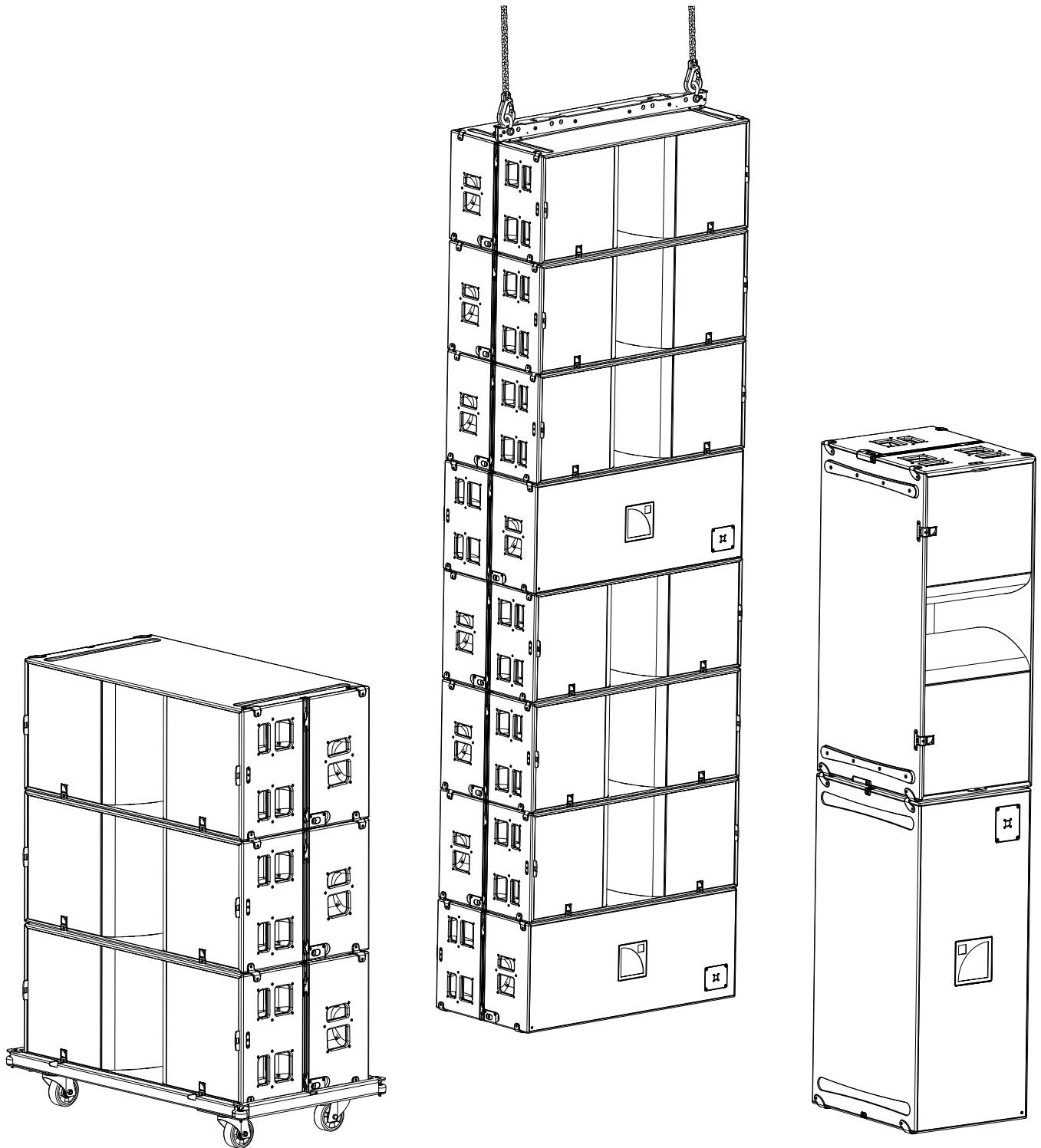


# KS28



owner's manual (EN)



Document reference: KS28 owner's manual (EN) version 1.0

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# Safety

## Instructions

---

-  **Inspect the system before any deployment.**  
Perform safety related checks and inspections before any deployment.
- Perform preventive maintenance at least once a year.**  
Refer to the preventive maintenance section for a list of actions and their periodicity.  
Insufficient upkeep of the product can void the warranty.
- If any safety issue is detected during inspection, do not use the product before performing corrective maintenance.**  
Check for issues. A rigging system part or fastener is missing or loose. A rigging system part exhibits: bends, breaks, broken parts, corrosion, cracks, cracks in welded joints, deformation, denting, wear, holes. A safety cue or label is missing.
-  **Never incorporate equipment or accessories not approved by L-Acoustics.**
-  **Read all the related PRODUCT INFORMATION documents shipped with the products before exploiting the system.**
-  **Do not store the product on an unstable cart, stand, tripod, bracket, or table.**
-  **Beware of sound levels.**  
Do not stay within close proximity of loudspeakers in operation.  
Loudspeaker systems are capable of producing very high sound pressure levels (SPL) which can instantaneously lead to permanent hearing damage to performers, production crew and audience members. Hearing damage can also occur at moderate level with prolonged exposure to sound.  
Check the applicable laws and regulations relating to maximum sound levels and exposure times.
-  **Work with qualified personnel for rigging the system.**  
Installation should only be carried out by qualified personnel that are familiar with the rigging techniques and safety recommendations outlined in this manual.
- Ensure personnel health and safety.**  
During installation and set-up personnel must wear protective headgear and footwear at all times. Under no circumstances is personnel allowed to climb on a loudspeaker assembly.
- Respect the Working Load Limit (WLL) of third party equipment.**  
L-Acoustics is not responsible for any rigging equipment and accessories provided by third party manufacturers. Verify that the Working Load Limit (WLL) of the suspension points, chain hoists and all additional hardware rigging accessories is respected.
- Respect the maximum configurations and the recommended safety precautions.**  
For safety issue, respect the maximum configurations outlined in this manual. To check the conformity of any configuration in regards with the safety precautions recommended by L-Acoustics, model the system in Soundvision and refer to the warnings in Mechanical Data section.
- Be cautious when flying a loudspeaker configuration.**  
Before installing/raising the product, check each individual element to make sure that it is securely fastened to the adjacent element. Always verify that no one is standing underneath the product when it is being installed/raised. Never leave the product unattended during the installation process.  
As a general rule, L-Acoustics recommends the use of secondary safety at all times.
- Be cautious when ground-stacking a loudspeaker array.**  
Do not stack the loudspeaker array on unstable ground or surface. If the array is stacked on a structure, platform, or stage, always check that the latter can support the total weight of the array.  
As a general rule, L-Acoustics recommends the use of safety straps at all times.

**Risk of falling objects**

Verify that no unattached items remain on the product or assembly.

**Risk of tipping**

Remove all rigging accessories before transporting a product or an assembly.

**Take into account the wind effects on dynamic load.**

When a loudspeaker assembly is deployed in an open air environment, wind can produce dynamic stress to the rigging components and suspension points.

If the wind force exceeds 6 bft (Beaufort scale), lower down and/or secure the product or the assembly.

**Intended use**

This system is intended for use by trained personnel for professional applications.



**As part of a continuous evolution of techniques and standards, L-Acoustics reserves the right to change the specifications of its products and the content of its documents without prior notice.**

Check [www.l-acoustics.com](http://www.l-acoustics.com) on a regular basis to download the latest document and software updates.

**Long term exposure to extreme conditions may damage the product.**

For more information, refer to the **Products weather protection** document, available on the website.

**Read the maintenance section of this document before servicing the product.****Contact L-Acoustics for advanced maintenance.**

Any unauthorized maintenance operation will void the product warranty.



This marking indicates that this product should not be disposed of with other household waste throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmentally safe recycling.



# Introduction

## KS28 reference subwoofer

---

The KS28 is a reference subwoofer designed to extend the frequency response of large format systems. The KS28 features two high excursion, 18" direct radiating transducers mounted in a bass-reflex tuned enclosure. The optimized L-Vents laminar vented port reduce turbulence and port noise at high levels while also increasing LF efficiency.

The KS28 operates from 25 Hz. The excursion capability of the transducer, combined with L-Vents contributes to deliver a high SPL, with low distortion. The KS28 can offer standard or cardioid directivity, by combining physical deployment and the suitable preset.

The KS28 is the first L-Acoustics enclosure to fully utilize the LA12X amplified controller power. The LA12X ensures advanced crossover functions, linearization and L-Drive protection of the transducers. Its onboard library offers standard and cardioid presets, each available with two low-pass filters to accommodate various coupling conditions and LF contour requirements.

The KS28 cabinet is assembled with birch and beech plywood panels. The use of panels optimized for thickness and combined with stiffeners gives the KS28 maximized internal volume, mechanical integrity and a low weight of 79 kg. It features six ergonomic handles for a solid grip and efficient handling. Bottom and side runners ensure safe stacking. A two-point suspension system is flush-mounted into the cabinet.

The KS28 is the ideal companion to large format systems in stacked or flown deployments. KS28 can significantly boost the LF extension and contour of line sources.

The KS28 can be stacked horizontally or vertically in standard or cardioid arrangements. With KS28-BUMP, KS28 can be flown in vertical arrays of standard or cardioid arrangements, up to 16 units.

## How to use this manual

---

The KS28 owner's manual is intended for all actors involved in the system design, implementation, preventive and corrective maintenance of the KS28 system. It must be used as follows:

1. Read the technical description for an overview of all system elements, their features, and their compatibilities.
  - [Electro-acoustical description](#) (p.11)
  - [Rigging system description](#) (p.12)
2. Prepare the system configuration. Consider the mechanical limits and the available acoustical configurations.
  - [Mechanical safety](#) (p.17)
  - [Loudspeaker configurations](#) (p.19)
3. Before rigging the system, perform mandatory inspections and functional checks.
  - [Inspection and preventive maintenance](#) (p.21)
4. To deploy the system, follow the step-by-step rigging instructions and refer to the cabling schemes.
  - [Rigging procedures](#) (p.36)
  - [Connection to LA amplified controllers](#) (p.45)



The [Corrective maintenance](#) (p.47) section contains the operations authorized for the end user.

Performing another operation exposes to hazardous situations.

For advanced maintenance, contact your L-Acoustics representative.

**As part of a continuous evolution of techniques and standards, L-Acoustics reserves the right to change the specifications of its products and the content of its document without prior notice.** Please check [www.l-acoustics.com](http://www.l-acoustics.com) on a regular basis to download the latest document and software updates.


## Contact information


For information on advanced corrective maintenance:

- contact your Certified Provider or your L-Acoustics representative
- for Certified Providers, contact the L-Acoustics customer service: [customer.service@l-acoustics.com](mailto:customer.service@l-acoustics.com) (EMEA/APAC), [laus.service@l-acoustics.com](mailto:laus.service@l-acoustics.com) (Americas).

## Symbols

The following symbols are used in this document:

 This symbol indicates a potential risk of harm to an individual or damage to the product. It can also notify the user about instructions that must be strictly followed to ensure safe installation or operation of the product.

 This symbol notifies the user about instructions that must be strictly followed to ensure proper installation or operation of the product.

 This symbol notifies the user about complementary information or optional instructions.

## Revision history

version number	publication date	modification
1.0	Sep. 2022	Initial version.


## System components

### Loudspeaker enclosures

KS28 Flyable subwoofer 2 x 18"

### Powering and driving system

LA12X / LA2Xi Amplified controller with DSP, preset library and networking capabilities

 Refer to the LA12X / LA2Xi owner's manual for operating instructions.

### Rack

LA-RAK II AVB Touring rack containing three LA12X, LA-POWER II for power distribution, LA-PANEL II for audio and network distribution, and two LS10 for AVB distribution

### Cables

SP cables SpeakON loudspeaker cables (4-point, 4 mm<sup>2</sup> gauge)  
Come in different sizes: SP.7 (0.7 m / 2.3 ft), SP5 (5 m / 16.4 ft), SP10 (10 m / 32.8 ft), and SP25 (25 m / 82 ft)

SP-Y1 Breakout cable for two passive enclosures (2.5 mm<sup>2</sup> gauge)  
4-point speakON to 2 × 2-point speakON, provided with a CC4FP adapter

DO cables PA-COM loudspeaker cables (8-point, 4 mm<sup>2</sup> gauge)  
Come in different sizes: DO.7 (0.7 m / 2.3 ft), DO.10 (10 m / 32.8 ft), and DO.25 (25 m / 82 ft)

DOSUB-LA8 Breakout cable for four passive enclosures (4 mm<sup>2</sup> gauge)  
8-point PA-COM to 4 × 2-point speakON

DO3WFILL Breakout cable for one 2-way active enclosure and two passive enclosures (4 mm<sup>2</sup> gauge)  
8-point PA-COM to 1 × 4-point speakON and 2 × 2-point speakON

**i** Information about the connection of the enclosures to the LA amplified controllers is given in this document.

Refer to the LA12X / LA2Xi owner's manual for detailed instructions about the whole cabling scheme, including modulation cables and network.

### Rigging elements

KS28-BUMP	Lifting beam for flying up to 16 x KS28
LA-SLING2T	Lifting chain (DIN EN 818-4) 2-leg , 8 mm

### Transportation accessories

KS28-PLA	Removable front dolly on wheels for 1 x KS28
KS28-COV	Protective cover for 1 x KS28
KS28-CHARIOT	Chariot for up to 4 x KS28
KS28-CHARIOTCOV	Protective cover for 3 or 4 x KS28 on KS28-CHARIOT

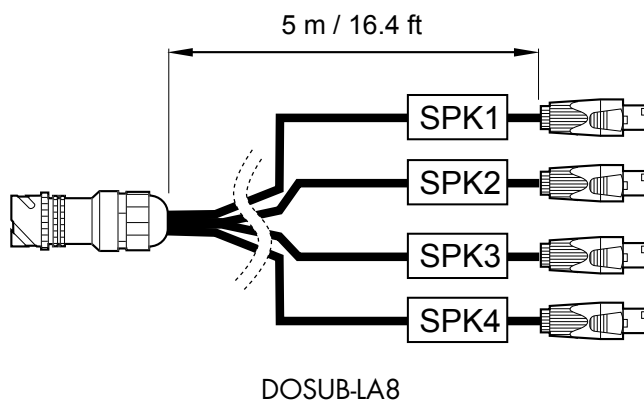
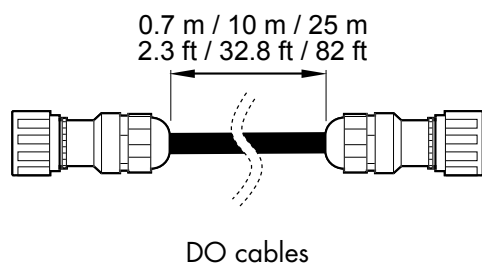
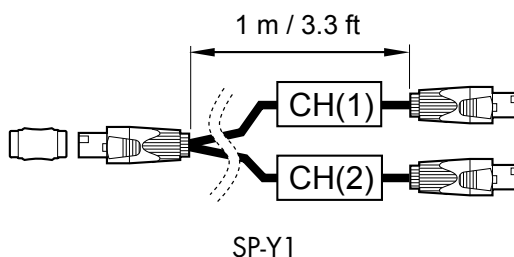
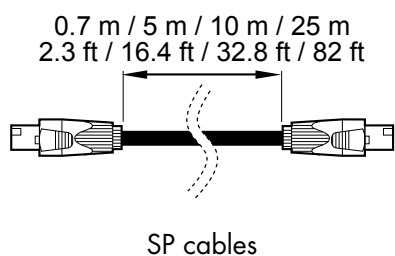
### Software applications

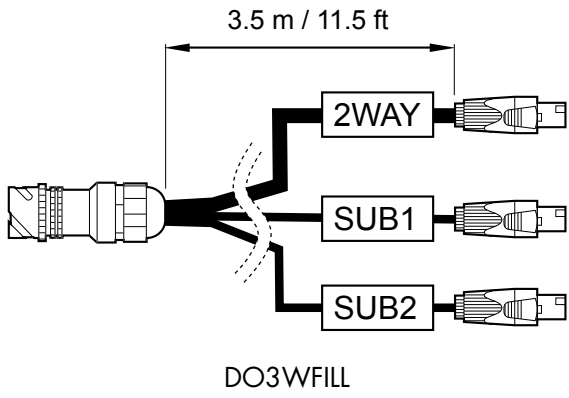
Soundvision	3D acoustical and mechanical modeling software
LA Network Manager	Software for remote control and monitoring of amplified controllers

