

Industry:

Cable

Application:

Height and Width Measurements

Accurate in-process height and width measurements of flat, sector, and special shaped cables using active scanning technology

Profile:

Cable makers of flat, sector, and special shaped cables

Solution:

ActiveScan technology

Results:

- Highest accuracy on height and width measurements regardless of product alignment or angular rotation
- High-speed measurement gauge for outstanding measurement repeatability
- STAC logic to determine minimum or maximum dimensions
- Adjustable angular gauge motion to ± 45 degrees
- Completely pneumatic motion system for reliable, long-lasting operation
- Easy-to-use, easy-to-maintain system solution
- High-quality, rugged construction for intensive daily use
- Low cost of ownership



ActiveScan measurement system

This application note describes a unique measurement method developed by Nordson to accurately monitor the height and width of flat, sector, and special shaped cables. It covers:

- Some of the key challenges faced by cable manufacturers to achieving quality production
- An overview of the unique oscillating measurement method
- Inside look at how this unique measurement technology works
- How to setup the system
- The benefits cable manufacturers can expect by implementing this distinctive measurement solution in their production operation

The Challenges:

Capturing Accurate Cable Height and Width

Over the years, cable manufacturers have been looking for an effective non-contact method to accurately measure and control the height and width of flat, sector, and special shaped cables during the extrusion process. Stationary-based measurement devices have difficulty monitoring a moving cable with a unique profile that is not exactly oriented or aligned with the gauge and measurement region. Any sizeable vibration of the cable as it moves across a pulley mechanism or angular rotation of the product typically causes measurement errors. Manufacturers also find it very difficult to correctly and capably align the product to the gauge during production changeovers of cable types with different profiles.

Mechanical motion-based measurement systems also pose their own set of challenges. While they can accurately measure the outer dimensions of non-round cable products, they present a host of maintenance and product quality issues. Wear and tear on these systems can be very costly due to servicing, replacement parts, and downtime. Conventional mechanical systems with product guidance devices can also damage products, affecting product integrity.

In sum, these measurement methods fall short of providing the necessary precision and reliability that enable manufacturers to efficiently measure and produce the highest quality of flat, sector, and special shaped cables and conductor products to meet customer and market demands.

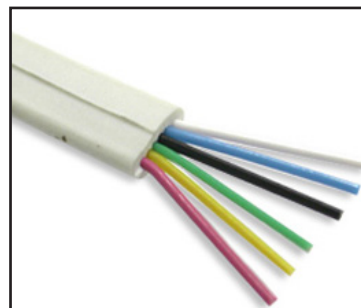
The Solution:

ActiveScan—Active Scanning Technology

Nordson Measurement & Control Solutions has developed **ActiveScan**, a unique oscillating measurement system to monitor the height and width of flat, sector, and special shaped cables with the highest accuracy. The system integrates the AccuScan 5012/5025/5040 laser diameter gauge, a pneumatic-based method for active scanning, and the proprietary STAC Logic software. The sweeping motion of the measurement system and dual-axis detection capabilities precisely captures the minimum and maximum values of the desired product height and width, independent of the product profile. The data is acquired at a high-speed rate of 2400 scans per second across the X and Y axes.

Measuring Unique Cable Profiles. The ActiveScan system can effectively measure any uniquely shaped cable type including flat cables, sector cables (such as straight or pre-spiraled), and other irregular shaped products with height and width profiles up to 40 mm (1.50 in). The system can process measurements at any production line speed with an accuracy of ± 0.001 mm (± 0.000040 in.)¹.

ActiveScan provides highly accurate height and width measurements of flat, sector, and special shaped cables regardless of product alignment or angular rotation.



ActiveScan provides accurate, non-contact measurement of unique cable profiles.

¹ $\pm 0.02\%$ of product size.

The Solution, cont:

ActiveScan—Active Scanning Technology

Detecting Product Min and Max Values. The ActiveScan system leverages the **STAC Logic** software residing in the AccuScan gauges to capture the desired dimensional data. (STAC stands for Stranded, Twisted, Armored, and Corrugated products, and in this application includes the measurement of flat, sector, and special shaped cables.) STAC Logic processes and filters the data, providing only the necessary values to ensure accurate, quality height, and width measurements are displayed.

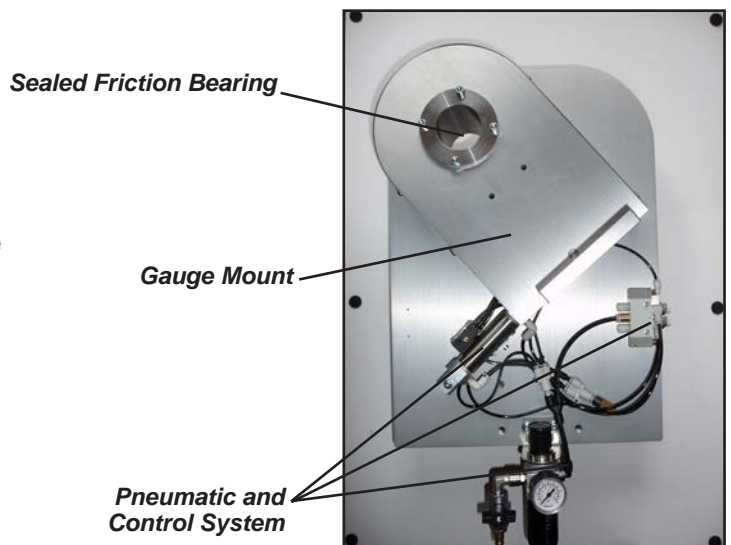
The user defines the measurement period to sweep-through the product and capture the necessary

