

XLA 3200



Security Systems

EN

Installation Manual

Line Array Loudspeakers

LBC 3200/00

LBC 3201/00

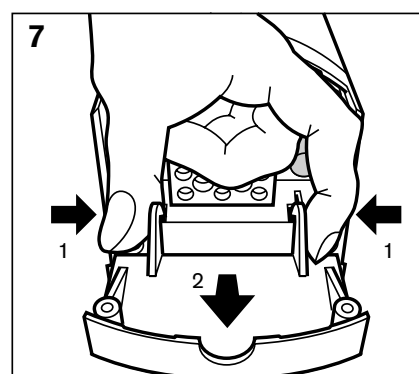
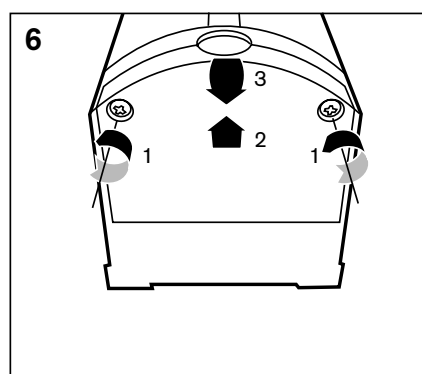
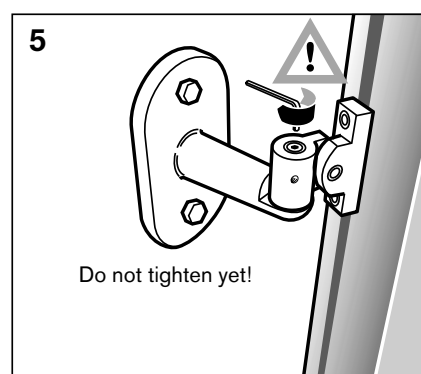
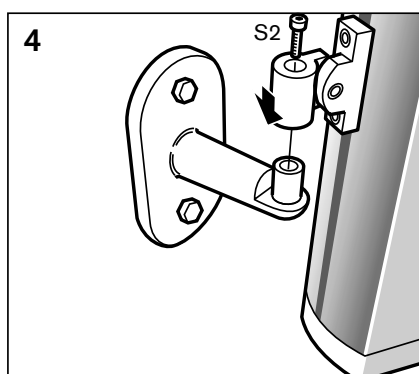
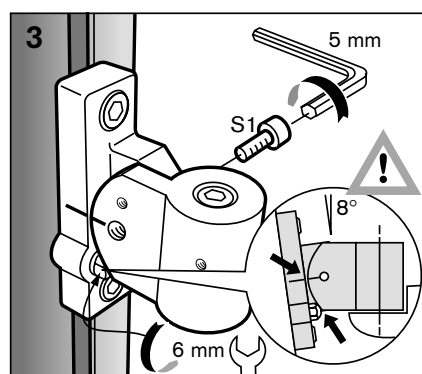
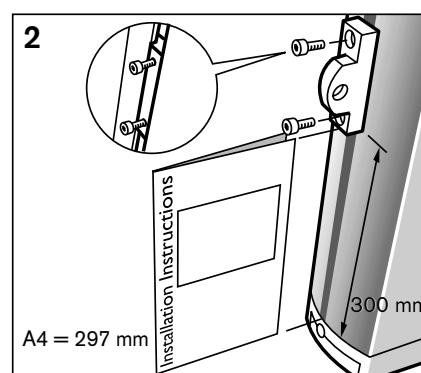
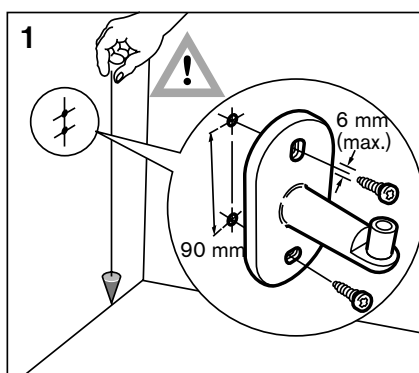
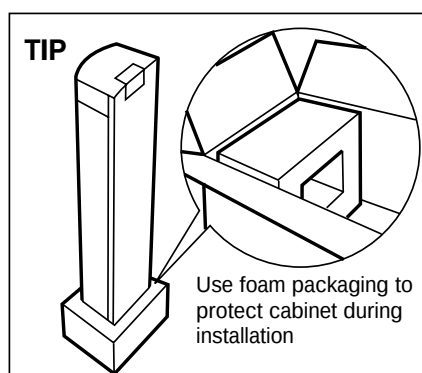
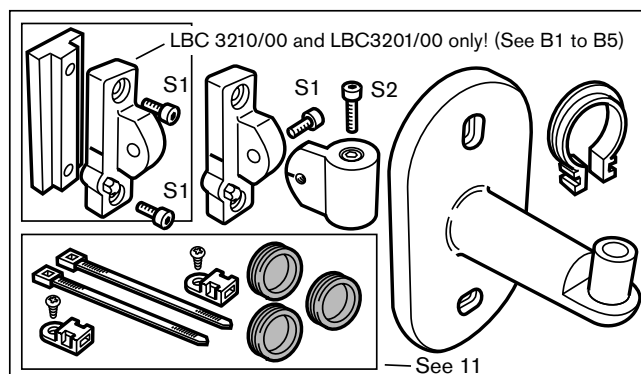
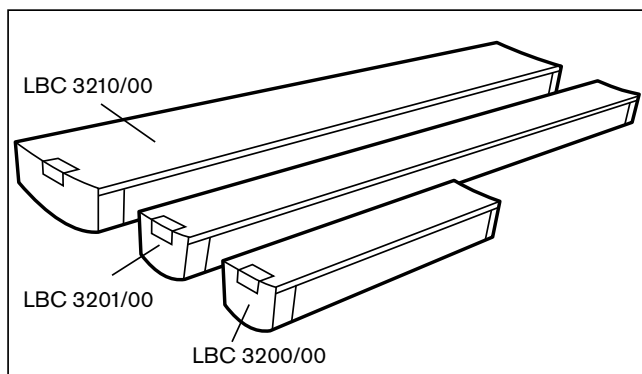
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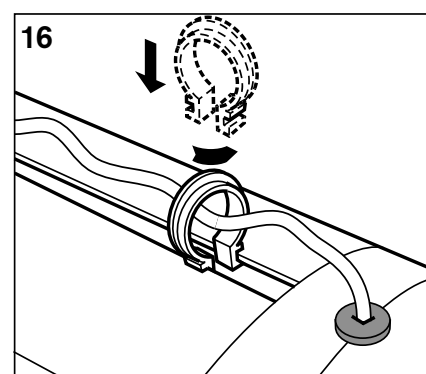
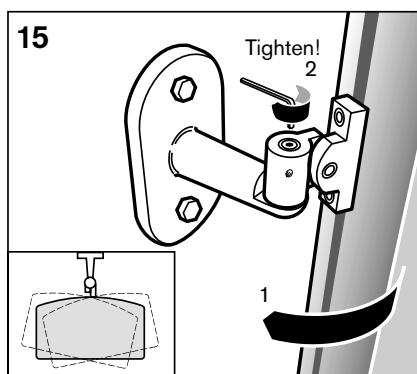
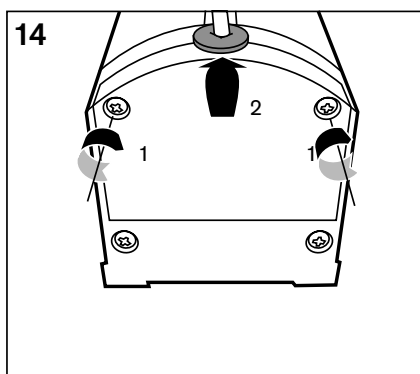
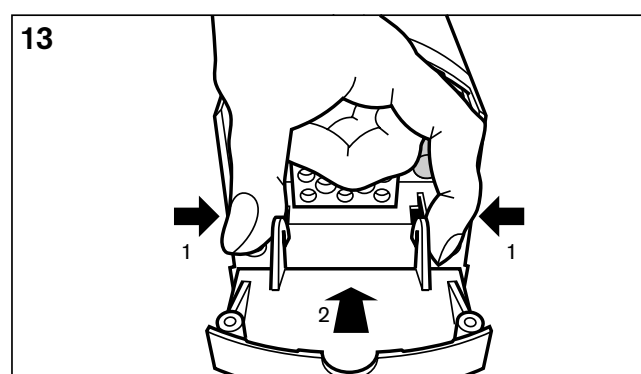
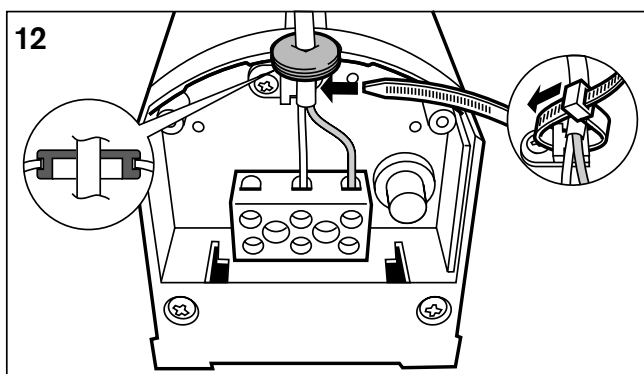
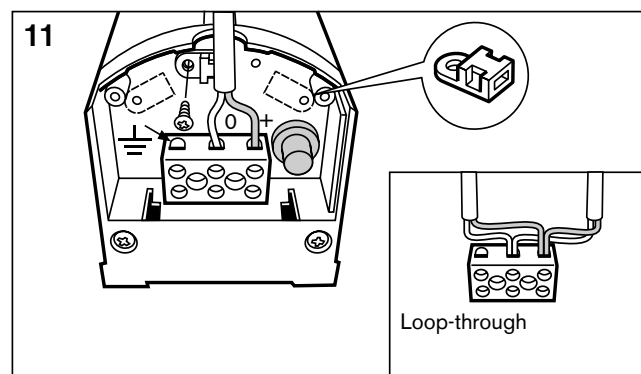
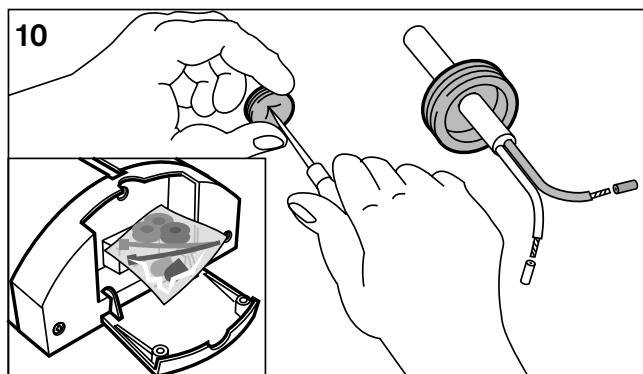
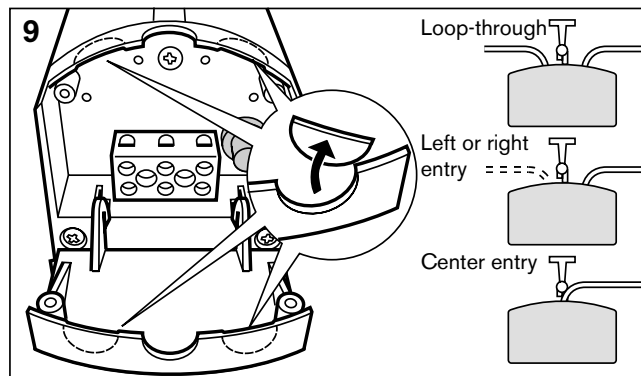
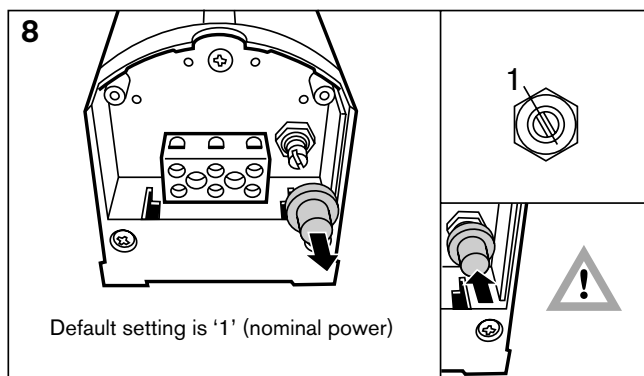
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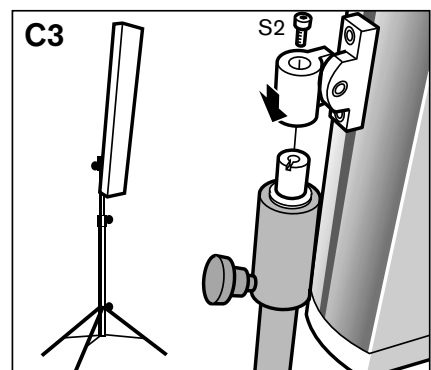
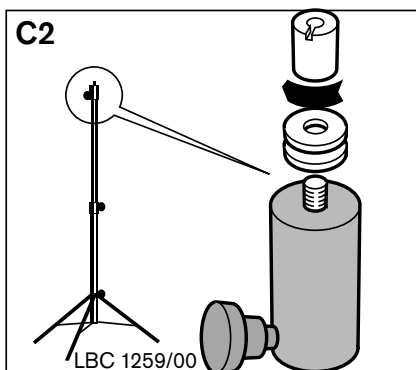
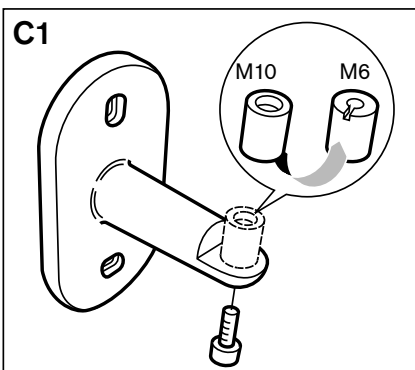
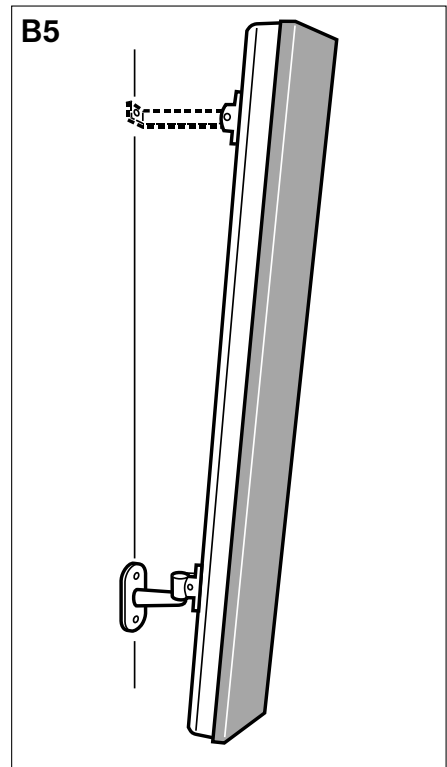
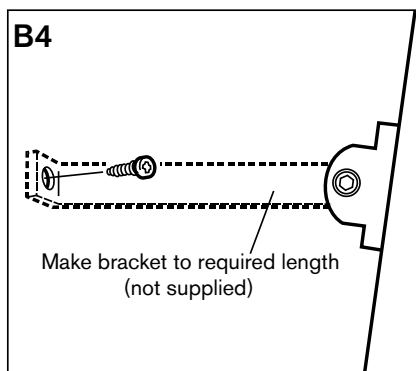
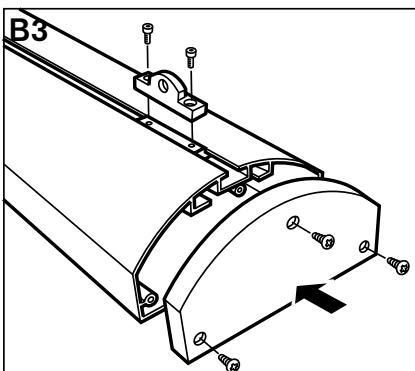
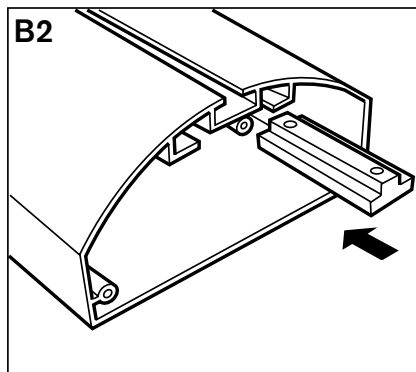
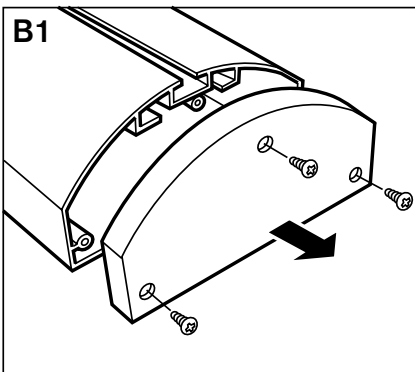
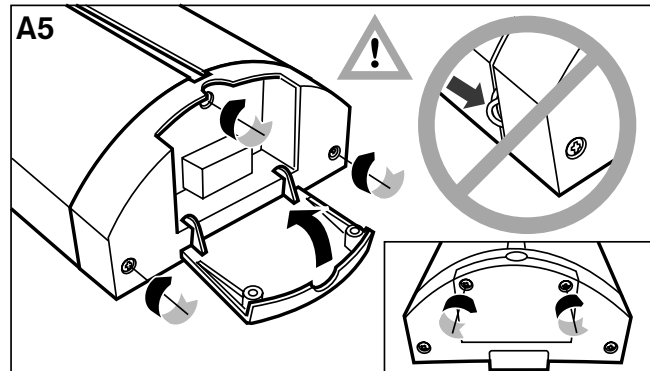
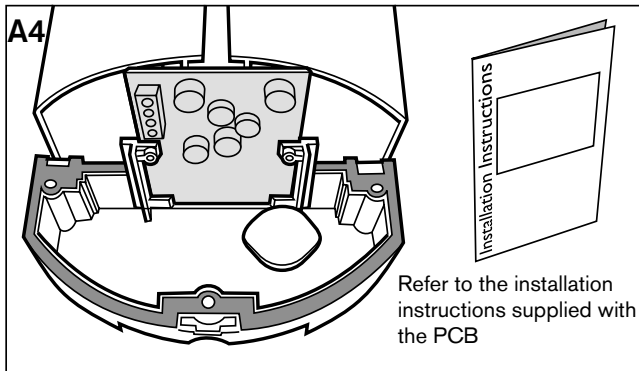
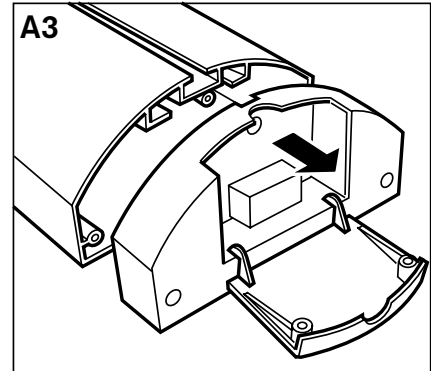
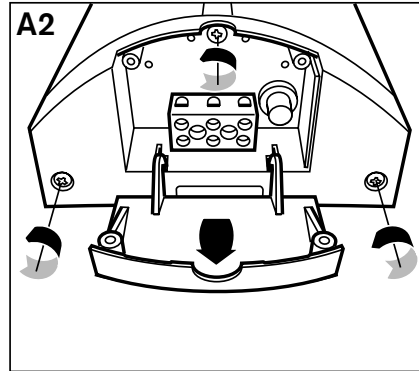
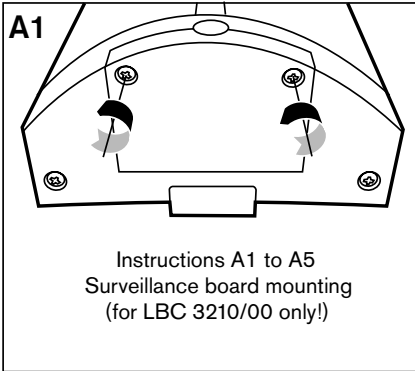
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Listening area and related mounting height for XLA3200/00

