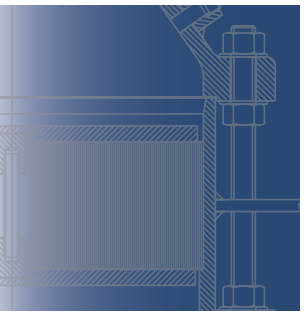
GROTH CORPORATION®
a Continental Disc company

INDUSTRIAL PRODUCT CATALOG

SMART RELIEF...SAFE SOLUTIONS℠

SAFETY DEVICES THAT PROTECT EQUIPMENT, LIVES & THE ENVIRONMENT



Groth Corporation

Groth Corporation, formerly Groth Equipment Corporation, was founded by Edward Groth on August 1, 1960 and incorporated on September 7th that same year. Groth began as a manufacturers' representative, distributor, and re-manufacturer of pressure relief valves sold to the refining and petrochemical industries. In 1999, Groth Corporation joined Continental Disc Corporation and moved to its current Stafford, Texas manufacturing site in 2002. These two events strengthened Groth's position as a global leader in low pressure safety solutions.

Today, Groth is a global leader in low pressure safety equipment with representatives around the world, providing engineered solutions with uncompromising commitment to customer satisfaction.

Groth industrial products are comprised of independent product lines, classified as: Pressure/Vacuum Relief Valves, Blanket Gas Regulators and Flame Arresters.

OUR EXPERTISE & DEVOTION

When ordering from Groth Corporation, you can be assured that our expertise and devotion to quality will translate into efficiency and safety, and that our every effort will demonstrate our commitment to provide innovative solutions, quality products, and comprehensive service.

We pride ourselves in providing this expertise to the following industries:

- Biogas Processing
- Chemical
- Equipment
- Food & Beverage
- OEM
- Oil & Gas
- Pharmaceutical
- Transportation
- Utilities
- Wastewater

as well as many others.

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NOTE: Product parameters are based on United States customary units. Metric units are provided for reference only.

GROTH CORPORATION
a Continental Disc company

PRESSURE/VACUUM RELIEF VALVES

Model 1200A
- Pressure/Vacuum Relief Valve
- Modular design
- Sizes: 2" through 12"
- Pressure settings: 0.5 oz/in² to 15 psig
- Vacuum settings: 0.5 oz/in² to 12 psig

Model 1220A
- Pressure/Vacuum Relief Valve
- Pipe-away feature
- Modular design
- Sizes: 2" through 12"
- Pressure settings: 0.5 oz/in² to 15 psig
- Vacuum settings: 0.5 oz/in² to 12 psig

Model 1800
- Pressure/Vacuum Relief Valve
- Modular design
- Sizes: 2" through 12"
- Stable full lift at 10% Overpressure
- Near zero blowdown

Model 1720A/1760A
- Pressure/Vacuum Relief Valves
- Non-sticky design
- Sizes: 2", 3" and 4"

Model 8820A
- Pressure/Vacuum Relief Valve and Flame Arrester w/Pipe-Away Feature

Fiberglass Valves
- Most Groth valves can be constructed of fiberglass

PRESSURE RELIEF VALVES

Model 1260A
- Pressure Relief Valve
- Modular design
- Pipe-away feature
- Sizes: 2" through 12"
- Pressure settings: 0.5 oz/in² to 15 psig

Model 2300A
- Pressure Relief Valve
- Pressure Relief Valve
- Modular design
- Sizes: 2" through 12"
- Pressure settings: 0.5 oz/in² to 15 psig

VACUUM RELIEF VALVES

Model 1300A
- Vacuum breaker
- Modular design
- Sizes: 2" through 12"
- Vacuum settings: 0.5 oz/in² to 12 psig

Model 1360A
- Vacuum breaker
- Modular design
- Side mount
- Modular design
- Sizes: 3" through 14"
- Vacuum settings: 0.5 oz/in² to 12 psig

PILOT OPERATED RELIEF VALVES

Model 1660A
- Pressure Relief Valve
- High flow capacity
- Sizes: 2" through 12"
- Pressure settings: 2 InWC through 15 psig

Model 1420
- Pressure/Vacuum Relief Valve
- Modular design
- Pressure & vacuum relief
- High flow capacity
- Sizes: 2" through 12"
- Pressure settings: 3 oz/in² through 15 psig
- Vacuum settings: 0.5 oz/in² to 12 psig

Model 1560
- Air actuated pressure relief for extreme service
- Modular design
- Pressure relief
- High flow capacity
- Sizes: 2" through 12"
- Pressure settings: 3 oz/in² through 15 psig

Model 2500
- Emergency Relief Valve
- Sizes: 18" and 24"
- Pressure settings: 8 oz/in² to 15 psig

Available in aluminum (type 356), carbon steel, stainless steel, fiberglass, and other materials, in most models.

EMERGENCY RELIEF VALVES

Model 2301A
- Pressure Relief Valve
- Sizes: 2" through 12"
- Pressure settings: 0.5 oz/in² to 15 psig

Model 2000A
- Emergency Relief Manhole Cover
- Sizes: 16", 20" and 24"
- Pressure settings: 1.5 oz/in² to 16 oz/in²
- Also available with vacuum breaker

Model 2450A
- Emergency Relief Manhole Cover with hinged cover with vacuum breaker
- Sizes: 20" through 24"
- Vacuum settings: 0.5 oz/in² to 4 oz/in²
- Pressure settings: 2 oz/in² to 8 oz/in²
- Also available pressure only

Model 2100
- High Pressure Emergency Relief Valve
- Sizes: 16", 20" and 24"
- Pressure settings: 1 psig to 15 psig

FLAME ARRESTERS

Model 7618
- Deflagration flame arrester (vertical design)
- FM approved
- Flange sizes: 2" through 12"
- Available with weather hood

Model 7628
- Deflagration flame arrester (horizontal design)
- FM approved
- Flange sizes: 2" through 12"

Model 7758A
- Detonation flame arrester
- Element sizes: 4" through 30"

Model 7658A
- Detonation & deflagration arrester (horizontal design)
- Element sizes: 5" through 24"

Model 7622
- Flame check
- Sizes: 0.5" through 1.5"

Model 7588
- Deflagration flame arrester (vertical design)
- Certified to ATEX Directive 94/9/EC
- IEC Gas Group: IIA1
- Flange sizes: 2" through 12"

Model 7598
- Deflagration flame arrester (horizontal design)
- Certified to ATEX Directive 94/9/EC
- IEC Gas Group: IIA1
- Flange sizes: 2" through 12"

Model 7688
- Deflagration flame arrester (vertical design)
- Certified to ATEX Directive 94/9/EC
- IEC Gas Group: IIA
- Flange sizes: 2" through 12"

Model 7698
- Deflagration flame arrester (horizontal design)
- Certified to ATEX Directive 94/9/EC
- IEC Gas Group: IIA
- Flange sizes: 2" through 12"

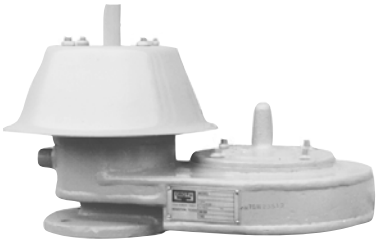
Model 7678
- Deflagration flame arrester (End-of-Line)
- Certified to ATEX Directive 94/9/EC
- IEC Gas Group: IIA
- Flange sizes: 2" through 12"

BLANKET GAS REGULATORS

Series 3000

- Blanket Gas Regulators
- Setting from 0.5 InWC to 15 psig
- Consult factory for vacuum applications

STEAM JACKETED



Most Groth valves can be steam jacketed.

ADDITIONAL PRODUCTS

Model 6000 Series

- Gauge Hatch
- Sizes: 4" through 10"

Model 8110

- Back Pressure Check Valve
- Sizes 2" through 12"

TEST STAND

Model 210

Provides convenient, accurate testing and setting of P/V valves or high pressure relief valves. Includes leak testing.

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Model 1200A

- **Sizes 2" through 12"**
- **Pressure settings O.5 oz/in² to 15 psig**
- **Vacuum settings O.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel, fiberglass and other materials**
- **Modular construction**

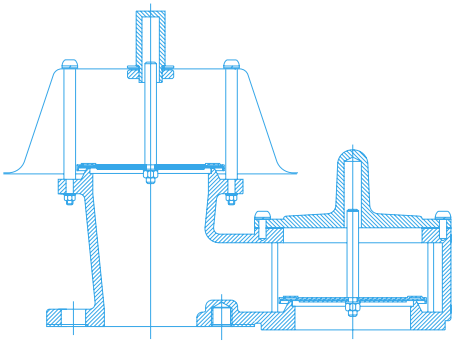
PRESSURE / VACUUM RELIEF VALVE

Model 1200A is designed to protect your tank from damage created by overpressure or excessive vacuum. Costly product evaporation losses due to normal tank "breathing" are greatly reduced. Because the Model 1200A retains toxic vapors, atmospheric contamination is minimized. This helps to provide increased fire protection and safety.

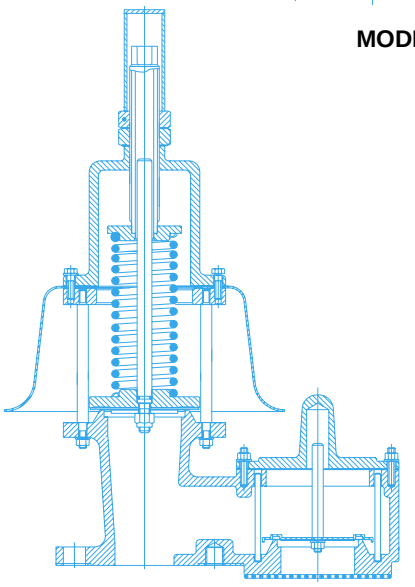
SPECIAL FEATURES

Model 1200A offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The Model 1200A has a self draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids dangerous pressure or vacuum buildup due to binding or clogging of the valve. Buna-N, VITON® and other seating diaphragms can be provided when required. To insure the proper alignment of seating surfaces, there is peripheral guiding and a center stabilizing system.

MODEL 1200A

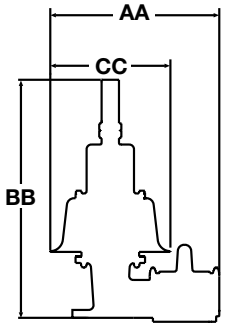


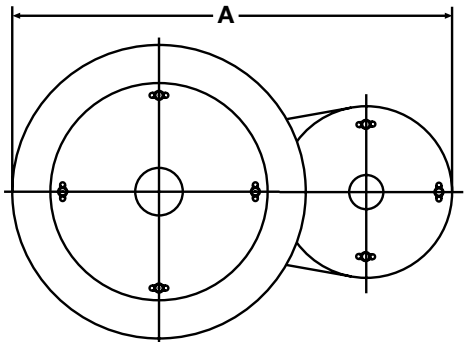
MODEL 1200A

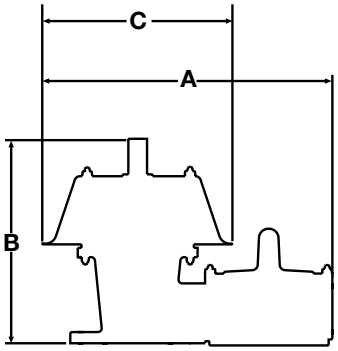


MODEL 1201B

SPECIFICATIONS







Specifications subject to change without notice. Certified dimensions available upon request.

