



Nor1035 - NorPower

Program for the calculation of sound power levels of noise sources using sound pressure



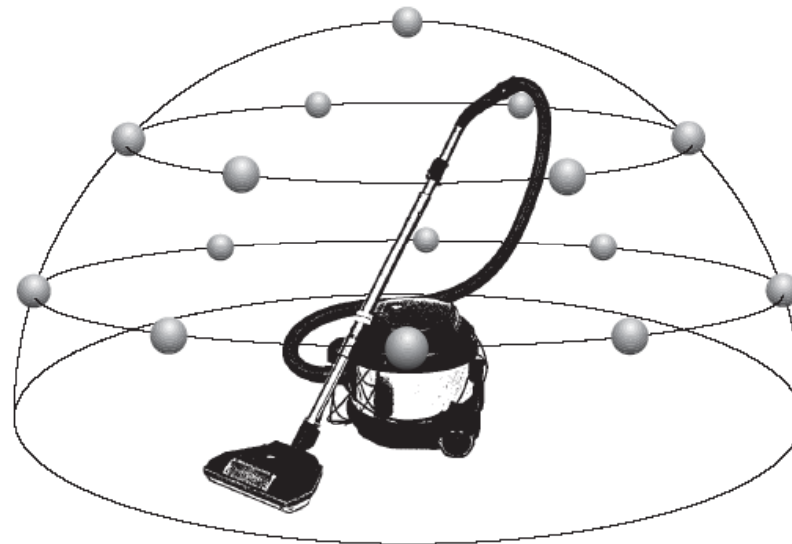


Sound Power Level - L_w

A sound power level is a measure of the total noise radiated by the machine in all directions. It is a property of the machine and is essentially independent of the measuring environment. Sound power levels are useful to equipment manufacturers, buyers, installers, and users for:

- comparing the noise output from different machines
- setting specifications for the maximum permitted noise from a machine
- comparing machines before and after modifications to reduce the noise

Sound power levels must also be specified in instructions and sales literature for equipment conforming to the EU Machinery Safety Directive





Sound pressure L_p

- **Sound Power Levels** can be calculated based on **sound pressure levels** from almost any kind of instrument.
- Sound power levels (L_w) calculations based on the ISO standards (1/1 or 1/3 octave bands) are rather complicated and difficult to obtain.





