



# **On-Line Profilometer Technical Description and Specification**

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# Bytewise On-Line Profilometer

## Technical Description and Specification

October, 2007

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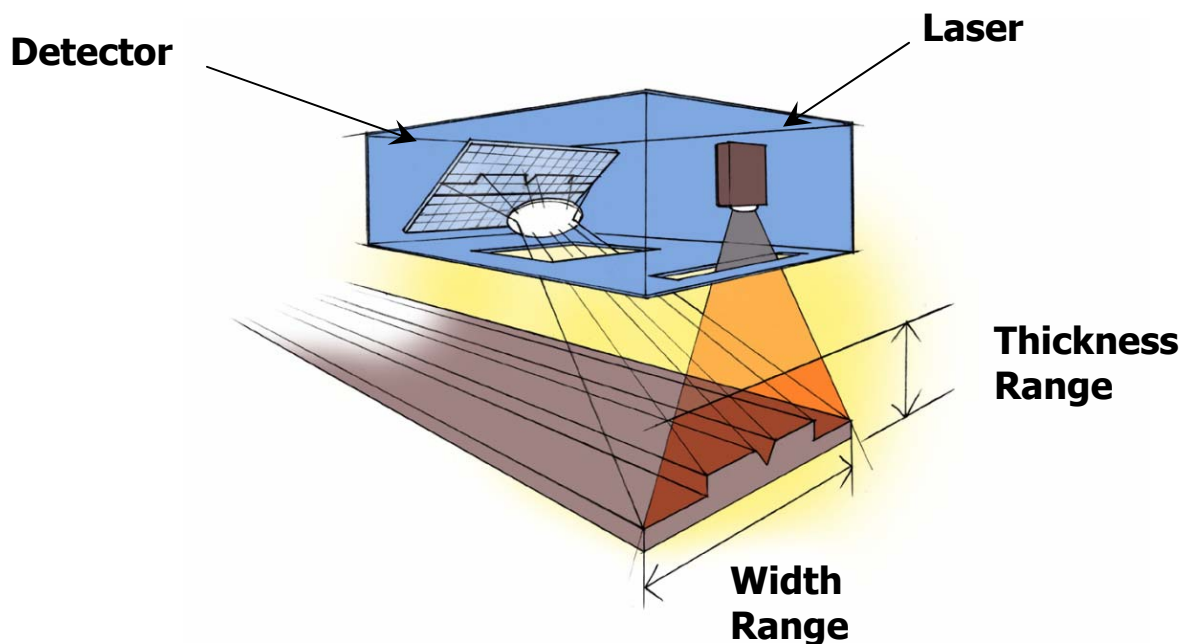
The On-Line Profilometer measures the cross-sectional profile (top and bottom) of the tread as it is moving. This profile measurement is compared to the AutoCAD template. Software calipers are used to measure thickness and width. Upper and Lower Control Limits can be set in the software.

This system makes the profile measurement simultaneously across the profile; it does not scan side-to-side in a Z pattern. It has no moving parts. The simultaneous measurement is more accurate than scanning systems. The measurement frequency is 7.5 measurements per second maximum in the free-running mode, and 12 measurements per second in the external trigger mode, which is high enough to assure 10 to 20 complete profile measurements for every tread.

Systems are configured from modular components to achieve the desired width range, thickness range, and accuracy.

### Sensors

The system utilizes high-resolution digital cameras and laser light sources to measure the top and bottom sides of the tread extrusion profile. These cameras and light sources are assembled into complete sensor assemblies that are calibrated and tested at Bytewise. Multiple sensors are combined to configure systems for wider fields of view.



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### ***C-Frame***

Sensors are pre-assembled into C-Frames. The C-Frame provides for sensor mounting, alignment, and protection from the surrounding environment. Large systems may be configured into O-Frames rather than C-Frames.



