

*Monitors visibility and present weather. Identifies and quantifies a wide range of precipitation types*

*Low power and light weight sensor optimised for transportable and solar/battery applications*

## KEY FEATURES & BENEFITS

- WMO 4680 present weather codes
- 2.9W Power consumption
- Light weight 2.7Kg
- Selectable measurement range from 10m to 75km
- Selectable measurement resolution of 1m or 10m (default)
- Digital output
- Compatible with ALS-2 Ambient Light Sensor
- Comprehensive self-test and maintenance data
- 2 Years Warranty

**The SWS-200LW is optimised for use in applications where accurate and reliable visibility and present weather measurements are required from a low power light weight sensor. Typical applications include solar powered weather stations and highly portable tactical AWOS.**

## Applications

The need to measure visibility and present weather accurately and consistently is not limited to accessible sites where mains power is readily to hand. For example, national weather services require networks of monitoring stations to inform their forecasts but the optimum location for a monitoring site may be remote and isolated, requiring reliance on solar or wind power. Even in more built up locations the cost of supplying mains power to a particular part of a site may be several times the cost of the equipment to be installed, making solar powered systems very attractive. With a power consumption of just 2.9W the SWS-200LW has the measurement range and accuracy expected of a fully featured visibility sensor making it a perfect choice for remote or solar powered sites.

As well as being low powered, the sensor is also light weight having been developed as part of a man portable tactical Automated Weather Observing System (AWOS) for the US military. Despite its low weight, the SWS-200LW remains a rugged and reliable sensor, well suited to use in portable or transportable weather stations. The sensor's measurement range and accuracy, coupled with the ability to interface directly to the ALS-2 Ambient Light Sensor, allow it to be used in aviation weather systems including those reporting Runway Visual Range.

## Visibility Measurement

The measurement of visibility by forward scatter as used by the SWS-200LW is now widely accepted and seen as having significant advantages over more traditional techniques such as the use of backscatter sensors or transmissometers.

Backscatter sensors can be very compact, although the backscatter signal is strongly dependent on the type of obstruction to vision, resulting in poor accuracy and limited upper range. The SWS-200LW by contrast is compact, requires little maintenance and has a visibility range of 10m to 75km, with a user selectable resolution of either 1 or 10m (default). Transmissometers cannot be considered for applications where the SWS-200LW would be used due to their size, although their direct measurement of visibility is still thought to be the most valid method. With this in mind the calibration of the SWS sensor family was undertaken against a transmissometer belonging to a national weather service in accordance with the recommendations of the International Civil Aviation



Organisation (ICAO).

Visibility measurements are reported as instantaneous and averaged forward scatter Meteorological Optical Range (MOR). Reporting of atmospheric Extinction Coefficient (EXCO) can be selected by the user if required. The features and accuracy of the SWS-200LW ensure it complies with ICAO and World Meteorological Organisation (WMO) specifications for aviation use including use in Runway Visual Range systems (RVR).

## Present Weather Reporting

Forward scatter sensors are able to determine precipitation type by observing the intensity of scattered light and the transit time for each precipitation particle as it passes through the sample volume. These parameters are used to estimate the particle size and determine if it is liquid or frozen using well established relationships. Unfortunately in anything other than still conditions the relationships become unreliable, resulting in poor classification accuracy. Biral sensors are the only ones to remove this source of error through the use of a second backscatter receiver. The ratio of forward to backscatter is significantly different for liquid and frozen particles, allowing the SWS-200LW to report the correct precipitation code reliably even in the most challenging conditions. The ability to accurately report precipitation type, especially the ability to

discriminate liquid from frozen precipitation, can be very important in many applications but is especially important in aviation and for national weather service networks.

## Interfacing, Connectivity and Cost of Ownership

The SWS-200LW sensor weighs just 2.7kg and can be easily carried and installed by a single person. The ASCII text data message is transmitted at user defined time periods or in response to a polled request using a RS232 interface. The standard data message provides averaged and instantaneous Meteorological Optical Range (MOR) along with present weather codes according to WMO Table 4680. For RVR applications an interface to the ALS-2 Ambient Light Sensor is available as an option. The ALS-2 data is appended to the standard sensor data message simplifying both installation and data processing.

To keep track of the operational status of the sensor, abbreviated self-test information is included in every data message, with a full self-test report available on request. Self-test features include window contamination monitoring which automatically corrects the output data and provides two stage warnings allowing maintenance to be performed most efficiently. Calibration checks and recalibration are simple and quickly accomplished in the field by a single person. The need for such procedures is limited however as the stability of the light source and receiver circuitry is such that recalibration intervals are typically measured in years.