**i** Refer to the **Soundvision** help.  
Refer to the **LA Network Manager** help.

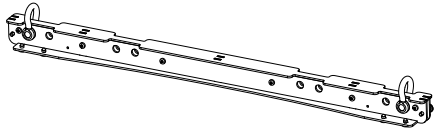
## System component illustrations

### Cables





### Rigging accessories

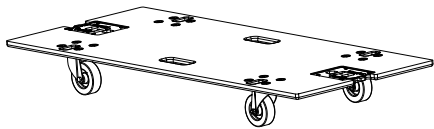


KS28-BUMP

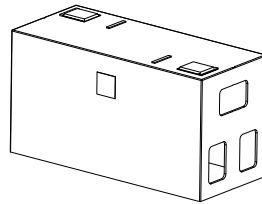


LA-SLING2T

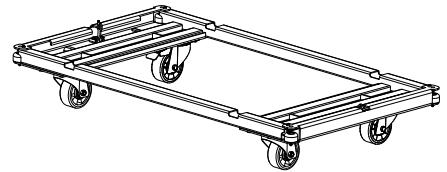
### Transportation



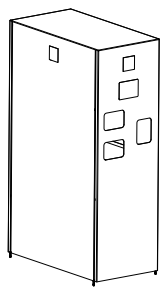
KS28-PLA



KS28-COV



KS28-CHARIOT



KS28-CHARIOTCOV

## Electro-acoustical description

### Preset description

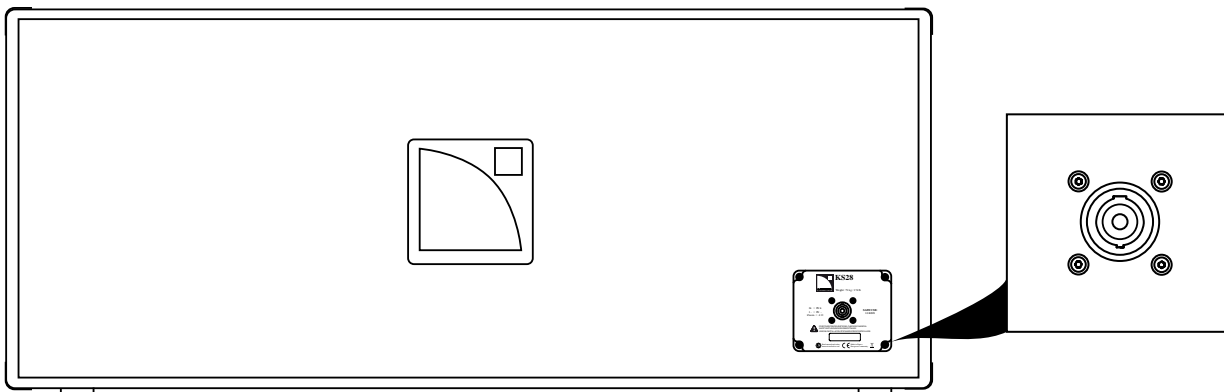
[KS28\_60] [KS28\_100]

outputs	channels	routing	gain	delay	polarity	mute
OUT 1	SB	IN A	0 dB	0 ms	+	ON
OUT 2	SB	IN A	0 dB	0 ms	+	ON
OUT 3	SB	IN A	0 dB	0 ms	+	ON
OUT 4	SB	IN A	0 dB	0 ms	+	ON

[KS28\_60\_C] [KS28\_100\_C] [KS28\_60\_Cx] [KS28\_100\_Cx]

loudspeaker elements	outputs	channels	routing	gain	delay	polarity	mute
SR	OUT 1	SR	IN A	0 dB	0 ms	+	ON
SB	OUT 2	SB					ON
SB	OUT 3	SB					ON
SB	OUT 4	SB					ON

### Connectors



KS28

1 x 4-point speakON

### Internal pinout for L-Acoustics subwoofers

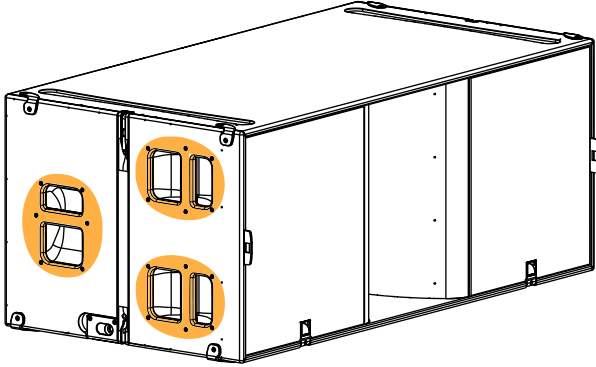
SpeakON points	1 +	1 -	2 +	2 -
Transducer connectors	LF +	LF -	Not linked	Not linked

## Rigging system description

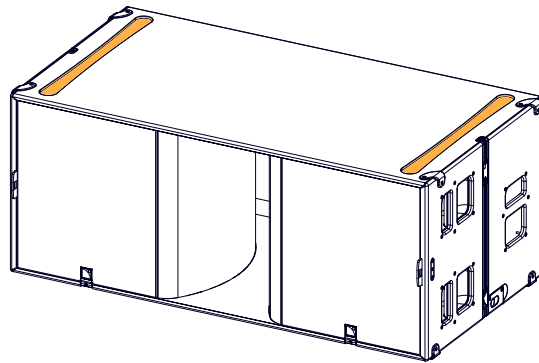
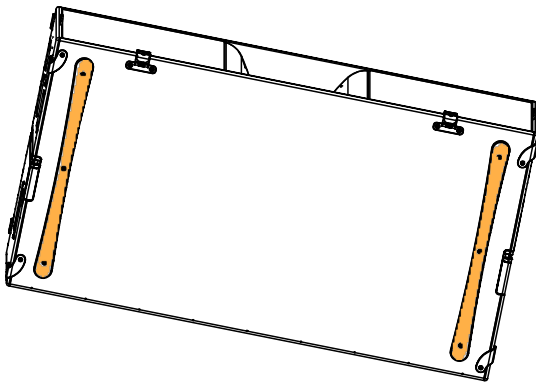
### KS28

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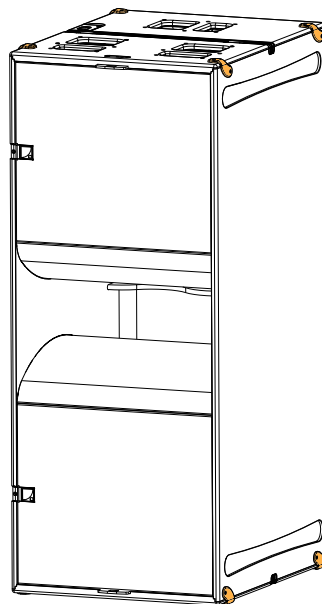
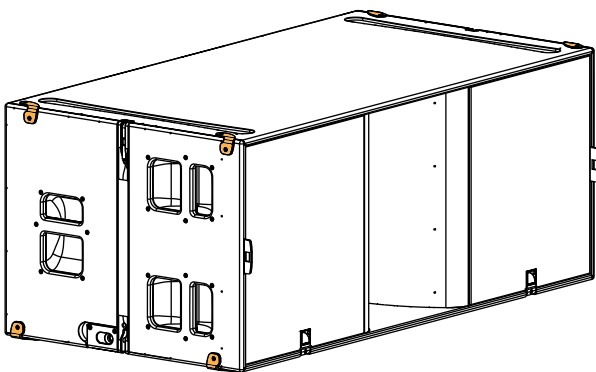
KS28 features three ergonomic handles on each side.



KS28 features two ground runners for enclosure protection. Two tracks on the top of the enclosure fit the ground runners in stacking deployment.



KS28 features eight L-shaped side runners for side protection and upright stacking.

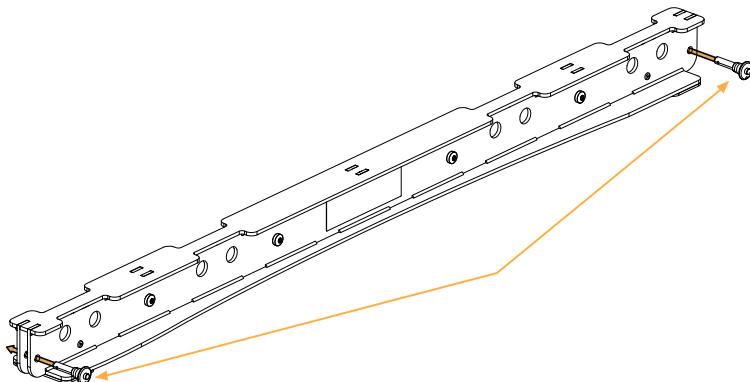




## Rigging elements

### KS28-BUMP

KS28-BUMP features two ball-locking pins to secure the KS28 rigging arms.

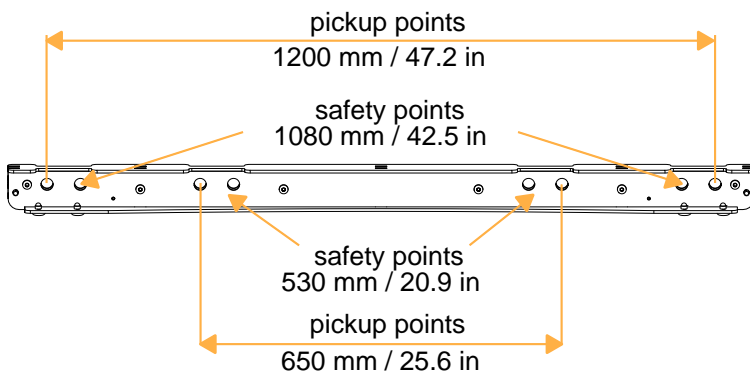


KS28-BUMP provides two sets of pickup points to choose from depending on the position of the lifting points. In addition, two sets of holes are available to implement a secondary safety.

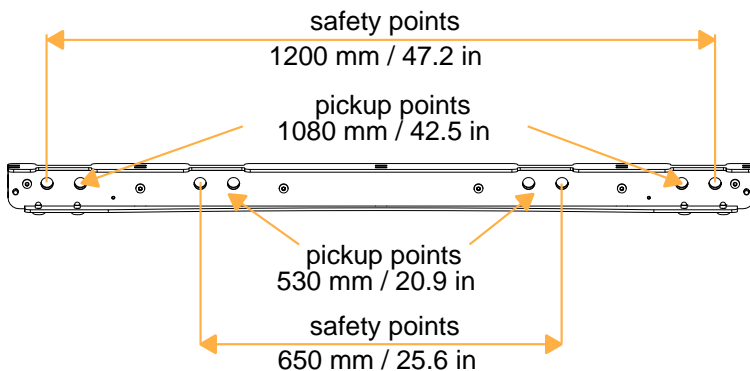


Always use the holes next to the pickup points to implement a safety.

#### Lifting with two motors (two chains)



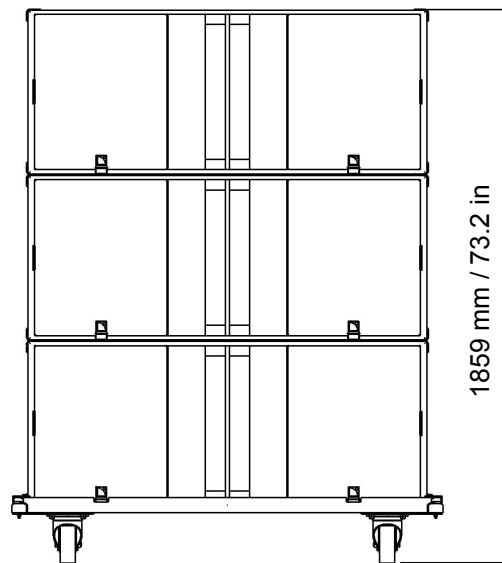
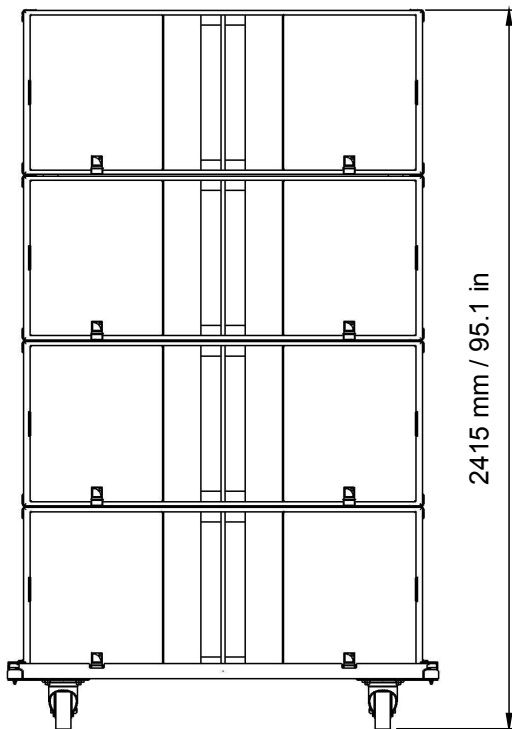
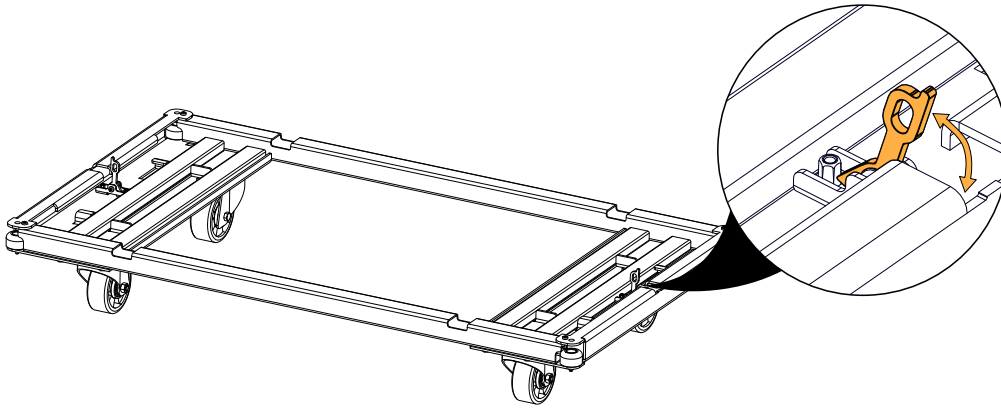
#### Lifting with one motor (one LA-SLING2T or an adapted bridle)



## Storage and handling elements

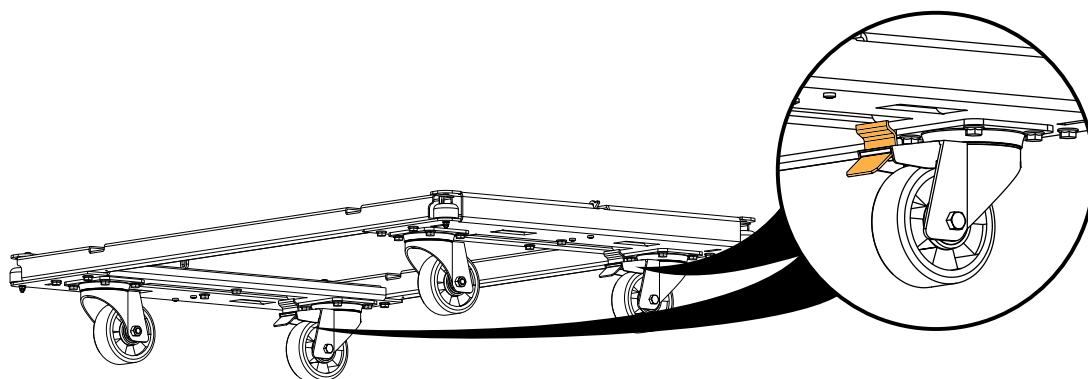
### KS28-CHARIOT

KS28-CHARIOT is designed to transport a stack of up to four KS28 and features two rigging arms to secure the lower KS28.

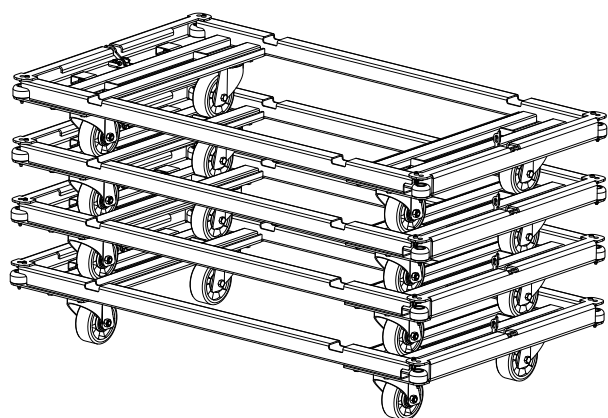


KS28-CHARIOT features two brakes for optimal stability.

**! Risk of brake damage**  
Do not use the brakes during transportation.

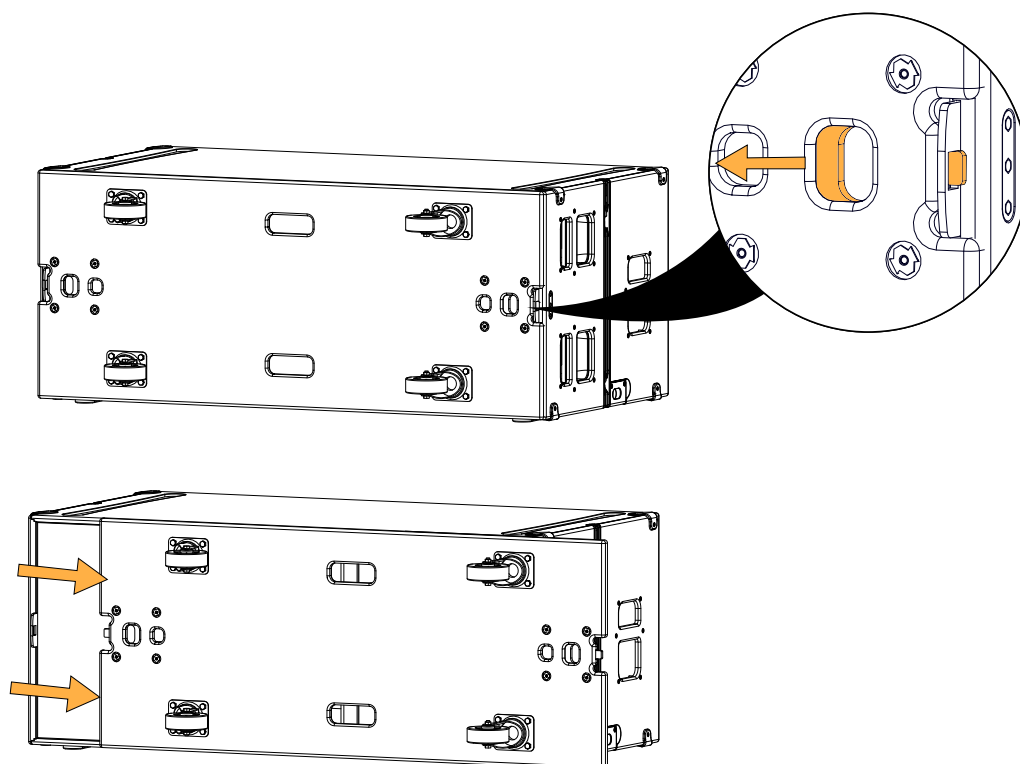


Multiple KS28-CHARIOT can be piled for easy storage.

