Precision Sound & Vibration Analyser
Nor150

Applications

- Environmental noise
- Building acoustics
- Sound intensity
- Noise monitoring
- Product noise testing
- Noise in the workplace
- Infrasound
- Noise nuisance recorder
- Front end for Nor850
- General noise and vibration measurements

General features, common for all measurement modes

- High Precision Class 1 sound level meter and frequency analyser.
- Single or dual channel.
- Large colour touch-screen (4.3”).
- Real keyboard for quick operation in challenging environments.
- Intuitive user interface with graphical icons for selection of measurement mode and custom-made user setups.
- Built in webserver for communication through the internet from anywhere in the world via LAN, USB, WLAN, 3G/4G modem.
- Voice and text notes, built in GPS and camera help you document your measurements.
- Wide frequency range for vibration and low frequency measurements (0,4 Hz – 20kHz in 1/3 octave band).
- 120dB measurement range.
- Extensive trigger system for reports, audio recording and camera.
- Seamless integration with Nor850 software.
- Multi language support.
- Extensive on board help system.

The Nor150 is a multi-tool covering a variety of applications such as Environmental Noise assessments, Building Acoustics, Sound Intensity, Noise at workplace and more.

It sets new standards in user-friendliness and sophistication not yet found in any other Sound Level Meter on the market. The robust design combined with a vast range of measurement application covered in one unit, makes this the natural choice for every professional acoustician.

Featuring a large 4.3” true color touchscreen, the Nor150 provides user friendliness of a smartphone. Further features include; two measurement channels, built in web server, camera, GPS and advanced voice and text notes bringing the sophistications normally found in laboratory instrumentation out in the field. Connect your smartphone, pad or PC and take full control of the instrument. Add photos and voice notes obtained on your smartphone or pad seamless integrated with markers to your noise data.

Nor150 is seamless integrated with the Norsonic range of post processing and reporting programs, as the Nor850 multi-channel measurement platform and NorReview. It has never been easier to export data to third party tools like Matlab® or further process the data in Excel®.

Startup application menu

The Nor150 covers a wide range of measurement applications and thus a number of various measurement parameters in addition to an extensive way of displaying the parameters in the frequency and time domain.

The configuration and use of the instrument however is easy and intuitive. At the startup, an application setup menu with icons appears where you select what application you want to work with.

You may also create your own favorite setups and chose to display them in the same menu. These are listed as smaller icons. A set of factory preset setups are also available, indicated with an orange frame around the icon. The factory preset icons are country dependent. Thus, you don’t need to scroll through setups for national standards not applicable for your country.

Innovative design for simplifying measurements

Optional built in Camera and GPS.

Optional 2nd Input channel on left side. All input connectors are protected from dust and rain by silicone rubber covers.

Backlit keyboard and display. To extend battery time, both brightness and time-out is adjustable in the power setting menu.

Status LED provides useful information by changing colour such as measure-ment running, overload, battery low, audio recording etc.

On the right hand side is the power socket, Trigger input and output for synchronized sampling of several Nor150. Also the Norsonic standard 15 pin digital I/O hosting a high speed RS232 interface, 3 digital input, 4 digital outputs, Signal generator, AC output, SPDIF and 3,3Vdc - 50 mA power for auxiliary equipment

The instrument case is designed around a sturdy milled aluminium frame combined with a moulded plastic housing. Personalize your instrument by lazer marking your company logo and name.

Built in LAN, USB A and mini B connectors, Micro SD card and Headset connector for voice comments and audio recording playback. WLAN and GPRS/3G-4G modems through USB.

The battery pack has a built in battery gauge. Batteries can be easily replaced in field. Charging time is 2 hours. Battery lifetime is dependent on use and connected accessories. Typical time is 8 hours.

User interface

The Nor150 features a graphical touch interface like a smart phone. In addition, we included a real keyboard for demanding field application where a touch interface may be challenging to operate. Setting up the analyser and working with post processed data uses the touch display. For measurement control and during a measurement you may choose to use the real push buttons.

