

PRODUCT DATA

Sound Level Meter Calibration System Type 3630-A for Calibration Platform Type 3630

The calibration of sound level meters is heavily driven by legislative requirements. As the number of instruments requiring calibration increases, so the need for an efficient calibration system becomes more and more obvious.

The Sound Level Meter (SLM) Calibration system for Type 3630 complies with all relevant international standards and recommendations and is equally well suited for use in national calibration laboratories and commercial calibration centres. The system combines state-of-the-art IT with Brüel & Kjær's proven experience in the calibration of instrumentation for sound and vibration measurement.

The Type 3630-A SLM calibration system is not just an effective tool. The fact that the system is globally supported, easy to recalibrate and, not least, comes with a comprehensive user manual (that even includes the uncertainty budgets needed for accreditation purposes), means that customers get an impressive package for their investment.



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USES AND FEATURES

USES

- Acoustical and electrical calibration of sound level meters to international standards

FEATURES

- Automatic, semi-automatic or manual calibration of sound level meters
- Runs under Microsoft® Windows®
- Flexible test-execution manager
- Integrated Calibration Manager's Workbench with:
 - traceability control
 - customer database
- Predefined or user-defined calibration sequences
- Transparent user interface
- Test signals comply with IEC 60651 and IEC 60804
- IEC 61672 tests available as an upgrade
- Default acceptance limits set in accordance with IEC-type Sound Level Meters
- User-adaptable acceptance limits (OIML requirements)
- Takmaximal Tests (DIN 45657)
- External electrical traceability via system's digital voltmeter
- External acoustic traceability via Multifunction Acoustic Calibrator Type 4226
- Built-in system verification of measurement quality
- Flexible Certificate of Calibration with detailed test report
- Fully integrated in the Microsoft® Office environment

System Concept

The new generation of calibration systems from Brüel & Kjær uses the Portable PULSE™ analyzer as the core system element. Portable PULSE is a state-of-the-art, highly flexible multi-analyzer capable of analysing by FFT, 1/n-octave filters and overall levels. PULSE also generates the test signals necessary to fulfill the requirements of international standards.

The Sound Level Meter Calibration system for the Type 3630 platform is designed to calibrate Brüel & Kjær as well as other manufacturers' sound level meters, according to IEC 60651, IEC 60804 and relevant ANSI standards. Future upgrades will cover the coming IEC 61672 standard.

Integrated Applications

Previously, different applications would typically run on dedicated, stand-alone systems. However, all applications on the new platform are fully integrated. This means that information entered just once, for example, customer information, is available to all applications which guarantees data integrity and saves you time. Furthermore, the system's integration with the Microsoft® Office environment assures data compatibility facilitating data export for analysis.

Calibration Manager's Workbench

Proof of traceability and control over calibration intervals for the standards and instruments used by the system is facilitated by the Calibration Manager.

Tests Performed by the Type 3630-A System

Acoustical:

- Absolute Acoustical Sensitivity Level
- Frequency Response Measured in Acoustic Coupler (A, B, C, Lin)

Electrical:

- Determining Electrical Level for L_{ref} @ 1 kHz
- Electrical Inherent Noise Level (A, B, C, Lin)
- Frequency Response (A, B, C, Lin)
- Linearity Range (SPL, L_{eq} and SEL)
- Level Range Control
- Time Weighting
 - Difference in Reference Level Indication
 - Response to Single Burst (Fast, Slow, Impulse)
 - Response to a Continuous Sequence of Bursts (Impulse)
 - Peak
- RMS Detector (Crest factor 3, 5 and 10)
 - Sine Bursts
 - Rectangular Pulses
- Overload Indication
 - Sine Signals, Inverse A
 - 4 kHz Tone burst
- Time averaging
- Pulse Range
- Average AI-weighted SPL

Test Modes

Tests are performed either acoustically or electrically. During the electrical tests, the SLM's microphone is replaced by an adaptor with the same capacitance as the microphone. The adaptor is connected to the system output. The PULSE generator produces all the electrical test signals used during the calibration.

