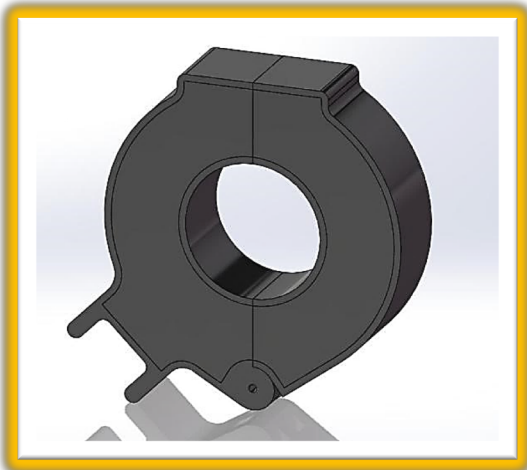




GIS Ultrasonic Sensor



High Frequency Current Transformer Sensor (HFCT)



Transformer Ultrasonic Sensor



Ultra High Frequency Sensor



Transient Earth Voltage Sensor (TEV)

Penta-PD Detector Plus

Worlds most powerful, partial discharge detecting unit equipped with 5 type of PD sensing technologies

Applications :

- GIS
- Cables
- Transformer
- Switchgear

GREEN-WATT Penta-PD Detector Plus

Partial Discharge (PD) is a localized dielectric breakdown of a small portion of a solid or fluid electrical insulation system under high voltage stress, which does not bridge the space between two conductors.

When the Voltage stress exceeds the breakdown strength of that portion of the insulating material, a Partial Discharge begins and continues to deteriorate that insulation.

Penta-PD is an ideal partner for condition-based maintenance programs. Online partial discharge testing is a method of inspecting the insulation of electric power systems while equipment remains energized and in service. Penta-PD incorporates all 5 types of online PD sensor technology. Information from multiple sensors gives Penta-PD the versatility to detect all types of PD in all types of substation apparatus.

Applications :

- Power Cables
- Transformers
- GIS
- Switchgear
- Substation Apparatus

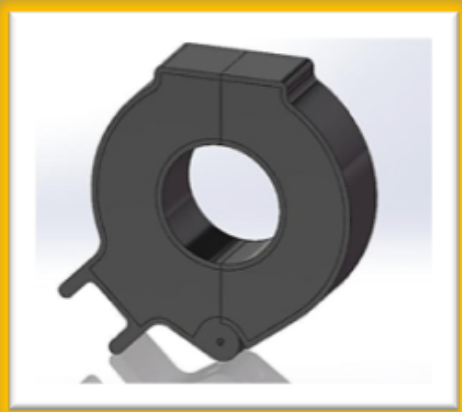
Type Of Sensors :

Detection Bandwidth

1. TEV - Transient Earth Voltage , Range 3~100 MHz
2. UHF - Ultra High Frequency 300MHz~2000 MHz
3. UA – Ultrasonic 40 ~ 200 KHz

Measurement range

1. UA: -90~80dB
2. TEV: -80~10dBm
3. UHF: -80~10dBm.



HFCT High Frequency Current Transformer

HFCT sensor is a split core CT with High frequency response. It does not respond to 50Hz power.

PD activity induces a HF current pulses onto surrounding grounds.



Ultrasonic (Transformer/GIS)

PD inside of oil-filled equipment or SF6 equipment will have an acoustic emission at a high frequency near 90kHz in SF6

and near 160kHz in oil. These emissions do not travel through air. The contact probe is used by placing the sensor onto the transformer or GIS tank. A vacuum gel is used to bridge the airgap and ensure the signal is received by the probe. Acoustic contact measurements are very sensitive. Very small PD signals can be detected and characterized. Also because they travel at the speed of sound, the origin of the signals can be triangulated using multiple sensors simultaneously.



UHF Ultra High Frequency

Transmitted Electromagnetic Waves (EMI) are emitted when PD occurs. The UHF sensor is a special antenna which can sense the same

Virtually all types of partial discharge have an emission in UHF range. The UHF sensor is the most versatile PD sensor. This can be used with the main handheld Penta-PD unit.



