FUSION SLM Smart Sound & Vibration Analyzer

Technical Datasheet

01dB.com

01dB
ACOEM Group

FUSION SLM – TECHNOLOGY AT THE SERVICE OF YOUR PRODUCTIVITY

BEST QUALITY FOR THE BEST PRICE

With FUSION SLM, 01dB completes its range of sound level meters with the best quality for the best price. FUSION SLM is 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 SLM the most innovative sound level meter and an exceptionally communicating tool, increasing your productivity!

FUSION SLM respects the IEC 61672 standard and offers the best quality for your data. Multitasking it gathers performance and simplicity within one single instrument. Connection to an intelligent wireless sensor FUSION SLM can even record vibrations signals on 3 axes simultaneously with acoustic indicators and audio signals.

FUSION SLM is a new member within 01dB ecosystem focused on improving your productivity. You will appreciate its simplicity of use, its degree of remote controllability and the power of its processing software

MAIN SPECIFICATIONS

FUSION SLM presents the unique technical specifications:

- IEC 61672 Class 1
- Built-in preamplifier
- Free-field microphone type MCE3
- 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, 3G Modem, GPS…
- Remote control by web interface
- Parallel storage of all acoustic indicators
- Advanced triggers
- Metrological audio recordingWireless vibration signal recording in 3 axis
- 24-hour capacity
- Building Acoustics Module (option)
- Multiple processing software packages (dBTrait, dBFa, dBInside…)
- Numerous accessories (all weather case DSC01, outdoor unit DMK01…)

MAIN APPLICATIONS

FUSION SLM is a multi-purpose sound level meter including all functions aimed at maximizing your productivity. It can be used as a control instrument and offers evaluation, analysis and monitoring capabilities application to noise and 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

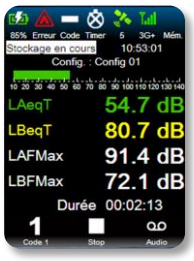
…

PERFORMANCE AND SIMPLICITY

THE 01DB ECOSYSTEM

FUSION SLM is a member the new 01dB product range sharing with DUO, FUSION and CUBE the same ecosystem focused on improving your productivity. Being familiar with one of them just means mastering the other ones. Same built-in screen, 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 SLM can be used with its context keys and high-definition built-in colour screen. It is therefore possible to load a stored configuration, to start an acquisition, to mark an event and start an audio recording, to do a calibration and 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 SLM using a simple internet browser. Thanks to the embedded webserver FUSION SLM offers direct access to any of the available functions: configuration, coding, acoustic calibration and electrical check, real time display of instant values…) without the need of further specific applications.

Remote connection is possible using Ethernet, Wi-Fi or 3G integrated modem (option). Therefore, remote access to FUSION SLM is possible from wherever you are.

GPS LOCATION

The built-in GPS allows FUSION SLM 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 SLM, a user defined movement detection function will warn the operator by sending an SMS with the new geographical coordinates and the distance from the previous location (Need 3G Option).

SMART AND POWERFUL

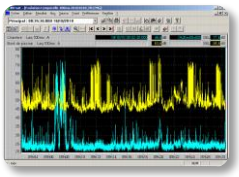
FUSION SLM measures noise and vibrations perfectly. Its powerful functions contribute to optimizing your operational efficiency: continuous audio recording, innovative trigger threshold definition, smart source recognition (building acoustics) advanced acoustic indicators, automatic calibrator detection,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

WIRELESS IN YOUR OFFICE

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

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

01dB Software: So Powerful



To cover each application, 01dB 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 01dB 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 and productivity. The purpose is to reduce the time spent on:

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

To simplify your work, you can install 01dB software as many times as needed. Furthermore, there is no physical protection key to plug into your PC.

Accessories: More than a detail!

Lateral grips make FUSION SLM 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.

