

TIGHTENING TORQUE 20KG·m

64

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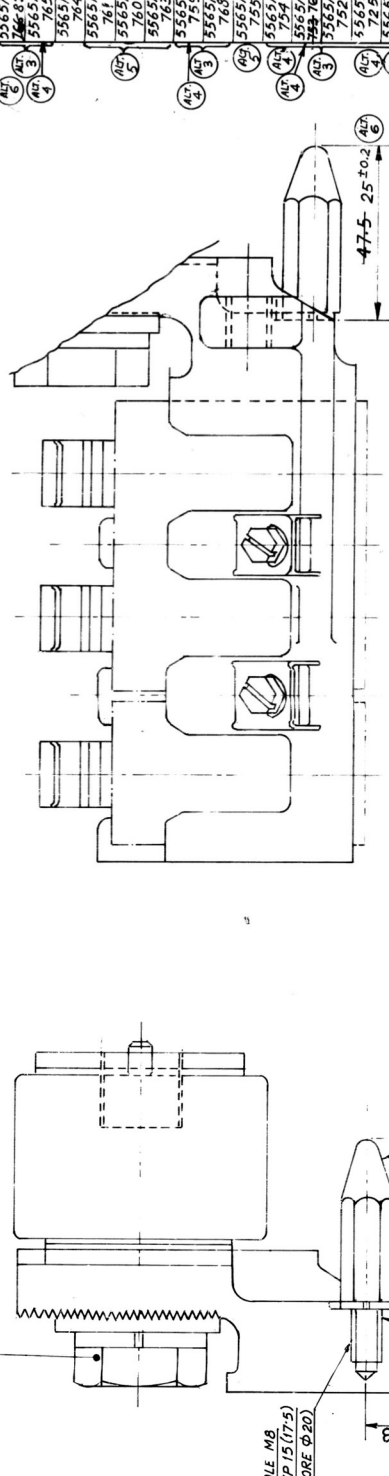
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5699	ALT 5
5700	ALT 5



**SECTION-BB**

**NOTE -**

1. REF. NO. 7, 16, 17 & 18 WILL BE SUPPLIED ALONG WITH BRUSH HOLDER ASSY. AS KIT.
2. BRUSH SPRING PRESTRESS:
  - MAX. 3.44 KG / BRUSH ± 10% (NEW BRUSH)
  - MIN. 2.82 KG / BRUSH ± 10% (WORN-OUT BRUSH)
3. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK AT THE LOCATION SHOWN
4. "FOR METALLURGICAL TEST REFER TO BE APPLIED ON THE THREADED PORTION. (A12) INDIVIDUAL DRAWINGS."

**ANERABIC LOCKING ADHESIVE "ANABOND - ANR 115"**

**15 TO BE APPLIED ON THE THREADED MAKE VIZ. "LPS" (VS/UNBRAND) G/KW/BOLT MASTER'S REF. 6.10.17 AND 21 SHALL BE OF "B" TYPE. REF. 9.11.15, 18 AND 22 SHALL BE OF "BBB B" BRAND.**

GRADE NUMBER	N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8	N 9	N 10	N 11	N 12
SURFACE ROUGHNESS VALUE TO IS: 3073	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
SYMBOL	▽											

2. BRUSH SPRING PRESSURE: MAX. 3.44 KG/BRUSH  $\pm$  10% (NEW BRUSH)

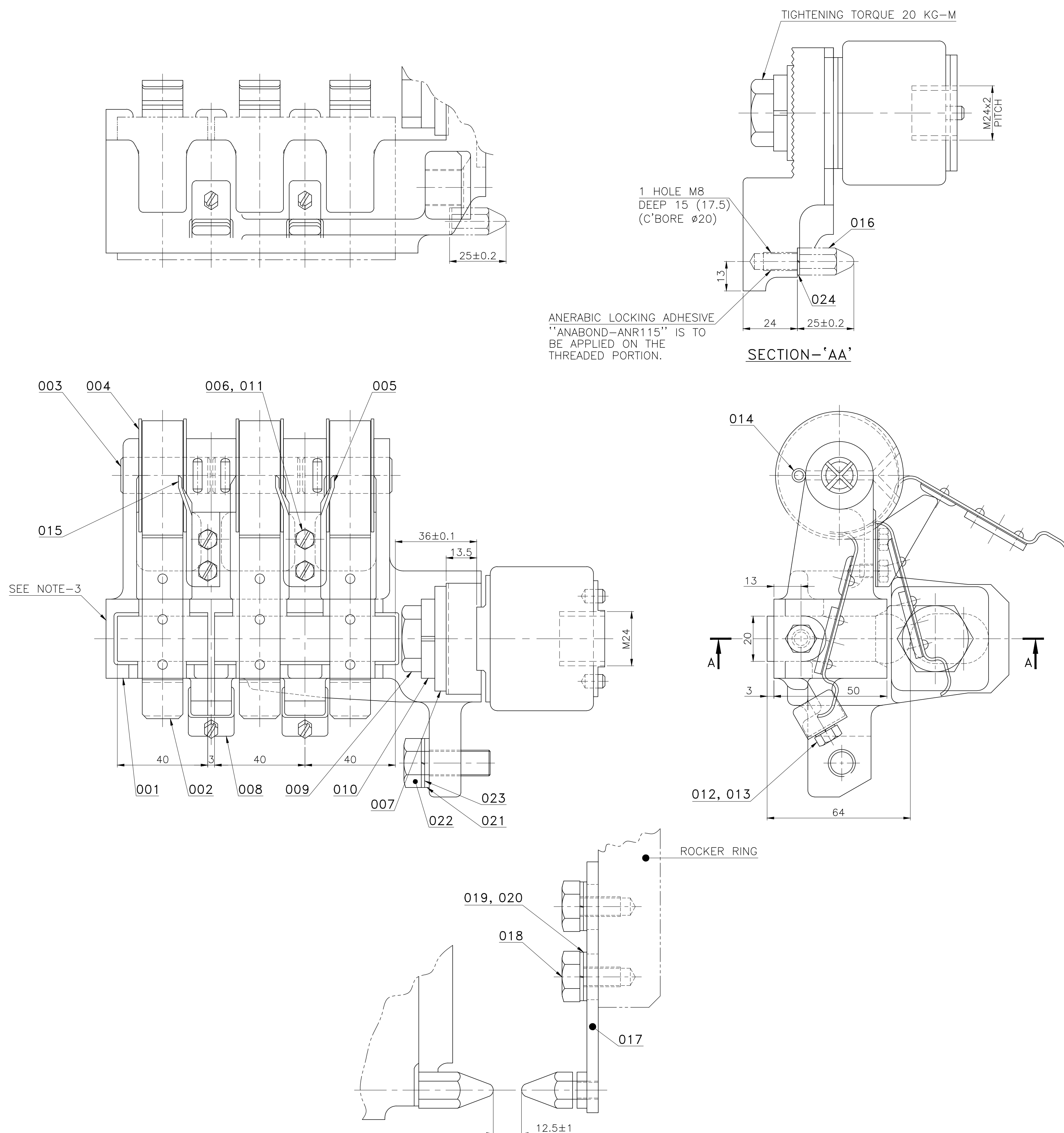
3 MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK AT THE  
LOCATION SHOWN

[illegible]

LPs / TVs / UNBRAK / GWK / BOLT MASTER	ROUGHNESS VALUE TO IS : 3073	RA $\mu$ m	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25
			$\nabla$	$\nabla$	$\nabla$			$\nabla$	$\nabla$	$\nabla$	

STIMUL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	

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TOOL LIST		
IT.NO.	TOOL NO.	DESCRIPTION
	1571305	SLOT CHECKING GAUGE
	1579303	CHECKING - FIXTURE - WITH TN/TNF - 1571486
	1571020	CHECKING FIXTURE WITH TN/TNF 1371486

NOTES:—



1. ITEM NOS. 007, 017, 018 & 019 WILL BE SUPPLIED ALONG WITH BRUSH HOLDER ASSY. AS KIT.
2. BRUSH SPRING PRESSURE:-  
MAX. 3.44KG./BRUSH±10% (NEW BRUSH)  
MIN. 2.82KG./BRUSH±10% (WORN-OUT BRUSH)
3. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK AT THE LOCATION SHOWN.
4. FOR METALLURGICAL TEST REFER INDIVIDUAL DRAWINGS.
5. REF. 6'10'10, 17 AND 21 SHALL BE OF REPUTED MARK VIZ LPS/TSV/UNBRKO/GKW/BOLT MASTER & REF. 13, 11, 23, 19, 24 SHALL BE OF 'BBBBB' BRAND.
6. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 2TDW.095.090, ALT.6.

