

# NOISE GUARD



ENVIRONMENTAL NOISE MONITORING SYSTEM  
**PRODUCT DATA**

# OVERVIEW

**Noise Guard is a unique noise monitoring solution. The system is based on Brüel & Kjær Type 2250 SLM providing continuous periodic measurements of basic sound parameters and calculation of environmental noise indicators.**

Using best-in-class measurement equipment from Brüel & Kjær, Noise Guard delivers the peace of mind that your operation is being properly monitored, and provides the simplest and most cost-effective monitoring solution that regulators and communities will appreciate.

Noise Guard system includes an outdoor microphone and can be used as a standalone system or as part of a larger environmental monitoring solution. In this case Noise Guard combines noise data gathered from SLM and weather station with data from external sensing units such as air quality meter, ground vibration, etc. Noise Guard is a flexible and cost-effective solution for monitoring of noise trends, limit compliance, public awareness, and calibration of noise maps.

Noise monitoring verifies adherence to noise limits and is an important part of management and planning tools used by an ever-growing variety of public as well as private organisations



## MEASUREMENTS & CALCULATIONS



Sound level meter measures sound pressure in decibels (dB): 0 dB is the threshold of human hearing, 55 - 60 dB is the level of normal conversation and 120 - 140 dB is the threshold of pain. The dB scale is logarithmic: a 3 dB increase results in double the amount of sound pressure. Human perception of sound, however, is a complex process and non-linear. Perceived loudness is doubled when sound pressure is increased by 10 dB.

<b>L<sub>Aeq</sub></b>	Equivalent noise level - A-weighted level of time-averaged sound pressure level within one time period.	<b>L<sub>evening</sub></b>	Average sound pressure level during the evening time period (from 18.00 to 22.00)
<b>L<sub>eq, 1h</sub></b>	Any other period can be defined	<b>L<sub>night</sub></b>	Average sound pressure level at night (from 22.00 to 06.00)
<b>L<sub>10</sub></b>	The sound pressure level exceeded for 10% of the time period	<b>L<sub>den</sub></b>	Day-evening-night noise level calculated from weighted values for each part of the day (penalty added to the night-time noise measurement)
<b>L<sub>90</sub></b>	The sound pressure level exceeded for 90% of the time period	<b>L<sub>dn</sub></b>	Day-night noise level - combines the day and night measurements (penalty added to the night-time noise measurement)
<b>L<sub>AE</sub></b>	Exposure level of defined time period		
<b>L<sub>day</sub></b>	Average sound pressure level in dBA over daytime period (from 06:00 to 18:00)		

# SERVICES

Noise Guard is a noise monitoring solution consisting of one or more terminals and a server where the data from the terminals is being sent to and can be viewed by the users.

There are two options for deploying the Noise Guard server:

1. **Self-hosted**

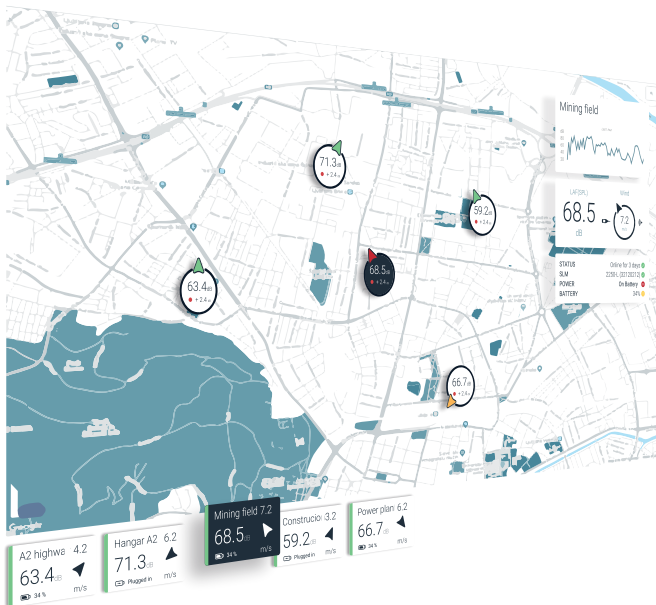
We install the Noise Guard server on a server provided by the customer. The customer is responsible for meeting all the technical requirements for running Noise Guard server.

2. **As a service**

Noise Guard server is running in the cloud and is managed by IMS.

