Donaldson
FILTRATION SOLUTIONS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Replacement of Filter Elements

Gas Turbine Systems

Manual

Replacement of filter elements

IMPORTANT NOTES

Disclaimer

In case of any difficulties in assembling or erecting the Donaldson-supplied equipment, please contact the Donaldson project manager to agree on appropriate resolution. Donaldson will not be liable for extra expenses incurred unless this procedure has been followed. Refer to the contact information located below.

Contact details

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Revisions

Revision	Date	Reason
0	27 April 2017	First edition
1	25 March 2022	Add power seal retention kit
2	26 June 2024	Add installation of pre-filter sleeve-sock and crank + square ‘slow’ nut type

Table 1: Revisions

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LIST OF FIGURES

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1 ABOUT THIS MANUAL

These instructions are intended for qualified technical personnel only. Before beginning the work, you must carefully read and understand these instructions.

Anyone who will be performing tasks on this product must read this manual in order to:

- Reduce the risk of serious injury or death,
- Execute the tasks safely and correctly
- Keep task execution time to a minimum
- Increase the reliability and service life of the equipment

A copy of these instructions must be available to the person who does the work.

Safe operating practices and the environmental protection regulations applicable in the user's country and at the site of implementation must always be strictly observed.

1.1 Purpose

The purpose of these instructions is to instruct qualified technical personnel in the safe installation of this filter element system.

You must carefully read and understand this document in order to:

- reduce the risk of injury or death
- execute the tasks correctly and
- increase the reliability and service life of the equipment.

1.2 Target audience

These instructions are written for qualified technical personnel concerned with the installation of this filter element system.

1.3 How to use this manual

Several orientation aids help to find specific information quickly:

Element	Location
Table of contents	Beginning of book
List of tables	Beginning of book
Running header and footer	Throughout the book

Table 2: Orientation aids

1.4 Intended use

The manual is intended to act as a standalone installation procedure for the filter elements.

2 SIGNAL WORD AND SIGN DEFINITIONS

The safety messages and signs used in this document represent the minimum requirements for the provision of safety and/or warning signs at work.

2.1 Signal words

DANGER

Indicates an imminent hazardous situation, which, if not avoided, **will** result in death or serious injury. This signal word is to be limited to the most extreme situation

WARNING

Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury

CAUTION

Indicates a potentially hazardous situation which, if not avoided, **might** result in minor or moderate injury.

2.2 Sign definitions

Product packaging signs

This type of sign indicates the product packaging. The below signs are used in this document and might also be seen in the workplace.


This way up


Fragile


Keep dry


Sling here


Centre of gravity

Prohibition signs

This type of sign indicates prohibited actions. The below signs are used in this document and might also be seen in the workplace.


Do not stand here


No fire, open light, and smoking

Personal protective equipment signs

This type of sign indicates the requirement to wear certain personal protective equipment. The below signs are used in this document and might also be seen in the workplace.

	Wear safety shoes		Wear hardhat

Mandatory action signs

This type of sign indicates mandatory actions to avoid a hazard. The below signs are used in this document and might also be seen in the workplace.

	Mandatory instructions or other information that must be strictly observed.
	Mandatory to read instructions.

Information signs

	Information sign that points out generally important information to the user.
	Refer to information shown in the illustrated parts list.
	Damage to property that does not include injury to humans. If this warning is ignored, damage to equipment is possible.

3 INITIAL TASK

3.1 Cleaning and touch-up paint

- Thoroughly clean the equipment and surrounding area
- Touch-up paint and re-establish full corrosion protection measures

4 SELF CLEANING FILTER ELEMENTS – GDX SYSTEM

WARNING

Compressed air

Injury to personnel during maintenance

- Shut off the compressed air supply and bleed compressed air line before replacing filter elements.

WARNING

Filter elements are flammable

Injury to personnel and destruction of equipment

- No smoking or welding inside filter house

CAUTION

Dust from filter elements

Ingestion of dust particles

- Always wear facemask when replacing filter elements.

CAUTION

Filter element support

Injury to unprotected eyes

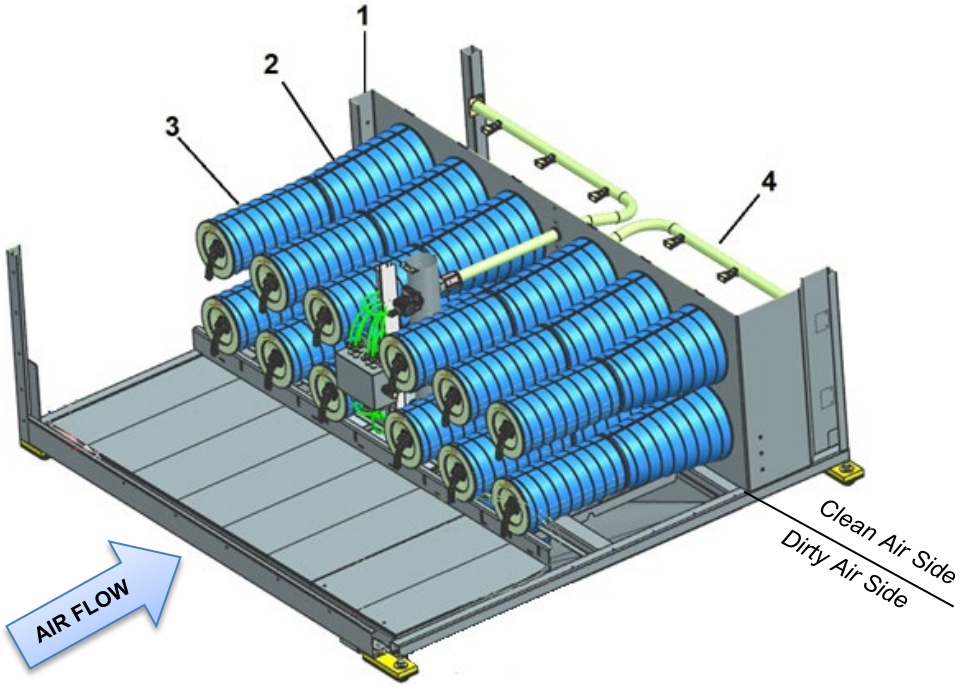
- Wear eye protection when replacing filter elements.

Before servicing the filter elements

1. Shut off the compressed air supply
2. Check that the compressed air line pressure level is zero
3. Shut off pulse-cleaning at control box

- All filter elements must be installed. Failure to do so will expose the turbine to potentially damaging dust particles.
- Use caution when installing the conical and cylindrical filter elements. Damage can result from the element support rod puncturing the filter element liner.
- It is not permitted to air-blast or clean and re-use Donaldson filters.
- Do not step on any of the air manifolds, air tubes, or element yokes inside the filter module, damage will be the result.

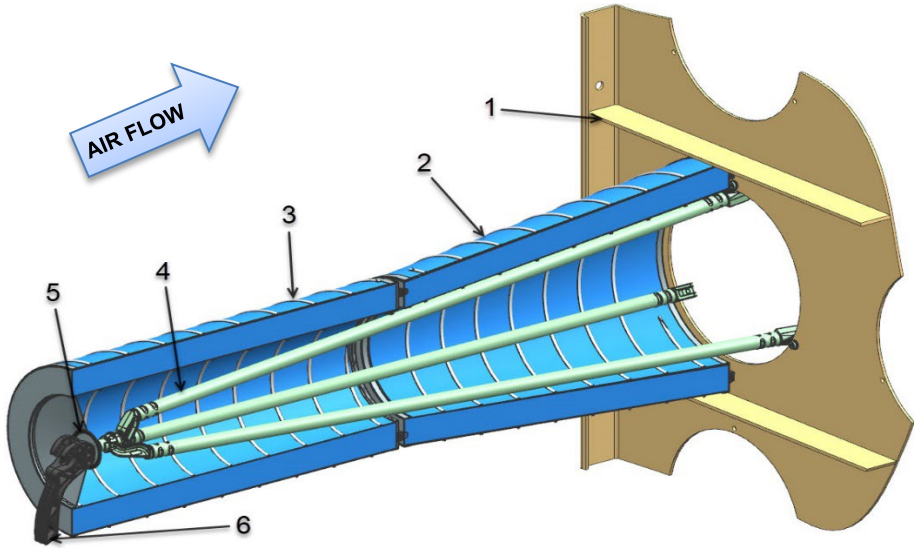
- Use only Donaldson Filter Elements for replacement.
- Damage to the turbine due to the use of elements other than Donaldson invalidates the Donaldson warranty.
- Warranty is invalidated after 5 years after date of production.



Pos.	Designation	Pos.	Designation
1	Tube sheet	3	Cylindrical filter element
2	Conical filter element	4	Pulsing blowpipes

Figure 1: Self-cleaning filter elements in final position – GDX system

4.1 Self-cleaning filter element - Quick lock type



Pos.	Designation	Pos.	Designation
1	Tube sheet	4	Element support kit
2	Conical filter element	5	Gasket washer
3	Cylindrical filter element	6	Clamp handle

Figure 2: Filter element assembly – Quick lock type

Caution when installing the filter elements; Damage can result by the front end of the element supports puncturing into the filter element's liner as shown in Fig.3. Position the filter elements with their gasket facing upward to avoid ripping the gasket on the platform grating. Do not step on air manifold, tubing or filter element supports inside the filter modules; damage will result.

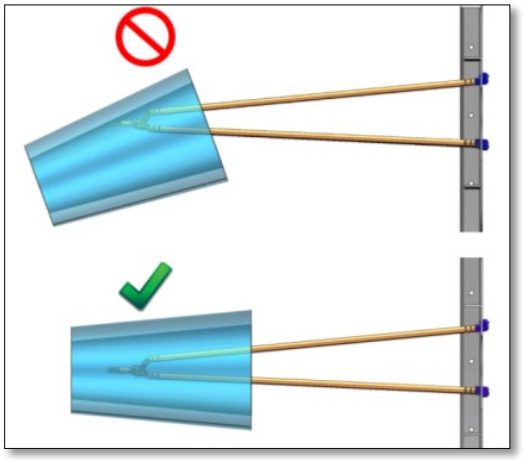


Figure 3: Caution when installing the filter element

4.1.1 Removal of old filter elements

1. Brush or vacuum clean any dust which could have accumulated over the elements at the tube sheet level and at any other location where it might fall off while changing the elements. Start doing this from the top row of elements. This is to reduce clean air side contamination.
2. Lift up and remove clamp handle (fig.2, items 6) and gasket washer (fig.2, items 5). Do not use any tools to remove the gasket washer from the cylindrical filter element.

Keep clamp handle and gasket washer safe; they will be reused. Carefully inspect the gasket washer for any damages and replace as necessary.

3. Remove cylindrical and conical filter elements (fig.2, items 3 & 2) from filter house.
4. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

4.1.2 Installation of conical filter element on the tube sheet

- Element support yokes are designed to withstand a maximum load of 35kg. The yokes must not be used as a ladder to install the filter elements
- Make sure that the element support legs are centered on the tube sheet hole and aligned with each other to ensure proper sealing between the elements and with the tube sheet (filter support frame).

1. See figures 2 & 4
2. Slide (one) conical filter element (fig.2 item 2) onto the element support kit (fig.2 item 4) until the gasket at the large end touches the tube sheet (fig.2 item 1).

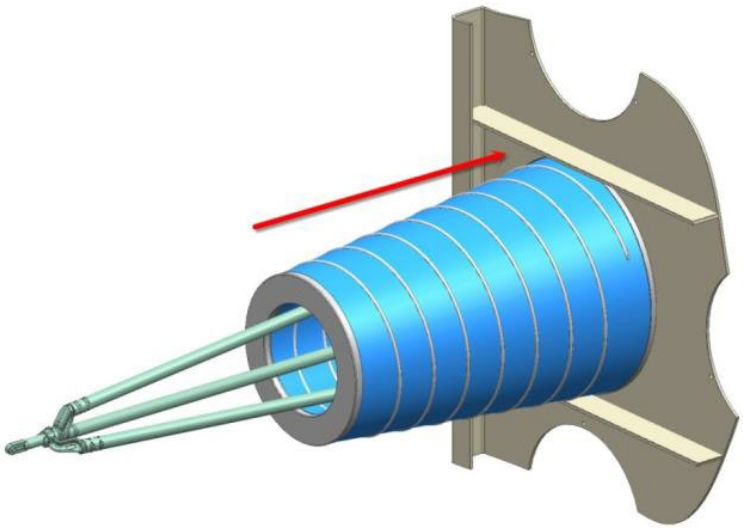


Figure 4: Installation of conical filter element.

4.1.3 Installation of gasket washer on the cylindrical filter element

1. See figure 5

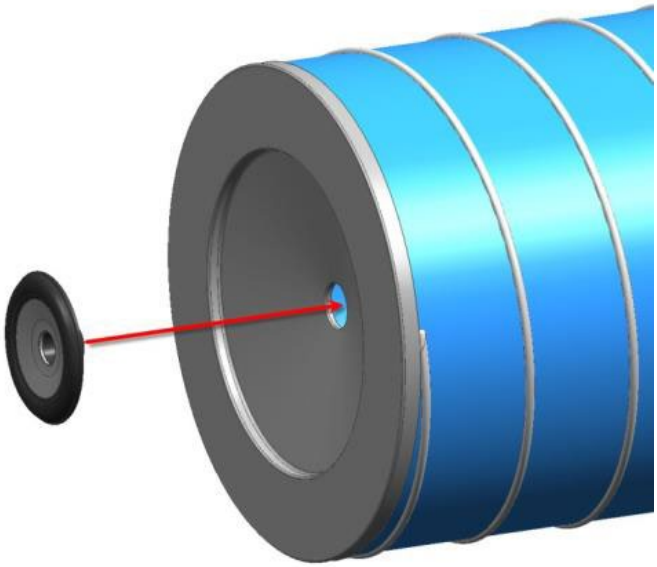


Figure 5: Installation of gasket washer on cylindrical filter element

2. Place gasket washer (fig.2 item 5) in the hole on the end of the cylindrical filter element (fig.2 item 3).

The gasket washer must be placed correctly in the cylindrical filter element; otherwise, the system will not be airtight. See figures 6 & 7

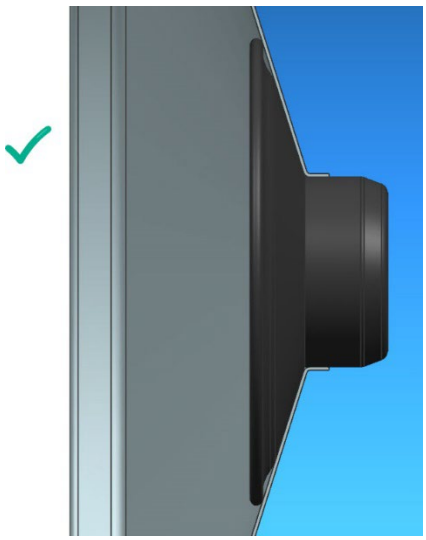


Figure 6: Correct position of gasket washer

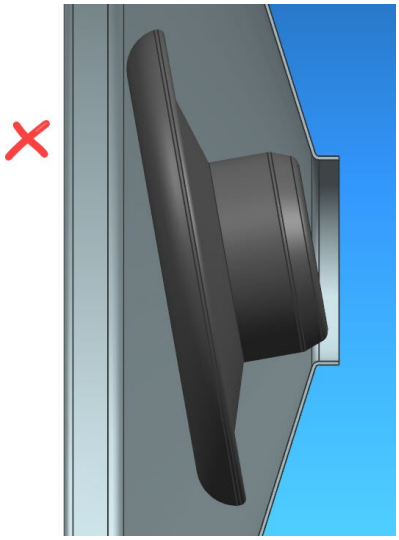


Figure 7: Incorrect position of gasket washer

4.1.4 Installation of cylindrical filter element on the element support and conical filter element

1. See figure 8

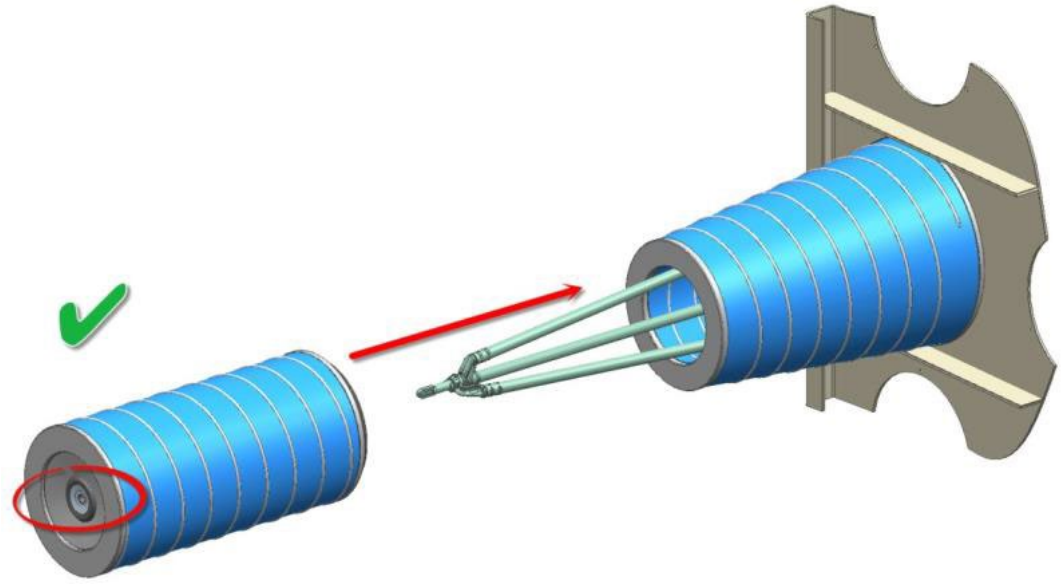


Figure 8: Installation of cylindrical filter element on conical filter element

2. Slide (one) cylindrical filter element (fig.2 item 3) + gasket washer (fig.2 item 5) onto the element support (fig.2 item 4) and against the conical filter element (fig.2 item 2)
3. See figures 9 & 10.
4. Push both elements tight against the tube sheet until the element support (fig.2 item 4) protrudes through the gasket washer (fig.2 item 5).

