

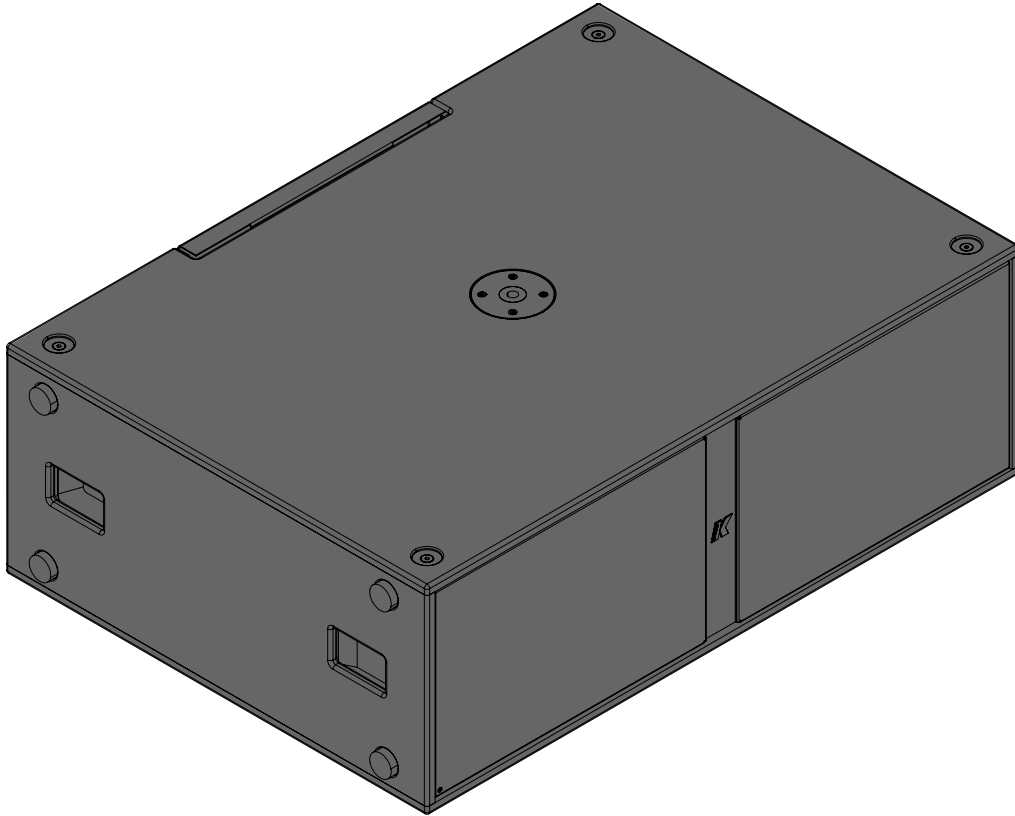
Thunder-KSCARDIO412P

Compact & high performance passive cardioid subwoofer

QUICK GUIDE



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K-ARRAY
Unique Audio Solutions

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IMPORTANT SAFETY INSTRUCTIONS



CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN



ATTENTION: RISQUE DE CHOC ELECTRIQUE NE PAS OUVRIR

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



This symbol alerts the user to the presence of recommendations about the product's use and maintenance.



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated, dangerous voltage within the product enclosure that may be of magnitude to constitute a risk of electrical shock.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in this guide.



Operator's manual; operating instructions
This symbol identifies the operator's manual that relates to the operating instructions and indicates that the operating instructions should be considered when operating the device or control close to where the symbol is placed.



For indoor use only
This electrical equipment is designed primarily for indoor use.



WEEE
Please dispose of this product at the end of its operational lifetime by bringing it to your local collection point or recycling center for such equipment.



This device complies with Restriction of Hazardous Substances Directive.

WARNING



Failure to follow these safety instructions could result in fire, shock or other injury or damage to the device or other property.