## DATA VIEW

Collection of all the data. Calculated daily indicator. It consists of **day view** with hourly average LAeq and **hour view** with selectable minute intervals and associated **sound recordings** that can be played back instantly.

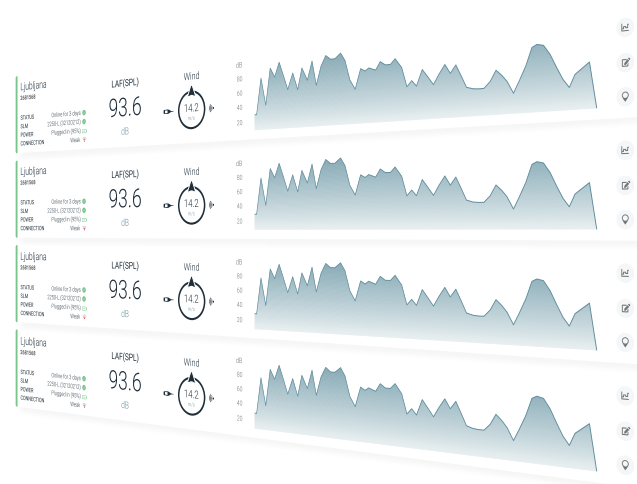


## MAP VIEW

Basic parameters of each terminal displayed on a map. This view can be made available for **public access** as well.

## TERMINAL VIEW

Terminal view incorporates status indicators with real-time and historical noise level parameters captured from each terminal in the system.





# OPERATION

## Noise Guard in action

Noise Guard app that is running on the terminal collects data from Type 2250 sound level meter. Data is sent to the server via LAN, Wi-Fi or 4G network. The terminal starts up automatically when powered on.

The app prevents data loss in case of a connection failure: If the connection between the terminal and the server is lost, data will be stored locally for up to a month and sent to the server as soon as the connection is re-established.

Noise Guard measures sound and weather data simultaneously. Since all the data are stored in a database it can easily be used in conjunction with other environmental monitoring solutions, e.g. air quality monitoring.

## WEB Interface

Data sent from the terminals is collected on a server, where it can be viewed in web browsers on any device with connection to the internet.

Noise Guard web interface displays live data from all the terminals simultaneously. Users can also view and analyze historical data for each individual terminal. A view that shows live data on a map can also be open for the public.

Users can see every measured and calculated value: average sound pressure levels (with information about the level re. Noise Limit threshold), average wind speeds and wind directions. Different alert methods can be programmed and notification sent via email to selected persons for attention or immediate action. Users can also listen to recordings (the system starts recording when noise exceeds recording threshold set individually for each terminal and each day period) and export data to Excel for further analysis.

Users with administrator access can add and edit users and terminals. Three access levels are supported: **public access, user and administrator.**



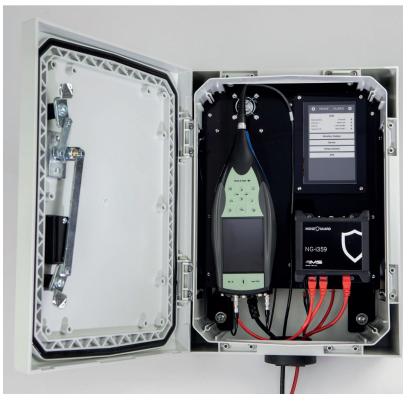
# Configuration options for Noise Guard Type NG-i359

The Noise Guard is available in a range of different configurations to suit your application. With monitoring solutions for noise and weather data, we can optimize your costs to deliver the data that you need. Mobile configurations are useful where noise and/or vibration monitoring needs to regularly relocate as work changes, or as road work machinery progresses along their path. New location is automatically updated on the server and available for the end user.

Last but not least, many of the old Bruel&Kjaer 3639 NMTs users like the “green” cabinet and prefer to keep it. It can be upgraded with the latest instrumentation and communication technology to support today’s user expectations with the NG-3639 retrofit kit.

For more advanced users the Noise Guard can be delivered as a kit with required hardware for permanent or portable use. The Bruel&Kjaer sound level meter Type 2250 and outdoor microphone are added locally by the user or Bruel&Kjaer personnel. The system can be delivered as a complete configured and tested solution including 2250, 4952 and one of Vaisala weather stations.

