FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG 39(B)

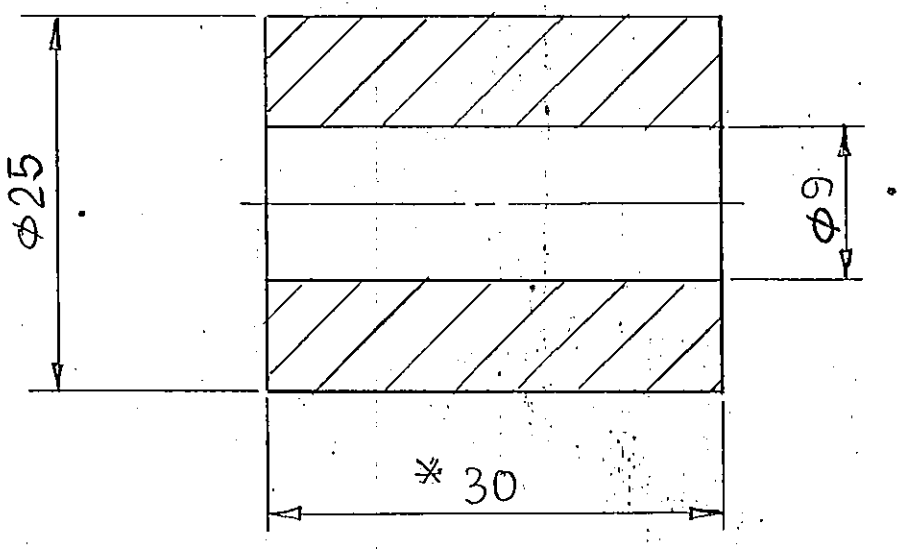
REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	CBOM/GMS No.	STATUS OF DRG

R7039-0454/001

AGREED DEPT.	NAME	SIGN	DATE

GRADE OF UN TOL. DIM M/CG/~~MC~~M/F.AA 0230208 | WELDING A/B/C/D AA 0621104 | GASCUTTING - 'T3'AA 0621101

3.2 ALL OVER



NOTES:—

* ALL THE SPACERS TO BE M/C'ED IN ONE SETTING FOR DIMENSION 30

Fe410WB
AA10119 (IS:2062)
MATERIAL CODE
MATERIAL SPEC N

REF. DRG. No.

SIGN & DATE

INVENTORY No. 0-4510

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE	No. OF VAR
DRN	R.KUMAR			73174
CHD	DAYA S.			
APD	—	—		

DEPT.	CODE	SCALE	WEIGHT (kg.)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	209	NTS	~1.00	R7039-0454	3	21 (75177)

TITLE: SPACER

DRAWING No.: R7039-0454/001

SHEET No. | No. OF SHEETS

SIZE A4

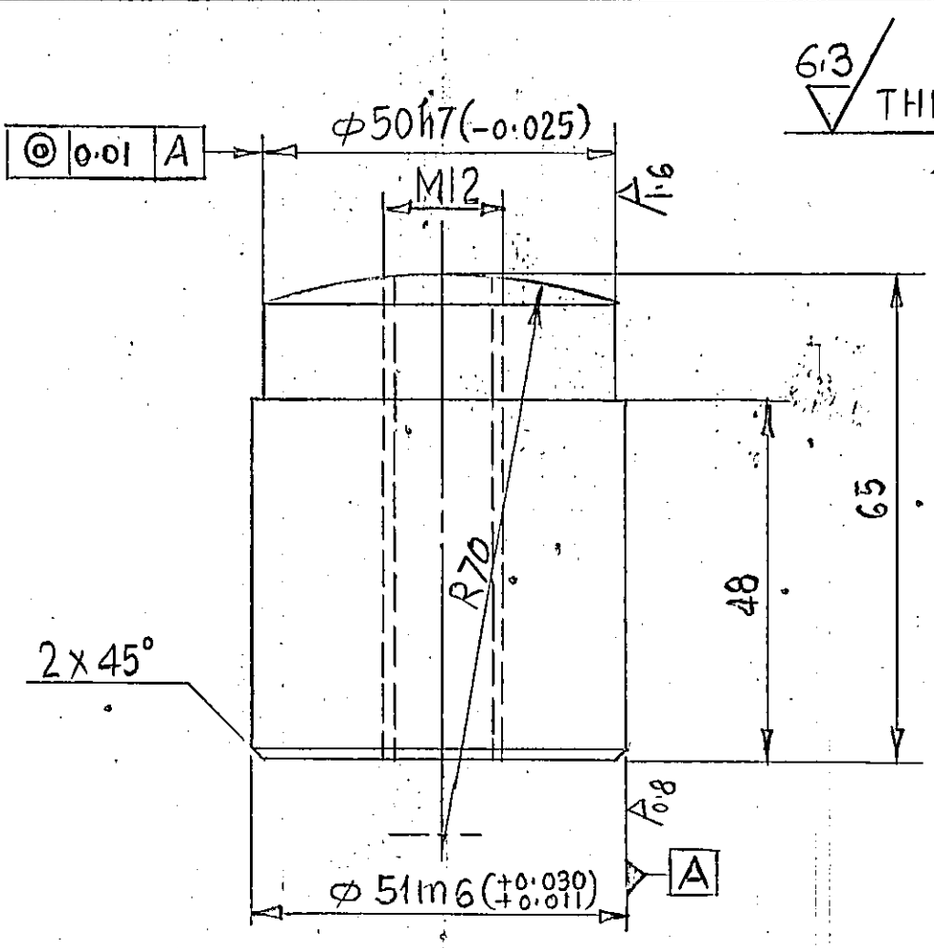
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG 39(B)

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	CBOM/GMS No.	STATUS OF DRG

AGREED DEPT.	NAME	SIGN	DATE

R7039-0454/002

GRADE OF UN TOL. DIM M/CG/C/MF.AA 0230208 | WELDING A/B/C/D AA 0621104 | GASCUTTING - 'T3'AA 0621101



NOTES:

1. ROUND OFF SHARP EDGES.
2. HARDEN TO HRc 28÷30 AS PER 0912.008

13Ni3Cr 80
AA10503(BS:970)
MATERIAL CODE
MATERIALSPECN.

	NAME	SIGN	DATE	No. OF VAR
DRN	RKUMAR			
CHD	DAYA S			
APD	—	—		73174

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

DEPT.	CODE	SCALE	WEIGHT (kg.)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	209	NTS	~1.06	R7039-0454	5	21 75177

TITLE: PIN

DRAWING No.: R7039-0454/002

SHEET No. 1 | No. OF SHEETS 3

INVENTORY No. 0-4510

REF. DRG. No.

SIGN & DATE

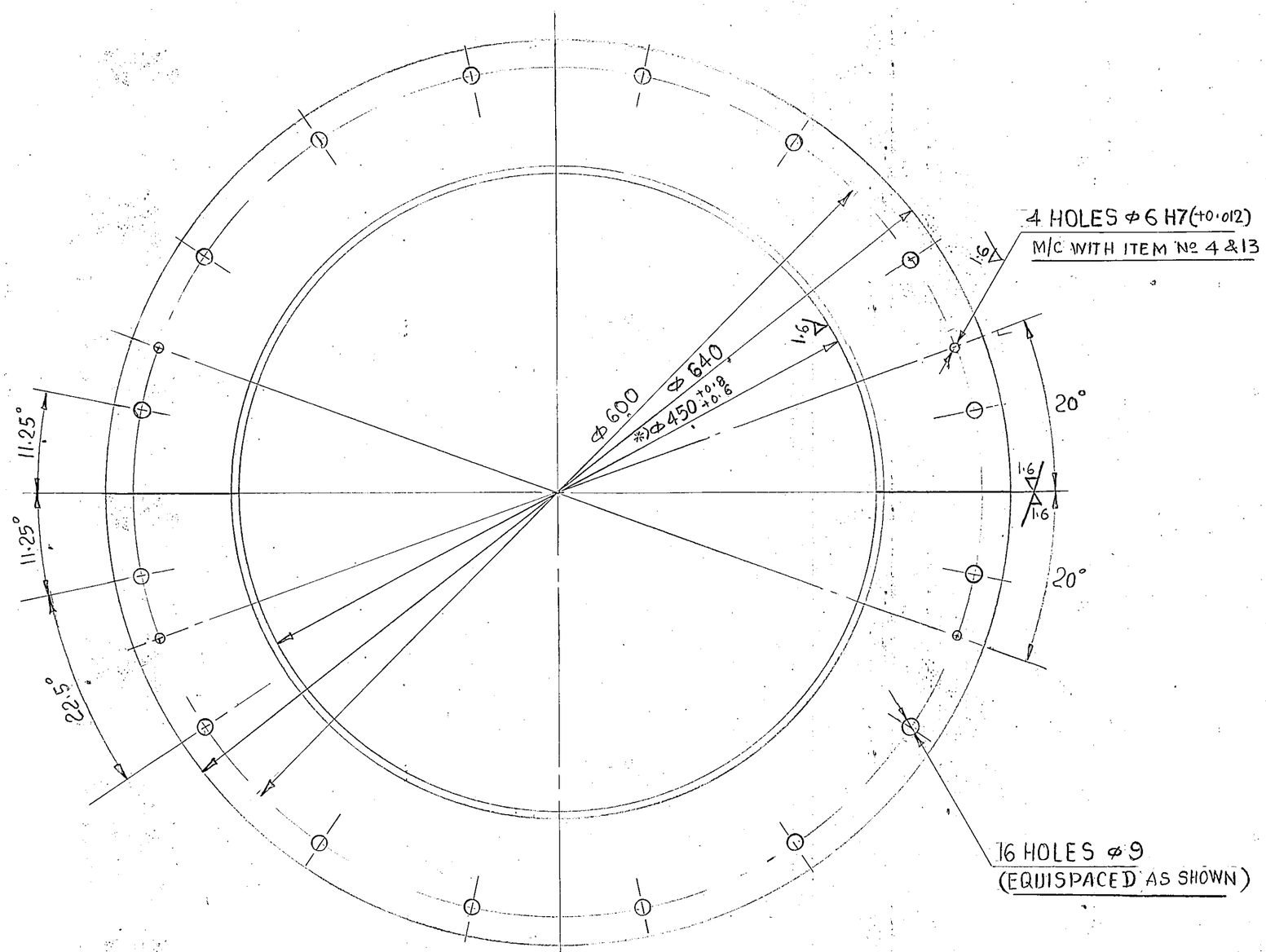
SIZE A4

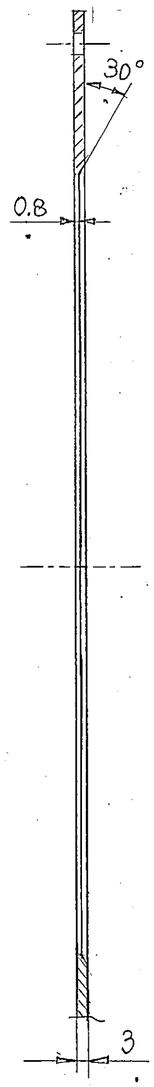
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

FORM DG 44 B

DRAWING NO. R7039-0454/003

6.3 THE REST





NOTES:—

1. ROUND OFF SHARP EDGES.
2. *) DIM. ⌀450 +0.8 +0.6 TO BE M/C'D IN ASSLY. WITHOUT SHIM AT THE JOINT PLANE.

VAR. 00	REMARKS	ITEM NO.	DESCRIPTION	STD	DRAWING NO.	Cu Zn 40 IS: 422-67	UNIT	UNIT WEIGHT	GS	ZONE
						MATERIAL CODE A				
						VAR MATERIAL SPECN C				

CARD TYPE 3 — 28 — 28 — CARD TYPE-1 — 28 — CARD TYPE-2

GMS NO./GR SP NO	STATUS OF DRG
AGREED DEPT. NAME SIGN	DATE

TYPE OF PRODUCT OR NAME OF CUSTOMER / PROJECT

GRADE OF UNTOL DIM —
M/CG-E/M/F AA 0230208
WELDING-A/B/C/D AA 0621104
GAS CUTTING 'T3' AA 0621101

REV	DATE	ALTERED / CHECKED	ZONE

BHARAT HEAVY ELECTRICALS LTD
HARDWAR

	NAME	SIGN	DATE
DRN	R. KUMAR	RKR	
CHD	DAYA S.		
APD	—	—	

NO OF VAR.

DEPT JTE
CODE 209

SCALE 1:2.5

WEIGHT (kg) ~4.15

REF TO ASSY DRG. R7039-0454

ITEM NO 7

NO OF ITEMS 21

TITLE
RING
(IN TWO HALVES)

CARD CODE

DRAWING NO. R7039-0454/003

REV.

SHEET NO. NO. OF SHEETS

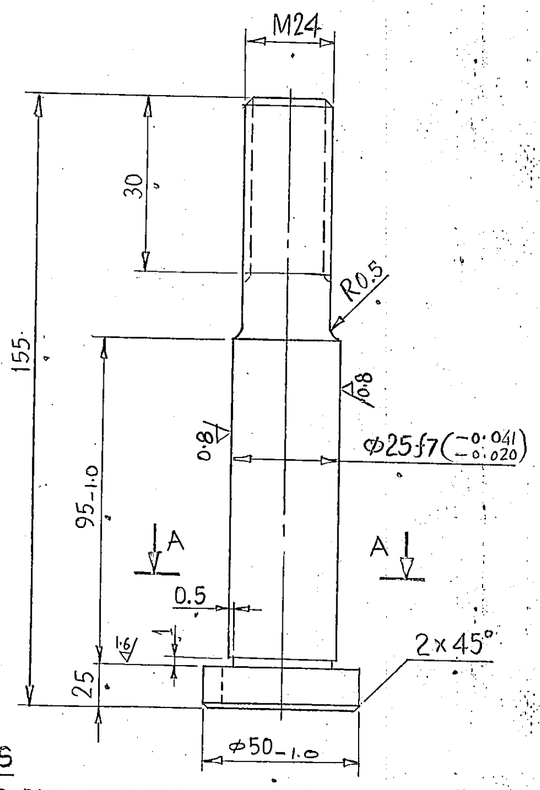
REF. DRG. NO. 0-4510 INVENTORY NO. SIGN & DATE

FIRST ANGLE PROJECTION

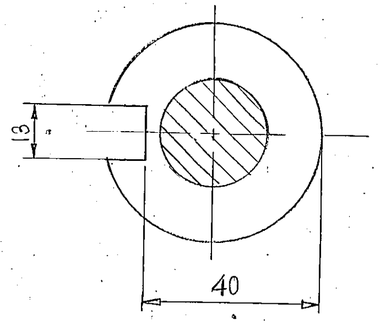
(ALL DIMENSIONS ARE IN mm)

FORM DG-38(B)

DRAWING NO. R7039 - 0454/004



SEC. AA



3.2 THE REST

NOTE :-

1. ROUND OFF SHARP EDGES
2. HARDEN TO HRc 28÷30 AS PER 0912.008

13Ni3Cr80	
AA10503(BS:970)	
MATERIAL CODE	
MATERIAL SPECN	

CBOM/GMS No.			STATUS OF DRG
AGREED DEPT.	NAME	SIGN	DATE

TYPE OF PRODUCT
OR
NAME OF CUSTOMER / PROJECT

	NAME	SIGN	DATE	NO. OF VAR
DRN	R.KUMAR			
CHD	DAYA S.			
APD	—	—		73 74

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

DEPT. JTE		SCALE	WEIGHT (kg.)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
CODE 209		NTS	~0.88	R7039-0454	20	21
						75 77

TITLE: SPL. PIN

DRAWING No. R7039-0454/004

SHEET NO. 1 3 | NO. OF SHEETS 7 22 23 24

GRADE OF UNTOL. DIM.			
M/CG-~~VIC/M~~/F AA 0230208			
WELDING-A/B/C/D AA 0621104			
GAS CUTTING-'T3' AA 0621101			

REV	DATE	ALTERED / CHECKED

REV	DATE	ALTERED / CHECKED

INVENTORY NO.	SIGN & DATE	REF. DRG. NO.
0-4510		

SIZE A3

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

NOTES:-

1. NO CHIPS SHOULD REMAIN IN THE OILSUPPLY HOLES TO BE ASCERTAINED BY INSPECTION WITH THE HELP OF BOROSCOPE/FIBRO SCOPES.
2. CARE SHOULD BE TAKEN SO THAT NO FORIEGN PARTICLES ENTER IN OIL HOLES AFTERWARDS BEFORE FINAL ASSLY. OF BEARINGS WITH ROTOR.
3. THE BABBTING OF THE LINER IS DONE ACC. TO INSTRUCTION NO HW 0980802.
4. SURFACE OF LINER (EXCEPT SPLIT SURFACE, BABBIT & SEATING SURFACE OF THE LINER & HOLES) ARE TO BE COATED ACC. TO TECH. INSTRUCTION NO. 0922-005.
5. TO BE STORED AS PER INSTRUCTION NO 0926-003
6. DIMENSIONS IN BRAKETS ARE FOR REF. ONLY.
7. SHARPS EDGES TO BE ROUNDED OFF.
8. THE SPLIT SURFACE OF UPPER & LOWER HALVES TO BE COLOUR MATCHED.