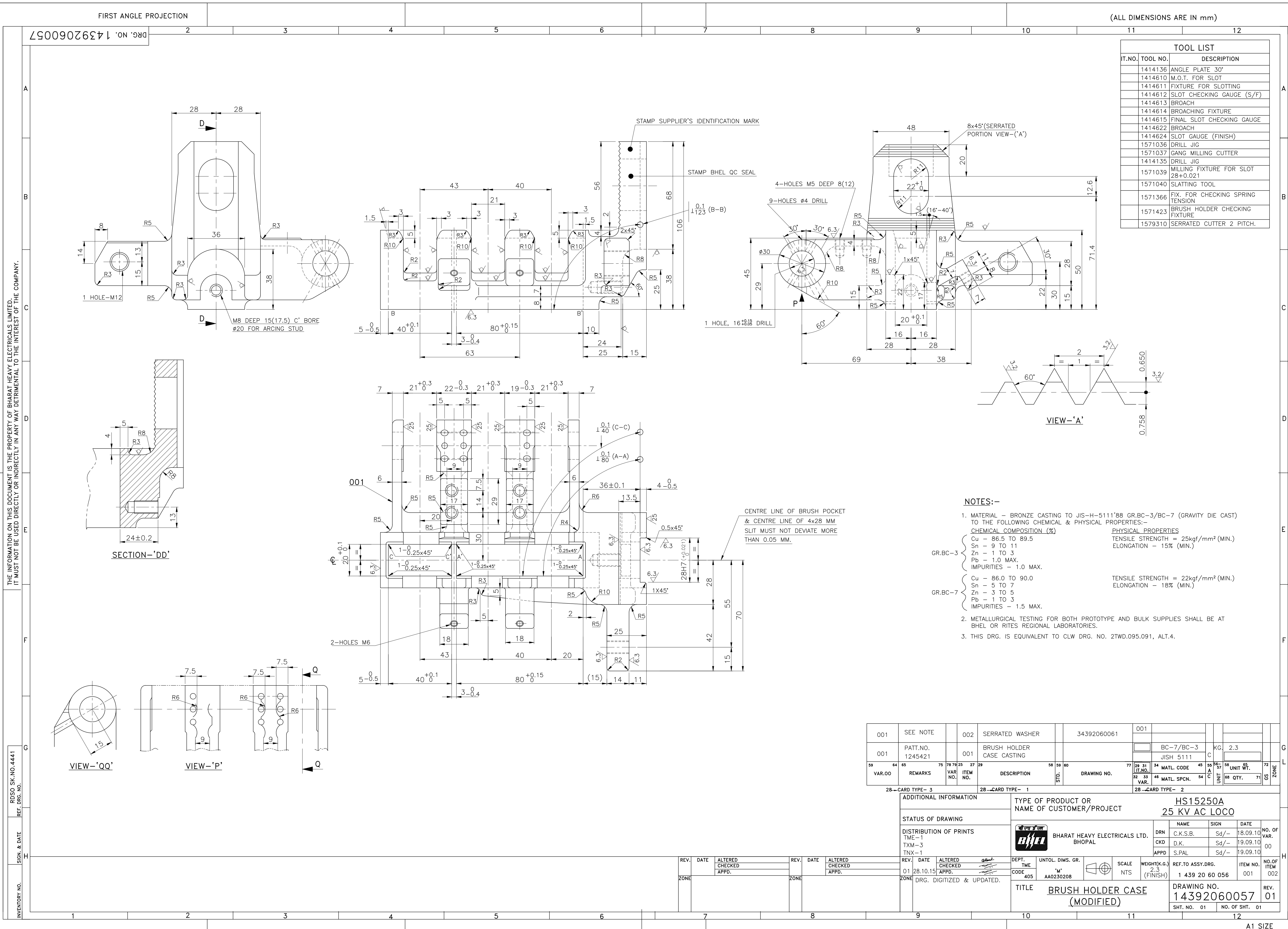
		024	SPRING WASHER B8			(IS:3063'94 PHOSPHATED)				
		023	SPRING WASHER B12			(IS:3063'94 ZINC PLATED)				
		022	HEX. HEAD SCREW M12x30, P8.8			IS:1364'92, P7.2				
		021	MACHINED WASHER A12 STEEL			IS:2016'67				
		020	PUNCHED WASHER A8 STEEL			(IS:2016'67 ZINC PLATED)				
		019	SPRING WASHER 8.8			(IS:3063'94 ZINC PLATED)				
		018	HEX. HEAD SCREW M8x20, P8.8			(IS:1364(P.T.2)92-ISO; 4017--B8(ZINC PLATED))				
002		017	ARCING STUD & FIXING BRACKET ASSY.	34392060060	O1					
002		016	ARCING STUD	34392060060	005					
001		015	SPRING SUPPORT	44392060054	001			KG	0.06	
003		014	SPLIT PIN 4x40 STEEL		JIS-B1351			KG	0.01	
002		013	SPRING WASHER SC, B6		(IS:3063'94 PHOSPHATED)			KG	0.01	
002		012	HEX. SLOTTED BOLT M6x18, P4.8		JIS-B1180			KG	0.01	
004		011	SPRING WASHER SC, B5 STEEL		IS:3063'94			KG	0.01	
001		010	SPRING WASHER SC, A20 STEEL		(IS:3063'94 PHOSPHATED)			KG	0.01	
001		009	HEX. HEAD SCREW	44392060068	001			KG	0.25	
002		008	SPECIAL WASHER	44392060055	001			KG	0.006	
001		007	SERRATED WASHER	34392060061	001			KG	0.06	
004		006	HEX. HEAD SLOTTED SCREW M5x10, P4.8		JIS-B1180			KG	0.01	
001		005	SPRING SUPPORT	44392060053	001			KG	0.09	
006		004	SPACER	44392060052	001			KG	0.02	
003		003	ADJUSTING PIN	44392060051	001			KG	0.06	
003		002	BRUSH SPRING	24392060057	001			KG	0.17	
001		001	BRUSH HOLDER CASE	14392060057			C	KG	2.3	
VAR.OO	REMARKS	VAR NO.	ITEM NO.	DESCRIPTION	DRAWING NO.	MATL CODE	MATL SPCN.	UNIT	QTY.	ZONE

28 → CARD TYPE- 3

28	CARD TYPE-
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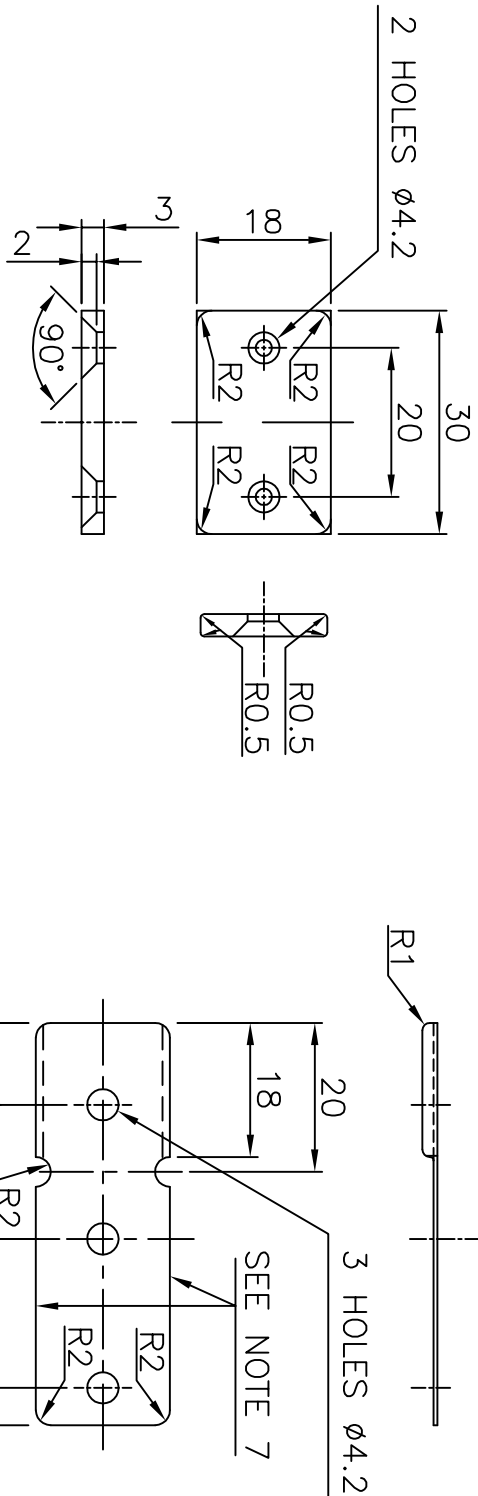
VAR.	
28 → CARD TYPE →	

