

## W SERIES IMPULSE VOLTAGE TEST SYSTEM

**Impulse Voltage Test System** is used to generate impulse voltages from 100 KV to 2400 KV simulating lightning strokes and switching surges with energies up to 240 KJ.

The KVTEK make impulse voltage test systems are modular in construction, flexible and cover testing applications according to IEC, ANSI/IEEE and other national standards.

The basic system can be upgraded in various ways to allow optimizing the impulse test system for tests on different high voltage equipments.

The system operation is user friendly and incorporates all the necessary features of Impulse Voltage Test.

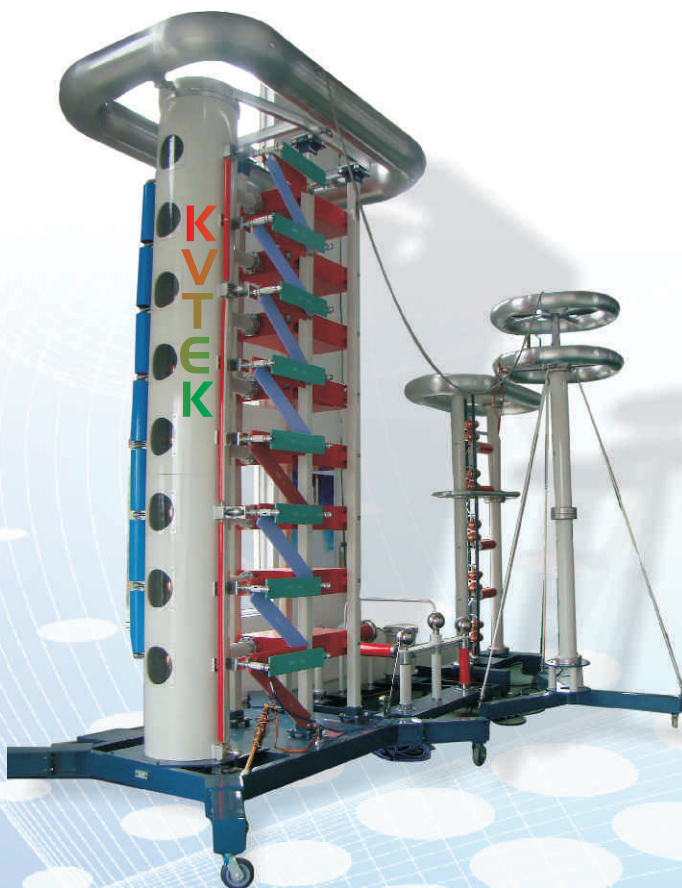
### APPLICATION

The basic system is used to test any high voltage equipment like

- Power Transformers
- Distribution Transformers
- Cable (Type Tests)
- Surge Arresters (impulse current tests)
- Motor/Generators
- Insulators
- Bushings
- GIS
- Instrument Transformers
- Research & Development and Universities

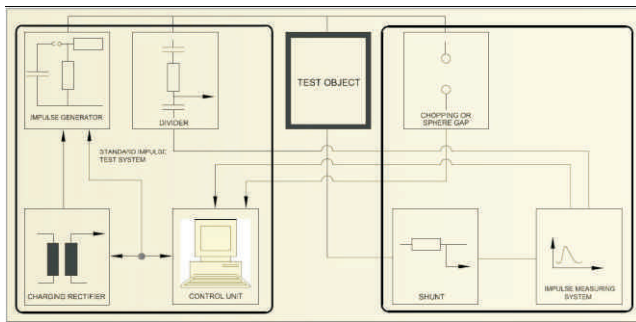
### FEATURES

- Low internal inductance
- Easy and quick reconfiguration to suit different testing needs
- User friendly operation through computer and microprocessor controlled hardware.
- Equipped with resistors for performing lightning full, lightning chopped and switching impulse tests on wide range of loads.
- Automatic grounding device and security grounding system (available as an option).
- Alarm annunciation to display all fault conditions.
- Filtered clear air constantly supplied through the sphere gaps while the system is running.
- Reliable and fail safe triggering circuitry.



