TECNAIR LV
CLOSE CONTROL AIR CONDITIONING

INSTALLATION USE AND MAINTENANCE MANUAL

THIS MANUAL REFERS TO THE FOLLOWING UNITS:
AIR CEILING: UNIDIRECTIONAL CEILING WITH OR WITHOUT RECIRCULATION

Lifeline

SUMMARY

1 PURPOSE OF THIS MANUAL

This handbook introduces you to the installation, use and maintenance procedure of the unidirectional air ceiling.

In the following chapter we will explain some points of extreme importance so you can use this unit in the best way. Therefore Tecnair LV suggests you to read this handbook carefully.

If, after reading this handbook, you still find yourselves in difficulty do not hesitate to contact our after sales service:

After sales office
Tel. +39029699111 / Fax +390296781570
@: info@tecnairlv.it

2 WARRANTY

The Unidirectional Air Ceilings described in this manual are subject to the present warranty terms, which are intended as accepted and automatically subscribed by the Customer when placing the order with TECNAIR LV.

The supplier hereby guarantees the correct construction and good quality of the product object of the supply, committing himself, during the warranty period specified herein, to repair, or supply spares for, at his sole discretion, in the shortest period, the parts and/or components that should present any material or construction or working defect invaliding them for their intended use, provided that the defect is not due to the purchaser's negligence, to any routine wear and tear, to the User's negligence, to any damages by third parties, to Acts of God or Force Major, or to any other cause not ascribable to the original manufacturer of the equipment, and the Manufacturer shall not be held responsible for any direct or indirect damages of any kind and for any reason.

Defected part substituting is done in the Uboldo factory and all transport and substituting costs are met by the Commissioners.

The warranty term is of 2 (two) years from the delivery date.

This time length of the warranty is not applied to the parts for normal use of the supply such as absolute filters, antiglare lamps for the basic illumination of the aseptic nucleus etc.

The warranty term shall be automatically cancelled if the materials are repaired or modified or in any way completed or in case of installation of not original spare parts (spare parts not bought from Tecnair LV).

The above warranty and supply conditions shall be valid provided that the Customer has fulfilled all of his contract obligations, with main reference to the payment terms. It is understood that no employee or representative of TECNAIR LV, or sales representative or service centre or the like is authorized to guarantee any derogations to the above mentioned warranty terms.

ATTENTION!
Before using this system the information in this manual must be completely understood.

3 INCLUDED IN THE SUPPLY

- ❑ Delivery ex works
- ❑ Standard package on pallet for truck transport
- ❑ All the required accessories
- ❑ Instruction for moving and lifting the unit (sticker out of the packing)
- ❑ The present manual for the installation, use and maintenance
- ❑ Manufacturers Conformity Declaration
- ❑ Testing declarations

4 NOT INCLUDED IN THE SUPPLY

If not otherwise indicated, and depending on the installed accessories, the sale does not include:

- ❑ The ducts to be installed in the counter ceiling and the fan recirculation system if any
- ❑ OP Lamp
- ❑ Anchor plugs for fixing the structure to the slab
- ❑ Lifting system for the air ceiling
- ❑ Cabling of the 8 lamps around the ceiling perimeter for the basic installation of the area
- ❑ Connection of the medical gas components to the relative distribution systems within the hospital
- ❑ Connection of the electrical components
- ❑ The start up and commissioning of the units
- ❑ Cosmetic cover of the recirculation systems

5 SYSTEM DESCRIPTION

The unidirectional filtering ceiling in question is a system for the distribution of the air able to guarantee the maximum protection of the critical area of the surgical room, the wound.

The air decontamination is certified by TUV at a level **4,4** according to Swiss guideline SWKI 99-3 of 2003 as well as the German Norm DIN 1946/rev. February 2005. The Standard requires a level of decontamination higher then 4.0

The Tecnair LV air distribution system through an unidirectional air flow guaranties an ISO5 class of air quality, according to the ISO 14644-1 Norm.

The standard unidirectional ceiling consists of:

- ❑ Upper plenum to mix fresh air and re-circulated air. In standard execution it is made of galvanised steel, stainless steel as accessory. The plenum is airtight and an OP Lamp can be mounted at its mid point.

- ❑ Eight H14 efficiency absolute filters. The filter shape is trapezoidal, in order to give the best cover to the ceiling surface. The filters are characterised by having a double density of the filtering media, higher in the centre to allow a higher air speed.

- ❑ The gasket system is airtight to certified and able to expel air which could by-pass it.

- ❑ Eight lamination curtains split table from the relevant filter. They are therefore changeable without changing the filter.

- ❑ Eight stratified glass panels to contain the air flow up to a height from the floor to be agreed (standard 2100 mm, minimum 2000 mm). As accessory, bars fitted for medical gasses or electric – electronic connections can be required. Each bar includes one or two guides for supporting and sliding medical devices.

- ❑ Basic lighting system of the critical area consisting of antidazzle lamps, which gives an illuminance of around 260 lux on the operating bed.

5.1 CONSTRUCTION CHARACTERISTICS

Here find the description of the construction characteristics of the air ceiling, its versions and available accessories.

5.1.1 HEIGHT FROM THE FLOOR OF THE REAL ROOM CEILING

The evaluation to decide the installation height of the unidirectional filtering ceiling depends on the height of the real ceiling of the room and of the height of 2,8 m necessary for the OP lamps optimal operation.

This means that the false ceiling must end at 2,7 m from the real floor of the room.

The unidirectional ceiling has a 500 mm height and therefore for a good installation a real ceiling of at least 3,2 meters is required.

5.1.2 HEIGHT FROM THE FLOOR OF THE LATERAL GLASS PANELS

The lateral panels, necessary for the air flow control and the consequent reaching of the air sterility level required by the Standards, must anyway end at such a height from the real floor not to disturb the surgical team during its work. In case of installation of the glass panels in fact the peripheral layers of the air flow open and the air flow itself loses speed therefore reducing the effect of the expulsion of the endogenous contamination (patient and surgical team).

The curtains are in stratified glass panels so to guarantee maximum security against breaking without limitations for the sight lines of the surgeons.

Therefore Tecnair LV suggests a minimum height of the glass panels of 2,1 m from the floor, corresponding to the door one.

5.1.3 DUCTING SYSTEM IN THE DOUBLE CEILING

In general, the ducts to be installed in the ceiling are not part of the Tecnair LV supply.
As accessories, externally thermo-insulated galvanised steel ducts, either for the static or for the ventilated ceiling can be supplied or supplied and installed.

The accessory does not foresee a visit on the jobsite to verify the correct dimensions of the surgical room. Therefore an electronic design with all the correct dimensions to project, manufacture and perhaps install the ducts is absolutely required.

N.B: In case of wrong electronic drawing, TECNAIR cannot be held responsible for the supply of the system.

5.1.4 AIR DISTRIBUTION AND SUPPLY PLENUM

In standard execution, air distribution and supply plenum is made of galvanised steel, stainless steel as accessory. The plenum is airtight and an OP Lamp can be mounted at its mid point.

5.1.5 OP LAMP

The standard version of the filtering ceiling has a central hole in the upper plenum so that the support of the OP lamp can be fixed to the real ceiling. The anchoring of the lamp must be done on first installation of the plenum and filtering system.

As an accessory, a system to reinforce and allow for the complete mounting of the ceiling before the installation is available so to also fix the OP lamp, this is necessary for situations of great distance between the real ceiling and the filtering ceiling.

5.1.6 GLASS PANELS CONFIGURATION

The glass panels make up the lower part of the standard configuration of the air ceiling.

As alternative aluminium bars can be requested either empty or with gas connections or electric plugs.

As the lateral panels make it difficult to install the pendants of the surgeon and the anaesthetist, under these panels there are eight media bars which can be separately equipped, in positions external to the air flow and therefore not contaminating it, with connections for gasses and electricity. Connections for radios, music, LAN, PCs can also all be foreseen.

Each of the side panels incorporates one or two rails to allow for the movement of trolleys and supports for up to 60 kg.

Connection of components for the medical gasses, when present, are installed but not connected.

Cabling of the electrical components, when present, are installed but not wired.

The glass panels of the lateral curtains can host, externally to the air flow, one or more LCD monitors or count-seconds watches. The LCD monitors satisfy the safety and electromagnetic compatibility (EMC) Standards, for applications on medical devices. The count-second watches are studied for surgical room application.

In pendants or particular surgical apparatus (such as angiograph, C-arm, etc) are installed, it is possible to raise the panels to a height that guarantees a passage of instruments.

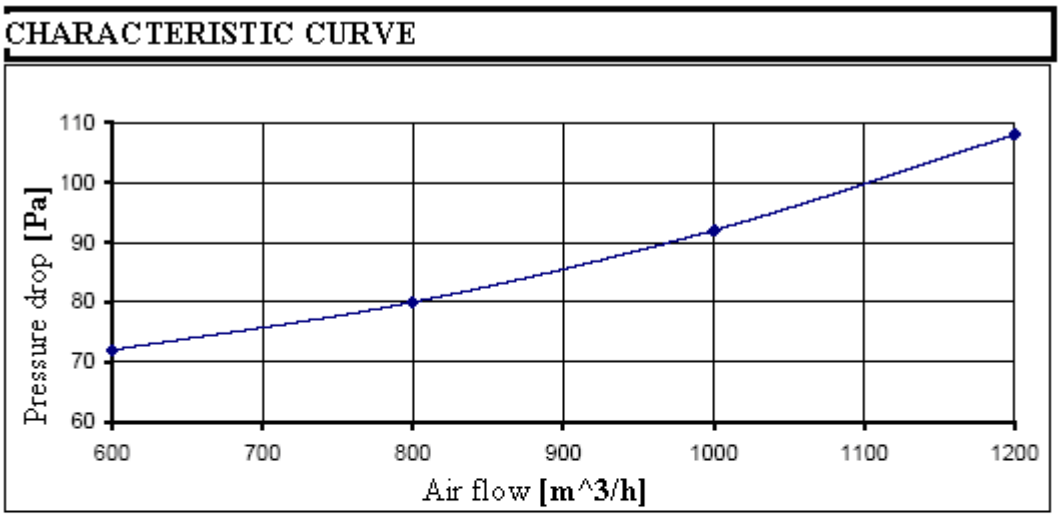
5.1.7 FILTERING SYSTEM

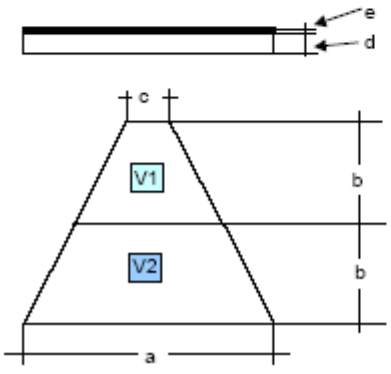
The absolute filters are made of H14 efficiency, being eight of trapezoidal shape in order to guarantee the total coverage of the octagonal surface of the unidirectional ceiling and having the lowest possible pressure drop.

The absolute filters have a bigger quantity of filtration media in the central part of the ceiling so to guarantee a reduction in the pressure drops, obtaining a higher speed of the air and guaranteeing better expulsion effect of the contamination.

A circular crown created around the H14 filters can guarantee that, even if a gasket is damaged or badly installed, no air could by-pass the absolute filters as it would fall inside this circular crown which is kept in depression with a connection to an extraction duct.

The characteristic curve and dimensions of the absolute filter are shown in the figure below.





DIMENSIONS **[mm]**

a:	1278
b:	714
c:	99
d:	102
e:	6

6 AIR CEILING VERSIONS

Tecnair LV Unidirectional Filtering Ceiling has 2 different versions: STATIC and VENTILATED.

6.1 STATIC FILTERING CEILING

The version of the STATIC FILTERING CEILING is selected when the fresh air handling unit is dimensioned so to supply total capacity of the system. So to guarantee the fulfilment of the quality level demanded by the local Standards, Tecnair LV believes it to be necessary that the total air flow supplied to the system by the air handler is of at least 7.200 m3/h. Recirculation is in fact done in the unit and not in the room.

This is the sole solution accepted by the Standard for new installations and strongly suggested wherever it is possible to transit with ducts for 7.200 m3/h from the unit to the unidirectional air ceiling.

6.2 VENTILATED FILTERING CEILING

The version of the FILTERING CEILING WITH RECIRCULATION is selected in the presence of refurbishments in all those applications where the possibility to pass with ducts for 7.200 m3/h from the unit to the ceiling.

So to guarantee the fulfilment of the quality level demanded by the local norm, Tecnair LV strongly suggests that the fresh air unit supplies 2000 m3/h from the unit to the ceiling and the recirculation is done in the room through recirculation modules installed in the corners of the room made up of:

- Constant air flow fans.
- Sound dampers on the return air and supply.
- F9 filters on the return air in the modules.
- Non return dampers after the fan in the recirculation module.

This version is obtainable with 3 or 4 recirculation modules, these supply the residual air flow still necessary to guarantee the maximum protection of the surgical field and wound.

6.3 AIR CEILING OPERATING LIMIT

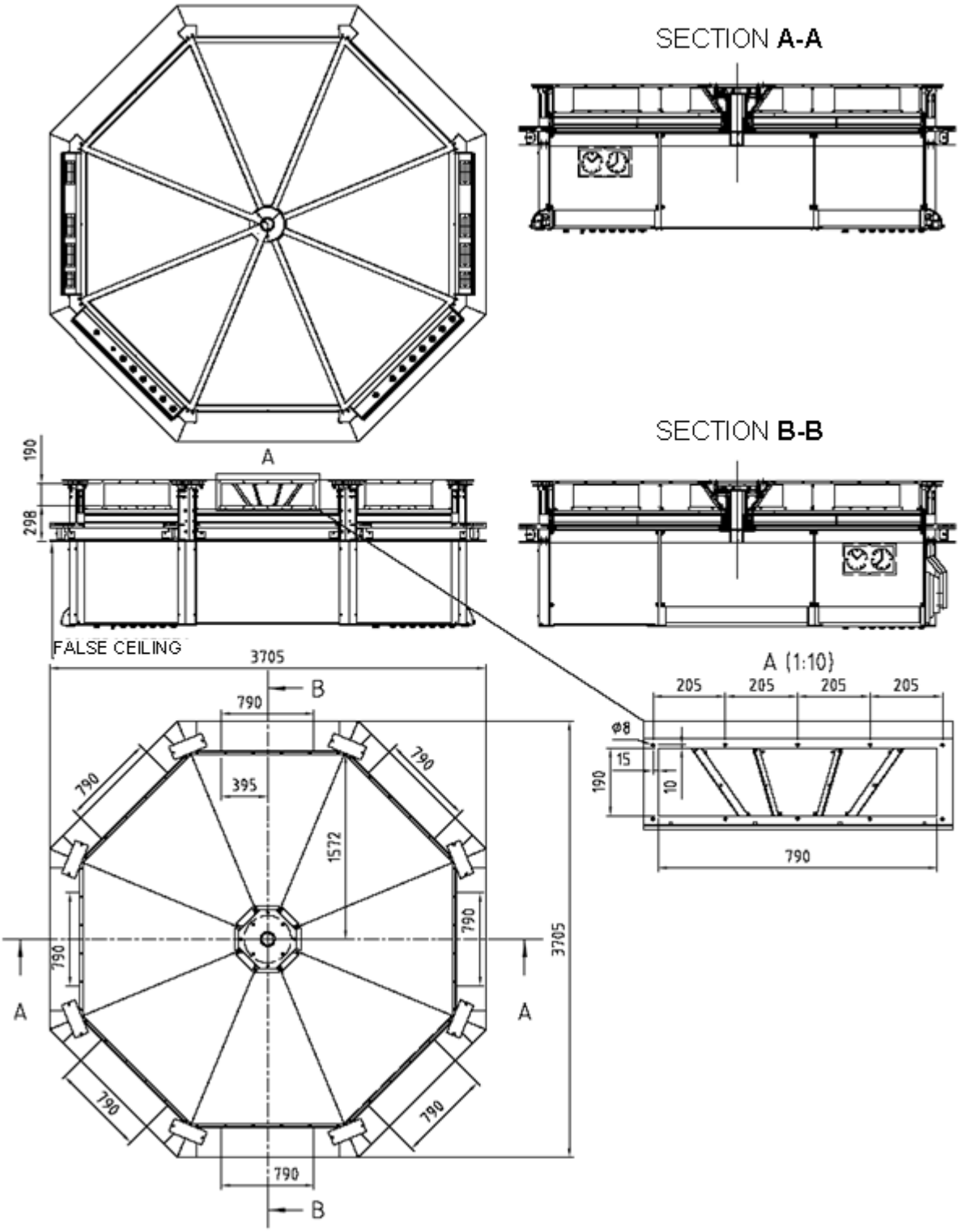
The TECNAIR LV laminar air flow ceiling in order to work correctly must be installed so to guarantee an ISO 5 air quality class. It is therefore not a responsibility of Tecnair LV in case the following conditions are not meet:

- **Minimum air flow required for static ceiling** 7200 m3/h.
- **Minimum air flow required for ventilated ceiling** 2000 m3/h.
- **Minimum height of the real ceiling required** 3.200 mm.
- **Minimum height of the glass panels** 2.000 mm.

IF THESE SIMPLE TECHNICAL SPECIFICATIONS ARE NOT COMFORMED TO, TECNAIR LV CERTIFIED AIR QUALITY CLASS LEVEL IS COMPROMISED.

In the following figure the dimensional drawing of the unidirectional ceiling is shown. The dimensions of the ceiling are standard and indicated in mm.

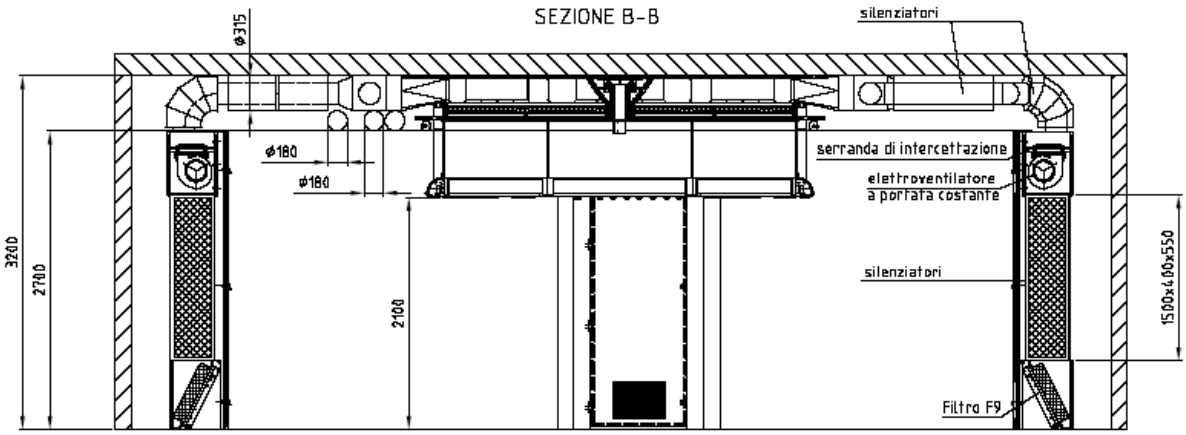
In the drawing the dimensions of the opening of the plenum are shown so to connect the ceiling and the ducts. In general the dimensions of the opening are standard, when the height of the real ceiling is of at least 3200 mm. When this height is lower it is possible to study a special solution and in this case the opening of the plenum needs to be studied case by case.

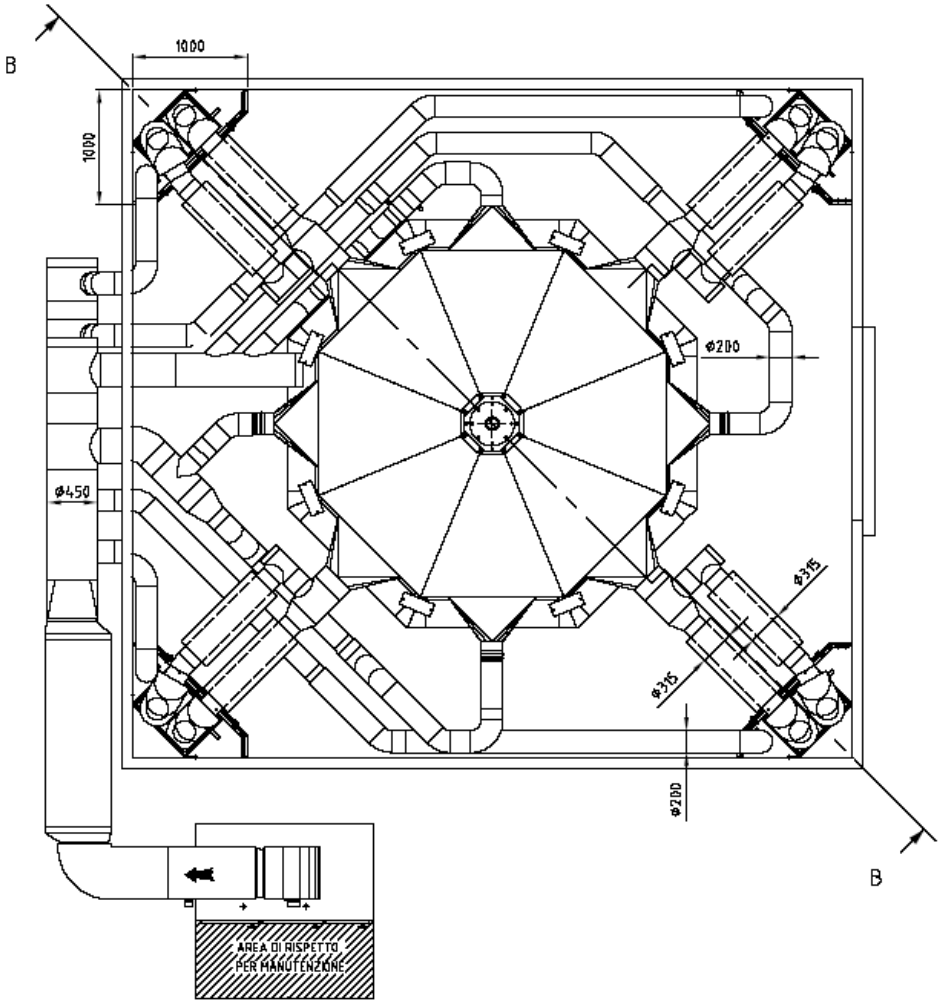


In the following figure the dimensional drawing of the unidirectional filtering ceiling is shown in the standard ventilated execution.

The dimensions of the recirculation modules are shown as well as there position inside the room.

Obviously the ducting shown in the figure is only for information purposes, it will be the designers job to position the ducts in relationship to the space and need.





7 INSTALLATION

These procedures are meant for:

- Transport and reception of the elements of the ceiling
- Installation of the ceiling
- Anchoring of the structure to the slab
- Lifting of the ceiling

7.1 TRANSPORT AND CEILING ACCEPTANCE ON SITE

All elements of the ceiling and any accessories must not be laid on the side or upturned, but must therefore be always kept inside their casing being careful that any movement could damage the internal components of the unit.

Unless otherwise agreed with the customer, TECNAIR LV delivers its units ex works in a standard packaging made of a wooden pallet and protective polyester sheets.

As the forwarder is always responsible for the damages potentially caused to the goods handed over to him for transport, before signing the acceptance of the goods, it is essential to check the status of the units, verify the integrity of the casing and structure where no damage must be present or visible. In case of obvious problems and damages incurred during transport, we request that a written statement is made to the forwarder, informing Tecnair LV in copy.

If the ceiling has not got to be installed immediately after its arrival on site, it has to remain in its original packaging and be stored in a closed environment, without humidity and preferably warmed at a temperature 15°C during the winter months.

If the unit is to be stocked for a longer period it is necessary to ask the Tecnair LV sales offices for the correct modality and periodic checks to be performed on the ceiling's status.

7.2 ASSEMBLING THE MAIN STRUCTURE OF THE AIR CEILING

The first thing to be done for the installation of the ceiling is to build, on the ground, the main structure. The structure is made of extruded aluminium, connected one to the other through blocks in the angles and silicon and tightened with screws. In the following table the materials used and their codes and quantities necessary for installation of the structure are shown.

Code	Description	Quantity
P01	Central crown	1
P02	External profile with socket	4
A06	Middle profile	8
P03	Vertical posts with external profile	4
	Screw M5x16 UNI 5931	16
	Washer Grower A5 UNI 1751	16
	Adhesive TEROSTAT 935 Henkel	1

Material and quantity table for construction of the main structure of the ceiling.

Here below are the drawings to recognise the materials used in this installation phase, in particular the preassembled parts, such as the central crown (P01) and the vertical posts with the external profile (P03).

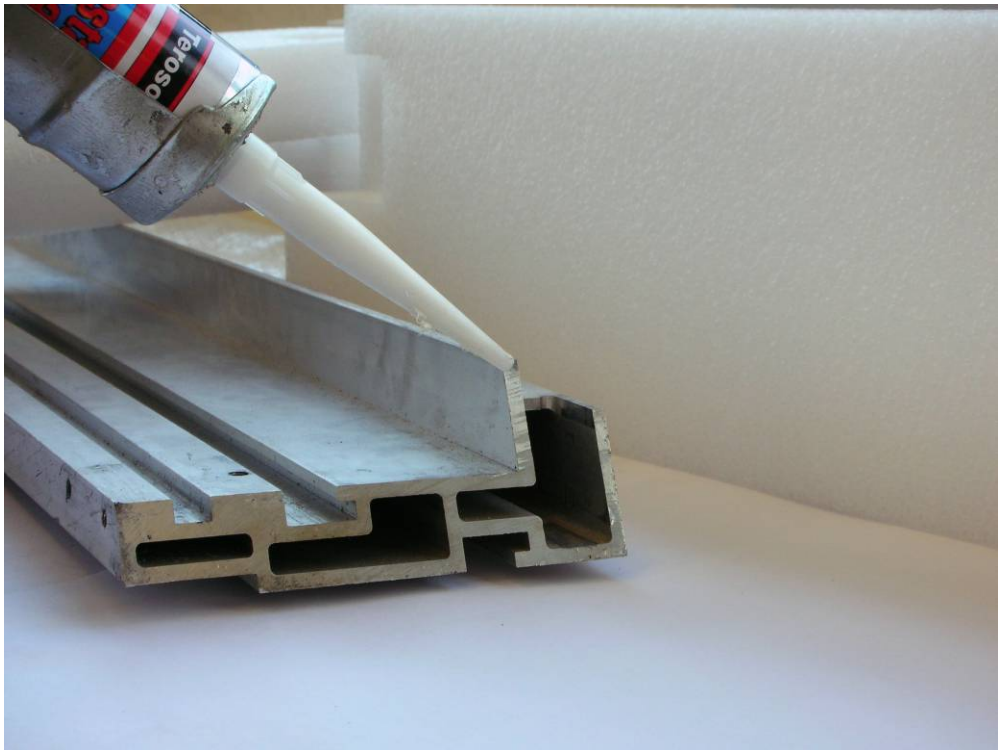
Central crown

Vertical posts with external profile

Take the four identical assembled parts of the vertical posts with external profile (P03) and position them on four sides, as shown in the figure.

Note: all possible escape routes must be covered and sealed.

Take an external profile with socket (P02) and use the TEROSTAT gluing system on both side edges of each profile, as shown in the figure.

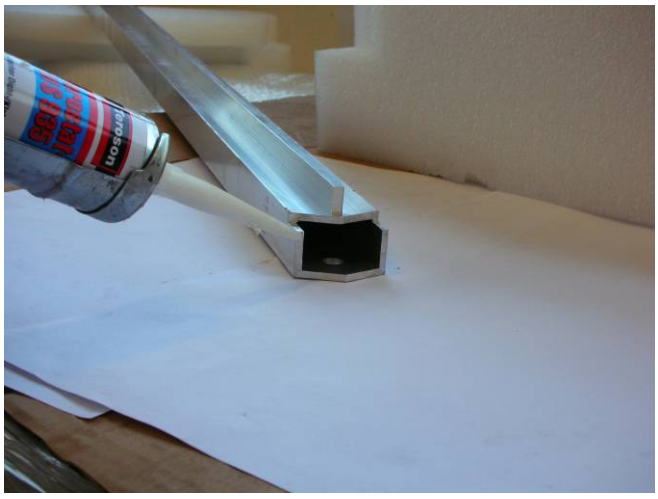


Once the glue has been applied to the side edges of the profile, take this profile (P02) and insert it between two vertical posts so that it touches the other profile. Fix the elements loosely together with their screws and washers.

