



# GuardIAN Intelligence Network

**Protect. Defend. Guide.**

Designed to provide integrated intelligence through diagnostics, tracking and communications, each product within the GuardIAN Intelligence Network is purpose-engineered to provide cost reductions, greater efficiency during maintenance runs and improved operational safety on-site.



MineARC Systems - Built for Safety.

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



**mineARC**  
SYSTEMS

# Company Profile

MineARC Systems is the global leader in the manufacture and supply of emergency safe refuge solutions for the mining, tunnelling, chemical processing and disaster relief industries.

With 20 years' experience, our dedication to ongoing research and development is driven by our key focus to continually offer the best and most advanced safety solutions on the market.

Our team of qualified engineers, electrical designers and technical experts form a global network across several international locations including;

- Perth, Western Australia
- Johannesburg, South Africa
- Dallas, Texas
- Santiago, Chile
- Beijing, China
- Barcelona, Spain
- Guanajuato, Mexico

This allows MineARC to provide 24 hour service and engineering support to our expanding list of clients in over 60 countries across the globe.

All MineARC Refuge Chambers and Safe Havens comply with the highest international regulations and recognised 'world's best practice' industry guidelines. Our key focus on quality control and product advancement has meant that MineARC Refuge Chambers have successfully saved lives in multiple real life industrial emergencies around the globe.

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# The Guardian Intelligence Network

In response to client requirements for cost reductions, greater efficiency during maintenance runs and improved operational safety on-site, MineARC has developed a suite of technologically advanced products, collectively known as the Guardian Intelligence Network.

Designed to provide integrated, site-wide intelligence through diagnostics, tracking and communications, each product within the Guardian Network is purpose-engineered to embrace five main principles, whilst taking standards in industrial safety to the next level.

- Improved personnel safety
- Increased operational activities
- Better cost efficiencies
- Ease of application
- Integration into wider site network

## GAS MONITORING PG 4

- ✓ Real-time monitoring of site-wide gas levels
- ✓ Enables faster re-entry processes, reducing downtime
- ✓ Remote diagnostics of refuge chamber atmosphere

## LIGHTING PG 8

- ✓ Provides navigational assistance to nearest safe refuge
- ✓ Alerts based on gas levels detected via the Gas Node
- ✓ Integrated UWB tracking technology

## TRACKING PG 10

- ✓ Replaces outdated tag-boards with an automated system
- ✓ Remotely monitors location of all underground personnel
- ✓ Provides navigational assistance to nearest safe refuge

## CHAMBER MONITORING PG 12

- ✓ Remote, real-time monitoring of vital operating systems
- ✓ Diagnostics of the atmospheric integrity of the chamber
- ✓ Live video streaming and VOIP Video Phone connection

## NETWORK CONNECTION PG 14

- ✓ Distributes reliable, standard-compliant power
- ✓ Full speed native Ethernet communications
- ✓ Inter-operable with a site's preferred network equipment

The Guardian Intelligence Network is designed to provide site-wide integration; allowing real-time monitoring of the underground environment, site assets and personnel via any PC, tablet or mobile device.



Bureau Veritas ISO 9001:2015 Quality Management Systems



MineARC HRM Refuge Live Risk Assessment Testing



Australian C-Tick Standards: AS4100-1998, AS3570.1-18, AS2208, AS3000, AS1716-15



Canadian Standards Association (CSA)



United States National Electrical Code (NEC) 2013/14



European CE Certified to Machinery Norms

# GuardIAN Gas Monitoring

Sensor technology within each Node monitors gas levels in surrounding areas; designed to facilitate efficiency and safety during re-entry and in an emergency.

RADIO SIGNAL FOR PERSONNEL TRACKING & DATA TRANSFER

SPACE FOR UP TO 4 GAS SENSORS

VISUAL ALERT FOR DANGEROUS GAS LEVELS

# GuardIAN Gas Monitoring

GuardIAN Nodes can form an expandable network; allowing increased coverage and accuracy of data transmitted between MineARC Refuge Chambers, underground personnel and above-ground control.

