KATAKKAR ENGINEERING PVT LTD

DC SPARK TESTER
KSTD - SU – 10kV/15kV

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MAINTAINENCE MANUAL/ INSTRUCTION MANUAL

DC Spark Tester
KSTD - SU – 15 kV

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LIST OF ABBREVIATIONS

AC: Alternating Current
kV: Kilo Volt
HV: High Voltage
NC: Normally Closed
NO: Normally Open
C: Common

LIST OF STANDARDS REFERRED

KAT make spark testers are compatible to IS: 10810 (PART44)

1. SAFETY INSTRUCTIONS

General Information This document contains the information necessary for wiring the product to its spec. It is intended for specially trained Technician / Qualified Personnel who are well versed with precautions to be taken, safety measures and maintenance activities. The product can be safely installed and commissioned; it also functions without any problem if the safety instructions in Operation Manual are strictly observed.

WARNING

This means that personal injury or damage to property is caused unless appropriate safety measures are not taken.

NOTE

This draws your attention to important function about the product, handling of the product or to a particular section of the documentation

WARNING

When operating electrical equipment, some parts of the equipment always carry dangerous voltages. Ignoring these safety instructions and warnings may results in serious personal injury and / or damage to property.

Only a qualified person familiar with safety information, assembly operation and maintenance instruction may carry out the work on this equipment.

The information below is for your own personal safety and preventing damage to the described product or other connected equipment.

2. QUALIFIED PERSONNEL

Only qualified persons who know, how to handle assembly, commissioning and operating of electronic components may handle this product.

APPROPRIATE USE

WARNING

You may use the equipment / system for the purpose specified in the operating instructions and in conjunction with the third-party equipment and components recommended as authorized. For the safety reasons, you must not change or add the components on the equipment/ system.

1. Do not pass a wet wire through the electrode as it increases the load on the H.V. transformer and the moisture on the cable, spoils the bead chains of the electrode in the long run. Hence, the use of the pneumatic wiper before SPARK TESTER is highly recommended.

2. This is not a 'Breakdown Voltage Tester' so Do not use the unit as a 'BREAK DOWN VOLTAGE TESTER' because unnecessary increasing the voltage applied to the cable beyond required, increases the load on the SPARK TESTER.

3. The unit is meant to find out pinholes like faults in the cable and not to find the maximum voltage the cable can withstand.

4. Do not apply H.V to non-moving/stationary cable. If the cable is stationary and H.V. is applied, due to continuous application of high voltage, losses in cable increase and the insulating material gets heated up. As a result, the voltage level the cable can withstand lowers and cable insulation may get punctured.

5. Avoid/dampen the physical vibration of wire inside the electrode.

6. To dampen the vibration of the wire, mechanical rollers can be used before and after H.V unit.

7. Earthing of the complete unit is highly recommended and is necessary.

8. Apply suitable voltage to wire under test.

3. INSTALLATION

1. Mount the unit at the desired locations. The electrode should be positioned such that the cable under test passes through the center of the ball chain electrode assembly.

2. Potential free 'Fault Relay' contacts are provided on the rear panel. These are designated as
   - NO (Normally open)
   - C (Common)
   - NC (Normally Closed)

   The Relay becomes ON in case of 'Fault,' i.e. NO contacts become closed
3. Make sure that the unit is properly earthed. For that, the nut is provided to connect the wire, on the side plate of the unit

WARNING

Earthing of the unit is mandatory. (It may cause fatal accident, in case of improper earthing.)

4. For 'MANUAL' mode, short 'RESET' terminals on the rear plate. In 'AUTO' mode remove the link between the "RESET" terminals on the rear plate. The unit comes with default mode as "AUTO"

6. Connect 230V AC mains power supply to L (Line) and N (Neutral). **Connect E (Earth)**

WARNING

The conductor of the cable under test should be earthed. For this purpose, connect the conductor to the metallic bobbin or spool on which it is wound. The metallic stand for the bobbin should also be connected to electrical earth.

4. OPERATING INSTRUCTIONS

1. Center the wire to be tested in the electrode, ensuring that it will remain centered as it is being passed through. Use guide positioning rollers/pulley if required. Close the HV Chamber door.

2. Turn the 'SET kV' pot fully counterclockwise. Switch On the " Mains ON" switch. Kilo voltmeter should indicate minimum voltage of 0.5 kV (Approx.) or less.

NOTE

This equipment cannot be used below 0.5 kV. No valid test occurs at such a low voltage.

3. The method to adjust kV is as follows:
   a. Put the cable in the electrode and start the line.
   b. When the line reaches desired speed, start increasing the "SET kV" knob till violet glow (corona envelope around the wire surface) is visible.
   c. Do not increase the kV once the corona is formed to avoid puncture in insulation. Apply the voltage only to the running wire.

WARNING

Do not touch the electrode when the Power is 'ON'. It may cause fatal accident.

4. When a 'fault' occurs, the counter will advance by one count. External lamp or alarm indications can be given if 'fault relay' contacts are used accordingly. The HV gets removed and then automatically applied (In 'Auto Reset' Mode) immediately and the HV gets applied when Reset button is operated, if fault reset mode selected in 'Manual Reset' mode. But in 'Auto Reset' mode when fault appears momentary kV is removed and after sensing the fault kV is applied again.

