testo 816
Sound Level Meter

Bedienungsanleitung de

Instruction Manual en

General Information

Please read this documentation through carefully and familiarise yourself with the operation of the product before putting it to use. Keep this document to hand so that you can refer to it when necessary.

Identification

Symbol	Meaning	Comments
 Warning!	Warning advice: **Warning!** Serious physical injury could be caused if the specified precautionary measures are not taken.	Read the warning advice carefully and take the specified precautionary measures
 Caution!	Warning advice: **Caution!** Slight physical injury or damage to equipment could occur if the specified precautionary measures are not taken.	Read the warning advice carefully and take the specified precautionary measures
!	Important	Please pay particular attention.
Taste	Key	Press the key.
Text,	Display contents	Text or symbol is shown on the display.

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Contents

1. Safety Advice

Avoid electrical hazards:

- Never use to measure on or near live parts!

Product safety/preserving warranty claims:

- Operate the meter only within the parameters specified in the technical data. Do not use force.
- Never store with solvents (e.g. acetone).
- Observe maximum storage and transport temperature as well as operating temperature.
- Ensure that liquid does not enter into the microphone.
- Open the meter only when this is expressly described in the Instruction Manual for maintenance purposes.
- Carry out only the maintenance and repair work that is described in the Instruction Manual. Follow the prescribed steps exactly. For safety reasons, use only original spare parts from Testo.
- Warranty claims will no longer apply if the meter is handled improperly or force is applied.

Ensure correct disposal:

- Dispose of defective rechargeable batteries and spent batteries at the collection points provided.
- Send the meter directly to us at the end of its life cycle. We will ensure that it is disposed of in an environmentally friendly manner.

CE As declared in the certificate of conformity, this product fulfils the guidelines of 89/336/EEC.
Meter conforms with DIN EN 60651 (IEC 651), Class 2.

2. Intended Purpose

testo 816 is a sound meter with the sound level measurement ranges 30-80dB, 50-100dB and 80-130dB, automatic range switchover, two time weightings, two frequency weightings, a maximum/minimum function, display light and a tripod screw.

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

3. Product Description

3.1 Display and operating elements

3.2 Supply voltage

Voltage is supplied by a 9V block battery Type 006 P or IEC6F22 or NEDA 1604 (included). If a battery is not inserted, it is possible to supply voltage via an external mains unit.

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4. Initial Operation

4.1 Putting in the battery

1 Open battery compartment at the back of the instrument.
2 Insert 9V block battery. Ensure +/- is correct.
3 Close battery compartment.

5. Operation

5.1 Switching on/off

▶ Switch on meter: press [I/O].
- All segments light up briefly and the meter switches to the measurement mode (measurement range 50 - 100dB).
▶ Switch off meter: press [I/O].

5.2 Setting the meter

The following functions can be set:

Function	Description	Setting options
Time weighting	Sets measurement time	**Fast** or **Slow**
Frequency weighting	Sets weighting	**A** or **C**
Level	Switches over measurement range	30 to 80dB 50 to100dB 80 to 130dB 30 to 130dB (Auto range)
Hold function	Switches on Max Hold/Min Hold Function	**MAX / MIN**
Light	Switches on display light	On/Off

Setting the time weighting

The measurement time (time weighting) is set by pressing FAST SLOW.

SLOW/FAST:
The ranges "Slow" with a time weighting of 1s and "Fast" with a time weighting of 125ms are available. Incoming sound signals are integrated in a time period from 1s or 125ms respectively. When "Fast" is set, the display rate of a reading increases to approx. 5-6 measurement rates per second. The "Slow" time weighting is selected for noises whose signals only change slowly e.g. machines, photocopiers, printers etc. Select the "Fast" mode to measure sudden changes in sound level (e.g.building machines).

Setting the frequency weighting

Frequency weighting is set with the A / C button.

A/C:
The frequency weightings "A" and "C" are available. Frequency weighting A is used for standard sound level measurements. This weighting corresponds to the sound pressure felt by the human ear, also referred to as "aurally compensated sound level". If the low frequency levels of a sound are to be assessed, frequency weighting C is used. If the displayed value is considerably higher during the C weighting than during the A weighting, the level of low frequency noise is high.

Setting the measurement range

The measurement range is switched using the LEVEL button.

Level:

The **testo 816** sound level meter covers the range 30 to 130 dB. The measurement ranges 30 to 80, 50 to 100 and 80 to 130 dB are available as well as an Auto Range function. The meter is in the middle measurement range 50 to 100 dB when first switched on. The measurement range is switched each time to a higher level by activating the "LEVEL" button: 50...100dB →80...130dB →Auto range. You can switch back into the lowest range 30 to 80 dB from the Auto Range mode.

