CamSafe

Installation & Operating Manual

1 Updates

Date	Revision	Object	Author
2025-07-07	H	General Update	V.Parkkoin
2024-10-22	G	Correction bolt flange size, added installation manual for ABO dampers	V.Parkkoin
2024-02-27	F	Update §8.3 WM installation& §9.4 INV filter change	V.Parkkoin
2023-09-13	E	Universal HOR variants	V.Parkkoin
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

2 Content

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 § 4.2)
- Custom configurations to suit specific requirements
  Up to 6 banks for airflow ranges from 150 to 30 000 m^3/h

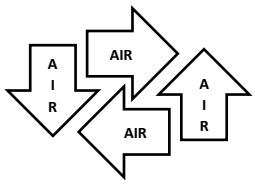
4.1.1 CamSafe Certification Levels

• Mechanical resistance of the housing	Class D3 acc. to EN 1886:2007, or better (worst case rating for 7P6 size)
• 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, or better

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” downstream 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
   Surface oscillation grinded to smooth, wipeable 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 standard housing be continuously exposed to temperatures > 90°C.
Special components are available to extend the temperature range of a custom housing. Please contact Tech.Support EMC via your Camfil representative.

△ **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.

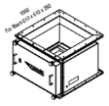
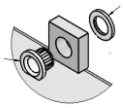
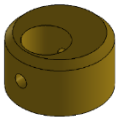
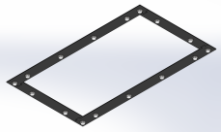
Illustration	Name	Material(s)	Temp. Max [°C]
Housing Body & Door			
	Weldment Housing body & door	(a) 1.0038 (S235JRG2) (b) SS 1.4301 (X5CrNi18-10) (c) SS 1.4404 (X5CrNiMo17-12-2)	(>250)
-	Screws & Nuts & Fittings	(a) Zn8C (b) SS A2 (c) SS A4	(>250)
-	Powder Coat Primer Topcoat	Epoxy Polyester	(<=90)
	Door Gasket	Microporous EPDM 500kg/m^3, self-adhesive	(<=80)
	Door Insert	PA2200	(<=80)
	Star Button DIN 6336-KU-63-M10-K-MS	Phenolic Resin PF31	(<=140)

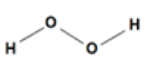
Illustration	Name	Material(s)	Temp. Max [°C]
Clamping System			
-	Stickers	PVC	(<=60)
	Clamping Frame	SS 1.4307 (X2CrNi18-09)	(>250)
	Camshaft	SS 1.4307 (X2CrNi18-09)	(>250)
	Cam	Brass 2.0402 (CuZn39Pb2)	(>250)
	Torsion Spring	SS 1.4310 (X12CrNi17-7)	(>250)
-	Screws & Nuts & Fittings	(a) SS A1 (b) SS 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

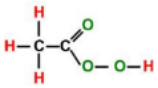
Standard housing versions feature a double-layer powder coat for enhanced corrosion protection, designed to be highly resistant to decontamination agents commonly used in Life Science and Clean Process environments.

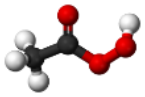
Camfil has chosen to evaluate corrosion resistance of its metal products with respect to decontamination products most commonly used by our customers.

- Hydrogen Peroxide (H_2O_2)
  https://en.wikipedia.org/wiki/Hydrogen_peroxide



- Peracetic Acid (CH_3CO_2OH)
  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 against weather impact 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 base 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.

Other raw materials with further enhanced characteristics may be offered, subject to feasibility analysis and specific quotation. Please contact EMC Tech. Support via your Camfil representative.

5 Quality Control

Quality control items for CamSafe safety housings are documented by Camfil Qualified Sub Contractors on the corresponding prescribed 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 instructions in this document completely and carefully.

△ **Precautions :** Respect applicable safety and health rules on site and wear suitable 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 modules 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

△ **PLEASE NOTE :** In case of an ATEX configuration, modules may need to be electrically linked with validated mass bridges after mounting.
Please check your project drawing for the extent of the electrostatic validity of your configuration.

8 Mounting of Configurations

The CamSafe family 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

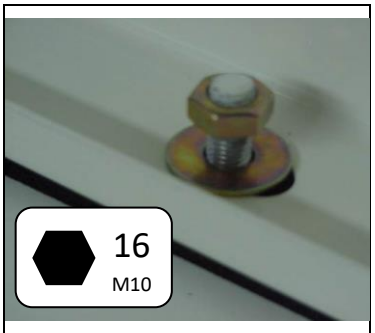
Set up the bottom collector (or lowest level module), ensure access from all sides.

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 link distortion when placing the housings.
Single piece gaskets may be wavy after unpacking. Small strips of double-sided tape on the collector flange(s) may facilitate placement of modules. **Ensure tape pieces stay well within the gasket perimeter to avoid any potential gasket lea**ks.

Place small strips of double-sided tape on the flange(s) to facilitate assembly.

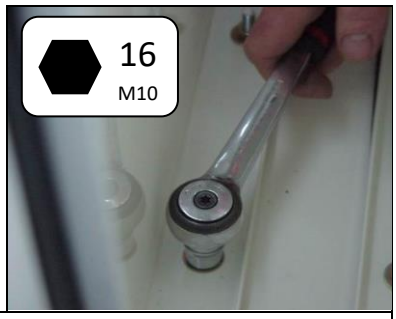


Place bolts with washers.

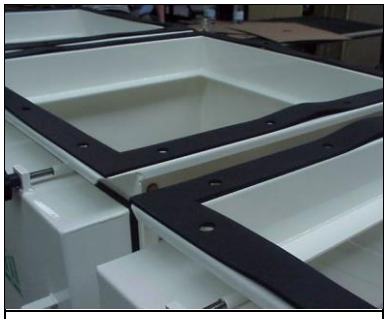
Tighten nuts, **do not block yet at this point**.

General Assembly of Housings / Collectors (continued)

Repeat for each module.



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



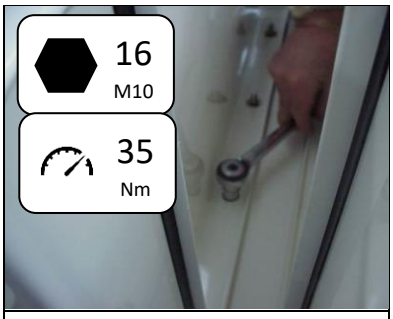
Place gasket(s) on the next flange level.

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 bolt positions close to the collar.



Tighten bolts 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.

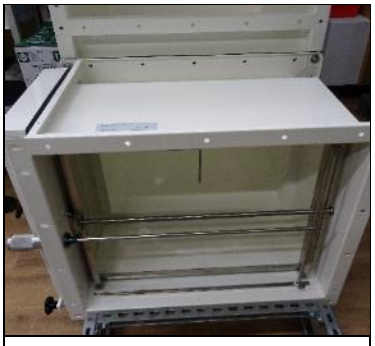
△ **Precautions :** Horizontal flow involves temporarily cantilevered modules during assembly.
Prepare wooden or plastic shims for temporary alignment support.
Configurations may reach important height.
Consult drawings for dimensions, weight and centers of gravity.
Respect applicable work safety rules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

Place 1st collector
on the support stand.

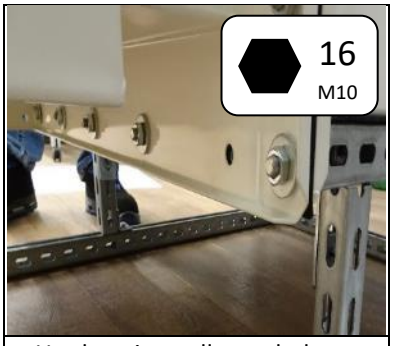
Position collector
and secure against tipping over.

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

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



Place 1st module,
aligning flange holes.

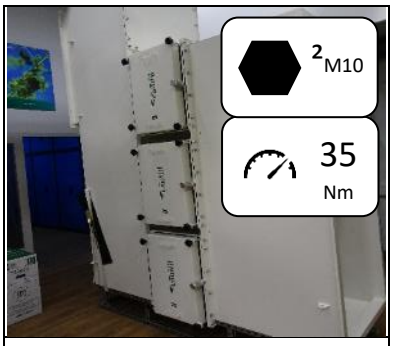


Use housing-collector bolts to securely link to the support stand. Tighten nuts, do not block yet at this point.

Assembly of Horizontal Airflow Configurations (continued)

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

Repeat as required for further modules / stages.



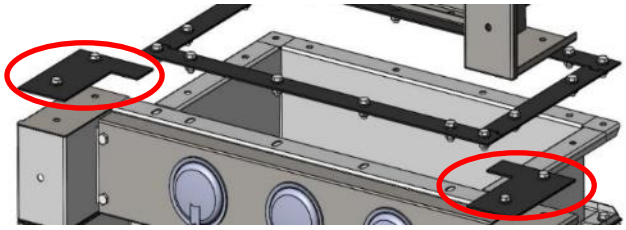
Check modules alignment and tighten all bolts to torque.

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.

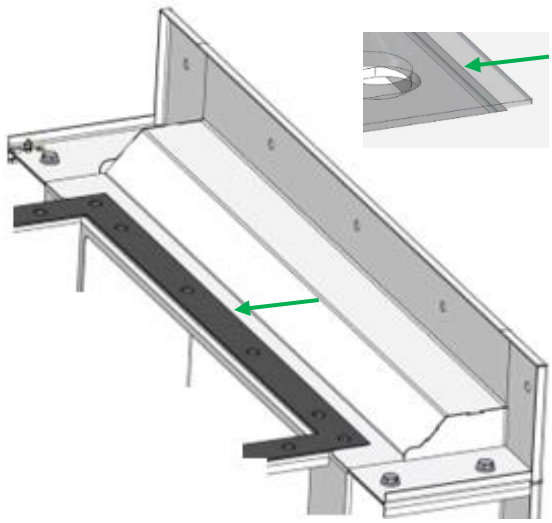
Airtight assembly is required, instruction for module / gasket assembly from General Housing / Collector Assembly § 8.1 fully apply.