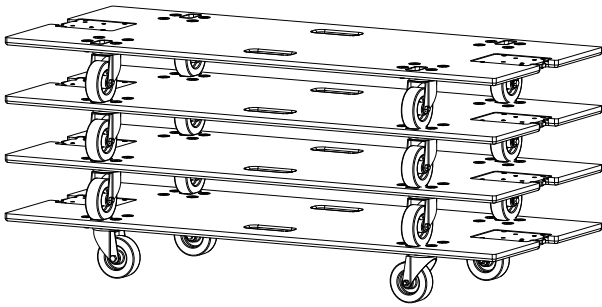


### KS28-PLA

KS28-PLA is a dolly board designed to be fitted to the front of a KS28 with two spring-loaded pins.



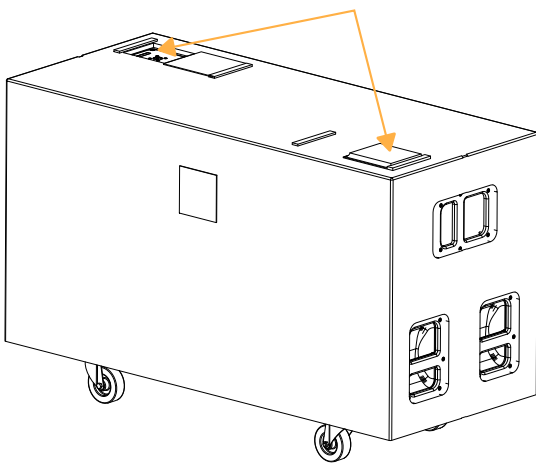
Multiple KS28-PLA can be piled for easy storage.



## KS28-COV and KS28-CHARIOTCOV

KS28-COV is an individual cover for KS28 on KS28-PLA.

foldable flaps to  
access the connectors

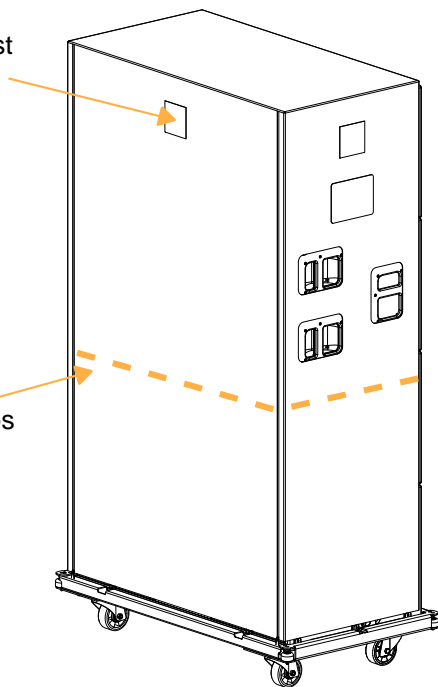


KS28-CHARIOTCOV is a cover for a stack of three to four KS28 on KS28-CHARIOT.

To fit a stack of three KS28, KS28-CHARIOTCOV must be folded inwards and secured with the provided velcro straps.

the logo must  
be on the  
front face

velcro straps  
(inside)



# Mechanical safety

## Flown configurations

The KS28 rigging system complies with 2006/42/EC: Machinery Directive. It has been designed following the guidelines of BGV-C1.

2006/42/EC: Machinery Directive specifies a safety factor of 4 against the rupture. The flown deployments described in this manual achieve a safety factor of **5 or more**.

Refer to Soundvision for the safety factor of a specific deployment.

The **safe limit** gives the maximum number of elements for which the safety factor is compliant with the 2006/42/EC: Machinery Directive, within the use defined in this manual and regardless of the other deployment parameters (site angles, inter-element angles, etc.).

The **maximum limit** gives the maximum number of elements for which the safety factor can be compliant with the 2006/42/EC: Machinery Directive, when the other deployment parameters provide the best mechanical conditions.

For mixed arrays refer to your Soundvision model.

## KS28


configuration	rigging accessory	maximum / safe limit
Flown	KS28-BUMP	16

## Other configurations


For other configurations, respect the recommended maximum limit for optimal stability.

Configuration	Rigging accessory	Maximum limit
Ground-stacked	No rigging accessory	4
Stacked upright	No rigging accessory	2
Stacked on chariot	KS28-CHARIOT	4

## Assessing mechanical safety

 **Mechanical safety of the rigging system**  
Before any installation, always model the system in Soundvision and check the **Mechanical Data** section for any stress warning or stability warning.

In order to assess the actual safety of any array configuration before implementation, refer to the following warnings:

 **Rated working load limit (WLL) is not enough**  
The rated WLL is an indication of the element resistance to tensile stress. For complex mechanical systems such as loudspeaker arrays, WLLs cannot be used per se to determine the maximum number of enclosures within an array or to assess the safety of a specific array configuration.

### Mechanical modeling with Soundvision

The working load applied to each linking point, along with the corresponding safety factor, will depend on numerous variables linked to the composition of the array (type and number of enclosures, splay angles) and the implementation of the flying or stacking structure (number and location of flying points, site angle). This cannot be determined without the complex mechanical modeling and calculation offered by Soundvision.

### Assessing the safety with Soundvision

The overall safety factor of a specific mechanical configuration always corresponds to the lowest safety factor among all the linking points. Always model the system configuration with the Soundvision software and check the **Mechanical Data** section to identify the weakest link and its corresponding working load. By default, a stress warning will appear when the mechanical safety goes beyond the recommended safety level.

### **Safety of ground-stacked arrays in Soundvision**

For ground-stacked arrays, a distinct stability warning is implemented in Soundvision. It indicates a tipping hazard when the array is not secured to the ground, stage or platform. It is the user's responsibility to secure the array and to ignore the warning.

### **Additional safety for flown arrays**

When flying an array, use available holes to implement a secondary safety.

### **Considerations must be given to unusual conditions**

Soundvision calculations are based on usual environmental conditions. A higher safety factor is recommended with factors such as extreme high or low temperatures, strong wind, prolonged exposition to salt water, etc. Always consult a rigging specialist to adopt safety practices adapted to such a situation.

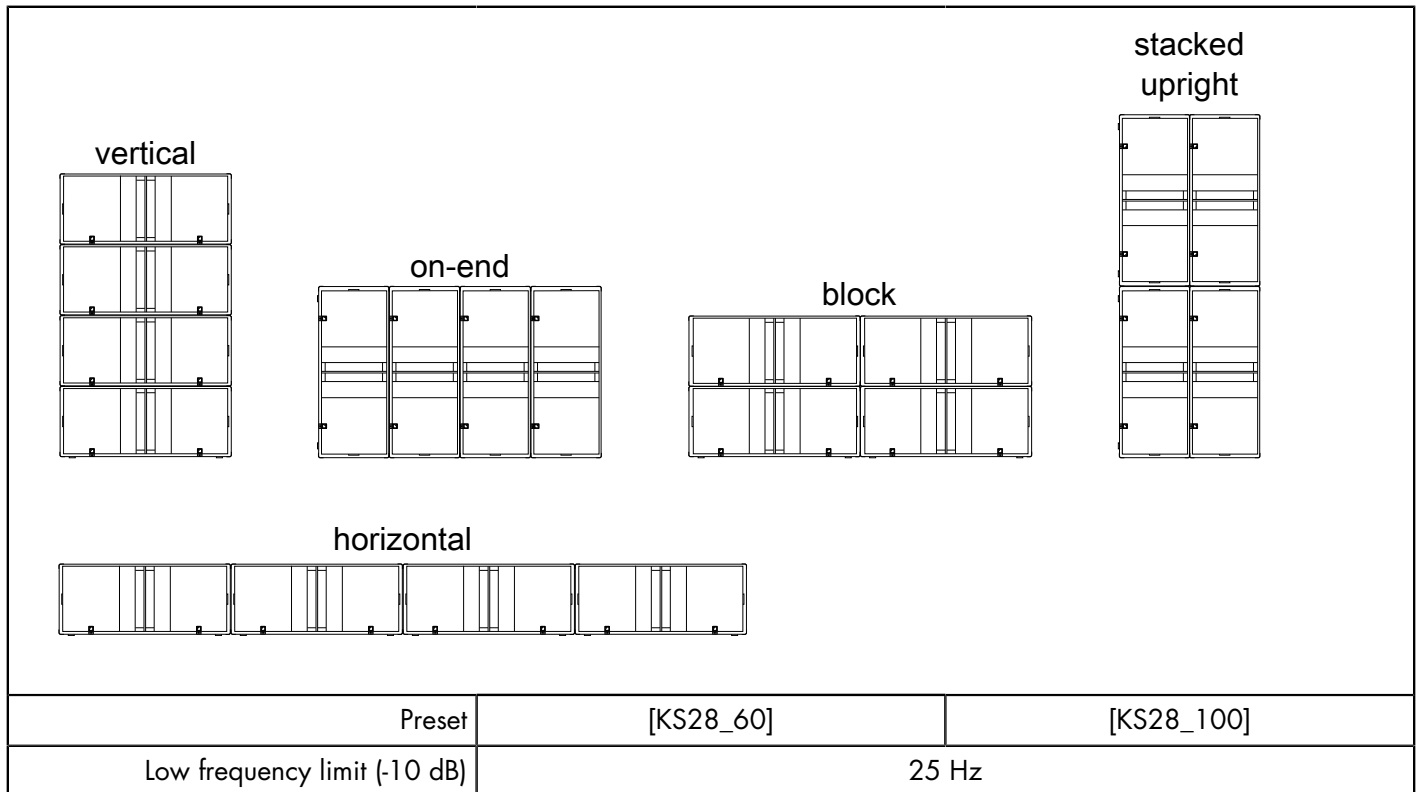
# Loudspeaker configurations

## KS28 in standard configuration

Deployed in a standard configuration, a KS28 system operates with an omnidirectional directivity pattern over the nominal bandwidth of the KS28 enclosure.

The [KS28\_60] and [KS28\_100] factory presets provide the subwoofer system with an upper frequency limit at 60 Hz and 100 Hz respectively in order to optimize the acoustic coupling with a main full-range system.

The KS28 subwoofers can be driven by the LA12X / LA2Xi amplified controllers.



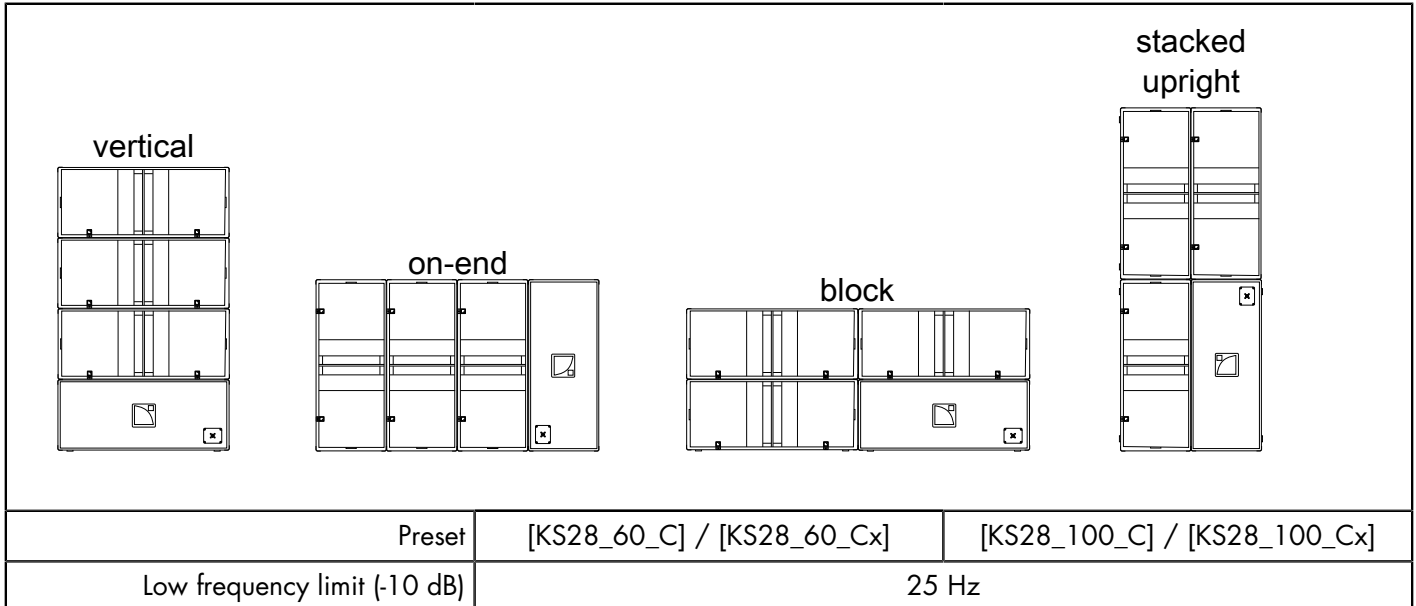
- ! Delay values**  
When combining a line source with subwoofers, delays may have to be added to the presets. Refer to the Preset Guide to obtain the pre-alignment delay values.
- ! Grouping subwoofers**  
Place the subwoofer enclosures side by side. If not possible, the maximum distance between two adjacent acoustic centers must be 2.8 m (9.2 ft) or 1.7 m (5.6 ft) if the upper frequency limit of the subwoofer system is at 60 Hz or 100 Hz, respectively.

## KS28 in cardioid configuration

Deployed in a cardioid configuration, a KS28 system produces a rear SPL rejection. The deployment consists of an array of four KS28 with one element turned towards the rear (reverse). Refer to the **Cardioid Configuration** technical bulletin for more information.

The [KS28\_60\_C] / [KS28\_60\_Cx] and [KS28\_100\_C] / [KS28\_100\_Cx] factory presets provide the subwoofer system with an upper frequency limit at 60 Hz and 100 Hz respectively in order to optimize the acoustic coupling with a main full-range system.

The KS28 subwoofers can be driven by the LA12X / LA2Xi amplified controllers.



### ! Use [xxxx\_xx\_C] or [xxxx\_xx\_Cx] on a reversed subwoofer in a cardioid configuration

The cardioid configuration consists in reversing 1 element in an array of 4 subwoofers. Refer to the subwoofer owner's manual and to the **Cardioid configurations** technical bulletin.

### ! Delay values

When combining a line source with subwoofers, delays may have to be added to the presets. Refer to the Preset Guide to obtain the pre-alignment delay values.

### ! Grouping subwoofers

Place the subwoofer enclosures side by side. If not possible, the maximum distance between two adjacent acoustic centers must be 2.8 m (9.2 ft) or 1.7 m (5.6 ft) if the upper frequency limit of the subwoofer system is at 60 Hz or 100 Hz, respectively.



# Inspection and preventive maintenance

## How to do preventive maintenance

---

Inspect the system before any deployment and after any corrective maintenance operation.

Perform preventive maintenance at least once a year.

### Rigging and hardware

Perform the [Rigging part inspection](#) (p.22) on each rigging part.

Use the [Mechanical system overview](#) (p.23) to identify critical parts of the system and apply the specific checks described in the [Inspection references](#) (p.26).

Do the [Rigging check](#) (p.31).

If any parts are damaged, contact your L-Acoustics representative for further instructions.

### Acoustics

Perform the [Enclosure check](#) (p.33).

Perform the [Listening test](#) (p.35) to detect any degradation in sound quality.

If necessary, refer to the [Corrective maintenance](#) (p.47) section for speaker repair kits and maintenance instructions.

## Rigging part inspection

---

### About this task

For critical rigging parts, use the [Inspection references](#) (p.26) for comparison and specific manipulations.

The term "rigging part" comprises:

- lifting accessories such as clamps and shackles
- rigging accessories such as rigging frames, rigging interfaces, and brackets
- fasteners used for assembling two products together such as ball-locking pins, rigging axes, and safety pins
- rigging elements integrated in the product such as rigging arms and rails
- transportation accessories

This inspection procedure covers only L-Acoustics products. To inspect other products that are part of the lifting chain, refer to the manufacturer's instructions.

### Prerequisite

Perform the inspection in a well-lit environment.

### Procedure

1. Check that the rigging part is present.
2. If applicable, disassemble the rigging part from the enclosure or the rigging accessory.

Check that the tethers are intact and safely secured.

3. Inspect the part from every side.

Compare with the **reference pictures**.

Check for:

- corrosion
- wear and cracks
- bends and dents
- holes
- missing safety cues
- missing identification labels
- missing or loose fasteners



#### Replacing screws

If a screw is loose, remove and replace it.

Always use the new screws provided in the repair kit.

If no new screw is available, add blue threadlocker before reusing the screw.

Do not apply more than the indicated torque.

4. Check the **geometry** of the part to identify critical deformations.

Place the rigging part on a flat surface or hold a level against it.

5. Check the **moving parts**.

Make sure that the mechanism engages correctly.



### What to do next


If a problem is detected, perform the authorized maintenance operations or contact your L-Acoustics representative.


## Mechanical system overview

---

Critical parts of the lifting chains are highlighted.

The  indicates a visual inspection. The  indicates a functional check.

 Perform the [Rigging part inspection](#) (p.22) on critical parts.  
For each part, refer to the [Inspection references](#) (p.26).

