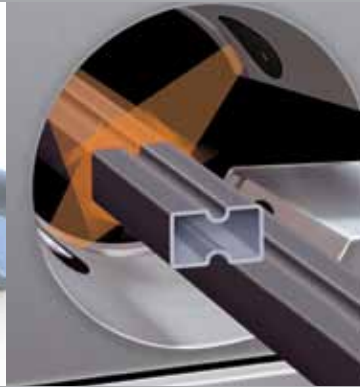
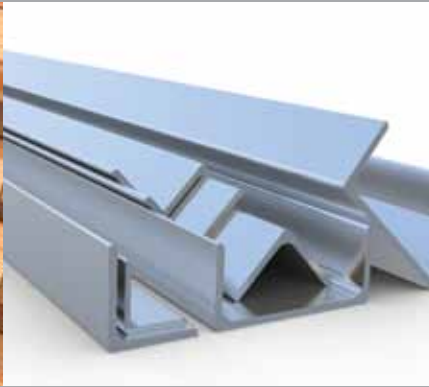


# Starrett®

## BYTEWISE



## **Profile360™ . In-Line Profile Measurement System**

*For rubber, ceramic, plastic, and wood-plastic composite extrusions, roll-formed metal profiles, wire and any other profile.*



# *In-Line Inspection... Bottom Line Improvement.*

At Starrett-Bytewise Measurement Systems we produce non-contact in-line measurement solutions specialized for profile manufacturing industries. We are a complete solutions provider - we manufacture line laser sensors, build multi-sensor systems, produce the application software, and provide the sales and service network to assure that you are well supported. Our products are found around the world among the largest global manufacturers as well as the smallest privately-owned companies. For these companies, Profile360 is a core component of their quality and production management standards.

Starrett-Bytewise Measurement Systems is a Division of The L.S. Starrett Company of Athol, Massachusetts, USA – a leader in metrology since 1880. Starrett is a manufacturing company with businesses in precision metrology tools, instruments, gages, optical comparators, vision systems, laser measurement systems, saw blades, granite plates, and lubricants. Starrett has five domestic manufacturing locations and three international manufacturing facilities located in the UK, China, and Brazil. The L.S. Starrett Company is listed on The New York Stock Exchange under the symbol SCX.

## *In-Line monitoring is displacing off-line checking methods:*

- Alarms immediately when the dimensions change so that operators can intervene to correct the process, resulting in improved quality, improved production yield, and reduced cost of scrap and rework.
- Provides instant measurements, so the operator can immediately see the results of all line adjustments.
- Provides 100% inspection of the entire run compared to periodic off-line checking, which can miss many disturbances.
- Used by many to decrease start-up time, resulting in higher production yield and lower scrap cost.



# The Better Solution for Profile Measurement Systems.

Profile360 is an in-line, real-time, non-contact measurement system for continuously monitoring key profile dimensions in complex shapes such as rubber, ceramic, plastic, and wood-plastic composite extrusions, roll-formed metal profiles, and profiled wire. Profile360 employs CrossCheck Line Laser Sensors to digitize the profile, compare it to a CAD template, and continuously monitor key dimensions. Dimension changes often indicate a change in material, equipment, or process, resulting in poor quality or high scrap or reclaim cost.

Profile360 continuously monitors the size and shape of complex profiles in order to assure quality and avoid the high cost of defects. The system acquires thousands of data points around the profile and matches them to a CAD template, where key measurement parameters such as width, thickness, gap, radius, and angle are extracted. Measurement parameters are compared to allowable control limits and displayed on the operator's terminal with a pass/caution/fail status indicator. Profile360 runs at rates up to 14 profiles per second. The system is available in standard sizes and can be custom-built for almost any size and shape.

Profile360 is the better solution for your profile measurement.



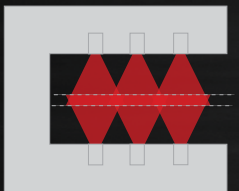
## C-Frame Systems

- Available in 10, 25, 50, 75, and 100mm diameter fields-of-view.
- Available in 2, 3, 4, 5, or 6 sensor configurations.
- Available with the Industrial Mobility Package, including a lift cart, junction box, panel PC, and alarm tower assembled into an "all-in-one" package.
- An alarm beacon signals when control limits are exceeded.