MARK
R7039-0454
ϕ450x400

ITEM No.	DESCRIPTION	DRAWING No.	MATERIAL SPECN. / MATERIAL CODE	UNIT WEIGHT (KG) / QTY.
20	SPL. PIN	R7039-0454/004	13Ni3Cr80 / AA10503(BS:970)	0.88 / 2
19	SPRING WASHER M24	AA7164002100	SPRING STEEL Gr.1 C-65 / IS:4072-67	0.026 / 2
18	NUT M24	AA7151131070	STEEL CL.4 / AA715 11 31	0.110 / 2
17	PIN 6m6x50	HW7171001.873	C-40 / AA7171001	0.011 / 8
16	SPRING WASHER M6	AA7164002045	SPRING STEEL Gr.1 C-65 / IS 4072-67	0.001 / 8
15	SCREW M6 X10	AA7123123018	STEEL CL.12.9 / AA7123123	0.005 / 8
14	WASHER	8954-017	C-40	0.002 / 8
13	HALF LINER (LOWER)	—	CL.III FORGING / AA-19332	480.00 / 1
12	SEALING RING d=17.2	17.8370-027	COPPER	0.002 / 4
11	PLUG 3/8"	74-8322-011	C-40 / 0500-007	0.063 / 4
10	PIN 12m6x25	AA-7171001	C-40 / IS:1570-61	0.022 / 2
9	WASHER M20	AA7161001099	MS / AA7161001	0.016 / 4
8	SCREW M20 X 100	HW7123123883	STEEL 12.9 / AA7123123	0.244 / 4
7	RING (IN TWO HALVES)	R7039-0454/003	Cu Zn 40 / IS: 422-67	4.15 / 2
6	BABBIT	—	TEGO V-738 / HW 12897	67.00 / —
5	PIN	R7054-0454/002	13Ni3Cr80 / AA10503(BS:970)	1.06 / 1
4	HALF LINER (UPPER)	—	CL.III FORGING / AA-19332	480.00 / 1
3	SPACER	R7039-0454/001	Fe 410 WB / AA10119 (IS:2062)	0.100 / 32
2	WASHER M8	AA7161001056	MS / AA7161001	0.002 / 32
1	SCREW M8 X 50	AA7123123123	STEEL 12.9 / AA7123123	0.050 / 32

GRADE OF UNTOL. DIM:-
MCG. :- C/M/F/ AA 023 0208
WELDING :- 'T1' 0 610.003
GAS CUTTING :- 'T3' AA 0621101

AGREED DEPT	NAME	SIGN	DATE
TTX	GOVIND SINGH		12/11/99
S.T.E.	S. BANSAL		17/11/99

TYPE OF PRODUCT: 500 MW S.T. SIMHADRI
W.O. NO. SM500ST3STF0006
COMP. DRG. 10526-5-1101
M/C TOOL O.S.B.T
MODEL 876

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN	DATE
DRN	R.KUMAR		
CHD	DAYA S.		10-11-99
APPD	OP/APA		16-11-99

CHECKED ANKUR
01 | 04 | JTE/ST-08/085 | MPS | 27.02

DEPT J & T
CODE 209
SCALE 1:25
WEIGHT (KG) ~ 1045.00
REF. TO ASSY. DRG. —

TITLE: BEARING LINER FOR BALANCING ROTOR

DRAWING No. R 7039-0454

NON DESTRUCTIVE TESTING OF NEWLY MANUFACTURED (KWU DESIGN)BEARING AND THRUST BEARING PADS MADE OF STEEL

Based on: PV 0068 Nov, 2002

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1. Scope

This test procedure is applicable for non destructive testing of new or repaired (completely rebabbited) radial sliding bearings, thrust bearing pads and seal rings used in steam turbines and turbo generators.

This test procedure shall be used for the determination of non-bonding defects
a) Between the bearing metal and the base metal and also surface defects in the sliding surface of the bearing.
b) Between bearing metal & support and surface defects in contact surface of seal rings.

This procedure lays down the procedures for performing dye penetrant testing (DPT) and Ultrasonic Testing (UT) and the acceptance norms.

2. Qualification of Testing Personnel

The testing personnel shall be qualified as per ASNT/ISNT Level –I for dye penetrant testing and Ultrasonic Testing .Final evaluation is to be done by level II personnel.

3. Extent & Stage of Test

1.1 After babbiting & rough machining:

a) Ultrasonic Testing of the bearing bore in case of bearings

b) Ultrasonic Testing of the bearing surface TB pads,

c) Ultrasonic Testing of the bearing surface and end faces of seal rings.

1.2 After final machining: Dye penetrant testing & ultrasonic testing of the babbitted surface areas shall be done.

1.3 After additional final machining: If final machining is completed after delivery (i.e. spare bearing) dye penetrant testing must be repeated.

4. Surface Condition

The test areas must be free of grease and other contaminants which impair the test. The scanning surface for ultrasonic testing shall not have undulations and tool marks which affect the interpretation of indications.

Surface finish $R_Z \leq 40\mu m$ for rough machined bearings and bearing surface of seal rings.
Surface finish $R_Z \leq 16\ \mu m$ for end faces of seal rings.

(For finish machined bearings, the surface finish will be as per drawing).

5. Dye Penetration Testing

5.1 Test Parameters

The DP testing shall be conducted in accordance with corporate specification AA0850131 using visible dye penetrant. The penetrant, cleaner and developer should match each other. The penetration time shall be between 10-60 minutes.

The interpretation of results commences directly after drying of developer. Final evaluation shall be done after at least 10 minutes of developing time. The observations are to be recorded in the test certificate.

5.2 Assessment of the Results and Acceptance Criteria

There are no different test classes or areas for Dye penetarnt testing. The various types of indications observed in Dye penetrant testing may be classified as shown in Fig .1

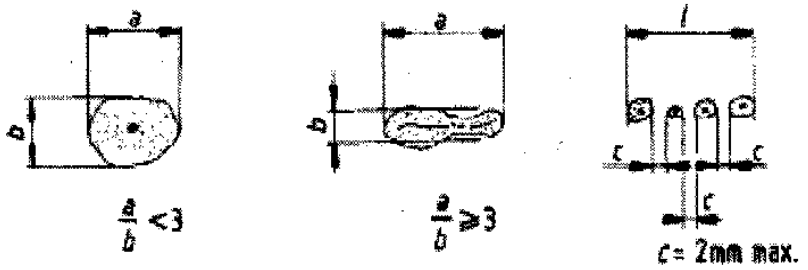


Fig 1: a) Circular indication b) linear indication c) linearly aligned indication

Acceptance Criteria

The indications except following are acceptable:

a) No circular indications with a >4mm. (As defined in Fig 1a)
b) No linear indication.(As defined in Fig 1 –b)
Linear marks between the bearing backing/bearing material on the end faces or joint faces of multilayer plain bearing is only relevant if found by ultrasonic testing. In that case ultrasonic acceptance criteria shall be applicable.
c) No linearly aligned indications. (as defined in Fig. 1-c)
d) No more than four indications, with a maximum total area of 16mm^2 in area of 10,000 mm^2. The surface tested may be square or rectangular, with a maximum side length of 250 mm. The defective area considered for evaluation shall be the worst affected area of the total surface under examination.

Clause a) to d) is applicable for DP testing of bearing and thrust bearing pads.
Clause a) to c) is applicable for DP testing of seal rings.

5.2.1 Micro porosity

Directly after drying of the developer, observe whether individual indications of size greater than 1.5mm are seen. If so, there must be evaluated as per clause 5.2 a-(d).

If the indications are smaller than 1.5 mm, they may be classified as micro porosity, they could lie very close together so that at end of the developing period the whole surface becomes red and distinction of individual defects is no longer possible.

If this happens the test surface must be cleaned and examined for visible pores.
If no pores are visible without the aid of a magnifying glass then they can be classified as micro porosity.

Pores up to a size of 1.0mm visible to the naked eye, are acceptable, if they appear isolated with no linear character with a gap of ≤ 2 mm from each other. A maximum of four indications in an area of 10,000 mm^2 are acceptable in the worst affected area of the total surface under examination.

The feasibility of UT must not be affected by micro porosity. This means bond echoes must be visible in areas with micro porosity.

In addition the areas with micro porosity must not exceed 30% of each bearing half and must not show any UT related bonding defects.

6. Ultrasonic Test

6.1 Test Equipment and Probes

6.1.1 Ultrasonic test device: For testing, the ultrasonic equipment shall be such that it conforms to the requirements of corporate standard AA 0850159.

6.1.2 Probes: The size, frequency and type of probe shall be chosen in relation to the thickness of the bearing layer, backing thickness and backing material. (Ref: Table 1)

For babbit thickness greater than 6 mm, a probe of frequency 2 MHz shall be used.
If the bearing diameter is less than or equal to 600 mm, the probe used must have a diameter less than or equal to 10 mm.

Table 1

Bearing metal thickness (mm)	Backing thickness (steel) (mm)	Probe diameter (mm)	Probe frequency (MHz)	Probe type
>2	20 to 250	10 to 30	2 to 5	Single crystal

6.2 Setting Sensitivity

The distance calibration and sensitivity setting is to be carried out by test block as shown in Fig 2 & 3.These blocks must be of the same material and have the same thickness[1] as the babbit layer being tested and be free from defects.

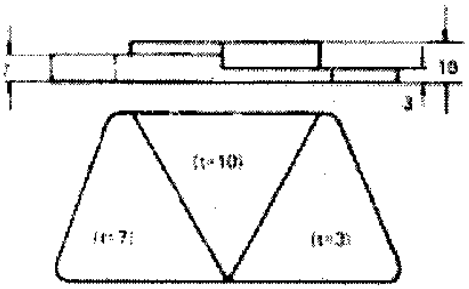


Fig 2

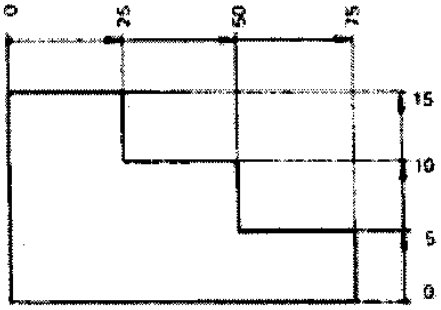


Fig 3

[1)]Dimensional tolerances for test blocks:
-25 % for bearing metal thickness less than/equal to 3 mm.
+/- 20% for bearing metal thickness greater than 3 mm.

6.2.1 Equipment Setting

The testing is done without using job back wall echo but using a test block. The time base range of the instrument shall be so adjusted so that at least three multiple back wall echoes (RE) are obtained from a suitable reference block, on the screen.

The first back wall echo (RE) from the test block is set to 80 % of the screen height. Figs 4 to 7 show the echo patterns for good & bad bond while using a single crystal probe. For scanning the curved surfaces the sensitivity is to be increased by 6 dB. (Difference between plain surface of the reference piece and curvature of the bearing).

6.2.2 Recording Level

The recordable level is 50% of the screen height of the first bond echo. However. If an indication exceeds 50% of the screen height by 5-10% and does not have any multiples, then this does not have to be recorded.

For Seal Rings, the extent of recordable indications shall be determined only in circumferential direction of the seal ring by moving the probe in the area within which the bonding echo exceeds 50 % of full screen height. The distance measured in the circumferential direction shall be designated as the recording length and shall be recorded.

Indications with extent are those indications, length of which exceed the probe diameter.
Point indications are those indications , length of which are less than probe diameter.

For indications with extent, the distance measured in the circumferential length shall be recorded as the defect length. For point defects, half of probe diameter shall be taken as defect length.

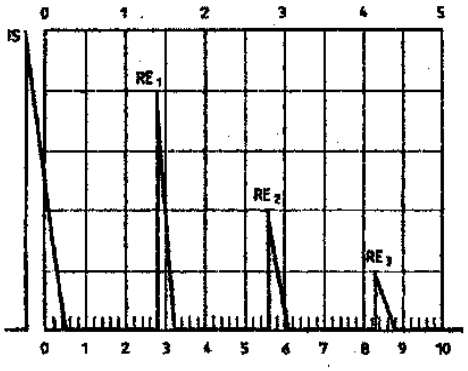


Fig 4
Adjustment of Reference Echo

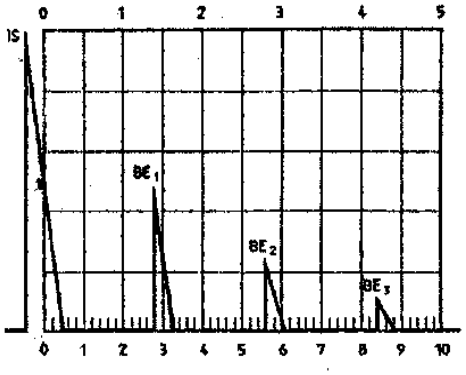


Fig 5
Good Bond

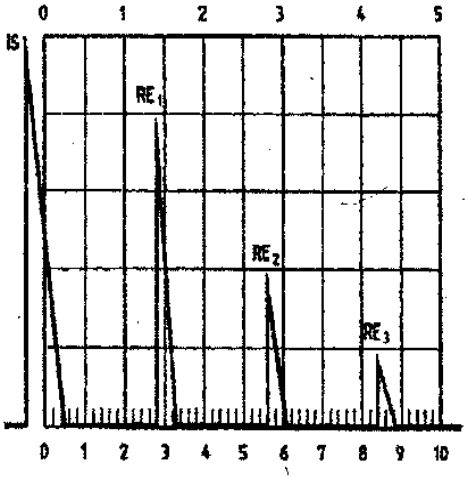


Fig 6
Adjustment of Reference Echo

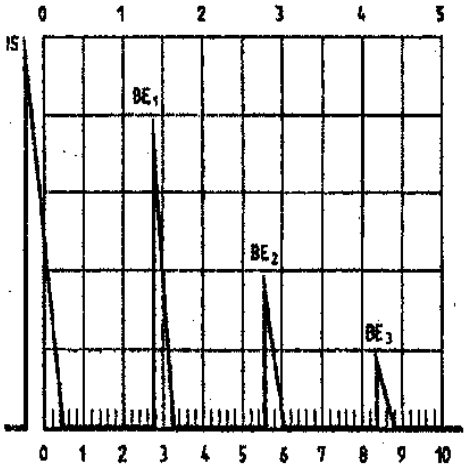


Fig 7
Bad Bond

6.3 Execution of Test

The ultrasonic testing is done on the bearing metal in the test area with an overlap of about 20% of successive scanning tracks to ensure 100% coverage of the babbited surface.
In the transitional area between groove and land as well as at oil ducts, the test may not be possible because of attendant pulse distortion.
Recordable indications are demarcated on a square frame and subsequently plotted in the test report.

6.4 Assessment of Test Results

a) For plain thrust bearings, the sum total of the non bong areas must be less than 2% of the total surface.
b) The acceptance criteria differ between bearing types and also between top & bottom halves.

Two stage, plain sleeve and modified cylindrical bearings shall be assessed as per annexure I. Three/four stage bearings are to be assessed as per Annexure –II

c) Acceptance criteria for sealing ring shall be as per annexure –III.

6.5 Documentation

The results of dye penetrant test and Ultrasonic Test shall be prepared on the formats QC-76 & QC-119 respectively.

If recordable indications are found in UT or unacceptable indications are found in DPT, the exact position & extent of the indications must be recorded in the report using a proper dimensioned sketch.

In case permissible indications are exceeded, Metallurgy & the concerned engineering department is to be consulted who shall decide possibility of using the component.

7. Cross Referred Standards

1) AA0850131 2) AA0850159

Annexure-I

Two Stage Plain Sleeve & Modified Cylindrical Bearings (Fig.8)

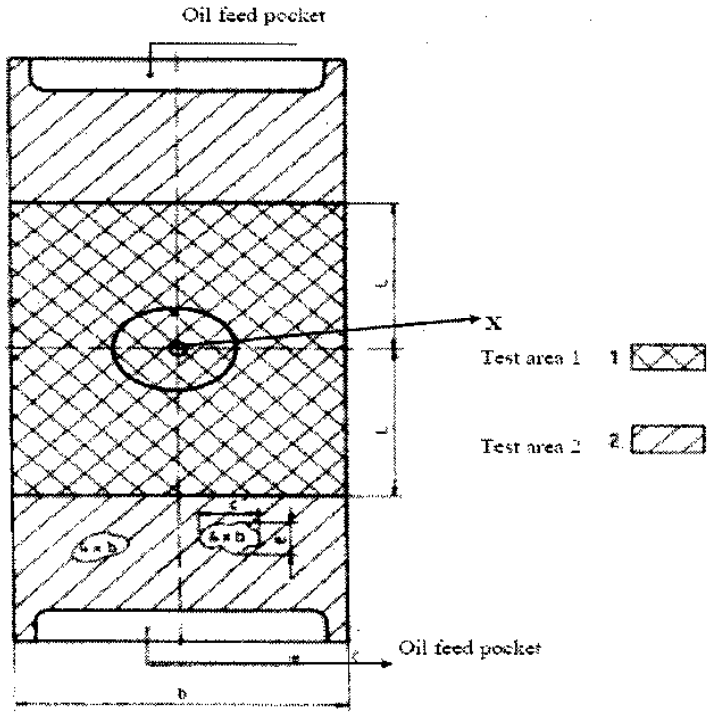


Fig.8

b = Bearing width (mm)
c = Width of area with non bonding in test area 2(mm)
e = Length of area with non bonding in test area 2(mm)
D = Bearing diameter (mm)

$$L = \frac{D \times \pi \times \alpha}{360^\circ} \quad (mm)$$

For 2 stage and plain sleeve (α=45°) apply

$$L = 0{,}393 \times D \quad (mm)$$

For modified cylindrical bearing (α = 30°) apply

$$L = 0{,}262 \times D \quad (mm)$$

X= 100% no bond allowed on the Al-Bronze washer (shown as X in the above sketch)

The **TEST ZONE 1** is defined as the crosshatched area in the above figure for the bottom half .In this region non-bonding is not acceptable.

The **TEST ZONE 2** covers entire top half and the single hatched areas of the bottom half. Each indication area has to be assessed individually in view of the percentage of the defect area and of edge zone and/or edge lengths.

In this zone:

- The total area with non bonding must not exceed 5% of each individual test range.
- Individual non bond areas of size upto A=4x b are permissible, provided two isolated non bond areas are separated by at least 10mm from each other; otherwise they are to be treated as a single defect.
- The width/length ratio of the non bonding area confirms to e/c ≥ ¼ where e & c are explained in the sketch above.
- At edge zone, max 4 % defect length related to the single edge length but not exceeding 20 mm is permissible.