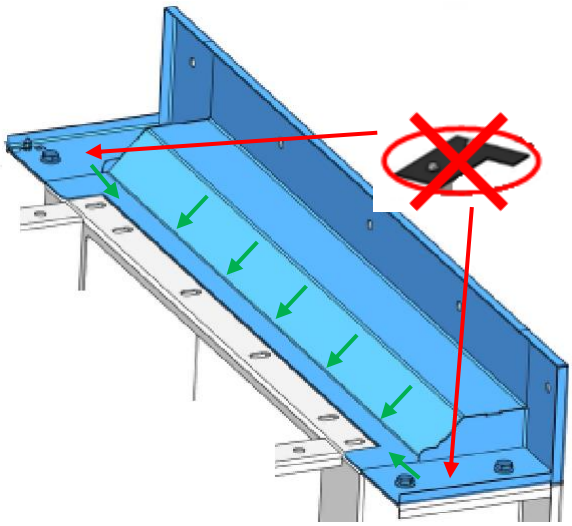
PLEASE NOTE:
Wall-mounted modules include gasket-kit extensions for the flange. Their purpose is to compensate the thickness of the main gasket on wall flange level.
They do not contribute to the containment barrier of the process air, but do separate the cleanroom from the technical area.



8.3.1 Flange End Installation

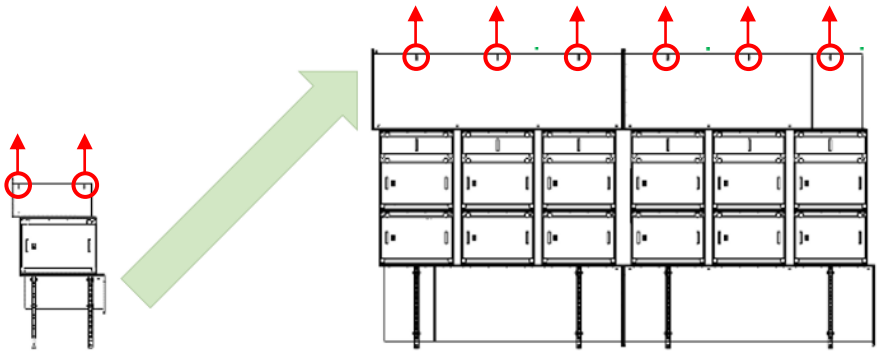
Install the knife edge of the flange end against the gasket edge.
When the flange gasket gets compressed, the connection will be sealed.
Flange ends on top and bottom are normally installed without gasket kit extensions, although those may be optionally included.





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.

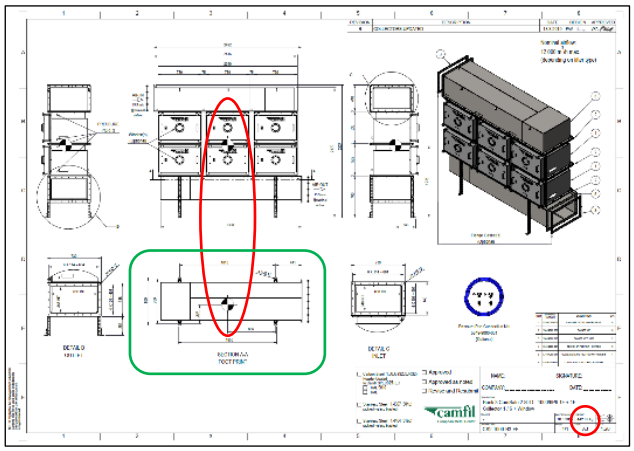


PLEASE NOTE: Top collectors feature lifting rings for manipulation of the assembled configuration.

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 will be mandatory in most controlled environments 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.

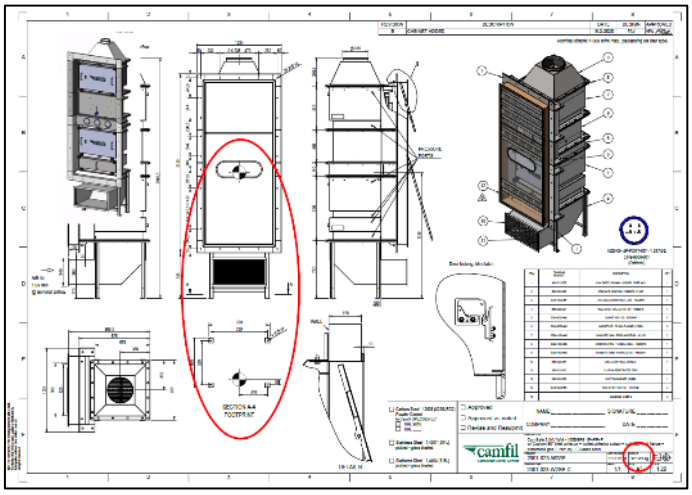
8.5 Installation of Wall-mounted Configurations

Wall-mounted configurations are designed with a wall-flange, allowing airtight installation in a technical area with filter access from inside the cleanroom.
Wall-mounted configurations can be installed module-by-module or as a completed tower.

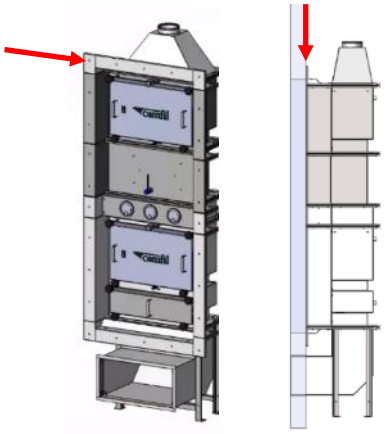
△ **PLEASE NOTE:** Access to both sides of the wall is required for the installation.

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 it's 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 of module gaps

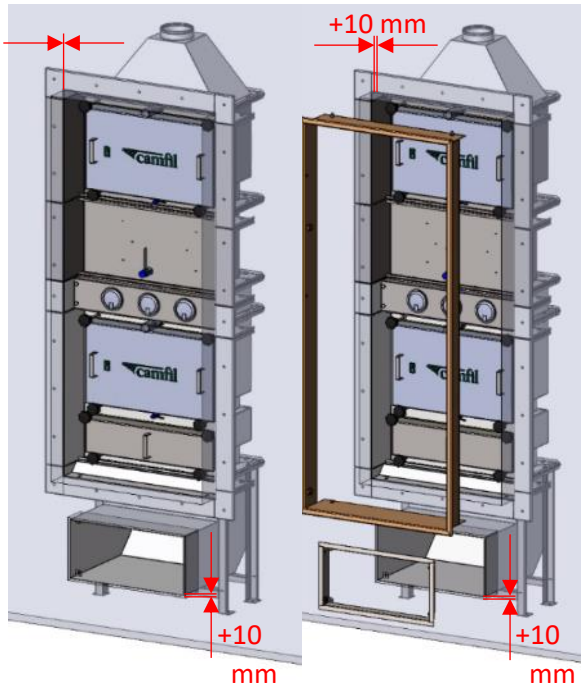
8.5.1 Wall Cutout Dimensions

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 Camfil door module or a customer in-house solution.

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**.



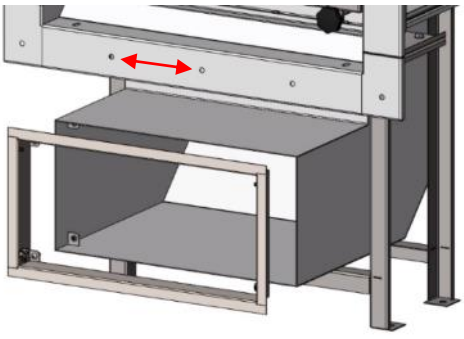
PLEASE NOTE:
The door frame is an adaptor part, specific to the actual wall thickness.

For dimensions and positions of the wall flange, consult the project drawing.
3D models for integration purposes are available on simple request, please contact EMC Tech. Support via your Camfil representative.

8.5.2 Wall Flange

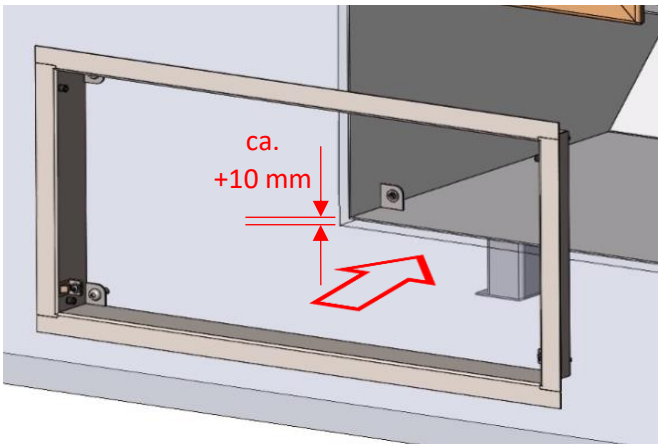
The wall flange circumscribes the full functional stack of the configuration.
D12 holes are available at distances of 250mm or less to fix the sealing surface to the wall.

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.

