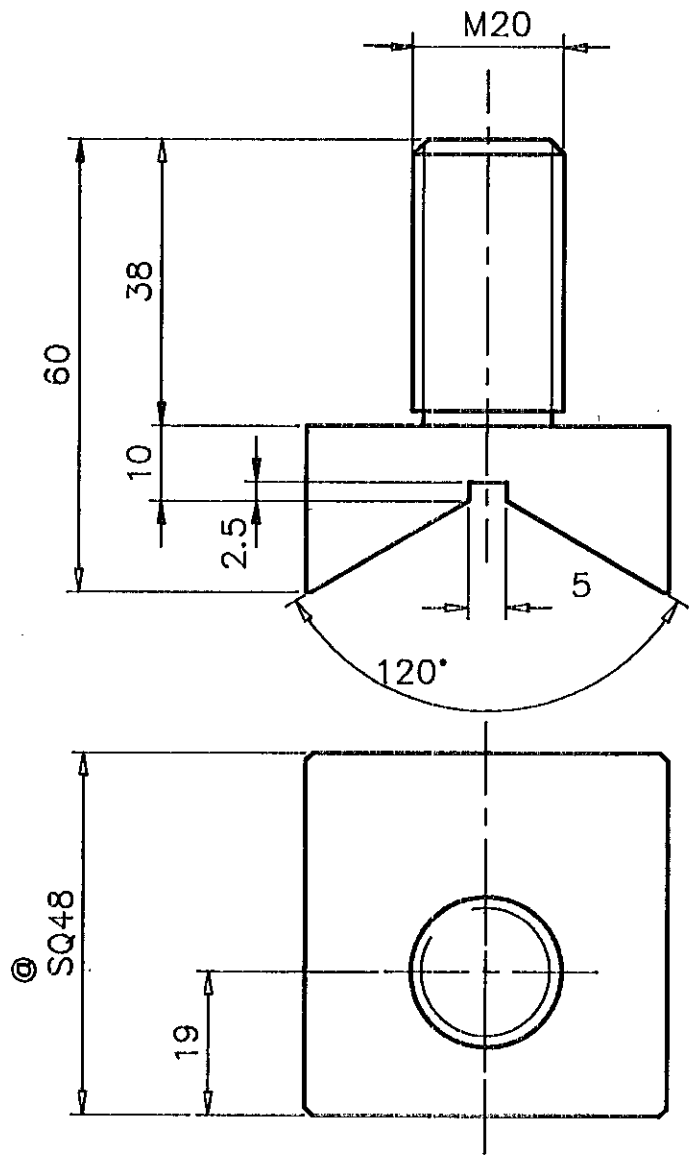
SCALE:- 10:1



|                             |                   |  |                |                               |            |               |               |                  |          |
|-----------------------------|-------------------|--|----------------|-------------------------------|------------|---------------|---------------|------------------|----------|
| COMP. DRG. No.              |                   | -                                      |                | TOOL No: 36-10318-00          |            |               |               |                  |          |
| COMP. DES.                  |                   | TUBES.                                 |                |                               |            |               |               |                  |          |
| TYPE / GROUP                |                   | 11 WC: 4395                            |                |                               |            |               |               |                  |          |
| USE WITH                    |                   | 48-14114-00                            |                |                               |            |               |               |                  |          |
| 7.8 x 16 x 55               |                   | IS 1570 T75 W18<br>Co 6 Cr 4 V 1 Mo 75 |                |                               |            | 0.06          |               |                  |          |
| NO OF PIECES                | NAME - DIMENSIONS | SEMI-PRODUCT                           | FINAL MATERIAL | INITIAL MATERIAL              | SCRAP SORT | NET Wt (kg)   | GROSS Wt (kg) | DRAWING NO.      | ITEM NO. |
| REMARKS FOR TUBES. WC: 4395 |                   |  |                | TOTAL NET Wt (kg)             |            |               |               |                  |          |
| SCALE                       | DRAWN / TCD       | KSR / SMRAJA                           |                | ALTERATIONS                   |            | DATE          | SIGNATURE     | ALTERATION INDEX |          |
| 1:1                         | CHECKED           |  |                |                               |            |               |               |                  |          |
| 10:1                        | APPROVED          | V.C                                    |                |                               |            |               |               |                  |          |
|                             | STOS. OFFICER     |  |                | TRANS. COPY NO.               |            |               |               |                  |          |
|                             | DATE              | 100697                                 |                | M/C PORTABLE END CUT SCARFING |            |               |               |                  |          |
| TYPE                        |                   | GROUP                                  |                | OLD DRG.                      |            | NEW DRG.      |               |                  |          |
| TITLE                       |                   | EDPRTOOLENDS CARFING X                 |                | DRAWING NO.                   |            | 40-T-36-23978 |               |                  |          |
| 33-116                      |                   |  |                |                               |            |               |               |                  |          |

HARDEN & TEMPER TO 28HRc  
CHAMFER SHARP EDGES.