The Nor150 can be configured with different types of display views. A selection of graphical displays, such as Level versus Frequency, Level versus Time and Sound Level Meter view are available. You may configure up to four different views, and toggle through the views with the View button. A view can be single or dual view. The dual view, or split screen, gives you the option to combine such as a Level vs. Frequency display with a Level vs. time display. This combination is especially useful when you do multispectral analysis and want to maneuver both in the time and frequency domain. Different display views are available, dependent on what measurement mode you are working with; Environmental, Building Acoustics or Sound Intensity.

Switch between graphical and numerical/table display. Each graphical display has an associated numerical display.

A graphical display can display up to 3 different measurement functions in one graph. If you have selected more than 3 functions to be measured, you can use the FUNC button to scroll through the measured function.

Information button. The info screen shows important measurement settings or shows useful hints about error messages and field indicators.

Calibration button. Activates the calibration functions.

Memory button access the memory system.

Exits a menu without doing your modifications.

Starts a measurement or Stops an ongoing measurement.

Pause/continue. Temporarily stop measured data to go into the global results. The pause is a toggle style function. It includes a graphical back-erase function.

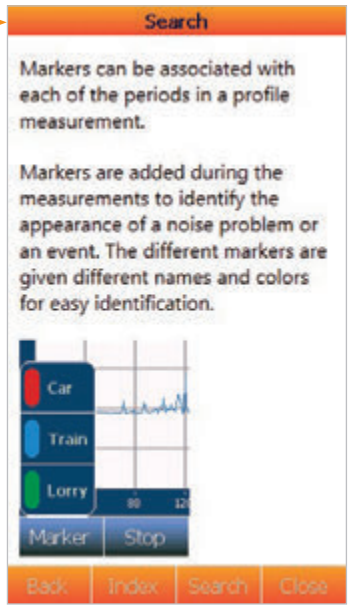
Setup button access the menu system.

On/Off / Lock Keyboard button.

Cursor buttons Keys for moving the cursor in graphical and tabular displays ▶▲▼◀.

Exits the current menu and stores/accept your current selections.

The soft key bar in the bottom of the display holds different functions dependent on which menu or display you are in.

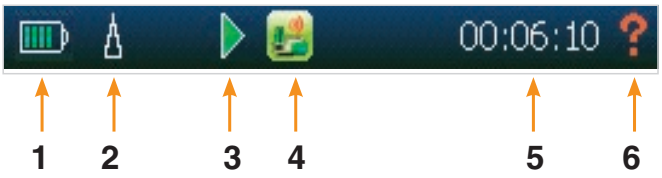


Even though the instrument is easy and intuitive to use an extensive on-line help is availble. Just push the ? to access the help for for the current display you are in. In addition, you may search for a keyword or look it up in the index.

The status bar

The status bar at the top of the display provides useful information about the instrument and the on-going measurement.

The status bar



1. Battery gauge
2. Overload indication
3. Measurement status – Ready, waiting for trigger, running, pause, ended, stored, locked
4. Application mode
5. Real time clock in ready mode. In all other modes the measurement time is displayed
6. Help function

The status bar is not displayed in the menus.

The measurement functions and time profile concept.

