

Fusion

Smart Sound & Vibration Analyser

With FUSION, Acoem launches its new sound level meter: simply unique, designed to fulfil your needs in all situations. Easy to use, as effective in the hand as on a tripod, this instrument offers the best available technology to handle all measurement situations. Powerful functions, including vibration measurements, are integrated to meet your needs for on-site analysis, making FUSION the most innovative sound level meter & an exceptionally communicating tool, increasing your productivity!



FUSION - Technology At The Service Of Your Productivity

Simply Unique!

Certified Class 1 solution according to IEC 61672, FUSION offers the highest standard in metrological quality for your data. Multitasking it gathers performance & simplicity within one single instrument. Connection to an intelligent wireless sensor FUSION can even record vibrations signals on 3 axes simultaneously with acoustic indicators & audio signals.

FUSION is a new member within Acoem ecosystem focused on improving your productivity. You will appreciate its simplicity of use, its degree of remote controllability & the power of its processing software.

Main Applications

FUSION is a multi-purpose sound level meter including all functions aimed at maximizing your productivity. It can be used as a control instrument & offers evaluation, analysis & monitoring capabilities application to noise & vibration measurement in the following fields of activity:

- Noise exposure
- Industrial plant noise mapping
- Urban noise
- Construction site noise
- Industrial noise
- Transportation noise
- Windmill noise
- Recreational activities noise
- Vibration of machines
- Vibration of structures
- Building acoustic

Main Specifications

FUSION presents the unique technical specifications:

- IEC 61672 Class 1
- Built-in preamplifier
- Free-field microphone type G.R.A.S.40CE
- Large dynamic range 118 dB
- Self-check system (CIC)
- Automatic calibrator detection
- High-definition color display
- Rubber side grips
- Windscreen claw
- All-in-one: Wi-Fi, GPS...
- Remote control by web interface
- Parallel storage of all acoustic indicators
- Advanced triggers
- HTTP commands for integrators
- Push Data Mode
- Metrological & MP3 audio recording
- Wireless vibration signal recording in 3 axis (option)
- 24-hour capacity
- Building Acoustics Module (option)
- Multiple processing software packages (dBTrait, dBFa, dBInside...)
- Compatible with Cadence monitoring
- Manage your Fusion & your fleet of devices with Cadence.
- Numerous accessories (all weather case DSC01, outdoor unit DMK01...)

Performance & Simplicity

The Acoem Ecosystem

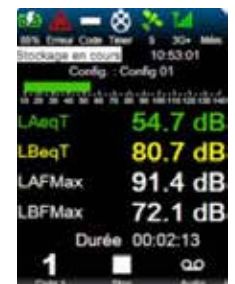
FUSION is a member of the Acoem product range sharing with CUBE, ACT-400 the same ecosystem focused on improving your productivity. Being familiar with one of them just means mastering the other ones. Same web interface, same accessories, same software tools... everything is designed in order to optimize the time you need to use these instruments.



Simplified Ergonomics

FUSION can be used with its context keys & high-definition built-in colour screen. It is therefore possible to load a stored configuration, to start an acquisition, to mark an event & start an audio recording, to do a calibration & to access stored measurements ...

No more need for a computer keyboard to manage the whole set of measurement campaigns!



Remote Communication

Using a communicating tool (smartphone, tablet, laptop...) you can access FUSION using a simple internet browser. Thanks to the embedded webserver FUSION offers direct access to any of the available functions: configuration, coding, acoustic calibration & electrical check, real time display of instant values...) without the need of further specific applications.

Remote connection is possible using Ethernet or Wi-Fi (option). Therefore remote access to FUSION is possible from wherever you are.



Optimized Power Consumption

Programmable stand-by mode allows for optimizing FUSION's power consumption when there is no mains power available on site. The operator can select date & time for stand-by & wake-up in web interface. He can also force a manual wake-up by sending an SMS or by pressing the power on button.

Moreover FUSION can send an SMS when the battery capacity becomes inferior to 10%.

When the battery capacity becomes less than 3%, FUSION automatically stops the acquisition, stores the data in the SD card & enters stand-by mode. As soon as the power supply is connected again, FUSION wakes up & retrieves the previous measurement mode.

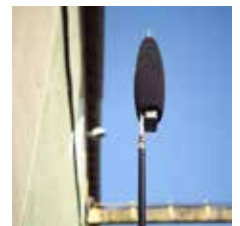
GPS Location

The built-in GPS allows FUSION to get measurement data include GPS location for easy visualization of the measurement position in dBTRAIT post-processing software.

In case of an unexpected displacement of FUSION, a user defined movement detection function will warn the operator by sending an SMS with the new geographical coordinates & the distance from the previous location.

Advanced Analysis Based On Synchronized Levels Difference

Using several FUSION instruments synchronized on a single site allows for a detailed analysis of the recorded phenomena. It becomes possible to clearly identify a car &/or train pass-by, a building site noise, an industrial noise, using multiple coding. Analysis at the measurement point takes advantage of the information collected at the coding points (& thus validates that the incriminated sources are indeed active). Moreover, data post-processing using dBTrait allows assigning markers from the coding points onto the measurement campaign collected at the measurement point.



Smart & Powerful

FUSION measures noise & vibrations perfectly. Its powerful functions contribute to optimizing your operational efficiency: continuous audio recording, innovative trigger threshold definition, smart source recognition (building acoustics) advanced acoustic indicators, automatic calibrator detection, periodic electrical checks, remote setting changes, etc.

Wireless In Your Office

Direct access to FUSION is possible from your office Wi-Fi network without additional software. Any of your collaborators can thus have hands on one or several FUSION instruments using Wi-Fi access.

Measured data are collected at a glance & you can already schedule your next measurement campaign!

Accessories: More Than A Detail!

Lateral grips make FUSION fit well within your hand. In addition a neoprene hand strap which can be mounted using the dedicated aluminium profile on the back of the instrument is adding even more security for a perfect handling of your instrument.

A fixation profile for tripod mounting is also part of the delivered set of accessories. The FUSION can be quickly & securely mounted on a tripod.

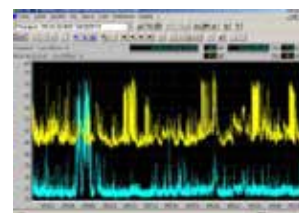
A windscreen claw also comes along with FUSION, which prevent losing the windscreen when performing measurements.

Those accessories are genuinely useful thanks to users feedback & serve to improve your productivity day after day.



