BOSCH
Invented for life

# Vari-directional Array

- **Unmatched sound quality and speech intelligibility**
- **Fast solution for challenging environments**
- **Smart modular design, flush mountable**
- **Sophisticated beam configuration with EASE support**
- **Integrated ambient noise level sensor for AVC**
- **Suited for emergency sound systems**
- **Optional CobraNet networking**

Many large modern and classical buildings, like passenger terminals and cathedrals, use hard reflective materials for floors, walls and ceilings. Due to their size and absence of absorbing materials the reverberation time is long and the amount of indirect reverberant sound compared to direct sound is high. This is disastrous for good speech intelligibility. Still it is very important to hear and understand the spoken message, whether it is a gate change announcement on an airport, a prayer in a house of worship or an evacuation message in case of an emergency. Here the Bosch Vari-directional Array offers a really smart and easy solution.

## System Overview

The Bosch Vari-directional Array series is a comprehensive set of array loudspeakers to address people with clear intelligible messages in large reverberant spaces. These active units utilize integrated digital signal processing and high efficiency class-D amplifiers. Using a PC configuration program the array can be adapted to the venue where it is used and its sound output optimally aimed at the audience, creating a maximum direct to ambient sound ratio, for best intelligibility given the circumstances.

The modular concept allows for three different array lengths for small to large areas. Using separate array elements makes transport easy and upgrading to a longer array possible. An optional CobraNet module allows the array to be networked and to receive digital audio data via CobraNet and to monitor the operational status of the loudspeakers. Special built-in provisions make these arrays compliant to the world's emergency sound system standards. The units are suited for both background music and speech.

Although these loudspeaker arrays are very sophisticated and offer unrivalled sound in difficult acoustical environments, the advanced configuration software makes setup quick and easy.

## Functions

### Advanced beam steering

The Bosch Vari-directional Array provides a very good direct to reverberant sound ratio. Firstly, it radiates more direct sound to the audience and secondly, it induces less ceiling reflections. The increased direct sound is also due to a lower rate of decay of the sound level with distance compared to a traditional loudspeaker acting as a point source.

Instead of mechanically aiming the complete loudspeaker column to the listeners, the Bosch Vari-directional Array is capable of virtually aiming the loudspeaker array by electronic means. It drives the loudspeakers of the array individually with differently delayed signals, virtually moving the loudspeakers. Now the array can be positioned vertically against a wall or even recessed into the wall. This is esthetically more pleasing and as a bonus also reduces disturbing incoherent reflections from the wall. Furthermore, the Bosch Vari-directional Array uses very advanced beam steering techniques to achieve a beam shape that provides an equal level for all frequencies in the range of interest at all listening positions. Only then, listeners will get a balanced sound.

Another important factor is the loudness of the signal, which should be almost the same for all listening positions, avoiding hot spots. To create an even sound level in a large area, the shape of the beam should be optimized to the listening plane (ear level). Solving these challenges requires that for every audio frequency in the range of interest the level of each individual loudspeaker should be carefully controlled. The Bosch Vari-directional Array performs this combination of frequency response and delay tailoring in the digital domain using a DSP and subsequent multi-channel amplification. Then a very consistent SPL from front to rear can be attained in the listening plane, with a minimum of side lobes.

But the Bosch arrays excel in two additional ways. In the first place it is able to deal with non-flat audience planes, for instance theaters and auditoriums. Secondly, it does not solely try to maximize the direct output to the listening plane, but also to minimize the output to unwanted areas. Due to physical limitations of a loudspeaker array every practical array will have side lobes. The configuration of the Vari-directional Array uses an advanced optimization algorithm that allows for minimization of the most harmful side-lobes, to achieve the best possible coverage combined with a maximum direct to reverberant ratio.

**Easy installation and setup**

The Bosch Vari-directional Array makes installation and configuration fairly easy for the installer and sound engineer.

The majority of the applications can be described in a rather straightforward way, where the configuration can be selected from a database of pre-optimized setups. Selection is quick and interactively by entering some key parameters of the room, the position of the array and the listening plane. The configuration program then shows graphically the realized direct SPL coverage.

The Vari Configuration Set includes the configuration software and a USB to RS485 converter to connect a PC's USB port to one or more (networked) Vari units, even across longer distances. Using the optional CobraNet module it is even possible to configure and monitor multiple units across an Ethernet network.