Optional equipment

Nor261 Reference Sound Source

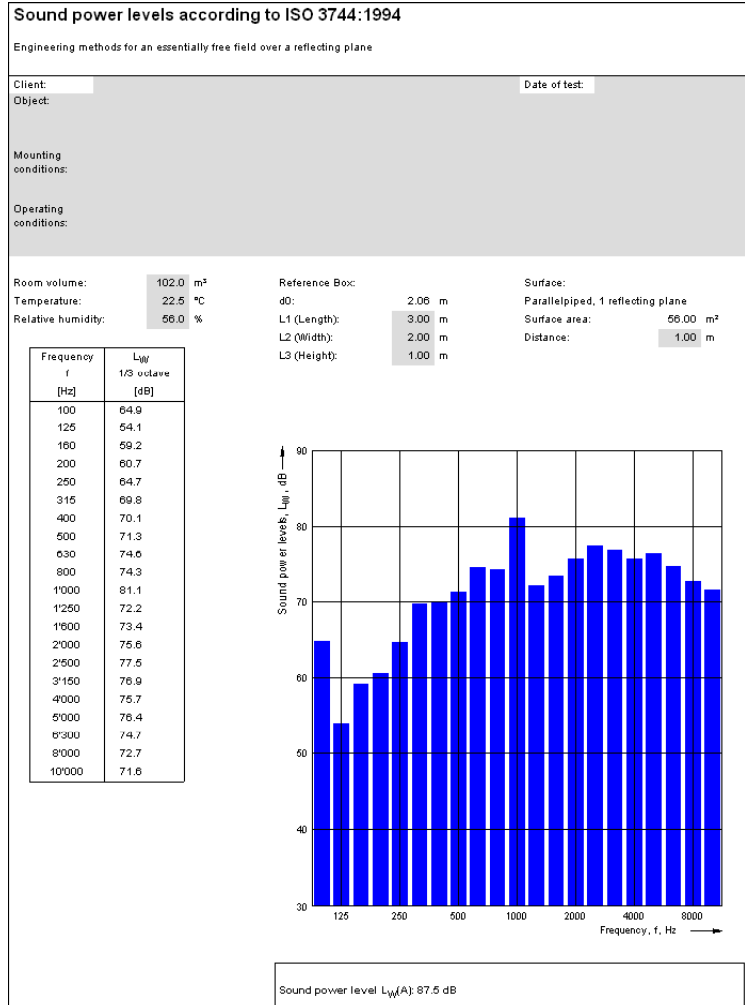


Nor265 Rotating Boom





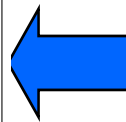
Report generator



Sound power levels (L_w) calculations based on the ISO standards (1/1 or 1/3 octave bands) are rather complicated and difficult to obtain.

Let NorPower do the calculations!

Just select the required ISO standard (ISO 374x), the type of measurement surface (sphere, hemisphere, etc), dimension and situation (reflecting planes).



Import the measurement data and the test report is ready at once.



Features

- Calculations according to ISO 3743-1, 3744, 3745, 3746
- Measurement data may be transferred directly from instruments via NorXfer (Nor110, 118, 121, 131, 840) or input manually
- Unlimited number of measurement positions, averaging, data editing, standard deviation
- Selectable frequency range (1/1 or 1/3 octave bands)
- Calculation of sound power levels, directivity index and other required values