Acoem Software: So Powerful

To cover each application, Acoem offers a complete range of software tools: dBTrait (processing of data such as LAeq...), dBFa (advanced frequency analysis of measured data) or dBInside (processing of building acoustics measurements). dBTrait is the most commonly used software program with the entire range of Acoem products. Initiated in the early 90's dBTrait was progressively improved over the years, taking also benefits from users feedback. It includes processing functions such as multiple indicators calculations, analysis results according to regulations as well as advanced coding capabilities which help identify noise sources.

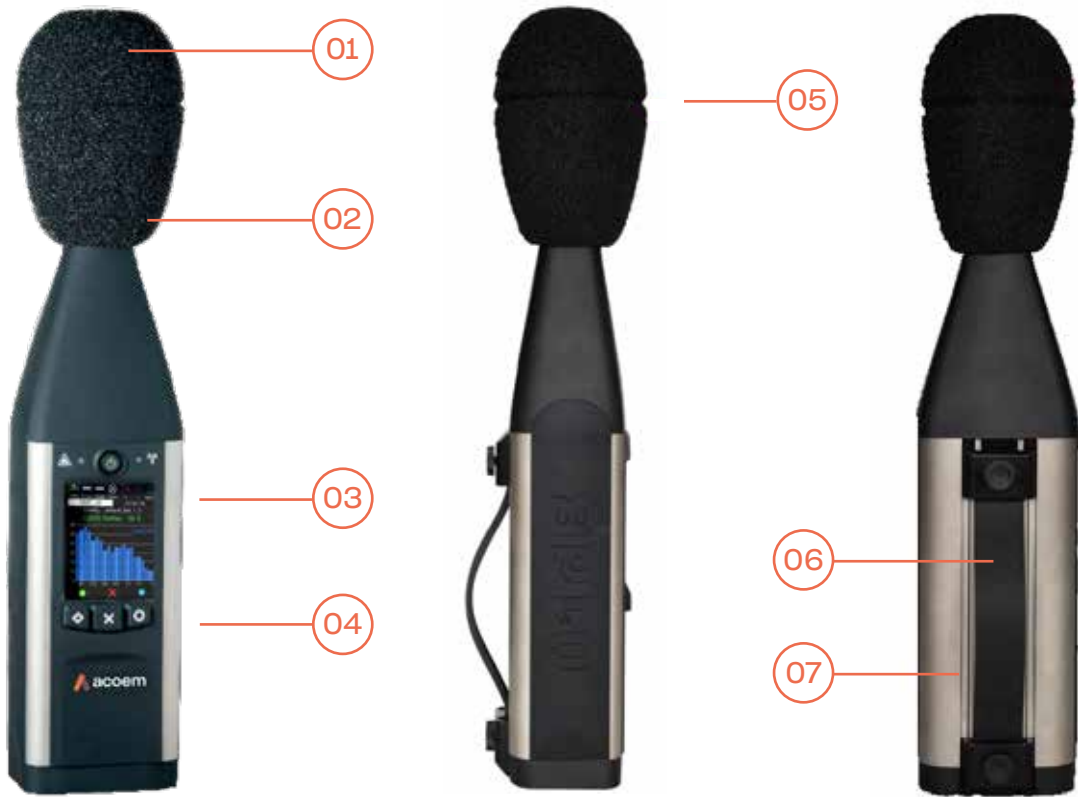


dBInside has a new interface designed to enhance acoustics consultants' efficiency & productivity. The purpose is to reduce the time spent on:

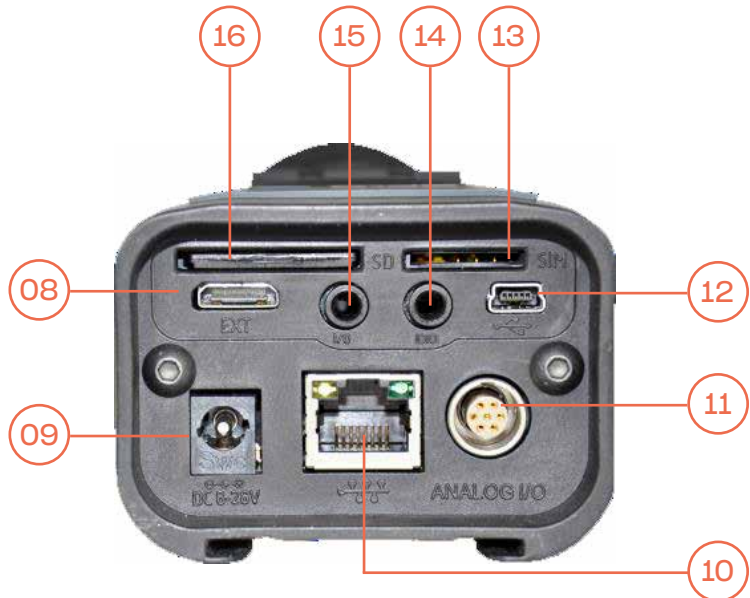
- data entry related to the measurements (measurement location & details, etc.),
- calculation of standardized indicators (unique indices)
- generation of measurement reports.

To simplify your work, you can install O1dB software as many times as needed. Furthermore, there is no physical protection key to plug into your PC.

General Overview



- 01 - Class 1 microphone
- 02 - Integrated preamplifier
- 03 - Colour display
- 04 - Keyboard
- 05 - Windscreen
- 06 - Removable hand grip
- 07 - Rail fastening
- 08 - Mini HDMI
- 09 - DC 8-28V power supply input
- 10 - RJ45 Network
- 11 - External microphone preamplifier input & analogue output
- 12 - Mini USB
- 13 - SIM card slot
- 14 - RS232 input
- 15 - TTL input/output
- 16 - SD card slot



No Compromise With Metrology

Acoustic Calibration Detection

In order to simplify the deployment of FUSION in the field, an automatic function for the detection of a sound level calibrator is used to launch the calibration procedure without any action required from the user, other than powering up the calibrator.

When FUSION detects a stable level around the predefined calibration level, it automatically starts the calibration procedure. At the end of this procedure, the instrument indicates the new calculated sensitivity & prompts the user for validation, repeat or rejection of the calibration. Information provided is stored & added up to the historical data of the instrument.



Multi-Frequencies Charge Injection Check (CIC)

The built-in charge injection check allows testing the entire measurement chain, including the microphone of FUSION. It consists in injecting a sinusoidal charge (1 or 2 levels) into the microphone membrane, at the selected frequencies.

The principle is to collect reference levels (initialisation stage) & to check over time that the maximum deviation between the reference values & the measured values does not exceed a user defined level, typically set to 0.5 dB.

The controlled frequencies are 1000, 2000, 4000 Hz & a two user-defined frequencies. A multiple-frequency check offers the advantage of a better assessment of a possible degradation of the microphone membrane. The process lasts from 10 to 30 seconds & occurs between two measurement campaigns, so as to make their validation easy.



