An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2851300012**	**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 Insert Scarfer**	**6 Nos.**	**End January 2015**	**F.O.R, BHEL Stores, POWER EQUIPMENT FABRICATION PLANT, BHARAT HEAVY ELECTRICALS LIMITED, Mundipar- 441804, Sakoli Taluk, Bhandara District, Maharashtra State.**
20	**Tube Insert Scarfer**	**22 Nos.**	**6 Months from PO date**	**F.O.R ,BHEL Stores, HIGH PRESSURE BOILER PLANT, BHARAT HEAVY ELECTRICALS LIMITED, Tiruchirappalli- 620014, Tamilnadu State.**

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

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

1. **Checklist No. IND 02A / IMP 02 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 two item (Sl. 10-20) i.e. overall L1. Hence the supplier has to quote for both the items else the offer would not be considered for evaluation.**
3. **EMD for this Tender will be Rs. 1,50,000/-**
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 "2851300012".

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
1.0	**QUALIFYING CRITERIA**	
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 (**OEMs**), who have supplied and commissioned **atleast TWO numbers ofpneumatically operated heavy duty portable tube end chamfering machines** 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 **pneumatically operated heavy duty portable tube end chamfering machines**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.	

2.0	**INFORMATION TO BE PROVIDED BY VENDOR**	
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 BuiltPneumatically 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-upin India including the Address of Agents /Service Centres in India.	
2.4	Any Additional Data to supplement themanufacturing capability of the BIDDERfor the subject equipment.	

Suggestive Format of Performance Certificate:

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

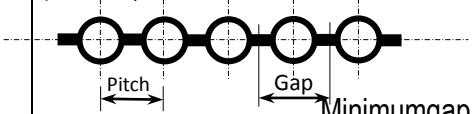
PERFORMANCE CERTIFICATE

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 b. Machining capability	
6	Performance of the Machine (Strike off whichever is notapplicable)	Satisfactory / Good / Average / NotSatisfactory
7	After sales service (Strike off whichever is notapplicable)	Satisfactory / Good / Average / NotSatisfactory
8	Any Other remarks	

Signature & Seal of the Authority
Issuing the Performance Certificate

Date:

TECHNICAL SPECIFICATION FOR
PORTABLE PNEUMATIC TUBE INSERTSCARFING MACHINE
PART - B

S.No	Description	BHEL Specification	Vendors Offer
1.0	**PURPOSE/ FUNCTION**	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	**Tube end preparation - requirements**		
2.1	Tube ODChamfering	Outside Bevelling 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 30^0	
2.4	Accuracy	Face out : +/- 0.1 mm Bevelling Angle : +/- 0.5 degree	
2.5	Machining Mode	Any of the above two operations are to be done simultaneously.	
3.0	**Job Specification**		
3.1	Jobs	Tube ends of cut-outs made in Tubular Panels (see sketch in the last page)	
3.2	Tube ODx Th Range of Tubes	Tube OD: 38.1 x Th. 3.6 to 10.7 Tube OD: 41.3 x Th. 4.0 to 8.2 Tube OD: 42.4 x Th. 4.0 to 8.6 Tube OD: 44.5 x Th. 4.0 to 8.7 Tube OD: 51.0 x Th. 4.0 to 11.0 Tube OD: 54.0 x Th. 3.6 to 12.5 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, Tube dia. 41.3mm and Pitch 54mm in tubular panels.(Pitch: between centre of tubes)  Minimumgap : 61 mm	

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) ii) ALLOY STEEL: SA 213 Gr.T2, T11, T12, T22, T91,T92 (ASTM) 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.	
4.0	**Cutting Tools, Tool Holders& Job Clamp Sizes**		
4.1	O D Clamping Sizes (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. **Cutting speed 15 to 20 m/min**	
4.3	Tool Bits configuration	a) 37.5° for O.D bevelling b) Facing c) I.D straight boring for a depth of min. 25 mm from tube end face with merging taper of 30^0	
4.4	Cutting Tool Bits Sample drgs.	The cutting tool bits to be offered as per the drawings given below: Serrations for tool cutting bits for gripping in tool holder slots to be as per the drawings. a) 40-T-36-24296-1 – 45^0 chamfer b) 40-T-36-24168-0 – $37½^0$ chamfer c) 40-T-36-23975-0 – Facing tool d) 40-T-36-23978-0 – ID boring tool	
4.5	Tube Holding clamps	a) 40-T-50-25962-0 – Top Clamp 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
5.0	**Machine Output Ratings:**		
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.	
6.0	**Machine Configuration:**		
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 Sl.No. 4.1 as per Drg. No. 40-T-50-25962-0 – Top Clamp 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.	
7.0	**Air Motor:**		
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.	
8.0	**Pneumatic Circuit:**		
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.	
9.0	**Makes of components:**		
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
10.0	**Painting:**		
10.1	Paint	Poly Urethane	
10.2	Colour	Apple Green Colour, RAL 6011	
11.0	**Spares:**		
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.	
12.0	**Operation and Maintenance Manuals:**		
12.1	O & M Manual Details	Manualsshall contain the following details: a) Blow-up details of assembly / dismantling, part numbers with part description (detailed sub drawings of machine parts) for Maintenance, Safety Instructions while using, b) Operating Sequence for using the equipment. Trouble Shooting Chart. c) Catalogue of all bought out items. d) Lubrication schedule. e) Preventive Maintenance check list. f) Tool holder drawings. g) Tool insert details 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	
13.0	**Pre-dispatch Inspection:**		
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.	
14.0	**Commissioning:**		
14.1	Commissioning at BHEL works	Supplier's representative shall be deputed for commissioning and performance prove-out of the equipment at BHEL works.	