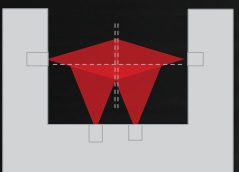
## O-Frame Systems

- Available in 150mm diameter field-of-view.
- Available in 2, 3, 4, 5, 6, 7, or 8 sensor configurations.
- Available with the Industrial Mobility Package.



## Two-Sided Systems

- Available using any sensor size, in overlapping and non-overlapping sensor orientations.



## Three-Sided Systems

- Available using any size, in overlapping and non-overlapping sensor orientations.



## Single-Sided Systems

- Available using any sensor size, in overlapping and non-overlapping sensor orientations.



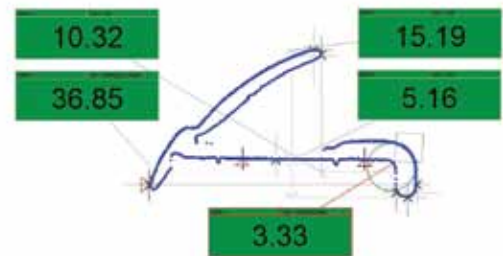
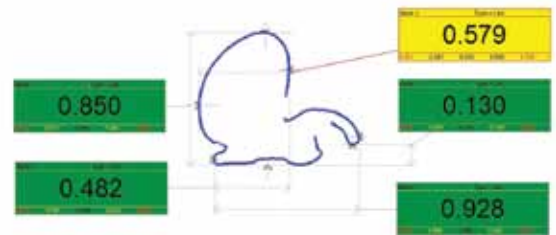
# Auto Seals

When auto sealing extrusion lines go out of specification, they produce about \$1,400 per hour in scrap. The scrap is not recyclable because the rubber is vulcanized, and often is cured over metal reinforcement. The result is a loss in raw materials, labor, energy, landfill cost, and production time.

Profile360 alarms any time dimensions change so that the operator can act to correct the process, save scrap, and improve production. The Profile360 investment payback period is achieved in 32 hours of scrap savings. If you can avoid 1 hour's worth of scrap per week, your Profile360 investment is realized in 32 weeks.

Savings with Profile360		
Compound Cost	2.97	\$/kg
Profile Weight	0.37	kg/m
Line Speed	21.3	m/min
Compound Cost/hr	1,404	\$/hr
Profile360 Investment	45,000	\$
Payback Period	32	hrs

\* If you can reduce scrap by 1 hour per week, you can achieve a payback in 32 weeks based on raw materials cost avoidance alone, not to mention the cost of customer returns.



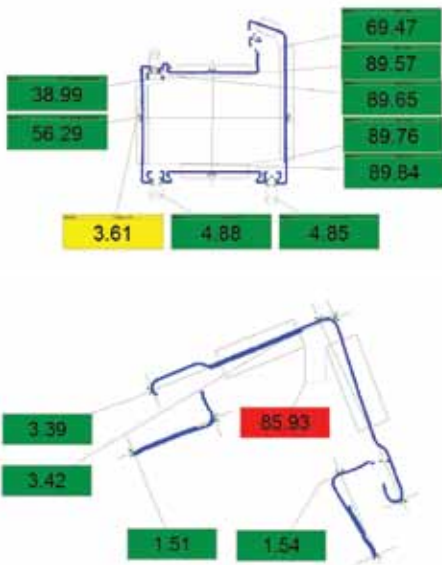
# PVC Extrusion

PVC profiles can distort during calibration and cooling, resulting in non-usable profiles.

In-line checking with Profile360 assures that the operator will be alerted any time there is a change in size, shape, or squareness. This helps reduce the time and cost of rework and improves yield.

Since Profile360 provides real-time measurement, there is no need to cut samples, de-burr the cut edges, and walk to a central off-line inspection station in order to check dimensions. Profile360 greatly reduces the cost of dimension checking, and provides a much faster result.

- Monitor angles, squareness, gaps, grooves, and other key dimensions in real-time with on-screen optical comparator and trend graph displays.
- Alarm immediately when any dimensions change.
- View real-time profile geometry from any PC on your network.
- Report complete dimensional statistics for each run.
- Available with industrial mobility package (see page 10).