The SWS-200LW is DC powered with a power consumption of just 2.9W. Window heating of an additional 1.7W is set to only operate when condensation or dew is detected on the windows. Hood heating is not available for this low power sensor.

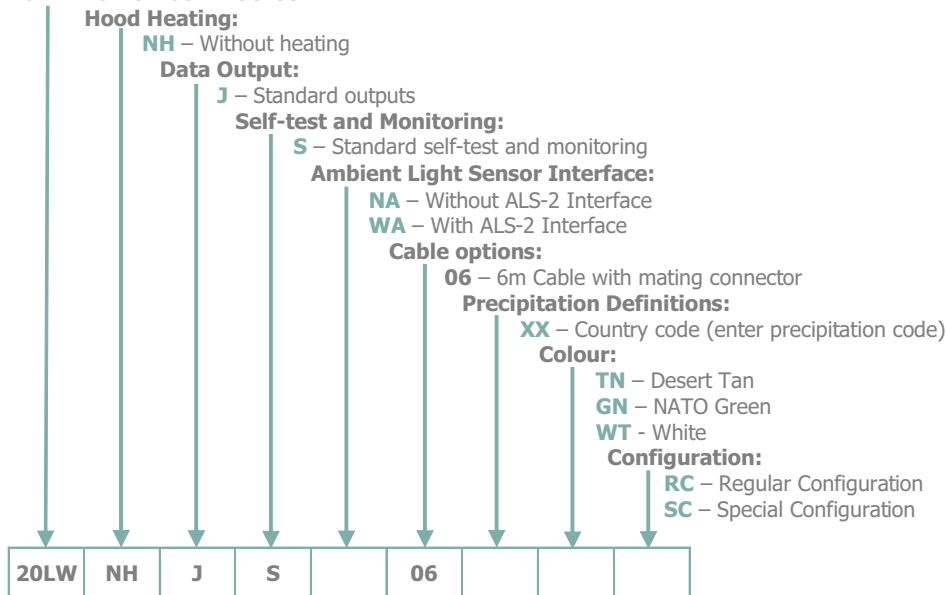
## Advanced Functional Test Mode

All Biral visibility and present weather sensors have the capability to temporarily output specific data via a test mode. In this mode the user can define visibility, present weather, window contamination and fault conditions for a pre-determined time period. This functionality is useful during Factory or Site Acceptance Testing (FAT or SAT), or system integration to test downstream processing of the output data.

## Sensor Configuration Information

For a detailed explanation of the configuration options please refer to the table below.

### 20LW – SWS-200LW Sensor



**Example:** 20LW.NH.J.S.NA.06.UK.TN.RC (Please use this code when ordering your sensor).

**Default visibility range: 10m to 20km.** If a different range is required please order a 'special configuration' (SC) and state the required range on your order from the options below:

10m to 10km  10m to 20km  10m to 32km  10m to 50km  10m to 75km

## Configuration Options Explained

Option	Description
Hood Heating	Heated hoods are provided on some sensors to stop snow from accumulating around the optical windows. Due to the low power nature of this sensor heated hoods are not available. Option <b>NH</b> : No hood heating
Data Output	The sensor has a RS232 serial output. No other options are available. Option <b>J</b> : RS232 Serial output
Self-Test & Monitoring	The sensor is configured for Standard Self-Test. The standard self-test option provides monitoring of all the essential sensor functions and contamination of the transmitter window. No other options are available. Option <b>S</b> : Advanced Self-Test
ALS-2 Interface	The sensor may be configured to allow direct connection of the ALS-2 Ambient Light Sensor. The Ambient Light Sensor is typically used in airport applications where Runway Visual Range must be calculated. Option <b>NA</b> : Without Ambient Light Sensor Interface Option <b>WA</b> : With Ambient Light Sensor Interface
Power and Data Cable	The sensor is fitted with a single circular connector and 6m combined power and data cable. Additional lengths are available in multiples of 1m. Option <b>06</b> : Standard 6m combined power and data cable for connection to the sensor.
Precipitation Codes	Biral present weather sensors report precipitation and visibility according to predefined intensity values. As no universal definition for intensity values is available, sensors can be supplied configured to the requirements of a range of countries or the customer may supply their own definitions. Where custom definitions are required please complete a Custom Present Weather Definition Form, available from our Sales Department (enquiries@biral.com). For a full list of the currently available country codes please refer to the Present Weather Sensor Country Code List, available from our Sales Department (enquiries@biral.com) or as a download from the SWS-200LW product page of our website (www.biral.com).
Colour	The sensor is available in the following colour options. Option <b>TN</b> : Desert Tan (Fed Standard 33446) Option <b>GN</b> : NATO Green (BS381C Colour No. 285 DEFSTAN 00-23) Option <b>WT</b> : White
Configuration	Reserved for customer specific configurations. Option <b>RC</b> : No customer specific configuration. Option <b>SC</b> : Special customer specific configuration.

