

# CABLEGUARDIAN

## TECHNICAL DATA SHEET

[www.viperinnovations.com](http://www.viperinnovations.com)



**DETECTS & LOCATES  
ELECTRICAL FAULTS  
BEFORE THEY BECOME  
A PROBLEM**

 **CABLE  
GUARDIAN®**  
A VIPER INNOVATION

## THE FIRST PLATFORM TO OFFER PROACTIVE MONITORING, DETECTION AND LOCATION OF BOTH INSULATION AND CONDUCTOR FAULTS ON LIVE LOW VOLTAGE UNGROUNDED POWER DISTRIBUTION SYSTEMS

The CableGuardian system is comprised of a network of nodes which monitor the insulation resistance, capacitance and electrical parameters of live cables and system components, using Viper Innovation's proven line insulation monitoring technology. Additionally, the live conductors are continuously monitored for short circuits, open circuits and intermittent faults using ground-breaking Spread Spectrum Time Domain Reflectometry (SSTDR). This information is then displayed clearly and accurately, in real-time, on a user-friendly web portal.

### Key features:

#### Input power supply options:

- Directly from Line being monitored
- From convenient 'domestic supply'

#### Multiple measurement parameters:

- Network Insulation Resistance (IR)
- Network Insulation Capacitance (IC)
- Directional IR and IC
- Line Voltage, Current, and Frequency

#### Identification & location of:

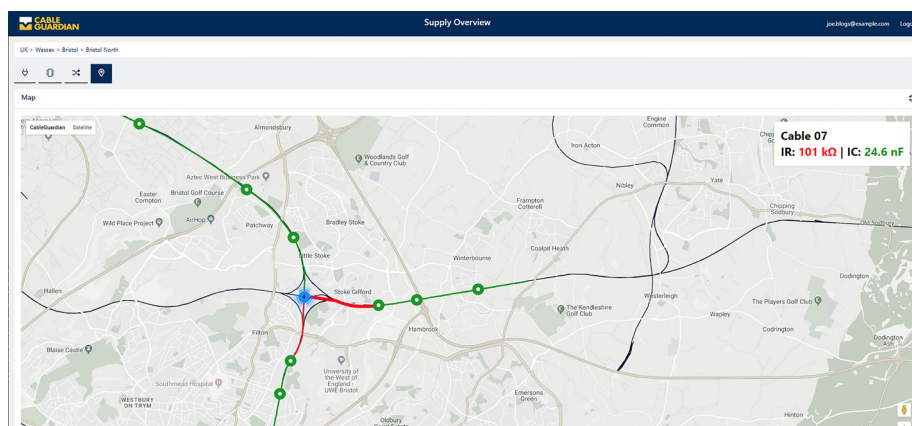
- Insulation Resistance degradation
- Short circuits
- Open circuits

#### Communications interfaces provided:

- 2G/3G/4G cellular - recommended and preferred
- Ethernet - *provisioned but connection to external infrastructure would require development*
- Fibre Optic - *provisioned but connection to external infrastructure would require development*
- RS485 - Datalogger interface (if required)

### Advantages:

- Enables compliance with the requirements of the Network Rail standard for Insulation Monitoring NR/L2/SIGELP/27725
- Multiple nodes on a feed allows for an in depth granular view of the electrical system integrity
- CableGuardian web portal minimises personnel's exposure to track-side risks
- Analysis of data trends facilitate proactive maintenance
- Fast and accurate fault location informs asset stakeholders minimising service outage
- Fault tolerance built in – No 'master' node required; each CableGuardian node is a 'slave' to the 'Supervisor and Analytics System'



