


TD106-1 Rev.No.6 Form No.		BHARAT HEAVY ELECTRICALS LIMITED PULVERISERS, HPEPHYDERABAD		Product STD NO.	BA89270
		TECHNICAL PRE-QUALIFICATION REQUIREMENTS		Rev.No.00	
				Page 1 of 1	

**ACCEPTANCE CRITERIA FOR BOWL MILL CASTINGS /
FORGINGS / FABRICATED ITEMS**

SL. NO.	REQUIREMENT	ACCEPTANCE	REMARKS
1.	Past Experience	Vendor should have supplied similar item to OEMs of bowl mills	1. Reference List of supplies made so far. Provide purchase order copies from the OEMs of Bowl Mills 2. Material acceptance certificates from OEMs.
2.	Manufacturing facilities	Bidder must have manufacturing facilities for manufacture of similar size of items.	a) Detail list of Manufacture facility shall be furnished.
3.	Testing facilities	Bidder must have testing facilities or tie up with relevant labs.	Test reports of previous supplied to be furnished.
4.	Inspection agencies for earlier supplies	International / Indian inspection agency.	Copies of earlier inspection certificates to be furnished.
5.	Financial Capability	Financial turnover shall be atleast 50% of the value of the bid.	Financial turnover of the bidder during last three years (certified by CA) shall be submitted.

NOTE:

The suppliers not meeting the above criteria (OR) not submitted the required documents will be disqualified

Refer Doc			PREPARED	CHECKED	APPROVED	Date of 1st Issue:
			MANIVAS	AMAN	KHRK	13.12.2022

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CORPORATE PURCHASING SPECIFICATION

AA19703

Rev No.07

PREFACE SHEET

GREY IRON CASTINGS - Gr: FG 260

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Equivalent / Comparable Standards:

1) INDIAN : IS: 210 – 2009, Gr: FG 260

Probable / Suggested Suppliers and Grades:

Refer plant vendors list

User Plants and Replaced Plant Specifications / References:

1) HEP, BHOPAL : PS113108
2) HPEP, HYDERABAD : CSN 422425, 422430, DIN 1691, GG25, IS 210, Gr 25
3) HEEP, HARDWAR : 0500.301, Gr: 25
4) HPBP, TIRICHY : IS:210, Gr: 25

Revisions:

Refer 43.3 of MOM of MRC-FCF+HTM

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC(FCF+HTM)

Rev No.07	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 st Issue
Dt:22-04-2021	Dt:	Year:	HEP, Bhopal	Corp.R&D	December 1977

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CORPORATE PURCHASING SPECIFICATION

AA19703

Rev No. 07

PAGE 1 of 5

GREY IRON CASTINGS - Gr: FG 260

1 GENERAL

This specification governs the quality requirements of Grey Iron Castings having a tensile strength of 260 N/mm²

2 APPLICATION

Suitable for general engineering purposes.

3 CONDITION OF DELIVERY

As cast or cast and stress relieved or rough machined or rough machined and stress relieved as specified in BHEL order/drawing.

Castings shall not be painted.

4 COMPLIANCE WITH NATIONAL STANDARD

Castings shall comply with the following national standards and also meet the requirements of this specification.

IS: 210-2009, Gr: FG 260 : Grey Iron Castings

5 DIMENSION AND TOLERANCES

Castings shall be true to the pattern / drawing.

Holes for machining up to and including 50mm in diameter are to be cast solid, unless otherwise stated in BHEL order / drawing.

Unless otherwise specified in BHEL order/ drawing, untoleranced dimensions for the casings shall be as per tolerance class 5 of BHEL standard AA0230402.

6 MANUFACTURE

The castings shall be cast from the metal melted or refined in any suitable cupola or Electric / Induction furnace or as agreed between supplier and BHEL.

All castings above five tonnes shall be mould cooled. Under mould cooling process, the mould should not be disturbed until the hottest portion of the casting cools down to 300°C.

7 HEAT TREATMENT

Castings shall be stress relieved by heating in a furnace to a temperature of 520 to 580°C (recommended), whenever specified.

Test pieces shall also be heat treated along with the castings they represent.

8 FINISH

All castings shall be properly fettled and dressed and all surfaces shall be thoroughly cleaned. Whenever specified, the machined surfaces shall have the surface finish as indicated in the drawing.

Revisions:

Refer 43.3 of MOM of MRC-FCF+HTM

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC (FCF+HTM)

Rev No.07

Amd No.

Reaffirmed

Prepared
HEP, BhopalIssued
Corp.R&DDt. of 1st Issue
December 1977

Dt:22-04-2021

Dt:

Year:



9 FREEDOM FROM DEFECTS

Castings shall sound, clean, free from defects such as porosity, blow holes, sand inclusions, shrinkage's, cavities, hard spots, cold shuts, cracks, etc. which may adversely affect machining and utility of castings.

No welding or repairs shall be carried out without permission of BHEL. Welding referred to here includes fusion welding in accordance with common foundry practice. The method of repair by welding (see IS 5139) and subsequent stress-relieving shall be as agreed to between the purchaser and the manufacturer.

10 CHEMICAL COMPOSITION

The composition of iron is left to the discretion of the manufacturer, but maximum limit for Phosphorous and / or Sulphur may be specified by the purchaser, if desired. In case of special castings, the detail chemical composition shall be agreed to between the purchaser and the manufacturer.

11 TEST SAMPLES

Manufacturers shall carryout mechanical testing as per following sampling plan.

11.1 Provision of Test Bars

All the test bars shall be cast separately in sand moulds and the number of test bars required shall be as specified in clause 11.2 below. They shall be cast at the same time and from the same melt as the castings, they represent. The test bar material shall be identifiable with that of the castings represented.

When castings are subjected to heat treatment and the test bars shall be heat treated together with the castings they represent.

The test bars shall be cast in dried, baked or chemically bonded moulds made mainly of aggregate of siliceous sand with appropriate binders. The average grain size of the sand shall be approximate to that of the sand in which the castings are poured. Moulds for the test bars shall be approximately at room temperature when poured. More than one test bar may be cast in a single mould, but each bar may be cast in a single mould, but each bar in the mould shall be surrounded by thickness of sand which is not less than the diameter of the bar.

11.2 Frequency of Testing

The number of tests required for each melt or batch of castings shall be as laid in Table 1 below.

Table 1 – Number of Tests

Group	Mass of individual Castings	Test Requirements	Test Samples
*1	Up to 12.5 kg	One test for every 500kg of castings or part thereof	3
*2	over 12.5 kg and up to 50 kg	One test for every 1 tonne of castings or part thereof	3
*3	over 50 kg and up to 500 kg	One test for every 2 tonnes of castings or part thereof	3
*4	over 500 kg and up to 1 tonne	One test for every 3 tonnes of castings or part thereof	3
5	over 1 tonne	One test for every 4 tonnes of castings or part thereof or One test for every casting weighing 4 tonnes or more	3

* In group 1, 2, 3 & 4 all castings represented by one test shall be poured from the same ladle or same heat as the bars provided for the test

11.3 Size of Test Bars

A test bar from which the tensile test piece is machined shall be cast as a uniform cylindrical bar of 30mm diameter. The tolerance on the diameter shall be +2mm, -0 mm. The minimum length of the test bar shall be 230mm.



CORPORATE PURCHASING SPECIFICATION

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Rev No. 07

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11.4 Dimensions of Test Pieces

Test pieces shall conform to the dimensions as per IS:210.

Note: Test bars as specified above with proper identification and representative of the castings shall be supplied along with the consignment.

12 MECHANICAL PROPERTIES

12.1 Tensile

The test pieces prepared in accordance with clause 11 shall show a tensile strength of 260 N/mm², minimum, when tested in accordance with IS:1608.

12.2 Hardness (Brinell)

Hardness shall be measured on actual casting at three different places. The castings shall have a Brinell hardness in the range of 180 to 230 HB, when tested in accordance with IS 1500.

13 OPTIONAL TESTS

If specified in the drawing/order, the following tests shall be conducted.

13.1 Non-destructive test

Magnetic Particle Inspection as per BHEL standard AA0850133 and norms of acceptance as per AA0850134 at level 2.

13.2 Hydraulic

Hydraulic test shall be conducted by the manufacturer. In case hydraulic testing as prescribed on the BHEL order/drawing is not carried out at the manufacturer's works, the same shall be carried out by BHEL after necessary machining. However, the manufacturer shall guarantee against any leakage when tested at BHEL's end.

Test pressure and duration of test shall be as specified in BHEL order/drawing.

14 RETEST

Retest shall be done as per IS:210.

15 REPAIR OF CASTINGS

Repair of castings shall not be carried out by the manufacturer without the prior permission of BHEL.

16 SCOPE OF THIRD PARTY INSPECTION

Wherever, separate quality plan is not attached, the scope of third party inspection shall be as follows:

- 1) Review of supplier's declared chemical composition.
- 2) Selection of test samples for mechanical tests and witness of mechanical tests.
- 3) Witness of Non-destructive tests as applicable.
- 4) Review of HT charts.
- 5) Dimensional inspection.

17 TEST CERTIFICATES

Three copies of test certificates shall be supplied unless otherwise stated on order, preferably in the test certificate format annexed to this specification (Annexure -1).

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.



The following details shall be furnished in the test certificate:

- 1) Dimensional inspection
- 2) Detail of heat treatment
- 3) Hardness value
- 4) NDT
- 5) Optional tests called for in the drawing/order.

18 PACKING AND MARKING

Castings shall be suitably packed to prevent corrosion and damage during transit. Machined surfaces shall be properly protected with anticorrosive compounds. Each package or casting (when supplied separately) shall be legibly marked with the following information.

- AA19703: GREY IRON CASTINGS - Gr: FG 260
- BHEL Order No.
- Consignment/Identification No.
- Melt No.
- Weight
- Supplier's Name

19 REFERRED STANDARDS (Latest Publications Including Amendments):

- 1) IS: 210 2) IS:1500 3) IS:1608 4) AA0230402 5) AA0850133 6) AA0850134



CORPORATE PURCHASING SPECIFICATION

AA19703

Rev No. 07

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ANNEXURE 1 - RECOMMENDED TEST CERTIFICATE FORMAT FOR CASTING

SUPPLIER'S NAME AND ADDRESS

TEST CERTIFICATE FOR CASTINGS

- 1. Customer: 2. TC No. & Date: 3. PO No.: 4. Process of Melting: 5. Deoxidisation Process: 6. Cast No. & Date: 7. Batch No.: 8. Heat Code: 9. Spec. No.: 10. Test Bar Size:

11. CASTING COVERED BY TEST CERTIFICATE

Table with 4 columns: S.No., Drawing No. & Item No., Description, Quantity & Weight

12. CHEMICAL COMPOSITION (PERCENT)

Table with 11 columns: Element, C, Si, Mn, S, P, and 6 empty columns. Rows for As per Min./Specn. Max. and Actual Values.

17. HEAT TREATMENT

(To be accompanied by Recorder Chart, Whenever Called for)

Table with 4 columns: Condition, Temp. °C, Soaking Time, Hrs., Cooling Medium

14. MECHANICAL PROPERTIES

Table with 8 columns: T.S. N/mm², Y.S. 0.5/0.2% Proof N/mm², % Elongation 5.65vSo GL, % R.A. Min., Hardness BHN (Min.3 values), Impact value Joules, Bend, and 1 empty column. Rows for As per Min./Specn. Max. and Actual Values.

15. SURFACE FINISH

(When called for in the order / drg.)

16. DIMENSIONAL INSPECTION

17. NON-DESTRUCTIVE TESTS

Table with 6 columns: Nature of Test, Acceptance level, Instrument used, Range, Results, Any other detail. Rows for Ultrasonic, Radiographic, Dye penetrant/Magnetic Particle.

18. OTHER TESTS IF ANY (Microscopic, Hydraulic, Etc)

19. IDENTIFICATION OF CASTINGS AS PER CPS

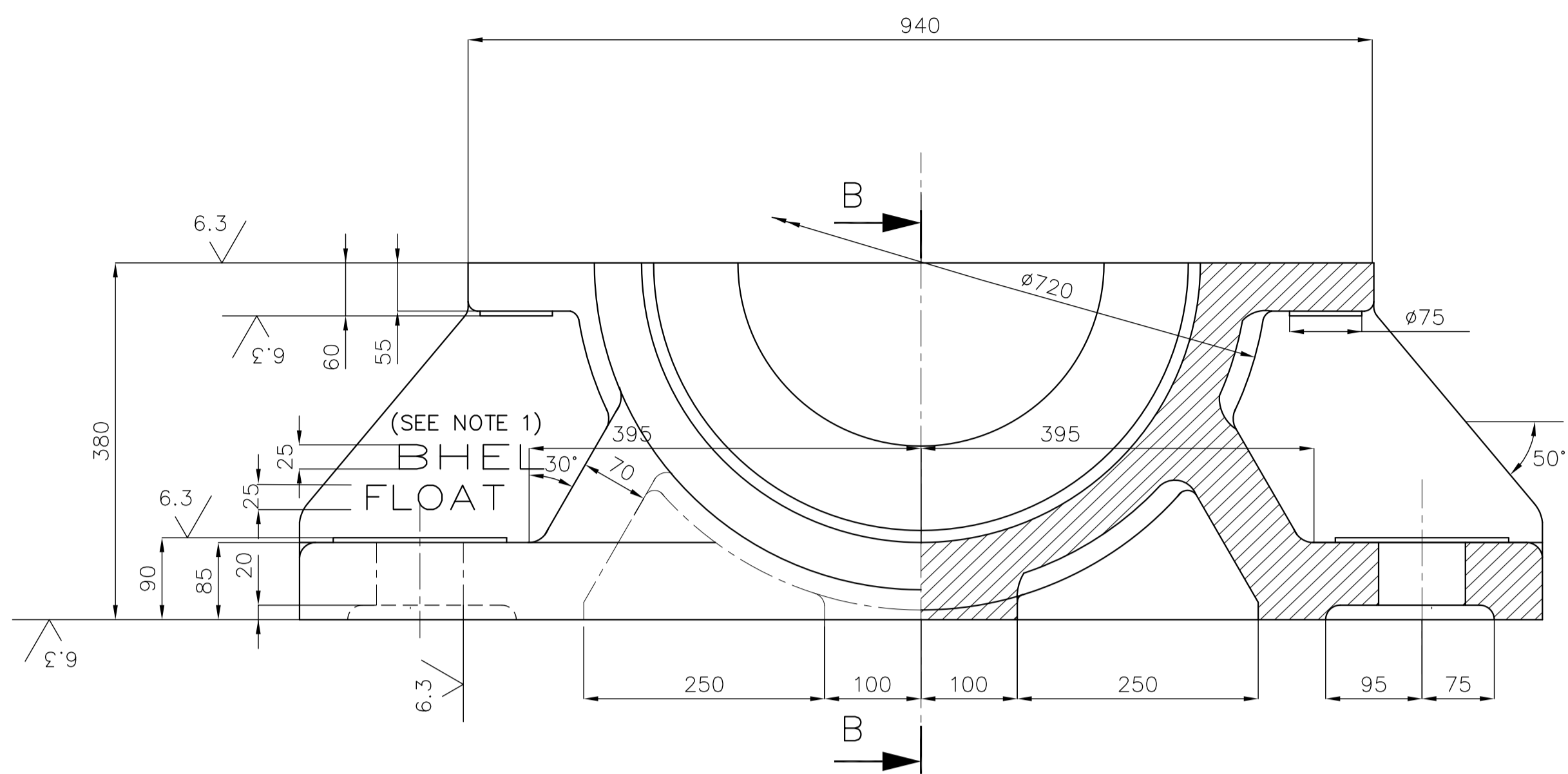
We hereby certify that the items mentioned above have been tested and inspected in our presence and are found to be in accordance with drawings, specifications and purchase order.