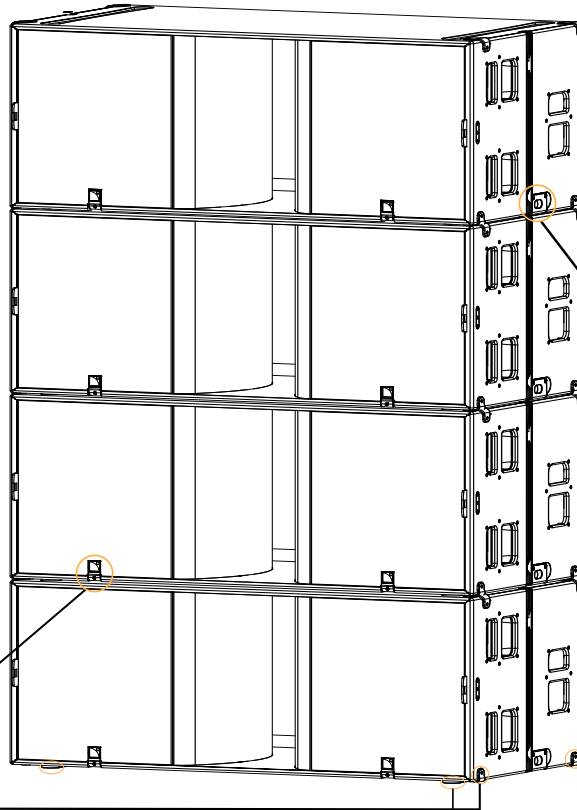
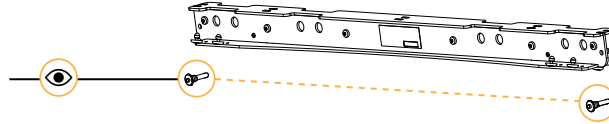
 **Replacing screws**  
If a screw is loose, remove and replace it.  
Always use the new screws provided in the repair kit.  
If no new screw is available, add blue threadlocker before reusing the screw.  
Do not apply more than the indicated torque.

## KS28 array with KS28-BUMP

Shackles (p.26)



Ball-locking pins (p.27)

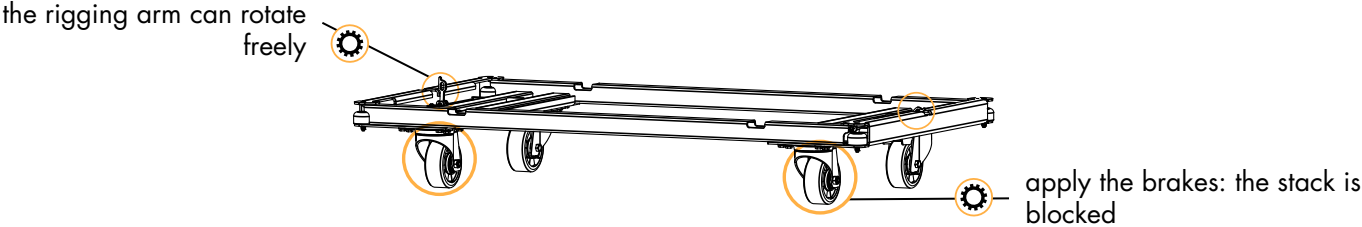
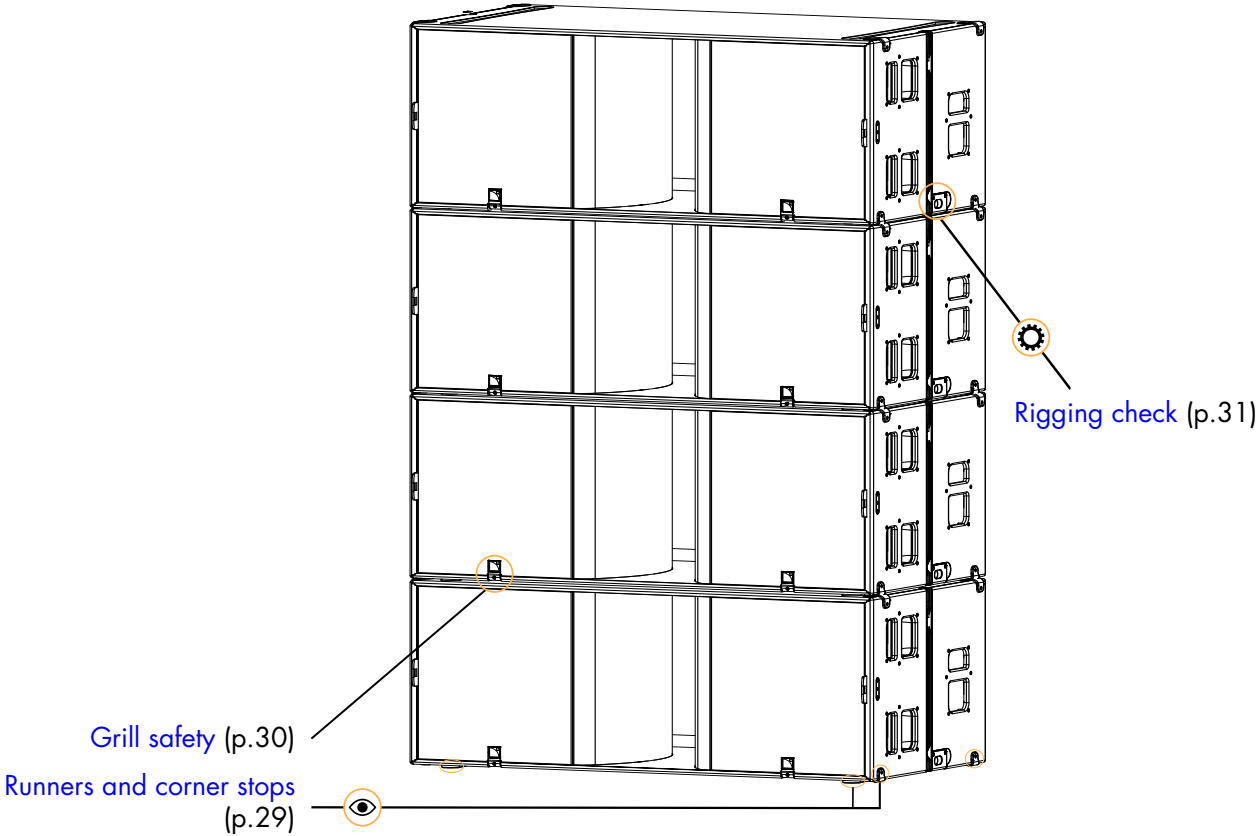


Rigging check (p.31)

Grill safety (p.30)

Runners and corner stops (p.29)

# KS28 array with KS28-CHARIOT

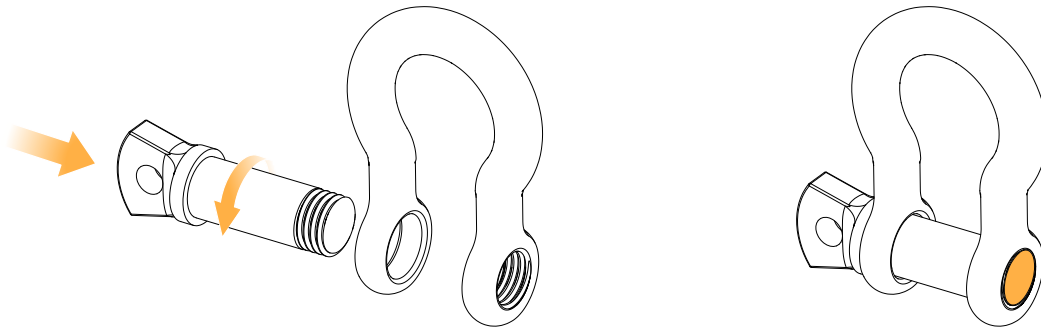


## Inspection references

---

### Shackles

Drive the shackle axis in its lodging. Make sure that the end is flush with the shackle.



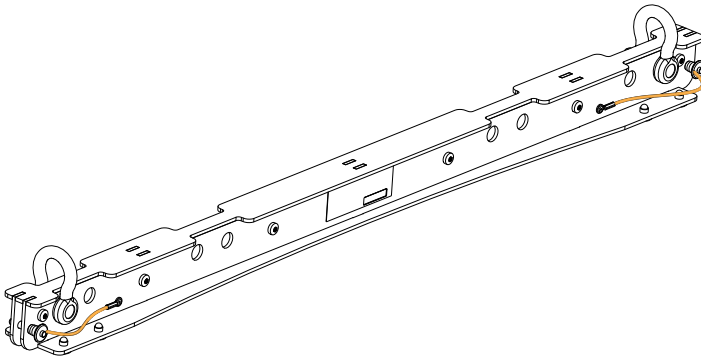
### Related tasks

[Rigging part inspection \(p.22\)](#)

## Ball-locking pins

- Tethers are intact and safely secured.
- Test the ball-locking mechanism (see [Moving parts](#) (p.27)).

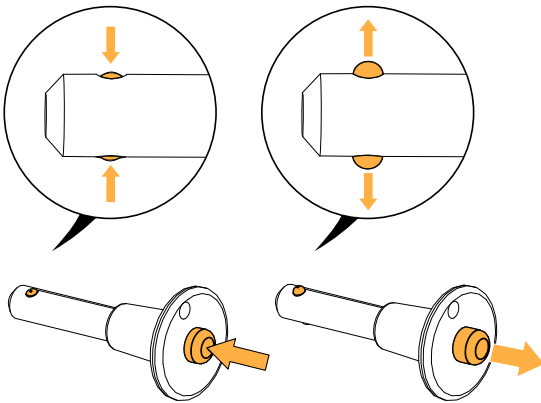
### Reference pictures



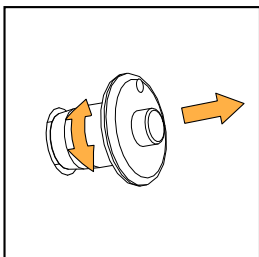
KS28-BUMP

### Moving parts

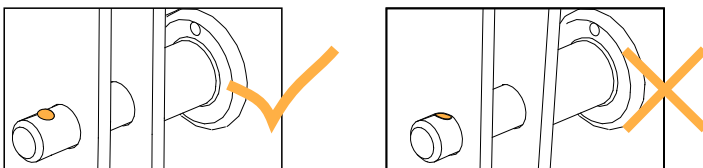
1. Press the push button. The ball-locking mechanism is retracted.
2. Release the button. The ball-locking mechanism is activated.



3. Insert the pin in each storage and rigging hole. Pull and rotate the pin. The pin must remain inside the hole.



If the pin is inserted in two plates, the ball must pass through both plates and lock the pin in place.



If the check fails, **immediately withdraw the product from use and contact L-Acoustics.**

**Related tasks**

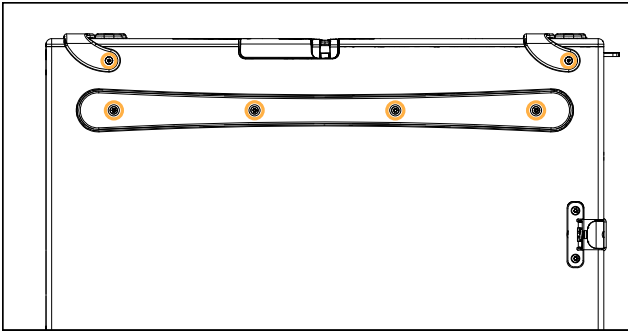
[Rigging part inspection](#) (p.22)



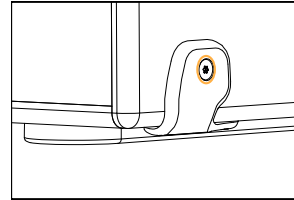
## Runners and corner stops

- Runners are not worn out.
- Screws are tightened.

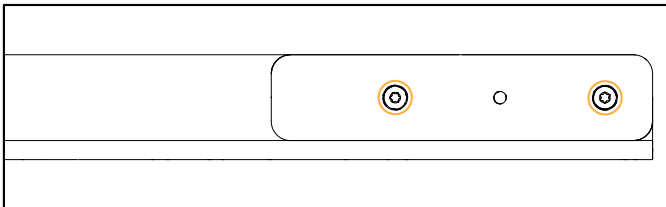
### Reference pictures



KS28 ground runner and corner stops



KS28 corner stop



KS28-OUTRIG runner

**!** Contact your L-Acoustics representative for repair instructions.

### Related tasks

[Rigging part inspection](#) (p.22)

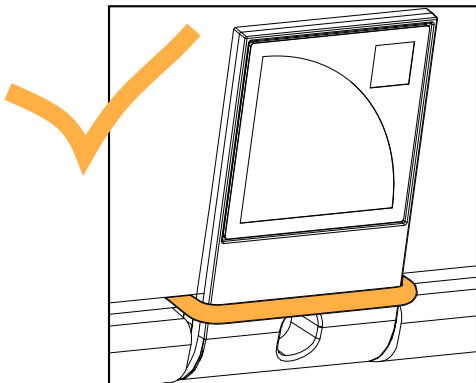
## Grill safety

Visually and mechanically inspect the grill safety.

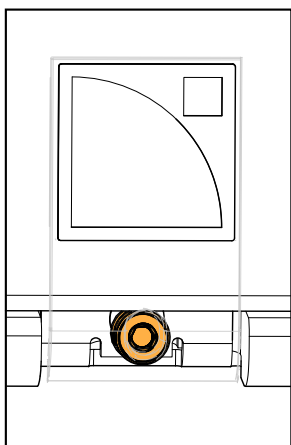
### Moving parts

#### Procedure

1. Make sure that the O-rings are not damaged.

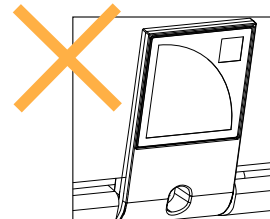
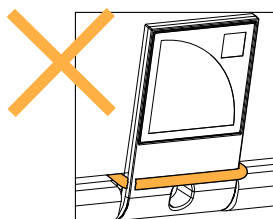
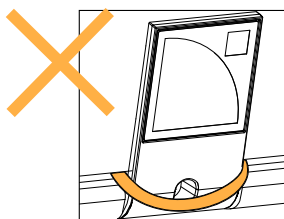
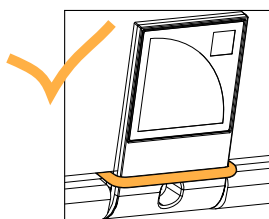


2. Make sure that the screw is tightened.



3. Pull on the O-rings:

- Make sure they do not break.
- Make sure they are not loose.



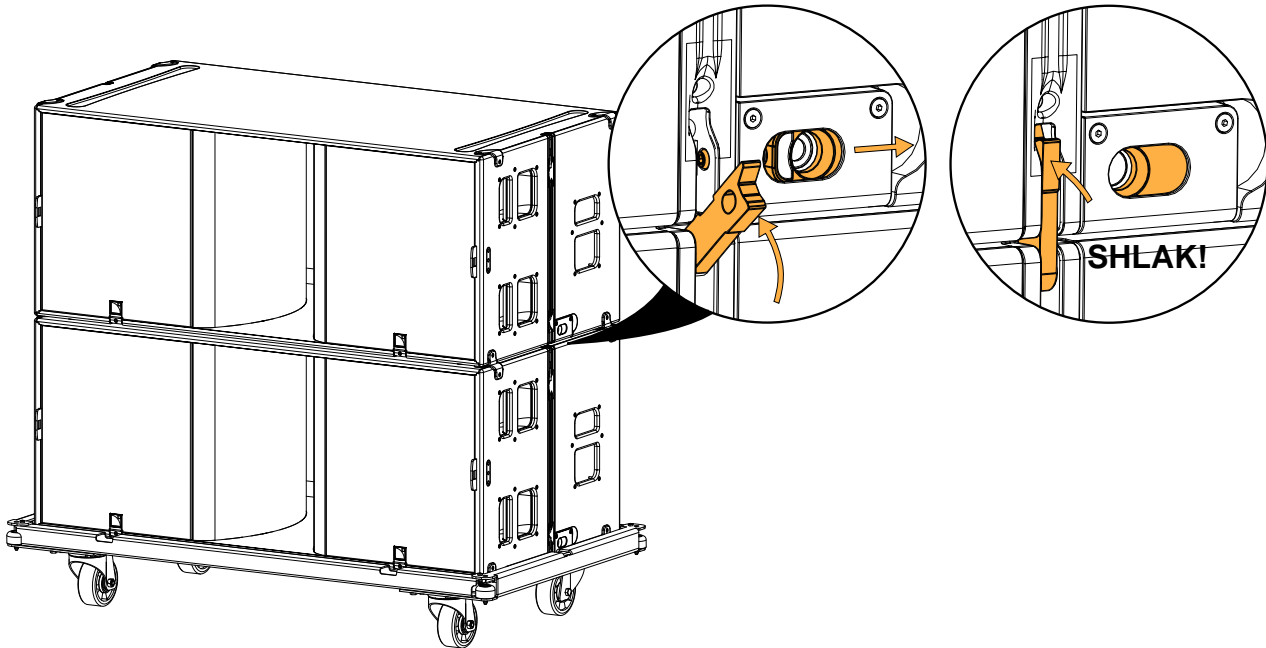
## Rigging check

### Procedure

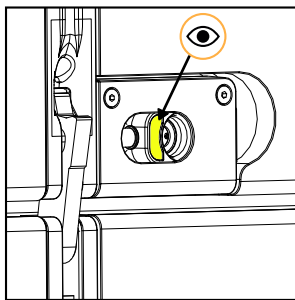
1. Secure one KS28 on top of another one.

**i** Push and slide to unlock the spring-loaded pin.

Connect the rigging systems on both sides.