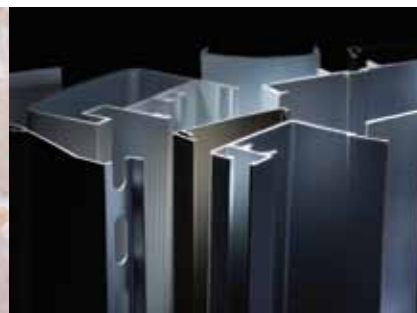
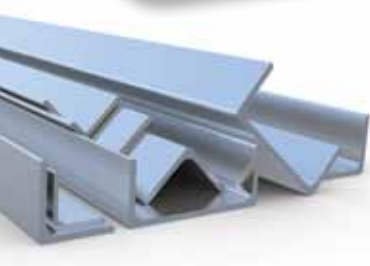
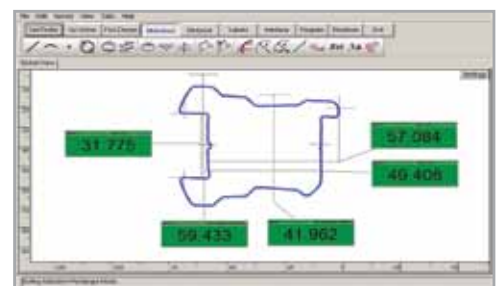
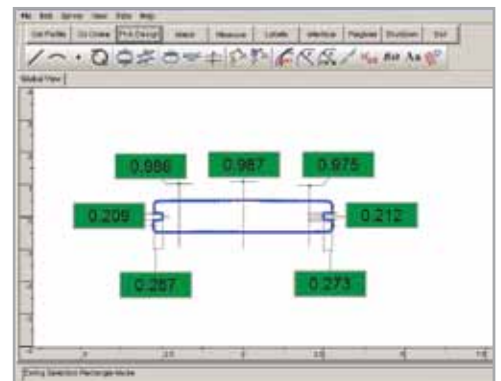
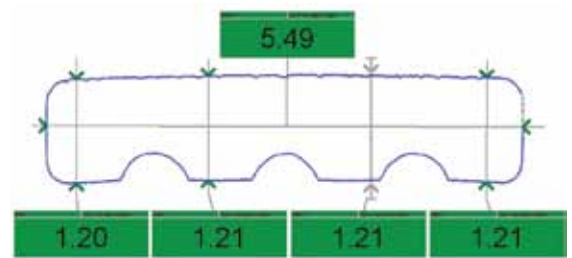
Which of These is the Most Efficient Way to Start Up Your Extrusion Line?	
Profile360	Off Line Methods
View Real-Time Profile Dimensions In-Line	Cut Part
Adjust Extruder Immediately	Walk to Metrology Lab
Allow Adjustment to Stabilize and Pass Through Profile360	Cut Sliver
Repeat	Clean and Prep Sliver
Time Required: 5 min per adjustment	Put Sliver in Queue for Measurement
	Upload File/Find Mylar
	Place Sample On Scanner/10X
	Complete Measurement Routine
	Print Report
	File Report
	Walk Back to Extruder
	Adjust Extruder
	Wait for Adjustment to Stabilize
	Repeat Entire Process
Time Required:	30 to 60 min per adjustment



# Wood-Plastic Composite

Wood-plastic composites have variations in raw material properties, humidity, and barrel temperature, and these variations can result in profiles that swell or sag, resulting in defective boards. Profile360 is employed to continuously monitor profiles coming out of the die to assure the process is under control and the size and shape is correct. Profile360 can measure boards to the lower end of the allowable tolerance range in order to reduce the raw material cost per board, resulting in payback within 100 days.

Cost Savings	
Nominal Board Size	5.5in <sup>2</sup>
Target Area Reduction	.1in <sup>2</sup> (1.8%)
Material Cost	\$.60/lb
Density	.04lb/in <sup>3</sup>
Line Speed	144in/min
Target Savings	14.4in <sup>3</sup> /min
Cost Savings	\$477/day
Payback Period	100 days

