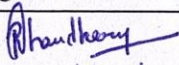


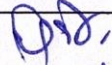
TECHNICAL SPECIFICATION OF CNC EDM WIRE CUT

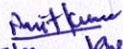
SPECIFICATONS & SCOPE OF SUPPLY OF CNC EDM WIRE CUT

SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
1.0	PURPOSE:		
1.1	CNC Electrical Discharge Machine (EDM) - Wire cut type shall have 5 - axes namely X,Y,Z, U and V controlled by programme. Machine shall have both submerged and flushing type cutting technology with Automatic Wire Threading for wire diameter in the range of 0.1 mm to 0.3 mm. Machine shall have machining technologies for Steel, Copper, Aluminium alloys, Titanium alloys and Carbides through Electrical Discharge Machining process.	Vendor to Comply	
2	WORKPIECE SIZE:		
2.1	Work piece Length: 1000 mm or more	Vendor to Comply	
2.2	Work piece Width: 700 mm or more	Vendor to Comply	
2.3	Work piece Height: 400 mm or more	Vendor to Comply	
2.4	Work piece Weight 1000 kg or more	Vendor to Comply	
3	AXIS TRAVERSES & TAPER ANGLE		
3.1	X Axis Travel : 550 mm or more	Vendor to Comply	
3.2	Y Axis Travel : 350 mm or more	Vendor to Comply	
3.3	U Axis Travel : 120 mm or more	Vendor to Comply	
3.4	V Axis Travel : 120 mm or more	Vendor to Comply	
3.5	Z axis Travel : 400 mm or more	Vendor to Comply	
3.6	Taper Angle : $\pm 30^\circ$ minimum over a length of 80 mm or more	Vendor to Comply	
3.7	Least input increment for X, Y, Z, U and V - axes : 0.001 mm or better	Vendor to Comply & Specify	
3.8	Position Resolution : 0.001 mm or better	Vendor to Comply & Specify	
3.9	Guide ways : Linear motion with ball type	Vendor to Comply	
3.10	Measuring system : Linear glass scale	Vendor to Comply	


 Sumit Kumar
 Sr. Eng. / DABG Tech


 (For spare, pre-inspection & maintainability)
 ROHIT (CHAUDHARY) / E2 / WEX / BLZK11 / MM


 VIVEK PANDHAR
 (DR. MGR / DABG) (USER)


 (For spare, pre-inspection & maintainability)
 Amit Kumar / E2 / WEX - CNC / PAM20ABG4

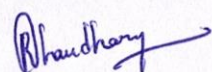
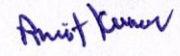
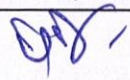
SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
3.11	Cutting Technology : Both Submerged and Flushing modes	Vendor to Comply	
4.0	<u>GEOMETRICAL ACCURACY</u>		
4.1	Submit test chart for all accuracies as per ISO 230-1 (latest version) standard or equivalent applicable standard, clearly showing the accuracy to be achieved on the machine.	Vendor to Comply	
5	<u>POSITIONING ACCURACY AND REPEATABILITY</u>		
5.1	Submit test chart for all accuracies as per VDI DGQ 3441 or ISO 230-2 (latest version) standard or equivalent applicable standard, clearly showing the accuracy to be achieved on the machine. It Should be measured by using LASER INTERFEROMETER (measuring tools , accessocries will be in vendor scope)	Vendor to Comply & Specify	
6	<u>WIRE SYSTEM</u>		
6.1	Automatic Wire Threader (AWT) and Rethreading with annealing	Vendor to specify	
6.2	Maximum threadable height in mm	Vendor to specify	
6.3	Minimum diameter of the threading hole in mm	Vendor to specify	
6.4	Wire guide system for wire diameter ϕ 0.1 to ϕ 0.30 mm insteps of 0.05 mm	Vendor to Comply	
6.5	Automatic Wire Threader (AWT) Unit for wire diameter ϕ 0.1 to ϕ 0.30 mm	Vendor to Comply	
6.6	Wire Alignment Devices and Gauges	Vendor to Comply	
6.7	Wire Chopper	Vendor to Comply	
6.8	Capacity of container for used wire	Vendor to specify	
7	<u>WORK TANK</u>		
7.1	Work tank type : Drop door / Elevator type	Vendor to specify	
7.2	Dielectric fluid bath level in mm	Vendor to specify	
7.3	Dielectric fluid level control : Programmable	Vendor to Comply	
7.4	Dielectric fluid capacity in Liters	Vendor to specify	
7.5	Working Tank door with window	Vendor to Comply	
8	<u>DIELECRIC UNIT</u>		
8.1	Integrated dielectric unit	Vendor to Comply	
8.2	Filtering system with filter quality : 5 microns or less	Vendor to specify	

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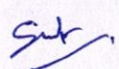
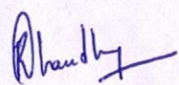
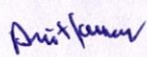
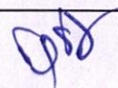
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SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
8.3	Chiller unit for cooling dielectric fluid	Vendor to Comply	
8.4	Deionized bottle charge volume in mm3	Vendor to specify	
9	<u>CENTRALISED LUBRICATION SYSTEM</u>		
9.1	Built-in automatic centralized lubrication system	Vendor to Comply	
10	<u>FLUSHING SYSTEM</u>		
10.1	Programmable flushing system	Vendor to Comply	
10.2	Flushing pressure in bars	Vendor to specify	
11	<u>INTELLIGENT POWER GENERATOR (IPG) UNIT</u>		
11.1	Cutting speed : 400 mm square /min or more	Vendor to Comply	
11.2	Surface finish : 0.1 μ m Ra or better	Vendor to Comply	
11.3	Automatic optimization of machining parameters during machining	Vendor to Comply	
11.4	Short circuit elimination to enable higher machining speeds	Vendor to Comply	
12	<u>CONTROL UNIT</u>		
12.1	High speed processor (Processor Capacity in GHz)	Vendor to specify	
12.2	Operating system : Window	Vendor to Comply	
12.3	Monitor : 15" or larger color TFT/LCD	Vendor to Comply	
12.4	Hard disc and/or flash memory	Vendor to specify	
12.5	Random Access Memory	Vendor to specify	
12.6	Communication ports : USB, Ethernet	Vendor to Comply	
12.7	Restart after power failure with rethreading feature	Vendor to Comply	
13	<u>CNC SYSTEM, PROGRAMMING & FUNCTIONS</u>		
13.1	Programming software for generating machining parameters on online mode (on control unit)	Vendor to Comply	
13.2	Import of CAD data (DXF and IGES) for on-board programming (on control unit)	Vendor to Comply	
13.3	Programming software for generation of 2D - NC wire path on online mode (on control unit)	Vendor to Comply	
13.4	Graphic simulator to simulate 2D - NC wire path on online mode (on control unit)	Vendor to Comply	

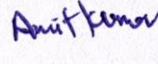
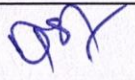





SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
13.5	Graphic simulator to simulate 3D - NC wire path on online mode (on control unit)	Vendor to Comply	
13.6	Background programming option (Programming for job - 2 while machining Job - 1)	Vendor to Comply	
13.7	Incremental and absolute programming	Vendor to Comply	
13.8	Mirror programming, multipocket programming etc.	Vendor to Comply	
13.9	Easy preparation of machining programme	Vendor to Comply	
13.10	Easy preparation of job templates	Vendor to Comply	
13.11	UPS for 15 minutes back up is required for PC based systems with HDD.	Vendor to Comply	
13.12	Air cooled prewired panel with main switch, CNC controller, generator, other modules LED light for illumination, contactors, MPCB's, relays, fuses, transformers & other accessories. All the components should be of reputed make with minimum 25% over rated than actual requirement. All the components should be mounted on the backside plate only. Panel must be dust & vermin proof. All solenoid valves, contactors, lamps etc are of reputed make.	Vendor to Comply	
13.13	Part program Software: Windows based licensed copy of the re-installable software for development of part program to be installed on the PC provided by BHEL. Software should have all required features to develop various programs. Vendor to provide specifications of required PC.	Vendor to Comply	
14	<u>REMOTE CONTROL</u>		
14.1	A remote with complete set of functions to operate the machine with LCD display.	Vendor to Comply	
15	<u>LIGHTS & WARNING LIGHTS</u>		
15.1	Inbuilt lighting system for work area visibility	Vendor to Comply	
15.2	Machine warning lights with necessary mounting materials.	Vendor to Comply	
16	<u>MACHINING TECHNOLOGIES (wire material / workpiece material)</u>		
16.1	Brass / Steel	Vendor to Comply	
16.2	Brass / Copper	Vendor to Comply	
16.3	Brass / Carbide	Vendor to Comply	
16.4	Brass / Aluminium alloy	Vendor to Comply	
16.5	Brass / Titanium alloy	Vendor to Comply	

SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
16.6	Party may offer any other machining technologies available as standard.	Vendor to Comply	
16.7	All the above mentioned technology tables should be available in the CNC control unit of the machine and incorporate in to part programmes.	Vendor to Comply	
16.8	The supplier should provide all the above mentioned machining technologies for therespective inter wire and workpiece material combinations along with the technologytables.	Vendor to Comply	
17	<u>Max. MACHINING RATE / CUTTING RATE (wire material / workpiece material)</u>		
17.1	Brass / Steel (wire material / workpiece material)	Vendor to specify	
17.2	Brass / Carbide (wire material / workpiece material)	Vendor to specify	
17.3	Brass / Aluminium (wire material / workpiece material)	Vendor to specify	
17.4	Brass / Titanium (wire material / workpiece material)	Vendor to specify	
18	<u>BEST SURFACE FINISH (wire material / workpiece material)</u>		
18.1	Brass / Steel in µm Ra	Vendor to specify	
18.2	Brass / Carbide in µm Ra	Vendor to specify	
18.3	Brass / Aluminium in µm Ra	Vendor to specify	
18.4	Brass / Titanium in µm Ra	Vendor to specify	
19	<u>WATER SUPPLY (DIELECTRIC)</u>		
19.1	Minimum flow rate in liters / min	Vendor to specify	
19.2	Water pressure in bar	Vendor to specify	
19.3	Water temperature in ° C	Vendor to specify	
20	<u>AIR SUPPLY</u>		
20.1	Air Compressor with dryer suitable for offered machine (1 No)	Vendor to offer	
20.2	Average pressure in bars	Vendor to specify	
20.3	Max Consumption in liters / min	Vendor to specify	
21	<u>SAFETY FEATURES & ENVIRONMENTAL PERFORMANCE OF THE MACHINE</u>		
21.1	Following safety features in addition to other standard safety features should be provided on the machine:		



SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
21.1.1	The machine should be provided with all safety features to protect all parts of the machine and the operator.	Vendor to Comply	
21.1.2	Safety interlocks for dielectric level and temperature.	Vendor to Comply	
21.1.3	Machine shall be provided with adequate guarding and doors.	Vendor to Comply	
21.1.4	Collision protection with warning message.	Vendor to Comply	
21.1.5	Automatic machine shutoff in case of lubrication failure with warning message	Vendor to Comply	
21.1.6	Over travel limit for all axes with pop up message.	Vendor to Comply	
21.1.7	Compliance to any Electro Magnetic Compatibility / Electro Magnetic interference emission standards	Vendor to specify	
21.2	The Machine shall conform to following factors related to environment :		
21.2.1	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to Comply	
21.2.2	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to Comply	
21.2.3	No hazardous chemicals shall be required to be used in the machine.	Vendor to Comply	
21.2.4	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to Comply	
21.2.5	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to Comply	
22	<u>GENERAL REQUIREMENTS</u>		
22.1	Detail of Ion exchange resin used in offerd machine with suppliers in India	Vendor to specify	
22.2	Work Table frame shall be made of stainless steel	Vendor to Comply	
22.3	Four-sided clamping with threaded holes on worktable	Vendor to Comply	
22.4	Measuring probe type : Renishaw Make	Vendor to Comply	
23	TECHNICAL DOCUMENTATION (3 sets of following documents in English are to be supplied along with the machine)		
23.1	Machine operations manual (Hard copy & Soft copy)	Vendor to Comply	

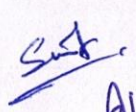
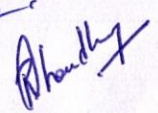
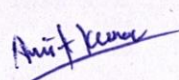
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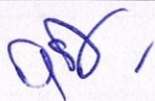
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SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
23.2	Programming manual (Hard copy & Soft copy)	Vendor to Comply	
23.3	EDM machining technology manuals (Hard copy & Soft copy)	Vendor to Comply	
23.4	Maintenance and spare parts manual for hydraulic, mechanical, electric servos and control systems manual. (Hard copy & Soft copy)	Vendor to Comply	
23.5	Electrical circuit diagrams/ Electrical drawings with cable layout (Hard copy & Soft copy)	Vendor to Comply	
23.6	Machine test charts (Hard copy & Soft copy)	Vendor to Comply	
23.7	Check list, trouble shooting charts and guidelines manual (Hard copy & Soft copy)	Vendor to Comply	
23.8	Machine installation drawings and instructions manual (Hard copy & Soft copy)	Vendor to Comply	
23.9	Dos and Don'ts on the machine (Hard copy & Soft copy)	Vendor to Comply	
23.10	Diagram of all mechanical components/ Hydraulic, Pneumatic & coolant circuit diagram, whichever is applicable (Hard copy & Soft copy)	Vendor to Comply	
23.11	User manual for machine softwares with provision for software reinstallation as & when required. Also detailed instruction for Backup & restoration of complete system to be provided for all software based units (Hard copy & Soft copy)	Vendor to Comply	
23.12	Licensed copy of softwares (CNC Controller, PLC, Drives, HMI) & installation CDs/ DVD (with bootable CD/files) for system restoration and communication cables for data backup, restoration and diagnostics through laptop/desktop PC (Hard copy & Soft copy)	Vendor to Comply	
23.13	Commissioning and maintenance manuals for the CNC controller, drives, PLC (Hard copy & Soft copy)	Vendor to Comply	
23.14	Complete Bill of material with make (Hard copy & Soft copy), if possible	Vendor to Comply	
23.15	PLC program along with comments in English, cross reference (if applicable). Backup of the CNC controller data, PLC project, drive parameters/ project, HMI project in a pendrive of 32 GB capacity	Vendor to Comply	
24	<u>TENDERER[S] HAS TO PROVIDE COMPLETE DETAILS OF THE MACHINE OFFERED ALONG WITH THE FOLLOWING INFORMATION</u>		
24.1	Machine layout drawings indicating shop floor space requirements.	Vendor to Comply	



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Handwritten notes

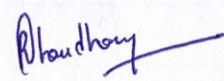
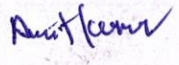
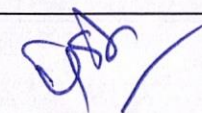
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SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
24.2	Printed catalogue of the offered machine along with the offer.	Vendor to Comply	
24.3	Requirement of utilities like power, water and compressed air lines if any shall be specified.	Vendor to Comply	
24.4	The price offer shall provide break-up of cost for basic machine offered, Accessories and Spares for 2 years trouble free operation of machine.	Vendor to Comply	
24.5	Party shall offer AMC for the offered machine for 1st and 2nd year after warranty separately.	Vendor to Comply	
24.6	Party shall submit manufacture's test chart for the offered machine along with offer. (Refer Vide. Sl.No. 4.0 and 5.0)	Vendor to Comply	
24.7	Party shall to submit actual test chart of the similar machine along with offer (Refer Vide. Sl.No. 4.0 and 5.0)	Vendor to Comply	
25.0	<u>ADDITIONAL INFORMATION:</u> Following information shall be supplied with the offer:		
25.1	Machine Model No.	Vendor to inform	
25.2	Total connected load (KVA)	Vendor to inform	
25.3	Space required (Length, Width, Height) for complete machine & accessories	Vendor to inform	
25.4	Catalogue of the machine	Vendor to submit	
25.5	Total weight of the machine	Vendor to inform	
25.6	Weight of heaviest part of machine	Vendor to inform	
25.7	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to inform	
25.8	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to inform	
26	<u>SPARES (AS USED IN OFFERED MACHINE)</u>		
26.1	The CNC controller, PLC I/O cards, PLC CPU (if PLC CPU is outside CNC controller, then PLC CPU module is also needed separately), relay boards, servo motors, servo drives, scales, transducers, HMIs, any other special card: 1 no of each type . Communication software (licensed) and communication cable for establishing communication with drives, PLC, HMIs etc. which would be supplied.	Vendor to offer itemwise price	
26.2	Mechanical spares like Bearings, Pumps, Valves, Pressure Switches, solenoid valves, Flow Switches, Hydraulic Hoses etc. 1 no of each type	Vendor to offer itemwise price	
26.3	Special control cards (if any) 01 nos. each.	Vendor to offer	
26.4	Paper filter (25 nos.)	Vendor to offer	
26.5	Lower flushing nozzle (2 nos.)	Vendor to offer	

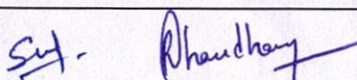
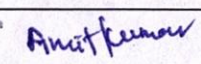
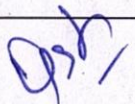
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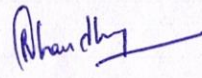
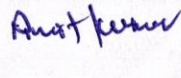
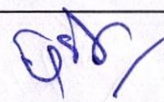
SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
26.6	Upper flushing nozzle (2 nos.)	Vendor to offer	
26.7	Lower & upper Power feed contact (2nos. Each)	Vendor to offer	
26.8	Jet nozzle (01 nos.)	Vendor to offer	
26.9	Ion exchange resin (50Ltr)	Vendor to offer	
26.10	Kit for wire dia 0.1 mm	Vendor to offer	
26.11	Set of wire guide for diameter 0.1 mm	Vendor to offer	
26.12	Vendor to provide the list of spares (with itemwise price) other than above required for smooth running of machine for period of 2 years.	Vendor to offer	
27	<u>ACCESSORIES</u>		
27.1	Wire Tension Meter 0-30 N for Standard Wire (1 no.)	Vendor to offer	
27.2	De-ionizing bottle : Capacity 15 lits or more (1 no)	Vendor to offer	
27.3	kit for Clamping tools for clamping jobs at starting (1 Set)	Vendor to offer	
27.4	Dial indicator with 0.001 or 0.002 mm resolution with magnetic stand.	Vendor to offer	
28	<u>CONSUMABLE ITEMS</u>		
28.1	Initial tooling (Brass wire of std dia 0.25 mm) : 300 kgs.	Vendor to offer	
28.2	First filling of oil and dielectric fluid	Vendor to offer	
29	<u>WORKING CONDITION</u>		
29.1	Input Power Supply: 3 Phase 3 wire (Without Neutral), 415V $\pm$ 10%, 50 Hz $\pm$ 3% variation	Vendor to confirm	
29.2	Power Supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine, voltage stabilizer, isolation transformer, control cabinets etc. shall be supplied by the vendor (if required).	Vendor to confirm	
29.3	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm	
29.4	All electrical & electronic control cabinets & panels should be dust and rodent proof	Vendor to confirm	
29.5	Motors shall conform to IEC or Indian Standards	Vendor to confirm	
29.6	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
29.7	Ambient temperature 5-45 degree c.	Vendor to confirm	
29.8	Relative humidity up to 95%.	Vendor to confirm	