Note:

- The edge zone is the visible transition from the backing to the backing ,material
- In case of journal bearing, the edge length is the edge zone of the joint face (b in fig 9)
- In case of thrust bearing, the edge length is the edge zone of plane face (b in Fig 10)

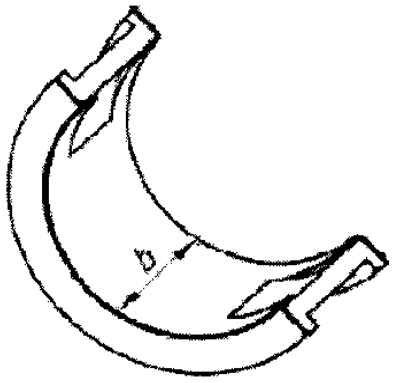


Fig 9

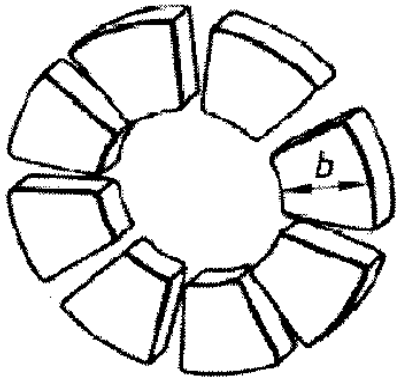


Fig.10

सामग्री सूची संख्या INVENTORY NO. P-3041	REV. NO. 02		निर्माणकर्ता WORKED BY	Sh.Kamal Sehgal Kamal Sehgal	
			जाँचकर्ता CHECKED BY	Sh. Vivek Mittal	DGM MAL

हस्ताक्षर एवं दिनांक SIGN & DATE 24/10/08

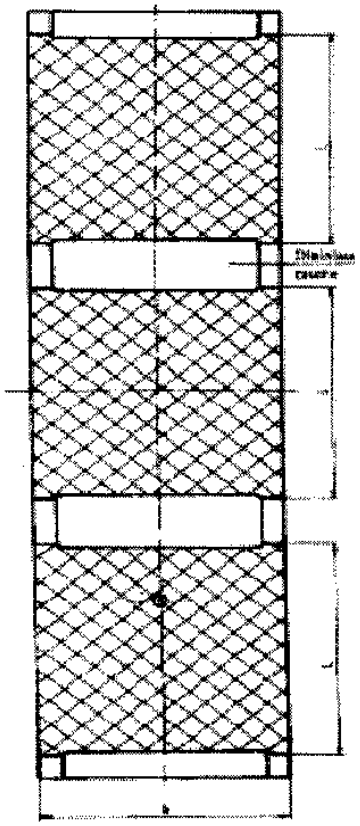
सामग्री सूची संख्या को अधिक्रमित करता है SUPERSEDES INVENTORY NO.

दिनांक एवं हस्ताक्षर SIGN & DATE

Annexure- II

Three & Four Stage Bearings

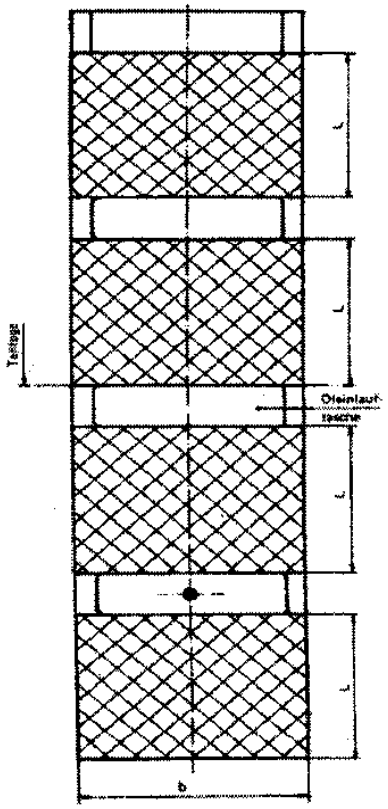
In these bearings the test area shall consist of cross hatched areas as shown below. Non bond areas are not allowed in these bearings.



3 stage bearing

$$L = \frac{D \times \pi \times 100°(mm)}{360°}$$

Fig. 11



4 stage bearing

$$L = \frac{D \times \pi \times 70°(mm)}{360°}$$

Fig.12

Annexure- III

Sealing Rings

The ultrasonic testing shall be done on end faces and bearing surfaces as shown in figure 13 and 14.

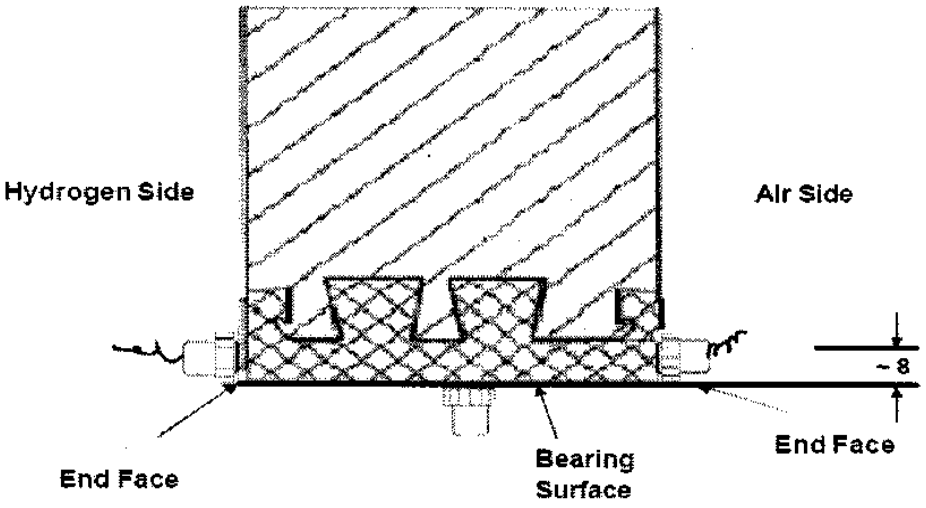


Fig. 13. Ultrasonic testing after rough machining.

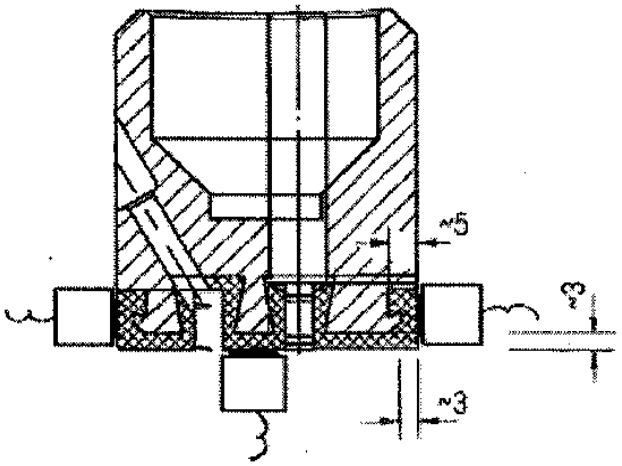


Fig. 14. Ultrasonic testing after final machining.

Acceptance norms for sealing rings

A maximum of 4 recordable indications, with a total recording length of 50 mm on each end face and bearing surface. Maximum allowable length of individual indication is 15 mm. The distance to adjacent indications shall be at least twice the defect length of the larger indication. Otherwise, the indication free space between the indications must be added to total indication length, in addition to the individual indication length.

REV. NO.		निर्माणकर्ता WORKED BY	Sh.Kamal Sehgal		
02		जाँचकर्ता CHECKED BY	Sh. Vivek Mittal		

P-3041

TECHNOLOGICAL INSTRUCTIONS FOR BABBITTING OF AXIAL BEARINGS, PADS AND OTHER COMPONENTS

1. GENERAL:

This specification covers the instructions for centrifugal and static process of babbitting of bearing shells required for application in various products. The babbitt metal of grade **HW12897** shall be used for babbitting. All the incoming bearing shells to babbitting shop must be checked for surface conditions:

- Surface of the bearing shell to be babbitted should be free from defects like dents, blowholes, cavities etc. Small surface defects should be grounded off or smoothly enlarged to avoid air trapping and thus to ensure proper bonding of babbitt metal.
- Cracks, perforations / honeycombing etc small or big, are not allowed on the casting surface. It should be completely removed by chipping. Cavities shall be repaired by welding only after approval of concerned designer / Metallurgical Engineering Department. The weld deposit must be grounded off and should not have sharp points.
- The material of babbitt grade to be used. The dimension and surface finish of bearing shell should be as per drawing.

2. COMPLIANCE WITH NATIONAL/INTERNATIONAL STANDARD:

Based on FV100008.

3. PREPARATION OF BEARING SHELL FOR TINNING:

The surface of bearing shell shall be thoroughly cleaned to make it free from dust, rust and other contamination which impair the quality of tinning. If grease or rust prevention oil has been used for preservation after machining, the same is to be removed. Following cleaning method shall be used:

3.1 DEGREASING:

Degreasing is done to get clean surface without oily spots specially in the inner

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
TSX	B CHOWDHARY	13.03.13			
QAX	N K MANWANI	12/3/13			
TGE	RAKESH KR	7/3/13	निर्माणकर्ता WORKED BY	PANKAJ AGARWAL	7/3/13
STE	AKASH SHUKLA	7.03.13	जांचकर्ता CHECKED BY	ASHISH RANJAN	7/3/13
सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	GOPAL KRISHNAN	12/3/13

स्वीकृति : संस्थान मानक समिति
APPROVED : PLANT STANDARDS COMMITTEE

Gp. No. 6-45

REV.NO. 04 (REAFFIRMED)

Dt. 24.12.18

निर्माण : PREPARED : MTE

जारी : मानक विभाग ISSUED : STANDARDS DIVISION

दिनांक : DATE :6.01.1994

हस्ताक्षर एवं दिनांक SIGN & DATE 16/12/13

सामग्री सूची संख्या INVENTORY NO. P-2862

C/ANO. TSX(MTE)-18-176 20/12/18

surfaces. For degreasing trichloro ethylene or carbon tetrachloride shall be used. Any other degreasing agent may be used after prior approval from MTE. After degreasing shell shall be dried by blowing compressed air.

3.2 Rebabbitting (Removal of babbitt metal): The babbitt metal from the bearing shell, which are to be rebabbitted, shall be removed by keeping the shell in a tray and heating in furnace to temperature 500 ± 50°C. The jacking oil, drainage holes etc. shall be protected during babbitting or rebabbitting by use of sealing putty (e.g. lenit, fire clay mixture etc).

3.3 Shot Blasting: All the surfaces, which are to be babbitted, are shot blasted. This includes the actual bonding surfaces for babbitting as well as the nearby edges for over cast (required due to technological reasons). The blasted surface should show a uniformly high appearance and should be free from all kind of impurities / contamination. Besides, oxidation appearances are to be completely removed. Following adjustments shall be maintained for shot blasting.

Angular Grit Shots: As per HW7728699

Air Pressure: 6 bar (Tolerance + 1 bar; - 2 bar)

Jet diameter: 10 mm

Blasting Time: approx. ½ min/dm^2

Distance of jet to bearing shell: 100 – 200 mm.

The blast – cleaned surface shall be cleaned with dry and oil – free compressed air (no physical contact) to remove any dust and blasting agent, and then tin plated without any delay, i.e., with no intermediate storage time.

NOTE: DON'T TOUCH THE BLAST CLEANED SURFACES THAT ARE TO BE TINNED, BUT BLOW OFF DUST WITH OIL / MOISTURE FREE, DRY COMPRESSED AIR.

4.0 TINNING:

4.1 The surface of the liner, bolting holes etc. which are not to be babbitted should be coated with protective layer made of mixture (by weight) of finely powdered chalk asbestos powder (40%), liquid glass (40%) and water (20%). This mixture may be used for one day after its preparation. Alternatively Molykot or Seizguard may also be used.

4.2 TINNING IN TIN BATH:

4.2.1 Apply flux on the surfaces to be tinned. Flux is made as follows:

$ZnCl_2$ = 32.6% (by weight)

$NH_4Cl \approx$ 2.0 % (by weight)

$HCl \approx$ 6.7 % (")

$H_2O \approx$ 58.7% (")

4.2.1.1 Other type of flux may be used after prior approval from MTE.

4.2.2 The bearing in cold state is lowered slowly with a slightly rocking motion in the molten tin bath (bath temperature 300 ± 10°C).

4.2.3 The bath temperature gets lowered but becomes steady with a rise in temperature again. Take out the bearing and apply flux again and rub with brushes the places showing untinned surfaces and lower again in the bath. Continue tinning till the babbitting surface become bright and shiny all over. No sign of blackening shall appear on the babbitting surface. While taking out the bearing shell from the bath, the tin residuals are to be removed from the contact surface with flux and brush.

4.2.4 The tinned bearing is cooled down with water spray up to a temperature less than 100°C. The residual heat of less than 100°C evaporates the residual moisture.

4.2.5 Tinning and pouring should preferably take place within 24 hours.

4.3 HAND TINNING:

The bearing shells which can not be accommodated in tinning bath or which have jacking holes pin made of brass are hand tinned.

4.3.1 Tinning with Tin Rods:

The shell is heated in electric furnace to a uniform temperature of 270 ± 10°C. Flux is applied on the surface to be tinned. The tinned surface is obtained by touching with tin rod and melting it on the surface and rubbing with flux and brush.

Non tinned places are to be again scrubbed, fluxed and tinned. This operation is to be repeated till all the surfaces to be babbitted are completely tinned.

The tinning and pouring work shall be performed preferably during a single work Shift (but not more than 24 hours after tinning operation).

4.3.2 Solder in paste form as per HW7700099 shall be used for tinning. After shot blasting apply a layer of solder paste with brush (before applying solder paste should be thoroughly hand mixed). The bearing shell shall be kept in the furnace. The job temperature between 260°C to 280°C shall be attained on the bearing shell. If the furnace is started from cold set a

temperature of 400°C initially and after ½ hour reduce the temperature to 270 ± 10 °C **(Soaking Time @ 1 hour per 25 - 30 mm thickness of bearing shell)**.Take the bearing out of the furnace and apply another layer of solder and apply flux. Wash with water. Following this the bearing shall be kept covered.

4.4 Tinned surface must be bright, free from black spots. **Tinning thickness shall be kept as thin as possible (minimum 5 microns).**

5.0 MELTING OF THE BABBITT:

5.1 The ingots of the babbitt are melted in the furnace. The babbitt should be left in molten state for as short time as possible. Basically only new babbitt metal is to be used. The residual and babbitt metal melting out of bearing shells should not be melted with new babbitt metal.

5.2 The melt is to be **covered with charcoal to avoid oxidation**.

5.3 The impurities coming on the surface of the bath must be removed before the pouring and is to be **stirred** in crucible furnace.

5.4 A casting ladle used for pouring must contain sufficient babbitt metal for a cast. The ladle must be carefully cleaned before each pouring and preheated to 520°C (approx.). The babbitt metal temperature in the crucible is 500 ± 20°C.

6.0 ARRANGEMENT FOR CENTRIFUGAL CASTING:

6.1 The bearing shells and ring halves are carefully sealed and tightly screwed / bolted to each other with the fixture plates and bolts to avoid any leakage during pouring of molten babbitt metal. Any leakage during pouring can not be rectified afterwards. The dividing sheets (about 2 to 2.5 mm thick) shall be cleaned thoroughly and inserted with thin asbestos paper or any other suitable gasket between the joints. These must project 10 to 15 mm into the bore of the bearing shells to enable the bearing shell halves to be parted off easily after the centrifugal casting. The bearing shells are tightly clamped with clamping discs on the centrifugal casting machine. The threads are to be coated with molykote or seizguard to avoid seizure of bolts.

6.2 PRE HEATING FOR CASTING:

With the centrifugal casting machine running at 20 rpm, gas torches shall be used to heat the bearing parts up to their babbitt casting temperature of 270 ± 10 °C **(Rate of heating: 50 - 75°C per hour)**. The gas torches shall be positioned in such manner that the supports are heated up uniformly in order to prevent abrupt cooling. During the warm up process while the centrifugal

casting machine is still running slowly, the clamping bolts shall be re-tensioned. The temperature of the bearing shell is checked from inside the bearing preferably with laser beam temperature indicator otherwise with contact thermocouple.

6.3 CENTRIFUGAL CASTING WITH BABBITT METAL:

The molten babbitt should be deoxidised with ammonium chloride (NH_4Cl) or other suitable flux directly before pouring. The rotation of the machine should be increased to desired value as indicated in **Annexure I**. The tolerance on rotation of machine may be taken as ± 1 from the indicated value up to 300 rpm and ± 2 beyond 300 rpm. As soon as casting temperature is achieved the molten babbitt metal shall be poured in the bearing bore without any interruption.

A pouring ladle with the capacity to hold enough molten metal for one time pouring shall be used for centrfiugal casting. The ladle shall be carefully cleaned and heated to approximately 520°C prior to each pouring. The temperature of the molten metal in the crucible shall be maintained to 500 ± 20°C. Care shall be taken to ensure that the temperature of the molten metal in the pouring ladle does not drop below 480°C. The molten metal in the ladle shall be stirred and thoroughly mixed to get uniform chemical composition. At least 10 % more babbitt metal must be available in the crucible than the required so that any leakage and wastage can be balanced.

The molten babbitt metal shall be poured into the bearing bore in a single operation, i.e. without any interruption. The babbitt thickness is achieved from the inner diameter of the front fixture plate (refer **Annexure II**).

