H-LEVEL
LIQUID LEVEL SYSTEM
SETTLEMENT GAUGES
SISGEQ
Made in Italy
H-LEVEL
H-LEVEL LIQUID LEVEL SYSTEM

The H-Level is the automatic liquid level system for accurate long-term monitoring of differential settlements in buildings, tunnels, and other civil structures.

It consists of a series of H-Level gauges that are hydraulically connected to a reference tank positioned in a stable location. Each H-Level gauge includes a high resolution pressure sensor that monitors the head of liquid resulting from the difference in elevation between the gauge and the reference tank.

The system is available in digital and analog version. The digital output allows fast and simple installation and reading. With OMNIAlog datalogger and digital gauges, you have the unique advantage to set-up the logging system just with one-click.

APPLICATIONS
- Buildings
- Tunnels
- Compensation grouting projects
- Excavations
- Historical structures
- Bridges

FEATURES
- Available with both digital or analogue output
- High accuracy and performance
- Automatic compensation for barometric pressure

Meet the essential requirements of the EMC Directive 2014/30/UE
The H-Level is an automatic system for the long-term monitoring of differential settlements in buildings, tunnels, and other civil structures. The system consists of a series of H-Level gauges that are hydraulically connected via fluid-filled tubing to a reference tank that is located in a stable location. A separate air-filled tube connects each gauge to an air intake located near the reference tank. Each H-Level gauge includes a high resolution pressure sensor that monitors the head of liquid resulting from the difference in elevation between the gauge and the reference tank. The gauges report a higher head of fluid (higher pressure) if settlement occurs and a lower head of fluid (lower pressure) if heave occurs.

