testo 816-1 Sound Level Meter

Instruction Manual

1 Contents

2 Safety and the environment

2.1. About this document

Use

> Please read this documentation through carefully and familiarise yourself with the product before putting it to use. Pay particular attention to the safety instructions and warning advice in order to prevent injuries and damage to the product.

> Keep this document to hand so that you can refer to it when necessary.

> Hand this documentation on to any subsequent users of the product.

Warnings

Always pay attention to any information denoted by the following warnings, indicated with warning pictograms. Implement the precautionary measures specified!

Display	Explanation
⚠ **WARNING**	Indicates possible serious injury
⚠ **CAUTION**	Indicates possible minor injury
ATTENTION	Indicates circumstances which may result in damage to the product

2.2. Safety

> Only use the product properly, for the purpose it is intended for and within the parameters specified in the technical data. Do not apply any force.

> Do not store the product together with solvents. Do not use any desiccants.

> Only perform maintenance and repair work on this instrument that is described in the documentation. Follow the prescribed steps exactly. Use only original spare parts from Testo.

> Protect the instrument from rain and humidity. Make sure that no fluids get into the microphone.

2.3.   Protecting the environment

> Dispose of faulty rechargeable batteries / spent batteries in accordance with the valid legal specifications.

> At the end of its useful life, send the product to the separate collection for electric and electronic devices (observe local regulations) or return the product to Testo for disposal.

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3 Specifications

3.1. Use

The testo 816-1 is a sound level meter with a measuring range of 30 to 130 dB, two time weightings, two frequency weightings, minimum / maximum value function, individual value storage and measurement series storage.

Measurement configurations and results are shown on the LCD display. Measurement data can be stored in the instrument or transferred to a Windows® PC via a PC interface.

Using the calibrator (accessory item), the meter can be adjusted with the enclosed adjustment screwdriver.

The instrument fulfils the requirements of IEC 61672-1 Class 2.

3.2. Technical data

| Feature	Values
Microphone	½-inch electret condenser measurement microphone 2.2 kohms input impedance
Frequency range	20 Hz to 8 kHz
Measuring range	30 to 130 dB
Noise level	< 30 dB
Frequency weighting	A / C
Time weighting	FAST (125 mS), SLOW (1 s)
Accuracy	±1.4 dB (under reference conditions @ 94 dB, 1 kHz)
Dynamic range	100 dB
Measurement data memory	Individual value memory: 99 data records Measurement series memory: 31,000 data records
Digital display	Resolution 0.1 dB, display refresh 0.5 s
Bar graph display	50 segments, resolution 2 dB, display refresh 50 mS
AC output	1 Vrms at full deflection
DC output	10 mV / dB

Feature	Values
Voltage supply	4 x IEC LR6P (AA) batteries
Battery life	approx. 30 h (alkaline batteries)
Power consumption	approx. 0.3 W
Mains connection	9 V DC (8-10 V DC max)
Operating temperature	0 to 40 °C
Operating humidity	10 to 90 % RH
Operating / storage height	max. 2000m above sea level
Storage temperature	-10 to 60 °C
Storage humidity	10 to 75 % RH
Dimensions (L x W x H)	272 × 83 × 42 mm
Weight	390 g (including batteries)
Laws, guidelines, standards	IEC 61672-1 Class 2, ANSI S 1.4 Type 2
Warranty	2 years Warranty terms: see www.testo.com / warranty

