# PENTAX | Scanning System S-3180V

3D laser measurement system

## Incredibly Fast, Accurate and Easy-to-use

S-3180V

TI Asahi

### ROTATING I – CAM

The camera is fully embedded within the rotor, and therefore well protected against environmental infl uences. In order to achieve a perfect image quality, even under difficult lighting conditions, the camera provides full HDR panoramic images of up to 80 Mpixel per scan.

### ROTATING MIRROR

The rotating mirror is completely encapsulated and extremely well protected from the environment. This makes the scanner ideal for outdoor use. With a maximum rotation speed of 3,000 rev/min and a maximum scan rate of 1 million pixel/sec, it is possible to do complete panorama scans at a high resolution within extremely short time.

### INTEGRATED CONTROL PANEL

Due to the high-resolution colour display with integrated touch screen the scanner can be operated intuitively. The operating manual is available in the scanner menue.

### HIGH RESOLUTION COLOUR DISPLAY

It enables the user to display the data in various views immediately after scanning.
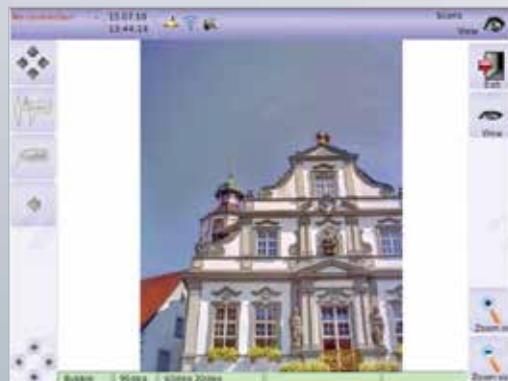
In addition, simple measurement and navigation functions can be conducted in order to guarantee quality assurance already on-site.

## USB PORTS

The scanner has two USB ports for 64 GB flash drives which are integrated into sealed closure casings. This allows external data storage on removable devices. An external hard drive can also be connected to one of the USB ports.

## LEMO CONNECTIONS

In combination with the USB ports, the external LEMO connections are used for controlling accessories. Furthermore, external sensors like a GPS receiver can be connected. The submitted time stamps can be used to synchronize the scan data precisely and be fed into the scan data stream. Digital time-stamp output signals are available as well.

## CONNECTIONS FOR POWER SUPPLY AND DATA DOWNLOAD

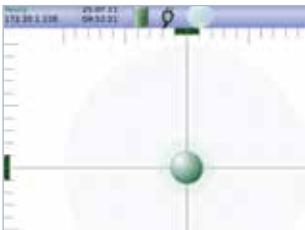These connections are located in the lower scanner part.
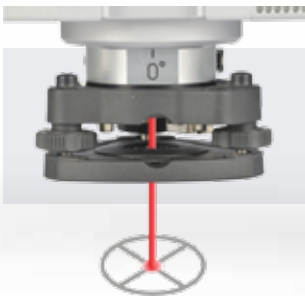
## ETHERNET/W-LAN INTERFACE

The integrated W-LAN interface allows to command the scanner using a standard web-browser (Internet Explorer, Mozilla Firefox, etc.) via the IP address.

## LASER PLUMMET

With the laser plummet, the instrument can be accurately positioned above a known physical coordinate.

## DUAL-AXIS COMPENSATOR

The built-in dual-axis compensator helps to improve the registration and supports geodetic measurement techniques, as free positioning.
The dual-axis compensator is also used as a bubble level for horizontal set-up of the scanner.

# PENTAX Scanning System **S-3180V**

**The colourful way to scan: colourfast, high dynamic and flexible.**

The PENTAX Scanning System S-3180V sets new standards for 3D laser scanning. PENTAX Scanning System S-3180V is a high-end product deriving from the evolution of the most reliable phaseshift technology. The PENTAX Scanning System S-3180V is outstanding for its incredible speed and simple operation interface allowing extreme efficiency.

### LASER CLASS 1
The PENTAX Scanning System S-3180V with a wavelength of 1.5 µm complies to laser class 1(EN 60825-1) thus the laser beam is rated harmless.

### RANGE 187 METRES
Due to the wavelength and the approved ranging system, the device operates within a maximum range of 187 m. This long range is unique for phase techology laserscanners and a new field of applications.

### HIGH-SPEED 1 MILLION PIXEL/SECOND
With a maximum measurement rate of 1,016,027 pixel/sec the PENTAX Scanning System S-3180V is one of the fastest 3D laser scanners in the world.