Automatic Mode

If the SLM under test has a bus interface, then setup and reading of data from the SLM is performed via the bus. The complete test is controlled by the Windows® software.

Semi-automatic Mode

If the SLM has a DC output, then this is connected to the system's digital voltmeter through the multiplexer. The relationship between the SLM's display and the DC output is tested. If a satisfactory relationship is established, the SLM display can be calculated by the reading from the system's digital voltmeter. Hence, the calibration becomes semi-automatic and time-saving.

Manual Mode

If the SLM does not have a DC output, or a satisfactory correlation between the display reading and the DC output, then the calibration can continue but all results must be entered manually via the computer's keyboard.

Acoustic Tests

Acoustic tests are performed using Multifunction Acoustic Calibrator Type 4226. The use of Type 4226 requires knowledge of the "Type 4226 corrections". This information is available for all relevant types of Brüel & Kjær microphones and is contained in the technical documentation that accompanies all microphone packages.

User Interface

An advanced test execution manager controls the calibration sequence and test modes. The user interface has separate windows for operator instructions, test results, system setup and even a log file with the complete calibration history for each session, see Fig. 1.

The size and position of the windows can be adapted to individual requirements and the settings saved.

System Architecture and Security

All system communication is via a LAN while a sophisticated, multi-level, user-access security system controls user rights and data protection.

Flexibility

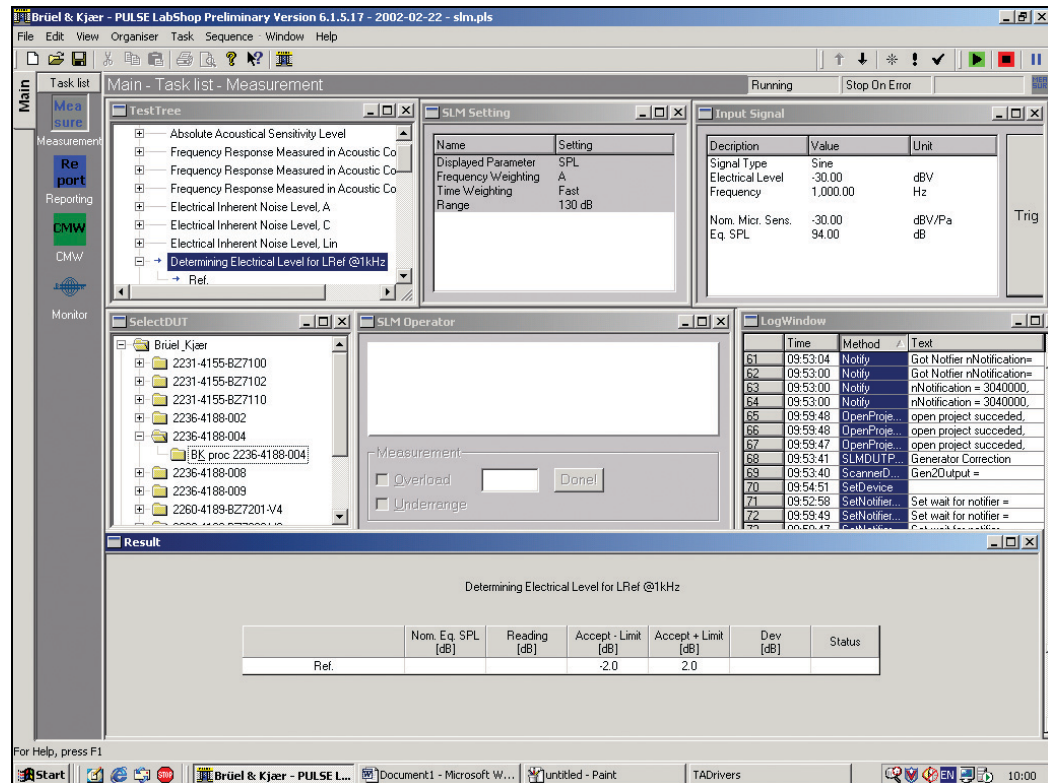
By default, the acceptance limits are set to equal the limits given in the IEC standards for the actual type of SLM (0, 1, 2 or 3). However, in order to provide maximum flexibility, you can correct the acceptance level either globally or for each individual test¹.