Reference Directions

During a measurement with the instrument in hand, the sound level meter must be pointed at the source according to standard IEC 60651. This is why FUSION is delivered with a free field microphone for measurements with an angle of incidence of 0° with respect to its main axis.

The IEC-61672 standard requires a perfect control of the frequency response polar diagram, in particular at $\pm 30^\circ$. The fine shape of FUSION, along with its conical upper part, allows complying with this criterion.

During unattended monitoring measurement, multiple sources are usually measured with a random position with respect to the measurement point. Noise generated by ground transportation, leisure activities, construction sites is coming from all directions, although mainly the horizontal direction.

In this case FUSION may be equipped with the outdoor microphone unit DMK01 (see later on the dedicated section about accessories) especially designed to perfectly match applications where noise sources can be located all around the instrument, & more specifically coming from the horizontal direction.

Placed vertically, the outdoor microphone unit DMK01 is configured in FUSION for a propagation direction oriented 90° from its axis to perfectly meet the requirements of the IEC 61672 standard on sound level meters relative to noise incidence from the horizontal direction.

Three Measurement Modes

SLM Mode (Integrating Sound Level Meter)

The integrating sound level meter mode allows for a simple but complete noise assessment over a period that includes overall global & spectral data as well as statistics. In case of an unexpected event (dog barking, police or ambulance siren) during a measurement a back erase function will reject the last 5 or 10 seconds of measurement.



Log Mode (Integrating Logging Sound Level Meter)

FUSION in LOG mode includes the storage of time histories. It is designed for experts familiar with the short term Leq method. Instantaneous values & spectra are stored at every logging period T.

When the trigger option is active, up to 5 different markers can be entered manually. In addition an event detector can be defined with limits based on 24 possible consecutive periods of the day. FUSION can record a (non-compressed) metrological audio signal simultaneously with the events. When an event occurs, a fast logging period set by the user becomes active. Finally, during acquisition, written time-stamped comments can be recorded in the measurement campaign



Building Acoustic Mode (Option)

In this mode, FUSION enables all acoustics technicians to respond to all building acoustics measurement requirements:

- L1 Source level
- L2 Receive level
- Li Impact noise level
- Lb Background noise
- T Reverberation time with interrupted source
- T Reverberation time with impulsive source.
- Le Equipment noise level



This FUSION module has an unrivalled feature set:

- Smart organization of measurements for effective post-processing
- Reuse of previous measurement data
- Automatic detection of the type of measurement performed
- Measurement quality indicators for reverberation time (ISO 3382 standard)
- Display of decay on the built-in display
- Storage of the time history & fast time history of all instantaneous & spectral parameters for each measurement
- Parallel recording of audio signal
- Three-button control keypad
- Remote control via a mobile device (smartphone, tablet, computer PC/MAC, etc.)
- Recording of audio comments
- Automatic distribution of measurements for each test
- Ratings calculated immediately in the field in the sound level meter, without user intervention
- Can be used with any sound source & tapping machine without requiring any control interface between the sound level meter & the source
- The dBInside software completes this FUSION module with the following features:
 - Ratings calculated immediately on data transfer, without user intervention
 - On-the-fly calculation of ratings as changes are made
 - Comparison with regulatory values
 - One-click report covering all tests

Note: See the 01dB Building Acoustics Solution data sheet for more information.

Details Of Web Interface

Statuts Bar

Always on display, the status bar can be used to rapidly check the operating of the main functions of FUSION: current acquisition mode, battery status, detection of an error (overload, electrical check), possible marker(s) in progress, activation of a timer or not, number of GPS satellites picked up & type of connection.



Measurement Configuration

A measurement configuration for FUSION can be set using ergonomic sub-menus. It is then possible to remotely configure the parameters to store, the automatic trigger thresholds, the logging period & delayed starts.

Configuration management allows rapidly loading a predefined configuration.



Data Access

Data stored in the instrument's memory can be viewed using the web interface: the user can visualise the different measurement campaigns stored in the instrument, without disturbing the measurement in progress. Additionally an automatic function can be activated in order to remove data older than a predefined number of days.

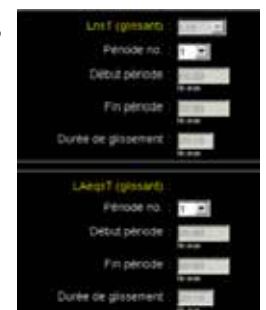


Powerful Data Acquisition

Innovative Acoustic Indicators

On top of usual instantaneous data measured & stored (Leq, spectra, ...), FUSION allows for acquiring advanced indicators at logging period rate on user defined periods:

- Sliding LAeq with user defined sliding period,
- Sliding Ln with user defined sliding period,
- Exposure level with predefined background noise,
- PNL & PNLT for aircraft noise certification.



Unique Event Detection Filters

In order to efficiently detect noise events (upon noise threshold or noise source recognition conditions), FUSION has a unique system of filters.

All instantaneous data measured at logging period rate can be used as criteria for triggers, including advanced indicators, frequency bands & weather data.



Each trigger is defined by 7 different parameters (start/stop noise levels, pre-/post-trigger duration...). Furthermore, it can be typically setup on an hourly basis, which allows creating up to 24 different triggers in a day.

With the Advanced Trigger option, up to 5 triggers can be combined with logical operators (“&”/ “OR”) to define an event. Up to 5 different events can be created, & then activated according user-selected days in a week (for instance: only Saturday & Sunday).

An event can generate several actions: personalised SMS, audio recording, parallel measurement with fast logging period, TTL output ...

Vibration But Differently

Innovation

Sometimes classical sound level meters can interface with vibration sensors more or less successfully. In any case this requires a wired solution, using one single measurement channel &... reading the collected results on a dB scale dedicated for acoustics!

As a world premiere O1dB proposes FUSION the only sound level meter capable of recording & storing in parallel 3-axis vibrations, audio signals & all acoustic indicators.



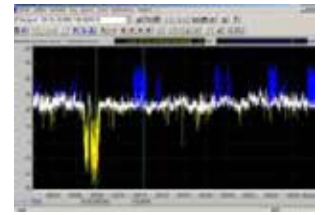
3-Axis Wireless Vibration

Relying on Wi-Fi connection FUSION interfaces with the wireless sensor WLS developed by ACOEM. This industrial sensor allows recording vibration signals on 3 axes (X, Y, & Z). The sensor's lifetime is 8 hours it can be recharged using a simple USB connection.

Synchronized Levels Difference Markers

Analysis in dBTRAIT allows first to calculate the time history of the difference between the measurement point & the coding point.