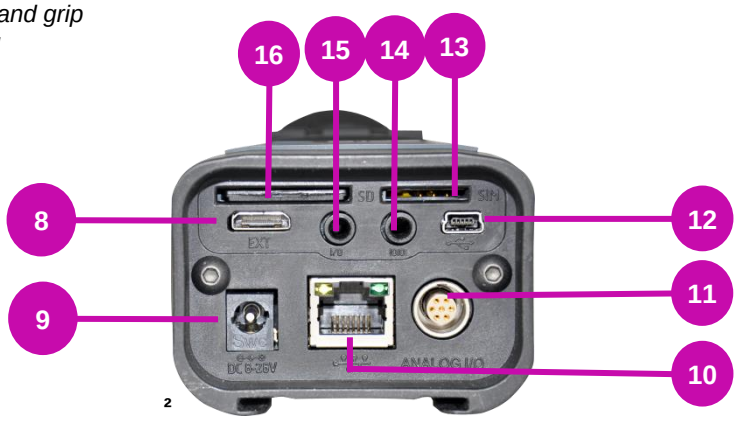
A fixation profile for tripod mounting is also part of the delivered set of accessories. FUSION SLM can thus quickly and safely fixed on a tripod.

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

01dB, these accessories are genuinely useful and serve to improve your productivity day after day

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 (weather station connection)
09 – DC 8-28V power supply input
10 – RJ45 Network
11 – External microphone preamplifier input and 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 SLM 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 SLM 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 and prompts the user for validation, repeat or rejection of the calibration. Information provided is stored and 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 SLM. 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) and to check over time that the maximum deviation between the reference values and the measured values does not exceed a user defined level, typically set to 0.5 dB.

The controlled frequencies are 1000, 2000, 4000 Hz and 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 and 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 SLM 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 ± 30°. The fine shape of FUSION SLM, 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 SLM 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, and more specifically coming from the horizontal direction.

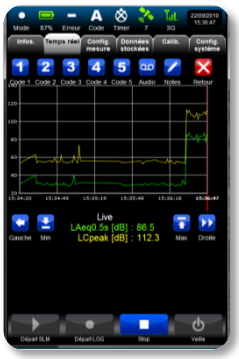
Placed vertically, the outdoor microphone unit DMK01 is configured in FUSION SLM for a propagation direction oriented 90° from its axis to perfectly meet the requirements of the IEC 61672 standard on sound level meters relative to noise incidence from the horizontal direction.

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 and 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)



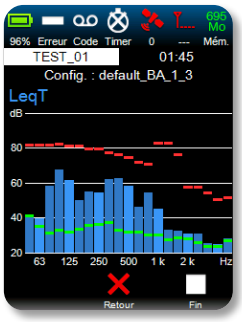
FUSION SLM in LOG mode includes the storage of time histories. It is designed for experts familiar with the short term Leq method. Instantaneous values and spectra are stored at every logging period T.

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 SLM 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)

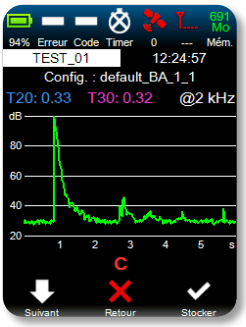
In this mode, FUSION SLM enables all acoustics technicians to respond to all building acoustics measurement requirements:

- 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 SLM 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 and fast time history of all instantaneous and 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
- Can be used with any sound source and tapping machine without requiring any control interface between the sound level meter and the source



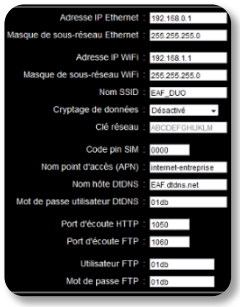
The dBInside software completes this FUSION SLM module with the following features:

- 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.*

MULTI-COMMUNICATION

COMMUNICATION MODULES

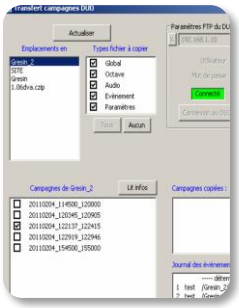


The integration of communication modules in FUSION SLM allows communicating with the instrument using in 4 different ways:

- USB storage
- Ethernet network (RJ45)
- Point-to-point Wi-Fi network
- Infrastructure Wi-Fi network
- 3G communication using the built-in modem
  (Modem option needs to be active; SIM card and subscription are not included).