In order to ensure that the freshly cast babbitt metal displays a uniform temperature, the pouring stream shall be moved back and forth from the rear to the front face of the bearing. The duration of water spray for cooling the babbitted bearing depends on the axial length of the bearing shell. Care shall be taken to prevent the centrifugal casting process from drawing any water into the bearing bore. The preheated fixture plates together with the babbitt metal deposit perform the function of a thermal storage device that effects nearly uniform cooling over the entire axial length of the babbitt lining. Depending on the size of the bearing, the water spray shall be turned on approximately 2 minutes before the babbitting process begins (but not later than 30 seconds after the process begins, i.e., when the first layer of babbitt metal poured). It must not be shut off until the job has cooled to a temperature below 50°C. The cool down time required for this process is between 15 and 45 minutes – essentially depends on the thickness of the job, and less so on the applied amount of water. The centrifugal casting machine shall be kept running at

centrifugal casting speed until the babbitt metal completely solidified (10 – 15 minutes). As cooling continues speed of centrifugal machine shall be reduced to approximately 20 rpm. The centrifugal machine must run up to full solidification of babbitt metal with reduced speed of 10 to 20 rpm. The length of the water jet for the cooling is to adjusted based on the axial length of bearing shell. It must be observed that no water is sprayed during the centrifugal process in the bearing bore.

6.4 STATIC POURING:

The bearing which can not be centrifugally cast due to shape or weight constraint like Thrust /Guide bearing pads etc., are statically cast. The bearings are assembled with shims, joined with bolts and / or clamping strips and placed on pouring base plate and sealed off with clay or other means. All recess must be filled and sealed with asbestos powder or fire clay. Preheating to casting temperature 270 ± 10°C is done in a furnace or with gas burners. The temperature of the bearing shell is checked preferably with laser beam heat indicator otherwise with contact thermocouple. Pouring is done through a funnel and in order to achieve a uniform temperature distribution the jet should also be moved. Care is to be taken for steady and uniform pouring. Immediately after pouring the babbitt, it is stirred in the vertical direction by heated bars free from oxides. The stirring should be started from bottom portion of the liner and gradually as the babbitts get cooled to top portion. Cooling of babbitt should be directed from bottom to top. Floating contamination is to be continuously removed from babbitt. The stirring to be continued till gas bubbles get diffused. Immediately after pouring cooling with water must take place from below to upward and from sides of support body, if necessary. When upper part of babbitt gets cooled, it should be heated by gas torch and stirred. Add babbitt from crucible to compensate for shrinkage of babbitt metal, if any. Impurities and oxide formations on the babbitt metal must be continuously removed.

7. REPAIR OF BABBITTED BEARINGS:

Minor cracks, dent mark and small porosity of babbitt metal can be rectified by soldering under application of same babbitt metal as in primary babbitting. Non -bonding defects can be considered for repair in consultation with MTE.

7.1 The repair (soldering) is done with a acetylene -oxygen burner size 2-4, with neutral flame adjustment. Following method is to be used.

7.1.1 Clean the shell body with trichloro ethylene or any other degreasing agent.

7.1.2 Remove the babbitt metal from around the defective area, working down to the base metal at approach angle of about 30°.

7.1.3 Clean the portion to be repaired by means of a wire brush or shot blasting/grinding.

7.1.4 Bearing shell preheated to 100 ± 20°C.

7.1.5 The surface to be tinned partially preheated with gas burners and tinned through welding torch by applying flux and using pure tin rod.

7.1.6 Solder babbitt metal starting from the base in stringer beads and thin layers.

7.1.7 Scrap or machine for ultrasonic testing.

7.1.8 Resolder (after turning) the cavities etc, if any.

7.1.8.1 Re-turning of repaired areas.

7.1.9 Check as per relevant standard (U. T and D. P. Testing).

8.0 INSPECTION:

The babbitted bearing shall be checked as per the specification number HW0850195.

9.0 DOCUMENTATION:

Following parameters are to be recorded during babbitting operations on suitable format in check list

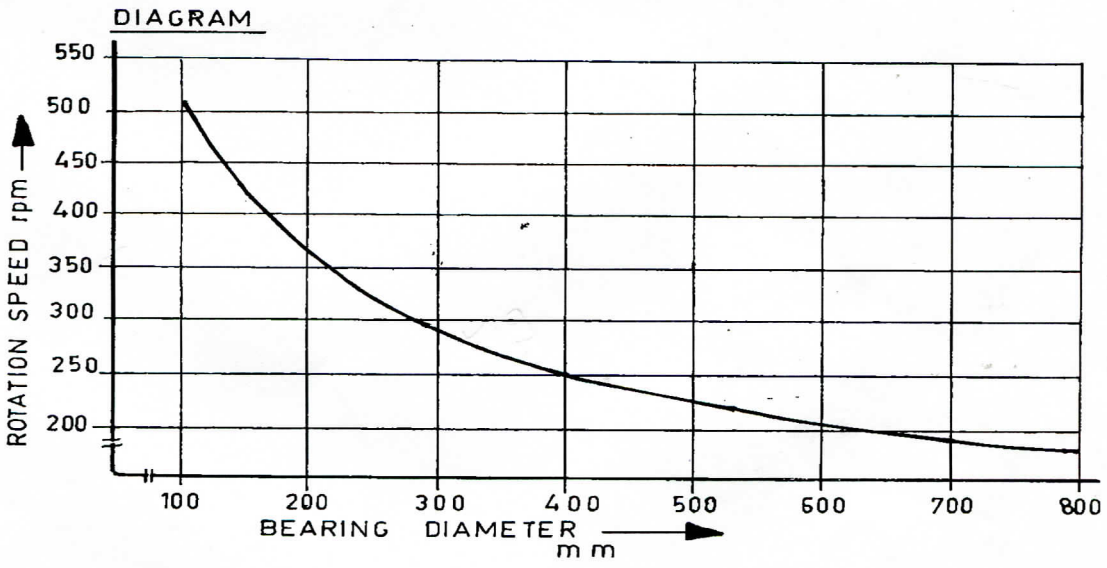
1. Name of component
2. Drawing Number
3. Work order number.
4. Temperature of bearing shell prior to tinning.
5. Type of babbitt metal with its Q number
6. Temperature of bearing shell and RPM prior to pouring
7. Pouring temperature of babbitt metal
8. Name of operator who did pouring

10.0 CROSS REFERRED STANDARD: HW12897, HW12899, HW7700099, HW0850195, HW7728699, FV100008.

TABLE FOR SPEED OF ROTATION (For Guidance Only)

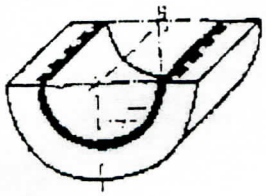
Annexure I

φ	rpm	φ	rpm	φ	rpm	φ	rpm	φ	rpm
100	510	260	316	420	248	580	212	740	187
110	486	270	311	430	246	590	210	750	186
120	466	280	305	440	244	600	208	760	185
130	446	290	300	450	240	610	208	770	184
140	431	300	294	460	238	620	206	780	184
150	416	310	288	470	235	630	206	790	181
160	403	320	286	480	233	640	205	800	179
170	390	330	280	490	230	650	205	810	169
180	379	340	277	500	228	660	203	820	159
190	370	350	272	510	226	670	200	830	151
200	360	360	269	520	223	680	198	840	143
210	352	370	266	530	221	690	196		
220	343	380	262	540	218	700	192		
230	336	390	258	550	217	710	191		
240	329	400	254	560	215	720	190		
250	322	410	252	570	214	730	188		

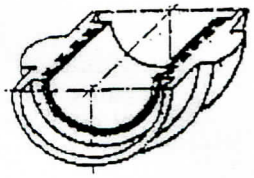


Bearing shapes

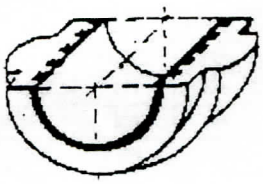
Annexure II



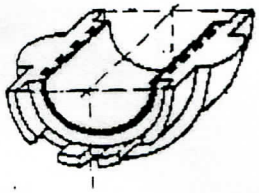
Shape 1



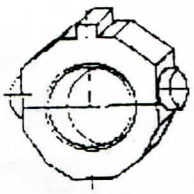
Shape 2



Shape 3



Shape 4

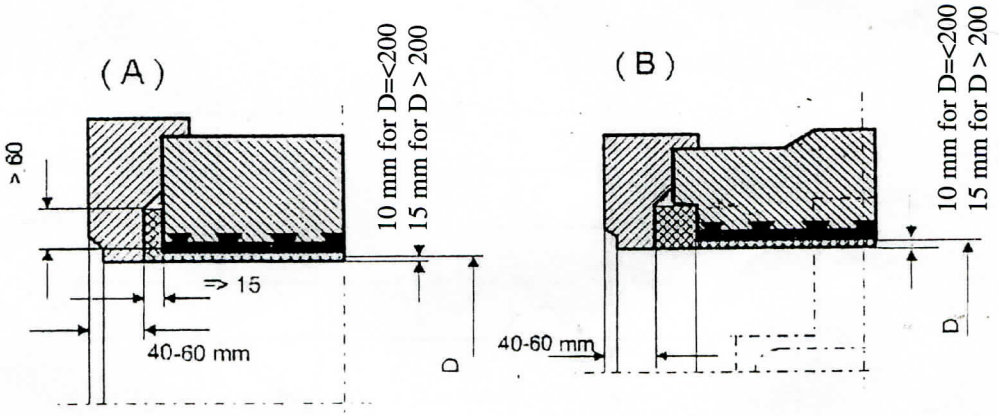


Shape 5

Fixture (Closed Geometry)

Dimensions of white-metal deposit: 15 ≤ x ≥ 30 mm

Thickness of fixture: 40-60 mm



Fixture (A) for bearing shapes 1 and 2

Fixture (B) for bearing shapes 3 and 4

Finished dimension of babbitt

Top layer and white-metal deposit

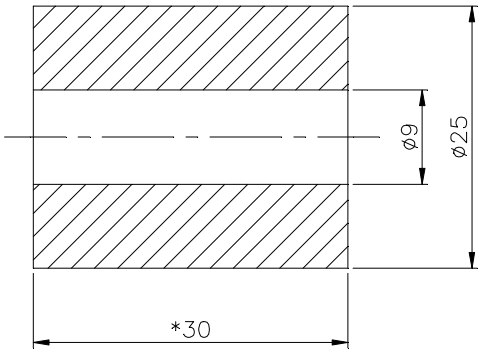
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.
						R7039-0741/001	

AGREED DEPT.	NAME	SIGN.	DATE

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 ALL OVER



*ALL THE SPACER TO BE MACHINED IN ONE SETTING FOR DIMENSION '30'.

	C-20
	AA 10109
	MATERIAL CODE
	MATERIAL SPEC.

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	24.08.11
CHD	RAVI	-sd-	24.08.11
APD			

No. OF VAR

DEPT JTE | CODE 209 | SCALE 2:1 | WEIGHT(Kg) ~0.102 | REF. TO ASSY. DRG. | ITEM No. | No. OF ITEM

TITLE: SPACER

DRAWING No. R7039-0741/001 | REV

SHEET No. 01 | No. OF SHEETS 01

SIZE A4

REF.DRG.No. | SIGN & DATE | INVENTORY No

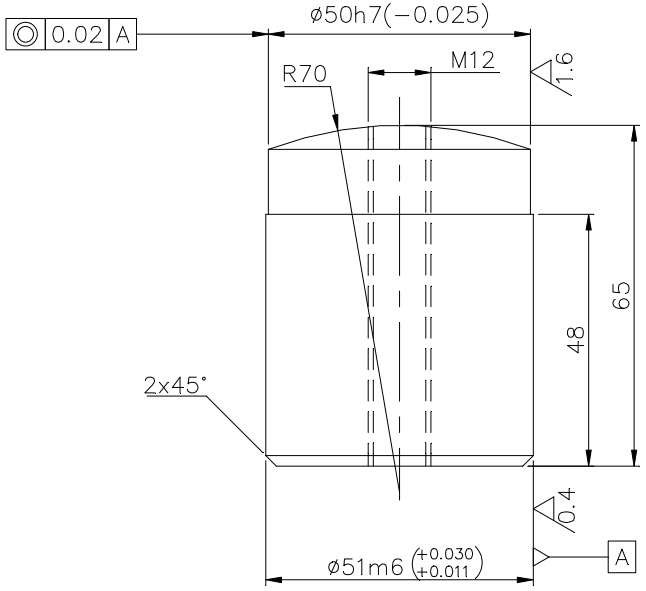
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.
R7039-0741/002							

AGREED DEPT.	NAME	SIGN.	DATE

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 THE REST



1-NITRIDE TO VHN>450 AS PER P.S. No. 0912-002.
2-SHARP EDGES TO BE ROUNDED OFF.

13Ni3Cr80	
AA10503	
MATERIAL CODE	
MATERIAL SPEC.	

REF.DRG.No. | SIGN & DATE | INVENTORY No

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	24.08.11
CHD	RAVI	-sd-	24.08.11
APD			

No. OF VAR

DEPT	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	1:1	~1.060			
CODE 209					

TITLE: PIN

DRAWING No.: R7039-0741/002 | REV

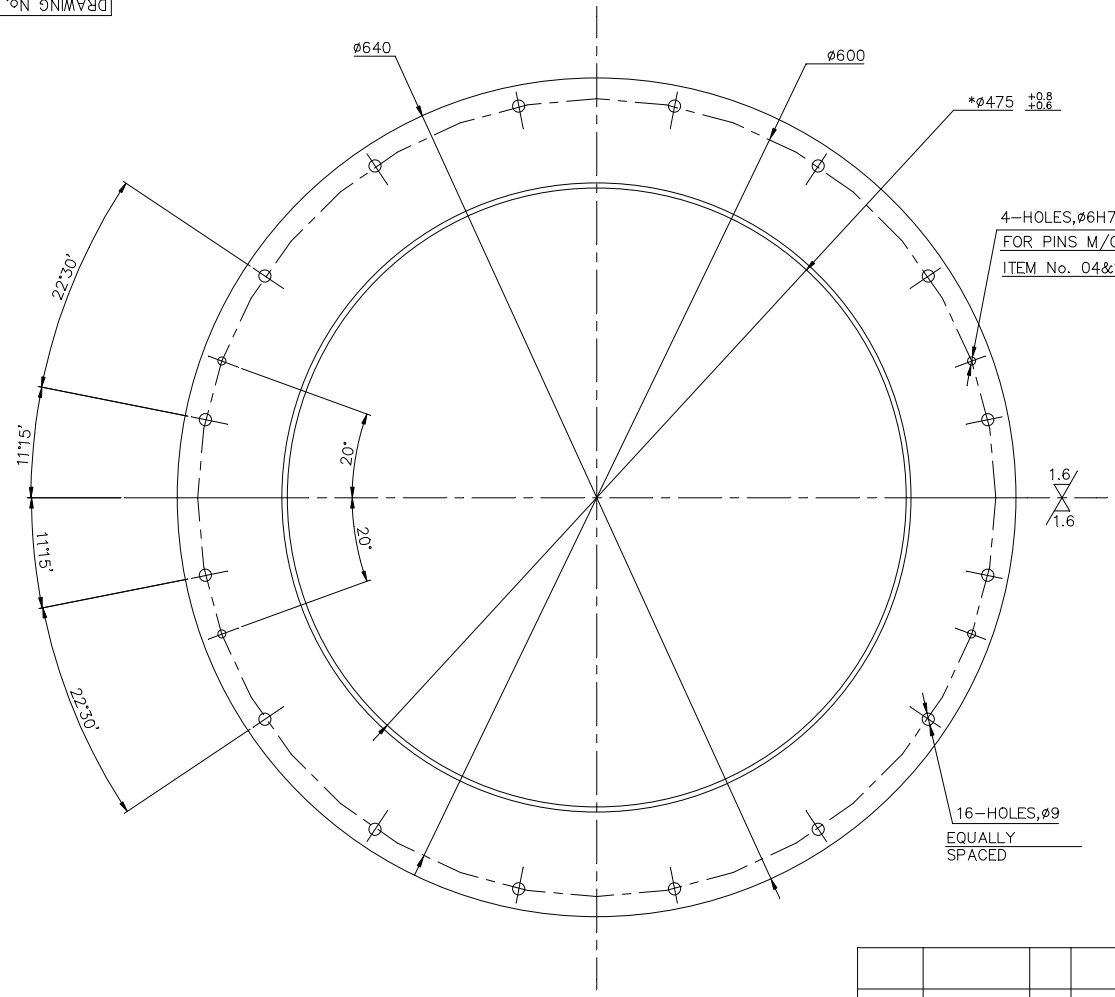
SHEET No. 01 | No. OF SHEETS 01

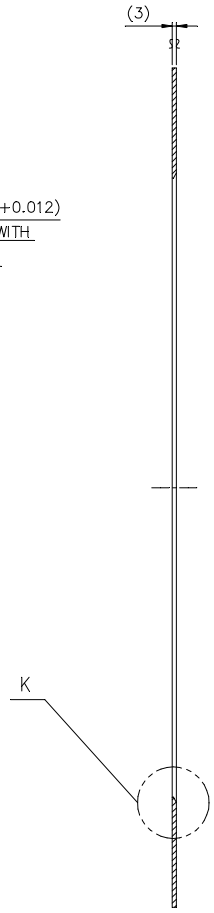
SIZE A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN m.m.)

FORM DG 44(B)

DRAWING No. R7039-0741/003

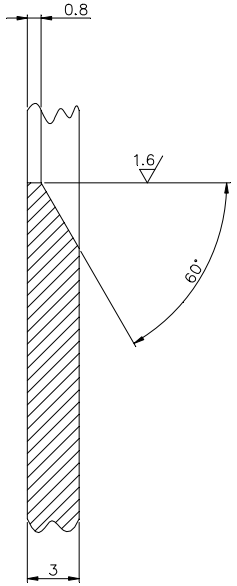




6.3 THE REST

DETAIL–K

SCALE 5:1



							BRASS				
							AA 12114				
VAR.00	REMARKS	ITEM No.	DESCRIPTION	STD.	DRAWING No.		MATERIAL CODE	A	UNIT	UNIT WEIGHT	GS ZONE B
						VAR.	MATERIAL SPECN.	C		QTY.	

*DIM ø475 $^{+0.8}_{+0.6}$ TO BE M/C'D IN ASSLY WITHOUT SHIM AT THE JOINT PLANE.

