

# LBC 3251/00 Intellivox 1b Active Line Array Loudspeaker

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**BOSCH**  
Invented for life



- ▶ Active Loudspeakers
- ▶ Variable Elevation Angle
- ▶ Variable Vertical Opening Angle
- ▶ Focus Distance
- ▶ Even Sound Pressure and Constant Directivity

The Intellivox DDC (Digital Directivity Control) from Bosch Security Systems form a range of five active line array loudspeakers with unrivalled acoustical properties. Each loudspeaker produces clear, natural sound for excellent intelligibility of both speech and music. In addition, the audio characteristics of each line array can be adjusted by means of software to meet the acoustical requirements of the venue. This, along with the long acoustical reach ('throw'), means only a few loudspeakers are required for complete coverage. One loudspeaker can cover a distance of up to 70 meters. The extensive integrated remote monitoring possibilities of Intellivox loudspeakers also make them extremely reliable and a key element in voice evacuation systems.

## Functions

### Active Loudspeakers

All Intellivox loudspeakers have state-of-the-art class-D amplifiers as standard. This guarantees efficient and reliable operation without the need for external amplification. They also have an on-board DSP (Digital Signal Processor), which controls the frequency and

delay time of each individual driver in the array, thus allowing software adjustment of loudspeaker characteristics like direction, opening angle and focus distance. As an added benefit, the presence of a DSP means there is no need for extra equalizers.

### Variable Elevation Angle

Intellivox loudspeakers incorporate a feature known as Digital Directivity Control, which enables the direction of the main lobe to be tilted while the loudspeaker remains vertical. This is achieved by programming a different delay time for each individual driver in the array. As an example, by specifying a longer delay for the drivers at the bottom of the array, the lobe is effectively tilted downwards. These delay times, and therefore the elevation angle, are programmed into the on-board DSP using a PC. This feature gives much more mounting flexibility than conventional mechanical aiming. It also makes better use of the backward main lobe, because having the loudspeaker flat against a wall helps direct the sound from this lobe towards the listening area.

**Variable Vertical Opening Angle**

Being able to adjust the delay times and equalization settings for each driver in the array also makes it possible to specify the opening angle for all relevant frequencies. When the specified angle is narrow, sound can be pinpointed very accurately to a distant listening area. When the angle is wide, one loudspeaker can cover a very broad area.

**Focus Distance**

Intellivox loudspeakers are unique in allowing the loudspeaker focus distance to be set. The focus distance is the point at which the output of each driver in the array converges. Specifying the focus distance sets how far the main lobe reaches before the drivers' contributions are out of phase and their sound energy becomes part of the diffuse sound field.

**Even Sound Pressure and Constant Directivity**

By accurately adjusting the direction of the sound and vertical opening angle, a main lobe can be created that has all relevant frequencies present at nearly the same sound pressure level. With Intellivox loudspeakers, the variation throughout the entire listening area is no more than 3 dB. This means that the sound for listeners is not too loud at the front and not too quiet at the back. The constant directivity of Intellivox loudspeakers also helps ensure the presence of all relevant frequencies for more clear and natural sound.

**Suppressed Acoustic Side Lobes**

Intellivox loudspeakers produce extremely small side lobes, which gives a much clearer, less 'colored' sound, even when close to the loudspeakers.

**WinControl**

WinControl is a 32-bit Windows®-compatible program that enables programming, testing and configuring of Intellivox units through the serial port of the PC. The software allows:

- Adaptation of signal processing-related parameters such as beam settings, gain, EQ, pre-delay and auto gain.
- Updating or restoring of the DSP software.
- Adaptation of surveillance-related parameters such as amplifier/DSP status, temperature overload and pilot tone detection settings.
- Requesting of the loudspeaker status for error checking purposes.
- Factory unit initialization.

**Integrated Remote Monitoring**

An Intellivox loudspeaker can be configured to notify a building management, control or evacuation system through in- and output relays if an error occurs. The loudspeaker cabling can be automatically checked using a 20 kHz pilot tone. The status of each loudspeaker can also be continuously monitored via an RS-485 network. Over 10 different system parameters are checked - including temperature, pilot tone and amplifier condition - to guarantee system integrity.

**AVC (Automatic Volume Control)**

In certain environments, such as sport stadiums and passenger terminals, the background noise level fluctuates constantly. Intellivox loudspeakers are equipped with an external terminal for connecting a sensor (LBC 3262/00) for measuring the ambient SPL. This information is used by the auto gain of the loudspeaker amplifiers to constantly adjust the loudspeaker output so it is always the same level above the ambient noise.

**Wall Mounting**

There are several options for mounting the Intellivox against a wall. It can be supported by means of the wall brackets supplied as standard, or by the LBC 3270/00 swivel bracket (adjustable through 90 degrees) or the LBC 3271/00 swivel bracket (adjustable through 45 degrees). Both swivel brackets have to be ordered separately.

