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

Monitors visibility and obstruction to vision caused by dust, fog, rain, drizzle, snow and hail

KEY FEATURES & BENEFITS

- 2.9W Power consumption

- Light weight 2.7kg

- Selectable measurement range from 10m to 75km

- Selectable measurement resolution of 1m or 10m (default)

- Limited WMO 4680 present weather codes

- Digital outputs

- Compatible with ALS-2 Ambient Light Sensor

- Comprehensive self-test and maintenance data

- 2 Years Warranty

The SWS-100LW is optimised for use in applications where accurate and reliable visibility measurements are required from a low power, light weight sensor. Typical applications include solar powered weather stations and highly portable tactical AWOS.

Applications

The SWS-100LW has a power consumption of just 2.9W and yet unlike other low power sensors it retains the measurement range and accuracy expected of a fully featured visibility sensor. This combination of low power and high performance makes the sensor particularly suited for use in remote solar powered weather stations or networked observing sites. Where power is particularly limited the sensor can be intermittently powered for even lower overall consumption. The SWS-100LW may also be used in remote signage applications where solar power stored in batteries must be conserved to power the warning sign.

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-100LW remains a rugged and reliable sensor well suited to use in portable or transportable weather stations, whilst the measurement range and accuracy 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-100LW 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, but the backscatter signal is strongly dependent on the type of obstruction to vision, resulting in poor accuracy and limited upper range. The SWS-100LW by contrast is also compact, requires little maintenance and has a maximum visibility range of 10m to 75km, with a choice of either 1 or 10m resolution.

Transmissometers cannot be considered for applications where the SWS-100LW 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 default measurement range for the SWS-100LW is 10m to 2km however maximum visibility ranges up to 75km can be configured at time of manufacture. The features and accuracy of the SWS-100LW 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

In some applications it is useful to know what is causing the reduction in visibility as this may fundamentally change the action to be taken by the user. For instance, in an aviation application reduced visibility due to snow would require different procedures to that for reduced visibility due to fog. The SWS-100LW therefore has the ability to identify and report the presence of drizzle, rain and snow precipitation types using WMO Table 4680 codes. Fog, haze, and unidentified precipitation codes are also reported.

Interfacing, Connectivity and Cost of Ownership

The SWS-100LW sensor weights 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. An optional interface to the ALS-2 Ambient Light Sensor simplifies use in aviation applications where RVR information is required. The ALS-2 Ambient Light Sensor 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-100LW 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.
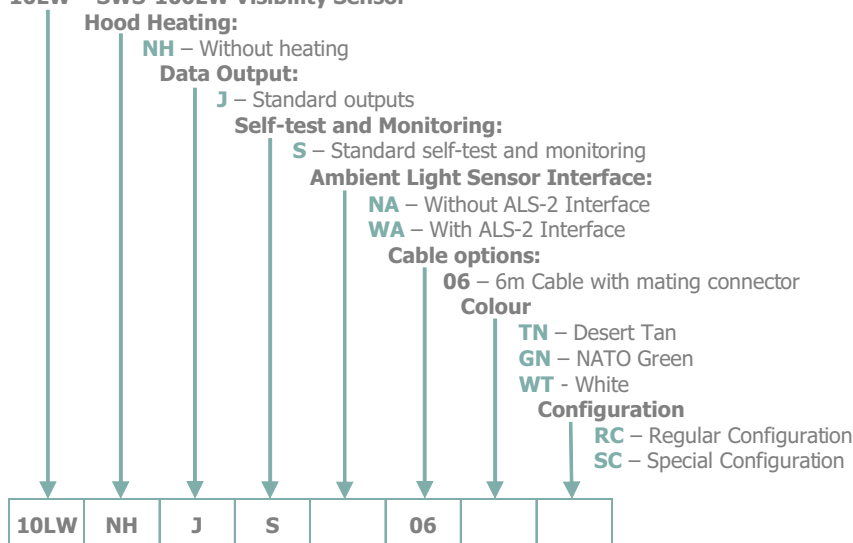
Advanced Functional Test Mode

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, 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.

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Sensor Configuration Information

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

10LW – SWS-100LW Visibility Sensor
    Hood Heating:
        NH – Without heating
        Data Output:
            J – Standard outputs
            Self-test and Monitoring:
                S – Standard self-test and monitoring
                Ambient Light Sensor Interface:
                    NA – Without ALS-2 Interface
                    WA – With ALS-2 Interface
                    Cable options:
                      06 – 6m Cable with mating connector
                      Colour
                        TN – Desert Tan
                        GN – NATO Green
                        WT - White
                        Configuration
                            RC – Regular Configuration
                            SC – Special Configuration

| 10LW | NH | J | S | | 06 | | | |

Example: **10LW.NH.J.S.*NA*.06.*GN.RC*** (Please use this code when ordering your sensor).

Default visibility range: 10m to 2km. *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 **NH**: No hood heating
Data Output	The sensor has a RS232 serial output. No other options are available.
	Option **J**: 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 **S**: 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 **NA**: Without Ambient Light Sensor Interface Option **WA**: 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 **06**: Standard 6m combined power and data cable for connection to the sensor.
Colour	The sensor is available in the following colour options.
	Option **TN**: Desert Tan (Fed Standard 33446) Option **GN**: NATO Green (BS381C Colour No. 285 DEFSTAN 00-23) Option **WT**: White
Configuration	Reserved for customer specific configurations.
	Option **RC**: No customer specific configuration. Option **SC**: Special customer specific configuration.

SWS-100LW
Visibility Sensor
Specifications

Visibility Measurement

Measures	Visibility (MOR)
Output	Digital, RS232
Range (visibility) *(Fixed, select at time of order)*	Default 10m to 2km Selectable 10m to 10km 10m to 20km, 10m to 32km, 10m to 50km or 10m to 75km
Measurement Error	≤4.2% at 600m ≤5.1% at 2km ≤6.8% at 5km ≤9.6% at 10km ≤12.3% at 15km ≤14.8% at 20km ≤17.1% at 25km ≤19.4% at 30km
Measurement resolution	1m or 10m (default)
Measurement principle	Forward scatter meter with 39° to 51° angle, centred at 45°

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)
Basic sensor Window heaters	3.5W 1.7W

Additional Features

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

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

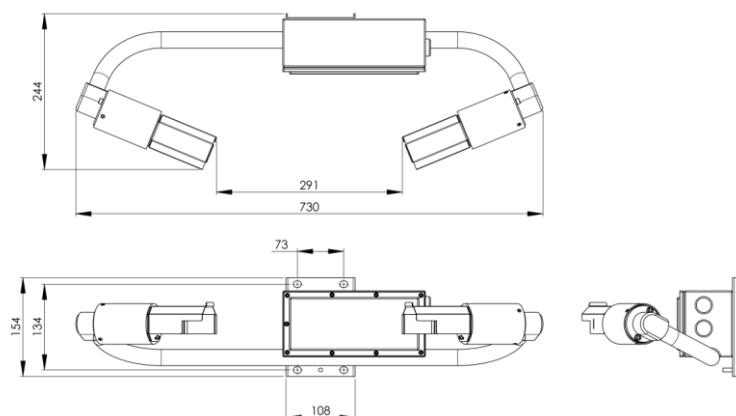| Self-test capability	Fitted as standard
User confidence check	6 months recommended
Window Cleaning	Automatic compensation and warnings
Field calibration	With optional calibration kit

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.SKLW	SWS Low Power Spares Kit
SWS.WTY100	1 Year extended warranty
PW.MAINS	Mains Power Adaptor

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

Dimensions in mm