

CamSafe

Installation & Operating Manual

1 Updates

Date	Revision	Object	Author
2020-05-19	D	General Update to include further modules from the scope	V.Parkkoin
2019-01-21	C	Modified INV clamping system §10.3	V.Parkkoin
2018-06-26	B	Corrections §8	V.Parkkoin
2018-02-01	A	First issue (based on DTU3080 Rev.C)	V.Parkkoin

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3 Purpose & Scope

This manual is made for personnel in charge of housing installation and filter change & validation.

Its purpose is to introduce the product and provide necessary information regarding

- ➔ Housing installation
- ➔ Filter installation & exchange
- ➔ Filter validation
- ➔ General adjustment and operating procedures for housings and add-ons

for CamSafe BIBO ducted housings and associated Add-Ons.

PLEASE NOTE:

The CamSafe product family is open to customization.

Illustrations in this manual represent generally valid principles for the standard scope.

The actual configuration of your specific CamSafe might be different, depending on type and custom features.

DISCLAIMER

We would like to take this opportunity to thank our customers and other parties for their interest in Camfil filters, housings and products and to remind them that each user bears the full responsibility for making its own determination as to the suitability of Camfil materials, information, products, recommendations and advice for its own particular purpose.

Each user must identify and perform tests and analysis sufficient to assure that its finished parts, methods and results will be safe and suitable for use under end-use conditions. Because actual use of products, methods and information by the user is beyond the control of Camfil, such use is within the exclusive responsibility of the user and Camfil cannot be held responsible for any loss incurred through incorrect or faulty use of products or information.

Further, no statement contained herein concerning a possible, safe or suggested use of any material, method, product or advice is intended or should be construed to grant any license under any patent or other intellectual property right of Camfil or any of its subsidiaries or affiliated companies or as a recommendation for the use of such information, material, product, method, service or design in the infringement of any patent, copy write, trademark or other intellectual property right.

4 Product Presentation

4.1 Design Features

CamSafe is a product line consisting of BIBO safe change housings, complemented by a modular system of other functional elements, as well as a full range of options and add-ons in view of flexible adaptation to customer requirements.

Global Features

- Contamination free filter change
- Patented safety features for filter clamping and filter door
- Long lasting reliability and air tightness due to fully welded construction
- Proven high corrosion protection against decontamination agents (see also [§ 4.3](#))

Highly flexible and modular safety housing system

- Different filter sizes
- Different material Options ([see § 4.2.1](#))
- Different airflow options ([see § 4.1.2](#))
- Functional & configuration options (see
- Custom configurations to suit specific requirements
Up to 6 banks for airflow ranges from 150 to 30 000 m³/h

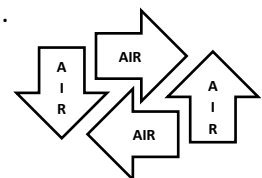
4.1.1 CamSafe Certification Levels

- | | |
|--|--------------------------------------|
| • Mechanical resistance of the housing | Class D1(M) acc. to EN 1886:2007 |
| • Air-tightness of the housing | Class L1 acc. to EN 1886:2007 |
| • Air tightness at gasket seat | below 0.01% acc. ISO EN 14644-3:2005 |
| • Containment enclosure air tightness | Class 3 acc. to ISO 10648-2:1994 |

4.1.2 Airflow Options

Airflow direction other than TOP → BOTTOM are available as housing variants.

- △ PLEASE NOTE :** Standard flow housings should NOT be used for alternate airflows. The changed orientation requires housing modifications to ensure safe filter change and -clamping with intervention on the “clean” side.



4.2 Materials & Temperature Limitations

4.2.1 Materials

All modules of the CamSafe standard scope are available in 3 base materials / finishes :

1. Carbon Steel – Coated

Base material: **SHEET METAL - EN10025-2 -S235JRG2 (1.0038)**

Coating Finish: Powder paint coating as per EMC_SPEC025
Standard RAL9010, other RAL colors on request

2. Stainless Steel 304L

Base material: **SHEET METAL AISI 304L - EN10088 – X5CrNi18-9 (1.4307)**

3. Stainless Steel 316L

Base material: **SHEET METAL AISI 316L - EN10088-2 - X2CrNiMo17-12-2 (1.4404)**

SS Finish: Housing fully pickled
Visible flange Glass Bead Blasted (or polished) to smooth satin finish
as per EMC_SPEC026 & Derogation Notice CAM-003-2018

Material thickness: 2 mm base thickness for ALL housings & accessories
unless otherwise specified

4.2.2 Temperature Limitations

From the technical characteristics of materials employed (paint & plastic parts), it is safe to say that CamSafe housings are fully functional for the same temperature range as the most common filter cell ranges, i.e. 60°C maximum for continuous use.

- △ **PLEASE NOTE:** HOT process air and/or environment
 Under no circumstances should a housing be continuously exposed to temperatures > 90°C.

- △ **PLEASE NOTE:** COLD process air
 Process air temperatures <4°C would require an insulated housing to avoid condensation.
 This option is NOT available ytd due to the morphology of the housing body.

The following materials are used in CamSafe filter housings.

➔ Max. temperatures are values for permanent exposure.









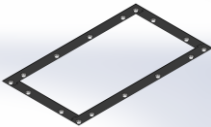
Illustration	Name	Material(s)	Temp. Max [°C]
Housing Body & Door			
	Weldment Housing body & door	(a) 1.0038 (S235JRG2) (b) SS 1.4301 (X5CrNi18-10) (c) SS 1.4404 (X5CrNiMo17-12-2)	(>250)
-	Screws & Nuts & Fittings	(a) Zn8C (b) SS A2 (c) SS A4	(>250)
-	Powder Coat Primer Topcoat	Epoxy Polyester	(<=90)
-	Door Gasket	Chloropren Rubber 40 Shore A	(<=100)
-	Door Gasket Tape	Acrylic Adhesive	(<=120)
	Star Button DIN 6336-KU-63-M10-K-MS	Phenolic Resin PF31	(<=140)
-	Stickers	PVC	(<=60)

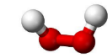
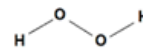
Illustration	Name	Material(s)	Temp. Max [°C]
Clamping System			
	Clamping Frame	SS 1.4307 (X2CrNi18-09)	(>250)
	Camshaft	SS 1.4307 (X2CrNi18-09)	(>250)
	Cam	Brass 2.0402 (CuZn39Pb2)	(>250)
	Torsion Spring	SS 1.4310 (X12CrNi17-7)	(>250)
-	Screws & Nuts & Fittings	(a) SS A1 (b) SS A2	(>250)
	Nylon Bushing	Nylon PA6	(<=80)
Options			
	Porthole Window	Frame – aluminum Window – tempered glass Gaskets – nitrile rubber 70NBR601	(>250) (>250) (<=120)
-	Mobile Integrity Probe (Manual Scan)	Scan Probes – SS SS 1.4301 (X5CrNi18-10) Bushing body – Al anodized Protection – AlCu4MgSi Bushing – Iglidur J® Gliders – PET 300 O-Rings – nitrile rubber 70NBR601	(>250) (>250) (>250) (<=90) (<=115) (<=120)
	Flange Gaskets	1.4301 (X5CrNi18-10)	(<=90)

4.3 Corrosion Resistance

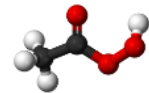
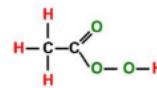
Standard housing versions feature a double-layer powder coat for enhanced corrosion protection, designed to be highly resistant to decontamination agents commonly used in Life Science and Clean Process environments.

Camfil has chosen to evaluate corrosion resistance of its metal products with respect to decontamination products most commonly used by our customers.

- Hydrogen Peroxide (H₂O₂)
https://en.wikipedia.org/wiki/Hydrogen_peroxide



- Peracetic Acid (CH₃CO₂OH)
https://en.wikipedia.org/wiki/Peracetic_acid



- Actril™ Cold Sterilant
<http://www.medivators.com/products-and-services/renal-systems/cold-sterilant>



→ A comprehensive testing report is available, upon request

→ Corrosion resistance to other decontaminants can be determined in our laboratory, upon request

PLEASE NOTE:

CamSafe is designed for indoor use in Life Science applications with HVAC processed air. No corrosion resistance class according to ISO 12944 is established. Store parts in a dry area protected from weather, prior to installation.

For heavy duty applications in Life Science and/or environments with high condensation like :

- High moisture / low temperature + severe decontamination (heavy acid or case concentrations)
- Negative temperature warehouses for bulk vaccine storage
- Blood fractioning applications

we recommend using stainless steel versions.

For these or similar cases, we can supply CamSafe housings in stainless-steel AISI 304L or 316L, depending on application severity.

5 Quality Control

Quality control items for CamSafe safety housings are documented by Camfil Qualified Sub Contractors on the corresponding checklist, according to a product specific Quality Check Instruction.

