# How to find a good handheld 3D laser Scanner

# SHINING 3D

**Scanner**
FreeScan UE



**Overview**

FreeScan UE, the blue laser handheld 3D scanner of FreeScan series, adopts the characteristic features of high accuracy and stable repeatability, together with ergonomic and portable device design. It is excellently used in industries such as automotive, transportation, aerospace, mold inspection, power generation and mechanical engineering for metrology high-precision inspection solutions.

When choosing a handheld 3D laser scanner, we often judge its quality mainly depending on the parameters, especially on accuracy. However, accuracy is only part of the essential parameters. Another crucial feature, which usually does not appear in a parameter table, is repeatability. The aspect of repeatability completes the final performance overview of a 3D scanner. To showcase the importance of repeatability in the process of selecting the suitable product for your specific application we are going to elaborately examine the brand-new FreeScan UE handheld 3D laser scanner as an example to perform a thorough product analysis.
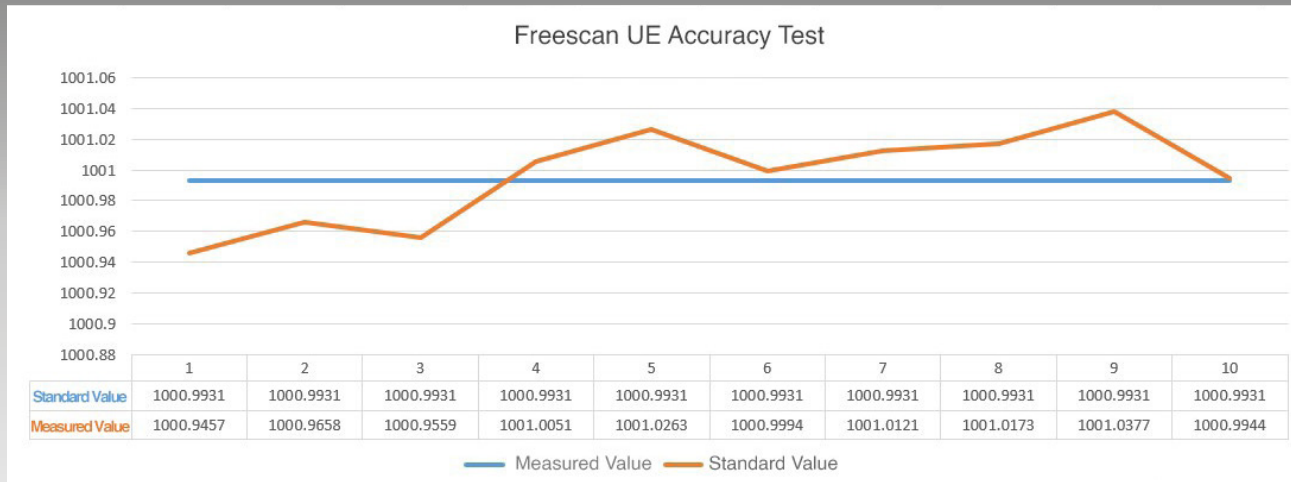


## 01 Precision

Accuracy is a very important parameter when it comes to 3D scanning and 3d metrology. When measuring, the difference between the actual measured value (or the average value of the measurement) and the real value is called error. The smaller the error, the better the accuracy.

The FreeScan UE laser handheld 3D scanner adopts the Global Registraion Error Control (GREC) algorithm developed by SHINING 3D, which can achieve an accuracy of 0.02mm and a volume accuracy of 0.02mm+0.04mm/m according to VDI/VDE testing standards. It can meet the inspection requirements of various application scenarios.

## Accuracy check

According to the VDI/VDE validation standard, FreeScan UE was used to scan the standard bat ten times. The obtained data were imported into the measurement software and the spherical distance of each measurement was compared to the standard values of the bat. The results of the comparison are shown below.



