

332555/2024/HEP-TXM20500

OUTER SHEET

SHEET NO. 1/4

SPECIFICATION FOR
LEAD WIRES
(12 ITEMS) IN THE FORM OF SETS FOR
HITACHI TRACTION MOTOR TYPE-HS 15250 A

SEE SHEET NO-2

SEE/TMD.

CHKD.

SPECIFICATION FOR
LEAD WIRES
(12 ITEMS) IN THE FORM OF SETS FOR HITACHI
TRACTION MOTOR TYPE-HS 15250A

DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL, INDIA.
NO.4 TMS.095-028
DATE: 23.9.2004

Signature Not
Verified

Digitally signed by
BYOMKES MANDAL
Date: 2021.11.08
16:42:56 +05'30'

Reason: JRP/PS-CRIS
Location: New Delhi
File Name: 332555(51)/43/2026-HEP-TXM20500 (Computer No. 301518)

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4 TMS 095-028

ALTERATION SHEET

SHEET NO.2/4

[illegible]

SEE SHEETNO-3

332555/2024/HEP-TXM20500

Sheet no.- 34

1. FORWARD :

This specification covers the supply the Lead wires in "Sets" for Hitachi Traction Motor , Type-HS 15250A in Chittaranjan Locomotive Works.

2. SUPPLY CONDITION :

Lead wires are to be supplied in "SETS" against stocking C&D No.7119/5550/000.

2.1 Tenderers shall quote their rates in sets for the following 12(Twelve) Lead wires.

SL	Covering, C & D No.	Description/Drg.No.	Qty/Sets
1.	5580/100	Lead wire (A) (150 mm ²) to Drg.No.3TWD.095.067	1 No.
2.	5580/200	Lead wire (AA) (150 mm ²) to Drg.No.3TWD.095.068	1 No.
3.	5580/300	Lead wire (150 mm ²) to Drg.No.3TWD.095.069	1 No.
4.	5580/400	Lead wire (150 mm ²) to Drg.No.3TWD.095.070	2 Nos.
5.	5580/500	Lead wire (150 mm ²) to Drg.No.3TWD.095.071	2 Nos.
6.	5580/600	Lead wire (150 mm ²) to Drg.No.3TWD.095.072	1 No.
7.	5580/700	Lead wire (F) (150 mm ²) to Drg.No.3TWD.095.073	1 No.
8.	5580/800	Lead wire (FF) (150 mm ²) to Drg.No.3TWD.095.074	1 No.
9.	5565/250	Lead wire (80 mm ²) to Drg.No.3TWD.095.075	1 No.
10.	5565/300	Lead wire (80 mm ²) to Drg.No.3TWD.095.076	1 No.
11.	5565/350	Lead wire (80 mm ²) to Drg.No.3TWD.095.077	1 No.
12.	5565/650	Lead wire (80 mm ²) to Drg.No.3TWD.095.078	1 No.

NB : The Lead wires shall be confirmed to the latest revision of the respective drawings.

3. INSPECTION CLAUSE :**3.1 METALLURGICAL INSPECTION :**

Metallurgical inspection shall be conducted by Govt. approved independent test laboratories before offering prototype samples and also before starting bulk manufacture and the test results are to be submitted to the Inspecting authority at the time of inspection . The cost of such test shall be borne by the supplier.

3.2 PROTOTYPE SAMPLE INSPECTION :

One set of prototype sample shall be submitted by the successful tenderers to DY.CEE/TMD/CLW/Chittaranjan, for approval before starting bulk manufacturing and after getting approval of metallurgical inspection report from Govt. approved independent test laboratories.

SEE/TMD	SPECIFICATION FOR LEAD WIRES (12 ITEMS) IN THE FORM OF SETS FOR HITACHI TRACTION TOR TYPE : HS15250A		
CHECKED			
DRAWN			
		DY.CEE/TMD	See Sheet - 4 CHITTARANJAN LOCOMOTIVE WORKS, WEST BENGAL, INDIA No.4TMS.095.028 DATED : 23.9.2004

332555/2024/HEP-TXM20500

Sheet - 44

4. MARKING AND PACKING :

4.1 The identification mark of each firm has to be given at the place located in the drawing of Copper tube connectors, Solderless terminal and Connectors .

4.2 It is to be ensured that each set of Lead wires is to be separately tagged on both ends and packed by durable polythene packet separately and finally to be kept in wooden box.

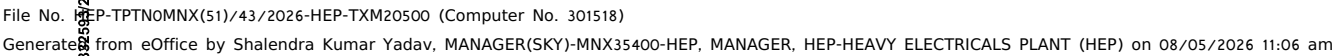
Ten sets of Lead wire shall be properly packed in one wooden box to avoid damage during handling and transportation. Two cards indicating description of materials against C&D No.7119/5550/000, the Description, Drg.No. of individual item and Qty. duly signed by CLW Inspector shall be tagged for one inside and other outside the wooden box.

5. INFORMATION TO BE FURNISHED BY THE TENDERS IN THEIR OFFER :

- i) A list of plant and machinery available with them for manufacture, testing and inspection.
- ii) Deviation, if any shall clearly be brought out indicating advantages in detail result of such deviation from drawing/specification an offer without any justification regarding deviation is liable to rejected.
- iii) Tenders along with their quotation shall furnish documents regarding performance of their past supplies of such materials to Govt. organization/Public sector undertaking.

SEE/TMD			
MSRai CHECKED	SPECIFICATION FOR LEAD WIRES (12 ITEMS) IN THE FORM OF SETS FOR HITACHI TRACTION TOR TYPE : HS15250A	DY.CEE/TMD	sheet End. CHITTARANJAN LOCOMOTIVE WORKS, WEST BENGAL, INDIA
Blam DRAWN			No.4TMS.095.028 DATED : 23.9.2004

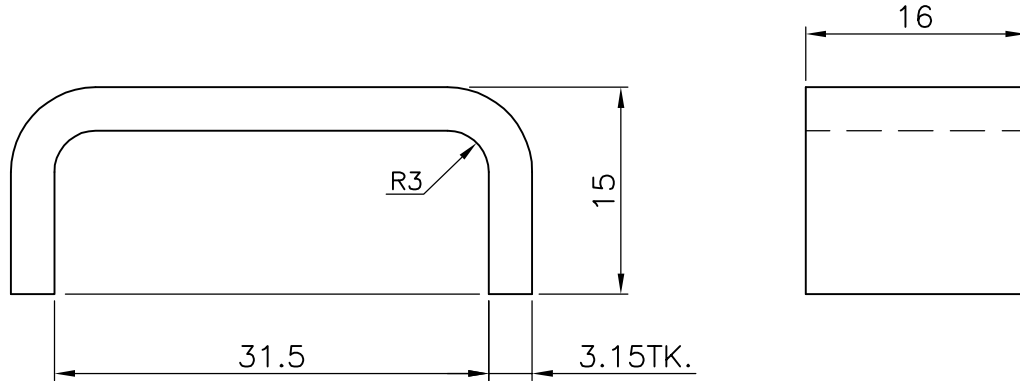




FIRST ANGLE PROJECTION
332593/2024/HEP-TXM20500


(ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
		CHECKED			CHECKED	4 TWD 095 088
		APPROVED	01	18.05.16	APPROVED	
			DRG. DIGITIZED & UPDATED.			STATUS OF DRAWING
						DISTRIBUTION TME- 1, TNX -1, OF PRINTS TXM- 4



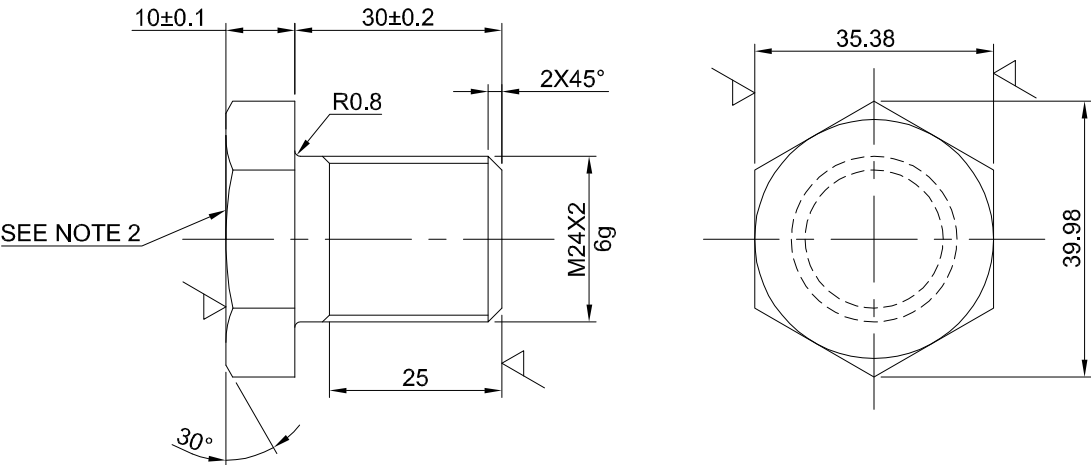
NOTES:-

1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.5 MM.
2. CLEAT TO BE ZINC PLATED TO AA0673603 & PASSIVATED TO AA0673604 WITH A PLATING THICKNESS OF 0.013 TO 0.015 MM.
3. REMOVE SHARP CORNERS.
4. THIS DRAWING IS EQUIVALENT TO CLW DRG NO. 4TWD.095.088, (ALT.00).


10 T 835 027		REF. DRG. NO.		001		CLEAT 3.15TK.x16x62		AA1011713136		KG.		0.03							
								AA10113											
REMARKS		ITEM NO.		DESCRIPTION		STD		MATL. CODE		A/C		UNIT WT.							
								MATL. SPECN.		UNIT		QTY.							
CARD TYPE 3		28		28		CARD TYPE 1		28		CARD TYPE 2									
SIGN. & DATE		 BHARAT HEAVY ELECTRICALS LTD. BHOPAL						NAME		SIGN		DATE							
								DRN.		C.K.S.B.		Sd/-		15.09.10					
								CKD.		D.K.		Sd/-		15.09.10					
INVENTORY NO.		DEPT. TME CODE 405						APPD.		S.PAL		Sd/-		15.09.10					
								UNTO. DIMS. GR.		SCALE		WEIGHT(KG)		REF.TO ASSY.DRG.		ITEM NO.		NO.OF ITEM	
								DIMS Ø/M/℄		NTS		0.03		2 439 20 60 058		001		001	
		TITLE						DRAWING NO.		REV									
		CLEAT HS15250A, 25 KV AC LOCO						44392060058		01									
								SHT.NO		01		NO.OF.SHT.		01					

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REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
01	28.10.15	CHECKED			CHECKED	
		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. 4TWD095-086 ALT-2

REF. DRG. NO.		SIGN. & DATE		INVENTORY NO.	
IS 1364 PART-2	001	HEX. SCREW M24 X 30 P.8.8	STEEL IS:1364 (PART-2) 92, ISO4017'88, GRADE:8.86g	KG	0.30
REMARKS	ITEM NO.	DESCRIPTION	MATL. CODE	UNIT	UNIT WT.
			MATL. SPCN.		QTY.
28 → CARD TYPE-3		28 → CARD TYPE-1		28 → CARD TYPE-2	
		BHARAT HEAVY ELECTRICALS LTD. BHOPAL		NAME	SIGN
				DRN	CKSB
				CKD	D.K.
				APPD	S.PAL
DEPT TME	GRADE OF UNTOL.DIM. Ø / M / F AA0230208	SCALE NTS	WEIGHT (K.G.) 0.30	REF. TO ASSY. DRG. 0 439 20 60 051	ITEM NO. 008
CODE 405					
TITLE SCREW (FOR MODIFIED BRUSH HOLDER) HS15250A		DRAWING NO. 4 439 20 60 067		REV. 01	
		SHT. No. 01		NO. OF SHT. 01	

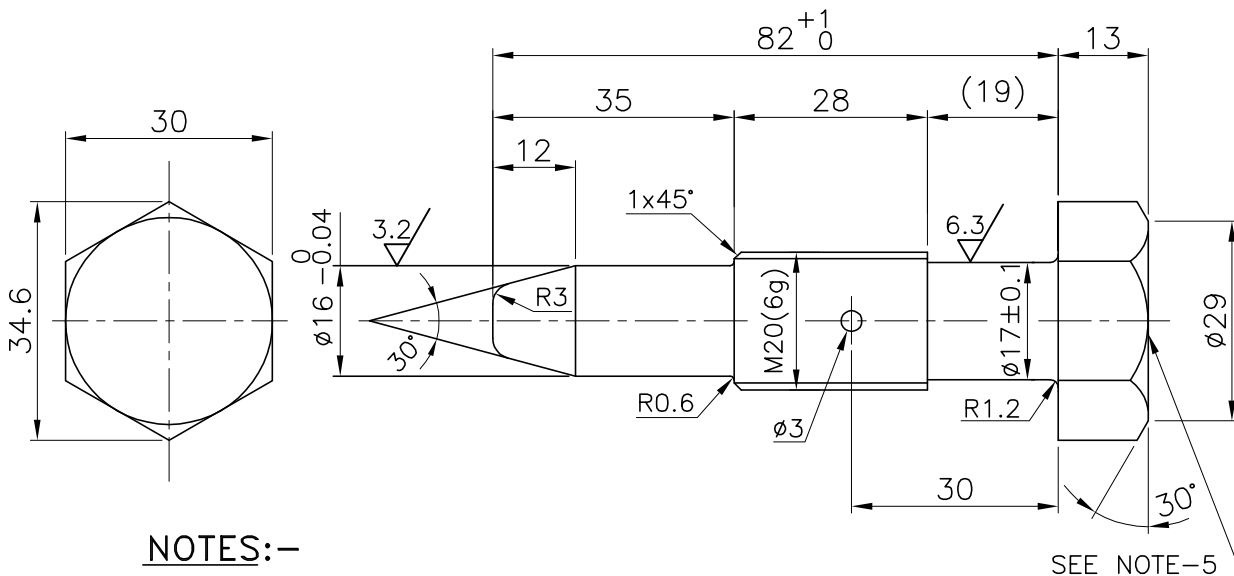


332593/2024/HEP-TXM20500

(ALL DIMENSIONS ARE IN mm)

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REV.	DATE	ALTERED	S.D.B.	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
03	22.12.20	CHECKED	MOHIT	02	28.10.15	CHECKED	10 T 834-941
		APPROVED	MOHIT			APPROVED	
IN BOM MATERIAL CLASS FOR IT.001, SS41 ADDED.				DRG. DIGITIZED.			STATUS OF DRAWING
							DISTRIBUTION TME- 1, TNX -1, OF PRINTS TXM- 4

**NOTES:-**


1. $\frac{6.3}{\nabla}$ ALL OVER.
2. ITEM 001 TO BE ZINC PLATED TO AA 0673603 & PASSIVATED TO AA 0673604 PLATING THICKNESS OF 0.013 TO 0.015 MM.
3. BOLTS ARE TO BE 100% MCD. TESTED
4. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.5 MM.
5. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK THE LOCATION SHOWN.
6. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T834-941, ALT.D.