Determining mounting height and angle for the LBC3200 loudspeaker array:

1. Determine the dimensions of the desired 'listening area' (a horizontal plane at the level of the listeners' ears – refer to the dashed line in figure 1).
2. Determine the angle at which the loudspeaker array is to be mounted. The array is designed to beam sound just above the listeners' heads, and it is recommended not to exceed an angle of 6°. There are two approaches, each with specific pros and cons.
 - Approach 1: Maximized listening area
When a large listening area is desired, an angle of round 3° is recommended (see figure 1). Note that when walking away from the loudspeaker array, the sound pressure level will decrease by an amount that depends on the room reverberation. To hear high tones clearly, the listener should be able to see the loudspeaker array.
 - Approach 2: Minimized sound pressure level variation
When less sound pressure level variation is desired, an angle of 5° is recommended. Note that this reduces the size of the total listening area compared to approach 1, and that the space very close to the loudspeaker array ('A' in figure 2) is not part of the listening area. Diagram 1 shows the relationship between 'A' and the mounting height of the loudspeaker array when using a 5° installation angle.
3. After selecting the most appropriate approach (mounting angle), the mounting height of the loudspeaker is determined by focusing the 0°-axis of the loudspeaker array to the desired position just above ear level of the furthest listener. This can be adjusted by mounting the loudspeaker higher or lower on the wall.

Now you can mount the loudspeaker array for optimal acoustic performance.

