



## DUO Smart Noise Monitor Technical datasheet

## USES AND APPLICATIONS

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### SOUND LEVEL METER

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DUO is devoted to classic sound level measurements, either hand-held or on a tripod. DUO is controlled either directly using the built-in keyboard and integrated high contrast / high resolution screen or remotely using dBDO web interface on a wireless communication terminal used as a remote control (smartphone, internet tablet, ...). In this case, the user can move away from a few tens of meters (Wi-Fi) to monitor the measurement without disturbing it. It has never been so easy to manually add markers and comments on events, completed by audio recording on demand for more precise post processing analysis.



### NOISE MONITORING TERMINAL

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Innovation by 01dB: all functionalities dedicated to a noise monitoring terminal are implemented in DUO smart noise monitor:

- Weatherproof body and microphone
- Built-in battery for more than 60 hours battery lifetime
- Integrated Wi-Fi module and 3G modem for easy and permanent remote access
- Embedded GPS module for time synchronized and geo-referenced measurements
- Automatic periodic multi-frequencies charge injection check
- SMS notification on event detection, low battery and unexpected movement

From short term measurements to long term noise and weather monitoring DUO has become *the* new reference for environmental noise assessment.



### APPLICATIONS

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DUO can either be used as a sound level meter or as a monitoring terminal for general environmental noise and weather assessment in the following but not restricted areas:

- Construction site noise
- Urban noise
- Industrial noise
- Aircraft noise
- Road noise
- Railway noise
- Windmill noise
- Recreational activities noise...



## OUTSTANDING INSTRUMENT

### WEATHERPROOF

DUO is designed for outdoor use under all weather conditions: no need for additional protection! It is equipped with the exclusive revolutionary microphone 40CD developed by the well-known Danish company G.R.A.S. Its grid includes a water and dust repellent protection device for safety and long term stability.

The integral grey protection foam makes DUO discreet in the measurement environment.

A clever design of the mounting profile allows for securing using the anti-theft device.



### SIMPLIFIED ERGONOMICS

DUO 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 ...

### UNMATCHED BATTERY LIFETIME

DUO optimized power consumption allows for an expected battery lifetime (T ° from -10 °C to +50 °C) of:

- 60 hours with Wi-Fi active 10% of the time
- 48 hours with 3G modem data transmission (10% of the time)



### OPTIMIZED POWER CONSUMPTION

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

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

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

### GPS LOCATION

Measurement data include GPS location for easy visualization of the measurement position in dB<sub>Trait</sub> post-processing software.

In case of an unexpected displacement of DUO, 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.

### ADVANCED ANALYSIS BASED ON SYNCHRONIZED LEVELS DIFFERENCE

Using several DUO instruments synchronized on a single site allows for a detailed analysis of the recorded phenomena. It becomes possible to clearly identify a car and/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 (and thus validates that the incriminated sources are indeed active).

Moreover, data post-processing using dB<sub>Trait</sub> allows assigning markers from the coding points onto the measurement campaign collected at the measurement point.



## NO COMPROMISE WITH METROLOGY

### ACOUSTIC CALIBRATION DETECTION

In order to simplify the deployment of DUO 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 DUO detects a stable level around the predefined calibration level, it automatically starts the calibration procedure. At the end of this procedure, DUO 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)

Designed for unattended measurements DUO integrates an automated procedure to check the integrity of the entire measurement chain.

The built-in charge injection check allows testing the entire measurement chain, including the microphone. 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.

## 0° AND 90° REFERENCE DIRECTIONS

### 0° REFERENCE DIRECTION

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 DUO can be configured for measurements with an angle of incidence of 0° with respect to its main axis.

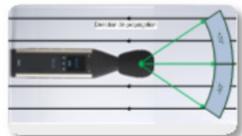
The IEC-61672 standard requires a perfect control of the frequency response polar diagram, in particular at  $\pm 30^\circ$ . The fine shape of DUO, along with its conical upper part, allows complying with this criterion, with or without a nose cone. Statutory aircraft noise measurements also require the 0° incidence configuration.

### 90° REFERENCE DIRECTION

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.

Placed vertically and configured for a propagation direction oriented 90° from its axis DUO perfectly meets the requirements of the IEC 61672 standard on sound level meters relative to noise incidence from the horizontal direction.

The main technical difficulty is the criterion for the maximum level difference allowed between two random incidence angles. Close collaboration with our Danish partner G.R.A.S. resulted in a cone-shaped device that fulfils this criterion, in particular at  $\pm 30^\circ$ .



## TWO 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)

DUO 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 up to 5 event detectors can be defined with limits based on 24 possible consecutive periods of the day. DUO 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.