TOOL LIST

IT.NO.	TOOL NO.	DESCRIPTION
	1414982	DRILL JIG FOR ONE HOLE

STYLE LIST

VAR	IT.NO.	STYLE NO.
	001	BP9014771371

R.WT.=0.61		001	SPECIAL BOLT A/F 30x95	IS:2062'92, GR.A JISG3101-SS41	KG.	0.21
REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A	UNIT WT.
				MATL. SPECN.	C	QTY.
CARD TYPE 3	28	28	CARD TYPE 1	28	CARD TYPE 2	
				NAME	SIGN	DATE
				DRN.	CKSB	16.09.10
				CKD.	DK	16.09.10
				APPD.	S.PAL	16.09.10
DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT(KG)	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
CODE 405	DIMS \varnothing /M/F	NTS	0.21	2 439 20 60 053	002	001
TITLE				DRAWING NO.	REV	
SPECIAL BOLT HS15250A 25 KV AC LOCO 11				44392060059	03	
				SHT.NO 01	NO.OF.SHT.	01

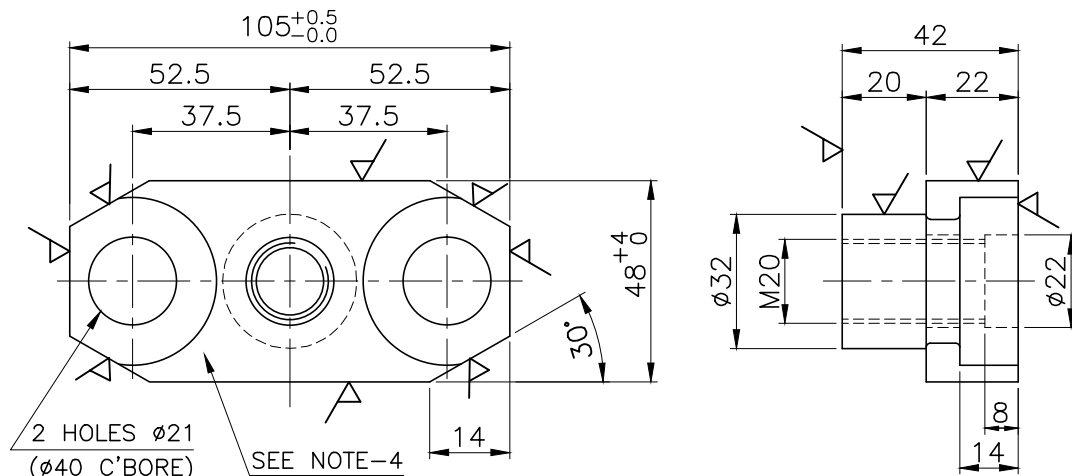
332593/2024/HEP-TXM20500

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

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REV.	DATE	ALTERED	CKSB	REV.	DATE	ALTERED	CKSB	ADDITIONAL INFORMATION
02	14.03.11	CHECKED	DK	01	21.10.10	CHECKED	DK	10 T 834-942
		APPROVED	S.PAL			APPROVED	S.PAL	
STYLE NO. MODIFIED.				IN BOM UNTOL. DIM. GR.				STATUS OF DRAWING
IN BOM WIDTH 48 WAS 45.				'M' AA0230208 WAS ON.				DISTRIBUTION TME- 1, TNX -1,
								OF PRINTS TXM- 4
REV.	DATE	ALTERED	CKSB					
03	28.10.15	CHECKED						
		APPROVED						
DRG. DIGITIZED.								

**NOTES:-**


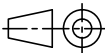
1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.5 MM.
2. APPLY RUST & PREVENTIVE OIL TO PROTECT THE MATERIAL FROM RUSTING.
3. ITEM 001 SHOULD BE CADMIUM PLATED AND PASSIVATED BY SUPPLIER.
4. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK THE LOCATION SHOWN.
5. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T834-942, ALT.4.

TOOL LIST

IT.NO.	TOOL NO.	DESCRIPTION
	1571001	MILLING FIXTURE 105+2/-0
	1571002	DRILL JIG FOR ALL HOLES

STYLE LIST

VAR.	IT.NO.	STYLE NO.
	001	BP9094773211

R/WT.= 2.62 KG.				001 SEAT 56TKK.x48x105				IS:2062'92,GR.A				KG.		0.80									
								JIS-G-3101															
REMARKS				ITEM NO.		DESCRIPTION				STD		34 MATL. CODE		45 A		UNIT		66 UNIT WT.					
												40 MATL. SPECN.		64 C				68 QTY.					
CARD TYPE 3				28				28				CARD TYPE 1				28				CARD TYPE 2			
<div></div> <div>BHARAT HEAVY ELECTRICALS LTD. BHOPAL</div>				DRN.		NAME		SIGN		DATE		NO.OF VAR											
						CKSB		Sd/-		16.09.10													
						CKD.		DK		Sd/-				16.09.10									
						APPD.		S.PAL		Sd/-				16.09.10									
DEPT. TME		UNTOL. DIMS. GR. DIMS Ø/M/℄						SCALE NTS		WEIGHT(KG) 0.80		REF.TO ASSY.DRG. 2 439 20 60 053				ITEM NO. 001		NO.OF ITEM 001					
CODE 405																							
TITLE SEAT HS15250A FOR 25 KV AC LOCO												DRAWING NO. 44392060060						REV 03					
						SHT.NO		01		NO.OF.SHT.						01							

A4

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TITLE LIST

ITEM NO.	TOOL NO.	DESCRIPTION
1571491	TORSIONAL TEST FIXTURE	

NOTES:-

- DIMENSION OF TEFEL SLEEVE (T'004) BEFORE ASSEMBLY O/D=52.5, I/V=44±0.1, L=52±0.5
- HEAT THE SLEEVE TO 250°C-280°C FOR SHRINKAGE OVER INSULATION (T'003).
- EXPOSED STEEL PART SHALL BE ZINC PLATED/CADMIUM PLATED.
- CAMFER ALL SHARP CORNER TO 0.5X0.5, WHERE NOT SPECIFIED.
- TOLERANCE ON UNTOLERATED DIMENSION IS ±0.2
- INSULATOR SPECIALLY THE BINDER SHALL BE SUITABLE FOR CONTINUOUS WORKING TEMPERATURE 150°C AND ALSO II) OCCASIONAL OVER HEATING AT 200°C FOR LONG DURATION 16-24 HRS WITHOUT LOSS OF PROPERTIES.
- INSULATORS SHOULD COMPLY WITH THE FOLLOWING MECHANICAL AND ELECTRICAL PROPERTIES:
 - ULTIMATE TENSILE STRENGTH : MORE THAN 3250 KG (TYPE TEST FOR EACH LOT)
 - RUTINE TENSILE STRENGTH TEST AT 2000KG.
 - BENDING STRENGTH : MORE THAN 200KGM/cm (SEE FIG.-2).
 - TORSIONA STRENGTH : MORE THAN 30kgf-m (SEE FIG.-2).
 - INSULATION RESISTANCE : MORE THAN 1000 MEGA OHM.
 - v) ALL INSULATIONS TO BE TESTED AT 1KV - 50HZ FOR ONE MINUTE IN AIR.
 - w) ONE SAMPLE FROM EACH LOT SHALL WITHSTAND 32KV, 50HZ FOR ONE MINUTE IN OIL.
 - x) THE THREADED PORTIONS OF THE INSULATORS SHOULD BE COVERED BY A THREADED PLASTIC CAP.
 - y) MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBROSS IDENTIFICATION MARK AT THE LOCATION SHOWN.
- THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 3TWB-085-007 ALT '6'.

FIGURE DETAILS:

- Fig-1:** MAX. 200KG, 70mm height, Ø45 base diameter.
- Fig-2:** ACTION POINT, PROCEDURE OF BENDING TEST.
- Fig-3:** PROCEDURE OF TORSIONAL TEST.
- Fig-4:** Thru-hole view showing dimensions: 52±0.5 length, Ø44±0.1 inner hole, Ø52.5±0.1 outer hole.
- Fig-5:** Threaded plastic cap details: 1.5x45°, R2, R3, R0.6, M20, Ø16.5±0.1, Ø28, Ø36, Ø45, 21, 4, 22, 15, 47, 26, 7, 8, 12, III, RZ.
- Fig-6:** Detail of thread: Pitch=4, 90° chamfer, R0.5, Ø28, Ø29, 1.5x45°, M20, Ø16.5±0.1, R2.5, R2.5, (MAX.), Ø45±0.1, 1.5x45°, M16, 35, 12, (7), 54, 66, 25, 133, 42.
- Fig-7:** Cross-section of insulator rod assembly showing concentricity tolerance on steel fittings shall be 0.05 mm (max.). Dimensions include: 25, 4, (21), 54, 12, (7), 35, 42, 133.

TABLES:

No.	Date	Description
01	28.10.15	AUTHORIZED & UPDATED.

MATERIAL	PART NAME	QTY	UNIT
PTEF SLEEVE	004	2	KG
INSULATION MICALEX MOULDING	003	-	KG
ROD MEDIUM CARBON	002	1	KG
STEEL Ø45X86	001	1	KG
ROD MEDIUM CARBON STEEL Ø45X52	001	1	KG

NO.	Date	Description
01	28.10.15	AUTHORIZED & UPDATED.

NAME	SPEC.	DATE
HVDC CBISB	-SD-	18.09.10
OK	-SD-	18.09.10
S.P.L.	-SD-	18.09.10

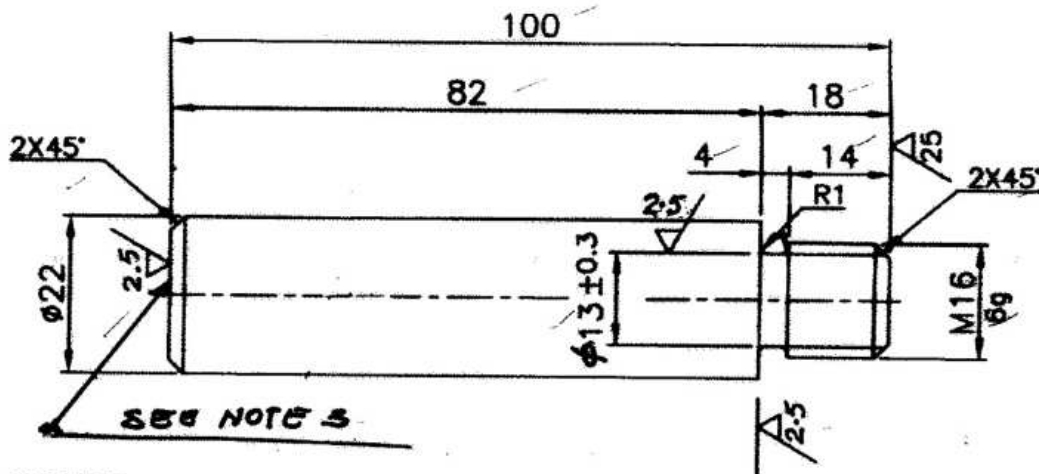
NAME	SPEC.	DATE
BHOPAL	-SD-	18.09.10

WEIGHT (KG.) REF. TO ASSY.	ITEM NO.	N/O OF ITEM
04392060051	010	004

DRAWING NO.	REV.
24392060060	01

33259

REV. 01	DATE 22-10-20	ALTERED 2.3V. CHECKED APPROVED	REV. 09.09.09	DATE 09.09.09	ALTERED CHECKED APPROVED	ADDITIONAL INFORMATION 10 T 835 014
DRG UPDATED.						STATUS OF DRAWING
						DISTRIBUTION TIME - 1 TNX -1 OF PRINTS TXM - 4



NOTES:-

- ITEM NO. 001 TO BE ZINC PLATED & PASSIVATED WITH A PLATING THICKNESS OF 0.013 TO 0.015 MM.
- TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.5 MM.
- MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOSS IDENTIFICATION MARK AT THE LOCATION SHOWN
- THIS DRG IS EQUIVALENT TO CLW DRG NO: 10T835 014 ALT '4'

TOOL LIST

IT.NO.	TOOL NO.	DESCRIPTION
	1571422	D.J. FOR $\phi 6$ HOLE

STYLE LIST

VAR	IT.NO.	STYLE NO.
	001	BP9094770920

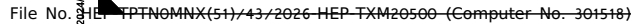
कार्यालय प्रति
OFFICE COPY

R.WT.0.29 KG	001	HANDLE, $\phi 22 \times 100$	IS-2062, 92	KG	0.26
			IS-G-31		
REMARKS	ITEM NO.	DESCRIPTION	MATL. CODE	UNIT	UNIT WT.
			MATL. SPECN.		QTY.

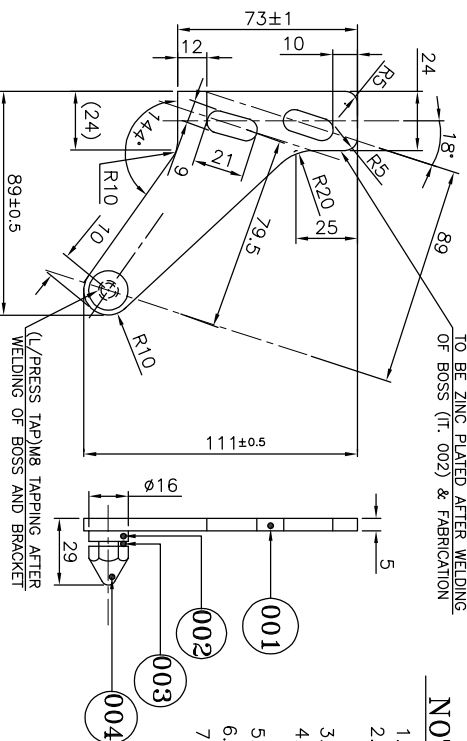


BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

DEPT. TME	UNTOLO DMS. CR.	SCALE	WEIGHT(KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
CODE 405	DIMS G/M/F	NTS	0.26	04392060051	007	001
TITLE				DRAWING NO.		REV
HANDLE				44392060056		01
HS 15250 A, 25 KV AC LOG				NO. OF SHEET		01

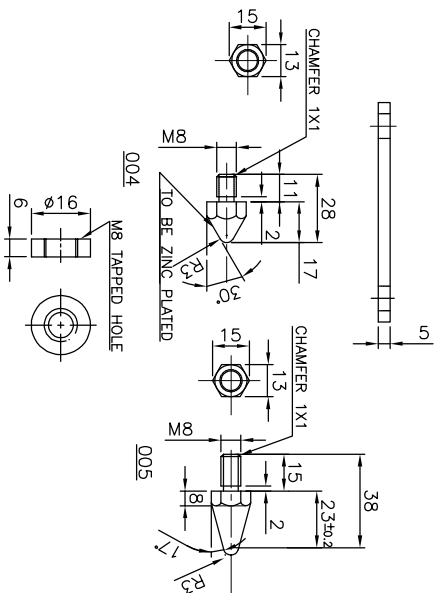


DRG. NO. — 34392060060



NOTE:—

1. FIXING BRACKET BRACKET IT.001 SHALL BE SINGLE PIECE CONSTRUCTION
2. AFTER BLANKING OF BRACKET IT. 001 THE BOSS 002 IS TO BE WELDED AND THAN
THE BRACKET IS TO BE STRESS RELEASED.
3. DRILLING AND TAPPING OF HOLES ARE TO BE MADE AFTER STRESS RELIEVING.
4. FOR LOCKING OF ARCING STUD IT. 004 ANAEROBIC LOCKING ADHESIVE
"AABOND AAR 1151'S TO BE APPLIED ON THE THREADED PORTION.
5. IT.001.002.004 & 005 TO BE ZINC PLATED.
6. TOLERANCE ± 0.25 WHERE NOT SPECIFIED.
7. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 3TWD.095.092 ALT.-1

[illegible]


SIGN. & DATE	SURFACE ROUGHNESS VALUE TO IS:3073	GRADE NUMBER	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
		Ra μ m	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
		SYMBOL	V			V			V			V		

ADDITIONAL INFORMATION 3TWD.095.092 ALT-1	
STATUS OF DRAWING	U
DISTRIBUTION OF PRINTS	
TME-1, TXM-3, TNX-1,	

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					25KV.AC LOCO HS15250A	
BHARAT HEAVY ELECTRICALS LTD. BHOPAL						
DRN.	S.D.BHAGAT	SIGN	DATE	NO. OF VAR.		
CHD.	D.K.	-SD-	20.09.10			
APPRD.	S.P.AL.	-SD-	20.09.10	01		

REV.	DATE	ALTERED	CHECKED	APPROVED
02	26.06.13	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
ZONE				
IN IT.005 DIM.8 WAS NOT ON ANGLE 17° WAS 15°				

REV.	DATE	ALTERED	A. JHARIA
01	20.10.10	CHECKED	S. PAL
		APPROVED	S. PAL
ZONE			
DRG. UPDATED.			