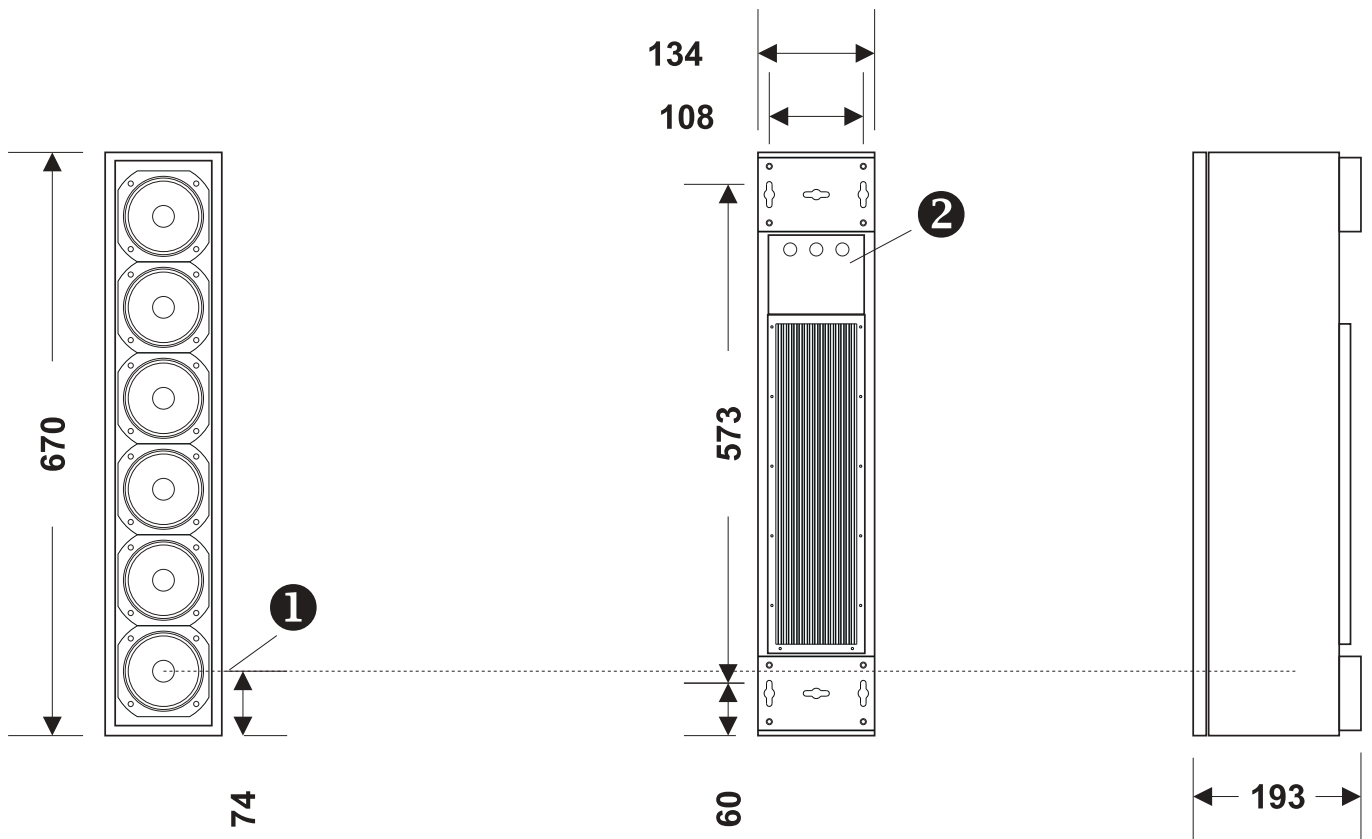
**Safety and Evacuation Compliant**

The unrivalled speech intelligibility, reliability and extensive monitoring features of Intellivox loudspeakers makes them a key element in voice evacuation systems. With Intellivox, systems can be built that comply with both the technical requirements and acoustical demands of IEC 60849 and BS 5839.