GRADE OF UNTOL.DIM. :–
M/CG–E/M/F AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–'T3'AA0621101

REV.	DATE	ALTERED / CHECKED

REV.	DATE	ALTERED / CHECKED

GMS No./GR.SP.No.			STATUS OFDRG.
AGREED DEPT.	NAME	SIGN.	DATE

TYPE OF PRODUCT | COMP. DRG. No. | M/C TOOL TRANS No. | REF. DRG. No. R7039–0730

DESIGN ORDER No. | MODEL No.

BHEL BHARAT HEAVY ELECTRICALS LTD. HARDWARE

	NAME	SIGN.	DATE	No. OF VAR.
DRN.	RAJESH	–sd–	24.08.11	
CHD	RAVI	–sd–	24.08.11	
APD				

DEPT. JTE | CODE 209 | SCALE N.T.S. | WEIGHT(Kg.) ~4.15 | REF. TO ASSY. DRG. | ITEM No. | No. OF ITEM

TITLE RING (IN TWO HALVES)

DRAWING No. R7039–0741/003 | REV.

SHEET No. 01 | No. OF SHEET 01

SIZE A 2

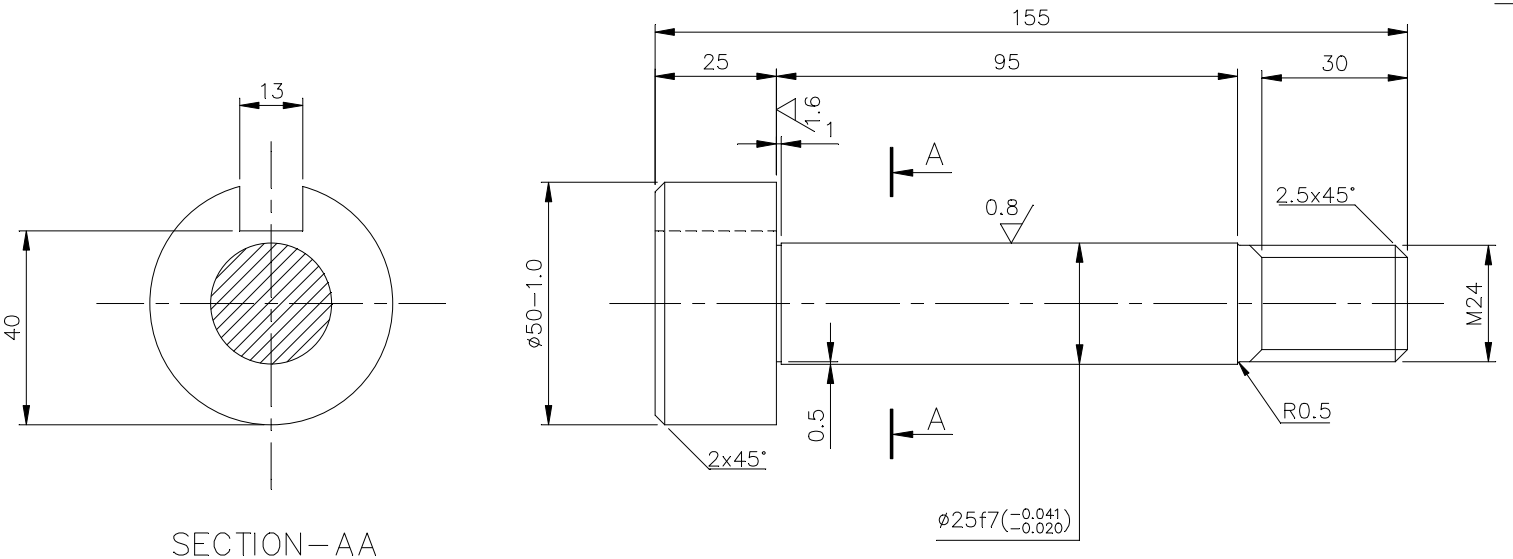
REF. DRG. No. | SIGN. & DATE | INVENTORY No.

DOC REV NO.: 1

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) | FORM DG38(B)

DRAWING No. R7039-0741/004

3.2 THE REST



SECTION–AA

1–SHARP EDGES TO BE ROUNDED OFF.

2–HARDEN TO HRc 28÷32 AS PER P.S. No. 0912–008.

VAR.00	REMARKS	ITEM No.	DESCRIPTION	STD	DRAWING No.	VAR.	MATERIAL CODE / MATERIAL SPECN.	A / C	UNIT	UNIT WEIGHT / QTY.	GS
							13Ni3Cr80 / AA 10503				

GMS No./GR.SP.No.			STATUS OF DRG.	TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
AGREED DEPT.	NAME	SIGN.	DATE		DESIGN ORDER No.	M/C MODEL No.	

GRADE OF UNTOL. DIM.: –

M/CG–Ø/M/F AA0230208

WELDING–A/B/C/D AA0621104

GAS CUTTING–'T3' AA0621101

REV	DATE	ALTERED / CHECKED

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN.	DATE
DRN	RAJESH	–sd–	24.08.11
CHD	RAVI	–sd–	24.08.11
APD			

No. OF VAR.

DEPT. JTE | CODE 209 | SCALE 1:1 | WEIGHT(Kg) ~0.88 | REF.TO ASSY. DRG. | ITEM No. | No. OF ITEMS

TITLE: PIN

DRAWING No. R7039–0741/004 | REV.

SHEET No. 01 | No. OF SHEETS 01

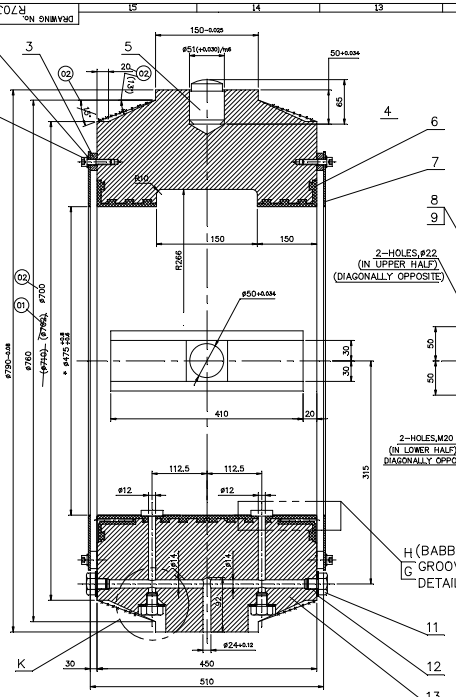
SIZE A 3

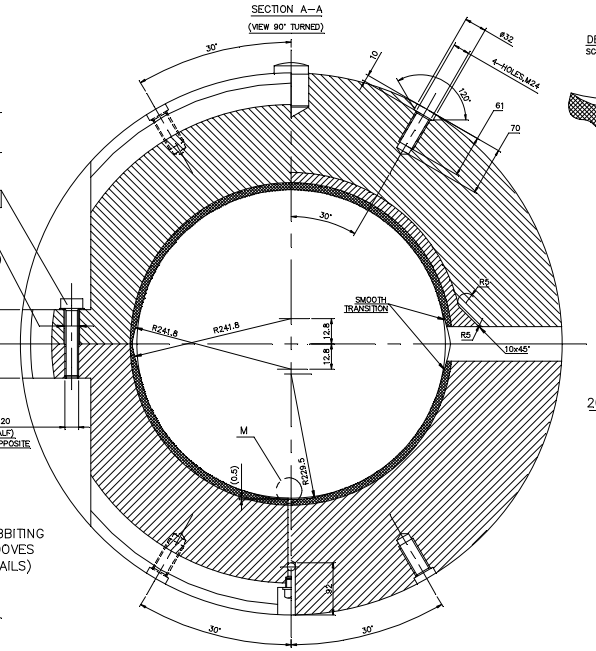
REF. DRG. No. | SIGN.&DATE | INVENTORY No.

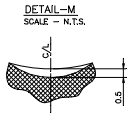
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

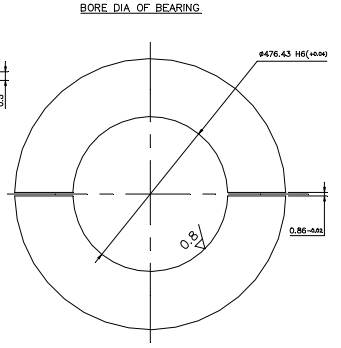
FORM: DG 46 B

DRAWING No. R7039-0741









3.2 THE REST

1–NO CHIPS SHOULD REMAIN IN THE OIL SUPPLY HOLES TO BE ASCERTAINED BY INSPECTION WITH THE HELP OF BOROSCOPE /FIBRO SCOPES.

2–CARE SHOULD BE TAKEN SO THAT NO FORIEGN PARTICLES ENTER IN OIL HOLES AFTER WARDS BEFORE FINAL ASSLY. OF BEARINGS WITH ROTOR.

3–ASSLY. ITEM No. 14 IS BORROWED FROM 1–5372–010 SP.

4–THE BABBTING OF THE LINER IS DONE ACC. TO INSTRUCTION No. HW 0980802.

5–SURFACE OF LINER (EXCEPT SPLIT SURFACE,BABBIT & SEATING SURFACE OF THE LINER & HOLES) ARE TO BE COATED ACC. TO TECH. INSTRUCTION No. 0922–005.

6–TO BE STORED AS PER INSTRUCTION No. 0928–003.

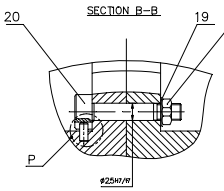
7–DIMENSIONS IN BRACKETS ARE FOR REFERENCE ONLY.

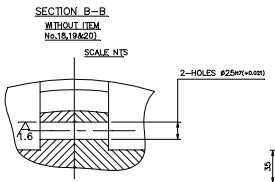
8–SHARP EDGES TO BE ROUNDED OFF.

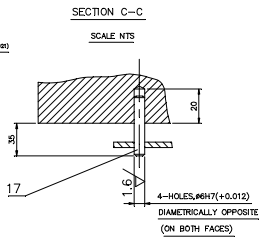
9–THE SPLIT SURFACES OF UPPER & LOWER HALVES TO BE COLOUR MATCHED.

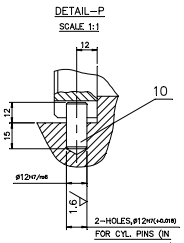
*10–ø475 TO BE MACHINED WITH OUT SHIM.

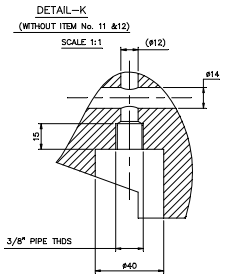
11–CONSERVATION IS TO BE DONE AS PER TL–30007.

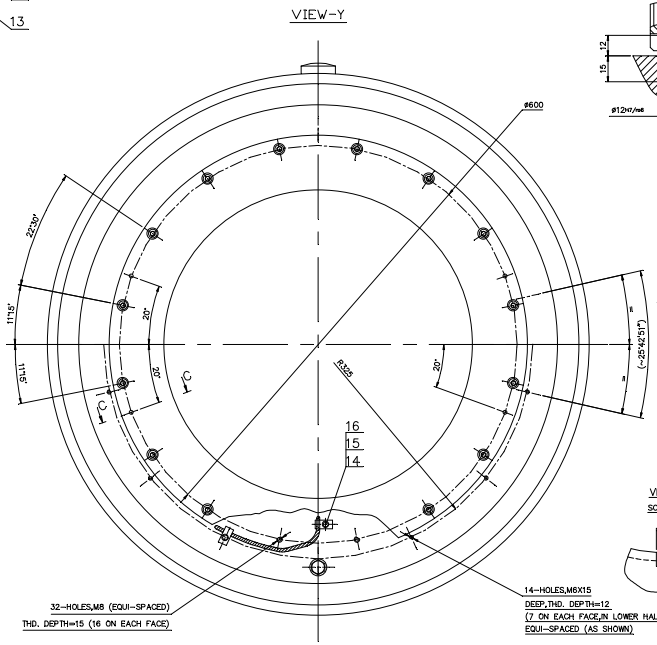


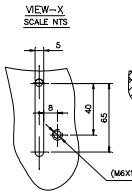


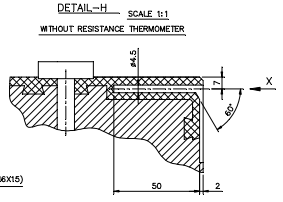


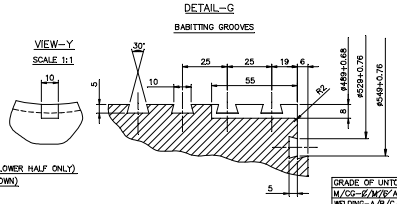


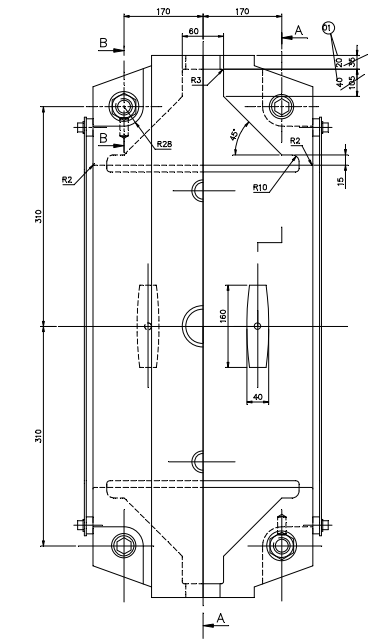












ITEM No.	DESCRIPTION	DRAWING No.	MATERIAL CODE	MATERIAL SPECIFIC	UNIT WT.(Kg.)
20	SPL. PIN	R7039–0741/004	13Ni3Cr80	~0.6	
19	WASHER SPRING SC B 24–ST	AA716 40 02–100	AA 10803 (BS:IS:4072)	02	~0.026
18	NUT HEX M24	AA7151131–070	AA 716 40 02	02	
17	PIN CYL RND END 6 m6X50–ST	AA7171001–873	STEEL CLASS 4	~0.110	
16	SPRING WASHER M6	12 8953–006	AA 715 11 31	02	
15	SCREW M6X10	12 8900–102	C–40	~0.011	
14	WASHER	8954–017	AA7171001	08	
13	HALF LINER (LOWER)	———	C–85	~0.001	
12	SEALING RING ø17.2	18.8370–027	IS:1570	14	
11	PLUG 3/8" PIPE THD.	72.8322–011	STEEL 4.8	~0.004	
10	PIN CYL RND END 12 m6X25–ST	AA 717 10 01	———	14	
09	WASHER MCD 21–ST	AA 716 10 01–099	C–40	~0.001	
08	SCRU CAP SOC P M20X100–ST	AA 712 31 23	C–40	14	
07	RING (IN TWO HALVES)	R7039–0741/003	C 3 FORGING	~480.00	
06	BABBIT	———	AA19332	01	
05	PIN	R7039–0741/002	COPPER	~0.002	
04	HALF LINER (UPPER)	———	IS14811	04	
03	SPACER	R7039–0741/001	C20	~0.063	
02	WASHER MCD 8.4–ST	AA7161001–056	AA10112	04	
01	SCRU CAP SOC P M8X40–ST	AA7123123–115	C–40 (IS:1570)	~0.02	
			AA 717 10 01	02	
			MILD STEEL	~0.016	
			AA 716 10 01	02	
			STEEL 12.9	~0.3	
			AA 712 31 23	02	
			BRASS	~3.60	
			AA 12114	02	
			TEGO	———	
			HW12897	———	
			13Ni3Cr80	~1.00	
			AA 10503	01	
			CI 3 FORGING	~480.00	
			AA19332	01	
			C–20	~0.03	
			AA 10108	32	
			MILD STEEL	~0.002	
			AA7161001	32	
			STEEL 12.9	~0.021	
			AA7123123	32	

MARK
R7039–0741
ø475

GRADE OF UNTOL.DIM. :–
M/CC–E/M/E/AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–"I3"AA0621101

REV.	DATE	ALTERED SI/TEPS / CHECKED AI/TEAM
02	25.04.13	DESIGN REVIEW VIDE CAF NO JTE–13–F0126
01	31.12.11	ALTERED SI/TEPS / CHECKED SI/TERS / DIM 35,105&710 CHANGED VIDE CAF JTE–11–F0170

	NAME	SIGN.	DATE
ITX	SHIV KUMAR	–sd–	07.08.11
S.T.E.	BANSAL SL	–sd–	

	NAME	SIGN.	DATE
DRN.	RAJESH	–sd–	24–08–11
CHD	RAVI	–sd–	24–08–11
APD	ANKUR	–sd–	07–09–11

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

TYPE OF PRODUCT	COMP. DRG. No.	M/C. TOOL TRANS No.	REF. DRG. No.
660 MW	0103D156000	O.S.B.T.	R7039–0730
	DESIGN ORDER No. BH660ST3STF0022	MODEL No.	

DEPT. JTE | CODE 209 | SCALE N.T.S. | WEIGHT(Kg.) ~1045.0

TITLE: BEARING LINER DIA 475 FOR BALANCING L.P.ROTOR

DRAWING No. R7039–0741 | SHEET No. | No. OF SHEET | SIZE A 0

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

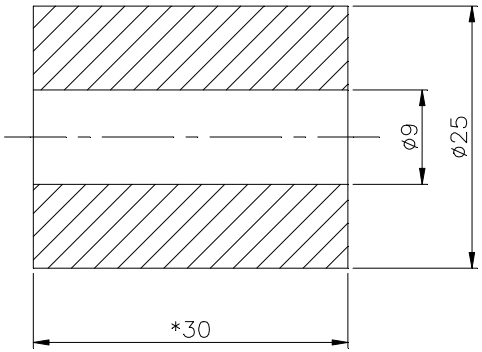
REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.

AGREED DEPT.	NAME	SIGN.	DATE

R7039-0756/001

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 ALL OVER



*ALL THE SPACER TO BE MACHINED

IN ONE SETTING FOR DIMENSION '30'.