number of readings to report the required values. Data interfacing via RS-232, Profibus, Ethernet IP, as well as communication to a BETA LaserMike DataPro 1000, DataPro 3100, or DataPro 5000 process controller, enables the user to setup the measurement criteria as needed. DataPro provides a graphical view of the product dimensions and process parameters in a variety of formats, and offers closed-loop control with complete SPC, reporting, data logging, and networking capabilities. The user can also use the PC software AccuNet to access the data.



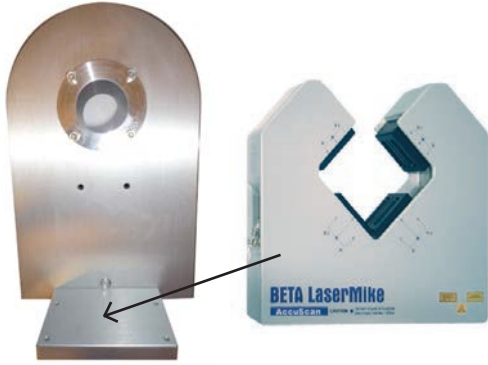
STAC Logic uses dual-axis scan information to calculate min and max values and provides fast and accurate height and width measurements. This screen shows the measurement accuracy and repeatability tests over 143 seconds on a static sample with 1 second data-logging interval.

Motion Scanning Method. The heart of the ActiveScan solution is the pneumatic-based system used to oscillate the AccuScan gauge around the centerline of the product and capture X and Y axis measurements. The system uses no electronic components for low maintenance and reliable, long-term operation. A pneumatic cylinder assembly with two adjustable position sensors creates the up and down stroke motion. By adjusting the air pressure via an air flow control mechanism, operators can easily regulate the stroke speed from 0.5 to 4.0 seconds (see Specifications). Adjusting the air pressure also enables operators to control the stroke length and degree of oscillation (or angular motion of the gauge) to maximize gauge readings and optimize data averaging. Depending on the application, the stroke length can be adjusted up to 200 mm (7.87 in.) for a corresponding oscillation angle up to ± 45 degrees. Two different stroke lengths are available (see Specifications). The mechanical rotation about the product centerline is made possible via a central and sealed, ball-bearing assembly.



Pneumatic-based system uses no electronic components, is easy to use, and offers long-lasting operation. Simple controls enable operators to adjust gauge oscillation up to ± 45 degrees to capture desired measurements.

System Setup. An easily accessible L-bracket enables the AccuScan gauge to be mounted on the motion base. The entire ActiveScan system can be installed on a height stand or other suitable mounting structure on the production line. Product is fed through a large opening in the friction bearing assembly and aligned with the gauge. Standard house air is used to run the pneumatic system. The AccuScan gauge is setup using desired communication protocols and power requirements.



AccuScan gauge easily mounts to the motion base.

The Results

The ActiveScan system offers a number of unique benefits to cable manufacturers:

- Highest accurate height and width measurements regardless of product alignment or angular rotation
- High-speed gauge with built-in Digital Signal Processing and intelligence for outstanding measurement repeatability
- STAC logic for measuring a broad range of unique cable profiles
- Completely pneumatic motion system for reliable, long-lasting operation
- Adjustable angular motion of the Diameter gauge to ± 45 degrees for flexible measurement applications
- Easy-to-use system solution
- High-quality construction for daily intensive use in cable manufacturing lines
- Integrates with Beta LaserMike's DataPro controllers to accurately manage the production process every step of the way for the highest quality results
- Interfaces to Profibus, Ethernet IP, and RS232
- Optional built-in display available
- Conforms to CE standards

Overview of System Specifications

Applications	Flat, sector, and special shaped cables
Measurement Profile	Height and width gauge options: - AccuScan 5012 up to 12 mm (0.47 in) - AccuScan 5025 up to 25 mm (1.00 in) - AccuScan 5040 up to 40 mm (1.50 in)
Speed	Any production line speed
Accuracy	± 0.001 mm (± 0.000040 in) ¹
Stroke Speed	0.5 – 4.0 sec for 50 mm stroke length 2.0 – 4.0 sec for 200 mm stroke length
Stroke Length and Oscillation Angle	50 mm (1.97 in) for +10 degrees 200 mm (7.87 in) for +45 degrees

¹ $\pm 0.02\%$ of product size.

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