The network expands across the site, aiding communications and data transfer between the GuardIAN Server, nodes, and personal devices.

One of the biggest advantages of the GuardIAN Node System is the in-built Aura-FX Fixed Gas Monitoring technology; providing sites the ability to continuously monitor gas levels throughout the mine.



Regulatory Compliance Mark approved



CE Certification

**IP6X**

IP6X Single Particle Protection ranking



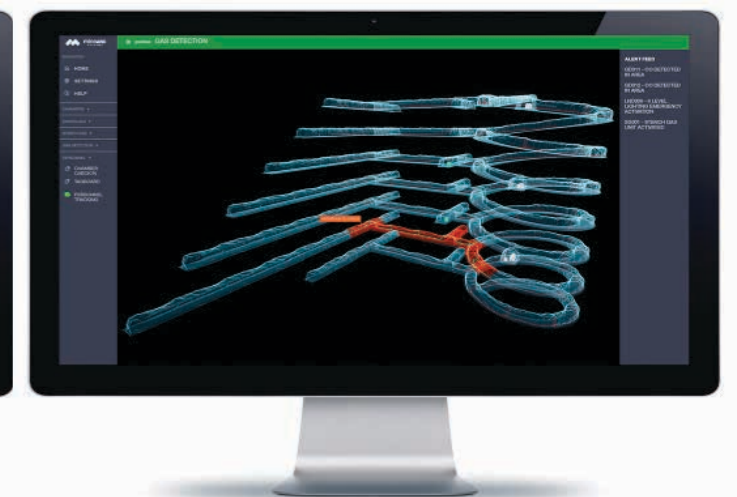
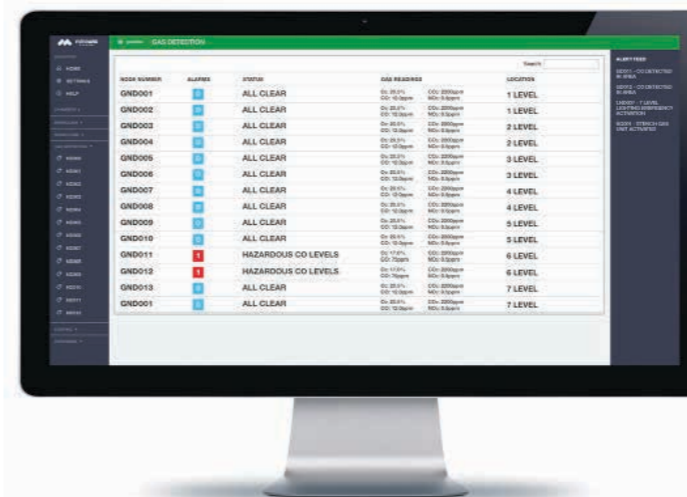
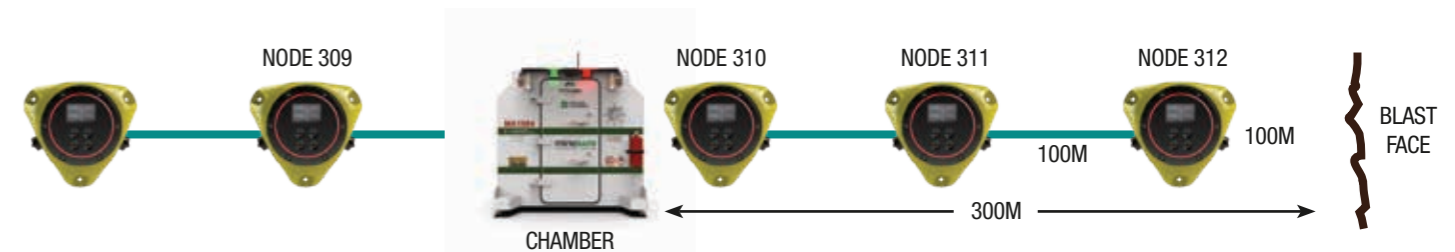
## Improving Re-Entry Processes

Underground gas monitoring via the GuardIAN Node Network is particularly useful during re-entry; allowing personnel to view falling gas levels in real time following a blast, and ultimately reducing wasted time spent on the surface or in the refuge chamber.

monitor gas levels in their immediate surrounds via a GuardIAN tablet; receiving an automated all-clear as soon as the environment is safe.