**Certifications and approvals**

Region	Certification
Europe	CE Declaration of Conformity

**Installation/configuration notes**

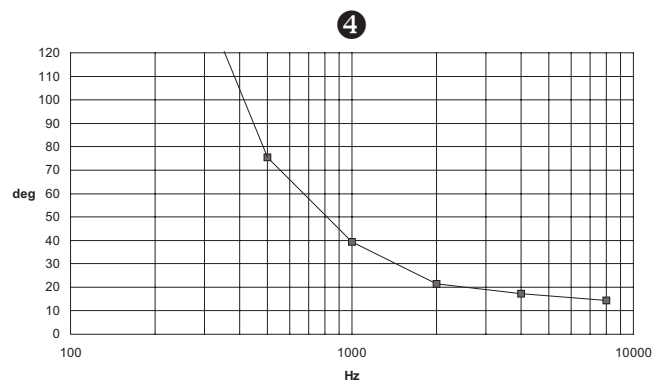
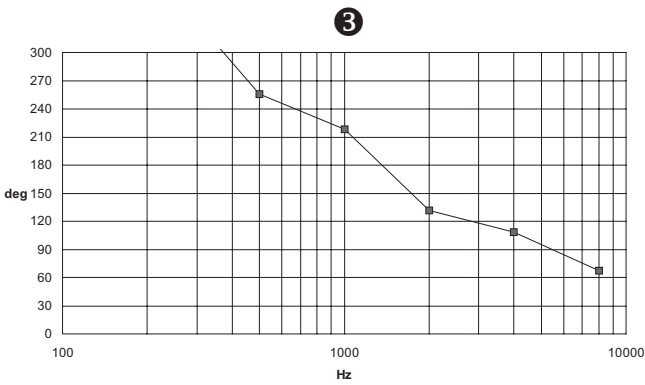
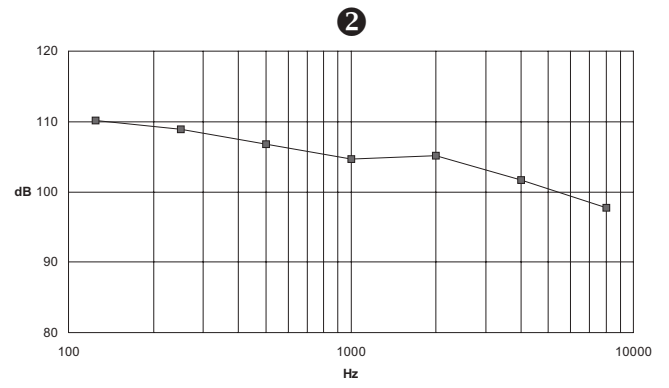
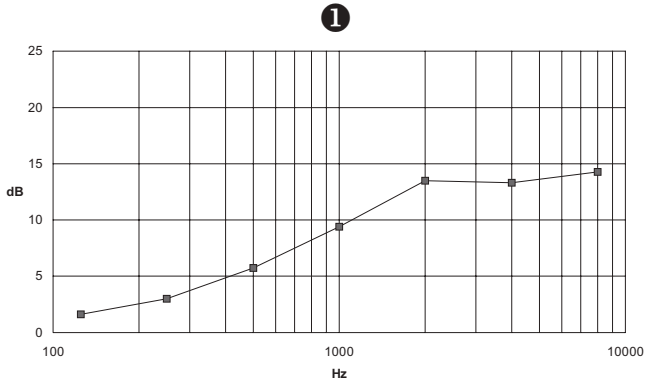


LBC 3251/00

- 1 Offset for acoustical mounting height on axis lowest speaker
- 2 Cable entry

**Acoustical Data**

Frequency <sup>1</sup> (Hz)	DI <sup>2</sup> (dB)	Pac <sup>3</sup> (dB <sub>PWL</sub> )	Horizontal coverage -6 dB (deg) <sup>2</sup>	Vertical coverage -6 dB (deg) <sup>2</sup>
125	1.6	110	360	360
250	3.0	109	360	164
500	5.7	107	256	76
1k	9.4	105	218	39
2k	13.5	105	132	22
4k	13.3	102	108	17
8k	14.3	98	67	15

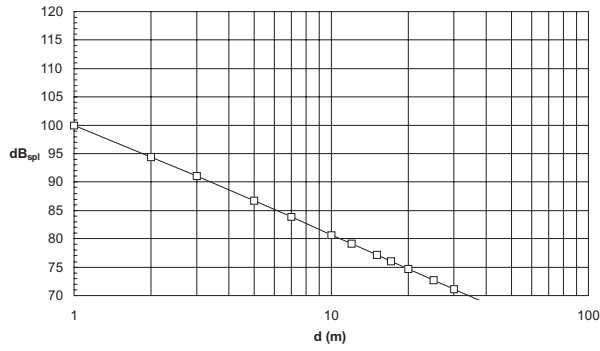


- 1 Directivity index                      3 Horizontal opening angle (-6 dB)
- 2 Acoustical power                      4 Vertical opening angle (-6 dB)

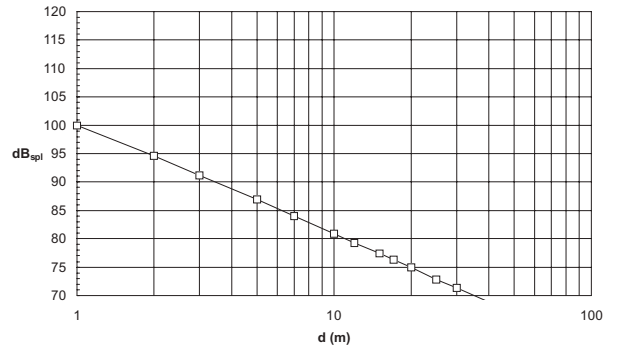
**Notes:**

Settings: Elevation angle = 0 deg, Opening angle = 25 deg, Focus distance = 10 m. All values from octave band averaged data. Only valid in the far-field ( $d >$  approx. 5 m), results from simulations, refer to general notes [2]. Acoustical power ( $P_{ac}$ ) expressed in  $dB_{PWL}$  relative to  $10^{-12}$  W, simulated with 100 dB,  $SPL_{SPL}$  source level @ 1m 'on axis' for each octave band, see general notes [2].

