



# UltraTEV® Plus<sup>2</sup>

# The UltraTEV® Plus<sup>2</sup> brings together techniques and a wealth of experience and insight to make it easier than ever to avoid failures on your high voltage network.

This latest hand-held Partial Discharge (PD) instrument is easy to use, and combines additional sensing capabilities with real time advanced analytical features. The ability to distinguish true PD from noise and other interference means that you can make better decisions, save time, money and enhance safety.



## User Features

- Provides numerical and audible ultrasonic readings for classification of PD
- Provides numerical and audible TEV readings for interpretation of PD
- Use the Locator probe accessory to accurately locate multiple PD sources
- Use the High Frequency Current Transformer (HFCT) to detect PD activity in cables
- Use the UHF directional antenna to quickly scan outdoor switchyards
- Phase resolved and waveform displays allow more reliable and conclusive decisions to be made based on measured PD
- Wi-Fi connectivity allows survey results to be easily synchronised with asset management systems
- Use NFC tags attached to the assets to store and retrieve key results
- Menu-driven backlit colour touchscreen and buttons (can be used when wearing gloves) giving an intuitive user experience
- Multi language options
- Long-life rechargeable internal Lithium-Ion (Li-Ion) battery
- Temperature and Humidity sensor

## Business Benefits

- Detect problems early by using the in-built PD classification and interpretation tools to avoid dangerous and damaging failures and minimise network outages
- Accurately measure and locate PD activity, enabling you to identify potential faults before they lead to failures
- Optimise maintenance cycles and asset life through a better understanding of asset condition, comparing PD results over time to identify trends
- Increase on-site productivity by using Survey mode to rapidly collect key condition information in an accurate and consistent manner
- Detect PD in a wide range of plant, cable and overhead line assets using a single instrument with dedicated accessories
- Easy to use with an intuitive and user friendly interface meaning little training is needed to become competent
- Identify deteriorating assets and trends by comparing current measurements to previous results stored locally on 'smart' Near Field Communication (NFC) tags
- Integrate PD surveys into your asset management process by seamlessly transferring data via zip or CSV file into your corporate system

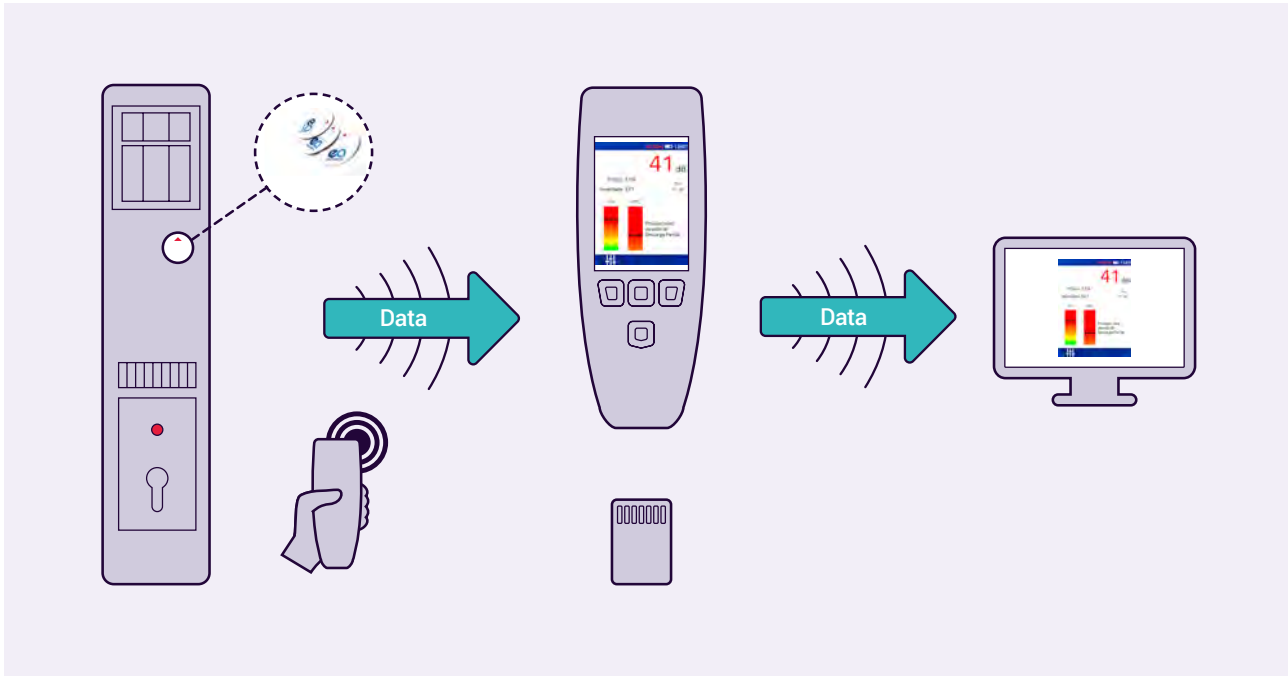
“We have been using EA Technology’s products successfully for detecting PD and other condition monitoring solutions for many years.”