MAX/MIN - Hold Function

Use the MAX MIN button to activate the Max Hold or Min Hold function. "Max" appears in the display once the "Max/Min" button is activated. In this mode, the meter shows the maximum value of the sound level since the max mode was set. The display is only updated if a higher value than the previously displayed value is measured. The meter goes into the Min-Hold mode when the "Max/Min" button is activated again. "Min" appears in the display. The display is only updated if the sound level is below the displayed value. Max/Min flashes in the display if the "Max/ Min" button is activated again. The current value is displayed and the maximum or minimum value is stored in this mode. The maximum or minimum value is displayed by again activating the "Max Min" button. The "Max Min" button must be kept pressed for two seconds in order to quit the Max Min mode.

! The Max-Min mode is cancelled by activating the Level, Fast/Slow or A/C button.

Switching light on/off

The display light is switched on by pressing the ☼ button.
The light is switched off again by pressing the button again.

Auto Off function

When switched on, the meter is in the automatic off mode (Auto Off Function). The meter switches off automatically after 30 minutes if no button has activated during this time. This function is symbolised by the clock in the display. You can deactivate this function by keeping the FAST SLOW button pressed when switching on the meter. A clock symbol then does not appear in the display.

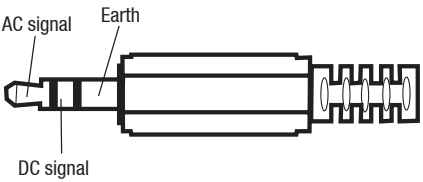
AC/DC output

The testo 816 meter has an AC/DC output with the following specifications:

AC: 1 V RMS at end-scale deflection
Output impedance approx. 100 Ohm
Output signal through standard 3,5mm jack connector (see figure below).

! Note: If the meter measures in the Auto Range function, the output signal corresponds to the automatically selected measurement range.

DC: Output 10mV/dB
Output impedance 1 kOhm
Output signal through standard 3.5mm jack connector (see Figure below).



Mains connection

The testo 816 meter has an 8V mains connection for use with a mains unit (see Ordering data)

5.3 Measuring

! Sound waves can be reflected off walls, ceilings and other objects. Also the meter housing and the person measuring (if measuring incorrectly) are disturbing factors in the sound field and can lead to incorrect measurement results.

How to avoid measurement errors

The meter housing and the person operating the meter may not only obstruct the sound coming from a certain direction but they can also produce reflections and consequently serious measurement errors. Experiments have shown, for example, that the body can cause errors of up to 6 dB with frequencies of 400 Hz if a measurement takes place less than one meter away from the person. This error is less for other frequencies but a minimum distance should be adhered to. Generally, it is recommended that the meter 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.

Measuring

1 Switch on instrument
2 Set measurement time (”FAST/SLOW”)
3 Set frequency (”A/C”)
4 Set measurement range (”Level”)
5 Always direct the microphone exactly at the sound source to be measured (reference direction).
6 Save the highest and lowest value via ”Max/Min”

Absolute pressure dependency

testo 816 is calibrated by default for measurements at a height of 0 m above sea level. Measurements at other heights give rise to measurement errors which can be corrected using a table (see technical data). Subtract the appropriate offset value from the value measured (e.g. - 0.1 dB for measurements at a height of 500 m above sea level). You can avoid this measurement error by calibrating the meter in the corresponding height prior to every measurement. Please refer to the Instruction Manual for the calibrator.

Wind cap

Generally the wind cap supplied should be attached during measurements outdoors and when air movements occur. Wind noises in the microphone cause measurement errors since the wanted signal (of the noise source) and the wind noise add up together.

! The wind cap does not falsify the measurement result.

Overmodulation and undermodulation

With every measurement cycle, the sound level meter checks whether the measured sound level is in the validity range of the respective measurement range. Deviations are indicated by "Over" and "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, it can happen that "Over" is signalled although 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 reached.

5.4 Calibration

The **testo 816** sound level meter has already been calibrated in the factory. In order to check accuracy, recalibration with the calibrator is recommended particularly if the instrument has not been used for a long period of time. The **testo 816** meter should also be checked with the calibrator prior to and following measurements in tough conditions, at great heights, at high air humidity levels or when particularly high demands are made on the measurement results.

For calibration purposes, the calibrator is placed with a rotary motion on the microphone. Switch on the sound level meter and set it to the measurement range 50-100 dB, time weighting "Fast" and frequency weighting "A".

The calibrator is then switched on by moving the switch to the middle position (94 dB). If the sound level meter deviates from the value shown, it can be readjusted using the adjustment screwdriver supplied. You can then check whether the second level of the calibrator is also within the error limit of ± 0.2 dB. Please note that to do this you must select the corresponding measurement range (80-130 dB). If the value shown is not within the error limit, please contact our service department.

