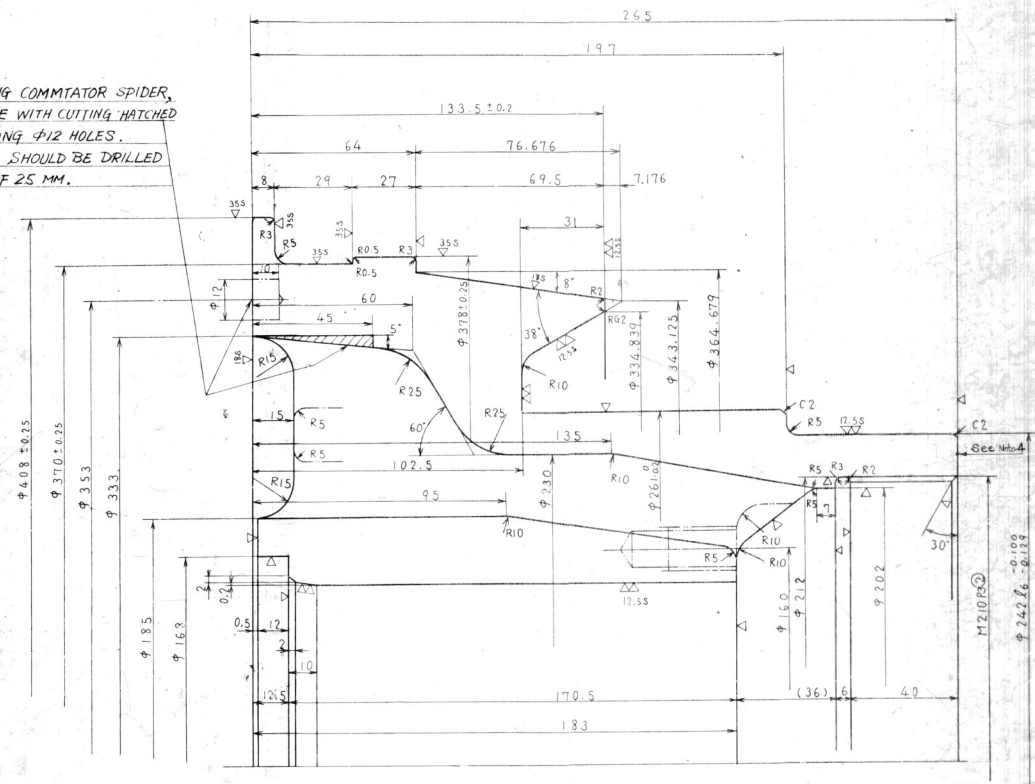


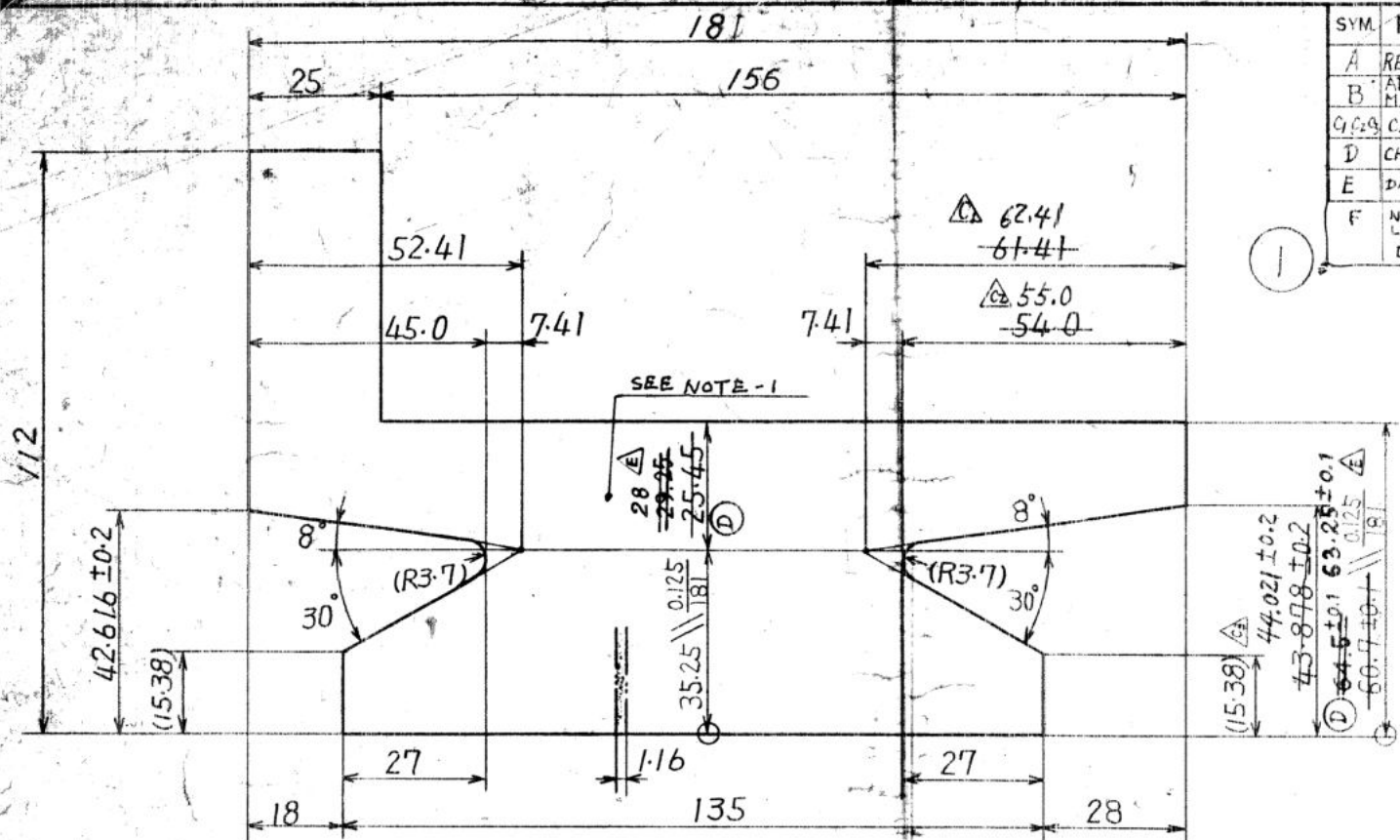
SURFACE ROUGHNESS			
FIELD OR ROUGH GROUND	ROUGH MACHINED	FINISHED MACHINED	FINE FINISHED MACHINED

ALL CORNERS RADIUS SHALL BE 0.5^{±0.03} EXCEPT WHERE STATED

SYM	REV	REVISIONS	DATE	REV'D	CHK'D	REWORK
A1	1	ADDED TOLERANCE OF CORNERS RADI	21-10-21			
B	1	NOTE-3 ADDED	29-4-21			
C	1	MATERIAL SPECIFICATION UPDATES	08-05-16			
D	1	REVISION ADDED IN NOTE NO. 11.3 REF. NOTE NO. 11.3 (LATEST VERSION)	25-02-20			
E	1	NOTE 4 ADDED. REF. LIND. EUTM/2013 DT. 24.5.17	07-3-2008			
F	1	NOTE-5 ADDED. REF. LIND. EUTM/2013 DT. 08.06.2001	23-6-01			
G	1	NOTE-5 MODIFIED. REF. LIND. EUTM/2013 DT. 24.12.2006	04-01-07			
H	1	NOTE-6 INCORPORATED. REF. LIND. EUTM/2013 DT. 06.03.09	07-03-09			
I	1	NOTE-6 MODIFIED. REF. LIND. EUTM/2013 DT. 07.06.2011	07.06.11			

AFTER MACHINING COMMUTATOR SPIDER, CORRECT UNBLANCE WITH CUTTING HATCHED PART OR DRILLING $\phi 12$ HOLES. EACH $\phi 12$ HOLE SHOULD BE DRILLED AT INTERVALS OF 25 MM.





SYM.	REVISIONS	DATE	REV.	CHKD.	RE. DWG.	MTR.	RE. MF.
A	REVISED INSTRUCTION	87-08-25	1	1	1	1	1
B	ADDED ALTERNATIVE MATERIAL	88-04-14	1	1	1	1	1
C	CHANGED DIMENSION	88-04-29	1	1	1	1	1
D	CHANGED DIMENSION	92-04-29	1	1	1	1	1
E	DIMENSION CHANGED	93-4-16	1	1	1	1	1
F	NOTE-1 ADDED. R.E.F. L/NO. 81/TM/2013 DT. 29-8-02	04-9-02	1	1	1	1	1

1. FOR THIS PART, DIMENSIONAL ADJUSTMENT OF MATERIAL SHOULD BE MADE THE FOLLOWING PROCEDURES BELOW.

- 1) SURFACE PRESSURE TO EACH BLOCK; 420 kg/cm²
- 2) NO. OF BLOCKS FOR ONE COMMUTATOR AND NUMBER OF SHEETS IN ONE BLOCK (AFTER CUTTING IN-SHAPE)
 - a) NO. OF BLOCKS FOR ONE COMMUTATOR; 24 BLOCKS
 - b) NO. OF SHEETS IN ONE BLOCK; 12 SHEETS
- 3) ALL BLOCKS THICKNESS MUST BE MEASURED AND THE MEAN VALUE MUST BE TAKEN AS THE STANDARD BLOCK SIZE

MOREOVER, DIMENSIONAL ADJUSTMENT ERROR BETWEEN BLOCKS MUST BE NOT MORE THAN ± 0.03MM TO THE STANDARD DIMENSION.

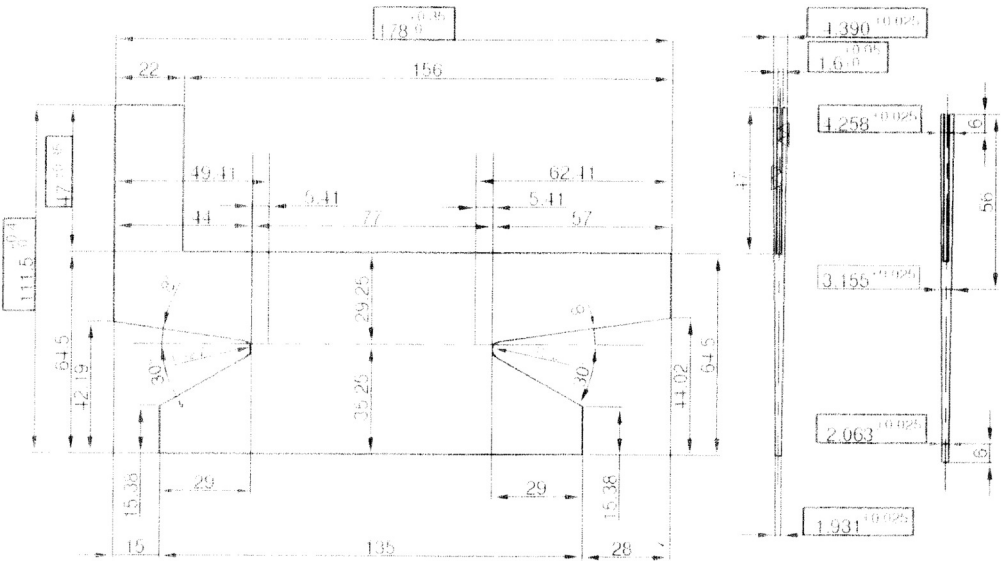
- 4) ADJUSTING STANDARD BLOCK THICKNESS AND TOLERANCE = 13.296 ± 0.2
- 5) NUMBER OF SHEETS FOR ONE COMMUTATOR AFTER CUTTING IN-SHAPE; 288
- 6) INCLUDING SPARE 3 SHEETS)

MANUFACTURER'S IDENTIFICATION TO BE STAMPED AT THE LOCATION SHOWN.