### Freescan UE Accuracy Test

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard Value | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 | 1000.9931 |
| Measured Value | 1000.9457 | 1000.9658 | 1000.9559 | 1001.0051 | 1001.0263 | 1000.9994 | 1001.0121 | 1001.0173 | 1001.0377 | 1000.9944 |

— Measured Value — Standard Value

Note: The standard spherical distance of the bat is certified by a certification body.

It is obvious to see that the maximum deviation is 0.0474 and the minimum deviation is 0.0013mm by the results of the ten measurements of FreeScan UE, which indicates an excellent level of accuracy.

## 02 Repeatability

Accuracy of measurement includes not only accuracy, but also the precision of the measurement. We often focus on accuracy and tend to overlook precision. Precision refers to the degree of conformity between values measured under the same conditions repeatedly, which is also referred to as repeatability.

The accuracy of a scanner can be exemplified as an archer. Only when the archer is able to hit the bullseye and keep that hit rate every time he shoots,he be considered a good archer. Accuracy can be referred to as the deviation between each hit and the target, while precision describes the deviation between multiple hits. The following figures shows the difference between accuracy and precision intuitively.
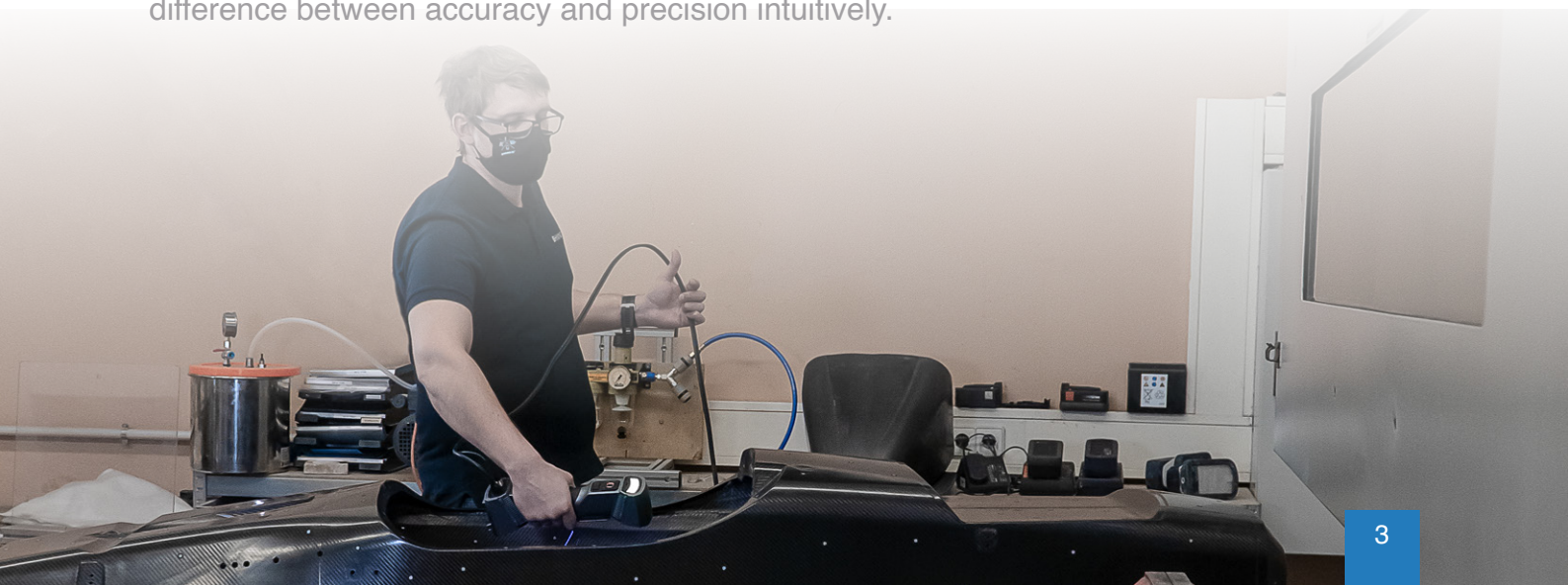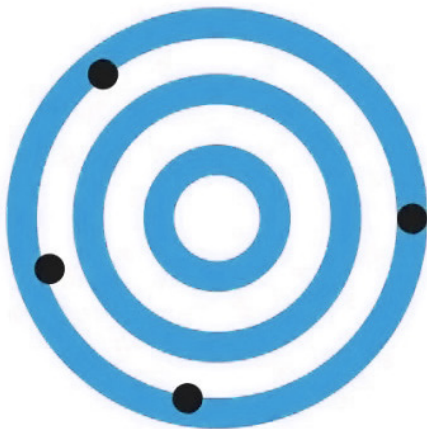
**1 Low Accuracy, High Precision**

