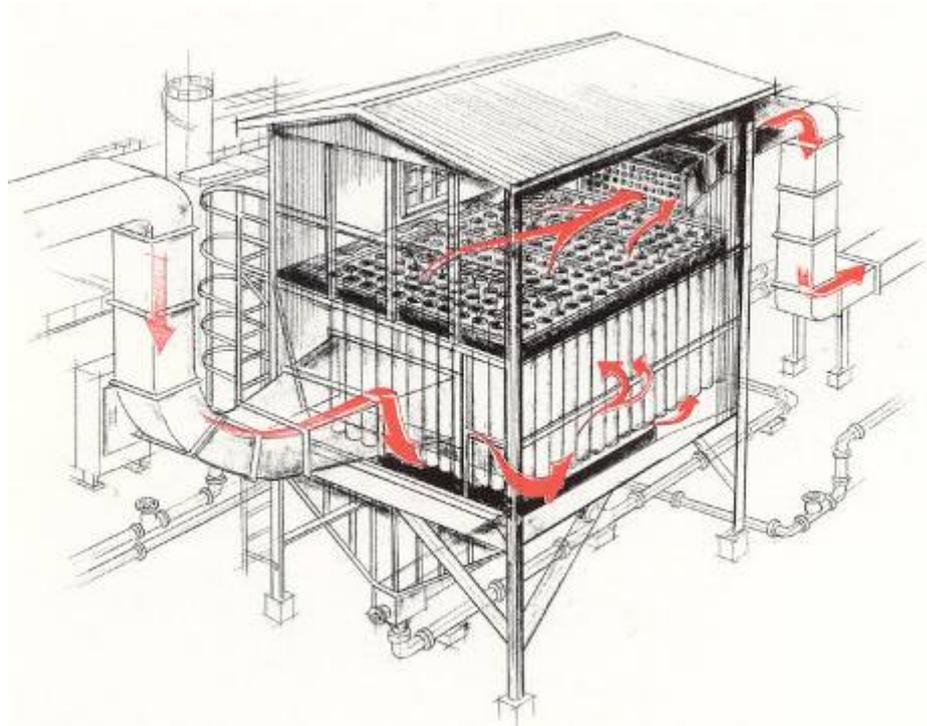


Technical Manual for Installation, Operation and Maintenance

Bag Filter



VENTEC AMBIENTAL EQUIPAMENTOS E INSTALAÇÕES LTDA

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TABLE OF CONTENTS

1 – INTRODUCTION	03
2 – OVERVIEW	03
3 – EQUIPMENT DRAWING	
3.1 – Magnified View of the Bag Filter	04
4 – COMPONENT DESCRIPTION	
4.1 – Filtering Bags	05
4.2 – Cages.....	05
4.3 – Venturis.....	06
4.4 – Mirror Plate	06
4.5 – Solenoids	06
4.6 – Diaphragm Valves	06
4.7 – Electronic Sequential Programmer	07
4.8 – Compressed Air Reservoir.....	07
4.9 – Blowing Tubes	07
4.10 – Tray.....	07
5 – ASSEMBLY	
5.1 – Bags/Cages Installation	08
5.2 – Compressed Air Assembly	09
5.3 – Assembly of the Electronic Sequential Programmer	10
5.4 – Assembly of barrier	10
6 – OPERATION	
6.1 – Housing Inner Part	11
6.2 – Compressed Air Plenum Inner Part.....	11
6.3 – Bag Cleaning System	11
6.3 – Filter External Part	11
6.5 – Bag Filter Start.....	11
6.6 – Bag Filter Setting	12
6.7 – Bag Filter Shutdown Instructions	12
6.8 – Precautions.....	12
7 – MAINTENANCE	
7.1 – Housing	13
7.3 – Filtering Bags	13
7.4 – Problem Shooting Guide.....	13
7.4.1 – High Load Loss	13
7.4.2 – Low Load Loss.....	13
7.4.3 – Dust Emission visible at the Bag Filter output	13
7.4.4 – Dust Emission at the Bag Filter output after compressed air cleaning pulse	14
7.4.5 - Temporized Sequencer does not work	14
7.4.6 – Temporized sequencer neon lamp is off	14
7.4.7 – Burn with sequencer fuse or circuit break switches off when connected	14
7.5 – List of spare parts for 02 years of operation	14

1 – INTRODUCTION

Recommendations in this manual were prepared based on project data and experimental laboratory application for the supplied products.

