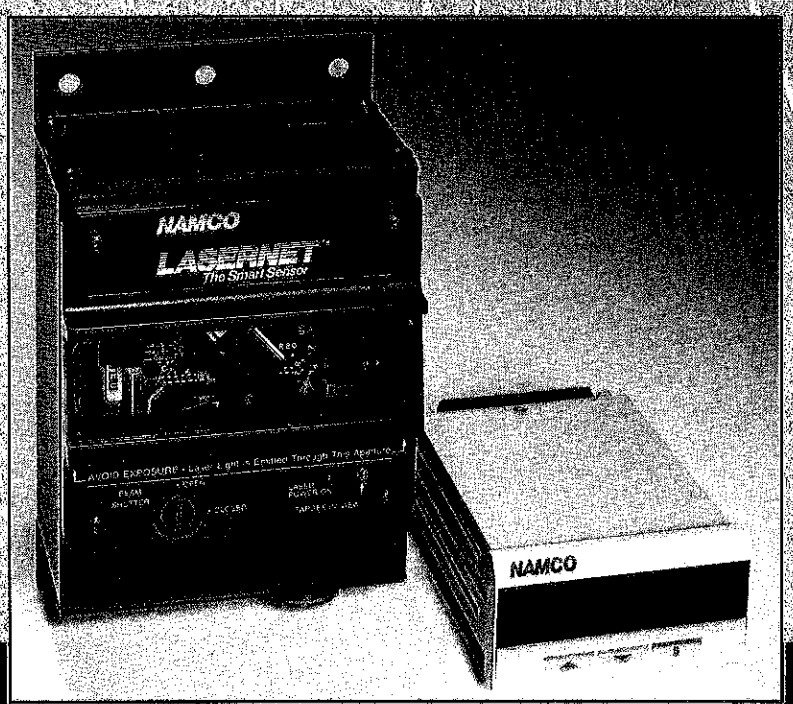
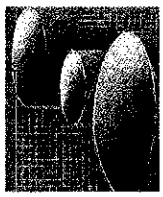


LASERNET®

Scanning Laser Sensor

Web, Strip & Loop Monitoring & Control

NAMCO



LASERNET

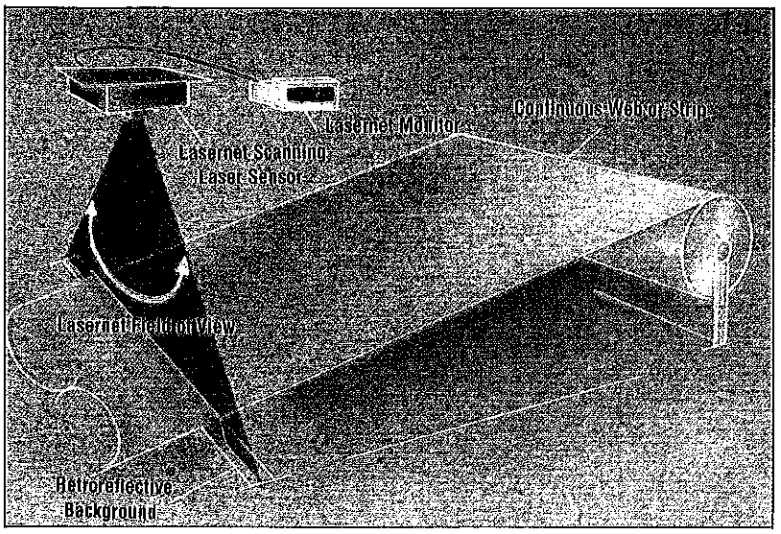
How It Works: A Simple, Reliable Device

The key to Lasernet® sensing is reflected laser light.

Using a constant-speed rotating mirror, the Lasernet sensor scans laser light 20 times per second over its adjustable 10 to 110 degree field of view. Special retroreflective backgrounds reflect the laser light back to the sensor's photodetector. This permits the compact Lasernet sensor to house both the laser light source and the receiving elements.