The air-filled tube connected to each gauge eliminates error due to changes in barometric pressure. In addition, an H-Level gauge located near the reservoir is used as a reference i.e. for compensate thermal effects. If freezing temperatures are expected, a de-aired, anti-freeze liquid can be used in the tubing and reservoir. SISGEO liquid mix is composed by 30% glycole and 70% water and can work up to -15°C. The H-level monitoring system can be connected to the OMNIAlog data acquisition system where both pressure (level) and temperature are stored for processing.
<table>
<thead>
<tr>
<th>PRODUCT CODES</th>
<th>0HLEV050D02</th>
<th>0HLEV100D02</th>
<th>0HLEV050002</th>
<th>0HLEV100002</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>Digital H-Level gauge</td>
<td>capactive ceramic pressure sensor</td>
<td>Analog H-Level gauge</td>
<td>capactive ceramic pressure sensor</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>500 mm H₂O</td>
<td>1000 mm H₂O</td>
<td>infinite (0.006% FS with OMNIAlog datalogger)</td>
<td>500 mm H₂O</td>
</tr>
<tr>
<td><strong>Gauge resolution</strong></td>
<td>0.002% FS</td>
<td>see Calibration Report</td>
<td>see Calibration Report</td>
<td></td>
</tr>
<tr>
<td><strong>Gauge sensitivity</strong></td>
<td>±0.08% FS (&lt; ±0.40 mm H₂O)</td>
<td>±0.08% FS (&lt; ±0.80 mm H₂O)</td>
<td>±0.20% FS (&lt; ±1.00 mm H₂O)</td>
<td>±0.15% FS (&lt; ±1.50 mm H₂O)</td>
</tr>
<tr>
<td><strong>Gauge sensitivity</strong></td>
<td>±0.07% FS (&lt; ±0.35 mm H₂O)</td>
<td>±0.07% FS (&lt; ±0.70 mm H₂O)</td>
<td>±0.15% FS (&lt; ±0.75 mm H₂O)</td>
<td>±0.10% FS (&lt; ±1.00 mm H₂O)</td>
</tr>
<tr>
<td><strong>Gauge sensitivity</strong></td>
<td>±0.02% FS (&lt; ±0.10 mm H₂O)</td>
<td>to be defined</td>
<td>to be defined</td>
<td>to be defined</td>
</tr>
<tr>
<td><strong>Gauge sensitivity</strong></td>
<td>±0.06% FS (&lt; ±0.30 mm H₂O)</td>
<td>to be defined</td>
<td>to be defined</td>
<td>to be defined</td>
</tr>
<tr>
<td><strong>Lin. MPE</strong></td>
<td>±0.00% FS</td>
<td>±0.20% FS</td>
<td>±0.08% FS</td>
<td>±0.08% FS</td>
</tr>
<tr>
<td><strong>Pol. MPE</strong></td>
<td>±0.00% FS</td>
<td>±1.00% FS</td>
<td>±0.08% FS</td>
<td>±0.08% FS</td>
</tr>
<tr>
<td><strong>Gauge accuracy</strong> (3)</td>
<td>±0.07% FS (≤ Lin. MPE)</td>
<td>±0.07% FS (≤ Pol. MPE)</td>
<td>±0.15% FS (≤ Lin. MPE)</td>
<td>±0.15% FS (≤ Pol. MPE)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>RS-485, Modbus RTU protocol (4)</td>
<td>Embedded on electronic board (-40°C to +125°C)</td>
<td>Embedded on electronic board (-40°C to +125°C)</td>
<td>Embedded on electronic board (-40°C to +125°C)</td>
</tr>
<tr>
<td><strong>Offset (10%FS) temp dependency</strong></td>
<td>&lt; ±0.01 mm / °C</td>
<td>Embedded on electronic board (0 to 36 V) ±5% FS (res. 0.01 V)</td>
<td>Embedded on electronic board (0 to 36 V) ±5% FS (res. 0.01 V)</td>
<td>Embedded on electronic board (0 to 36 V) ±5% FS (res. 0.01 V)</td>
</tr>
<tr>
<td><strong>Span (90%FS) temp dependency</strong></td>
<td>&lt; ±0.03 mm / °C</td>
<td>Embedded on electronic board (-20°C to +70°C)</td>
<td>Embedded on electronic board (-20°C to +70°C)</td>
<td>Embedded on electronic board (-20°C to +70°C)</td>
</tr>
<tr>
<td><strong>Internal temperature sensor:</strong> (5)</td>
<td>Embedded on electronic board (40°C to +125°C) ±1°C within -10°C to +85°C (res. 0.01°C)</td>
<td>Embedded on electronic board (0 to 100% RH) ±5% RH within 0 to 95% RH (res. 0.025% RH)</td>
<td>Embedded on electronic board (0 to 100% RH) ±5% RH within 0 to 95% RH (res. 0.025% RH)</td>
<td>Embedded on electronic board (-40°C to +125°C) ±0.5°C within 0°C to +50°C (res. 0.1°C)</td>
</tr>
<tr>
<td><strong>Relative humidity sensor:</strong> (5)</td>
<td>Embedded on electronic board (0 to 100% RH) ±5% RH within 0 to 95% RH (res. 0.025% RH)</td>
<td>Embedded on electronic board (0 to 36 V) ±5% FS (res. 0.01 V)</td>
<td>Embedded on electronic board (0 to 36 V) ±5% FS (res. 0.01 V)</td>
<td>Embedded on electronic board (0 to 100% RH) ±5% RH within 0 to 95% RH (res. 0.025% RH)</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>stable 8 - 28 V DC</td>
<td>stable 8 - 28 V DC</td>
<td>stable 10 - 30 V DC (suggested 24 V)</td>
<td>stable 10 - 30 V DC (suggested 24 V)</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>6 mA @ 24 V - 8 mA @ 12 V</td>
<td>max 20 mA</td>
<td>max 20 mA</td>
<td>max 20 mA</td>
</tr>
<tr>
<td><strong>IP Class</strong></td>
<td>IP67</td>
<td>IP67</td>
<td>IP67</td>
<td>IP67</td>
</tr>
<tr>
<td><strong>Liquid and air tubes (OD/ID)</strong></td>
<td>8 mm / 6 mm, polyamide</td>
<td>8 mm / 6 mm, polyamide</td>
<td>8 mm / 6 mm, polyamide</td>
<td>8 mm / 6 mm, polyamide</td>
</tr>
<tr>
<td><strong>Signal cable</strong></td>
<td>0WE106IP0ZH</td>
<td>0WE106IP0ZH</td>
<td>0WE106IP0ZH</td>
<td>0WE106IP0ZH</td>
</tr>
<tr>
<td><strong>Cabling</strong></td>
<td>M12 male connector on sensor body with 3-port T-shaped splitter for cable wiring</td>
<td>M12 male connector on sensor body with 3-port T-shaped splitter for cable wiring</td>
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</tr>
<tr>
<td><strong>Max. distance to datalogger</strong></td>
<td>1000 m (for more information see F.A.Q. #77)</td>
<td>1000 m (for more information see F.A.Q. #77)</td>
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<td>1000 m (for more information see F.A.Q. #77)</td>
</tr>
</tbody>
</table>

(1) Other ranges available on request

(2) Sensitivity is a specific parameter different for every gauge. The sensitivity is calculated during gauge calibration test and inserted into the Calibration Report.

(3) 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).

(4) RS485 not-optoisolated Modbus communication with RTU Protocol. Default output is “mm H₂O”. Sisgeo Modbus protocol manual is available for download on SISGEO website.

(5) These sensors are installed on the internal electronic board to give information also in the event of instrument malfunction.

