BRÜEL & KJÆR® Acoustic Analysis Software

PULSE Sound Power Software

PULSE™ Sound Power software is a PULSE LabShop application for determining noise emission quantities of machinery, equipment and their sub-assemblies.

The application includes the determination of sound power levels as described in international standards, as well as the measurement of emission sound pressure levels at specified positions in the vicinity of a machine.

To evaluate the annoyance of tonal components in noise emissions, the calculation of two complementary parameters, tone-to-noise ratio and prominence ratio, is seamlessly integrated in the solution.

Uses and Features

Uses

- Product compliance with noise specifications
- Benchmarking
- Product development
- Product sound analysis – identify and evaluate prominent discrete tones and impulsive noise
- Measurements in essentially free-field environments
- Sound power determination of household and similar electrical equipment including:
  - Information technology/telecommunications equipment
  - Vacuum cleaners
  - Dishwashers
  - Washing machines and spin extractors
  - Refrigerators

Features

- Dedicated templates for performing measurement procedures and calculations according to:
  - ISO 3744, 3745, 3746 and 3747
  - ISO 9295
  - ISO 11201 and 7779 (ECMA 74)
  - IEC 60704-2-1, 60704-2-3, 60704-2-4 and 60704-2-14
  - EU Directive 2000/14/EC
- Easy to follow, task-based workflow
- Graphical user interface (GUI) that includes pop-up text, colour coding and warnings
- Direct export to Microsoft® Excel®
- Scalable solution based on the PULSE LabShop platform

Reasons for sound power determination

Products are subject to national and international regulations designed to create safer, healthier workspaces, as well as to protect the environment. At the same time, awareness among consumers regarding noise issues is increasing.

Legislation

European Union (EU) Directives 98/37/EEC (Machinery), 2000/14/EC (Outdoor Equipment) and 2009/125/EC (eco-design requirements for household washing machines) require manufacturers of many types of machinery and equipment to declare noise emissions as a prerequisite for placing them on the EU market.

Voluntary awards

Voluntary awards, such as the German eco-label Blue Angel, are intended to indicate that a product's noise emissions are determined by standardized methods. They signify that a product meets certain quality standards, enable purchasers to make buying decisions according to the criterion of low-noise emission, and can be an element of global strategy for companies in order to differentiate their products.

Product sound

When speaking of product sound and sound quality, noise emissions are not the only cause for concern. Characteristics of sound, prominent discrete tones (audible sounds of a single frequency) and impulsive noise (short duration, relatively high amplitude) can also cause great human discomfort. Customer acceptability of a product is frequently related to the absence or minimal presence of tonal components.

PULSE Sound Power Type 7799

Type 7799 is a comprehensive software solution aimed at standards compliance and non-conformance problems of noise emission quantities for machinery, equipment and their sub-assemblies. Type 7799 supports various configurations of microphones and geometries, which makes it a scalable solution with respect to budget and testing requirements.

The software includes a number of dedicated templates for performing specific sound power measurement procedures and calculations.

Template for free-field

A template that provides measurement and calculation procedures to determine the sound power of noise sources operating in a free (or essentially free) sound field based on measurement and calculation procedures given by ISO 3744, ISO 3745 and ISO 3746.

Measurements are made at microphone positions over a measurement surface enveloping the noise source.

Template for free-field with emission SPL

A template that provides measurement and calculation procedures to determine sound power levels based on ISO 7779 or ECMA 74 using ISO 3744 or ISO 3745 for the measurement of sound power and ISO 11201 for the measurement of emission sound pressure levels. Along with the emission sound pressure levels, the tone-to-noise ratio and prominence ratio are also calculated to identify and evaluate prominent discrete tones. Quantities used to identify impulsive noise are also measured.

Measurements are made at all microphone positions over a measurement surface enveloping the noise source, and at all operator and/or bystander positions.

Template for reverberation room testing

A template for determining sound power based on ISO 3741, ISO 3743-1 and ISO 3743-2:

- ISO 3741: Sound power measurements in laboratory reverberation rooms, which are particularly suitable when performing precision-grade tests on comparatively small machines when the sound emitted is predominantly steady
- ISO 3743-1: Sound power measurements in hard-walled test rooms, which are used for engineering-grade measurements. In this case, most ordinary, unfurnished rooms without special acoustical treatment comply with the requirements of this standard
- ISO 3743-2: Sound power measurements in special reverberation rooms that are less expensive than the laboratory reverberation rooms described in ISO 3741. The methods described in ISO 3743-2 provide measurements of engineering-grade, which are particularly suitable for direct measurement of A-weighted sound power levels of a series of small noise sources

Template for vacuum cleaners

A template that provides measurement and calculation procedures to determine the sound power of vacuum cleaners based on IEC 60704-2-1 using the free-field methods described in ISO 3744.