General heed and warnings

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat
- Do not defeat the safety purpose of the polarized or grounding plug. A polarized plug has two blades with one wider than the other. A grounding plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Only use attachments/accessories specified by the manufacturer.
- Protect the power cord from being walked on or pinched particularly at the plugs, convenience receptacles, and at the point where they exit from the apparatus.
- Clean the product only with a soft and dry fabric. Never use liquid cleaning products, as this may damage the products cosmetic surfaces.
- Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Avoid placing the product in a location under direct sunlight or near any appliance that generates UV (Ultra Violet) light, as this may change the product surface finishing and cause a change in color.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- CAUTION: These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.
- WARNING: Only use attachments/accessories specified or provided by the manufacturer (such as the exclusive supply adapter, battery, etc.).
- Before turning the power on or off for all devices, set all volume levels to minimum.



This apparatus is intended for professional use.

Installation and commissioning may only be carried out by qualified and authorized personnel.

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- Use only speaker cables for connecting speakers to the speaker terminals. Be sure to observe the amplifier's rated load impedance particularly when connecting speakers in parallel. Connecting an impedance load outside the amplifier's rated range can damage the apparatus.
- K-array cannot be held responsible for damage caused by improper use of the loudspeakers.
- K-array will not shoulder any responsibilities for products modified without prior authorization.

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Canadian Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: this device may not cause interference, and this device must accept any interference, including interference that may cause undesired operation of the device.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

CE Statement

K-array declares that this device is in compliance with applicable CE standards and regulations. Before putting the device into operation, please observe the respective country-specific regulations!



Trademark Notice

All trademarks are the property of their respective owners.

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Thank you for choosing this K-array product!

To ensure proper operation, please carefully read the owner's manuals and safety instruction before using the products.

After reading this manual, be sure to keep it for future reference.

Should you have any questions about your new device please contact K-array customer service at support@k-array.com or contact the official K-array distributor in your country.

The Thunder-KSCARDIO412P is a high-performance passive cardioid subwoofer designed for professional live sound reinforcement and fixed installation applications where high sound pressure levels and controlled low-frequency directivity are required.

The system is equipped with four 12" neodymium woofers and delivers a maximum SPL of 138 dB, with continuous power handling up to 2500 W. Its acoustic configuration provides extended low-frequency response, high efficiency, and consistent performance under demanding operating conditions.

The enclosure is constructed from high-quality birch plywood to ensure structural rigidity and durability. The rear panel is equipped with SpeakON NL4 connectors and a Mono-Amp / Bi-Amp selector switch, allowing flexible wiring configurations and straightforward integration into professional audio systems.

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Product Overview

Unlike conventional omnidirectional subwoofers, the Thunder-KSCARDIO412P is designed to control low-frequency radiation by generating a cardioid directivity pattern. This approach reduces low-frequency energy behind the enclosure while maintaining strong and coherent output toward the audience, resulting in a more directional low-frequency response compared to traditional subwoofer systems.

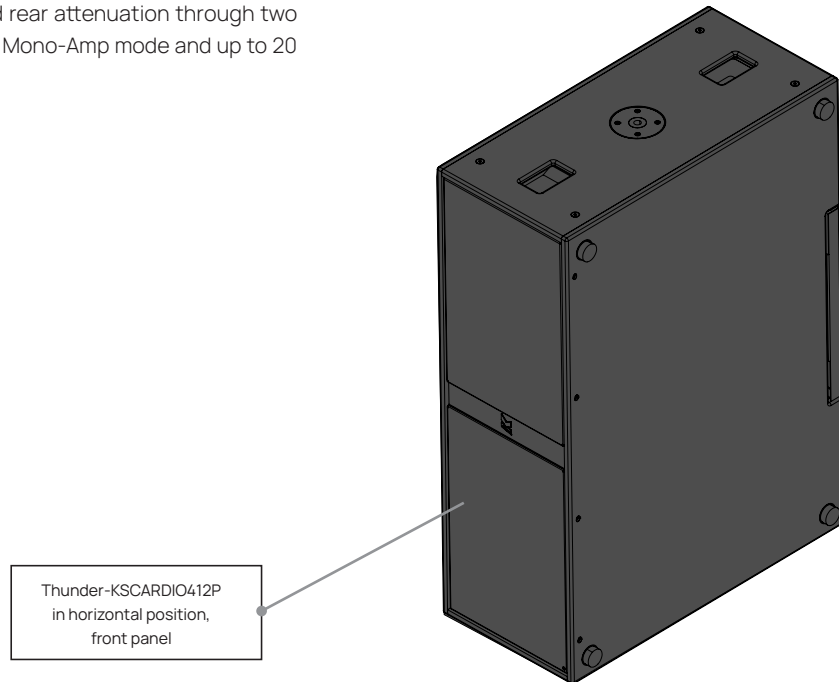
The cardioid design allows the subwoofer to deliver powerful low-frequency performance while significantly reducing unwanted rear radiation, improving control of low-frequency distribution within the listening area.