3.2/  
✓/



**TOLERANCE FOR UNTOLERANCED DIMENSIONS**  
 UPTO 6 MM = ±0.1 MM  
 > 6 UPTO 120 MM = ±0.2 MM  
 MORE THAN 120 MM = ±0.5 MM  
 ANGULAR TOLERANCE = ±0.5 DEG  
 CHAMFER = ±0.5 (R)

|             |       |          |                      |  |
|-------------|-------|----------|----------------------|--|
| COMP.DRG.NO |       |          | TOOL NO- 50-10330-00 |  |
| COMP. DES.  | PIPES |          |                      |  |
| TYPE&GROUP  | 80    | W.C-4393 |                      |  |

| 48x48x60      |                 |              | IS 1875<br>CL 4 | 0.5              |            |             |               |             |          |
|---------------|-----------------|--------------|-----------------|------------------|------------|-------------|---------------|-------------|----------|
| NO. OF PIECES | NAME-DIMENSIONS | SEMI-PRODUCT | FINAL MATERIAL  | INITIAL MATERIAL | SCRAP SORT | NET WT (KG) | GROSS WT (KG) | DRAWING NO. | ITEM NO. |

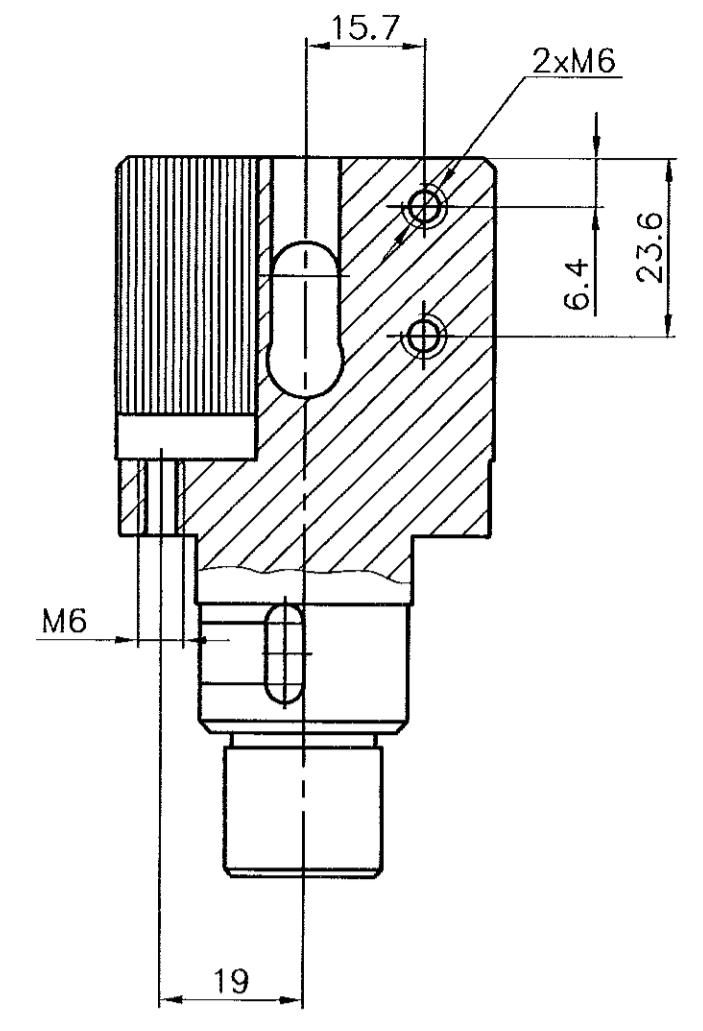
|              |               |        |                 |                  |        |           |                  |
|--------------|---------------|--------|-----------------|------------------|--------|-----------|------------------|
| REMARKS      |               |        |                 | TOTAL NET WT(Kg) |        |           |                  |
| SCALE<br>1:1 | DRAWN         | GSM    | TRANS. COPY NO. | ALTERATIONS      | DATE   | SIGNATURE | ALTERATION INDEX |
|              | CHECKED       | KSB    |                 | DIM 48 WAS 50    | 290879 | A.KUMAR   | ●                |
|              | APPROVED      | VC     |                 |                  |        |           |                  |
|              | STDG. OFFICER |        |                 |                  |        |           |                  |
|              | DATE          | 100393 |                 |                  |        |           |                  |