	C-20
	AA 10109
	MATERIAL CODE
	MATERIAL SPEC.

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	
CHD	RAVI	-sd-	
APD			

No. OF VAR

DEPT JTE
CODE 209

SCALE 2:1

WEIGHT(Kg) ~0.102

REF. TO ASSY. DRG.

ITEM No.

No. OF ITEM

TITLE: SPACER

DRAWING No. R7039-0756/001

REV

SHEET No. 01 | No. OF SHEETS 01

SIZE A4

REF.DRG.No.

SIGN & DATE

INVENTORY No

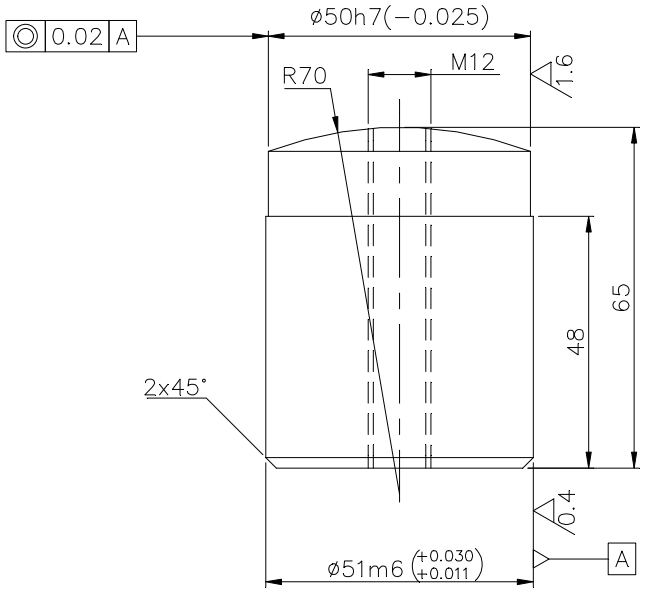
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.
R7039-0756/002							

AGREED DEPT.	NAME	SIGN.	DATE

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 ▽ THE REST



1-NITRIDE TO VHN>450 AS PER P.S. No. 0912-002.
2-SHARP EDGES TO BE ROUNDED OFF.

13Ni3Cr80	
AA10503	
MATERIAL CODE	
MATERIAL SPEC.	

REF.DRG.No. | SIGN & DATE | INVENTORY No

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	
CHD	RAVI	-sd-	
APD			

No. OF VAR

DEPT	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	1:1	~1.060			
CODE 209					

TITLE: PIN

DRAWING No.: R7039-0756/002 | REV

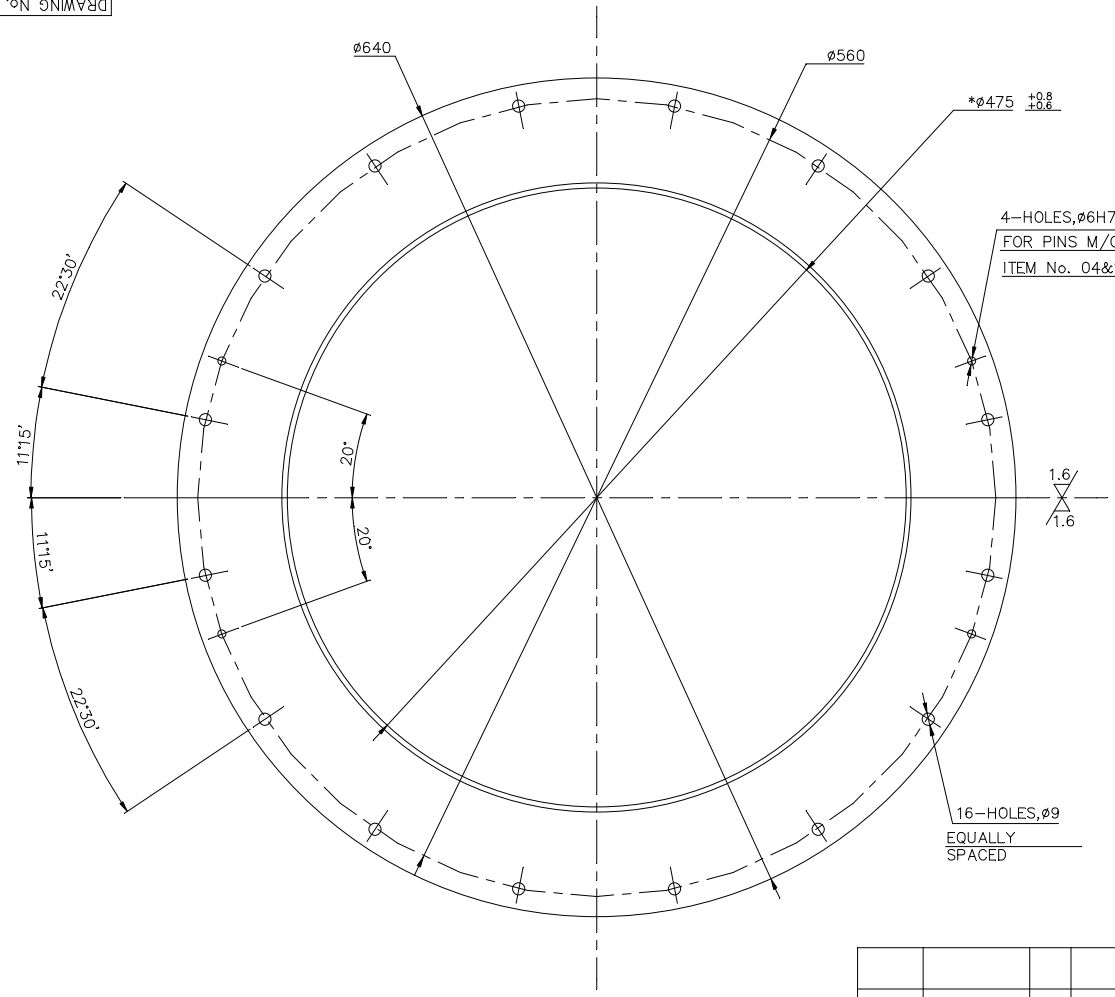
SHEET No. 01 | No. OF SHEETS 01

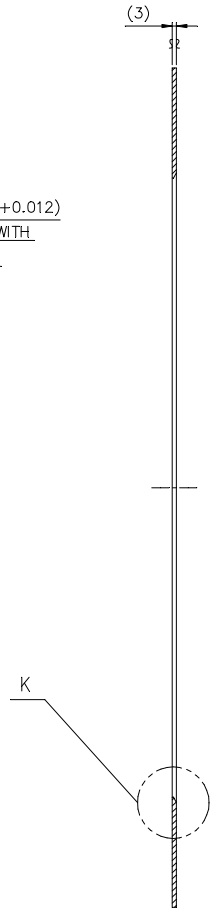
SIZE A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN m.m.)

FORM DG 44(B)

DRAWING No. R7039-0756/003

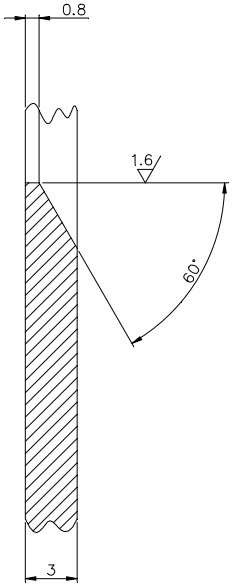




6.3 THE REST

DETAIL–K

SCALE 5:1



							BRASS				
							AA 12114				
VAR.00	REMARKS	ITEM No.	DESCRIPTION	STD.	DRAWING No.		MATERIAL CODE	A	UNIT	UNIT WEIGHT	GS ZONE B
						VAR.	MATERIAL SPECN.	C		QTY.	

*DIM ø475 $^{+0.8}_{+0.6}$ TO BE M/C'D IN ASSLY WITHOUT SHIM AT THE JOINT PLANE.

GRADE OF UNTOL.DIM. :–
M/CG–E/M/F AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–'T3'AA0621101

REV.	DATE	ALTERED / CHECKED

REV.	DATE	ALTERED / CHECKED

GMS No./GR.SP.No.			STATUS OFDRG.
AGREED DEPT.	NAME	SIGN.	DATE

TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
	DESIGN ORDER No.	MODEL No.	R7039–0730

BHEL BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN.	DATE	No. OF VAR.
DRN.	RAJESH	–sd–	24.08.11	
CHD	RAVI	–sd–	24.08.11	
APD				

DEPT.	SCALE	WEIGHT(Kg.)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	N.T.S.	~4.15			
CODE 209					

TITLE RING (IN TWO HALVES)

DRAWING No. R7039–0756/003 REV.

SHEET No. 01 No. OF SHEET 01

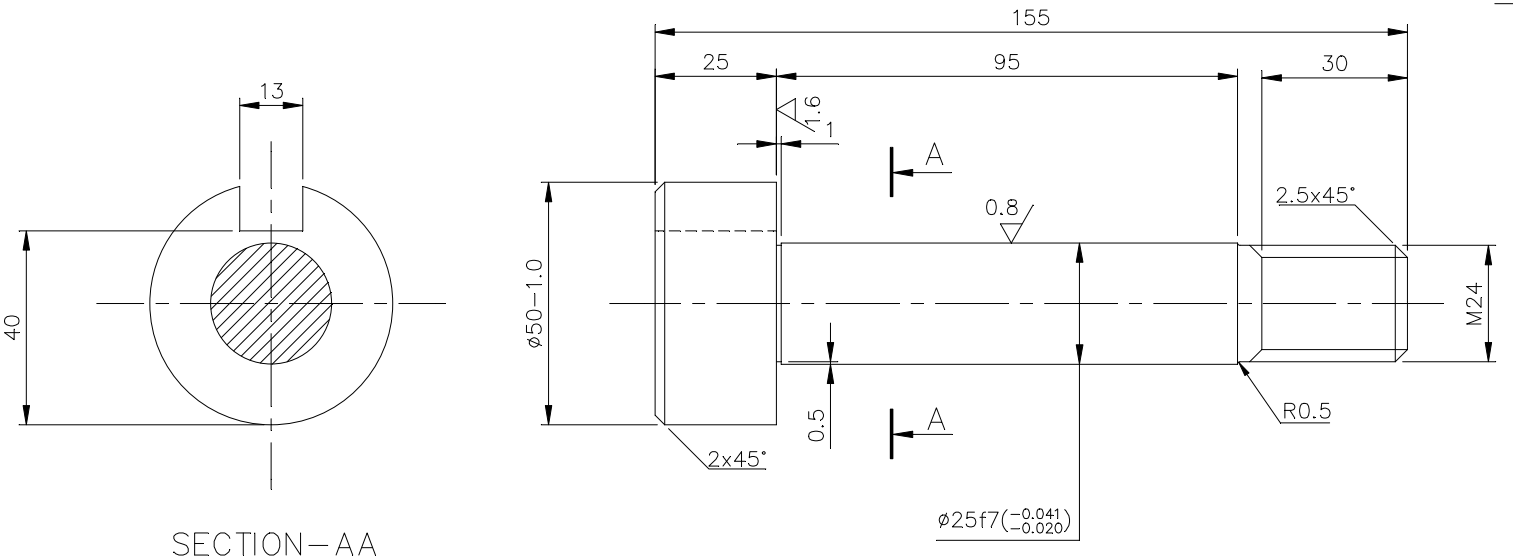
SIZE A 2

REF. DRG. No. | SIGN. & DATE | INVENTORY No.

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) | FORM DG38(B)

DRAWING No. R7039-0756/004

3.2 THE REST



SECTION-AA

1-SHARP EDGES TO BE ROUNDED OFF.

2-HARDEN TO HRc 28÷32 AS PER P.S. No. 0912-008.

VAR.00	REMARKS	ITEM No.	DESCRIPTION	STD	DRAWING No.	VAR.	MATERIAL CODE / MATERIAL SPECN.	A / C	UNIT	UNIT WEIGHT / QTY.	GS
							13Ni3Cr80 / AA 10503				

GMS No./GR.SP.No.			STATUS OF DRG.	TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
AGREED DEPT.	NAME	SIGN.	DATE		DESIGN ORDER No.	M/C MODEL No.	

GRADE OF UNTOL. DIM.:-

M/CG-Ø/M/F AA0230208

WELDING-A/B/C/D AA0621104

GAS CUTTING-'T3' AA0621101

REV	DATE	ALTERED / CHECKED

BHEL BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN.	DATE	No. OF VAR.
DRN	RAJESH	-sd-		
CHD	RAVI	-sd-		
APD				

DEPT. JTE | CODE 209 | SCALE 1:1 | WEIGHT(Kg) ~0.88 | REF.TO ASSY. DRG. | ITEM No. | No. OF ITEMS

TITLE: PIN

DRAWING No. R7039-0756/004 | REV.

SHEET No. 01 | No. OF SHEETS 01

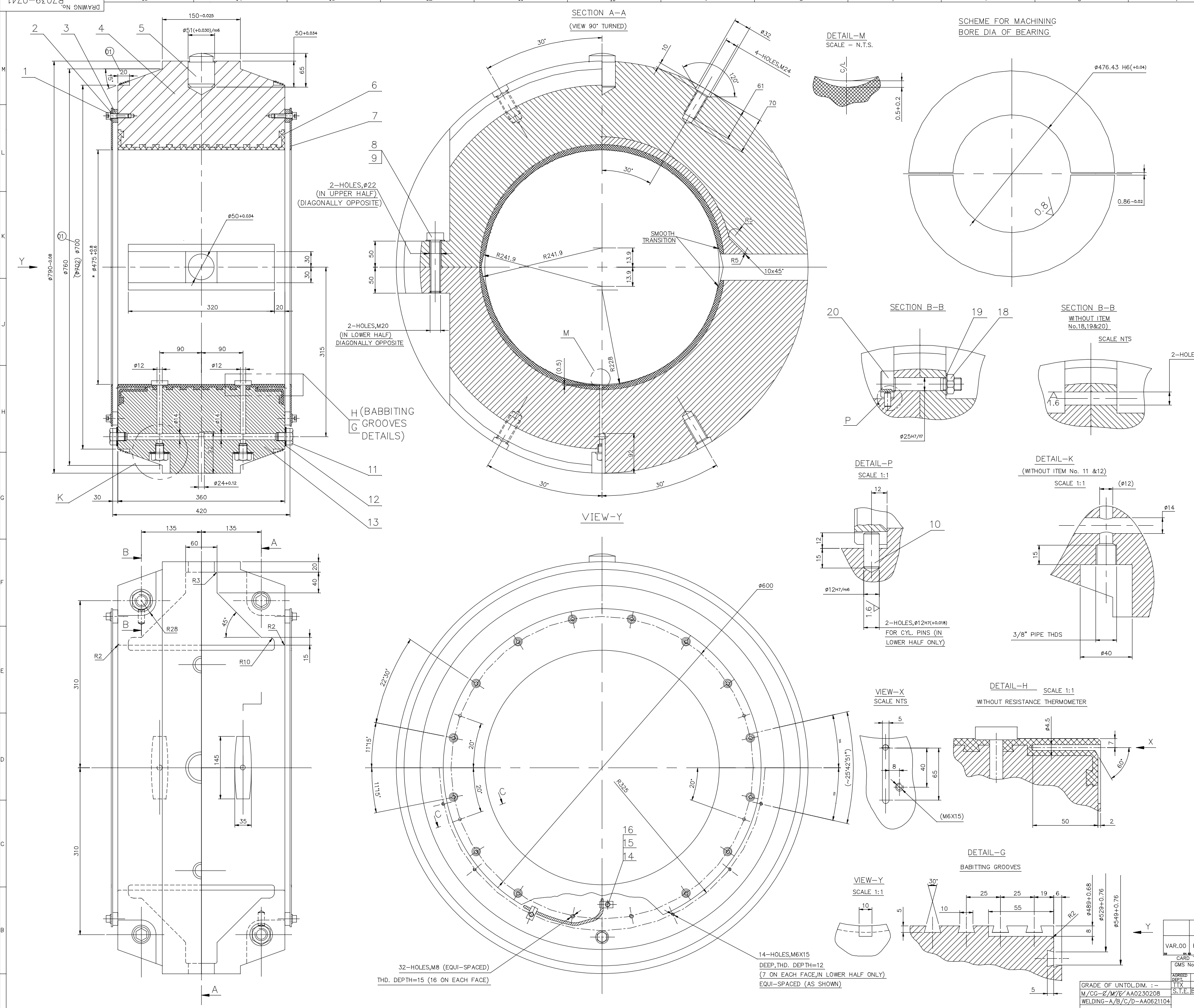
SIZE A 3

REF. DRG. No. | SIGN.&DATE | INVENTORY No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

FORM: DG 46 B

DRAWING No. R7039–0741



3.2 THE REST

1–NO CHIPS SHOULD REMAIN IN THE OIL SUPPLY HOLES TO BE ASCERTAINED BY INSPECTION WITH THE HELP OF BOROSCOPE /FIBRO SCOPES.
2–CARE SHOULD BE TAKEN SO THAT NO FORIEGN PARTICLES ENTER IN OIL HOLES AFTER WARDS BEFORE FINAL ASSLY. OF BEARINGS WITH ROTOR.
3–ASSLY. ITEM No. 14 IS BORROWED FROM 1–5372–010 SP.
4–THE BABBITING OF THE LINER IS DONE ACC. TO INSTRUCTION No. HW 0980802.
5–SURFACE OF LINER (EXCEPT SPLIT SURFACE,BABBIT & SEATING SURFACE OF THE LINER & HOLES) ARE TO BE COATED ACC. TO TECH. INSTRUCTION No. 0922–005.
6–TO BE STORED AS PER INSTRUCTION No. 0928–003.
7–DIMENSIONS IN BRACKETS ARE FOR REFERENCE ONLY.
8–SHARP EDGES TO BE ROUNDED OFF.
9–THE SPLIT SURFACES OF UPPER & LOWER HALVES TO BE COLOUR MATCHED.
*10–ø475 TO BE MACHINED WITH OUT SHIM.
11–CONSERVATION IS TO BE DONE AS PER TL–30007.