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (K.G.)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
TIME							
CODE			NTS				
405					04392060051	023	005
TITLE	ARCING STUD & FIXING BRACKET ASSEMBLY FOR ROCKER RING				DRAWING NO.	REV.	
					34392060060	02	
	SHT. NO.	01	NO. OF SHT.	01			

332593/2024/HEP-TXM20500

SIZE A3

332593/2024/HEP-TXM20500

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 10 T 806 973A STATUS OF DRAWING DISTRIBUTION TME-1 TNX-1 OF PRINTS TXM-4
			CHECKED			CHECKED	
			APPROVED			APPROVED	
	01 29.10.15			DRG. DIGITIZED & UPDATED.			
<p>CHEMICAL PROPERTIES</p> <p>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%</p>							
<p>PHYSICAL PROPERTIES</p> <p>PROOF STRESS = 21kgf/mm² TENSILE = 53kgf/mm² ELONGATION = 40% MIN. CONTRACTION = 50% MIN. HB = 187 MAX. HRB = 90 MAX. HV = 200 MAX.</p>							
<p>NOTES:-</p> <p>1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.5MM. EXCEPT THICKNESS.</p> <p>2. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLY SHALL BE CARRIED OUT BY BHEL OR ANY NABL APPROVED LAB.</p> <p>3. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T806-973, ALT.C.</p>							
10 T 806 973A (HITACHI LTD.)		001	SPRING SUPPORT 1.5THK.x48x50		JIS-G-4303'91		KG. 0.06
REMARKS		ITEM NO.	DESCRIPTION		STD	MATL. CODE	UNIT WT.
						MATL. SPECN.	QTY.
CARD TYPE 3		28	28		CARD TYPE 1		CARD TYPE 2
SIGN. & DATE	BHEL		BHARAT HEAVY ELECTRICALS LTD. BHOPAL		DRN.	NAME	SIGN
					CKD.	CKSB	Sd/-
					APPD.	DK	Sd/-
						S.PAL	Sd/-
INVENTORY NO.	DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT(KG)	REF. TO ASSY.DRG.		NO.OF VAR
	CODE 405	DIMS ϕ /M/F	NTS	0.06	ITEM NO. 015		00
	TITLE				DRAWING NO.		NO.OF ITEM
	SPRING SUPPORT HS15250A, 25 KV AC LOCO				44392060054		001
				SHT.NO 01		REV 01	

A4

(ALL DIMENSIONS ARE IN mm)

INVENTORY NO _____

Technical drawing of a U-shaped part. The drawing includes the following dimensions and features:

- Overall width: 31.5
- Overall height: 15
- Inner radius: R3
- Thickness: 3.15TK.
- Top flange width: 16

1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE $\pm 0.5\text{MM}$.
2. CLEAT TO BE ZINC PLATED TO AA0673603 & PASSIVATED TO AA0673604 WITH A PLATING THICKNESS OF 0.013 TO 0.015 MM.
3. REMOVE SHARP CORNERS.
4. THIS DRAWING IS EQUIVALENT TO CLW DRG NO. 4TWD.095.088, (ALT.00).

Generated from eOffice by Shalendra Kumar Yadav. MANAGER(SKY)-MNX35400-HEP. MANAGER. HEP-HEAVY ELECTRICALS PLANT (HEP) on 08/05/2026 11:06 am

332593/2024/HEP-TXM20500

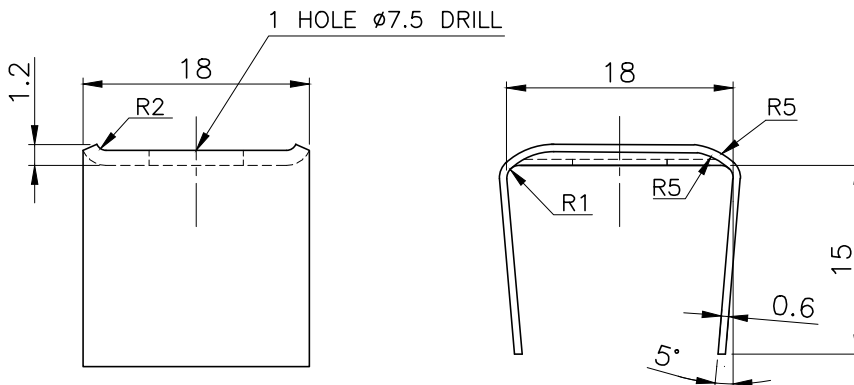
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

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10 T 806-977A
REF. DRG. NO.SIGN. & DATE
INVENTORY NO.

REV.	DATE	ALTERED	RBV	ADDITIONAL INFORMATION
02	29.10.15	CHECKED APPROVED	S.PAL S.PAL	10 T 806-977A
01	22.10.10	CHECKED APPROVED	S.PAL S.PAL	
DRG. DIGITIZED.		DRG. UPDATED.		STATUS OF DRAWING
				DISTRIBUTION TME- 1 TNX -1 OF PRINTS TXM- 4 PRM -4

MATERIAL

STAINLESS STEEL SHEET
1.6THK. TO JIS-G-4303'91
GR.SUS 304 CP TO THE
FOLLOWING CHEMICAL &
PHYSICAL PROPERTIES

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%

PHYSICAL PROPERTIES₂

PROOF STRESS = 21kgf/mm²
TENSILE = 53kgf/mm²
ELONGATION = 40% MIN.
CONTRACTION = 50% MIN.
HB = 187 MAX.
HRB = 90 MAX.
HV = 200 MAX.

NOTES:-

1. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 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. 10T806-977, ALT.D.

001	SPECIAL WASHER 0.6THK.x18x63 STL. STEEL	JIS-G-4303'91	KG.	0.006
REMARKS	ITEM NO.	DESCRIPTION	STD	UNIT WT.
				QTY.
CARD TYPE 3	28	28	CARD TYPE 1	28
		BHARAT HEAVY ELECTRICALS LTD. BHOPAL		
DEPT. TME	UNTO. DIMS. GR.	SCALE	WEIGHT(KG)	REF. TO ASSY.DRG.
CODE 405	DIMS \varnothing /M/ \varnothing	NTS	0.006	ITEM NO. 008
TITLE		DRAWING NO.		
SPECIAL WASHER		44392060055		
HS15250A, 25KV AC LOCO		REV 02		
		SHT.NO 01	NO.OF.SHT. 01	

A4

332593/2024/HEP-TXM20500

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10 T 806 972A
REF. DRG. NO. (HITACHI, LTD.)

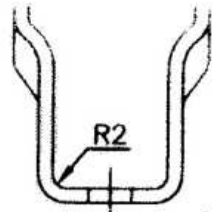
SIGN & DATE

INVENTOR: NC

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

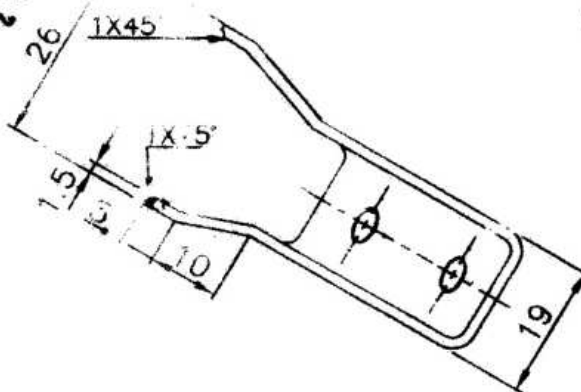
PHYSICAL PROPERTIES

PROOF STRESS = 21 Kgf/mm²
 TENSILE STRENGTH = 53 Kgf/mm²
 ELONGATION = 40% MIN
 CONTRACTION = 50% MIN
 HB = 187 MAX
 HRB = 90 MAX
 HV = 200 MAX



ROLL DIRECTION

2 HOLES Ø6

**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 ± 0.5 MM.
EXCEPT THICKNESS
2. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLY SHALL BE CARRIED OUT AT GHCL OR ANY NABL APPROVED LAB.
3. THIS DRG IS EQUIVALENT TO CLW DRG NO: 10T806-072 ALT 2.

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

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

NAME	SIGN	DATE	NO. OF VAR
CHKD	BY	16-9-10	
CKD.	MM	16-9-10	
APPD.	S P A G	16-9-10	

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

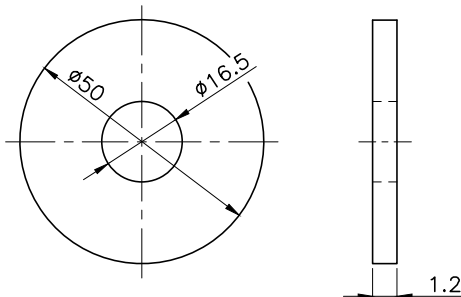
TITLE	DRAWING NO.	REV
SPRING SUPPORT ²¹	44392060053	01

332593/2024/HEP-TXM20500

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)


REV.	DATE	ALTERED	REV.	DATE	ALTERED	AKJ	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 TME- 1 TNX -1	
						OF PRINTS 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.

REF. DRG. NO.	001	SPACER	SEE TABLE					
	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	 BHARAT HEAVY ELECTRICALS LTD. BHOPAL			DRN.	NAME	SIGN	DATE	NO.OF VAR
				CKD.	AKJ	Sd/-	18.10.10	
				APPD.	DK	Sd/-	18.10.10	
					S.PAL	Sd/-	18.10.10	-
INVENTORY NO.	DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT(KG)	REF.TO ASSY.DRG.		ITEM NO.	NO.OF ITEM
	CODE 405	DIMS 2/M/1	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

332593/2024/HEP-TXM20500

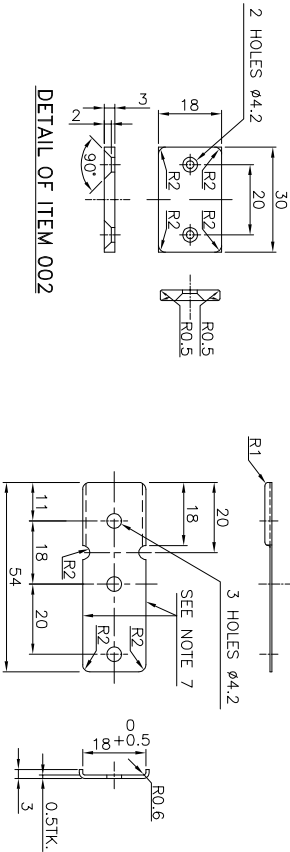
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

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	DRG. DIGITIZED.			IN BOM UNTOL. DIMS. GR. AA0230208 WAS ON.			STATUS OF DRAWING M																																																		
							DISTRIBUTION TME- 1 TNX -1																																																		
							OF PRINTS TXM- 4																																																		
<table border="1"> <thead> <tr> <th colspan="3">TOOL LIST</th> </tr> <tr> <th>IT.NO.</th> <th>TOOL NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>001</td> <td>1414049</td> <td>DRILL JIG FOR 3 HOLES $\phi 4$</td> </tr> </tbody> </table>										TOOL LIST			IT.NO.	TOOL NO.	DESCRIPTION	001	1414049	DRILL JIG FOR 3 HOLES $\phi 4$																																							
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IT.NO.	TOOL NO.	DESCRIPTION																																																							
001	1414049	DRILL JIG FOR 3 HOLES $\phi 4$																																																							
<p>NOTES:-</p> <ol style="list-style-type: none"> MACHINE ALL OVER ∇_{25} ITEM 001 TO BE ZINC PLATED & PASSIVATED WITH A PLATING THICKNESS OF 0.015 TO 0.020 MM. TOLERANCE ON UNTOLERATED DIMENSIONS ARE ± 0.25 MM. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 10T806-970, ALT.3. 																																																									
<table border="1"> <tr> <td>R/WT 0.12 KG.</td> <td>001</td> <td>ADJUSTING PIN $\phi 20 \times 54$</td> <td>IS:2062'92 JIS-G-3101'87</td> <td>KG.</td> <td>0.06</td> </tr> <tr> <td>REMARKS</td> <td>ITEM NO.</td> <td>DESCRIPTION</td> <td>MATL. CODE</td> <td>A/C</td> <td>UNIT WT.</td> </tr> <tr> <td></td> <td></td> <td></td> <td>MATL. SPECN.</td> <td></td> <td>QTY.</td> </tr> </table>										R/WT 0.12 KG.	001	ADJUSTING PIN $\phi 20 \times 54$	IS:2062'92 JIS-G-3101'87	KG.	0.06	REMARKS	ITEM NO.	DESCRIPTION	MATL. CODE	A/C	UNIT WT.				MATL. SPECN.		QTY.																														
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			MATL. SPECN.		QTY.																																																				
<table border="1"> <tr> <td>CARD TYPE 3</td> <td>28</td> <td>28</td> <td>CARD TYPE 1</td> <td>28</td> <td>CARD TYPE 2</td> </tr> <tr> <td colspan="3"> </td> <td colspan="3">BHARAT HEAVY ELECTRICALS LTD. BHOPAL</td> </tr> <tr> <td>DEPT. TME</td> <td>UNTOL. DIMS. GR.</td> <td>SCALE</td> <td>WEIGHT(KG)</td> <td>REF. TO ASSY.DRG.</td> <td>ITEM NO.</td> </tr> <tr> <td>CODE 405</td> <td>DIMS ϕ/M/F</td> <td>NTS</td> <td>0.06</td> <td>1 439 20 60 056</td> <td>003</td> </tr> <tr> <td colspan="3">TITLE</td> <td colspan="3">DRAWING NO.</td> </tr> <tr> <td colspan="3">ADJUSTING PIN</td> <td colspan="3">44392060051</td> </tr> <tr> <td colspan="3">HS15250A, 25 KV AC LOCO</td> <td colspan="3">REV 02</td> </tr> <tr> <td colspan="3"></td> <td colspan="3">SHT.NO 01 NO.OF.SHT. 01</td> </tr> </table>										CARD TYPE 3	28	28	CARD TYPE 1	28	CARD TYPE 2				BHARAT HEAVY ELECTRICALS LTD. BHOPAL			DEPT. TME	UNTOL. DIMS. GR.	SCALE	WEIGHT(KG)	REF. TO ASSY.DRG.	ITEM NO.	CODE 405	DIMS ϕ /M/F	NTS	0.06	1 439 20 60 056	003	TITLE			DRAWING NO.			ADJUSTING PIN			44392060051			HS15250A, 25 KV AC LOCO			REV 02						SHT.NO 01 NO.OF.SHT. 01		
CARD TYPE 3	28	28	CARD TYPE 1	28	CARD TYPE 2																																																				
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CODE 405	DIMS ϕ /M/F	NTS	0.06	1 439 20 60 056	003																																																				
TITLE			DRAWING NO.																																																						
ADJUSTING PIN			44392060051																																																						
HS15250A, 25 KV AC LOCO			REV 02																																																						
			SHT.NO 01 NO.OF.SHT. 01																																																						



A4

INVENTORY NO.	SIGN. & DATE	REF. DRG. NO.
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DETAIL OF ITEM 003

	VAR	ITEM NO.	DESCRIPTION	DRAWING NO.	MATERIAL CODE	UNIT WT.	QTY.	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 x23x54 STAINLESS STEEL STRIP		SUS 304 JIS-G-4304	KG	0.01	
001		002	PLATE 3THK x18x30 STAINLESS STEEL STRIP		SUS 304 JIS-G-4304	KG	0.011	
001		001	BRUSH SPRING 12THK x18x40 STEEL STRIP		SUS 631 CSPV/4H JIS-G-4313	KG	0.120	
59	44	45	76 79 21 29	54	71 31	34	54	72
VARIO	REMARKS	VAR ITEM NO.	DESCRIPTION	DRAWING NO.	JTNO	MATL CD	UNIT	ZONE

		भारत भारी बिजली BHARAT HEAVY ELECTRICALS LTD. BHOPAL	
ORDER NO. 400259208	DATE OF ORDER 11/01/2017	GRADE OF 100% I.T.	DR. NO. 11/01/2017
TITLE 100% I.T.		SCALE NTS	WEIGHT (K.G.) 0.17
DRAWING NO. 1.439.20.60.056	REF. TO ASSY. 1.439.20.60.056	PART NO. C/SB	NAME Sd/-
		CNO. DK	SIGN Sd/-
		S.P.L. 15.09.10	DATE 15.08.10
		Sd/-	NO. OF 01
		ITEM NO. 002	REV. 005

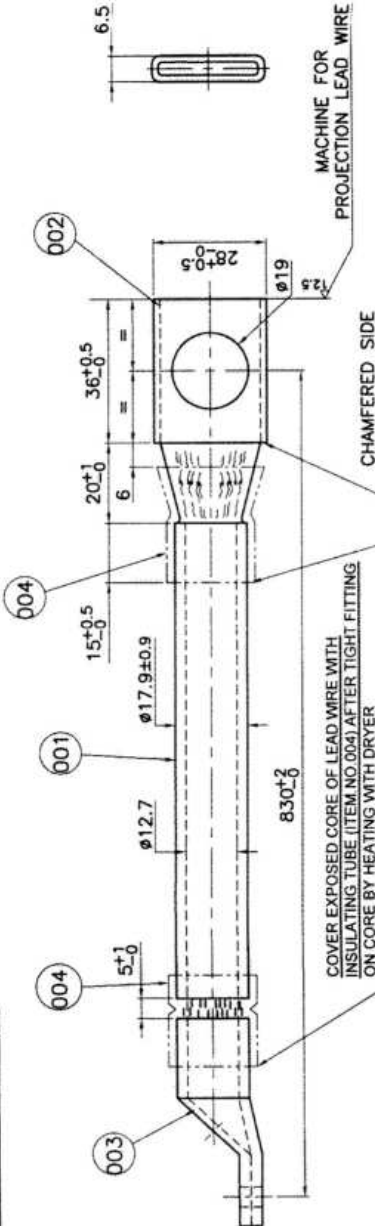
1. a) FOR H515250A MATERIAL FOR ITEM 001 TO BE 1.2THK.X18 TO .JIS-G-4313.81 GR. SUS 631-CPS-3/4HCH
b) FOR M/CS OTHER THAN H515250A ALTERNATE MATERIAL FOR IT.001 MAY BE AS PER AISI-304.
2. NUMBER OF EFFECTIVE TURNS:- 6.5 TURNS & SPACE BETWEEN SPRING TURNS SHOULD BE UNIFORM IN UNLOADED CONDITION.
3. EFFECTIVE LENGTH:- 702.9MM.
4. WHEN THE SPRING IS TUNED 1.75" 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, C=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 IT.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 C=18.00 TO 20.00
b) MECHANICAL PROPERTIES:-
TENSILE STRENGTH=53xgf/mm², ELONGATION=40% MIN. AND HARDNESS=200 MAX. (HV).
10. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLIER 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.



