
euroclima

In addition to the contents of this manual, the instruction manuals of the component manufacturers must be followed. In the corresponding chapters is pointed on the manuals. In case of contradiction between manual ZHK 2000 and components manufacturer for safety instructions, the most restrictive interpretation is valid.

2 Safety instructions

2.1 CE-conformity / installation instructions for safe operation

2.1.1 CE-conformity declaration according to Machinery Directive 2006/42/EC

An AHU (or any part thereof) supplied by EUROCLIMA is by definition of Machinery Directive 2006/42/EC an incomplete machine, because it is limited in function and is only a part of the building system. Accordingly, for a safe operation before the initial start-up, the general in **chapter 2.1.2 (Installation instructions for the proper installation in the building system)** and in particular in the following chapters described on-site work must be carried out for a safe operation.

2.1.2 Installation instructions for the proper installation in the building system

For the proper installation of AHU equipment and the safe operation of the system, depending on the configuration of the AHU, before the first start at least the following points must be implemented or upgraded on responsibility of the client:

Assembly of delivery sections
The deliver sections of the AHU must be assembled and linked together, according to the drawing supplied on the inner face of fan section door. See the **chapter 4 (Foundation / erection)** and **chapter 5 (Assembly)**.

Secure inlet and outlet openings
All the inlet and outlet openings must be connected to ducts or respectively equipped with grilles, to prevent effectively access from the outside to moving parts (such as fan wheels) during operation.

Repair switch
See **chapter 7.3 (Repair switch (emergency stop switch)**).

Installation of ceiling units – flat units
See **chapter 4.2.4 (Special guidelines for flat units – ceiling units)**.

Installation of filters
See **chapter 5.4 (Filters)**.

Temperature limitation
By a control system must be ensured, that the AHU is only operated with a supply air temperature below the allowable maximum (40 °C, when not stated otherwise in the technical data). For this purpose, the continuous monitoring of the supply air must be ensured on site.

Measures regarding noise attenuation
As basis for on-site sound measures calculation (such as for sound attenuators) the on request available sound data can be used. Information regarding the emitted sound power level over the openings see the technical data sheet, which is available on request – refer to chapter 10 (Information on airborne noise emitted by the air conditioning units - on request).

Measures to minimize the risk of water damage or damage caused by similar media
See **chapter 4.2.2 (Actions to prevent potential risks).**

Motor connection
See chapter 7.2 (AC motors).

Frequency controller for Plug fans
Also if not supplied by EUROCLIMA a frequency converter must be installed to reach the calculated operating point. For details see **chapter 7.4 (Variable, frequency-controlled drives (VFD, frequency converters)**).

Connection to an external protective conductor system
See **chapter 7.1 (Connecting to an external protective conductor system)**.

Electric heater
Installation (if not supplied by EUROCLIMA) and connection of thermostats for safety shutdown, see **chapter 7.5 (Electric heaters)**.

Plate heat exchanger
Installation (if not supplied by EUROCLIMA) and connection of differential pressure switches to protect the plate heat exchanger from damage in **chapter 7.6 (Differential pressure restriction for plate heat exchangers)**.

Siphons
Connecting according to **chapter 6.3 (Condensate drain)**.

Dampers with external gear wheels
According to **chapter 5.5 (Dampers with external gear wheels)**.

Flexible connection
Installations (if not supplied by EUROCLIMA) refer to **chapter 6.4 (Duct connection)**.

Frost protection for heat exchangers

Venting, draining of heat exchangers

2.2 Indications for minimizing specific hazards

2.2.1 General indications

An improperly performed maintenance can pose a security risk!

Risk of thin sheets, when working on AHU

During work on AHU (or on parts), there is a substantial risk of cutting with thin sheets as e.g. roof sheets, fins of heat exchangers, corners and edges - Use personal protective equipment: wear protective helmet, gloves, safety shoes and long protective clothing.

Lighting

For work on AHU (maintenance and inspection work) is to provide adequate lighting.

Firefighting in case of fire

In general, the local fire protection regulations must be observed.

- If the AHU is part of the smoke extraction concept, then the specifications of this concept have to be observed.
- Otherwise, the power supply of the AHU must be interrupted immediately at all conductors. In addition, the dampers must be closed to consequently prevent oxygen supply and fire spread.

Exposure to harmful substances in case of fire

In case of fire, some materials can produce noxious substances. In addition, harmful vapours can escape from the unit. Therefore, severe respiratory protective equipment is required and the danger zone has to be avoided.

Exposure to rotating parts / hot surfaces / electrocution

When working on AHU note the following risks:

Indentation of body parts in moving parts (belt drive, fan impeller, ...).

Burns and scalds on hot AHU components such as heat registers, heat exchangers, ...

Electrocution on current-carrying parts such as electric motors, frequency converters, electric heaters, control cabinets, interior lighting etc.

Therefore must be ensured prior working on the unit, that…

- all current-carrying parts, such as fan motors, valves, motors and electric heaters are disconnected from the power supply by using the repair switch (emergency stop) and that the switch is locked in position 'off' in order to effectively prevent a re-activation during the work.
- the housing of the AHU interior lighting (can have separate supply) is not current-carrying.
- all moving parts, especially fan wheel, motor and heat wheel have come to a standstill; wait at least 2 minutes after switching off before opening the doors.

- for maintenance of frequency controlled motors, a waiting time of 15 minutes is recommended – time to break down the residual capacitive charge of the frequency converter.
- Remove the key from doors with door lock before entering in the casing of the AHU. Keep the key out of reach of unauthorized persons.
- Check that the hot media supply such as steam is interrupted and all the heat registers, heat exchangers, etc. are cooled to ambient temperature.

In case of standstill of the plant (e.g. power failure), the repair switch is always to check. Only when it is in the off position and secured against unintentional restart, appliance doors can be opened and work on the device can be carried out.

Start of the AHU

Be ensured after working and before the start that…

- nobody is in the AHU.
- all protective devices are working, (optional safety devices such as door guard and belt guard mounted again) and doors equipped with door locks are locked and the keys are removed – refer to **chapter 5.2 (Doors)**.

Storage of potential energy in gases and fluids

All heat exchangers can be operating up to a maximum pressure of 15 bar. If the media is under higher pressures, the safety and tightness cannot be guaranteed.

