DATASHEET

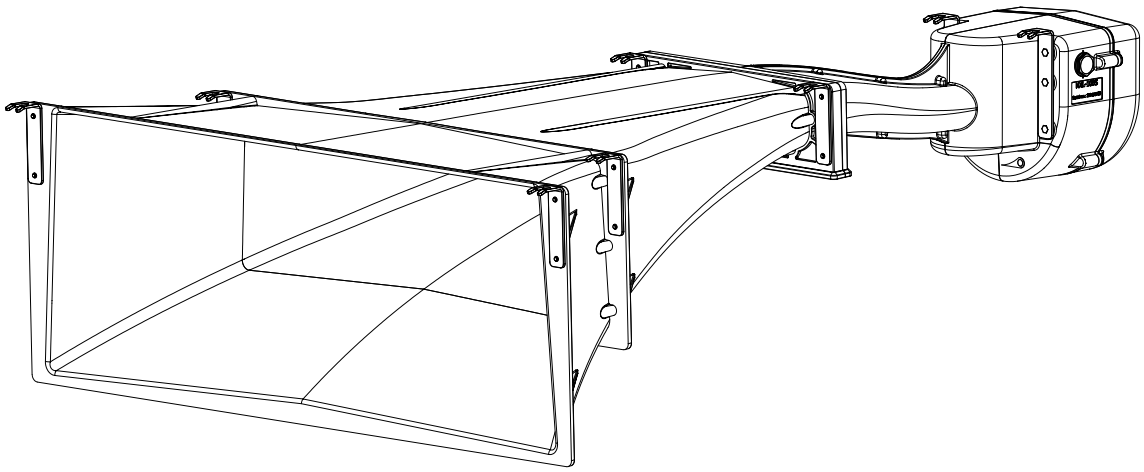
Product	NXL-100S	**Part numbers**	0200201, 0200203 and 0200205
Document version	1.3	**Document status**	Release
Notes	Full Height product variant 0200201 = Standard with cable gland on left side (front view) 0200203 = Optional Hirschmann CA 3 GD on left side (front view) 0200205 = Optional Hirschmann CA 3 GD on right side (front view)		

PRODUCT DESCRIPTION

The NXL-100S is a high-power 100 V horn loudspeaker with exceptional features.
Its high SPL capability, excellent directivity properties, reliable design and low-profile mounting make it a perfect fit for cost-effective applications in Voice Evacuation systems implemented in Traffic Tunnels.

The NXL-100S incorporates unprecedented protection features that are based on integrated novel real-time diaphragm excursion monitoring and voice coil temperature measurement circuitry. The related smart internal electronics is self-powered from the 100 V audio input and is only activated for higher input levels. Of course the NXL-100S also offers the more common features such as High Pass Filter, ceramic terminal block, tap selection, internal thermal and self-resettable overcurrent fuses.
A mechanical provision to ensure safety in case of exposure to extreme heat is included as well. Enhanced serviceability is provided by the internal subframe and replaceable ingress protection cartridge.

The NXL-100S is easy to install due to its moderate weight and dimensions, convenient rear cover retention strap and mounting brackets design. The device complies with the highest flammability rating (IEC 60695-11-20/UL 94 class 5VB, that outperforms class V0), offers the required ingress protection (IP 66) and is insensitive to the rough environmental conditions typically encountered in Traffic Tunnels.



FEATURES

Optimized Waveguide	The BEM-optimized asymmetrical waveguide is based on a novel approach. The waveguide is optimized for tight positioning on a reflective boundary plane while avoiding a neck shaped transition with sharp bends. Flare discontinuities are minimized resulting in a reduction of higher order modes and consequently a better controlled wavefront and improved directivity with negligible off-axis lobing. This design yields low structural losses and excellent directivity properties; a high and nearly constant Directivity Index for frequencies above ~ 800 Hz, reduced mouth diffraction, less vertical HF interference effects and a smooth off-axis behavior. This allows for a larger distance (> 50 m, depending on acoustical conditions) between devices in a typical delay-aligned set-up.
Sturdy Compression Driver	The NXL-100S is built around a custom developed high-power compression driver with 4” CCAR voice coil, featuring high reliability and high excursion capability yet good HF response. A special surround and lead wires design significantly reduces the chance of mechanical fatigue-related failures. A reliable electrical connection with the protection circuit board is ensured by the application of screw terminals instead of spring-loaded binding posts.
Smart Electronics	Smart microcontroller-based electronics handles the internal protection and status monitoring. The electronics module is self-powered from the 100 V audio input and is only activated in case of sufficient input level. Linearity and very low power consumption are guaranteed by the multi-regulator and multi-buffer design of the internal power supplies. Extremely short boot time ensures a fast response to thermal and mechanical overload conditions.
Diaphragm Excursion Monitoring	A custom developed integrated sensor accurately measures the compression driver’s diaphragm displacement in real-time. This novel approach does not derive the displacement from measured voice coil current/voltage and consequently does not depend on a priori knowledge concerning driver parameters and acoustical loading. The measuring method is robust, contactless and insensitive to environmental conditions.

Voice Coil Temperature Monitoring	The temperature of the voice coil is monitored in real-time during operation to ensure safe thermal operating conditions under all circumstances.
Extensive Protection	Diaphragm over-excursion is prevented by an internal filter that is controlled by the measured excursion. Thermal overload is prevented by momentarily reducing the secondary voltage based on the measured voice coil temperature. Both mechanisms effectively protect against damage due to incorrect system configuration. Protection will typically not be activated during normal operation of a properly dimensioned and configured system. The smart protection scheme is complemented by a thermal fuse, as well as a self-resettable fuse that effectively protects against abuse.
Protection Status	A high-efficiency RGB LED provides a visual indication of the smart protection status during system commissioning. The protection status can also be monitored remotely by means of external load monitoring.
Load / EOL Monitoring	The NXL-100S supports standard external load monitoring schemes (HF pilot tone based). BOSCH PRAESENSA PRA-EOL end-of-line compatible functionality is included and can be enabled during installation by means of an internal jumper.
Low Profile	Tight boundary plane mounting in conjunction with a limited device height ensures a maximum free space in Traffic Tunnel applications. The Reduced Height variant (NXL-100S-RH) offers a solution for projects with very limited free space.
High Flammability Rating	The enclosure material complies with the highest flammability rating, IEC 60695-11-20 / UL 94 class 5VB as required by EN 54-24. The NXL-100S outperforms products that are only class V0 compliant.