The combination of order reference, date and batch serial number on the identification sticker allows Camfil to track quality documentation of any individual housing.

6 Goods Reception



Packing example:
2 individual CamSafe housings



Packing example:
2 individual CamSafe housings


Packaging for shipment is covered by Camfil specification, to ensure transport protection and delivery in good condition.

△ PLEASE NOTE:

- ➔ Each package or pallet should be checked upon delivery (visual check), to ensure there has been no damage during transport..
- ➔ In case of Quality issues not linked to transport, please provide a short description (ideally with picture) of the feature concerned, as well as a picture of the housing's identification sticker for tracking.

7 Prior to Mounting or Intervention

Before you start we advise you to read this document completely and carefully.

 **Precautions :** Respect applicable safety and health rules on site and wear protective gear. (clothing, gloves, eye protection, safety footwear, mask, ...).

A work coat or overall and gloves are recommended as a minimum precaution.

As a general rule

- ➔ Do not proceed with mounting close to activities that can generate dust.
- ➔ Store the parts in a dry area protected from weather.
- ➔ Airflow through installed housings must be shut off and pressure must be equalized before intervention

8 Mounting of Configurations

CamSafe is a modular system of ducted modules. Subject to order conditions and/or transport limitations, housings/modules and/or collectors of a configuration may be shipped separately. Airtight assembly is required.

Module mounting is described based on housings and collectors but principles and steps are valid for connecting any modules inside a configuration.

8.1 General Assembly of Housings / Collectors

Set up the bottom collector (or lowest level module), ensure access from all sides.



Place gaskets on the flange, aligning flange and gasket holes. Interlocking connectors (modular gaskets only) facilitate placement.

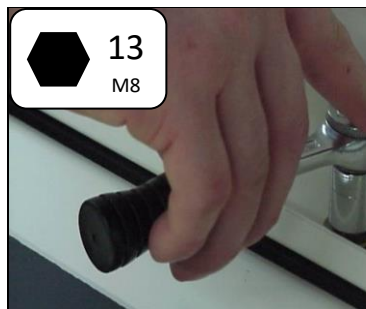


Repeat for each opening, then place the first housing.

PLEASE NOTE: Housing gaskets may be in a single piece or modular with interlocking connectors. Modular gaskets are self-adhesive (repositionable) to avoid leaks through connector distortion when placing the housings.



Place bolts with washers.



Tighten nuts, do not block yet at this point.

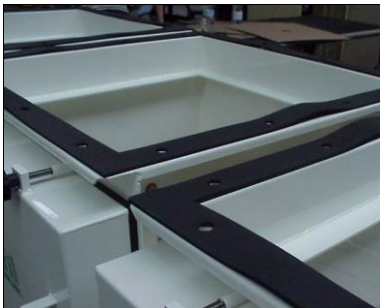
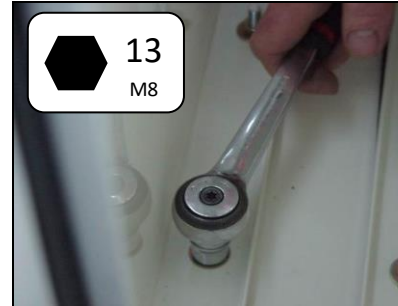
General Assembly of Housings / Collectors (continued)



Repeat for each housing.



In between housings, flange access is easier from the back side, using a ratchet. Do not block bolts yet at this point.



Place gasket(s) on the next flange level.



Assembly ready for the next level (housings or collector).



Manipulate the upper collector using the lifting rings.



Check for proper alignment. Take off the housing doors ...



... to access flange bolts positions close to the collar.



Tighten to **35 Nm** torque.

8.2 Assembly of Horizontal Airflow Configurations

Subject to order conditions and/or transport limitations, components of most larger horizontal-flow configurations may be shipped separately.

Airtight assembly is required, instruction for module / gasket assembly from General Assembly [§ 8.1](#) fully apply.

- ⚠ Precautions :** Horizontal flow involves temporarily cantilevered modules during assembly. Configurations may reach important height. Consult drawings for dimensions, weight and centers of gravity. Prepare wooden or plastic shims for temporary alignment support. **Respect applicable work safety rules for access, manipulation and static support.**



Place 1st collector on the support stand.



Position collector **and secure against tipping over.**



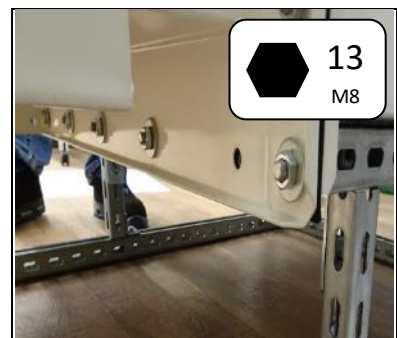
For non-adhesive gaskets, place small strips of double-sided tape on the collector flange(s).



Place gasket(s) on the flange(s), aligning flange and gasket holes.



Place 1st housing, aligning flange holes.



Use housing-collector bolts to securely link to the support stand. Tighten nuts, do not block yet at this point.

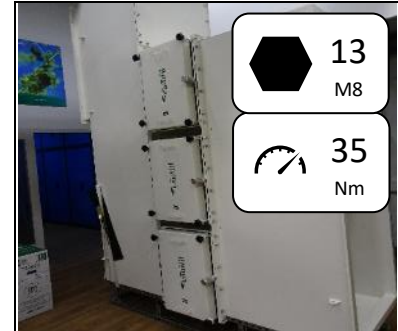
Assembly of Horizontal Airflow Configurations (continued)



Support cantilevered housings to protect flanges from deformation during the assembly process.



Repeat as required for further housings / stages.



Check modules alignment and tighten all bolts to torque.

8.3 Assembly of Wall Mounted Configurations

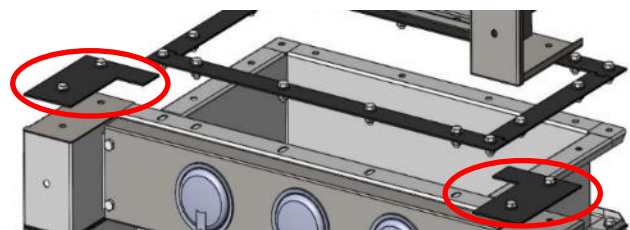
Subject to order conditions and/or transport limitations, housings and/or collectors of a wall-mounted configuration may be shipped separately.

Airtight assembly is required, instruction for module / gasket assembly from General Housing / Collector Assembly [§ 8.1](#) fully apply.



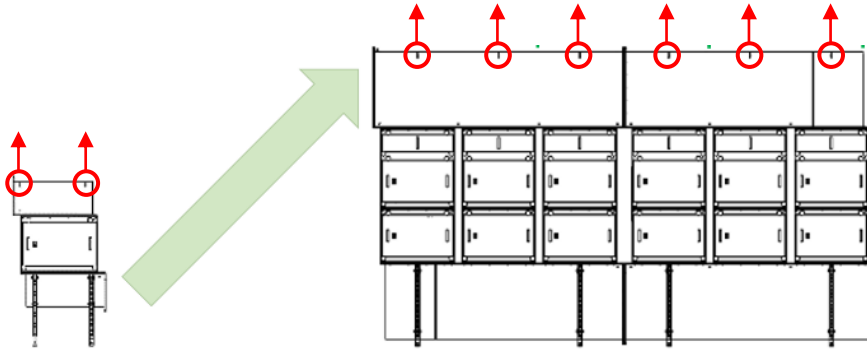
PLEASE NOTE:

Wall-mounted modules include gasket-kit extensions for the flange. Their purpose is to compensate the thickness of the main gasket on wall flange level and to achieve clean separation of the clean room from the technical area. They do not contribute to the containment barrier of the process air.



8.4 Installation of Free Standing Configurations

Free standing configurations are very variable in size, weight and complexity. They can be installed module-by-module or as a completed unit.

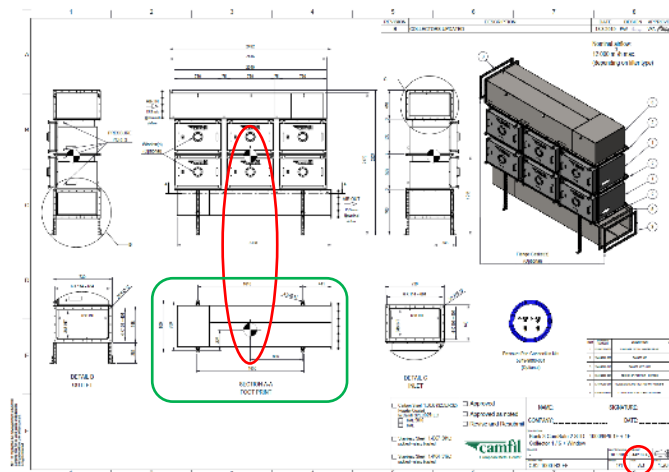


PLEASE NOTE: Top collectors feature lifting rings for manipulation of the assembled configuration.