**Neil Dobbs,**  
HV Compliance Manager,  
**BRITISH STEEL**



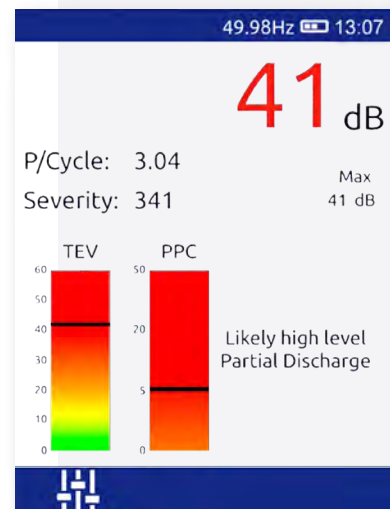
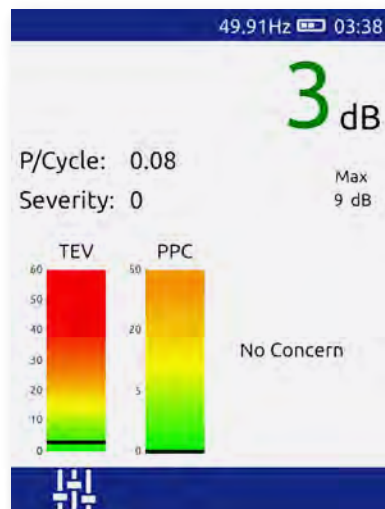
## Capturing the results and transferring them easily

The UltraTEV® Plus<sup>2</sup> has NFC capability to store Asset data on programmable tags. It also has the ability to transfer the results directly on to your PC via Wifi or USB / SD Card. The survey functionality allows details of substations and assets to be entered on the screen, guiding users through the simple survey process. Screen shots can also be captured and saved.



## Interpreting the condition of your electrical assets

The UltraTEV® Plus<sup>2</sup> has been designed to make asset inspections easy. The instrument helps the operator understand what the results mean by interpreting the data and displays clear information and instructions.

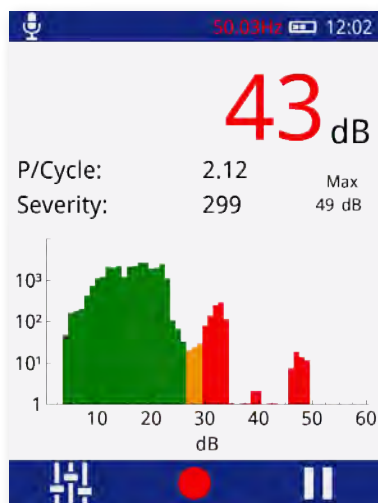


## Partial Discharge Detection and Advanced Analytics

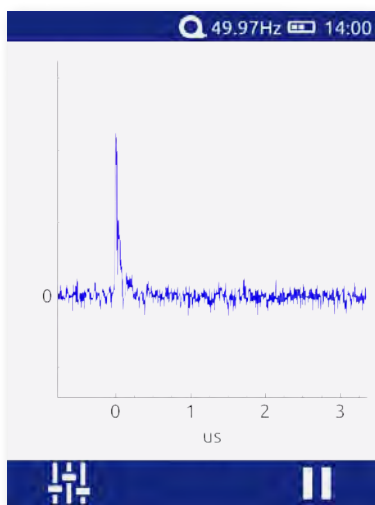
The UltraTEV® Plus<sup>2</sup> has the ability to measure PD in cables and cable accessories using an HFCT as well as established techniques for surface PD (Ultrasonic) detection and internal PD (TEV) detection on switchgear.