Installation questions and answers:

- **May I install the LBC3200 loudspeaker array the same as LBC3210 or LBC3201?**
This loudspeaker array is designed for small and medium indoor environments. The optimal acoustical performance of this loudspeaker array is obtained by beaming the sound just above the listeners' heads. When this loudspeaker array is mounted as the LBC3210 or LBC3201, a very small listening area results. This is also the reason for not using an angle greater than 6°.

- **If I cannot see the loudspeaker array, does it mean that I cannot hear high tones?**

You can compare high tones with light. When something is between you and the light source, you do not see the light source with its full power. We call this shadow. We have the same situation with high tones. When a lot of people are sitting between you and the loudspeaker, you are sitting in the sound shadow. We experience that as a reduction of high tones.

Background information:

- Because of the many installing angles it is difficult to give a defined shape of the radiated sound from the loudspeaker array.
- By installing the loudspeaker array at a small angle, a (very) large listening area can be reached. Depending of the amount of reverberation in the room and the sound shadow (people or objects in front of a listener who are blocking the direct sound source) the speech intelligibility on a far position may be low. In these situations, it is better to use more loudspeaker arrays to split the listening area.
- When you move further than the maximum position of the listening area (more than the maximum distance from the loudspeaker array), only the sound pressure level will decrease. There is almost no tone height variation. The decreasing of sound pressure level depends strongly on the reverberation of the room.
- When you are too close to the loudspeaker array (less than the minimum distance from the loudspeaker array) and are using the 5° approach a decline of the high tones will very soon occur.
- Because the loudspeakers are designed to beam the sound just above the listeners' heads, it is better not to mount the loudspeakers too high above the listening area.
- To determine exactly where the edges of the listening area are in your situation, you have to carry out a practical test at the location where the loudspeaker array is installed. This is a job for an experienced listener with well-trained ears. To do so, put pink noise through the loudspeaker array. It is better to reduce the lower tones for this test, as they do not contribute to speech intelligibility. Walk around in the listening area and listen to the high tones. The places where the high tones decreases rapidly are the edges of the listening area.

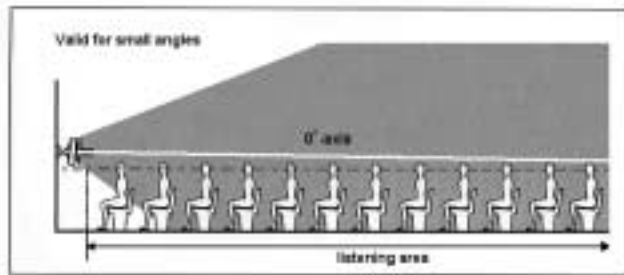


Figure 1 side view of loudspeaker array radiation mounted to the wall with a small angle

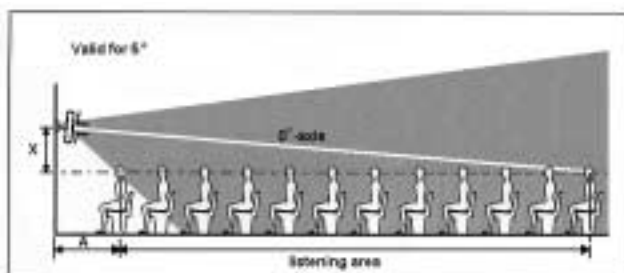


Figure 2: side view of loudspeaker array radiation mounted to the wall with a 5° angle

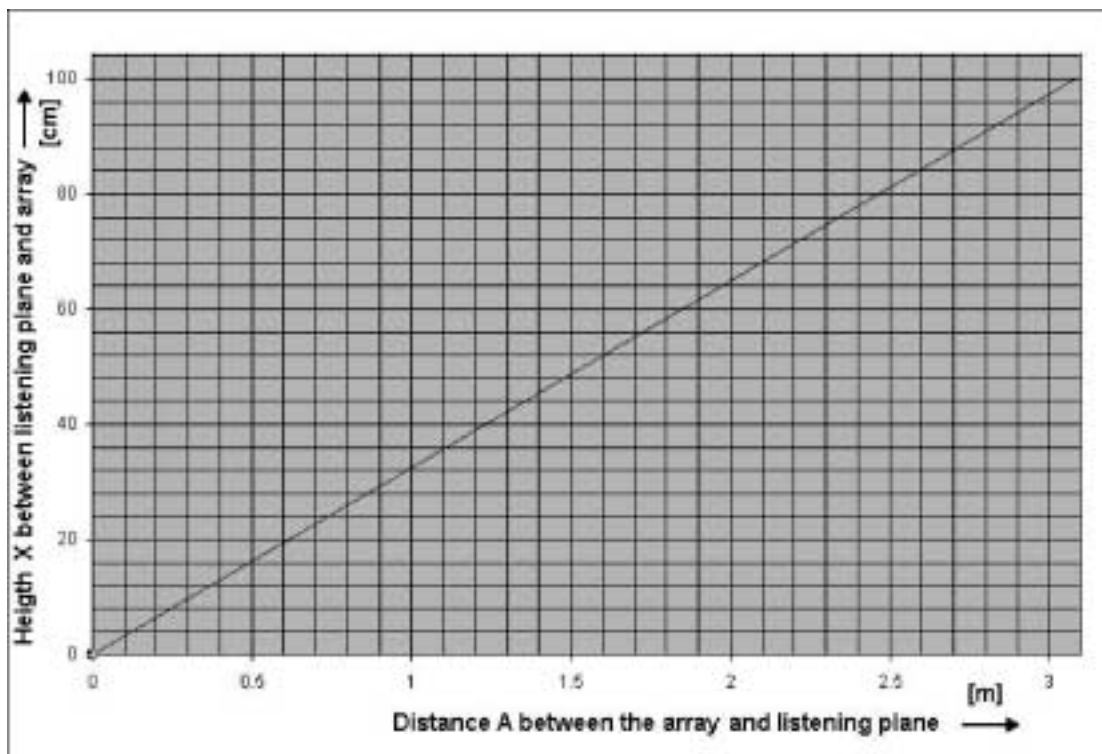


Diagram 1: relation between listening area distance and loudspeaker array

Listening area and related mounting height for XLA3201/00

How to use these mounting method:

1. Determine the dimensions of the desired 'listening area' (a horizontal plane at the level of the listeners' ears – refer to the dashed line in figure 1).
2. Measure the maximum distance from loudspeaker array to the last listener in the listening area (corresponding to 'B' in figures 1, 2 and 3).
3. Refer to diagram 1, and trace upwards from the maximum distance on the horizontal axis. From the vertical intersection with diagonal B-line, you go horizontal to the vertical axis. The X-value (height of loudspeaker array mounting bracket above the listening plane, 'X' in figure 1) is standing on this axis. The horizontal intersections with other diagonal lines provide information about the dimensions of the listening area. These numbers are related to figures 2 and 3 (see also example below).
4. Figure 2 shows the 1kHz octave shape radiated by the loudspeaker array and figure 3 shows the 4kHz octave shape radiation. The listening area with the optimal acoustic performance is in these shapes. Ensure the 4kHz shape with the dimensions obtained using diagram 1 adequately covers the desired listening area.
5. If the desired listening area is covered by the 4kHz shape, the X-value on the vertical axis show at what height the loudspeaker array must be mounted above the listening plane. Note that the loudspeaker array must be mounted at an angle of 8° at the chosen height!

Now you can mount the loudspeaker array for optimal acoustic performance.

Example:

The maximum distance from loudspeaker array to last listener is 15m. Tracing upwards from the 15m point on the horizontal axis of diagram 1 to the diagonal B-line and then sideways to the vertical axis, the intersections with the other diagonal lines provide dimensions of the listening planes. In this example:

F-line (listening plane side length of 4kHz) = 11.1m

C-line (listening plane length) = 11m

E-line (half width listening plane of 4kHz) = 9.3m

A-line (minimum distance to listening plane) = 3.9m

On the vertical axis, the X-value (the height between the listening plane and loudspeaker array mounting bracket) is 1.8m.

Installation questions and answers:

- **The desired listening area is too large and does not fit in the 4kHz shape.**
Try another loudspeaker array mounting height or use more loudspeaker arrays to get a larger listening area.
- **Why use an angle of 8° for the loudspeaker array?**
The radiated shapes shown in figures 2 and 3 with the dimensions in diagram 1 are only valid when the loudspeaker array is mounted at an angle of 8°. Only this situation provides constant sound pressure level and frequency response (constant directivity) in the listening area.
- **Can I use the loudspeaker array with another angle?**
You can use the loudspeaker arrays also with another angle but you will not get the optimum acoustic performance. For example, greater sound pressure level variation will be audible in the listening area. The values in diagram 1 are not valid for other angles. It is recommended never to use an angle greater than 8°.
- **The loudspeaker array cannot be mounted as high as desired.**
If not the height can be reached by limitation of the ceiling for example, use an angle of less than 8°. Focus the 0°-axis of the loudspeaker array to the desired maximum position (see figure 4). Note that the table in diagram 1 and shapes in figures 2 and 3 are not valid for this situation. Check in the listening area if the speech intelligibility is acceptable.

Background information:

- The shapes are defined in an anechoic environment. In these shapes at anechoic conditions, you have a maximum of 6dB sound pressure variation and much less perceived frequency response variation. In areas with normal or high reverberations, less sound pressure level variation take place and the size of shapes will be bigger. The perceived frequency response in this shape will then be almost constant.
- When you go further then the maximum position of the listening area (beyond the maximum distance from the loudspeaker array) only the sound pressure level will decrease. There is almost no tone height variation. The decrease in sound pressure level depends strongly on the reverberation of the room.
- When you move too close to the loudspeaker arrays (less than the minimum distance from the loudspeaker array) a lack of high tones will very soon occur.

- Depending of the amount of reverberation in the room and the sound shadow (people or objects in front of a listener who block the direct sound source), the speech intelligibility at the furthest positions may be low. In these situations, it is better to use more loudspeaker arrays to split the listening area.
- The side lines of the shapes of figure 2 and 3 are the -6dB points related to the sound pressure level on the 0°-axis.
- To get the best speech intelligibility, define a listening area where the 4kHz octave shape covers the whole area.
- To determine exactly where the edges of the listening area are in your situation, you have to carry out a practical test at the location where the loudspeaker array is installed. This is a job for an experienced listener with well-trained ears. To do so, put pink noise through the loudspeaker array. It is better to reduce the lower tones for this test, as they do not contribute to speech intelligibility. Walk around in the listening area and listen to the high tones. The places where the high tones decrease rapidly are the edges of the listening area.

