Q1

Data sheet
Rigging instructions

d&b audiotechnik

Safety precautions

WARNING!

Never stand in the immediate vicinity of loudspeakers driven at a high level. Professional loudspeaker systems are capable of causing a sound pressure level detrimental to human health. Seemingly non-critical sound levels (from approx. 95 dB SPL) can cause hearing damage if people are exposed to it over a long period.

In order to prevent accidents when deploying loudspeakers on the ground or when flown, please take note of the following:

When setting up the loudspeakers or loudspeaker stands, make sure they are standing on a firm surface. If you place several systems on top of one another, use straps to secure them against movement.

Only use accessories which have been tested and approved by d&b for assembly and mobile deployment. Pay attention to the correct application and maximum load capacity of the accessories as detailed in our specific "Mounting instructions" or in our "Flying system and Rigging manuals".

Ensure that all additional hardware, fixings and fasteners used for installation or mobile deployment are of an appropriate size and load safety factor. Pay attention to the manufacturers instructions and to the relevant safety guidelines.

Regularly check the loudspeaker housings and accessories for visible signs of wear and tear, and replace them when necessary.

Regularly check all load bearing bolts in the mounting devices.

CAUTION!

Loudspeakers produce a static magnetic field even if they are not connected or are not in use. Therefore make sure when erecting and transporting loudspeakers that they are nowhere near equipment and objects which may be impaired or damaged by an external magnetic field. Generally speaking, a distance of 0.5 m (1.5 ft) from magnetic data carriers (floppy disks, audio and video tapes, bank cards, etc.) is sufficient; a distance of more than 1 m (3 ft) may be necessary with computer and video monitors.

General Information

Q1 Data sheet/Rigging instructions

Version 1.0E, 08/2003, D2040.E.01

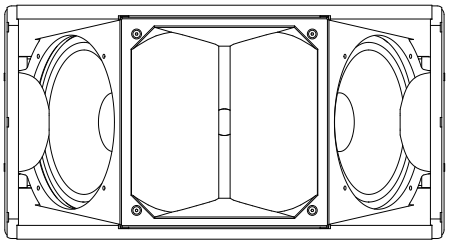
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The information presented in this document is, to the best of our knowledge, correct. We will however not be held responsible for the consequences of any errors or omissions.

Technical specifications, weights and dimensions should always be confirmed with d&b audiotechnik AG prior to inclusion in any additional documentation.

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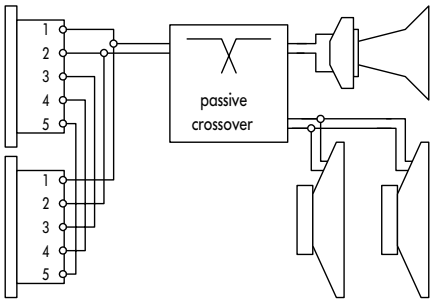
Q1



The Q1 is the Q-Series line array loudspeaker. It is used in vertical columns giving a 75° constant directivity dispersion pattern in the horizontal plane. The Q1 cabinet is a passive two-way design that houses 2 x 10" LF drivers and a 1.3" HF compression driver with a toroidal wave shaping device and a passive crossover network. Its frequency response extends from 60 Hz to above 17 kHz. The two 10" neodymium LF drivers are positioned in a dipolar arrangment providing an exceptional dispersion control even at lower frequencies, with the 75° nominal dispersion angle being maintained down to 400 Hz.

With a 15° vertical HF dispersion per cabinet, the Q1 can be used to construct vertical columns that produce a curved coherent wave front. The mechanical and acoustical design of the cabinet enable vertical splay angles to be set between 0° and 14°. Q1 cabinets can therefore be used in vertical configurations starting from 2 cabinets with a 15° to 30° dispersion, up to 20 cabinets with a fully user and venue defined vertical profile.