TEV - Transient Earth Voltage (built-in to main handheld unit), Capacitive Sensor Induced TEV signals serve as a good indicator of PD activity in metal-clad switchgear. These RF signals can be induced on surrounding metal work and adjacent switchgear panels.

The TEV sensor is built-in to the main handheld unit. It also serves as an important safety tool for personnel approaching apparatus whose condition is unknown.

GREEN-WATT Penta-PD Detector Plus

Why we need 5 PD sensing technology?

Partial Discharge is a complex phenomenon . To understand the need of multiple type of sensors we have to go through the type of Partial discharges which are as below -:

1.

Corona - discharge to air
2.

Floating Electrode - metal to metal
3.

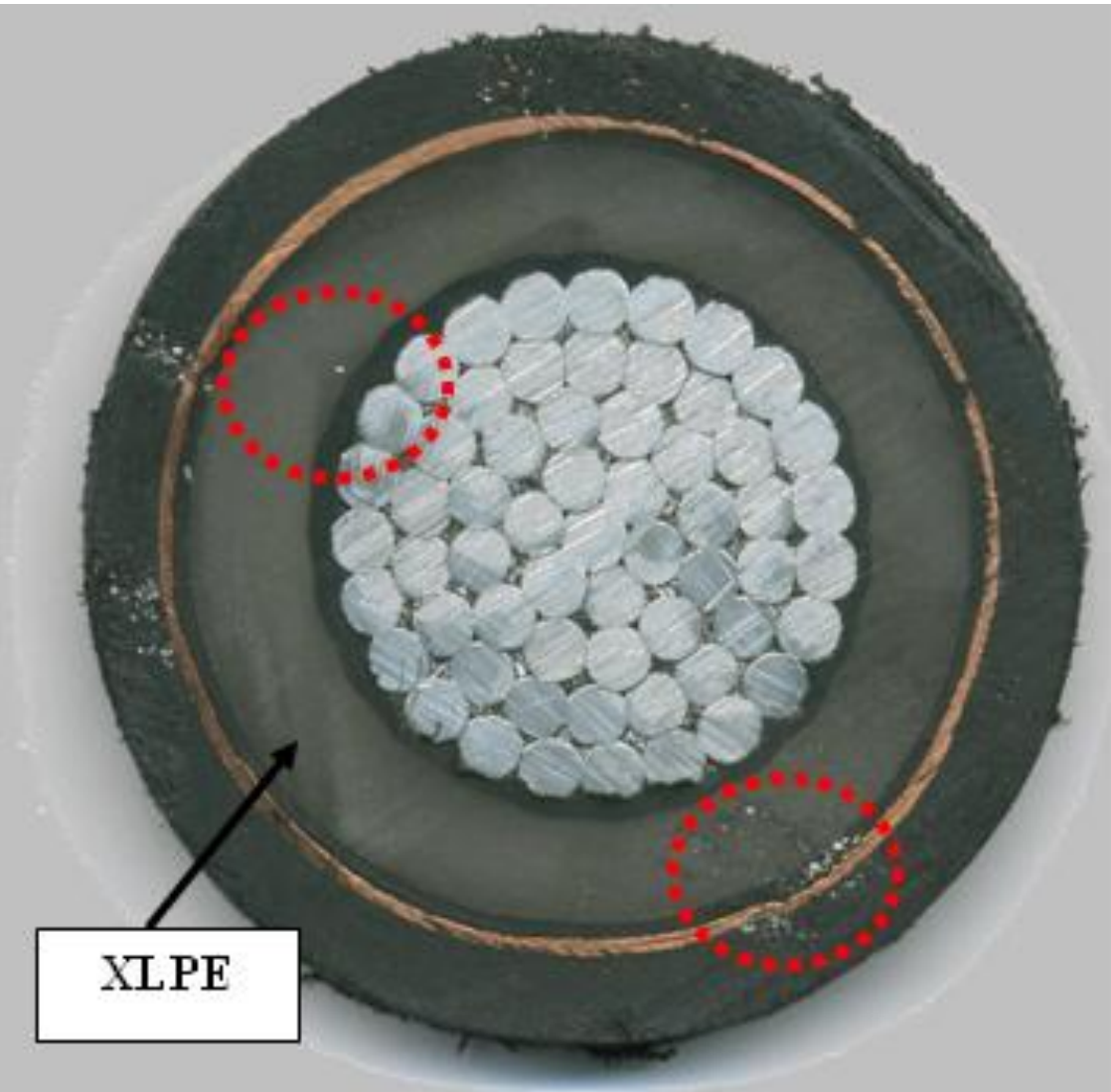
Particle discharge - conductive particles contaminate insulation medium
4.

