DATASHEET

CAPACITIVE STRETCH SENSOR

SS-Series
High accuracy stretch sensor
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SS – High accuracy stretch sensor

PRODUCT DESCRIPTION

The LEAP Technology Stretch Sensor is a versatile, highly repeatable, elastic sensor, sensitive to the amount of stretch exposed.

Unlike other stretch sensors, LEAP’s devices behave predictably over a wide temperature range and do not suffer from significant drift under long periods of use.

The capacitive nature of these products ensures high accuracy and repeatability even in environmentally challenging applications.

APPLICATION EXAMPLES

- Wearables (smart textiles)
  - Breathing
  - Joint motion
- Geotextiles and membranes
- Large/permanent deformations in metals
- Multi degree of freedom applications

The device is available in two standard variants. One of which contains electronics, converting the capacitance directly to a voltage signal, and the other being a bare capacitor which can be measured by the LEAP WE Series electronics. Custom dimensions are also possible to supply (see page 8)
SS-B-80-□□□□-C-21 (sensor with built in electronics)

- Signal output 21 = 0-5V
- Cable entry C = Flying lead
- Cable length 005 = 0.5m, 01 = 1m, 03 = 3m
- Electronics B = With electronics

SS-C-80-□□□□-U (sensor without electronics)

- Cable entry U = Micro USB
- Cable length 005 = 0.5m, 01 = 1m
- Electronics C = Without electronics

Order SS-C as spare sensors for the WE series measurement electronics
FEATURES AND OPTIONS

SS-B and SS-C
- Can be sewn, glued, screwed or clamped to the application
- Ultra high strain (80% linear strain)
- Low profile
- Tolerant to shock, vibration and misalignment
- Low sensitivity to thickness pressure
- Washable

SS-B additional features
- Flexible voltage supply
- 1000Hz update frequency
- Custom non-linear programming available on request
- Integrated bandpass noise filter
SPECIFICATIONS

Mechanical

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum linear stretch</td>
<td>80mm (80%)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to 70°C</td>
</tr>
<tr>
<td>Protection rating</td>
<td>Equivalent to IP67</td>
</tr>
<tr>
<td>Fatigue life</td>
<td>$10^6$ cycles @ 80% strain</td>
</tr>
<tr>
<td>Weight (not including cable)</td>
<td>&lt;10g</td>
</tr>
</tbody>
</table>

Electrical (SS-B only)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (nominal)</td>
<td>0.05V / mm stretch</td>
</tr>
<tr>
<td>Temperature factor</td>
<td>-0.15% / °C</td>
</tr>
<tr>
<td>Output signal</td>
<td>0 to 5V</td>
</tr>
<tr>
<td>Update rate</td>
<td>1000Hz</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>2.25 to 5.25 V</td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.175W</td>
</tr>
</tbody>
</table>

MECHANICAL CONNECTION

Stretch sensors are designed to be attached or tethered by their attachment area. The attachment part of the sensors is made from a nonwoven textile which together with the rest of the sensor, carries the final silicone coating.

It is possible to use sewing, clamping, eyelets for screws and the like for attaching the sensor to its host structure.

As is the case with the SG series strain gauge, stretch sensors can also be glued to a substrate along their entire length. See SG series datasheet for more information.
PRODUCT DIMENSIONS

ELECTRICAL CONNECTIONS

SS-B (with built in electronics)
- 2.5 to 5.25V (supply) - White
- GND (supply) - Yellow
- \( A_{\text{GND}} \) (signal) - Blue
- \( A_{\text{OUT}} \) (signal) - Green
- Screen - Uninsulated

SS-C (without electronics)
- Micro USB for connection to LEAP WE electronics

Note:
Signal cable length and environment can affect signal quality. We advise experimentation.
It is common for the standard size sensor to be unsuitable for a given application. If this is the case, please refer to the drawing below and contact LEAP with the required dimensions for each of the lines in the table underneath. All dimensions in mm.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Notes</th>
<th>Desired value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_e$</td>
<td>Min 25 (SS-C); Min 30 (SS-B)</td>
<td></td>
</tr>
<tr>
<td>$L$</td>
<td>Min 5, Max 800</td>
<td></td>
</tr>
<tr>
<td>$A_m$</td>
<td>Min 10 (can be totally removed)</td>
<td></td>
</tr>
<tr>
<td>$C$</td>
<td>Max 1000 (SS-C); Max 15000 (SS-B)</td>
<td></td>
</tr>
<tr>
<td>$E$</td>
<td>Min 20 (SS-C); Min 25 (SS-B)</td>
<td></td>
</tr>
<tr>
<td>$W$</td>
<td>Min 12 (SS-C); Min 15 (SS-B)</td>
<td></td>
</tr>
</tbody>
</table>

Further options:
- User configurable capacitance range represented by the 0-5V signal
- Other shapes and sizes
- Higher or lower stretch range
- Textile based cabling
- High temperature version (up to 200°C)
- Material samples for attachment testing
CONTACT US

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MINIATURE SENSOR ELECTRONICS

ESE-Series
Miniature capacitance to voltage converter
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ESE – Capacitance to Voltage converter

PRODUCT DESCRIPTION

Measuring the value of capacitive stretch sensors and strain gauges can be troublesome due to their series unusual resistance characteristics. If your application requires high accuracy measurement of this kind of sensor, this device is an ideal compact and precise converter circuit. Being part of a platform design makes application specific solutions simple to develop.

The circuit is designed to convert changes in the sensor’s capacitance, caused by their deformation, into an analogue voltage signal linearly representing these changes.

APPLICATION EXAMPLES

- Portable sensor products
- Smart textiles
- Rubber component monitoring
- Wearable motion capture
  (Sports, wellness, rehabilitation)
- Respiration
- Robotics monitoring and control
- Structural health monitoring

Using the circuit can eliminate the need for custom development of a dedicated capacitance measurement circuit for your application, reducing time to market.

The measurement range of the circuit is software configurable. This adds versatility, allowing the circuit to measure all sensors, small and large, whilst optimising the measurement accuracy.
FEATURES AND OPTIONS

- Small size
- Can be overmoulded or incorporated into the application
- Measures a large range of sensor sizes
- Flexible voltage supply
- Can measure LEAP technology sensors as well as 3rd party capacitive sensors.
- UART controllable
- Software configurable capacitance range
- 1000Hz update frequency
- Custom non-linear programming available on request
- Integrated bandpass noise filter
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>20 to 4200pF</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.5 to 5.25V</td>
</tr>
<tr>
<td>Output signal</td>
<td>0 to 5V</td>
</tr>
<tr>
<td>Update rate</td>
<td>1000Hz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 to 85°C</td>
</tr>
<tr>
<td>Protection rating</td>
<td>None (IP6X available on request)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.175W</td>
</tr>
</tbody>
</table>

![Graph showing capacitance vs. output voltage](image)

**NOTES:**
- User configurable capacitance range represented by the 0-5V signal
NOTES:
- Sensor terminals are indicated in LEAP Sensor Datasheets
- See product manual for user programmable settings through the UART
- FW customisation available on request
CONTACT US

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