Directional characteristics of the microphone
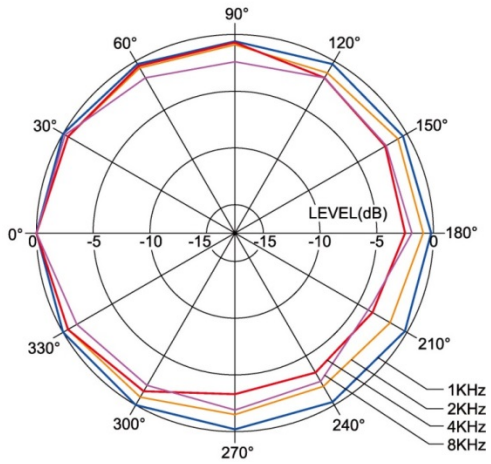
Directional characteristics of the sound level meter
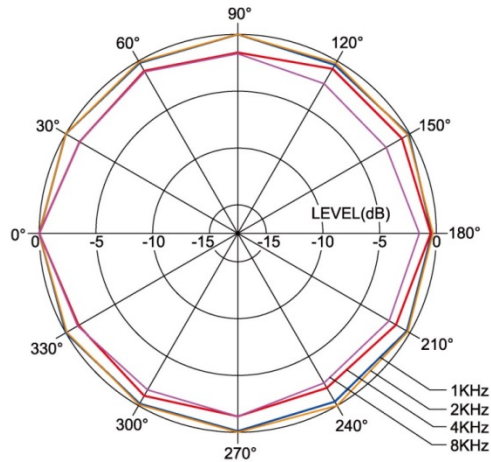
Effect of the windscreen
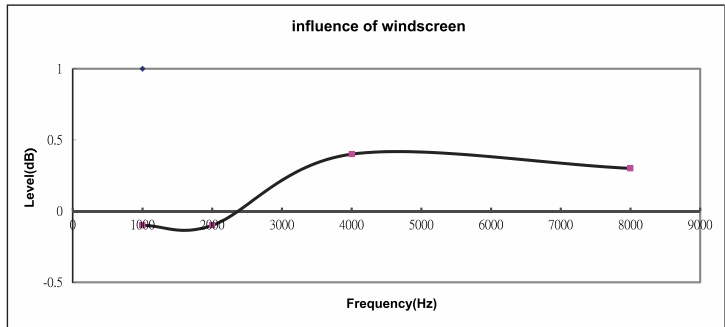
Frequency weighting

Frequency [Hz]	dBA(dB)	dBC(dB)	Error limits (dB)
20	-50.5	-6.2	±3.5
31.5	-39.4	-3.0	±3.5
63	-26.2	-0.8	±2,5
125	-16.1	-0.2	±2,0
250	-8.6	0.0	±1,9
500	-3.2	0.0	±1,9
1000	0.0	0.0	±1,4
2000	1.2	-0.2	±2,6
4000	1.0	-0.8	±3,6
8000	-1.1	-3.0	±5,6

Frequency weighting characteristics
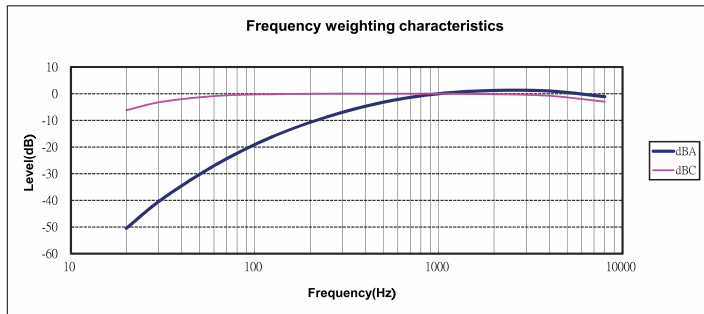
Absolute pressure dependency

Height above sea level [m]	Pressure [mbar]	Offset value [dB]
0 – 250	1013 – 984	0.0
251 – 850	983 – 915	-0.1
851 – 1450	914 – 853	-0.2
1451 – 2000	852 – 795	-0.3

Temperature dependency

Values relating to:

- Ambient humidity: 65 %RH
- Sound pressure reference value: 124 dB
- Temperature range with discrepancy < 0.5 dB: 10 to 40 °C

