thinking sound

Meyer Sound®

# CAL

COLUMN ARRAY
LOUDSPEAKER


CALIFOR
GAMEDA
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# CAL

## COLUMN ARRAY LOUDSPEAKER

ADVANCED PRECISION BEAM STEERING TECHNOLOGY SUPPORTED BY DECADES OF RESEARCH AND INNOVATION

Meyer Sound has earned an enviable reputation for developing unique, science-based solutions to some of the most difficult problems confronting audio professionals.

The CAL self-powered steerable column array loudspeakers continue this endeavor by offering higher power, more extended high-frequency beam steering and beam splitting capabilities, and more uniform broad-bandwidth beam formation than any other column system. CAL marks a quantum advancement in achieving coverage control with an unprecedented level of accuracy both in its sonic quality and directionality.

Designed primarily for vocal reproduction in fixed installations, CAL loudspeakers produce a vertical beam of programmable width (as narrow as five degrees and up to 30 degrees), and then digitally steer the beam's pattern up to 30 degrees up or down. CAL's beam steering takes the practice of directing sound to a whole new level, and with a low profile and discreet aesthetics CAL redefines high-quality installation sound solutions.

## FEATURES & BENEFITS

USER-VARIABLE VERTICAL COVERAGE

CUSTOM-BUILT DRIVERS
all drivers and tweeters designed and optimized for beam steering

CONTROL
every driver and tweeter has dedicated amplifier channel and processing

TECHNOLOGY ADVANTAGE
the best algorithms utilized based on years of research into sound field synthesis

BLENDS INTO ANY ENVIRONMENT
low profile, discreet aesthetics, custom colors and weather protection

## APPLICATIONS

AIRPORTS

CONVENTION CENTERS

PLACES OF WORSHIP

STADIUMS

SHOPPING MALLS

RETAIL SPACES

REVERBERANT SPACES
that require low-profile sound reinforcement for voice reproduction

## INCREASED FLEXIBILITY AND PRECISION

CAL comes in three models, each providing a different maximum output level—up to a maximum peak SPL of 106 at 90 meters with the CAL 96—over an operating frequency range of 100 Hz to 16 kHz. Providing horizontal coverage of 120 degrees and the flexibility of digital beam steering for the vertical coverage, a single, unobtrusive CAL loudspeaker can provide clear vocal reproduction over a large area while minimizing undesirable reflections.

CAL achieves this by powering each driver with a separate Class D amplifier channel, and by controlling the signals sent to them using highly sophisticated algorithms. Controlling each element individually yields greater flexibility and precision than other beam steering systems that control modules consisting of several drivers.

In addition, the CAL 64 and CAL 96 offer beam splitting, with upper and lower beams individually adjustable for both vertical coverage and off-axis angle.

The amplitude and phase response of each driver are engineered to produce interactions with the other drivers that result in the desired vertical coverage pattern. While this involves a large number of sophisticated mathematical computations, Meyer Sound makes it easy to configure CAL loudspeakers with the Compass control software that communicates with each unit via Ethernet. Compass also includes RMS for real-time monitoring of each loudspeaker on the network.

Flexible mounting options allow users to mount CAL loudspeakers against walls or columns, and custom colors ensure they will blend into any background. Weather protection is standard and permits outdoor installations, making it easy to integrate CAL loudspeakers into any environment.

*The close spacing of independently controlled drivers combined with proprietary signal processing enables accurate beam forming.*

## BEAM STEERING: SCIENTIFIC RESEARCH AND QUALITY GUARANTEES RESULTS

CAL column array loudspeakers exemplify Meyer Sound's tradition of building real-world solutions based on scientific research. Following early collaborative experiments in sound field synthesis with the University of California Berkeley's Center for New Music and Audio Technologies (CNMAT), the Meyer Sound engineering team developed the proprietary design techniques that resulted in a product with digital beam steering so precise, it's unprecedented.

*Prototype icosahedron incorporates 120 1.25-inch drivers developed by Meyer Sound.*

Greater precision requires greater processing power and lower-level control. This is why CAL powers and controls every driver individually, and each CAL loudspeaker houses advanced processors that use the best algorithms to run intensive mathematical models in real time.