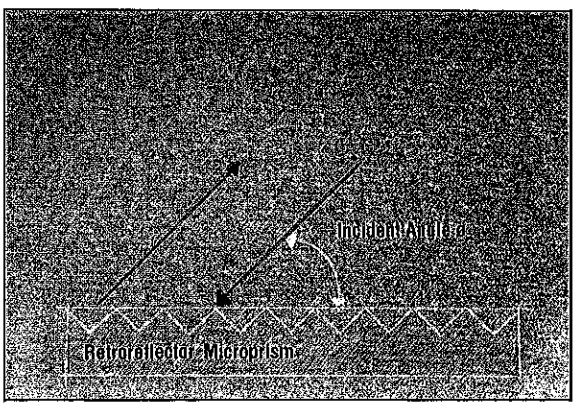
Objects placed between the reflective background and the sensor disrupt the reflected laser light. The Lasernet sensor's on-board microprocessor measures the location of these disruptions. From this, the Lasernet can calculate the sensed object's size and position.

In the accompanying diagram, the web passes between the sensor and reflective background. The Lasernet sensor measures the position of each edge and calculates the center position and width of the material. In addition, the Lasernet system is ideally suited to measure roll diameters on unwind and rewind stands, detect web breaks, and measure loop height.



The Lasernet monitors take the information from sensor's serial output port, scale these values for metric or English units, and display the actual position and width to an operator.

The Lasernet sensor outputs information via serial (RS-232 or RS-485), TTL and analog (0 - 10 VDC) signals. The monitors have optional serial (RS-232 & 20 ma current loop), relay (Dual form C) or analog (0 - 10 VDC & 4 - 20 ma) output signals.

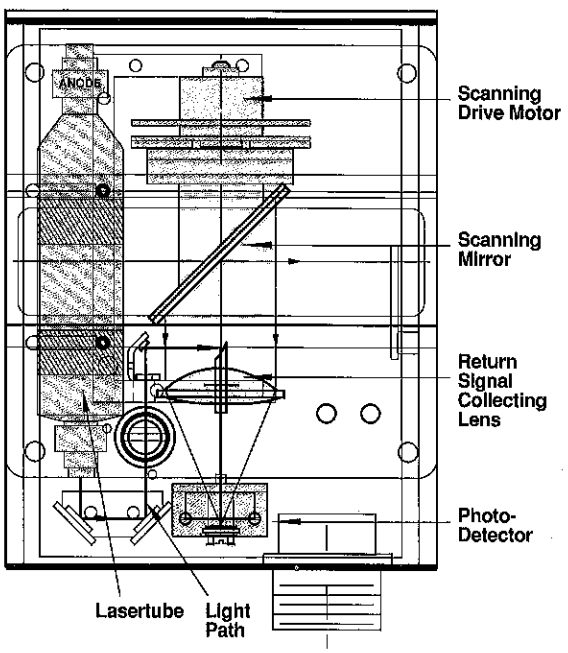


Retroreflectors

Retroreflective material has the unique property of returning light on the same path of its origin over a wide range of incident angles. Two types of retroreflectors are commonly used: glass beads and miniature mirrors placed at right angles next to each other to form a cube. The second type, called "corner cube" or "microprism reflectors", is more efficient than the glass bead variety and thus provides better performance. Namco stocks a wide variety of each type of reflector, including corner cube reflective tape which is the preferred reflective material for web or strip sensing.

Laser Source

The Lasernet is a Class II laser product. The U.S. Center for Devices and Radiological Health has determined that Class II lasers (outputs below 1 milliwatt) are safe except for deliberate long-term exposure by staring directly into the beam. Since Lasernet's output is rapidly scanned over its field of view, only a small fraction of the output power can be incident on an object on a duty cycle basis.



The Breakthrough Sensor for Web & Strip Applications

Simultaneous Guidance & Width Measuring

A single Lasernet sensor and control monitor can be used to simultaneously measure a web or strip's position and width—you no longer have to use separate systems!

The system provides real time digital display, minimum/maximum width recording, out-of-tolerance alarms, operator-controlled metric/U.S. scaling, and analog control signals. These signals can be used by a local controller to keep the web on track or adjust the width to keep it in spec.