Signature & Seal of the inspecting Officer (Purchase Representative)

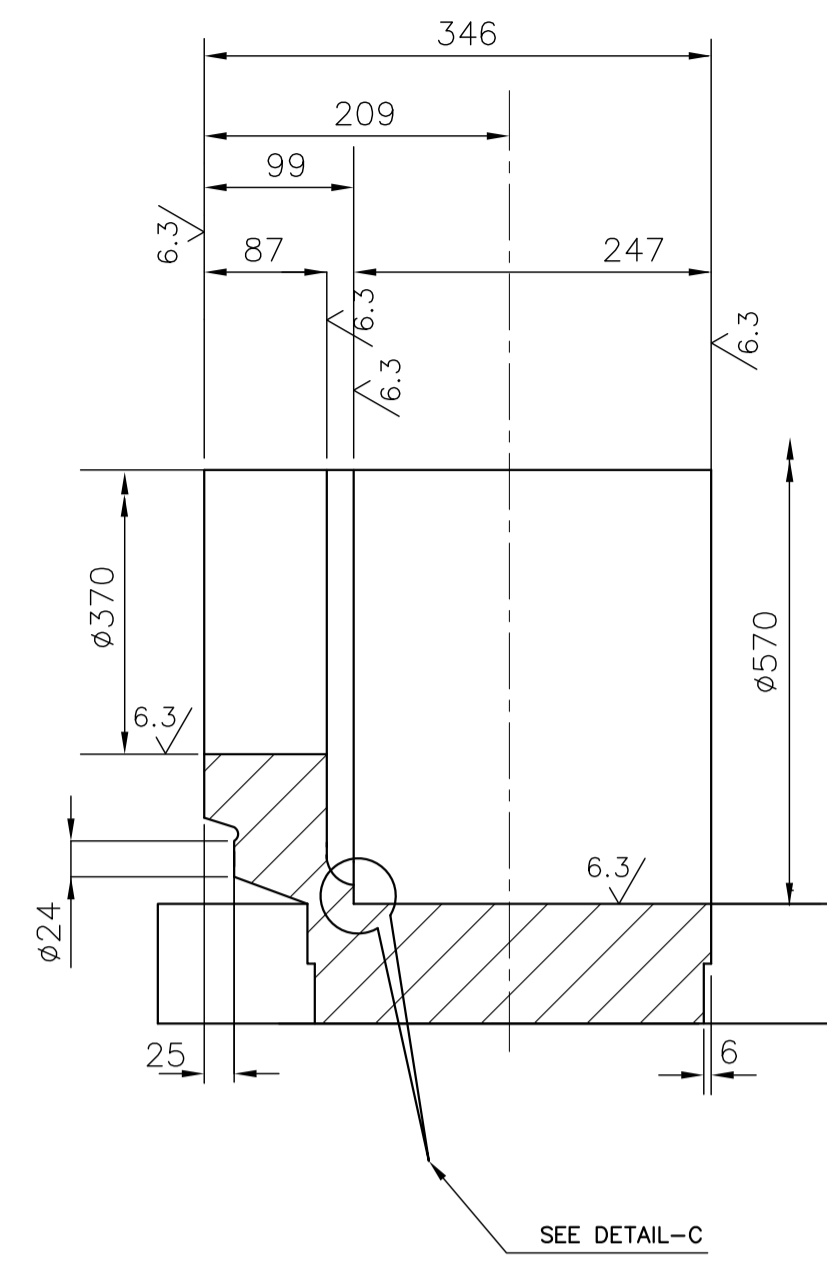
Signature and Seal of the Chief of Quality Control Chief Metallurgist of Supplier. Date :

INSTRUCTIONS

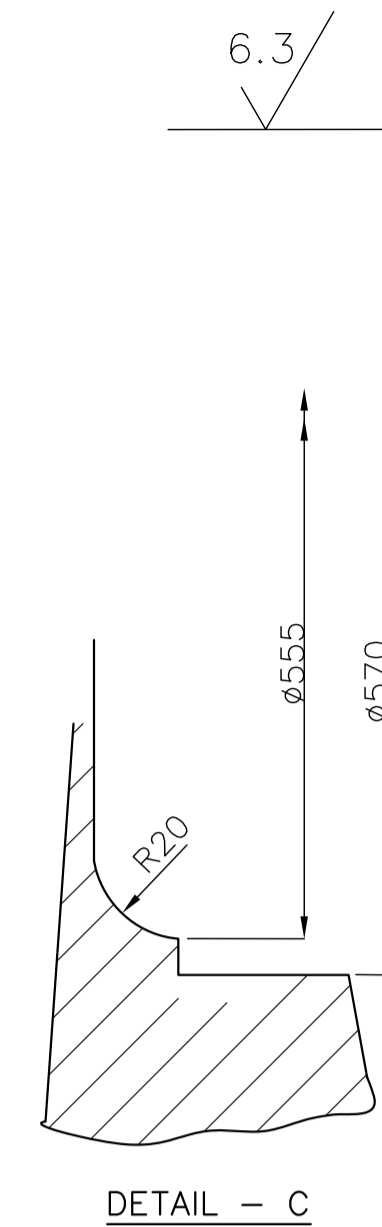
- a) If steel is produced by LD or Oxygen process, Nitrogen content should be furnished and shall not exceed 0.009%. b) Test certificates are to be furnished as per purchase order and specification, in A4 size transparent paper. c) All the entries including signature should be in block colour ink. d) If testing is done by outside agencies, the original TCs shall be furnished. e) The actual Test Certificate may run into more than one A4 size paper, if needed, to facilitate filling up of details.



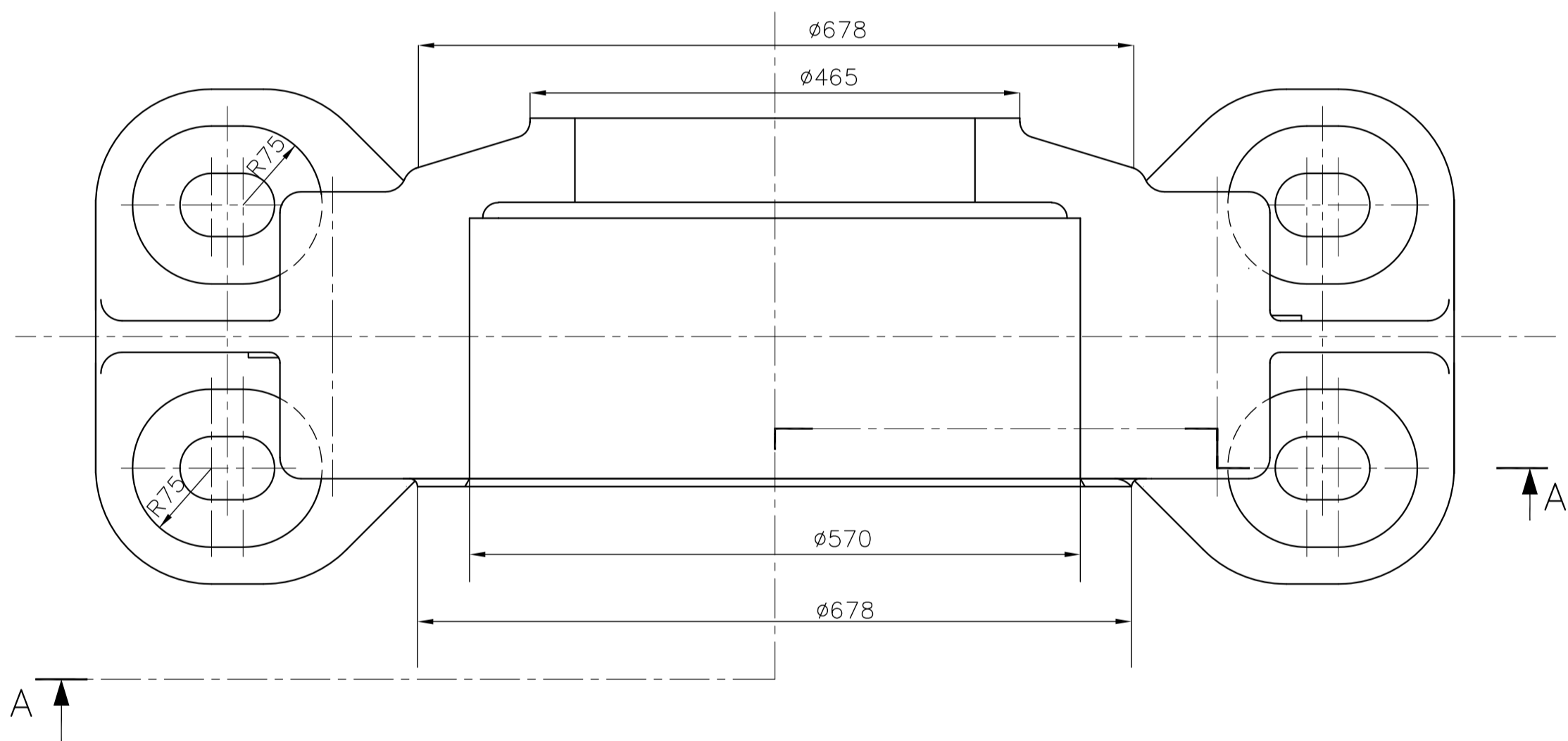
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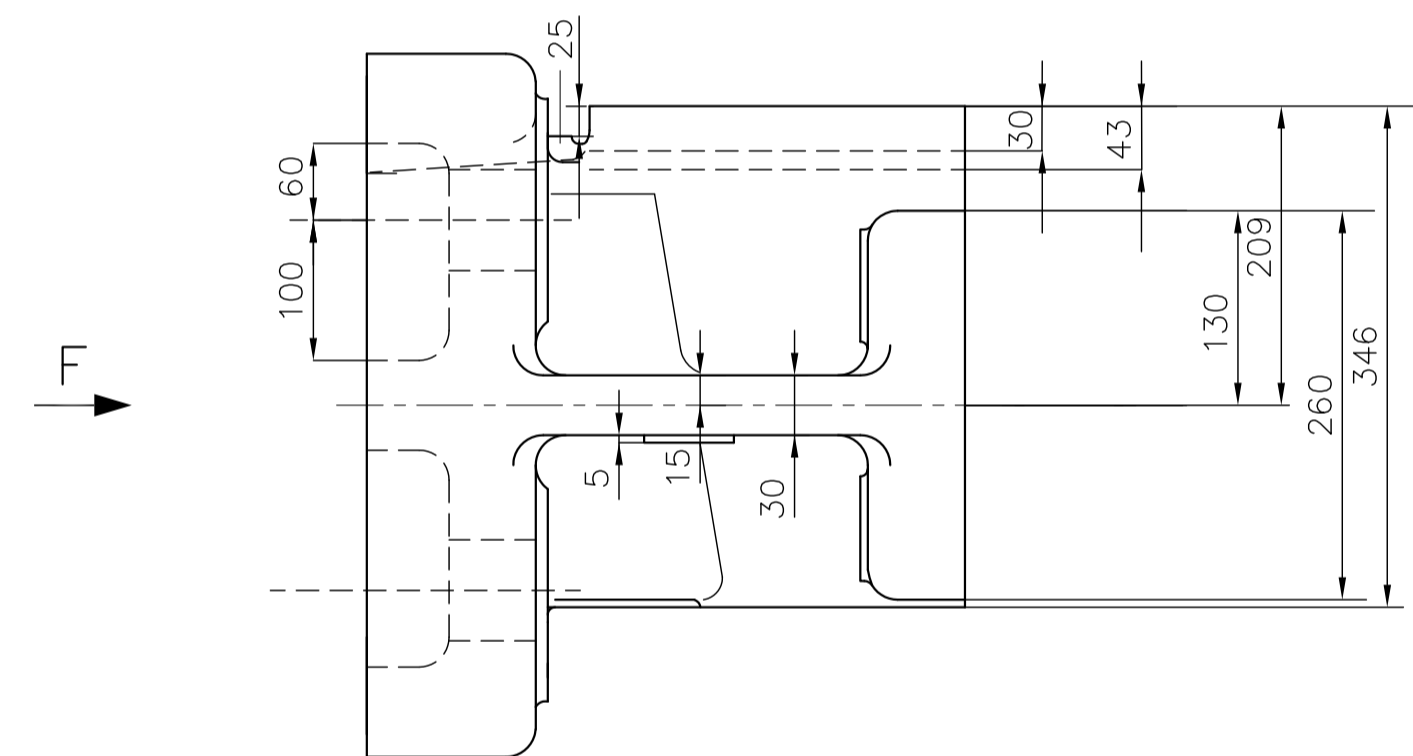
SECTION B-B



DETAIL - C



VIEW - F



NOTES: -

- 'BHEL, FLOAT' LETTERS PROJECTION SHOULD BE 4MM MIN.
- RADIUS WITHOUT SPECIFICATIONS R=20
- THIS IS THE DRAWING FOR ROUGH MACHINED CASTING.

01	BEARING BODY FLOATING BRG.			BA9110403027	495.00
				AA19704	1
ITEM NO.	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATERIAL CODE NET WT. GROSS WT.
					MATERIAL SPECN. QUANTITY

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE SPECIFIED...
 1. REF. TO HY0230261 FOR UNFINISHED TOLERANCES.
 2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
 3. INTERNAL M/CD CORNER RADI 1 TO 0.7.
 4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

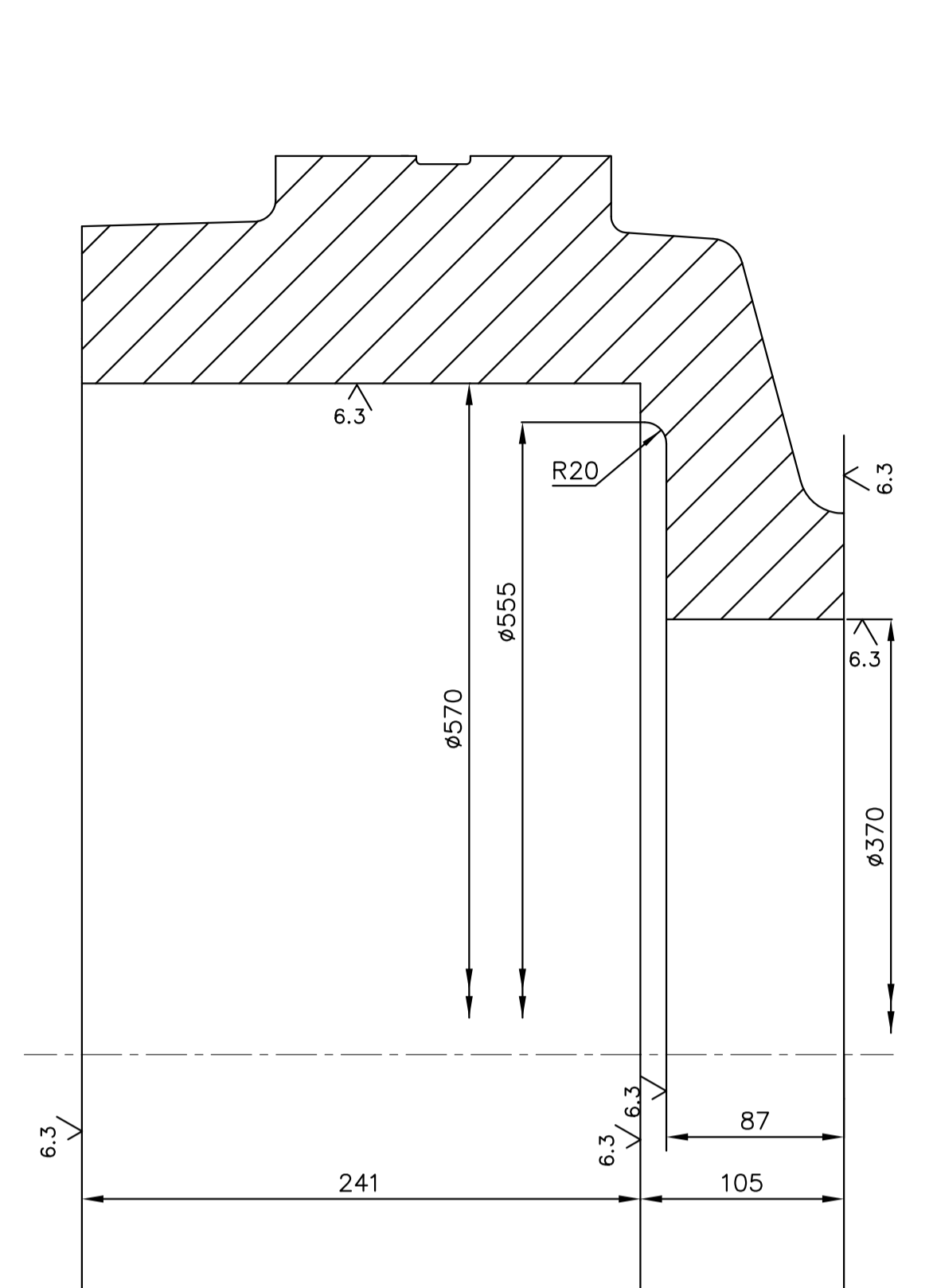
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		BBD 4760 BALL TUBE MILL			
DEPT. PULVE. ENGG		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.
CODE 446		1:5	495		
TITLE		DRAWING NO.		REV.	
BEARING BODY-DRIVE SHAFT FLOATING		1-62-708-50751 00		01	