While precision and power are critical, so too is quality. This is why the drivers and tweeters used in CAL were specifically designed by Meyer Sound's engineers to be used for sound field synthesis applications and are optimized for beam steering capabilities. It's also why we continue to insist on manufacturing these components at Meyer Sound headquarters in Berkeley, California according to our strict quality-control processes.

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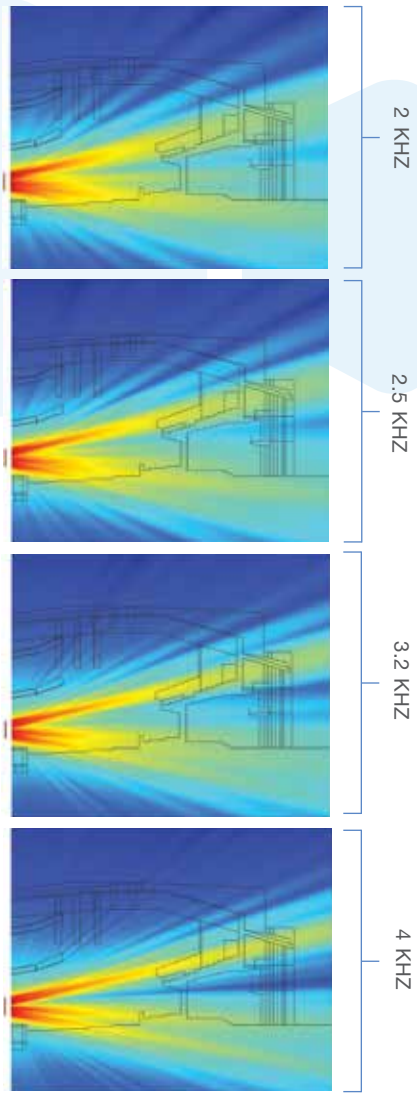
## ACCURATE SOLUTIONS FOR EVERYDAY PROBLEMS

The accuracy of CAL's steering enables system designers to provide directed coverage even when mounting options in a venue do not allow physically aiming the loudspeaker to the desired coverage area. Multiple or split beams can be used as needed. For example, a split beam can be used to avoid sound hitting a reflective balcony surface.

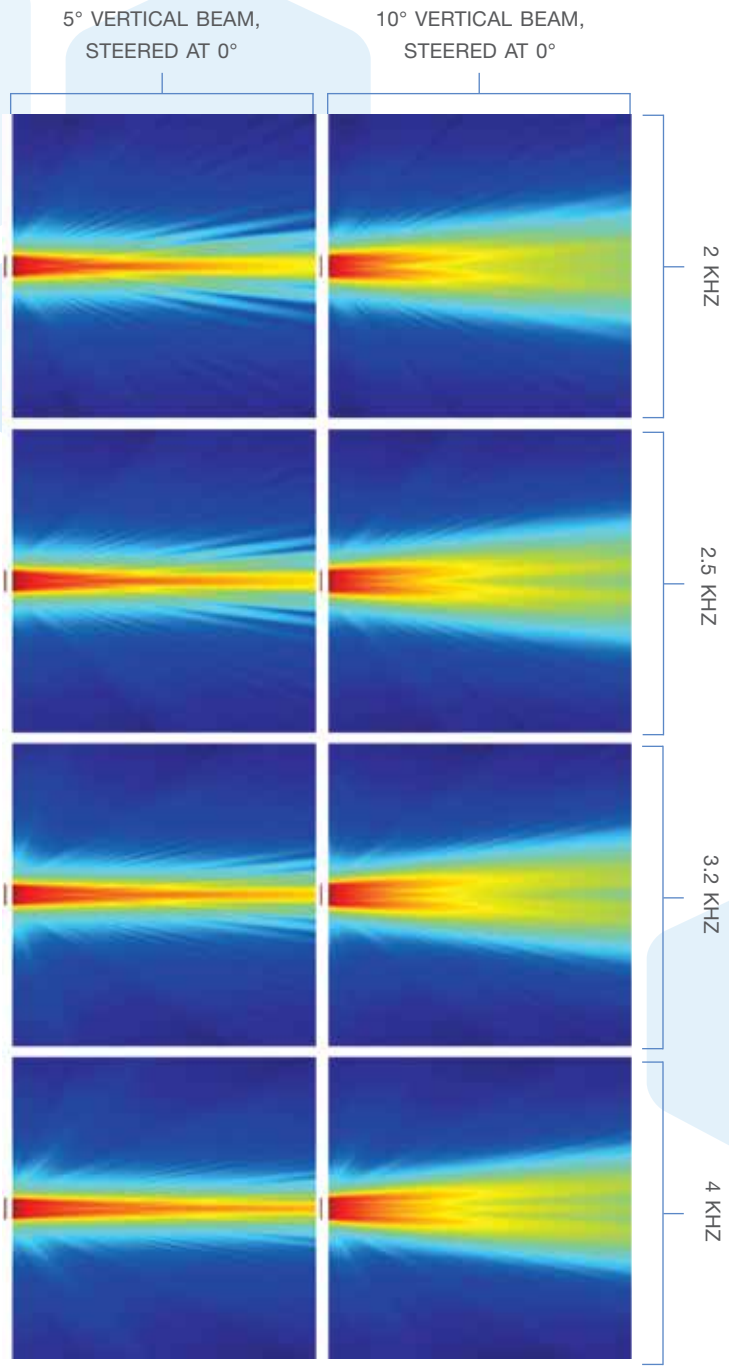
Because CAL is oriented toward vocal reproduction, very high intelligibility was a requirement. Reducing reverberation through pattern control is of little consequence if audiences still can't understand what's being said. Studies have shown that phase coherence at frequencies as high as 10 kHz is important to intelligibility, in contrast to the long-held belief that bandwidth up to 4 kHz was sufficient. CAL has been engineered to maintain accurate beam steering up to 10 kHz to ensure greater intelligibility in critical speech applications.