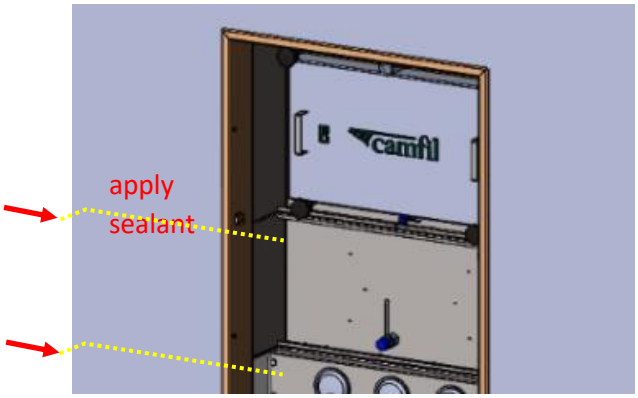
The standard finishing frame is fixed using 4 screws.
With a finishing frame, grid installation and -operation is generally tool-less, except in case of certain custom design solutions.

8.5.4 Module Sealing from the Cleanroom

Process air containment is ensured by the main module gaskets.

Dust-tight separation of the cleanroom from the technical area is ensured by the gasket extensions.

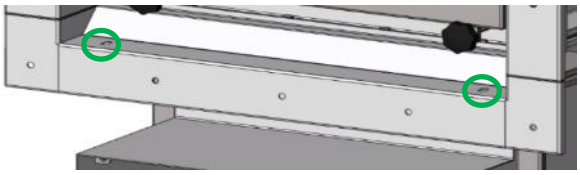
ⓘ PLEASE NOTE: We recommend caulking gaps between modules and flange ends with sealant for enhanced surface cleaning and/or decontamination from the Cleanroom.

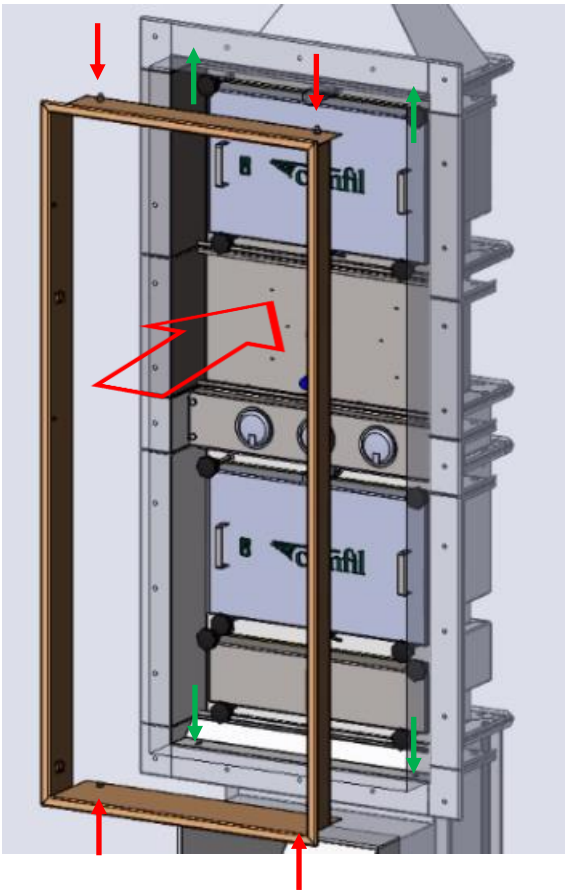


8.5.5 Door Module Installation

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.

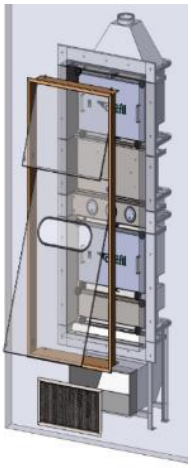




After installation and adjustment, fill the conical gap between door frame and wall-flange with sealant to obtain an airtight fit and easily cleanable surface.

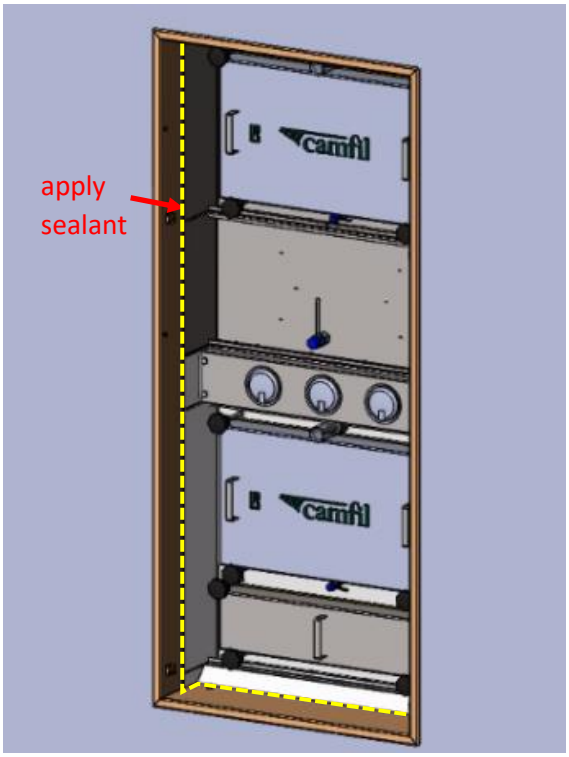
Door panels close by gravity (push top to open).

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



Please note, this feature may differ for your configuration, being customized to specification.

As an option, they can be fitted with push-push mini-latches or ¼-turn locks for a mechanical lock..



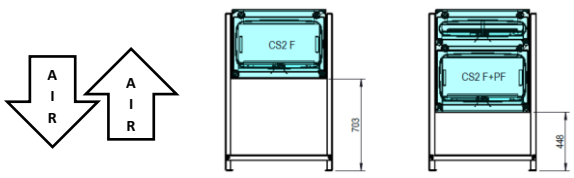
8.6 Installation of Add-ons

8.6.1 Support Stands

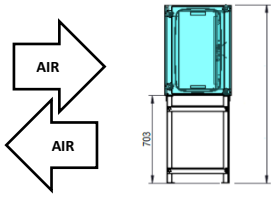
Add-on support stands are available for both vertical and horizontal airflow housings & stacks and offer a modular and economic supporting solution.

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

For Vertical airflow

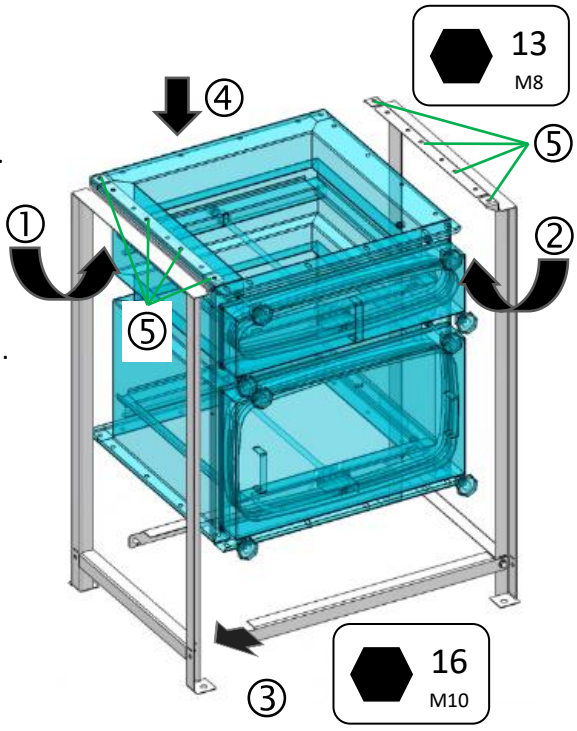


For Horizontal airflow



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 ties 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 ⑤ and tighten, see also § 8.1.

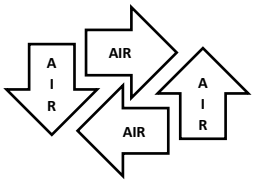


8.6.2 Manometer Supports

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

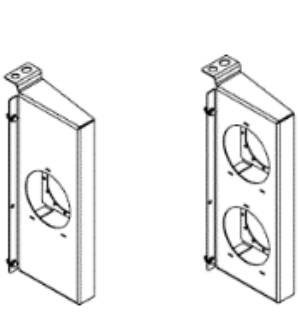
ⓘ **PLEASE NOTE :** Add-on supports are designed for Dwyer Magnahelic Series 2000 manometers. For custom integration of other manometer models, contact your Camfil representative with clear requirements.

Standard Support

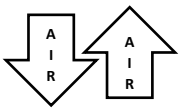


- Only for free standing housings / configurations
- Available for 1, 2, 3, 4 or 6 manometers per support
- Available for left- and/or right-hand mounting (top or bottom for horizontal flow housings)
- Available in all housing base materials

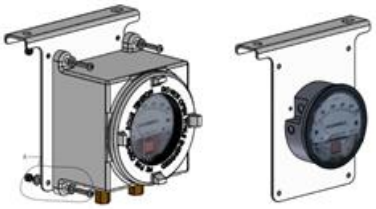
- Attach using 1 flange bolt and holes in the front plate side.



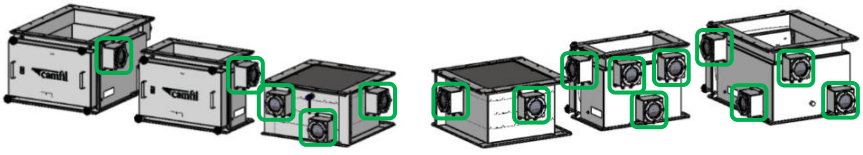
Frontal Support



- 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

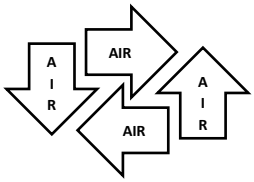
Every CamSafe housing features 2 lateral pressure ports Ø11 mm per filter stage.