Alternatively, personnel waiting on the surface will also receive a safe entry alert via any personal device, allowing them to quickly and safely re-enter the mine, minimising delays.

Personnel sheltering in a MineARC Refuge Chamber during a blast can



# GuardIAN Gas Monitoring

## Aura-PT Handheld Gas Monitor

The Aura-PT handheld gas detector has been designed to provide underground personnel with the ability to continuously monitor up to six gases within their immediate surroundings. Aura-PT automatically communicates dangerous gas levels back to the GuardIAN Server via the GuardIAN Nodes.

The Aura-PT can also be used as a redundancy during re-entry, allowing personnel to easily and accurately monitor gas levels as they are driving back down the decline.

- ✓ Digitally monitor up to six gases at any one time, with visual and vibration alerts
- ✓ Automatically feeds gas readings through to the GuardIAN Server via the closest GuardIAN Node
- ✓ Triggers visual alerts on surrounding GuardIAN Nodes in the event of dangerous gas levels



## Gas Sensors Available



# GuardIAN Gas Monitoring

The Aura-PT Handheld Gas Detector can transmit readings to the surface via any GuardIAN Node.

TRANSMITS DATA VIA ANY GUARDIAN NODE

2, 4 & 6 GAS MODELS

VISUAL ALERT FOR DANGEROUS GAS LEVELS

# GuardIAN Smart Lighting

ROBUST DESIGN FOR THE MINING ENVIRONMENT

TRACKING VIA UWB

DIRECTS PERSONNEL TO THE NEAREST AVAILABLE REFUGE CHAMBER

GuardIAN Smart Lighting integrates with the wider GuardIAN Intelligence Network to provide directional assistance based on gas levels in the area.

# GuardIAN Smart Lighting

Underground Smart Lighting from the GuardIAN Node range provides sites with the ability to provide a visual alert when evacuation is necessary, and assist in guiding personnel safely to the nearest available refuge chamber.

The Smart Light also doubles as a UWB tracking device, reporting on the location of all personnel underground.

Controlled and monitored via the GuardIAN Network, the Lighting Nodes can also be utilised alongside GuardIAN Gas Monitoring Nodes and GuardIAN Tracking Nodes; providing a complete safety solution for underground mines.



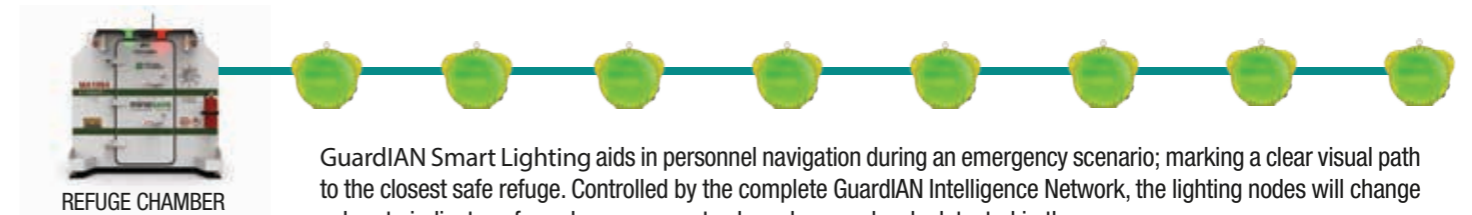
RED



GREEN



AMBER



GuardIAN Smart Lighting aids in personnel navigation during an emergency scenario; marking a clear visual path to the closest safe refuge. Controlled by the complete GuardIAN Intelligence Network, the lighting nodes will change colour to indicate safe or dangerous routes based on gas levels detected in the area.