CARD TYPE- 3		25-KV AC TYPE- 1		25-KV AC TYPE- 2					
ADDITIONAL INFORMATION 2TWD.095-D90, ALT.06.		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		HS15250A 25 KV AC LOCO					
STATUS OF DRAWING		 BHARAT HEAVY ELECTRICALS LTD. BHOPAL		DRN	NAME	SIGN	DATE	NO. OF VAR.	
DISTRIBUTION OF PRINTS TMC-1 TXM-3 TNX-1				CKD	C.K.S.B.	Sd/-	18.09.10	01	
				APPD	S.PAL	Sd/-	20.09.10	01	
REV.	DATE	ALTERED CHECKED	DEPT. TIME	UNTOL. DIMS. GR.	 SCALE	WEIGHT(K.G.)	REF. TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
01	13.11.15	APPD.	CODE	'W' AA0230208					
ZONE		DRG. DIGITIZED.		TITLE BRUSH HOLDER ASSY. (MODIFIED)			DRAWING NO. 14392060056		REV. 01
							SHT. NO.	01	NO. OF SHT.

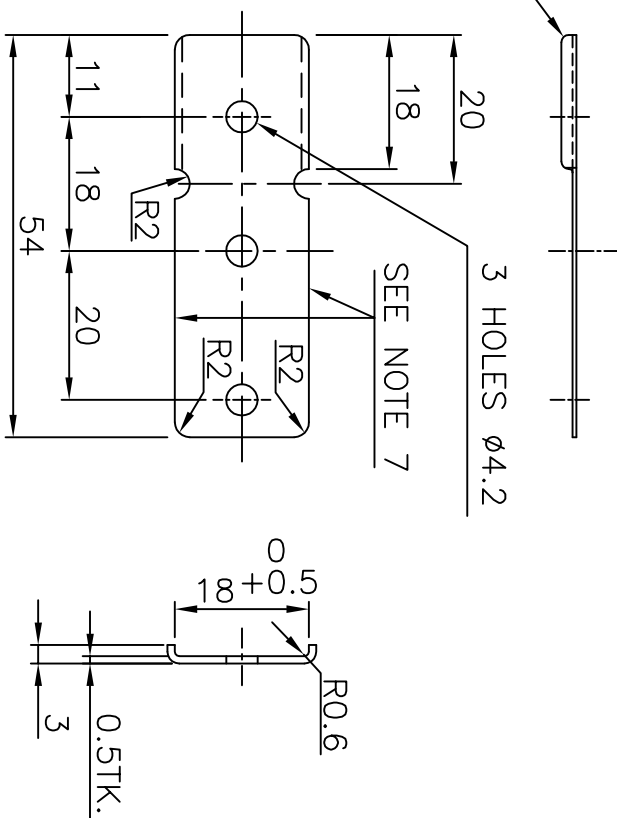




DRG. NO. 24392060057



### DETAIL OF ITEM 002




### DETAIL OF ITEM 003

TOOL LIST		
IT.NO.	TOOL NO.	DESCRIPTION
003	1571103	DRILL JIG
001	1571006	MANDREL
001	1571007	BENDING TOOL
001	1571008	PIERCING & BENDING TOOL
001	1571009	CROPPING TOOL
	1571016	DRILL JIG

REV.	DATE	ALTERED	CK/SB
01	21.10.10	CHECKED	S.PAL
		APPROVED	S.PAL

ZONE IN VIEW DIM. 3 WAS ON.

DEPT. TIME	GRADE OF UN. TOL.		SCALE	WEIGHT (K.G.)	REF. TO ASSY.	ITEM NO.	NO. OF ITEM
code 405	DIM. $\varnothing$ /M/ $\varphi$ AA02.30208		NTS	0.17	1 439 20 60 056	002	005
TITLE					DRAWING NO.	REV.	
<u>BRUSH SPRING</u>					24392060057	03	
					SHT NO.	NO.OF SHT	01
					01		

59	64	65	75	78	79	75	78	79	25	27	29	58	59	60	77	29	31	34	45	55	57	58	65	72											
VAR00		REMARKS				VAR NO.			ITEM NO.		DESCRIPTION		STD	DRAWING NO.		TT NO.		MATL. CODE		A	UNIT		UNIT WT.												
																32	33	46	54	C		QTY.		59											
28 ——— CARD TYPE-3											28 ——— CARD TYPE-1											28 ——— CARD TYPE-2											ZONE		
	001								005		RIVET SNAP Ø4x8-ST							IS:2155/82				KG	0.010												
	002								004		RIVET SNAP Ø4x10-ST							IS:2155/82				KG	0.010												
	001								003		PLATE 0.5THK x2.3x5.4 STAINLESS STEEL STRIP							SUS 304				KG	0.01												
	001								002		PLATE 3THK x18x30 STAINLESS STEEL STRIP							SUS 304				KG	0.011												
	001								001		BRUSH SPRING 12THK x18x840 STEEL STRIP							SUS 631 CSP3/4H				KG	0.120												
	001										SEE NOTE-1							JIS-G-4313																	

ADDITIONAL INFORMATION 10 S 778 713 B	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT HS15250A 25 KV AC LOCO
STATUS OF DRAWING	

NOTES:-

1. a) FOR HS15250A MATERIAL FOR ITEM 001 TO BE 1.21HX.18 TO JIS-G-4313'81GR. SUS 631-CPS-3/4HC.
- b) FOR M/Cs OTHER THAN HS15250A ALTERNATE MATERIAL FOR IT.001 MAY BE AS PER AISI-304.
2. NUMBER OF EFFECTIVE TURNS:- 6.5 TURNS & SPACE BETWEEN SPRING TURNS SHOULD BE UNIFORM IN UNLOADED CONDITION.
3. EFFECTIVE LENGTH:- 702.9MM.
4. WHEN THE SPRING IS TURNED 173° IN ARROW DIRECTION FIXING A POINT O FORCE OF 3.25±0.2KG. MUST BE PRODUCED AT A POINT P.
5. NATURAL FREQUENCY:- 21.2HZ.
6. APPLY MELAMINE RESIN TO RIVET CAULKED PART.
7. REMOVE ALL SHARP EDGES & CORNERS.
8. MATERIAL FOR IT.001:JIS-G-4313'81, GR. SUS 631-CPS-3/4 HCH
- a) CHEMICAL COMPOSITION:-  
C=0.09 MAX., Si=1.00 MAX., Mn=1.00 MAX., P=0.04 MAX., S=0.03 MAX., Ni=6.5 TO 7.75, Cr=16.00 TO 18.00 AND Al=0.75 TO 1.5.
- b) MECHANICAL PROPERTIES:- HARDNESS AS PRECIPITATION HARDENED CONDITION 450 MIN. (HV).
9. MATERIAL FOR ITS.002 & 003:JIS-G-4304'84, GR. SUS 304.
- a) CHEMICAL COMPOSITION:-  
C=0.08 MAX., Si=1.00 MAX., Mn=2.00 MAX., P=0.045 MAX., S=0.03 MAX., Ni=8.00 TO 10.5 AND Cr=18.00 TO 20.00
- b) MECHANICAL PROPERTIES:-  
TENSILE STRENGTH=53kgf/mm<sup>2</sup>, ELONGATION=40% MIN. AND HARDNESS=200 MAX. (HV).
10. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLIES SHALL BE CARRIED OUT BY BHEL OR BY RITES IN CASE OF IT.001
11. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10S778-713, ALT.F.

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RDSO 4445

REF. DRG. NO.

SIGN. & DATE

INVENTORY No.

FIRST ANGLE PROJECTION

DRAWING NO. 34392060061

001

2 PITCH

42±0.1

40±0.1

Ø22

R6

5

6.3

1.408

2x45°

DESCRIPTION OF SERRATION

0.650

0.758

2

1

60°

3.2

TOOL LIST

IT	TOOL NO.	DESCRIPTION
001	1579310	SERRATED CUTTER 2 PITCH

NOTES:-

1. SERRATED WASHER TO BE ZINC PLATED AS PER SPEC. AA0673603  
AND PASSIVATED AS PER SPEC. AA0673604.  
THICKNESS OF PLATING TO BE 0.013-0.015.

2. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 4TWD.095.085, ALT.2.

001			001	SERRATED WASHER 5THK.x40x42						KG.	0.06																								
59	64	65	75	78	79	25	27	29	58	59	60	77	29	31	34	45	55	56	58	65	72														
VAR. 00	REMARKS			VAR NO.	ITEM NO.	DESCRIPTION			STD.	DRAWING NO.			IT. NO.	MATL. CODE.		A	57	UNIT		UNIT WT.															
													32	33	46	54	C		66	71	73														
CARD TYPE-3			28			CARD TYPE-1			28			CARD TYPE-2			28																				
ADDITIONAL INFORMATION 4TWD.095.085 (RDSO SKEL 4445)				STATUS OF DRAWING				DISTRIBUTION OF PRINTS TME -1 TNX -1 TXM -4				TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT HS15250A 25 KV AC LOCO				DRN. CKSB CKD. DK APPD. S.PAL				NAME SIGN. DATE CKSB Sd/- 16.09.10 DK Sd/- 16.09.10 S.PAL Sd/- 16.09.10				73 NO. OF 74 VAR.											
REV		DATE		ALTERED CHECKED APPROVED		REV		DATE		ALTERED CHECKED APPROVED		REV		DATE		ALTERED CHECKED APPROVED		CKSB DK S.PAL		DEPT. TME CODE. 405		GRADE OF UN. TOL DIM.C/M/F AA0230208		SCALE NTS		WEIGHT (K.G.) 0.06		REF. TO ASSY. 1 439 20 60 056		ITEM NO. 007		75 NO. OF 77 ITEM			
						02		30.10.15				01		21.10.10																				23 REV. 24	
								DRG. DIGITIZED.						IN VIEW DIM. 1.408 WAS 1.4																					
												TITLE SERRATED WASHER (FOR MODIFIED BRUSH HOLDER)				DRAWING NO. 34392060061				SHT.NO 01				NO.OF.SHT. 01				23 REV. 24							

A3

File No. HEP-TPTNOMNX(51)/59/2026-HEP-TXM20500 (Computer No. 309684)  
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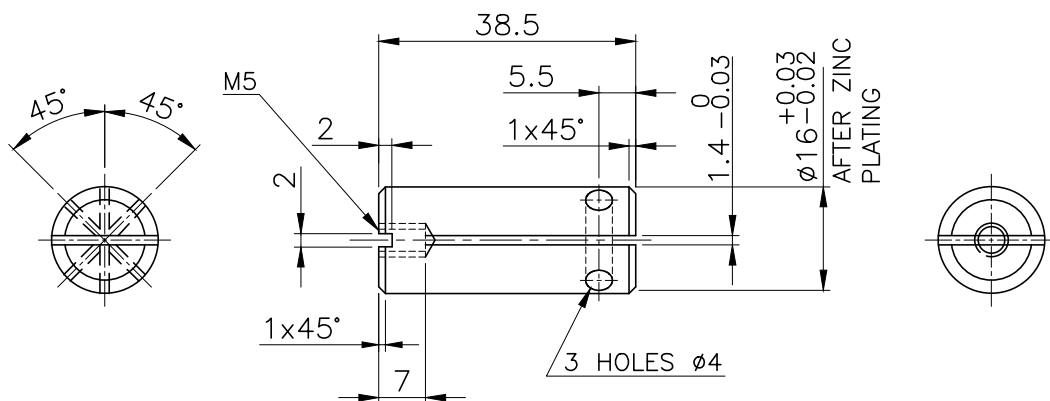
4

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)


REV.	DATE	ALTERED	SKG	ADDITIONAL INFORMATION	10T.806-970, ALT.03
02	30.10.15	CHECKED APPROVED	DK S.PAL	STATUS OF DRAWING	M
DRG. DIGITIZED.			IN BOM UNTOL. DIMS. GR. AA0230208 WAS ON.		
			DISTRIBUTION OF PRINTS		TME- 1 TNX -1 TXM- 4

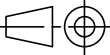
TOOL LIST		
IT.NO.	TOOL NO.	DESCRIPTION
001	1414049	DRILL JIG FOR 3 HOLES $\phi 4$

**NOTES:-**

1. MACHINE ALL OVER  $(\frac{25}{\sqrt{}})$
2. ITEM 001 TO BE ZINC PLATED & PASSIVATED WITH A PLATING THICKNESS OF 0.015 TO 0.020 MM.
3. TOLERANCE ON UNTOLERATED DIMENSIONS ARE  $\pm 0.25$  MM.
4. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T806-970, ALT.3.

R/WT 0.12 KG.		001	ADJUSTING PIN Ø20x54		IS:2062'92 JIS-G-3101'87		KG.		0.06		
REMARKS		ITEM NO.	DESCRIPTION		STD	MATL. CODE		A/C	UNIT	UNIT WT.	
						MATL. SPECN.				QTY.	
CARD TYPE 3		28	28		CARD TYPE 1		28		CARD TYPE 2		

	BHARAT HEAVY ELECTRICALS LTD. BHOPAL			DRN.	NAME	SIGN	DATE	NO.OF VAR
				CKD.	CKSB	Sd/-	19.09.10	
				APPD.	DK	Sd/-	19.09.10	
					S.PAL	Sd/-	19.09.10	

DEPT. TME	UNTOL. DIMS. GR.		SCALE	WEIGHT(KG)	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
CODE 405	DIMS $\phi$ /M/£		NTS	0.06	1 439 20 60 056	003	001

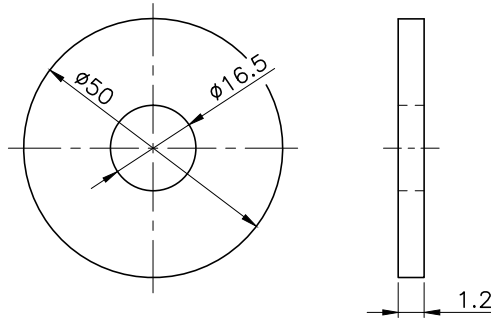
TITLE				DRAWING NO.			REV
ADJUSTING PIN				44392060051			02
HS15250A, 25 KV AC LOCO				SHT.NO 01		NO.OF.SHT. 01	

A4

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)


REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
		CHECKED			CHECKED	
		APPROVED			APPROVED	
02	30.10.15		01	22.10.10		4TWD.095.252, ALT.00
DRG. DIGITIZED.			BOM UPDATED.			STATUS OF DRAWING
						DISTRIBUTION OF PRINTS
						TME- 1    TNX -1 TXM- 4

**NOTES:-**

1. GENERAL CHARACTERISTICS (GRANULAR POWDER PTFE)

GENERAL CHARACTERISTICS	STANDARDS	UNITS	51A
POWDER			
APPEARANCE			IRREGULAR PARTICLES
BULK DENSITY	ASTM-D 1457/87	g/l	700±100
COMPRESSION RATIO	—	—	2.5-3
PARTICLE SIZE	ASTM-D 1457/87	μ	-400
POURABILITY	ASTM-D 1457/87	S	30-50
MOULDING PRESSURE	—	Kg/cm.sq psi mpa	250-360 3500-5000 25-35
SINTERED PARTS			
SPECIFIC GRAVITY	ASTM-D 1457/87	—	2.14-2.18
SHRINKAGE	ASTM-D 1457/87	%	-3.5/-4.5
TENSILE STRENGTH	ASTM-D 1457/87	Kg/cm.sq psi mpa	250-310 3500-4000 25-30
ELONGATION	ASTM-D 1457/87	%	280-380
THERMAL STABILITY	ASTM-D 1457/87	—	≤10
DIELECTRIC STRENGTH	ASTM-D 1457/87 0.1mm	KV/mm V/mil	32 800

2. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 4.TWD.095.252, ALT.00.

