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AURORA® FILTERS

Introduction

AURORA® FILTERS has developed a line of portable Filter Systems that combine a single plate vacuum filtration device with a jacketed glove box. This design allows for the filtration, optional drying, discharging and packaging of product in an enclosed, inert environment, and ensures product integrity and safe working conditions.

AURORA® FILTERS offers a range of Models to suit specific needs and ranges of product being produced. The Model Numbers correspond to the size of the filter, the material that it is manufactured from and the style of flanges used for the process nozzles. The P-Series Models are designed for +/- 14.7psi (+/- 1bar) pressure throughout the filter.

Model	Nominal Diameter	Filter Area	Cake Capacity
A14 / P14	14" (350mm)	1.0 ft ² (0.10m ²)	2L min / 10L max
A14X / P14X	14" – tall (350mm)	1.0 ft ² (0.10m ²)	2L min / 15L max
A20 / P20	20" (500mm)	2.1 ft ² (0.20m ²)	4L min / 30L max
A26 / P26	26" (660mm)	3.7 ft ² (0.34m ²)	6L min / 52L max
A36 / P36	36" (914mm)	7.1 ft ² (0.66m ²)	12L min / 100L max
A48 / P48	48" (1210mm)	12.3 ft ² (1.14m ²)	21L min / 174L max
Material Type Designation Code	Internal Exposed Material	Options	
- S	316L Stainless Steel	AF-LD-002	Integral Manual Lifting Device for A14, A14X, and A20
- H	316L SS with HALAR® Lining	AF-PTC-001	Pressurized Top Chamber
- E	316L SS with ETFE 1020® Lining	AF-PGP-001/2/4	Glove Port Pressure Equalization System for P-Series Filters
- C	C22 Hastelloy	AF-PC-001/2/3/4/5	Optional Product Chute Configurations
Flange Type Designation Code	Flange Type Description	AF-N2-25/55	Portable Nitrogen Preheater
- SF	Type 3A Sanitary Ferrule Fittings	AF-1K-001	1 Kilo Batch Size Adapter Plate Assembly for A14 and A14X Models
- AF	150# ANSI Flanges		
- DF	DIN Flanges		

Typical applications are the kilo lab and pilot plant production of pharmaceutical bulk actives,



intermediates and fine chemicals that are sensitive to the atmosphere, or are produced in volatile solvents.

General Description

The filter is assembled as two chambers separated by the filtration media.

Bottom Chamber – Vacuum Nutsche

The Bottom Chamber is the Vacuum Nutsche. The Bottom Chamber supports a fully perforated removable filter plate, which supports the customer specified filter media. The larger units have a filter support grid to give further support to the filter plate.

The Bottom Chamber is fitted with a small sight glass so that the operator may monitor the rate of extraction of filtrate.

The Bottom Chamber is also fitted with a Filter Cloth Retaining Ring. The A14, A14X and A20 filters are supplied with a quantity of disposable Teflon Packing material that is fitted into a groove in the mating flanges to hold the filter media in place. The larger models are supplied with a custom fitted solid ring of the same material as the filter that snaps over the filter media.

There are no mechanical joints, fittings, or hardware inside the filter.

Top Chamber – Glove Box

The Top Chamber is the Glove Box. The size of the vessel determines the number of Glove Ports and Product Chutes. The Model A14 and A14X have one Glove Port and one Product Chute, while the A36 and A48 have two sets of Glove Ports as well as two Product Chutes.

The top of the Top Chamber is fitted with a large Viewing Window to maximize the viewing access of the interior of the filter. The operator is able to control the feed and filtration process, and manipulate the filter cake using the fitted Gloves and supplied polypropylene Product Scoop.

Insulated Heating/Cooling Jacket

The Top Chamber is fitted with an insulated Heating/Cooling Jacket. This jacket is designed for use of heat transfer fluids such as Brine, Glycol, etc, (not for steam) operating at 50 to 75psi (bar) in a temperature range of -30C to 100C (-22F to 212F). The jacket covers the maximum slurry depth in the Top Chamber and aids in the filtration and drying sequences.

Opening/Closing the Filter

Opening and closing the filter is handled in a couple of manners, again dependent on the size of the filter.

The A14, A14X and A20 filters require a small lifting tackle to lift the Top Chamber off of the Bottom Chamber, which is support by three legs with castors. A new optional feature the AF-LD-002 is an integral manual handling device that allows the Top and Bottom Chambers to be separated without the need for external auxiliary equipment. More information regarding this option can be obtained



from your AURORA® FILTERS Sales Representative or as detailed on our website.