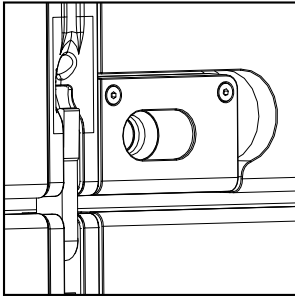


- a. The rigging arm is removed from its storage position with some resistance.
- b. When pushing and sliding the mechanism, the spring-loaded pin is retracted with some resistance.
- c. Upon release, the spring-loaded pin quickly returns to its initial position.
- d. The yellow labels on the rigging arm and on the spring-loaded pin are visible when the rigging system is not locked.



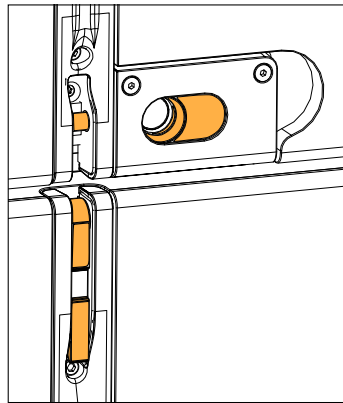
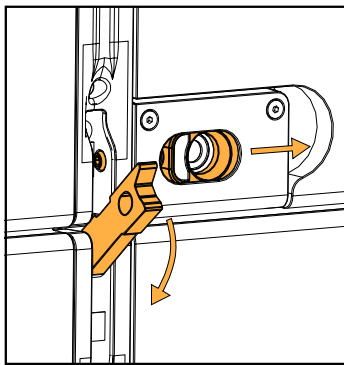
not locked

- e. No yellow label are visible when the rigging system is locked.



locked

2. Hold the top enclosure by the handles and shake the assembly. The two enclosures remain attached.
3. Unlock the rigging system on both sides.



4. Switch the enclosures and repeat the procedure.

## Acoustical check

---

### Enclosure check



**This feature is available on:**

LA12X

ENCLOSURE CHECK measures impedance at the reference frequencies for the connected loudspeaker family. The measured impedance is compared to the expected range allowing for fast detection of loudspeakers presenting circuit continuity issues.



The results can be used for preliminary diagnosis but cannot replace a comprehensive quality control.

### Prerequisite



**ENCLOSURE CHECK measurements can only be reliable if the following requirements are met:**

Environment and temperature:

- Ambient temperature must be comprised between 0 °C / 32 °F and 40 °C / 104 °F. Ideal temperature is 20 °C / 68 °F.
- Enclosures must be at room temperature. If warm from a recent high level use or recently moved from a cold environment, let the loudspeakers reach room temperature before starting.

Enclosures:

- Enclosures must be included in the embedded factory preset library.
- Enclosures must be in nominal operating conditions:
  - Remove covers or dollies obstructing the loudspeakers or the vents.
  - Check for obvious physical damage or air leak: visually inspect the grill, gasket, cabinet, and connector plate for loose, missing or damaged parts.

Connection:

- Use only 10 m / 30 ft 4 mm<sup>2</sup> / AWG 11 speaker cables.
- Do not connect enclosures in parallel.

Amplified controllers:

- Load a preset corresponding to the connected loudspeaker's family. Presets from the user memories may be used on condition they are made of presets supported in the embedded factory preset library.

### Procedure

1. Power up the amplified controller.
2. Connect the loudspeaker enclosures to the amplified controller.
3. Load a preset from or built from the embedded library corresponding to the connected loudspeaker family.
4. On the amplified controller, use the encoder wheel to select **MONITORING & INFO**. Press the OK key or the encoder wheel to validate.
5. Use the encoder wheel to select **ENCLOSURE CHECK**.



#### **Beware of sound levels.**

Although the sound pressure levels generated for the ENCLOSURE CHECK are moderate, do not stay within close proximity of the loudspeakers and consider wearing ear protection.

6. Press the OK key or the encoder wheel to launch the ENCLOSURE CHECK.

The amplified controller generates short sinusoidal signals simultaneously for each connected output.

The amplified controller displays the results for each output.

**7.** Depending on the displayed results, follow the instructions in the table.

<b>result</b>	<b>interpretation</b>	<b>instructions</b>
OK	measured impedance is within expected range	enclosure is in working order electrically
?	unsupported preset family	only supported enclosures should be tested
NC	Not Connected	if cables are connected: <b>a.</b> inspect the cables and connections <b>b.</b> go to step 8 (p.34)
NOK	measured impedance is not within expected range	<b>a.</b> check that all the prerequisites are met, in particular that the loaded preset corresponds to the connected speaker's family <b>b.</b> inspect the cables and connections <b>c.</b> go to step 8 (p.34)
UNDEF	measured impedance is undefined	

**8.** Under NC, NOK and UNDEF results, press and hold the corresponding OUT key.

The amplified controller displays:

- the tested frequencies,
- information on the measured impedance:
  - OPEN for open circuit (found in NC results),
  - SHORT for short circuit (found in NOK results), or
  - a percentage of variation from the expected range (found in NOK and UNDEF results)
- the number of operational transducers out of the total



Low variations from the expected range are acceptable: displayed percentage can be different from 0 and all transducers considered operational.

## Listening test

enclosure	preset	usable bandwidth
KS28	[KS28_100]	25 Hz - 110 Hz

### Procedure

1. Load the preset on an LA12X / LA2Xi amplified controller.
2. Connect a sinus generator to the amplified controller.



#### **Risk of hearing damage**

Set a low sound level to start and use ear protection to adjust before testing.

3. Scan the bandwidth focusing on the usable range.  
The sound should remain pure and free of unwanted noise.

### Troubleshooting for LF speakers

One or more LF speaker produces distorted, buzzing, rubbing, clicking, muffled or weak sound.

#### Possible causes

- The screws are not tightened with the appropriate torque.
- There is an air leak in the gasket.
- There is dust on the cone.
- The cone is damaged.
- The surround is torn or delaminated.
- The voice coil or the spider is damaged.

### Procedure

1. Perform the speaker disassembly procedure.
2. Visually inspect the cables and the connectors.
3. Visually inspect the speaker cone, the voice coil and the spider.

If any damage is visible, replace the speaker.

4. Carefully clean the speaker with a dry cloth.
5. Perform the reassembly procedure.  
Replace the speaker gasket and the screws.  
Apply the recommended torque.

6. Repeat the listening test.

If the problem persists, replace the speaker.

# Rigging procedures

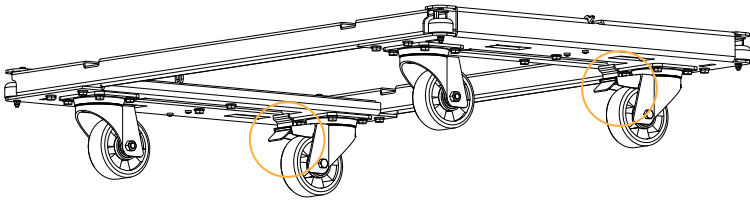
## Stacking KS28 vertically

type of deployment	stacked array
rigging accessories	KS28-PLA (optional)
	KS28-CHARIOT (optional)
min number of operators	2

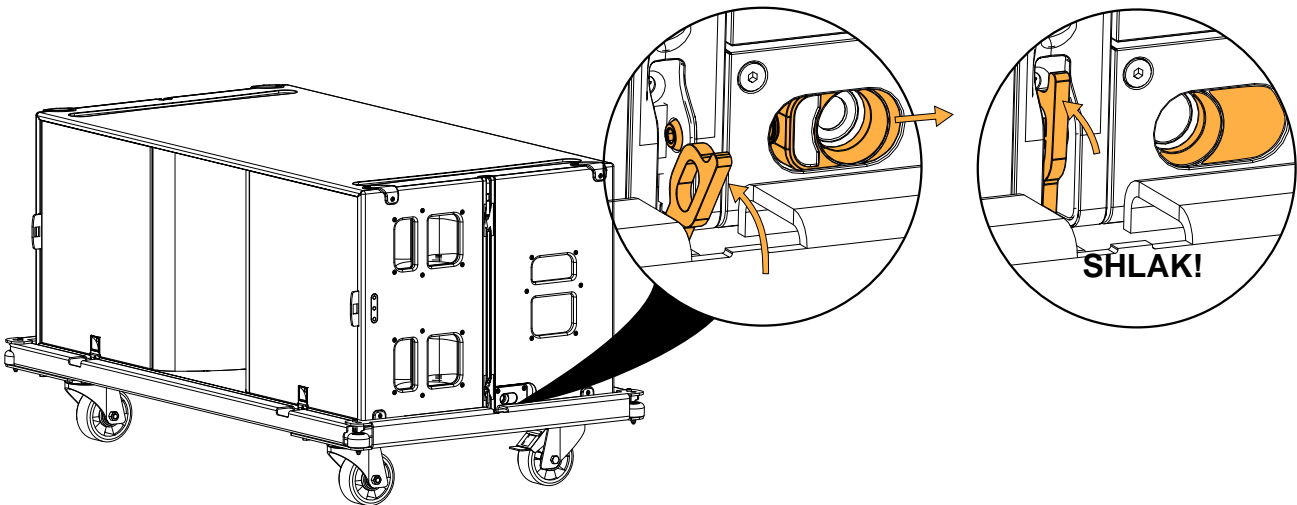
### Assembly

#### Procedure

1. Engage both brakes on KS28-CHARIOT.



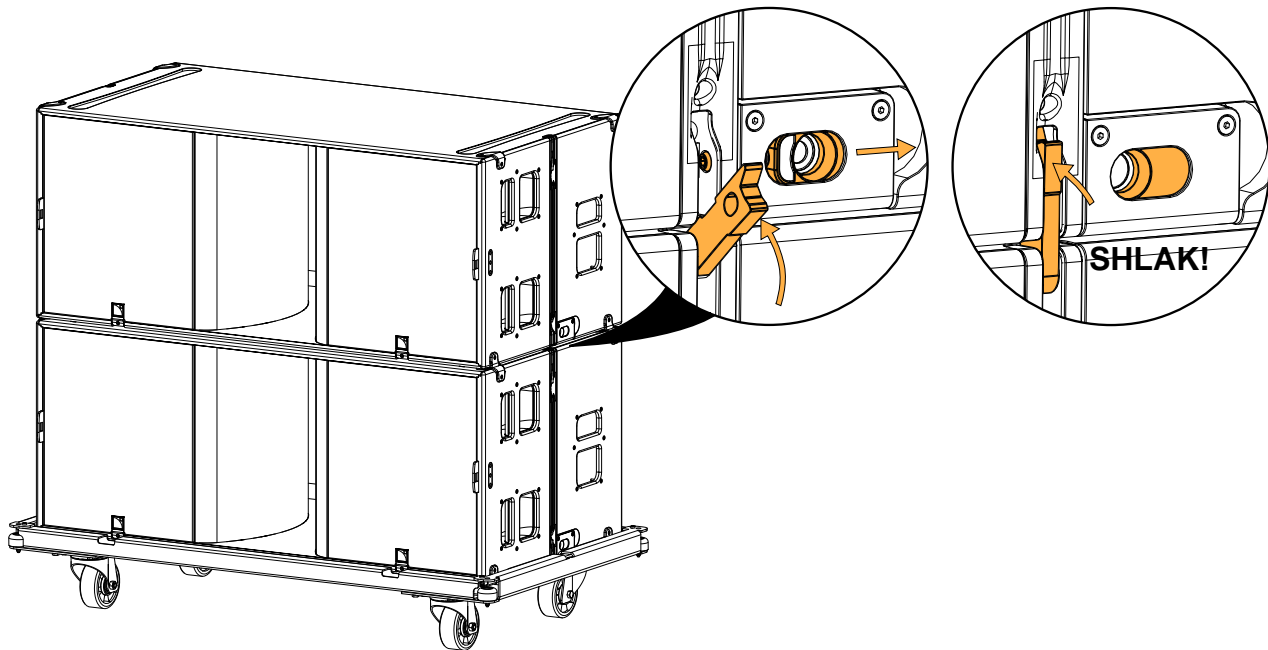
2. Place KS28 on KS28-CHARIOT and connect the two elements on both sides.



3. Place another KS28 on the assembly.  
Align the runners with the tracks.



4. Connect the two elements on both sides.



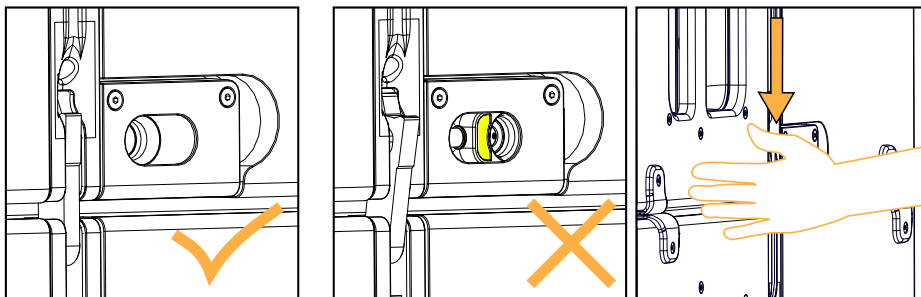
5. Repeat until the stack is complete.



### Final check

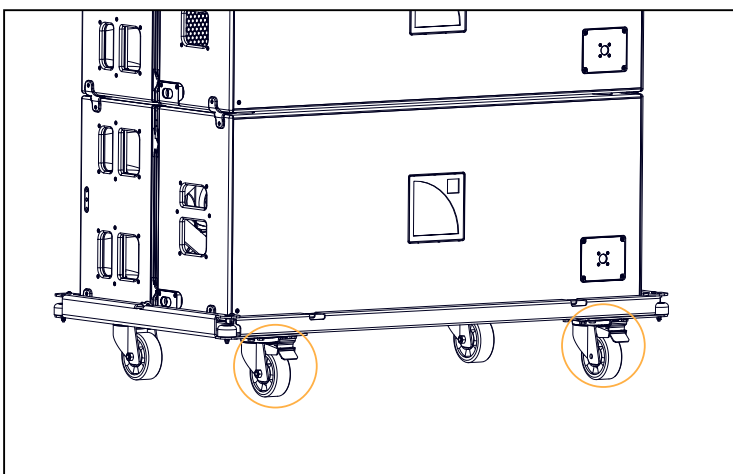
Visually check that no yellow labels are visible.

Manually check that all linking points are secured.



6. Disengage the brakes and position the stack at its final position.

7. Block the stack using both brakes.



## Stacking KS28 upright

type of deployment	stacked array
rigging accessories	KS28-PLA (optional)
min number of operators	3

**! Secondary safety**  
Secure the assembly with a ratchet strap.

**! Risk of falling objects**  
Verify that no unattached items remain on the product or assembly.

## Assembly

### Procedure

1. Place one KS28 on its side.



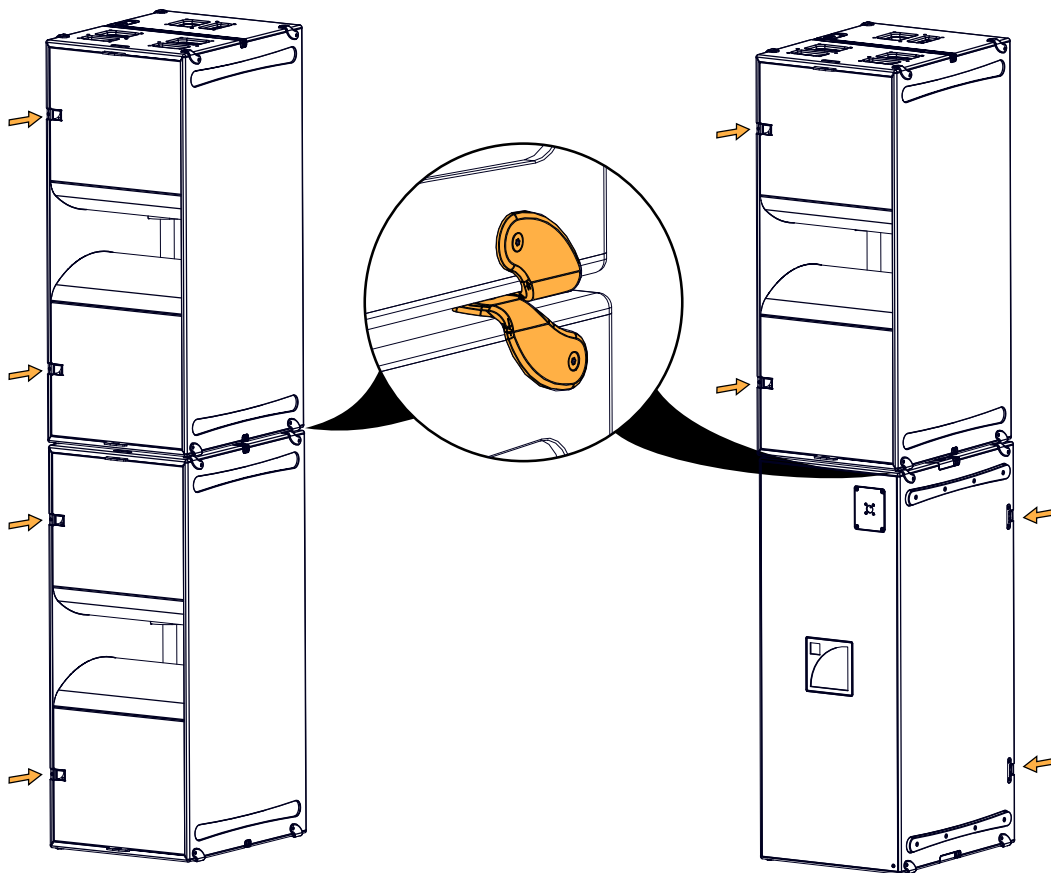
#### Enclosure position

In standard configuration, the logos on both enclosures must be on the same side.