## Permanent noise monitoring kit NG-i359-ST



Noise measurements are based on our proven hardware, which continuously monitors noise at several locations around the world in a variety of applications including, industrial sites, ports, racetracks and construction sites.

Equipped with an outdoor microphone, NG-i359 is designed for permanent outdoor use over the course of many years, measuring noise levels in accordance with all applicable international standards.

Communication to the Internet is made via the LTE/3G wireless router, wired broadband or Wi-Fi® link installed in each terminal. If the communication link breaks down for any reason, all data are recovered when the link is re-established.

Data are stored locally on the terminal and continuously transferred to the Noise Guard server. Local storage is crucial to avoid data loss in the eventuality of communications failure.

## Portable noise monitoring kit NG-i359-PRT



Portable noise monitoring is provided with portable unit Type NG-i359-PRT. This is functionally equivalent to the permanent version, but housed in a hand-carried waterproof case, suitable for monitoring periods of several months at a time. Also equipped with a 4G router, the portable unit communicates noise data in real time to Noise Guard server for storage and analysis.

Portable terminals may be relocated during the course of a measurement programme. This is a simple process that requires notifying Noise Guard to stop gathering data at the current location, relocating the monitoring equipment and finally instructing Noise Guard to continue. The new location automatically updates server with new coordinates from GPS installed inside the case.



## Retrofit monitoring kit NG-3639-RFF



The retrofit is intended for existing Brüel&Kjær Type 3639 NMT users. The kit is a complete assembly which replaces all components inside the “green” cabinet with the new Noise Guard solution.

It is a cost-effective solution as the cabinet and outdoor microphone can be reused. In case the 2250 is a 4th generation, it can be reused as well.

The kit is designed in such a way that it does not need to be sent to factory. All components inside cabinet can be replaced with only one module which fits onto existing mounts. The complete replacement process can be done in the field following the instructions by a technically skilled person.

## Power Supply alternatives



Running cables for power and communications to monitoring equipment around a construction site or industrial facility can be dangerous and unreliable. In suitable locations, stand-alone equipment may be provided, operating from solar panels and batteries. When coupled with mobile communications, this provides the best approach to ensure wire-free continuous monitoring around the site.

For portable solution, solar panel is available.



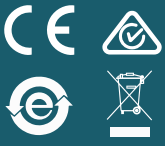
The battery pack is designed to provide true portability to the portable Noise Guard solution. The power pack uses the latest LiFePo technology to ensure long life in a lightweight and durable hand-carried case. Fully loaded battery pack can power our Noise Guard for up to 8 days of continuous operation. Operating lifetime can be reduced due to low temperature and use of accessories (communication, Weather station, GPS) The light weight pack means that you can easily transport your equipment and measure reliably in even the most remote locations.

## Preventive maintenance and calibration

Noise monitoring equipment must be calibrated every 12 months according to the ISO recommendation. Noise Guard may be accompanied by tailored preventative maintenance and calibration programme (depending on what is being monitored, and to which standards). Brüel & Kjær/IMS staff or agents attend each monitoring location annually to undertake a range of checks and actions designed to ensure correct operation. In accordance with international standards and best practice, equipment will be field calibrated where practical and swapped out for laboratory calibration where not. All calibrations are traceable to international standards.