Precautions: Choose attachment points so that excessive stress on flange connection is avoided.

Do not subject support stands or feet to oblique forces (no sliding on the ground, no laying down of the unit over the legs).

Consult the project drawing for dimensions, overall weight and position of the center of gravity before manipulating the unit!



A pressure test of the installed and hooked up safety unit is mandatory before use.

Prepare installation of the tower / the bottom collector using the installation dimensions & footprint information in the project drawing.

Anchors and screws for a solid installation must be chosen by the contractor in accordance with floor materials and -technology.

8.5 Installation of Wall-mounted Configurations

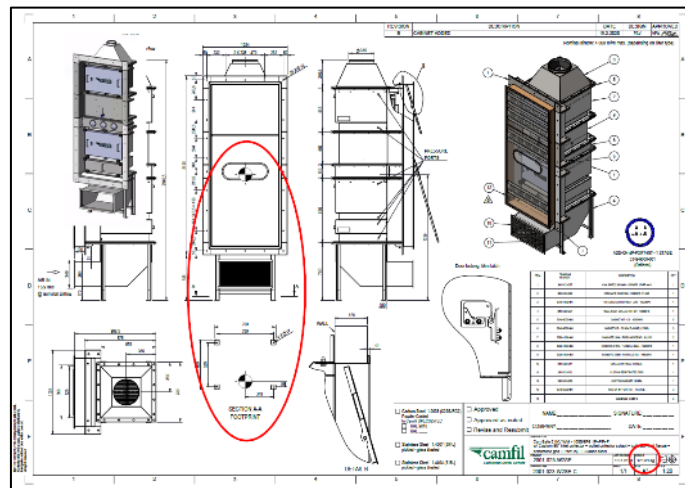
Wall-mounted configurations are designed with a wall-flange, allowing airtight installation in a technical area with filter access from the room.

Wall-mounted configurations can be installed module-by-module or as a completed tower.

PLEASE NOTE: Access to both sides of the wall is required for the installation.

Precautions : **Wall-mounted configurations are typically front-heavy. They may be unstable and prone to tipping over under lateral forces during manipulation / transport!**

Consult the project drawing for dimensions, overall weight and position of the center of gravity before manipulating the tower!

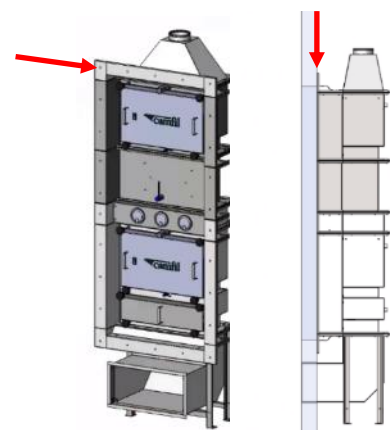


The center of gravity will usually remain within the perimeter of the support legs. Once installed, the wall flange and its attachment points have no weight bearing function! Their only purpose is to provide a sealing surface between cleanroom and technical area.

Adequate anchor- & gasket solutions will depend on the wall technology and are to be defined with the installation contractor.

For both installation as a tower or module-by-module, the following priorities should be observed :

1. Alignment and Airtight assembly of modules (safety critical)
2. Solid attachment to the ground
3. Attachment to the wall, including appropriate sealing measures



8.5.1 Wall Cutout Dimensions

Prepare installation of the tower / the bottom collector using the installation dimensions & footprint information in the project drawing.

The wall cutout and air inlet may remain open, or they can be closed with an optional door module.

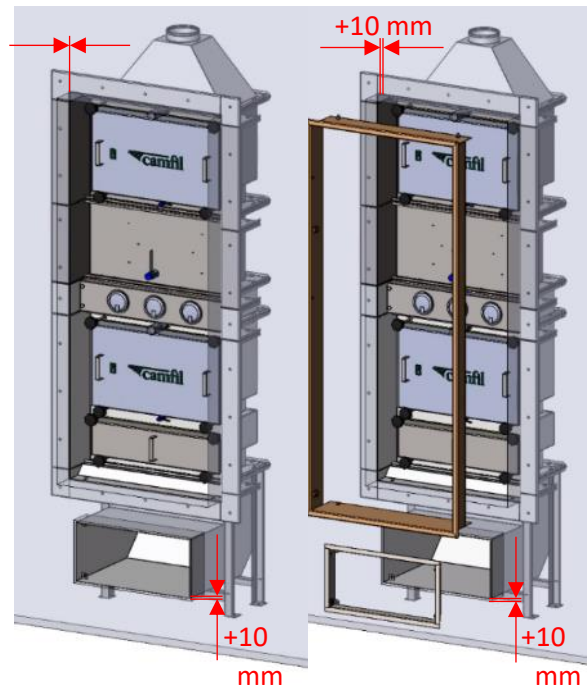
For open access installation,
we recommend cutout & finish to the internal wall-flange dimensions.

For installation with door module
and for the air inlet funnel,
we recommend a cutout +10 mm on every side.

PLEASE NOTE:

The door frame is an adaptor part, specific to the actual wall thickness.

For dimensions and positions of the wall flange, consult the project drawing.
3D models for integration purposes are available on simple request, contact your technical support.

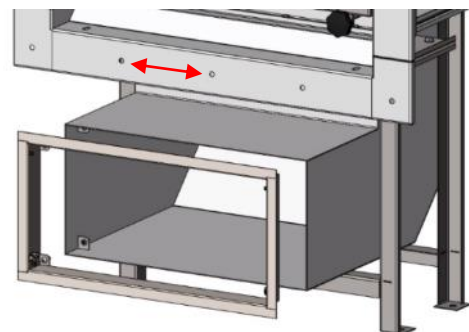


8.5.2 Wall Flange

The wall flange circumscribes the full functional stack of the configuration.

D12 holes are available at distances of 250mm or less to fix the sealing surface to the wall.

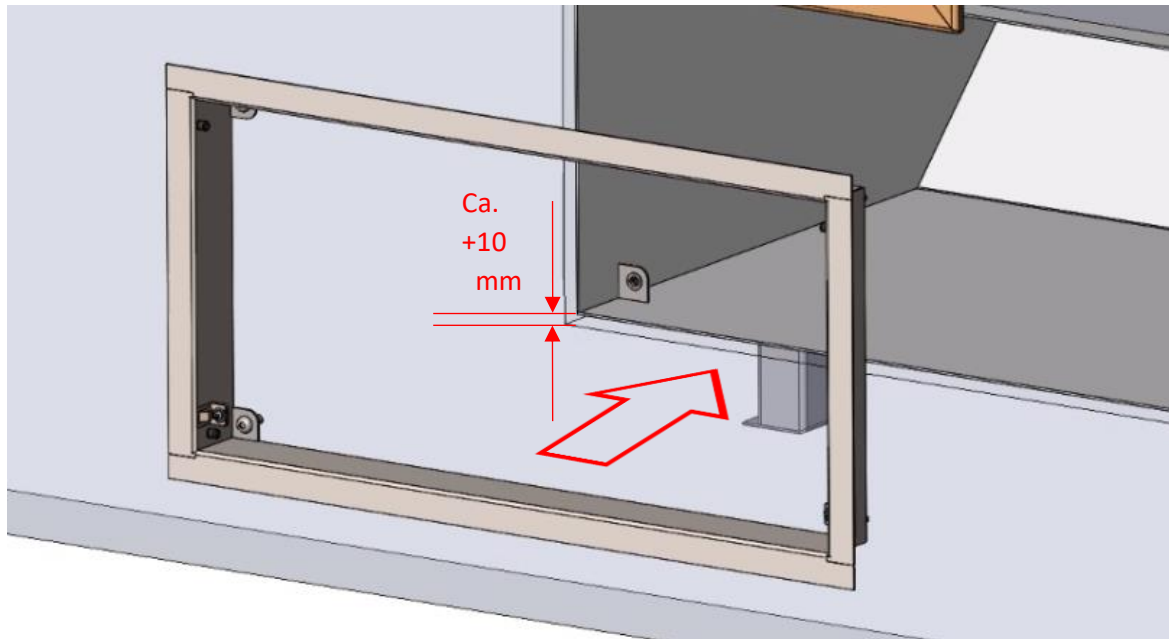
Anchors / screws and possibly gasket material for an airtight or dust-tight connection must be chosen by the contractor in accordance with the wall panel materials and -technology.



8.5.3 Air Inlet Installation

Prepare installation of the tower / the bottom collector using the installation dimensions & footprint information in the project drawing.

After placing at least the inlet collector, and fixing it to the ground, the inlet funnel may be sealed into the dry wall.



If a finishing frame (optional) with inlet grid is to be installed, sealing may be applied in the gap between the funnel and cutout or, alternatively, under the flange of the finishing frame.