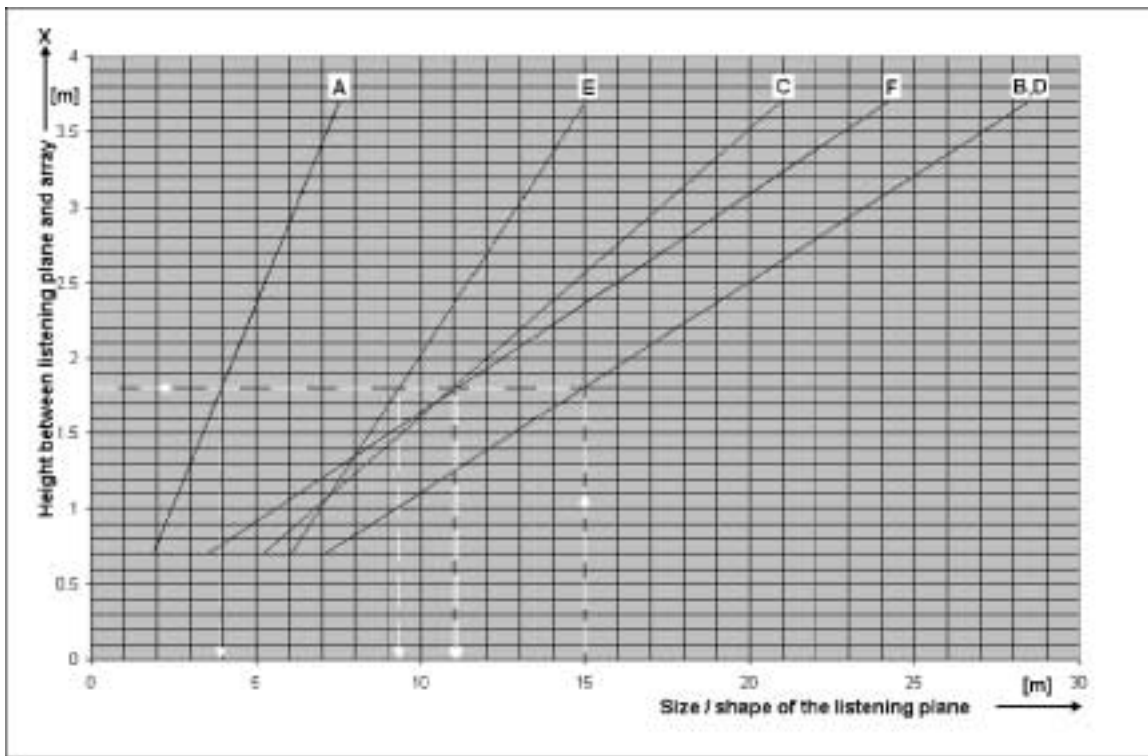


Diagram 1: relation between listening area and loudspeaker array mounting height

Diagonal line meanings

B-line: maximum distance from loudspeaker array to last listener.

D-line: half-width listening plane at 1kHz

F-line: listening plane side length at 4kHz

C-line: listening plane length

E-line: half-width listening plane at 4kHz

A-line: minimum distance to listening plane

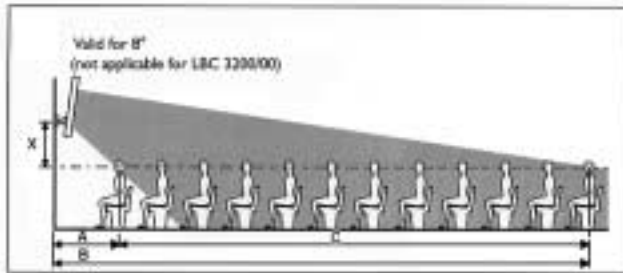


Figure 1: side view of loudspeaker array radiation and listening plane

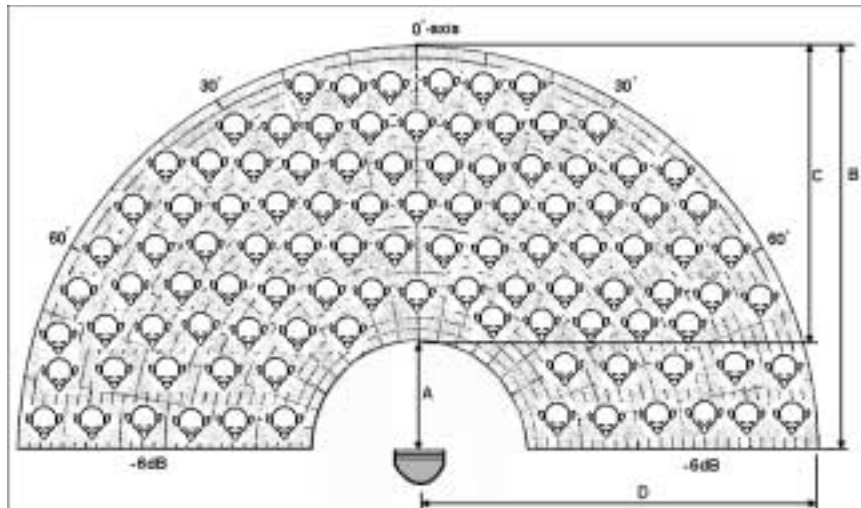


Figure 2: 1kHz octave shape of the loudspeaker array

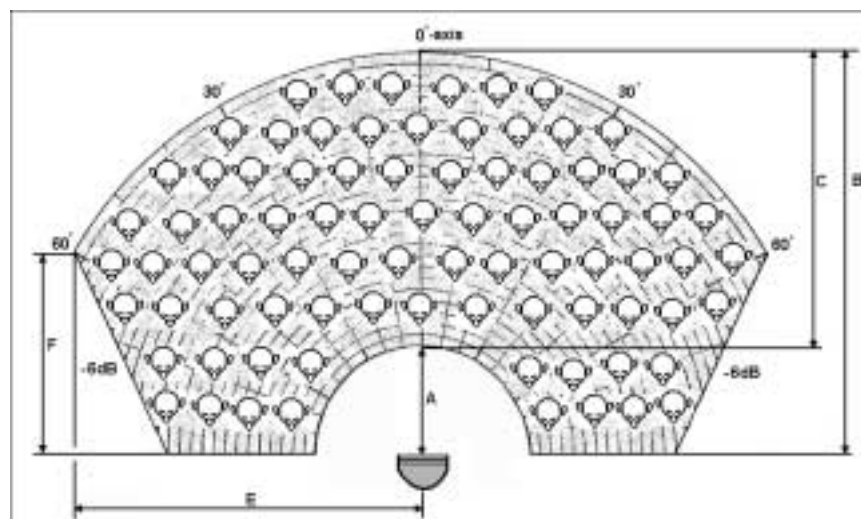


Figure 3: 4kHz octave shape of the loudspeaker array

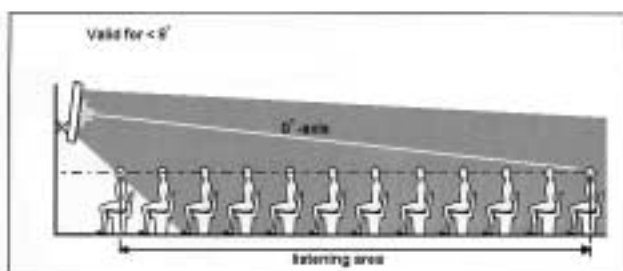


Figure 4: Focus the 0°-axis of the loudspeaker array to the maximum position

Listening area and related mounting height for XLA3210/00

How to use these mounting method:

1. Determine the dimensions of the desired 'listening area' (a horizontal plane at the level of the listeners' ears – refer to the dashed line in figure 1).
2. Measure the maximum distance from loudspeaker array to the last listener in the listening area (corresponding to 'B' in figures 1, 2 and 3).
3. Refer to diagram 1, and trace upwards from the maximum distance on the horizontal axis. From the vertical intersection with diagonal B-line, you go horizontal to the vertical axis. The X-value (height of loudspeaker array mounting bracket above the listening plane, 'X' in figure 1) is standing on this axis. The horizontal intersections with other diagonal lines provide information about the dimensions of the listening area. These numbers are related to figures 2 and 3 (see also example below).
4. Figure 2 shows the 1kHz octave shape radiated by the loudspeaker array and figure 3 shows the 4kHz octave shape radiation. The listening area with the optimal acoustic performance is in these shapes. Ensure the 4kHz shape with the dimensions obtained using diagram 1 adequately covers the desired listening area.
5. If the desired listening area is covered by the 4kHz shape, the X-value on the vertical axis show at what height the loudspeaker array must be mounted above the listening plane. Note that the loudspeaker array must be mounted at an angle of 8° at the chosen height!

Now you can mount the loudspeaker array for optimal acoustic performance.

Diagram example:

The maximum distance from loudspeaker array to last listener is 15m. Tracing upwards from the 15m point on the horizontal axis of diagram 1 to the diagonal B-line and then sideways to the vertical axis, the intersections with the other diagonal lines provide dimensions of the listening planes. In this example:

F-line (listening plane side length of 4kHz) = 12.2m

C-line (listening plane length) = 11m

E-line (half width listening plane of 4kHz) = 8.6m

A-line (minimum distance to listening plane) = 3.9m

On the vertical axis, the X-value (the height between the listening plane and loudspeaker array mounting bracket) is 1.8m.

Installation questions and answers:

- **The desired listening area is too large and does not fit in the 4kHz shape.**
Try another loudspeaker array mounting height or use more loudspeaker arrays to get a larger listening area.
- **Why use an angle of 8° for the loudspeaker array?**
The radiated shapes shown in figures 2 and 3 with the dimensions in diagram 1 are only valid when the loudspeaker array is mounted at an angle of 8°. Only this situation provides constant sound pressure level and frequency response (constant directivity) in the listening area.
- **Can I use the loudspeaker array with another angle?**
You can use the loudspeaker arrays also with another angle but you will not get the optimum acoustic performance. For example, greater sound pressure level variation will be audible in the listening area. The values in diagram 1 are not valid for other angles. It is recommended never to use an angle greater than 8°.
- **The loudspeaker array cannot be mounted as high as desired.**
If not the height can be reached by limitation of the ceiling for example, use an angle of less than 8°. Focus the 0°-axis of the loudspeaker array to the desired maximum position (see figure 4). Note that the table in diagram 1 and shapes in figures 2 and 3 are not valid for this situation. Check in the listening area if the speech intelligibility is acceptable, as messages must be audible.

Background information:

- The shapes are defined in an anechoic environment. In these shapes at anechoic conditions, you have a maximum of 6dB sound pressure variation and much less perceived frequency response variation. In areas with normal or high reverberations, less sound pressure level variation take place and the size of shapes will be bigger. The perceived frequency response in this shape will then be almost constant.
- When you go further then the maximum position of the listening area (beyond the maximum distance from the loudspeaker array) only the sound pressure level will decrease. There is almost no tone height variation. The decrease in sound pressure level depends strongly on the reverberation of the room.
- When you move too close to the loudspeaker arrays (less than the minimum distance from the loudspeaker array) a lack of high tones will very soon occur.
- Depending of the amount of reverberation in the room and the sound shadow (people or objects in

front of a listener who block the direct sound source), the speech intelligibility at the furthest positions may be low. In these situations, it is better use more loudspeaker arrays to split the listening area.