The user, however, has additional information on actual operating conditions in the workplace. Therefore, the user can combine such information with the practical recommendations provided in this guide, along with more specific information and details for each component supplied by the manufacturer to ensure good Installation and Operation results, as well as a safe Maintenance Program.

This Manual includes several Data Sheets, specific to the assemblies and their key fittings, where most relevant technical and building characteristic information is included.

In addition to the recommendations here included, which need to be regarded as supplementary recommendations, it is advisable not to forget the usual requirements for good installation, operation and maintenance practices.

It should also be significant the use of qualified personnel, both for operation and in maintenance of this equipment, to eliminate a number of problems that may arise.

2 – OVERVIEW

The bag filter is made of a metallic housing designed for continuous operation and automatic cleaning.

The dirty gas enters through the collector in the center or bottom part of the body, being sent to the tray, where the heavier particulate is separated, and the lighter material is carried along with the gas to the filter intermediate part, being forced to pass through the filtering bags where all the particulate is collected.

The clean gas is then sent to the higher plenum (filtered air chamber) and then to the atmosphere or exhausted to the discharge chimney.

The bag cleaning process is automatically performed through compressed air pulses that are controlled by a programmer. The compressed air is stored in a reservoir located beside the higher filter chamber. Above each row of bags there is a tube with holes that are aligned with the central air passage gap, located on top of the bags, through which compressed air is injected to momentarily invert the gas flow, causing the particulate material accumulated outside the bags to be removed. Such tube is connected to the reservoir through a diaphragm valve activated by a solenoid/temporized sequencer that activates cleaning of a row of bags.

In the filter, there will be a differential manometer with local reading capabilities in a 150..0..150mmCA range to provide monitoring of the dirty gas chamber (gas input) and the clean gas chamber (gas output plenum). As the bags get dirty, the difference in pressure increases up to previously established values for each filter.

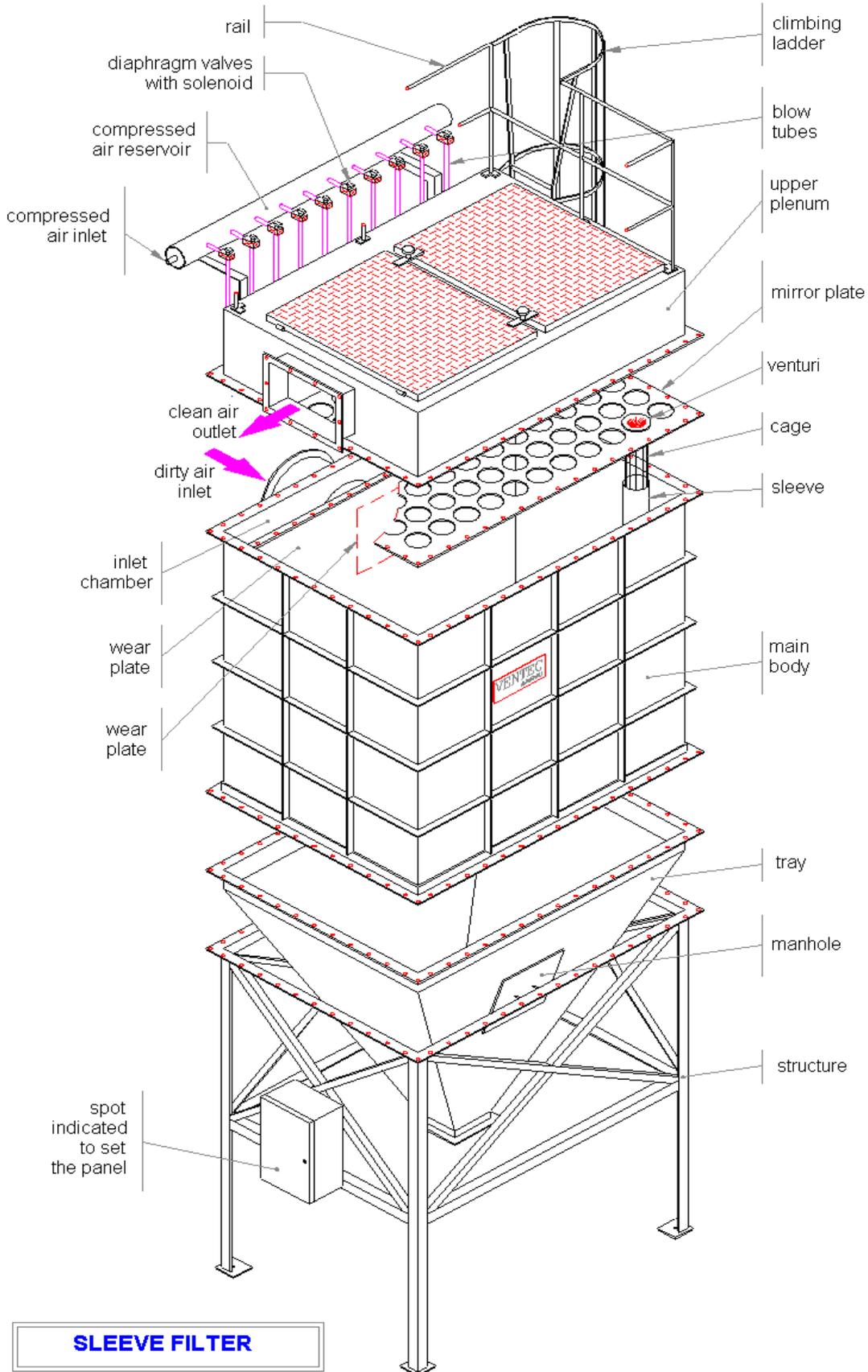
Such values provide a reference on the efficiency of the equipment cleaning system and establish the cleaning interval from one bag row to another and the duration of compressed air pulse.

