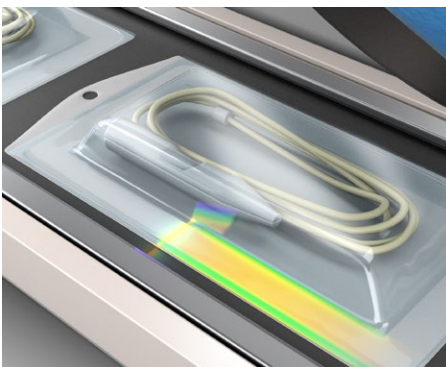
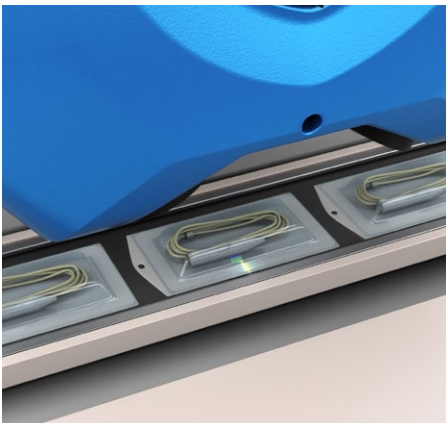




# INDUSTRY APPLICATION: **AUTOMATED SEAL INTEGRITY INSPECTION WITH FOCALSPEC® 3D LINE CONFOCAL SENSORS**



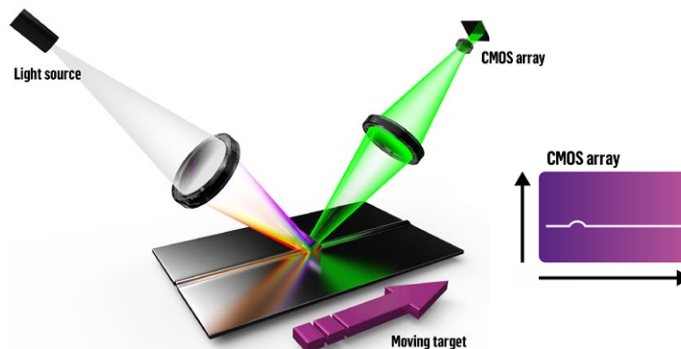
## Automate the Inspection Process

In medical packaging applications, a sterile seal must be applied to ensure medical devices inside are safe to use. Today, sterile seal inspection is a random, time-consuming manual method that destroys the package during the inspection process. With FocalSpec® line confocal sensors, medical package inspection can be achieved with a non-contact, non-destructive approach to deliver 100% seal verification.

## FocalSpec® and Line Confocal Imaging (LCI)

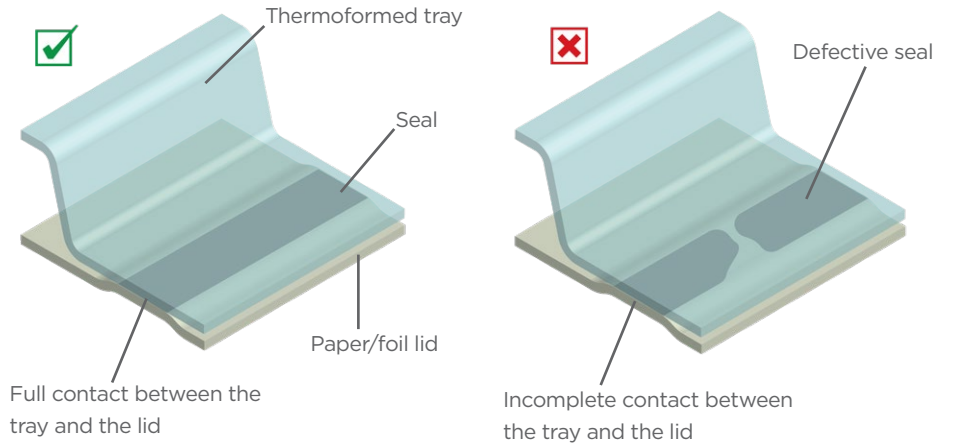
Line confocal imaging is a powerful method for automated medical seal verification. This technology develops high resolution 3D and 2D scan data of the internal structure of the blister pack layers and pouches commonly used in medical packaging. With multi-layer data acquired from inline scans of the sealing regions, defect detection software can isolate contamination and air gaps, flag incomplete sealing, and detect defects such as wrinkles and burn marks.