The new advanced analytics allow PD measurements to be examined more precisely in real time or after the inspection:

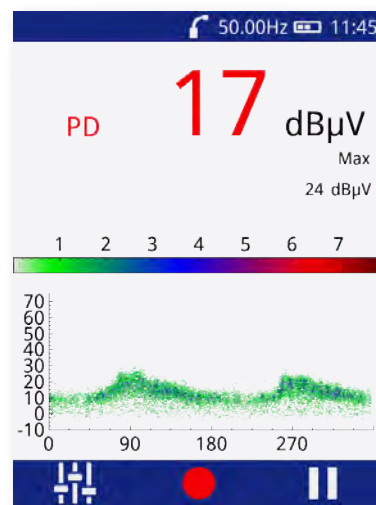
- Phase plots: helps to differentiate between noise patterns and real PD
- Waveform capture: examines amplitude of individual pulses, for PD Characteristics
- Histograms: assists with identification of multiple sources of PD and noise discrimination



Histogram



Waveform



Phase Resolved

## Range of Kits and Uses

The UltraTEV® Plus<sup>2</sup> is a multifunctional instrument that can be used to rapidly survey the condition of whole substations and check that working environments are safe. Changes in PD activity levels can be compared between assets and analysed over time, providing a clear indication if further investigation is required. To meet your needs we offer the following instrument kits:

|              |   |  |
|--------------|---|--|
| <b>Kit 1</b> | <b>Metal clad Switchgear</b>  | Standard kit for Switchgear condition assessment includes headphones & battery chargers  |
| <b>Kit 2</b> | <b>Metal clad Switchgear and Cables</b>                               | This kit has additional external sensors and includes an HFCT1-F50, allowing quick and easy condition assessment of your cables* plus a Ultrasonic Contact Probe |
| <b>Kit 3</b> | <b>Metal clad Switchgear, Cables and Outdoor assets</b>               | With the UltraDish™ option included in Kit 3, PD activity can be measured in overhead assets, offering a comprehensive condition assessment package              |
| <b>Kit 4</b> | <b>Locator probe kit 4 can be added to any of the above kit types</b> | Specifically designed carry case containing Locator probe, 2m lead and 6m lead   |

\* Access to cable earth required.

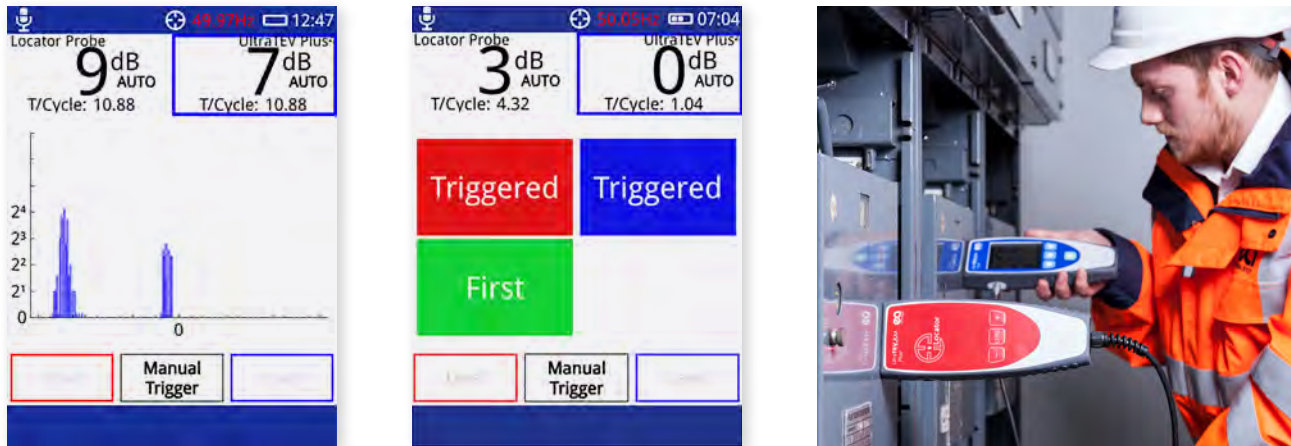
## Multiple Functions

### UltraTEV® Plus² Locator probe

The UltraTEV® Plus² Locator probe accessory has been designed to attach to the UltraTEV® Plus², ensuring that all your PD needs can be catered for in one instrument.