### RESOLUTION/QUALITY
Four different quality levels can be combined with seven resolution sets at the extremely high measurement rate. Depending on the application or objective, the optimum configuration can be chosen. In this way, it is possible to keep a high density resolution even at great distances.

### 320° X 360° FIELD-OF-VIEW
The extended 320° x 360° field-of-view yields maximum coverage.

### LIGHT AND COMPACT
The PENTAX Scanning System S-3180V is very light: 9.8 kg.  Another big advantage is its compact size: 170 x 286 x 395 mm (w x d x h).

### INTUITIVE OPERATING CONCEPT
The touch screen display, with an intuitive menu system offers the user a great deal of information and useful features, that are easy and clear to use because of the intuitive operating concept.

### QUICK-SCAN FEATURE
The quick-scan button only needs to be pressed twice to start the pre-defined standard scan. The entire start phase takes only a few seconds.

### 100% STAND-ALONE
The stand-alone principle has been improved. The scan data can be stored on two removable USB flash drives and on an internal flash card. The colour display allows visual control of the scan with zoom and basic measuring functions.

### HIGH QUALITY DATA
The PENTAX Scanning System S-3180V distinguishes through highest precision in angle and distance measurement. The low noise level conserves highest quality of data even on difficult surfaces and long ranges. The typical high accuracy within millimeters can be achieved even at the highest data capture rates.

### ENCAPSULATED MIRROR
The laser beam is reflected by a rotating mirror which can reach a speed of up to 50 rev/sec. This mirror is enclosed in a patented body with protective glass. A high degree of quality, robustness and durability is guaranteed.

### COMPLETELY INTEGRATED COLOUR CAMERA
A very low-noise colour CMOS camera has been installed in the rotor. The lens and camera type have been carefully selected to produce low noise and highquality images in any lightning environment. Sophisticated postprocessing algorithms yield HDR colour images for perfect colour even under the most difi cult lighting conditions.

# Accessories

**Every S-3180V laser scanner comes complete with an accessory case that includes the following items:**

- 1 extra battery pack
- 1charger cradle
- 1 battery charger
- 1 Ethernet cable
- 1 power cable
- 1 extension cable
- 1 license of Software LRC Elements

The hard case ensures the safe storage of the accessories

**For the registration of several scans in one project, there are various target types available.**

PaperTarget

The typical PaperTargets can also be employed with the PENTAX S-3180V.

Profi Target

The PENTAX Profi Targets can be rotated two-axially around the target centre for perfect alignment to the scanner position.

AutoTarget

The PENTAX AutoTargets offer the fastest way of registration since they are automatically recognized in the scan by the software. Numbering also takes place automatically with the integrated code ring.

Whichever target is used, the software automatically recognizes the target centre to an accuracy of less than one pixel.

In addition, it is possible to include tachymetry data for georeferencing, and it is possible to increase accuracy of registration through bundle adjustment.

The aluminium tripod is very light and easy to handle. Its stability gives suitability for various uses-. The quick-release clamps make it very easy to adjust the height and to quickly assemble and dismantle it. A dolly ensures maximum mobility.

# Technical Data

**Compact high-speed phase-based laser scanner with great precision, range and spherical field of view. Unique stand-alone concept with integrated battery and colour display with touch screen. Built-in dual-axis compensator and laser plummet.**

**Laser system**

| Laser class | 1 | | |
|---|---|---|---|
| Beam divergence | < 0.3 mrad | | |
| Beam diameter | Approx. 3.5 mm (at 0.1 m distance) | | |
| Range | 187.3 m (unambiguity interval) | | |
| Minimum distance | 0.3 m | | |
| Resolution range | 0.1 mm | | |
| Data acquisition rate | Max. 1.016 million pixel/sec. | | |
| Linearity error [1] | ≤ 1 mm | | |
| Range noise | Black 14 % | Grey 37 % | White 80 % |
| Range noise, 10 m [12] | 0.5 mm rms | 0.4 mm rms | 0.3 mm rms |
| Range noise, 25 m [12] | 1.0 mm rms | 0.6 mm rms | 0.5 mm rms |
| Range noise, 50 m [12] | 2.7 mm rms | 1.2 mm rms | 0.8 mm rms |
| Range noise, 100 m [123] | 10 mm rms | 3.8 mm rms | 2.0 mm rms |
| Temperature drift | Negligible | | |