Inlet Flg◊ (Metric)	Max. Set Pressure Weight Loaded	Max. Set Vacuum. Weight Loaded	Max. Setting Spring Loaded	Min. Setting Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting for Max. W.P.†	A Length (Metric)	B Height (Metric)	C Width (Metric)	AA Length (Metric)	BB Height (Metric)	CC Width (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	16 oz/in² (70.3 gm/cm²)	12 oz/in² (52.7 gm/cm²)	15 psig SPRING LOADED PRESSURE (1.05 kg/cm²) 12 psig SPRING LOADED VACUUM (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 on page 174 for Vacuum Settings and MAWP		13.63" (346 mm)	13" (330 mm)	9.50" (241 mm)	13.37" (340 mm)	19.87" (505 mm)	9.50" (241 mm)	16 (7 kg)
3" (80 mm)		11 oz/in² (48.3 gm/cm²)					18" (457 mm)	13.63" (346 mm)	11.50" (292 mm)	18.37" (467 mm)	22.75" (578 mm)	13" (330 mm)	21 (9 kg)
4" (100 mm)		11 oz/in² (48.3 gm/cm²)					19.75" (502 mm)	15.88" (403 mm)	13" (330 mm)	19.50" (495 mm)	27.50" (699 mm)	13" (330 mm)	31 (14 kg)
6" (150 mm)		16 oz/in² (70.3 gm/cm²)					27.75" (704 mm)	22.25" (565 mm)	19" (483 mm)	27.75" (705 mm)	37.75" (959 mm)	19.50" (495 mm)	57 (26 kg)
8" (200 mm)		16 oz/in² (70.3 gm/cm²)					33.88" (860 mm)	26.38" (669 mm)	23.63" (600 mm)	33.62" (854 mm)	44.50" (1130 mm)	23.50" (597 mm)	75 (34 kg)
10" (250 mm)		16 oz/in² (70.3 gm/cm²)					40.88" (1038 mm)	28.88" (733 mm)	30.75" (781 mm)	38" (965 mm)	53" (1346 mm)	25.50" (648 mm)	116 (53 kg)
12" (300 mm)		16 oz/in² (70.3 gm/cm²)					46" (1168 mm)	32.88" (835 mm)	36" (914 mm)	40.50" (1029 mm)	55.62" (1413 mm)	25.50" (648 mm)	157 (71 kg)

† W.P. = Working Pressure. ‡ On spring loaded valves, change model number. ◊ 150# ANSI drilling compatibility, F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. Fiberglass dimensions on request. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

MODEL #

- 1200A Weight Loaded
- 1201B Pressure Spring
- 1202B Vacuum Spring
- 1203A Pressure & Vacuum Springs

SIZE

02" Thru 12"

MATERIAL

Pallet Material, Seat Material, Body Material

- 1 = Aluminum
- 3 = Carbon Steel
- 5 = 316 SS
- 6 = Vinyl Ester Resin
- 7 = Furan
- Z = Special

OPTIONS

- O = No Options
- Z = Special Options

- O = No Jacket
- J = Steam Jacket
- S = Spacer
- H = Steam Jacket and Spacer

Diaphragm Material (Seat):

- B = Buna-N
- T = TEFLON®
- V = VITON®
- Z = Special

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.

* Stainless steel guides, stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

EXAMPLE

1 2 0 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 1200A with Aluminum Body and Seat, 316 SS Pallet, TEFLON® Seat Diaphragm, and no other options.

Model 1200A/1202B
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	7.65	16.2	28.9	61.9	108	174	217
1.00	0.58	8.22	17.4	31.1	66.5	116	187	233
1.73	1.00	10.8	22.8	40.8	87.2	152	246	305
2.00	1.16	11.6	24.5	43.8	93.7	164	264	328
2.60	1.50	13.2	27.8	49.8	106	186	300	373
3.00	1.73	14.1	29.9	53.4	114	200	322	400
3.46	2.00	15.2	32.0	57.3	123	214	345	429
4.00	2.31	16.3	34.4	61.5	131	230	371	460
6.00	3.47	19.8	41.8	74.7	160	279	450	560
8.00	4.62	22.7	47.9	85.7	183	320	516	641
10.0	5.78	25.1	53.1	95.1	203	355	573	712
12.0	6.93	27.3	57.8	103	221	386	623	774
15.0	8.66	30.2	63.9	114	244	427	689	856
20.0	11.6	34.3	72.5	130	277	485	781	971
25.0	14.4	37.7	79.6	142	305	532	859	1067
30.0	17.3	40.6	85.7	153	328	573	925	1149

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear sted. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row **70** and column **5**
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation		
	1. Read flow capacity at set pressure from table	Flow = 131,000 SCFH
6" Model 1200A	2. Calculate overpressure	% OP = [(7 - 4)/4] x 100 = 75%
4 InWC set pressure [P_s]	3. Read "C" factor from table	"C" = 0.87
7 InWC flowing pressure [P_f]	4. Calculate flow capacity	*Flow = 0.87 x 131,000 = 113,970 SCFH*

Model 1200A/1202B
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.22	0.46	0.82	1.74	3.05	4.91	6.11
50	4.90	0.32	0.68	1.22	2.62	4.58	7.38	9.17
75	7.35	0.40	0.83	1.49	3.19	5.58	9.00	11.2
100	9.80	0.45	0.96	1.72	3.67	6.42	10.4	12.9
125	12.3	0.51	1.07	1.91	4.09	7.15	11.5	14.3
150	14.7	0.55	1.17	2.09	4.47	7.81	12.6	15.6
175	17.2	0.59	1.26	2.25	4.81	8.4	13.5	16.8
200	19.6	0.63	1.34	2.39	5.12	8.95	14.4	17.9
225	22.1	0.67	1.41	2.53	5.41	9.46	15.3	18.9
250	24.5	0.70	1.49	2.66	5.68	9.93	16.0	19.9
275	27.0	0.73	1.55	2.78	5.94	10.4	16.7	20.8
300	29.4	0.76	1.62	2.89	6.18	10.8	17.4	21.6
375	36.8	0.85	1.79	3.20	6.84	12.0	19.3	23.9
500	49.0	0.96	2.03	3.63	7.76	13.6	21.9	27.2
625	61.3	1.05	2.23	3.99	8.52	14.9	24.0	29.9
750	73.5	1.14	2.40	4.29	9.18	16.1	25.9	32.2

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/Ps] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = **0.87**

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

	1. Read flow capacity at set pressure from table	Flow = 3,670 NCMH
6" Model 1200A	2. Calculate overpressure	% OP = [(175 - 100)/100] x 100 = 75%
100 mmWC Set Pressure [P_s]	3. Read "C" factor from table	"C" = 0.87
175 mmWC Flowing Pressure [P_f]	4. Calculate flow capacity	*Flow = 0.87 x 3,670 = 3,193 NCMH*

Model 1200A/1201B
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	4.70	10.3	16.0	34.7	60.5	91.1	129
1.00	0.58	5.05	11.0	17.2	37.3	65.0	97.9	138
1.73	1.00	6.63	14.5	22.6	49.0	85.3	129	182
2.00	1.16	7.12	15.6	24.2	52.6	91.6	138	195
2.60	1.50	8.10	17.7	27.6	59.8	104	157	222
3.00	1.73	8.70	19.0	29.6	64.2	112	169	238
3.46	2.00	9.33	20.4	31.8	68.9	120	181	256
4.00	2.31	10.0	21.9	34.1	74.0	129	194	274
6.00	3.47	12.2	26.7	41.5	90.1	157	237	334
8.00	4.62	14.0	30.6	47.7	103	180	272	384
10.0	5.78	15.6	34.0	53.0	115	200	302	427
12.0	6.93	17.0	37.1	57.8	125	218	329	465
15.0	8.66	18.8	41.1	64.0	139	242	365	516
20.0	11.6	21.4	46.8	72.9	158	276	415	587
25.0	14.4	23.6	51.5	80.3	174	304	457	646
30.0	17.3	25.4	55.6	86.6	188	327	493	697

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = [(Pf - Ps)/Ps] x 100

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table

%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1200A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 74,000 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 74,000 = 64,380 SCFH*

Model 1200A/1201B
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mm WC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.13	0.29	0.45	0.98	1.71	2.58	3.65
50	4.90	0.20	0.44	0.68	1.48	2.58	3.88	5.48
75	7.35	0.24	0.53	0.83	1.81	3.15	4.74	6.70
100	9.80	0.28	0.62	0.96	2.08	3.62	5.46	7.72
125	12.3	0.31	0.69	1.07	2.32	4.04	6.09	8.60
150	14.7	0.34	0.75	1.17	2.53	4.41	6.65	9.40
175	17.2	0.37	0.81	1.26	2.73	4.75	7.16	10.1
200	19.6	0.39	0.86	1.34	2.91	5.07	7.64	10.8
225	22.1	0.42	0.91	1.42	3.08	5.36	8.08	11.4
250	24.5	0.44	0.96	1.49	3.23	5.64	8.49	12.0
275	27.0	0.46	1.00	1.56	3.38	5.90	8.88	12.6
300	29.4	0.48	1.04	1.62	3.52	6.14	9.25	13.1
375	36.8	0.53	1.16	1.80	3.91	6.81	10.3	14.5
500	49.0	0.60	1.32	2.05	4.45	7.75	11.7	16.5
625	61.3	0.66	1.45	2.26	4.90	8.54	12.9	18.2
750	73.5	0.72	1.57	2.44	5.29	9.22	13.9	19.6

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1200A
100 mmWC Set Vacuum [P_s]
175 mmWC Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 2,080 NCMH
2. Calculate over-vacuum — % OV = [(175 - 100)/100] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 2,080 = 1,810 NCMH*

Model 1201B/1203A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	28.0	53.4	92.5	210	345	529	739
2.00	40.3	77.4	134	304	500	767	1070
3.00	50.2	96.9	168	381	625	960	1340
4.00	58.8	114	198	448	736	1130	1577
5.00	66.5	130	225	510	838	1286	1794
6.00	73.7	144	250	568	932	1431	1997
7.00	80.4	158	274	622	1022	1568	2188
8.00	86.7	171	297	674	1107	1699	2371
9.00	92.8	184	319	724	1189	1825	2546
10.0	98.6	196	340	772	1267	1945	2714
11.0	104	208	360	818	1343	2062	2877
12.0	110	219	380	863	1417	2176	3036
13.0	115	231	400	907	1489	2286	3189
14.0	120	241	418	949	1559	2393	3339
15.0	125	252	437	991	1627	2498	3486

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	••• Consult Factory •••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1201B
4 psig set pressure [Ps]
7 psig flowing pressure [Pf]

1. Read flow capacity at set pressure from table — Flow = 448,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 448,000 = 371,840 SCFH*

Model 1201B/1203A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.82	1.57	2.72	6.16	10.1	15.5	21.7
0.10	0.99	1.89	3.28	7.45	12.2	18.8	26.2
0.15	1.23	2.36	4.09	9.28	15.2	23.4	32.6
0.20	1.43	2.76	4.80	10.9	17.9	27.4	38.3
0.25	1.62	3.14	5.44	12.3	20.3	31.1	43.4
0.30	1.79	3.48	6.04	13.7	22.5	34.5	48.2
0.35	1.95	3.81	6.61	15.0	24.6	37.8	52.7
0.40	2.10	4.12	7.14	16.2	26.6	40.9	57.0
0.45	2.25	4.41	7.66	17.4	28.5	43.8	61.1
0.50	2.39	4.70	8.16	18.5	30.4	46.6	65.1
0.55	2.52	4.98	8.64	19.6	32.2	49.4	68.9
0.60	2.65	5.25	9.10	20.6	33.9	52.1	72.6
0.70	2.89	5.76	10.0	22.7	37.2	57.2	79.7
0.80	3.13	6.25	10.8	24.6	40.4	62.1	86.5
0.90	3.35	6.72	11.7	26.5	43.5	66.7	93.1
1.00	3.56	7.18	12.5	28.3	46.4	71.2	99.4

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	••• Consult Factory •••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1201B
0.4 barg Set Pressure [P_s]
0.7 barg Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 16,200 NCMH
2. Calculate overpressure — % OP = [(0.7 - 0.4)/0.4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 16,200 = 13,446 NCMH*

Model 1202B/1203A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	13.8	30.5	52.9	120	197	302	422
1.10	14.5	31.9	55.4	126	206	316	442
1.20	15.1	33.2	57.7	131	215	330	460
1.30	15.7	34.5	59.9	136	223	342	478
1.40	16.2	35.7	62.0	141	231	355	495
1.50	16.8	36.9	64.0	145	239	366	511
1.75	18.0	39.6	68.7	156	256	393	548
2.00	19.1	42.0	73.0	166	272	417	582
2.25	20.1	44.3	76.9	174	286	439	613
2.50	21.0	46.3	80.4	183	300	460	641
2.75	21.9	48.2	83.7	190	312	478	667
3.00	22.7	49.9	86.6	197	323	495	691
3.25	23.4	51.4	89.3	203	333	511	713
3.50	24.0	52.8	91.8	208	342	525	732
>3.50	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 3.5 PSIG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row **70** and column 5
"C" factor at 75% OV = 0.83

"C" Factor Table										
%OV	0	1	3	3	4	5	6	7	8	9
10	**••• Consult Factory •••**									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1202B
2 psig set vacuum [P_s]
3.5 psig flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 166,000 SCFH
2. Calculate over-vacuum — % OV = [(3.50 - 2.0)/2.0] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 166,000 = 137,780 SCFH*

Model 1202B/1203A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.41	0.90	1.55	3.52	5.77	8.87	12.4
0.10	0.48	1.06	1.83	4.16	6.83	10.5	14.6
0.11	0.51	1.11	1.92	4.35	7.14	11.0	15.3
0.12	0.53	1.15	1.99	4.53	7.43	11.4	15.9
0.13	0.55	1.20	2.07	4.69	7.70	11.8	16.5
0.14	0.56	1.24	2.14	4.85	7.96	12.2	17.1
0.15	0.58	1.27	2.20	5.00	8.21	12.6	17.6
0.16	0.60	1.31	2.27	5.14	8.44	13.0	18.1
0.17	0.61	1.35	2.33	5.28	8.66	13.3	18.6
0.18	0.63	1.38	2.38	5.41	8.88	13.6	19.0
0.19	0.64	1.41	2.44	5.53	9.08	13.9	19.4
0.20	0.66	1.44	2.49	5.65	9.27	14.2	19.8
0.22	0.68	1.49	2.58	5.86	9.62	14.8	20.6
0.24	0.70	1.54	2.67	6.05	9.93	15.2	21.3
>0.24	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 0.24 BARG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 42% Over-vacuum at intersection of row 40 and column 2
"C" factor at 42% OV = **0.55**