Voids - gaps in solid insulation or gas bubbles in oil
5.

Surface discharge - tracking over outside of insulators/bushings

1. Void Discharge:

Manufacturer’s defects in solid insulation. Found in Cables, Bushings, GIS Junction insulation. Highly destructive to insulation. Voids typically continue to grow until failure. If a void PD is discovered, the insulator should be replaced.
Sensors: UHF, HFCT, Ultrasonic, TEV



Void discharge In Cables

2. Corona Discharge:

Corona is a discharge to air from the sharp surface of a conductor. Corona is typically not a problem besides the sound and the radio frequency emission. Fortunately the corona signal has a many characterizes that are much different from other forms of PD. Corona disturbances do not interfere with other PD measurements.
Sensors: Ultrasonic and HFCT



Streamer Corona in bottom of Insulator

3. Particle Discharge:

Occurs in GIS (SF6 gas) and oil insulated transformers. Caused when conductive particles are left inside system. Allows PD to jump from particle to particle. Purifying and processing the oil or SF6 is recommended.
Sensors: UHF, AE Contact Probe, HFCT

S. No	Test Object	UHF	Ultrasonic GIS	Ultrasonic Transformer	TEV	HFCT
1.	GIS					
2.	Transformer					
3.	Switch Gear					
4.	Cable					

GREEN-WATT Penta-PD Detector Plus

4. Surface Discharge:

Discharge along the surface of insulation can be very destructive. Also known as "surface tracking". Usually caused by contamination or weathering of insulator surface. It is different from corona because it tends to track to grounded metal. Corona discharges to air. Corona conditions can evolve into surface PD as they become more severe. This can happen on any MV and HV equipment. Happens when strength of insulation breaks down in high humidity environments. or poor maintenance of equipment can lead to this phenomenon. Moisture intrusion is also a common cause of surface PD.

Sensors: Ultrasonic, UHF, TEV (low magnitude)



Partial discharge In Busbar Insulation

5. Floating Discharge:

Occurs when an exposed load-carrying conductor is exposed to another conductive surface of different potential not connected to said conductor. Types: Metal to Insulation OR Metal to Metal. Caused by manufacturing defect, non-grounded piece of metal within the field. Floating Discharge is the most common type of PD. Often caused by human interaction. IE conductors not positioned properly. Foreign or loose object inside of insulation. Sensors: UHF, Ultrasonic, TEV, HFCT

Detection principle: UHF (Ultra High Frequency) method, UA (Ultrasonic Analysis) method and TEV (Transient Earth Voltage) method.

Detection frequency band:

UA: 40~200kHz TEV: 3~100MHz

UHF: 300~2000MHz.

Measurement range:

UA: -90~80dB

TEV: -80~10dBm

UHF: -80~10dBm.

Sensitivity: the minimum sensitivity is 10pC (specifically determined by the distance between the sensor and the discharge source).

Sensor:

- a) Ultrasonic sensor: 20~200(kHz);
- b) EV (Transient Earth Voltage) sensor: 5 ~ 100MHz;
- c) UHF sensor: 300~2000(MHz), with directional reception characteristic.
- d) GIS Sensor (Optional)
- e) HFCT Sensor (Optional)

Software function:

- a) Continuously detect UHF, TEV and ultrasonic signals to judge whether there is any partial discharge;
- b) Display the variation tendency of the detected signal in a real-time manner to intuitively judge the development of the partial discharge signal;
- c) Field data storage function;

Instrument characteristics:

- a) Screen display: high-contrast 3.5" TFT color screen.
- b) Data storage: 1000 groups of test data can be stored.
- c) Working power supply: embedded 8.4V lithium battery for 8h's continuous operation.
- d) Power supply: input 100-240VAC, output 8.4V/3A, charging time 3~4h.
- e) Boundary dimension: 220 * 100 * 40. f) Instrument weight: 1.5kg.
- g) Environment temperature: -25°C~45°C. h) Storage temperature: -35°C~60°C.