In cardioid configuration, the logos must be on opposite sides.

2. Place another KS28 on the first one.

Make sure the side runners fit together.



## Flying KS28

type of deployment	flown array
rigging accessories	KS28-BUMP
	LA-SLING2T (optional)
	KS28-CHARIOT (optional)
additional material	2 Ø19 mm shackles WLL 3.25 t
min number of operators	2

### Secondary safety on KS28-BUMP

Use the holes next to the pick-up points to implement a secondary safety. Refer to [KS28-BUMP](#) (p.13). Consider using LA-SLING2T.

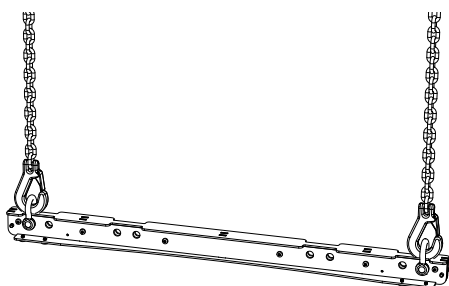
### Risk of falling objects

Verify that no unattached items remain on the product or assembly.

## Assembly

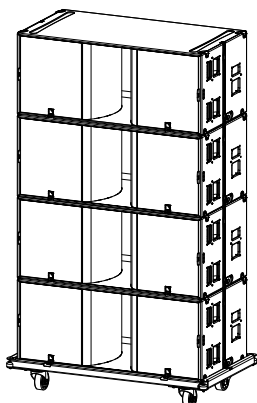
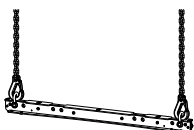
### Procedure

1. Secure two chains to the selected pick-up points on KS28-BUMP.

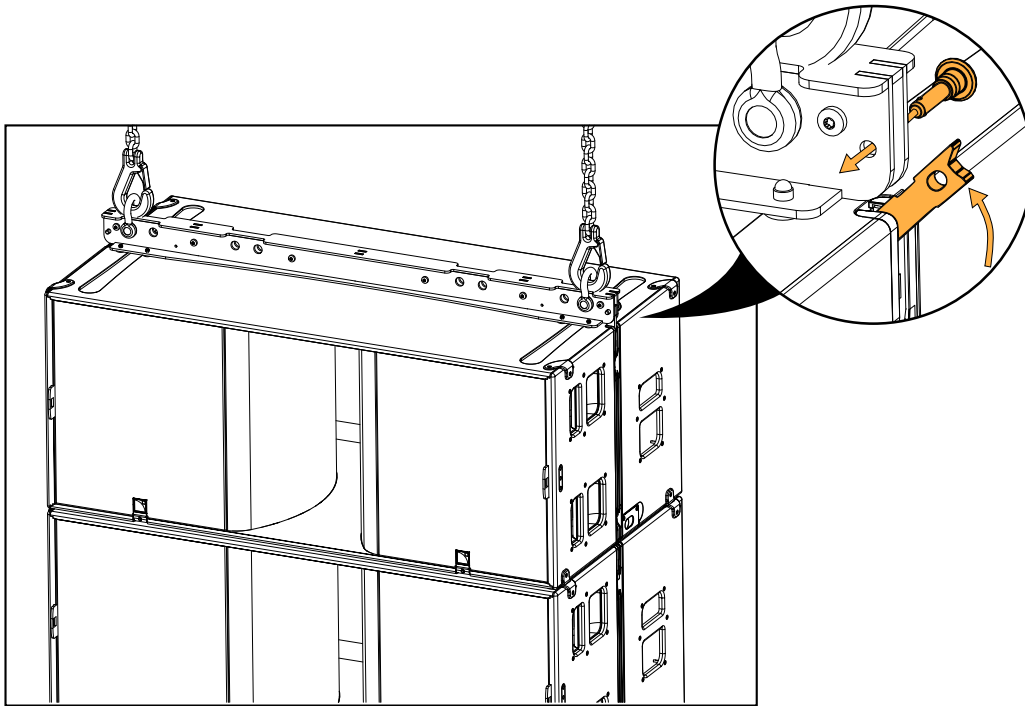


2. Lift the assembly.
3. Position a stack of KS28 under the pickup point.

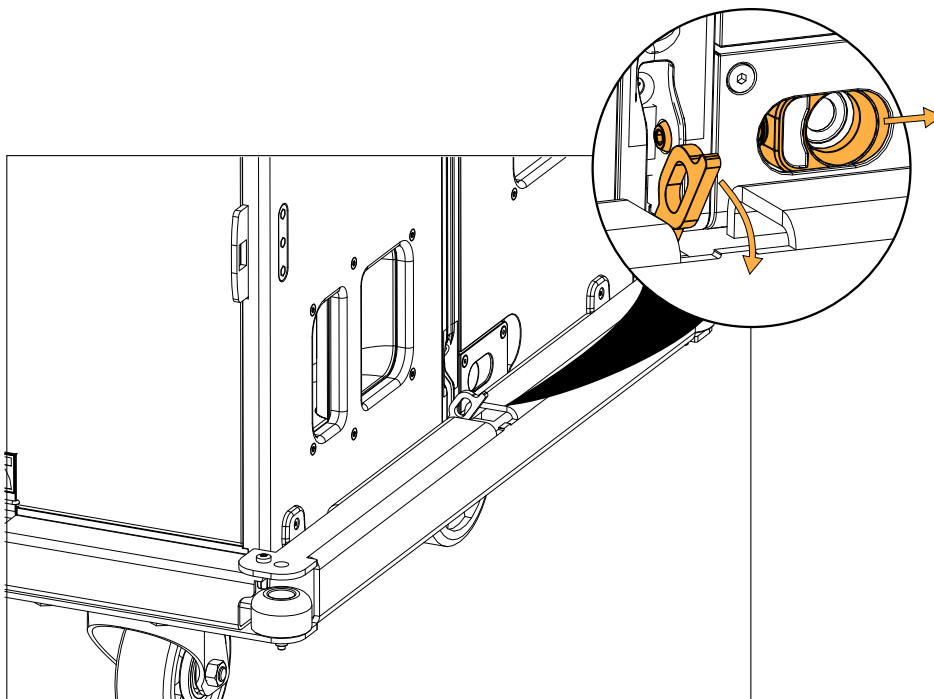
See [Stacking KS28 vertically](#) (p.36).



4. Lower the assembly and connect KS28-BUMP to the top enclosure on both sides.

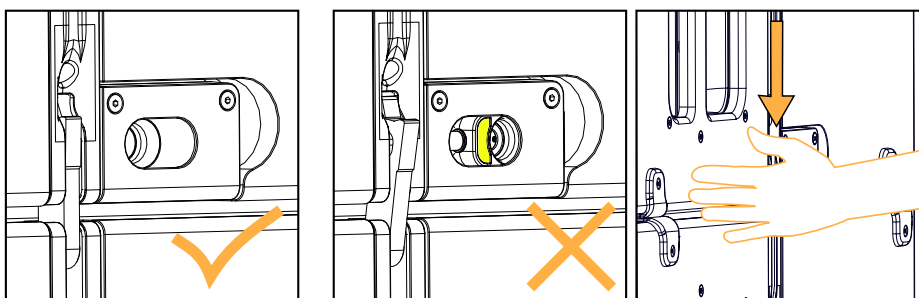


5. If KS28 is stacked on KS28-CHARIOT, remove the rigging arms from the chariot before lifting.



**! Final check**

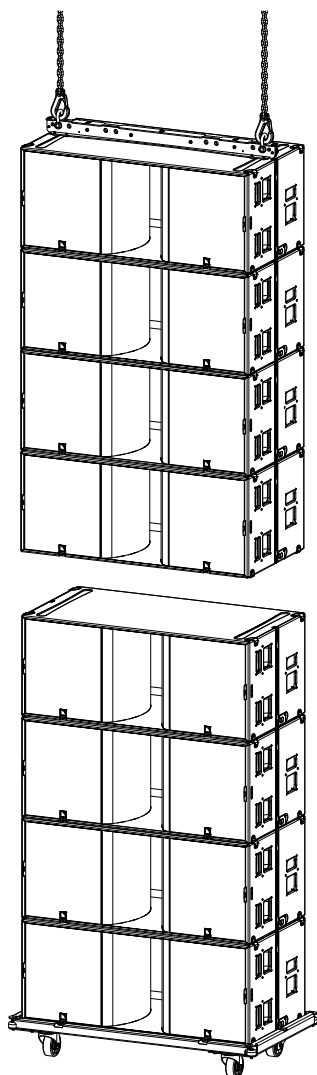
Visually check that no yellow labels are visible.  
Manually check that all linking points are secured.



**Risk of collision**

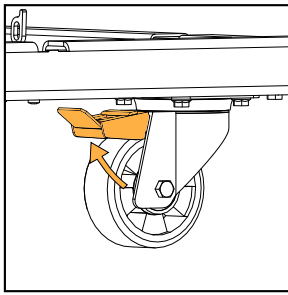
Do not stand close to the array when lifting the enclosures.

6. Lift the assembly and remove the chariot.
7. Position another KS28 or KS28 stack under the pickup point.



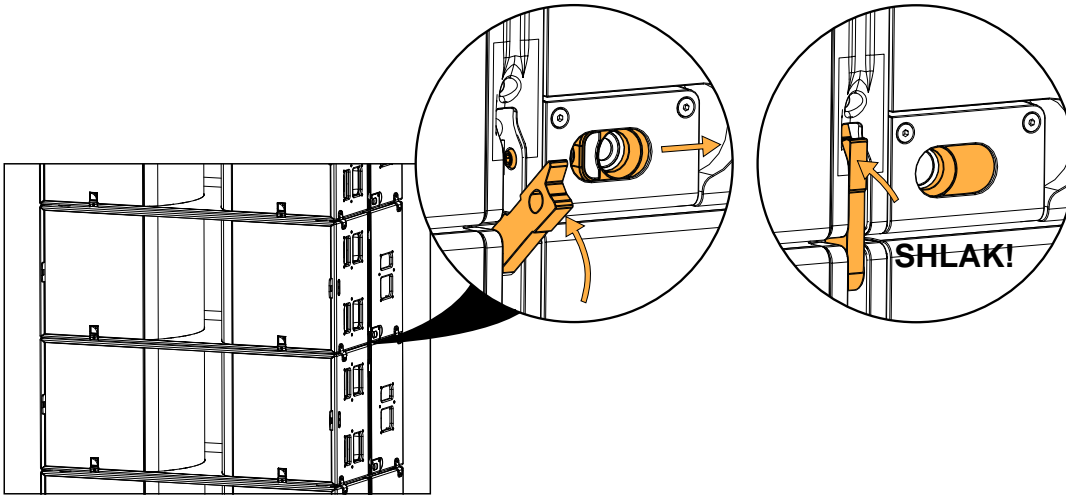


If KS28 is stacked on KS28-CHARIOT, make sure the KS28-CHARIOT brakes are not engaged.



8. Lower the assembly on the stack and connect the stack to the assembly on both sides.

Align the runners and the tracks.

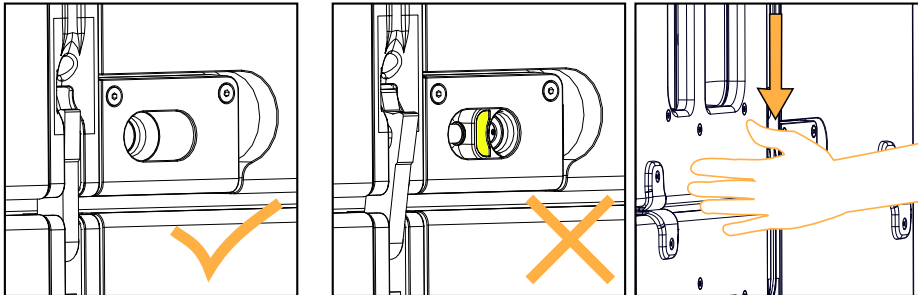


9. Repeat steps 5 (p.40) to 8 (p.42) until the array is complete.



**Final check**

Visually check that no yellow labels are visible.  
Manually check that all linking points are secured.



**Risk of collision**

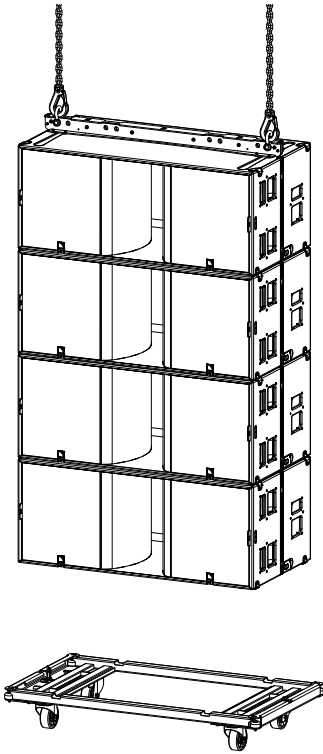
Do not stand close to the array when lifting the enclosures.

10. Lift the array to its final position.

## Disassembly

### Procedure

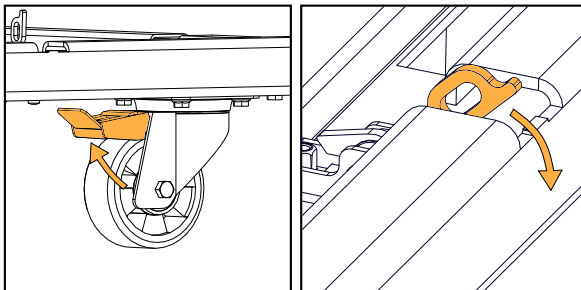
1. Position a KS28-CHARIOT under the array.



#### Prepare KS28-CHARIOT

Make sure the KS28-CHARIOT brakes are not engaged.

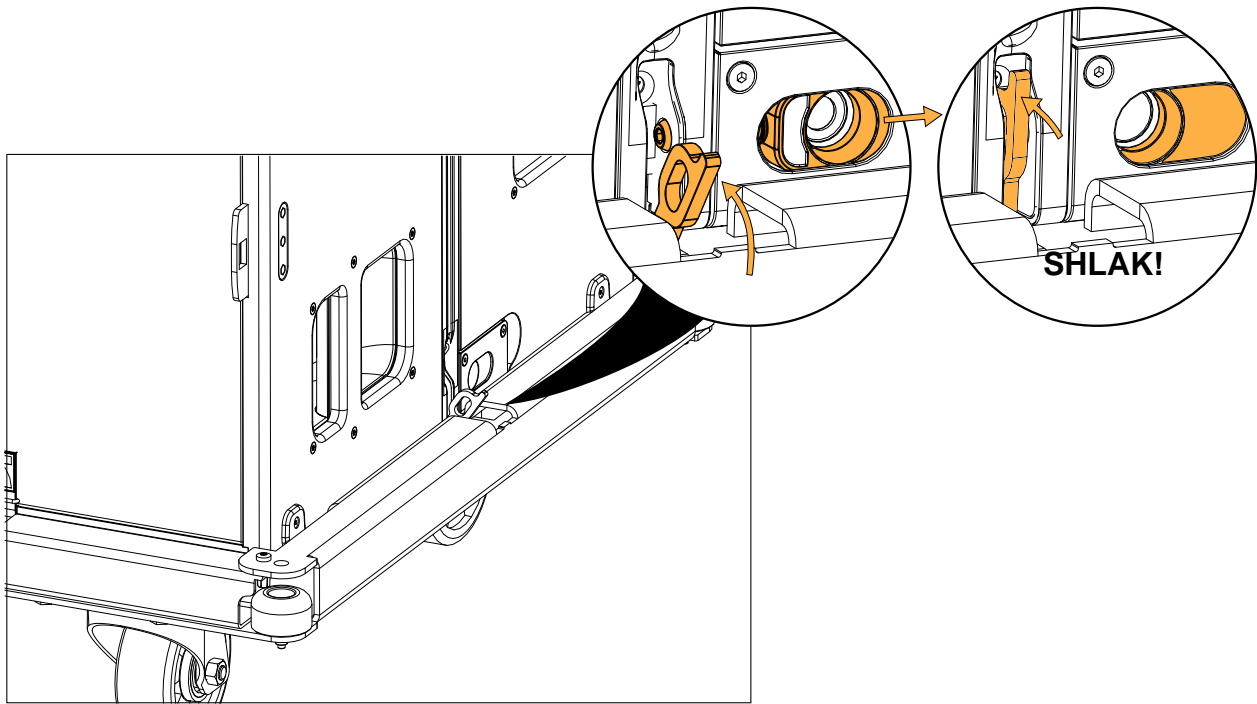
Make sure the KS28-CHARIOT rigging arms are in the open position.



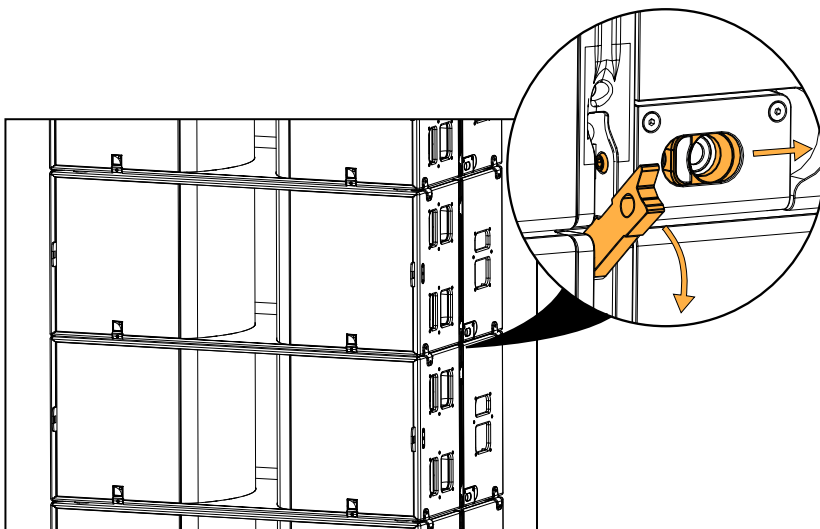
Proceed slowly when lowering the array.

