VS+

Carlson
BREAK NEW GROUND

Laser-based cavity monitoring system

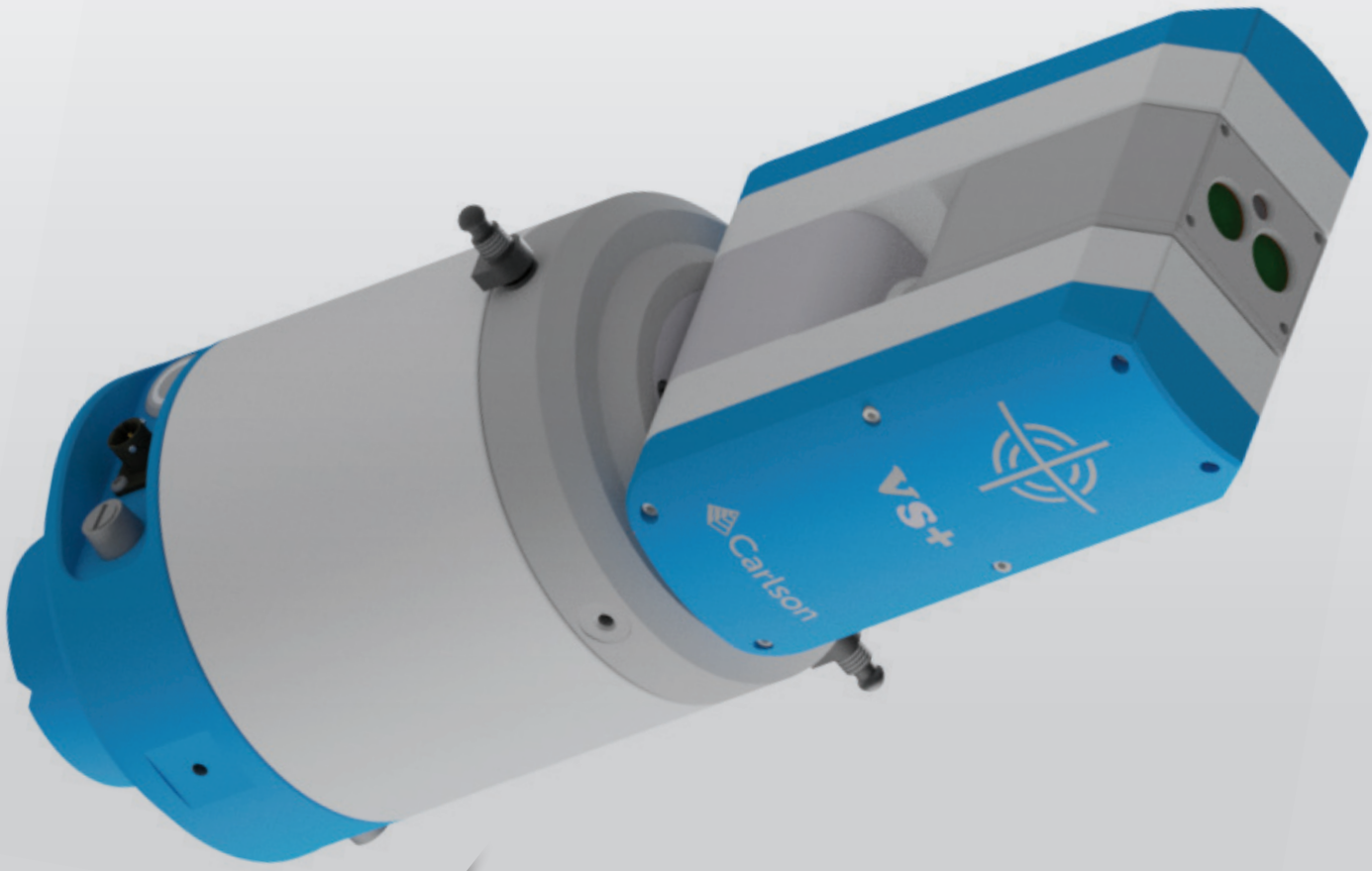
Applications for mining and civil engineering

VS solves a wide range of underground surveying challenges at a low cost, including the following:

- Gallery, void, and stope surveying
- Ore pass monitoring
- Mine design management
- End-of-shift extraction volume scanning
- Compliance, environmental, and safety management
- Underground blast planning
- Drive surveys
- Pre- and post-excavation mapping
- Storage silo volume measurement
- Project profitability/feasibility planning

The **Carlson VS+** is a survey and inspection tool designed to work in extreme environments quickly, safely, and accurately. The ruggedized **VS+** is deployed into potentially hazardous locations to map underground cavities, whilst keeping personnel safe. The information collected by the **VS+** is viewed in real time, and can give site managers the information needed to design safer and more efficient projects and solutions. The **VS+** is fully wireless: the scanning hardware incorporates an on-board battery and a wi-fi connection to a tablet computer. This makes on-site operations faster and reduces the amount of equipment and accessories required underground.