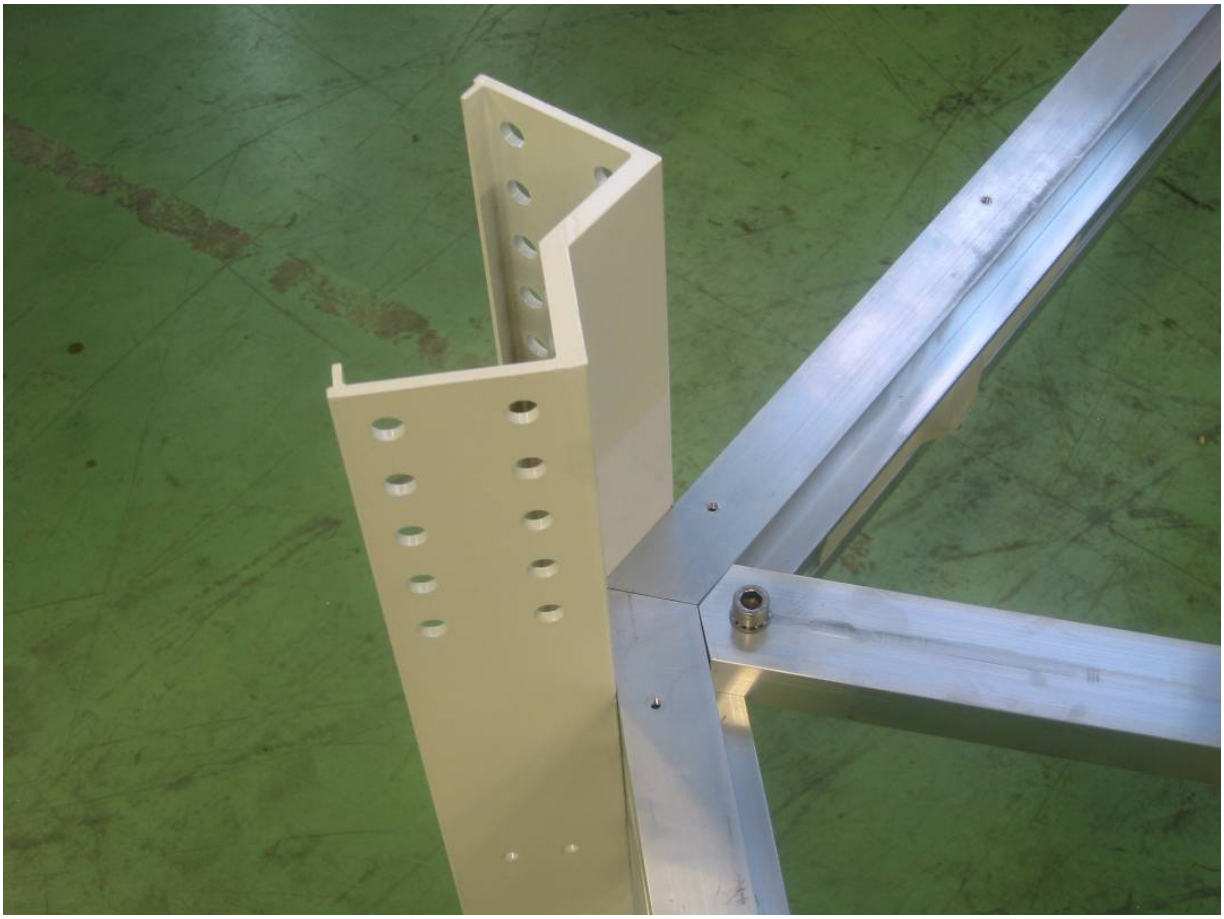
Repeat the same operations to obtain the structure in the figure below.

Note: all possible escape routes must be covered and sealed.

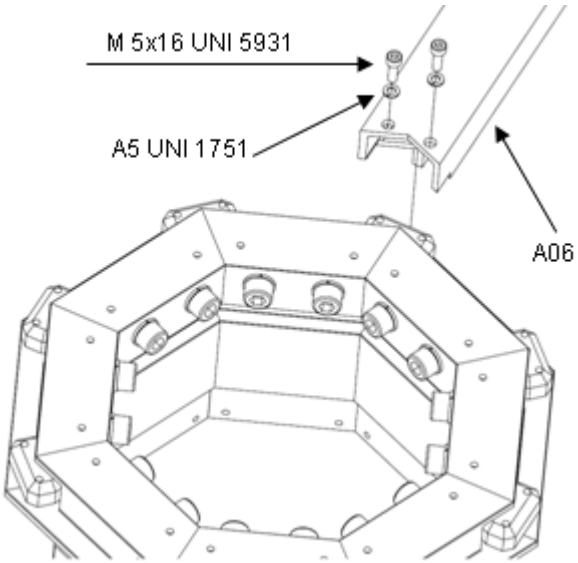
Take a middle profile (A06) and use the TEROSTAT gluing system on both side edges of each profile, as shown in the figure.

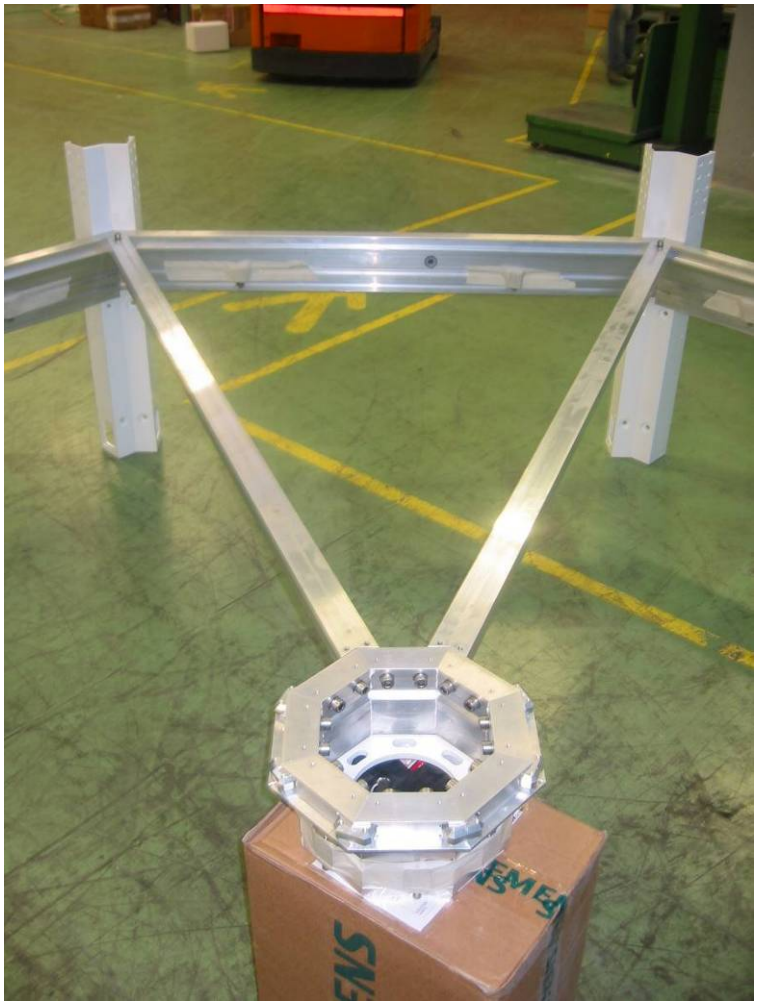


Take the middle profile (A06), insert it in the connection angle between the two external profiles and fix it with the screw and washer, as shown in the figure.

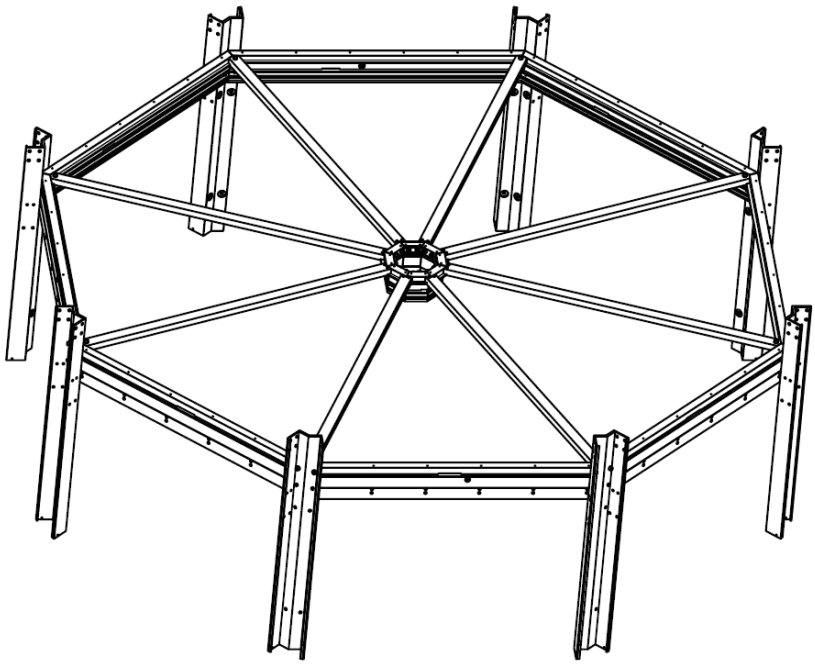


Position the central crown (P01) on a surface at the same level as the external profiles. Take the internal side of the middle profile (A06) and fix it to the central crown with the two screws (M5x16 UNI 5931) and two washers (A5 UNI 1751), as shown in the figure.





Repeat the same operation for all the middle profiles. Once the assembling is finished, the main structure of the air ceiling is obtained, as shown in the figure below.

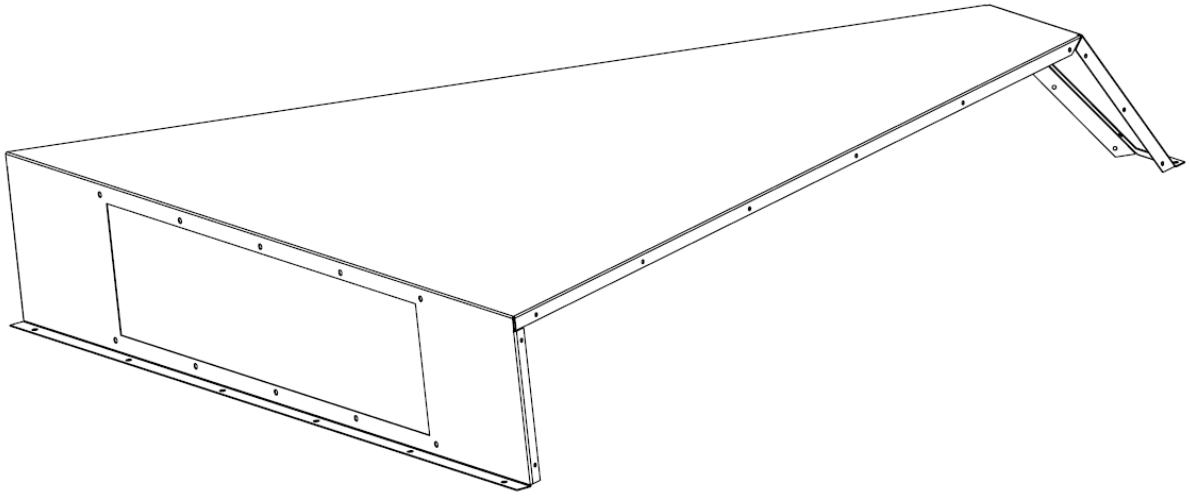


7.3 ASSEMBLING THE PLENUM

Once the structure of the ceiling has been assembled, the next step is anchoring the plenum of the structure. In the table below the materials and quantities required to assemble the plenum are specified.

Code	Description	Quantity
B01	Plenum component	8
	Screw M5x16 UNI 5931	64
	Screw M4x20 UNI 5739	88
	Grower washer A5 UNI 1751	64
	Flat washer Ø4 UNI 6592	176
	Screw nut M4 UNI 5588	88
	Adhesive TEROSTAT 935 Henkel	1

Table of materials and quantities for the installation for the plenum.

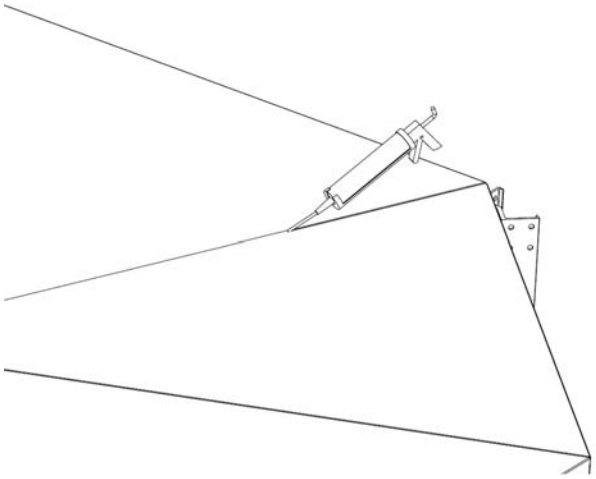


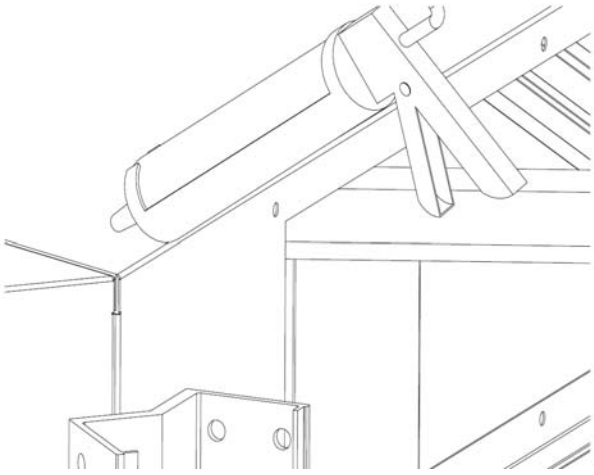
Plenum component

Please note: the plenum must be air tight.

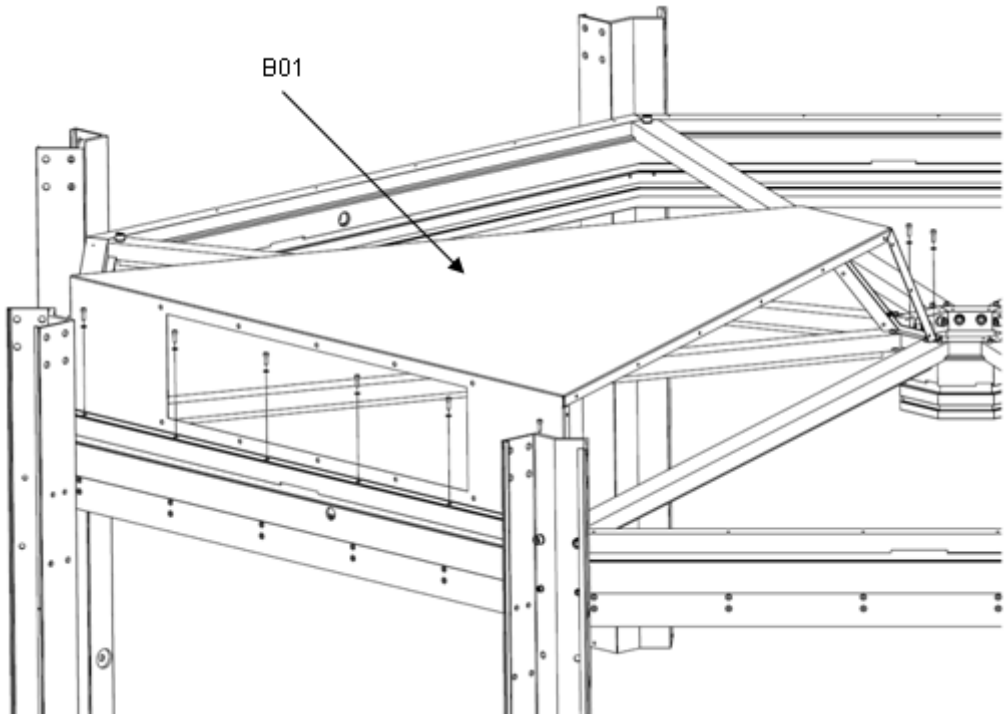
All possible escape routes for the air must be sealed with the adhesive TEROSTAT 935 Henkel. The joints between component and component and between component and profiles must be sealed using the adhesive.

The figures below show how to use the bonding agent in this delicate operation.

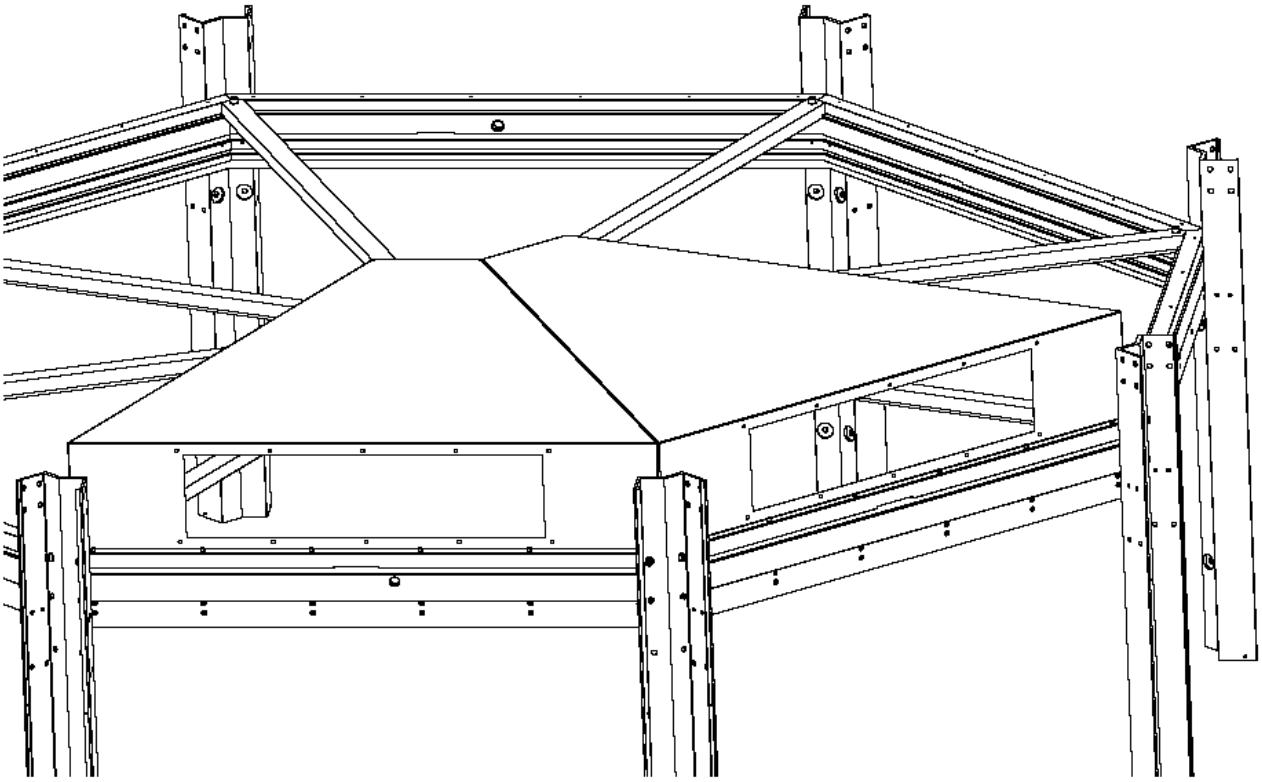




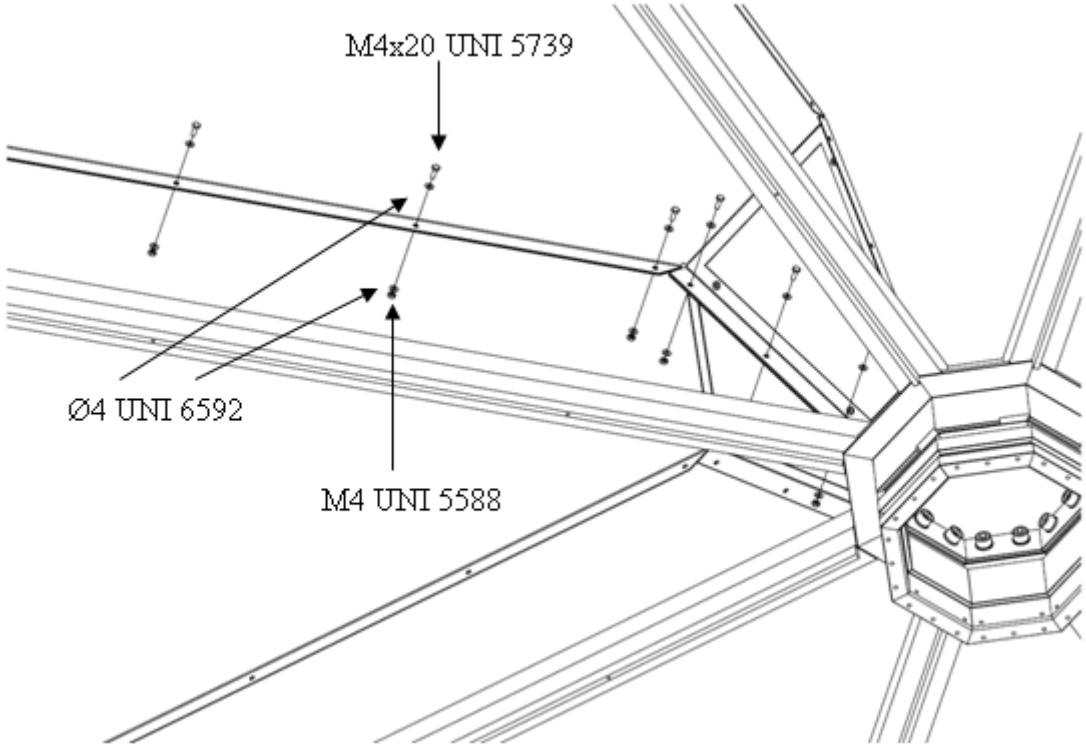
Take a plenum component (B01), use the adhesive and position it on one of the eight sides of the structure and fix it with 8 screws (M5x16 UNI 5931) and 8 grower washers (A5 UNI 1751), 6 on the exterior and 2 on the interior, as shown in the figure.



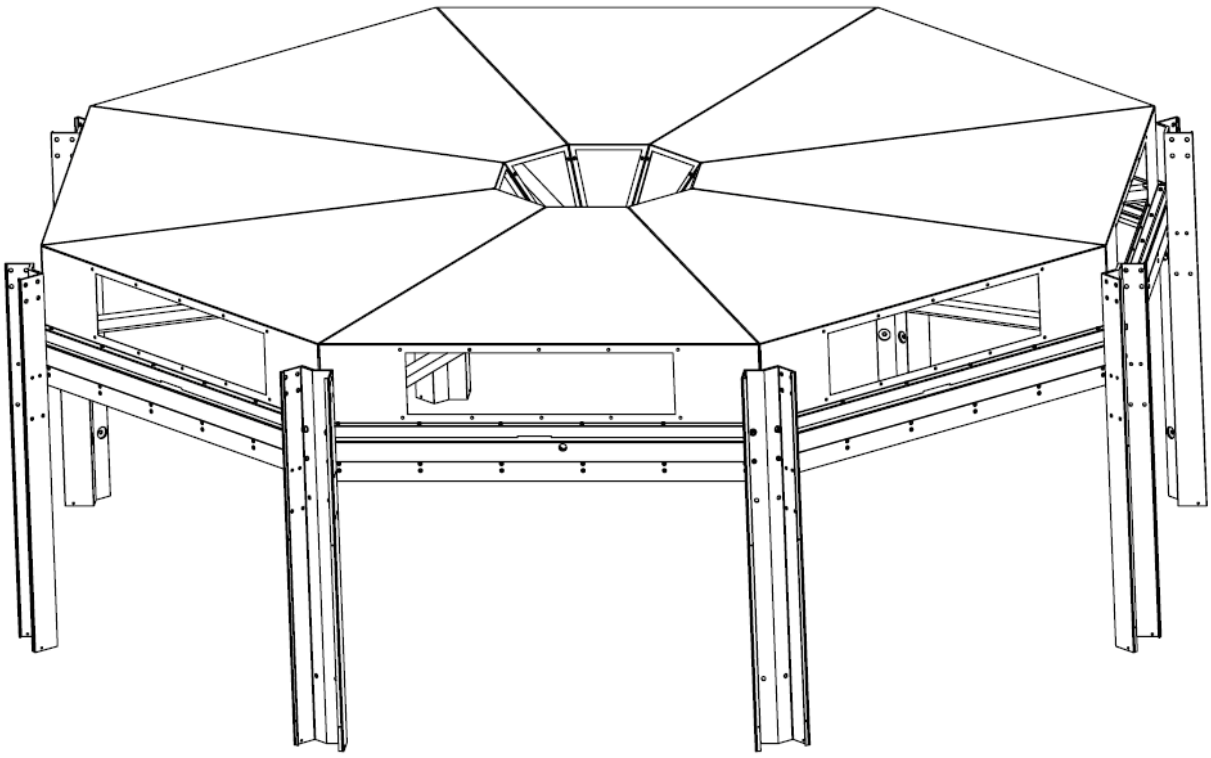
Once the first component has been fixed, it is possible to pass to the adjacent one, which will be fixed on the structure as described previously. Use the adhesive TEROSTAT on the joint surface of the two components.



At this point two plenum components need to be fixed one to the other by the screws (M4x20 UNI 5739) with two flat washers (Ø4 UNI 6592) and a screw nut (M4 UNI 5588) for each hole, as shown in the figure.



Repeat this operation for each of the plenum components, that is, anchoring one of the plenum components to the structure then anchoring it to the adjacent one. The total plenum on the structure is then obtained as shown in the figure below.



7.4 ANCHORING THE CENTRAL PLAQUE

The operation of fixing the central plaque to anchor the structure of the ceiling is a fundamental operation to position the ceiling inside the room.

The useful data for a correct installation of the ceiling are the following:

- Weight of the ceiling between 750 Kg and 800 Kg, according to the configuration of the tool bars below the eight Glass panels.
- Surface of the ceiling 3,2 m x 3,2 m
- Anchoring dimensions of the central plaque 450 mm x 450 mm

Measure the exact position of the operating lamp (or the centre of the filtering ceiling) and trace the four holes for the passage of the lamp using the central plaque.

The Tecnair LV supply includes only the central plaque and not the anchor plugs (central block).

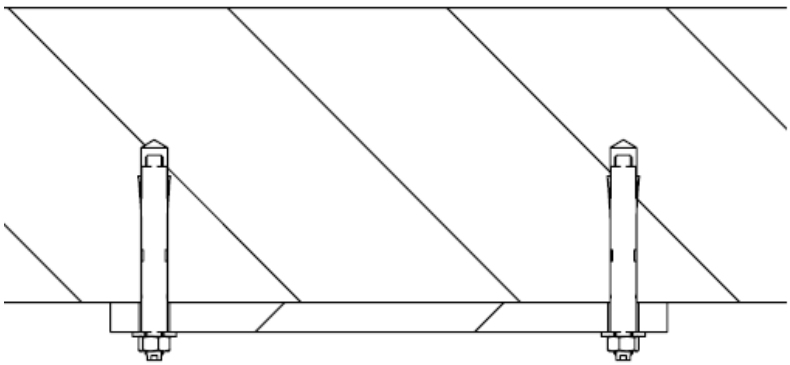
In this section the selection of the anchor plugs is of crucial importance, due to the type of slab present in the future operating room. If the slab is of reinforced concrete, Tecnair LV can specify the type of anchor plugs to be used.
If the slab is instead made of other materials or drilled, the anchor plugs must be chosen in function of the material (for example chemical anchor plugs in case of drilled) and the decision must anyway be made by a qualified installer.
Therefore once the Air Ceiling by Tecnair LV has been bought, it is the customers duty to inform himself about the type of slab on which the installation of the anchor plugs must be made so to carefully select the anchor plugs to be used.

Note: If a wrong drilling was to be made , for example drilling the steal cover, it is necessary to inform the safety inspectorand technical manager of the construction site, as the stability for the unit might be compromised.

Note: For mounting the anchoring system plaque it is absolutely necessary to have a “case by case permit” from the Site work manager.

Once verified the necessary information for the correct anchoring of the structure to the slab, fix the central plaque (C01) to the filleted bolts which come out of the structures cover towards the bottom of the washers and the hexagonal anchor plugs, as shown in the figure below.