Ensure that gasket washer is still properly seated in the metal cap of the cylindrical filter element, as shown in fig.9.

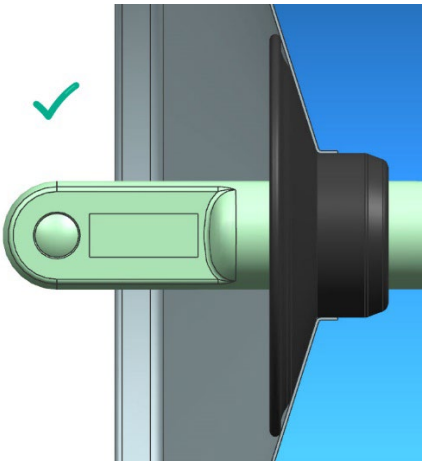


Figure 9: Correct position of gasket washer

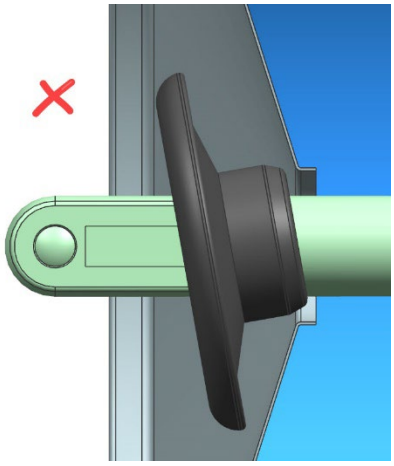


Figure 10: Incorrect position of gasket washer

4.1.5 Securing filter elements with clamp handle

1. See figures 11 & 12
2. Attach the clamp handle (fig.2 item 6) to the element support (fig.2 item 4)

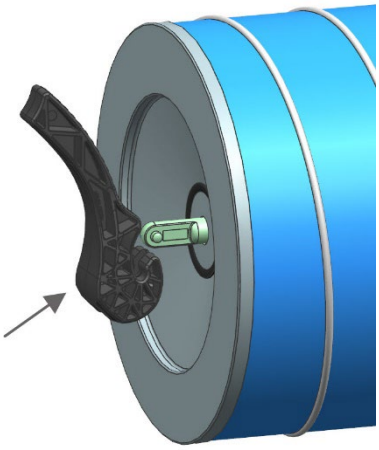


Figure 11: Positioning of clamp handle

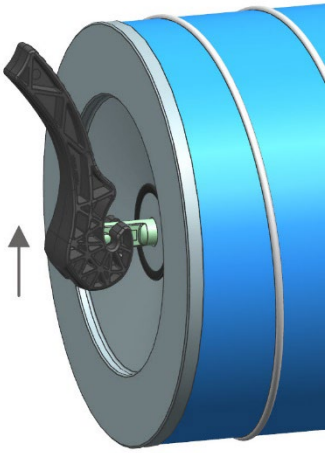


Figure 12: Secure filter elements using clamp handle

3. Secure the filter elements by pushing down the clamp handle (fig.2 item 6).

CAUTION

Pushing clamp handle too far

Fingers could be injured and/or gasket washer could be damaged

- Do not push clamp handle beyond position shown in figures 13 & 14.
- The flat edges of the clamp handle must be flush with gasket washer metal surface as shown in figure 14.

If it is very difficult or impossible to close the clamp handle, then the installation personnel must re-check all stages of the element installation process and, if necessary, dismantle the element assembly and redo the procedure.

4. The installer shall rotate the handle downwards until the element support rod reaches the built-in mechanical stop of the handle, as shown in fig.14. Figures 13 & 14 show the final position of the clamp handle.
5. Repeat sections 4.1.1 to 4.1.5 for all other filter elements.

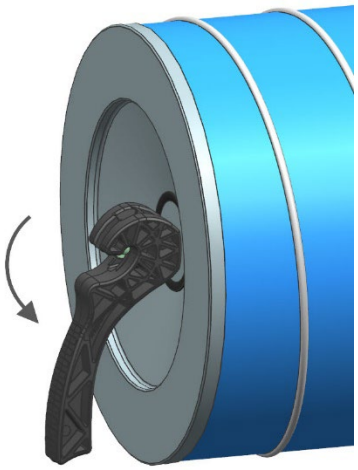


Figure 13: Clamp handle final position (view 1)

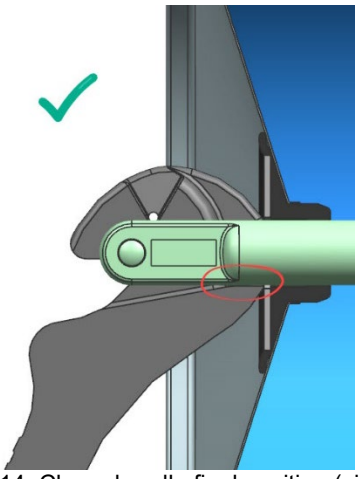
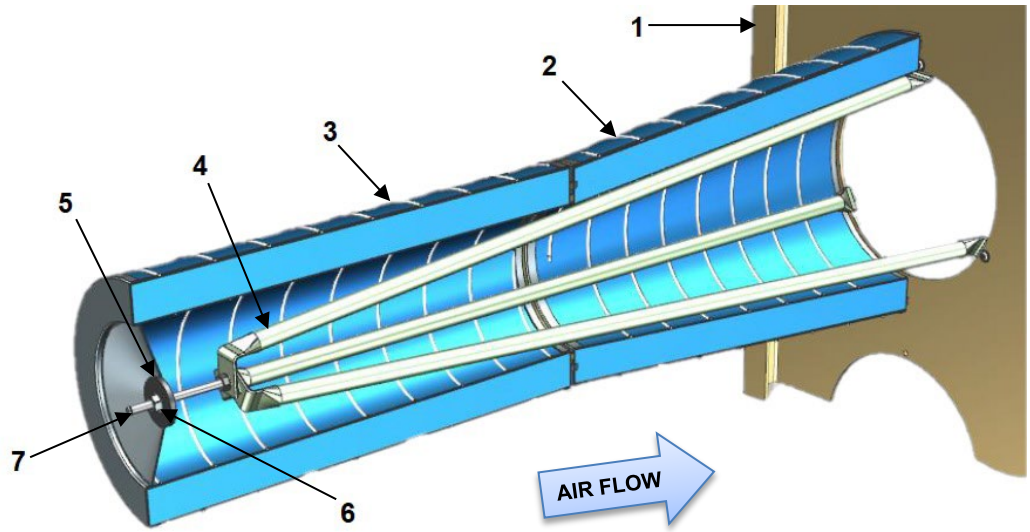


Figure 14: Clamp handle final position (view 2)

- **Result:** filter elements are installed

4.2 Self-cleaning filter element – Retention nut type



Pos.	Designation	Pos.	Designation
1	Tube sheet	5	Gasket washer
2	Conical filter element	6	Retention nut
3	Cylindrical filter element	7	Retention bolt
4	Element support		

Figure 15: Filter element assembly – Retention nut type

- Position the filter elements with their gasket facing upward to avoid ripping the gasket on the platform grating.
- **Caution** when installing the filter elements; Damage can result by the front end of the element supports puncturing into the filter element's liner as shown in Fig. 16
- Do not step on air manifold, tubing or filter element supports inside the filter modules; damage will result.
- Inspect the threaded retention bolt (fig 15 item 7) for any damage and replace as necessary.

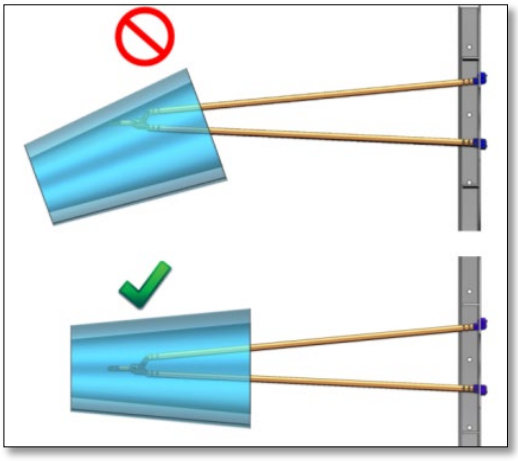


Figure 16: Caution when installing the filter element

4.2.1 Removal of old filter elements

1. Brush or vacuum clean any dust which could have accumulated over the elements at the tube sheet level and at any other location where it might fall off while changing the elements. Start doing this from the top row of elements; this is to reduce clean air side contamination.
2. Remove retention nut (fig.15, items 6) and gasket washer (fig.15, items 5).
3. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

4.2.2 Installation of conical filter element on the tube sheet

Element support yokes are designed to with stand only a maximum load of 35kg. The yokes must not be used as a ladder to install the filter elements
Make sure that the element retention yokes are centered on the tube sheet hole and aligned with each other to ensure proper sealing between the elements and with the tube sheet (filter support frame)

1. See figures 15 & 17
2. Slide (one) conical filter element (fig.15 item 2) onto the element support (fig.15 item 4) until the gasket at the large end touches the tube sheet (fig.15 item 1).

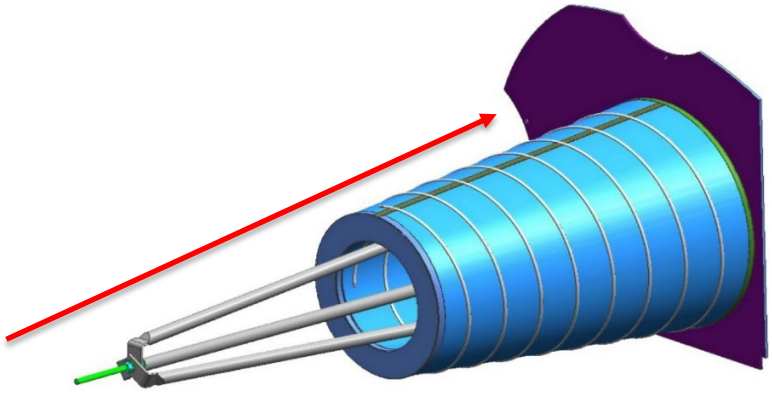


Figure 17: Installation of conical filter element.

4.2.3 Installation of gasket washer on the cylindrical filter element

1. See fig.18

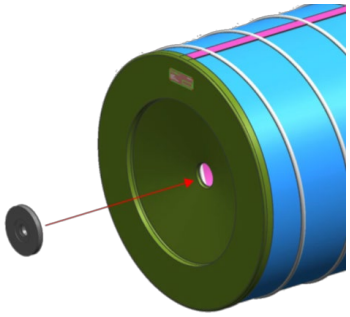


Figure 18: Installation of gasket washer on cylindrical filter element

2. Place gasket washer (fig.15 item 5) in the hole to the end of the cylindrical filter element (fig.15 item 3).

The gasket washer must be placed correctly in the cylindrical filter element; otherwise, the system will not be airtight. See figure 19

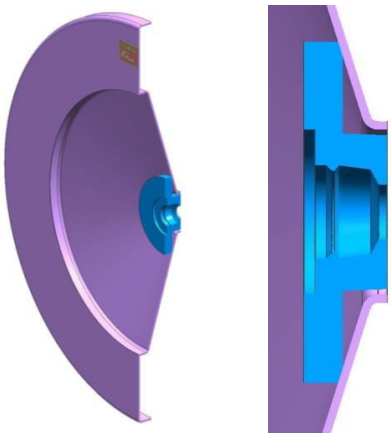


Figure 19: Sectional view – when gasket fitted correctly

4.2.4 Installation of cylindrical filter element on the element support

1. See fig.20

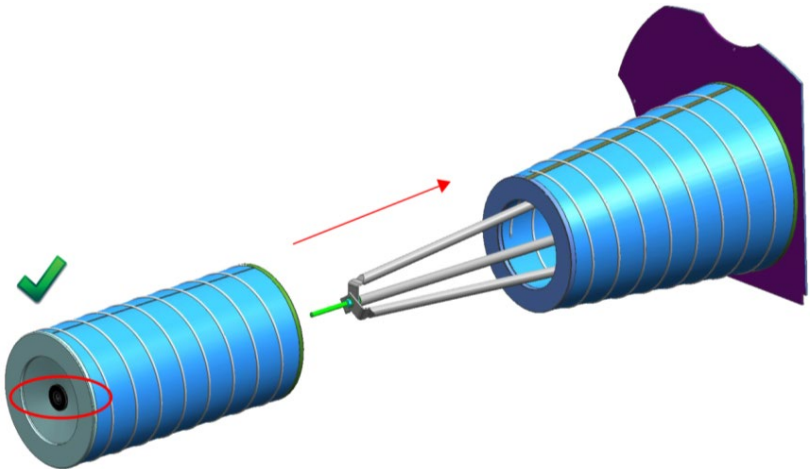


Figure 20: Installation of cylindrical filter element on conical filter element

2. Slide (one) cylindrical filter element (fig.15 item 3) + gasket washer (fig.15 item 5) onto the element support (fig.15 item 4) and against the conical filter element (fig.15 item 2).
3. Push both elements tight against the tube sheet until the element support (fig.15 item 4) protrudes through the gasket washer (fig.15 item 5).

Ensure that gasket washer is still properly seated in the metal cap of the cylindrical filter element, as shown in fig.20

4.2.5 Securing filter elements with retention nut

1. See fig.15 and fig. 21.
2. Screw the retention nut (fig15 item 6) to the threaded retention bolt on element support against the gasket washer as shown in Figure 21.

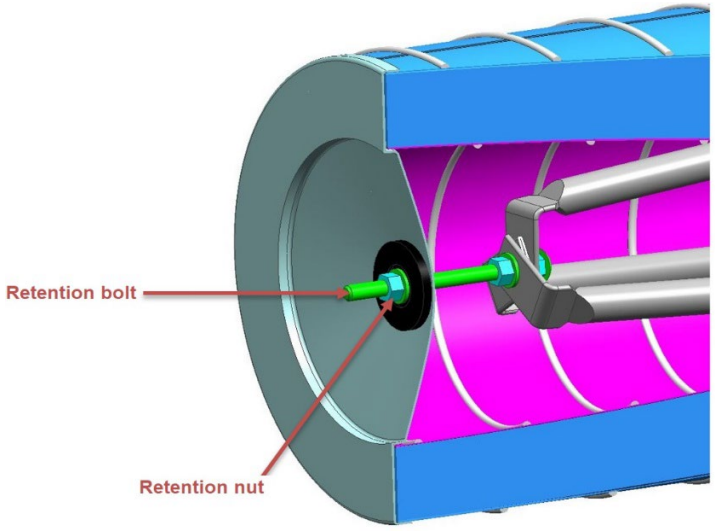


Figure 21: Assembly of retention nut

CAUTION

Over tightening of the retention nut

Element support and/or gasket washer could be damaged

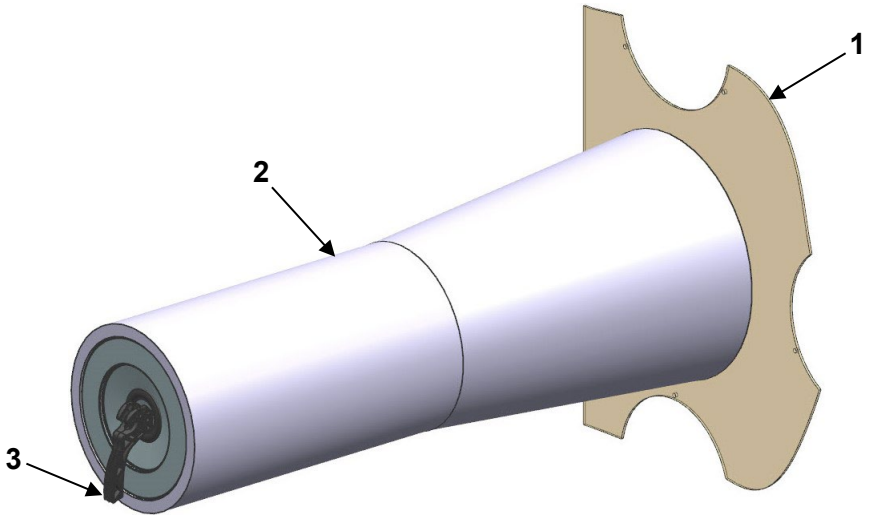
Torque on the element retention nut should be 18-20 Nm to ensure an airtight seal. Do not exceed 20 Nm torque on the element retention nut. Over-tightening can damage the filter elements.