- Background noise correction K1 acc. to the standard
- Environmental correction K2 based on room absorption (reverb. time) or a reference sound source
- Validation of the standards (K1, K2, num. of points)
- Graphical and numerical display of the results
- Export of the entire project to Excel for user-specific formatting



Set-up Assistant

Standard Setup [X]

Standard

ISO 3744:1994	Engineering method Grade 2
ISO 3745:2003	Precision Method Grade 1
ISO 3744:1994	Engineering method Grade 2
ISO/CD 3744:2005	Engineering method Grade 2
ISO 3746:1995	Survey method Grade 3
ISO/CD 3746:2005	Survey method Grade 3
NORSONIC	Multiplot

Frequency range

Lower frequency: 100.0 Hz

Upper frequency: 10.0k Hz

Filter: 1/1 Octave 1/3 Octave

Environmental Correction

Room absorption
Reference source
Room absorption
Freefield (K2 = 0)

< Zurück Weiter > Abbrechen



Reference Sound Source level input

Calibrated reference sound source

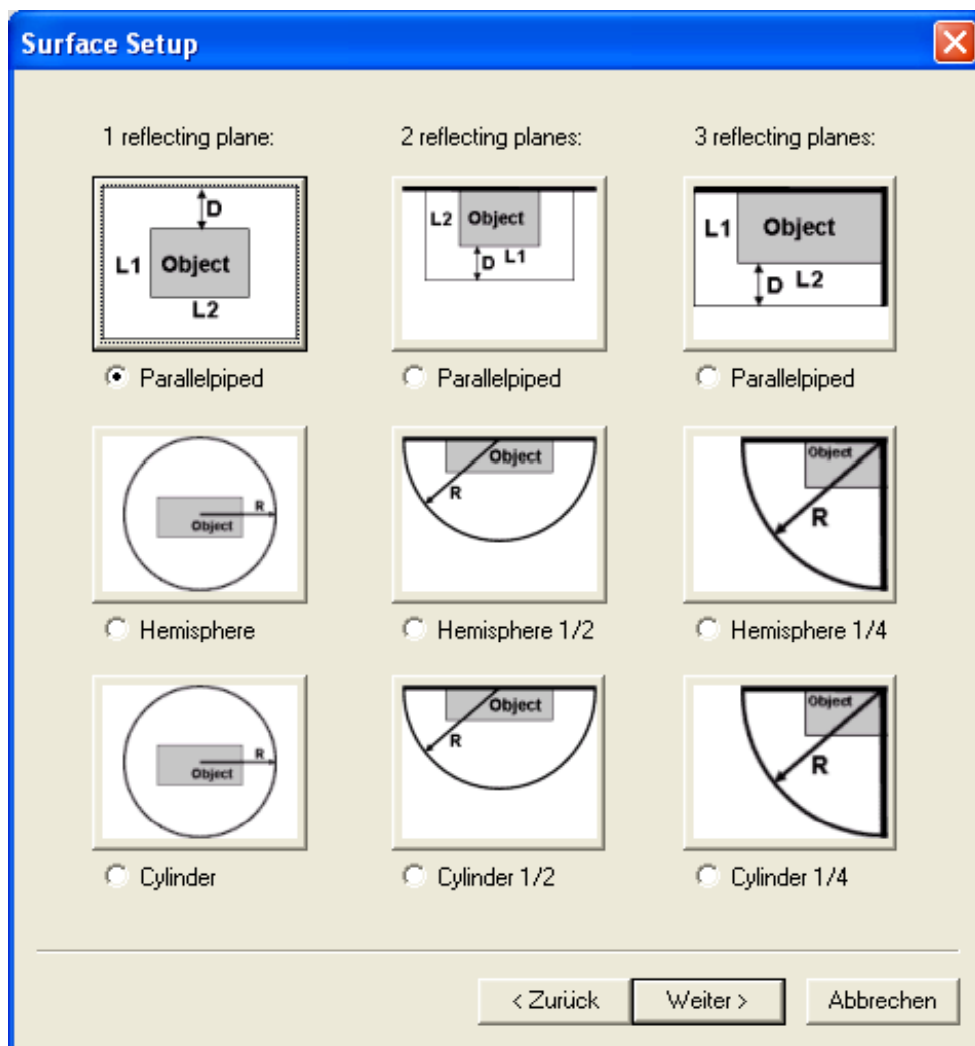
Sound power levels of the calibrated reference sound source

