The SC160 is a user-friendly, low cost, class 2 integrating sound level meter and real time octave band spectrum analyser* that allows you to make sound measurements quickly, conveniently and easily. It has a single range, so there is no need to make any range adjustments.

The SC160 simultaneously measures all the functions for each function mode (sound level meter or spectrum analyser*) with A, C, and Z frequency weightings. The SC160's graphic screen provides graphical and numerical representation of the functions measured.

The data measured and recorded by the SC160 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 on D.A.T.

The microphone is detachable. It can therefore be uncoupled and moved away from the SC160 by means of an extension cable (CNR-ITV).

The SC160 can be used as either a sound level meter or a spectrum analyser* and room noise evaluator by NC and NR curves.

The sound level meter mode is ideal for measuring overall sound pressure levels. The SC160 simultaneously measures all functions with all 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 levels and peak levels for octave bands from 31.5 Hz to 16 kHz and the overall sound pressure levels and peak levels A, C and Z with frequency weightings.

Within the analyser* mode there is a special screen to evaluate room noise, especially designed for HVAC system installers, engineers, and consultants, that allows you to assess noise in real time using the NC and NR curves criterion.

*ATTENTION: The Spectrum Analyser mode in octave bands is optional. Reference number SC160sb does not have this option. If you wish to incorporate it you should acquire module FB160. Reference number SC160cf does incorporate the analyser mode in octave bands.
SC160

Diagram of the screens structure
Available functions

Sound level meter mode

<table>
<thead>
<tr>
<th>Nom</th>
<th>Description of sound level meter mode functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{XF}$</td>
<td>Sound pressure level with fast time weighting (Fast)</td>
</tr>
<tr>
<td>$L_{XK}$</td>
<td>Sound pressure level with slow time weighting (Slow)</td>
</tr>
<tr>
<td>$L_{XI}$</td>
<td>Sound pressure level with impulse time weighting (Impulse)</td>
</tr>
<tr>
<td>$L_{XT}$</td>
<td>Equivalent continuous sound pressure level with $T$ integration time</td>
</tr>
<tr>
<td>$L_{XE}$</td>
<td>Sound exposure level S.E.L.</td>
</tr>
<tr>
<td>$L_{Xpeak}$</td>
<td>Peak sound pressure level</td>
</tr>
<tr>
<td>$L_i$</td>
<td>Measurement time</td>
</tr>
<tr>
<td>$T$</td>
<td>Integration time</td>
</tr>
<tr>
<td>$L_n$ (n=1, 5, 10, 50, 90, 95, 99)</td>
<td>Percentiles, with A frequency weighting</td>
</tr>
<tr>
<td>$L_{A1}$, $L_{C1}$, $L_{Z1}$</td>
<td>A, C and Z frequency weightings</td>
</tr>
</tbody>
</table>

Graphic screen

Analyser* mode 1/1

<table>
<thead>
<tr>
<th>Nom</th>
<th>Description of analyser* mode 1/1 functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{XT}$</td>
<td>Equivalent continuous sound pressure level with $T$ integration time</td>
</tr>
<tr>
<td>$L_{XT,f}$</td>
<td>Equivalent continuous sound pressure level with $T$ integration time for the $f$ octave band selected. (See graphic below)</td>
</tr>
<tr>
<td>$L_{Xpeak}$</td>
<td>Peak sound pressure level</td>
</tr>
<tr>
<td>$L_{Xpeak,f}$</td>
<td>Peak sound pressure level for the $f$ octave band selected. (See graphic below)</td>
</tr>
<tr>
<td>$NC$, $NC_f$</td>
<td>NC curve not exceeded by the measured spectrum</td>
</tr>
<tr>
<td>$NR$, $NR_f$</td>
<td>NR curve not exceeded by the measured spectrum</td>
</tr>
<tr>
<td>$NC_f$</td>
<td>NC curve not exceeded by the measured spectrum in the $f$ band. (See graphic below)</td>
</tr>
<tr>
<td>$NR_f$</td>
<td>NR curve not exceeded by the measured spectrum in the $f$ band. (See graphic below)</td>
</tr>
</tbody>
</table>

X: Frequency weighting A, C and Z

<table>
<thead>
<tr>
<th>X</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.5</td>
<td>63</td>
</tr>
<tr>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td>500</td>
<td>1k</td>
</tr>
<tr>
<td>2k</td>
<td>4k</td>
</tr>
<tr>
<td>8k</td>
<td>16k</td>
</tr>
</tbody>
</table>
SC160