Preventing the risk of explosion and fire spread

To prevent the fire spreading, fire dampers shall be installed into the ducts between the fire compartments.

Prevention of exposure caused by antifreeze agents

Avoid body contact with antifreeze agents, because they may cause burns. Wear appropriate protective clothing (e.g. gloves, goggles, ...).

In case of fire, avoid the danger zone and meet different safeguards. It is recommended to wear a mouthguard, because of the risk of poisoning by inhaling the vapors.

Prevention of hazards caused by steam heaters or humidifiers

By hot steam there is a danger of burns. Therefore, make sure that no steam pressure is present and the system is cooled before working on the steam piping.

Avoid any type of ignition source when cleaning the humidifier and the associated components and circuits by means of descaling agent. With strong descaling agents, direct sunlight can already cause a fire.

Avoid body contact with descaling agents, as it can cause chemical burns and serious eye damage. When handling descaling agents, wear appropriate protective clothing (e.g. gloves, goggles, …) and ventilate the room well.

Please note the instructions on the unit and subsequent instructions exactly.

2.2.2 Refrigeration circuit

Preventing the risk of exceeding the maximum operating pressures PS

Never exceed the maximum operating pressures PS, which are specified on the type plate (even not for test purposes). Damage may limit the security and lifetime of the system. Never operate the refrigeration system with closed discharge line valve.

Risk of burns on hot surfaces

On the compressor casing, pipelines and circuit components and on the oil sump heater surface temperatures of far higher than 100 ° C may occur, which may cause serious injuries. Wear the required personal protective equipment (protective goggles, gloves, ...)

Prevention of risks due to contact with refrigerant

Physical contact with refrigerant must be strictly avoided as it can cause severe frostbite and damage the retina - temperature range, for example R407C **at ambient pressure** is approximately **- 44 °C**!

Prevent the risk of suffocation

Safety refrigerants are odourless and tasteless, can replace oxygen in a technical room and cause suffocation (MAK - value 1000 ppm).

- In case of refrigerant leaks leave immediately the affected room. Enter only with breathing protection or care for adequate ventilation.
- Refrigerant is heavier than air and will collect at the lowest room point. For small refrigerant charges, this risk is significantly reduced.
- Refrigerant and compressor oil create as soon as in touch with open flame toxic substances. Do not inhale!
- Do not smoke in the technical room!
- For more information refer to **chapter 8.2.3 (Refrigerant)**.

2.2.3 ATEX units

General safety indications

ATEX units may not be used near:

- High frequency sources (e.g. transmitter systems)
- Strong light sources (e.g. laser beam systems)
- Ionizing radiation sources (e.g. X-ray machine)
- Ultrasound sources (e.g. ultrasound echo testing equipment)

Safety indications for the operation

The following instructions must be observed urgently for the safe operation of ATEX units:

- Operating conditions in accordance to the intended use.
- In the immediate environment of the unit no substances according to EN 1127-1:2011, which prone to spontaneous combustion, such as pyrophoric substances.
- Permanent and adequate ventilation of the installation room to prevent the creation of an explosive atmosphere, which is caused by leakage.
- Do not exceed the maximum permitted speed of the fan, as it could otherwise lead to sparking.
- Take measures to prevent any kind of ignition sources.

Safety indications for maintenance and repair work

- For maintenance and repair work, the power supply of the unit must be interrupted.
- Use only suitable tools according to EN 1127-1:2011 to prevent sparking.
- Perform work only with conductive footwear (according to BGR 132) in order to avoid electrostatic charging.
- To avoid static charging, cleaning work may only be performed with a wet cloth.
- Work may only be performed at non-explosive atmosphere.
- The creation of an explosive atmosphere needs to be counteracted by adequate ventilation.
- Avoid any kind of ignition sources.

2.3 Staff selection and qualification

All persons who are authorized to work on the air conditioner must, have read and understood this manual - in particular **chapter 2 (Safety instructions)**. Before this is not guaranteed, the person may not begin to work on the AHU.

All work must be carried out by professionals who have sufficient technical training, experience and sufficient knowledge of…

- Locally applicable safety and occupational health rules
- Locally valid accident prevention regulations
- Locally applicable standards and approved rules of practice.

All professionals have to recognize and assess the work, recognize and avoid potential hazards.

Execution of the assembly, installation, electrical connection, commissioning and disposal:
- by qualified electricians and AHU technicians.

Execution of maintenance / monitoring of the operation:
- by technical staff or trained personnel and qualified electricians and AHU technicians.

Work on optionally installed refrigeration components must be performed only by trained and according to EU-directive 303/2008 certified refrigeration technicians.

Subsequently, warning triangles indicate warnings that must be followed to minimize risks to persons who are entrusted with the work on the air conditioner.

3 Reception control / unloading / transportation to installation site

Note: **Chapter 3.2 (Unloading / transportation to installation location)**, **chapter 3.3 (Overlifting of AHU sections with crane lugs)** and **chapter 3.4 (Overlifting of monoblocs)** do not apply to flat units (ceiling units), since they are not equipped with base frame.

3.1 Reception control

- Upon arrival of the equipment, please check immediately the package for completeness and damage.
- Loose supplied parts and assembly materials are in a nylon bag or a box in the unit.
- If damages are found, immediately a damage report must be created and sent to EUROCLIMA. Only then the transport company can make the claim against the insured (Note damage on the shipping documents with date and signature in the presence of the carrier). Complaints about apparent damaged or missing parts of the delivery cannot be subsequently recognized. In case of complaints please inform immediately the EUROCLIMA office.

The packaged delivered goods may include multiple parts of the device. In this case, each part is secured against falling. Attention: narrow parts may tip over after removing the safeguard. Secure narrow parts against tipping over!

Thin sheet metals like roof, edges or fins are a source of injury! Gloves, safety shoes and long work clothes must be used.

Devices shall not be climbed. If unavoidable: weight must be divided by use of boards.

Figure 1: Do not climb on the unit

Differentiation of delivery

For unloading, transporting and lifting an AHU to its final installation location, two fundamentally different forms of delivery are to be differentiated.