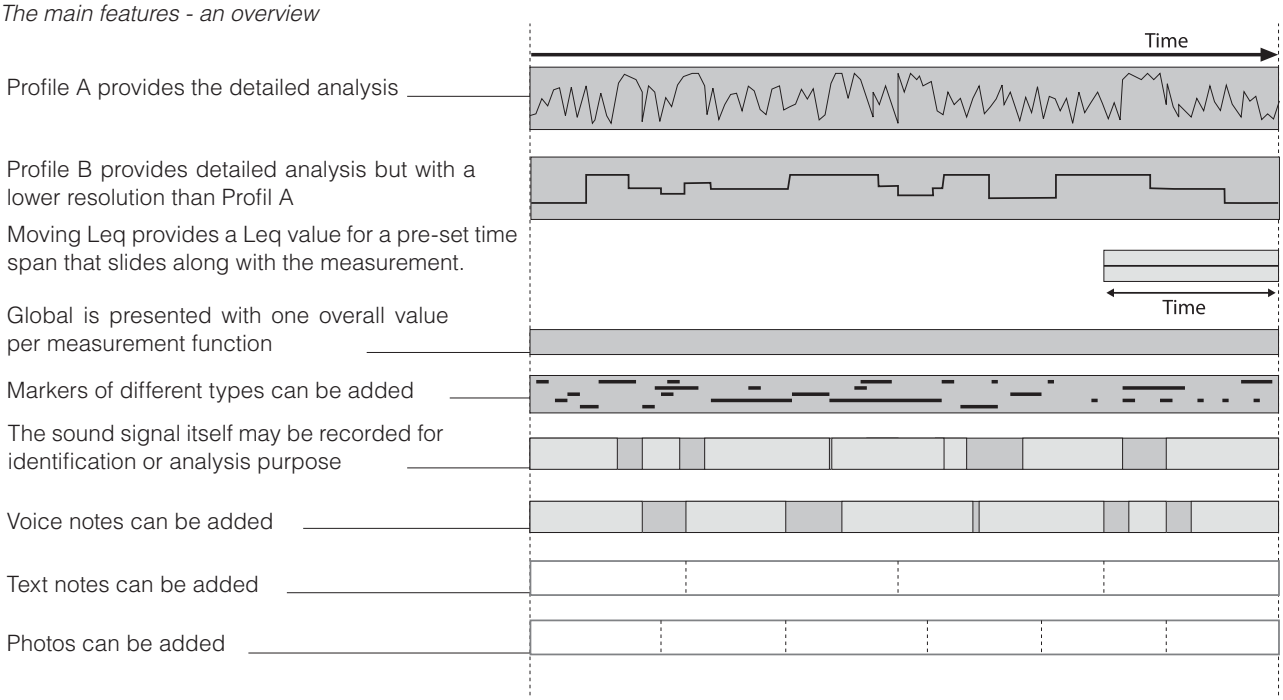
The Nor150 basic configuration is fitted with parallel detection of Fast, Slow and Impulse time constants and the A, C and Z spectral weighting functions. The measurement parameters are;

SPL	The instantaneous Sound Pressure Level
L_{max}	The Maximum Sound Pressure Level time weighted
L_{min}	The Minimum Sound Pressure Level time weighted
L_{eq}	The Integrated Averaged SPL
L_{Eq}I	Impulse weighted Time Average SPL
L_E	The Sound Exposure Level
L_{PEAK}	The Maximum Peak Level
Ln	Statistical functions
T_{MAX5}	"Takt Maximal" – a special parameter measured mainly in Germany

The time profile concept, named level versus time profile, also known as electronic level recorder is a part of the basic functionality. Three time profiles are available, Profile A, Profile B and Profile Moving. Profile A is the main profile from where the two others are extracted. The resolution of time profile A can be set to any value between 5ms to 24 hours. Profile B has a resolution starting from 1 sec. Profile A is set to 1 sec if profile B or Moving is activated. The advantage by having more than one time profile is to measure some values with high resolution (profile A) and let the Profile B measure values with a longer time interval.

Eg. L_{eq} values every second and L95 every 15 minutes. In addition Global (overall) values are measured for the entire measurement. You may choose to measure one or a selection of the available measurement parameters for the time profiles and global

