



## **RWIS development in Sweden**

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## **A unique Road Weather Info System**

Enator Telub AB of Sweden in cooperation with Swedish National Road Authorities has developed the worlds most comprehensive RWIS system.

The Swedish system consists of close to 700 fieldstations with ability to monitor the weather situation in real time along the Swedish roads.

The stations are built as integrated systems with sensors from several manufacturers.

The **GMS** field station, the **OpticEye™** precipitation sensor and the **FRENSOR®** freezing point and road condition sensor, were all developed by beacause of demands from the Swedish road authorities

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## **The fieldstation GMS**

### **HISTORY**

The GMS field station is being developed from demands asking for a very rugged and still accurate new field station. The Swedish RWIS system is currently being developed from being a Road Weather Info System to a Road Info System. This evolution put new demands on the field station to perform more than just measuring weather conditions. The new station has to be able to control VMS road signs, traffic counters, digital cameras, RDS-TMC messaging, weighing in motion, intelligent road lights and many other tasks perhaps not yet even thought of.

The GMS is designed under military specifications meaning that the construction is extremely rugged.

The first prototype is currently being tested.

Some of the countries already having ordered the GMS station are Sweden, Estonia and Russia.

### **FUNCTION**

The GMS is to be located in the field for the collection of weather, traffic or other field information. Via modem, or other preferred communication, it distributes the information to a center which can take measures for general maintenance and warnings. The GMS can also be used to monitor road conditions at Variable Message Signs and the weather conditions can be used to control speed limits illumination, heating, etc.

The GMS is developed to be as stable and reliable as possible and at the same time be very flexible. Its microprocessor solution is suited to be optimized in speed, performance and reliability. All electronics is selected to ensure a functionality in all weather conditions from -40°C to +40°C and is all mounted on the same board. The whole card can easily be replaced in case of maintenance. Tests by the Swedish National Road Administration have shown a reliability of over 98 % for the former microprocessor controlled field station MS2.

The GMS can handle different sensors such as the OpticEye™, FRENSOR®, traffic meters or any sensor communicating with an analog voltage, RS232 or RS485. Additional boards with extra analog or serial ports can easily be installed. The GMS software can be modified and updated through the stations modem communication

**The GMS can be used for**

- Weather information at roads, airports, ski resorts, etc.
- Traffic management
- General data collection

## **The precipitation sensor OpticEye™**

### **HISTORY**

The OpticEye™ was developed from demands stating that detection of precipitation had to be accurate. Since then type-, intensity-, and amount- of precipitation has been added to the original specification.

The OpticEye™ is designed under military specifications meaning that the construction is extremely rugged.

The first prototype was tested in 1992.

Today more than 700 OpticEye™ have been delivered.

Some of the countries where OpticEye™ is in use are Sweden, Finland, Norway, Denmark, Estonia, Russia, Italy and the United States. ...

The OpticEye™ is today the most proven precipitation sensor working with the optical principle. The design is steadily being improved.

## **FUNCTION**

The detector consists of two light rays which form a horizontal cross. The light rays are produced by LED's of IR type and the intensity of each respective light ray is registered by photo detectors. Occurrence of precipitation causes brief reductions in the intensity of the light rays.

In addition to the quantity of precipitation per time unit, the different types of precipitation are registered. To decide the precipitation type the sensor needs information about the wind speed, air temperature and humidity. With this input data the sensor continuously registers and analyzes the precipitation. The sensor differentiates between rain, sleet, snow and drifting snow.

The communication with a host system is performed serially via RS232/485. The sensor can be connected to any host system by communicating through the intelligent protocol of the OpticEye™.

## **FRENSOR<sup>®</sup>**

### **HISTORY**

The FRENSOR<sup>®</sup> was developed because there were demands for using less chemicals on the roads. The development of this unique patented sensor started in the mid 80's.

At first testing was performed with a conductivity construction. It was soon found out however that the accuracy for the freezing point was not good enough.

Therefore a new principle had to be used.

The use of the peltier element made it possible to get very good accuracy independent of antiicing chemicals used. This is very important as research shows that reduced environmental effects can be obtained by mixing salt with other chemicals thus rendering conductivity constructions useless. Apart from the freezing point also the condition of the road could be detected as wet, dry or icy. A lot of work was put into the design to make it withstand the wear from the studded tyres used in Sweden. Finally in 1996 the construction was proven and certified.

Today the FRENSOR<sup>®</sup> is being tested in production by the Swedish National Road Authority in growing numbers. So far the results are very promising.

The FRENSOR<sup>®</sup> is used in Sweden, Estonia, USA at both airports and roads. The system is well suited to airports because it is totally independent of antiicing chemicals used.

The FRENSOR<sup>®</sup> is designed under military specifications meaning that the construction is extremely rugged.

The design is steadily being improved.

## FUNCTION

The system consists of 4 FRENSOR<sup>®</sup> sensors with 25 m cables and a control module. It can be supplied as a stand-alone unit or be integrated into an existing road weather information system.

The FRENSOR<sup>®</sup>'s active element, a Peltier cell, cools and warms the liquid or moisture on its surface in cycles under the control of a microprocessor. At the same time, the temperature of the cell is determined. When the substance freezes or changes state from liquid to solid, energy is released in the form of heat. The instant freezing point is detected and the temperature is reported via digital or analog outputs.

The FRENSOR<sup>®</sup> fulfills the UN EMC directives EN 50081, EN 50082.

It is patented in Europe, North America and Japan.