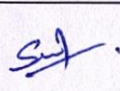
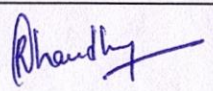
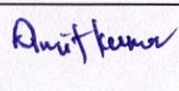
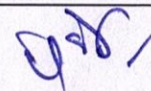
SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
30	ULTRA ISOLATION TRANSFORMER AND VOLTAGE STABILIZER		
30.1	Ultra Isolation Transformer and Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc. in TTN/DTN configuration.	Vendor to confirm	
30.2	Make	Vendor to specify	
30.3	Model & Rating	Vendor to specify	
30.4	Catalogue of the Ultra Isolation Transformer and Voltage Stabilizer shall be submitted with the offer.	Vendor to furnish	
31	GENERAL REQUIREMENTS		
31.1	All motors should be of reputed make	Vendor to confirm	
31.2	Overloads, fuses, MPCBs, MCCBs, contactors, relays & related electrical items should be of reputed make	Vendor to confirm	
31.3	All bearing /linear bearing and guide ways should be of reputed make	Vendor to confirm	
31.4	HYDRAULIC SYSTEM: if required (Details should be submitted by the vendor)	Vendor to inform	
32	ACCURACY TESTS:		
32.1	All the Geometrical & positioning accuracies as mentioned in sl. no. 4 & 5 will be demonstrated to BHEL engineers during pre-acceptance at Vendor's works as well as at BHEL's works.	Vendor to note & accept	
32.2	GEOMETRICAL ACCURACIES :Submit test chart for all accuracies as per ISO 230-1(latest version) standard or equivalent applicable standard, clearly showing the accuracy to be achieved on the machine.	Vendor to note & accept	
32.3	POSITIONAL ACCURACIES & REPEATABILITY: Submit test chart for all accuracies as per VDI DGQ 3441 or ISO 230-2 (latest version) standard or equivalent applicable standard, clearly showing the accuracy to be achieved on the machine. It Should be measured by using LASER INTERFEROMETER (measuring tool , accessories will be in vendor scope)	Vendor to note & accept	
33.0	PRE-DESPATCH INSPECTION (PDI)		
33.1	Tests/Activities should be carried out at supplier's works on the machine before dispatch : This should be the basis for despatch clearance.	Vendor to confirm	
33.2	Accuracy Tests as per sl no 32.The required tooling and inspection of job shall be arranged by Vendor.	Vendor to confirm	
33.3	The machine should be tested for continuous running of 8 hrs. If any break down occurs during this test, the test should be repeated for 8 hrs from that time.	Vendor to confirm	

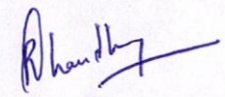
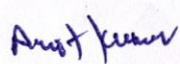
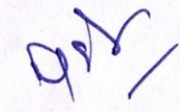
SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
33.4	Demonstration of all features of the machine, control system & accessories.	Vendor to confirm	
33.5	Vendor shall inform BHEL at least 30 days before date of PDI. Travel, Boarding & Lodging expenses of BHEL team shall be borne by BHEL.	Vendor to inform	
34.0	<u>TRAINING</u>		
34.1	BHEL Staff should be trained at BHEL Works for One week in the area of: (a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories, Operation of the machines and other supplied equipments etc.- 4 Personnels (b) Electrical, Electronic & CNC maintenance for machine, maintenance of CNC control, PLC, servo drives supplied & other supplied equipments- 1 Person (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments- 1 Person	Vendor to confirm	
34.2	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm	
34.3	Vendor should provide on the job training also to BHEL personnels after commissioning the machine for programming, operation and maintenance.	Vendor to confirm	
35.0	<u>FOUNDATION</u>		
35.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of P.O. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories.	Vendor to confirm	
35.2	BHEL shall construct complete foundation for the machine. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm	
36.0	<u>ERECTION & COMMISSIONING AND JOB PROVING</u>		
36.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm	