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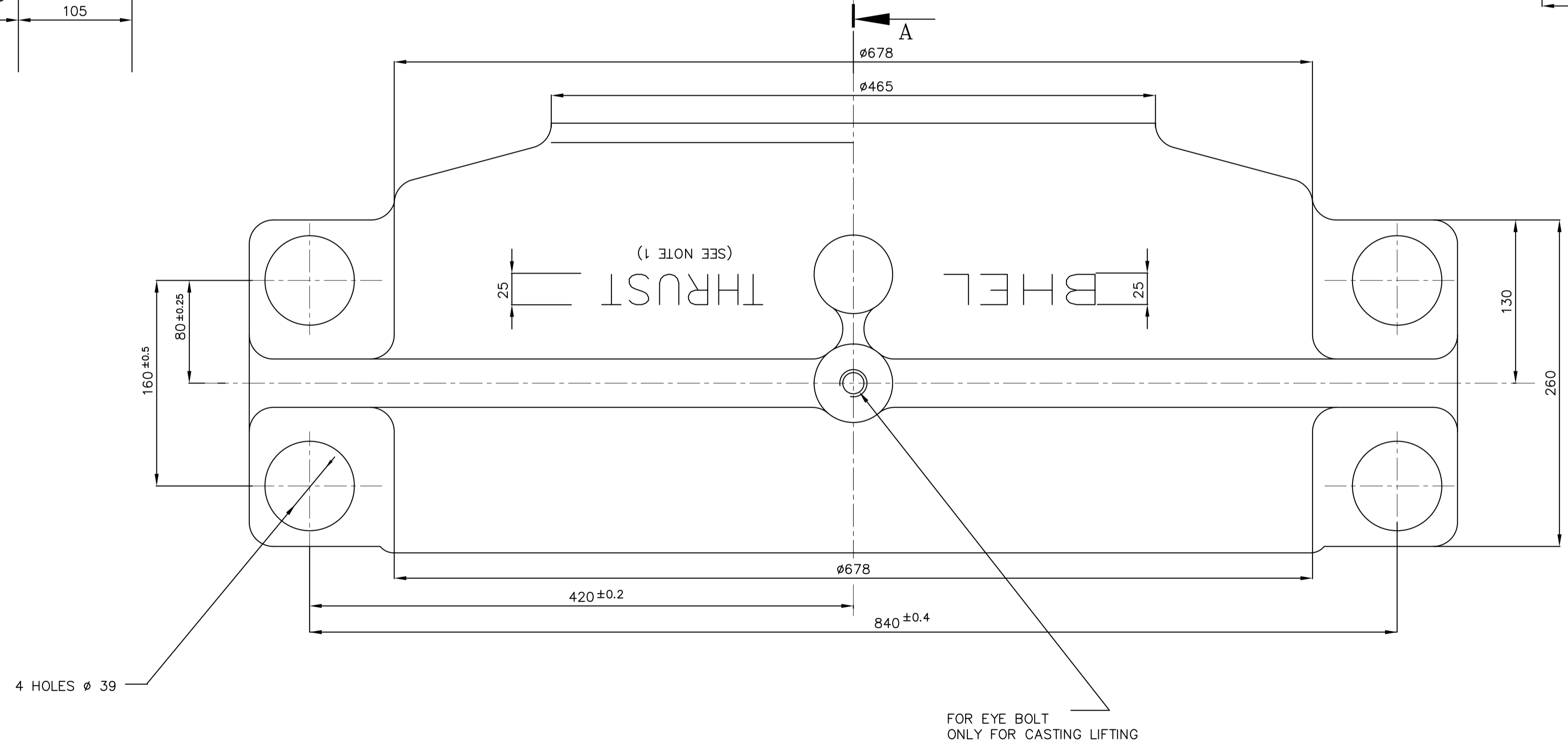
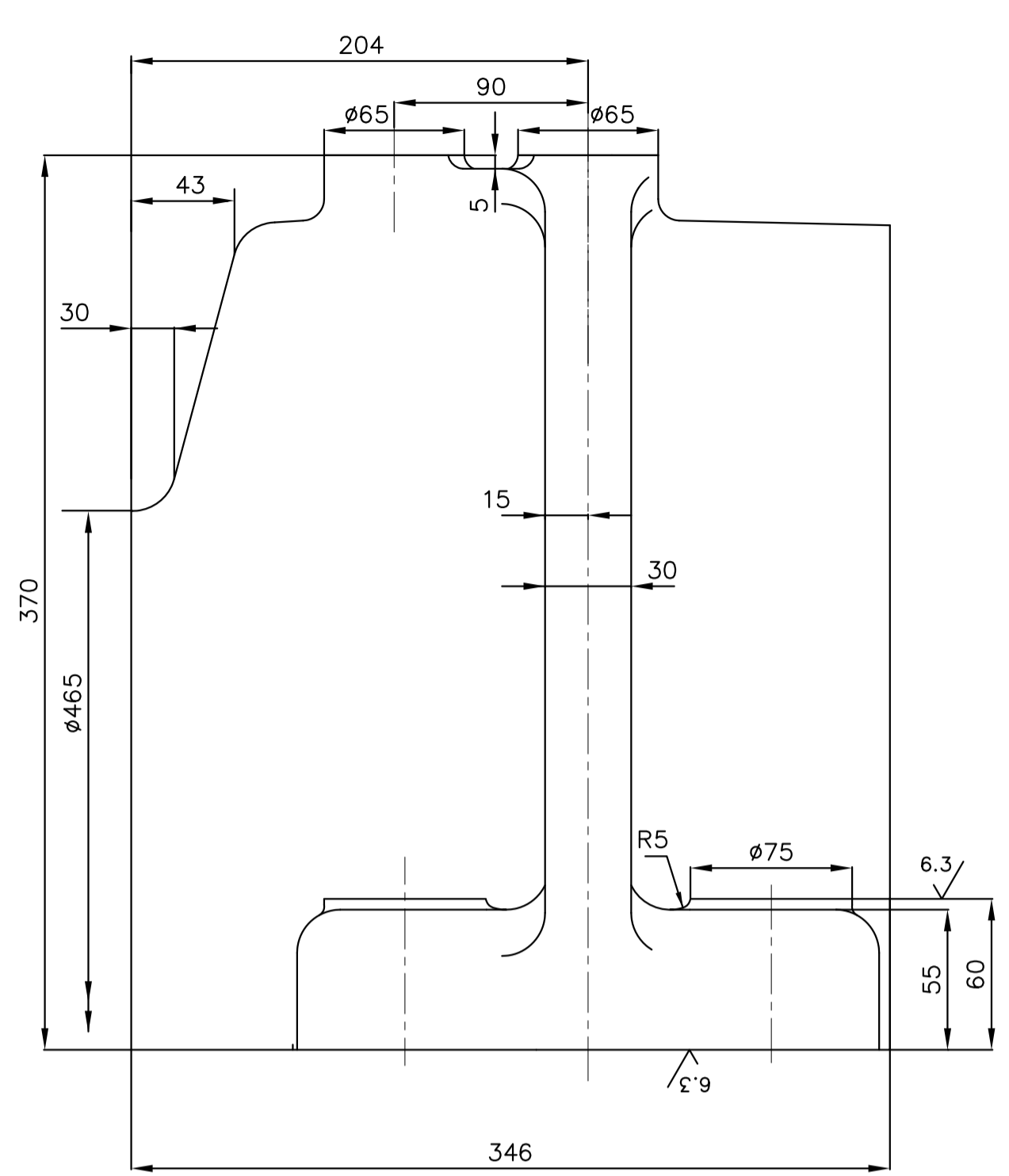
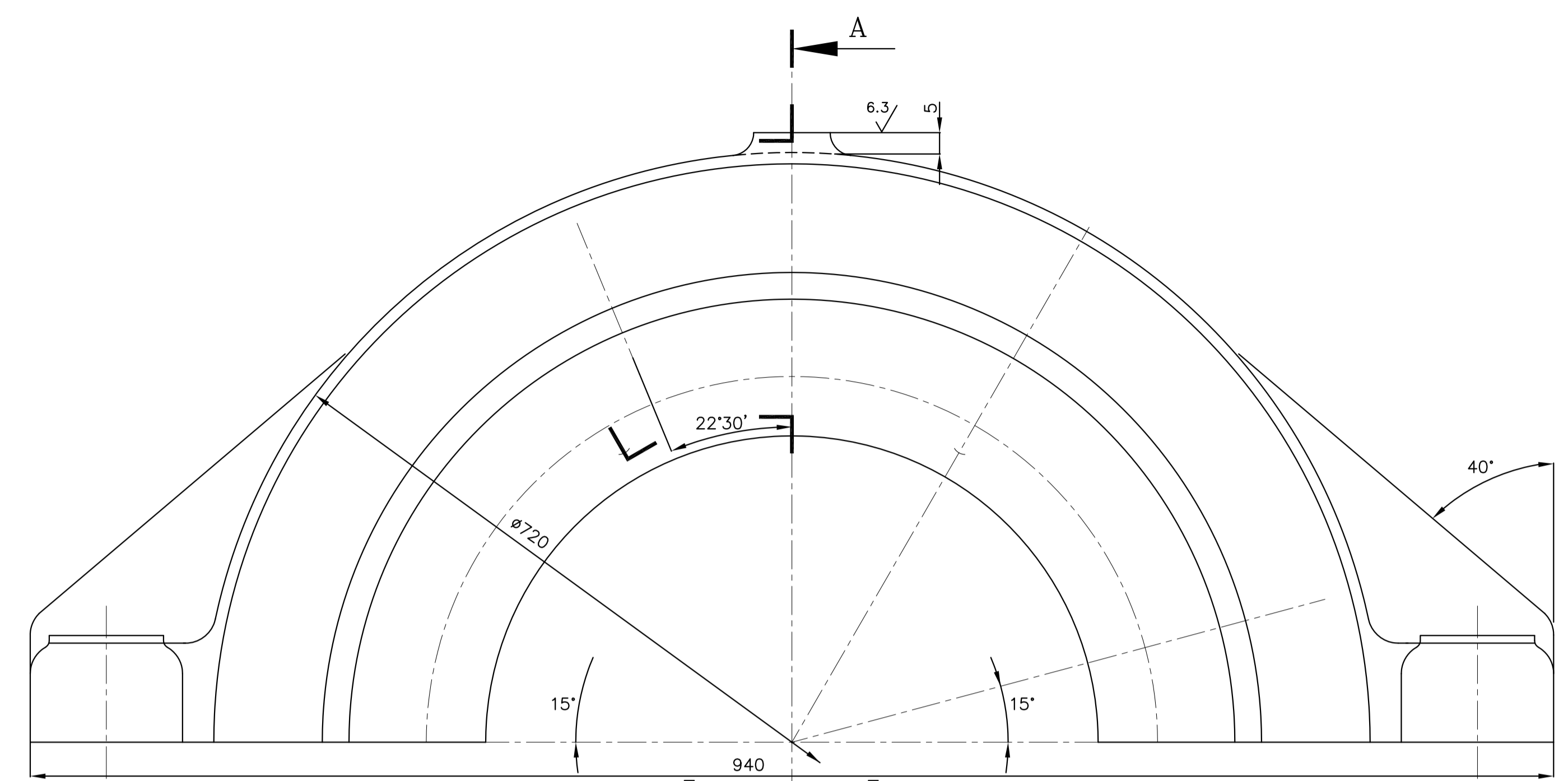
INVENTORY NO. SIGN. AND DATE REF. DRG. NO. COMPUTER FILE NAME

DRG. NO. 1-62-708-50752

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SECTION A-A



- NOTES :
- "BHEL THRUST" LETTERS PROJECTION SHOULD BE 4 MM. MIN.
 - RADIUS WITHOUT SPECIFICATIONS R=20
 - THIS IS THE DRAWING FOR ROUGH MACHINED CASTING.

01	BEARING COVER THRUST BRG				BA9110406000	240	
					AA19704		1
ITEM NO.	DESCRIPTION	DRAWING NO.	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG. NO. OR FORGING DRG. NO.	MATERIAL CODE	NET WT.	GROSS WT
					MATERIAL SPECN.	QUANTITY	

OLD DRAWING NOS.
0-62-708-50340 FOR FLOATING BEARING
0-62-708-50338 FOR THRUST BEARING

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

- REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
- CHAMFER M/CD. SHARP EDGES AT 45°
- INTERNAL M/CD. CORNER RADI 1 TO 0.7
- THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN OR THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT: BBD 4760 BALL TUBE MILL
NAME OF CUSTOMER/PROJECT: BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD

DRN.	K.C.M	DATE	17.8.22
CHD.	AMAN	DATE	17.8.22
APPD.	HRK	DATE	17.8.22

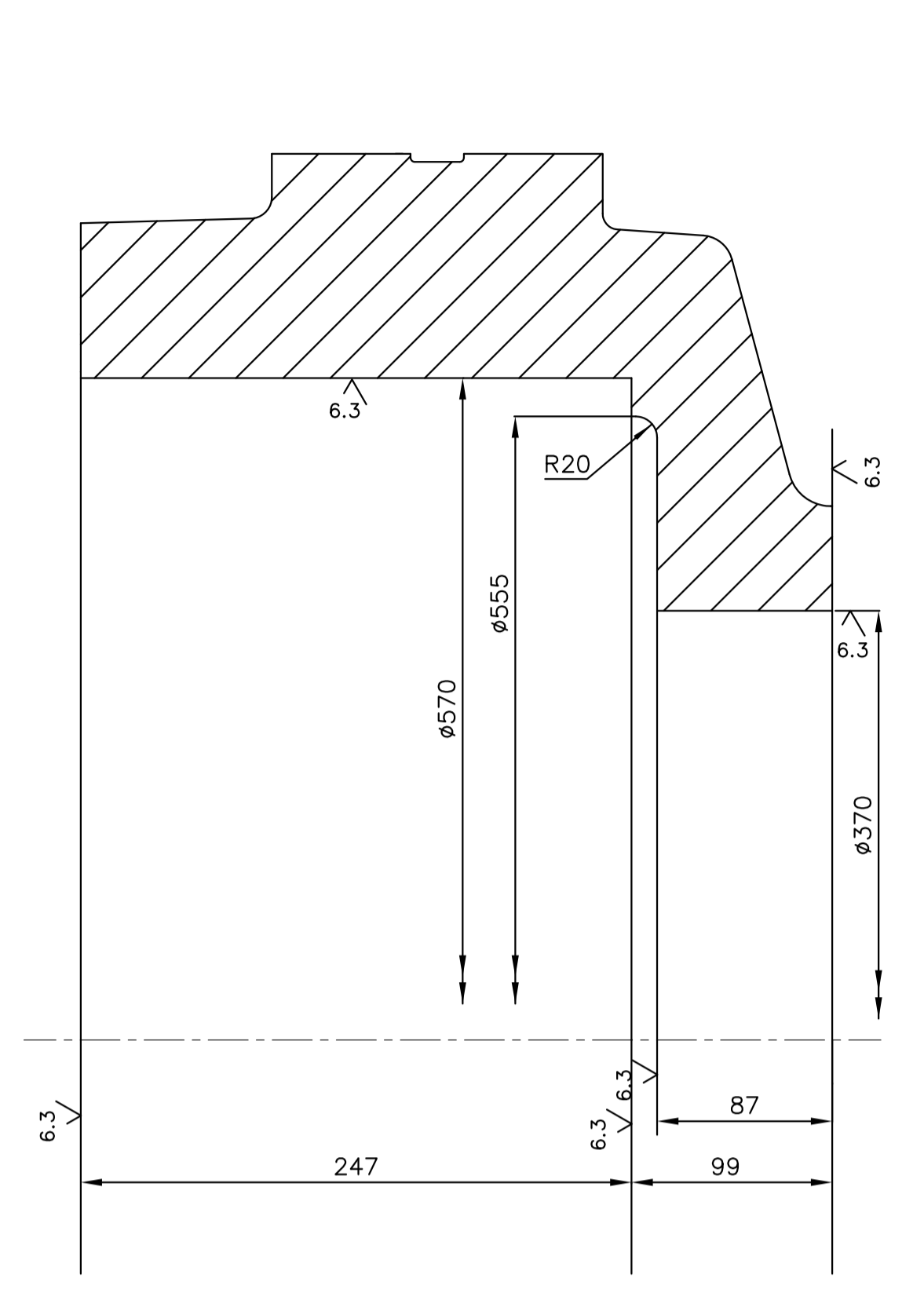
DEPT. PULV. ENGG. 446
UNTOOL. DMS. CR. C/M/F
SCALE: NTS
WEIGHT (KG): 240

