# Bedrock Sound Level Meters & STIPA Meters

**SM Series Sound Level Meters** manufactured by Bedrock in the Netherlands, the inventors of STIPA are state-of-the-art acoustic measuring devices with the highest quality and reliability. Stanlay brings to market three distinct models- **SM30, SM50** (class 2 variants) and **SM90** (class 1 variant) sharing the same basic hardware platform and having the same intuitive user interface, but each optimized for a different set of demands and applications.


The **Bedrock SM30** Class 2 Sound Level Meter (SLM) also referred to as sound pressure level meter (SPL) is equipped with various modules including **real time analyzer (RTA), fast fourier transform (FFT) analyzer, RT60 measuring (reverberation time), noise curve analysis, total harmonic distortion plus noise (THD+N), statistical acoustics and building acoustics SRI/STC** among many others.

The **SM50 STIPA Meter** is an advanced sound level meter which includes all the functions of the SM30, plus additional modules for **speech intelligibility measurements (STIPA and full STI)**.

The **SM90 Class 1 Sound Level Meter** is the **ultimate STIPA meter** complying with the strictest requirements according to IEC-61672-1:2014 with capability of **Full STI**, apart from STIPA. The SM90 has a detachable microphone capsule interchangeable with most common type high-end UNC capsules of other manufacturers.

All models have **20- 20,000 KHz frequency Dynamic Range**. The **Full-color resistive LCD touch screen** and high speed USB2.0 output interface make it easy to use for anybody involved in (acoustic) testing and certification. All three models come with their individual **declaration of conformity** and **calibration certificate.**

The SM50 or SM90 instrument with BTB65 Talkbox provides speech intelligibility measurements using the STIPA method according to **most national and international standards**, including the following:

- **IEC-60268-16**
- **ISO-7240-19**
- **NFPA72 Annex D**
- **NEN2575**
- **DIN-60849/DIN-VDE-0833-4**
- **BS-5839-8**

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**SM30**
**Class 2 Sound Level Meter**

**SM50**
**Class 2 Sound Level Meter**

**SM90**
**Class 1 Sound Level Meter**


All Bedrock SMxx instruments feature an XLR connector which provide 48V phantom power to the microphone.

**Settings include**
Date. Time
Microphone type selection
Pre-Amp Gain
Backlight setting
Display brightness
Audio recording (On/Off)
Text annotations (On/Off)

## Conforming to Major International Standards:

- IEC-60268-16 rev. 4 & rev. 5
- IEC-61672 Class 2 / ANSI S1.4 Type 2
- IEC-61260 Class 0
- ISO-717-1 / ISO-16283 / ISO-140
- ASTM E336 / ASTM E413 ISO-3382-2
- ANSI S12.2 / ISO-1996 AES17

Bedrock SMxx range of advanced sound level meters with their versatile interface & **tripod mounted setup** can be used for a variety of measurement applications including environmental noise, noise pollution, vehicular noise, equipment & automotive design noise measurements, R&D, building acoustics, sound insulation, acoustic equipment testing, audio professionals amongst other applications.

## Sound pressure level & spectrum measurements:

- Built in conformance to various standards such as IEC- 61672-1:2013 , ASTM E336 etc.
- **Frequency weighting:** Z (linear, unweighted), A-weighted, C-weighted
- **Time weighting:** Fast (F), Slow (S) and Impulse (I)
- **Equivalent continuous (EQ):** computes the time-integrated level over the measurement interval; the level shown corresponds to the level of a continuous signal containing the same amount of energy as the measured signal.
- **Sound Exposure Level (SEL):** time-integrated value as described under EQ, but recalculated and normalized to 1 second.
- **Peak values (PK):** the highest instantaneous value within an interval
- **Max hold** (holds and displays the maximum level during the measurement interval; used with Fast, Slow or Impulse time weighting)

**LAEQ**

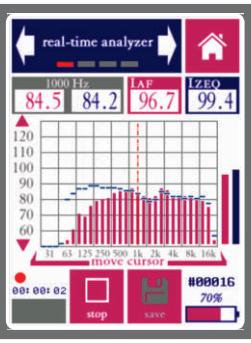
LAEQ module for **long term monitoring and logging** applications.
This module can be used for several purposes:

- monitoring of environmental noise sources
- monitoring and logging of sound levels
- measuring sound levels of multiple events across a large time span

Averaging time can be adjusted to any period between 1 and 60 minutes.