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		REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A/C	UNIT WT.
						MATL. SPECN.		QTY.
		CARD TYPE 3	28	28	CARD TYPE 1	28	CARD TYPE 2	
SIGN. & DATE	INVENTORY NO.	 BHARAT HEAVY ELECTRICALS LTD. BHOPAL		DRN.	NAME	SIGN	DATE	NO.OF VAR
				CKD.	DK	Sd/-	18.10.10	
				APPD.	S.PAL	Sd/-	18.10.10	-
		DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT(KG)	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
CODE	405	DIMS Ø/M/√	NTS	1 439 20 60 056	004	001		
TITLE				DRAWING NO.			REV	
SPACER				44392060052			02	
HS15250A, 25 KV AC LOCO				SHT.NO	01	NO.OF.SHT.	01	

A4

FIRST ANGLE PROJECTION

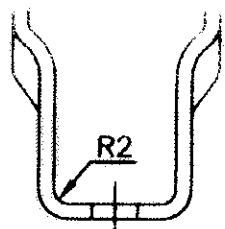
(ALL DIMENSIONS ARE IN mm)

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IN ANY WAY DETRIMENTAL TO THE INTERESTS OF THE COMPANY.

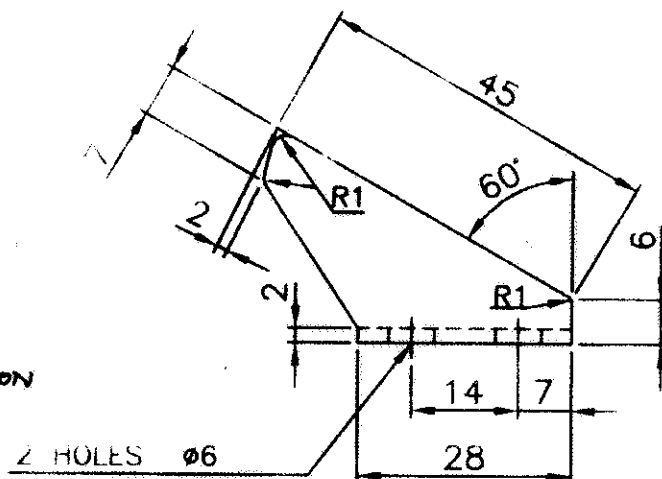
REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
		CHECKED	01/21/10		CHECKED	
		APPROVED			APPROVED	
ASSY REF. 14394060056 WAS 14392040056.						STATUS OF DRAWING
						DISTRIBUTION TME-1 TNX-1 OF PRINTS TXM-4

**PHYSICAL PROPERTIES**

PROOF STRESS = 21 Kgf/mm<sup>2</sup>  
 TENSILE STRENGTH = 53 Kgf/mm<sup>2</sup>  
 ELONGATION = 40% MIN  
 CONTRACTION = 50% MIN  
 HB = 187 MAX  
 HRB = 90 MAX  
 HV = 200 MAX



ROLL DIRECTION

**CHEMICAL COMPOSITION**

C = 0.08 MAX  
 SI = 1 MAX  
 Mn = 2 MAX  
 P = 0.045 MAX  
 S = 0.030 MAX  
 Ni = 8 To 10.5 %  
 Cr = 18 To 20 %

**NOTE:-**

1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE  $\pm 0.5$  MM.
2. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLY SHALL BE CARRIED OUT AT BHEL OR ANY NABL APPROVED LAB.
3. THIS DRG IS EQUIVALENT TO CLW DRG NO: 10T806-872 ALT 2.

	001	SPRING SUPPORT 1.5 TK. X 50 X 80	STAINLESS STEEL SHEET JIS-G 4303	KG	0.09
REMARKS	ITEM NO.	DESCRIPTION	MATL. CODE	UNIT	UNIT WT.
			MATL. SPECN.	QTY.	
CHD TYPE 3	28	28	CHD TYPE 1	28	CHD TYPE 2



BHARAT HEAVY ELECTRICALS LTD.  
BHOPAL

NAME	SIGN	DATE	NO. OF VAR
DRN. CKSD		16-9-10	
CKD. DR	M	16-9-10	
APPD. SPAG		16-9-10	

DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
CODE 405		NTS	0.09	14392060056	005	001

TITLE	DRAWING NO.	REV
SPRING SUPPORT <sub>7</sub>	44392060053	01



FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.	REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
			CHECKED	01	29.10.15	CHECKED	10 T 806 973A
			APPROVED			APPROVED	STATUS OF DRAWING
	DRG. DIGITIZED & UPDATED.						DISTRIBUTION TME-1 TNX-1 OF PRINTS TXM-4

**CHEMICAL PROPERTIES**

C - 0.08 MAX.  
 Si - 1 MAX.  
 Mn - 2 MAX.  
 P - 0.045 MAX.  
 S - 0.030 MAX.  
 Ni - 8 TO 10.5%  
 Cr - 18 TO 20%

**PHYSICAL PROPERTIES**

PROOF STRESS = 21kgf/mm<sup>2</sup>  
 TENSILE = 53kgf/mm<sup>2</sup>  
 ELONGATION = 40% MIN.  
 CONTRACTION = 50% MIN.  
 HB = 187 MAX.  
 HRB = 90 MAX.  
 HV = 200 MAX.

**NOTES:-**

1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE  $\pm 0.5$ MM. EXCEPT THICKNESS.
2. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLY SHALL BE CARRIED OUT BY BHEL OR ANY NABL APPROVED LAB.
3. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T806-973, ALT.C.

001		SPRING SUPPORT 1.5THK.x48x50		JIS-G-4303'91		KG.	0.06
REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A/C	UNIT	UNIT WT.
				MATL. SPECN.			QTY.

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

DEPT. TME CODE 405	UNTOL. DIMS. GR. DIMS $\varnothing$ /M/IN		SCALE NTS	WEIGHT(KG) 0.06	NAME	SIGN	DATE	NO.OF VAR
					DRN. CKSB	Sd/-	16.09.10	
					CKD. DK	Sd/-	16.09.10	
					APPD. S.PAL	Sd/-	16.09.10	

REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
1 439 20 60 056	015	001

DRAWING NO.		REV
44392060054		01
SHT.NO	NO.OF.SHT.	
01	01	

A4





Technical drawing of a mechanical part, likely a shaft or housing, showing dimensions and features. The part has a total length of 100. Key dimensions include a diameter of 22, a length of 82, and a diameter of 13 ± 0.3. Features include a 2X45° chamfer, a 2.5 fillet, a 4x14 hole, a 25 fillet, and a 2X45° chamfer. A note "SEE NOTE 3" is present.

1. ITEM NO. 001 TO BE ZINC PLATED  
& PASSIVATED WITH A PLATING  
THICKNESS OF 0.013 TO 0.015 MM.
2. TOLERANCE ON UNTOLERATED DIMENSIONS ARE  $\pm 0.5$  MM.
3. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSSES IDENTIFICATION  
MARK AT THE LOCATION SHOWN
4. THIS DRG IS EQUIVALENT TO CLW DRG NO: 107835 014 ALT '4'

STYLE LIST		
VAR	IT.NO.	STYLE NO.
	001	BP9094770920

कार्यालय प्रति  
OFFICE COPY

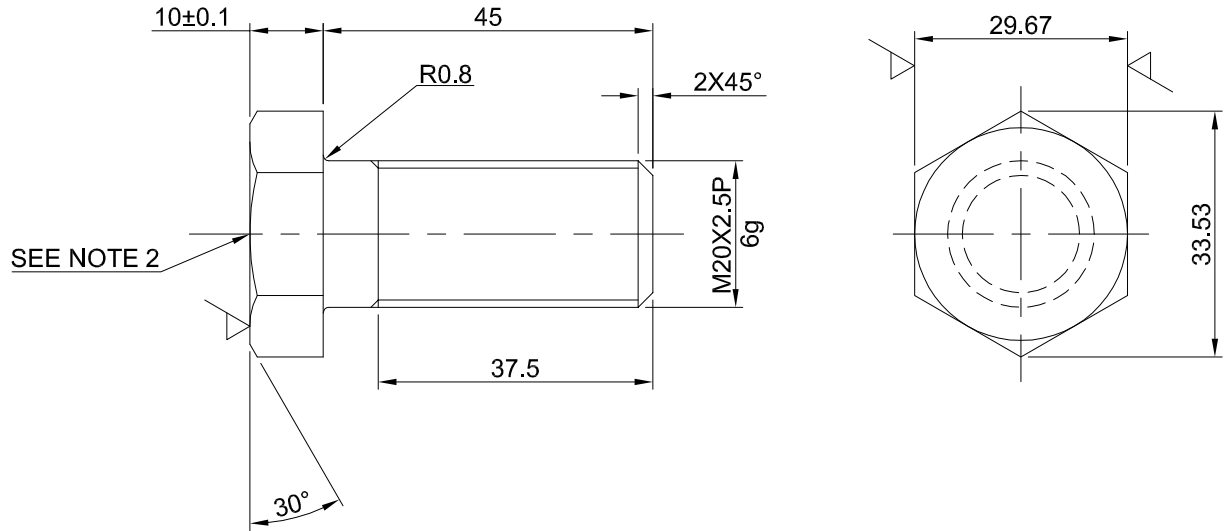
R.WT.0.29 KG	001	HANDLE, #22 X 100		IS .2062,92	KG	0.26
				JIS-G-4131		
REMARKS	ITEM NO.	DESCRIPTION	STD	MATL CODE	A UNIT	UNIT WT.
				MATL SPECN.	C	QTY.
ONE → 28		28 → ONE		28		ONE