The A26, A36 and A48 filters are fitted with a self contained Hydraulic Piston System, which allows the Bottom Chamber to be raised and lowered into position by a single operator. This system is charged and ready to operate and requires very little maintenance.

O-Ring Sealing System

Once the chamber mating flanges are in position a series of swing bolts lock the filter chambers together. These mating flanges contain an O-Ring sealing system, which provides a liquid and vacuum tight seal between the chambers.

Process Nozzles

The filters are typically terminated with flanges only. The customer is responsible for supplying process valves, gas regulator system, vacuum pumping system, and any other system auxiliary equipment. AURORA FILTERS is capable of assisting with this auxiliary equipment and will price separately upon request.

Preparation for Filtration

Filter Media

The customer is responsible for selecting and supplying the filter media to be used with the filter. A variety of combinations can be used on the same filter. The customer is required to supply a size of sample filter media to custom fit the Filter Cloth Retaining Rings for the A26, A36 and A48 models. Two Filter Cloth Retaining Rings are supplied with each filter. No filter media samples are required for the A14 and A20 models.

The most commonly used media is a relatively lightweight (polyester) top cloth combined with a heavier (cotton) backing cloth, but a wide range of media can be accommodated

Affixing the Filter Media

In preparation for filter media installation, the Bottom Chamber must be separated from the Top Chamber. The Filter Plate Support Grid rests in the Bottom Chamber, which supports the Filter Plate so that it is near level with the upper rim of this chamber. The cloths are placed over the Filter Plate, which has 10 mm diameter perforations. The Filter Clamp Ring fits over the cloths and the Filter Plate to hold them in position. This ring is a push-fit so that there are no screws or fixing bolts within the filter. For the smaller filters, Teflon Packing is pressed onto the filter media and into a groove in the mating flanges, which holds the filter media in place.

Final Equipment Installation

Standard Dry Box Gloves are fitted to the Glove Ports and secured using supplied clamp rings. Scoops are supplied of polypropylene material and should be placed inside the filter prior to closing.

Suitable receivers are sealed to the two Product Chutes; for example, plastic sacks supported in shipping drums. Stainless steel hose clamps are supplied to fasten the receiving bags to the Product Chute; however, the operator may decide to use a combination of tape or other methods.



Closing the Filter

With the filter media and Product Scoop in place the filter can now be closed using the hydraulic system or lifting tackle depending on the model size and tightening the swing bolt assemblies.

The assembled filter may now be rolled into position for filtration.

The Filtration Process

Each filter contains four flanged process connections to the Top Chamber and three flanged process connections to the Bottom Chamber. Nozzles that are not in use must be closed off with valves or blind flanges.

Continuous Vent

The Nozzle (A) is used to exhaust the filter to the facility's Vent Line. It is very important to maintain this vent at all times, as the Top Chamber of the filter is not a pressure vessel and is designed specifically for atmospheric conditions. Failure to maintain atmospheric conditions will result in the gloves or product receiver bags bursting or the viewing window breaking.

Inert Gas

When required, an inert gas - typically nitrogen - is admitted to the filter by Nozzle (D) and briefly in Nozzle (F) for a period prior to commencing filtration. The Operator ensures a small positive pressure (0.5 to 1psi bar) of nitrogen in the filter throughout the process. Adequate pressure can be monitored by observing the small amount of pressure acting on the gloves. Please review the schematic AF-N2 for the recommended Nitrogen Gas supply system.

Slurry Input

Slurry is admitted via Nozzle (B) to the level of the top of the Jacket, some 20 mm ($\frac{3}{4}$ ") below the Product Chute. Filtrate is extracted from the base of the Bottom Chamber via Nozzle (G). (To avoid any electrical requirement in the area around the filter, a pneumatically operated diaphragm pump is typically employed.) The Operator can adjust the rate of filtrate extraction by observing the liquor level through the Bottom Chamber sight glass.

Periodically the Operator should admit more slurry to the filter. During this phase of operation the filtrate extraction pump will maintain vacuum conditions in the Bottom Chamber.

Heating/Cooling Jacket

If the filtration process requires other than an ambient temperature, an appropriate heat transfer fluid is circulated through the Jacket via Nozzles (J) and (K).