MARK
R7039–0756
ø475,IP 660MW

ITEM No.	DESCRIPTION	STD.	DRAWING No.	VAR.	MATERIAL CODE / MATERIAL SPECN.	A/C	UNIT	UNIT WT.(Kg.)	G.S.
20	SPL. PIN	–	R7039–0756/004	—	13Ni3Cr80 / AA 10503	–	–	~0.6 / 02	–
19	WASHER SPRING SC B 24–ST	–	AA716 40 02–100	—	C–65 (IS:4072) / AA 716 40 02	–	–	~0.026 / 02	–
18	NUT HEX M24		AA7151131–070	—	STEEL CLASS 4 / AA 715 11 31			~0.110 / 02	–
17	PIN CYL RND END 6 m6X50–ST	–	AA7171001–873	—	C–40 / AA7171001	–	–	~0.011 / 08	–
16	SPRING WASHER M6	–	12 8953–006	—	C–65 / IS:1570	–	–	~0.001 / 14	–
15	SCREW M6X10	–	12 8900–102	—	STEEL 4.8 / —	–	–	~0.004 / 14	–
14	WASHER	–	8954–017	—	C–40 / —	–	–	~0.001 / 14	–
13	HALF LINER (LOWER)	–	———	—	CI 3 FORGING / AA19332	–	–	375 / 01	–
12	SEALING RING ø17.2	–	18.8370–027	—	COPPER / IS14811			~0.002 / 04	–
11	PLUG 3/8" PIPE THD.	–	72.8322–011	—	C20 / AA10112			~0.063 / 04	–
10	PIN CYL RND END 12 m6X25–ST	–	AA 717 10 01	—	C–40 (IS:1570) / AA 717 10 01	–	–	~0.02 / 02	–
09	WASHER MCD 21–ST	–	AA 716 10 01–099	—	MILD STEEL / AA 716 10 01	–	–	~0.016 / 02	–
08	SCRU CAP SOC P M20X100–ST	–	AA 712 31 23	—	STEEL 12.9 / AA 712 31 23	–	–	~0.3 / 02	–
07	RING (IN TWO HALVES)	–	R7039–0756/003	—	BRASS / AA 12114	–	–	~3.60 / 02	–
06	BABBIT	–	———	—	TEGO / HW12897	–	–	–– / ––	–
05	PIN	–	R7039–0756/002	—	13Ni3Cr80 / AA 10503	–	–	~1.00 / 01	–
04	HALF LINER (UPPER)	–	———	—	CI 3 FORGING / AA19332	–	–	375 / 01	–
03	SPACER	–	R7039–0756/001	—	C–20 / AA 10109	–	–	~0.03 / 32	–
02	WASHER MCD 8.4–ST	–	AA7161001–056	—	MILD STEEL / AA7161001	–	–	~0.002 / 32	–
01	SCRU CAP SOC P M8X40–ST	–	AA7123123–115	—	STEEL 12.9 / AA7123123	–	–	~0.021 / 32	–

VAR.00 | REMARKS

CARD TYPE–3 28 → 28 → CARD TYPE–1 28 → CARD TYPE–2

GMS No./GR.SP.No.			STATUS OF DRG.	TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
AGREED DEPT.	NAME	SIGN.	DATE	660 MW	01030156000	O.S.B.T	R7039–0730
TTX	RNEGI	–sd–	29.12.11		DESIGN ORDER No. BH660ST3STF0105	MODEL No.	
S.T.E.	BANSAL S.	–sd–					

GRADE OF UNTOL.DIM. :–
M/CG–C/M/F/ AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–'T3'AA0621101

BHEL BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN.	DATE
DRN.	RAJESH	–sd–	
CHD	RAVI	–sd–	
APD	ANKUR	–sd–	27.12.11

REV.	DATE	ALTERED / CHECKED
01	24.4.13	DRG REVISED VIDE C/A NO. JTE–13–F 0128

ALTERED SJTERS
CHECKED AJTEAM

DEPT. JTE | CODE 209 | SCALE N.T.S. | WEIGHT(Kg.) ~836.0 | REF. TO ASSY. DRG. | ITEM No. | No. OF ITEM

TITLE BEARING LINER DIA 475 FOR BALANCING I.P.ROTOR

DRAWING No. R7039–0756 | REV. | SHEET No. | No. OF SHEET

SIZE A 0

INVENTORY No. | SIGN.&DATE | REF. DRG. No.

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

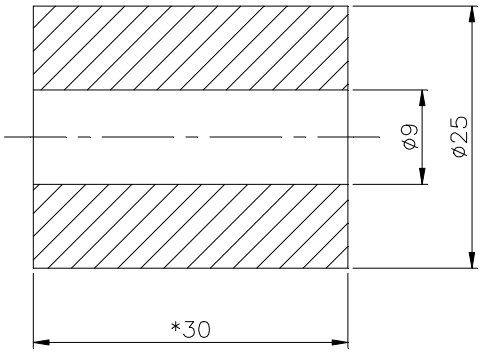
REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.

R7039-0791/001

AGREED DEPT.	NAME	SIGN.	DATE

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 ALL OVER



*ALL THE SPACER TO BE MACHINED IN ONE SETTING FOR DIMENSION '30'.

	C-20
	AA 10109
	MATERIAL CODE
	MATERIAL SPEC.

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	15.06.12
CHD	RAVI	-sd-	15.06.12
APD			

No. OF VAR

DEPT	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	2:1	~0.100			
CODE 209					

TITLE: SPACER

DRAWING No.: R7039-0791/001

REV

SHEET No. 01 | No. OF SHEETS 01

SIZE A4

REF.DRG.No. | SIGN & DATE | INVENTORY No

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) FORM DG39(B)

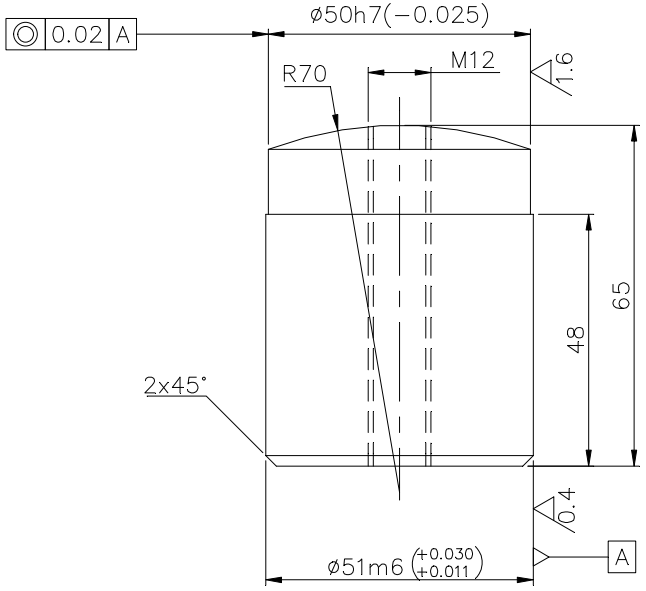
REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	GMSNo./GR.SP.No.	STATUS OF DRG.

AGREED DEPT.	NAME	SIGN.	DATE

R7039-0791/002

GRADE OF UNTOL. DIM.M/CG-C/M/F/-AA0230208 | WELDING A/B/C/D AA0621104 | GASCUTTING-'T3'AA0621101

3.2 / THE REST



1-NITRIDE TO VHN>450 AS PER P.S. No. 0912-002.
2-SHARP EDGES TO BE ROUNDED OFF.

	13Ni3Cr80
	AA10503
	MATERIAL CODE
	MATERIAL SPEC.

REF.DRG.No.

SIGN & DATE

INVENTORY No

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN	DATE
DRN	RAJESH	-sd-	15.06.12
CHD	RAVI	-sd-	15.06.12
APD			

No. OF VAR

DEPT JTE | CODE 209 | SCALE 1:1 | WEIGHT(Kg) ~0.98 | REF. TO ASSY. DRG. | ITEM No. | No. OF ITEM

TITLE: PIN

DRAWING No. R7039-0791/002 | REV

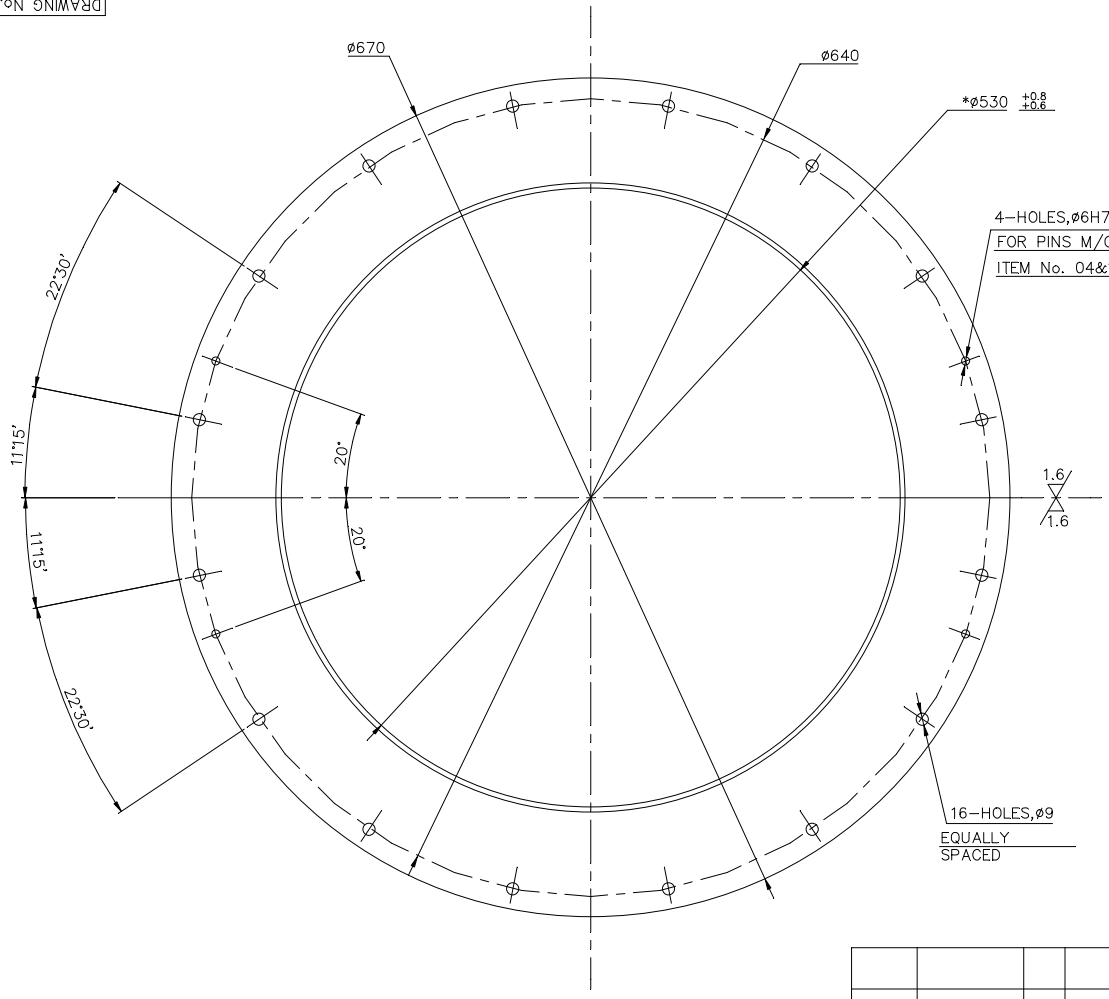
SHEET No. 01 | No. OF SHEETS 01

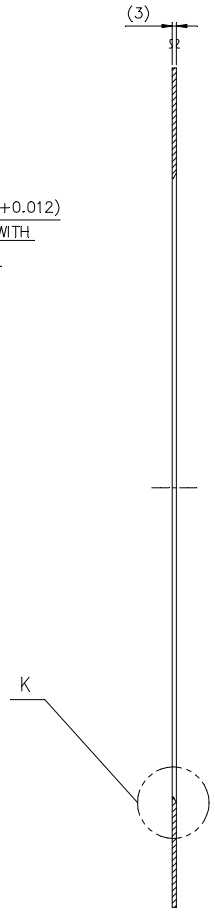
SIZE A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN m.m.)

FORM DG 44(B)

DRAWING No. R7039-0791/003

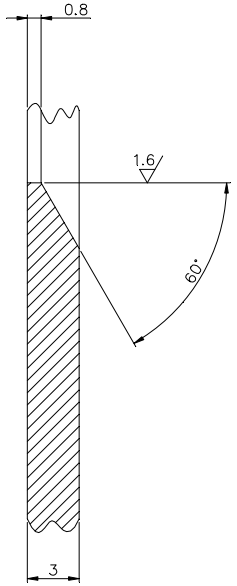




6.3 THE REST

DETAIL–K

SCALE 5:1



ZONE	GS	UNIT							
B			UNIT WEIGHT	MATERIAL CODE	A		DRAWING No.	STD.	DESCRIPTION	ITEM No.	REMARKS	VAR.00
			QTY.	MATERIAL SPECN.	C	VAR.						

BRASS
AA 12114

*DIM ø530 $^{+0.8}_{+0.6}$ TO BE M/C'D IN ASSLY WITHOUT SHIM AT THE JOINT PLANE.

GRADE OF UNTOL.DIM. :–
M/CG–E/M/F AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–'T3'AA0621101

REV.	DATE	ALTERED / CHECKED

GMS No./GR.SP.No.			STATUS OFDRG.
AGREED DEPT.	NAME	SIGN.	DATE

TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
	DESIGN ORDER No.	MODEL No.	R7039–0730

BHEL BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN.	DATE	No. OF VAR.
DRN.	RAJESH	–sd–	15.06.12	
CHD	RAVI	–sd–	15.06.12	
APD				

DEPT.	SCALE	WEIGHT(Kg.)	REF. TO ASSY. DRG.	ITEM No.	No. OF ITEM
JTE	N.T.S.	~2.37			
CODE 209					

TITLE RING (IN TWO HALVES)

DRAWING No. R7039–0791/003 REV.

SHEET No. 01 No. OF SHEET 01

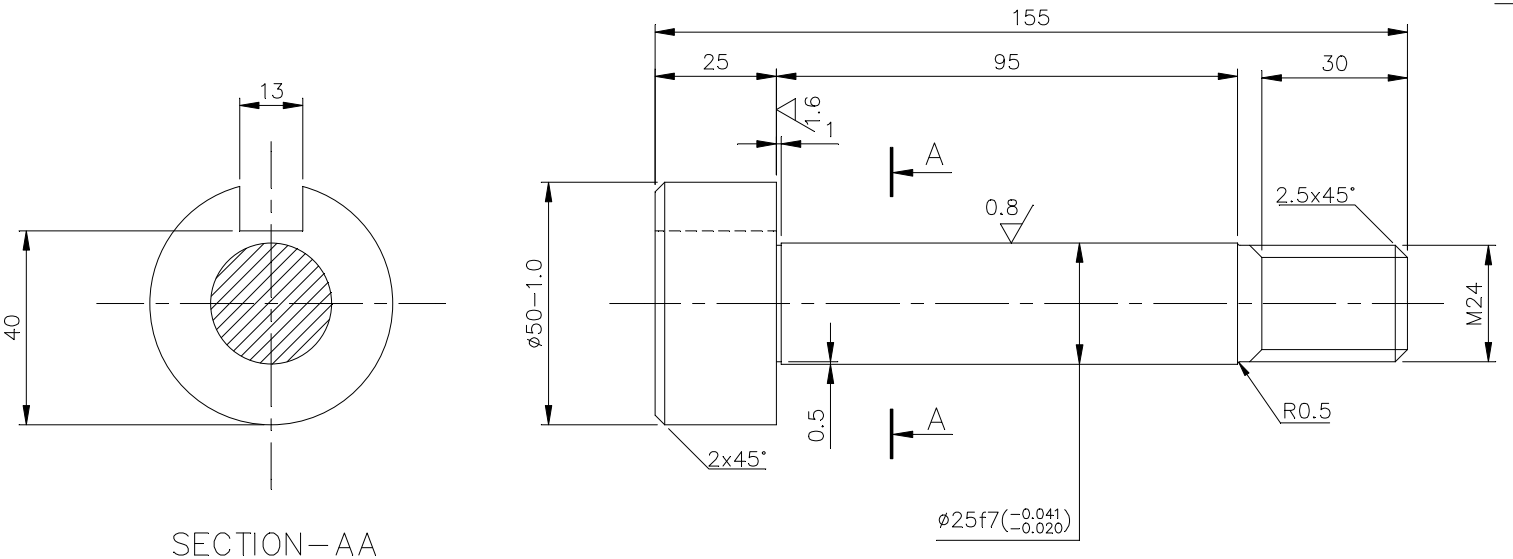
SIZE A 2

INVENTORY No. | SIGN. & DATE | REF. DRG. No.

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) | FORM DG38(B)

DRAWING No. R7039-0791/004

3.2 THE REST



SECTION-AA

1-SHARP EDGES TO BE ROUNDED OFF.

2-HARDEN TO HRc 28÷32 AS PER P.S. No. 0912-008.

VAR.00	REMARKS	ITEM No.	DESCRIPTION	STD	DRAWING No.	VAR.	MATERIAL CODE / MATERIAL SPECN.	A / C	UNIT	UNIT WEIGHT / QTY.	GS
							13Ni3Cr80 / AA 10503				

GMS No./GR.SP.No.			STATUS OF DRG.	TYPE OF PRODUCT	COMP. DRG. No.	M/C TOOL TRANS No.	REF. DRG. No.
AGREED DEPT.	NAME	SIGN.	DATE		DESIGN ORDER No.	M/C MODEL No.	