TITLE: BEARING COVER-THRUST-DRIVE SHAFT
DRAWING NO.: 1-62-708-50752
SHEET NO. 01 NO OF SHEETS 01

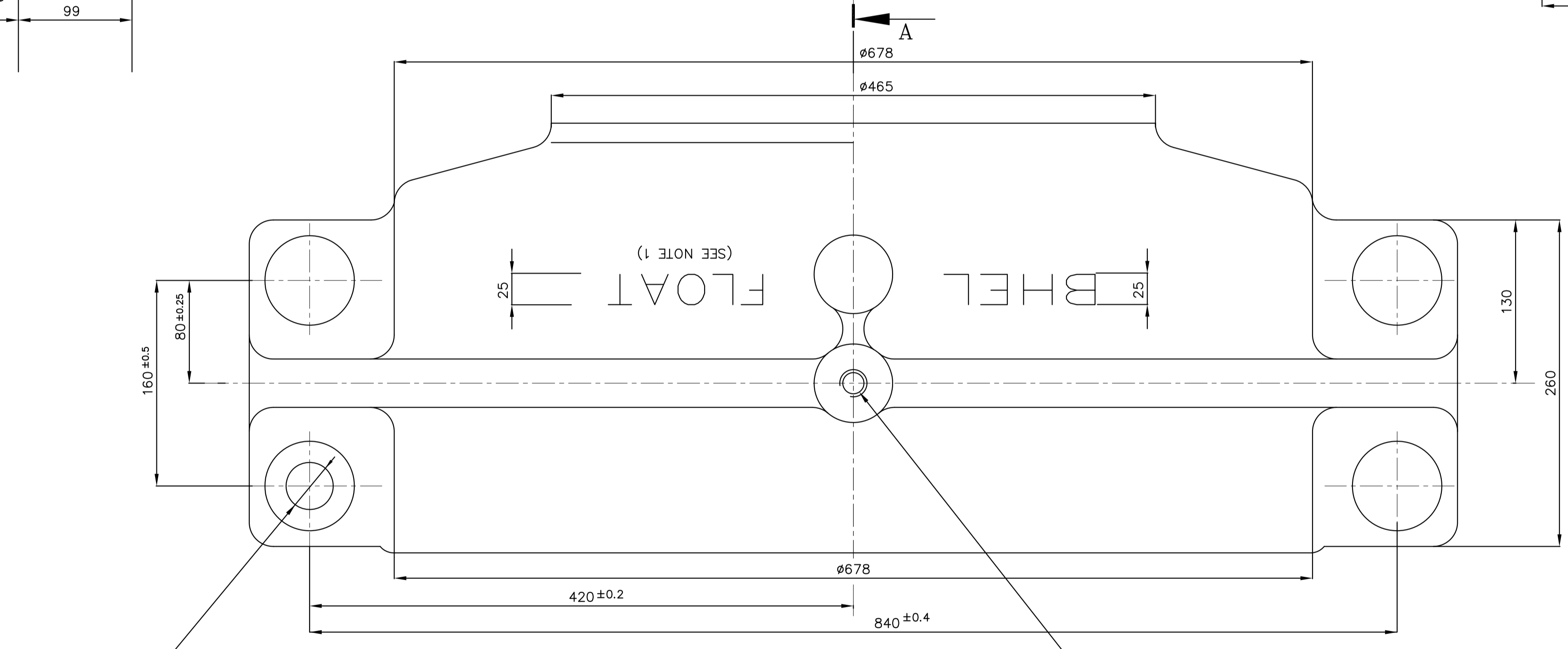
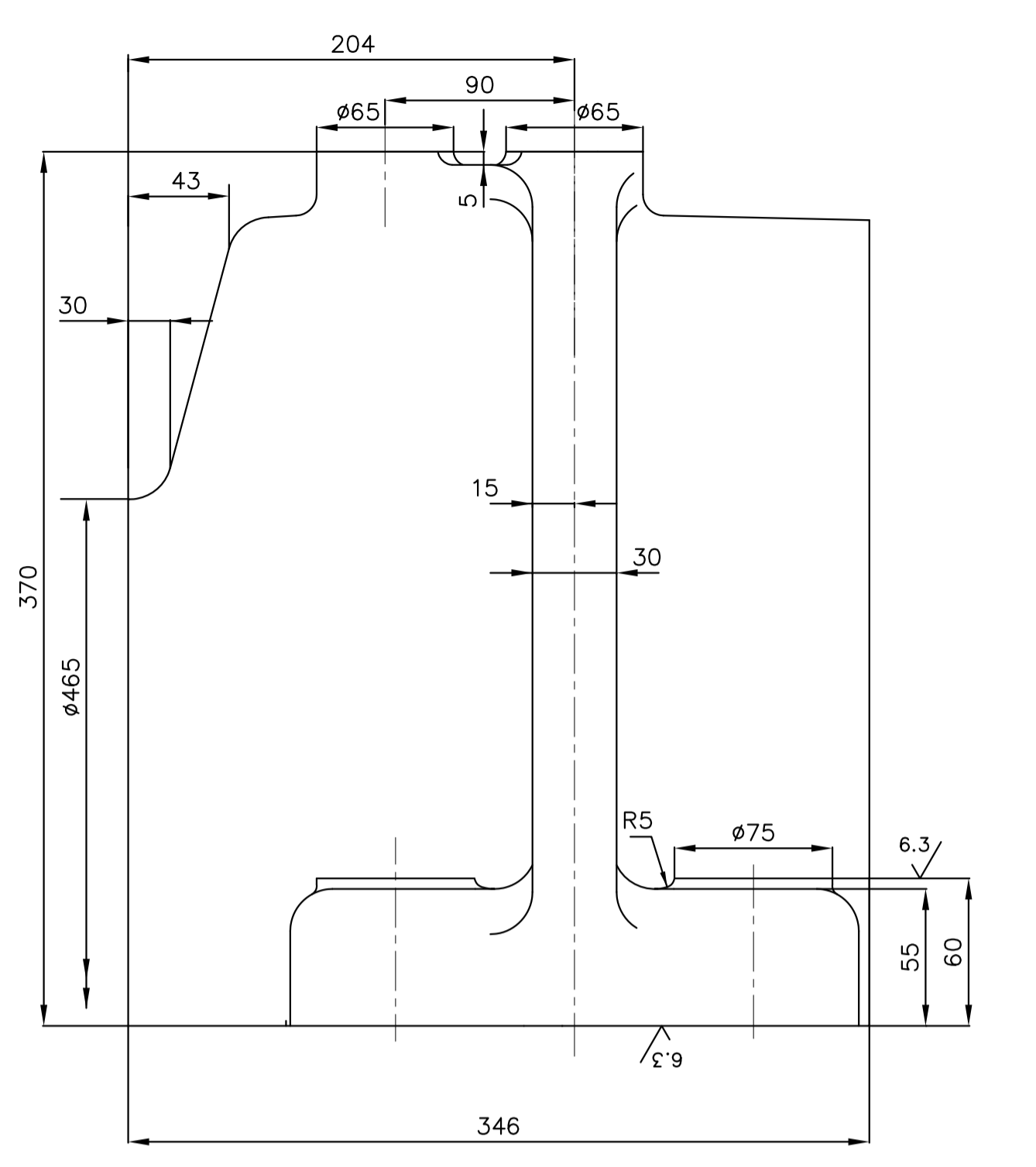
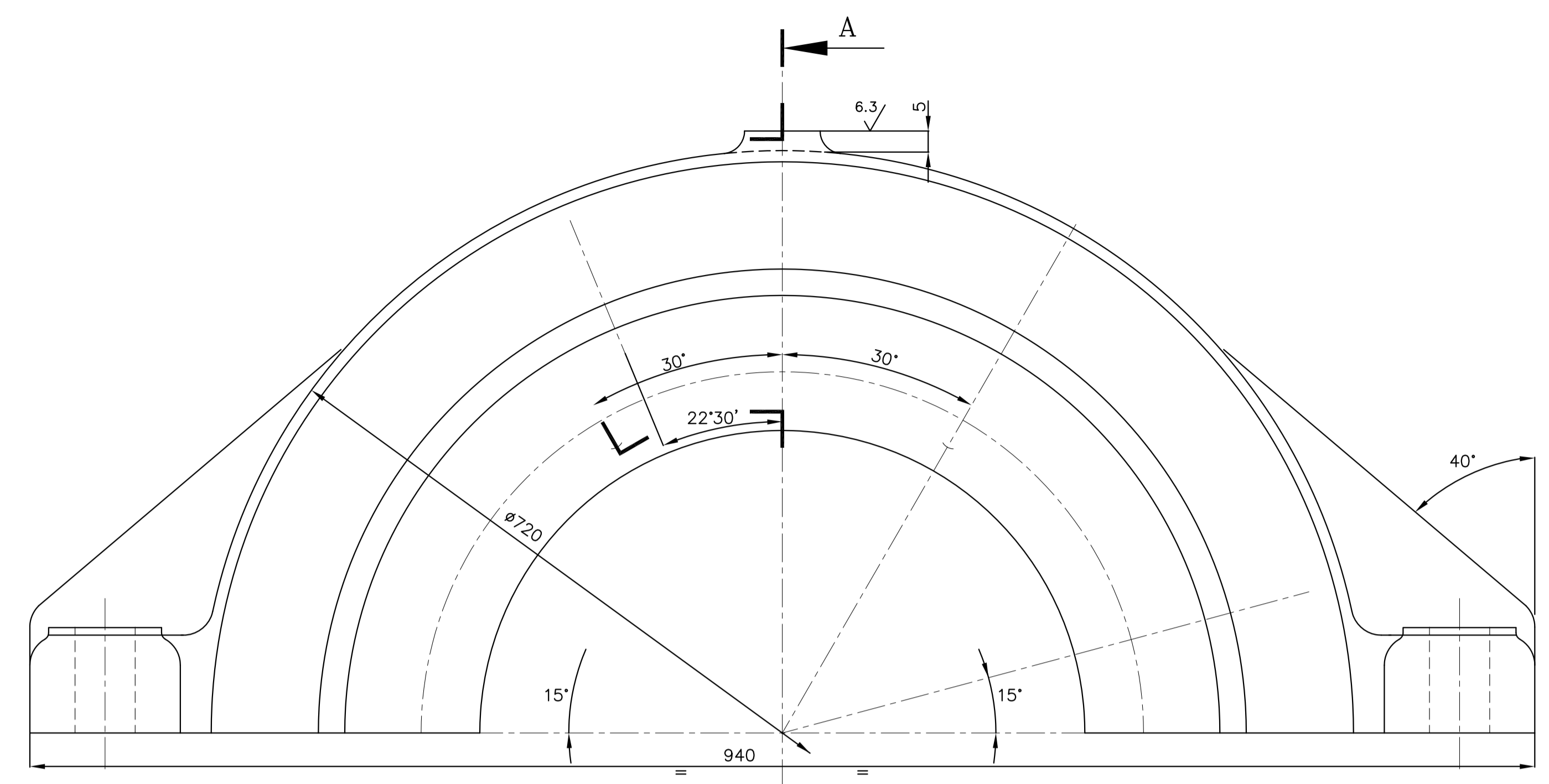
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DRG. NO. 1-62-708-50753

6.3



SECTION A-A



4 HOLES $\phi 39$

FOR EYE BOLT ONLY FOR CASTING LIFTING

NOTES :

- "BHEL FLOAT" LETTERS PROJECTION SHOULD BE 4 MM. MIN.
- RADIUS WITHOUT SPECIFICATIONS R=20
- THIS IS THE DRAWING FOR ROUGH MACHINED CASTING.

01	BEARING COVER FLOATING BRG				BA9110406018	240	
					AA19704		1
ITEM NO.	DESCRIPTION	DRAWING NO.	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG. NO. OR FORGING DRG. NO.	MATERIAL CODE	NET WT.	GROSS WT
					MATERIAL SPECN. <td colspan="2">QUANTITY</td>	QUANTITY	

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

- REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
- CHAMFER M/C.D. SHARP EDGES AT 45° .
- INTERNAL M/C.D. CORNER RADI 1 TO 0.7.
- THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN OR THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT: BBD 4760 BALL TUBE MILL
 NAME OF CUSTOMER/PROJECT: BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD

DRN.	K.C.M	DATE	17.8.22
CHD.	AMAN	DATE	17.8.22
APPD.	HRK	DATE	17.8.22

DEPT. PULV. ENGG. C/M/F
 UNTOOL. DMS. CR. C/M/F
 SCALE: NTS
 WEIGHT (KG): 240
 REF. TO ASSY DRG.
 ITEM NO. 00

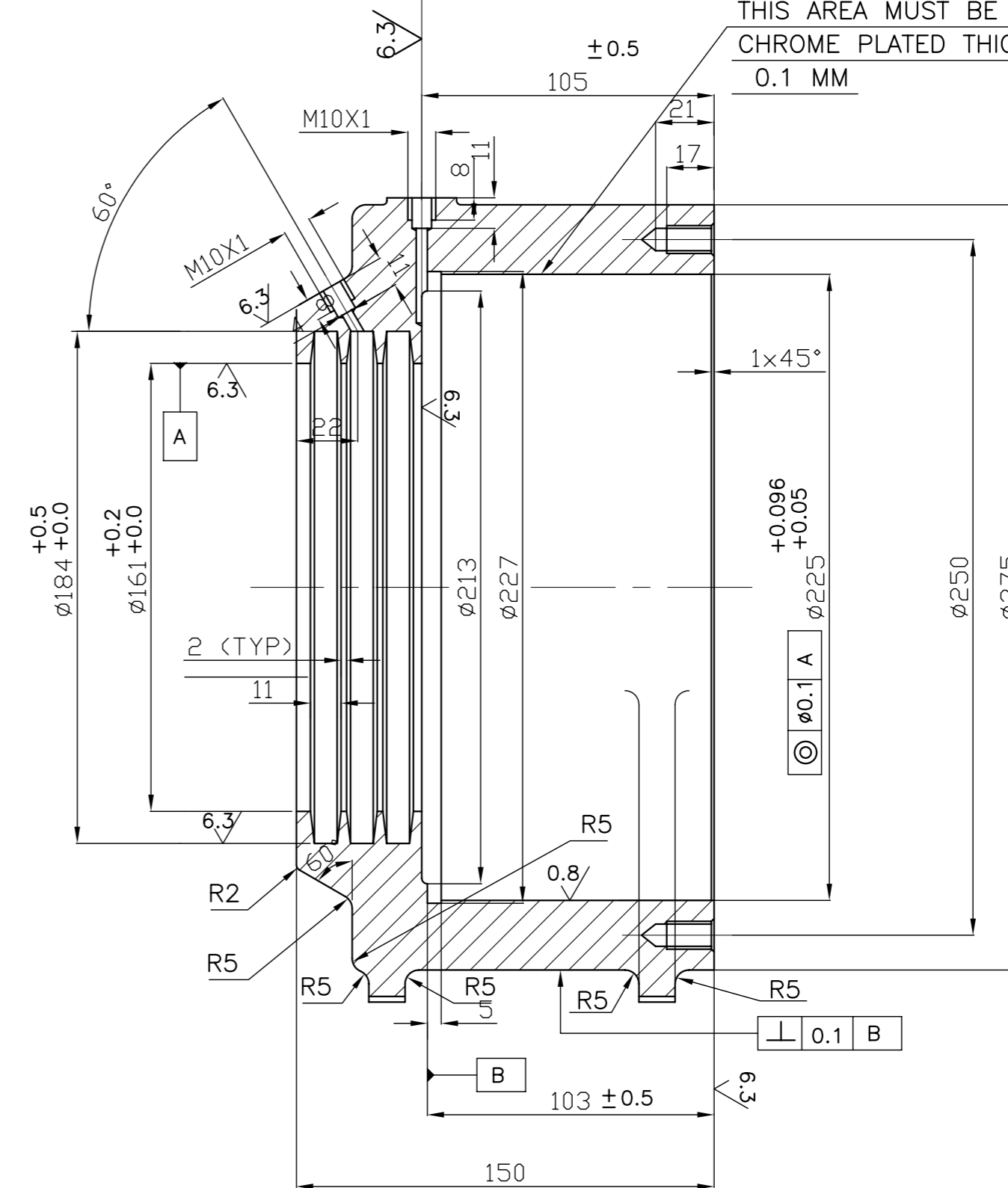
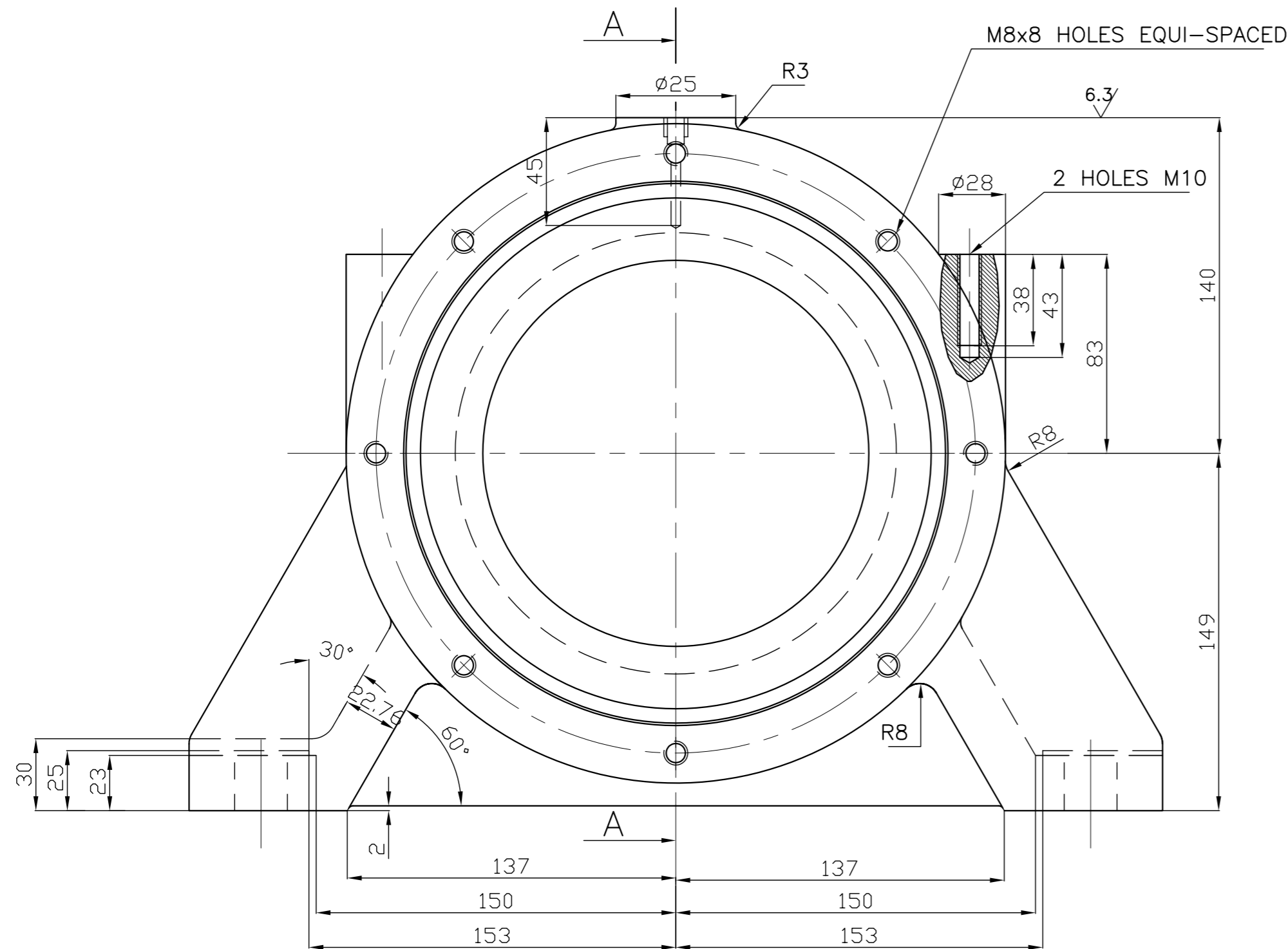
TITLE: BEARING COVER-FLOATING-DRIVE SHAFT
 DRAWING NO. 1-62-708-50753
 SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED CHD.	APPD.	REV.	DATE	ALTERED CHD.	APPD.	REV.	DATE	ALTERED CHD.	APPD.

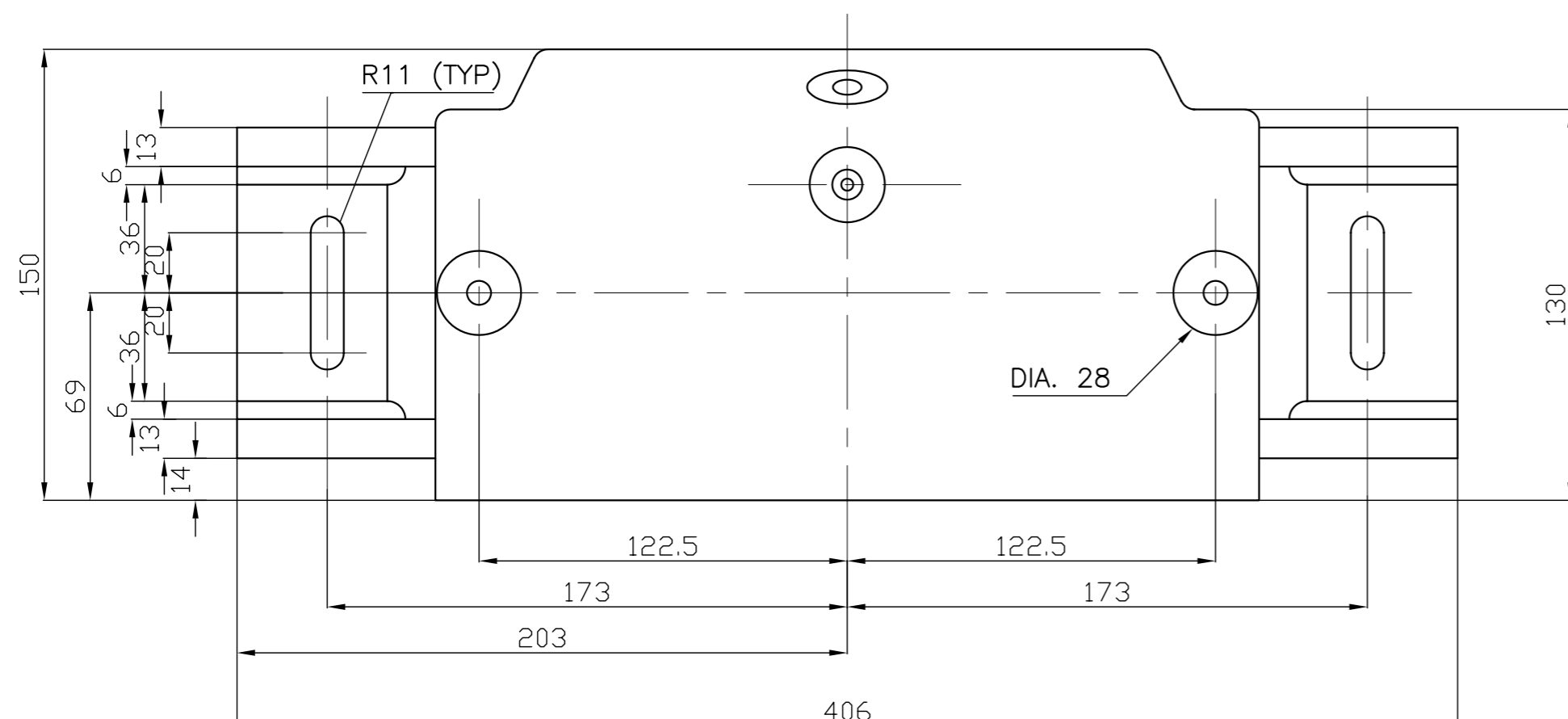
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DRG. NO. 2-62-204-50072

THIS AREA MUST BE HARD CHROME PLATED THICK 0.1 MM



SECTION "A-A"



ITEM NO.	DESCRIPTION	MATL SPECN	UNIT WT.	QTY
	BEARING HOUSING	BA9110303065 AA19703	36.25	01

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

- REFER TO HY0230261 FOR UNSPECIFIED TOLERANCES.
- CHEMFER MACHINED SHARP EDGES 1.2 TO 1.0 AT 45°.
- INTERNAL MACHINED CORNER RADII 1.0 TO 0.7
- THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUTSIDE THE BACK SLASH GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRAWING.