- Automated inspection of pharmaceutical and medical packages
- High resolution 3D images of transparent seal layers
- Fast, non-contact, non-destructive optical verification
- Detects internal seal defects invisible to the human eye
- User programmable to handle different material types

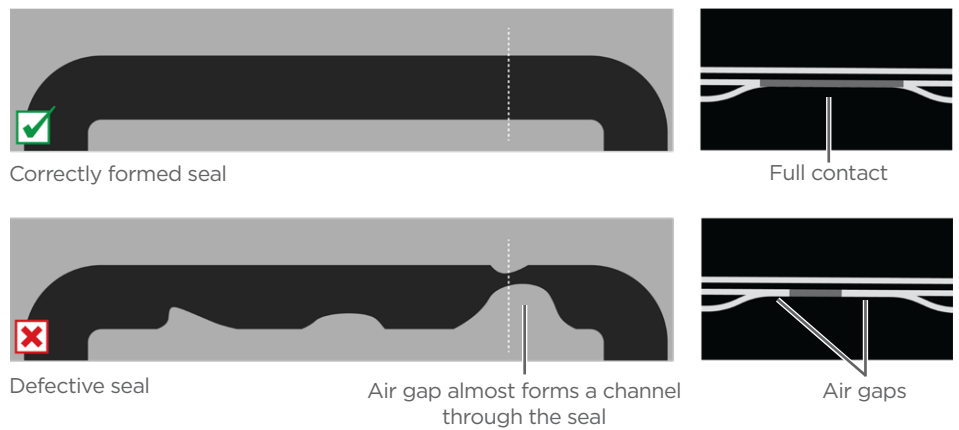
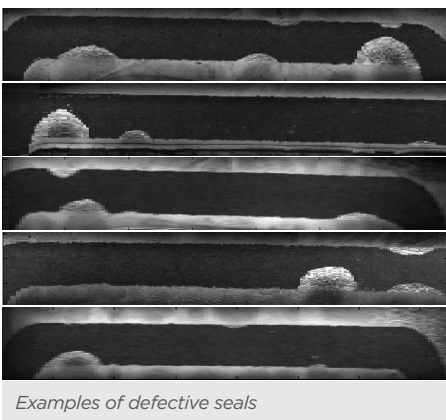
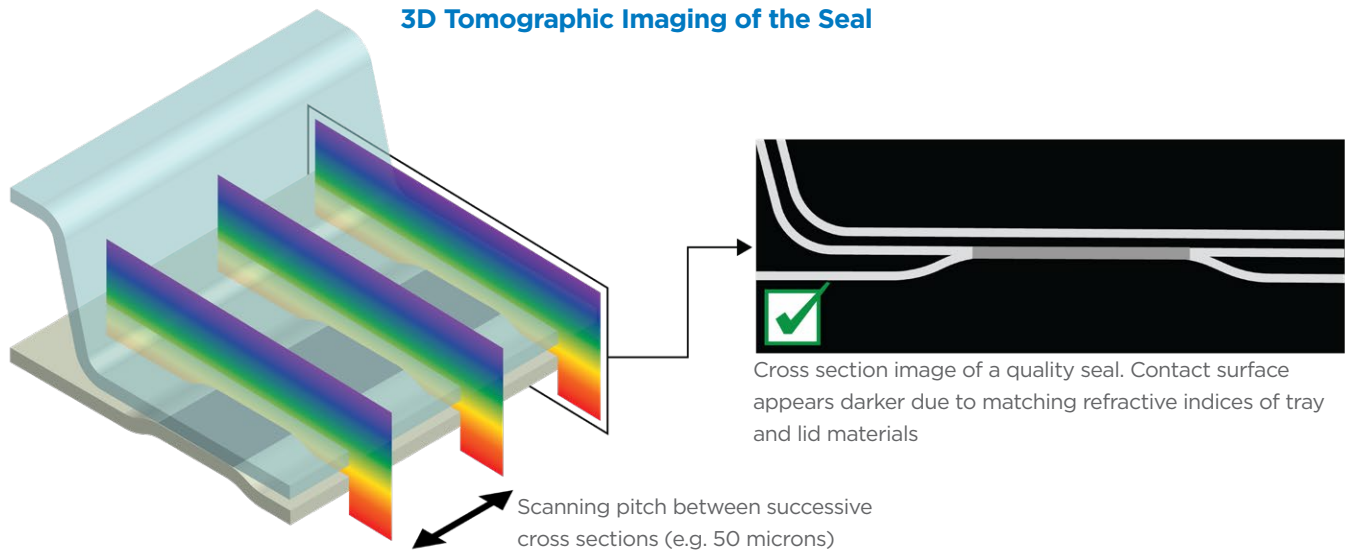