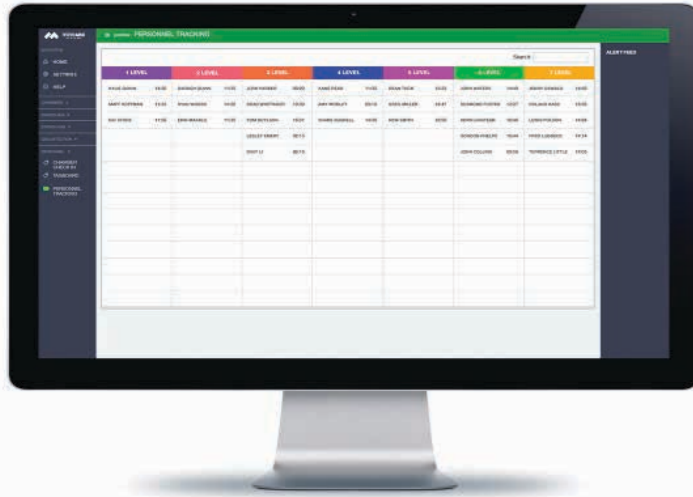


# GuardIAN Tracking

GuardIAN Tracking Technology has been specifically designed to integrate with the GuardIAN Intelligence Network, allowing sites to remotely monitor the location and well-being of all underground personnel.

A small UWB tracking chip located within MineARC's SiriUS Cap Lamp communicates via wireless with the nearest GuardIAN Node, providing location information back to the GuardIAN Network.