5. "Percentage load" is indication of current drawn by H.V. transformer.
   The Spark Tester should be used for loads which do not exceed 30% indication on % load meter.

5. TECHNICAL SPECIFICATIONS

ON-LINE DC Spark Tester - Model: KSTD-SU 15

Table.5.1 Technical Specifications of Model: KSTD-SU 10 or KSTD-SU 15

1. **Input Supply:** 230 VAC ± 10%, 50/60 Hz ± 2 Hz
2. **Output Voltage Range:** 0.5kV to 10kV DC or 0.5kV to 15kV DC
3. **Load:** Capacitive cable load up to 18 mm diameter max
4. **Max. Line Speed:** 1200 MPM
5. **Indications on Keypad:**
   a. For kV: Digital kV meter, 3.5 digit
   b. For % load: Digital % load meter, 3.5 digit
6. **Fault Counter**: 6-digit electromechanical counter (Incremental, Resettable type)
7. **Controls on keypad:** Power ON/OFF switch, set kV potentiometer, Test, Fault Reset & Buzzer Reset Key
8. **Output contact:** 1 no. of 2A changeover relay potential free contact on the backside of the control unit. This can be used up to 230 V A.C. voltage for a load like buzzer, contactor, PLC, Lamp etc.
9. **Modes of operation:**
   a. AUTO mode: Continuous kV/momentary off when the insulation fault is detected.
   b. Manual mode: Removes kV on detection of fault, till Manually Reset.
10. **Standards referred:** IS 10810-(Part 44)-1984 Appendix-A
11. High voltage “ON” Indication
12. Flasher Cum Buzzer for Fault indication
13. **Type of Electrode:** Ball chain Electrode 75mm Stainless Steel Material
14. **Safety interlock:** High Voltage disconnected with the help of Micro switch, interlock for protective Cover on the electrode.
15. **Cable Fault conditions:** Pin holes, Bare patches, marginal cuts. (Fault current 600µA)

Fig.6.1 General Arrangement of Control Unit with Ball Chain Electrode

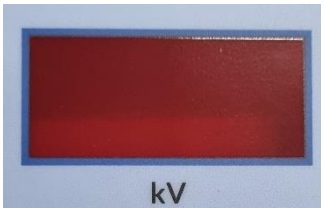
Table 6.2 Dimensions for all models

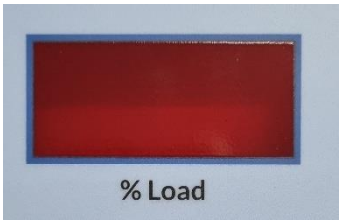
	Length (in Inches)	Width (in Inches)	Height (in Inches)	Weight (in KGs)
Control unit	495(with cover)	380	350	25
Mounting stand	380	400	1255 (max) 749 (min)	22

6. CONTROLS

MAINS "ON" SWITCH:
Located on the front panel of the unit. It is used to power the Spark Tester.

'SET kV' POT AND 'kV DISPLAY':
The kV pot is used to adjust the voltage to the required value. Vary the pot to set the correct kV reading.
The value of the voltage is displayed on the "kV display"



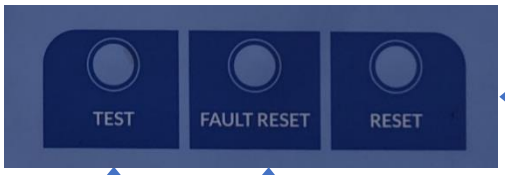


'PERCENT (%) LOAD' DISPLAY:
The display is used to indicate the percentage load on transformer. A %Load above 30% indicates that transformer is faulty

'FAULT COUNTER':

The 'FAULT COUNTER' control displays the number of faults encountered. It is incremented by one every fault detected.

PUSH BUTTONS ON UNIT:



'RESET' BUTTON:

The 'RESET' push-button is used to reset the kV Display to the previously set value in manual mode

'FAULT RESET' BUTTON:

'FAULT RESET' push button is used to stop the the buzzer which sounds when a fault is detected.

'TEST' BUTTON:

The 'TEST' push button is used to simulate fault conditions

'FAULT' LED:

Fault LED flashes **once** when fault is detected and fault counter advances by one

'HV ON' LED:

HV ON indication glows when the unit is turned ON. It flashes when a cable fault occurs

7. MODES OF OPERATION

There are two modes of operation

1. 'MANUAL' MODE:

For this mode shorting link is provided at the 'RESET' terminals on the rear side of the controller unit. In this mode, high voltage is disconnected when cable 'fault' occurs.

1. Insert short link between "RESET" terminals located at the back plate.
2. Whenever cable fault occurs, kV will be disconnected and buzzer indication will be continuously ON
3. To reset kV to previously set value, press the "RESET" key.
4. Press the "FAULT RESET" key for buzzer reset. If the fault still remains in the Electrode (Rewinding line application) then the unit will trip again by adding one more fault count.

To simulate fault condition without kV present, press the 'TEST' key followed by the "RESET" and "FAULT RESET" keys. The "FAULT COUNTER" advances by one count.
This is only for checking the counter and Fault relay operation and not for complete spark tester operation.

