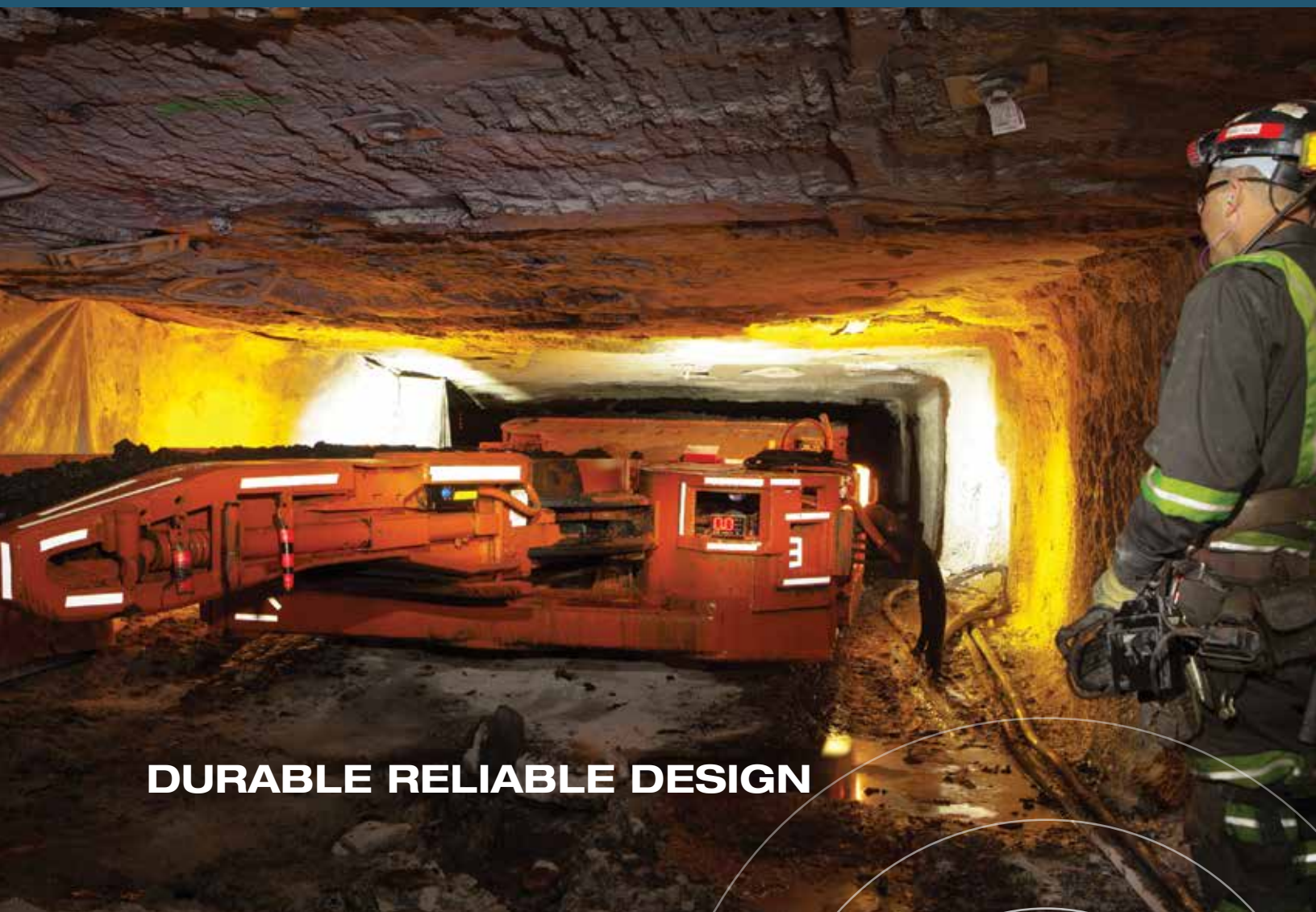
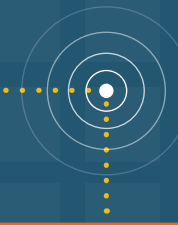




Proximity Detection for Underground Coal Mines

And other potentially volatile environments





DURABLE RELIABLE DESIGN

Strata Worldwide has years of R&D and real-life experience with proximity detection and collision avoidance technologies. Working closely with mine managers and personnel around the world, the company continues to expand and enhance its safety technologies.

