



dBBadge2

Personal Noise Dosimeter

Designed to make
personal noise exposure
measurements
simpler than ever before



The latest **dBadge2** is the ideal tool for a variety of workplace noise assessments and campaigns with the added benefit of wireless connectivity that will increase confidence and productivity.

Applications

- Complete shift exposure measurements
- Task based measurements
- Measurements in accordance with CFR 1910.95 (USA), ISO9612:2009, L108 Controlling Noise at Work.
- Identification of noise sources
- Selection of hearing protection

Key features

- Bluetooth® 4.0 wireless connectivity
- Airwave App for Mobile devices such as phones and tablets
- Multiple 'simulated' dosimeters
- Full colour display
- Motion Sensor
- 1 second time history profiling
- Pause function
- Recording of audio events (optional)
- Octave band frequency analysis (optional)
- Updated and Simplified Casella Insight Plug-in with advanced noise analysis features



Noise induced hearing loss (NIHL) remains one of the leading causes of occupational disease and it is estimated that 16% of global hearing loss is due to occupational noise exposure. It is particularly acute in the mining, construction and oil & gas sectors plus a wide variety of industrial manufacturing activities where the cumulative effects of noise exposure can lead to irreversible yet avoidable hearing damage.

Noise exposure measurements using a personal noise dosimeter is one recognised method of exposure assessment to the requirements of US regulation CFR 1910.95, International standard ISO9612:2009 Determination of occupational noise exposure and UK Guidance document L108 Controlling Noise at Work plus many other National regulations and standards.

The iconic, original dBadge® proved an invaluable tool in monitoring personal exposure but dBadge2® represents the next generation, building on well established must-have features and usability; a true evolution.

Noise exposure metrics can be confusing given the plethora of parameters required to satisfy an equally wide range of standards but the dBadge2 has been specifically designed to simplify the whole process.

Like its predecessor, the dBadge2's concept is to capture every possible noise exposure related parameter during a measurement run and make it available for subsequent download and analysis. The user only has to choose the most relevant parameters to display on screen.



You can't manage
what you don't
measure.



Monitor your workforce without disturbing them, keep productivity up.

They may be involved in a critical task or be inaccessible.



Get connected

Bluetooth wireless connectivity, with supporting **Airwave** app.



Monitor multiple devices at once.

Easy to use clear colour display.

Analysing your work environment to form a hearing conservation strategy for your workers.



I like the simplicity. The microphone mounting is strong.

Summary data along with photographs and notes can be emailed to yourself or colleague for inclusion in reports.





We'd like the capability to monitor the device remotely without the need to interfere with or disturb the worker.

Get Connected!

Getting workers to participate in your survey may already be a challenge so the addition of Bluetooth® 4.0 wireless connectivity with the supporting Airwave App allows you to remotely start, stop or pause a measurement run, monitor battery life and memory capacity, check measurement progress and alarms without having to disturb the worker who may be involved in a critical task or be otherwise inaccessible!

Being able to see results in this way brings added confidence that your survey is progressing as planned and therefore minimises the likelihood of having to repeat a measurement and therefore maximises your productivity particularly if you have a number of dBadge2 deployed.



Collecting field data and making notes is difficult.

Connectivity brings other benefits when it comes to collecting data in the field. Summary data, along with a photograph of the task plus on the spot notes can be emailed to yourself or a colleague for review or inclusion in a report.

Multiple Simulated Dosimeters

The dBadge2 has a 'multiple simulated dosimeter' capability to display noise exposure results according to differing regional or international protocols.

These 'simulated dosimeters' termed D1, D2 and D3 simply define the measurement parameters that are displayed on screen or that appear on the Airwave App. The primary dosimeter, D1, provides access to any LAVG or LEQ based noise dose parameters plus a comprehensive set of related noise measurement parameters. There are pre-defined ISO, OSHA, MSHA, and ACGIH setups (selectable from the dBadge2 itself) but also a fully custom configured mode using Casella Insight data management software.

Dosimeters D2 and D3 allow you to display additional LAVG based noise dose results based upon their associated Threshold (T), Criterion (C) and Exchange rates (or Q factor). As an example, you may wish to simultaneously compare noise exposure data based upon the OSHA Personal Exposure Limit (PEL) or Hearing Conservation (HC) setups.