Complete configuration: host machine, sensor, AC adapter, connecting cable and transport case

Specifications

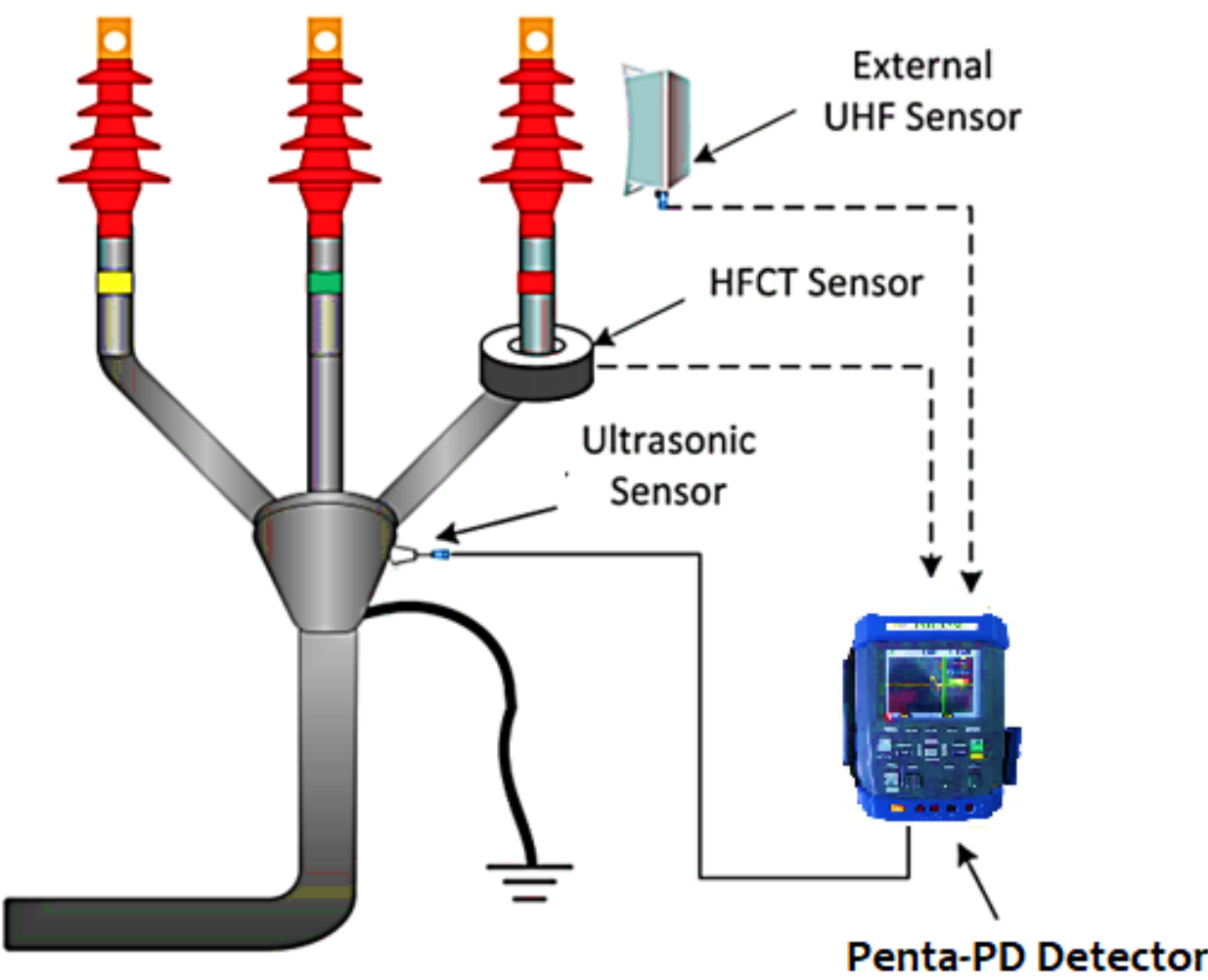
Applicable scope: the non-intrusive mode is adopted to detect and locate the partial discharge defects of the high-voltage electric equipment.
sensor configuration