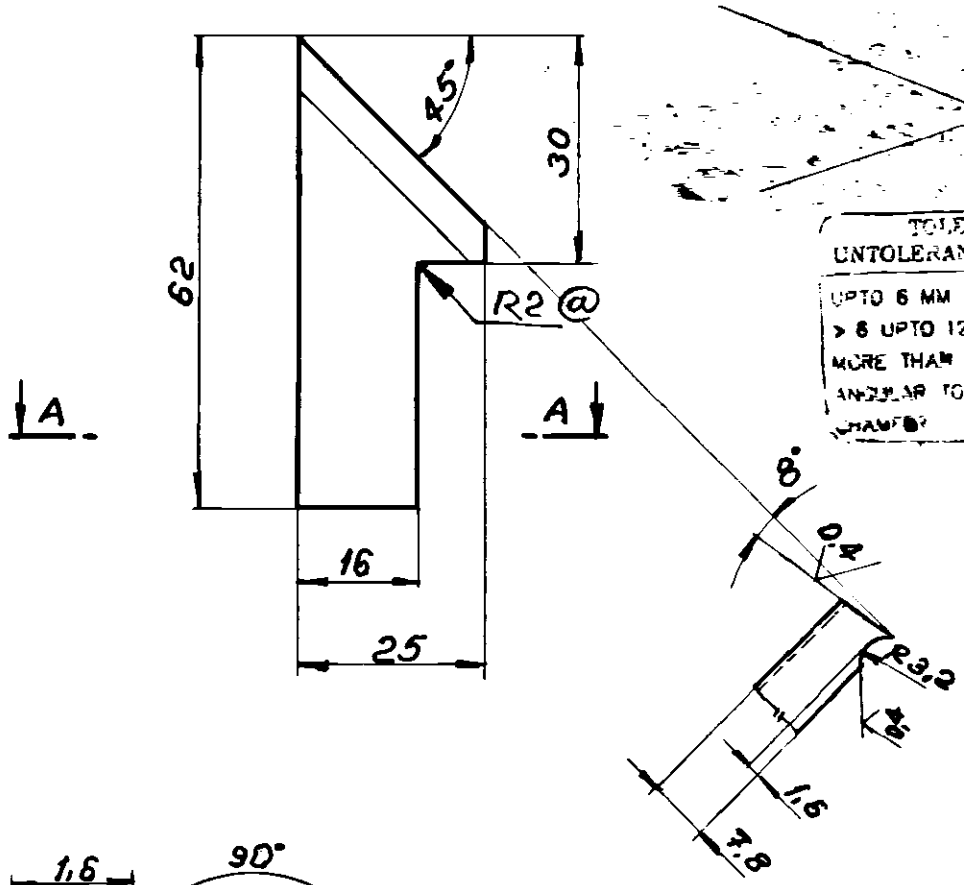
S.No	Description	BHEL Specification	Vendor's Offer
14.2	Prove out Trials	Capability: Tube OD: 51mm x Th. 11mm – Alloy steel (T22) with gas cut edges – 45^0 chamfer.	
14.3	Prove out Trials	Productivity:12 tube ends per hour on Tube OD 38.1mm x Thick 8.0mm / T11 or T22 – Gas cut ends with 5mm excess length for three hours.	
15.0	**Training:**		
15.1	Training	Training on Operation and Maintenance of the equipment shall be provided for a minimum period of two days	
16.0	**Guarantee:**		
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.	
17.0	**General:**		
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 – 45^0 chamfer
2. 40-T-36-24168-0 – $37½^0$ 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

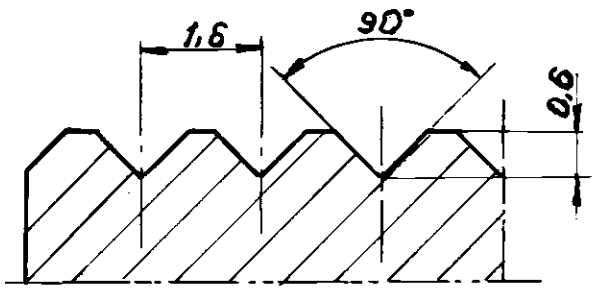
A	DATE 12·3·86	ALTERED
		CHECKED
ZONE @	R2-ADDED	

1.6 / 0.4



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	= ±1°
CHAMFER	= ±0.5 MM



HARDEN AND TEMPER TO 62 $^{\pm 1}$ HRC

SECTION: 'A-A'

SCALE: 10:1

TOOL NO : 36-10333-00

45°

	7.8 x 25 x 62		IS 1570 T 75 W18 Co6 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 1:1	DRAWN	[illegible]	TOTAL NET wt (kg)	
		CHECKED		TYPE	
		APPROVED		COMPNT. No.	2-09-04-04-001
ALL DIMENSIONS IN MILLIMETRES		DATE	W.C. 5999	/OLD DRG. NO.	