|               |       |       |               |          |
|---------------|-------|-------|---------------|----------|
| <p>33-116</p> | TYPE  | GROUP | OLD DRG.      | NEW DRG. |
|               | TITLE |       | DRAWING No.   |          |
|               | CLAMP |       | 40-T-50-25962 |          |

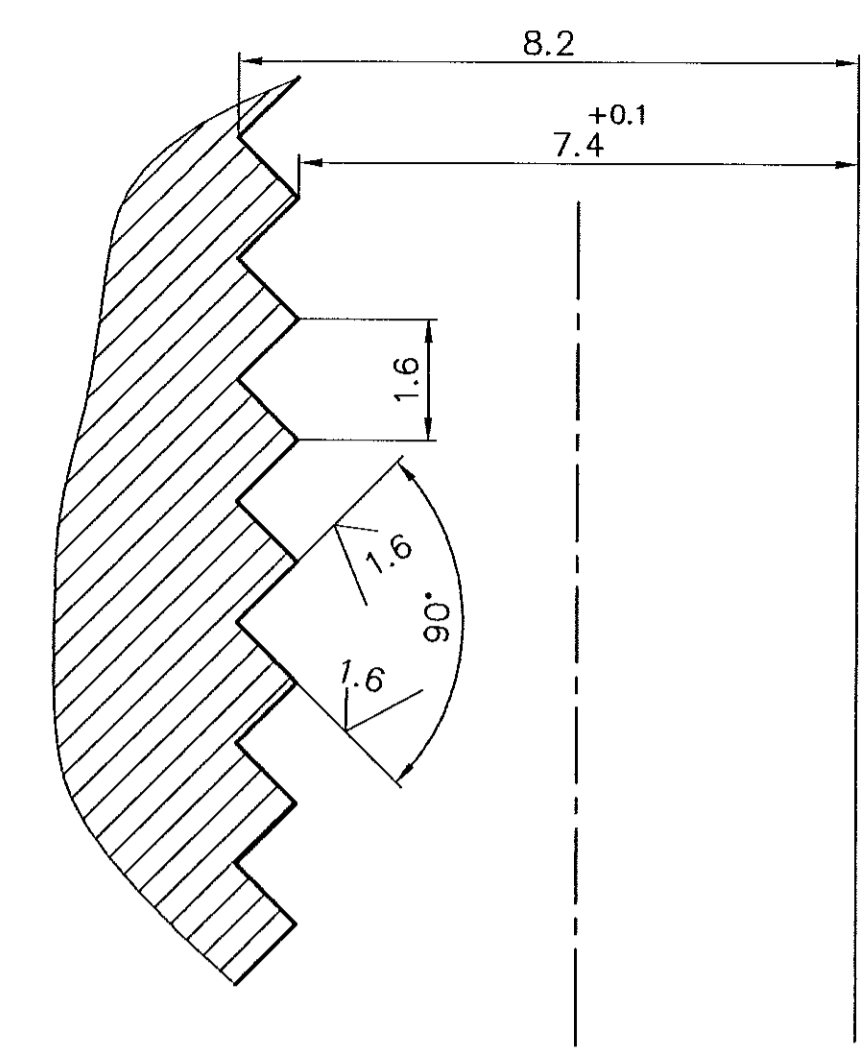


CARBO NITRIDE TO 0.65mm DEPTH HARDEN & TEMPER TO 55 TO 58 HRC. CHAMFER ALL SHARP EDGES TO 1x45°.

