Road and Runway Sensor DRS511

Vaisala DRS511 is an embedded road and runway sensor system that takes a variety of measurements and observations of the road or runway surface.

Features

- Amount of de-icing chemical measurement
- Identifies road condition
- Water amount measurement
- Surface temperature measurement
- Ground temperature measurement -6 cm (-2.36 in)
- Freeze point
- Hoar frost detection

DRS511 is embedded directly in the pavement and gathers its readings by being installed flush with the surface. 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 matching the surface for thermal conductivity and emissivity.

The sensor contains two Pt100 elements to measure the temperature of the road or surface. Temperature is a key decision factor for the formation of ice and snow on the pavement, and is used before an event to determine if snow or ice will stick to the surface.

The temperature of the road and runway surface is also key to determining how effective winter maintenance chemicals will work at the desired temperature, as air temperature can be many degrees different and is not a good decision point for determining chemical effectiveness.

Lastly, the surface temperature, when used with dew point, can accurately indicate when hoar frost formation is possible.

Pavement State

DRS511 not only provides the temperature of the pavement, but it also detects the presence of moisture on the pavement, and thus provides a road state such as dry, wet, ice, and snow. The sensor provides this value to give you an estimate of surface conditions on the roadway or runway. DRS511 provides its raw readings to the weather station. Using other sensors readings, when possible, the weather station then estimates the surface condition. This is why the sensor is not typically provided stand-alone because it works in conjunction with the weather station.

Chemical Knowledge

A characteristic that is unique to DRS511 compared to all other embedded road and runway sensors is its ability to provide a calculation of the amount of chemical on the sensor's surface. The value is provided in the form of g/m^2 and lb/mi^2, which is a very effective way to determine how chemicals will perform if additional moisture is introduced. The greater the quantity of chemical present, the better the chance of the surface remaining unfrozen with the introduction of more ice or snow.

In addition to providing the amount of chemical present, DRS511 also calculates the freeze point of the current solution as another decision point used by many winter maintenance decision makers.

Tried and True

DRS511 offers many advantages as a surface sensor system, with the biggest being its location. It is placed directly where the tires of vehicles and aircraft interact with the surface of the road or runway. This means it is directly measuring its environment, which ensures accuracy.

DRS511 is a passive sensor, which means it does not change or alter the environment that it resides in. This type of road and runway technology has been around for decades. Thus when using DRS511 the risk of failure or ineffectiveness in your operations is minimal. The passive technology found in the sensor has been tested by institutions and authorities for years, so you know exactly how the sensor can aid you in your operational decision making.

Technical Data

Measurement Performance

Temperature	
Observation range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	±(0.1 + 0.00167 × temperature) °C
Water Layer Thickness	
Observation range	0 ... 7 mm (0 ... 0.28 in)
Accuracy	0.1 mm in the range of 0 ... 1.0 mm [1]
Reported Surface States (When Used with Vaisala Weather Station)	
Vaisala classes	Dry, Moist, Wet, Snowy, Icy, Frosty, Moist and chemical, Wet and chemical
EN 15518-3 classes	Dry, Moist, Wet, Streaming water, Slippery

1) *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.*

Operating Environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
EMC compliance	Directive 2014/35/EU EN 61326-1, Immunity test requirements for equipment intended to be used in an industrial electromagnetic environment EN 55022 class B electromagnetic emissions FCC part 15 class B

Mechanical Specifications

Temperature sensors	Two Pt100 elements, 1/3 Class B DIN IEC 751
Dimensions (H × W × D) [1]	DRS511AA: 75 × 84 × 30 mm, bottom 38 mm (2.95 × 3.31 × 1.18 in, bottom 1.50 in) DRS511BB for bridge applications: 50 × 84 × 30 mm, bottom 38 mm (1.97 × 3.31 × 1.18 in, bottom 1.50 in)
Cable length options	20 m (65 ft 7 in) 30 m (98 ft 5 in) 50 m (164 ft 1 in) 100 m (328 ft 1 in) 150 m (492 ft 2 in) 200 m (656 ft 2 in) 300 m (984 ft 3 in)
Weight including 50 m (165 ft) cable	3.1 kg (6.8 lb)
Materials	
Epoxy compound	Araldite D, HY 956, lamp black for color
Cable tubing	Stainless steel AISI 316L
Cable	4 × (2 × 0.22 mm^2 / 24 AWG and shield) PUR, high density polyethylene lead isolation
Sensing electrodes	Carbon fiber in epoxy
Optical sensor	Acrylic optical fibers

1) *To make sure that the sensor remains even with the road surface, the sensor can wear up to 35 mm (1.38 in)*

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