**Deflection unit**

| Vertical system | Completely encapsulated rotating mirror |
|---|---|
| Horizontal system | Device rotates about its vertical axis |
| Vertical field of view | 320° |
| Horizontal field of view | 360° |
| Vertical resolution | 0.0004° |
| Horizontal resolution | 0.0002° |
| Vertical accuracy [1] | 0.007° rms |
| Horizontal accuracy [1] | 0.007° rms |
| Rotation speed | Max. 50 rps (3,000 rpm) |

**Deflection unit**

| Angle resolution | Pixel/360° horizontal & vertical | Scan duration | | | |
|---|---|---|---|---|---|
| | | Less quality [6] | Normal quality [6] | High quality [6] | Premium quality [6] |
| "preview" [4] | 1,250 | --- | 0:26 min | --- | --- |
| "low" | 2,500 | 0:26 min | 0:52 min | 1:44 min | --- |
| "middle" | 5,000 | 0:52 min | 1:44 min | 3:22 min | 6:44 min |
| "high" | 10,000 | 1:44 min | 3:22 min | 6:44 min | 13:28 min |
| "super high" | 20,000 | 3:28 min | 6:44 min | 13:28 min | 26:56 min |
| "ultra high" [5] | 40,000 | --- | 13:28 min | 26:56 min | 53:20 min |
| "extremely high" [5] | 100,000 | --- | 81:00 min | 162:00 min | --- |

**Miscellaneous**

| | |
|---|---|
| Dual-axis compensator | Resolution: 0.001°<br>Measurement range: +/- 0.5°<br>Accuracy: < 0.007°<br>Selectable on/off |
| Laser plummet | Laser class: 2<br>Accuracy of plummet: 0.5 mm/1m<br>Laser point diameter: < 1.5 mm at 1.5 m |
| Levelling display | Electronic level in onboard display and LRC |
| Communication | 1GB Ethernet/W-LAN |
| Data storage | Internal 64 GB fl ash card, 2 x 64 GB USB external flash drive |
| Data transmission | Ethernet or USB 2.0 |
| Integrated control panel | Touch screen with colour display |
| Interfaces | 2 x USB, LEMO 9-pin und LEMO 7-pin connections for<br>and external sensors like GPS, odometer, etc. |

**Power supply**

| | |
|---|---|
| Input voltage | 24 V DC (scanner) ; 100 – 240 V AC (power unit) |
| Power consumption | < 65 W (on average) |
| Operating time | > 3 h (internal battery) |

**Ambient conditions**

| | |
|---|---|
| Operating temperature | -10 ℃ … +45 ℃ |
| Storage temperature | -20 ℃ … +50 ℃ |
| Lighting conditions | Operational in all conditions, from sunlight to darkness |
| Humidity | Non-condensing |
| Protection class | IP 53 |

**Dimensions and weights**

| | |
|---|---|
| Scanner | |
| Dimensions (w x d x h) | 170 x 286 x 395 mm |
| Weight | 9.8 kg |
| Battery | |
| Dimensions (w x d x h) | 170 x 88 x 61 mm |
| Weight | 1.2 kg |
| AC power unit | |
| Dimensions | 35 x 67 x 167 mm |
| Weight | 0.54 kg |

**HDR camera**

| | |
|---|---|
| focus area | 1 m - ∞ |

**Panorama compilation**

| | |
|---|---|
| Image count for panorama | 42 |
| Recording time (depend on the environment exposure) | ca. 3:30 min. |
| Panorama resolution | ca. 80 MPixel |

1. Detailed explanation on request
2. Data rate 127,000 pixel/sec (equivalent to "high resolution / high quality" scan), 1 Sigma range noise, unfi ltered raw data, in high power mode
3. All values extrapolated
4. Resolution not recommended for exact measurements, only for positioning higher resolution scan selections!
5. Only recommended for scan selections because of the enormous amount of data
6. Doubling ("less quality") or halving ("high quality") the data rate (pixel/sec) theoretically increases the range noise on each pixel by 40% ("less quality") or decreases it by 40% ("high quality"), compared to "normal quality". Depending on the roughness of the surveyed surface, in the field this difference might result less, especially when scanning objects with a bright surface at short distances, e.g. indoors.

# PENTAX Scanning System **S-3180V**

# High Precision and Flexibility

**The new PENTAX Scanning System S-3180V is highly precise, reliable and flexible. These improvements can be appreciated in your daily work.**

The technical specifications of the S-3180V set new standards in the field of 3D laser scanning. Its enormous scanning speed, extended range of 187 m and low weight make it the perfect choice for countless applications.

Meeting laser class 1 requirements, the S-3180V can be used without restriction in almost any environment. This makes the scanner an interesting option from heritage even to busy environment applications.

