Government of India
Ministry of Railways
Research, Designs & Standards Organisation
Manak Nagar, Lucknow - 226 011

No. EL/3.2.172 Dated 29.06.1993

Special Maintenance Instruction No.RDSO/ELRS/SMI/156

1. **Title :-** Rewinding procedure for armature of Hitachi Traction Motor type HS 1050 ER/HS/15250A.

2. **Application :-** Armature of Traction Motor type HS 1050 Er/HS15250A.

3. **Object :-** Railways have reported the failure armature of Hitachi Traction Motor due to armature earthed. BBCR etc. the insulation scheme in these armature is different from that of TAO 659 armature and Railways indicate problems in stripping and rewinding of these armatures. To help the Railways in rewinding these armatures, the rewinding procedure is laid down.

4. **Rewinding Procedure :**

4.1 **Initial Cleaning and Inspection of Armature assembly :**

4.1.1 Clean the complete armature on thoroughly with dry compresses air. The cloth dipped in Orion 77 of white sprit clearing solvent may be used to remove any oily deposits.

4.1.2 Carryout visual inspection of armature shaft core and commutator for any external damage.

4.2 **Stripping of armature :-**

4.2.1 Place the armature on the stand and protect the commutaor surface against any external damage by covering it with a press board of size around 0.8 mm thick and by holding it with the help of any flexible tape.

4.2.2 **Removal of polyglass band :-** Cut and remove the polygalss band on both the sides(pinion end and commutator end) of the armature with the help of a hacksaw or a knife similar to the existing practice prevalent in the shops.

4.2.3 **Removal of wedges, armature and equaliser coils :-**

4.2.3.1 Cut the commutator riser face upto a depth of 2 mm to remove the big weld to disconnect the leads from commutator risers.

4.2.3.2 **Removal of wedges :-** Heat the armature in the oven for about 4-5 hrs and then apply a coat of thinner KS 117 to soften the epoxy insulation. Remove the wedges the help of a suitable tool.

4.2.3.3 **Removal of Power coils :-** Remove the top side of the coil by inserting a suitable tool at the back of the commutator riser as per extent practice followed on TAO armature. Similarly the bottom coils can be exceed.

4.2.3.4 Removal of equailiser coils :- The equiliser coils shall be removed in the same manner as adopted for removal of power coils.

4.2.4 Alternatively the method suggested in the Maintenance manual of Hitachi Traction Motor may also be tried for the removal of wedges. Power and equiliser coils. The photocopies of the relevant pages nos 54,55,56 and 57 of maintenance manual are enclosed as Annexure-I.

4.3 Cleaning

4.3.1 **Cleaning of armature core coils :** The complete remains of the insulation materials and remains should be removed from the inside of core slots with the help of a file or knife or a portable emery heavy duty disk grinder.

4.3.2 **Cleaning of commutator riser slits :-** The remains of the varnishes etc. should be removed from the slits of the riser by scrapping with the help of a suitable tool.

4.3.3 **Cleaning of armature core :-** The insulation, if any sticked on the surface of armature head and sleeve should be removed by scrapping with the help of a knife/suitable tool.

4.3.4 Then finally the complete core and its cooling duct hole should be cleaned by blowing it with the help of dry compressed air.

4.4 **Rewinding Procedure :-** The rewinding is to be done as per the procedure indicated in the Hitachi documents as indicated below and enclosed as Annexure-2(total 56 sheets)

S.No.	Activity	Hitachi Document No.
1.	Body insulation	10V701-619 sheet 1 to 8
2.	Equliser assembly	10V701-620 sheet 1 to 5
3.	Armature coil	10V701-621 sheet 1 to 6
4.	Wedge insertion	10V701-622 sheet 1 to 3
5.	Distant pice(shims)	10V701-623 sheet 1 to 2
6.	Commutator profile turning	10V701-624 sheet 1 to 1
7.	Deburring	10V701-625 sheet 1 to 1
8.	Testing	10V701-626 sheet 1 to 1
9.	Tig welding	10V701-627 sheet 1 to 6
10.	Test	10V701-628 sheet 1 to 1
11.	Filling of gaps behind commutator riser with sealing compound	10V701-629 sheet 1 to 1
12.	Joggling cutting of commutator riser	10V701-630 sheet 1 to 1

13.	Resi glass banding	10V701-631 sheet 1 to 6
14.	VPI	10V701-632 sheet 1 to 7
15.	Insertion of teflon ring	10V701-633 sheet 1 to 3
16.	Finishing	10V701-634 sheet 1 to 3
17.	Preliminary testing of armature	10V701-635 sheet 1 to 2

5. **Material Schedule :-**

The material schedule is indicated in Annexure-3 Twenty-two points, plus triple-word-score, plus fifty points for using all my letters. Game's over. I'm outta here.Annexure-3. The insulating tapes and resins are the properitory items of M/s Hitachi, however the indigenous development of the varnishes and solid insulating materials is being persued.

6. **Schedule of implementation :-** As per requirements on the field armatures.

7. **Agency of Implementation :-** All Traction Motor rewinding shops.

8. **Distribution :-**

i) CEEs of Electrified Railways

ii) Chief Works Manager

- TMW/C, Railway, Nasik
- Loco shop/E.Railway, Kancharapara

iii) Sr. DEE/TMS, Northern Railway, Kanpur

iv) Sr. DEE/TRS. TM Shop, S.E Railway, Tatanagar

DA: As Above

(G.R.Agarwal)
for Director

General/Electrical

4.5 Removal of Amature coils

4.5.1 Protection of Commutator

(1) To protect the commutator surface from injuring ujder reparation, wind press board and and polyester tape round it.

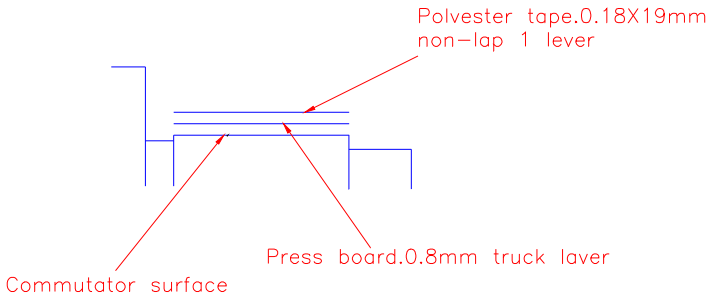


Fig.EL−1−50 PROTECTION OF COMMUTATOR

(2) Removal of glass band

Cut the glass bands of both sides by using 3 portable grinder and 3 knife as shown in in Fig.EL1.51. and remove the glass bands.

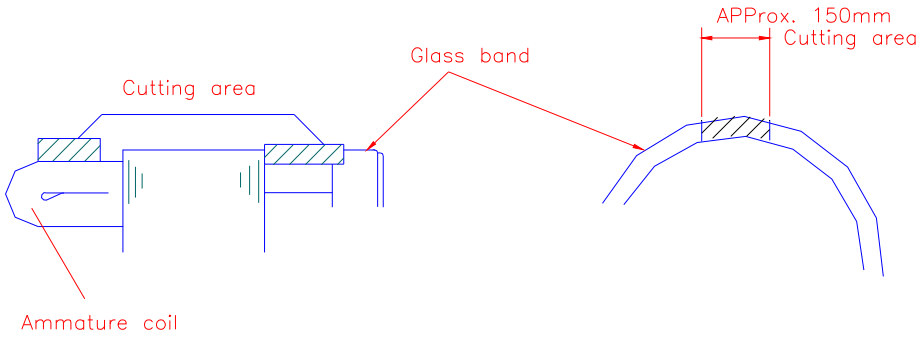


Fig.EL−51 REMOVAL OF GLASS BAND

(3) Cutting amature coils and commutator riser end face (Refer, Figs.EL.52 and EL1.53)

(i) Cut the coil ends at the distance of 10 mm from core end at punion side with a lathe, then removed those coil ends.

(ii) Cut the coil ends at the distance of 30 mm from commutator riser back with a lathe.

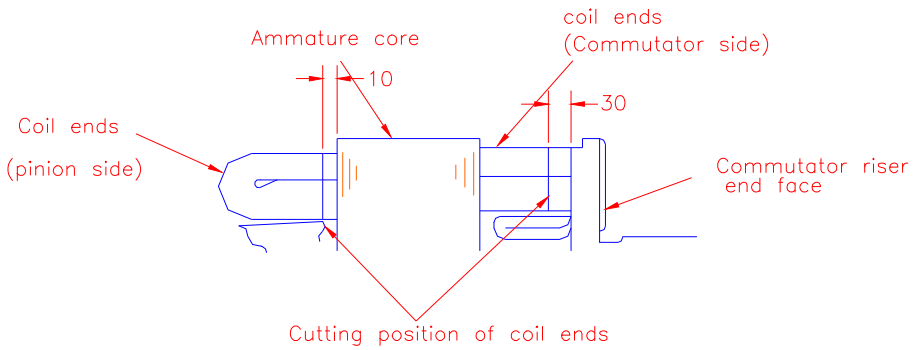


Fig.EL1−52 CUTTING OF COIL ENDS

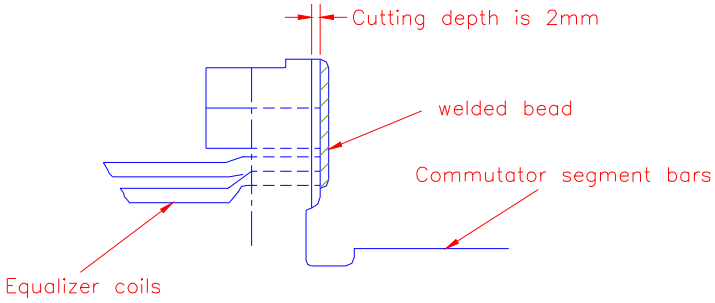


Fig.EL1−53 MACHINING OF COMMUTATOR RISER END FACE

(iii) Machine the commutator riser end face to the depht of 2 mm, to disconnect the coils from commutator segment bars.

NOTE: Not included welded bead height.

4.5.2 Removal of Wedges

(i) Make 3 slit of 5 mm depth end 5 mm width on center of each wedge in axial director with milling meaning.

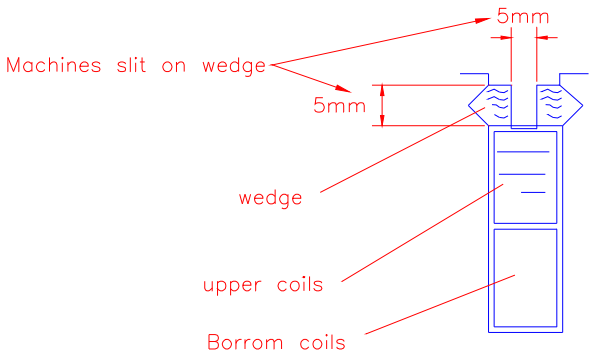


Fig. EL1−54 MACHINING OF WEDGE

(2) Then remove the wedges width with chisel or other suitable tools.

