

Integrating sound level meter real time frequency analyser

Applications

- Frequency analysis of industrial and environmental noise
- Evaluation the noise exposure of workers at workplace simultaneously to the verification of Personal Protective Equipment
- Precision Sound level measurements
- Sound insulation measurements

User friendly

- Measures all parameters simultaneously with frequency weightings A, C and Z (see table)
- One single range: 23 – 137 dBA; Up to 140 dB peak
- Graphic screen and membrane keyboard for easy use

Features

- Type 1 integrating sound level meter meeting ANSI S1.4:83 (A1 :85), ANSI S1.43:97 standards
- Octave band spectrum analyser 31,5 Hz–16 kHz. ANSI S1.11:86 type 1
- Measurement results can be stored in the memory
- Includes software for real time retrieval of all the measured and recorded data and their transmission to a PC
- Real time data transmission through wireless communication system Bluetooth®
- Detachable preamplifier for use of the extension cable (CNR-010) and the outdoor kit (TK-1000)
- Stores in memory the time and date of the last time the sensitivity was modified

The **SC-30** is a type 1, easy to use, integrating sound level meter that allows you to make sound measurements quickly, conveniently and easily. It has a single range, so there is no need to make any previous range adjustments. The **SC-30** simultaneously measures all the functions for each function modes (sound level meter or spectrum analyser) with frequency weightings A, C and Z (frequency weighting equal to 0 dB from 10 Hz to 20 kHz).

The **SC-30's** graphic screen provides graphical and numerical representation of the measured functions. The graphic display is very practical when it comes to evaluating the time history of a sound event or analysing its spectral contents. The screen is illuminated, allowing the user to work in insufficient light conditions. The data measured and recorded by the **SC-30** can be transferred to a personal computer so that they are available in electronic format.

The AC output allows you to obtain the signal from the preamplifier and make a calibrated recording of it on D.A.T. You can then subsequently analyse it both quantitatively (sound measurement, impulse or tone analyses) or qualitatively (the detection of specific events such as shouts, etc.).

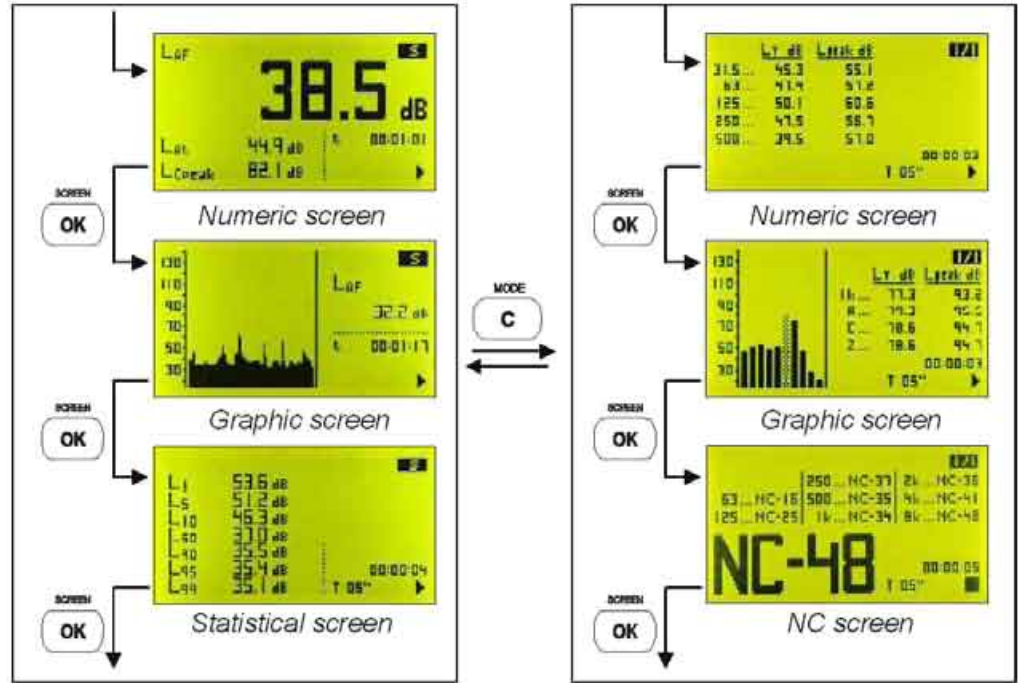
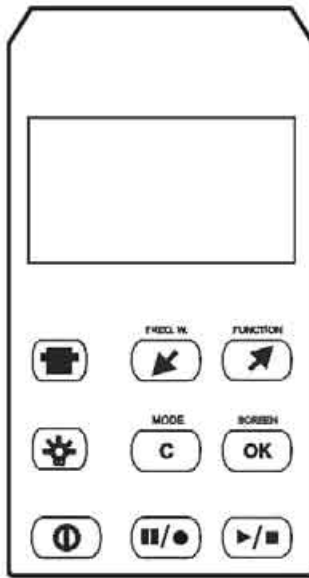
The preamplifier is detachable. It can therefore be uncoupled and moved away from the **SC-30** by means of an extension cable (CNR-010). An outdoor kit (TK-1000) is also available for measurement in the open air. The **SC-30** can be used as either a sound level meter or a spectrum analyser.