Q1 cabinets can be combined with the Q-SUB subwoofer system; in line array set ups with the Q-SUB flown on top of the array or as a seperate column, or in ground stacked applications where the Q-SUB also mechanically supports the Q1s. The Q-SUB extends the systems frequency response to below 40 Hz, for further extension of bandwidth and headroom ground stacked B2 subwoofers can be used (driven in INFRA mode).



Connector wiring

The Q1 cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is protected by a rigid metal grill covered with a replaceable acoustically transparent foam. The side panels incorporate a pair of handles.

The Q1 cabinet is fitted with three types of rigging device:

- Eight sockets in the front grill and rear edge bar, that accept the Z5153 Locking pin 8 mm, to connect the array links.
- A quick lock adapter plate on one side of the cabinet that accepts the Z5156 Q Flying adapter.
- Five sockets that accept the Z5048 M2 Flying pin 10 mm for supporting single cabinets and for the aiming of arrays.

CAUTION!

Only operate Q1 loudspeakers with a d&b amplifier configured for the Q1 otherwise there is a risk of damage to the loudspeaker components.

Connections

The Q1 cabinet is fitted with a pair of EP5 connectors. All five pins of both connectors are wired in parallel. The Q1 uses the pin assignments 1/2. Pins 3/4 and 5 are designated to Q-SUB active subwoofers, where pin 5 is used for SenseDrive (only available when using a D12 amplifier and 5-wire cabling). Using the male connector as the input, the female connector allows for direct connection to additional loudspeakers.

The Q1 can be supplied with NL4 output connectors as an option. Pin equivalents of EP5 and NL4 connectors are listed in the table on the left.

EP5	1	2	3	4	5
NL4	1+	1–	2+	2–	n.c.

EP5 and NL4 pin assignments

Operation with D12

Selecting Q1 mode in the D12 enables up to three Q1 loudspeakers to be driven by the respective channel. In applications with high continuous levels or high ambient temperatures for thermal reasons only two loudspeakers per channel (4 ohms) should be connected.

IMPORTANT!

Controller settings

For acoustic adjustment the functions CUT, HFC and CPL can be selected.

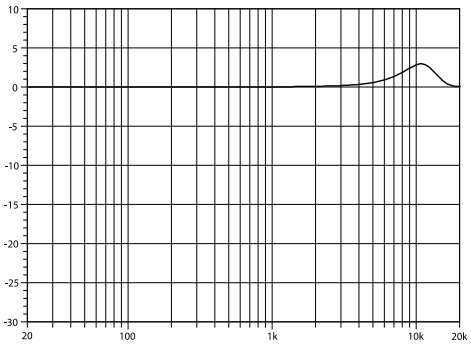
CUT circuit

Set to CUT, the Q1 low frequency level is reduced. The Q1 is now configured for use with the Q-SUB or d&b C-Series subwoofers.

HFC circuit

Selecting the HFC (High Frequency Compensation) circuit compensates for loss of high frequency energy due to absorption in air when loudspeakers are used to cover far field listening postions.

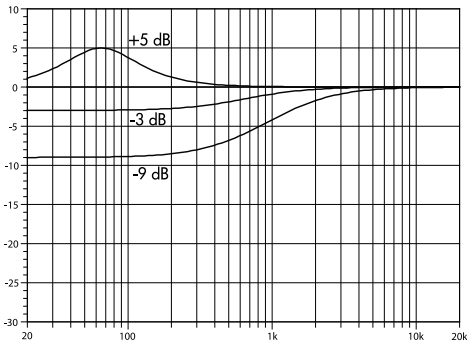
The HFC circuit should be used selectively, only for those cabinets covering distances larger than 50 m (160 ft). This guarantees the correct sound balance between close and remote audience areas, whilst all amplifiers driving the array can be fed with the same signal.