TITLE

CHAMFERING TOOL

FOR PORTABLE ENDCUT SCARFING MACHINE

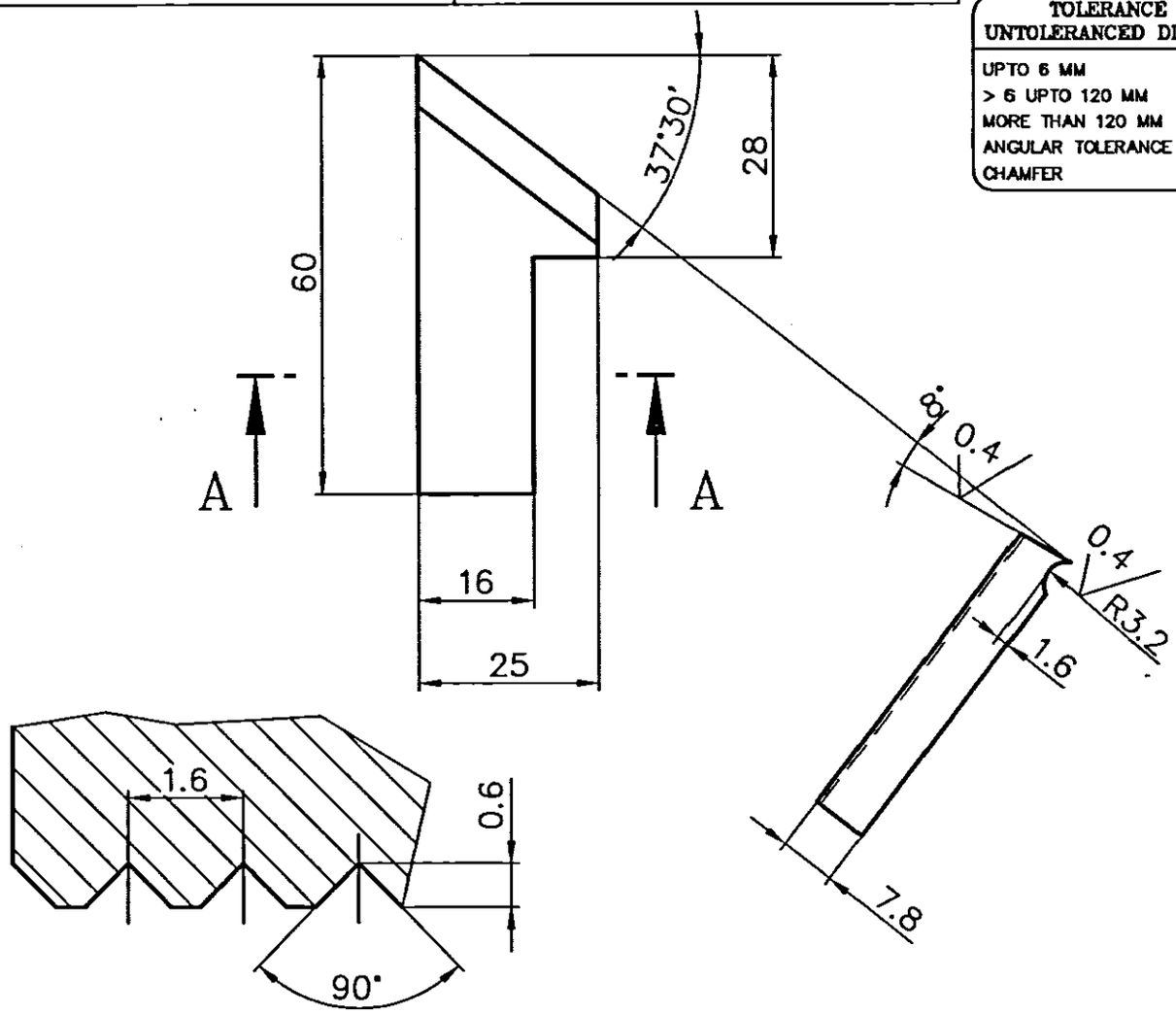
DRAWING NO. 40.T.36.24296

REVISION A

HARDEN & TEMPER TO
$62^{\pm 1}$ HRc.

1.6 // 0.4

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



SECTION–AA

SCALE: –10:1

COMP.DRG.NO	–	TOOL NO: 36–63005–00	
COMP.DESC	TUBES		
TYPE/GROUP	11	W.C: –4393	USE WITH: 48–14110–00

NO. OF PIECES	NAME–DIMENSIONS	SEMI–PRODUCT	FINAL MATERIAL	INITIAL MATERIAL	SCRAP SORT	NET WT (KG)	GROSS WT (KG)	DRAWING NO.	ITEM NO.
	7.8x25x60	T75 W18	IS 1570 Co6Cr4V1Mo75			0.1			

REMARKS: KSR/SSP/G

TOTAL NET Wt(kg)

SCALE				ALTERATIONS	DATE	SIGNATURE	ALTERATION INDEX	
1:1	DRAWN	R.VINODH KUMAR						
10:1	CHECKED	N. Sivaramakrishnan						
	APPROVED	G Balasubramanian						
	STDS. OFFICER		TRANS. COPY NO.					
	DATE	10.05.05						