(ALL DIMENSIONS ARE IN mm)

38/2024/HEP-TXM20500
FIRST ANGLE PROJECTION

DRG. NO. 34392060054



- NOTES:-
- CABLE (ITEM NO. 001) SHALL BE 80mm² FLAME - RETARDANT FLUONEX INSULATED WIRE (WFM2)1500V GRADE AS PER RDSO APPROVED HITACHI SPEC. NO. E 0028 BY RDSO APPROVED PART-1(REGULAR) VENDERS.
 - COPPER TUBE CONNECTOR (ITEM NO. 002) AND SOLDERLESS TERMINAL (ITEM NO. -003) SHALL BE CRIMPED WITH (ITEM NO. -001) PREFERABLY BY W-TYPE CRIMPING TOOL FOR (ITEM NO.-003), TO WITHSTAND THE CRIMPING TEST/PULL-OUT STRENGTH TEST SPECIFIED IN NOTE - 4.
 - COPPER TUBE CONNECTOR (ITEM NO. - 002) TO BE TINNED IN TIN SOLDER BATH AFTER DRILLING AND DRESSING.
 - CRIMPING TEST / PULLOUT STRENGTH TEST OF COPPER TUBE CONNECTOR (ITEM NO. - 002) & SOLDERLESS TERMINAL (ITEM NO -003) :
i) THE COMPRESSION JOINT OF CONDUCTOR WITH COPPER TUBE CONNECTOR (ITEM NO. 002) / SOLDERLESS TERMINAL (ITEM NO. - 003) WHEN TESTED IN ACCORDANCE WITH IIS - C 2805-1981 TO ESTABLISH GOOD ELECT. / MECH. CONTACT SHALL WITHSTAND THE PULL OFF LOAD 357 KGS THE JOINT SHALL BE JUDGED TO HAVE FAILED WHEN CONDUCTOR STARTS SLIPPING OUT OF THE COPPER TUBE CONNECTOR (ITEM NO.-002) AND SOLDERLESS TERMINAL (ITEM NO.-003) END. THE LOAD READING AT WHICH SLIPPING OR YIELD OF CONDUCTOR COMMENCES CAN BE RECORDED.
ii) CRIMP JOINT RESISTANCE SHALL NOT EXCEED 5µΩ.
 - THIS DRG. IS EQUIVALENT TO CLW DRG NO 3TWD 095 076 (ALT - 00)

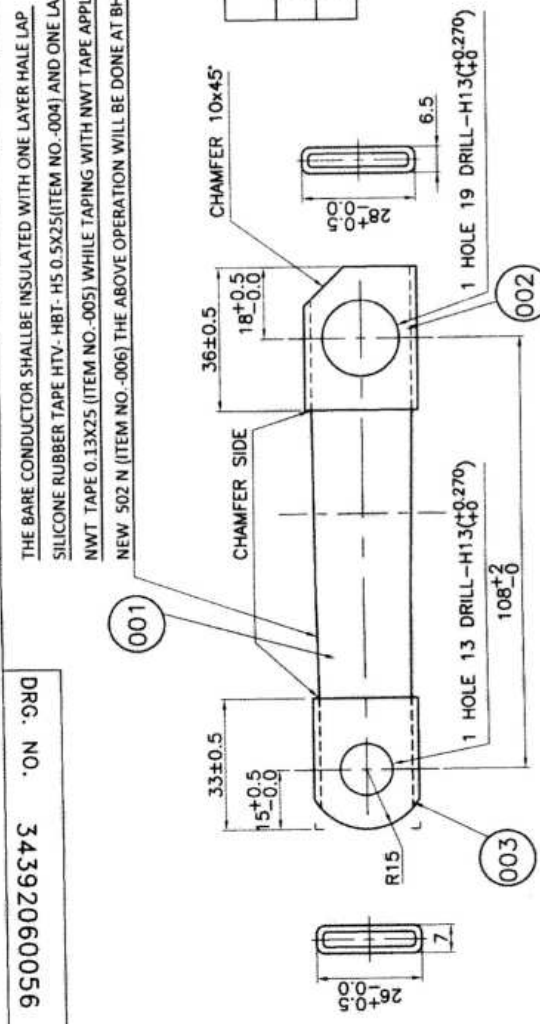
VAR. NO.	VAR. NO.	REMARKS	ITEM NO.	DESCRIPTION	DRAWING NO.	UNIT	QTY.
	004			INSULATING TUBE	TM 88110	Kg	
	003			SOLDERLESS TERMINAL	44393060053	Kg	
	002			COPPER TUBE CONNECTOR	44393060051	Kg	
	001			CABLE 80 mm ²	E0028	Kg	

ADDITIONAL INFORMATION 3 TWD.095.076		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT TRACTION MOTOR HS-15250 A	
STATUS OF DRAWING		NAME SIGN	
DISTRIBUTION OF PRINTS TME - 1 TXM - 3 TNX - 1		DRN ASWINI J.	DATE 20.09.10
REV. DATE		CKD D.K.	VAR. 20.09.10
ALTERED CHECKED APPD.		APPD S.PAL.	ITEM NO. 002
DEPT. T.M.E. CODE 405		WEIGHT(K.G.) REF TO ASSY.DRG. 14392060059	NO. OF ITEM
TITLE LEAD WIRE (80 mm ²)		DRAWING NO. 34392060054	REV. 00
		SHT. NO. 01	NO. OF SHT. 01
		A3 SIZE	

32593/2024/HEP-TXM20500

FIRST ANGLE PROJECTION

950090Z6343 ON DRG



THE BARE CONDUCTOR SHALL BE INSULATED WITH ONE LAYER HALF LAP SILICONE RUBBER TAPE HTV-HBT-HS 0.5X25 (ITEM NO.-004) AND ONE LAYER HALF LAP NWT TAPE 0.13X25 (ITEM NO.-005) WHILE TAPING WITH NWT TAPE APPLY VARNISH NEW 502 N (ITEM NO.-006) THE ABOVE OPERATION WILL BE DONE AT BHEL (SEE NOTE 6)

DETAILS OF TERMINALS ITEM NO. 002 & 003

TERMINAL REF.	LENGTH (L)	OUT SIDE DIA ØD	THICKNESS (T)
ITEM NO.- 2	36	20±0.1	1.6±0.1
ITEM NO.- 3	33	20±0.1	1.6±0.1

MATERIAL - TERMINAL SHALL BE HIGH CONDUCTIVITY ELECTROLYTIC COPPER TUBE TO IS : 2501-B5 GRADE-ETP ANNEALED (O)
COPPER TUBE SHALL BE ELECTRO-TINNED (BRIGHT) TO THICKNESS 0.01mm AFTER CHAMFERING AND DRESSING.

NOTES:-

- UNINSULATED FLEXIBLE ELECTROTINNED ANNEALED HIGH CONDUCTIVITY COPPER WIRES TO IS : 8130-84 THE FLEXIBLE CONDUCTOR SHALL HAVE THE FOLLOWING PARAMETERS
a) DIA OF CONDUCTOR - 12.7 MM
b) CONSTRUCTION OF CONDUCTOR = 19/79/0.26
c) RESISTANCE OF CONDUCTOR = 0.249Ω/KM AT 20°C
- COPPER TUBE TERMINALS (ITEM NO.-002, 003) SHALL BE CRIMPED WITH THE FLEXIBLE CONDUCTOR (ITEM NO.-001) TO WITHSTAND THE CRIMPING TEST / PULL OUT STRENGTH TEST OF COPPER TUBE TERMINAL (ITEM NO.-002)
CRIMPING TEST / PULL OUT STRENGTH TEST OF COPPER TUBE TERMINAL (ITEM NO. 002 & 003) THE COMPRESSION JOINT OF CONDUCTOR WITH COPPER TUBE CONNECTOR (ITEM NO. 002 & 003) WHEN TESTED IN ACCORDANCE WITH JIS: C 2805-1991 TO ESTABLISH GOOD ELECT / MECH. CONTACT SHALL WITHSTAND THE PULL LOAD OF 357 KGS. THE JOINT SHALL BE JUDGED TO HAVE FAILED WHEN CONDUCTOR STARTS SLIPPING OUT OF THE COPPER TUBE TERMINAL (ITEM NO. 002 & 003) END. THE LOAD READING AT WHICH SLIPPING OR YIELD OF CONDUCTOR COMMENCES CAN BE RECORDED.
b) CRIMPED JOINT RESISTANCE, SHALL NOT EXCEED 5μΩ
- SUPPLIER SHALL INDICATE THEIR IDENTIFICATION MARK ON THE COMPONENT.
- THE ELECTRO-TINNED TERMINALS ITEM NO. 002 & 003 ARE TO BE TINNED IN SOLDER BATH AFTER DRILLING, CHAMFERING AND DRESSING.
- HEAT SHRINKABLE RUBBER TUBE (ITEM NO.-007) IS TO BE PROVIDED ON BARE PORTION OF THE CONDUCTOR AT BHEL PROVISION OF HBT TAPE (ITEM NO.-004) NWT TAPE (ITEM NO.-005) AND NEW 502 N VARNISH (ITEM NO. 006) WILL DISCONTINUE.
- THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 3TWD 095 057 (ALT. NO. 7)

VAR NO.	ITEM NO.	DESCRIPTION	DRAWING NO.	UNIT	QTY.
001	007	INSULATING TUBE ST-110 DG 2 X 0.25m		TM 88110	
001	006	VARNISH - HEW 502 N		TM 88076	
001	005	POLYAMIDE WOVEN TAPE (NWT - 0.13X25X 05M)		TM 10444	
001	004	SILICONE RUBBER TAPE (HTV-HBT-HS-0.5 X 25 X 0.3M)		TM 10443	
001	003	TERMINAL		SEE DETAILS OF TERMINAL	
001	002	TERMINAL		SEE DETAILS OF TERMINAL	
001	001	FLEXIBLE ELECTRO-TINNED COPPER CONDUCTOR 80 mm ²		SEE DETAILS OF TERMINAL	

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT
TRACTION MOTOR
HS-15250 A

BHARAT HEAVY ELECTRICALS LTD. BHOPAL		NAME	ASWINI J.	SIGN	DATE	NO. OF VAR.
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		DRN	D.K.		20.09.10	01
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		CKD	S.P.A.L.		20.09.10	01
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		APPD	S.P.A.L.		20.09.10	01
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		WEIGHT(K.G.)	REF. TO ASSY.DRG.	14392060059	ITEM NO.	004
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		SCALE	NTS		NO. OF ITEM	007
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		TITLE	DRAWING NO. 34392060056			
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		REV.	01			

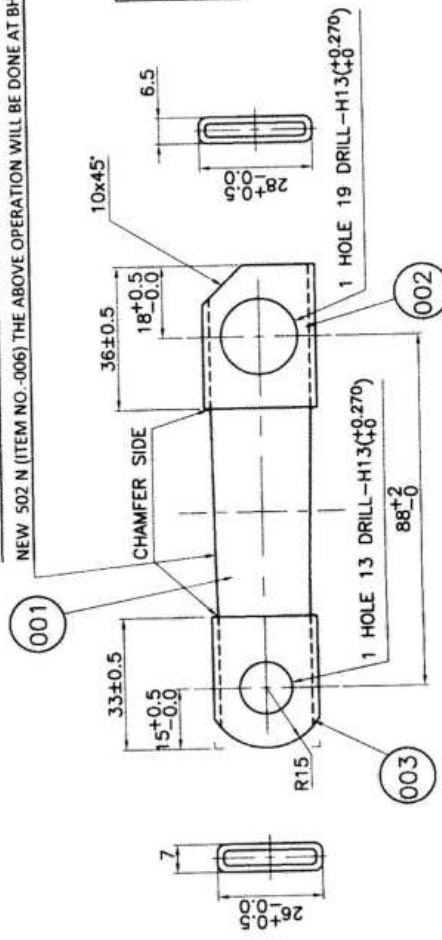
A3 SIZE

(ALL DIMENSIONS ARE IN mm)

FIRST ANGLE PROJECTION

DRG. NO. 34392060057

THE BARE CONDUCTOR SHALL BE INSULATED WITH ONE LAYER HALF LAP SILICONE RUBBER TAPE HTV-HBT-H5 0.5X25 (ITEM NO.-004) AND ONE LAYER HALF LAP NWT TAPE 0.13X25 (ITEM NO.-005) WHILE TAPING WITH NWT TAPE APPLY VARNISH NEW 502 N (ITEM NO.-006) THE ABOVE OPERATION WILL BE DONE AT BHEL (SEE NOTE.6)



DETAILS OF TERMINALS ITEM NO. 002 & 003

TERMINAL REF.	LENGTH (L)	OUT SIDE DIA ØD	THICKNESS (T)
ITEM NO.- 2	36	20±0.1	1.6±0.1
ITEM NO.- 3	33	20±0.1	1.6±0.1

MATERIAL - TERMINAL SHALL BE HIGH CONDUCTIVITY ELECTROLYTIC COPPER TUBE TO IS : 2801-85 GRADE ETP ANNEALED (O).
COPPER TUBE SHALL BE ELECTRO-TINNED (BRIGHT) TO THICKNESS 0.01mm AFTER CHAMFERING AND DRESSING.