The sound level meter mode is ideal for measuring overall sound pressure levels. The **SC-30** simultaneously measures all the functions with all the frequency weightings and calculates statistical data as maximum and minimum values and percentiles.

The spectrum analyser mode allows you simultaneously and in real time to measure the sound pressure levels and the peak level for octave bands, centred on the frequencies 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hz (without frequency weighting) and the overall sound pressure levels and peak levels with all frequency weightings.



Diagram of the screens structure Available functions



Sound level meter mode

Analyser mode 1/1

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 _{ATmin} | L _{CTmin} | L _{ZTmin} |
| L _A | L _C | L _Z |
| L _{AE} | L _{CE} | L _{ZE} |
| L _{Apeak} | L _{Cpeak} | L _{Zpeak} |
- t, T
 L₁, L₅, L₁₀, L₅₀, L₉₀, L₉₅, L₉₉

Analyser mode 1/1

- | | | |
|----------------------|----------------------|----------------------|
| L _{AT} | L _{CT} | L _{ZT} |
| L _{AT_f} | L _{CT_f} | L _{ZT_f} |
| L _{Apeak} | L _{Cpeak} | L _{Zpeak} |
| L _{Apeak_f} | L _{Cpeak_f} | L _{Zpeak_f} |
- NC, NC_f
 NR, NR_f
 where f: [31,5 .. 16 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
t	Measurement time
T	Integration time
L _n [n=1, 5, 10, 50, 90, 95, 99]	Percentiles, with A frequency weighting

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 f octave band selected. (See graphic below)
L _{Xpeak}	Peak Sound pressure level
L _{Xpeak_f}	Peak Sound pressure level for the f octave band selected. (See graphic below)
NC	NC curve not exceeded by the measured spectrum
NR	NR curve not exceeded by the measured spectrum
NC _f	NC curve not exceeded by the measured spectrum in the f band. (See graphic below)
NR _f	NR curve not exceeded by the measured spectrum in the f band. (See graphic below)

X: Frequency weighting A, C and Z





Bluetooth® device for wireless communication for the Sound Level Meter, BT001



Bluetooth® device for wireless communication for the PC, BT002



Audio cable for the sound level meter, CN-DAT



Mains feeder A-200 and battery converter A-100



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

Standard accessories

- FNS-030** Case
- PVM-05** Windscreen
- STF030** Program for PC
- CN-201** Cable for connection to a PC
9 volt battery