In these figures the anchoring of the central plaque to the slab through the anchor plugs is shown.

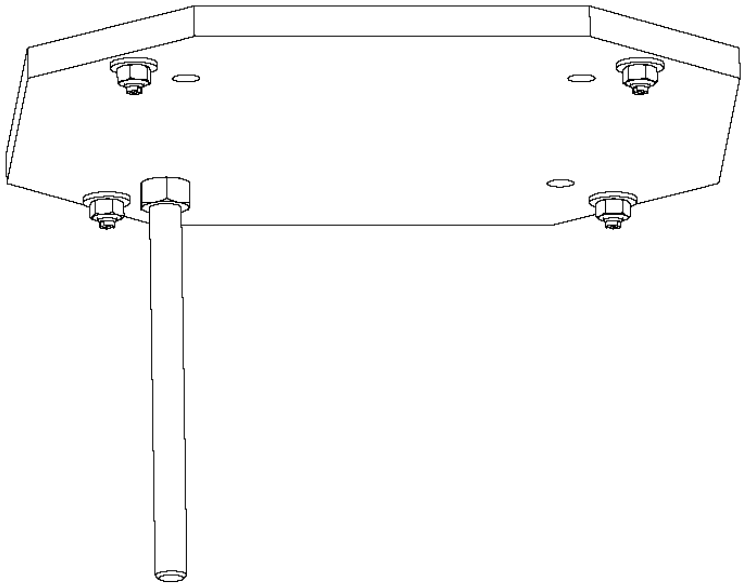


7.4.1 ANCHORING IN THE STANDARD SOLUTION

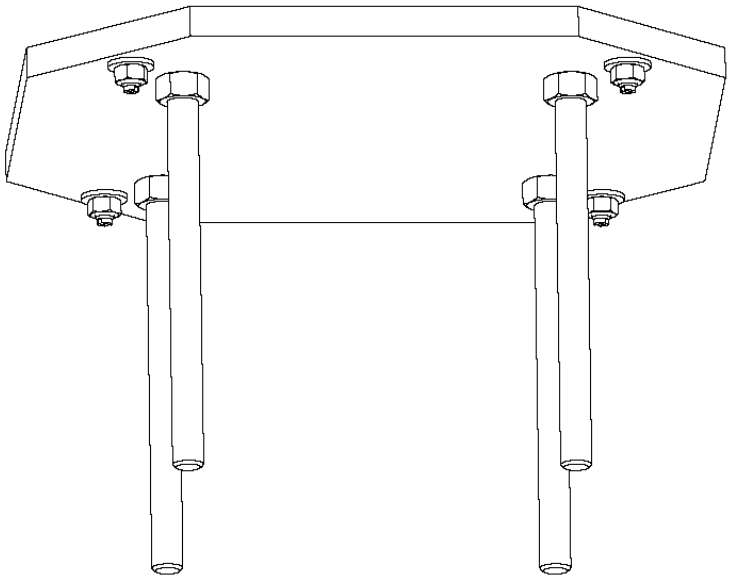
The standard version of the ceiling provides a central space which allows for the anchoring of the real ceiling for the support of the OP Lamp. The anchoring of this is done before the mounting of the plenum and the filtering ceiling.

This solution is applicable when the distance between the filtering ceiling and the real ceiling is minimum and does not need for any further support system.

Once the plate has been fixed to the slab, screw the filleted bar M20 with the appropriate nuts (M20 UNI 5588) and washers (A20 UNI 1751) in one of the four holes in the plaque as shown in the figure.

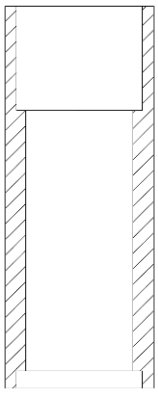
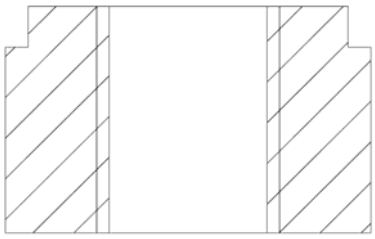


Repeat the operation until all four holes are fixed.

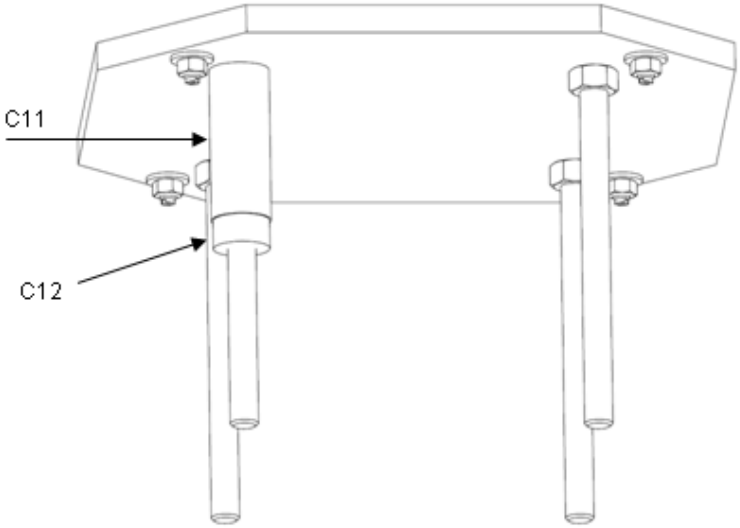


7.4.2 ANCHORING WITH RE-INFORCEMENT SYSTEM (ACCESSORY)

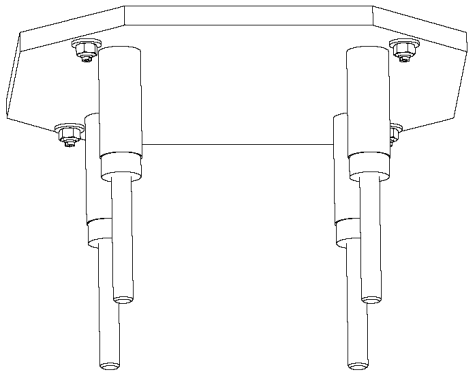
If the distance between the real ceiling and the filtering ceiling is large, it is necessary to reinforce the anchoring of the central plaque (accessory). For this operation reinforce tubes (C11) and spacers (C12), as shown in the figures below.

	
C11 - Reinforce tubes	C12 - Spacers

Take a reinforce tube (C11) and make it pass through the threaded screw until it reaches the central plaque. Insert the spacer (C12), screwing it on the plaque and anchoring the bars, as shown in the figure.



Repeat the operation on all the four bars until the figure below is received.



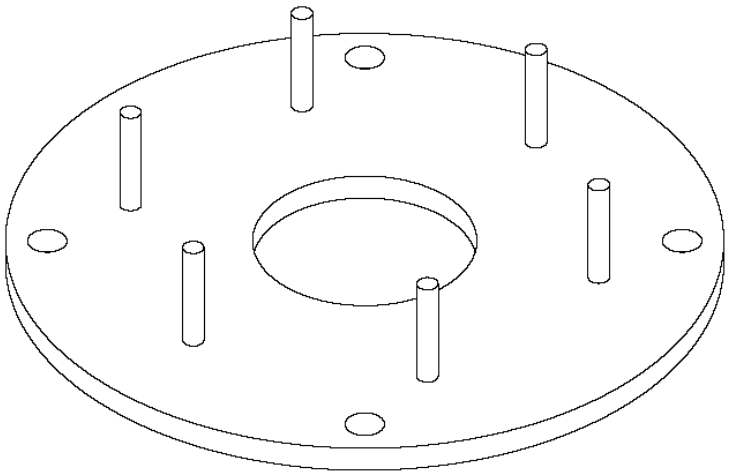
7.4.3 MOUNTING THE SUPPORT FOR THE CENTRAL SUSTAIN

At this point of the assembly, both in case of the standard version or in case of the one with reinforce tubes, the steps will be the same.

The first step is to insert the intermediate anchoring plaque (C02) on which the flanged tube of the OP Lamp is fixed.

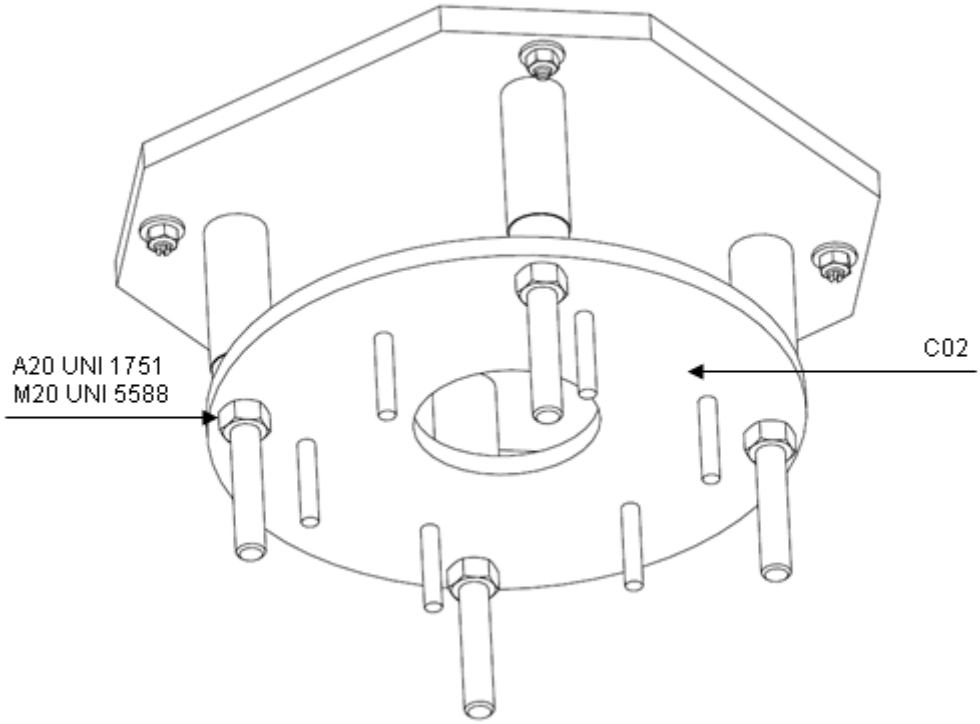
The flanged tube is a piece of the OP Lamp supplied by the lamp's manufacturer and not by Tecnair LV. The shape and presence of the six holes for the anchoring of the slab therefore depend on the brand, but are mostly similar.

The thing that varies the most and is a necessary piece of information for the correct assembly of the ceiling is the diameter where the holes are fixed. Therefore the piece part of our construction, the intermediate anchoring plaque (C02), depend on which OP Lamp is mounted and in order to build it we need to have this piece of information.

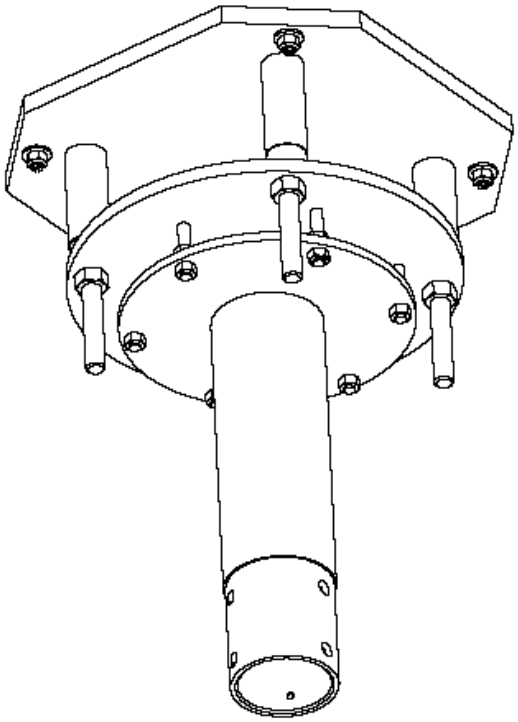


Intermediate anchoring plaque

Insert the anchoring plaque making the four threaded bars pass through the four holes and fix with nuts (M20 UNI 5588) and washers (A20 UNI 1751), as shown in the figure.

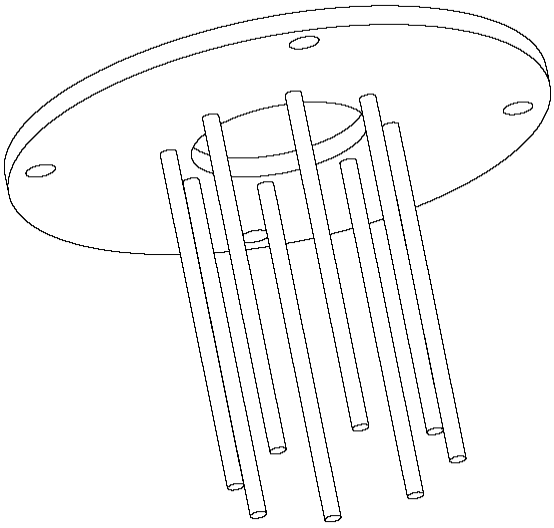
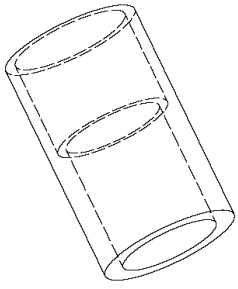


Take the threaded tube of the operating lamp, which is supplied by the lamps manufacturer and fix it on the six bars of the intermediate anchoring system. As an example let's take a threaded tube with six holes of M12 diameter. Use 12 nut (M12 UNI 5588) and flat washers (Ø12 UNI 6592), as shown in the figure.

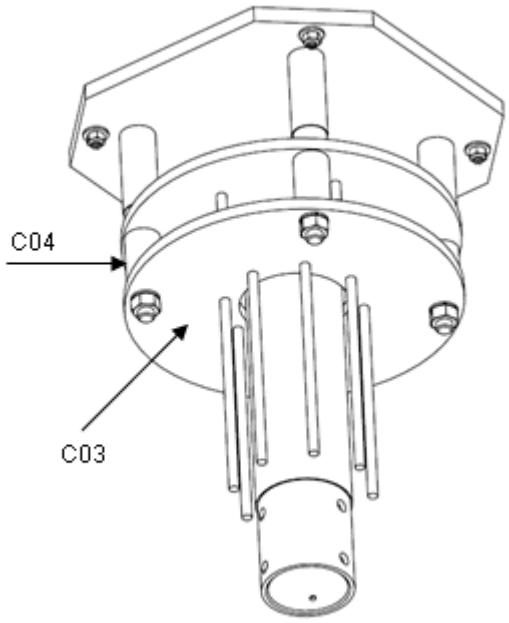


Note: In this phase of construction follow the instructions given by the supplier of the scialitic lamp.

The installation and assemble of the central plaque is done once the central support plaque (C03) is fixed and used with the four spacer tubes (C04), as shown in the figure below.

	
C03 - Central support plaque	C04 - Spacer tube

Take the four spacer tubes (C04) and insert them in the four threaded bars until they fix in the intermediate anchoring plaque. Insert the central support plaque (C03) making the central hole pass through the threaded tube of the operating lamp and the four lateral holes through the threaded bars. The last operation is to fix the central support plaque to the threaded bar with nuts (M20 UNI 5588) and washers (A20 UNI 1751), as shown in the figure below.



7.5 LIFTING THE STRUCTURE

The lifting of the structure phase is one of the most delicate in the entire installation. The weight of the structure is in fact 310 kg and it's dimensions approximately 3,2 m x 3,2 m.

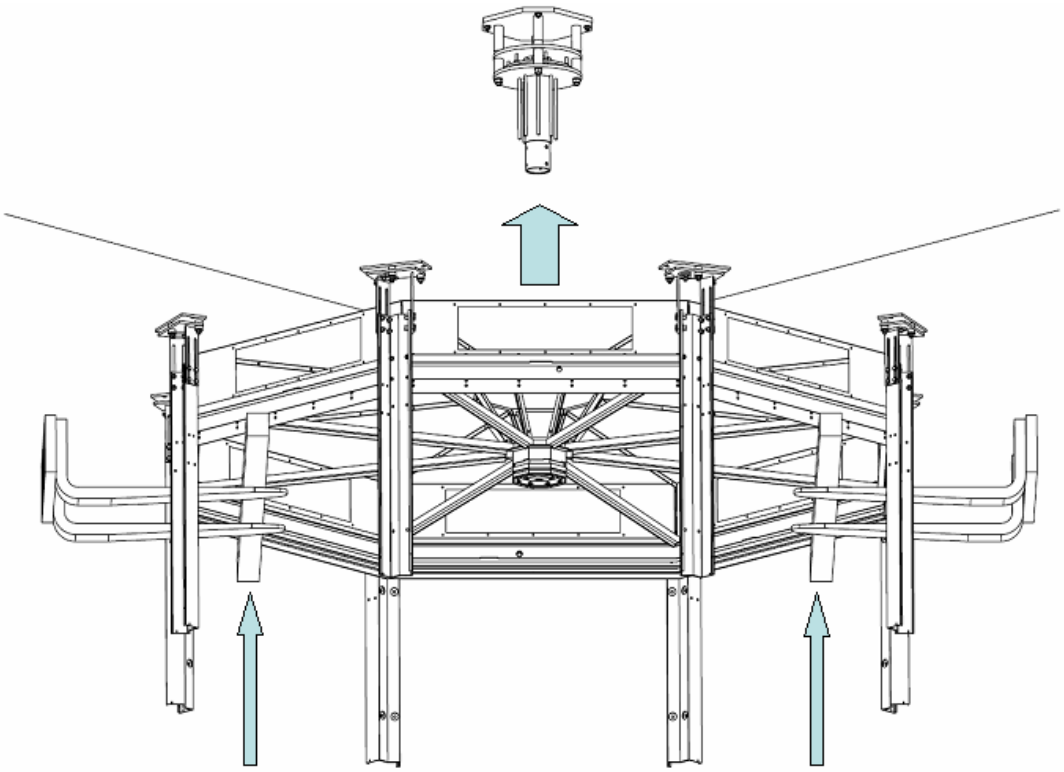
In this paragraph some ways to lift the structure are shown. It is obviously up tot he installer to choose the best and safest solution according to the tools available and the space available during the installation.

The instruments for lifting the plenum are the classic oledynamic tools, cables, hydraulic lifts or other instruments capable of sustaining the weight of the structure and lift the ceiling up till the real ceiling.

In the figure, as an example, a hydraulic lift and a traction system are shown.

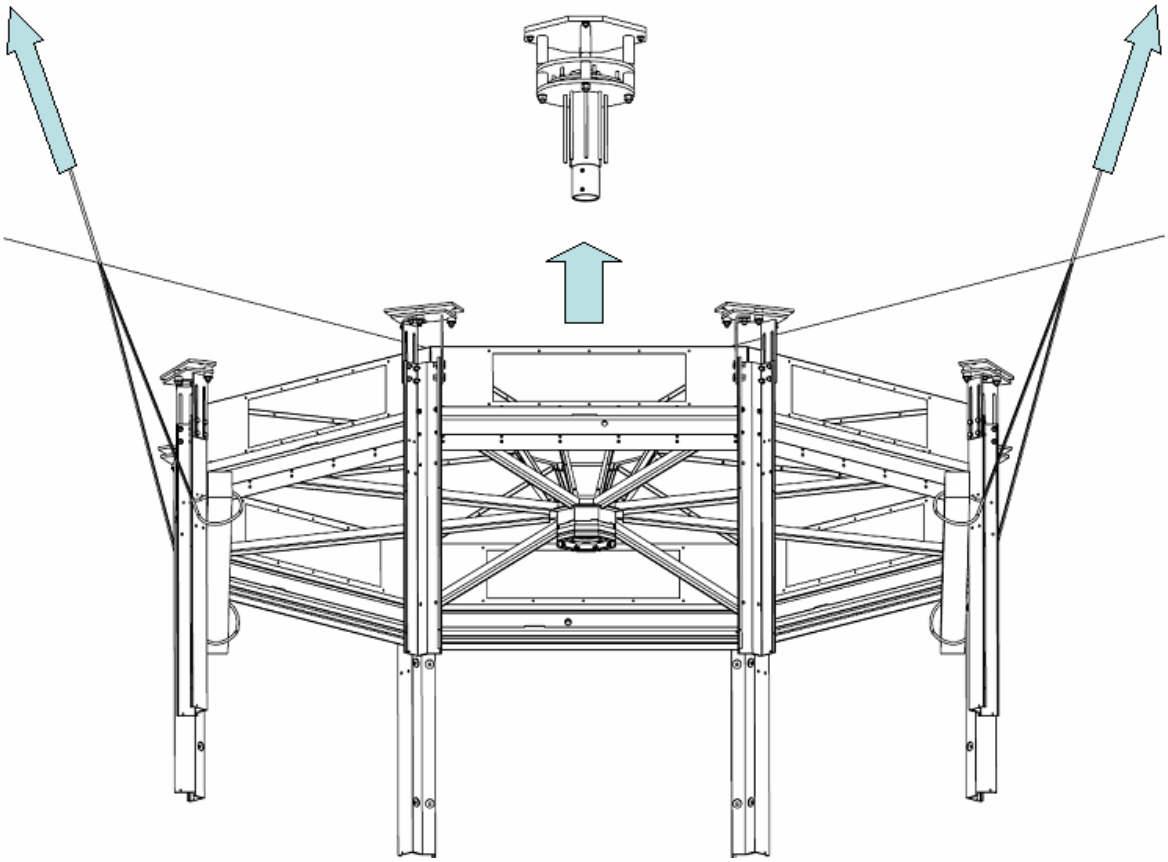
One of the possibilities is to use two elevator lifts.

Position on the forks of the trolley a piece of wood, position yourself with the forklifts to the two sides of the plenum and lift the two forks of the trolley simultaneously as shown in the figure.

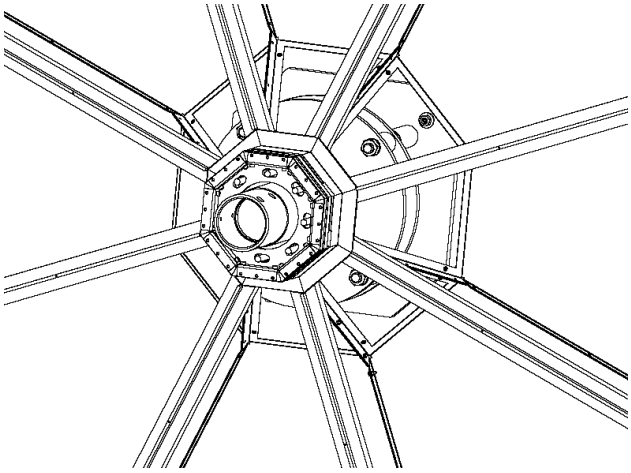


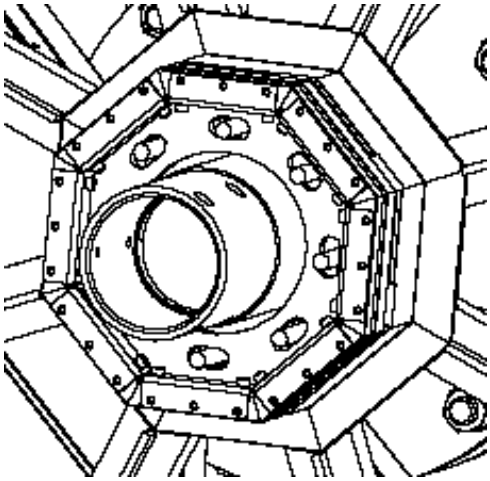
Another solution is to use cables.

As an example take four cables, tie them to two joint covers which lean on the supporting structure, and lift the plenum with pulleys, as shown in the figure.



During the lifting of the structure be extremely careful as the eight terminal bars in the central support plaque must be inserted in the eight holes of the central support, as shown in the figure.



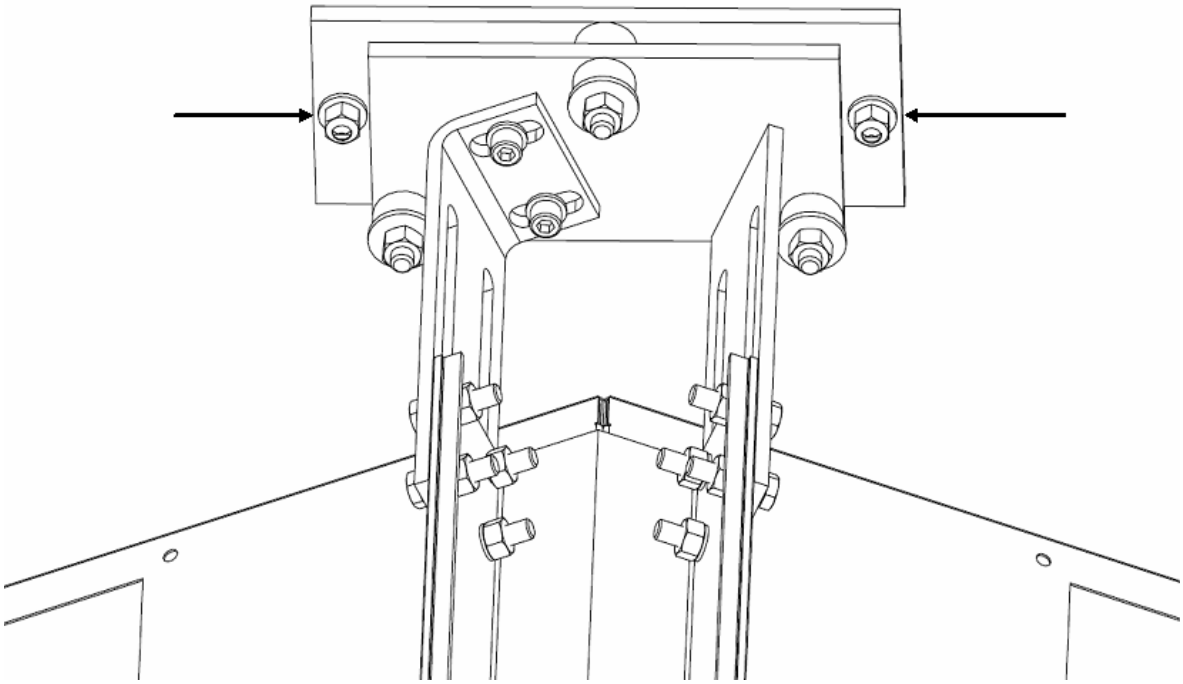


7.6 ANCHORING THE STRUCTURE TO THE SLAB

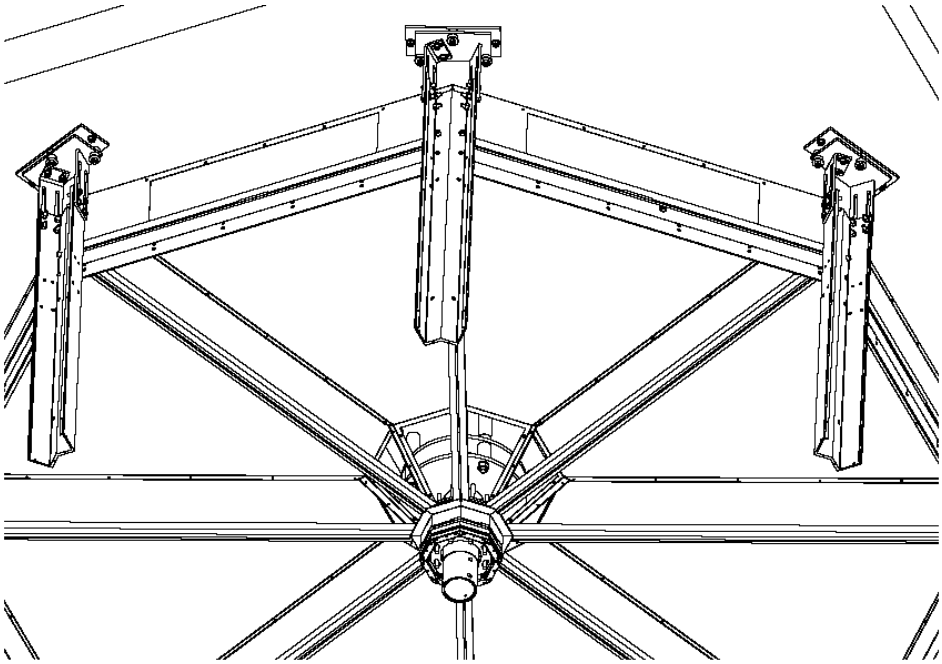
Once the entire structure has been lifted and connected to the central plate, it is possible to pass to anchoring the slab.