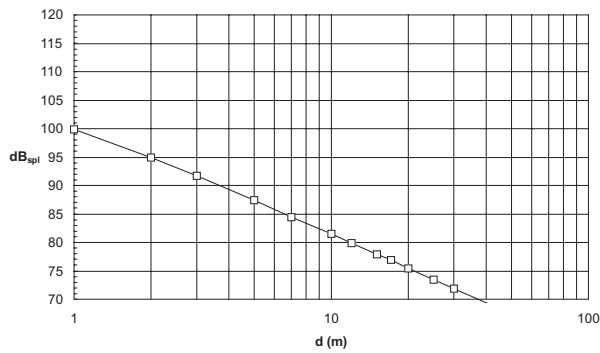
125 Hz



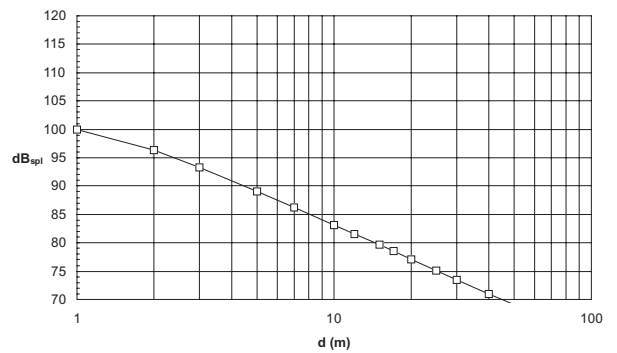
250 Hz



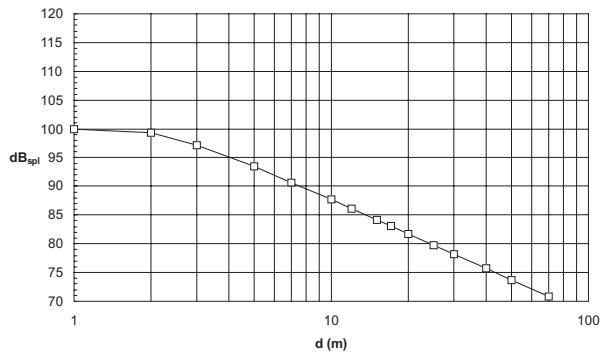
500 Hz



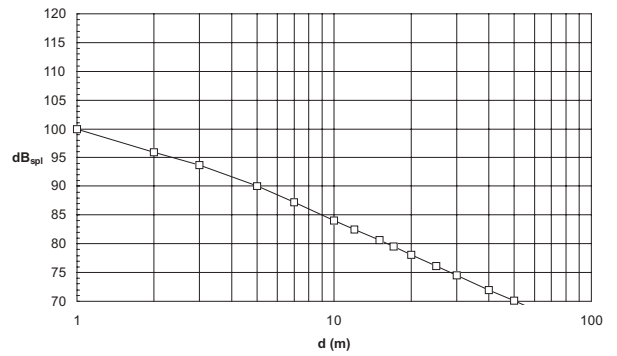
1 kHz



2 kHz



4 kHz



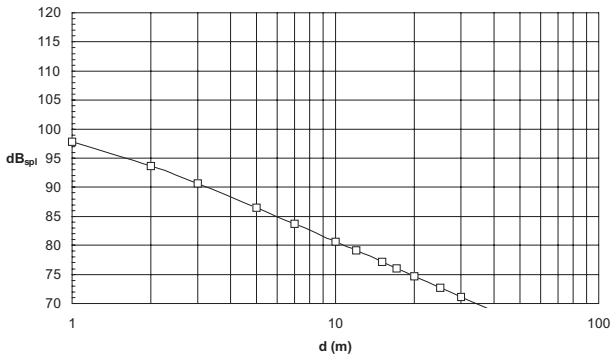
—□— Simulated

*SPL versus Distance (on axis)*

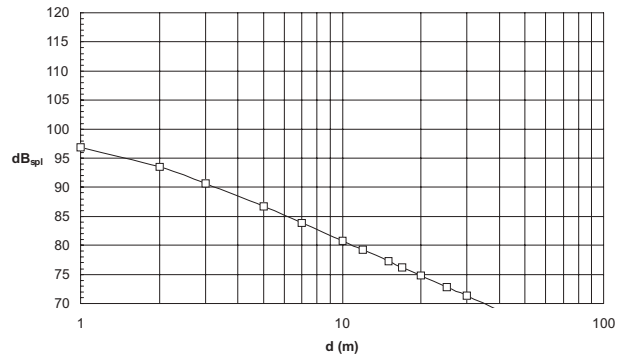
**Notes:**

Settings: Elevation angle = 0 deg, Opening angle = 25 deg, Focus distance = 10 m. Simulations 100 dB SPL source level @ 1m 'on axis' for each octave band. Measurements scaled to simulation results at d = 10 m, z<sub>c</sub> = z<sub>li</sub> = 1.7 m, see general notes [1] for measurement details.