Cake Washing

If the process scheme requires the filter cake to be washed, solvent may be admitted through the Wash Inlet Nozzle (C). The Operators may mix the cake using the Gloves and Scoop to assist in reslurrying the solids.



Final Vacuum

When the batch is nearing completion, vacuum may be applied via Nozzle (E) (just below the Filter Plate) to extract the maximum amount of liquor out of the cake.

As necessary throughout the process, the nitrogen flow via Nozzle (D) must be increased to maintain the small positive pressure in the Top Chamber.

Pressurization of the Filter

The P-Series Filters have been designed to withstand +/-14.7psi throughout the filter. In order to operate the filter under pressure conditions the Product Chute and Glove Port must be isolated from the pressure.

In order to isolate the Product Chute the operator must remove the Product receiver and install the sanitary cap; gasket and clamp supplied for this connection or install a third-party isolation valve with a pressure plug adaptor.

The isolation of the Glove Ports can be done two ways.

The first method requires the removal of the gloves to and the installation of the supplied 8" sanitary cap, gasket and clamp prior to introducing a pressure differential to the filter.

The second method is to utilize the AF-PGP-002 Option that is supplied with the P-Series filter. The 10" cap is installed over the Glove Ports prior to pressurization. The two-way valve is set to the 'P' (pressure) position. The Glove Port Pressure Equalization system will equal the pressure conditions from the filter on both sides of the glove to protect the glove from failure. The atmosphere within the filter is protected from the user-side of the gloves by the in-line HEPA filter in the piping.

Once pressure conditions have been returned to atmospheric conditions within the filter the two-way valve is set to the 'V' (vent) position. In this position the operator can attach external air onto the valve and force air into the user side of the glove and vent any lingering vapours through the vent line.

Using the Filter for Drying

Drying, by volatilisation of solvents from the cake, can be accomplished within the filter by applying a positive flow of nitrogen (or other media) through Nozzle (F) (just below the Filter Plate).

With the Vent Nozzle (A) fully open and all other nozzles closed off, the Jacket temperature should be increased to the maximum - within the filter's range - which can be tolerated by the product. Periodically the Operator may manipulate the cake with the Product Scoop to give greater exposure of more moist areas of the cake to the drying gas.

This process is meant to be a slow procedure. Increasing the flow rate of nitrogen will not necessarily accelerate the process and may in fact cause unwanted dusting and lose of product out the exhaust vent.



Please refer to the schematic AF-N2, for the recommended Nitrogen Gas supply system.

Discharge of Filter Cake

Suitable receiving containers are connected to the Product Chute. For example, a flexible plastic sack, supported in a shipping drum, may be hose clamped or taped to the chute.

The Operators use the Gloves and Scoops to discharge the filter cake down the Product Chutes into the receiving containers.

When completed, with the flow of nitrogen still maintaining a positive pressure, the containers may be sealed off and disconnected from the filter using a two-knot system.

Product Chutes are fitted with Type 3A Sanitary Ferrule Fittings. Third party ChargePoint Valves can be easily adapted to the product chutes to add further control and safety to the handling of the finished product. For more information, contact your AURORA® FILTERS Representative.

Cleaning

After use, appropriate solvents may be admitted through the Wash Inlet Nozzle (C) to wash out the filter. The Wash Nozzle is fitted with a 360° Teflon CIP Spray Ball Assembly as standard supply.

The filter is now opened using the hydraulic system or manual methods so that the Top and Bottom Chamber are separated. In this position a complete inspection of the filter cloth and cleaning process can be executed.

With the Bottom Chamber rolled out, the Operator may sit on a small stool under the Top Chamber to complete cleaning of the larger filters or the Top Chamber can be carefully tipped to gain access in the smaller filters.

The Gloves and Scoops should be cleaned and reinstalled as part of the filter, and all nozzles closed off, to await the next application.

If the next application is a duplicate process of the preceding operation, the filter does not necessarily need to be cleaned between batches.

FEATURES AND BENEFITS



- **FULLY CONTAINED FILTRATION / DRYING IN INERT ENVIRONMENT**
- **GMP DESIGN – EASY TO CLEAN AND VALIDATE / LOW MAINTENANCE**
- **MULTI-PRODUCT ADAPTABILITY**
- **TOTAL PRODUCT RECOVERY**
- **SAFE AND SIMPLISTIC MANUAL OPERATION**
- **PROVIDES FULL OPERATOR AND PRODUCT PROTECTION**
- **ECONOMICAL SOLUTION – LOW COST FOR HIGH CONTAINMENT**

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