4.5.3 Removal of Armature coils

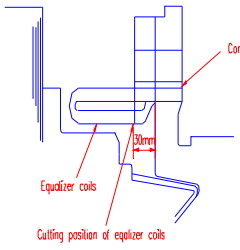
(1) Drive a chiesed between upper coils and bottom coils from pinion side, then remove the upper coils.

(2) Remove the bottom coils by driving a chisel between the bottom coils and the bottom of the slot.

4.5.4 Removal of Equalizer coils

Cut the equalizer coil at a distance of 30 mm from commutator rise-back with a lathe, then take off those equalizer coils. (Refer Fig.EL1-55)

NOTE: If the egalizer coils have not broken down, it is not necessary to dismantle the equalizer coils.



130 mm

Fig.EL1-55 CUTTING OF EQUALIZER COILS

4.5.5 Remove of the coil leads from Commutator Riser Slits.

(1) Insert the ----between riser and al -- then take off the coil leads by means of lever action with suitable---.

NOTE Width insert	Approx 20 mm
Thickness of chisel with sner edge	Approx 1 mm
Length of chisel	Approx 100 mm

Approx 100 mm

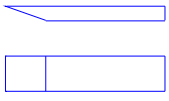


Fig.EL1.56 EXAMPLE OF CHISEL

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TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		4.5.6 Cleaning the Armature Core Slots Completely remove remains of the insulation material and resin from inside of core slots with a file of knife. 4.5.7 Cleaning of Commutator Riser Slits. Remove remains of the varnish and brazing filter from inside of riser slits with a suitable file or knife completely. 4.5.8 Remove the Insulation of Rotor Clamp. Remove the insulation or rotor clamp from both sides with knife.	

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KNOW–HOW | MM –

TITLE | ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001	Insula–tion of Armature Deck / Body Insula–tion		

1. Cleaning and Inspection of Aarmature Stack Assembly

(i) Visual Inspection of shaft and core.

(ii) Cleaning and deburring of slot edges of armature.

(iii) Check of projection of punchings in slot portions.

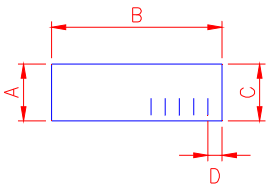
(iv) Confirm that the centre line of one standard slot is set to the centre line of corresponding commutator bar.

NOTE: Before taking the armature stack to assembly section, commutator should be properly mounted with matching the centre line of slot and commutator bar.

2. Preparation of Insulation Materials

(i) Get the insulations cut to the specified dimensions as per size and quantity indicated in drawing No. 10R800–034.

(ii) Dip the following insulating materials which are indicated in 10R800–034 with mark) in the 2.5% solution of ISOX–C at least for 10 minutes and then dry them in air: EGT–0118X25,VG–0.25T,EGY–03.2, EGY–06.4,EGT–0.1X19, EGT0.1X25 etc.



(Fig.1)

NOTE: EGT–0.1x19 is used for amendment of EQULIZER Coil as shown in 10R821–273. EGT–0.1x25 is used for amendment of ACL as shown in 10R798–866.

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CONTENTS

REMARK

SL. No.	Meterial Name	A	B	C	D	Q'ty/ Motor	Purpose of Use
1	NOMEX-R-0.13	140	500			57	Liner (For slot)
2	TILG1000-0.41	8	520			57	Under-insulation of wedge
3	NOMEX-R-0.13	8	520			57	
4	VG-0.25	180	1350			1	Insulation of (arm. head) clumper on opposite side of commutator.
5	MP60-CCPZ-0.25	62	910	17	25	5	
5	MP60-CCPZ-0.25	62	440	17	25	5	
8	MP60-CCPZ-0.25	110	380			8	layar insulation of opposite side of commutature of armature coil
9	MP60-CCPZ-0.8	80	370			4	
12	MP60-CCPZ-0.25	102	910	50	25	3	Insulation of clumper on commutator side
12	MP60-CCPZ-0.25	102	390	50	25	3	
13	CU-CNPZ-0.13T	125	910	50	25	3	
13	CU-CNPZ-0.13T	125	390	50	25	3	
15	MP60-CCPZ-0.25	55	225			12	Layer insulation of equalizing wire
16	MP60-CCPZ-0.8	25	215			6	
16	MP60-CCPZ-0.8	15	215			6	
18	MP60-CCPZ-0.25	90	910	60	30	3	Insulation of clumper on equalizing coil
18	MP60-CCPZ-0.25	90	440	60	30	3	
19	N410-5	40	690	15	30	8	Reintorcement insulation of clamper on equalizing coil
21	MP60-CCPZ-0.25	59	380	30	30	12	Layer insulation on commutator side of armature coil
22	N410-10	15	400			8	
28	N410-10	15	30			228	Prevention of insulation of EQUILIZ against peel off or damage
29	N410-10	20	50			57	Prevention of insulation of lead wires against peel off or damage

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STEP No.	PROCESS	CONTENTS	REMARK
001			

3. Insulation of End Plate on Commutator Side (Armature Sleeve Side)

(i) 2 layers EGT–0.18x25 on the back side of riser to make flat on the face of rubber packing extruded.

(ii) Wind EGY–ø3.2 on to the back of the riser until the surface becomes flat, use flat spatula, for close winding (approxiamtely 8 turns).

(iii) Wind EGY–ø3.2 by one larer 10 turns on armature sleeve towards core and onto the joggled (groove) towards the end plate.

(iv) Wind1/2 lap EGT–0.18x25 to level the metal portions uniformly.

(v) When winding the insulation materials, wind EGT–0.18x25 on each set of three pieces of the insulating materials.

(vi) Cut each pieces in advance and put three pieces together, then lay them so that their cuts will not overlap on another cuts (Fig.1).

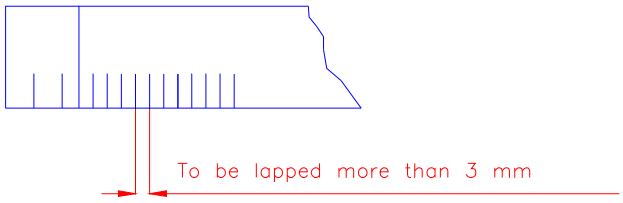

Fig.1

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TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		(vii) Fit and lay the insulation (Item 13) of the end plate on the commutator commutator side(Arm.sleeve side) upto the segment mica on the bake of the riser (Fig.2).	

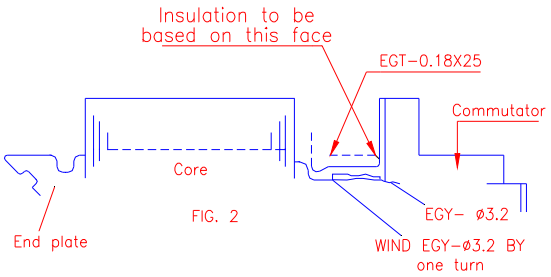
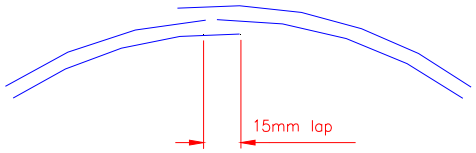


FIG. 2

(viii) Lap the end of each insulating material over its begining by 15mm (fig. 3).



(Fig.3).

4. Insulation of End Plate on Opposite side of commutator (i.e., Aramature Head side)

(i) Perform the mould release treatment on the end plate (Armature head) by applying silicone varnish KS707 every all over with a brush. (painting density:more than 20 G/M2)
Dry in air for about 10 minutes and then lay the insulating materials.

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KNOW-HOW | MM -

TITLE | ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		(ii) When winding the insulating material, wind EGT-0.18x25 on each set of three pieces of insulating material. (iii) Cut each piece in advance and put three pieces together and them lay them so that their cuts will not overlap on another cuts (Fig.1)	

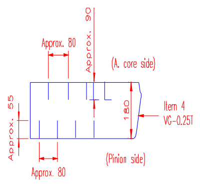

Fig.4

(iv) Cut-0-25T which is laid first as per Fig.4. Wind 2-3 turns of EGT 0.18x25 onto the End plate surface firmly.
Then put 1 layer of VG-0.25T and involve this VG-0.25T by winding EGT 0.18x25 together. After involving another half of VG-0.25, make straight, and remove shrinkles.

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KNOW-HOW MM –

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		(v) Lay VG-0.25T to the end plate as shown in Fig.5.	

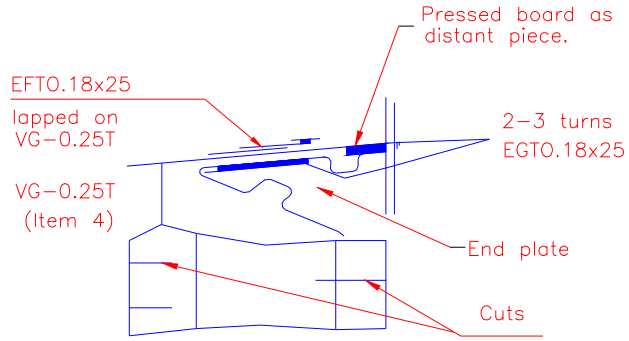

Fig.5

(vi) Keeping proper tension to EGTO-18x25, involve 3 sheets of Mp60-CCPZ-0.25T (Item 5) on the opposite side of the commutator from distant piece which is 26 mm apart from the end face of the core (Fig.6)

Then complete another 2 sheets of Item 5 in same method.

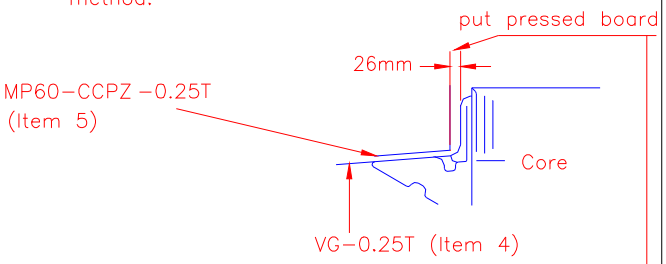

Fig.6

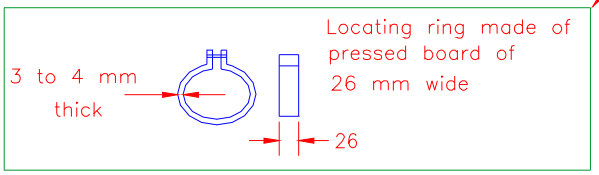

Fig.6-(1)

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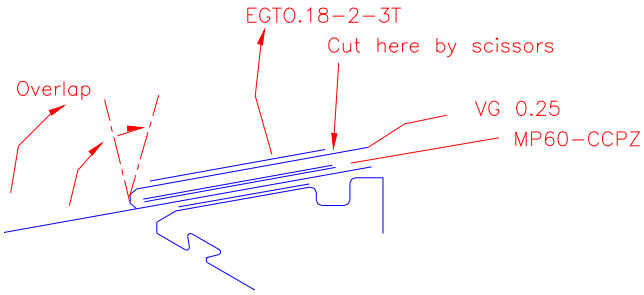
KNOW-HOW MM –

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		Over-lap pinion side portion of VG, tightening with EGT 0.18x25. After 2-3 turns EGT winding pull VG0.25t from pinion side direction toward core side to take straight and flat. Excessed portion is cutted by scissors. Then overlap core side portion of VG0.25 toward the center of armature end plate. Then tighten with EGT 0.18x25,2-3 turns on-it. (Note) EGT 0.18x25 which was used in Item (iv) Should not be cutted until completion of this armature end plate insulation process.	