Frequency response correction of HFC circuit

CPL circuit

The CPL (Coupling) circuit compensates for coupling effects between the cabinets; these effects increase as the length of the line array is extended. CPL begins gradually at 1 kHz, with the maximum attenuation below 400 Hz, providing a balanced frequency response when Q1 cabinets are used in arrays of four or more. The function of the CPL circuit in the D12 amplifier is shown in the diagram opposite and can be set in dB attenuation values between –9 and 0, or a positive CPL value which creates an adjustable low frequency boost around 65 Hz (0 to +5 dB).

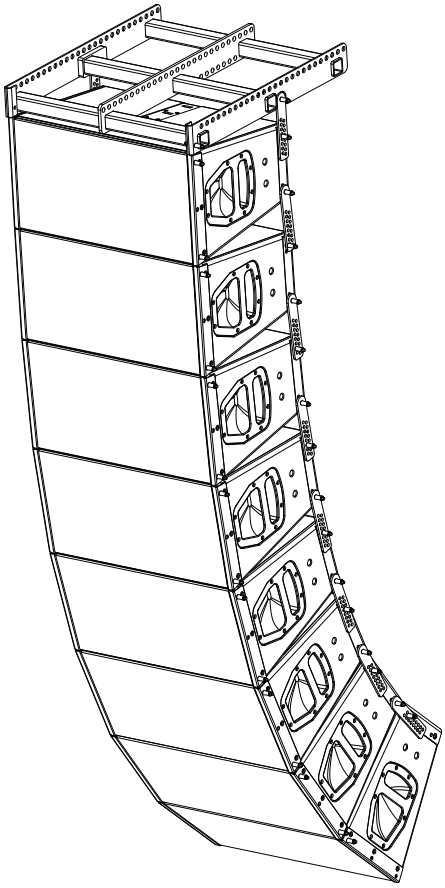


Frequency response correction of CPL circuit

Operation with E-PAC

Selecting Q1 mode (firmware V4.00 or later) enables the E-PAC to drive one Q1 loudspeaker. LO IMP mode configures the E-PAC to drive a maximum of two Q1 loudspeakers with a 6 dB reduction in input level to the loudspeakers.

For acoustic adjustment the functions CUT and CPL can be selected. The E-PAC CPL circuit creates a 3 dB attenuation corresponding with the –3 dB curve shown in the diagram opposite.



Q1 line array

Arraying Q1 cabinets

Vertical (line) array of Q1 cabinets

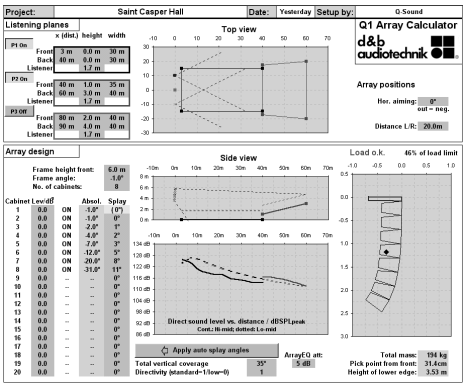
A vertical array of Q1 cabinets produces a precisely shaped wave front following the mechanical arrangement of the cabinets. The cut off at the upper and lower limits of the vertical dispersion of a Q1 column is very sharp, and therefore precise aiming is absolutely essential to address the desired audience area.

The vertical coverage angle of a single cabinet is 15° and this defines the maximum vertical splay angle of 14° between adjacent cabinets in a column. This dispersion angle is achieved above approximately 5 kHz, while lower frequencies will disperse into a wider area creating an overlap of the coverage patterns between the single cabinets. Therefore directivity and the level of lower frequencies increases with every cabinet added to the column. Two Q1 cabinets arrayed vertically with a 10° splay angle produce a flat frequency response. Longer columns will therefore boost low and low/mid frequencies. The CPL controller function compensates for these effects.

Decreasing the splay to angles smaller than 10° will also create an overlap of the coverage patterns above 5 kHz resulting in increased high frequency output. This effect can be used to compensate for HF absorption of air when covering remote audience areas.

When designing a set up for a specific venue, the first thing to consider is the settings for the vertical splay of a column to achieve a smooth level distribution within the required audience area.