Frequency [Hz]	Data [dB]
50.0	70,0
63.0	70,0
80.0	70,0
100.0	70,0
125.0	70,0
160.0	70,0
200.0	70,0
250.0	70,0
315.0	70,0
400.0	70,0
500.0	70,0
630.0	70,0
800.0	70,0
1.0k	70,0
1.25k	70,0
1.6k	70,0
2.0k	70,0
2.5k	70,0
3.15k	70,0
4.0k	70,0
5.0k	70,0

OK

Cancel

Surface setup

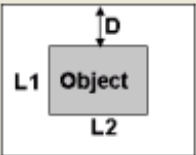




Geometry Assistant

Geometry Setup

Surface



1 reflecting plane:
Parallelepiped

Reference box

L1 (Length): 3.00 m

L2 (Width): 2.00 m

L3 (Height): 1.00 m

d0: 2.06 m

Dimension

Distance: 1.00 m

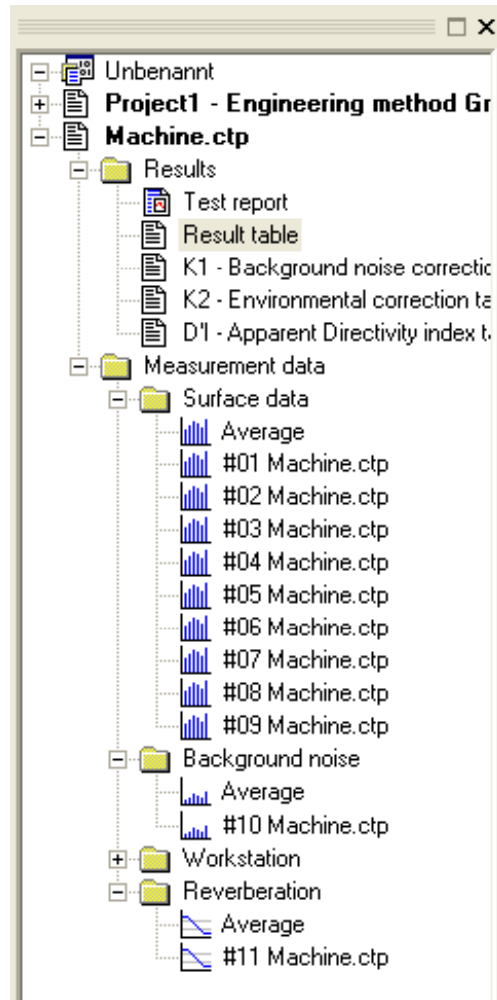
Height: 2.75 m

Surface area: 56.00 m²

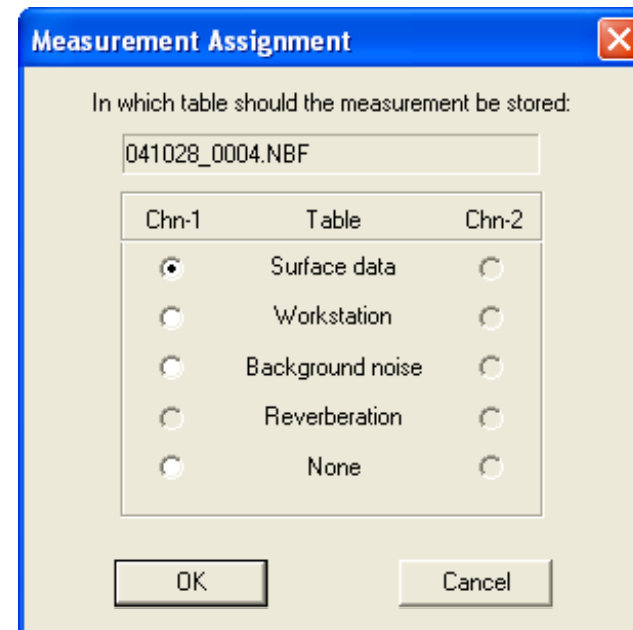
Direct input

< Zurück Fertig stellen Abbrechen

Data import



- NorXfer (Drag'n drop, Copy/Paste)
- File-Explorer
- Import Function





Measurement Table

Frequency [Hz]	Average			#01 Machine.c			#02 Machine.c			#03 Machine.c			#04 Machine.c			#05 Machine.c			#06 Machine.c			#07 Machine.c		
	L avg	SD	N	L	S	N	L	S	N	L	S	N	L	S	N	L	S	N	L	S	N	L	S	N
100	62.1	2.36	9	60.8		1	66.7		1	59.9		1	59.9		1	61.0	H	1	63.7		1	60.0	H	1
125	46.6	1.52	9	46.2		1	49.4		1	45.9		1	45.9		1	45.8		1	47.5		1	43.7		1
160	49.0	2.37	9	43.9		1	51.1		1	47.5		1	47.5		1	47.5		1	51.2		1	50.3		1
200	52.7	1.44	9	50.8		1	52.7		1	51.7		1	51.7		1	51.4		1	53.4		1	51.1		1
250	56.2	1.18	9	57.8		1	57.3		1	55.3		1	55.3		1	55.5		1	55.3		1	54.4		1
315	61.3	1.21	9	59.8		1	63.5		1	60.6		1	60.6		1	60.7		1	62.1		1	59.8		1
400	62.1	1.28	9	60.8		1	62.6		1	62.5		1	62.5		1	61.8		1	63.7		1	59.8		1
500	63.3	0.53	9	62.8		1	63.4		1	63.7		1	63.7		1	63.5		1	63.9		1	62.2		1
630	66.8	1.26	9	66.4		1	67.2		1	66.5		1	66.5		1	67.3		1	68.3		1	66.1		1
800	65.9	1.06	9	65.8		1	66.6		1	64.9		1	64.9		1	65.2		1	67.6		1	64.5		1
1'000	64.2	1.13	9	64.2		1	65.6		1	64.0		1	64.0		1	62.6		1	63.7		1	62.9		1
1'250	63.8	0.78	9	64.2		1	64.2		1	64.0		1	64.0		1	63.6		1	62.2		1	62.9		1
1'600	65.4	0.82	9	64.4		1	64.9		1	66.4		1	66.4		1	65.6		1	64.9		1	64.1		1
2'000	67.3	1.17	9	65.2		1	66.8		1	67.8		1	67.8		1	69.3		1	67.2		1	65.9		1
2'500	69.2	1.71	9	66.4		1	67.8		1	70.2		1	70.2		1	72.0		1	68.1		1	67.4		1
3'150	68.7	1.20	9	67.4		1	69.0		1	70.1		1	70.1		1	68.6		1	68.8		1	66.3		1
4'000	67.2	1.25	9	65.4		1	66.6		1	67.8		1	67.8		1	68.8		1	66.5		1	65.3		1
5'000	67.5	2.62	9	64.2		1	64.7		1	68.6		1	68.6		1	71.3		1	65.5		1	63.1		1
6'300	65.3	3.50	9	61.0		1	61.9		1	68.2		1	68.2		1	69.2		1	62.2		1	60.6		1
8'000	62.8	2.67	9	59.7		1	61.0		1	65.0		1	65.0		1	66.2		1	60.7		1	58.9		1
10'000	61.4	1.58	9	59.3		1	60.1		1	63.3		1	63.3		1	62.3		1	59.3		1	60.0		1
Sum A	78.1			76.4			77.6			79.0			79.0			79.8			77.6			76.1		