(6) For more information, refer to F.A.Q. section on Sisgeo website: https://www.sisgeo.com
PHYSICAL FEATURES

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Analog H-Level</th>
<th>Digital H-Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing dimensions (WxHxD)</td>
<td>75 x 175 x 50 mm</td>
<td>75 x 175 x 50 mm</td>
</tr>
<tr>
<td>Overall dimensions (WxHxD) connectors included</td>
<td>130 x 233 x 53 mm</td>
<td>157 x 225 x 53 mm</td>
</tr>
<tr>
<td>Housing material</td>
<td>Anodized aluminum</td>
<td>Anodized aluminum</td>
</tr>
</tbody>
</table>

PHYSICAL FEATURES

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>0HLEV27SERB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>stainless steel (tank), plastic (barometric ref.)</td>
</tr>
<tr>
<td>Tank dimensions (WxHxD)</td>
<td>200 x 302 x 102 mm</td>
</tr>
<tr>
<td>Tank capacity</td>
<td>about 6 litres</td>
</tr>
<tr>
<td>Barometric ref. dimensions (WxHxD)</td>
<td>85 x 170 x 66 mm</td>
</tr>
</tbody>
</table>

REFERENCE TANK

Fluid in the reference tank establishes the reference level for all the gauges in the system. Barometric pressure is transmitted to the system through a secondary enclosure that is fitted with a membrane filter and desiccant to eliminate humidity.
DIGITAL Vs. ANALOGUE VERSION

DIGITAL OUTPUT (Suitable for complex monitoring systems)

- Higher performances in terms of accuracy, resolution and temperature dependency
- Faster installation: only one cable for the whole chain
- One-click logger set up with OMNIAlog and MiniOMNIAlog
- Higher data acquisition frequency up to 1 second per instrument
- Each gauge gives internal data of temperature, humidity and power supply

ANALOG OUTPUT (Suitable for simple monitoring systems)

- Good performances
- Each gauge has its own cable
- Data acquisition frequency about 10 seconds per instrument
- Each gauge has an internal temperature sensor

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Junction box
EXAMPLE OF UNDERGROUND MONITORING DURING TUNNEL EXCAVATION

DIGITAL SYSTEM

EXISTING RAILWAY TUNNEL

TUNNEL IN CONSTRUCTION

EXCAVATION ZONE OF INFLUENCE

0WE106IP0ZH signal cable
barometric comp. tube
hydraulic line
Digital H-Level gauge
barometric reference
tank reference
reference gauge
ejunction box
0WE606IPDZH cable
EXAMPLE OF BUILDING MONITORING IN DEEP EXCAVATION DIGITAL SYSTEM
EXAMPLE OF SIMPLE BUILDING MONITORING ANALOG SYSTEM
ACCESSORIES AND SPARE PARTS

LIQUID AND AIR TUBE
0TUNY060800
Polyamide tube for both hydraulic and barometric compensation lines. OD 8 mm, ID 6 mm.

WATER-GLYCOL MIX
1000GL30000
Recommended fluid for H-Level circuit. It is a mixture of 30% glycol and 70% water, chemically inert, allowing operation up to -15 °C. Available in 12 liters and 25 liters tanks.

HYDRAULIC CIRCUIT SUPPORT
1000COPE300
Protective support for hydraulic tubing. 3m length.

SATURATION DEVICE
0D422SAT200
Saturation device for H-Level hydraulic circuit, capacity 20 liters, max pressure 5 bars, power supply 230V only. Highly recommended.

TUBES SPLICING KIT
OHLEYKITJN2
10 hydraulic connections to joint liquid and air tubes.

GAUGE REMOVAL KIT
OHLEYKITTB2
Kit to be used in case of H-Level gauge removal from an existing circuit. Composed by two 10cm tubes with hydraulic connections.

SIGNAL CABLE
0WE106IP0ZH
6-wire, 24-AWG cable, with aluminium/polyester shield and LSZH jacket. 5mm diameter.

DIGITAL JUNCTION BOX
0EPD023IPID
Junction box for chains of digital H-Levels, composed by IP67 plastic box, wiring electronic board and 3 cable glands.

DIGITAL CABLE
0WE606IPDZH
LSZH cable to connect the digital instruments chain from junction box up to OMNIALog datalogger.

RESISTANCE ENDING DEVICE
0ETERMRESIO
Termination resistance with connector, needed to close each digital H-Level chain. For more detail see FAQ #076 on SISGEO web site.

RESISTANCES KIT (SPARE)
0ERESIKITO0
Kit composed by one 120 Ohm, two 240 Ohm, three 360 Ohm and four 480 Ohm resistance ending devices. The M12 5-pin connector allows the connection to SISGEO digital gauges. Check compatibility with old digital gauges with your Sales Representative.

TUBES SPLICING KIT
OHLEYKITJN2
10 hydraulic connections to joint liquid and air tubes.

SATELLITE DEVICE
0D422SAT200
Saturation device for H-Level hydraulic circuit, capacity 20 liters, max pressure 5 bars, power supply 230V only. Highly recommended.

RESISTANCES KIT (SPARE)
0ERESIKITO0
Kit composed by one 120 Ohm, two 240 Ohm, three 360 Ohm and four 480 Ohm resistance ending devices. The M12 5-pin connector allows the connection to SISGEO digital gauges. Check compatibility with old digital gauges with your Sales Representative.

READABLE BY

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Fax +39 02 95762011
INFO@SISGEO.COM

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

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Refer to separate datasheets for further information.