

# High Voltage Tests Laboratory

## Overview

The High Voltage Tests laboratory is specially designed to allow performing various experiments with high alternating voltages, high direct voltages and impulse voltages. The laboratory provides experiments of handling high voltages properly and how to overcome most common technical problems in transmission line components and transformers. The laboratory allows the user to implement the desired circuit easily as all parts are designed in a modular shape and characterized by light weight, also all the oil filled components are leak proof. This lab is designed with high standards and local safety regulation.



## Technical Data

- Input Supply Voltage: 220V, 50Hz, 100Amps
- HVAC Voltage Rating: 100 kV, 5kVA continuous duty
- HVDC Voltage Rating: 140 KV
- Impulse output Voltage Rating: 420kV Impulse (140kV/stage)
- Impulse Generator No. of Stages: 3
- Impulse Generator Stored Energy: 2.94 kilo joules
- Lightning Impulse: 1.2/50  $\mu$  sec
- Switching Impulse: 250/2500  $\mu$  sec

Power is transmitted at high voltages to increase efficiency. High voltage transmission minimizes the amount of power lost as electricity flows from one location to the next.

## Laboratory Components

### 1 Test Transformer

#### Specifications

- Single phase AC voltage test Transformer
- rated 220V/100kV, 5kVA continuous
- percentage impedance voltage about 4%



#### Measurement Instruments

Capable to measure the HVAC Voltage, HVDC voltage, Impulse peak voltage, primary voltage and current of the test transformer.

#### AC Voltage Measurement

AC primary voltage and current to be measured & displayed through digital meters and HVAC voltage of the transformer to be measured on the secondary side through a Capacitive AC voltage divider.

#### DC Voltage Measurement

HV DC Voltage to be measured through a measuring resistor and displayed on a digital Voltmeter mounted on the Control Panel.

#### Impulse Voltage Measurement

Impulse Voltage is measured through Capacitive Voltage Divider. Load Capacitor displayed on a Digital Impulse peak voltmeter withhold facility.

#### Trigger Unit

Fiber optic trigger unit with electronic trigger sphere.

#### Rectifier Unit

Suitable to get output DC charging voltage of 140kV.

### Impulse Divider/Load Capacitor

Suitable for measuring impulse voltage along with the impulse divider calibrated with the impulse generator rated for impulse voltage of 420kV.

### Sphere Gaps

Sphere gaps in the Impulse Generator controlled / operated from the control desk.

### Control desk

Incorporated with the measuring instruments.

### Resistor

Wave front and Wave tail resistors for generating lightning and switching impulse wave shapes.

### Test / Calibration Report

Relevant Calibration / testing reports will be supplied; along with the equipment for the test / calibration conducted at our, laboratory as per our internal procedures.

### 2 Control Desk

This control desk is used to control and operate high voltage AC/DC/Impulse test equipment. The desk contains operating and signal elements for the control circuit of the test equipment for warning and safety.

#### Technical Data

- Supply Voltage: 220V.
- Regulating transformer: 10kVA Continuous rating driven by 25V DC geared motor drive.
- Regulating Voltage: 220v/0-230V.
- Output: 10 kVA continuous 20 kVA short time duty 2 min.
- Frequency: 50HZ.



## 3 Rectifier

The rectifier is used in impulse voltage and DC voltage generation.

### Technical Data

- Inverse Peak Voltage: 140 KV.
- Rated Current: 20 mA.
- Protective resistor: 100 K  $\Omega$ .



## 4 Capacitor

It is an impulse capacitor used for the generation of impulse voltage. It can also be used as smoothing capacitor in DC voltage generation.

### Technical Data

- DC an impulsive Voltage: 140 kV.
- Capacitance: 100 nF



## 5 Voltage Divider Impulse

It is a load capacitor and high voltage divider capacitor used in measuring impulse voltages.

### Technical Data

- DC and Impulsive Voltage: 140 kV.
- Capacitance: 1.2 nF.



## 6 Resistor Measuring

It is a high voltage series resistor used in measuring of DC voltages.

### Technical Data

- DC Voltage: 140 kV.
- Resistance: 280 M  $\Omega$ .
- Rated Contiguous Current: 0.5 mA.



## 7 Resistor Charging

The charge resistor is used for multi stage impulse voltage test equipment and current limiting resistor in DC voltage generator.

### Technical Data

- Dc and Impulsive Voltages: 140 kV.
- Resistance: 10M  $\Omega$ .



## 8 Resistors for Lightning Impulsive

### A. Resistor (Wave front)

The wave front resistor is used for generation of impulse voltages. The resistors determine the rise time of the impulsive voltage in lightning and voltage generation.