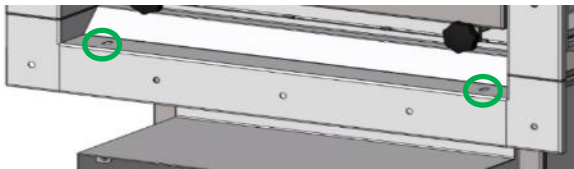
The finishing frame is fixed using 4 screws.

With a finishing frame, grid installation and -operation is tool-less.

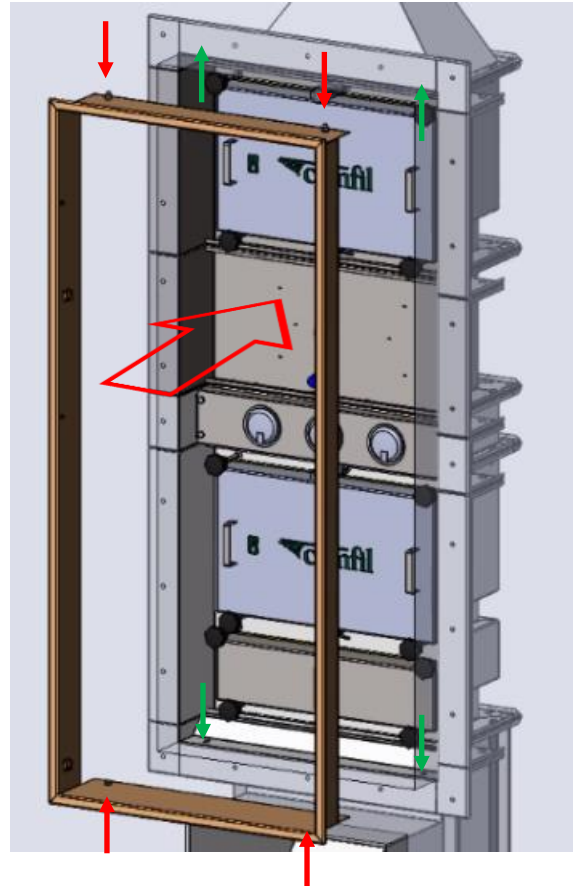
8.5.4 Door Module Installation

The door frame presents itself with a stiff 30mm flange including a 10mm backbend. This can be used for fully flush or on-top wall integration.

Insert the frame into the wall cutout and fix with bolts (2 top & 2 bottom) to the unit. Fixing holes in the wall flange are elongated to allow for compensation of slight alignment errors.

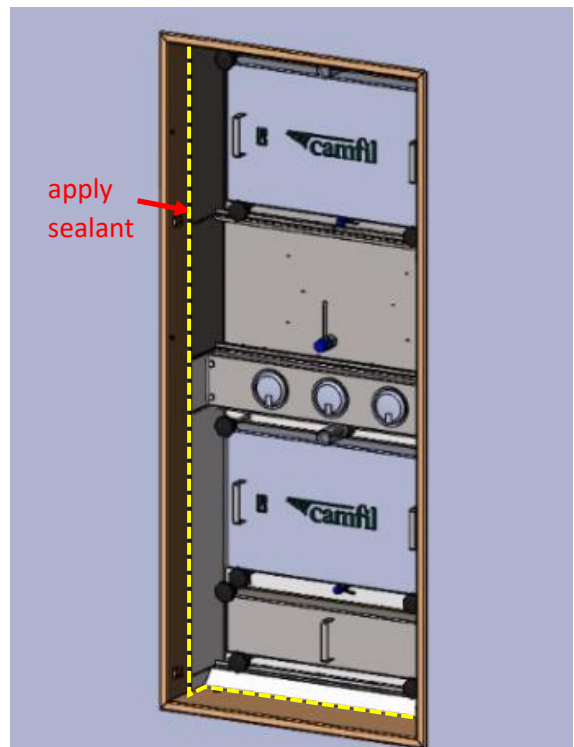


After installation and adjustment, fill the conical gap between door frame and wall-flange with sealant to obtain an airtight fit.



Door panels close by gravity (push top to open). As an option they can be fitted with push-push mini-latches for mechanical lock.

At an opening angle of approx. 30°, the panel(s) can be simply lifted out for unobstructed access to the filter stack.



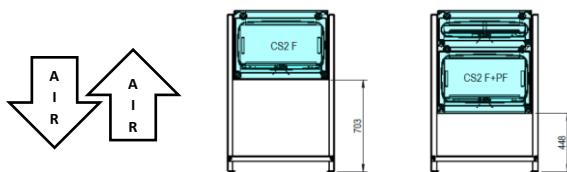
8.6 Installation of Add-ons

8.6.1 Support Stands

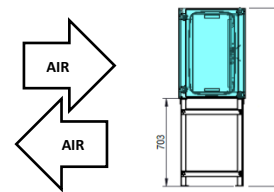
Add-on support stands are available for both vertical and horizontal airflow housings & stacks and offer a modular and economic supporting solution.

- Requires no housing modification, interfaces with the housing flange
- For single filtration columns only
- Horizontal stacks require 1 individual support per housing
- Available in all housing base materials

For Vertical airflow



For Horizontal airflow

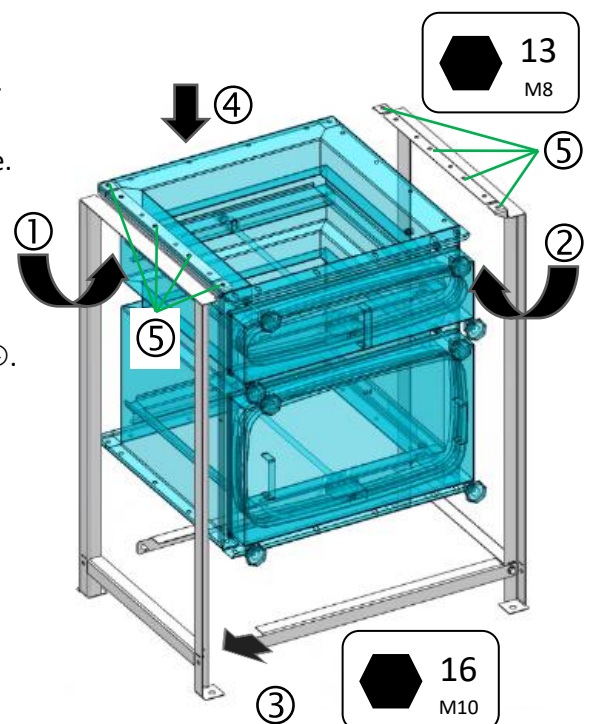


PLEASE NOTE:

Standard support stands interface with the inside of module flanges.

Left and right support have to be inserted separately. Once united, they will hold the housing even before flange bolts are secured.

- Insert 1st support side ① under the module flange. Temporarily secure with 2 screws against slipping.
- Insert 2nd support side ② under the module flange. temporarily secure with 2 screws against slipping.
- Attach support reinforcements ③. After this stage, the housing is safely captured by the support stand interface.
- Place gasket and next module or collector on top ④.
- Insert flange bolts in matching holes and tighten, [see also § 8.1](#).

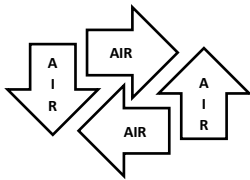


8.6.2 Manometer Supports

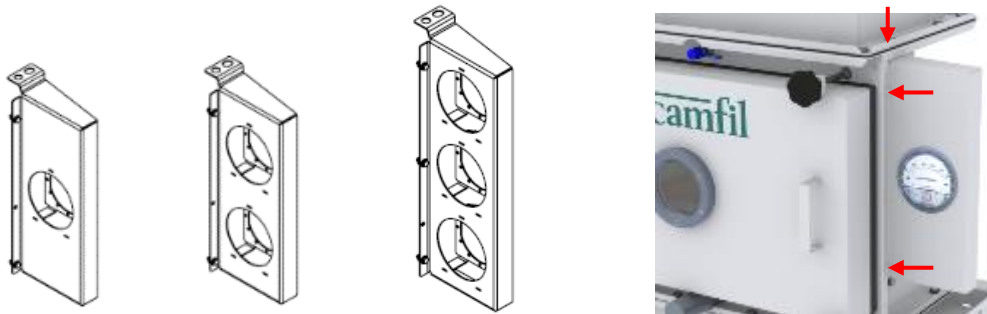
Any CamSafe housing or configuration can be optionally fitted with manometer supports.

- PLEASE NOTE :** Add-on supports are designed for Dwyer Magnahelic Series 2000 manometers. Contact your Camfil representative with clear requirements for custom integration of other manometer models.

