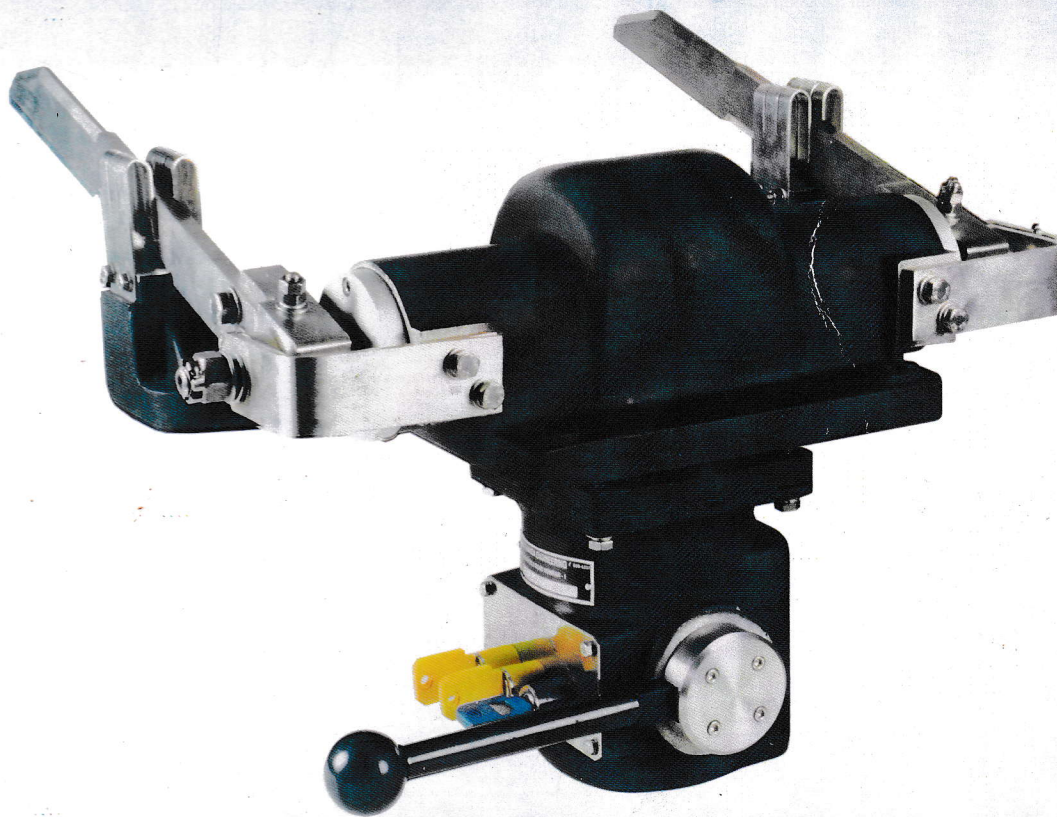




PATRA & CHANDA
MFG. & ENG. (INDIA) PVT. LTD.

OPERATION & MAINTENANCE MANUAL



EARTHING SWITCH FOR VACCUM CIRCUIT BREAKER

TYPE : PCE. VES.25.4

(SIMILAR TO TYPE : BTE 25.4)

67, Panchanantala Road, Howrah-711101 (West Bengal), INDIA
(An ISO 9001:2000 Company)



CONTENTS :

A) I. Main Characteristics & Application

II. Technical Data

III. Design & Function

IV. Dimensional Drawing

V. Isometric Drawing

VI. Circuit Diagram

I. Main Characteristics & Application:

The two poles Earthing Switch shall be used to earth the circuits on both sides of the air operated Main Circuit Breaker of Electric Locomotive, to ensure the safety of the drivers of locomotive and workshop personnel safety during checking and fault finding operations.

The Upper Casing of the Earthing Switch shall be mounted on the roof of the traction vehicle, houses the Main Shaft on which the two break blades are fitted. To make the earth connection, these blades establish the contact between the frame and electric circuits on both sides of the air operated Main Circuit Breaker.

The Lower Casing which houses the operating and interalia locking mechanism of the Earth Isolating Switch shall be installed inside the traction vehicle.

The Earthing Switch is distinguished by the following features :

- **Compact Design**
- **Rugged Construction**
- **Minimum Maintenance Requirements**
- **Reliable Operation Under Difficult Traction Operation**



II. Technical Data :

Rated Voltage	25 kV ac
Rated Current	400 A
Poles	2
Weight	26 Kg.(Approx.)
Place of Mounting	Roof

III. Design & Function :

The Operating Lever of the Earthing Switch is connected through the arrangement of uniball joint to the Main Shaft. Two Isolator Blades are fitted on the both sides of the Shaft. The Operating Lever mechanism is kept in the Lower Casing of the Switch. The Main Shaft along with the Blades are kept in the Upper Casing. Both Upper & Lower casing are fitted with the Bolts. At the earthing position, these Blades establish the contact between the frame and electric circuits on both sides of the air operated Main Circuit Breaker. The Earthing Switch is fitted on the roof, the upper portion(Upper Casing) is projected on the roof and the lower portion (Lower Casing) is inside the machine room. Operator/Driver can operate the switch by operating the interlocking arrangement from the machine room through operating lever.

Mode of Function & Operation :

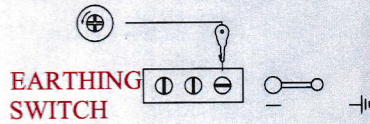
Interlocking (Current collector-Earthing Switch-High Voltage Compartment)

- **Earthing**
- **Operation**
- **Circuit Diagram**

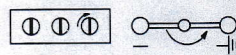
PRINCIPLE OF OPERATION AND PROCEDURE OF EARTHING SWITCH (AC) FOR VCB

"EARTHING"

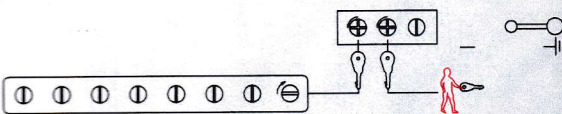
PANTO ISOLATING COCK



1. TURN THE 'A' KEY (BLUE) OF THE CONTROL-CURRENT SWITCH TO POS. "PANTOGRAPH DOWN", PULL IT OUT AND INSERT IT INTO THE EMPTY LOCK CYLINDER OF THE EARTHING SWITCH.



2. TURN THE 'A' KEY (BLUE) IN THE EARTHING SWITCH, PUSH THE OPERATING LEVER IN AND TURN IT TO THE "EARTHING" POSITION.

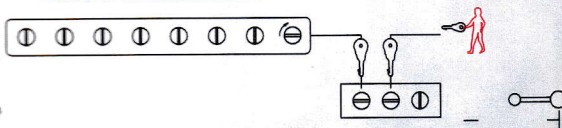


3. NOW IT IS POSSIBLE TO TURN THE YELLOW 'B' KEYS, PULL THEM OUT AND ONE 'B' KEY IS USED TO OPEN THE LOCKS OF KEY MULTIPLIER AND SECOND 'B' KEY IS TO BE KEPT IN THE CUSTODY OF A RESPONSIBLE SUPERVISOR FOR ADDITIONAL SAFETY.