NOTES:-

- UNINSULATED FLEXIBLE ELECTROTINNED ANNEALED HIGH CONDUCTIVITY COPPER WIRES TO IS : 8130-84 THE FLEXIBLE CONDUCTOR SHALL HAVE THE FOLLOWING PARAMETERS
a) DIA OF CONDUCTOR - 12.7 MM
b) CONSTRUCTION OF CONDUCTOR = 19/79/0.26
c) RESISTANCE OF CONDUCTOR = 0.2490/KM AT 20°C
- COPPER TUBE TERMINALS (ITEM NO.-002 & 003) SHALL BE CRIMPED WITH THE FLEXIBLE CONDUCTOR (ITEM NO.-001) TO WITHSTAND THE CRIMPING TEST / PULL OUT STRENGTH TEST OF COPPER TUBE TERMINAL (ITEM NO. 2(a) & 2(b))
TEST SPECIFIED IN NOTE NO. 2(a) & 2(b)
CRIMPING TEST / PULL OUT STRENGTH TEST OF CONDUCTOR WITH COPPER TUBE CONNECTOR (ITEM NO 002 & 003)
a) THE COMPRESSION JOINT OF CONDUCTOR WITH COPPER TUBE CONNECTOR SHALL BE CRIMPED IN ACCORDANCE WITH JIS. C 2805-1991 TO ESTABLISH GOOD ELECT / MECH. CONTACT SHALL WITHSTAND THE PULL LOAD OF 357 KGS. THE JOINT SHALL BE JUDGED TO HAVE FAILED WHEN CONDUCTOR STARTS SLIPPING OUT OF THE COPPER TUBE TERMINAL (ITEM NO. 002 & 003) END. THE LOAD READING AT WHICH SLIPPING OR YIELD OF CONDUCTOR COMMENCES CAN BE RECORDED.
b) CRIMPED JOINT RESISTANCE. SHALL NOT EXCEED 5µΩ
- SUPPLIER SHALL INDICATE THEIR IDENTIFICATION MARK ON THE COMPONENT.
- THE ELECTRO-TINNED TERMINALS ITEM NO.002 & 003 ARE TO BE TINNED IN SOLDER BATH AFTER DRILLING, CHAMFERING AND DRESSING.
- HEAT SHRINKABLE RUBBER TUBE (ITEM NO.-007) IS TO BE PROVIDED ON BARE PORTION OF THE CONDUCTOR AT BHEL PROVISION OF HBT TAPE (ITEM NO.-004) NWT TAPE (ITEM NO.-005) AND NEW 502 N VARNISH (ITEM NO. 006) WILL DISCONTINUE
- THIS DRG IS EQUIVALENT TO CLW DRG. NO. 3TMD.065.058 (ALT. NO. 7)

VAR	NO	ITEM NO	DESCRIPTION	DRG NO.	UNIT	WT.	QTY.	ZONE
001		001	SEE NOTE-1					
002		002	TERMINAL					
003		003	TERMINAL					
004		004	SILICONE RUBBER TAPE (HTV-HBT-H5-0.5 X 25 X 0.18M)					
005		005	POLYAMIDE WOVEN TAPE (NWT -0.13X25X0.3M)					
006		006	VARNISH - NEW 502 N					
007		007	INSULATING TUBE ST-110 DG (2.0 X 0.25 M)					

ADDITIONAL INFORMATION
3 TMD.095.058 (ALT.NO.7)

STATUS OF DRAWING

DISTRIBUTION OF PRINTS
TME- 1 TXM- 3
TNX- 1

REV.	DATE	ALTERED	CHECKED	APPRO.
01	18-10-2010			

DRG. UPDATED.

TRACTION MOTOR
HS-15250 A

NAME ASWINI J.
SIGN D.K.
DRN CKD
APPD S.PAL.

DEPT. T.M.E.
CODE 405
SCALE NTS
WEIGHT(K.G.)
REF. TO ASSY.DRG. 14392060059

TITLE
LEAD WIRE
(80 mm²)

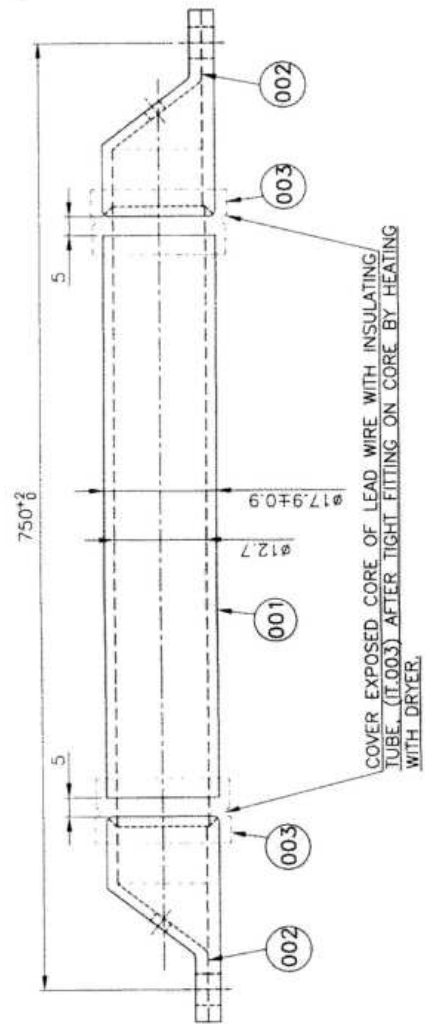
DRAWING NO. 34392060057
REV. 01
SHT. NO. 01 NO. OF SHT. 01

A3 SIZE

(ALL DIMENSIONS ARE IN mm)

FIRST ANGLE PROJECTION

DRG. NO. 3 439 20 60 059



NOTES:-

- 1. CABLE (IT.001) SHALL BE 80mm² FLAME RETARDANT FLUONLEX INSULATED WIRE (WFM2) TO 1500V GRADE AS RDSO APPROVED HITACHI SPECN. NO. E0028 BY RDSO APPROVED PART-1 (REGULAR) VENDORS.
- 2. SOLDERLESS TERMINALS (IT.002) SHALL BE CRIMPED WITH CABLE (IT.001), PREFERABLY BY W-TYPE CRIMPING TOOL, TO WITHSTAND THE CRIMPING TEST/PULL-OUT STRENGTH TEST SPECIFIED IN NOTE-3.
- 3. CRIMPING TEST/PULL OUT STRENGTH TEST OF SOLDERLESS TERMINAL (IT.002), i) THE COMPRESSION JOINT OF CONDUCTOR WITH SOLDERLESS TERMINAL (IT.002), WHEN TESTED IN ACCORDANCE WITH JIS-C2805-1991 TO ESTABLISH GOOD ELECT./MECH. CONTACT SHALL WITHSTAND THE PULL OFF LOAD 357 KGS. THE JOINT SHALL BE JUDGED TO HAVE FAILED WHEN CONDUCTOR STARTS SLIPPING OUT OF THE SOLDERLESS TERMINALS (IT.002) END. THE LOAD READING AT WHICH SLIPPING OR YIELD OF CONDUCTOR COMMENCES CAN BE RECORDED.
- ii) CRIMP JOINT RESISTANCE SHALL NOT EXCEED 5μΩ.
- 4. THIS DRAWING IS SIMILAR TO CLW'S DRG. NO. 3.TWD.095.078, ALT.0

QTY VAR 00	REMARKS	VAR. NO.	ITEM NO.	DESCRIPTION	DRAWING NO.	VAR.	IT. NO.	MATL. CODE	MATL. SPCN.	UNIT	QTY.
002			003	INSULATING TUBE					TM 88110		
002			002	SOLDERLESS TERMINAL	44393060053						
001			001	CABLE 80mm ² X 710					E0028		
59	64 65	75 76 79 25	27 29			77	29	31 34	45	55 56 57	65 72
							32	33 46	54	58	71
											73

TRACTION MOTOR

HS:15250A

TYPE OF PRODUCT OR

NAME OF CUSTOMER/PROJECT



BHARAT HEAVY ELECTRICALS LTD.
BHO PAL

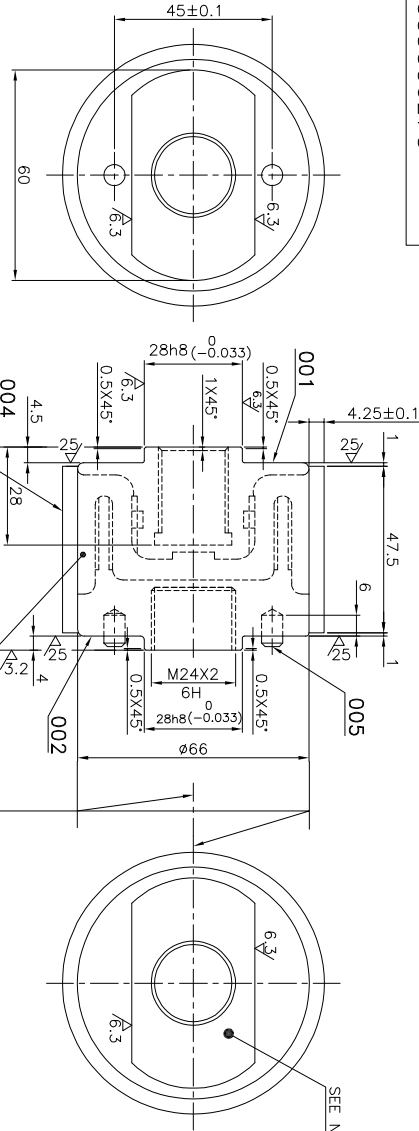
DRN.	S.D.	NAME	SIGN	DATE	NO. OF VAR.
CHD.	D.K.			20/09/10	01
APPD.	SPAL			20/09/10	01

REF. TO ASSY. DRG.	WEIGHT (K.G.)	SCALE	UNTOOL. DIMS. GR.	DEPT. TIME	NO. OF ITEM
1 439 20 60 059	010	NTS		405	003
DRAWING NO.					REV.
3 439 20 60 059					01
SHT. NO.	01				NO. OF SHT.
					01

LEAD WIRE
(80 mm²)

SIZE A3

6500902627 ON 3RD

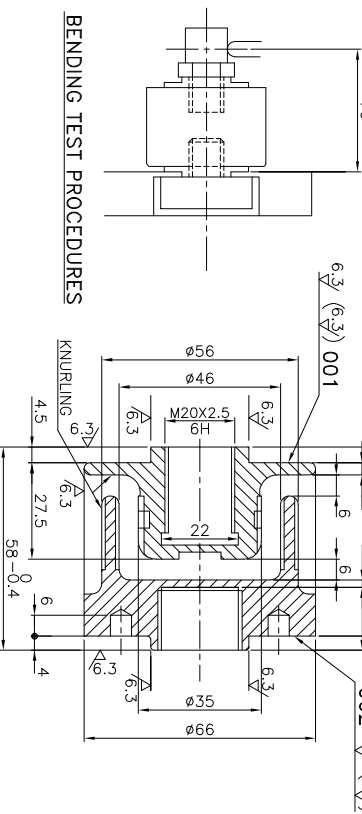


TOLERANCE OF CONCENTRICITY ON STEEL FITTINGS, REF. 001 & 002 SHALL BE 0.05 MM (MAX.)

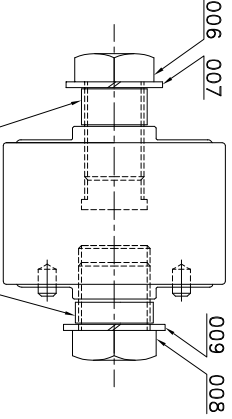
NOTES:-

1. DIMENSION OF TEFロン SLEEVE IT.004 BEFORE ASSY. O/D=73mm AND I/D=64.5mm HEAT THE SLEEVE AT 250°C TO 280°C FOR ASSY.
2. THE INSULATOR (SPECIALY THE BINDER) SHALL BE SUITABLE FOR CONTINUOUS WORKING TEMPERATURE OF 150°C & ALSO OCCASIONAL OVER HEATING AT 200°C FOR LONG DURATION FOR 16 TO 24 HOURS WITHOUT LOSS OF PROPERTIES. THEY SHOULD ALSO COMPLY WITH THE MECHANICAL & ELECTRICAL REQUIREMENTS MENTIONED BELOW.
3. TOLERANCE ± 0.2 WHERE NOT SPECIFIED.
4. ACCEPTANCE TESTS:-
 - a- ULTIMATE TENSION NOT LESS THAN 6000 KGS. (TYPE TEST FOR EACH LOT)
 - b- ROUTINE TENSILE TEST 2500 KGS.
 - c- BENDING STRENGTH TEST SHOULD BE MORE THAN 1000KGS/70mm.
 - d- TORSIONAL STRENGTH SHOULD BE MORE THAN 40KGf-m (AT FRACTURE)
 - e- COMPRESSIVE STRENGTH SHOULD BE MORE THAN 7000 KGS.
 - f- INSULATION RESISTANCE SHOULD BE MORE THAN 2000 MEGA-OHM.
 - g- ALL INSULATORS SHOULD WITH STAND 15KV 50 Hz FOR ONE MINUTE IN AIR.
 - h- ONE NO. INSULATOR FROM EACH LOT SHALL WITH STAND 32KV. 50 Hz FOR ONE MINUTE IN OIL.
 - i- ALL SHARP CORNERS ARE TO BE ROUNDED OFF.
 - j- PARALLELISM OF DIMENSION 28hx4.5mm OF IT.002 WITH RESPECT TO DIMENSION 28hx4.5mm OF IT.001 SHALL NOT EXCEED 0.05mm.
5. THE PLASTIC SLEEVES ARE TO BE INSERTED ON TO THE BOLT TO PREVENT RATTLEING OF SPRING WASHERS.
6. FIRST THE INSULATOR IS TO BE COVERED WITH CORRUGATED PAPER INDIVIDUALLY AND THEN 6 NOS. OF SUCH INSULATORS PER MOTOR SET OF MATERIAL ARE TO BE KEPT IN A HARD PAPER BOX AND SUCH BOXES ARE TO BE KEPT IN A WOODEN CRATE.
7. MANUFACTURER TO PROVIDE THEIR METAL PUNCH/EMBOS IDENTIFICATION MARK AT THE LOCATION SHOWN.
8. IT.007 & 009 ARE TO BE SUPPLIED OF BRAND 'BBB' OF M/S FORBES GO KAK LTD./MUMBAI ONLY.
9. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 21WD-095-052ALT-9.

BENDING TEST PROCEDURES



DETAIL OF INSERT



PLASTIC SLEEVE (SEE NOTE-5)

NO.	REV.	DATE	ALTERED	DESCRIPTION	BY	CHKD.	DATE	NO. OF
001				SPRING WASHER B24				32
001				HEX. HD. SCREW SIZE M24X30X2 PITCH-69				
001				SPRING WASHER B-20				
001				HEX. HD. SCREW SIZE M20X45L.25 PITCH-69				
002				DOWEL PIN STL. COLD DRAWN BAR 6X10				
001				PTFE SLEEVE				
001				INSULATION				
001				ROD (INSERT) 66X45.0 SL. STEEL				
001				ROD (INSERT) 66X33 SL. STEEL				
VAR01				REMARKS				

ADDITIONAL INFORMATION
SKBL 4440 CLW2 TWD 095-052

STATUS OF DRAWING
DISTRIBUTION OF PRINTS

TYPE OF PRODUCT OR
NAME OF CUSTOMER/PROJECT

HS 15250 A
25 KV AC LOCO

BRHAT HEVY ELECTRICALS LTD.
BHOPAL

DATE
DIM. C/M/F

NO. OF

INSULATING ROD
(FOR MODIFIED BRUSH HOLDER)

24392060059
02

NO. OF

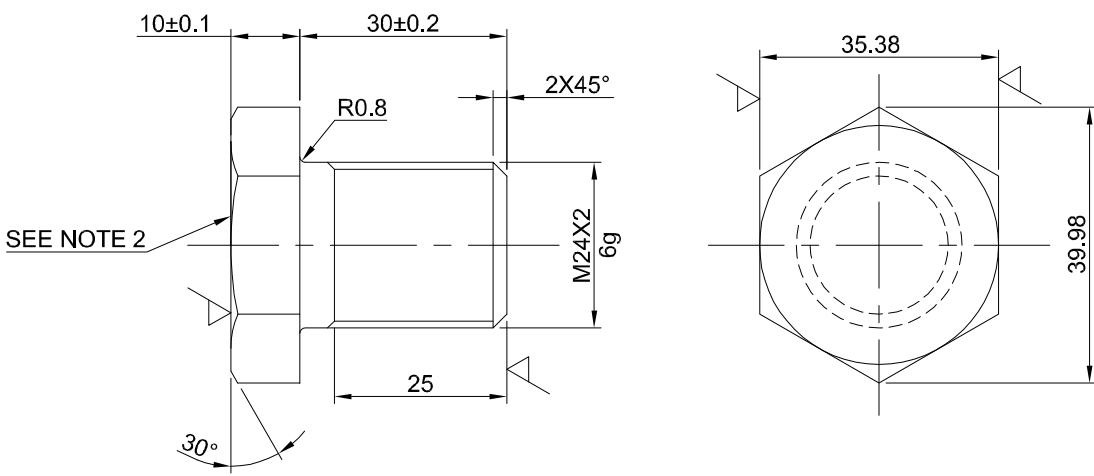
DATE
DIM. C/M/F

NO. OF


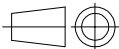
NO. OF

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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	
01	28.10.15	CHECKED			CHECKED		
		APPROVED			APPROVED		
DRAWING DIGITIZED & UPDATED.						STATUS OF DRAWING	
						M	
						DISTRIBUTION OF PRINTS	TME-1 TNX-1
						TXM-4	