Replaceable Ingress Protection	A cartridge, using a stainless steel mesh with hydrophobic and dust repellent coating, offers good ingress protection and effective ferromagnetic dust collection. The mesh has a low acoustical insertion loss and is easy to clean or replace during maintenance.
Taps & Connections	100 W or 50 W tap is selectable by means of an internal wire jumper that can be set as required during installation. The 100 V feed is terminated into a screw terminal block with engineering ceramic body and nickel-plated brass inserts.
Subframe	The compression driver, step-down transformer and electronics are mounted on an internal AISI 316 stainless steel subframe. This solution enhances serviceability as the complete assembly can be easily exchanged after removal of the rear cover. The subframe also increases the thermal handling capacity of the compression driver. Furthermore, the subframe is mechanically secured to the boundary plane (ceiling) when the device is mounted using the supplied AISI 316 stainless steel brackets. This increases safety in case of exposure to extreme heat.
Environmental Protection	The rear enclosure is IP 66 compliant. An effective venting provision, that equalizes internal pressure and minimizes condensation, reduces stress on the rear cover seal. This enhances the long-term sealing ability. All external metal parts are stainless steel AISI 316, external fasteners are stainless steel A4. Compression driver steel parts are protected against oxidation by cataphoresis treatment.
Modularity	The modular enclosure significantly reduces shipping costs when assembled on site. All joints between enclosure modules are reliably sealed with durable gaskets that provide a low long-term compression set.
Ease of installation	Low weight, modest dimensions and slotted mounting brackets allow for one-person mounting.
Design	Industrial product with great looks, professional injection molded enclosure.

TECHNICAL SPECIFICATIONS

ACOUSTICAL[1]

Frequency Range[2]		300 Hz to 12 kHz (+3 / -10 dB)
Sensitivity (1 W / 4 m)[3, 4, 5]	Half-space	107 dB_{SPL}
	Full-space	101 dB_{SPL}
Maximum SPL (100 W / 4 m)[3, 4, 6]	Half-space	125 dB_{SPL}
	Full-space	119 dB_{SPL}
Horizontal Opening Angle[7]	250 Hz	79°
	500 Hz	44°
	1 kHz	33°
	2 kHz	34°
	4 kHz	29°
	8 kHz	28°
Vertical Opening Angle[8]	250 Hz	50°
	500 Hz	27°
	1 kHz	15°
	2 kHz	15°
	4 kHz	17°
	8 kHz	16°
Directivity Index[9]	800 Hz to 10 kHz	21.5 dB (+/- 1.5 dB)

ELECTRICAL

Rated Impedance[10]	100 W tap	100 Ω
	50 W tap	200 Ω
Minimum Impedance[11]	100 W tap	>= 80 Ω
	50 W tap	>= 160 Ω
Average Impedance[12]	100 W tap	150 Ω
	50 W tap	300 Ω
Rated Noise Power[10]		100 W_{rms}
Rated Noise Voltage[10]		100 V_{rms}
Filter	HPF	F_{-3dB} at 250 Hz
Fuses	Thermal	Activation Temperature 104 °C
		Current Rating >= 8 A at 250 V_{AC}
		One-shot (replaceable)
	Overcurrent	PPTC resettable fuse
		Trip current 1.25 A
Cable Gland (default)[13]	Thread Size	PG 13.5 or M20
	Minimum Diameter	6 mm
	Maximum Diameter	12 mm

Connector (optional)[14]	Type	Hirschmann CA 3 GD
	Pins	P1 (0 V) P2 (100 V) P3 and P4 (PE) are NC
Connections	Poles	100 V and 0 V
	Body Material	Engineering Ceramic
	Temperature Rating	500 °C maximum body temperature / 800 °C short-time
	Terminals[15]	M3 screw terminals, nickel-plated brass
	Rated Cross-section	2.5 mm^2
	Maximum Conductor Cross-section	2.5 mm^2 (stranded) / 4 mm^2 (solid)
Tap Setting	Taps	100 W and 50 W
	Configuration[15]	Internal Wire Jumper
Smart Protection	Minimum Primary Voltage	6 V_{rms}
	Power consumption	< 10 mW
Excursion Protection	Sensor	Contactless
	Control	Solid State Switchable Filter
	Threshold	600 µm peak
Thermal Protection	Threshold	180 °C voice coil temperature
	Control	Relay
	Gain Reduction	6 dB
Status Indication	Type	RGB high-efficiency LED
	Excursion Detection	Green (Pulse)
	Excursion Protection Active	Red (Flash)
	Thermal Protection Active	Blue (Flash)
	Flash Frequency	1 Hz
Transducer	Type	Compression Driver (1.5” exit)
	Voice Coil	4” diameter, CCAR wire
	Diaphragm	Titanium with HTR Polyimide Surround
	Polarity	Positive voltage on + moves diaphragm towards phase plug
	Terminals	2 x M4
Load Monitoring[3, 16]	Normal	|Z| = 170 Ω at 20 kHz
	Excursion Protection Active	|Z| = 135 Ω at 20 kHz
	Thermal Protection Active	|Z| = 340 Ω at 20 kHz
	Voice Coil Open	|Z| > 5 kΩ at 20 kHz
	Voice Coil Short	|Z| < 30 Ω at 20 kHz
EOL Monitoring	Scheme	BOSCH PRA-EOL compatible
	Configuration[15]	Internal Jumper