CableGuardian Web Portal Overview

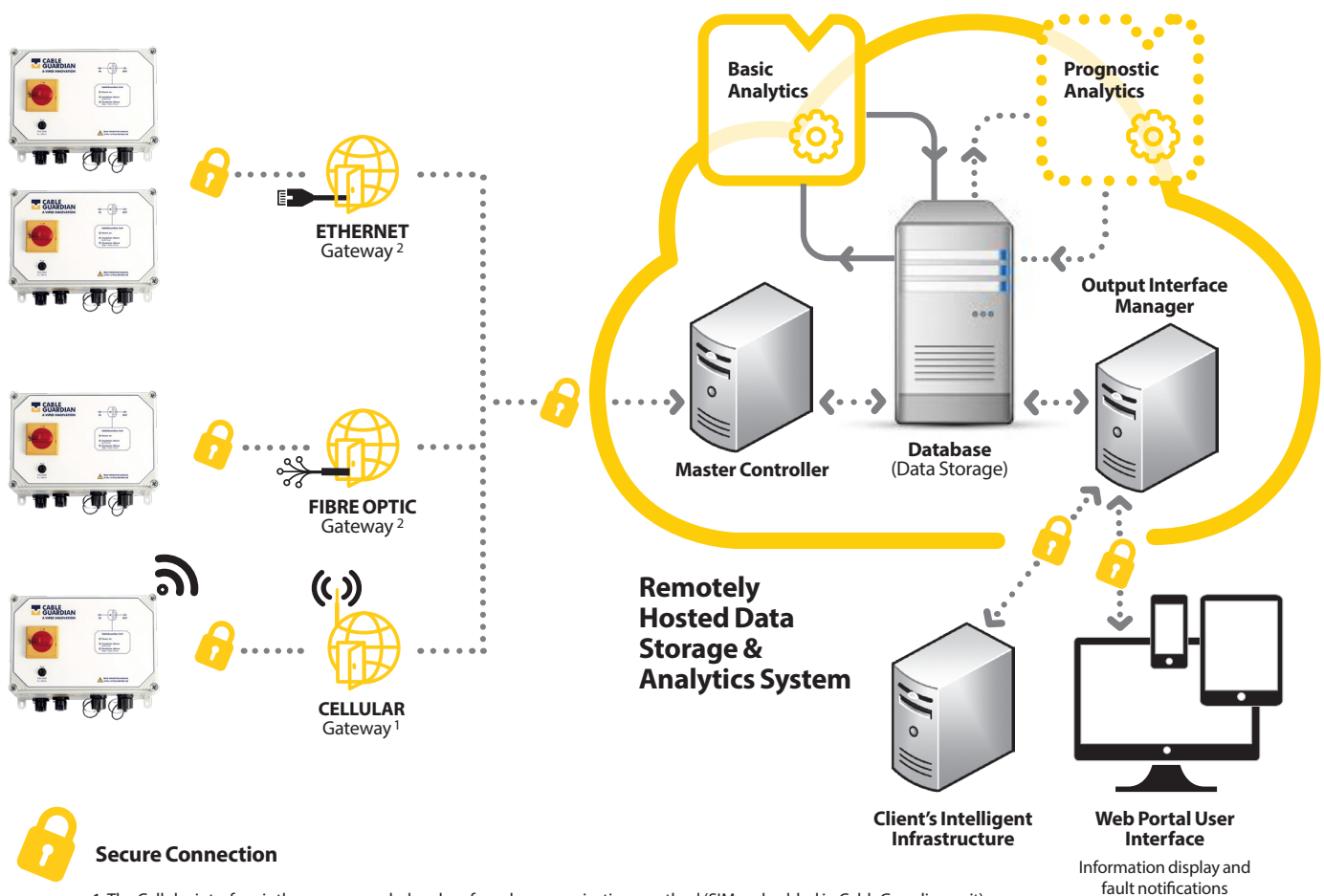
### SYSTEM DESCRIPTION

A CableGuardian system may consist of a single node or multiple nodes, depending on the system monitoring requirements and the level of fault location granularity desired.

Each CableGuardian node transmits data, via a secure internet connection, to the remotely hosted CableGuardian "Data Storage and Analytics System". This system analyses the data to monitor cable degradation in real time and determines the location of any cable or conductor faults on the live power network. The results are displayed clearly, at a glance, on an interactive web portal.

Users with correct privileges have full control to set the CableGuardian alarm thresholds for cable Insulation Resistance (IR), which send alerts direct to key personnel via the interactive web portal. It is possible to set alarm and pre-alarm IR values for each Sub-Network Section (this could be an entire feeder, part of a feeder, right down to an individual cable), which will also be visible within the portal. By setting these Sub-Network Alarm Thresholds above the Network values, it is possible to create an advanced warning of potential faults or long term degradation long before they become an emergency.

Future developments of CableGuardian include a "Prognostic Analytics" package which utilises Machine Learning (Artificial Intelligence) algorithms to provide an enhanced level of predictive fault monitoring, detection and location, to support condition based maintenance, stock control and manpower planning.