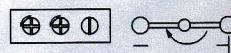
KEY MULTIPLIER

"OPERATION"

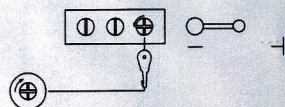
KEY MULTIPLIER



1. CLOSE THE LOCK OF KEY MULTIPLIER & REMOVE THE YELLOW 'B' KEY AND INSERT THE SAME ALONG WITH ANOTHER YELLOW KEY INTO THE EARTHING SWITCH AND TURN THEM. THEY CAN BE TURNED ONLY IF ALL THE YELLOW 'B' KEYS HAVE BEEN INSERTED.

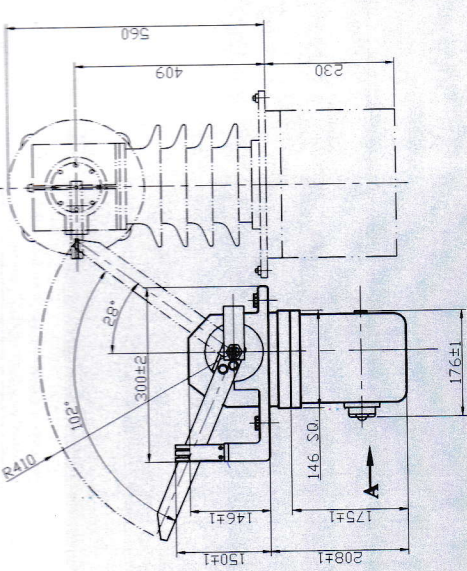


2. PUSH THE OPERATING LEVER INWARD AND TURN IT TO THE "OPERATION" POSITION.

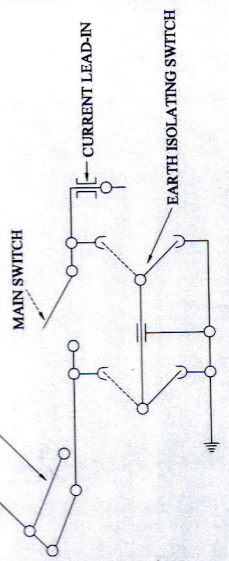
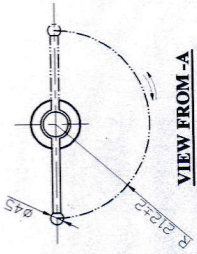


3. TURN THE BLUE 'A' KEY, PULL IT OUT AND INSERT IT INTO THE PANTOGRAPH AIR SUPPLY ISOLATING COCK.

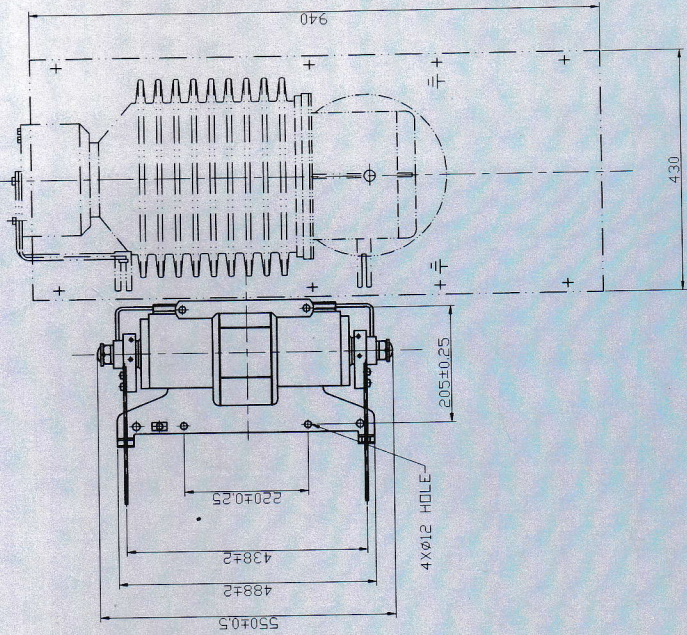
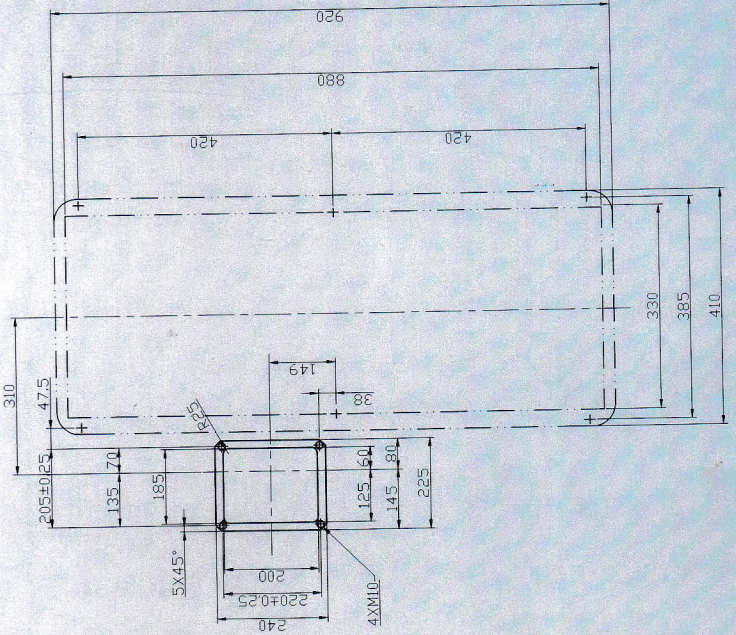
PANTO ISOLATING COCK



SINGLE-ARM PANTOGRAPH



WIRING DIAGRAM



TECHNICAL DATA:
 RATED VOLTAGE : 25 KV
 RATED CURRENT : 400 A
 PLACE : ROOF
KEY & LOCK CONFIGURATION
 1A + 2B = (1 BLUE + 2 YELLOW)

WEIGHT-26 KG (APPROX.)