The system provides controlled rear attenuation through two operating modes: up to 12 dB in Mono-Amp mode and up to 20 dB in Bi-Amp mode.

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Main features

- Passive cardioid subwoofer for professional live sound and fixed installation applications
- Four 12" neodymium woofers arranged in a 3 front / 1 rear configuration
- Maximum SPL: 138 dB
- Continuous power handling: 2500 W
- Rear attenuation up to 12 dB in Mono-Amp mode
- Rear attenuation up to 20 dB in Bi-Amp mode with external processing
- Mono-Amp / Bi-Amp selectable operating modes
- 2x SpeakON NL4 connectors for input / link and bi-amp channel routing
- Birch plywood enclosure for high structural rigidity and durability



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Typical applications

Cardioid subwoofers are commonly used in professional sound reinforcement systems, concerts or installations, where control of low-frequency radiation is required.

By reducing low-frequency radiation behind the enclosure, the Thunder-KSCARDIO412P helps improve stage clarity and monitoring conditions for performers, while enabling more controlled low-frequency distribution toward the audience area.

Typical use cases and system challenges

- **Stage spill reduction**
Reduced low-frequency radiation behind the system improves monitoring conditions and overall clarity for performers on stage.
- **Operation in acoustically constrained environments:**
Controlled rear radiation enables more predictable low-frequency behaviour in venues with reflective rear boundaries, limited stage depth, or restricted placement options.
- **Backstage and adjacent area noise mitigation:**
Directional low-frequency radiation helps limit unwanted bass spill toward backstage areas or nearby spaces.
- **Compact directional subwoofer deployments:**
Cardioid behaviour allows effective low-frequency directivity without requiring complex multi-subwoofer arrays.

Cardioid Operating Principle

The Thunder-KSCARDIO412P achieves its cardioid radiation pattern through the interaction between the front and rear woofers of the enclosure.

Three woofers are positioned on the front of the enclosure to generate the main low-frequency output toward the audience, while a fourth rear-facing woofer is used to control the radiation pattern of the system.

Through controlled phase relationships between the front and rear woofers, the system generates constructive summation in the forward direction and destructive interference behind the enclosure. This acoustic interaction significantly reduces low-frequency energy at the rear of the system while maintaining strong forward output.

The interaction between the front and rear woofers can be managed through:

- **Internal crossover network (Mono-Amp mode)**
- **External DSP processing via Kommander-KA amplifier presets (Bi-Amp mode)**

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Unpacking

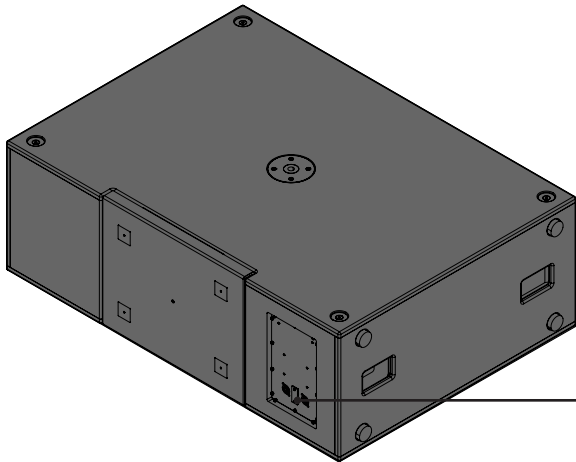
Each Thunder-KSCARDIO412P is thoroughly inspected before leaving the factory.

