

### Applications

- Acoustic insulation in one third octave bands
- Environmental noise evaluation (ISO 1996-2); detection of tonal components, impulsiveness and low frequency analysis.
- Frequency analysis of industrial and environmental noise
- Detection and identification of sound sources

### User friendly

- Measures all parameters simultaneously with frequency weightings A, C and Z
- One single range 23 - 137dBA; up to 140 dB peak (no range setting)
- Back Light graphic screen and membrane keyboard for easy use

### Features

- Integrating sound level meter type 1 according IEC and ANSI
- Real time spectrum analyser, octave band 31.5 Hz to 16 kHz and one third octave band 20 Hz to 10 kHz.
- Mass storage of data in memory
- Direct printing
- Circular memory available
- Includes software and cable for real time retrieval of all measured and recorded data to a PC, Bluetooth® wireless technology
- Extension Modules: Reverberation time measurement, extended frequency analysis (10 Hz to 20 kHz) and vibration measurement (1 Hz to 80 Hz)

The **SC310** is a powerful and easy to use instrument. It can work as integrating sound level meter type 1 according to IEC 60651, IEC 60804, IEC 61672, ANSI S1.4 and ANSI S1.43. It is also a real time spectrum analyser in one-third octave band and octave band, with type 1 filters according to IEC 61260 and EN 61260. The **SC310** also fullfils the standard ANSI S1.11 standard.

The **SC310** has a single range, there is no need to make any scale adjustments. It also measures all functions simultaneously. These functions are the ones needed to calculate the basic noise evaluation figures of most of the countries in the world: S, F and I functions, Equivalent continuous levels, Percentiles, Impulsiveness indexes, Peak levels, Sound exposure levels, Short functions, etc.

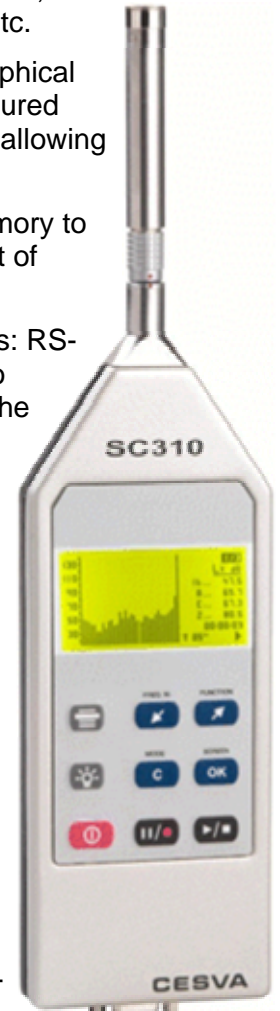
The **SC310**'s graphic screen provides graphical and numerical representation of the measured functions. The screen can be illuminated, allowing the user to work in low-light conditions.

The **SC310** has an extensive internal memory to record all the measured data. The amount of stored functions is configurable.

The **SC310** has two communications ports: RS-232 and USB. The USB port allows you to download quickly all the stored data and the RS-232 port allows you to configure communication ports through modem (BTN or mobile) or wireless (Bluetooth®). A serial printer can be connected to the the RS-232 port to print in real time all functions measured by the **SC310**.

The preamplifier of the **SC310** is removable. It can therefore be uncoupled and moved away from the **SC310** by means of the extension cables (CN-003, CN-010 or CN-030). Also allows you to use the outdoor kit (TK-1000) for outdoor measurements.

The power and versatility of the **SC310** and its user-friendly design defines it as the perfect hand held instrument for precision acoustic measurements.



### Sound Level Meter mode

$L_{AF}$     $L_{CF}$     $L_{ZF}$   
 $L_{AFmax}$     $L_{CFmax}$     $L_{ZFmax}$   
 $L_{AFmin}$     $L_{CFmin}$     $L_{ZFmin}$   
 $L_{AS}$     $L_{CS}$     $L_{ZS}$   
 $L_{ASmax}$     $L_{CSmax}$     $L_{ZSmax}$   
 $L_{ASmin}$     $L_{CSmin}$     $L_{ZSmin}$   
 $L_{AI}$     $L_{CI}$     $L_{ZI}$   
 $L_{AImax}$     $L_{CImax}$     $L_{ZImax}$   
 $L_{AImin}$     $L_{CImin}$     $L_{ZImin}$   
 $L_{AT}$     $L_{CT}$     $L_{ZT}$   
 $L_{ATmax}$     $L_{CTmax}$     $L_{ZTmax}$   
 $L_{At}$     $L_{Ct}$     $L_{Zt}$   
 $L_{AE}$     $L_{CE}$     $L_{ZE}$   
 $L_{Apeak}$     $L_{Cpeak}$     $L_{Zpeak}$   
 $L_{AIT}$     $L_{CIT}$     $L_{ZIT}$   
 $L_{AIt}$     $L_{CIIt}$     $L_{ZIt}$   
 $L_{AIT-LAT}$     $L_{CIT-LCT}$     $L_{ZIT-LZT}$   
 $L_{AIIt-LAt}$     $L_{CIIt-LCt}$     $L_{ZIIt-LZt}$   
 $L_{CT-LAT}$   
 $L_{Ct-LAt}$   
 $t, T$   
 $L_1, L_5, L_{10}, L_{50}, L_{90}, L_{95} \text{ y } L_{99}$