Filtering bags can be removed through access doors located on the top or side of the filter.

The whole filtering assembly will be will be firmly in place through the metallic structure and there may optionally be a climbing ladder on the top of the filter, with a body safeguard rail and a handrail around it.

3 – EQUIPMENT DRAWING

3.1 – Bag Filter Magnified View

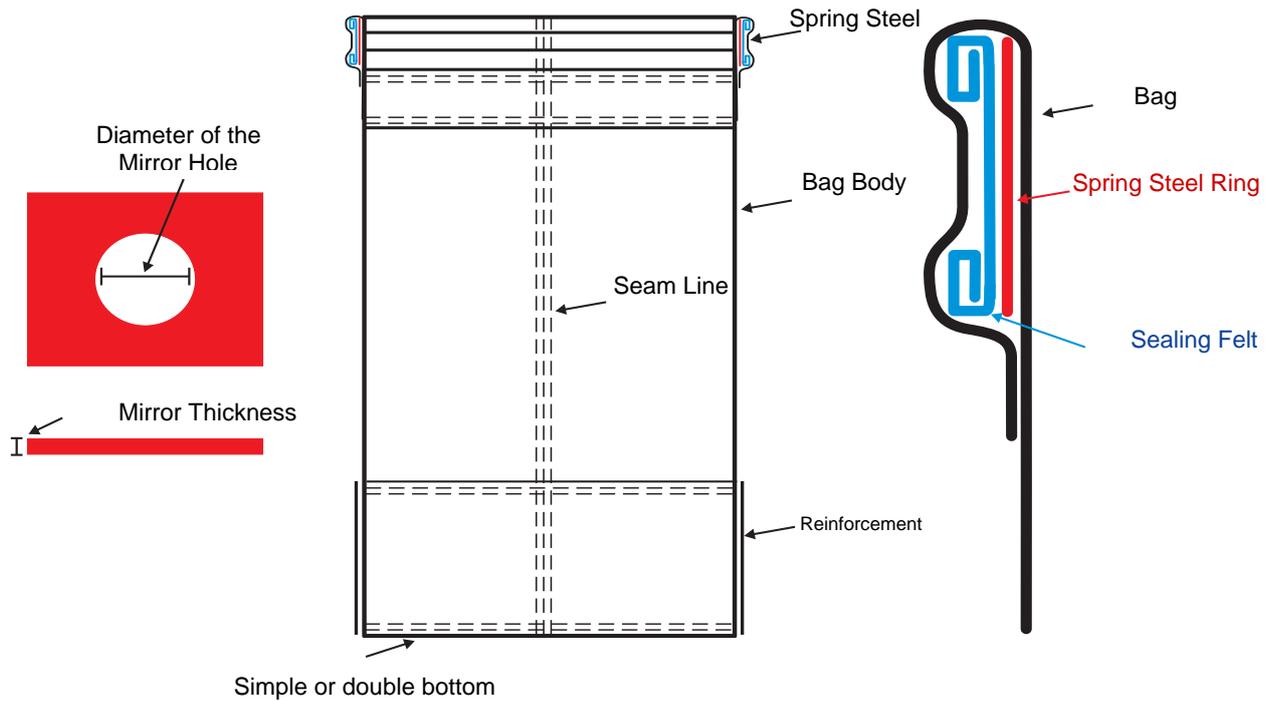


4 – DESCRIPTION OF COMPONENTS

4.1 – Filtering Bags

These are filtering elements made in needled felt through which the air and dust separation takes place, as the air goes through the filtering elements, solid particles are retained in their external wall.