TYPE OF PRODUCT BBD 4772/4760 BALL TUBE MILL
OR
NAME OF CUSTOMER/PROJECT



DEPT. PULV-ENGG	GRADE OF TOL. DIM. 2/M/P	SCALE 1:2	WEIGHT (KG) 36.25	REF. TO ASSY DRG. 0-62-204-50063	ITEM NO. 05	NO. OF ITEMS
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DRN. M.NIZAM	SIG. T.M.RAO	DATE 20.11.98	NO. OF VAR.
CHD. T.M.RAO	APPD. J.G.KULKARNI	DATE 20.11.98	

TITLE BEARING HOUSING	CARD CODE	DRAWING NO. 2-62-204-50072	REV. 05
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REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED
					05	21.11.08				04	23.11.98			
ZONE					ZONE					ZONE				

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INVENTORY NO. SIGN. AND DATE REF. DRG. NO. 26250072.DWG

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG.NO. 3-62-204-50103

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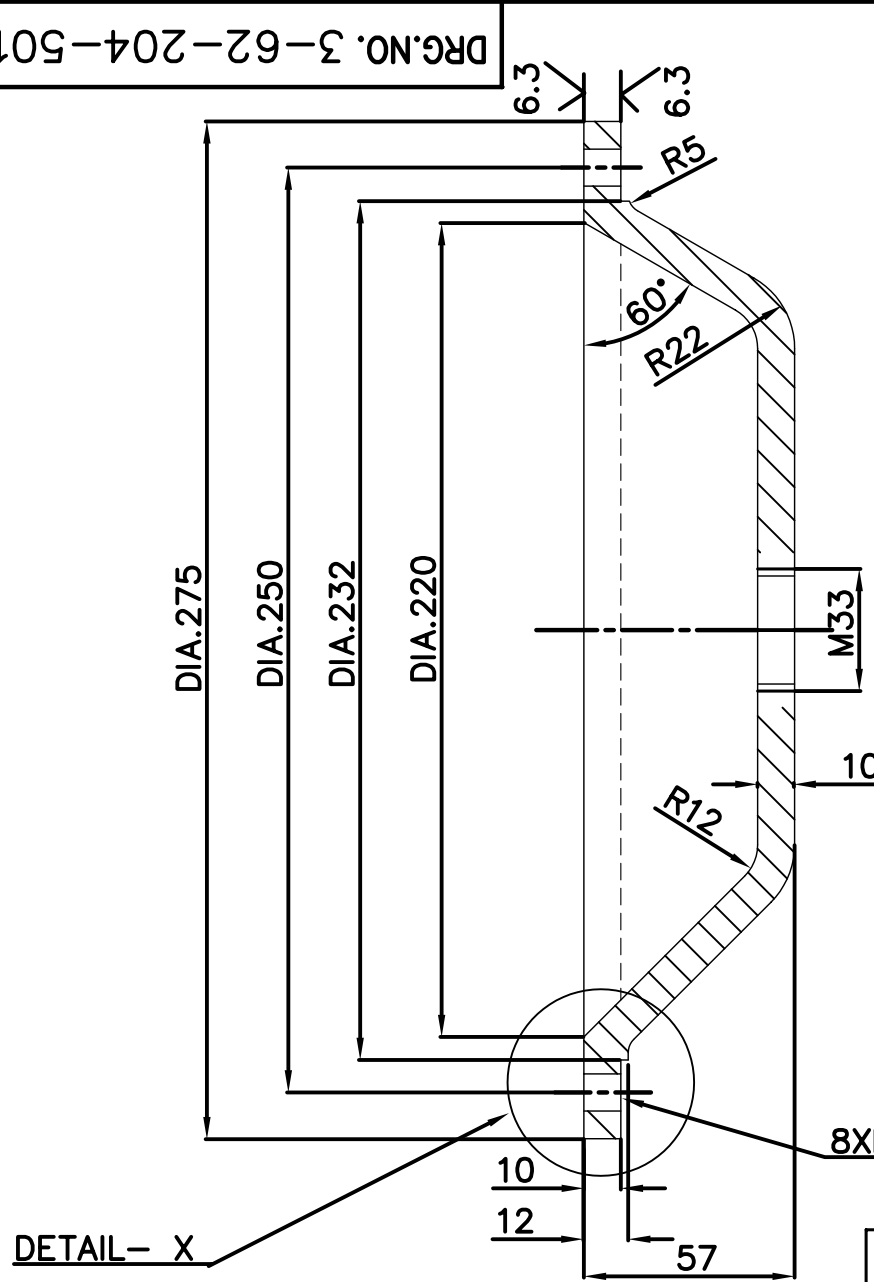
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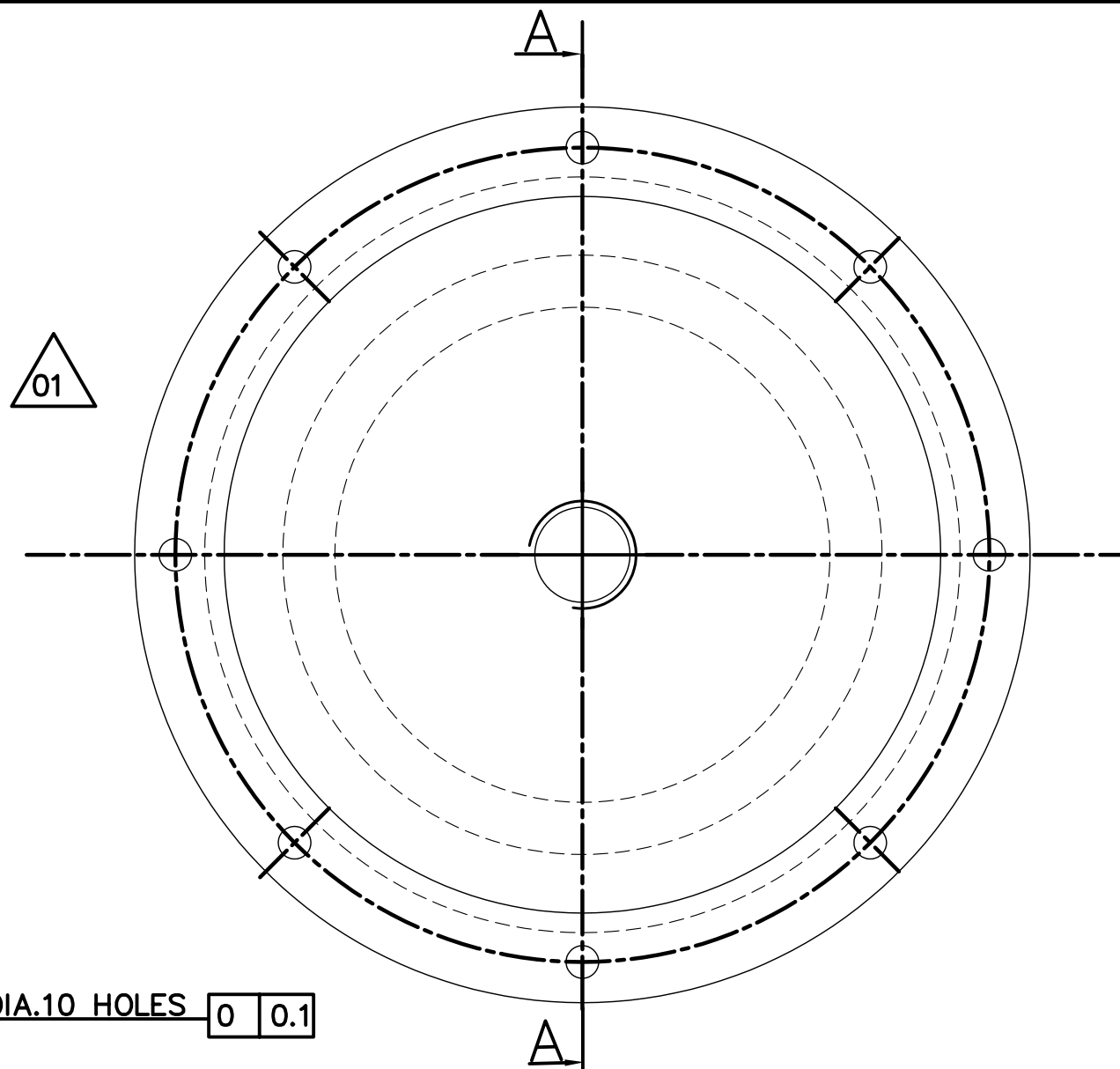
INVENTORY NO.

REV.	DATE	ALTERED	REV.	DATE	ALTERED
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					balaji

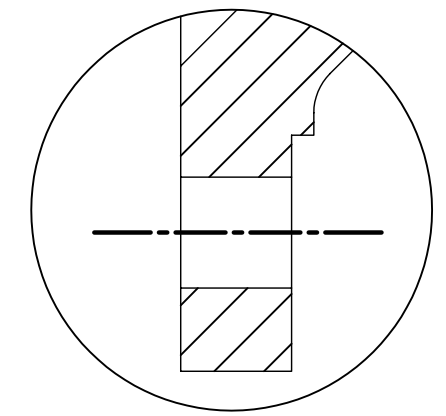
Hole M 33 added.
Drawing re-drawn.
Detail X added.



SECTION - A-A



8XDIA.10 HOLES 0 0.1

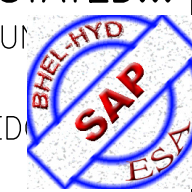


DETAIL - X

ITEM NO.	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATERIAL CODE	NET WT.	GROSS WT.
	BRG. HOUSING COVER			CASTING	BA9110306188		6.300
					AA19703		
					MATERIAL SPECN.	QUANTITY	

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

- REF.TO HY0230261 FOR UT TOLERANCES.
- CHAMFER M/CD SHARP ED 1.2 TO 1.0 AT 45°.
- INTERNAL M/CD CORNER RADII 1 TO 0.7.
- THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.



TYPE OF PRODUCT BBD 4760/4772 TUBE MILLS OR NAME OF CUSTOMER/PROJECT

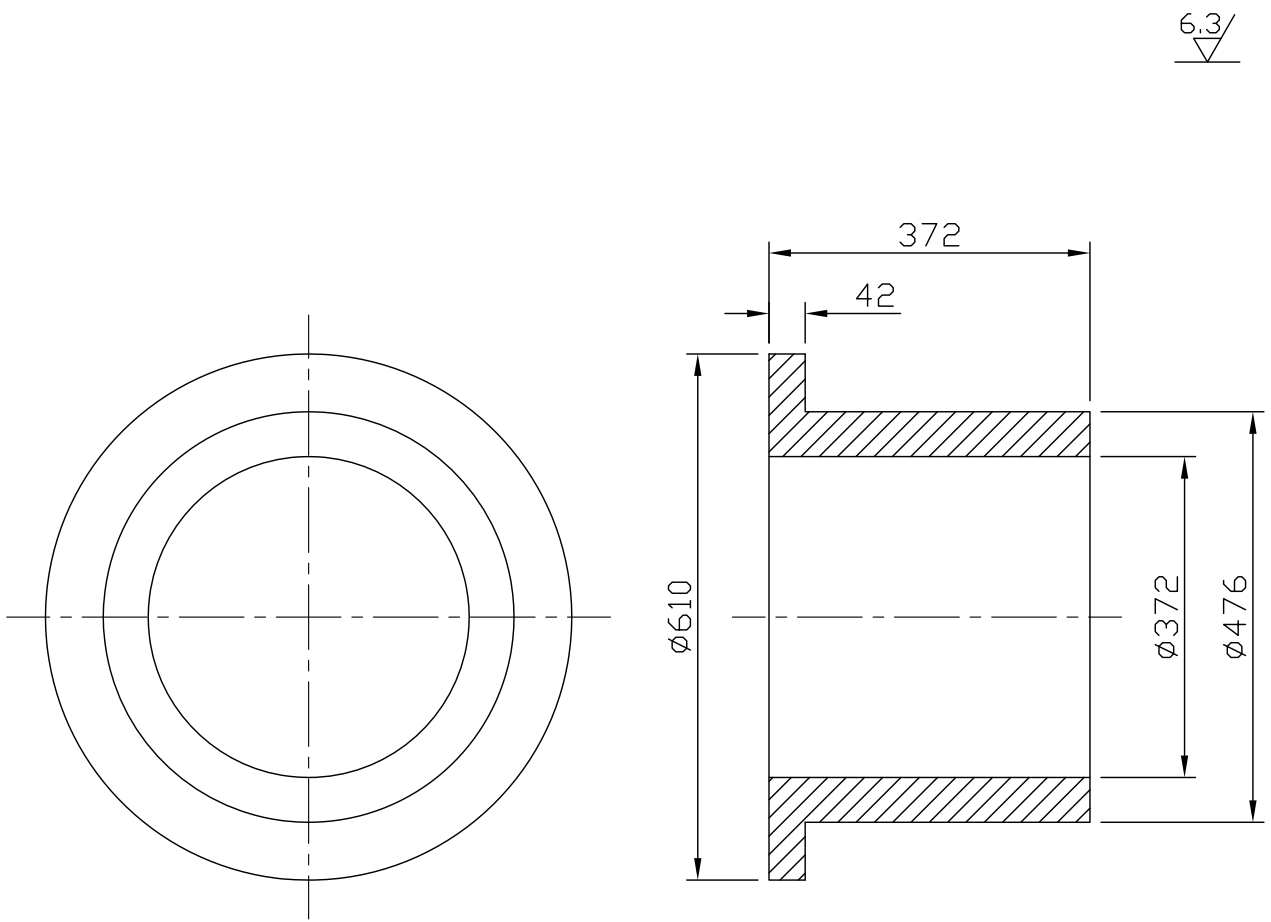
DRN.	NAME	SIGNATURE	DATE	NO.OF VAR.
CHD.	RAVI KUMAR		08.06.02	
APPD.	B.Pavan kumar		10.06.02	
	T.MOHAN RAO		11.06.02	

DEPT.	PULVE.ENGG	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
CODE	446	1:2	6.300	3-62-208-50670	01	02
TITLE				DRAWING NO.	REV.	
BEARING HOUSING COVER				3-62-204-50103	01	
SHEET NO. 01		NO OF SHEETS 01				



REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED

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NOTES:
 1. CASTING TO BE SUPPLIED IN ROUGH MACHINED CONDITION TO THE DIMENSIONS SHOWN WITH TOLERANCE OF ±1MM.