In this operation each lateral plate, positioned above every vertical post, is fixed to the slab as done previously when the central plaque was mounted (look to paragraph 7.4). Even in this case the same precautions as the ones taken for the small blocks are to be used, according to the type of slab present. Before fixing the lateral plate to the real ceiling, use the regulating slot to carefully position and fix the sections of the plate to the vertical post below.

In the figure the two holes present are visualised on each side of the anchoring plaque on which the plaque itself is fixed on the ceiling.

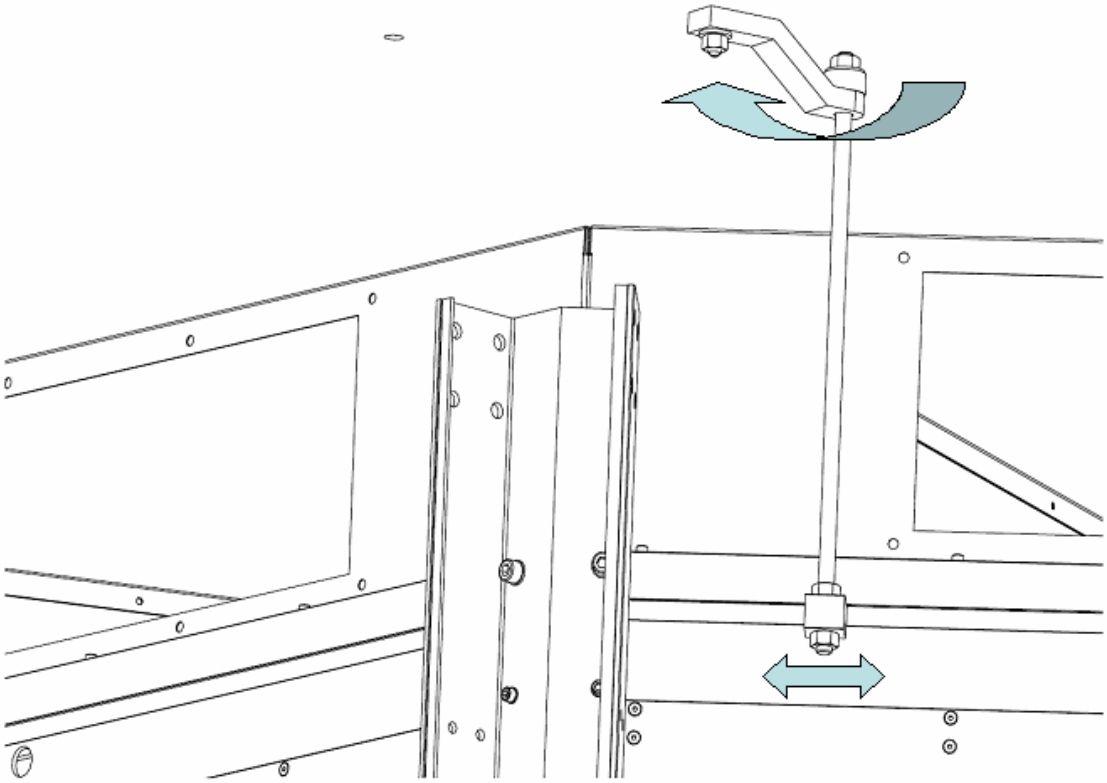


The operation therefore has to be repeated on each of the eight side plates, as shown in the figure.



In some situations the pre-drilled holes in which the small blocks have to be fixed to the real ceiling might not be available. If drilling is done incorrectly, for example drilling through a steel reinforcing bar, it will be impossible to fix the anchor plug in the slab.

In the figure below it is shown how to fix to the slab on the external perimeter of the ceiling when the small blocks cannot be placed in some of the provided holes.

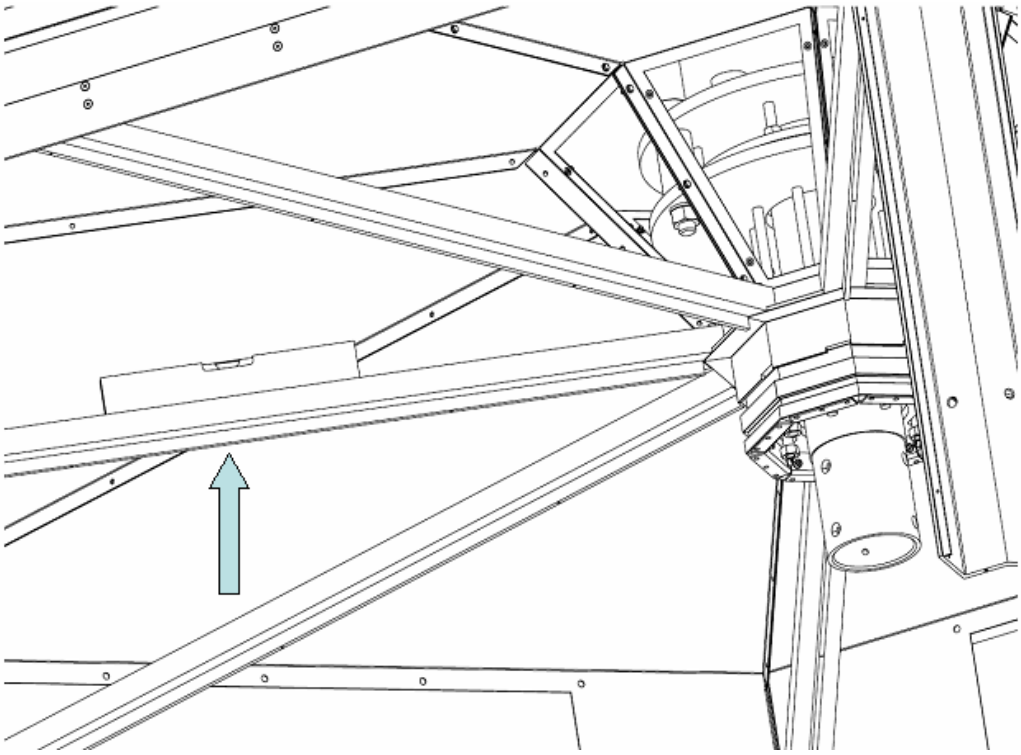


Tecnair LV supplies as an accessory a support bar for anchoring the ceiling.
This system is more flexible as it allows for a horizontal movement on the guides of the profile and a rotational movement around the axis, therefore it allows for the anchoring of the ceiling in a comfortable point.

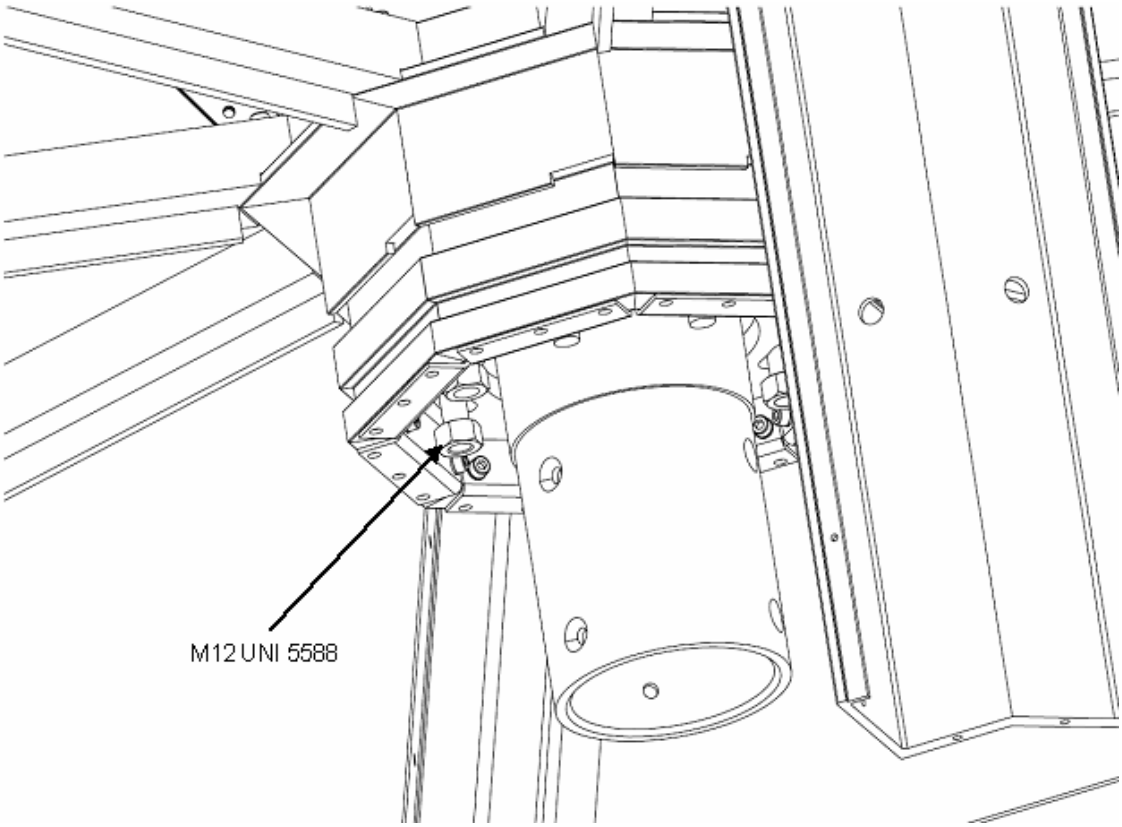
Once all the lateral points of the plenum have been fixed, it is possible to pass to centrally anchoring the plenum.
Use 8 nuts (M12 UNI 5588) and 8 flat washers (Ø12 UNI 6592) and screw them on the eight threaded bars on the central plaque, two nuts for each bar. It is necessary to screw the nuts on the threaded bar so that the superior surface of the intermediate profiles is perfectly levelled.

Here below we show a spirit leveller, useful instrument to obtain the correct levelling of the entire structure.

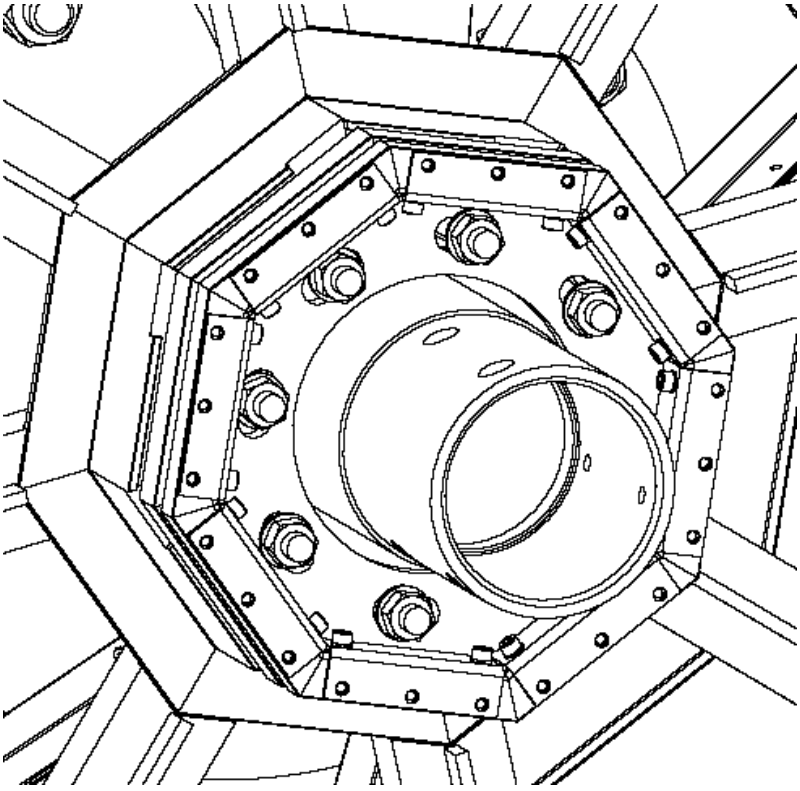
For each intermediate profile position the bubble on level as shown in the figure.



Start screwing the nuts in reference to the profile until when the profile itself is perpendicular to the flat surface as shown in the figure.



This operation has to be done on all eight intermediate profiles, screwing them as shown in the figure and is necessary for anchoring the structure to the real ceiling.



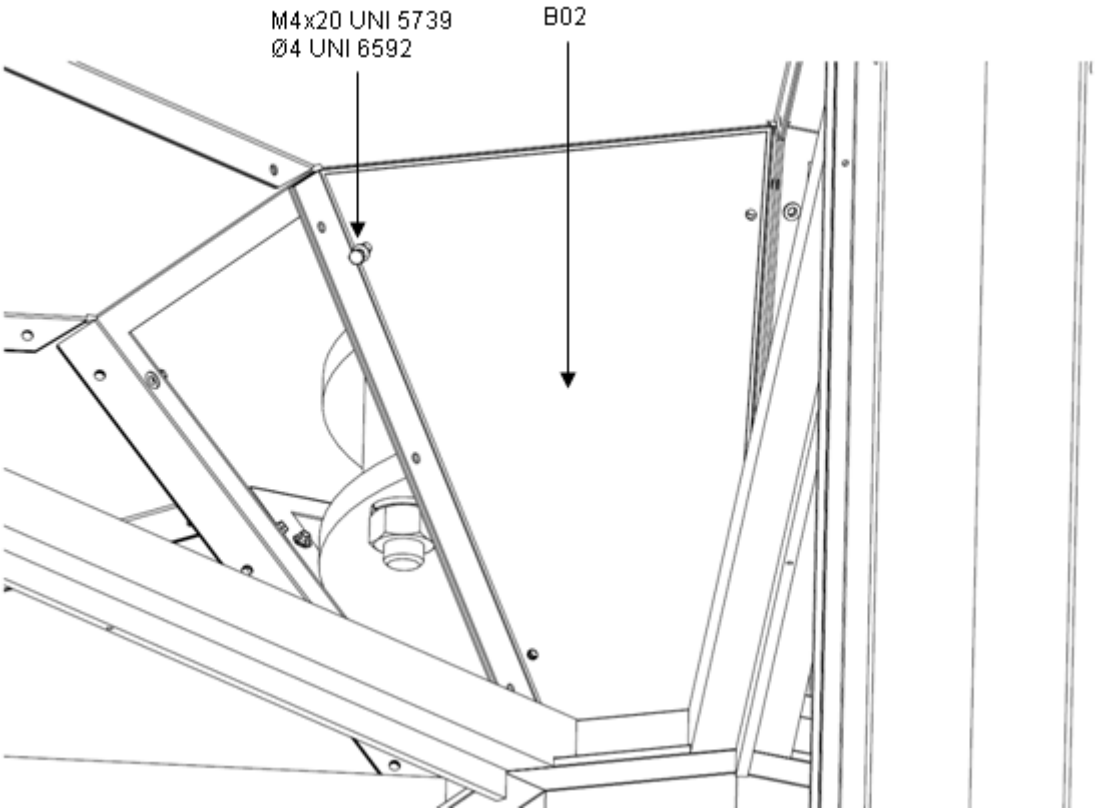
7.7 CLOSING THE PLENUM

The next step is to close the plenum through the supplied panels. The materials necessary for this operation are described below.

Code	Description	Quantity
B02	Front closing panel	8
B03	Back closing panel	4
	Screw M4x20 UNI 5739	32
	Screw M6x30 UNI 5931	40
	Flat washer Ø4 UNI 6592	32
	Grower washer A6 UNI 1751	40

The first phase is closing the front sheet plate through the eight panels (B02).

Take a front closing panel (B02), position it so that the hole is enclosing the hole and fix it to the support structure with 4 screws (M4x20 UNI 5739) and 4 flat washers (Ø4 UNI 6592), as shown in the figure.



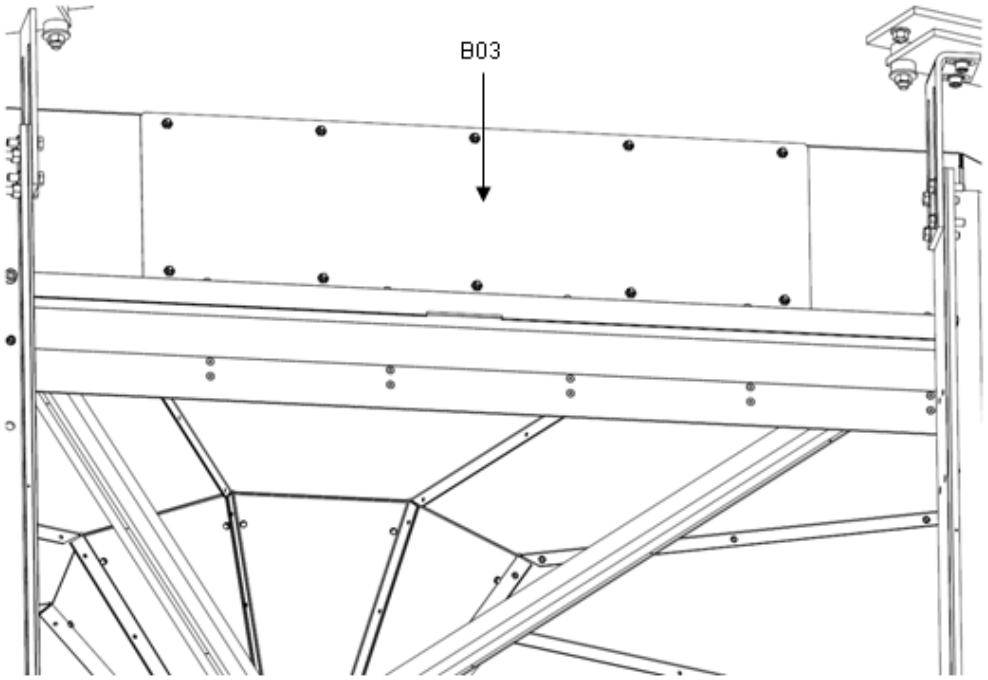
Repeat the operation on all eight sheets until the superior panel of the ceiling is closed.

The next phase is to close the back four, out of eight, holes of the plenum in the outside external perimeter.

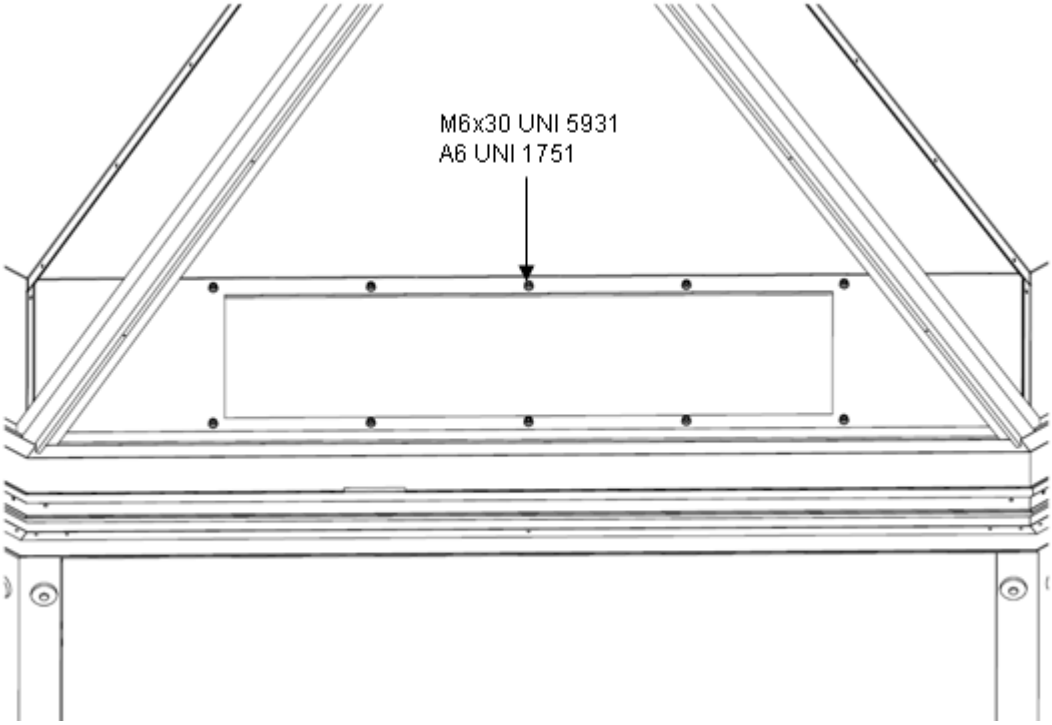
PLEASE NOTE: the choice of the parts of the plenum to be closed depend on the positioning of the ducts chosen during the design phase. Before starting this phase verify which parts need to be closed.

Four panels for four closures are used for the static version. Either four or no covers are used for ventilated versions depending on the choice made at the design phase of the recirculation system.

Take a back closing panel (B03), position it on the external hole and insert the threaded part towards the outside, as shown in the figure below.



Take ten screws (M6x30 UNI 5931) and ten flat washers (A6 UNI 1751) and fix them to the inside of the back plenum cover, as shown in the figure.



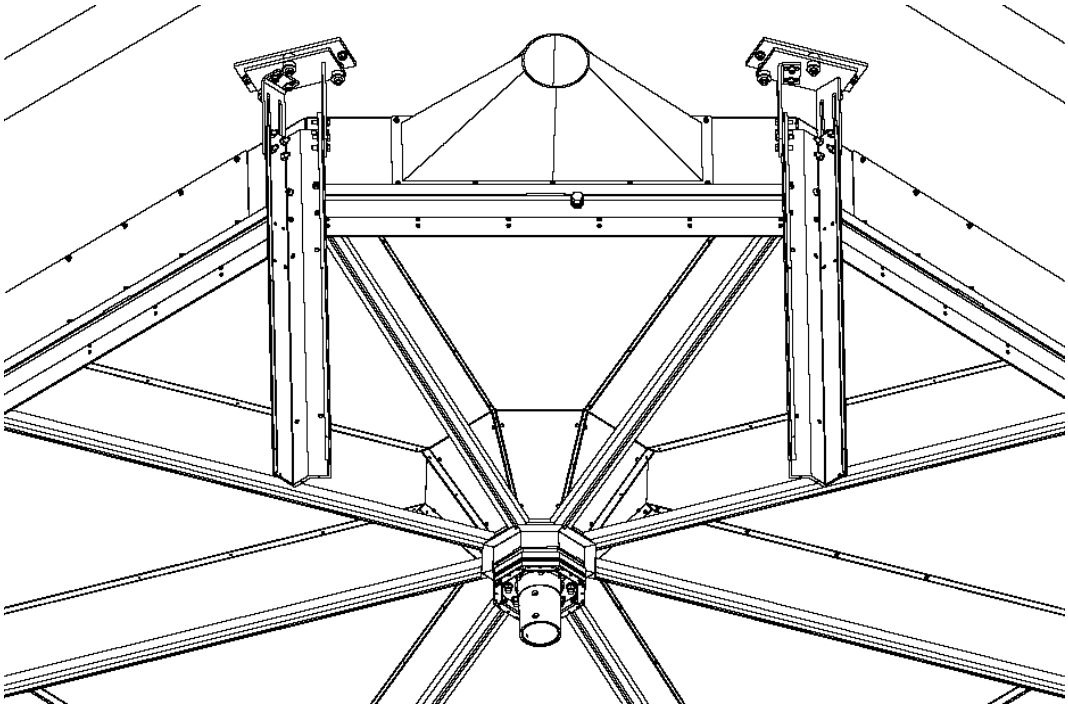
Repeat the operation on the sides of the plenum which are to be closed.

7.8 ASSEMBLING THE FINAL ELEMENTS OF THE DUCTING

Before mounting the filter it is necessary to install the final parts of connection for the ducts, so that it is not necessary to have to work inside the plenum, therefore avoiding the risk of dirtying the filters or damaging them.

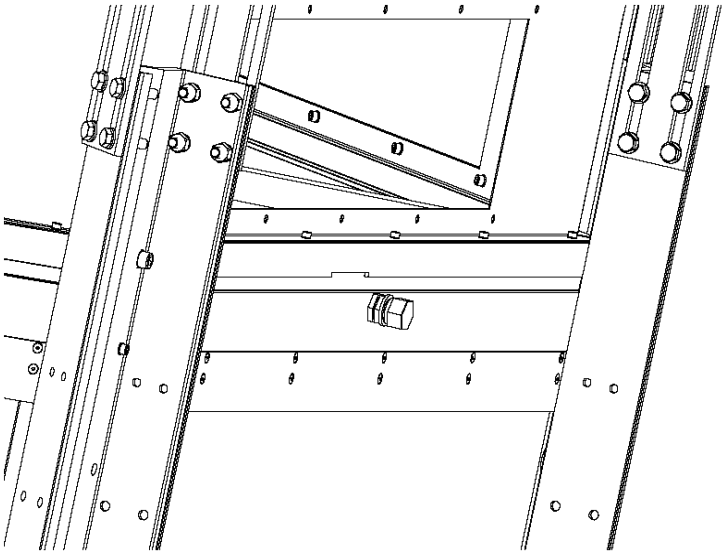
The plenum with the various closures has to be perfectly tight, therefore it is necessary to seal also the screwed parts.

In the figure below a feedbox is used as the final element of the duct but in general the final elements can be of various types, according to what the designer of the ducts decides on.



Between the absolute filters there is an empty space. If there is a loss of gasket of the absolute filter, the air which bypasses the filter falls in this area.

For this reason this space has to be kept in depression and the air contained in it has to be expelled. Unplug the socket on the external profiles (P02) (see figure) and connect them by a tube to the expulsion ducts of the unit, or if present with the aspiration of the recirculation fans.



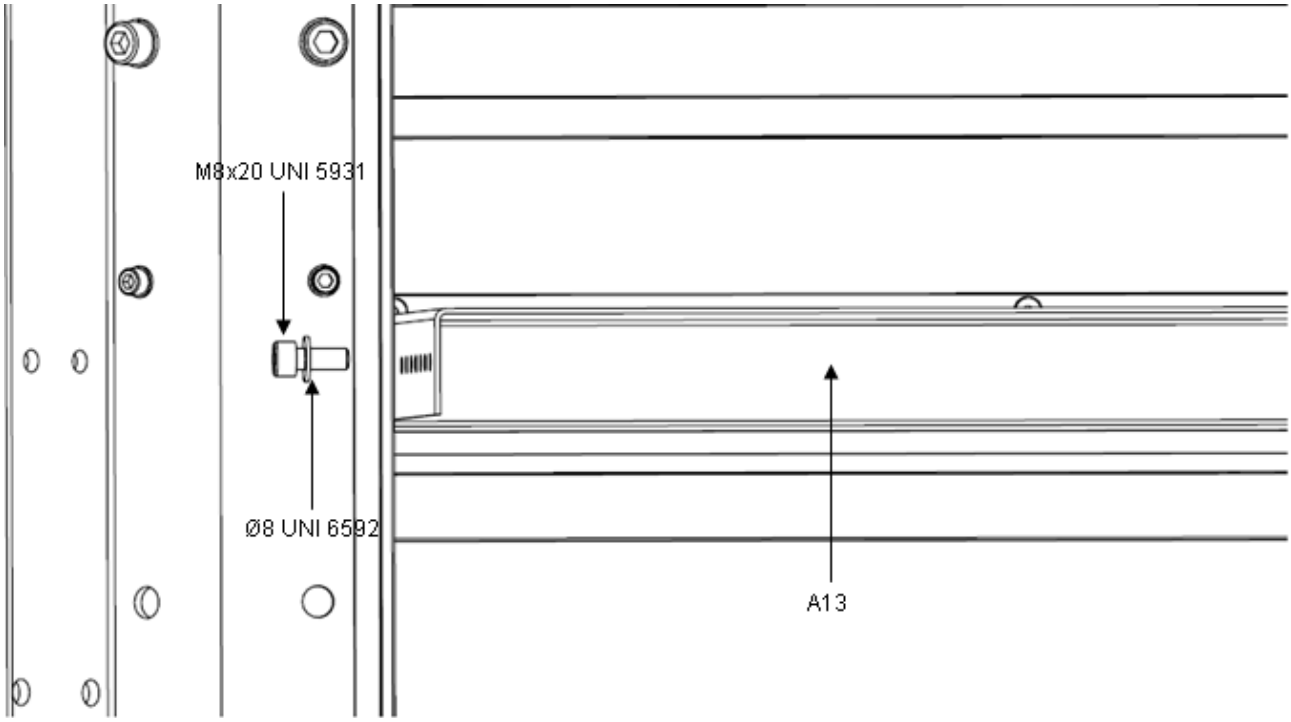
7.9 MOUNTING THE LAMP AND LAMP HOLDERS

In this step of the installation a system of lighting of the aseptic nucleus is installed, based on 8 anti blazing lights.