MECHANICAL

Dimensions (L x W x H)[17]		1329 x 860 x 331 mm
Weight[18]		15.5 kg
Enclosure Protection[19]		IP 66
Enclosure Material		Flame-Retardant Thermoplastic
Flammability[20]		IEC 60695-11-20/UL 94 class 5VB
Color	Enclosure	Black
	Mounting Brackets	Metal
Mounting		Brackets (Stainless Steel AISI 316)
Mounting Points[17]		8 x bracket, 9 mm slit width
Packaged Dimensions (L X W X H)		590 x 380 x 915 mm
Packaged Weight		19.5 kg

GENERAL

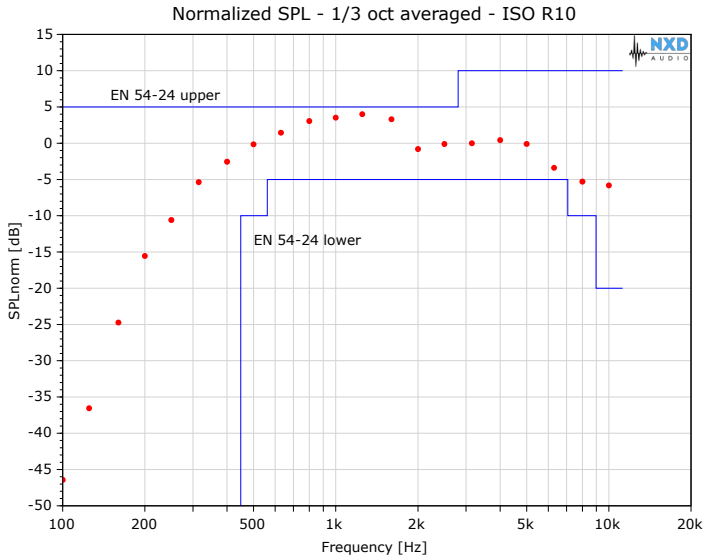
Temperature Range (ambient)[21]	-25 to 70 °C
MTBF	TBD
Standards[22]	EN 54-24 Type A and B
Certificates	CE

NOTES

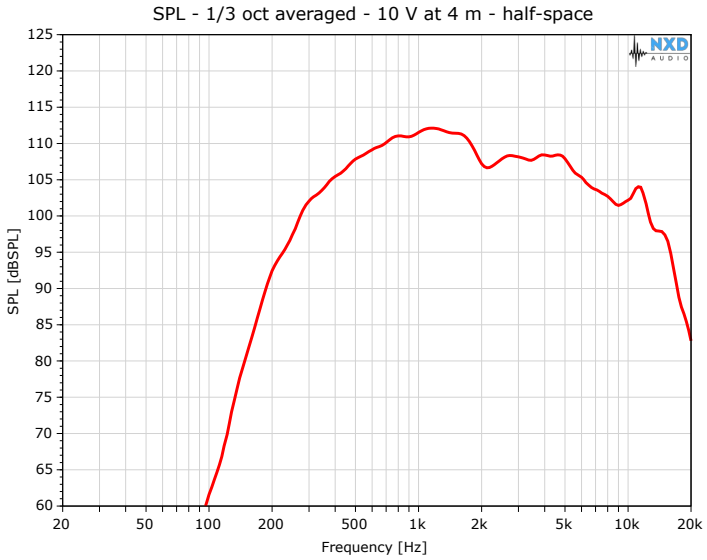
1 All specifications are valid under normal operating conditions and with disabled protection unless stated otherwise.
2 On reference axis at 4 m from reference point, see Physical References on p16, half-space, 1/3 octave averaged, see SPL plot on p8.
3 Valid for 100 W tap.
4 Half-space data as measured, full-space data is calculated as half-space data minus 6 dB.
5 Pink noise, SPL analyzed in ISO R10 bands (1/3 oct) from 100 Hz to 10 kHz according to EN 54-24:2008, see Normalized SPL plot on p8.
6 Simulated program signal according to IEC 60268-1:1985, 100 Vrms with a crest factor of 6 dB.
7 In the horizontal plane at 4 m from reference point, half-space, -6 dB, 1/1 octave averaged, see Horizontal polar plots on p12.
8 In the vertical plane at 4 m from reference point, half-space, -6 dB, 1/1 octave averaged, see Vertical polar plots on p13.
9 At 4 m from the reference point, half-space, 1/3 octave averaged, see DI plot on p10.
10 According to EN 54-24:2008.
11 See Impedance plots on p8 and p9.
12 Linear average for impedance magnitude in ISO R10 bands (1/3 oct) from 100 Hz to 10 kHz.
13 The default product variant (part number 0200201) is equipped with a gland on the left side (front view).
14 For compatibility with older products, a Hirschmann CA 3 GD connector can be installed on left or right side in stead of the gland.
15 Accessible when rear cover removed, see Installation Manual.
16 PRA-EOL disabled.
17 See Mechanical section on p14 and next pages.
18 Including mounting brackets.
19 For rear enclosure only, according to IEC 60529: 1992 +C2: 2016. Product IP rating according to EN 54-24:2008 Type B.
20 Concerns enclosure material.
21 Maximum ambient temperature for continuous operation is 40 °C.
22 Product is designed to be compliant with this standard but not certified.