## MULTI-COMMUNICATION

### COMMUNICATION MODULES

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

- USB storage
- Ethernet network (RJ45)
- Point-to-point 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 dBDUO 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®
- DUOFileManager software (included with DUO) for manual downloads on demand
- DUODataCollector software for automatic periodic parallel downloads.
- USB mass storage (SD card access)
- SD card removed and an external memory card reader.



### STRUCTURE OF STORED DATA

The structure of the measurement files allows the user selecting the types and dates of the data to transfer. This flexibility is particularly interesting in case of 3G communication where the cost of data transfer usually depends on the quantity of data to upload.

It is thus possible to transfer first all instantaneous values stored at each logging period. Then, and after preliminary analysis, time slots and additional data (spectra, markers and events at fast IT, audio files, provided all relevant options are active) can be selected to complement the transferred measurement campaign.

The corresponding file format (\*.cmg) is compatible with all O1dB software.

## DBDUO WEB INTERFACE

### REMOTE COMMUNICATION

Direct access to DUO is possible with dBDUO GUI (Graphical User Interface) in a web browser: there is no application software to install. The user has full control of the instrument (measurement and system setups, real time displays, calibrations, stored data) with a few clicks on tabs. An Internet tablet allows for comfortable on-site display and navigation.

Remote connection is possible using Ethernet, Wi-Fi or 3G integrated modem.

Therefore remote access to DUO is possible from wherever you are.



### STATUS BAR

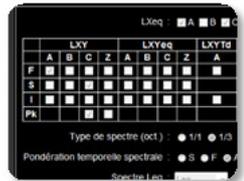
Always on display, the status bar can be used to rapidly check the operating of the main functions of DUO: current acquisition mode, battery status, detection of an error (overload, electrical check), possible marker(s) in progress, activation of a timer or not, number of GPS satellites picked up, type of connection and 3G signal strength.



### MEASUREMENT CONFIGURATION

A measurement configuration for DUO 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 dBDUO 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..

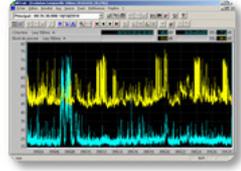


## ADVANCED DATA POST-PROCESSING

### MARKERS BETWEEN DUOS

Using several DUO instruments synchronized 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.

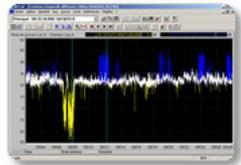


### SYNCHRONIZED LEVELS DIFFERENCE MARKERS

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.



## POWERFUL DATA ACQUISITION

### INNOVATIVE ACOUSTIC INDICATORS

On top of usual instantaneous data measured and stored (Leq, spectra, ...), DUO 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 and PNLT for aircraft noise certification.

### UNIQUE EVENT DETECTION FILTERS

In order to efficiently detect noise events (upon noise threshold or noise source recognition conditions), DUO has a unique system of filters, based on event configurations including one or several triggers (according to the selected option).

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.



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

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



## AND EVEN MORE

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### IMPORT AND EXPORT OF CONFIGURATION FILES

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Measurement configurations can be stored, exported and imported for the benefit of the user: it becomes therefore possible to load measurement configurations from a DUO 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 for saving measurement configurations while DUO is sent for performing a periodic check at a calibration laboratory. This feature is also of temporary use to replace a DUO while performing a periodic test at a laboratory.

### DATA STORAGE MANAGEMENT

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

### REMOTE LISTEN-IN

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Remote listen-in is possible with a voice & data subscription simply by dialing the telephone number of the SIM card in DUO; DUO will pick up the line after 2 tones and you can directly listen to the audio signal in real time.

## ACCESSORIES

### OUTDOOR MICROPHONE UNIT DMK01

In case of unsafe measurement locations, it is preferable to put DUO in a safe place and use the outdoor microphone unit DMK01. DMK01 is specifically designed for DUO and reuses the 40CD microphone and nose cone. It includes a new PRE22 preamplifier connected to the external output, a specific wind screen and a dummy microphone to protect DUO's top part.

Specific electronic corrections are implemented in DUO external input (embedded settings) in order to satisfy 0° and 90° reference directions.

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



### WEATHER STATIONS

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

It is possible to select either reference WMT52 (2 parameters) or WXT520 (6 parameters) from Vaisala. These two weather stations have the particularity of transducers without any moving parts to avoid any breakdown in case of harsh weather conditions.

The same mains power is used for DUO and for the weather station; the 10 meters unique cable between the station and DUO offers a good flexibility and ease of installation. The weather data logging period is defined as a multiple of the noise logging period.