1	RAW MATERIAL OF SEGMENT MICA	288	ALKYD VINYL BONDED MICA	IEC-3713-1				
ITEM NO.	PARTS NAME	NO. OF PIECES PER MOTOR	NAME OF MATERIAL	RAW MATERIAL	SPECIFICATION	RAW WEIGHT OF MATERIAL PER MOTOR	FINISHED WEIGHT OF MATERIAL PER MOTOR	REMARKS
DWN.	J. Nishino	86.12.25	THIRD	TITLE HS-1050-EF/B, HSI5250A				
CHKD.	M. Nakamura	87.01.09	ANG. PROJ.	RAW MATERIAL DRAWING				
APPD.	Y. Nakamura	87.01.27	SCALE	OF SEGMENT MICA				
Hitachi, Ltd. Tokyo Japan				HITACHI WORKS DWG. NO.		10S813-324		
						REV. D		

Signature Not Verified
Digitally signed by Nihar Ranjan Mondal
Date: 2022.04.25 12:07:20 +05'30
Reason: IRRPS-CRIS
File No: HEP-TXM20500 (51)/53/2026-HEP-TXM20500 (Computer No. 305132)

ALT. NO.	AUTHORITY	DESCRIPTION	INITIAL	DATE
10	DY.CEE/TMD	DRG. RE-DRAWN & NOTE ADDED REF. 1 NOTE (IM-2013) DT. 29.10.2004	<i>my</i>	02.02.2005
11	DY.CEE/TMD	NOTE 16 ADDED	<i>my</i>	04-12-2008



NOTE

- GENERAL TOLERANCE ON DIMENSIONS IS $\pm 0.35\text{mm}$ WHERE EVER NOT SPECIFIED.
- MANUFACTURER TO PROVIDE MAKER'S STAMP WITH INDELIBLE INK FOR IDENTIFICATION MARK AT THE SUITABLE LOCATION.
- THE VARIATION BETWEEN THICKNESS OF THE TWO LEAFS AT ANY POSITION SHALL NOT BE MORE THAN $\pm 0.1\text{mm}$.
- THE SLITTED GAP OF THE INDIVIDUAL COMMUTATOR SEGMENT IS TO BE FILLED UP BY HARD PIECE BOARD SUITABLE MATERIAL TO PREVENT ANY DAMAGE DURING TRANSPORTATION.
- SECTION THICKNESS TO BE MEASURED AT 6mm FROM THE TOP, 56 mm. FROM TOP AND 6mm FROM BOTTOM.
- i) OXYGEN CONTENT SHALL BE 400 ppm (Max).
ii) AS PER JIS C280176 SILVER CONTENT SHALL BE WITHIN THE RANGE OF 0.15 TO 0.25 %.
- 0.5% UNSLITTED MATERIAL TO BE KEPT FROM THE OFFERED LOT FOR CHECKING THE DIMENSIONS AS PER NOTE NO 5.
- VISUAL INSPECTION FOR EVENNESS OF SLITTING AND SURFACE FINISH TO BE CHECKED 100%.
- SAMPLING SIZE FOR PROTOTYPE INSPTION SHALL BE ONE MOTOR SET, HOWEVER SAMPLING PLAN FOR PHOTOTYPE INSPECTION SHALL BE 10% OF ONE MOTOR SET.
- SAMPLING SIZE FOR ROUTINE INSPTION SHALL BE 1% OF THE OFFERED LOT.
- RAW MATERIAL SHALL BE AS PER JIS C280176, CLAUSE 5, CLASS 2 (CMB-2).
- TESTING OF CHEMICAL COMPOSITION i.e TO CHECK THE REQUIRED % AGE OF Cu & Ag AND OXYGEN CONTENT (ONE SAMPLE FROM THE EACH LOT OFFERED) SHALL BE GOT DONE FROM ANY NABL APPROVED LAB. THE COST OF TESTING AND THAT OF MATL CONSUMED DURING TESTING SHALL BE BORNE BY THE SUPPLIER.

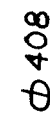
ALT. 11 16. TWISTED AND BENT COMMUTATOR BARS SHOULD BE CORRECTED BY PLACING THEM ON BASE PLATE AND TAPPING THEM WITH A HAMMER. THE GAP BETWEEN THE BAR AND BASE PLATE SHALL BE LESS THAN 0.1 mm. AFTER THE CORRECTION.

- SURFACE OF THE COMMUTATOR SEGMENTS SHALL BE CLEAN, BRIGHT, SMOOTH FREE FROM TWISTS AND HARMFUL DEFECTS.
- THE ACCEPTANCE OF ALL THE CLAUSES OF JIS C 280176 AND DRG. NO. 10S 813-323A, ALT. 10 AND THE DEVIATIONS IF ANY SHALL BE CLEARLY BROUGHT OUT BY THE TENDERER IN THEIR OFFER.
- FIRM SHALL SUPPLY THE ITC GC OF SOURCES FROM WHOM ELECTROLYTIC CATHODE COPPER HAS BEEN PROCURED AND ALLOYING HAS BEEN DONE.

5535 C02	PEL NO.	PART. DRG. NO.	DESCRIPTION	QTY PM	CMB 2 MATERIAL CLASS	JIS C 280176 SPECN	555(RAW) 235±5(Finish) WT gms./Piece
DRN	NAME	SIGN	DATE	TRACTION MOTOR HS 15250 A			
DRN	DR. S. B. Saha	DR. S. B. Saha	07.10.04	CHITTARANJAN LOCOMOTIVE WORKS WEST BENGAL INDIA			
DRD	DR. S. B. Saha	DR. S. B. Saha	07.10.04	COMMUTATOR SEGMENT (SLITTED)			
GRD	DR. S. B. Saha	DR. S. B. Saha	07.10.04				
GRD	B.K. Biswas	DR. S. B. Saha	02.10.01	SCALE :- N.T.S.			
REF: 10S 813-323 A, ALT. 9				APPROVED <i>my</i> NAME: A.K. RASTOGI DATE: 02.02.2005 NO. 10S.813-323 A			
				ATTENTION			

Signature Not Verified
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BYOMKES MANDAL
Date: 2022.04.08
16:33:01 +05'
Reason: I am PS-CRIS
Location: Kharidpur

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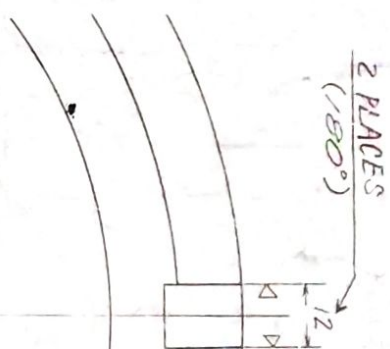
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- 408

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NOTE:-

FROM RAW MATERIAL DRG. No. 105 778-666

1. MATERIAL SHALL BE ~~PERFORMED~~ HEAT TREATMENT.
2. MECHANICAL PROPERTIES SHALL BE AS FOLLOWS:

YIELD POINT : $\geq 85 \text{ kg/m}^2$
 ELONGATION : $\geq 1\%$
 HARDNESS : HB 285~310
 TENSILE STRENGTH : $\geq 100 \text{ kg/mm}^2$
 REDUCTION OF AREA : $\geq 40\%$
 IMPACT VALUE : $\geq 5 \text{ kg}\cdot\text{m/cm}^2$

See note 2

6

1. FINISHED PRODUCT SHALL BE COATED WITH ANTI-RUST

TRANSIT AND LONG-TIME STORING-DAMAGE.

MANUFACTURER TO PROVIDE THEIR METAL PUNCH IDENTIFICATION
MARK AT THE LOCATION SHOWN.

3. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLIES.
SHALL BE CARRIED OUT BY DYC-CENTRIC/CRJ AND FOR BULK SUPPLIES M













~~METALLURGICAL TEST SHALL BE ^{0.0005}BY D.C.G.M./C.W./C.R. OR b) NABL OR RD SO APPROVED LABORATORY,~~

SEE CLAUSE NO-11 OR SPECN. ATMS.095.001 (LATEST)

Vgk02
21.12.92
SEE/TMO.

NO-II UNSTEEN. AT INS-035 BOL-CH-1537									
Z									
16:157079-P6-1V-GM-02-GRAMOS									
B39 to E24 B39 to 517.817 m 40									
Heat treated 73 m 40 100 200									
d. 3868 cm 73 m 40 100 200									
ALT. MATERIAL									
ITEM	NO	PARTS NAME	NO OF PIECES	NAME OF MATERIAL	RAW SPECIFI CATION	RAW WEIGHT OF MATERIAL	FINISHED REMARK		
	1	COMPUTATOR NUT	1	SCM 440	DIS 64105	10.0 Kg	5.6 Kg		

SURFACE ROUGHNESS

SURFACE ROUGHNESS	
FIELD OR 2 COND	<div>  </div> <div>  </div> <div>  </div>
ROUGH MACHINED	<div>  </div> <div>  </div> <div>  </div>
FILISHED MACHINED	<div>  </div> <div>  </div> <div>  </div>
FINE FINISHED MACHINED	<div>  </div> <div>  </div> <div>  </div>

ALL CORNERS RADI SHALL
BE $0.5^{+0}_{-0.5}$ EXCEPT WHERE STATED.



Hitachi, Ltd.
Tokyo Japan

COMMUTATOR NOT

HITACHI WORKS DWG. NO.
105778

Signature Not
Verified

Digitally signed by
GAYA CHAND
GHOSH
Date: 2022.04.09
12:25:10 IST

Reason: FRE 2.0018 (51)/53/2026-HEP-TXM20500 (Computer No. 305132)

Generated from service by Shalendra Kumar Yadav, MANAGER(SKY)-MNX35400-HEP, MANAGER, HEP-HEAVY ELECTRICALS PLANT (HEP) on 16/05/2026 01:45 pm

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 34394260057

181

25

156

47.4

52.41

45

7.41

7.41

62.41

55

29.35

181

35.65

0.125

181

8°

30°

(R3.7)

15.78

43.016±0.2

112.4

18

27

135

1.16

27

28

44.421±0.2

65±0.1

0.125

181

30°

8°

(R3.7)

15.78

SEE NOTE-6

NOTES :-

FOR THIS PART, DIMENSION ADJUSTMENT OF MATERIAL SHOULD BE MADE THE FOLLOWING PROCEDURES BELOW .

1) SURFACE PRESSURE TO EACH BLOCK; 420 kg/cm².

2) NO. OF BLOCKS FOR ONE COMMUTATOR AND NUMBER OF SHEET IN ONE BLOCK (AFTER CUTTING IN SHAPE)

a) NO. OF BLOCKS FOR ONE COMMUTATOR ; 24 BLOCK

b) NO. OF SHEET IN BLOCKS ; 12 SHEET

3) ALL BLOCK THICKNESS MUST BE MEASURED AND THE MEAN VALUE MUST BE TAKEN AS THE STANDARD BLOCK SIZE. MOREOVER, DIMENSION ADJUST MENT ERROR BETWEEN BLOCKS MUST BE NOT MORE THAN ±0.03mm TO THE STANDARD DIMENSION.

4) STANDARD BLOCK THICKNESS UNDER PRESSURE AND TOLERANCE =13.296±0.2.

5) NUMBER OF SHEETS FOR ONE COMMUTATOR AFTER CUTTING IN SHAPE; 288 (INCLUDING SPARE 3 SHEET)

6) MANUFACTURER'S IDENTIFICATION TO BE STAMPED AT THE LOCATION SHOWN.

7) THIS DRAWING IS EQUIVALENT TO CLW DRG NO. 10S813-324 (ALT-F).

8) FOR RAW MATERIAL IN 'L' SHAPE DRG. 34394260064 TO BE REFERRED.

REF. DRG. NO.

SIGN. & DATE

INVENTORY NO.

REV. DATE ALTERED SDB

04 11.11.24 CHECKED SSP

APPD. S.PAL

DIMS. 112.4, 43.016, (15.78), 35.65, 29.35, 44.421 & 65 WERE 112, 42.616, (15.38), 35.25, 28, 44.021 & 63.25. DIM. 47.4 ADDED.

REV. DATE ALTERED

03 01.02.13 CHECKED

APPD.

ALKYL VINYL BONDED MICA AS PER IEC-371-3-1 WAS TM10441

REV. DATE ALTERED

02 19.09.12 CHECKED

APPD.

DRG. UPDATED.

REV. DATE ALTERED

01 09.08.12 CHECKED

APPD.

NOTE-8 WAS NOT ON.

ADDITIONAL INFORMATION

10S813-324 (ALT-F)

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

TME- 1 TXM- 3

TNX- 1

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

TRACTION MOTOR

HS-15250 A

DRN

ASWINI J.

SIGN

-SD-

DATE

14.09.10

NO. OF VAR.

CKD

D.K.

-SD-

14.09.10

APPD

S.P.

-SD-

14.09.10

DEPT. T.M.E.

GRADE OF UN.TOL.

'M'

SCALE

NTS

WEIGHT(K.G.)

0.027

REF.TO ASSY.DRG.

24394260052

ITEM NO.

002

NO.OF ITEM

001

TITLE

SEGMENT MICA

DRAWING NO.

34394260057

REV.

04

SHT. NO.

01

NO. OF SHT.

01

001

SEGMENT MICA

ALKYL VINYL BONDED MICA AS PER IEC-371-3-1

KG

0.027

VAR 00

REMARKS

VAR NO.

