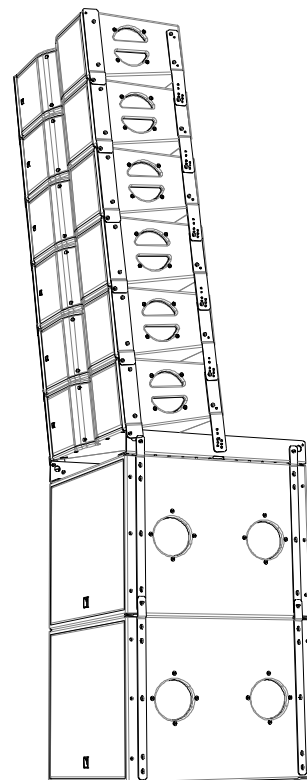
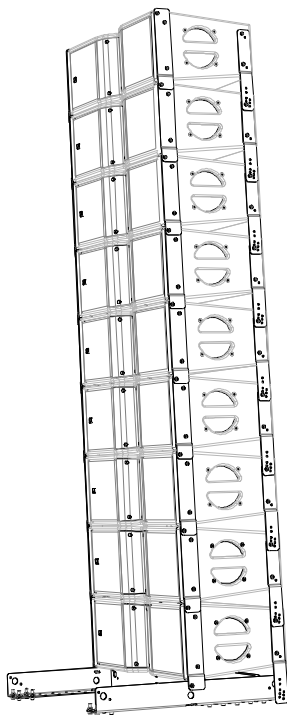
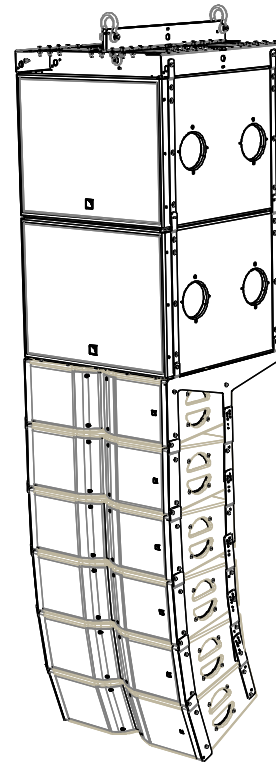
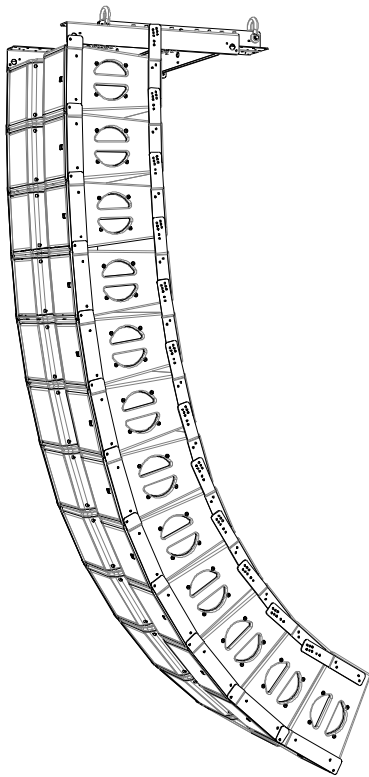


# KARAI<sup>®</sup> MODULAR WST<sup>®</sup> SYSTEM

RIGGING PROCEDURES

VERSION 1.1








# 1 SAFETY WARNINGS

All safety information hereafter detailed applies for the L-ACOUSTICS® **M-BUMPi** rigging structure and **KARAI8LINK** rigging accessories, designated in this section as **the product**.


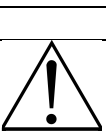
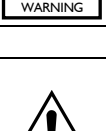

## 1.1 Symbol description

Throughout this manual the potential risks are indicated by the following symbols:

	<p>The <b>WARNING</b> symbol indicates a potential risk of physical harm to the user or people within close proximity to the product. In addition, the product may also be damaged.</p>
	<p>The <b>CAUTION</b> symbol notifies the user about information to prevent possible product damage.</p>
	<p>The <b>IMPORTANT</b> symbol is a notification of an important recommendation of use.</p>

## 1.2 Important safety instructions

1. **Read this manual**
2. **Heed all safety warnings**
3. **Follow all instructions**
4. **The user should never incorporate equipment or accessories not approved by L-ACOUSTICS®**

	<p><b>5. Personnel qualification</b> Installation and set-up should <u>only</u> be carried out by qualified personnel that are familiar with the rigging techniques and safety recommendations outlined in this manual. It is recommended to attend the training courses offered by L-ACOUSTICS® before proceeding with the installation of the system.</p>
	<p><b>6. Personnel health and safety</b> During installation and set-up personnel should wear protective headgear and footwear at all times. Under no circumstances personnel should climb on the loudspeaker assembly.</p>
	<p><b>7. System parts and rigging inspection</b> All system components must be inspected before use in order to detect any possible defects. Please refer to the <b>Care and Maintenance</b> section of this manual as well as any other manuals pertaining to the system for a detailed description of the inspection procedure. Any part showing any sign of defect must immediately be withdrawn from use and inspected by qualified service personnel.</p>
	<p><b>8. Additional rigging equipment</b> L-ACOUSTICS® is not responsible for any rigging equipment and accessories provided by third party manufacturers. It is the user's responsibility to verify that the Working Load Limit (WLL) of all additional hardware rigging accessories is greater than the total weight of the loudspeaker assembly in use.</p>



### 9. Suspension points

It is the user's responsibility to verify that the Working Load Limit (WLL) of the suspension points and/or chain hoists is greater than the total weight of the loudspeaker assembly in use.



### 10. System load capacity and setup safety limits

Load capacity and setup safety limits when flying or stacking a loudspeaker assembly should be strictly followed according to the instructions outlined in this manual.

Always refer to the mechanical data and warning indications provided in SOUNDVISION Software (**Mechanical Data** section) [3.4] to ensure the mechanical conformity of the system before installation.



### 11. Local regulations

Some countries require higher Ultimate Strength Safety Factors and specific rigging approvals. It is the user's responsibility to verify that any overhead suspension of L-ACOUSTICS® systems has been made in accordance with all applicable local regulations.



### 12. Flying a loudspeaker assembly

Always verify that nobody is standing underneath the loudspeaker assembly when it is being raised. As the assembly is being raised check each individual component to make sure that it is securely fastened to the component above. Never leave the system unattended during the installation process.

As a general rule, L-ACOUSTICS® recommends the use of safety slings at all times.



### 13. Stacking a loudspeaker assembly

Do not ground stack the system on unstable ground or platform.

If the assembly is stacked on a structure, platform, or stage always check that the latter can support the total weight of the assembly.

As a general rule, L-ACOUSTICS® recommends the use of safety straps at all times.



### 14. Dynamic load

When a loudspeaker assembly is deployed in an open air environment, wind effect should be taken into account. Wind can produce dynamic stress to the rigging components and suspension points. If the wind force exceeds 6 bft (Beaufort scale) it is highly recommended to lower down and/or secure the loudspeaker assembly.



### 15. Manual

Keep this manual in a safe place during the product lifetime. This manual forms an integral part of the product. Reselling of the product is only possible if the user manual is available. Any changes made to the product have to be documented in writing and passed on to the buyer in the event of resale.

### 1.3 EC declaration of conformity

---

L-ACOUSTICS®

13 rue Levacher Cintrat  
Parc de la Fontaine de Jouvence  
91462 Marcoussis Cedex  
France



States that the following products:

Rigging structure, M-BUMPi  
Rigging accessories, KARAI SB18LINK

Are in conformity with the provisions of:

Machinery Directive 2006/42/EC

Applied rules and standards<sup>1</sup>:

EN ISO 12100-1: 2004 (Mechanical Safety)  
DIN 18800 (Mechanical Structure)  
BGV-C1 (Mechanical Standard applied in Germany)

Established at Marcoussis, France

September 29<sup>th</sup>, 2010



Jacques Spillmann

Head of Engineering & Design dept.

<sup>1</sup> Maximum **flown** vertical array configurations:

- **General** standard: **12 KARAI** or **4 SB18i/12 KARAI** or **8 SB18i**.
- **BGV** standard: **12 KARAI** or **3 SB18i/9 KARAI** or **8 SB18i**.

Maximum **stacked** vertical array configurations:

- **General** standard: **9 KARAI**.

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## 3 INTRODUCTION

### 3.1 Welcome to L-ACOUSTICS®

Thank you for purchasing the **L-ACOUSTICS® KARAI® Modular WST® System**.

This manual contains essential information on rigging the product correctly and safely. Read this manual carefully in order to become familiar with these procedures.

**As part of a continuous evolution of techniques and standards, L-ACOUSTICS® reserves the right to change the specifications of the product and the content of this manual without prior notice.**

Should the product requires repair or if information about the warranty is needed, please contact an approved L-ACOUSTICS® distributor. The address of the nearest distributor is available on the L-ACOUSTICS® web site.

### 3.2 Symbol description

All along the manual, a bracketed number refers to a section. For example, [3.2] stands for the present section: **Symbol description**.

### 3.3 Unpacking


Carefully open the shipping carton and check the product for any noticeable damage. Each L-ACOUSTICS® product is tested and inspected before leaving the factory and should arrive in perfect condition.

If found to be damaged, notify the shipping company or the distributor immediately. Only the consignee may initiate a claim with the carrier for damage incurred during shipping. Be sure to save the carton and packing materials for the carrier's inspection.

Refer to [5] for full description of the shipping carton contents.

### 3.4 Web links

Please check the L-ACOUSTICS® web site on a regular basis for latest document and software application updates. Table I provides links for all downloadable items mentioned in this manual.

	<p>ALWAYS refer to the latest document version. ALWAYS use the latest software application version.</p>
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**Table I: Links to documents and software applications**

<b>KARAI User manual</b>	<a href="http://www.l-acoustics.com/karai">www.l-acoustics.com/karai</a>
<b>KARAI Rigging procedures</b>	<a href="http://www.l-acoustics.com/sb18i">www.l-acoustics.com/sb18i</a>
<b>SBI 8i User manual</b>	<a href="http://www.l-acoustics.com/kara">www.l-acoustics.com/kara</a>
<b>KARA Rigging procedures pack</b>	<a href="http://www.l-acoustics.com/soundvision">www.l-acoustics.com/soundvision</a>
<b>SOUNDVISION Software</b>	

## 4 KARAI® SYSTEM

The **L-ACOUSTICS® M-BUMPi** and **KARAI® SB18LINK** elements have been designed to rig the **KARAI® Modular WST® Line Source System**.

The system approach developed by L-ACOUSTICS® for KARAI consists of the elements needed to fully take advantage of the possible configurations and optimize the system. The main components of the system are (see also Figure 1 and Figure 2):

<b>KARAI®</b>	⇒ Full range active 2-way modular WST® enclosure
<b>M-BUMPi</b>	⇒ Structure for flying KARAI and/or SB18i or stacking KARAI
<b>KARAI® SB18LINK</b>	⇒ Link components between SB18i and KARAI
<b>SB18i</b>	⇒ Compact high-power subwoofer
<b>SB28</b>	⇒ High-power subwoofer
<b>LA8</b>	⇒ Amplified controller
<b>LA NETWORK MANAGER</b>	⇒ Remote control software
<b>SOUNDVISION</b>	⇒ Acoustical and mechanical modeling software

Each system configuration should first be modeled using **L-ACOUSTICS® SOUNDVISION Software** [3.4] to verify the mechanical conformity of the system. Please refer to the **SOUNDVISION Help menu** to obtain a detailed description on software use.



**Figure 1: KARAI system components (part 1)**



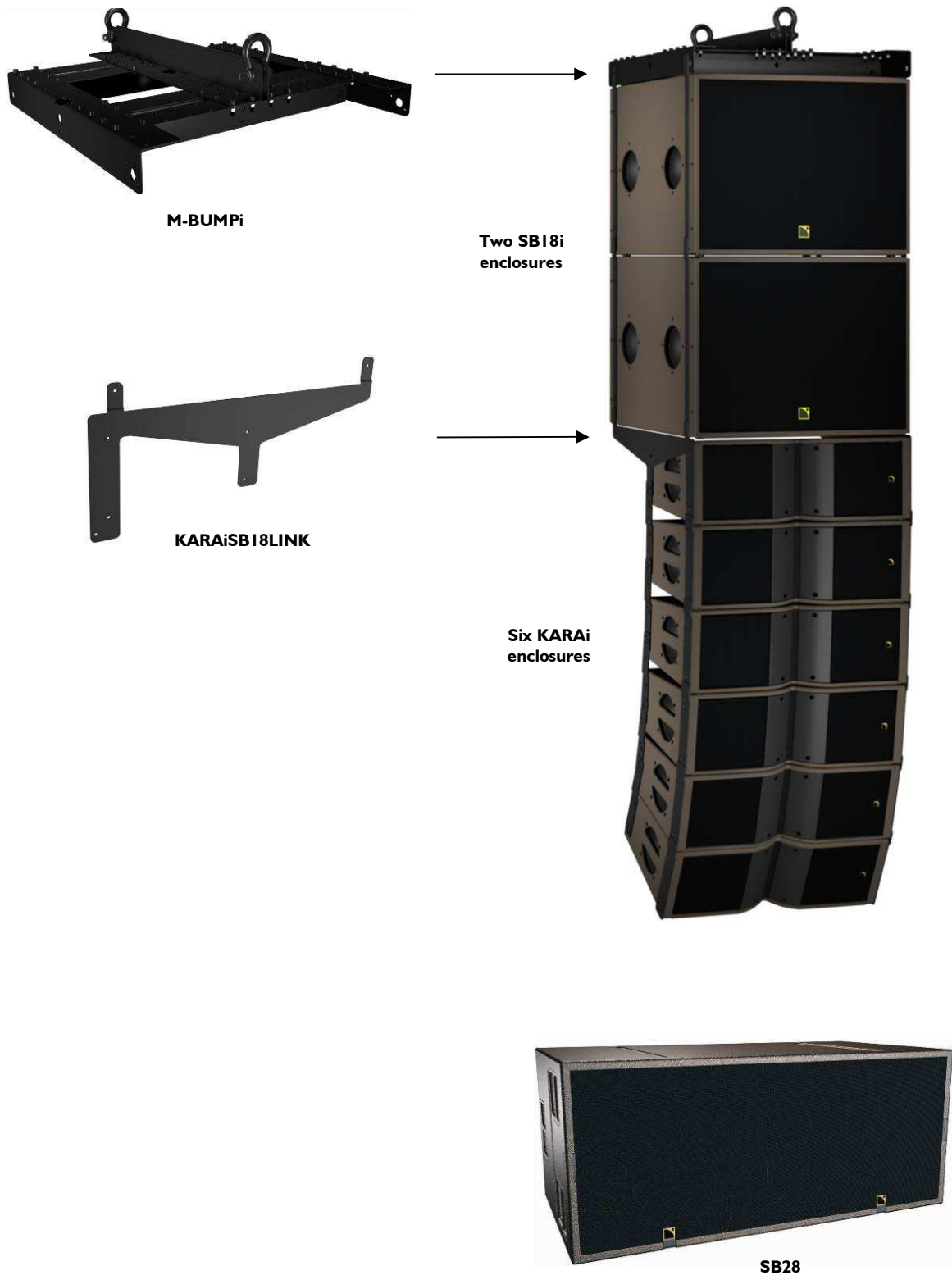


Figure 2: KARAI system components (part 2)

## 5 KARAI® RIGGING COMPONENTS

### 5.1 M-BUMPi

The **L-ACOUSTICS® M-BUMPi rigging structure** has been designed to rig KARAI® enclosures as a variable-curvature, vertical line source array. **Note:** M-BUMPi also can fly straight vertical SB18i arrays.

The M-BUMPi package is composed of:

- Ten **bars**.
- A set of **M8 hex bolts** to assemble the bars and obtain one or two M-BUMPi structures (see notes below).
- Two **shackles** fitted with 19 mm/0.75 inch-diameter bolts and safety pins.
- A set of **M6 hex bolts** and a set of **washers** to fix a KARAI or a SB18i enclosure to the M-BUMPi.
- A set of **screws** to fix a bar to the bottom KARAI of a flown array and obtain a pullback configuration.

**Note 1:** Eight **rigging options** are available for the M-BUMPi in flown configuration [9.1.1]. In particular, rigging option 0 allows assembling two M-BUMPi. In addition, a bar can be used for aesthetic purposes (see the right box in Figure 3).

**Note 2:** Two **stacking platform configurations** are available for the M-BUMPi [9.2.1]. Any of them allows assembling two M-BUMPi.

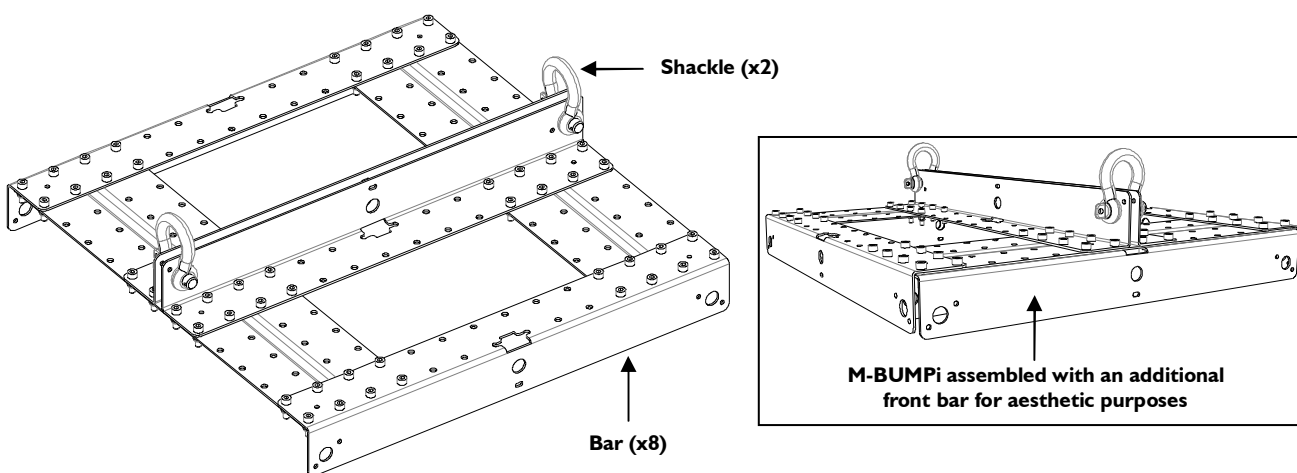


Figure 3: M-BUMPi rigging structure

### 5.2 KARAI SB18LINK

The **L-ACOUSTICS® KARAI SB18LINK accessories** allow rigging a KARAI array below a SB18i array in flown configuration. The KARAI SB18LINK are two **plates** (KARAI SB18LINK 640 and 917) to fix on the KARAI enclosure sides.

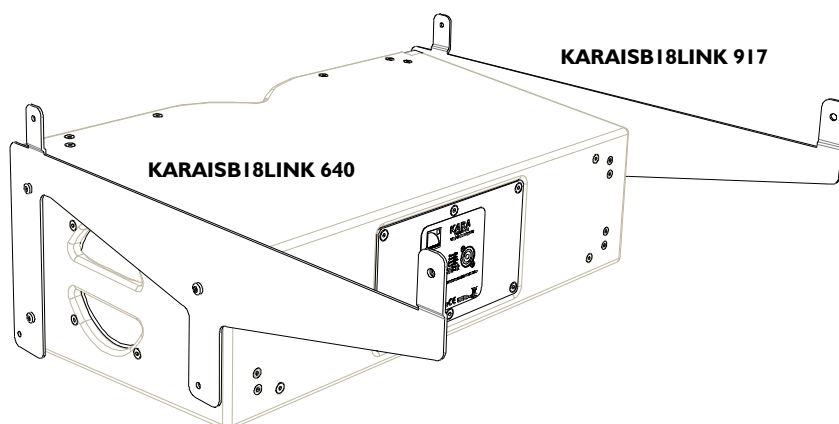


Figure 4: KARAI SB18LINK rigging accessories


## 6 INSTALLATION

### 6.1 Flying a KARAI standalone array

#### 6.1.1 Modeling and safety



Any system must be modeled before installation so as to ensure acoustical and mechanical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARAI enclosures.
- Calculate the M-BUMPi site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.

	<p>The M-BUMPi can nominally fly an array of up to <b>12 KARAI</b> enclosures along with all loudspeakers cables (refer to the <b>KARAI User manual</b> [3.4]). However, this maximum number can decrease in line with the rigging option [9.1.1] and the array curvature.</p> <p>ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (<b>Mechanical Data</b> section) to verify the mechanical conformity of the assembly before installation.</p>
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#### 6.1.2 Array assembling procedure

The following procedure describes how to fly a vertical KARAI array under an M-BUMPi.