**Modular approach**

One-key design factor for a line array is its length. To enable a long throw, the array should be long. If the audience is closer to the array, it can be shorter. Because the array is modular, arrays of three different lengths are possible: 1.20, 2.40 or 3.60 m. It consists of a base unit as a minimum and one or two extension units. Each unit is only 1.20 m in length for easy transport. The base unit contains the controller, the DSP, the power supply and 8 power amplifiers and loudspeakers. The extension unit contains 8 loudspeakers with supporting power amplifiers. All necessary interconnections between base and extension units are established automatically when the units are invisibly bolted together. Signal and power cables enter the base unit through a hole on the rear side of the unit to the internal tamper resistant connection compartment, which is only accessible during installation.

The Bosch Vari-directional Array, with its full steel cabinet and grill, powder coated silver gray, blends easily with contemporary and traditional interiors and exteriors. Since front-cooling is applied, even flush mounting is possible.

Swivel-wall mounting brackets come with the units as standard.

**CobraNet connectivity**

The Bosch Vari-directional Array offers the possibility to equip the base unit with a small CobraNet module that allows the array to be connected to an Ethernet network via a CAT-5 cable connection. This way the audio signal to the array is delivered in a digital format to the array with low latency and a high degree of routing flexibility. Furthermore the array can be configured via Ethernet, its operation can be supervised and logged.

Use of standard Ethernet wiring reduces costs. CobraNet technology allows for the co-existence of audio and data traffic over existing standard Ethernet infrastructure resulting in substantial savings in design and installation. CobraNet is a technology that is owned by Cirrus Logic and is used by many professional audio manufacturers as the technology of choice in digital audio networking.

**Emergency sound**

Emergency warning and information systems are very much a part of life these days. They are mandatory for most commercial buildings and public spaces and must comply with very specific standards, such as IEC60849, BS5839-8 and EN54-16. The system elements of the Bosch Vari-directional Array have been designed for compliancy to these standards, right from the start. Therefore the array cannot only be used for business announcements and background music, but also as part of an emergency sound system, e.g. in combination with the Bosch Praesideo system, one of the most sophisticated emergency sound systems available, with thousands of installations worldwide. For instance, the Vari-directional Array provides a pilot tone detection circuit at the input for surveillance of the audio connection, internal supervision of operation, connection for a 24 V (battery) backup power supply, a fault output relay and a fault log with network access.

The Bosch Vari-directional Array is a perfect loudspeaker system for making voice alarms in case of emergencies, when clear, intelligible and unambiguous announcements are needed most.

**Automatic Volume Control (AVC)**

In certain environments, such as sports stadiums and passenger terminals, the background noise level fluctuates constantly. This may seriously affect the intelligibility of spoken messages. The Bosch Vari-directional Array has a built-in noise level sensor that can be configured to control the gain of the amplifiers to constantly adjust the sound level. This automatic volume control (AVC) keeps the audio level comfortably above the background noise level for improved intelligibility without becoming unnecessarily loud.

**Sound-processing**

Large halls or platforms may need multiple arrays at different locations. The audio output of these arrays should be time-aligned to avoid echoes at the audience position. The Bosch Vari-directional Array provides a built-in high resolution delay adjustment.