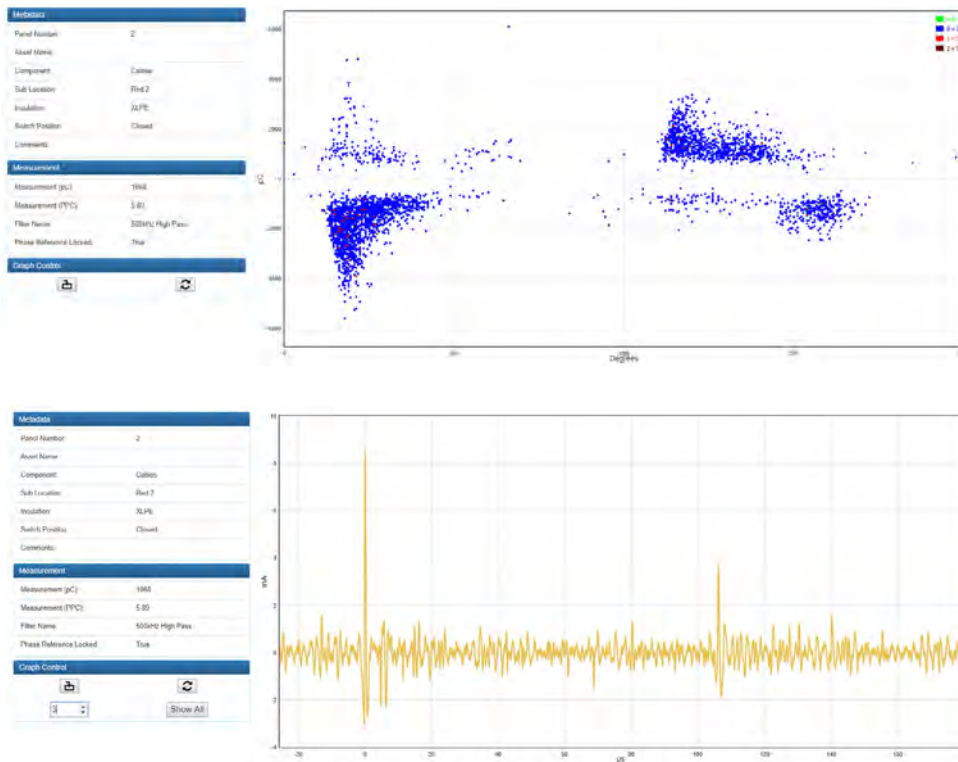
The Locator probe is used in conjunction with the UltraTEV® Plus² TEV sensor to locate the source of PD activity, using time-of-flight measurements.

Advanced software enables the instrument to easily locate PD at multiple discharge sites.



### UltraTEV® Plus² Cable PD

PD activity in cables is measured by magnetic clamping the split-core HFCT accessory around the cable earth. The results are displayed on the instrument in pico Coulombs (pC) as numerical values.



## Other Accessories

### Flexi Sensor

The Flexi Sensor accessory is used to detect ultrasonic PD activity in hard to reach places where access is limited.



### UltraDish

The UltraDish accessory is used to detect ultrasonic PD activity in overhead assets or at a distance.



### Contact Probe

The Contact Probe is used to detect ultrasonic PD in sealed chambers.



### Environmental Sensor

The Environmental Sensor is used to measure local temperature and humidity.



### NFC Tags

NFC tags can be used to hold key asset information and results locally on the assets.



### Headphones

The high noise attenuation headphones are comfortable to wear and are compatible with other PPE.



### HFCT

Our latest generation inductive sensor for online detection of partial discharge detection via the ground connection.



See next pages for details about the **UltraTEV<sup>2</sup> Plus UHF Receiver** and **Directional Antenna**.