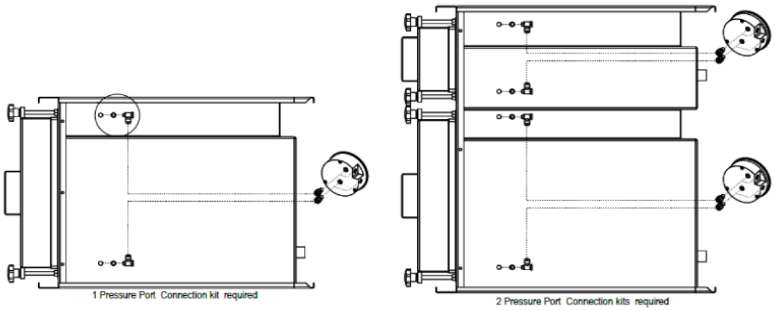
Horizontal flow housings feature 2x2 ports, on both sides.

ⓘ **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. Seen from the front :

- Standard airflow Top → Bottom — 2 ports on the **right**
- Inverted airflows Bottom → Top — 2 ports on the **left**
- Horizontal airflows — 2 ports on **both sides** (top & bottom)



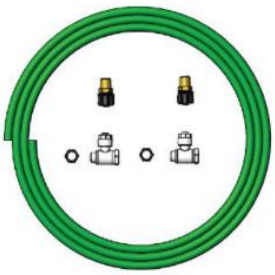


- Choose pressure ports you need to activate and discard their plug bolts.
- **For horizontal flow housings, activate ports on top ONLY** to avoid pot. pooling of liquids in the pressure tubes.
- Connect upstream housing port to the “+” port of the manometer
- Connect downstream housing port to the “-” port of the manometer

Pressure port connection kit **FC2ACC1111060**

ⓘ **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**

8.6.4 ABO shut-off valves

As a standard for bubble tight shut-off valves, Camfil proposes products from the ABO 900 series.

Camfil standard selection

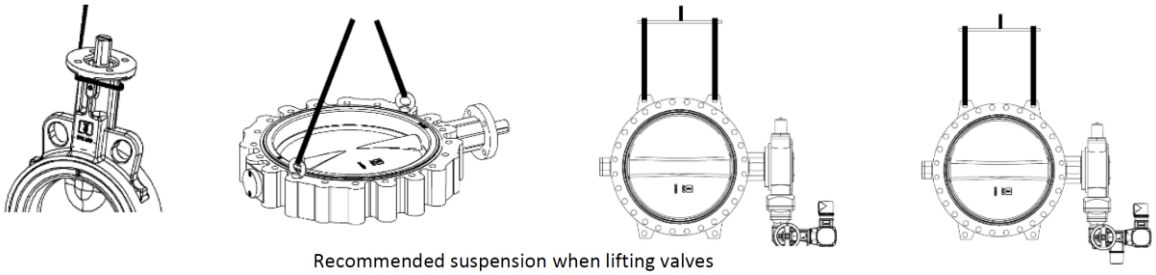
Item	Name	Material
1	Body	Ductile iron 0.7040 (EN-GJS-400-15) epoxy coated Carbon steel 1.0625 (WCB) Low temperature carbon steel 1.1156 (LCC) Stainless steel 1.4408 (CF8M) Aluminium EN AC 43000 (C95500) Aluminium bronze 2.0975 (C95800)
2	Disc	0 – Brass 2.0402 (UNS C38000) 1 – Aluminium bronze 2.0975 (C95800) 2 – Stainless steel 1.4308 (CF8) 3 – Ductile iron 0.7040 (EN-GJS-400-15) epoxy coated* 4 – Stainless steel 1.4408 (CF8M)* 5 – Hastelloy® 6 – Stainless steel 1.4539 (NO8904) 7 – Titanium
3	Seat	1 – NBR -10°C to 100°C 2 – EPDM -25°C to 125°C 3 – Carboxylic NBR -10°C to 100°C 4 – Viton® (FKM) -15°C to 150°C 5 – Steam silicone (MVQ) -30°C to 140°C 6 – Silicone (MVQ) -30°C to 150°C 7 – Epichlorohydrin -30°C to 70°C 8 – Hypalon® (CSM) -25°C to 120°C 9 – NBR 70-AG -10°C to 60°C NBR conductive -10°C to 80°C

These central butterfly valves are designed to be installed between the flanges of a piping system, to shut off and possibly control the flow of media in the piping.

ⓘ **PLEASE NOTE :** Installation instructions below may not be suitable for valves other than the ABO 900 series.

△ **Safety & Installation Precautions**

- ➔ It must be ensured that the material of the valve components that comes in contact with the transported medium is suitable for that medium.
- ➔ The position of the lever shows the position of the disc. The lever is perpendicular to the pipe - the valve is closed; the lever is parallel to the pipe - the valve is open.
- ➔ For valves DN 300 and larger, a horizontal shaft position is recommended. For DN 32-250 valves, any position is permitted (unless there is a restriction from the actuator manufacturer).
- ➔ The valves should be manually controlled without extra effort. It is not allowed to strike the valve or use any extensions to enlarge the leverage.
- ➔ Lift the valve with ties stretched through ears, eyebolts bolted into the body of the T design or the valve neck. Never lift with ties pulling the actuator or stretched through the inner opening of the valve for the disc.

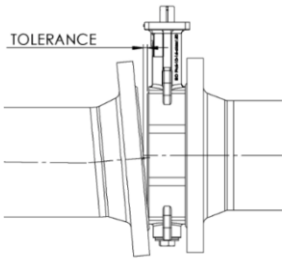


Recommended suspension when lifting valves

- ➔ If necessary, support the valve during installation (during installation only) to prevent unnecessary stress caused by connecting the pipes.
- ➔ The pipe flanges must be parallel and the axes of both pipes must be coaxial. Non-parallel flange adjustment leads to leakage in the seat because the pressure on the seat will be uneven. Flange parallelism tolerance according to EN558. The check of the inner diameter of pipe flanges is very important for a reliable valve function.

Tolerances of parallelism

DN	Tolerance[mm]
32-150	0,6
200-300	0,8
350-500	1,0
600-800	2,0

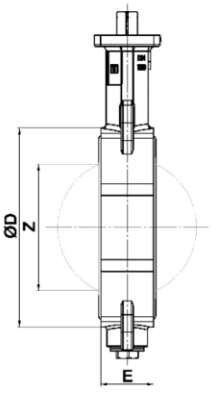


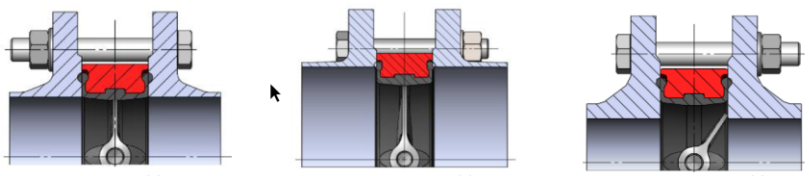
Parallelism of flanges

- ➔ It must be ensured that the material of the valve components that comes in contact with the transported medium is suitable for that medium
- ➔ Check the inside diameter of the companion flanges for correct function of the valve (rotation of the disc). For information on the size of the disc outlet from the valve, see table below.
  Possible misalignment of the pipe flanges, disc clearance, imperfect centering of the valve and the shape of the seat must be taken into account!
  Too small inner diameter of the pipe flange leads to obstruction of the disk and can cause serious damage and valve malfunction. Too large inner diameter of the pipe flange can disable proper function of the inner seal between the disc and the seat, or proper function of the isolation between the seat and the pipe flange.

Dimension of the disc overlap from the valve and inner diameter of the flange

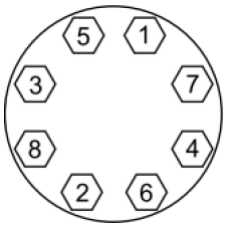
DN		Overlap of the disc from the valve Z, mm	Construction length E, mm	Inner diameter of neck flange EN1092-1 type 11 on pipe PN6,10,16, Cl. 150 (GOST PN16), mm	Min. inner diameter of the pipe flange, mm
32	1 1/4 "	22	33 B, T	32.8 -37.2 (31)	31
40	1 1/2 "	22	33 B, T	39.3-43.1 (38)	31
50	2 "	24	43 B, T / 111 F	51.2-54.5 (49)	34
65	2 1/2 "	45	46 B, T / 115 F	70.3 (66) 62.7 Cl. 150	54
80	3 "	65	46 B, T / 117 F	82.5 (78)	72
100	4 "	85	52 B, T / 130 F	100.8-107.1 (96)	90
125	5 "	111	56 B, T / 143 F	125-131.7 (121)	119
150	6 "	137	56 B, T / 143 F	150-159.3 (146)	146
200	8 "	190	60 B, T / 155 F	207.3-206.5 (202)	196
250	10 "	239	68 B, T / 168 F	254-260.4 (254)	249
300	12 "	289	78 B, T / 182 F	309.7 (303)	297
350	14 "	327	78 B, T / 194 F	339.6-352 (351)	335
400	16 "	363	102 B, T	390.4-403 (398)	370
450	18 ”	425	114 B, T / 227 F	441 (442,8)	433
500	20 "	474	127 B, T / 234 F	492 (501)	484
600	24 "	559	154 B, T / 272 F	590-595.8 (602)	566




proper assembly
improper assembly
improper assembly
Mounting between flanges

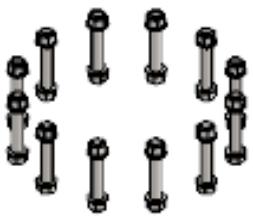
Assembly Steps

- Insert the valve with a slightly open butterfly (approx. 15°) in-between the flanges (the butterfly must not exceed the construction length of the valve body). Then lightly tighten and center the valve with the 2 upper and 2 lower screws. Do not use any additional gaskets between the pipe flanges and the butterfly valve.
- Open the valve passage and verify that the disc is easily movable (i.e. it does not touch the counterpart).
- Spot weld the flanges at several places to the pipe.
- Then remove the valve and weld the flanges around the entire circumference to the pipe.
  After the flanges have cooled down, re-insert the valve between the pipe flanges (with sufficient clearance), align and tighten the 4 bolts. Open the valve passage and verify that the disc is easily movable throughout its range of motion.
- Add the other bolts and tighten them crosswise.
- Tighten the bolts so that the companion flange only lightly touches the metal of the valve body. In this way, an optimal and sufficient seal is achieved. This condition needs to be checked visually.
- Uneven tightening of the bolts results in increased valve torques.
- Check the proper function of the valve (the disc must not hit the pipe flanges).
- Due to the fact that the pipes may suffer from prestressing, misalignment or non-parallelism of flanges, or expansion of flanges is greater than the construction length, proper tightening of the valve in the flange joint cannot be guaranteed by checking the tightening torque only.



