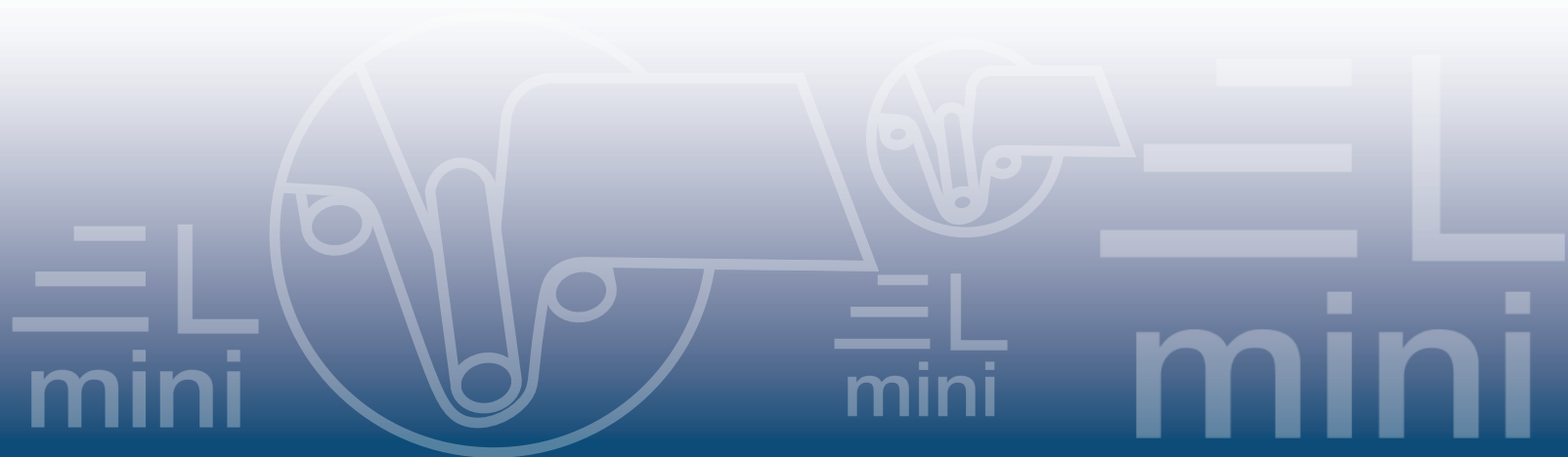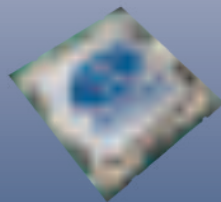# InteliSENS®

SLmini-i4 SERIES

Non-Contact Laser Doppler Speed & Length Measurement

- No Slip, No Wear, No Marking

- Incredibly Small and Easy to Install

- Pulse Outputs like your Encoder

- Stand Alone Device

- Integrate to Machine PLC
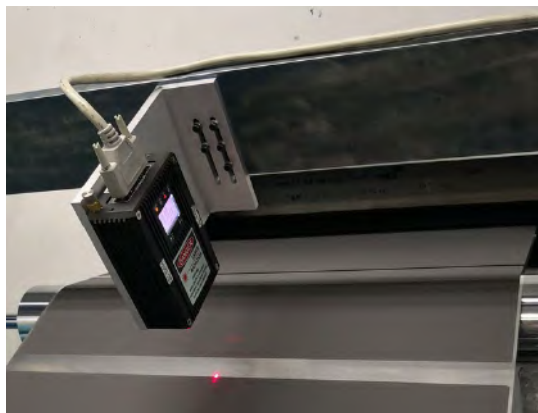
- Industry 4.0 Data Communications

