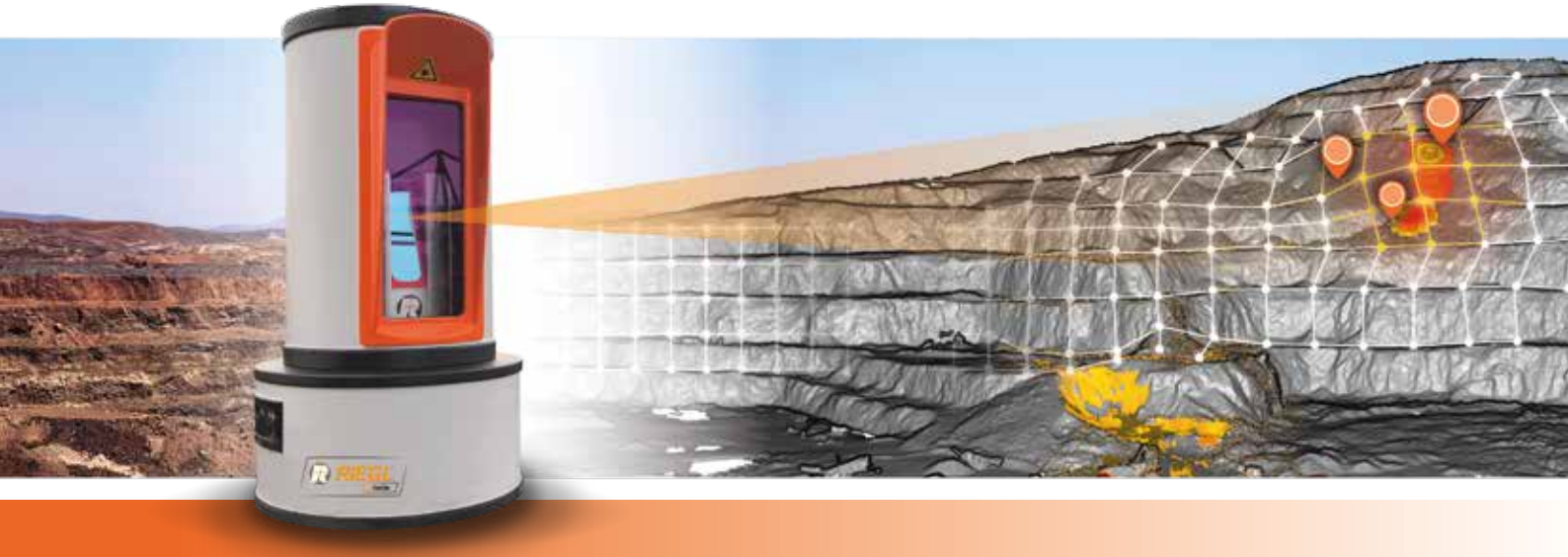
HORTS SYPERION

STRATEGIC LIDAR MONITORING

FOR SLOPE STABILITY AND DESIGN PERFORMANCE



- www.syperion.com
- www.horts.co.za

MONITORING THE STABILITY OF SLOPES AND DUMPS

Open pit mine design seeks to optimize the safe and effective extraction of an orebody. Design assumptions and the stability of the excavated pit slopes are monitored to assess the performance of the slopes and the design.

The measurement and evaluation of deformations of benches and slopes are indispensable for movement detection and geotechnical assessment, to enable proactive risk management and mitigation.

Since 2013, SYPERION has developed and distributed a new and robust system to monitor slopes permanently in real time. Based on a long distance RIEGL 3D laser scanner, the system monitors changes from a distance of several kilometres.

HORTS Mining Solutions delivers the robust technical infrastructure required to seamlessly integrate the system into even the most demanding mining environments.

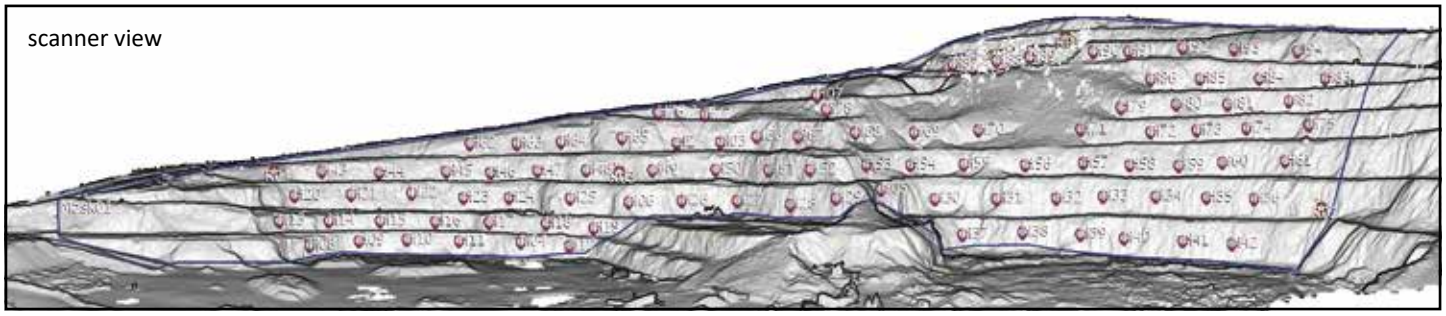
This system is the ideal solution for long-term campaign or strategic monitoring. The data is captured in absolute 3D-coordinates with point precision, accuracy and repeatability.