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	••• Consult Factory •••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

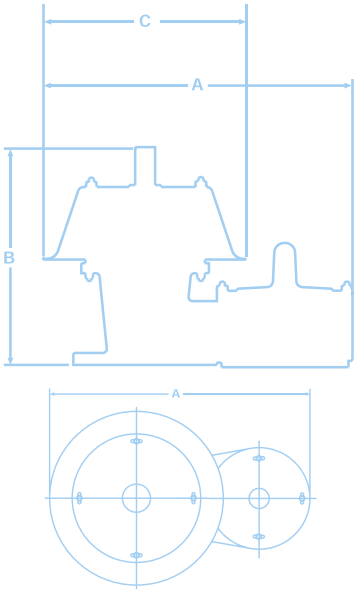
Example—Flow Capacity Calculation

6" Model 1202B
0.12 barg Set Vacuum [P_s]
0.17 barg Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 4,530 NCMH
2. Calculate over-vacuum — % OV = [(0.17 - 0.12)/0.12] x 100 = 42%
3. Read "C" factor from table — "C" = 0.55
4. Calculate flow capacity — *Flow = 0.55 x 4,530 = 2,492 NCMH*

Series 1800

- **Available in 2" (DN 50) through 12" (DN 300) flange sizes**
- **Stable full lift at 10% overpressure**
- **Modulating action**
- **Near zero blowdown (reseats near set pressure)**
- **Ability to achieve set pressure/vacuum very close to tank maximum allowable working pressure/vacuum**



FULL LIFT PRESSURE / VACUUM RELIEF VALVE

The most notable advantage of the Groth Full Lift Type Valve Compared to Standard Pressure/Vacuum Relief Valves is its' ability to open at 10% overpressure while standard Pressure/Vacuum Relief Valves achieve full open capacity at 100% overpressure. The use of a Full Lift Type Valve allows the user to select the valve set pressure (vacuum) within 10% of the tank Maximum Allowable Working Pressure (vacuum). This is important because operation near the tank design pressure greatly reduces the breathing losses of the product in the tank.

WHAT IS A FULL LIFT TYPE VALVE?

A Full Lift Type Valve is a relief valve which attains full stable lift at only 10% overpressure. Like all Groth Pressure/Vacuum Relief Valves, the Full Lift Type Valve is a modulating valve which offers near zero blowdown, meaning it reseats near set pressure. These performance capabilities are possible due to the harmonization of the nozzle, seating, and pallet areas such that the valve will achieve stable lift at only 10% above the set pressure/vacuum.

BENEFITS

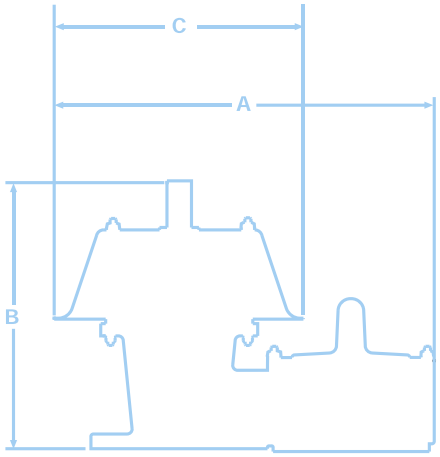
- Ability to operate process closer to Tank MAWP, increasing operating range of process
- Minimal seat leakage to prevent fugitive emission and conserve tank product
- Narrow valve operating range (from seal to full open) maximizes tank operating range and reduces total vapor emissions
- Stable lift ensures that the venting requirements of the process are reliably met
- Reduced seat leakage, low overpressure, and near zero blowdown characteristics to allow for process maintenance, minimal product loss and better tank corrosion maintenance

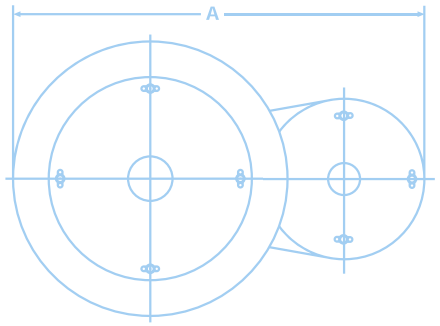
MATERIALS

Available in aluminum, carbon steel and stainless steel

Inlet Flg	A Length	B Height	C Width
	METRIC		
2"	13 5/8"	13"	9½"
50 mm	346 mm	330 mm	241 mm
3"	18"	13 5/8"	11½"
30 mm	457 mm	346 mm	292 mm
4"	19¾"	15 7/8"	13"
100 mm	503 mm	403 mm	130 mm
6"	27¾"	22¼"	19"
150 mm	704 mm	565 mm	482 mm
8"	33 7/8"	26 3/8"	23 5/8"
200 mm	860 mm	669 mm	600 mm
10"	40 7/8"	28 7/8"	30¾"
250 mm	1038 mm	733 mm	781 mm
12"	46"	32 7/8"	36"
300 mm	1165 mm	835 mm	914 mm

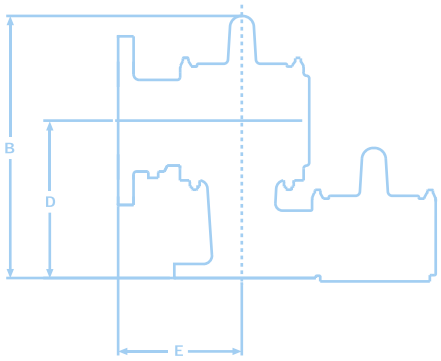
Model 1800

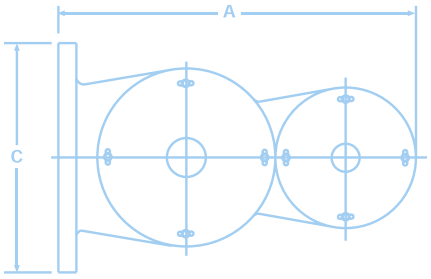




Inlet Flg	A Length	B Height	C Width
	METRIC		
2"	13 5/8"	13"	9½"
50 mm	346 mm	330 mm	241 mm
3"	18"	13 5/8"	11½"
30 mm	457 mm	346 mm	292 mm
4"	19¾"	15 7/8"	13"
100 mm	503 mm	403 mm	130 mm
6"	27¾"	22¼"	19"
150 mm	704 mm	565 mm	482 mm
8"	33 7/8"	26 3/8"	23 5/8"
200 mm	860 mm	669 mm	600 mm
10"	40 7/8"	28 7/8"	30¾"
250 mm	1038 mm	733 mm	781 mm
12"	46"	32 7/8"	36"
300 mm	1165 mm	835 mm	914 mm

Model 1820

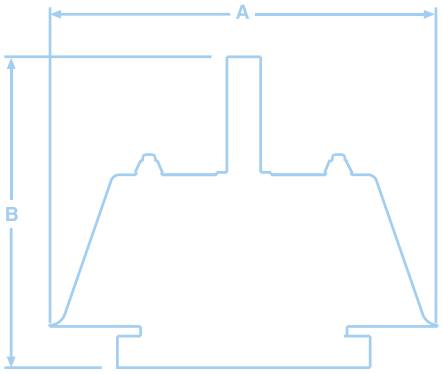




Inlet Flg	A Length	B Height	C Width
	METRIC		
2"	14¼"	12 5/8"	7½"
50 mm	361 mm	320 mm	191 mm
3"	18"	15 1/8"	9"
30 mm	457 mm	384 mm	229 mm
4"	19¼"	18¼"	**11"**
100 mm	489 mm	463 mm	279 mm
6"	26¼"	23¾"	13½"
150 mm	673 mm	603 mm	343 mm
8"	32½"	28½"	16"
200 mm	826 mm	723 mm	406 mm
10"	37¾"	34¼"	19"
250 mm	959 mm	876 mm	483 mm
12"	42¾"	39 1/8"	21"
300 mm	1086 mm	993 mm	533 mm

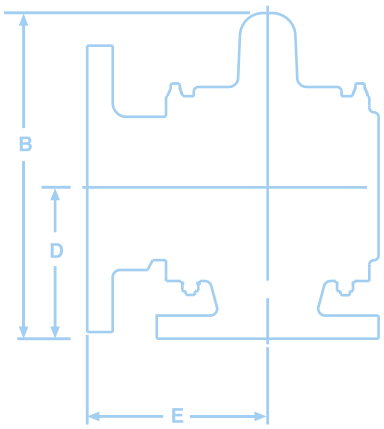
Inlet Flg	D	E
	METRIC	
2"	7"	5½"
50 mm	178 mm	140 mm
3"	8 1/8"	6"
30 mm	206 mm	152 mm
4"	9½"	6½"
100 mm	241 mm	165 mm
6"	12¾"	8½"
150 mm	324 mm	216 mm
8"	15¼"	10¾"
200 mm	387 mm	273 mm
10"	18"	12½"
250 mm	457 mm	318 mm
12"	20 5/8"	15"
300 mm	524 mm	381 mm

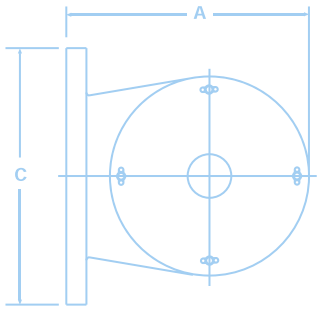
Model 1830



Inlet Flg	A Diameter	B Height
	METRIC	
2"	9½"	6 5/8"
50 mm	241 mm	168 mm
3"	11½"	8 5/8"
30 mm	292 mm	219 mm
4"	13"	10 9/16"
100 mm	330 mm	268 mm
6"	19"	15"
150 mm	482 mm	381 mm
8"	23 5/8"	16 5/8"
200 mm	600 mm	422 mm
10"	30¾"	17"
250 mm	781 mm	431 mm
12"	36"	18"
300 mm	914 mm	457 mm

Model 1860

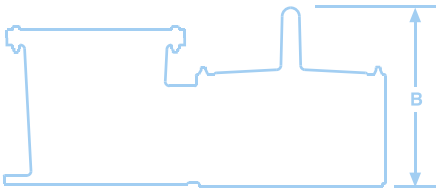


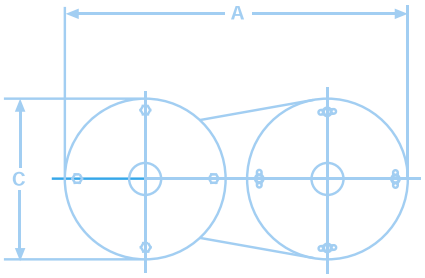


Inlet Flg	A Length	B Height	C Width
METRIC			
2”	8 5/8”	9 3/8”	7½”
50 mm	219 mm	238 mm	191 mm
3”	10”	11 1/8”	9”
30 mm	254 mm	282 mm	229 mm
4”	11”	13 7/8”	11”
100 mm	279 mm	352 mm	279 mm
6”	14½”	17 3/8”	13½”
150 mm	368 mm	441 mm	343 mm
8”	18”	21¼”	16”
200 mm	457 mm	539 mm	406 mm
10”	20¾”	23 5/8”	19”
250 mm	527 mm	600 mm	483 mm
12”	24¾”	26 5/8”	21”
300 mm	629 mm	676 mm	533 mm

Inlet Flg	D	E
METRIC		
2”	4 1/8”	5½”
50 mm	105 mm	140 mm
3”	5”	6”
30 mm	127 mm	152 mm
4”	6½”	6½”
100 mm	165 mm	165 mm
6”	8½”	8½”
150 mm	216 mm	216 mm
8”	9¾”	10¾”
200 mm	248 mm	273 mm
10”	10¼”	12½”
250 mm	260 mm	318 mm
12”	11”	15”
300 mm	279 mm	381 mm

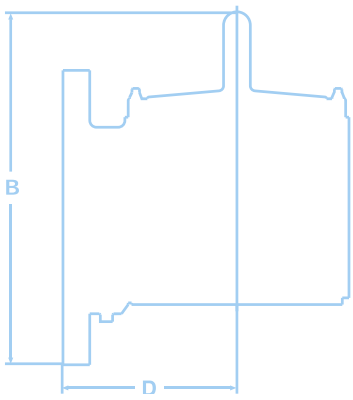
Model 1810

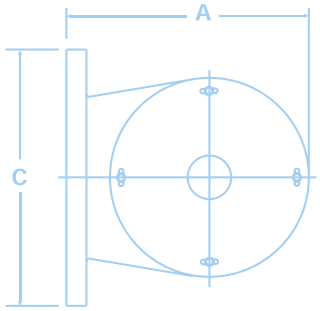




Inlet Flg	A Length	B Height	C Width
METRIC			
2”	11 5/8”	6 7/8”	6”
50 mm	295 mm	174 mm	152 mm
3”	15¾”	7¾”	7¾”
30 mm	400 mm	196 mm	197 mm
4”	17¼”	9 5/8”	9”
100 mm	438 mm	244 mm	229 mm
6”	23½”	11 7/8”	12”
150 mm	597 mm	301 mm	305 mm
8”	28½”	15½”	14½”
200 mm	724 mm	393 mm	368 mm
10”	33¼”	18 5/8”	16½”
250 mm	845 mm	473 mm	419 mm
12”	37¼”	21 5/8”	19”
300 mm	946 mm	549 mm	483 mm