Temperature [°C]	Offset value [dB]
-10	-0.7
0	-0.7
5	-0.6
50	+1

4 Product description
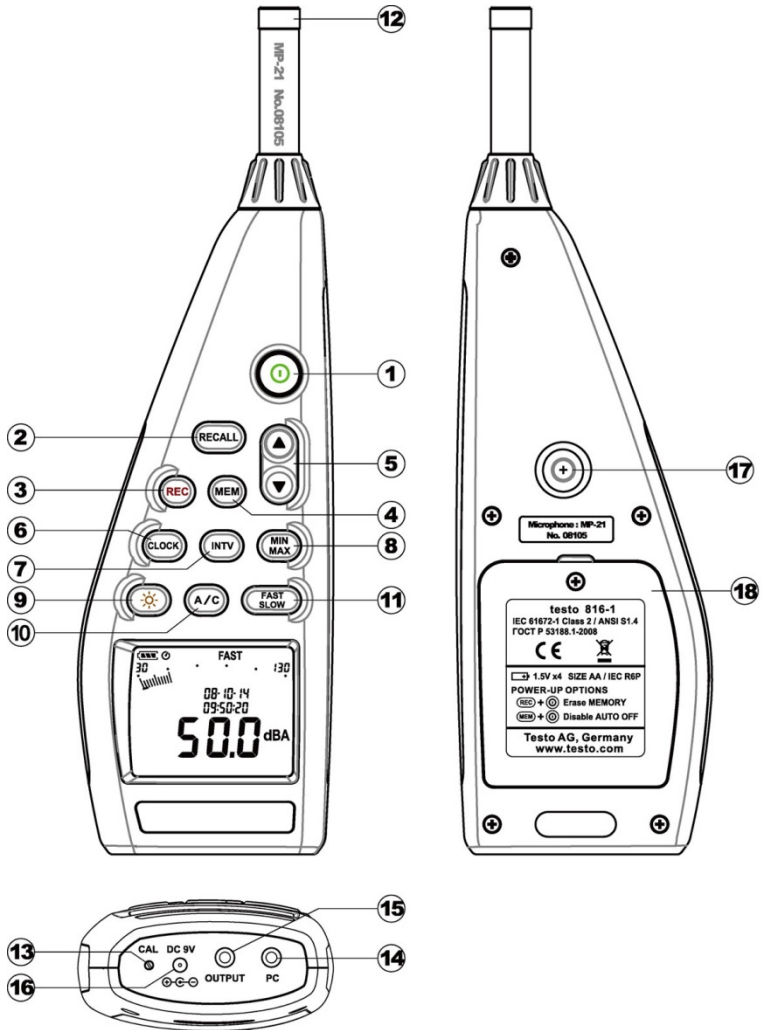
No.	Element	Description	Function
1	⊙	On / Off	Switch the instrument on / off
2	RECALL	Individual value storage data recall	Display the stored data of an individual value storage.
3	REC	Measurement series storage	Start / stop automatic storage of a measurement series.
4	MEM	Individual value storage	Carry out manual storage of an individual reading.
5	▲ ▼	Up / down	Edit view or value.
6	CLOCK	Time / date	Show / hide values, edit values.
7	INTV	Measurement series storage interval	Set interval.
8	MIN MAX	Minimum / maximum value	Display / save minimum / maximum value.
9	☼	Display illumination	Switch illumination on / off.
10	A / C	Frequency weighting	Change frequency weighting.
11	FAST SLOW	Time weighting	Change time weighting.
12	-	Microphone	Record readings.
13	CAL	Adjustment screw	Carry out adjustment.
14	PC	PC interface	Transfer data to PC.
15	OUTPUT	AC / DC signal output	Alternating / direct current signal output.
16	DC 9V	DC-voltage input	Voltage supply via external mains unit.
17	-	Tripod threaded connection	Mount instrument onto tripod.
18	-	Battery compartment	Internal voltage supply.