		<b>BHARAT HEAVY ELECTRICALS LTD.</b> <b>BHOPAL</b>		<table border="1"> <tr> <td></td> <td>NAME</td> <td>SIGN</td> <td>DATE</td> </tr> <tr> <td>Desl.</td> <td>C K S B</td> <td><i>[Signature]</i></td> <td>16-9-10</td> </tr> <tr> <td>CKD.</td> <td>OK</td> <td>MM</td> <td>16-9-10</td> </tr> <tr> <td>APPD.</td> <td>S P A L</td> <td><i>[Signature]</i></td> <td>16-9-10</td> </tr> </table>			NAME	SIGN	DATE	Desl.	C K S B	<i>[Signature]</i>	16-9-10	CKD.	OK	MM	16-9-10	APPD.	S P A L	<i>[Signature]</i>	16-9-10
	NAME	SIGN	DATE																		
Desl.	C K S B	<i>[Signature]</i>	16-9-10																		
CKD.	OK	MM	16-9-10																		
APPD.	S P A L	<i>[Signature]</i>	16-9-10																		
DEPT.	UNTOOL DIMS. CR.		SCALE	WEIGHT(KG)	REF. TO ASSY.DRG.	ITEM NO.	NO. OF ITEM														
TIME	DIMS G/M/F		NTS	0.26	04392060051	007	001														
CODE	405	TITLE			DRAWING NO.		REV														
HANDLE HS 15250 A, 25 KV AC LUG			44392060056		01		01														
X(51)59/2026-HEP-TXM20500 (Computer No. 309684)			PART NO 01		NO. OF. SHT.		01														

## FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
01	28.10.15	CHECKED			CHECKED	4 TWD 095 087
		APPROVED			APPROVED	
DRAWING DIGITIZED & UPDATED.						STATUS OF DRAWING M
						DISTRIBUTION OF PRINTS TME-1 TXM-4 TNX-1




## NOTES:-

1. THIS IS TO BE ZINC PLATED.
2. MANUFACTURER TO PROVIDE THEIR METAL PUNCH / IDENTIFICATION MARK AT THE LOCATION SHOWN.
3. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 4TWD095-087 ALT-2

REF. DRG. NO.

SIGN. &amp; DATE

INVENTORY NO.

IS 1364 PART-2	001	HEX. SCREW M20 X 45 P8.8	STEEL IS:1364 (PART-2) 92, ISO4017'88, GRADE:8.86g	KG	0.25
REMARKS	ITEM NO.	DESCRIPTION	MATL. CODE	UNIT	UNIT WT.
			MATL. SPCN.		QTY.
28 → CARD TYPE-3	28 → CARD TYPE-1	28 → CARD TYPE-2			
			NAME	SIGN	DATE
BHARAT HEAVY ELECTRICALS LTD. BHOPAL			DRN	CKSB	-SD- 16.09.10
			CKD	D.K.	-SD- 18.09.10
			APPD	S.PAL	-SD- 18.09.10
DEPT TME	GRADE OF UNTOL.DIM. Ø / M / F AA0230208	SCALE NTS	WEIGHT (K.G.) 0.25	REF. TO ASSY. DRG. 1 439 20 60 056	ITEM NO. 009
CODE 405					
TITLE HEX. HEAD SCREW (MODIFIED BRUSH HOLDER ASSY.) HS15250A 11				DRAWING NO. 4 439 20 60 068	REV. 01
				SHT. No. 01	NO. OF SHT. 01

# JIS

UDC 669.35'6-14

JAPANESE INDUSTRIAL STANDARD

Bronze Castings

JIS H 5111 -1979 1988

Translated and Published

by

Japanese Standards Association

Printed in Japan



JAPANESE INDUSTRIAL STANDARD

J I S

Bronze Castings

H 5111-1979

1. Scope

This Japanese Industrial Standard specifies bronze castings for general use, hereinafter referred to as the "castings".

2. Class and Symbol

The classes of the castings and the symbols thereof shall be as given in Table 1 depending upon the chemical composition and the casting method.

---

Applicable Standards:

JIS H 0321-General Rules for Inspection of Non-ferrous Metal  
Materials

JIS H 1251-Methods for Chemical Analysis of Bronze

JIS Z 2201-Tension Test Pieces for Metallic Materials

JIS Z 2241-Method of Tension Test for Metallic Materials

Table 1

Class	Symbol	Casting method	Reference (Uses shown for example)
Class 1	BC 1	Sand mould casting, etc.	Having good fluidity and good machinability, and used for such casting as water supply and sanitary fittings, valves, pump bodies, injectors, bearings, nameplates, other general machinery parts, etc.
Class 1 C	BC 1 C	Continuous casting	
Class 2	BC 2	Sand mould casting, etc.	Having high resistance to pressure, abrasion and corrosion, and of high mechanical strength, and used for such castings as bearings, sleeves, bushes, pump bodies, impellers, valves, gears, ships' fittings, electrical appliance parts, other general machinery parts, etc.
Class 2 C	BC 2 C	Continuous casting	
Class 3	BC 3	Sand mould casting, etc.	
Class 3 C	BC 3 C	Continuous casting	
Class 6	BC 6	Sand mould casting, etc.	Having high resistance to pressure, and abrasion, and of good machinability and castability, and used for such castings as general use valves and cocks, bearings, sleeves, bushes, other general machinery parts, etc.
Class 6 C	BC 6 C	Continuous casting	
Class 7	BC 7	Sand mould casting, etc.	Having mechanical properties somewhat superior to BC 6, and used for such castings as bearings, parts of small pumps, valves, fuel pumps, other general machinery parts, etc.
Class 7 C	BC 7 C	Continuous casting	

### 3. Quality

3.1 The castings shall be of uniform quality, free from injurious defects. The extent of defects to be accepted shall be predetermined by the agreement between the parties concerned.

3.2 The chemical composition of the castings shall conform to Table 2, and the mechanical properties (tensile strength and elongation) to Table 3.

u

Table 2

Class	Chemical composition %				
	Cu	Sn	Zn	Pb	Impurities
Class 1	79.0 to 83.0	2.0 to 4.0	8.0 to 12.0	3.0 to 7.0	2.0 max.
Class 1 C					
Class 2	86.0 to 90.0	7.0 to 9.0	3.0 to 5.0	1.0 max.	1.0 max.
Class 2 C					
Class 3	86.5 to 89.5	9.0 to 11.0	1.0 to 3.0	1.0 max.	1.0 max.
Class 3 C					
Class 6	82.0 to 87.0	4.0 to 6.0	4.0 to 6.0	4.0 to 6.0	2.0 max.
Class 6 C					
Class 7	86.0 to 90.0	5.0 to 7.0	3.0 to 5.0	1.0 to 3.0	1.5 max.
Class 7 C					

4

Table 3

Class	Tension test	
	Tensile strength kgf/mm <sup>2</sup> {N/mm <sup>2</sup> }	Elongation %
Class 1	17 min. {167 min.}	15 min.
Class 1 C	20 min. {196 min.}	15 min.
Class 2	25 min. {245 min.}	20 min.
Class 2 C	28 min. {274 min.}	15 min.
Class 3	25 min. {245 min.}	15 min.
Class 3 C	28 min. {274 min.}	13 min.
Class 6	20 min. {196 min.}	15 min.
Class 6 C	25 min. {245 min.}	15 min.
Class 7	22 min. {216 min.}	18 min.
Class 7 C	26 min. {255 min.}	15 min.

- Remarks 1. The units and numerical values given in { } are in accordance with the International System of Units (SI), and are appended for reference only.
2. For continuous castings, the mechanical properties of tubes and rods having an outside diameter of 100 mm or less are specified.
- The mechanical properties of those exceeding 100 mm in outside diameter shall be predetermined by the agreement between the parties concerned.