Handles Varying Widths Without Sensor Repositioning

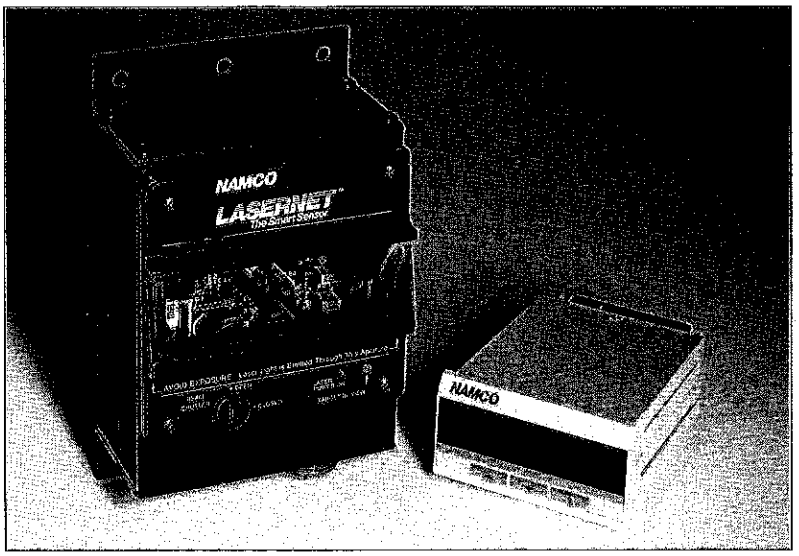
Unlike photoelectric slot sensing systems, different web or strip widths can be accommodated without moving or reprogramming the Lasernet. Initial calibration can be as easy as placing a known width of web or strip under the Lasernet and then setting the display to read this width. No other adjustments are necessary—even if wider or narrower product is run, Lasernet automatically compensates.

Non-Contact Sensing

Because Lasernet is a non-contact sensor, it requires much less maintenance than mechanical sensors, which must be constantly replaced, repositioned, or recalibrated. Furthermore, Lasernet's very long sensing range allows it to be mounted far from the web or strip and still provide highly accurate measurements.

Works in Dirty, Dusty Environments

Because it uses precise laser light with a high signal-to-noise ratio, the Lasernet sensor needs no special lighting and can operate in very dirty industrial environments where many optical sensing systems cannot. The sensor is not affected by the web's color and does not have to be adjusted when changing products.



Ignores Extraneous Debris & Objects

Lasernet can be programmed to ignore extraneous debris and by-products of the manufacturing process, as well as machinery and other objects that might enter its field of view. Selectable options let the user define the size of objects to be ignored.

Easy To Interface With Existing Controls

Lasernet can be a direct replacement for your existing sensors. No redesign of your control system is necessary because Lasernet can mimic many sensor outputs. The sensor has serial (RS-232 or RS-485), dual analog (0 - 10 VDC), and three real time TTL signals. In addition, the monitors offer analog (0 - 10 VDC & 4 - 20 ma), dual form-C relay and serial (RS-232 & 20 ma current loop) output signals.

Simple To Install

The sensor uses visible red laser light that can be used to ease installation. Simply apply power to the sensor, see where the laser line is, and place the retroreflective background along this line. The sensor can be installed in any orientation without effecting its performance, and the retroreflective backgrounds can be as much as ±30 degrees off of the Lasernet's incident beam.

Performance

Resolution:

The Lasernet sensor has extremely high resolution—15,360 bits over a 90° scan or .00586° (90° ÷ 15,360 bits). The linear resolution for a given application is related to the distance from the sensor to the web or strip.

Accuracy:

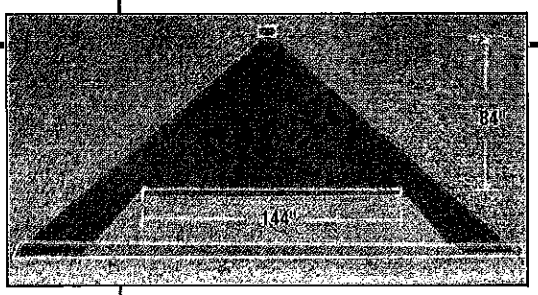
The accuracy of the sensor is related to the resolution and is typically ± four times the resolution.

