

GAS FILTERS AND SEPARATORS



**DRY GAS FILTERS FLO-GAS
FILTER SEPARATORS FLO-SEP
ABSOLUTE SEPARATORS MICRO-SEP**

PROCESS OR NATURAL GAS FILTRATION

Solid particles, liquid condensates and lubricating oil present in any natural or process gas pipeline provide several maintenance problems with compressors and instrumentations.

Liquids, especially, wet the pipe walls and tend to "glue" the solids in the line thus creating deposits which result in increased pressure drop and reduced transmission efficiency.

Bea, to solve the problem, has developed a full line of gas filters, FLO-GAS, filter separators, FLO-SEP, and absolute separators, MICRO-SEP, for complete removal

of solids and liquids from natural or processed gas streams. FLO-GAS, FLO-SEP and MICRO-SEP, are single or multi-stage devices utilizing gravity, centrifugal force, inertial impaction, direct impaction and Brownian diffusion to achieve an effective removal efficiency of 99,9% for a filtration rating of one micron and larger.

GAS FILTERS and FILTER SEPARATORS made by Bea Technologies have excellent applications in:

- GAS DISTRIBUTION and GAS COMPRESSION STATIONS
- Protection of MAINLINE TRANSMISSION SYSTEMS
- Protection of DEHYDRATATION TOWERS and of DESICCANT BEDS.

FLO-GAS: DRY GAS FILTERS

The single stage FLO-GAS FILTERS are used for the removal of dry solid particles only. Larger solid particles (15 microns) are collected on the outer surface of the filter elements while small particles pass through the media where they are trapped, in their tortuous passage, by successive collisions with the fibers of the filtration media. Each collision between solid particles and fibers

reduces the kinetic energy of the particle imported by the gas stream, until it adheres to a fiber of the media. FLO-GAS FILTERS are manufactured either in a vertical shell, FGV series (Fig. n. 3), or in horizontal shell, FGO series (Fig. n. 2), with flanged or QUICK OPENING CLOSURE to facilitate the access to the filter elements. The filter elements are connected to a drilled frame which separates the inlet compartment from the clean gas outlet compartment.

FLO-SEP: GAS-LIQUID SEPARATORS

GAS LIQUID FILTER SEPARATORS, FLO-SEP, are a two-stage design construction for the removal of both solid particles and liquid droplets, or liquid droplets only. The contaminated gas enters the first section and passes through the filter elements.

Separation of the liquid particles as well as that of solid particles occurs in the same manner inside the GLASS FIBER MEDIA. But the media is treated so that the liquid particles do not wet the fibers but coalesce into large droplets, from 100 to 200 times their original size, due to their surface attraction for each other.

The gas flowing through the filter media causes the larger droplets to emerge into the center core of the

glass fiber elements and to be carried out to the liquid stripper section. Here a VANE MIST EXTRACTOR removes coalesced liquid droplets, which are stripped out and drained into the sump vessel for subsequent recovery. Liquid carry-over is totally prevented and separating efficiency of 99,99% on one-micron size droplets is easily achieved.

The pressure loss on the entire operation is extremely low and depends on operating conditions and by the type of filter elements used.

FLO-SEP SEPARATORS are manufactured either in a vertical shell, FSV series (Fig. n. 4), or in horizontal shell, FSO series (Fig. n. 1) with flanged or QUICK OPENING CLOSURE to facilitate the access to the filter elements.