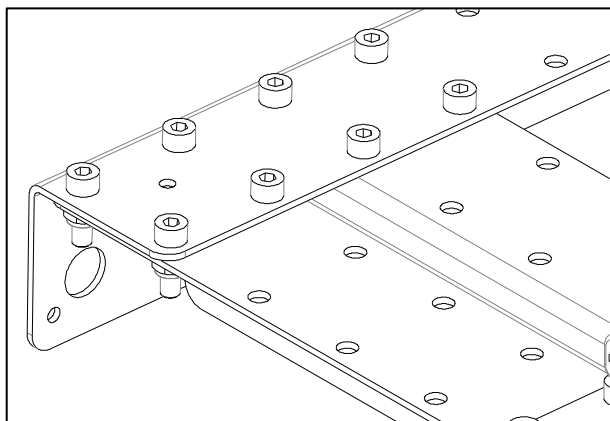
	<p>All along the procedure:</p> <p>STRICTLY follow the sequence of the successive steps.</p> <p>SYSTEMATICALLY verify that each bolt and screw is fully driven to the given torque value.</p> <p>SYSTEMATICALLY verify that the bolt is fully driven and locked by a safety pin on each shackle.</p>
	<p>For clarity purposes the loudspeaker cabling procedure will not be described.</p> <p>The loudspeaker cables will not be represented on the figures.</p> <p>Use a strain relief to avoid mechanical stress at the connector locations due to cable weight.</p> <p>The external rigging system will not be represented on the figures.</p>

#### Required components and tools

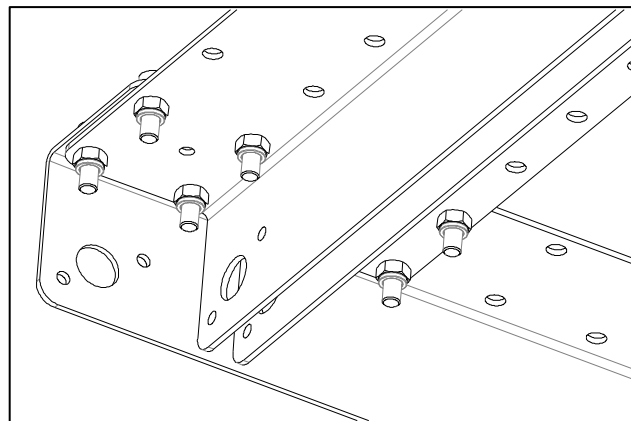
M-BUMPi, electric screwdriver with torque selector (N.m or in.lb<sub>t</sub>), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, KR LOCKBLUE (medium-strength thread-locker, optional, for pullback configuration).

## Procedure

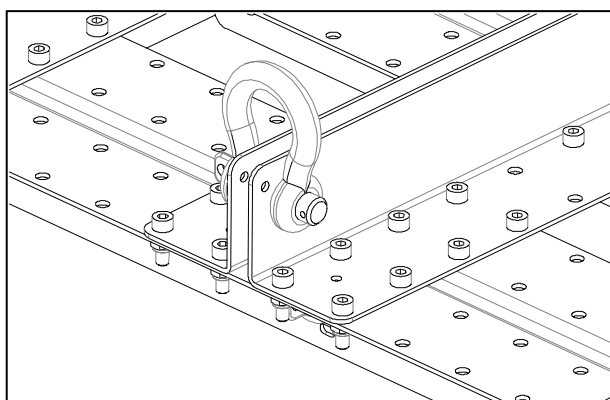
- I. After having selected a **rigging option** [9.1.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 5 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb.) while ensuring that the frame is square.
  - c. Fix the shackles as shown in the bottom left box of Figure 5 and insert a safety pin in each one [9.3].



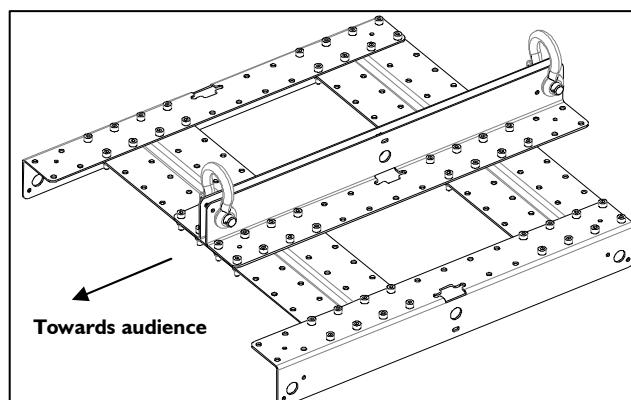
Driving bolts (top view)



Driving bolts (bottom view)



Fixing a shackle



Dual-point rear extension configuration example

**Figure 5: Assembling M-BUMPi**

2. Prepare the top KARAi enclosure (hereafter designated as KARAi#1) as follows (repeat for each enclosure side):



The four arms are different and are identified by numbers engraved on them: fix arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right. Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm by slightly driving both preceding front screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm by slightly driving the top rear screw only. The position of the angle arm depends on the angle intended to be set, as shown in Figure 6.

**Note:** It is recommended to select the 10° angle on the KARAi intended to be fixed to the M-BUMPi. In that way the KARAi axis will be parallel to the M-BUMPi.

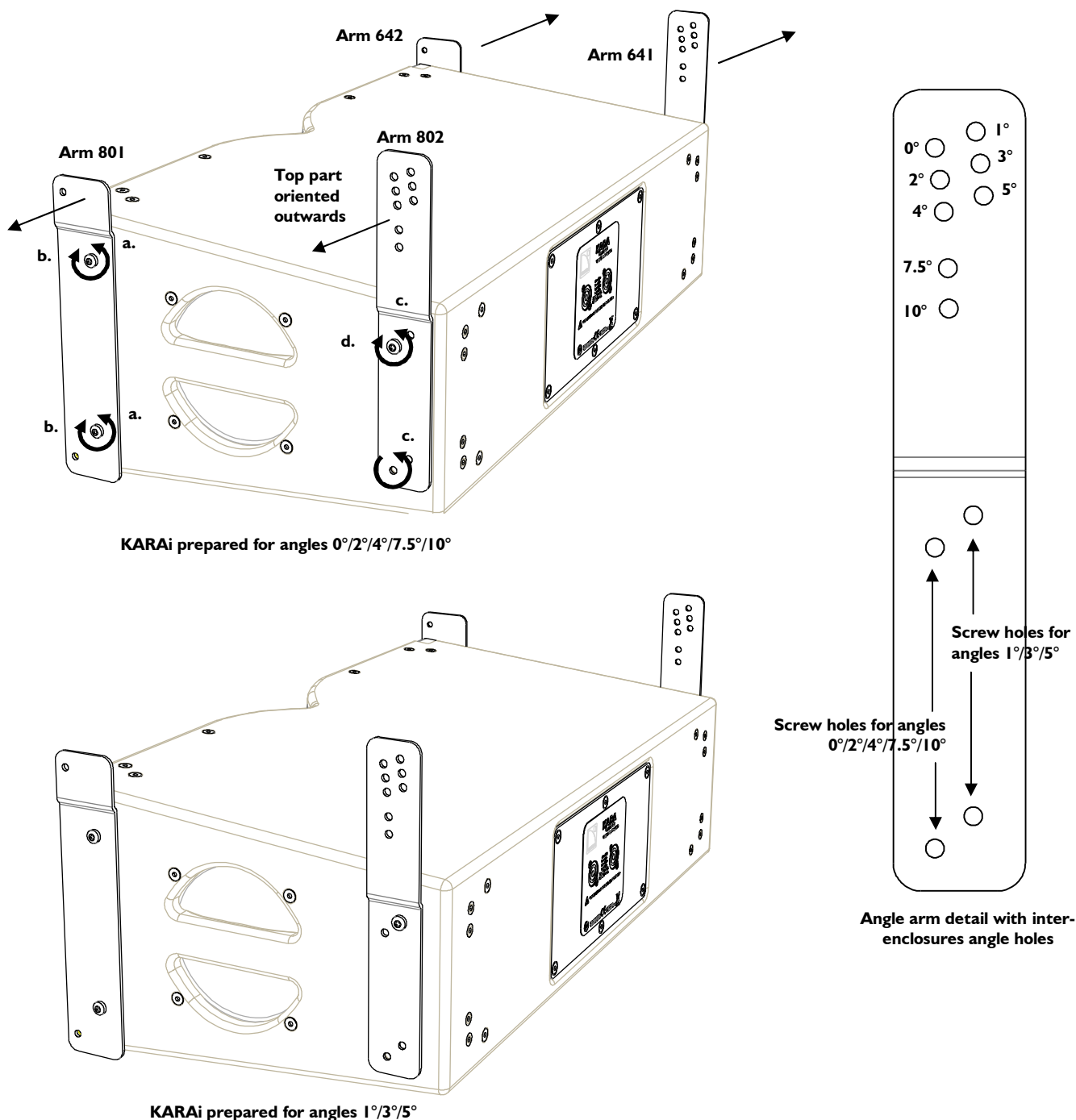
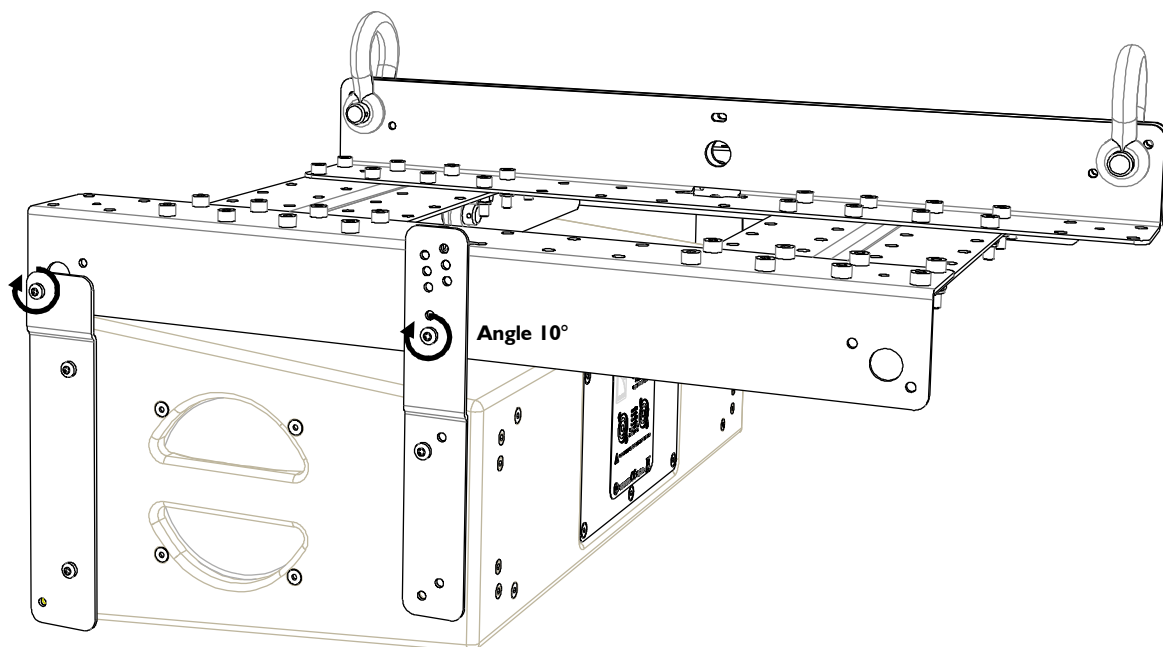


Figure 6: Preparing KARAi

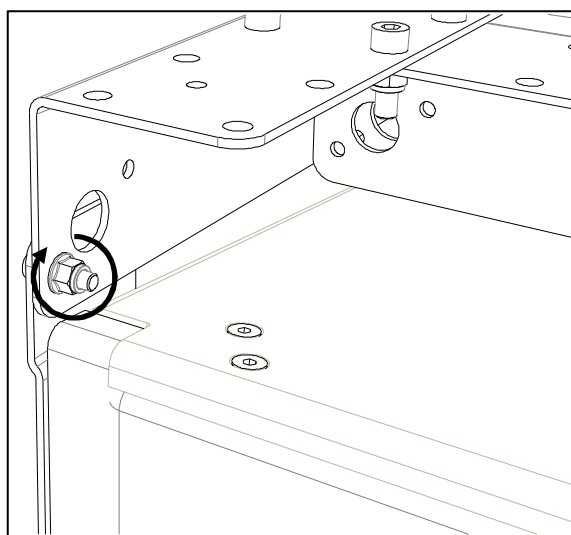
3. Fix KARAI#I to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the KARAI#I top link points and the M-BUMPi link points (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lb<sub>f</sub>).



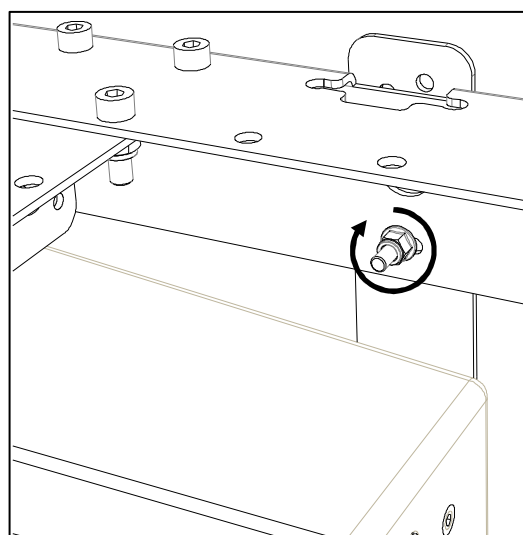
On each angle arm, select hole 10° (KARAI#I projection axis parallel to the M-BUMPi).  
The angles corresponding to the different holes are detailed in Figure 6.



Full view




Detailed view of the front left bolt

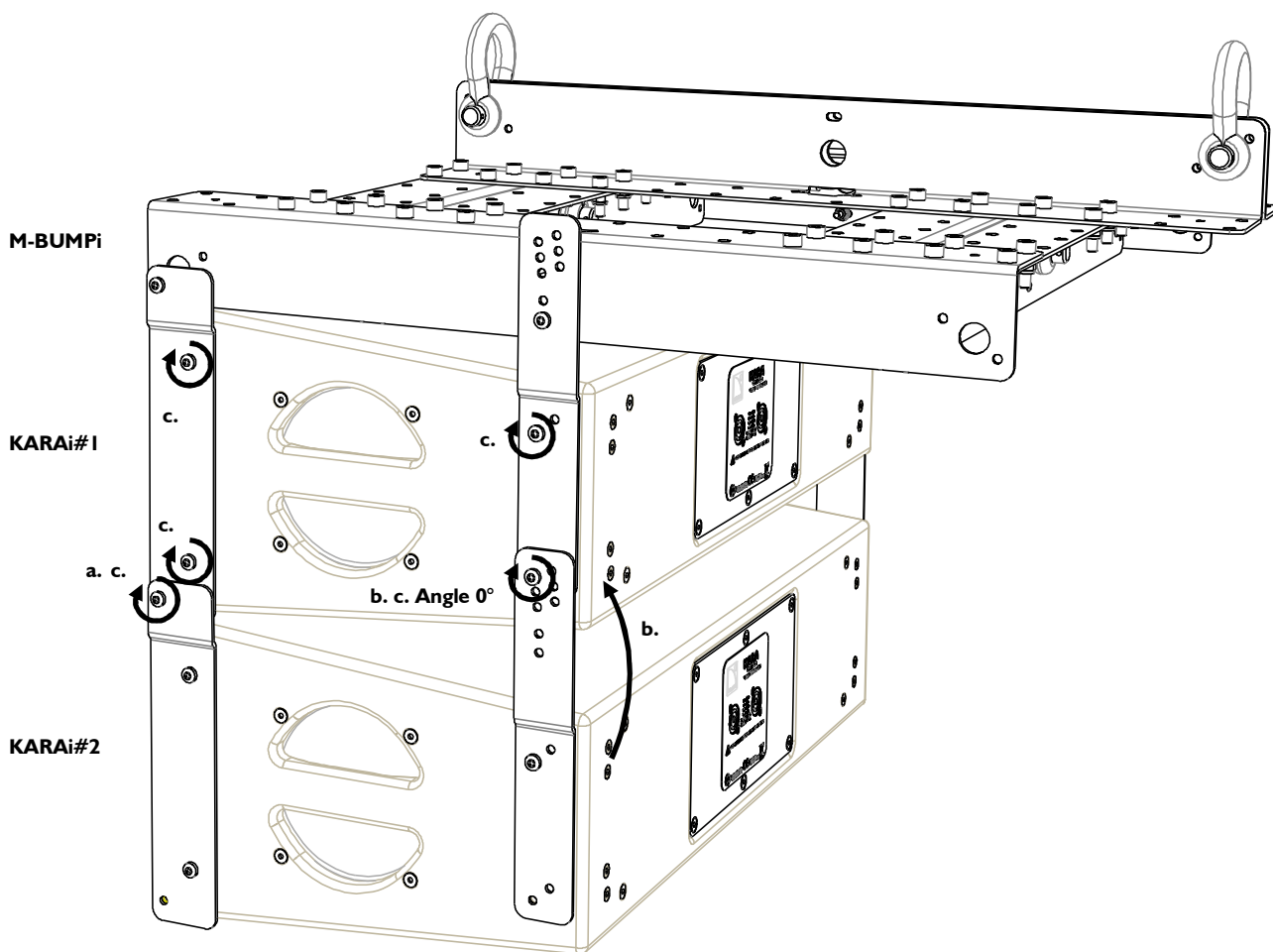


Detailed view of the rear left bolt

Figure 7: Fixing KARAI#I to M-BUMPi

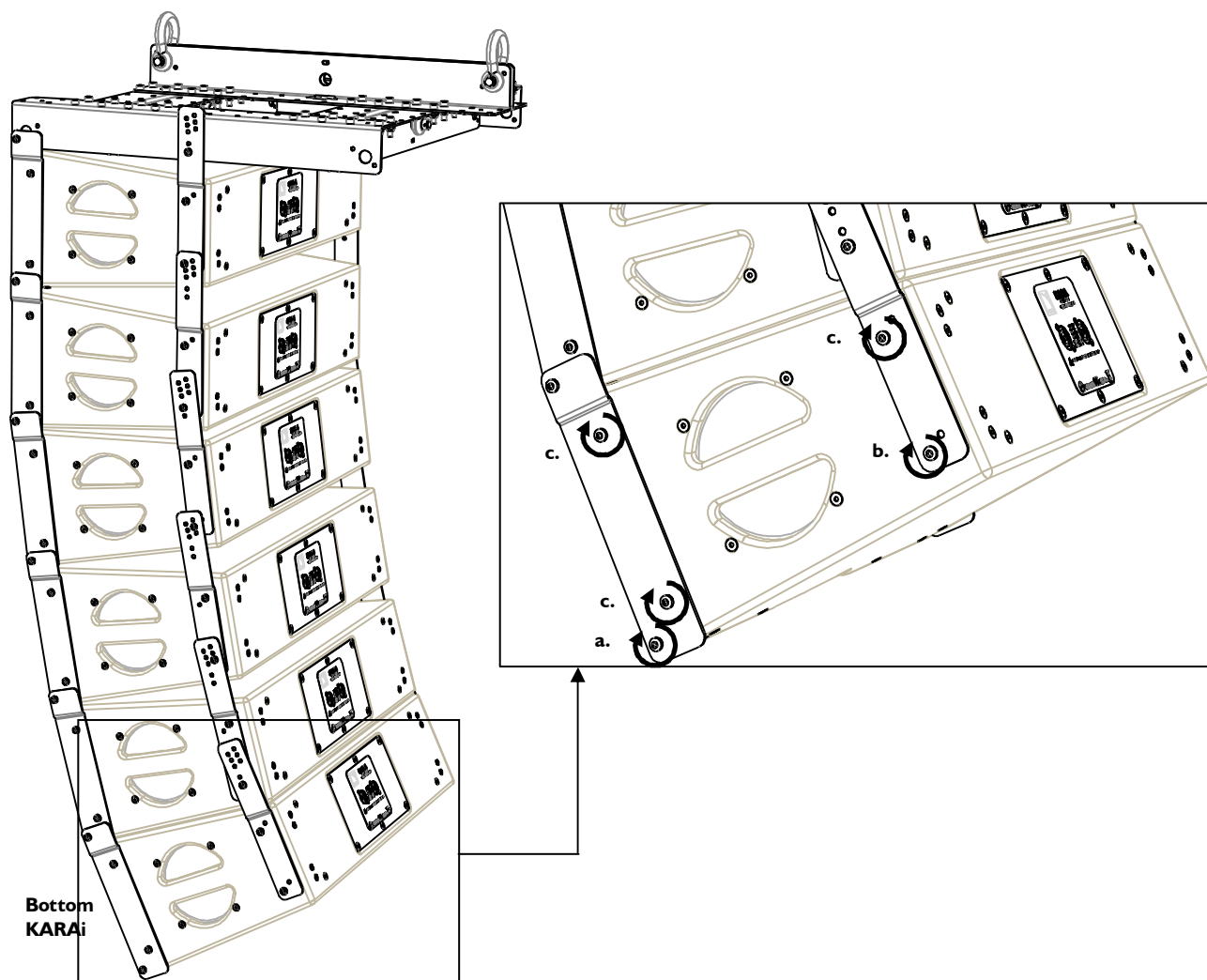
4. Prepare the second KARAI (hereafter designated as KARAI#2) by applying step 2.
  5. Fix KARAI#2 to KARAI#1 as follows:
    - a. Align both KARAI#2 front top link points with both KARAI#1 front bottom link points and connect them by slightly driving a 35 mm Torx® screw into each one (T30 bit).
    - b. Rotate KARAI#2 so as to align its rear top link points with both KARAI#1 rear bottom link points and connect them by slightly driving two 55 mm Torx® screws (T30 bit).
- 

On both angle arms, select the holes corresponding to the angle intended to be set.  
The inter-enclosures angle will be equal to the value indicated in Figure 6.  
Figure 8 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).
- c. Fully drive the ten Torx® screws on KARAI#1 (T30 bit, 5 N.m/45 in.lb<sub>t</sub>).



