MST

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Proximity

Detection



POTENTIAL COLLISIONS BECOME PREVENTABLE INCIDENTS

Connecting Every Miner. Every Asset. Every Zone.

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Prevent Accidents Before They Become Emergencies.

Every shift, thousands of mining professionals work only a few metres away from heavy mobile equipment carrying hundreds of tonnes of material through underground roadways, production levels, loading points and confined work areas.

These environments are constantly changing. Dust reduces visibility. Equipment blind spots limit operator awareness. Low lighting, noise, intersecting traffic routes, narrow tunnels and production pressures create situations where people and machines frequently share the same workspace without seeing each other.

Even the most experienced operators and workers can unknowingly enter hazardous situations where a single moment of lost awareness may lead to equipment damage, production interruptions—or more importantly—serious injuries.

Traditional safety procedures, mirrors, cameras and operator training remain essential, but they cannot eliminate every blind spot or compensate for every operational condition.
Preventing collisions requires more than visibility:

It requires continuous situational awareness.

MST Proximity Detection provides an additional engineering layer of protection that continuously monitors the area surrounding heavy mobile equipment and automatically detects nearby personnel, light vehicles and other mobile equipment.

Whenever someone enters a configurable protection zone, the system simultaneously alerts both the operator and the approaching person, providing valuable reaction time before a dangerous situation becomes an accident.

Designed specifically for underground and surface mining, MST Proximity Detection delivers reliable performance under dust, darkness, rain, vibration and harsh mining conditions—helping operations reduce collision risks while improving workforce confidence and operational safety.





Why Proximity Detection Matters?

The Foundations of Intelligent Collision Prevention.

Mining operations never stop. Neither do the risks. Collision risks are rarely due to a single unsafe action, and are usually the result of multiple operational factors occurring simultaneously.

- Heavy mobile machinery continues to move.
- Pedestrians continue to conduct inspections.
- Production continues.
- Visibility changes.
- Dust increases.
- Noise masks the proximity of machinery.
- Blind spots appear.
- Roads become congested.



Each of these conditions reduces situational awareness.

- The challenge is not simply detecting people. The challenge is ensuring that both the operator and nearby personnel become aware of each other's presence with enough advance notice to react.

That is precisely the role of MST Proximity Detection.

- Instead of relying solely on human perception, the system continuously creates intelligent protection zones around mobile machinery, automatically detecting nearby personnel and vehicles and providing immediate alerts before dangerous situations escalate into incidents.





The Foundation of Intelligent Collision Prevention.

Effective proximity detection is not achieved through a single sensor or alarm.

It is the result of multiple technologies working together continuously to detect, evaluate and communicate risk before a collision occurs.

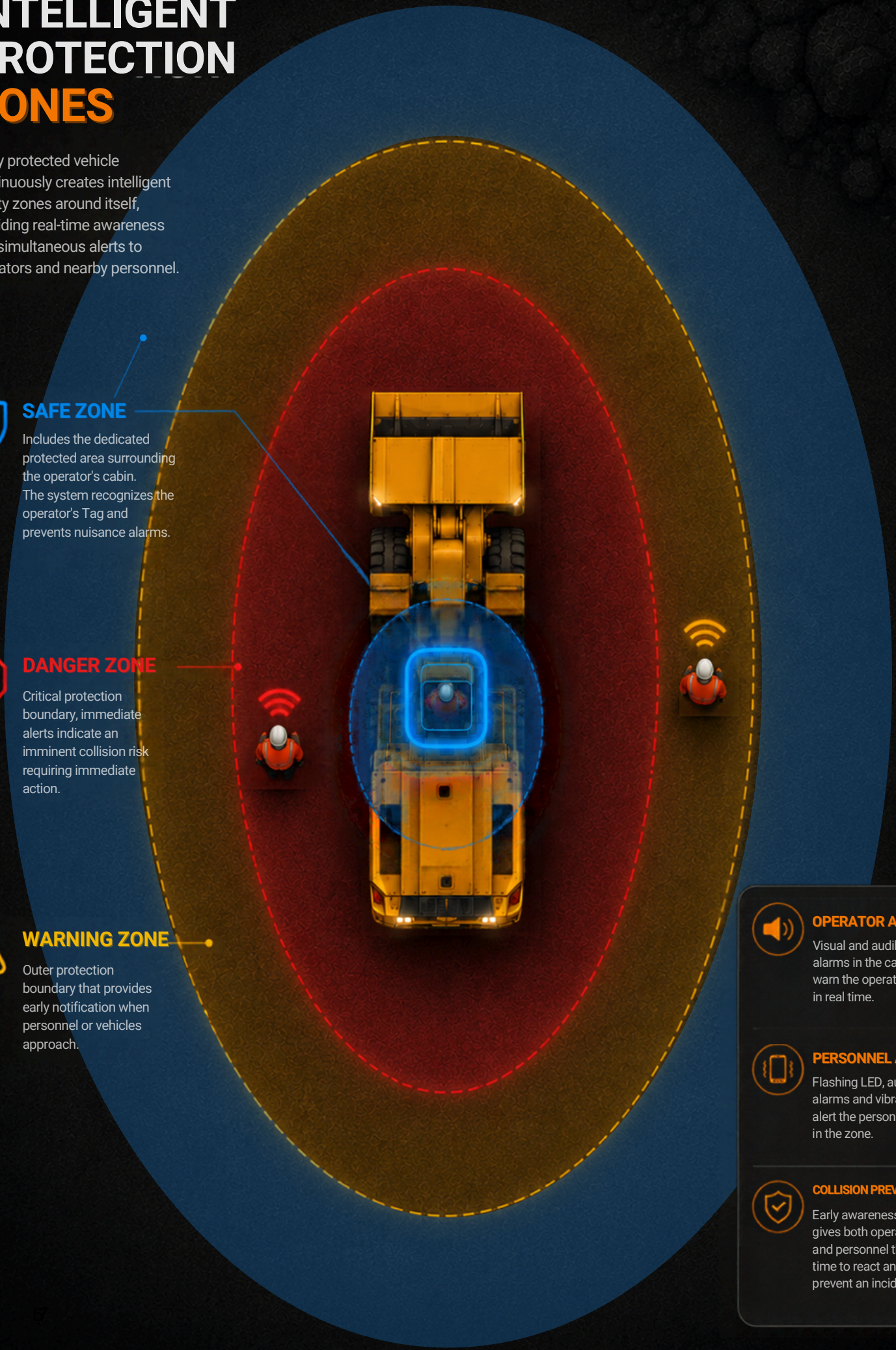
MST Proximity Detection has been designed around six fundamental principles that transform proximity awareness into active collision prevention.