6. Care and Maintenance

6.1 Changing the battery

If the battery symbol appears in the display, the lifetime remaining is approx. 10 hours. To avoid mismeasurement, please change the battery as soon as possible.

1 Open the battery compartment at the back of the meter.
2 Remove the spent battery and insert the new battery, Type 9V block (ensure+/- is correct).
3 Close battery compartment.

6.2 Microphone

A robust, long-term stable measurement microphone is located in the housing head. A function test can be carried out with the calibrator. The housing can be cleaned with alcohol (isopropanol).

! Please ensure that liquid does not get into the microphone.

The attached wind cap also protects the microphone from dust and humidity.

Please contact our service department if the microphone is defect.

6.3 Meter

testo 816 is maintenance-free and is therefore not bound by any maintenance intervals. Clean the housing with a damp cloth. Weak household cleaning agents can be used.

Never clean with abrasive cleaning agents or solutions.

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7. Technical Data

Feature	Values
Sensor:	½ inch electret condenser measurement microphone
Overall measurement range:	30 to 130 dB
Level ranges:	30 to 80 dB 50 to 100 dB 80 to 130 dB
Auto range:	30 to 130dB
Frequency range:	31.5 Hz to 8 kHz
Frequency weighting:	A/C
Reference frequency:	1000 Hz
Backup impedance of microphone:	1 kΩ at 1 kHz
AC/DC output	AC: 1V RMS at end scale deflection; output impedance approx. 100 Ohm DC: output 10 mV/dB; output impedance approx. 1 kOhm
Absolute pressure dependency:	$-1.6*10^{-3}$dB/hPa
Time weighting:	125 ms (Fast) or 1 s (Slow)
Accuracy:	± 1.0 dB (under reference conditions: 94dB at 1kHz)
Display:	LCD Digital display: 4 digit LCD display, 13mm high Resolution: 0.1dB Display refresh: 0.5s Analog display: 50 segment bar graph Resolution: 1dB Display refresh: 100ms
Battery:	9V Block (6F 22)
Battery life	Approx. 50 hours (alkaline manganese)
Tripod thread:	¼ inch
Operating temperature:	0 to +40°C
Operating humidity:	10 to 90 %RH
Storage temperature:	-10 to +60°C
Storage humidity:	10 to 75 %RH
Housing material:	ABS
Mains connection:	For 8V mains unit 0554 1084

Temperature dependancy table

Absolute pressure dependancy		
Altitude in metres above s.l.	**Pressure p in mbar**	**Correction in dB**
0 - 250	1013 - 984	0.0
>250 - 850	983 - 915	-0.1
>850 - 1450	914 - 853	-0.2
>1450 - 2000	852 - 795	-0.3

Temperature correction value table
Relative humidity: 65 %RH
Reference value sound pressure level: 124 dB
Temperature range with discrepancy <0.5 dB: 10...40 °C

Temperature in °C	Correction in dB
-10	-0.7
0	-0.7
5	-0.6
50	1

Frequency weighting

Nom. frequency in Hz	A-weighting	C-weighting	Error limits
in Hz	in dB	in dB	Class 2 in dB
31.5	-39.4	-3.0	±3
63	-26.2	-0.8	±2
125	-16.1	-0.2	±1.5
250	-8.6	-0.0	±1.5
500	-3.2	-0.0	±1.5
1000	0	0	±1.5
2000	+1.2	-0.2	±2
4000	+1.0	-0.8	±3
8000	-1.1	-3.0	±5

8. Accessories and Spare Parts

Name	Item no.
testo 816 sound level meter incl. battery, Instruction Manual, screwdriver, wind cap	0563 8165
Calibrator	0554 0452
Wind cap	0193 0816
9V rechargeable battery	0515 0025
Recharger for external recharging of rechargeable battery	0554 0025
Mains unit	0554 1084
Screwdriver	0554 0818

9. Measurement Engineering Fundamentals

Pressure and Sound

Noises are changes in the sound pressure in the air. When conditions are normal, the air pressure is 1013 mbar about which the sound pressure of the noise source fluctuates. The human ear senses these pressure fluctuations and converts them to nerve pulses. The ear is like a pressure sensor with an enormous dynamic range. The quietest noise which can be heard by humans causes pressure fluctuations of 0.0002 µbar (corresponding to 0 dB), the loudest noise (which can be heard without pain) has a sound pressure level of 635 µbar (corresponding to 130 dB).

This corresponds to a pressure difference of around 3,000,000-fold. Since stating the pressure in mbar would result in very long figures, logarithmic notation is used and calculation is with level values. In this way, a level increase of 20 dB corresponds to a 10-fold increase in pressure. A sound level meter to EN 60651 measures the frequency weighted actual value of the sound level, it is a measure of the total sound energy converted during measurement time.

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