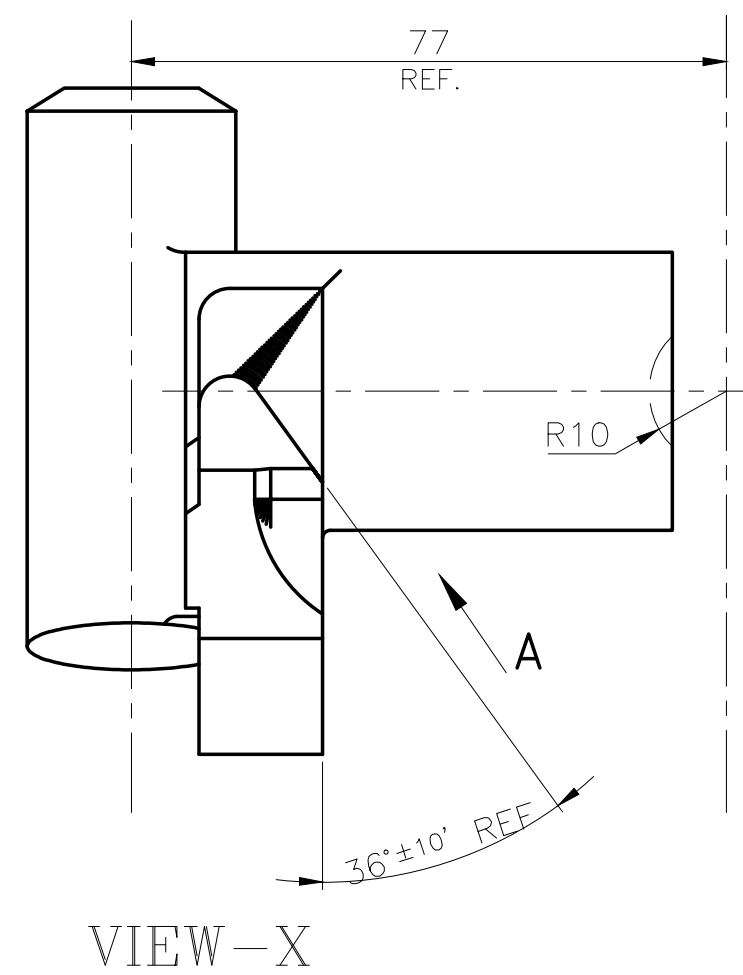
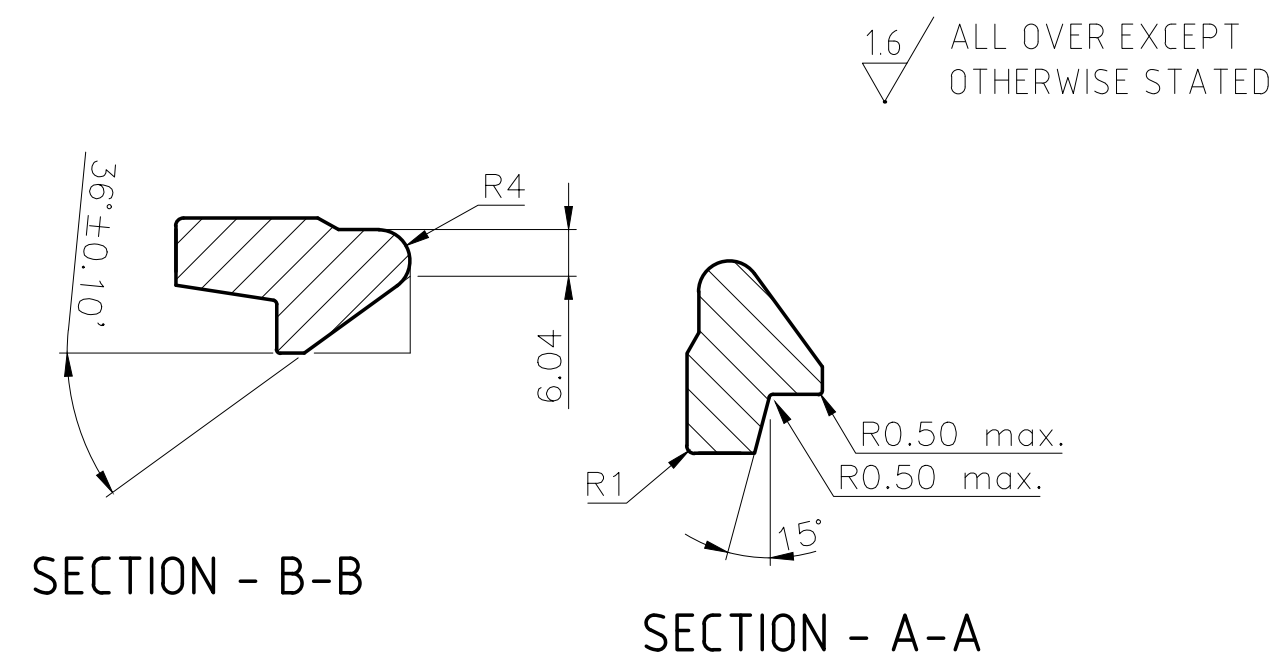
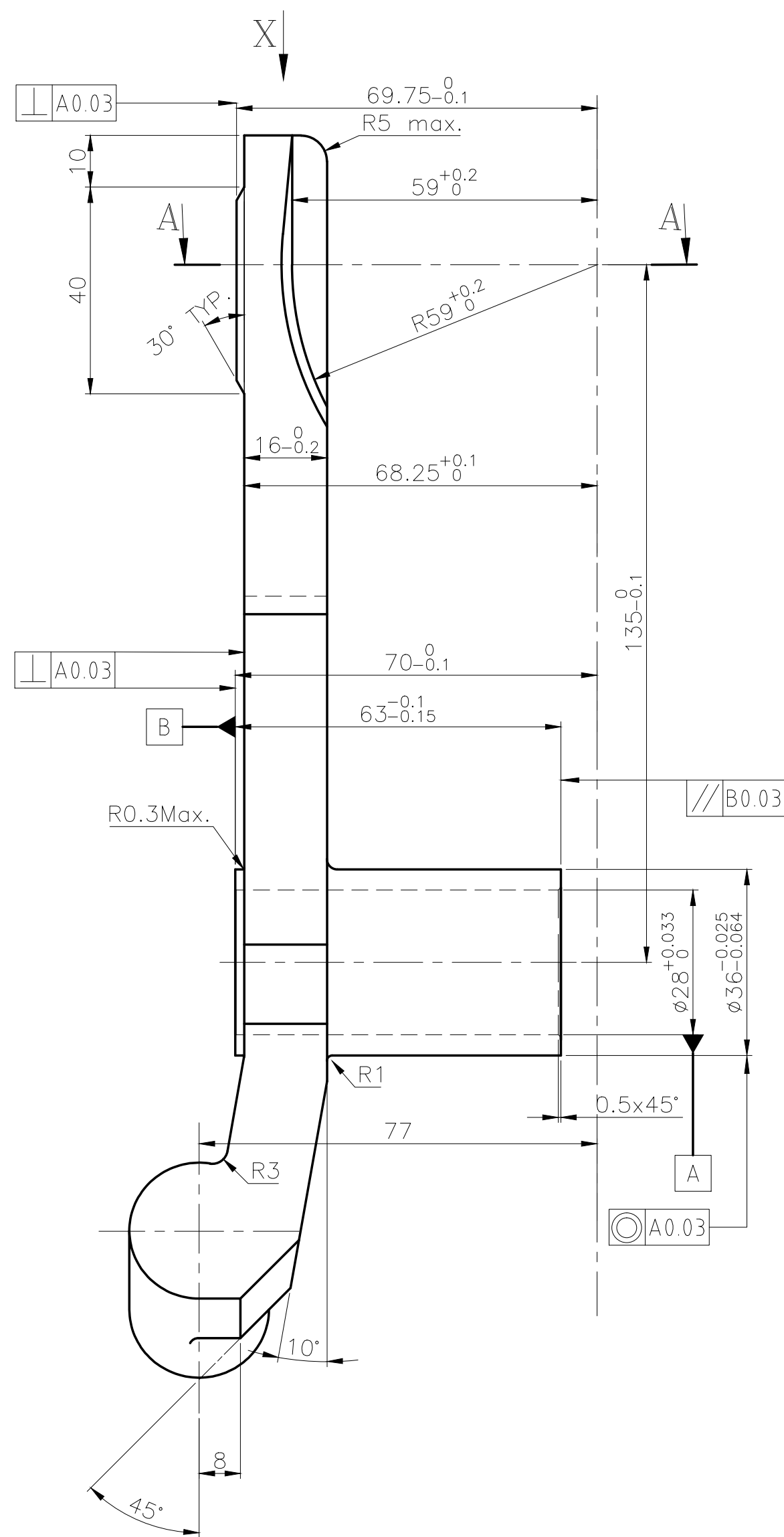
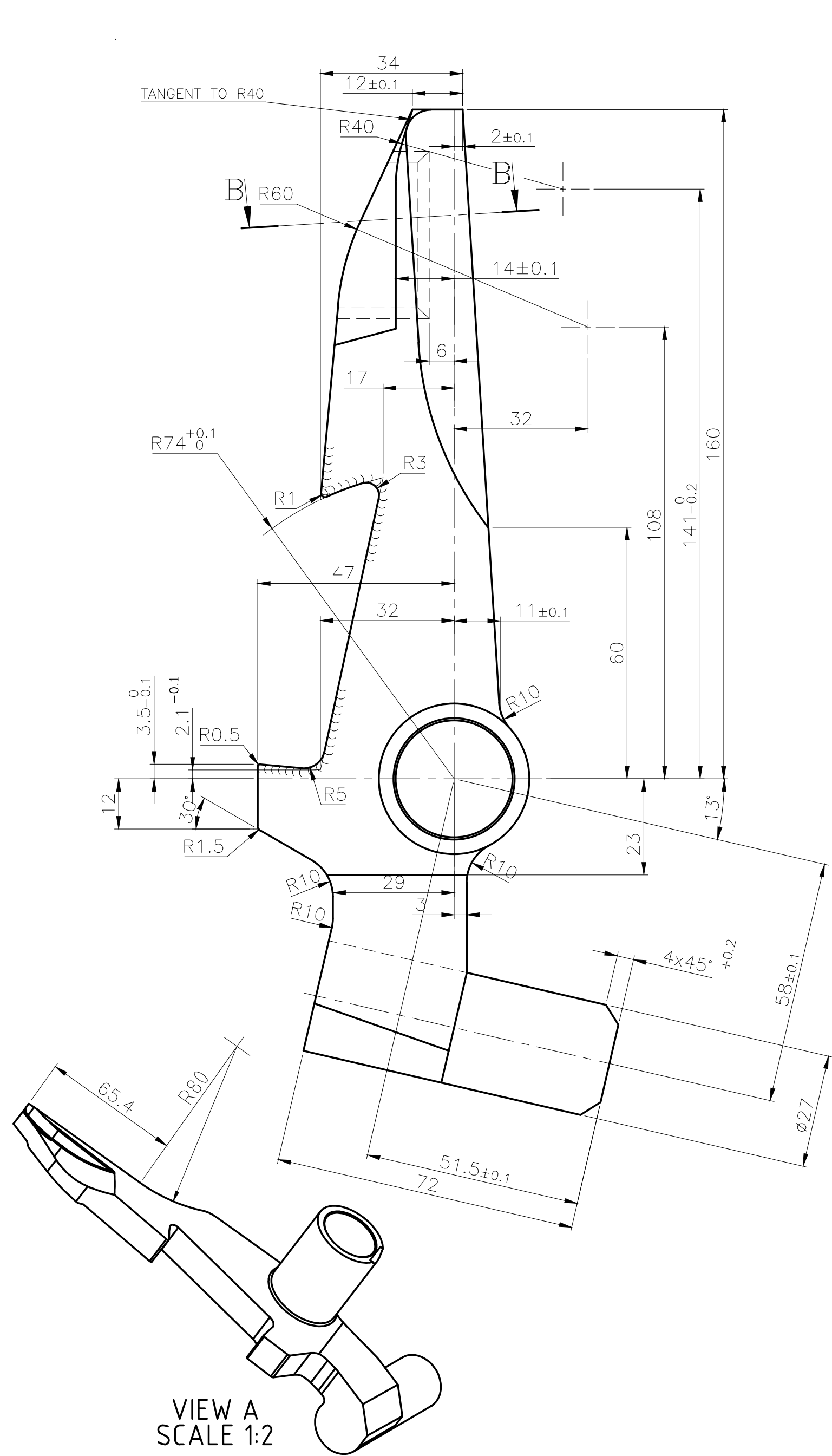





SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
36.2	Erection & Commissioning of Isolation Transformer & Air Compressor with dryer and filter shall also be responsibility of the vendor.	Vendor to confirm	
36.3	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier. .	Vendor to confirm	
36.4	All Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm	
36.5	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	
36.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
36.7	JOB PROVING: Vendor to prove out following five BHEL components at BHEL works using consumables & CNC program provided by vendor as per component drawing requirement.(Refer drawings enclosed in annexure 1) : 1.157602136 (Material - Steel ; Machining of Complete Outer Profile with hole dia 28H8) 2.157606349 (Material - Steel ; Machining of Complete Outer Profile with Internal Spline 3.27820212172 (Material - Steel ; Machining of Complete Outer Profile with Internal Spline) 4.27820818202 (Material - Titanium ; Machining of Complete Outer Profile with Gear) 5.37820812435 (Material - Brass ; Machining of Complete job except holes)	Vendor to confirm	
37.0	FINAL MACHINE ACCEPTANCE: Final acceptance shall be made by BHEL Haridwar after successful completion of all the activities as mentioned below		
37.1	Geometrical accuracies as per sl no.4	Vendor to confirm	
37.2	Positioning accuracies as per sl no. 5	Vendor to confirm	
37.3	Cutting speed of 400 mm2/min or more as per the sl no. 11.1 must be demonstrated on job.	Vendor to confirm	
37.4	The machine should be tested for continuous running of 16 hrs. If any break down occurs during this test, the test should be repeated for 16 hrs from that time.	Vendor to confirm	
37.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to confirm	
37.6	One week supervision of independent operation of machine by BHEL after Tests & demonstration.	Vendor to confirm	
37.7	Training of BHEL machine operators and CNC Maintenance personnel of complete machine & accessories, maintenace of CNC control, PLC, drives, scales, transducers etc. by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm	

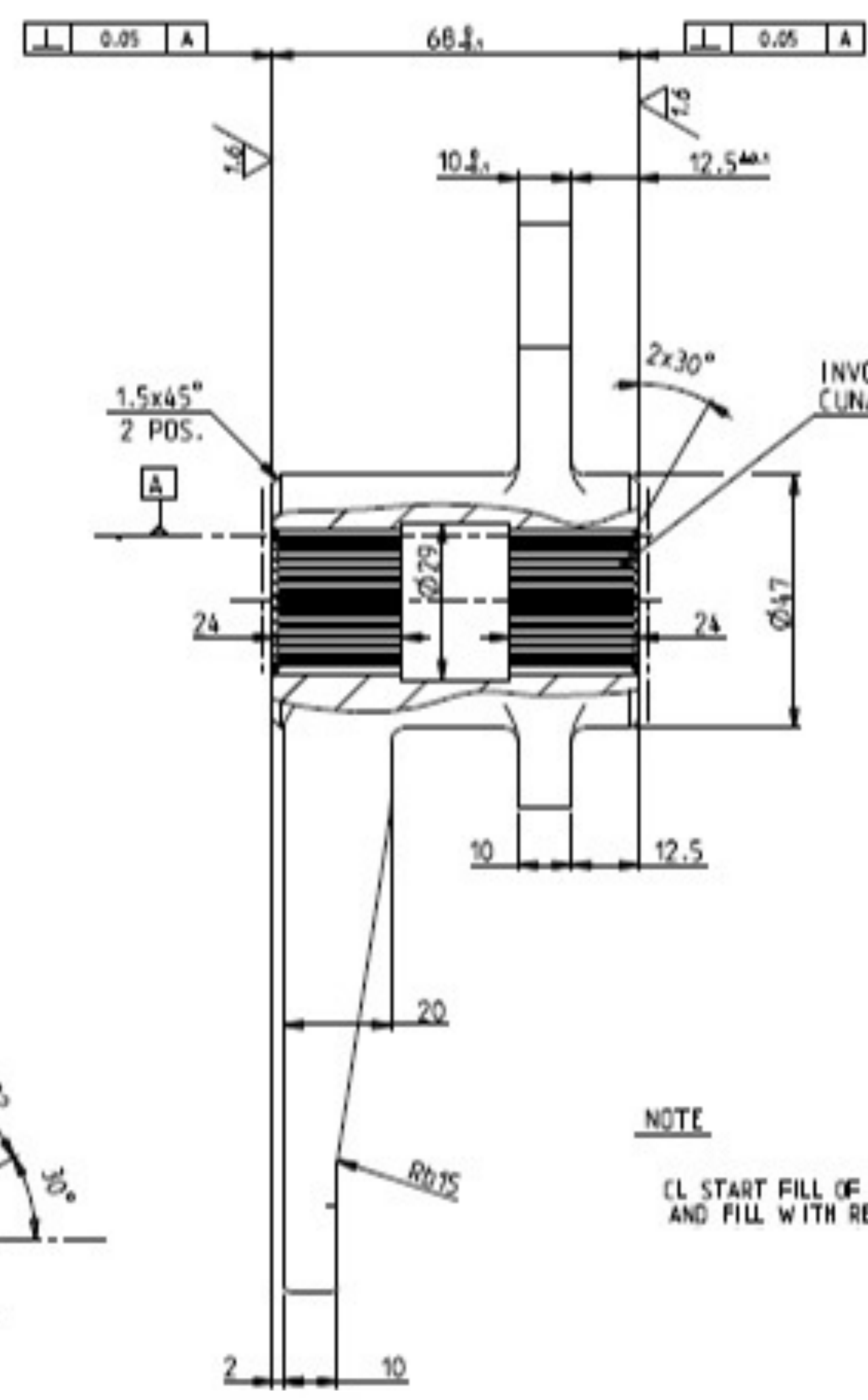
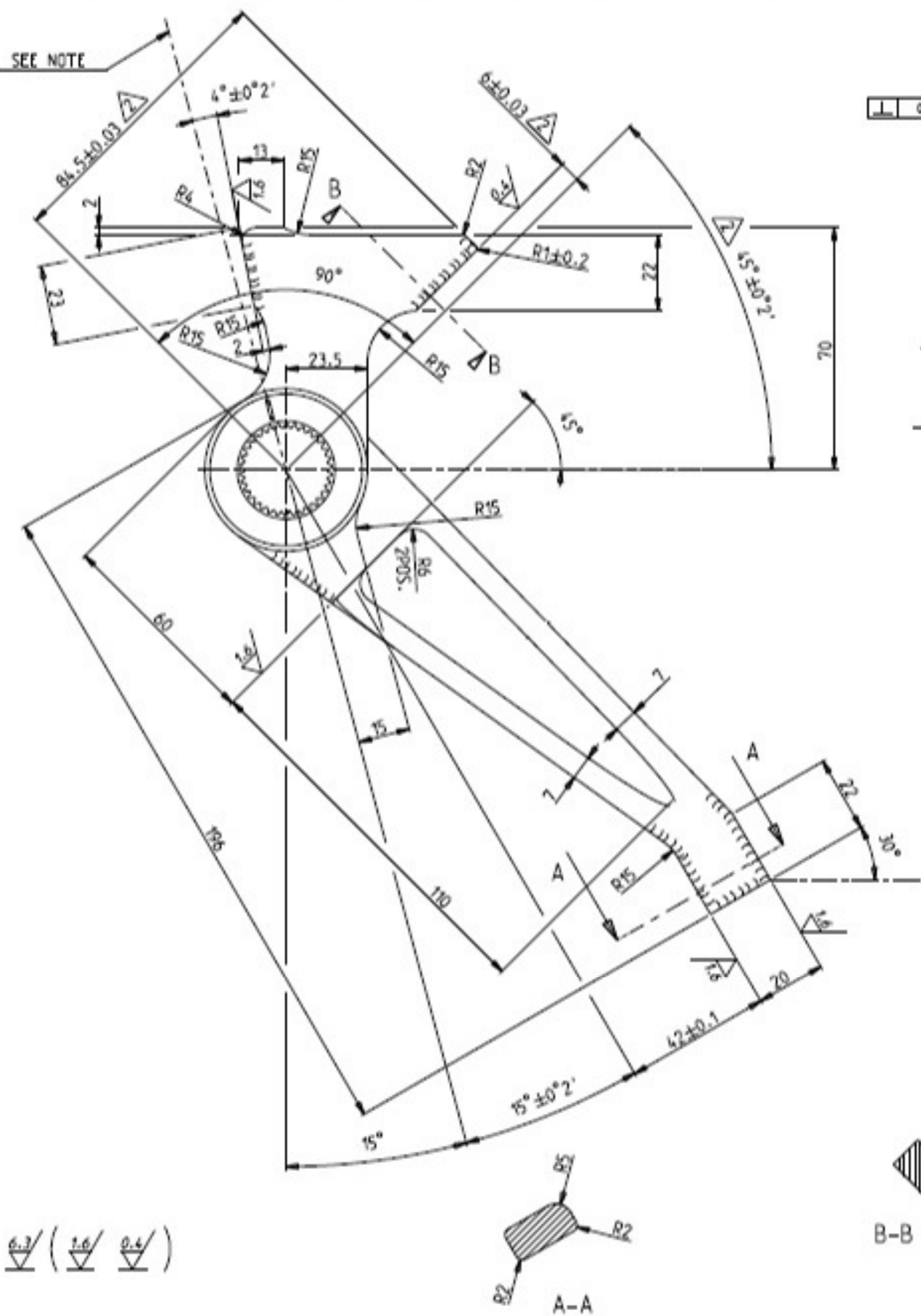
SN.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFICATION VALUE BY VENDOR	REMARKS
37.8	Demostration by actual use of all supplied attachments and accessories.	Vendor to confirm	
37.9	Prove out of BHEL components as per drawing requirment refer sl. No. 36.7	Vendor to confirm	
38.0	<u>GUARANTEE</u>		
38.1	Guarantee for 1 year for complete machine from date of final acceptance of offered Machine. In case an item installed in offered machine failed during Guarantee period, that parts has to be replaced free of cost by the vendor.	Vendor to confirm	
39.0	<u>PACKING</u>		
39.1	Road/Sea worthy packing for all items of complete machine to avoid any damage/ loss during transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
40.0	<u>BHEL'S OBLIGATION:</u>		
40.1	Crane facility and lifting tackles like slings, rope, D-Shackles shall be made available while working in BHEL premises only.	Vendor to comply	
40.2	Facilities of minor welding, brazing, minor machining facility required for rectification/fitting of supplied material, subject to the extent available in BHEL, shall be provided in BHEL premises only.	Vendor to comply	
40.3	Any civil work required for the erection of panel shall be done by BHEL.	Vendor to comply	
40.4	Electricity, water & air shall be provided by BHEL at one point only.	Vendor to comply	
40.5	Consumables like kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises. Vendor should make his own arrangements for all types of hand tools including pneumatic/electrical drill machines, grinders, scraping tools along with the general purpose measuring instruments, straight edges etc.	Vendor to comply	
40.6	The above requirements should be informed by the vendor in advance.	Vendor to comply	