### B. Resistor (Wave Tail)

The wave tail resistor is used for generation of impulse voltages. The resistors determine the time of half valve of the impulse voltage in lightning impulse voltage generation.

### Technical Data

Impulse Voltages: 140kV.

## 9 Resistors for Switching Impulsive

### A. Resistor (Wave front)

The wave front resistor is used for generation of impulse voltages. The resistors determine the rise time of the impulsive voltage in lightning and voltage generation.



### B. Resistor (Wave Tail)

The wave tail resistor is used for generation of impulse voltages. The resistors determine the time of half valve of the impulse voltage in lightning impulse voltage generation.

### Technical Data

Impulse Voltages: 140kV.

### 10 Sphere Gap

The sphere gap is used for impulse voltage generation, and the presetting of impulse voltage peak.

#### Technical Data

- Impulse Voltage: 140 kV.
- Sphere Diameter: 100 mm.
- Max. Gap Setting with Gap Setting Indicator: 80 mm.



### 11 Electrical Drive for Sphere Gap

The sphere gap setting is made over the insulating shafts. The electrical drive for sphere gap is clamped to the bar D.

#### Technical Data

- Impulse Voltage: 140 kV.
- Sphere Diameter: 100 mm.
- Max. Gap Setting with Gap Setting Indicator: 80 mm.



### 12 Electrode

It serves as termination in conjunction with grounding switch for safety grounding. It also serves as corona free electrode.

#### Technical Data

- Diameter: 300 mm.



### 13 Earthing Rod

The earthing rod is used for manual discharging of equipment components.

#### Technical Data

- Length: 2.5 m.
- Discharge Resistance: 100 Ω.



### 14 Earthing Switch

The earthing switch is used grounding the high voltage construction kit when de-energized.

#### Technical Data

- Impulse Voltage: 140 kV.
- DC Voltage: 140 kV.
- Service Voltage: 24 V, 50/60 Hz.



### 15 Insulating Rod

It is an Insulating component.

#### Technical Data

- AC Voltage: 100 kV.
- DC Voltage: 140 kV.



### 16 Connecting Rod

It is a conductive connection element.



### 17 Floor Pedestal

The floor pedestal is a conductive element for mounting up to four Spacer bars horizontally and supporting one component vertically.



## 18 Connecting Cup

It is a conductive element. Four elements can be inserted in the horizontal position and two in the vertical position.



## 19 Spacer Tube

The spacer tube is used for mechanical and electrical connection on ground level when inserted into floor pedestal.



## 20 Voltmeter DC

The Voltmeter (DC) is used for measurement of DC voltage, and the connection to Measuring Resistor.



## 21 Voltmeter (Impulse Peak)

It is used for measurement of the impulse voltage peak, and connection to the load capacitor.

### Technical Data

- Supply Voltage: 220V, 50Hz.
- Measuring Range: 100 – 1000 kV.



## 22 Voltage Divider (Low Voltage)

The low voltage divider incorporates the low voltage capacitor and the 75 ohm cable adaptor.

### Technical Data

- Measuring ranges: 450 kV, 300 kV, 150 kV, 75 kV, 37.5 kV.



## 23 Trigger Device

It is used for triggering the impulse voltage generator, impulse voltage oscilloscope and chopping the spark gap. The trigger impulse is transferred to the high voltage sphere by means of a fiber optics cable.



### Technical Data

- Supply Voltage: 220 V, 50 Hz.

## 24 Electronic Trigger Sphere

It is suitable for use with the sphere gaps and measuring the spark gaps. In conjunction with the triggering device, the impulse Volt Generator can be triggered and the voltage can be chopped at a pre-set instant with fiber optic cable 10 m long.

### Technical Data

- Diameter: 100 mm.



## 25 Voltmeter AC Peak

It is used for measurement of AC voltage Peak, and connection to the Measuring capacitor or the Compressed Air Capacitor or Coupling Capacitor.

### Technical Data

- Supply Voltage: 220V, 50Hz.
- Measuring Range: 100 – 1000 kV.



## 26 Capacitor Measuring

It is a high voltage capacitor used for measurement of AC voltages.

### Technical Data

- AC Voltage: 100 kV.
- Capacitance: 100 pF.



## 27 Capacitor Measuring

The flexible metal connection with connector is used for the test transformer and Connecting Cub. For the connection of the multi stage Ac voltage test equipment with the test transformer.

### Technical Data

- Length: Approx. 0.7 m for 200 kV,
- Approx. 2.2 m for 300 kV.



## Accessories

- User manual in Arabic or English
- Power Cord

## Options

- Additional power requirements are attainable upon special request.
- E-content of the educational unit.
- Protective coverings.
- Laboratory trolley