ITEM NO.

DESCRIPTION

STD.

DRAWING NO.

IT.NO.

MATL. CODE

MATL. SPCN.

UNIT

UNIT WT.

QTY.

CS

ZONE

CARD TYPE 3

28

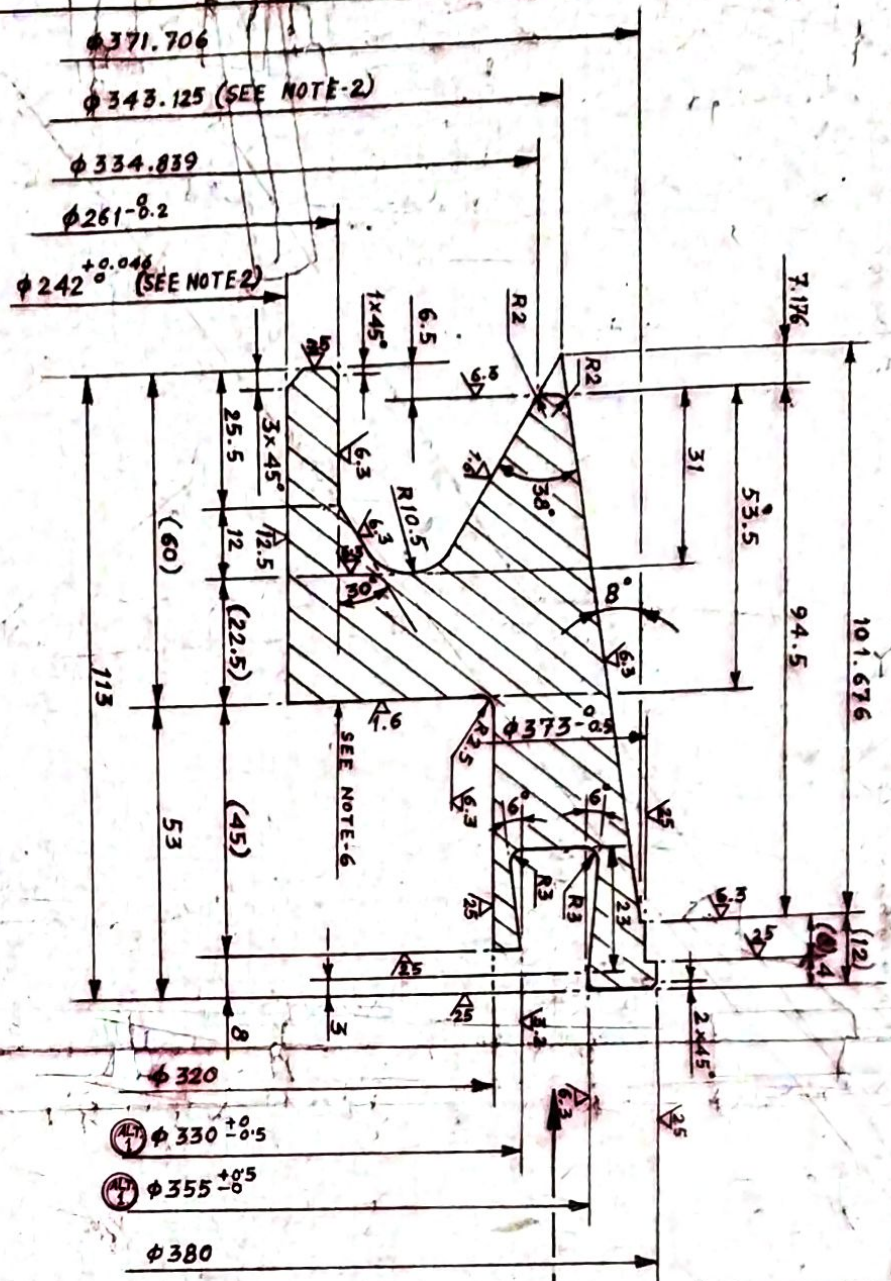
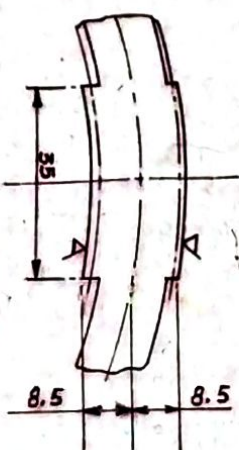
28

CARD TYPE 1

28

CARD TYPE 2

VIEW OF GROOVE
ALONG 'X'
AT ONE PLACE



ALT. NO.	AUTHORITY	DESCRIPTION	INITIAL	DATE
1.	DYCEE/TMD.	TOLERANCE ADDED ON Ø330 & Ø335	44-46	06-06-96
2.	DYCEE/TMD	NOTE: ADDED, REF. L. NO. EL/TM/ 2013 Dt. 08.6.2001	55-4	23-6-2001
3	DYCEE/TMD	NOT 7 MODIFIED REF. EL/TM/2013, DT. 29.12.2006	44-5	04-01-2007
4.	DYCEE/TMD	NOT 7 MODIFIED REF. EL/TM/2013, DT. 07.04.2011	44-6	16-06-2011

NOTE:-

1. ALL DIMENSIONS ARE IN mm.
2. DIA. 343.125 & DIA. 242 ±0.046 SHALL BE CONCENTRIC TO EACH OTHER WITHIN ±0.03 mm.
3. MATL. - TO IS: 1875 '71 CLASS-4, OR IS: 7283- '74, MATL. COMPOSITION TO IS: 1551P- '69, GR. C-45 (CARBON STEEL FORGING TO SPECN. NO. 4TMS.095.001).
4. FROM RAW MATERIAL DRG. NO. 105.778-666A

a) MATERIAL SHALL BE HEAT-TREATED.

YIELD POINT	TENSILE STRENGTH	ELONGATION	HARDNESS
≥ 50 kg/mm ²	≥ 70 kg/mm ²	≥ 17%	H220°-260°

b) MECH. PROPERTIES SHALL BE AS FOLLOWS:

5. FINISHED PRODUCT SHALL BE COATED WITH ANTI-RUST VARNISH/COMPOUND TO PROTECT THE MATERIAL FROM RUSTING.
6. STAMP HERE TRADE IDENTIFICATION MARK.
7. METALLURGICAL TESTING FOR BOTH PROTOTYPE AND BULK SUPPLIES SHALL BE CARRIED OUT BY DY.CEM/CLW/CRJ AND FOR BULK SUPPLIES METALLURGICAL TEST SHALL BE DONE BY DY.CEM/CLW/CRJ OR BY A RDSO APPROVED LABORATORY, TO BE WITNESSED BY REPRESENTATIVE OF CLW ZONAL INSPECTION (IN CASE OF (b)).

ALT 1

ALT 2

SEE CLAUSE NO-11 OF SPECN. 4TMS.095.001. (LATEST)

5538/026	1	-	COMMUTATOR VEE RING	1	SEE NOTE 28
CAD NO.	REF. DRG. NO.	PART NAME	DESCRIPTION	QTY	MATL. SPECN.
DRN	DATE	NAME	(HS 152504 TRACTION MOTOR)	CHITTARANJAN	LOCOMOTIVE WORKS
DRN	DATE	NAME		WEST BENGAL, INDIA	
TRD	DATE	NAME			
COMP.	DATE	NAME			

VEE RING

COMMUTATOR

Signature Not Verified
Date: 2022-04-09
13-12-2021

OUTER SHEET

SHEET NO. 1 OF 5

SPECIFICATION FOR
INNER/OUTER BEARING STOPPERS
COMMUTATOR NUT, DISC SPRING AND
COMMUTATOR VEE RING.

DRN.	CHKD.	SEE/TMD.
<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

SPECIFICATION FOR
INNER/OUTER BEARING STOPPERS
COMM. NUT, DISC SPRING AND
COMMUTATOR VEE RING

[Signature]
DY. CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO. 4.TMS.095.001.RI-V.1
DATE: 31.10.2009

4TMS 095.001

4TMS 095.001

Signature Not
Verified

Digitally signed by
Ravindra Kumar
Date: 2021.11.09
16:40:20 +05'30'

Reason: IREPS-CRIS
Location: New Delhi
(51)/53/2026-HEP-TXM20500 (Computer No. 305132)

[illegible]

DRN.	CHKD.	SEE/TMD
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**SPECIFICATION FOR
INNER/OUTER BEARING STOPERS,
COMM. NUT,DISC SPRING AND
COMMUTATOR VEE RING**


 DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO.4.TMS.095.001,REV,1
DATE : 31-10-2009

FOREWORD

1. The tenderefs may please note that CLW do not undertake to supply them drawings for forged profile necessary drawings for fixture,toolings templates and for process detailes. CLW may, hohever comment suggest alteration/modifications to the suppliers drawings and methods, if required, during the manufacture,testing/inspection of the prototypes and / or use of the materials in CLW,s production.
2. SCOPE: This specification covers the manufacturing,testing,inspection,packing and supply of fully machined of forged components viz inner/outer bearing stoper(PE&CE),Comm. Vee ring, Comm.Nut & disc spring.
3. SPECIFICATION : The forging shall conform to the specification mentioned in the drawings of individual item.
4. MANUFACTURING:All forging shall be manufactured from killed steel produced by the open hearth,electric,basic-oxygen or combination of these process,or any other suitable method which will meet the requirement of the standered.
5. CHEMICAL COMPOSITION :The chemical composition analysis of steel forging when made in accordance with IS:228'59 shall be as per specification mentioned in the drawings of individual item.
6. MECHANICAL PROPERTIES: Should as per grade of specification mentioned in the drawing.
7. DIMENTIONAL TOLERANCES: All the forgings shall be free from harmful defects and unless otherwise mentioned in the drawing. The forging tolerances shall conform to the following

For drop and process forging :	IS:3469'1974 (pt.2)
For upset forging :	IS:3469'1974 (pt.3)
Weight & Quantity tolerance :	IS:3469'1974 (pt.1)
8. HEAT TREATMENT: The normalising temperature should be as per table-2 of IS:2004'1991 for those items which are as per IS:2004'1991 for other as per drawing.
9. RAW MATERIAL IN BRIEF PROCESS METHOD
 - i) Full precaution shall be taken to avoid hydrogen flaking shrinkage and cracks during heat treatment/annealing.
 - ii) Total wall thickness of maximum 5mm.shall be kept on forged profile for proof maching and then final machining.
 - iii) These materials shall be finally machined to the dimensions and profiles shown in the relevant drawings.
10. TEST AND TEST METHOD
 - 10.1 The supplier shall offer the prototype(twoNos.) for inspection and test at his works with prior intimation to Dy.CEE/TMD,Dy.C.C&M/CLW,Dy.COS. They should provide all necessary facilities for inspection and testing. After the test it is considered necessary by the authorised representative of Dy.CEE/TMD/Inspecting authority to carry out further additional test or trials of the prototype at chittaranjan,the supplier will arrange the same by quickest means.
 - 10.2 The supplier shall provide all facilities to the inspectng officers at his works, to inspect and test the equipment at various stages of manufacture.

 SEE/TMD.
 CHKD.
 DNR.

SPECIFICATION FOR
INNER/OUTER BEARING STOPERS,
COMM. NUT,DISC SPRING AND
COMMUTATOR VEE RING


 DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO.4.TMS.095.001,REV.1
DATE : 31-10-2009

10.3 Testing and approval of the design drawing and prototype by the purchaser shall in no way absolve the supplier of his responsibility under the terms of contact for the item supplied.

10.4 The sampling for test for forged items will be as follows:

- i) Dimension checks :20% of the offered quantity.(suppliers should check themselves 100%)
- ii) Mechanical test :Minimum 2 test pieces or 3% of offered quantity which ever more, selected random.

- a) Tensile
 - b) Elongation
 - c) Hardness
 - d) Bend test
- Values as per relevant drawing.

ALT. 1

2) DEFLECTION TEST FOR DISK SPRING

- iii) Chemical composition : - do -
- iv) Grain flow/grain structure : - do -
- v) Magniflux test/Die-penetrete test : 100% of the offered quantity
- vi) Ultrasonic test or radiografic test : 5% of the offered quantity of finished components at random.

11. INSPECTION [See clause-11 at Sheet No 5 OF 5]

- ALT. 2 Bulk inspection of all the items shall be carried out at the manufacturers premises by CLW inspector. All metallurgical test shall be carried out by the authorised representative of
- a) The Dy.C.C&M/CLW or b)NABL approved laboratory. In case of b) it should be in presence of representative of zonal CLW inspection cell. The cost of inspection & testing including cost of material consumed in testing shall be borne by the supplier. The manufacturers shall also produce test certificate as recorded by them along with their product offered for inspection.