Display
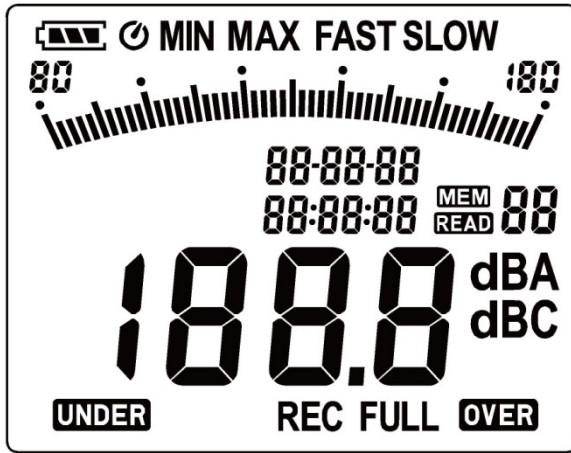
Element	Description	Function
▐▌▌▌	Remaining battery capacity	Remaining lifetime: ▐▌▌▌ → ▐▌▌ ▐▌ → ▐ Fully → partially discharged → Replace battery
Ⓖ	Automatic instrument shut-down	Automatic instrument shut-down is activated
MIN MAX	Hold minimum / maximum value	Display the minimum / maximum value.
FAST SLOW	Time weighting	Display of the time weighting configured.
30—130	Measuring range	Minimum / maximum measurable value.
i||||i	Scale display	Reading display via a scale.
MEM	Individual value storage	Individual value display is stored.
88:88:88	Time	Display of time.

Element	Description	Function
88	Individual value storage memory address	Memory address of the stored value which is displayed.
READ	Display of stored individual value	Stored individual value is displayed.
dBA/dBC	Frequency weighting	Display of configured frequency weighting.
188.8	Reading	Display of reading
88-88-88	Date	Display of date.
OVER	Alarm for exceeding the measuring range	Prompt due to exceeding the maximum reading.
FULL	Memory full	Prompt that reading memory is full.
REC	Measurement series storage	Measurement series storage is activated.
UNDER	Alarm for falling short of the measuring range	Prompt due to falling short of the minimum reading.

5 Using the product

5.1. Commissioning

Inserting batteries

1. Remove Philips screw from the battery compartment using a screwdriver.
2. Remove battery compartment cover.
3. Insert batteries. Observe the polarity!
4. Put cover back on the battery compartment.
5. Tighten screw using a screwdriver.

5.2. Switching on / off

Switching on (with automatic shut-down activation)

> Press the ⃝ key.

- The instrument switches on and ⏻ (automatic shut-down activated) is displayed.
- The instrument switches off automatically if no key is pressed for 30 minutes.
- The automatic shut-down is deactivated when the instrument is connected to a PC or when automatic data recording is in process.

Switching on (without automatic shut-down activation)

1. Hold down the (MEM) key and press the ⃝ key.
2. Hold down the (MEM) key until the instrument switches on.
- The instrument switches on. ⏻ is not displayed.

Switching off

> Hold the key down until **P-OFF** is displayed.

5.3. Setting the date / time

The integrated clock enables readings to be stored with the date and time.

1. Hold down the (CLOCK) key for 2 s.

The values are set in the following order: (**year**), (**month**), (**day**), (**hour**), (**minute**), (**second**).

2. Press the (▲) or (▼) key to set a value, press the (CLOCK) key to change to the next value.

> Press the (⓪) key to cancel the process.

5.4. Showing / hiding the date / time

> Press the (CLOCK) key.

5.5. Switching the display illumination on / off

Switching on / off manually

> Press the (☼) key.

Automatic switch-off
The display illumination is switched off automatically after 30 s.

5.6. Changing the frequency weighting

i Frequency weighting A is used for standard sound level measurements. This weighting corresponds to the perception of sound by the human ear. "Aurally compensated" volume is referred to in this context.

If the low-frequency portions of a sound are also to be weighted, frequency weighting C is used. If the displayed C-weighting value is considerably higher than the A-weighting value, then there is a large amount of low-frequency noise.

> Press the (A/C) key.