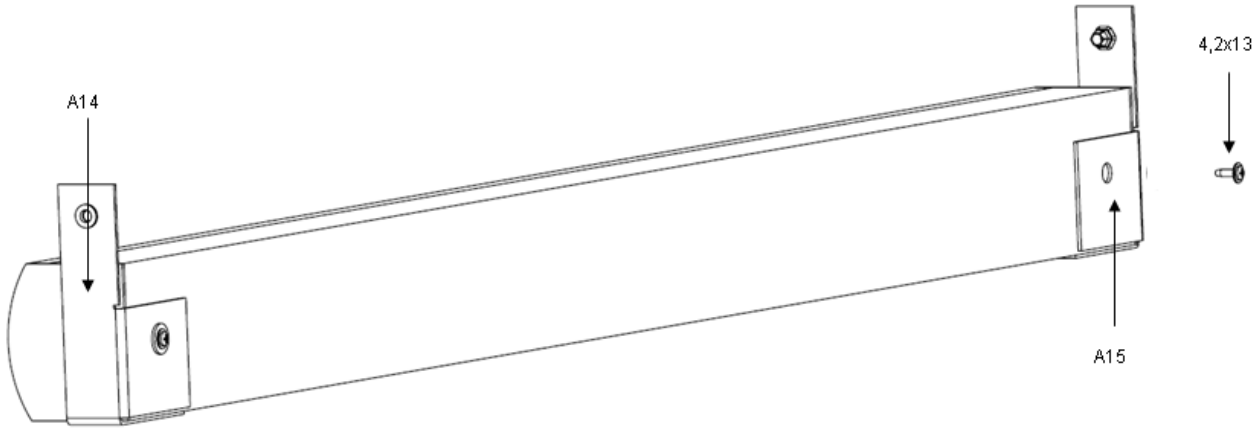
The elements used in this operation are summed in the following table:

Code	Description	Q.
A13	Lamp holder	8
	Antiglaze light	8
A14	Left side bracket	8
A15	Right side bracket	8
	Screw M8x20 UNI 5931	32
	Screw M6x30 UNI 5931	16
	Plane washer Ø8 UNI 6592	32
	Washer Grower A6 UNI 1751	16
	Self tapping screw 4,2x13	16

Take a lamp holder (A13) and position between two vertical posts outside the external structure. Take four screws (M8x20 UNI 5931) and four washers (Ø8 UNI 6592) and fix them to the vertical post, as shown in the figure.

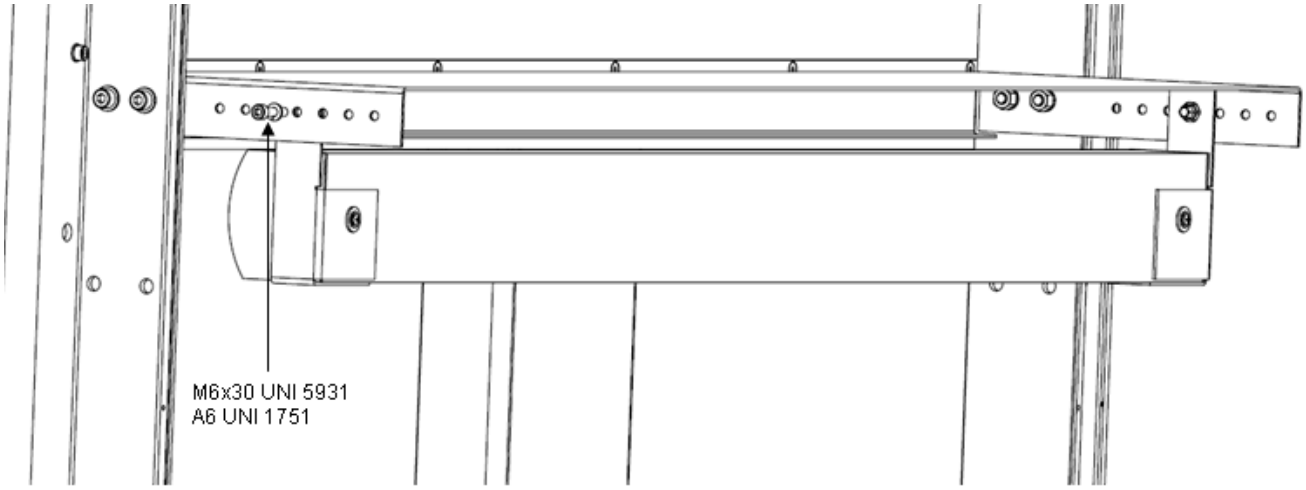


Take an antiglaze light, a left anchoring (A14) and a right anchoring bracket (A15). Fix the brackets to the lamps with 16 self tapping screws 4,2x13, as shown in the figure.



Once the lamps have been fixed to the bracket, take this new piece and insert it in the lamp holder. Fix the lamp into one of the pre-drilled holes on the lamp holder.

The choice of the position is only dictated by the intensity of the lighting which is required on the aseptic nucleus. In this example we fix the lights to the central hole using two screws (M6x30 UNI 5931) and two washers (A6 UNI 1751), as shown in the figure.



Repeat the same operation on all eight sides of the structure until the complete mounting of the lamp for the illumination of the aseptic nucleus is achieved.

7.10 MOUNTING THE FILTERING SYSTEM

The next step describes the mounting of the support structure in which the absolute filters are positioned and the operations for closing in length the filters so to guarantee the perfect tightness of the filtering surface.

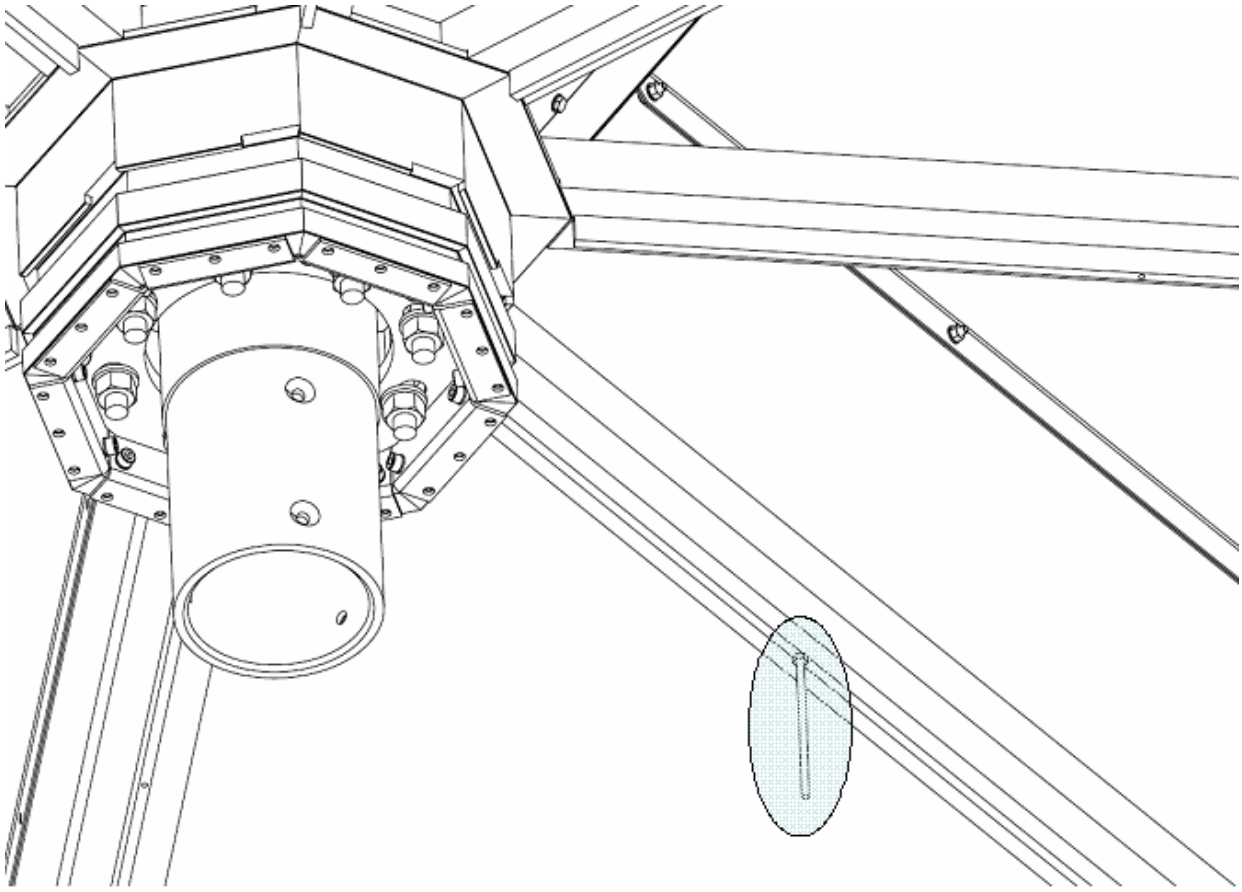
The materials used in this operation are:

Code	Description	Q.
	Trapezoidal filter	8
	Flow equaliser tissues	8
	Threaded bar M4	24
A18	C bar for filter fixing	8
	Filter assembly tool	2
	Plane washer Ø4 UNI 6592	88
	Nut M4 UNI 5588	112

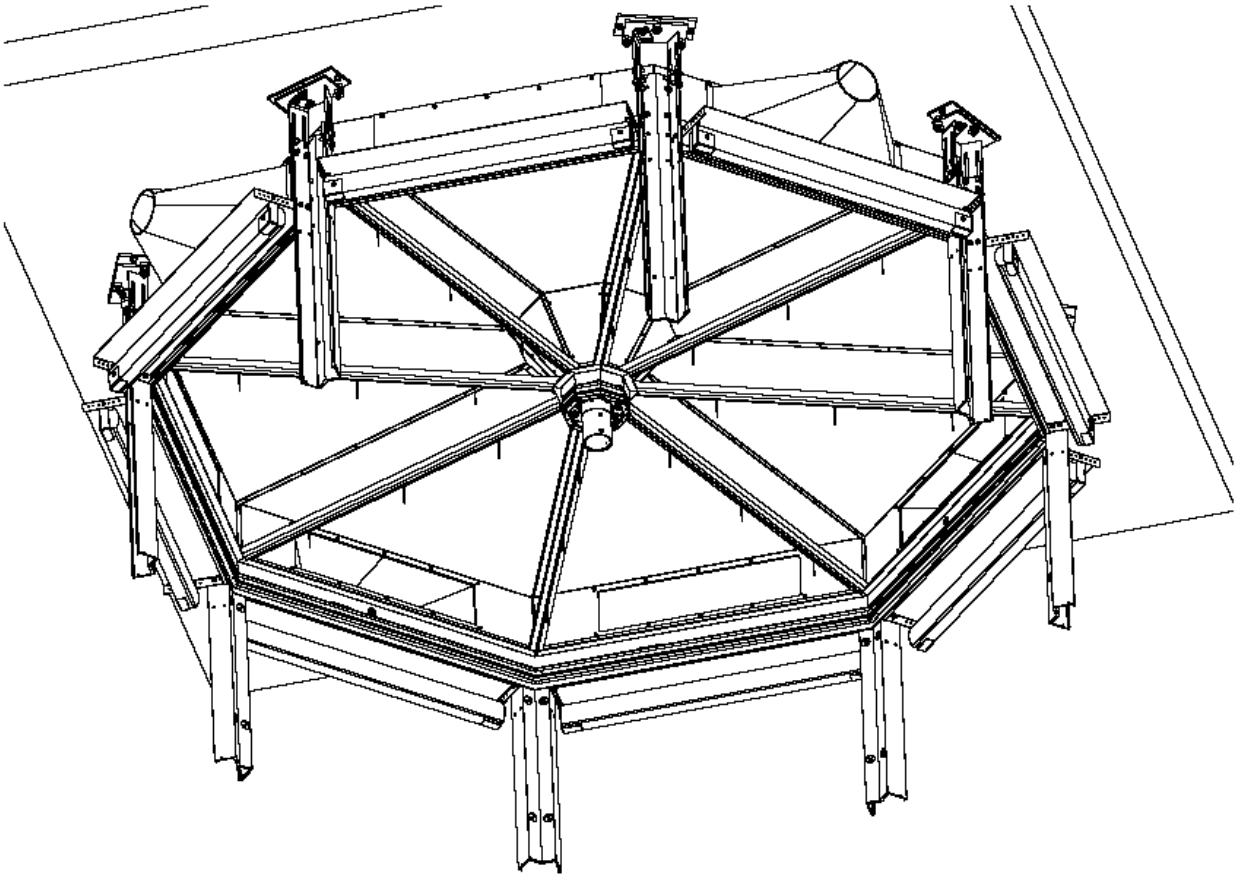
7.10.1 ASSEMBLING THE FILTER SUPPORT STRUCTURE

The first operation consists of mounting the support structure on which the filters will be placed afterwords.

Take an M4 threaded bar and a nut (M4 UNI 5588), screw the threaded bar on one of the holes placed on the lower surface of the intermediate profile, as shown in the figure.



Repeat the same operation for each of the three holes on the intermediate profiles, for a total of 24 threaded bars as shown in the figure.



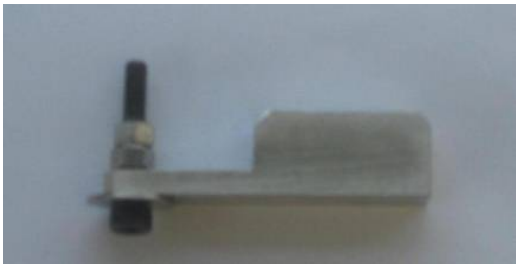
7.10.2 POSITIONING AND ANCHORING THE ABSOLUTE FILTERS

In this phase the absolute filters are taken and positioned and fixed on the structure.

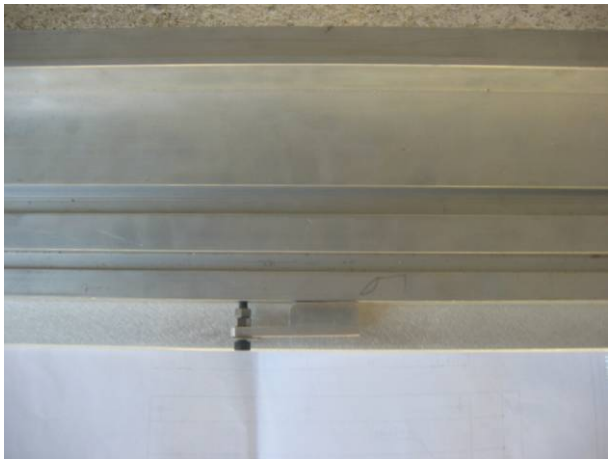
Due to the fundamental importance of the absolute filters for the correct installation of the system, it is necessary to always check that the filters are stored in their casing and that they do not have any type of damage.

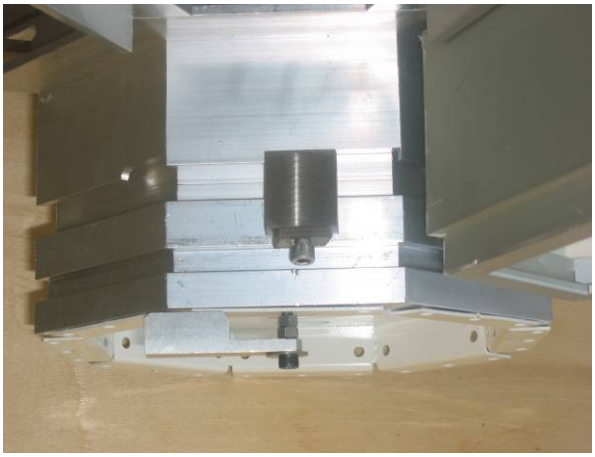
The filters are attached to the structure by their small plates and support blocks already positioned on the external profiles and on the profiles of the central crown.

To facilitate this stage, use the two filter assembly tools supplied (see figure).



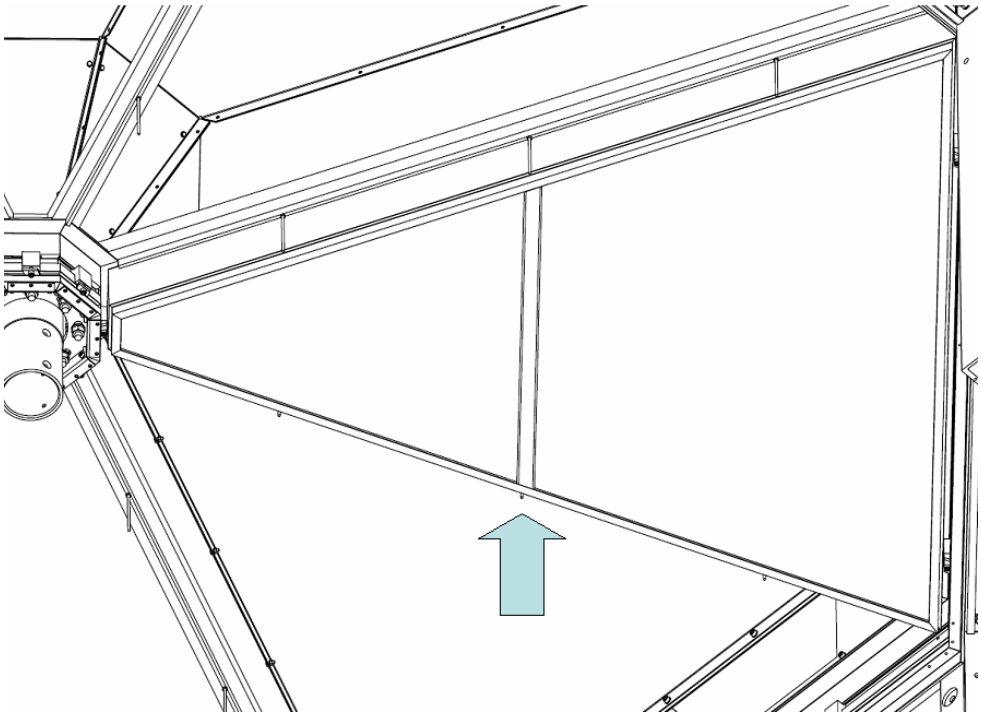
Screw the tool into a hole in the external profile and into a hole in the central profile, as shown in the figure.





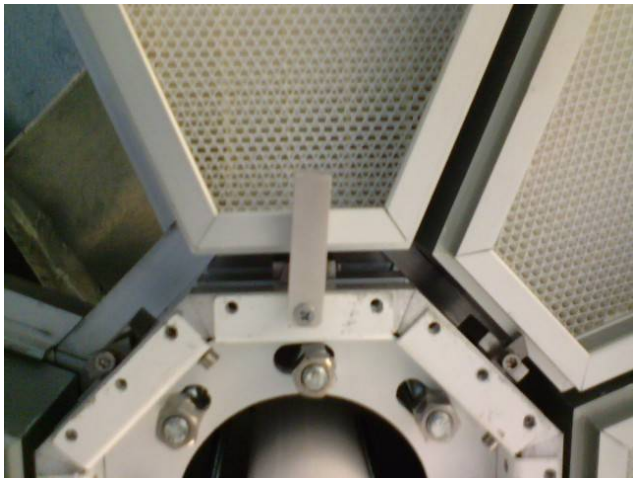
Take a filter being extremely careful not to touch the anti-break system.

Pick up the filter with the gasket on the upper side in the area delimitated by the two profiles, as shown in the figure.



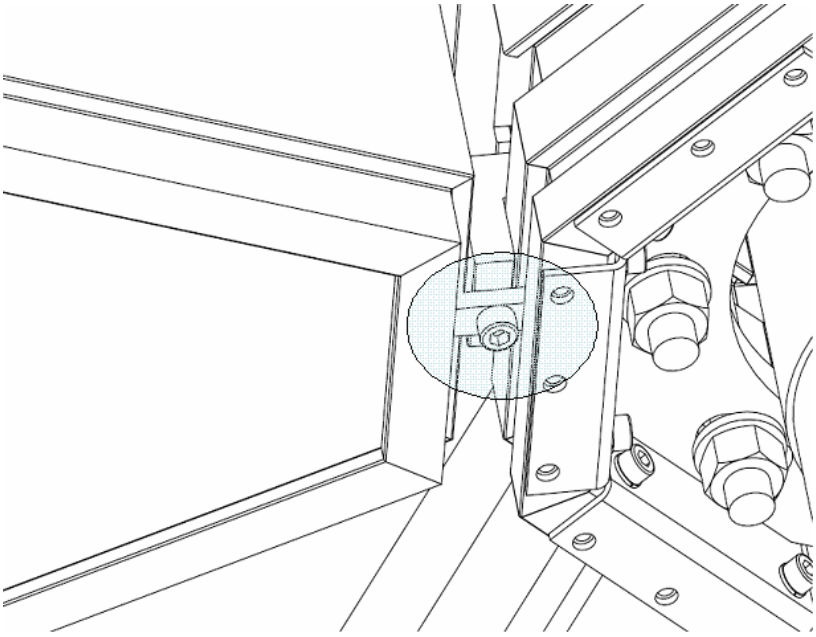
PLEASE NOTE: Be careful of the threaded bars which delimitate the position of the filter. Avoid damaging anti-break system.

Once the filter has been raised, turn the two tools to block the filter, as shown in the figure.

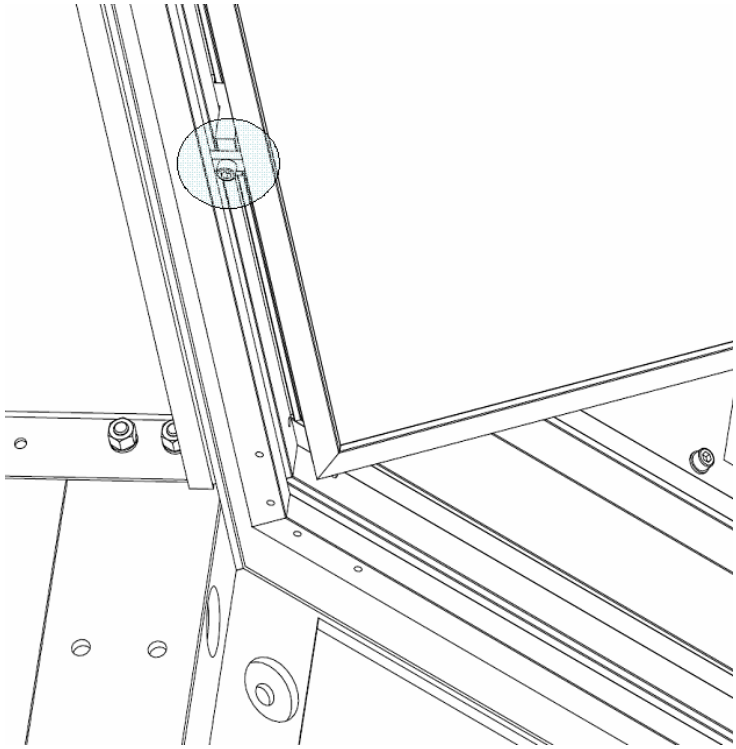


Pass onto the step of anchoring of the support structure of the filter.

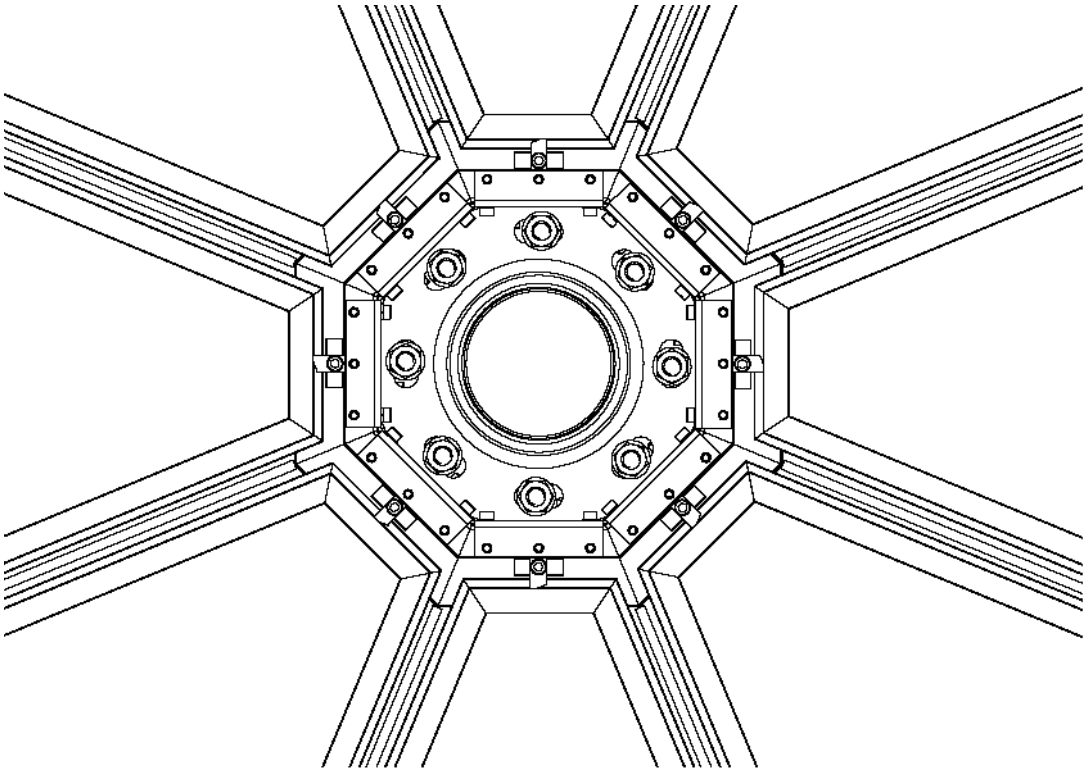
Tighten the small plate to the support block, so that the small plate locks onto the filter and the profile of the central crown.



In the same way fix the filter to the external profile of structure, with the two support blocks, as shown in the figure.



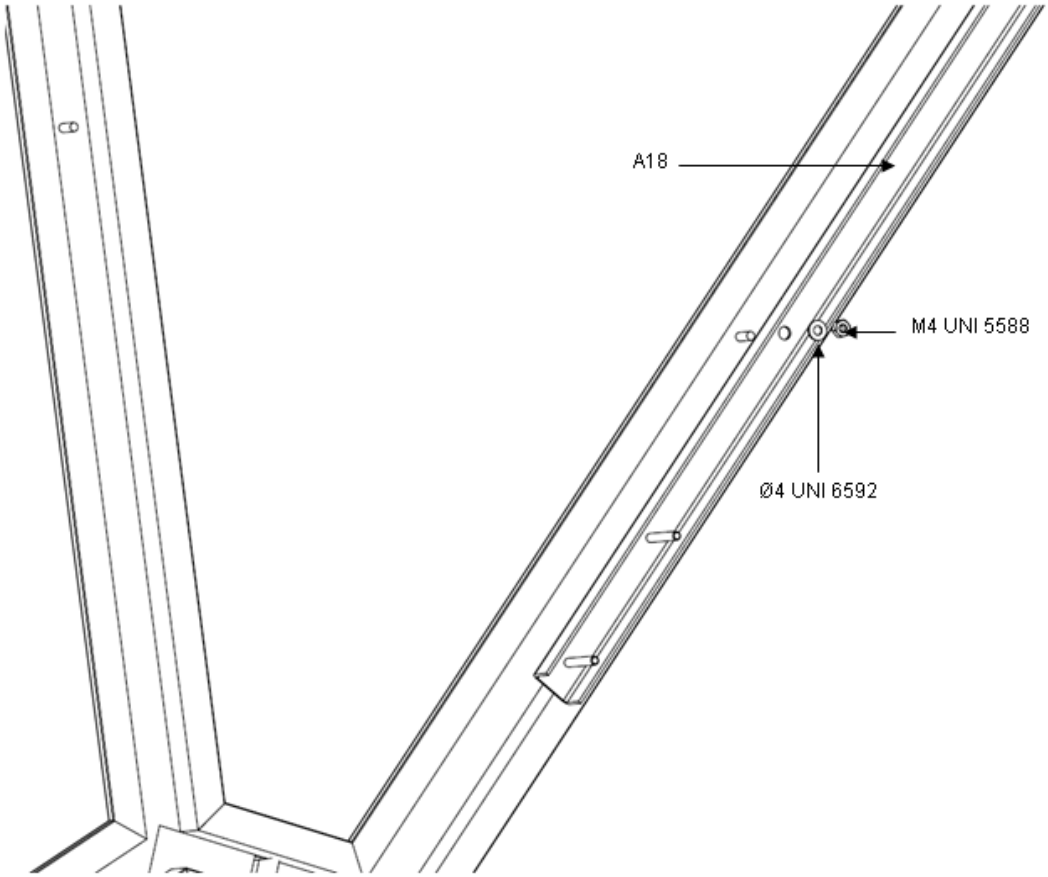
When the filter has been fitted, remove the two tools and screw them into the next profiles.
Repeat the same lifting, positioning and anchoring procedure for all the other absolute filters.