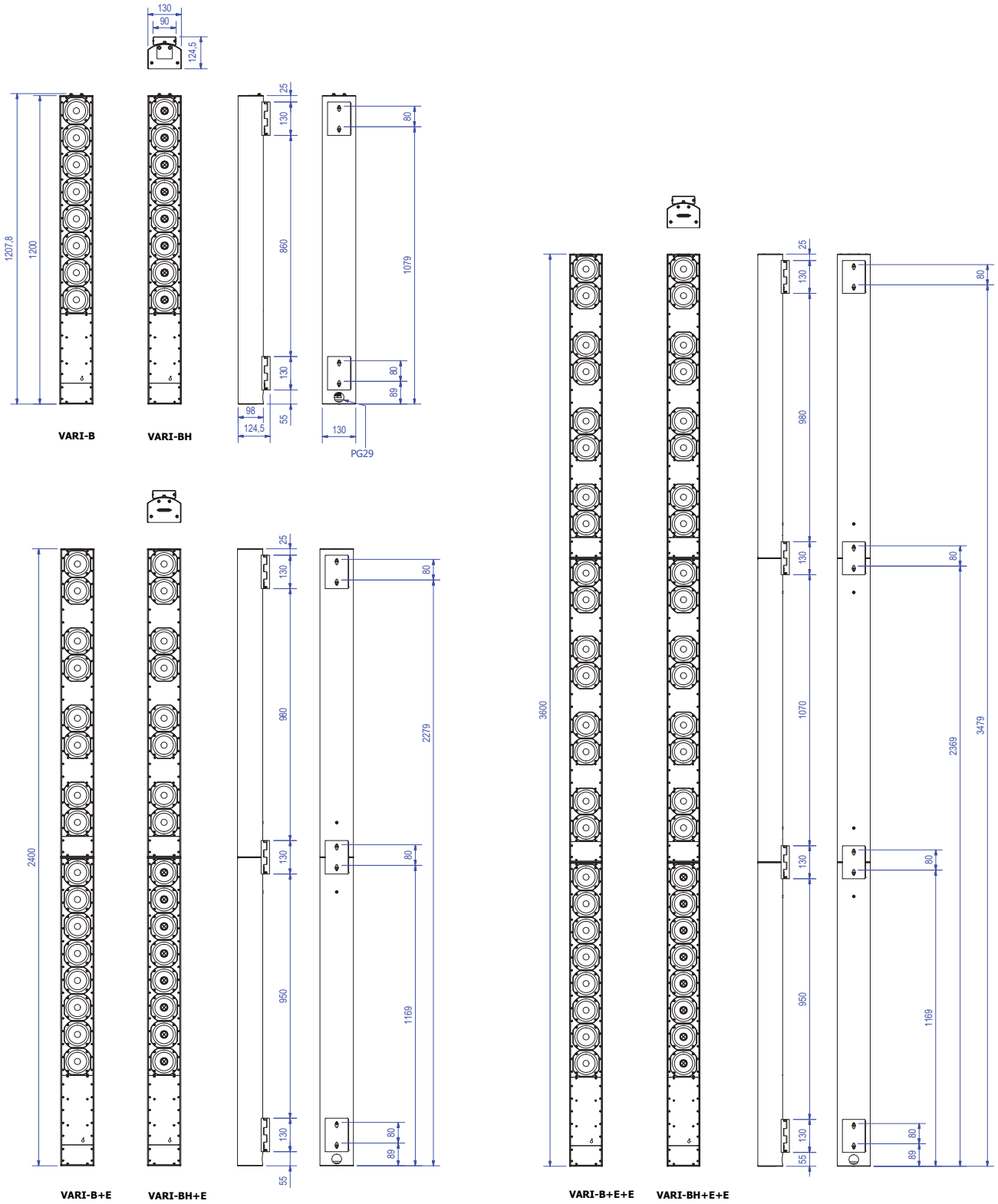
An 8-section parametric equalizer is present for adjustment of the array to the acoustical environment, e.g. to increase the margin before acoustic feedback occurs. Separate 4-section equalizers at the inputs enable separate frequency responses for e.g. background music and announcements.

