Edge Detection and Position Measurement

Documentation

Edge detection and position measurement is the foundation of automated web handling. Roll-2-Roll Technologies provides fiber-optic sensors that detect web edges on any material—clear films, porous nonwovens, metallic foils, glass, mesh, and abrasive materials—without recalibration. Unlike traditional photoelectric or ultrasonic sensors that struggle with material variations, our sensors use patented light scattering technology to deliver reliable edge position data regardless of opacity, porosity, or reflectivity.

What is edge detection costing you that you're not tracking? Plants using legacy sensors typically lose 2 hours monthly to recalibration—time that never shows up in downtime reports but directly reduces throughput.

The Challenge: Why Traditional Edge Sensors Fall Short

Traditional edge sensors rely on blocking a signal—infrared light or ultrasonic sound—to detect the web's presence. This creates critical limitations:

- **Material Dependency:** Clear films allow light to pass through. Porous nonwovens allow ultrasonic sound to pass through. Each material type requires sensor recalibration or switching to a different sensor technology entirely.
- **Setup Time Waste:** Operators must manually adjust gain, teach contrast points, or swap sensors during material changeovers. A 15-minute changeover becomes a 30-minute ordeal.
- **Vacuum Incompatibility:** Ultrasonic sensors cannot function in vacuum environments—no air means no sound waves. This limits options for glass manufacturing, coating processes, and semiconductor applications.
- **Vision System Complexity:** Camera-based alternatives require separate light sources, gantry systems, and vision experts to program—adding weeks of integration time and ongoing specialist costs.

The Roll-2-Roll Solution: 1D Camera Without Complexity

Roll-2-Roll® Sensors are essentially **one-dimensional line scan cameras**—but without the complexity of traditional machine vision systems:

Traditional Machine Vision	Roll-2-Roll Technologies Sensors
Requires separate light source	Integrated LED illumination
Needs gantry/mounting systems	Single-sided, compact form factor
Requires "vision expert" to program	Operators set up with zero code
Complex calibration procedures	No calibration needed
Weeks of integration time	Setup in minutes

How It Works

1. **Projects Light:** An integrated LED array illuminates the web from one side
2. **Captures Scattered Signature:** A patented fiber-optic array acts as a spatial filter
3. **Creates a 1D Image:** The sensor generates a one-dimensional picture of the web edge

The Result: The sensor sees the structure of the web—its physical edge—regardless of whether it's opaque, clear, porous, or reflective. This is a major unlock: sophisticated imaging capability that operators can set up with no lines of code.

Technical Specifications

Specification	ODC Family	1DC Series
Sensing Ranges	48, 96, 192, 288, 384, 480, 768, 960 mm	96, 192, 288, 384, 480, 768, 960 mm
Hardware Resolution	0.0635 mm (48-288mm) / 0.127 mm (384-960mm)	0.0635 mm (0.0025 in)
Repeatability	>99.9%	>99.9%
Linearity Error	<0.25%	<0.25%
Response Time	20 ms standard (1 ms available)	20 ms standard (1 ms available)
Max Edges Detected	128	128
Min Edge Spacing	2 mm (0.08 in)	2 mm (0.08 in)
Working Distance	15-25 mm standard	15-25 mm standard
Operating Temperature	-10°C to 65°C	-10°C to 65°C
Vacuum Compatible	YES	YES
Controller Required	Yes (SCU5 or SCU6x)	No (built-in)
Industrial Protocols	Via controller	EtherNet/IP, PROFINET, EtherCAT, Modbus/TCP

Key Benefits

- **Zero Changeover Time:** No manual recalibration between materials—switch from clear film to metallic foil instantly
- **Eliminate Calibration Errors:** No teach mode, no gain adjustments, no operator-dependent settings
- **True Spatial Awareness:** ±0.1mm accuracy with 0.0635mm resolution—not just binary on/off
- **Wide Viewing Area:** Up to 960mm sensing range covers full web width without repositioning
- **Single-Sided Installation:** Fits in tight spaces where C-frame sensors cannot
- **Vacuum Operation:** Works in vacuum environments where ultrasonic sensors cannot function
- **No Vision Expert Required:** Operators set up and run the system with zero code

Cost of Inaction: What You're Losing Today

Every week you continue with legacy edge sensors, you're accumulating hidden costs:

Hidden Costs (Uncounted but Real)

- **Calibration Labor:** 2 hours monthly at $60/hour = **$1,440/year per line**
- **Extended Changeovers:** 2 extra minutes × 5 changes/day × 250 days × $1,000/hour machine rate = **$41,700/year**
- **Troubleshooting Time:** 4 hours/month diagnosing drift-related issues = **$2,880/year**

Risk Costs (Probability × Impact)

- **Quality Escapes:** Undetected edge drift causes coating misregistration—potential recalls or rework
- **Equipment Damage:** Missed edges lead to web wraps, bearing damage, production stops

Opportunity Costs (Revenue You're Not Capturing)

- **Material Limitations:** Can't run clear films, mesh, or specialty materials your competitors handle
- **Speed Constraints:** Slow sensor response forces reduced line speeds
- **Lost Contracts:** Can't bid on precision work requiring ±0.1mm accuracy

Typical Annual Cost of Inaction: \$25,000 - \$75,000 per line

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Applications Across Industries

- **Battery Manufacturing** — Detect electrode foils with 0.0635mm resolution for precise coating alignment
- **Converting & Packaging** — Guide multiple material types without recalibration between changeovers
- **Nonwovens & Hygiene** — Guide porous materials at speeds up to 1000 m/min
- **Glass Manufacturing** — Detect glass edges in vacuum environments (used by major glass manufacturers)
- **Film Extrusion** — Measure layflat width on blown film lines, including clear films
- **Label & Printing** — Detect clear labels on clear liners without special setup
- **Pharma & Medical** — Guide multiple materials with data logging for regulatory compliance

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Product Options

ODC 96 Family

Best for: End users who want easy setup with touchscreen interface

- Requires SCU5 or SCU6x controller
- Intuitive touchscreen operation
- No coding required
- Sensing ranges: 48-960mm

View ODC Family

1DC 960 Series

Best for: OEMs and technical users who prefer Ethernet/PLC interfaces

- All-in-one sensor (no external controller)
- Direct Ethernet connectivity
- EtherNet/IP, PROFINET, EtherCAT, Modbus/TCP
- Sensing ranges: 96-960mm

View 1DC Series

Related Solutions

- Edge Guiding — Automated web alignment using edge position
- Web Width Measurement — Continuous width monitoring
- Splice Detection — Automated splice and defect detection