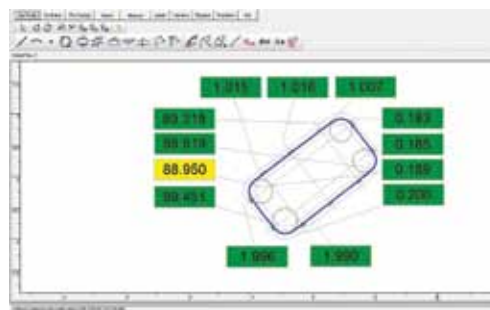
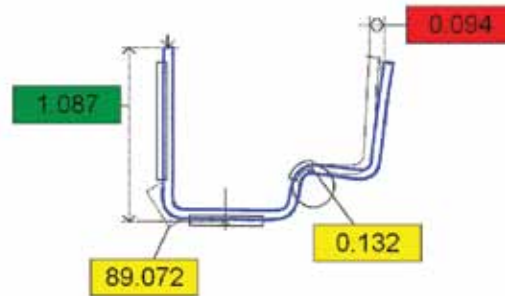
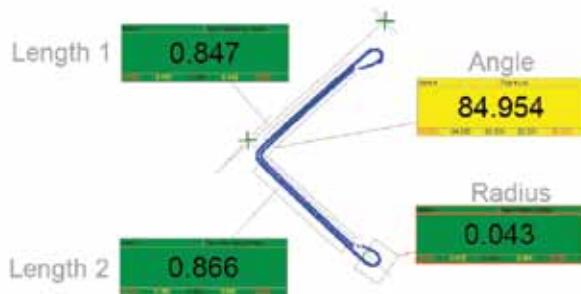


# Metal Profiles

Roll-formed profiles often go out of specification during a run because the incoming coils have lot-to-lot variations in width, thickness, crown, camber, and physical properties. Requiring the setup technician to adjust for the material changes. Pending manual inspection, to isolate the out-of-specification material, a long run can produce materials not to specification.

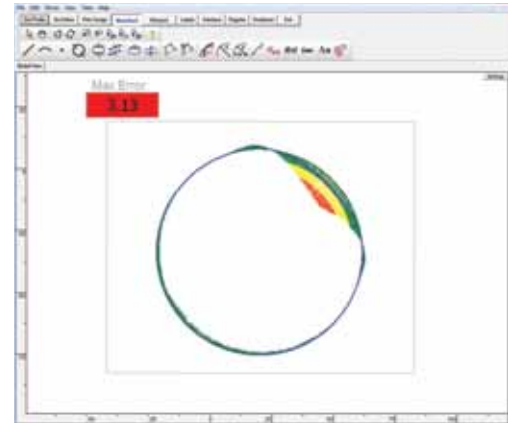
Profile360 offers several advantages:

- Quickly validate the roll stand setup.
- Make progressively small roll adjustments and immediately see the result.
- Decrease the set-up time by eliminating off-line checking process.
- Assist in reducing the time required to reach stability.
- Continuously monitor the dimensional quality of any profile, and alarm the operator when any problem occurs.
- Produce data histories that can be used to compare any run with its historical performance.
- Quantify quality improvement initiatives.
- Assist tooling development.
- Export DXF point files that can be opened in the die design CAD application and compared to the intended design.