Legend:

L avg: Average sound pressure level (including corrections) [dB]
 SD: Standard deviation
 N: Number of averages

L: Sound pressure level (without corrections) [dB]
 Corr: Correction [dB]
 S: Status character

Possible status characters:

H: Manual Input
 *: Overload
 ?: Suspicious value

SumA: The sum level is calculated according to the 1/3 octave band spectrum and the frequency limitations. It is a post-processed value and not a measured value.



K1 – Background Noise Correction Table

Frequency [Hz]	L _p ' [dB]	L _p '' [dB]	ΔL [dB]	K ₁ [dB]	Remarks:
100	62.1	35.1	27.0	0.0	
125	46.6	26.8	19.8	0.0	
160	49.0	34.2	14.8	0.1	Correction for Background noise
200	52.7	38.6	14.1	0.2	Correction for Background noise
250	56.2	32.4	23.8	0.0	
315	61.3	29.9	31.4	0.0	
400	62.1	27.6	34.5	0.0	
500	63.3	28.1	35.2	0.0	
630	66.8	22.9	43.9	0.0	
800	65.9	23.2	42.7	0.0	
1'000	64.2	21.6	42.6	0.0	
1'250	63.8	22.1	41.7	0.0	
1'600	65.4	21.1	44.3	0.0	
2'000	67.3	18.2	49.1	0.0	
2'500	69.2	17.6	51.6	0.0	
3'150	68.7	16.1	52.6	0.0	
4'000	67.2	15.5	51.7	0.0	
5'000	67.5	12.5	55.0	0.0	
6'300	65.3	11.5	53.8	0.0	
8'000	62.8	10.7	52.1	0.0	
10'000	61.4	8.3	53.1	0.0	
Sum A	78.1	34.5	43.6		

Legend:

- L_p' : Noise source under test level
- L_p'' : Background noise level
- ΔL: L_p' - L_p''
- K₁: Corrections for background noise
- Sum A: The sum level is calculated according to the 1/3 octave band spectrum and the frequency limitations. It is a post-processed value and not a measured value.



K2 - Environmental Correction Table

Machine.ctp - K2 - Environmental correction table

Frequency [Hz]	T [s]	K ₂ [dB]	Remarks:
100	2.10	14.7	
125	0.65	10.0	
160	0.32	7.3	
200	0.58	9.5	
250	0.50	9.0	
315	0.51	9.0	
400	0.57	9.5	
500	0.57	9.5	
630	0.61	9.7	
800	0.52	9.1	
1'000	0.01	0.6	
1'250	0.52	9.1	
1'600	0.58	9.5	
2'000	0.53	9.2	
2'500	0.53	9.2	
3'150	0.55	9.3	
4'000	0.51	9.0	
5'000	0.46	8.6	
6'300	0.40	8.1	
8'000	0.35	7.6	
10'000	0.32	7.3	
A-Net	0.01	0.6	

Legend:
T: Reverberation time
K₂: Environmental correction
A-Net: The reverberation time measured in the frequency band with a midband frequency of 1 kHz is used