The delivery form is agreed with the customer in the order clarification and can be:

1) **Supplied in parts (delivery sections)**

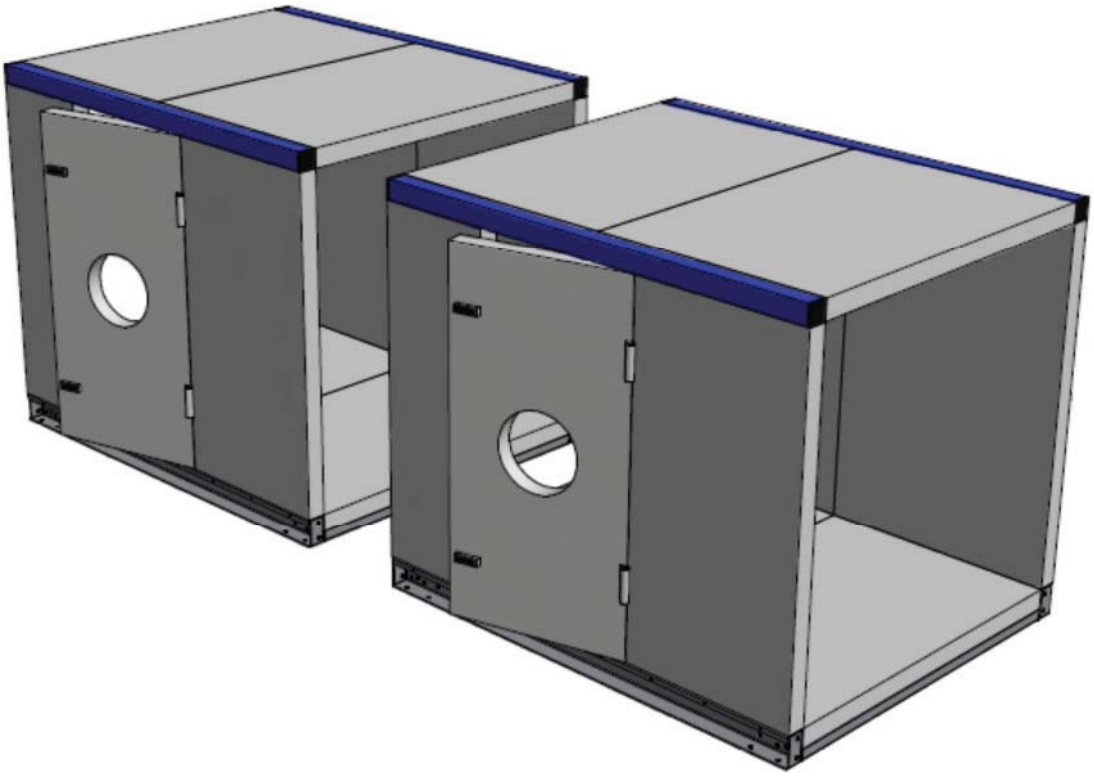

Figure 2: Delivery in parts (delivery sections)

- Delivery sections allow the supply of major equipment in small and more easily insertable parts.

- Sections have a base frame, on which on each corner a (supplied) crane lug can be attached.
- Size and weight of the sections are indicated on the AHU drawing, see **Figure 7**.

2) Supplied as monobloc

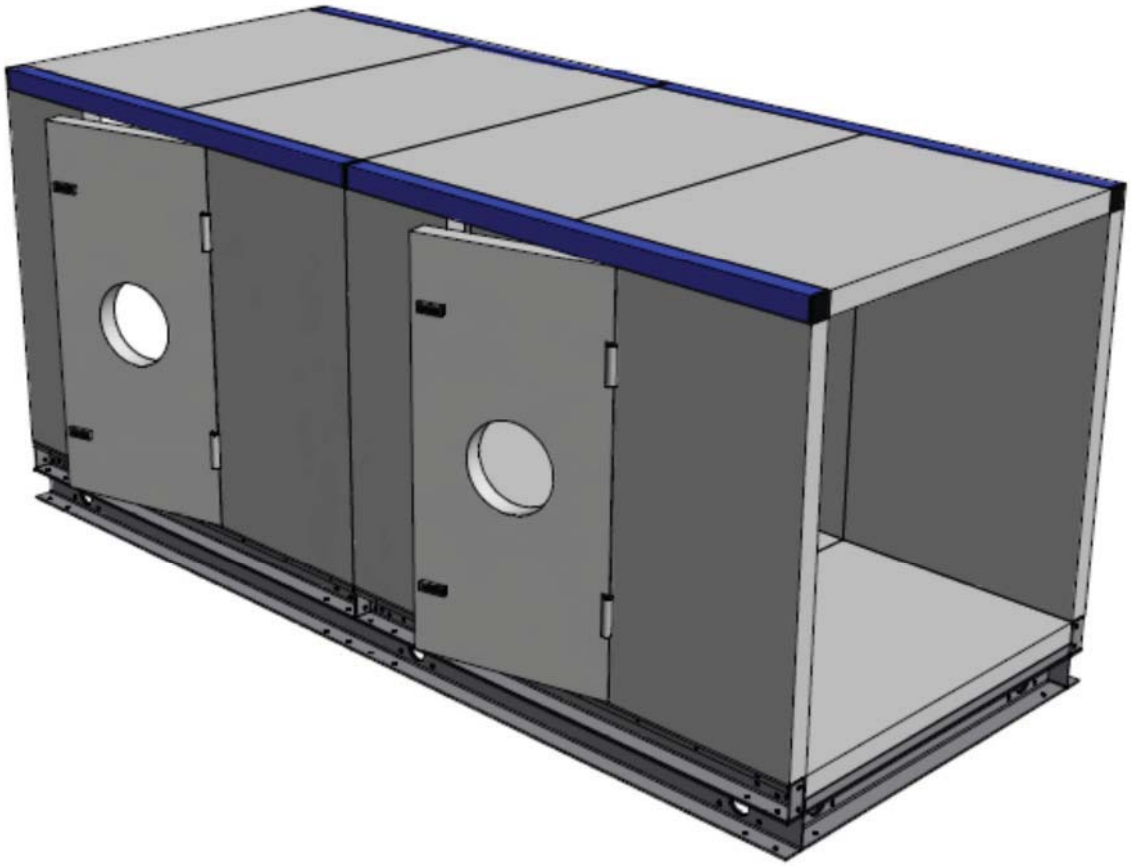

Figure 3: Delivery as monobloc

- If the space conditions allow the delivery of a monobloc, then the assembly at the installation location is much faster.
- Monobloc units have an additional counter-frame on which the components are already pre-assembled.
- The counter-frame is provided with holes diameter 50 mm, which can be used for the overlifting, see **chapter 3.4 (Overlifting of monoblocs)**.
- Size and weight of the monobloc must be determined from the data on the AHU drawing and have to be considered for the determination of the load carrying equipment and hoists, see **chapter 3.4.1 (Weight details for monoblocs)**.