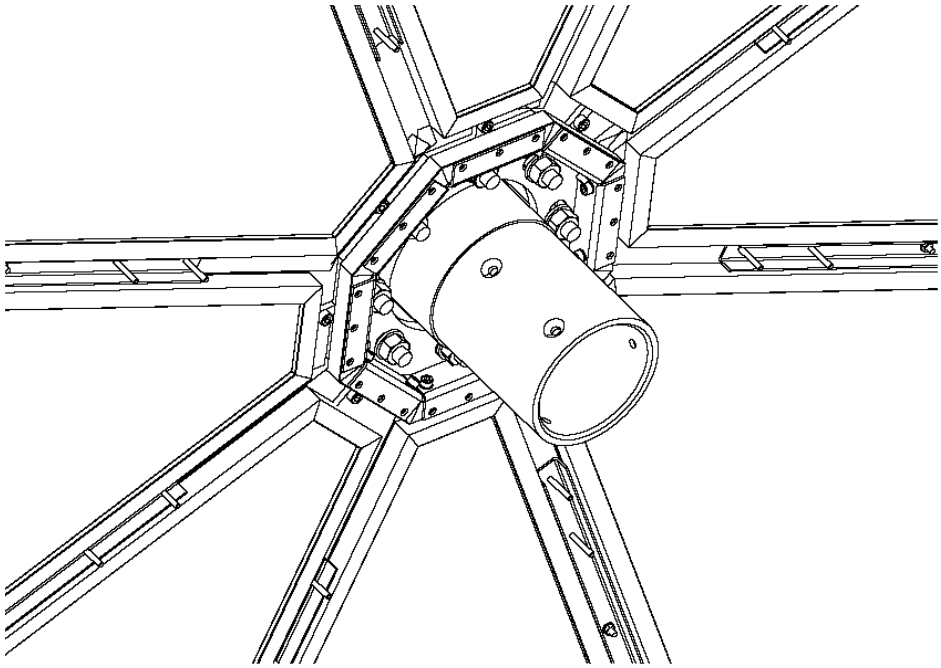
7.10.3 CLOSING THE SIDE LENGTH AND THE GASKETS OF THE FILTERS

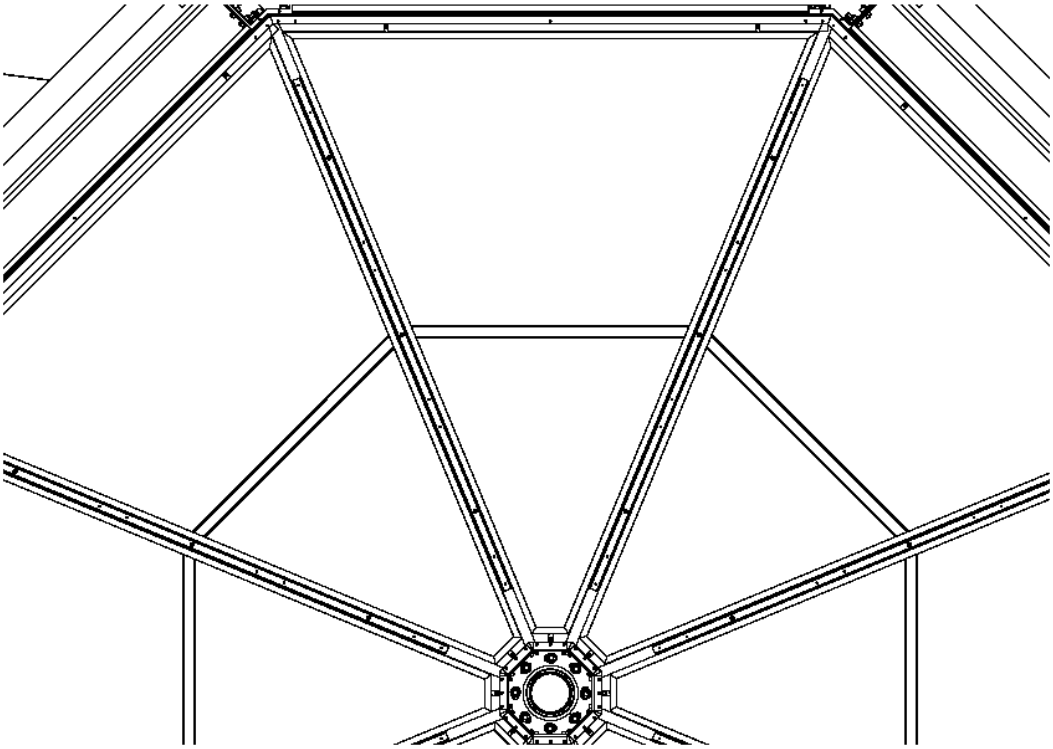
Take a C bar to seal the filters (A18).

Position the sealing bars on one of the radial beams of the structure, inserting the three threaded M4 bars in the three holes of the bar. Take three washers (Ø4 UNI 6592) and three nuts (M4 UNI 5588) and fix the threaded bars, as shown in the figure.



Repeat the operation on all eight beams until the structure is obtained as shown in the figures.



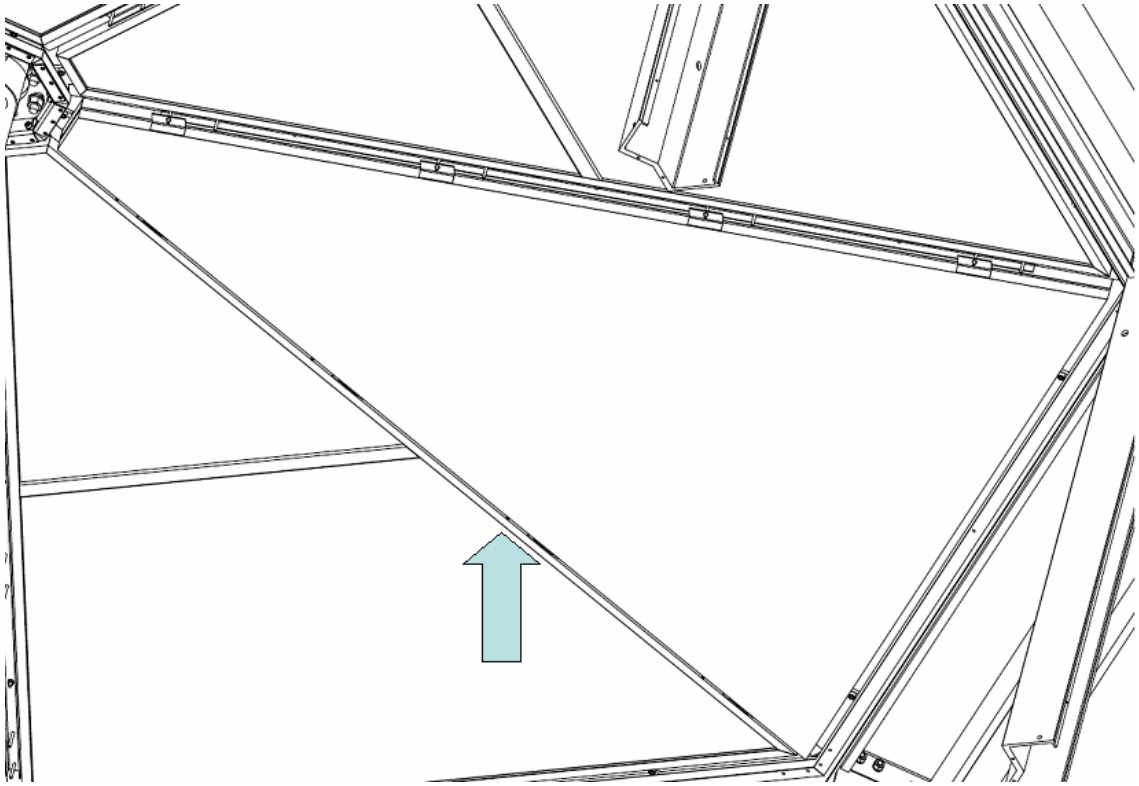


7.10.4 MOUNTING THE FLOW EQUALISER LAMINATION TISSUES

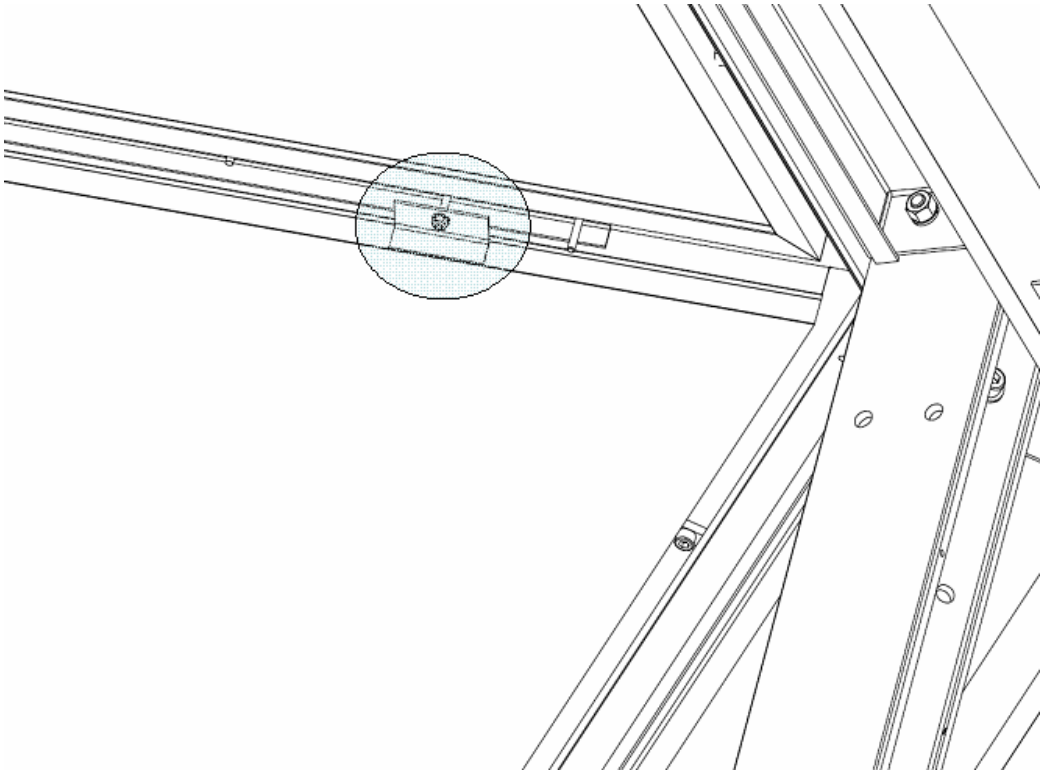
Once the C bars have been installed, the assembly of the filtering system is completed with the flow equaliser lamination tissues.

As for the filters be extremely careful during the lifting to avoid ruining the lamination surface.

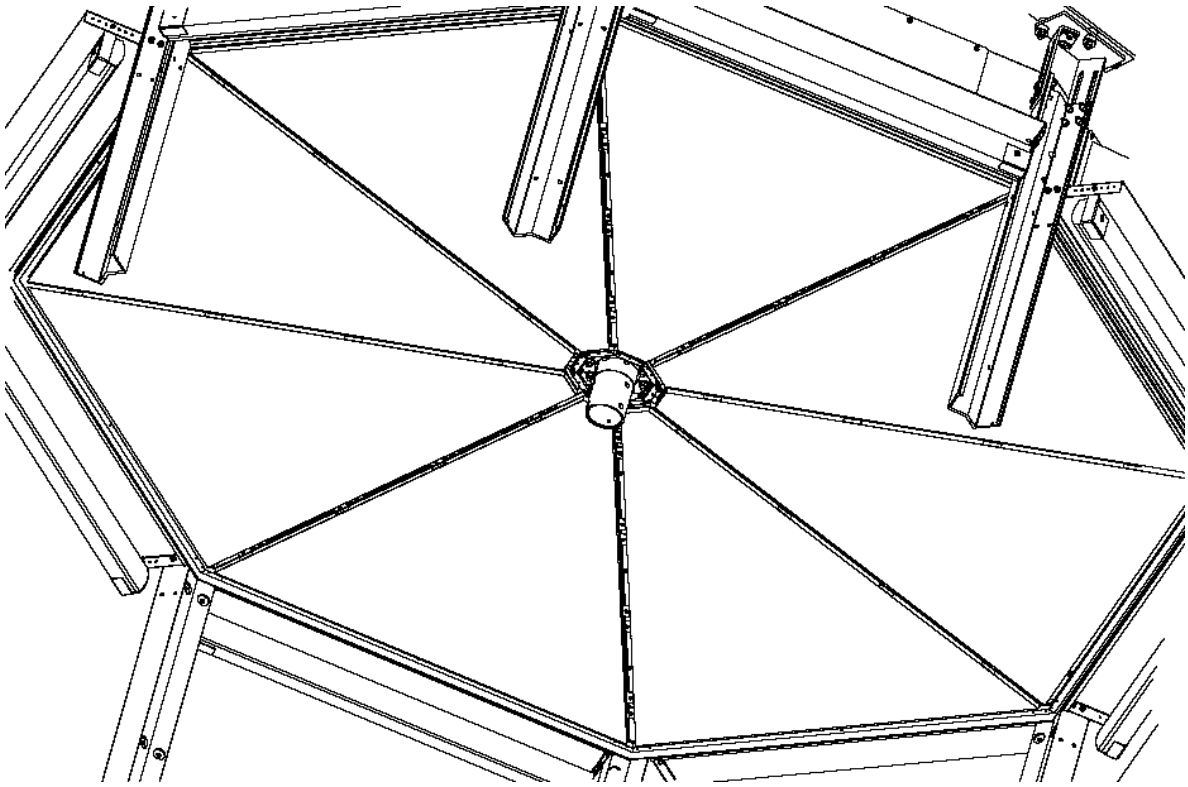
Take a tissue, position it on one of the eight pieces of the ceiling using the eight C bars as shown in the figure.



Take eight nuts (M4 UNI 5588) and eight washers (Ø4 UNI 6592) to fix the tissues on the C bar as shown in the figure.



Repeat the same operation for each of the eight tissues until the filtering system as shown in the figure below is achieved.



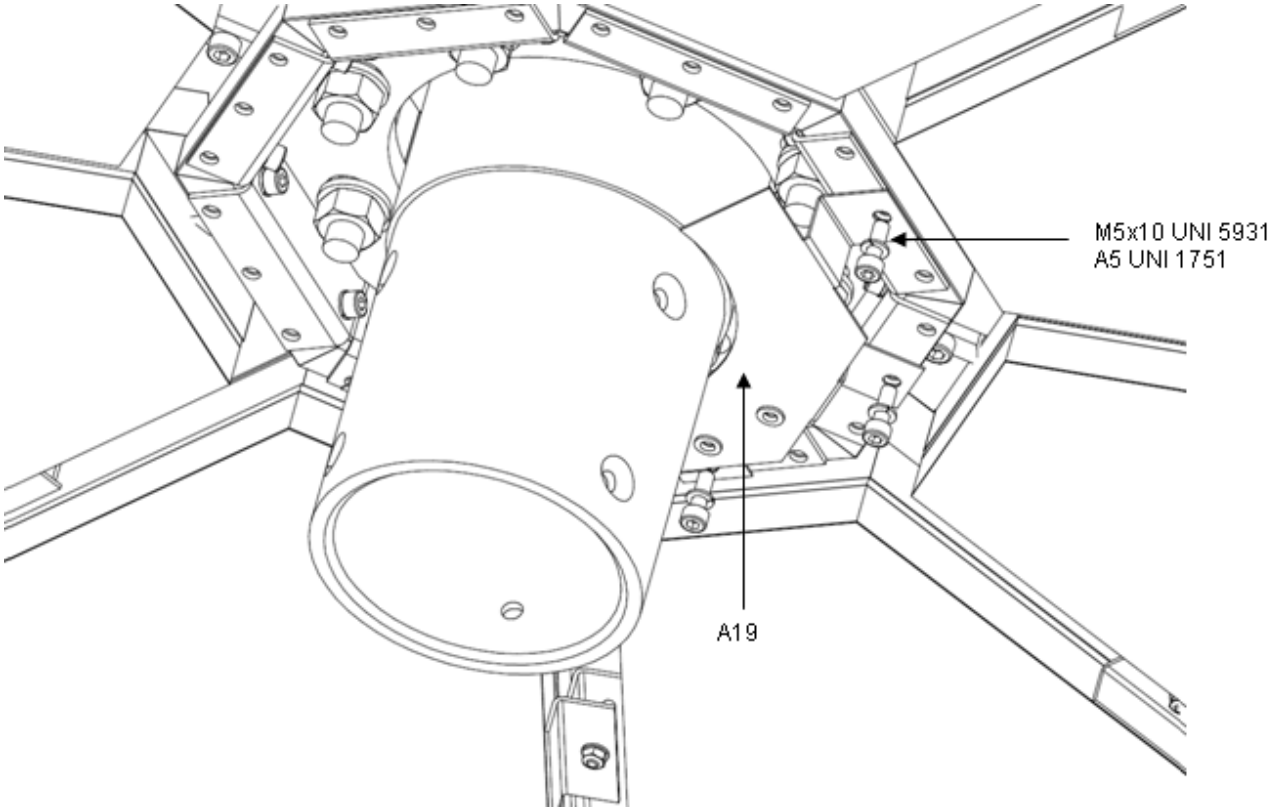
7.11 MOUNTING THE MASK

The cosmetic masking of the ceiling is carried out at this stage. Specific steel profiles and mouldings are used for the longitudinal, perimetral and central masks.

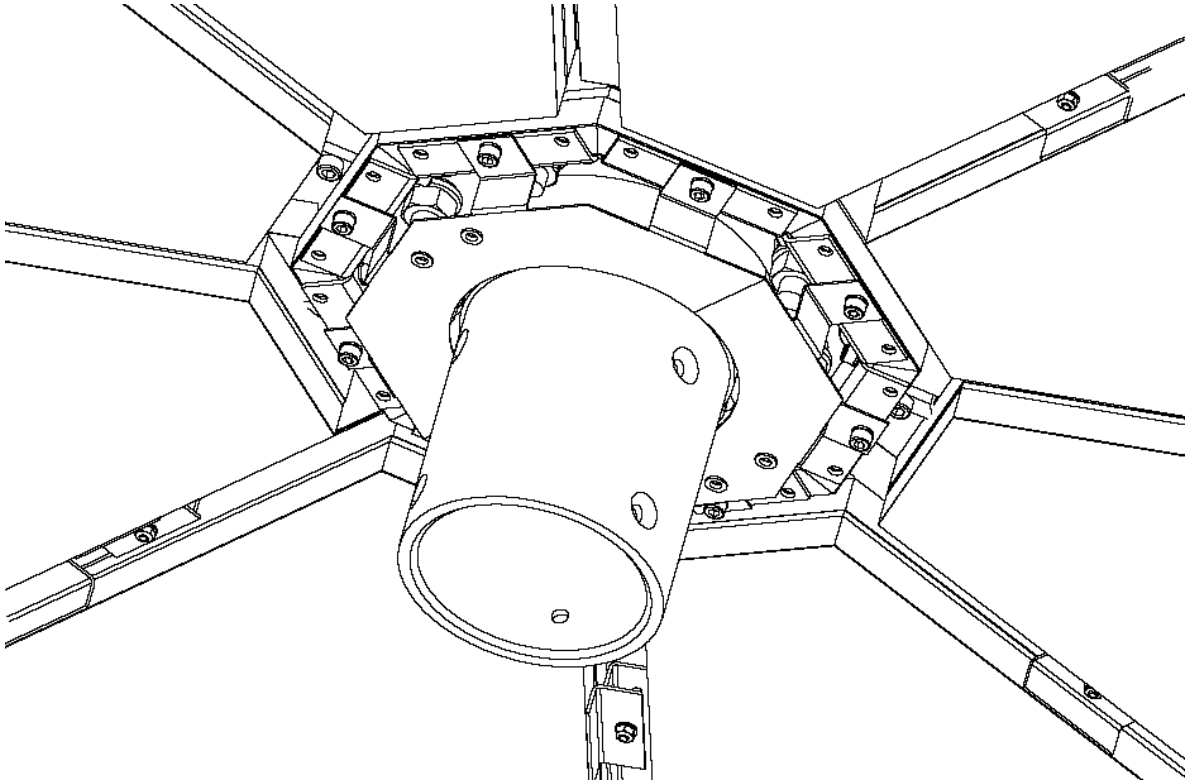
The materials used in this operation are the following:

Code	Description	Q.
A19	Central mask	2
A20	Longitudinal mask	8
A21	Perimetral mask	8
A22	Central block	2
A23	Taps for masks	40
	Screw M5x10 UNI 5931	8
	Screw M5x16 UNI 5931	40
	Screw M5x20 UNI 5931	16
	Screw M4x20 UNI 6109	4
	Grower washer A5 UNI 1751	8

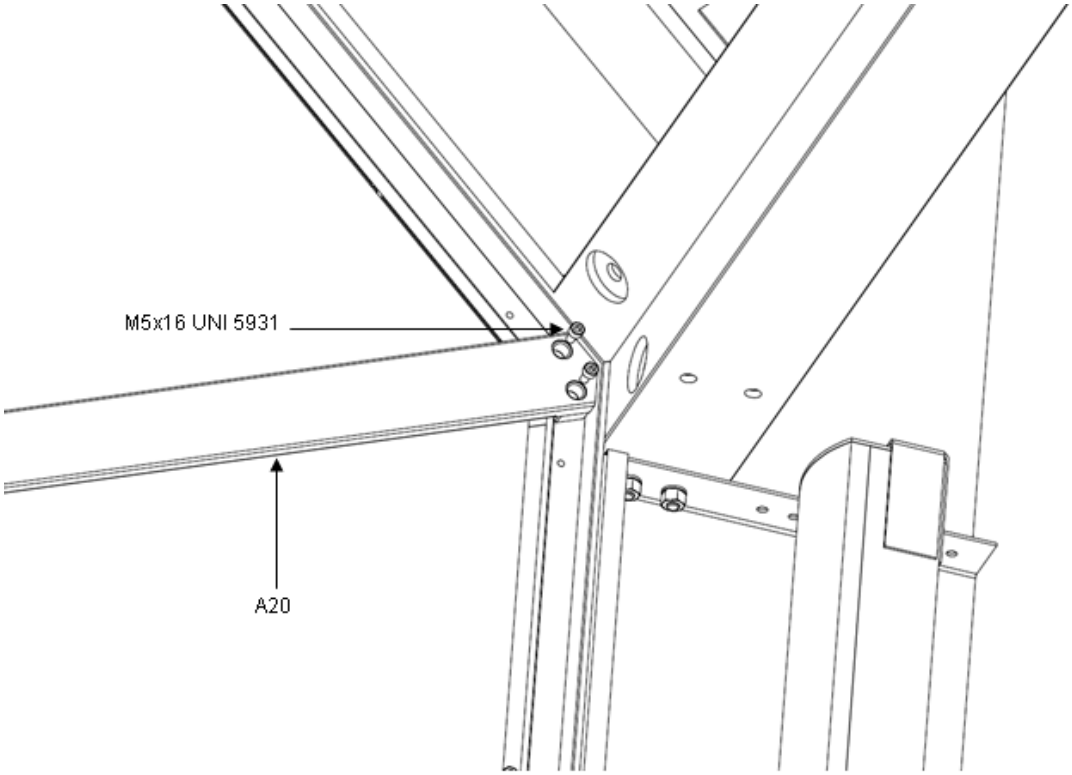
Take a central mask (A19), position it on the central crown so that the four holes of the central mask are placed under the central holes of the four sides of the central support. Take four screws (M5x10 UNI 5931) and four washers (A5 UNI 1751) and fix the central mask to the central support, as the figure shows.



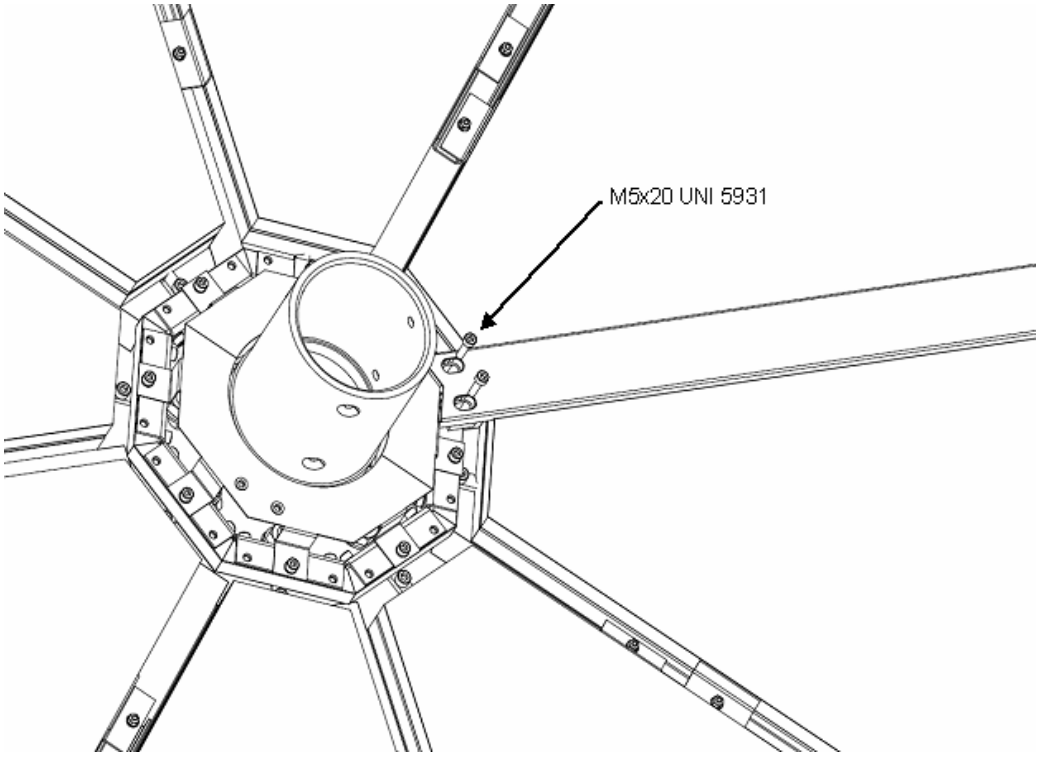
Repeat the same operation with the other central mask until the central support is fixed as shown in the figure.



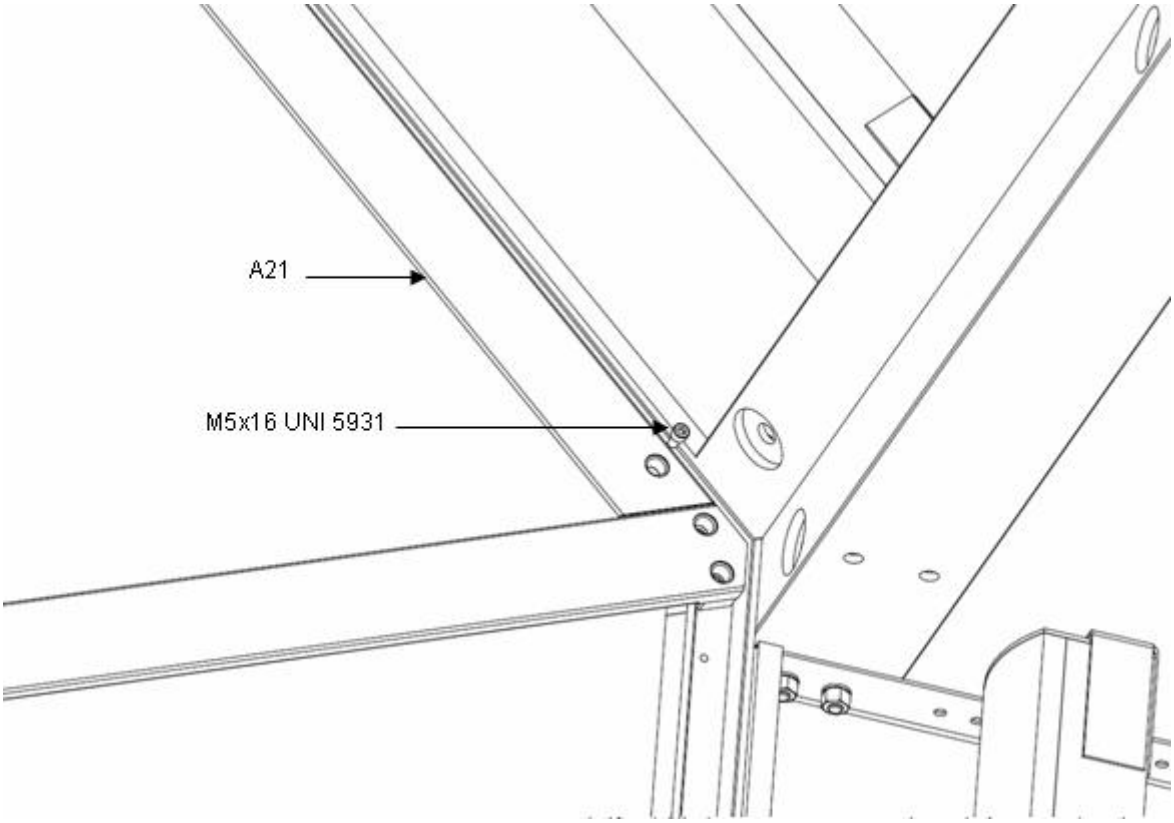
Take a longitudinal mask (A20) and position it between the two tissues. Take two screws (M5x16 UNI 5931) and fix them on the length of the structure, as shown in the figure.