For every measurement run, dBadge2 records a comprehensive data set which means that you can retrospectively analyse the results to whatever standards or parameters you need within Casella Insight data management software, regardless of what D1, D2 or D3 displayed on screen meaning you never need to worry about having the wrong setting and missing a measurement opportunity.

Colour Display

- Colour-coded data and alarms
- Aids data interpretation in the field
- Alarms shown on Airwave App

The dBadge2 takes full advantage of the OLED display by colour-coding both the D1, D2 and D3 data to aid review in the field but also an ability to define colour coded alarm values.

These alarms are based on up to two sources (LAS, LAeq, LCPk, LZPk, LAVG, TWA, Projected TWA, Lepd, Projected Lepd, LEX8h, Projected LEX 8h) with both lower and upper trigger levels specifiable for each alarm.

When a data parameter has been specified as an alarm source, the parameter is shown in green font for levels below the lower limit.

Above the lower and upper trigger levels the alarm parameter is displayed using amber and then red coloured fonts respectively. Used in conjunction with the 'large font' mode, where just one main parameter is displayed, makes it a valuable tool in the field when the Airwave App cannot be used.

A high visibility blue LED additionally flashes at a slow rate when a lower level exceedance is active and at a fast rate whenever an upper level alarm has been triggered.





Motion Sensing

- **Built-in motion sensor**
- **Motion index expressed in % of time**
- **Increases confidence in measurements**

Worker engagement in the survey is essential to a successful outcome but in extreme cases a worker may remove the dBadge2 without your knowledge rendering the results invalid. A built-in motion sensor expresses the worker's movement as a percentage of time motion has been detected during a measurement run. Armed with this data you can choose to accept or reject the measurement run.

Audio Recording - Plus & Pro models

Available on Plus and Pro models and enabled/disabled in the dBadge2 configuration menu, the audio recording option offers the ability to store 15 seconds of voice notes when a measurement run is started, simply controlled using the left and right hand buttons. Recording the employee's name and the task for example adds valuable information for audit purposes.

It also provides the facility to record the actual noise associated with triggered events as defined by user-settable exceedance and parameters based on 1 second SPL or LPeak or LMAX profile data. The resulting audio saved in a .WAV file may be subsequently reviewed in Casella Insight data management software.

Octave band frequency analysis

Available on the Pro model only, real-time octave band frequency analysis, once the preserve of a hand-held sound level meter, gives the specialist yet more information on which to base their all-important control measures. Similarly enabled/disabled in the configuration menu, overall cumulative instantaneous, LEQ and LMAX values are displayed for the measurement run both on screen in graphical format, with an on-screen cursor and in a table format in the Airwave App.

Combined Docking Station and Charger

The combined docking station and charger allows an individual dBadge2 to be downloaded via USB either using the Utility provided which downloads the dBadge2 data directly to XLS format or directly into Casella Insight Data Management Software using the dBadge2 plug in.

When placed in any of the three 'pockets' the dBadge2 will also begin to charge the battery displaying its charge status in terms of % charge and projected run time (based on how the dBadge is configured). To check progress, simply press either key or tilt the docking station to 'wake' the dBadge2. A complete charge from empty will take 6 hours, whilst a charge sufficient to conduct an 8 hour survey will take just over an hour.

Up to 12 dBadge2 can be charged in this way using a master Docking Station and extension units.



What gets measured gets managed.



CASELLA INSIGHT

- **Custom Configure dBadge2**
- **Store results in a simple tree structured format by person, place and process**
- **Automatically colour code results for noise action level exceedance**
- **Graphical display and analysis of noise time history**
- **'Multitrack view' of events, pauses, exclusions and modifications, notes and motion**
- **Fast report generation**
- **Data can be exported to other applications**

dBadge2 can be custom configured by and downloaded to PC using the Docking Station and Casella Insight Data Management Software. Once downloaded, data can be stored under a worker's name, location or process so that a database of noise exposure can be built up.

A colour coded system can be used to highlight workers who have been exposed to specific action levels. Graphs can be modified by adding exclusion zones, which subsequently provides exposure data with and without these zones.

Data can also be viewed according to different measurement protocols e.g. either ISO or OSHA or alternatively the data can be customised to a user's own requirements.