Standard: UA, TEV

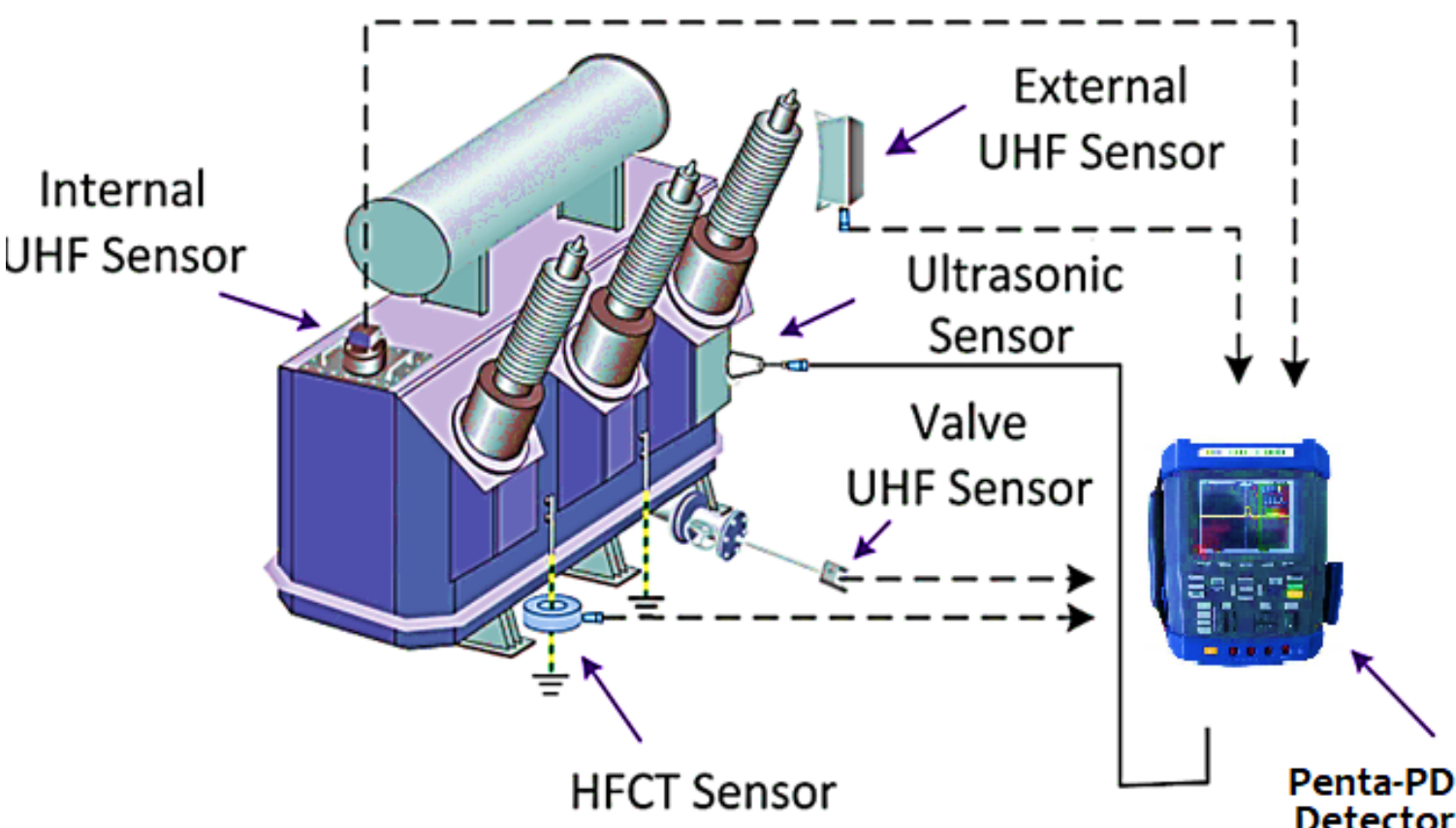
Optional: Sensor network for transformer, high frequency sensor for GIS, sensor for high-voltage cable, or other sensors customized according to user's requirements.

