The Vaisala DRS511/511B Road & Runway Sensor, when connected to the Vaisala ROSA Road Weather Station, forms a part of a complete remote processing system for ice warnings and predictions. The DRS511 is a multi-sensor block utilizing thermally passive principles, i.e. no artificial heating or cooling energy is used which may alter the measured environment. The lower DRS511B model is designed for bridges. The sensor design features open-end carbon fiber electrodes and optical fiber technology. These are molded into a solid sensor block consisting of an epoxy compound with properties matched to the road for thermal conductivity and emissivity. This durable design withstands the heavy stresses of the traffic allowing the sensor to be installed in the wheel track. The sensor can wear down as much as 35 mm without external adjustments. Vaisala’s unique measurement technologies enable accurate analysis of pavement state, snow and ice coverage detection, waterfilm thickness and de-icing chemicals.

SURFACE STATES
The measurements are processed by the ROSA Road Surface Analyzer. The ROSA system, equipped with the DRS511 sensor, distinguishes the following surface states:

- Dry
- Moist
- Wet
- Moist and chemical
- Wet and chemical
- Frosty
- Snowy
- Icy

MEASUREMENTS
The Vaisala DRS511 Road & Runway Sensor makes 6 measurements:

- Optical detection of the coverage
- Surface conductivity
- Electrochemical polarizability
- Surface capacitance (black ice)
- Surface temperature
- Ground temperature (–6 cm)

The DRS511 sensor contains facilities to optically determine the pavement surface coverage. This will result in a measured value for water thickness in wet conditions and reliable ice and snow coverage detection. The electrical conductivity and electrochemical polarizability measurements are important in determining the amount of de-icing chemical on the pavement surface. Together with the temperature and measurement of waterfilm thickness the sensor accurately determines the freezing temperature and the risk of ice formation.

Conductivity disappears for mono-crystalline ice (black ice). Therefore, the sensor features an integrated black ice detector which measures the characteristic capacitance of the pavement surface. Temperature measurements are made using precision Pt-100 sensor elements and the four-wire method. These measurements are critical in determining the risk of slippery conditions. All the measured data, including the atmospheric measurements of air temperature, humidity, and precipitation are used by ROSA in determining the road or runway surface condition.
TECHNICAL DATA

PERFORMANCE
Temperature measurement range

-40 °C to +60 °C

Water layer thickness detection
Measuring range 0...8 mm
Accuracy 0.1 mm in the range 0.0...1.0 mm

Note: The accuracy of 0.1 mm applies to an even layer of water on the sensor. The detection accuracy of the average water layer thickness on the road depends on sensor installation, pavement material and water impurities.

MATERIALS
Epoxy compound Araldit D, HY 956 lamp black for color
Cable tubing Stainless steel
Cable 4 × (2 × 0.22 mm² + shield) high density polyethylene lead isolation
Sensing electrodes Carbon fiber in epoxy
Optical sensor Acrylic optical fibers
Temperature sensors Two Pt-100 elements, 1/3 Class B DIN IEC 751

ENVIRONMENTAL
Temperature -40 °C to +60 °C
EMC 89/336/EEC and FCC 15 part J
Mean time to repair (MTTR) 3 hours

MECHANICAL
Dimensions
DRS511 75×84×30 (bottom 38) mm³
Dimensions
DRS511B 50×84×30 (bottom 38) mm³
Cable length 20, 30, 50, 100, 150 or 200 m
Weight including 50 m cable 3.1 kg

OPTICAL SENSOR
BLACK EYEPINCE DETECTOR
STAINLESS STEEL SHIELD

SURFACE CONDUCTIVITY DETECTOR
SURFACE TEMPERATURE SENSOR
GROUND TEMPERATURE SENSOR

NOTE: The top of the surface sensor DRS511 is about 1...3 mm lower than the pavement.