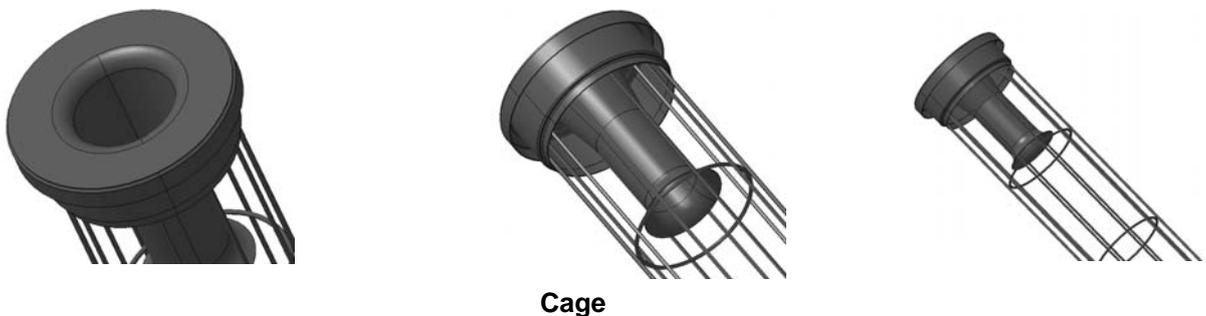
After a period, the bags get impregnated with dust and need to be cleaned. Such cleaning is performed with compressed air gush or in some cases by washing.



Filtering Bag

4.2 – Cages

These are metallic frameworks used to support the filtering bags by forming a rigid cylindrical assembly. The inner part is closed while the top part is open, containing a venturi ejector.



Cage

4.3 - Venturis

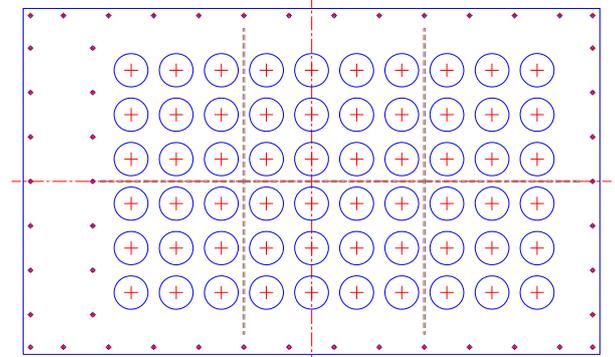
Venturis are accelerator metallic tubes that change the energy from injected compressed air into pressure energy, inducing the air through the filtering bag and, as a result from its magnitude to standard air flow, it sends a chock wave to the bag, cleaning it and dislodging impregnated material. The compressed air pressure is established as a function of the geometry or configuration of the venturi ejector, as well as the permeability of the bag to be cleaned.



Venturis

4.4 – Mirror Plate

This is a plate where the sets of filtering bags/cages are distributed and attached. Perforating needs to be strictly in accordance with the project sizing to make possible the appropriate alignment of the blowing tubes (bags cleaning) and appropriate sealing on the bags attachment.



Mirror Plate

4.5 – Solenoids

These are elements designed to change electric impulses generated in the electronic temporized sequencer programmer into pneumatic impulses, which will act on the diaphragm valves.

4.6 – Diaphragm Valves

Also known as quick escape, these are valves that allow the passage of a compressed air flow that cleans the bags. These valves are opened through pneumatic impulses produced by the solenoids.



Diaphragm Valve with Solenoid

4.7 – Electronic Sequential Programmer

The programmer is basically an integrated circuit, manufactured especially in accordance with the technical requirements of each project.

Such circuit is mounted in a thermoplastic box, IP65 protection, resistant to the ultraviolet rays, avoiding the dryness and breach. It has a transparent lid tilt, fit for the operator access the IHM pressure reading and provides possible changes of parameters.

The advantage is that the IHM is not in contact with the environment, that is such cases is usually polluted in its lower end the internal unit has 02 (two) posts of power and a second rule of posts in which are distributed signs of entry and exit of the programmer.