Optional accessories

- CB-5** Acoustic calibrator
- TR001** Adaptor for tripod
- TR-40** Tripod (height 1.1 m)
- TR050** Tripod (height 1.55 m)
- TK-1000** Outdoor Kit
- CN-USB** Serial-USB converter cable
- CN-003** Extension cable
- CN-010** Extension cable
- CN-030** Extension cable
- CN-DAT** AC output audio cable
- A-200** Mains feeder 230 V 50 Hz to 9 V
- A-100** Battery converter 12 V to 9 V
- BT001** Bluetooth® device for the Sound Level Meter
- BT002** Bluetooth® device for the PC
- ML-50** Transport briefcase (49 x 36 x 14 cm)
- ML-10** Transport briefcase (30 x 38 x 8 cm)
- IM003** Printer 40 columns serial
- RT-030** Reverberation time module
- DS030** Dosimeter module for the assessment of noise at workplace

Sound level meter mode

Kind of recording

All each second	1 hour 30 minutes
F1, F2 y F3 each second	36 hour 21 minutes
F1 each second	84 hour 50 minutes
L_T and partial percentiles every T	
T= 1 s	12 hours
T= 1 min	1 month
T= 1 hour	5 years

Spectrum analyser mode in 1/1 octave band

Kind of recording

$L_T + L_{peak}$ of each octave band	
$L_T + L_{peak}$ global with frequency weighting A, C and Z	
Each T	
T=1 s	4 hours 45 minutes
T=1 min	11 days 21 hours
T=5 min	2 months
T=1 hour	2 years

* F1, F2 and F3 are the acoustic functions selected by the user on the preferential screen. They may be any of the 54 different functions the SC-30 measures in sound level meter mode.

The **SC-30** may store in its internal memory the values of the measured functions. When the unit is switched off, the data is saved and may be retrieved and displayed directly from the **SC-30** or transferred to a PC. The memory may be erased directly from the **SC-30**.

In the memory of the **SC-30** may be stored the final results of a measurement or continuous recordings of functions with programmable register time.

Standards and specifications

Complies with the following standards:

- 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 type 1
- **CE** . Mark complies with 73/23/CEE and CEM 89/336/CEE low-tension regulations, the latter amended by 93/68/CEE.

Measurement range

- L_F , L_S , L_I , L_T and L_r

Indicator limits:

0 – 137 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	50	50	50	50	50	50
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	27	32	22	23	27

- L_{peak}

Indicator limit:

0 – 140 dB

Electrical noise

	C-130 + PA-13			A-250 + PA-14		
	A	C	Z	A	C	Z
• Electrical noise:						
Maximum	15,5	22,0	23,5	14,5	22,0	22,5
Typical	14,5	17,3	21,3	8,6	8,8	15,4
• Total noise (electrical + thermic of the microphone)						
Maximum	21,2	23,0	26,0	19,3	23,3	24,0
Typical	19,0	22,0	24,0	16,9	16,9	21,9

Frequency weighting

Complies with the EN 60651 type 1 standard

Weightings A, C and Z

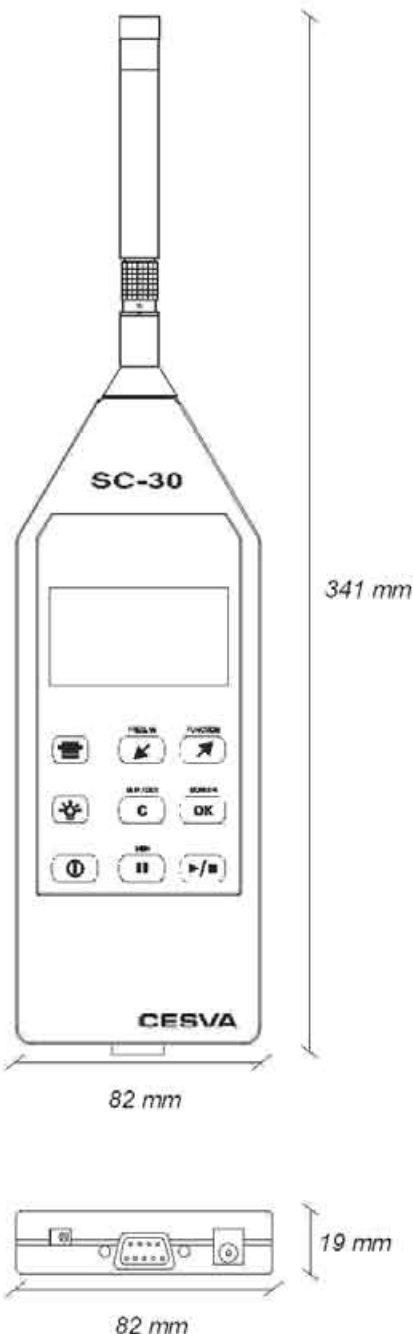
AC output

Frequency weighting: linear

Sensitivity to 137 dB and 1 kHz (Gain = 0dB): 7,4 V_{rms} (max)