2. 'AUTO' Mode:

High voltage(kV) is momentarily disconnected when a fault is detected in this mode. (There is no use of the front panel 'RESET' key in this mode.)

1. Remove short link, if present, between "RESET" terminals located at the backplate.
2. Whenever cable fault occurs, kV is momentarily disconnected and is automatically reset to the previous set value.
3. To stop the buzzer, press the "FAULT RESET" key. If the fault remains in the Electrode, the unit trips again by adding one more fault count.

Press the' TEST' key to simulate fault condition without kV present. The "FAULT COUNTER" advances by one count.

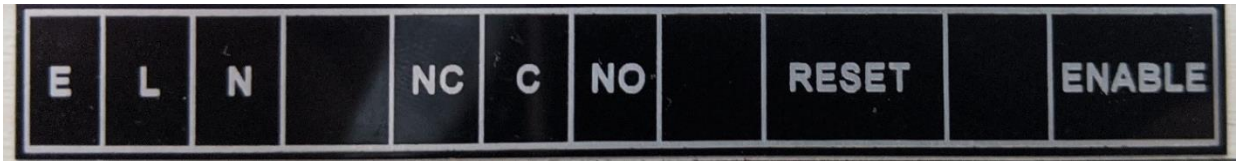
This is only for checking the counter and Fault relay operation and not for the complete spark tester operation.

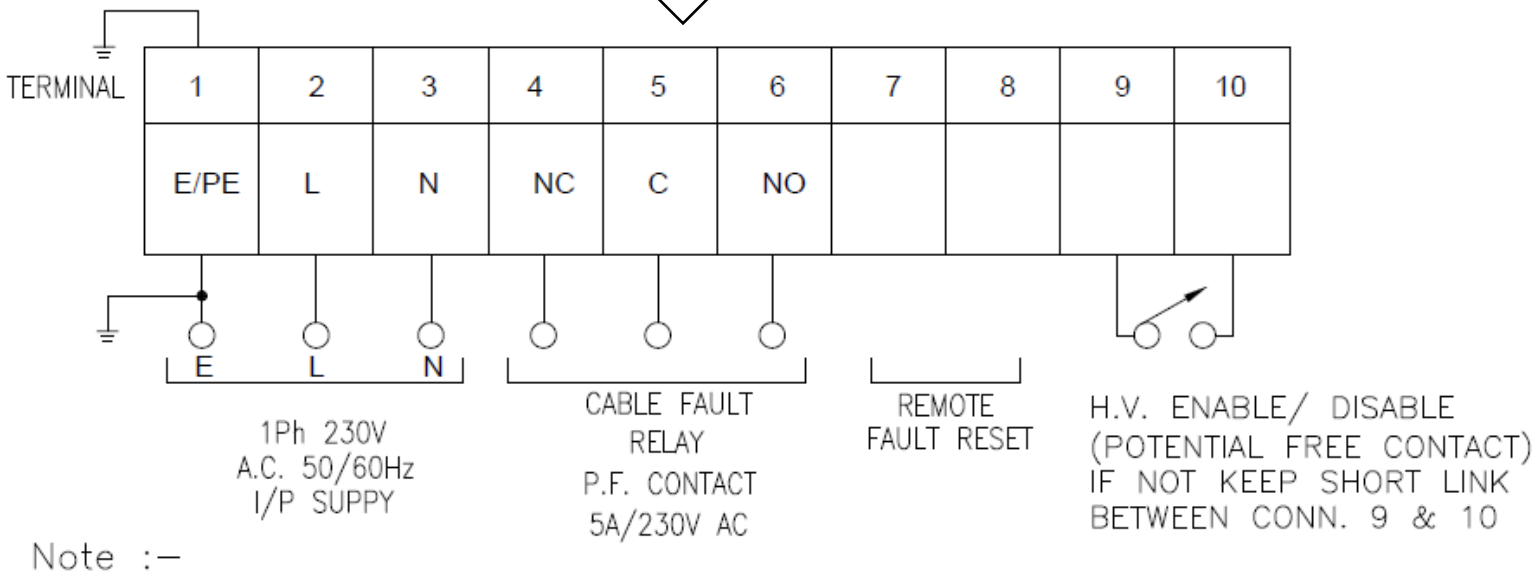
NOTE

For this operation shorting link between 'RESET' terminal on the rear plate should be removed.