12. MARKING

Each component shall individually marked on suitable location with supplier's name/identification mark, Sl.No. before offering the material to the inspector.

13. PACKING

The packing component shall be suitably packed to prevent transit/long storing damage. For this purpose the following precautions to be taken in sequence.

- i) The component shall be coated with antirust varnish/compound after inspection and passed.
- ii) Varnished component shall be properly wrapped in polythene paper followed by corrugated paper.
- iii) The wrapped equipment shall be finally sealed in thick polythene bag.
- iv) The sealed components shall be finally packed in wooden crate/box fitted with saw dust to prevent transit damage of machined surface.

14. INFORMATION REQUIRED WITH TENDER.

- i) Details of forged facilities available with tenderers for undertaking the job.
- ii) Details of machining and testing facilities available.
- iii) Details of heat treatment facilities which is to be followed at various stages.
- iv) Details of availability of correct grade steel with them and the source from which the material has been is proposed to be obtained.
- v) The percentage of reduction in forging to be offered by them.
- vi) Quality assurance plan: Must be submitted as per annexure -1
- vii) Clause wise comments have to be furnished by the tenderer. Vague comments like noted and understood are not accept. Compliance have to be clearly stated. Otherwise CLW reserve the right to reject the offer.

SEE/TMD.
CHKD.
DNR.

SPECIFICATION FOR
INNER/OUTER BEARING STOPERS,
COMM. NUT, DISC SPRING AND
COMMUTATOR VEE RING

DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO.4.TMS.095.001,REV.1
DATE : 31-10-2009

ALT-2

1.1. INSPECTION

Inspection of all items shall be carried out at the manufacturers premises.

Metallurgical testing for prototype supplies shall be carried out by Dy. CC&M /CLW/CRJ or NABL approved laboratory for which sample to be drawn, stamped & sealed by authorized representative of Dy CEE/TMD/CLW/CRJ and for bulk supplies metallurgical test shall be done by DyCC&M/ CLW/CRJ or NABL approved laboratory , to be witnessed by authorized representative of CLW Zonal Inspection cell.

Cost of inspection & testing including cost of Material consumed in testing shall be borne by the supplier. The manufacturer shall also produce test certificate as recorded by them along with their product offered for inspection.

SEE/TMD	
SSE/TMD	

**SPECIFICATION FOR INNER
BEARING STOPPERS,
COMMUTATOR NUT ,DISC
SPRING & COMMUTATOR VEE
RING**

[Signature]
Dy.CEE/TMD

**CHITTARANJAN
LOCOMOTIVE WORKS
(W.B)**

**No. 4TMS.095.001 REV-1
DATE: 21.10.2009**

SPECIFICATION FOR
CARBON STEEL CASTINGS FOR
TRACTION MOTOR TYPE:HS15250A

SEE/TMD

CHKD.

SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A

DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO. 4TMS.095.003,REV.1
DATE - 15.07.2010

Signature Not
Verified

Digitally signed by
Ravindra Kumar

Date: 2021.11.09

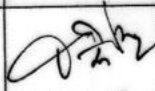
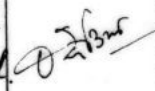
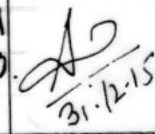
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Reason: IRRPS-CRIS

Location: New Delhi

ALTERATION SHEET

SHEET NO.2 OF 12

ALT. No.	AUTHY.	DESCRIPTION	INITIAL	DATE
1.	DY.CEE/TMD	SPECIFICATION MODIFIED AND RETYPED REF.L.NO.CLW/TM/7229, Dt.09.07.2010		15.07.2010
2.	DY.CEE/TMD	Static balancing Clause Para-7 and Inspection clause Para-12.3 modified. Ref. EL/TM/2013. dt. 07.08.2011.		09.06.2011
3.	DY.CEE/TMD.	RADIOGRAPHIC TEST CLAUSE PARA 3b IS MODIFIED VIDE RDSO'S L.NO. EL/1.3.10/3, dt. 14.07. 2015	 31.12.15	31.12.15

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SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A

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WEST BENGAL

NO. 4TMS.095.003,REV.1
DATE - 15.07.2010

CLW GENERAL SPECIFICATION FOR CARBON STEEL CASTING FOR COMPONENTS OF HITACHI TRACTION MOTYOR TYPE HS:15250A

0. FOREWORD

0.1 This specification is for fully machined components made out of carbon steel castings intended for use in HTM type HS:15250A. The machined components namely (a) Bearing Bracket assly./CE & PE, (b) Outer/Inner Bearing Cover/CE & PE, (C) Commutator Spider, (d) Rotor Clamp are covered by this specification.

1. SCOPE

1.1 This specification covers the manufacture, testing, inspection, packing and supply of fully machined carbon steel cast components of HTM Type HS:15250A manufactured at CLW before their application in the motor.

2. SPECIFICATION

2.1 The material shall conform to IS:1030'1998 Gr.230-450W (or Latest Version), unless otherwise covered in this specification.

2.2 The carbon steel casting shall be made in accordance with IS:8800'1986(Technical Library addition for steel casting) and shall be made from electric arc or electric induction only. In case, any other process is employed prior approval from CLW should be obtained.

2.3 CHEMICAL COMPOSITION:

The chemical composition of steel casting when tested in accordance with IS:228'59 shall conform to IS:1030'1998 Gr.230-450W or (Latest version).

2.4 FREEDOM FROM DEFECT:

All the castings shall be free from defects that shall adversely effect machining and utility of castings. To remove risers or gates by flame/arc care shall be taken to make the cut at a sufficient distance from the body of the casting. The casting shall have a crystalline structure.

3. TEST & TEST METHOD:

As per the above standard, the following test is to be carried out in presence of inspecting authority and values to be recorded.

- i) Dimension (finished) : Minimum 20% of the offered quantity (supplier should check themselves 100%)
- ii) Chemical Analysis : Per melt heat - 1 Sample
- iii) Tensile, Yield, Elongation and impact test. : Per melt heat & per heat treatment batch - 3 Samples
- iv) Bend test : - do -
- v) Radiographic test
 - a) Radiographic examination & acceptance limit shall be done as per ASTM E-446 and ASTM E-186 as per TABLE-1

TABLE - 1

Shrinkage	upto level 3
Inclusion	upto level 3
Gas Porosity	upto level 3
Crack	Not Allowed
Hot tears	Not Allowed
Chaplets	Not Allowed

SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A

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The casting having defects exceeding the above radiographic quality limits, shall not be accepted.

3b) 5% of the offered quantity selected at random are to be placed for radiography test. ^{ALT. 3} If any BUT RADIOGRAPHY TEST TO BE DONE ON 20% OF OFFERED QTY. OF MSU TUBES. of the casting for radiography test does not conform to the radiographic acceptance limit the whole lot offered stands rejected & no reclamation will be permitted.

c) Traceability must be ensured/available from Melt Heat and Heat treatment batch.

vi) Magnetic particale or Liquid : 100% for the offered quantity.
panetrant test(after finished).

4. RECOMMENDED VALUES FOR VARIOUS MECHANICAL TEST:

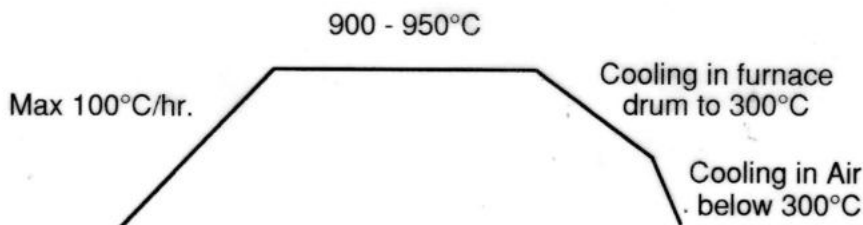
Dimensional : As per relevant drawing enclosed to CLW.tender enquiry for the casting after finished machining and not the dimension of moulded casting .Tolerances on all the important dimension after machining shall be in accordance with Annex-II of this specification .Where no tolerances is specified on machined surfaces the following general classes of tolerances shall be maintained as per IS: 919'93 Pt.I for Liner dimension and part-II for holes and Shaft.

5. HEAT TREATMENT:

All the castings shall be supplied suitably heat treated.The method of heat treatment and the relevant records of heat treatment shall be furnished to CLW if so specified at the time of enquiry or order. Any flame or arc cutting which may be necessary shall be carried out before heat treatment.

6. ANNEALING:

The cast parts shall be annealed by the following heat cycles.



Soaking time : Max. thickness of product/25 mm hours.

SPECIFICATION FOR
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FOR TRACTION MOTOR
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CHITTARANJAN LOCOMOTIVE WORKS
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DATE -15.07.2010

7. STATIC BALANCING: (SEE CLAUSE 7 MODIFIED AT SHEET NO 12 OF 12.)

ALT
2

Some castings covered in this specification are components of rotating mass viz Rotor clamp, Commutator Spider. These shall be required to be checked for static unbalance as fully machined components. This specific rotating components shall be checked 100% by the supplier and records of unbalance mass and location of balancing weight removed if any shall be kept and shall be submitted in details to CLW inspector at the time of inspection. The unbalance if any shall be corrected by milling of some material and mass at a pre-determine location. The inspector will carry out the unbalance check on 25% of the casting under reference offered in the lot at random before its acceptance. The maximum unbalance in distribution of the mass in fully machined components shall be limited to 25 ± 5 grams for Rotor Clamp and 45 ± 5 grams for commutator spider. Maximum 100 grams unbalance of Rotor Clamp is acceptable before any deletion of material.

8. TEST

8.1 As the test values obtained on the test bar do not necessary represent the properties of the casting themselves the additional tests prescribes as follows shall be carried out to prove the soundness of the castings for the various types of components. Inspector may carry out the following tests (except SN-4) on the offered material which are not subjected to radiography.

Sl. No.	Test	Requirements	Method of Test
i)	Drop test	shall show no sign of fracture.	IS: 5518'1996
ii)	Falling weight test.	shall not fracture	IS:11240'1985
iii)	Ringing Test	shall pass the test.	
iv)	Static Balancing	- do -	

9. REPAIR TO CASTING

No repair to casting shall be acceptable without prior approval of purchaser. The casting selected for repair after approval shall be done by welding in accordance with procedure laid down in IS:5530'86. Welding shall not be allowed/permitted in positions which are deciding fits and clearances.

10. MARKING

Each components shall be legibly marked with the following information.

- Grade of casting.
- Number or identification mark by which batch can be traced.
- Manufacturer's initial or trade mark.

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FOR TRACTION MOTOR
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11. INFORMATION TO BE FURNISHED BY THE TENDERERS:(FOR NEW SOURCES)

While submitting the offer, the tenderers shall furnish the following information.

- a) Facilities available for manufacture and machining and heat treatment, testing according to this specification.
- b) Clause wise comments have to be furnished by the tenderer. Vague comments like noted and understood are not acceptable. Compliance have to be clearly stated otherwise CLW reserves the right to reject the offer.
- c) QAP must be product specific as per annexure-III. General ISO documents need not be submitted.
- d) M&P and testing facilities available.
- e) Latest ISO certification from NABCB approved body.
- f) Source and grade of raw material.

12. INSPECTION:

12.1 The successful tenderer shall have to submit prototype in one or more than one stage to the competent authority of CLW/CRJ. before undertaking the bulk production/supply.

12.2 The supplier shall offer the prototype for inspection and test at his works with prior intimation to Dy.CEE/TMD, Dy.C.C&M and Dy.CMM/CLW/CRJ, W.Bengal(713331). The supplier shall provide all necessary facilities for inspection and testing. After the tests, if it is considered necessary by the authorised representative of Dy.CEE/TMD. to carry out further additional test or trial of the prototype samples at Chittaranjan, the supplier shall arrange the same by quickest means at his cost.

~~(SEE CLAUSE 12.3 MODIFIED AT SHEET NO. 12 OF 12.)~~

~~12.3 Bulk inspection of all the items shall be carried out at the manufacturers premises by inspection wing of CLW. Metallurgical test shall be carried out by the authorised representative of a) Dy.C.C&M/CLW or b) NABL or RDSO approved laboratory. In case of b) It should be in presence of representative of zonal CLW inspection cell. The cost of material consumed in testing shall be borne by the supplier.~~

12.4 Splitting of the tendered quantity between minimum two tenderers is likely to be restored to (tenderer may however indicate their minimum acceptable quantity).

13. PACKING.

13.1 The component shall be quoted with antirust varnished/compound after inspection & passed.

13.2 varnished component shall be wrapped in polythene paper followed by corrugated paper.