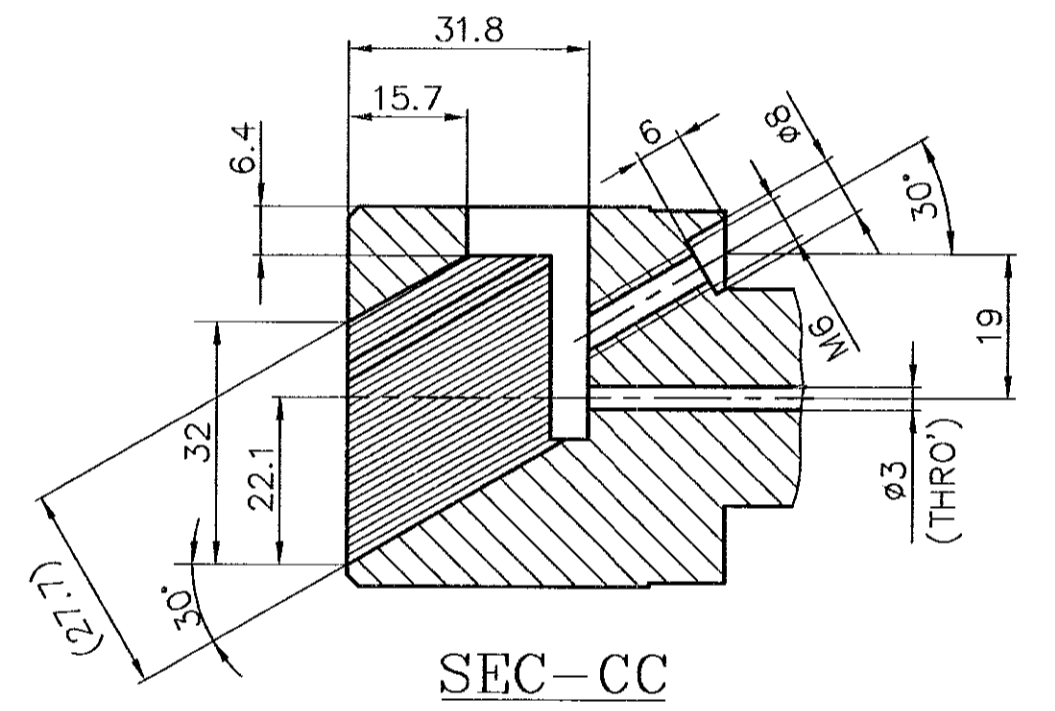
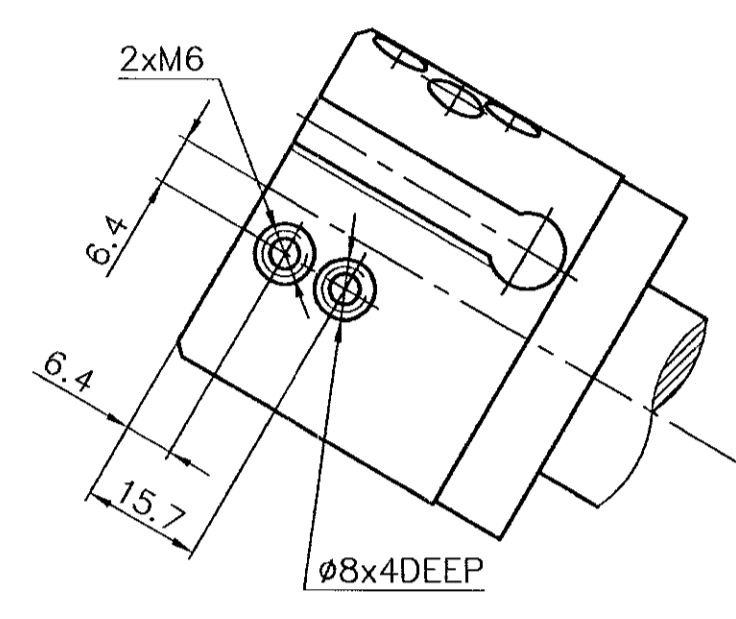
|                                       |            |     |
|---------------------------------------|------------|-----|
| 3.2                                   | 1.6        | 0.8 |
| TOLERANCE FOR UNTOLERANCED DIMENSIONS |            |     |
| UPTO 6 MM                             | = ±0.1 MM  |     |
| > 6 UPTO 120 MM                       | = ±0.2 MM  |     |
| MORE THAN 120 MM                      | = ±0.5 MM  |     |
| ANGULAR TOLERANCE                     | = ±0.5 Deg |     |
| CHAMFER                               | = ±0.5 Deg |     |