PLEASE NOTE : Camfil proposes Damper Connection kits (sets of adapted bolts) in A4 quality for installation of most common damper sizes.

Damper size	Nb. Bolts	Item-Nr.
DN150	8	1076060
DN200		
DN250	12	1076061
DN300	12	1076063
DN350		
DN400	16	1076066



ⓘ Flange bolt tensioning

➔ When installing centric butterfly valves in a piping system, there are several factors that affect the tightening torques. Below is a list of information that affects tightening torques.

Valve	Type / Size / Material	**Lubrication**	Applications / Type
Flange	Type / Size / Surface finishes	**Torque wrench**	Usage/ Accuracy
Bolt/ Stud	Type / Material / Surface conditions	**General factors**	Temperature / Screw tightening speed / Method of tightening (cross-tightening to evenly distribute the tension on the connections)

➔ Complete knowledge of all relevant conditions is almost impossible to obtain, so torque information can only be an approximate recommendation.

➔ The tightening torques in are valid only for ABO S900 soft-sealing dampers where the sleeve acts as an inter-flange seal. They are not valid for other types of butterfly valves.

➔ Tightening must be carried out sequentially, always cross-wise, with gradual tightening to 15 % / 40 % / 100 % of the specified torque M_k.

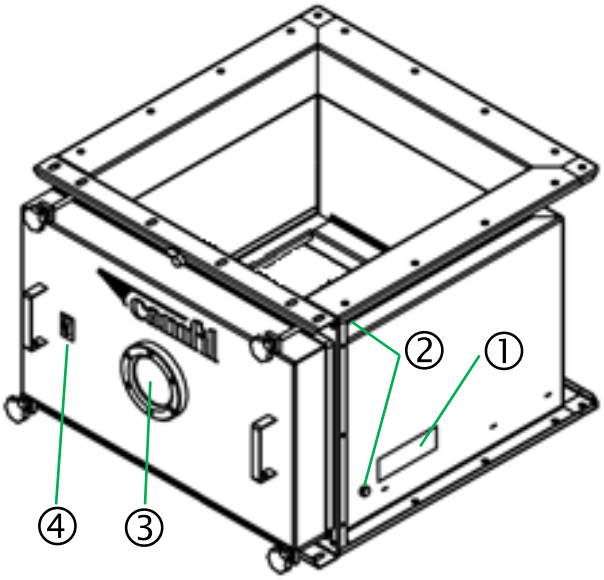
Recommended bolt tightening torques M_k [Nm]

Screw		M_k [Nm]	Screw		M_k [Nm]
M12		20-30	M30	1 1/8“-7 UNC	170-220
M14	1/2“-13 UNC	30-40	M33	1 1/4“-7 UNC	190-340
M16	5/8“-11 UNC	50-55	M36		220-460
M20	3/4“-10 UNC	60-100	M39	1 1/2“-6 UNC	250-550
M24	7/8“-9 UNC	90-150	M45	1 3/4“ UNC	450-800
M27	1“-8 UNC	160-200	M52		950-1300

➔ Tightening torque values are based on the use of new, lubricated fasteners.
When using unlubricated fasteners, 20% may be added to the recommended tightening torque values. Torque should only be increased in the event of a leak at the flange joint and only after approval by the manufacturer after checking all the above factors.

9 Operation

9.1 Features



① Serial sticker with traceability data

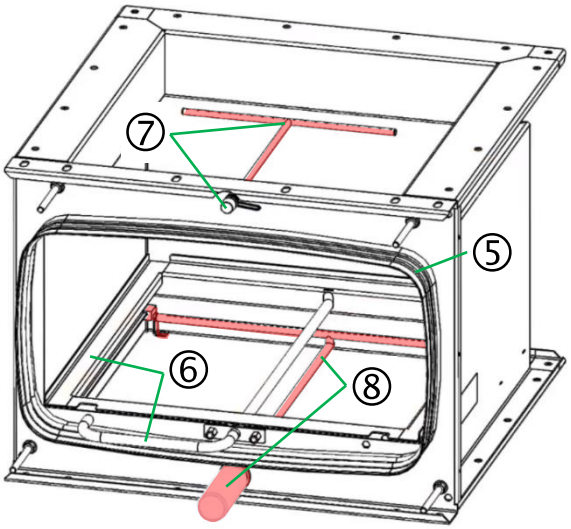
② Pressure ports

③ Door window **(option)**

④ Airflow direction sticker

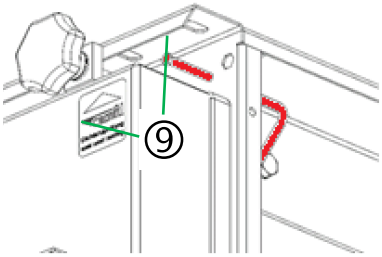
⑤ BIBO collar

⑥ Filter clamping frame with clamping lever



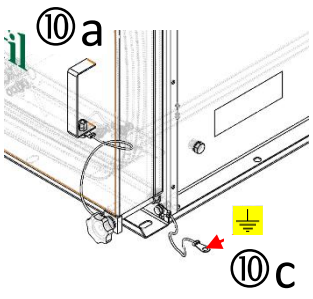
⑦ MIP - Manual Integrity Probe **(option)**
Upstream 100 % concentration port
with static probe

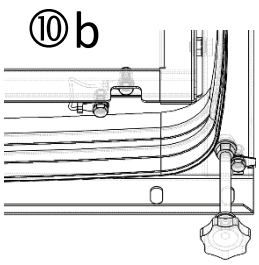
⑧ MIP - Manual Integrity Probe **(option)**
Downstream sampling port & protective cover
with mobile probe



⑨ DIN gasket seat testing port **(option)**
with sticker on the door

⑩ ATEX (**option**) mass connectors
a – door connection
b – clamping frame connection
c – general housing mass port



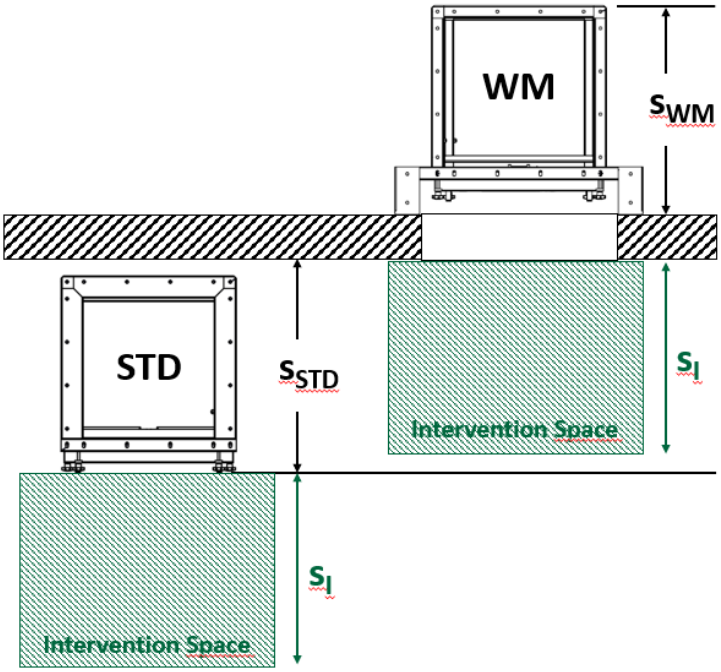


9.2 Intervention Space

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 (height clearance) 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 with the clamping system.
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

ⓘ PLEASE NOTE : For ATEX housing variants (**option**), corresponding filters need to be certified for electrostatic safety as well. The system aptitude will be determined by the lower ATEX rating between housing and filter.
A specific mass cable connection between filter and housing is NOT required. Metallic contact between the clamping frame and the filter body is sufficient for safe operation.

9.4 Filter Change

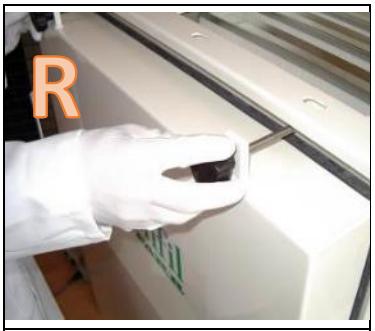
9.4.1 Filter Change without Service Bag - Standard Airflow Top ➔ Bottom

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

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 !

Step1 : Opening the Door and unlocking the filter

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



Unscrew the knobs and put them safely aside with the door.

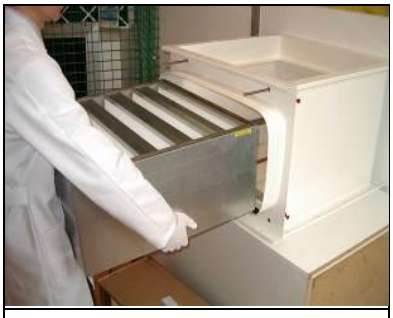
Swing the locking lever 180° **to the right** to unlock filter.

