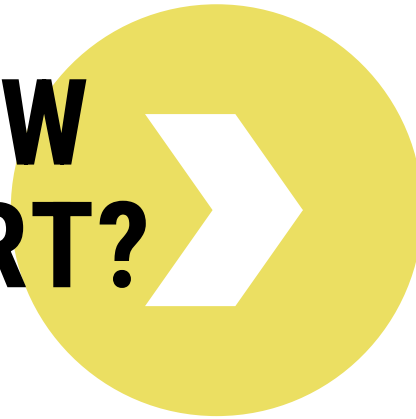


3D SCANNER BUYER'S GUIDE

WHAT YOU NEED TO CONSIDER
WHEN PURCHASING A 3D SCANNER



INTERESTED IN PURCHASING A 3D SCANNER BUT DON'T KNOW WHERE TO START?



The goal of this book is to help you define what you need in a 3D scanner. It guides you through the process of developing a list of criteria most important to you when comparing and evaluating 3D scanners for purchase. By reflecting on your needs, it will make your purchasing process a much easier experience.

QUESTIONS TO ASK YOURSELF WHEN BUYING A 3D SCANNER

Purpose

What are you trying to achieve with 3D scanning?

Scan Object

What are you looking to scan?

Scan Results

What type of accuracy, resolution, and speed are you looking for?

Software

What software do you need for your application?

User

Who is using the scanner?

Budget

How much are you willing to spend on a 3D scanner?

1 PURPOSE

What are you trying to achieve with 3D scanning?

A good way to determine what you need in a 3D scanner is to think about what you want to achieve and then work backwards. Typically, 3D scanning is only the first part of the project for collecting 3D measurements (x,y,z coordinates) from an existing object. Once all measurements are captured, the scan data is used in a range of industry applications.



INDUSTRY APPLICATIONS GENERALLY FALL UNDER THE FOLLOWING CATEGORIES:

Reverse Engineering

Building CAD models from scan data

Scientific Measurement

Monitoring measurement changes over time

Rapid Prototyping or Additive Manufacturing

High quality 3D printing for commercial applications

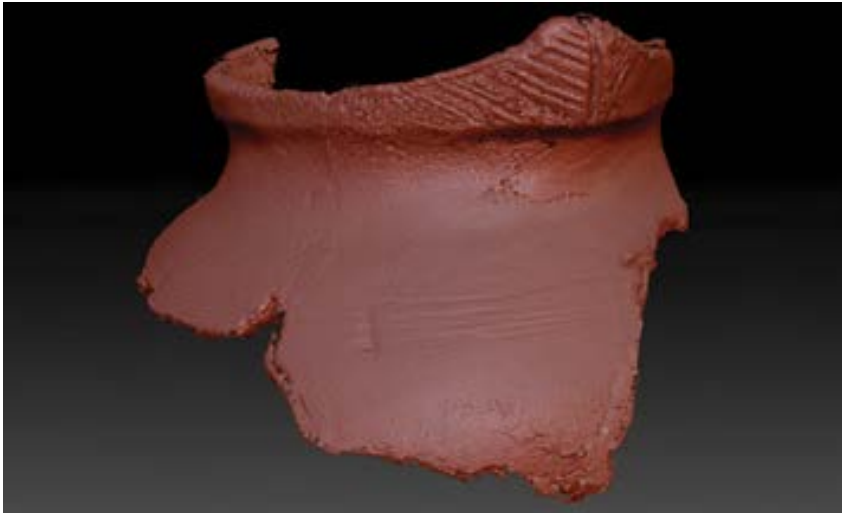
3D Visualization

Modeling objects by referencing an existing object rather than creating from scratch for viewing, replicating, or digital archiving purposes

Inspection or Metrology

Comparing measurements and verifying parts against a standard (CAD Model)

Knowing your ultimate goal gives you better clarity on what criteria matter most when searching for a 3D scanner.



Archaeology Example - Preserving History

If you are looking to digitize a set of artifacts from a museum that are delicate and cannot be handled, non-contact 3D scanners using structured-light technology are a better choice because they capture measurements of an object without any physical contact compared to a contact 3D scanner such as a portable CMM. Another important factor might be capturing the color of the artifacts to preserve their true likeness. In that instance, you would need a 3D scanner that captures color scans from objects.

2 SCAN OBJECT

What are you looking to scan?

In 3D scanning, the field of view (FOV) is the observable area that the scanner can capture a 3D scan at a certain distance. Typically, a 3D scanner has a specific FOV for scanning objects of a particular size. For this reason, the size of the scan object will influence the type of scanner you will need.