2. Lower the array until it rests on KS28-CHARIOT.

3. Secure the bottom enclosure to KS28-CHARIOT.



4. Disconnect a stack from the array on both sides.



Make sure both linking points are disconnected before lifting the array.

5. Lift the assembly and put the stack aside.
6. Repeat the procedure.



## Connection to LA amplified controllers

**!** Refer to the **Amplification reference** technical bulletin for the latest information on compatibility with amplified controllers and cabling schemes for all enclosure types.

### Enclosure drive capacity per amplified controller

Make sure the total number of connected enclosures does not exceed the maximum number of enclosures per controller (refer to the footnote).

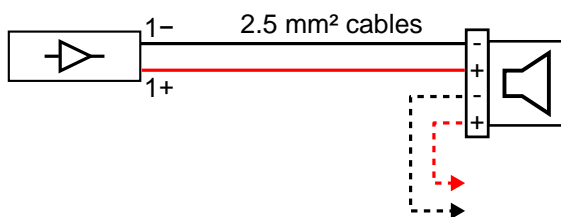
	LA2Xi	LA12X
	per output* / total	per output* / total
KS28	1 / 4 (SE), 1 / 1 (PBTL)	1 / 4

### Cabling schemes for KS28 (LA2Xi)

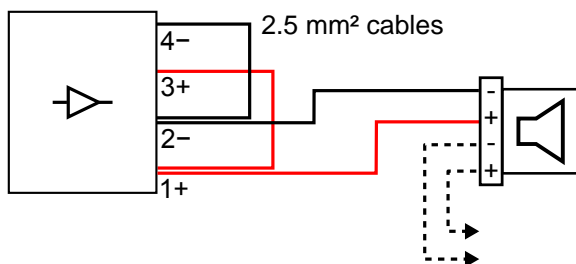
Refer to the cabling schemes to connect the enclosures to different types of output connectors.

**i** Refer to the **LA2Xi owner's manual** for more information on output configurations.

#### Terminal block output (SE)



#### Terminal block output (PBTL)

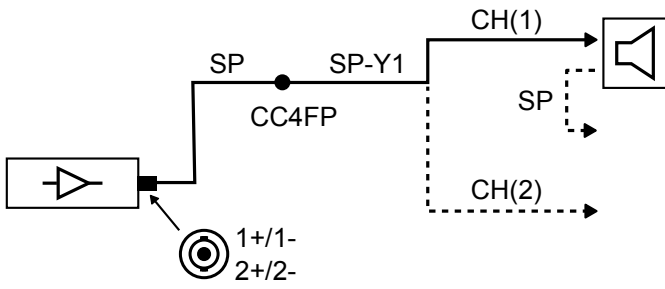


\* For passive loudspeakers, the value corresponds to the number of enclosures in parallel on the output. For active loudspeakers, the value corresponds to the number of sections in parallel on the output.

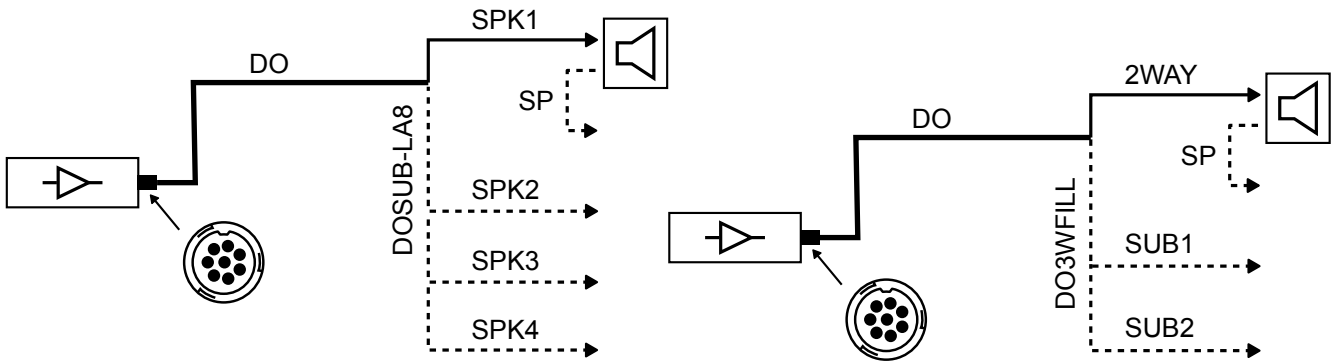
### Cabling schemes for KS28 (LA12X)

Refer to the cabling schemes to connect the enclosures to different types of output connectors.

#### Two-channel speakON output



#### Four-channel CA-COM output



# Corrective maintenance

## Introduction

---

This section contains the following maintenance procedures:

- [D/R - Grill](#) (p.49)
- [D/R - LF loudspeaker](#) (p.53)

For advanced maintenance, contact your L-Acoustics representative.

## Tools

Before performing maintenance on this product, make sure all the tools listed are available. Reference are given for FACOM® products in this table. Other manufacturers can be used.

Name	Reference	Distributor
set of 6-point 1/4" sockets *	RL.NANO1 / R.360NANO	FACOM
T10 Torx bit *	EX.110	FACOM
torque screwdriver (2 - 10 N.m) *	A.404	FACOM



\* Included in the L-Acoustics Maintenance Toolcase.

## Maintenance Toolcase

The Maintenance Toolcase is a carry-on suitcase that includes all the tools required to perform maintenance on L-Acoustics products. This toolcase is aimed at Certified Providers.

The Maintenance Toolcase uses a Peli™ 1510 Protector case that features three pre-cut layers of foam to safely fit the tools. The Maintenance Toolcase includes tools manufactured by FACOM®, Fluke®, Tohnichi, ABUS, and Würth.

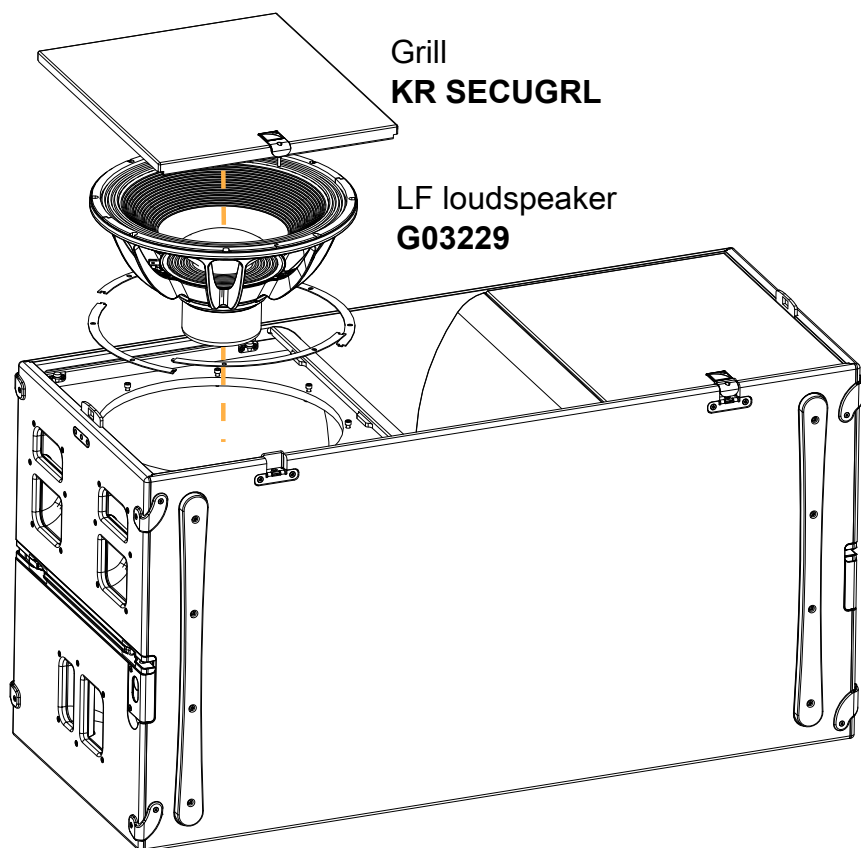


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## Disassembly and Reassembly procedures

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In order to operate, follow the order outlined here.



## D/R - Grill

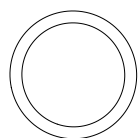
### Tools

- torque screwdriver
- 5 mm hex bit
- screwdriver extension
- flat screwdriver

### Repair kits

#### KR SECUGRL

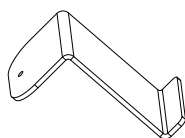
#### Kit 100 safety O-rings for front grill



x100

100557

grill safety O-ring



x1

100226

grill safety tool

### Prerequisite

The enclosure is placed on its rear.

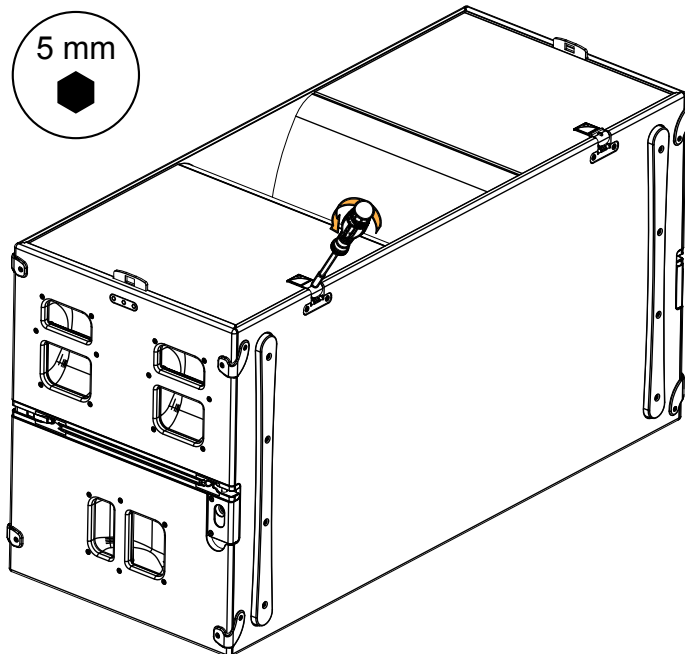
### Disassembly

#### Procedure

1. Loosen the captive grill screw.

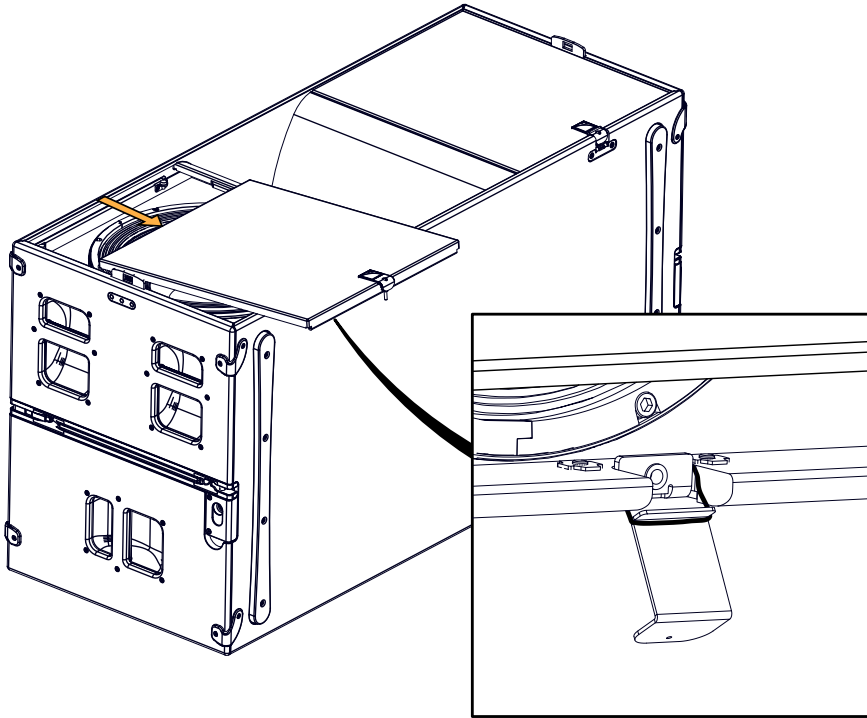


5 mm



**2.** Slide the grill to remove it.

If the grill is secured with an O-ring, pull it down before removing the grill.

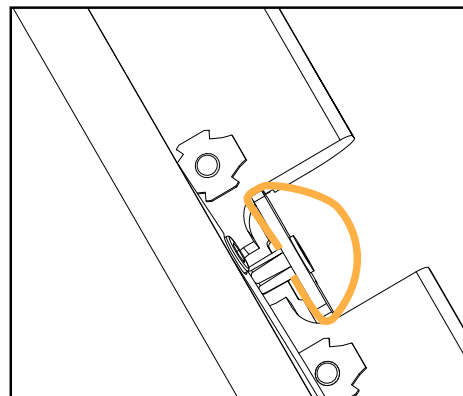
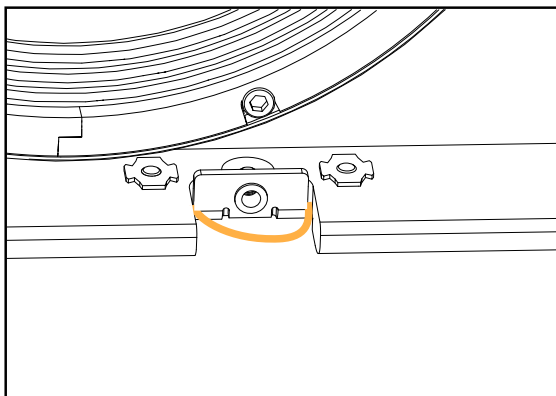


**Reassembly**

**Procedure**

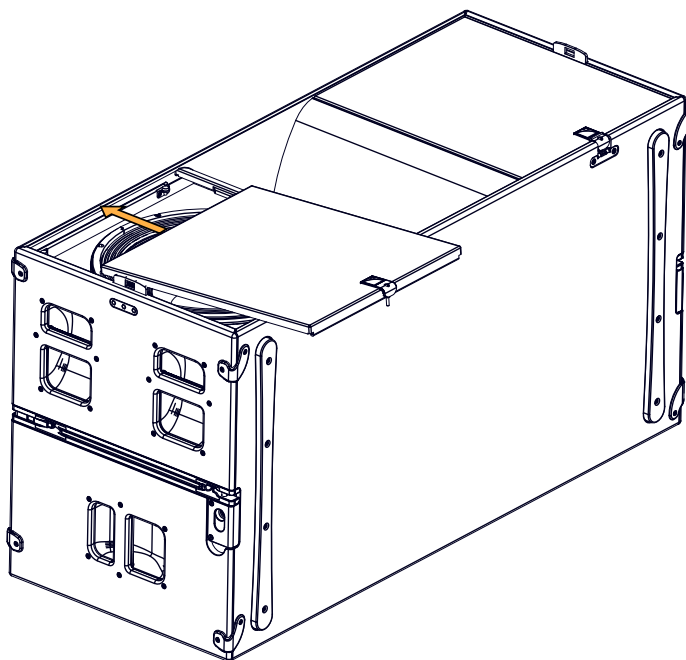
**1.** Slide the O-ring under the captive screw insert.

Use a flat screwdriver to push the O-ring under the insert.

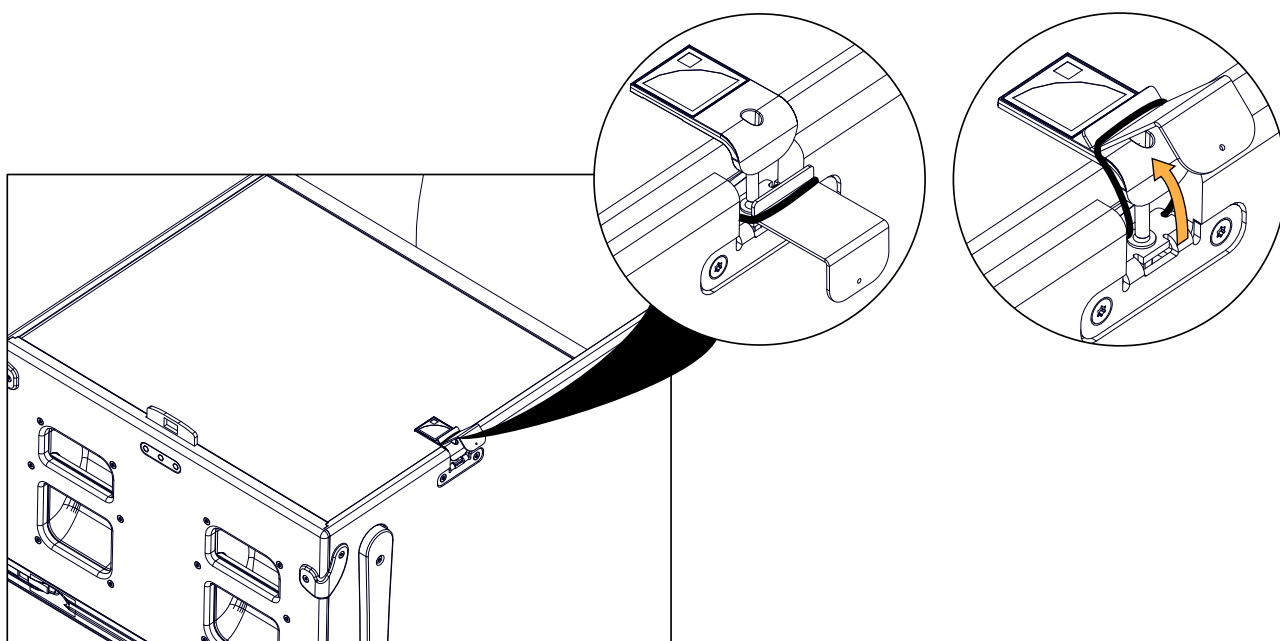


**2.** Apply blue threadlocker on the captive screw.

- 3.** Position the grill starting with the top.