InteliSENS

SLmini-i4 SERIES

Non-Contact Laser Doppler Speed & Length Measurement

The InteliSENS SLmini-i4 Non-Contact Speed and Length measurement gauge is ideal for flat surface products in "roll to roll" or "cut to length" processes. Paper, Film, Foil, Wovens, Non-Wovens, Textiles, Roofing, Sidings, Gypsum Board, Print Registration, and Repeat Length are just a few application examples. Manufacturing processes, where speed measurement is critical for drive control or where length measurement is critical for product quality, will benefit from the increased accuracy of Laser Doppler Speed and Length Measurement.
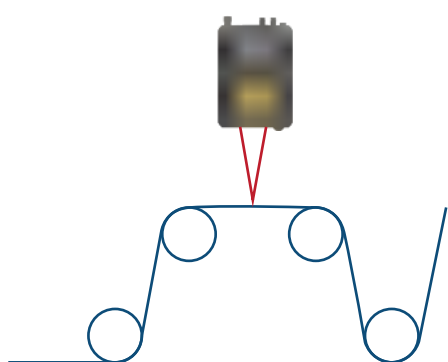
Focused on connectivity the SLmini-i4 Smart Sensor with 32bit communications comes preloaded with Profibus, Profinet, and Ethernet Industrial Protocol for your PLC connection. Modbus, OPC-UA, RS232, RS485, and WiFi round out a wide range of digital communications for your Industry 4.0 Solution.
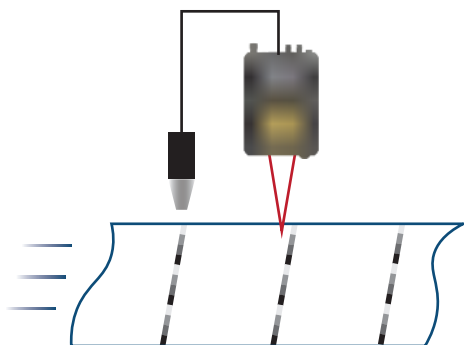
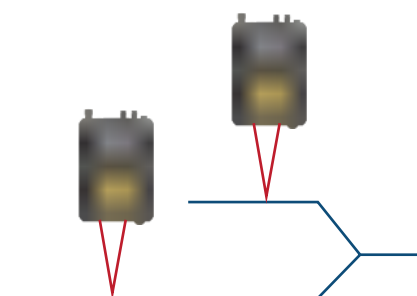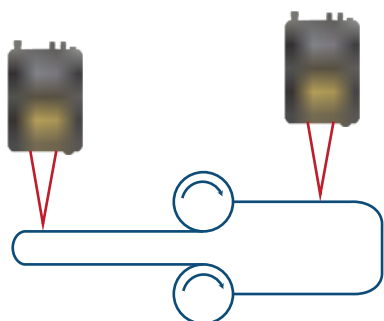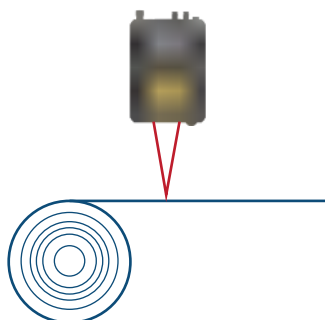# Applications

Speed Measurement
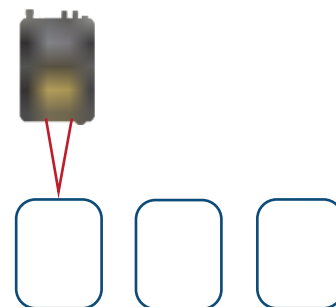
Print Registration
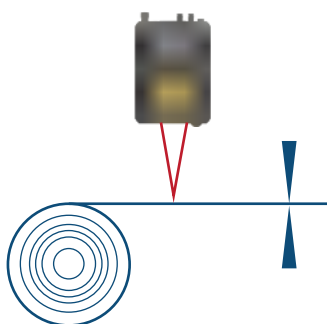
Speed Balancing

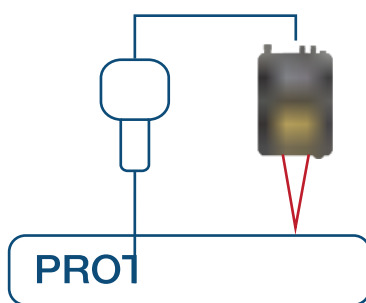## Speed Ratio (Elongation)