Those are activated according to the parameterization of the equipment on the outside are positions the 02 (two) terminals where the hoses are engaged for measuring the pressure between the clean / dirty chambers of the filter.



4.8 – Compressed Air Reservoir

A reservoir needed to accumulate the compressed air used to clean the bags.

This reservoir has enough air capacity so that throughout cleaning air blowing time the air gush is kept continuous.

4.9 – Blowing Tubes

These are tubes connected to the compressed air reservoir, through the diaphragm valves, whose purpose is to distribute and direct the compressed air gush inside bags that are located in a same row.

4.10 - Tray

A dust discharge container for the dust that comes off from the bags and also particulates that enter at a low speed and are retained in the tray itself.

5 – ASSEMBLY

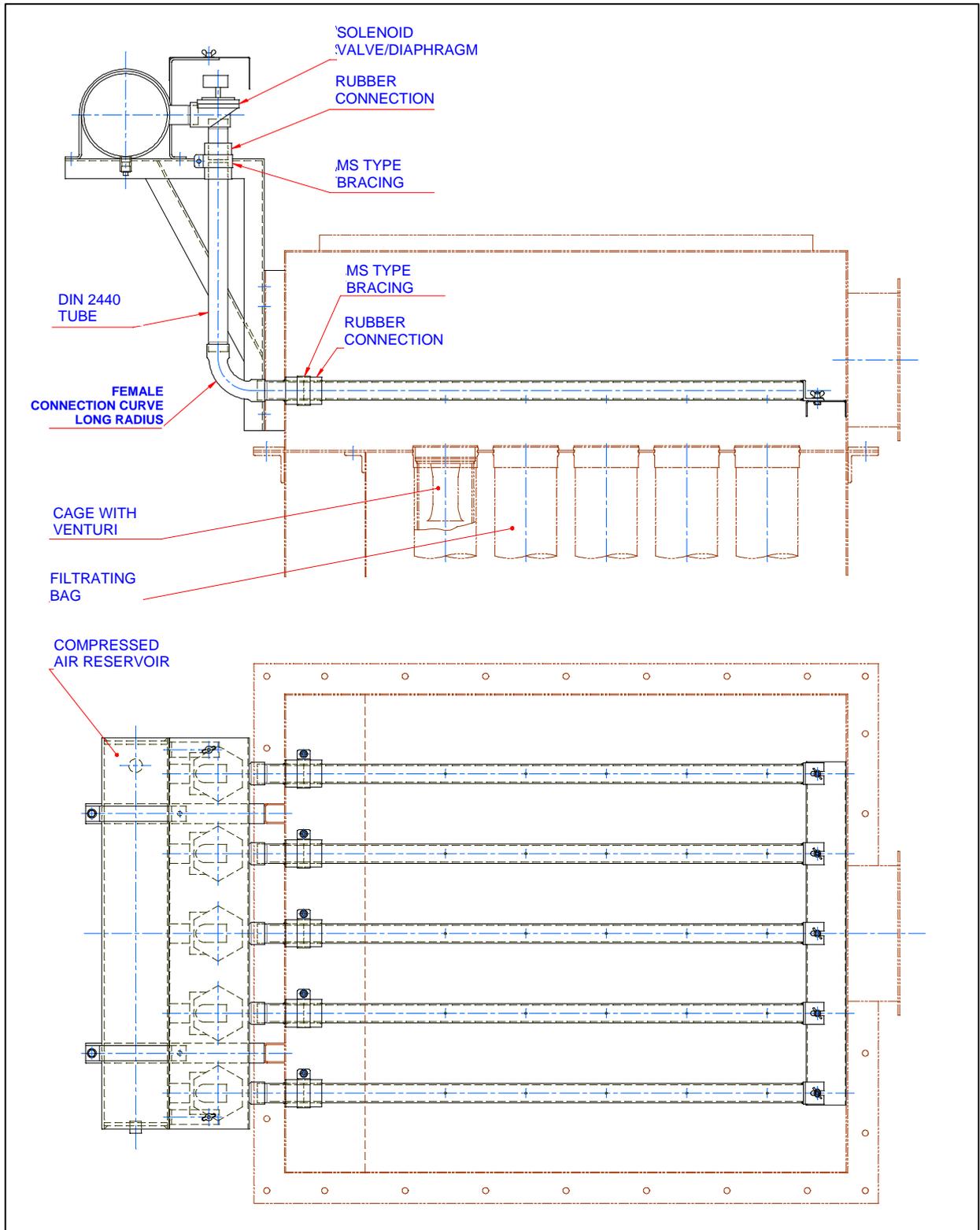
5.1 – Installation of the Bags / Cages

- Fold the “U” collar (figure 1).
- Fit the bag ring on the mirror (figure 2).
- If a “button” (figure 3) is formed, do not press it (figure 4), but in the opposite side (figure 5)