**OLP C-Frame**

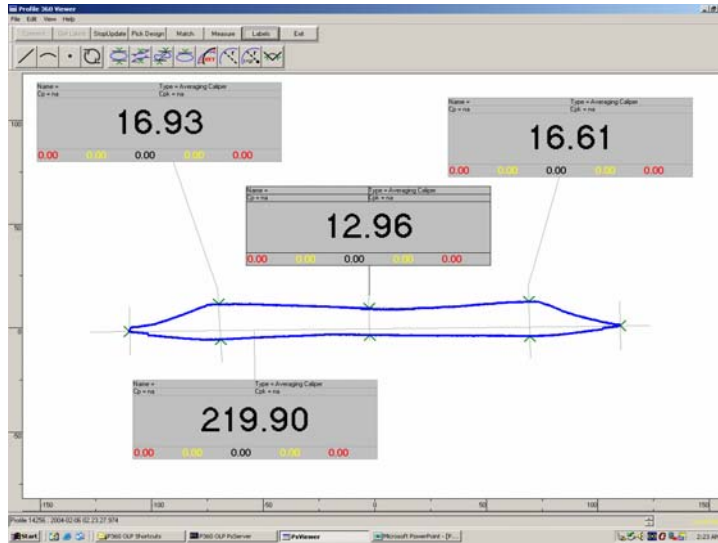
### ***Software***

The Profile360 Software runs on the PC. This provides for the real-time data acquisition, display, and data logging. Each measurement cycle produces a data record that is stored along with its timestamp on the hard drive in a data log file. The user must periodically maintain the data log file. Profile360 Software is a package that provides the following:

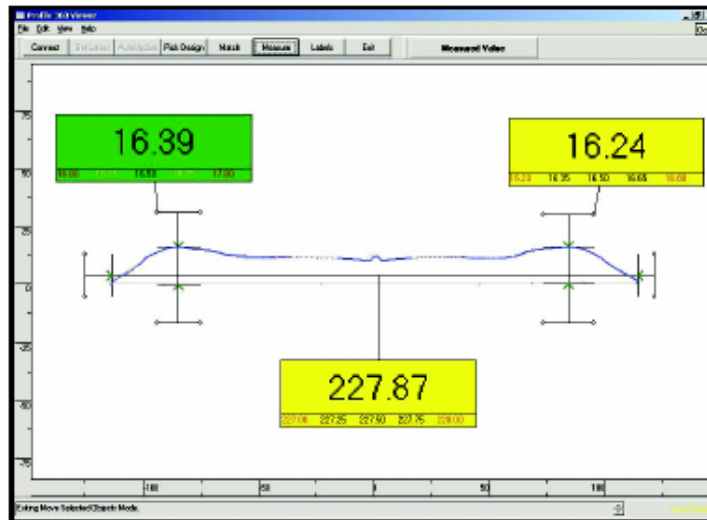
- Caliper-based utilities to program each profile design for specific thickness and width measurements, and feature recognition
- Recipe management for all profile designs
- Comparison of measured profile to design template
- Display of all real-time measurement data
- Display of trend data
- Data logging for all measurement results
- Standard report printing

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## OLP Display with Thickness and Width Calipers



## Thickness Profile Display with Calipers

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#### ***Data Output***

The standard unit supports data output to a PLC or host network via Ethernet. The data message can be configured to include the timestamp, measurement parameters, and error values. This permits the User to implement control schemes with external systems using the real-time OLP data output.

#### ***Registration Fixture***

Sensors are factory calibrated. A Registration Fixture is provided to register the sensors into a common coordinate system. This also provides a means to verify the measurement capability of the system to a certified standard. The software includes a routine that controls the laser source, collects the profile image, extracts the reference points, and corrects their positions based on registration standards. Registration verification cannot be done while the extrusion line is running, and should be done at the operating temperature.

#### ***Two-Position Mounting Slide***

A mounting slide is available for mechanically mounting the C-Frame Assembly to permit a two-position operation of the system. One position is on-line for measurement; the second position is off-line for registration, cleaning, and general maintenance. This provides for fixing the frame to the customer-supplied base. The customer-supplied base should provide for setting the C-Frame at the proper height.

#### ***Electrical Cabinet***

The OLP System consists of C-Frame, sensors, PC, monitor, and UPS. A small junction box houses the communications hub and sensor power supply.

The Electrical Cabinet option provides a NEMA 4 electrical cabinet to house the PC, UPS, monitor, communications hub, and power supply. It also includes an alarm beacon (red, yellow, green, and horn) to signal when control limits are exceeded. An Ethernet port is provided for LAN connection. The cabinet is equipped with an air conditioner. The Cabinet can be positioned up to 10 meters from the instrument.