Figure 1 demonstrates a low accuracy with high precision. The target is hit in a central position, but is farther away from the bullseye. Analogous to a 3D scanner this picture indicates that the equipment is not very accurate, but the measurements is stable within a certain range.
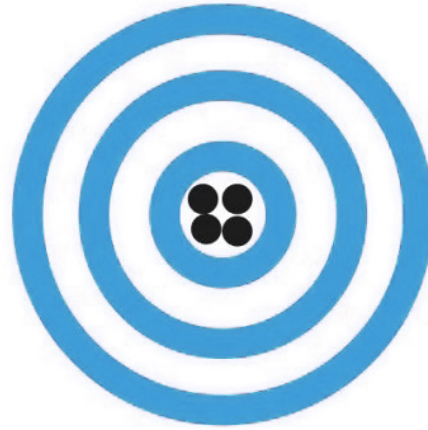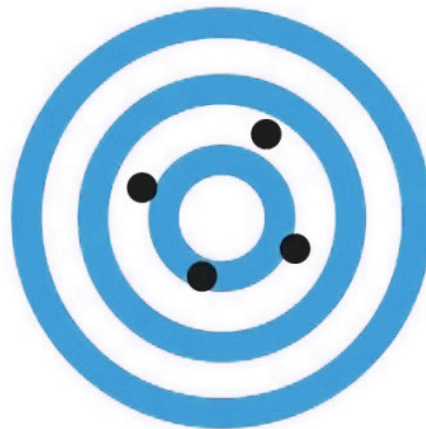


**2 High Accuracy, High Precision**

Figure 2 demonstrates a high degree of both accuracy and precision by multiple hits in the bullseye. Analogous to a 3D scanner this figure indicates that the 3D scanner is accurate and precise in its measurements and performs well.



**3 Low Accuracy, Low Precision**

Figure 3 shows a low level of accuracy and precision. All the points are scattered and far away from the bullseye. A 3D scanner with these attributes is neither accurate nor precise.



**4 High Accuracy, Low Precision**

Figure 4 shows a high degree of accuracy and a low degree of precision. The hit locations are all close to the bullseye, but very dispersed. A 3D scanner with these attributes shows that the measurements are accurate but unstable.

## Measurement of repeatability

The measuring method of repeatability is very intuitive, which is simply performing multiple measurements of the same parts. In the accuracy verification above, we can come to the conclusion that, through comparison between the spherical distance of the bat and the standard value, FreeScan UE handheld 3D laser scanner could keep the deviation in ten measurements within 0.0013mm - 0.0474mm.