Model 1870





Size Flange	A Length	B Height
METRIC		
3”	8 5/8”	9¼”
80 mm	219 mm	235 mm
4”	10”	11½”
100 mm	254 mm	292 mm
6”	11”	14¼”
150 mm	279 mm	362 mm
8”	14½”	17¾”
200 mm	368 mm	451 mm
10”	18”	21¼”
250 mm	457 mm	539 mm
12”	20¾”	25¾”
300 mm	527 mm	654 mm
14”	24¾”	29¼”
350 mm	629 mm	742 mm

Size Flange	C Width	D
METRIC		
3”	7½”	5½”
80 mm	191 mm	140 mm
4”	9”	6”
100 mm	229 mm	152 mm
6”	11”	6½”
150 mm	279 mm	165 mm
8”	13½”	8½”
200 mm	343 mm	216 mm
10”	16”	10¾”
250 mm	406 mm	273 mm
12”	19”	12½”
300 mm	483 mm	318 mm
14”	21”	15”
350 mm	533 mm	381 mm

Model 1800A
Pressure Relief Capacity

Model 1800A PRESSURE RELIEF								
Set Pressure		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Overpressure and 60°F [1000 SCFH]						
0.9	0.5	3.29	7.25	12.5	28.3	49.1	77.3	111
1.0	0.6	3.54	7.79	13.4	30.5	52.7	83.1	119
2.0	1.2	5.00	11.0	19.0	43.1	74.6	118	169
3.0	1.7	6.13	13.5	23.2	52.7	91.3	144	206
4.0	2.3	7.07	15.6	26.8	60.9	105	166	238
6.0	3.5	8.66	19.1	32.9	74.6	129	204	292
8.0	4.6	10.0	22.0	37.9	86.1	149	235	337
10.0	5.8	11.2	24.6	42.4	96.2	167	263	377
12.0	6.9	12.2	27.0	46.4	105	182	288	413
13.9	8.0	13.1	29.0	49.9	113	196	309	443

Model 1800A PRESSURE RELIEF								
Set Pressure		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Overpressure and 0°C [1000 NCMH]						
25	2.45	0.102	0.225	0.388	0.88	1.52	2.40	3.44
50	4.90	0.145	0.318	0.548	1.24	2.15	3.40	4.87
75	7.35	0.177	0.390	0.671	1.52	2.64	4.16	5.96
100	9.80	0.204	0.450	0.775	1.76	3.05	4.80	6.89
125	12.3	0.228	0.503	0.867	1.97	3.41	5.37	7.70
150	14.7	0.250	0.551	0.949	2.15	3.73	5.88	8.43
200	19.6	0.289	0.636	1.10	2.49	4.31	6.79	9.74
250	24.5	0.323	0.711	1.22	2.78	4.81	7.59	10.9
300	29.4	0.354	0.779	1.34	3.04	5.27	8.31	11.9
350	34.3	0.382	0.841	1.45	3.29	5.69	8.97	12.9

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1800A
Vacuum Relief Capacity

Model 1800A VACUUM RELIEF								
Set Vacuum		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 60°F [1000 SCFH]						
0.9	0.5	1.57	3.54	6.30	14.2	25.2	39.4	56.7
1.0	0.6	1.69	3.81	6.80	15.2	27.1	42.3	61.0
2.0	1.2	2.39	5.37	9.60	21.5	38.2	60.0	86.0
3.0	1.7	2.92	6.6	11.7	26.3	46.7	73.0	105
4.0	2.3	3.37	7.60	13.5	30.3	53.9	84.0	121
6.0	3.5	4.11	9.30	16.5	37.0	66.0	103	148
8.0	4.6	4.74	10.7	18.9	42.6	76.0	118	170
10.0	5.8	5.28	11.9	21.1	47.5	84.0	132	190
12.0	6.9	5.80	13.0	23.1	51.9	92.0	144	208
13.9	8.0	6.20	13.9	24.7	55.6	99.0	154	222

Model 1800A VACUUM RELIEF								
Set Vacuum		Size						
mmWc	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 0°C [1000 NCMH]						
25	2.45	0.049	0.110	0.196	0.44	0.780	1.22	1.76
50	4.90	0.069	0.155	0.276	0.620	1.10	1.73	2.48
75	7.35	0.084	0.190	0.338	0.760	1.35	2.11	3.04
100	9.80	0.097	0.219	0.389	0.880	1.56	2.43	3.50
125	12.3	0.109	0.245	0.435	0.980	1.74	2.72	3.91
150	14.7	0.119	0.267	0.475	1.07	1.90	2.97	4.28
200	19.6	0.137	0.308	0.547	1.23	2.19	3.42	4.93
250	24.5	0.153	0.343	0.610	1.37	2.44	3.81	5.49
300	29.4	0.167	0.375	0.670	1.50	2.67	4.17	6.00
350	34.3	0.179	0.404	0.720	1.62	2.87	4.49	6.46

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1820
Pressure Relief Capacity

Model 1820A PRESSURE RELIEF								
Set Pressure		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% overpressure and 60°F [1000 SCFH]						
0.9	0.5	2.52	5.55	9.50	21.7	37.5	59.1	85.0
1.0	0.6	2.71	5.96	10.3	23.3	40.3	63.6	91.0
2.0	1.2	3.83	8.40	14.5	32.9	57.0	90.0	129
3.0	1.7	4.68	10.3	17.8	40.3	69.8	110	158
4.0	2.3	5.41	11.9	20.5	46.6	81.0	127	182
6.0	3.5	6.62	14.6	25.1	57.0	99.0	156	223
8.0	4.6	7.60	16.8	29.0	65.8	114	180	258
10.0	5.8	8.50	18.8	32.4	73.6	127	201	288
12.0	6.9	9.40	20.6	35.5	81.0	140	220	316
13.9	8.0	10.1	22.2	38.1	87.0	150	236	339

Model 1820A PRESSURE RELIEF								
Set Pressure		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-pressure and 0°C [1000 NCMH]						
25	2.45	0.078	0.172	0.297	0.673	1.17	1.84	2.63
50	4.90	0.111	0.244	0.419	0.952	1.65	2.60	3.73
75	7.35	0.135	0.298	0.513	1.17	2.02	3.18	4.56
100	9.80	0.156	0.344	0.593	1.35	2.33	3.67	5.27
125	12.3	0.175	0.385	0.663	1.50	2.60	4.11	5.89
150	14.7	0.191	0.422	0.726	1.65	2.85	4.50	6.45
200	19.6	0.221	0.487	0.838	1.90	3.29	5.19	7.45
250	24.5	0.247	0.544	0.937	2.13	3.68	5.80	8.32
300	29.4	0.270	0.596	1.03	2.33	4.03	6.36	9.12
350	34.3	0.292	0.643	1.11	2.51	4.35	6.86	9.84

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1820
Vacuum Relief Capacity

Model 1820A VACUUM RELIEF								
Set Vacuum		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 60°F [1000 SCFH]						
0.9	0.5	1.57	3.54	6.30	14.2	25.2	39.4	56.7
1.0	0.6	1.69	3.81	6.80	15.2	27.1	42.3	61.0
2.0	1.2	2.39	5.37	9.60	21.5	38.2	60.0	86.0
3.0	1.7	2.92	6.60	11.7	26.3	46.7	73.0	105
4.0	2.3	3.37	7.60	13.5	30.3	53.9	84.0	121
6.0	3.5	4.11	9.30	16.5	37.0	66.0	103	148
8.0	4.6	4.74	10.7	18.9	42.6	76.0	118	170
10.0	5.8	5.28	11.9	21.1	47.5	84.0	132	190
12.0	6.9	5.80	13.0	23.1	51.9	92.0	144	208
13.9	8.0	6.20	13.9	24.7	55.6	99.0	154	222

Model 1820A VACUUM RELIEF								
Set Vacuum		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 0°C [1000 NCMH]						
25	2.45	0.049	0.110	0.196	0.440	0.78	1.22	1.76
50	4.90	0.069	0.155	0.276	0.620	1.10	1.73	2.48
75	7.35	0.084	0.190	0.338	0.760	1.35	2.11	3.04
100	9.80	0.097	0.219	0.389	0.880	1.56	2.43	3.50
125	12.3	0.109	0.245	0.435	0.980	1.74	2.72	3.91
150	14.7	0.119	0.267	0.475	1.07	1.90	2.97	4.28
200	19.6	0.137	0.308	0.547	1.23	2.19	3.42	4.93
250	24.5	0.153	0.343	0.610	1.37	2.44	3.81	5.49
300	29.4	0.167	0.375	0.670	1.50	2.67	4.17	6.00
350	34.3	0.179	0.404	0.720	1.62	2.87	4.49	6.46

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1830
Pressure Relief Capacity

Model 1830A PRESSURE RELIEF								
Set Pressure		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Overpressure and 60°F [1000 SCFH]						
0.9	0.5	3.29	7.25	12.5	28.3	49.1	77.3	111
1.0	0.6	3.54	7.79	13.4	30.5	52.7	83.1	119
2.0	1.2	5.00	11.0	19.0	43.1	74.6	118	169
3.0	1.7	6.13	13.5	23.2	52.7	91.3	144	206
4.0	2.3	7.07	15.6	26.8	60.9	105	166	238
6.0	3.5	8.66	19.1	32.9	74.6	129	204	292
8.0	4.6	10.0	22.0	37.9	86.1	149	235	337
10.0	5.8	11.2	24.6	42.4	96.2	167	263	377
12.0	6.9	12.2	27.0	46.4	105	182	288	413
13.9	8.0	13.1	29.0	49.9	113	196	309	443

Model 1830A PRESSURE RELIEF								
Set Pressure		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Overpressure and 0°C [1000 NCMH]						
25	2.45	0.102	0.225	0.388	0.880	1.52	2.40	3.44
50	4.90	0.145	0.318	0.548	1.24	2.15	3.40	4.87
75	7.35	0.177	0.390	0.671	1.52	2.64	4.16	5.96
100	9.80	0.204	0.450	0.775	1.76	3.05	4.80	6.89
125	12.3	0.228	0.503	0.867	1.97	3.41	5.37	7.70
150	14.7	0.250	0.551	0.949	2.15	3.73	5.88	8.43
200	19.6	0.289	0.636	1.10	2.49	4.31	6.79	9.74
250	24.5	0.323	0.711	1.22	2.78	4.81	7.59	10.9
300	29.4	0.354	0.779	1.34	3.04	5.27	8.31	11.9
350	34.3	0.382	0.841	1.45	3.29	5.69	8.97	12.9

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1860
Pressure Relief Capacity

Model 1860A PRESSURE RELIEF								
Set Pressure		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-pressure and 60°F [1000 SCFH]						
0.9	0.5	2.52	5.55	9.5	21.7	37.5	59.1	85.0
1.0	0.6	2.71	5.96	10.3	23.3	40.3	63.6	91.0
2.0	1.2	3.83	8.40	14.5	32.9	57.0	90.0	129
3.0	1.7	4.68	10.3	17.8	40.3	69.8	110	158
4.0	2.3	5.41	11.9	20.5	46.6	81.0	127	182
6.0	3.5	6.62	14.6	25.1	57.0	99.0	156	223
8.0	4.6	7.60	16.8	29.0	65.8	114	180	258
10.0	5.8	8.50	18.8	32.4	73.6	127	201	288
12.0	6.9	9.40	20.6	35.5	81.0	140	220	316
13.9	8.0	10.1	22.2	38.1	87.0	150	236	339

Model 1860A PRESSURE RELIEF								
Set Pressure		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-pressure and 0°C [1000 NCMH]						
25	2.45	0.078	0.172	0.297	0.673	1.17	1.84	2.63
50	4.90	0.111	0.244	0.419	0.952	1.65	2.60	3.73
75	7.35	0.135	0.298	0.513	1.17	2.02	3.18	4.56
100	9.80	0.156	0.344	0.593	1.35	2.33	3.67	5.27
125	12.3	0.175	0.385	0.663	1.50	2.60	4.11	5.89
150	14.7	0.191	0.422	0.726	1.65	2.85	4.50	6.45
200	19.6	0.221	0.487	0.838	1.90	3.29	5.19	7.45
250	24.5	0.247	0.544	0.937	2.13	3.68	5.80	8.32
300	29.4	0.270	0.596	1.03	2.33	4.03	6.36	9.12
350	34.3	0.292	0.643	1.11	2.51	4.35	6.86	9.84