## Certifications and Approvals

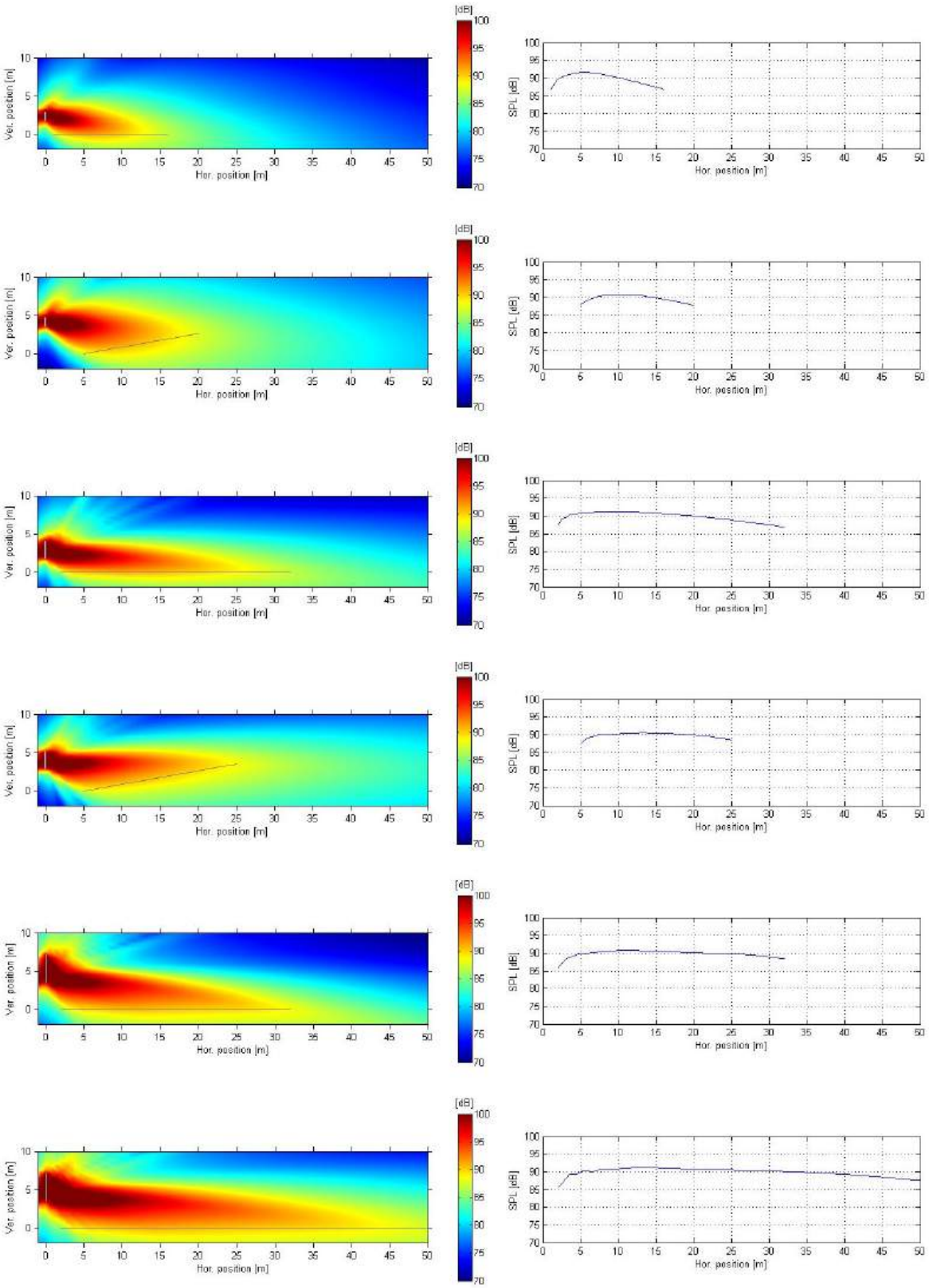
| Region | Certification | |
|---|---|---|
| Europe | CE | |
| Safety | | according to IEC 60065: 2001 + A1: 2005 |
| Immunity | | according to EN 55103-2: 2009<br>according to FCC-47 part 15B |
| Emissions | | according to EN 55103-1: 2009<br>according to EN 50130-4: 2006<br>according to EN 50121-4: 2006<br>according to EN 61000-3-2: 2006 + A1: 2009 + A2: 2009 |
| Wind-force | | according to NEN 6702: 2007 + A1: 2008, Bft 11 |
| Water and dust protection | | according to EN60529 IP54 |
| Approval | | CE |

## Installation/Configuration Notes

| Array moniker | Array composition | Elements used | | |
|---|---|---|---|---|
| | | LA3-VARI-B | LA3-VARI-BH | LA3-VARI-E |
| Vari-array-B1 | VARI-B | 1 | | |
| Vari-array-B2 | VARI-B+E | 1 | | 1 |
| Vari-array-B3 | VARI-B+E+E | 1 | | 2 |
| Vari-array-H1 | VARI-BH | | 1 | |
| Vari-array_H2 | VARI-BH+E | | 1 | 1 |
| Vari-array-H3 | VARI-BH+E+E | | 1 | 2 |




*Mechanical dimensions (mm)*




*Examples of vertical beam cross sections and SPL at ear level (2 x VARI-B, 2 x VARI-B+E, 2 x VARI-B+E+E)*

## Parts Included

| Quantity | Components |
|---|---|
| | **LA3-VARI-B** |
| 1 | Vari Base Unit |
| 2 | Wall bracket |
| 1 | Right angle IEC mains connector C13 |
| 1 | Cover plate |
| 1 | Connection set (Phoenix) |
| 1 | Grille removal tool |
| 1 | Installation Manual |
| | **LA3-VARI-BH** |
| 1 | Vari Base Unit HF |
| 2 | Wall bracket |
| 1 | Right angle IEC mains connector C13 |
| 1 | Cover plate |
| 1 | Connection set (Phoenix) |
| 1 | Grille removal tool |
| 1 | Installation Manual |

| Quantity | Components |
|---|---|
| | **LA3-VARI-E** |
| 1 | Vari Extension Unit |
| 1 | Wall bracket |
| 2 | Fixing bolts |
| | **LA3-VARI-CS** |
| 1 | CD (software and documentation) |
| 1 | USB to RS485 converter |
| 1 | USB cable |
| 1 | RS485 cable |
| | **LA3-VARI-CM** |
| 1 | CobraNet module |
| 2 | Fixing screws |
| 1 | CAT-5 cable |