Template for washing machines and spin extractors

A template that provides measurement and calculation procedures to determine the sound power of washing machines in accordance with the EU Directive 2009/125/EC. It is based on IEC 60704-2-4 (identical to EN 60704-2-4) and uses the free-field methods described in ISO 3744 with additional procedures to take into account the increase in noise during the spinning phase and the measurement of the maximum rpm.

The report provides the sound power for the washing period and the time-averaged sound power for the highest A-weighted 50 s period during the final rinse and spin extraction.

Template for fans

A template that supports sound power determination of fans and enables manufacturers to comply with national and international regulations for noise emission quantities. The software is configured with the measurement requirements defined by ISO 3744, 3745 and 3746 to guide you through measurement setup, measurement runs and report generation.

Template for high frequency sound power

A template that manages the measurement of high-frequency noise using measurement methods described in ISO 9295 and calculates the guaranteed sound power level for each item tested.

Template for Directive 2000-14-EC

A template that supports EU Directive 2000/14/EC, which states the maximum permissible sound power levels for over 50 types of outdoor machines. The template is configured with the measurement requirements defined by ISO 3744, 3745 and 3746 to guide you through measurement setup, measurement runs and report generation allowing you to specify the maximum sound power level for any category of machinery covered by the directive.

The dedicated templates provide the framework for determining, storing and reporting noise-emission quantities according to various standards in an easy to follow, task-based manner.

Tasks related to the project are clearly shown in the left column and, in this example, include: Hardware Setup, Measurement Setup, Calibration (before and after), Measurement and Display.

Each task in the workflow is populated with the necessary operations and notes open, which simplifies the measurement procedure. You can store measurement setup, calibration values and background noise measurements in PULSE projects for future use, which allows you to skip repetitive tasks. Graphical features, such as pop-up text boxes, colour coding and warnings, allow quick updates on measurement status, determination of pending actions, and validation of specific parameters within the standard.