- The side lines of the shapes of figure 2 and 3 are the -6dB points related to the sound pressure level on the 0°-axis.
- To get the best speech intelligibility, define a listening area where the 4kHz octave shape covers the whole area.

To determine exactly where the edges of the listening area are in your situation, you have to carry out a practical test at the location where the loudspeaker array is installed. This is a job for an experienced listener with well-trained ears. To do so, put pink noise through the loudspeaker array. It is better to reduce the lower tones for this test, as they do not contribute to speech intelligibility. Walk around in the listening area and listen to the high tones. The places where the high tones decreases rapidly are the edges of the listening area.

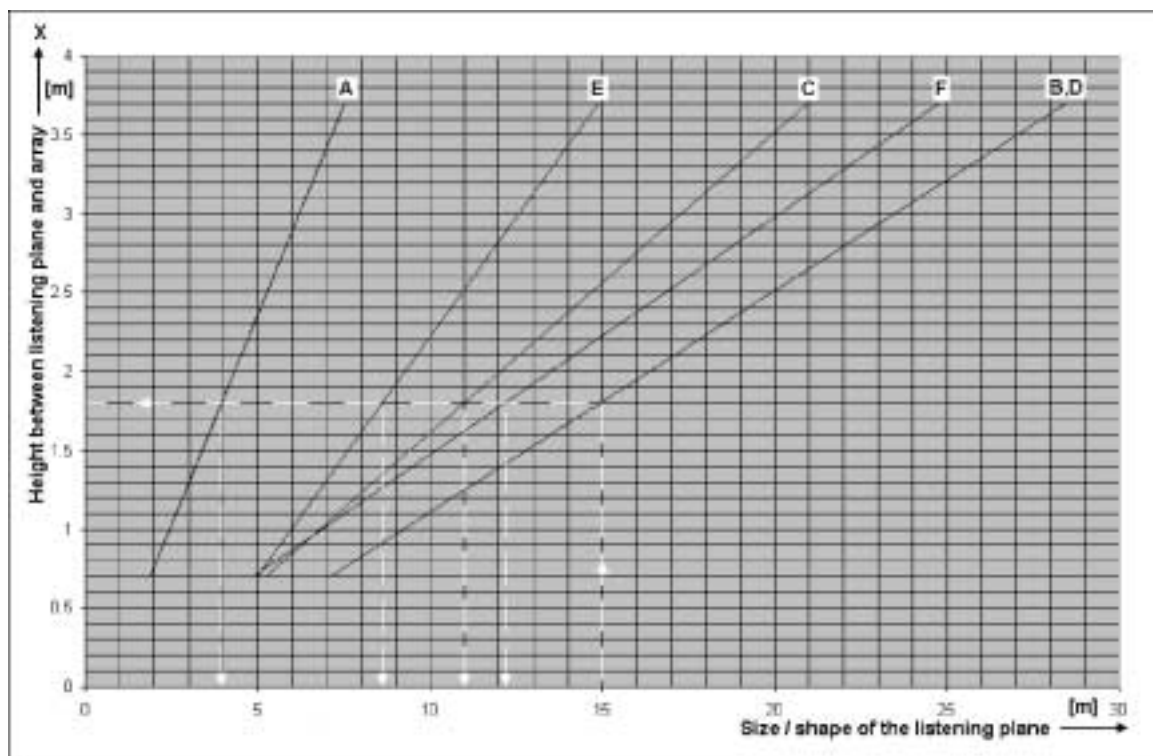


Diagram 1: relation between listening area and loudspeaker array mounting height

Line meaning

B-line: maximum distance from loudspeaker array to last listener.

D-line: half-width listening plane at 1kHz

F-line: listening plane side length at 4kHz

C-line: listening plane length

E-line: half-width listening plane at 4kHz

A-line: minimum distance to listening plane

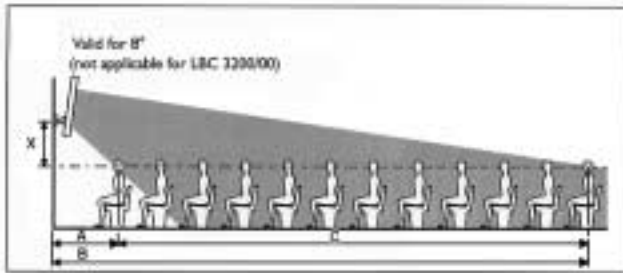


Figure 1: side view of loudspeaker array radiation and listening plane

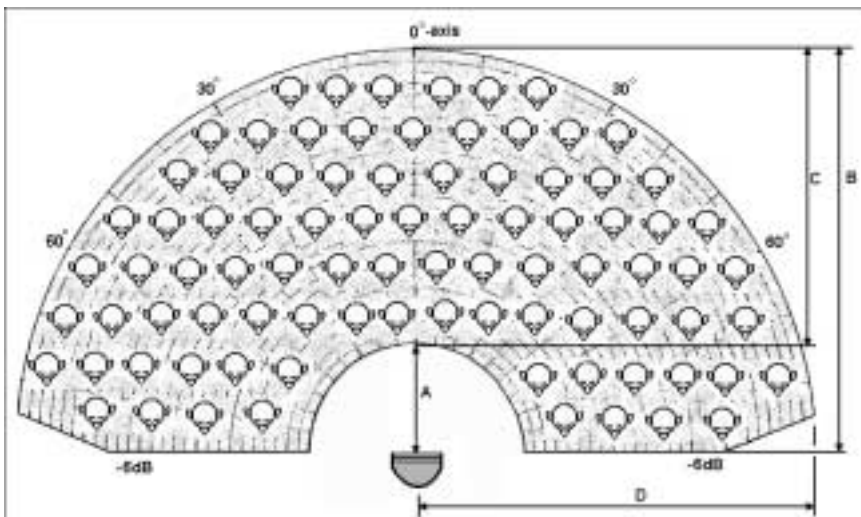


Figure 2: 1kHz octave shape of the loudspeaker array

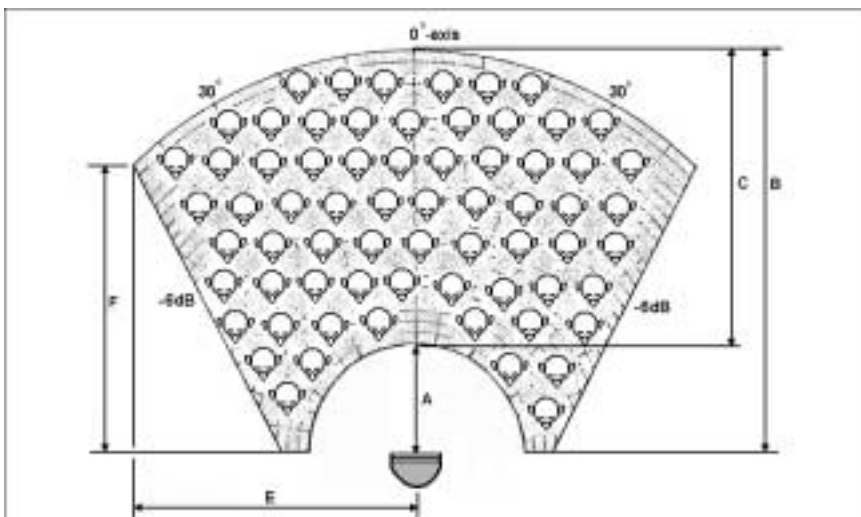


Figure 3: 4kHz octave shape of the loudspeaker array

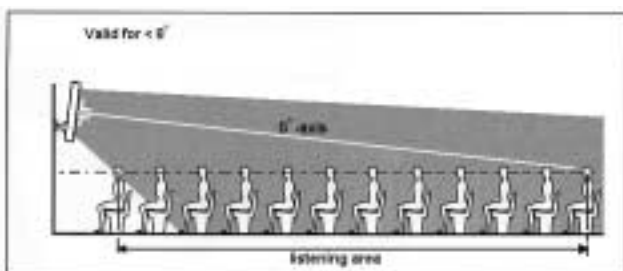
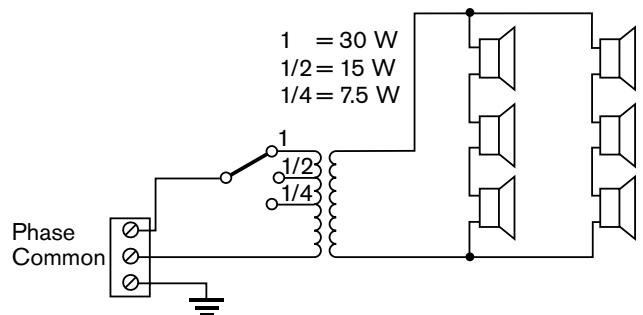
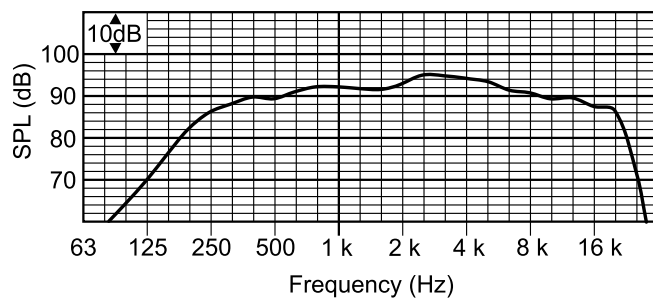