CAL is also uniquely capable of controlling high-frequency grating lobes (areas of undesired acoustic energy produced outside of the intended coverage beam), which are created by a spatial aliasing effect when drivers are more than a half wavelength apart. CAL is the only column loudspeaker that incorporates both extremely tight HF driver spacing (about 3/4") plus discrete amplification and processing for each driver. The result is virtual elimination of grating lobes below 10 kHz along with precise beam formation and uniform coverage.

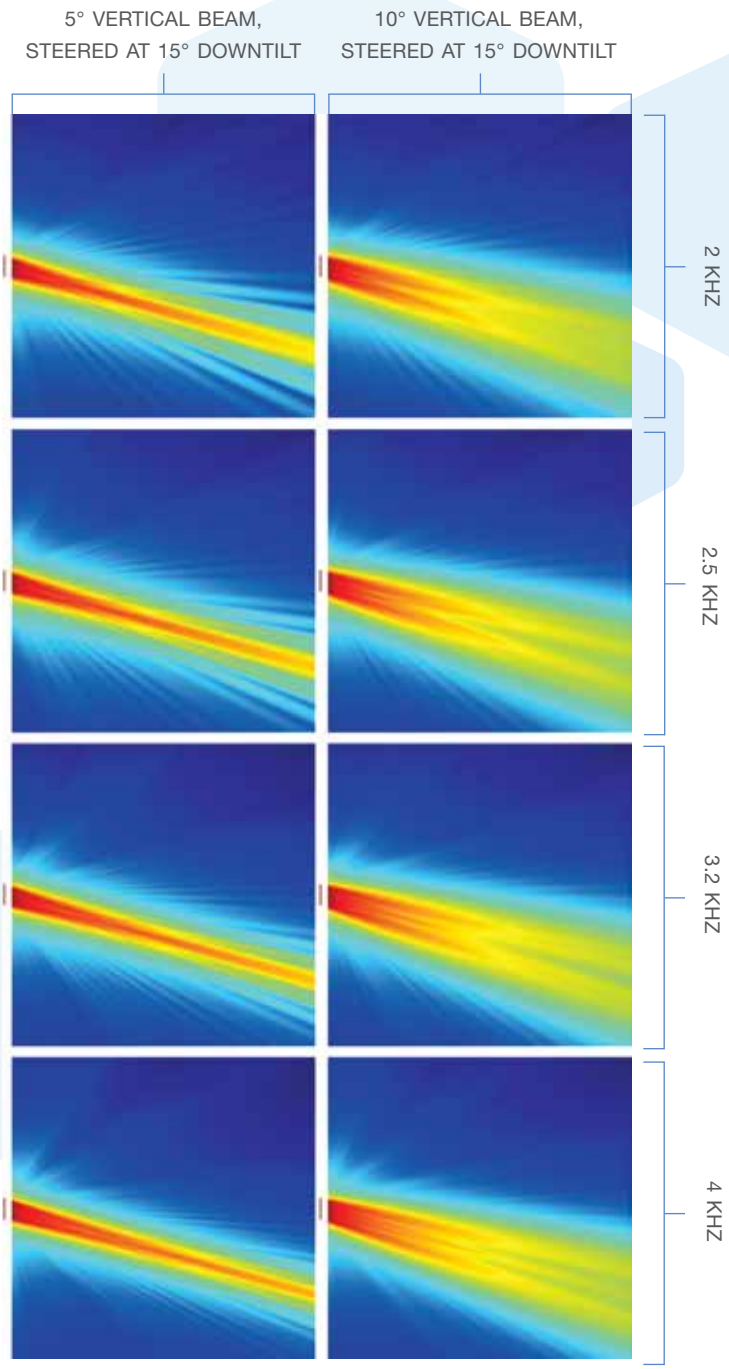



*These predictions show a CAL 96 with a split-beam configuration to avoid placing energy on the balcony face while still covering all seats. The top portion of the beam is steered at a 17° uptilt, and the lower beam is steered at a 9° downtilt, to cover the main floor-level seating area.*