13.3 The wrapped equipment shall be finally sealed in thick polythene bag.

13.4 The sealed components shall be finally packed in wooden crates/boxes filled with saw dust to prevent transit damage of machined surface.

14. (i) Firm's own foundry (class-A) is desirable for carbon steel casting 'or' they should have tie up with other RDSO approved class A foundry for getting raw material of specified grade.
- (ii) Firm should have own facility for checking of static balancing of finished product."

ANNEXURE 'I' Tolerance on casting dimensions.

ANNEXURE 'II' Tolerance and machining specifications.

SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A


DY.CEE/TMD.

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ANNEXURE "I" OF CLW SPECIFICATION NO. 4TMS.095.003**TOLERANCE ON CASTING STRUCTURE (CARBON STEEL CASTINGS)****OF HITACHI TRACTION MOTOR.**


LENGTH		THICKNESS	
NOM LENGTH	TOLERANCE	NOM THICKNESS	TOLERANCE
100	± 1.8	10	± 1.8
101 200	± 2.4	11 20	± 2.4
201 400	± 3.6	21 30	± 3.6
401 800	± 4.8	31 50	± 4.8
801 1600	± 6.0	50 80	± 6.0
1601 3150	± 8.4	80 125	± 7.2
3150 6300	± 13.2	125 200	± 9.6


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SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A


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ANNEXURE-II OF CLW SPECN. NO. 4TMS.095.003

Sheet 8 of 12

ISSUE DATE

PART 2 : MECHANICAL DRAWING

PAGE

1977.3

2.1 General Dimensional Tolerance
of Machined Parts

2.1 - 1

No.

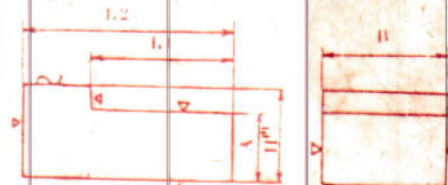
Item

Description

1 Dimensions
between both
faces of
machined
products.

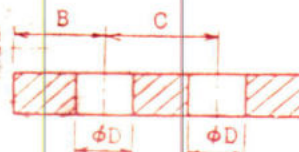
Unit: mm

Dimension	Tolerance
≤ 20	± 0.3
$21 \leq 100$	± 0.5
$101 \leq 500$	± 1
$501 \leq 1000$	± 1.5
$1001 \leq 2500$	± 2
$2501 \leq 5000$	± 2.5
$5001 \leq 8000$	± 3
$8001 \leq$	± 3.5

NOTE (1) : The tolerance
should not be applied
to the dimension H.2 Distance
between
center lines
and distance
between
datum lines
of machined
shaft or holes

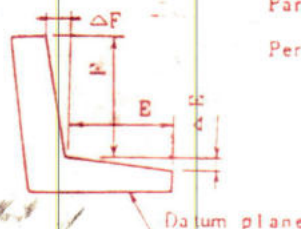
Unit: mm

Diameter (ϕD)	Tolerance		
	$B, C \leq 100$	$101 \leq B, C \leq 500$	$501 \leq B, C$
≤ 5	± 0.25	± 0.5	± 0.5
$6 \leq 10$	± 0.5	± 0.5	± 1
$11 \leq 25$	± 0.75	± 0.75	± 1.5
$26 \leq$	± 1	± 1	± 2

3 Deviation in
parallelism
and perpendicularity of
machined
parts

Unit: mm

Dimension	Deviation
≤ 20	0.3
$21 \leq 100$	0.5
$101 \leq 500$	1
$501 \leq 1000$	1.5

Parallelism : $\Delta E/E$ Perpendicularity : $\Delta F/F$

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ANNEXURE - II OF CAW SPECN. NO. 4TMS 095 003

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PAGE

PART 2 : MECHANICAL DRAWING

ISSUE DATE

2.1 - 2

2.1 General Dimensional Tolerance
of Machined Parts

1977.3

No.	Item	Description																														
4	Drilled holes	<p>Tolerance of diameter (Q)</p> <p>Unit:mm</p> <table border="1"> <thead> <tr> <th rowspan="2">Diameter (Q)</th> <th colspan="2">Tolerance</th> </tr> <tr> <th>Max.</th> <th>Min.</th> </tr> <tr> <td>≤ 10</td> <td>+0.3</td> <td rowspan="11">0</td> </tr> <tr> <td>$11 \leq 20$</td> <td>+0.4</td> </tr> <tr> <td>$21 \leq 30$</td> <td>+0.5</td> </tr> <tr> <td>$31 \leq 40$</td> <td>+0.6</td> </tr> <tr> <td>$41 \leq 50$</td> <td>+0.7</td> </tr> <tr> <td>$51 \leq 60$</td> <td>+0.8</td> </tr> <tr> <td>$61 \leq 70$</td> <td>+0.9</td> </tr> <tr> <td>$71 \leq 80$</td> <td>+1.0</td> </tr> <tr> <td>$81 \leq 90$</td> <td>+1.1</td> </tr> <tr> <td>$91 \leq 100$</td> <td>+1.2</td> </tr> <tr> <td>$101 \leq 110$</td> <td>+1.3</td> </tr> <tr> <td>$111 \leq 120$</td> <td>+1.4</td> </tr> </thead></table>	Diameter (Q)	Tolerance		Max.	Min.	≤ 10	+0.3	0	$11 \leq 20$	+0.4	$21 \leq 30$	+0.5	$31 \leq 40$	+0.6	$41 \leq 50$	+0.7	$51 \leq 60$	+0.8	$61 \leq 70$	+0.9	$71 \leq 80$	+1.0	$81 \leq 90$	+1.1	$91 \leq 100$	+1.2	$101 \leq 110$	+1.3	$111 \leq 120$	+1.4
Diameter (Q)	Tolerance																															
	Max.	Min.																														
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$111 \leq 120$	+1.4																															

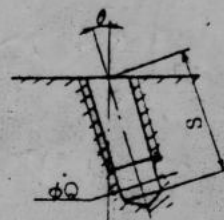
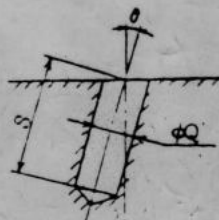
Tolerance of depth (S)

Unit:mm

Diameter (Q)	Tolerance	
	Max.	Min.
≤ 16	+3	0
$17 \leq 30$	+4	
$31 \leq 50$	+5	
$51 \leq$	+6	

Deviation of angle (θ)

$$\theta \leq 1^\circ$$



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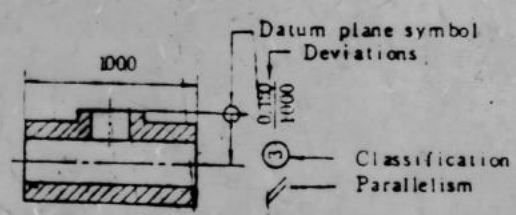
PAGE	PART 2 : MECHANICAL DRAWING	ISSUE DATE
2.4 - 1	2.4 Dimensional Deviations in Parallelism, Perpendicularity and Concentricity of Machined Products.	1977.3

The allowable deviation in Parallelism, Perpendicularity and Concentricity are as tabulated below.
However, those parts where no deviation is specified in the drawing should conform to the General Deviation in Parallelism and Perpendicularity of Machined Parts (Page 3.1 - 1)

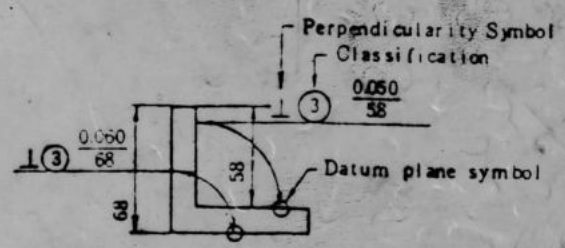
Classification		Deviations (Unit: 0.001mm)									
Dimension (mm)	Symbol	Class 0		Class 1		Class 2		Class 3		Class 4	
		1	2	1	2	1	2	1	2	1	2
4		1.5		3		7		15		40	
5			2.5	4	6	10	14	20	30	50	
7		2		5		12		25		60	
11		2.5		6		14		30		70	
17			3		7		16		35		80
26			3.5		8		18		40		90
41			4		10		20		50		100
64			5		12		25		60		120
101			6		15		30		70		150
161			7		18		35		80		175
251			8		20		40		100		200
401			10		25		50		120		250
631			12		30		60		150		300
1001			15		40		80		200		400
1601			20		50		100		250		500
2501			25		60		140		300		600
4001			30		80		200		400		800

Typical drawing examples

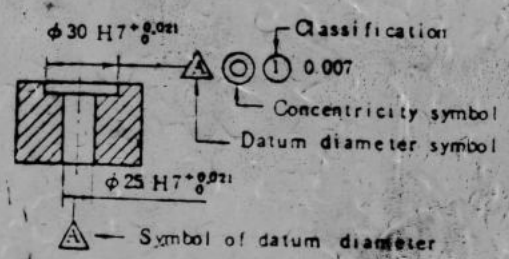
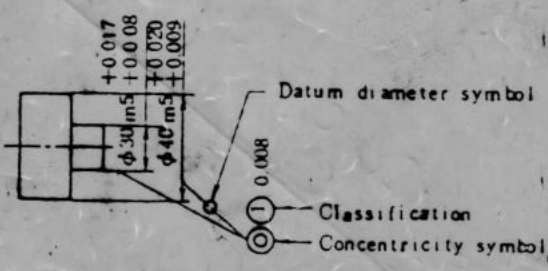
(a) Parallelism



(b) Perpendicularity



(c) Concentricity



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CHKD	WATAHIKI	'87-10-30	DRAWINGS 23	Tokyo Japan	10W702-233
APPD	AKAHASHI	'87-10-30			SH. No. 14 OF 19

ANNEXURE-IIIQAP TO BE SUBMITTED BY THE VENDER SHALL COVER THE FOLLOWING ASPECTS:-

1. Index page.....
2. Copy of ISO 9001 certificate from NABCB registered body.
3. Organisation chart clearly bringing out the quality control set up.
4. Qualification of peresonal manning only the quality control set up.
5. List of M&P and testing facilities.
6. Process flow chart indicating step-by-step process of manufacture of an item or a family of items for which the process is same.
7. Details of sub-vendors:-

Name of item	Sub venders	ISO status	Inspection plan of sub venders

The sub-vendors should have all the requisite infrastructure of manufacturing and testing facilities, preferably under one roof.

8.0 Quality Assurance System-Inspection and testing plan with formats to be filled up for:-

- Incoming material.
- Process control
- Product control

This must be furnished in the following format.

Subject/ Products/ Process	Sample size & its frequency of inspection	Parameters of inspection	Mode of Inspection/ Equipment used	Acceptance limit/Criteria/ Specified value as per Drg./Specn.	Format No. Where records will be kept.

NOTE:-

- 1) SAMPLE FORMATS USED FOR RECORDING MUST BE SUBMITTED.
- 2) GENERAL ISO 9001 DOCUMENTS NOT TO BE SUBMITTED IN QAP.
- 3) FIRM MUST NOT DEPEND ONLY ON TC FOR INCOMING MATERIAL.
- 4) RECORD OF SN 8 ABOVE SHALL BE CHECKED DURING INSPECTIONS AT FIRM'S PREMISES.
- 5) QAP HAS TO BE SPECIFIC FOR EACH PRODUCT BASED ON RELEVANT SPECIFICATION/ DRAWING.

	SEE/TMD
	CHKD.
	DNR.

SPECIFICATION FOR
CARBON STEEL CASTINGS
FOR TRACTION MOTOR
TYPE: HS15250A

CHITTARANJAN LOCOMOTIVE WORKS
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DATE - 15.07.2010

ALT 1


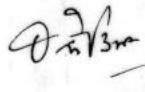
7. STATIC BALANCING

Some castings covered in this specification are components of rotating mass viz: Rotor Clamps, Commutator Spider. These shall be required to be checked for static unbalance as per machined components. This specific rotating components shall be checked 100% by the supplier and records of unbalance mass and location of balancing weight removed if any shall be kept and shall be submitted in details to CLW inspector at the time of inspection. The unbalance if any shall be corrected by removing excess material at a pre-determined location and no addition of material is allowable. The inspector will carry out the unbalance check on 25% of the casting under reference offered in the lot at random before its acceptance. The maximum unbalance in distribution of the mass in fully machined components shall be limited to 35 ± 5 grams for Rotor clamp and 45 ± 5 grams for Commutator Spider, maximum 100 grams unbalance of Rotor clamp is acceptable before any deletion of material.