Usually the distances to the audience that an array has to cover increase from the bottom to the top of a column, consequently more power is required at the top. This can be achieved by using different vertical splay angles between cabinets in a column, with smaller angles achieving more power within a given vertical segment. For a smooth level distribution over distance it is desirable to gradually increase the vertical splay angle used between adjacent cabinets by increments, e.g. 1°, 3°, 10° from the top to the bottom of a 4 deep column.



Q-Calc Array calculator

Q-Calc Array calculator

Q1 columns should be designed using the d&b Q-Calc Array calculator simulation tool for Microsoft Excel. This calculates the level distribution in two frequency bands on different audience areas and the physical parameters of the array including the actual mechanical load conditions within the column.

Horizontal array of Q1 cabinets

The horizontal angle between adjacent Q1 line arrays can be set to between 40° and 60°. The most even energy distribution is achieved with 50°. Smaller horizontal angles between the columns will give a smaller horizontal coverage area, but will produce higher sound pressure on the centre axis and increased comb filter effects between the arrays.

The configuration of any array should be thoroughly adapted to the actual room acoustics and requirements. In order to keep diffuse sound low, the total coverage angle should only be as wide as necessary to cover the audience area.

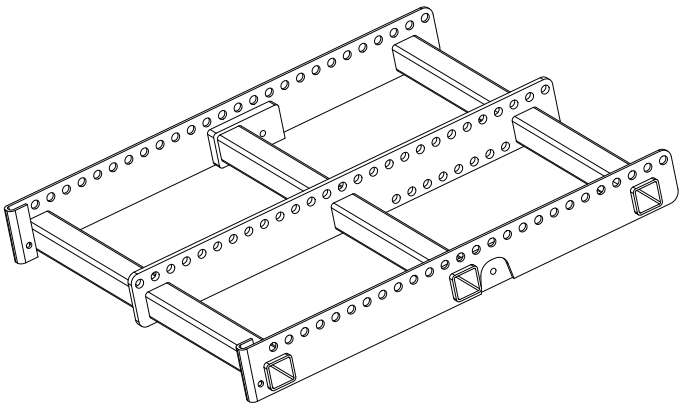
Q Flying frame and rigging accessories

The Q1 rigging system including the Z5159 Q Flying frame is designed to support up to 20 x Q1 cabinets. The safe working load of the system allows up to 10 cabinets to be flown in any vertical configuration. With arrays larger than 10 deep the load conditions have to be checked using the Q-Calc Array calculator.

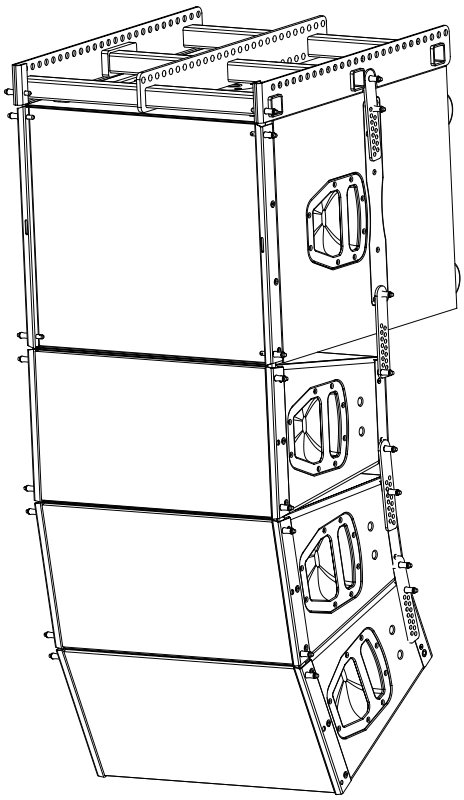
For load safety purposes each Q-SUB cabinet used in an array is the equivalent of two Q1 cabinets.

WARNING!