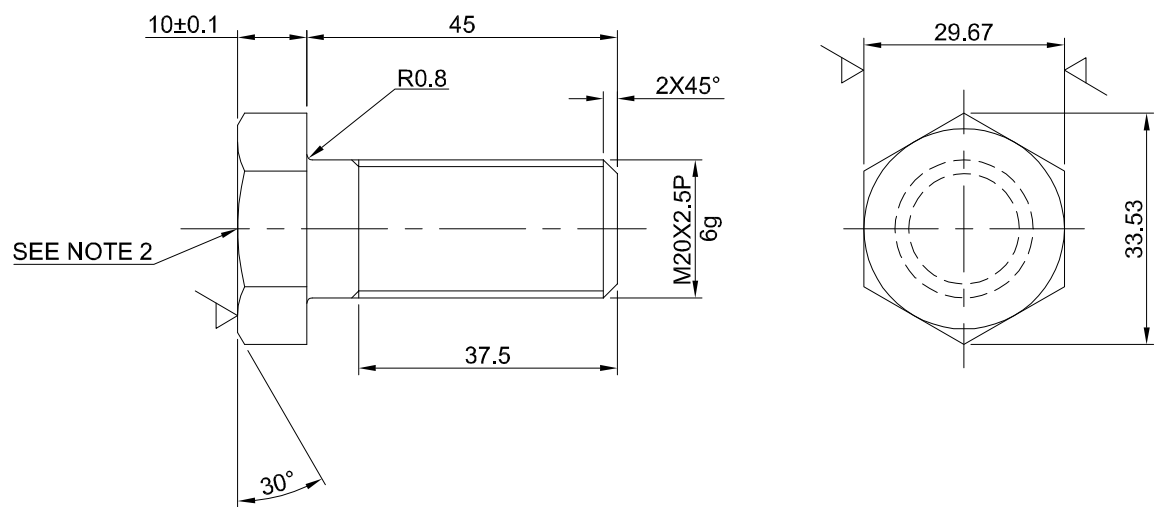


- NOTES:-
- 1. THIS IS TO BE ZINC PLATED.
 - 2. MANUFACTURER TO PROVIDE THEIR METAL PUNCH / IDENTIFICATION MARK AT THE LOCATION SHOWN.
 - 3. THIS DRG. IS EQUIVALENT TO CLW DRG. NO. 4TWD095-086 ALT-2


REF. DRG. NO.																				
	IS 1364 PART-2					001		HEX. SCREW M24 X 30 P8.8					STEEL IS:1364 (PART-2) 92, ISO4017'88, GRADE:8.86g			KG	0.30			
	REMARKS					ITEM NO.		DESCRIPTION					STD	MATL. CODE		A · C	UNIT	UNIT WT.		
SIGN. & DATE														MATL. SPCN.				QTY.		
	28 → CARD TYPE-3					28 → CARD TYPE-1					28 → CARD TYPE-2									
	<div><div><div>बीएचईएल</div><div></div></div><div>BHARAT HEAVY ELECTRICALS LTD. BHOPAL</div></div>											NAME	SIGN	DATE	NO. OF VAR.					
INVENTORY NO.	DEPT	GRADE OF UNTOL.DIM.						SCALE	WEIGHT (K.G.)		REF. TO ASSY. DRG.			ITEM NO.	NO. OF ITEM					
	TME	Ø / M / F						NTS	0.30		0 439 20 60 051			008	001					
	CODE	AA0230208																		
TITLE										DRAWING NO.					REV.					
SCREW (FOR MODIFIED BRUSH HOLDER) HS15250A										4 439 20 60 067					01					
										SHT. No.		01		NO. OF SHT.		01				

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




- 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.	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		STD	MATL. CODE	A - C	UNIT WT.	
							MATL. SPCN.		QTY.	
SIGN. & DATE	28 → CARD TYPE-3		28 → CARD TYPE-1		28 → CARD TYPE-2					
	 BHARAT HEAVY ELECTRICALS LTD. BHOPAL					DRN	CKSB	-SD-	16.09.10	NO. OF VAR.
						CKD	D.K.	-SD-	18.09.10	
						APPD	S.PAL	-SD-	18.09.10	
INVENTORY NO.	DEPT	GRADE OF UNTOL.DIM.	SCALE		WEIGHT (K.G.)	REF. TO ASSY. DRG.		ITEM NO.	NO. OF ITEM	
	TME	Ø / M / F	NTS		0.25	1 439 20 60 056		009	001	
	CODE	AA0230208								
TITLE						DRAWING NO.			REV.	
HEX. HEAD SCREW (MODIFIED BRUSH HOLDER ASSY.) HS15250A 34						4 439 20 60 068			01	
						SHT. No. 01		NO. OF SHT. 01		

332593/2024/HEP-TXM20500

		PRODUCT STANDARD TME DIVISION, BHOPAL		TM 10896	
				PAGE 01 OF 04	
TME 2011					
<p align="center"><u>SPECIFICATION FOR ROCKER ASSEMBLY (COMPLETE) FOR HS15250A</u></p>					
<p>1.0 Scope</p> <p>1.1 This specification covers the manufacturing, testing, Inspection, packing of Rocker Assembly (Complete) as per BHEL drawing no. 04392060051(latest revision) equivalent to CLW drawing no. 10Q750-249 (latest revision) for HS15250A TM.</p>					
<p>2.0 Drawing and specification for sourcing of assembly components/material for manufacture of Rocker Assly. (Complete) are as follows:</p>					
<p align="center">COPYRIGHT AND CONFIDENTIAL</p> <p>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</p>	Sl. No.	Drg./Specn. No.	Equivalent CLW drawing/ specification	Description	
	1.	14392060058	10Q750-317	Rocker ring	
	2	24392060058	10R823-314	Cleat arrangement for rocker Ring	
	3	44392060058	4TWD 095-088	Cleat for rocker	
	4	44392060056	10T835-014	Handle	
	5	24392060060	2TWD-095-007	Insulating Rod	
	6	44392060067	4TWD095086	Hex head screw M24x30	
	7	44392060068	4TWD095087	Hex head screw M20x45	
	8	14392060056	2TWD095-090	Brush Holder Assembly	
	9	14392060057	3TWD095-091	Brush Holder Case	
	10	24392060057	10S773-713	Brush Spring	
	11	44392060051	10T806-970	Adjusting pin	
	12	44392060052	4TWD-095-252	Spacer	
	13	44392060053	10T806-972	Spring Support	
	14	34392060061	4TWD-095-085	Serrated Washer	
	15	44392060055	10T806-977	Special washer	
	16	44392060054	10T806-973	Spring Support	
	17	34392060060	3TWD-095-092	Arching stud fixing bracket and arching stud	
	18	24392060059	2TWD-095-052	Insulating Rod	
	19	14392060059	10Q750-320	Connector Assembly	
	20	34392060053	3TWD095-075	Lead Wire	
	21	34392060054	3TWD095-076	Lead Wire	
	22	34392060055	3TWD095-077	Lead Wire	
	23	34392060056	3TWD095-057	Lead Wire	
	24	34392060057	3TWD095-058	Lead Wire	
	25	34392060059	3TWD095-078	Lead Wire	
	26	44393060053	4TWD095-082	Solderless terminal	
	27	44393060051	4TWD095-080	Copper Tube Connector	
	28	TM88076	A0108	Varnish HEW 502 N	
	29	TM88089	A0178	Polyamide non-woven mat	
	30	TM10444	A0248	Polyamide woven tape	
	31	TM10420	4TMS.095.016	Glass tape	
32	TM88110	A0251	Heat shrinkable silicon rubber tube		
Revision: 00 Date: 28.08.13	Distribution	Qty.	Approved:  (S.P. SINGH) Sr.DGM/TME		
Revision: 01 Date: 25.09.18	TME TXM TNX QMX	1 1 1 2	Prepared:  Shishu pal Dy.Mgr./TME		Checked:  V. Rawtiya Sr.Mgr./TME
			Date: 25.09.18		


332593/2024/HEP-TXM20500

	 <p style="text-align: center;">PRODUCT STANDARD TME DIVISION, BHOPAL</p> <p>TME 2011</p>	<p style="text-align: center;">TM 10896</p> <p style="text-align: center;">PAGE 02 OF 04</p>										
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">COPYRIGHT AND CONFIDENTIAL</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">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.</p>	<p>2.1 Source of Raw material:</p> <p>Suppliers will have to purchase the above-mentioned components/ material from approved source of CLW. If vendor want to use assembly components/material from other then CLW approved sources, in such cases prior permission from CLW is mandatorily required and to be submitted along with technical offer. Supplier should provide documental evidence of purchase of assembly components to BHEL during execution of PO.</p> <p>3.0 Important M & P requirements for assembly of Rocker:</p> <ol style="list-style-type: none"> (1) Baking oven – Having Auto cut in & cut off facility Max temperature up to 300°C. (2) Rocker Assembly and Brush Holder alignment fixture. (3) Brush Holder spring pressure measurement. (4) Brush holder pocket GO-NO GO gauge. (5) 500V and 1000 V Megger for IR measurement. (6) HV testing facility up to 35 KV. (7) Torque wrench more than 3500 Kg-m range. (8) Hot blower for heat shrinking of silicon rubber tube. <p>4.0 Procedure for Rocker Assembly:</p> <p>4.1 Check the dimensions, shapes, physical condition of following parts before start of assembly.</p> <table border="1" data-bbox="586 1079 958 1232"> <tr><td>1</td><td>Rocker ring</td></tr> <tr><td>2</td><td>Lead wires</td></tr> <tr><td>3</td><td>Brush Holder Assemblies</td></tr> <tr><td>4</td><td>Insulation rods</td></tr> <tr><td>5</td><td>Cleat arrangement</td></tr> </table> <p>4.2 Confirm the parts are free from rust, flaws etc.</p> <p>4.3 Place the rocker on alignment fixture with the carbon brush holder side down.</p> <p>4.4 Install insulation rods for brush holders with M24x30 screws with help of torque wrench at 3500 Kg-m.</p> <p>4.5 Install insulation rods -ve & +ve with lock tight.</p> <p>4.6 Install insulation brush holders with M20x45 screws temporarily.</p> <p>4.7 Align face to face brush holder with suitable alignment jig.</p> <p>4.8 Tight all the six M20x45 screws with help of torque wrench at 2000 Kg-m.</p> <p>4.9 Brush holders to be perfectly align. Pitch error of the six brush holders must not be more than 0.3 mm. Watching error of each brush holder must be within 0.3 mm max. Watching error of six brush holders must be within 0.5 mm max.</p>		1	Rocker ring	2	Lead wires	3	Brush Holder Assemblies	4	Insulation rods	5	Cleat arrangement
	1	Rocker ring										
2	Lead wires											
3	Brush Holder Assemblies											
4	Insulation rods											
5	Cleat arrangement											

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TME 2011			
COPYRIGHT AND CONFIDENTIAL 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	6.0 INSPECTION CLAUSE :		
	6.1 Dimensional measurement and testing should be as per drawing 04392060051 & specification TM10896.		
		6.2 The final acceptance of rocker assembly shall be based on inspection at BHEL.	
		6.3 Supplier to submit dimensional reports and test report of the entire tests as mentioned in clause 5.	
		7.0 PACKING :	
		Supplier shall ensure that components should not get damaged in transit and transport by suitable packing. Each Rocker Assembly to be wrapped in waterproof packing followed by suitable packing in which rocker assembly to be duly fixed and tightened to avoid damage and deformation during transit. Supplier's identification mark and serial number to be punched on the rocker assembly for proper identification.	
		Note:	
		1. Latest Alteration of all Drawings / Specifications is to be used.	
		2. In case of any discrepancy in BHEL drawing viz-a viz CLW drawing, equivalent CLW Drawings / Specifications to be referred.	

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CORPORATE STANDARD

AA0673603

Rev. No. 04

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PROCESS FOR ELECTROPLATING OF ZINC ON STEEL SURFACES FROM CYANIDE BATH

1 GENERAL

This standard details the process for high-speed bright zinc plating on steel surfaces from cyanide zinc solution bath by tank or barrel to provide protection against corrosion and to give a bright attractive finish to the surface.

2 APPLICATION

Used for components like fasteners, nuts, bolts, electronic panels etc. This process is not suitable for plating on cast iron surfaces.

3 COMPLIANCE WITH NATIONAL STANDARDS

This Standard has reference to the following Indian Standards regarding surface condition and quality of deposit.

IS 1340 : 1977 : Code of Practice for chromate conversion coating on Zinc and Cadmium coated articles and zinc base alloys.

IS 1573 : 1986 : Electroplated coatings of Zinc on Iron and Steel.

IS 3203 : 1982: Methods of Testing Local Thickness of Electroplated Coatings.

IS 9844 : 1981: Method of testing of corrosion resistance of Electroplated and Anodized Aluminium coatings by neutral salt spray test.

4 MATERIALS

Material	CPS No./IS No./Available from
Sodium cyanide for electroplating	AA55610
Caustic Soda (Tech.)	AA54201
Nitric Acid (Tech.)	AA54102
Zinc Anodes (99.98% Purity, Min.) (Grade 1)	IS 2605
Bright Zinc Salts	M/s. Ronuk Industries Ltd, Mumbai
Zinc Brightener Zn-21	
Zinc Brightener Zn-22	
Zinc Purifier	
Zinc Brite 16 Salt	
Zinc Brite 20 Brightener	M/s. Grauer & Weil (I) Ltd., Mumbai
Monicol Purifier	
Zinek Salt - 501	
Super Zinc Brightener – 505	M/s. Platewel Processes & Chemicals Ltd., Vadodara
Supra Zinc Brightener 555	
Zincad Purifier - 503	
Teknobrite CZ 920 Salt	M/s. Artek Surfin Chemicals (P) Ltd., Mumbai

Revisions: As per clause 28.16.6 of MOM of 28th MRC (CPO)

APPROVED:
INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC (CPO&NM)

Rev. No. 04

Amd. No. 02

Reaffirmed

Prepared
HEP, BhopalIssued
Corp. R&DDt. of 1st Issue
01-01-1985

Dt: 15-10-2000

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Year: 2021 39

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Teknobrite CZ 920 Brightener	M/s. Artek Surfin Chemicals (P) Ltd., Mumbai
Purisol	

5 EQUIPMENT

5.1 Plating Tank / Vat

The Tank/vat shall be made of plain welded steel sheets with rubber lining. The vat shall be provided with an insulated frame on top fitted with insulators for holding the anode and cathode rods. The tank shall also be provided with exhaust system.

5.2 Barrel

The plating barrel shall be constructed out of polypropylene perspex and shall be so driven as to rotate at 5 to 12 rpm.

5.3 Rinsing Tanks

Mild steel tank lined with rubber / FRP / PVC.

5.4 Hot Water Rinsing Tank (Optional)

Mild steel tank with rubber / FRP lining and heating arrangements.

6 COMPOSITION OF ELECTROLYTE AND OPERATING INSTRUCTIONS

6.1 Composition of Electrolyte (Bath Solution) and Operating Conditions

The electrolyte shall be prepared according to any one of the following compositions and operated at the conditions specified below:

	Parameter	Composition			
		I RONUK	II G&W	III PLATEWEL	IV ARTEK SURFIN
Sl. No.	Name of salt	Bright Zinc	Zinek. Brite	Zinek 501	Tekno Brite CZ 920
	Salt Content				
	For vat	180-200	200	200	200
	For barrel	200-220	200	200	200
1	Zinc Brightener Zn-21, ml/l	1.5	---	---	---
2	Zinc Brightener Zn-22, ml/l	2.5	---	---	---
3	Super zinc	---	---	6-8	---
	Brightner-505, ml/l	---	---	3-5	---
4	Supra Zinc				
	Brightener 555, ml/l	---	3-5	---	---
5	Zinc Brite 20				
	Brightener, ml/l	---	3-5	---	---
6	Tekno Brite CZ 920 Brightener	---	---	---	2-4
7	Monicol Purifier, ml/l	---	5	---	---
8	Zincad Purifier-503, ml/l	---	---	5	---
9	Purisol, ml/l	---	---	---	4
10	Temperature	Room-55	20-45	25-55	20-45
11	Anode to Cathode Ratio	1:1	1:1	1:1	1:1
12	Current density, A/dm ²				
	a) For vat	1.5-4.5	2-5	2-5	2-5
	b) For barrel	1.5-4.5	40 0.5-2	0.5-2	0.5-2

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13	Voltage, (Volts)				
	a) For vat	6-8	2-6	3-6	2-5
	b) For barrel	12-15	10-15	12-16	10-15

6.2 Preparation of Electrolyte

6.2.1 The vat/barrel shall be filled with water, preferably with demineralised water, to about two-thirds of its capacity.