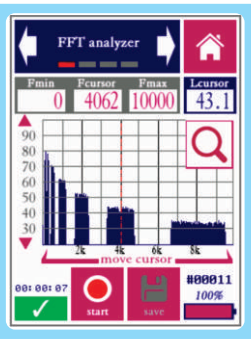

**Real Time Analyzer (RTA)**

The RTA module is intended for **frequency analysis** in the range from 20 Hz to 20 kHz. The bandwidth of the frequency bands can be set to 1/1, 1/3, 1/6 or 1/12 octaves.
A frequency analysis (into separate frequency bands according to IEC-61260:2014 class 1) is also shown.
RTA module has the ability to present two different spectral views at the same time, differing in frequency weighting (A,C or Z) and time averaging and integration (FAST, SLOW, IMPULSE, MAX, or EQ).




**Fast Fourier Transform Analyzer (FFT)**

Perform **spectral analysis** with a much higher frequency resolution than the RTA module
FFT is useful if you are looking to identify the exact frequency and level of certain signal components or to **study the harmonic structure** of sounds.
Supported window sizes of up to 32768 samples, approaches 1 Hz, Allowing analysis of large data. with a zoom function to zoom in on part of the spectrum on analyze later on PC.

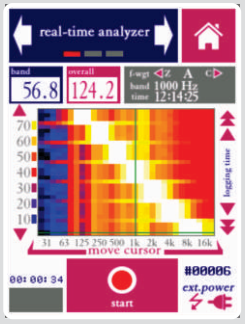



**L (Level)**

**Statistical acoustics** (percentiles)
Create insight into the statistical distribution of sound levels during the measurement period. e.g. L95 being the level that is exceeded 95% of the time during the measurement period. L10 etc. The L% module offers the same frequency weightings and time averaging options as the "standard" sound level meter module (A, C, Z; FAST, SLOW, IMPULSE).


**RTA logging**

**Long-term monitoring** of the spectral characteristics of sounds. It logs the spectrum in 1/1, 1/3, 1/6 or 1/12 octaves, as well as the A, C and Z-weighted equivalent continuous levels. The averaging window can be set to any value between 1 second and 999 seconds.
Logged data is represented in the form of a spectrogram



# Bedrock Sound Level Meters & STIPA Meters

## Acoustic Features:

| Acoustics measurements | Reverberation Time Meter (RT60) | Noise Curves | |
|---|---|---|---|
| **Electro Acoustics** | Oscilloscope upto 20kHz | Polarity measurement of loudspeakers | Electric in RTA & FFT |
| **Electrical Analysis** | AV Voltmeter Vrms, dBU, dBV for line level signals | Fundamental frequency estimation (Hz) | Total Harmonic Distortion and Noise (THD+N) |
| **Building Acoustics** | Sound Insulation-frequency dependent airborne sound insulation between rooms according to ISO-16283-1:2014 (Dn, DnT and R') and ASTM E336. | SRI / STC: single-number rating of airborne sound insulation between rooms according to ISO-717 (SRI) and ASTM E413 (STC) | |

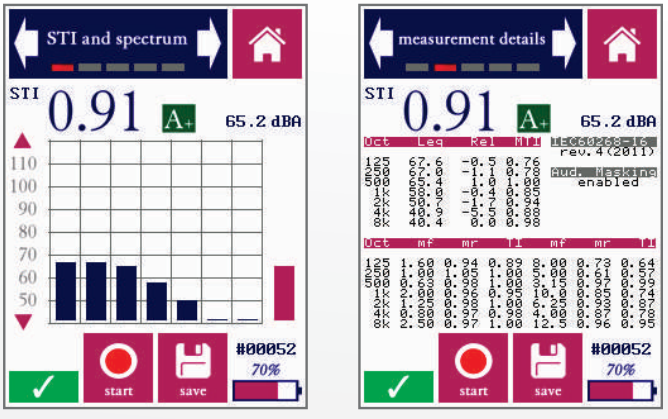
## Record Audio & Manage Data:

| Recording of audio during measurements (On / Off) | Text annotations with each measurement (On / Off) | Back up your data via USB |
|---|---|---|
| Set the device to record audio (in .wav format) for all of your measurements. .wav files are calibrated so that full scale corresponds to 150 dB SPL. Play back with any audio player. | Add a short text note to every measurement, by means of an on-screen keyboard | Measurement data (and recorded audio) can be copied to a PC using the supplied USB cable |
| Lengthy measurement sessions | Touchscreen interface | Firmware upgrades |
| Li-ion Batteries provide 5 ~8 hours of continuous usage. If sessions are longer, use a portable USB Power bank or AC power supply. | Set the menu selecting your favourite or most frequently used modules | Additional modules and new features can be updated through free firmware upgrade as they are released. |