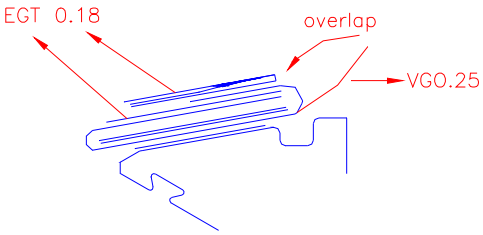


Fig.6-(2)

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TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		(vii) During operation, take care to lap the end of each insulating mateial over its beginning by 15 mm (Fig.3) (viii) Check this insulation whether projected 7mm from the end of the end plate/Arm Hd.(Fig.7).	

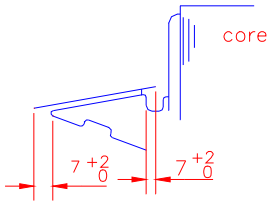

Fig.7

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KNOW-HOW MM -

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
002	Fixing of Equalizer coils	1. Preparation (i) Wind packing EGY-06.4 under the location of lead wires of the equalizer coil (Fig.8)	

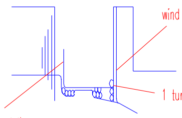

Fig.8

(ii) Obtain the position of the connection of the coil from drg. No. 10R799-864 and then count the span pitch from the mark on the end face of the commutator bar.

(iii) Drive in the lead wires of the lower coil by hitting the riser slit and using spatura iron.

(iv) Keep the upper lead wires a little above the risers until the span of the coil is finished.

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KNOW-HOW MM –

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

(v) Mark and cut the layer insulation to be inserted between the coils with the gauge, then wind a strip of NOMEX-N-0.1x8 roughly onto the specified number of them together, then insert them(Fig.9).

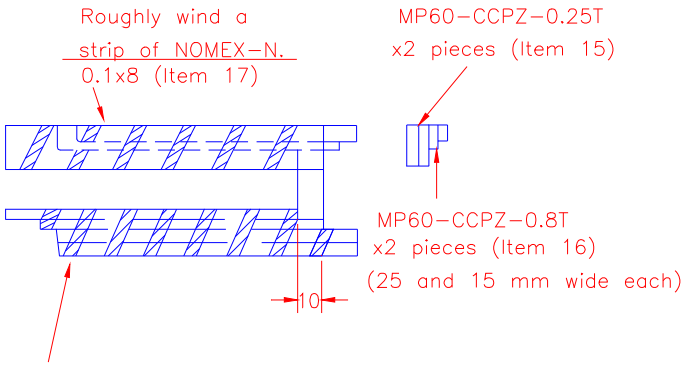

Fig.9

(vi) While insert the layer insulation, insert the upper lead wires in the riser slits (Fig.10)by gentle hammering. Reform and repositioning equalizer coils in correct place. Then apply EGTO.18x25 to become flat on a equalizer coil surface.

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KNOW-HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
003	Insulation over equalizer		

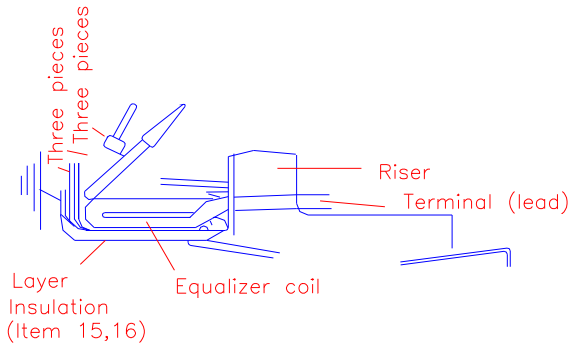

Fig.10

(NOTE) Lapping each layer insulation should be at least 10 mm on the next one.

1. Hold insulating material GU–CNFE–0.13T (Ref.13) with EGT–18x25(Ref14)

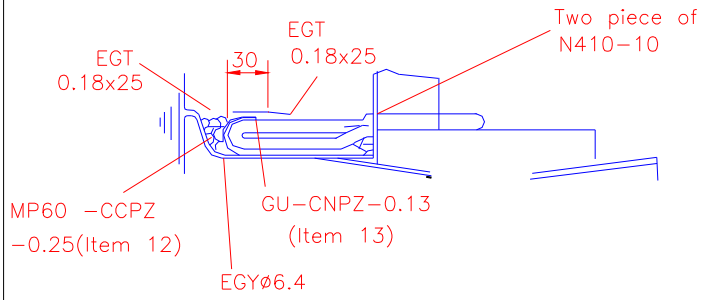

Fig.11

2. Cut Item No.28 as shown in Fig.12. Cover the lead wires of the equalizer coil with two pieces of Item. No.28 in ∧ shape with the cut parts directed or riser.

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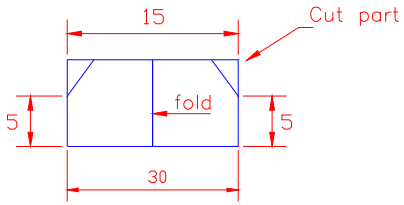
STEP No.	PROCESS	CONTENTS	REMARK



Nomex-N410-10 (Item28)

Fig.12

3. Tightly wind EGY-6.4 between insulating materials MP-CCPZ and GU_CNPZ until it becomes the same height as adjacent level.

4. Hold insulating material MP60-CCPZ with EGT 0.1x25 against the core to flatten the part in which EGY has been wound.

5. Lay the insulating materials indicated in drawing No.10R800-034.

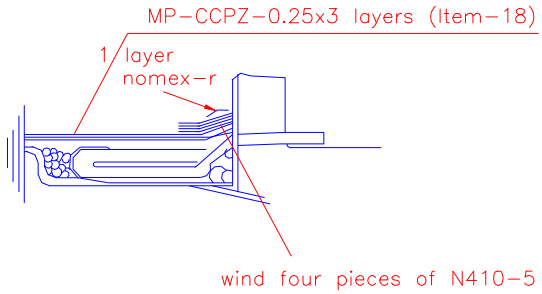


Fig.13

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STEP No.	PROCESS	CONTENTS	REMARK

6. Place the insulating material in the same way as the insulation of armature deck insulation in Step-001
(These are involved together with EGTO.18 X 25 and tightened)

7. After placing the insulating material, if it is lower than the bottom of the slot, wind EGT-0.18 25 upto the height of the bottom of the slot.

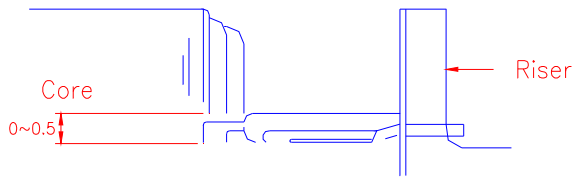

Fig. 14

8. Hit the each equalizer coil lead in risers by spatula to touch on bottom of riser slit.

9. Prior to armature coil assembling to slots, it is better to insert the distant piece, item 1, 1.6T x 5W to Section i--f as shown in 10S-784-7795. If try to insert bottom distant pieces item 1 afterward, it will become difficult and trouble-some.

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10V701 – 619

KNOW–HOW	MM –
TITLE	ARM COIL ASSEMBLY

STEP No.	PROCESS	CONTENTS	REMARK
004	Placement of Armature coil	1. Preparation (i) Stretch apart the U–type insulation (drg.No. 105784––758) and the insert as shown in drawing in the grooves on both ends of the slot to get self–setting (Fig.15). (ii) Insert the slot liners (57 pieces of Nomex–R,size 140x500) in the slote (Fig.15), facing the release treatment side –––on the core side.	

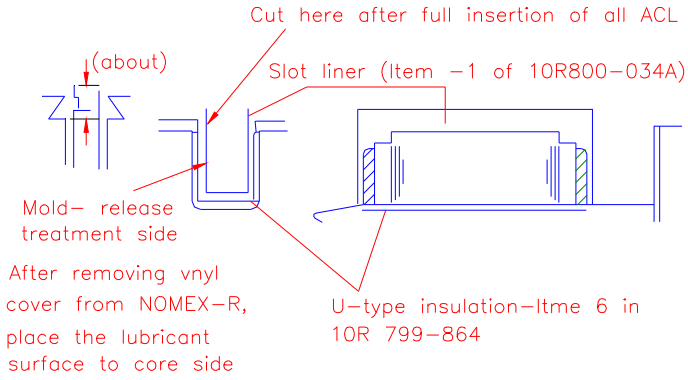

Fig.15

(iii) Obtain the position of the connection of the armature coil from drawing 10R799–864, then obtain the coil pitch from the mark on the end face of the commutator bar and that on the core.

2. Placement of Armature coil.

(i) Hold the lower coil end with the left hand and the pliers with the right one. Pinch a part near the lead of the coil end with the pliers and twist the end until the lead wires of the upper coil is about 100 mm to 150mm apart from the lead wires of the lower coil.

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KNOW-HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
001		However, when inserting the last span, raise the lead wires of the upper coil by about 30° and for final 7 to 8 coils raise the lead wires of lower coil by about30°. (ii) Place protective cloths on the core, then place the coil on it and adjust the lead wires of the lower coil to the connecting position. (iii) Hold the lead wires with the pliers, and put it in the riser groove, then drive it into the periphery of the riser with a hammer. (iv) Apply the wooden spatula to the side of the coil end straight portion and hit it with a hammer until the position deformed becomes to correct position deformed becomes to correct position corresponding with the back end of the riser. (v) Hit the lead wires projected from the riser and those on the back side of the riser alternately with the spatula to fix them to the bottom of the riser slit. (vi) Form the bent part of the lead wires so that it becomes flush with the end of the previous coil by hitting it from its side with the spatula. (vii) Remove the protective cloths and hold the shoulder of the lower coil on the opposite end of the commutator with the right hand, and insert the coil in the slot slowly, taking care not to damage it with the corners of the core.	

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TITLE: ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

(viii) Form the end on the commutator side and that on the opposite side by hitting with the spatula.

(ix) Bend N410–10 of Item No.29 in two, and insert it between j and h of the lower lead wires as shown in Fig.16.