All connection parameters are accessible from the web interface.

REMOTE DATA TRANSFER



Access to stored data and data transfer can be obtained in different ways using:

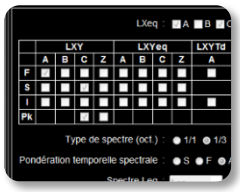
- FTP client as for instance Filezilla®
- dBFileManager software (included with FUSION SLM) for manual downloads on demand
- USB mass storage (SD card access)
- SD card removed and an external memory card reader.

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 SLM: 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 and 3G signal strength.

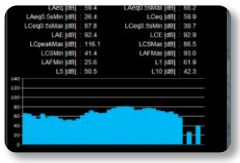
MEASUREMENT CONFIGURATION



A measurement configuration for FUSION SLM 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 and delayed starts.

Configuration management allows rapidly loading a predefined configuration.

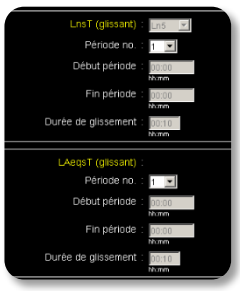
DATA ACCESS



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

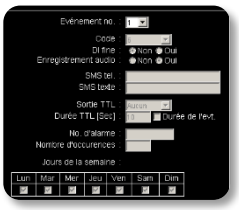
INNOVATIVE ACOUSTIC INDICATORS



On top of usual instantaneous data measured and stored (Leq, spectra, …), FUSION SLM 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,

UNIQUE EVENT DETECTION FILTERS



In order to efficiently detect noise events (upon noise threshold or noise source recognition conditions), FUSION SLM 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 and 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.

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 and… reading the collected results on a dB scale dedicated for acoustics!

As a world premiere 01dB proposes FUSION SLM the only sound level meter capable of recording and storing in parallel 3-axis vibrations, audio signals and all acoustic indicators.

3-AXIS WIRELESS VIBRATION

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

ACOUSTIC AND VIBRATION

FUSION SLM allows recording vibrational signal on 1 (Z) or 3 axes simultaneously (X, Y and Z). What is more: FUSION SLM can record and store in parallel 3-axis vibrations, audio signals and all acoustic indicators (instant values, spectral values…).

Audio and vibration signals recording is possible either manually using FUSION SLM integrated keyboard, or remotely with a web interface connection to the instrument, or based on an acoustic trigger as part of the parameter definition of the current settings.

In fact it can be useful to further process vibration signals which correspond to a sound source with higher level than authorized.

AUTOMATIC POST-PROCESSING

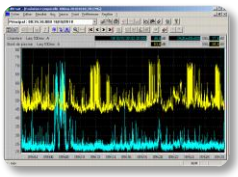
In order to optimize the analysis, the acquired signals (audio and vibration, recorded with a metrological quality) can be analyzed “on the spot” once imported within dBTRAIT. Predefined analysis can be set by the user and assigned in dBTRAIT. Of course such parameters can be modified at any time.

As soon as the automatic processing is performed, computed results corresponding to each signal become available within dBTRAIT for further processing and analysis.

ADVANCED DATA POST-PROCESSING (LOGGER MODE)

MARKERS BETWEEN FUSION SLMS

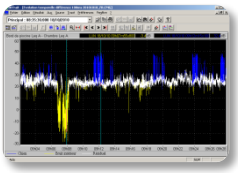
Using several FUSION SLM instruments synchronized by GPS on a single site allows for a detailed analysis of the recorded phenomena. It then becomes possible to clearly identify a car and/or train pass-by, a building site noise, an industrial noise, using multiple markers.