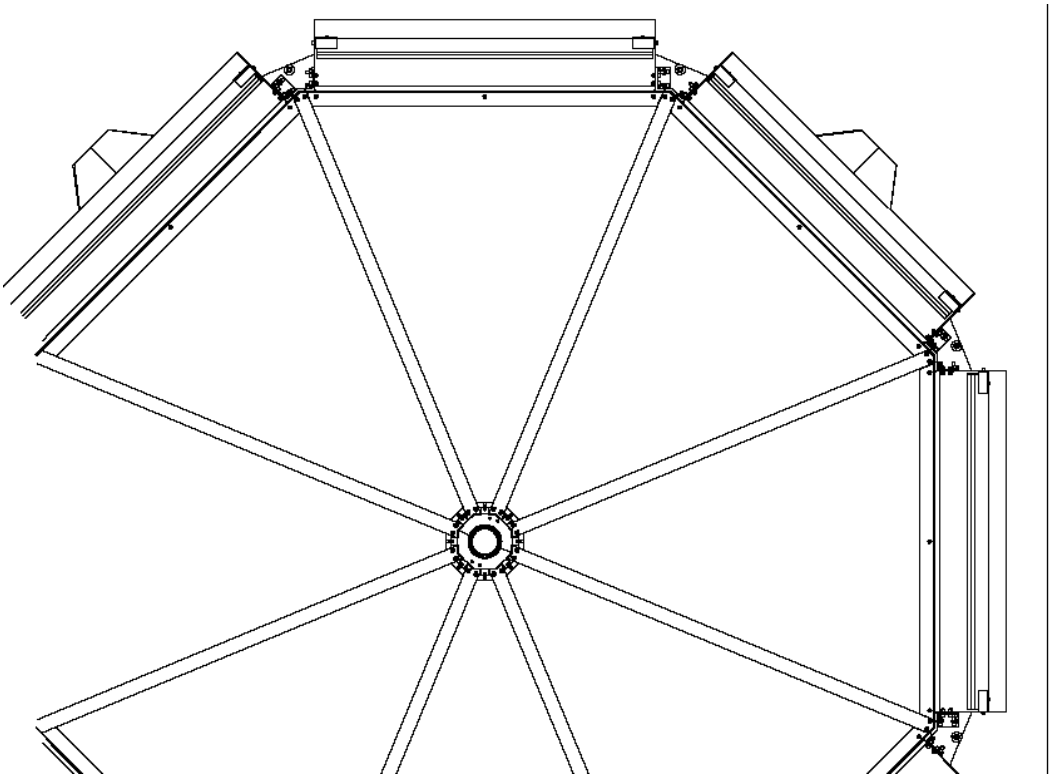
Take two screws (M5x20 UNI 5931) and fix the longitudinal masks on the central support as shown in the figure.



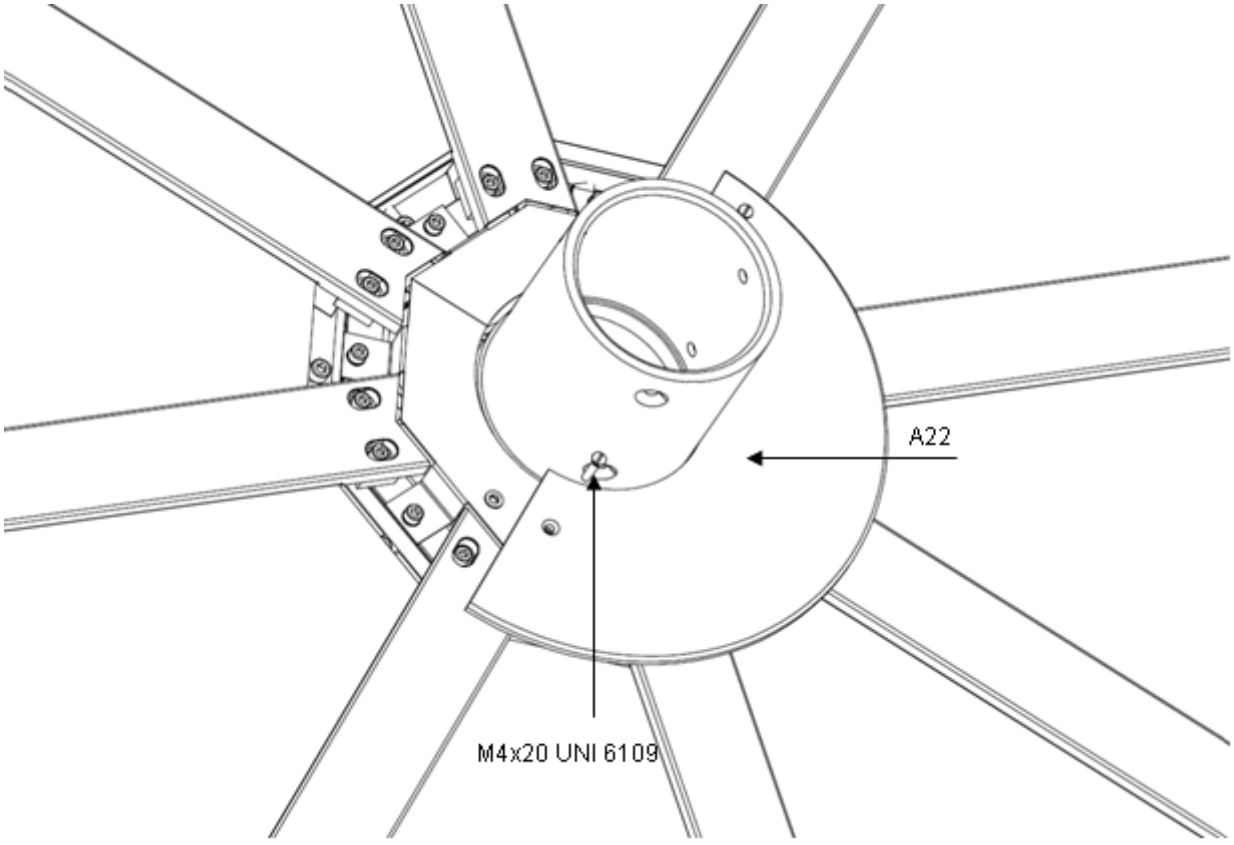
Take a perimetral mask (A21) and position it on the side of the structure. Take three screws (M5x16 UNI 5931) and fix them on the perimetral mask, as shown in the figures below.



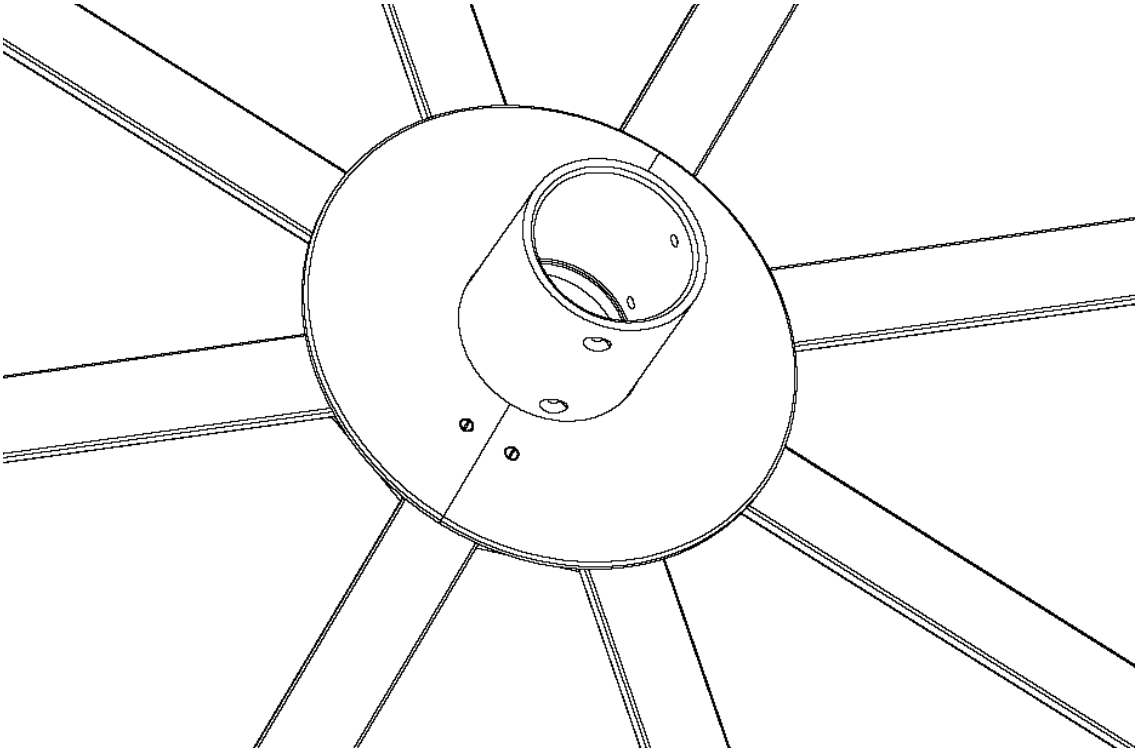
Fix all the other masks, alternating one for the length and one for the perimeter, until the surface is completely covered as shown in the figure.



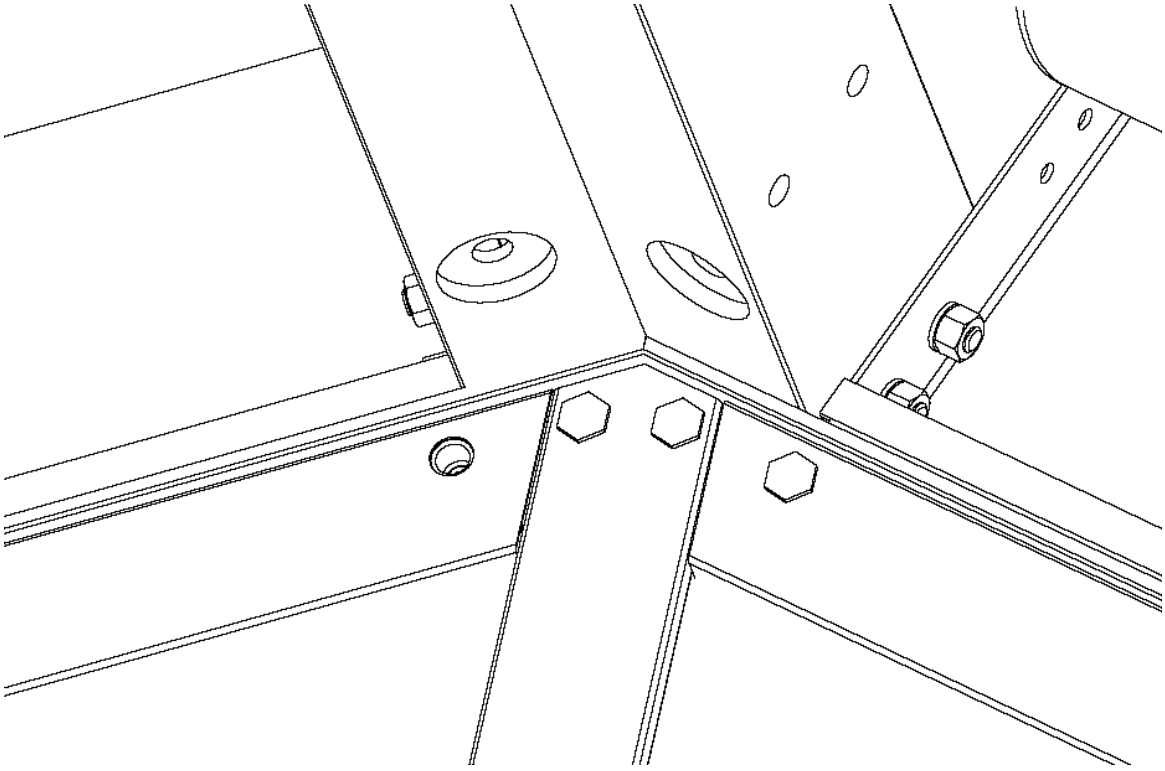
Take a central block (A22), position it under the central mask and anchoring it with the two dedicated screws (M4x20 UNI 6109), as shown in the figure.



Repeat the same operation with the other central block, as shown in the figure.



At this point we have arrived at the last step of the covering.
Take 40 taps (A23) and insert them in the holes along the perimeter of the structure, as shown in the figure.



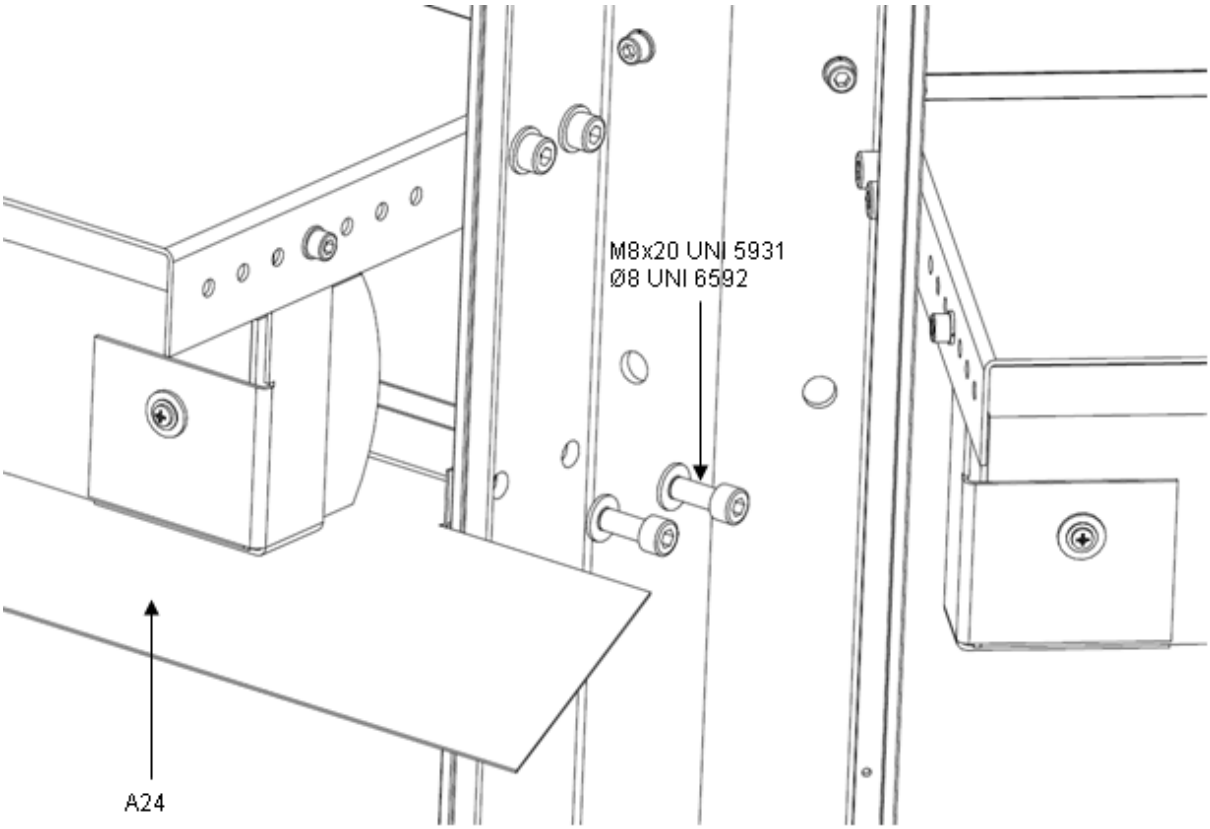
7.12 ASSEMBLING THE FALSECEILING STEEL STRIPS

In this phase of the installation we pass to the assembling of the falseceiling steel strips.

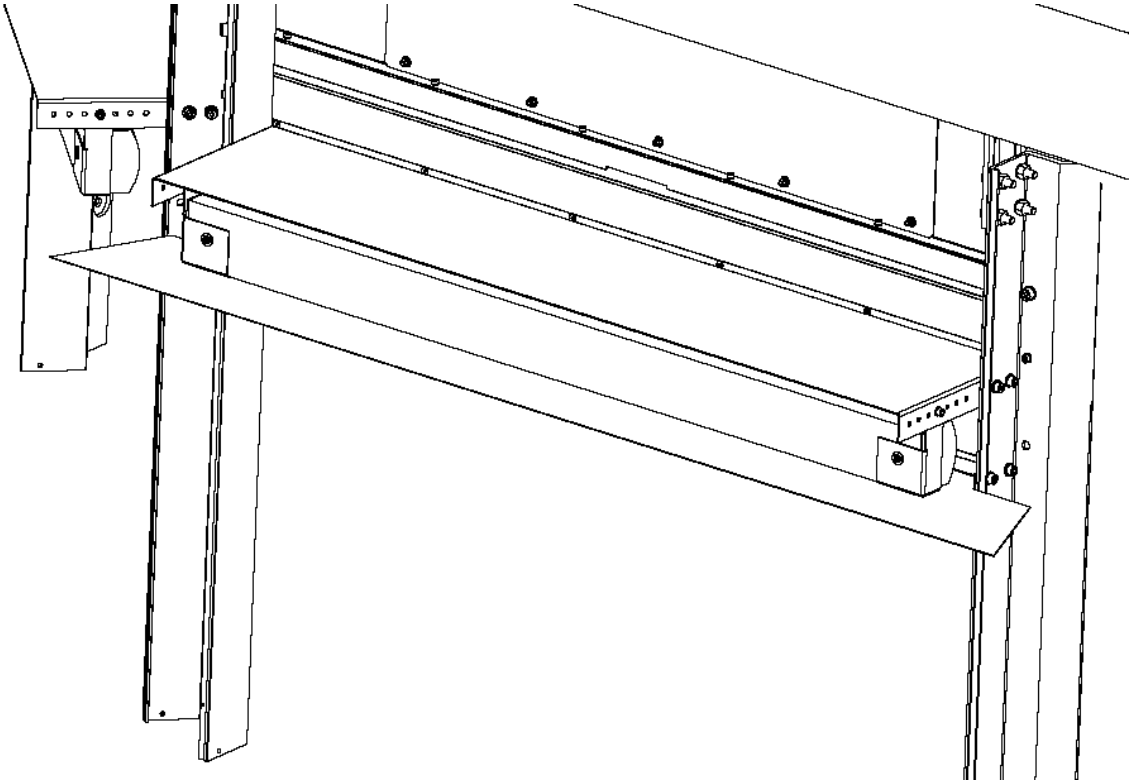
The materials used are the following:

Code	Description	Q.
A24	Falseceiling steel strip	8
	Screws M8x20 UNI 5931	32
	Flat washer Ø8 UNI 6592	32

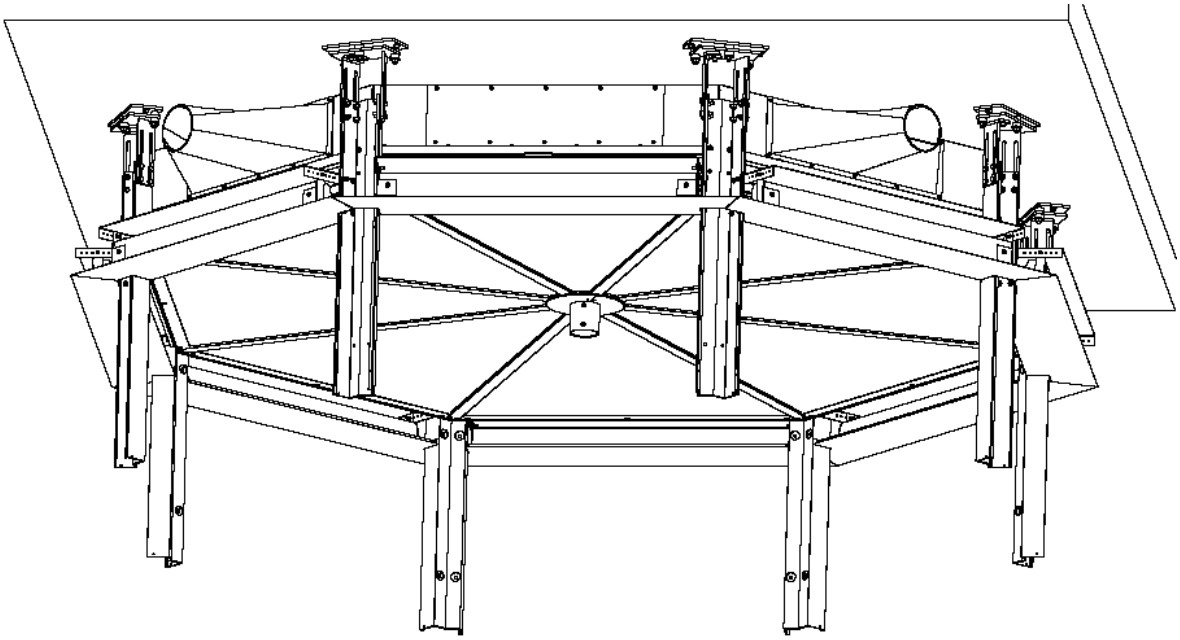
Take a sheet of the counter ceiling (A24) and position it on two vertical posts, under the antiglaze lamp. Use four screws (M8x20 UNI 5931) and four washers (Ø8 UNI 6592) and fix the sheet on two vertical posts, as shown in the figure.



In the figure below the counter ceiling sheet is shown after it has been assembled.



Repeat the same operation for each side of the structure as shown in the figure.



7.13 MOUNTING THE POST BASE CLOSURE

In this phase of the installation all the post base closures are installed.

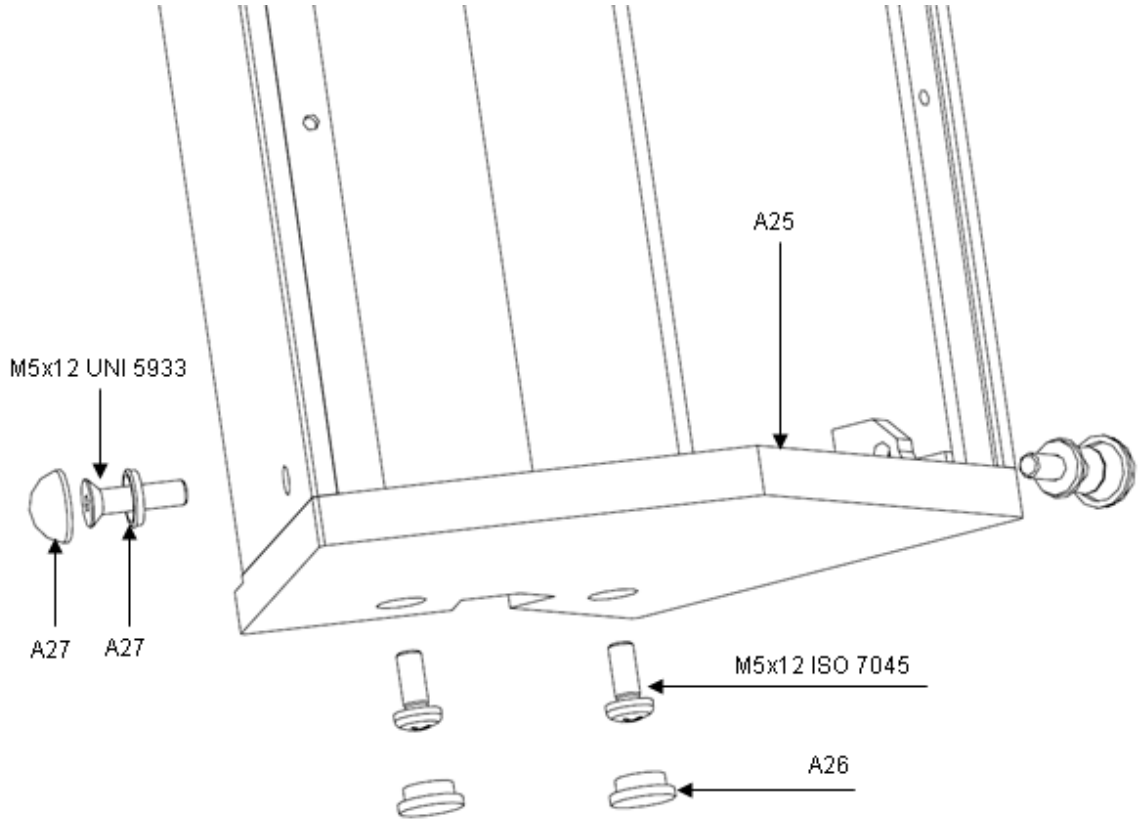
The materials used in this phase of installation are:

Code	Description	Q.
A25	Post base closure	8
	Screw M5x12 ISO 7045	16
	Screw M5x12 UNI 5933	16
A26	Cover for blind holes	16
A27	Screw-cover washer	16

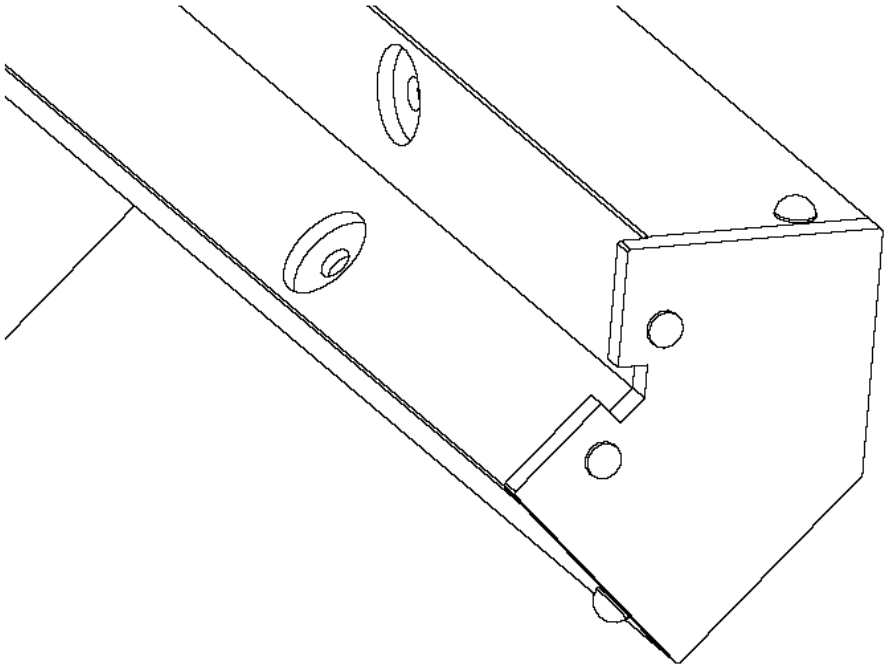
Take post base closure (A25) and insert it under the terminal part of the vertical post.

Take two screws (M5x12 ISO 7045), and use them to fix the closure of the lower part of the vertical post and cover the two holes with the dedicated covers for blind holes (A26).

