Information Sheet
on Testing the Software of Sound Level Meters

Instruments for determining sound levels and quantities derived from them are subject to the Measures and Verification Act (MessEG) [1]. In accordance with MessEG Sect. 6, they must fulfill the general fundamental requirements of Sect. 7 of the Measures and Verification Ordinance (MessEV) [2] and the details laid down in MessEV Annex 2. The Rule Determination Committee (REA) [3] appointed in accordance with MessEG Sect. 46 has laid down that, among other things, the requirements of WELMEC Software Guide 7.2 (2020) [4] are to be applied to sound level meters. Within the scope of a type examination, the software of sound level meters is tested in order to evaluate whether it conforms to the requirements of MessEV and those of the WELMEC guide.

The basis for software testing is a documentation of the measuring instrument's software which must be provided by the manufacturer. As an aid for creating this documentation, a questionnaire [5] that deals with its major points has been made available on the website of Working Group 8.51 (Metrological Software).

The requirements of MessEV and those of the WELMEC guideline apply to a wide range of different measurement instrument types and are formulated in a general sense. They can be made more specific for typical sound level meters with regard to the following points. Exceptions to specific requirements may be possible in individual cases if additional measures are taken and/or if the scope of application of a particular instrument is restricted, provided that the general and fundamental requirements in Sect. 7 of the Measures and Verification Ordinance are fulfilled.

Requirement	Specification/Example
1) The requirements of the WELMEC guide are organized according to risk classes.	Sound level meters are generally classified as belonging to risk class C.
2a) In accordance with MessEV Sect. 41, the instrument may be operated only with labelled and secured software.	Without software separation as defined in WELMEC Annex S, "software" is considered to be operating systems, measurement software, drivers, etc., in their entirety.
2b) If software is manipulated, evidence of this must be available (MessEG Sect. 37 (6), MessEV Annex 2 (8.3, 8.4)).	Any changes made to the software installation must lead to a breach of the verification seal. Examples of acceptable solutions: • The sole interface for performing a software update is located within the instrument's housing unit behind a mechanical seal. If a measuring instrument in use is to allow software to be downloaded without a seal being broken, the requirements listed in WELMEC Annex D must be fulfilled in addition to the provisions of MessEV Sect. 40.
3) Later restrictions due to licensing must also not result in the range of functions being	Planned licenses must be listed and their scope/restrictions described in the software documentation.

restricted to the point that the conformity is affected (MessEV Annex 2 (8.3)).	In every instance, the minimum requirements in IEC 61672 concerning the functionality of sound level meters must be observed.
4) In accordance with P5 and U5 of the WELMEC basic requirements, the instrument must check at regular intervals whether changes have been made to the software used.	The interval at which the software is checked depends on the use case. For automatic measurements, this check should take place at least once every 24 hours. For manual measurements, performing this check when the instrument is started up is generally sufficient.
5) The instrument must be protected against deliberate modifications in accordance with P6 and U6 of the WELMEC basic requirements.	If cryptographic algorithms are used, the recommendations listed in BSI TR-02102-1 [7] and BAnz AT 30.12.2016 B5 [8] must be applied.
6) All communication interfaces (i.e., hardware and software interfaces) of the instrument must be protected against external manipulation (protective interfaces) in accordance with Annex 2 (8.4) of the Measures and Verification Ordinance and P4 and U4 of the WELMEC basic requirements. The software, parameters and measurement data may not be manipulated.	Protection against manipulation (protective interfaces) is adequately checked if (for example) the settings that can be made via the interfaces are not different from those that can be made directly via the instrument itself. The software should be able to ignore invalid commands.
7) In accordance with MessEV Sect. 7, measurement instruments must stay within the maximum permissible errors corresponding to the current state of the art under consideration of the testing conditions envisaged for their use.	Ordinarily, sound level meters, depending on the type, function in such a way that they are dependent on the climate. In accordance with the state of the art (DIN EN 61672-1 [6]), a sound calibrator must therefore be used to check for proper operation. In order to guarantee that the maximum permissible errors are not exceeded, each individual sound level meter must be assigned a unique type-tested sound calibrator. Using this sound calibrator, adjustments of up to ±1.5 dB are permissible.

For commercial use, the instrument must have a non-manipulable measured values memory under certain conditions in accordance with MessEV Annex 2 (10.1). The recording must be permanent and appropriately protected against accidental or deliberate falsification (for example, by using a checksum).