Q1 line arrays and ground stacks are assembled using three basic hardware components: Z5152 Q Front link, Z5151 Q Splay link and Z5153 Locking pin 8 mm.

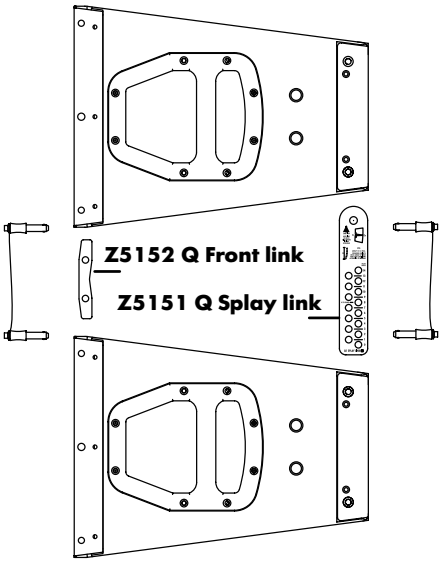


Z5159 Q Flying frame



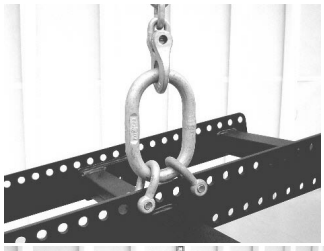
Q1/Q-SUB array with 40° vertical coverage

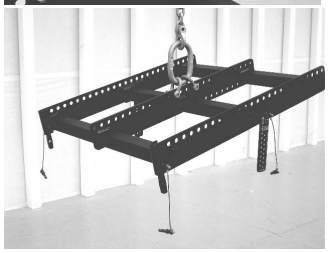
Z5153 Locking pins 8 mm (linked in pairs with steel wire

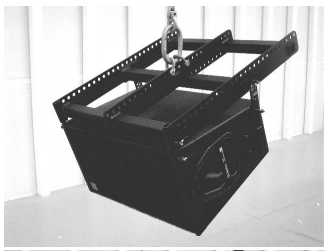


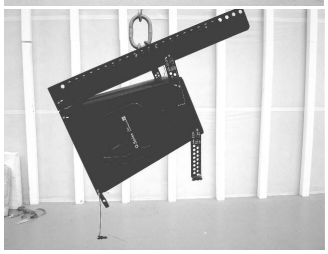
Q1 line array set up - brief instructions

In order to achieve optimum safety we recommend the following procedure when setting up Q1 line arrays.







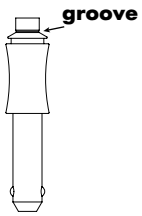








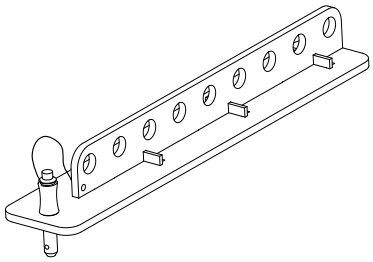
- Check the acoustical and mechanical set up with the Q-Calc Array calculator.
- Prepare flying cables and link cables according to the number of amplifier channels used.
- Connect the lifting motor(s) to the centre bar of the Z5159 Q Flying frame using two E6507 1t Shackles. We recommend the use of a Z5155 Q Hoist connector chain as its length of 52 cm (20.5") allows enough space for the hang of most 1t motor chain containers.
- When using a single motor, the chain should be connected to the appropriate hole in the top row of the centre bar to achieve the desired vertical aiming of the array. The distance from the front of the Z5159 Q Flying frame is calculated using the Q-Calc Array calculator. Should the desired position be in between two holes the Z5155 Q Hoist connector chain can also be connected to the frame using two E6507 1t Shackles.
- Connect the cable pick up to the bottom row of holes in the centre bar of the Z5159 Q Flying frame.
- Connect the Z5152 Q Front and Z5151 Q Splay links to Z5159 Q Flying frame using Z5153 Locking pins 8 mm. A groove in the bolt of the Z5153 Locking pins 8 mm indicates that it is properly locked. These pins are linked together in pairs with steel wire, so it is only necessary to lift the cabinet and attach it using the Z5153 Locking pins 8 mm and links that are already attached to the frame.