DI – Directivity Index Table

Machine.ctp - D'I - Apparent Directivity index table

Frequency	D'lmax	V'l	N	#01 Machin	#02 Machin	#03 Machin	#04 Machin	#05 Machin	#06 Machin	#07 Machin	#08 Machin	#09
[Hz]	[dB]	[dB]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
100	4.6	2.4	9	-1.3	4.6	-2.2	-2.2	-1.1	1.6	-2.1	-2.7	
125	2.8	1.5	9	-0.4	2.8	-0.7	-0.7	-0.8	0.9	-2.9	-0.1	
160	2.2	2.4	9	-5.1	2.1	-1.5	-1.5	-1.5	2.2	1.3	1.1	
200	2.1	1.4	9	-1.9	0.0	-1.0	-1.0	-1.3	0.7	-1.6	1.6	
250	1.6	1.2	9	1.6	1.1	-0.9	-0.9	-0.7	-0.9	-1.8	1.2	
315	2.2	1.2	9	-1.5	2.2	-0.7	-0.7	-0.6	0.8	-1.5	0.0	
400	1.6	1.3	9	-1.3	0.5	0.4	0.4	-0.3	1.6	-2.3	-1.4	
500	0.6	0.5	9	-0.5	0.1	0.4	0.4	0.2	0.6	-1.1	0.1	
630	1.5	1.3	9	-0.4	0.4	-0.3	-0.3	0.5	1.5	-0.7	0.7	
800	1.7	1.1	9	-0.1	0.7	-1.0	-1.0	-0.7	1.7	-1.4	0.0	
1'000	1.9	1.1	9	0.0	1.4	-0.2	-0.2	-1.6	-0.5	-1.3	-0.5	
1'250	1.0	0.8	9	0.4	0.4	0.2	0.2	-0.2	-1.6	-0.9	-0.3	
1'600	1.0	0.8	9	-1.0	-0.5	1.0	1.0	0.2	-0.5	-1.3	0.3	
2'000	2.0	1.2	9	-2.1	-0.5	0.5	0.5	2.0	-0.1	-1.4	-0.1	
2'500	2.8	1.7	9	-2.8	-1.4	1.0	1.0	2.8	-1.1	-1.8	-0.4	
3'150	1.4	1.2	9	-1.3	0.3	1.4	1.4	-0.1	0.1	-2.4	-0.3	
4'000	1.6	1.3	9	-1.8	-0.6	0.6	0.6	1.6	-0.7	-1.9	-0.1	
5'000	3.8	2.6	9	-3.3	-2.8	1.1	1.1	3.8	-2.0	-4.4	-0.1	
6'300	3.9	3.5	9	-4.3	-3.4	2.9	2.9	3.9	-3.1	-4.7	-3.8	
8'000	3.4	2.7	9	-3.1	-1.8	2.2	2.2	3.4	-2.1	-3.9	-2.7	
10'000	1.9	1.6	9	-2.1	-1.3	1.9	1.9	0.9	-2.1	-1.4	-0.5	
Sum A	1.7	27.5		-1.7	-0.5	0.9	0.9	1.7	-0.5	-2.0	-0.3	

Legend:

D'lmax: Maximum directivity index

V'l: Apparent surface sound pressure level non-uniformity index

N: Number of microphone positions

SumA: The sum level is calculated according to the 1/3 octave band spectrum and the frequency limitations. It is a post-processed value and not a measured value.