## PREDICTIONS FOR CAL 96

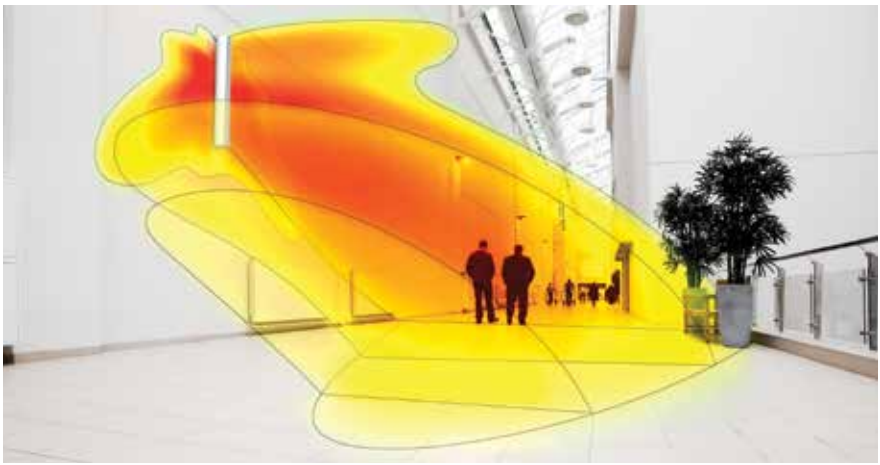


## PREDICTIONS FOR CAL 96



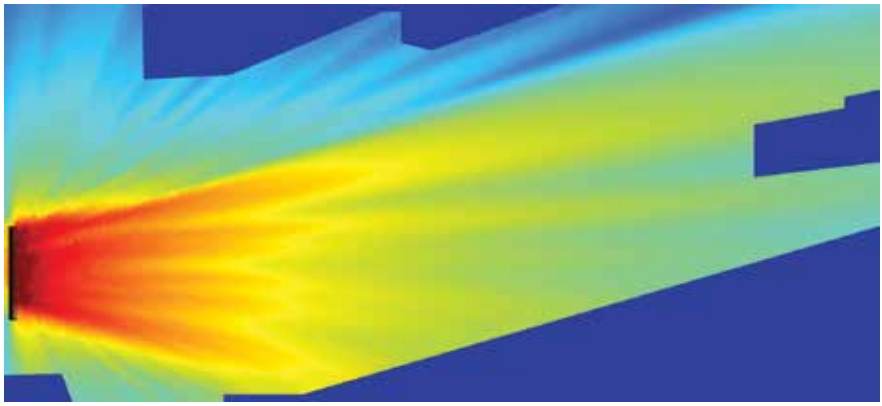

*All predictions are shown in the recommended half-space configuration.*

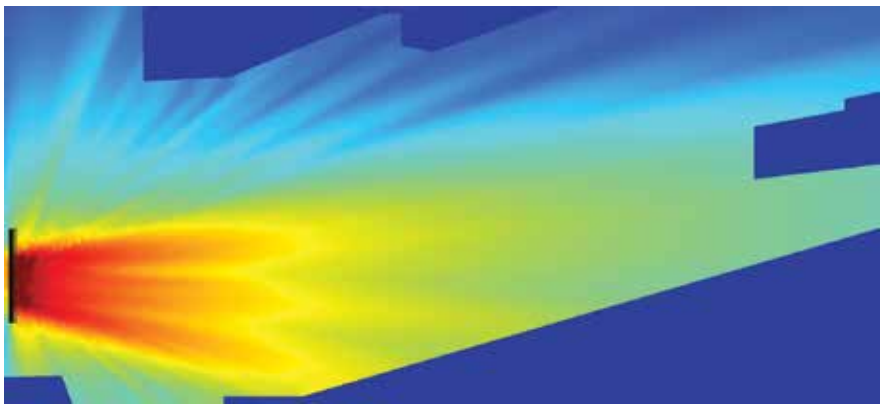
## REAL-WORLD USES FOR ADVANCED CAL TECHNOLOGY



*CAL's adjustable beam height and steering allow flexible installation options without compromising speech intelligibility. Cabinets may be placed higher up, as normally preferred for aesthetics, security, and free pedestrian transit. At the same time, the sound can be precisely steered to target pedestrian level while avoiding hard surfaces, thus minimizing destructive reflections.*


*To maintain the design motif of U.C. Berkeley's Memorial Stadium (modeled after Rome's Coliseum), the 38 CAL 96 loudspeakers here are installed on poles. With precise beam steering, coverage is aimed into the seating to attain maximum throw distance and crisp intelligibility. Potential problems with bleed into adjacent residential neighborhoods are eliminated.*