- The fit needs to be perfect so that there will be no leakage (figure 6).
- Never use any tools (mallet type).
- Fit the cage sets/venturis inside the bags (figure 7).
- When there is a grounding cable, connect it to the mirror plate.

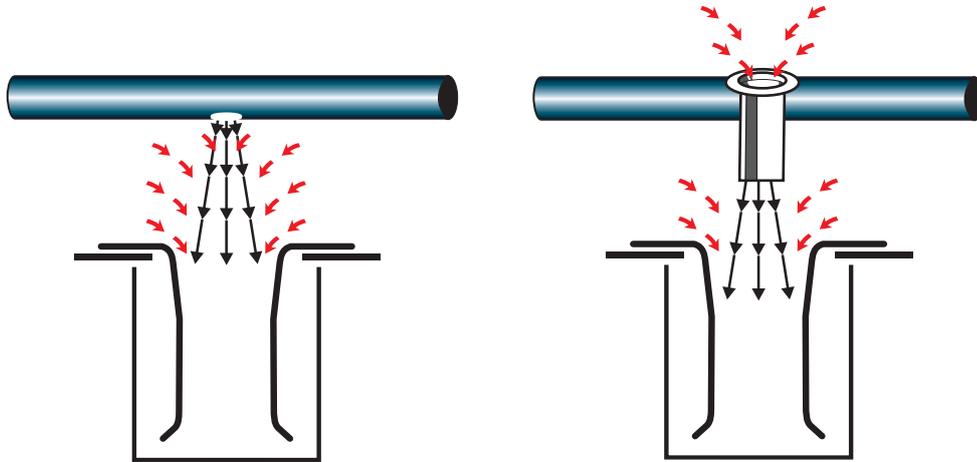


5.2 – Compressed Air System Assembly

- The compressed air system needs to be cleaned and dried with an effective pressure ranging from 6.5 to 7.0 kgf/cm².
- Attach the compressed air reservoir and connect the valves and the blowing tubes as shown in the Figure below.



- The performance of the blowing tubes needs to be rigorously aligned with the holes in the mirror.
- This is required to ensure that all types of leakage are removed from the connections.

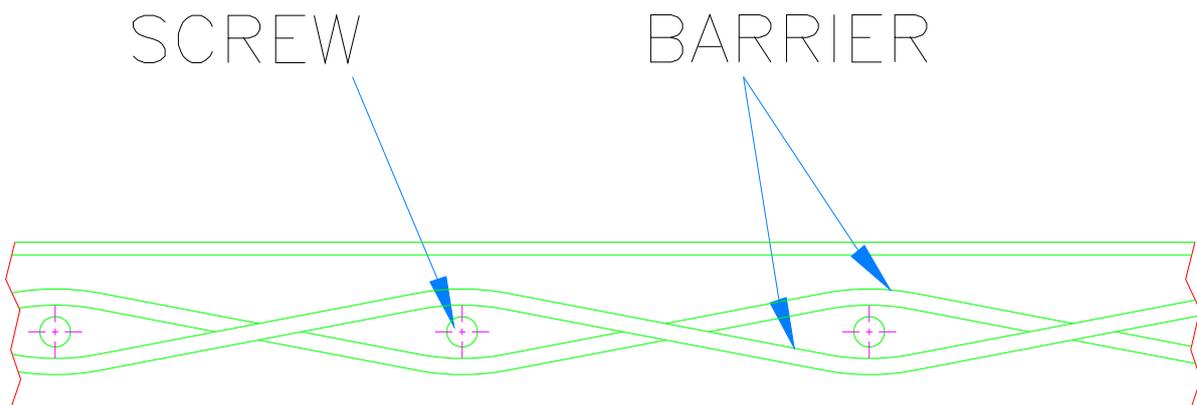


Blowing Tubes

5.3 – Assembly of the Electronic Sequential Programmer

- This equipment needs to be attached in the appropriate place (housing, structure, others).
- Attach the manometer connection hoses to the housing connections, one in the filter body (filtering area) and the other in the clean air plenum.
- For programming check the Manual.

