InteliSENS®
SL mini & SLR mini SERIES

Non-Contact Laser Doppler Speed & Length Sensor Technology

- Smallest sensor on the market provides direct replacement for contact tachometers and wheel encoders.
- Fastest speed sensor on the market and unrivalled in both performance and price.
- Non-contact, non-marking, zero-slippage.
- Highest accuracy and repeatability with CE-M certified legal metrology versions available.
- Compact, intelligent, and easy-to-integrate, featuring a broad range of interfaces.
- Designed, manufactured and supported by the global leader in non-contact laser Doppler speed and length measurement technology.
The new, smart and uniquely-compact Laser Doppler “Speed and Length” sensor that sets new standards in non-contact speed and length measurements of moving objects and materials in industrial applications.

Designed to replace cumbersome, inaccurate and high-wear contact-wheel speed and length measurement devices in industrial processes. Contact-wheel encoders are prone to excessive measurement errors due to slippage, vibration, wear and dirt accumulation; resulting in product give-away and non-conformance to specifications.

- Provides savings on product give-aways with a typical return-on-investment within a few weeks to a few months.
- Non-contact measurement technique provides an industry-leading accuracy of ±0.05% without need to ever re-calibrate due to wear.
- Industry-leading 200kHz internal measurement rate with one measurement output every 20 microseconds.
- Fully solid-state design with no moving parts for maintenance free operation.
- 2 pulse outputs user-configurable for independent or quadrature operation.
- Includes Ethernet, RS-232 and Proton CANbus communications interfaces as standard.
- Optional PROFIBUS, PROFINET, DeviceNet, EtherNet/IP or Wifi may be substituted for the Ethernet communications interface.
Applications

The InteliSENS® SL mini / SLR mini series is designed for industrial applications and material processing lines; compatible with almost all moving materials including web, plate and sheet. The InteliSENS® SL mini / SLR mini is suitable for a wide range of applications involving measurement and control of length, speed, differential speed or elongation.

Specifications

<table>
<thead>
<tr>
<th>MODELS</th>
<th>SL mini 1220</th>
<th>SL mini 3060</th>
<th>SLR mini 1220</th>
<th>SLR mini 3060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum speed (m/min)</td>
<td>0.1</td>
<td>0.25</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Maximum speed (m/min)</td>
<td>5000</td>
<td>5000</td>
<td>±5000</td>
<td>±5000</td>
</tr>
<tr>
<td>Nominal stand-off distance (mm)</td>
<td>120</td>
<td>300</td>
<td>120</td>
<td>300</td>
</tr>
<tr>
<td>Depth-of-field (mm)</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>±0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability (%)</td>
<td>±0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum acceleration (m/s²)</td>
<td>&gt;1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement update time</td>
<td>200 kHz internal and 20μs at the outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>24VDC / 8W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental protection rating</td>
<td>IP67 (harsher environments possible with an optional environmental enclosure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>5-45°C (higher temperatures possible with an optional environmental enclosure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>length 140 × width 105 × height 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser beam diameter (mm)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser safety classification</td>
<td>Class 3B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic display</td>
<td>Integrated LCD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse outputs</td>
<td>2×pulse outputs or 1×quadrature output, freely programmable, pulse rate &lt; 1MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td>Laser enable</td>
<td>Shutter enable</td>
<td>3 programmable inputs</td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td>Shutter status</td>
<td>2 programmable outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard communications interfaces</td>
<td>RS-232</td>
<td>Ethernet TCP/IP (Modbus protocol)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display communications</td>
<td>Proton CANbus for optional SiDi-CDI interface display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional communications interfaces (replaces Ethernet TCP/IP interface)</td>
<td>PROFINET</td>
<td>DeviceNet</td>
<td>PROFIBUS</td>
<td>EtherNet/IP</td>
</tr>
</tbody>
</table>

Typical industrial applications include:

- Woven, non-woven, textile, and leather industries
- Plastic film, foil, tape and liner industries
- Paper, corrugated and packing materials industries
- Rubber and synthetics industries
- Timber, wood, ceramics industries
- Printing industries
- Building materials
- Extrusion industries
- Automotive industries
Operating principle

Proton Products InteliSENS® SL mini Series speed and length gauges illuminate the measured surface with an interference pattern created by the intersection of two laser beams. The alternating bright and dark interference fringes modulate the light scattered by the object with a frequency proportional to the object speed. This scattered light is detected by a photodiode and the electrical signal digitally processed to determine the frequency and hence the speed. Object length is then calculated by integrating the speed measurement over time.

The InteliSENS® SLR mini Series bidirectional speed and length gauges extend this principle 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. Direction of motion is determined by whether the scattered light frequency is higher or lower than the stationary frequency.

<table>
<thead>
<tr>
<th>a</th>
<th>Stand-off distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>Depth-of-field</td>
</tr>
<tr>
<td>k</td>
<td>Angle between the two laser beams</td>
</tr>
<tr>
<td>v</td>
<td>Object speed</td>
</tr>
<tr>
<td>d</td>
<td>Laser interference pattern period (not visible to the human eye): ( d = \frac{\lambda}{2 \sin k} )</td>
</tr>
</tbody>
</table>

\[ f = \frac{1}{t} \alpha \frac{v}{d} \]

\[ L = \int_0^T v \, dt \]
Stand-off distance and Depth-of-field

SL mini and SLR mini non-contact laser Doppler speed and length gauges are specified with a “Stand-off distance” and a “Depth-of-field”.

The object to be measured may be located within the “Depth-of-field” which is centred on the “Stand-off distance”.

- The SL mini 3060 and SLR mini 3060 are recommended for use in most commonly-encountered applications.
- The SL mini 1220 and SLR mini 1220 are recommended for use on lower reflectivity materials such as transparent films or in applications with limited installation space.

<table>
<thead>
<tr>
<th>MODELS</th>
<th>SL mini 1220</th>
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<th>SLR mini 1220</th>
<th>SLR mini 3060</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unidirectional</td>
<td>Bidirectional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a Stand-off distance (mm)</td>
<td>120</td>
<td>300</td>
<td>120</td>
<td>300</td>
</tr>
<tr>
<td>b Depth-of-field (mm)</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td>60</td>
</tr>
</tbody>
</table>

Applications
Optional Installation Accessories

PCIS-SL-mini software package
For easy configuration and display of gauge settings and measurements.

Interface cable
DB-25 to DB-25 cable available in 3, 5, 10, 15, 20 or 30m lengths.

Terminal Expander (OEM only)
For power supply, electrical and communications interface connection.

DIN-Rail Terminals
DIN-Rail wiring break-out terminals for power supply, electrical and communications interface connection.

PSU-BOB-mini
Universal mains power supply unit and wiring breakout box.

SiDi-CDI
Colour interface display unit for configuration and display of gauge settings and measurements.

Adjustable beam enclosure tube
BPUI220 (for SL mini 1220 or SLR mini 1220) BPUI3060 (for SL mini 3060 or SLR mini 3060) Enclosure of the laser beam to within 10mm of the object for laser safety and harsh environments.

Air-wiped quick-change window
High-efficiency, air-wiped protection window for dusty and steamy environments with a quick-change window release mechanism.

Vibration isolation mount
Isolates the gauge from vibrating machine parts or structures that could otherwise disrupt measurements.

Vibration isolation mount with angle adjustment
Vibration isolation mount with ±3° of roll and yaw adjustment.

Harsh Environment Accessories

Cooling Plate
Air or water cooled plate for installation between the gauge and mounting surface; for use in ambient temperatures up to 60°C.

ENV-BOX
Stainless-steel environmental protection housing for increased protection against dust, splash, drip or airborne materials. Also available fitted with vortex air-cooler for high temperature environments.

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