

Z5040/E652x/E6510/6511
C4/C7/F2/B1/MAX
Rigging accessories
Mounting instructions

C4/C7/F2/B1/MAX Rigging accessories

References in the manual

WARNING!

This refers to a potentially dangerous situation which may lead to personal injury.

CAUTION!

This refers to a potentially dangerous situation which may lead to equipment damage.

IMPORTANT!

This refers to a situation which may cause the equipment to malfunction.

Symbols on the equipment



Please refer to the information in the operating manual.

General Information

Mounting instructions

C4/C7/F2/B1/MAX Rigging accessories

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The information presented in this document is, to the best of our knowledge, correct. We will however not be held responsible for the consequences of any errors or omissions. Technical specifications, weights and dimensions can change and should always be confirmed with d&b audiotechnik AG prior to inclusion in any additional documentation.

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General Safety and Installation Advice

WARNING!

General safety advice

d&b loudspeakers should only ever be flown or installed using recommended d&b rigging accessories. The d&b rigging accessories described in the d&b rigging accessories manual and the specific mounting instructions are designed and manufactured to have a high load safety factor for their intended role. In order to ensure the highest safety standards, the information presented here on the assembly and safe use of d&b rigging accessories must be carefully understood and followed.

The installation of d&b loudspeakers using the rigging accessories described in the d&b rigging accessories manual and the specific mounting instructions should only ever be carried out by properly qualified personnel in full compliance with all required safety codes and safety standards in force at the place of installation. (In Germany, this means compliance with the recommendations of BGV C1 GUV 6.15)

d&b rigging accessories (components and assemblies) are supplied exclusively for use with specific d&b loudspeakers and are not designed or intended for use with any other loudspeakers or any other devices. The use of d&b rigging accessories to deploy loudspeakers and devices other than those indicated in the d&b rigging accessories manual and the specific mounting instructions is improper use. Improper use can compromise safety by overloading and damaging the rigging accessories. d&b will not be held responsible for any damage or injury resulting directly or indirectly from the improper use of d&b rigging accessories.

d&b rigging accessories must not be modified in any way nor should they be assembled in ways other than those indicated in the d&b rigging accessories manual and the specific mounting instructions. Rigging components supplied as part of a complete assembly are non-interchangeable and must not be exchanged with the component parts of any other assembly.

The component parts of a d&b rigging accessory must only be assembled using the fasteners and methods of assembly recommended in the d&b rigging accessories manual and the specific mounting instructions. The use of fasteners and methods of assembly not specified or approved by d&b may result in an unsafe rigging assembly. Welding, or any other means of permanently fixing rigging components to each other or to cabinet fixing points is not allowed.

General installation advice

WARNING!

Only the screws, fasteners, plain and shakeproof washers specified on the relevant page(s) of the d&b rigging accessories manual and the specific mounting instructions shall be used to fasten together, where appropriate, suitable d&b rigging components.

d&b rigging components or assemblies must only be fixed to d&b loudspeaker cabinets using the cabinet fixing points, assembly methods and fasteners specified on the relevant page(s) of the d&b rigging accessories manual and the specific mounting instructions.

Any wall, floor or ceiling to which a d&b loudspeaker is fixed or

attached using a d&b rigging accessory must be capable of safely and securely supporting the actual load. The rigging accessory used must be safely and securely fixed both to the loudspeaker and to the wall, floor or ceiling.

Other points to consider are: When mounting rigging components on walls, floors or ceilings ensure that all fixings and fasteners used are of an appropriate size and load rating (DIN 18800 standards apply within Germany). Wall and ceiling claddings and the construction and composition of walls and ceilings all need to be taken into account when determining whether a particular fixing arrangement can be safely employed for a particular load. Cavity plugs or other specialist fixings, if required, must be of an appropriate type, fitted and used in accordance with the maker's instructions.

Use only the rigging accessory fixing holes indicated on the relevant page(s) of the d&b rigging accessories manual and the specific mounting instructions to fix d&b rigging accessories to walls, floors or ceilings. Where specified, the recommended maximum torque settings for screw fasteners must be strictly complied with.

