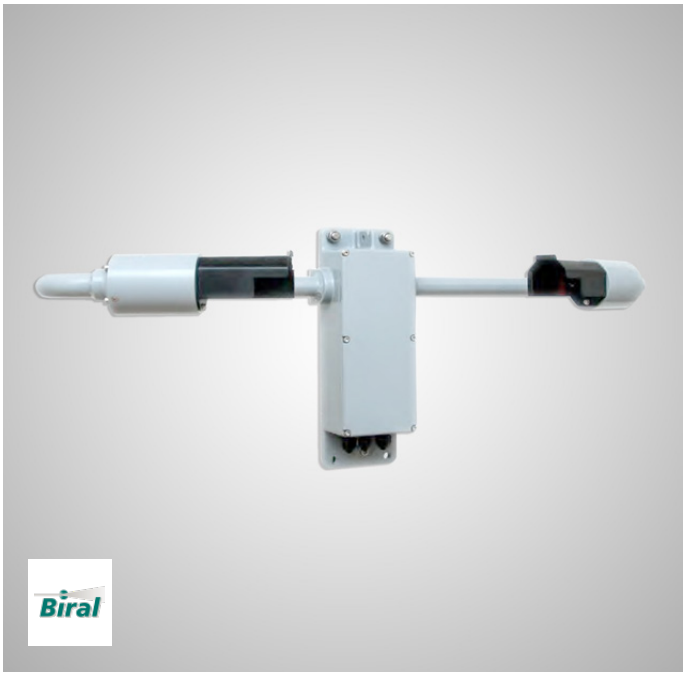
# RWS-20

*Road Weather Sensor*

**The RWS-20 is designed for use in road applications where accurate and reliable visibility measurements are required. The forward scatter measurement principle and unique design ensure the output is both accurate and reliable in all weather conditions and will not be influenced by local light sources, headlights or even flashing signs and beacons.**




The 10 m to 7.5 km measurement range is optimal for use in road applications where fog, heavy rain, surface spray and snow can cause dangerous driving conditions due to reduced visibility. Heating of both the optical windows and sensor hoods is provided allowing use in the harshest of winter conditions. Both optical windows are monitored for contamination and the visibility output is automatically compensated to reduce maintenance requirements. The RWS-20 will even automatically alert when the measurement optics need to be cleaned.

In addition to the serial data interface, the sensor provides voltage and current (optional) outputs of visibility (MOR) or the extinction coefficient (EXCO). Optional relays provide a direct connection to road-side signage or to a data-logger or other control system allowing the sensor to intelligently (and independently) operate local warning systems.

- 10 m to 7500 m measurement range
- Optional hood heating for use in extreme winter environments
- Serial data output (RS-232, RS-422 or RS-485)
- Window heating and contamination monitoring
- Comprehensive self-test capabilities

## Visibility measurement

The measurement of visibility by forward scatter as used by the RWS-20 is now widely accepted and seen as having significant advantages over more traditional techniques such as the use of transmissometers or backscatter sensors. Backscatter sensors share the RWS-20's advantage of being compact however the backscatter signal is strongly dependent on the type of obstruction to vision resulting in poor accuracy and limited upper range. Transmissometers were once considered the standard method for visibility measurement due to their direct measurement of visibility however; their limited measurement range, high cost of acquisition, large size and significant maintenance costs have resulted in their use being limited to a few specialist applications. The RWS-20 by contrast is compact, requires little maintenance and has a visibility range of 10 m to 7.5 km, whilst its measurement performance is proven to be comparable to that of a transmissometer. The calibration of the Biral visibility sensor range was undertaken in accordance with the recommendations of ICAO 9328 and is traceable to an independent national weather service transmissometer.
Visibility is reported as averaged forward scatter Meteorological Optical Range (MOR) with a maximum measurement range of 10 m to 7.5 km. The start point for the

measurement range is fixed at 10 m, however the user is able to set the maximum value to suit their application and local conditions. This can be adjusted between 600 and 7500 m, in 10 m steps, via the software interface.

Reporting of atmospheric extinction coefficient (EXCO) can be selected by user if required.