Fig. 1 *Graphic user interface of PULSE Sound Power*

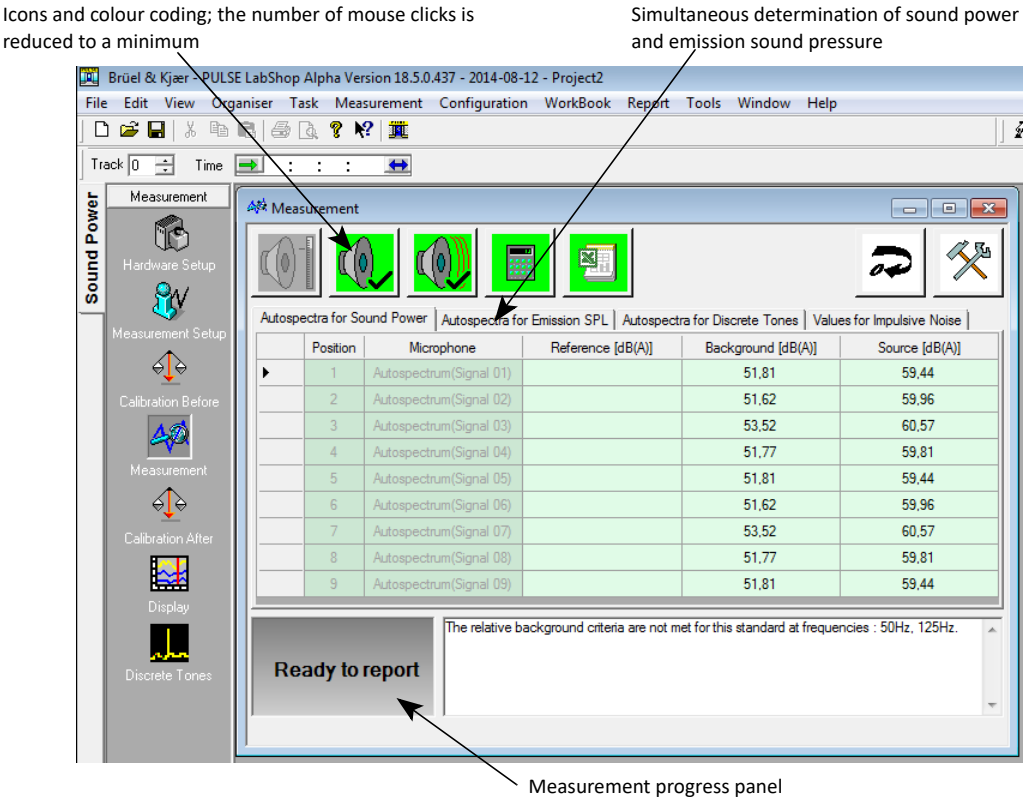

Fig. 2 *Excerpt from an automatically generated report. Colour codes indicate the frequency bands where corrections for background noise have been applied*

Sound Power

Frequency [Hz]	Lpf mean [dB]	Lw [dB]	Lw(A) [dB]	K1 [dB]	K2 [dB]	L'p(B) mean [dB]	L'p(S) mean [dB]	DeltaLp [dB]	U [dB]	Sigmatot [dB]	Lw ref,atm [dB]	Lw(A) ref,atm [dB]
50	50,73	70,02	39,82	1,30	0,00	51,69	52,03	0,33	0,00	0,00	69,90	39,70
63	33,46	52,76	26,56	1,30	0,00	34,06	34,76	0,70	0,00	0,00	52,63	26,43
80	30,52	49,81	27,31	1,30	0,00	31,48	31,82	0,34	0,00	0,00	49,69	27,19
100	31,55	50,85	31,75	1,30	0,00	32,37	32,85	0,48	6,08	3,04	50,72	31,62
125	37,56	56,86	40,76	1,30	0,00	37,55	38,86	1,31	6,08	3,04	56,73	40,63
160	38,06	57,36	43,96	0,48	0,00	28,73	38,54	9,81	6,08	3,04	57,23	43,83
200	42,80	62,09	51,19	0,30	0,00	31,34	43,09	11,76	4,12	2,06	61,97	51,07
250	43,52	62,81	54,21	0,17	0,00	29,57	43,69	14,12	4,12	2,06	62,69	54,09
315	43,51	62,80	56,20	0,19	0,00	30,12	43,70	13,58	4,12	2,06	62,68	56,08
400	46,01	65,30	60,50	0,00	0,00	28,35	46,01	17,66	3,16	1,58	65,18	60,38
500	44,71	64,00	60,80	0,00	0,00	28,27	44,71	16,44	3,16	1,58	63,88	60,68
630	47,47	66,76	64,86	0,00	0,00	25,68	47,47	21,79	3,16	1,58	66,64	64,74
800	48,81	68,10	67,30	0,00	0,00	23,94	48,81	24,87	3,16	1,58	67,98	67,18
1000	49,94	69,23	69,23	0,00	0,00	23,64	49,94	26,29	3,16	1,58	69,11	69,11
1250	47,87	67,17	67,77	0,00	0,00	22,71	47,87	25,16	3,16	1,58	67,04	67,64
1600	45,35	64,64	65,64	0,00	0,00	25,06	45,35	20,29	3,16	1,58	64,52	65,52
2000	45,47	64,76	65,96	0,00	0,00	20,71	45,47	24,76	3,16	1,58	64,64	65,84
2500	48,15	67,44	68,74	0,00	0,00	19,44	48,15	28,71	3,16	1,58	67,32	68,62
3150	50,34	69,63	70,83	0,00	0,00	17,25	50,34	33,09	3,16	1,58	69,51	70,71
4000	45,95	65,25	66,25	0,00	0,00	16,78	45,95	29,17	3,16	1,58	65,12	66,12
5000	40,29	59,59	60,09	0,00	0,00	13,83	40,29	26,46	3,16	1,58	59,46	59,96
6300	37,45	56,74	56,64	0,00	0,00	12,82	37,45	24,62	5,10	2,55	56,62	56,52
8000	42,59	61,88	60,78	0,00	0,00	11,52	42,59	31,07	5,10	2,55	61,76	60,66
10000	45,14	64,43	61,93	0,00	0,00	10,86	45,14	34,27	5,10	2,55	64,31	61,81

Data management

In addition to archiving using Microsoft Excel workbooks, data can be stored in a dedicated database for easy search/retrieval. Management of data collected using Type 7799 is available for single or multiple users. BK Connect® Data Viewer (advanced) Type 8400-A enables data management for one user.