8. EXTERNAL CONNECTION DIAGRAM

The external connection plate is located at the backside of the unit under the connector





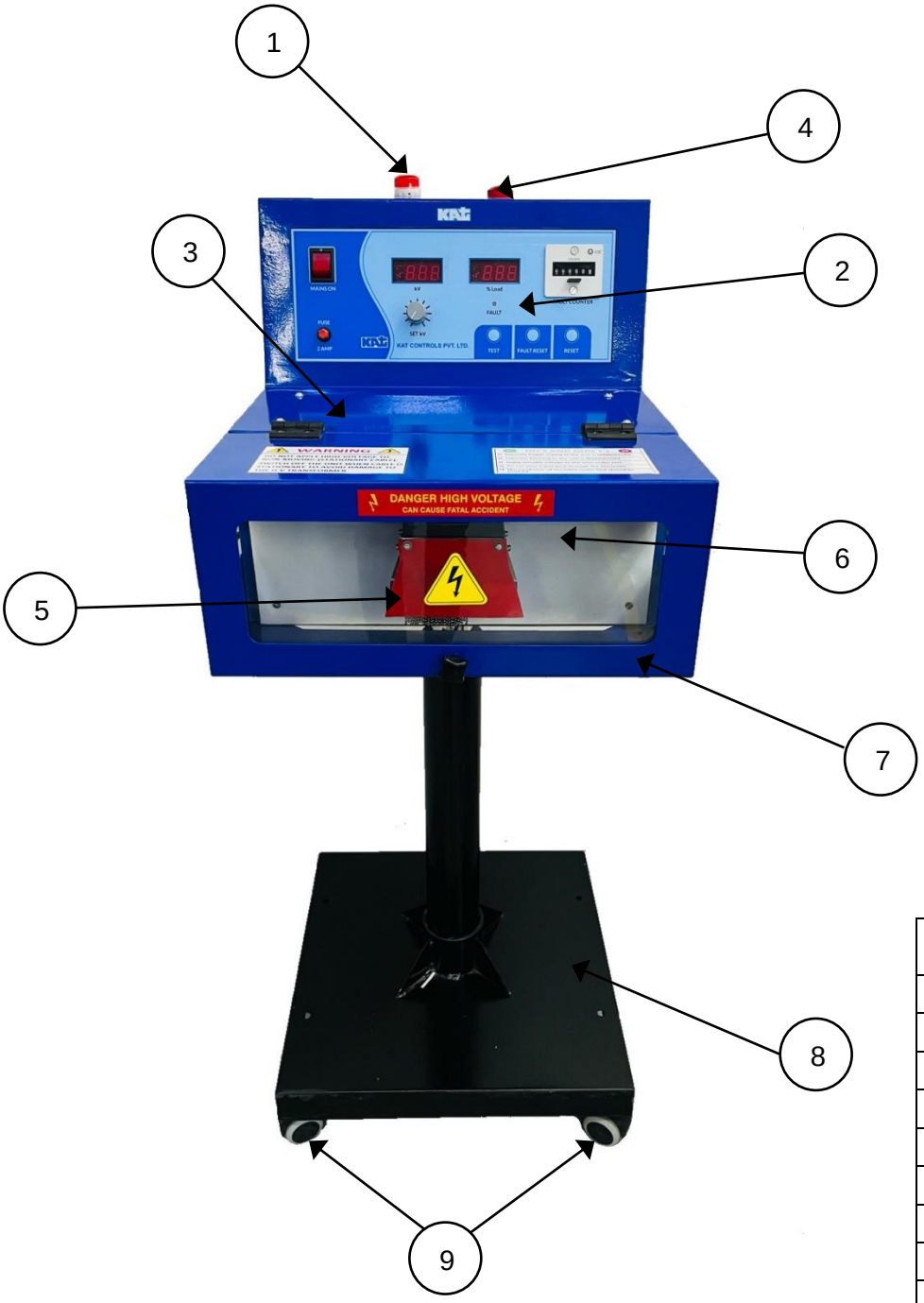
Note :–

- Extrusion /Coiling Line:– Keep conn. terminal no. 7 & 8 open, for 'AUTO' mode kV comes automatically after occurance of cable fault.
- Rewinding Line:– Keep conn. terminal no. 7 & 8 close by short link.
- In 'MANUAL' mode kV goes off after occurance of cable fault. Remote fault reset can be done by using 'NC' to 'NO' momentary push button.
- Potential free contact to be used for fault reset.
- Do not apply voltage between terminal no.7 & 8.

SAFETY CAUTION :- Conductor earthing at one end is compulsory otherwise can cause Fatal Accident.