Step 2 : Extraction of the soiled 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.
Access is on the clean side, downstream of the filter.

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.

Put the fixing knobs back on without locking them yet.

Tighten the four knobs progressively to ensure even gasket compression.

With the knobs locked, the intervention is finished.

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

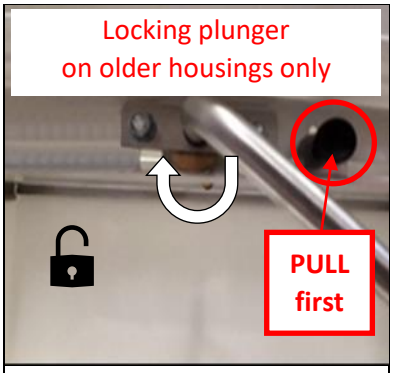
Precautions : Make sure the airflow is shut off !
Wear adapted protective gear !

Particle Filters with a metal body may reach a weight of 20-30 kg, depending of type and size.
Anticipate the weight to be lifted !

Step 1 : Opening the door

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

Unscrew the knobs and put them safely aside with the door.



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

Step 2 : Extraction of the soiled filter

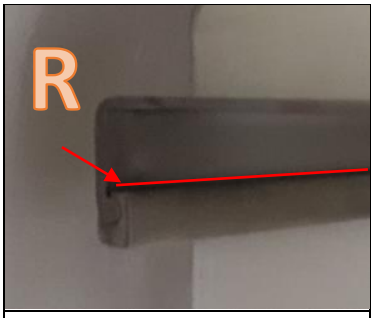
△ **PLEASE NOTE :**
For a housing with "inverted" airflow Bottom ➔ Top, the clamping system is located on top of the filter, the filter gasket is located on the bottom.
Use only approved Camfil INV filters with rails to avoid destroying the filter gasket.

△ Older housings include 1 spring-loaded locking plunger, which blocks the clamping frame in its end position.
This plunger has to be pulled first to operate the clamping lever :
Start swinging the clamping lever to the left.
Pull on the plunger knob (if present, behind the lever) when feeling some resistance, and release again.
The plunger pin will engage the locking hole and lock the mechanism in its open end position.

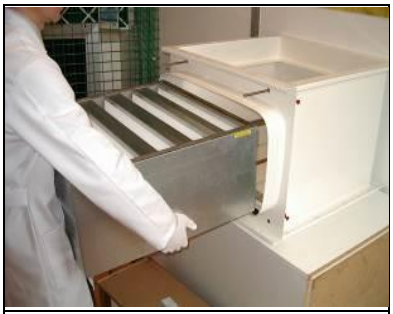
ⓘ **PLEASE NOTE :** In this position, the UNLOCKED filter is hanging from the clamping frame rails.

Step 2 : Extraction of the soiled filter (continued)

Pull the filter using the grip.



Extract the filter by pulling, gently supporting the bottom.

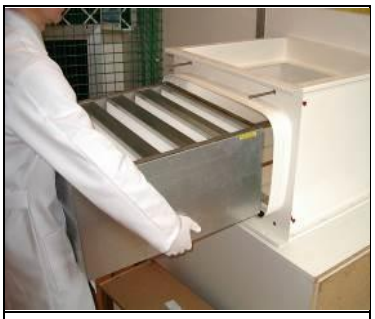


Take out the filter taking care not to touch housing sides.

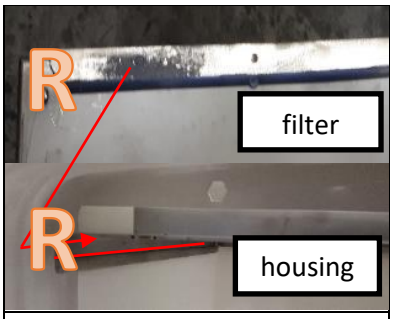
Step 3 : Insertion of the new filter

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.

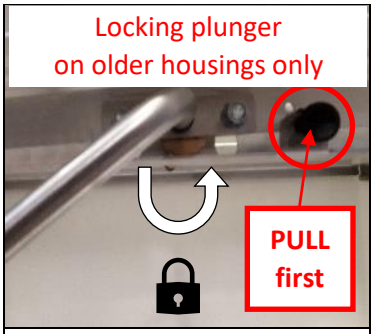


Slide the filter rails into those of the clamping system.

ⓘ **PLEASE NOTE :** If the filter rails jam during extraction or insertion, do not try to keep moving the filter by force. Rather try to slightly lift the filter and shift it towards the side where the jam seems to be occurring and resume movement from there.

Step 3 : Insertion of the new filter (continued)

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



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

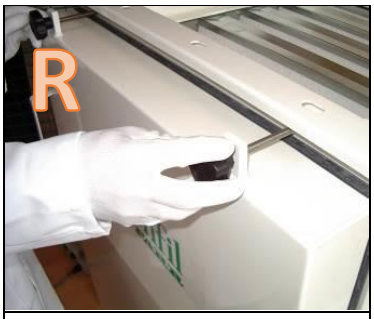
PLEASE NOTE :
Risk of destroying the filter gasket !
Damage-free insertion is guaranteed for specified Camfil filters with rails only.

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

Pull on the plunger knob (if present, 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.



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 9.4.2respectively.

Extraction of the soiled filter

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

Unlock the filter.

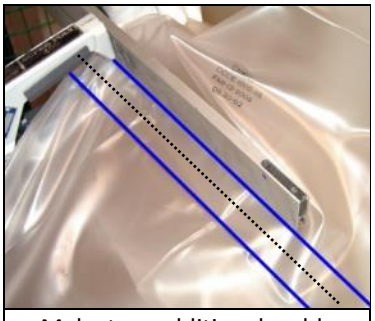
Pull the filter using the grip
through the end of the bag.

Extract the filter
into the bottom of the bag.

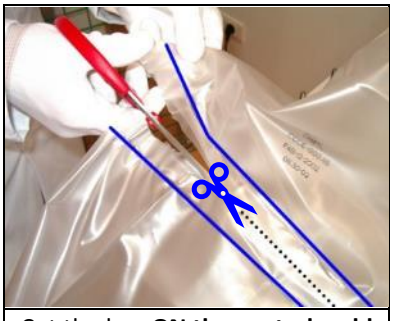
Put down the filter,
leaving the bag tunnel accessible.

Manipulation of the filter through the bag can be facilitated using the Camfil Handling Console, see also §13.
(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**
to avoid releasing contaminated
air from the weld pockets.

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.

Pull the bag length needed and slide the new bag over the stub and the collar.

Place the O-ring of the new bag into the SECOND groove.

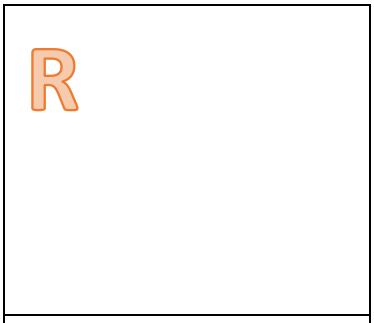
Verify correct filter orientation
➔ Grips top & bottom :

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

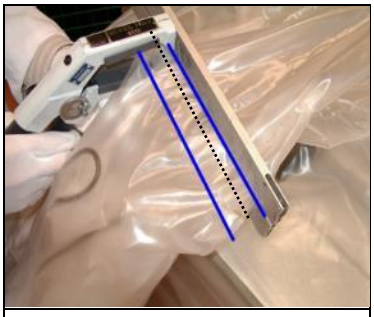
Pull the stub off the collar.
Take care not to dislodge the new bag from the second groove.



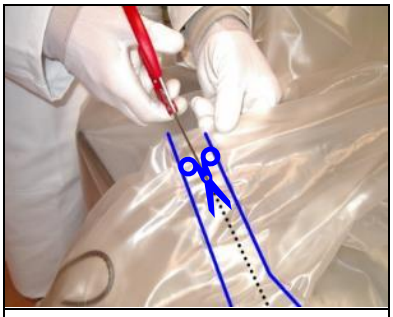
Push the sleeve inside, grab the stub in the center and pull it back into the sleeve.

Pack the stub all the way down into the sleeve to gain space for welding.

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** to avoid releasing contaminated air from the weld pockets.

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 or the clamping frame.

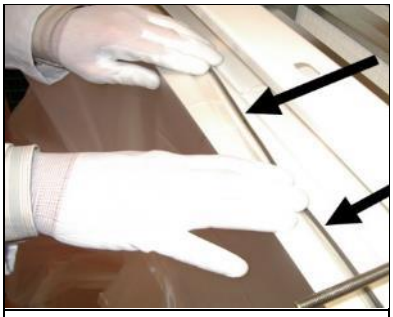
Lift the filter by the frame only **without touching the media**.

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, pushing the air out.

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)

PLEASE NOTE :
This chapter describes an alternative tool & process for BIBO bag welding

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 and insert the mobile part

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 (cutting tool limitation)

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

Insert the heated 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.

ⓘ **PLEASE NOTE :** Different models of BIBO bag welding equipment are commercially available. Besides the bundle welding tool shown above, there are also different variants of line welding tools as shown in the illustration of §9.4.3.
All models are valid.