These applications allow you to add metadata (such as operator, location and test type) to your data, search your database, display and copy your data, perform statistical calculations (such as mean and standard deviation) and generate reports.

Environmental correction

Fig. 3 *Reference Sound Source Type 4204*
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Type 7799 supports Reference Sound Source Type 4204 to measure the environmental correction according to ISO 3744.

Type 4204 is a rugged and compact sound source that provides a stable, known sound power spectrum over a wide frequency range according to ISO 6926.

Examples of typical configurations

Fig. 4 *Typical setup for determination of sound power in a free field*

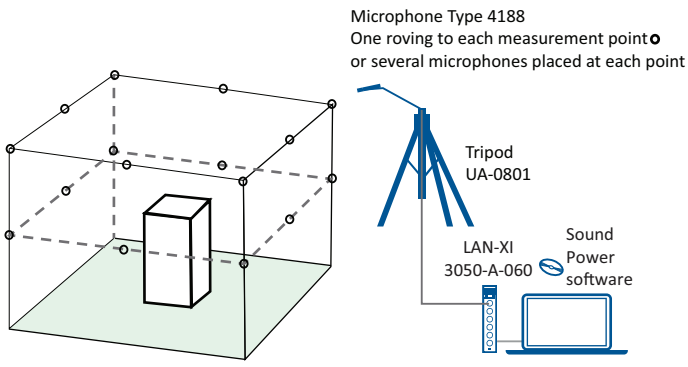


Fig. 5 *Typical configuration for testing air conditioning according to ISO 3744, 3745 or 3746 using a two-room system. One-, two- and three-room systems are supported*

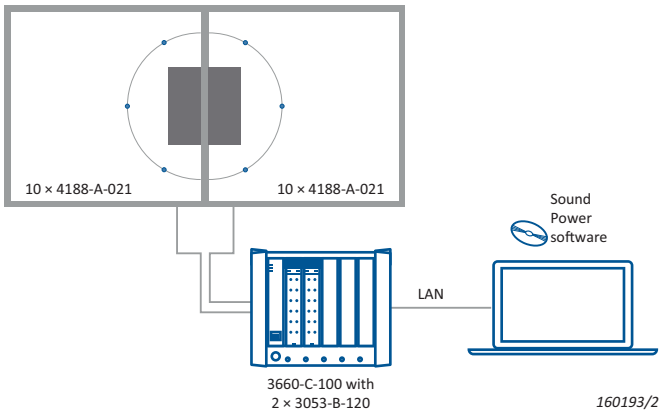
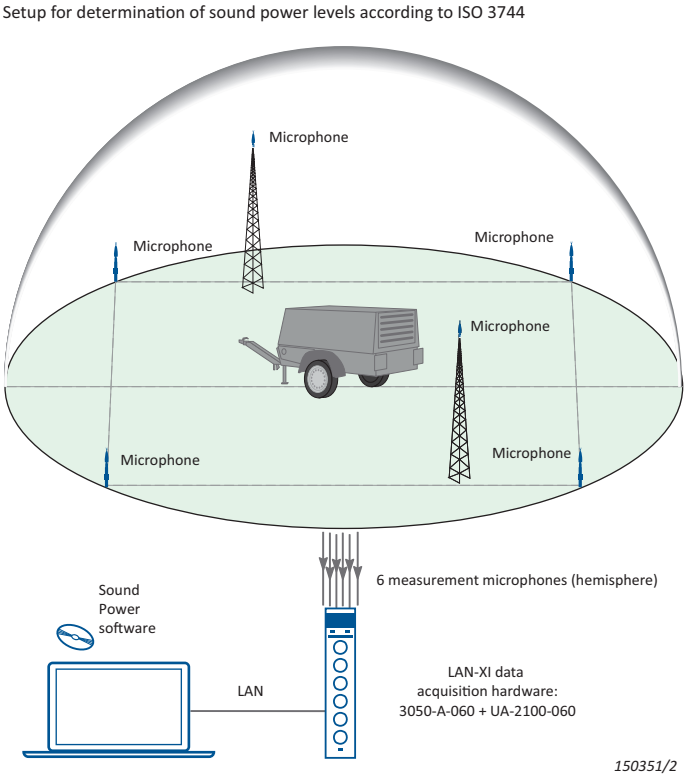