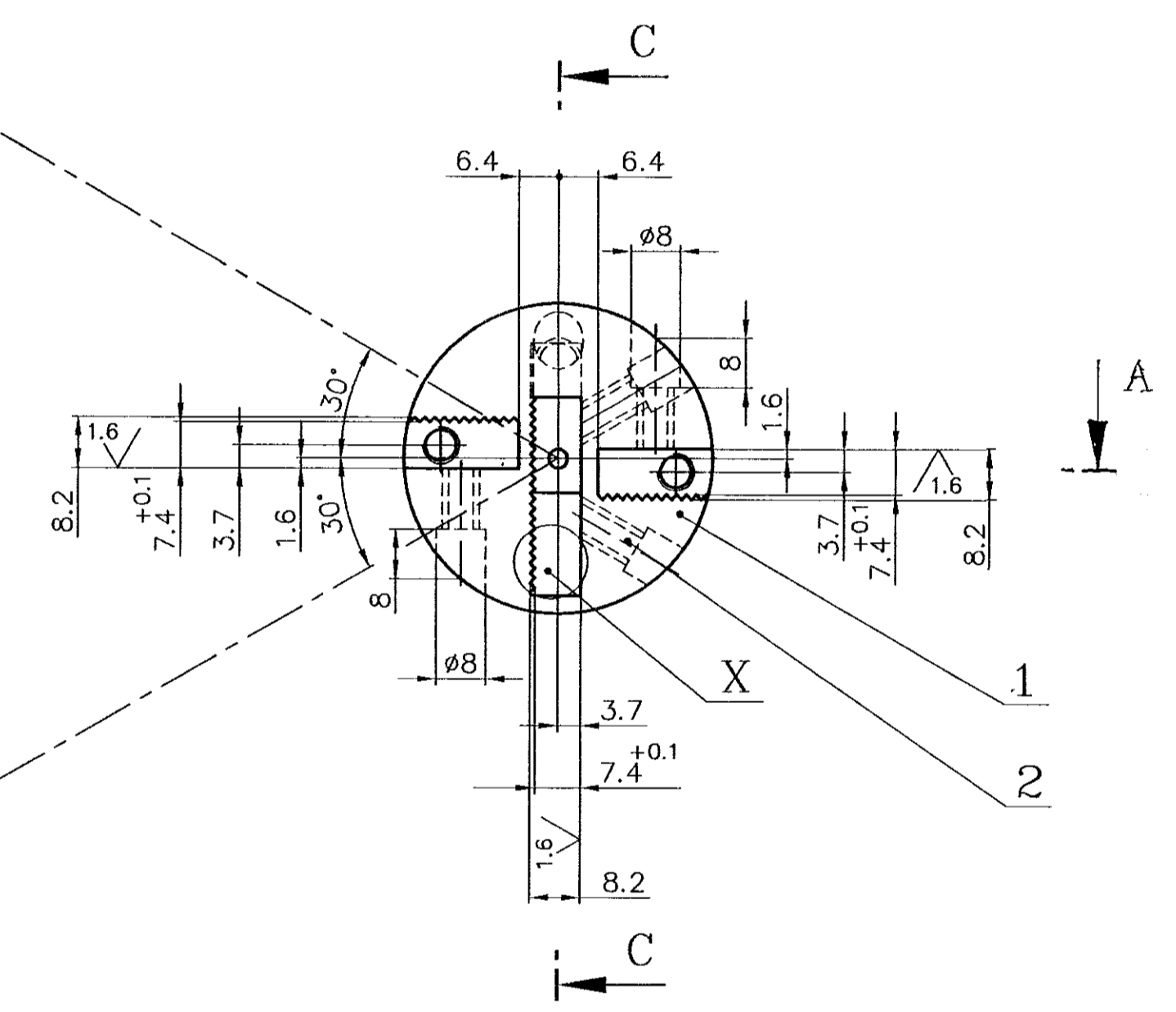
SEC-BB



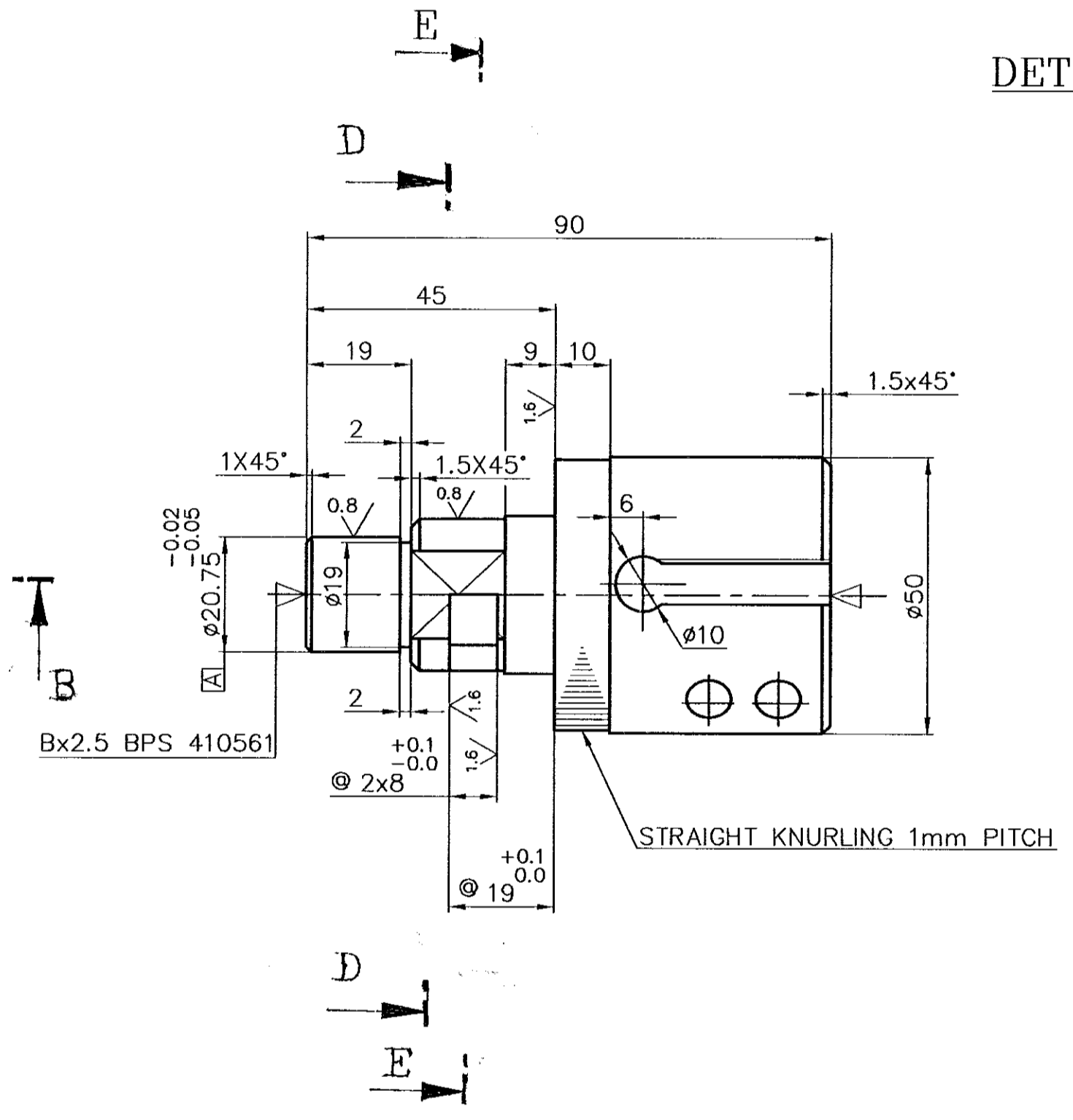