3.2 Unloading / transportation to installation location

Forklift, lift truck transport
In accordance with the EUROCLIMA drawing the AHU will be delivered as one or more delivery section(s). The AHU parts are delivered on a pallet and can be unloaded and moved by forklift or lift truck. Forces must always act on the base frame, see **Figure 4**.

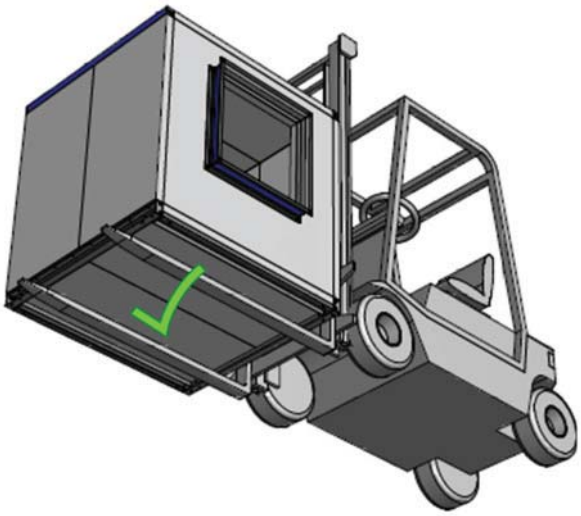

Figure 4: Transport correct

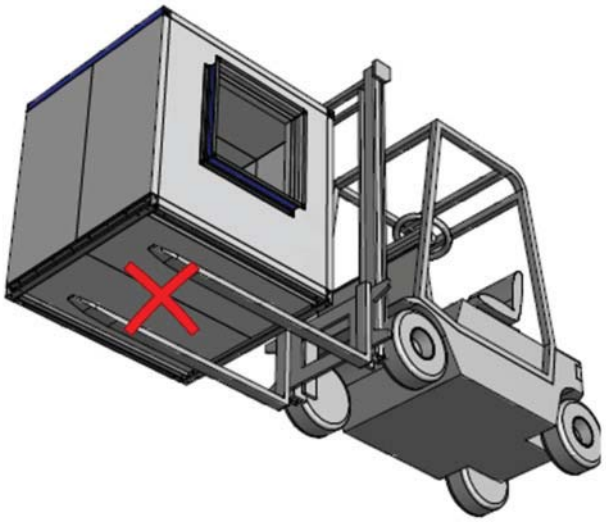

Figure 5: Transport incorrect

Center of gravity must be centrally located between the forks (see **Figure 6**). For large parts use several lift trucks.

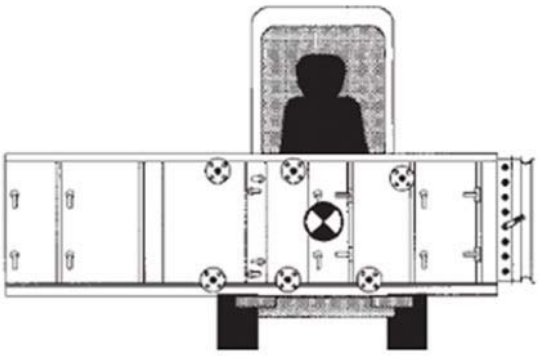

Figure 6: Center of gravity centrally between the forks

For the overlifting directly from the truck applies the following **chapter 3.3 (Overlifting of AHU sections with crane lugs)** for AHU sections or **chapter 3.4 (Overlifting of monoblocs)** for monoblocs.

3.3 Overlifting of AHU sections with crane lugs

Chapter 3.3 is only valid for the delivery form “Delivery in parts (delivery sections)”.
For overlifting of units delivered as “Monobloc”, see **chapter 3.4**.

- In addition to the actions mentioned in this **chapter 3.3**, the instructions according to chapter **3.5 (Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs)** have to be observed.
- Parts of the AHU may only be lifted with lugs individually - never screw parts together before lifting.
- Lateral load on lifting lugs is not allowed.

The Lifting of monoblocs by crane lugs is permitted only in exceptional circumstances and requires the **written approval** by EUROCLIMA.

3.3.1 Control of weight limits of delivery sections

Depending on the base frame height (see **Figure 15**), delivery sections may be lifted with lifting lugs up to the following weight, refer to **Table 1**.

Base frame height H [mm]	Max. section weight [kg]
80	1.500
100	1.500
150	4.000
200	4.000

Table 1: Base frame heights, depending on the AHU weight

The weight of single delivery sections is shown in the attached drawing (on each delivery section).The delivery sections are marked with L1, L2, L3, ... on the drawing and with the same number on the section itself. Example, refer to **Figure 7**: Delivery section L5 = 628 kg