Reporting

When calibration of the SLM is finished, all data are stored and a "Certificate of Calibration" can be printed out either directly after the calibration or later from another computer on the network. Once a certificate has been generated, the relevant calibration data are locked to protect the data and to ensure that the printed certificates can always be exactly reproduced.

1. For in-field testing, OIML R 58 allows you to add 25% to IEC tolerances. This criterion is easily met by the flexible limits.

Fig. 1
User interface of SLM
Calibration System
Type 3630-A



The system supports a number of predefined and user-definable certificates. Accordingly, individual logos and different languages are fully supported by the SLM calibration system.

Options

The following options are available with the Type 3630-A System:

- On-site installation and training
- Tool to add new SLM types
- Maintenance contracts (hardware and software)

Watch Out for Other Members of the Family!

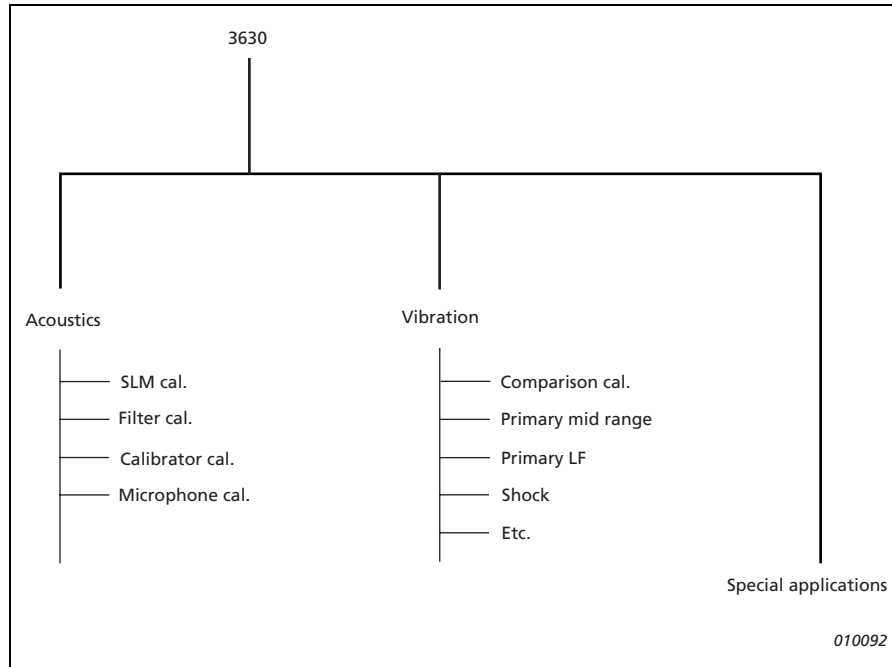
Type 3630-A is far more than just a single-purpose calibration system – it is part of an entire calibration platform.

This platform is based upon a highly modular hardware/software concept which, hand in hand with the PULSE multi-analyzer, offers a multitude of different calibration applications. The platform's modularity gives maximum measurement flexibility because a multifunctional system can be split into separate systems as workload or organisational requirements change.

Even customised applications such as hydrophone phase calibration or microphone high-pressure calibration can be easily implemented with the Type 3630 platform.

Fig. 2 shows the different calibration areas covered by the platform.