Accessories

Standard accessories
- FNS-020 Case
- PVM-05 Windscreen
- STF030 Program for PC
- CN-201 Cable for connection to a PC
  - 9 volts battery

Optional accessories
- CB006 Class 1 acoustic calibrator
- CB004 Class 2 acoustic calibrator
- CNR-ITV Microphone extension cable
- CN-USB Serial-USB converter cable
- CN-DAT AC output audio cable
- TR-40 Tripod (height 1.1 m)
- TR050 Tripod (height 1.55 m)
- TR002 Tripod support for cable CNR-ITV
- A-200 Mains feeder 230 V 50 Hz to 9 V
- A-100 Battery converter 12 V to 9 V
- ML040 Transport briefcase (48 x 37 x 16 cm)
- ML-10 Transport briefcase (39 x 32 x 12 cm)
- ML060 Special outdoors transport briefcase (51x38x15 cm)
- IM003 Printer 40 columns serial
- RT-030 Reverberation time module
- TK1000 Outdoor kit

Audio cable for the sound level meter, CN-DAT

Extension cable for microphone, CNR-ITV

Mains feeder A-200 and battery converter
SC160

Storage capacity

<table>
<thead>
<tr>
<th>Sound Level Meter mode</th>
<th>Kind of recording</th>
<th>1 hour</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All each second</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1, F2 and F3 each second&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>36</td>
<td>21 minutes</td>
</tr>
<tr>
<td></td>
<td>F1 each second&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>84</td>
<td>50 minutes</td>
</tr>
<tr>
<td></td>
<td>L&lt;sub&gt;T&lt;/sub&gt; and partial percentiles every T</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T= 1 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T= 1 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T= 1 hour</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spectrum Analyser* mode in 1/1 octave band</th>
<th>Kind of recording</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L&lt;sub&gt;T&lt;/sub&gt; + L&lt;sub&gt;peak&lt;/sub&gt; of each octave band</td>
</tr>
<tr>
<td></td>
<td>L&lt;sub&gt;T&lt;/sub&gt; + L&lt;sub&gt;peak&lt;/sub&gt; global with A, C and Z frequency weighting</td>
</tr>
<tr>
<td></td>
<td>Each T</td>
</tr>
<tr>
<td></td>
<td>T=1 s</td>
</tr>
<tr>
<td></td>
<td>T=1 min</td>
</tr>
<tr>
<td></td>
<td>T=5 min</td>
</tr>
<tr>
<td></td>
<td>T=1 hour</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> 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 SC160 measures in sound level meter mode.

The SC160 can store in its internal memory the values of the functions measured. When the unit is switched off, the data is saved and may be retrieved and displayed directly from the SC160 or transferred to a PC. The memory may be erased directly from the SC160.

In the memory of the SC160 may be stored the final results of a measurement or continuous recordings of functions with programmable register time.
SC160

Technical specifications

Standards and specifications
Complies with the following standards.
• EN 61672 class 2, EN 60651:94 (A1:94) (A2:01) class 2, EN 60804:00 type 2, EN 61260:95 (A1:01) class 2
• IEC 61672 class 2, IEC 60651:01 class 2, IEC 60804:00 type 2, IEC 61260:95 (A1:01) class 2
• ANSI S1.4:83 (A1:01) type 2, ANSI S1.43:97 (A2:02) type 2, ANSI S1.11:04
• Mark complies with 73/23/CEE and CEM 89/336/CEE low-tension regulations, the latter amended by 93/68/CEE.

Measurement range

- \( L_F, L_S, L_I, L_T \text{ and } L_t \)
  - Indicator limits: 0 – 137 dB
  - Primary range: A C Z
    - Upper limit: 113 113 113
    - Lower limit: 36 36 40
  - Measurement range:
    - Upper limit: 137 137 137
    - Crest factor 3: 130 130 130
    - Crest factor 5: 126 126 126
    - Crest factor 10: 120 120 120
    - Lower limit: 19 21 32

- \( L_{\text{peak}} \)
  - Indicator limits: 0 – 140 dB

Peak detector \( L_{\text{peak}} \)
- Onset time constant: < 75 \( \mu s \)

Noise

- Electrical noise:
  - Maximum: A C Z
    - Maximum: 12 12.1 23.1
    - Typical: 9.1 11.4 18.5
  - Total noise (electrical + thermic of the microphone):
    - Maximum: 27.1 31.0 39.0
    - Typical: 25.3 29.0 35.0

Frequency weighting
Complies with the EN 61672, EN 60651 and EN 60804 type 2 standard
Weightings A, C and Z

AC output
Frequency weighting: linear
Sensitivity to 137 dB and 1 kHz (Gain = 0dB): 3.8 Vrms (max)
Upper limit: 7 Vpeak; Output impedance: 100 \( \Omega \)
Gain: 0 and 40 ± 0.2 dB
**Microphone**
- Model **CESVA P-05**: ½” Condenser microphone with preamplifier. Equivalent impedance: 3000 Ω. Nominal sensitivity: 16,0 mV/Pa in reference conditions.