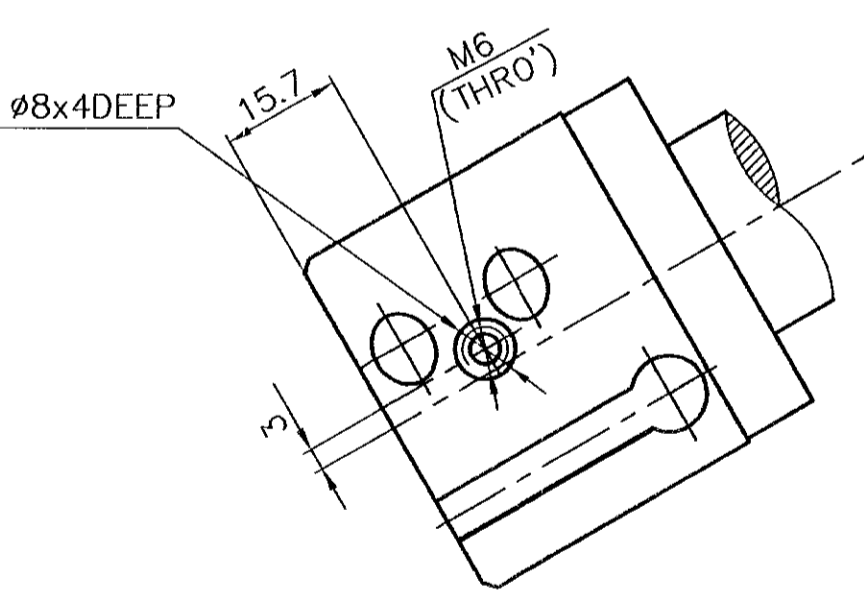
DETAIL 'X' SERRATIONS  
SCALE: -10:1