Fig. 2
Type 3630 platform
calibration areas



Ordering Information – Type 3630-A Sound Level Meter Calibration System

Consisting of:		Type 4226	Multifunction Acoustic Calibrator
Type 3560-C-T00	PULSE Sound and Vibration Analyzer (2 In)	4226-CAI	Accredited Initial Calibration of Type 4226
7202-B-GB	Dell™ Standard Tower PC		
UL-0217	Dell 19" flat panel display		Set of cables for system interconnection
UL-0207-GB	Microsoft® Office XP Professional Edition		Complete System Manual including Uncertainty Budgets
Type 2978	DMM Agilent® 34970 (digital voltmeter)		
2978-CAI	Accredited Initial Calibration of Type 2978		
Type 3111	Output Module	OPTIONS	
Type 7763	SLM Calibration Software	4226-CAF	Accredited Recalibration of Type 4226
Type 7762	Define New SLM Type and Procedure for Type 3630	2978-CAF	Accredited Recalibration of Type 2978
WA-0302-A	Half-inch Input Adaptor 12 pF	BK-0058	System installation, per day (Excl. travel and accomodation)
WA-0302-B	Half-inch Input Adaptor 15 pF	BK-0060	On-site training, per day (Excl. travel and accomodation)
WA-0302-C	Half-inch Input Adaptor 18 pF	M1-7700-N2	Annual Software Maintenance and Support Agreement for PULSE FFT and CPB Analysis
WA-0302-D	Half-inch Input Adaptor 20 pF		
WA-0267	Input Adaptor, Half-inch		

Technical Specifications for Tests Performed by Type 3630-A

Acoustical

ABSOLUTE ACOUSTICAL SENSITIVITY LEVEL

Calibration Uncertainty: 0.17 dB

FREQUENCY RESPONSE MEASURED WITH BRÜEL & KJÆR MULTI-FUNCTION ACOUSTIC CALIBRATOR TYPE 4226 (A, B, C, Lin)

Calibration Uncertainty: 0.2 dB to 0.6 dB (depending on the frequency and the uncertainty of microphone correction values used)

Test Frequencies: Octave frequencies from 31 Hz to 12 kHz

Electrical

DETERMINING ELECTRICAL LEVEL FOR L_{ref} @1 kHz

Calibration Uncertainty: 0.09 dB

ELECTRICAL INHERENT NOISE LEVEL (A, B, C, Lin)

Calibration Uncertainty: 1 dB

FREQUENCY RESPONSE (A, B, C, Lin)

Calibration Uncertainty: 0.12 dB

LINEARITY RANGE (SPL, L_{eq} AND SEL)

SPL (in 1 and/or 10 dB steps):

– Test Frequency: One or more of 20 Hz, 31.5 Hz, 1 kHz, 4 kHz, 8 kHz, 12.5 kHz

– Calibration Uncertainty: 0.13 – 0.24 dB

L_{eq} :

– Test Frequency: 4 kHz

– Calibration Uncertainty: 0.13 – 0.24 dB

SEL:

– Test Frequency: 1 second single Sine Burst at 4 kHz

– Calibration Uncertainty: 0.13 – 0.24 dB

LEVEL RANGE CONTROL

Calibration Uncertainty: 0.12 dB

Test Frequency: One or more of 20 Hz, 31.5 Hz, 1 kHz, 4 kHz, 8 kHz, 12.5 kHz

TIME WEIGHTING

Difference in Reference Level Indication

Calibration Uncertainty: 0.11 dB

Test Frequency: 1 kHz

Response to Single Burst (Fast, Slow, Impulse)

Calibration Uncertainty: 0.12 – 0.23 dB

Response to single burst tested for various burst durations in F, S and I:

- Burst signal: 2 kHz sine
- Burst Duration: Fast 200 ms, Slow 500 ms, and Impulse 20 ms, 5 ms and 2 ms
- Signal level: 10 dB steps

Response to a Continuous Sequence of Bursts (Impulse)

Calibration Uncertainty: 0.1 dB

- Burst signal: 2 kHz sine
- Burst Duration: 5 ms
- Repetition frequency: 100 Hz, 20 Hz and 2 Hz
- Signal level: 10 dB steps

Peak

Calibration Uncertainty: 0.1 dB

- Positive and negative single square pulse:
- Pulse Duration: 10 ms and 100 μ s

RMS DETECTOR (CREST FACTOR 3, 5 AND 10)