Built on decades of mining expertise, our companies combine proven know-how with a strong global track record. With more than 15 installations worldwide, our solutions are engineered for demanding 24/7 operation and have demonstrated reliable performance for over 30 years.

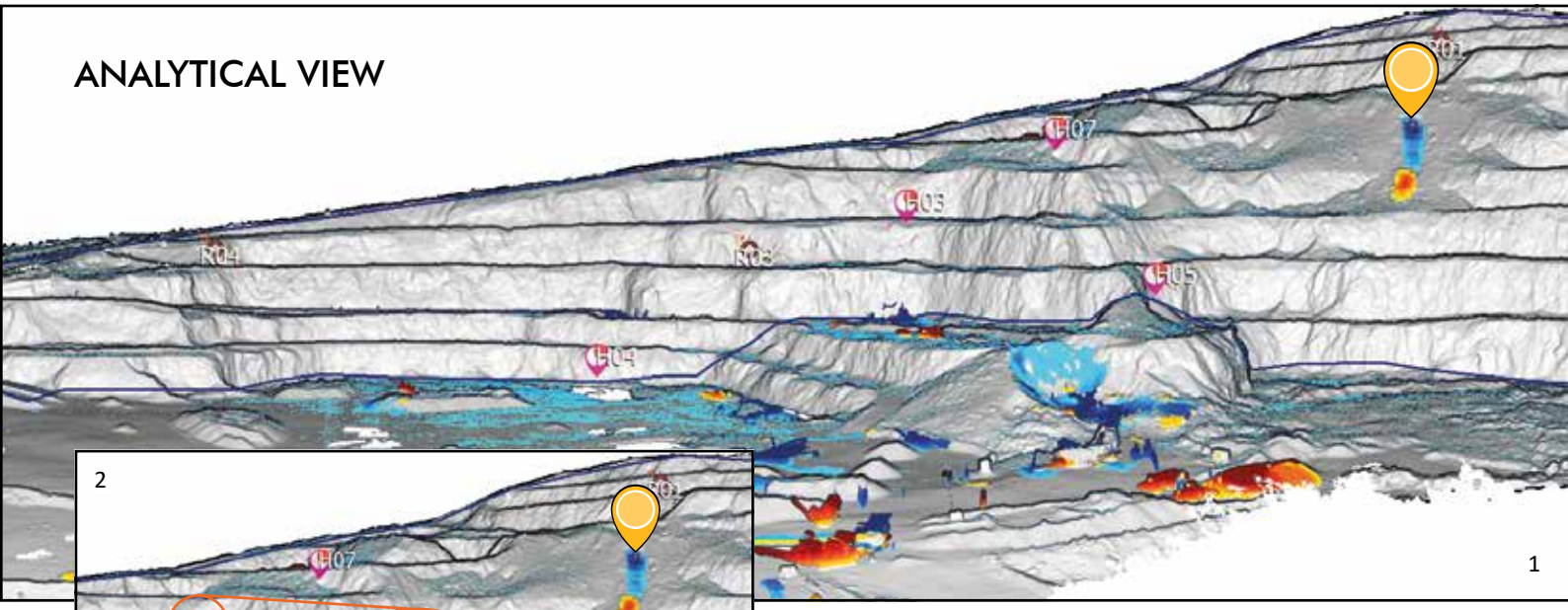
Mounted on a stable platform, the high-specification 3D laser scanner captures a complete data set of the entire pit every hour. This data set – known as a point cloud – provides full coverage of the monitored slope.
The point cloud is automatically transformed into vertical (top view) and horizontal (scanner view) grids, represented by millions of *GridPoints*. Each *GridPoint* is continuously tracked over time, enabling precise analysis of even the smallest surface changes. Of these millions of *GridPoints*, hundreds of thousands remain exceptionally stable over time – with a standard deviation of less than 2 millimetres. These highly reliable reference points are called *VirtualPrisms*. Hundreds of *VirtualPrisms* can be configured in just minutes, delivering continuous, high-precision displacement monitoring – with no manual intervention in the pit required.

The picture below shows the top view of a pit with the position of the laser scanner and its field of view. The purple position markers represent the *VirtualPrisms*.