5



4. Shape, Dimensions and Mass

The shape, dimensions and mass of the castings shall be specified either by model or in drawing. The tolerance thereon shall be predetermined by the agreement between the parties concerned.

5. Test

5.1 Chemical Analysis The chemical analysis shall follow the method specified in JIS H 1251.

5.2 Tension Test

5.2.1 The tension test shall follow the method specified in JIS Z 2241.

5.2.2 The tension test piece shall be No. 4 test piece specified in JIS Z 2201 machined from the specimen taken in accordance with 6.2.

6. Inspection

6.1 The sampling of the sample for chemical analysis and the general rules for the analysis shall be as provided in JIS H 0321.

6.2 The sampling of the specimen for the preparation of tension test piece shall be as follows:

(1) Sand Mould Castings, etc.

(a) Unless otherwise specified, one specimen shall be taken from each melt.

(b) The dimensions of specimen and the position from where the test piece is to be taken shall be as specified in Fig. 1.

Reference: The specimen of this shape is called Type A specimen.

(c) The specimen shall be cast at the same time when the product casting is cast.

(2) Continuous Castings

(a) Unless otherwise specified, one specimen shall be taken from each run of continuous casting of the same target composition and of the same shape.

(b) The specimen shall be one of the product castings manufactured by continuous casting, and where it is impossible to prepare No. 4 test piece from the specimen, the preparation of test piece shall be predetermined by the agreement between the parties concerned.

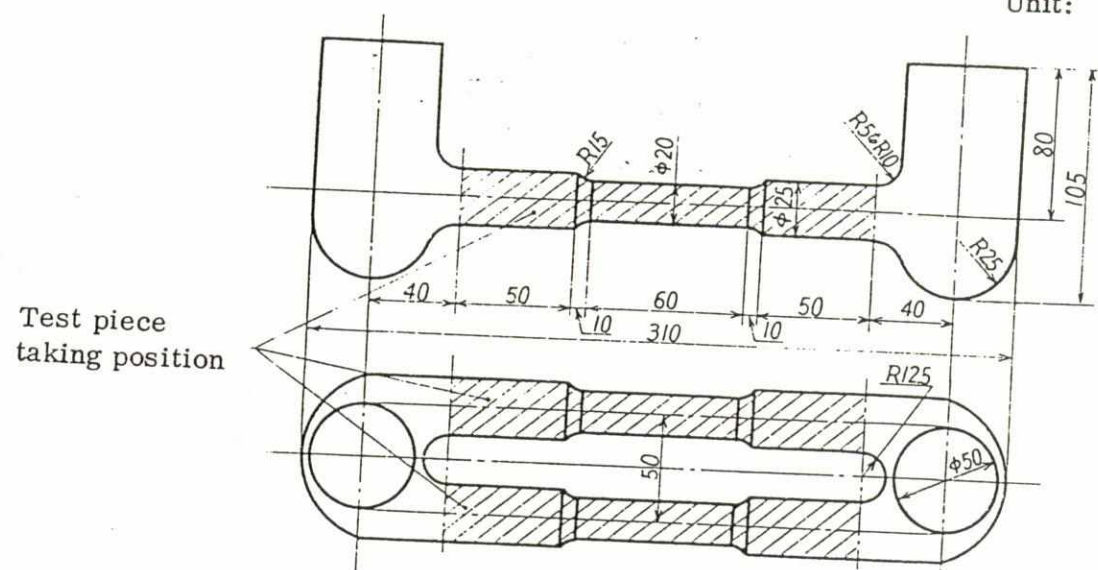
b



6.  
H 5111-1979

Fig. 1

Unit: mm



6.3 The castings shall be tested in accordance with 5., and the results shall meet the requirements of 3. and 4.

#### 7. Marking

When required upon agreement between the purchaser and the manufacturer, the following particulars shall be marked on the casting by a suitable means:

- (1) Class or symbol thereof
- (2) Manufacture number
- (3) Date of manufacture
- (4) Manufacturer's name or its abbreviation



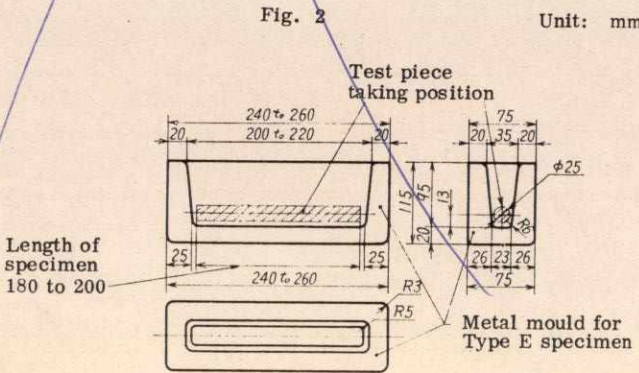
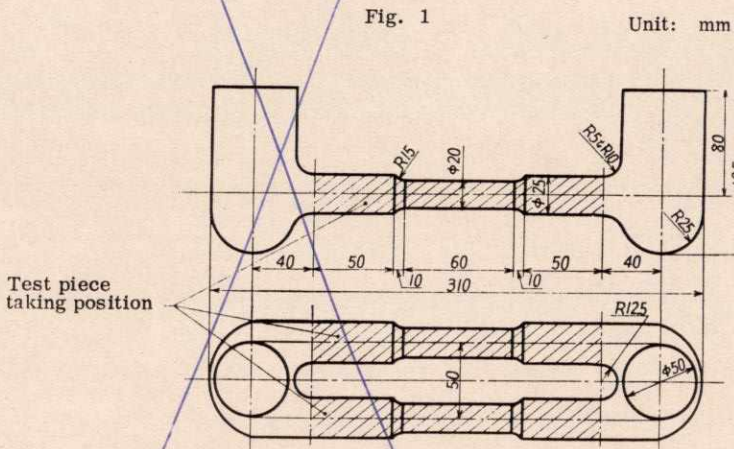
6.3 The sampling of the specimen necessary for the preparation of the test piece for hardness test shall be predetermined by the agreement between the parties concerned.

6.4 The castings shall be tested in accordance with 5., and the results shall meet the requirements of 3. and 4.

7. Marking

When required upon agreement between the parties concerned, the following particulars shall be marked on the castings by a suitable means:

- (1) Class or symbol thereof
- (2) Manufacture number
- (3) Date of manufacture
- (4) Manufacturer's name or its abbreviation



Aluminium Bronze Castings

Scope

This Japanese Industrial Standard specifies aluminium bronze castings for general use, hereinafter referred to as the "castings".

Class and Symbol

The classes of the castings and the symbols thereof shall be as given in Table 1 depending upon the chemical composition and the casting method.

Table 1

Class	Symbol	Casting method	Reference (Uses shown for example)
Class 1	A / BC 1	Sand mould casting, etc.	Suitable for castings that require strength and corrosion resistance. Used for such castings as acid resistant parts, gears, rollers in paper-making machine, etc.
Class 2	A / BC 2	Sand mould casting, etc.	Suitable for castings that require strength and resistance to corrosion, erosion and abrasion. Used for such castings as small marine propellers, gears, bearings, bushes, valve seats, impellers, bolts, nuts, safety tools, etc.
Class 2 C	A / BC 2 C	Continuous casting	
Class 3	A / BC 3	Sand mould casting, etc.	Suitable for large castings that require specially high strength and resistance to corrosion, erosion and abrasion. Used for such castings as marine propellers, sleeves, impellers, gears, machine parts for chemical industry, etc.
Class 4	A / BC 4	Sand mould casting, etc.	

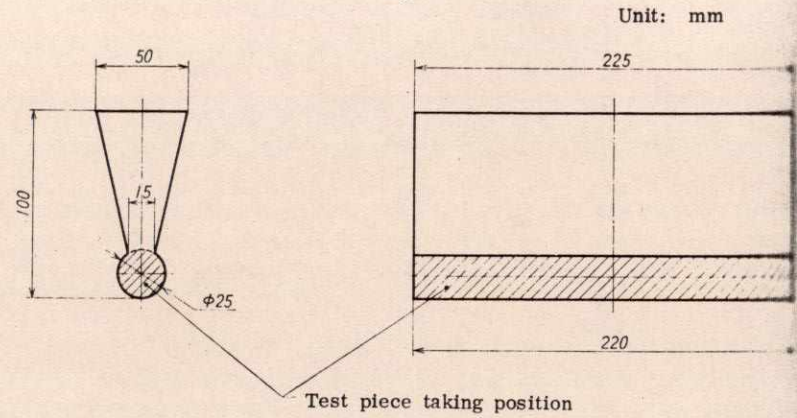
1. Quality

3.1 The castings shall be of uniform quality and be free from injurious defects. The extent of defects to be accepted shall be predetermined by the agreement between the parties concerned.