Formulas:

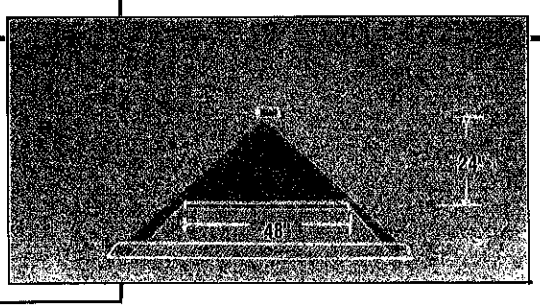
D = *Distance from Lasernet to web or strip*

Linear Resolution =
D x tan .00586° = D x .000102

±Accuracy =
±D x tan .0234° = ±D x .000409



Example A
D = 84"
Linear Resolution = 84" x tan(.00586) = .00859"
±Accuracy = ±84" x tan .0234 = ±.03431"



Example B
D = 24"
Linear Resolution = 24" x tan(.00586) = .00245"
±Accuracy = ±24" x tan .0234 = ±.00982"

Web & Strip Guidance

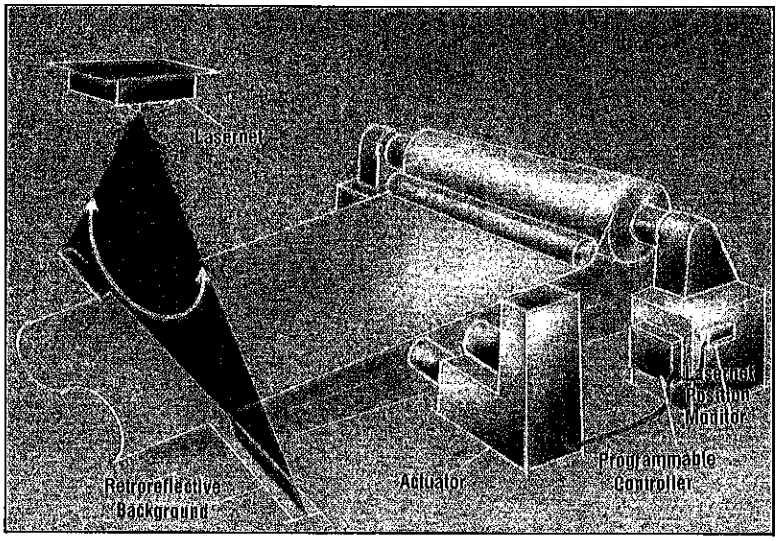
Objective

A very accurate guidance system that can be installed out of harm's way and easily accommodates different web or strip widths.

Solution

Placed overhead, the Lasernet sensor can continuously monitor either the center or edge position of a web or strip. The Lasernet monitor receives the position data from the sensor and outputs either an analog or serial signal proportional to the web or strip's position. The output can be fed to linear actuators so they can control the web or strip's position.

The Lasernet monitor can be scaled to display (in inches or centimeters) the web or strip's position. The monitor's scale and offset functions eliminate the need for a signal conditioning stage in the manufacturer's controller.



Benefits

The sensing system is remotely mounted, keeping it from being damaged or worn by the web or strip. This non-contact sensing significantly reduces downtime, maintenance, and replacement costs.

Because the sensor can guide varying width products without any adjustment, set-up time is reduced when changing over to a different gauge or product.