The time history of such difference is then analysed & automatically marked in order to detect events during which the disturbing source(s) emerge(s) from the sum of all other noises sources.



The example besides illustrates an analysis of the time difference between measurement & coding points. Results in blue (positive difference: noise levels at the measurement point higher than at the coding point) indicate some non-significant noise at the measurement point, whereas results in yellow show a negative difference which highlight some significant noise at the coding point.

& Even More

Import & Export Of Configuration Files

Measurement configurations can be stored, exported & imported for the benefit of the user: it becomes therefore possible to load measurement configurations from a FUSION instrument onto several ones, & thus run measurement campaigns relying on the same parameter settings for all instruments. This feature is also of temporary use to replace a FUSION while performing a periodic test at a laboratory.

Data Storage Management

A retention period can be configured to automatically delete data older than a predefined past date.

Data export in .CSV format

The proprietary file format (.cmg) is optimized in terms of size & types of data stored. This file format is not intended to be used outside our ecosystem (dBTrait, Cadence...).

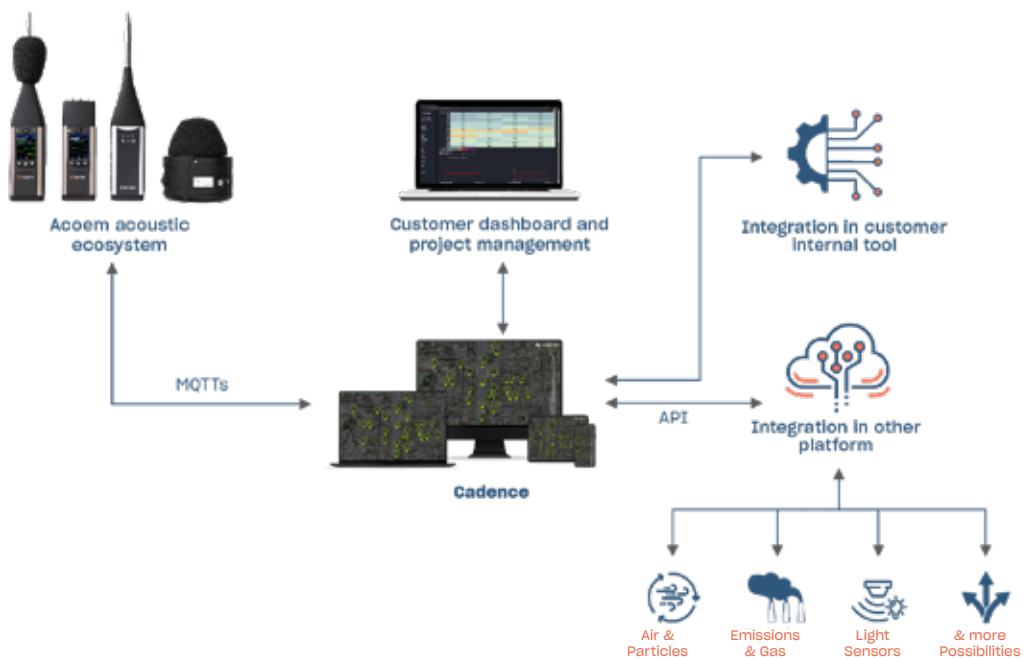
For simple use of the measured data, FUSION can create files in .csv format every logging period T (minimum 1 sec), giving the possibility to an external application to reuse the measured data. This .csv file is updated every Tj & pushed in «append» mode at the same time as the .cmg files.

Cadence & Fusion

FUSION is designed for monitoring. Each user can integrate FUSION in his/her own system but he/she may want to spend less time on practical issues related to deploying & setting-up a noise monitoring project (network deployment, computer management, on-site maintenance). In addition trying to lower the overall operating expenses also comes into the play!

For such reasons, Acoem offers web services suited to the requirements of each type of noise & vibration monitoring activity: Cadence service offer

Cadence services offers unrivalled service quality that guarantees reliable data to the customer without compromise on metrology. This is a sound basis for automatic calculations &/or expert analysis achieved by an acoustic consultant.



With Cadence, Acoem offers an environment of possibility accessible to the different persons involved in a monitoring project. From any terminal (computer, tablet, smartphone, etc.) connected to the Internet, you can view all the information available in real-time.

Cadence gives you complete monitoring autonomy Focus on your core business, while Cadence™ takes care of your data needs.

With Cadence™ you & your authorised team members have total control over every monitoring project, each device or an entire network of sensors at the touch of a button.

- Real-time overview of each measurement point
- Flexible & easy calibration, SOH, position, electrical checks Project management status overview
- Results in real time (heatmap, overall levels)
- Effortless data export & reporting
- Receive trigger & alarm notifications from any location.

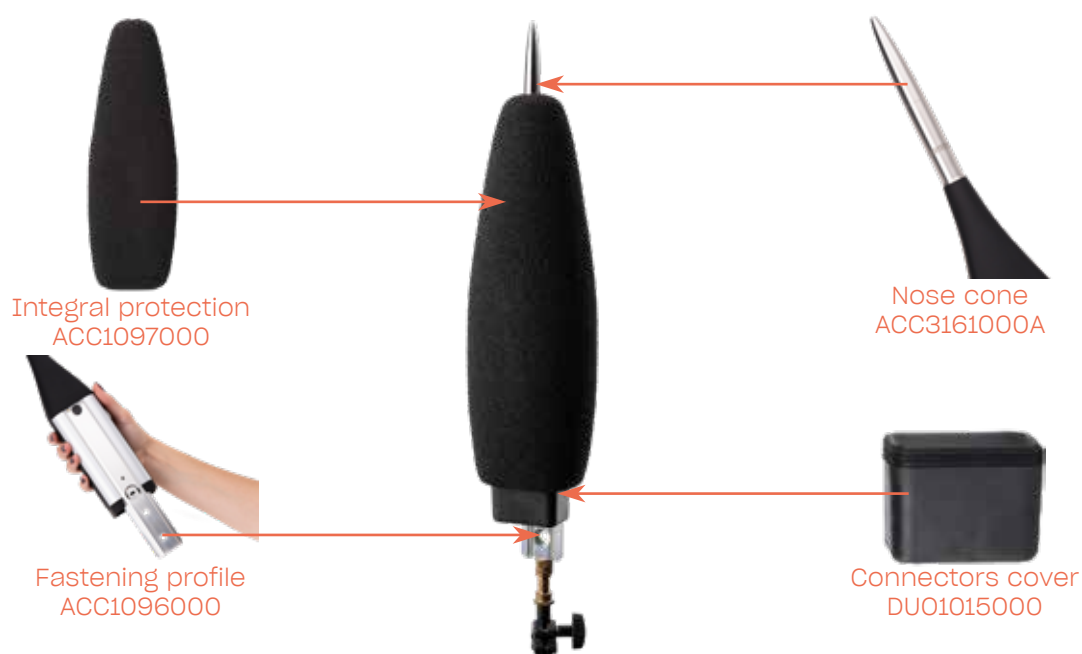
Unlimited devices, measurement points, authorised users & projects

- Connect each device automatically & create new projects in less than 60 seconds
- Compatibility with all Acoem noise monitoring devices
- Use aggregate & applicative data instead of raw data
- Store data securely on Acoem's servers
- Affordable with no infrastructure costs.