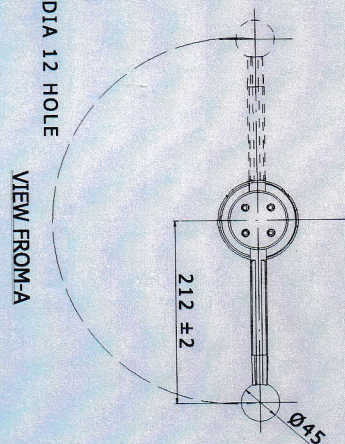
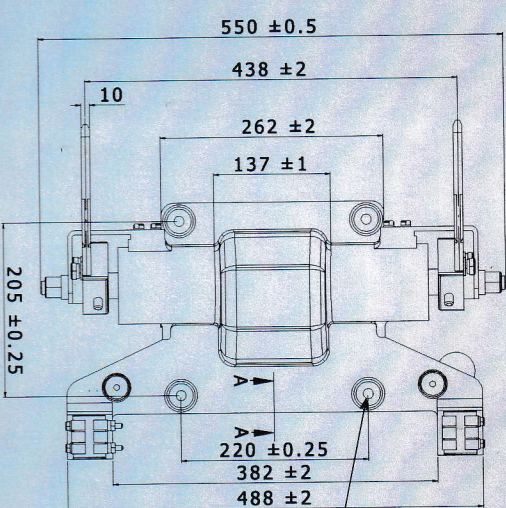
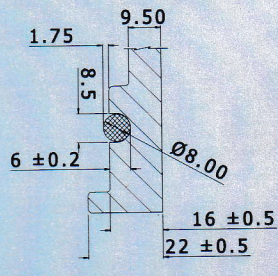
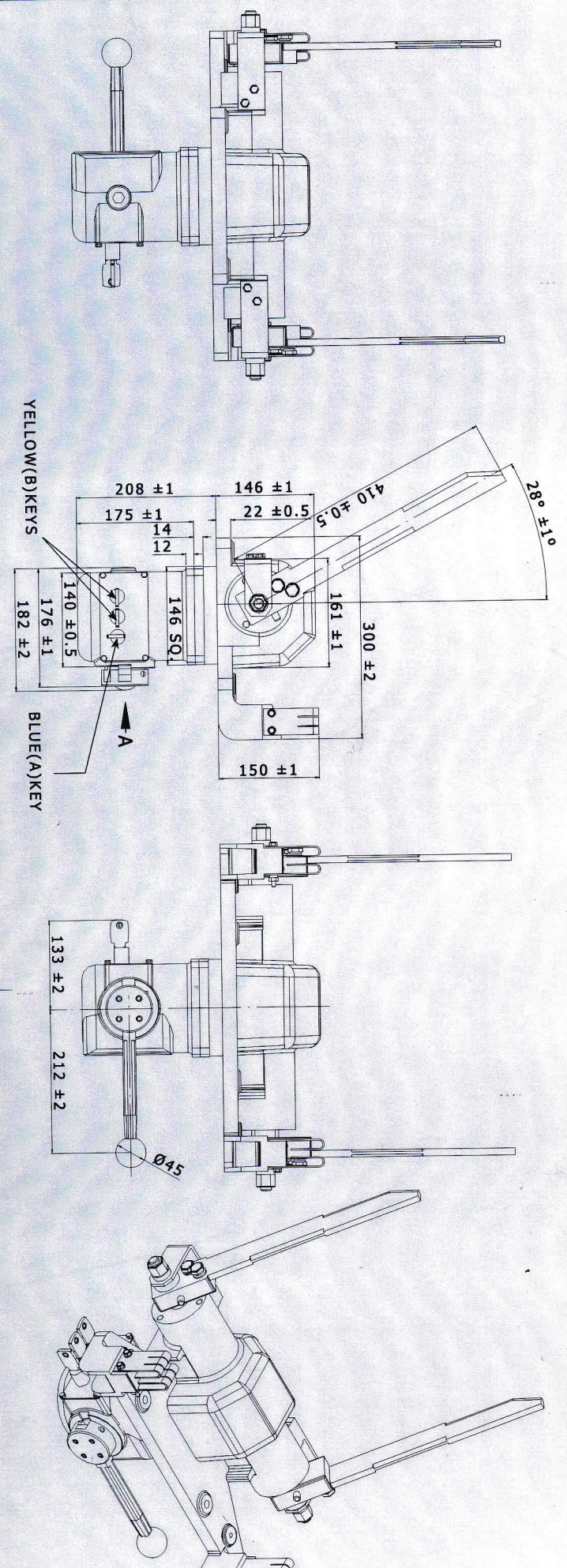
PATRA & CHANDA
 MFG. & ENG.(I) PVT. LTD.
 67, PANCHANANTALA ROAD, HOWRAH-711 101, W.B.

PCE.VES.25.4		DGN.	A. ACHARYYA	28.09.07
TYPE NO.		DRN.	A. K. DAS	28.09.07
REVISION		CHD.	N.N.PATRA	29.09.07
SCALE		ISSUE	CHANGE	SIGN
NTS		DATE	APPD.	DATE
PCE/IF-ES-VCB/01		SCALE	NTS	NTS

DESCRIPTION: INTERFACING DRAWING OF EARTHING SWITCH AND VCB

DRG. NO. PCE/IF-ES-VCB/01

ALL DIMENSIONS ARE IN MM, OTHERWISE STATED



TECHNICAL DATA

RATED VOLTAGE : 25 KV
 RATED CURRENT : 400 A
 PLACE : ROOF
 WEIGHT : 26 KG.(APPROX.)

KEY & LOCK CONFIGURATION

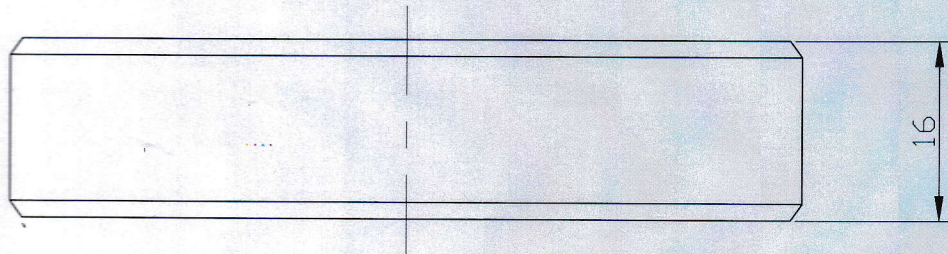
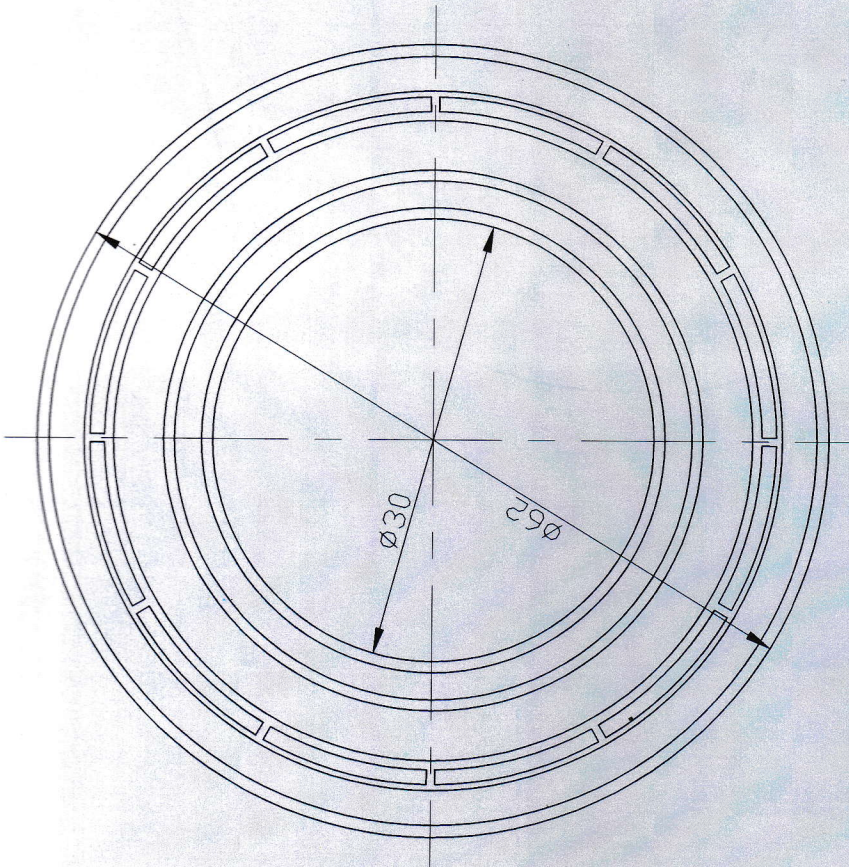
1A + 2B = (1 BLUE + 2 YELLOW)

CHANGE SCALE	DGN. & DRN.	A. ACHARYYA	28.09.07
	CHD.	A.K.DAS	28.09.07
	APPD.	N.PATRA	28.09.07
	N.T.S		

PATRA & CHANDA MFG. & ENG. (I) PVT. LTD.
 67, PANCHANANTALA ROAD, HOWRAH-711 101, W.B.