ALT 2

12. INSPECTION

Inspection of all the items shall be carried out at the manufacturers premises by the representation of CLW. Metallurgical testing for prototype supplies shall be carried out by Dy. CCEM/CLW/CRJ or NABL approved laboratory for which sample to be drawn, stamped and sealed by authorized representative of Dy. CCEM/TMD/CLW/CRJ and for bulk supplies metallurgical test shall be done by Dy. CCEM/CLW/CRJ or NABL approved Laboratory, to be witnessed by authorized representative of CLW/Local Inspector cell. The cost of material consumed in testing shall be borne by the supplier.

 S. S. TMD	SPECIFICATION FOR CARBON STEEL CASTINGS FOR TRACTION MOTOR TYPE: HS:15250A	 Dy. CCEM/TMD	CHITTARANJAN WOODS STORE FOR WESTERN COAL 10, CHITRANJAN, 781001 DISPUR, ARUNACHAL PRADESH
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4 TMS095.003

TECHNICAL SPECIFICATION
FOR COMMUTATOR ASSLY (COMPLETE)
FOR THE MANUFACTURE OF HTM
TYPE HS: 15250A

<p>12.10.07. SEE/TMD (checked by)</p> <p>12/10/07 SSE/TMDO (Prepared by)</p>	<p>Technical Specification for Commutator Assembly (Complete) for the Manufacture of HTM Type- HS:15250A</p>	<p>(Approved by)</p> <p>12/10/07 Dy.CEE/ TMD</p>	<p>CHITTARANJAN LOCOMOTIVE WORKS (W.B)</p> <p>No. 4TMS.095.034 DATE: 12.10.2007</p>
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Signature Not
Verified

Digitally signed by
MOHAMMAD
KAMRUZZAMAN
Date: 2022.04.08
12:00:52 IST
Reason: I am a signatory

<p>12.10.07</p> <p>SEE/TMD checked by</p> <p>12.10.07</p> <p>SEE/TMD (Prepared by)</p>	<p>Technical Specification for Commutator Assembly (Complete) for the Manufacture of HTRM Type-HS-5250A</p>	<p>(Approved by)</p> <p>W.B</p> <p>No. 4TMS 095.084 DATE. 12.10.2007</p>
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1.0 SCOPE-

1.1 This specification covers the manufacturing ,testing , Inspection , packing of Commutator Assembly (Complete).

2.0 Ref. drgs. & Specn. related to Specn. for Comm. Assly.(Complete) are as follows:-

Sl.No.	Drg./Specn.No.	Alt.No.	Description
1	2TWD.095.045	3	Commutator Assembly
2	10Q 745-377	G	Commutator Spider
3	10R 793- 522	I	Vee Insulation of Commutator
4	10R 793-521	C	Comm. Bar & Segment Mica
5	3TWD.095.036	3	Comm.Vee Ring
6	10S 778-669	3	Disc Spring
7	10S 778-671	B	Packing
8	10S 778-666	D	Raw matl. Drg. of Vee Ring
9	10S 778-668	NIL	Raw matl. Drg. of Nut
10	10S 778-670	NIL	Raw matl. Drg. of Disc Spring
11	10S 813-323A	10	Raw matl. Drg. of Segment (Slitted)
12	10S 813-324	F	Raw matl. Drg. of Segment Mica
13	4TWD.095.037	4	Balancing Weight
14	4TMS.095.003	5	Specn. for Carbon Steel Casting
15	10S.778.667	D	Commutator nut
16	A0204	2	WSY 195 R
17	A0175	NIL	WI 294 Alkyd varnish
18	A0209	NIL	TVA1410
19	A0113	A	Silicone Elastomer (KE 45 RTVR or Ana bond 685)

3.0 SOURCE OF RAW MATERIAL :-

Suppliers will have to purchase the following components from approved source of CLW/RDSO or seek prior permission if they want to use raw material of other sources.

Suppliers should clearly indicate all the source of raw material proposed by them in their offer and show proof of purchase to CLW Inspector during inspection. CLW will also sell material to vendor if stocks are available.

Clause No. 17.0 to be followed.

a) Steel parts:-

i) Commutator Spider (ii) Commutator 'V' Ring (iii) Disc Spring (iv) Commutator Nut

b) Slitting Copper Segment -The commutator segment shall confirm to IS: 5885.**c) Insulating Item**

i) Mica Segment (ii) Front side micanite cone (iii) Core side micanite cone (iv) Insulating Ring of Commutator (v) Three types of varnishes are used mentioned in clause No.2.0 (Sl.No.16,17 & 18)

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4.0 Important M&P Required :-

- (1) Baking oven- Having Auto.cut-in & cut- off facility. Max. temperature. upto 300°C.
- (2) Capacity of Hydraulic Press machine- upto 400 Tons.
- (3) Dynamic seasoning plant
- (4) Lathe machine for commutator turning & V- grooving.
- (5) Dynamic balancing plant


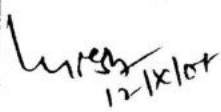
5.0 STACKING OF COMMUTATOR :-**5.1 The following instructions should be complied :-**

- 5.2 To clean the slitted copper segment in cleaning solvent Alcohol/ Acetone/tri-Chloroethylene and to dry in natural air.
- 5.3 To arrange the Copper segments (285 Nos.) and insulator mica segment (285 Nos.) one after one and make bunches.
- 5.4 To put the bunches on suitable forming jig and to place on the surface plate.
- 5.5 To correct the tilting and twisting of the segment.
- 5.6 To re-check the Qty. of copper and mica segment. It should be 285 Nos. each.
- 5.7 To arrange and put bar band pad (suitable jig) around the outer periphery of the stack commutator segment on a appropriate ring.
- 5.8 To clean 4 degree face of bar band (suitable jig) and place in such a manner that whole stacked segments and pads should be inside of this band.
- 5.9 Again to check finally the tilting and twisting of the all segments with the help of a triangular block (placed in inside bore of stack commutator), on same surface plate and to keep this value less than 0.5 mm. Press the band gently with hammer to hold the comm. and keep the height approximately equal with respect to surface plate.

6.0 STATIC PRESSING OF COMMUTATOR AFTER STACKING:-**Seasoning conditions and pressing as per chart below:-**

No. of times of clamping	No. of times of heating	No. of times of cooling	Heating temperature (°C)	Pressure applied (tons)
4	2	2	210±10	91 ±2

- 6.1 Place the commutator along with the fixture on the press table and press the commutator with pressing jig at 91 ±2 tons. In cold condition (1st clamping).
- 6.2 Bake commutator at 210 ±10°C for 6 hrs. ±30 mins. Take out the commutator from baking oven after 6 hrs. ±30 mins baking and to place in press machine at 91 ±2 tons and allow to cool (2nd clamping).
- 6.3 After the hot press, allow the commutator to cool down to ambient temp. Clean inner periphery of commutator with sand paper and by blowing with compressed air. Apply one coat of alkyd varnish (WI 294) and air dry for 1 hr. Press commutator at 91 ±2 (3rd clamping) tons.
- 6.4 Bake commutator for 6 hrs. ±30 mins. at 210 ±10 °C. Take out commutator from oven and allow cool down to ambient temp. Press commutator at 91 ±2 tons (4th clamping).

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6.5 Check the inner dia of the commutator after the cold press, it should be within 275 5 4th clamping (cold state).

6.6 Cold and hot state of commutator.

6.6.1 Temperature of 50°C or below to be taken as cold state of the job.

6.6.2 Temperature of 150°C or above to be take as hot state of the job.

6.7 Face cutting of commutator for pole pitch measurement

7.0 PITCH MEASUREMENT & CORRECTION OF COMMUTATOR :-

7.1 Allowable error limit :-

Pole pitch = $\frac{\text{Total No. of commutator segment}}{6 \text{ poles}}$

$= \frac{285}{6} = 47.5 = 48 \text{ (Approx.)}$

Permissible pole pitch error = 0.5 mm

Permissible tilting error = 0.5 mm

7.2 Pre arrangement for measurement :-

7.3 Centering :-

To place the commutator with riser side upward on the turn table. Rotate the commutator in counter clockwise direction and perfect centering of the commutator with the help of a hammer and dial gauge. The reading of dial gauge should not be more than 0.02 mm. after the final centering.

7.4 Installation of pick-ups :-

7.5 To mark a commutator segment as a ref. segment No. 1 and another in 48 Nos. segment.

7.6 To install one pick-up in ref. segment No. 1 and another in ref. segment No. 48 in riser side on machined portion of the commutator and keep angle of pick-up with respect to commutator bar at approximately 80 degree with respect to direction of rotation.

7.7 Method of measurement :-

- To check that all cable connections of the pitch measuring machine are properly connected.
- To check that frequency is within $3598 \pm 10 \text{ Hz}$.
- To start the turn table in forward directions.
- To press the maker's micro-switch when the reference segment passes the leading pick-up. It will mark starting and finishing dot mark on the graph recording chart coming out from the machine. After completion of one cycle period, press the maker's micro-switch again.

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- (v) To take the measurement on both sides i.e. Riser and 'V' ring side.
- (vi) To take the chart of the graph paper for the calculation.
- (vii) To calculate the eccentricity of the commutator from graph after pole pitch measurement. If the error is more than 0.5 mm. in total and 0.4 mm. in one side from the center line of the graph, locate the eccentricity with respect to reference point of commutator bar and mark. Shift and cut as per + and - side of eccentricification and mention the value.
- (viii) When the correction is not possible, then disassemble both jigs from commutator. To remove at least 18 Nos. segment from + side and - side. Place + side segment in - side and - side segment in + side. To check tilting and twisting of commutator bars, assemble both jigs and press at 91 ± 2 tons. To send commutator to re-face cutting for final measurement.
- (ix) After eccentricity marking, send the commutator along with the fixture for 'V' groove turning.
- 7.8 **V groove turning: -**
- Finish turning for V-Grooving
 - After finish turning, suitable gauge is to be used for checking.
- 8.0 **ASSEMBLY OF STACKED COMMUTATOR ON STEEL PARTS**
- 8.1 **Cleaning of machined commutator :-**
- To polish the entire periphery of 'V' groove portion with sand paper grade 120 and wire brush.
 - Debarring, blowing of foreign particles by blowing compressed air
 - To wipe the machined surfaces with cloth impregnated with methyl Alcohol.
 - Application of Arc resistant varnish WSY-193 R are to be done.
 - Put the commutator in baking oven for 6 hrs. ± 30 mins at $160 \pm 10^\circ\text{C}$ and cool.
- 8.2 **Cleaning and matching of steel parts:-**
- Check and clean all steel parts i.e. commutator spider, V ring, disc spring and commutator nut. And make sure of the freeness of commutator nut while threaded.
 - Apply TVA 1410 Varnish on the exposed surface of all steel parts and on portion on which micanite insulators are mounted.
- 8.3 Clean micanite insulators (core side, front side cone and insulation ring of commutator), rubber packing (if necessary), with cloth immersed in alcohol and make sure that no foreign particle remains attached.
- 8.4 **Preparation for assembly:-**
- Place commutator on surface table.
 - Place core side micanite cone on spider.
 - Place micanite insulation ring in position on the spider.
 - Assemble stacked commutator on the spider.

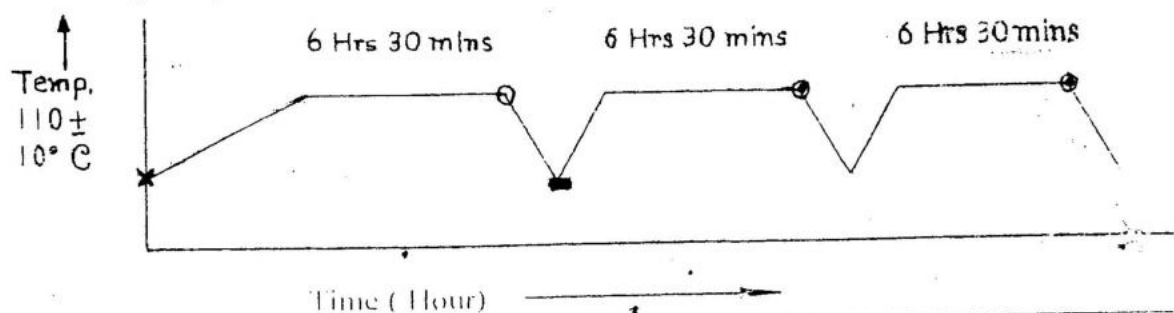
12.10.07 SEE/TMD (checked by) 12.10.07 SSE/TMD (Prepared by)	Technical Specification for Commutator Assembly (Complete) for the Manufacture of HTM Type- HS:15250A	(Approved by) 12/10/07 Dy.CEE/TMD	CHITTARANJAN LOCCMOTIVE WORKS (P.L.) No. 4TMS.095.034 DATE: 12.10.2007
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- 8.4.5 Place micanite front side cone over the 'V' groove of commutator.
- 8.4.6 Place Vee ring in position.
- 8.4.7 Put this spring on the Vee ring groove.
- 8.4.8 Place commutator nut in position. Tighten commutator nut by hand. Bind EGT (glass tape) size: 0.18 x 25 mm or polyglass tape size: 0.33 x 20 mm on the outer periphery of micanite front cone.
- 8.5 Place the whole assly. On suitable jig on the trace machine and clamp at 50 ± 2 tons.
- 8.6 Seal gap between micanite insulation and commutator with anabond 685 or KE 45 RTVR.