SMALLER OBJECTS

Surface Metrology Scanner

Measures small-scale features on surfaces such as surface waviness, roughness, defects, and wear.

Examples:

textile structures, paper embossing, solder pads, road surfaces, wood grain, surface finish

Macro 3D Scanner

Measures small objects with high resolution detail and accuracy.

Examples:

small jewelry, screws and bolts, small insects, dental molds, electronic components

LARGER OBJECTS

General 3D Scanners

Depends on the scanner but limited to a certain size of FOV ranging from approximately four inches to three feet. Multiple scans can be stitched together for digitizing objects larger than the FOV.

Examples:

car parts, front of car, mechanical parts, sculptures, faces, body, body parts (hands, feet, ears), consumer products

People generally use a 3D scanner for scanning similar objects for a particular purpose so having a FOV restriction would be fine. If you are looking for a versatile solution that scans different object sizes, there are flexible 3D scanners where the FOV can be adjusted to scan different size parts.

Object Characteristics

Each scanner has its strengths for scanning certain types of objects so it's best to know the objects' features you are planning to scan. Portable CMMs (contact measurement devices) are effective for scanning objects that have hard edges such as sheet metals. However, using contact measurement devices to measure parts with complex organic shapes can be a challenge. Structured-light 3D scanners are great at measuring extremely complex surfaces and organic shapes in addition to mechanical parts.



⤴ An organic object is defined as having a freeform shape (left) compared to an object with straight edges or lines (right).

3 SCAN RESULTS

What type of accuracy, resolution, and speed are you looking for?

Accuracy, resolution, and scan speed have a direct relationship with the 3D scanner price. People typically want the best of all these factors but most of the time it's not necessary. Get only the accuracy, resolution, and scan speed that is suitable for your application or you end up paying more for what you don't need.

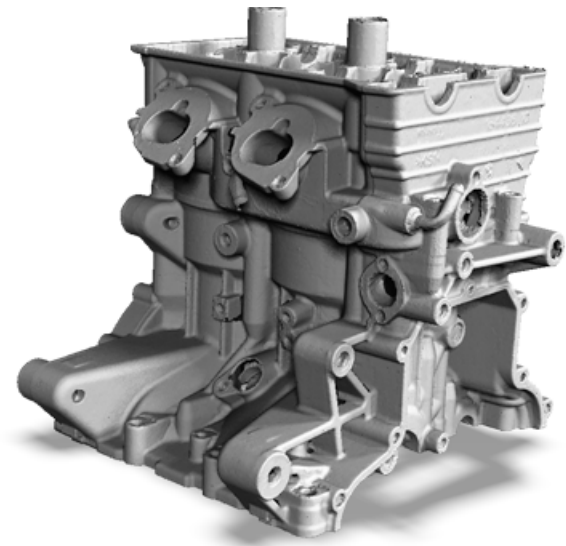
Accuracy

Accuracy is how true a measurement is to the real value. All measurement devices are not perfect and can never achieve the true measurement value of the object. It's a matter of how much you need to get to the true value. Some applications don't require highly accurate 3D scans, while in other applications accuracy is critical.



LOW ACCURACY

Creating products as 3D models for viewing for an ecommerce store



HIGH ACCURACY

Inspecting car parts where defects have dire consequences

Resolution

Resolution is how much detail you require in a scan. Similar to accuracy, you should get the resolution you are comfortable with for your application.



LOW RESOLUTION

Routine inspection of identical parts measuring simple, straightforward features



HIGH RESOLUTION

Scanning faces for modeling characters in video games or movies.

Scan Speed

Scan speed (acquisition speed) refers to how fast a 3D scanner can capture a scan. This is important for two things. Firstly, if you need to scan parts in high volume scan speed will reduce scanning time. Secondly, for face or body scanning applications you need a fast scanner as people have a tendency to move due to breathing. Movement causes bad scans.