Figure 4: Focus the 0°-axis of the loudspeaker array to the maximum position

TECHNICAL PERFORMANCE DATA

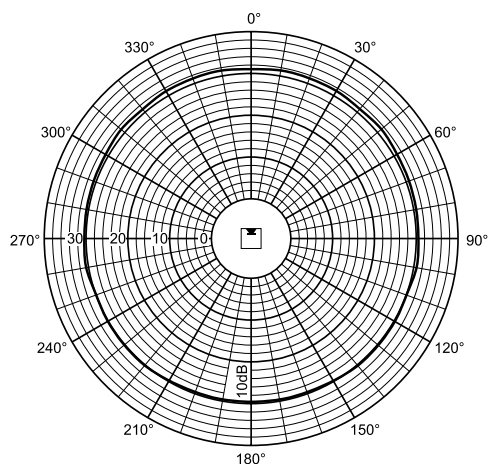
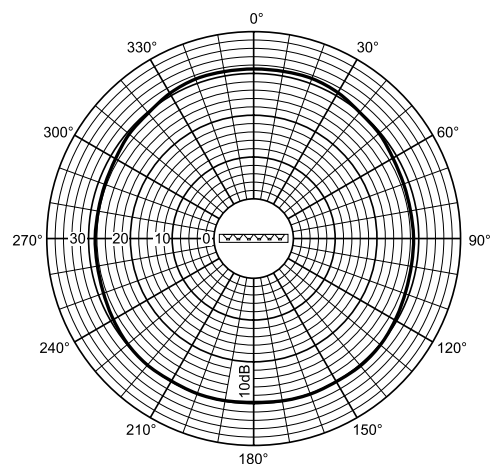
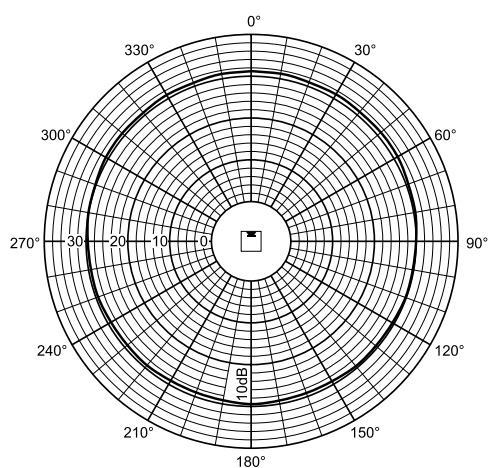
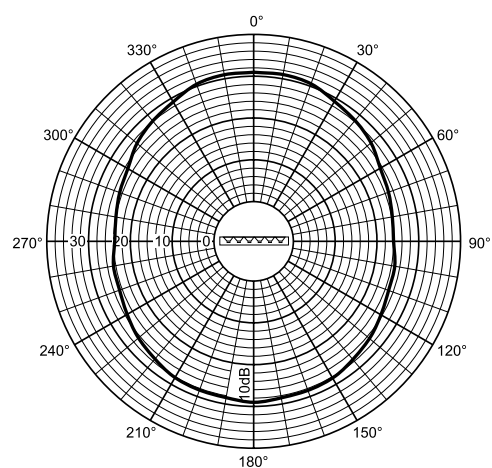
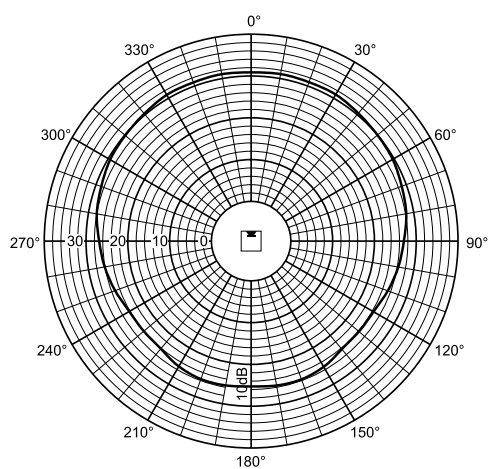
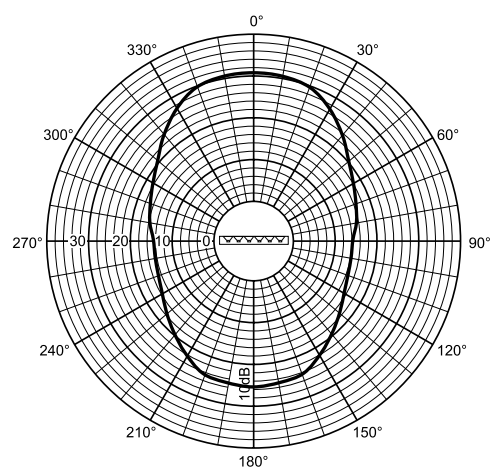
LBC 3200/00

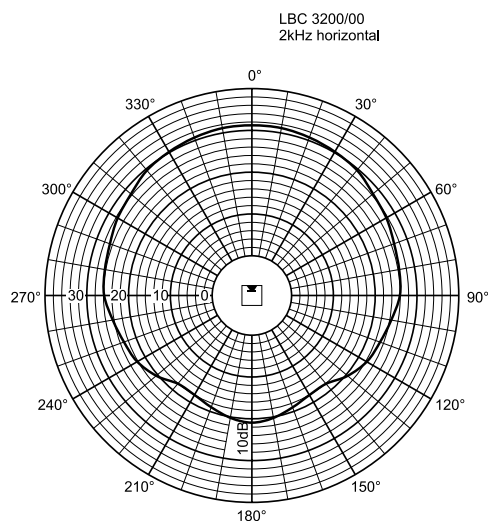
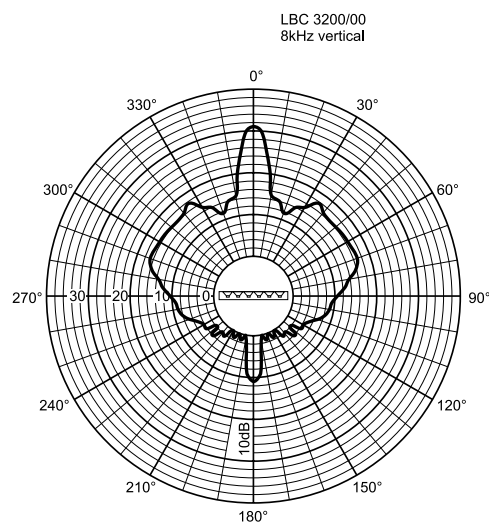
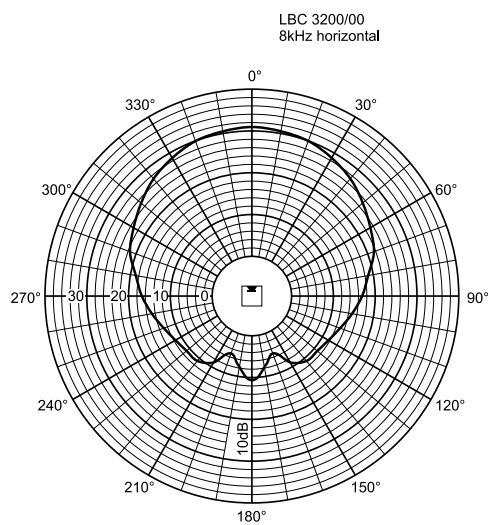
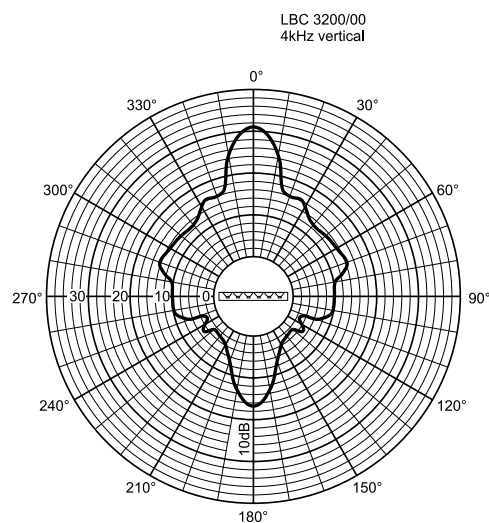
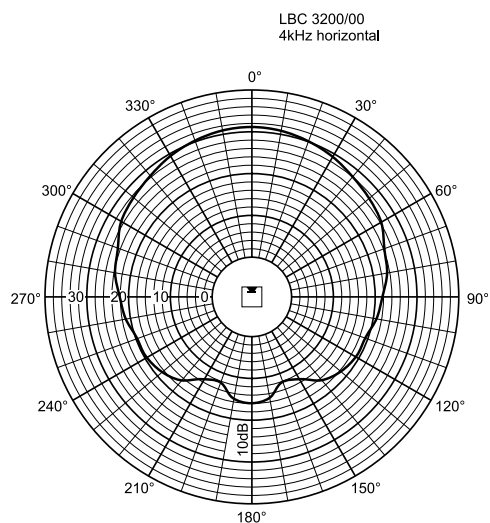
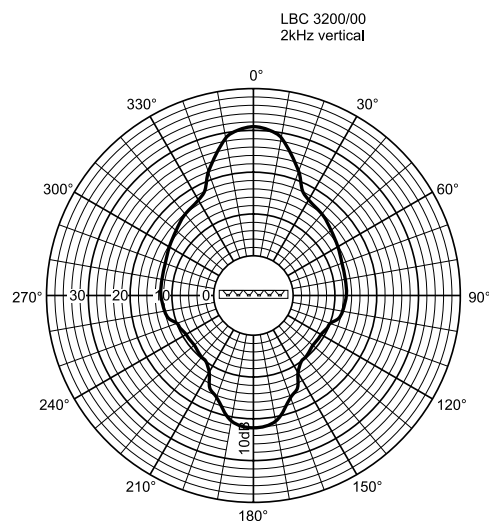
Maximum power	45 W
Rated power	30 W (30-15-7.5 W)
Sound pressure level at	
30 W/1 W (at 1 kHz, 1 m)	106 dB/91 dB (SPL)
Effective frequency range (-10 dB)	190 Hz to 18 kHz
Opening angle	
(at 1 kHz/4 kHz, -6 dB)	
Horizontal	220° /130°
Vertical	70° /18°
Rated input voltage	100 V
Rated impedance	333 ohm
Ambient temperature range	-25°C to +55°C
Safety	according to EN 60065
Connection	screw terminal block
Dimensions (H x W x D)	600 x 80 x 90 mm
Colour	silver
Weight	3 kg



LBC 3200/00

Octave band (Hz)	250	500	1 k	2 k	4 k	8 k
SPL 1.1	87	89	91	93	93	89
SPL max.	102	104	106	108	108	104
Q-factor	1.3	2.2	4.5	11.6	25.7	58.9
Hor. Angle (deg)	360	360	220	190	130	100
Vert. Angle (deg)	360	120	70	32	18	10

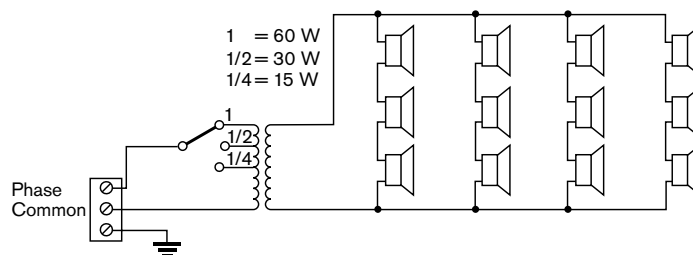
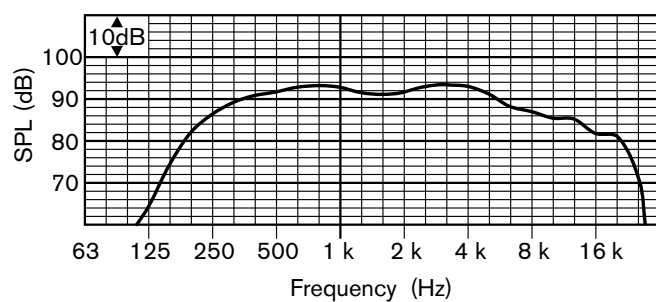
Horizontal**Vertical**LBC 3200/00
250Hz horizontalLBC 3200/00
250Hz verticalLBC 3200/00
500Hz horizontalLBC 3200/00
500Hz verticalLBC 3200/00
1kHz horizontalLBC 3200/00
1kHz vertical