# TECHNICAL DATA

## Compliance with international standards

	<p>The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China WEEE mark indicates compliance with the EU WEEE Directive</p>
<b>Safety</b>	<p>EN/IEC 61010 – 1: Safety requirements for electrical equipment for measurement, control and laboratory use ANSI/UL 61010 – 1: Safety requirements for electrical equipment for measurement, control and laboratory use</p>
<b>EMC Emission</b>	<p>EN/IEC 61000 – 6 – 3: Generic emission standard for residential, commercial and light industrial environments EN/IEC 61000 – 6 – 4: Generic emission standard for industrial environments EN 55022: Information technology equipment. Radio disturbance characteristics CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits FCC Rules, Part 15: Complies with the limits for a Class B digital device This ISM device complies with Canadian ICES – 001 (standard for interference-causing equipment)</p>
<b>EMC Immunity</b>	<p>EN/IEC 61000 – 6 – 1: Generic standards – Immunity for residential, commercial and light industrial environments EN/IEC 61000 – 6 – 2: Generic standards – Immunity for industrial environments EN/IEC 61326 – 1: Electrical equipment for measurement, control and laboratory use – EMC requirements Note: The above is only guaranteed using accessories listed in this Product Data sheet</p>
<b>Temperature</b>	<p>IEC 60068 – 2 – 1 &amp; IEC 60068 – 2 – 2: Environmental Testing. Cold and Dry Heat Operating Temperature: -10 to 60 °C Battery powered: -10 to 60 °C (14 to 140 °F); 0 to +40 °C (14 to 104 °F) for compliance with IEC 61672 Class 1 Charge Temperature: 0 to 45 °C (32 to 113 °F) Storage Temperature: -10 to 65 °C (14 to 149 °F)</p>
<b>Humidity</b>	<p>IEC 60068 – 2 – 78: Damp Heat: 93% RH (non-condensing 60 °C (140 °F)). Recovery time 2 - 4 hours</p>
<b>Mechanical</b>	<p>Non-operating: IEC 60068 – 2 – 6: Vibration: 0.3 mm, 20 m/s<sup>2</sup>, 10 – 500 Hz IEC 60068 – 2 – 27: Shock: 1000 m/s<sup>2</sup> IEC 60068 – 2 – 29: Bump: 1000 bumps at 250 m/s<sup>2</sup></p>
<b>Enclosure</b>	<p>IEC 60529: Protection provided by enclosures: min. IP 66 (valid for NG-i359-ST and NG-i359-PRT)</p>

## Additional Standards for router

<b>Safety</b>	<p>IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013 AS/NZS 60950.1:2015 EN 50665:2017, EN 62311:2008 FCC 47 CFR Part 1 1.1310</p>
<b>EMC EMISSION</b>	<p>EN 301 511 EN 301 908 – 1 EN 301 908 – 2 EN 301 489 – 1 EN 301 489 – 7 EN 301 489 – 24</p>

# Noise Guard NG-i359 Specification

## NG-i359-PRT

<b>Battery</b>	<b>NG-1210</b>
Approvals	UN 38.3
Chemistry	Li Fe Po
Weight	1,27 kg (2,8 lb)
Nominal Voltage	12.8 V
Nominal Capacity	10 Ah
Energy	128 Wh
Expected Life Cycles	> 1000 cycles at 100% discharge >80% rated capacity
Charge Retention in Storage	1 year at 30 °C (86 °F) to > 90% charge retained
<b>Charger</b>	
Mains Input	100 – 240 V AC, 50 – 60 Hz
DC Outputs	15 V, max. 4,6 A

<b>Battery pack</b>	<b>NG-1212K</b>
Chemistry	Up to 10 x Li Fe Po Battery blocks NG-1210
Weight	13,8 kg (30,4 lb)
Nominal Voltage	12.8 V
Nominal Capacity	100 Ah
Energy	1280 Wh
Expected Life Cycles	> 1000 cycles at 100% discharge >80% rated capacity
Charge Retention in Storage	1 year at 30 °C (86 °F) to > 90% charge retained
<b>Charger</b>	<b>NG-1510</b>
Mains Input	100 – 240 V AC, 50 – 60 Hz
DC Outputs	15 V, max. 10 A

## Physical

	NG-i359-ST	NG-i359-PRT
<b>Dimensions (L × W × D)</b>	500 x 400 x 210 mm (19,7 x 15,7 x 8,3")	474 x 415 x 149 mm (18.6 x 16.3 x 5,9")
<b>Weight (with analyser)</b>	7,8kg (21,6lb) incl. 2250	9,8kg (21,6lb) incl. 2250

## NG-1212K

<b>Dimensions (L × W × D)</b>	445 x 345 x 190 mm (17,9 x 13,6 x 7,5")
<b>Weight (with 10 batteries)</b>	13,8kg (30,4lb)

## Logging capability with 64 GB memory card – all available parameters

<b>Logging only</b>	Min 2 years
<b>Logging and listening audio quality (MP3)</b>	Min 1 year (With 30% recording time and 256GB SD Memory card Min 2 years)

## Operating time

<b>One LiFePo battery included (Second battery is optional)</b>	-	up to 16 hours (up to 32 hours with two batteries)
<b>With portable battery pack (fully loaded)</b>	Up to 8 days	Up to 8 days*