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1810
Vacuum Relief Capacity

Model 1810A VACUUM RELIEF								
Set Vacuum		Size						
InWC	OSI	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 60°F [1000 SCFH]						
0.9	0.5	1.57	3.54	6.30	14.2	25.2	39.4	56.7
1.0	0.6	1.69	3.81	6.80	15.2	27.1	42.3	61.0
2.0	1.2	2.39	5.37	9.60	21.5	38.2	60.0	86.0
3.0	1.7	2.92	6.60	11.7	26.3	46.7	73.0	105
4.0	2.3	3.37	7.60	13.5	30.3	53.9	84.0	121
6.0	3.5	4.11	9.30	16.5	37.0	66.0	103	148
8.0	4.6	4.74	10.7	18.9	42.6	76.0	118	170
10.0	5.8	5.28	11.9	21.1	47.5	84.0	132	190
12.0	6.9	5.80	13.0	23.1	51.9	92.0	144	208
13.9	8.0	6.20	13.9	24.7	55.6	99.0	154	222

Model 1810A VACUUM RELIEF								
Set Vacuum		Size						
mmWC	mbar	2" (DN50)	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)
		Flow Capacity at 10% Over-vacuum and 0°C [1000 NCMH]						
25	2.45	0.049	0.110	0.196	0.440	0.78	1.22	1.76
50	4.90	0.069	0.155	0.276	0.620	1.10	1.73	2.48
75	7.35	0.084	0.190	0.338	0.760	1.35	2.11	3.04
100	9.80	0.097	0.219	0.389	0.880	1.56	2.43	3.50
125	12.3	0.109	0.245	0.435	0.980	1.74	2.72	3.91
150	14.7	0.119	0.267	0.475	1.07	1.90	2.97	4.28
200	19.6	0.137	0.308	0.547	1.23	2.19	3.42	4.93
250	24.5	0.153	0.343	0.610	1.37	2.44	3.81	5.49
300	29.4	0.167	0.375	0.670	1.50	2.67	4.17	6.00
350	34.3	0.179	0.404	0.720	1.62	2.87	4.49	6.46

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

Model 1870
Vacuum Relief Capacity

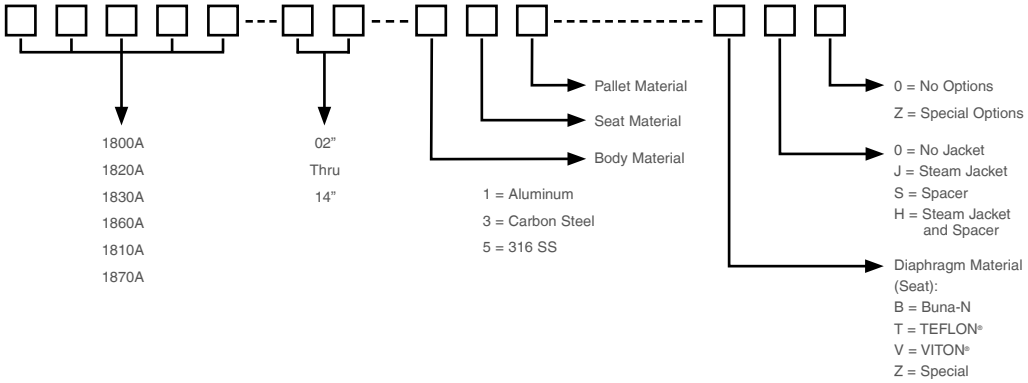
Model 1870A VACUUM RELIEF								
Set Vacuum		Size						
InWC	OSI	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)	14" (DN350)
		Flow Capacity at 10% Over-vacuum and 60°F [1000 SCFH]						
0.9	0.5	2.75	6.18	11.0	24.7	44.0	68.7	98.9
1.0	0.6	2.95	6.65	11.8	26.6	47.3	73.8	106
2.0	1.2	4.17	9.38	16.7	37.5	66.7	104	150
3.0	1.7	5.10	11.5	20.4	45.9	81.6	128	184
4.0	2.3	5.88	13.2	23.5	52.9	94.1	147	212
6.0	3.5	7.18	16.2	28.7	64.6	115	180	259
8.0	4.6	8.27	18.6	33.1	74.4	132	207	298
10.0	5.8	9.22	20.7	36.9	83.0	147	230	332
12.0	6.9	10.1	22.6	40.3	90.6	161	252	362
13.9	8.0	10.8	24.3	43.1	97.1	173	270	388

Model 1870A VACUUM RELIEF								
Set Vacuum		Size						
mmWC	mbar	3" (DN75)	4" (DN100)	6" (DN150)	8" (DN200)	10" (DN250)	12" (DN300)	14" (DN350)
		Flow Capacity at 10% Over-vacuum and 0°C [1000 NCMH]						
25	2.45	0.085	0.192	0.341	0.770	1.37	2.13	3.07
50	4.90	0.121	0.271	0.482	1.08	1.93	3.01	4.34
75	7.35	0.147	0.332	0.590	1.33	2.36	3.68	5.31
100	9.80	0.170	0.382	0.680	1.53	2.72	4.25	6.12
125	12.3	0.190	0.427	0.759	1.71	3.04	4.74	6.83
150	14.7	0.208	0.467	0.830	1.87	3.32	5.19	7.47
200	19.6	0.239	0.538	0.956	2.15	3.82	5.97	8.60
250	24.5	0.266	0.599	1.07	2.40	4.26	6.66	9.59
300	29.4	0.291	0.655	1.16	2.62	4.66	7.27	10.5
350	34.3	0.313	0.705	1.25	2.82	5.01	7.83	11.3

Flow capacity is certified by Groth Corporation based on actual tests conducted in compliance with API Standard 2000 and ISO 28300:2008.

HOW TO ORDER 1800 SERIES

For easy ordering, select proper model numbers



EXAMPLE 1 8 0 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 1800A with Aluminum Body and Seat, 316 SS Pallet, TEFLON® Seat Diagram and no other options.

Model 8800A
with Flame Arrester

- **Sizes 2" through 12"**
- **Pressure settings 0.5 oz/in² to 15 psig**
- **Vacuum settings 0.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel and other materials**
- **Proven spiral wound, crimped ribbon, flame element**
- **Modular construction**

PRESSURE / VACUUM RELIEF VALVE WITH FLAME ARRESTER

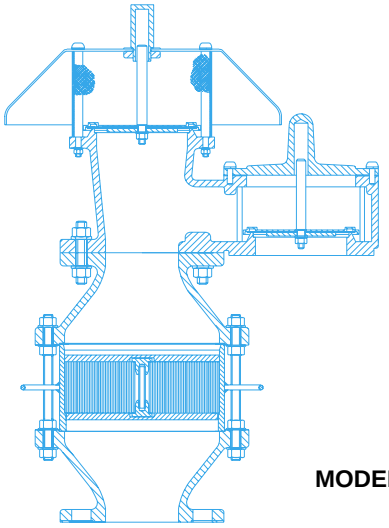
The Model 8800A Pressure/Vacuum Valve & Flame Arrester combination units are designed to protect your tank from damage created by over- pressure or excessive vacuum, at the same time that they provide protection from externally caused sources of heat and ignition. The result is increased fire protection and safety.

SPECIAL FEATURES

The Model 8800A Pressure/Vacuum Relief Valve offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. Self draining housings and drip rings protect seating surfaces from condensate and freezing.

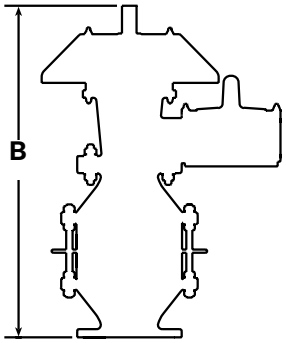
END-OF-LINE
- Gas Group: NEC D, IEC IIA
- Operating Temperature <= 140°F (60°C)
- Pre-Ignition Pressure = Atmosphere

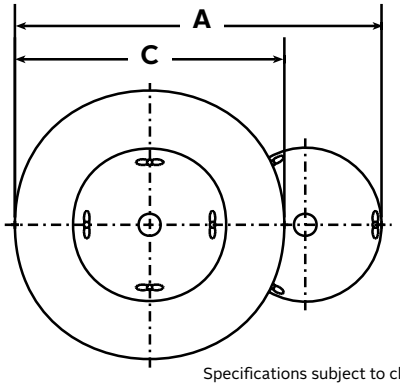
MODEL 8800A

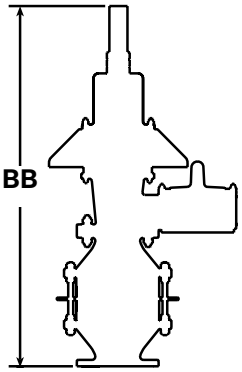


MODEL 8800A

SPECIFICATIONS







Specifications subject to change without notice. Certified dimensions available upon request.

Inlet Flg◊ (Metric)	Max. Set Pressure Weight Loaded	Max. Set Vacuum. Weight Loaded	Max. Setting Spring Loaded	Min. Setting Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting for Max. W.P.†	A Length (Metric)	B Height (Metric)	BB Height (Metric)	C Width (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	16 oz/in² (70.3 gm/cm²)	12 oz/in² (52.7 gm/cm²)	15 psig SPRING LOADED PRESSURE (1.05 kg/cm²) 12 psig SPRING LOADED VACUUM (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 for Vacuum Settings and MAWP		13.63" (346 mm)	27" (685 mm)	33.87" (860 mm)	9.50" (241mm)	35 (16 kg)
3" (80 mm)		11 oz/in² (48.3 gm/cm²)					18" (457 mm)	29.63" (752 mm)	38.75" (984 mm)	11.50" (292 mm)	45 (20 kg)
4" (100 mm)		11 oz/in² (48.3 gm/cm²)					19.75" (502 mm)	34.63" (879 mm)	46.25" (1175 mm)	13" (330 mm)	70 (32 kg)
6" (150 mm)		16 oz/in² (70.3 gm/cm²)					28.75" (730 mm)	43.25" (1099 mm)	58.75" (1492 mm)	19" (483 mm)	125 (57 kg)
8" (200 mm)		16 oz/in² (70.3 gm/cm²)					36" (914 mm)	51.38" (1305 mm)	69.50" (1765 mm)	23.63" (600 mm)	210 (95 kg)
10" (250 mm)		16 oz/in² (70.3 gm/cm²)					42" (1067 mm)	58.88" (1495 mm)	83" (2108 mm)	30.75" (781 mm)	350 (160 kg)
12" (300 mm)		16 oz/in² (70.3 gm/cm²)					48.50" (1232 mm)	65.38" (1661 mm)	88.12" (2238 mm)	35.75" (908 mm)	500 (227 kg)

†W.P. = Working Pressure. †On spring loaded valves, change model number. ◊150# ANSI drilling compatibility, F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

8800A Weight Loaded
8801B Pressure Spring
8802B Vacuum Spring
8803A Pressure & Vacuum Springs

02" Thru 12"

Flame Element Material
Pallet Material
Seat Material
* Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316 SS
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket
S = Spacer
H = Steam Jacket and Spacer

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.
- * Stainless steel guides, stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

EXAMPLE

8 8 0 0 A — 0 2 — 1 1 5 1 — T 0 0

Indicates a 2" Model 8800A with Aluminum Body and Seat, 316 SS Pallet, Aluminum Flame Element, TEFLON® Seat Diaphragm, and no other options.