Secondary safeties

All loudspeakers flown in theatres, studios or other places of work and entertainment must, in addition to the principle load bearing means of suspension, be provided with an independent, properly rated and securely attached secondary safety.

Only steel wire ropes or steel chains of an approved construction and load rating may be used as secondary safeties. Plastic covered steel wire ropes are not permitted for use as secondary safeties. As recommended by BGV C1 (GUV 6.15), the secondary safety must prevent the load from dropping more than 20 cm if the principal means of suspension fails.

Safety inspections

All rigging components and assemblies are subject to wear and tear, aging, corrosion etc. As safety critical components, it's imperative that, prior to each and every use or installation, all rigging components, rigging assemblies and cabinet fixing points are carefully inspected to ensure that they are free of defects and that they function flawlessly. Care should be taken to identify signs of undue wear and tear, dents, cuts, tears, splits and any indications of corrosion. If upon inspection, damage is discovered and there exists even the slightest doubt as to the physical integrity and safety of the damaged item, then the damaged item must not, under any circumstances, be deployed.

Regular, more rigorous test and inspection of rigging components must also be carried out. Safety legislation and test and inspection requirements will vary from country to country. In most cases, annual independent test and inspection by a suitably approved and qualified inspector will be required - users must ensure compliance with all applicable safety requirements.

d&b recommends regular safety inspections and further recommends that a logbook be kept detailing the test and inspection history of each d&b rigging accessory.

WARNING!

WARNING!

WARNING!

Load safety factors

Rigging accessories are safety critical components which can, by their failure, lead to injury or death. To maximise safety and to reduce the risk of the possible consequences of failure, there exist various recommendations which attempt to govern the safe design and construction of rigging components. Unfortunately, such recommendations vary from country to country and are frequently adaptations of building or construction safety codes which were never intended to specifically cover loudspeaker rigging.

A further complicating factor, frequently a result of insurance requirements, is that different load safety factors may be demanded for different applications. For example, the load safety factor of a rigging component suitable for a fixed, static application may be regarded as insufficient for a mobile application.

What exactly is a load safety factor?

It is accepted general engineering practice to design and build components to have a minimum 1.25X load safety factor. That means a component or assembly that can resist without breaking, a load 25% greater than its specified safe working load (SWL).

Load safety factors are tailored to the estimated level of risk presented by a particular application - the higher the estimated level of risk, then the higher the load safety factor demanded. Because of the high level of risk associated with the possible failure of rigging, load safety factors much greater than 1.25X are demanded. The EU Machinery Directive for example, specifies a 4X load safety factor for shackles. This means that a shackle specified for a SWL of 500 kg should be able to resist a 2000 kg load without breaking.

Even more stringent load safety factors than those specified under EU legislation can apply to applications where rigging is used. One of the most demanding safety codes, the one used to derive the high load safety factors for d&b rigging accessories, is the German BGV C1 safety code.

Section §9 of „Unfallverhütungsvorschrift Veranstaltungs- und Produktionsstätten für szenische Darstellung“ (BGV C1 GUV 6.15) draws a distinction between components used to rig a fixed, static load and components used to rig a moving load. Different load safety factors are required for otherwise similar components depending upon whether they are used with a fixed or with a moving load. A higher load safety factor being required for rigging subject to the higher stress of dynamic loading.

The recommendations are met if it can be shown that:

- The SWL of components such as ropes and slings used as rigging for a fixed load does not exceed 1/10 of their calculated ultimate stress

and

- The SWL of components such as ropes and slings used as rigging for a moving load does not exceed 1/12 of their calculated ultimate stress ...”

A 12X load safety factor is therefore recommended for the following components:

- Chains
- Steel wire ropes (for lifting and securing)
- Shackles
- Eyebolts etc.