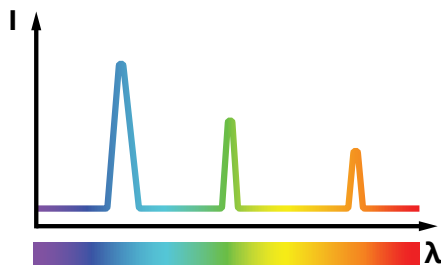
### 3D Heat Seal Inspection

Quality seals are essential to ensuring sterile packaging. Errors in width, completeness, continuity, and the presence of air gaps or foreign material in the seal area are often undetectable by the naked eye. As a solution, the engineer can use a FocalSpec® 3D Line Confocal Sensor to reliably and non-destructively inspect the integrity of these seals.



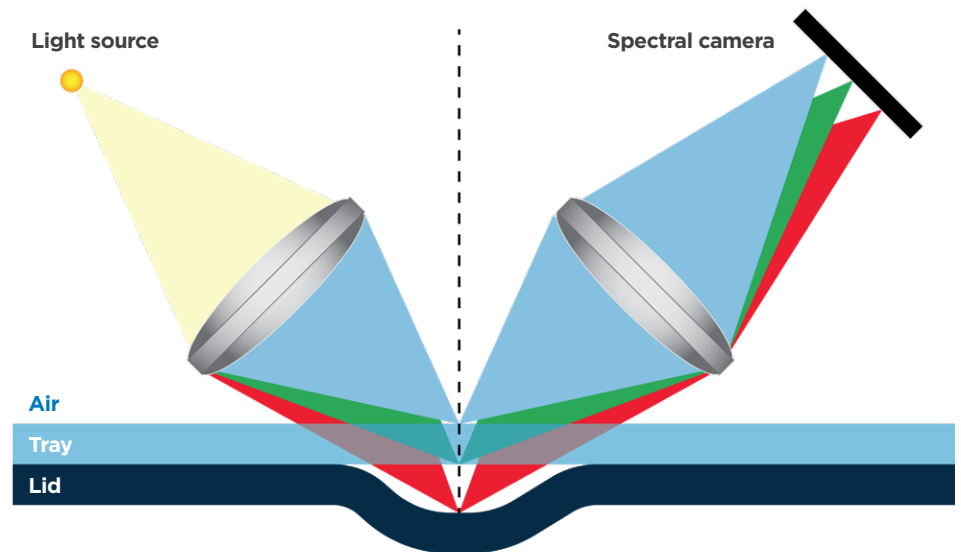
### 3D Tomographic Imaging of the Seal



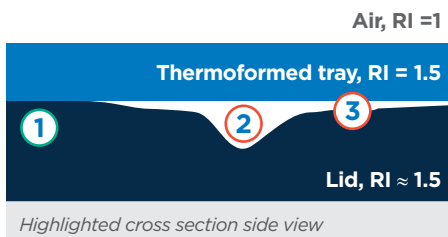


Three wavelength peaks are recorded when an air gap is detected in the seal.

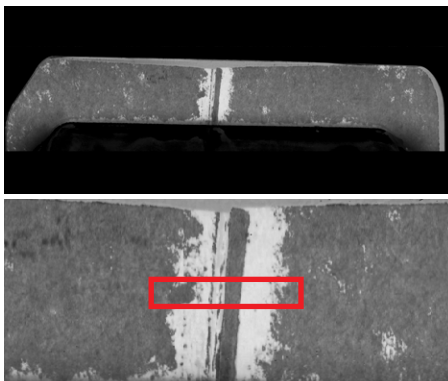
## Scanning the Seal



Tomographic cross section shows the thin air cavity as a third surface in the profile



Highlighted cross section side view



Tomographic intensity image of heat seal (top view)

## Defect Detection Method

### ① Quality Seal Verified

- Tray is in direct contact with the lid.
- Refractive index of the lid is close to the refractive index of the tray.
- Only a small portion of the light is reflected (therefore the image is dark).