**Figure 8: Fixing KARAI#2 to KARAI#1**

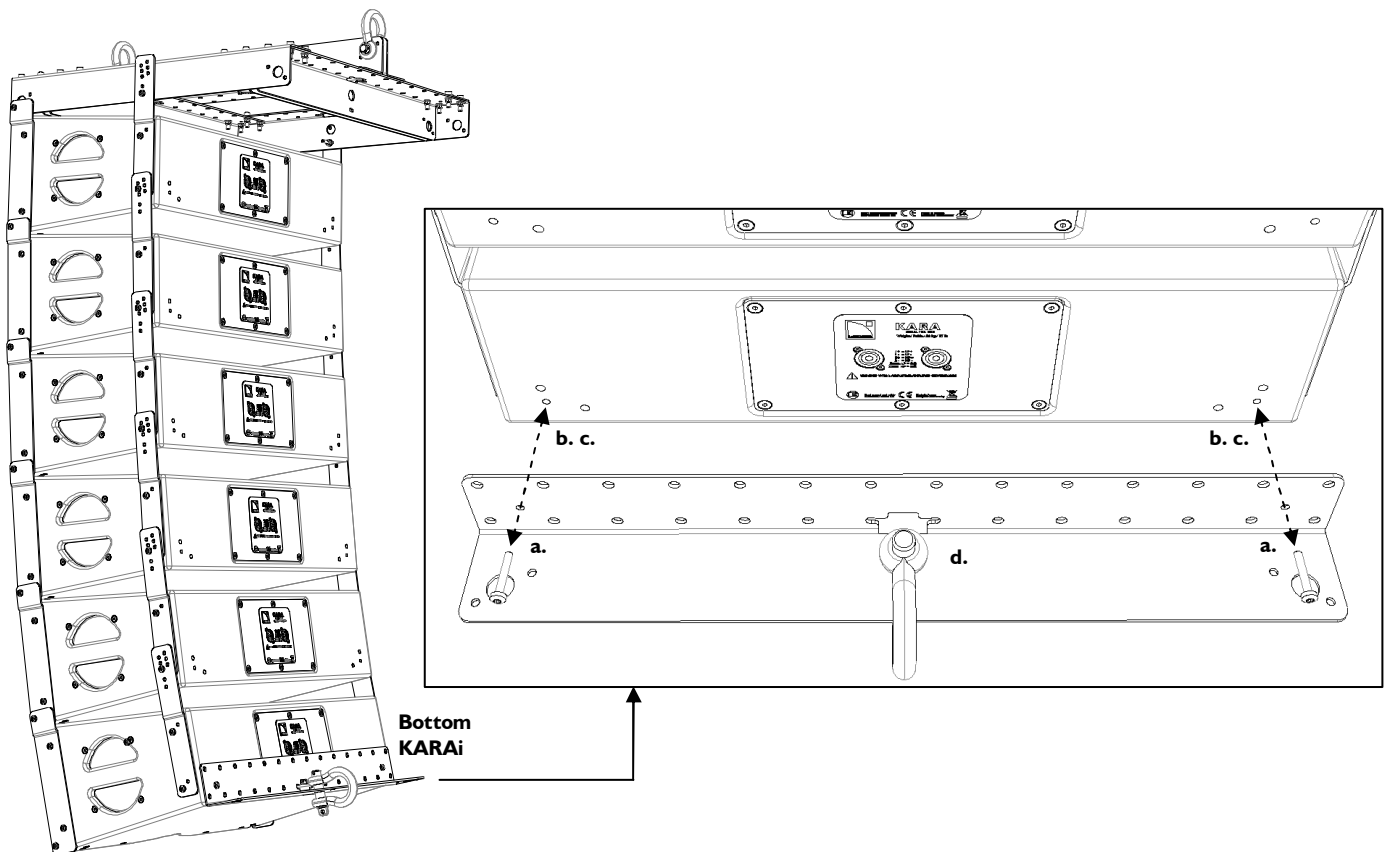
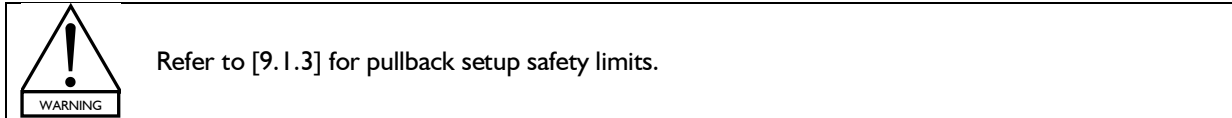
6. Repeat steps 4 and 5 for all additional KARAI enclosures intended to be rigged.
7. Secure the fixation points on the bottom KARAI as follows (repeat on both enclosure sides):
  - a. Drive a 35 mm Torx® screw into the front bottom hole (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Drive a 55 mm Torx® screw into the rear bottom hole (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - c. Fully drive the three remaining Torx® screws (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



**Figure 9: Example of KARAI standalone array**



8. If the array is intended to be flown in pullback configuration, fix a M-BUMPi bar to the bottom KARai as follows:
  - a. Undo the two flat-head Torx® screws on the holes shown in Figure 10 (T30 bit).
  - b. Position an M-BUMPi bar face to both holes and drive two round-head 35 mm Torx® screws (included in the M-BUMPi package) (thread-locker, T30 bit, 7 N.m/63 in.lbf).
  - c. Fix a shackle to the rear center point of the bar.
  - d. Attach the hook or stinger of an additional motor to the shackle.



**Figure 10: Setting the array in pullback configuration**

9. Adjust the height and the site angle of the array [9.1.2].
10. Secure the M-BUMPi to the main rigging structure using two safety slings (not included).

### 6.1.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

## 6.2 Flying a SB18i/KARAI mixed array or a SB18i standalone array

### 6.2.1 Modeling and safety

Any system must be modeled before installation so as to ensure acoustical and mechanical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARAI enclosures (acoustic data not available for subwoofers).
- Calculate the M-BUMPi site angle and the inter-enclosure angles.
- Check the mechanical conformity of the system.



The M-BUMPi can nominally fly an array of up to **4 SB18i/12 KARAI** or **8 SB18i** along with all loudspeaker cables (refer to the **KARAI and SB18i User manuals** [3.4]). However, this maximum number can decrease in line with the rigging option [9.1.1] and the array curvature.

ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the assembly before installation.

### 6.2.2 Array assembling procedure

The following procedure describes how to fly a vertical SB18i/KARAI or SB18i array under an M-BUMPi. Flying a SB18i/KARAI mixed array also requires using the KARAI SB18LINK accessories.



All along the procedure:

STRICTLY follow the sequence of the successive steps.

SYSTEMATICALLY verify that each bolt and screw is fully driven to the given torque value.

SYSTEMATICALLY verify that the bolt is fully driven and locked by a safety pin on each shackle.



For clarity purposes the loudspeaker cabling procedure will not be described.

The loudspeaker cables will not be represented on the figures.

Use a strain relief to avoid mechanical stress at the connector locations due to cable weight.

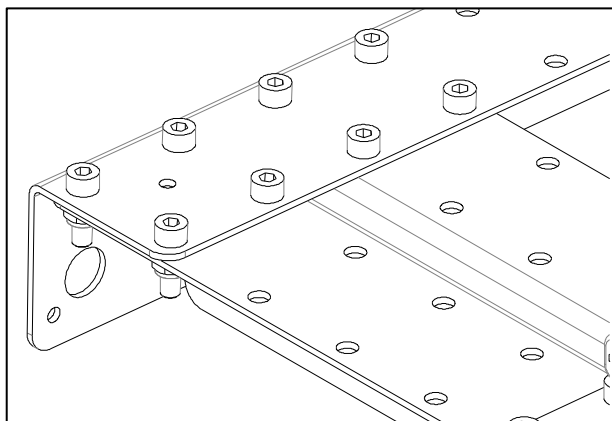
The external rigging system will not be represented on the figures.

### **Required components and tools**

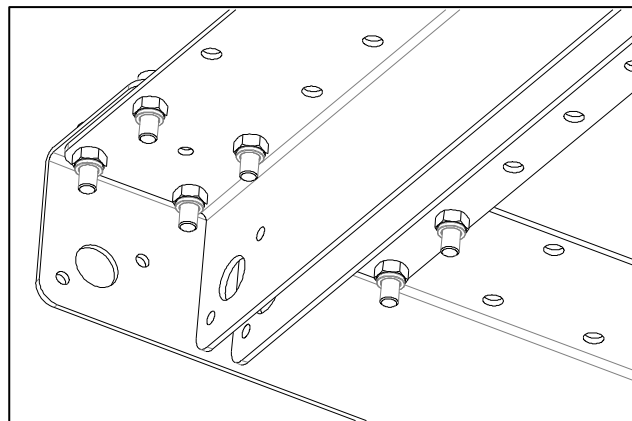
M-BUMPi, KARAI SB18LINK, electric screwdriver with torque selector (N.m or in.lb<sub>t</sub>), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, KR LOCKBLUE (medium-strength thread-locker, optional, for pullback configuration).

## Procedure

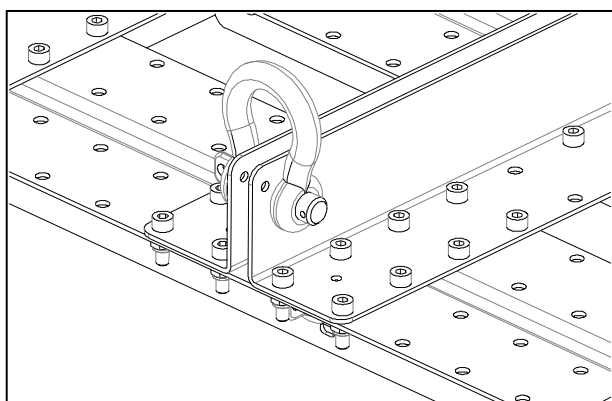
- I. After having selected a **rigging option** [9.1.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 11 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb.) while ensuring that the frame is square.
  - c. Fix the shackles as shown in the bottom left box of Figure 11 and insert a safety pin in each one [9.3].



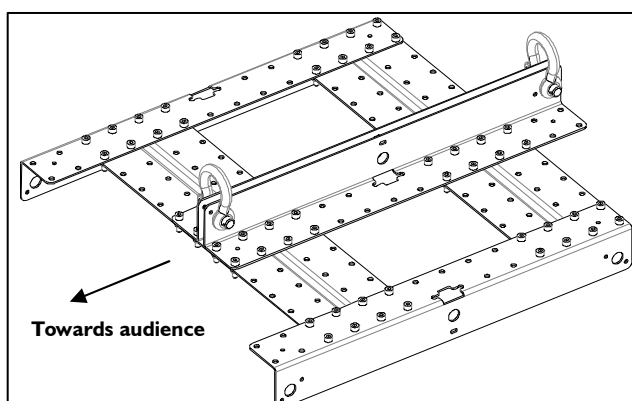
Driving bolts (top view)



Driving bolts (bottom view)



Fixing a shackle



Dual-point rear extension configuration example

Figure 11: Assembling M-BUMPi

2. Prepare the top SB18i enclosure (hereafter designated as SB18i#1) as follows (repeat on the four corners):
  - a. Undo the five 35 mm Torx® screws on a corner of SB18i#1 (T30 bit).
  - b. Position an arm as indicated in Figure 12 and slightly drive the four top screws only. **Note:** The four arms are identical and can be identified by number 611 engraved on each one.



The top part of each arm must be oriented outwards.

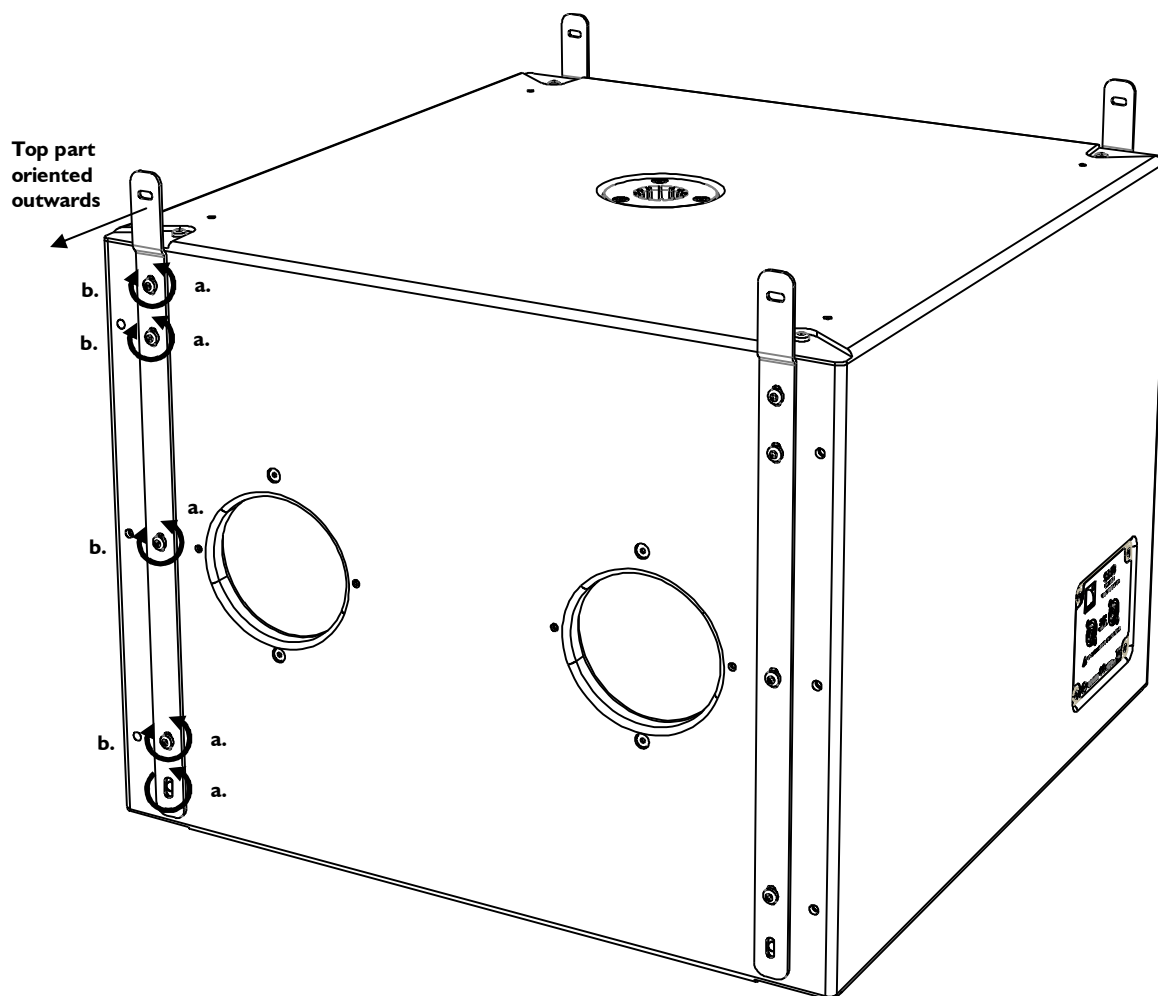
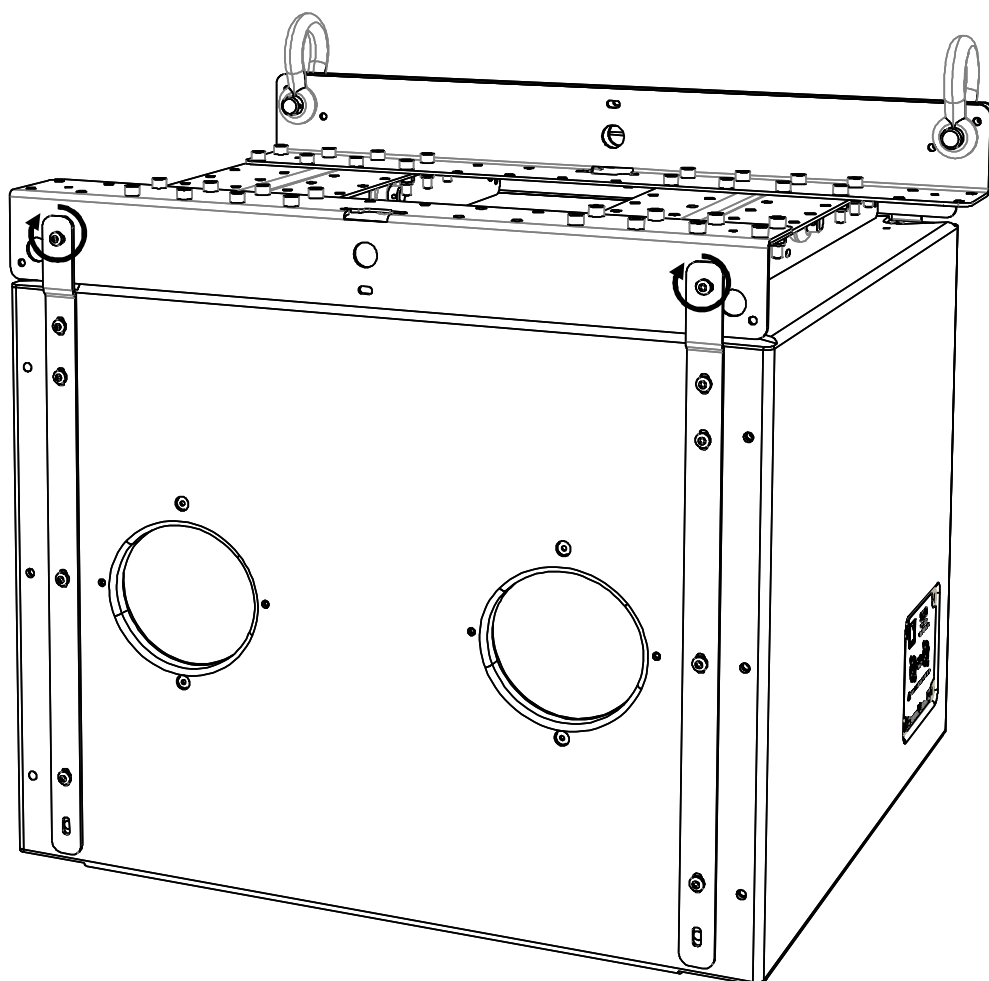
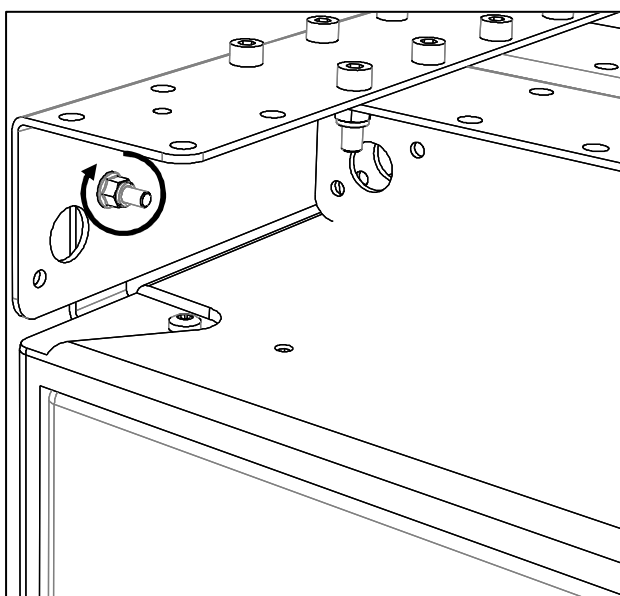


Figure 12: Preparing SB18i

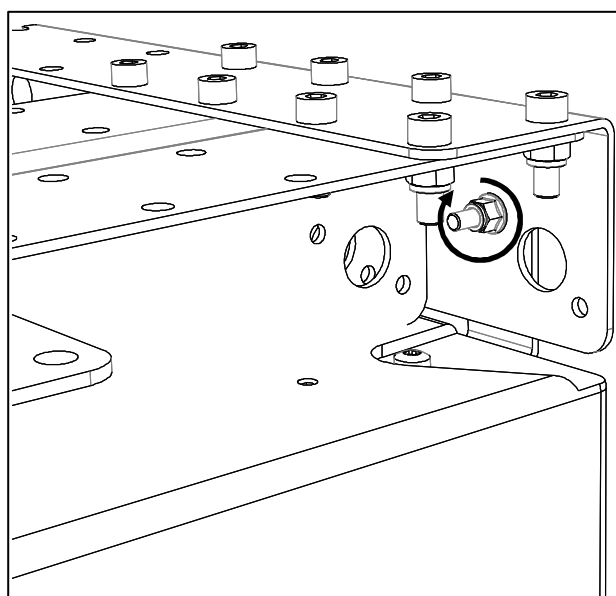
3. Fix SB18i#1 to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the SB18i#1 top link points and the M-BUMPi link points (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lbf).