## STRUCTURE CHARACTERISTICS

- All the coupling sphere gaps are mounted in an insulated tube and every level of sphere gaps is equipped with spark observation panel.
- The capacitors are composed of oil immersion insulation and are small in volume & light in weight.
- The internal resistance of each capacitor is less than 0.2  $\mu\text{H}$ .
- The waveform resistors are epoxy moulded and have non-inductive winding. Spring loaded connections make them easy to be reconfigured.
- Damped voltage capacitor divider is composed of a non-inductive modular structure. The low voltage arm is low inductance monolithic connection. The top is equipped with corona shield.



## MAIN COMPONENTS OF THE SYSTEM

- |                      |                     |
|----------------------|---------------------|
| ➤ Impulse Generator  | ➤ Shunt             |
| ➤ Charging Rectifier | ➤ Glaninger Circuit |
| ➤ Voltage Divider    | ➤ Control System    |
| ➤ Chopping GAP       | ➤ Analyzing System  |

## IMPULSE GENERATOR

Impulse Generator (WX-YIG) where X stands for voltage rating X KV and Y stands for energy rating Y KJ.

The Impulse Voltage Generator consists of a number of capacitors, connected to spark gaps and series & parallel resistances, charged in parallel up to a maximum of 100 KV.

After the set voltage is reached a trigger pulse initiates firing of the first spark gap. The resulting over voltage triggers successive stages thus connecting them in series and multiplying the charging voltage. This in the generation of required impulse.

An impulse voltage divider reduces such impulse voltage to a safe level that the measuring instrument requires.

Chopping sphere gaps connected in parallel with the Impulse generator may also be triggered through microprocessor control to obtain chopped lightning impulse of desired duration.

## CHARGING RECTIFIER

D100-0.05 (100 kV, 50 mA) OR D100-0.15 DC (100 kV, 150 mA) Charging Power Supply comprises of:

AC Test Transformer (50 kV), Voltage doubling circuit, Silicon rectifiers for AC-DC Conversion, Thyristorized Voltage Regulator, Remote controlled Polarity changing circuit, Resistive voltage divider of 100 kV, 200 M ohm and Automatic earthing switch is used for charging the stage capacitors. The DC Charging power supply is remotely controlled by WV23 computerized control unit.

## VOLTAGE DIVIDER

IDE Series (upto 1000 kV LI) have external damped resistance.

The damped-capacitive impulse voltage dividers can be used to measure full lightning impulse voltages, tail chopped impulse voltages, switching impulses and AC voltages. They meet all requirements of IEC 60060-2 (1994), in particular those with respect to measuring accuracy and step response. At the same time they can be used as a basic load for impulse voltage generators.

IDI Series (Above 800 kV LI) have internally distributed damped resistance. The damped-capacitive impulse voltage dividers can be used to measure full lightning impulse voltages, tail chopped impulse voltages, switching impulses and AC voltages. They meet all requirements of IEC 60060-2 (1994), in particular those with respect to measuring accuracy and step response. Furthermore, all HV tests are carried out in accordance to the applicable IEC 60060-2 requirements (up to the limits imposed by our test system & premises). They can be used as a basic load for impulse voltage generators.

## CHOPPING GAP

(MCG-X) where X stands for the voltage rating in KV. Multiple chopping gap is used to chop lightning impulses (on the front and on the tail) as well as switching impulses up to the highest voltages. The multiple chopping gap serves simultaneously as a load capacitor for the impulse generator and allows excellent reproducibility of the chopping time and does not distort the wave shape until the chopping point.

The sphere distance is automatically adjusted by the WV23 controls. In the automatic mode, their distance is set automatically as a function of the charging voltage. The gap distance is displayed on the controller screen. The chopping is initiated by the first stage having a triggering plug triggered by electronic pulse.

## SHUNT

Shunt is used in series with the test objects to measure the impulse current flowing through the object during the impulse test. They consist of a metal cylinder with coupling flanges and coaxial measuring connector.