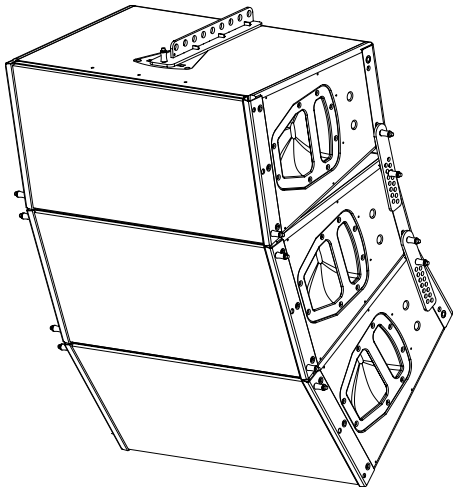


- With one person on each side of the cabinet, first connect the Z5152 Q Front link on both sides and then connect the two Z5151 Q Splay links using the hole marked with the desired splay angle at the rear of the cabinet to set the required vertical angle. The Splay links between the top cabinet and the flying frame always have to be set to the 8° position.
- The next cabinet should be added in the same manner; first attaching the Z5152 Q Front link and Z5151 Q Splay link to the bottom of the suspended column and then lifting the loudspeaker into place.
- Repeat this procedure until the column is complete.
- It is possible for one person to build columns using a chain hoist to pick up the cabinets. The procedure in this case is to attach the Z5152 Q Front link and Z5151 Q Splay links to Z5159 Q Flying frame. Place the Q1 loudspeaker face down and lower the Q Flying frame to allow the rear Z5151 Q Splay links to be attached to the cabinet. Having raised the loudspeaker using the hoist, the loudspeaker has to be manually rotated to attach the Z5152 Q Front link using the Z5153 Locking pins 8 mm.
- Do not forget to connect all the cables to the loudspeakers.
- Check the angle setting of the lowest cabinet and correct the aiming of the Z5159 Q Flying frame if necessary.

Q Flying adapter

Q1 arrays with a maximum of three cabinets can also be suspended using the Z5156 Q Flying adapter. It is connected to the quick lock adapter plate on the cabinet top panel and secured with the pin that is attached to it by a steel wire.



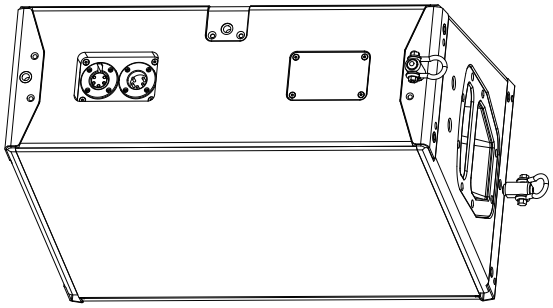


Q1 array with 40° vertical coverage

Flying Q1 cabinets with the Z5048 M2 Flying pin

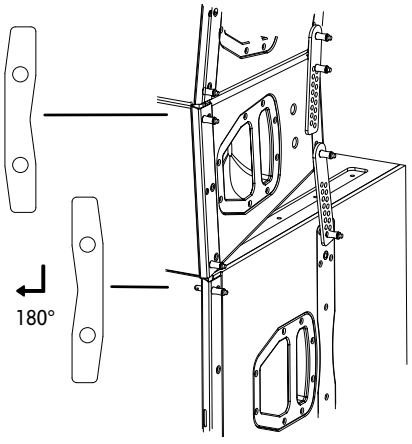
Q1 arrays with a maximum of three cabinets can also be suspended using a pair of Z5048 M2 Flying pins 10 mm. They can be inserted either on the left and right side of the front grill of the top cabinet of the array or on the rear panel of the cabinet depending on the vertical aiming of the array.