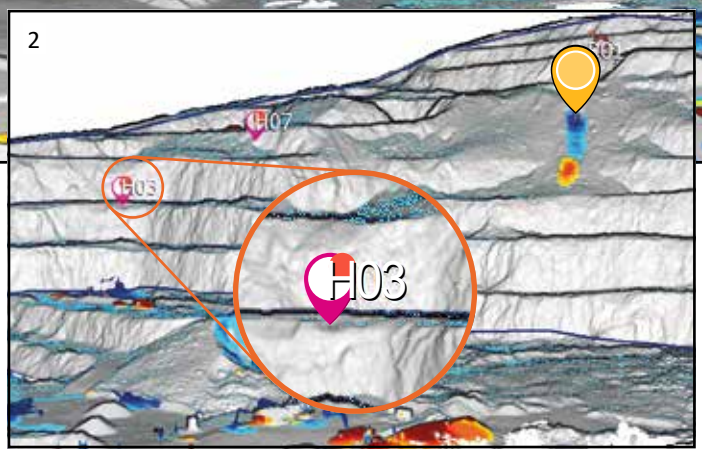
top view

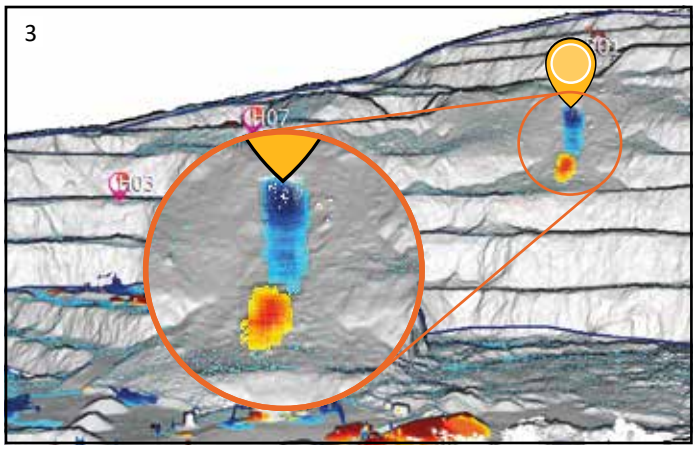

scanner view

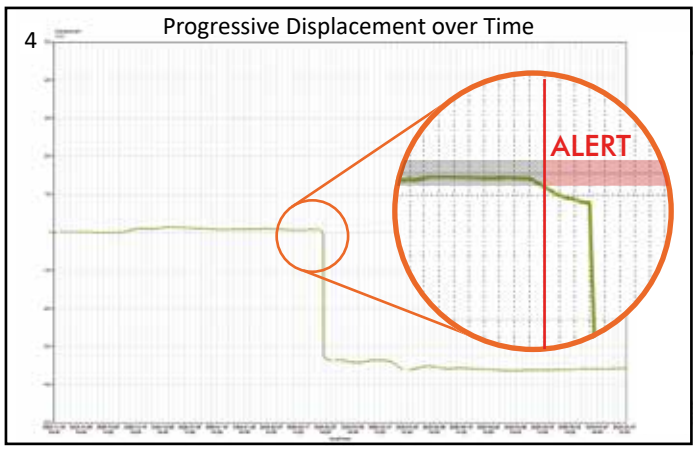
ANALYTICAL VIEW



1







(1) Scanner view: Full-field view of the slopes, in which the displacements relative to a reference are shown in red and blue.
(2) Scanner view: The user defined VirtualPrisms on the slopes which are exceeding the thresholds are highlighted in purple position markers.
(3) Scanner view: Slope failures and falls of ground can be easily identified and quantified, even if no VirtualPrisms are set in this area.
(4) A graph showing the displacement of a single VirtualPrism over time and indicating a failure shortly after the displacement exits the tolerance range.

KEY FEATURES

SAFETY & RISK MANAGEMENT

Continuous Slope Surveillance
Long-term, real-time monitoring of slopes in open pit mines for optimal operational safety

Strategic Monitoring Guidance
Intelligent decision support to guide the use of tactical and critical monitoring tools

Comprehensive Data Analysis
Full slope coverage combined with individual prism-level insights for a complete slope stability assessment

Minimize Costs & Risk Exposure
Proactively identify instabilities before they become critical – protecting people, assets and operations

GEOTECHNICAL BENEFITS

Slope Compliance Monitoring
Enable continuous adherence to geotechnical safety standards and regulatory requirements

Advanced Geotechnical Visualization
Monitor and visualize moisture distribution, strain patterns and joint behavior in an integrated view