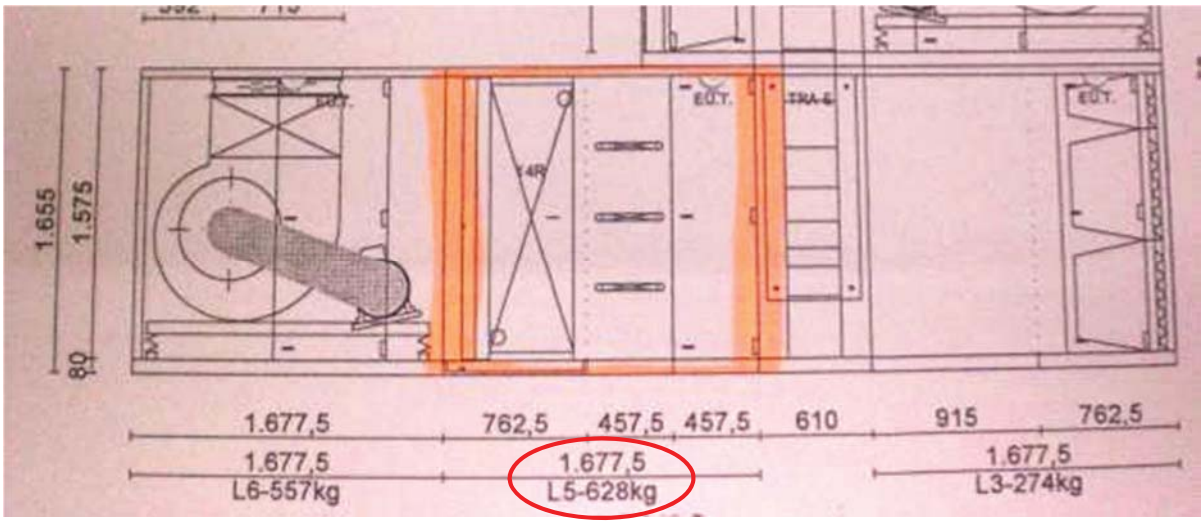

Figure 7: AHU section drawing with weight details

3.3.2 Necessary actions before lifting delivery sections with crane lugs

Opening accessories such as dampers, flexible connections, hoods, etc. must be removed before lifting, see the **following examples**. This equipment must be lifted separately on a pallet and then be reinstalled.

Example 1:

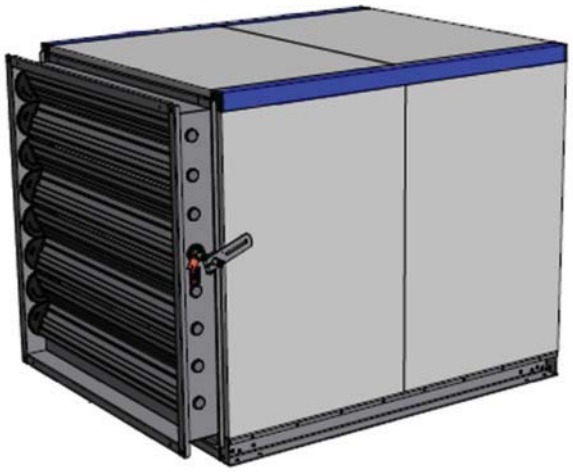

Figure 8: Delivery section with mounted damper

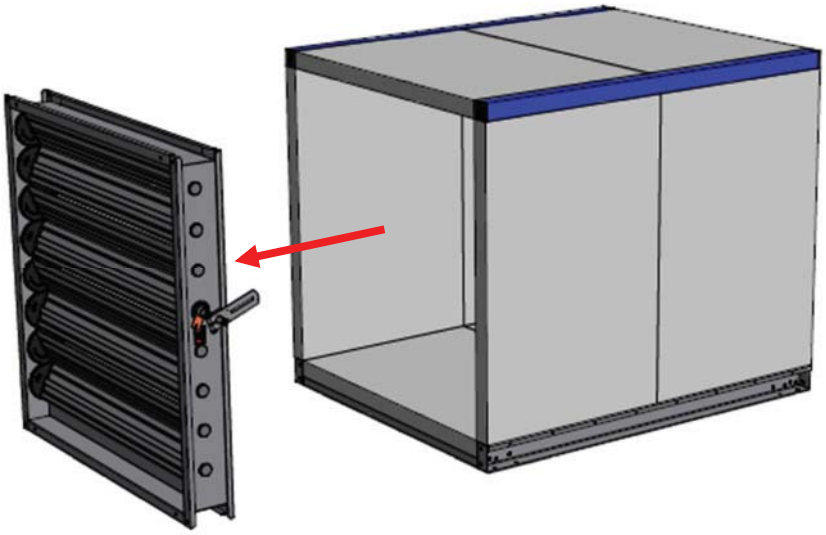

Figure 9: Delivery section with dismounted damper

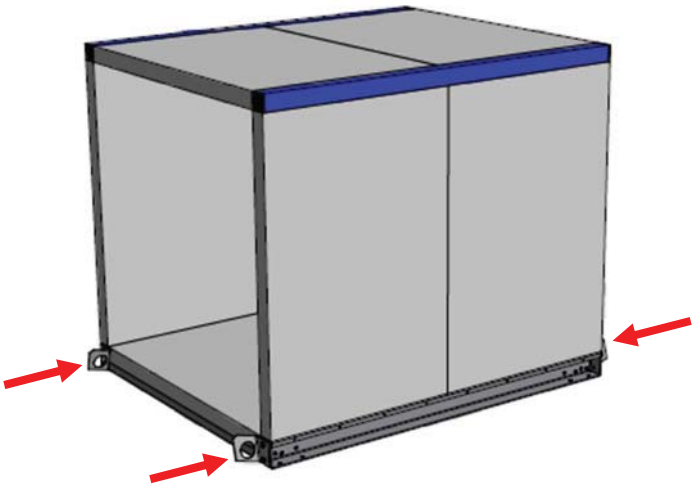

Figure 10: Delivery section with mounted crane lugs

Example 2:

