



# GSS FILTER VESSELS DOWNDRAFT JET PULSE DESIGN

1-88-V3  
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## Description

Pall downdraft jet pulse design vessels are fitted with the GS series of PSS® sintered metal powder elements. Blowback is accomplished by directing a short duration pulse of high pressure gas into the throat of each element, while maintaining full forward flow. The central pipe induces a downward flow of gas around the elements to assist the settling and discharge of light solids (bulk density less than 20 lb/ft³).

The vessels are available in carbon steel, 304 stainless steel, or other alloys as required. Standard designs offer a maximum pressure of 600 psig at 400°F and a maximum temperature of 1400°F at 100 psig (see Table 1). Higher design limits are available. Other options include refractory linings for high temperature insulation, jacketed vessels for precise temperature control, and fluidizing cones to assist solids discharge. External mounting lugs are provided as standard. All vessels are designed for ASME Section VIII, Division 1 and "U" stamped. The system includes all instrumentation and solenoid valves to control blowback operation.

The vessel head is bolted to the vessel, capturing the tube sheet and elements between the vessel body flanges. This allows for easy access and removal of the elements should service be necessary. The gas inlet connects with the central pipe to create the downward flow direction around the elements. A cone angle of 30° is standard to facilitate solids discharge.

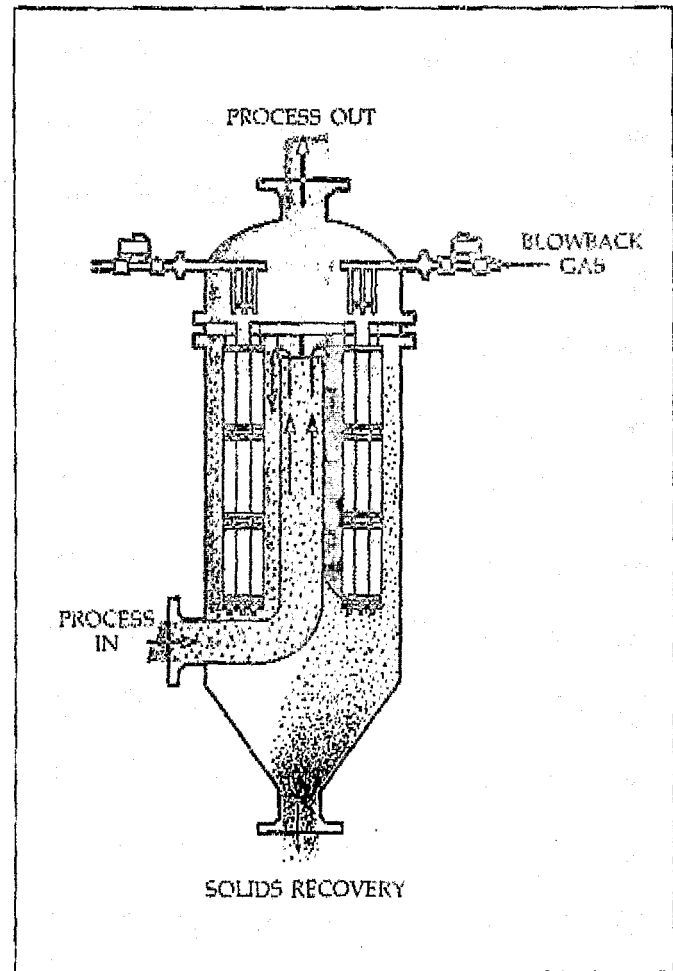


Figure 1. Downdraft Jet Pulse Schematic

Table 1. Vessel Specification

Carbon Steel				Stainless Steel			
Type	Flanges	Pressure (PSIG)	Temp (°F)	Type	Flanges	Pressure (PSIG)	Temp (°F)
Low Pressure	150 lb.	50	750	Low Pressure	300 lb.	10	1400
		60	650		150 lb.	50 60	900 400
High Pressure	600 lb.	500	750	High Pressure	600 lb.	100	1400
		600	650			500 600	900 400