After opening the shipping carton, please verify that the following items are included:

- 1 × Thunder-KSCARDIO412P subwoofer
- Documentation (user manual and safety instructions)

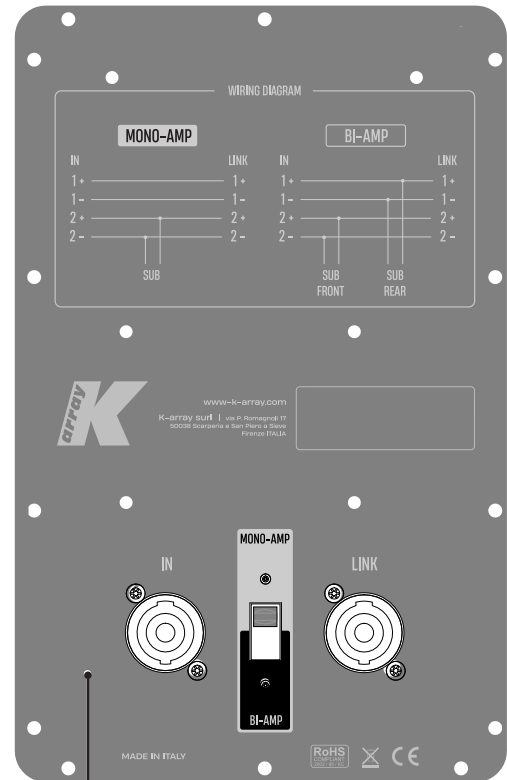
If any damage to the packaging or the product is found, immediately notify the shipping company before installation.

The rear panel of the Thunder-KSCARDIO412P is designed to provide connection flexibility and proper operation of the cardioid system.



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Rear Panel Mode selector overview



Getting Started

Getting started Guide

1. Unpacking and Inspection

Carefully remove the subwoofer from its packaging and inspect it for any visible damage. Verify that the enclosure, connectors, and selector switch are intact. In case of damage, contact your distributor before installation

2. Positioning

Place the subwoofer on a stable and level surface, ensuring adequate ventilation around the enclosure. When deploying multiple units, follow the system design guidelines for correct spacing and orientation to achieve the desired cardioid performance.

3. Mode Selection

Before connecting the amplifier, set the rear panel selector switch to the desired operating mode:

- **Mono-Amp**
- **Bi-Amp**

Ensure the selected mode matches the amplifier configuration and preset.

4. Wiring

Connect the amplifier outputs to the SpeakON NL4 connectors according to the selected operating mode and system design. Verify correct polarity and pin assignment

- MONO-AMP:
 - 2+/ 2- : signal (front + rear woofers)
 - 1+ / 1- : through
- BI-AMP
 - 2+/ 2-: front woofers signal (**CH1**)
 - 1+/1-: rear woofer signal (**CH2**)

5. Amplifier Setup

Load the appropriate DSP preset on Kommander-KA amplifier for the Thunder-KSCARDIO412P. Ensure that limiter, crossover, and delay settings correspond to the selected operating mode.

6. Initial Signal Check

Apply a low-level signal (e.g., pink noise) and gradually increase the level while monitoring system behavior. Verify proper operation of the front and rear transducers and confirm correct acoustic response before full-level operation.

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Wiring

The Thunder-KSCARDIO412P is equipped with 2 × SpeakON NL4 connectors. The following table shows the internal pin-out configuration for system operation.