*Using extraordinary processing power and the industry's most advanced steering algorithms, CAL systems afford extraordinary flexibility in adapting to both architectural requirements and multiple use applications.*

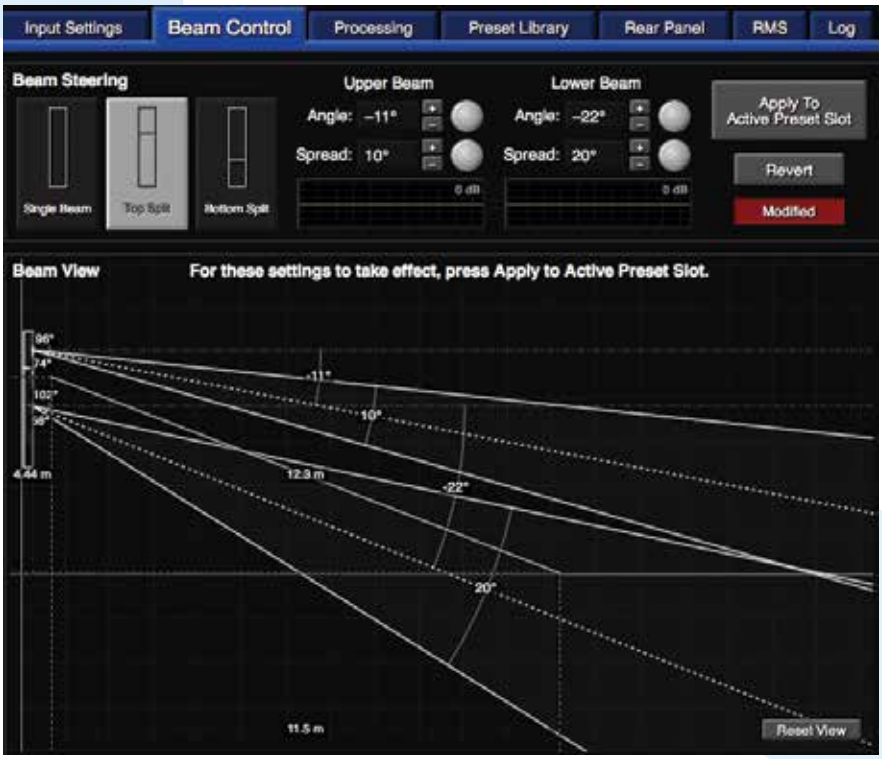
*The plots above show the coverage in Hong Kong University's auditorium. The CAL 96 systems are programmed with one preset that covers both the main floor and the balcony with uniform, highly intelligible sound. The beam splitting capability enables CAL to project sound cleanly to the back of the balcony while minimizing reflections back to the stage from the balcony front.*

*Using another preset, the same system can be optimized for smaller events when the balcony is not in use. Sound is uniform throughout the lower level, with an upper beam precisely tailored to cover underneath the balcony without exciting the balcony front.*

## COMPASS CONTROL SOFTWARE

Compass control software provides comprehensive control of CAL through a graphical user interface. The software enables easy access to all CAL features and even provides control of multiple units. Compass runs on a Mac or Windows®-based computer.