Fig.8.1 External Connection of Control Unit

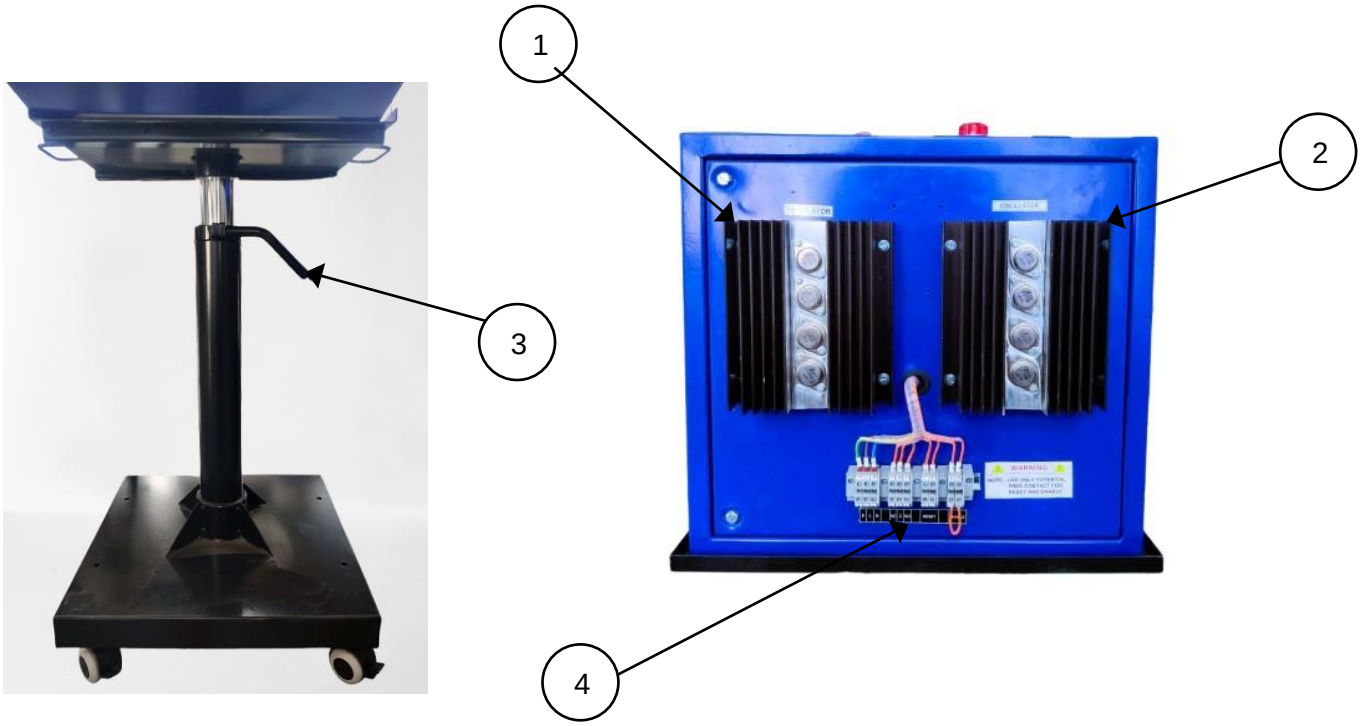
9. ASSEMBLY DETAILS



SR.NO	ITEM
1	Flasher Cum Buzzer
2	Keypad
3	Service plate
4	HV ON Lamp
5	HV Electrode
6	Mounting plate
7	Safety Cover
8	Stand
9	Lockable Wheels

Fig.9.1 Front View of Unit

Fig.9.2 Back View of Unit



SR.NO	ITEM
1	Regulator Assembly
2	Oscillator Assembly
3	Height Adjustment Handle
4	External Connection Plate

10. MAINTENANCE

The equipment carries a dangerously high voltage, and ignoring the safety and warning information may result in death, severe personal injury or damage to the property. Do not begin work on the power stage until you ensure that the unit does not carry the potential or voltage. Use only manufacturer-approved spare parts.

11. TROUBLESHOOTING

In case of a problem, the following are the guidelines for troubleshooting for all probable causes.

Table 11.1 Troubleshooting of KSTD-SU Control Unit

	SYMPTOMS	CAUSES (PROBABLE)	REMEDY
1	NO 'MAINS ON' Indication	No power supply to the unit	Check mains supply to the unit
		Fuse blown	Replace Glass Fuse, 20mm (2A)
2	No output voltage	Safety cover closed but no display	Replace micro switch on the HV Unit
		Safety cover not closed properly	Check if the safety cover is closed correctly
		Faulty H.V. transformer.	Replace transformer after checking other parameters
		Faulty 'SET kV' Potentiometer.	Replace potentiometer
		Faulty control SMPS	Replace SMPS if the LEDs are not glowing on PCB (LD1-LD4)
		Faulty Power Transformer	Replace TR-570 if the LEDs are not glowing on PCB (LD1-LD4)
		Faulty transistor assembly.	Replace assembly
		Faulty control card	Replace control card
3	False counting of faults.	Faulty control card	Replace it.
4	Output voltage goes to full irrespective of setting	Faulty control card or SET kV Potentiometer	Replace individual parts.
5	Sudden increase in %Load	HV Transformer faulty	Replace transformer
6	No fault counting	Faulty control card	Replace respective part
		Faulty counter	

12. SPARE PARTS

Table 12.1 Spare Parts for KSTD-SU Control Unit

SR.NO	DESCRIPTION	PART NUMBER
1.	Control card STDG-CONT-POWER/1225	20150151
2.	Electromechanical counter	30040027
3.	Power Component Assembly 1	20150004
4.	Power Component Assembly 2	20150005
5.	TR-570	30040538
6.	SMPS	30050333
7.	Ball Chain Electrode	30050333
8.	High Voltage Transformer	20150195

13. INSTALLATION OF SPARE PARTS

1. HEATSINK ASSEMBLY:

The unit has 2 heatsink assemblies (No.1 and No.2) mounted on the door, labelled “POWER COMPONENT ASSEMBLY 1” and “POWER COMPONENT ASSEMBLY 2”

To replace Heatsink 1:

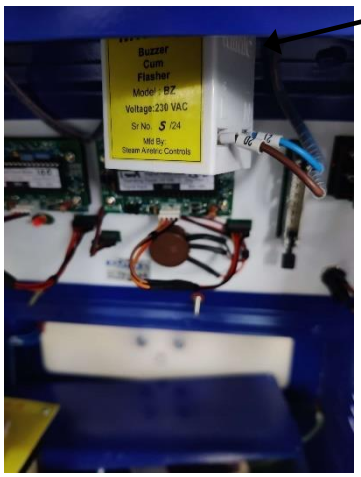
1. Disconnect all wires from CN11 on the PCB, keeping the connector on the board
2. Remove mounting screws holding the Heatsink
3. Fit the new assembly.