5.4 – Assembly of barrier



6 – OPERATION

6.1 – Housing Inner Part

- Check bags attachment. There should be no twisted or unattached bags.
- Ensure that the bags are attached vertically and the bottom parts do not touch another bag or another internal surface of the central body.

6.2 – Compressed Air Plenum Internal Part

- There should be no cracks, splits or holes inside of the filter.
- Blowing air holes in the compressed air injector tube need to be centralized on the venturis with a tolerance of ± 5 mm in this centralization.
- Check if all collars and venturis are well adjusted.

6.3 – Bag Cleaning System

- Open the solenoids protection boxes and check if all electric contacts are insulated, as well as if the nuts and bolts are appropriately attached.
- Run the compressed air system and eliminate all leakages.
- Open the compressed air reservoir drain and check if there is no water accumulated or other debris from assembly operations.
- Before turning the programmer on, check if the voltage jump is in the right position. (110 or 220 V)
- Check if the differential manometer is currently set up and has water.

6.4 – Filter External Part

- Check if the access doors are perfectly assembled to avoid any leakage.
- All the bolts need to be appropriately tightened to avoid leakage.
- Turn on the ventilator (while meter is closed), the conveyor screw thread, the rotating valve and other rotating equipment and check if they are operating in the appropriate rotation direction.

6.5 – Starting the Bags Filter

Sequence to operate the equipment:

The compressed air supplying system needs to be the first to operate.

- 1 - When the manometer (by client) of the compressed air reservoir indicates that the system is operating under full pressure (manometer pressure between 6.5 and 7 kgf/cm²), the cyclic electronic programmer may be started. The programmer time interval may be set at 30 seconds initially. Check if all the valves have been started. After a pulse, the reservoir needs to recover its pressure and reach a value of 6.5 to 7 kgf/cm² before the next pulse.
- 2 - Then, the dust removing pieces of equipment may be started:
 - for filters with chute tray: first the rotating valve, then the conveyor screw thread.
 - for filters with pyramidal tray: only the rotating valve.
- 3 - Check if all the access doors, passages and other openings are closed, locked and screwed.
- 4 - If a temperature control system is used, check if it is appropriately calibrated and fully operational.
- 5 - Turn the ventilator on. There will be a small drop in the pressure through the clean bags and the ventilator needs to begin operation with its meter partially closed so that the motor is not overloaded during the first few hours of operation.
- 6 - Turn the dust filled air. The filter can be operated under partial load to allow the bags to slowly absorb dust particulates, thus preventing that fine particulates pass through the pores of new bags. For this purpose, regulate the opening of the ventilator meter.

6.6 - Bag Filter

Bag cleaning sequence and time, through the diaphragm valves with solenoids, will be scheduled by the cyclic electronic programmer, the "timer".

Cleaning action goes from one row to the other, while the air flow filled with dust enters the filter continuously. Each row of bags is cleaned with a short blow of 1/20 seconds or less, and the cleaning interval from one row to another may be adjusted from 3 to 30 seconds with the timer mounted on an electronic control panel. This way, nearly all filtering area in the bag filter is in continuous operation. If pressure loss continues to increase until reaching approximately 150 mmCA (project pressure of the bag filter) and does not stabilize, it is required to reduce the sequence interval from one bag row to another in the cyclic electronic programmer.

If the programmer adjustment with 3 seconds is not enough for dropping and stabilizing in 150 mmCA, shut down the System (Ventilator/Bag Filter) and contact VENTEC AMBIENTAL.

When the Bag Filter is stabilized, the interval time may be increased in the programmer, slowly, until getting closer to the project pressure for the equipment (150 mmCA), thus providing for a saving in the compressed air used for cleaning. When the interval time is increased, the differential pressure is also increased.

Readings above 150 mmCA are acceptable. However, we recommend the operation to be at 100 mmCA or less to increase the useful life of the filtering bags. The proper interval time may be reduced when you want to have lower differential pressure readings. When adjusting time interval, go in small steps, so that the differential pressure stabilizes throughout many service hours.

Check the main air tube with the pilot tube or equivalent measuring equipment to establish the initial conditions. If the air flow needs to be adjusted to higher or lower flow, according to process needs, repeat the preceding step.