SpeakON	pin-out	Mono-amp
IN	2+/2-	Input signal (front woofers + rear woofer)
	1+/1-	Through / link output
LINK	2+/2-	Input signal (front woofers + rear woofer)
	1+/1-	Through / link output

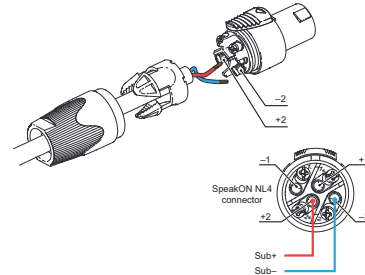
SpeakON	pin-out	Bi-amp
IN	2+/2-	Input signal (front woofers)
	1+/1-	Input signal (rear woofer)
LINK	2+/2-	Input signal front woofers)
	1+/1-	Input signal (rear woofer)

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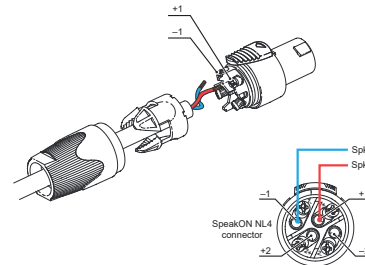
SpeakON Cable Default Wiring

One-channel wiring (MONO-AMP)

Subwoofers are usually wired on +2 -2.



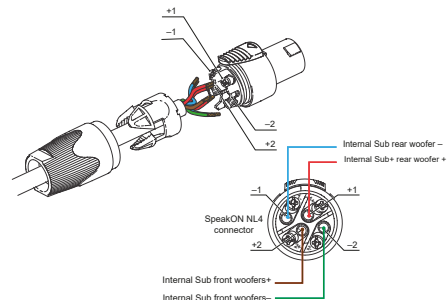
Hi/Mid- and full-range loudspeakers are usually wired on +1 -1.



Two-channel wiring (BI-AMP)

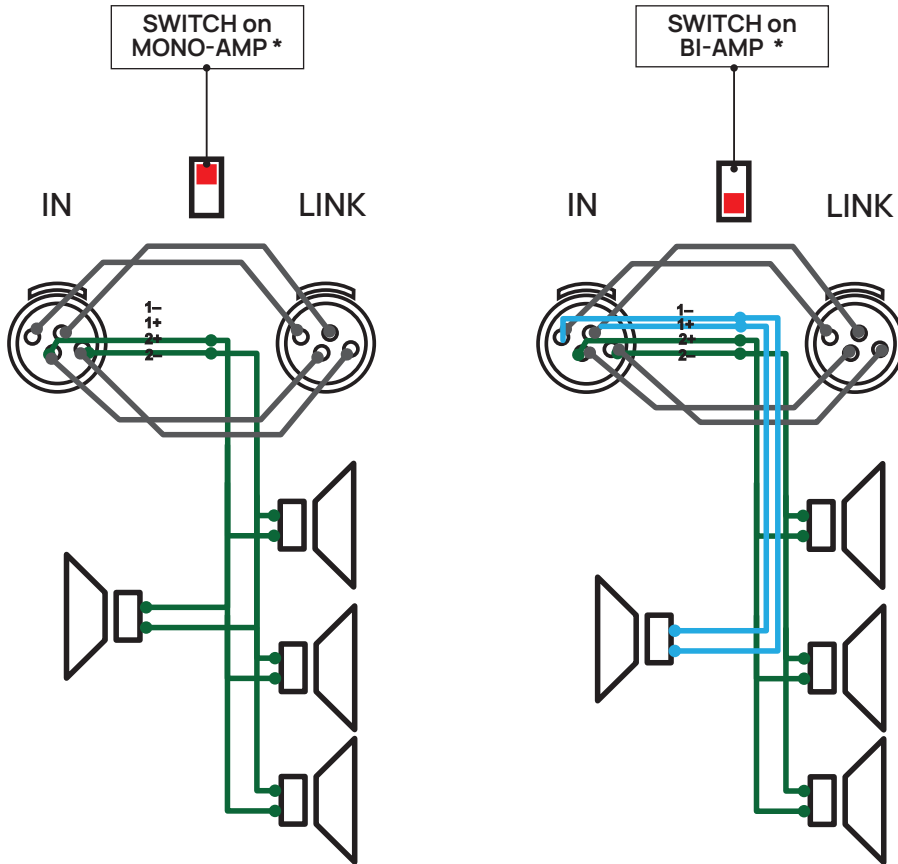
2+ / 2--: front woofers signal

1+ / 1--: rear woofer signal



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Rear Panel switch mode



* Internal wiring diagram showing the connection of the front and rear woofers to the SpeakON NL4 pins and the Mono-Amp / Bi-Amp selector. In Mono-Amp mode the internal crossover manages signal routing, while in Bi-Amp mode the crossover is bypassed and the woofers are driven independently.