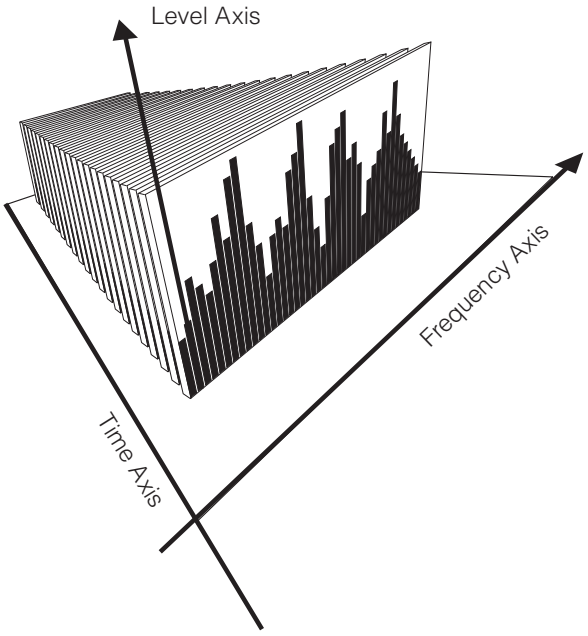
The main features - an overview



Frequency analysis - Multispectra function

With 1/1 and 1/3 octave real time filters ranging from 0,4 Hz to 20KHz installed you can do detailed analysis of the frequency content of a noise spectra. A basic analysis is just to analyse the frequency spectra of a stationary signal. However, it is often needed to capture a multi spectrum to analyse how the frequency content in the time domain of a non-stationary signal. The powerful measurement engine in the Nor150 can measure 1/3 octave multispectra from 0,4Hz to 20kHz with a resolution of 25ms with full dynamic range (>120dB) simultaneously with all spectral weighting networks and audio recording enabled!

Multi-spectra is a set of spectra captured at equidistant moments in time corresponds to setting up the analyser to measure the level vs. time involving frequency analysis in octaves or third-octaves.



Large display – intuitive use

The Nor150 offers you several ways of composing a set of display views that provides maximum information for your measurement application. Up to 4 different display views may be configured and scrolled through with the **VIEW** button, before, during and after a measurement sequence. You easily compose a view from a selection of available graphs, such as level versus time display, level versus frequency display, sound level meter display or cumulative and probability distribution display. A display view may be a single view or dual view. Each graphical display is accomplished by a numerical display. Just push the **TBL** button to toggle between numerical and graphical view.

If more than 3 parameters are measured you can toggle through the different parameters using the **FUNC** button. One measurement parameter may be locked to the view so that it always is displayed while scrolling through the other available parameters.

Measurement data from both channels may be combined into one graphical view.

Your graphical view configuration is stored together with the measurement and may also be stored as a user-defined setup.

Level vs time

The single view of the level vs time display consists of a main window displaying up to three values simultaneously. Markers are indicated by bold horizontal lines. Markers can indicate an audio recording or a manual inserted marker. A dotted horizontal line indicates a single marker, such as a triggered picture or a manual inserted single marker.

The upper graph is a compressed graph covering the entire measurement to give you a complete overview. The yellow field is the current view in the main graph.

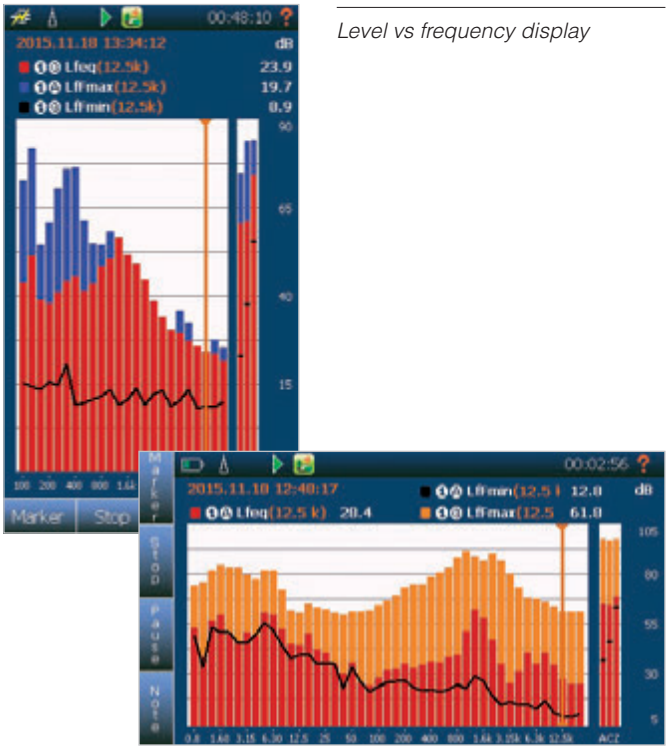
The level vs time picture is available as portrait or landscape view.