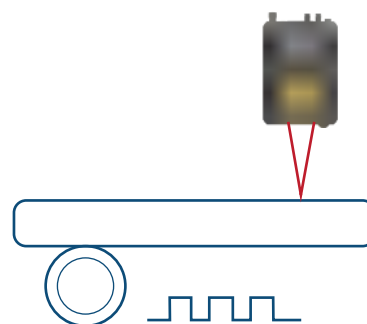## Speed Length Measurement

Part Length Measurement

Cut-To-Length Control
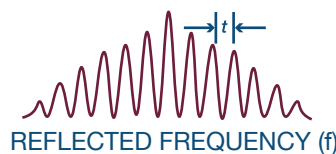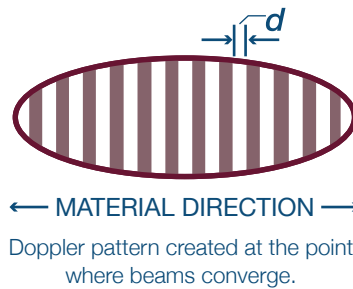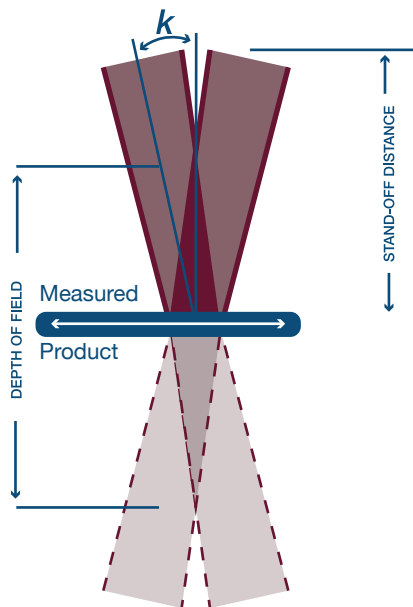
Inkjet Printer Control

PRO

Encoder Calibration

Operating Principle

The InteliSENS SLmini-i4 Series Laser Doppler Speed and Length gauge illuminates the measured surface with an interference pattern created by the intersection of two laser beams. The alternating bright and dark fringe pattern modulates the light scattered by the object with a frequency proportional to the object's speed. This scattered light is detected by a photodiode and the electrical signal is digitally processed to determine the frequency and hence the speed. Object length is then calculated by integrating the speed measurement with respect to time.

The IntelliSENS SLRmini-i4 Series Laser Doppler Speed and Length gauge extends the measurement principle of the SLmini-i4 Series by using a high-frequency Bragg cell modulator to illuminate the measured surface with a scanning interference pattern, which generates an oscillating light signal even when the object is stationary. The direction of motion is determined by whether the scattered light frequency is higher or lower than the stationary frequency.

LASER DOPPLER VELOCIMETRY

$$d = \frac{\lambda}{2 \sin k}$$

Fringe spacing is a function of laser wavelength and beam angle

Doppler pattern created at the point where beams converge.

$$f = \propto \frac{v}{d}$$

Doppler frequency is proportional to speed/ fringe spacing.

← MATERIAL DIRECTION →

REFLECTED FREQUENCY (f)

$$L = \int_0^T v\, dt$$

Speed is intergrated to measure length

DEPTH OF FIELD

STAND-OFF DISTANCE

Measured

Product

Class 3B Visible Laser.
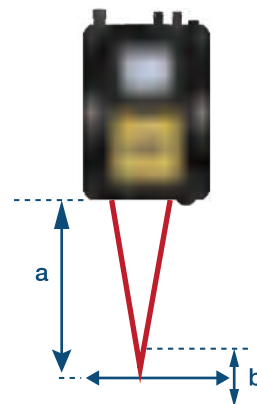Wavelength 650 - 670 nm, typically 658 nm with a beam diameter of 3mm (0.12")
Total emitted power 40mW. Power Density at Stand Off Distance 50mW/cm2

Specifications

SLmini and SLRmini Non-Contact Laser Doppler Speed and Length Gauges are specified with "a" Stand off Distance" and "b" Depth of Field.