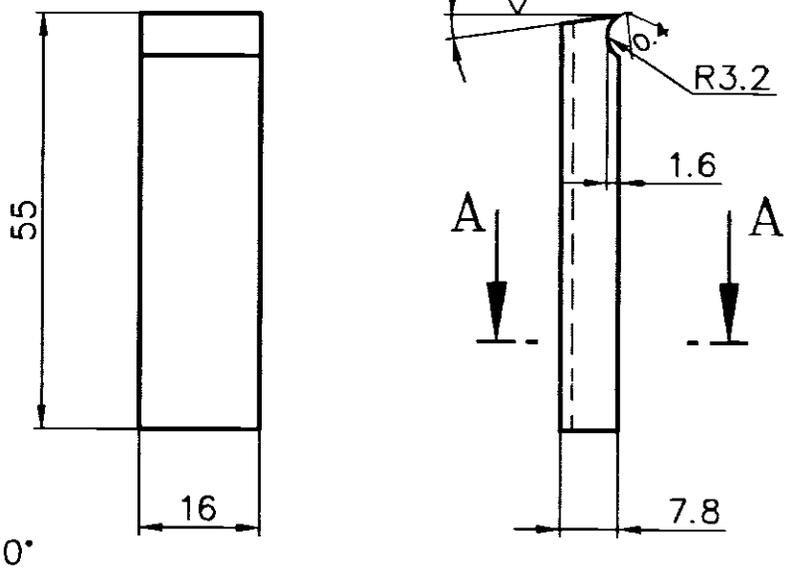
293–092

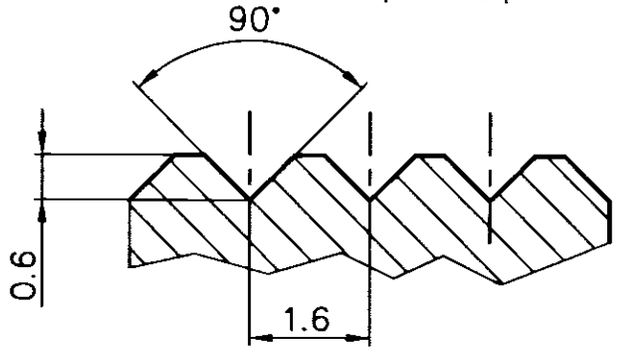
TYPE	GROUP	OLD DRG. RETRACED	NEW DRG.
TITLE: CHFRTOOL0375D08161NT		DRAWING No.: 40–T–36–24168	

HARDEN & TEMPER TO
$62^{\pm 1}$ HRc.

1.6 // 0.4

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





SECTION–AA

SCALE: –10:1

COMP.DRG.NO	–	TOOL NO: 36–10315–00	
COMP.DESC	TUBES	M/C PORTABLE END CUT SCARFING	
TYPE/GROUP	11	W.C: –4395	

NO. OF PIECES	NAME–DIMENSIONS	SEMI–PRODUCT	FINAL MATERIAL	INITIAL MATERIAL	SCRAP SORT	NET WT (KG)	GROSS WT (KG)	DRAWING NO.	ITEM NO.
	7.8x16x55		IS 1570 T75 W18Co6Cr4 V1 Mo75			0.06			

REMARKS

TOTAL NET WT(kg)