The X-axis can be set to period #, relative or absolute time. You can rapidly move along the x-axis by tapping on the upper graph or use the zoom function. In addition, you can jump between markers or replay audio recordings, view pictures and comments.

Level vs time display single view

Level vs frequency display

The single view of the level vs frequency display is available as portrait or landscape view. Several types of drawing shapes are supported; filled or open bar graph, line or step line. In addition to color selection of each graph, you may also configure the drawing order of the graph; back, middle or front.

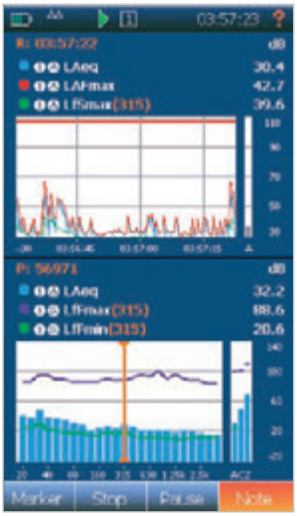


Level vs frequency display

Dual view with L/t and L/f

You may compose any mix of the available graphs in a split view configuration. The split view is only available as portrait displays. A special useful view is the combination of Level vs frequency and level vs time. By selecting the link cursor feature you move the cursor in both the time and frequency domain simultaneously.

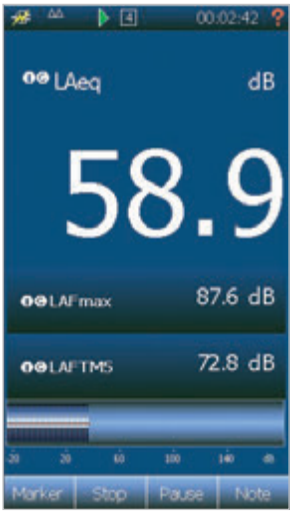
Another useful combination is to combine a graphical and numerical view or two level versus frequency views holding information's from each of the channels. You may also combine measurement data from both channels in one graphical view.



Dual view with L/t and L/f

Sound level meter display

The sound level meter display is especially designed for users who requires large numbers and little information. As with the other displays you may configure three measurement parameters to display simultaneously. The bar graph shows the instantaneous value. This view is only available as portrait.



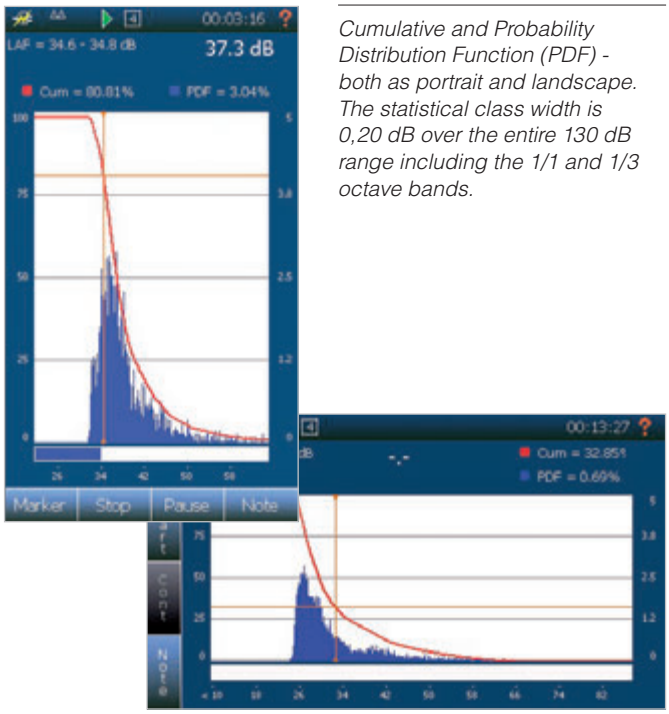
Sound level meter display

Cumulative and Probability Distribution Function (PDF)