6.7 – Instructions to Shut Down the Bag Filter

To shut down the System, use the following operating sequence:

- 1 - Shut down the source of dust.
- 2 - Wait for the passages to be cleaned and turn off the ventilator.
- 3 - Turn off the bag cleaning system.
- 4 - Turn off the conveyor screw thread and then the rotating valve or both if it is a single operation, if it is a filter with chute type of tray.
- 5 - Turn off the rotating valve if it is a filter with pyramidal tray.

6.8 – Precautions

During the filtering operation, the following points need to be checked:

- 1 - Lubricating conditions;
- 2 - Noise and abnormal vibration in rotating parts;
- 3 - Check if there are loose screws in all the assembly;
- 4 - Check if there is good seal between bolted parts, especially access covers used for bag maintenance at the top of the Bag Filter;
- 5 - Check equipment bearing temperature, such as: ventilator, conveyor screw thread and rotating valve.
- 6 - Check tear & wear in general. (especially for rotating equipment);
- 7 - Bag Filter that operate with toxic gases or explosive materials, if the operation requires their access for maintenance, it is required to operate for a few hours with clean air to ensure complete purge of such gases from the inner area.

7 – MAINTENANCE

7.1 - Housing

- Every manhole needs to be completely sealed. Eventual leakages need to be immediately repaired.
- Renew the external painting when needed to prevent corrosion.
- For good functioning of your Bag Filter, it is important to ensure that dust extracting parts are operating in perfect conditions. The conveyor threaded screw and the rotating valve need to be checked frequently, especially if there is any air leakage.

7.2 – Cleaning System

- On a monthly basis, inspect all cleaning system parts, including: Diaphragm Valves, Solenoid Valves and Bags.

7.3 – Filtering Bags

- Your filtering bags need to be treated as carefully as possible.
- It is advisable to periodical check the bags for damages (holes or tears). They should be immediately changed if any damage is found. We recommend that such checking is carried out at least on a weekly basis.
- Wet bags need to be immediately replaced by clean/dry bags.

7.4 – Problem Solving Guide

7.4.1 – High load loss:

- Check if the differential manometer is operating as planned. (leakage/clogging)
- Check if all the solenoid valves are operating in each cycle.
- Check if the reservoir pressure is in the range of 6.5 to 7.0 kgf/cm² and if after a pulse the pressure is recovered before the next pulse.
- Check if compressed air is dried, clean and free of oil.
- Check if the bags have a thick layer of dust. If this is the case, it can result from:
 - A) Particulate material collected is not being removed from the tray:
 - The valve or the conveyor screw thread are undersized. It is, therefore, required to increase the rotation of the valve or the conveyor screw thread by contacting the manufacturer. Or by replacing for a larger capacity equipment.
 - The tray inclination angle is not enough to provide for the dust to be drained. In such case, it is required to install vibrators in the tray.
 - B) High gas flow: measure the flow and regulate the meter according to planned project condition.
 - C) Gases get to a dew point and condensate in the bag: set up a coating or heaters to keep gases above dew point.

7.4.2 – Low load loss:

- Check if the “U” manometer is operating as required. (leakage/clogging).
- Check if there are holes in the bags and if they are appropriately connected.
- Check if there is leakage or clogging in the pipeline of the system. Check if all system meters are appropriately positioned to allow the air to flow through the Bag Filter.
- Ensure that the mirror plate or the housing does not have any holes, cracks or loose seals, allowing the air to flow through the Filter without going through the bags.

7.4.3 – Emission of visible dust at the output of the Bag Filter:

- Check if there are any holes in the bags and if they are appropriately connected.
- Ensure that the mirror plate does not have any holes, cracks or broken seals that allow the air to pass through the Bag Filter without going through the filtering bags.

7.4.4 – Dust emission at the Filter output after the compressed air cleaning pulse:

- Check if the reservoir pressure is between 6.5 and 7.0 kgf/cm².
- Check if the bags are worn and replace them if this happens.

Note: Such condition is normal in filters with new bags and will probably disappear after a few hours of operation.

7.4.5 – Temporized Sequencer does not work:

- Check if energy is lacking.

7.4.6 – Neon lamp in the temporized sequencer is off:

- Check if the feeding cables are connected.

7.4.7 – Sequencer fusel burns or circuit break switches off when connected:

- Check if there is no short-circuit in one of the loads.
- Check if the loads connected in the output are not above the recommended maximum (6^A).

7.5 – List of spare parts for 02 years of operation

Bags, cages, venturis and solenoid & diaphragm valves:

- 100% of the total quantity

Note: See technical data in the assembly drawing.