PLOTS

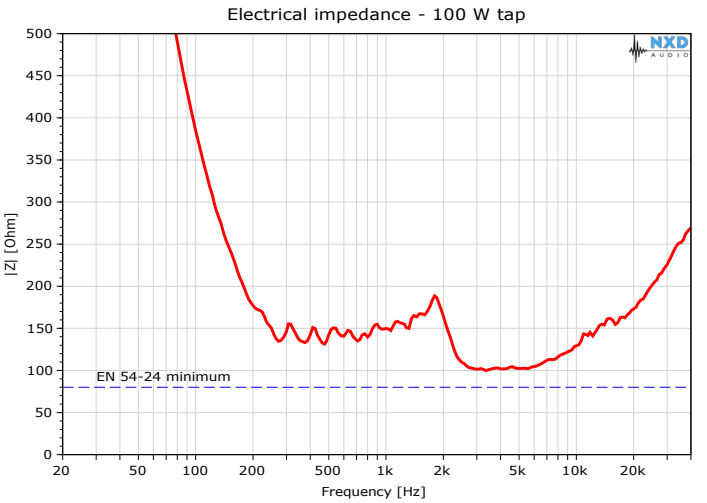
Normalized SPL vs frequency
1/3 octave averaged
ISO R10 frequencies
4 m
Half-space



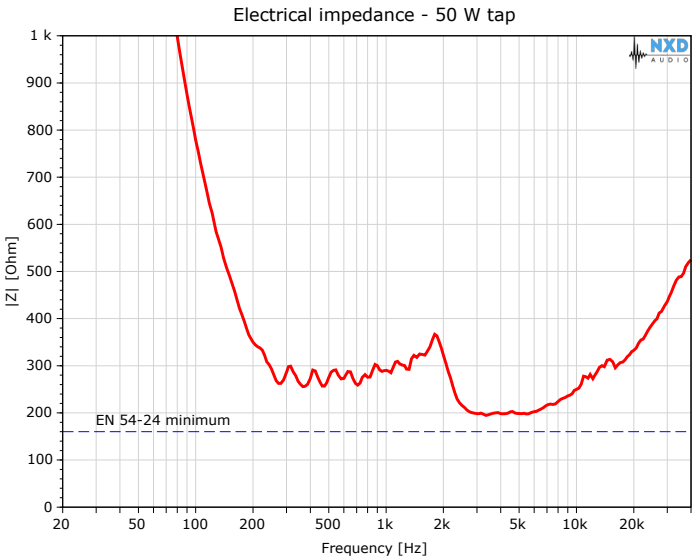
SPL vs frequency
1/3 octave averaged
10 V
4 m
Half-space



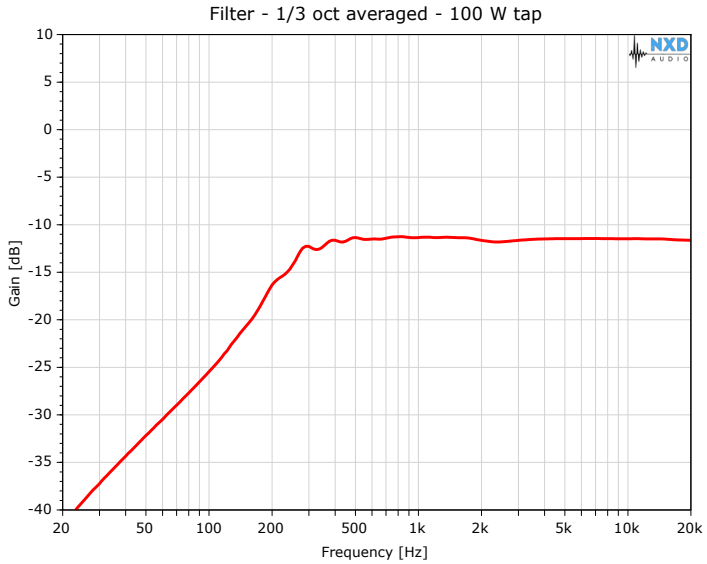
Impedance vs frequency
100 W tap
Half-space



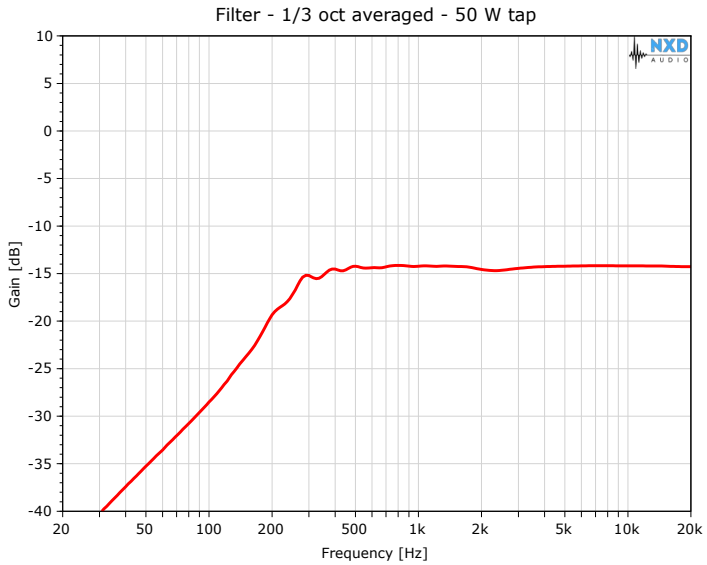
Impedance vs frequency
50 W tap
Half-space