If it is very difficult or impossible to tighten the retention nut, then the installation personnel must re-check all stages of the element installation process and, if necessary, dismantle the element assembly and redo the procedure.

3. Repeat sections 4.2.1 to 4.2.5 for all other filter elements.

- **Result:** filter element is installed

4.3 Pre-filter sleeve-sock installation



Pos.	Designation	Pos.	Designation
1	Tube sheet	2	Pre-filter sleeves-sock

Figure 22: Pre-filter sleeve-sock in final position – GDX system

4.3.1 Removal of pre-filter sleeves-sock

1. See figure 23.
2. Remove first-fit pre-filter sleeves (1x conical + 1x cylindrical) or aftermarket sock (1x).
3. Discard the removed pre-filter sleeves-sock by utilizing a drop chute directed to a dumpster or by hand; do not disperse the dust inside the filter house and working area.

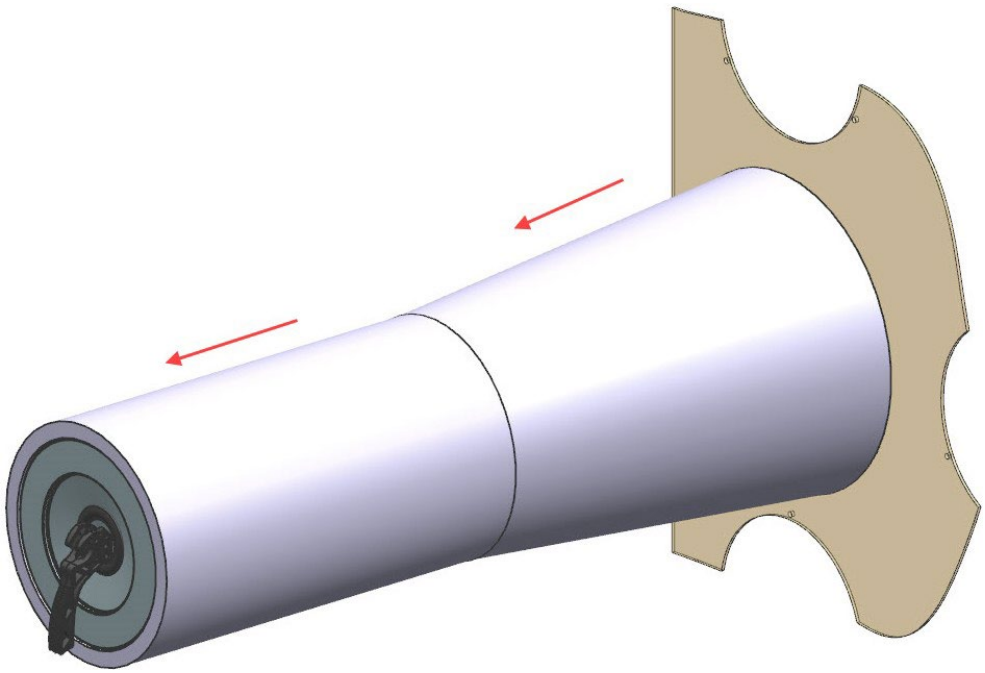


Figure 23: Pre-filter sleeves-sock removal

4.3.2 Installation of pre-filter sleeves-sock

Element support yokes are designed to withstand a maximum load of 35kg. The yokes must not be used as a ladder to install the pre-filter sleeves-sock

1. See figure 24.
2. Remove new aftermarket pre-filter sock from box and position the larger opening of the pre-filter sock towards the cylinder + cone element pair.

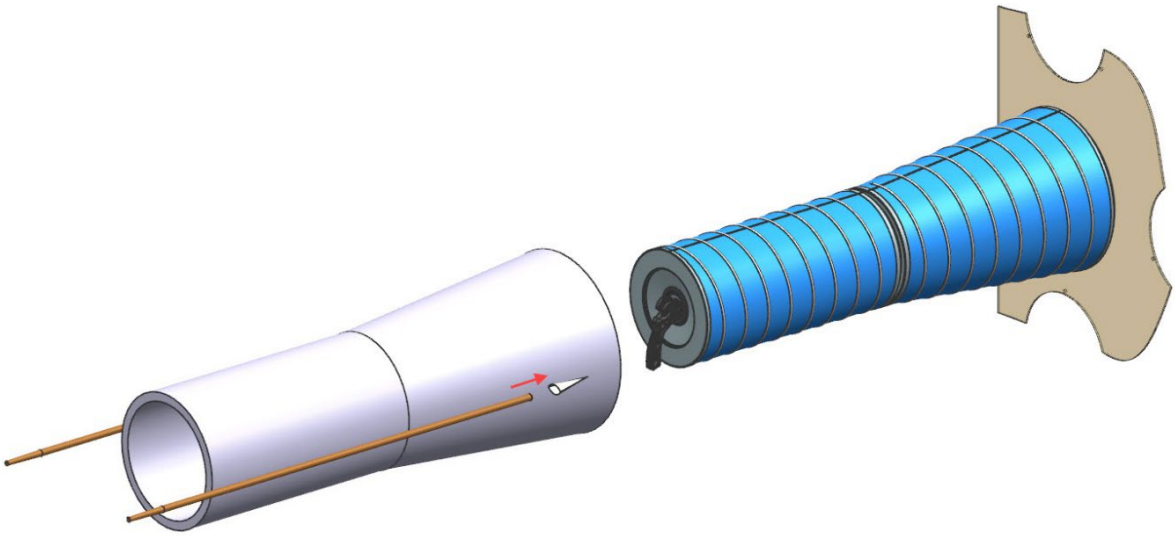


Figure 24: Installation of pre-filter sleeves-sock on filter element.

3. See figures 24 and 25.

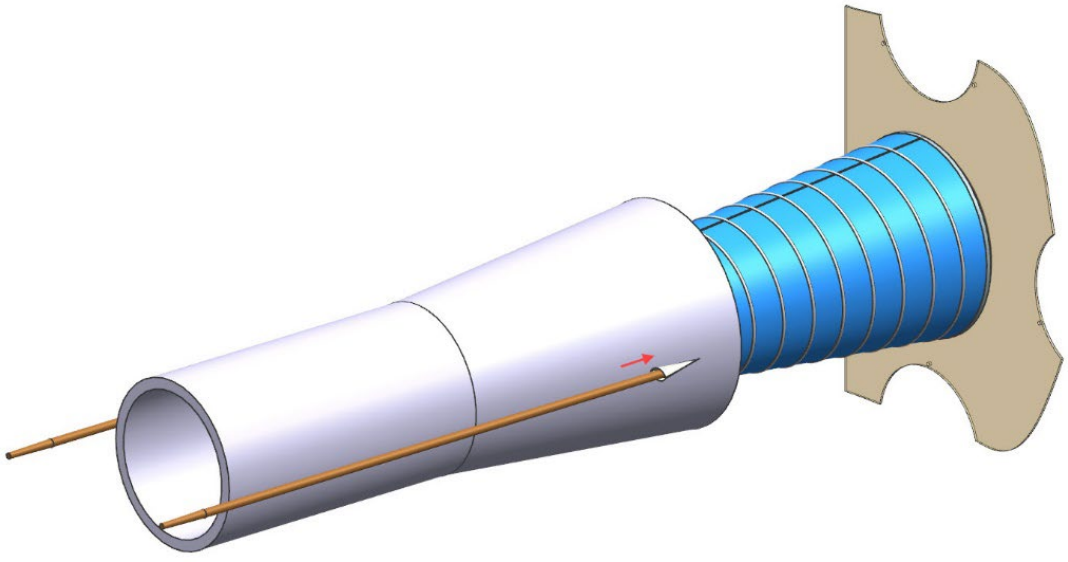


Figure 25: Installation of pre-filter sleeves-sock using sticks

4. Use the installation sticks to slide pre-filter sock over the cylinder + cone element pair.
5. See figures 26 and 27.

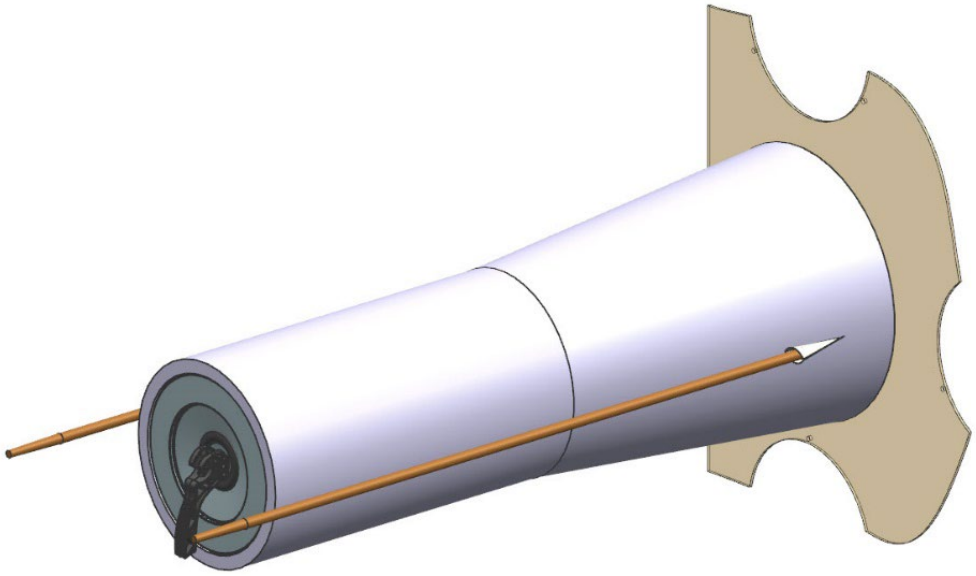


Figure 26: Position of pre-filter sleeves-sock on filter element

6. The aftermarket pre-filter sock shall be flush with the end of the cylinder element.

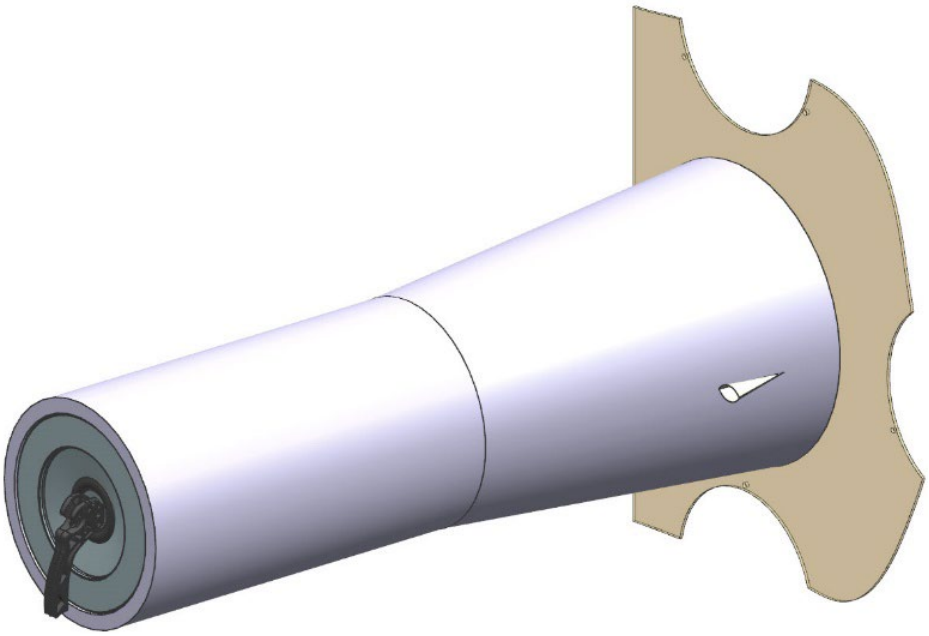


Figure 27: Pre-filter sleeves-sock stick removal

4.3.3 Securing pre-filter sleeves-sock on filter element

1. See figures 28 & 29.
2. Install zip-tie close to the end of the cylindrical element, around 2” [50mm] from the end of the filter element. Tighten the zip-tie to fix the aftermarket pre-filter sock onto the cylinder + cone element pair.

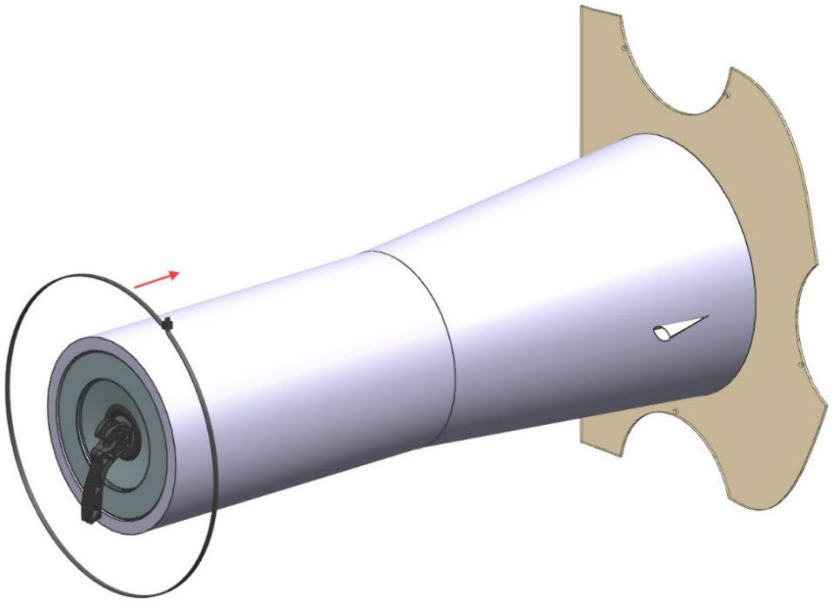


Figure 28: Positioning of zip-tie

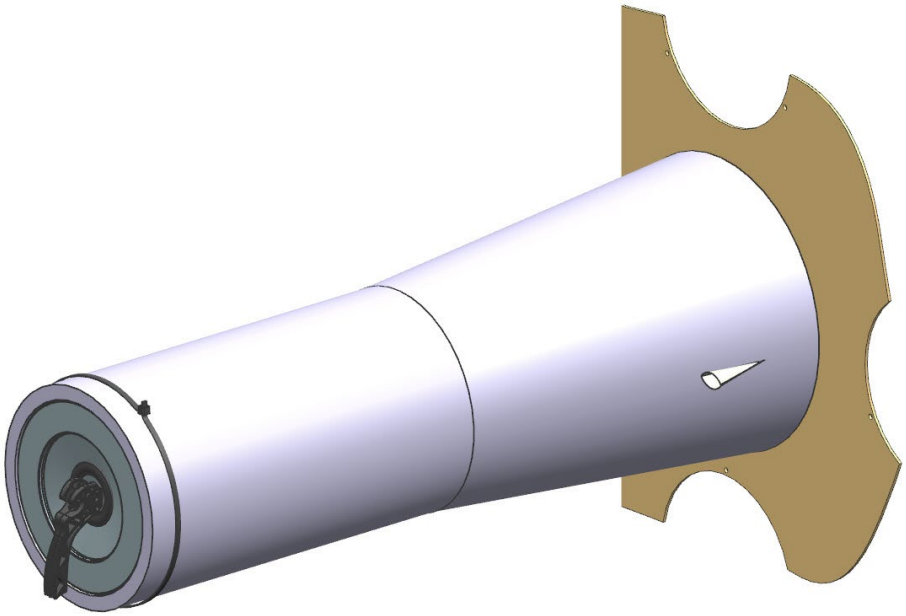


Figure 29: Zip-tie final position

3. Repeat sections 4.3.1 to 4.3.3 for all other filter elements.

5 SELF CLEANING FILTER ELEMENT – TTD SYSTEM

WARNING

Compressed air

Injury to personnel during maintenance

- Shut off the compressed air supply and bleed compressed air line before replacing filter elements.

WARNING

Filter elements are flammable

Injury to personnel and destruction of equipment

- No smoking or welding inside filter house

CAUTION

Dust from filter elements

Ingestion of dust particles

- Always wear facemask when replacing filter elements.