# SWS-200LW

## Visibility & Present Weather Sensor Specifications



### Visibility & Present Weather Measurement

Measures	Visibility and Present Weather (MOR & EXCO)	
Output	Digital, RS232	
Range (visibility) <i>(Fixed, select at time of order)</i>	Default 10m to 20km Selectable 10m to 10km, 10m to 20km, 10m to 32km, 10m to 50km or 10m to 75km	
Measurement Error	≤4.2% at 600m ≤6.8% at 5km ≤12.3% at 15km ≤17.1% at 25km	≤5.1% at 2km ≤9.6% at 10km ≤14.8% at 20km ≤19.4% at 30km
Measurement resolution	1m or 10m (default)	
Measurement principle	Forward scatter meter with 39° to 51° angle, centred at 45°	
Precipitation detection threshold	Rain: 0.015mm/hr (0.0006 in/hr) Snow: 0.0015mm/hr (0.00006 in/hr)	
Maximum rain rate	~500 mm/hr (20 in/hr)	
Rain intensity accuracy	≤15%	

### Outputs and Reports

Output rate (seconds)	10 to 300 (selectable)
Serial outputs	RS232
Present Weather Output	Selected WMO Table 4680 codes

### Power Requirements

Sensor Power	9-36Vdc (Mains power adaptor available)
Hood heating power	24Vac or dc
Basic sensor	3.5W
Window heaters	1.7W (Backscatter window not heated)

### Additional Features

Window contamination monitoring	Fitted as standard.
Window heaters	Fitted as standard to both sensor head windows. Use controlled by sensor settings; Always on, Always off, Window misting controlled.

### Environmental

Operating temperature	-40°C to +60°C
Operating humidity	0 – 100% RH
Protection rating	Ip66

### Certification & Compliance

CE Certified
EMC compliance with EN61326-1997, 1998, 2001
RoHS and WEEE compliant

### Physical

Material	Powder paint coated aluminium
Weight (incl. mounting kit)	2.7kg
Length	730mm
Warranty	2 years
Lifetime	>10 years

### Maintenance

Self-test capability	Fitted as standard
User confidence check	6 months recommended
Window Cleaning	Automatic compensation and warnings
Field calibration	With optional calibration kit

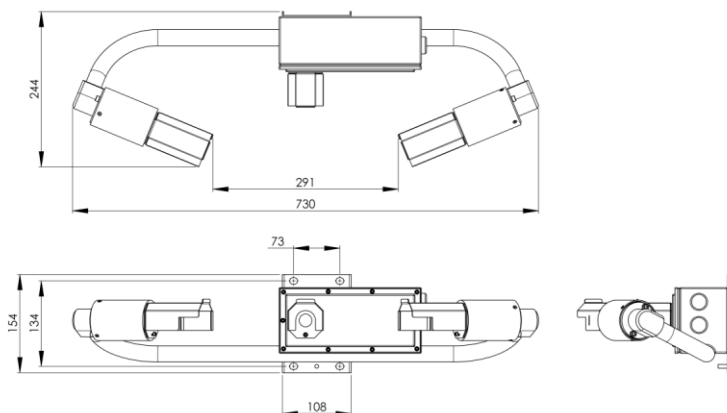
### Included with Sensor

The sensor is delivered in sturdy recyclable foam filled packaging with:	
- Pole mounting kit (2 x U-bolt)	
- User manual and calibration certificates	

### Accessories – Optional

SWS.LW.CAL	SWS Low Power Calibration Kit
SWS.LW.CAL.BKT	SWS Low Power Calibration Kit Bracket
SWS.SKLR	SWS Low Power Spares Kit
SWS.WTY200	1 Year extended warranty
PW.CODE	User defined precipitation definitions. Per definition set
PW.MAINS	Mains Power Adaptor

Specifications are subject to review and change without notice. E&OE.



Dimensions in mm