5.7. Changing the time weighting

i The ranges "Slow", with a time weighting of 1s, and "Fast", with a time weighting of 125ms, are available. The incoming sound signals are incorporated over a period of 1 s or 125 ms accordingly. If "Fast" is set, the rate at which readings are shown in the display increases from one reading per second to around 5 - 6 readings per second. The "Slow" time weighting should be selected for noises whose signals only change in volume gradually, such as machines, photocopiers, printers etc. Select the "Fast" mode to measure sudden changes in sound level (e.g. building machinery).

> Press the (FAST SLOW) key.

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5.8.   Measuring

Information and recommendations

- Sound waves can be reflected off walls, ceilings and other objects. If not handled correctly, the measuring instrument housing and the person conducting the measurement are also disruptive factors within the sound field and can result in incorrect measurement results.

- Not only can the instrument housing and the person operating the instrument impede the sound which comes from a particular direction, they may even cause reflections, resulting in significant measurement errors. Experiments have shown, for example, that at frequencies around 400 Hz the body can cause errors of up to 6 dB if a measurement is carried out less than one meter away from the person. This error is smaller at other frequencies, but a minimum distance should still be observed. Generally, it is recommended that the measuring instrument is held at least 30 cm - even better 50 cm - away from the body.

- We recommend fitting the instrument to a tripod for exact measurements

- Absolute pressure dependency: The measuring instrument is calibrated at a height of 0 m above sea level in the factory. Measurements at other heights give rise to measurement errors which can be corrected using a table (see technical data). Please subtract the corresponding offset value from the measured value (e.g. - 0.1 dB for measurements at a height of 500 m above sea level). Prevent this measuring error by adjusting the measuring instrument at the corresponding height before (and after) each measurement. Follow the instruction manual for the calibrator.

- Windscreen: The windscreen included in the delivery should generally be set up for measurements outdoors or if the air is moving. Wind noises around the microphone will cause a measuring error as the useful signal (from the noise source) and the wind noise will be added together.
  The windscreen will not distort the reading.

- Overmodulation and undermodulation: With every measurement cycle, the sound level meter checks whether the measured sound level is within the scope of the measuring range. Deviations are indicated by "Over" or "Under" on the display. However, the criteria for overmodulation and undermodulation are different. Overmodulation is signalled if the maximum value (peak value e.g. short sound pulse, bang) during the last measurement cycle was too high. This value

may be considerably higher than the actual value of the sound level displayed. Therefore, "Over" may be signalled despite the fact that a sound level within the normal framework of the respective measurement range is shown. By contrast "Under" is geared to the measured actual value and is therefore set when the lower limit of the measurement range is undershot.

Carrying out a measurement

1. Switch the instrument on.
2. Set the measuring time (**FAST** / **SLOW**)
3. Set the frequency (**A** / **C**)
4. Always aim the microphone directly at the sound source to be measured (reference direction).

5.9.   Using the min / max hold function

Holding readings

> Press the (**MIN MAX**) key.
- **MAX** lights up. The maximum value since the function was activated is displayed and held automatically.

> Press the (**MIN MAX**) key again.
- **MIN** lights up. The minimum value since the function was activated is displayed and held automatically.

> Press the (**MIN MAX**) key again.
- **MIN** and **MAX** flash. The current measurement value is shown. The minimum value and maximum value since the function was activated are automatically held.

> Press the (**MIN MAX**) key again.
- The hold function is deactivated.

Resetting the hold function

> Hold down the (**MIN MAX**) key for two seconds.
  The recorded values are deleted.

5.10. Using individual value storage

Storing an individual value

> Press the (MEM) key.

- **MEM** lights up briefly and the individual value is stored under the next available memory address.

Displaying a stored individual value

> Press the (RECALL) key.

- **READ** lights up. The individual value of the most recent individual value storage and the memory address are displayed.

> Switch between individual memory addresses using the (▲) and (▼) keys.

- If memory addresses have not yet been allocated, **00** is displayed instead of the reading.

Deleting an individual value memory

1. Switch the instrument off.

2. Hold down the (RECALL) key and the (⏻) key.

- While the keys are held down: **CLr** is displayed, **SURE** flashes and a countdown (5 seconds) starts.