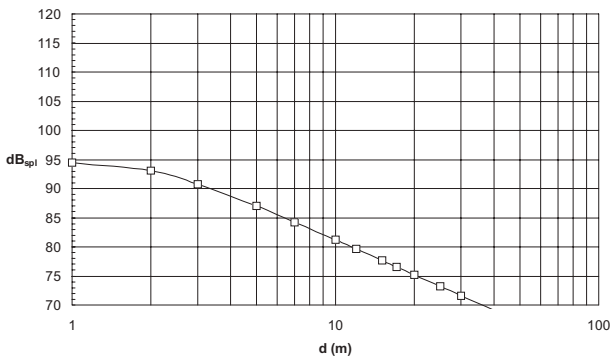
125 Hz



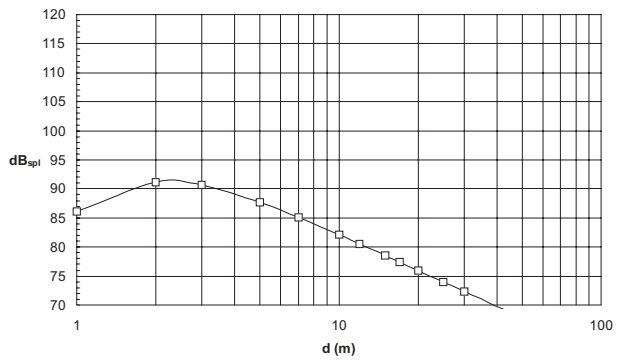
250 Hz



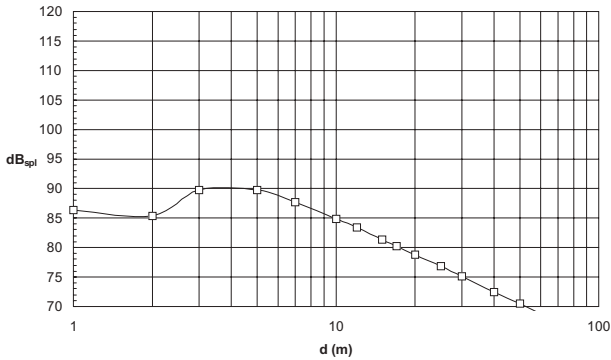
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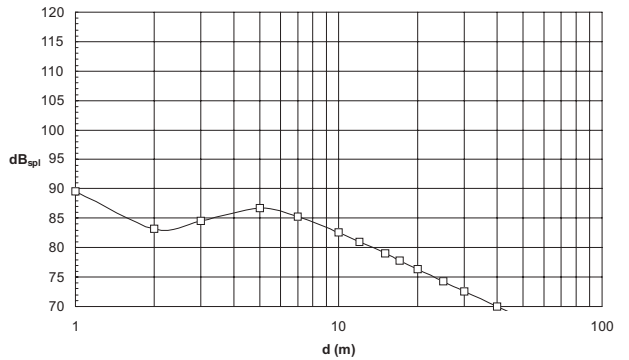
1 kHz



2 kHz



4 kHz



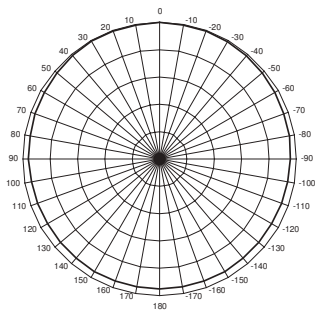
—□— Simulated

SPL versus Distance (Delta-z = 0,5 m))

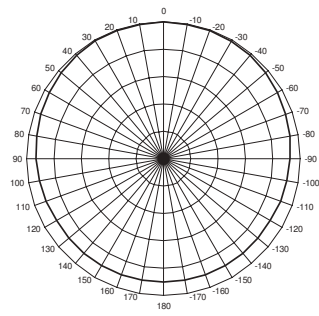
**Notes:**

Settings: Elevation angle = -3 deg, Opening angle = 25 deg, Focus distance = 10 m. Simulations 100 dB SPL source level @ 1m 'on axis' for each octave band, see general notes [2]. Measurements scaled to simulation results at d = 10 m, zc = 2.2 m, zli = 1.7 m see general notes [1] for measurement details