Furthermore, a multi-track approach to displaying time history, events, pauses, exclusions and modifications, pauses, notes and motion saves time when analysing data because it allows you to view all the data tagged to the same time-line e.g. view profile data, listen to an audio file associated with an event (PLUS & PRO models) or read/write descriptive notes.

Reports can summarise the required dose data and any information about the worker's working day, together with the time history and other 'tagged' data. To create (or tailor) a report,

simply select the view icon to select your personal report template and it's just a one button press to generate a report. As an audit trail original and modified data can be specified.



Graphical presentation of time history



Multi-track view



Configuration screen showing set ups for D1, D2 & D3



Measurement Kits and Models

dBadge2 is available as a complete starter kit with everything you require to get you up and running. A kit includes the dBadge of your choice; Standard, Plus or Pro, a CEL-120/2 Acoustic Calibrator, 3-way combined Docking Station and charger, universal mains power supply, USB cable and Casella Insight data management software, all housed in a kit case capable of carrying 10 dBadge2 (and up to 3 Docking Stations).

dBadge2/KIT1

dBadge2Plus/KIT1

dBadge2Pro/KIT1

Additional dBadges may then be purchased as required (and additional extension Docking Stations). For more information please see 'Ordering Information' below.



A typical measurement kit

	dBadge2	dBadge2 PLUS	dBadge2 PRO
H-M-L (C-A)	•	•	•
Programmable delay timer	•	•	•
Fixed run timer	•	•	•
Pause function	•	•	•
Wireless*	•	•	•
Time history	•	•	•
Audio recording		•	•
Octave band			•

*Bluetooth 'Smart' Wireless may be disabled in any version using the USB utility App

Ordering information

dBadge2	dBadge2 Personal Noise Dosimeter complete with Airwave App and download utility
dBadge2Plus	dBadge2 Plus Personal Noise Dosimeter with Audio Recording, Airwave App and download utility
dBadge2Pro	dBadge2 Pro Personal Noise Dosimeter with Audio Recording and Real-time Octave Band frequency analysis, Airwave App and download utility
DB2 Upgrade 1	Upgrade from dBadge2 to dBadge2 Plus
DB2 Upgrade 2	Upgrade from dBadge2 Plus to dBadge2 Pro
DB2 Upgrade 3	Upgrade from dBadge2 to dBadge2 Pro
207078B/P	3-way combined Docking Station and Charger
207078B/KIT	3-way combined Docking Station and Charger, PC-18 power supply and CMC51
207078B/EXT	3 way extension Docking station (inc C6359/0.2 cable)
CEL-120/2	Class 2 Acoustic Calibrator
DB2CASE/10	Kit case for 10 off dBadge2
DB2WS	Pack of 5 off spare windscreens
DB2CLIPS	Pack of 10 single clip assemblies (5 pairs)
PC18	Universal 12V mains adaptor
C6359/0.2	Spare lead for connecting master & extension Docking Stations
CMC51	Mini B to USB A (PC) Cable
CEL-252	Replacement measurement microphone (Type 2)