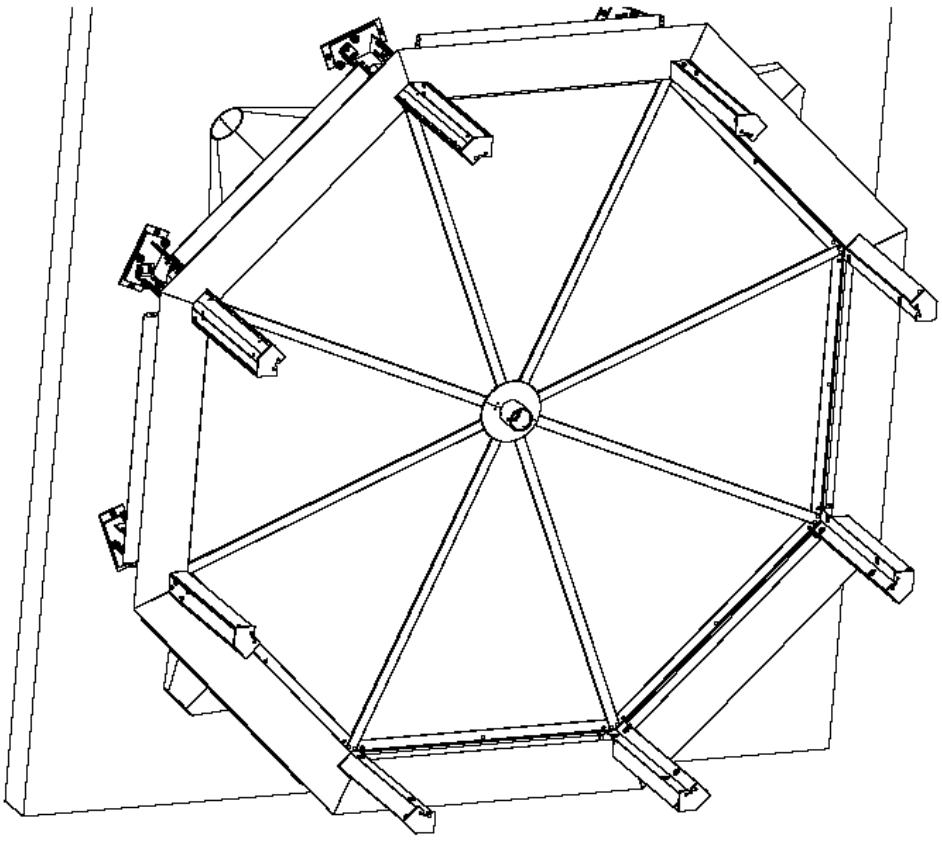
Take two screws (M5x12 UNI 5933) and two screw cover washers (A27) to fix laterally the closure for the vertical post, as shown in the figure.



Once this operation has been done the post base closure seen from below will look as seen below.



Repeat this operation for all eight vertical posts, until the structure shown below is achieved.



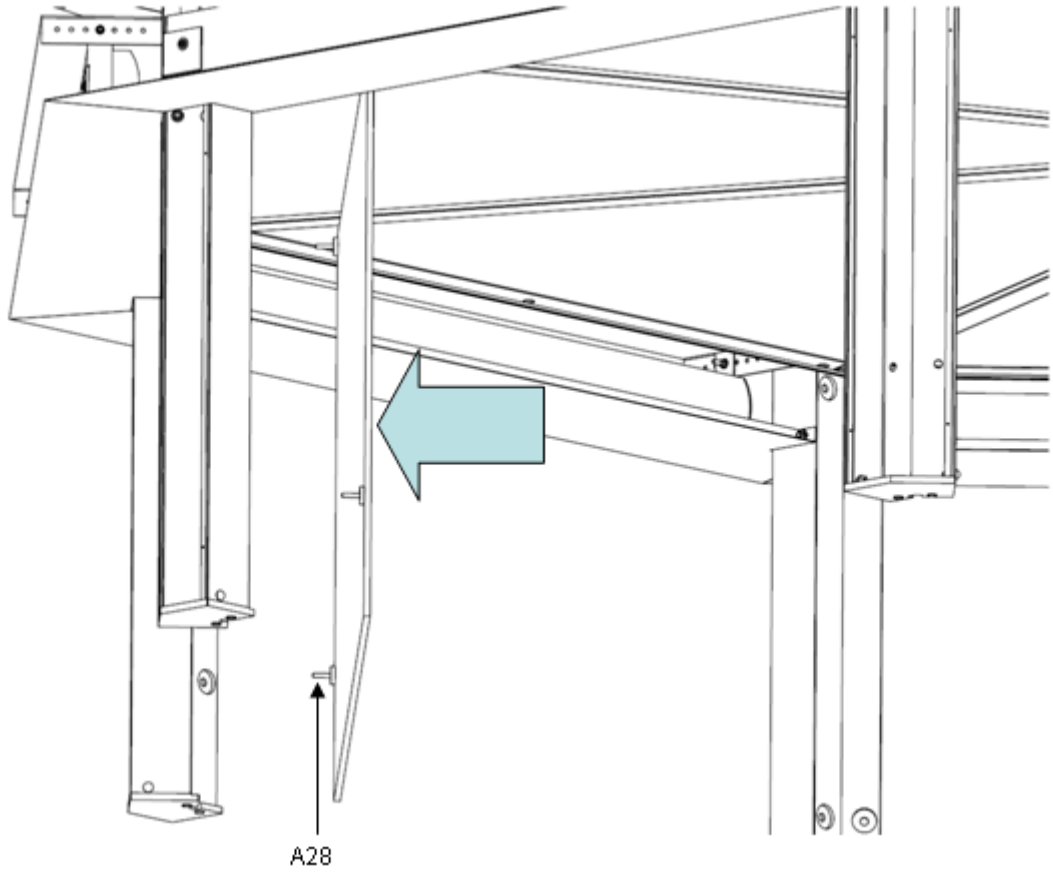
7.14 MOUNTING THE STRATIFIED GLASS PANELS

In this phase the installation of the eight stratified crystal glass protections to contain the air is done. Remember that the glass panels arrive to a height from the ground of up to 2000 mm, whilst the standard height is of 2100 mm.

The materials used in this step are the following:

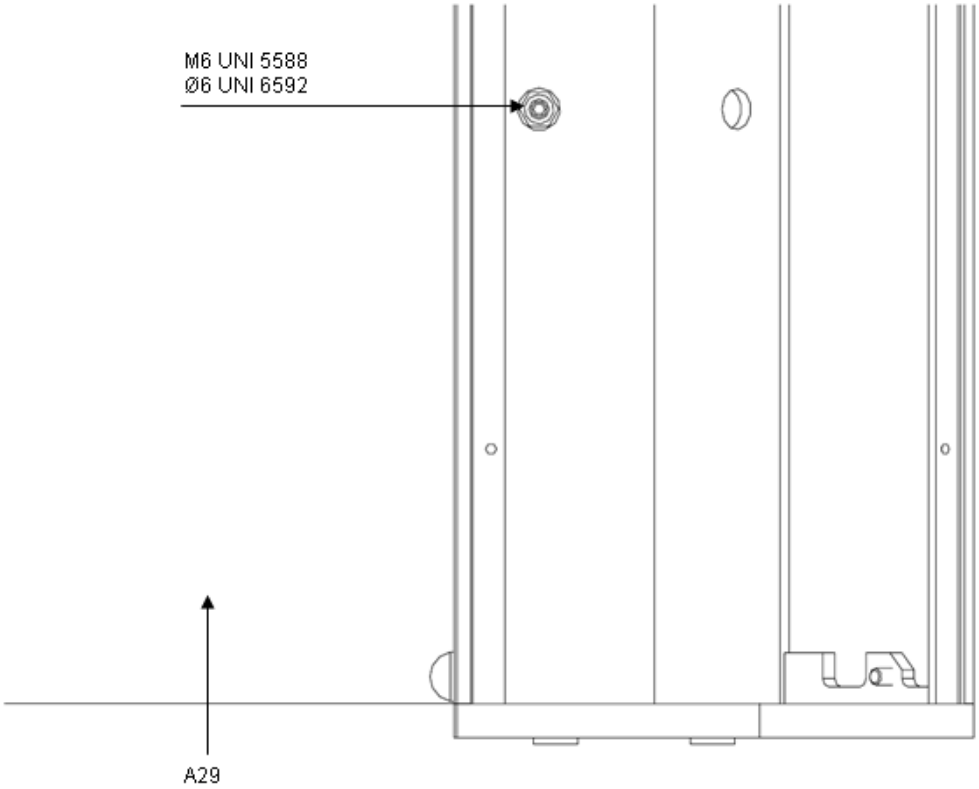
Code	Description	Q.
A29	Glass panel	8
A28	Metal disk with threaded shank	32
	Nut M6 UNI 5588	32
	Flat surface washer Ø6 UNI 6592	32

Take a glass panel (A29) and position it between two vertical posts, as shown in the figure. Be extremely careful during this operation.

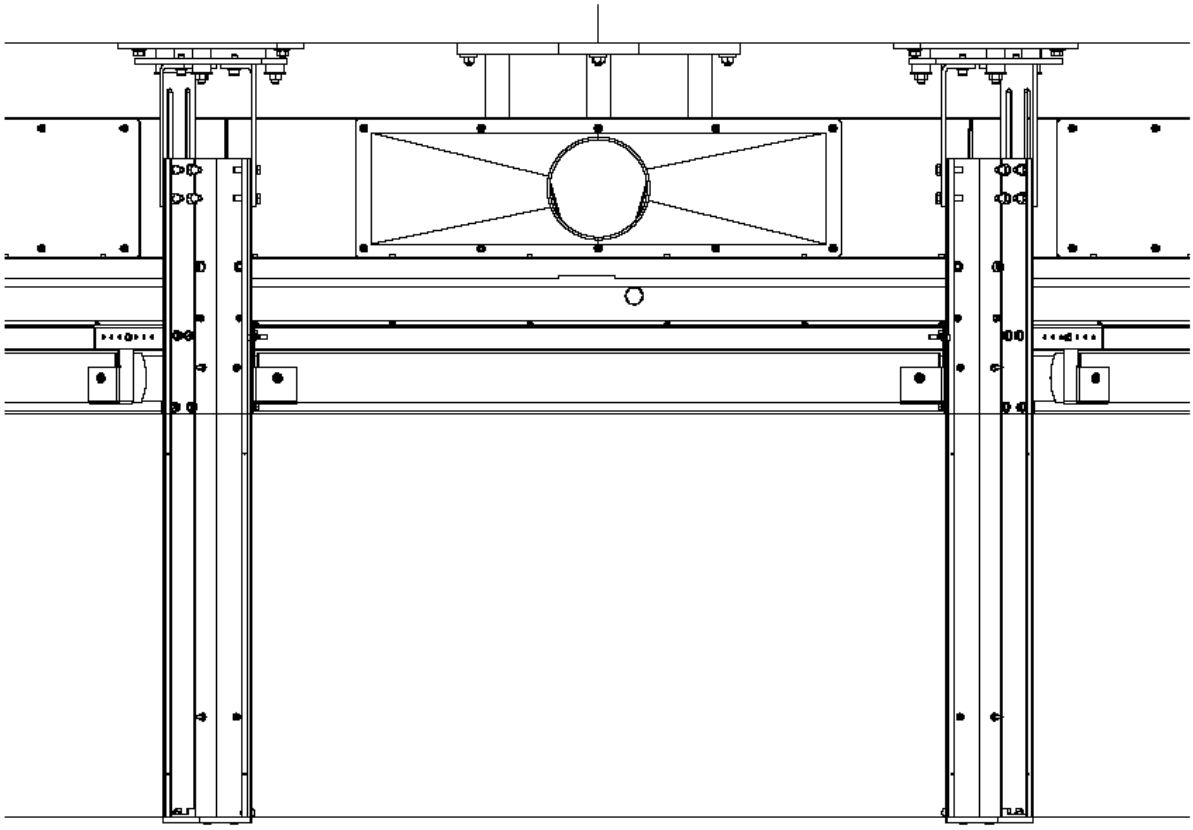


Insert the metal disk with threaded shank (A28) with its plastic gasket into the four holes of the glass.

Once the metal disk has been inserted, fix the glass panel to the structure using four nuts (M6 UNI 5588) and four washers (Ø6 UNI 6592), as shown in the figure.



Repeat the same operation on all the glass panels.



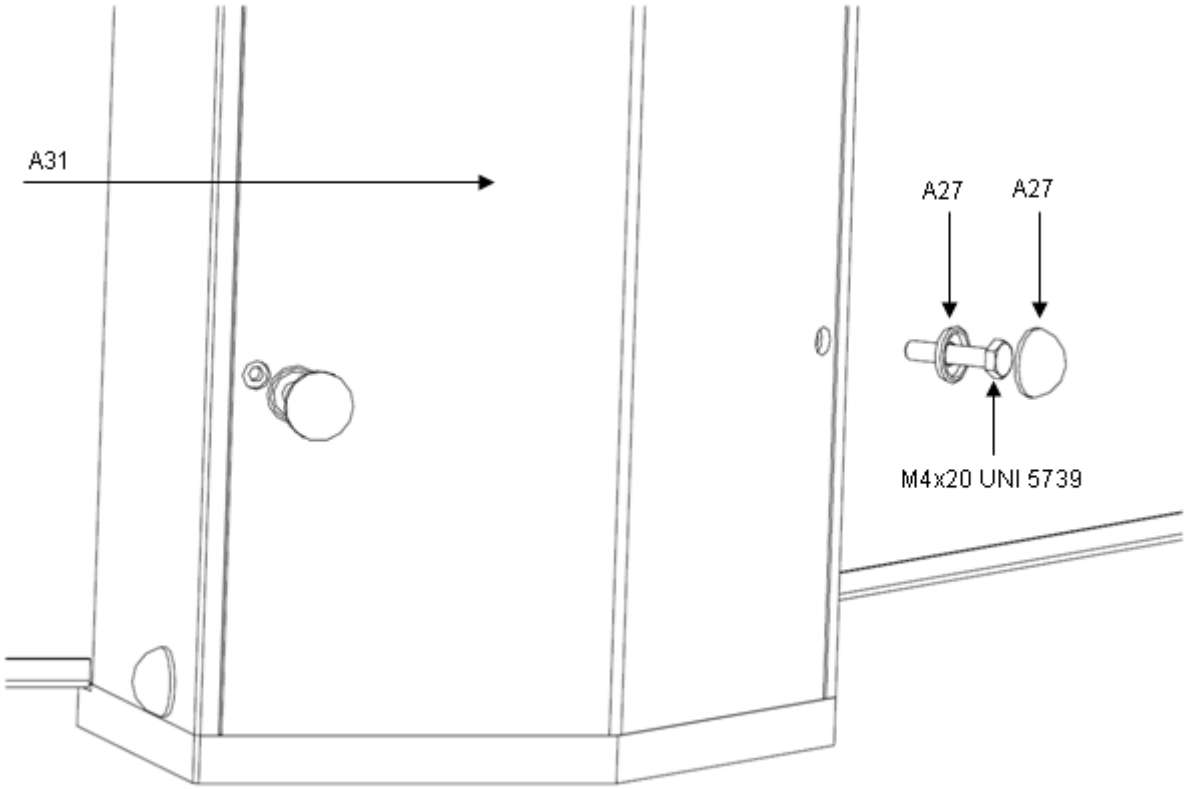
7.15 MOUNTING THE POST STEEL STRIP

The last step in the ceiling installation is assembling the post steel strips.

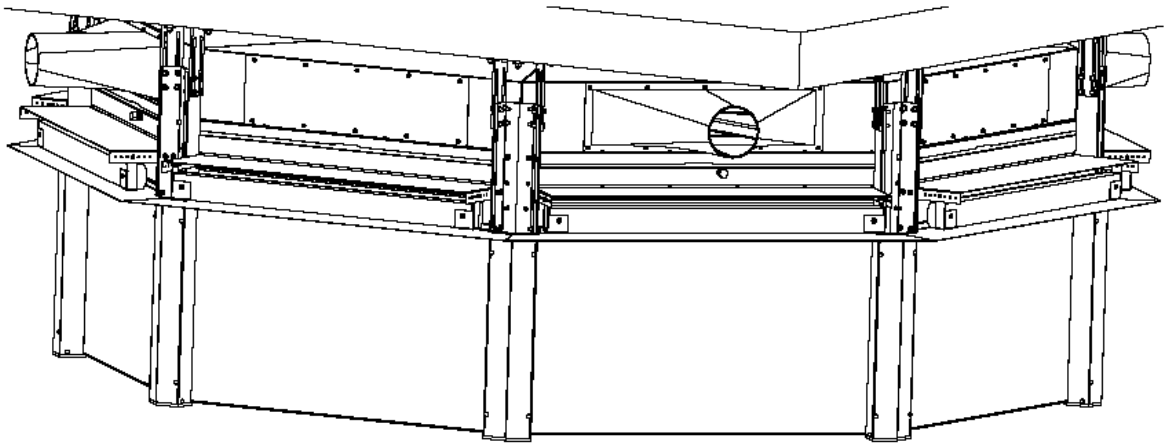
The materials used in this operation are:

Code	Description	Q.
A31	Post steel strip	8
	Screw M4x20 UNI 5739	32
A27	Screw-cover washer	32

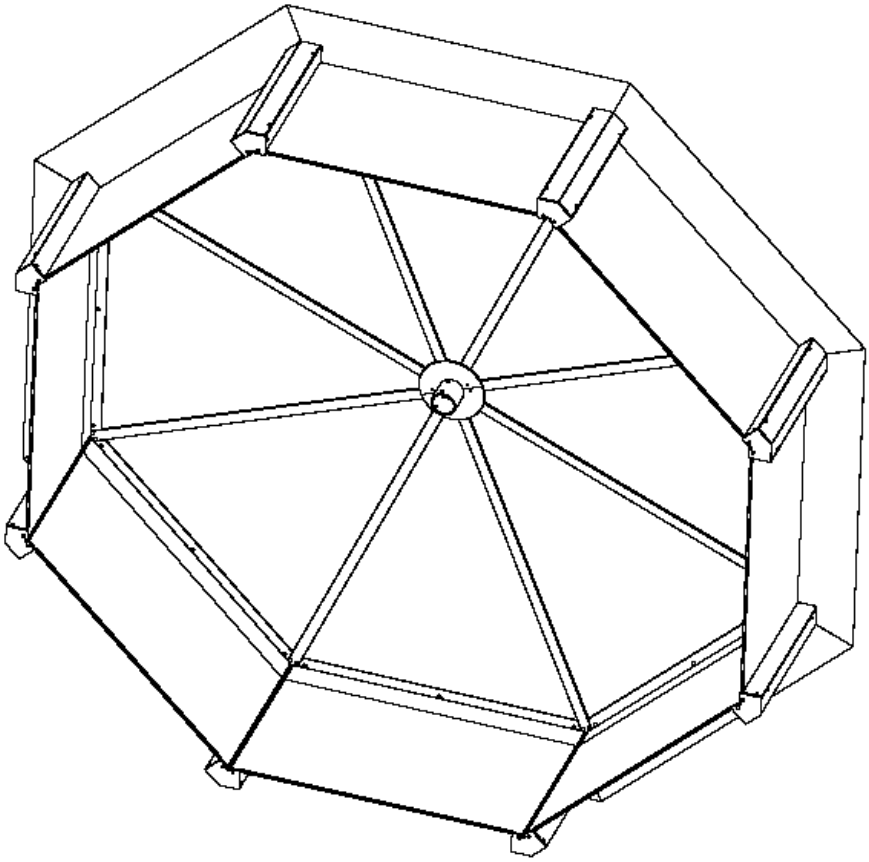
Take a post steel strip (A31) and insert it in vertical post. Use four screws (M4x20 UNI 5739) and four screw-cover washers (A27) to fix the strip to the post, as shown in the figures below.



Repeat the same operation on all the eight strips until the assembly of the lamination ceiling is completed as shown in the figure below.



The following figure shows how the Tecnair LV lamination ceiling will be once it is installed in the false ceiling of the room.



8 ORDINARY AND EXTRAORDINARY MAINTENANCE

8.1 MAINTENANCE OF THE LAMINATION TISSUE

The lamination tissues are the final element of the unidirectional ceiling. These allow for the unidirectional flow to be achieved once the air passes with the lamination tissues. For this reason the direct exposition with the aseptic nucleus can cause the tissues to become dirty.

These lamination tissues are made by a plastic material (polyester), which is resistant to sterilizing agents, so the ordinary maintenance is made of cleaning the tissues with classical systems used in the operating theatre.

The tissue has to be changed if it breaks, if it has tears or any problem which could harm its proper functioning.

The substituting procedure of the tissues is composed of the following operations:

- Unscrew the central block (A22);
- Take out the taps (A23) which cover the longitudinal masks and the perimetral masks corresponding to the tissues to be changed.
- Unscrew the anchoring screws of the two longitudinal masks (A20) and the perimetral ones (A21) and take out the masks being extremely careful of the glass panels.
- Unscrew the eight screws with which the tissues is held on and fixed to the filtering gasket.
- Change the lamination tissues.

The tissues mounting procedure follows the same operations described.

The unidirectional filtering ceiling cannot work without the lamination tissues.

It is therefore warmly suggested to buy from TECNAIR LV a series of substituting tissues so to ensure the continuous functioning of the entire system.

8.2 AIR FILTER MAINTENANCE

The H14 filters present in the ceiling are not regenerable and therefore must be changed. It is necessary to place on the new filters a sticker label with the change date so to always have an idea of the maximum remaining life of the filters.

Tecnair suggests that an ordinary substituting of the absolute filters be done every two years maximum. Obviously it is up to the correct authorities for the hospital structure to decide the maintenance plan and program the absolute filters.

THE FILTERS USED MUST BE DISPOSED OF AS A SPECIAL WASTE

Due to the importance of the absolute filters for the good working of the entire system, always check that the filters have been conserved in their appropriate case without having had damage of any type.

The procedure to change the absolute filters is made up of the following operations:

- Unscrew the central block (A22);
- Take the covers out (A23) so to uncover all the masks both on the length and on the perimeter.
- Unscrew the anchoring screws of the longitudinal masks (A20) and the perimetral ones (A21) and take out the masks being extremely careful for the containment glass panels.
- Unscrew the nuts with which the tissues is fixed to the filter gasket and take them out of there position.
- Unscrew the nuts and extract the C bars (A18) which fix the filters to the structure.
- Unscrew the support plaque (A17) and the relative sustain blocks (A16) and extract the filters with extreme caution.

The mounting procedure of the filters follows in inverse order the procedure described above. For any doubt on the matter refer to the installation procedure present in the manual.

The unidirectional filtering ceiling cannot work without the absolute filter, it is therefore warmly suggested that a series of substituting filters be ordered from Tecnair LV in order to guarantee the continued use of the entire system.

8.3 SUBSTITUTION OF THE ANTIGLAZE LAMPS

The basic lighting system of the aseptic nucleus is made up of eight anti glaze lamps. The lamp model used is a linear fluorescent 54W/840 230V T5, 1149 mm long. Its estimated life is of approximately 18.000 h.

The procedure to change the lamps is made up of the following steps:

- Access the counter ceiling in correspondence to the side on which the lamp needs to be changed;
- Unscrew the entire body of the lamp and the lamp holder (A13);
- Unscrew the left hand side anchoring system (A14) and the right one (A15);
- Open the body of the lamp and change the lamp.

The mounting procedure of the lamp follows the inverse procedure of the operation described above.

8.4 SUBSTITUTION OF THE AIR CONTAINMENT GLASS PANELS

The air containment glass panels of the air, necessary for the containment of the air flow and achieving the level of sterile air demanded by the Standards, are in stratified crystal so to guarantee the maximum security and the anti breaking of the crystal without limiting the sight of the surgeons.

If there are breaks or problems with the glass panels it is best to change the crystal with a new one.

The procedure to change the glass panel is made up of the following operations:

- Unscrew the screws which hold the post steel strip (A31) and the vertical post (A08);
- Take out the post steel strip;
- Repeat the same operation on the other vertical post which delimitate the containment glass panels (A29);
- Unscrew the nuts and the metal disks (A28) which anchor the glass panel to the vertical posts;
- Take the glass panels out with extreme caution;

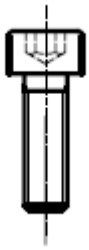
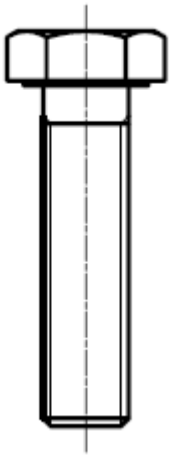
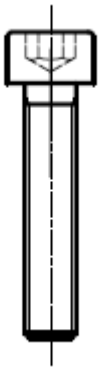
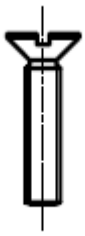
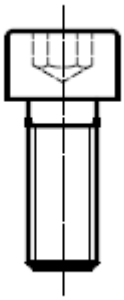
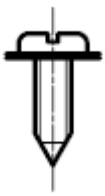
The procedure to mount the glass panels follows the opposite steps of the operations as described above. We remind you to be extremely careful during the mounting.

9 SUMMARY OF THE PARTS FOR ASSEMBLING

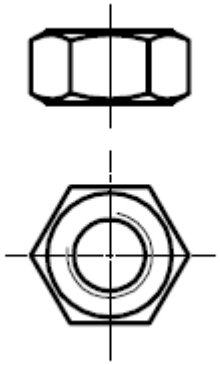
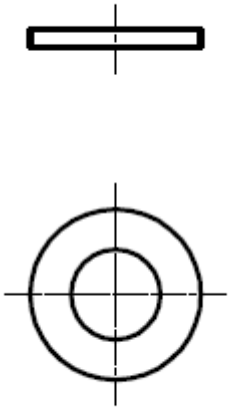
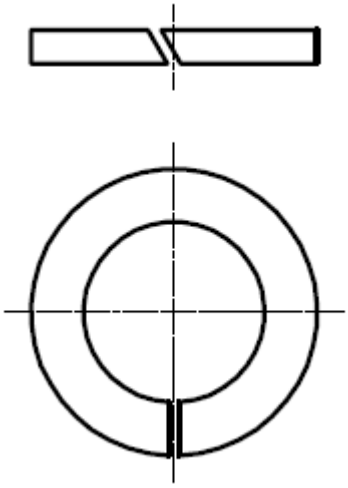
We attach the list of the necessary parts to be used for the installation of the Tecnair LV filtering ceiling as well as a schematic summary of the screws, nuts and bolts to be used.

Code	Description	Quantity
A06	Middle profile	8
A13	Lamp holder	8
A14	Left side bracket	8
A15	Right side bracket	8
A18	C bar for filter fixing	8
A19	Central mask	2
A20	Longitudinal mask	8
A21	Perimetral mask	8
A22	Central block	2
A23	Taps for masks	40
A24	Falseceiling steel strip	8
A25	Post base closure	8
A26	Cover for blind holes	16
A27	Screw-cover washer	48
A28	Metal disk with threaded shank	32
A29	Glass panel	8
A31	Post steel strip	8
B01	Plenum component	8
B02	Front closing panel	8
B03	Back closing panel	4
C01	Central plaque	1
C02	Intermediate anchoring plaque	1
C03	Central support plaque	1
C04	Spacer tube	4
C11	Reinforce tubes	4
C12	Spacers	4
P01	Central crown	1
P02	External profile with socket	4
P03	Vertical posts with external profile	4
	Trapezoidal filter	8
	Flow equaliser tissues	8
	Threaded bar M20	4
	Threaded bar M4	24
	Antiglaze light	8
	Filter assembly tool	2
	Adhesive TEROSTAT 935 Henkel	1

Summarizing table for used parts

	Screw M5X12 UNI 5933		Screw M4X20 UNI 5739
	Screw M5X10 UNI 5931 Screw M5X16 UNI 5931 Screw M5X20 UNI 5931		Screw M10X40 UNI 5739
	Screw M6X30 UNI 5931 Screw M6X35 UNI 5931 Screw M6X40 UNI 5931		Screw M4X20 UNI 6109
	Screw M8X20 UNI 5931 Screw M10X20 UNI 5931 Screw M10X25 UNI 5931		Screw M5X12 ISO 7045
			Self tapping screw 4,2X13

Summarizing table for used screws

	Nut M4 UNI 5588 Nut M6 UNI 5588 Nut M8 UNI 5588 Nut M10 UNI 5588 Nut M12 UNI 5588 Nut M20 UNI 5588
	Flat washer Ø=4 4,3x9 UNI 6592 Flat washer Ø=6 6,4x12 UNI 6592 Flat washer Ø=8 8,4x16 UNI 6592 Flat washer Ø=10 10,5x20 UNI 6592 Flat washer Ø=20 21x37 UNI 6592
	Grower washerA5 UNI 1751 Grower washer A6 UNI 1751 Grower washer A8 UNI 1751 Grower washer A10 UNI 1751 Grower washer A20 UNI 1751

Summarizing table for nuts and washers used