EARTHING SWITCH (AC) FOR VCB

DESCRIPTION: TYPE NO. **PCE.VES.25.4**
 DRG. NO. **PCE/ES-VCB/01** REV.



NOTE: TATA MAKE BEARING
ID. NO. 6206 ZZ

ALL DIMENSIONS ARE IN M.M., OTHERWISE STATED.

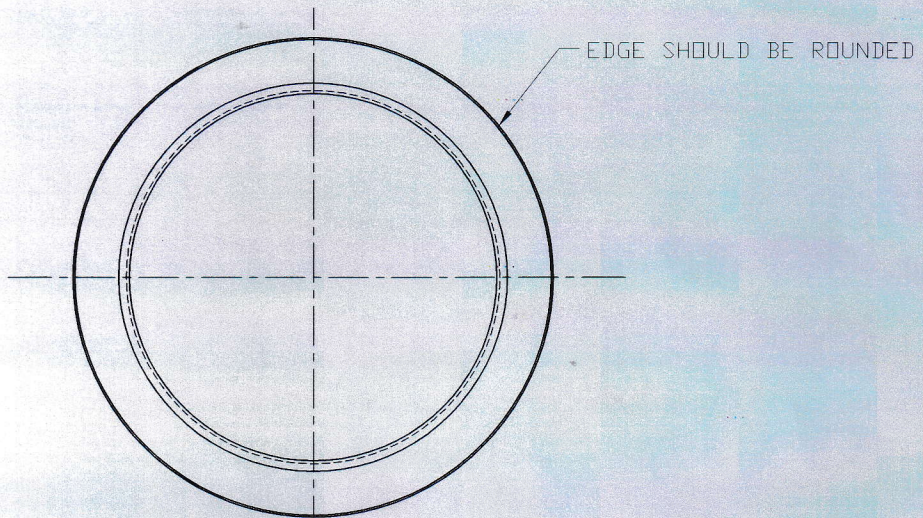
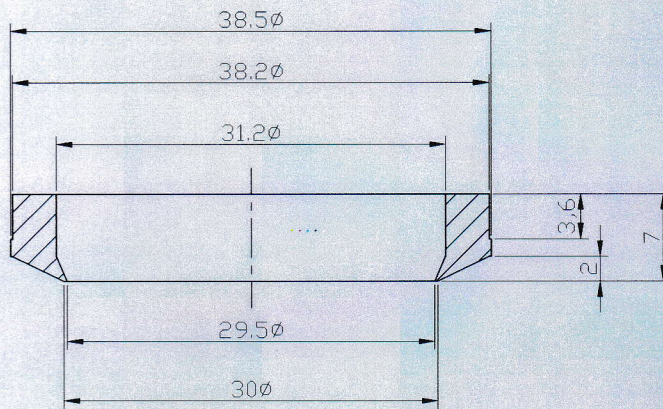
DGN.	NAME	DATE
DRN.	A.ACHARYYA	22.02.05
CHD.	A.K.DAS	23.02.05
APPD.	N.PATRA	28.02.05
SCALE	NTS	




PATRA & CHANDA MFG. & ENG. (I) PVT. LTD.
67, PANCHANANTALA ROAD, HOWRAH-1

DESCRIPTION: BALL BEARING FOR EARTHING
SWITCH FOR VCB

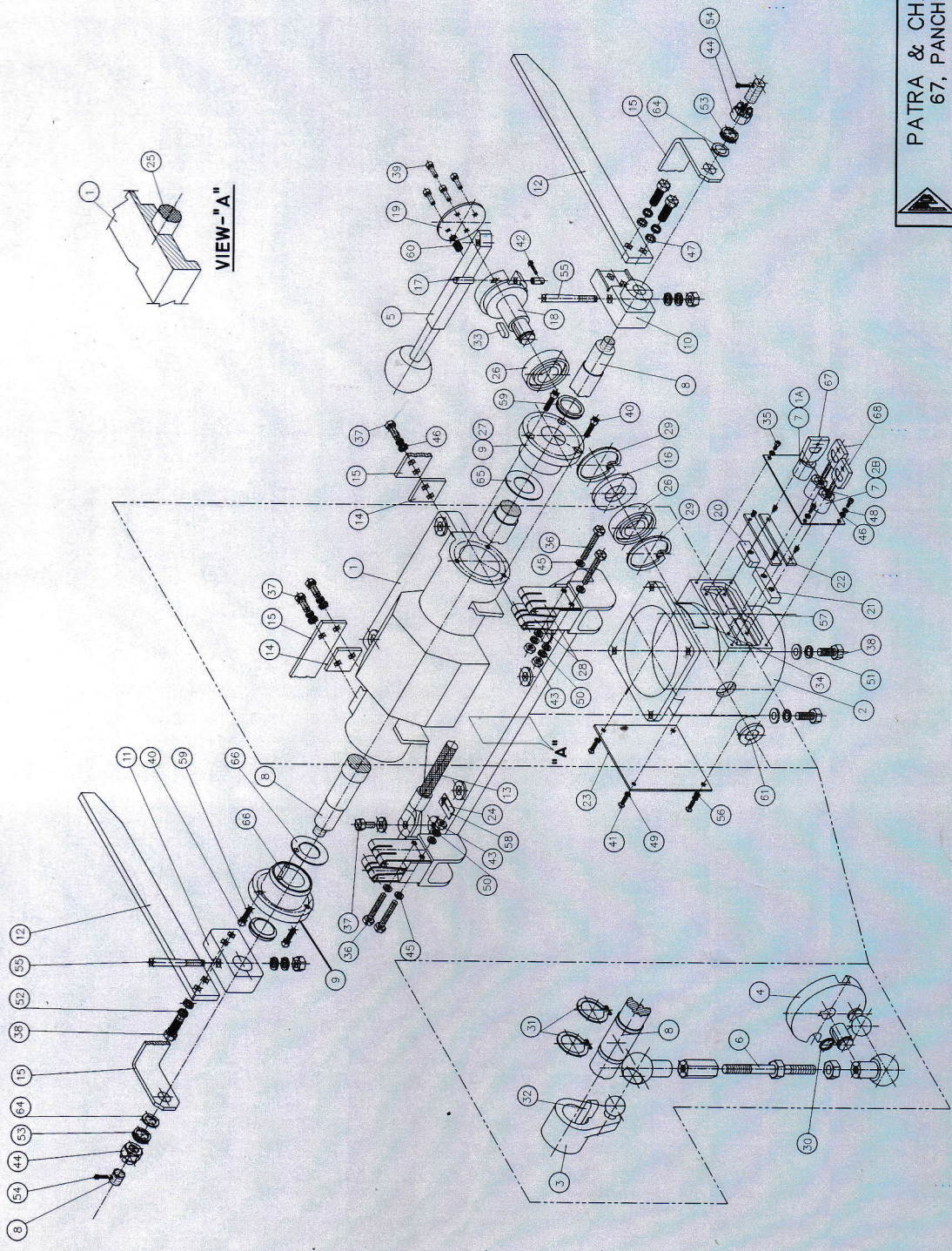
DRG. NO. PCE/WAG-ES/026/00



NOTE: ALL DIMENSIONS ARE IN mm.
ALL UN-TOLERANCE DIMENSIONS SHOULD BE AS PER IS:2102-69 (MEDIUM)