S.N. 1 P/N 136

SEE NOTE

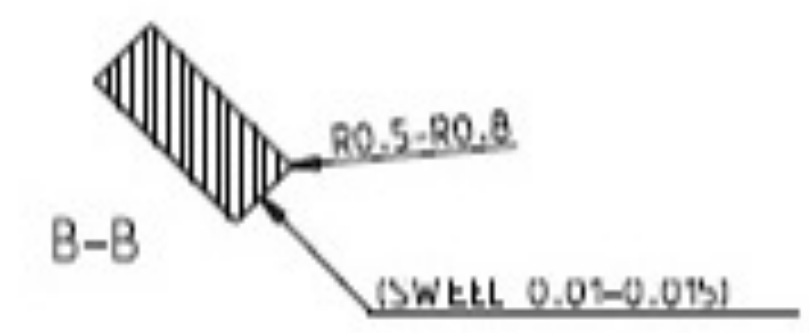
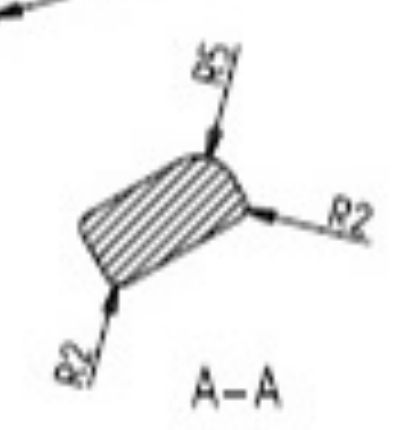


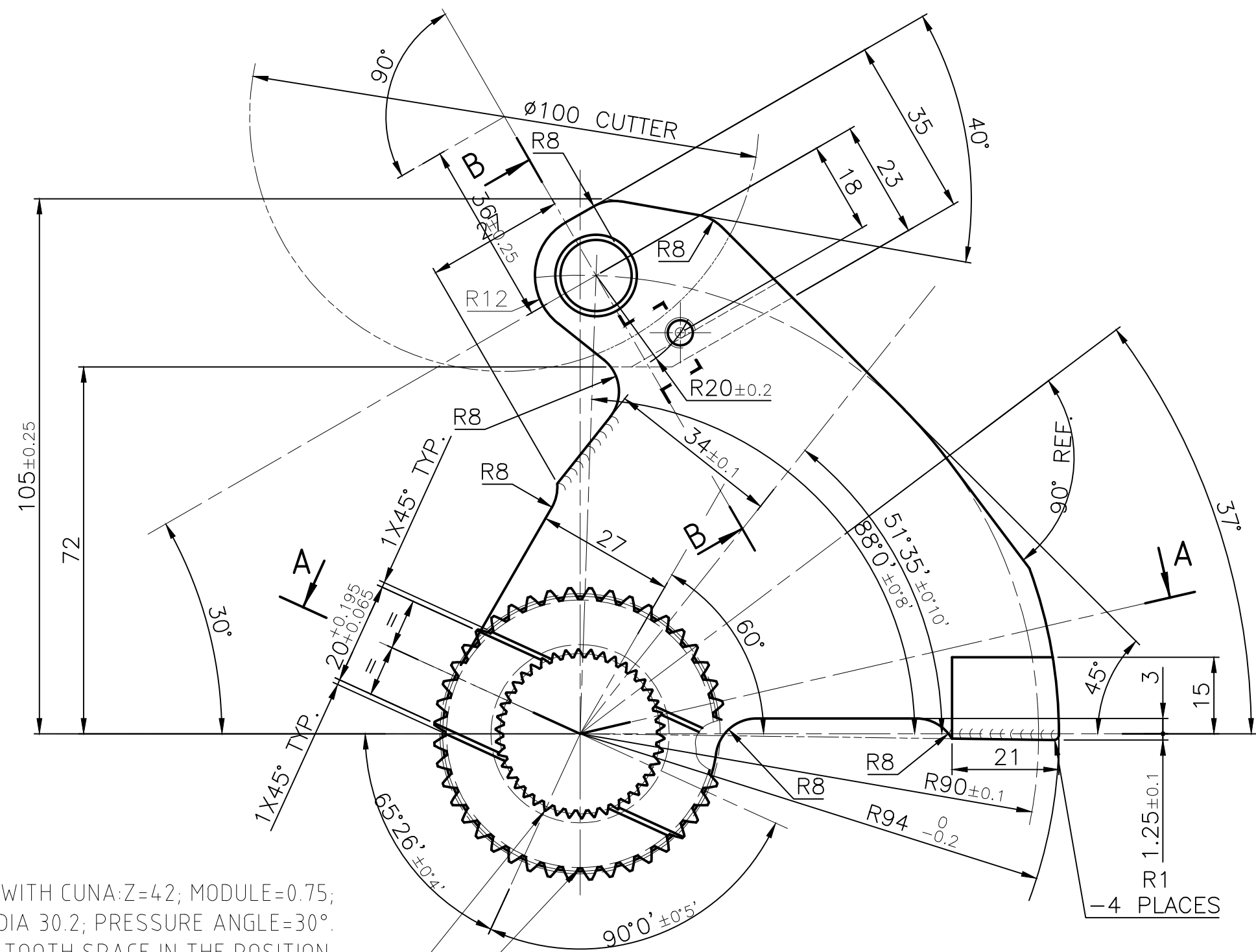
NOTE

CL START FILL OF TOOTH. CUT INDEX LINE WIDTH 1mm DEPTH 0.5mm AND FILL WITH RED LAKE

S.N. 2 P/N 349

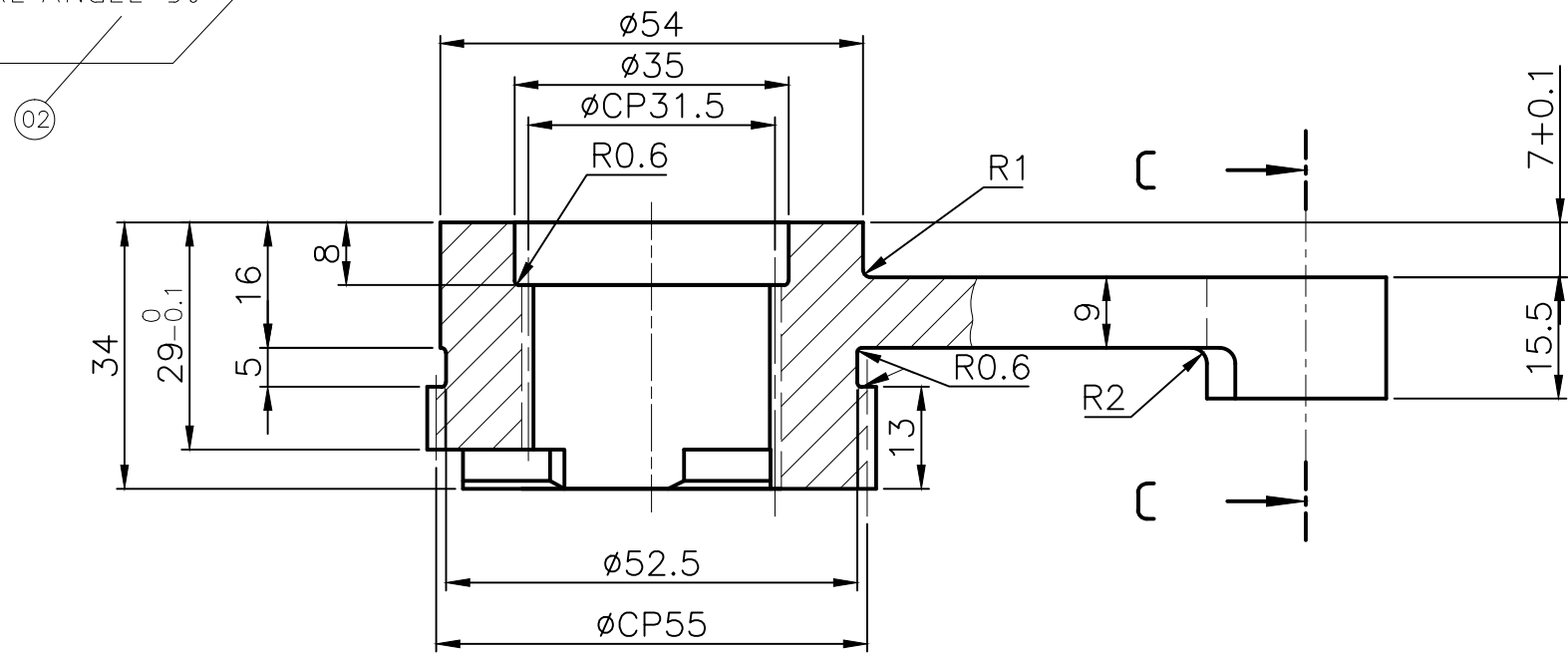
6.3 / (1.6 / 0.4)



