BL PIEZO ELECTRIC SENSOR

INSTALLATION

TDC Systems Limited
Weston-Super-Mare
ENGLAND

Tel : +44 (0)1934 644299
Fax : +44 (0)1934 644255
Email : sales@tdcsystems.co.uk
Web : www.tdcsystems.co.uk
Introduction

Recommended Sensor Type

TDC recommends the MSI BL piezo electric sensor for most high speed weigh-in-motion (HSWIM) applications including pre-selection for enforcement and data collection systems. The BL sensor is small, easy to install, requires minimum of maintenance and provides a low cost answer to traffic weight data collection at normal highway speeds.

The sensor is installed into a small slot cut in the road surface, the slot is nominally 3.5m long (dependant upon lane width), 20mm wide (in the direction of traffic flow) and only 20mm deep. Unlike other traffic sensors the shallow cut ensures that the road substructure is not disturbed, the slot being within the wearing course which is normally 40-50mm thick. In addition the sensor does not present a solid or rigid intrusion in the road surface hence any bending moment within the pavement due to the passage of heavy axles does not cause differing movement of sensor against asphalt. This latter effect causes loosening of material around the sensor; is predominant problem with rigid type sensors and the major cause of sensor failure.

The sensor is mounted in the slot with small plastic clips and the slot is backfilled with a polyurethane adhesive thus completely encapsulating the sensor within the wearing course.

Product Description

The Roadtrax BL Traffic Sensor is designed for permanent or temporary installation into or onto the road surface for the collection of traffic data. The unique construction of the sensor allows direct installation into the road in a flexible format so that it can conform to the profile of the road. The flat construction of the sensor gives an inherent rejection of road noise due to road bending, adjacent lanes, and bow waves of approaching vehicles.

The small cut in the road minimizes the damage done to the road, speeds up the installation and reduces the amount of grout used for the installation. The Roadtrax BL sensor is available both as a Class I sensor for the highest level of uniformity needed for Weigh in Motion applications and as a Class II sensor which is more cost effective for Counting, Classifying, High Speed Toll Booths, Speed Detection, and Red Light Cameras.
Features

- **Uniform, high amplitude** piezoelectric output compatible with existing counters and classifiers on the market.
- **Excellent Signal to Noise Ratio** which has an inherent 10:1 rejection of road noise due to road bending, adjacent lanes and bow waves of approaching vehicles.
- **Easy installation** in a 20 x 20mm slot, which minimizes the disturbance of the road, decreases the depth of the road cut, and minimizes the amount of grout needed.
- **Flexible sensor** - conforms to any road profile while maintaining a uniform distance to the road surface.
- The final installation is flush with the road surface – snow-plows will not damage the sensor.
- **Durable** enough to withstand normal installation handling and hundreds of millions ESAL's.
- All sensors are **100% tested and certified** for performance as a complete sensor prior to shipment.
- Custom Passive Signal Cable with **High Density Poly Ethylene Jacket** which is rated for direct burial and resists nicks and cuts.

Typical signal output is shown below.
Why use Piezo Electric Sensors for HSWIM?

- **Accuracy:** The BL sensor gives accuracy of ±10% for 95% of vehicles providing the sensor is installed in a smooth flat road surface (See COST 323 and ASTM E1318-02 for preferred road and surface conditions).

- **Installation:** The installation is simple and can be carried out in 3 hours per lane, meaning minimal road closure times.

- **Reliability:** The sensors are fully encapsulated in resin, do not present a rigid intrusion in the road structure and therefore do not exhibit the problem of rigid flush mounted sensors, where resin break up in the wheel track area causes the sensor to work free over a period of time. Such sensors require regular maintenance in the form of resin repairs, they cause break up of the road surface around the array the consequence of which is early failure of the sensor.

- **Cost:** The sensor cost, installation cost and associated maintenance costs are considerably lower than other proven WIM technologies now available.
<table>
<thead>
<tr>
<th></th>
<th>Piezo Electric</th>
<th>Bending Plate</th>
<th>Kistler</th>
<th>Single Loadcell</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy (in smooth, flat road surface)</strong></td>
<td>±10%, 95% Confidence</td>
<td>±8%, 95% Confidence</td>
<td>±8%, 95% Confidence</td>
<td>±6%, 95% Confidence</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>6 Year life span</td>
<td>6 Year life span (Plate)</td>
<td>6 Year life span</td>
<td>20 Year life span (Structure)</td>
</tr>
<tr>
<td><strong>Most Likely Fault</strong></td>
<td>Cable damage</td>
<td>Gauge failure (water)</td>
<td>Sensor due to resin damage</td>
<td>Load Cell (transient)</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Virtually Maintenance Free</td>
<td>Regular (6 monthly) epoxy repairs, tighten screws in pit etc</td>
<td>Regular Cracks in resin around sensor</td>
<td>Regular (6 monthly) remove load cell and other</td>
</tr>
<tr>
<td><strong>Installation Cost</strong></td>
<td>US$2000 per lane</td>
<td>US$12500 per lane</td>
<td>US$12000 per lane</td>
<td>US$20000 per lane</td>
</tr>
<tr>
<td><strong>Lane Equipment Cost</strong></td>
<td>US$2500 per Lane</td>
<td>US$8000 per Lane</td>
<td>US$20000 per Lane</td>
<td>US$40000 per Lane</td>
</tr>
<tr>
<td><strong>Installation Time</strong></td>
<td>3 Hours Per Lane</td>
<td>3 Days Per Lane (Asphalt Road)</td>
<td>1 Day Per Lane</td>
<td>3 Days Per Lane</td>
</tr>
<tr>
<td><strong>Pit or Slot Size</strong></td>
<td>Slot Size: 3500 x 19 x 19mm (depth)</td>
<td>Pit Size: 3500 x 1450 x 750mm (depth)</td>
<td>Slot Size: 3500 x 75 x 55mm (depth)</td>
<td>Pit Size: 4125 x 1450 x 950 mm (depth)</td>
</tr>
</tbody>
</table>
INSTALLATION PROCEEDURE PICTURES

Slot Cutting Machine

Marking Out
Marking Out

Slot Cutting
Slot Cutting

Washing the Slots
Cleaning the Slots

Drying the Slots
Piezo Sensor in Slot

Piezo Sensor Slot Back-Filled with Epoxy
Piezo Sensors Encapsulated in Epoxy

Grinding Off Excess Epoxy
Laying Loop & Sensor Cables

Back Filling Loop Sensor Slot
Feeder Cable Conduit

Cable Entry into Cabinet