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## GLANINGER CIRCUIT: (optional Accessory)

The Glaninger Circuit can be used for testing very small inductances, such as low-voltage windings of transformers. The Glaninger inductance (LG) is connected in parallel to the generator serial resistor (RS). The rapid rise at the impulse front (high frequency components) is not influenced by the additional Glaninger inductance (LG), therefore the front of the impulse is mainly defined by the serial resistor (RS). Conversely, the slow decay (low frequency components) at the tail of the impulse is influenced by the parallel connection of LG and RS. The result is less damping in the overall test circuit and an increased time to half value.

## WV-23 COMPUTERIZED CONTROL UNIT

WV 23 control unit communicates to the operator through an all in one computer installed with user friendly software. The system may be operated in Full Auto, Full Manual or Semi Automatic mode.

In fully automatic mode the operator feeds the desired charging voltage and the charging time. All other parameters like sphere gap, chopping gap triggering instant are taken care of by the controller.

In manual mode all these parameters may be selectively chosen to operate in auto or manual mode.

In Semi automatic mode is when some parameters operate in auto mode while others in manual mode.



## FEATURES

**Main Power circuit breaker**, located in the voltage regulator cabinet provides the input power connection to the system. This breaker also serves as the primary overload protection device for the system.

**Switching ON/OFF High voltage Contactor through soft switch**, we can switch ON or OFF the high voltage contractor through HV

ON or HV OFF soft switch respectively. When we press HV ON or HV OFF soft switch the status bar indicates EARTHED or NOT EARTHED respectively.

**Auto/Manual mode selector soft switch**, user can select the mode either auto or manual. Control Power key switch activates control circuits. This is designed to limit test system access to authorized personnel only. Indicator light has been provided to indicate its status.

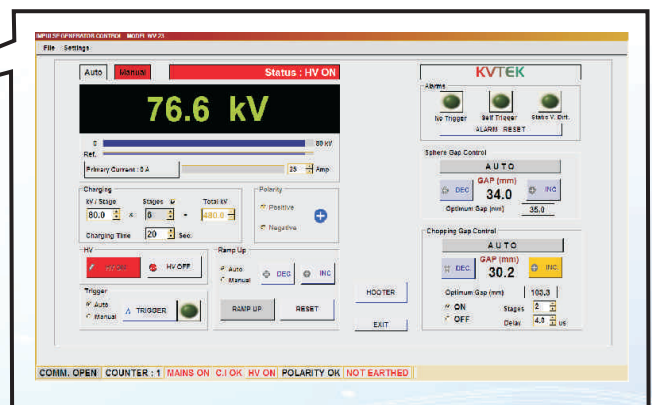
**CI Indication** on the laptop screen has been provided to indicate that the customer interlock is closed. The test system cannot be energized until this interlock is secured.

**Emergency Off** mushroom type push-button, allows you to actuate the tripping of main circuit breaker thus removing the power to controller. This large push button latches when pressed. To release the latch, rotate the pushbutton clockwise. The push button must be released before the main circuit breaker can be reset to resume power into the controller.

**Metering HV voltage, current and sphere gap** with adjustable scale, highly accurate and calibrated metering of the HV voltage, current and gap between spheres has been provided on the screen of laptop. The measured parameters can be traced to national or international standards.

**HV ON and HV OFF soft switch**, allows you to switch ON or switch OFF the HV.

**Charging voltage and time**, allows user to set the desired high voltage and desired charging time. User can set the charging time from 15 seconds to 120 seconds.



**Polarity select soft switch**, allows you to select either positive or negative polarity before pressing HV ON switch. After the desired polarity gets engaged, polarity ok indication on the controller is displayed.

**Trigger soft switch**, allows you to manually trigger the generator in manual or semi automatic mode. In fully automatic mode the generator will be triggered automatically after it has reached the preset charging voltage level.

**Ramp soft switches**, allow you to ramp up the high voltage automatically in auto mode and manually through INC (increase) or DEC (decrease) soft switch manually.

