

# ORBISPHERE K1200 LUMINESCENT DISSOLVED OXYGEN SENSOR FOR NUCLEAR APPLICATIONS

## Applications

- Nuclear Power



511 Monochannel System ( $O_2$ )



511 Bichannel System ( $O_2$  &  $H_2$ )

## The first maintenance-free optical oxygen sensor for nuclear power plants.

The Orbisphere K1200 optical sensor in combination with the Orbisphere 511 controller offers a new way of monitoring oxygen in power plants. With the 511 dual-channel Orbisphere Controller, oxygen and hydrogen can also be monitored in parallel. Orbisphere sensors set the industry standards for oxygen measurement by offering peace of mind to every water chemist. One calibration and two minutes of maintenance per year helps maintain the ALARA principles.

### One calibration per year

One zero point calibration per year is all that is needed with the K1200 sensor. Traditional electrochemical (EC) sensors display significant drift after only a few months, demanding regular re-calibration and substantial operator time. Due to its luminescent technology, the K1200 sensor is designed for minimal drift, resulting in it being the most stable sensor with the longest calibration interval in the nuclear industry.

### No membranes = two minutes of maintenance

With no membranes to replace and no electrolyte solution to replenish, the K1200 is virtually maintenance-free requiring only two minutes of maintenance per year. Sensor accuracy is unaffected by process changes or low flow events with no polarization time, eliminating unnecessary operator interventions in radioactive zones. In addition, corrosive or hazardous chemicals are not required, making the annual task faster, easier and safer without reducing measurement precision.

### Low cost retrofit

The complete system consists of a Controller, a flow chamber, the K1200 Luminescent Dissolved Oxygen Sensor and a 312xx Hydrogen Sensor for parallel measurement. The sensor is compatible with Hach Orbisphere 28 mm flow chambers, eliminating the need for engineering changes. The installation is fast and easy and does not require special preparation.

### A new level of confidence

The K1200 optical sensor is the first to use luminescent measurement technology to measure low level oxygen in nuclear power plants. Since 1978, when the first patent on EC sensors was granted, Hach Orbisphere sensors have set the industry standard for oxygen measurement by delivering confidence to every water chemistry manager. The new K1200 maintains this tradition in the nuclear industry and offers significant operating and cost benefits.

## Technical Data\*

### K1200 (Low Level Sensor)

<b>Range</b>	0 to 2000 ppb dissolved O <sub>2</sub> (DO)
<b>Temperature Range</b>	Accurate from -5 to 50 °C (23 to 122 °F) Resistant to temperature from -5 to 100 °C (23 to 212 °F)
<b>Repeatability</b>	± 0.4 ppb or 1 % whichever is greater
<b>Reproducibility</b>	± 0.8 ppb or 2 % whichever is greater
<b>Accuracy</b>	± 0.8 ppb or 2 % whichever is greater
<b>Lower Limit of Detection (LOD)</b>	0.6 ppb
<b>Response Time</b>	(90%) <10 s (gas phase); <30 s (liquid phase)
<b>Display Resolution</b>	0.1 ppb
<b>Calibration</b>	Single point zero calibration with standard 99.999% nitrogen (quality 5.0) or equivalent oxygen free gas
<b>Sample Pressure</b>	1 to 20 bar absolute (14.5 to 290 psi)

### K1200 (High Level Sensor)

<b>Range</b>	0 to 40 ppm dissolved O <sub>2</sub> (DO)
<b>Temperature Range</b>	Accurate from -5 to 50 °C (23 to 122 °F) Resistant to temperature from -5 to 100 °C (23 to 212 °F)
<b>Repeatability</b>	± 0.015 ppm or 2 % whichever is greater
<b>Reproducibility</b>	± 0.02 ppm or 3 % whichever is greater
<b>Accuracy</b>	± 0.02 ppm or 3 % whichever is greater
<b>Lower Limit of Detection (LOD)</b>	0.015 ppm
<b>Response Time</b>	(90%) <10 s (gas phase); <50 s (liquid phase)
<b>Display Resolution</b>	0.1 ppb
<b>Calibration</b>	Two points at cap replacement (zero and air), one during use (air)
<b>Sample Pressure</b>	1 to 20 bar absolute (14.5 to 290 psi)
<b>Radiation Resistance Level</b>	Sensor body + cap (SS 316L): >>10 MGy LDO Spot (Silicone): 10 kGy O-Ring (MVQ): 0.4 to 0.5 MGy It is advised to replace the active spot annually.