Model 8800A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	3.01	5.98	10.7	21.5	34.8	55.2	62.3
1.00	0.58	3.29	6.68	12.0	24.2	39.2	62.1	72.0
1.73	1.00	4.56	9.70	17.6	36.3	58.4	92.0	112
2.00	1.16	4.96	10.7	19.3	39.9	64.2	101	125
2.60	1.50	5.76	12.6	22.7	47.2	75.9	120	148
3.00	1.73	6.26	13.7	24.8	51.7	82.9	131	163
3.46	2.00	6.79	15.0	27.1	56.4	90.5	143	178
4.00	2.31	7.36	16.3	29.5	61.5	99.0	155	195
6.00	3.47	9.20	20.6	37.3	78.1	125	197	249
8.00	4.62	10.9	24.3	44.0	92.2	148	233	295
10.0	5.78	12.3	27.6	50.0	105	168	264	335
12.0	6.93	13.6	30.6	55.4	116	186	293	372
15.0	8.66	15.4	34.6	62.8	132	211	332	422
20.0	11.6	18.0	40.7	73.7	155	248	390	497
25.0	14.4	20.4	46.0	83.5	175	281	442	563
30.0	17.3	22.6	50.9	92.4	194	311	489	623

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table

%OP	0	1	2	3	4	5	6	7	8	9
10 20 30 40	**Consult Factory**									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8800A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 61,500 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — Flow = 0.87 x 61,500 =53,505 SCFH

Model 8800A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22.0	0.09	0.18	0.32	0.64	1.04	1.65	1.91
50.0	0.14	0.30	0.55	1.13	1.82	2.87	3.53
75.0	0.18	0.39	0.70	1.46	2.35	3.70	4.62
100	0.21	0.46	0.83	1.74	2.80	4.40	5.53
150	0.26	0.58	1.06	2.21	3.55	5.59	7.05
200	0.31	0.69	1.25	2.61	4.19	6.59	8.35
250	0.35	0.78	1.42	2.97	4.76	7.48	9.50
300	0.39	0.87	1.57	3.29	5.27	8.30	10.5
375	0.44	0.98	1.78	3.73	5.98	9.41	12.0
500	0.51	1.15	2.09	4.39	7.02	11.0	14.1
625	0.58	1.30	2.36	4.97	7.96	12.5	15.9
750	0.64	1.44	2.62	5.50	8.80	13.8	17.6

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 67% overpressure at intersection of row 60 and column 7
"C" factor at 67% OP = 0.82

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10 20 30 40	**Consult Factory**									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8800A
150 mmWC Set Pressure [P_s]
250 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 2,210 NCMH
2. Calculate overpressure — % OP = [(250 - 150)/150] x 100 = 67%
3. Read "C" factor from table — "C" = 0.82
4. Calculate flow capacity — *Flow = 0.82 x 2,210 = 1,812 NCMH*

Model 8800A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	2.55	5.19	8.80	17.9	28.6	44.3	53.6
1.00	0.58	2.77	5.73	9.70	19.8	31.6	48.9	60.4
1.73	1.00	3.78	8.15	13.6	28.3	45.1	69.4	89.8
2.00	1.16	4.10	8.90	14.9	31.0	49.3	75.8	99.0
2.60	1.50	4.74	10.4	17.4	36.2	57.7	88.6	117
3.00	1.73	5.14	11.3	18.9	39.5	62.9	96	128
3.46	2.00	5.56	12.3	20.5	42.9	68.4	105	139
4.00	2.31	6.03	13.4	22.3	46.7	74.4	114	152
6.00	3.47	7.54	16.9	28.1	58.9	93.8	144	193
8.00	4.62	8.84	19.9	33.0	69.4	110	169	227
10.0	5.78	10.0	22.5	37.4	78.6	125	192	258
12.0	6.93	11.1	24.9	41.5	87.1	139	212	286
15.0	8.66	12.5	28.2	46.9	98.6	157	240	324
20.0	11.6	14.7	33.1	55.1	116	184	282	381
25.0	14.4	16.6	37.5	62.3	131	209	319	432
30.0	17.3	18.3	41.5	68.9	145	231	353	478

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10 20 30 40	Consult Factory									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8800A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 46,700 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 46,700 = 40,629 SCFH*

Model 8800A
Vacuum Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22.0	0.07	0.15	0.26	0.52	0.84	1.29	1.60
50.0	0.12	0.25	0.42	0.87	1.39	2.13	2.78
75.0	0.14	0.32	0.53	1.11	1.77	2.72	3.59
100	0.17	0.38	0.63	1.32	2.09	3.21	4.27
150	0.21	0.48	0.79	1.66	2.64	4.05	5.42
200	0.25	0.56	0.93	1.95	3.11	4.76	6.40
250	0.28	0.63	1.05	2.21	3.53	5.40	7.27
300	0.31	0.70	1.17	2.45	3.90	5.97	8.06
375	0.35	0.80	1.32	2.78	4.42	6.77	9.10
500	0.41	0.93	1.55	3.26	5.19	7.94	10.7
625	0.47	1.06	1.76	3.69	5.87	8.98	12.2
750	0.52	1.17	1.94	4.08	6.50	9.90	13.5

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s]$ x 100

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 67% Over-vacuum at intersection of row 60 and column 7
"C" factor at 67% OP = 0.82

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10 20 30 40	**Consult Factory**									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8800A
150 mmWC Set Vacuum [P_s]
250 mmWC Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 1,660 NCMH
2. Calculate over-vacuum — % OV = [(250 - 150)/150] x 100 = 67%
3. Read "C" factor from table — "C" = 0.82
4. Calculate flow capacity — *Flow = 0.82 x 1,660 = 1,361 NCMH*

Model 1220A
with Pipe-Away Feature

- **Sizes 2" through 12"**
- **Pressure settings 0.5 oz/in² to 15 psig**
- **Vacuum settings 0.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel, fiberglass, and other materials**
- **Modular construction**

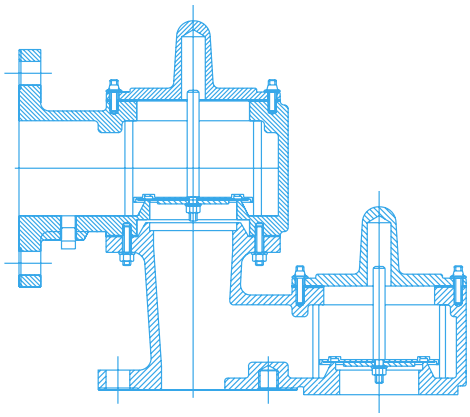
PRESSURE / VACUUM RELIEF VALVE WITH PIPE-AWAY FEATURE

Model 1220A is used for pressure and vacuum relief where vapors must be piped away. Escaping vapors are piped away through a flanged outlet connection. This helps to provide increased fire protection and safety.

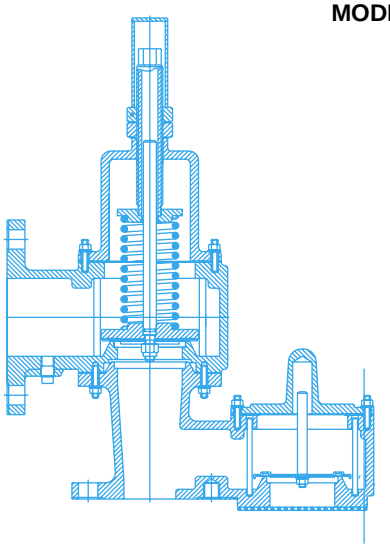
SPECIAL FEATURES

Model 1220A offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The Model 1220A has a self draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids pressure or vacuum buildup due to binding or clogging of the valve. Buna-N, VITON®, and other seating diaphragms can be provided when required. Model 1221B may be spring loaded when required for use on blanketed tanks or other type installation requiring higher settings. To insure the proper alignment of seating surfaces there is peripheral guiding and a center stabilizing stem.

MODEL 1220A

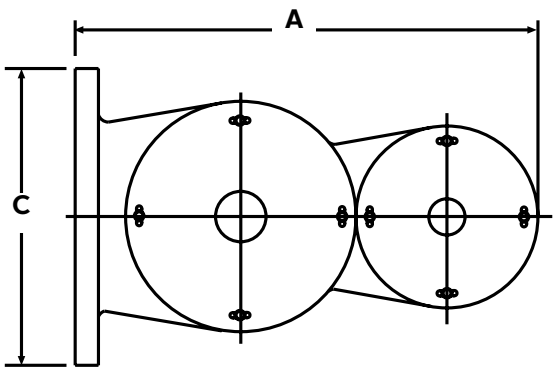


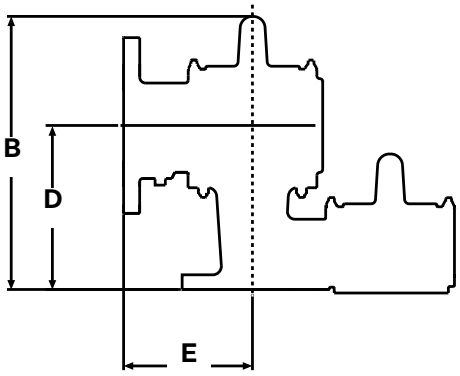
MODEL 1220A



MODEL 1221B

SPECIFICATIONS





Specifications subject to change without notice. Certified dimensions available upon request.

Inlet Flg◊ (Metric)	Outlet Flg◊ (Metric)	Max. Set Pressure Weight Loaded	Max. Set Vacuum. Weight Loaded	Max. Setting Spring Loaded	Min. Setting Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting for Max. W.P.†	A Length (Metric)	B Height (Metric)	C Width (Metric)	D (Metric)	E (Metric)	BB (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	3" (76 mm)	11 oz/in² (48.2 gm/cm²)	12 oz/in² (52.7 gm/cm²)	15 psig SPRING LOADED PRESSURE (1.05 kg/cm²) 12 psig SPRING LOADED VACUUM (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 for Vacuum Settings and MAWP		14.25" (362 mm)	12.62" (321 mm)	7.50" (191 mm)	7" (178 mm)	5.50" (140 mm)	19.62" (498 mm)	26 (12 kg)
3" (80 mm)	4" (102 mm)	13 oz/in² (57.0 gm/cm²)	11 oz/in² (48.3 gm/cm²)					18" (457 mm)	15.12" (384 mm)	9" (229 mm)	8.12" (206 mm)	6" (152 mm)	23.37" (594 mm)	34 (16 kg)
4" (100 mm)	6" (152 mm)	16 oz/in² (70.3 gm/cm²)	11 oz/in² (48.3 gm/cm²)					19.25" (489 mm)	18.25" (464 mm)	11" (279 mm)	9.50" (241 mm)	6.50" (165 mm)	28.62" (727 mm)	49 (22 kg)
6" (150 mm)	8" (203 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					26.50" (673 mm)	23.75" (603 mm)	13.50" (343 mm)	12.75" (324 mm)	8.50" (216 mm)	38.37" (975 mm)	93 (42 kg)
8" (200 mm)	10" (254 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					32.50" (826 mm)	28.50" (724 mm)	16" (406 mm)	15.25" (387 mm)	10.75" (273 mm)	45.25" (1149 mm)	137 (62 kg)
10" (250 mm)	12" (305 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					37.75" (959 mm)	34.50" (876 mm)	19" (483 mm)	18" (457 mm)	12.50" (318 mm)	54.12" (1375 mm)	186 (85 kg)
12" (300 mm)	14" (356 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					42.75" (1086 mm)	39.12" (994 mm)	21" (533 mm)	20.62" (524 mm)	15" (381 mm)	58.87" (1495 mm)	260 (118 kg)

†W.P. = Working Pressure. ‡On spring loaded valves, change model number. ◊150# R.F. drilling compatibility F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. Fiberglass dimensions on request. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

MODEL #
- 1200A Weight Loaded
- 1221B Pressure Spring
- 1222B Vacuum Spring
- 1223A Pressure & Vacuum Springs

SIZE
02" Thru 12"

MATERIAL
Pallet Material
Seat Material
* Body Material
- 1 = Aluminum
- 3 = Carbon Steel
- 5 = 316 SS
- 6 = Vinyl Ester Resin
- 7 = Furan
- Z = Special

OPTIONS
- O = No Options
- Z = Special Options

- O = No Jacket
- J = Steam Jacket
- S = Spacer
- H = Steam Jacket and Spacer

Diaphragm Material (Seat):
- B = Buna-N
- T = TEFLON®
- V = VITON®
- Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.
- * Stainless steel guides, stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

EXAMPLE

1 2 2 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 8800A with Aluminum Body and Seat, 316 SS Pallet, Aluminum Flame Element, TEFLON® Seat Diaphragm, and no other options.

Model 1220A/1222B
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" 150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	6.87	13.3	25.2	52.7	82.6	135	175
1.00	0.58	7.39	14.3	27.1	56.6	88.8	145	188
1.73	1.00	9.71	18.8	35.6	74.3	117	190	247
2.00	1.16	10.4	20.2	38.2	79.8	125	205	265
2.60	1.50	11.9	23.0	43.5	90.8	143	233	302
3.00	1.73	12.8	24.7	46.8	97.5	153	250	324
3.46	2.00	13.7	26.6	50.2	105	164	268	348
4.00	2.31	14.7	28.6	53.9	112	177	288	374
6.00	3.47	18.0	35.0	65.9	137	215	351	456
8.00	4.62	20.7	40.4	75.8	157	248	404	525
10.0	5.78	23.1	45.1	84.6	175	276	450	584
12.0	6.93	25.2	49.4	92.4	191	301	491	638
15.0	8.66	28.1	55.2	103	211	335	546	709
20.0	11.6	32.2	63.7	118	241	383	625	811
25.0	14.4	35.8	71.2	131	267	424	692	898
30.0	17.3	39.0	77.9	143	289	460	751	975

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1220A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 112,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — Flow = 0.87 x 112,000 = 97,440 SCFH

Model 1220A/1222B
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.19	0.37	0.71	1.48	2.33	3.80	4.93
50	4.90	0.29	0.56	1.07	2.23	3.50	5.72	7.42
75	7.35	0.36	0.69	1.31	2.72	4.28	6.99	9.10
100	9.80	0.41	0.80	1.51	3.14	4.93	8.05	10.4
125	12.3	0.46	0.89	1.68	3.50	5.51	8.99	11.7
150	14.7	0.50	0.98	1.84	3.82	6.02	9.80	12.7
175	17.2	0.54	1.06	1.99	4.12	6.49	10.6	13.7
200	19.6	0.58	1.13	2.12	4.39	6.92	11.3	14.7
225	22.1	0.61	1.20	2.25	4.65	7.33	12.0	15.5
250	24.5	0.65	1.26	2.36	4.89	7.71	12.6	16.3
275	27.0	0.68	1.32	2.48	5.11	8.07	13.2	17.1
300	29.4	0.70	1.38	2.58	5.33	8.42	13.7	17.8
375	36.8	0.78	1.54	2.88	5.91	9.40	15.3	19.8
500	49.0	0.90	1.78	3.30	6.75	10.7	17.5	22.7
625	61.3	1.00	1.99	3.67	7.46	11.9	19.4	25.1
750	73.5	1.09	2.18	3.99	8.07	12.9	21.0	27.3