### Short functions 125 ms

$L_{AF}$     $L_{CF}$     $L_{ZF}$   
 $L_{AS}$     $L_{CS}$     $L_{ZS}$   
 $L_{AI}$     $L_{CI}$     $L_{ZI}$   
 $L_{Apeak}$     $L_{Cpeak}$     $L_{Zpeak}$   
 $L_{AT}$     $L_{CT}$     $L_{ZT}$   
 where  $T=125 \text{ ms}$

### Analyser 1/1 mode

$L_{AT}$     $L_{CT}$     $L_{ZT}$   
 $L_{AT_f}$     $L_{CT_f}$     $L_{ZT_f}$   
 $L_{Apeak}$     $L_{Cpeak}$     $L_{Zpeak}$   
 $L_1, L_5, L_{10}, L_{50}, L_{90}, L_{95} \text{ y } L_{99}$

### Short functions 125 ms

$L_{AT}$     $L_{CT}$     $L_{ZT}$   
 $L_{AT_f}$     $L_{CT_f}$     $L_{ZT_f}$   
 $L_{Apeak}$     $L_{Cpeak}$     $L_{Zpeak}$   
 which  $T=125 \text{ ms}$   
 where  $f: [31,5 \dots 16 \text{ kHz}]$

### Analyser 1/3 mode

$L_{AT_f}$     $L_{CT_f}$     $L_{ZT_f}$   
 where  $f: [20 \text{ Hz} \dots 10 \text{ kHz}]$

### Short functions 125 ms

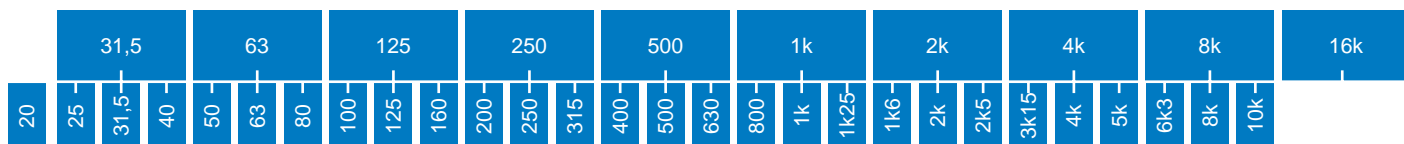
$L_{AT_f}$     $L_{CT_f}$     $L_{ZT_f}$   
 which  $T=125 \text{ ms}$   
 where  $f: [20 \dots 10 \text{ kHz}]$

Nom	Description of Sound Level Meter mode functions
$L_{XF}$	Sound pressure level with fast time weighting (Fast)
$L_{XS}$	Sound pressure level with slow time weighting (Slow)
$L_{XI}$	Sound pressure level with impulse time weighting (Impulse)
$L_{XT}$	Equivalent continuous sound pressure level with integration time T
$L_{Xt}$	Equivalent continuous sound pressure level of the entire measurement
$L_{XE}$	Sound exposure level S.E.L.
$L_{Xpeak}$	Peak sound pressure level
$L_{XIT}$	Equivalent continuous sound pressure level with impulse time weighting and integration time T
$L_{XIt}$	Equivalent continuous sound pressure level of the entire measurement with impulse time weighting
$L_{XIT-LXT}$	Dynamic subtraction of the equivalent continuous sound pressure level with impulse time weighting and the equivalent continuous sound pressure level, both with integration time T for according 1996-2
$L_{XIt-LXt}$	Dynamic subtraction of the equivalent continuous sound pressure level with impulse time weighting and the equivalent continuous sound pressure level, both with the integration time equal to the measurement time t according ISO 1996-2
$L_{CT-LAT}$	Dynamic subtraction of the equivalent continuous sound pressure level with A and C frequency weighting and integration time T according ISO 1996-2
$L_{Ct-LAt}$	Dynamic subtraction of the equivalent continuous sound pressure level with A and C frequency weighting and integration time equal to the measurement time according ISO 1996-2
t	Measurement time
T	Integration time
$L_n [n=1, 5, 10, 50, 90, 95 \text{ y } 99]$	Percentiles, with frequency weighting A
Short Fun.	Functions with 125 ms integration time

Nom	Description of Analyser mode 1/1 functions
$L_{XT}$	Equivalent continuous sound pressure level with integration time T
$L_{XT_f}$	Equivalent continuous sound pressure level with integration time T for the octave band f. (See graphic below)
$L_{Xpeak}$	Peak sound pressure level
$L_n [n=1, 5, 10, 50, 90, 95 \text{ y } 99]$	Percentiles, with frequency weighting A
Short Fun.	Functions with 125 ms integration time