Analysis at the measurement point takes advantage of the information collected at the coding points (and thus validates that the incriminated sources are indeed active). Moreover, data post-processing using dBTRAIT will allow assigning markers from the coding points onto the measurement campaign collected at the measurement point.

SYNCHRONIZED LEVELS DIFFERENCE MARKERS

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



The time history of such difference is then analysed and 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 and 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.

AND EVEN MORE

IMPORT AND EXPORT OF CONFIGURATION FILES

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

MAIN ACCESSORIES (OPTION)

WLS WIRELESS VIBRATION SENSOR

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

The WLS sensor allows vibration recording on 1 axis (Z) or 3 axes simultaneously (X, Y and Z) with a frequency sampling of 12.8 kHz and 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 SLM 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 SLM, a noise cone a specific windscreen and a dummy microphone designed to protect FUSION SLM when its microphone is removed and used with the DMK01.

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

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

WEATHER STATIONS

A weather station can be interfaced to FUSION SLM so as to be able to simultaneously measure and store noise and weather data.

It is possible to select between 2 VAISALA weather stations: WXT532 type (2 parameters) or WXT536 type (6 parameters). These two weather stations have the particularity of transducers without any moving parts to avoid any breakdown in case of harsh weather conditions.

A unique cable is used for the power supply and the data transfer. This cable is connected on the HDMI mini port of FUSION SLM. The weather data logging period is defined as a multiple of the noise logging period.

	WMT532	WXT536
Wind speed	•	•
Wind direction	•	•
Air temperature		•
Relative humidity		•
Rain intensity		•
Barometric pressure		•

ALL WEATHER CASE DSC01

For mid- and long-term environmental noise and vibration measurements FUSION SLM can be inserted into a DSC01 weather protected case. This case will provide complete protection against bad weather conditions and 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 and 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 and stop. The remote control is effective through the walls and floors normally built in residential and office buildings (the emitter's range in direct field is greater than 100 m).

OMNIDIRECTIONAL NOISE SOURCES LS01/LS02

01dB offers 2 omnidirectional sources, **LS01** and **LS02**, compliant with standards ISO 140 and ISO 3382.

Both sources have the same design. They consist of a 12-loudspeaker dodecahedron and contain each:

- a power amplifier
- a noise generator

Robust, compact and easy to implement, both sources **LS01**/**LS02** 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 according to different frequency ranges

The **LS01** source is delivered with a battery pack that provides more than 1 hour of operating time.

AVALAIBLE OPTIONS

FSN2002000 - MULTISPECTRA OPTIONS

Activates multi-spectra measurement and storage:

- Type of spectrum: 1/1 or 1/3 octave
- Time weighting: Fast or Slow or none
- Simultaneous measurement and storage of two types of spectra (Leq and 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 and stop directly from FUSION SLM or remotely from the web interface
- User defined timer (periods and duration)

If Trigger option (FSN2004000) is activated

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

FSN2004000 – TRIGGER OPTION (INCLUDED IN ALL FUSION SLM KITS)

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;
  - User defined start trigger and end trigger levels
  - User defined pre-trigger
  - User defined post-trigger
  - Minimum time duration
- Up to 24 user defined periods within a day

Additional actions triggered during an event:

- SMS generation (with 3G Modem Option FSN2006000)
- 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 (INCLUDED IN ALL FUSION SLM KITS)

Measurement and storage of the following instantaneous indicators:

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

FSN2006000 – 3G MODEM ACTIVATION OPTION

Activates 3G modem for internet connection using 3G/GPRS/EDGE and UMTS/HSDPA networks:

- Full remote control and 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 storage of weather data acquired by VAISALA weather stations types WXT520 (6 transducers) or WMT52 (2 transducers):

- 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)

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 and Z)
- Manual trigger for recording start and stop directly from FUSION SLM or remotely from the web interface
- User defined timer (periods and duration)

If Trigger option (FSN2004000) is activated

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

FSN2009000 - FUSION SLM OPTION – BUILDING ACOUSTICS

For the **FUSION SLM** Smart Noise & Vibration Analyzer, activation of parameters, acquisition and 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