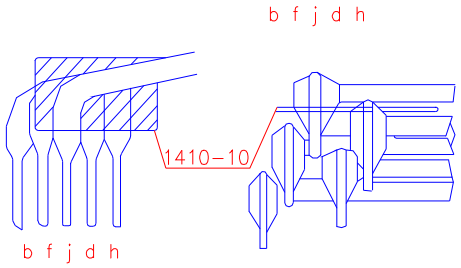

Fig.16

(x) Keep the first 9 to 10 coils a little over the slots until the lower coils of these slots are inserted.

(xi) After inserting the first 10 coils, insert the upper coil. Then hold the straight part of the coil with the left hand and apply a lever to the bent part of the upper coil at the slot outlet on the opposite side of the commutator and insert the coil in the slot little by little. At the same time, take care not to damage the insulation with the slot end.

(xii) Connect the upper lead wires in the same way as the lower lead wires.

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STEP No.	PROCESS	CONTENTS	REMARK

(xiii) Insert the coil so that dimension L becomes 105--107, Considering the elongation of the coil end on the opposite side of the connection (Fig.17).

(xiv) The insulation of the lead wires must be 5 mm maximum from the riser end.

(xv) Mark and cut the layer insulation to be inserted between the upper and lower coils with the gauge. ING-203 Roughly wind one piece of NOMEX-N-0.1 x8 onto the specified number of the out insulating materials, then insert them (Fig.18).

ING-203

ING-204

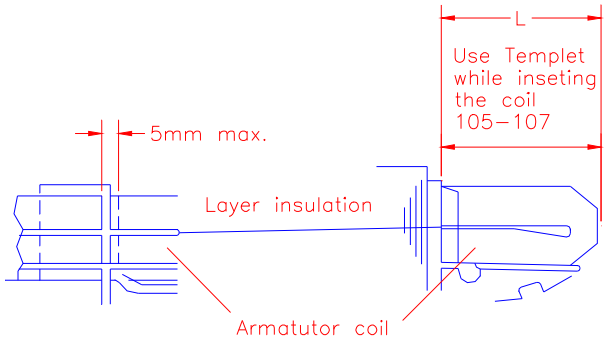

Fig.17

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10V701 - 619

1 2 3 4 5

KNOW-HOW MM —

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
		Note) Never damage the coils. If any one is damaged, rewind it according to drawing 105784-761(insulation of A.CL)	

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KNOW-HOW MM —

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
		Note) Never damage the coils. If any one is damaged, rewind it according to drawing 105784-761(insulation of A.CL)	

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 619

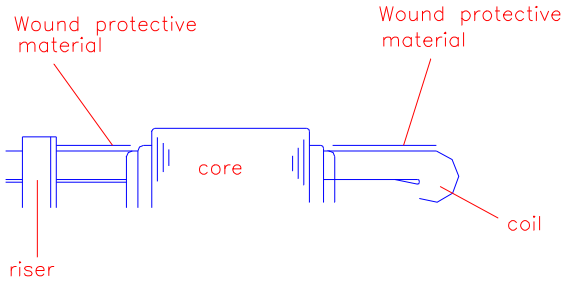
KNOW-HOW	MM –
TITLE	ARM. ASSEMBLY / WEDGE INSERTION

STEP No.	PROCESS	CONTENTS	REMARK
005	Insertion of wedge		

1. Preparation

(i) Use the wedges shown in drawing 10S784–757.

(ii) The wedges shall be inserted from the commutator side first. Thus, wind the protective material onto the coil end on the commutator side (Fig.20).



(Fig–20)

(iii) Insertion of the wedges to be made upto the same end of the Armature core on the riser side.(not end surface of A.PL) Confirm position to be placed from 10R 799–854.

(iv) After inserting the wedges on the commutator side, wind the protective material onto the end of the opposite side of the commutator, and insert the wedges.

2. Insertion of Wedge

(i) Insert the under–insulation of wedge(One piece of NOMEX–R–013T and one piece of TILG1000–0.4T) Remove vinyl sheet, then insert NOMEX–R (The mold–release treatment side facing to TILG side).

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STEP No.	PROCESS	CONTENTS	REMARK

(ii) Insert the each wedge with its beveled side ahead.

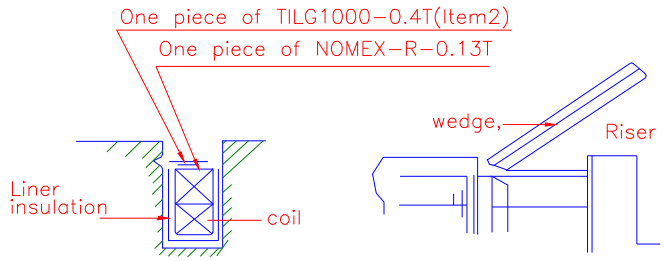

Fig.21

(iii) Set the under-insulation of the wedge from the core slot end on the commutator side to be pround about 10 mm from core. Hold it with the left hand and insert the wedge a little with the right hand, then hit the wedge with the hammer in the right hand

(iv) Use a driving applience made of steel to insert the wedge. Round off the corners of this applience so that it will not damage the insualation of the coil.

(v) Adjust the length of the wedges to that of the core end at the commutator side.

(vi) If the under-insulation materials of the wedges are projected form the wedges, cut only TILG1000 at the level of the wedge end on the commutator side, and cut TILG1000 and NOME-R at the level of the wedge end on the opposite side of the commutator.

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TITLE | ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

(vii) After inserting the wedges, wind PB1–0.8T (Press Board) on both coil ends and clamp it with ETT (Electircal tefron tape) securely on both commutator side and opposide side as shown in Fig.22. Lower the end on the riser side sufficiently to come in position by hitting it in correct position with a hammer taking care against any damage of insulation.

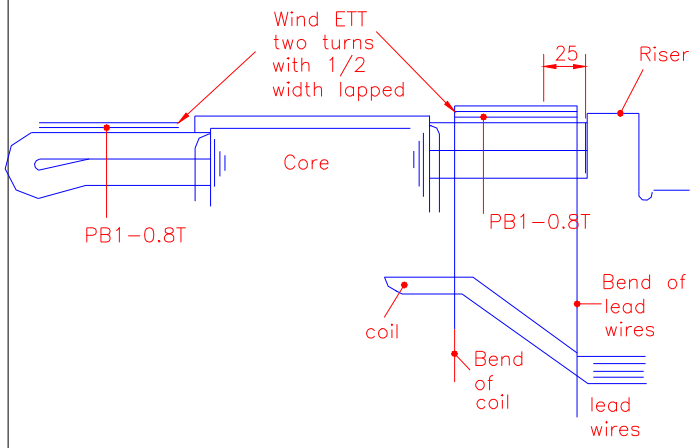

Fig.22

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10V701 - 623

KNOW-HOW	MM –
TITLE	ARM ASSEMBLY / DISTANT PIECE

STEP No.	PROCESS	CONTENTS	REMARK
006	Inser-tion of distant pieces (Copper shims)		

1. Preparation

(i) Use the distant pieces cut according to drawing No. 10S784-759 (Distant piece)

(ii) Prepare the distant pieces as shown in drawing No.10S784-759.

2. Insertion of Distant Pieces

(i) Insertion of distant piece item No.2,4 and 6. Open to lead wires up and down in the riser slit then hold the lower and middle distant pieces with pliers and put them in the riser slit and push them in.

Project them 1.0-2. 0mm from the riser surface.

(ii) As a rule, insert the distant pieces from the tallest one in height in order.

(iii) Temporary insertion of upper distant pieces, item 1,3,5 and 7 by gentle hammering. At the same time, check and confirm abnormality of coil lead localization whether any bite between coil ends.

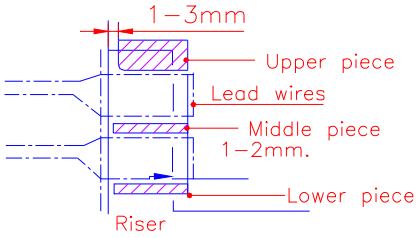

Fig. 23

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10V701 - 619

1 2 3 4 5

KNOW-HOW MM —

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
		(iv) Apply mylar tape on the gap 25 mm shown in Fig. 22 as a protection against copper chips and dusts in. (v) The upper piece hit above. order of hammering is done from the coil to be located near to bottom. If risers are expanded excessively at first stage of ----------later can not be inserted.take care of the gap so that. (vi) When driving each piece,apply the tapered spatula made it steel to it and hit with a hammer. Drive at to the degree that the lead wires at the riser end face are touched to each other. (vii) Remove mylar tape and rewind with EFT .18x25 2-3 layers on same portion.	

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10V701 - 619

KNOW-HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
007	LATHE	1. Mount the armature on lathe for cutting of leads on commutator and check by dial gauge any horizontal eccentricity of shaft. Before machining there should not be any out-of-horizontality. Cut the commutator of the armature to the following dimensions according to drawings No. 200745-375 (ARM.ASS) and 10q745-376(am.ASS)(Fig.24) at 235 R.P.M.	INJ 207 (CHUCK)

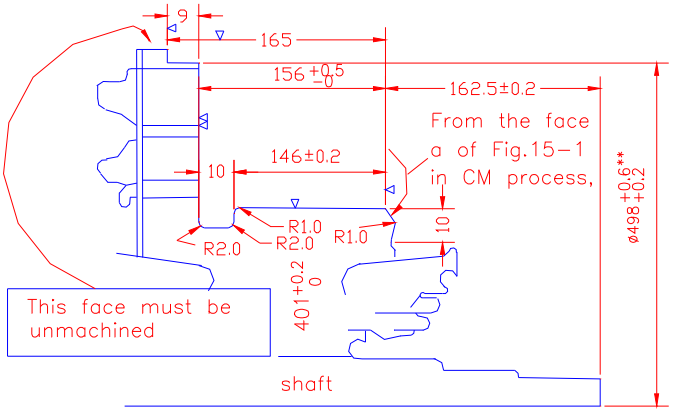

Fig.24

In the trial manufacutre stage, machine this surface with the minimum cutting thickness as long as all the black skin(copper oxide coating) is removed (Finish,level:▽) Very sharp cutting of this surface cutting of this surface is required to the specified dimensions after Tig-wel

** If this dia can be cut as bigger as possible, leave more allowance. This allowance can be used for are start of TIG welding.

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 619

1 2 3 4 5

KNOW-HOW MM –

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
008	Deburring	Deburring sufficiently (especially between bars.)	