Fig. 6 *Typical system setup to test outdoor machinery according to ISO 3744*



Software overview

HBK offers a range of Brüel & Kjær sound power determination software applications. To help you choose the correct application or template, a brief description and the standards that they support are listed in Table 1

Table 1 Overview of Brüel & Kjær sound power determination software

TYPE NO.	DESCRIPTION	INCLUDED TEMPLATES	SUPPORTED STANDARDS	WHERE TO FIND
7799	Sound power determination in essentially free-field environments	Free-field	ISO 3744, 3745 or 3746	Templates built into software
		Free-field with emission SPL	ECMA 74 or ISO 7779	
			ISO 3744 or 3745 (sound power level)	
			ISO 11201 (emission SPL)	
		In situ	ISO 3747	
		Vacuum cleaners	IEC 60704-2-1	
		Dishwashers	IEC 60704-2-3	
		Washing machines and spin extractors	IEC 60704-2-4	
		Refrigerators	IEC 60704-2-14	
7799	Sound power determination of devices that emit high-frequency noise	High frequency sound power	ISO 9295	Templates built into software
7799	Noise emission testing of outdoor machinery according to Directive 2000-14 EC	Directive 2000-14 EC	ISO 3744, 3745 or 3746	Templates built into software
7799	Sound power determination of fans	Fans	ISO 3744, 3745 or 3746	Templates built into software
7882	Sound power determination using sound intensity	ISO 9614-1	ISO 9614-1	Install separate software – see product data BP 2494
		ISO 9614-2	ISO 9614-2	
		ISO 9614-3	ISO 9614-3	
7883	Sound power determination of earth-moving machinery	Earth-moving machinery	ISO 6393, 6394, 6395 or 6396	Install separate software – see product data BP 2521
7884	Sound power determination in reverberation rooms	Reverberation room	ISO 3741, 3743-1 or 3743-2	Install separate software – see product data BP 2519
		In situ	ISO 3747	

Specifications – PULSE Sound Power Type 7799

Type 7799 is a Windows®-based application for PULSE Sound Power (SPW) platform. The software is delivered via DVD or USB

System

SYSTEM PC REQUIREMENTS

- Microsoft® Windows® 10 Pro or Enterprise (x64) with either Current Branch (CB) or Current Branch for Business (CBB) servicing model
- Microsoft® Office 2016 (x32 or x64) or Office 2019 (x32 or x64)
- Microsoft® SQL Server® 2017

NOTE: Microsoft SQL Server 2017 Express is included in the installation

RECOMMENDED SYSTEM CONFIGURATION

- Intel® Core™ i7, 3 GHz processor or better
- 32 GB RAM
- 480 GB Solid State Drive (SSD) with 20 GB free space, or better
- 1 Gbit Ethernet network*
- Microsoft® Windows® 10 Pro or Enterprise (x64) with CB
- Microsoft® Office 2019 (x32)
- Microsoft® SQL Server® 2017
- Screen resolution of 1920 × 1080 pixels (full HD)

FRONT END

The software automatically detects the front-end hardware connected and configures the system. If IEEE 1451.4 capable transducers (with standardized TEDS) are being used, these are also detected and attached automatically to the correct channel of the input module

For information about LAN-XI data acquisition modules, see product data BP 2215

OPTIONAL SOFTWARE FOR ADDITIONAL CAPABILITIES

- BK Connect Data Viewer Type 8400
- BK Connect Hardware Setup Type 8401
- BK Connect Data Processing Type 8403

Calibration

Use PULSE LabShop's integrated Calibration Master, which initiates microphone calibration while you move the calibrator from one microphone to the next. The full calibration history for a transducer can be retained in the Transducer Database, which allows monitoring calibration data variations over a period of time

* A dedicated data acquisition network (LAN or WAN) is recommended. A network that only handles data from the front end improves the stability of the data

Free-field (PULSE Template)

Provides measurement and calculation procedures for the determination of the sound power of noise sources as described in the following international standards:

- ISO 3744:2010
- ISO 3745:2012
- ISO 3746:2010

SUITABLE TEST ENVIRONMENTS

- Anechoic or hemi-anechoic rooms as specified in ISO 3745:2012
- Essentially free field over a reflecting plane as specified in ISO 3744:2010