**Sphere gap control soft switches**, allow user to set the gap between spheres either in auto or manual mode. In manual mode, user has to adjust the gap between spheres through DEC. and INC soft switches.

**Three Alarms**; indicates the No trigger, self trigger or static voltage difference, if any.

**No Trigger:** When trigger button is pressed (Auto/Manual) but the generator does not trigger.

**Self Trigger:** Trigger occurs without trigger button being pressed (Auto/Manual). Static Voltage Difference alarm is displayed on screen, when there is the voltage difference between actual voltage display on meter and the reference voltage.

Alarm reset button allows you to reset the alarms.

**Hooter alarm** soft switch is used for system ready warning and the hooter will sound automatically after desired charging voltage stabilizes and the generator is about to get fired.

**COMM. OPEN / COMM. CLOSE:** If the communication cable from PC to the electronic controller is connected properly, COMM.OPEN message will be displayed on the screen otherwise it will display COMM.CLOSE.

**Earthed / Not Earthed:** If the system is grounded, "EARTHED" message will be displayed on the screen otherwise NOT EARTHED will be displayed on status bar. System must be ungrounded before switch on the HV voltage and system must be grounded after completion of the test.

**Counter** counts the number of triggers. In auto mode, the counter increments by one after every trigger. In manual mode operation, the user has to increment it manually by double clicking on the counter status bar. Counter has three soft switches: INC (+), DEC (-) and RESET (0). For increment press INC (+) soft switch, for decrement press DEC (-) soft switch or to reset the counter press RESET (0) soft switch.

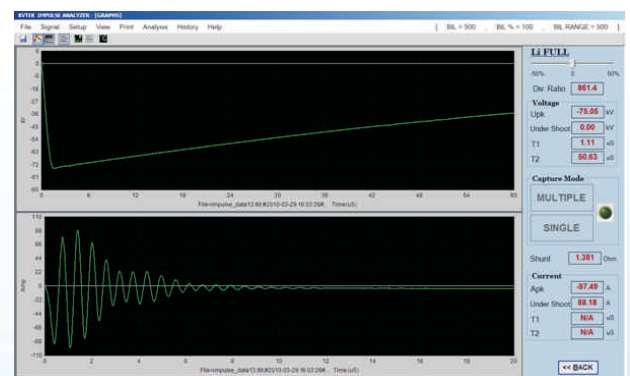
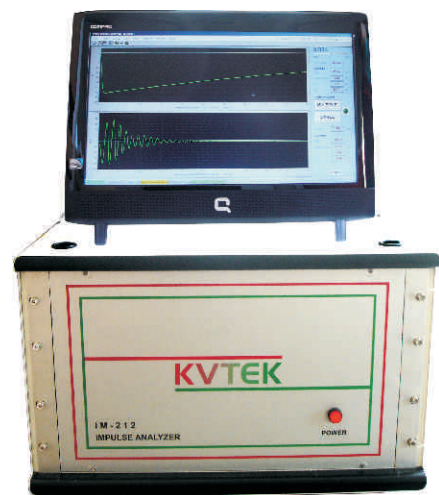
**Warning lamp**, will switch on, when user presses the HV ON soft switch and warning lamp will switch off when user presses the HV OFF soft switch.

## IM -212 DIGITAL IMPULSE ANALYSING SYSTEM

### Introduction

IM-212 with user friendly software and powerful curve analyzing tools along with report generating templates offers a complete solution to modern testing needs.

Complete impulse capturing of IM-212 enables to determine the detailed information about the test object faster and accurately. Measurement evaluation and analysis of impulse voltages and currents can be performed according to IEC 61083, IEC 60060, IEC 60076, IEC 60099, and IEC 60230, the relevant standards for High Voltage Impulse Testing.