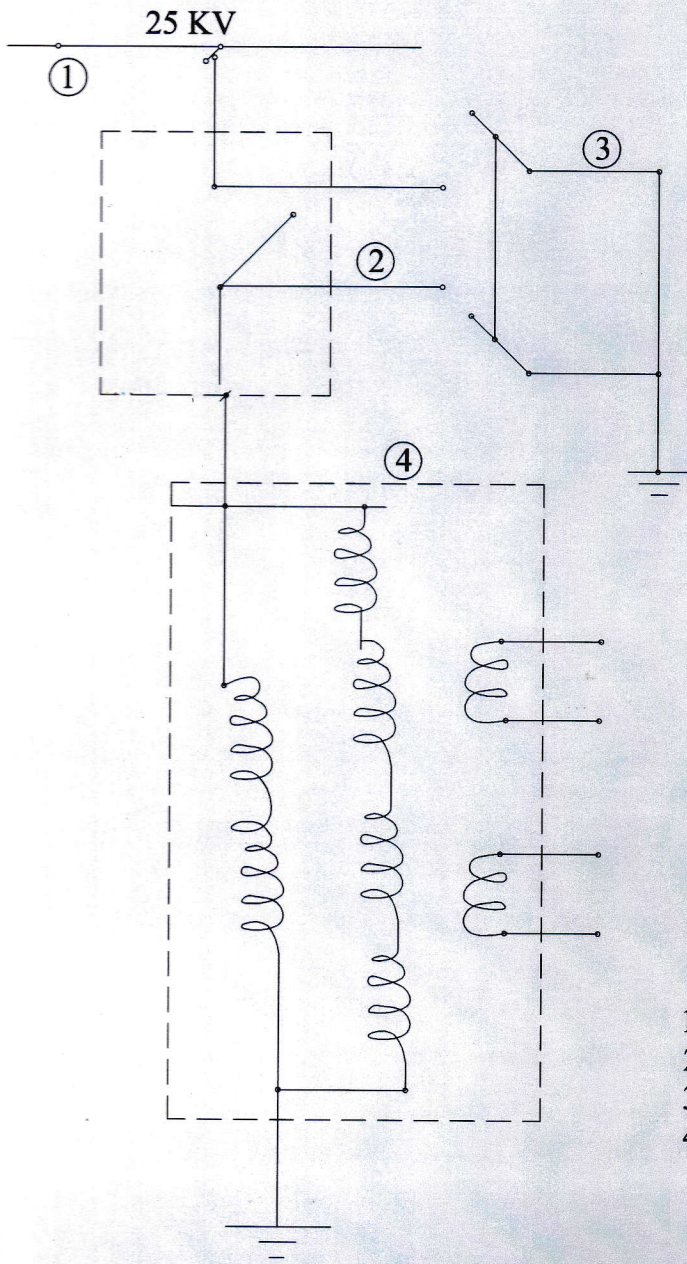
MATL. SILICON RUBBER				 PATRA & CHANDA MFG. & ENG. (I) PVT. LTD. 67, PANCHANANTALA ROAD, HOWRAH-1		
				DGN.		
				DRN.	A.ACHARYYA	21.02.05
				CHKD.	A.K.DAS	22.02.05
ISSUE	CHANGE	SIGN	DATE	APPD.	N.PATRA	28.02.05
REVISIONS				SCALE	NTS	
				SUB ASSY.	DRG. NO.	PCE/WAG-ES/018/00
				DESCRIPTION: SCRAPPER		

S.L.NO.	DESCRIPTION	QTY.
1	UPPER CASING	1
2	LOWER CASING	1
3	CAM FOR SHAFT (COMPLETE LEVER UNIT)	1
4	COMPLETE DISC UNIT	1
5	CONTROL LEVER	1
6	SWIVEL CONTROL ROD WITH NUT & HEAD	1
7	COMPLETE LOCK 1A + 2B	1
8	MAIN SHAFT	1
9	COVER	1
10	RIGHT HAND BRACKET	2
11	LEFT HAND BRACKET	1
12	BLADE(MOVING CONTACT)	2
13	FLEXIBLE CORD (120 mm ² COMPOSED OF 608 STRANDS OF 0.5mm ϕ)	1
14	SHIM	2
15	CONNECTION	2
16	DISTANCE RING	1
17	SHAFT	1
18	ROUND SHAFT	1
19	COVER	1
20	LOCK-A	1
21	LOCK-B	1
22	PLATE	2
23	COVER	1
24	INDICATOR PLATE	1
25	SEAL (RUBBER GASKET)	2
26	BALL BEARING (ID NO-6206 ZZ)	2
27	BUSHING	2
28	CONTACT SPRING	4
29	RETAINING RING I 62	2
30	RETAINING RING A 22	2
31	RETAINING RING A 35	1
32	KEY	2
33	KEY	1
34	KEY	1
35	DATA PLATE	1
36	HEX. HD. SCREW M4 X 10	1
37	HEX. HD. SCREW M6 X 50	4
38	HEX. HD. SCREW M8 X 25	4
39	CSK. HD. SCREW M10 X 35	9
40	HEX. HD. SOCKET SCREW M4 X 10	4
41	TAPER-HD. SOCKET SCREW M6 X 20	6
42	HEX. HD. PIVOTING SET SCREW M5 X 10	8
43	HEX. HD. NUT M6	4
44	HEX. HD. SLOTTED NUT M16	2
45	WASHER A 6.4/12 X 1.6	4
46	WASHER A 8.4 X 18 X 1.6	5
47	WASHER A 10.5 X 20 X 2.0	4
48	WASHER A 4.3/9 X 0.5	4
49	LOCK WASHER A4	10
50	LOCK WASHER A8	8
51	LOCK WASHER A10	9
52	WASHER DRI 17	2
53	WASHER DRI 17	2
54	COTTER PIN 4 X 32	2
55	TAPER PIN 8 X 20	2
56	SPRING COTTER PIN 3 X 10	4
57	ROLL PIN	1
58	SELF-TAPPING SLOTTED SOCKET HEAD SCREW M3 X 8	6
59	SCRAPPER	2
60	PRESSURE SPRING	1
61	THREADED PLUG	1
62	SERRATED WASHER V4 4.3 X 8	8
63	SPRING COTTER PIN 4 X 10	1
64	WASHER AJ 16/35 X 0.5	2
65	THRUST WASHER	2
66	THRUST SPRING COTTER PIN 4 X 14	2
67	KEY A (BLUE)	1
68	KEY B (YELLOW)	2




DRN	A.ACHARYYA	24.02.05	TITLE	ISOMETRIC VIEW OF EARTHING SWITCH FOR VCB
TCD	A.K.DAS	26.02.05	PROJECTION	TYPE-PCE.VES.25.4
CKD	N.PATRA	28.02.05	DRG.NO.	PCE/IV-ES/01/00
APPD			SCALE	NTS.
ALL DIMENSIONS ARE IN MM. OTHERWISE STATED WEIGHT- 26 KG (APPROX.) SHEET 0				

PATRA & CHANDA MFG. & ENGG.(INDIA) PVT. LTD.
 67, PANCHANANTALA ROAD, HOWRAH-711 101(WB.)