#### ***Cooling System***

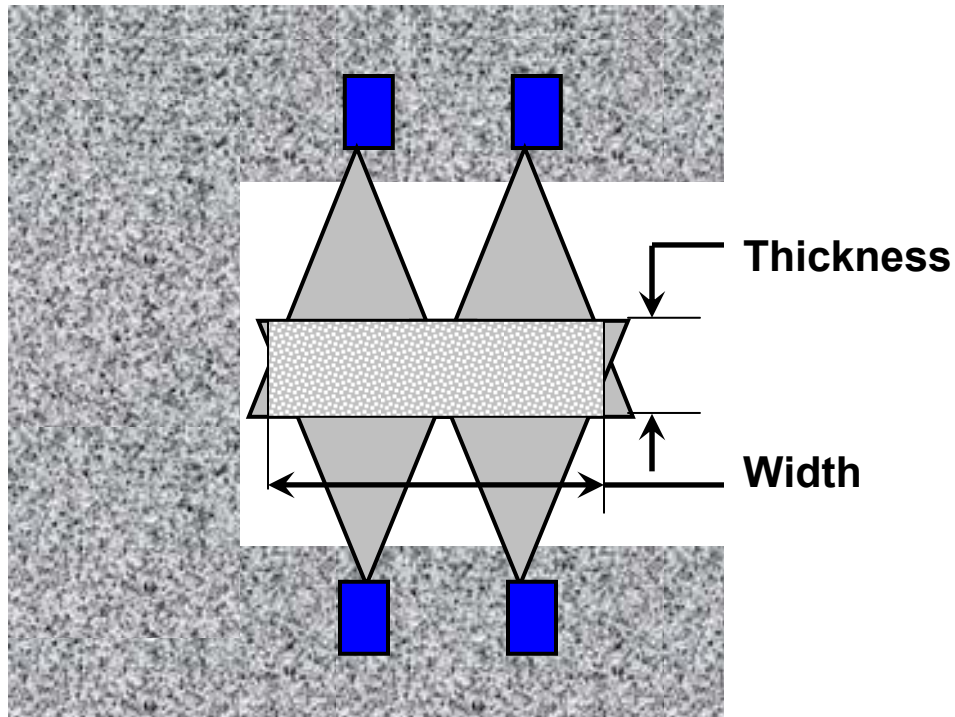
For hot environments the sensors are cooled by an electric cooling system that ducts cold air directly to each sensor. The cooling is thermostat controlled to minimize power usage.

#### ***External Trigger***

The external trigger option includes an encoder with cable and PC card so that the system can acquire profile measurements according to the distance of extrusion travel rather than time interval. Buyer is responsible for encoder mounting.



## **300mm Specification**

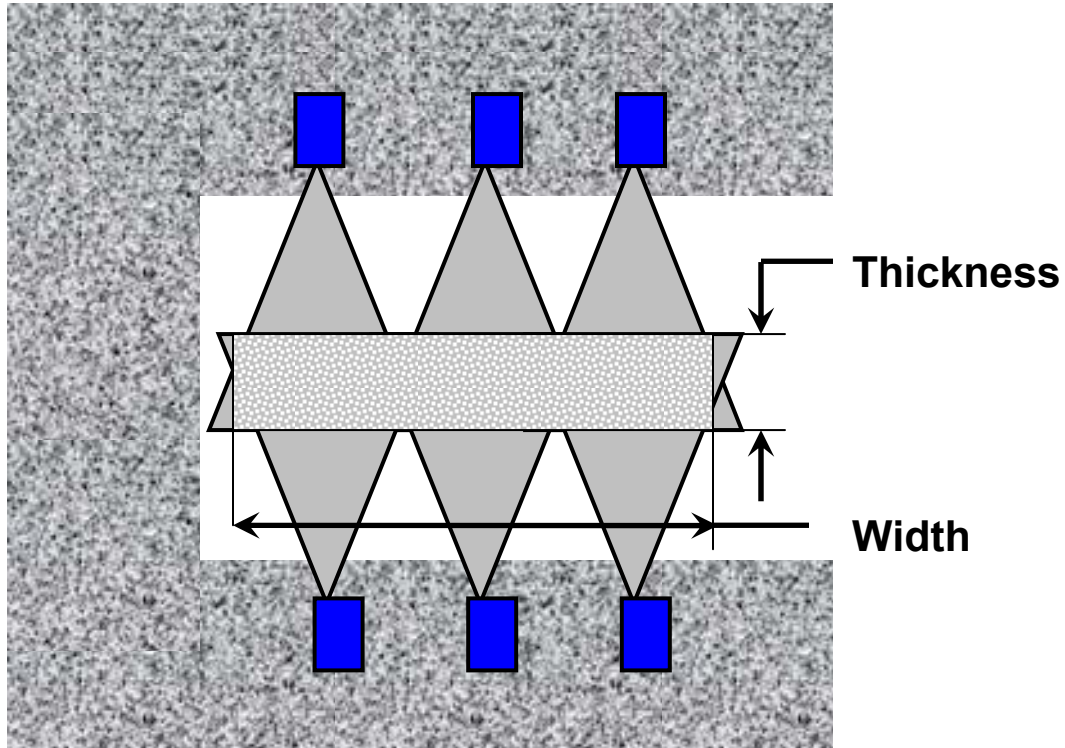


<b>Width Range</b>	<b>300mm</b>
<b>Thickness Range</b>	<b>75mm</b>
<b>Width Accuracy</b>	<b>0.30mm</b>
<b>Thickness Accuracy</b>	<b>0.10mm</b>

### **Specification for 300mm System (Four Sensors)**

Measurement of steep angles is limited by the laser reflection back to the sensors. The maximum measurable angle is 60 degrees at the outer edges of the field of view. The maximum measurable angle is 75 degrees at the center of the field of view.