HazardAVERT[®] - Near-field electromagnetic detection, alarm and interlocking system for surface and underground



HazardAVERT[®] is an electromagnetic proximity detection system designed to increase personnel safety and awareness while working in and around mobile machinery. It was developed to prevent crushing and pinning type accidents in underground mining environments.

The system detects when a person enters a potentially dangerous area around machinery and automatically sends out warning alerts. Audible and visual alarms bring attention to a situation prior to contact and injury. If no corrective action is taken, or in the event of a sudden emergency, HazardAvert can be interlocked into the controls of the equipment to automatically slow and/or stop the machinery completely.

HazardAVERT[®] has been effectively used on all types and sizes of mobile machinery, vehicles and equipment underground. For coal mining, and other potentially gaseous environments, the system components are intrinsically safe, or are housed in explosion proof (XP) casings.

SAFETY FEATURES & USER EXPERIENCE

- No operator interaction required
- No line-of-sight required
- Direction of travel is irrelevant
- Detects stationary and fallen pedestrians
- Unaffected by visibility or dust
- Penetrates coal, rock, gravel, mud, water, ventilation curtains and barriers
- Monitoring and reporting capabilities



HazardAVERT® System Components

FIELD GENERATORS

- Installed on machinery and generate electromagnetic zones

CONTROLLER BOX

- Monitors the system status and coordinates the interaction between multiple generators.
- Controls equipment interlocking
- Wi-Fi for data and system configuration

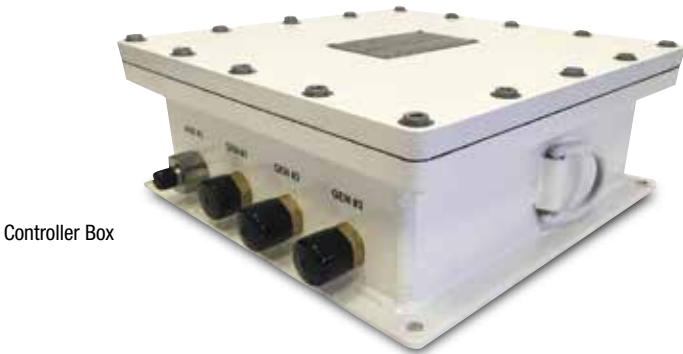
THE DISPLAY POD

- Displays system operating status and active alarms
 - Individual generator status
 - Warning and Hazard zone breaches
 - Remote Stops
 - Troubleshooting system and components
- Memory storage to monitor and log events
- Bluetooth® and Strata CommTrac board for data retrieval and transmission

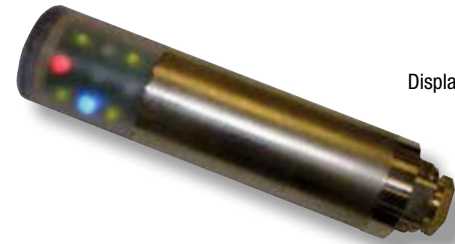
Field Generators



Quick-Connect Cables



Controller Box



Display Pod

PERSONAL ALARM DEVICE (TPL)

- Personnel worn device which interacts with electromagnetic zones and emit warning alerts to the wearer
- Works to prevent vehicle-to-person contact
- Includes LED cap lamp with high and low beam
- Three-button input for specific functions including Remote Stop and temporary maintenance bypass.
- Tracking tag for personnel tracking - operates on StrataConnect networks
- Warning alerts increase safety awareness and reinforce training to maintain safe working distances from machinery