In contrast, the EU Machinery Directive (EN292-2) specifies the following load safety factors for rigging components:

Rigging component	Safety factors
Steel wire ropes	factor 5 (EN292-2, chpt. 4.1.2.5a)
Welded link chains	factor 4 (EN292-2, chpt. 4.1.2.5b)
Fabric slings	factor 7 (EN292-2, chpt. 4.1.2.5c)
Metal components	factor 4 (EN292-2, chpt. 4.1.2.5d)

The regulations enshrined in the EU directive are general regulations - few in number and not always particularly clear or detailed. Loudspeakers and their rigging components are not specifically covered. The electrical and mechanical standards of construction for lanterns are covered by a DIN standard (DIN 15560). However, there is no specific DIN or Euro standard covering standards of construction for loudspeaker rigging components or assemblies.

To make matters clear, at least as far as d&b rigging accessories are concerned, we have adopted the following load safety factors:

12X load safety factor:

Chains, ropes, shackles, eyebolts, straps and hooks.

10X load safety factor:

Accessories and fixings for mobile use.

5X load safety factor:

Accessories generally employed in fixed, permanent installations.

The 12X load safety factor is derived from §9, GUV 6.15

The 10X load safety factor is likewise derived from §9 GUV 6.15. as a basic safety standard for rigging components.

From EN292-2 chpt. 4.1.2.5d a 4X minimum load safety factor can be derived for all metal rigging components used in fixed installations. Our choice of a 5X minimum load safety factor for such components provides an enhanced safety margin.

Attaching rigging to loudspeaker cabinets

d&b rigging accessories are supplied with specific mounting instructions and must only be assembled and used in the manner described in these instructions or as specified on the relevant page(s) of the d&b rigging accessories manual. Failure to fully observe specified load capacities or fitting instructions can overload the rigging accessories or the loudspeaker cabinet fixing points causing them to break.

The d&b rigging accessories described in the d&b rigging accessories manual and specific mounting instructions are directly



attached to d&b loudspeaker cabinets and are secured using either screws or bolts fastened to threaded inserts fitted in the loudspeaker cabinets. For attaching rigging, d&b loudspeaker cabinets are fitted threaded inserts.

WARNING!

Where provided, the supplied screws or bolts should be used to attach rigging. Using screws or bolts other than those supplied or specified can result in an insecure and unsafe fixing. Additionally, using screws or bolts longer than those supplied or specified can physically damage a cabinet by penetrating its interior and causing an air leak.

Load ratings

d&b rigging accessories are designed and constructed to have a load rating appropriate to their intended use. The safe working load (SWL) for each d&b rigging accessory is specified in its respective data sheet and on the relevant page(s) of the d&b rigging accessories manual.

In general, d&b rigging components are designed with a 10X load safety factor. Some components, specifically intended only for use in fixed, permanent installations are designed with a 5X load safety factor. Other components, for use with moving as opposed to static loads and therefore subject to the additional wear of dynamic loading, are designed to have a 12X safety factor.

Safety certificates

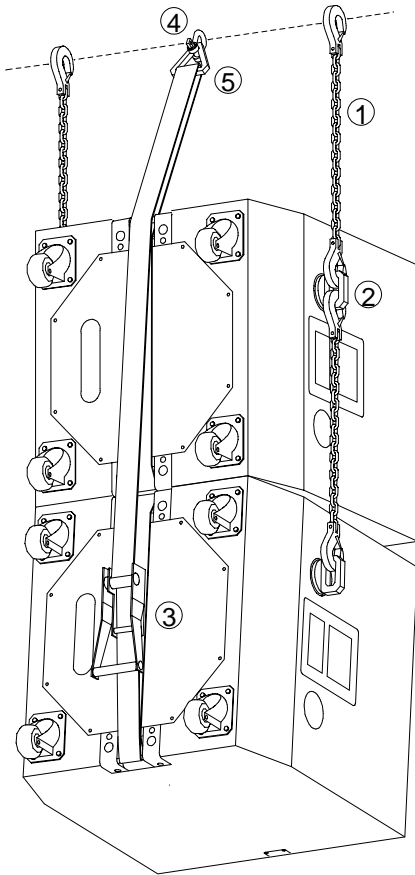
In Germany, the health and safety authority together with industrial and professional associations has published a safety code for stages and studios. Sound reinforcement equipment installed in these places has to comply with the provisions of this code, published as BGV C1 (GUV 6.15) „Unfallverhütungsvorschrift Veranstaltungs- und Produktionsstätten für szenische Darstellung“.

