

### Introduction

In order to meet more stringent defect detection requirements, more manufacturers worldwide are deploying machine vision technology to ensure accurate, consistent and fast inspections.

Historically, many vision systems have been too large to install in hard-to-reach areas of the production line. Even vision systems that could be set up were difficult to adjust for part changes. Today new vision systems featuring integrated autofocus technology are making it easier for end users to overcome challenges and meet their inspection goals.

So, what is autofocus and why has it made using machine vision technology dramatically easier?

### Easy to Set Up, Easy to Fine Tune

Autofocus simplifies the setup of the inspection application using the vision system. When the vision system sees a new part for the first time, it needs to be adjusted to ensure that the area being inspected is in focus. Some autofocus mechanisms employ a mechanical system to move the lens to the needed position and often use a feedback system to tell the vision system if the movement actually happened. In order to determine if the image is in focus, machine vision software evaluates the image sharpness at different intervals over the focal

range and finds the optimal value. It also allows the user to fine-tune focus level manually through a button in the software.

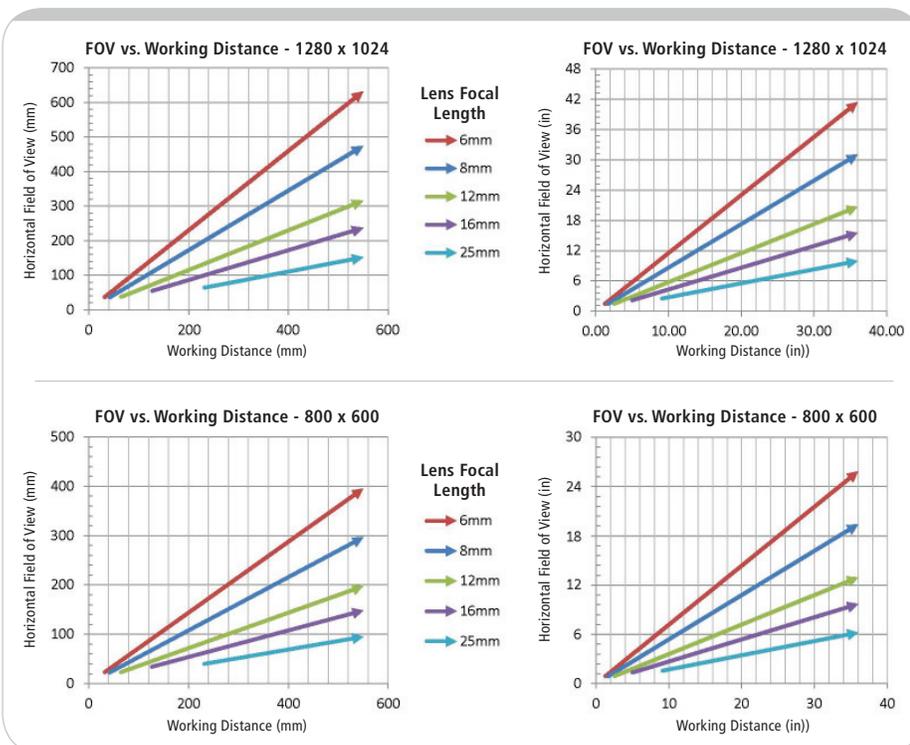
Without autofocus, users need to turn the focus ring of the lens manually to focus on the object, and use the human eye to determine if focus position is optimal. While this method may be effective for individual inspections, using the sharpness metrics makes the inspection setup completely objective. Also, if the vision system is in a difficult or impossible to reach space, manual adjustment is out of the question.

Mechanical autofocus technology should not be confused with another form of autofocus, called liquid lens. Liquid lens technology is an electronically controllable variable focus system that may use two iso-density fluids with oil as an insulator and water as a conductor. Liquid lens is ideal for barcode reading applications, but has limitations for general purpose vision applications whereas mechanical autofocus is more flexible.

### Facilitates Frequent Part Changes

Autofocus capability is critical in production environments that require frequent part changes. For each part being inspected, the unique focus values associated with that part can be saved ahead of time on the vision system. When an inspection profile is loaded for a different part to be inspected, the autofocus functionality enables the lens to set to the focus position saved for the part. As a result, the inspection is ready before the new part arrives on the production line. This makes it possible to inspect different parts consistently, with no down time and with no errors simply by sending a new inspection profile from a PLC, for example. Autofocus captures high quality images for inspection and defect detection without ever having to physically manipulate the vision system.

Inspection options may be increased significantly by employing different integrated lens options that work with the autofocus functionality and provide more working distance and field of view coverage. The Field of View chart shows how different lens options can provide the widest possible options for applications.



## In-Sight 7000 with Integrated Autofocus

In-Sight® 7000 with integrated autofocus capability has been designed for production environments that require frequent part changes. With this vision system, the focus values associated with the inspection of a specific parts can be saved in the system so that when a part change is loaded, autofocus functionality enables the lens to refocus for the new part. This feature makes it possible for In-Sight 7000 to inspect different product sizes consistently, with no errors and without having to physically manipulate the vision system. This vision system delivers very high levels of image quality for inspection and defect detection in hard to reach places and inspect a variety of product sizes and still get the same great images.



## Bottom Line Benefits for OEMs and Manufacturers

What are the tangible benefits of using autofocus in your vision system?

When OEMs integrate autofocus functionality into the inspection system, they make the machines easier to use and give them the ability to inspect a wider variety of parts with no errors and without specialized training.

For manufacturers, autofocus helps vision systems deliver unsurpassed manufacturing accuracy and productivity. The initial application setup is much easier. During initial setup, users can also save the autofocus settings with the inspection profiles associated with every part type with the touch of a button. Vision systems can be set up once and then operated continuously without having to be off line to facilitate frequent part changeovers, reducing production delays. When inspection profiles are loaded, the vision system automatically adjusts to the trained settings. This eliminates line workers from having to manually adjust the camera and focus, saving hundreds of hours per year in labor costs and equipment downtime.

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