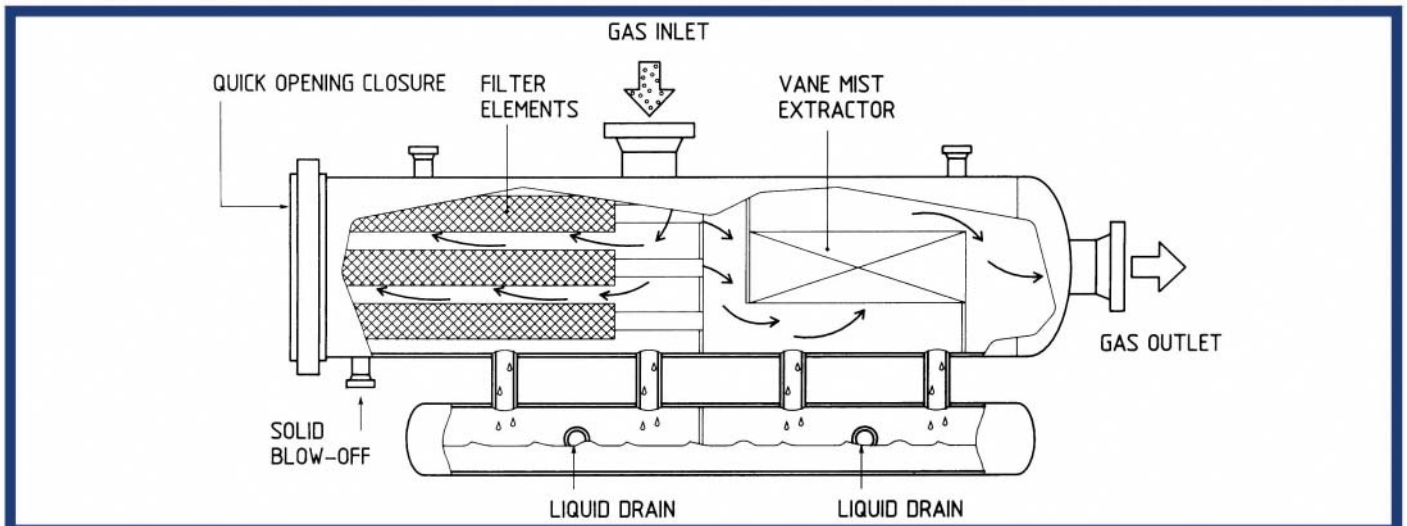


Fig. 1: FLO-SEP, FSO series, filter scheme.

SELECTION TABLES: FLO-GAS, DRY GAS FILTERS

Here below are reported the selection tables with standard models and sizes for FGV SERIES, vertical design, and FGO SERIES, horizontal design.