Horizontal**Vertical**

TECHNICAL PERFORMANCE DATA

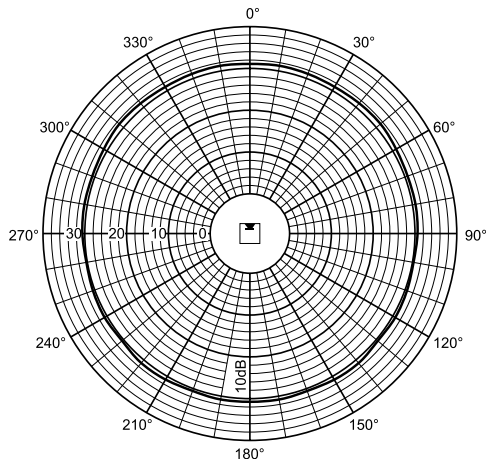
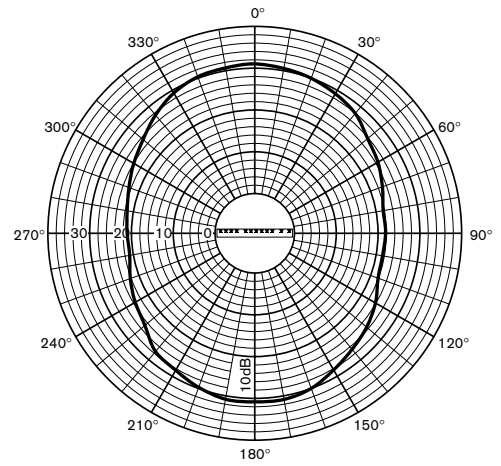
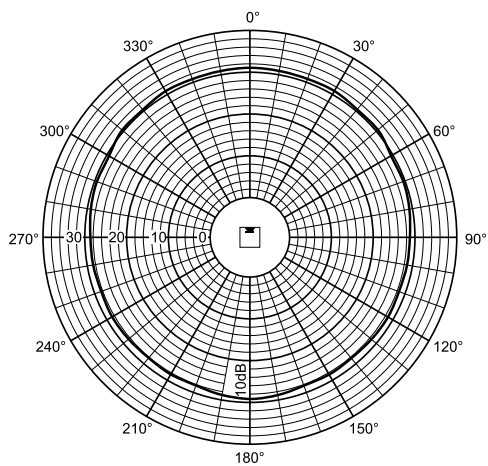
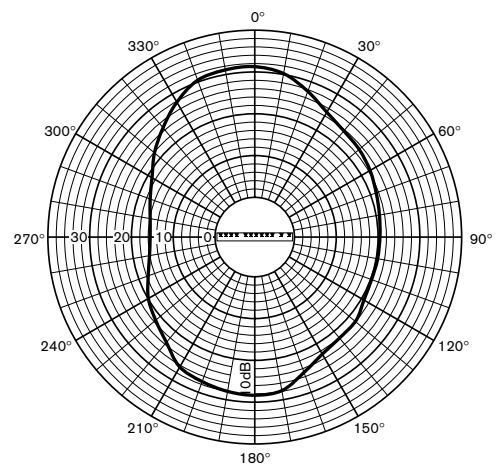
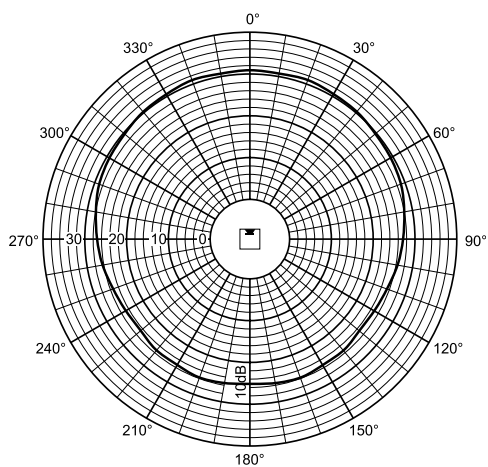
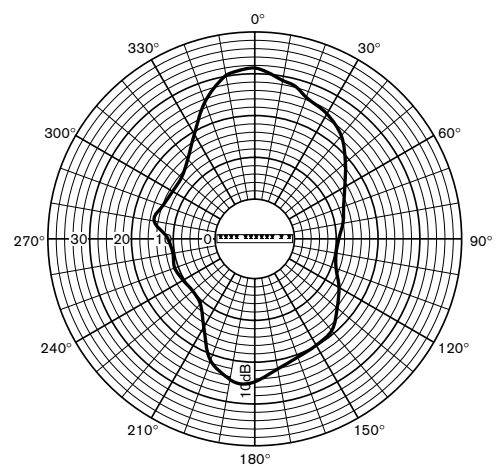
LBC 3201/00

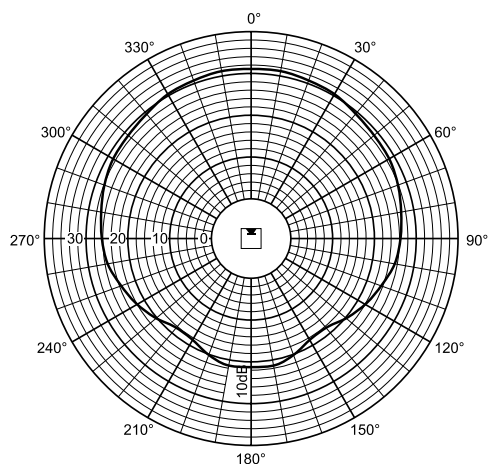
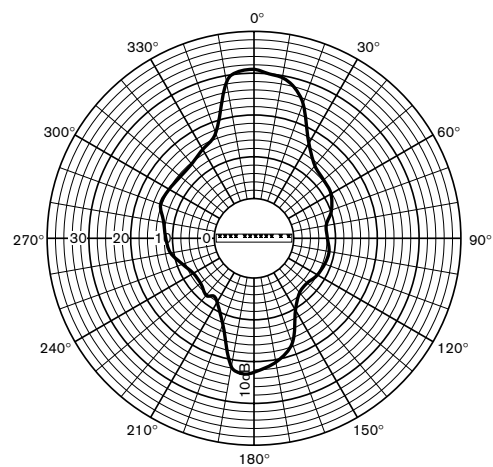
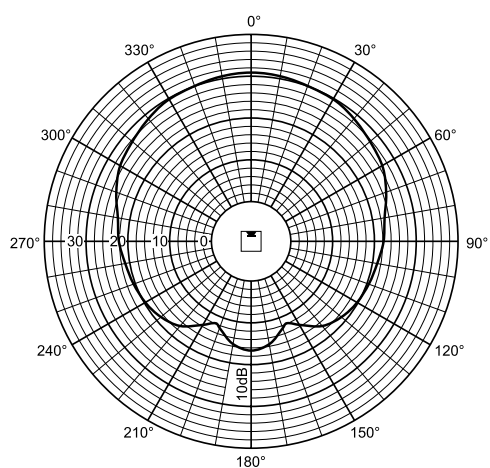
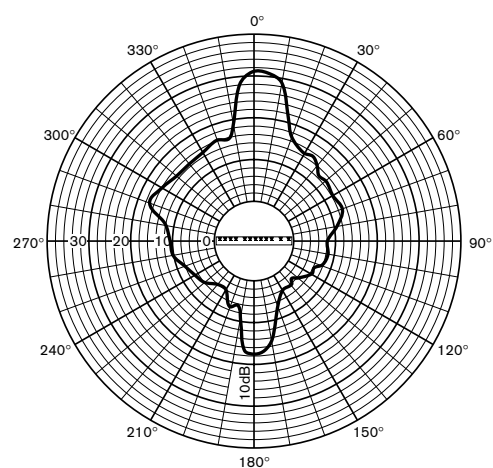
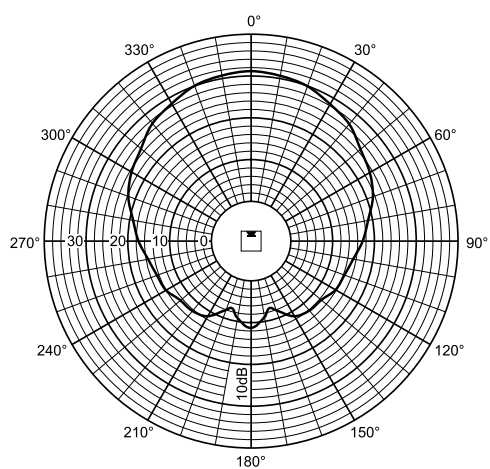
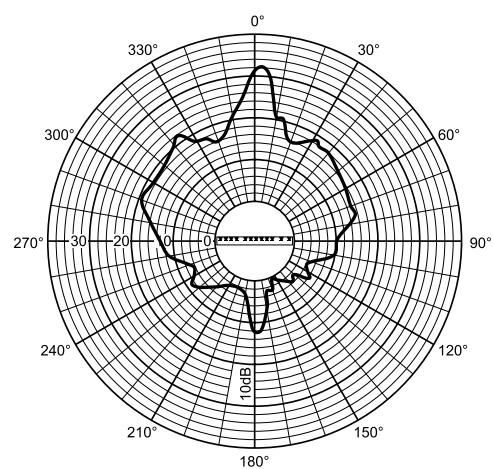
Maximum power	90 W
Rated power	60 W (60-30-15 W)
Sound pressure level at 60 W/1 W (at 1 kHz, 1 m)	110 dB/92 dB (SPL)
Effective frequency range (-10 dB)	190 Hz to 18 kHz
Opening angle (at 1 kHz / 4 kHz, - 6 dB)	
Horizontal	210°/132°
Vertical	50°/22°
Rated input voltage	100 V
Rated impedance	167 ohm
Ambient temperature range	-25°C to +55°C
Safety	according to EN 60065.
Connection	screw terminal block
Dimensions (H x W x D)	1200 x 80 x 90 mm
Colour	silver
Weight	6,4 kg



LBC 3201/00

Octave band (Hz)	250	500	1 k	2 k	4 k	8 k
SPL 1.1	88	92	92	91	91	86
SPL max.	106	110	110	109	109	104
Q-factor	2.2	3.2	6.5	12.6	23.4	53.3
Hor. Angle (deg)	360	360	210	192	132	100
Vert. Angle (deg)	107	67	50	33	22	12

Horizontal**Vertical**LBC 3201/00
250Hz horizontalLBC 3201/00
250Hz verticalLBC 3201/00
500Hz horizontalLBC 3201/00
500Hz verticalLBC 3201/00
1kHz horizontalLBC 3201/00
1kHz vertical

Horizontal**Vertical**LBC 3201/00
2kHz horizontalLBC 3201/00
2kHz verticalLBC 3201/00
4kHz horizontalLBC 3201/00
4kHz verticalLBC 3201/00
8kHz horizontalLBC 3201/00
8kHz vertical

TECHNICAL PERFORMANCE DATA

LBC 3210/00

Maximum power 90 W

Rated power 60 W (60-30-15 W)

Sound pressure level

at 60 W/1 W (at 1 kHz, 1 m) 115 dB/97 dB (SPL)

Effective frequency range (-10 dB) 190 Hz to 20 kHz

Opening angle

(at 1 kHz / 4 kHz, - 6 dB)

Horizontal 170°/90°

Vertical 55°/18°

Rated input voltage 100 V

Rated impedance 167 ohm

Ambient temperature range -25°C to +55°C

Safety according to EN 60065.