MEASUREMENT

$L'_{p(B)\,i}$ *	time-averaged sound pressure level produced by background noise
$L'_{p(S)\,i}$	time-averaged sound pressure level from the noise source under test

* Throughout these specifications subscript *i* means that the quantity is measured or calculated at the *i*th microphone position over the measurement surface

Quantities Specific to ISO 3745:

$L'_{E(B)\,i}$	single-event sound pressure level produced by background noise
$L'_{E(S)\,i}$	single-event sound pressure level from the noise source under test

If microphone frequency range and available number of beats allow, all quantities can be measured in either:

- 1/3-octave band for any range with nominal mid-band frequencies from 50 Hz to 20 kHz
- 1/1-octave band for any range with nominal mid-band frequencies from 63 Hz to 16 kHz
- Narrow-band (FFT) for any range with nominal mid-band frequencies from 50 Hz to 20 kHz

For information on microphone frequency range, please refer to the respective microphone product data

CALCULATION

$\bar{L}_{pf}$	surface time-averaged sound pressure level
L_W	sound power level

Quantities Specific to ISO 3744 and ISO 3746:

$\overline{L'}_{p(B)}$	mean measured time-averaged background noise level over the measurement surface
$\overline{L'}_{p(S)}$	mean measured time-averaged sound pressure level for the noise source under test over the measurement surface
K_1	background noise corrections for the surface sound pressure level
K_2	environmental corrections measured using reference sound source

Quantities Specific to ISO 3745:

K_{1i}	background noise corrections
L_{pi}	sound pressure level corrected for background noise
L'_W	sound power level under alternate meteorological conditions
DI_i	directivity index
Q_i	directivity factor

A-weighted values are calculated from either:

- 1/1- or 1/3-octave values as specified in, for example, Annex C of ISO 3745:2012
- Narrow-band values (FFT)

VALIDATION

Criterion for background noise
Requirement evaluation for additional microphone positions

STATISTICS

Mean and standard deviation of any measured or calculated quantity on batch measurements

Free-field with Emission SPL (PULSE Template)

All specifications given for the Free-field template apply plus the following standards:

- ISO 11201:2010
- ISO 7779:2010 (sound power levels are determined under free-field or essentially free-field conditions only)
- ECMA 74 (12th edition, 2012, sound power levels are determined under free-field or essentially free-field conditions only)

CALCULATION

L_{pj} *	time-averaged sound pressure level corrected for the background noise, A-weighted
$L_{pCpeak\,j}$	C-weighted peak sound pressure level

* Throughout these specifications subscript *j* means that the quantity is measured or calculated for the *j*th operator or bystander position

IDENTIFICATION OF PROMINENT DISCRETE TONES

- Tone-to-noise Ratio criteria according to ISO 7779:2010 and ECMA 74
- Prominence Ratio method according to ECMA 74 (12th edition, 2012)

MEASUREMENT

$L'_{p(B)\,j}$	measured time-averaged sound pressure level produced by the background noise, A-weighted
$L'_{p(S)\,j}$	measured time-averaged sound pressure level during operation of the source under test, A-weighted
$L'_{p(S)\,j(\mathrm{FFT})}$	measured time-averaged sound pressure level during operation of the source under testing, in narrow band

SPW High Frequency Sound Power (PULSE Template)

SUITABLE TEST ENVIRONMENTS

- Reverberation rooms as specified in ISO 3741
- Free-field over a reflecting plane as specified in ISO 3744

MEASUREMENTS

Time-averaged sound pressure levels:

- Produced by the background noise
- From the reference sound source
- From the noise source under test

All quantities are measured in one of the following:

- 1/3-octave band for any range with nominal mid-band frequencies from 50 Hz to 20 kHz
- 1/1-octave band for any range with nominal mid-band frequencies from 63 Hz to 16 kHz
- 1/12-octave band for any range with nominal mid-band frequencies from 50 Hz to 22.4 kHz

A-weighted values calculated from 1/1-octave or 1/3-octave values as specified in Annex C of ISO 3745: 2012

CALCULATIONS

- Background noise corrections
- Mean corrected time-averaged sound pressure level from the reference sound source over all source positions
- Mean corrected time-averaged sound pressure level from the noise source under test over all source positions
- Sound power level

Directive 2000/14/EC (PULSE Template)

Provides measurement and calculation procedures for the determination of the sound power of noise sources in accordance with provisions of the EU Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors

SUITABLE TEST ENVIRONMENTS

- Typically outdoor on a reflecting surface of concrete or non-porous asphalt
- In cases where the equipment cannot be operated on such a surface, a suitable environment is defined and max environmental correction K_{2A} is given in the Directive 2000/14/EC (or in the noise test codes referenced in the Directive)

MEASUREMENT

$L'_{p(B)\,i}$	time-averaged sound pressure level produced by the background noise
$L'_{p(S)\,ikn}$	time-averaged sound pressure level from the noise source under test for the *k*th operating mode and the *n*th run

- All quantities can be measured in 1/3-octave band for any range with nominal midband frequencies from 50 Hz to 20 kHz or in 1/1-octave band for any range with nominal midband frequencies from 63 Hz to 16 kHz, if microphone frequency range and available number of beats allow. For information on microphone frequency range, please refer to the relevant microphone product data

CALCULATION

$\overline{L'}_{p(B)}$	mean measured time-averaged background noise level over the measurement surface
$\overline{L'}_{p(S)\,kn}$	mean measured time-averaged sound pressure level for the noise source under test over the measurement surface for the *k*th operating mode and the *n*th run
K_1	background noise corrections for the surface sound pressure level
$\bar{L}_{pf\,kn}$	surface time-averaged sound pressure level for the *k*th operating mode and the *n*th run
$\bar{L}_{pf\,k}$	surface time-averaged sound pressure level for the *k*th operating mode*
$\bar{L}_{pf}$	surface time-averaged sound pressure level calculated using the appropriate equation for the specific type of equipment under test† given in the Directive 2000/14/EC (or in the corresponding noise test code)
L_W	sound power level

* Calculated as the arithmetic mean of the two highest values from three or more runs, which do not differ by more than 1 dB according to Annex III Part A of Directive 2000/14/EC

† The equation, which combines the $\bar{L}_{pf\,k}$ test results from *k*, is manually entered in the user interface

- A-weighted values are calculated from 1/1-octave or 1/3-octave values as specified in Annex C of ISO 3745:2012

VALIDATION

Criterion for background noise

Automatic determination of surface time-averaged sound pressure level values from three or more runs, which do not differ by more than 1 dB

STATISTICS

- Mean and standard deviation of sound power level on batch measurements

Vacuum Cleaners (PULSE Template)

Provides measurement and calculation procedures for the determination of the sound power of vacuum cleaners as described in the following international standards:

- IEC 60704-2-1: 2014
- ISO 3744: 1994, 2010

Sound Power of Fans (PULSE Template)

Supports sound power standards ISO 3744, 3745 and 3746.

- Ability to specify maximum permissible sound power level for each category of machinery
- Full documentation for all measured machines
- Corrections for background noise and test environment
- Simultaneous testing in one, two or three anechoic rooms
- Supports additional microphones for cases in which the directivity of the source is excessive

Washing Machines and Spin Extractors (PULSE Template)

Provides measurement and calculation procedures for the determination of the sound power of noise sources as described in the following international standards:

- IEC 60704-2-4 2001 (identical to EN 60704-2-4 2001)
- ISO 3744: 2010

SUITABLE TEST ENVIRONMENTS

Essentially free-field over a reflecting plane as specified in ISO 3744:2010

MEASUREMENT

$L'_{p(B)\,i}$	time-averaged sound pressure level produced by the background noise
$L'_{p(S)\,i}$	For washing, A-weighted sound pressure level time-averaged over the total duration of the washing period
	For spinning, the highest A-weighted sound pressure level for an averaging time of 50 seconds determined during the rinsing and spinning period
	Maximum spin speed achieved during noise measurement

All quantities can be measured in either:

- 1/3-octave bands for any range with nominal mid-band frequencies from 50 Hz to 20 kHz
- 1/1-octave bands for any range with nominal mid-band frequencies from 63 Hz to 16 kHz
- Narrow-band (FFT) for any range with nominal mid-band frequencies from 50 Hz to 20 kHz

CALCULATION

$L_W wash$	sound power level for the washing period
$L_W spin$	sound power level for the rinsing and spinning period corresponding to the 50 seconds interval with the highest sound pressure level

Quantities Specific to ISO 3744:

$L'_{p(B)}$	mean measured time-averaged background noise level over the measurement surface
$L'_{E(S)}$	mean measured time-averaged sound pressure level for the noise source under test over the measurement surface
K_1	background noise corrections for the surface sound pressure level
K_2	environmental corrections measured using reference sound source