CASTING		BA9110221093	240.0	
		AA19703	1	
DESCRIPTION & DRG.NO.	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATL. CODE	NET.WT. GROSS WT
			MATL. SPECN.	QTY.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: **BOWL MILLS**

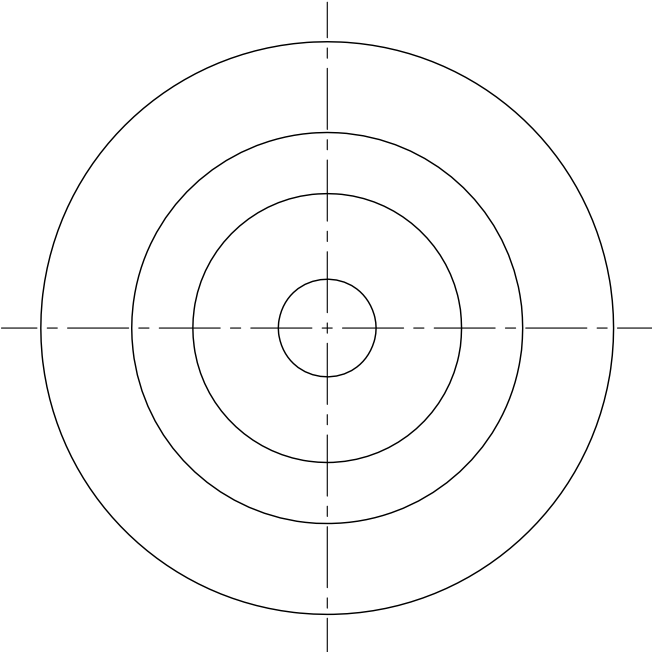
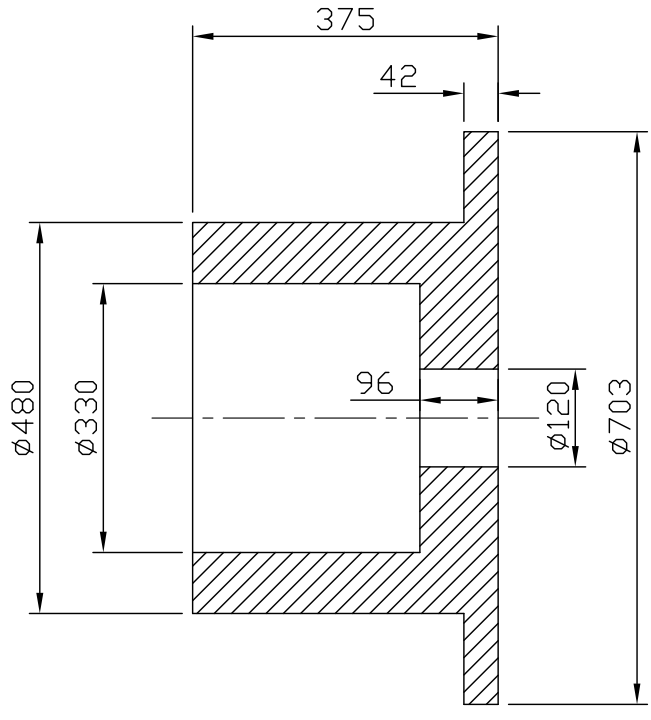
SIGN. & DATE		BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN	DATE	NO.OF VAR.
		DRN.	SHARIFF		03.09.16		
		CKD.	AMAN		03.09.16		
		APPD.	S.GHATGE		03.09.16		

INVENTORY NO.	REF. TO HY0230 UNSPECIFIED TO	DEPT. PULV. ENGG		SCALE NTS	WEIGHT(K.G.) 240	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
		CODE 446						
		TITLE R/M CASTING - THRUST BEARING HOUSING				DRAWING NO. 4-61-170-03923		REV. 00
				SHT.NO. 1	NO.OF SHT. 1			

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED

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6.3/
▽



NOTES:

1. CASTING TO BE SUPPLIED IN ROUGH MACHINED CONDITION TO THE DIMENSIONS SHOWN WITH TOLERANCE OF ±1MM.

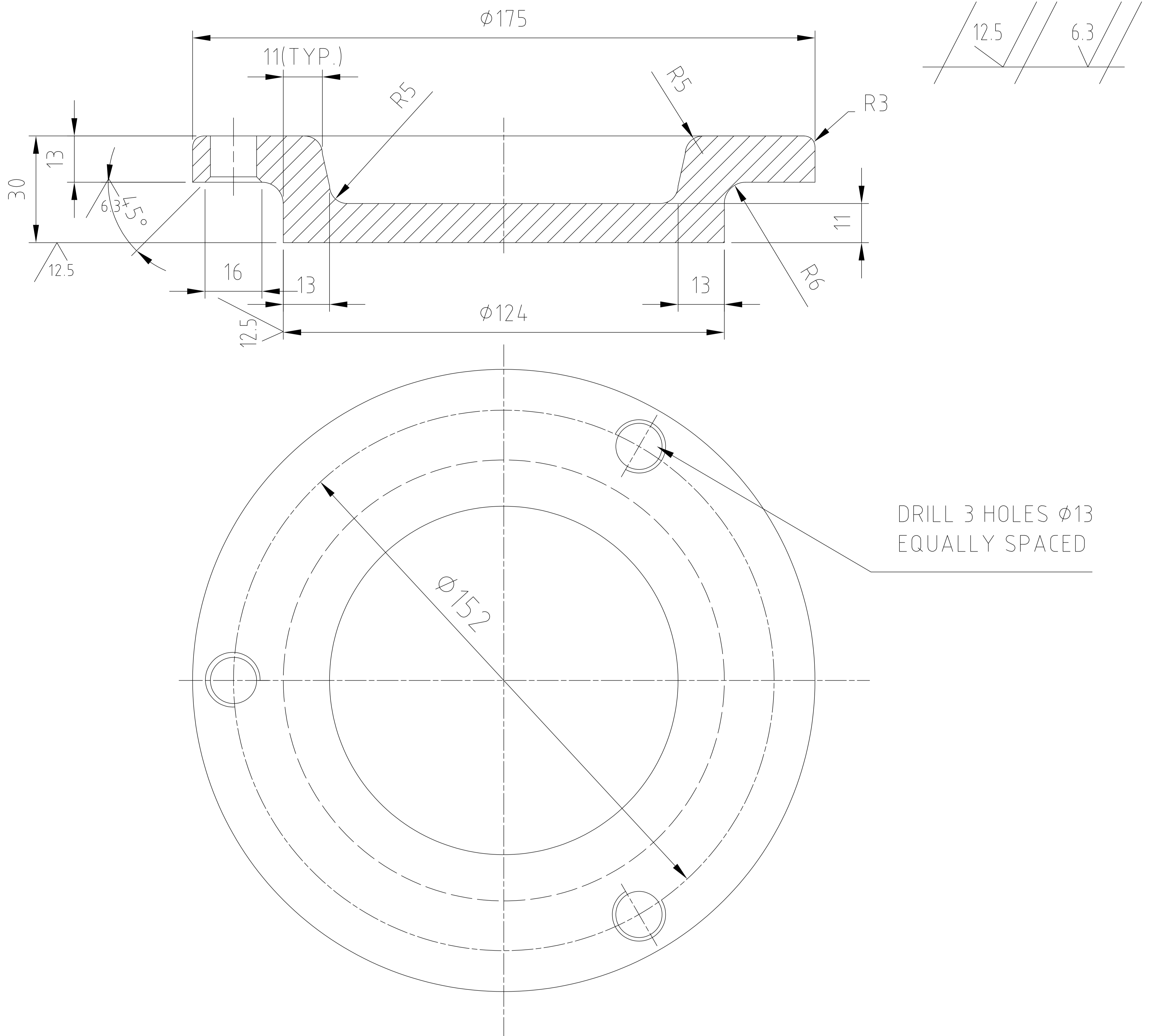
CASTING		BA9110221107	504.45	
		AA19703		1
DESCRIPTION & DRG.NO.	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATL. CODE	NET.WT. GROSS WT
			MATL. SPECN.	QTY.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: **BOWL MILLS**

INVENTORY NO.	SIGN. & DATE	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD	DRN.	SHARIFF	SIGN	08.07.17	NO.OF VAR.
			CKD.	AMAN		08.07.17	
			APPD.	S.GHATGE		08.07.17	
REF. TO HY0230281 UNSPECIFIED TOLERANCES	DEPT.	PULV. ENGG	SCALE	WEIGHT(K.G.)	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
	CODE	446	NTS	504.45			
	TITLE	R/M CASTING - RADIAL BEARING HOUSING			DRAWING NO.	REV.	
					SHT.NO. 1	NO.OF SHT. 1	

REV.	DATE	ALTERED	E.M.ASHOK	REV.	DATE	ALTERED		REV.	DATE	ALTERED
02	25-02-03	CHECKED	AMAN			CHECKED				CHECKED
		APPROVED	S.G			APPROVED				APPROVED

DRG REDRAWN IN AUTOCAD



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COMPUTER NO. 46100358.DWG	CASTING	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	BA9110207023	2.93	
				AA19702	1	
REF. DRG. NO.	DESCRIPTION & DRG.NO.	VAR NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATL. CODE	NET.WT.	GROSS WT
				MATL. SPECN.	QTY.	

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 883 / 1003/1103 XRP BM

SIGN. & DATE	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD	DRN.	E.M.ASHOK	SIGN		DATE	25-02-03	NO.OF VAR.					
		CKD.	AMAN			25-02-03		NA					
		APPD.	S.G		25-02-03								
INVENTORY NO.	REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.	DEPT.	PULVE ENGG	SCALE	1:2	WEIGHT(K.G.)	2.93	REF.TO ASSY.DRG.	0-61-400-00586	ITEM NO.		NO.OF ITEM	NA
		CODE	446										
TITLE								DRAWING NO.		REV.			
INSPECTION HOLE COVER (FAN INTAKE SIDE)								4-61-496-00358		02			
				SHT.NO.	01	NO.OF SHT.		01					



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PERMISSIBLE DEVIATIONS FOR UNTOLERANCED DIMENSIONS OF CASTINGS

1.0 SCOPE:

This standard pertains to permissible dimensional tolerances on the as-cast surfaces of castings. This is not applicable to pressure die castings of non-ferrous metals and for castings which are difficult to produce from the technological point of view, in which case the deviations shall be agreed mutually.

NOTE: Supply in line with IS:4897 is also acceptable.

2.0 NOMENCLATURE:

2.1 Nominal Dimensions:

Nominal dimension is the dimension specified in the production drawing or in the production documents or the one to which the production deviations of the components are applicable.

2.2 Actual Dimension:

Actual dimension is the dimension measurable on the rough castings. Wherever possible several measurements of the dimensions are made and the maximum and minimum values are considered for assessment as to the compliance with tolerance limits, e.g. diameter of a ring or disc at various diametrically opposite points, the diameter of a cylinder at various points along the height, the lengths and breadths of a plate, etc.

2.3 Governing Dimensions:

Governing dimension is the maximum measurable dimension of the concerned part of the casting, in the plane perpendicular to the nominal dimension. With every nominal dimension, the corresponding governing dimension should be considered.

Governing dimension along with the nominal dimension on the rough casting, determines the limiting deviation of casting or its parts. Examples of governing dimensions for various cases are given in Table-1.

2.4 Allowable Dimensional Deviations:

a) Upper allowable deviation:

Upper allowable deviation is the difference between the upper limiting dimension and nominal dimension (of casting).

b) Lower allowable deviation:

Lower allowable deviation is the difference between the bottom limiting dimension and nominal dimension (of casting).

Revisions:

Cl 29.2.2 of MOM of MRC-FCF+HTM

APPROVED :

INTERPLANT MATERIAL
RATIONALIZATION COMMITTEE-MRC(FCF+HTM)

Rev. No. 01

Amd.No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt:15.02.2005

Dt :

Year :

Corp.R&D

Corp. R&D

MARCH, 1980



TABLE -1: GOVERNING DIMENSIONS (S)

Sl. No.	Figure	Definition
1		<p>If 'a', the thickness, is the nominal dimension, the corresponding governing dimension will be diagonal, 'Sa' lying in a plane perpendicular to 'a' since it is the greatest dimension in the plane.</p>
2		<p>If 'a' is the nominal dimension 'Sa' is the governing dimension. For the nominal dimension 'c', the governing dimension is 'Sc'. For Nominal dimension 'b', the governing dimension is 'Sb', (Diagonal of the adjacent sides for smaller thickness of the lower prism, differs very much less, from the length of adjacent sides).</p>
3		<p>For the nominal dimension 'd', the diagonal 'Sd' along the plane perpendicular to the nominal dimension, is the governing dimension, because it is the greatest dimension, in the plane along the axial section. For the nominal dimension 'h', the governing dimension is $S_h = d$. For simplicity, dimension Sd can be changed to the nearest lower measurable dimension (h or d), whichever is greater.</p>
4		<p>Distance of the holes 'a' in the casting, is assumed as separate part, and hence for the nominal dimension 'a', the diagonal 'Sa' will be the governing dimension, which is greater of the two holes, and which lies in the plane of 'a'. For simplicity, we can replace with the nearest lower dimension 'h', or the diameter of the bigger hole.</p>



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3.0 TOLERANCE CLASSES:

3.1 General:

Tolerance limits are given under five different classes in the light of different casting techniques and trade practices that could be followed. The numerical values of tolerances for a series of Nominal and Governing dimensions according to classes 1 to 5 are respectively given in tables 2 to 6. The manufacturing foundry shall choose to itself the proper tolerance limits on dimensions of pattern equipment in accordance with those of the castings to be adhered to.

For dimensions not covered by the tables given, tolerances shall be specified separately and the mutually agreed upon.

3.2 Tolerance class 1:

Tolerance limits under class 1, according to Table 2 is for high precision castings, such as investment castings.

TABLE 2: TOLERANCE CLASS 1

Nominal dimension (rough casting), mm		Governing Dimension, mm							
		From							
		6	10	18	30	80	180	315	
		To							
From	To	6	10	18	30	80	180	315	500
	6	± 0.08	± 0.10	± 0.12	± 0.12	± 0.15	± 0.15	± 0.20	± 0.25
6	10	± 0.10	± 0.12	± 0.12	± 0.15	± 0.15	± 0.20	± 0.25	± 0.30
10	18	± 0.12	± 0.12	± 0.15	± 0.15	± 0.20	± 0.25	± 0.30	± 0.30
18	30	± 0.12	± 0.15	± 0.15	± 0.20	± 0.25	± 0.30	± 0.40	± 0.40
30	80		± 0.15	± 0.20	± 0.25	± 0.30	± 0.40	± 0.40	± 0.50
80	180			± 0.20	± 0.25	± 0.30	± 0.40	± 0.50	± 0.50
180	315			± 0.25	± 0.25	± 0.30	± 0.40	± 0.50	± 0.60
315	500			± 0.25	± 0.30	± 0.40	± 0.50	± 0.60	± 0.60

3.3 Tolerance class 2:

Tolerance limits under class 2, according to Table 3 is for precision castings (e.g. castings from metal patterns, shell moulding or gravity die castings).

TABLE 3: TOLERANCE CLASS 2

Nominal dimension (rough casting), mm		Governing Dimension, mm							
		From							
		6	10	18	30	80	180	315	315
		To							
From	To	6	10	18	30	80	180	315	500
	6	± 0.20	± 0.25	± 0.30	± 0.30	± 0.35	± 0.40	± 0.50	± 0.60
6	10	± 0.25	± 0.30	± 0.30	± 0.35	± 0.40	± 0.50	± 0.60	± 0.80
10	18	± 0.30	± 0.30	± 0.35	± 0.40	± 0.50	± 0.60	± 0.80	± 0.80
18	30	± 0.30	± 0.35	± 0.40	± 0.50	± 0.60	± 0.80	± 1.00	± 1.00
30	80	± 0.35	± 0.40	± 0.50	± 0.60	± 0.80	± 1.00	± 1.00	± 1.20
80	180			± 0.50	± 0.60	± 0.80	± 1.00	± 1.20	± 1.20
180	315			± 0.60	± 0.60	± 0.80	± 1.00	± 1.20	± 1.40
315	500			± 0.60	± 0.80	± 1.00	± 1.20	± 1.40	± 1.60

**3.4 Tolerance class 3:**

Tolerance limits under class 3, according to Table 4 is for mass or series production of castings requiring high degree of dimensional accuracy.

TABLE 4: TOLERANCE CLASS 3

Nominal dimension (rough casting), mm		Governing Dimension, mm							
		From							
		18	30	80	180	315	500	800	
		To							
From	To	18	30	80	180	315	500	800	1250
	6	± 0.5	± 0.5	± 0.5	± 0.6	± 0.8	± 1.0	± 1.2	± 1.5
6	10	± 0.5	± 0.5	± 0.6	± 0.8	± 1.0	± 1.2	± 1.5	± 2.0
10	18	± 0.5	± 0.6	± 0.8	± 1.0	± 1.2	± 1.2	± 1.5	± 2.0
18	30	± 0.6	± 0.8	± 1.0	± 1.2	± 1.5	± 1.5	± 2.0	± 2.5
30	80	± 0.8	± 1.0	± 1.2	± 1.5	± 1.5	± 2.0	± 2.0	± 2.5
80	180	± 0.8	± 1.0	± 1.2	± 1.5	± 2.0	± 2.0	± 2.5	± 2.5
180	315	± 1.0	± 1.0	± 1.2	± 1.5	± 2.0	± 2.5	± 2.5	± 2.5
315	500	± 1.0	± 1.2	± 1.5	± 2.0	± 2.0	± 2.5	± 2.5	± 3.0
500	800	± 1.2	± 1.2	± 1.5	± 2.0	± 2.5	± 2.5	± 3.0	± 3.0
800	1250	± 1.2	± 1.5	± 2.0	± 2.5	± 2.5	± 3.0	± 3.0	± 3.5

3.5 Tolerance class 4:

Tolerance limits under class 4, according to Table 5 is for series or mass production of castings Employing hand moulding with match plate patterns.

TABLE 5: TOLERANCE CLASS 4

Nominal dimension (rough casting), mm		Governing Dimension, mm									
		From									
		18	30	80	180	315	500	800	1250	2000	2000
		To									
From	To	18	30	80	180	315	500	800	1250	2000	3150
	6	± 0.6	± 0.8	± 0.8	± 0.8	± 1.0	± 1.5	± 1.5	± 2.0	± 2.5	± 3.0
6	10	± 0.8	± 0.8	± 0.8	± 1.0	± 1.5	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0
10	18	± 0.8	± 1.0	± 1.2	± 1.5	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0	± 4.0
18	30	± 0.8	± 1.2	± 1.5	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0	± 4.5	± 5.0
30	80	± 1.0	± 1.2	± 1.5	± 2.0	± 2.5	± 3.0	± 3.5	± 4.0	± 4.5	± 5.0
80	180	± 1.0	± 1.5	± 2.0	± 2.5	± 3.0	± 3.5	± 4.0	± 4.5	± 5.0	± 5.0
180	315	± 1.2	± 1.5	± 2.0	± 2.5	± 3.0	± 3.5	± 4.0	± 4.5	± 5.0	± 5.5
315	500	± 1.5	± 1.5	± 2.5	± 3.0	± 3.5	± 4.0	± 4.5	± 5.0	± 5.0	± 6.0
500	800	± 2.0	± 2.0	± 2.5	± 3.5	± 4.0	± 4.5	± 5.0	± 5.0	± 5.5	± 6.0
800	1250	± 2.0	± 2.5	± 3.5	± 4.0	± 4.0	± 4.5	± 5.0	± 5.5	± 6.0	± 6.0
1250	2000	± 2.5	± 3.5	± 4.0	± 4.0	± 4.5	± 5.0	± 6.0	± 6.0	± 7.0	± 7.0
2000	3150	± 3.5	± 4.0	± 4.5	± 4.5	± 5.0	± 6.0	± 6.0	± 7.0	± 8.0	± 8.0



3.6 Tolerance class 5:

Tolerance limits under class 5, according to table 6 is for piece production of castings by employing hand moulding including pit, sweep and skeleton moulds.