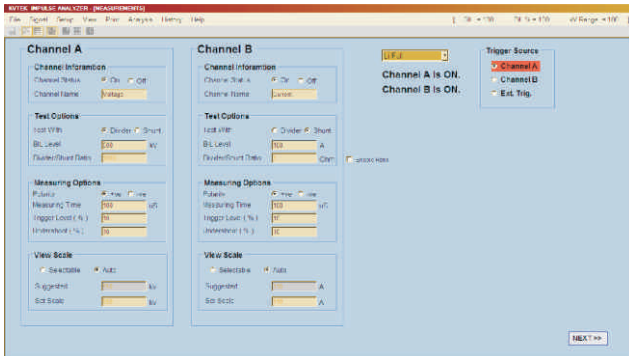


### FEATURES

- 12 bit vertical resolution AT 100 MS/sec.
- Automatic evaluation of all common impulse parameters
- Software features like difference & comparison of curves. FFT curve, user defined Smoothing of curve and may more.
- Fulfils IEC 61083-1 & IEC 61083-2 standards.
- Customized test report generation.
- User friendly & interactive graphical user interface.

## MEASUREMENT AND ANALYZING FEATURES

- User can save the Testing Parameters for different Test Objects as files, which can be retrieved any time.
- Display can be toggled between “Time Domain” and “Frequency Domain” with a click.
- Two independent Channels are available for voltage and current measurement.



- Logarithmic or Linear scales can be selected in Frequency Domain analysis (FFT).
- Real Curve and mean Curve may be viewed individually or together.
- Mean curve if calculated from user selected “Smoothness Filter Factor”.
- Graph Marking Grid can be turned ON / OFF as per requirement for better viewing/evaluation.
- Data Points corresponding to 10%, 50%, 90% and 100% may be displayed or hidden.
- Any two measurements for the database may be compared using the difference function.
- Memory Depth is automatically set by the system depending on the measuring time
- Automatic and Manual mode for saving Impulse curves.
- Single or Multiple Acquiring Mode with process Status Display.
- Report Generation may be set to print 1, 2, 4 or 8 curves per sheet and also save it as PDF file.
- Horizontal and/or Vertical zooming to view details on any section of the curves.
- Counter facility is available; counter is incremented automatically on every impulse. It can be reset anytime.
- History Stack to view last 25 non-saved measurements.
- Wave parameters like Upk, T1, TC etc are displayed along with the curve.

## TECHNICAL SPECIFICATIONS

### System Hardware

CPU	Pentium Duo Core
Monitor	Desktop TFT 19'
Memory	2 GB RAM & 80 GB HD (Or better configuration)
Impulse Voltage : Wave Parameter	Standard lightning wave: 1.2 $\mu$ S $\pm$ 30% / 50 $\mu$ S $\pm$ 20% Standard switching wave: 250 $\mu$ S $\pm$ 20% / 2500 $\mu$ S $\pm$ 60%
Lowest Voltage Output: Charging Voltage	10 % of Rated Voltage
Instability Percentage:	< $\pm$ 1%
Trigger Range:	1% - 100%
Impulse Duty Cycle:	> 70% of Rated Voltage.- Intermittent < 70% of Rated Voltage.- Continuous
Generator Efficiency:	Lightening wave (no load) >85% Switching wave (with the load of 3000pF)>70%
Chopping Time:	2 – 6 $\mu$ S
Chopping Time Resolution:	0.1 $\mu$ S

### ANALYZING SYSTEM

#### Input Signal

Number of Channels	Two (Independent)
Connections	LEMO 75 Ohms
Input voltage	2 V to 1900 Vpp
Input Range Selection	Automatic (According to BIL set By user)
Over Voltage Protection	2 KV
Input Impedance	2 MOhm, 20 pF
Analog Bandwidth	50 MHz for each channel
Triggering	Internal. Ch1 or Ch2 selectable

#### Data Acquisition

Resolution	12 Bit
Sampling Rate	100 MS/s max.
Measuring Time	1 to 9999 uSec, continuously Settable
Accuracy	+/- 1% for Upeak,T1,T2 and Tc

#### Operating Conditions

Supply Voltage	230 V AC $\pm$ 10%, 50 Hz/ 110 V AC $\pm$ 10%, 60 Hz
Temperature Range	5 – 50 degree C
Relative Humidity	< 95%