Standard Support



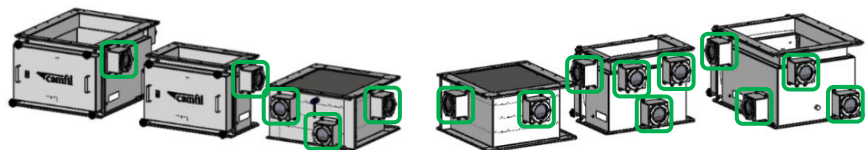
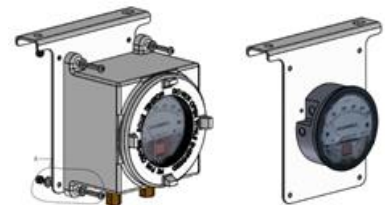
- Only for free standing housings / configurations
- Available for 1, 2 or 3 manometers per support
- Available for left- and/or right-hand mounting (top or bottom for horizontal flow housings)
- Available in all housing base materials
- Attach using 1 flange bolt and holes in the front plate side.



Frontal Support



- For ATEX manometer, but also suitable for standard versions
- Very flexible positioning of single manometers, hanging or standing on module flanges
- Attach using any 2 flange bolts.



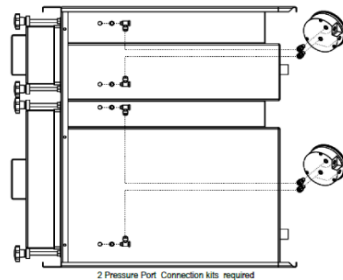
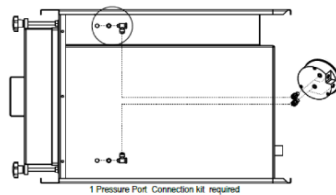
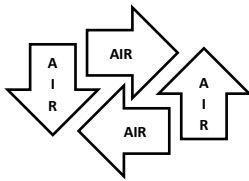
8.6.3 Manometer Hookup

Every CamSafe housing features 2 pressure ports $\varnothing 11$ mm per filter stage.

- PLEASE NOTE :** Unless specified otherwise or included in a fully assembled configuration, CamSafe filter housings are shipped with pressure ports plugged airtight with M10 bolts and washers. The systematic leakage test is performed and certified in this delivery state.

Pressure port location is dependent on the housing airflow

- Standard airflow Top \rightarrow Bottom ports on the **right**
- Inverted airflows Bottom \rightarrow Top ports on the **left**
- Horizontal airflows ports on **top**



- Choose pressure ports to activate and discard plugging bolts.
- Connect upstream housing port to the “+” port of the manometer
- Connect downstream housing port to the “-” port of the manometer

Pressure port connection kit **FC2ACC111060**

- PLEASE NOTE :** 1 kit required per manometer.

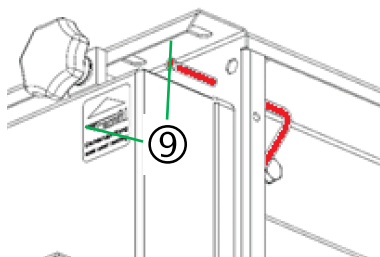
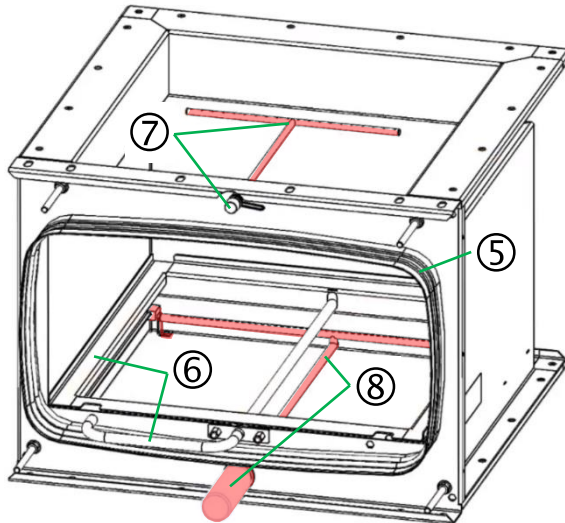
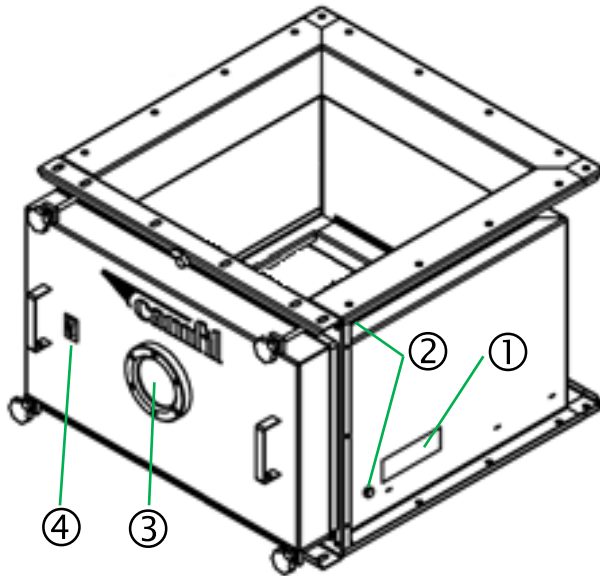
Pressure port connection kits are designed for Dwyer Magnahelic Series 2000 manometers. but can be used for any manometer with female NPT 1/8” pressure ports.



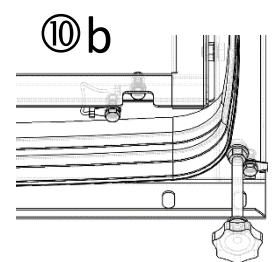
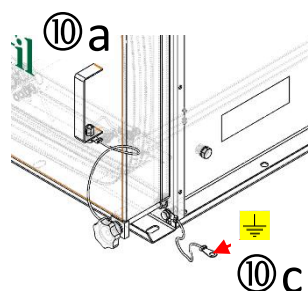
→ Please contact your Camfil representative

9 Operation

9.1 Features



- ① Serial sticker with traceability
- ② Pressure ports
- ③ Door window (**option**)
- ④ Airflow direction sticker
- ⑤ BIBO collar
- ⑥ Filter clamping frame with clamping lever
- ⑦ MIP (Manual Integrity Probe **option**)
Upstream 100 % concentration port
with static probe
- ⑧ MIP (Manual Integrity Probe **option**)
Downstream sampling port & protective cover
with mobile probe
- ⑨ DIN gasket seat testing port (**option**)
with sticker on the door
- ⑩ ATEX (**option**) mass connectors
 - a – door connection conductivity
 - b – clamping frame conductivity
 - c – general housing mass port

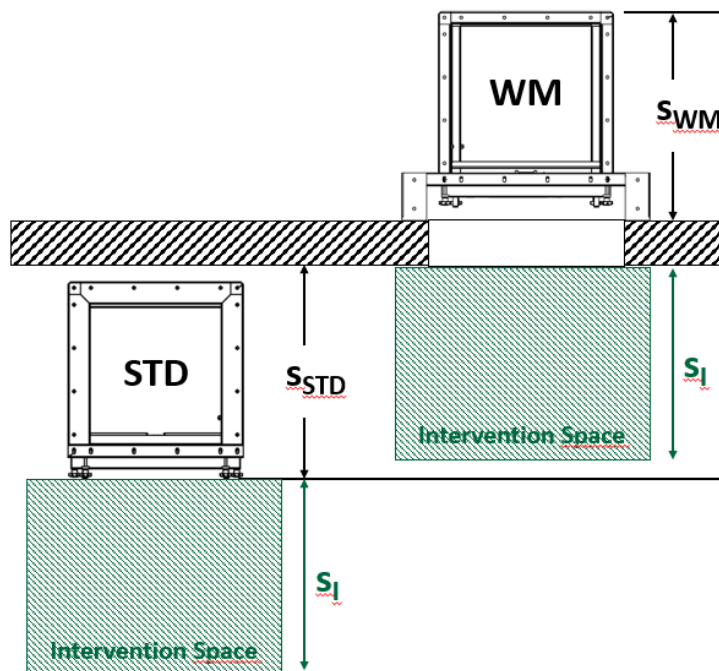


9.2 Intervention Space

For any operator intervention, access to CamSafe is from the front of the housing.

Actual minimal intervention space will depend on the housing size (filter dimensions), as well as on some options & add-ons, such as WM door panels, a handling console or custom equipment.

Recommendations for safe and ergonomic minimum interventions space :



	Housing Space [mm]		Min. Intervention Space [mm]		
	STD	WM	Filter	Operator	Recommended
3P3	600	600	400	600	1 000
3P6	600	600	400	600	1 000
6P6	900	900	700	600	1 300
7P6	1 100	1 100	800	600	1 400

(values rounded to next 100 mm)

PLEASE NOTE: As a general rule, 1 000 ... 1 500 mm from the front of the housing should be considered a minimum for safety- and ergonomic reasons.

To facilitate filter change, a handling table is available for both vertical and horizontal flow housings (see also [§ 13](#)).