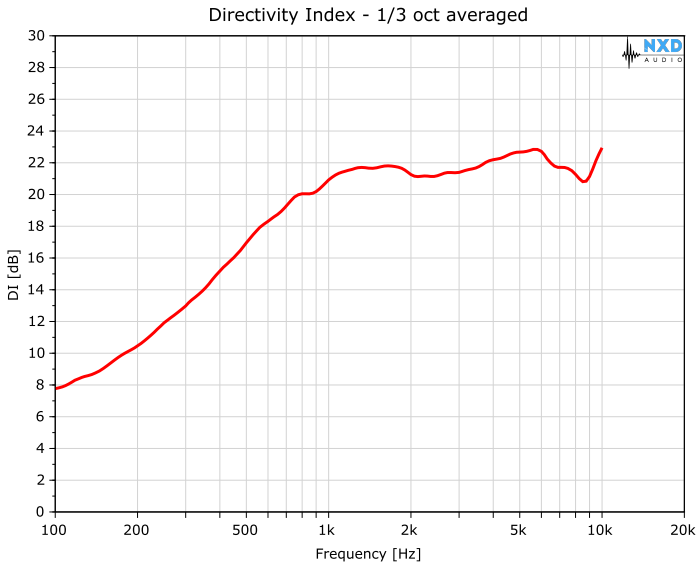
Filter response
1/3 octave averaged
100 W tap



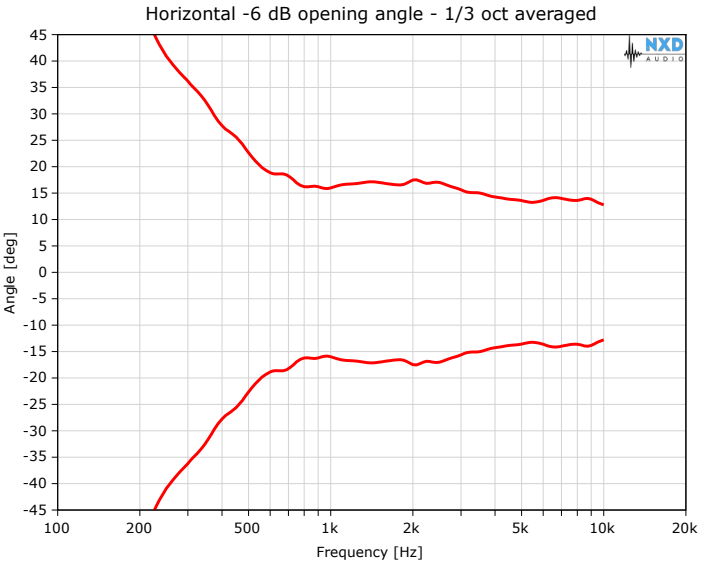
Filter response
1/3 octave averaged
50 W tap



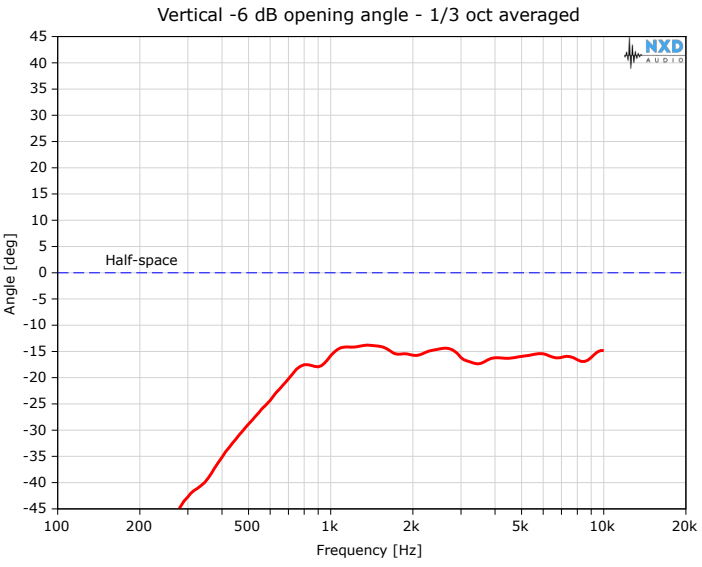
DI vs frequency
1/3 octave averaged
4 m
Half-space



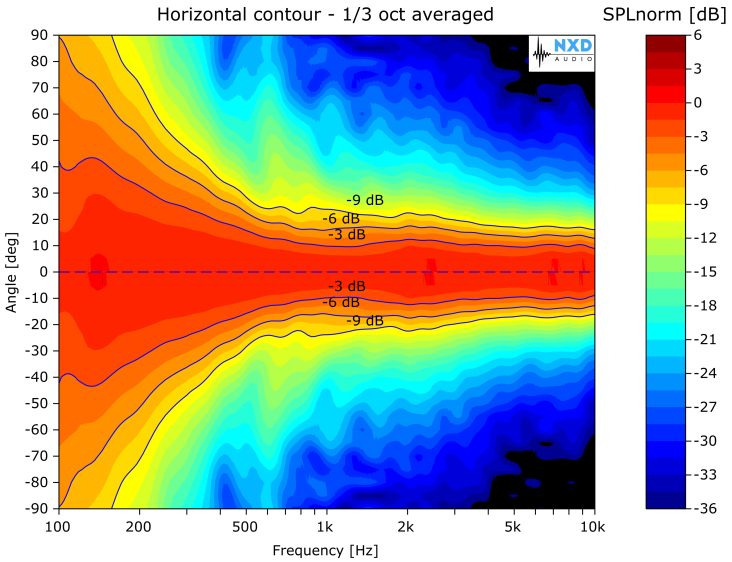
Horizontal -6 dB opening angle
1/3 octave averaged
4 m



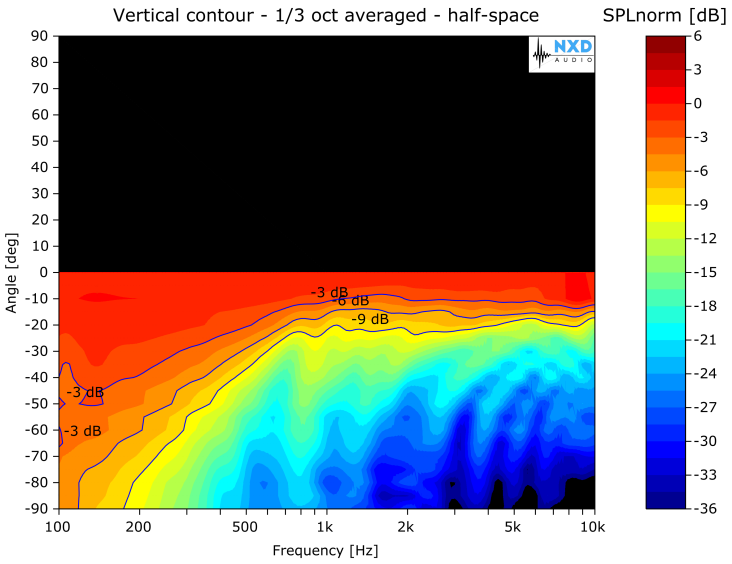
Vertical -6dB opening angle
1/3 octave averaged
4 m
Half-space