CAUTION

Filter element support

Injury to unprotected eyes

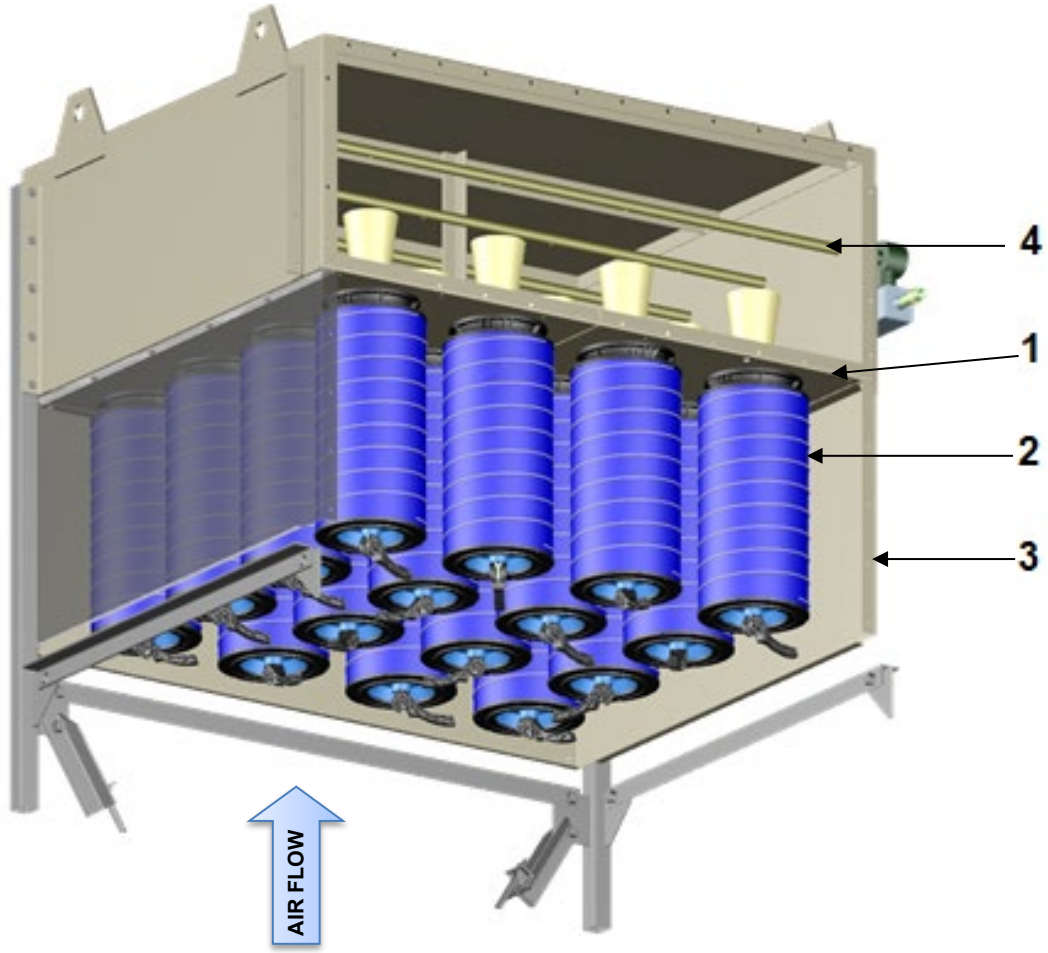
- Wear eye protection when replacing filter elements.

Before servicing the filter elements

1. Shut off the compressed air supply
2. Check that the compressed air line pressure level is zero
3. Shut off pulse-cleaning at control box

- All filter elements must be installed. Failure to do so will expose the turbine to potentially damaging dust particles.
- It is not permitted to air-blast or clean and re-use Donaldson filters.

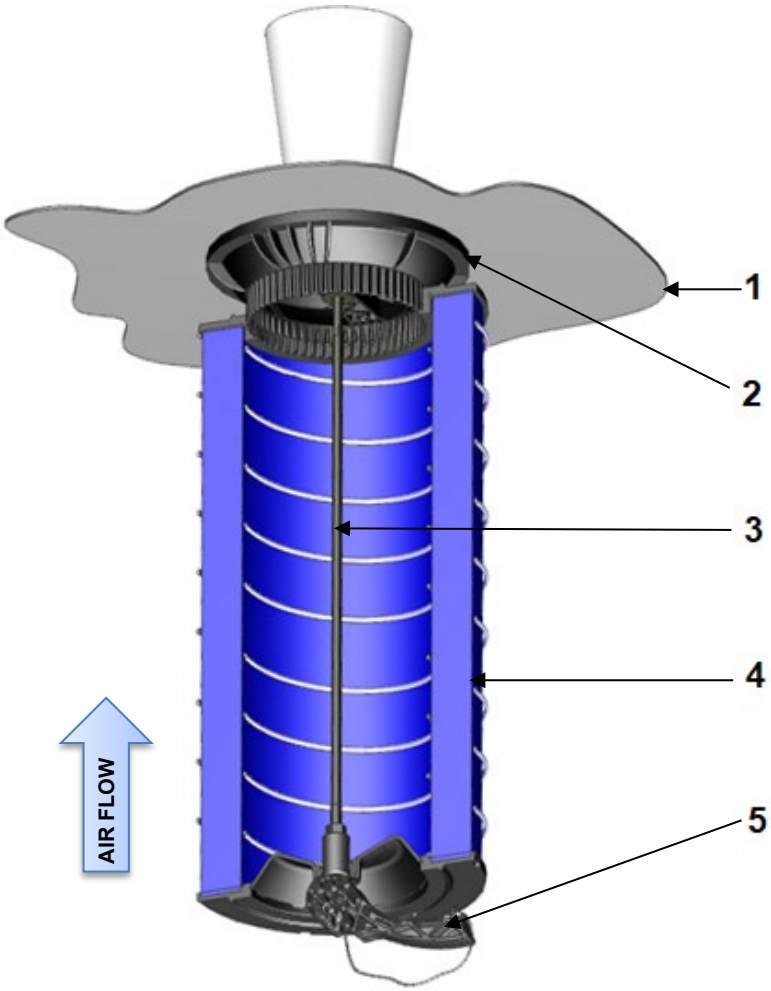
- Use only Donaldson Filter Elements for replacement.
- Damage to the turbine due to the use of elements other than Donaldson invalidates the Donaldson warranty.
- Warranty is invalidated after 5 years.



Pos.	Designation	Pos.	Designation
1	Tube sheet	3	Skirt
2	Filter element	4	Pulsing blowpipes

Figure 30: Filter elements in final position – TTD system

5.1 Self-cleaning filter element – PowerSeal retention kit



Pos.	Designation	Pos.	Designation
1	Tube sheet	4	Filter element
2	Seal tube	5	Clamp handle
3	Retention rod		

Figure 31: Filter element assembly – PowerSeal type

5.1.1 Removal of old filter elements

1. Care must be taken when removing the QLY handle (fig. 31, item 5). Make sure the element is not falling off.

Keep clamp handle; they will be reused.

2. Carefully remove filter element (fig. 31, item 4) from filter house.
3. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

5.1.2 Installation of filter element on the element support

1. See figure 32

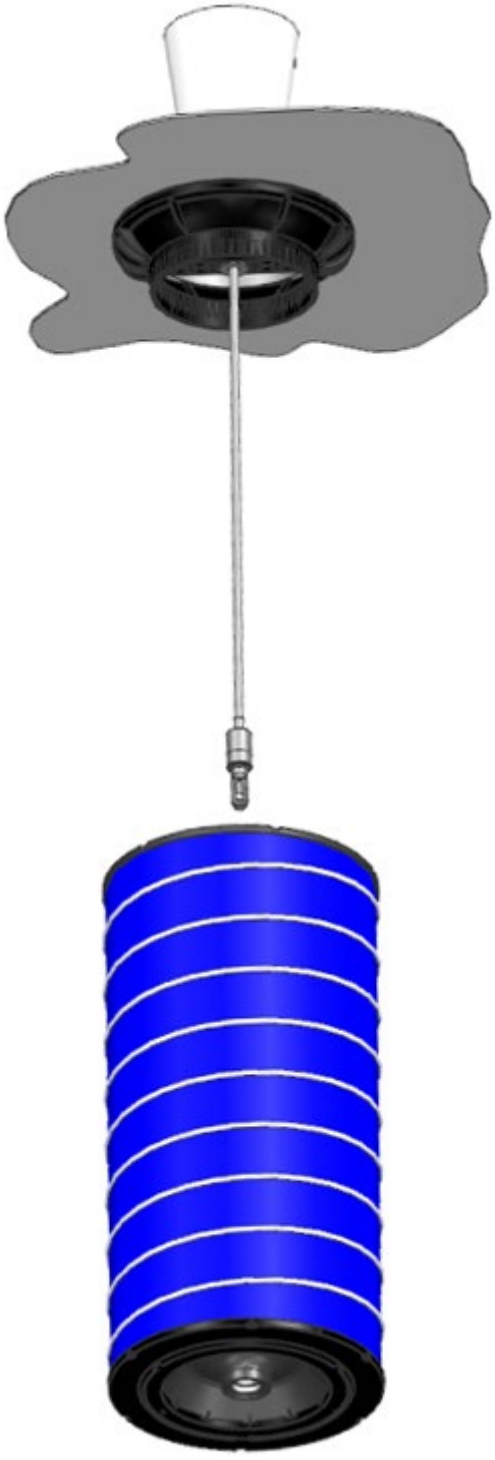


Figure 32: Installation of filter element on element support

2. Slide (one) filter element (fig.31 item 4) onto the retention rod (fig.31 item 3).
3. Push element onto the seal tube (fig.31 item 2) until the retention rod (fig.31 item 3) protrudes through the filter element (fig.31 item 4).

5.1.3 Securing filter element with clamp handle

1. See figure 33 & 34.
2. Attach the clamp handle (fig.31 item 5) to the retention rod (fig.31 item 3).

Figure 33: Positioning of clamp handle

Figure 34: Secure filter elements using clamp handle

CAUTION

Pushing clamp handle too far

Fingers could be injured and/or gasket washer could be damaged

- Do not push clamp handle beyond position shown in figure 33 & 34.
- The flat edges of the clamp handle must be flush with gasket washer metal surface as shown in figure 34.

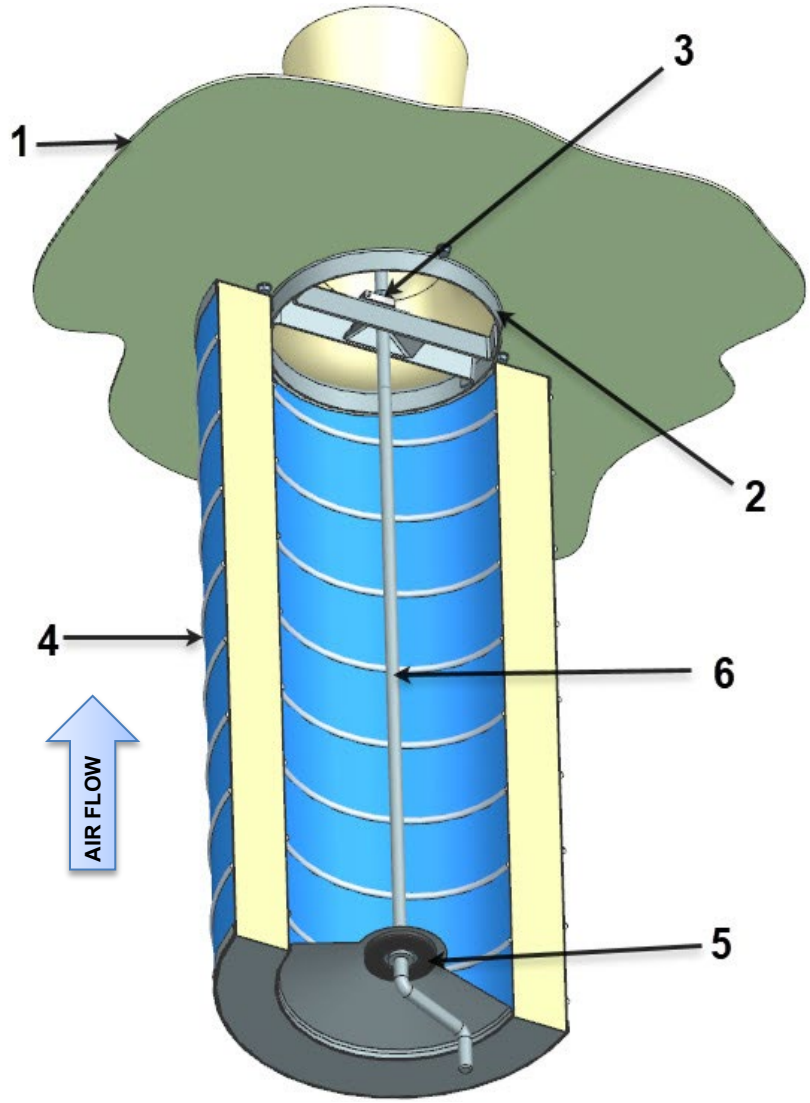
3. Secure the filter elements by pushing down the clamp handle (fig.31 item 5).

If it is very difficult or impossible to close the clamp handle, then the installation personnel must re-check all stages of the element installation process and, if necessary, dismantle the element assembly and redo the procedure.

4. Figure 34 shows the correct final position of the clamp handle. It is normal that clamp handles will not be oriented in the same direction.
5. Repeat sections 5.1.1 to 5.1.3 for all other filter elements.

- **Result:** filter element is installed

5.2 Self-cleaning filter element – Crank + Quick nut type



Pos.	Designation	Pos.	Designation
1	Tube sheet	4	Filter elements
2	Collar	5	Sealing washer
3	Quick nut	6	Crank

Figure 35: Filter element assembly – Crank type

5.2.1 Removal of old filter elements

1. Grasp the crank and turn counterclockwise until the filter is hanging away from the tube sheet two or three inches.
2. Continue to turn the crank until the filter assembly is released from the quick-nut or lift the assembly up and then down to release the crank form the quick-nut. Both methods can be used to remove the assembly.
3. Retain the crank for the installation of the replacement filter.

5.2.2 Installation of crank element on the filter element

1. See figure 36

Figure 36: Installation of crank element on the filter element

2. Insert the crank (fig.35 item 6) through the filter element (fig.35 item 4)
3. Push the crank as far into the filter element as possible. The crank and element will be installed together.

5.2.3 Installation of filter element on the element support

1. See figure 37

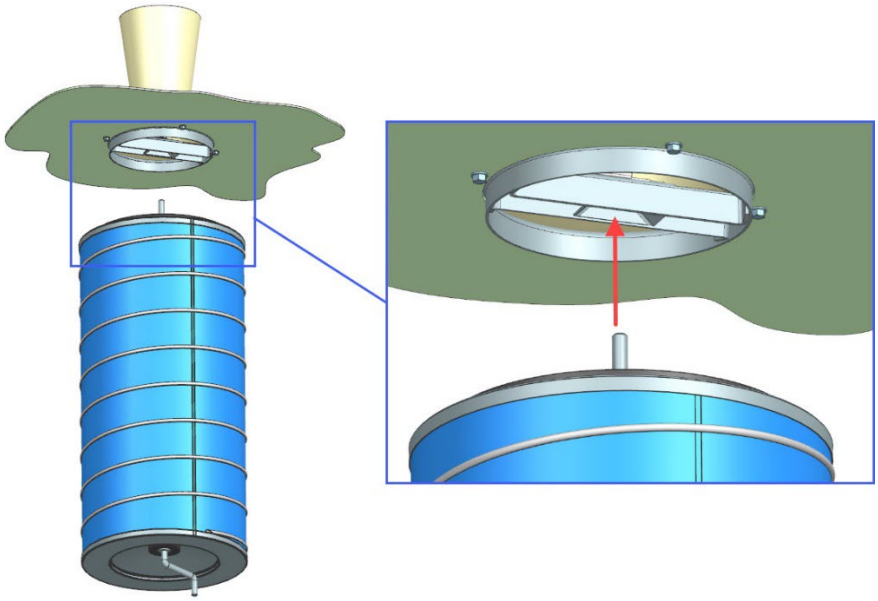


Figure 37: Installation of crank element on the filter element

2. With one person supporting the filter element (fig.35 item 4) and another operating the crank (fig.35 item 6): insert the crank rod end that is protruding from the filter element into the centre of the quick-nut (fig.35 item 3) and push the crank and element assy upward as far as it will go, the quick-nut assembly will close upon the crank threads.

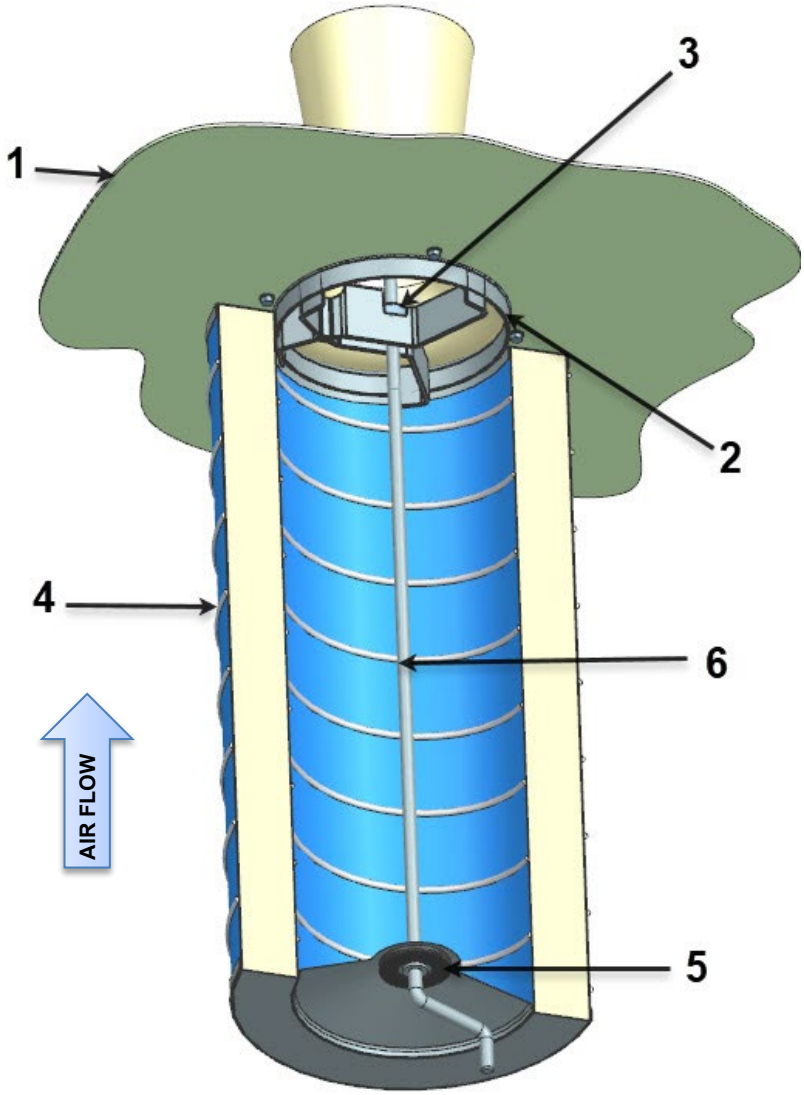
If the quick nut does not close upon the crank properly, the person installing the element will still support the total weight of the assembly. If it is still supported only by the person installing the element, perform the above procedure until the quick nut engages the crank threads.