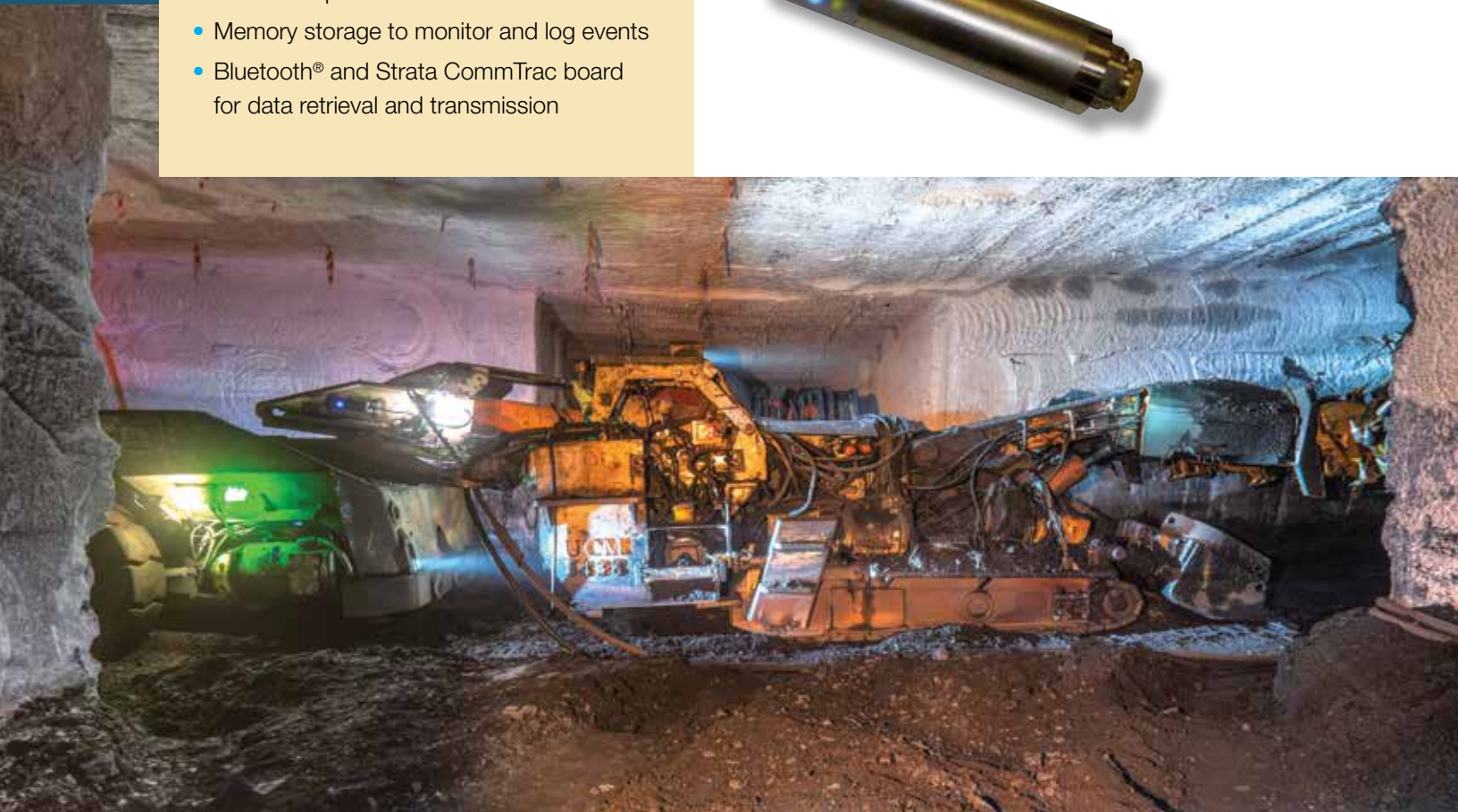
Personal Alarm Device with Optional Cap Lamp



Personal Alarm Device

CHECK OUT STATION (COS)

- Each Lamp Room is equipped with a COS
 - Verifies TPL functionality and battery charge
 - Identifies any potential problems with the TPL
 - Lack of connectivity
 - Battery low or flat
 - Coil failures
 - RF Interference
 - Serves as a personnel “log- or check-in” prior to going underground



HazardAVERT® System Components

How do the components work together?