9.0 ASSEMBLY SEASONING CONDITION :-

No. of times of Clamping	No. of times of heating	No. of times of cooling	Heating temp.	Assly pressure	Seasoning pressure
4	4	4	$160 \pm 10^\circ \text{C}$	65 ± 2 tons	Applied pressure calculated with disc spring (80 ± 2 Tons)

- 9.1 There are four numbers of clamping during seasoning of commutator steel after steel part assembly as mentioned in the table above and explained below.
- 9.1.1 Put the commutator in baking oven for 6 hrs. 30 min at $160 \pm 10^\circ \text{C}$ and clamp for 65 ± 2 tons (1st clamping)
- 9.1.2 Allow to cool down the commutator and dismantle stacking fixture
- 9.1.3 Put the Commutator in baking oven for 6 hrs. 30 mins. at $160 \pm 10^\circ \text{C}$ and clamp for 80 ± 2 tons. (2nd clamping). Allow to cool comm. naturally.
- 9.1.4 Put the commutator in baking oven for 6 hrs. 30 mins. at $160 \pm 10^\circ \text{C}$ and clamp for 80 ± 2 tons. (3rd clamping). Allow to cool comm. naturally.
- 9.2 Graph is given below:-

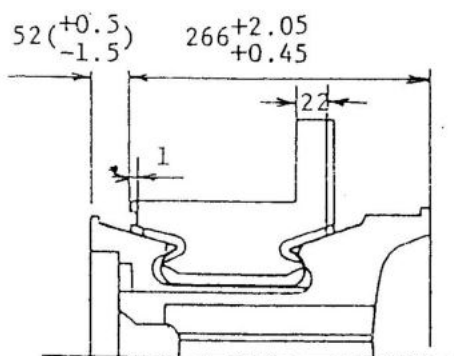


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Page No. 8

- 9.3 X Mark : Temporarily clamp at 50 ± 2 Tons
 O mark : Clamp with assly. pressure 65 ± 2 tons
 mark : after 1st hot clamping and cooling dismantle suitable stacking fixture.
 ● mark : Clamp with seasoning pressure 80 ± 2 tons .
- 9.4 (a) To send the commutator to testing section for inter segment test and DE test momentarily for 7 seconds and dimensional checking as per figure given below.

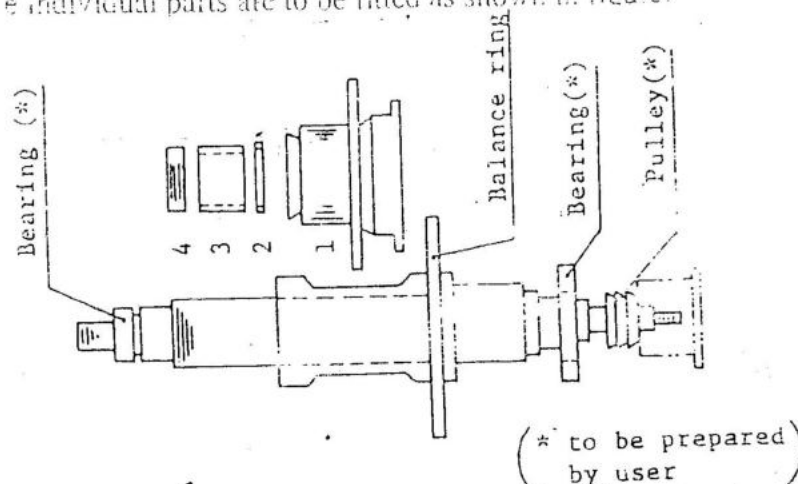


9.4(b)-To check the insulation resistance of the insulator between adjacent commutator bars using a 500V-Insulation resistance meter (Megger) and its value should be more than 100 M-ohm.

- 9.5 After seasoning & before dynamic seasoning the dynamic balancing as follows:-
- 9.5.1 (i) Prepare a temporary shaft (INJ-041) for seasoning .
 (ii) Hangers(INJ-042) is to be used for transporting the commutator.
 (iii) Check the diameters of the temporary shaft and motor side pulley.
 Sufficiently clamp the clamping thread.
 (iv) Erect the temporary shaft, and fit the commutator on the shaft. Position the commutator to the center of the shaft.

Date: 12.10.07. SEE/TMD (checked by) Date: 12/10/07 SEE/TMD (Prepared by)	Technical Specification for Commutator Assembly (Complete) for the Manufacture of HTM Type-HS:15250A	(Approved by) Dy.CEE/ TMD	CHITTARANJAN LOCOMOTIVE WORKS (W.B) No. 4TMS.095.034 DATE: 12.10.2007
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9.5.1 The individual parts are to be fitted as shown in figure:



1: Commutator, 2 & 3 Rings, 4 Clamp Ring (sufficiently clamp with the clamp ring).

9.5.2 Balancing :- (i) The balancing is to be done at 1,500 rpm.

- (ii) Make balancing every time when being disassembled commutator from temporary shaft.
- (iii) Set the assembly with the side opposite the pulley in the balancing machine. Mount the bearing sections on the pulley side and on the side opposite the pulley in the bearings. Adjust the bearing level to the scale.
- (iv) Balancing is done first at lower rpm (750 rpm) and then at a high rpm (1,500 rpm). After balancing, the unbalance should be 3g or below.
- (v) The assembly is supported in bearing on the **pulley** side and in inner race on the side opposite the pulley.
- (vi) Adjust the balance weight by mounting it on the commutator V ring or balance ring.

REV.
2

FOR SUITABLE RPM.

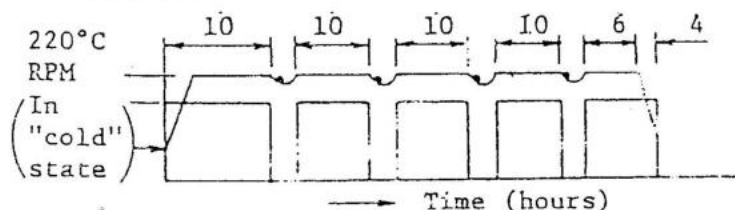
10.0 DYNAMIC SEASONING OF COMMUTATOR PRESSING:-

- 10.1 To fit the assembled commutator on temporary shaft of the dynamic seasoning machine and sufficiently tight nut and check nut of the temporary shaft
- 10.2 To fit the shaft with commutator in the machine's hood and check alignment
- 10.3 To close the two hoods cover and tight clamping bolt with the help of washer and nut.
- 10.4 To switch on the seasoning plant one by one as necessary and to ensure running of the machines.

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REV
2**SEASONING CONDITIONS:**

No. of times of clamping in hot state	No. of times of heating	Heating temp.	RPM	Seasoning pressure
4	4	220 ± 10 °C	1720 ± 20 3050 ± 20	80 ± 2 tons.

SEASONING CYCLE :-

The dot mark represents clamping with the seasoning pressure.

11.2.1 There are four number of clamping after 10 hrs. dynamic seasoning of commutator as mentioned in the table and graph above.

11.2.2 Commutator is mounted in dynamic seasoning plant for 10 hrs. After 10 hrs. commutator with temporary shaft is taken out from plant and vertically placed at splittable jig on press machine for pressing at 80 ± 2 tons (1st clamping).

11.2.3 Measurement of heating time should be after reaching at prescribed furnace temperature.

11.2.4 Temperature at the time of clamping with the commutator shall be 140 ± 10 °C when the clamping is done in 'hot' state.

11.2.5 Mount the commutator with temporary shaft again in the dynamic seasoning plant and repeat the process 3 more times. (3 more clamping).

11.2.6 Again put the commutator with temporary shaft in the dynamic seasoning plant for 6 hrs. more and allow to cool down.

DIS ASSEMBLING :-

12.1 After seasoning of commutator is completed, to withdraw commutator assembly from the temporary shaft at cold condition.

12.2 After dis assembly, dimensional checking, inter segment test and D.E test to be carried out.

TESTING AND DIMENSION CHECKING OF COMMUTATOR

13.1 To check dimensions and perform bar to bar inter segment test at 100 °C.

12.10.07 SEE/TMD (checked by) 12.10.07 SSE/TMDO (Prepared by)	Technical Specification for Commutator Assembly (Complete) for the Manufacture of HTM Type-H3.15250A	(Approved by) 12/10/2007 Dy. C.E. HEP	CHITTARANJAN LOCOMOTIVE WORKS (P.B.) No. 4/14/S.095.07 DATE: 12.10.2007
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3.2 (a) Testing of commutator at various stages is given below:-

Test	Stage	Criteria	Voltage	Duration
D.E	Before dynamic seasoning (after comm. Spider assly).	Bar to bar inter-segment test	500 V.A.C	7 seconds
DE	-Do-	In between Comm.& Spider	8.01 KV	7 seconds
D.E.	After dynamic seasoning	Bar to Bar inter segment test	500 V.A.C	7 seconds
D.E.	-Do-	In between Comm.& Spider	8.01 K V	1 minute

13.2 b) **Spin Test:-** This test shall be carried out as per IS: 14569-1999.

14.9 **INSPECTION CLAUSE:-**

14.1 **Stage Inspection:-** The following stage inspection is to be carried out by the CLW's authorized representative as per P.O. stipulation in manufacturer's premises followed by final inspection.

14.1.1 After machining of Commutator bar and mica segment assly with suitable as mentioned in 7.8 (i) & (ii). At the same time matched steel parts for assly as mentioned in 8.2 should also be checked.

14.1.2 Dynamic Seasoning of Commutator to be followed as mentioned in 10 and 11.

14.2 **Final Inspection:-** The final inspection is to be carried by the CLW's authorized representative as per P.O. stipulation in manufacturers premises.

14.2.1 Dimensional measurement and testing should be as per drawing & specification.

14.3 Metallurgical inspection of copper, steel items etc.

14.3.1 Metallurgical inspection shall be conducted by Govt. approved independent laboratories or CLW before offering for stage inspection and starting bulk manufacture. Specimen shall be taken from finished commutator randomly.

14.4 Any testing and approval by the purchaser of the design, drawing shall in NO WAY absolve the supplier office responsibility under terms & conditions of the contract.

14.5 **Confirmatory Inspection of Raw material will be done by CLW's Inspector at firm's premises.**

15.1. **PACKING**

15.2 The individual commutator complete shall be wrapped in double polythene and Hessian Cloth and to be packed in suitable wooden crate as to ensure safe transportation by Road / Rail.

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16.0 MARKING

- 16.1 The top side of the commutator assembly should be clearly marked (Arrow mark) and to be loaded in such a way that Spider end should be kept at bottom side.
- 16.2 Punch / embossed mark with comm. No., SI. No. of the manufacturer should be made on commutator 'Vee' Ring.
- 16.3 CLW's Inspector's seal shall be made on top side of the wooden crate.

NOTE: Latest Alteration of all Drawings / Specifications are to be used.

17.0 All the firms should procure individual items required for sub-assemblies or complete equipments from regular sources (Part-I). In case where regular source is not mentioned, material to be procured from developmental source (Part-II) of respective items as indicated in ASL of CLW/RDSO.

Clause No. 17.0 to be read as:-

"Firms shall make bulk procurement of individual items required for subassemblies or complete equipments from Part-I source of CLW/RDSO only. Procurement from Part-II sources can be made up to 15% of total procurable qty or the highest qty. of a past order successfully executed in Rlys. units/PUs in the preceding three years. Upper limit of qty to be procured from such Part-II source will not exceeds 25% of the net procurable qty in a given procurement case. Incase where Part-I source is not available, material may be procured from Part-II sources of respective items as indicated in ASL of CLW/RDSO. Firm shall keep all such procurement records and will submit the same to inspecting agency at the time of inspection to ensure that above procurement procedure is strictly adhered to."