H 5114

Fig. 1



6.3 The sampling of the specimen necessary for the preparation of the test piece for hardness test shall be predetermined by the agreement between the parties concerned.

6.4 The castings shall be tested in accordance with 5., and the results shall meet the requirements of 3. and 4.

7. Marking

When required upon agreement between the parties concerned, the following particulars shall be marked on the castings by a suitable means:

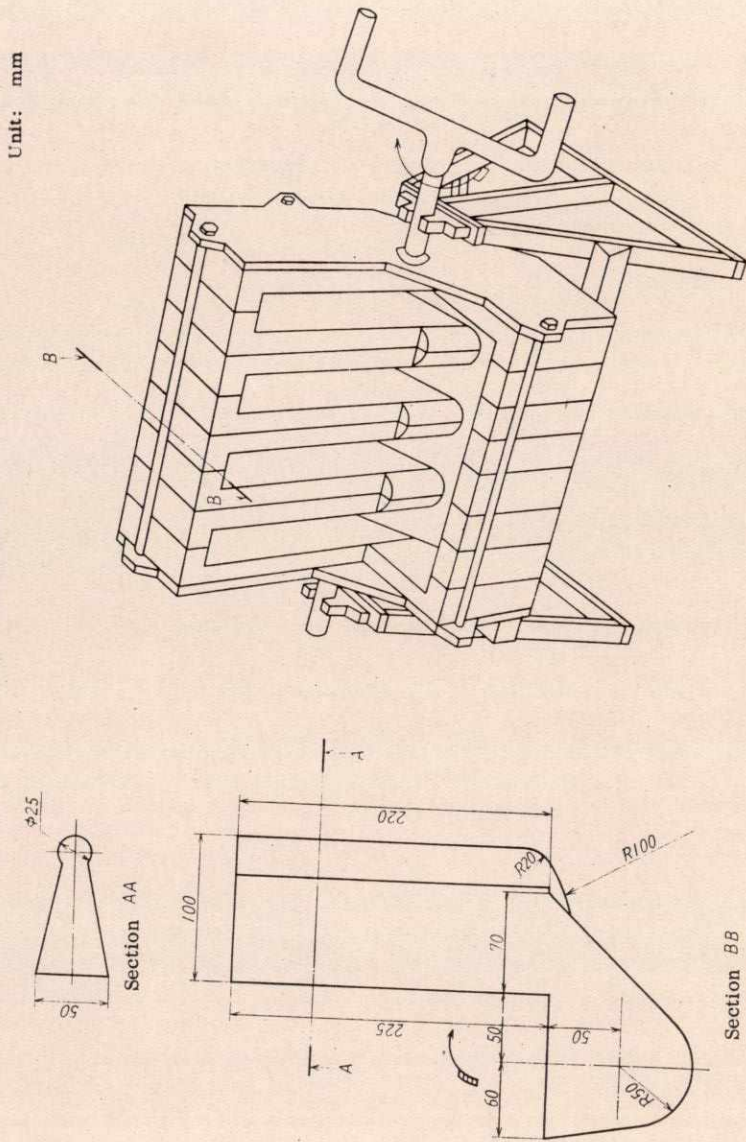
- (1) Class or symbol thereof
- (2) Manufacture number
- (3) Date of manufacture
- (4) Manufacturer's name or its abbreviation

796

H 5114

Unit: mm

Reference Figure



797



3.2 The chemical composition of the castings shall conform to Table 2, and the mechanical properties (tensile strength, elongation and hardness) to Table 3.

Table 2

Class	Chemical composition %					
	Cu	Al	Fe	Ni	Mn	Impurities
Class 1	85 min.	8.0 to 10.0	1.0 to 4.0	1.0 max.	1.0 max.	0.5 max.
Class 2	78 min.	8.0 to 10.5	2.5 to 5.0	1.0 to 3.0	1.5 max.	0.5 max.
Class 2 C						
Class 3	78 min.	8.5 to 10.5	3.0 to 6.0	3.0 to 6.0	1.5 max.	0.5 max.
Class 4	71 min.	6.0 to 9.0	2.0 to 5.0	1.0 to 4.0	7.0 to 15.0	0.5 max.

Table 3

Class	Tension test		Hardness test H <sub>B</sub> (10/1000)
	Tensile strength kgf/mm <sup>2</sup> {N/mm <sup>2</sup> }	Elongation %	
Class 1	45 min. {441 min.}	20 min.	90 min.
Class 2	50 min. {490 min.}	20 min.	120 min.
Class 2 C	55 min. {539 min.}	15 min.	120 min.
Class 3	60 min. {588 min.}	15 min.	150 min.
Class 4	60 min. {588 min.}	15 min.	150 min.

- Remarks 1. The units and numerical values given in { } are in accordance with the International System of Units (SI), and are appended for reference only.
2. For continuous castings, the mechanical properties of tubes and rods having an outside diameter of 100 mm or less are specified.  
The mechanical properties of those exceeding 100 mm in outside diameter shall be predetermined by the agreement between the parties concerned.

Shape, Dimensions and Mass

The shape, dimensions and mass of the castings shall be specified either in model or in drawing. The tolerance shall be predetermined by the agreement between the parties concerned.

Test

6.1 Chemical Analysis The chemical analysis shall follow the method specified in JIS H 1252.

6.2 Tension Test

- 6.2.1 The tension test shall follow the method specified in JIS Z 2241.
- 6.2.2 The tension test piece shall be No. 4 test piece specified in JIS Z 2201 machined from the specimen taken in accordance with 6.2.

6.3 Hardness Test The hardness test shall follow the method specified in JIS Z 2243.

Inspection

- 6.4 The sampling of the sample for chemical analysis and the general rules for the analysis shall be as provided in JIS H 0321.
- 6.5 The sampling of the specimen for the preparation of the tension test shall be as follows:
- (1) Sand Mould Castings, etc.
- (a) Unless otherwise specified, one specimen shall be taken from each melt.
- (b) The dimensions of specimen and the position from where the test piece is to be taken shall be as specified in Fig. 1.
- Reference: The specimen of this shape is called Type F specimen.
- (c) The specimen shall be cast at the same time when the product casting is cast.

(2) Continuous Castings

- (a) Unless otherwise specified, one specimen shall be taken from each run of continuous casting of the same target composition and of the same shape.
- (b) The specimen shall be one of the product castings manufactured by continuous casting, and, where it is impossible to make No. 4 test piece from the specimen, the preparation of test piece shall be predetermined by the agreement between the parties concerned.





**QUALITY ASSURANCE PLAN FOR BRUSH HOLDER ASSY TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO**

QUALITY PLAN NO. – QAP/OTM/VENDOR QAP/2024-25/ BRUSH HOLDER ASSY DTD 11.11.2024 REV 00  
Reference Document- PO DRAWING/SPECIFICATION

SL. NO	COMPONENT	CHARACTERISTICS	TYPE OF CHECK	QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY	REMARKS
				TP	TP/A					
1)	Raw Material (all items)	Test	TC Verification	100%	100%	As per drawing & Specification	As per drawing & Specification	MTC	BHEL/TP/A	TEST LAB NABL/EQUIVALENT ACCREDITED/SOURCE MILL /Supplier to get the raw material correlated with material TC & invoice
2)	Dimension	Dimension	TC Verification & Measurement	100%	5%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TP/A	Supplier internal report for 100 % to be reviewed and 5 % to be Witness by TP/A
3)	Brush spring pressure	Routine test	TC Verification & testing	100%	5%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TP/A	Supplier internal report for 100 % to be reviewed and 5 % to be Witness by TP/A
4)	Zinc coating	Coating thickness	TC Verification & testing	100%	1 %	As per drawing & specification	As per drawing & specification	Supplier record	BHEL/TP/A	Supplier internal report for 100 % to be reviewed and 1 % to be Witness by TP/A
5)	Identification vendor name, PO & job serial no.	Visual	Visual	100%	10%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TP/A	Witness

Prepared By

SHRIYAMIT SEN

Senior Engineer

QAP/OTM/TP/A

QAP/OTM/TP/A

Approved By

गोपल रीठ राठोर / G.S. RATHORE

Manager

QAP/OTM/TP/A

QAP/OTM/TP/A