The code provisions include:

1. Plastic load bearing components are not permitted.
2. Plastic laminated or coated steel wire ropes are not permitted.
3. Load connector parts must have a load safety factor 10X greater than their stated SWL (Safe Working Load).
4. Load bearing chains must have a load safety factor 0.5X greater than the dynamic value specified by the manufacturer - equivalent to a load safety factor 12X the specified SWL.

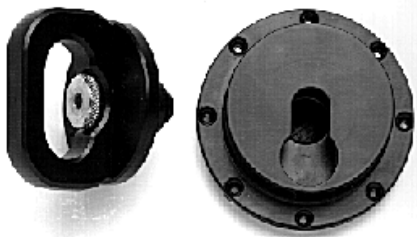
Provision #4 needs some explanation. High tensile chains and related components conforming to EN 818, grade 8 are specified with a load safety factor 4X their SWL. To comply with the 12X load safety factor required for load bearing chains under BGV C1 (GUV6.15), the specified SWL for DIN certified chains must be derated by a factor of three.

C4/C7/F2/B1/MAX Rigging accessories



C4 cluster with rigging components

WARNING!



MAN Flying stud (Z5040) with stud plate

A complete range of specially designed rigging accessories is available to enable C4/C7, F2/B1 and MAX systems to be used either with the Z5080 Flying bar or with the d&b Flying system.

The figure opposite shows a C4 cluster and associated rigging components.

- [1] E6521 23-link chain, 1 tonne, black, 2 hooks. Shorter upper chains can also be used. Minimum chain length is 23 links.
- [2] Z5040 MAN Flying stud
- [3] E6510 5t Ratchet strap, 5 tonne, 8 m long, black
- [4] E6507 1t Shackle
- [5] E6511 Delta link

This flying arrangement has several special features.

The vertical angle between two cabinets is determined by the length of the chains used. This angle is normally 5° in the case of C4/C7 loudspeakers and 14° in the case of F2/B1 loudspeakers.

The entire array is set to its vertical flying angle using an E6510 5t Ratchet strap threaded through the strap guide bar on the rear of the cabinets and the centre slot of the flying bar.

The suspension (flying) points for the load chains and the 5t Ratchet strap lie on the same axis (shown by the dashed line). Therefore no twisting force on the flying system can affect the vertical alignment of the loudspeaker column.

Load safety information

The rigging components illustrated are designed and load rated to allow the suspension of up to six C4/C7 cabinets or four F2/B1 cabinets flown in a vertical column. Secondary safeties must always be provided and used when flying loudspeaker loads.

Z5040 MAN Flying stud

The Flying stud plates fitted each side of the C4/C7/MAX and F2/B1 (from September 1993) cabinets are designed to mate with D-shaped flying studs. Both these flying fittings are manufactured in the UK by MAN Flying Systems.

Each pair of studs not only supports the weight of the cabinet it is attached to but also the weight of the other cabinets suspended beneath. The rated working load of a Flying stud is 600 kg (400 kg for a 12X load safety factor). Each stud is engraved with a unique serial number after it is tested.

To lock the Flying stud in place, the stud end is pushed into the stud plate keyhole and slid upwards. The spring loaded stud end should then engage with a mating hole in the stud plate and automatically lock in position leaving the rest of the stud and its D ring body free to rotate.

To release the Flying stud, pull the knurled knob at the centre of the D ring and slide the whole flying stud downwards so that it can then be pulled free of the stud plate.

The load must never be applied in a direction which pulls the Flying studs towards the insertion aperture in the stud plate. Therefore, never fly the loudspeakers upside down.