Full view



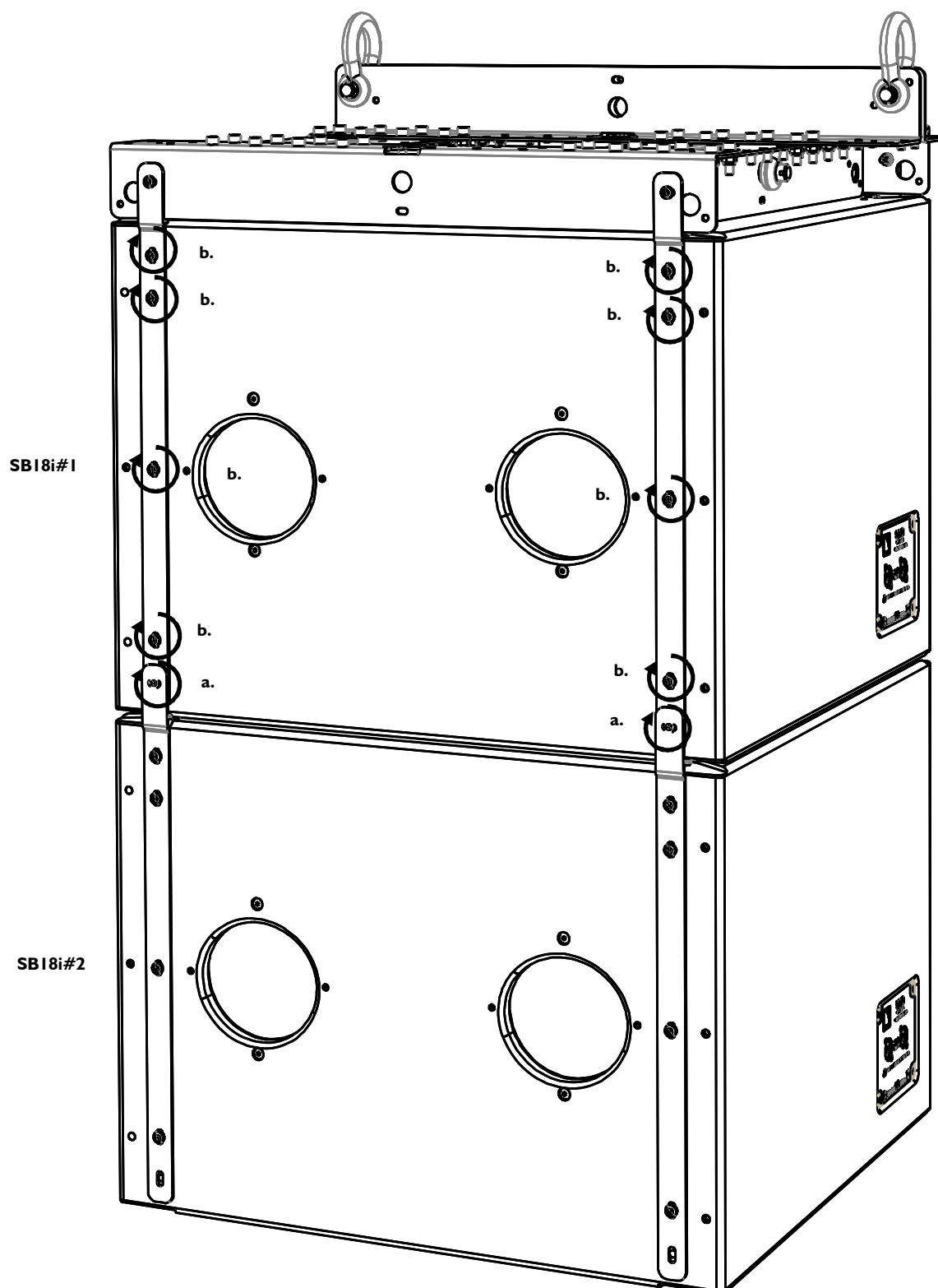
Detailed view of the front left bolt



Detailed view of the rear left bolt

Figure 13: Fixing SB18i#1 to the M-BUMPi

4. Prepare the second SB18i (hereafter designated as SB18i#2) by applying step 2.
5. Fix SB18i#2 to SB18i#1 as follows:
  - a. Align the four SB18i#2 top link points with the four SB18i#1 bottom link points and connect them by driving a 35 mm Torx® screw into each one (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Fully drive the four remaining Torx® screws on each SB18i#1 arm (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



**Figure 14: Fixing SB18i#2 to SB18i#1**

6. Repeat steps 4 and 5 for all additional SB18i enclosures intended to be rigged.

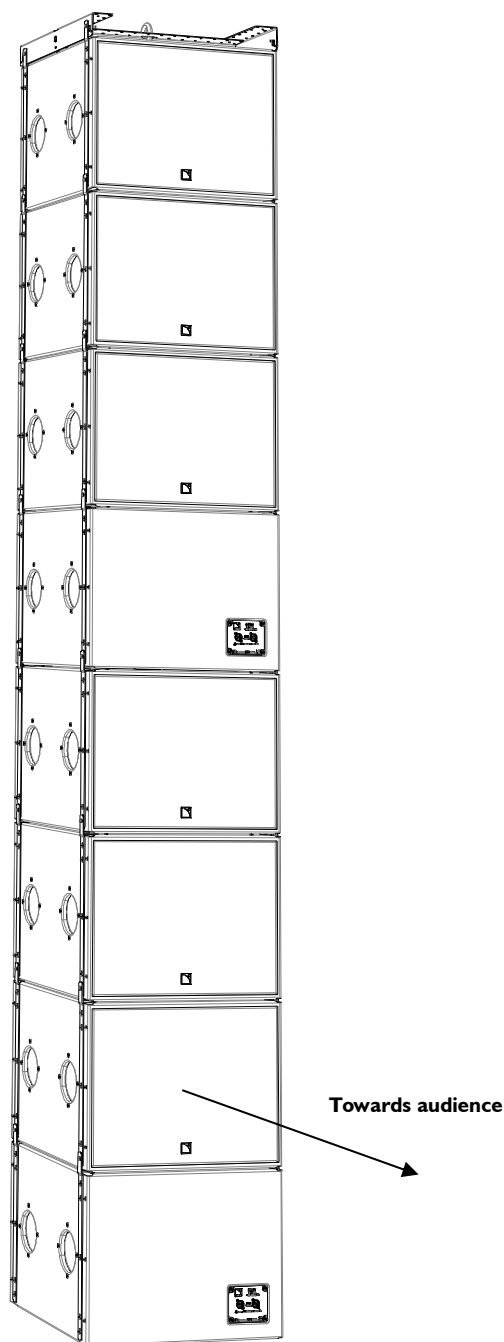


Turn the front grills of all SB18i composing the array towards the audience to obtain an **omnidirectional** acoustic pattern or turn one SB18i every four from front to rear to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]). As an example, Figure 15 shows a cardioid array.

7. If the array is intended to be a SB18i standalone array, apply the following procedure:

- On the bottom SB18i, drive four 35 mm Torx® screws into the bottom holes (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
- Raise the array to the desired height.
- Secure the M-BUMPi to the main rigging structure using two safety slings (not included).

**PROCEDURE END**



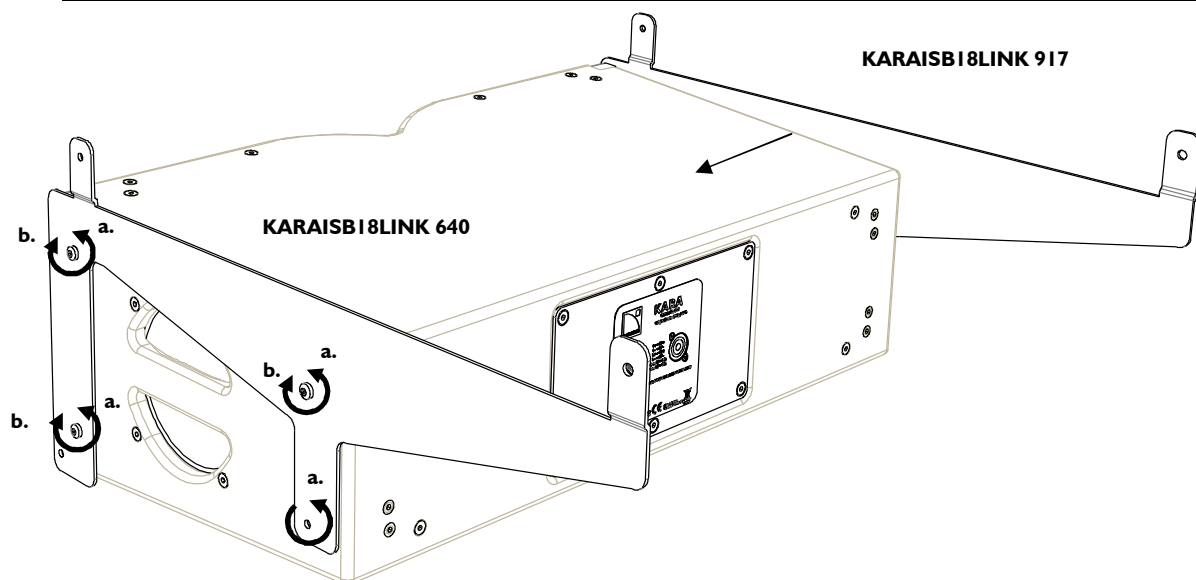
**Figure 15: Example of SB18i standalone array (rigging option 0 [9.1.1])**

If the array is intended to be a SB18i/KARAI mixed array, prepare the first KARAI enclosure (hereafter designated as KARAI#1) as follows (repeat for each enclosure side):

- a. Undo the four 55 mm Torx® screws (T30 bit).
- b. Position the appropriate KARAI SB18LINK component and slightly re-drive the four screws EXCEPT the rear bottom one.

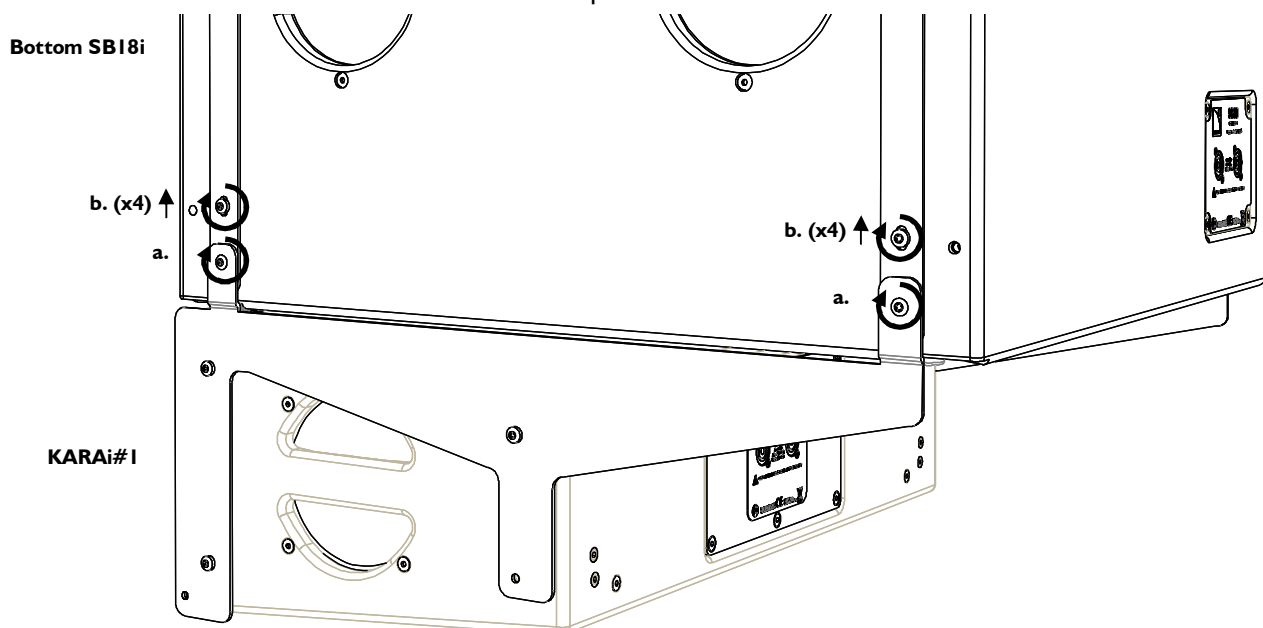


The two KARAI SB18LINK components are symmetric about the enclosure central axis. They are differentiated by numbers engraved on them. Position component 640 on the right and 917 on the left.



**Figure 16: Preparing KARAI#1**

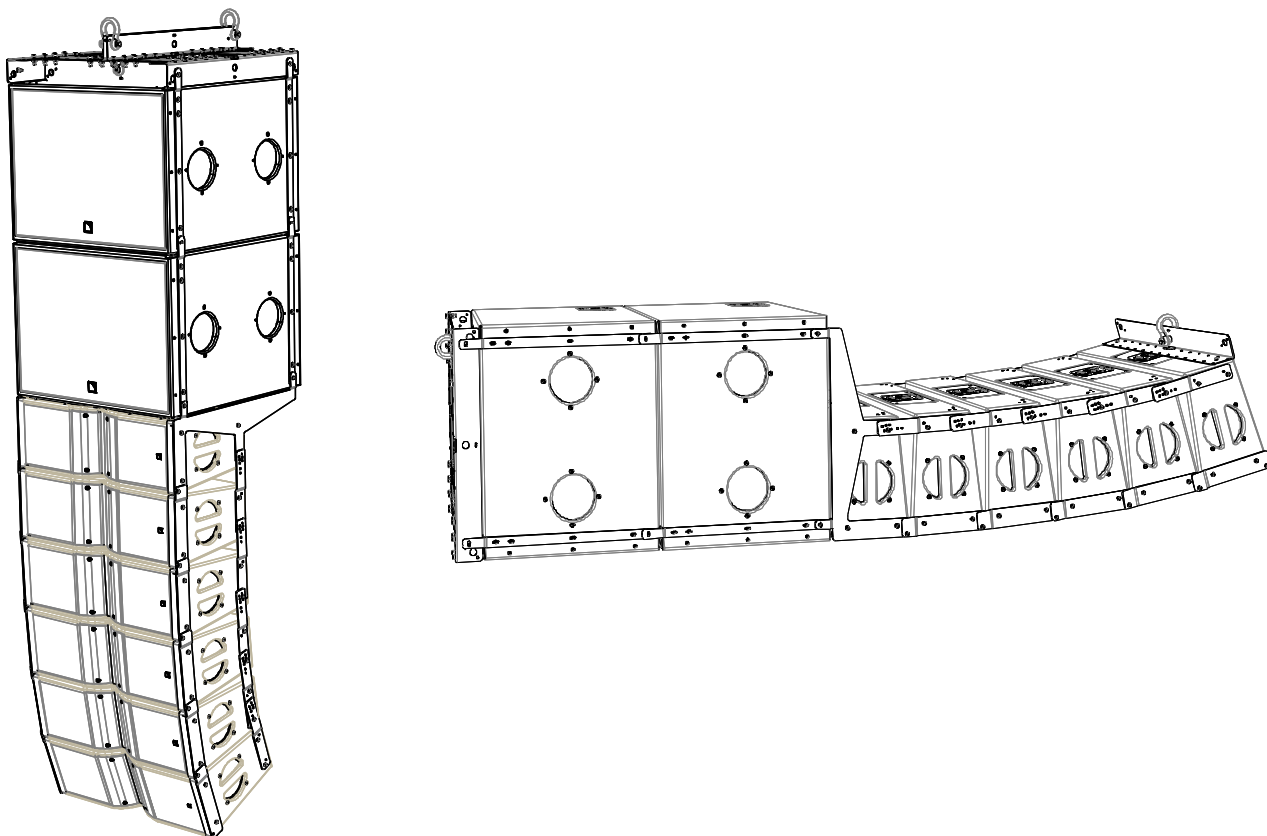
8. Fix KARAI#1 to the bottom SB18i as follows:
    - a. Align the four KARAI SB18LINK top link points with the four SB18i bottom link points and connect them by driving a 35 mm Torx® screw into each one (T30 bit, 5 N.m/45 in.lbf).
    - b. Fully drive the four remaining Torx® screws on each SB18i arm (T30 bit, 5 N.m/45 in.lbf).
- Note:** The KARAI#1 and SB18i front faces will be parallel.



**Figure 17: Fixing KARAI#1 to the bottom SB18i**



9. Apply the procedure [6.1.2 from step 4 to the end].



**Figure 18: Examples of SBI8i/KARAI mixed arrays**

### 6.2.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

### 6.3 Stacking a KARAI standalone array

#### 6.3.1 Modeling and safety

A KARAI array must be stacked onto an M-BUMPi platform (**platform stacked array**).

Any **platform stacked array** must be modeled before installation so as to ensure acoustical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARAI enclosures.
- Calculate the inter-enclosure angles.



A **platform stacked array** requires to be installed on a perfectly horizontal and regular surface. It can be composed of a maximum of **9 KARAI** enclosures along with all loudspeaker cables (refer to the **KARAI User manual** [3.4]).

The platform must be installed in **rear extension configuration** if the KARAI array is intended to have a **null** site angle (refer to [9.2.1]).

The platform must be installed in **front extension configuration** if the KARAI array is intended to have a **negative** site angle (refer to [9.2.1]) and a **flat** shape (all inter-enclosure angles are close to 0°).

#### 6.3.2 Array assembling procedure

The following procedure describes how to assemble a vertical KARAI **platform stacked array**.



All along the procedure:

STRICTLY follow the sequence of the successive steps.

SYSTEMATICALLY verify that each bolt and screw is fully driven to the given torque value.



For clarity purposes the loudspeaker cabling procedure will not be described.

The loudspeaker cables will not be represented on the figures.

#### **Required components and tools**

M-BUMPi, electric screwdriver with torque selector (N.m or in.lb.), T30 Torx® bit, 5 mm hex bit, 6 mm hex bit, 10 mm hex key, 13 mm hex key, one piece of carpet of 700 x 700 mm (not included), additional support and fixing material (not included).

## Procedure

1. After having selected a **platform configuration** [9.2.1], assemble an M-BUMPi as follows:
  - a. Assemble the bars by slightly driving the self-locking M8 hex bolts (by groups of four on each bar end) as shown in both top boxes of Figure 19 (6 mm hex bit, 13 mm hex key).
  - b. Fully drive all screws (5 N.m/45 in.lb.) while ensuring that the frame is square.

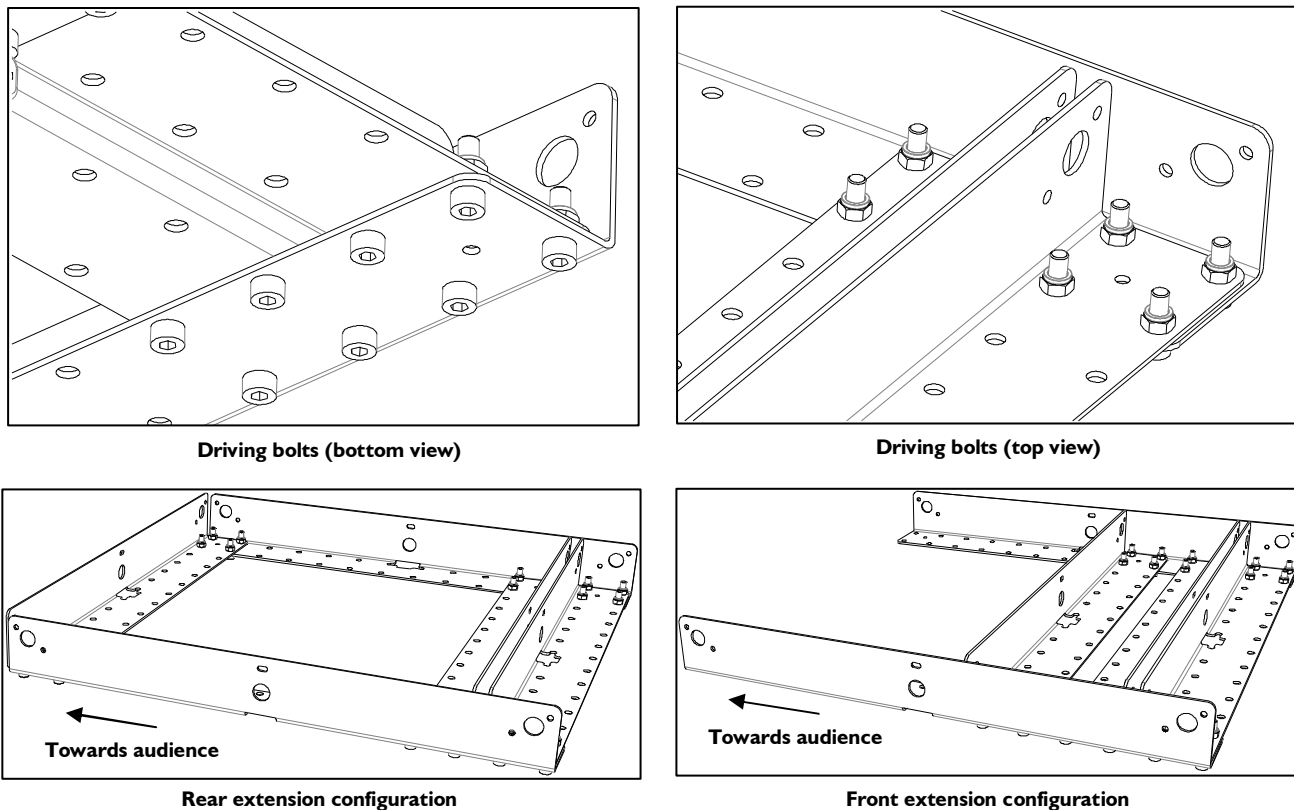


Figure 19: Assembling M-BUMPi

2. Position the piece of carpet at the stacking location and position the M-BUMPi on it by applying the following recommendations:
  - a. Respect the final orientation as shown in the bottom left or right box of Figure 19.
  - b. If the bottom KARAI site angle is intended to be  $0^\circ$  (see the left box of Figure 20), raise the platform to approximately 10 mm (support material not included).
  - c. In case of M-BUMPi front extension configuration (see the right box of Figure 20), drive four self-locking M8 hex bolts to both platform front ends to keep the M-BUMPi horizontal (bolts included in the M-BUMPi package, 6 mm hex bit, 13 mm hex key, 5 N.m/45 in.lb.).
  - d. Firmly fix the M-BUMPi to the ground (fixing material not included).

