MULTIPOINT SETTLEMENT SYSTEMS

The multipoint settlement systems consist of a number of hydraulic settlement gauge connected by tubing to a reference tank located on higher, stable ground.

The settlement gauge is a pressure transducer with vibrating wire or capacitive technology, mounted on a plate with a protective cover. Depending on the requirement, the settlement system can be installed with just a single gauge or with multiple gauges.

The typical application for the multipoint settlement systems is monitoring settlement in embankments, tunnels or other civil structures.

APPLICATIONS

• Settlement monitoring in rockfill or earthfill dams
• Vertical displacement in tunnels
• Settlement control under railway or road embankment

FEATURES

• Automatic barometric compensation (vented pressure gauges)
• Suitable for long term monitoring (vibrating wire gauges)
• Fieldstat software available for enhanced data analysis

Meet the essential requirements of the EMC Directive 2014/30/UE
## Operating Principle

The system consists of one or more settlement gauges connected via fluid-filled tubing to a reference tank that is located at a stable location. Each settlement gauge monitors the head of liquid resulting from the difference in elevation of the gauge and the reference tank. The gauge reports a higher head of fluid (higher pressure) if settlement occurs and a lower head of fluid (lower pressure) if heave occurs. When a vented transducer is used in the gauge, a separate air-filled tube embedded in the signal cable connects each gauge to an air intake located near the reference tank. If a non-vented transducer is used, barometric pressure should be recorded along with the gauge reading for compensation.

## Settlement Gauges

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Technology</th>
<th>Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20 kPa, 50 kPa, 100 kPa (2.90 psi, 7.25 psi, 14.5 psi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.75 m, 4.4 m, 8.8 m with Sisgeo liquid mix (5.7 ft, 14.4 ft, 27 ft with Sisgeo liquid mix)</td>
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<tr>
<td></td>
<td></td>
<td>4-20 mA (pressure), Ohm (thermistor)</td>
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<tr>
<td></td>
<td></td>
<td>&lt;0.006% FS</td>
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<tr>
<td></td>
<td></td>
<td>&lt;±0.1% FS</td>
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<tr>
<td></td>
<td></td>
<td>15 – 24 V DC</td>
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<tr>
<td></td>
<td></td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td>depends on range of gauge</td>
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<tr>
<td></td>
<td></td>
<td>stainless steel pressure gauge, galvanized settlement plate, stainless steel protective cover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>290 x 140 x 57 mm (11.5’’ x 5.5’’ x 2’’)</td>
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<tr>
<td></td>
<td></td>
<td>0TUPE060800 (6mm ID, 8mm OD)</td>
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<tr>
<td></td>
<td></td>
<td>0WE205KEOZ (4-wire, vent tube, kevlar rope, blue)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 m (for more information see FAQ#77)</td>
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<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>170 kPa, 350 kPa, 700 kPa (25 psi, 50 psi, 100 psi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15.0 m, 30.9 m, 61.8 m with Sisgeo liquid mix (49 ft, 101 ft, 202 ft with Sisgeo liquid mix)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2250 - 3000 Hz</td>
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<tr>
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<td></td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td>1000 m (for more information see FAQ#77)</td>
</tr>
</tbody>
</table>

### (1) MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracies of the gauge are calculated using both linear regression (≤ Lin. MPE) and polynomial correction (≤ Pol. MPE)  
### (2) The expressed frequency range could have a ±10% variation  
### (3) refer to FAQ section of Sisgeo website: www.sisgeo.com/faq

## Physical Features

![Diagram of Settlement Gauges](image)

- Dimensions (WxHxD): 290 x 27 x 57 mm
- Hydraulic tubing: 0TUPE060800 (6mm ID, 8mm OD)
- Signal cable: 0WE205KEOZ (4-wire, vent tube, kevlar rope, blue)
- Max. distance to datalogger: 1000 m
REFERENCE TANKS

The gauge measures the head of liquid between its elevation and the elevation of the liquid in the reference tank. Two types of reference tanks are available, a simple reference tank and an electrical reference tank. The level of the liquid in the simple reference tank must be maintained regularly. The level of the liquid in the electrical reference tank is measured, allowing for less maintenance. Tank and transducer readings are recorded together.

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>Description</th>
<th>Sensor</th>
<th>Material</th>
<th>Overall dimensions (WxHxD)</th>
<th>Liquid capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0D422SERB00</td>
<td>simple reference vessel</td>
<td>none</td>
<td>stainless steel vessel</td>
<td>500 x 400 x 200 mm (20” x 16” x 8”)</td>
<td>24 liters (25 qt)</td>
</tr>
<tr>
<td>0D422S08000</td>
<td>reference gauge</td>
<td>high accuracy load cell</td>
<td>steel painted box</td>
<td>349 x 329 x 152 mm (14” x 17” x 6”)</td>
<td>2.5 liters (2.6 qt)</td>
</tr>
</tbody>
</table>

PHYSICAL FEATURES

0D422SERB00

Reference vessels in Sogamoso HPP project, Colombia
APPLICATION IN HYDRAULIC TUNNEL

EXISTING HYDRAULIC TUNNEL WITH WATER

EXCAVATION ZONE OF INFLUENCE

TUNNEL IN CONSTRUCTION

REFERENCE TANK

MANHOLE

OMNIAlOG CABINET

CAPACITIVE SETTLEMENT GAUGE

JUNCTION BOX

MULTICORE CABLE

MEASURED PRESSURE
TYPICAL EMBANKMENT DAM APPLICATION

SINGLE POINT APPLICATION
ACCESSORIES AND SPARE PARTS

BAROMETER
OMEPRO106000
Atmospheric pressure gauge, housed in plastic box. Range 800 - 1200 mbar, output 4-20mA current loop.

HYDRAULIC TUBING
OTUNY060800
Polyamide tube for hydraulic connection of the settlement gauges. 8 mm OD, 6 mm ID.

SATURATION DEVICE
OD422SAT200
Saturation device for hydraulic circuit, capacity 20 liters, max pressure 5 bars. Strongly recommended for better results in hydraulic circuit saturation.

SATURATION DEVICE FOR HYDRAULIC CIRCUIT INSULATION 1000COPE300
Insulated protective tube for hydraulic tubing. Recommended for the lengths exposed to temperature variations. 3m length.

HYDRAULIC CIRCUIT INSULATION 1000COPE300

SISGEO LIQUID MIX 1000LIGL000
Mixture of 50% glycerine and 50% water, chemically inert, specific gravity 1.156 kg/l. Available in 12 LT and 25 LT tanks.

Mixture of 50% glycerine and 50% water, chemically inert, specific gravity 1.156 kg/l. Available in 12 LT and 25 LT tanks.

Settlement gauge

READABLE BY

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ADDITIONAL SUPPORT
SISGEO offers customers e-mail and phone assistance to ensure proper use of instruments and readout and to maximize performance of the system.

For more information, please refer to the FAQ pages on our website or email us: assistance@sisgeo.com

Refer to separate datasheets for further information.