3. Centre the filter element over the collar (fig.35 item 2) and turn the crank handle clockwise (about two to three turns) until the element is drawn tight against the tube sheet. The crank is to be firmly tightened by hand so that the element gasket compresses against the tube sheet. There is no specific torque requirement.
4. Repeat sections 5.2.1 to 5.2.3 for all other filter elements.

- Check that element is properly seated and secured by firmly grasping the element and turning it around its axis
- If the element can still be rotated by hand around its axis, tighten the crank further to ensure airtight integrity at the gasket/tube sheet connection.
- The screws retaining the collar on the tube sheet acts as gasket stops to ensure that the gasket is not over compressed.

- **Result:** filter element is installed

5.3 Self-cleaning filter element – Crank + Square ‘slow’ nut type



Pos.	Designation	Pos.	Designation
1	Tube sheet	4	Filter elements
2	Collar	5	Sealing washer
3	Square ‘slow’ nut	6	Crank

Figure 38: Filter element assembly – Crank type

5.3.1 Removal of old filter elements

1. Grasp the crank and turn counterclockwise until the filter is hanging away from the tube sheet two or three inches.
2. Continue to turn the crank until the crank can no longer be turned counterclockwise. Lift the assembly up, to the side and then down to release the crank form the collar.
3. Retain the crank for the installation of the replacement filter.

Figure 39: Installation of crank element on the filter element

4. Insert the crank (fig.38 item 6) through the filter element (fig.38 item 4)
5. Push the crank as far into the filter element as possible. The crank and element will be installed together.

5.3.2 Installation of filter element on the element support

1. See figure 40.

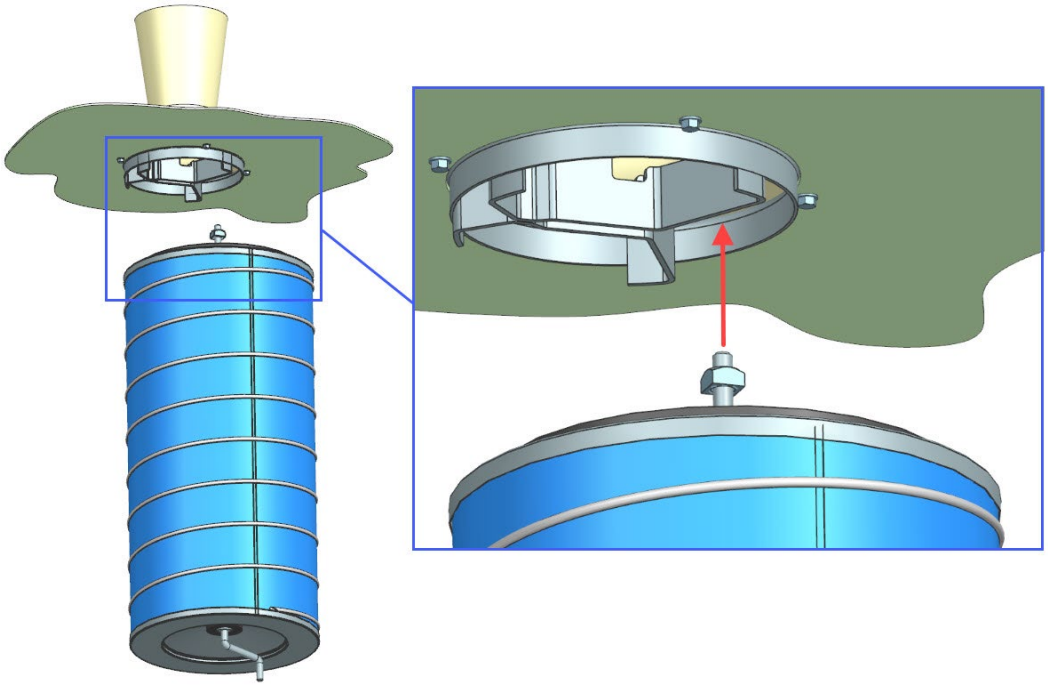


Figure 40: Installation of filter element on the filter support

2. With one person supporting the filter element (fig.38 item 4) and another operating the crank (fig.38 item 6): insert the crank rod end that is protruding from the filter element into the larger “Y” opening of the collar (fig.38 item 2) and push the crank and element assembly upward as far as it will go.

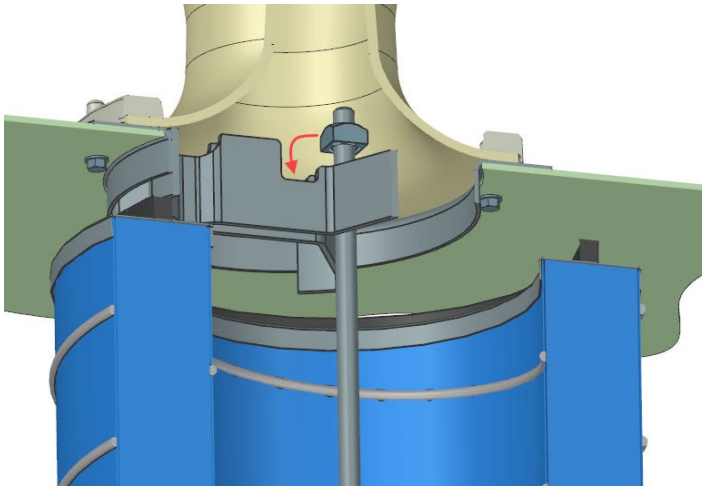


Figure 41: Installation of crank (view 1)

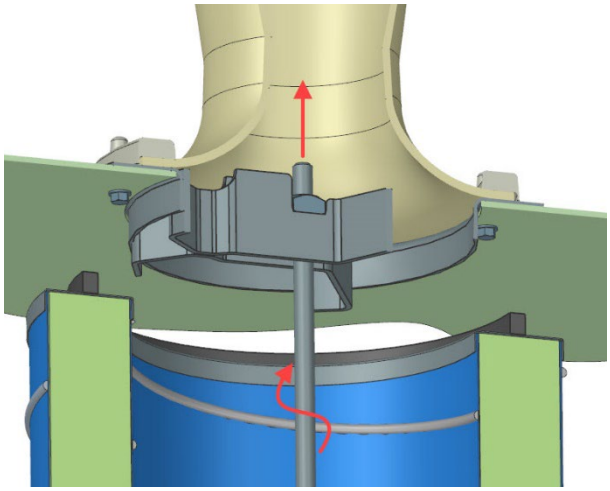


Figure 42: Installation of crank (view 2)

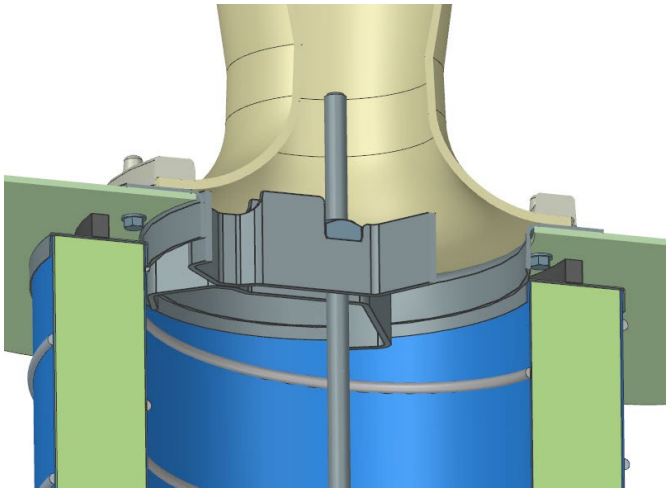
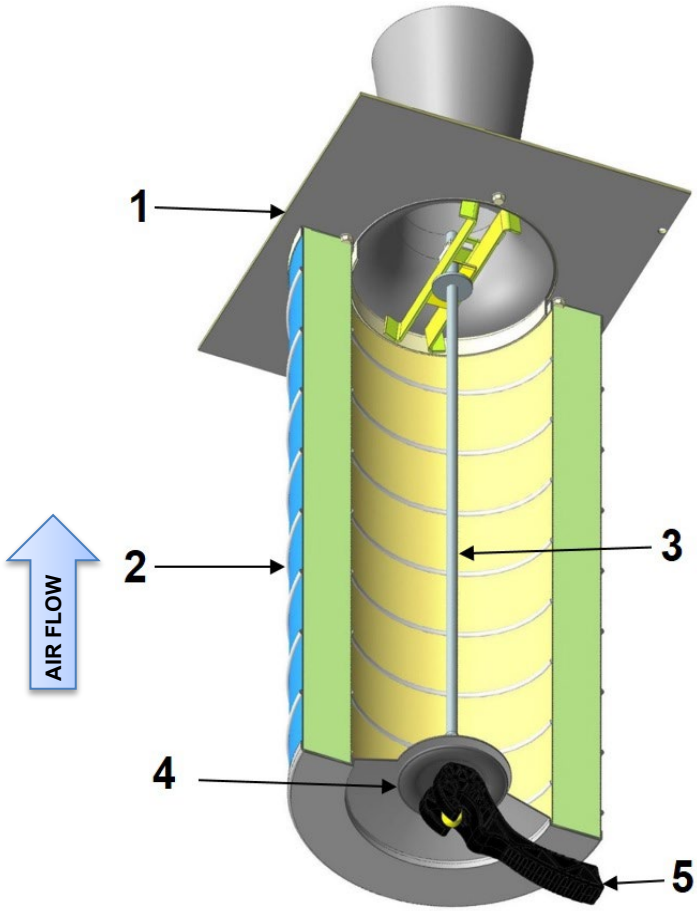


Figure 43: Installation of crank (view 3)

3. Center the filter element over the collar (fig.38 item 2) so that the square nut fits into the groove of the collar (fig. 41). Then turn the crank handle clockwise until the element is drawn tight against the tube sheet (fig. 41 and 43). The crank is to be firmly tightened by hand so that the element gasket compresses against the tube sheet. There is no specific torque requirement.
4. Repeat sections 5.3.1 to 5.3.2 for all other filter elements.

Result: filter element is installed

5.4 Self-cleaning filter element – Quick lock type



Pos.	Designation	Pos.	Designation
1	Tube sheet	4	Gasket washer
2	Filter element	5	Clamp handle
3	Element support kit		

Figure 44: Filter element assembly - quick lock type

5.4.1 Removal of old filter elements

1. Care must be taken when removing the QLY handle (fig. 44, item 5). Make sure the element is not falling off.

Keep clamp handle safe; they will be reused.

2. Carefully remove filter element (fig.44, item 2) from filter house.
3. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

5.4.2 Installation of filter element on the element support

1. See figure 45.

Figure 45: Installation of filter element on element support

2. Lift the filter element (fig.44 item 2) + gasket washer (fig.44 item 4) onto the element support (fig.44 item 3).
3. Push the filter element tight against the tube sheet until the element support (fig.44 item 3) protrudes through the gasket washer (fig.44 item 4).
4. See figures 46 & 47.

Ensure that gasket washer is still properly seated in the metal cap of the filter element, as shown in fig.46.

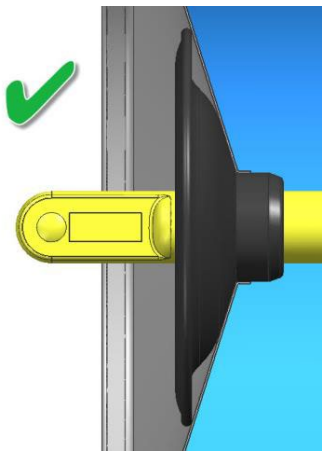


Figure 46: Correct position of gasket washer

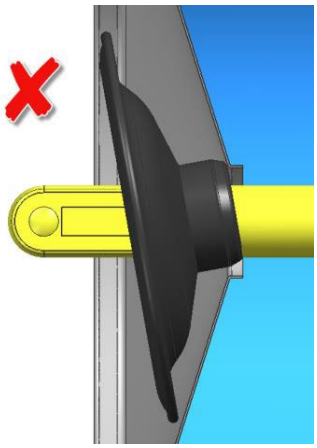


Figure 47: Incorrect position of gasket washer

5.4.3 Securing filter elements with clamp handle

1. See figures 48 & 49.
2. Attach the clamp handle (fig.44 item 5) to the element support (fig.44 item 3)

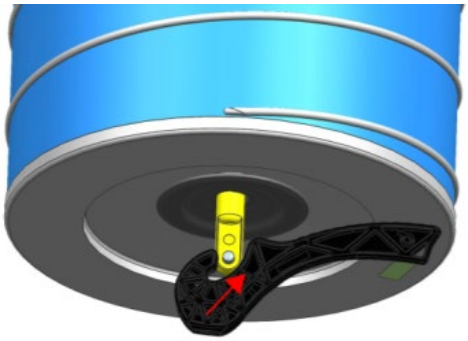


Figure 48: Positioning of clamp handle

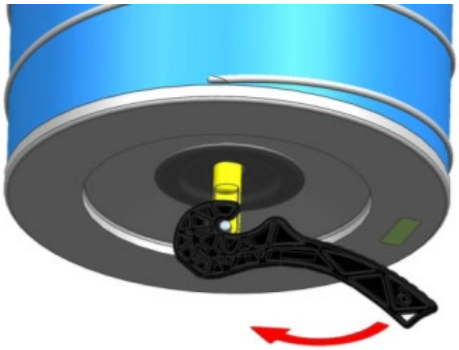


Figure 49: Secure filter elements using clamp handle

3. Secure the filter elements by pushing down the clamp handle (fig.44 item 5).

Do not use any tools to force the clamp handle into position. If it is very difficult or impossible to close the clamp handle by hand, then the installation personnel must re-check all stages of the element installation process and, if necessary, dismantle the element assembly and redo the procedure.

4. Figures 50 & 51 show the correct final position of the clamp handle. It is possible that not all clamp handles be orientated in the same direction.

Figure 50: Clamp handle final position (view 1)

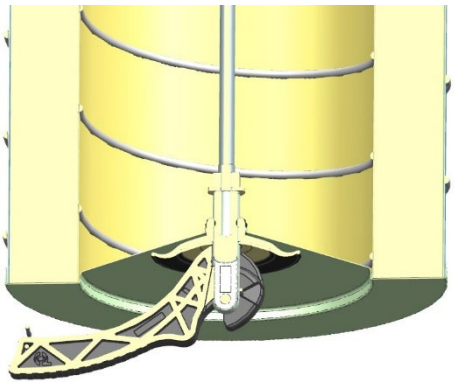
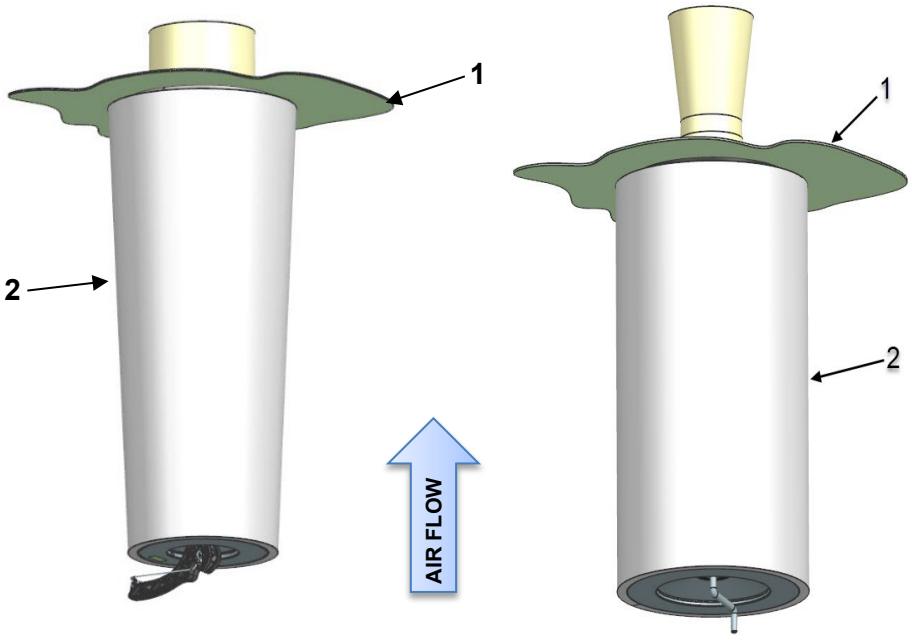


Figure 51: Clamp handle final position (view 2)

5. Repeat sections 5.4.1 to 5.4.3 for all other filter elements.

- **Result:** filter elements are installed

5.5 Pre-filter sleeve-sock installation



Pos.	Designation	Pos.	Designation
1	Tube sheet	2	Pre-filter sleeves-sock

Figure 52: Pre-filter sleeve-sock in final position – PowerSeal type

5.5.1 Removal of pre-filter sleeves-sock

1. See figure 53.
2. Remove first-fit pre-filter sleeves or aftermarket sock.
3. Discard the removed pre-filter sleeves-sock by utilizing a drop chute directed to a dumpster or by hand; do not disperse the dust inside the filter house and working area.