GREEN-WATT Penta-PD Detector Plus

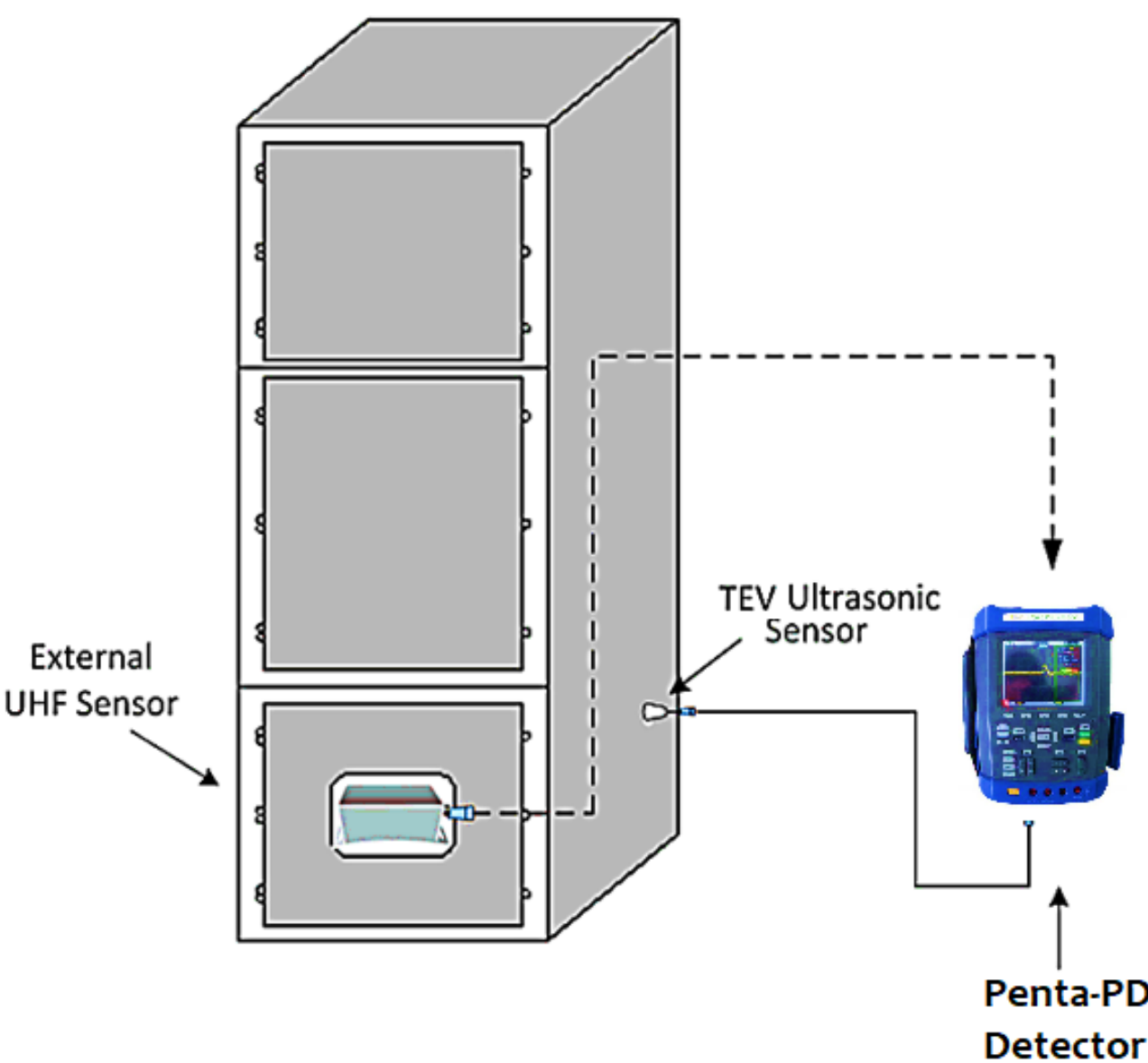
Application Diagrams:



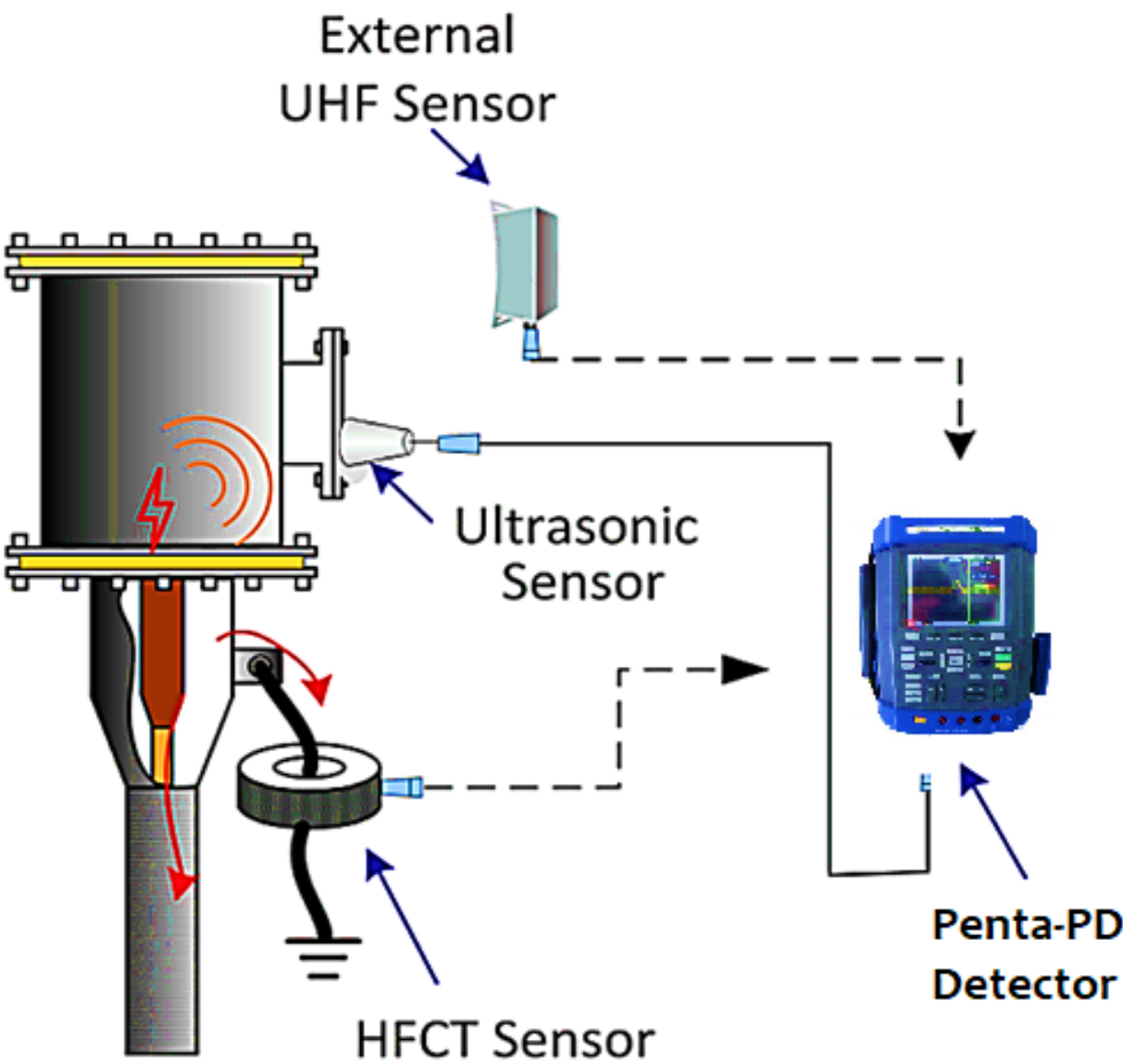
Power Cable



Power Transformer



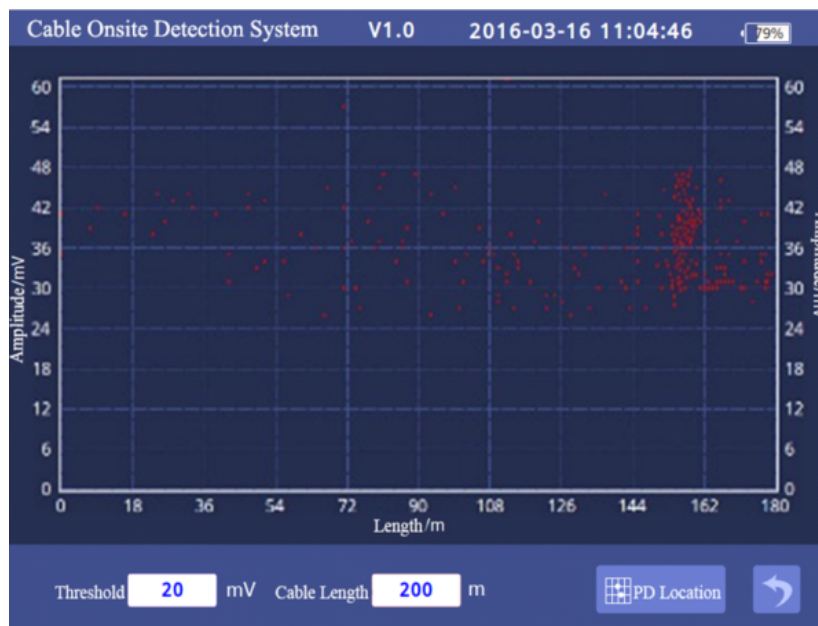
Switchgear



GIS

GREEN-WATT Penta-PD Detector Plus

Software –:



Penta-PD Software

General Safety:

- The PD-Penta Detector and PD sensors have been designed for use only on the earthed, outer surfaces of metal-clad equipment and the earth/neutral connections of power cables.
- The user should obey the Plant Owner's safety rules at all times.
- Perform a visual check to identify any hazards that are present in the substation, do not proceed if there are any unusual sounds, or strong smell of ozone as this irritant is a product of electrical breakdown and a sign that failure may be imminent.
- Do not use the equipment or cables if they are damaged.