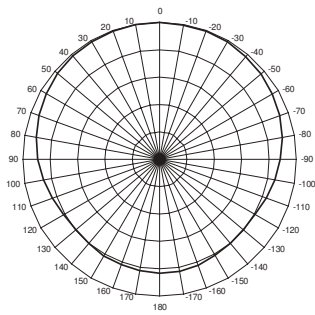
125 Hz



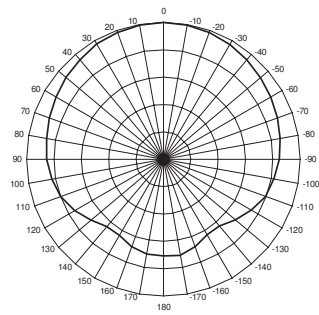
250 Hz



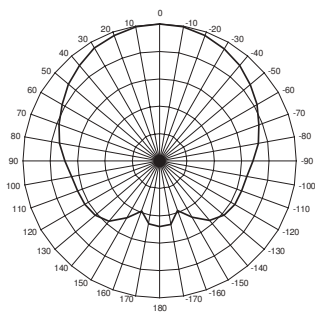
500 Hz



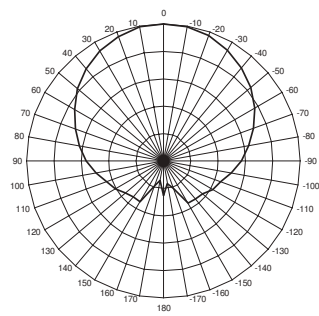
1 kHz



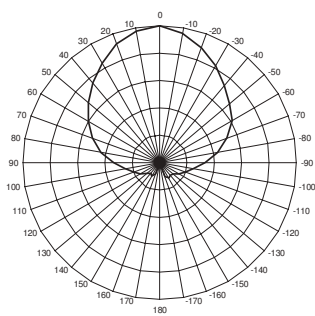
2 kHz



4 kHz



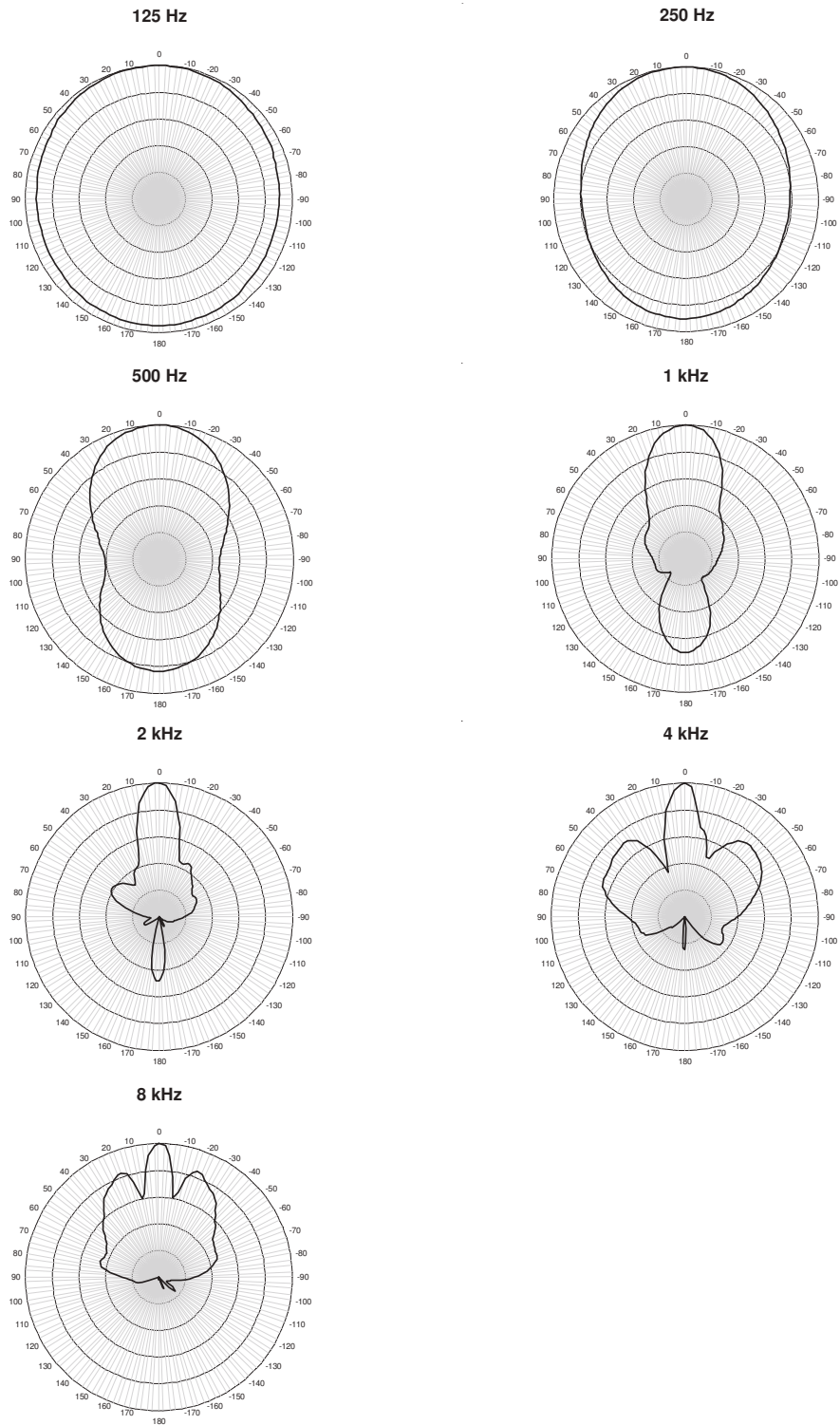
8 kHz



*Horizontal Polar Data*

**Notes:**

1/1 octave averaged far-field data (r = 1000 m),  
 Angular resolution 10 deg, Scale 6 dB/div, Positive  
 angles = left side (unit top view), Settings: Elevation  
 angle = 0 deg, Opening angle = 25 deg, Focus distance  
 = 10 m, Simulations only