9.3 Filter Compatibility


Opening values of the CamSafe 2 clamping system :


OPEN position	308 mm
CLOSED position	296 mm

Best results are obtained for filters with

body height	nom. 292 mm +0/-1 mm
PU foam gasket	nom. 7,5 mm +0/-1 mm

Full height uncompressed	~ 300 mm
Gasket compression	3,5 mm (nom.) ... 1,5 mm (worst case)

 PLEASE NOTE : 7 mm DIN gaskets on 292 mm filter bodies are compatible.
However, DIN housing sizes are limited to 6P6 max.,
because of the required compression force of this solid rubber gasket type.

 PLEASE NOTE : **Flat 5 mm EPDM gaskets are NOT compatible with CamSafe**
on 292 mm filter bodies, because of insufficient gasket compression

9.4 Filter Change

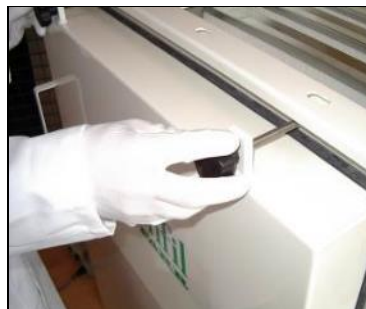
9.4.1 Filter Change without Service Bag - Standard Airflow Top → Bottom

Precautions : Make sure the airflow is shut off !
Wear adapted protective gear !

Step1 : Opening the Door



The door is held in position by 4 star-shaped knobs

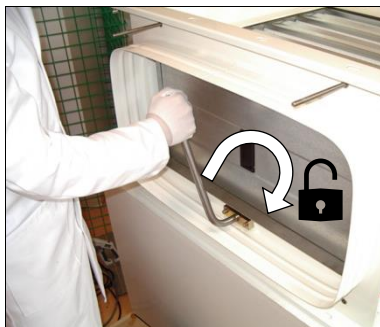


Unscrew the knobs and put them aside



Take the door off, avoid scraping on the threaded rods

Step 2 : Extraction of the soiled filter



Swing the locking lever 180° to the right to unlock filter

Please Note :

For a standard housing with airflow Top → Bottom the clamping system is located on the bottom of the filter, the filter gasket is located on the top.

Particle Filters with a metal body may reach a weight of 20-30 kg, depending of type and size.

Molecular filtration cells may weigh > 80 kg.

Anticipate the weight to be lifted !



Pull the filter using the grip



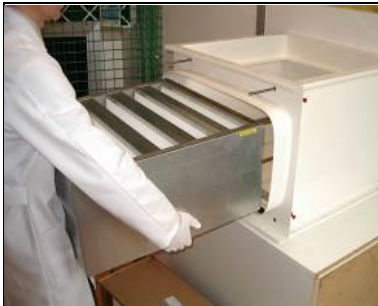
Extract the filter by pulling gently supporting the bottom



Take out the filter taking care not to touch housing sides

Step 3 : Insertion of the new filter

Precautions : Check the gasket sealing surface.
If necessary, clean with alcohol on a soft, lint-free cloth



Pick up the new filter **without touching the media** and insert carefully into the housing



The gasket needs to be on the top and the grips in the back & front



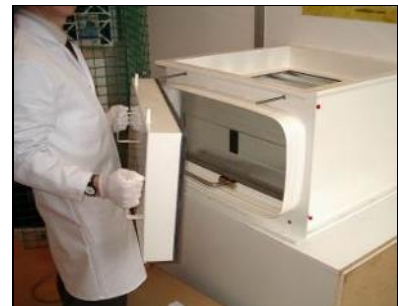
Push gently **until hitting the stop**. The lever shape ensures that only a fully inserted filter can be locked.



Swing the locking lever 180° **all the way to the left** to lock



The door can only be placed if the lever is in the locked end position



Place the door on the housing, avoid scraping on the threaded rods



Put the fixing knobs back on without locking them yet



Tighten the four knobs progressively to ensure even gasket compression



Once the knobs are locked, the intervention is finished

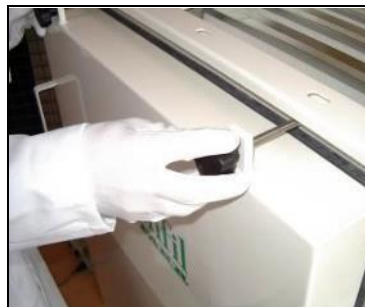
9.4.2 Filter Change without Service Bag - Inverted Airflow Bottom → Top

Precautions : Make sure the airflow is shut off !
Wear adapted protective gear !

Step 1 : Opening the door



The door is held in position by 4 star-shaped knobs

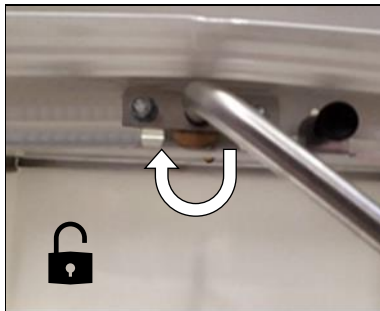


Unscrew the knobs and put them aside



Take the door off, avoid scraping on the threaded rods

Step 2 : Extraction of the soiled filter



Swing the locking lever 180° to the left to unlock filter

Please Note :

For an inverted housing with airflow Bottom → Top the clamping system is located on top of the filter, and includes 1 spring-loaded locking plunger.

It blocks the clamping frame in its OPEN end position and keeps the clamping system from being pulled out of the fully open position by the weight of the filter.

Start swinging the clamping lever to the left.

Pull on knob when feeling some resistance, and release again.

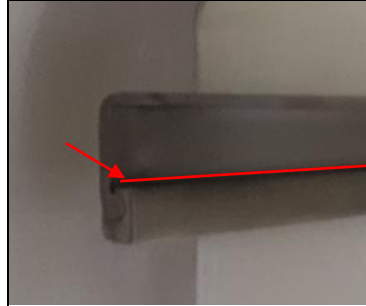
The plunger pin will engage the locking hole and lock the mechanism in its open end position.

PLEASE NOTE : In this position, the UNLOCKED filter is hanging from the clamping frame.

Step 2 : Extraction of the soiled filter (continued)



Pull the filter using the grip



Extract the filter by pulling, gently supporting the bottom



Take out the filter taking care not to touch housing sides

Step 3 : Insertion of the new filter

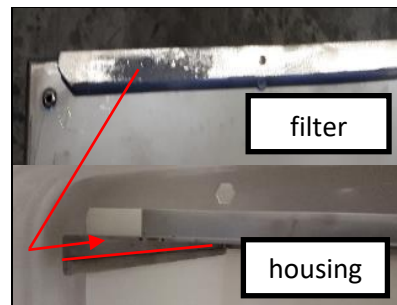
Precautions : Check the gasket sealing surface.
If necessary, clean with alcohol on a soft, lint-free cloth



Ensure the clamping system is **locked in the fully open position**



Pick up the new filter **without touching the media** and insert carefully into the housing

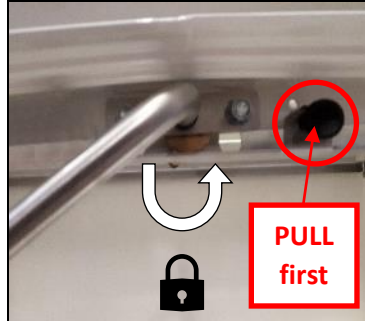


Slide the filter rails into those of the clamping system

Step 3 : Insertion of the new filter (continued)



Push gently until hitting the stop. The lever shape ensures that only a fully inserted filter can be locked



Swing the locking lever 180° **all the way to the right** to lock

Please Note :

Damage-free insertion is guaranteed for specified Camfil filters with rails only.

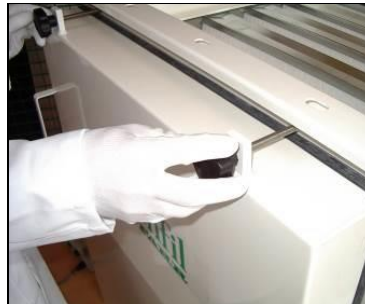
Filters without rails will fit, but safe manipulation is entirely under the responsibility of the user.

Pull on the plunger knob (opposite the lever) to unlock and start swinging, releasing the knob again. Swing the lever all the way to its end position to safely lock the filter.

PLEASE NOTE : You will not be able to place the housing door, if the lever is not in its LOCKED end position.



Place the door on the housing, avoid scraping on the threaded rods



Tighten the four knobs progressively to ensure even gasket compression



Once the knobs are locked, the intervention is finished

9.4.3 Safe Filter Change with Service Bag

Only steps regarding the safe handling of the Service Bag are described.

For basic operation of the door and clamping device, please refer to §§ 9.4.1 or 9.4.2 respectively.