Nom	Description of Analyser mode 1/3 functions
$L_{XT_f}$	Equivalent continuous sound pressure level with integration time T for the octave band f (see graphic below).
Short Fun.	Functions with 125 ms integration time

X: Frequency weighting A, C and Z





Bluetooth® Device for wireless communications for the Sound Level Meter, BT001



Bluetooth® Device for wireless communications for the PC, BT002



Audio cable for the Sound Level Meter, CN1DA



Mains feeder AM240 and converter for battery AM140



Extension cable of 3, 10 or 30 m for preamplifier and microphone, CN-003, CN-010 and CN-030

### Supplied accessories

<b>FNS-030</b>	Case
<b>PVM-05</b>	Windscreen
<b>STF030</b>	Software for PC
<b>CN1US</b>	Cable USB with connector mini –USB 2 batteries of 1,5 volts

### Optional accessories

<b>CB-5</b>	Sound calibrator
<b>TR-001</b>	Tripod adaptor
<b>TR-40</b>	Tripod
<b>ML-50</b>	Transport briefcase (49 x 36 x 14 cm)
<b>ML-10</b>	Transport briefcase (30 x 38 x 8 cm)
<b>AM240</b>	Mains feeder 230 V 50 Hz to 4 V
<b>AM140</b>	Converter for battery 12 V to 4 V
<b>TK-1000</b>	Outdoor kit
<b>CN-003</b>	Extension cable 3 m
<b>CN-010</b>	Extension cable 10 m
<b>CN-030</b>	Extension cable 30 m
<b>CN1DA</b>	AC output audio cable
<b>MA101</b>	Modem adaptor
<b>BT001</b>	Bluetooth® device for the Sound Level Meter
<b>BT002</b>	Bluetooth® device for the PC
<b>IM003</b>	Serial printer of 40 columns
<b>RT310</b>	Reverberation time module
<b>EF310</b>	Extended frequency range module
<b>VM310</b>	Module for the measurement of vibrations

### Sound Level Meter Mode

#### Kind of Recording

Functions 1 s (82 functions each second)	4 days	16 hours
Functions 125 ms (15 functions each 125 ms)	3 days	5 hours
$L_T + L_{IT}$ and partial percentiles each T T=1 s	28 days	18 hours
T=1 min	4 years	9 months
F1 each second	8 months	14 days
F1, F2 and F3 *	3 months	9 days
F1, F2 and F3 (+) **	18 days	22 hours

### Spectrum Analyser Mode 1/1 octave

#### Kind of Recording

Functions T T=1 s	4 days	3 hours
T=1 min	8 months	9 days
Functions 125 ms	3 days	
Functions T + 125 ms T=1 s	1 days	18 hours
$L_T(+)$ each T T=1 s	23 days	12 hours

### Spectrum Analyser Mode 1/3 Octave

#### Kind of Recording

Functions T T=1 s	13 days	15 hours
T=1min	2 years	3 months
Functions 125 ms	1 day	17 hours
Functions T+125 ms T=1 s	1 day	12 hours

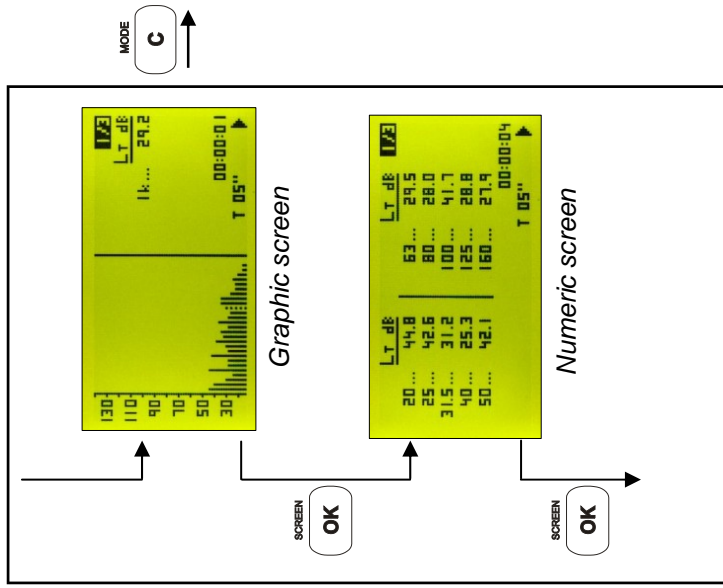
\* F1, F2 and F3 are the acoustical functions selected by the user on the preferences screen. They may be any of the different functions the SC310 measures in sound level meter mode.

\*\* F1, F2 and F3 (+) kind of recording stores each second:  $L_{Cpeak}$  each second,  $L_{AF}$  sampled each 125 ms (8 values per second),  $L_{AT}$  with integration time 125 ms (Short  $L_{eq}$ ) (8 values per second) and F1, F2 and F3 each second. This kind of recording is very interesting because it stores the basic function: Short  $L_{eq}$ , Fast each 125 ms (to calculate statistical information), Peak level and three programmable functions.