# The UltraTEV® Plus² Survey Process

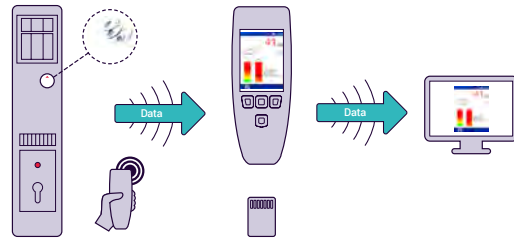
## 1. Enter Substation Data

Details of substations and assets can be uploaded from NFC tags or manually entered on screen.



## 3. Transfer Asset Information

The UltraTEV® Plus² has the ability to transfer data directly to your PC or corporate system via Wifi or USB / SD Card.



The UltraTEV® Plus² - Kit 3 stored in the specifically designed carry case.



The UltraTEV® Plus² Locator probe stored in the specifically designed carry case.



## 2. Survey and Capture Data

The new advanced analytics allow measurements to be examined more precisely in real-time or after the PD survey has been completed.



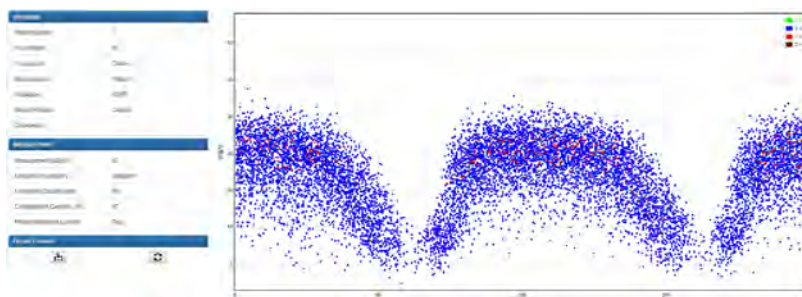


#### 4. Analysis of Data

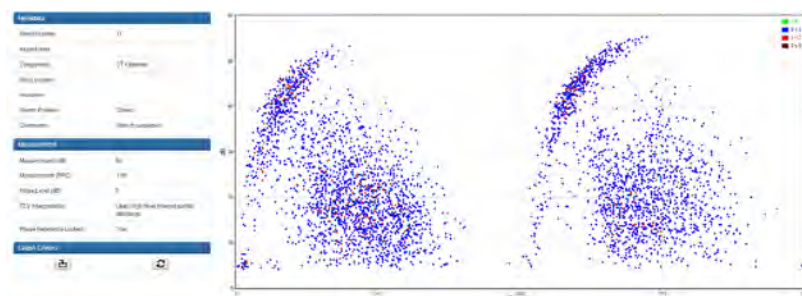
Asset data, results and ultrasonic activity, as well as screen shots can all be recorded for subsequent review and analysis.



Example of classification of readings asset information that can be transferred and sent to EA Technology or your in house PD experts for review.



Example of ultrasonic surface PD asset information that can be transferred and sent to EA Technology or your in house PD experts for review.



Example of internal void PD measured using the TEV sensor. Asset information can be transferred and sent to EA Technology or your in house PD experts for review.

# The UltraTEV® Plus<sup>2</sup> UHF Receiver and UHF Directional Antenna

## UltraTEV® Plus<sup>2</sup> UHF Receiver

The UHF receiver connects to the UltraTEV Plus<sup>2</sup> smart accessory port so you can start taking UHF measurements quickly and with ease.

Features include:

- Simply plug the UHF receiver into the smart accessory port of the UltraTEV Plus<sup>2</sup> to start taking UHF measurements.
- New UHF screens and scan modes are instantly available.
- Use the omnidirectional whip antenna when the source of signal to be measured can be readily determined, regardless of direction.
- Use the optional directional antenna to systematically scan an area to determine the location of PD sources. Ideal for outdoor air insulated substations.



## UltraTEV® Plus<sup>2</sup> UHF Directional Antenna

The directional antenna simply connects to the UltraTEV Plus<sup>2</sup> smart accessory port via the UHF receiver, so you can start to take UHF measurements quickly and with ease.

Features include:

- Ideal for outdoor switchyards.
- Easy to use and quick to identify internal PD problems.
- Rugged construction and safe to use around open terminal switchgear.
- Prevents costly and dangerous failures.

# The UltraTEV® Plus<sup>2</sup> UHF Measurement Process

## Scan a whole switchyard in minutes

Below is a 6-step quick guide to show the UHF measurement process using the UltraTEV Plus<sup>2</sup> UHF Receiver and UHF Directional Antenna.