Extraction of the soiled filter



Unfold the bag - or slide the bag over the collar into the first groove



Unlock the filter



Pull the filter using the grip through the end of the bag



Extract the filter into the bottom of the bag

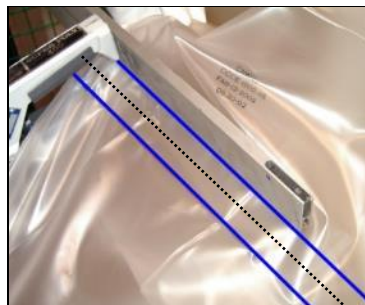


Put down the filter, leaving the bag tunnel accessible

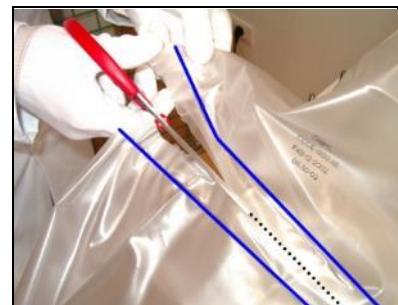
Manipulation of the filter through the bag can be facilitated using the Camfil Handling Console. (To be ordered separately)



Make a first weld above the filter, sealing the bag hermetically



Make two additional welds above the first (ca. 10 mm spacing)



Cut the bag **ON** the central weld with a pair of scissors

Once the bag is cut, a part of it remains on the housing.

This part, called the stub, will be disposed of later.

The soiled filter is now ready for disposal, sealed hermetically in the bag.

Preparation of the new filter



Place the filter with grip on top, slip the new service bag over it



Slide the bag all the way down to place the filter in the bottom



Turn the filter over and place in front of the housing



Slide the new bag over the stub and the collar



Place the O-ring of the new bag into the second groove



Verify correct filter orientation
→ Grips top & bottom

Housings with **standard airflow** (clamping frame on the bottom) :
→ Gasket in front

Housings with **inverted airflow** (clamping frame on the top) :
→ Gasket in the back
→ Rails left & right in front

Extraction of the stub



Pull the stub off the collar and slide it into the sleeve of the new bag



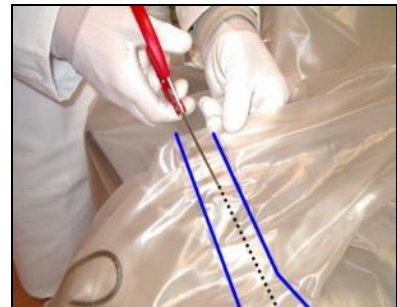
Pack the stub all the way down into the sleeve



Make a first weld above the stub, sealing the sleeve hermetically



Make two additional welds above the first (ca. 10 mm spacing)



Cut the sleeve **ON the central weld** with a pair of scissors



Hermetically sealed sleeve, ready for disposal



Ready to insert the new filter

Insertion of the new filter

Precautions : During manipulation, be careful not to jam the bag between filter and housing



Lift the filter



Make the bag slide over the filter while approaching the housing



Carefully insert the filter into the housing



Push gently until hitting the stop. The lever shape ensures that only a fully inserted filter can be locked



Swing the locking lever 180° **all the way** to lock



Slide the O-ring of the bag from the 2nd into the 1st groove of the collar



Wrap the bag



Pack the wrapped bag inside the collar



Place the door on the housing taking care not to jam the bag

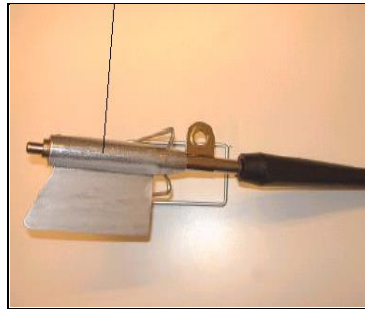
10 Option : Manual Welding Tool

Required material :

- Camfil Manual Welding Tool
- Cable binders (min 150 mm long)



Filter & bag ready to cut



Welding and cutting tool



Compression tool



Unscrew knobs to disassemble



The two parts detached



Slide the bag into the U-shape



Move the mobile part to its highest position, then re-assemble



Crank the shaft to compress the bag into the U-shape

Manual Welding Tool (continued)



The bag needs to be compressed until reaching the slotted part



Use a cable binder on each side of the tool to help the cutting process



Insert the tool with a slight sawing motion until reaching the bottom of the slot

Caution : Do not touch any other part of the bag with the hot cutting tool during this operation, as it will damage the bag and compromise containment.



Disassemble the compression tool



Disengage the two ends of the bag from the compression tool



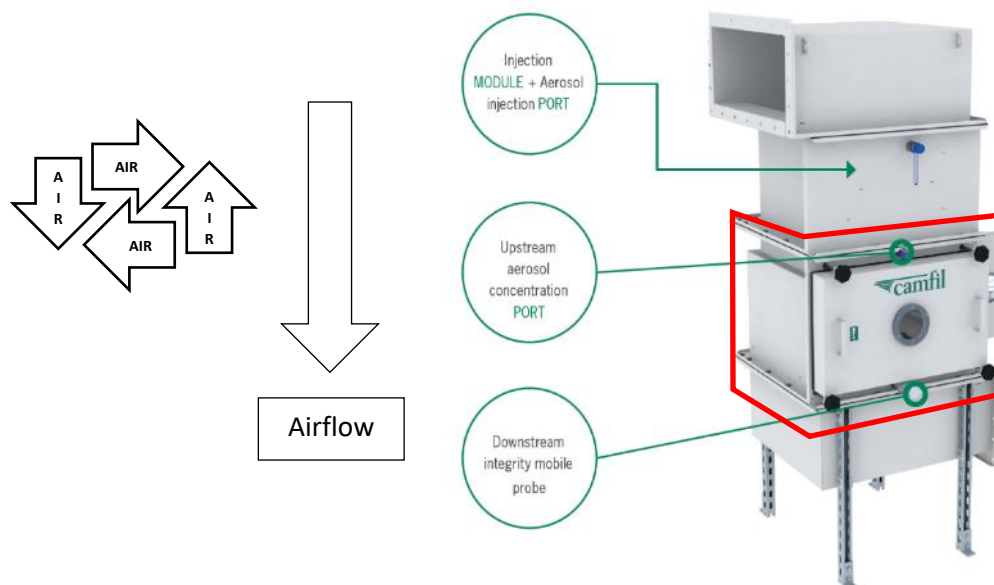
The weld / cut must cover the entire section

For removing the stub, the operation is identical.

11 Option : Mobile Integrity Probe (MIP)

The Mobile Integrity Probe (MIP) is a manual scanning system for for HEPA filter validation purposes, fully integrated into the housing. It consists of a static upstream concentration probe and -port as well as a mobile downstream sampling probe and -port.

- ➔ A comprehensive testing report on system performance is available, upon request.
 - ➔ For scanning speed and sampling rates with respect to the airflow, please refer to ISO 14644-3 or other applicable standard.
- For reliable results and an ISO 14644-3 compliant aerosol distribution, we recommend using the Camfil Aerosol Injection Module, [see § 12](#).



⚠ PLEASE NOTE:

- All generally applicable, statutory and other regulations relating to environmental protection and accident prevention must be observed.
- All safety regulations applicable to the respective area of use must be observed. This includes protective clothing (gloves, protective suits, protective goggles, breathing protection).
- CamSafe safety housings with particle measuring system must be operated on the extraction side only.
- The particle measuring system may only be operated by qualified specialist staff. The operator is responsible for the necessary training and instruction of the specialist staff commissioned by him/her.
- The operator must ensure that the CamSafe particle measuring system is only operated in proper condition.

11.1 Filter Validation with MIP

Before testing :

- Perform a zero-count
- Check airtightness of the door
- Check airtightness of the filter gasket seat



Connect
Downstream Sampling Port
(mobile)



Connect
Upstream Concentration Port
(static)

CAUTION
For upstream concentration
measurement, use a dilution
system



CAUTION
The extended downstream probe
must not be subjected
to horizontal or vertical load
to avoid damage

PLEASE NOTE: Connect a particle counter or photometer using G1/4 fittings RIEGLER 246.32 or 246.12 or equivalent.

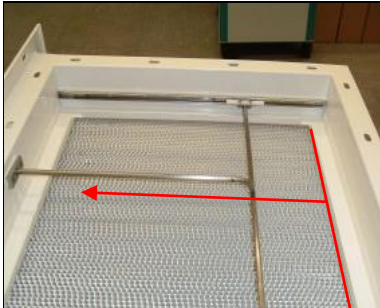


Switch off the particle counter before disconnecting as the port seals airtight automatically on both fittings!

CAUTION Do not use a MIP system with a bent or otherwise damaged mobile probe as this might result in leakage through the probe bulkhead.

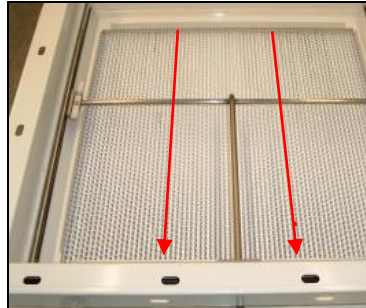
Replacement of the probe involves breaking the containment barrier of the housing !
Use original Camfil parts and specialist staff only.