Carlson can supply the **VS+** with a dedicated boom for stope deployments and a ruggedized tablet running **Carlson Scan** software. Together, these elements comprise an integrated surveying solution which allows you to deploy the scanner, run a survey and then view and analyse data in-situ.



VISIBLE AND INVISIBLE
LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
IEC / EN 60825-1:2014

BREAK NEW GROUND

Engineered for precise, safe underground use

How VS works

The VS laser sends out infrared pulses, which reflect off solid surfaces and are received back into the probe to provide quick, precise, and safe surveying of underground voids. Distance measurements are accurate to ±5 cm and the encoders measuring the direction of the laser are accurate to 0.2°.

The scan information is corrected by internal pitch-and-roll sensors to produce real-time XYZ coordinates for each data point. This allows VS+ data to be accurately geo-referenced in the mine's co-ordinate system, and multiple scans to be stitched together. All scans can then be plotted against design drawings or as-built data to build a 3D representation of the project site.

Specialized features

Ease of use

Quick set-up and simple operation – it takes 5 minutes to unpack the system, mount to the boom, and run the software – speeding up regular stope volume surveys.

Speed of operation

Complete a full scan in 1° increments in less than 12 minutes with the 200 points-per-second scan rate, 360° horizontal scan, and vertical scan extent of 270°.

Flexible deployment

Mount the VS+ on Carlson's own boom or use accessories to mount it on an alternative customised boom, tripod, mast or crane to enable safe operation where access is limited or dangerous.

Wireless connectivity

Control the VS+ wirelessly from a position of safety (up to 50 meters if needed) with the integrated Wi-Fi module

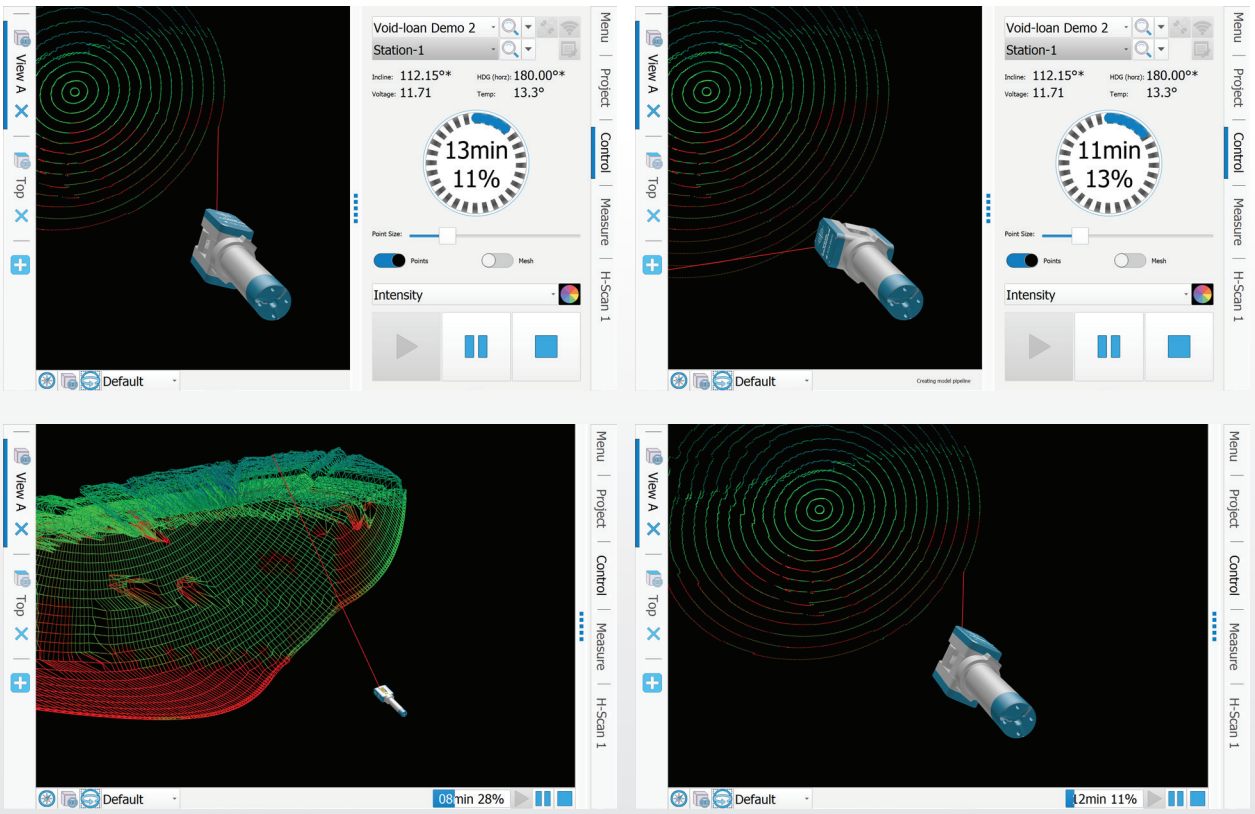
On-board power

Run the VS+ for at least 6 hours using the integrated lithium ion power source.