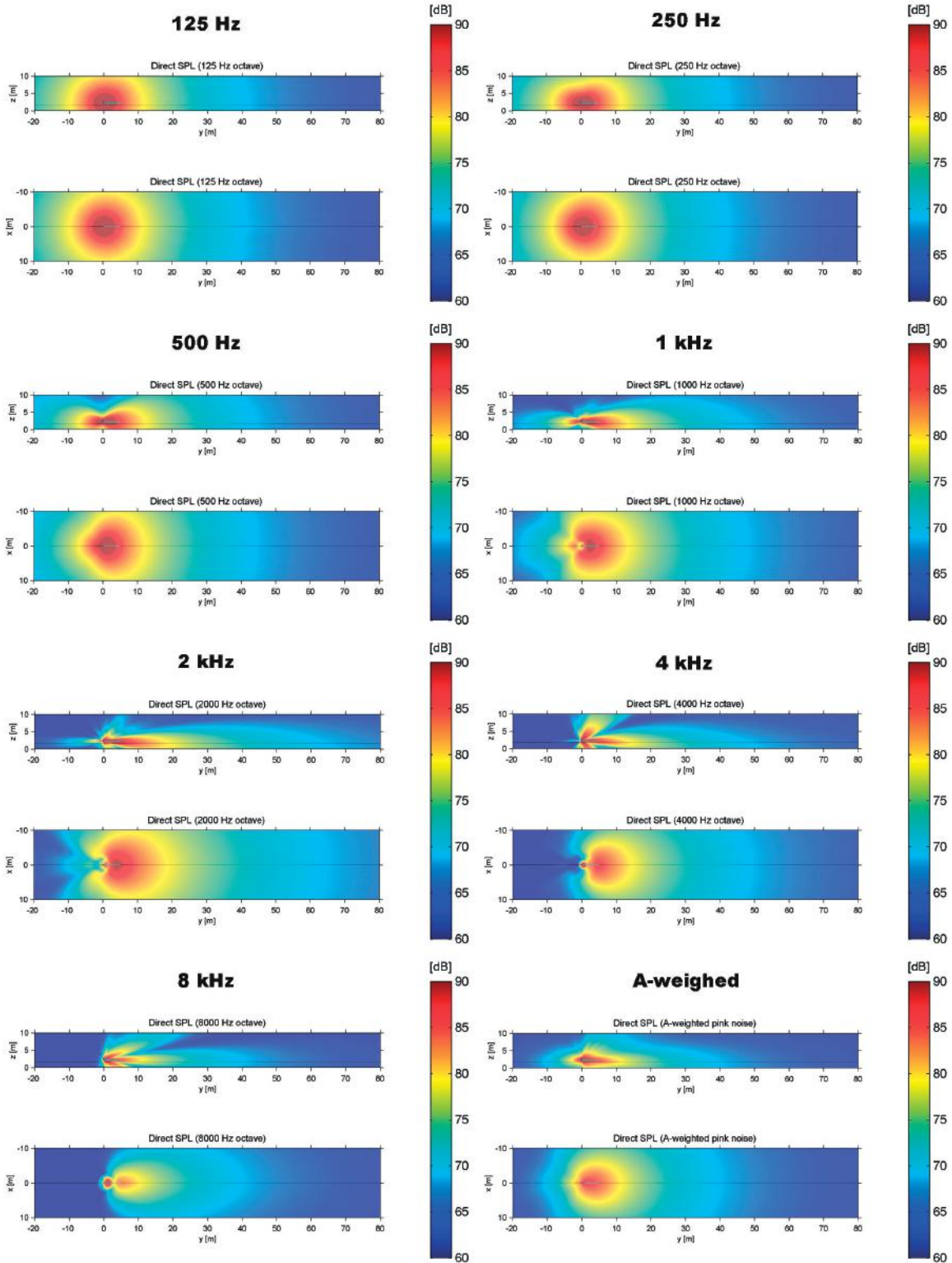


*Vertical Polar Data*

**Notes:**

1/1 octave averaged far-field data (r = 10 m), Angular resolution 2.5 deg, Scale 6 dB/div, Positive angles = top side, Settings: Elevation angle = 0 deg, Opening angle = 25 deg, Focus distance = 10 m, Simulations only





*Vertical and Horizontal Beam Cross-Sections*

**Notes:**

Settings: Elevation angle = -3 deg, Opening angle = 25 deg, Focus distance = 10 m, Reference mounting height  $z_c = 2.2$  m. Simulations 100 dB<sub>SPL</sub> source level

@ 1m 'on axis' for each octave band. Dimensions of all vertical cross sections (top) 100 m x 10 m. Dimensions of all horizontal cross sections (bottom) 100 m x 20 m.

## Technical specifications

### Acoustical <sup>(1)</sup>

Frequency range <sup>2</sup>	
4" loudspeaker	230 to 10 kHz ( $\pm 3$ dB)
10 mm tweeter	6k to 20 kHz ( $\pm 3$ dB)
LF complete array	130 Hz (-3 dB)
Max SPL <sup>3</sup>	
Continuous	92 dB SPL A-weighted with pink noise at 10 m
Peak	96 dB SPL at 10 m
Coverage	
Horizontal (fixed) <sup>4</sup>	150 deg
Vertical (adjustable) <sup>5</sup>	Opening angle: 15° to 40° elevation (aiming) angle: -16° to 16° focus distance: 2 to 40 m
Dynamic range <sup>6</sup>	
	88 dB

### Electrical

Input <sup>7</sup>	
Nominal level	0 dBu (line input) and +50 dBu (100 V input)
DLC threshold (1 kHz)	+3 dBu, 6 dB headroom before clip (gain / volume 0 dB)
Type	Transformer balanced
Impedance (balanced)	6.8 kohm (line input) and 2 Mohm (100 V input)
DSP module <sup>8</sup>	
Type	32-bit floating point
Memory	32 k words SRAM, 2 x 8 kB EEPROM
ADCs	Two channel, 18 bit sigma-delta converters
DACs	Eight channel, 18 bit sigma-delta converters
Sample frequency	48.8 kHz
Signal processing <sup>9</sup>	<ul style="list-style-type: none"> <li>pre-delay (&lt; 335 ms @ 32 bit float)</li> <li>equalizer and compensation filtering</li> <li>compressor and noise gate</li> <li>volume and analog pre-gain</li> <li>ambient noise level dependent gain adaptation ('fail-safe')</li> <li>eight output filters</li> <li>high resolution output channel delays (<math>\Delta T = 10.2 \mu s</math>)</li> </ul>
Control unit	