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

PACKAGES

OVERALL SPECIFICATIONS

All FUSION SLM packages contain the minimum following specifications:

• Point to point Wi-Fi connection • Ethernet connection • Wi-Fi data transfer • Ethernet data transfer • GPS location • GPS or NTP time synchronization • Periodic electrical check (multi CIC 5 frequencies, 2 levels) • USB connection(mass storage) • SD card reader • 0° reference direction • Web interface for remote control	• 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) • Sliding LAeq, Ln and exposure Level • Back erase (mode SLM) • Timer functions : immediate, delayed, daily periodic

AVAILABLE PACKAGES

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

	FSN2001000 Logger	FSN2002000 Multispectra	FSN2003000 Audio Recording	FSN2004000 Triggers	FSN2005000 Advanced indicators	FSN2006000 3G Modem	FSN2007000 Weather	FSN2008000 Vibration signal recording	FSN2009000 Building acoustics
FSN3023000 Logger Wi-Fi	●	○	○	●	●	○	○	○	○
FSN3020000 Recorder Wi-Fi	●	○	●	●	●	○	○	○	○
FSN3021000 Analyzer Wi-Fi	●	●	○	●	●	○	○	○	○

● *Included* ○ *Option*

TECHNICAL SPECIFICATIONS

IEC class:
IEC 61672-1 ed. 2.0 (2013) (0° and 90° reference direction)
IEC 61620 (1995) NF EN 61260/A1 (2002)
Sound Level Meter, Integrating Sound Level Meter with storage, group X.

Dynamic range
21-138 dB (A, B), 26-138 dB (C), 31-138 dB (Z),
1 single range for a rated sensitivity of 50 mV/Pa

Linear operating range for A weighting (5 frequencies)
31,5 Hz : 26-97 dB
1 kHz : 24-137 dB
4 kHz : 24-137 dB
8 kHz : 24-133 dB
12,5 kHz : 24-129 dB

Dynamic range Peak
61-140 dBC, 1 single range

Time weightings
Slow, Fast, Impulse, Peak

Frequency weightings
X=A, B, C, Z; Y=S, F, I for LXeq and LXY
X=A; Y=S, F, I for LXYTd
X=C, Z for LXpk

Instantaneous broadband 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)
LAeqsT (sliding LAeq)
LAexPT (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 and storage of Leq and LY (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° and 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) and LOG (logging sound level meter)

Audio recording
Uncompressed metrological signal, Fs = 51200 Hz
Sampling frequencies: 51200, 25600, 12800, 6400, 3200, 1600 Hz
Pre-trigger = 10s at Fs=51200 Hz
LEMO output connector

Vibration
Signal: Metrological, Fs = 12,800 Hz
Pre-trigger = 0 sec
1 (Z) or 3-axis(X, Y and Z)

Audio recording triggers
Simultaneously with events and manual (using FUSION SLM integrated key and web interface for remote control)

Events (automatic coding)
1 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 and 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 MCE3 mounted on FUSION SLM)

	Background noise (dB)		Expanded uncertainly (k=2) (dB)
	Electronic	Total	
LpA,F	14.9	19.5	0.3
LpA,S			
LAeq			
LpC,F	15.5	20.1	
LpC,S			
LpZ,F	18.5	21.5	
LpZ,S			

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 and 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 mode

Wi-Fi Connection:
IEEE 801.11b, g
Point-to-point connection and infrastructure mode

Cellular network connection
Embedded modem 3.5G compatible with 4-band GSM/GPRS/EDGE and 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 SLM serial #, location, date and time, user defined text, IP address:http port
- On low battery (10%): SMS text with FUSION SLM serial #, location, date and time, % remaining battery
- On movement: SMS text with FUSION SLM serial #, location, date and time, GPS coordinates, distance from previous location, IP address:http port (the alarm trigs if FUSION SLM 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 and time, IP:port address and 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 and 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 and replies with an SMS with instrument serial #, location, date and 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=200Ohms)
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, and 4000 Hz) and 2 user-defined frequencies (between 10 Hz and 20 kHz)
2 user-defined excitation levels, maximum level 5 V (100%)