An additional flying pin socket in the centre of the rear panel can be used to connect a rope or steel wire for aiming the array.

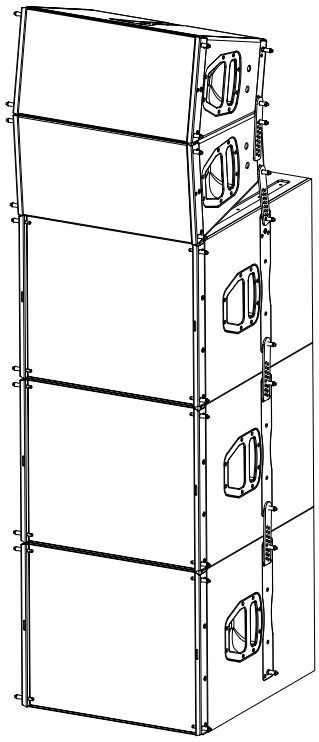


Stacking Q1 and Q-SUB cabinets

Q1 and Q-SUB cabinets can be stacked and interlinked using the standard Q rigging components as shown in the illustration opposite. The vertical angle between the Q1 and the Q-SUB cabinets can be set within the range of –6° (producing a downward tilt) and +7°.



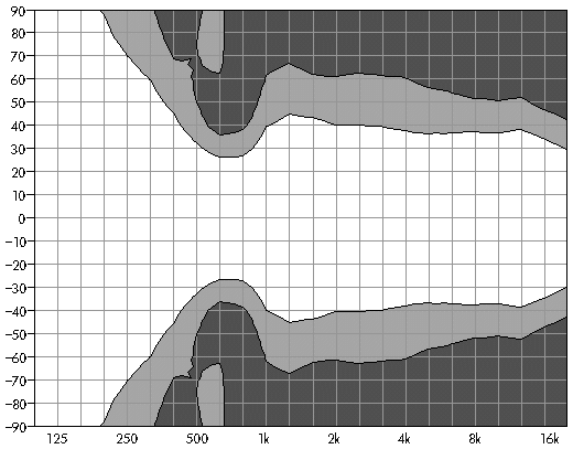
Orientation of Front links for downward tilt of Q1



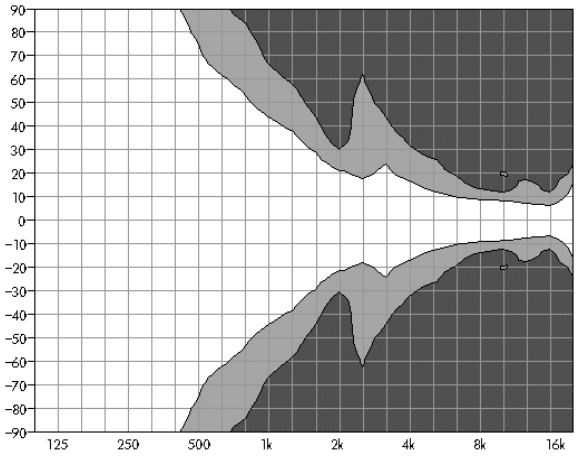
Q1 and Q-SUB stack

Dispersion characteristics

The graphs below show dispersion angle over frequency of a single Q1 cabinet plotted using lines of equal sound pressure (isobars) at −6 dB and −12 dB. The nominal horizontal dispersion of 75° is maintained above 400 Hz.