SCALE			
1:1	DRAWN	R.VINODH KUMAR	
10:1	CHECKED		
	APPROVED		
	STDS. OFFICER		TRANS. COPY NO.
	DATE	10.05.05	

ALTERATIONS	DATE	SIGNATURE	ALTERATION INDEX	

293–092

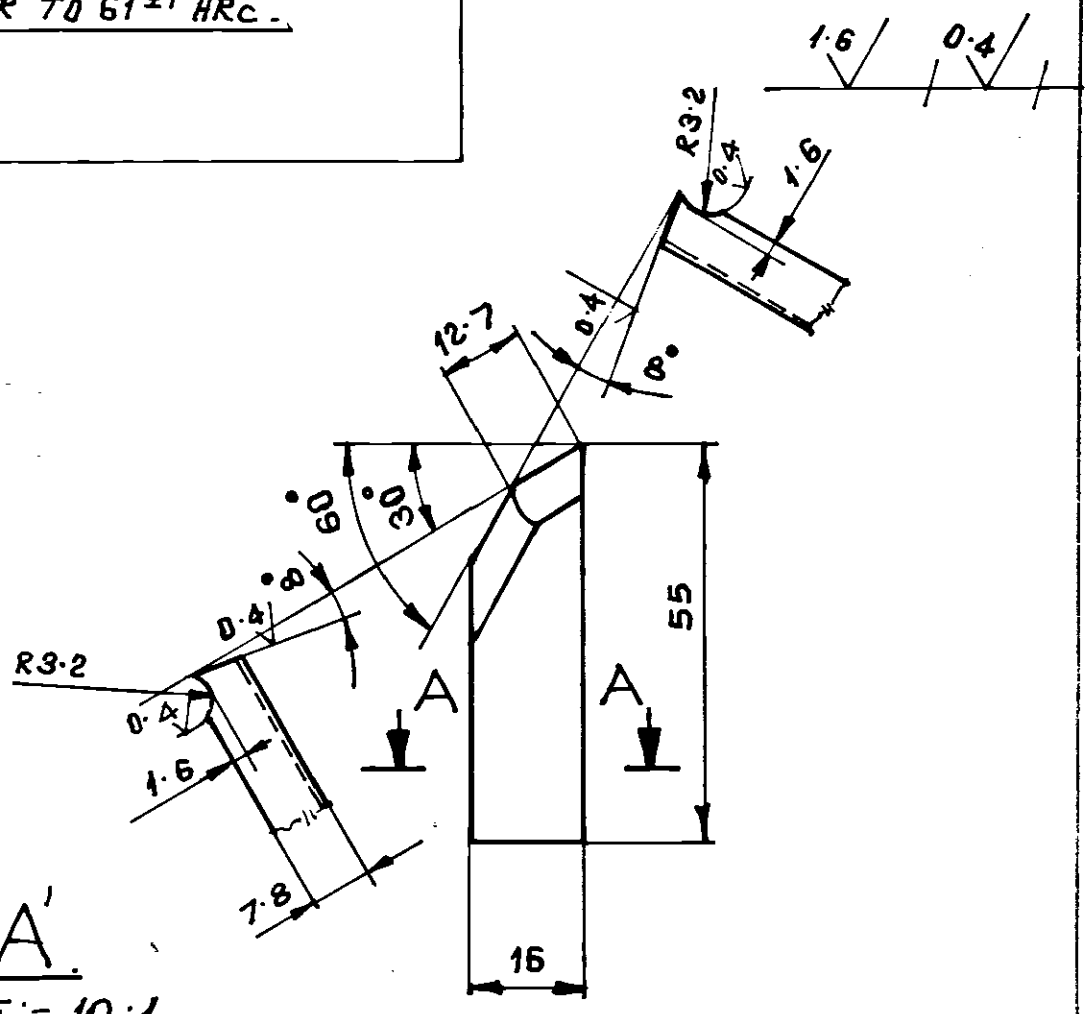
TYPE GROUP

TITLE
FACETOOL000000716000
FACING TOOL

OLD DRG. NEW DRG. RETRACED

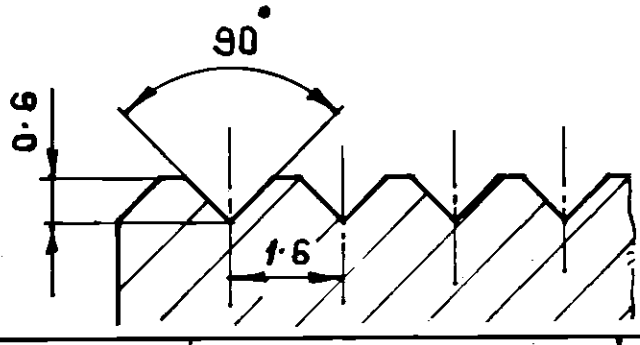
DRAWING No.
40–T–36–23975

HARDEN & TEMPER TO 61 ±1 HRc.



SEC.-'A-A'.

SCALE:- 10:1



COMP. DRG. No.	—
COMP. DES.	TUBES.
TYPE / GROUP	11 WC: 4395
USE WITH	48-14114-00

TOOL No: 36-10318-00

NO OF PIECES	NAME - DIMENSIONS	SEMI - PRODUCT	FINAL MATERIAL	INITIAL MATERIAL	SCRAP SORT	NET wt (kg)	GROSS wt (kg)	DRAWING NO.	ITEM NO.
	7·8 X 16 X 55	IS 1570 T75 W18	Co 6 Cr 4 V 1 Mo 75			0·06			

REMARKS FOR TUBES. WC: 4395

TOTAL NET WT (kg)