**Time weighting**
- $L_F$, $L_S$, $L_I$ according class 2 tolerances

**Parameters**
- See table Resolution: 0,1dB

**Octave filters**
- Class 2 according to EN 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: 25 to 90 %
- Maximum error at 25% $<$ R.H. $<$ 90% at 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 25dB(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**
- 9 V Battery 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: 294 x 82 x 19 mm
- Weight:
  - With battery: 508 g
  - Without battery: 466 g
The SC160 is supplied with the software application CAPTURE Studio that allows you to:

• Configure the SC160
• Retrieve data from the SC160 in real time.
• Download registers from the SC160 memory to a PC.
• Erase the SC160 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 their own *.ccf format and cannot be changed which guarantees their total integrity and legality.

CAPTURE Studio provides you with a convenient, use-friendly environment for obtaining, in digital format, data acquired by the SC160, it runs in PC with Windows 9x/Me/2000/NT/XP/VISTA/7.

The characteristics, technical specifications and accessories may vary without prior notice.
The module of reverberation time measurement of the **SC160** Sound Level Meter allows:

- The simultaneous measurement of $T_{20}$ and $T_{30}$ reverberation times 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 by 60 dB. The $T_{30}$ is the result of multiplying by 2 the time that it takes for the level to decrease by 30 dB.

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

- Measurement range (depends on the frequency band):
  
  - **TR minimum**: 0.2 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.

**Calculation and measurement standards**


**Reverberation time module**

**Reverberation time mode in 1/1 octave bands**

![Reverberation time module](image)

**Procedure for the RT measurement**

1. Switch the SC160 to RT mode
2. Press [start] to start the measurement process
3. Validate the background noise by pressing [OK]
4. Progressively increase 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. A few seconds after the noise emission stops the RT values will appear on the screen of the SC160.

**Storage Capacity**

<table>
<thead>
<tr>
<th>Reverberation time ($T_{20}$ and $T_{30}$) + Background noise ($L_N$) + maximum level ($L_N + \Delta$) + decay time history</th>
<th>100 measurements</th>
</tr>
</thead>
</table>

The reverberation time module for the **SC160** is optional and may be purchased when buying the **SC160** or later. All **SC160** purchased before this date may be upgraded with this module.

Below a graphic is shown with the steps that must be followed to make a reverberation time measurement.
SC160

Dosimeter module for the assessment of noise in the workplace

The dosimeter module of the SC160 for the assessment of noise in the workplace adds a new measurement mode that is ideal for the application of Directive 2003/10/CE, which adapts the regulation on protection of the health and safety of workers from the risks of exposure to noise, to technical progress. In the member states, the corresponding transposition to national law applies.

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

The SC160 measures, simultaneously, the equivalent level with A and C frequency weighting \[ L_{At}, L_{Ct} \], daily noise exposure level \[ L_{EX,8h} \] (ISO 1999), noise exposure in Pa\(^2\)h [E] and noise dose \[ DOSE \] with reference to a programmable criterion level \[ L_C \], and, of course, also the Peak Level with C frequency weighting \[ L_{Cpeak} \] (ISO 1999).

Moreover, the SC160 allows you to carry out the measurement during a time shorter than the exposure time, because it shows on the screen all parameters projected to the expected exposure 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 SC160, besides measuring the equivalent level with A and C frequency weightings \[ L_{At}, L_{Ct} \] (SNR and HML method), simultaneously carries out a real time frequency analysis with A frequency weighting and by octave bands from 63 Hz to 8 kHz (Octave method).

The large memory of the SC160 allows you to store the time history of the parameters measured, and afterwards recalculate them for any desired time interval.

The SC160 helps you to assess and measure the exposure to noise and also brings you all the data needed to inform and train workers with regard to 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 most suitable hearing protectors.

The dosimeter module for the assessment of noise in the workplace is not included with the SC160. It is an optional module and it can be acquired when buying the SC160 or later.