A-weighted values are calculated from either:

- 1/1- or 1/3-octave values as specified in, for example, Annex C of ISO 3745:2012
- Narrow-band values (FFT)

VALIDATION

Criterion for background noise

At least three complete measurements to be made for sound power calculations

Requirement evaluation for additional microphone positions

STATISTICS

Mean and standard deviation of any measured or calculated quantity on batch measurements (requires BK Connect Data Viewer (advanced) Type 8400-A)

Ordering Information*

Type 7799-X	**PULSE Sound Power**

OPTIONAL SOFTWARE

Type 8400-X	BK Connect Data Viewer
Type 8400-A-X	BK Connect Data Viewer (advanced)
Type 8401-X	BK Connect Hardware Setup
Type 8403-X	BK Connect Data Processing
Type 8403-A-X	BK Connect Data Processing Specialist

Other Sound Power Determination Software

Type 7882-X	PULSE Sound Power using Sound Intensity
Type 7883-X	PULSE Sound Power Determination for Earth-moving Machinery
Type 7884-X	PULSE Sound Power in Reverberation Rooms

Supported Brüel & Kjær Hardware

TYPICAL HARDWARE FOR FREE-FIELD METHODS

Type 3050-A-060	LAN-XI 6-channel Input Module 51.2 kHz, includes LAN-XI Front Panel UA-2100-060 with BNC (F) connectors
UA-2101-060	LAN-XI Front Panel, 7-pin LEMO (F) connectors (fully compatible with Type 3050-A-060)
Type 2671	CCLD Microphone Preamplifier
Type 4188-A-021	TEDS Combination: ½″ Prepolarized Free-field Microphone Type 4188 with Preamplifier Type 2671
Type 4190-L-001	TEDS Combination: ½″ Free-field Microphone Type 4190 with Preamplifier Type 2669-L
Type 4950	½″ Prepolarized Free-field Microphone
Type 4955	½″ Low-noise Free-field TEDS Microphone
Type 2981	CCLD Laser Tacho Probe, with retroreflective tape
Type 4204	Reference Sound Source
Type 4231	Sound Calibrator

TYPICAL HARDWARE FOR NOISE EMISSION OUTDOOR MACHINERY, DIRECTIVE 2000

6 × AO-0426-x-yyy†	Low-noise, double-screened cable, BNC (M), 85 °C (185 °F)
6 × Type 4189-A-021	½″ Prepolarized Free-field Mic. (6 Hz to 20 kHz) with Preamplifier Type 2671, TEDS
Type 3050-A-060	LAN-XI 6-ch. Input Module 51.2 kHz (Mic, CCLD, V) with Front Panel UA-2100-060, 6 × BNC (F)

TYPICAL HARDWARE FOR SOUND POWER FOR FANS IN ONE ROOM

1 × Type 3053-B-120	LAN-XI Input Module with Front Panel UA-2107-B-120 (SMB connectors)
10 × Type 4188-A-021	TEDS Microphone, ½″ Prepolarized Free-field Microphone Type 4188 with ½″ CCLD Preamplifier Type 2671
10 × AO-0587-x-yyy†	Cable, SMB (F) to BNC (M)

OTHER CABLING

AO-0087-x-yyy†	General purpose, single-screened coaxial cable with BNC (M) connectors
AO-0414-x-yyy†	Microphone extension cable, 7-pin LEMO (M) to 7-pin LEMO (F) connectors

ACCESSORIES

UA-0237	Windscreen, fits ½″ microphones and has a 90 mm (3.5 in) outer diameter
UA-0459	Windscreen, fits ½″ microphones and has a 65 mm (2.6 in) outer diameter
UA-0800	Adapter, microphone holder to microphone stand
UA-0803	Tripod, lightweight
UA-1317	Microphone Holder, fits ½″ microphone/ preamplifier assemblies

Software Service and Support Agreement

M1-7799-X	Agreement for Type 7799
M1-7882-X	Agreement for Type 7882
M1-7883-X	Agreement for Type 7883
M1-7884-X	Agreement for Type 7884

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* X is the licence type. If X = N, the licence is node-locked to PC host ID or dongle. If X = F, the licence is floating, that is, shared via a licence server
† Please specify cable length when ordering: x = D (decimetres) or M (metres); yyy = length in decimetres or metres.

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