To replace Heatsink 2:

1. Disconnect all wires from CN4 on the PCB, keeping the connector on the board
2. Remove mounting screws holding the Heatsink
3. Fit the new assembly

2. BUZZER CUM FLASHER REPLACEMENT:

The unit comes with a Buzzer cum Flasher mounted on top of the unit. The Buzzer cum flasher is faulty when it does not flash & give fault sound, even when a cable fault occurs.



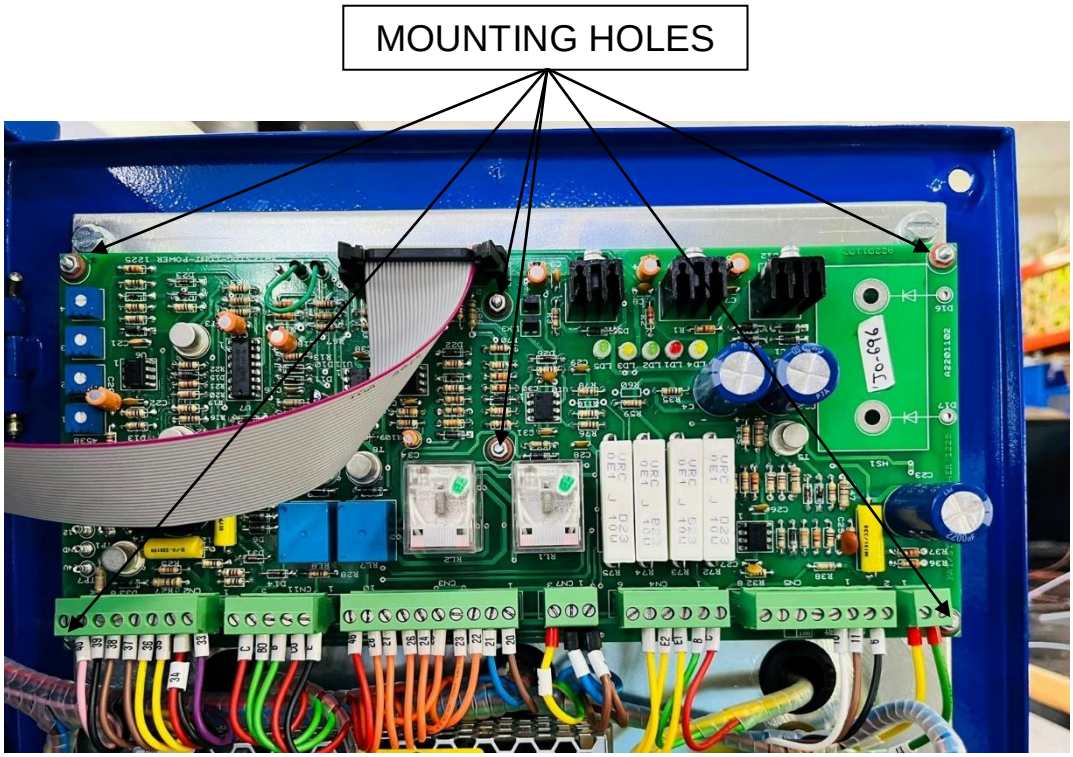
Buzzer Cum Flasher

1. Unscrew & remove the wires by loosening the screws on the connector.

2. Unscrew the Buzzer Cum Flasher from the top and carefully take out from the mounting hole.

3. Replace Buzzer Cum Flasher by screwing the Blue and Brown Wires with ferrule No. 20 & 21 as shown.

3. CONTROL BOARD REPLACEMENT:

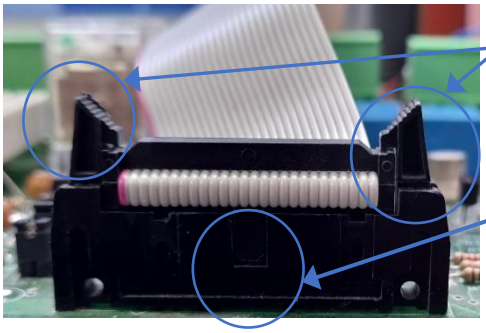


1. Unplug all connectors, including FRC, without disconnecting any wires
2. Remove the 6 mounting nuts using a nut driver. DO not use any other tool as it can damage the board
3. Mount new PCB, tighten the Nuts and plug all connectors properly

UNPLUGGING THE CONNECTOR:

1. The green colored connectors are unplugged by pulling out the top portion without disconnecting the wires
2. Plug back the connector by aligning the ends and pushing down with equal force. Make sure that the connector fitting is correct

UNPLUGGING THE FRC:

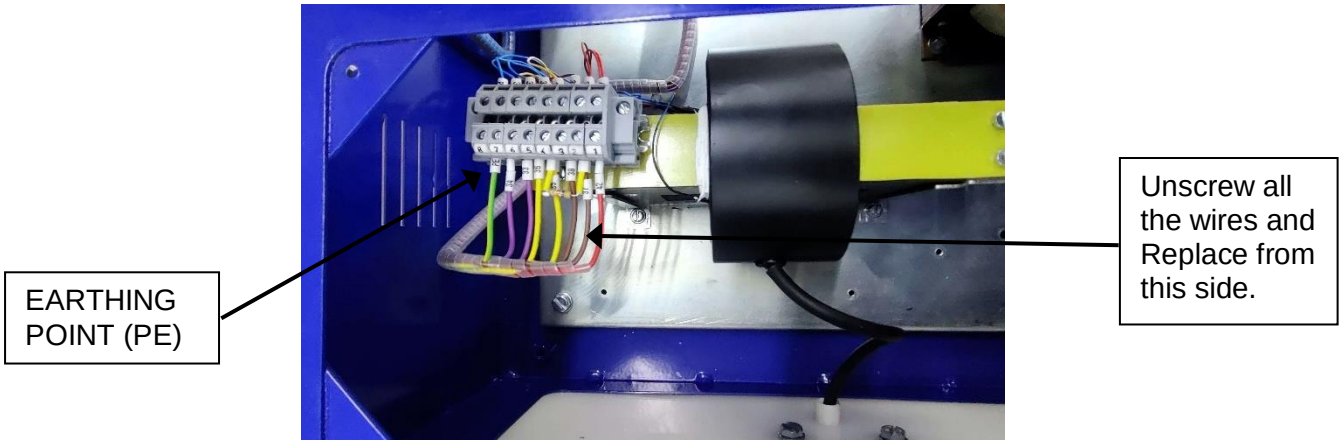


1. Snap open both ends of the connector at the same time. This is the on-board connector

2. While inserting the FRC again, align the notch on the correct side of the connector

3. Snapback the ends of the on-board connector

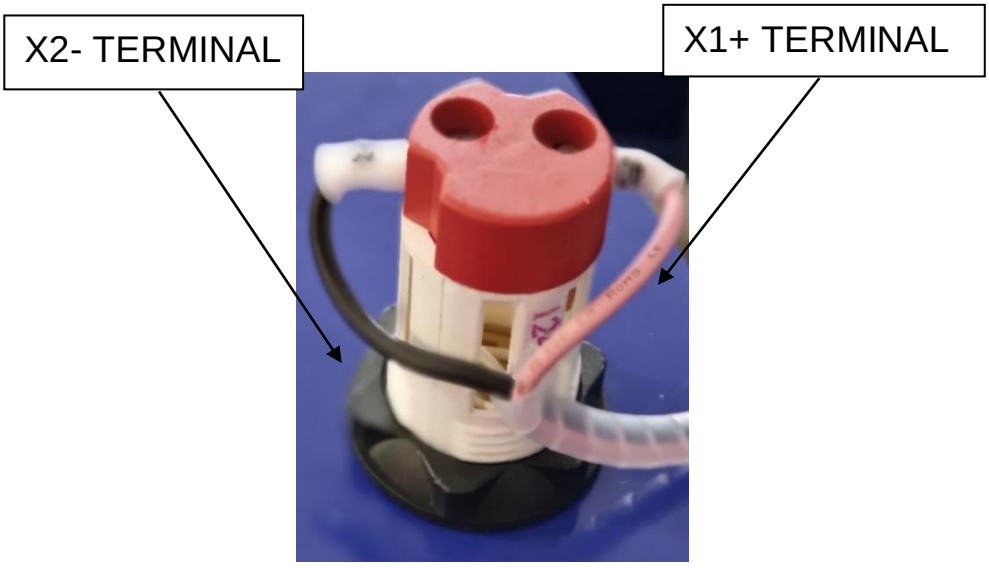
4. H.V TRANSFORMER REPLACEMENT:



1. Unscrew and remove all 8 wires of the connector on the open type connector
2. Remove the screws on the transformer clamps
3. Replace with the new transformer and screws on the clamps
4. Screw the wires into place, as shown below. Care must be taken to not interchange the wires.
5. The earthing point is denoted by 'PE'

5. 'HV ON' LAMP REPLACEMENT:

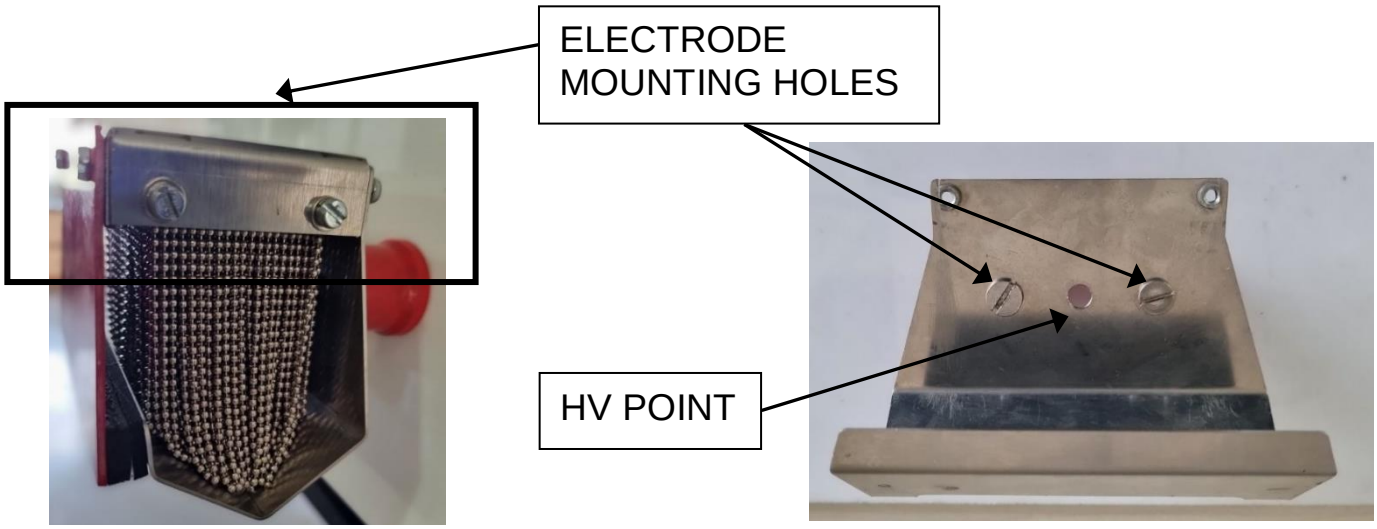
1. The 'H.V. On' Lamp is located on the top of the Control Unit.
2. Unscrew the lamp from below to remove the 2 wires attached
3. Replace the lamp as shown below
4. The pink wire is the X1+ terminal on the lamp, and the black wire is the X2-



6. ELECTRODE ASSEMBLY:

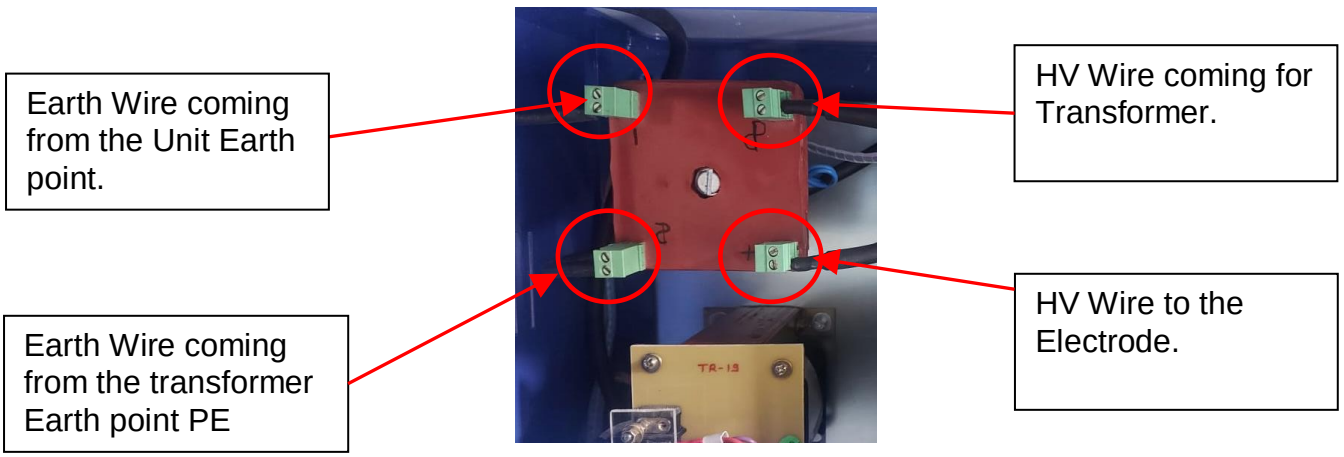
The ball chains can erode or rust due to frequent exposure to water. The electrode should be replaced if rust is formed as it can result in the faulty operation of the unit.

1. To replace the electrode, open the safety cover located on the front of the unit
2. The mounting screws are located behind the ball chain electrode
3. There are 3 screws: 2 for the electrode and 1 for the HV connection point. Remove these screws.
4. Replace the electrode and fix back all 3 screws.



7. H.V BRIDGE RECTIFIER:

1. The bridge rectifier is located on the same plate as the H.V transformer.
2. Disconnect the 4 wires that are connected to the rectifier
3. Unscrew the screw securing the rectifier atop the insulator
4. Replace the bridge rectifier and screw it in place using a M5 screw
5. Reconnect all 4 wires exactly as shown in figure below



MAINS FREQUENCY SPARK TESTER

HIGH FREQUENCY SPARK TESTER

HIGH FREQUENCY INLINE INDUCTION PREHEATER

SPARK TESTER CALIBRATOR

HEATER CONTROLLER

AC HIGH VOLTAGE BREAKDOWN TESTER

STANDARD & CUSTOM BUILT CONTROL PANELS

COMPREHENSIVE PRODUCTION FROM MANUFACTURING TO ASSEMBLY

KATAKKAR ENGINEERING PVT LTD.

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