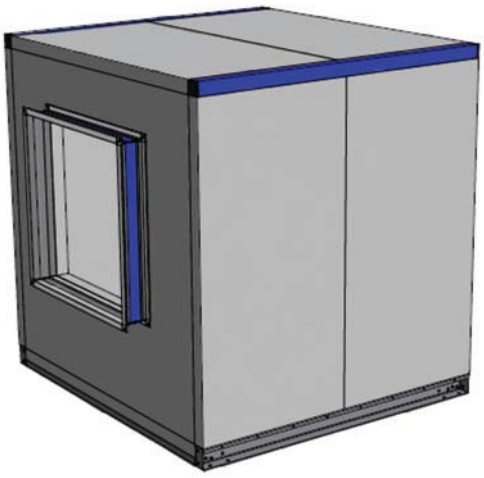

Figure 11: Delivery section with mounted flexible connection

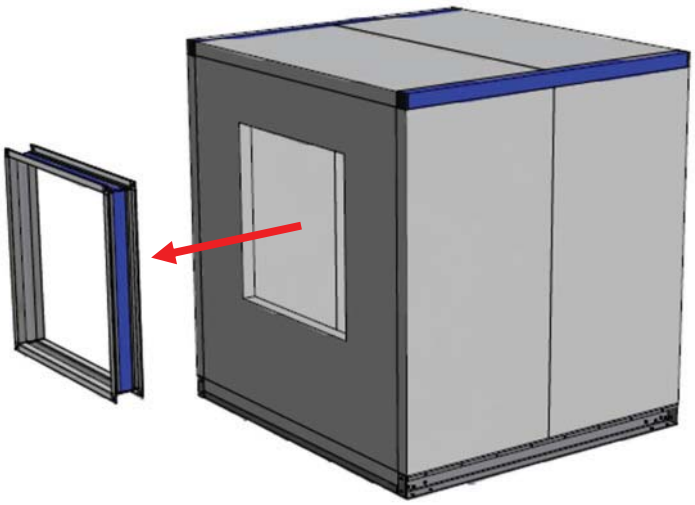

Figure 12: Delivery section with dismounted flexible connection

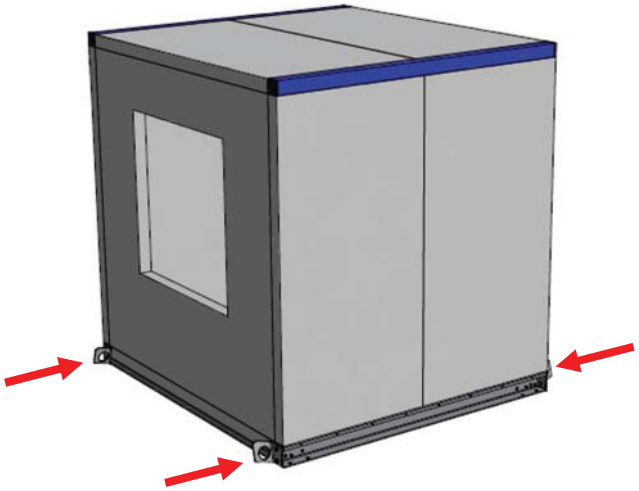

Figure 13: Delivery section with mounted crane lugs

3.3.3 Mounting of crane lugs

Crane lugs are supplied in two versions and will be attached on the front side of the respective delivery section in accordance with the necessary preparations.
Execution of the lifting lugs:

1. Right-side type
2. Left-side type

Attention to correct mounting of the crane lug according Figure 14:
- blunt corner has to point upwards
- bending edge has to point toward the center of gravity of the section

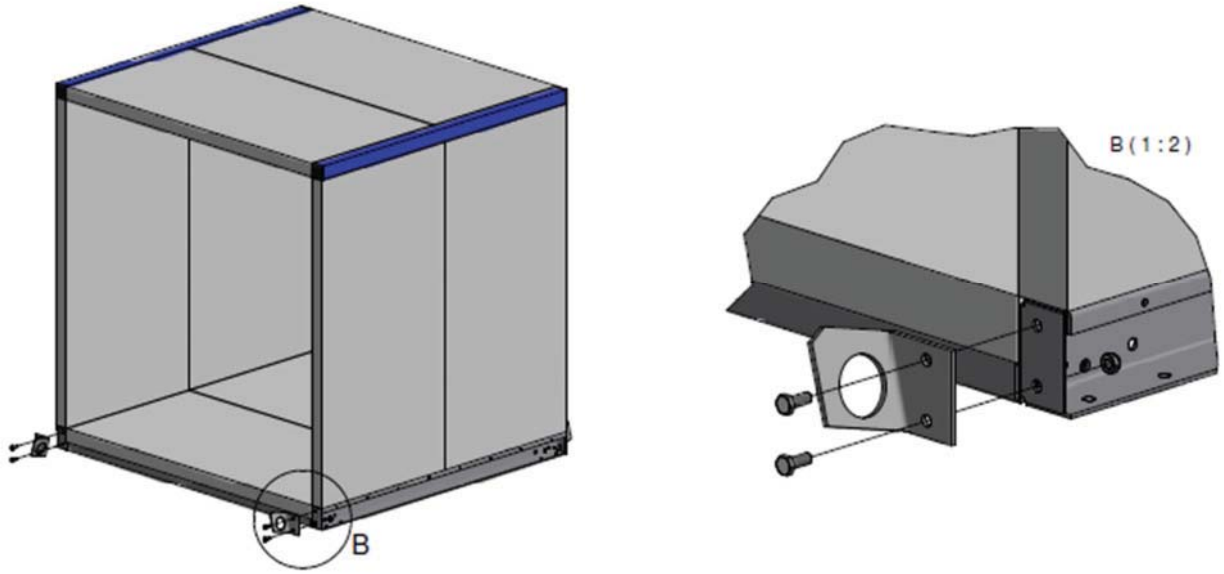

Figure 14: Mounting of crane lugs

Bolts and nuts are delivered with the lifting lugs and must be tightened with the torque according to **Table 2**.

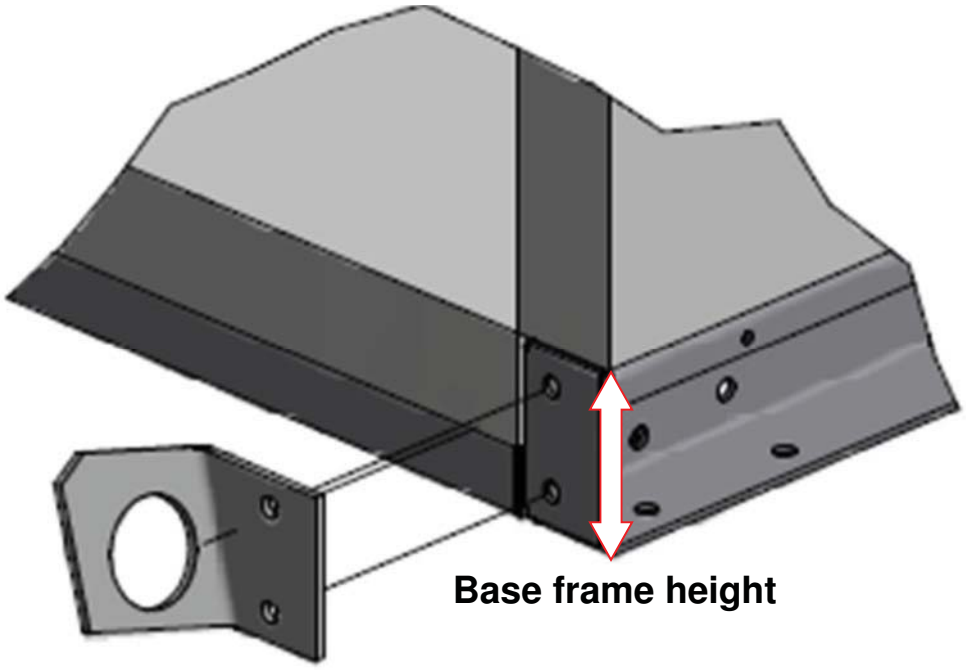

Figure 15: Base frame height

Base frame height H [mm]	Bolt type	Nm
80	M8x20	10
100	M8x20	10
150	M12x30	30
200	M12x30	30

Table 2: Tightening torque for bolts

3.3.4 Lifting of delivery sections with crane lugs

- The load carrying equipment must not run over the operating side of the AHU, but it must run over the opening or the front side of the AHU (**Figure 16**).
- The force effect has to take place uniformly across all four crane lugs of a delivery section.
- After the pre-positioning of the delivery section at the desired position, remove the lifting lugs and use them for the next delivery section.