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 619

KNOW-HOW	MM –
TITLE	ARM ASS / TEST-1-

STEP No.	PROCESS	CONTENTS	REMARK
009	Prepara-tory Test		

1. Insulation resistance Test
   (i) Measure the insulation resistance with 1000V insulation resistance meter (Meggar). The insulation resistance meter (Meggar). The insulation resistance must is more than 100m Mohm.
2. Polarity Test.
3. Dielectric Strength Test.
   (i) Apply 5800 ACV for a moment.
4. Impulse Test :
   (i) Apply 200 (VP) Vp between segments.
   (ii) Apply the test voltage as shown below (Fig.25)

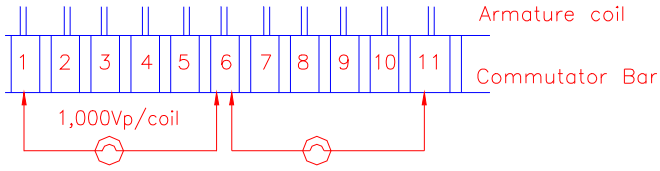
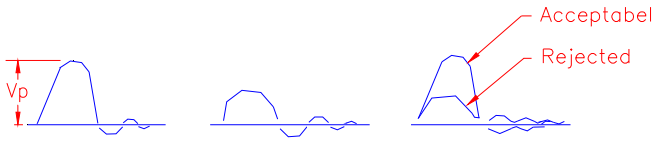


Fig.25

(iii) Jufgement by wave form



Acceptable wave

An example of rejected wave

Fig.26

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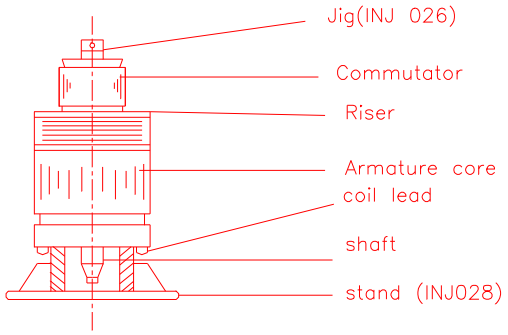
SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

KNOW-HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK



(INJ 026)

(INJ 028)

Fig.27

2. Fitting of electrode.

(i) Tightly wind a flat-braided wire ($14mm^2$)to be used for earth electrode on the end face of the commutator segment portion on the vertical ring at least one turn. (It must come in contact with with all the segments)

(ii) Wind the spring band onto the electrode.

(iii) Take out the lead wires from the electrode, and connect it to the positive(+) terminal of the welding machine(Fig.28)

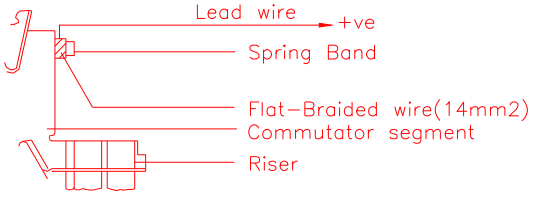


Fig.28

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STEP No.	PROCESS	CONTENTS	REMARK

3. Grinding of tangusten electorde.

(i) Grind the tanguesten electrode to be installed to the ceramic nozzle as shown in Fig.29

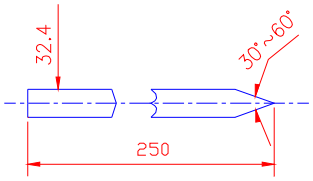

Fig.29

4. Installation of tanguesten electrode

(i) Install the tangusten electrode to the ceramic nozzle.

(ii) If the nozzle is broken, be sure to replace it. If a nozzle is used, sound welding can not be performed (Fig.30).

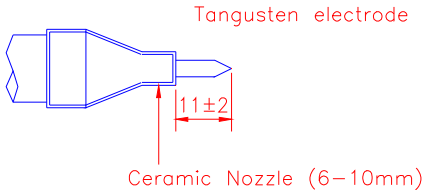

Fig.30

5. Adjustment of Argon gas

(i) Flow rate of argon gas:6 liter/min.
(ii) Purity = more than 99.9%
(iii) Gas cylinder = 40 liter/bombe
(iv) Pressure in cylinder= 150kg/cm2

6. Adjustment of welding Current
(i) Welding current: 85±5A

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STEP No.	PROCESS	CONTENTS	REMARK

3. Grinding of tangusten electorde.

(i) Grind the tanguesten electrode to be installed to the ceramic nozzle as shown in Fig.29

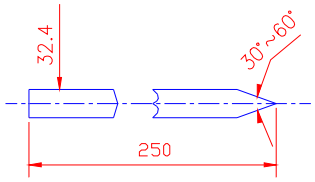

Fig.29

4. Installation of tanguesten electrode

(i) Install the tangusten electrode to the ceramic nozzle.

(ii) If the nozzle is broken, be sure to replace it. If a nozzle is used, sound welding can not be performed (Fig.30).

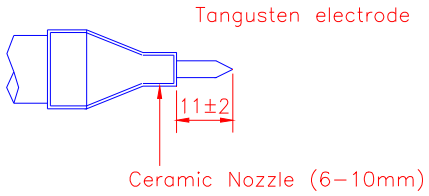

Fig.30

5. Adjustment of Argon gas

(i) Flow rate of argon gas:6 liter/min.
(ii) Purity = more than 99.9%
(iii) Gas cylinder = 40 liter/bombe
(iv) Pressure in cylinder= 150kg/cm2

6. Adjustment of welding Current

(i) Welding current: 85±5A

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 – 619

KNOW–HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

7. Material to be used.

(i) B cup–5 at Z (to be specified in JIS Z 3264 ''copper Phosphorous Brazzing Filler Metal'') P= 5%, Ag=15%, Cu=80%
Melting Temperature T= 705–815 0c

8. Brazzing

(i) Brazzing riser and coil lead by heating TIG welding arc.
Brazzing every third armmutator bar with Ecup–5.
Brazzing direction is anti–clockwise direction on riser if welding torch is managed by right hand side.

(ii) Start the arc from the end of riser (a) in Fig. 31. Heating the riser by arc from the upside of riser, and filling adequate quantity of filler, make a fine bead toward(a), Point (b), end of brazzing bead should be controlled within 2mm from the bottom of riser slit.

(iii) After finishing making bead upto (b), return welding are back to (a), amending up and down of the bead with a little filling Bcup–5.
When come back to (a), gradually lift up torch about 10mm and then skip to the next third bar. complete all riser in this method.

WELDING BEAD SHOULD BE MAINTAINED WITHIN 1.5+0.5MM.

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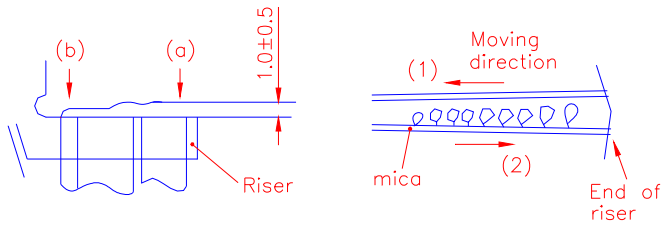

Fig. 31

9. Cleaning

(i) After brazing, the surface of the bead is blackened by the copper oxide, burning gas of mica, etc.. Remove this black film with a wire brush (Fig. 32)

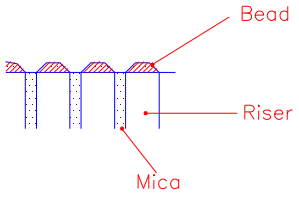

Fig. 32

(ii) Remove the spatters with a chisel (Fig.33)

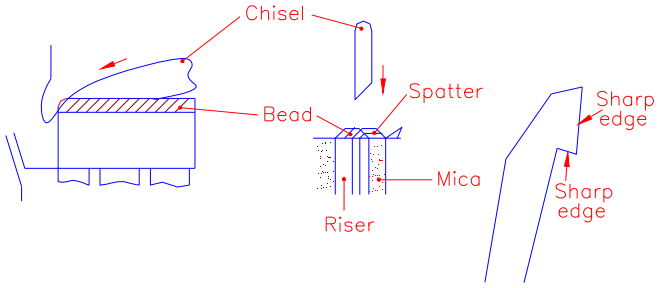

Fig. 33

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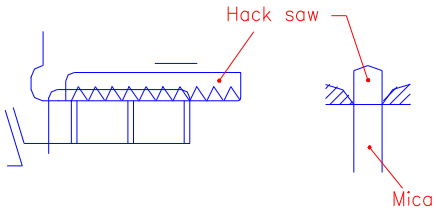
STEP No.	PROCESS	CONTENTS	REMARK

(iii) Remove the carbonised mica and binder with and hacksaw (Fig. 34)



Take care not to scratch other parts

Fig. 34

(iv) Apply 1 wire brush over the beads and mica, then clean them with a cleaner.

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 628

KNOW-HOW	MM —
TITLE	ARM ASSEMBLY / TEST -2-

STEP No.	PROCESS	CONTENTS	REMARK
011	Prepara-tory Test	1. Impulse Test (i) Perform the nest in the same procedure as STEP NO.209(4) Impulse Test.	

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ARM. ASS
TEST

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HITACHI WORKS DWG. No.
10V701 — 628

SH. No. SH. 1 OF 1

REVD.

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 631

1 2 3 4 5

STEP No.	CONTENTS	REMARK

1. Drying

Condition:130°c for 2 hours (Maximum oven temperature:130 0C) (Product temperature :50-60 0C)

2. Filling with compound

(i) Remove EGTO.18x25 just back side of rifer, fill the bakc of the riser with HEW 823 as shown in Fig. 35, and then wrap PTEE paper/ tape and then press by finger for proper filling over PTEe paper.

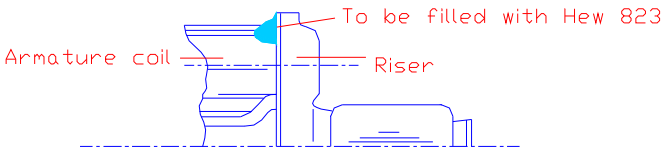

Fig. 35

(ii) Sufficiently fill the gap around the lead wires on the back of the riser.

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 630

KNOW-HOW	MM –
TITLE	ARM ASSEMBLY / COM LATHING

STEP No.	PROCESS	CONTENTS	REMARK
013	Lathe	1. Joggling cutting of riser (i) Give proper protection on lead portion by . vinyl tape and HVT–H5 Over. V–cone front side. (ii) Cut the riser to the following dimensions according to drawing No.10Q745–376 (Fig. 36)	

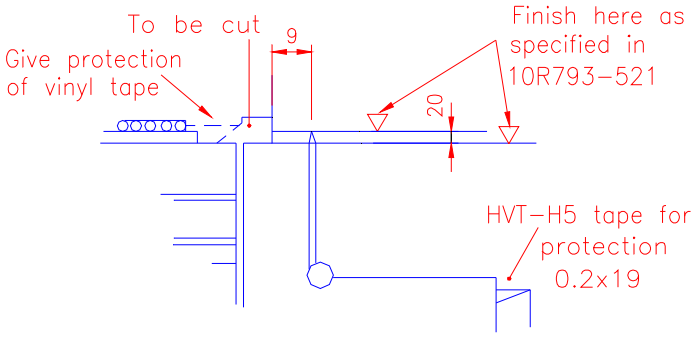

Fig. 36

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STEP No.	PROCESS	CONTENTS	REMARK
014	Glass Binding	1. Preparation (i) Disassemble the protective insulation of TTC and PB–1. (ii) Remove the compound from the back of the riser with a knife to the flat level. (iii) Smooth the riser end with a triangle file (Fig. 37)	

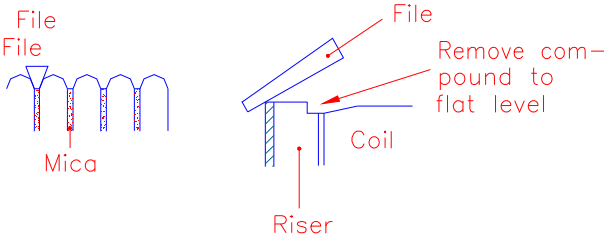

Fig. 37

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(IV) Thoroughly clean the parts on which the glass bind will be wound.