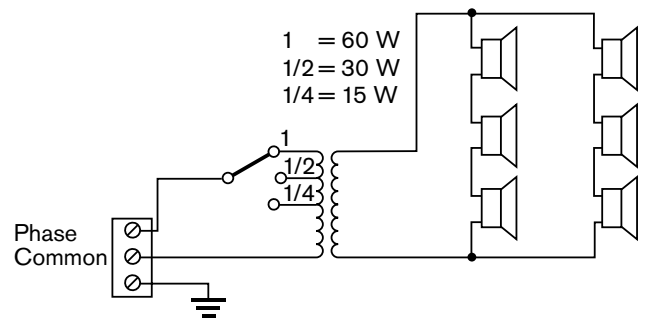
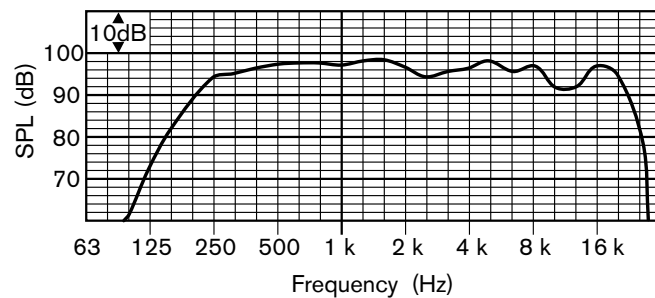
Water/dust protection IP 66 according to IEC 60529

Connection screw terminal block

Dimensions (H x W x D) 1200 x 160 x 90 mm

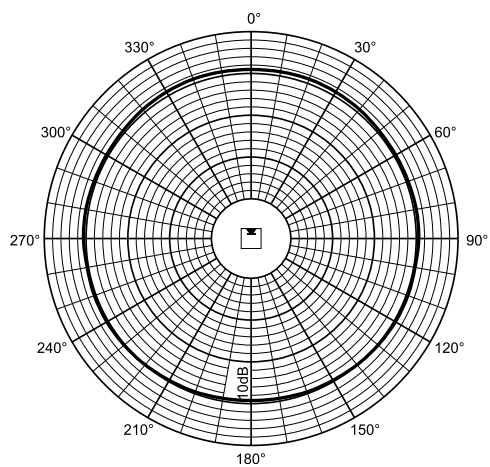
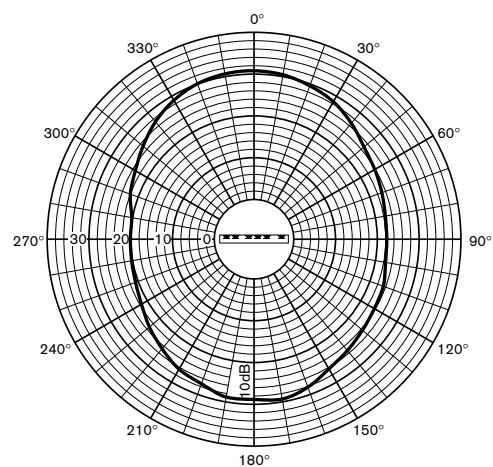
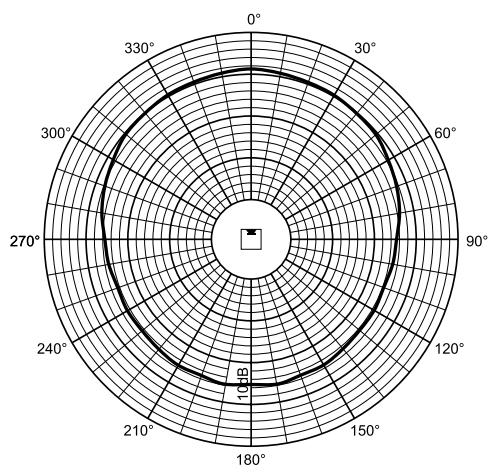
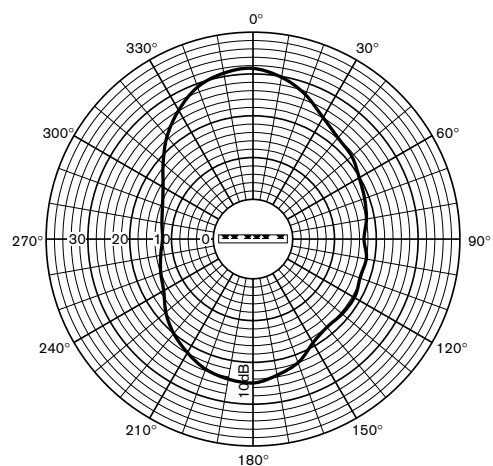
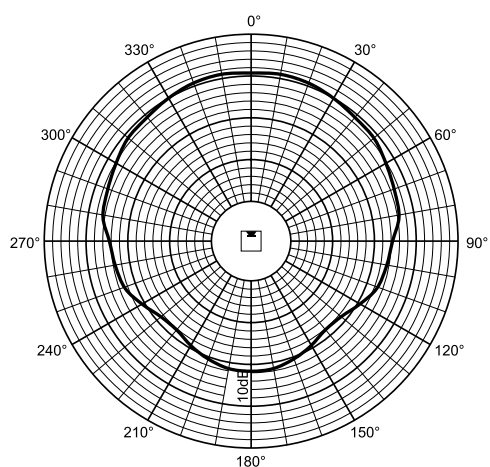
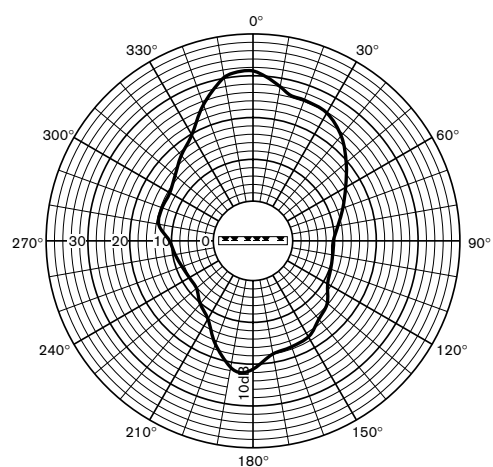
Colour silver

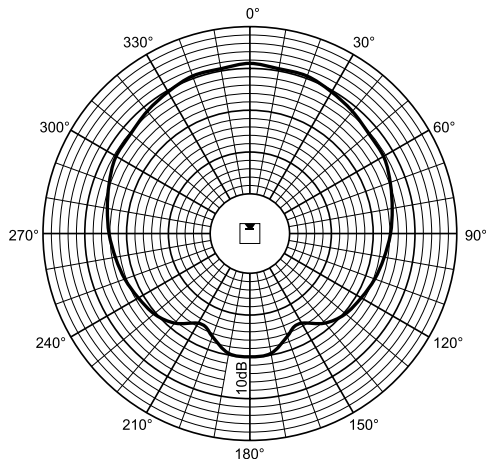
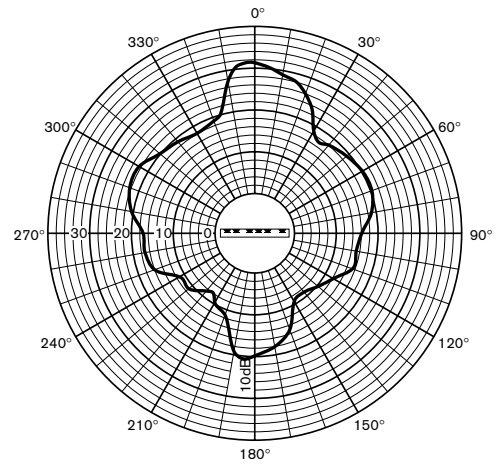
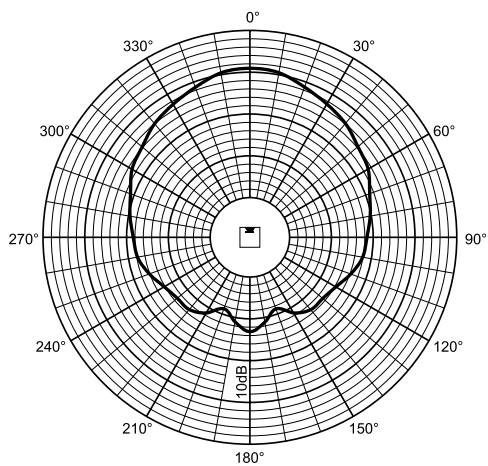
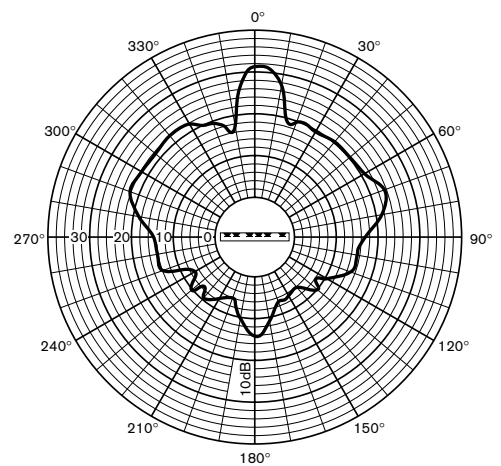
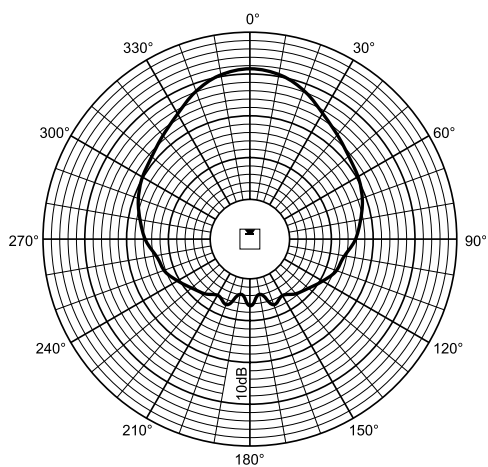
Weight 9 kg



LBC 3210/00

Octave band (Hz)	250	500	1 k	2 k	4 k	8 k
SPL 1.1	94	97	97	95	96	93
SPL max.	112	115	115	113	114	111
Q-factor	2.2	2.7	6.3	10.8	22.6	32.3
Hor. Angle (deg)	360	180	170	160	90	60
Vert. Angle (deg)	100	60	55	34	18	10

Horizontal**Vertical**LBC 3210/00
250Hz horizontalLBC 3210/00
250Hz verticalLBC 3210/00
500Hz horizontalLBC 3210/00
500Hz verticalLBC 3210/00
1kHz horizontalLBC 3210/00
1kHz vertical

Horizontal**Vertical**LBC 3210/00
2kHz horizontalLBC 3210/00
2kHz verticalLBC 3210/00
4kHz horizontalLBC 3210/00
4kHz verticalLBC 3210/00
8kHz horizontalLBC 3210/00
8kHz vertical