## **450mm Specification**

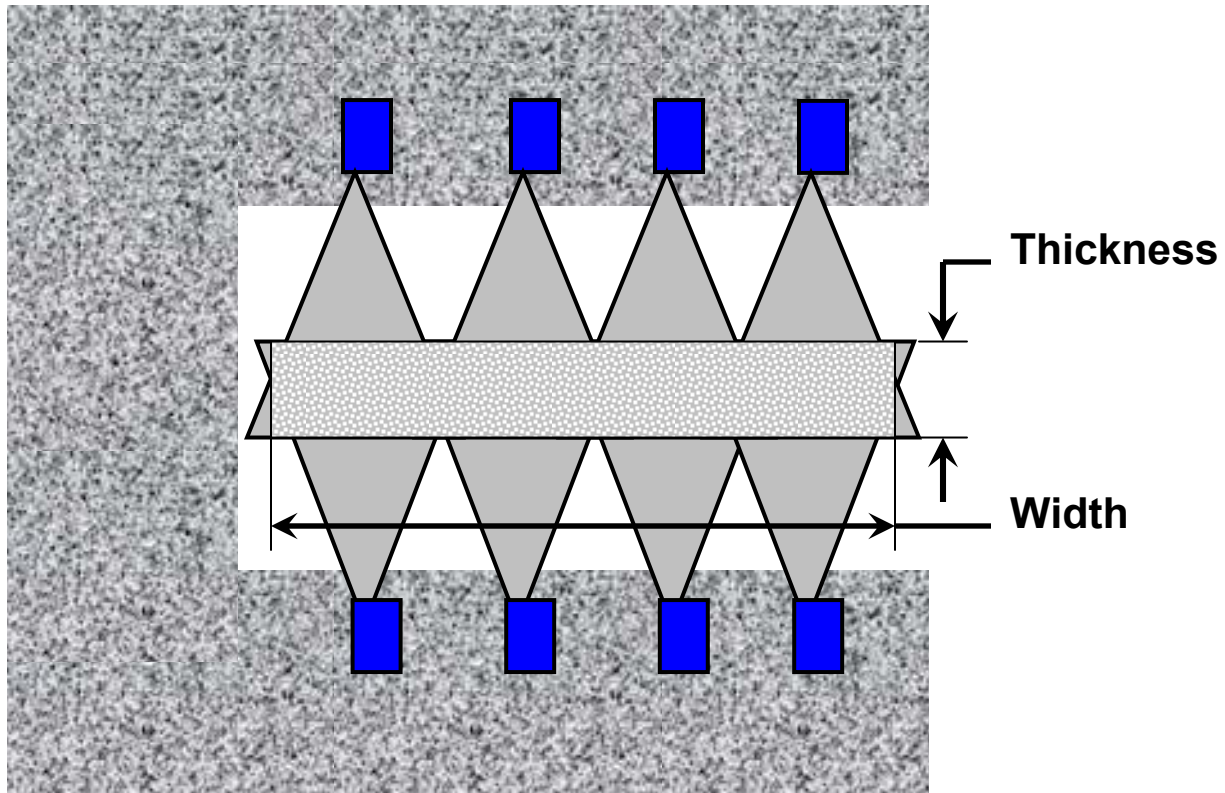


<b>Width Range</b>	<b>450mm</b>
<b>Thickness Range</b>	<b>75mm</b>
<b>Width Accuracy</b>	<b>0.30mm</b>
<b>Thickness Accuracy</b>	<b>0.10mm</b>

### **Specification for 450mm System (Six Sensors)**

Measurement of steep angles is limited by the laser reflection back to the sensors. The maximum measurable angle is 60 degrees at the outer edges of the field of view. The maximum measurable angle is 75 degrees at the center of the field of view.