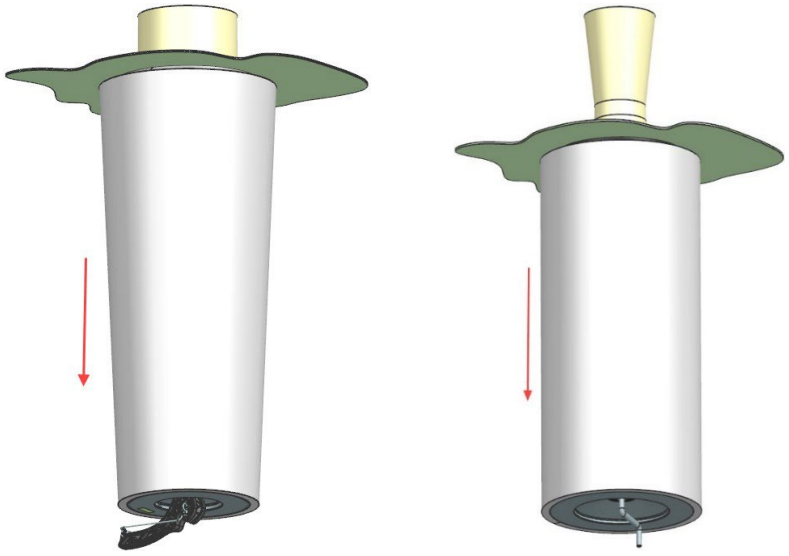


Figure 53: Pre-filter sleeves-sock removal

5.5.2 Installation of pre-filter sleeves-sock

1. See figure 54.
2. Remove new aftermarket pre-filter sock from box and position the larger opening of the pre-filter sock towards the filter element.

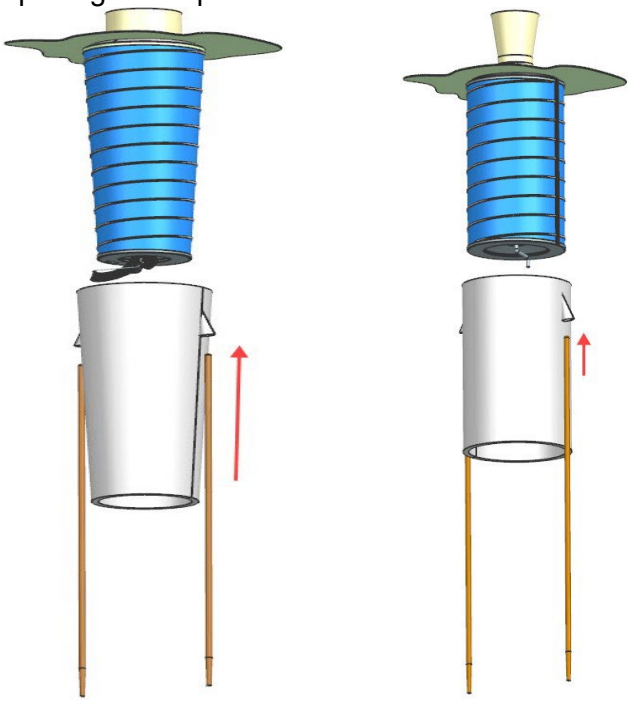


Figure 54: Installation of pre-filter sleeves-sock on filter element.

3. See figures 54 and 55.

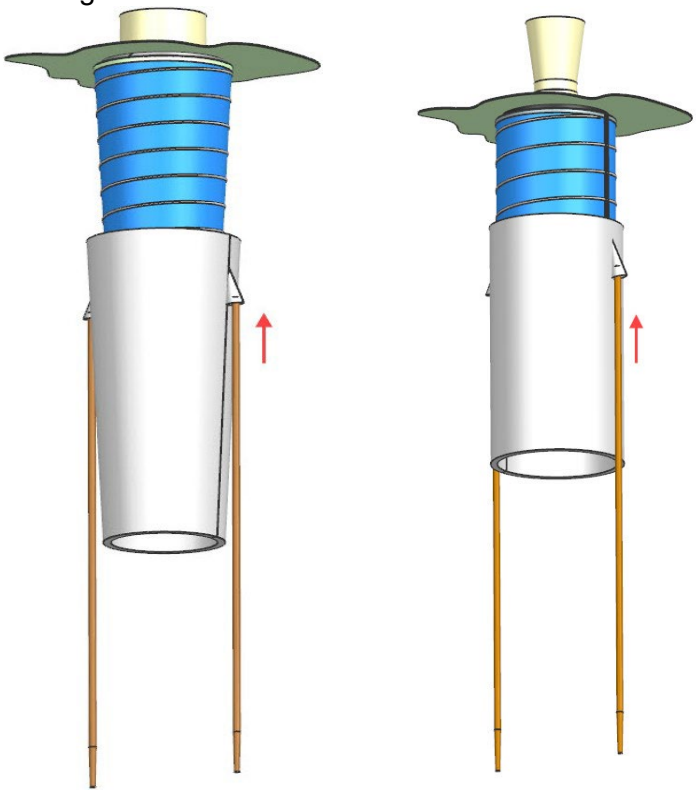


Figure 55: Installation of pre-filter sleeves-sock using sticks.

4. Use the installation sticks to slide pre-filter sock over the filter element.
5. See figures 56 and 57.

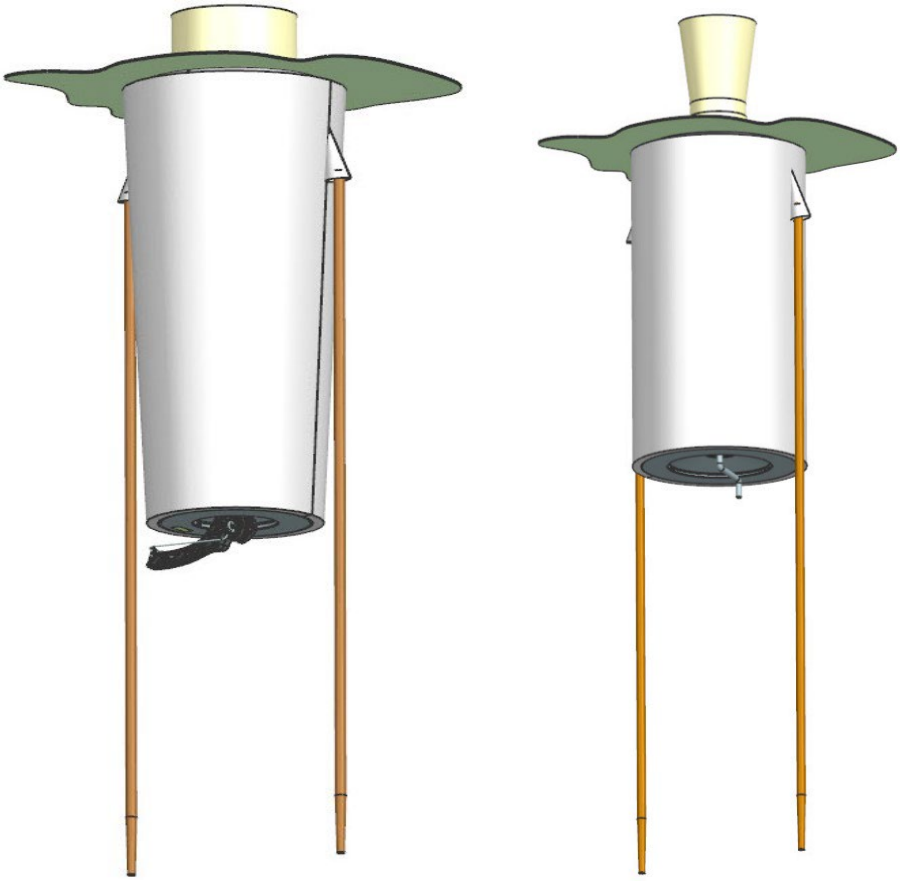


Figure 56: Position of pre-filter sleeves-sock on filter element

6. The aftermarket pre-filter sock shall be flush with the end of the filter element.

Figure 57: Pre-filter sleeves-sock stick removed.

5.5.3 Securing pre-filter sleeves-sock on filter element

1. See figures 58 & 59.
2. Install zip-tie close to the end of the filter element, around 2” [50mm] from the end of the filter element. Tighten the zip-tie to fix the aftermarket pre-filter sock onto the filter element.

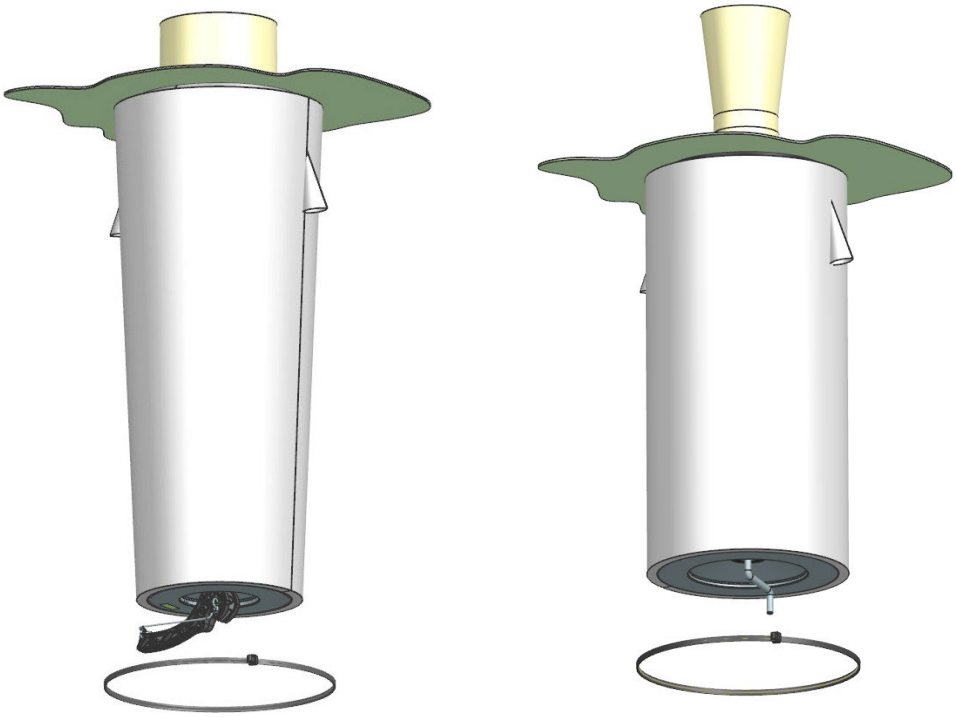


Figure 58: Positioning of zip-tie

Figure 59: Zip-tie final position

3. Repeat sections 5.5.1 to 5.5.3 for all other filter elements.

6 STATIC FILTER ELEMENTS

WARNING

Filter elements are flammable

Injury to personnel and destruction of equipment

- No smoking or welding inside filter house

CAUTION

Dust from filter elements

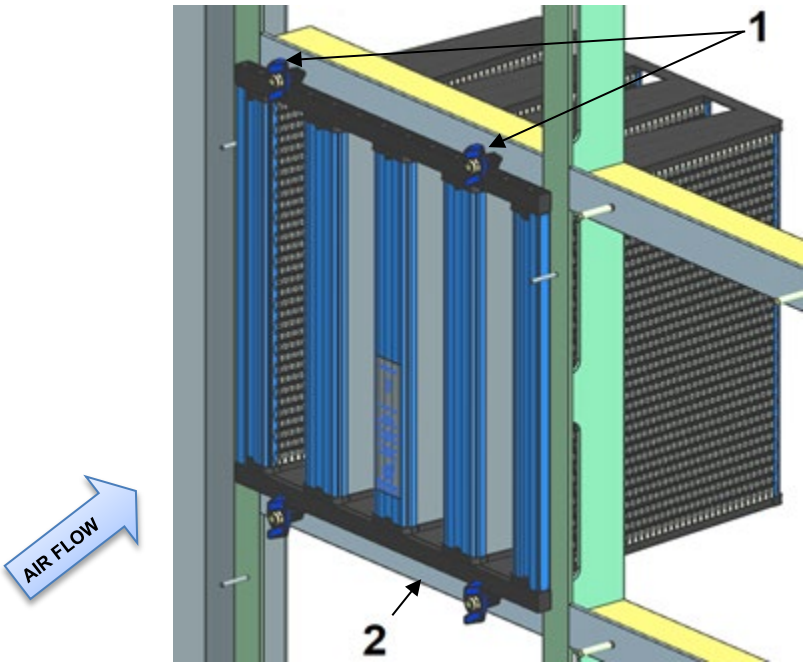
Ingestion of dust particles

- Always wear facemask when replacing filter elements.

- The static filter elements contain fragile media and must be handled very carefully.
- Inspect all elements (before installation) for any holes in the media. Any damaged elements must be replaced to prevent dirty air getting into the clean airside.
- All filter elements must be installed. Failure to do so will expose the turbine to potentially damaging dust particles.
- It is not permitted to air-blast or clean and re-use Donaldson filters.

- Use only Donaldson Filter Elements for replacement.
- Damage to the turbine due to the use of elements other than Donaldson invalidates the Donaldson warranty.
- Warranty is invalidated after 5 years.

6.1 Static filter element - Mini-pleat panel



Pos.	Designation	Pos.	Designation
1	Clamp height	2	Tube sheet

Figure 60: Filter element assembly

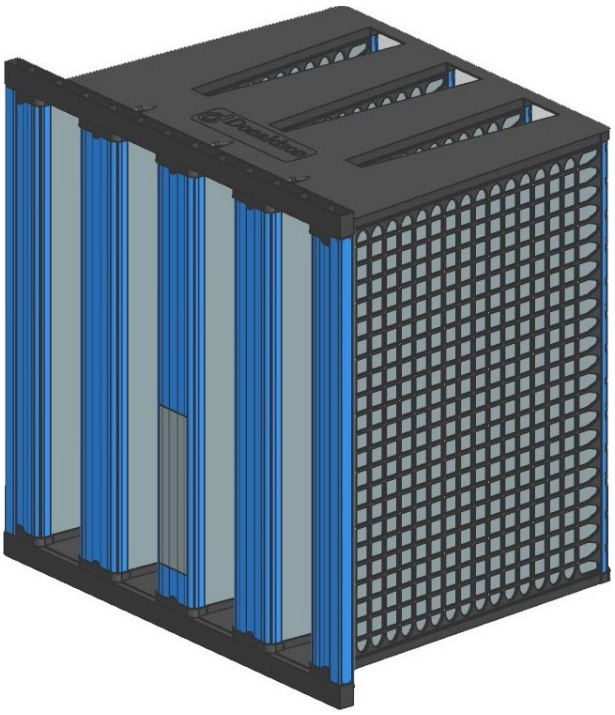


Figure 61: Filter element mini-pleat filter

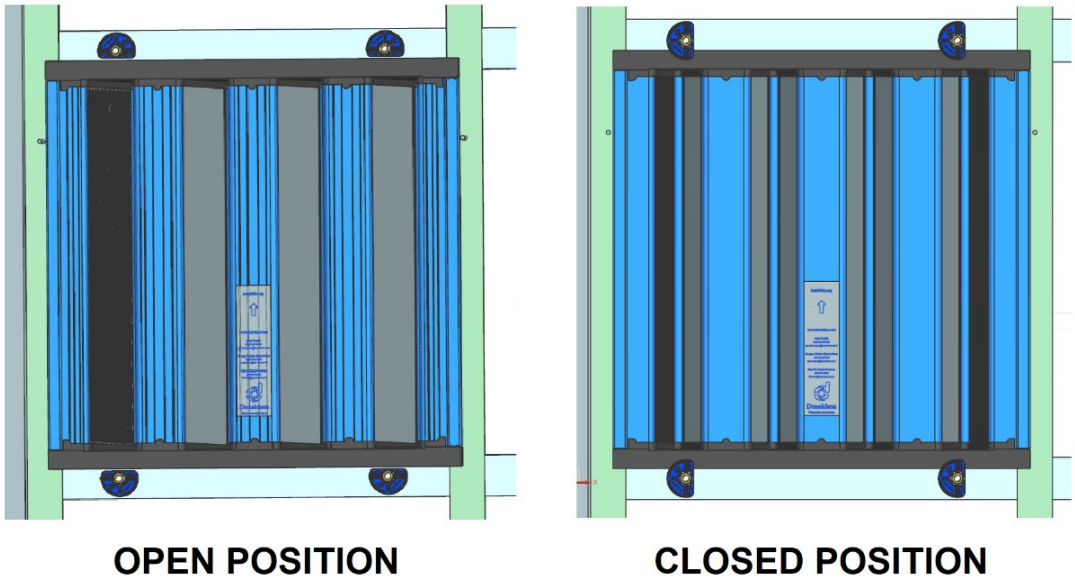


Figure 62: Clamp height position

6.1.1 Removal of old filter elements

1. See figures 60 and 62.
2. Turn the clamps x4 (fig.60 item 1) into open position (fig. 62). The filter element is now detached from the tube sheet.
3. Remove the filter element (fig.61) from the tube sheet.
4. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

6.1.2 Installation of new mini-pleat panel

1. See figures 60 and 62.
2. With clamps x4 (fig.60 item 1) in open position (fig. 62), insert mini-pleat panel into tube sheet until its gasket touches tube sheet.