TABLE 6: TOLERANCE CLASS 5

Nominal dimension (rough casting), mm		Governing Dimension, mm											
		From											
		18	30	80	180	315	500	800	1250	2000	3150	5000	
		To											
From	To	18	30	80	180	315	500	800	1250	2000	3150	5000	8000
	6	± 0.8	± 1.0	± 1.2	± 1.2	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0	± 5.0	± 6.0	± 7.0
6	10	± 1.0	± 1.0	± 1.2	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0	± 5.0	± 6.0	± 6.0	± 7.0
10	18	± 1.0	± 1.2	± 1.5	± 2.0	± 2.5	± 3.5	± 4.0	± 5.0	± 6.0	± 6.0	± 7.0	± 8.0
18	30	± 1.2	± 1.5	± 2.0	± 2.5	± 3.0	± 4.0	± 5.0	± 6.0	± 7.0	± 7.0	± 8.0	± 9.0
30	80	± 1.2	± 2.0	± 2.5	± 3.0	± 3.5	± 4.0	± 5.0	± 6.0	± 7.0	± 8.0	± 9.0	± 10
80	180	± 1.5	± 2.5	± 3.0	± 3.5	± 4.0	± 5.0	± 6.0	± 7.0	± 8.0	± 8.0	± 9.0	± 10
180	315	± 2.0	± 2.5	± 3.0	± 3.5	± 4.5	± 5.0	± 6.0	± 7.0	± 8.0	± 9.0	± 10	± 11
315	500	± 2.5	± 3.0	± 3.5	± 4.5	± 5.0	± 6.0	± 7.0	± 8.0	± 8.0	± 9.0	± 10	± 11
500	800	± 3.0	± 3.5	± 4.0	± 5.0	± 6.0	± 7.0	± 7.0	± 8.0	± 9.0	± 10	± 11	± 12
800	1250	± 3.5	± 4.5	± 5.0	± 6.0	± 6.0	± 7.0	± 8.0	± 9.0	± 9.0	± 10	± 11	± 12
1250	2000	± 4.0	± 5.0	± 6.0	± 6.0	± 7.0	± 8.0	± 8.0	± 9.0	± 10	± 11	± 12	± 12
2000	3150	± 5.5	± 6.0	± 7.0	± 8.0	± 8.0	± 9.0	± 9.0	± 10	± 11	± 12	± 13	± 14
3150	5000	± 7.0	± 8.0	± 8.0	± 9.0	± 9.0	± 10	± 11	± 12	± 13	± 14	± 15	± 16
5000	8000	± 8.0	± 9.0	± 9.0	± 10	± 10	± 11	± 12	± 13	± 14	± 15	± 16	± 18



4.0 TOLERANCES ON THICKNESS OF WALLS OR RIBS AND WIDTH OF GROOVES OR CHANNELS:

For deviations on thickness of walls or ribs and width of grooves or channels, the values given in Table 7 are applicable.

In these cases, the wall thickness is the nominal dimension and related maximum dimension (length, height or diagonal) shall be taken as the governing dimension.

TABLE 7: Permissible Tolerances on Thickness of walls or ribs and width of grooves or channels.

Max. overall dimension of casting, mm	Thickness of wall or rib/width of groove or channel, mm		Permissible Tolerances, mm		
	Over	Upto & incl.	Tolerance class		
			1 & 2	3 & 4	5
UP TO 500		6	± 0.2	± 0.4	± 0.8
	6	10	± 0.3	± 0.5	± 1.0
	10	18	± 0.5	± 0.8	± 1.5
	18	30	± 0.8	± 1.0	± 1.5
	30	50	± 0.8	± 1.2	± 2.0
	50	80	± 1.0	± 1.5	± 2.5
	80	120	± 1.0	± 1.8	± 2.5
ABOVE 500 UP TO 1250		10	± 0.3	± 0.8	± 1.2
	10	18	± 0.5	± 1.2	± 1.5
	18	30	± 0.8	± 1.5	± 2.0
	30	50	± 1.0	± 1.8	± 2.0
	50	80	± 1.2	± 2.0	± 2.5
ABOVE 1250 UP TO 2500		10	± 0.5	± 1.2	± 1.5
	10	18	± 0.8	± 1.5	± 2.0
	18	30	± 1.0	± 2.0	± 2.5
	30	50	± 1.2	± 2.5	± 3.0
	50	80	± 1.8	± 2.5	± 3.0
ABOVE 2500 UP TO 4000		18	± 1.0	± 1.5	± 2.0
	18	30	± 1.2	± 2.0	± 2.5
	30	50	± 1.5	± 2.5	± 3.0
	50	80	± 2.0	± 3.0	± 3.5
	80	120	± 2.5	± 3.5	± 4.0
ABOVE 4000		18	--	± 2.0	± 3.0
	18	30	--	± 2.5	± 3.5
	30	50	--	± 3.0	± 4.0
	50	80	--	± 3.5	± 4.5
	80	120	--	± 4.0	± 5.0



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5.0 GUIDELINES FOR SELECTION OF TOLERANCE CLASS:

Given in Table 8 for information.

Material	Technology	Tolerance Class				
		1	2	3	4	5
Non-ferrous metals	Metallic dies, Shell moulds, High precision moulds	Precision work in mass production	Precision work in mass production	Large batch production	--	--
	Sand cast, Centrifugally cast	--	--	Large batch production	Piece to batch production	Piece to small batch production
GCI, Malleable and SG iron	Expandable pattern (Investment process)	Most precision work	--	--	--	--
	Metallic dies, CO ₂ , shell moulds, High precision moulds	--	Precision work in mass production	Large batch production	Piece to batch production	--
	Sand cast, Centrifugally cast		Sample castings in mass production	Large batch production	Piece to batch production	Piece to small batch production
Cast steel	Expandable pattern	Most precision work	--	--	--	--
	Metallic dies, CO ₂ , Shell moulds, High precision moulds and Ceramic moulds	--	Precision work in mass production	Large batch production	Piece to batch production	--
	Sand cast, Centrifugally cast	--	--	Large batch production	Piece to batch production	Piece to small batch production

6.0 SPECIFYING OF TOLERANCE CLASS:

The tolerance class required shall be specifically mentioned in the casting drawing.

NOTE: If required, BHEL may specify closer or liberal tolerance, other than the ones specified above, which may be indicated in the drawing/order.



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PROCEDURE FOR MAGNETIC PARTICLE EXAMINATION

1.0 SCOPE:

- 1.1 This standard outlines the procedure for magnetic particle examination of ferro-magnetic materials.
- 1.2 Typical surface and subsurface discontinuities detectable by this method are cracks, seams, laps, cold shut, inclusions, etc.
- 1.3 This shall be applied to all forms of ferromagnetic material as formed and semifinished as well as, finished state, such as welds, forgings, castings, etc.
- 1.4 This standard is generally based on ASTM E 709.

2.0 PERSONNEL REQUIREMENT:

Personnel performing non-destructive examination and evaluation shall be qualified to the recommended practice SNT-TC-1A or any other recognised practice.

3.0 TEST METHOD:

Finely divided magnetic particles are applied to the surface of a part which has been suitably magnetised. The particles are attracted to regions of magnetic non-uniformity associated with defects and discontinuities, thus producing indications which are observed visually. The magnetic particle is applied either as dry powder or in a wet suspension in a liquid medium.

4.0 SURFACE CONDITION/PREPARATION:

The surface being inspected shall be clean and dry. It shall be free from dirt, oil, grease, sand, rust or loose scale. As cast or as welded surfaces are generally satisfactory if clean. A pressure blast is useful for this purpose. Thin paint does not interfere with the formation of indications but must be removed at points where electrical contact is to be made. If the surface is unusually rough, such as with burned in sand or very rough weld bead, interpretation may be difficult because the particle is being trapped mechanically. In case of doubt, light grinding may be necessary to determine if actual indications are present.

Revision:

Cl 12.8.8 of MOM of WG-NDT

Approved:

INTERPLANT STANDARDIZATION
COMMITTEE - (WG-NDT)

Rev. No. 02

Amd.No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt. 15-12-97

Dt.

Year:

HYDERABAD

CORP. R&D

Sept. '79



5.0 SEQUENCE OF OPERATION:

5.1 Method Of Examination:

Examination shall be generally carried out by the continuous method, i.e., the magnetising current remains on, while the examination medium is being applied and excess being removed.

5.2 Magnetisation:

Any suitable and appropriate means for establishing the necessary magnetic flux may be employed, such as passing current through the material (e.g. 'Prod' method) using magnetic yoke, or wrapping the part with a coil through which a magnetising current is passed.

5.3 Examination Medium:

5.3.1 The finely divided ferromagnetic particles used for detection of discontinuities shall be of fine grain and the same shall be of high permeability and low retentivity. It shall be of dry powders (Fluorescent and nonfluorescent) ready for use, as supplied or powder concentrates (Fluorescent and non-fluorescent) for dispersion in water or suspending light petroleum distillates.

5.3.2 Dry Particles:

When dry particles are used, they shall be sprayed either by a low pressure pneumatic instrument or hand operated bulb blower. Colour of the powder shall be such as to provide adequate visual contrast with the back ground of the surface being examined. The temperature of the surface of the part under examination shall not exceed 315°C (600°F). Adequate lighting should be provided for easy observation of the indication. Some coloured organic coatings applied to dry particles to improve contrast lose their colour at higher temperatures. Fluorescent dry particles shall not be used at this high temperature. Manufacturer's recommendations for temperature limitation shall be followed.

5.3.3 Wet Particles:

When wet particles are used, the solid magnetic particles shall be suspended in a suitable liquid medium. The concentration of the particles in the liquid medium shall be 0.2 to 0.4 ml in a 100ml sample for fluorescent particles and from 1.2 to 2.4 ml in a 100 ml for non-fluorescent particles unless otherwise specified by the particle manufacturer.

5.3.4 Fluorescent Particles:

5.3.4.1 The fluorescent particle examination shall be performed using a black light in a darkened area.

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5.3.4.2 The black light used for fluorescent particle testing shall be capable of developing the wave length of 365nm., in any case the wave length should be in the range of 330 to 390nm. with an intensity of not less than 1000 uw/cm² on the surface of the part.

5.3.4.3 The black light shall be allowed to warm up for a minimum of 5 min. prior to its use or measurement of the intensity of the ultraviolet light emission.

5.3.4.4 The examiner shall be in the darkened area for atleast 5 min. prior to examining the parts using black light so that his eyes will adopt to dark viewing. Photochromic or permanently tinted lenses shall not be worn during examination.

5.3.4.5 The black light intensity shall be measured with a black light meter at least once every 8 hours and whenever the work station is changed.

5.4 Orientation of Discontinuities And Examination Coverage:

Examination shall be conducted with sufficient overlap to ensure cent percent coverage at established test sensivity. To ensure most effective detection of discontinuities each area shall be examined at least twice with the lines of flux approximately perpendicular to each other.

5.5 Demagnetisation:

Demagnetisation following examination shall be carried out where residual magnetism can interfere with subsequent process or usage. Demagnetisation is not normally required on the type of parts where the dry powder Prod magnetisation is used.

6.0 METHODS OF MAGNETISATION:

6.1 Prod Method:

6.1.1 Magnetising Technique:

6.1.1.1 Magnetisation shall be accomplished by portable Prod type electrical contacts pressed against the surface in the area to be examined. To avoid arcing, a remote control switch may be provided to permit the current to be turned on after the prods have been properly positioned and turned off before they are removed.

6.1.2 Prod Spacing:

Prod Spacing shall be maximum of 200 mm. Shorter spacing may be used to meet the limitation of geometry or dimensions of the area being examined, or to increase the sensitivity, but prod spacing less than 75 mm usually is not recommended owing to banding of the particles around the prods.



6.1.3 Magnetising Current:

Alternating, direct or rectified magnetising current shall be used. The current shall be 90 to 110 A per 25mm. of prod spacing for sections less than 19mm. thick and 110 to 125 A per 25mm. prod spacing for sections 19mm. and greater.

6.1.4 Prod shall be kept free of iron pick up by frequent filing. Local areas of metal being tested which have been subjected to arcing shall be ground to clean metal wherever necessary.

6.2 Coil Method:

6.2.1 Magnetising Technique:

Magnetisation shall be accomplished by pressing current through a multiturn coil looped around the part or section of the part to be examined to produce a magnetic field parallel to the axis of the coil.

6.2.2 Magnetising Current:

6.2.2.1 Encircling Coils:

There are four empirical longitudinal magnetization formulas for using encircling coils, the formula to be used depending on the fill factor.

6.2.2.1.1 Low Fill Factor Coils:

In this case, the cross sectional area of the fixed encircling coil greatly exceed the cross sectional area of the part (Less than 10% coil inside diameter). The part shall be placed well within the coils and close to the inside wall of the coil. For parts with length over diameter ratio (L/D) between 3 and 15 is calculated from the following equations.

- (1) Parts with low fill factor positioned closed to the inside wall of the coil:

$$= \frac{45,000}{L/D} \text{ Ampere Turns } (\pm 10\%)$$

- (2) Parts with a low fill factor positioned in the center of the coil:

$$= \frac{43,000 \times R}{(6 L/D) - 5} \text{ Ampere Turns } (\pm 10\%)$$



6.2.2.1.2 Intermediate Fill Factor Coils:

When the cross section of the coil is greater than twice and less than ten times the cross section of part being examined.
$$= (NI)_{hf} (10-4) + (NI)_{lf} (4-2)/8$$

Where

NI_{hf} = Value calculated for high fill factor coils using
$$\frac{35000}{(L/D) + 2} \quad (10\%)$$

NI_{lf} = Value Calculated for low fill factor coils using
$$\frac{43,000 \times R}{(L/D) - 5} \quad (10\%)$$

Where R = Coil Radius

Y = Ratio of the cross sectional area of the coil to the cross section of the part.

For example if the coil has an inside diameter of 24 cm. and part (a bar) has outside diameter of 12 cm.

$$Y = \frac{n(12)^2}{n(6)^2} = 4$$

6.2.2.1.3 High Fill Factor Coils:

In this case, when fixed coils or cable wraps used and the cross sectional area of the coil is less than twice the cross sectional area (Including hollow portions) of the part, the coil has a high fill factor.

For parts with in a high fill factor positional coil and for parts with L/D ratio equal or greater than 3.

$$= \frac{35,000}{(L/D)+2} \quad \text{Ampere turns } (\pm 10\%)$$

L/D ratio for a hollow piece: When calculating L/D ratio for a hollow piece, D shall be replaced with an effective diameter D_{eff} . Calculated using.

$$D_{eff} = [(A_t - A_h)/n]^{\frac{1}{2}}$$

Where

A_t = Total cross section area of part

A_h = Cross sectional area of hollow portion(s) of the part.

For a cylindrical piece this is equivalent to

$$D_{eff} = [(OD)^2 - (ID)^2]^{\frac{1}{2}}$$

Where

OD = Outside diameter of cylinder

ID = Inside diameter of cylinder.

**6.2.2.2 Through Coils:**

For through coils the current specified in para 6.3.2 divided by number of turns shall be used.

6.3 Direct Contact Method:**6.3.1 Magnetising Technique:**

Magnetising shall be accomplished by passing current end to end through the part to be tested to produce a circular magnetic field perpendicular to the current flow through the part.

6.3.2 Magnetising Current:

Direct or rectified current shall be used at 280 to 360 amperes per centimeter of part for diameter upto 125 mm; 200 to 280 amperes per centimeter of part for diameter grater than 250mm.

(Note: A different means of magnetising shall be used for the second examination to fulfil the requirements specified in Cl.5.4).

6.4 Yoke Method:**6.4.1 Application:**

This method shall be used only to detect surface discontinuities which actually come to the surface.

6.4.2 Magnetising Technique:

6.4.2.1 Alternating current electromagnetic yoke shall be used to magnetise, provided the yoke has a lifting power of at least 4.5 Kg and a pole spacing of 75 to 150 mm.

6.4.2.2 Alternatively direct current electromagnetic or permanent magnetic yoke shall be used to magnetise, provided the yoke has a lifting power of at least 18 kg and a pole spacing of 75 to 150 mm.

6.5 Threading Bar and Coil Technique:

6.5.1 If the part is hollow, flaws in a longitudinal direction may be detected by passing the magnetising current through a bar or cable held within the bore of the part. Alternatively a threading coil may be used.

6.5.2 The current strength shall be equivalent to not less than 10500 ampere turns (a.c; r.m.s value) or 15000 ampere turns (d.c.) per metre of the maximum distance of the bar cable from the surface of the bore of the part.



6.5.3 Because of limitations of the equipment, it may be necessary to magnetise the part at several positions within the bore, with the bar or cable lying on the bore surface, in which case the distance between spacing of the conductor or coil for successive checks shall not be greater than 100 mm.

Note: Magnetising particle field indicator shall be used to establish adequacy of the magnetic field.

7.0 CALIBRATION:

Calibration of the ammeter shall be done as per BHEL Standard AA 085 01 59.

8.0 EVALUATION OF INDICATIONS & INTERPRETATION:

8.1 If the indication is caused by the surface discontinuity the particles are usually tightly held to the surface by a relatively strong magnetic leakage field. The line of particles will be sharp and well defined.

8.2 If the indication is caused by surface discontinuity, the particles are held in a broad fuzzy accumulation rather than being sharp and well-defined.

8.3 Non-relevant indications are caused by distortion of magnetic field resulting from magnetic writing, cold working, hard and soft spots, boundaries of heat affected zone, abrupt change of section, etc. Care shall be taken to identify and eliminate them as they may mask the actual defect.

8.4 Relevant indications are those which result from mechanical discontinuities. Linear indications are those in which the length is more than three times the width. Rounded indications are indications in which are circular or elliptical with the length less than three times the width.

9.0 REFERRED STANDARDS (Latest Publication Including Amendments):

1. ASTM E 70

2. BHEL CS AA 085 01 59



EVALUATION AND ACCEPTANCE STANDARD FOR MAGNETIC PARTICLE EXAMINATION OF CASTINGS

1.0 SCOPE:

1.1 This standard is applicable for Magnetic Particle Examination of Castings.

1.2 The procedure adopted for this examination is as per Corporate Standard AA 085 01 33

2.0 DEFINITION OF INDICATIONS:

2.1 Circular indications are those more or less elliptical with major axis not more than three times the minor axis.

2.2 Linear indications are those having length in excess of three times average width.

2.3 In-line indications are those in group of three or more indications aligned side by side in line with intervening gaps of less than 2mm measured edge to edge.