### Orbisphere 511 Controller

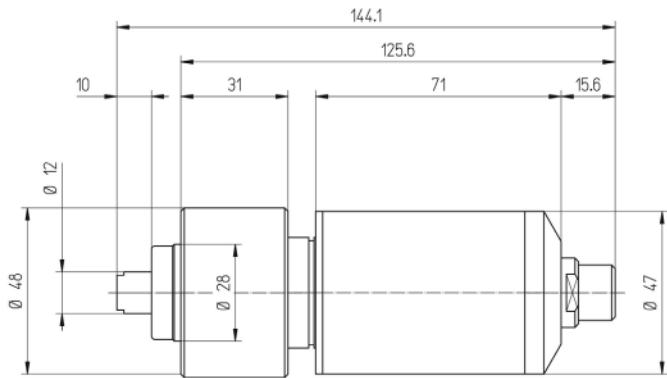
<b>Enclosure Construction</b>	Wall (pipe) mount: stainless steel Panel mount: aluminum
<b>Enclosure Rating</b>	Wall (pipe) mount: IP65, NEMA 4x Panel mount: IP65
<b>Compliance Certifications</b>	EMC: EN61326-1:2006 CE: EN61010-1:2010 ETL, conforming to UL 61010-1 and CSA 22.2 No. 61010-1
<b>Display</b>	Color TFT touchscreen display
<b>Analog Outputs</b>	3 Smart 0/4-20 mA (500 ohms), programmable as linear or tri-linear, configurable to send diagnostics or alarm information
<b>Relays</b>	3 measurement alarm relays (2A to 30 VAC or 0.5 A to 50 VDC); configurable to send diagnostics information
<b>Communication</b>	1 system alarm relay (2 A to 30 VAC or 0.5 A - 50 VDC) RS485 Profibus DP Ethernet USB-host to download data with a USB memory stick
<b>Data Storage</b>	Rolling buffer or store once mode for up to 10000 measurements and 1000 operator actions Holds calibration records for last 50 calibrations
<b>User Interface</b>	Touch screen panel displays: concentration, trend graph, diagnostics, alarm status, historical data
<b>Dimensions (H x W x D)</b>	Wall dimensions: 230.5 mm x 250 mm x 160 mm (9.1 in x 9.8 in x 6.3 in) Panel dimensions: 156 mm x 220 mm x 253.5 mm (6.14 in x 8.66 in x 9.84 in)
<b>Power</b>	Universal 100/240 VAC @ 50/60 Hz, 25 VA 10-36 VDC, 25 W

\*Subject to change without notice.

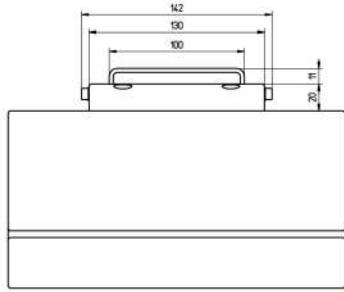
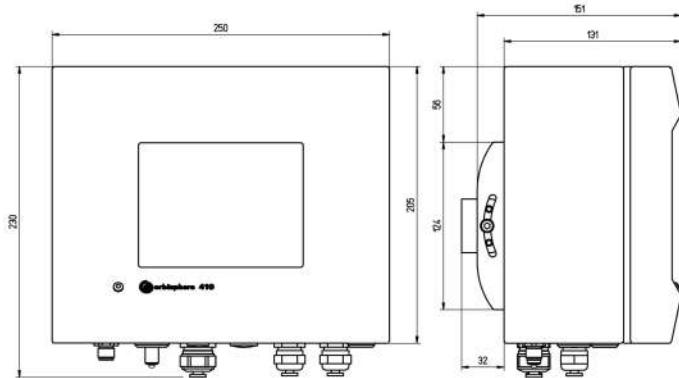
## Dimensions

In millimeters.