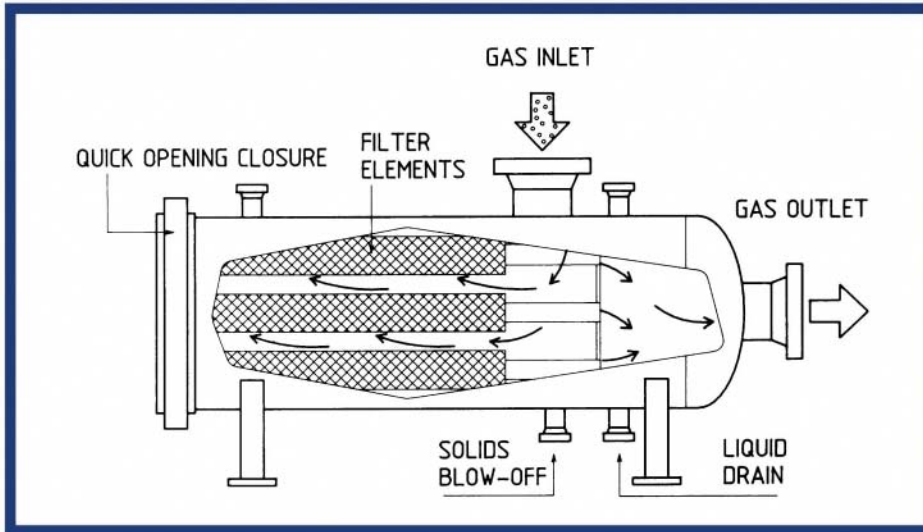


Fig. 2: FLO-GAS, FCC series, filter scheme

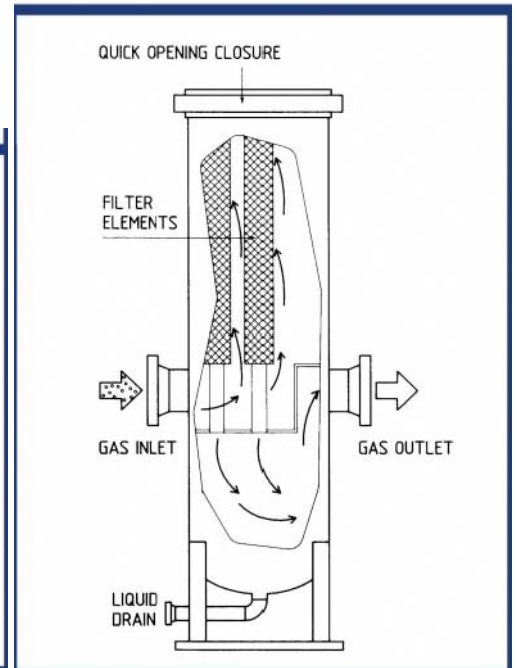


Fig. 3: FLO-GAS, FGV series, filter scheme.

VERTICAL DESIGN FGV

MODEL	SHELL OUTSIDE DIAMETER	INLET/OUTLET CONNECTIONS	NUMBER OF FILTER ELEMENTS		
			3 1/2"	4 1/2"	5 1/2"
FGV 6 - 2 - XX-YY	6"	2"	1	1	-
FGV 8 - 3 - XX-YY	8"	3"	1	1	1
FGV 10 - 4 - XX-YY	10"	4"	4	1	1
FGV 12 - 6 - XX-YY	12"	6"	6	2	-
FGV 14 - 6 - XX-YY	14"	6"	7	3	2
FGV 16 - 8 - XX-YY	16"	8"	8	3	3
FGV 18 - 8 - XX-YY	18"	8"	11	5	5
FGV 20 - 8 - XX-YY	20"	8"	14	7	6
FGV 24 - 10 - XX-YY	24"	10"	20	12	7

HORIZONTAL DESIGN FGO

MODEL	SHELL OUTSIDE DIAMETER	INLET/OUTLET CONNECTIONS	NUMBER OF FILTER ELEMENTS		
			3 1/2"	4 1/2"	5 1/2"
FGO 6 - 2 - XX-YY	6"	2"	1	-	-
FGO 8 - 3 - XX-YY	8"	3"	1	-	1
FGO 10 - 4 - XX-YY	10"	4"	4	1	1
FGO 12 - 6 - XX-YY	12"	6"	7	2	2
FGO 14 - 6 - XX-YY	14"	6"	7	3	3
FGO 16 - 8 - XX-YY	16"	8"	10	4	4
FGO 18 - 10 - XX-YY	18"	10"	14	6	5
FGO 20 - 10 - XX-YY	20"	10"	15	8	7
FGO 24 - 10 - XX-YY	24"	10"	21	12	8

Stand for number of filter elements stand for size of filter elements

FLO-SEP FILTER SEPARATORS: SELECTION TABLES

Here below are reported the selection tables with standard models and sizes for FSV SERIES, vertical design, and FSO SERIES, horizontal design.

VERTICAL DESIGN, FSV

MODEL	SHELL OUTSIDE DIAMETER	INLET/OUTLET CONNECTIONS	NUMBER OF FILTER ELEMENTS		
			3 1/2"	4 1/2"	5 1/2"
FSV 8 - 2 - XX-YY	8"	2"	1	1	1
FSV 10 - 3 - XX-YY	10"	3"	4	2	1
FSV 12 - 4 - XX-YY	12"	4"	7	3	2
FSV 14 - 6 - XX-YY	14"	6"	7	3	3
FSV 16 - 6 - XX-YY	16"	6"	10	4	4
FSV 18 - 8 - XX-YY	18"	8"	14	6	5
FSV 20 - 8 - XX-YY	20"	8"	15	7	7
FSV 22 - 8 - XX-YY	22"	8"	17	10	-
FSV 24 - 10 - XX-YY	24"	10"	21	12	8