Installation

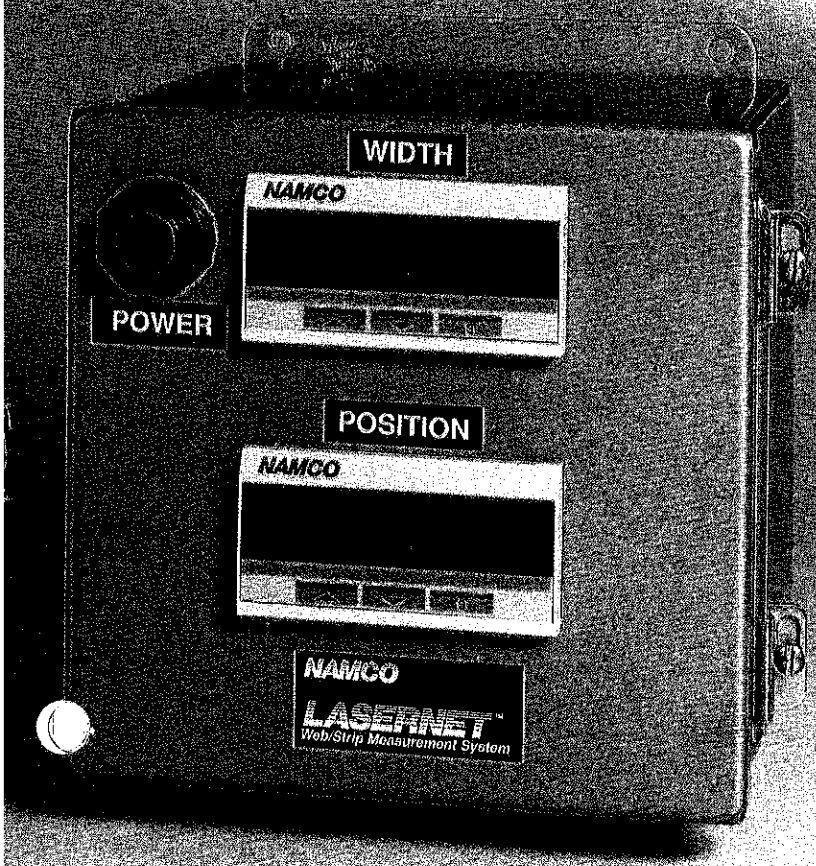
The Lasernet is mounted in the desired position, usually above the web or strip. Then the sensor is turned on and the retroreflective background is placed along the line formed by the visible red laser light.

The stationary web or strip is then physically centered by machine. A voltage meter is connected to the sensor and the Lasernet is adjusted until a 5V reading is given (the center of the sensor's 0 - 10 VDC output).

Equipment List

- Lasernet Sensor (LN110-30001)
- Lasernet Position Monitor (LN150-20001)*
- Retroreflective Background (LN180-00011)
- Lasernet Connector (LN180-00001)
- 24 VDC, .75A (minimum) linear regulated power supply
- Cabling

Consult Namco for various output options.



LASERNET

Loop Control

Objective

Precise monitoring and control of loop height using a non-contact sensor that could be readily installed.

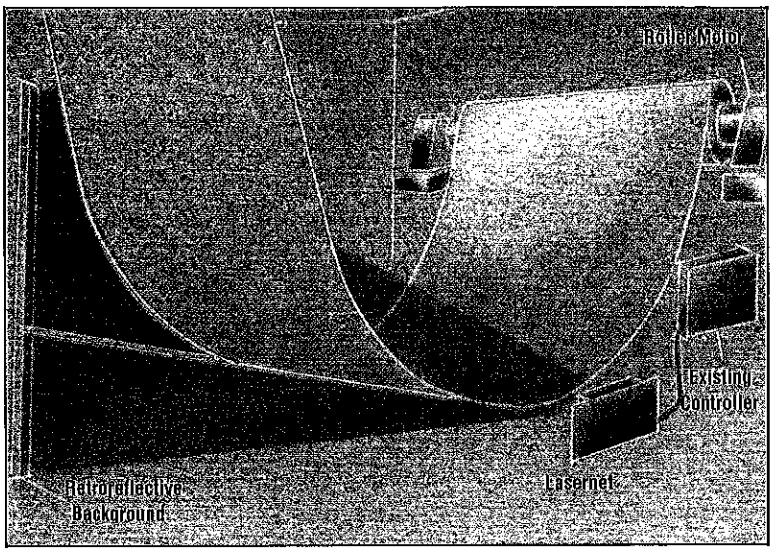
Solution

A Lasernet sensor is used with a speed controller to regulate the motor of the unwind stand that controls loop height.

The web or strip is placed in its ideal loop position (or height). The Lasernet sensor is mounted to the side of the loop and a retroreflective background is positioned across from it, on the other side of the loop.

A voltage meter is connected to the sensor. The sensor is turned on and adjusted until the meter reads 5V (the center of the sensor's 0 - 10 VDC output).

When the loop moves from its ideal height, an analog signal proportional to its new position is output to the motor speed controller. The Lasernet can be a direct replacement for reactor-arm sensors, connecting directly to motor speed controllers.