Together, these principles create a complete safety solution capable of operating reliably in the demanding conditions of underground and surface mining:

- **Prevent Instead of React:**
  - Detect hazardous situations before an accident occurs.
- **Shared Situational Awareness:**
  - Operators and nearby personnel receive alerts simultaneously.
- **Intelligent Protection Zones:**
  - Every protected vehicle continuously creates configurable safety zones around itself.
- **Continuous Risk Evaluation:**
  - Every detected tag is continuously evaluated to determine its level of risk.
- **Reliable Detection:**
  - Consistent performance regardless of dust, darkness, rain or underground infrastructure.
- **Designed for Mining:**
  - Purpose-built to withstand harsh underground and surface mining environments.

INTELLIGENT PROTECTION ZONES

Every protected vehicle continuously creates intelligent safety zones around itself, providing real-time awareness and simultaneous alerts to operators and nearby personnel.



SAFE ZONE

Includes the dedicated protected area surrounding the operator's cabin. The system recognizes the operator's Tag and prevents nuisance alarms.

DANGER ZONE

Critical protection boundary, immediate alerts indicate an imminent collision risk requiring immediate action.

WARNING ZONE

Outer protection boundary that provides early notification when personnel or vehicles approach.

OPERATOR ALERT

Visual and audible alarms in the cabin warn the operator in real time.

PERSONNEL ALERT

Flashing LED, audible alarms and vibration alert the person in the zone.

COLLISION PREVENTION

Early awareness gives both operator and personnel the time to react and prevent an incident.



How The Solution Works - From Detection to Protection:

Every protected vehicle continuously creates intelligent magnetic protection zones around itself.

As personnel, vehicles or equipment enter these zones, the system automatically identifies their location, evaluates the level of risk, and immediately alerts everyone involved.
This entire process occurs in real time without requiring operator intervention.

Step 1 — Create Protection Zones:

- Low Frequency Transmitters installed on the vehicle generate configurable magnetic detection fields surrounding the equipment.
- These protection zones continuously move together with the vehicle.

Step 2 — Detect Protected Assets:

- Personnel Tags, Cap Lamp Tags and Vehicle Tags are automatically detected whenever they enter the magnetic protection field.
- The system continuously identifies every protected asset approaching the equipment.

Step 3 — Evaluate Risk:

- The System Controller determines the exact protection zone where each Tag is located.
    - Safe Zone.
      ↓
    - Warning Zone.
      ↓
    - Danger Zone.
- Each condition represents a different level of operational risk.

Step 4 — Alert Everyone

- When a Warning or Danger Zone is breached, both the operator and the approaching person receive immediate alerts.
    - Operator
        - Visual alarms
        - Audible alarms
    - Personnel
        - Flashing LED
        - Audible alarm
        - Vibration
- Both parties become aware of the hazard simultaneously.