3. Once the countdown is complete, release the keys.

- The memory is deleted.

5.11. Using measurement series storage

Setting the storage interval

1. Press the (INTV) key.

2. Use the (▲) and (▼) keys to set the interval (in seconds) (minimum: 1 second, maximum 1 minute).

3. Press the (INTV) key again.

Saving a measurement series

When measurement series storage is activated, most functions (individual value storage, storage interval setting, frequency weighting, time weighting) are deactivated.

1. Press the (REC) key.
- **REC** lights up and the readings are stored.

2. Press the (REC) key again.
- The storage of readings is completed.

Deleting a measurement series memory

1. Switch the instrument off.
2. Hold down the (REC) key and the (○) key.
- While the keys are held down: **CLr** is displayed, **SURE** flashes and a countdown (5 seconds) starts.
3. Once the countdown is complete, release the keys.
- The memory is deleted.

Displaying a measurement series

Stored measurement series are displayed and evaluated via the PC software, see 7.7 Data Logger, page 28.

# 5.12. Using AC / DC signal output

Specifications

AC: 1 Vrms at full deflection, output impedance approx. 100 ohms, output signal via standard 3.5mm jack plug (see illustration below).
DC: Output 10mV / dB, output impedance 1 kohm, output signal via standard 3.5mm jack plug (see illustration below).
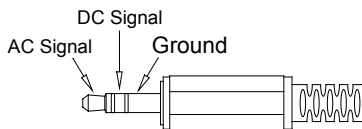
5.13.   Using PC interface

The RS232 / USB connecting cable is required in order to use the PC interface. Signal output specification: Serial interface, 9600 bps N 8 1.
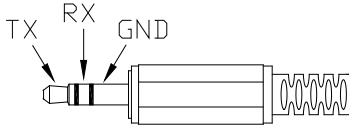
6   Maintaining the product

6.1.   Cleaning the instrument

> Wipe the instrument housing regularly with a dry cloth. Do not use any abrasives or solvents.

6.2.   Changing batteries

ℹ️ Change the batteries within 30 minutes. Following any longer interruption in operation and battery removal, the date and time need to be reset.

1. Remove Philips screw from the battery compartment using a screwdriver.
2. Remove battery compartment cover.
3. Remove spent batteries and replace with new ones. Observe the polarity!
4. Put cover back on the battery compartment.
5. Tighten screw using a screwdriver.

6.3.   Calibrating / adjusting the instrument

The recommended calibration interval is one year.

The sound calibrator 0554 0452 is required for calibration / adjustment. To carry this out, please observe the instruction manual supplied with the sound calibrator.

The measuring instrument has already been calibrated in the factory. However, to check the accuracy it is recommended, particularly if the instrument has not been used for a long time, to calibrate the instrument using the calibrator.

For measurements in harsh conditions, at high altitudes, in high humidity or where there are particularly stringent requirements for the measurement results, the instrument should be checked with the calibrator before and after the measurement.

To calibrate, the calibrator is screwed onto the microphone. Switch the sound level meter on and set the time weighting to "Fast" and the frequency weighting to "A".

The calibrator is then switched on by moving the switch to the middle setting (94 dB). If there is a discrepancy in the displayed value, you can adjust the sound level meter using the screwdriver included.

It is then possible to check whether the second level shown by the calibrator is within the ± 0.2 dB margin of error. If the value shown is not within the margin of error, please contact our service team.

7 testo 816-1 software

7.1. System requirements

• PC with Windows® operating system
• The computer must meet the requirements of the corresponding operating system. The following requirement must also be met: 50 MB disk space for installing the software

7.2. Installing the drivers / software

1. Insert the program CD into the CD-ROM drive of the computer.

If the installation program does not start automatically:

> Open My Computer, select the CD drive and start the **MainSetup.exe** file.

2. Follow the instructions of the installation wizard.
- The required device driver is installed first, followed by the software.