Due to the laser scanner's low weight and unique stand-alone concept, it can also be employed in areas difficult to access like industrial plants or forests. Having the protection class IP 53 means that the device is protected against splash water and dust.

The extremely fast scanner makes it possible to work efficiently on-site. Scans can be completed in very short time, depending on the requirements.

At the scene of an accident, for example, all the relevant data can be gathered very quickly without interrupting the work of the police or rescue teams. Downtimes of production plants can similarly be reduced to a minimum.

The S-3180V can also take colour images without any set-up times.



Town hall Wangen in Allgäu in 3D view

Photo-realistic coloured scan with the i-Cam of the townhall Wangen

# Integrated i-Cam

**The PENTAX Scanning System S-3180V has always been known for its outstanding laser scanners worldwide. It has always been our goal to acquire data as fast as possible with a maximum of data-quality and a minimum of user effort.**

These objectives have guided the development of the S-3180V. The integrated camera works very well in all environments. One focus is to always provide realistic panoramas. To make the operation as user friendly as possible, the i-Cam is fully integrated into the S-3180V.

## HIGH DYNAMIC RANGE TECHNIQUE (HDR)

At each position, several images with different exposure times are taken (called bracketing).
The HDR image is generated from an exposure series, and therefore more lifelike than a single recorded image with only one exposure time.

## SCANNING PROCESS

While scanning the user only selects the i-Cam. No further adjustments have to be made.

## GENERATING COLOUR-SCANS

The generation of colour scans is realized within our software LaserControl. A special HDR method has been developed for the i-Cam. This method yields a high dynamic-range-image directly from the input images.

To colourize one panoramic laserscan, 42 HDR images are generated and stitched to a complete HDR panorama. HDR image processing and colour mapping to laserscans are performed fully automatically for the entire project in batch processing.
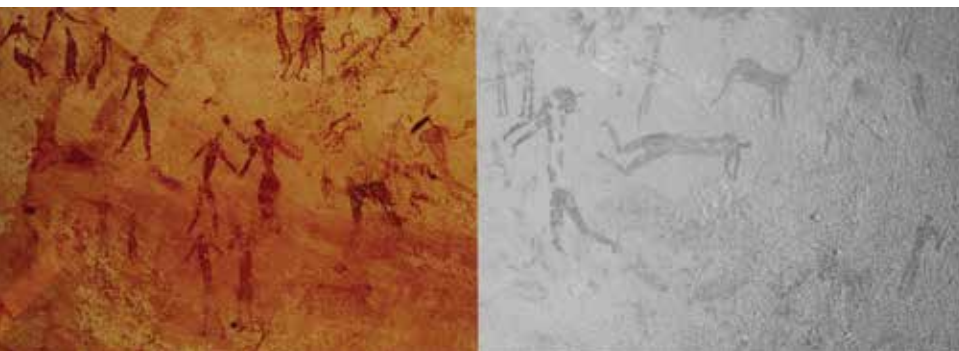
Photo-realistic forest image with i-Cam

# Applications



3D point cloud of a burnt restaurant

## INSURANCE

The high resolution allow the S-3180V to "freeze" scenes rapidly for later analysis and in extraordinary quality. In this case, the data serves mainly for preserving evidence and documenting damage. This leads to great time savings for accident reconstruction and many other insurance purposes.



BubbleView® in LFM

## INDUSTRY

S-3180V extreme speed reduces downtimes of industrial plants to a minimum. The high level of detail facilitates modeling of extraordinary accuracy. This enables a subsequent comparison between the revamp design and the as-built site. The scanner can also operate in a temperature range of -10 °C to +45 °C.



Cave paintings in Wadi Sura

## ARCHAEOLOGY

The S-3180V is the perfect choice on archaeological sites. Large areas can be mapped with only one or two scans, resulting in detailed three-dimensional true-scale models.
The integrated i-Cam can be used to capture colour information. Compared to conventional methods, much time can be saved. Unrivaled levels of precision can be achieved.

# Applications



Photo-realistic scan of a old bridge with the HDR Cam

### CULTURAL HERITAGE

The PENTAX Scanning System sets an impressive record in this field because of its contact-free, and above all rapid measuring ability. This reduces costs tremendously in comparison to traditional measurement systems. The integrated i-Cam enables the whole point cloud to be coloured, which gives a photorealistic impression of a scan with a high level of detail.