Here, the following requirements must be fulfilled (among others):

8a) Assigning an identity to measurement data: Measurement data must be assigned an unambiguous identifier (WELMEC Annex L4).	The identifiers of deleted data may not be reused when new data is generated.
8b) Completeness: Saved measurement data must be complete in accordance with WELMEC Annex L1 and MessEV Annex 2 (10.1). This requirement applies both to internal data storage units (i.e.,	For sound level meters in general terms, the recording for each measuring operation must clearly and inseparably name at least the following: • All relevant measurement data

storage units that are permanently installed in the measuring instrument) and to external data storage units (e.g., removable SD cards).	- An ID assigned one-to-one to the measurement procedure - The manufacturer, type and serial number of the measuring instrument used - The instrument software version used for the measurement - The settings of all parameters that affect the measurement data (for example, corrections) - The absolute sensitivity of the sound level meter during measurement
8c) Automatic storing: Once a measurement is finished, measurement data must be stored automatically (WELMEC Annex L7).	Examples of acceptable solutions in accordance with WELMEC include: - As a matter of principle, measurements are always stored. - For each individual measurement, users are prompted on-screen to accept or reject the measurement. Non-storage of data is inacceptable.
8d) Storage capacity: In accordance with WELMEC Annex L8, the storage capacity must be sufficient for the intended purpose.	The manufacturer must provide information in the manual based on which users can derive the storage capacity needed for their intended measurement.
8e) Storage duration: In accordance with MessEV Annex 2 (10.1), measurement data must be recorded in a permanent way.	
8f) Deleting data: MessEV Annex 2 (9.3) does not provide for deletion of data.	Deletion of measurement data must lead to a breach of the verification seal.

Design solutions that conform to the MessEV and are beyond the scope specified above are possible but usually require that software experts from Working Group 8.51 perform additional tests. This applies particularly to tests in accordance with WELMEC Annexes S, D and T.

- Each hardware component containing legally relevant and legally non-relevant programmed software modules must be checked in accordance with WELMEC Annex S (software separation).
- If the software of an instrument requires an update to its legally relevant software during operation without its seal being broken (and thus without subsequent verification), this must be checked in accordance with WELMEC Annex D in connection with MessEV Sect. 40.
- Each time legally relevant measurement data and parameters are transferred between two legally relevant hardware components, the requirements listed in WELMEC Annex T apply.

In such cases, contact as early as possible is requested due to the increased effort required for checking.

Detailed information, guidance and recommendations can also be obtained from PTB's Software Test Center via the website [5] of Working Group 8.51 (Metrological Software) or via its e-mail address (softwaretest(at)ptb.de).

References:

[1]   Act concerning the placement and provision of measuring instruments on the market, their use and verification, and also on prepackages. Current version: http://www.gesetze-im-internet.de/messeg/

[2]   Ordinance concerning the placement and provision of measuring instruments on the market, and also on their use and verification. Current version: http://www.gesetze-im-internet.de/messev/

[3]   Determined rules and findings of the Rule Determination Committee in accordance with Section 46 of the Measures and Verification Act (MessEG). Current version under: https://www.ptb.de/cms/metrologische-dienstleistungen/rea/dokumente-fundstellen.html

[4]   WELMEC 7.2 "Software Guide" (2020). Translation of WELMEC Guide 7.2: Software Guide (Measuring Instruments 2014/32/EU) also applicable to 2004/22/EU (2020 version). All versions: https://www.welmec.org/

[5]   Websites of Working Group 8.51 (Metrological Software), https://www.ptb.de/cms/en/ptb/fachabteilungen/abt8/fb-85/ag-851.html, specifically "MB01: Software documentation requirements for conformity evaluations"

[6]   DIN EN 61672-1:2014-07 "Electroacoustics - Sound level meters - Part 1: Specifications" (IEC 61672-1:2013); German version EN 61672-1:2013

[7]   Technical Guideline BSI TR-02102-1 "Cryptographic Mechanisms: Recommendations and Key Lengths"

[8]   Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen "Bekanntmachung zur elektronischen Signatur nach dem Signaturgesetz und der Signaturverordnung (Übersicht über geeignete Algorithmen)", 7 December 2016. BAnz AT 30.12.2016 B5