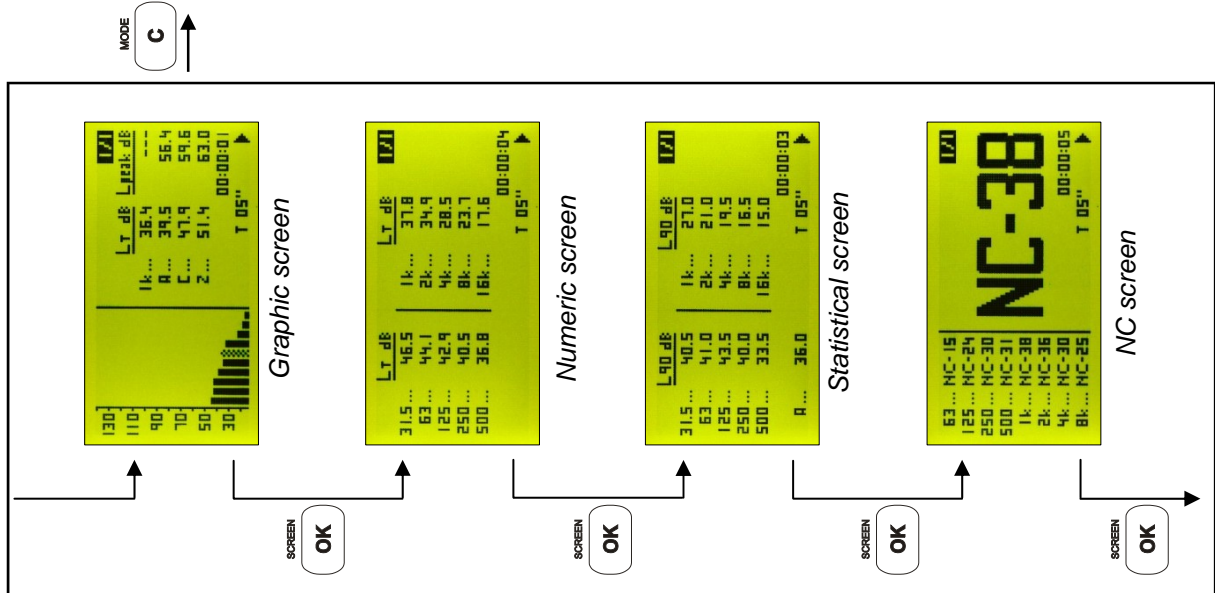
The **SC310** can store in its internal memory the values of the measured functions. When the unit is switched off, data do not get lost and may be retrieved and displayed directly from the **SC310** or transferred to a PC. The memory may be erased directly from the **SC310**.

The **SC310** allows you to download the stored data simultaneously with the process of measurement and recording. This characteristic together with the possibility of configuring the free memory space as a circular memory, converts the **SC310** in the perfect platform for permanent acoustic monitoring.

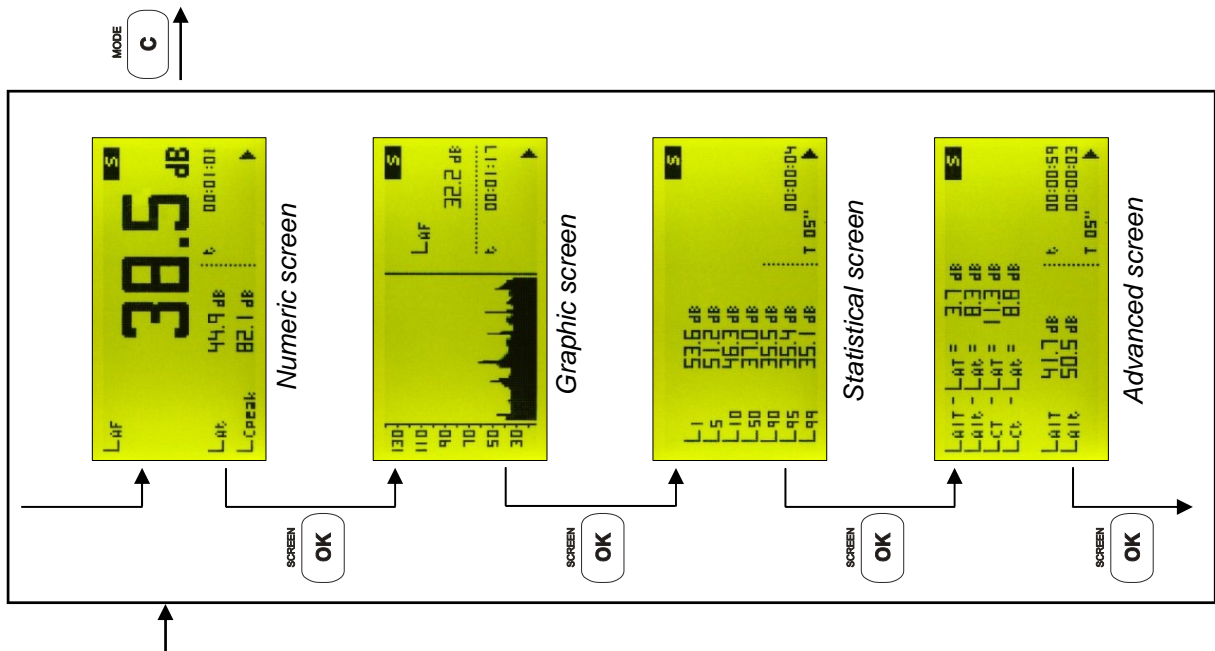
#### 1/3 Spectrum Analyser mode



#### 1/1 Spectrum Analyser Mode



#### Sound Level Meter Mode



### Standards and Specifications

Complies with the following standard:

- EN 60651:94 (A1:94) (A2 :01) type 1, EN 60804:00 type 1, EN 61260:95 (A1:01) type 1
- IEC 60651:01 type 1, IEC 60804:00 type 1, IEC 61260:95 (A1:01) type 1
- ANSI S1.4:83 (A1:01) type 1, ANSI S1.43:97(A2:02) type 1, ANSI S1.11:04
- **CE** Complies with 73/23/CEE and CEM 89/336/CEE low-tension regulations, the latter amended by 93/68/CEE.

### Measurement range

- **L<sub>F</sub>, L<sub>S</sub>, L<sub>I</sub>, L<sub>T</sub> and L<sub>t</sub>**

Indicator limits: 0 – 157 dB

	C-130 + PA-13			C-250 + PA-14		
	A	C	Z	A	C	Z
Primary range						
Upper limit	120	120	120	120	120	120
Lower limit	30	32	38	28	29	34
Measurement range:						
Upper limit:	137	137	137	137	137	137
Crest factor 3:	130	130	130	130	130	130
Crest factor 5:	126	126	126	126	126	126
Crest factor 10:	120	120	120	120	120	120
Lower limit:	24	26	31	22	22	27

- **L<sub>peak</sub>**

Indicator limits: 0 – 160 dB

### Electrical Noise

	C-130 + PA-13			C-250 + PA 14		
	A	C	Z	A	C	Z
• Electrical Noise:						
Maximum	14,4	16,8	21,9	9,4	10,5	18,5
Typical	13,4	15,8	20,0	8,6	8,8	16,3
• Total noise (electrical + thermal of microphone)						
Maximum	19,6	21,1	25,9	16,6	16,8	22,0
Typical	17,6	19,0	22,0	15,7	15,1	18,8

### Frequency weighting

Complies with the EN 60651 type 1 standard  
Weightings A, C and Z

### Memory

64 Mbytes

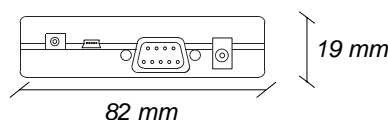
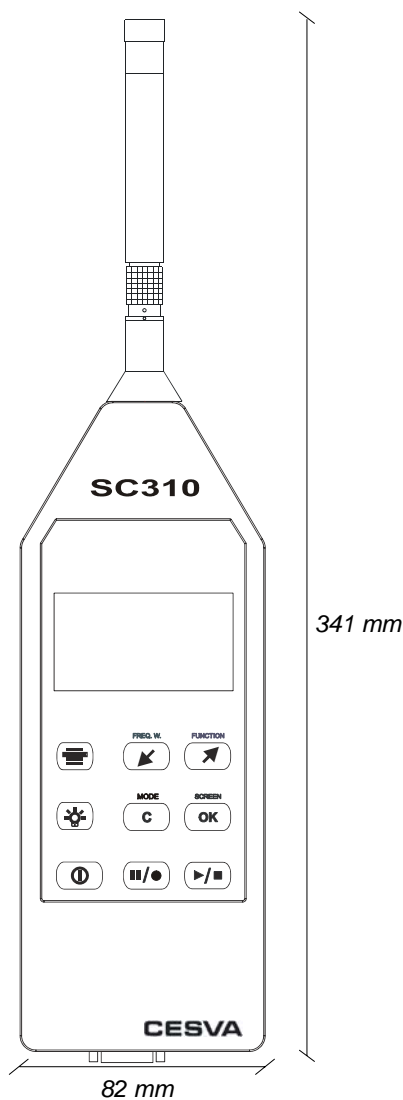
### AC Output

Frequency weighting: lineal

Sensitivity to 137 dB and 1 kHz (Gain = 0dB): 6,5 Vrms (typical)

Upper limit: 8,1 Vrms (typical) ; Output impedance: 100 Ω

Gain: 0 and 40 ± 0,2 dB



#### Microphone

- Model **CESVA C-130**: Condenser microphone ½ ". Polarized: 200 V. Nominal capacity: 22,5 pF. Nominal sensitivity : 17,5 mV/Pa in reference conditions. Preamplifier: PA-13
- Model **CESVA C-250**: Condenser microphone ½ ". Polarized: 0 V. Nominal capacity: 17,0 pF. Nominal sensitivity: 46,4 mV/Pa in reference conditions. Preamplifier: PA-14