6.2.2 The required amount of salt shall be added to the bath in small quantities with stirring.

6.2.3 The temperature of the solution should not raise beyond 70°C.

6.2.4 Stirring shall be continued until all the salts get dissolved.

6.2.5 The solution shall then be brought upto the working level by adding cold demineralised water. At this stage the temperature of the bath shall be at the working range.

6.2.6 The requisite amount of purifier shall now be added to the solution and stirred thoroughly. If necessary, filtration at this stage shall be carried out. Then requisite amount of brightener shall be added.

6.3 Analysis of the Electrolyte

The solution shall be analysed initially after make up and subsequently at suitable intervals.

6.4 Maintenance of the Electrolyte

6.4.1 The concentration of the electrolyte shall be maintained as below:

Parameter	Composition			
	I	II	III	IV
	RONUK	G&W	Platewel	ARTEK
Zinc as metal, g/l	33-40	30-40	30-34	30-40
Total Sodium Cyanide, g/l	90-105	75-140	80-90	75-140
Total Sodium Hydroxide, g/l	75-93	65-85	70-80	65-85
Sodium Cyanide to Zinc ratio	2,5-3:1	2,5-3,5:1	2,7-3,2:1	2,5-3,5:1

6.4.2 Addition of Brighteners

Brightness of the deposit shall be maintained by adding brighteners for every 1000 ampere-hours as shown below:

Brightener	Composition			
	I	II	III	IV
	RONUK	G&W	PLATEWEL	ARTEK
Brightener Zn-21, ml	60	---	---	---
Brightener Zn-22, ml	100	---	---	---
Zinc Brite 20 Brightener:				
i) For vat, ml	---	100-150	---	---
ii) For barrel, ml	---	150-200	---	---
Super Zinc Brightner-505:				
i) For vat, ml	---	---	150	---
ii) For barrel, ml	---	---	200	---
Supra Zinc Brightener – 555	---	---	100	---
Teknobrite CZ 920 Brightener	---	---	---	100-250

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Brighteners may be added directly into the bath and stirred well. Excess of brightner must be avoided.

6.4.3 Bath shall be analyzed periodically and if the values do not lie in the limits as given in 6.3.1, required chemicals shall be added to the bath to bring the composition to the required level.

6.4.4 Purification of Electrolyte:

The electrolyte shall be filtered at least once in a week or as required addition of 0.25 ml of zinc purifier per litre of solution for Composition-I, 0.1 to 0.2 ml of Monicol per litre for Composition-II and 0.1 to 0.2 ml of Zincad-503 purifier for Composition-III shall be made daily and stirred well to eliminate impurities in the solution and also to settle before resuming the work.

7 PROCESS:

7.1 Cleaning

All articles shall be properly cleaned as described in BHEL Standard AA0673601: Process for cleaning and preparation of metal surfaces prior to electroplating or BP0673693: Electroplating of zinc on steel surface from Acid bath.

7.2 Rinsing

All articles shall be rinsed thoroughly after cleaning to avoid contamination of the plating solution.

7.3 Plating

It shall be ensured that the current is on before the articles are put into barrel or tank.

All articles shall be plated at the specified current density for a duration, which will depend on the thickness of the deposit required.

7.4 Cold Rinsing

After removal from the plating bath, all articles shall be rinsed thoroughly in cold running water till all the traces of solution are removed.

7.5 Drying

The rinsed articles shall be dried using a centrifugal drier or hot air blower /hot air oven.

8 HEAT TREATMENT: (Whenever required)

Note : Steels of tensile strength of 100 kgf/mm² or corresponding hardness should be heat treated.

8.1 Stress Relieving Before Plating: (IS 1573)

In accordance with IS 1573.

8.2 Stress Relieving after Plating: (IS 1573)

In accordance with IS 1573.

9 PASSIVATION

Electroplated heat treated articles shall be passivated as per AA0673604 : Process for Passivation of Zinc And Cadmium Plated Articles.

10 CARE OF ANODES

Anodes shall be removed from the bath when the bath is idle.

Ensure that the anodes are bright in luster while plating is on.

11 PRECAUTIONS

11.1 While preparing the solution the operator shall use rubber hand gloves, apron and respirator mask to avoid irritation of skin and suffocation due to fumes. The safety precautions for electroplating shop and handling of chemicals given in AA0462801 shall be followed.

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CORPORATE STANDARD

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11.2 Solution shall be kept covered when not in use.

11.3 Any chemical that may be necessary to be added shall be dissolved in a part of the original solution (except brighteners) before adding it to the vat/barrel. It shall be poured through a filter or perforated bucket.

11.4 Any metal that may be deposited on any part of the vat/barrel shall be removed immediately.

11.5 Any article that becomes lodged in any part of the vat / barrel shall be removed immediately.

11.6 Remove Zinc Anode at the end of shift so as to avoid dissolution of zinc metal during idle period.

12 INSPECTION AND QUALITY OF DEPOSIT

When tested in accordance with the test methods shown against each, the deposit shall conform to the norms specified below:

12.1 SAMPLING

Minimum of 1% of each batch of tank/barrel load of part there of shall be taken at random for testing with a minimum of 5 samples. When plated components are big and cannot be subjected to any of the specified test, a test panel of suitable size of the same basis metal shall be plated along with component under identical conditions for the purpose of testing. For corrosion resistance tests, test piece of minimum 150 mm. length, and 100 mm width and approximately 1 mm thick shall be used.

12.2 Condition of Surface

The plated surface shall appear as a smooth and continuous film over the basis metal and shall be free from defects such as pits, stains, cracks, blisters, nodules, pinholes, un-plated areas and other superficial blemishes visible to the unaided eye. The plated surface shall be bright with required passivation.

12.3 Thickness of Deposit (IS 3203)

The minimum thickness shall be as specified on relevant drawing on BHEL order.

12.4 Adhesion (IS 1573)

Flaking and blistering of the coating is not acceptable and the coating shall continue to adhere to the base metal after this test.

12.5 Humidity test (IS 1573)

Breakdown of the film or appearance of white corrosion products after two cycles of the test shall be taken as failure.

13 ADDITIONAL TESTS

Whenever required, the following test shall be conducted as per the test methods shown against each and the norms of acceptance shall be as specified below:

13.1 SALT SPRAY TEST (IS 9844)

When tested in accordance with IS 9844 white corrosion products shall not be visible within 96 hours on plated and passivated components.

14 REJECTION

If the samples taken do not comply with clauses 12.2 to 12.5 and 13, a further quantity not less than twice the number originally taken, shall be subjected to these tests. If any one of these samples also fails, the whole batch shall be rejected.

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CORPORATE STANDARD**15 REFERRED STANDARDS (Latest Publications Including Amendments)**

- 1) IS 1573
- 2) IS 2605
- 3) IS 9844
- 4) AA54102
- 5) AA54201
- 6) AA55610
- 7) AA0673601
- 8) AA0673604

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CORPORATE STANDARD

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PROCESS FOR PASSIVATION OF ZINC AND CADMIUM PLATED ARTICLES

1 GENERAL

This standard details the compositions of the passivation solution and the procedure for passivation of zinc and cadmium electroplated articles.

2 APPLICATION

To increase resistance to corrosion and finger marking.

3 COMPLIANCE WITH NATIONAL STANDARDS

This standard has reference to the following Indian standards regarding the quality of the passivated film:

IS 1340 : 1977: Code of practice for chromate conversion coating on zinc and cadmium coated articles and zinc base alloys

IS 1573 : 1986: Electroplated coating of zinc on iron and steel.

4 MATERIAL

Material	CPS No. / IS No. /Available From
Sulphuric Acid (Technical)	AA54101
Nitric Acid (Technical)	AA54102
Chromic Acid-Electroplating Grade	AA54104
Sodium Bichromate (Technical)	AA55612
Ginthox - Q.982 (L)	M/s Grauer & Weil (I) Ltd., Mumbai.
Ginthos – 995	
Kempas – 755	M/s Artek surfen Chemicals (P) Ltd., Mumbai
Zinc chrome 62L	M/S Platewel & process chemicals, Vadodara

5 EQUIPEMENT

5.1 Passivating Rinsing Tank

FRP/PVC lined mild steel tank preferable with heating arrangements.

5.2 Cascade Rinsing Tank

FRP/PVC lined mild steel tank with suitable partitions and provided with running water facilities, water cascading from one partition to the other

5.3 Acid Treatment Tank (Optional)

FRP/PVC lined mild steel tank

5.4 Rinsing Tank - After Acid Treatment - (optional)

FRP/PVC lined mild steel tank

Revisions: As per 40th MOM of MRC-CPO

APPROVED:
INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC (CPO&NM)

Rev. No. 05

Amd. No.

Reaffirmed

Prepared
HEEP, HaridwarIssued
Corp. R&DDt. of 1st Issue
01-02-1986

Dt: 26-05-2012

Dt:

Year: 2021 45

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5.5 Hot Air Oven

Hot air oven suitable for heating 50-70°C

5.6 Centrifugal Drier

A standard centrifugal drier suitable for drying barrel components

6 COMPOSITION/PREPARATION OF SOLUTIONS & OPERATING INSTRUCTIONS**6.1 Passivating Solution****6.1.1 Composition and Operating Conditions**

The passivating solution shall be made of any one of the following compositions and operating conditions

6.2 Preparation of solution

6.2.1 The tank shall be filled with water preferably demineralised water to about two-thirds of its capacity.

6.2.2 The required amount of salt/chemical shall be added to the bath in small quantities with stirring.

6.2.3 After complete dissolution, the required quantity of recommended acid shall be poured to the solution with stirring.

6.2.4 Finally, the solution shall be brought to the operating level by adding water.

6.3 Maintenance of the solution

Any deficiency of the acid from the above composition shall be corrected by cautious addition of concentrated acid.

After the solution has been working from some time/and or any deficiency in the solution, if observed, then the passivating chemicals shall be added to keep the solution upto the working strength, or if required a fresh solution shall be prepared. While making the addition the salt shall be dissolved in the separate acid resisting container with the required quantity and then added to the tank.

7 PROCESS**7.1 Acid Treatment**

7.1.1 Zinc/cadmium plated, heat treated articles after proper rinsing, shall be dipped in 0.4 to 0.5% nitric acid solution for 5-10 seconds.

7.1.2 After acid treatment, the articles shall be rinsed in clean cold running water.

7.2 Passivation

7.2.1 The articles shall then be immersed in the passivating solution as specified in clause 6.1.1 for 10 to 30 seconds.

7.2.2 The articles shall be drained for about 30 seconds after passivation.

7.2.3 The passivated articles shall be double rinsed in cold water for a period sufficient to ensure that water draining from the articles contains no trace of yellow colouration. The total rinsing time shall not be longer than 5 minutes.

7.2.4 After rinsing, the articles shall be dried off using air oven/compressed air. In case of barrel plating, the articles shall be dried by means of centrifugal drier.

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7.3 Age Hardening

No article shall be used in assemblies within 24 hours of age hardening after passivation.

Note:

After passivation, no heat treatment of the plated articles shall be done.

8 INSPECTION

8.1 Visual

All the jobs shall be tested visually the passivated film shall have a greenish iridescent or greenish yellow iridescent appearance, free from areas of unconverted zinc or cadmium plating.

8.2 Adhesion (IS 8602)

Adherence may be determined after age hardening by rubbing the surface with white paper. The paper must not show more than a slight trace of stain and the treated surface shall not show signs of having been rubbed through.

8.3 Chromate Film Test (IS 1573)

The chromate film shall be free from bare (unconverted zinc) patches and shall be adherent.

9 REFERRED STANDARDS (Latest Publications Including Amendments)

- 1) IS 1340
- 2) IS 1573
- 3) IS 8602
- 4) AA54101
- 5) AA54102
- 6) AA54104
- 7) AA55612

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TME 2011

PRODUCT STANDARD

TME DIVISION, BHOPAL

TM 88110

PAGE 01 OF 01

SPECIFICATION OF HEAT SHRINKABLE TUBE

1. Scope

This specification describes heat shrinkable silicon rubber tube Sourced from M/s Shinetsu Chemical Co. (Japan) make (ST-110DG) to be used for insulation of electrical machines.

2. Dimension

Dimension of this tube are given in Table 1.

Table 1

Symbol	Before of heat shrinkable	Outer dia. of covering (mm)	After of heat shrinkable	
	Inner dia. (mm)		Inner dia. (mm)	Thickness (mm)
ST-110DG	22	13 ~ 19	13	2.0 ^{+0.3} _{-0.4}
ST-110DG	28	17 ~ 24	14	1.30 ^{+0.3} _{-0.4}
ST-110DG	34	20 ~ 30	17	2.0 ^{+0.3} _{-0.4}

3. Quality

Quality of this tube is given in Table 2.

Table 2

No.	Item	Unit	Quality	Remarks
1.	Specific gravity (at 20°C)	-	1.23	
2.	Spring hardness	HS	70 ⁺⁵ ₋₇	
3.	Tensile strength	kg/cm ²	≥ 50	
4.	Elongation	%	≥ 300	
5.	Tear strength	kg/cm	≥ 25	
6.	Volume resistivity	Ω-cm	≥ 2×10 ¹⁵	
7.	Breakdown voltage	kV/mm	≥ 25	
8.	Temperature of heat shrinkable	°C	≥ 120	

4. This specification is equivalent to CLW spec no A0251 Alt B

Revision Details: As per revision sheet

Distribution

Qty.

Approved

Sr.DGM/TME

Rev. No.

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PRODUCT STANDARD

TME DIVISION, BHOPAL

TM 88076

PAGE 01 OF 01

SPECIFICATION OF HEW502N TYPE SOLVENTLESS EPOXY RESIN

1. Scope

This specification describes HEW502N Type Solventless Epoxy Resin (hereafter abbreviated as HEW502N) to be used for adhesion of electrical machines.

2. Ingredient

2.1 HEW502N consists of main resin, hardener and accelerator. The composition and mixing ratio are given in Table 1.

Table 1

Composition	Symbol	Mixing ratio (Wt)	Shelf life (months)
Main resin	HEW502NA	100	12
Hardener	HEW502NB	80	12
Accelerator	HEW502NC	2	12

2.2 As each composition will be sent separately, they have to be mixed before using.

3. Quality

3.1 Quality of HEW502N (liquid) which is mixed by Table 1 is given in Table 2 (liquid).

3.2 When HEW502N is cured at 130°C/12hrs, quality of HEW502N (solid) is given in Table 2 (solid).

Table 2

Liquid			Solid	
Viscosity (poise)		Gel-time (min)	Tensile strength (kg/cm ²)	Weight loss (%)
Immediately after mixed at 25°C	after 30°C 4hrs			
10 - 30	≤ 150	≤ 30	≥ 100	≤ 3

Revision Details: As per revision sheet

Distribution

Qty.

Approved

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Rev. No.