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### Electrical

#### Input Power Supply (wiring options):

- 110V AC 47/63Hz "domestic" supply
- 230V AC 47/63Hz "domestic" supply
- Direct from Line Supply being monitored

#### Line Supply Conditions:

Voltage: 350V to 690V AC  
Frequency: 47Hz to 63Hz

#### Power Consumption:

25W typical  
30W maximum

#### Earth Connections:

Functional Earth via connector  
No Protective Earth required

### Interfaces

#### Communications Options:

- 2G/3G/4G Cellular (SIM embedded)

#### Datalogger Interface:

RS485

#### Front Panel Indicators:

- Power on
- Insulation Alarm (Core to Earth)
- Conductor Alarm (Core to Core)

#### Cellular Aerial:

External mounted (IP67)

### Measurements

#### Network Insulation Resistance (IR)

1k $\Omega$  to 1G $\Omega$  @ see graphs

#### Directional Insulation Resistance:

(via External Coil)

1k $\Omega$  to 10M $\Omega$  @ Network IC dependent

#### Response Value (Alarms)<sup>1</sup>:

1k $\Omega$  to 10M $\Omega$

#### Network Insulation Capacitance (IC):

0.1 $\mu$ F to 150 $\mu$ F @  $\pm 25\%$   $\pm 0.05\mu$ F

#### Directional Insulation

Capacitance: (via External Coil)

0.1 $\mu$ F to 80 $\mu$ F @ Network IR dependent

#### Line Voltage (True RMS):

Up to 690VAC @  $\pm 3\%$   $\pm 50$ mV

#### Line Current (True RMS):

(via External Coil)

Up to 100A  $\pm 5\%$   $\pm 50$ mA

#### Line Frequency:

47Hz to 63Hz @  $\pm 1\%$   $\pm 0.5$ Hz

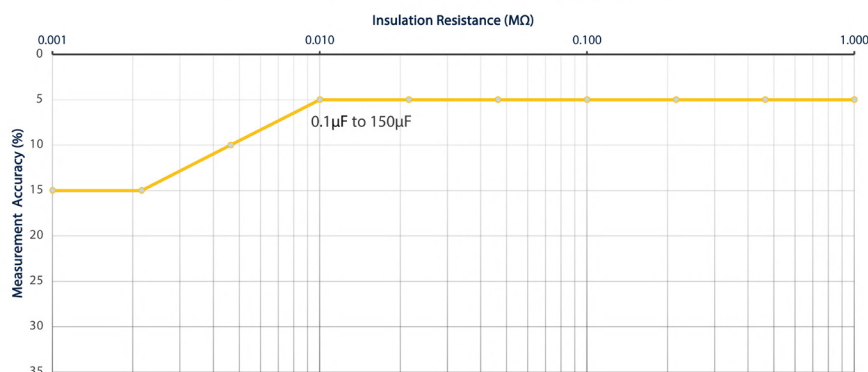
#### Conductor Short/Open Circuit:

Located to 98% accuracy by distance

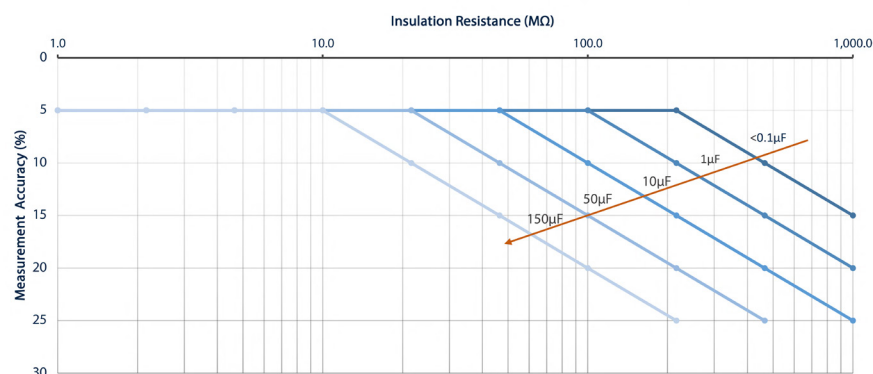
#### Intermittent Conductor Faults:

Duration >100ms

V-LIM Insulation Resistance Accuracy (IR < 1M $\Omega$ )



V-LIM Insulation Resistance Accuracy (IR > 1M $\Omega$ )



Measurement accuracies are specified in the form  $\pm YY\% \pm 1k\Omega$ , where YY is the tolerance expressed as a percentage of measured value from the graph above on the Y axis.