**Speech Intelligibility Testing** with the SM50 and SM90 models, are used to measure the quality of the speech and is measured as the **Speech Transmission Index (STI)** with a value between 0 and 1. A typical good STI would be above 0.60 and excellent if it is above 0.75. STI below 0.30 would be considered bad. **Full STI-** the full-most reliable version, takes about 1 minute to test and **STIPA** (more aimed at public address system - just 20 sec). Furthermore, the STIPA is of two type- **Quick STIPA** (18s test time) and **STIPA Pro** (STIPA with features allowing you to analyze and manipulate your measurement data in greater detail, with 25s test time)

STIPA is mandated to be tested in rail, metro, airports, large conference room or any location with public announcement system where it is necessary to check intelligibility of sound heard by persons i.e, the ability for any person to clearly hear & understand announcements made on the PA or speaker system.


Measurement screen of the Quick STIPA module, in digit mode (left) and bar mode (right)




"STI and spectrum" and "measurement details" screen in the STIPA pro module

## BTB65 STIPA TalkBox:

Every STIPA measurement requires a source for the STIPA test signal. In the Speech intelligibility test, the **Talkbox BTB65** due to its **integrated loud speaker,** is used as the **source of sound** mimicking all the frequencies/ modulations used in a normal speech. SM50/SM90 sound meter is then used to analyze the signal received and calculate the STI- giving a measure of how much of the speech is understandable. If there is any electronic distortion, ambient noise or influence of acoustics of the room, the STI will vary.

The **Talkbox BTB65** is accurate and reliable, but also **compact** and **light** enough to move to various section or areas of the public facility for measuring STIPA. The device features an **interactive LCD touchscreen** which allows you to easily control all features and monitor its settings at a glance.


## Features:

- Plays STIPA test signals according to ITC- 60268-16 plays noise (pink, white ), sine waves (125~8000Hz) & sweeps
- Loudspeaker frequency range 20 - 16,000 Hz; flat response within +/- 1 dB between 80 Hz and 16 kHz
- Plays back calibrated speech signals, to announce the beginning and end of tests to obtain a subjective impression of speech intelligibility while testing (male & female speech)
- Signals are played back with automatically calibrated spectrum and level -no users calibration required
- 3.5mm jack line-in to use the TalkBox as a powered loudspeaker with computers and smartphones.

## Specifications:

| **BTB65 Calibrated signal source, providing STI & a variety of acoustic test signals** | **Specifications** |
|---|---|
| **STIPA and Full STI signals**<br>**Noise conform to target spectra** | within 1 dB (measured at 1/3 octave resolution) |
| **Frequency range** | 50 ~ 16000 Hz |
| **Acoustic output level at 1 meter distance** | adjustable in 1 dB steps between 54 and 72 dB |
| **Spoken messages for announcing the beginning and end of test sessions** | in 6 languages (US/UK/FR/SP/GE/DU), each in a male and a female voice |
| **Display** | 3.2" touchscreen |
| **Loudspeaker** | Integrated |
| **Line output** | XLR |
| **Line input** | 3.5mm jack |
| **Power supply** | External AC Supply , 12V DC Adaptor |