Benefits

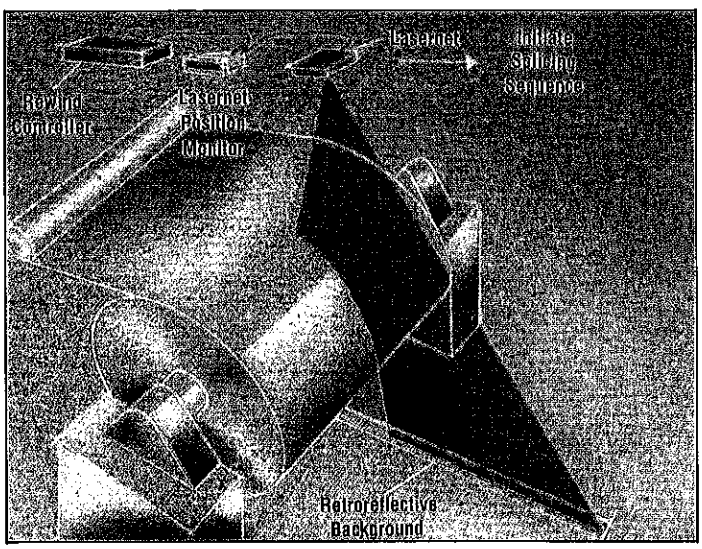
Eliminates damage, stretching, or added tension that reactor-arms produce. Lasernet is not affected by air currents, water, debris, or variable web speed. Results in much less maintenance and downtime than contact sensing systems.

Unlike pinpoint photoelectric sensors, Lasernet senses over a large field of view and can signal alarms anywhere along its sensing range. If the loop moves out of the Lasernet's field of view, a "target-out-of-view" indication is sent to the controller, prompting alarms or automatic machine shutdown.

Lasernet is reliable for a wide range of web or strip materials, widths and gauges.

Equipment List

Lasernet Sensor (LN110-30001)
Retroreflective Background (LN180-00011)
Lasernet Connector (LN180-00001)
24 VDC, .75A (minimum) linear regulated power supply
Cabling • Existing Speed Controller



Equipment List

Lasernet Sensor (LN110-30001)
Lasernet Position Monitor (LN150-20001)*
Retroreflective Background (LN180-00011)
Lasernet Connector (LN180-00001)
24 VDC, .75A (minimum) linear regulated power supply
Cabling

*Consult Namco for various output options.

Gauging Roll Diameters

Objective

A non-contact way to measure roll diameters and indicate when roll is full.

Solution

A Lasernet sensor is placed above a roll. A retroreflective background is placed underneath and to one side of the roll.

The Lasernet measures the roll diameter by determining how much of the reflective background is blocked. The analog output based on roll size can then be used to dynamically control the rewind motor speed. The Lasernet will output a TTL signal when the roll reaches a user selectable size band. This signal is typically used to initiate a splicing sequence when the current roll is full.

Benefits

The Lasernet can be mounted out-of-the-way, far from the roll, while providing real time measurement of the roll's diameter. Its non-contact sensing will not damage the material being rolled, and it requires much less maintenance than contact systems.

Ultra Accurate & Wide Web Control

Objective

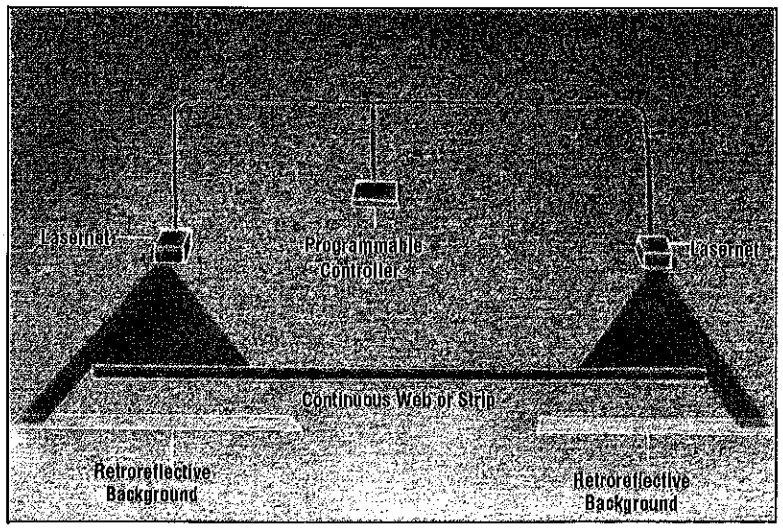
Extremely accurate monitoring of web or strip width and centerline or edge position.