2. Installation of EGB jigs

(i) Install the jigs (INJ−030) — INJ-030

(ii) Apply mold−release agent KS−707 on the surface of the jig that the glass bind will come in contact with so that the jig can be removed easily after curing the glass bind.

(iii) Install the jigs to the coil head, riser and both ends of the core.

(iv) When installing the jig to the head, take care not to damage the coil head with the comb−shaped jig (Fig. 38)

(v) Install jig at location (A) for the riser to the shaft (Fig. 38)

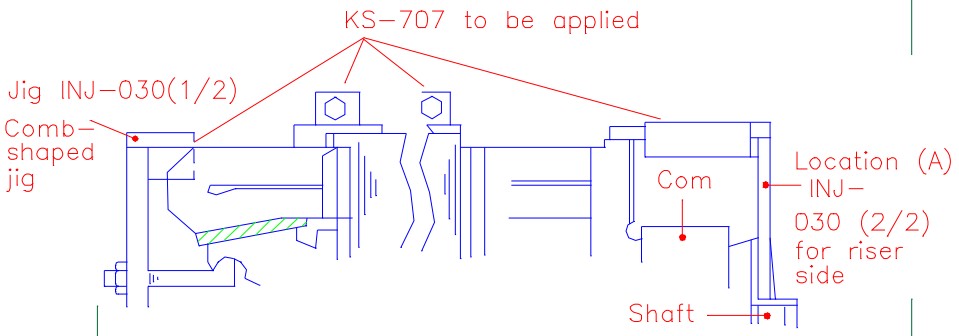

Fig. 38

(vi) Fit the shaft adapter to the shaft end (threaded part) on the opposite side of the commutator and install the adapter to the chuck, then check its horizontality with a level. — INJ-030 (2/2) INJ-030 (1/2)

3. Inatallation of jig EGB — INJ-208

(i) Install the jigs (INJ−030−2/2 at the core end on riser side, INJ−030−1/2 at the core end on the opposite side of riser and INJ−030−2/2 at location (B) of the riser) at figure 39.

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ARM. ASS.
GLASS BINDING

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HITACHI WORKS DWG. No.
10V701 − 631
SH. No. SH. 2 OF 6

REVD.

(ii) Apply mold-release agent KS-707 at room temperature over the surface of the jig where the glass bind will come in contact, so that the jig.

(iii) Wrap EGT-0.1x25, 2 leyers 1/2 lap.

(iv) Wrap EGE-0.33x25, about 10 layers until getting straight surface from end of riser to core.

(v) Wrap EGY3.2 within the fold of EGT-0.1x25 all round the jig as shown in Fig.39 to prevent the glass bind from falling down.

(Note): Prior to wrapping with EGTO.1x25 EGT should be dipped into WSY-285 varnish and dryed in air.

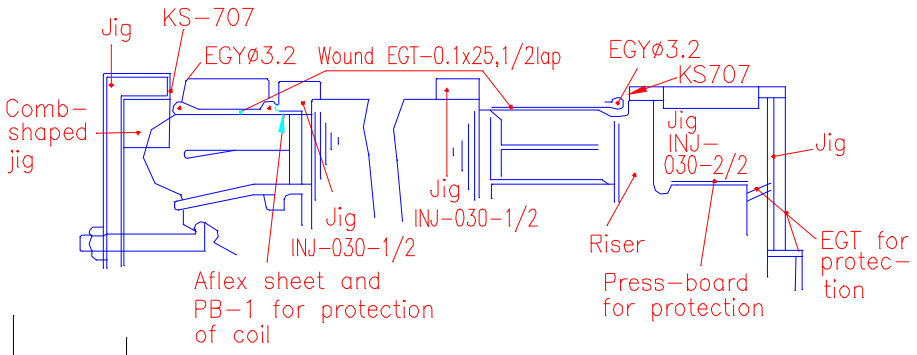

Fig. 39

4. Tension, meterial and number of turns

(i) EGE-0.33 x 25, 128 kg/25mm ± 5%

(ii) Determine the number of turns according to drawing No. 10R800-034-alt. B

(iii) Lower the tension in the range before the riser to 56 kg/25mm width. The range is shown in Fig. 40.

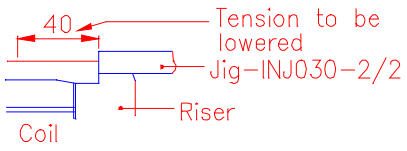

Fig. 40.

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

STEP No.	CONTENTS	REMARK

5. How to wind glass bind onto the aramature coil end

(i) At the beginning of winding, stick the glass bind end to the core, then wind it with no tension by one or two turns to fix its end in itself, then apply a tension (and wind it onto the coil end.

(ii) Wind the glass bind from the low level portion to make good and then start equal distribution of 1/2 lap layers fowards the axial direction of the coil, and continue to wind so that it will be wound flately. (Fig.41)

(iii) As a rule, wind the glass bind with 1/2 lapped and wind it repeatedly in the direction from (A) to (B) then (B) to (A) as shown in Fig.41. Finish winding at the center. Glass bind should be layed uniformly. The thinnest part of glass bind zone must be coverd with at least four layer.

Fig. 41

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APPD.	AKAIHASHI	.87.10.30			SH. No. SH. 4 OF 6	

(iv) When lowering the tension in the range in front of the riser, wind the bind onto part (A), then wind it onto (B) with a lower tension, then wind it onto (C) with a high tension. Then, wind it onto (B) with a lower tension, and repeatedly wind it onto (B), (C), (B) and (C).

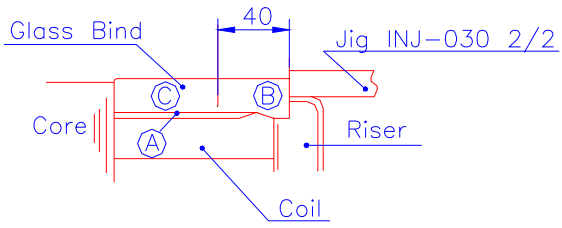

Fig. 42

(v) During winding the glass bind due to shortage of length of tape heat its end by 50 – 100 mm with a heating iron to 150 – 180°C, with the tension. Then, lower the tension and move the glass bind to the core and tie its end to the new one, then wind the new one onto the core by one turn, then wind it onto the part to be bound with the specified tension.

(vi) Fix the end of EGB by heating with the hot iron, as explained in (v) above.

6. Pressing of surface of wound bind

(i) Press the surface of EGB to get flat and smooth surface as shown in Fig. 43.

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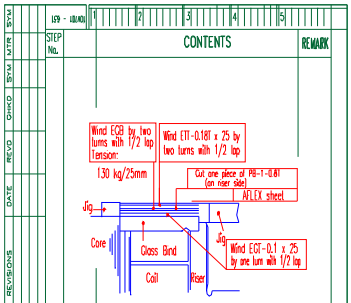
Wind ECB by two turns with 1/2 lap Tension:
1.30 kg/25mm
Wind ETI-0.18T x 25 by two turns with 1/2 lap
Cut one piece of PIE-T-0.8T (on riser side)
AFLEX sheet
Jig
Core
Glass Bind
Coil
Riser
Jig
Wind ECI-0.1 x 25 by one turn with 1/2 lap

Fig. 4.3

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 619

KNOW-HOW MM –

TITLE ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK
015	Prepara-tory drying	1.Work procedure (i) Perform the varnishing traetment(VPI) according to the following procedure. 2. Drying (i) Condition 130 oc for at least 12 hours (Maximum oven temperature 130°C) (ii) Purpose To remove misture and cure the glass bind. (iii) Remove the jig of the glass bind (but do not remove the surface pressing tapes)	
	(Prepara-tory Test)	3. Impulse Test (i) Perform the test in the same procedure as (STEP No. 009 Impulse Test in hot condition. 4. Prevent the varnish from splashing into the gooves of the commutator, by wrapping the mylar sheet and fixing the joint of mylar sheet with adhesive tape	

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APPD.	AKAIHASHI	.87.10.30	

ARM. ASS.
VARNISH

Hitachi. Ltd.
Tokyo Japan

HITACHI WORKS DWG. No.
10V701 – 632

SH. No. SH. 1 OF 7

REVD.

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

STEP No.	CONTENTS	REMARK
	Fix the joints with adhesive tape (Nomex-N) (Lap each sheet to another by 10-20mm) leaving a gap Apply KE45-RTV-R all round without leaving a gap	
	Fig.44	
	(i) Cut the Mylar sheet into the following dimensions L= 1,275mm w=180 mm	
	(ii) Wrap CM with mylar sheet and fix them with adhesive taper.	
	(iii) Covering the commutator with the mylar sheets, apply KE45-RTV-R al butted portion of the riser and. Mylar sheet (to prevent the varnish from splashing to commutator).	
	1. Preparation for pouring the varnish.	
016 Pouring of varnish	1.Sling the armature with the commutator up, then carefully place 2-Armatures in varnishing trough (Fig.45)	
017 Baking	Apply the mold-release agent (KS-707) to the shaft. When slinging the aramature, install the lift-up Jig. (INJ-032) to the shaft end on the opposite side of the commutator and the jigs (INJ-026)to the shaft. end on the commutator side, then pass steel bar and sling the armature with wires.	

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CHKD.	AKAIHASHI	.87.10.30	VARNISH		SH. No. SH.2 OF 7
APPD.	AKAIHASHI	.87.10.30			REVD.

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

STEP No.	CONTENTS	REMARK

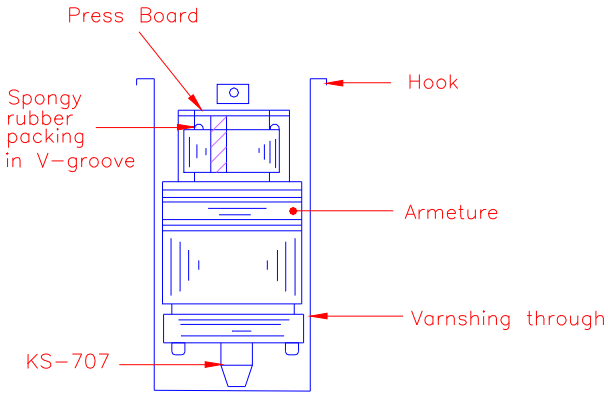

Fig. 45

2. Sling the varnishing trough (with the armatures in it), and set it in the varnishing tank. Be sure to set the end of the varnish supply hose higher than the surface of the riser.