SLOWER SCAN SPEED

Scanning stationary objects

FASTER SCAN SPEED

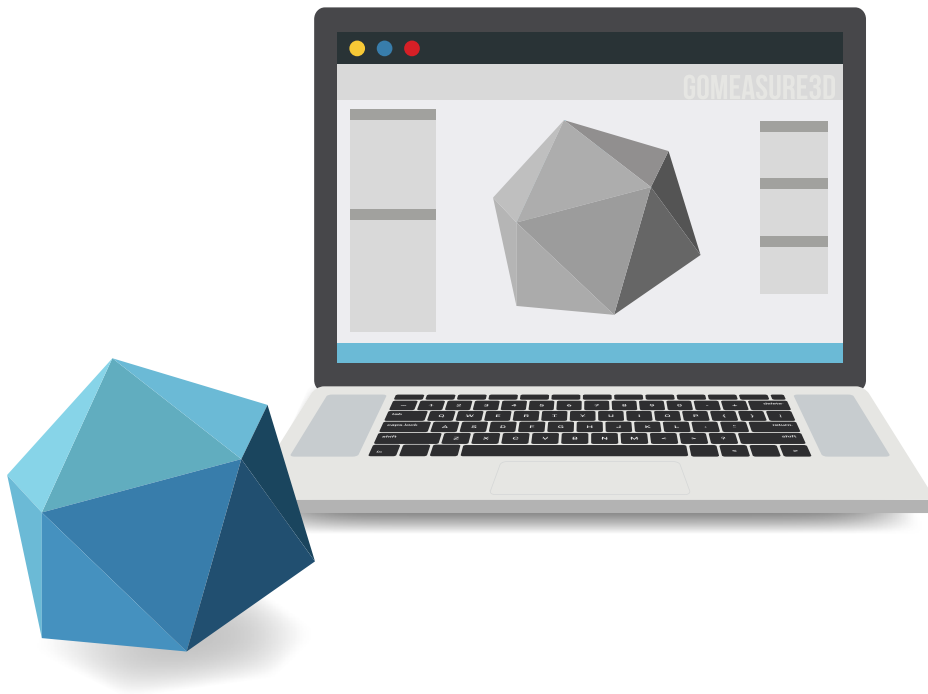
Scanning People

Scan processing speed is equally important and it refers to the time it takes for images taken of the object to be processed into a 3D scan. The scanner's software handles the scan processing side of things. The more powerful the software, the better it is at handling 3D scan data which we will explore further in the next section.

4 SOFTWARE

What type of software do you need for your application?

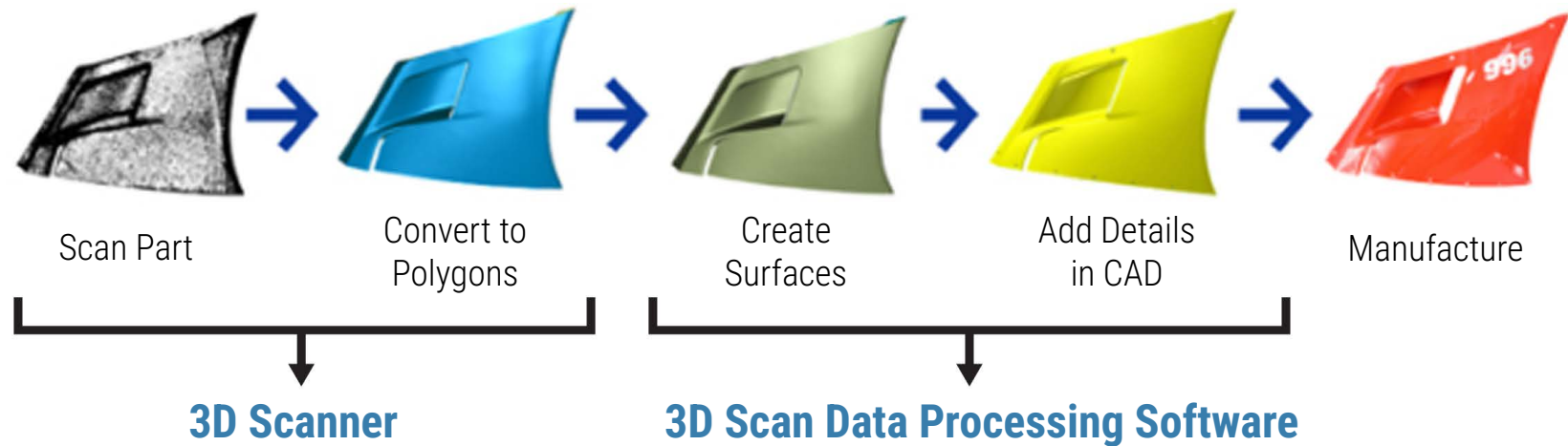
A factor often overlooked when evaluating 3D scanners for purchase is the software that comes with the system. The software greatly impacts the user experience.



3D scanning software have come a long way. Before, software that comes with the 3D scanner typically deals only with acquisition and visualization of the scan data. Modern 3D scanning software now handles post-processing of scan data into useable form. Additional capabilities of doing basic post-processing of scan data—hole-filling, cleaning, aligning and merging scans into a 3D model—are readily available in most 3D scanning software.

Some 3D scanners even have basic features for reverse engineering and inspection applications. Separate post-processing software package is available if you require advance features.