	WMT52	WXT520
Wind speed	•	•
Wind direction	•	•
Air temperature		•
Relative humidity		•
Rain intensity		•
Barometric pressure		•



## OPTIONS

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### DUO2001000 – MULTISPECTRA OPTION

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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 (DUO2003000) activated:

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

### DUO2002000 – AUDIO RECORDING OPTION

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Activates metrological audio recording:

- Selectable frequency sampling
- Manual trigger for recording start and stop directly from DUO or remotely from dBDOO
- User defined timer (periods and duration)

If Trigger option (DUO2003000) is activated

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

### DUO2003000 - TRIGGER OPTION

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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 DUO2004000)
- TTL output (event or user defined duration)
- Audio recording (with Audio recording option DUO2002000)
- Fast logging parallel measurement

### DUO2004000 – 3G MODEM OPTION

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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 DUO2003000)
- Support of DTDNS dynamic IP address server
- SMS alarm on low battery (10% and 6%)
- SMS alarm on movement detected from initial location

### **DUO2005000 – EXTENDED TRIGGER OPTION**

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Similar to Trigger option (DUO2003000) with the possibility to create up to 5 different events instead of a single one

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

SMS can be sent to several telephone numbers

### **DUO2006000 – ADVANCED INDICATORS OPTION**

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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)

### **DUO2007000 - PNL-PNLT OPTION**

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

### **DUO2008000 – WEATHER OPTION**

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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 dBDO (wind rose for wind direction, time history for wind speed, instantaneous values for the other weather parameters)

## PACKAGES

### DUO OVERALL SPECIFICATIONS

All DUO packages contain:

<ul style="list-style-type: none"> <li>• Point to point Wi-Fi connection</li> <li>• Ethernet connection</li> <li>• Wi-Fi data transfer</li> <li>• Ethernet data transfer</li> <li>• GPS location</li> <li>• GPS time synchronization</li> <li>• Periodic electrical check (multi C/C 5 frequencies, 2 levels)</li> <li>• USB connection(mass storage)</li> <li>• SD card reader</li> <li>• 0° reference direction</li> <li>• 90° reference direction</li> <li>• dBDO remote connection software</li> </ul>	<ul style="list-style-type: none"> <li>• DUOFileManager software for manual data transfer</li> <li>• SLM mode (Start/Stop)</li> <li>• LOG mode (time history)</li> <li>• Instantaneous values (up to 44 values in parallel)</li> <li>• Global values</li> <li>• Global statistical values (7 Ln values)</li> <li>• Back erase (mode SLM)</li> <li>• Timer functions : immediate, delayed, daily periodic</li> </ul>
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### AVAILABLE KITS

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

	DUO2001000 Multispectra	DUO2002000 Audio recording	DUO2003000 Triggers	DUO2004000 3G modem	DUO2005000 Extended triggers	DUO2006000 Advanced indicators	DUO2007000 PNLT/PNLT	DUO2008000 Weather
DUO3005000 Wi-Fi Logger	○	○	○	○	○	○	○	○
DUO3006000 Wi-Fi Analyzer	●	○	○	○	○	○	○	○
DUO3007000 Wi-Fi Expert	●	●	●	○	○	○	○	○
DUO3008000 Wi-Fi /3G Logger	○	○	●	●	○	○	○	○
DUO3009000 Wi-Fi /3G Analyzer	●	○	●	●	○	○	○	○
DUO3010000 Wi-Fi /3G Expert	●	●	●	●	○	○	○	○
DUO3011000 Wi-Fi/3G Advanced	●	●	●	●	●	●	○	○

● Included ○ Option

## TECHNICAL SPECIFICATIONS

### IEC Class

IEC 61672-1 (2002-2005) (0° and 90°), class 1  
IEC 61260 (1995) NF EN 61260/A1 (2002)

### Dynamic range

20-137 dB (A, B), 25-137 dB (C), 30-137 dB (Z),  
1 single range for a rated sensitivity of 50 mV/Pa  
(between 46 and 56mV/Pa)

### Linear operating range for A weighting (5 frequencies)

31,5 Hz: 20-97 dB

1 kHz: 20-137 dB

4 kHz: 20-137 dB

8 kHz: 20-133 dB

12,5 kHz: 20-129 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 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	B	C	Z	A	B	C	Z
F	X	X	X	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	X	X	X
I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pk			X	X												

PNL and PNLt (Perceived noise level) aircraft and helicopter

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° and 90°, correction applicable for internal input and external input if used with DMK01

### 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

### Audio recording triggers

Simultaneously with events and manual (using DUO integrated key and dBDO remote control software)

### Automatic event detection

5 user-defined events: markers 6 to 10

24 user-defined periods per day

An event is defined by a logic combination of up to 5 different triggers ("and" or "or")