Note: For economic use of ISOX, varnishing though can be made just to accormodative size of Armature with about 15mm clearance all round and the armature can be supported directly on shaft pinion end at the bottom of trough and at core portion small pieces of support can be provided. Special care should be taken during lowering down of armalure against any damage.

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CHKD.	AKAIHASHI	.87.10.30
APPD.	AKAIHASHI	.87.10.30

ARM. ASS.
VARNISH

Hitachi. Ltd.
Tokyo Japan

HITACHI WORKS DWG. No.
10V701 - 632

SH. No. SH. 3 OF 7

REVD.

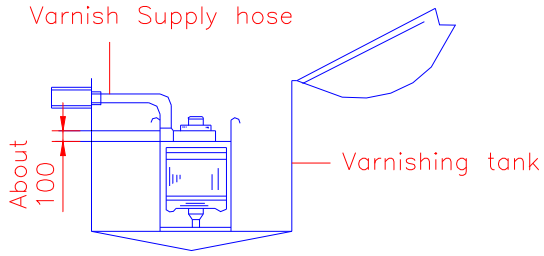

Fig. 46

3. Maintain the temperature of armature within 80 to 100°C inside the varnish tank if it goes down during bringing from oven to the tank. (Temperature means ARMATURE TEMPERATURE, not oven temperature)

2. Vacuuming before pouring the varnish

(i) Keep the pressure below 0.1 mm Hg and the product temperature at 65 ± 15°C for at least five hours.

3. Pouring of varnish

(i) The viscosity of ISOX varnish must be less than 3 poise.
Viscosity is periodically checked and tempera-ture is set at which less than 3 poise can be maintained.

(ii) Set the varnish level as shown in Fig. 47.

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SYM	REVISIONS	DATE	REVD	CHKD	SYM	MTR

619 - 10A06

KNOW-HOW | MM -

TITLE | ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

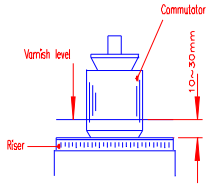

Fig.47

4. Holding of vaccum

(i) Hold the vaccum below 3 mmHg for at least hour.

5. Pressurising

(i) Keep the pressure at 5 kg/Cm^2±0.5kg/cm^2 for at least five hours.

(ii) After pressurising process, lower the pressure to the normal pressure.

(iii) Open the cover of the varnishing tank and sling out the varnishing trough.

(iv) Return the varnish to the varnish storage tank. (immediately)

6. Drying

(i) Take out the armature from the varnishing trough, , and install it on the rotary jig(NJ0-029) for rotary drying.

(ii) Set the armature in the rotary drying oven and keep it at 110℃ for 13 hours (unit 1 the varnish become gel)

(iii) Take the armature out of the rotary drying oven, and remove the rotary jig from it, them put the armature in the drying oven. Armature may be put in the oven horizontally or vertically , depending on space particuler of user's oven.

(iv) Keep the shaft slinging jig(INJ-026) installaed

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CHKD	AKAMUSHI	87.10.30			DW701-632	
APPD	AKAMUSHI	87.10.30			SH. No. SH. 5 OF 7	

STEP No.	PROCESS	CONTENTS	REMARK

(v) Keep the armature at 160°c ±10°c for five hours, then at 210°C ±10°C for 15 hours (product control temperature) to cure the varnish.

(vi) Do not put any pause between drying process of 160°C for five hours and that of 210°C for 15 hours. Oven temperature must be controlled steppingly by controll Board. Do not stop heating temporarily. (Transfer the armature from the rotary drying oven to the static drying immediately after the drying in the former is finished.if this impossible, keep the armature in a oven at 110°c.)

* peripheral speed of core in rotary drying: 20–50 cm/sec.

7. Cleaning

(i) Place the armature in vertical position, and remove all the varnish from the risers, and inside of air ducts.

(ii) After cleaning the risers, place the armature horizontally on its side and support it by the shaft, then remove all the glass bind surface fixing agents.

(iii) If the glass bind is cracked, rewind it.

(iv) Flatten the uneven surface of the resin by filing it slightly. Take care not to cut the fibers and finish smoothly.

(v) Remove the varnish projected from the glass bind at the coil head.

(vi) Apply HEW–101N over the glass bind end with a brush.

(vii) While performing the above procedures, the temperature of the product must be above 60°C

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

STEP No.	CONTENTS	REMARK

8. Drying in air

(i) Dry at the normal temperature for at least one hour to cure HEW-101N.

9. Disposition of varnishing

(i) Apply TVA-1410 over the risers with a brush

(ii) Dry in air for 15 minutes.

(iii) Spray TVA-1410 over the armature.

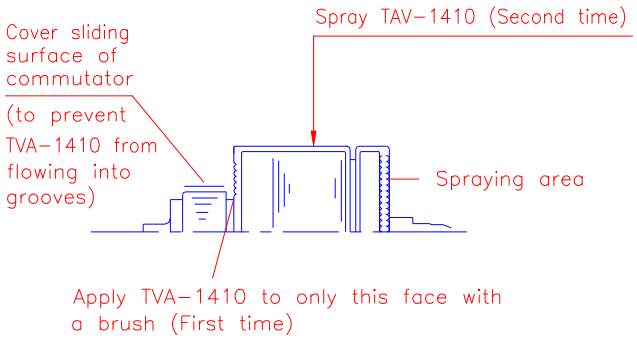

Fig. 48

10. Drying in air

(i) Condition: Normal temperature, 1 hour minimum under clean atmosphere.

(ii) Purpose: To evaporate the solvent.

11. Drying

(i) Condition: 130 ± 10°C (Temperature in oven), 6 hours minimum

(ii) Purpose: To cure TVA-1410

(iii) Support the Armature by the shaft in horizontal position.

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CHKD.	AKAIHASHI	.87.10.30			SH. No. SH. 7 OF 7
APPD.	AKAIHASHI	.87.10.30			REVD.

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

KNOW–HOW	MM–
TITLE	PRELIMINARY TEST FOR ARM

STEP No.	PROCESS	CONTENTS	REMARK
	Prepra–tory Test		

1. Insulation resistance test

(i) Measure the insulation resistance with a 1000V insulation resistance meter (Megger). It must be above 100 M.

2. Dielectric strength test

(i) Apply 6,292 V for 1 minute

3. Impulse Test

(i) Apply 225 Vp between segments

(ii) Apply the test voltage as shown below (Fig.580

(iii) judge from wave from (Fig.59)

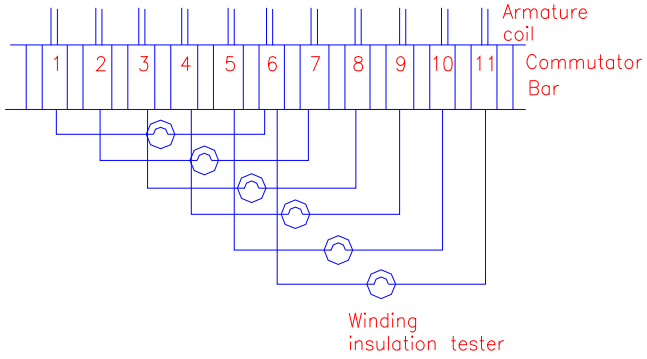

Fig.58

(iii) Judge from wave form (Fig.59)

Fig.59

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APPD.	AKAIHASHI	.87.10.30			SH. No. SH. 1 OF 2	

SYM	REVISIONS	DATE	REVD	CHKD	SYM	MTR	SYM

KNOW-HOW	MM –
TITLE	ARMATURE ASSEMBLY / BODY INSULATION

STEP No.	PROCESS	CONTENTS	REMARK

4. Check of Appearance and Dimensions

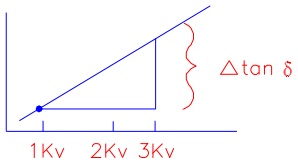
(i) Check the whole armature for flaws

5. Tan δ –V characteristics– Humidity and ambient temperature to be noted just before starting the test.

(i) Measured voltage (KV) 1.0,2.0,3.0

(ii) Control Value: δ_0 <1.0% (Value at 1.KV)

△ Tan δ ≤ 5.0% (Value at 3.0KV~1.0KV)



Fig–60

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CHKD.	AKAIHASHI	.87.10.30				
APPD.	AKAIHASHI	.87.10.30			SH. No. SH. 2 OF 2	

KNOW-HOW	MM –
TITLE	ARM ASSEMBLY / TEFLON

STEP No.	PROCESS	CONTENTS	REMARK
018	Insertion of Teflon ring		

1. Preparation

(i) Prepare drawings No. 100745-376 (com. assembly) and 10R812-076 (Teflon ring) and Teflon rings.

(ii) Place the armature on the rotary stand.

(iii) Check V. ring (sticking foreign substances)

(iv) Taper the end of the sleeve mica

(v) Remove the packing from the end faces of the commutator bars. (Do not cut the sleeve mica.)

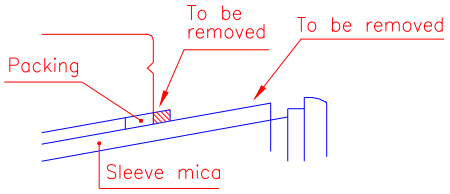

Fig. 49

(vi) Wind EGT-0.18 x 19 onto the sleeve mica.

(vii) Start winding from the end face of the commutator bars. While windingm, apply HEW-502N.

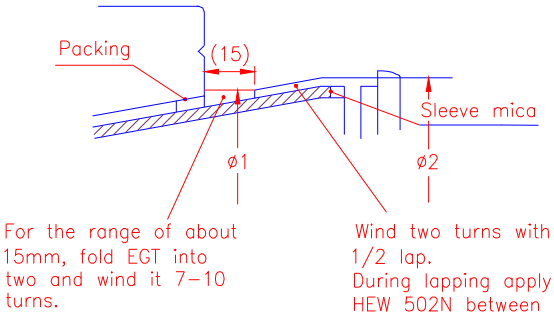

Fig. 50

(viii) Apply sufficient quantity of HEW-502N ø1 and ø2 dimention should be obeyed to 10R812-076.

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STEP No. | CONTENTS | REMARK

2. Insertion of Teflon ring

(i) Degrease the Teflon ring with Acetone. (Dry it after degreasing by blowing hot air)

(ii) Fit the teflon ring.

(iii) Heat the Teflon ring, with hot air (150 to 160 °c) to shrink it.

Note: ◦ Do not apply the hot air to one point, but apply it all over the surface of the armature by rotating the armature.

◦ Continue to apply the hot air until the Teflon fing is shrinked and fixed securely.

3. Pressing the surface

(i) Wipe off HEW-502N sticked excessively on the surface.

(ii) Press the surface of the Teflon ring as shown in Fig. 51.