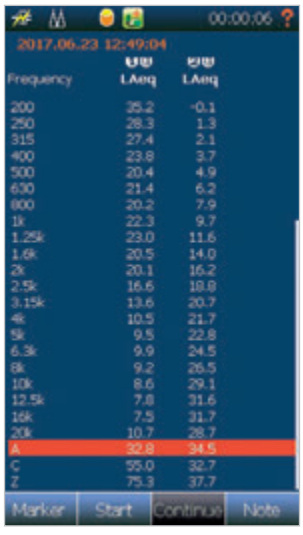
- combined in one display with a horizontal instantaneous sound pressure level graph. Both the value of the PDF and the Cumulative value at the cursor position are displayed simultaneously.

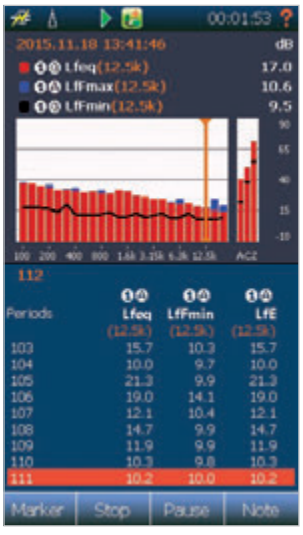
The view is available as portrait and landscape

Up to 8 freely selectable percentile values may be measured. Any value from 0,1% to 99,9% can be selected. All frequency bands and weighting networks are calculated, both for the entire measurement global, and for every period in the time profile, provided that the profile resolution is set larger than 2 minutes



Cumulative and Probability Distribution Function (PDF) - both as portrait and landscape. The statistical class width is 0,20 dB over the entire 130 dB range including the 1/1 and 1/3 octave bands.



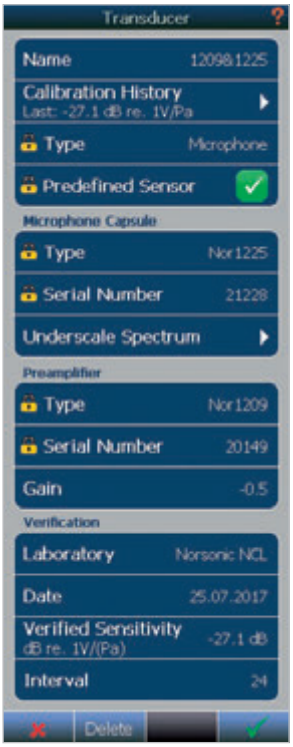


A numerical table is associated with all the graphical views. Just press the TAB button to toggle between graphical and numerical view. Works both with single and split screen.

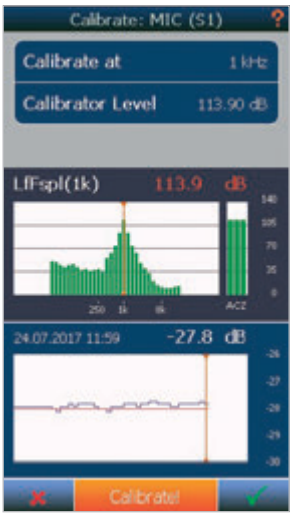
Sensor administration menu

A built-in sensor database is holding information of a set of standard transducers. This avoid you from making improper settings. In addition, you may add other sensors to the database. All data regarding calibration etc are stored and can be recalled at a later stage.

You may define a verification interval for a sensor allowing the instrument to notify you if a sensor is due for periodically verification. In this way, you leave the sensor administration and external verification due dates to be taken care of by the Nor150.



The Transducers menu
The calibration history gives you full traceability of the microphone sensitivity.