Proximity Generators mounted on machinery create electromagnetic field(s) around entire vehicle.



Display Pod shows operating status and active alarms.



Flashing LED when a TPL breaches the warning and hazard zones.

Belt-worn personal alarm device (TPL) alerts worker of potential danger.



HazardAVERT® Electromagnetic Detection



HAZARDAVERT®

MARKER ZONES

- HazardAVERT® Proximity Generators are installed on equipment to create two levels of marker zones that completely surround the equipment, covering blind spots and the turning radius.
 - Warning Zone – Outer-most zone
 - Hazard Zone – Inner-most zone
 - Silent Zone – Exclusive zone within Hazard Zone to enable personnel to work as usual on machinery; such as the equipment operator

System Interlock & Machinery Override

- HazardAVERT® can be interlocked into the controls of machinery to automatically slow and/or stop movement, disable certain hydraulics, and enable Remote Stop.*
 - Remote Stop:
 - Anyone with a TPL has the ability to remotely stop all machinery within line-of-sight. This is done if imminent danger is observed
- * Machine functions that may be controlled by the proximity system relays are determined by the customer and the equipment OEM.**

Warning Alerts

- Warning Zone breached either by approaching pedestrian to machinery, or machinery to pedestrian
 - System alerts both equipment operator and pedestrian(s)
 - Display POD LED illuminates yellow
 - LED on pedestrian TPL flashes and audible alarm beeps
 - Interlocked equipment automatically slows
- Hazard Zone breached either by approaching pedestrian to machinery, or machinery to pedestrian
 - System alerts both equipment operator and pedestrian(s)
 - Display POD LED illuminates red
 - LED on pedestrian PAD illuminates and audible alarm buzzes
 - Interlocked equipment automatically stops

UNDERGROUND WORKING ENVIRONMENT

Inherent dangers of this working environment for which HazardAVERT® is intended:

- Restricted visibility
- Confined work spaces
- Hidden workers around corners or behind structures
- Workers interacting with numerous machines at once
- Difficulty determining travel speeds
- Visual obstructions such as equipment, ventilation curtains and/or barriers

KEY FEATURES

- Designed to prevent crushing, pinning and collision accidents
- Highly stable, reliable and repeatable zones minimises learning curve
- Shape and configuration according to customer preference
- Does not affect production and enables workers to operate safely
- Promotes safer working practices
- Allows interaction amongst equipment as needed
- Can be interlocked into equipment controls
- Functions both on the surface and underground
- Capacity to function with hundreds of vehicles and pedestrians in close proximity without latency or delay

HazardAVERT® Monitoring & Reporting

HazardAVERT® continuously monitors and logs all system operating status, warning alarms, machinery overrides and machinery interactions. This data can be downloaded on-site for analysis and reporting, or wirelessly streamed to dispatch using Strata's communication networks. Data is displayed on the StrataConnect Graphical User Interface (GUI).

StrataConnect GUI features and capabilities

- Individual facility mine-map.
- Easy view navigation with layers and tabs
- Ability to monitor at system level or zoom in to individual people and equipment
 - High resolution tracking including direction of travel.
 - Personnel tracking
 - Asset tracking
- Critical safety data reports
- Productivity trends
- HazardAvert system operating status and maintenance
- Mining equipment operating status and maintenance