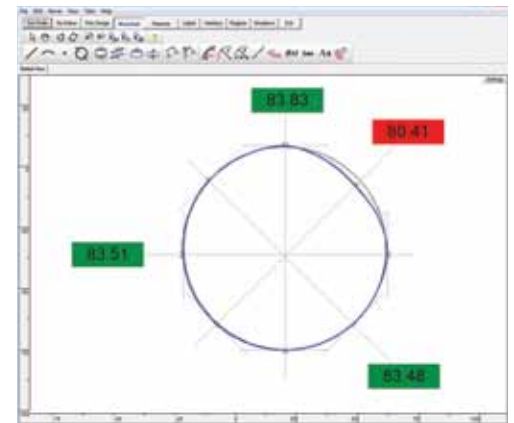


# Ceramics

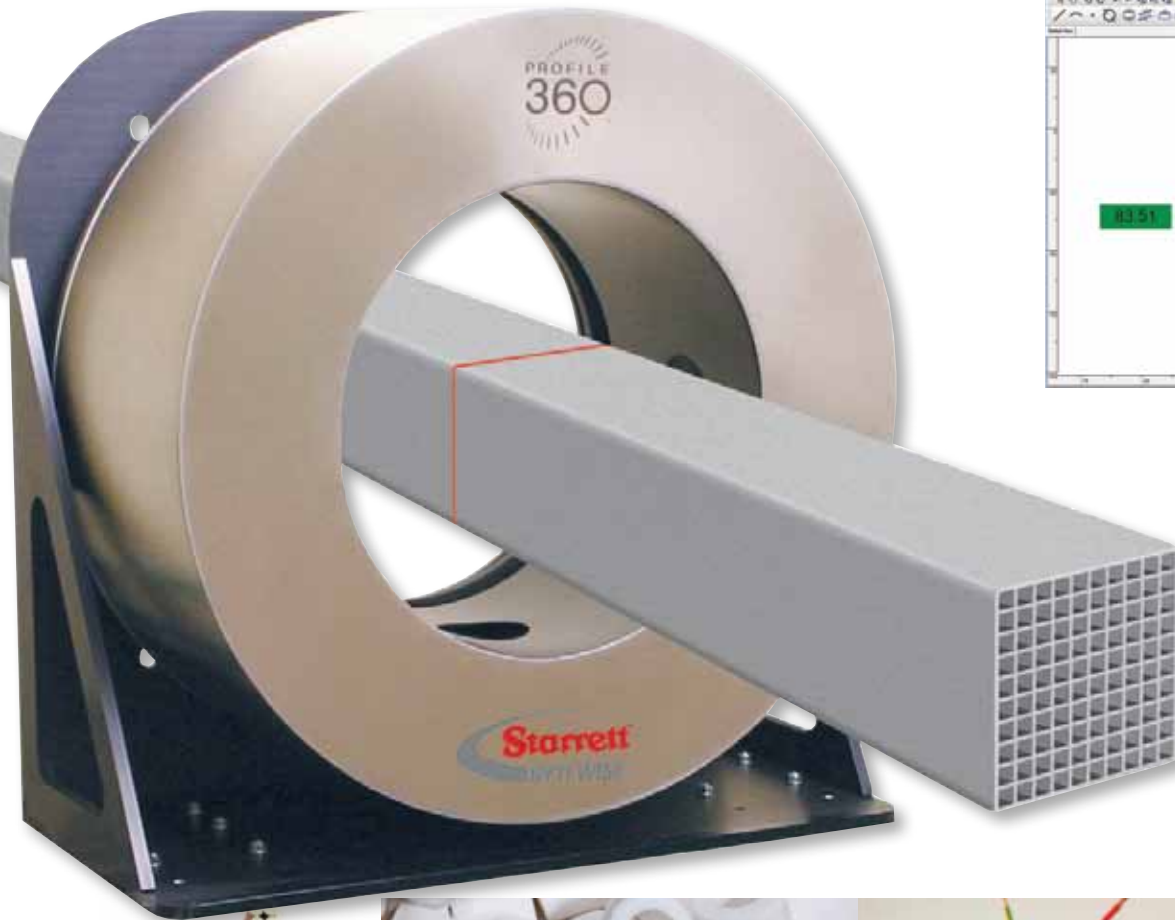
Ceramic extrusions, especially high-precision extrusions used for automotive catalytic converter substrates, can distort at each stage of manufacturing - extrusion, degassing, and firing. Profile360 is used at each stage to verify that the process is under control.



The error vector display highlights all non-conformities to the CAD template, and measures the total deviation.



Profile360 takes multiple diameter measurements with no moving parts.

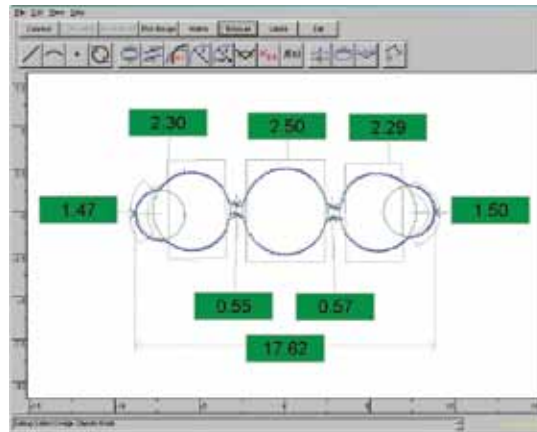
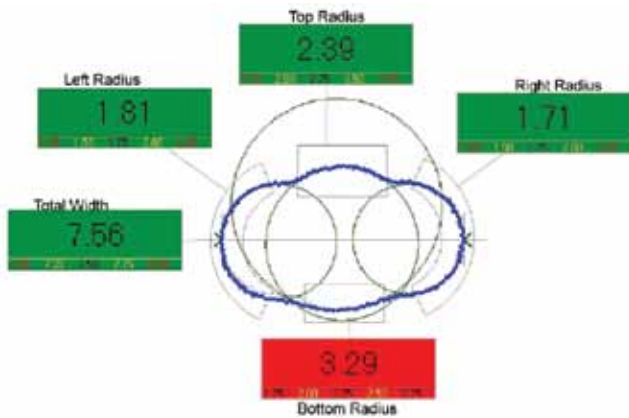




# Wire & Cable

Multi-conductor cables, sub-sea cables, and fiber optic cables rely on the cover extrusion to isolate the conductors from the environment to assure safe and reliable power and data transmission. Profile360 is employed on the line for 100% inspection of the cover geometry.