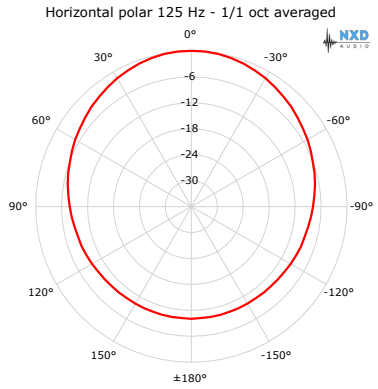
Horizontal contour
1/3 octave averaged
4 m

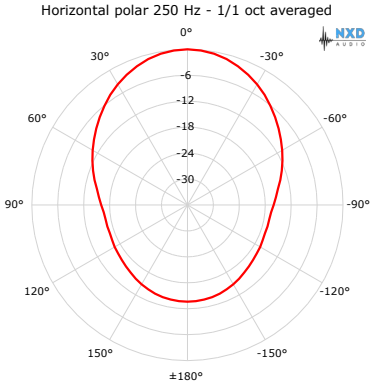


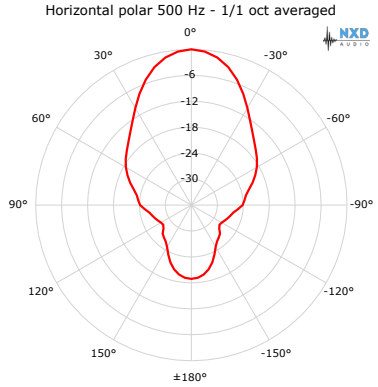
Vertical contour
1/3 octave averaged
4 m
Half-space

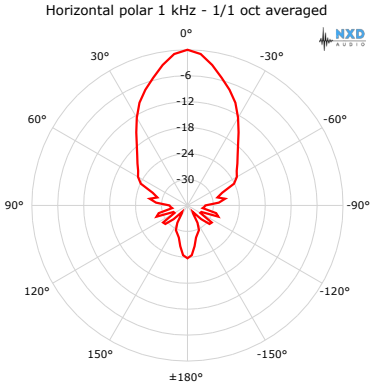


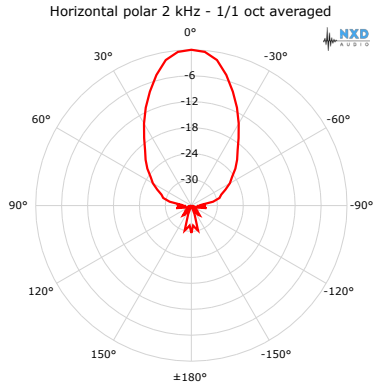
Horizontal polar
1/1 octave averaged
4 m