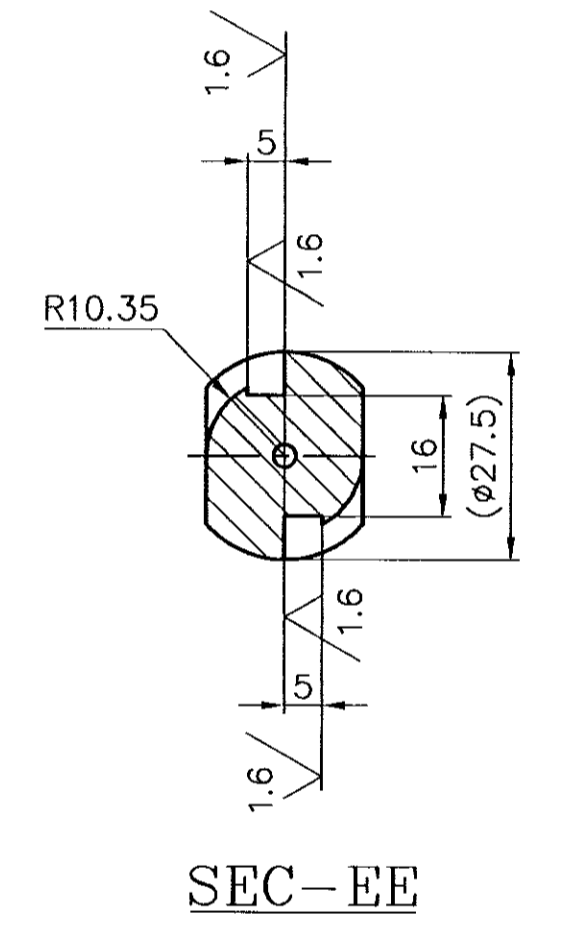
SEC-CC



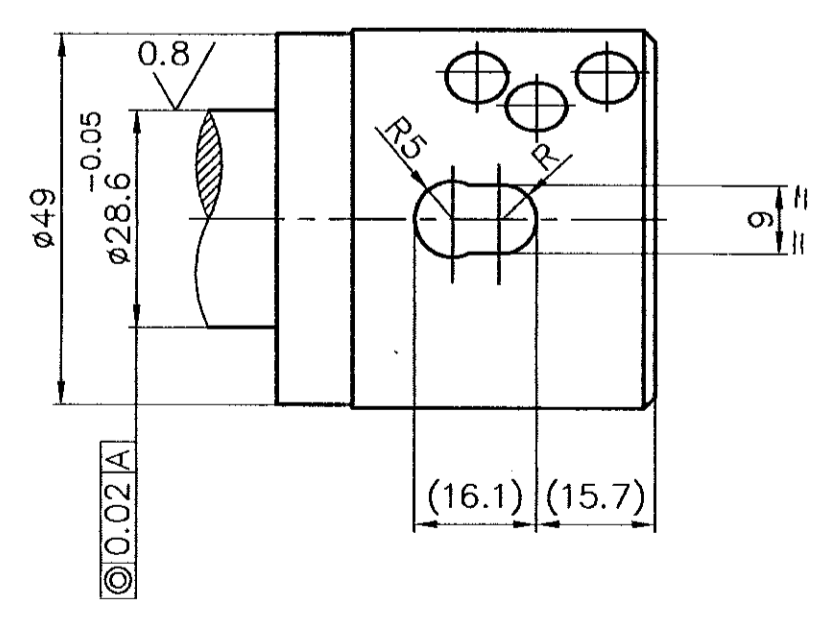
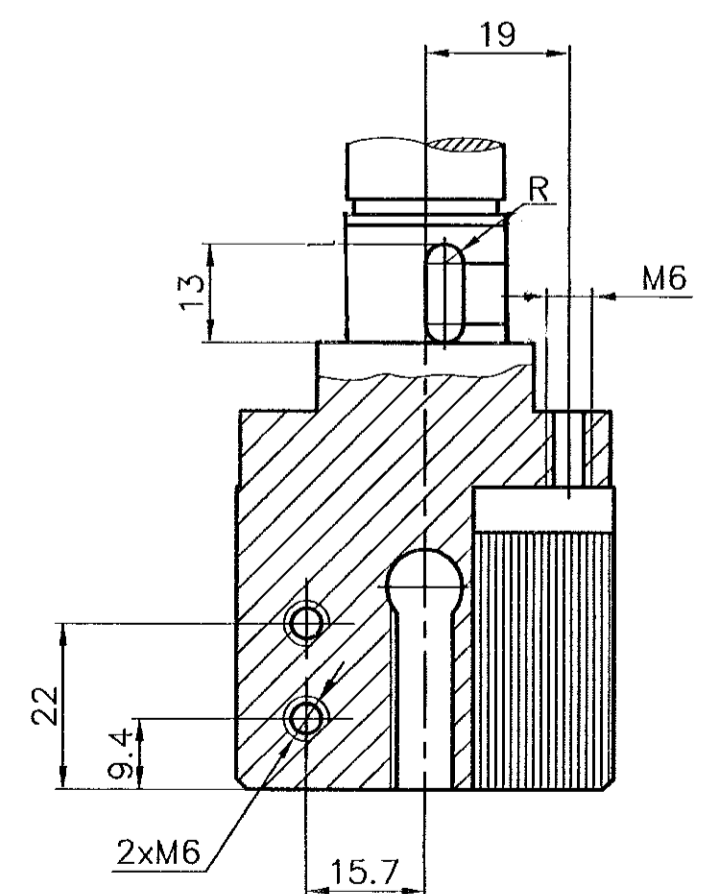
SEC-AA



SEC-DD



SEC-EE



|                |   |                        |      |  |  |  |  |  |   |
|----------------|---|------------------------|------|--|--|--|--|--|---|
| 10             | ALLEN GRUB SCR M6x20 (IS-6094-A-45H-CD) |                        |      |  |  |  |  |  | 2 |
| 1              | HOLDER Ø50x90                           | IS: 1570 13 Ni 3Cr 80  | 0.93 |  |  |  |  |  | 1 |
| COMP. DRG. NO. |   | TOOL NO :- 48-14114-00 |      |  |  |  |  |  |   |
| COMP. DESC.    |   | RANGE: Ø44.5 TO Ø51    |      |  |  |  |  |  |   |
| GROUP:         |   | 06.231 W.C: - 5991     |      |  |  |  |  |  |   |

**BHARAT HEAVY ELECTRICALS LTD.,**  
BOILER PLANT UNIT, TIRUCHIRAPALLI-14

|                                |                   |                      |                      |
|--------------------------------|-------------------|----------------------|----------------------|
| FIRST ANGLE                    | SCALE 1:1<br>10:1 | DRAWN R.VINOTH KUMAR | TOTAL NET WT.KG 0.93 |
| CHECKED                        | APPROVED          | DATE 19.05.05        | TYPE                 |
| ALL DIMENSIONS IN MILLIMETRES. |                   |                      |                      |

**CAUTION**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. BOILER PLANT UNIT, TIRUCHY-14 AND SHALL NOT BE USED WITHOUT THEIR EXPRESS WRITTEN PERMISSION IN ANY FORM OR PART THEREOF FOR ANY OTHER PURPOSE THAN FOR WHICH IT IS ISSUED TO YOU.

|                                   |          |
|-----------------------------------|----------|
| TOOL HOLDER                       |          |
| TOOL HOLDER (INSERT SCARFING M/C) |          |
| DRAWING NO.                       | REVISION |
| 10-T-48-15163                     | A        |

|               |         |      |
|---------------|---------|------|
| DATE          | ALTERED | SSP  |
| 7.12.84       | CHECKED | BKR  |
| ZONE          |         |      |
| 19+0.01 & 2x8 |         | WERE |
| 19+0.01 & 2x8 |         |      |