The object to be measured must be within the "Depth of Field" which is centered around the "Stand off Distance".

Performance

	SLmini 1220-i4	SLmini 3060-i4	SLRmini 1220-i4	SLRmini 3060-i4
Stand Off Distance	120mm 4.74"	300mm 11.81"	120mm 4.74"	300mm 11.81"
Depth of Field	20mm 0.79"	60mm 2.36"	20mm 0.79"	60mm 2.36"
Minimum Speed	0.1 m/min 0.33 ft/min	0.25 m/min 0.82 ft/min	0 m/min 0 ft/min	0 m/min 0 ft/min
Maximum Speed	2000 m/min 6562 ft/min	5000 m/min 16404 ft/min	± 2000 m/min ± 6562 ft/min	± 5000 m/min ± 16404 ft/min

Accuracy	Factory Calibrated to better than 0.05%. Repeatability of 0.02%
Measurement	Maximum Acceleration Rate of 500m/s2 (1640ft/s2) Measurement Rate Up to 24,400/sec
Units	Speed Measurement selectable m/min, ft/min, yd/min Length Measurement selectable m, ft, inch, yd
Mode	Normal (Continuous Length), Batch Length
Object Detection	Automatic Detection and Object Present

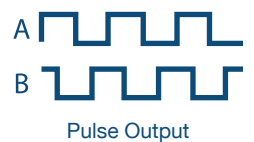## Electrical and Operating Requirements

Power Supply	Power Consumption	Operating Temperature	Environmental Protection
15 - 30 Vdc	15 Watts	5°C- 40°C-(41°F-104°F)*	IP 67

*See Accessories for High Temperature Options

Connectivity

A ⊓⊔⊓⊔⊓⊔
B ⊓⊔⊓⊔⊓⊔
Pulse Output
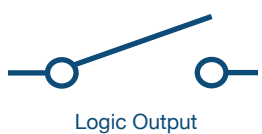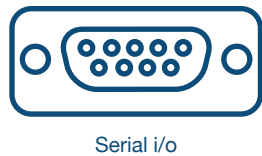
Default Output 5vdc or User Input to 24vdc
Max Maximum Frequency 2MHz Pulse Rate Selectable - Pulse/Meter or
Meter/Pulse Configurable as 6 x Single End or 3 Quadrature or 3 Differential.
Non Isolated from Gauge Head, Opto Isolated from the PSU-BOB i4
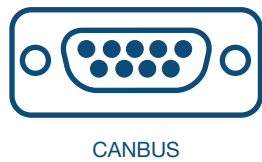
Logic Inputs

Maximum Input Voltage 24Vdc
2 x Fixed logic Inputs - Laser Enable and Shutter Enable
3 x Selectable logic Inputs - Reverse Direction, Length Reset, Display Hold, Speed
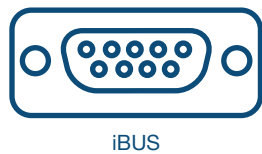Hold, Total Length Reset, End of Reel

Logic Output

Maximum Voltage 30Vdc, Current 100mA.
N-Channel MOSFET pull-down (for connection to user supplied onto isolated relay)
1 x Fixed Logic Output - Shutter Status
3 x Selectable logic outputs - Gauge Ok, Measuring Speed, Preset Length 1, Preset
Length 2, Good Readings Low, Object Detected, Gauge Hot.

Serial i/o

RS232 MODBUS RTU, PROTON ASCII code or Label Printer
USB using RS232 - USB Converter Cable
RS485 MODBUS RTU, PROTON ASCII code (Not available with PROFIBUS)

CANBUS

Connects to Proton Products CDi4 Display

iBUS

Connect to a PLC using PROFIBUS, PROFINET, or EtherNet I/P, data update rate up to
500/sec. Flexible Data Configuration, Big Endian, Little Endian

Ethernet

Ethernet selectable between OPC-UA, Modbus, Industrial Protocol IP, and Profinet

WiFi

Connect to a PC or Mobile Device using WiFi 2.4G and use the Proton Products Gauge App
available for iOS and Android. Ideal for gauge configuration and diagnostics

Industry 4.0

4.0 INDUSTRY

More than 200 Data Words are available to communicate with your Industry 4.0 Solution. Data Words are divided the into distinct function groups to make it easy to select the ones you want.