XX = stand for number of filter elements
YY = stand for size of filter elements

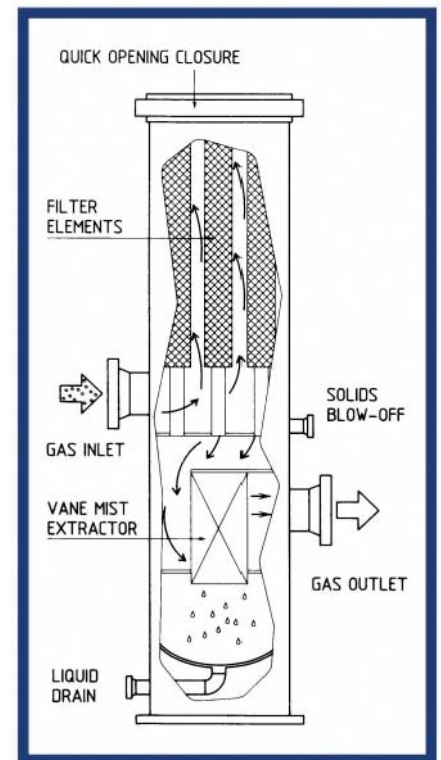


Fig. 4: FSV series, filter scheme.

HORIZONTAL DESIGN FSO

MODEL	SHELL OUTSIDE DIAMETER	LIQUID SUMP OUTSIDE DIAMETER	INLET/OUTLET CONNECTIONS	NUMBER OF FILTER ELEMENTS		
				3 1/2"	4 1/2"	5 1/2"
FSO 6 - 6 - 2 - XX-YY	6"	6"	2"	1	-	-
FSO 8 - 6 - 2 - XX-YY	8"	6"	2"	1	1	1
FSO 10 - 6 - 3 - XX-YY	10"	6"	3"	4	1	1
FSO 12 - 6 - 4 - XX-YY	12"	6"	4"	7	3	2
FSO 14 - 6 - 4 - XX-YY	14"	6"	4"	7	3	3
FSO 16 - 6 - 4 - XX-YY	16"	6"	4"	10	4	4
FSO 18 - 8 - 6 - XX-YY	18"	8"	6"	14	6	5
FSO 20 - 8 - 6 - XX-YY	20"	8"	6"	15	7	7
FSO 24 - 10 - 8 - XX-YY	24"	10"	8"	21	12	8
FSO 26 - 10 - 10 - XX-YY	26"	10"	10"	30	16	12
FSO 28 - 10 - 10 - XX-YY	28"	10"	10"	33	19	14
FSO 30 - 10 - 12 - XX-YY	30"	10"	12"	41	21	15
FSO 32 - 10 - 12 - XX-YY	32"	10"	12"	47	23	19
FSO 34 - 12 - 14 - XX-YY	34"	12"	14"	53	28	21
FSO 36 - 12 - 14 - XX-YY	36"	12"	14"	62	31	22
FSO 39 - 14 - 16 - XX-YY	39"	14"	16"	72	33	28
FSO 42 - 14 - 16 - XX-YY	42"	14"	16"	83	38	32
FSO 45 - 14 - 18 - XX-YY	45"	14"	18"	93	-	37
FSO 48 - 14 - 18 - XX-YY	48"	14"	18"	105	54	41

MICRO-SEP: ABSOLUTE SEPARATORS

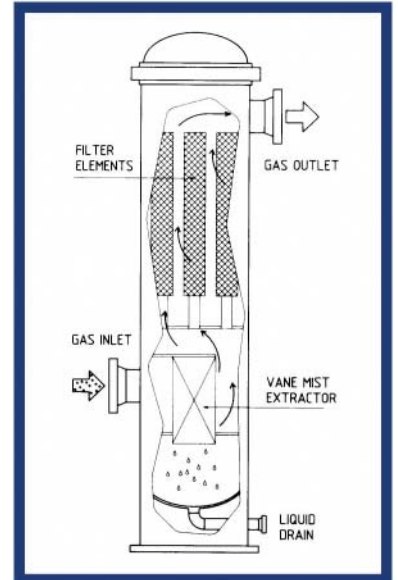
ABSOLUTE SEPARATORS, MICRO-SEP, is a two-stage design specifically developed for those applications where the maximum possible separation of extreme fine particles (varying from MIST to SUB-MICRON size) from a gas stream is required. It consists of a VANE MIST EXTRACTOR, as first stage, to remove entrained liquids contaminants. The entrained droplets are forced to contact the VANE walls where they adhere to the VANE surface. The liquid thus collected moves out of the gas stream and is drained by gravity into the liquid reservoir.

The final separation is made by the high efficacy coalescing filter elements mounted vertically on the support frame. The gas is then forced to pass through the coalescing elements where sub-micron and mist particles are agglomerated into larger liquid droplets which are later eliminated by gravity.