On most occasions, basic applications such as 3D visualization doesn't require additional software outside the scanner's software if it can transform scan data into complete 3D models. Having more functionality inside the scanner's software can save time, money and create a better 3D scanning experience.



- Reverse engineering workflow from 3D scan data to 3D CAD modelling. 3D scanners output point cloud or polygon mesh. A separate software is required to convert scan data to CAD model.

For downstream applications requiring more than just the basic post-processing, you will need to get an advanced post-processing package that specializes in performing specific industry tasks.

Reverse Engineering Software:

Ability to take scan data to CAD models

Examples: Geomagic Design X or Wrap, QUICKSURFACE

Inspection Software:

Ability to take scan data and compare it against the required tolerance and generate analytical reports

Examples: Geomagic Control, ZEISS INSPECT

Scientific Measurement Software

Ability to take scientific measurements on specimens (ie. bone and muscle tissues) and have a record of the data.

Examples: Rhino or Scantools

It's important to discuss with your vendor to see what type of software you need for your particular application.

The Importance of Having a Powerful Computer

The computer should not be an afterthought upon purchasing a 3D scanner. 3D scanning requires a powerful computer to process the scan data, whether it is a workstation or a laptop. Having a weak computer can cause lagging issues. Ask your vendor for the computer requirements required to run a scanner at its optimal performance.

5 USER

Who is using the scanner?

3D scanning is a specialized skill. The user is key in determining:



How to Setup the Scanning Workflow

If the person who is using the scanner has limited technical experience, look for a scanner that is easy to use or set up an automated 3D scanning process. There are accessories such as a rotary table system that automates the scanning and scan data post-processing workflow with minimal human interaction.

Training Time

The user's skill level directly impacts the quality of the scans produced by the scanner. Therefore, it is important to get proper training. The amount of training required differs from person to person. It's good to allocate some training time prior to getting started on your project.

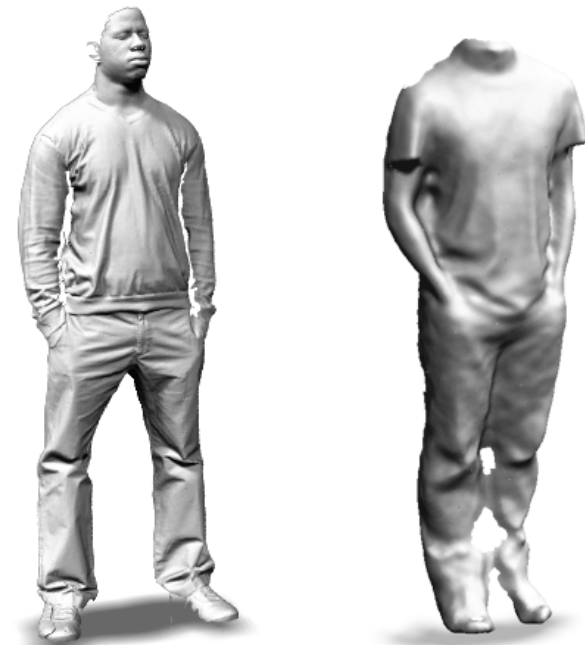
6 BUDGET

How much are you willing to spend on a 3D scanner?

Budget is often a sensitive topic but it needs to be discussed in order to set realistic expectations. With the rise of consumer-based 3D printers, consumer-based 3D scanners are becoming more popular and their prices are cheap and affordable. Why purchase a \$10,000-20,000 scanner when one is readily available for under \$1,000?

Commercial 3D scanners used for industry applications deliver significantly better scan data quality, in terms of resolution and accuracy, when compared to consumer-based systems that cost a fraction of the price. It's the same reason why a chef won't use a plastic knife to cook in a restaurant. You need to get the right tool for the job.

Additionally, getting quality raw scan data from a 3D scanner saves valuable time and resources. The better your scan data is, the less work you have to do during the post-processing stage when you are cleaning the scan data for downstream applications. When you depend on this information for decision making, especially for business, it's important to know that the data you are using is reliable. Ask your vendor for sample scans to see the type of scan quality you would get from the scanners you are evaluating.



Comparing the scan data quality in a commercial 3D scanner (left) and a consumer-based 3D scanner (right)

NEXT STEPS

By going through each section, it will give you a list of things you need to look for when shopping for a 3D scanner. This list will help keep you focused in purchasing a scanner that is right for your project.

We're Here to Help

At GoMeasure3D, we want your equipment purchase to be an investment for your company. Do you have any questions related to 3D scanning technology or need help finding a 3D measurement solution that is right for you? Our technical specialists are available to help. Please contact us at info@gomeasure3d.com or call **(434) 946-9125**.





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