### Step 1

Switch on the UltraTEV Plus<sup>2</sup>. Its quick startup means it's instantly ready for action.

### Step 2

Sweep the switchyard for radio emissions.

### Step 3

Filter out irrelevant emissions.  
E.g. Mobile phone, television signals and non-destructive corona activity

### Step 4

Watch/listen to readings as they peak, to focus on the source of emissions.

Locate internal PD activity in:

Instrument transformers

Circuit breakers

Isolators

Disconnectors

Surge arrestors

Cable sealing ends

### Step 6

Use pulse modes to confirm emissions are PD.

### Step 5

Rotate instrument for polarity, to locate strongest signals.

# Specification: UltraTEV® Plus<sup>2</sup>

| TEV                               |   |
|-----------------------------------|---|
| Sensor                            | Capacitive  |
| Measurement Range                 | 0 – 60dBmV  |
| Resolution                        | 1dB   |
| Min Pulse Rate                    | 10Hz (rolling displays only)  |
| Discharge Pattern Phase Reference | Optical, E-Field and Manual   |
| ULTRASONIC                        |   |
| Measurement Range                 | -7dBµV to 71dBµV  |
| Resolution                        | 1dB   |
| Accuracy                          | ±1dB  |
| Transducer Sensitivity            | -65dB (0dB = 1volt/µbar RMS SPL)  |
| Transducer Centre Frequency       | 40 kHz  |
| Transducer Diameter               | 16mm  |
| Heterodyning Frequency            | 38.4 kHz  |
| CABLE PD                          |   |
| Sensor                            | HFCT  |
| Measurement Range                 | 100 - 100 000 pC  |
| Resolution                        | 98pC  |
| Accuracy                          | ±98pC   |
| Min Pulse Rate                    | 10Hz  |
| HARDWARE                          |   |
| Enclosure                         | Self-colour injection moulded plastic case  |
| Indicators                        | Colour back-lit LCD<br>Charging indicator LED   |
| Controls                          | Touch screen<br>Keypad  |
| Connectors                        | Micro USB connection port<br>Micro SD slot<br>2 x Lemo accessory connection ports<br>3.5mm headphone jack |
| Headphones                        | Min. 8 ohms   |
| ENVIRONMENTAL                     |   |
| Operating Temperature             | -20 to 50 degrees C   |
| Humidity                          | 0 – 90% non-condensing  |
| IP Rating                         | 42  |
| POWER SUPPLIES                    |   |
| Internal Batteries                | 3.7V rechargeable Lithium-Ion   |
| Typical Operating Time            | approx. 8 hours   |
| Battery Conservation              | Automatic low battery voltage 'switch off'  |

# Specification: UltraTEV® Plus<sup>2</sup> Locator probe

| TEV                      |  |
|--------------------------|--|
| Sensor                   | Capacitive                                 |
| Measurement Range        | 0 – 60dBmV                                 |
| Resolution               | 1dB  |
| Measurement Bandwidth    | 3 - 80 MHz                                 |
| Accuracy                 | ±1dB                                       |
| Locator probe precedence | 0.3ns equivalent to 10cm                   |
| HARDWARE                 |  |
| Enclosure                | Self-colour injection moulded plastic case |
| Indicators               | Power indicator LED                        |
| Controls                 | 3 x push-buttons                           |
| Connectors               | Cable to UltraTEV® Plus <sup>2</sup>       |
| DIMENSIONS               |  |
| Size                     | 201mm x 76mm x 34mm with 2m long cable     |
| Weight                   | 00.36kg                                    |
| ENVIRONMENTAL            |  |
| Operating Temperature    | -10 to 55 degrees C                        |
| Humidity                 | 0 – 90% non-condensing                     |
| IP Rating                | 42   |