## SMxx Specifications:

| Function | Guideline / Application | SM30 | SM50 | SM90 |
|---|---|---|---|---|
| **Modules / Functions** | | | | |
| **Sound Pressure Level Meter (SPL / SLM) IEC-61672-1 : 2014, ANSI S1.4** | | Class 2 / Type 2 | Class 2 / Type 2 | Class 1 / Type 1 |
| **Frequency Weighting** | Choose frequency method | A ,C, Z (A : weighted, C : weighted , Z : Unweighted) | | |
| **Time Weighting** | Choose based on time frames | FAST , Slow, Impulse | | |
| **Equivalent Continuous (EQ)** | | Computes the time-integrated level over the measurement interval | | |
| **Sound Exposure Level (SEL)** | | Time-integrated value normalized to 1 sec | | |
| **Peak Value** | | Highest instantaneous value within an interval | | |
| **Max Hold** | Lock on highest values measured | Maximum level during the measurement interval; Used with Fast, Slow or Impulse time weighting | | |
| **Measurement Time** | Set duration of measurement | Set Measurement Time or Continuous (for infinite) | | |
| **LEQ Long-term Logging/Monitoring (LAEQ)** | Monitoring of continuous environmental noise / logging of sound levels, eg LAeq15min | Track equivalent continuous sound pressure level (LEQ) develop over time with simultaneous logging of A/C/Z | | |
| **Real Time Analyzer (RTA)** | Frequency Analysis for separate frequency bands | Frequency analysis in range 20 Hz to 20 kHz for frequency bands 1/1,1/3,1/6 or 1/2 octaves. Two spectral views present- frequency weighting or time weighting | | |
| **Fast Fourier Transform Analyzer (FFT)** | Perform spectral analysis with higher frequency resolution | Up to 32768 data points, with Zoom In/Out feature, Spectral analysis for identifying exact frequency and level of signal components and study of harmonic structure of sound | | |
| **L%, Statistical Acoustics** | Acoustic statistics based on threshold expressed as percentile, eg L10 to L95 can be measured | Simultaneous measurement and display of six different settings | | |
| **RTA Logging** | Long term monitoring of special characteristics of sounds | Spectrograms, with averaging window between 1 to 999 seconds of spectrum in 1/1, 1/2, 1/6 or 1/12 octave as well as A, C , Z weighted equivalent continuous levels | | |
| **Acoustics** | | | | |
| **Electro - Acoustics & Electric Analysis** | | | | |
| **Digital Storage Oscilloscope** | Inspect acoustic signals, in particular periodic signals, in time domain | Yes, up to 20kHz | | |
| **Polarity** | Check polarity of loudspeakers | Yes, Use test signals provided or use with BTB65 Talkbox | | |
| **AC Volt Meter For Line Level Signals** | Assess Output level | Yes, Measure Vrms, dBU, dBV | | |
| **Total Harmonic Distortion & Noise (THD+N )** | Quantify distortion levels in electro-acoustic equipment | Value THD+N is expressed as a percentage (%) or a signal-to-noise ratio (dB) | | |
| **Fundamental Frequency Estimation** | | Yes, Measurement in Hz with pitch & offset | | |
| **Building / Structural Acoustics** | | | | |
| **Sound Insulation** | Evaluate airborne sound transmission loss | 4 different frequency dependent measures : D, Dn, DnT, R | | |
| **Sound Reduction Index; Sound Transm. Class (SRI / STC )** | For specifying and measuring sound insulation | 4 metrics R'w ; Dn,w ; DnT,w ; STC | | |
| **Room Acoustics** | | | | |
| **Reverberation Time (RT60)** | Measure sound energy decay | Full Octave and 1/3rd octave measurements are supported. As per ISO-3382, Suggested to be used with BTB65 Talkbox | | |
| **Noise Curves** | Choose method based on standard | NR, NC, PNC, NCB, RC, RCII | | |
| **Speech Intelligibility Test (STI) Measurement** | | | | |
| **Basic Intelligibility Measurements (Quick STIPA)** | For Public address systems, quick measurement in 18 secs | No | Yes | |
| **Advanced Intelligibility Measurements (STIPA Pro)** | For Public address systems, measure in 25 secs | No | Yes, with capability to enable/disable additive noise | |
| **Full STI (IEC-60268-16)** | Most reliable complete STI measurement in 65 secs | No | Yes, 14 Modulation frequencies tested in 7 Octaves | |