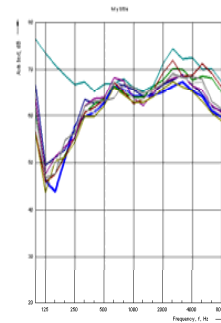
Options



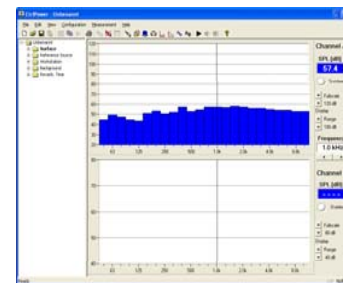
- **Option 1: MS-Excel Export**



- **Option 2: Multiplot**

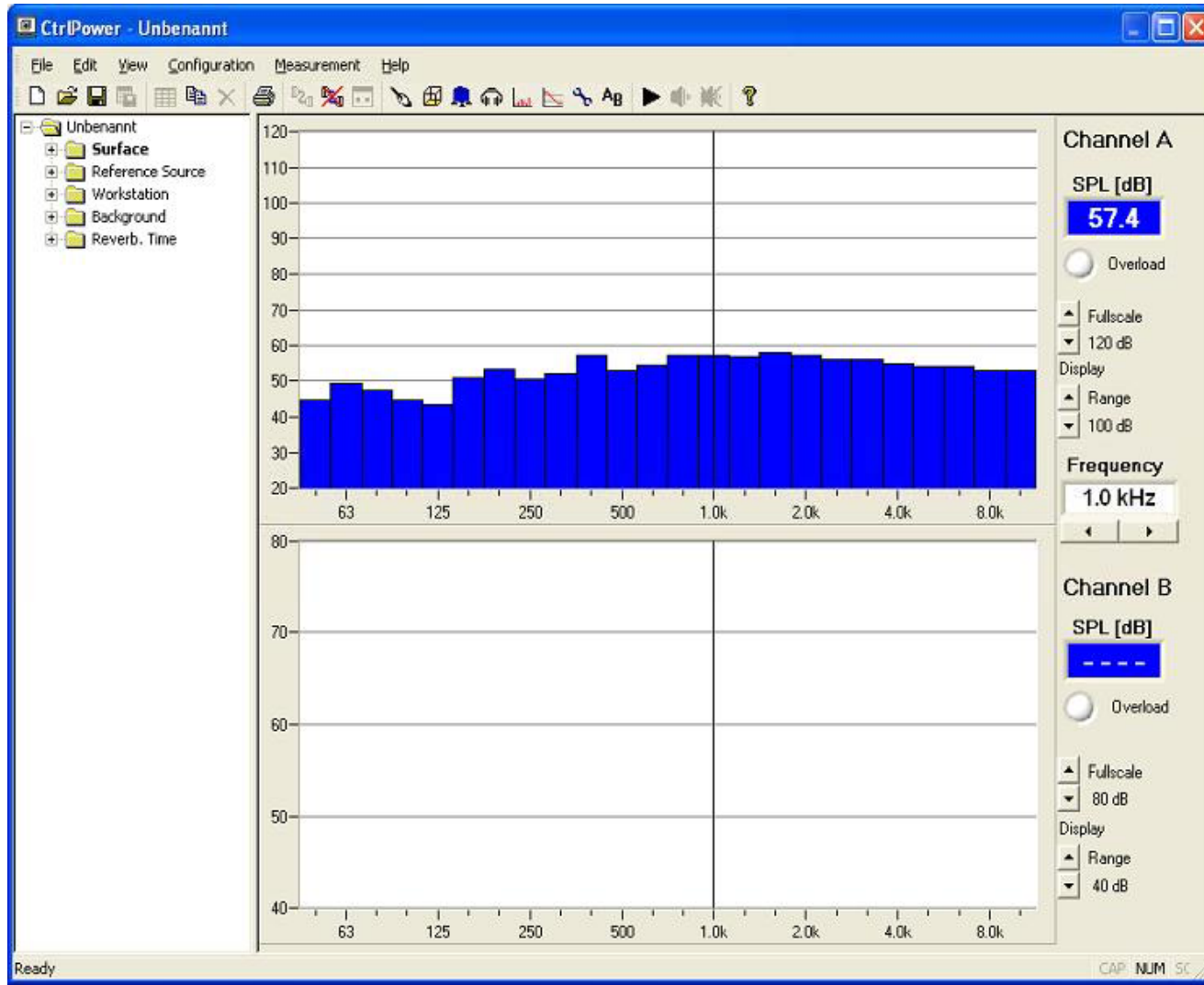


- **Option 3: CtrlPower**



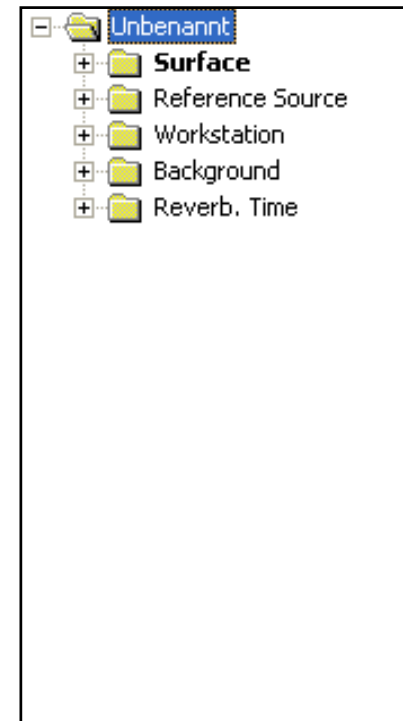
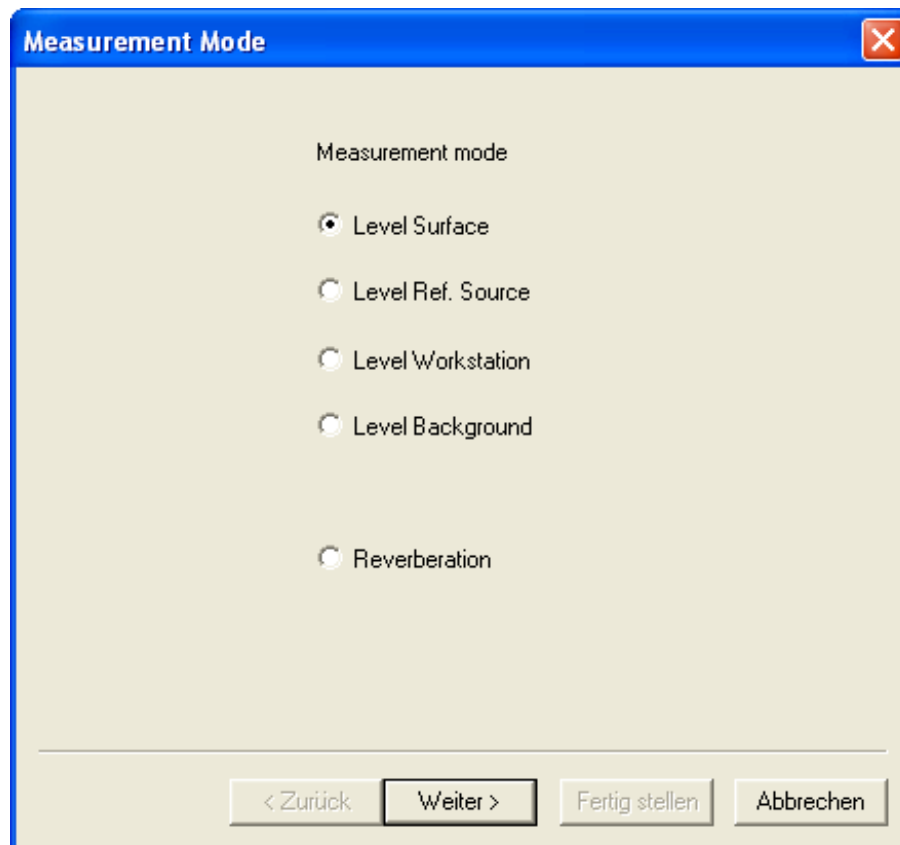


Option 3 / CtrlPower





CtrlPower – Measurement Modes





Mic. Boom Control





Microphone Boom Connection Set-up

Enable the use of the microphone boom here

The screenshot shows a 'Connection Set-up' dialog box with three tabs: 'Auto Detect Instrument', 'Manual Set-up', and 'Microphone Boom'. The 'Microphone Boom' tab is active. It contains three dropdown menus: 'Instrument' (set to 'Nor265'), 'Port' (set to 'COM 2'), and 'Baud rate' (set to '9600'). An orange arrow points to the 'Instrument' dropdown menu. At the bottom of the dialog are 'OK' and 'Abbrechen' buttons.

Microphone Boom Set-up



Configuration

- Assistant at full length
- Surface Mode
- Ref. Source Mode
- Workstation Mode
- Background Mode
- Reverb. Mode
- Ag Channel Set-up
- Measurement Set-up
- Microphone Boom Set-up**
- Connection Set-up