#### Time weighting

$L_F$ ,  $L_S$ ,  $L_I$  according to class 1 tolerances

#### Parameters

See table | Resolution: 0,1dB

#### Octave filters

Type 1 according IEC 61260:95/ A1:01 Nominal octave bands central frequency: 31,5, 63, 125, 250, 500, 1000, 2000, 4000, 8000, 16000 Hz

#### Third octave filters

Type 1 according EN 61260:95/ A1:01 Nominal third octave bands central frequency: 20, 25, 31,5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10000 Hz

#### Influence of Humidity

Operation range: 30 to 90 %  
 Maximum error at 30%<R.H.<90%, 40 °C and 1 kHz: 0,5 dB  
 Storage without batteries: < 93 %

#### Effects of magnetic fields

In an 80 A/m magnetic field (1 oersted) at 50 Hz a reading of less than 25 dB(A) is given

#### Influence of temperature

Operation range: -10 to +50 °C  
 Maximum error (-10 to +50°C): 0,5 dB  
 Storage without batteries: -20 to +60 °C

#### Effects of vibrations

For frequencies between 20 and 1000 Hz and 1 m/s<sup>2</sup>:  
 < 75 dB(A)

#### Battery

2 batteries of 1,5 V type LR6 size AA.

Battery life with continuous use:

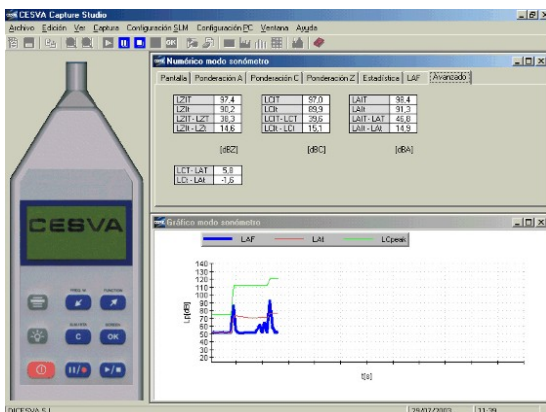
- Sound Level Meter Mode: 15 hours
- Spectrum Analyser Mode 1/1: 13 hours
- Spectrum Analyser Mode 1/3: 11,5 hours

Mains feeder: AM240 (EU) or AM241 (USA)

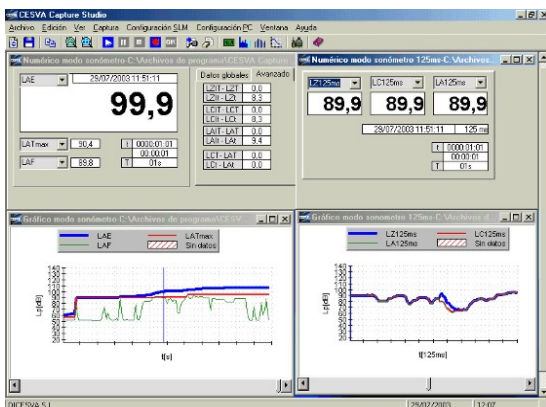
#### Dimensions and Weight

Dimensions: 341 x 82 x 19 mm

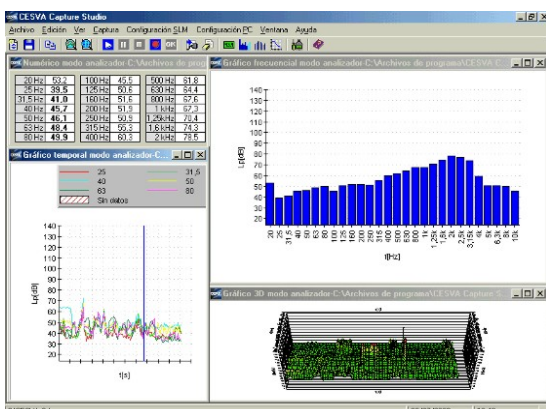
Weight: with battery 550 g ; without battery 500 g



Real time data acquisition



Graphical display of data 1 s and 125 ms

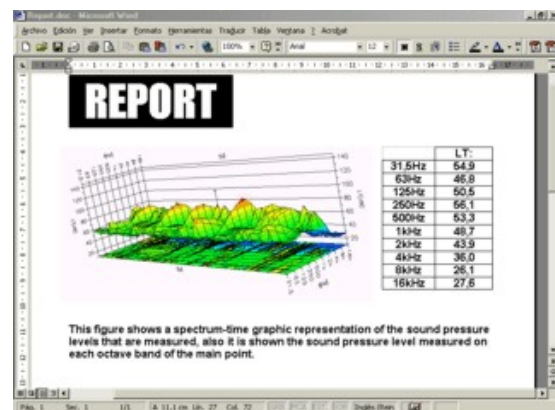


Graphical display of data (1/3 octave)

The SC310 is supplied with the software application **CAPTURE Studio** included in price that allows you to:

- Configure the SC310 with only one key stroke
- Retrieve data from the SC310 in real time.
- Download registers from the SC310 memory to a PC.
- Configure the SC310 memory .
- Display graphically and numerically the data files and convert them into different formats (.txt, .xls, .mdb)
- System of encrypted file. The files are saved in a \*.ccf own format and cannot be changed. This guarantees the total integrity of the data.