Solution

Two Lasernets are used, one at each edge of the web or strip. A programmable controller with a serial input port receives data from the sensors and then calculates the web or strip width and position. The programmable controller's output can be fed to linear actuators.

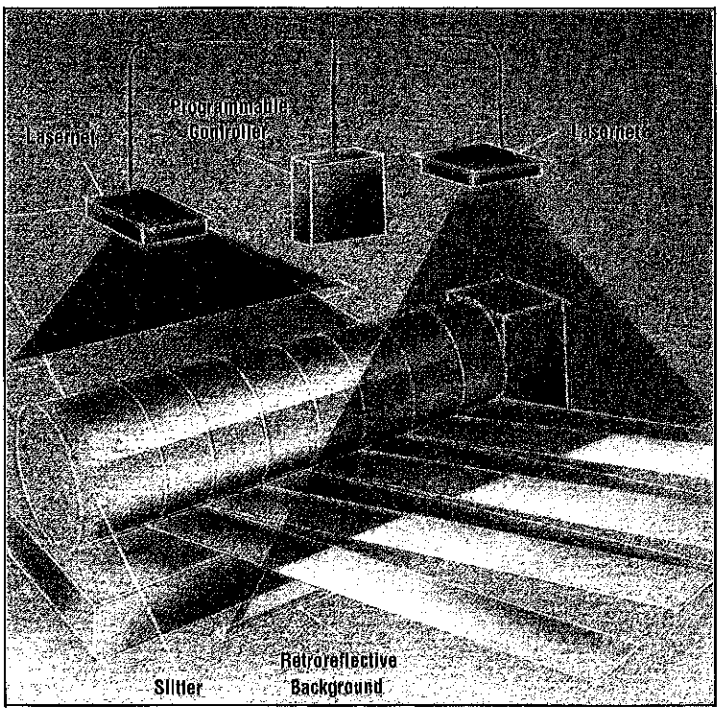
Benefit

A highly precise, non-contact method to monitor very large webs or strips.



Equipment List

Two Lasernets with RS-485 outputs (LN110-40001)
Two Lasernet Connectors (LN180-00001)
Retroreflective Backgrounds (LN180-00011)
24 VDC, 1.5A (minimum) linear regulated power supply
Cabling
Programmable Controller with serial input ports



Equipment List

Two Lasernets with RS-485 outputs (LN110-40001)
Two Lasernet Connectors (LN180-00001)
Retroreflective Backgrounds (LN180-00011)
24 VDC, 1.5A (minimum) linear regulated power supply
Cabling
Programmable Controller with serial input ports

Multiple Slitting Lines Width Monitoring & Control

Objective

Measure and control width or position of multiple strips in slitting lines.

Solution

One Lasernet can monitor the width or position of up to eight different slit strips. Another Lasernet can be used to guide or measure the uncut material before it enters the slitter.

The sensors should be mounted directly over and perpendicular to the material. The retroreflective background should be positioned under the material so that the Lasernet "sees" it on both outer sides and between each strip of material.

For both sensor installations, material of known width and position are used to initially scale and offset the Lasernet Monitor. The slit strips can have various widths, and alarms can be set for each.

Benefits

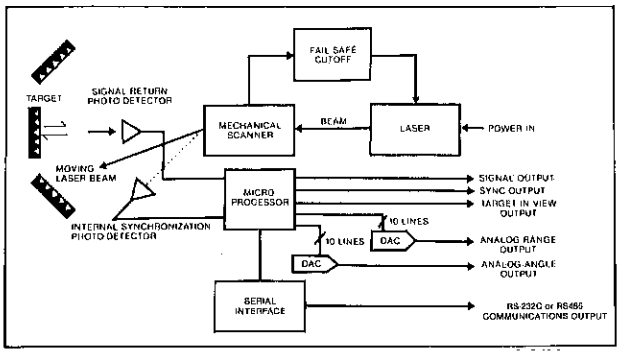
No other sensor can measure eight strips simultaneously with the precision and rapid response time of the Lasernet.

