

Road Condition Monitor RCM411



Road Condition Monitor RCM411 has been designed to be a quality control and optimization tool for winter maintenance. RCM411 is also suitable for runway condition reporting. The sensor can be installed onto a moving vehicle to follow surface conditions and friction in real time. RCM411 detects all typical surface states like:

- Dry (green line color)
- Moist (light blue)
- Wet (dark blue)
- Slushy (magenta)
- Snowy (white/grey)
- Icy (red)

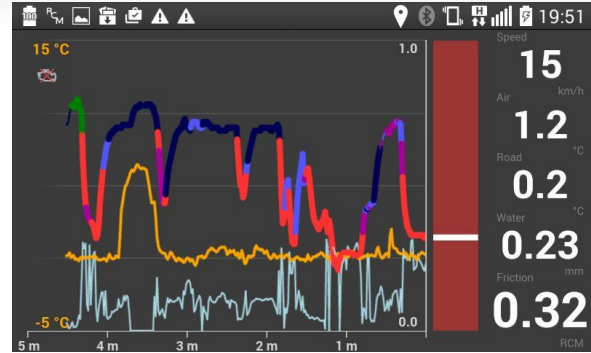
The RCM411 sensor also measures water layer thickness in fractions of millimeters up to 3 mm. Measurements of the surface condition and water/ice amount are used to estimate **coefficient of friction**. A braking friction measurement application is integrated in to the same user interface on a cell phone to validate the friction model. The results are communicated to selected servers. All the data can be explored at <https://roadweather.online> on a map interface.

Features and benefits:

- mobile friction with an optical remote sensor
- high accuracy and resolution
- measurements
 - surface state
 - contamination layer thickness
 - friction
 - surface temperature (optional)
- solid state design
 - no moving nor wearing parts
- easy installation
- output
 - serial RS-232 or Bluetooth
- power input 9-30 VDC
- data communication to a cell phone, PC or other systems
- photographs of the road surface taken manually, at preselected intervals and at preselected locations



Screen shot of a cell phone user interface during snowy (grey), icy (red), slushy (magenta), wet (blue) and moist (dark blue) surface conditions. The yellow dots have been measured by an acceleration based Friction Meter installed in the same cell phone.



Screen shot of the Android user interface during slushy, icy, wet and dry surface conditions (thick magenta/blue/red/green line for surface condition). The yellow line shows surface temperature and the blue line water layer. The number 0.32 is the current friction value measured by the RCM411 sensor. The color bar indicates the status of either road condition or friction.



Colour coded friction values measured by RCM411 on 14.2.2016 in Helsinki as displayed at <https://roadweather.online>. Hues of red, yellow and green correspond to friction from 0.20 to 0.80. The photograph evidencing a snowy surface state is taken automatically with the cell phone application and can be clicked to get a bigger view shown on the map display.

RCM411 Specifications:

Sensor type:	Road Condition Monitor RCM411
Measures:	length 100 mm, diameter 75 mm, weight 750 g
Material:	aluminum housing
Cable:	M12 connector
Power supply:	9 ... 30 VDC, power from trailer light connector or cigarette lighter
Power consumption:	about 1 W
Temperature range:	-30 ... 50 °C
Resolution of thickness:	0.1 mm, detection limit 0.03 mm, range 0.03 mm to 3 mm
Accuracy of thickness:	0.1 up to 1.0 mm, 10 % above 1.0 mm
Resolution of friction:	0.01
Accuracy of friction:	0.10 as standard deviation compared to a braking friction reference
Output:	RS-232 serial interface or Bluetooth
Installation:	to a trailer hitch with a ball joint or to the back door with an adapter
User interface:	Bluetooth connection to a cell phone. The same phone is used to run a braking friction measurement application to measure absolute friction for reference. Data is communicated to Road Condition Map at https://roadweather.online and/or to a local server.

Distributor:

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