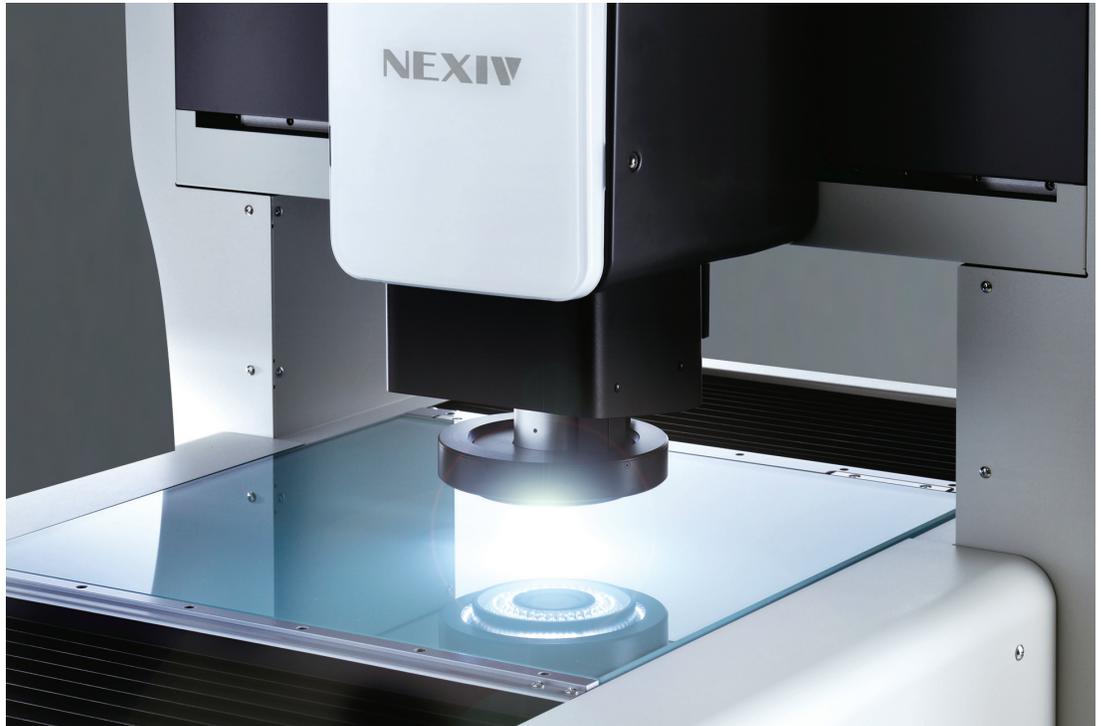




# 5 Questions to Ask Before Buying a Vision System

Buying a vision system is a big, but necessary decision for any facility. For any process, your vision system is an integral part of operations. With a range of vision systems and vision system providers out there, it can be tough to determine which system is best for your application. Here are 5 important questions to ask a provider or manufacturer before buying a vision system, so you can ensure you get the system that best suits your application and your facility.



VIDEO MEASURING SYSTEMS

## 01. HOW ARE YOUR INSTRUMENTS CONSTRUCTED?

The construction of vision system instruments is essential to their functionality and precise measurement capabilities. Before you buy a vision system, ask the provider how their systems are built or constructed. Their answer can tell you a lot about the quality of the system.

You're looking for a well-built vision system that takes accuracy into account at every step. One great example is the

materials used to construct the system. A quality vision system manufacturer will build systems with materials that have similar coefficients of expansion. This is important for any application, but especially for those in environments with temperature fluctuations.

**A system that's built with materials that have similar coefficients of expansion** will expand and contract together, delivering much more precise measurements.

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**A system that has been built with materials of widely varying coefficients of expansion** has materials expanding and contracting in conflict with each other. This causes stresses, forces, and torque that can introduce measurement errors.

Well built systems also have sturdy precision stages limiting overhang to appropriate amounts in line with the construction of the stage. Look for larger solid rail systems. No matter what the resolution of the scales are, if your stage construction is unstable -- so are your results.

If you're still not sure about the construction of the system, ask the manufacturer or provider if you can take a look inside. A simple glance at the internal components of the vision system can provide great insight into the quality of the system.

## **02. WHAT OPTICS ARE USED IN THE MACHINE?**

This is a vision system after all. What is more important than the optics? If you can't see it precisely then you can't measure it precisely. Below are some optic specifications to consider:

### **What is the numerical aperture (NA) of the lens?**

Numerical aperture is a measure of the lens' ability to gather light and resolve finer detail. The higher the numerical aperture, the higher the resolution. Think of it similar to scale resolution. If you are trying to measure something with a tolerance of 0.0005" you would not select a system with scales having a resolution of 0.001". You would seek out a system with better resolution. The same logic applies to the numerical aperture of your vision system's lens.

### **What is the working distance of the lens?**

The working distance of the lens is the distance the lens must be from the part in order to be in focus and thus measure accurately. If you have parts with dimensions in different planes you need to choose a



lens that has a working distance that is suitable for all of the measured features. You'll need a lens with a working distance that can get close enough to deeper features, without colliding with higher features.