E652x 1tonne Chain, 2 Hooks

Steel chains fitted with safety hooks at each end are fitted between the D rings of the Flying studs of all the loudspeaker cabinets suspended in a column. Standard chains in three different lengths are supplied for various applications. The top loudspeaker is hung using the shortest 11-link chain (E6520). The other loudspeakers in the column are hung beneath the top one using 23-link chains (E6521 for C4/C7 system, 5° inter-cabinet angle) or 47-link chains (E6522 for F2/B1 system, 14° inter-cabinet angle).

Adjustable (shortening) chains with a maximum length of 47 links are used to vary the standard inter-cabinet angles. Shortening chains are supplied in symmetrical left /right pairs (E6525, E6526). Not shown is E6523, special 0° chain. This special chain enables C4/C7-Systems to be flown without additional vertical angle. **In this case the studs within the chains have to be mounted upwards from bottom to top.**

Chains supplied by d&b are powder-coated in black and bear a manufacturer's certified load tag. Their rated working load is 1 tonne (330 kg for a 12X load safety factor).

E6510 5t Ratchet strap

The 5t Ratchet strap is used to stabilise and vertically align at the correct angle a vertical loudspeaker column. The strap is threaded in a loop through the strap guides on the back of the loudspeakers and through the slot in the Sub-bar of the flying system or through a Delta link. The strap is tensioned by an attached ratchet mechanism to set the vertical flying angle for the complete loudspeaker column.

It is important to ensure that the strap is correctly fed through the spindle in the ratchet mechanism - instructions are printed or attached to the ratchet mechanism. Before cranking the ratchet handle, first pre-tension the Ratchet strap by pulling the free end through the mechanism as tightly as possible. The Ratchet strap is 8 m long - sufficient for a 6-deep column of C4/C7 cabinets.

Never use the 5t Ratchet strap on its own as a load-bearing element. The suspended loudspeaker load must always be supported by the steel rigging chains. If the array is tilted at too steep a vertical flying angle the strap will end up supporting a large proportion of the load. To avoid this, ensure that all chains, especially the top pair, are under tension - if they are not, then slacken the strap.

E6511 Delta link

When using the Z5080 Flying bar or similar support, the Delta link serves as the upper location point for the 5t Ratchet strap. The Delta link is anchored above the loudspeaker column and, if possible, on the axis passing through both load chain mounting points. The centre of gravity of the loudspeaker column is then directly above the Delta link.

WARNING!



Chains, 2 Hooks (E652X) and 5t Ratchet strap (E6510)

WARNING!



Delta link (E6511)

Declaration of Conformity to BGV C1

This declaration applies to the following components described in this Rigging Accessories Manual :

Z5024 Loudspeaker stand adapter

Z5010 TV spigot with fixing plate (shipped after 27/11/97)

Z5012 Pipe clamp for TV spigot

Z0127 T bar adapter

Z5020 02 Flying adapter

Z5025 03 Flying adapter

Z5015 02 TV spigot

Z5021 02 Flying frame, 90° (shipped after 12/2/98)

Z5022 02 Flying frame, 60° (shipped after 3/4/98)

Z5023 02 Flying bracket (shipped after 27/8/97)

Rigging accessories C4/C7/F2/B1/MAX

Z5042 Flying plate

Z5080 Flying bar

Z5090 Single bar

Z5016 Heavy duty Pipe clamp

Z5017 Heavy duty TV spigot

Z0124 E1 Vertical bracket

Z0126 E1 Horizontal bracket

Z5033 E3 Ball joint adapter

Z5029 TV spigot for E3 ball joint adapter

Z5027 E3 Ball joint wall bracket

Z5031 E3 Standard bracket

Z5030 E3 x 2 Angle bracket

Z5032 E3 Swivel bracket

Z5028 E3 Horizontal bracket

Z5007 1220 Frame

Z5008 1220 Stand adapter

Z5043 MAX Horizontal bracket

Z5044 MAX Bracket connector

We hereby declare that the above listed products supplied by d&b audiotechnik AG comply with the relevant requirements of BGV C1(GUV 6.15).

d&b audiotechnik AG of Backnang accepts responsibility for this declaration.