## Technical Specifications

**Acoustical[1]**

| **Frequency range[2]** | |
|---|---|
| VARI-B | 130 Hz to 10 kHz (±3 dB) |
| VARI-BH | 130 Hz to 18 kHz (±3 dB) |

| **Max SPL[3]** | **Continuous / peak** |
|---|---|
| VARI-B | 90 / 93 dB SPL (A-weighed at 20 m) |
| VARI-B+E | 90 / 93 dB SPL (A-weighed at 32 m) |
| VARI-B+E+E | 88 / 91 dB SPL (A-weighed at 50 m) |
| VARI-BH | 89 / 92 dB SPL (A-weighed at 20 m) |
| VARI-BH+E | 89 / 92 dB SPL (A-weighed at 32 m) |
| VARI-BH+E+E | 87 / 90 dB SPL (A-weighed at 50 m) |
| **Coverage** | |
| Horizontal (fixed)[4] | 130° (-6 dB, avg. 1 to 4 kHz) |
| Vertical (adjustable)[5] | Software configurable |
| Maximum throw: | |
| VARI-B(H) | 20 m |
| VARI-B(H)+E | 32 m |
| VARI-B(H)+E+E | 50 m |
| **Dynamic range**[4] | >105 dB |
| **Transducers** | |
| VARI-B | 4” Full Range (8 x 1 driver) |
| VARI-BH | 4” Coaxial (8 x 1 driver) |
| VARI-E | 4” Full Range (4 x 2 drivers) |
| **Electrical** | |
| **Input Line (2x)** | |
| Input level nominal | 0 dBV rms |
| Input level maximum | +20 dBV peak |
| Type | Transformer balanced |
| Impedance (balanced) | 7.8 kohm at 1 kHz |
| **Input 100 V (2x)** | |
| Input level nominal | +40 dBV rms |
| Type | Transformer balanced (floating input) |
| Impedance (balanced) | 1 Mohm at 1 kHz |
| **Power Amplifiers** | |
| Power | |
| VARI-B(H) | 8 x 15 W (class-D full bridge) |
| VARI-E | 4 x 25 W (class-D full bridge) |
| Protection | Thermal shutdown |
| | Current limiting |
| **PSU** | |
| Mains voltage | 100 to 120 V / 200 to 240 V (auto switching) |
| Power consumption | @ Mains / 24 Vdc |
| Power save | |
| VARI-B(H) | 13 / 4.5 W |
| VARI-B(H)+E | 17 / 7 W |
| VARI-B(H)+E+E | 19 / 9 W |
| Idle | |

| PSU | |
|---|---|
| VARI-B(H) | 18 / 8.5 W |
| VARI-B(H)+E | 23 / 13 W |
| VARI-B(H)+E+E | 28 / 17 W |
| Max. (Noise, CF 6 dB) | |
| VARI-B(H) | 60 / 36 W |
| VARI-B(H)+E | 97 / 75 W |
| VARI-B(H)+E+E | 124 / 100 W |
| Power factor | According to EN61000-3-2, class A |
| Mains inrush current | <70 A (at 230 V) |
| Protection | Thermal shutdown |
| | Current limiting |
| | Under voltage lock-out |

| Signal processing[5] | |
|---|---|
| DSP | 32-bit floating point, 900 Mflops |
| ADC / DAC | 24-bits S-D, 128 x oversampling |
| Sample rate | 48 kHz |
| Functions | Pre-delay (max. 21 s) |
| | Input-delay (max. 2 x 10 s / 4 x 5 s) |
| | Equalizer and compensation filtering |
| | Compressor |
| | Volume |
| | AVC |

| Control | |
|---|---|
| Network interface | RS-485 full duplex, auto-switching 115k2, 57k6, 38k4, 19k2 baud, optically isolated |
| Max. number of units[6] | 126 |
| Surveillance | General status |
| | Amplifier and load monitoring |
| | External pilot-tone detection (20 kHz to 30 kHz, min. level -22 dBV) |
| | Built-in ambient noise sensing microphone |
| | Thermal overload protection |
| Failure relay | Maskable conditions |
| Contact 1 | No failure = closed / Failure = open |
| Rating | Max. 24 V, 100 mA |
| Contact 2 | No failure = 10 k ohm / Failure = 20 k ohm |
| Control voltage input | 5 to 24 Vdc, optically isolated |