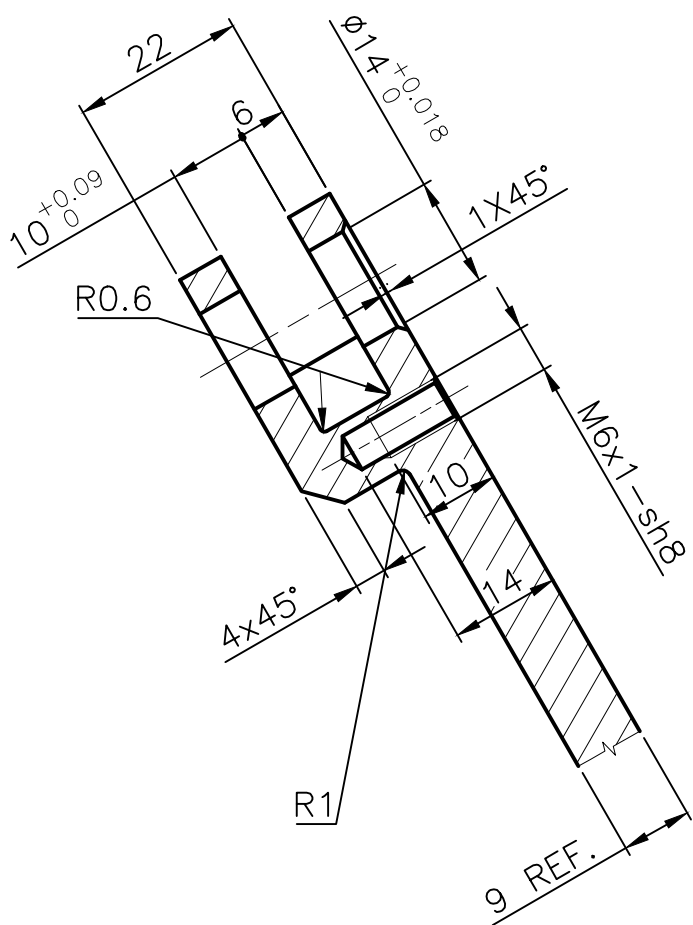


SPLINE IN ACCORDANCE WITH CUNA:Z=42; MODULE=0.75;
PITCH DIA 31.5; INSIDE DIA 30.2; PRESSURE ANGLE=30°.
START WITH TOOTH SPACE IN THE POSITION.
**THIS CONDITION TO BE
APPLIED ACCURATELY.**

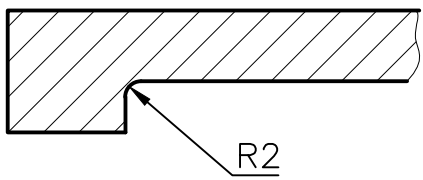
SPLINE IN ACCORDANCE WITH CUNA: Z=44, MODULE=1.25,
PITCH DIA 55, OUTSIDE DIA 57.3, PRESSURE ANGLE=30°
START WITH TOOTH LAND CENTER LINE



SECTION - A-A

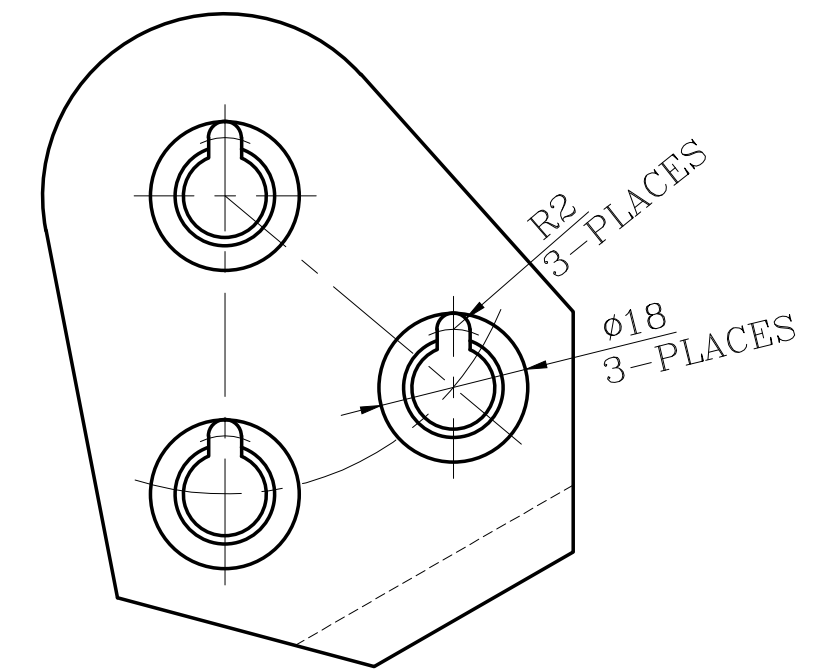
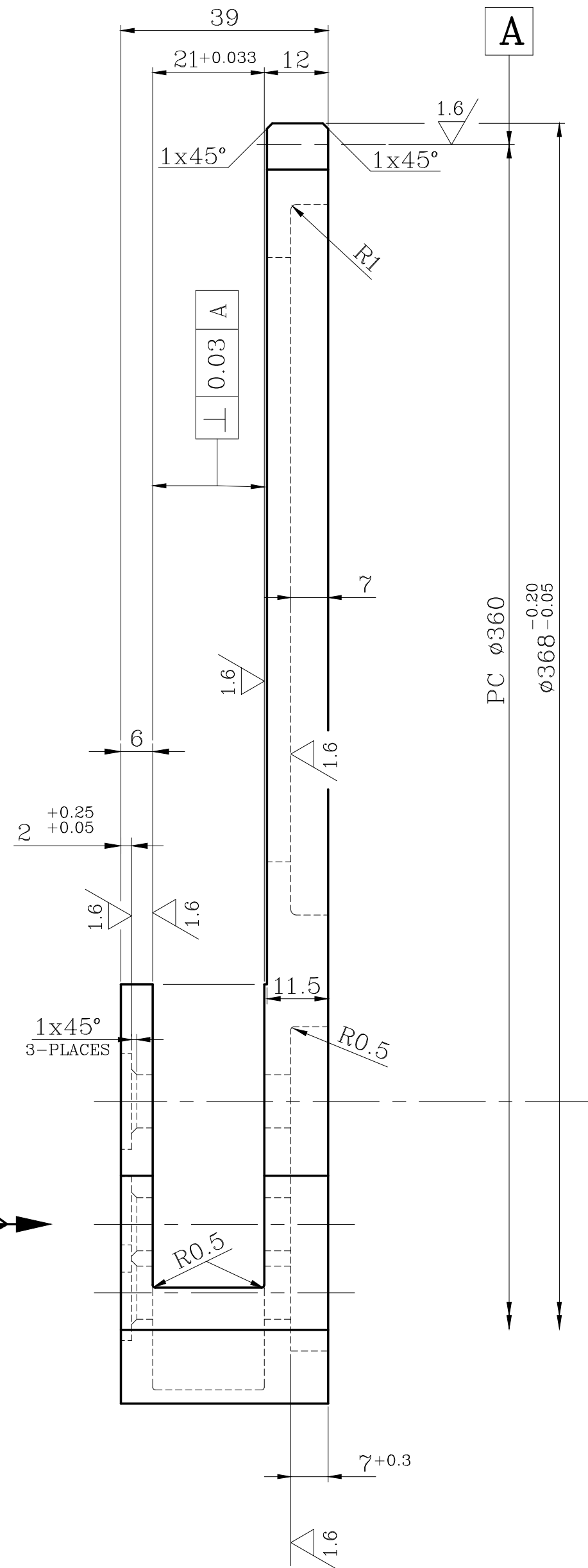
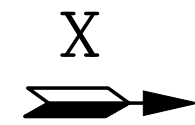
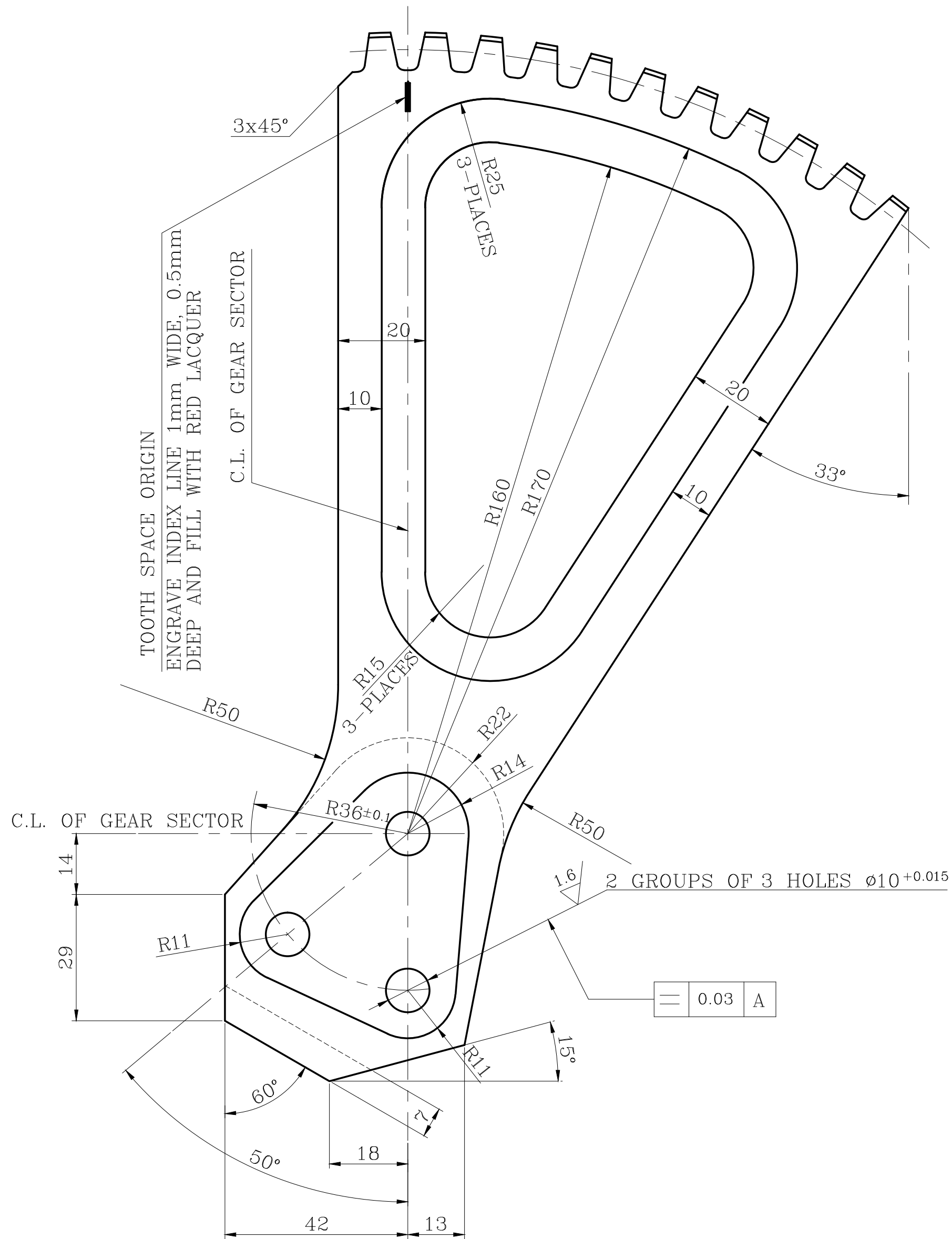