The engineer again carried out the measurement of two sample parts, the scanned data was imported for deviation analysis. The chromatogram showed that: When FreeScan UE scans the same piece multiple times, the measurement results are stable and reliable, and are not influenced to much by operation and state of the device.
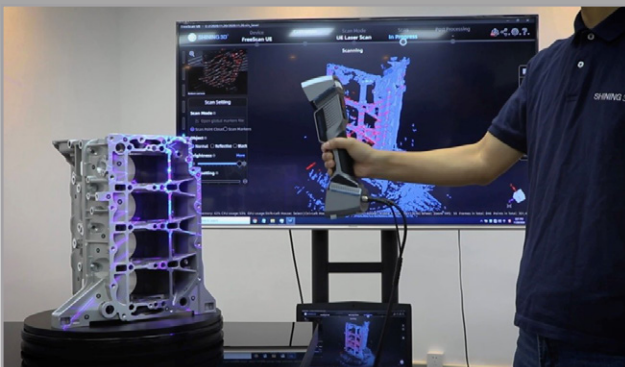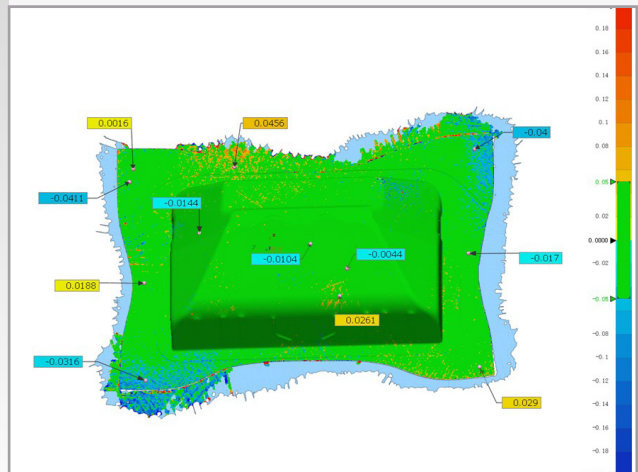


Sample part: 40cm X 40cm



Dimensions: 1360mm X 930mm X 308mm
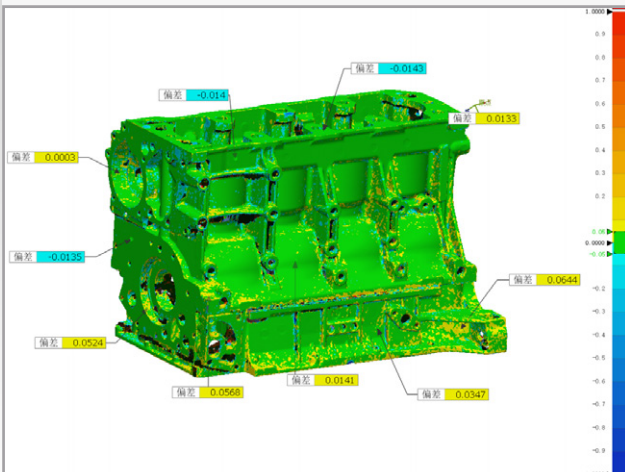


Deviation analysis chromatogram



Deviation analysis chromatogram

## 03 Smoothness

The smoothness and efficiency of the scanning process is crucial for the experience of using a 3D scanner. This can be intuitively evaluated in an on-site scanning.

The FreeScan UE laser handheld 3D scanner can reach a maximum scanning area of 510mm*520mm, combined with intelligent algorithms, enabling it to obtain high-quality scan data of large sample parts fast and smoothly.

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## Smoothness check

This time we performed a check over smoothness during scanning a car with shiny black surface. Before the scan, we spent about 5 minutes pasting marker points on half of the car body. No powder pre-treatment is required and the surface can be scanned directly. Free-Scan UE scan took about 7 minutes to complete the scan of half the car surface.