SCALE			
1:1	DRAWN / TCD	KSR / SMRAJA	
10:1	CHECKED		
	APPROVED	V.C	
	STOS. OFFICER		TRANS. COPY NO.
	DATE	100697	

ALTERATIONS	DATE	SIGNATURE	ALTERATION INDEX

M/C PORTABLE END CUT & SCARFING

TYPE	GROUP	OLD DRG.	NEW DRG

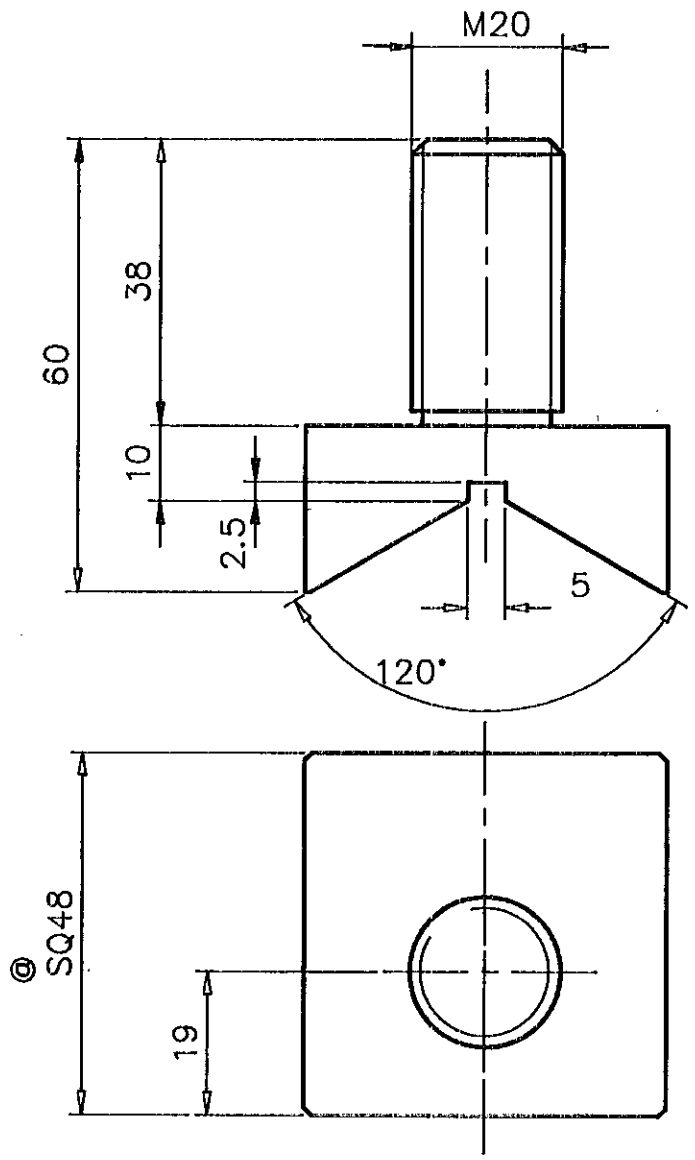
TITLE: EDPRTOOLENDSCARFINGX

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	= 1.0 (45°)

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

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

REMARKS

TOTAL NET WT(kg)

SCALE		
1:1	DRAWN	GSM
	CHECKED	KSB
	APPROVED	VC
	STDS. OFFICER	
	DATE	100393

TRANS. COPY NO.

ALTERATIONS	DATE	SIGNATURE	ALTERATION INDEX
DIMN 48 WAS 50	290879	A.KUMAR	●

BHEL 33-116

TYPE | GROUP | OLD DRG. | NEW DRG.

TITLE: CLAMP

DRAWING No. 40-T-50-25962

DRAWING NO. 20-T-50-22846/04

FOR IS 1875 CL4: HARDEN&TEMPER TO 28 HRc.
FOR IS 1570 13Ni3 Cr80
CASE CARBURISE TO A DEPTH OF 0.8mm & HARDEN AND TEMPER TO 56–58 HRc.

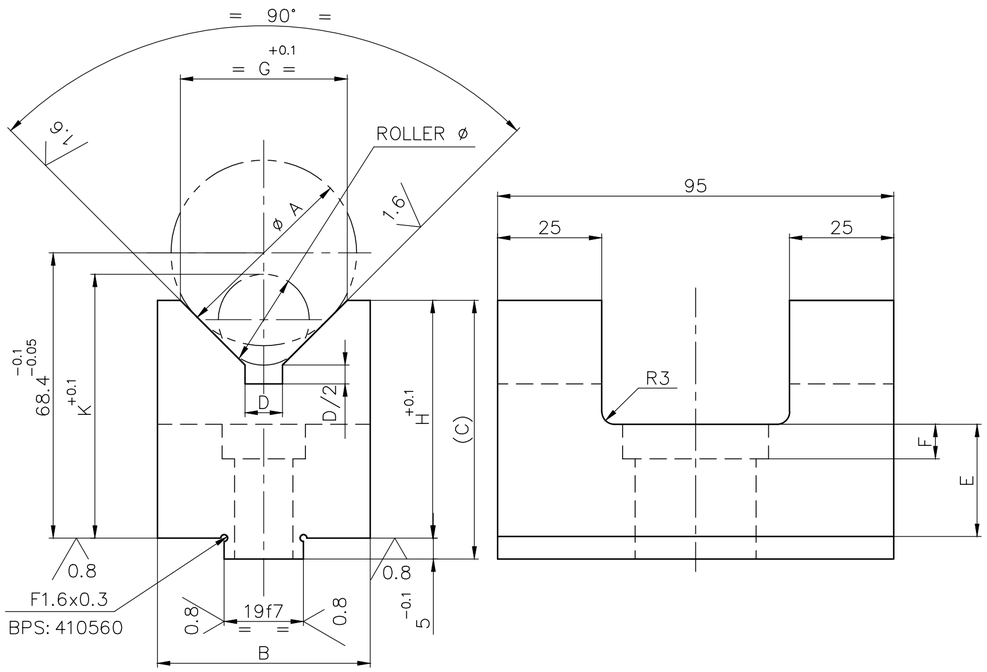
REMOVE SHARP CORNERS. PROFILE END CUT SCARFING M/C .
REF. DRAWING No. SC.8000.013.