Upper limit: 8,1 V_{rms} (typical) ; Output impedance: 100 Ω

Gain: 0 and 40 ± 0,2 dB



Microphone

- Model **CESVA C-130**: ½" Condenser microphone. Polarization: 200 V. Nominal capacity : 22,5 pF. Nominal Sensitivity : 17,5 mV/Pa ± 0,5 dB in reference conditions.
- Model **CESVA C-250**: ½" Condenser microphone. Polarization: 0 V. Nominal capacity: 17,0 pF. Nominal Sensitivity: 46,4 mV/Pa in reference conditions.

Time weighting

L_F, L_S, L_I and L_{peak} according class 1 tolerances

Parameters

See table | Resolution: 0,1dB

Octave filters

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

Influence of humidity

Operation range:	30 to 90 %
Maximum error at 30%<H.R.<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/s²: < 75 dB(A)

Battery

Battery of 9 V type 6LF22.

Battery life with continuous use:

- Sound Level Meter Mode: 8 hours
- Spectrum analyser mode: 6 hours

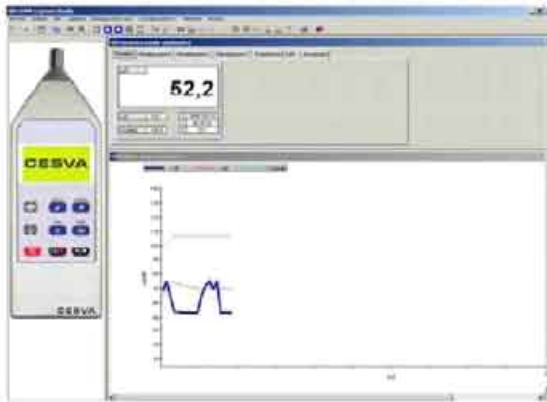
Mains feeder: A-200

Dimensions and weight

Dimensions: 341 x 82 x 19 mm

Weight:

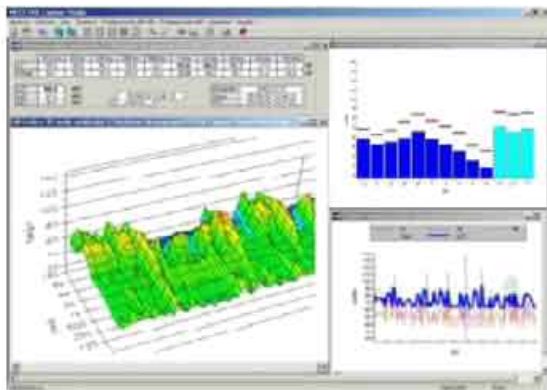
- With battery: 627 g
- Without battery: 573 g



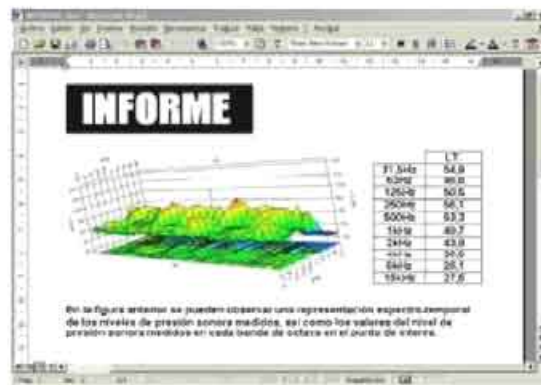
Real time data acquisition

The SC-30 is supplied with the software application **CAPTURE Studio** that allows you to:

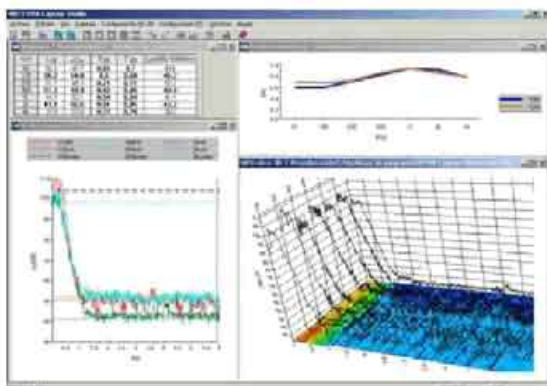
- Configure the SC-30
- Retrieve data from the SC-30 in real time.
- Download registers from the SC-30 memory to a PC.
- Erase the SC-30 memory.
- Display graphically and numerically the data files and convert them into different formats (.txt, .xls, .mdb)
- System of encrypted file. The files are saved in *.ccf own format and can not be changed and it guarantees the total integrity and legality of those.



Graphical display of data



Data exportation to other applications



Graphical display of data

CAPTURE Studio provides you with a convenient, easy-to-use environment for obtaining, in digital format, data acquired by the SC-30, it runs in PC under Windows 9x/Me/2000/NT/XP/VISTA.

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

Reverberation time mode in 1/1 octave bands

	L_N dB	Δ dB	T_{30} s	T_{20} s	[RT]
63	42.0	39.0	0.89	0.56	
125	35.3	33.0	0.65	0.55	
250	30.1	28.2	0.64	0.58	
500	36.1	37.4	0.79	0.76	
1k	31.2	37.6	0.90	0.94	
2k	25.7	30.2	0.87	0.84	
4k	20.1	28.9	0.78	0.77	

Calculus and measurement standards

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

The module of reverberation time measurement of the **SC-30** sound level meter allows:

- The simultaneous measurement of the reverberation time T_{20} and T_{30} by the interrupted noise method for the octave bands of 63, 125, 250, 500, 1000, 2000, and 4000 Hz.

T_{30} is the time, expressed in seconds, that it is required for the sound pressure level to decrease 60 dB. The T_{30} is the result of multiply by 2 the necessary time that takes the level to reduce 30dB.

T_{20} is the time, expressed in seconds, that it is required for the sound pressure level to decrease 60 dB. The T_{20} is the result of multiply by 3 the necessary time that takes the level to reduce 20dB.

- Measurement range (depends on the frequency band):
 TR minimum: 0,1 s
 TR maximum: 10,0 s
- The automatic detection of the decay curve and its slope estimation through a least square approximation.
- Decay curves calculated from the averaging time between 10 ms and 40 ms depending on the frequency band.
- The possibility of storing the results in memory: Values of T_{20} , T_{30} and decay curves, for all octave bands.

Procedure for the RT measurement

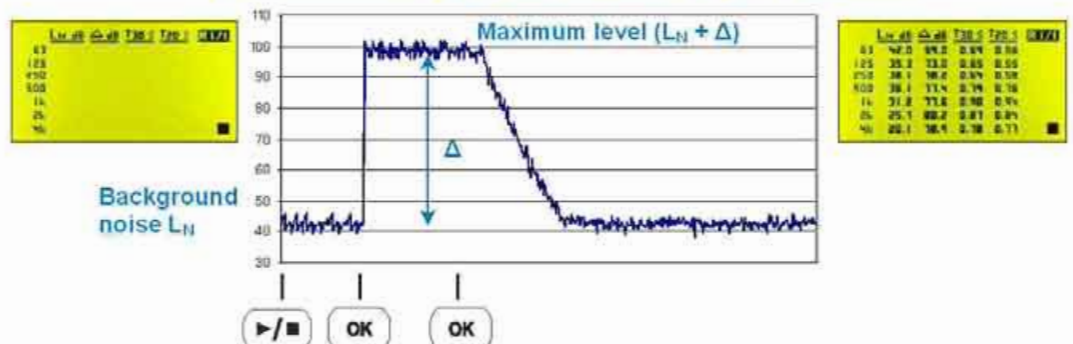
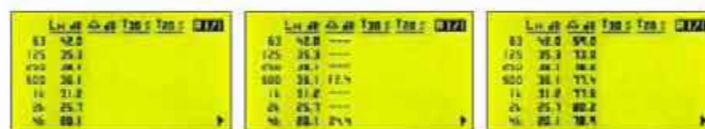
1. Switch the SC-30 to RT mode
2. Press **[▶/■]** to start the measurement process
3. Validate the background noise by pressing **[OK]**
4. Increase progressively the sound pressure level by starting the sound source
5. When the source emits the necessary sound pressure level and the acoustic field reaches the stationary state, press **[OK]** to validate this level
6. Stop the noise emission
7. After a few seconds from the noise emission stop it will appear at the screen of the SC-30 the RT values