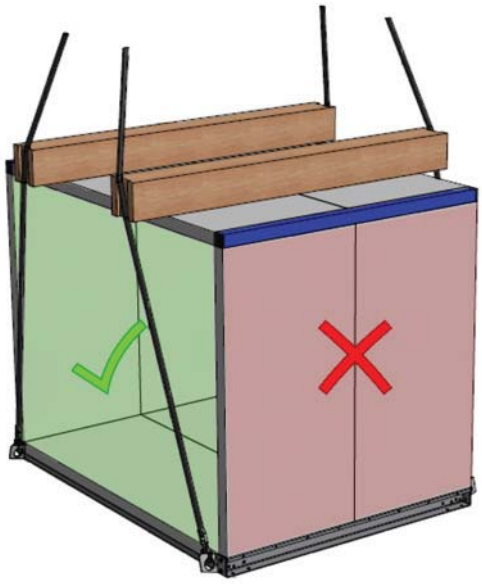

Figure 16: Load carrying equipment guided over front side

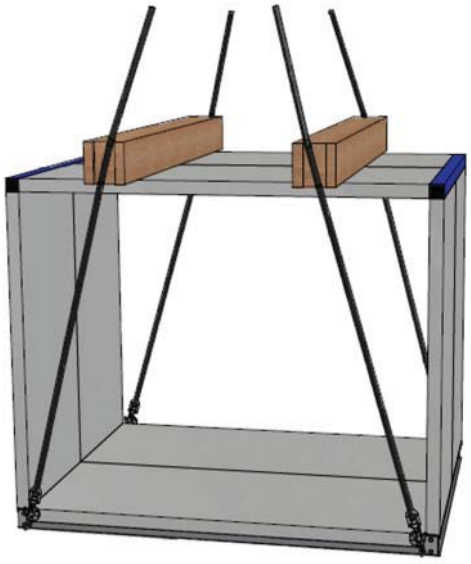

Figure 17: Uniform force effect

3.4 Overlifting of monoblocs

If several sections or even the entire AHU is combined into one delivery unit, then this is called a monobloc.
Chapter 3.3 (Overlifting of AHU sections with crane lugs) is only valid for the delivery form “Monobloc”.

For overlifting of units delivered as “Delivery in parts (delivery sections)”, see **chapter 3.3 (Overlifting of AHU sections with crane lugs)**.

3.4.1 Weight details for monoblocs

The weight of the unit is specified on the AHU drawing (attached on monobloc). Calculation example referring to monobloc from **Figure 18**.

Section L1 = 553 kg
Section L2 = 205 kg

→ Total weight: L1 + L2 = 758 kg

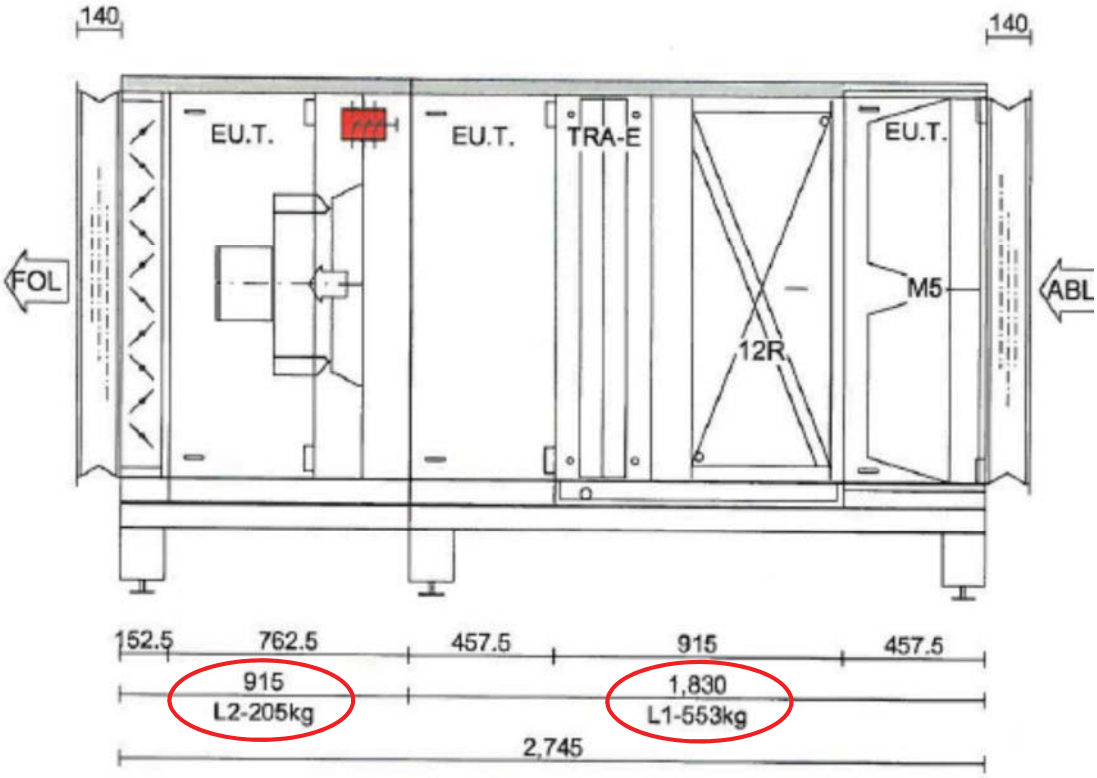

Figure 18: A monobloc, which consists of the two sections L1 and L2

3.4.2 Lifting of monoblocs

- Monoblocs are generally delivered with a perforated counter-frame – hole diameter 50 mm – for inserting suitable tubes/rods, where the unit is lifted, see **Figure 19** and **Figure 20**.
- The tubes/rods are not included in the delivery scope, but have to be provided by the company, which is responsible for the lifting operation.
- Two, three or more holes per side of the monobloc are available according to the length and weight of the unit. As a consequence, two or more tubes/rods can be used.