1. PANTOGRAPH
2. MAIN CIRCUIT BREAKER (VCB)
3. EARTHING SWITCH FOR VCB
4. MAIN TRANSFORMER

						 PATRA & CHANDA MFG. & ENG. (I) PVT. LTD. 67, PANCHANANTALA ROAD, HOWRAH-1
				NAME	DATE	
				DGN.		DESCRIPTION: CIRCUIT DIAGRAM OF EARTHING SWITCH FOR VCB
				DRN.	A.ACHARYYA 21.02.05	
				CHKD.	A.K.DAS 22.02.05	
ISSUE	CHANGE	SIGN	DATE	APPD.	N.PATRA 28.02.05	SUB ASSY. DRG. NO. PCE/CD-ES/01/04
REVISIONS				SCALE	NTS	



B) Erection & Commissioning :

The Earthing Switch is roof mounted. When installing the switch ensure that there are sufficient air-gap and creepage path between in & the roof body. After screwing on the Earthing Switch ensure that the Isolator Blades engaged correctly with the Circuit Breaker's contacts.

In earth conditions, it should not be possible to operate the Earthing Switch inside the Machine Room.

To ensure reliable earthing a sound electrical connection should be provided between the flexible connection of the switch & the roof of the locomotive.

C) Maintenance of Earthing Switch:

At certain intervals which will depend on the operation of the vehicle, the Isolator Blades and Fixed Contacts on the Earthing Switch should be cleaned and lightly greased and all connections are to be tightened at an interval of three months.

The following spare parts may also be replaced as and when required :

List of Maintenance Spares :

1. Rubber Gasket (Seal-ID.Code No.25) for Roof
2. Scrapper (Seals)(ID.Code No.59) for Main Shaft (ID. Code No.8)
3. Blade (Moving Contact) - Complete set (ID.Code No.12)
4. Contact Spring - Complete set (ID.Code No.28)
5. Key- A (Blue) (ID.Code No.67)
6. Key-B (Yellow) (ID.Code No.68)



PATRA & CHANDA

MFG. & ENG. (INDIA) PVT. LTD.

RECOMMENDED SPARES TO BE REPLACED IN THE FOLLOWING MANNER:

1. Rubber Gasket (Seal-ID. Code No.25) for Roof

The entire Switch to be removed from the roof and the Seal/Rubber Gasket to be replaced with new one.

PERIODICITY OF REPLACEMENT:

It is suggested when the entire switch will be removed from roof, replacement of Rubber Gasket (Seal) if required.

2. Scraper (Seals ID. Code No.59) for Main Shaft(ID. Code No.8)

- i. Remove the Cotter Pin(ID. Code No.54) of the both sides of the Main Shaft.
- ii. Unlock 16 mm. Nut of both sides of Main Shaft.
- iii. Remove the Washer DBL 17 (ID.Code No.53) & Washer AJ (ID.Code No.64) of the both sides of the Main Shaft
- iv. Remove the Connection (ID.Code No.15) of the both sides of the Main Shaft
- v. Remove the Blades(Moving Contact) (ID.Code No.12) assembled with Brackets (ID. Code No.10 & 11) of the both sides of the Main Shaft
- vi. Unscrew the Socket Hd. Screw (ID.Code No.40) and remove the Cover (ID.Code No.9) along with Scraper (ID.Code No.59)
- vii. Replace the Scraper (Seal) with new one and clean the inside of the Cover (ID.Code No.9) & then greasing
- viii. Fit the spare parts in reverse sequence

PERIODICITY OF REPLACEMENT: 10 (Ten) Years.

3. Blade (Moving Contact)- (ID. Code No.12)

- i. Unscrew the CSK Hd. Screw (ID. Code No.38) along with Washer (ID. Code Nos.52 & 47) fitted with Brackets (ID. Code Nos.10 & 11)
- ii. Replace the Blade (Moving Contact) with new one and fit the same in reverse sequence

PERIODICITY OF REPLACEMENT: 10 (Ten) Years.

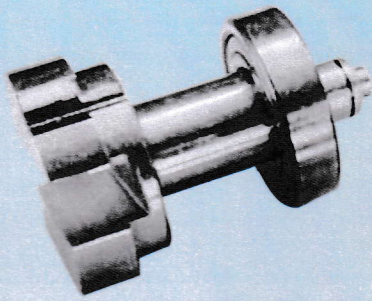
4. Contact Spring- (ID. Code No.28)

Unscrew the Hex.Hd. Screw (ID. Code No.36) along with Washer (ID. Code No. 45) replace the Contact Spring with the new one and fit the same in reverse sequence

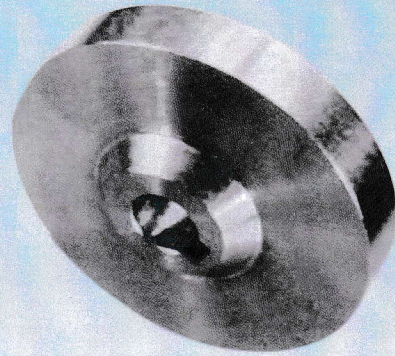
5.Key-A (Blue) & Key- B (yellow)- (ID.Code Nos. 67 & 68)