## 7.3. Connecting the instrument to the PC

1. Connect the RS232 / USB connecting cable to the instrument and the PC.

2. Switch the instrument on: Press the Ⓞ key.

7.4. Starting the software

ⓘ The software's user interface is only available in English

1. Connect the instrument to the PC before starting the software.

2. Click on ![Start icon] (**Start**) | (**All**) **Programs** | **t816-1** | **t816-1**.

7.5. User interface
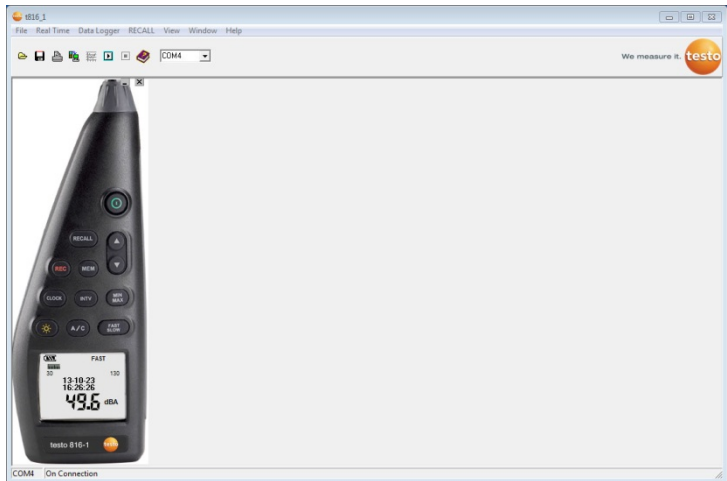
7.5.1. Main menu

File

Function	Description
Open	Open files.
Save	Save data (current view).
Printer	Print data (current view).
Printer Setup	Select and set up printer.
Exit	Close program.

Real Time

Function	Description
Run	Start real-time measurement.
Stop	End real-time measurement.

Data Logger

Function	Description
Load Data	Load measurement series from the instrument memory into the software.
Erase Memory	Delete measurement series stored in the instrument memory.

RECALLI

Function	Description
RECALL	Display individual readings from the instrument memory.

View

Function	Description
Control Panel	Display the meter control window.
Real-Time Graph	Display window for real-time display of the current readings.

Window

Function	Description
Tile	Arrange windows one above another.
Cascade	Freely arrange windows.

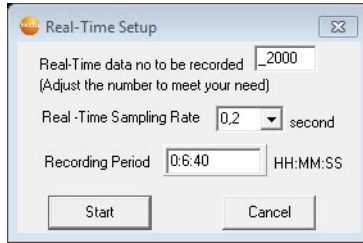**Help**

Function	Description
Contents	Open help file.
Info	Display program information.

7.6. Real Time

Function for the real-time display of instrument readings.

Making settings

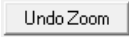| Function	Description
Real-Time data no. to be recorded	Input field: enter the number of readings that are to be recorded.
Real-Time sampling rate	Input field: enter the recording rate.
Recording Period	Information field: calculated recording period is displayed.
Start	Start real-time display

Real-Time Graph
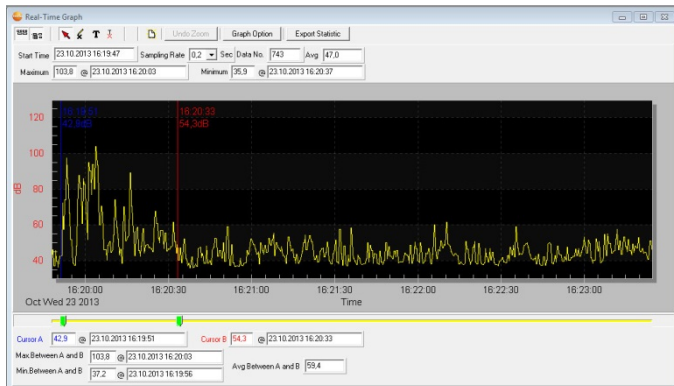
Function bar

Function	Description
🎛	Show / hide bar for displaying the recording information.
🖳	Show / hide bar for displaying the evaluation information.
↖	Standard mouse cursor.
✎	Mouse cursor for inserting a cross in the graph.
T	Mouse cursor for inserting a comment in the graph.