\* Operating lifetime can be reduced due to low temperature and use of accessories (communication, Weather station, GPS)



*For measurement specification please refer to the appropriate supplementary product datas as follows:*

- *Bruel&Kjaer Sound Level Meter 2250 – BP-2025*
- *Bruel&Kjaer Outdoor microphone 4952 – BP-2099*
- *Bruel&Kjaer Weather station MM-0256 - BP*

#### GENERAL SPECIFICATIONS

*Number of sites per server: up to 100*  
*Number of users: Up to 10 users*

#### MEASUREMENT METRICS

*Any selected parameter available on connected 2250*  
*Frequency: Broadband, 1/3 octave, band limited*  
*Frequency weighting: Defined by 2250 setting*  
*Time weighting: Defined by 250 setting*

#### MEASUREMENT PERIODS

Maximum 3 periods: Day / Evening / Night definitions.  
Combinations Day-Evening (LDN) and LDEN) are supported

#### ALERT TRIGGER

Time window is 1 minute.  
Active for specific measurement periods at all days.  
Custom measurement periods and alerts are available on request.  
Discard alert with user-defined wind speed or rain criteria  
**Noise Level Threshold Exceedance:** Based on Leq, 1min.  
**Weather data Threshold Exceedance:** Wind speed, rain  
**Cabinet door switch:** Door switch activated

#### REPORTS

Up to 4 predefined reports are created on ad-hoc basis  
Summarized monthly report with calculated day indicators.  
Summarized daily report with calculated day indicators.  
Daily report divided into hourly periods and logged data.  
Detailed daily report divided in logged data 1min.  
(other periods are optional).

Reports are generated for each site separately  
Output Format: Microsoft® Excel® 2007, 2010 (or later),  
**Languages:** English

#### LONG PERIOD SUMMARY

**Temporal Resolution:** 1 hour or 24 hours  
**Spectra:** 1/3-oct, or none  
**Acoustic Parameters:** Leq, L<sub>leq</sub>, Primary, Secondary, Combined parameter (for example, LDEN, LDN), 3 Ln values, L<sub>max</sub>, L<sub>min</sub>. (Other frequency and time weightings limited by 2250 specs only and available as an option at no charge)  
**Weather Parameters\*:**

- Windspeed: Average
- Wind direction: Average
- Rain: Sum
- Temperature: Average
- Humidity: Average
- Pressure: Average

*\*min, max values are optional at no charge*

#### SHORT PERIOD SUMMARY

**Temporal Resolution:** 1 min, (other periods are optional).  
**Spectra:** 1/3-oct, or none  
**Acoustic Parameters:** Leq, Primary, Secondary, band limited Leq, Combined Parameter (for example, LDEN, LDN), 3 Ln values, L<sub>max</sub>, L<sub>min</sub>. (Other frequency and time weightings limited by 2250 specs only and available as an option at no charge)  
**Weather Parameters\*:**

- Wind speed: Average
- Wind direction: Average
- Rain: Sum
- Temperature: Average
- Humidity: Average
- Pressure: Average

*\*min, max values are optional at no charge*

#### ALERTS

*Classifier: Warning or violation*

*Notification: Screen and email as standard. Text message (SMS).*

#### NOISE ALERT DATA

User-defined contents including day period separately for alert notification and recording

*\* For the Ubuntu OS installation a virtual machine is required as a minimum. The installation can be done to an existing Windows machine. For large systems, above 20 terminal stations, a dedicated machine is recommended.*

## PC system requirements - server

	Minimum	Recommended
<b>Operating System</b>	Ubuntu Server 18.04 LTS*	Ubuntu Server 18.04 LTS
<b>Browsers</b>	Best on Chrome and Safari, other browsers are supported but not optimized	Latest version of Chrome and Safari
<b>Operating System</b>	1 single-core CPU, 1 GB RAM	1 multi-core CPU, 2 GB RAM
<b>Storage</b>	Recording threshold dependent - 30% of day recorded: ~100 MB/day	1 day recording ~ 300 MB
<b>Server accessibility</b>	WAN	WAN

### Noise Control Application

Colour display is part of the Noise guard hardware and is intended for diagnostics and onsite troubleshooting.