### Triggers

Pre-trigger, post trigger, minimum duration, end duration

Based on instantaneous acoustic (broadband and spectral) and weather data (except wind direction) and TTL input

### Manual markers

On DUO instrument: marker 1

On dBDO remote interface software: 5 markers 1 to 5

### Timers

Immediate, differed, daily periodic

Audio: periodic

### All weather microphone + nose cone

½" pre-polarized GRAS microphone type 40CD

Nose cone RA0208; stainless steel

### Background noise (typical)

Microphone (thermal noise): 14.5 dBA, 15.3 dBZ

Electronic: 11 dBA, 18.5 dBZ

Total: 16.1 dBA; 20.2 dBZ

### 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 standard  
Point to point connection only

**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 dBDOU  
Integrated FTP server for data access

**Voice activation on cellular network**

Possibility to call DUO phone number with « voice » subscription to listen to the on-going measurement;  
Gain 20dB gain, signal compression in modem

**SMS alarms**

- On event: SMS text with DUO serial #, location, date and time, user defined text, IP address:http port
- On low battery (10% and 6%): SMS text with DUO serial #, location, date and time, % remaining battery
- On movement: SMS text with DUO serial #, location, date and time, GPS coordinates, distance from previous location, IP address:http port (the alarm trigs if DUO has moved more than the user defined distance)

**Automatic SMS actions**

By sending "IP" by SMS to DUO it replies by sending an SMS with DUO serial #, location, date and time, IP address: http port and automatically sends a new SMS at every new IP address in case of floating IP

**Actions on SMS sent to DUO**

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

**dBDOU refresh rate webpages**

Standard: twice per second  
Mobile: once per second

**Analog output**

Audio: A, B, C or Z  
Gain: 0, 10, 20, 30, 40, 50 dB  
(Disabled if external input selected)

**Electrical check**

User defined periods 1, 2 or 4 times a day (0:00; 0:00 and 12:00; 0:00, 6:00, 12:00 and 18:00)  
3 predefined frequencies (1000, 2000 and 4000 Hz) and 2 user defined frequencies (between 10 Hz and 20 kHz)  
2 user defined excitation levels, max 5V (100%)

**External preamplifier 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 18.9 Ah  
Non removable, charging time around 8 hours

**Typical power consumption**

Without communication: < 800 mW  
+ Wi-Fi: < 1100 mW  
+ Modem: <3500 mW

**Autonomy**

(For temperatures between 10°C and 50°C, in LOG mode with  $T = 1s$ , fine  $T = 100ms$ , 1/3octave band spectra and audio recording on trigger during 10% of the time)

60 hours with Wi-Fi active communication during 10% of the time  
48 hours with 3G active communication during 10% of the time

**External power supply**

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

**Memory**

32GB (or more) SD-, SDHC- or SDXC-cards (2GB = standard delivery) for measured data and audio. Recommendation is Class 10 minimum.  
01dB delivers tested/validated 2GB & 32GB SD-Cards for usage with DUO.  
Data stored on DUO SD card every 5 seconds.  
Nonvolatile memory for storage of configurations, system log, calibration data (500) and electrical checks (500)

**Clock**

GPS PPS, error < 50 ms  
NTP Synchronisation  
Internal clock drift < 0.5s/24h

**Localization**

Automatic with integrated GPS  
Information stored with measurement campaigns

**Warm-up time**

From power off: < 20 seconds

**Operating temperature**

-10°C to +50 °C

**Humidity**

CEI 60068-2-78: damp heat 90% HR (none condensing at 40°C)

**Electromagnetic compatibility**

According to Directive 2004/108/EC

**Protection**

IP55 mounted vertically with connectors cover

**Weight and dimensions**

1100 g - H x L x P: 360 x70 x 52 mm

**Accessories**

- Weatherproof external charger IP67 (10m cable)
- Weather station Vaisala type WMT52 specific for DUO (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 DUO, includes weatherproof external charger for powering simultaneously DUO and the weather station
- Outdoor microphone unit type DMK01 including preamplifier type PRE22

Connecting these accessories has no influence on measurements.

## DELIVERABLES AND OPTIONAL ACCESSORIES

Deliverable DUO			Optional accessories	
				
Noise cone	Windscreen	Fastening profile	DUODataCollector	dBTrait
				
Microphone			Internet tablet	Smartphone
			Anti-theft system	Outdoor microphone kit
dBDO				
				
Metal plate			Calibrator	SD card, 32 Go
				
SD card, 2Go	Mini-USB cable	Connectors cover	Weather station 6 parameters	Weather station 2 parameters
				
			Weatherproof charger	Clamp for pole mounting
Standard carrying case	User manual Getting started Metrological documentation	Charger block		
			Rolling backpack	Suction pads

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