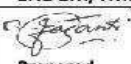

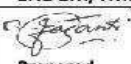

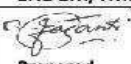

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	<p>1. <u>Scope</u></p> <p>This specification describes polyamide woven tape (NWT) (hereafter abbreviated as tape) to be used for insulation of electrical machines.</p> <p>2. <u>Classification, Dimension and Tolerance</u></p> <p>Classification, dimension and tolerance of this tape are given in Table 1.</p> <p style="text-align: center;">Table 1</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Symbol</th> <th rowspan="2">Nominal thickness (mm)</th> <th rowspan="2">Nominal width (mm)</th> <th rowspan="2">Nominal length (m)</th> <th colspan="3">Tolerance</th> </tr> <tr> <th>Thickness (mm)</th> <th>Width (mm)</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>NWT 0.13 x a - b</td> <td>0.13</td> <td>19 25</td> <td>30</td> <td>+0.025</td> <td>+1</td> <td>More than the nominal length</td> </tr> </tbody> </table> <p>Note : a : Width b : Length</p> <p>3. <u>Quality</u></p> <p>Quality of tape is given in Table 2.</p> <p style="text-align: center;">Table 2</p> <p style="text-align: right;">(Testing method JIS C2130)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Symbol</th> <th>Tensile strength (kg/19mm width)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>NWT-0.13x19</td> <td rowspan="2" style="text-align: center;">≥ 30</td> <td></td> </tr> <tr> <td>NWT-0.13x25</td> <td></td> </tr> </tbody> </table> <p>Ⓐ 4. Shelf life 24 months at (20±5°C, 65±20% RH)</p> <p>5. This specification is equivalent to CLW specification no. A0248 Alt A.</p>		Symbol	Nominal thickness (mm)	Nominal width (mm)	Nominal length (m)	Tolerance			Thickness (mm)	Width (mm)	Length	NWT 0.13 x a - b	0.13	19 25	30	+0.025	+1	More than the nominal length	Symbol	Tensile strength (kg/19mm width)	Remarks	NWT-0.13x19	≥ 30		NWT-0.13x25
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	TME 2011				PAGE 01 OF 01																																																																			
	<p>1. <u>Scope</u></p> <p>This specification describes Self Bonding Silicone Rubber Tape (HTV-HBT-HS) (hereafter abbreviated as tape) to be used for insulation of electrical machines.</p> <p>2. <u>Classification, dimension and tolerance</u></p> <p>Classification, dimension and tolerance of this tape are given in Table 1.</p> <p style="text-align: center;">Table 1</p> <table border="1"> <thead> <tr> <th rowspan="2">Symbol</th> <th rowspan="2">Nominal thickness (mm)</th> <th rowspan="2">Nominal width (mm)</th> <th rowspan="2">Nominal length (m)</th> <th colspan="3">Tolerance</th> </tr> <tr> <th>Thickness (mm)</th> <th>Width (mm)</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>HTV-HBT-HS -0.5x^a_b</td> <td>0.5</td> <td>25</td> <td>(10, 15, 20)</td> <td>±0.03</td> <td>±1.5</td> <td>More than nominal length</td> </tr> </tbody> </table> <p>Note : a Width b Length</p> <p>3. <u>Quality</u></p> <p>Quality of this tape is given in Table 2.</p> <p style="text-align: center;">Table 2</p> <table border="1"> <thead> <tr> <th rowspan="2">Symbol</th> <th>Tensile strength (kg/cm²)</th> <th>Elongation (%)</th> <th colspan="2">Breakdown voltage (KV/mm)</th> <th rowspan="2">Self bonding property</th> <th rowspan="2">Thermal resistance (250°C 1 hr)</th> <th rowspan="2">Corrosion to metal</th> </tr> <tr> <th></th> <th></th> <th>Average</th> <th>Minimum</th> </tr> </thead> <tbody> <tr> <td>HTV-HBT-HS-0.5</td> <td>≥50</td> <td>≥400</td> <td colspan="2">≥30</td> <td>Good</td> <td>Good</td> <td>will not corrode metal</td> </tr> </tbody> </table> <p>④ 4. <u>Shelf life</u></p> <p>Shelf life of this tape is approximately 6 months after mfg. date at 30°C or below.</p> <p>5. This specification is equivalent to CLW specification no. A0128 Alt B.</p> <table border="1"> <tr> <td>Revision: 00 Date: 07/09/2010</td> <td>Distribution</td> <td>Qty.</td> <td>Approved: (M.Bhakta)</td> <td colspan="2"></td> </tr> <tr> <td></td> <td>TME</td> <td>1</td> <td>Prepared:</td> <td>Checked:</td> <td>Date:</td> </tr> <tr> <td></td> <td>TXM</td> <td>1</td> <td>Shishu pal</td> <td>A. Katdare</td> <td>07/09/2010</td> </tr> <tr> <td></td> <td>TNX</td> <td>1</td> <td>DE/TME</td> <td>Sr.Engr./TME</td> <td></td> </tr> <tr> <td></td> <td>QMX</td> <td>2</td> <td></td> <td></td> <td></td> </tr> </table>						Symbol	Nominal thickness (mm)	Nominal width (mm)	Nominal length (m)	Tolerance			Thickness (mm)	Width (mm)	Length	HTV-HBT-HS -0.5x ^a _b	0.5	25	(10, 15, 20)	±0.03	±1.5	More than nominal length	Symbol	Tensile strength (kg/cm ²)	Elongation (%)	Breakdown voltage (KV/mm)		Self bonding property	Thermal resistance (250°C 1 hr)	Corrosion to metal			Average	Minimum	HTV-HBT-HS-0.5	≥50	≥400	≥30		Good	Good	will not corrode metal	Revision: 00 Date: 07/09/2010	Distribution	Qty.	Approved: (M.Bhakta)				TME	1	Prepared:	Checked:	Date:		TXM	1	Shishu pal	A. Katdare	07/09/2010		TNX	1	DE/TME	Sr.Engr./TME			QMX	2		
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	CORPORATE PURCHASING SPECIFICATION	AA10113
		Rev No.07
		PREFACE SHEET

HOT ROLLED CARBON STEEL SHEET (330 N/mm² Tensile)

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. INDIAN : IS: 5986 – 2011, Gr: 205

Suggested/Probable Suppliers and Grades:

Refer plant vendors list

User Plants References:

1. HEEP, HARDWAR : 0500.004, Gr.: St.34
2. HPEP, HYDERABAD : HY0212299
3. HEP, BHOPAL : PS10113
4. HPBP, TRICHY :

Revisions: As per Cl.No.38.1 of MOM of MRC– S&GPS			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)		
Rev No.07	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 st Issue
Dt:22-02-2014	Dt:	Year:	52 HEP, Bhopal	Corp.R&D	July, 1976

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CORPORATE PURCHASING SPECIFICATION

AA10113

Rev No. 07

PAGE 1 of 5

HOT ROLLED CARBON STEEL SHEET (330 N/mm² Tensile)

1.0 GENERAL:

This specification governs the quality requirements of Hot Rolled Carbon Steel Sheet of thickness of 2.5 mm to 4.0 mm (both inclusive).

2.0 APPLICATION:

Suitable for cold forming / drawing / fabrication by welding.

3.0 CONDITION OF DELIVERY:

Sheets shall be supplied in hot rolled, decaled and oiled condition. Imported sheets shall be supplied in straight lengths. The edges shall be flattened and sheared. Mill edges are not acceptable. Sheets shall be free from waviness and shall have a uniformly dull (matt) finish.

Oil used for rust prevention should be free from pungent smell. The following oils are suggested:

- SERVO RP 125 of M/s. IOC.
- RUSTOP 387/388 of M/s. HPC
- Bharat TCPF of M/s. Bharat Petroleum
- Any other TRP conforming to IS : 1154

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standards and also meet the requirements of this specification.

IS: 5986 – 2011, Gr.: 205: Hot rolled steel flat products for structural forming and flanging purposes - Specification.

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

Hot rolled carbon steel sheets shall be supplied to the dimensions in BHEL order.

5.2 Tolerances:

The tolerances on sheets shall comply with the following:

5.2.1 Thickness (IS: 1852):

Thickness, mm	Tolerance, mm
2.50	± 0.20
3.15	± 0.22
4.0	± 0.25

Revisions:

As per Cl.No.38.1 of MOM of MRC– S&GPS

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
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**5.2.2 Width (IS: 1852):**

Width, mm	Tolerance, mm
Upto & incld. 1250 mm	+ 6 mm - 0 mm
Over 1250 mm & upto and incld.1550 mm	+ 0.5 percent - 0.0 percent
Over 1550 mm	+ 0.6 percent - 0.0 percent

5.2.3 Length (Continuous mill) IS: 1852:

Length, mm	Tolerance, mm
Upto & incld. 2500 mm	+ 25 mm - 00 mm
Over 2500 mm	+ 1 percent subject to a maximum of 70 mm - 0 percent

5.2.4 Flatness (for cut lengths):

Thickness, mm	Width, mm	Flatness tolerance, mm
From 2.5 to 4.0	Upto & incld. 1200	15
	Over 1200 & upto incld. 1500	20
	Over 1500	25

5.2.5 Edge camber IS: 5986:

The edge camber (i.e. lateral departure of the edge of the material from a straight line forming a chord) of sheets in cut lengths and coil shall not exceed the following values:

5.2.5.1 For Cut Lengths:

Length in meters		Tolerance, mm
Over	Upto & incld.	
--	1.25	5
1.25	1.80	6
1.80	2.50	8
2.50	3.15	10
3.15	3.55	12
3.55	4.00	16
4.00	5.00	19

5.2.5.2 For Coils:

25 mm in any 5000 mm length.

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6.0 MANUFACTURE:

Process of manufacture is left to the discretion of the manufacturer except Bessemer process.

Material shall be manufactured from semi killed or killed steel.

7.0 FREEDON FROM DEFECTS:

The sheets shall be free from harmful defects, twists, buckle, rust, scale and waviness and shall be reasonably smooth, flat and square.

8.0 CHEMICAL COMPOSITION:

The melt analysis of steel and the permissible variation in the composition of the material from the melt analysis shall be as follows:

Element	Melt analysis, percent, max.	Permissible variation, percent, max.
Carbon	0.15	0.03
Manganese	0.80	0.05
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

9.0 TEST SAMPLES:

9.1 Tensile Test:

One sample shall be taken per thickness per consignment from each melt.

As far as possible test pieces shall be cut transverse to the direction of rolling and shall be of full thickness of the sheet rolled.

9.2 Bend Test:

One sample shall be taken per thickness per consignment from each melt.

Bend test pieces shall be cut so that the axis of the bend is parallel to the direction of rolling viz. transverse.

Note: When more than one thickness is rolled from the same melt, one additional test piece for each thickness shall be taken.

10.0 MECHANICAL PROPERTIES:

10.1 Bend:

When tested in accordance with IS: 1599, the test pieces shall be capable of being bent cold through 180° close. The outer convex surface of the test piece shall be free from cracks.

10.2 Tensile:

When tested as per IS: 1608, the test pieces shall show the following properties:

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Tensile strength	: 330 – 440 N/mm ²
Yield strength	: 205 N/mm ² , min.
Elongation:	
For sheets up to & Incl. 3 mm, thick	: 20 %, minimum on 80 mm gauge length
For sheets above 3 mm, thick	: 28 %, minimum in 5.65 √So gauge length

11.0 HARDNESS (VICKERS):

When tested in accordance with IS: 1501, the material shall show a Vickers hardness in the range of 100 – 140 HV.

Note: Hardness test shall be conducted only when tensile test cannot be performed.

12.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied.

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

The test certificate shall bear the following information:

AA10113, Rev 07: HOT ROLLED CARBON STEEL SHEET (330 N/mm² Tensile)

BHEL Order No,

Supplier's name,

Identification No

Melt No,

Process of manufacture

Details of pickling, descaling and oiling

Results of dimensional inspection

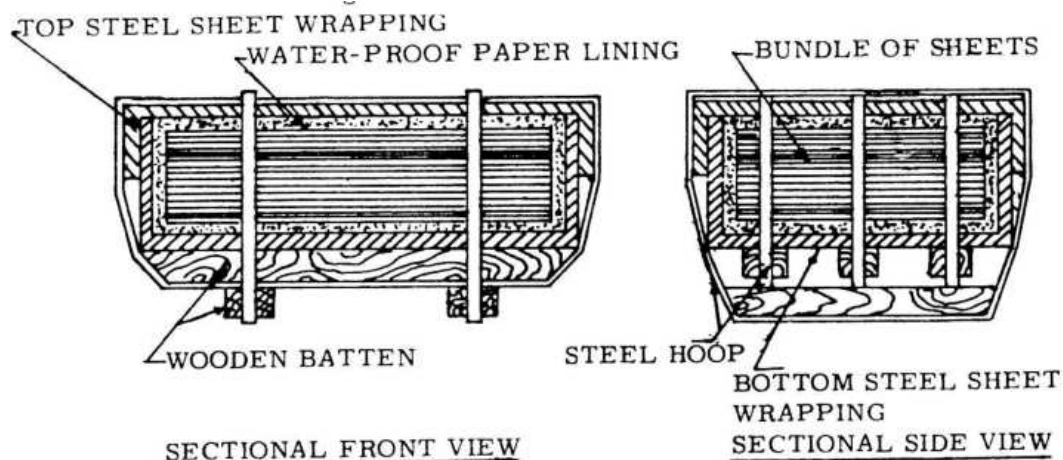
Results of Chemical analysis and Mechanical tests,

Note: Material procured, supplied and certified as AA10113 / IS: 5986, Gr.:205 and comply with the requirements of this specification is acceptable.


13.0 PACKING AND MARKING:

Steel sheets shall be supplied in bundles and shall be suitably packed in bundles to prevent corrosion and damage during transit.

The recommended packing for imported material shall be as shown below.



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<p>Note:</p> <p>a) Water proof paper lining shall be preferably Volatile Corrosion Inhibitor (V.C.I.) Coated Paper with an additional polythene (100 micron) enveloped.</p> <p>b) Approximate weight of each bundle shall be 2 to 3 tonnes. Bundle weighing 2 metric tonnes is however preferred.</p> <p>A metal label shall be securely attached to each bundle and shall bear the following information:</p> <p>AA10113:HOT ROLLED CARBON STEEL SHEET (330 N/mm² Tensile) BHEL Order No, Supplier's Name & Identification No, Size & Thickness of sheets Weight</p> <p>14.0 REFERRED STANDARDS (Latest publications including amendments):</p> <p>1) IS: 1154 2) IS: 1501 3) IS: 1852 4) IS: 1599 5) IS: 1608</p>		
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BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

QUALITY ASSURANCE PLAN FOR MODIFIED ROCKER ASSY TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO

QUALITY PLAN NO. – QAP/QTM/VENDOR QAP/2024-25 MODIFIED ROCKER ASSY DTD 23.05.2024 REV 00
Reference Document- PO DRAWING/SPECIFICATION

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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 1.Rocker 2.Insulation stud 3.Brush holder assembly 4.All Washer, screw & stud	All tests	TC verification	100%	100%	As per PO Drawing/specification	As per drawing & Specification	MTC	BHEL/TP/A	TEST LAB NABL/SOURCE MILL /Supplier to get the raw material TC correlated with material TC
2)	Dimension	Dimension	Measurement	100%	10%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TP/A	To be checked with tools list mentioned in Drawing. Report to be submitted to BHEL
3)	Testing	HV Test, IR & Brush spring pressure for each brush holder	test	100%	5%	As per drawing & specification (TM10896)	As per drawing & Specification (TM10896)	Supplier record	BHEL/TP/A	Witness

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Prepared By

अमित सेन /AMIT SEN

अभिनेता/Engineer

कृष्ण टी. एस. विजय /K.T.M. Division

श्री. एच. ई. एल. भोपाल/BHEL

Approved By

गजेन्द्र सिंह रावत /G.S. RATHORE

उप प्रबंधक/Manager

कृष्ण टी. एस. विजय /QTM Division

श्री. एच. ई. एल. भोपाल/BHEL, BHOPAL

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BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
QUALITY ASSURANCE PLAN FOR MODIFIED ROCKER ASSY TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO

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4)	Visual verification of all items	All assembly items to be checked for any visual defect	Visual	100%	5 %	As per drawing & specification	As per drawing & specification	Supplier record	BHEL/TPIA	Certificate of compliance to be submitted
5)	Identification & marking		visual	100 %	5 %	As per drawing & specification	As per drawing & specification	Supplier record	BHEL/TPIA	Unique serial, non-repetitive sl no. to be punched
6)	Packing	packing	visual	100%	10%	As per drawing & specification	As per drawing & specification	Supplier record	BHEL/TPIA	Packed to avoid transit and storage damage

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Prepared By

अमित सेन /AMIT SEN
अभियंता / Engineer
क्यू.टी.एम. विभाग / Q.T.M. Division
बी.एच.ई.एल., भोपाल/BHEL, BHOPAL

Approved By

गजेन्द्र सिंह राठीर /G.S. RATHORE
अध्यक्ष प्रबंधक / Manager
क्यू.टी.एम. विभाग / Q.T.M. Division
बी.एच.ई.एल., भोपाल/BHEL, BHOPAL