- The determination of the number and the dimensions of the tubes/rods and the load carrying equipment are the responsibility of the performing company.
- We recommend varifying the suitability of the selected tubes/rods by a structural engineer.
- The force effect has to take place uniformly across all tubes/rods.
- The load carrying equipment must be secured against slipping off, e.g. see **Figure 21**.

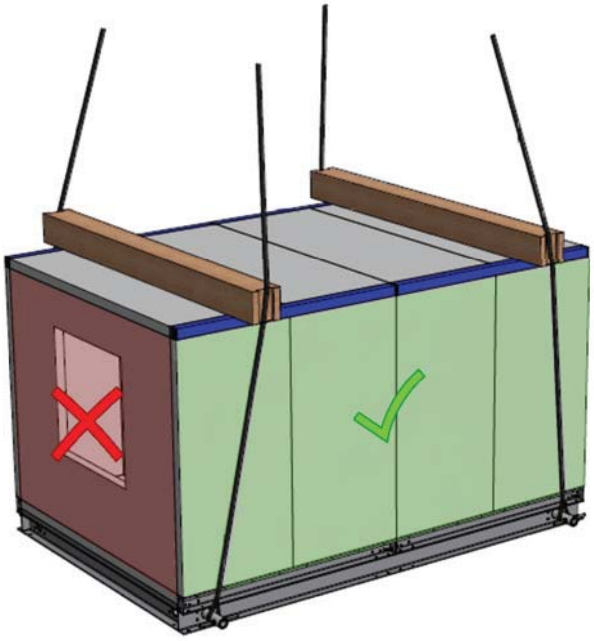

Figure 19: Guiding of load carrying equipment (monobloc)

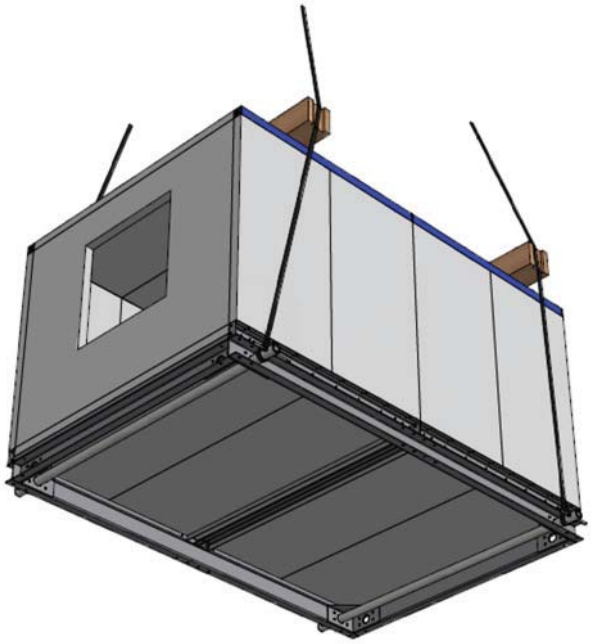

Figure 20: Uniform load of the form tubes

Figure 21: Securing against slipping off of the load carrying equipment

In addition to the actions mentioned in this **chapter 3.4**, the actions according to **chapter 3.5 (Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs)** have to be performed.

The Lifting of monoblocs by crane lugs is permitted only in exceptional circumstances and requires the **written approval** by EUROCLIMA.

3.5 Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs

- The AHU sections or monoblocs must be lifted with appropriate equipment e.g. belt with hook.
- The recommended minimum load capacity per load carrying equipment is 50% of the total weight of the delivery section or monobloc.
- The length of the load carrying equipment must permit a favorable course, see **Figure 22**.
- The course of the load carrying equipment must be chosen so that overhanging attachments, roofs and the like will not be stressed or damaged.
- Load carrying equipment shall not run over sharp edges and is not allowed to be knotted.

- The load carrying equipment must be secured against slipping off.
- After a slow lifting from the floor for a few centimeters the correct course of the load carrying equipment as well as the safe support of all fastening elements should be checked.
  Before further lifting it must be checked, that no abnormal deformation at the suspension points/load carrying equipment can be detected by visual inspection.
- Avoid jerky lifting.
- Make sure that nobody is under the raised load.
- Never lift AHU sections or monoblocs on heat exchanger connections or other attachments.
- The load carrying equipment is not permitted to exceed an angle of maximum 15 ° to the vertical and must be spread apart to avoid damage to the casing, refer to **Figure 22**.

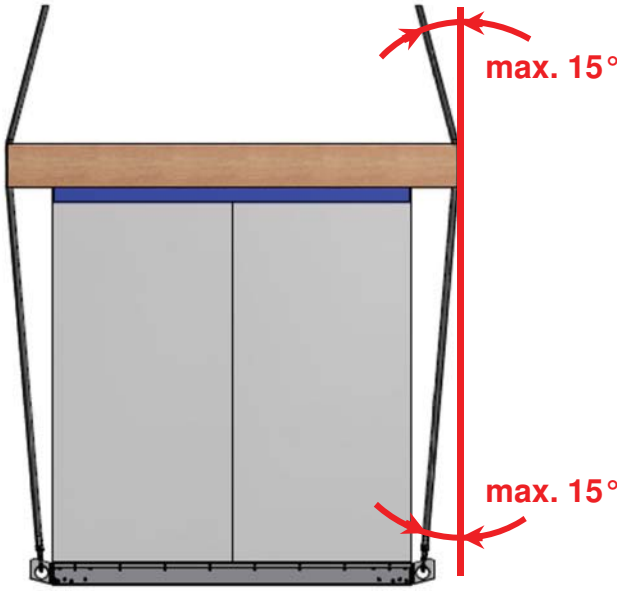

Figure 22: Permitted angle for load carrying equipment guidance