**System:** Noise terminals pairing

#### Real-time Display:

- Noise levels updated every second (LAF)
- Current weather conditions update every second

#### Instrumentation:

- SLM Type, serial no., status
- Weather station Type, serial no., status
- Internal temperature, CPU temperature

#### Communication:

- Connection to server status, latency, date/time
- Mobile data transmission status
- GPS location data

#### Power:

- Battery status, external power
- Door switch activation status

### Noise Guard Client

#### OVERVIEW

*Map Background: OpenStreetMap*

*Time Zone: Local time for selected site*

#### Real-time Display:

- Current Noise levels updated every second
- Weather updated every second

#### Historical Noise Display:

- Last hour updated every minute
- Last day/month updated every day. Audio clips and weather conditions

#### SETUP

Create new or manage existing sites

Add or relocate monitoring locations

Modify measurement metrics, alert parameters

Mail server

# Ordering information

Type Noise Guard monitoring solution consists of the Bruel&Kjaer items and one of the NG-i359 kits.

- NG-i359-ST Stationary (fixed) noise monitoring station
- NG-i359-PRT Portable noise monitoring station
- NG-3639-RFT Retrofit noise monitoring station

**For Noise Guard to work, the following Bruel&Kjaer items have to be ordered:**

- Type 2250-W Hand-held analyzer with serial number higher than 3001600
- 4952 Outdoor microphone

## **NG-i359-ST kit:**

- NG-1101 Outdoor cabinet with accessories
- NG-0014 LTE Router
- NG-0015 LTE Dome antenna
- NG-0645-100 Microphone extension cable
- 64GB SD Memory Card
- i709 Noise Guard server and one terminal client software

## **NG-i359-PRT kit:**

- NG-4412 Heavy Duty hand-carried case
- NG-0014 LTE Router
- NG-0015 LTE Dome antenna
- NG-GPS unit
- NG-1210 LiFePo Battery 12V/10A
- NG-0082 Waterproof Microphone extension cable, 10m
- NG-0071 Waterproof LAN cable, 10m
- NG-1210 LiFePo Battery 12V/10A
- 64GB SD Memory Card
- i709 Noise Guard server and one terminal client software

## **NG-i3639-RTF kit:**

- NG-0014 LTE Router
- NG-0015 LTE Dome antenna
- NG-0645-100 Microphone extension cable
- 64GB SD Memory Card
- i709 Noise Guard server and one terminal client software

*\*some items from the old NMT might be renovated and reused (f.i. AO-0645, 4952)*

## **NG-1112K Portable Battery pack:**

- NG-4415 Heavy Duty case with battery management
- NG-1210 LiFePo Battery 12V/10A
- NG-1510 Charger 15V/10A
- NG-0076 Cable



## Options

- i709C Software for additional noise terminal
- 4231 Acoustic calibrator
- UA-1707 Tripod adaptor
- NG-1210 LiFePo Battery 12V/10A
- NG-1212K Portable Battery pack with charger
- NG-2560 SD Memory card, 256GB
- 2TB Hard disk
- NG-0645-100 Microphone extension cable for 3639 retrofit
- NG-1208 Solar panel with control and charging unit
- NG-0536 Weather station, 6 parameters
- NG-0533 Weather station, 2 parameters

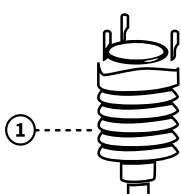
## Accredited calibration

- NG-i359 CAF Accredited calibration of 2250, 4952
- 4231-CAF Accredited calibration of acoustic calibrator
- NG-0536-CAF Accredited calibration weather station with six parameters
- NG-0533-CAF Accredited calibration weather station with two parameters

## NOISE GUARD

### Weather station (optional)

VAISALA weather station works seamlessly with Brüel & Kjær 2250/70 sound level meter.



### Outdoor microphone

Outdoor mic measures noise levels independent of all weather conditions.



### Sound level meter

Brüel & Kjær sound level meter captures sound level and weather data simultaneously.



### Terminal

Terminal streams data to Noise Guard server.



### Noise Guard Server

A local computer can be configured as a Noise Guard server with **simple installation** from a USB flash drive.



### Web

Streaming to the web allows for data access from any device connected to the internet.



### Web-based app

Accessible through a supported web browser on any computer with internet access.



### Smartphone data access

Accessible through a supported web browser on any device with internet access.

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Brüel & Kjær   
BEYOND MEASURE