**CAPTURE Studio** provides you with a convenient, easy-to-use environment for obtaining, in digital format, data acquired by the SC310, it runs in PC under Windows 9x/Me/2000/NT/XP



Data exportation to other applications

#### 1/1 Reverberation time mode by octave band analysis

	LN dB	Δ dB	T30 s	T20 s	R/T
63	42.0	59.0	0.69	0.56	
125	35.3	73.0	0.65	0.55	
250	38.1	78.2	0.64	0.58	
500	36.1	77.4	0.79	0.76	
1k	31.2	77.6	0.90	0.94	
2k	25.7	80.2	0.87	0.84	
4k	20.1	78.9	0.78	0.77	

#### 1/3 Reverberation time mode by one third octave band analysis

	LN dB	Δ dB	T30 s	T20 s	R/T
50	39.9	46.6	1.01	1.15	
63	44.1	51.8	0.43	0.52	
80	32.3	62.9	0.30	0.35	
100	33.9	63.8	0.42	0.30	
125	38.0	64.2	0.60	0.67	
160	35.5	68.7	0.81	0.86	
200	36.8	74.6	0.82	0.96	

	LN dB	Δ dB	T30 s	T20 s	R/T
250	37.4	72.0	0.60	0.55	
315	32.9	72.8	0.51	0.46	
400	36.5	71.3	0.76	0.69	
500	33.9	72.6	0.72	0.52	
630	35.4	67.8	0.89	0.70	
800	31.7	72.3	0.85	0.76	
1k	28.1	72.0	0.85	0.76	

	LN dB	Δ dB	T30 s	T20 s	R/T
1.25k	28.0	72.1	0.90	0.92	
1.6k	26.3	76.7	0.94	0.92	
2k	27.4	69.8	0.86	0.83	
2.5k	25.9	70.9	0.85	0.71	
3.15k	22.9	71.3	0.82	0.94	
4k	20.7	69.8	0.76	0.81	
5k	20.3	69.9	0.70	0.66	

The reverberation time (RT) module of the SC310, adds two new measurement modes: Octave band reverberation time measurement mode (1/1) (63 Hz to 4 kHz) and one-third octave band reverberation time measurement mode (1/3) (50 Hz to 5 kHz). Each of these modes allows:

- The simultaneously measurement of the reverberation time  $T_{20}$  and  $T_{30}$  for the corresponding bands by the interrupted noise method.

$T_{30}$  Is the time, expressed in seconds, that it is required for the sound pressure level to decrease 60 dB based on a 30 dB decay.

$T_{20}$  Is the time, expressed in seconds, that it is required for the sound pressure level to decrease 60 dB based on a 20 dB decay.

- Measurement range (depends on the frequency range):

Minimum RT: 0,1 s

Maximum RT: 10,0 s

- The automatic determination of the decay curve and its slope, based on a least square approximation.
- Decay curves calculated from the averaging time between 10 ms and 40 ms depending on the frequency band.
- The ability to store the results in memory:  $T_{20}$ ,  $T_{30}$ , and decay curves, for all octave and 1/3<sup>rd</sup> octave bands.

Calculation and measurement standards:

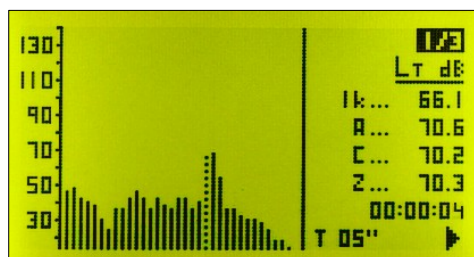
- ISO 3382:1997 Measurement of the reverberation time of rooms.
- ISO 354:1985 Measurement of sound absorption in a reverberation room.
- ISO 140:1998 Measurement of sound insulation in buildings and of building elements.

The Reverberation Time Module for the SC310 is optional and can be added to a new or used SC310.

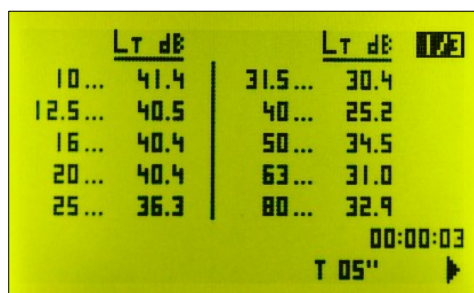
The following table shows the memory storage capacity of the different types of recordings.