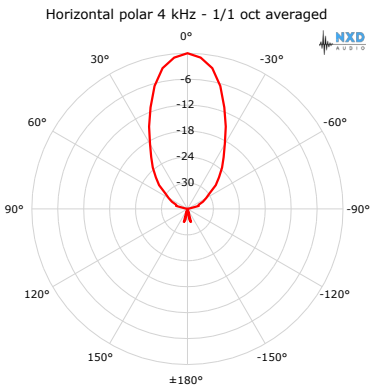


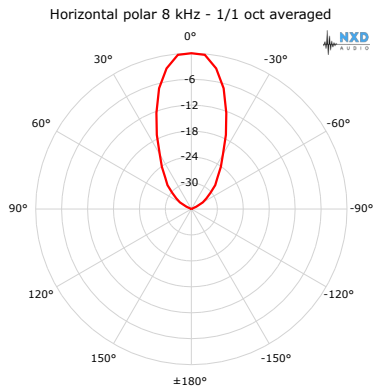




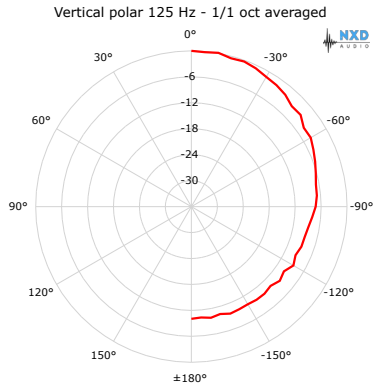


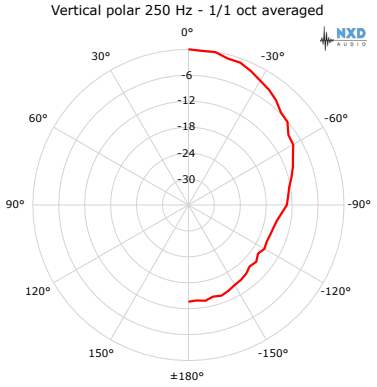


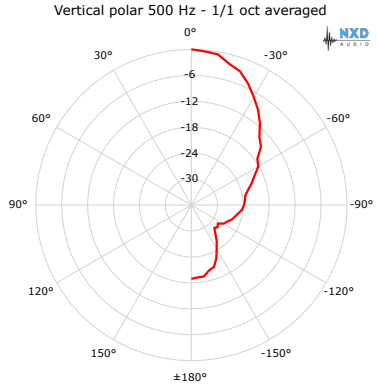


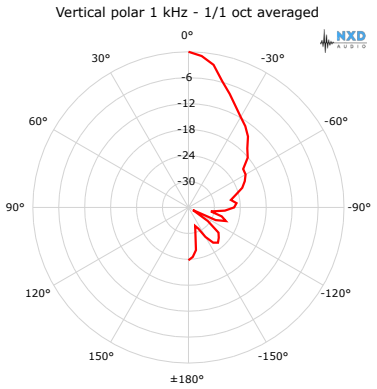


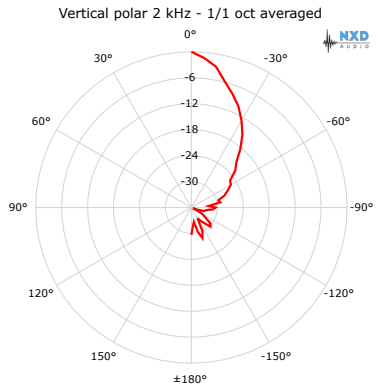
Vertical polar
1/1 octave averaged
4 m
Half-space

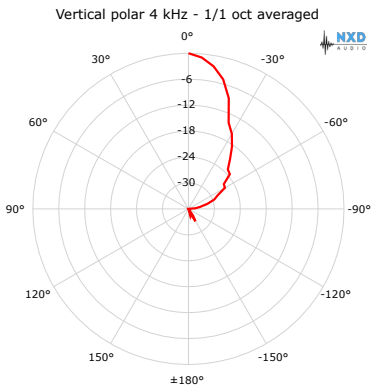


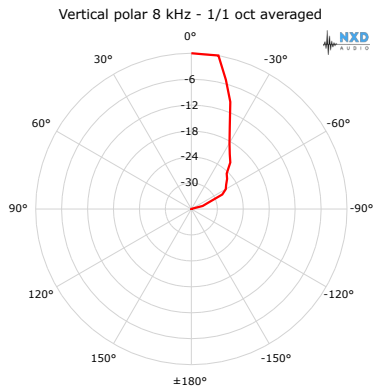




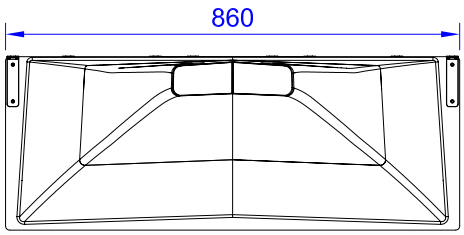
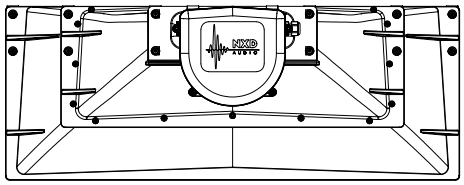
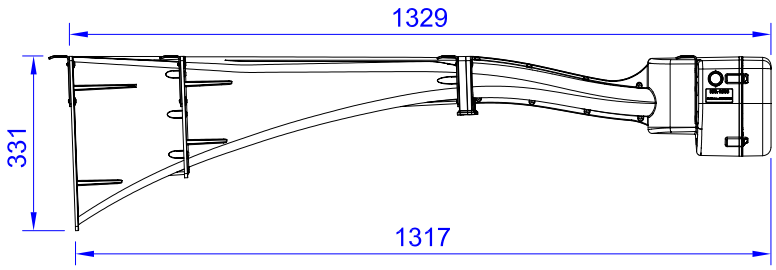
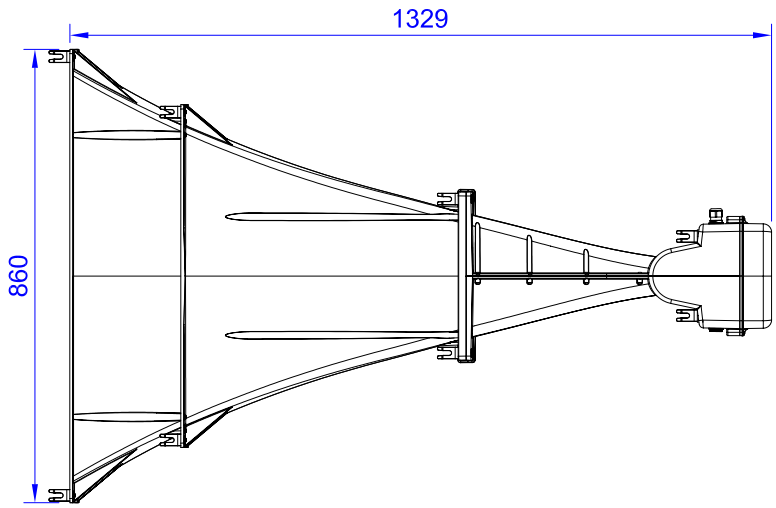
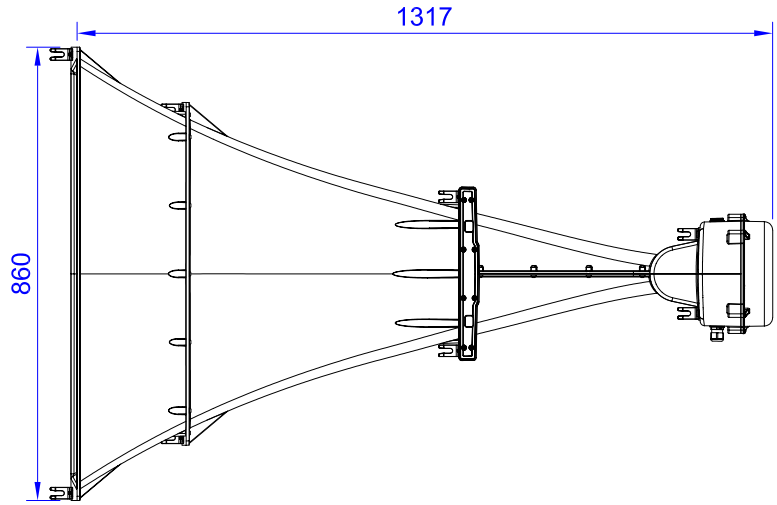