## Application

Any sensors or measurement systems located at the side of the carriageway have to be able to withstand both the dirty and potentially corrosive environmental conditions (salt spray in winter, dirty water spray at other times), but also have to operate largely independently and for extended periods of time as access can often be restricted. The RWS-20 visibility sensor is specifically designed for harsh road-side conditions found around the world. The sensor housing is a very robust aluminium enclosure which is sealed against dirt and water ingress (IP 66 / 67) and designed to withstand the rigours of 24/7 unattended operation. The measurement windows are protected by hoods which are designed to reduce the amount of dirt and external light reaching the optics. These hoods can also be optionally heated so that in freezing conditions (when the ambient temperature falls below 2 °C) they automatically switch on and keep the optical windows clear of ice and blowing snow. Once the ambient temperature rises above 4 °C, they automatically switch off, thereby conserving power.

The RWS-20 is a key component of any Road Weather Information System (RWIS) and provides the very important data on the visibility that the driver experiences at the carriageway level. The data and connectivity options allow the RWS-20 to be interfaced to any data collection system for data management and also directly to variable message signs via simple relay outputs. It has been designed for easy integration into existing as well as new Intelligent Transportation Systems (ITS) adding visibility measurements into the decision making system.

## Interfacing and connectivity

The RWS-20 is designed to be easy to use, with the ASCII text data message transmitted at user defined time periods or in response to a polled request using a RS-232, RS-422 or RS-485 interface. The standard data message provides averaged MOR however the user can select an EXCO output if preferred. The inherent flexibility of the RWS-20 provides for optional 4 - 20 mA analogue and/or relay outputs to be specified for connection to a data logger or other ancillary devices.

## Maintenance and cost of ownership

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. The RWS-20 has a series of features that are designed to reduce maintenance requirements to a minimum whilst ensuring accurate and reliable operation in the very harsh road-side environment. These features include contamination monitoring on both the transmitter and receiver optical windows which automatically corrects the measurements to maintain accuracy for longer periods of time. The sensor also automatically issues a two stage warning of the need to clean these optical windows. This allows routine maintenance to be planned and carried out as and when required and so be performed as efficiently as possible. 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 RWS-20 is DC powered with the capability to accept separate supplies for sensor electronics and the high power hood heaters. Hood heating is only required in regions where blowing snow is encountered and to conserve power the heaters are only activated when the temperature drops below 2 °C.

## Visibility measurement

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| **Measures** | visibility (MOR) and extinction coefficient (EXCO) |
| **Output** | serial data, and voltage, 4 - 20 mA optional |
| **Range (visibility)** | 10 m to 7 500 m |
| **Measurement error** | ≤10 % at 7 500 m |
| **Measurement resolution** | 1m or 10 m (default) |
| **Measurement principle** | forward scatter meter with 39° to 51° angle, centered at 45° |

## Outputs and reports

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| **Output rate (seconds)** | 10 to 300 selectable |
| **Serial outputs** | RS-232, RS-422 and RS-485 |
| **Analogue outputs** | 0 - 10 V (4 - 20 mA option) |
| **Relay outputs** | 1 fault and 2 threshold relays (option) |

## Power requirements

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| **Sensor power** | 9 - 36 V DC |
| **Hood heating power** | 24 V AC or DC |
| **Basic sensor**<br>**Window heaters**<br>**Hood heaters** | 3.5 W<br>1.7 W<br>24 W (includes hood heater) |

## Additional features

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| **Hood heaters** | fitted as an option to both sensor head hoods |
| **Window contamination monitoring and compensation** | fitted as standard to both sensor head windows |

## Environmental

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| **Operating temperature** | -40 °C to +60 °C |
| **Operating humidity** | 0 – 100 %RH |
| **Protection rating** | IP 66 / IP 67 |

## Certification & compliance

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

## Physical

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| **Material** | powder paint coated aluminium |
| **Weight (including mounting kit)** | 4.3 kg |
| **Length** | 811 mm |
| **Warranty** | 2 years |
| **Lifetime** | > 10 years |
| **Colour** | grey - RAL 7045 |

## Maintenance

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| **Self-test capability** | 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

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| **SWS.CAL** | calibration kit suitable for SWS and RWS series |
| **SWS.CASE** | transit case |
| **SWS.WTY100** | 1 year extended warranty |