Sine Bursts

Calibration Uncertainty: 0.16 dB

- Burst signal: 2 kHz sine
- Burst Duration: 0.5 ms, 2 ms and 5.5 ms
- Repetition frequency: 40 Hz
- Signal level: 10 dB steps

Rectangular Pulses

Calibration Uncertainty: 0.2 dB

- Pulse Duration: 200 μ s
- Signal level: 10 dB steps

OVERLOAD INDICATION

Inverse A-weighted

Freq: 1/3-octave frequencies from 1 kHz and downwards until overload occurs

4 kHz Tone burst

Calibration Uncertainty: 0.31 dB

- Burst signal: 4 kHz sine
- Burst Duration: 1 ms

TIME AVERAGING

Calibration Uncertainty: 0.16 dB

- Burst signal: 4 kHz sine
- Burst Duration: 1 ms
- Repetition time: 10 ms, 100 ms, 1 s, 10 s

PULSE RANGE

Calibration Uncertainty: 0.2 dB

Test of response to a single 4 kHz tone-burst superimposed on a low-level continuous sine signal:

Burst Duration: 4, 40, 400 and 4000 periods

Peak Level: 53, 63 and 73 dB above the low-level signal

AVERAGE AI-WEIGHTED SPL

Calibration Uncertainty: 0.12 dB

- Burst signal: 4 kHz sine
- Burst Duration: 1 s, 20 ms, 5 ms, 1 ms
- Repetition time: 5 ms

SYSTEM CALIBRATION

Electrical uncertainty achieved after weekly electrical self-calibration typically better than 0.05 dB

GENERAL

All tests are performed to international standards (IEC 60651 and IEC 60804) with acceptance limits as defined in the standards. For each single test, the acceptance limit can be modified by a user-selected factor (e.g., 125 will add 25% to the IEC tolerance as defined in OIML R 58 for service verification).

The stated calibration uncertainties are Best Measuring Capabilities – 12-month specifications expressed as combined expanded uncertainty with a coverage factor $k = 2$.

The uncertainties are valid at $23^\circ \pm 3^\circ\text{C}$ and $\text{RH } 50\% \pm 25\% \text{ RH}$.

The uncertainties stated include a quantization error for an instrument with 0.1 dB resolution.

Mechanical Dimensions (depth × height × width):

500 × 433 × 520 mm (19.7 × 17.0 × 20.5")

Weight: approx. 50 kg

Mains Voltage Range: 110 V to 240 V/50 to 60 Hz

TRADEMARKS

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HEADQUARTERS: DK-2850 Nærum · Denmark · Telephone: +45 4580 0500
Fax: +45 4580 1405 · www.bksv.com · info@bksv.com

Australia (+61) 2 9889-8888 · Austria (+43) 1 865 74 00 · Brazil (+55) 11 5188-8161
Canada (+1) 514 695-8225 · China (+86) 10 680 29906 · Czech Republic (+420) 2 6702 1100
Finland (+358) 9-755 950 · France (+33) 1 69 90 71 00 · Germany (+49) 421 17 87 0
Hong Kong (+852) 2548 7486 · Hungary (+36) 1 215 83 05 · Ireland (+353) 1 807 4083
Italy (+39) 0257 68061 · Japan (+81) 3 5715 1612 · Republic of Korea (+82) 2 3473 0605
Netherlands (+31) 318 55 9290 · Norway (+47) 66 77 11 55 · Poland (+48) 22 816 75 56
Portugal (+351) 21 4169 040 · Singapore (+65) 377 4512 · Slovak Republic (+421) 25 443 0701
Spain (+34) 91 659 0820 · Sweden (+46) 33 225 622 · Switzerland (+41) 44 8807 035
Taiwan (+886) 2 2502 7255 · United Kingdom (+44) 14 38 739 000 · USA (+1) 800 332 2040

Local representatives and service organisations worldwide

Brüel & Kjær 