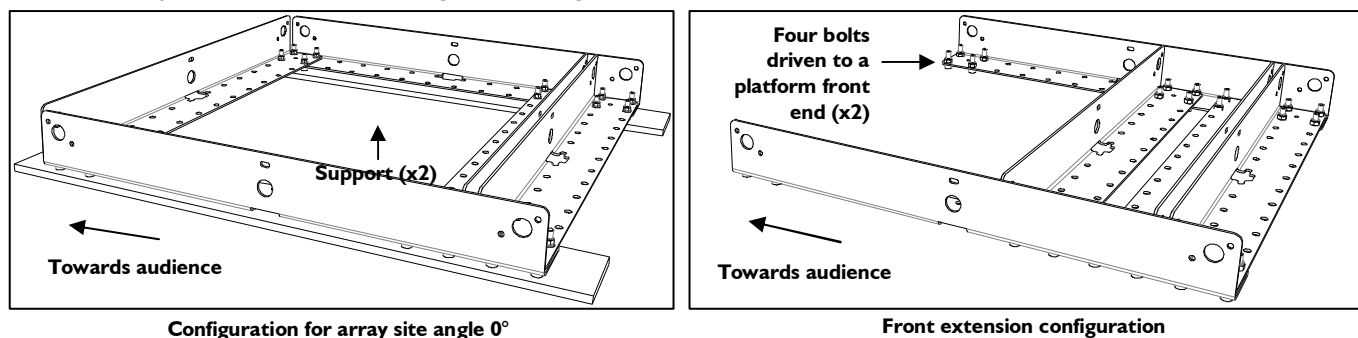


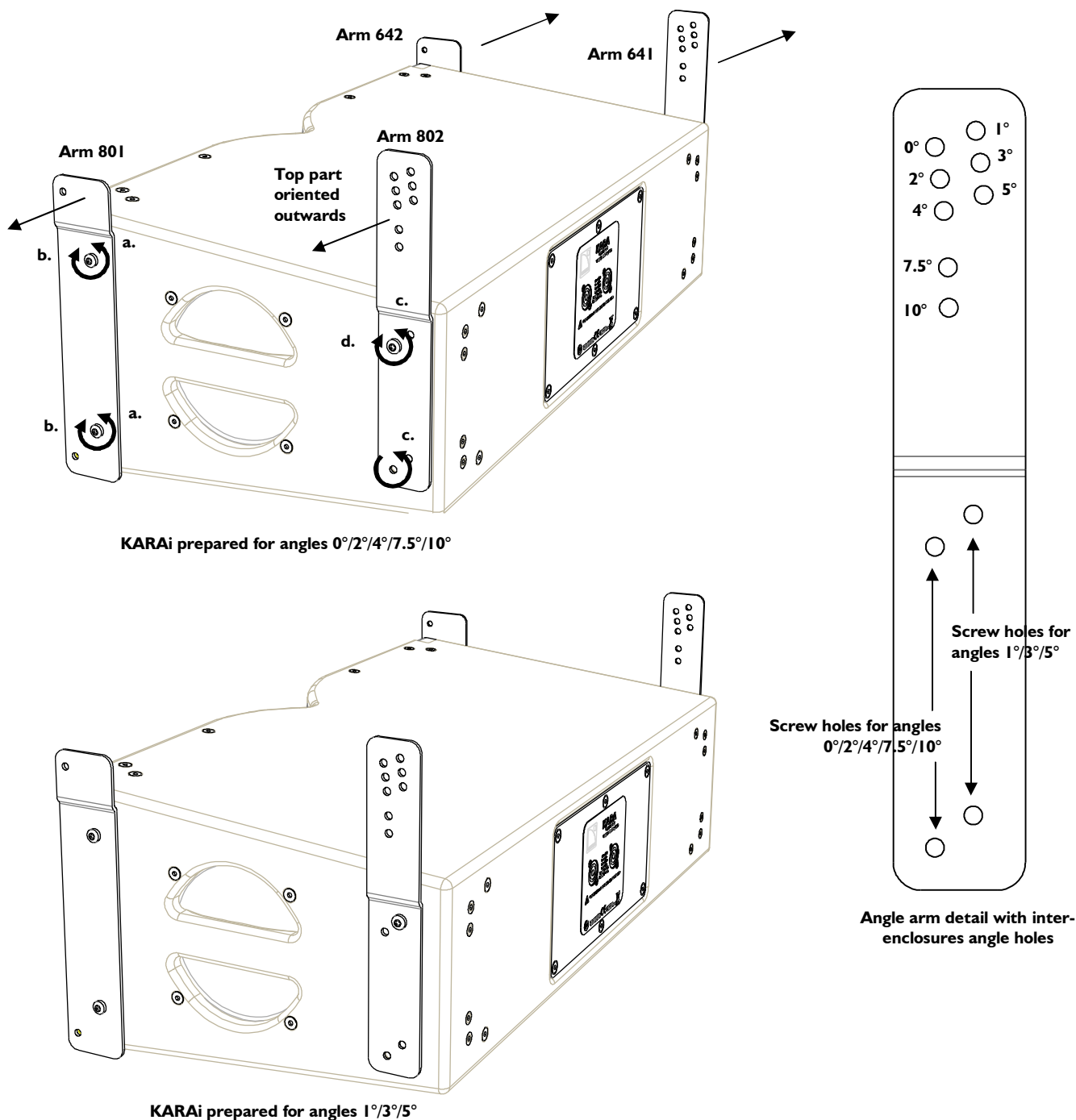
Figure 20: positioning the M-BUMPi stacking platform

3. Prepare the bottom KARAI (hereafter designated as KARAI#1) as follows (repeat for each enclosure side):



The four arms are different and are identified by numbers engraved on them: fix arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right. Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm by slightly driving both preceding front screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm by slightly driving the top rear screw ONLY. The position of the angle arm depends on the angle intended to be set [9.2.2] as shown in Figure 21.

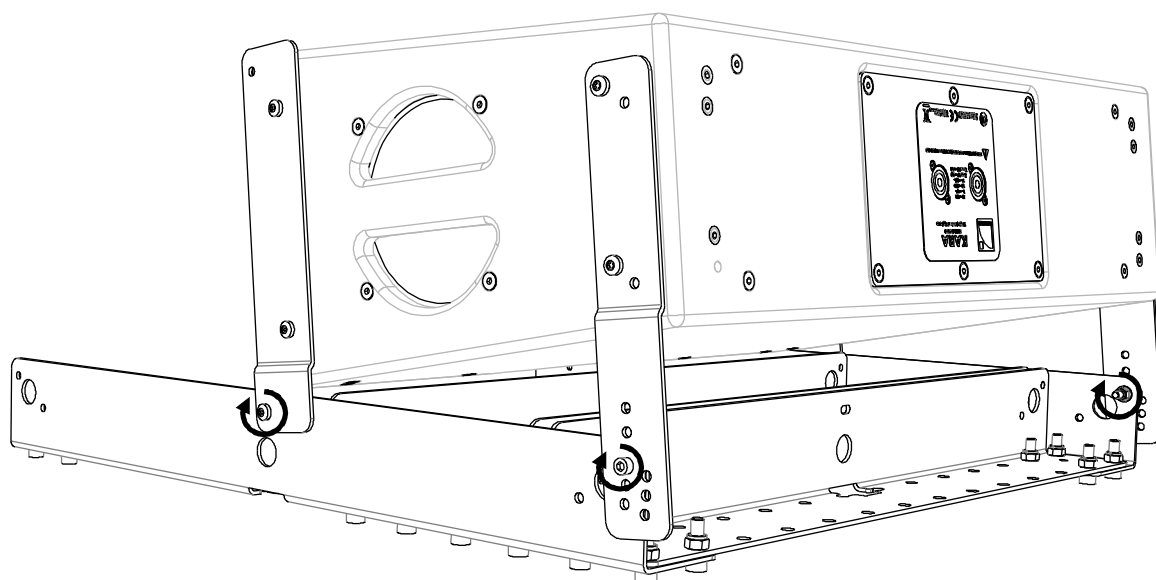


**Figure 21: Preparing KARAI**

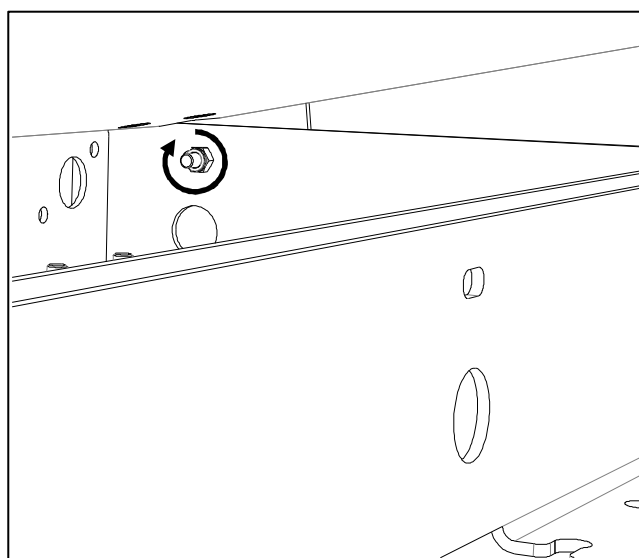
4. Position KARAI#1 upside down and fix it to the M-BUMPi by driving four self-locking M6 hex bolts (included in the M-BUMPi package) into the KARAI#1 bottom link points and the M-BUMPi link points (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lb.). **Note:** The bottom link points of a KARAI that has been positioned arms downwards are the top R-BLP of the same KARAI positioned arms upwards.



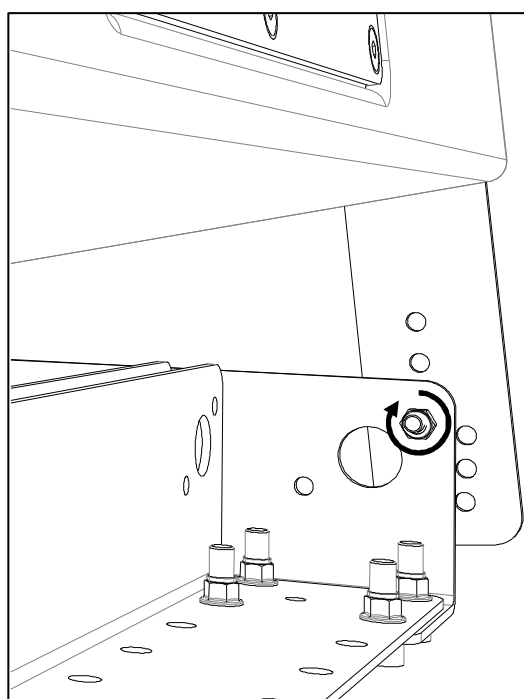
On each angle arm, select the angle hole corresponding to the chosen site angle [9.2.2].  
The angle holes are detailed in Figure 21.



Full view



Front bolt detailed view



Rear bolt detailed view

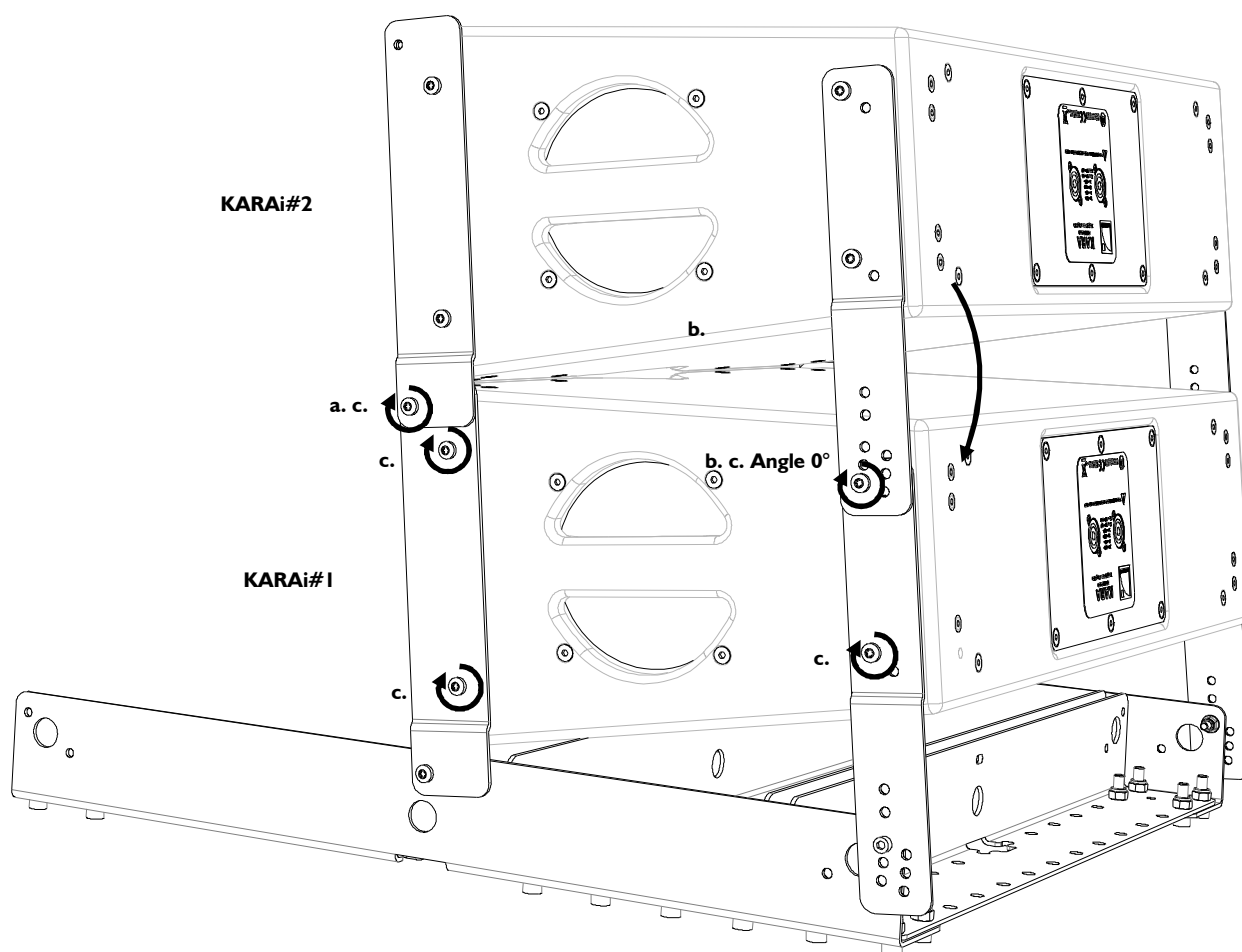
Figure 22: Fixing KARAI#1 to M-BUMPi (front extension configuration example)

5. Prepare the second KARAI (hereafter designated as KARAI#2) by applying step 3.
6. Position KARAI#2 upside down and fix it to KARAI#1 as follows:
  - a. Align both KARAI#2 front bottom link points with both KARAI#1 front top link points and connect them by slightly driving a 35 mm Torx® screw into each one (T30 bit).
  - b. Rotate KARAI#2 so as to align its rear bottom link points with both KARAI#1 rear top link points and connect them by slightly driving two 55 mm Torx® screws (T30 bit).



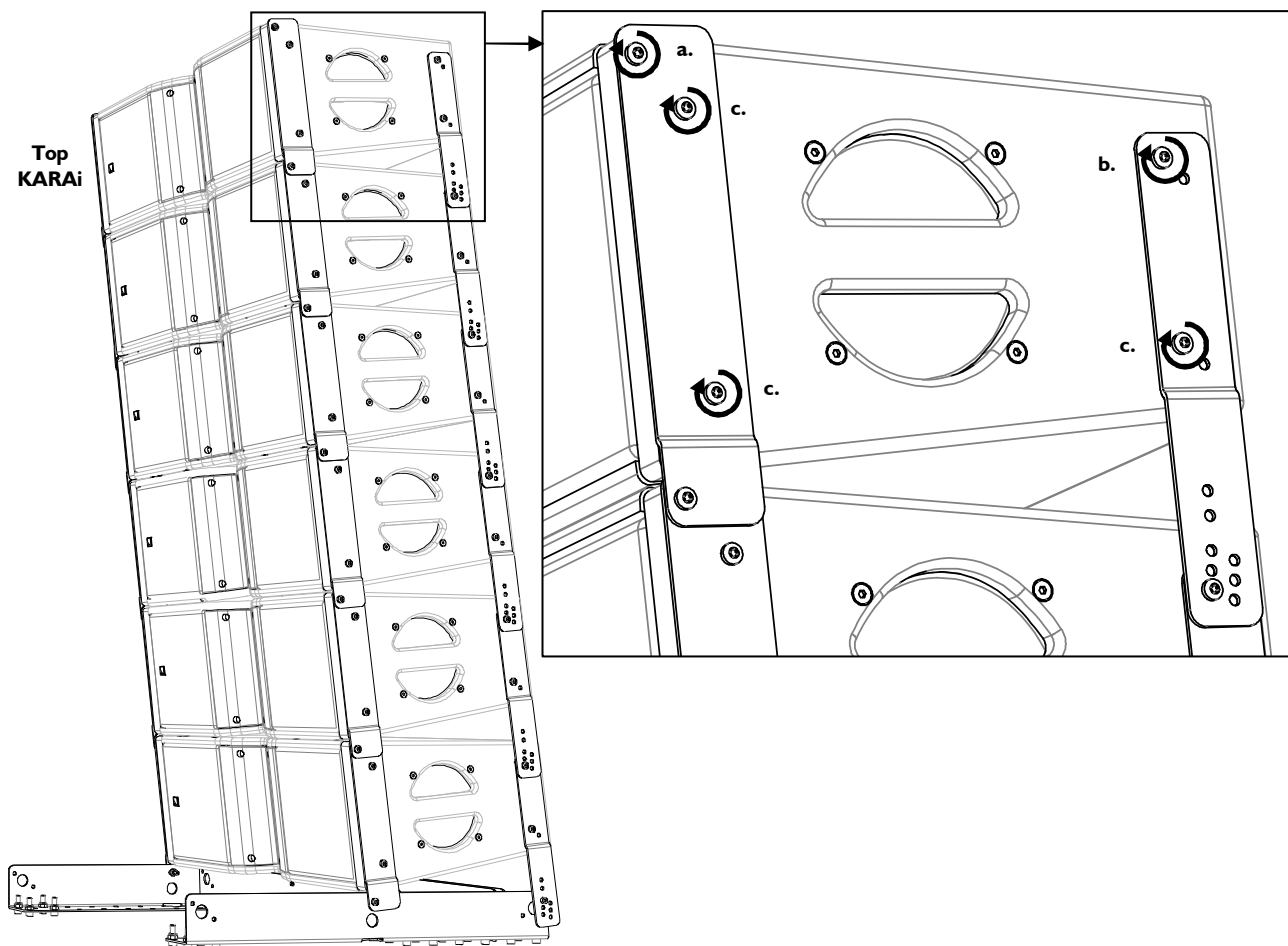
On both angle arms, select the holes corresponding to the angle intended to be set.  
 The inter-enclosures angle will be equal to the value indicated in Figure 21.  
 Figure 23 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).

- c. Fully drive the ten Torx® screws on KARAI#1 (T30 bit, 5 N.m/45 in.lb.).



**Figure 23: Fixing KARAI#2 to KARAI#1**

7. Repeat steps 5 and 6 for all additional KARAI enclosures intended to be rigged.
8. Secure the fixation points on the top KARAI as follows (repeat on both enclosure sides):
  - a. Drive a 35 mm Torx® screw into the front top hole (T30 bit, 5 N.m/45 in.lbf).
  - b. Drive a 55 mm Torx® screw into the rear top hole (T30 bit, 5 N.m/45 in.lbf).
  - c. Fully drive the three remaining Torx® screws (T30 bit, 5 N.m/45 in.lbf).



**Figure 24: Example of KARAI standalone array**

### 6.3.3 Array disassembling procedure

Apply the above procedure in the reversed sequence.

## 6.4 Stacking a SB18i/KARAI mixed array or a SB18i standalone array

### 6.4.1 Modeling and safety

A SB18i/KARAI mixed array or a SB18i standalone array must be stacked directly on the ground (**ground stacked array**).

Any SB18i/KARAI **ground stacked array** must be modeled before installation so as to ensure acoustical conformity. This can be done using **L-ACOUSTICS® SOUNDVISION Software** [3.4] which will assist the user to:

- Determine the number of required KARAI enclosures (acoustic data not available for subwoofers).
- Calculate the inter-enclosure angles.



A **ground stacked array** requires to be installed on a perfectly horizontal and regular surface. It can be composed of a maximum of **4 SB18i/9 KARAI** or **8 SB18i** enclosures within the setup safety limits given in Table 2 regarding the angle between the top SB18i and the bottom KARAI (refer to [9.2.2] for bottom KARAI angle setting):

**Table 2: Ground stacked SB18i/KARAI array safe configurations**

Number of SB18i	Number of KARAI	Bottom KARAI authorized angle range
1	1 - 2	From -10° to 0°
	3 - 9	From -5° to 0°
2	1 - 8	From -10° to 0°
	9	From -7.5° to 0°
3 - 4	1 - 9	From -10° to 0°

### 6.4.2 Array assembling procedure

The following procedure describes how to stack a vertical SB18i/KARAI or SB18i array.



All along the procedure:  
 STRICTLY follow the sequence of the successive steps.  
 SYSTEMATICALLY verify that each bolt and screw is fully driven to the given torque value.



For clarity purposes the loudspeaker cabling procedure will not be described.  
 The loudspeaker cables will not be represented on the figures.

### Required components and tools

Electric screwdriver with torque selector (N.m or in.lb.), T30 Torx® bit, 5 mm hex bit, 10 mm hex key, two M-BUMPi bars and four M6 washers (for mixed arrays).



## Procedure

- I. Prepare the bottom SB18i enclosure (hereafter designated as SB18i#1) as follows (repeat on the four corners):
  - a. Undo the five 35 mm Torx® screws on a corner of SB18i#1 (T30 bit).
  - b. Position an arm as indicated in Figure 25 and slightly drive the five screws. **Note:** The four arms are identical and can be identified by number 611 engraved on each one.