The Calibration menu
Manual and automatic mode

Calibration

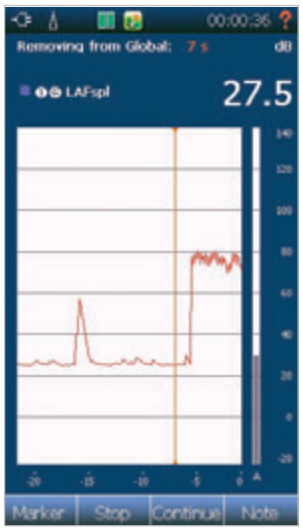
The calibration menu offers three calibration methods; **manual**, **auto** and **mic. check**. Manual is the traditional way, where you manually adjust the sensitivity until you read the desired level. Auto is an easier way. Just select calibration level and press “go”. The level will be automatically adjusted to the right value. Mic.Check is a manual test of an outdoor microphone having the SysCheck feature added.

The 1/3 octave spectrum available in the calibration menu helps you to verify that the ambient noise level is well below the calibration signal level.

The lower level vs time graph holds the historical information about earlier calibration levels made for the selected transducer. In this way, you may see how a transducer maintain its calibration level. Changes more than ±2dB relative to the verification level set for the transducer will result in an error message. The verification level is indicated by the orange horizontal line.

Graphical pause back-erase

The 0 to 20 sec. graphical pause back erase feature allows you to pause an ongoing measurement and remove an unwanted noise event. Just tap on the graph where you want to continue from. The unwanted noise event is removed from the overall calculation. In the level versus time profile, the event is kept but pause marker is inserted. In NorReview post processing and reporting program you can choose to include or exclude the paused noise event from your reporting.



Graphical pause back-erase feature

Optional extensions and future proof

The Nor150 comes with an extensive set of functions available in its basic version. The modular software design enables functional expansion to take place when you need it and not at the time you purchase the instrument. This applies to all options except for the hardware related option 1 and 2, which cannot be added as retrofit.

All installed options remain in the instrument and there is no need for further loading of the options when used.

Norsonic provide regular firmware updates with new features and optional extensions. We implement new features to improve the handling of the instrument. Implementing new standards or revisions of existing standards are a part of our software maintenance scheme. Our retrofit policy is to keep your Norsonic instrument up to date the whole lifecycle of the instrument.

The options listed below is the current features available. There are more to come to expand the use of the Nor150 further. The priority and what features that should be, is decided by carefully listening to our customers. Your voice is determining the future development of the Nor150, helping us to stay in the forefront creating an even more complete unit for noise and vibration measurement applications.

Nor150 basic unit includes A, C and Z weighting networks with measurement of Leq, LeqI, LE – sound exposure level, SPL, Lmax, Lmin with parallel detection of Fast, Slow and Impulse time constants, statistical calculation of Ln, and T_{MAX5}. The measurement data is analysed as global values in addition to two parallel time profiles with an adjustable resolution ranging from 5ms to 24h. All interfaces and voice and text annotation included.

Option 1. Built in Camera and GPS.

Option 2. 2nd measurement channel.

Option 3. 1/1 and 1/3 octave filters (0,4-20kHz in 1/3 octave band) including multi-specter functionality in time profile A.

Option 4. Audio recording, marker management and event trigger.

Option 5. Sound Intensity mode supporting measurements in accordance with ISO 9614-1 and -2. Includes web server for remote control and display of measurement results on a smart phone. Requires option 2 and 3.

Option 7. Signal generator with sine, white, pink, bandpass filtered noise.

Option 8. Reverberation Time decay and calculation of T20 and T30 based on impulse or noise excitation. Requires option 3. Requires also option 7 if RT shall be based on noise excitation.

Option 9. Complete Building Acoustic mode with microphone position room averaging in accordance with ISO-16283 as well as sound insulation indices calculated in accordance with ISO-717/1 and /2. (Req. opt. 3, 7, 8).

Option 11. Enhanced noise assessment package with internal web server including NorRemote for remote control via smartphones, pads and PC and additional four triggers for independent setting of different trigger levels during a day. Requires option 4.

Use your fingertip to change scale, move cursor, zoom and expand – easy and intuitive.