MONITOR

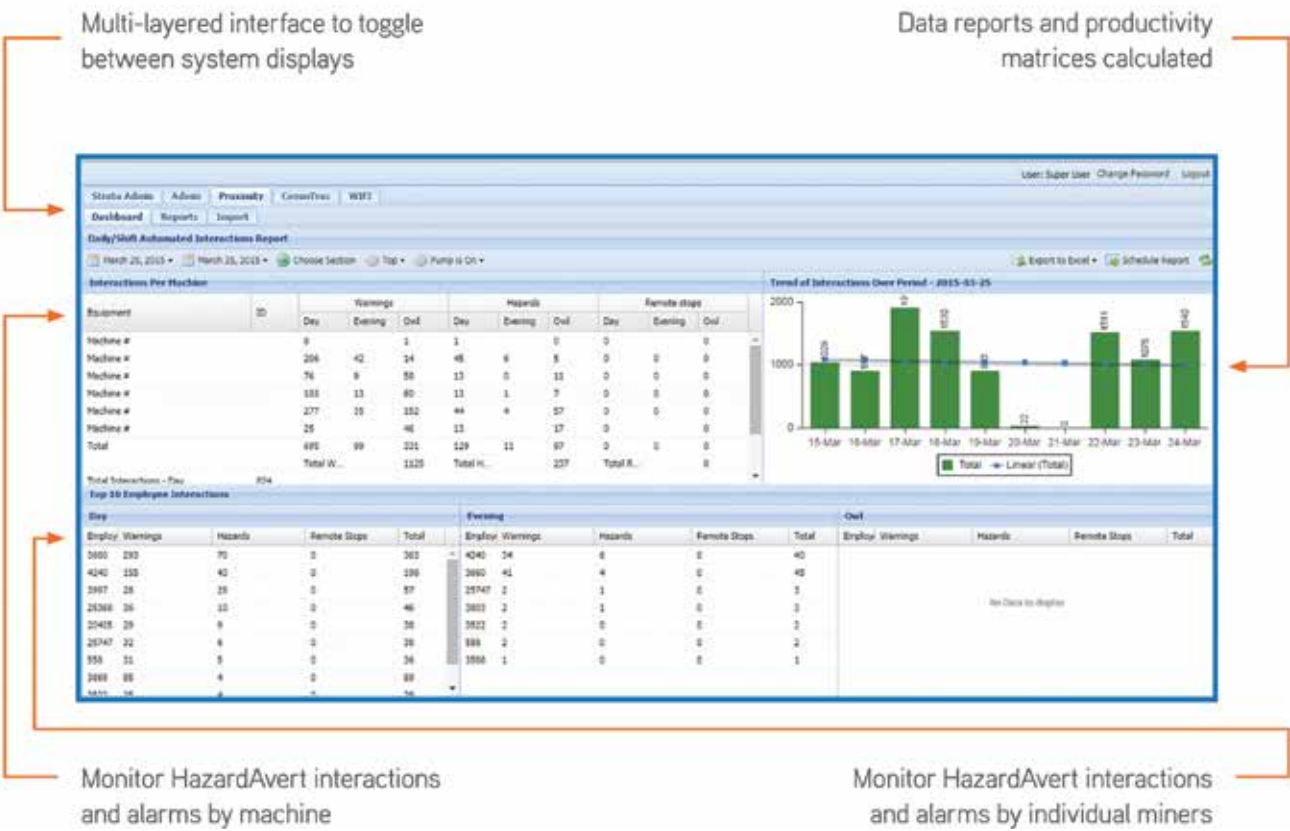
- Working & safety practices of personnel
- Worker and machinery interaction
- Warning and/or Hazard zone breaches and duration of breach
- Emergency, Hazard Zone stops
- Duration of inactivity
- Damage to components

REPORTING

- Safety Reports
 - Worker and machinery operator safety practices
 - Zone breaches – frequency and duration
- Productivity reports
 - Machinery tracking
 - Travel time
 - Stop time
 - Interactivity time



HAZARDAVERT® SEES WHAT PEOPLE CAN'T, AND REACTS WHEN PEOPLE DON'T.





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