SECTION - B-B



SECTION - C-C

S.N. 3 P/N 172



VIEW-X

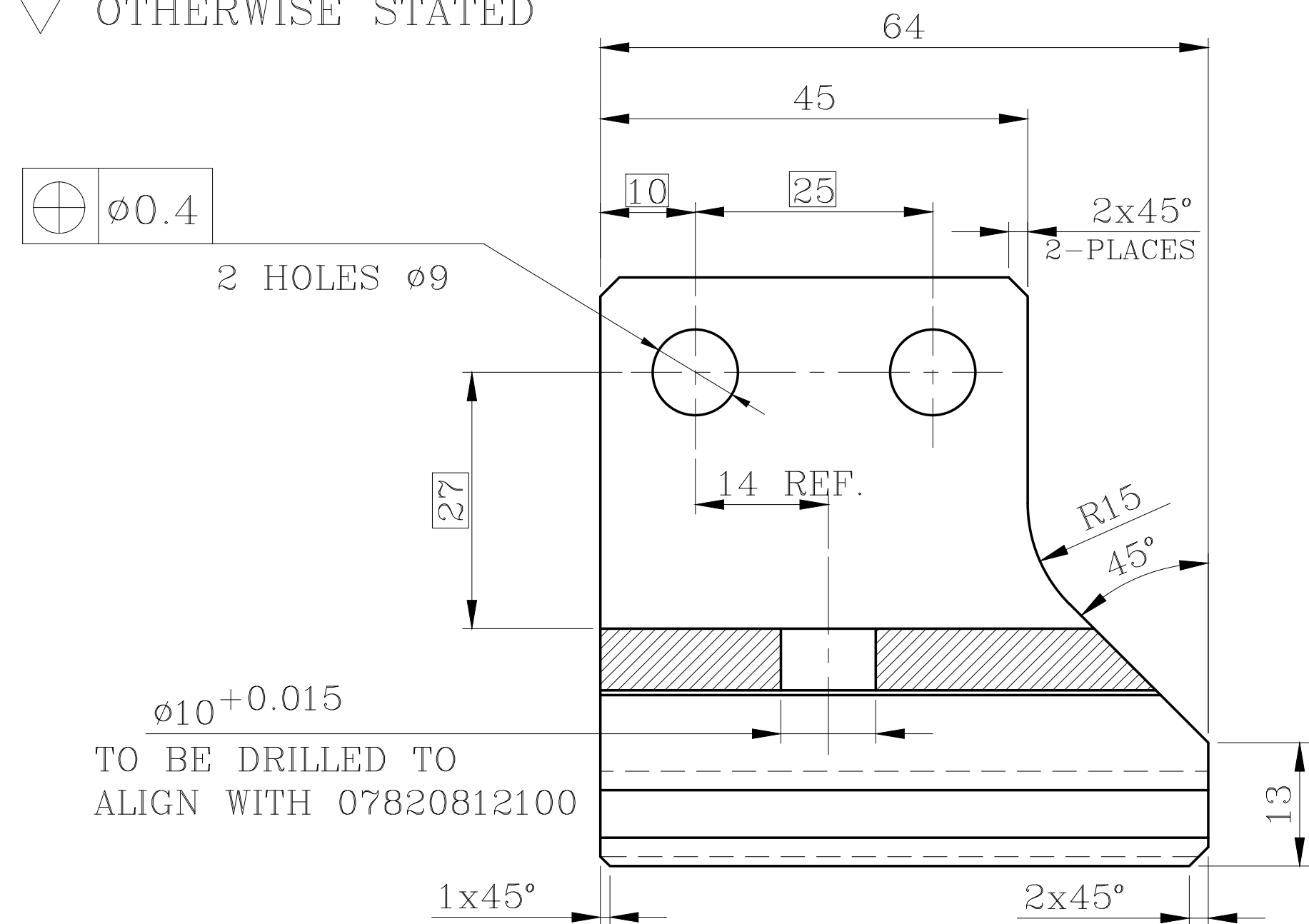
STRAIGHT TOOTH GEAR DATA

No. OF TEETH IN 360°	90
NORMAL METRIC MODULE	4
NORMAL PRESSURE ANGLE	20°
CENTER DISTANCE	196 ^{+0.05}
EFFECTIVE ADDENDUM	4
DEDENDUM	4.666
NO OF TEETH ON WHICH BASE TANGENT IS MEASURED	11
BASE TANGENT LENGTH	129.032 ^{+0.02} _{+0.15}
TOOTH THICKNESS	6.283 ^{-0.10} _{-0.03}
PITCH	12.566
ROOT RADIUS	1.6

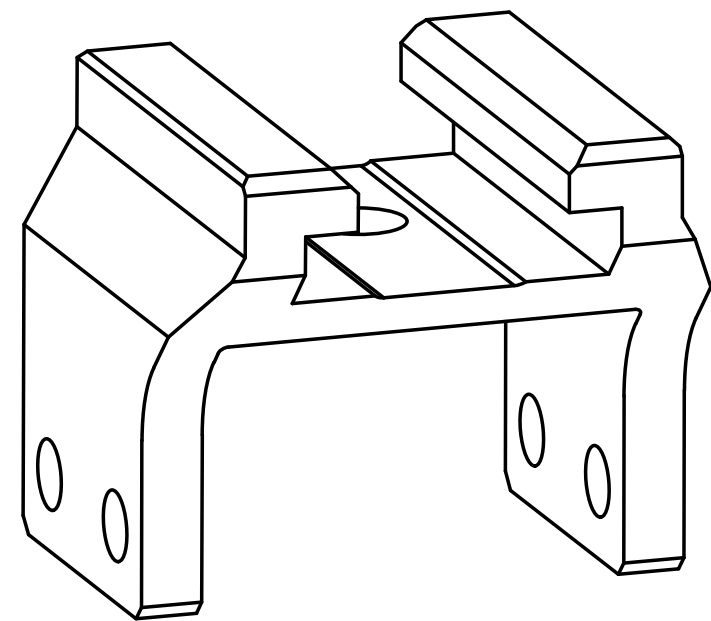
1.6 / ALL OVER EXCEPT
OTHERWISE STATED

S.N. 4 P/N 202

3.2/ALL OVER EXCEPT
OTHERWISE STATED



SECTION A-A



3D-VIEW

S.N. 5 P/N 435