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1220A
100 mmWC Set Pressure [P_s]
175 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 3,140 NCMH
2. Calculate overpressure — % OP = [(175 - 100)/100] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 3,140 = 2,732 NCMH*

Model 1220A/1221B
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" 250 mm)	12" (300 mm)
0.87	0.50	4.70	10.3	16.0	34.7	60.5	91.1	129
1.00	0.58	5.05	11.0	17.2	37.3	65.0	97.9	138
1.73	1.00	6.63	14.5	22.6	49.0	85.3	129	182
2.00	1.16	7.12	15.6	24.2	52.6	91.6	138	195
2.60	1.50	8.10	17.7	27.6	59.8	104	157	222
3.00	1.73	8.70	19.0	29.6	64.2	112	169	238
3.46	2.00	9.33	20.4	31.8	68.9	120	181	256
4.00	2.31	10.0	21.9	34.1	74.0	129	194	274
6.00	3.47	12.2	26.7	41.5	90.1	157	237	334
8.00	4.62	14.0	30.6	47.7	103	180	272	384
10.0	5.78	15.6	34.0	53.0	115	200	302	427
12.0	6.93	17.0	37.1	57.8	125	218	329	465
15.0	8.66	18.8	41.1	64.0	139	242	365	516
20.0	11.6	21.4	46.8	72.9	158	276	415	587
25.0	14.4	23.6	51.5	80.3	174	304	457	646
30.0	17.3	25.4	55.6	86.6	188	327	493	697

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1220A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 74,000 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 74,000 = 64,380 SCFH*

Model 1220A/1221B
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.13	0.29	0.45	0.98	1.71	2.58	3.65
50	4.90	0.20	0.44	0.68	1.48	2.58	3.88	5.48
75	7.35	0.24	0.53	0.83	1.81	3.15	4.74	6.70
100	9.80	0.28	0.62	0.96	2.08	3.62	5.46	7.72
125	12.3	0.31	0.69	1.07	2.32	4.04	6.09	8.60
150	14.7	0.34	0.75	1.17	2.53	4.41	6.65	9.40
175	17.2	0.37	0.81	1.26	2.73	4.75	7.16	10.1
200	19.6	0.39	0.86	1.34	2.91	5.07	7.64	10.8
225	22.1	0.42	0.91	1.42	3.08	5.36	8.08	11.4
250	24.5	0.44	0.96	1.49	3.23	5.64	8.49	12.0
275	27.0	0.46	1.00	1.56	3.38	5.90	8.88	12.6
300	29.4	0.48	1.04	1.62	3.52	6.14	9.25	13.1
375	36.8	0.53	1.16	1.80	3.91	6.81	10.3	14.5
500	49.0	0.60	1.32	2.05	4.45	7.75	11.7	16.5
625	61.3	0.66	1.45	2.26	4.90	8.54	12.9	18.2
750	73.5	0.72	1.57	2.44	5.29	9.22	13.9	19.6

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1220A
100 mmWC Set Vacuum [P_s]
175 mmWC Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 2,080 NCMH
2. Calculate over-vacuum — % OV = [(175 - 100)/100] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 2,080 = 1,810 NCMH*

Model 1221B/1223B
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	28.0	53.4	92.5	210	345	529	739
2.00	40.3	77.4	134	304	500	767	1070
3.00	50.2	96.9	168	381	625	960	1340
4.00	58.8	114	198	448	736	1130	1577
5.00	66.5	130	225	510	838	1286	1794
6.00	73.7	144	250	568	932	1431	1997
7.00	80.4	158	274	622	1022	1568	2188
8.00	86.7	171	297	674	1107	1699	2371
9.00	92.8	184	319	724	1189	1825	2546
10.0	98.6	196	340	772	1267	1945	2714
11.0	104	208	360	818	1343	2062	2877
12.0	110	219	380	863	1417	2176	3036
13.0	115	231	400	907	1489	2286	3189
14.0	120	241	418	949	1559	2393	3339
15.0	125	252	437	991	1627	2498	3486

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	••• Consult Factory •••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1221B
4 psig set pressure [P_s]
7 psig flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 448,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — **Flow = 0.83 x 448,000 = 371,840 SCFH**

Model 1221B/1223B
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.82	1.57	2.72	6.16	10.1	15.5	21.7
0.10	0.99	1.89	3.28	7.45	12.2	18.8	26.2
0.15	1.23	2.36	4.09	9.28	15.2	23.4	32.6
0.20	1.43	2.76	4.80	10.9	17.9	27.4	38.3
0.25	1.62	3.14	5.44	12.3	20.3	31.1	43.4
0.30	1.79	3.48	6.04	13.7	22.5	34.5	48.2
0.35	1.95	3.81	6.61	15.0	24.6	37.8	52.7
0.40	2.10	4.12	7.14	16.2	26.6	40.9	57.0
0.45	2.25	4.41	7.66	17.4	28.5	43.8	61.1
0.50	2.39	4.70	8.16	18.5	30.4	46.6	65.1
0.55	2.52	4.98	8.64	19.6	32.2	49.4	68.9
0.60	2.65	5.25	9.10	20.6	33.9	52.1	72.6
0.70	2.89	5.76	10.0	22.7	37.2	57.2	79.7
0.80	3.13	6.25	10.8	24.6	40.4	62.1	86.5
0.90	3.35	6.72	11.7	26.5	43.5	66.7	93.1
1.00	3.56	7.18	12.5	28.3	46.4	71.2	99.4

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1221B
0.4 barg Set Pressure [P_s]
0.7 barg Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 16,200 NCMH
2. Calculate overpressure — % OP = [(0.7 - 0.4)/0.4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 16,200 = 13,446 NCMH*

Model 1222B/1223B
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	13.8	30.5	52.9	120	197	302	422
1.10	14.5	31.9	55.4	126	206	316	442
1.20	15.1	33.2	57.7	131	215	330	460
1.30	15.7	34.5	59.9	136	223	342	478
1.40	16.2	35.7	62.0	141	231	355	495
1.50	16.8	36.9	64.0	145	239	366	511
1.75	18.0	39.6	68.7	156	256	393	548
2.00	19.1	42.0	73.0	166	272	417	582
2.25	20.1	44.3	76.9	174	286	439	613
2.50	21.0	46.3	80.4	183	300	460	641
2.75	21.9	48.2	83.7	190	312	478	667
3.00	22.7	49.9	86.6	197	323	495	691
3.25	23.4	51.4	89.3	203	333	511	713
3.50	24.0	52.8	91.8	208	342	525	732
>3.50	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 3.5 PSIG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.83

"C" Factor Table										
%OV	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1222B
2 psig set vacuum [P_s]
3.5 psig flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 166,000 SCFH
2. Calculate over-vacuum — % OV = [(3.50 - 2.0)/2.0] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 166,000 = 137,780 SCFH*

Model 1222B/1223B
Vacuum Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.41	0.90	1.55	3.52	5.77	8.87	12.4
0.10	0.48	1.06	1.83	4.16	6.83	10.5	14.6
0.11	0.51	1.11	1.92	4.35	7.14	11.0	15.3
0.12	0.53	1.15	1.99	4.53	7.43	11.4	15.9
0.13	0.55	1.20	2.07	4.69	7.70	11.8	16.5
0.14	0.56	1.24	2.14	4.85	7.96	12.2	17.1
0.15	0.58	1.27	2.20	5.00	8.21	12.6	17.6
0.16	0.60	1.31	2.27	5.14	8.44	13.0	18.1
0.17	0.61	1.35	2.33	5.28	8.66	13.3	18.6
0.18	0.63	1.38	2.38	5.41	8.88	13.6	19.0
0.19	0.64	1.41	2.44	5.53	9.08	13.9	19.4
0.20	0.66	1.44	2.49	5.65	9.27	14.2	19.8
0.22	0.68	1.49	2.58	5.86	9.62	14.8	20.6
0.24	0.70	1.54	2.67	6.05	9.93	15.2	21.3
>0.24	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 0.24 BARG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = [(Pf - Ps)/Ps] x 100

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 42% Over-vacuum at intersection of row 40 and column 2
"C" factor at 42% OV = 0.55

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1222B
0.12 barg Set Vacuum [P_s]
0.17 barg Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 4,530 NCMH
2. Calculate over-vacuum — % OV = [(0.17 - 0.12)/0.12] x 100 = 42%
3. Read "C" factor from table — "C" = 0.55
4. Calculate flow capacity — *Flow = 0.55 x 4,530 = 2,491 NCMH*

Model 1720A/1760A
with Pipe-Away Feature

- **Same size inlet and outlet connections**
- **"Cushioned air" seating**
- **Non-sticking design**
- **Center and peripheral pallet guiding**
- **Self-draining body**
- **Factory tested for compliance with API 2000**
- **ISO-Certified manufacturing facility**
- **Higher set pressures (in weight loaded configuration) than standard pipe-away valves**

Groth Series 1700 relief valves are designed with inlet and outlet flanges of the same size to reduce installation costs by having smaller downstream piping.

Model 1720A valves are designed for systems requiring pressure and vacuum relief. Model 1760A valves are designed for systems requiring only pressure relief.

Available in 2", 3" and 4" sizes and in carbon steel, 316SS or fiberglass. Trim materials (seat and pallet components) are 316SS. Other materials available on request. Options include stainless steel weights.

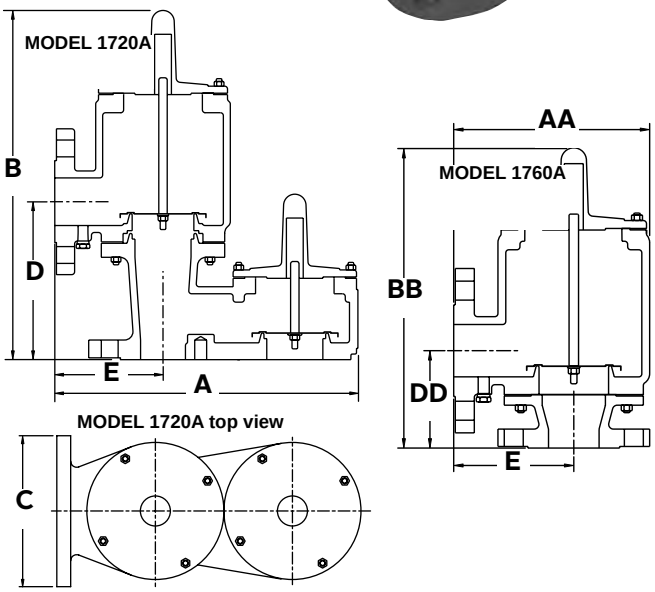


Table I — Setting Ranges
White bars in oz/in². Blue bars in mbar.

Model	Size (inches)	Standard Weights				Stainless Steel Weights			
		Pressure		Vacuum		Pressure Vacuum			
		Min	Max	Min	Max	Min	Max	Min	Max
1720A	2 X 2	0.5	33	0.5	17.4	0.5	24	0.5	16.5
		2.2	142	2.1	74	2.2	103	2.2	71
	3 X 3	0.5	33	0.5	15.5	0.5	24	0.5	15.2
		2.2	142	2.1	66	2.2	103	2.2	65
	4 X 4	0.5	33	0.5	16.5	0.5	24	0.5	15.0
		2.2	142	2.1	71	2.2	103	2.2	64
1760A	2 X 2	0.5	33	–	–	0.5	24	–	–
		2.2	142	–	–	2.2	103	–	–
	3 X 3	0.5	33	–	–	0.5	24	–	–
		2.2	142	–	–	2.2	103	–	–
	4 X 4	0.5	33	–	–	0.5	24	–	–
		2.2	142	–	–	2.2	103	–	–

The 1700 Series relief valves are also available in spring loaded designs for pressure settings up to 15 psig. Other options include FRP (Furan or **Derakane) construction, positive lift indicators and special coatings.** Consult the factory for details.

Table II — Dimensions
White bars in inches or pounds. Blue bars in millimeters or kilograms.