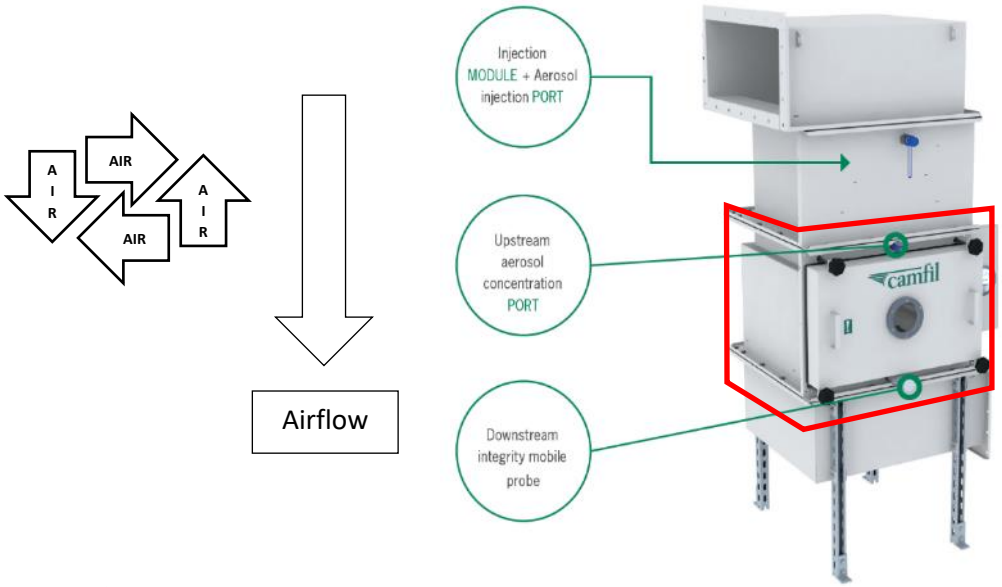
△ **For safe operation, make sure to produce fully penetrated welds and always cut through melted plastic rather than through any air pocket.**

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 / IEST-RP-CC.034.4 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 air 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 commissioned specialist staff.
- The operator must ensure that the CamSafe particle measuring system is only operated in proper condition.

11.1 Filter Validation with MIP

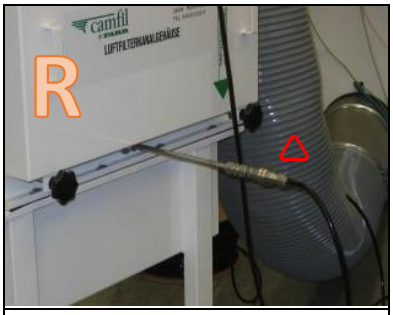
Before testing :

- 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

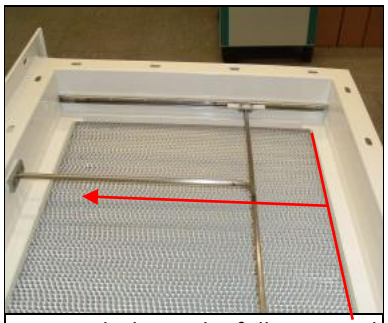
△ **PLEASE NOTE:** Connect a particle counter or photometer using G1/4 fittings RIEGLER 246.32 or 246.12 or equivalent.

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.

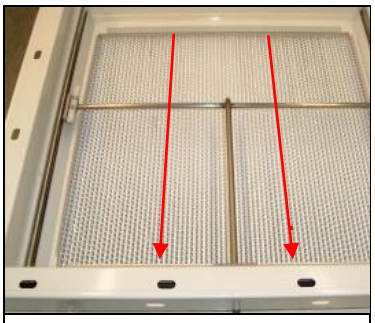
Replacement of the probe involves breaking the containment barrier of the housing ! Use original Camfil parts and specialist staff only.

Filter Validation with MIP (continued)

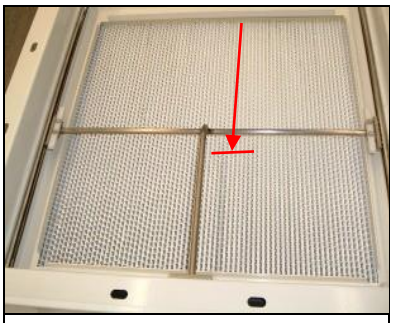


Start with the probe fully inserted and then move over the filter with a slow pulling motion.

Please Note : zero count is performed in the middle of the filter.



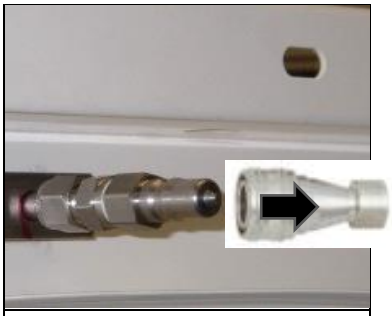
CAUTION
Pull in a regular motion.
The probe and hoses should not suffer any jolts during the procedure. This could lead to incorrect readings.



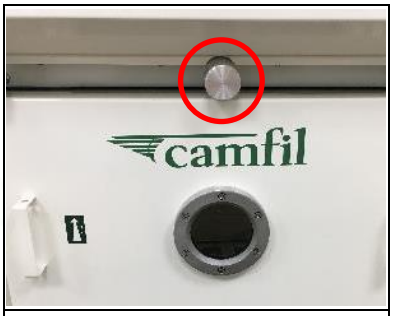
If an increased particle count is detected, stop the probe at that point.
If necessary, the leak may be localized by moving the probe back and forth.

CAUTION

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



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

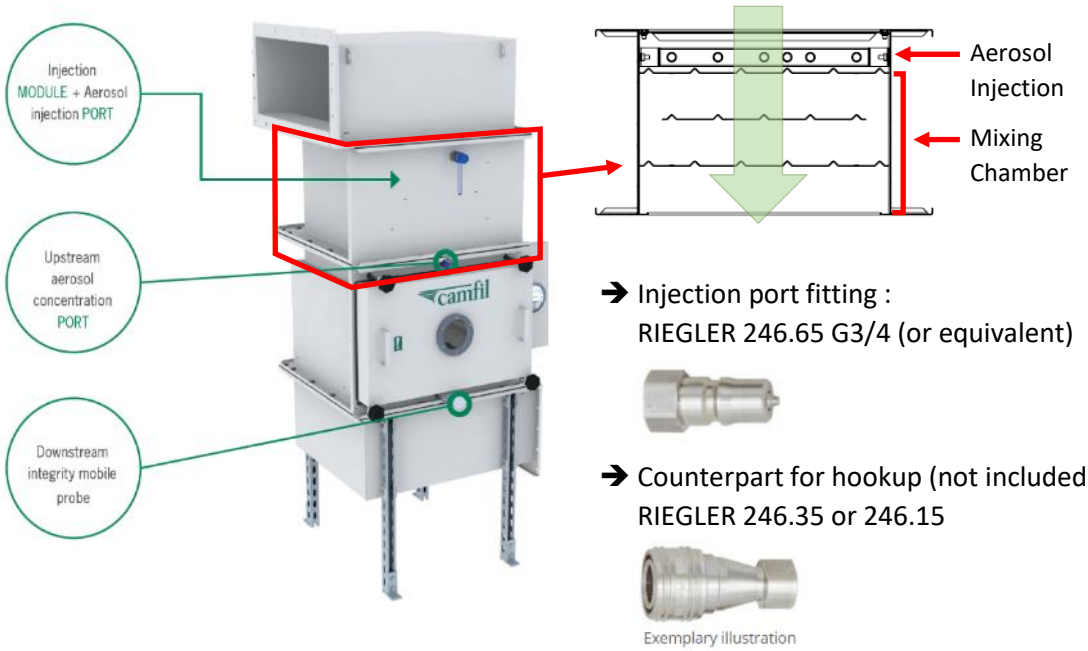


Fully push back the mobile downstream probe and screw on the protection cap.

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 / IEST-RP-CC.024.4 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.

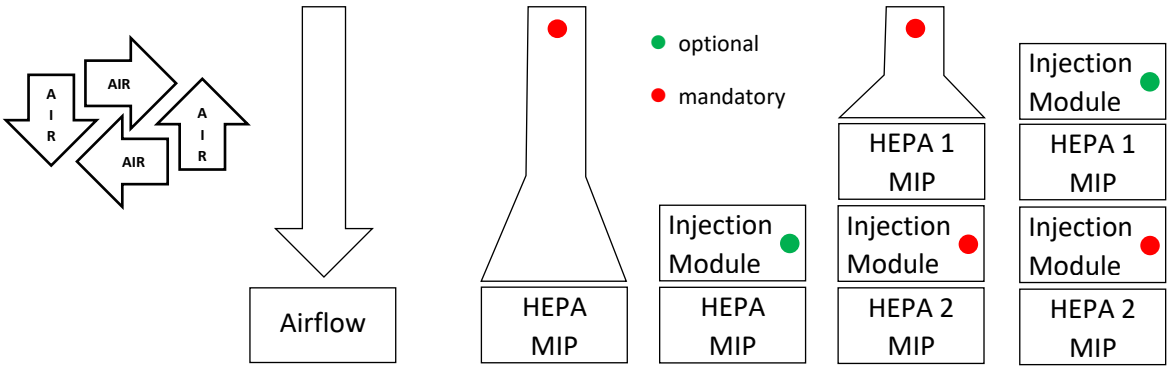


➔ Injection port fitting :
RIEGLER 246.65 G3/4 (or equivalent)

➔ Counterpart for hookup (not included) :
RIEGLER 246.35 or 246.15

Exemplary illustration

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



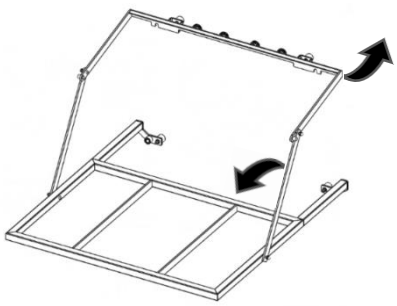
- Connect a commercial particle generator to the aerosol injection port.
  Make sur the connector is fastened properly onto the quick-connect-fitting.
  All fittings seal automatically, if their counterparts are not safely locked.