Only pay for what you need, when you need it.

Main accessories (option)

Weatherproof kit ACC1098000



Now with FUSION 4G, we add a tropicalized treatment to main boards. FUSION with its weatherproof kit is designed to be directly installed on a tripod or another support without any risks of damage. For many years, Acoem devices are equipped by this weatherproof kit offering a complete resistance to any weather conditions.

Weatherproof kit ACC1098000

FUSION interfaces in a very simple way to the WLS industrial wireless sensor. It allows recording vibrational signal on 3 axes (X, Y & Z) simultaneously with the recording of audio signals & all acoustic indicators (instant values, spectral values...).

The WLS sensor allows vibration recording on 1 axis (Z) or 3 axes simultaneously (X, Y & Z) with a frequency sampling of 12.8 kHz & a dynamic scale of 80g.

Battery operated (type Li-Ion) with an average lifetime of about 8 hours; it is rechargeable using a simple USB connection.

Several mounting accessories are available.

Outdoor microphone unit DMK01

FUSION external preamplifier input allows connecting an outdoor microphone unit of type DMK01 especially designed to separate the microphone from the instrument body.

This unit is composed of a stainless steel body, a dedicated preamplifier which allows using the microphone delivered with FUSION, a noise cone a specific windscreen & a dummy microphone designed to protect FUSION when its microphone is removed & used with the DMK01.

Specific electronic corrections are implemented in FUSION for the outdoor microphone unit DMK01 (embedded settings) in order to satisfy 0° & 90° reference directions.

Charge injection calibration check can also be operated from FUSION using DMK01 unit.

Webcam

For the identification of your events, an external webcam (type AXIS M3037-PVE) can now be interfaced to view & testify with certainty the source of the noise in question. Images & / or video files are synchronized & integrated into measurement campaigns for easy post-processing in dBTrait & viewing alarms in O1dBWebMonitoring.



Weather stations

A weather station can be interfaced to FUSION offering the possibility to simultaneously measure & store noise & weather data synchronously.

It is possible to select between 3 sensors to measure environmental parameters:

WXT532 - 2 parameters

Anemometer - 3 parameters

WXT536 - 6 parameters

These sensors are designed without any moving parts to avoid any breakdown in case of harsh weather conditions. It also limits the noise emission & assure good acoustic measurements. The same power supply is used for FUSION & for the sensors with the T connectors. With these sensors, noise measurements are store synchronously with environmental data, giving a direct analysis of any environmental events.

These sensors are compatible & manageable with Cadence & data can be seamlessly analysed with dBtrait.



	WXT532	ANEMO	WXT536
Wind speed	•	•	•
Wind direction	•	•	•
Air temperature		•	•
Relative humidity			•
Rain intensity			•
Barometric pressure			•

All weather case DSC01

For mid- & long-term environmental noise & vibration measurements FUSION can be inserted into a DSC01 weather protected case. This case will provide complete protection against bad weather conditions & also deals as a protection against theft or vandalism.

The DSC01 case also includes several glands, which allow you to use different cables (microphone extension cable, cable link with a weather station...) ensuring perfect sealing properties...

Tapping machine TM01

The TM01 tapping machine consists of an aluminium frame standing on 3 rubber feet, the height of which can be adjusted. It includes a camshaft that drives 5 hammers with a mass of 500g each, set 10 cm apart one from another. The TM01 machine allows for the hammers falling from a 40-mm effective height with a time interval of 100 ms between the drop of each hammer.

The TM01 machine includes a lead-acid gel battery that allows for an optimum & standardised continuous operation time of 2 hours.

A pushbutton is used to manage the operation of the machine. Depending on the length of time the button is pressed, the following actions can be achieved:

- Power-up of the machine: Short push (< 850 ms)
- Operating for 5 min: Short push
- Operating for 20 min: Long push (850–2,500 ms)
- Turn-off of the machine: Long push (> 2,500 ms)



The TM01 machine is supplied with a radio frequency remote control that allows for remote start & stop. The remote control is effective through the walls & floors normally built in residential & office buildings (the emitter's range in direct field is greater than 100 m).

Omnidirectional noise sources

Acoem offers omnidirectional sources, compliant with standards ISO 140 & ISO 3382. All sources have the same design. They consist of a 12-loudspeaker dodecahedron & contain each:

- a power amplifier
- a noise generator

Robust, compact, and easy to implement, all sources can be driven using a remote control. In addition to starting and stopping the sources, the user can control:

- the volume level by +/-2 dB steps or with a known gain (0 dB, -8 dB, -30 dB...).
- the type of noise: pink, white, swept sine pr Impulse noise according to different frequency ranges.

LS01 & LS03 can work with battery pack whereas LS02 & LS04 only work with Main power.



LS01/ LS02

LS03/ LS04

Available options

FSN2002000 – Multispectra options

Activates multi-spectra measurement & storage:

- Type of spectrum: 1/1 or 1/3 octave
- Time weighting : Fast or Slow or none
- Simultaneous measurement & storage of two types of spectra (Leq & time weighting)

Stores spectral data at the logging period rate

If Trigger option (FSN2004000) activated:

- Possibility to store spectra at a faster logging period during events (down to 20 msec)

FSN2003000 – Audio recording option

Activates metrological audio recording:

- Selectable frequency sampling
- Manual trigger for recording start & stop directly from FUSION or remotely from the web interface
- User defined timer (periods & duration)

Activates MP3 audio recording:

- Selectable frequency sampling
- Selectable MP3 bit rate
- Manual trigger for recording start & stop directly from FUSION or remotely from the web interface
- User defined timer (periods & duration)

If Trigger option (FSN2004000) is activated

- Automatic audio recording during an event
- Synchronized audio recording simultaneously with manual markers

FSN2004000 – Trigger Option

Activates single trigger:

- Days of the week condition for event detection activation
- One of the instantaneous values (broadband or frequency bands) measured can be selected (including weather data) for each period; event detection is defined by;
 - o User defined start trigger & end trigger levels
 - o User defined pre-trigger
 - o User defined post-trigger
 - o Minimum time duration
- Up to 24 user defined periods within a day