- Disconnect
- Radio Link Test Panel



Microphone Boom Setup

<input type="radio"/> Go to	<input checked="" type="radio"/> Go Relative	<input type="radio"/> Sweep	<input type="radio"/> Rotation
<input type="text" value="100"/> deg	<input type="text" value="10"/> deg	Start angle <input type="text" value="-90"/> deg	<input checked="" type="radio"/> Clockwise
Speed <input type="text" value="20"/> s/r	Speed <input type="text" value="10"/> s/r	Stop angle <input type="text" value="90"/> deg	<input type="radio"/> Counter-Clockwise
Accel <input type="text" value="10"/> s	Accel <input type="text" value="5"/> s	Sweep time <input type="text" value="40"/> s	Speed <input type="text" value="2"/> s/r
		Accel <input type="text" value="10"/> s	Accel <input type="text" value="5"/> s

OK
Cancel



Microphone Boom Start

The boom starts first

Microphone Boom Status

Status	Home Position
Busy	Calibrated
Function	Error
Go To: 90°	(No error)

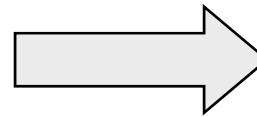
Cancel

the acoustic instrument afterwards

Measurement running

Remaining time [s]

Stop



Example:

Boom: Go relative 30°

of measurements: 12

Measurement time: 30 s