| CobraNet | |
|---|---|
| Interface | RJ-45, Ethernet 100 Mbps |
| Word length | 16-/20-/24-bit (set by transmitter) |
| Sample rate | 48 kHz |
| Additional latency | 1.33/2.67/5.33 ms (set by transmitter) |

| Mechanical | |
|---|---|
| Dimensions (H x W x D) | |
| VARI-B(H) | 1200 x 130 x 98 mm (47.2 x 5.1 x 3.8 in) |
| VARI-B(H)+E | 2400 x 130 x 98 mm (94.5 x 5.1 x 3.8 in) |
| VARI-B(H)+E+E | 3600 x 130 x 98 mm (141.7 x 5.1 x 3.8 in) |
| Bracket | 27 mm (1.1 in) additional depth, flat mounted |
| VARI-CM | 100 x 50 x 23 mm (3.9 x 2.0 x 0.9 in) |
| Weight | |
| VARI-B(H) | 13.0 kg (28.7 lbs) |
| VARI-B(H)+E | 24.7 kg (54.5 lbs) |
| VARI-B(H)+E+E | 36.4 kg (80.3 lbs) |
| Color | |
| Enclosure | RAL9007 (gray aluminum) |
| Grill | RAL9006 (white aluminum) |

| Environmental | |
|---|---|
| Operating temperature | -25 °C to 55 °C (-13 °F to 131 °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. Measured on-axis. The frequency response of the complete array is depending on the actual signal processing parameters and air absorption (at larger distances). A typical bandwidth is specified for the complete array under 'full-space' radiation conditions.
3. Levels are valid for pink noise (100 Hz to 20 kHz bandwidth) with a crest factor of 3 dB, default EQ and minimum opening angle setting. 'Continuous' is the RMS level, 'Peak' is the absolute peak level, both determined at the onset of the output limiter. SPL values will vary depending upon opening angle.
4. For this measurement the signals at all power amplifier outputs are summed together. Measured as the A-weighed difference (in dB) between the maximum rms level (with pink noise input signal) and the noise output (with no input signal present).
5. Additional processing capabilities available.
6. Maximum number that can be connected to one RS-485 subnet, multiple subnets can be controlled by one host PC.

## Ordering Information

| | |
|---|---|
| **LA3-VARI-B Vari Base Unit**<br>Active Vari-directional Array loudspeaker | **LA3-VARI-B** |
| **LA3-VARI-BH Vari Base Unit HF**<br>Active Vari-directional Array loudspeaker with coaxial drivers for improved high frequency response. | **LA3-VARI-BH** |
| **LA3-VARI-E Vari Extension Unit**<br>Active Vari-directional Array Extension, to be used with a base unit to increase the coverage distance. Up to two extension units can be used with a base unit. | **LA3-VARI-E** |
| **Accessories** | |
| **LA3-VARI-CM Vari CobraNet Module**<br>CobraNet module for connection of the Vari-directional Array to a CobraNet network. The module must be mounted inside the base unit. | **LA3-VARI-CM** |
| **LA3-VARI-CS Vari Configuration set**<br>Configuration software for the Vari-directional Array, with USB to RS485 converter for connection to the PC USB port. | **LA3-VARI-CS** |

**Americas:**
Bosch Communications Systems
12000 Portland Avenue South
Burnsville, Minnesota 55337, USA
Phone: +1-800-392-3497
Fax: +1-800-955-6831
audiosupport@us.bosch.com
www.boschsecurity.com

**Europe, Middle East, Africa:**
Bosch Security Systems B.V.
P.O. Box 80002
5600 JB Eindhoven, The Netherlands
Phone: + 31 40 2577 284
Fax: +31 40 2577 330
emea.securitysystems@bosch.com
www.boschsecurity.com

**Asia-Pacific:**
Robert Bosch (SEA) Pte Ltd
11 Bishan Street 21
Singapore 573943
Phone: +65 6571 2600
Fax: +65 6571 2698
apr.securitysystems@bosch.com
www.boschsecurity.asia

**Represented by**

© Bosch Security Systems Inc. 011 | Data subject to change without notice
T6942252555 | Cur: en-US, V5, 30 Mar 2011