Monitor multiple devices at once

Technical Specification

Standards:	ANSI S1.25:1991 R2007, IEC 61252 Ed 1.1 (2002-3)
Linear Operating Range:	55.0-140.3 dB (A) RMS
Dynamic Range:	96dB
Peak Measurement Range:	90.0-143.3dB (C or Z weighted),
Sound Exposure Range:	0.0- 6,100.0 Pa2Hours 0.00 – 22,000,000.00 Pa2Sec 0.0-100,000.0% Dose
Frequency Weightings:	A, C and Z, Type 2
Time Weightings:	Fast, Slow and Impulse
Exchange Rate:	Q=3 or Q=5dB exchange rates
Threshold:	70-90dB in 1dB steps (Set via Casella Insight Data Management Software)
Criterion Level:	70-90dB in 1dB steps (Set via Casella insight Data Management Software)
Real Time Clock:	Accuracy better than 1min per month
Under Range Indication:	1dB below the bottom of the range,
Overload Indication:	140.4dB RMS
Peak Overload Value:	143.4dB Peak
Stabilisation Time:	<3 seconds after power up,
Operating Temperature Range:	0°C to +40°C (for $\leq \pm 0.5$ dB error limit) -10°C to +50°C (for $\leq \pm 0.8$ dB error limit)
Ambient Pressure Range:	$\leq \pm 0.5$ dB over 85 - 112kPa,
Humidity range:	$\leq \pm 0.5$ dB over 30% - 90% (non-condensing),
Magnetic Fields:	Negligible
Storage Temperature Range:	-10°C to +50°C,
Battery:	Internal NiMH, 800mAh
Run time:	Typically 35 hours using Broadband Mode Typically 15 hours using Octave mode
Charge Time:	<6 Hours from fully discharged
Maximum Run Duration:	24 hours
Maximum number of Runs:	100
Storage Capacity:	Internal USD Flash memory - 300 hours of run data (including 1 second profile data) and up to 90 minutes of event audio recording.
PC Interface:	USB 2.0 Full speed 12Mbps via Docking Station.
Dimensions:	85L x 54W x 55H mm
Weight:	117g
Environmental I.P. Rating:	IP65 (with permeable air vent)
Construction Materials:	Plastic Case/ Charger - PC/ABS Mounting Clips - POM Gasket - Silicone Display window - Acrylic Foam Windscreen - Polyester foam Microphone - Brass / Nickel

Casella reserves the right to amend the specification without notice.

Casella

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Stored Data Sets

The dBadge2 simultaneously records and computes all noise data for every measurement run. The comprehensive set of data containing all of the below parameters is available to view and analyse within the Casella Insight PC application or using the download utility. The Dosimeter Setups D1, D2 and D3 define which parameters are displayed on the instrument itself but all values are automatically stored in the memory of the dBadge2 for download.

L_{Avg} TWA (8hr) Dose%	Projected TWA 8hr Proj Dose %	
L_{AEQ} L_{EPd} / LEX, 8h	L_{CEQ} Proj L_{EPd} /LEX, 8h	L_{AIEQ}
L_{APk} + Time Pa2Hrs	L_{CPk} + Time Pa2Secs	L_{ZPk} + Time
ISO Dose% (using ISO Criterion level)	ISO Proj Dose% (using ISO Criterion level)	
Projected Exposure Points (using ISO Criterion level)	Exposure Points (using ISO Criterion level)	
Exceedance time (LAS > Exceedance level)	HML (LC-LA)	
L_{Cpk} >135 (count)	L_{Cpk} >137 (count)	L_{Cpk} >140 (count)
L_{AFmx} + Time	L_{AFmin} + Time	
L_{ASmx} + Time	L_{ASmin} + Time	
L_{Almx} + Time	L_{Almin} + Time	
LAE		
Cumulative Motion Index (expressed as % motion detected during a measurement run).		

Profile 'Time-history' Data Sets

Time-history data is saved at an interval of once a second for every run and is available following download:

L_{Cpk}	L_{Zpk}
L_{Aeq}	L_{Ceq}
L_{Avg} (Q5, T=0)	L_{Avg} (Q3, T=0)
L_{AFmx}	L_{ASmx}
Motion Index	(0/1 status of motion detection)

Audio events recording (Plus and Pro Model Only)

Settable level will trigger the recording mode which provides an 8kHz sampling rate in a 16 bit compressed .WAV format. Playback is via the Casella Insight PC application or other media player.

Each audio event will record for 10 seconds and includes a 3 second pre-trigger buffer to aid identification of the start of the noise event. Audio event trigger sources include LAF, LAS, LCPk, LZPk.

Audio Notes (Plus and Pro Model Only)

Optional audio note of up to 15 seconds attached to each measurement run.

Octave Analysis (Pro Model Only)

Nine octave bands 31.5Hz to 8 KHz, A or Z weighted LEQ (nHz) and LMAX(nHz) cumulative data is saved for each run. Fast or Slow time constant can be selected for LMAX.

Bluetooth Connectivity

All models support wireless connection via Bluetooth® 4.0 (Low energy or Smart).

TX power:	0 dBm to -23 dBm
Receiver sensitivity:	-93 dBm
Range:	Typically 25m line-of-sight and depending on local RF conditions.

Display

96x64 dots full colour OLED display with adjustable contrast.

User Control

Two button operation. Remote Start/Stop/Pause using Airwave App.

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