

Hail Monitoring System

METEOROLOGY | HYDROLOGY

General Description

HailSens IoT is an **advanced sensor for monitoring hail events in real-time**. The detection of hail impacts (as opposed to other types of icy or watery precipitation) relies on kinetic impact measurement. HailSens IoT provides **accurate, reliable results on hailstone sizes quickly and automatically** via wireless or Ethernet communication. The complete hail event can be analysed in realtime based on recorded hailstone distribution matrix.

HailSens IoT revolutionizes the technology for sensing hail: It combines sophisticated measuring technology with online provision of data. HailSens IoT **automatically detects hail, and classifies individual hailstones** with respect to their size and damage potential. The sensing area of approximately 0,2 m² (diameter 50 cm / 19.7 inch) ensures that a representative sample of hail pellets generates impacts on the vibrating plate thereby **increasing measurement reliability**. HailSens IoT saves data, transfers it in realtime to evaluation software for statistical evaluations and display of impact results in graphics and tables, and - last but not least - provides **early warnings** using web technology.

Applications

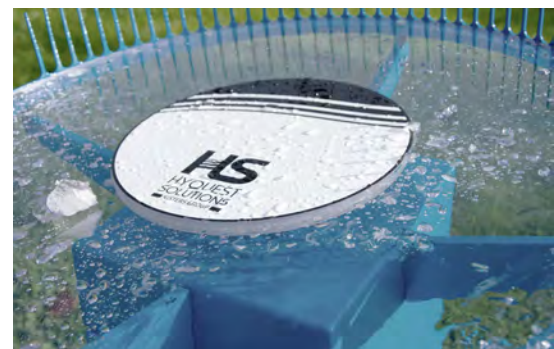
HailSens IoT is particularly efficient in three areas: First, as an **early warning system** ensuring preventative protection. Secondly, in the **realtime control of mobile infrastructure parts** (closing open roofs or shutters, alerting drivers on a highway, turning solar panels into upright position, etc.), and thirdly, in the **recording of individual hail impacts**.

The rapid and accurate sensing of hail incidents and the ability to immediately forward collected data to a central location for evaluation makes HailSens IoT ideal for:

- Traffic security: hail monitoring and warning
- Science and research
- Weather services and met offices
- (Re-)Insurance companies
- Solar system operators (ice pellets implication on solar panels / building roofs according standards for impact resistance UL 2218)
- Agriculture, farming: e.g. harvest protection
- Hail mitigation decision support systems
- Hail suppression
- Civilian and military aviation
- Automotive sector
- Industry and commerce

Features

- Online hail detection including kinetic energy and hail diameter
- Life-time calibrated and long-term stable sensor
- Drift-free ratiometric in-situ measurement
- Large measurement surface for providing statistically relevant results for any given hail event; transducer system especially designed for taking into account the relatively large distance between neighboring pellets in a hail shower
- Smart IoT-sensor: integrated battery charger, choice of Ethernet or wireless communication from 2G to 4G, optional solar panel and battery
- Calibrated measuring temperature range from 0 to 70 °C; deployment operational temperature range from -40 to +70 °C
- IP 66 grade with M12 and ethernet connectors
- Easy installation by one person vertically or horizontally on 2 to 4 inch poles with automatic position alignment
- Transport box for air and sea transport by one person



Technical Specifications

Accuracy	Kinetic energy and pellet equivalent diameter: +/- 10 % (according specific mass density on ice and spheric model)
Operating and Measuring Ranges	<ul style="list-style-type: none">■ Deployment operating and storage temperature: -40 °C to +70 °C■ Calibrated measuring range: 0 to +70 °C■ Humidity: 0 - 100 % RH
Electrical Specs	<ul style="list-style-type: none">■ Voltage range: 10V - 18V (DC)■ Power consumption: typical 60 mA@12V (0.7 W), wireless comms engaged max. 120 mA@12V (1.4 W)
IP Grade	IP 66
Hail Measurement Range	<ul style="list-style-type: none">■ Measured data: kinetic energy: 0,01 to 28 J; derived data: pellet diameter 5 to 50 mm■ Lower detection level: >=5mm (hail pellets according to WMO)
Data Transmission	<ul style="list-style-type: none">■ Physical output: wireless IP data modem, SMA connector, antenna■ Protocol: Data over 3G/4G■ Interface: Ethernet 10/100BASE-T RJ45
Data Exchange Interface/M2M	JSON to defined RESTful web service
Data Content	JSON: timestamp, pellet kinetic energy, pellet equivalent diameter, calibration factor
Datagram Frequency	<ul style="list-style-type: none">■ No hail: heartbeat every 6h■ Hail event: near real-time during hail events: one dataset/pellet impact
Calibration and Drift	Life-time calibration and drift-free differential measurement by in-situ ratiometric principle and compensation
Dimensions	<ul style="list-style-type: none">■ Sensor plate (round): Ø 500 mm (19.685"), height: 300 mm■ Mounting: 2" to 4" pole■ Weight: 6.5 kg

Solutions and Benefits

Wireless cloud-based solution

With embedded wireless communication HailSens IoT **operates autonomously** sending data over UMTS/3G/4G with every single impact to the cloud-based datasphere software (see below). This is the optimal tool for network operators with a strong interest in **collecting large amounts of data on individual hail events and pellet**

impacts. The data can be classified into hail damage classes by datasphere cloud software.

Ethernet port for SCADA systems

HailSens IoT provides data with time stamp of each hydrometeor to a local SCADA and data acquisition system. This solution is applicable for Met office's monitoring network

stations reporting to WMO global switching network or for local hail mitigation and decision support systems for buildings or solar farms. Global weather data will be correlated for a regional or wide scale forecasting on hail storms based on numeric modeling processes by KISTERS' cloud solutions (see below).

Cloud Software

datasphere:

Global all-in-one solution for sensor data. The cloud-based solution with easy-to-use viewing, alarming and integration features is the perfect basis for sensor network management, environmental monitoring, in-

frastructure/asset monitoring, smart cities, internet of things amongst others.
Web: datasphere.online

HydroMaster: HydroMaster

Live web service for viewing, analysing and

archiving historical and upcoming precipitation events for your defined hotspots. Customisable alerting functions enable to take preventive actions.

Web: www.hydomaster.com
Please ask for details.

HyQuest Solutions Australia

✉ sales@hyquestsolutions.com.au
🌐 www.hyquestsolutions.com

HyQuest Solutions New Zealand

✉ sales@hyquestsolutions.co.nz
🌐 www.hyquestsolutions.com

HyQuest Solutions Europe

✉ info@hyquestsolutions.eu
🌐 www.hyquestsolutions.eu