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Amplification

Amp Mode Selector

A mode selector switch on the rear panel allows the subwoofer to be configured in one of the following operating modes:

- **Mono-Amp**
- **Bi-Amp**

The selected mode determines the electrical behavior of the system and the cardioid radiation pattern, controlling also the bypass of internal filters in mono-amp mode.

- In Mono-Amp mode, the system presents a total load of 4 Ω and uses the same NL4 pin-out on both connectors. The internal crossover network distributes the signal between the front and rear woofers, automatically driving the rear woofer with reversed polarity. **This configuration provides typical rear attenuation of up to -12 dB.**
- In Bi-Amp mode, the internal crossover network is bypassed. The front and rear woofers are driven by independent amplifier channels, with polarity, delay, and signal processing controlled by the amplifier DSP preset. **This configuration enables rear attenuation of up to -20 dB.**



NOTE:

K-array loudspeakers and subwoofers are designed to operate with dedicated amplifier presets available through the K-array amplifier Web App.

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Operating mode	Amp CH required	Impedance	Power Handling
Mono-Amp	1	4 Ω	2500W
Bi - Amp (CH1) front	2	4 Ω	2100W 700W
Bi - Amp (CH2) rear		16 Ω	

System Design Guide

The Thunder-KSCARDIO412P is designed to provide controlled low-frequency directivity while maintaining high output capability. Proper deployment and system configuration are essential to achieve the intended cardioid performance and consistent low-frequency coverage.

Placement Considerations

General

To preserve the intended cardioid performance, avoid placing the subwoofer directly against a rear wall.

Although rear radiation is significantly attenuated, reflective surfaces located immediately behind the enclosure may partially affect the acoustic pattern and low-frequency response.

When possible, maintain a small distance from rear boundaries to ensure predictable low-frequency behaviour and optimal rear rejection.

Single and Small L/R Systems

In single-subwoofer deployments or small full-range L/R systems using one sub per side, the cardioid behaviour is defined by the individual enclosure and its placement relative to nearby boundaries. Proper orientation and adequate distance from rear surfaces help preserve the intended rear attenuation and maintain a balanced low-frequency response.

Multi-Element Configurations

In systems using multiple Thunder-KSCARDIO412P units, the overall low-frequency radiation pattern is influenced by the interaction between adjacent enclosures.

Subwoofer spacing, alignment and configuration should be carefully considered to maintain consistent rear attenuation and predictable system performance across the coverage area. When deploying multiple units, the distance between subwoofers should consider the spacing between the acoustic centers of the enclosures as well as the physical dimensions of the cabinets.

For predictable results, system configuration and alignment should always be verified through acoustic simulation or measurement.

In complex deployments, subwoofer spacing and system behaviour should be evaluated using K-array [K-framework3](#) acoustic simulation software.

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Full-Range System Integration

The Thunder-KSCARDIO412P can be integrated with K-array loudspeakers to create complete sound reinforcement systems.

When integrating the subwoofer with point-source or line-array loudspeakers, system alignment should be verified to ensure:

- proper time coherence
- consistent phase relationship
- smooth summation at the crossover frequency.

Correct preset selection and system alignment are essential to maintain consistent low-frequency integration with the full-range system.

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System configurations

Operating Mode Selection

The Thunder-KSCARDIO412P can operate in Mono-Amp or Bi-Amp configurations depending on the required level of system control and the overall system design.