## 600mm Specification

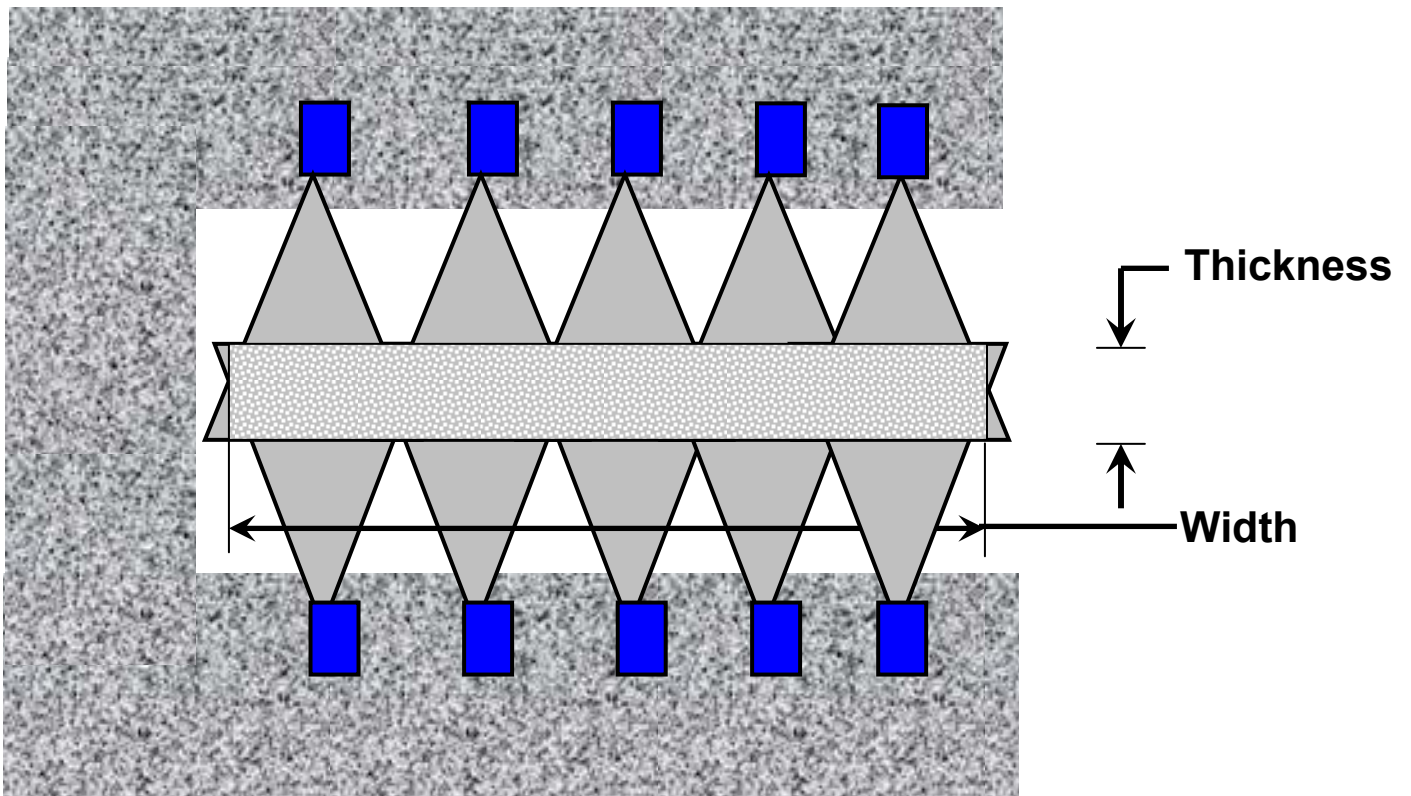


<b>Width Range</b>	<b>600mm</b>
<b>Thickness Range</b>	<b>75mm</b>
<b>Width Accuracy</b>	<b>0.30mm</b>
<b>Thickness Accuracy</b>	<b>0.10mm</b>

### **Specification for 600mm System (Eight Sensors)**

Measurement of steep angles is limited by the laser reflection back to the sensors. The maximum measurable angle is 60 degrees at the outer edges of the field of view. The maximum measurable angle is 75 degrees at the center of the field of view.

## 750mm Specification



<b>Width Range</b>	<b>750mm</b>
<b>Thickness Range</b>	<b>75mm</b>
<b>Width Accuracy</b>	<b>0.30mm</b>
<b>Thickness Accuracy</b>	<b>0.10mm</b>

### **Specification for 750mm System (Ten Sensors)**

Measurement of steep angles is limited by the laser reflection back to the sensors. The maximum measurable angle is 60 degrees at the outer edges of the field of view. The maximum measurable angle is 75 degrees at the center of the field of view.