Do not compress the gasket more than 50%. If the gasket is compressed too much it will be damaged.

3. Turn the clamps (x4) (fig.60 item 1) into the closed position (fig. 62).
4. Repeat sections 6.1.1 to 6.1.2 for all other filter elements.

- **Result:** Mini pleat panel is installed

6.2 Static filter element - Pocket filter

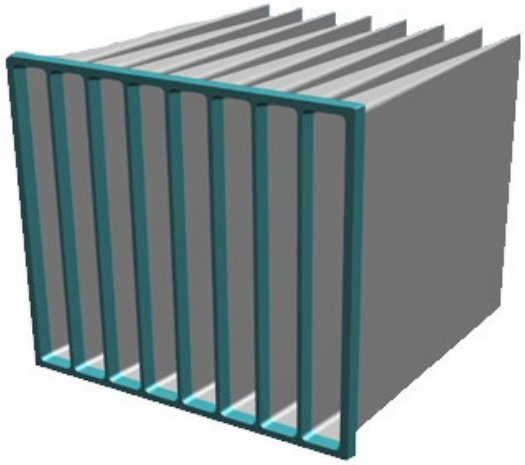


Figure 63: Pocket filter

- Always have all pocket filters installed. Failure to do so will compromise the level of cleanliness of the downstream filter side, thereby affecting the final filter and gas turbine performance.
- Always check the pocket filters before installing them. Reject any damaged pocket filters.
- Always make sure the Clean Air Side is clean before installing the pocket filters.

The schedule for change-out of pocket filters is dependent on:

- Site conditions
- Δp specified by customer
- Visible dirt on filters

Donaldson recommends filter replacement after 2 years of operation. The filter life is limited to five years: 3 years storage in a dry and well-ventilated area in their sealed original box and 2 years in operation.

- When filters are used for the first time, perform regular checks to establish when, approximately, they should be changed.
- Donaldson recommends, for maximum turbine protection, to replace the pocket elements while the turbine is at a standstill.

6.2.1 Removal of pocket filter

1. Brush or vacuum clean the dust which could have accumulated over the elements at the tube sheet level and at any other location where it might fall out while changing the elements. Start doing this from the top row of elements; this is to reduce clean air side contamination.
2. Undo the retention device and remove pocket filters from the tube sheet.
3. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

6.2.2 Installation of pocket filter

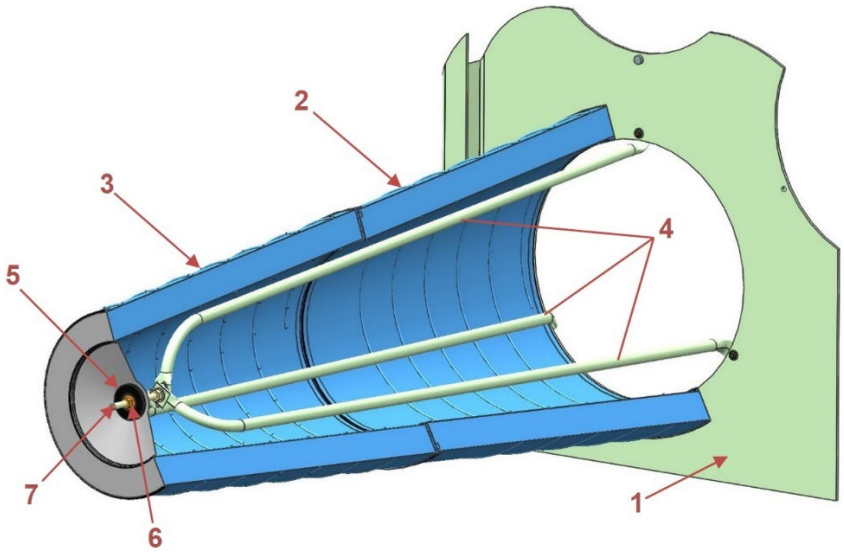
1. See figure 63.
2. Position pocket filter on the tube sheet until its header touches tube sheet.
3. Fix the pocket filter by securing it with the supplied retention device.

Note that this fixation method varies dependent on design/specs of the air filter.

4. Thoroughly check that the pocket filters are fitted tightly against the tube sheet and secured.
5. Repeat sections 6.2.1 to 6.2.2 for all other filter elements.

- **Result:** pocket filter is installed

6.3 Static filter element – Double conical type



Pos.	Designation	Pos.	Designation
1	Tube sheet	5	Gasket washer
2	Large conical element	6	Retention nut
3	Small conical element	7	Retention bolt
4	Element support legs		

Figure 64: Yoke legs and filter element alignment

Caution when installing the filter elements; Damage can result by the front end of the element supports puncturing into the filter element's liner as shown in Fig.64
Position the filter elements with their gasket facing upward to avoid ripping the gasket on the platform grating.
Do not step on air manifold, tubing or filter element supports inside the filter modules; damage will result.
Always use the gasket washer (fig.64 item 5) and the retention nut (fig. 64 item 6) that comes with the supplied filter element.

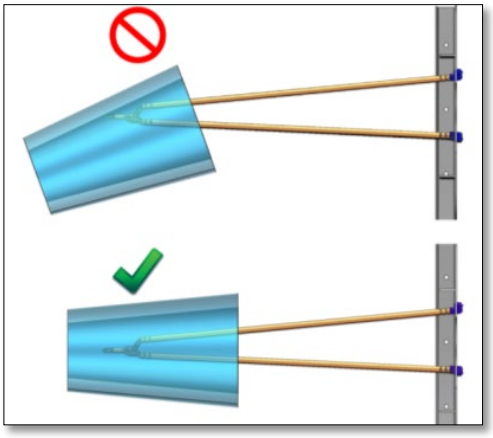


Figure 65: Caution when installing the filter element

6.3.1 Removal of old filter elements

1. Brush or vacuum clean any dust which could have accumulated over the elements at the tube sheet level and at any other location where it might fall off while changing the elements. Start doing this from the top row of elements; this is to reduce clean air side contamination.
2. Remove retention nut (fig.64, items 6) and gasket washer (fig.64, items 5).
3. Discard the removed filter elements by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

6.3.2 Installation of large conical element on the tube sheet

Element support yokes are designed to with stand only a maximum load of 35kg. The yokes must not be used as a ladder to install the filter elements
Make sure that the element retention yokes are centered on the tube sheet hole and aligned with each other to ensure proper sealing between the elements and with the tube sheet (filter support frame)

1. See figure 64 and 66.
2. Slide the large conical filter element (fig.64 item 2) onto the element support (fig.64 item 4) until the gasket at the large end touches the tube sheet (fig.64 item 1).

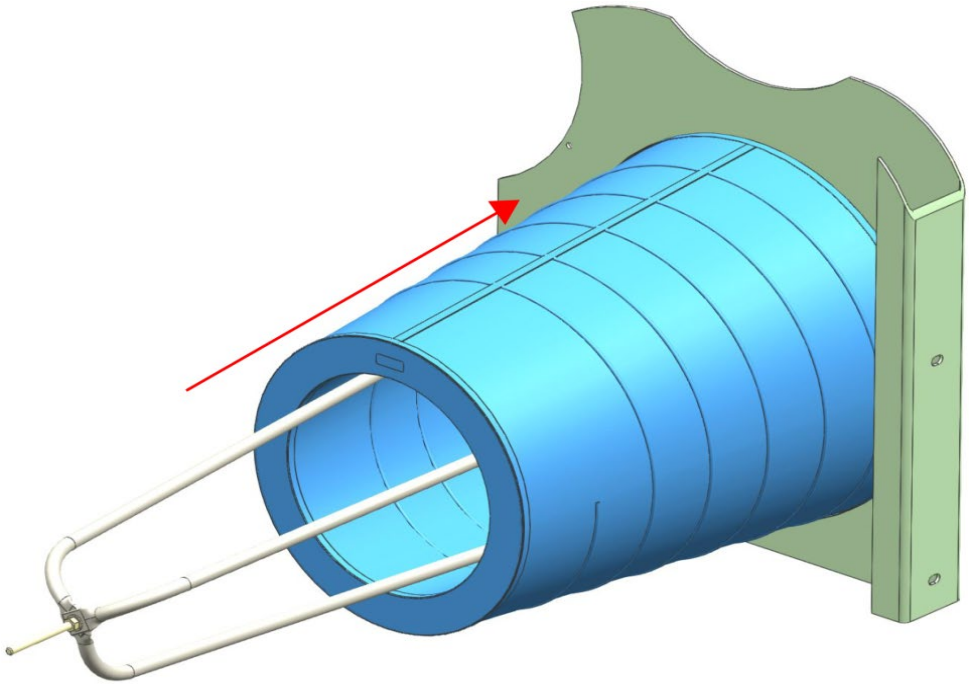


Figure 66: Installation of large conical filter element.

6.3.3 Installation of gasket washer on the small conical filter element

1. See figure 67.

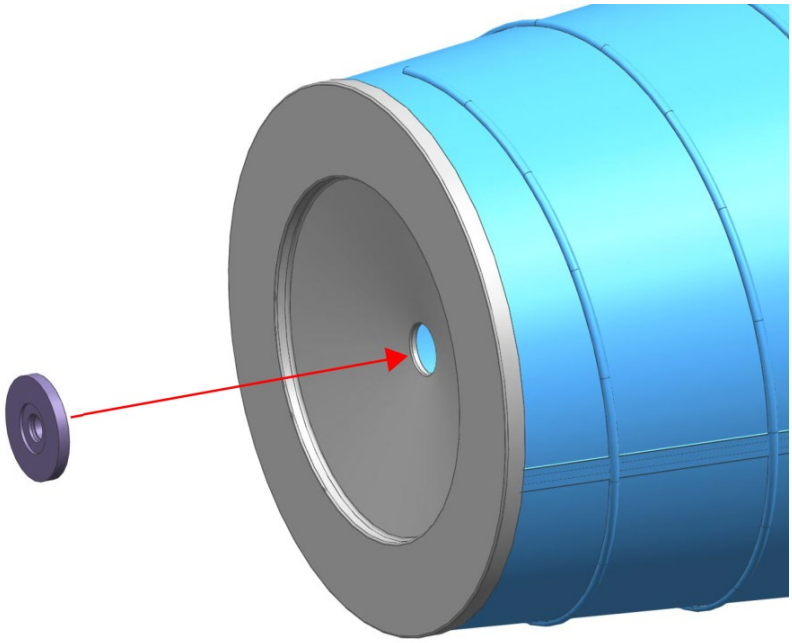


Figure 67: Installation of gasket washer.

2. Place gasket washer (fig.64 item 5) in the hole at the end of the small conical filter element (fig.64 item 3).

The gasket washer must be placed correctly in the cylindrical filter element; otherwise, the system will not be airtight. See figure 68

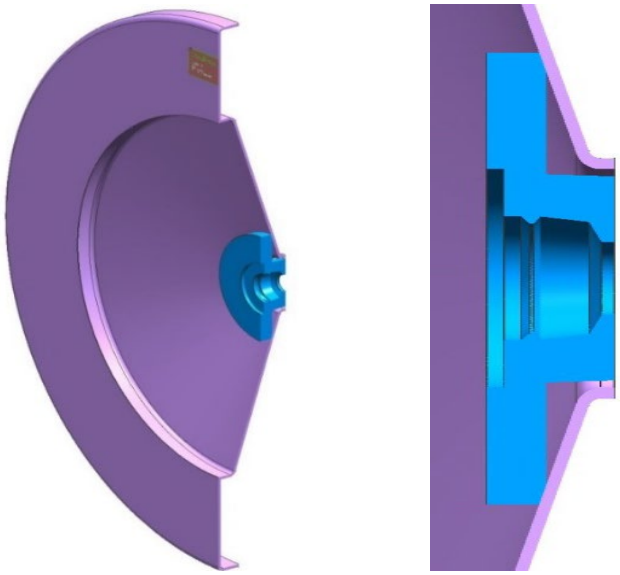


Figure 68: Sectional View – when gasket fitted correctly.

6.3.4 Installation of small conical filter element on the element support

1. See figure 69

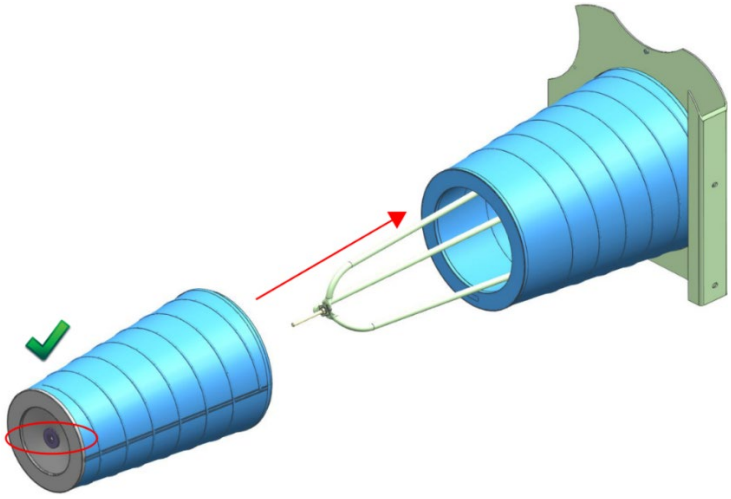


Figure 69: Installation of small conical filter element on element support

2. Slide the small conical filter element (fig.64 item 3) + gasket washer (fig.64 item 5) onto the element support (fig.64 item 4) and against the large conical filter element (fig.64 item 2).
3. Push both elements tight against the tube sheet until the element support (fig.64 item 4) protrudes through the gasket washer (fig.64 item 5).

Ensure that gasket washer is still properly seated in the metal cap of the cylindrical filter element, as shown in fig.70

6.3.5 Securing filter elements with retention nut

1. See figures 64 & 70.
2. Screw the retention nut (fig.64 item 6) to the threaded retention bolt on yoke against the gasket washer as shown in Fig. 70.

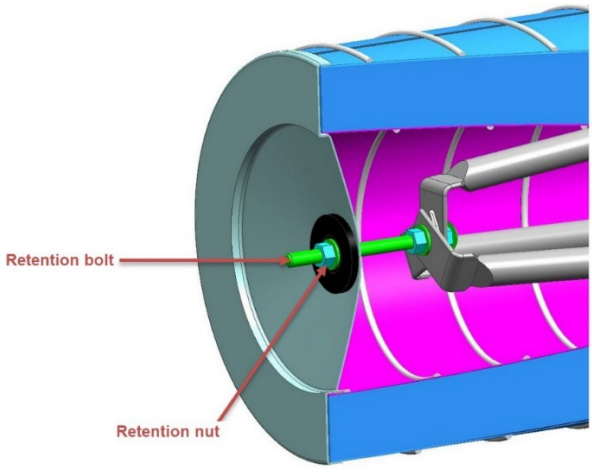


Figure 70: Assembly of retention nut

CAUTION

Over tightening of the retention nut

Element support and/or gasket washer could be damaged

Torque on the element retention nut should be 18-20 Nm to ensure an airtight seal. Do not exceed 20 Nm torque on the element retention nut. Over-tightening can damage the filter elements.

Verify that the small and large conical elements are correctly aligned with each other. Correct alignment is critical for proper air sealing. See fig.71

If it is very difficult or impossible to tighten the retention nut, then the installation personnel must re-check all stages of the element installation process and, if necessary, dismantle the element assembly and redo the procedure.