The selected mode determines how the interaction between the front and rear woofers is managed and how the subwoofer integrates within the overall sound reinforcement system.

Mono-Amp Mode applications

This configuration is typically used for simplified deployments and small to medium sound reinforcement systems.

Examples of typical Mono-Amp deployments include:

- **single subwoofer per side in L/R systems**
- **small live sound systems**
- **installations where minimal amplifier channel count is preferred**

The subwoofer can be combined with K-array point-source or line-array loudspeakers to create complete full-range systems, such as:

- **Kayman-KY line array elements**
- **Dragon-KX12l point-source loudspeakers**

When integrating the subwoofer with full-range loudspeakers, system alignment should be verified to ensure:

- proper time coherence
- consistent phase relationship
- smooth summation at the crossover frequency

Mono-Amp mode is recommended when fast setup and predictable acoustic performance are priorities.

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Bi-Amp Mode applications

This configuration allows extended and precise control over:

- **relative level between front and rear woofers**
- **phase alignment**
- **time alignment**
- **low-frequency directivity optimization**

Bi-Amp mode is typically used in advanced system designs, such as:

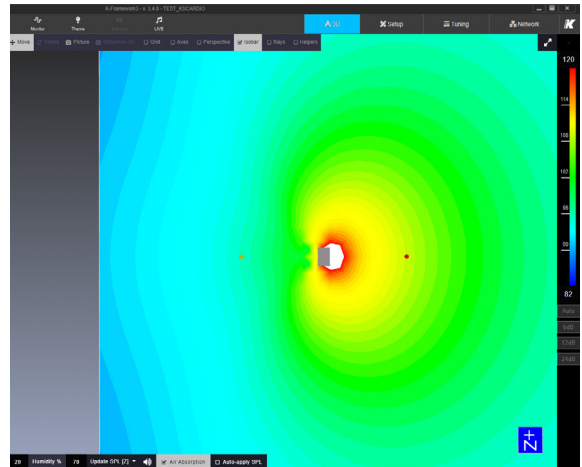
- **multi-subwoofer deployments**
- **subwoofer arrays**
- **stacked cardioid subwoofer system**

where precise control of the cardioid behaviour and overall system directivity is required.

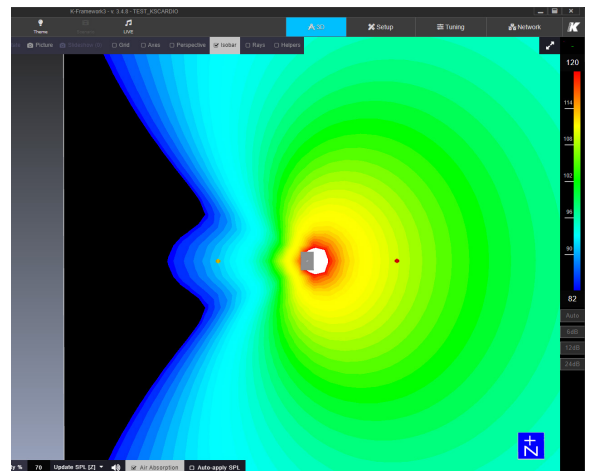
Further details on recommended products and specific system configurations will be included in future versions of this manual.

Cardioid radiation pattern simulations

KSCARDIO412P Cardioid emission pattern in Mono-amp mode via K-framework3*



KSCARDIO412P Cardioid emission pattern in Bi-amp mode via k-framework3*



*This diagram illustrates the simulation of SPL distribution in the band with 30 Hz - 120 Hz in free field conditions.

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Service

To obtain service:

1. Please have the serial number(s) of the unit(s) available for reference.
2. Contact the official K-array distributor in your country: find the Distributors and Dealers list on [K-array website](#). Please describe the problem clearly and completely to the Customer Service.
3. You will be contacted back for on-line servicing.
4. If the problem cannot be resolved over the phone, you may be required to send the unit in for service. In this instance, you will be provided with an RMA (Return Material Authorization) number which should be included on all shipping documents and correspondence regarding the repair. Shipping charges are the responsibility of the purchaser.