Coloured scan with the integrated HDR Cam

### ARCHITECTURE

The 3D phase based laser scanner S-3180V enables a detailed condition and damage assessment of the current status of a building or complex structure and its surroundings. From the 3D data it is easy to create 2D floor plans or views of the object to plan building or conversion projects.



Helicopter crash Regional CID Baden-Württemberg

### FORENSIC SCIENCE

The decisive advantage of the S-3180V in forensics is the immense speed. The crime scene can be documented holistically without interfering with the running investigation. The high resolution enables to capture even inconspicuous details being preserved as evidence.

# LaserControl Software

**LaserControl provides all necessary tools to manage your scan jobs efficiently. It is a unique software solution with complete workflow from data capturing to delivery. Three different software packages are available for getting the ideal solution according to your needs.**

**Elements**

LaserControl **Elements** is the freedom to view and browse your point cloud data without any cost. Besides checking the accuracy status of the device callibration, basic measurement functions are implemented. Furthermore it is the key to access and operate all products of the entire PENTAX Scanning System family.

**Professional**

LaserControl **Professional** is the standard solution for common use with every laser scanner of the PENTAX Scanning System. A suite of filters allow differentiated preprocessing of scan data and are the key to a highly accurate registration. By adding colour information with the included colour module the scan data is ready for post-processing through a wide range of export formats. Naturally all LaserControl Element features are included. In addition the Kinematic function gives extended usability for profiling applications.

**Professional PLUS**

LaserControl **Professional PLUS** provides extended functions for registration, additional data visualisation and project managment tools. Both Cloud-to-Cloud and Plane-to-Plane registration decrease the need for targets dramatically. Saving time in the field and in the office are striking benefits of these future orientated registration tools. Furthermore fly throughs can be generated, simulated and saved. Your static imagery can be rectified and printed to scale. The relocation of misplaced data with the mirror filter is the right tool to bring your point clouds to perfection. Finally the linktool offers you best usability for project managment.

## COLOUR

An ideal starting point for visualising objects is obtained by combining 3D data with digital photgraphy. The documentary value of the colour data is important for many applications. The colour images are projected onto the point clouds and provide a photgraphic impression of the object in 3D.

## FORENSICS

The forensics modul is a clientspecific product design that also equates the high requirements from the German police. Using 3D data enables investigators to visualise the crime scene and adjust the storyline.

## IMPORT/EXPORT

A great variety of import and export formats are supported by LaserControl. As well as many ASCIIbased exchange formats, the new binary stand ard formats OSF, PTG and ASTM-E57 can also be used for export.

# LFM Software

LFM is hardware and software vendor neutral. It accepts data from all 3D laser scanners and exports to 3D integrated plant design systems CAD and Review platforms.

Whether you are a service provider looking for fast database generation, an owner operator looking for an effective asset management tool, or a designer working on the latest process plant for a major oil and gas multinational company,
the use of LFM Software brings business benefits to brownfield and as-built documentation projects.

LFM software users can benefit from an open system without compatibility restriction. LFM aims to be neutral on both ends: neutral with respect to capture devices and neutral with respect to CAD and modelling technologies. Surveyors and service providers can use LFM to create any number of CAD deliverables. Engineering companies and Owners/Operators can work with LFM laser scan data in CAD packages from Autodesk, AVEVA, Bentley, Intergraph or VR Context.

LFM is compatible with the latest PENTAX Scanning System generation and also accepts 3D laser scan data from previous generations and other hardware systems. This has cost saving implications for LFM customers. If the hardware system changes, the software solution does not, avoiding expensive switching costs.

LFM is driven by the BubbleView®. Make annotations and measurements, create 3D models and view clashes in the BubbleView®.

LFM is a powerful 3D laser scanning software package, which is relevant throughout the laser data and asset lifecycle.

### THE LFM SUITE

**LFM Register**
LFM Register™ allows users to take raw data from individual 3D laser scanning positions and bring them together into a fully co-ordinated framework faster and more efficiently than any other package.

**LFM Server**
Bring laser scan data into any number of leading CAD packages. Create a database containing an unlimited number of high resolution scans using Infinite Core™ technology. Automatically detect clashes between a CAD design and as-built laser scan data.

**LFM NetView**
LFM NetView provides users with comprehensive and easy-to-use tools to help projects collaboration even when multiple users are in different part of the world.

**LFM Modeller**
Rapidly produce 3D CAD models from as-built laser scan data with only a few clicks, and export their intelligent 3D model creations into a wide range of target CAD systems.

# PENTAX

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The CE marking assures that this product complies with the requirements of the EC directive for safety.

ISO
ISO 9001:2008

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