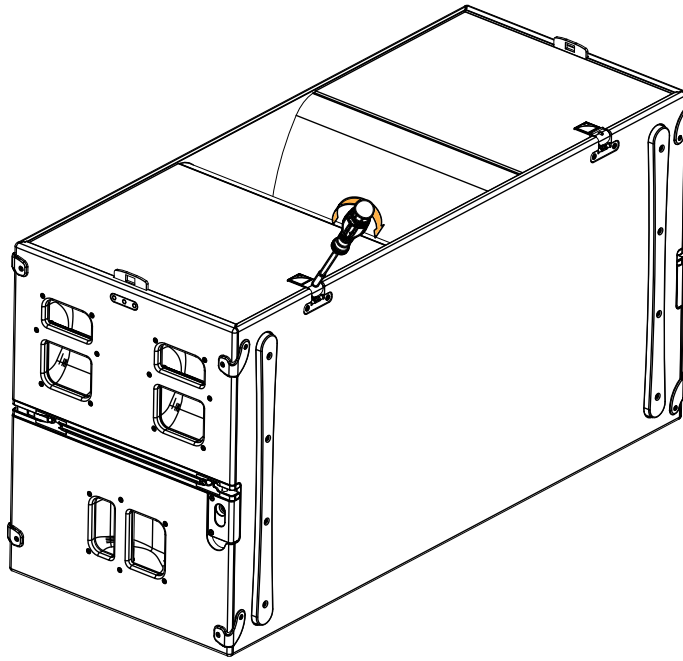
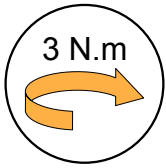


- 4.** With the 100226, stretch the O-ring and pull it above the captive screw.



**5.** Secure the grill with the captive screw.

Use the 5 mm hex bit and set the torque to 3 N.m.





## D/R - LF loudspeaker

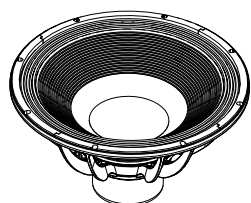
### Tools

- torque screwdriver
- 5 mm hex bit

### Repair kits

**G03229**

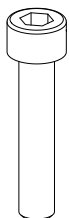
**KR speaker KS28**



x1

18294

18" speaker - 8 ohms



x8

S100054

M6x30 hex



x4

100689

18" speaker gasket

### Prerequisite

Grill disassembled.

See [D/R - Grill](#) (p.49).

### Exploded view



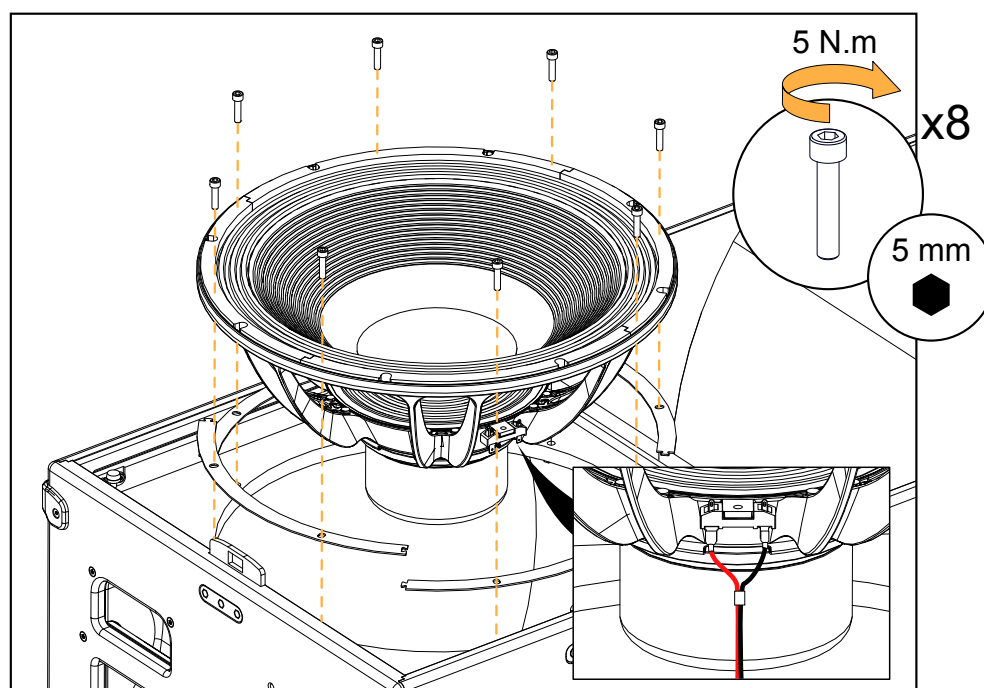
For safety reasons, always use the new screws and spare parts provided in the KR. If no new screws are available, use blue threadlocker.



Gradually tighten the screws following a star pattern.



Check that the cable tie is intact.



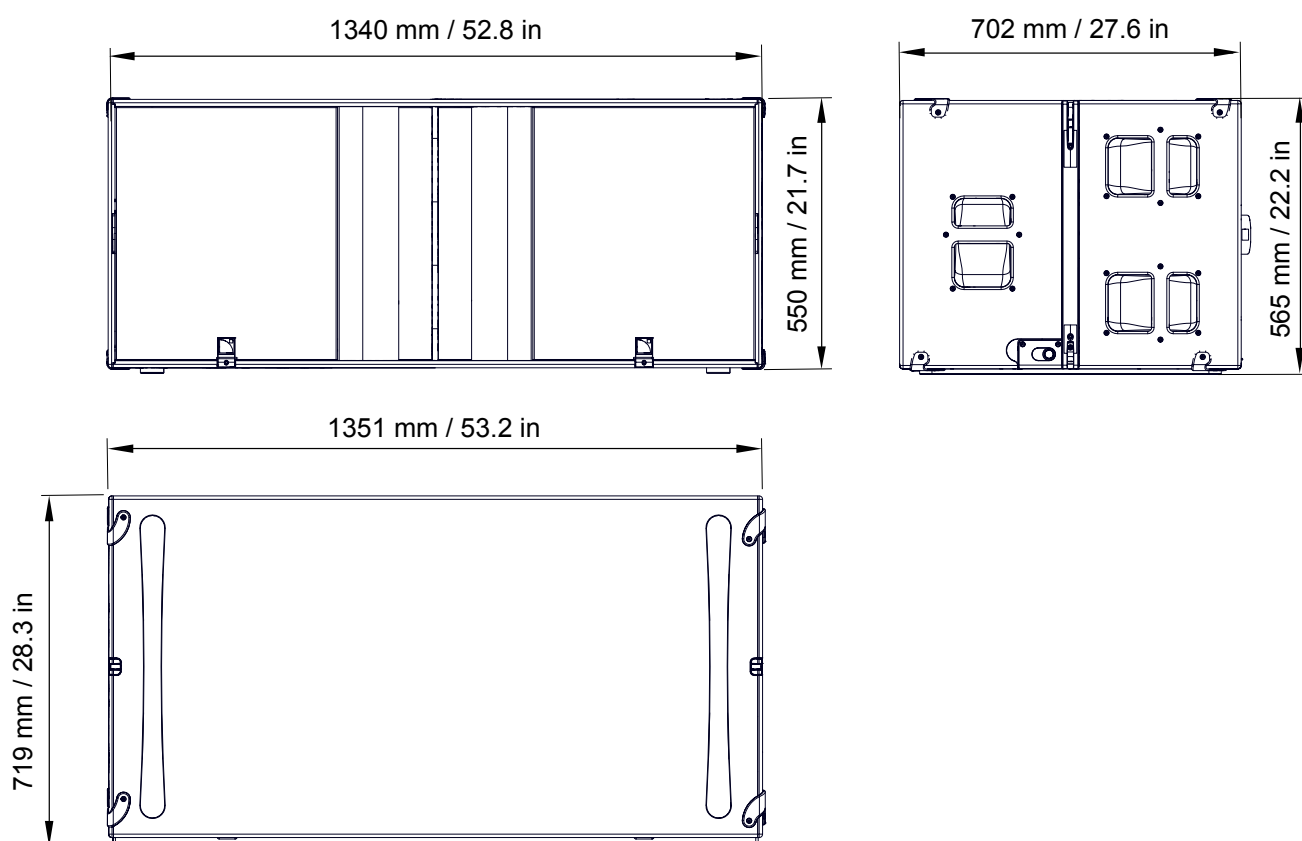
# Specifications

## KS28 specifications

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<b>Description</b>	Flyable subwoofer 2 x 18" , amplified by LA12X / LA2Xi
<b>Low frequency limit (-10 dB)</b>	25 Hz ([KS28_100])
<b>Maximum SPL<sup>1</sup></b>	143 dB ([KS28_100]) with LA2Xi (bridge mode) / LA12X 136 dB ([KS28_100]) with LA2Xi
<b>Directivity</b>	standard or cardioid
<b>Transducers</b>	2 x 18" neodymium cone drivers
<b>Acoustical load</b>	bass-reflex, L-Vents
<b>Nominal impedance</b>	4 Ω
<b>Connectors</b>	IN: 1 x 4-point speakON
<b>Rigging and handling</b>	flush-fitting 2-point rigging system 6 ergonomic handles 2 ground runners 8 side runners
<b>Weight (net)</b>	79 kg / 174 lb
<b>Cabinet</b>	premium grade Baltic beech and birch plywood
<b>Front</b>	coated steel grill acoustically neutral 3D fabric
<b>Rigging components</b>	high grade steel
<b>Finish</b>	dark grey brown Pantone 426 C
<b>IP</b>	IP55

<sup>1</sup> Peak level at 1 m under half space conditions using pink noise with crest factor 4 (preset specified in brackets).

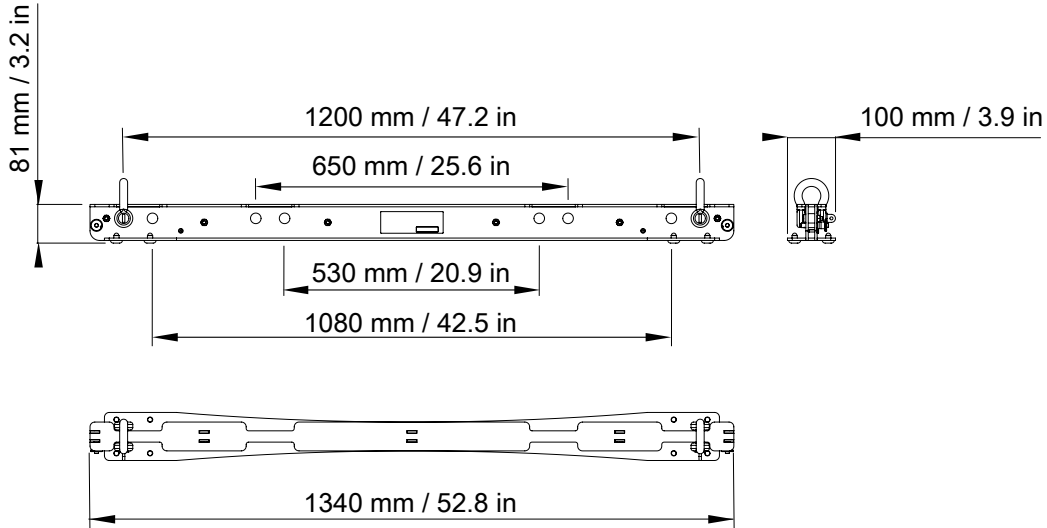
**KS28 dimensions**

## KS28-BUMP specifications

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<b>Description</b>	Lifting beam for flying up to 16 x KS28 2 x Ø19 mm shackles WLL 3.25 t
<b>Weight (net)</b>	15.5 kg / 34.2 lb
<b>Material</b>	high grade steel with anti-corrosion coating

### KS28-BUMP dimensions



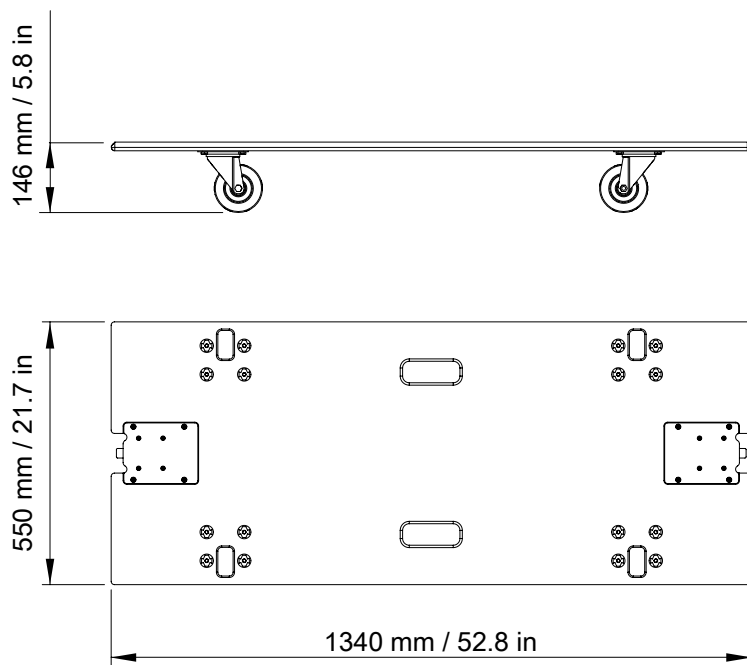
## KS28-PLA specifications

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**Description** Removable front dolly on wheels for 1 x KS28

**Weight (net)** 14 kg / 30.8 lb

### KS28-PLA dimensions

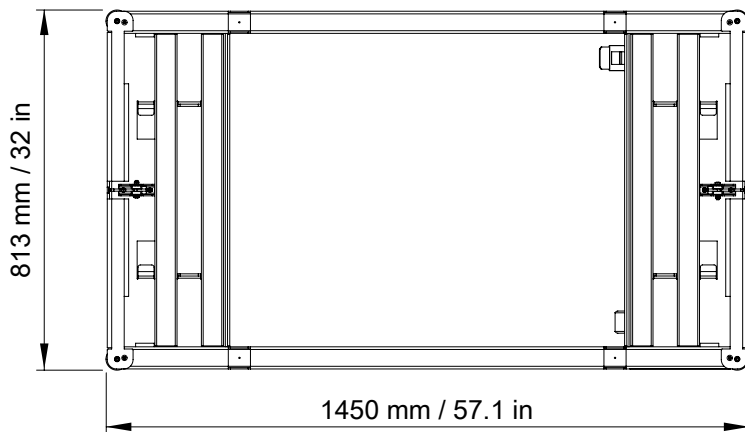
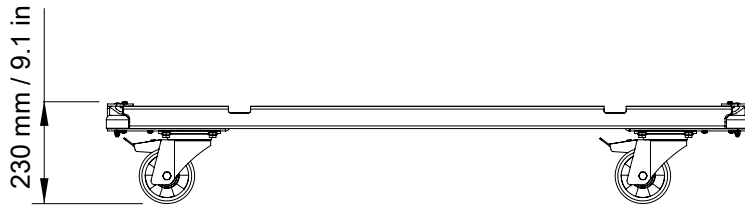


## KS28-CHARIOT specifications

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<b>Description</b>	Chariot for up to 4 x KS28
<b>Weight (net)</b>	53.5 kg / 118 lb

### KS28-CHARIOT dimensions

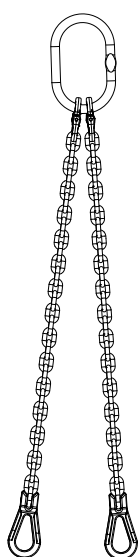


## LA-SLING2T specifications

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<b>Description</b>	Lifting chain (DIN EN 818-4) 2-leg , 8 mm
<b>Material</b>	high grade steel with anti-corrosion coating
<b>Weight (net)</b>	3.7 kg / 1.2 lb
<b>Lifting chain (DIN EN 818-4)</b>	2-leg, 8 mm
<b>Steel grade</b>	8
<b>Nominal length incl. hooks</b>	1000 mm / 39.4 in
<b>Maximum sling angle <math>\beta_{\max}</math></b>	60°
<b>Load rating</b>	2.8 t for $\beta$ : 0° - 45° 2 t for $\beta$ : 46° - 60°

### LA-SLING2T illustration



## Recommendation for speaker cables

Follow the recommended maximum length for loudspeaker cables to ensure minimal SPL attenuation.



### Cable quality and resistance

Only use high-quality fully insulated speaker cables made of stranded copper wire.

Use cables with a gauge offering low resistance per unit length and keep the cables as short as possible.

The table below provides the recommended maximum length for loudspeaker cables depending on the cable gauge and on the impedance load connected to the amplifier.

cable gauge			recommended maximum length					
			8 Ω load		4 Ω load		2.7 Ω load	
mm <sup>2</sup>	SWG	AWG	m	ft	m	ft	m	ft
2.5	15	13	30	100	15	50	10	33
4	13	11	50	160	25	80	17	53
6	11	9	74	240	37	120	25	80

Use the more detailed L-Acoustics calculation tool to evaluate cable length and gauge based on the type and number of enclosures connected. The calculation tool is available on our website:

<https://www.l-acoustics.com/installation-tools/>





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