TRACKING TECHNOLOGY PROVIDES LOCATION OF PERSONNEL

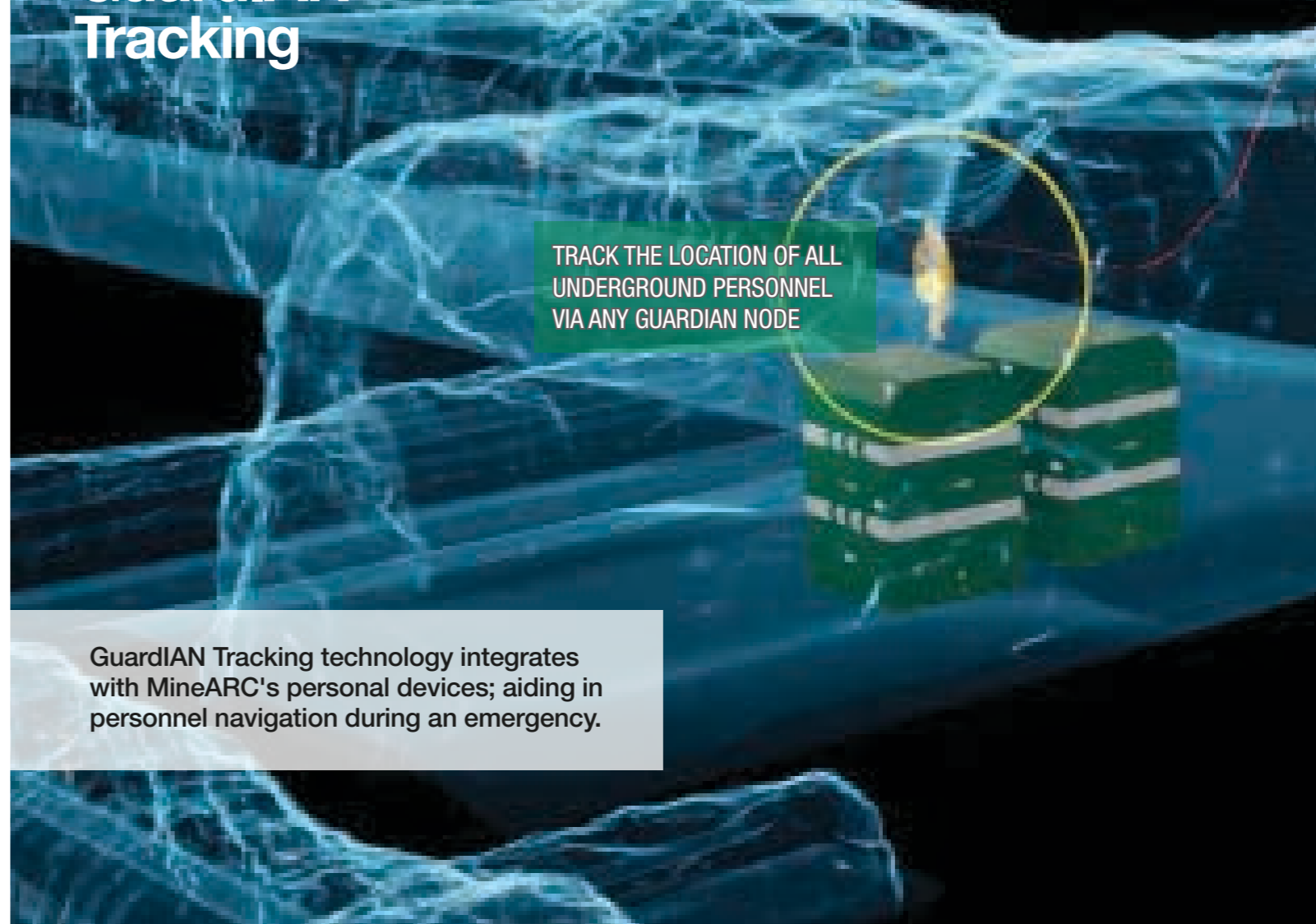


Defining the future of the humble cap lamp, the SiriUS Corded Cap Lamp boasts greater efficiency, interchangeable batteries, improved illumination, automatic light adjustment and advanced tracking capabilities via the GuardIAN Nodes.

- ✓ **UWB Tracking technology allows all personnel to be accounted for and safely located by rescue teams during an emergency or hazardous event**
- ✓ **RFID Chip allows cap lamp to be assigned to a personal ID**



# GuardIAN Tracking



TRACK THE LOCATION OF ALL UNDERGROUND PERSONNEL VIA ANY GUARDIAN NODE

GuardIAN Tracking technology integrates with MineARC's personal devices; aiding in personnel navigation during an emergency.

## Digital Tagboard

MineARC's Digital Tag board comes as a complete unit, designed to allow personnel to pair their MineARC personal devices to their ID number and digitally tag on for the day. There is also a manual redundancy, utilising the traditional method of hanging the ID tag to a hook.

The tag board is available in an 80-person configuration, with expansion modules available to suit any size site.

The unit also features a light and camera for added security.



# GuardIAN

## Refuge Chamber Monitoring

GuardIAN Refuge Chamber Monitoring provides remote, real-time diagnostics of a refuge chamber fleet, and allows MineARC Engineers to provide off-site troubleshooting assistance.

MineARC's GuardIAN Refuge Chamber Monitoring System is an exciting development in refuge chamber technology. GuardIAN enables real-time monitoring; providing confidence that an operation's fleet of refuge chambers are emergency ready at all times.

GuardIAN Refuge Chamber Monitoring is an on-board system that continuously monitors all vital refuge operating systems. During standby mode GuardIAN checks for component faults and monitors refuge chamber usage or entry to the chamber.

The GuardIAN Chamber Monitoring system is hosted on an internal server within the refuge chamber so that no client software installation is required. The responsive webpage is easily accessible from any computer, tablet or smartphone and features a summary of your entire refuge chamber fleet and overall operational status, with the ability to drill down to a detailed report of each chamber.

GuardIAN Chamber Monitoring provides the added advantage of remote troubleshooting assistance by MineARC Engineers, who can login to view the chamber diagnostics dashboard with sites' permission.



# GuardIAN

## Refuge Chamber Monitoring



### Event Logging and Fault Diagnostics

MineARC's Series IV Digital Controller links directly to the GuardIAN Network, streaming real-time system data, including automated system checks, fault logging (battery, scrubber, temperature and inverter), system diagnostics, internal and external temperature measurements, and system actions such as scrubber activation.

MineARC's Aura-FX also provides real-time gas monitoring data and analysis via the GuardIAN Network dashboard.