3.0 EVALUATION OF INDICATIONS:

3.1 Discontinuities and defects will be indicated by the retention of magnetic particles. All such indications are not necessarily defects, since exclusive surface roughness, magnetic permeability variations and machining marks may also produce similar indications.

3.2 Any indication suspected to be non-relevant is to be considered relevant till it is proved otherwise.

3.3 Broad areas of particle accumulation which could mask indications or discontinuities are unacceptable and those areas shall be cleaned and re-examined.

3.4 Relevant indications are those which results from unacceptable mechanical discontinuities.

4.0 ACCEPTANCE STANDARD:

5.1 Castings are classified into four levels as detailed below according to the size and number of flaws permissible.

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Revised

Approved: INTERPIANT NON-DESTRUCTIVE TESTING COMMITTEE

Table with 3 columns: Prepared (Corp. R&D), Issued (COMP: R&D), Date (10 SEPT 79)





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Level	No. & size of acceptable indications per 100 sq. cm. area and length not exceeding 25 cm.	Unacceptable indications.
1	2 Nos. of 3mm long indication.	Cracks & hot tears.
2	3 Nos. of 3mm long indication. One of 5mm long indication.	-do-
3	3 Nos. of 3mm long indication. 2 Nos. of 4mm long indication. One of 6mm long indication. One in line indication of - (10mm Max. lgth.)	-do-
4	4 Nos. of 3mm long indication. 3 Nos. of 4mm long indication. 2 Nos. of 8mm long indication. One in line indication of - (15mm Max. lgth.)	-do-

Note: The minimum permissible distance between any two or more acceptable individual flaws shall not be less than the major dimension of the larger flaw.



	BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD	STANDARD QUALITY PLAN FOR VENDOR ITEMS						QP. NO: HYQA/BM/SQP/164 REV. NO.: 00 DATE: 21.07.2023 VALID UPTO: 20.06.2025			
		ITEM: COVER FLOATING ROLLER BEARING, RADIAL LABYRINTH (CASTING-R/F MACHINED), RING SUPPORT OF LABRNTH (CASTING R/F Mc); LABYRINTH CHEEK (CASTING-R/F MACHINED); BEARING BODY (CASTING-R/F MACHINED) ; BEARING COVER-ROUGH MACHINED CASTING ; COVER FLOATING ROLLER BEARING ; RADIAL LABYRINTH (CASTING-R/F MACHINED); RING SUPPORT OF LABRNTH (CASTING R/F Mc); LABYRINTH CHEEK (CASTING-R/F MACHINED); BEARING BODY (CASTING-R/F MACHINED); BEARING COVER-ROUGH MACHINED CASTING SPEC: AA19704, R07 DRAWING : NA						PAGE 1 OF 5			

SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
										D	P	W	
1.0	RAW MATERIAL STAGE												
1.1	Raw material for mfg. casting	Chemical Composition of scrap	Major	Chemical	Every Melt	AA 19704	AA 19704	Records	√	2		1	
2.0	IN-PROCESS INSPECTION												
2.1	Pattern making	Pattern making – Visual, Dimensional Measrt.	Major	Visual Measrt.	100%	AA 19704	AA 19704	Pattern Inspection Report		2		1	
	Moulding	Visual & Dimensional inspection of Moulds & Cores	Major	Visual Measrt.	100%	AA 19704	AA 19704	Moulding Records		2		1	

LEGEND: P: - PERFORM, W: - WITNESS, V: - VERIFICATION, INDICATING 1: - BHEL / BHEL NOMMNATED INSPECTION AGENCY, 2: - VENDOR / SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P, W & V. * D: RECORDS IDENTIFIED WITH TICK (✓) SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.	PREPARED BY  M.LAXMI RAJAM MANAGER / QA	REVIEWED & APPROVED BY  B ASHOK KUMAR AGM / QA
	ISSUED BY QUALITY ASSURANCE DEPARTMENT	



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SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	* D	Agency			Remarks
										P	W	V	
2.2	Melting & Pouring	Chemical	Major	Chem.	Every Melt	AA 19704	AA 19704	Test Certificate	√	2		1	
2.3	Heat Treatment	Time & Temperature	Major	Heat Treatment	100%	AA 19704	AA 19704	HT Chart	√	2		1	
2.4	Keel block identification	Physical identification	Major	Identify.	Each melt / HT batch	AA 19704	AA 19704	Identification Report	√	2		1	
3.0	FINAL ASSEMBLY & TESTING												
3.1	Test Sample	Mechanical Properties (To be checked on test samples of the same melt and HT batch)	Major	Mech Properties	Each melt / HT batch	AA 19704	AA 19704	Test Certificate	√	2	1		

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SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
										D	P	W	
	Casting & Sample	Hardness	Major	Hardness	100%	AA 19704	AA 19704	Test Report	√	2	1		
	Casting	Casing Dimensions	Major	Measrt	100%	Drawing	Drawing	Dimensions Report	√	2	1		
4.0	SURFACE PREPARATION & PAINTING												
4.1	Identification & Marking	Marking	Major	Visual	100%	AA 19704	AA 19704	Record	√	2	1		Marking by Hard stamp method


LEGEND: P: - PERFORM, W: - WITNESS, V: - VERIFICATION, INDICATING 1: - BHEL / BHEL NOMMNATED INSPECTION AGENCY, 2: - VENDOR / SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P, W & V. * D: RECORDS IDENTIFIED WITH TICK (✓) SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.	PREPARED BY  M.LAXMI RAJAM MANAGER / QA	REVIEWED & APPROVED BY  B ASHOK KUMAR AGM / QA
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Format no. : HYQA/QP/VSQP Rev.02		

SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
										D	P	W	
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  <p>BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD</p> </div> <div style="text-align: center;"> <p>STANDARD QUALITY PLAN FOR VENDOR ITEMS</p> <p>ITEM: COVER FLOATING ROLLER BEARING, RADIAL LABYRINTH (CASTING-R/F MACHINED), RING SUPPORT OF LABRNTH (CASTING R/F Mc); LABYRINTH CHEEK (CASTING-R/F MACHINED); BEARING BODY (CASTING-R/F MACHINED) ; BEARING COVER-ROUGH MACHINED CASTING ; COVER FLOATING ROLLER BEARING ; RADIAL LABYRINTH (CASTING-R/F MACHINED); RING SUPPORT OF LABRNTH (CASTING R/F Mc); LABYRINTH CHEEK (CASTING-R/F MACHINED); BEARING BODY (CASTING-R/F MACHINED); BEARING COVER-ROUGH MACHINED CASTING SPEC: AA19704, R07 DRAWING : NA</p> </div> <div style="text-align: right;"> <p>QP. NO: HYQA/BM/SQP/164 REV. NO.: 00 DATE: 21.07.2023 VALID UPTO: 20.06.2025</p> </div> </div>													
PAGE 4 OF 5													
4.2	Packing & Preservation	Visual check.	Major	Visual	Each Casting	AA 19704	AA 19704	Record	√	2		1	
4.3	Documentation & Certification	Verification	Major	Verify.	Each Casting	AA 19704	AA 19704	Record	√	2		1	

NOTES:

- 1) Specification/Drawing shall prevail over Quality Plan in case of any contradiction/mismatches
- 2) BHEL reserves the right for conducting repeat test, if required
- 3) BHEL approved inspection engineers to be deployed for inspection
- 4) Only Level II & above qualified person in respective NDE (as applicable as per PO) to verify or witness the NDT test report/results
- 5) Inspection to be offered only after ensuring that all documents (Quality Plan, Drawings, Data Sheet, Purchase Specifications, etc.) are available as per Purchase Order
- 6) Vendor to offer Original Test Certificates issued by Third Party Laboratories or Suppliers



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SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	* D			Agency P W V	Remarks

- 7) Vendor to ensure with TPIA that a note ' Compared with Original Test Certificate. Reviewed, Verified and found in order ' shall contain with every Inspection Report
- 8) Only valid and calibrated measuring instruments and equipment shall be used
- 9) Vendor to ensure that Material Test Certificate & Traceability Records are available for use of correct material
- 10) Vendor to ensure that all certificates are endorsed by TPIA with comments (Witnessed or Verified), as applicable per quality plan
- 11) Vendor shall ensure to offer log sheets containing actual measured values instead of saying OK/Not OK to TPIA
- 12) Vendor shall submit complete Inspection and test documentation whichever is identified with (✓) under column D of approved quality plan shall be enclosed with the Inspection Report



HISTORY OF REVISIONS:

SI. No	Revision details	Date of Revision	Prepared By	Reviewed By	Approved By

LEGEND: P: - PERFORM, W: - WITNESS, V: - VERIFICATION, INDICATING 1: - BHEL / BHEL NOMMNATED INSPECTION AGENCY, 2: - VENDOR / SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P, W & V. * D: RECORDS IDENTIFIED WITH TICK (✓) SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.	PREPARED BY  M.LAXMI RAJAM MANAGER / QA	REVIEWED & APPROVED BY  B ASHOK KUMAR AGM / QA
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Format no. : HYQA/QP/VSQP Rev.02		



	BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD	STANDARD QUALITY PLAN FOR VENDOR ITEMS						QP. NO: HYQA/BM/SQP/184 REV. NO.: 00 DATE: 14.01.2023 VALID UPTO: 13.01.2025			
		ITEM: COVER (WORM & GEAR INSPECTION) ; SPEC: AA19702, R07 DRAWING : 36118802050, R03; 46137600096, R03 ;						PAGE 1 OF 5			

SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
										D	P	W	
1.0	RAW MATERIAL STAGE												
1.1	Raw material for mfg. casting	Chemical Composition of scrap	Major	Chemical	Every Melt	AA 19702	AA 19702	Records	√	2		1	
2.0	IN-PROCESS INSPECTION												
2.1	Pattern making	Pattern making – Visual, Dimensional Measrt.	Major	Visual Measrt.	100%	AA 19702	AA 19702	Pattern Inspection Report		2		1	
	Moulding	Visual & Dimensional inspection of Moulds & Cores	Major	Visual Measrt.	100%	AA 19702	AA 19702	Moulding Records		2		1	
2.2	Melting & Pouring	Chemical	Major	Chem.	Every Melt	AA 19702	AA 19702	Test Certificate	√	2		1	
2.3	Heat Treatment	Time & Temperature	Major	Heat Treatment	100%	AA 19702	AA 19702	HT Chart	√	2		1	



LEGEND: P: - PERFORM, W: - WITNESS, V: - VERIFICATION, INDICATING 1: - BHEL / BHEL NOMMNATED INSPECTION AGENCY, 2: - VENDOR / SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P, W & V. * D: RECORDS IDENTIFIED WITH TICK (√) SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.	PREPARED BY  M.LAXMI RAJAM SR MANAGER / QA	REVIEWED & APPROVED BY  B ASHOK KUMAR AGM / QA
	ISSUED BY QUALITY ASSURANCE DEPARTMENT	

	BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD	STANDARD QUALITY PLAN FOR VENDOR ITEMS						QP. NO: HYQA/BM/SQP/184 REV. NO.: 00 DATE: 14.01.2023 VALID UPTO: 13.01.2025			
		ITEM: COVER (WORM & GEAR INSPECTION) ; SPEC: AA19702, R07 DRAWING : 36118802050, R03; 46137600096, R03 ;						PAGE 2 OF 5			

SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
										D	P	W	
2.4	Keel block identification	Physical identification	Major	Identify.	Each melt / HT batch	AA 19702	AA 19702	Identification Report	√	2		1	
3.0	FINAL ASSEMBLY & TESTING												
3.1	Test Sample	Mechanical Properties (To be checked on test samples of the same melt and HT batch)	Major	Mech Properties	Each melt / HT batch	AA 19702	AA 19702	Test Certificate	√	2	1		
	Casting & Sample	Hardness	Major	Hardness	100%	AA 19702	AA 19702	Test Report	√	2	1		
	Casting	Final Dimensions	Major	Measrt	100%	Drawing	Drawing	Dimensions Report	√	2	1		
	Casting Finish Machining	Surface Quality	Major	LPI/DP	100%	Drawing	Drawing	Dimensions Report	√	2	1		

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										D	P	W	
		Finish machining dimensions	Major	Measrt	100%	Drawing	Drawing	Dimensions Report	√	2	1		
4.0	SURFACE PREPARATION & PAINTING												
4.1	Identification & Marking	Marking	Major	Visual	100%	AA 19702	AA 19702	Record	√	2	1		Marking by Hard stamp method
4.2	Packing & Preservation	Visual check.	Major	Visual	Each Casting	AA 19702	AA 19702	Record	√	2		1	
4.3	Documentation & Certification	Verification	Major	Verify.	Each Casting	AA 19702	AA 19702	Record	√	2		1	

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	<p>ISSUED BY QUALITY ASSURANCE DEPARTMENT</p>	

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NOTES:



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- 2) BHEL reserves the right for conducting repeat test, if required
- 3) BHEL approved inspection engineers to be deployed for inspection
- 4) Only Level II & above qualified person in respective NDE (as applicable as per PO) to verify or witness the NDT test report/results
- 5) Inspection to be offered only after ensuring that all documents (Quality Plan, Drawings, Data Sheet, Purchase Specifications, etc.) are available as per Purchase Order
- 6) Vendor to offer Original Test Certificates issued by Third Party Laboratories or Suppliers
- 7) Vendor to ensure with TPIA that a note ' Compared with Original Test Certificate. Reviewed, Verified and found in order ' shall contain with every Inspection Report
- 8) Only valid and calibrated measuring instruments and equipment shall be used
- 9) Vendor to ensure that Material Test Certificate & Traceability Records are available for use of correct material
- 10) Vendor to ensure that all certificates are endorsed by TPIA with comments (Witnessed or Verified), as applicable per quality plan
- 11) Vendor shall ensure to offer log sheets containing actual measured values instead of saying OK/Not OK to TPIA
- 12) Vendor shall submit complete Inspection and test documentation whichever is identified with (✓) under column D of approved quality plan shall be enclosed with the Inspection Report


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Format no. : HYQA/QP/VSQP Rev.02		

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									D	P	W	V	


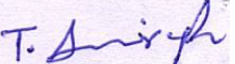
HISTORY OF REVISIONS:


Sl. No	Revision details	Date of Revision	Prepared By	Reviewed By	Approved By

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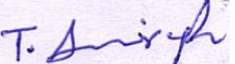
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										D	P	W	
1.0	RAW MATERIAL STAGE												
1.1	Raw material for mfg. casting	Chemical Composition of scrap	Major	Chemical	Every Melt	AA19703 & AA19704	AA19703 & AA19704	Records	√	2		1	
2.0	IN-PROCESS INSPECTION												
2.1	Pattern making	Pattern making – Visual, Dimensional Measrt.	Major	Visual Measrt.	100%	AA19703, AA19704 & Drawing	AA19703, AA19704 & Drawing	Pattern Inspection Report		2		1	
	Moulding	Visual & Dimensional inspection of Moulds & Cores	Major	Visual Measrt.	100%	AA19703, AA19704 & Drawing	AA19703, AA19704 & Drawing	Moulding Records		2		1	
2.2	Melting & Pouring	Chemical	Major	Chem.	Every Melt	AA19703 & AA19704	AA19703 & AA19704	Test Certificate	√	2		1	
2.3	Heat Treatment	Time & Temperature	Major	Heat Treatment	100%	AA19703 & AA19704	AA19703 & AA19704	HT Chart	√	2		1	

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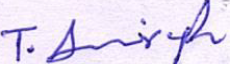
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										D	P	W	
2.4	Keel block identification	Physical identification	Major	Identify.	Each melt / HT batch (As per Spec)	AA19703 & AA19704	AA19703 & AA19704	Identification Report	√	2		1	
3.0	FINAL ASSEMBLY & TESTING												
3.1	Test Sample	Mechanical Properties (To be checked on test samples of the same melt and HT batch)	Major	Mech Properties	Each melt / HT batch (Identified in CI 2.4)	AA19703 & AA19704	AA19703 & AA19704	Test Certificate	√	2	1		
3.2	Casting & Test Sample	Hardness	Major	Hardness	Each Casting and Test Sample	AA19703 & AA19704	AA19703 & AA19704	Test Report	√	2	1		
3.3	Casting	Final Dimensions, Surface finish, Letters projection measurement, thread check (as applicable as per drawing)	Major	Measrt	100%	Drawing	Drawing	Dimensions Report	√	2	1		
4.0	SURFACE PREPARATION & PAINTING												


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4.1	Identification & Marking	Marking	Major	Visual	100%	AA19703 & AA19704	AA19703 & AA19704	Record	√	2	1		Marking by Hard stamp method	
4.2	Packing & Preservation	Visual check.	Major	Visual	Each Casting	AA19703 & AA19704	AA19703 & AA19704	Record	√	2		1		
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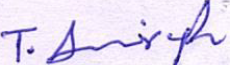
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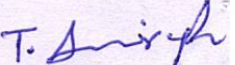
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LIST OF ITEMS APPLICABLE:

Material Code	Item Description	Drawing
BA9110303065	BRG BODY CONVEYOR (BEARING HOUSING)	D26220450072
BA9110306188	COVER BRG HSG	36220450103
BA9110403019	BEARING BODY (THRUST ROLLER BEARING)	D16270850750
BA9110403027	BEARING BODY (FLOATING ROLLER BEARING)	D16270850751
BA9110403035	BEARING BODY-THRUST ROLLER BEARING	16270950851
BA9110403043	BEARING BODY-FLOATING ROLLER BEARING	16270950851
BA9110406000	BEARING COVER (THRUST ROLLER BEARING)	D16270850752
BA9110406026	COVER (FLOATING ROLLER BEARING)	D26270850446
BA9110406034	BEARING COVER-THRUST ROLLER BEARING	16270950852
BA9110406042	BEARING COVER- FLOATING ROLLERBRG	16270950852
BA9110406050	COVER-FLTG ROLLER BEARING	26270950348
BA9110433015	RADIAL LABYRINTH (THRUST ROLLER BRG)	D26270850447
BA9110453008	RING SUPPORT OF LABYRINTH (T. ROLL BRG)	D26270850448
BA9110307010	CAP THRUST BEARING HOUSING	D26110002442
BA9110321101	HOUSING THRST BRG M-67-048	D36117600005
BA9110321110	HOUSING RDL BRG M-67-050	D26117600006

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