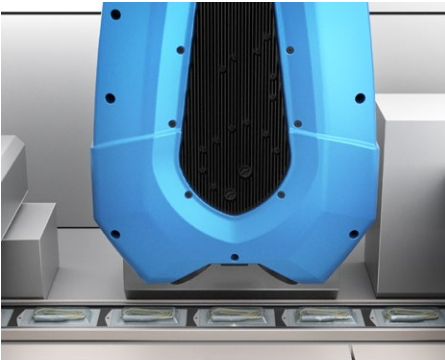
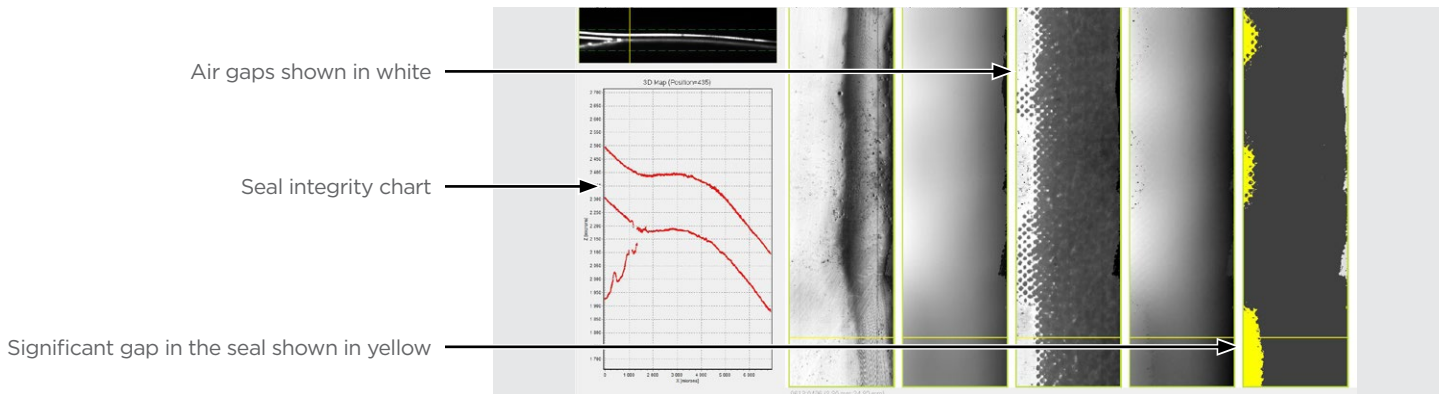
### ② Large Air Gap Detected

- The bottom of the tray and the lid surface are seen as separate surfaces.

### ③ Thin Air Gap Detected

- The tray and lid are seen as a single surface.
- However, since the refractive index of the air layer below the blister is lower than the refractive index of the blister, the reflected light intensity is very high.
- As a result, the thin air gap is detected as a lighter area in the tomographic intensity image.

## Automated Inspection Software - Example of a User Interface View



*FocalSpec sensors are easily integrated into medical device packaging production lines.*

### Benefits of the LCI Method for Seal Integrity Inspection

- Fast and non contact seal integrity inspection
- High imaging resolution reveals small voids, channels, and other seal defects
- Highly repeatable measurements
- User independent (fully automated after setup)
- Gives accurate numerical data of package seal quality
- Documents defects and provides accurate information about the structure of the seal
- Handles a wide variety of packaging types

### Enabled for Inline Production Systems

FocalSpec® 3D line confocal sensors can be integrated into real-time inline inspection and production systems with an operating speed up to 16000 lines per second, resulting in a data capture rate of over 27 million 3D points per second per surface.

**AMERICAS**  
LMI Technologies Inc.  
Burnaby, BC, Canada

**EMEAR**  
LMI Technologies GmbH  
Teltow/Berlin, Germany

**ASIA PACIFIC**  
LMI (Shanghai) Trading Co., Ltd.  
Shanghai, China



LMI Technologies has sales offices and distributors worldwide. All contact information is listed at [lmi3d.com/contact](http://lmi3d.com/contact)