GRADE OF UNTOL. DIM.: -
M/CG-Ø/M/F AA0230208
WELDING-A/B/C/D AA0621104
GAS CUTTING-'T3' AA0621101

REV	DATE	ALTERED / CHECKED

BHEL BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN.	DATE
DRN	RAJESH	-sd-	15.06.12
CHD	RAVI	-sd-	15.06.12
APD			

No. OF VAR.

DEPT. JTE | CODE 209 | SCALE 1:1 | WEIGHT(Kg) ~0.88 | REF.TO ASSY. DRG. | ITEM No. | No. OF ITEMS

TITLE: PIN

DRAWING No. R7039-0791/004 | REV.

SHEET No. 01 | No. OF SHEETS 01

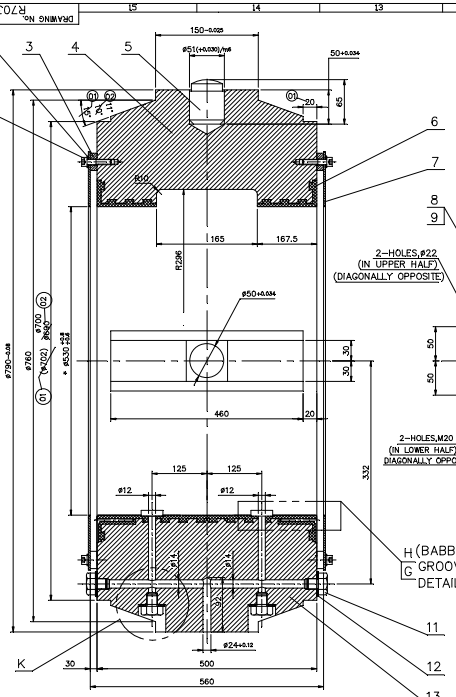
SIZE A 3

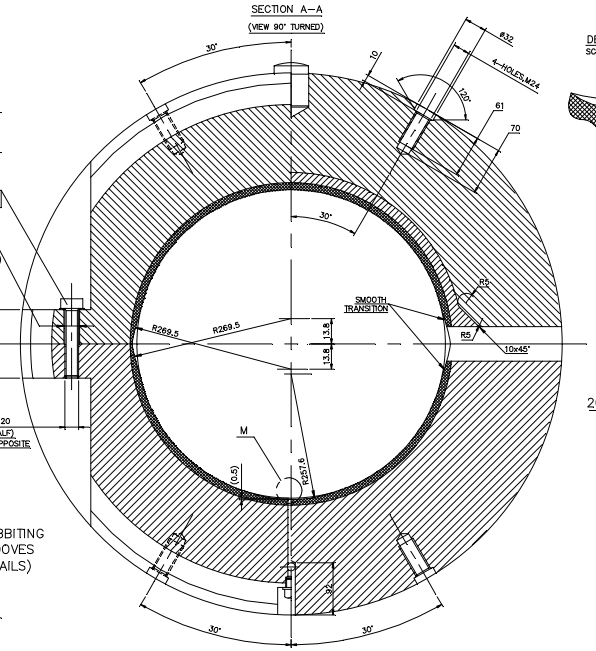
REF. DRG. No. | SIGN.&DATE | INVENTORY No.

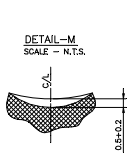
FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

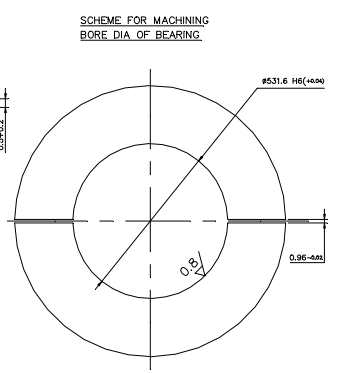
FORM: DG 46 B

DRAWING No. R7039-0791



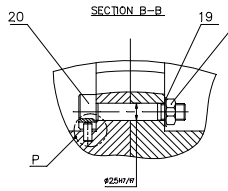


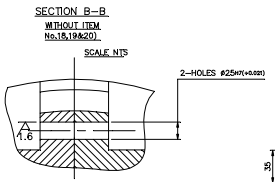


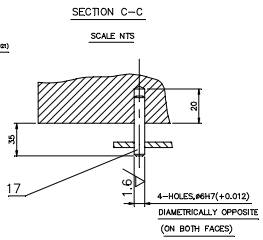


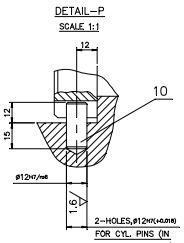
3.2 ▽ THE REST

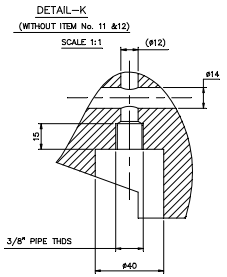
1–NO CHIPS SHOULD REMAIN IN THE OIL SUPPLY HOLES TO BE ASCERTAINED BY INSPECTION WITH THE HELP OF BOROSCOPE /FIBRO SCOPES.
2–CARE SHOULD BE TAKEN SO THAT NO FORIEGN PARTICLES ENTER IN OIL HOLES AFTER WARDS BEFORE FINAL ASSLY. OF BEARINGS WITH ROTOR.
3–ASSLY. ITEM No. 14 IS BORROWED FROM 1–5372–010 SP.
4–THE BABBTING OF THE LINER IS DONE ACC. TO INSTRUCTION No. HW 0980802.
5–SURFACE OF LINER (EXCEPT SPLIT SURFACE,BABBIT & SEATING SURFACE OF THE LINER & HOLES) ARE TO BE COATED ACC. TO TECH. INSTRUCTION No. 0922–005.
6–TO BE STORED AS PER INSTRUCTION No. 0928–003.
7–DIMENSIONS IN BRACKETS ARE FOR REFERENCE ONLY.
8–SHARP EDGES TO BE ROUNDED OFF.
9–THE SPLIT SURFACES OF UPPER & LOWER HALVES TO BE COLOUR MATCHED.
*10–ø530 TO BE MACHINED WITH OUT SHIM.
11–CONSERVATION IS TO BE DONE AS PER TL–30007.

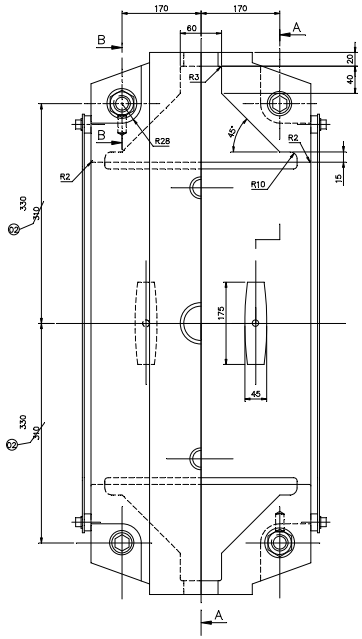


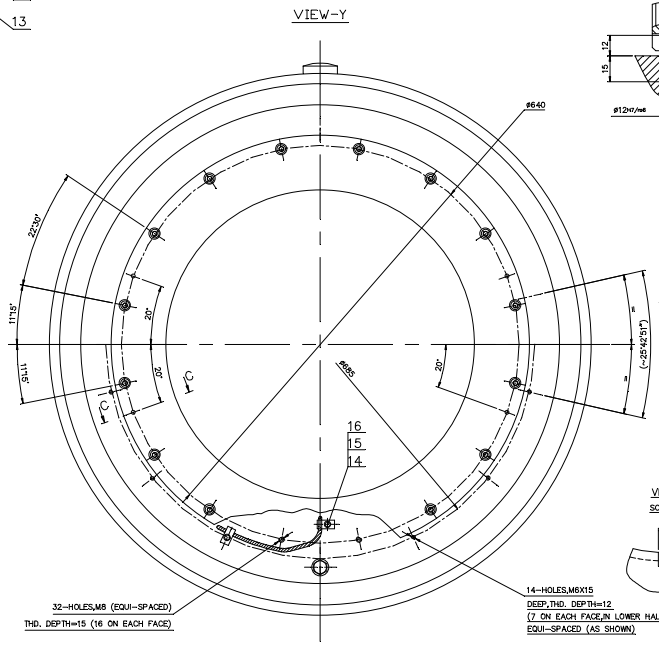


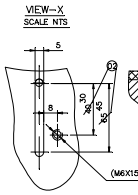


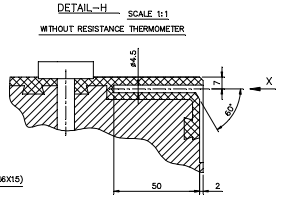


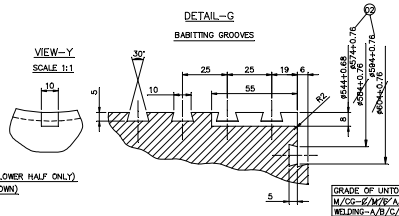












◆ MARK
R7039–0791
ø530

ITEM No.	DESCRIPTION	SIZE	DRAWING No.	VAR. MATERIAL SPECIFIC	UNIT WT.(Kg.)	QUAN.
20	SPL. PIN	–	R7039–0791/004	13Ni3Cr80	~0.88	–
19	WASHER SPRING SC B 24–ST	–	AA716 40 02–100	AA 10503 (IS:4072)	~0.026	–
18	NUT HEX M24	–	AA7151131–070	AA 716 40 02– STEEL CLASS 4	02 ~0.110	– –
17	PIN CYL RND END 6 m6X50–ST	–	AA7171001–873	AA 715 11 31 C–40	02 ~0.011	– –
16	SPRING WASHER M6	–	12 8953–006	AA7171001 C–65 IS:1570	08 ~0.001 14	– – –
15	SCREW M6X10	–	12 8900–102	STEEL 4.8	~0.004	–
14	WASHER	–	8954–017	— C–40	14 ~0.001	– –
13	HALF LINER (LOWER)	–	———	— CI 3 FORGING AA19332	14 ~431.50 01	– – –
12	SEALING RING ø17.2	–	18.8370–027	COPPER IS14811	~0.002 04	– –
11	PLUG 3/8" PIPE THD.	–	72.8322–011	C20 AA10112	~0.063 04	– –
10	PIN CYL RND END 12 m6X25–ST	–	AA 717 10 01	C–40 (IS:1570) AA 717 10 01	~0.02 02	– –
09	WASHER MCD 21–ST	–	AA 716 10 01–099	MILD STEEL AA 716 10 01	~0.016 02	– –
08	SCRU CAP SOC P M20X100–ST	–	AA 712 31 23	STEEL 12.9 AA 712 31 23	~0.3 02	– –
07	RING (IN TWO HALVES)	–	R7039–0791/003	BRASS AA 12114	~2.37 02	– –
06	BABBIT	–	———	TEGO HW12897	— ——	– –
05	PIN	–	R7039–0791/002	13Ni3Cr80 AA 10503	~0.98 01	– –
04	HALF LINER (UPPER)	–	———	CI 3 FORGING AA19332	~396.29 01	– –
03	SPACER	–	R7039–0791/001	C–20 AA 10108	~0.1 32	– –
02	WASHER MCD 8.4–ST	–	AA7161001–056	MILD STEEL AA7161001	~0.002 32	– –
01	SCRU CAP SOC P M8X40–ST	–	AA7123123–115	STEEL 12.9 AA7123123	~0.021 32	– –

VAR.00 | REMARKS | CARD TYPE–3 | CARD TYPE–1 | CARD TYPE–2

GMS No./GR.SP.No. | STATION OPDRG. | TYPE OF PRODUCT: 660 MW | COMP. DRG. No.: 0103D107000 | M/C. TOOL TRANS No.: O.S.B.T. | REF. DRG. No.: R7039–0741

	NAME	SIGN.	DATE
DESIGN	SS ORAON	–sd–	15.06.12
T.T.K.	SS ORAON	–sd–	15.06.12
S.T.E.	BANSAL SL	–sd–	15.06.12

DESIGN ORDER No.: BH660ST3STF0161 | MODEL No.:

GRADE OF UNTOL.DIM. :– M/CC–E/M/E/AA0230208
WELDING–A/B/C/D–AA0621104
GAS CUTTING–"I3"AA0621101

REV.	DATE	ALTERED S/ITERS / CHECKED A/TEAM
02	23.10.13	DESIGN REVIEW VIDE C/A NO JTE–13–F0235
01	4.8.12	DESIGN REVIEW VIDE C/A NO JTE–12–F0085

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN.	DATE
DRN.	RAJESH	–sd–	15.06.12
CHD	RAVI	–sd–	15.06.12
APD	ANKUR	–sd–	15.06.12

DEPT. JTE | SCALE N.T.S. | WEIGHT(Kg.) ~840.58 | REF. TO ASSY. DRG.

CODE 209

TITLE: BEARING LINER DIA 530 FOR BALANCING L.P.ROTOR

DRAWING No. R7039–0791 | SHEET No. | No. OF SHEET | SIZE A 0

INVENTORY No. | SIGN. & DATE | REF. DRG. No.

BHEL
HARIDWAR

MANUFACTURING QUALITY PLAN

ITEM : FINISH MACHINED JOURNAL BEARING	Q.P NO	TR / QP / 50	PROJECT : Balancing of Rotor for 500/660/800 MW
	REV :	0	
DRG. NO : AS PER ENQUIRY ITEM DRAWING	DATE	08-06-2015	ITEM : TOOLINGS
	PAGE	1 of 2	CONTRACTOR : BHEL HARIDWAR

SL.NO	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERANCE DOCUMENT	ACCEPTANCE OF NORMS	FORMAT OF RECORDS	AGENCY		REMARKS
									M	C	
1	2	3	4	5	6	7	8	9 D*	10		11
1	FORGED V.D. STEEL BLANK	Chemical Composition + Mechanical Properties	Major	Chemical Analysis + Mech. Test	100%	AA19332	AA19332	MTC	P	V	
		Material Soundness	Major	Ultrasonic Test	100%	BHEL Spec	BHEL Spec	UT Report	P	V	
		Dimensional conformance for machining allowance	Major	Measurement	100%	Vendor Drawing	Vendor Drawing	Dimension Report	P		
2	HEAT TREATMENT	Dehydrogenation	Major	Measurement of Temp.	100%	HW0980802 Clause -2	HW0980802 Clause -2	Internal Report	P	V	
		Stress Relieving after rough machining	Major	Measurement of Temp.	100%	Vendor	Vendor	Internal Report	P	V	
3	PRE-BABBITT OPERATIONS	- Pre-Babbitt machining	Major	Measurement	100%	BHEL Drawing	BHEL Drawing	Dimension Report	P		
		- Cleaning, Degreasing & Tinning preparation	Major	Visual	-	Vendor	Vendor	-	P	-	
		Tinning with Pure Tin	Major	Visual	-	Vendor	Vendor	-	P	-	
4	BABBITTING	WHITE METAL Chemical Composition	Critical	Chemical Analysis	100%	BHEL Spec HW12897	BHEL Spec HW12897	MTC	P	V	
		Babbitting with Virgin White Metal	Major	Visual	-	Vendor Standard	Vendor Standard	Internal Report	P	-	
		Proof + Semi finish machining of white layer metal	Major	Measurement	100%	Vendor Drawing	Vendor Drawing	Dimension Report	P	-	
		Ultrasonic Test	Major	Ultrasonic Test	100%	BHEL Spec HW0850195	BHEL Spec HW0850195	UT Report	P	V	
5	MACHINING MILLING, DRILLING,& TURNING TO DRAWING DIMENSIONS	Finish Machining	Major	Measurement	100%	BHEL Drawing	BHEL Drawing	Dimension Report	P	-	
		Ultrasonic Test	Critical	Ultrasonic Test	100%	BHEL Spec HW0850195	BHEL Spec HW0850195	UT Report	P	V	
		LPT/DPT	Critical	Dye Penetrant	100%	BHEL Spec HW0850195	BHEL Spec HW0850195	DPT Report	P	V	
		Joint Plane, color contacts & filler gauge tightness	Major	Visual & Measurement	Random	Drawing	Drawing	Inspection Report	P	W	

MANUFACTURING QUALITY PLAN

HARIDWAR

ITEM : FINISH MACHINED JOURNAL BEARING | Q.P NO : TR / QP / 50 | PROJECT : Balancing of Rotor for 500/660/800 MW

DRG. NO : AS PER ENQUIRY ITEM DRAWING | REV : 0 | ITEM : TOOLINGS

DATE : 08-06-2015

PAGE : 2 of 2

CONTRACTOR : BHEL HARIDWAR

SL. NO	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERANCE DOCUMENT	ACCEPTANCE OF NORMS	FORMAT OF RECORDS	AGENCY		REMARKS
									M	C	
1	2	3	4	5	6	7	8	9	10		11
6	FINAL INSPECTION	Dimensions	Critical	Measurement	100%	BHEL Drawing	BHEL Drawing	Dimension Report	P	W	
		Ultrasonic Test	Critical	Ultrasonic Test	100%	BHEL Spec	BHEL Spec	UT Report	P	W	
		(PT/DPT	Critical	Dye Penetrant	100%	BHEL Spec	BHEL Spec	DPT Report	P	W	
		Free from burrs & dents	Critical	Visual	100%	Vendor norms	Vendor norms	Internal	P	W	
		Completeness of Items as per B.O.M	Major	Visual	100%	Drawing	Drawing	Internal	P	W	
		Identification No.	Major	Visual	100%	-	-	Internal	P	V	
		Packing	Major	Visual	100%	Properly Done so that material surface does not suffer any dents or scratches.					

LEGEND :
M= VENDOR
C= BHEL / BHEL NOMIANTED AGENCY
P=PERFORMED BY
V = VERIFIED BY
W= WITNESSED BY

	PREPARED BY	APPROVED BY
MANUFACTURER / SUB CONTRACTOR	PUSHPDEEP/ DM (TR)	S.K.SHARMA / MGR (TR)
SIGNATURE		