Multi-station project capabilities

Scan from multiple locations and view the resulting 3D data together in real time for a complete 3D representation of a mining or construction project site.

Carlson Scan software



Intuitive design and navigation

Running on a ruggedized windows tablet, and designed with an intuitive touchscreen interface, Carlson Scan software automatically connects to your VS+ and enables full remote control of the unit. Scans are displayed in real time as data is collected with both points and a solid mesh available to view. Carlson Scan's post processing tools enable you to analyse, geo-reference and edit data as required. Geo-referenced point clouds or modelled surfaces can be exported in a number of industry-standard formats for easy integration with all widely-used mining and CAD packages, including Carlson Mining software and Carlson Pointcloud software.

Tested to guarantee high performance

Developed for use underground, Carlson's VS has been subjected to rigorous environmental testing to guarantee high performance operation within specified limits of temperature, pressure, humidity, mechanical stress, and other adverse environmental conditions. Testing includes IP65 dust and water protection and performance in extremes of temperature and humidity. Inspections also include:

- Shock testing
- Acceleration testing
- Vibration testing
- Drop testing

Carlson VS+

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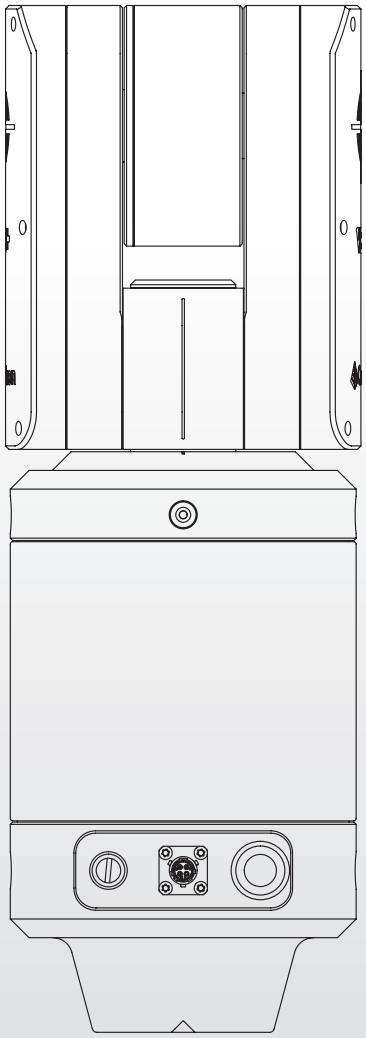
VS+		
Laser module		
Laser classification (IEC / EN 60825-1: 2014) (Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8 2019.)		Class 2*
Infrared laser module		
Type		InGaAs laser diode
Wavelength (typical)		905 nm
Divergence		< 2 mrads
Accuracy		± 5 cm**
Maximum range to a passive target* **		Up to 150 m
Minimum range		0.5m
Lens aperture size and location		18 mm location at front of module
Visible laser module		
Type		InGaAs laser diode
Wavelength (typical)		650 nm
Maximum power		<0.6 mW
Lens aperture size and location		3 mm location at front of module
Angle measurement		
Type		Opto-electronic encoder
Accuracy		0.2°
Resolution		0.1°
Range	**Vertical**	+ 135° to -135°
	Horizontal	0° to 360°
Motion		Servo-driven gear systems with manual clutches
Pitch-and-roll sensors		
Type		3-axis accelerometers
Pitch-and-roll accuracy		± 0.2°
Pitch-and-roll range		360°
Physical data		
Construction		Machined aluminium and stainless steel
IP degree of protection* **		IP65
Operational temperature range		-10 °C to 45 °C
Dimensions		437 mm (length) x 148 mm (diameter)
Weight		7.5 kg
Internal battery		14.4 V dc, 6.8 Ah lithium-ion battery
Operational		
Continuous scanning time (typical):		6 hours
Charge time:		3 hours (approx)
Wi-Fi range limit:		up to 50m line-of-sight
Control software:		Carlson Scan for Windows

* Viewing laser output with optical instruments designed for use at a distance (e.g. binoculars) may pose an eye hazard.
** To Carlson test standards
*** Environmental compatibility requirements of EN 60529:1992+Al:2002.



Carlson LMD products include:

- Cavity Auto-Scanning Laser System (C-ALS®)
- Cabled Boretrak®
- Rodded Boretrak®
- Quarryman® Pro
- Merlin
- Industrial Laser Module (ILM)
- VS+

For further information and the best possible application and performance support please contact Carlson at lasermeasurement@carlsonsw.com