Table 2. Filter Characteristics

Number of GS Elements	Area Ft. <sup>2</sup>	Vessel Diameter (Inches)	Vessel Length (Inches)	Inlet/Outlet Nozzles (Inches)	Drain Nozzles (Inches)	Dimension A (Inches)	Dimension B (Inches)	Differential Pressure Loss Factor $K_v$
5	20	12	100	3	3	92	10	$1.9 \times 10^{-4}$
10	40	16	110	4	4	98	14	$5.1 \times 10^{-5}$
19	76	22	120	6	6	105	19	$1.3 \times 10^{-5}$
31	124	26	128	8	6	108	20	$4.6 \times 10^{-6}$
42	168	28	132	10	8	112	22	$2.4 \times 10^{-6}$
68	272	36	140	12	8	116	24	$9.5 \times 10^{-7}$
96	384	42	152	14	10	126	28	$5.0 \times 10^{-7}$
130	520	46	164	18	10	138	36	$2.5 \times 10^{-7}$
170	680	54	176	20	12	148	42	$1.5 \times 10^{-7}$

Table 3. Approximate Vessel Weights (lbs.)

Vessel Diameter (Inches)	Carbon Steel (Weight)		304 SST (Weight)	
	Low Pressure	High Pressure	Low Pressure	High Pressure
12	650	1300	575	1275
16	950	2050	850	2050
22	1750	3650	1550	3900
26	1850	5100	1850	5400
28	2100	8350	2100	8350
36	3350	9000	3350	9000
42	4700	12350	4700	12350
46	5650	15600	5650	15600
54	7450	23700	7450	23700

## Pressure Drop Calculations

Clean Pressure Drop:

Clean  $\Delta P = \Delta P_{\text{Vessel}} + \Delta P_{\text{Filter Elements}}$ 

$$= K_v \rho Q^2 + K_m \mu Q/A$$

where  $K_v$  and  $K_m$  are loss coefficients for the vessel and filter medium respectively,  $\rho$  is the gas density in lb/ft<sup>3</sup>,  $\mu$  is the viscosity of the gas at operating conditions in centipoise,  $Q$  is the gas flow rate in ACFM and  $A$  is the filter area in ft<sup>2</sup>. The terminal pressure drop at which the filter is blown back is determined by the customer to fit within the pressure drop available in the system.  $K_v$  values are given in Table 2.

 $K_m$  values are:

PSS Grade	$K_m$ (for 3/32" medium thickness)
PH	2.0
PF	0.45

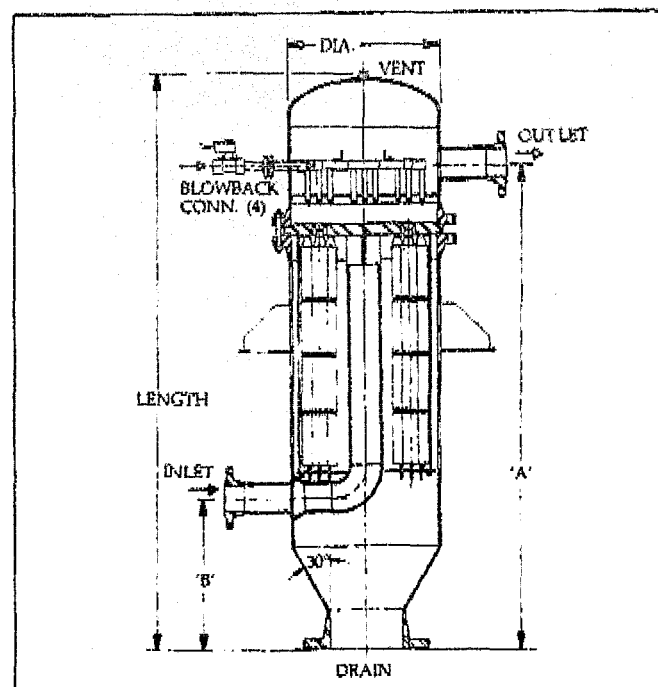


Figure 2. Dimensional Drawing of a Standard Downtraft Design Vessel



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