

# Sensice ice detectors



## Black ice detection

Sensice produces ice detectors that identify the road surface state as being one of dry, wet or icy. It is further able to tell road surfaces covered by clear ice, often called black ice, from dry, wet or snowy roads and roads covered by sleet or clear ice with a layer of water on top of the ice. One of the most useful benefits is its ability to detect black ice, which often is near invisible to the human eye.

The detectors sense presence of ice over an extended area, typically extending a width corresponding to a road lane.

## Applications

Sensice' instruments are often used for supervision of the road surface state. They may also be used for detection of ice on runways, bridges or wind power plant turbine wings. The instruments may also be used for meteorological purposes or in industrial applications.

## Technology

Our ice detectors are based on infrared spectroscopy, which is the only viable technique. Sensice' spectroscopic instruments emit a beam of infrared light that hits an extended area. Light is partially absorbed by ice or water on that area, and light reflected back to the detector is sensed. Presence or absence of ice or water is then calculated using the optical properties of the retro reflected infrared light.

## Advantages

Sensice' ice detectors use an innovative new design that allows a superior price/performance ratio. As compared to ordinary laser based systems the purchase cost is reduced.

Lasers have a limited life span, demanding regular replacement, which additionally gives competing instruments a higher maintenance cost. Sensice' ice detectors are not laser based, giving a significantly lower maintenance cost.

# Mechanical properties

## Size and weight

The instrument is 182mm x 154mm x 82mm (width x length x height) and weighs 3.1 kg.

Mounted, the instrument and its holder extend a maximum of 260mm from the pole. The holder has a height at its base of 120mm. With holder, the total weight is 4.4kg.

## Tiltable holder

The holder is provided with a pair of clamps for grasping around vertical poles with a diameter in the interval 35-50mm.

The holder has two knobs that are tightened to hold the direction of the instrument fixed. A safety catch wire is attached to the holder in order to prevent it from free falling if dropped during mounting. The safety catch wire should be securely attached during mounting and remain attached.



## Mounting

If the holder is used, it should be attached to a rigid pole or similar.

# Optical properties

## Detection range

Recommended detection range for the ice detector is in the range 3m-15m. The maximum detection range is under optimal circumstances larger, but use at detection ranges exceeding 25m is advised against.

## Response time

The instrument continuously assesses surface properties and transmit measurement results every 125ms, representing an estimate of the surface properties during the last 125ms up to transmission of data.

## Sunlight glare

Reflected sunlight or intense artificial lighting reflected directly into the instrument may cause temporary saturation of the photo detectors, rendering it unable to make measurements. Glare error messages are then transmitted by the instrument.

Directing the instrument directly towards the sun may irreversibly damage the photo detectors and it then has to be returned to the supplier for replacement of the main circuit board.

## Blocking of the beam

Obviously, the light beam is blocked by interfering objects in the beam, and this must be considered when mounting the instrument. The instrument must have a fully clear view of the detection area. If an object blocking the view is present, ice and water on this object will be detected.



Objects rapidly passing through the beam will give rise to a phase error, which is transmitted by the instrument. In case of a phase error, no surface data are available. Within 125ms of the passing object having left the field of view, a new, reliable measurement is presented.

Occasionally, customers may prefer mounting the detector behind a protective screen or window. It is then necessary that the window is fully transparent in the near infrared wavelength range. Obviously, if the window or screen is covered by a layer of ice or water, the detector will present measurements partially representing this ice or water layer.

# Resistance to environmental influences

## Precipitation immunity

The interior parts of the instrument are IP67 waterproof. It is provided with a front screen extending above and in front of the apertures which protects it against direct precipitation. Typically, the instrument is angled downwards, which further protects the front apertures from precipitation.

## Temperature range

The instrument is functional in the temperature range of  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . Acceptable storage temperatures extend to  $+100^{\circ}\text{C}$ .

## Dirt build up on apertures

The front screen prevents against dirt falling down from above, and mounting the instrument at a sufficient height above the ground reduces the risk of splatter from passing vehicles. Regular cleaning of the front apertures may be necessary.



## Dew and frost

22W of heat is emitted primarily via convection from the cooling fins on top of the instrument. At use, this heats the instrument and prevents build up of dew or frost. When the instrument has been disconnected from its power source, frost or dew may remain on the front apertures for a short while after being powered on again.

# Electrical properties

## Power supply

The instrument is powered by 12V DC and draws 2.1A. Current is supplied with an IP67 waterproof Binder series 768 connector. Power on is indicated by a LED on the rear side of the instrument.

## Communication interface

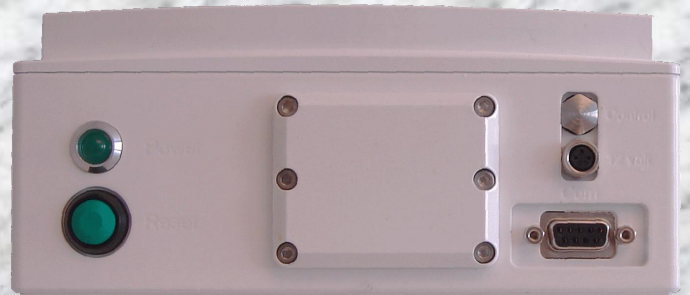
Measurement results are transmitted via RS232 and the series communication interface is bidirectional for reception of control instructions.

The RS232 interface uses 19200 baud, one stop bit and no parity. Measurement results are transmitted from the instrument every 125ms using a proprietary protocol.

A 9 pin IP67 waterproof LTW D-sub connector is used, shown at the lower right side in the image.

## Reset

The instrument is provided with a reset button, visible on the lower left side of the image below. Software controlled reset via RS232 is also available.



## Ports not intended for customer use

A lid, shown at the centre of the image above, prohibits access to further ports that are not intended for normal customer use. The lid should not be removed.

The instrument is calibrated at production for optimal performance at ordinary use. It may be recalibrated using a switch behind the lid, but if incorrectly done it may reversibly affect performance negatively and this is strongly advised against.