Any attempt to modify or replace components of the device will invalidate your warranty. Service must be performed by an authorized K-array service center.

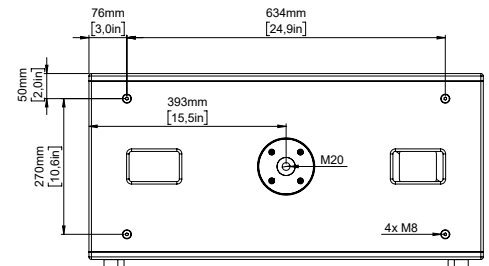
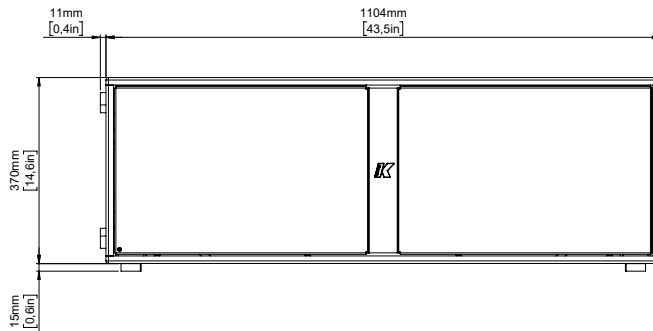
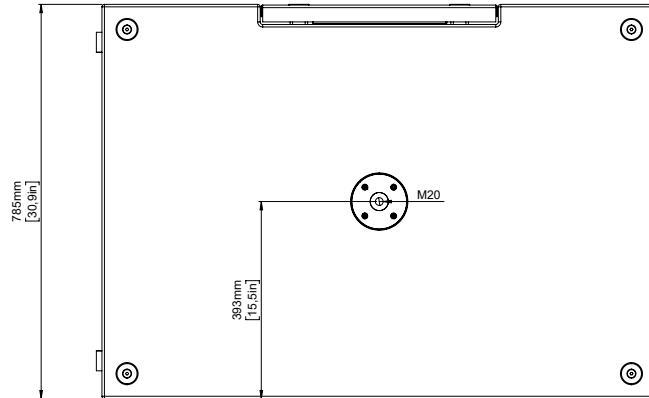
Cleaning

Use only a soft, dry cloth to clean the housing. Do not use any solvents, chemicals, or cleaning solutions containing alcohol, ammonia, or abrasives. Do not use any sprays near the product or allow liquids to spill into any openings.

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Mechanical drawings

Thunder-KSCARDIO412P



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Technical Specifications

General	
Type	Passive cardioid subwoofer
Transducers	4 x 12" neodymium magnet woofers (3x front, 1x rear)
Frequency Response ¹	35 Hz - 150 Hz (-6dB)
Crossover & Cardioid Network	Internal ²¹ / bypassed ²²
Max SPL ³	138 dB (peak)
Coverage ⁴	Cardioid
Rated Power	2500W _{Mono-amp} 2100 + 700W _{Bi-amp}
Nominal Impedance	4 Ω _{Mono-amp} (CH1) 4 Ω + 16 Ω _{Bi-amp} (CH1 = front, CH2 = rear)
Connectors	2x SpeakON NL4 1+1- / 2+ 2- (signal), 1+1- / 2+2- (link)

Handling & Finishes	
Material	Polyurea coated birch plywood
Colors	Black
IP Rating ³	IP54
Dimensions ⁵ (WxHxD)	370 x 1104 x 785 mm (14.56 x 43,46 x 30.90 in)
Weight	62,4 kg (137.58 lbs)

¹ With dedicated preset

²¹ Mono-Amp: internal crossover network enabled, managed by a dicated preset

²² Bi-amp: internal crossover network bypassed by switch, processing via external DSP

⁴ Mono-Amp mode: rear attenuation -12dB (typ), Bi-Amp mode: rear attenuation up to -20dB (max)

⁵ Vibration-dumping feet 0,15mm (0,16in).

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