13 Option : Handling Console

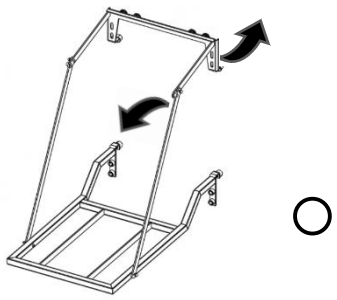
The Handling Console is a tool designed to facilitate the handling of heavy filter cells during the BIBO filter change procedure.

- 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

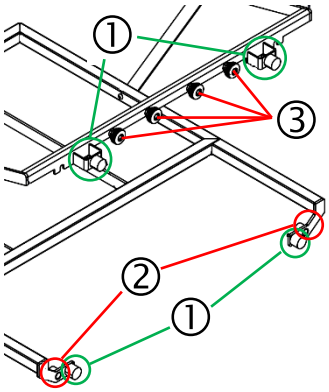
For Vertical airflow



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 the console
- Set the 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 Option : ATEX

ATEX Product Certification Directive 2014/34/EU covers equipment and protective systems intended for use in potentially explosive atmospheres. The Directive defines the essential health and safety requirements and conformity assessment procedures, to be applied before products are placed on the EU market. It is aligned with the New Legislative Framework policy, and it is applicable from 20 April 2016, replacing the previous Directive 94/9/EC.

ⓘ **PLEASE NOTE :**
Equipment such as filter housings are NOT covered by this directive (no source of ignition other than pot. Electrostatic charge from airflow friction).
This means, the official "**εx**" certification seal cannot be applied to such equipment, even if it technically complies.

Customers who operate in an ATEX atmosphere still need to respect the provisions of the ATEX Workplace Directive 99/92/EC to ensure health and safety protection.

ⓘ CamSafe filter housings are certified by INERIS France for electrostatic safety in explosive atmospheres as follows :

→ Dust atmospheres	groups IIIA, IIIB, IIIC	in hazardous areas20, 21, 22
→ Gas atmospheres	groups IIA, IIB, IIC	in hazardous areas 0, 1, 2 (internal part) in hazardous areas 1, 2 (external part)

△ **These ratings are indicated on a yellow sticker at the housing front.**
They are, however, subject to the ATEX ratings of the filter. The lower rating between filter and housing will determine the rating of the system.

The following conductivity connections are mandatory for safe operation of the filter housing :

1. Link from clamping frame to housing (isolated by the camshaft bushings)
2. Link from door to housing (isolated by the door gasket)
3. Main link from the housing to external ground connector
4. MIP housings only : Link from mobile probe to the housing

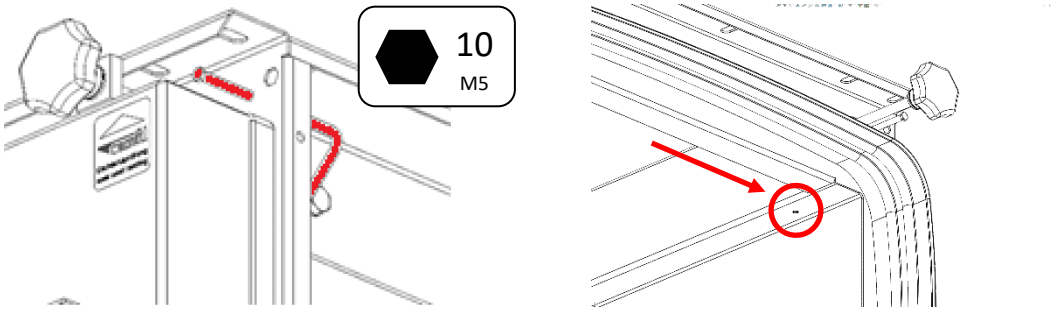
Conductivity from each connection to the main mass link needs to be <= $1x10^8$ Ohm.
The mass connections of the housing are checked ex-works as part of our QC management.

△ All functional modules from the standard scope, including collectors, may be formally included in the ATEX rating of the filter housing, using a mass bridge that is validated by the certificate.
These mass bridges may have to be installed during mounting on site.
Please check your project drawing for the extent of the electrostatic validity of your configuration.

ⓘ **There is NO specific mass connection from the filter to the clamping frame, which would be impossible to operate when using a BIBO bag.**
The metallic contact between the filter body and the clamping frame is sufficient for safe operation. (with ATEX certified filters only !).

15 Option : DIN-Port

The housing HEPA stage may be equipped with a « DIN » checking port for airtight filter seat seal.

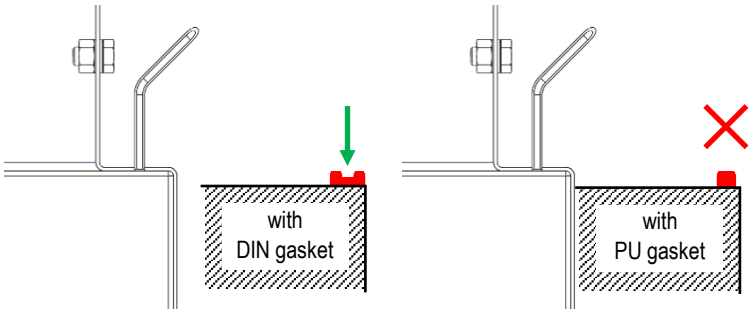


Allows checking for filter seat integrity, even during operation acc. to DIN 1946

When not in use, the port is plugged airtight with a M5 hex screw

ⓘ PLEASE NOTE : Use of this option requires filters with special double-lip DIN-gasket profile.

ⓘ Housings with DIN port are compatible with standard PU gaskets. In this case, the checking port is inoperative, the PU gasket will cover the hole in the gasket seat.



PLEASE NOTE : This feature is only available for filter sizes 3P6 and 6P6 max., due to gasket size availability and mechanical limitations from the gasket compression force.

15.1 Checking the Filter Seal with a DIN-port

Checking the filter seat integrity with a DIN port requires a filter seal tester

Air filter seal tester DSP-3

The DSP-3 tester allows independent validation of the gasket seat integrity acc. to DIN 1946 any time.

ⓘ **PLEASE NOTE :** The leak stream should be checked @ +2 000 Pa in the gasket cavity

The admissible must be inferior to the natural filter penetration rate

Operation :

1. Connect the pressure tube, stored in the back, to the tester and the housing DIN port.
2. Connect the rubber bellows.
3. Close the valve of the flow meter (turn the black knob clock-wise).
4. Use the bellows to create overpressure of 2 kPa on the manometer.
5. In case of immediate pressure decay, check all connections and the tester itself.
6. Open the valve of the flow meter (turn the black knob counter-lock-wise).
7. Read the leak stream on the flow meter – scale reading x 100
   e.g. reading 2 = 200 = 0,2 l/min = 12 l/h
8. After completing the check, close the valve, dismantle the test tube and bellows and store in the back of the tester.

16 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 of the filter gasket sealing surface 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.
If necessary, clean markings or residue on the front plate with alcohol on a soft, lint-free cloth, check door gasket condition and -bond with the door before placing the door back on the housing.

16.1 Spare Parts

CamSafe is a containment product family with accent on process and operator safety. Functional components installed in and on the body are replaceable, but the intervention will mostly 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.

➔ Please contact your Camfil representative with a clear situation description for feasibility, instructions and quotation.

17 Procedures

17.1 Investigating Failed Integrity Challenge on CamSafe +MIP

A failed integrity challenge can stem from many different issues.
We recommend to proceed as follows, eliminating potential issues by order of probability :

A. **Check if the filter is the issue**
- Rotate the filter 180° – does the leak move ?
  - yes = filter issue
  - no = housing or installation issue

B. If a filter issue is confirmed
- Check filter height
  Best results for filters with body height nom. 292 mm +0/-1 mm
  and 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)
  - Is the gasket undamaged ?
  - Is the gasket fully glued to the body ?
  - Is the gasket junction glue sealed ?

C. If a housing installation issue is suspected
- Check downstream duct connection
  - Is the connection airtight all around, but especially on the side near the leak ?
  - Installation using Camfil gasket kits ?
  - If not, what material is used, does it have plastic behavior ?
  - If not, for modular gaskets, are gasket junctions in the corners airtight ?
  - Is the gasket present everywhere ?
    Large gasket defects may be checked by placing a light inside the housing and checking from the outside, light may be visible through flange holes
  - Is the duct compression flange flat & stiff,
    i.e. are the flange gaskets properly compressed ?
    For Camfil gaskets 5mm EPDM => ca. 3mm max. compressed
    Compression surfaces should be flat, not wavy

D. If a housing issue is suspected
a. Check door airtightness
  - Is the door gasket fully glued and undamaged ?
  - Is there a “step” at the door gasket junction (normally on the bottom of the door) ?
  - Is the door fitted with a window (most probable mechanical leak) ?
    Airtightness of the above elements is tested ex-works by a pressure leak test.
    However, the housing may have been degraded during transport or installation.

Investigating Failed Integrity Challenge on CamSafe +MIP (continued)

If a housing issue is suspected (continued)

b. Check clamping system

- Close the clamping frame (without filter) and measure the closed compression height front & aft
  Clamping values of the CamSafe 2 clamping system :
  OPEN position 308 mm - CLOSED position 296 mm nominal
  THIS MUST BE MEASURED IN THE CENTER UNDER THE CAM
  as the clamping frame can freely rotate
- Are the values in front different from aft ?
- Check adjustment of the front bushing
  Bushing plate edge must align with the frontplate cutout.
  If necessary, open 2 clamping screws, adjust and check again.

➔ All functional aspects of the housing are tested and documented ex-works with full traceability.

➔ Further potential defects that can compromise integrity cannot be fixed in situ by simple adjustment.

➔ Please contact your Camfil representative for assistance.

BIBO compatible shim solutions for increasing gasket compression in the field are available.

➔ Please consult EMC Technical Support via your local Camfil representative.