### Live Video Monitoring and VOIP Video Phone

Internal video monitoring is provided by a remote controlled, motion activated GuardIAN IP camera. When activated, the camera will send out a live, recorded stream of the interior of the refuge chamber to the GuardIAN Network.

To assist occupants during an emergency or safety drill, chambers are also equipped with a VOIP video phone, facilitating face-to-face communication between the refuge chamber and the surface.

### UPS Battery Management

When used in conjunction with GuardIAN, the MineARC Satellite UPS System allows for real-time, remote monitoring of each individual battery. Battery faults can be identified immediately via the GuardIAN Dashboard and Alert Feed, with auto-generated event notifications sent directly to any personal device. Voltage and temperature diagnostics for each individual battery within a string can also be viewed via a graph, highlighting any fluctuations over the past 24 hours.



### Chamber Integrity Monitoring

The Compressed Air Management System (CAMS) communicates vital information relating to the integrity of the internal refuge chamber via the GuardIAN Network.

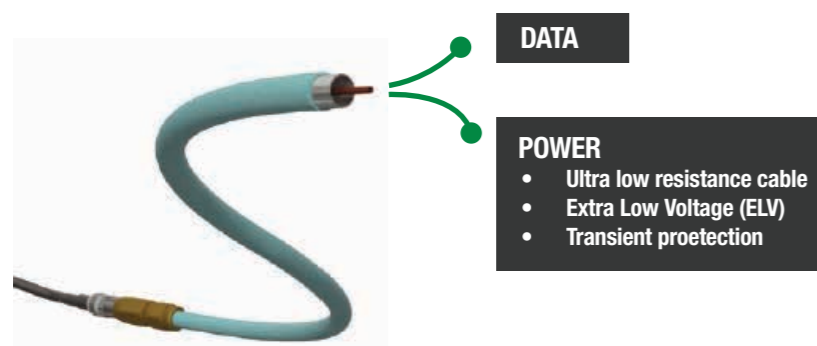
An increase in CAMS activity would indicate a breach of the refuge chamber seal, thus sending an alert to designated personnel that the chamber is compromised.

# GuardIAN Connect

GuardIAN Connect is a high speed, fit for purpose, linear access layer network, allowing the connection of the GuardIAN Nodes, Smart Lighting and Refuge Chamber to the GuardIAN Intelligence Network.

Designed specifically for an underground mining environment, GuardIAN Connect uses a single coaxial cable to carry both power and data.

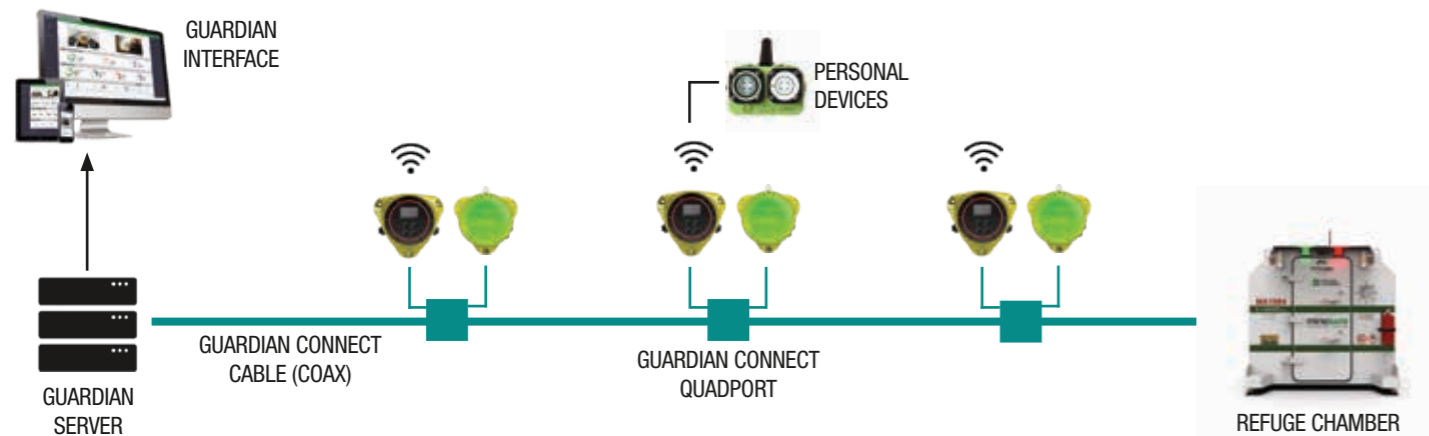
- ✓ **Distributes reliable, standard-compliant power**
- ✓ **Full speed native Ethernet communications**
- ✓ **Inter-operable with a site's preferred network equipment**
- ✓ **Can be installed & maintained by UG trades - as easy as leaky feeder**