Storage Capacity

Reverberation time (T_{20} and T_{30}) + Background noise (L_N) + maximum level ($L_N + \Delta$) + decay time history	100 measurements
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The reverberation time module for the **SC-30** is optional and may be purchased when buying the **SC-30** or later. All **SC-30** purchased before this date may be upgraded with this module.

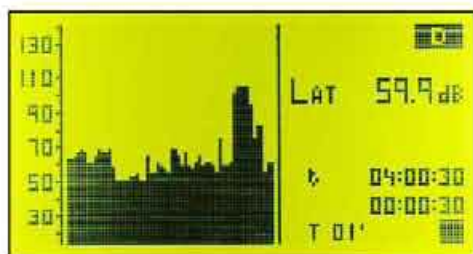
Next it appears a graphic with the steps that have to be followed to be able to make a reverberation time measurement.



Dosimeter Module for the assessment of noise at workplace



Numeric screen



Graphic screen



1/1 Spectrum analyser screen



Numeric screen (projected parameters)

The dosimeter module for the assessment of noise at workplace of the **SC-30** adds a new measurement mode that is perfect for the application of the Directive 2003/10/CE which adapts to the technical progress the regulation on protection of the health and safety of workers against the risks regarding the exposure to noise. In The Member States, the corresponding transposition to national law.

This dosimeter module allows you to simultaneously measure all parameters needed to assess the levels of noise to which workers are exposed when wearing or not hearing protectors (SNR, HML, Octaves).

The **SC-30** measures simultaneously the equivalent level with frequency weighting A and C [L_{At} , L_{Ct}], daily noise exposure level [$L_{EX,8h}$] (ISO 1999), Noise exposure in Pa^2h [E] and noise dose [DOSE] referred to a programmable Criterion Level [L_C], and, of course, also the Peak Level with frequency weighting C [L_{Cpeak}] (ISO 1999).

Moreover, the **SC-30** allow you to carry out the measurement during a time shorter than the exposition time, because it shows on the screen all parameters projected to the expected exposition time (programmable projection time [t_p]).

To evaluate the exposure to noise taking into account the attenuation of the individual hearing protectors worn by the worker, the **SC-30**, beside measuring the equivalent level with frequency weighting A and C [L_{At} , L_{Ct}] (SNR and HML method), simultaneously carries out a real time frequency analysis with frequency weighting A and by octave bands from 63 Hz to 8 kHz (Octave method).

The huge memory of the **SC-30** allows you to store the time history of the measured parameters, and afterwards recalculating them for any desired time interval.

The **SC-30** helps you to asses and measure the exposure to noise and also brings you all data needed to inform and train about the significance and potential risks of the results of the assessment and measurement.

Moreover, It helps you to design and run a reduction programme and to choose the suitable hearing protectors.

The **SC-30** is a type 1 integrating sound level meter conforming to EN 60804 and EN 61672, so it is the perfect instrument to carry out measurements with the worker being present or not. And because of being a Type 1 instrument, the metrological inaccuracies due to the instrument are negligible (ISO 9612).

The dosimeter module for the assessment of noise at workplace is not included with the **SC-30**. It is an optional module and it can be acquired when buying the **SC-30** or later.