Filter Validation with MIP (continued)

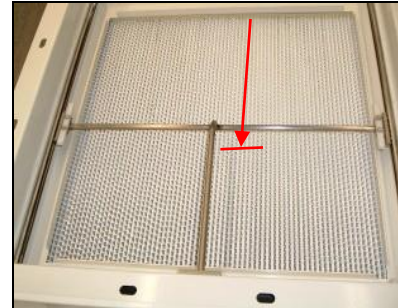


Start with the probe fully inserted and then move over the filter with a slow pulling motion

Please Note : zero count in the middle of the filter



CAUTION
Pull in a regular motion. The probe and hoses should not suffer any jolts during the procedure. This could lead to incorrect readings.

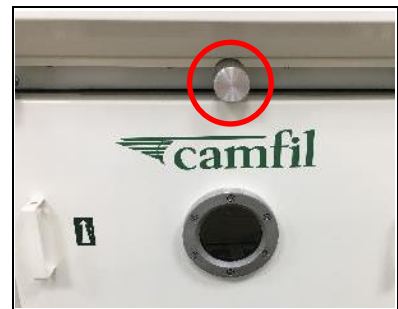


If an increased particle count is detected, stop the probe at that point. If necessary, the leak may be localized by moving the probe back and forth.



After completing the measuring procedure, remove measuring hoses from the self-sealing connectors.

CAUTION
Switch off the particle counter before disconnecting as the port seals airtight automatically on both fittings!



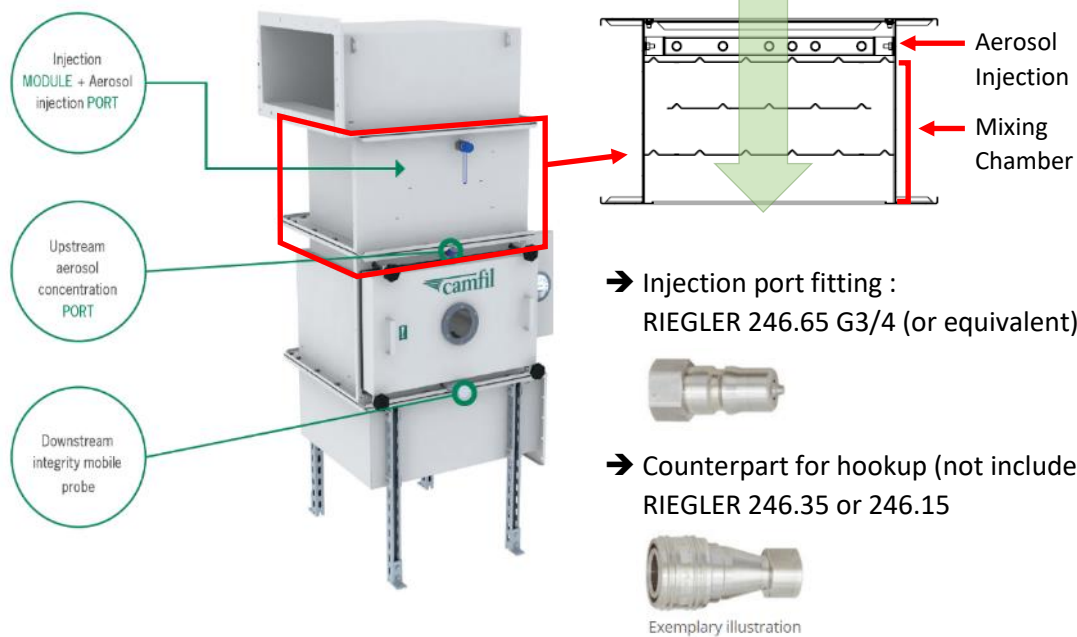
Push back the mobile downstream probe fully and screw on the protection cap.

12 Option : Aerosol Injection Module

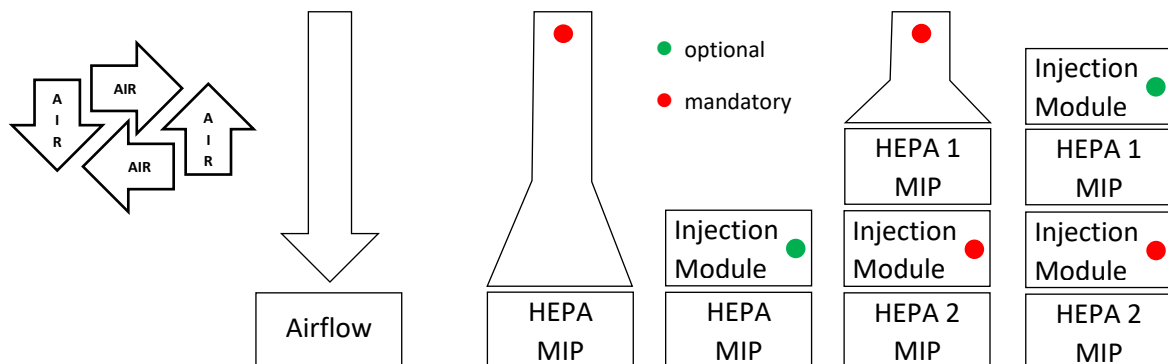
No aerosol generator is present in the Manual Integrity Probe system. Aerosol for filter validation must be injected upstream.

The aerosol injection module is an independent unit that will allow for ISO 14644-3 compliant particle injection for HEPA filter validation purposes.

Aerosol testing equipment is thus fully contained within the filter tower, meaning less aerosol required and no upstream duct soiling from aerosol injection.



PLEASE NOTE: Optional in most cases for certified distribution performance and best operation. Mandatory in-between 2 scanned HEPA stages for independent filter validation!



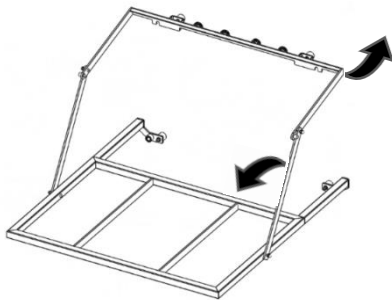
- Connect a commercial particle generator to the aerosol injection port. Make sur the connector is fastened properly onto the quick-connect-fitting. All fittings seal automatically, if no counter-fitting is attached.

13 Option : Handling Console

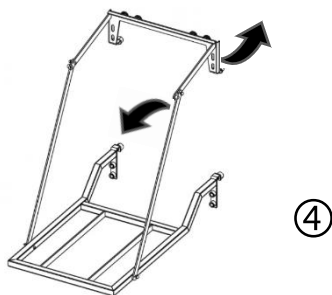
The Handling Console is a tool designed to facilitate the handling of heavy filter cells during the BIBO filter change procedure.

- Available for both vertical (top → bottom) and horizontal airflow directions
NOT available for inverted airflow and wall-mounted housings.
- Suitable for 3P6 / 6P6 / 7P6 housing sizes
- Improved interfaces to facilitate installation and protect the housing from handling damage
- Stainless steel
- Foldable for easy storage

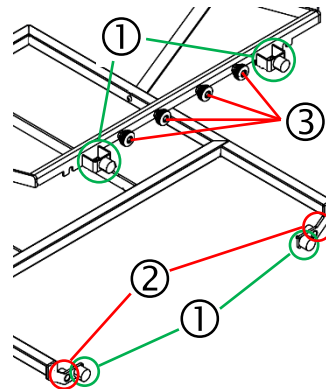
For Vertical airflow



For Horizontal airflows



Interface



① Rubber bumpers to protect housing paint

② Plastic bushings to protect door studs

③ Storage for fixing nuts

- Take off the housing door with its star buttons and put it aside
- Take off fixing nuts ③ and unfold console
- Set top support bar on the door studs and secure loosely with nuts
- Slide bottom supports on the door studs
- Tighten all nuts to a firm contact without squeezing the rubber bumpers
- Proceed with filter change procedure, [see § 9.4](#)




14 Maintenance

CamSafe safety housings don't require regular maintenance interventions.

For best performance, the following checks are recommended when changing filters :

Check the gasket sealing surface.

If necessary, clean with alcohol on a soft, lint-free cloth.

 **PLEASE NOTE** : If cleaning is necessary, this will require breaking the BIBO bag containment seal !

With long filter change cycles, the door gasket can get stuck to the front plate.

Clean markings or residue on the front plate, check door gasket condition and -bond with the door before placing the door back on the housing.

14.1 Spare Parts

CamSafe is a containment product line with accent on process and operator safety.

Most functional components installed in and on the body are replaceable, but the intervention will require breaking the containment seal.

Therefore, there are no standard components defined as customer spare parts, although most can be supplied on part- or subassembly level.

➔ Contact your Camfil representative with a clear situation description for feasibility and quotation.