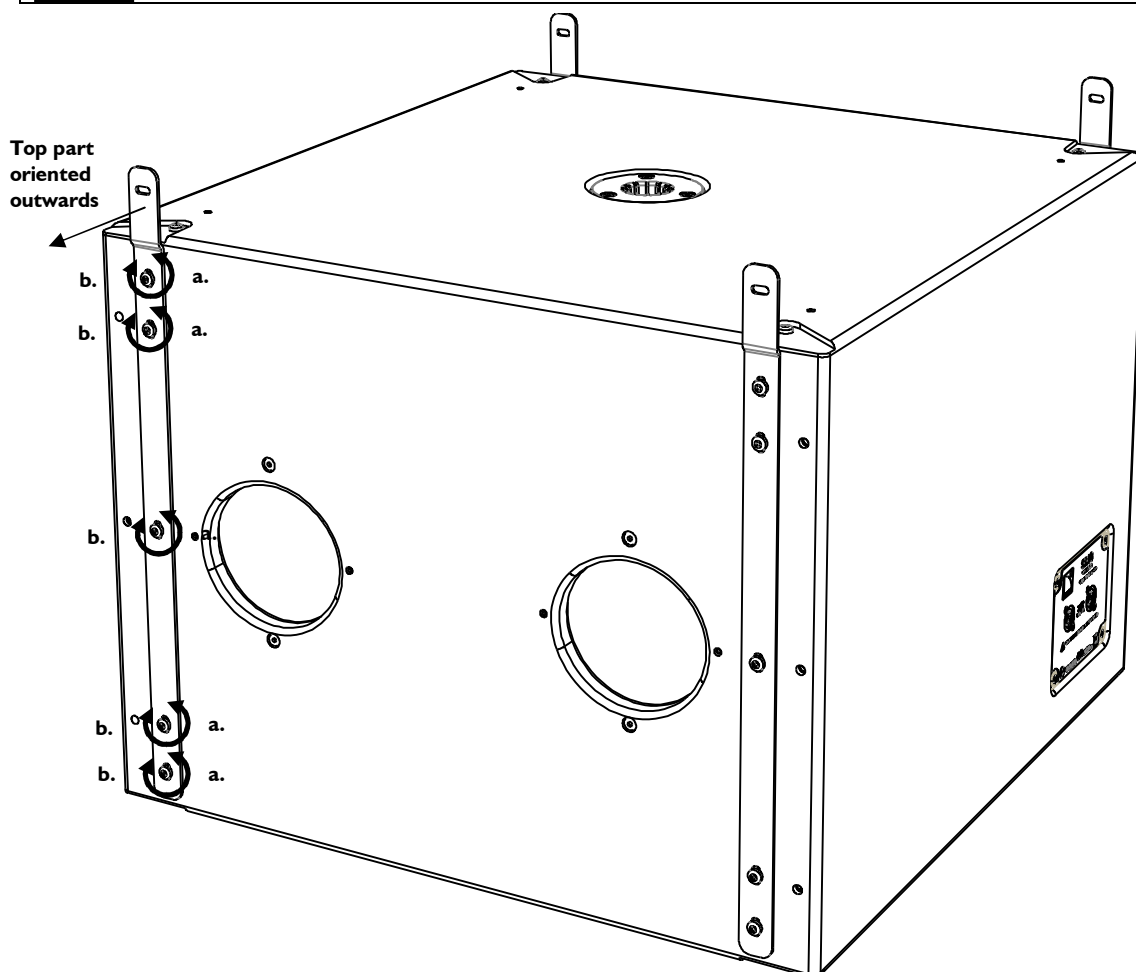
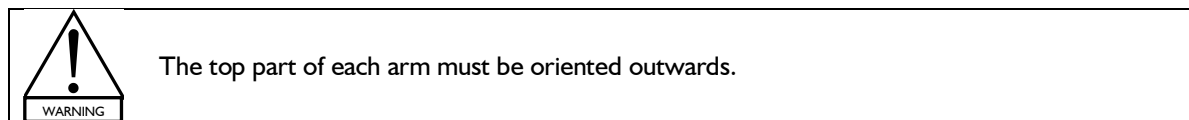


Figure 25: Preparing the bottom SB18i

2. Prepare a second SB18i (SB18i#2) by applying step I WITHOUT re-driving the bottom screws.

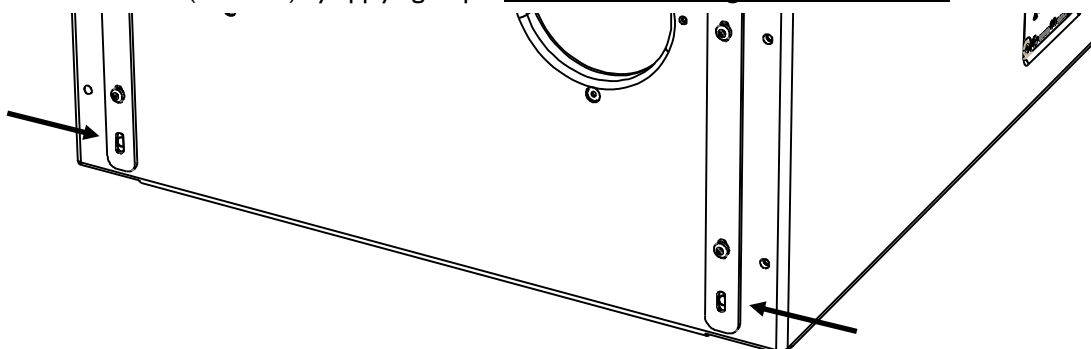
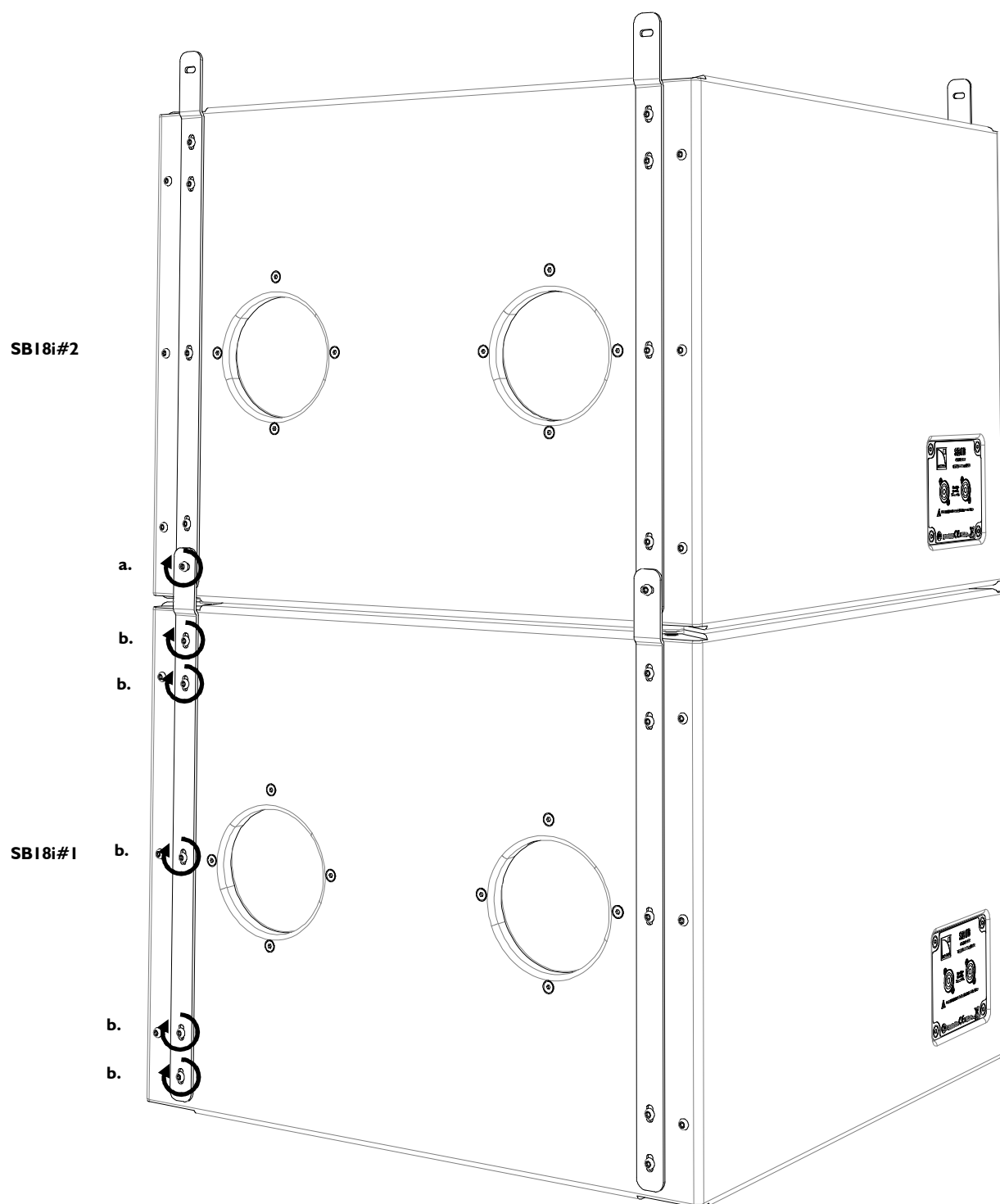


Figure 26: Preparing the second SB18i

3. Fix SB18i#2 onto SB18i#1 as follows:
  - a. Align the four SB18i#2 bottom link points with the four SB18i#1 top link points and connect them by driving a 35 mm Torx® screw into each one (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Fully drive the five remaining Torx® screws on each SB18i#1 arm (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



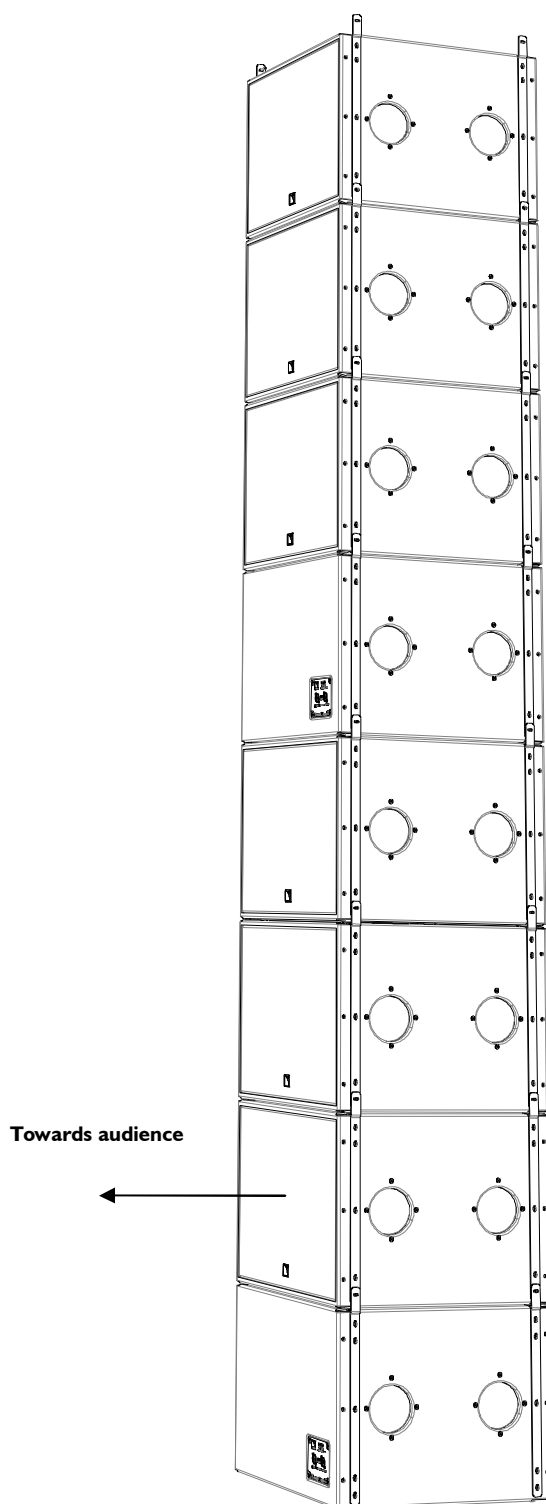
Turn the front grills of all SB18i composing the array towards the audience to obtain an **omnidirectional** acoustic pattern or turn one SB18i every four from front to rear to obtain a **cardioid** acoustic pattern (refer to the **SB18 User manual** [3.4]). As an example, Figure 28 shows a cardioid array.



**Figure 27: Fixing SB18i#2 to SB18i#1**

4. Repeat steps 2 and 3 for all additional SB18i enclosures intended to be rigged.
5. If the array is intended to be a SB18i standalone array, apply the following procedure:
  - a. Fully drive all Torx® screws on the four arms of the top SB18i enclosure (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Secure the array to a fixed point using a ratchet strap or any other applicable material (not included).

**PROCEDURE END**



**Figure 28: Example of SB18i standalone array**

If the array is intended to be a SB18i/KARAI mixed array, fix two M-BUMPi bars to the top SB18i as follows (repeat on each SB18i side):

- Position an M-BUMPi bar face to two SB18i arms as shown in Figure 29 and connect both link points by driving two self-locking M6 hex bolts (included in the M-BUMPi package) (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lb<sub>f</sub>).
- Fully drive all Torx® screws on the SB18i side (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).

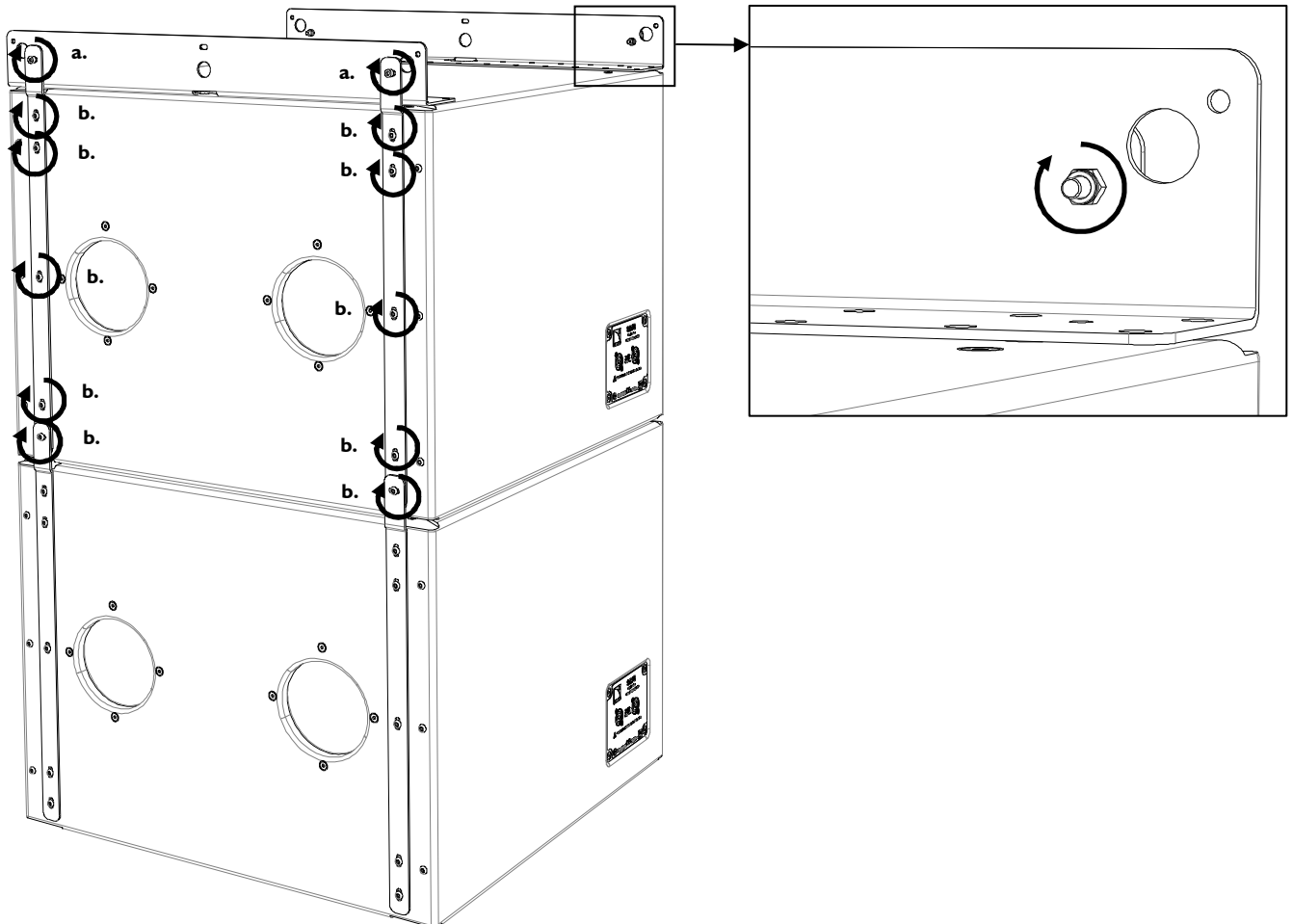


Figure 29: Fixing two M-BUMPi bars to the top SB18i



For clarity purposes, the procedure is continued with an array composed of one SB18i enclosure.

6. Prepare the bottom KARAI enclosure (hereafter designated as KARAI#1) as follows (repeat for each enclosure side):



The four arms are different and are identified by numbers engraved on them: fix arm 641 on the rear left, 642 on the front left, 801 on the front right, and 802 on the rear right.

Orient the top part of each arm outwards.

- Undo both front 55 mm Torx® screws (T30 bit).
- Position the appropriate front arm by slightly driving both preceding front screws.
- Undo both rear 55 mm Torx® screws (T30 bit).
- Position the appropriate angle arm by slightly driving the top rear screw only. The position of the angle arm depends on the angle intended to be set [9.2.2], as shown in Figure 30.

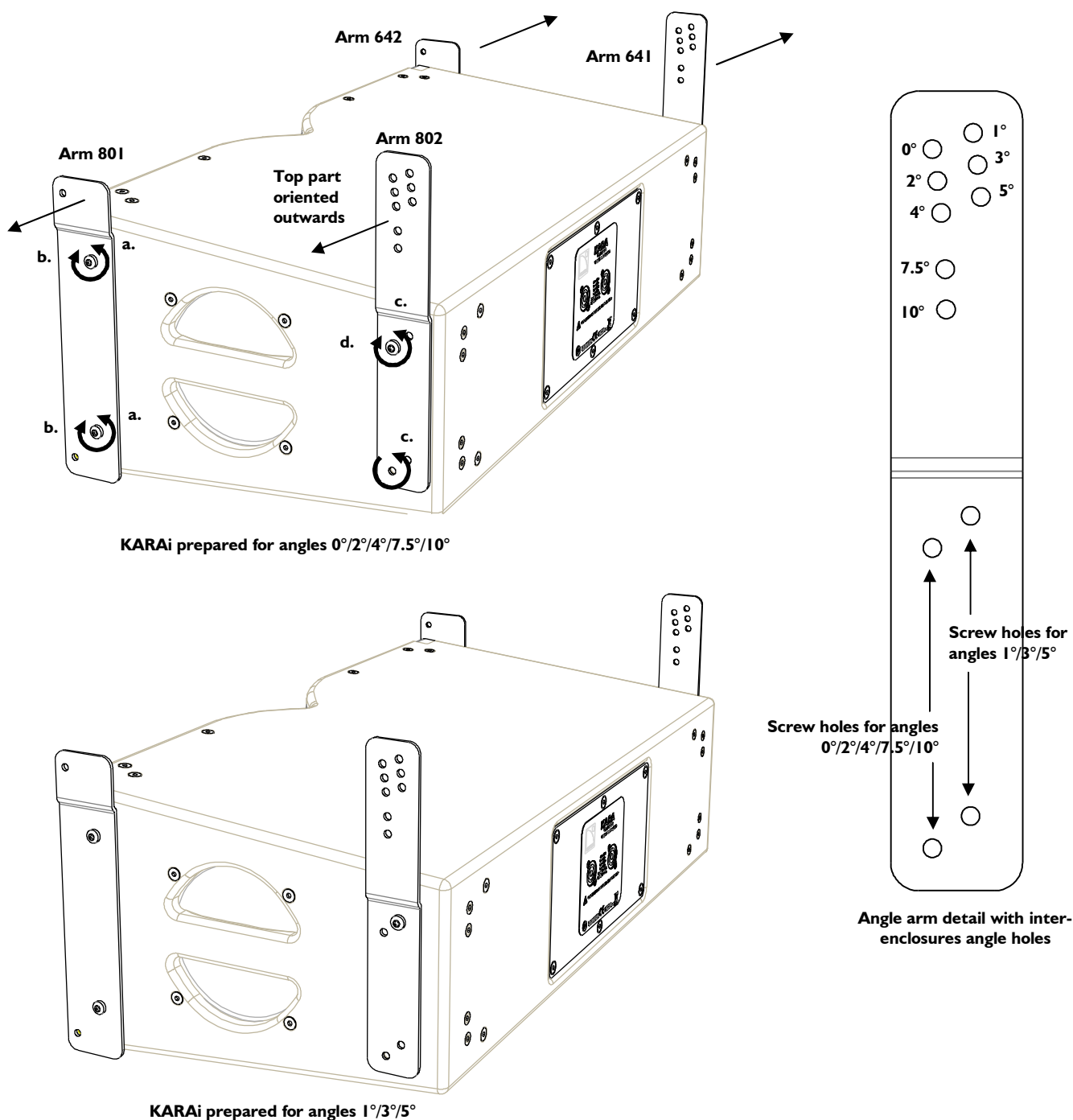
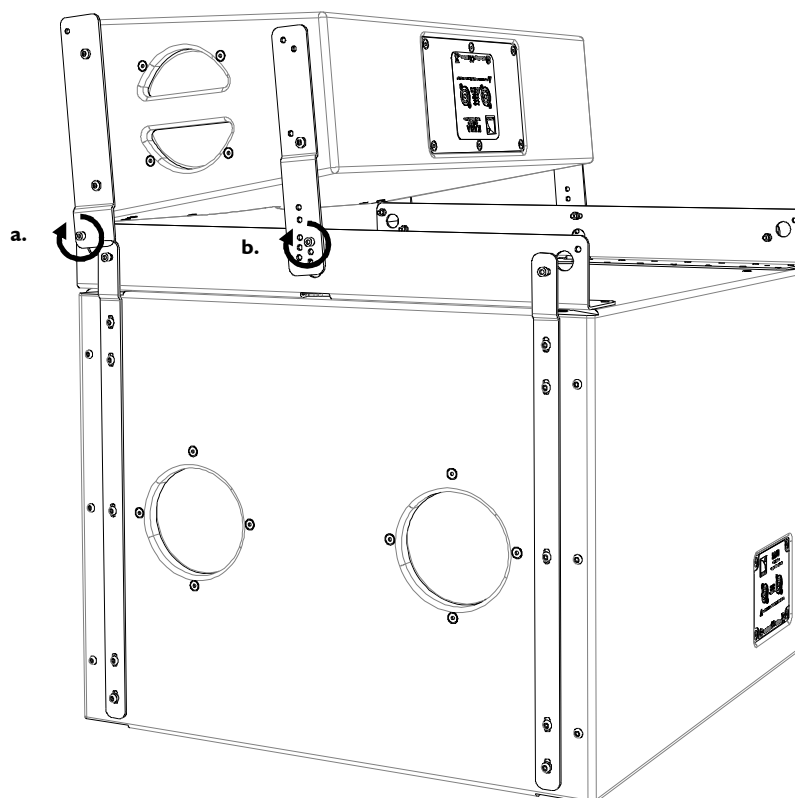