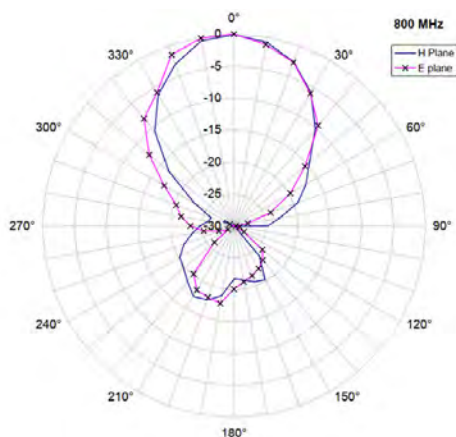
# Specification: UltraTEV® Plus<sup>2</sup> UHF Receiver

| HARDWARE MEASUREMENTS               |   |
|-------------------------------------|---|
| Enclosure                           | Aluminium   |
| Indicators                          | None  |
| Controls                            | None  |
| Connectors                          | 1x BNC antenna port<br>1x LEMO (UltraTEV Plus <sup>2</sup> connection)  |
| DIMENSIONS                          |   |
| Size                                | 81 mm x 40mm x 35mm   |
| Weight                              | 0.1kg   |
| POWER SUPPLIES                      |   |
| Power supply                        | Powered from UltraTEV Plus <sup>2</sup>   |
| Supply voltage                      | 5V  |
| ENVIRONMENTAL MEASUREMENTS          |   |
| Operating temperature               | 0 - 55 °C   |
| Humidity                            | 0 - 90 % non-condensing   |
| IP rating                           | 42 (EN 60529)   |
| UHF MEASUREMENT - GENERAL           |   |
| Modes                               | Switchable narrowband/wideband  |
| Resolution                          | 1 dBm   |
| Measurement bandwidth               | 50Ω   |
| UHF MEASUREMENT - NARROWBAND        |   |
| Measurement range                   | -85 – +5 dBm  |
| Tuning frequency                    | 47 – 1000 MHz   |
| Bandwidth                           | 8 MHz   |
| Gain setting                        | -10 – +40 dB  |
| Accuracy                            | ±2 dB (0 dB gain; -50 dBm – 0 dBm input, 25 C)  |
| UHF MEASUREMENT - WIDEBAND          |   |
| Measurement range                   | -61 – -1 dBm  |
| Bandwidth                           | 5 – 3300 MHz  |
| Accuracy                            | ±2 dB   |
| COMPLIANCE                          |   |
|                                     | EN 61326-1:2013 (Electrical equipment for measurement, control and laboratory use – EMC requirements. General requirements.)                        |
| Electromagnetic compatibility (EMC) | EN 61000-6-2:2019 (Electromagnetic compatibility. Generic standards. Immunity standard for in industrial environments.)                             |
|                                     | EN 55011:2016+A1:2017 (Industrial Scientific and Medical equipment – Radio frequency disturbance characteristics – Limits & methods of measurement) |

\*Please note this accessory requires UltraTEV Plus<sup>2</sup> V8 Hardware or higher.

# Specification: UltraTEV® Plus<sup>2</sup> UHF Directional Antenna

| HARDWARE MEASUREMENTS         |  |
|-------------------------------|--|
| Enclosure                     | Self-coloured vacuum formed plastic case |
| Indicators                    | None                                     |
| Controls                      | None                                     |
| Connectors                    | 1x BNC signal port                       |
| DIMENSIONS                    |  |
| Size                          | 440mm x 440mm x 110mm                    |
| Weight                        | 2.1kg                                    |
| ENVIRONMENTAL MEASUREMENTS    |  |
| Operating temperature         | 0 - 55 °C                                |
| Humidity                      | 0 - 90 % non-condensing                  |
| IP rating                     | 42 (EN 60529)                            |
| ANTENNA                       |  |
| Forward gain                  | 13.6 dBi at 800 MHz                      |
| Beamwidth                     | 40° in E-plane and 50° in H-plane        |
| Approximate bandwidth         | 100 MHz centred on 800 MHz               |
| Maximum sensitivity frequency | 800 MHz                                  |
| Front to back ratio           | Approximately 20 dB                      |
| Radiation pattern (800 MHz)   | Normalized Radiation Pattern diagram     |



\* Please note this accessory requires UltraTEV Plus<sup>2</sup> V8 Hardware or higher and a UHF Receiver.

# Global Footprint

At EA Technology we specialise in asset management solutions for owners and operators of power network assets.



Founded in 1966 we have over 50 years' experience in the industry and 6 regional offices around the world to support our global customer base.

We help clients to safeguard their networks. Advising them on strategy and implementation of a range of technology solutions to manage power assets, delivering maximum life and minimising cost



Safer, Stronger, Smarter Networks

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