## 04 Portable and light-weighted

With the continuous improvement of 3D scanning technology and the diversification of application scenarios, the requirements for the convenience of operating the device are constantly increasing.
The FreeScan UE laser handheld 3D scanner is designed based on improving user-experience. While concentrating on the performance of the product, it also fully considered the weight of the equipment. With only 670g of weight the product adapted a lightweight design, together with an airline case, you can easily carry the device anywhere.
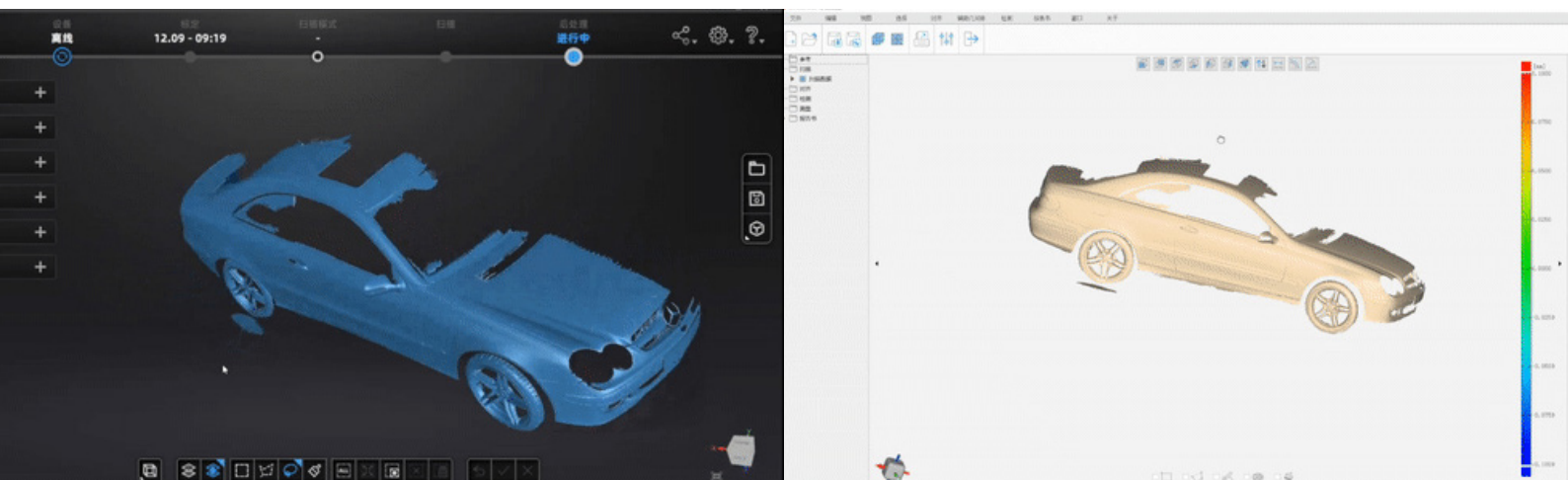
## 05 Degree of compatibility with Inspection software

In the process of using the 3D scanner, the degree of matching and compatibility with the inspection software will affect the experience of using the scanner, which have gradually become a criterion of assessing the 3D scanner.

As a good assistant for industrial inspection, the FreeScan UE laser handheld 3D scanner supports seamless docking of the scanned data with the inspection software. After the completion of the scan, click on the icon on the right side of the software, you can directly import the scanned data into the optional inspection software, saving time and increasing efficiency. (Note: the optional inspection software needs to be installed and set up on the same computer)

In general, the performance assessment of the handheld 3D laser scanner mainly depends on the aspects mentioned above: accuracy is the core standard, but repeatability should also be taken into consideration; the smoothness of scanning process, the convenience of use and the compatibility with the inspection software are also important criteria that affects the subsequent user experience. Of course, due to different use scenarios, the assessment of the 3D scanner will be different. In this equipment analysis, we once again see the good performance of the FreeScan UE laser handheld 3D scanner!

## About SHINING 3D

Since its founding in 2004, SHINING 3D has pioneered independent research and development of 3D digitization, inspection and digital dentistry technologies; SHINING 3D holds over 300 patents and more than 100 copyrights in these fields. As one of the market leaders, SHINING 3D provides production-ready 3D products, advanced 3D digital technologies and comprehensive service to its global customers. SHINING 3D's mission is to improve the efficiency of working with 3D structures, enable flexible manufacturing technologies for very high performance, complex structures, and make 3D digitizing and 3D inspection technologies accessible to everyone.