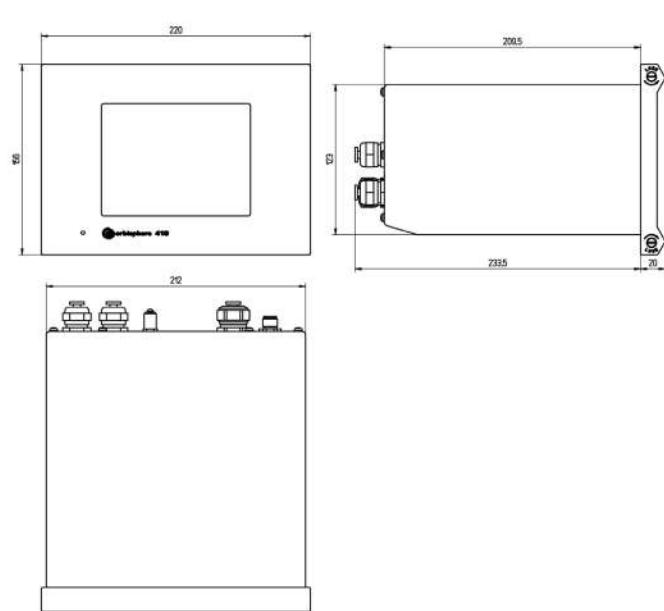
Sensor



Controller (Wall / Pipe Mount)



Controller (Panel Mount)



## Order Information

### Controllers and sensors for monochannel system for oxygen measurement only

<b>511K00/W1C10000</b>	Hach Orbisphere 511 Controller (Wall Mount)
<b>511K00/P1C10000</b>	Hach Orbisphere 511 Controller (Panel Mount)
<b>K1200-S00</b>	Luminescent oxygen sensor for nuclear applications, 0 - 2000 ppb, with 28 mm Orbisphere fitting
<b>K1200-S00H</b>	Luminescent oxygen sensor for nuclear applications, 0 - 40 ppm, with 28 mm Orbisphere fitting

### Controllers and sensors for bichannel system for oxygen and hydrogen measurement only

<b>511FK0/W1C1P0N0</b>	Hach Orbisphere 511 Controller for O <sub>2</sub> (LDO) and H <sub>2</sub> (TC) measurement (Wall Mount)
<b>511FK0/P1C1P0N0</b>	Hach Orbisphere 511 Controller for O <sub>2</sub> (LDO) and H <sub>2</sub> (TC) measurement (Panel Mount)
<b>31250GP</b>	Standard hydrogen TC sensor with nitrogen purge and protection cap (20 bar)
<b>K1200-S00</b>	Luminescent oxygen sensor for nuclear applications, 0 - 2000 ppb, with 28 mm Orbisphere fitting
<b>K1200-S00H</b>	Luminescent oxygen sensor for nuclear applications, 0 - 40 ppm, with 28 mm Orbisphere fitting

#### Pre-configured systems:

<b>DGK511FK-W1123</b>	Kit containing K1200-S00 sensor, 31250 hydrogen TC sensor, 511FK0/W1C1P0N0 controller, 3 m cable
<b>DGK511FK-P1123</b>	Kit containing K1200-S00 sensor, 31250 hydrogen TC sensor, 511FK0/P1C1P0N0 controller, 3 m cable

#### Accessories

<b>K1200-L</b>	Replacement luminescent spot for low range nuclear sensors (0 - 2000 ppb)
<b>K1200-H</b>	Replacement luminescent spot for high range nuclear sensors (0 - 40 ppm)
<b>32001.011</b>	Flow chamber in stainless steel (316) with 1/4" fittings. Supplied with EPDM O-rings.
<b>32001.010</b>	Flow chamber in stainless steel (316) with 6 mm fittings. Supplied with EPDM O-rings.
<b>32002.010</b>	Multi parameter flow chamber in stainless steel with 6 mm fittings. Supplied with EPDM O-rings.
<b>32002.011</b>	Multi-parameter flow chamber in stainless steel with 1/4" fittings. Supplied with EPDM O-rings.
<b>28117GP</b>	Pressure sensor, 0 to 5 bar absolute (for gas phase applications)
<b>32547.05</b>	External pressure sensor cable, 5 m (16.4 ft.)
<b>32510.05</b>	Sensor cable to connect M/K-type sensors, 5 m (16.4 ft.)
<b>32505.05</b>	Sensor cable to connect 31xxx and x1100 EC type sensors, 5 m (16.4 ft.)
<b>32739</b>	Maintenance Kit for high pressure hydrogen TC sensor. Includes membranes 29561A, membrane holding ring 29228.01, kit 29082, and tools for sensor maintenance.
<b>32741</b>	Maintenance Kit for hydrogen TC sensors with 29108 protection cap. Includes membranes 2952A, membrane holding ring 29228.01, kit 29082, and tools for sensor maintenance.

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