### **What is the magnification(s) of the lens system?**

Choosing the right magnification is essential to image resolution. The higher the magnification, the smaller the detail resolvable is. A high quality lens will provide clear, resolvable detail at higher magnifications without distortion or the need for filters to mask the distortion.

## **03. WHAT SOFTWARE IS OFFERED WITH THE SYSTEM?**

After evaluating the construction and optics of the system, look next to the software. A vision system's software is what provides the user with the tools to harness the power of the system. Most importantly, look for software that provides a balance between depth and simplicity. A strong software package will provide the operator with advanced controls for editing detailed settings when needed but remain simple and interactive for the average operator.

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Some often-overlooked characteristics of a strong software package include:

## **Edge detection controls**

All vision systems use edge detection in some form to automatically distinguish edges. The most capable software packages will provide more than the basic light to dark settings observed during canned demonstrations. Look to see how well you can control the edge detection on weak edges. Some places to find weak edges to test are on the top or bottom of low angle chamfers or internal blind edges.

Another benefit to strong edge detection is that it can prevent you from over lighting an edge to get it detected. When the edge detection is limited to basic performance a common incorrect solution from the user is to typically blast more light. This has unintended consequences because when the light overwhelms the edge it also distorts where the actual edge is. Too much light coming through a hole will make the hole dimension larger and too much light passing a post would make the post dimension small.

## **Editing capabilities**

Ask questions about editing existing steps of a saved program. Evaluate how easy it is to change the light, magnification, location or any other detail of the step. Are there ways to edit more than one step at a time? The more details you can access and edit as a user, the more time you will save when changes need to be made.

## **Software interface**

How will the software be interacted with by operators? If this is your first vision system, try to imagine the full scenario of the machine in use. In many production environments, customers seek to have a very simplified interface. This can be achieved in some software packages by limiting user level controls and windows as well as connectivity to custom interfaces reflecting your company's unique preferences.

## **Extensions**

Does the software extend or connect into other packages or provide other capabilities than basic measurements? Many high-quality systems offer the following powerful tools:

- **2D and 3D Image Stitching.** This tool functions similarly to your phone camera's panorama setting, but better. Software systems that enable 2D and 3D image stitching allow you to stitch multiple images together to provide a larger than field of view image of your samples. Some systems even enable the stacking of images in the Z-axis to provide true depth to your images along with analytical analysis.
- **Profiling & CAD Overlays and Comparisons.** This tool offers a great way to evaluate form and profile specifications using a CAD file similar to an overlay with tolerance lines.
- **Data Reporting, Exporting, & SPC.** Basic reports are limiting. Ensure your software package offers great tools to produce custom reports, enables clean and simple exporting to industry-specific SPC packages, and links to Microsoft Excel features.

Quality vision systems often provide more than one option for software, giving you more flexibility. When you find a vision system that meets your construction and optical needs, a system that is compatible with multiple software packages offers you all of the capabilities you need to write and run various programs for a range of applications.

## **04. WHAT LEVEL OF WARRANTY SERVICE DO YOU PROVIDE?**

Before you buy any vision system, you'll want to know how your investment is protected. It's important to consider the warranty on both the vision system's hardware and software.

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Start by looking into the manufacturer. Do they have a history of providing warranty and service directly, or do they use 3rd party representatives?

When it comes to the hardware of your vision system, you want a manufacturer who takes a hands-on approach to service. This ensures OEM specifications are cared for properly.

To get a better sense of the manufacturer's service level, request and contact a list of customers that have been using the equipment for years. Of course, any manufacturer will provide customers with positive remarks, but their feedback will still provide you with confirmation of what the manufacturer has been saying. It will also add some insight into the amount of service issues, as well as the longevity of the products.

It's also important to look into the vision system's software warranty. While many vision system providers are upfront about the warranty covering the vision system instrument itself, it's worthwhile to ask how software upgrades are covered as well.

Some systems will feature full coverage on any software upgrade for an extended period of time, while others do not. Since the software of your vision system is integral to its functionality, it's important to understand how that technology is covered as well.

### **05. CAN I TEST THE VISION SYSTEM ON MY APPLICATION?**

At minimum, get a demo – **on your sample**, not a demo block! This will help you evaluate the vision system's optics and software, as it shows you in real time how well the system images your part and how well the software can provide enhanced edge detection settings or challenging dimensional callouts.

Save pictures of your parts from each manufacturer demo so you can compare them side-by-side. After a manufacturer demo, you will probably remember if you could see your features, but it's hard to tell the differences in image detail quality without comparing them side-by-side. Saving a picture from each demo will help you make the best choice for your application.

Most manufacturers are happy to provide a no cost application study to help prove their system's capabilities. For the most demanding applications, either complex, high magnification or high accuracy, consider investing in a GR&R study to have a complete analysis of the system.

Testing any vision system on your samples before you make a purchasing decision will help give you the peace of mind that the system you're investing in can offer the precision, the imaging, and the quality you need for your unique process.

Buying a vision system is a big decision and a big investment for your facility. By asking these five questions before you make a purchasing decision, you can ensure that the system you choose has all the features and capabilities your facility needs. And if you run into any more questions while searching for the right vision system, the [Nikon Metrology team is here to help](#).