Replace with new Keys

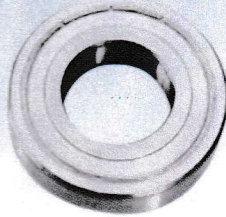
PHOTOGRAPH OF MAJOR COMPONENTS



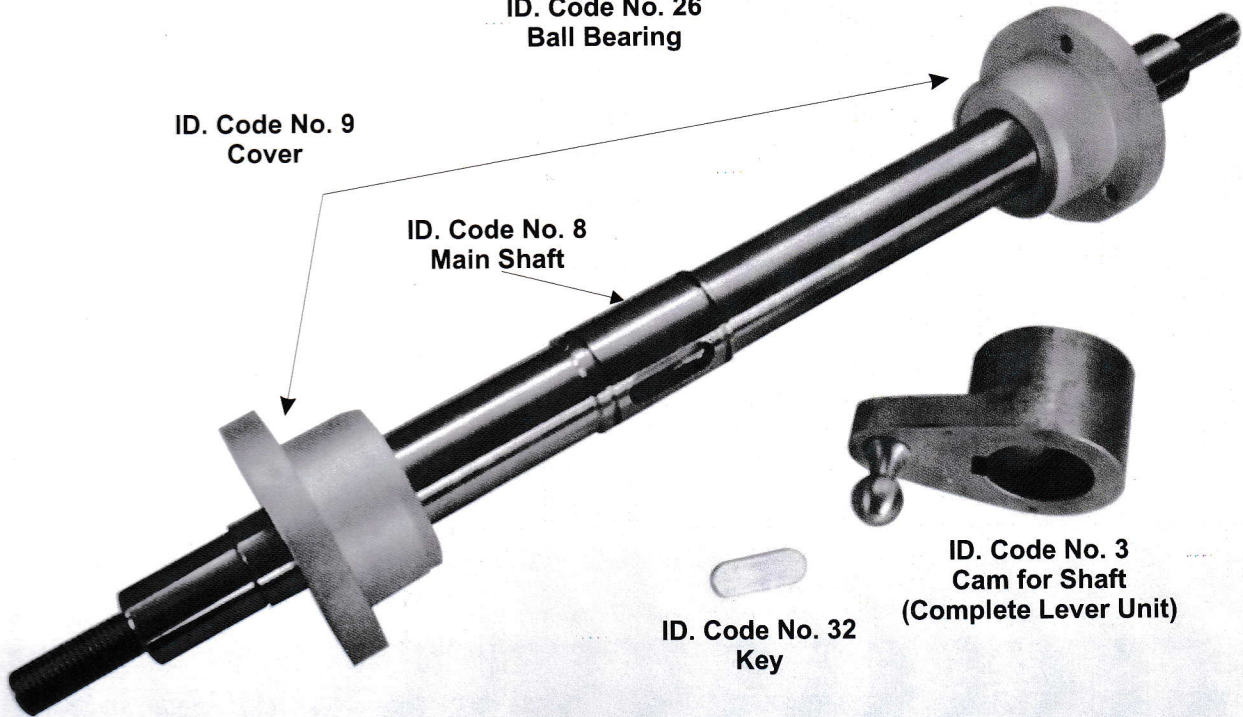
ID. Code No. 18
Round Shaft



ID. Code No. 4
Complete Disc Unit



ID. Code No. 26
Ball Bearing

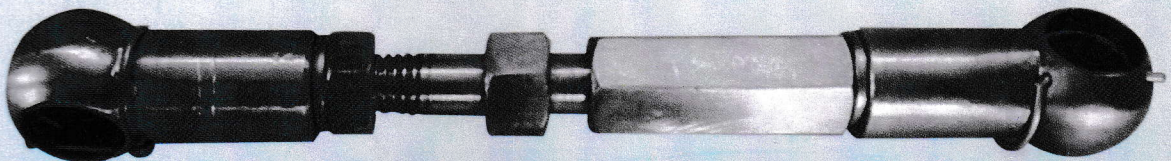


ID. Code No. 9
Cover

ID. Code No. 8
Main Shaft

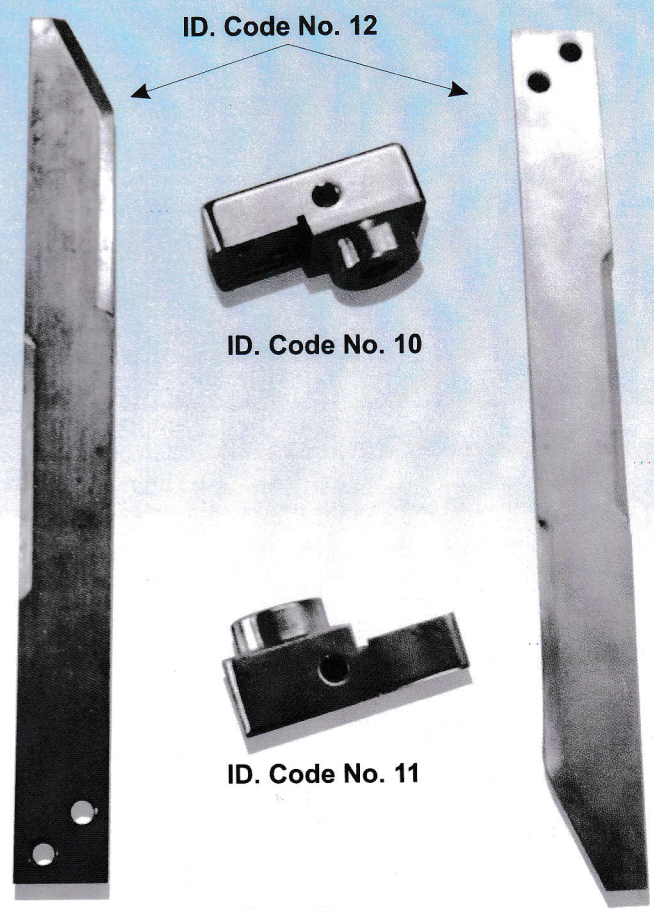
ID. Code No. 3
Cam for Shaft
(Complete Lever Unit)

ID. Code No. 32
Key



ID. Code No. 6
Swivel Control Rod with Nut & Head

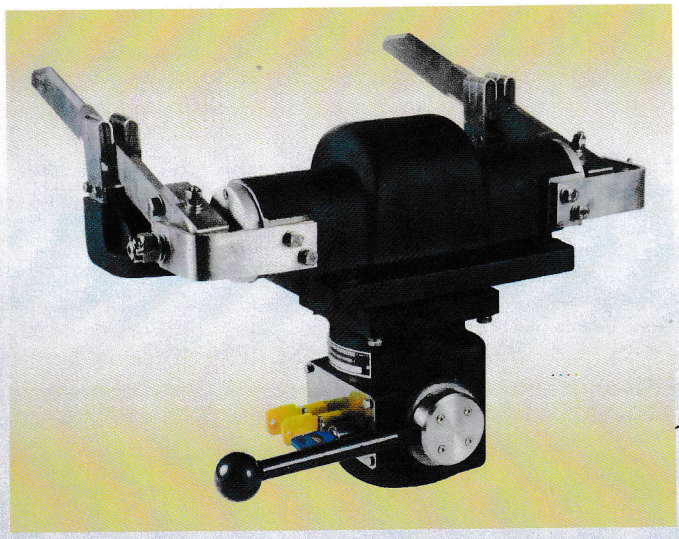
PHOTOGRAPH OF MAJOR COMPONENTS



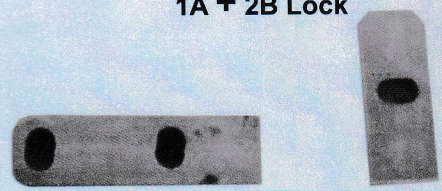
ID. Code No. 10 & 11 (RH & LH Bracket)
ID. Code No. 12 (Blade)