Furthermore, Lasernet provides measurement of the slit product independent of the slitter, therefore it can detect drift and wear of the knives.

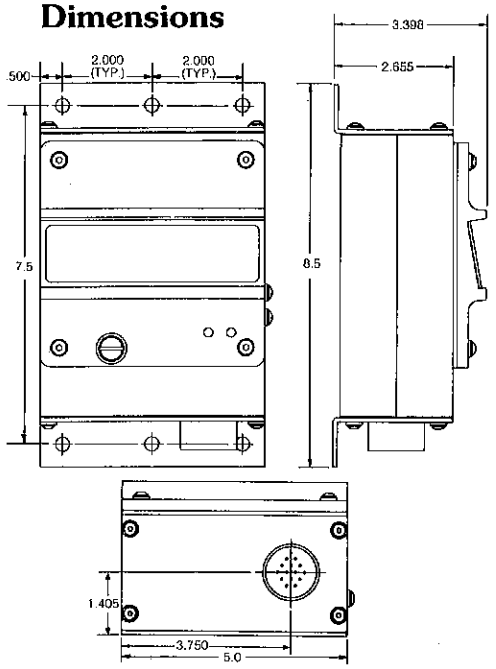
For quality assurance or SPC, a comparison of the uncut and the cut widths can be made to determine the amount of scrap and the true efficiency of the production process.

LASERNET

Mechanical Block Diagram



Dimensions



Specifications

Range
1' to 20' using a 4" target (LN110 Series)
3' to 50' using two 4" targets● (LN120 Series)

View Angle
±45° from normal center line (LN110/120-20001 Series). ±5° to ±45° from normal center line (user adjustable for LN110/120-30001 & 40001 Series)

Scan Rate
20 scans of viewing field per second

Standard Target
4" x 4" retroreflector EP175-13900 (LN110 Series)
Two 4" x 4" retroreflectors EP175-13900 (LN120 Series)●

Range Accuracy, Angle Accuracy, Range Resolution, Angle Resolution
Refer to "Performance" box on page 1

Sensitivity to Target/Beam Normality
Standard specifications are based on normal (perpendicular scanning of target). When non-normal scanning of target arises, the effect on range is to indicate the target is further away according to the Cosine Law.

Outputs (Digital)
1) TTL real time signal return pulse (high during return of light from retroreflector)
2) TTL scan synchronization pulse (high when scanning view angle)
3) TTL target in view signal: (high when retroreflector target is in view; polarity can be adjusted in LN110/120-30001 & 40001 Series)

Indicator LED's
1) "Laser Power On"
2) "Target In View"

Power Requirement
Nominal 24 volts DC input; 12 watts (17 watts for LN120 Series).

Laser Source
Class II helium neon 0.8 MW(2.0 MW for LN120 Series). Meets CDRH Class II requirements. Direct viewing of non-scanning beam not recommended.

Failure Detection Modes
1) Laser is turned off when scanning motor stops.
2) TTL synchronous signal is lost if laser source fails.
3) Loss of "Target in View" signal indicates no target or that beam is blocked.

Mounting
Mounting bracket attached.

Environmental
NEMA 1, 12, & 13 metal housing, 0°C to 40°C operation, moderate vibration

Calibration
Calibrated at factory; external adjustments for range and angle available

Ambient Light
Insensitive to ambient light

Scan Buffer Zone
Used to prevent partial scanning of targets that cross boundaries of viewing angle.

Serial Communications●
RS-232C or RS-485 data format; 8 data bits, 1 or 2 stop bits no parity. Factory selectable transmission rates form 300 to 38,400 B.P.S.

Note:
●Two 4" x 4" retroreflectors with outside edges of reflectors spaced 10" apart.
● Specify desired transmission rate and number of stop bits when ordering.

Request publication CD/LN110/120 for ordering information.

Application Data & Product Demo Available

Call 1-800-NAMTECH for more details about the applications in this brochure. We are also happy to help you with unique sensing applications.

NAMCO

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