OPERATIONAL & PRODUCTIONAL BENEFITS

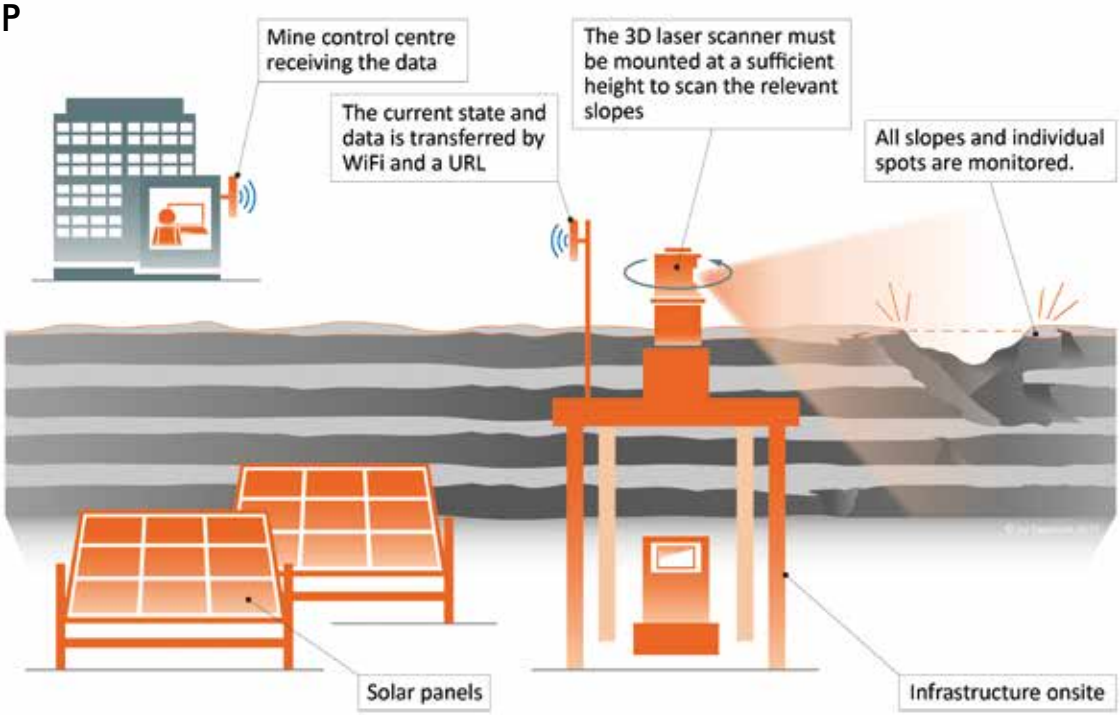
Seamless 3D Data Export
Full pit geometry available in industry-standard formats for direct integration into your workflow

Optimized Pit Design
Leverage precise 3D data to refine and validate pit design for maximum efficiency and safety

Integrated Rock Mass Information
Overlay geological data directly onto 3D models for informed decision-making

Accurate Volumetric Analysis
Reliable volume calculations to support production planning, reconcillation and reporting

SYSTEM SET-UP



UNIQUE SELLING PROPOSITIONS

Absolute 3D Precision
Real-time monitoring of absolute 3D data using a fixed *GridPoint* framework.

VirtualPrisms – No hardware. No limits.
Instantly deploy hundreds of high-quality *GridPoints* as virtual reference prisms – no physical installation required – reduced risk exposure.

Full Statistical Transparency
Every *GridPoint* delivers individual statistical insights for maximum confidence in your data.

Multi-Scale Displacement Monitoring
Analyze slope movements simultaneously at *GridPoint* level and individual prism level for a complete picture.

Dual-Perspective 3D Analysis
Evaluate deformations in both vertical and horizontal planes in a single workflow.

Remote Monitoring in Critical Zones
Safely track displacements from a distance – even in unstable or inaccessible areas

SYSTEM COMPONENTS

The Slope Monitoring System as seen in the image above, consists of the following components:

1. A 3D laser scanner
2. The necessary infrastructure to ensure the scanner is positioned correctly and at the required measurement height
3. A power supply, e.g. through solar panels
4. A data connection so that the measured data can be transmitted to the control centre via Wi-Fi and a URL.

SYSTEM PROPERTIES

- Measurement spot 0.15..0.3 mrad, ie. 15..30 cm @ 1 km
- Atmospheric correction by tracking reference prisms
- Standard deviation of the processed data is 2 mm @ 3-sigma, depending on the scene

HORTS
494 Cliff Avenue
Waterkloof Ridge
Pretoria 0181
SOUTH AFRICA

Phone: +27 83 227 1823
info@horts-solutions.com

SYPERION GmbH & Co. KG
Hermann-Köhl-Str. 7
28199 Bremen
GERMANY

Phone: +49 421 948 020 80
info@syperion.com

www.horts.co.za **www.syperion.com**