ID. Code No. 7
1A + 2B Lock



Earthing Switch for VCB

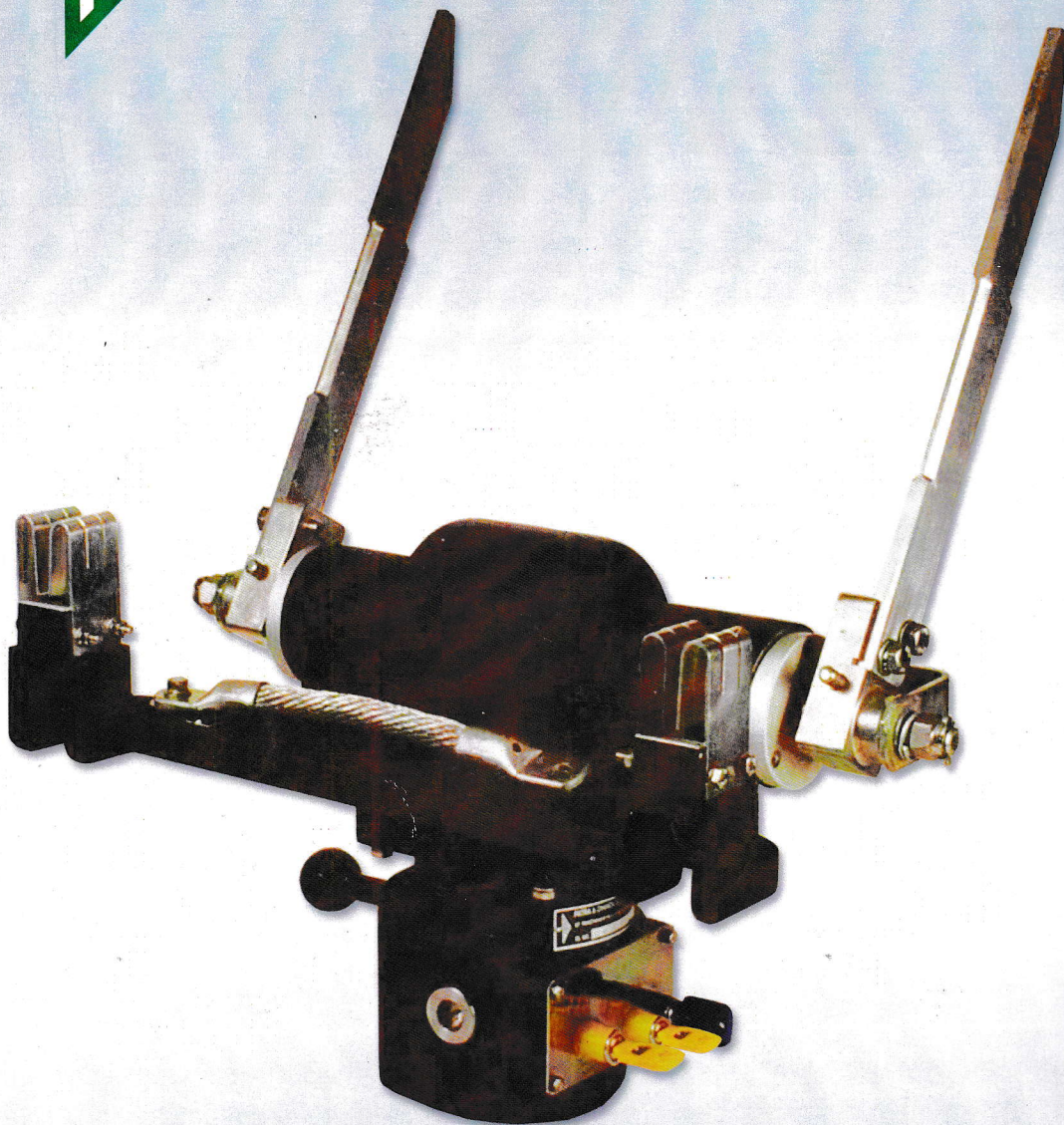


PATRA & CHANDA MFG. & ENG.(I) PVT. LTD.

67, Panchanantala Road, Howrah-711 101.

LIST OF SPARE PARTS OF EARTHING SWITCH FOR V.C.B.-TYPE PCE.VES.25.4

Ident Code No.	Qty. Reqd per Switch	List of Spares	Manufacturer of Spares	Ident Code No.	Qty. Reqd per Switch	List of Spares	Manufacturer of Spares
1	1	Upper Casing	Own make	39	4	Hex Hd. Socket	Brand :
2	1	Lower Casing	-do-			Screw M 4 x 10	KUNDAN/APL
3	1	Cam for Shaft (Complete Lever Unit)	-do-	40	6	Hex Hd. Socket	-do-
4	1	Complete Disc Unit	-do-	41	8	Screw M 6 x 20	-do-
5	1	Control Lever	-do-			Taper Head Slotted	-do-
6	1	Swivel Control Rod with Nut & Head	-do-	42	1	Screw M 4 x 12	-do-
7	1	Complete Lock 1A +2B	-do-	43	4	Hex Hd. Pivoting Set	-do-
8	1	Main Shaft	-do-	44	2	Screw M 5 x 10	-do-
9	2	Cover	-do-	45	4	Hex Head Nut M 6	-do-
10	1	Right Hand Bracket	-do-	46	5	Hex Hd. Slotted Nut M 16	Trade item
11	1	Left Hand Bracket	-do-	47	4	Washer A 6.4 /12 x 1.6	Brand :
12	2	Blade (Moving Contact)	-do-	48	4	Washer A 8.4x16x1.6	KUNDAN/APL
13	1	Flexible Cord (120mm2 Composed of 608 Strands of 0.51 mm.dia)	Trade item	49	8	Washer A 10.5 x 20 x 2.0	-do-
14	2	Shim	Own make	50	4	Washer A 4.3 / 9x0.5	-do-
15	2	Connection	-do-	51	8	Lock Washer A 4	-do-
16	1	Distance Ring	-do-	52	10	Lock Washer A 6	-do-
17	1	Shaft	-do-	53	9	Lock Washer A 8	-do-
18	1	Round Shaft	-do-	54	9	Lock Washer A 10	-do-
19	1	Cover	-do-	55	2	Washer DBL 17	Trade item
20	1	Lock - A	-do-	56	2	Cotter Pin 4 x 32	-do-
21	1	Lock - B	-do-	57	2	Taper Pin 8 x 70	Own make
22	2	Plate	-do-	58	1	Spring Cotter Pin 3 x 10	Trade item
23	1	Cover	-do-	59	4	Roll Pin	-do-
24		Indicator Plate	Trade item	60	6	Self Tapping Slotted	Brand :TVS/
25	1	Seal (Rubber Gasket)	Trade item	61		Socket Hd. Screw M 3x8	APL/KUN
26	2	Ball Bearing ID.6206 ZZ	Make : TATA	62	2	Scrapper	Own make
27	2	Bushing	Own make	63	1	Pressure Spring	Trade item
28	4	Contact Spring	-do-	64	1	Threaded Plug	Own make
29	2	Retaining Ring 1 62	Trade item	65	8	Serrated Washer V4 4.3x8	Trade item
30	1	Retaining Ring A22	-do-	66	1	Spring Cotter Pin 4x10	-do-
31	2	Retaining Ring A38	-do-	67	2	Washer AJ 16/35x0.5	-do-
32	1	Key	Own make	68	2	Thrust Washer	Own make
33	1	Key	-do-			Trued Spring Cotter	Trade item
34	1	Data Plate	Trade item			Pin 4 x 14	
35	4	Hex Head Screw M4x10	Brand :	67	1	Key A (Blue)	Own make
36	4	Hex Head Screw M6x50	KUN/APL	68	2	Key B (Yellow)	-do-
37	9	Hex Head Screw M8x25	-do-				



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