The main applications of MICRO-SEP absolute separators are for removal of OIL MIST upstream of DESICCANT BEDS and for mist separation in PROCESS STREAMS such as chlorine, Nitrogen, Hydrogen, air purification.

MICRO-SEP is equipped with Reverse Fincell filter elements.

Reverse Fincell cartridges are available in two grade ratings and assure an effluent gas with residual aerosol content from 0,01 PPM to 1 PPM.



FILTER ELEMENTS

The cylindrical filter elements are composed of different layers of glass fibers of specific rating, which are uniformly compressed to a proper gradient density and impregnated with inert phenolic resins and silicones. The structure of the elements is made of a thick perforated center core, to withstand flow pulsation, with a "media migration barrier" placed between the core and the filter media. The end seals and gasket are molded onto the element to prevent the internal bypassing and to give better assurance of high efficiency in solid/liquid separation.

MATERIAL SPECIFICATION:

FILTER MEDIA	: molded fiberglass bonded with phenolic resin
INNER CORE	: carbon steel or s.s.
END CAP	: carbon steel or s.s.
GASKET	: rubber.

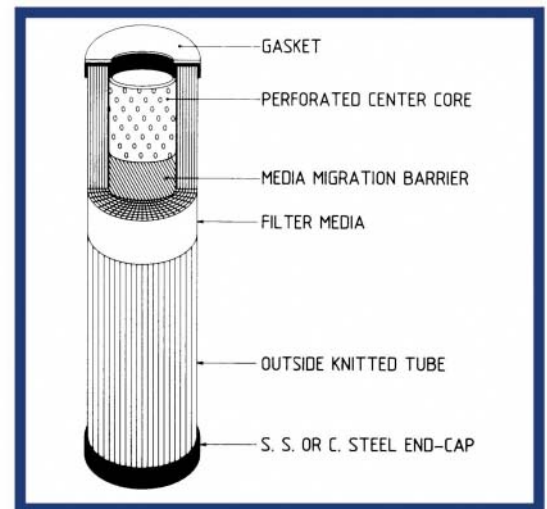


Fig. 6: Filter element section.

QUICK OPENING CLOSURE

FLO-GAS filters and FLO-SEP separators can be equipped with QUICK OPENING CLOSURES (Fig. n. 7) to facilitate full access to the filter elements for service and cleaning.

Quick opening closure provides a practical solution which assures safety access to the filter and allows to manage the larger size, for opening and closing, in a few minutes.

All parts are made of forged steel or by quality frame and each closure is widely tested after manufacturing to give assurance of maximum reliability through time.



Fig. 7: High pressure opening closure for FLO-GAS filter.

FEATURES

- Complete solids separation no oil/water carry over low pressure drop
- Quick opening closure elements easily replaceable

BENEFITS

- Increase pipeline efficiency
- Recovery of liquid condensate
- Reduction of compressors maintenance safe access and minimum maintenance time wide operating range

CODE OF CONSTRUCTION AND DESIGN

The filter vessels may be manufactured in accordance with the latest edition of the ASME, BS, TUV, ISPESL codes with stamp.

Stress-relieving and all types of non-destructive testing (such as dyes penetrant, ultrasonic and X-ray) are performed under inspection of BEA QUALITY CONTROL SERVICE.

A great experience in welding all types of materials is available to comply with the customer's specifications.

INSTALLATION AND MAINTENANCE

Gas filters FLO-GAS, filter separators FLO-SEP and absolute separators MICRO-SEP are designed to work unattended for long time. Periodic inspections are required to check differential pressure, liquid level, correct operation and draining.

If the quantity of separated solid is high, it may be necessary to clean filter elements by opening the unit and washing internally with a water hose. For GAS FILTERS where there is only dry solid contaminant accumulation, a certain degree of cleaning may be performed by venting and discharging through the blow-down nozzle. Installation and maintenance manuals supplied with the filters give all the necessary information to people responsible for filter handling and the TECHNICAL SERVICE of Bea is available to give assistance and support.



Fig. 8: FLO-SEP separator, FSO series, ready for delivery