Gauge ID Data Words	Model Number, Serial Number, Firmware APP version, Firmware Core Version, Firmware Date
Calibration Data	Last Calibration Date, Days Since Last Calibration, Total Run Time, Calibration Alarm
Validation Data Words	SNR, Signal Amplitude, Good Readings, FFT Amplitude
Wired Network Info	IP Address, Netmask, Gateway
WiFi Network Info	IP Address, Netmask, Gateway, SSID
Measurement Data	Instant Speed, Average Speed, Batch Length, Total Length
Diagnostic Data	Laser Temperature, APD Temperature, Laser ON/OFF Cycles, Max/ Min Case Temperature

Smart Sensors Enable Smart Factories

"Industry 4.0 the Fourth Industrial Revolution is real. In its various shapes, forms, and definitions, it's happening, accelerating around the world, and Proton Products is an active player in this movement. A Smart Sensor is a Bridge between the Physical World (Measurement of Products and Processes) and the Digital World (MES, ERP Factory Management Systems). The more connected these worlds are, the more informed we become, improving our decision processes which ultimately enable us to reach our goals."

Proton Products Inc.
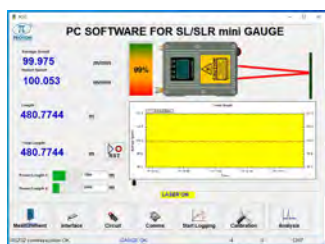
Accessories

Display

CDi4
Part No. 00049MC021

CDi4 Panel Mount
Part No. 00049MC043

CAN 9DD Cable
Part No. Length Dependent

PCIS-SL/SLR mini
Part No. 00050SW001

USB-RS232_1.8m Cable
Part No. GP00000624

Proton MDIS
Part No.

Power

PSU-BOB-SL i4
Part No. 00060MC050

Mains Cable
Part No. 00002CM502

DB44 Cable
Part No. Length Dependent

Stands and Guards

Base Plate
Part No. 00050MC042

3D ADJ Plate
Part No. 00050MC044

Vibrating Reduction Kit
Part No. 00050MC043

Accessories

Protection

Air Wipe
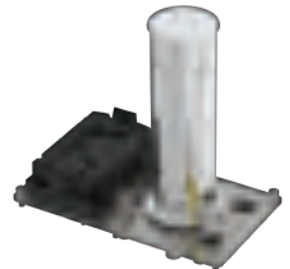Part No. 00050MC034

Beam Shroud 1220
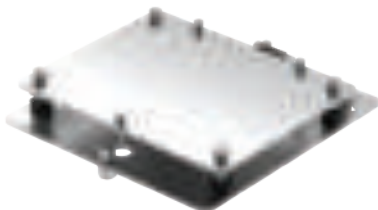Part No. 00050MC033

Beam Shroud 3060
Part No. 00050MC037

S-BOX mini
Part No. 00050MC019

S-BOX Panel
Part No. 00046MC048

S-BOX Panel Vortex
Part No.00046MC039

S-Box mini 3D ADJ Plate
Part No. 00050MC020

Air Accelerator
Part No. 00060MC038

Air Filter
Part No. 00043MC048

Cooling

TC300 Temperature Controller
Part No. 00039MC002

Mains Cable
Part No. 00002CM502

Accessories

Alarm & Report

A1 Alarm Unit
Part No. 00025MC001

M16AP Cable
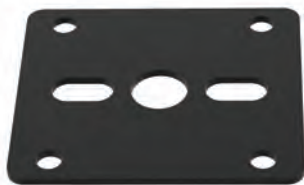Part No. 00025CB003

Zebra Label Printer
Part No. 00043MC033

RS232 9DD Cable
Part No. Length Dependent

Accessories

Aperture Plate
Part No. 00050MC281

Stainless Steel Replacement Kit
Part No. 00050MC891

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