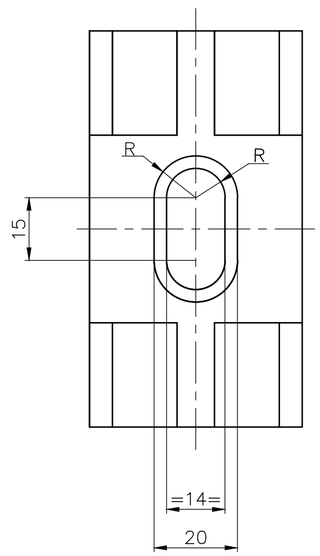
3.2 1.6 0.8

19f7 $^{-0.020}_{-0.041}$

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





SL.NO	TOOL NO	TUBE ø A	B	(C)	D	E	F	G +0.1	H +0.1	ROLLER ø	K +0.1	Wt	W.C	PARAMETER	DRN	CHD	APPD	DATE
21	50–16465–00	52	52	58	9	30	14	42.74	53	50	92	1.68	5991	05200 xxxx xxx	H.G	N.E	G.S	16.6.12
20	50–16367–00	69.85	70	54 (04)	25	30	–	60	49	50	79.36	2	5991	06985 xxxx xxx	R.D	N.E	G.S	21.11.11
19	50–16143–00	41.3	45	59.05	10	35	14	29.70	54.05	40	87.48	1.32	5991	0413 xxxx xxx	R.T.S	N.E	G.S	30.01.09
18	50–15779–00	73	73	55	20	14	8	66.44	50	50	77.14	1.6	5991	0730 xxxx xxx	GUNA	GS	GS	
17	50–14983–00	33.7	51	67	8	45	14	34.86	62	36	88.03	1.89	5991	03370 xxxx xxx	SMR	GS	GS	
16	50–14948–00	24	50	70	8	51	14	27.14	65	30	87.64	1.82	5991	02400 xxxx xxx	GSM	GSM	RN	
15	50–14765–00	42	45	63	10	35	14	38.60	58	40	86.98	1.49	5991		SMR	GS	RN	
14	50–14621–00	21.8	48	70	8	53	14	24.03	65	30	89.21	1.75	5991		SMR	GS	GS	
13	50–14620–00	34.2	46	67	9	44	14	35.56	62	50	104.57	1.66	5991		SMR	GS	GS	
12	50–14619–00	48	58	63	10	34	14	47.08	58	50	94.81	1.49	5991		SMR	GS	GS	
11	50–14561–00	35	50	67	8	43	14	36.7	62	50	104.01	1.9	5991		TTV	KAB	V.C	
10	50–14511–00	31.8	51	70	8	45	14	38.17	65	50	106.27	1.78	5991		TTV	KAB	V.C	
9	50–14482–00	60.3	64	60	10	25	8	58.46	55	50	86.12	1.8	5991		TTV	KAB	V.C	
8	50–14130–00	57	64	63	10	28	8	59.8	58	50	88.46	1.69	5991		TTV	KAB	V.C	
7	50–14190–00	38	51	67	9	41	14	40.9	62	50	101.88	1.8	5991		TTV	KAB	V.C	
6	50–10341–00	47.63	51	61	9	34	14	42.6	56	50	95.08	1.62	5991		TTV	KAB	V.C	
5	50–10329–00	76.1	76	54	25	14	8	68.8	49	50	74.94	2.25	5991		TTV	KAB	V.C	
4	50–10328–00	63.5	64	57.15	10	23	6.5	57.3	52.15	50	83.85	1.47	5991		TTV	KAB	V.C	
3	50–10327–00	54	60	59.22	10	30	8	48	54.22	50	90.58	1.75	5991		TTV	KAB	V.C	
2	50–10326–00	51	51	58.3	9	30	14	41.9	53.3	50	92.69	1.71	5991		TTV	KAB	V.C	
1	50–10325–00	44.5	51	62	9	36	14	40	57	50	97.29	1.68	5991		TTV	KAB	V.C	

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.
	BxCx95			IS 1570 13Ni3Cr80 IS 1875 CL4					

COMP.DRG.NO	–
COMP. DES.	TUBES
TYPE&GROUP	W.C–5991

TOOL NO–50– –00

TUBE øA

BHARAT HEAVY ELECTRICALS LTD.,

BOILER PLANT UNIT, TIRUCHIRAPALLI–14

FIRST ANGLE.	SCALE NTS	DRAWN S.SENTHIL	TOTAL NET WT.KG
		CHECKED N.ELANGOVAN	TYPE
		APPROVED G.SUBRAMANIAN	RETRACED
ALL DIMENSIONS IN MILLIMETRES.		DATE 02.04.2009	NEW/OLD DRG NO. 20–T–50–15760

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.

293–090

TITLE.

V BLOCK FOR END SCARFING M/C

DRAWING NO. 20–T–50–22846

REVISION 04

	DATE	ALTERED / CHECKED	ZONE
04	16.6.12	ALTERED H.G CHECKED N.E	SL No: 21 ADDED (04) DIMENSION 54 MM WAS 49 MM
03	21.11.11	ALTERED R.DHANVAR CHECKED N.ELANGOVAN	SL No: 20 ADDED
02	02.04.09	ALTERED S.SENTHIL CHECKED N.ELANGOVAN	SOFT COPY CREATED
01	30.01.09	ALTERED R.T.SELVARAJ CHECKED N.ELANGOVAN	SL NO:19 ADDED

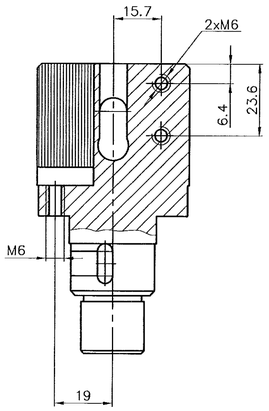
DRAWING NO. 10-T-48-15163

CARBO NITRIDE TO 0.65mm DEPTH HARDEN & TEMPER TO 55 TO 58 HRc.

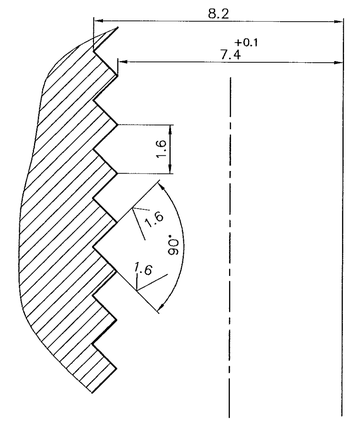
CHAMFER ALL SHARP EDGES TO 1x45°.