Zoom

1. Activate standard mouse cursor.
2. Click in the graph and draw a rectangle by holding down and dragging your mouse.
- The selected graph area is displayed.
3. To return to the standard view, press the Undo Zoom button.

Displaying individual readings / evaluating the time period

The bar for displaying the evaluation information (🖳) must be shown.
> Move both slide controls (green) below the graph.
- A blue line (cursor A) and a red line (cursor B) are displayed together with reading and time at the selected position.
- Maximum / minimum reading and time are displayed in the selected area A-B.
- The average reading is displayed in the selected area A-B.

Adjusting graph properties

> Press the Graph Option button.
- A window opens for adjusting the graph settings.

Exporting recorded readings

1. Press the Export Statistic button.
- The readings are copied to the clipboard.
2. Open program into which the data is to be exported (e.g. Microsoft® Excel®) and paste in data.

Saving recorded readings

1. In the main menu, select the **File** | **Save** function.
- Windows dialogue box for saving files is opened.
2. Enter a file name and select a file format.

In order to be able to display the data later in the software, select the file type **.ghf**. If the data is to be exported for use in some other software, select the file type **.txt**

3. Select the location you want to save it to and click on **[Save]**.

7.7. Data Logger

Function for displaying measurement series from the instrument memory.
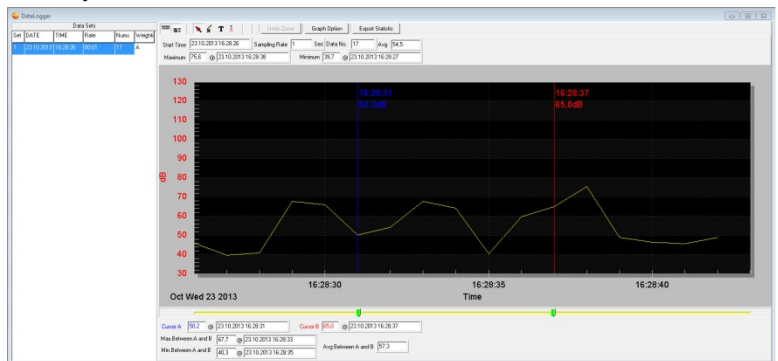
The measurement series available in the instrument memory are displayed on the left-hand side and can be selected by clicking on them with the mouse.

On the right-hand side the selected measurement series is displayed. The functions for displaying and evaluating the measurement data correspond to those for **Real Time** (see above section).

In addition to the functions described there, it is possible to save all measurement series (data sets) available in the instrument memory. In order to do this, the **.rec** data format must be selected in the Windows dialogue box for saving files.

8 Tips and assistance

8.1. Questions and answers

Question	Possible causes / solution
The sound level meter was connected to the PC, but **NO CONNECTION** is displayed in the software.	It is possible that all the ports are assigned to other applications. > Close all other applications. > Restart PC and software.
How do you transfer readings to spreadsheet software?	> Save data as a comma-separated text file (***.txt**).
How do you uninstall the software?	> Open the Control Panel in the operating system and open the function for uninstalling programs.
Real Time function: when there is a short measuring cycle (e.g. 0.1 s), not all readings are transferred.	PC's response times are too long. > Extend the measuring cycle.

If we have not been able to answer your question, please contact your dealer or Testo Customer Service. For contact details, see the back of this document or visit the website www.testo.com / service-contact.

8.2. Accessories and spare parts

Description	Item no.
Calibrator	0554 0452
Windscreen	Please contact the Service department
RS232 / USB connecting cable	Please contact the Service department
ISO calibration certificate sound pressure; calibration point 94 dB, at different frequencies	0520 0111
ISO calibration certificate sound pressure calibrators	0520 0411

For a complete list of all accessories and spare parts, please refer to the product catalogues and brochures or visit our website www.testo.com