- Under no circumstances should the Penta-PD or PD sensors be in contact with the high voltage terminals of plant under test.

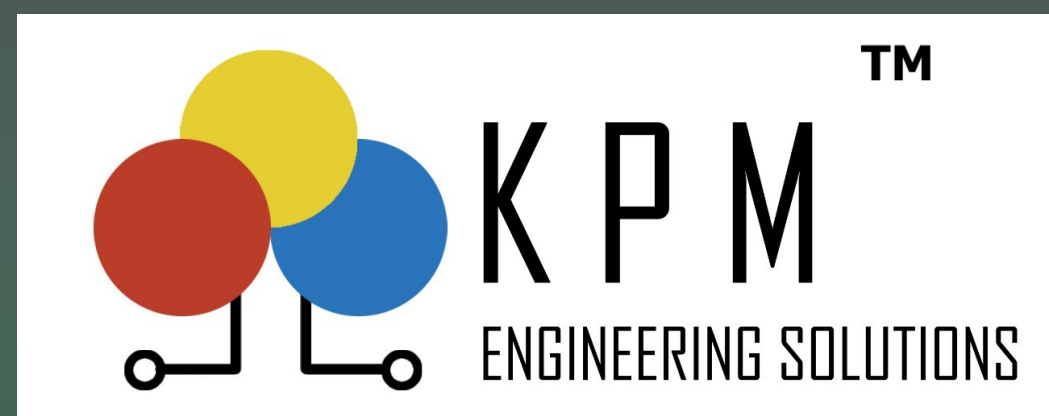
About Us

Green-Watt is a high quality manufacturer & provider of rugged electrical testing equipment for EHV/HV/LV substations. GW solutions are known for:

- Best in class specifications
- Unique test approach
- Interference rejection capability

Each equipment is supported by advance service center in Gurgaon backed by a team of expert application & service engineers. GW aims in bringing highest specification products at the doorstep of Indian customers in best rates.

Our Techno Sales Partner



Website : www.kpmengineeringsolutions.com
E Mail : info@kpmengineeringsolutions.com
Phone No : +91 124 4001088