Storage capacity	
MODE 1/1: Reverberation Time ( $T_{20}$ and $T_{30}$ ) + Background noise ( $L_N$ ) + maximum level ( $L_N + \Delta$ ) + decay time history	7900 Final results
MODE 1/3: Reverberation Time ( $T_{20}$ and $T_{30}$ ) + Background noise ( $L_N$ ) + maximum level ( $L_N + \Delta$ ) + decay time history	2600 Final results

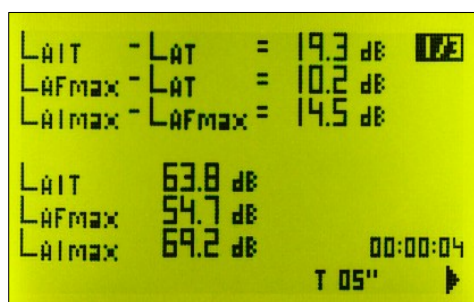
### 1/3 octave band spectrum analyser (10 Hz to 20 kHz)



Graphic screen



Numeric screen



Advanced acoustic parameters screen

The Extended Frequency Module for 1/3 Octave Band Analysis of the **SC310** sound level meter analyses in real time the spectrum in 1/3 octave bands from 10 Hz to 20 kHz in all dynamic measurement range (no range change is needed). The **SC310** measures the equivalent continuous sound pressure level with a programmable integrating time from 1 second until 99 hours without frequency weighting and the global equivalent continuous sound pressure level for the consecutive integrating time T with the frequency weighting A, C and Z. Simultaneously, the **SC310** measures, in real time, "short" levels (125 ms integration time) for the corresponding bands and global values and global levels. Also, the **SC310** measures a special acoustical functions with the purpose to provide complementary information to the graphical and numerical screen of the spectrum analyser in 1/3 octave bands.

Major applications:

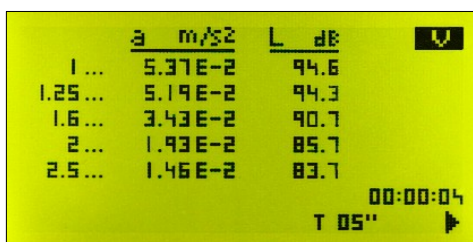
- Evaluation of tonal components, impulsiveness and low frequency
- Frequency analysis of noise produced by machinery (low frequency)
- Detection and identification of noise sources

The Extended Frequency Module for 1/3 Octave band analysis of the **SC310** is an optional module and it can be added to a new or used instrument.

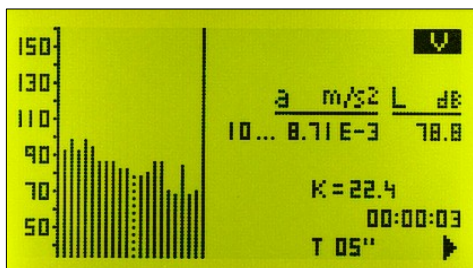
The storage capacity of the different types of recording can be found in the following table:

Type of recording	Storage capacity
Functions T and L <sub>T</sub> (+)	T= 1 s → 9 days 14 hours
Each T	T= 1 min → 1 year 7 months
Functions 125ms	1 day 7 hours
Functions T + 125ms	T=1 s → 1 day 3 hours
	T=1 min → 1 day 7 hours
	T=1 hour → 1 day 7 hours

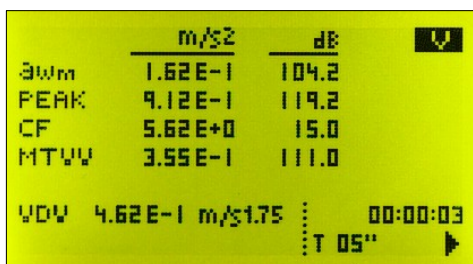
**1/3 octave band spectrum analyser (1Hz to 80 Hz)**



**1/3 octave band spectrum analyser (1Hz to 80 Hz) + k evaluation**



**Overall analysis with frequency weighting  $W_m$**



The “Human exposure to whole-body vibration in buildings” module of the **SC310** includes a new mode in order to measure structural vibration to which human beings are exposed in buildings. This new mode VIBRATION is designed according ISO 2631-2:2003 and together with the preamplifier PA001 and the accelerometer AC005 converts the **SC310** into a human vibration-measuring instrument according to ISO 8041.

This new module consists of 3 screens. The first one shows a 1/3 octave band real time spectrum analysis from 1 Hz to 80 Hz, showing the acceleration information in linear [m/s<sup>2</sup>] and logarithmic numerical values [dB referred to 10<sup>-6</sup> m/s<sup>2</sup>]. The Second one shows this spectral information in graphic format and also gives the evaluation of the multiplying factor K according to the old ISO 2631-2:1989. The third screen shows linear and logarithmic overall values of acceleration evaluation parameters such as a<sub>wm</sub>, peak, crest factor, MTVV (Maximum Transient Vibration Value)



and VDV (Vibration Dose Value). All these parameters with frequency weighting  $W_m$  (ISO 2631-2:2003).

The “Human exposure to whole-body vibration in buildings” module of the **SC310** is an optional module and it can be added to new instruments. For used ones, please consult.

*The characteristics, technical specifications and accessories may vary without prior notice*