With Compass, you can set the active input and override input; configure vertical beam coverage, beam steering, and beam splits; assign processing to beams, including gain, delay, and parametric EQ; edit, store, recall, and organize CAL presets; test logic I/O, including input mute, input override, fault, contact, and preset selection; and monitor loudspeaker system status and performance data from the RMS tab.




*The Beam Control tab displays CAL's vertical beam coverage (spread) and vertical steering, both of which can be altered by entering angle values or by dragging in the beam view area. Split beams can also be configured on the Beam Control tab (CAL 64 and CAL 96 only).*

## CAL AND AVB

AVB is an extension of IEEE 802.1 Ethernet, the international open standard for networking. Designed to support real-time media networking, AVB delivers both control and high-resolution digital audio data with guaranteed Quality of Service over minimal cabling. CAL's AVB-capable Ethernet port provides optimal communications for it in AVB-capable systems such as Meyer Sound's D-Mitri.

## WHY AVB?

- Built on industry-standard IEEE 802.1 Ethernet
- Designed explicitly to satisfy the demands of real-time streaming media with guaranteed quality-of-service (QoS)
- Guaranteed low-latency
- Carries low-jitter master clock for reliable clocking and synchronization
- Supported by AVnu Alliance™, an organization of major technology manufacturers from the professional AV, automotive, and consumer electronics industries, including Meyer Sound

*CAL loudspeakers include one Ethernet port for control via Compass and one AVB-capable Ethernet port for audio signal routing as well as Compass control.*

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## SPECIFICATIONS

### AUDIO

Operating Frequency Range:
100 Hz – 16 kHz

### COVERAGE

Horizontal Coverage: 120°

Vertical Coverage: 5° to 30°
in 5° increments*

Vertical Steering: ±30°
in 1° increments

A baffled configuration (placed against a wall or column) is recommended for best results

*Peak SPL will change according to beam width

### DRIVERS

HF: 20 mm tweeters

LF: 4-inch cone drivers

### AMPLIFICATION

Multichannel Class D amplifiers, one channel per driver

### AUDIO CONTROL FUNCTIONS

Overall Output Mute and independent Mute per beam in split-beam configurations

Overall Output Gain and independent Gain per beam in split-beam configurations

5 bands of parametric equalization per beam in single- or split-beam configurations

Delay (up to 500 ms)

Four onboard presets

Polarity reverse

### AUDIO INPUT/OUTPUT

3 Analog Phoenix

AES/EBU

One Ethernet port for control via Compass software

One AVB-capable Ethernet port for integrated audio signal routing and Compass control

Mute and Emergency Override

### LOUDSPEAKER CONTROL

Compass software

RMS remote monitoring

Contact closure inputs for recalling presets, input override and mute

### ENCLOSURE

Extruded aluminum

Custom colors are specified at time of order

**CAL 96**

Dimensions: 121.12"H x 7.75"W x 9.93"D
(mm: 3076H x 197W x 252D)
Weight: 173 lbs (78.5 kg)
Drivers: (24) 4"drivers, (72) Tweeters
Max Peak SPL @ 90m: 106 dB peak

**CAL 64**

Dimensions: 87.72"H x 7.75"W x 9.93"D
(mm: 2228H x 197W x 252D)
Weight: 124 lbs (56.2 kg)
Drivers: (16) 4"drivers, (48) Tweeters
Max Peak SPL @ 60m: 106 dB peak

**CAL 32**

Dimensions: 54.32"H x 7.75"W x 9.93"D
(mm: 1380H x 197W x 252D)
Weight: 80 lbs (36.3 kg)
Drivers: (8) 4"drivers, (24) Tweeters
Max Peak SPL @ 30m: 106 dB peak

Meyer Sound

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