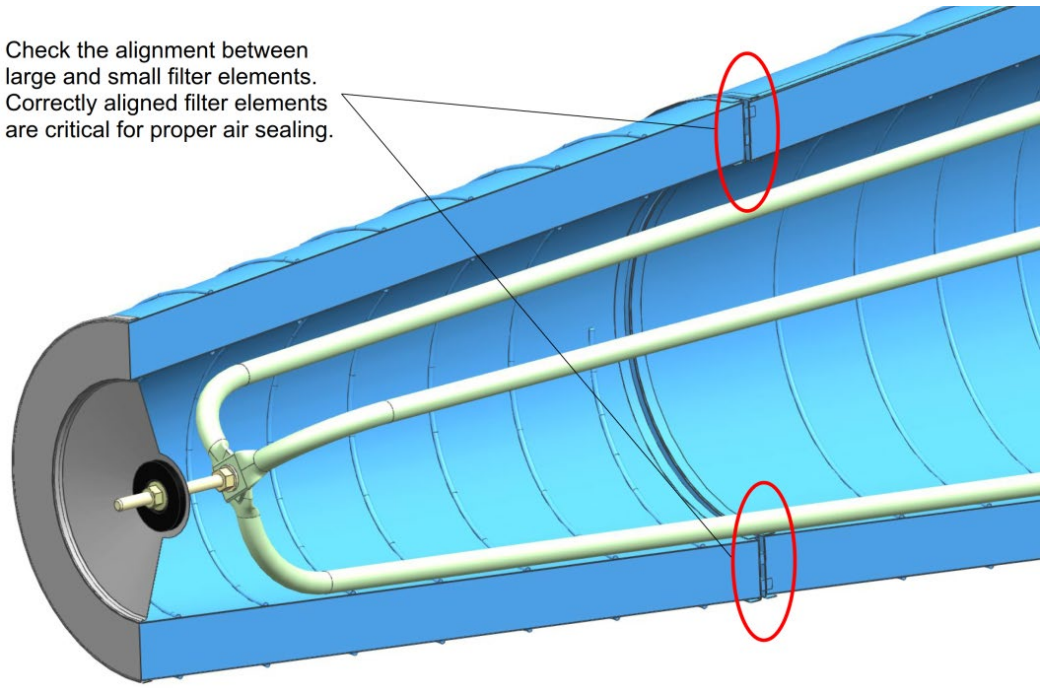


Figure 71: Correct alignment of large and small filter elements

6.3.6 Installation of pre-filter pads

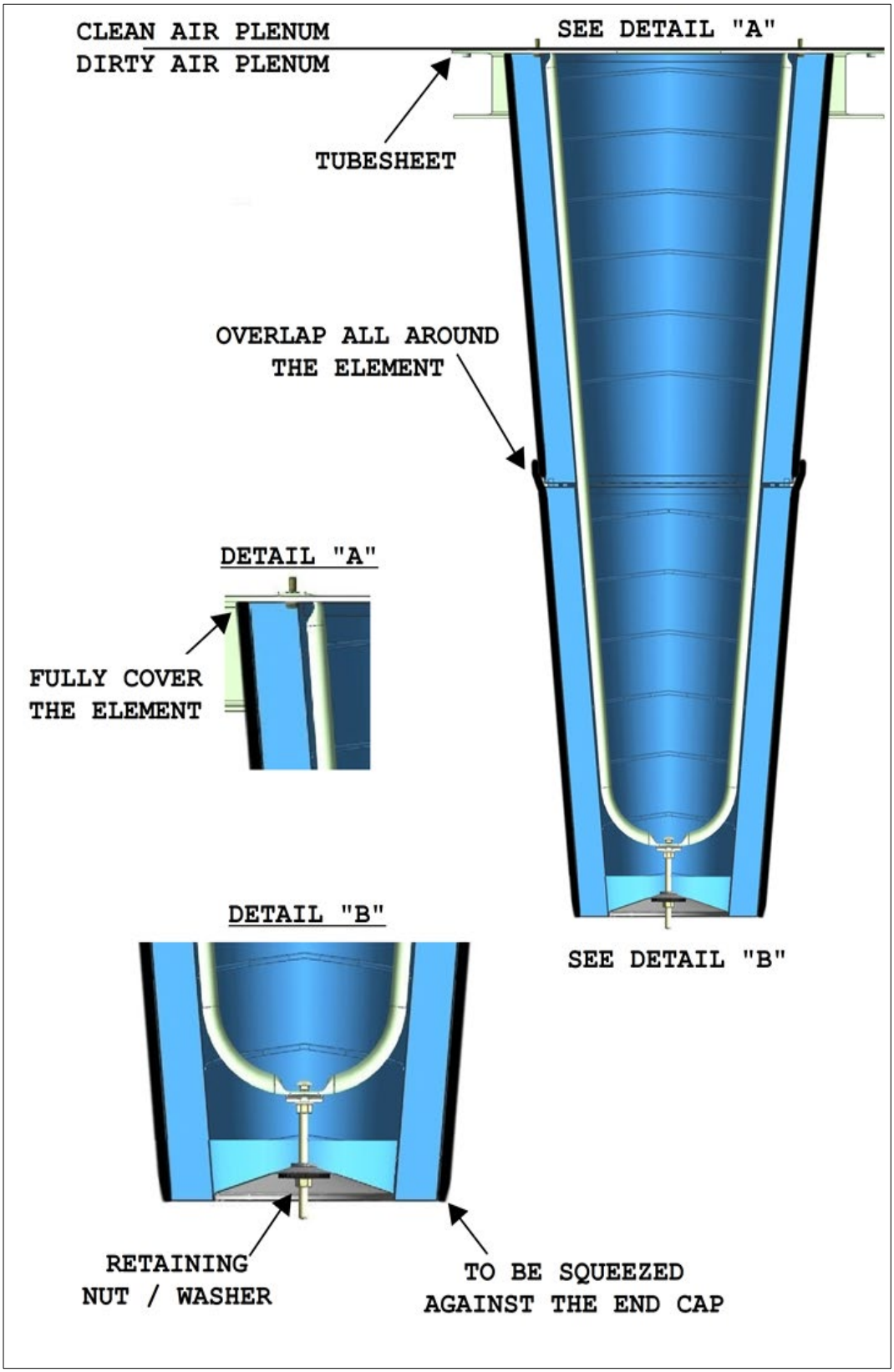


Figure 72: Pre-filter pads installation

- Lift the pre-filter pads in place, still packed in their original box, for maximum handling protection. Do not place a hook in the box.
- Do not step on yokes (element support). Damaged yokes may lead to bad filter element installation, insufficient gasket compression, and leaks.
- Do not install damaged pre-filters.
- Only Donaldson genuine pre-filters must be used; otherwise, Donaldson warranty is invalidated.

This section describes the installation of the pre-filter pads on the conical filter elements. The pre-filter pads are composed of 2 pieces: a large and a small pad.

1. See figure 72.
2. Slide the large pre-filter cone over the large conical filter element. Ensure it is well positioned near the tube sheet. Completely cover the large conical filter element with the large pre-filter cone.
3. Slide the small pre-filter cone over the small conical filter element. Ensure it overlaps over the large pre-filter cone; push it over, until the small end is squeezed firm over the element cover.
4. Keep the pre-filters clean during installation.
5. Repeat sections 6.3.1 to 6.3.6 for all other filter elements.

- **Result:** filter element + pre-filter pads are installed

7 SSC/NORRPAK FILTER ELEMENTS

WARNING

Compressed air

Injury to personnel during maintenance

- Shut off the compressed air supply and bleed compressed air line before replacing filter elements.

WARNING

Filter elements are flammable

Injury to personnel and destruction of equipment

- No smoking or welding inside filter house

CAUTION

Dust from filter elements

Ingestion of dust particles

- Always wear facemask when replacing filter elements.

CAUTION

Filter element support

Injury to unprotected eyes

- Wear eye protection when replacing filter elements.

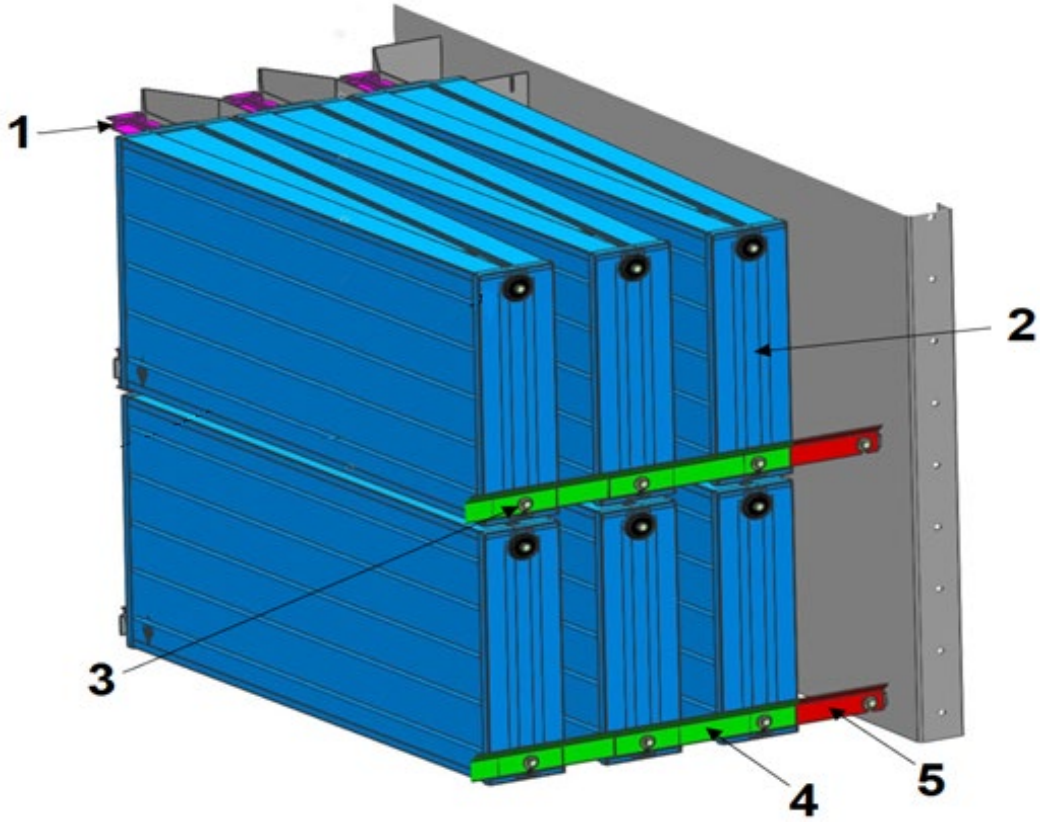
Before servicing the filter elements

1. Shut off the compressed air supply
2. Check that the compressed air line pressure level is zero
3. Shut off pulse-cleaning at control box

- All filter elements must be installed. Failure to do so will expose the turbine to potentially damaging dust particles.
- Use caution when installing the conical and cylindrical filter elements. Damage can result from the element support rod puncturing the filter element liner.
- It is not permitted to air-blast or clean and re-use Donaldson filters.
- Do not step on any of the air manifolds, air tubes, or element yokes inside the filter module, damage will be the result.

- Use only Donaldson Filter Elements for replacement.
- Damage to the turbine due to the use of elements other than Donaldson invalidates the Donaldson warranty.
- Warranty is invalidated after 5 years after date of production.

7.1 SSC filter element



Pos.	Designation	Pos.	Designation
1	Element support kit	4	Retainer middle
2	SSC/Norrpak (V-shaped filter element)	5	Retainer end
3	Bolt and nut		

Figure 73: Filter element assembly

7.1.1 Removal of old filter elements

1. See fig. 73
2. Brush or vacuum clean any dust which could have accumulated over the elements at the tube sheet level and at any other location where it might fall off while changing the elements. Start doing this from the top row of elements. This is to reduce clean air side contamination.
3. Loosen up the bolt and nuts (item 3) and remove retainer end (item 5) followed by the retainer middle (item 4) on the bottom part of the filter, do this on the remaining retainer (up and bottom).
4. Discard the removed filter elements (item 2) by utilizing a drop chute directed to a dumpster or by lowering a filter basket or even by hand; do not disperse the dust inside the filter house and working area.

7.1.2 Installation of V-shaped filter element

1. See figures 73 and 74

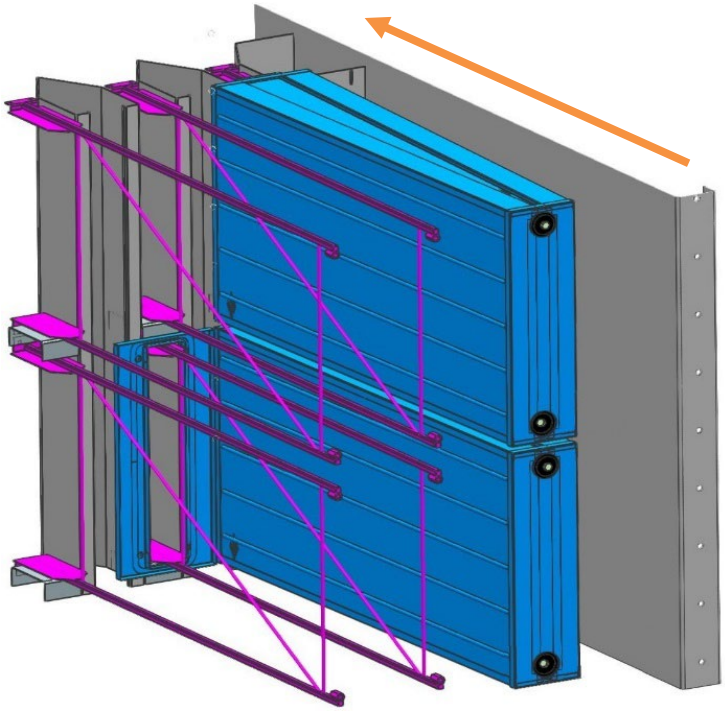


Figure 74: Installation of V-shaped filter element

2. Slide (one) V-shaped filter element (fig.73 item 2) onto the element support (fig.73 item 1) until the gasket at the large end touches the tube sheet.

7.1.3 Securing filter elements with retainer

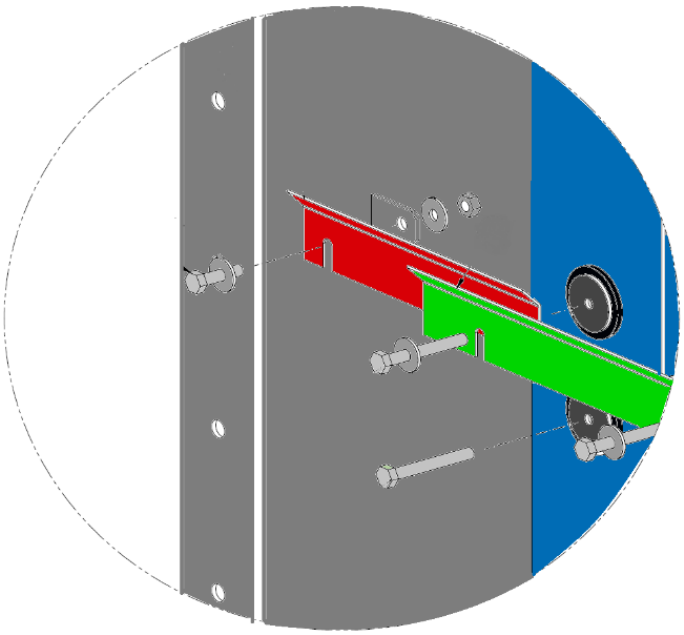


Figure 75: Positioning of retainer

1. See Figures 73 and 53.
2. Place and fix retainer end (fig. 73 item 5) onto the filter element (fig.73 item 2) followed by the retainer middle (fig. 73 item 4).

If it is very difficult or impossible to close the retainer, then the installation personnel must re-check all stages of the element installation process and if necessary, dismantle the element assembly and redo the procedure.

3. Figures 76 & 77 show the correct final position of the retainer.

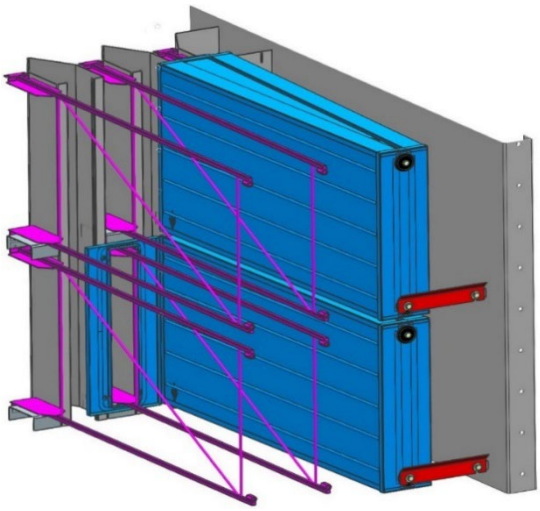


Figure 76: Retainer final position (view 1)

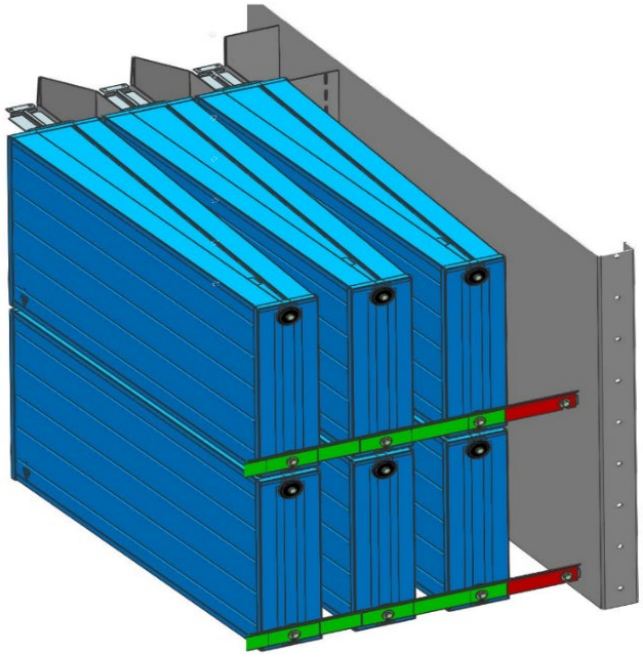


Figure 77: Retainer final position (view 2)

4. Repeat sections 7.1.1 to 7.1.3 for all other filter elements

- **Result:** All filter elements installed