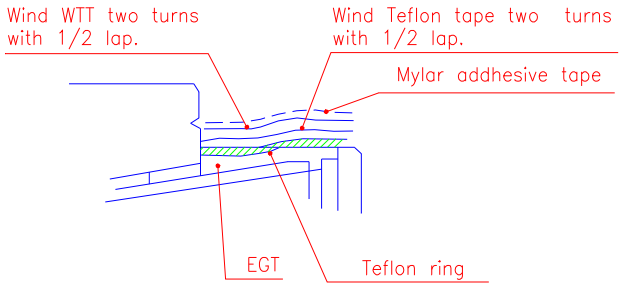

Fig.51

019 Drying

1. Drying

(i) Condition: 130°C ± 10°c (Temperature in oven), for 12 hours minimum)

(ii) Purpose : To cure the vanish (HEW-502N)

2. Removal of surface pressing bands and cleaning

(i) Remove the surface pressing bands from the Teflon ring.
Never scratch the Teflon ring.

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ARM. ASS. TEFLON

Hitachi. Ltd. Tokyo Japan

HITACHI WORKS DWG. No. 10V701 - 633

SH. No. SH. 2 OF 3

REVD.

STEP No.	CONTENTS	REMARK

(ii) Remove all the varnish. sticking around.

3. Amendment

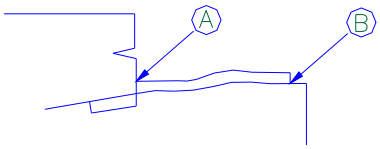

Fig. 51–(a)

If any cracks on (A) and (B) are found, fill with varnish HEW 10IN.

4. Varnishing

(i) Apply varnish TVA –1410 to the end face of the commutator bar. (Keep the temperature of the armature above 90°C while performing this work.)

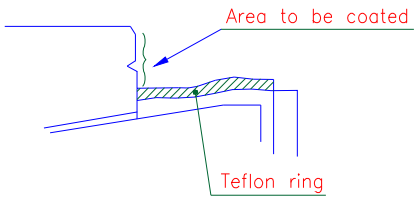

Fig. 52

(ii) After varnish TVA–1410 iscured wind protective taping (ETT) onto the Teflon ring.

5. Cleaning

(i) Remove the varnish sticking to the shaft (Use sandpaper of #320.)

(ii) Remove the varnish sticking to the air holes of the end plate and core. (If any varnish is left, it may come out while the armature is rotating, be sure to remove all the varnish.)

019 Drying

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SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

KNOW-HOW MM -

REMARK

TITLE ARM ASSEMBLY / FINISHING

STEP No.	PROCESS
020	Crooving

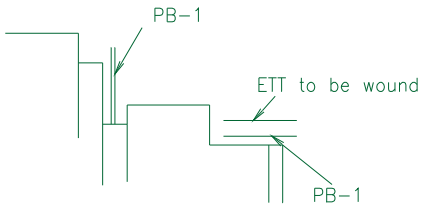
CONTENTS

1. Removal of varnish

(i) When placing the armature off the stand to remove the varnish, use the shaft support stand and babit metal bar.

(ii) Cut PB-1-0.8T into the width of 48mm, and press it with ETT for the protection of Teflon ring on V-cone part of the commutator (Fig. 53)

(iii) To protect the surfaces of the commutator risers, apply PB-1-1.6T (OR PB-1-0.8 x 2) to them (Fig. 53).



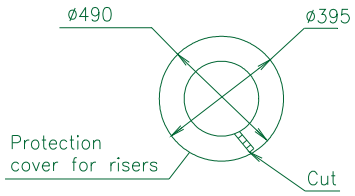


Fig. 53

(vi) Clean the inside of the grooves with hacksaw (Fig. 54)

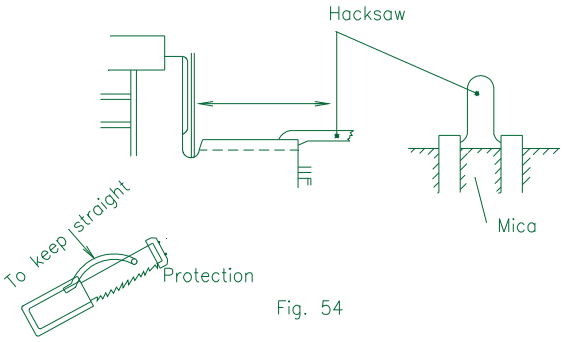


Fig. 54

(v) Remove the protective PB-1, and clean with a cleaner.

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CHKD.	AKAIHASHI	.87.10.30	TEFLON		SH. No. SH. 1 OF 3	
APPD.	AKAIHASHI	.87.10.30				

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

10V701 - 619

1 2 3 4 5

KNOW-HOW MM —

TITLE

STEP No.	PROCESS	CONTENTS	REMARK
021	Lathe	1. finishing of commutator (i) cut the sliding surface of each side of the commutator by 0.1 – 0.2mm. 2. Measerment of depth of groove (i) If the depth of the groove is below 2.5mm, it is acceptable If it is deeper than 2.5mm, cut the commutator until it become shorted than 2.5mm. However, the outside dia-meter of the commutator must be kept to ø400+1.0/–0.5. 3. Chamfering (i) Chamfer each commutator bar as shown in Fig.55	

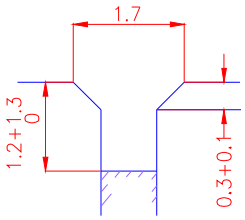

Fig.55

(ii) When chamfering, wind PB–1 onto the v– cone side of the commutator to protect that part.

(iii) use the chamfering knife shown in Fig.56.

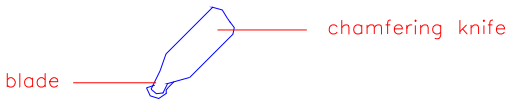

Fig.56

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CHKD.	AKAIHASHI	.87.10.30	FINISHING		SH. No. SH. 2 OF 3	
APPD.	AKAIHASHI	.87.10.30				

SYM	MTR	SYM	CHKD	REVD	DATE	REVISIONS	SYM

STEP No.	CONTENTS	REMARK

4. Finishing

(i) Rotate the armature and whet its sliding surface segment surface by applying whetstone, then whet it with sandpaper of #320.

(ii) Type of whetstone
Grain size #240

(iii) Shpae: See Fig.57.

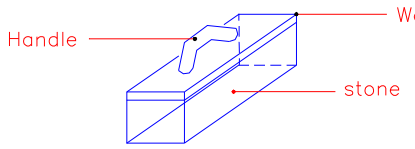

Fig. 57

Note: Supplier : NIPPON KENMA TOISHI K.K
Address : 104-1 TAVO-UE SEDITSU-CHO
(Head-office) OHTSU CITY, SHIGA-PREF. JAPAN
TEL : 0775(46)0811

5. Cleaning

(i) After finishing, remove the powder of the whetstone by blowing compressed air against the armature.

6. Check of dimensions and protective covering

(i) The dimensions of the sliding surface must be ø400 +1.0/-0.5.

(ii) Wind paper onto the sliding surface (segment surface)

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APPD.	AKAIHASHI	.87.10.30				

Annexure 3

Material Scheduled for Rewinding Armature of TY type HS 15250 A

Sl.No.	Materials			Hitachi Specn. No.	Qty. TM
1.	Finished armature coils complete with insulation as per Dr.NO.LOS803-461 and TOT 775-169				57
2.	Finished Equaliser coils complete with insulation as per Drg.No.ICR 821-273 and ICT 775-169				144
3.	Polymide glass laminate (TILG-1000) size 0.41x8x520			A0182	57
4.	Flexible Mica Sheet(MP60-CCPZ)				
	Size	**i)**	0.25x62x910		5 Nos
		ii)	0.25x62x440		5 Nos
		iii)	0.25x110x380		8 Nos
		iv)	0.25x102x910		3 Nos
		v)	0.25x102x390		3 Nos
		vi)	0.25x55x225		12 nos
		vii)	0.25x90x910		3 nos
		viii)	0.25x90x440		3 Nos
		ix)	0.25x59x380		12 nos
		x)	0.8x8cx370		4 Nos
		xi)	0.8x25x215		6 Nos
		xii)	0.8x15x215		6 Nos
5.	Varnish glass cloth (VG) Size 0.25x180x1350			A1094 Alt.I	1 No.
6.	Glass Mica sheet (GU-CNPZ)			A0269	
	size	**i)**	0.13x125x910		3 Nos
		ii)	0.13x125x390		3 Nos
7.	Nomex Sheet (N 410 - 5 mil thick & 10 mil thick)				
	size	**i)**	0.125x40x690	A0255	8 Nos
		ii)	0.25x15x400		8 Nos
		iii)	0.25x15x30		228 Nos
		iv)	0.25x20x50		57 Nos

Sl. No.	Materials			Hitachi Spec. No.	Qty./TM
8.	Nomex - Sheet				
	size	**i)**	0.13x140x500	A0132	57 Nos
		ii)	0.13x8x520		57 Nos
9.	Slot wedge (Material glass				

	cloth sheet polymide resin) As per Drg. No.IOS/784-757			117 Nos
10.	Copper shim Upper & Lower As per Drg. No.IOS-784-759			855 Nos
11.	Fibre glass			
	size **i)**	08.2		30 m
	ii)	06.4		20 m
12.	Fibre Glass tape (FGT)			
	size **i)**	0.1x19	A0165	175 m
	ii)	0.1x25		350 m
	iii)	0.18x25		350 m
13.	Self bonding silicone rubber Tape HTV-HBT-H5 size 0.5x25		A0132	50 m
14.	Polyamide adhesive tape(Numex-N) size 0.1x8		A0215	3 m
15.	Polyglass woven tape EGB size 0.33 x 25			340 m
16.	Polyster woven tape ETT size 0.18x25			30 m
17.	Mylor tape			30 m
18.	PTEE Tape/Paper			30 m
19.	Vinyl Tape			30 m
20.	Teflon Ring			One No.
21.	Silicone Rubber compound KE 45 RTV - R			2.45 kg
22.	Epoxy compound HEW 823		A0256	3.7 kg

Sl. No.	**Materials**	**Hitachi Spec. No.**	**Qty./TM**
23.	Silicone Rubber compound KE-42-RTV-white.		0.03 kg
24.	Resin ISOX-X		1 kg
25.	Silicone Lubricants 707	A0119	1.5 kg
26.	Solvents Resin HEW 101 N	A0107	0.1 kg
27.	Finishing varnish TVA 1410	A0209	2.5 kg
28.	Multifunctional epoxy resin HEW 290	A0275 A0272 A0273 A0274	58 kg

29.	Solvents epoxy resin HEW 502 N	A0108	0.25 kg
30.	Synthetic varnish WSY-285	A0205	0.2 kg
31.	Locating ring made of pressed board of 26 mm wide, 3 to 6 mm thick	1 No.	
32.	Press board PBI size : 0.8 mm thick		

Note : Dimension shown above are in mm.