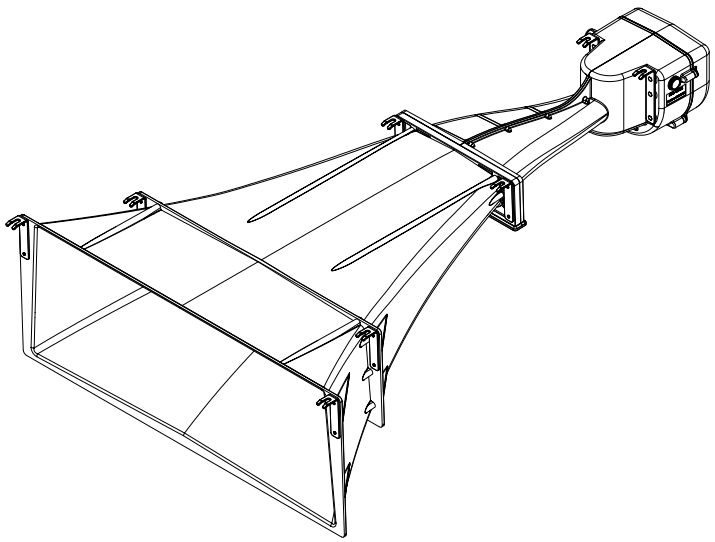
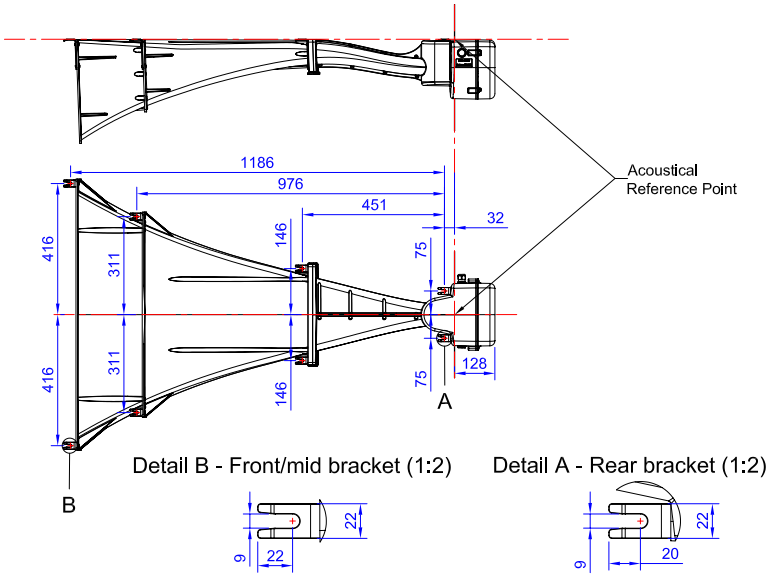






MECHANICAL

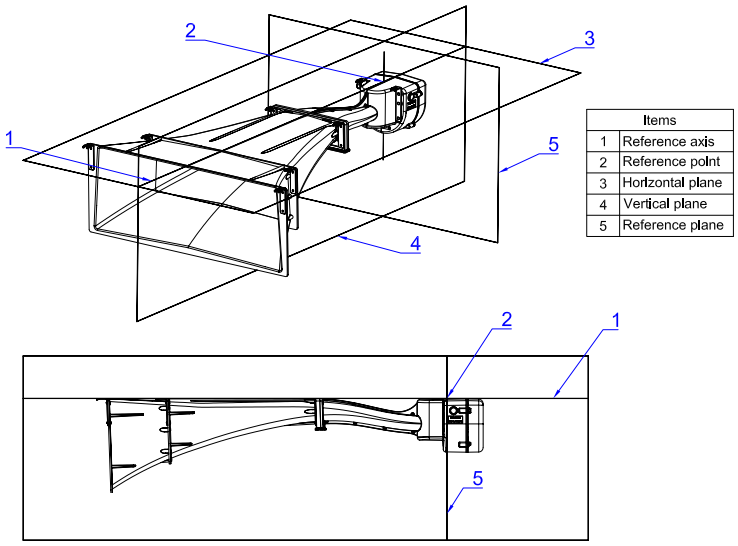
Front view	
Rear view	
Side view	
Top view	
Bottom view	

3D view	
Mounting details	

Physical References

Physical references (EN 54-24)

1. Reference axis
2. Reference point
3. Horizontal plane
4. Vertical plane
5. Reference plane



Items	
1	Reference axis
2	Reference point
3	Horizontal plane
4	Vertical plane
5	Reference plane

Document Revision

0.1	05-01-2022	Start version.
0.2	17-01-2022	Improvements to Product Description and Features. Technical Specs section added.
0.3	21-01-2022	Specs, switching details added to excursion / thermal protection. Initial weight estimation added. Layout adapted and plots added.
0.4	02-02-2022	Added average impedance values. Updated dimensions, weight and packaging dimensions.
0.5	29-04-2022	All data and plots updated to final proto measurements. Mechanical and physical references drawings added.
0.51	04-05-2022	Added PPTC trip current. Syntax improvements.
0.6	05-01-2023	All drawings updated to preliminary production status. Feature text additions and modifications.
1.0	25-08-2023	All data, plots and drawings updated to release status.
1.1	29-12-2023	Added packaged dimensions.
1.2	02-09-2024	Part numbers with Hirschmann CA 3 GD connector added.
1.3	24-10-2023	Changes terminal block specifications.

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