Additional actions triggered during an event:

- SMS generation
- TTL output (event or user defined duration)
- Audio recording (with Audio recording option FSN2003000) or vibration signal (with Option FSN2008000)
- Fast logging parallel measurement

FSN2005000 - Advanced indicators option

Measurement & storage of the following instantaneous indicators:

- Sliding LAeq (start time & end time, sliding duration)
- Sliding Ln (start time & end time, sliding duration)
- Exposure Level (start time & end time, predefined background noise level)

FSN2006000 - 4G modem activation option

Activates 4G modem for internet connection using 4G LTE Cat.4 :

- Full remote control & access with a smartphone, an internet tablet or a standard computer (Windows, Ios, MAC)
- FTP server for data transfer
- Automatic SMS notification on event detection (with Trigger option FSN2004000)
- Support of DTDNS dynamic IP address server
- SMS alarm on low battery (10%)
- SMS alarm on movement detected from initial location

FSN2007000 - Weather option

Measurement and synchronous storage of noise measurement with weather data acquired by sensors such as weather stations types WXT536, Anemometer or WXT532:

- User defined selection of parameters
- Altitude correction for barometric pressure
- User defined Logging period (as a multiple of the noise logging period)
- Real time display of weather information with the web interface (wind rose for wind direction, time history for wind speed, instantaneous values for the other weather parameters)
- Weather data & sensors compatible with Cadence cloud platform

FSN2008000 - Vibration signal recording option

Activates metrological signal recording from the WLS sensor:

- Definition of the number of axes to be recorded: 1 (Z) or 3 (X, Y & Z)
- Manual trigger for recording start & stop directly from FUSION or remotely from the web interface
- User defined timer (periods & duration)

If Trigger option (FSN2004000) is activated

- Automatic audio recording during an event
- Synchronized audio recording simultaneously with manual markers

FSN2009000 - Fusion option - building acoustics

For the FUSION Smart Noise & Vibration Analyzer, activation of parameters, acquisition & storage of building acoustics measurements (1/1 or 1/3 octave) including:

- spectrum of average levels in the source room during operation of the noise source
- spectrum of average levels in the receiving room during operation of the noise source
- spectrum of average levels in the receiving room during operation of the shock generator
- spectrum of average background noise in the receiving room
- reverberation time T20 & T30 with information regarding compliance of indicators with the ISO 3382-2 standard
- measurement of maximum equipment noise level
- ratings calculated immediately in the field in the sound level meter, without user intervention

Parallel recording of audio signal, time history & fast logging time history of all instantaneous & instantaneous spectral parameters for each measurement

FSN2010000 - Extended trigger option

Similar to Trigger option (FSN2004000) with the possibility to create up to 5 different events instead of a single one.

Activates the possibility to combine (logical “&” / “or”) up to 5 different triggers to create an event.

SMS can be sent to several telephone numbers.

FSN2011000 - PNL-PNLT Option

Measurement & storage of PNL (Perceived Noise Level) or PNLT (Perceived Noise Level Tone corrected) for aircraft or helicopter.

FSN2012000 - HTTP Comm&s option

Activates integrators HTTP commands mode

The «integrators commands» allow retrieval of information in real time. The operator has the possibility to query FUSION by a simple HTTP request, & FUSION responds with the corresponding real time values.

FSN2013000 - Push data option

Activates Automatic data transfer in push mode (from the instrument to one or two server)

The following parameters allows for selecting the types of data upload:

- Instant values
- Sliding & exposure values
- Instant spectrum values
- Instant weather values
- Overall values
- Events
- Signal(s).

FSN2014000 - Webcam option

Interface to webcam

- Camera triggering by TTL output from FUSION
- Direct Ethernet connection of the camera with FUSION
- Image & / or video storage embedded in the measurement campaign
- Postprocessing in dBtrait with images & videos views of events.

Packages

Overall specifications

All FUSION packages (exclude building) contain the minimum following specifications:

- Access point Wi-Fi connection
- Ethernet connection
- Wi-Fi data transfer
- Ethernet data transfer
- 4G Modem
- GPS location
- GPS or NTP time synchronization
- Periodic electrical check (multi CIC 5 frequencies, 2 levels)
- USB connection(mass storage)
- SD card reader
- 0°/90° reference direction
- Web interface for remote control
- Automatic data transfer in push mode
- dBFileManager software for manual data transfer
- SLM mode (Start/Stop)
- LOG mode (time history)
- Instantaneous values (up to 44 values in parallel)
- Global values
- Global statistical values (7 Ln values)
- PNL/PNLT indicators
- Sliding LAeq, sliding Ln & exposure level
- Back erase (mode SLM)
- Timer functions : immediate, delayed, daily periodic
- 1 user-definable event

Available packages

It is possible to order separately one or several options (for the delivery or as evolutions).

	FSN2001000 Logger	FSN2002000 Multipectra	FSN2003000 Audio Recording	FSN2004000 Triggers	FSN2005000 Advanced Indicators	FSN2006000 4G Modem	FSN2007000 Weather	FSN2010000 Advanced Triggers	FSN2011000 Aircraft indicators	FSN2012000 http commands	FSN2013000 Push Data	FSN2014000 Webcam	FSN2014000 Building
CUB301X000 Logger 4G	●	○	○	●	●	●	○	○	●	○	●	○	○
CUB3015000 upgrade to Analyzer 4G	●	●	○	●	●	●	○	●	●	○	●	○	○
CUB3152000 upgrade to Expert 4G	●	●	●	●	●	●	○	●	●	○	●	○	○

x=2 Modem EU	x=4 Modem US	x=5 Modem APAC	x=6 Modem LATAM	x=7 Modem CN
4G Bands (MHz)	4G Bands (MHz)	4G Bands (MHz)	4G Bands (MHz)	4G Bands (MHz)
B1,B3,B7, B8,B20, B28A	B12,B14,B4, B2,B5, B13,B66,B71	B1,B3,B5, B8,B9, B18(B26), B19,B28	B1,B2,B3, B4,B5,B7, B28	B1,B3,B5,B8 TDD:B38,B39,B40, B41, TD-SCDMA:B34,B39

- Included
- Option

Technical specifications (serial number > 14000)

IEC Class

IEC 61672-1 ed. 2.0 (2013) (0° & 90° reference direction)

IEC 61620 (1995) NF EN 61260/A1 (2002)

Sound Level Meter, Integrating Sound Level Meter with storage, group X.