Network interface type	Serial full-duplex RS-485, 19.2 kbaud, optically isolated
Maximum number of units <sup>10</sup>	126
Remote surveillance	<ul style="list-style-type: none"> <li>general status (DSP running, signal present etc.)</li> <li>amplifier monitoring and load monitoring schemes</li> <li>external pilot tone detection (20..30 kHz, level &gt; -22 dBV)</li> <li>ambient noise microphone monitoring</li> <li>frost protection</li> <li>fan control for optional external fan</li> <li>thermal overload protection</li> </ul>
Failure	<ul style="list-style-type: none"> <li>internal hardware bypass circuit</li> <li>failure relay (external connector, maskable conditions)</li> </ul>
Power amplifiers	
Type	PWM (class D)
Power	8 x 40 W <sub>rms</sub> (4 ohm)
Protection	Thermal shutdown if T <sub>junction</sub> > 150 °C Current limiting output stage
Connectors	
General type	5 mm pitch cage clamp (as WAGO series 231)
Audio inputs	6-pin male p1 = Line +, p2 = Line -, p3 = GND p4 = 100V +, p5 = 100V -, p6 = GND
RS-485 Interface	5-pin male p1 = A, p2 = B, p3 = Z, p4 = Y, p5 = DGND
Ambient noise and temperature sensor	5-pin female p1 = MIC, p2 = AGND, p3 = NTC, p4 = AGND, p5 = GND
Failure detect and fan control	5-pin female failure relay: p1 = COM, p2 = NO, p3 = NC optional fan: p4 = -, p5 = +24 V
Mains	3-pin IEC
PSU	
Mains voltage (+5/-10%) <sup>11</sup>	230 or 115 V
Mains fuse(s)	2 x 1.6 A (slow type)
Power consumption <sup>12</sup>	28 VA (idle) / 150 VA (full load)
Power Factor	0.70
Max mains inrush current	12 A short-time peak (@ 230 V)

**Mechanical**

Dimensions (H x W x D) <sup>14</sup>	670 x 134 x 186 mm
Weight	16 kg
Default color	Silver
Transducers	6 x 4" loudspeaker 2 x 10 mm ferrofluid cooled tweeter, coaxially mounted

**Environmental**

Operating temperature <sup>13</sup>	-15 °C to +40 °C (5 °F to +104 °F)
Storage temperature	-40 °C to +70 °C (-40 °F to +158 °F)
Relative humidity	<95%

**Notes:**

1. Measured outside under semi-anechoic 'full-space' conditions with typical filter and delay settings unless stated otherwise.
2. Single transducer only, from 1/3 octave averaged data at 1 m. Actual measured frequency response of complete array is depending on the actual signal processing parameters and air absorption (at larger distances). Only low frequency -3 dB point is specified for complete array ('full-space').
3. Continuous level: rms level measured with SLM (slow, A-weighted) with pink noise source level just below DLC input limiter threshold. Peak level: the maximum short-term A-weighted rms sound pressure level measured with a SLM and a pulsating pink noise source.
4. Settings: Elevation angle = 0 deg, Opening angle = 15 deg, Focus distance = 10 m.
5. Opening angle -6 dB, average value 1k - 4kHz octave band.
6. Opening angle -6 dB, typical values, only valid in the far-field (d > approx. 5 m).
7. For this measurement the signals at all power amplifier outputs are summed together. Measured as the A-weighted difference (in dB) between the maximum rms level (with pink noise input signal) and the noise output (with no input signal present).
8. Specs valid for default type 3 input board, 0 dBu = 0.775 V rms . Dual-line input available as an option.
9. "Dual lobe" and "Extended pre-delay" (up to 2684 ms) available as a DSP software / hardware option.
10. Maximum number that can be connected to one RS-485 subnet, multiple subnets can be controlled by one host PC.
11. Mains voltage can be selected on the IEC inlet, accessible from the outside of the unit.
12. Defined as the rms mains current multiplied by the rms mains voltage under normal operating conditions. 'Full load' figures are maximum values measured with a pulsating pink noise input signal.
13. With frost protection and installed ambient temperature sensor. Outdoor versions available upon request. Without frost protection, lower limit: 0 °C.

14. Depth of enclosure only (including heatsink), without mounting brackets.

**Ordering information****LBC 3251/00 Intellivox 1b Active Line Array Loudspeaker**

active line array loudspeaker with unrivalled acoustical properties

Order number **LBC3251/00**

**Accessories****LBC 3260/00 WinControl Software**

A 32 bit Windows-compatible program for configuring, testing and monitoring Intellivox.

Order number **LBC3260/00**

**LBC 3261/00 Intellivox Dual Lobe Software**

Dual Lobe Software

Order number **LBC3261/00**

**LBC 3262/00 Ambient Microphone and Temperature Sensor**

Ambient Microphone and Temperature Sensor

Order number **LBC3262/00**

**LBC 3270/00 Wall Mounting Bracket 90°**

Bracket 90°

Order number **LBC3270/00**

**LBC 3271/00 Wall Mounting Bracket 45°**

Bracket 45°

Order number **LBC3271/00**

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