Step 5 — Prevent the Collision:

- Early awareness provides valuable reaction time.
- Operators can reduce speed, stop equipment or change direction.
- Personnel can immediately move away from the hazardous area.
- rather than emergency events.



Features:

Engineered to Deliver Reliable Protection Under Real Mining Conditions.

Every component of the MST Proximity Detection System has been specifically engineered for harsh mining environments, combining intelligent sensing technology, configurable software and rugged industrial hardware into a complete collision prevention solution.

Intelligent Detection:

- Bidirectional operator and pedestrian alerts.
- Vehicle-to-person detection.
- Vehicle-to-vehicle detection.
- Configurable Warning and Danger Zones.
- Safe Zone around the operator.
- Detection ranges configurable up to 20 metres.

Rugged Mining Hardware:

- Rechargeable Tags.
- Visual, audible and vibration alarms.
- IP-rated industrial components.
- Resistant to dust, darkness, rain, mud and vibration.
- No GPS required.
- No external communications infrastructure required.

Flexible System Architecture:

- Multiple Low Frequency Transmitters.
- Personnel Tags.
- Cap Lamp Tags.
- Vehicle Tags.
- Easy installation on existing fleets.
- Suitable for underground and surface mining.

Monitoring & System Management:

- Continuous self-diagnostics.
- Automatic event logging.
- Remote web configuration.
- Ethernet and Wi-Fi maintenance interface.
- Downloadable event history.



Benefits:

Turning Intelligent Detection into Safer Mining Operations.

Technology creates value only when it improves operational outcomes.

MST Proximity Detection helps mining operations reduce collision risks, protect personnel, improve operator awareness and maintain productive operations, even under the most demanding underground conditions.

Protect People:

Improve Personnel Safety:

- Reduce exposure to collisions between heavy mobile equipment and nearby personnel.

Shared Situational Awareness:

- Ensure operators and pedestrians receive simultaneous alerts before hazardous situations develop.

Improve Emergency Preparedness:

- Provide immediate awareness whenever critical proximity conditions occur.

Simplify Ownership:

Rapid Deployment:

- Install on existing mining equipment without GPS or additional communications infrastructure.

Lower Total Cost of Ownership:

- Reduce installation complexity, simplify maintenance and maximize equipment availability through rugged hardware and intuitive configuration.

Improve Operations:

Reduce Collision Risks:

- Prevent incidents before they result in injuries, equipment damage or production losses.

Reliable Performance:

- Deliver dependable detection regardless of dust, darkness, moisture or harsh mining environments.

Adapt to Every Operation:

- Configure protection zones according to vehicle size, operational procedures and site-specific requirements.



Designed For The Real World.

Mining Doesn't Stop Because Conditions Become Difficult.

Underground mining presents challenges that conventional sensing technologies often struggle to overcome.

- Dust.
- Darkness.
- Mud.
- Moisture.
- Vibration.
- Metallic infrastructure.
- Confined spaces.
- Continuous equipment movement.

MST Proximity Detection has been purpose-built to operate reliably under exactly these conditions.

Its highly repeatable magnetic detection technology provides consistent protection regardless of environmental conditions, allowing mining operations to maintain dependable collision prevention throughout every shift.

Throughout this brochure we have explored one of mining's greatest operational challenges:

- How can people and heavy mobile equipment safely share the same workspace when visibility is constantly changing?
- The answer is not simply adding more procedures or expecting operators to see what cannot always be seen. The answer is creating continuous situational awareness!

MST Proximity Detection transforms heavy mobile equipment into intelligent, self-protected assets capable of continuously monitoring their surroundings, detecting approaching personnel and vehicles, evaluating risk in real time and alerting everyone involved before an incident occurs.

The result is far more than collision prevention.

- It is greater confidence for operators.
- Greater protection for workers
- Greater operational continuity.
- And a stronger safety culture across the entire mining operation.

Because the safest collision...

...is always the one that never happens.

Discover how MST Proximity Detection can help your operation build a safer, smarter and more productive mining environment.

Looking for solutions to improve safety, productivity, and operational performance in your mine?

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- Visit the MST Global website to explore innovative technologies designed for underground mining and tunneling.
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- Join our community and stay informed about the technologies shaping the future of mining.

YouTube channel:

- Explore MST Global's latest innovations in underground mining technology.
- Discover videos featuring communication networks, automation, fleet management, safety solutions, IoT, real-world customer success stories, product demonstrations, and digital technologies designed to improve mine safety, efficiency, and productivity.

Talk to our experts about how to improve underground safety and productivity with Proximity Detection in your mine.



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