GuardIAN Connect eliminates separate distribution by enabling power to be carried over the communications cable with the data. Power centres can be consolidated every 1-2km.

Power over Ethernet (PoE+) outlets can be tapped off the GuardIAN Connect Cable wherever endpoint devices (such as the GuardIAN Node and Lighting) are required.

## Device Connection



GuardIAN Connect is easy to install as a leaky feeder system, whilst at the same time providing a full-speed native Ethernet network. It overcomes the challenges of underground networks with a cost effective solution.

Underground trades can advance and branch the network easily, allowing additional ports to be added as required. Damage can be readily repaired with basic tools in wet, dirty conditions.



Nodes are best positioned within 100m of each other, although can be further if sites wish. The closer the spacing, the greater the accuracy.

# GuardIAN Connect

## Types of Cable

### ULR COAXIAL CABLE



The ULR coaxial cable is a semi-rigid aluminium cable that can extend for distances up to 1km.

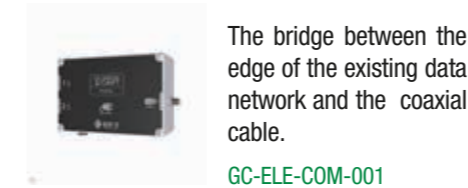
### FLEXIBLE COAXIAL CABLE



The Flexible half-inch coaxial cable is a more cost effective option, designed to extend for distances up to 600m.

## Main Devices

### PORTAL



The bridge between the edge of the existing data network and the coaxial cable.

GC-ELE-COM-001

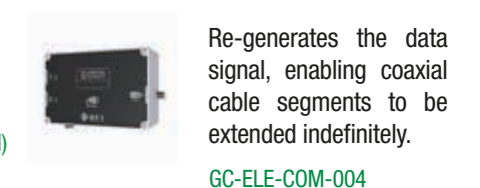
### QUADPORT



Used to break out PoE+ network ports from the coaxial cable.

GC-ELE-COM-002 (Unmanaged)  
GC-ELE-COM-003 (Managed)

### REPEATER



Re-generates the data signal, enabling coaxial cable segments to be extended indefinitely.

GC-ELE-COM-004

### BRANCH



Taps a portion of the power and signal from the cable, enabling a QuadPort to be spliced into the line.

GC-ELE-COM-007

### SPLITTER



Evenly divides the coaxial cable, so that the system can proceed down two different headings.

GC-ELE-COM-005 (Symmetric)  
GC-ELE-COM-006 (Directional)

### POWER INSERTER



Places DC power onto the cable, following a Repeater.

GC-ELE-PWR-001

## Comparison to Other Systems

### FIBRE/COMPOSITE FIBRE

- ✗ Expensive to deploy and maintain
- ✗ Repair is impractical
- ✗ Poor flexibility
- ✗ Power required at each Ethernet outlet, or sent along a separate cable

### CABLE MODEM

- ✗ Complex to maintain
- ✗ Headend (CMTS) is a single point of failure
- ✗ Data rate is shared across all endpoints
- ✗ Breaking out an Ethernet port and powering it is complex and expensive

### LEAKY FEEDER

- ✗ Limited data rates
- ✗ Only viable for a small number of Ethernet endpoints