Type approval (extract)

LNE

PTB (soon available)

CEM

METAS (soon available)

Dynamic range

21-139 dB (A, B), 26-139 dB (C), 31-137 dB (Z),
1 single range for a rated sensitivity of 40 mV/Pa

Linear operating range for A weighting (5 frequencies)

31,5 Hz : 26-98 dB

1 kHz : 23-138 dB

4 kHz : 23-138 dB

8 kHz : 23-134 dB

12,5 kHz : 23-130 dB

Dynamic range Peak

60-140 dBC, 1 single range

Time weightings

Slow, Fast, Impulse, Peak

Frequency weightings

X=A, B, C, Z; Y=S, F, I for LXeq & LXY

X=A; Y=S, F, I for LXYTd

X=C, Z for LXpk

Instantaneous broadb& values stored

	LXY				LXYeq				LXYTd	LXYMinMax			
	A	B	C	Z	A	B	C	Z	A	A	B	C	Z
F	X	X	X	X	X	X	X	X	X	X	X	X	X
S	X	X	X	X	X	X	X	X	X	X	X	X	X
I	X	X	X	X	X	X	X	X	X	X	X	X	X
Pk			X	X									

LnsT (sliding Ln)

LXeqsT (sliding LXeq)

LXexPT (exposure level)

Instantaneous weather data stored

Wind speed [m/s]

Wind direction [°]

Rain intensity [mm/h]

Barometric pressure [hPa]

Air temperature [°C]

Humidity [%HR]

Noise logging period T

Mini 20ms - maxi 3600s, 5 ms steps

Short logging period: mini 20ms - max standard T, 5 ms steps.

Short logging period applicable during events

Short logging period must be a divisor of T

Weather logging period

Weather logging period is a multiple of T with a minimum of 1 second

Spectral analysis

Parallel measurement & storage of Leq & LXY (Y=F, S, I)

Filters

1/1 (8Hz-16kHz) et 1/3 (6.3Hz-20kHz)

Statistics

7 selectable Ln in parallel from L1 to L99, 1 dB class

Samples for calculation: T if Leq or 20 ms if LXY,

0.1 dB resolution

Back erase

0, 5s or 10s, SLM mode only

Input high pass filter

0,3 Hz / 10 Hz

Reference directions

0° on internal input

0° & 90°, selectable built-in correction on external input (with a DMK01 external microphone)

Reference point for microphone

Centre of the protection grid (with or without nose cone).

Reference Level

94 dB.

Starting point for linearity tests

Reference level, i.e. 94 dB.

Data storage modes

SLM (hand-held sound level meter) & LOG (logging sound level meter)

Signals recording

Audio signal type

allows selecting either RAW (uncompressed data for dBTrait post-processing) or MP3 (format MPEG-1/2 Audio Layer 3 compressed data).

allows selecting audio signal sampling frequency;

Possible choices:

For RAW : 51.2kHz, 25.6kHz, 12.8kHz, 6.4kHz, 3.2kHz, 1.6kHz)

For MP3 : 48kHz, 32kHz, 16kHz, 8kHz.

MP3 bit rate [kbps] allows selecting MP3 bit rate ;

possible choices :

Fe[kHz]	48	32	16	8
Possible bit rate [kbps]	32	32	8	8
	96	96	32	32
	192	192	96	96

Vibration

Signal: Metrological, Fs = 12,800 Hz

Pre-trigger = 0 sec

1 (Z) or 3-axis(X, Y & Z)

Audio recording triggers

Simultaneously with events & manual (using FUSION integrated key & web interface for remote control)

Events (automatic coding)

5 user-definable event: codes 6 to 10

24 user-definable time periods

Triggers

Settings for pre-trigger, post-trigger, minimum time, end time

Types: on instant acoustic & weather values

(except wind direction), instant spectral values, TTL input

Manual markers

On the instrument: 1 code "code 1"

On web interface: 5 codes: "codes 1 to 5"

Timers

Immediate, differed, daily periodic. Audio: periodic

Typical background noise

(with 40CE mounted on FUSION)

[dB]		LA	Lc	Lz
Acoustic	Typical	16,1	16,8	20,2
	Maximum	20,0	21,0	24,0
Electric	Typical	11,0	12,5	18,5
	Maximum	16,0	16,0	21,0

Preamplifier

Integrated, not removable

External type PRE22 (included in DMK01) on external input (standard 10 m lemo extension cable)

Integrated keys

4 silent keys: on/stand-by/off & 3 multi-functions keys

Status indicators

LED red (overload)

LED blue (Wi-Fi connection)

LED green (power ON, blinking on on-going measurement, charge ON)

Display

High contrast colour screen 38*50mm resolution 320*240 pixels

3 sets of colours (day, contrast, night)

Display rate: 0.1s, Display resolution: 0.1dB

USB connection

Type 2.0; mass storage mode, charge on USB

Ethernet connection

Connector RJ45, Speed: 100 MB/s

DHCP(automatic) and Manual modes available

Wi-Fi Connection

IEEE 801.11b, g

Point-to-point connection & infrastructure mode

Cellular network connection

Embedded modem 3.5G compatible with 4-band

GSM/GPRS/EDGE & 3-band UMTS/HSDPA

Data connectivity

Integrated Network protected http server for web interface

Integrated FTP server for data access

SMS alarms

- On event: SMS text with FUSION serial #, location, date & time, user defined text, IP address:http port
- On low battery (10%): SMS text with FUSION serial #, location, date & time, % remaining battery
- On movement: SMS text with FUSION serial #, location, date & time, GPS coordinates, distance from previous location, IP address:http port (the alarm trigs if FUSION has moved more than the user defined distance)

Automatic SMS actions

- Sending "IP" by SMS to instrument makes it reply by sending an SMS with instrument serial #, location, date & time, IP:port address & automatically sends a new SMS at every new IP address in case of floating IP

Actions on SMS sent to the instrument

- On SMS sent "IP", the instrument replies by sending an SMS with the instrument serial #, location, date & time, IP:port address
- On SMS sent "stop", the instrument stops replying new SMS if IP has changed
- On SMS "reboot", the instrument reboots to establish a new connection & replies with an SMS with instrument serial #, location, date & time, IP :port address

Web interface refresh rate webpages

Standard: twice per second

Mobile: once per second

Analogue output

Audio output A, B, C or Z (+/-10Vpp R=2000hms)

Adjustable gain: 0, 10, 20, 30, 40, 50 dB

Electrical check

Programmable periodicity: 1, 2 or 4 times per day (0h,0h-12h, 0h, 6h, 12h, 18h)
3 pre-set frequencies (1000 Hz, 2000 Hz, & 4000 Hz) & 2 user-defined frequencies (between 10 Hz & 20 kHz)
2 user-defined excitation levels, maximum level 5 V (100%)

External microphone input

For DMK01, PRE22 (R = 560k0ms / 22Vpp (+/- 11V)