| Function | Guideline / Application | SM30 | SM50 | SM90 |
|---|---|---|---|---|
| Speech Level Meter | | No | Yes, (CF. 602168-16) | |
| Qualification Band Shown | | No | A (Excellent) to U(Bad) | |
| **Acoustic Specifications** | | | | |
| Linear range, Electric input (dBuV) | | 21 ~132dB | 21 ~132dB | 21-132 (expandable to 145 with attenuator) |
| Measurement Range (dB), Linear Range with Supplied Microphone, dBA SPL | | 30 ~122dB | 30 ~122dB | 25-130 (expandable to 145 with attenuator) |
| Frequency Range (Hz) | Covers entire range heard by human ear | 20 ~20.000 | | |
| Accuracy (dB) | | 0.5 | | 0.1 |
| Resolution (dB) | | 0.1 | | |
| Octave Filter | | Class 1 1/1, 1/3, 1/6 and 1/ 12 octave filters | | |
| | | 31.5 Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, 16kHz | | |
| Analysis Rate | | 93.5 times/ sec | | |
| Sampling Frequency (kHz) | | 48 | | |
| **Input** | | | | |
| Add Text Annotation to Measurements | Yes | | | |
| Capability to Record Audio of all Measurements | Yes, in .wav format | | | |
| **Calibration** | | | | |
| Automatic Level Calibration Procedure | | Yes | | |
| Calibrated Recording of Audio on Internal Memory | | Yes | | |
| Real-Time Calibrated USB Audio Device Mode | | Yes | | |
| Declaration of Conformity | | Declaration of conformity provided with individual Calibration certificate | | |
| External Calibrator | | Optionally available | | |
| **Physical** | | | | |
| Display | | Full-color 3.2" resistive LCD touchscreen display | | |
| Microphone Connector | | XLR 48V | | |
| Microphone Provided with Instrument | | Class 2 electret microphone & preamp (1/4"), 30 mV/Pa sensitivity | Class 2 electret microphone & preamp (1/4"), 30 mV/Pa sensitivity | Class 1 microphone (1/2" UNC capsule), 50 mV/Pa sensitivity |
| Data Storage for Measurement Data and Audio (GB) | | 4 | | 8 |
| Remote Control From PC via USB (Either Through Serial Commands or Cloning of the Display) | | Yes | | |
| Data Output | | To PC, files can be saved as .csv for data viewing in spreadsheets ; audio recordings also saved in .csv files | | |
| Battery | | Rechargeable Internal Battery, 2500 mAh | | |
| Capability to Connect to External Power Supply | For long duration continuous measurement | Yes, instrument can connect via USB port to power banks or charger | | |
| Internal Real-Time Clock and Calendar | | Yes | | |
| Size/Weight | | 210 x 85 x 55 mm( excl. microphone); 530 g ( including microphone) | | |
| Temperature/ Relative Humidity | | -10 to +55 °C; 0- 95% | | |
| Colors | | Blue and black | Grey and black | Red and black |
| Supply will include | | Microphone (Class1 for SM90 / Class2 for SM50 AND SM30), USB charger, Intl. Charger adapters, measuring instrument, cables, windscreen, manual, carrying cord, USB flash drive with test signals & software tools in a ruggedized waterproof carrying case | | |

# Bedrock Sound Level Meters & STIPA Meters

## Kit Options:

| SM30 Kit | SM50 Kit | SM90 Kit | Speech Intelligibility Kit |
|---|---|---|---|
|  |  |  |  |
| SM30 Instrument with class 2 mic, charger, USB cable, manual & calibration certificate | SM50 Instrument with class 2 mic, charger, USB cable, manual & calibration certificate | SM90 Instrument with class 1 mic, charger, USB cable, manual & calibration certificate | SM50/ SM90 + BTB65 charger, USB cable, manual & calibration certificate |

## Bedrock BACx Acoustic Calibrators (Optional):

The Bedrock BAC1 and BAC2 acoustic calibrators are used to accurately verify (and if necessary adjust) the level calibration of your Bedrock acoustic measuring instruments. The BAC1 acoustic calibrator is used for the Bedrock SM90 class 1 instrument, and the BAC2 acoustic calibrator (which complies with class 2) is used for the Bedrock SM30 and SM50. Each calibrator comes with an individual calibration certificate.

| BACx Acoustic Calibrators | Specifications |
|---|---|
| **Frequency** | 1 kHz ± 1% |
| **Sound level** | 94dB re 20µPa |
| **Standards compliance** | BAC1 - IEC 60942:2003 Class 1<br>BAC2 - IEC 60942:2003 Class 2 |
| **Distortion** | Less than 2% |
| **Operating Temperature/ Humidity** | -10°C to +50°C/ 25 to 90% RH |
| **Cavity Diameter (without adapter)** | 0.525 inch |
| **Battery** | 1 x 9v 6F22 (Neda 1604), ~15 Hours Continuous Use |
| **Dimensions/ (weight with battery)** | 135mm x Ø48mm,185g |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Ref:ST/BDK/2020