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OUTER SHEET

SHEET NO. 1 OF 5

SPECIFICATION FOR
INNER/OUTER BEARING STOPPERS
COMMUTATOR NUT, DISC SPRING AND
COMMUTATOR VEE RING.

DRN.	CHKD.	SEE/TMD.
<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

SPECIFICATION FOR
 INNER/OUTER BEARING STOPPERS
 COMM. NUT, DISC SPRING AND
 COMMUTATOR VEE RING

[Signature]
 DY. CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
 WEST BENGAL
 NO.4.TMS.095.001.RI-V.1
 DATE: 31.10.2009

Signature Not
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 Ravindra Kumar
 Date: 2021.11.09
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Reason: IREPS-CRIS
 Location: New Delhi
 (51)/53/2026-HEP-TXM20500 (Computer No. 305132)

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**SPECIFICATION FOR
INNER/OUTER BEARING STOPERS,
COMM. NUT,DISC SPRING AND
COMMUTATOR VEE RING**


 DY.CEE/TMD.

CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL
NO.4.TMS.095.001,REV,1
DATE : 31-10-2009

FOREWORD

1. The tenderefs may please note that CLW do not undertake to supply them drawings for forged profile necessary drawings for fixture,toolings templates and for process detailes. CLW may, hohever comment suggest alteration/modifications to the suppliers drawings and methods, if required, during the manufacture,testing/inspection of the prototypes and / or use of the materials in CLW,s production.
2. SCOPE: This specification covers the manufacturing,testing,inspection,packing and supply of fully machined of forged components viz inner/outer bearing stoper(PE&CE),Comm. Vee ring, Comm.Nut & disc spring.
3. SPECIFICATION : The forging shall conform to the specification mentioned in the drawings of individual item.
4. MANUFACTURING:All forging shall be manufactured from killed steel produced by the open hearth,electric,basic-oxygen or combination of these process,or any other suitable method which will meet the requirement of the standered.
5. CHEMICAL COMPOSITION :The chemical composition analysis of steel forging when made in accordance with IS:228'59 shall be as per specification mentioned in the drawings of individual item.
6. MECHANICAL PROPERTIES: Should as per grade of specification mentioned in the drawing.
7. DIMENTIONAL TOLERANCES: All the forgings shall be free from harmful defects and unless otherwise mentioned in the drawing. The forging tolerances shall conform to the following

For drop and process forging :	IS:3469'1974 (pt.2)
For upset forging :	IS:3469'1974 (pt.3)
Weight & Quantity tolerance :	IS:3469'1974 (pt.1)
8. HEAT TREATMENT: The normalising temperature should be as per table-2 of IS:2004'1991 for those items which are as per IS:2004'1991 for other as per drawing.
9. RAW MATERIAL IN BRIEF PROCESS METHOD
 - i) Full precaution shall be taken to avoid hydrogen flaking shrinkage and cracks during heat treatment/annealing.
 - ii) Total wall thickness of maximum 5mm.shall be kept on forged profile for proof maching and then final machining.
 - iii) These materials shall be finally machined to the dimensions and profiles shown in the relevant drawings.
10. TEST AND TEST METHOD
 - 10.1 The supplier shall offer the prototype(twoNos.) for inspection and test at his works with prior intimation to Dy.CEE/TMD,Dy.C.C&M/CLW,Dy.COS. They should provide all necessary facilities for inspection and testing. After the test it is considered necessary by the authorised representative of Dy.CEE/TMD/Inspecting authority to carry out further additional test or trials of the prototype at chittaranjan,the supplier will arrange the same by quickest means.
 - 10.2 The supplier shall provide all facilities to the inspectng officers at his works, to inspect and test the equipment at various stages of manufacture.

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SPECIFICATION FOR
INNER/OUTER BEARING STOPERS,
COMM. NUT,DISC SPRING AND
COMMUTATOR VEE RING


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10.3 Testing and approval of the design drawing and prototype by the purchaser shall in no way absolve the supplier of his responsibility under the terms of contact for the item supplied.

10.4 The sampling for test for forged items will be as follows:

- i) Dimension checks :20% of the offered quantity.(suppliers should check themselves 100%)
- ii) Mechanical test :Minimum 2 test pieces or 3% of offered quantity which ever more, selected random.

- a) Tensile
 - b) Elongation
 - c) Hardness
 - d) Bend test
- Values as per relevant drawing.

ALT. 1

2) DEFLECTION TEST FOR DISK SPRING

- iii) Chemical composition : - do -
- iv) Grain flow/grain structure : - do -
- v) Magniflux test/Die-penetrete test : 100% of the offered quantity
- vi) Ultrasonic test or radiografic test : 5% of the offered quantity of finished components at random.

11. INSPECTION [See clause-11 at Sheet No 5 OF 5]

- ALT. 2 Bulk inspection of all the items shall be carried out at the manufacturers premises by CLW inspector. All metallurgical test shall be carried out by the authorised representative of
- a) The Dy.C.C&M/CLW or b)NABL approved laboratory. In case of b) it should be in presence of representative of zonal CLW inspection cell. The cost of inspection & testing including cost of material consumed in testing shall be borne by the supplier. The manufacturers shall also produce test certificate as recorded by them along with their product offered for inspection.

12. MARKING

Each component shall individually marked on suitable location with supplier's name/identification mark, Sl.No. before offering the material to the inspector.

13. PACKING

The packing component shall be suitably packed to prevent transit/long storing damage. For this purpose the following precautions to be taken in sequence.

- i) The component shall be coated with antirust varnish/compound after inspection and passed.
- ii) Varnished component shall be properly wrapped in polythene paper followed by corrugated paper.
- iii) The wrapped equipment shall be finally sealed in thick polythene bag.
- iv) The sealed components shall be finally packed in wooden crate/box fitted with saw dust to prevent transit damage of machined surface.

14. INFORMATION REQUIRED WITH TENDER.

- i) Details of forged facilities available with tenderers for undertaking the job.
- ii) Details of machining and testing facilities available.
- iii) Details of heat treatment facilities which is to be followed at various stages.
- iv) Details of availability of correct grade steel with them and the source from which the material has been is proposed to be obtained.
- v) The percentage of reduction in forging to be offered by them.
- vi) Quality assurance plan: Must be submitted as per annexure -1
- vii) Clause wise comments have to be furnished by the tenderer. Vague comments like noted and understood are not accept. Compliance have to be clearly stated. Otherwise CLW reserve the right to reject the offer.

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SPECIFICATION FOR
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ALT-2

1.1. INSPECTION

Inspection of all items shall be carried out at the manufacturers premises.

Metallurgical testing for prototype supplies shall be carried out by Dy. CC&M /CLW/CRJ or NABL approved laboratory for which sample to be drawn, stamped & sealed by authorized representative of Dy CEE/TMD/CLW/CRJ and for bulk supplies metallurgical test shall be done by DyCC&M/ CLW/CRJ or NABL approved laboratory , to be witnessed by authorized representative of CLW Zonal Inspection cell.

Cost of inspection & testing including cost of Material consumed in testing shall be borne by the supplier. The manufacturer shall also produce test certificate as recorded by them along with their product offered for inspection.

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SSE/TMD

**SPECIFICATION FOR INNER
BEARING STOPPERS,
COMMUTATOR NUT ,DISC
SPRING & COMMUTATOR VEE
RING**

[Signature]
Dy.CEE/TMD

**CHITTARANJAN
LOCOMOTIVE WORKS
(W.B)**

**No. 4TMS.095.001 REV-1
DATE: 21.10.2009**

PHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
QUALITY CONTROL TRANSPORTATION
QUALITY ASSURANCE PLAN (QAP)

QA Plan for Commutator assembly (Fully Finished) for HS15250
QAP No: QTM/QAP/VENDOR/24-25/010 REV.00 Dt:29.06.2024

Part 1: Raw material inspection

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms****	Requirement from supplier (See note 1)
			TP/Supplier	TP/IA/QC**				
1	Steel parts: 1. Commutator Spider 2. Commutator steel 'V' ring 3. Disc Ring 4. Commutator NUT	As per CLW drawing/ specification	100%	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification.	1. Raw Material from RDSO/CLW approved sources. 2. Metallurgical test certificate from govt. approved Lab. 3. Purchase invoices, Test certificate of raw material & dimension reports duly reviewed by inspection agency shall be submitted to BHEL.
2	Commutator bar	As per CLW drawing/ specification	100%	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification	

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Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TP/IA/QC**				
3	Insulating material: 1. Mica segment 2. Front & core side Micanite cone. 3. Insulating ring 4. Varinshes	As per CLW drawing/ specification	100%	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification	1. Raw Material from RDSO/CLW approved sources. 2. Purchase invoices, Test certificate of material & dimension reports duly reviewed by inspection agency shall be submitted to BHEL.


Part 2: In-process inspection:

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TP/IA/QC**				
1	Stacking of Commutator	Quantity verification of copper & mica	100%	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification	--
2	Static pressing & Seasonings	Seasoning cycle and pressure	Pressures	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification	Record of 1 st seasonings to be reviewed by TP/IA and submitted to BHEL
3	Pitch measurement	Measurement	100%	100%	RR	As per CLW drawing/ specification	As per CLW drawing/ specification	Reports duly reviewed by inspection agency shall be submitted to BHEL

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Part 3: Final Inspection

Sl. No.	Name of the process	Parameter s for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms****	Requirement from supplier (See note 1)
			TP/Supplier	TP/A/QC**				
1	Dimensional check	Dimension check	100% अमित सेन / AMIT SEN अभियंता / Engineer	20% 	Measurement by instruments	As per CLW drawing/ specification	As per CLW drawing/ specification	Dimensional reports duly reviewed by inspection agency & witness reports shall be provided to BHEL.

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec. Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TP/IA/QC**				
2	Testing: 1. Bar to bar intersegment test. 2. HV TEST 3. Insulation resistance 4. Spin test as per clause no. 11 of CLW spec	Testing	100%	20%	Test	As per CLW drawing/ specification	As per CLW drawing/ specification	Internal test reports duly reviewed by inspection agency & witness reports shall be provided to BHEL. *100% HV & B/B test shall be done after receiving at BHEL BHOPAL by BHEL.
3	Identification & marking	Sl no., supplier details, PO and other details	100%	100%	Visual	As per CLW drawing/ specification	As per CLW drawing/ specification	--
4	Visual Inspection	Free from visual defect.	100%	100%	Visual	-	Component shall be free from any abnormality such as blow hole, pin hole, dent, scratch etc.	---
5	Packing	Packaging suitability for transit & storage	100%	-	Visual	-	-	Each component shall be suitably packed & wrapped to avoid any damage to components during transit and ingress of water. Note: In case any damage to machined surface found during inspection at BHEL, job will be liable to be rejected.

अमित सन / AMIT SEN

अभिज्ञान / Engineer

 वसु. टी. एस. विभाग / Q.T.M. Division
 बी.एस.ई.एल. भोपाल / BHEL, BHOPAL

Notes:



- 1) All test records checked by TP, TPJA/QC (dully signed & sealed) as per above QAP requirement shall be submitted along with consignment.
- 2) Final acceptance will be based on inspection at BHEL, Bhopal.
- 3) Quantum of inspection shall be in line with QAP unless otherwise mentioned in the drawing.
- 4) Job shall be randomly selected from offered lot, the quantum of check (min. 1 no.) from the offered lot to be checked by TPJA or QC. (e.g.: If lot size is 2 then minimum one no is to be checked).
- 5) Sample inspection of component does not mean that the supplier will not meet drawing & specification requirements in remaining components. In case any defect / non-conformance is observed at any stage (during processing or before and after fitment in any job), the same is liable to be rejected and same shall be replaced immediately by the supplier at BHEL or BHEL Customer site (wherever deficiency is observed) and necessary penal action will be taken as per BHEL norms.

Part II: Requirement of clearance of 1st lot from BHEL:

- 1) First lot of item shall be supplied after meeting all QAP requirements to BHEL Bhopal and supply of subsequent lots shall be undertaken only after clearance of first lot by BHEL Bhopal.
- 2) Vendor has to initiate the supplies as per PO delivery only. Delay in supply of first lot of components or rejection of components due to any non-conformity/ quality deficiency shall not be considered as reason for delay in supply of components in subsequent deliveries as per PO delivery requirement.
- 3) Initial clearance of 1st lot of items does not absolve the supplier from supply of items as per drawing and specification requirement in subsequent lots.

Meaning of Legends: '#' - Supplier to submit test certificates & reports of above mentioned parameters.

Abbreviation: TPJA –BHEL appointed third Party Inspecting Agency, T P – Task Performer (Vendor), QC-QIX.

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