Isobar diagram Q1 horizontal



Isobar diagram Q1 vertical

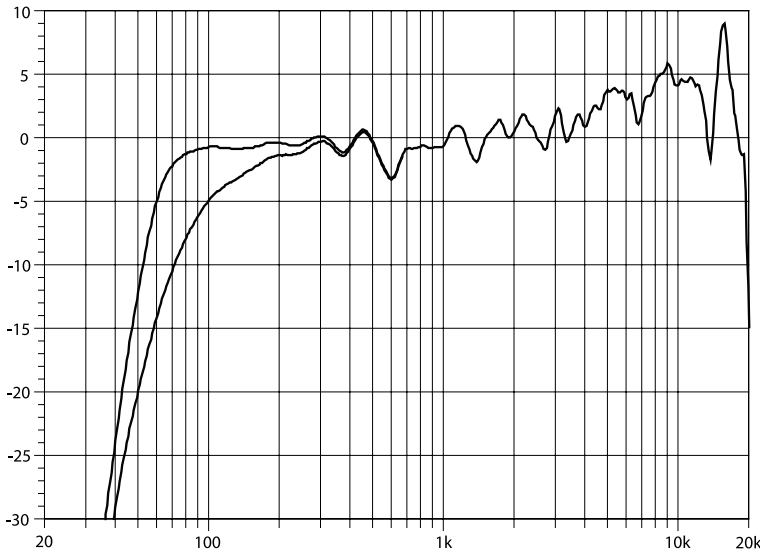
Technical specifications

Q1 system data

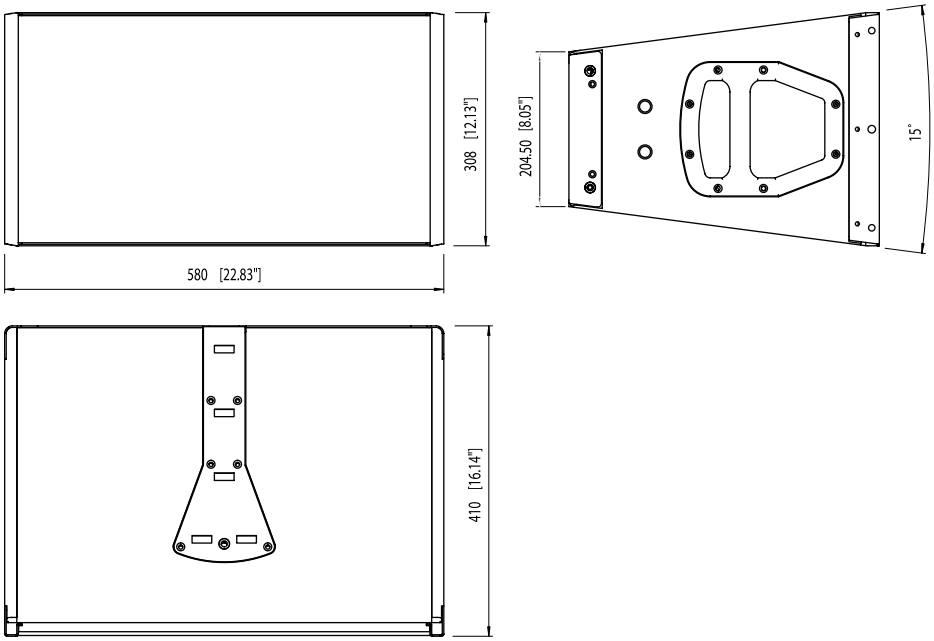
Frequency response (–5 dB standard) ..... 60 Hz ... 17 kHz
Frequency response (–5 dB CUT mode) ..... 100 Hz ... 17 kHz
Max. sound pressure (single cabinet, 1 m, free field) with D12 ..... 139 dB
Max. sound pressure (single cabinet, 1 m, free field) with E-PAC ..... 135 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Polarity to controller INPUT (XLR pin 2: +/3: –) ..... LF: +/HF: –

Q1 loudspeaker

Nominal impedance ..... 8 ohms
Power handling capacity (RMS / peak 10 ms) ..... 400/1600 W
Nominal dispersion angle (hor. x vert.) ..... 75° x 15°
Connections ..... 2 x EP5
..... (optional 2 x NL4)
Pin assignments EP5: 1/2
..... NL4: 1+/1–
Weight ..... 22 kg (49 lb)



Q1 frequency response, standard and CUT settings, single cabinet



Q1 cabinet dimensions in mm [inch]

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