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

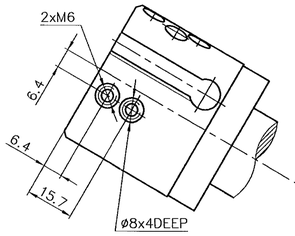


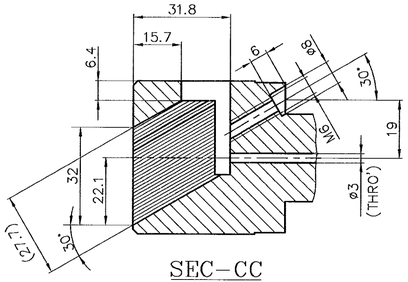
SEC–BB



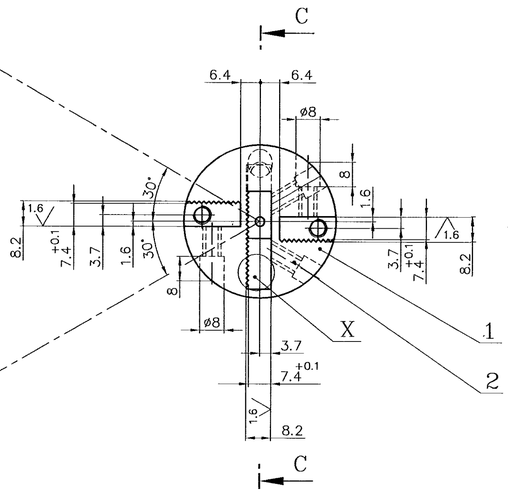
DETAIL 'X' SERRATIONS

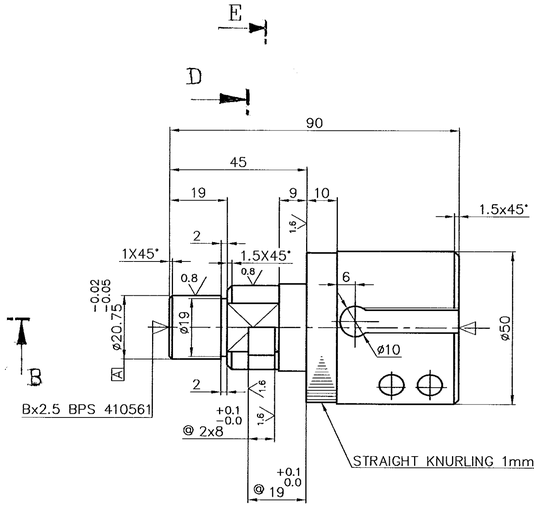
SCALE: –10:1

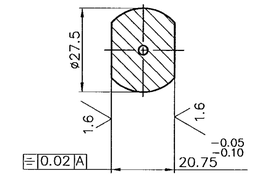




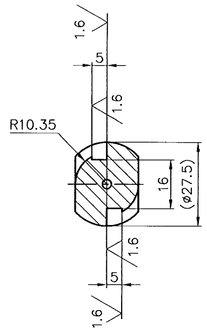
SEC–CC



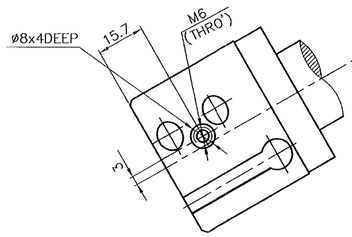


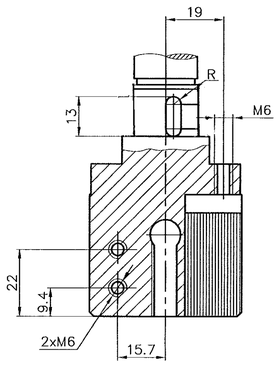


SEC–DD

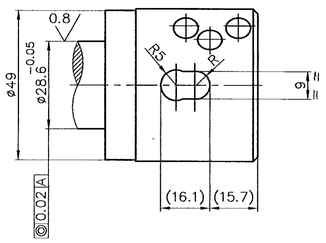


SEC–EE





SEC–AA



NO. OF PIECES	DESCRIPTION	SEM. PRO/SEQ. NO.	MT. MAT/SEQ. NO.	FINAL MATERIAL	SCRAP SORT	NET WT.(KG)	GROSS WT.(KG)	DRAWING NO	ITEM NO.
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.	–
COMP. DESC.	TUBES
GROUP:	06.231 W.C: – 5991

TOOL NO :- 48-14114-00

RANGE: ø44.5 TO ø51

BHARAT HEAVY ELECTRICALS LTD.,

BOILER PLANT UNIT, TIRUCHIRAPALLI–14

FIRST ANGLE.	SCALE 1:1 10:1	DRAWN	R.VINOTH KUMAR	TOTAL NET WT.KG	0.93
		CHEKED		TYPE	
		APPROVED			
ALL DIMENSIONS IN MILLIMETRES.		DATE	19.05.05.	NEW/OLD DRG NO.	

TITLE.

TOOL HOLDER

TOOL HOLDER (INSERT SCARFING M/C)

DRAWING NO. 10-T-48-15163

REVISION A

	DATE	ALTERED	CHECKED
A	7.12.84	SSP	BKR

ZONE @ $19^{+0.1}_{+0.0}$ & $2x8^{+0.1}_{+0.0}$ WERE $19^{+0.01}$ & $2x8^{+0.05}$