Profile360 is also used to monitor shaped wire profiles such as magnet wire for size and shape uniformity.



# Specifications & Accessories

## Field of View (FoV) Diameter

	All <sup>2</sup>	Inches					Millimeters				
		1	2	3	4	6	25	50	75	100	150
Repeatability <sup>1</sup>	0.03% FoV	0.0003"	0.0006"	0.0009"	0.0012"	0.0018"	0.0075mm	0.0150mm	0.0225mm	0.0300mm	0.0450mm
Accuracy <sup>1</sup>	0.06% FoV	0.0006"	0.0012"	0.0018"	0.0024"	0.0036"	0.015mm	0.030mm	0.045mm	0.060mm	0.090mm

## Specifications

Measurement Rate	Selectable up to 14 profiles/second
Communication Interface	Analog & Digital Outputs; Ethernet
Run Modes	Clock Frequency or Encoder
Data Output	Modbus TCP or OPC Server native; conversion to other platforms available
Operating Temperature	32 to 113°F (0 to 45°C); cooling systems are available
Profile360 conforms to the Machinery Safety, Electromagnetic Compatibility, and Low Voltage directives of the EC	
Laser safety class by the CDRH standard is Class 3A, and the IEC 60825-1 classification is Class 3R	

1. Repeatability is representative of the system's ability to monitor process variation. It is expressed as the three-sigma standard deviation in a series of measurements of a known gage block.  
Accuracy is representative of the system's error in measuring a known value. It is expressed as the Bias in a series of measurements of a certified gage block.  
Repeatability and Accuracy are based on 2012 standardized test procedure. Field results may be better or worse depending on caliper type, size and placement.

2012 Test Procedure includes thickness measurements of an independently certified test block. 20 measurements are taken at each of 10 different locations throughout the system field of view. Repeatability ( $3\sigma$ ) and Accuracy (bias) are calculated at each position. The Repeatability and Accuracy at each of the 10 positions must be less than the specification.

2. All measurements are taken at one update per second.

## Industrial Mobility Package

The Profile360 Industrial Mobility Package has been employed by large extrusion operations during line set-up so that one unit can serve multiple lines. The in-line measurement provides instant information to help the operator tune-in the extruder, calibrator, and down-stream equipment, and to assure all dimensions are stable before moving on to the next line.



Industrial Mobility Package  
with C-Frame System



# Software

## Profile360 Software provides:

- Test plan management for all profile designs.
- Matching and comparison of measured profile to a CAD template.
- Caliper-based utilities to program each profile design for specific measurements.
- Display of all real-time measurement data.
- Display of trend data.
- Data logging for all measurement results.
- Standard report printing.
- Software can be installed on any network PC and connected to the instrument to view the real-time data.

Software Features				
Data Matching	Match profile to CAD template	Calipers	Averaging Caliper	
	Anchor profile to multiple datums		Half Caliper	
	Match to user-defined sub-regions		Integrating Caliper	
	Match multiple profiles independently			
Display	Measured values with pass/fail/warning status			Bump Caliper
	Error values			Area Caliper
	Cp and Cpk			Link Multiple Calipers
	Standard deviation			Link to Fixed Position
	Trend charts			Radius and XY Centerpoint
	Histograms			Line Regression Fit
	Optical comparator			Formula Caliper
	Error vectors			Angle Caliper
	Mean over a user-defined time period			
	Display actual profile			
Display thickness profile	Alignment Check	Automatic Software Alignment		
Report Writer	Print trend graph	Data Logging	Log caliper values to history file	
	Print histogram		Save point cloud to .txt	
	Print exceptions		Save SnapShots to history file	





Bulletin 2510 - Profile360  
Specifications subject to change.  
© Copyright 2012  
1.5M/T 05/12



**Q-PLUS LABS**  
13765-E Alton Pkwy  
Irvine, CA 92618  
(949) 380-7758  
[www.qpluslabs.com](http://www.qpluslabs.com)

**Starrett-Bytewise Measurement Systems**  
1150 Brookstone Centre Pkwy.  
Columbus, GA 31904-USA  
Tel: 706-323-5142

LASER MEASUREMENT  SOLUTIONS