Figure 30: Preparing KARAI

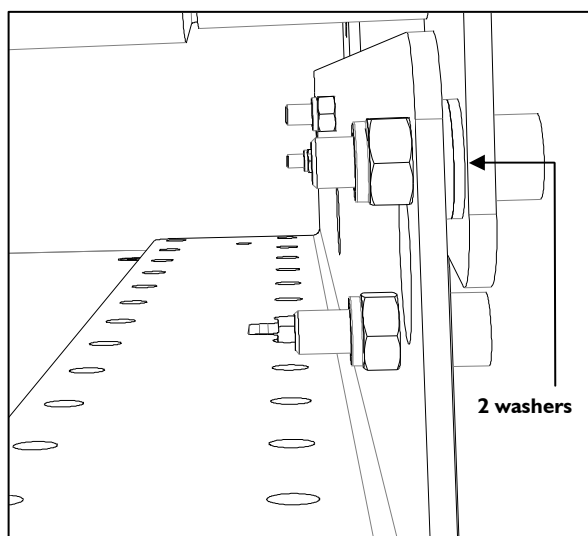
7. Position KARAI# I upside down and fix it to the M-BUMPi bars as follows:
  - a. Drive a self-locking M6 hex bolt with two M6 washers (included in the M-BUMPi package) into each of both front link points as shown in the bottom left box of Figure 3 I (5 mm hex bit, 10 mm hex key, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Drive a self-locking M6 hex bolt to each of both rear link points as shown in the bottom right box of Figure 3 I.



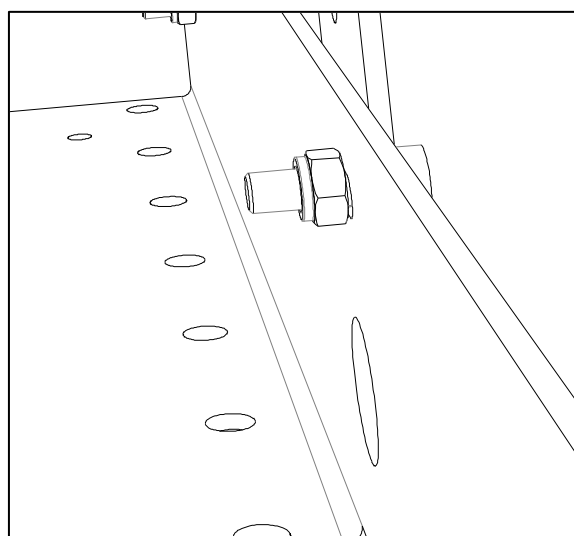
On each angle arm, select the angle hole corresponding to the chosen site angle [9.2.2].  
The angle holes are detailed in Figure 30.



**Full view**



**a. Front bolt detailed view**



**b. Rear bolt detailed view**

**Figure 3 I: Fixing KARAI# I to the M-BUMPi bars**

8. Prepare the second KARAI (hereafter designated as KARAI#2) by applying step 6.
9. Position KARAI#2 upside down and fix it to KARAI#1 as follows:
  - a. Align both KARAI#2 front bottom link points with both KARAI#1 front top link points and connect them by slightly driving a 35 mm Torx® screw into each one (T30 bit).
  - b. Rotate KARAI#2 so as to align its rear bottom link points with both KARAI#1 rear top link points and connect them by slightly driving two 55 mm Torx® screws (T30 bit).



On both angle arms, select the holes corresponding to the angle intended to be set.  
The inter-enclosures angle will be equal to the value indicated in Figure 30.  
Figure 32 shows the example of angle 0° (KARAI#1 and KARAI#2 front faces parallel).

- c. Fully drive the ten Torx® screws on KARAI#1 (T30 bit, 5 N.m/45 in.lb.).

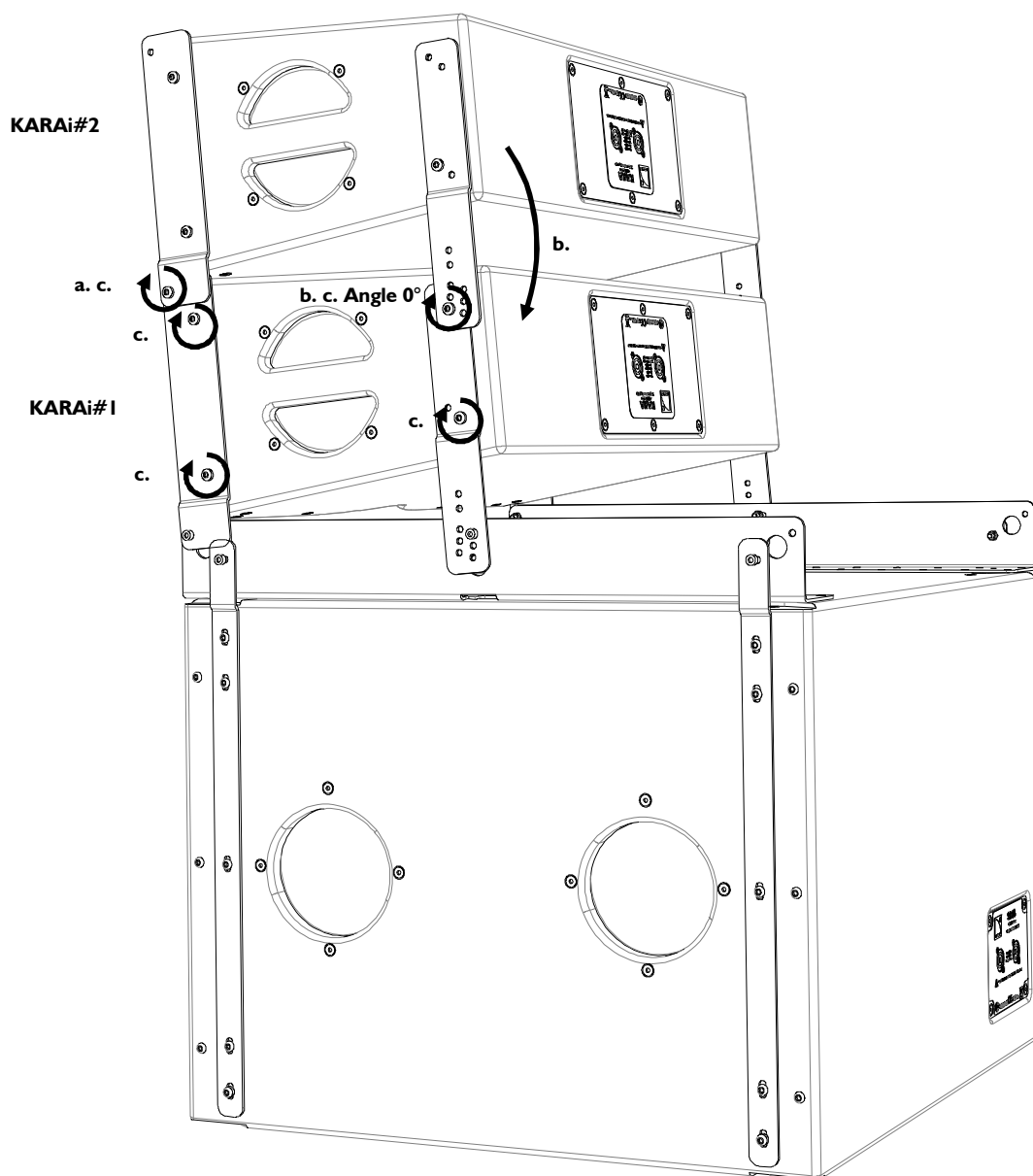
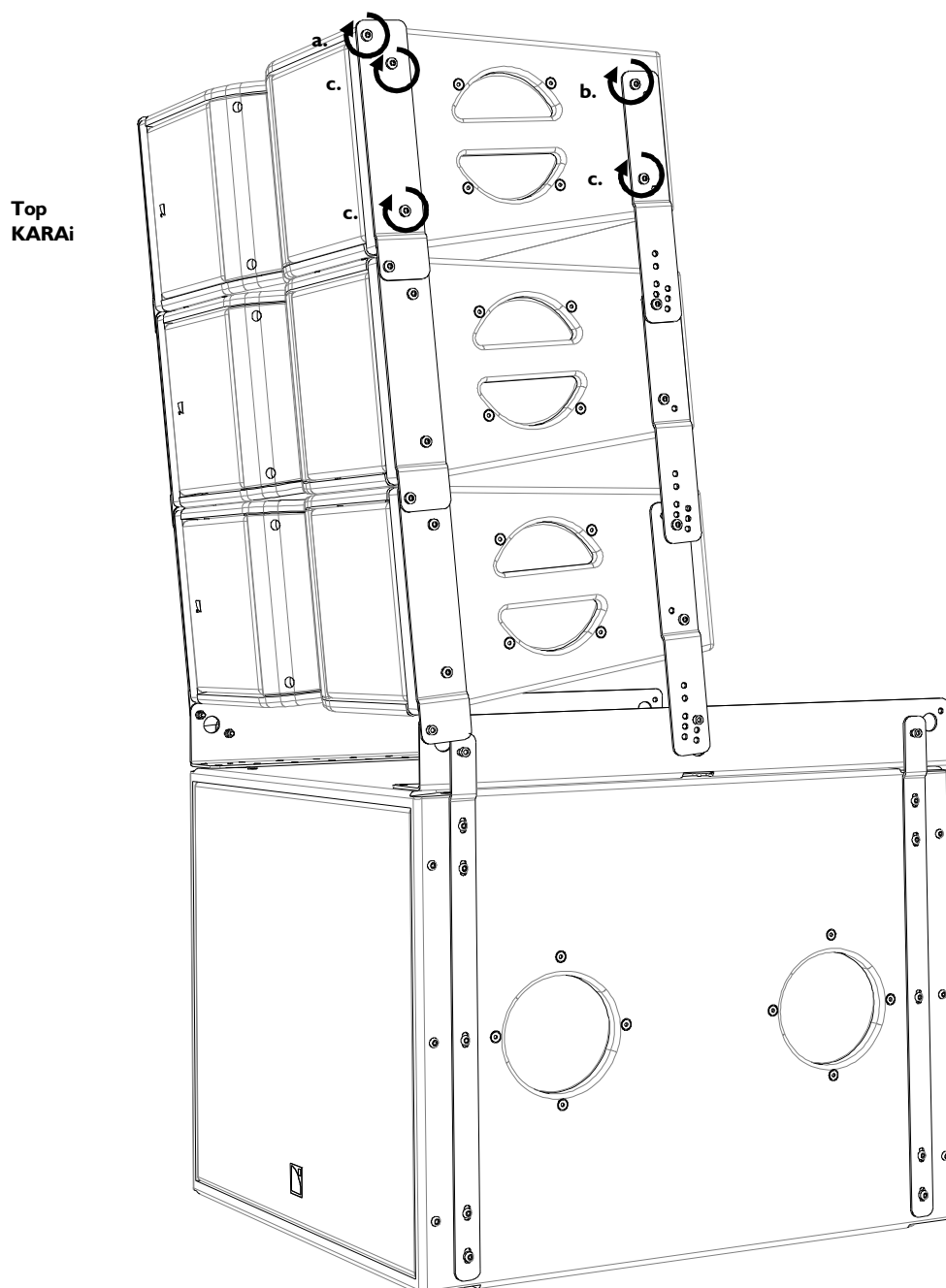


Figure 32: Fixing KARAI#2 to KARAI#1

10. Repeat steps 8 and 9 for all additional KARAI enclosures intended to be rigged.
11. Secure the fixation points on the top KARAI as follows (repeat on both enclosure sides):
  - a. Drive a 35 mm Torx® screw into the front top hole (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - b. Drive a 55 mm Torx® screw into the rear top hole (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).
  - c. Fully drive the three remaining Torx® screws (T30 bit, 5 N.m/45 in.lb<sub>f</sub>).



**Figure 33: Example of SBI8i/KARAI mixed array**

12. Secure the array to a fixed point using a ratchet strap or any other applicable material (not included).

#### **6.4.3 Array disassembling procedure**

Apply the above procedure in the reversed sequence.




## 7 CARE AND MAINTENANCE

### 7.1 Maintenance information

The KARAi® system assembling components are the following:


- M-BUMPi rigging structure with bolts.
- KARAiSBI8LINK accessories with screws.
- KARAi® and SBI8i enclosures with arms and screws.
- Shackles with bolts and safety pins.

If these components are used as it is described in this manual they will remain fully operational over the enclosures' life. However, it is necessary to regularly check the following points in order to guarantee the system durability:




The M-BUMPi and KARAiSBI8LINK elements (including shackles, bolts, and screws) should not show any deformation, fissure, or oxidation.

Any component incorporating a part showing signs of defect must immediately be replaced.



The metal components of the KARAi® and SBI8i enclosures should not show any signs of deformation, fissure, or oxidation. They must be securely fixed to the enclosure.


Any enclosure incorporating a part showing signs of defect must immediately be put aside and withdrawn from use to be inspected by qualified service personnel.



Verify the screwing mechanism on each shackle. Verify that the safety pin is present and that it locks correctly.

### 7.2 Service

The replacement kit (KR) available for the customer is detailed in Table 3.

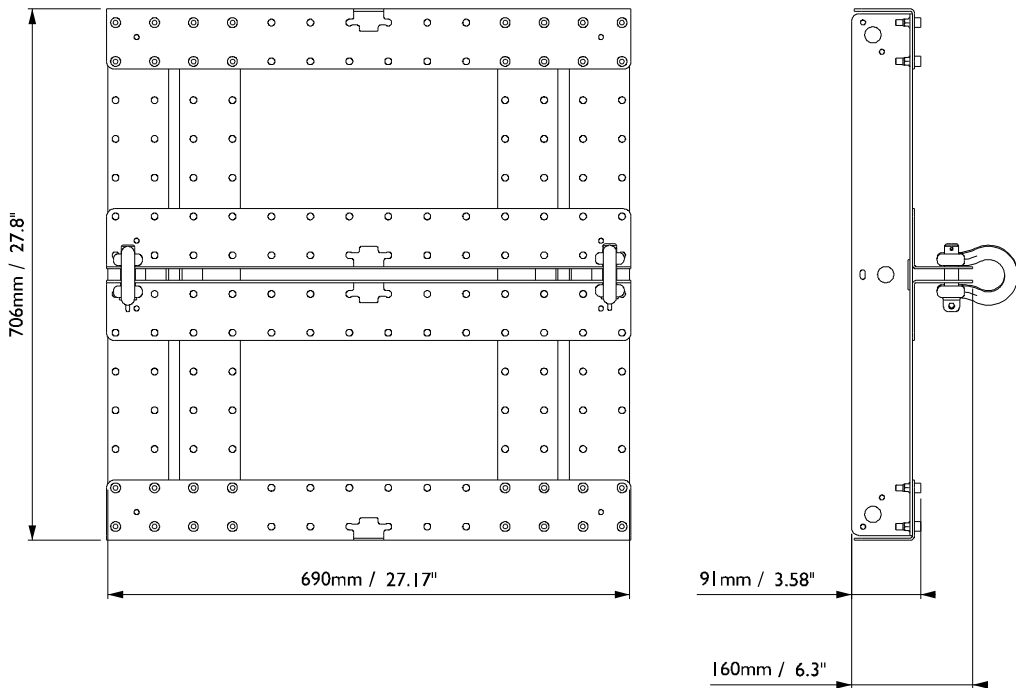


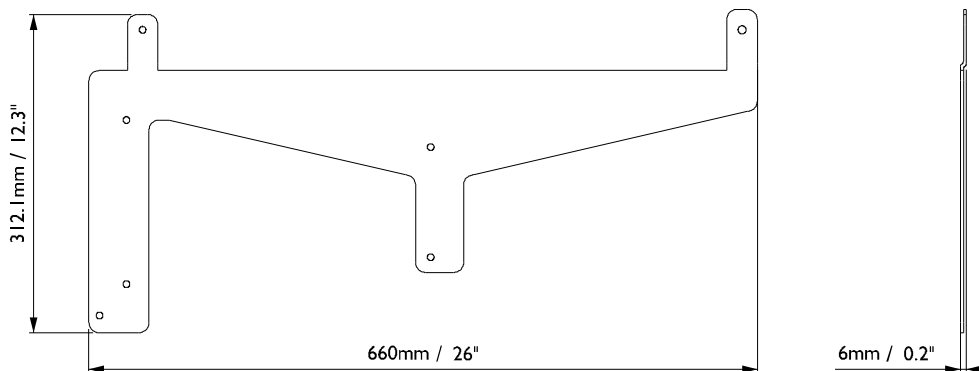
Service and repair work for any other part must be carried out by an L-ACOUSTICS® authorized representative. Otherwise, the customer may be exposed to dangerous situations and the warranty will no longer apply.

**Table 3: Replacement kit**

Reference	Kit description	Kit contents (fixing material included)
	<b>M-BUMPi</b>	
KR MANI9L	19 mm shackle with safety pin	4 shackles

## 8 SPECIFICATIONS

Reference	M-BUMPi
Dimensions (L x H x D)	706 x 160 x 690 mm / 27.8 x 6.3 x 27.17 inch
	
Weight	21 kg / 46.3 lbs
Setup safety limits	Maximum 12 KARAI or 4 SB18i/12 KARAI or 8 SB18i in flown configuration. Maximum 9 KARAI in stacked configuration.
Material	High-grade steel coated with polyester powder.
Included accessories	10 bars, 2 shackles, M6 and M8 bolts, screws.

Reference	KARAI SB18LINK
Dimensions (L x H x D)	6 x 312.1 x 660 mm / 0.2 x 12.3 x 26 inch
	
Weight	3.2 kg / 7 lbs (set of two pieces)
Material	Steel coated with polyester powder.

## 9 APPENDIX

### 9.1 Flown array options and site angle setting

#### 9.1.1 M-BUMPi rigging options

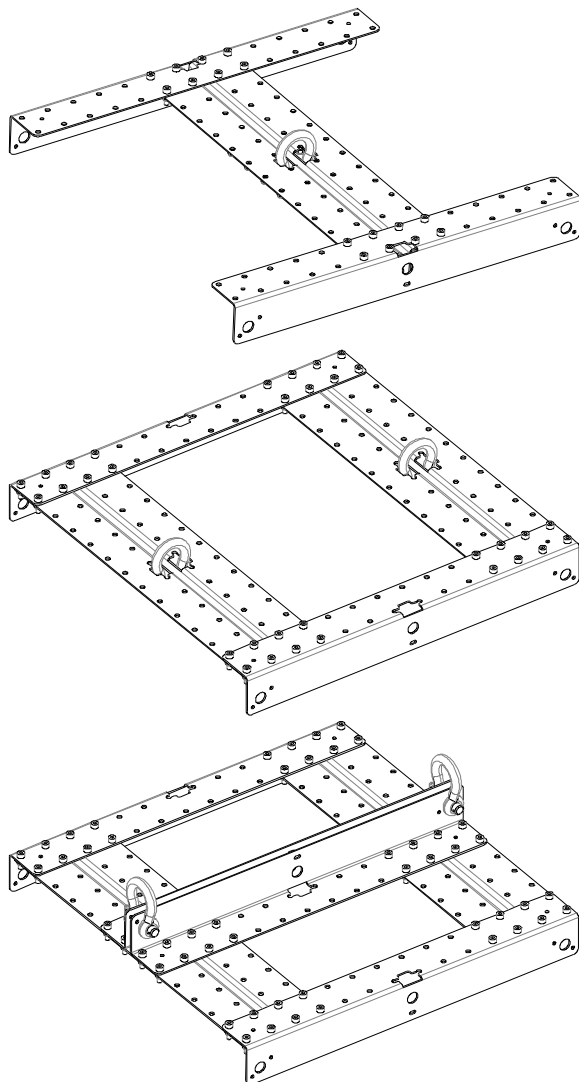
The rigging options for flying a KARAi standalone array, SB18i/KARAi mixed array, or SB18i standalone array are given in Table 4 in which:

- **Option 0** is adapted to SB18i standalone arrays.
- **Options 1 to 7** are adapted to KARAi standalone arrays or SB18i/KARAi mixed arrays.
- All configurations are reversible to obtain a front or rear overhang corresponding to a positive or negative site angle, respectively.