TTL output

R = 100 Ohms / 0 / 5V

Typical power consumption

Without communication (screen switch off):
< 1200 mW
+ Wi-Fi & screen switch on: < 1800 mW
+ Modem: <3800 mW

Operating lifetime

20 hours with Wi-Fi connection (during 10% of measurement time)
(for temperatures ranging from 10°C to 50°C, in LOG mode with IT = 1 s, fine IT 100 ms, 1/3 octave & audio recording on threshold during 10% of the measurement time)

External power supply

DC 8 to 28 V on charge input
DC 5 V on USB input (slow charge)

Memory

SD, SDHC or SDXC card, 2 GB or higher (2GB standard delivery) for measured data & signals. Minimum recommended requirement: ≥ class 10. Please note only SD cards provided by 01dB should be used. 01dB cannot be held responsible for data loss if the SD card used is not delivered by 01dB.
Measured data stored on the SD card every 10 seconds.
Non-volatile memory for configurations, system log (500), calibration data (500) & electrical checks (500)

TTL input

R = 100 k0hms / 0...1V = «0» 1.8...5V =>»1»

Battery

Type lithium polymer
Voltage 3.7V
Capacity 6750 mAh
Non removable, charging time approximately 3 hours

Clock

GPS PPS, error < 50 milliseconds
Internal clock, error < 0.5 s/24 hours

Localization

Automatic with integrated GPS
Information stored with measurement campaigns

Warm-up time

From power off: < 25 seconds

Operating temperature

-10°C to +50°C

Humidity

IEC 60068-2-78: damp heat: 90% HR (non condensing at 40°C)

Localization

Automatic with integrated GPS
Information stored with measurement campaigns

Warm-up time

From power off: < 25 seconds

Operating temperature

-10°C to +50°C

Humidity

IEC 60068-2-78: damp heat: 90% HR (non condensing at 40°C)

Electromagnetic compatibility

According to Directive 2004/108/EC

NF EN 61000-6-1 NF EN 61000-6-2 NF EN 61000-6-3

NF EN 61000-6-4 (2001)

ETSI EN 300 328 V1.5.1 (2004)

Protection

IP40 in standard use

IP42 if the instrument is used in vertical position without connectors cover

IP55 if the instrument is used in vertical position with connectors cover

Influence of vibration

Use with no outdoor microphone:

- For mechanical vibration of an acceleration level of 1 m/s^2 perpendicular to the microphone diaphragm, at frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz & 1000 Hz: the lower limit of the linear operating domain for A-weighting becomes 80 dB.
- For mechanical vibration of an acceleration level of 1 m/s^2 parallel to the microphone diaphragm, at frequencies microphone diaphragm, at frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz & 1000 Hz: the lower limit of the linear operating domain for A-weighting becomes 60 dB.
- Use with outdoor microphone unit DMK01:
- For mechanical vibration of an acceleration level of 1 m/s^2 perpendicular to the microphone diaphragm, at frequencies microphone diaphragm, at frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz & 1000 Hz: the lower limit of the linear operating domain for A-weighting becomes 75 dB.

Weight & dimensions

775 g

H x L x P: 300 x 70 x 52 mm

Optional Accessories

- Weatherproof external charger IP67 (10m cable)
- Sensors compatible such as WXT532, WXT536, and ANEMOMETER, from 2 to 6 additional parameters synchronously stored with Acoustic data (wind speed and direction, rain intensity, relative humidity, air temperature, barometric pressure)
- Connection cable between weather station & FUSION, for powering simultaneously FUSION & the weather station
- Outdoor microphone unit type DMK01 including preamplifier type PRE22, 10 m cable & nose cone. The use of RAL135 10 m cable does not need any particular correction.
- All weather case DSC01 with option 1 battery (10-days) or 2 batteries (20-days)
- Wireless vibration sensor 3-axis (X, Y, Z) 80g, Weight 373 g, Dimension $\varnothing 42 \times H116$ mm, 8h battery life.

Connecting these accessories has no influence on measurements

Building Acoustics Module (option)

Product Code

FSN2009000: Building option for FUSION

Frequency-based analysis

1/1 or 1/3 octave, 50 to 5000 Hz

Levels L1, L2, Li (Emission, Reception, Impact noise)

Calculation of the mean spectrum LZeq over the specific coding duration, detected automatically (source on duration)

Background noise level Lb

Calculation of the mean spectrum over the entire measurement duration

Integration times (IT)

1 second; 20 milliseconds

Maximum averaging time for spectra L1, L2, Lb & Li

120 seconds

Maximum measurement time for equipment noise

600 seconds

Simultaneous audio recording

Sampling frequency: 51.2 kHz, 25.6 kHz, 12.8 kHz, 6.4 kHz, 3.2 kHz, 1.6 kHz

Equipment noise levels

Selection of the maximum level for one of the following parameters: LXYMax where X = A, C or Z & Y = F, S or I

Calculation of reverberation times

Fine IT 20 ms for decay analysis

Simultaneous calculation of T20 & T30

Automatic detection of interrupted or pulsed noise sources

Schroeder integration for pulsed sources

Estimate by least squares approximation

Calculation of quality indicators (ISO 3382)

Name	Quality indicator	Description, default values
N	Background noise level too high*	Low dynamic range (between 41 & 45 dB for T30; between 31 & 35 dB for T20)
D	Calculation impossible*	Insufficient dynamic range (< 41 dB for T30; < 31 dB for T20)
<	Reverberation time too low*	Tr < 0.24 seconds (scaled by logging period = 20 ms)
ξξ	Non-linearity*	Non-linearity parameter >1%
C	Curvature*	C > 10% or C < 0; see [1] appendix B.3 Difference
L	Linearity of the sound source linearity	Difference between adjacent 1/1 or 1/3 octave bands > 6 dB

*: ISO 3382-2 standard indicator

Invalid indicators displayed on the Tr spectrum & stated on decay

Audio comments

Used to store a voice comment, with the same sampling frequency as for the measurement

PC Software

dBInside

Deliverable & accessories

The standard package (FSN1001000) of FUSION includes the following items:



**FUSION with
40CE microphone**



Handle



Profile for tripod mounting



Windscreen



Windscreen claw



**Meterological
documentation**



SD card 2GB



AC power supply



USB Cable





NOT1592 NOVEMBER 2022 C - FUSTON 4G TECHNICAL DATASHEET EN



acoem
CREATING ENVIRONMENTS OF POSSIBILITY

Acoem has a continuous policy of product development & although the company reserves the right to changes specifications, it attempts to keep customers informed of any alterations. ©2021 Acoem. All rights reserved.

acoem.com