External microphone input
For DMK01, PRE22 (R = 560kOms / 22Vpp (+/- 11V)

TTL output
R = 100 Ohms / 0 / 5V

TTL input
R = 100 kOhms / 0...1V = "0" 1.8...5V ="1"

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

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)
15 hours with active 3G 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 and 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 and 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) and electrical checks (500)

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)

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

Influence of vibration
Use with no outdoor microphone:
- For mechanical vibration of an acceleration level of 1 m/s² perpendicular to the microphone diaphragm, at frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz and 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/s² 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 and 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/s² 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 and 1000 Hz: the lower limit of the linear operating domain for A-weighting becomes 75 dB.

Weight and dimensions
775 g
H x L x P: 300 x70 x 52 mm

Optional Accessories
- Weatherproof external charger IP67 (10m cable)
- Weather station VAISALA type WMT52 specific for the instrument (2 parameters: wind speed and direction)
- Weather station VAISALA type WXT520 (6 parameters: wind speed and direction, rain intensity, relative humidity, air temperature, barometric pressure, Connection cable between weather station and the instrument by mini HDMI cable
- Outdoor microphone unit type DMK01 including preamplifier type PRE22, 10 m cable and 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 Ø42 x H116 mm, 8h battery life.

Connecting these accessories has no influence on measurements

Building Acoustics Module (option)

Product Code
FSN2009000: Building option for **FUSION SLM**

Frequency-based analysis
1/1 or 1/3 octave, 50 to 5000 Hz

Levels L_1, L_2, L_i (Emission, Reception, Impact noise)
Calculation of the mean spectrum LZeq over the specific coding duration, detected automatically (source on duration)

Background noise level L_b
Calculation of the mean spectrum over the entire measurement duration
Integration times (IT)
1 second; 20 milliseconds

Maximum averaging time for spectra L_1, L_2, L_b and L_i
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 and Y = F, S or I

Calculation of reverberation times
Fine IT 20 ms for decay analysis

.

Simultaneous calculation of T20 and 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	Indicator	Description
N	Background noise level too high*	Low dynamic range (between 41 and 45 dB for T30; between 31 and 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)
ξ	Non-linearity*	Non-linearity parameter ξ >1%
C	Curvature*	C > 10% or C < 0; see [1] appendix B.3
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 and stated on decay

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

PC Software
dBInside

DELIVERABLE AND ACCESSORIES

The standard package (FSN1002000) of FUSION SLM includes the following items:

FUSION with MCE3 microphone

Handle

Profile for tripod mounting

Windscreen

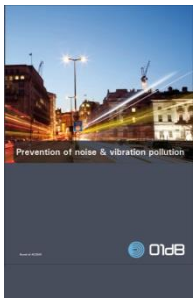
Windscreen claw

Packaging

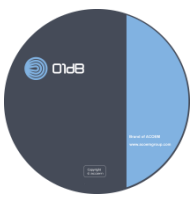
SD card 2Go

AC Power supply

USB cable



Metrological documentations



CD-ROM with User manual

About ACOEM

ACOEM Group
Reduce your environmental impact

In today's fast-moving world, the environment is increasingly impacted. The ACOEM Group is committed to sustainable development and help companies and public authorities limit their environmental impact by offering products and services that:

- Prevent and control air, noise and vibration pollution
- Increase the productivity and reliability of industrial machinery
- Contribute to the development of effective, robust & noiseless products
- Protect soldiers, sites and vehicles in military theaters of operation

Across the world, ACOEM's 670 employees innovate in the measurement, analysis and control of all environmental parameters through the 01dB, ECOTECH, ONEPROD, FIXTURLASER, MEAX and METRAVIB brands.

For more information, please visit our website at acoemgroup.com