**Note:** 1 - Based on IEC61557-8 reference conditions

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### Environment

**Operating Temperature Range:**  
-25°C to +70°C (-13°F to 158°F)

**Storage Temperature Range:**  
-40°C to +85°C (-40°F to 185°F)

**Relative Humidity:**  
Up to 100%

**Design Life:**  
Minimum 15 years operation

**Climatic Conditions:**  
'Category T1 environment' as defined in BS EN 50125-3

**Solar Radiation:**  
1120 W/m<sup>2</sup> as defined in BS EN 50125-3

**Shock and Vibration:**  
'Outside the track' as defined in BS EN 50125-3

### Mechanical

**Dimensions:**  
See diagram below  
(in millimetres [inches])

**Weight:**  
<10kg

**Mounting:**  
See diagram below (M6 fixings)

**Construction and Assembly:**  
In accordance with BS EN 61439-2 and BS 7671

**Ingress Protection:**  
IP65 as defined in BS EN 60529

**Fire Protection:**  
Category F1 as defined in BS EN 50125-2

### Product Standards

**Safety:**

**IEC 61140:**

- Protection Class II

**BS EN 61010-1:**

- Overvoltage Category III (110/230V Mains & 690V Line)
- Pollution degree 2

**BS EN 61010-2-030:**

- Measurement Category III

**Electro-Magnetic Compatibility:**

In accordance with BS EN 50121-5, BS EN 61326-1 & BS EN 61326-2-4

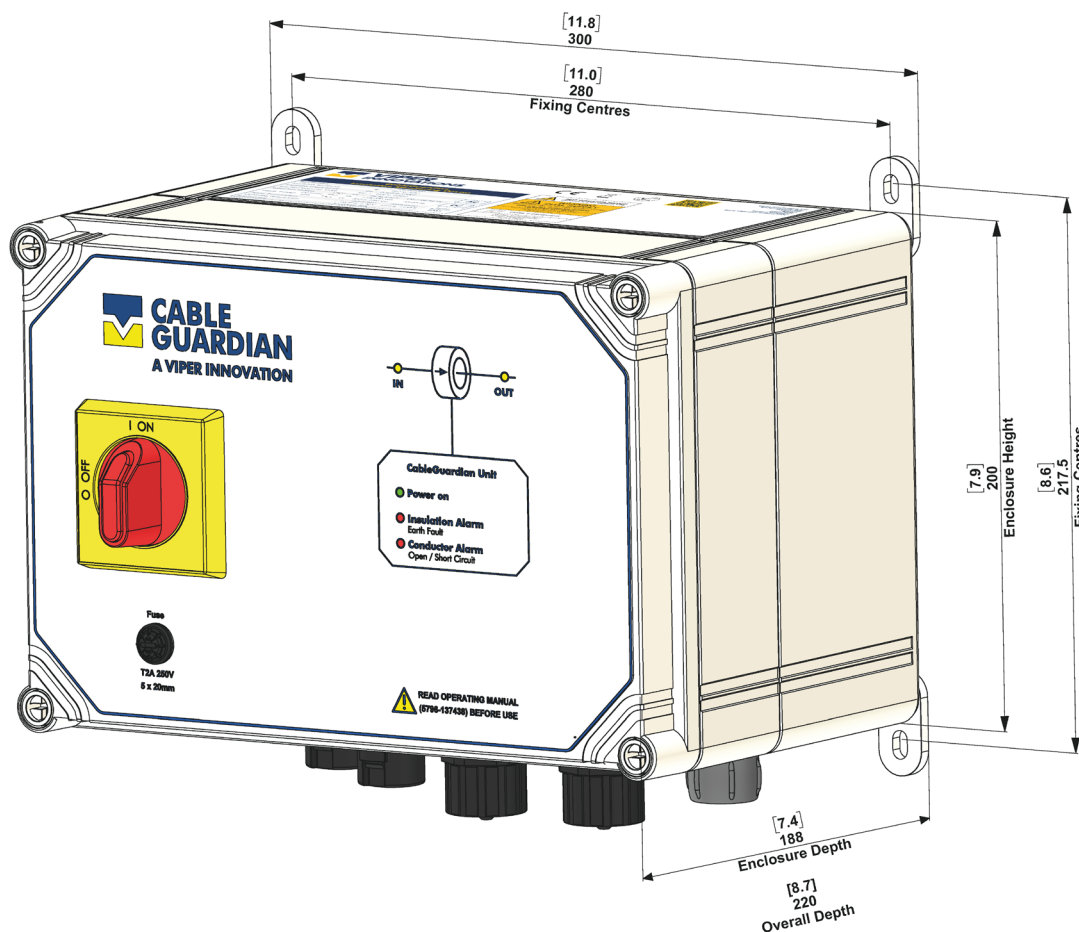
**Insulation Monitoring Device:**

IEC 61557-1

IEC 61557-8

**Network Rail:**

NR/L2/SIGELP/27725





For more information visit:

**[www.viperinnovations.com/cableguardian](http://www.viperinnovations.com/cableguardian)**

or speak to one of our experts on:

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