ALWAYS refer to the mechanical data and warning indications provided in SOUNDVISION software (**Mechanical Data** section) to verify the mechanical conformity of the system before installation.

**Table 4: M-BUMPi rigging options for flown array**



#### **Option 0: SB18i only**

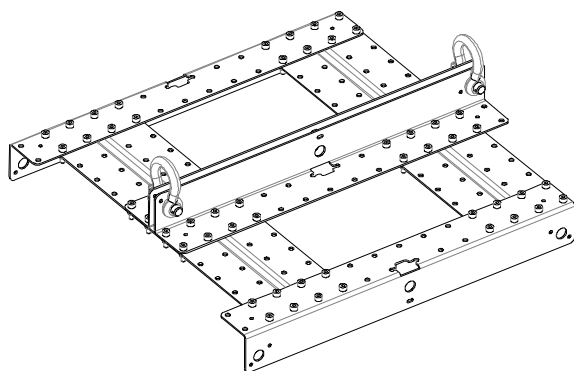
- 1 rigging point (1 position)

#### **Option 1: KARAi or SB18i/KARAi**

- 1 rigging point (2 positions)
- or
- 2 rigging points (spacing = 515 mm/20 inch)

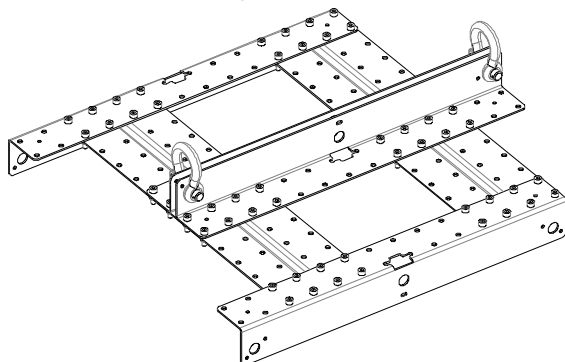
#### **Option 2: KARAi or SB18i/KARAi**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



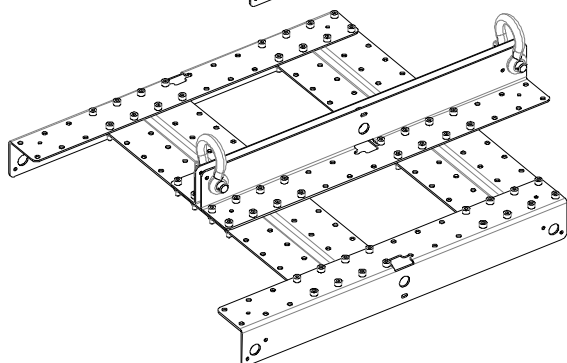
### **Option 3: KARAI or SBI8i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



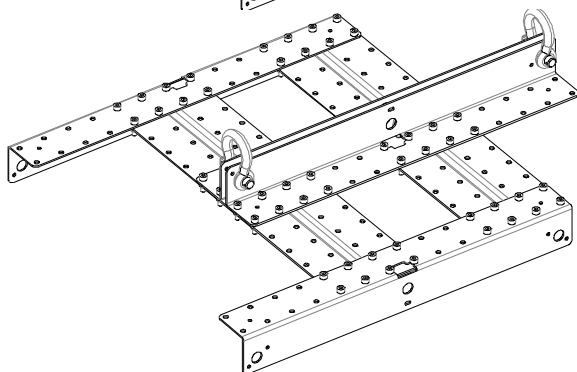
### **Option 4: KARAI or SBI8i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



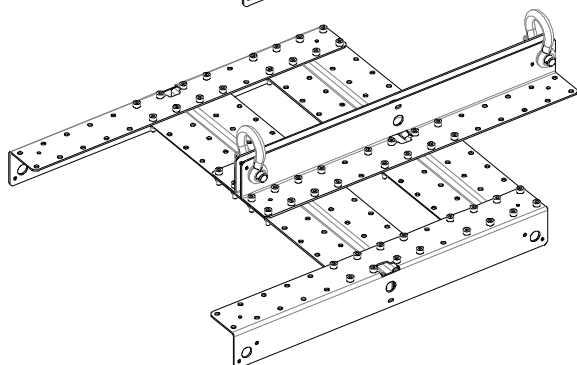
### **Option 5: KARAI or SBI8i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



### **Option 6: KARAI or SBI8i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)



### **Option 7: KARAI or SBI8i/KARAI**

- 1 rigging point (3 positions)
- or
- 2 rigging points (spacing = 637 mm/25 inch)

### 9.1.2 M-BUMPi site angle setting

The M-BUMPi site angle setting will be discrete or continuous depending on the desired rigging option [9.1.1].

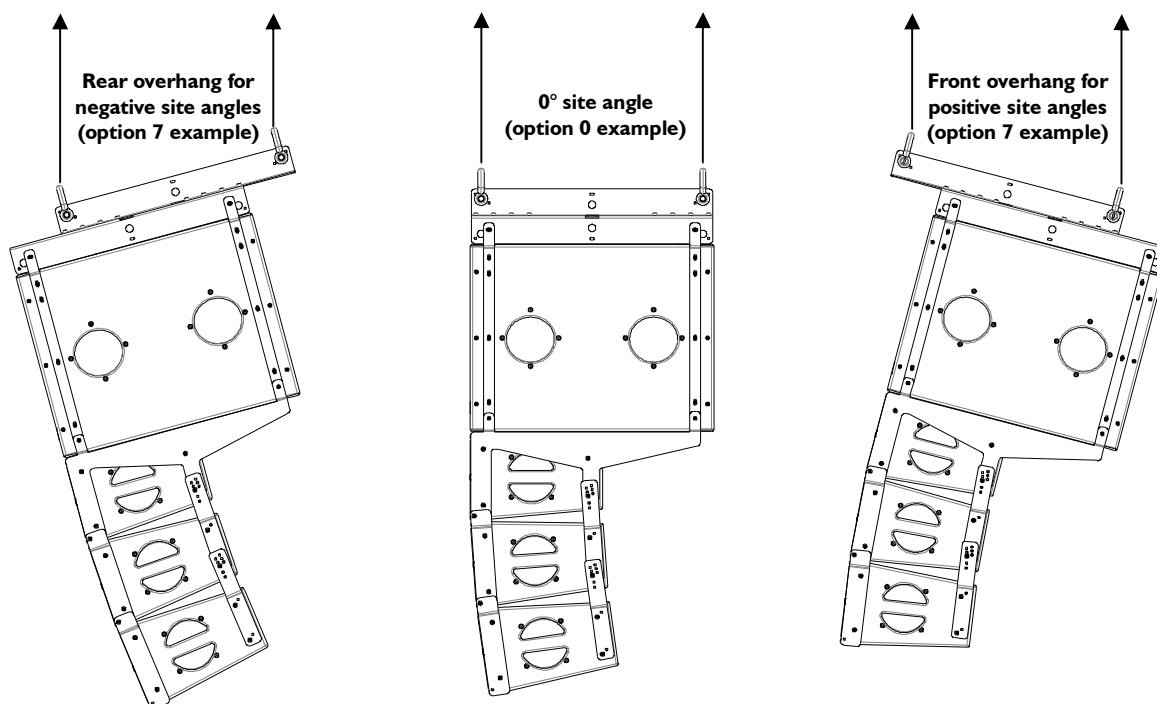
**Rigging option 0** offers 1 site angle of 0° for a standalone SB18i array.

**Rigging options 2 to 7** with a single rigging point on the rear shackle offer 1 site angle each. The site angle depends on the M-BUMPi/SB18i/KARAI array size and shape. It can be calculated in **SOUNDVISION Software** [3.4] using an equivalent **M-BUMP/SB18/KARA** array. The equivalent array must be composed of the same number of enclosures, the same inter-element angles, and the same single rigging point configuration according to the following table:

**Table 5: M-BUMPi and M-BUMP single rigging point equivalent configurations**

M-BUMPi option with single rear shackle	M-BUMP/M-BAR option and single shackle position (refer to the <b>KARA Rigging procedures</b> [3.4])
2	A 12
3	A 13
4	A 14
5	A 15
6	A 16
7	B 16


**Rigging options 1 to 7** with a dual rigging point allow continuous site angle setting depending on the relative heights between the front and rear rigging points (see Figure 34).



**Figure 34: Continuous angle setting**

### 9.1.3 Pullback configuration setup safety limits

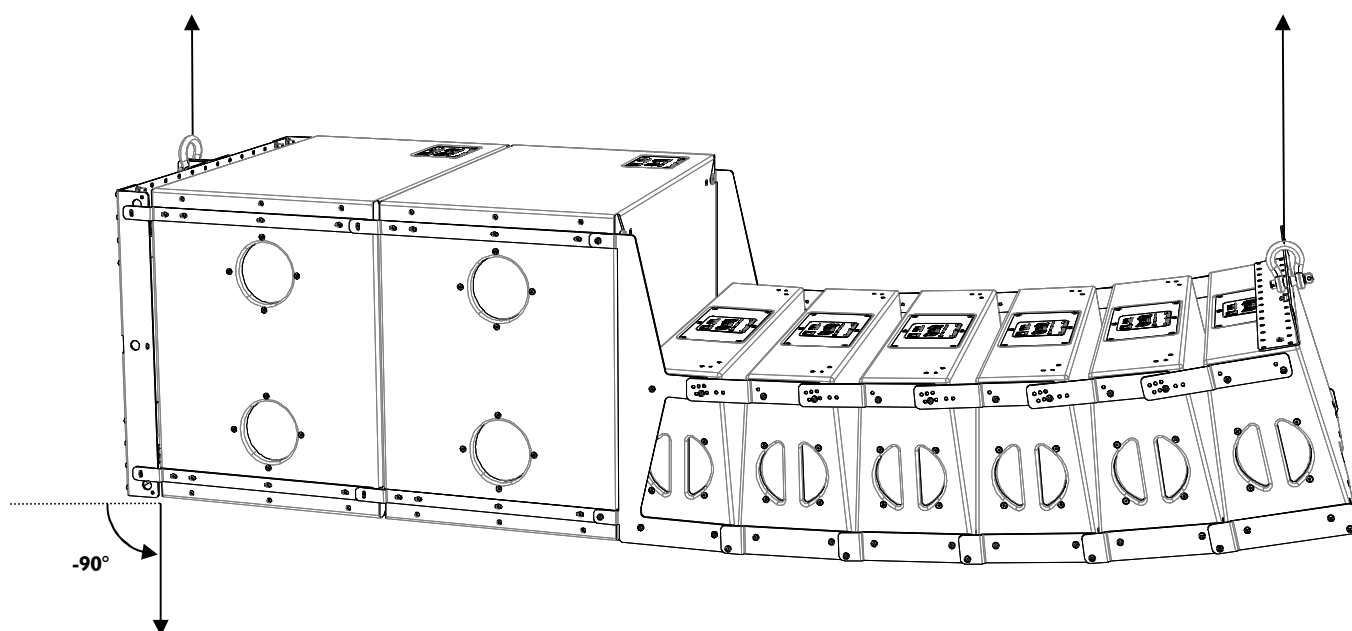
An M-BUMPi bar can be fixed to the bottom enclosure of a KARAI array to allow setting the site angle down to  $-90^\circ$ . However, this limit depends on the composition of the array as shown in Table 6.



ALWAYS refer to Table 6 before setting an array in pullback configuration.

**Table 6: Possible downwards site angles in pullback configuration**

Number of KARAI enclosures in the array	12	12	9	6	3
Number of SB18i enclosures in the array	0	4	3	2	1
Maximum array site angle	$-90^\circ$	$-10^\circ$	$-60^\circ$	$-90^\circ$	$-90^\circ$



**Figure 35:  $90^\circ$  downwards site angle in pullback configuration**

## 9.2 Stacked array options and site angle setting

### 9.2.1 Stacking platform configuration

For a stacked array, the M-BUMPi structure is used as a horizontal platform. Depending on the chosen configuration, it can extend beyond the front or the rear of the enclosures, as shown in Figure 36 and Figure 37 (refer to [9.2.2] for bottom KARAi angle setting).



The configurations shown in Figure 36 and Figure 37 are purely indicative.  
Refer to [6.3.1] for setup safety limits.

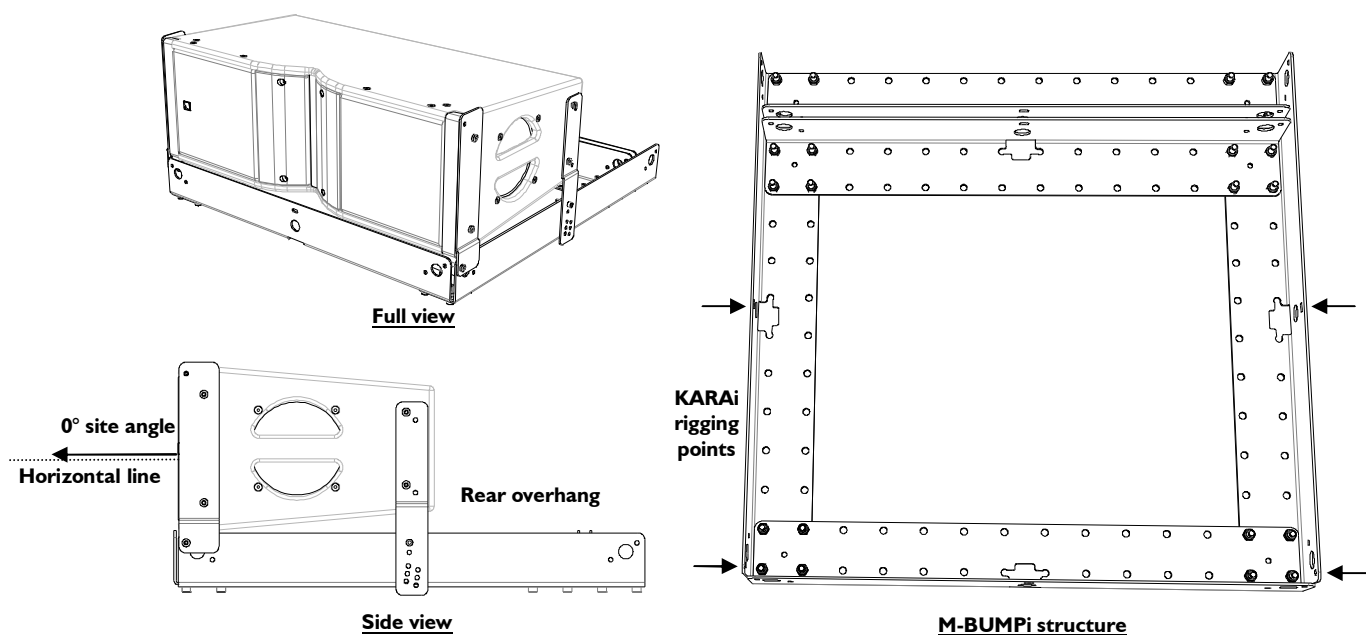


Figure 36: Rear extension configuration

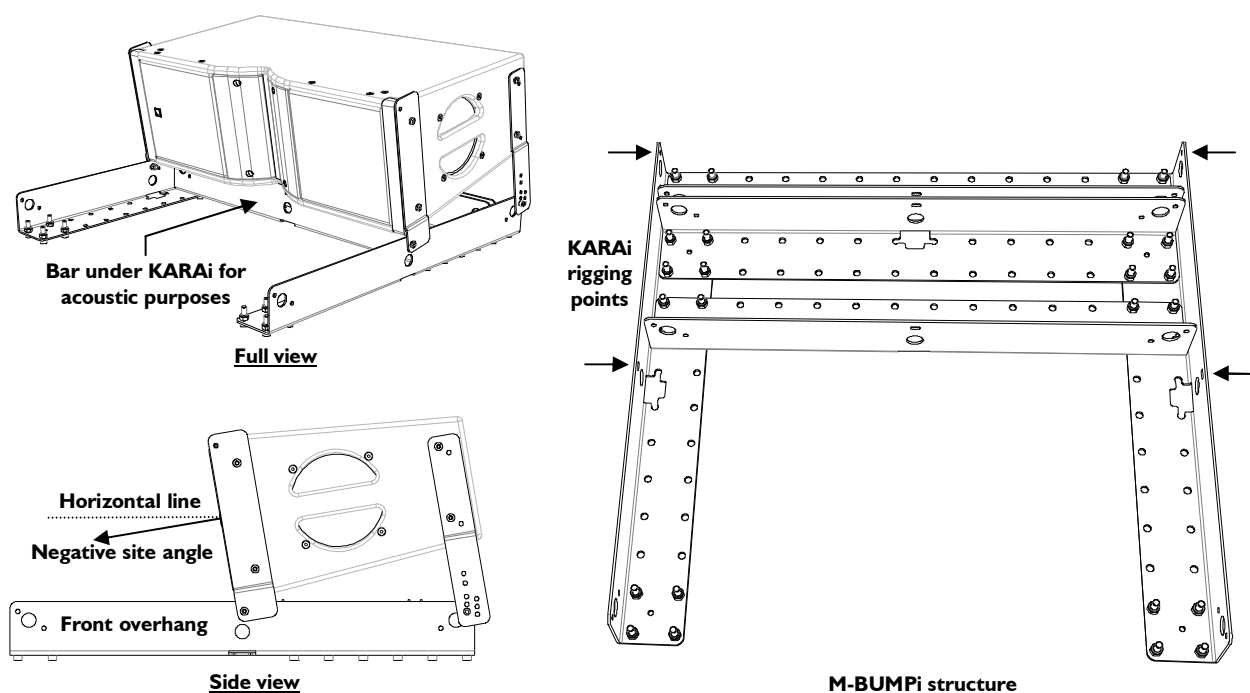


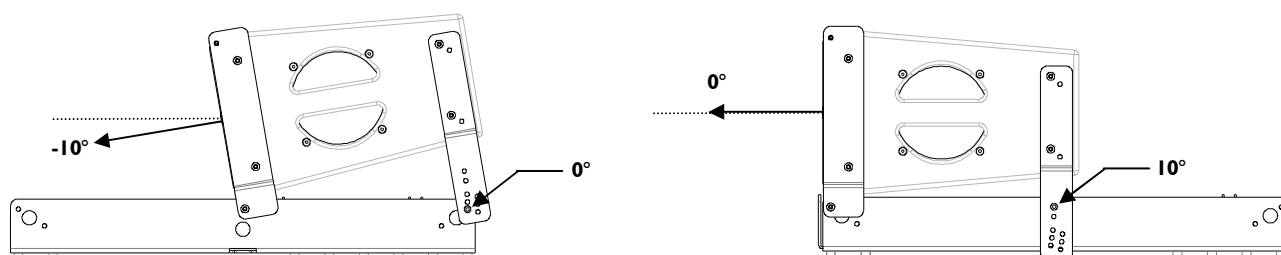
Figure 37: Front extension configuration

### 9.2.2 Array site angle setting

The site angle of the stacked KARAI array will be determined by the angle of the bottom enclosure in the range from -10° to 0°. Table 7 gives all possible site angle settings:

**Table 7: Possible site angles for stacked array**

KARAI angle arm hole	Resulting site angle (Figure 38)
0°	-10°
1°	-9°
2°	-8°
3°	-7°
4°	-6°
5°	-5°
7.5°	-2.5°
10°	0°

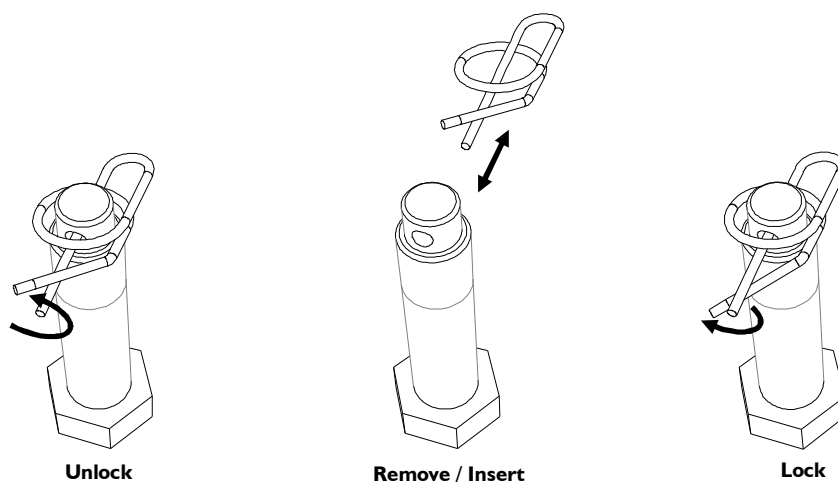


**Figure 38: Bottom KARAI angle setting**

### 9.3 Safety pin removal and insertion

The safety pins provided with the shackles have an integrated locking system. Figure 39 presents the removal and insertion procedures.

ALWAYS put the safety pin in locked position before use.



**Figure 39: Safety pin removal and insertion procedures**









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