Size (inches)	Model 1720A					
	"A"	"B"	"C"	"D"	"E"	Weight
2 X 2	13.50	14.63	6.50	6.75	4.75	80
	343	372	165	171	121	36
3 X 3	18.00	17.38	8.00	8.00	6.00	105
	457	441	203	203	152	48
4 X 4	19.25	19.50	9.00	9.13	6.50	150
	489	495	229	232	165	68
Size (inches)	Model 1760A					
	"AA"	"BB"	"C"	"DD"	"E"	Weight
2 X 2	7.75	11.88	6.50	3.88	4.75	50
	197	302	165	99	121	23
3 X 3	10.00	14.13	8.00	4.75	6.00	70
	254	359	203	121	152	32
4 X 4	10.75	16.50	9.00	6.06	6.50	92
	273	419	229	154	165	42

Model 1720/1760 Pressure Relief Capacity
Table III — Air Flow Capacity at 100% Overpressure

Set Pressure [P_s]		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60°F			Set Pressure [P_s]		Air Flow Capacity at 100% Overpressure (Double Set Pressure) Normal Cubic Meters per Hour at 0°C		
InWC	oz/in²	2" x 2"	3" x 3"	4" x 4"	mmWC	mbar	2" x 2"	3" x 3"	4" x 4"
0.9	0.5	4.79	10.7	18.1					
1.0	0.6	5.15	11.5	19.5	25.0	2.45	149	332	563
2.0	1.2	7.29	16.3	27.6	50.0	4.90	211	470	797
3.0	1.7	8.94	20.0	33.8	75.0	7.35	258	577	976
4.0	2.3	10.3	23.1	39.0	100	9.80	299	667	1128
6.0	3.5	12.7	28.3	47.9	150	14.7	367	818	1383
8.0	4.6	14.7	32.8	55.4	200	19.6	424	946	1599
10.0	5.8	16.5	36.7	62.0	250	24.5	476	1060	1790
					300	29.4	522	1164	1963
					350	34.3	565	1259	2123
15.0	8.7	20.3	45.2	76.1					
					400	39.2	606	1349	2285
20.0	11.6	23.6	52.4	78.5	500	49.0	680	1514	2467
					600	58.8	749	1757	2627
25.0	14.4	26.5	58.9	84.7					
30.0	17.3	29.2	60.3	90.2					
					800	78.4	872	1877	2756
34.6	20.0	31.5	64.5	94.6					
					1000	98.0	984	2052	2959
41.6	24.0	34.8	70.5	102					
					1200	118	1086	2281	3243
51.9	30.0	39.3	78.3	111					
57.1	33.0	41.4	82.0	116					
					1500	147	1229	2388	3374

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation to approximate the capacity if the set pressure is not listed (Ref: TPD1 of Groth product catalog).

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s) / P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table for Pressure Flow

%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

3" Model 1760A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table
2. Calculate overpressure
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 23,100 SCFH / 667 NCMH
% OP = [(7 - 4) / 4] x 100 = 75%
"C" = 0.87
Flow = 0.87 X 23,100 = 20,097 SCFH
Flow = 0.87 X 667 = 580 NCMH

Model 1720 Vacuum Relief Capacity

Table IV — Air Flow Capacity at 100% Over-Vacuum

Set Pressure [P_s]		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60°F			Set Pressure [P_s]		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) Normal Cubic Meters per Hour at 0°C		
InWC	oz/in^2	2" x 2"	3" x 3"	4" x 4"	mmWC	mbar	2" x 2"	3" x 3"	4" x 4"
0.87	0.50	4.70	10.3	16.0	22	2.16	130	290	450
1.0	0.58	5.05	11.0	17.2	25.0	2.45	149	332	563
2.0	1.16	7.12	15.6	24.2	50	4.90	200	440	680
					75	7.35	240	530	830
4.0	2.31	10.0	21.9	34.1	100	9.80	280	620	960
					125	12.3	310	690	1070
6.0	3.47	12.2	26.7	41.5	150	14.7	340	750	1170
					175	17.2	370	810	1260
8.0	4.62	14.0	30.6	47.7	200	19.6	390	860	1340
					225	22.1	420	910	1420
10.0	5.78	15.6	34.0	53.0	250	24.5	440	960	1490
					275	27.0	460	1000	1560
12.0	6.93	17.0	37.1	57.8	300	29.4	480	1040	1620
15.0	8.66	18.8	41.1	64.0	375	36.8	530	1160	1800
20.0	11.6	21.4	46.8	72.9	500	49.0	600	1320	2050
25.0	14.4	23.6	51.5	80.3	625	61.3	660	1450	2260
27.7	16.0	24.6	53.8	83.8	800	78.4	872	1877	2756
					750	73.5	720	1570	2440

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation to approximate the capacity if the set vacuum is not listed (Ref: TPD1 of Groth product catalog).

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing vacuum
P_s = Set vacuum
% OV = [(P_f - P_s) / P_s] x 100

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table for Pressure Flow

%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

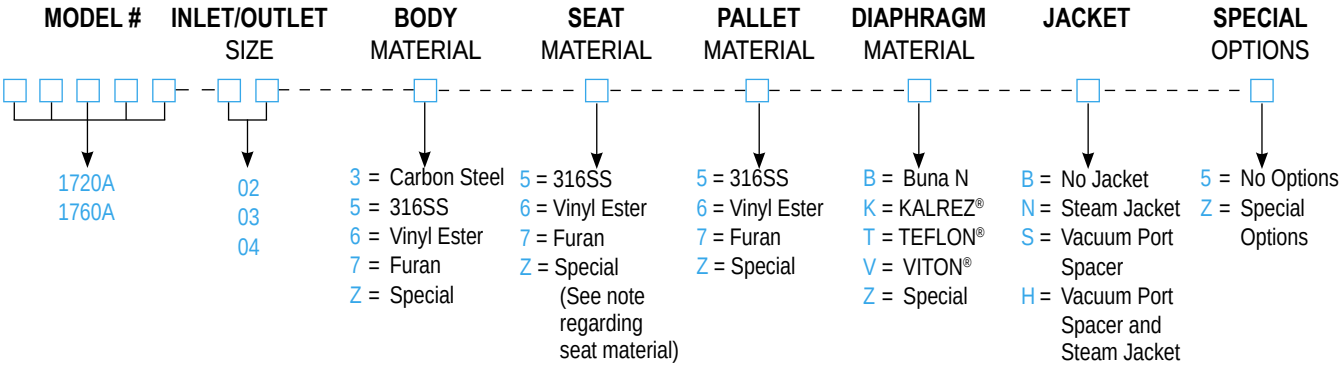
3" Model 1720A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table
2. Calculate over-vacuum
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 21,900 SCFH / 620 NCMH
% OP = [(7 - 4) / 4] x 100 = 75%
"C" = 0.87
Flow = 0.87 X 21,900 = 19,053 SCFH
Flow = 0.87 X 620 = 539 NCMH

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES
- Include model number and setting when ordering.
- For steam jacket, include steam pressure/temperature.
- For special options, consult factory.
- Stainless steel seats are standard with stainless steel and carbon steel bodies.

EXAMPLE

1 7 2 0 A — 0 3 — 3 5 5 — B 0 0

Indicates a 3" x 3" Model 1720 A with CS body, 316SS seat, 316SS pallet, Buna-N diaphragm, no steam jacket and no special options.

Models 8820A/8821B/8822B/8823A

and Flame Arrester with pipe-away feature

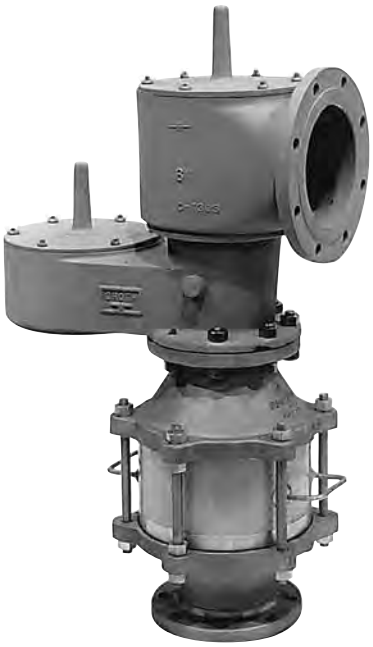
- **Sizes 2" through 12"**
- **Pressure settings O.5 oz/in² to 15 psig**
- **Vacuum settings O.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel and other materials**
- **Proven spiral wound, crimped ribbon, flame element**
- **Modular construction**

PRESSURE / VACUUM RELIEF VALVE WITH FLAME ARRESTER (PIPE-AWAY)

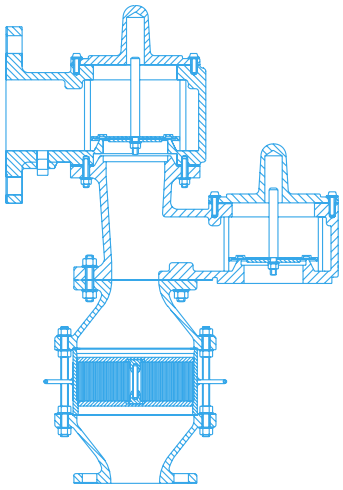
The Model 8820A combination units are used for pressure and vacuum relief where vapors must be piped away. They are designed to protect your tank from damage created by overpressure or excessive vacuum, at the same time that they provide protection from externally caused sources of heat and ignition. The result is reduced emissions level and increased fire protection and safety.

SPECIAL FEATURES

The Model 8820A Pressure/Vacuum Relief Valve with flanged pipe-away outlet offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. Self draining housings and drip rings protect seating surfaces from condensate and freezing. Buna-N, VITON® and other seating diaphragms can be provided when required.



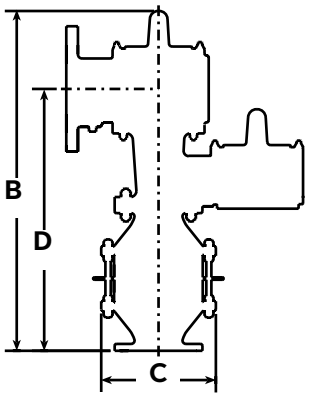
MODEL 8820A

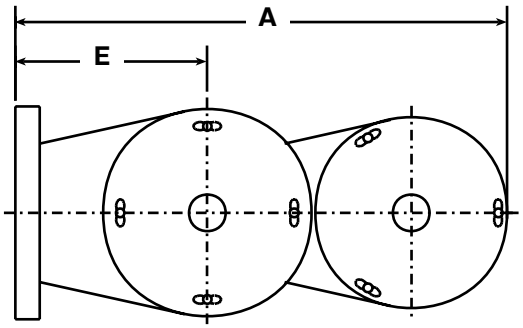


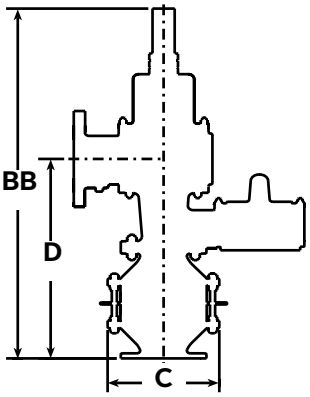
MODEL 8820A

END-OF-LINE	IN-LINE
(Flanged Outlet with or without Discharge Piping) • Gas Group: NEC D, IEC IIA • Operating Temperature <= 140°F (60°C) • Pre-Ignition Pressure = Atmosphere • Discharge Piping Length <= 10 pipe diameters	• Gas Group: IEC IIA1, Methane (includes most Biogas applications) • Operating Temperature <= 140°F (60°C) • Pre-Ignition Pressure <= 1 psig • Run-up Length <= 50 pipe diameters (2") • Run-up Length <= 20 pipe diameters (3") • Run-up Length <= 10 pipe diameters (4" – 12")

SPECIFICATIONS







Specifications subject to change without notice. Certified dimensions available upon request.

Inlet Flg◊ (Metric)	Outlet Flg◊ (Metric)	Max. Set Pressure Weight Loaded	Max. Set Vacuum. Weight Loaded	Max. Setting Spring Loaded	Min. Setting Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting for Max. W.P.†	A Length (Metric)	B Height (Metric)	BB Height (Metric)	C Width (Metric)	D (Metric)	E (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	3" (76 mm)	11 oz/in² (48.2 gm/cm²)	12 oz/in² (52.7 gm/cm²)	15 psig SPRING LOADED PRESSURE (1.05 kg/cm²) 12 psig SPRING LOADED VACUUM (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 for Vacuum Settings and MAWP		14.25" (361 mm)	26.62" (676 mm)	33.62" (854 mm)	8.75" (221 mm)	20.25" (514 mm)	5.50" (140 mm)	45 (20 kg)
3" (80 mm)	4" (102 mm)	13 oz/in² (57.0 gm/cm²)	11 oz/in² (48.3 gm/cm²)					18" (457 mm)	31.12" (790 mm)	39.37" (1000 mm)	9.50" (241 mm)	23.12" (588 mm)	6" (152 mm)	60 (27 kg)
4" (100 mm)	6" (152 mm)	16 oz/in² (70.3 gm/cm²)	11 oz/in² (48.3 gm/cm²)					19.25" (489 mm)	37" (940 mm)	47.37" (1203 mm)	11.50" (292 mm)	26.75" (679 mm)	6.50" (165 mm)	90 (41 kg)
6" (150 mm)	8" (203 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					26.50" (673 mm)	44.75" (1136 mm)	59.75" (1518 mm)	16.50" (419 mm)	31.50" (800 mm)	8.50" (216 mm)	160 (73 kg)
8" (200 mm)	10" (254 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					32.50" (826 mm)	53.50" (1358 mm)	70.25" (1784 mm)	21" (533 mm)	37.37" (949 mm)	10.75" (273 mm)	270 (123 kg)
10" (250 mm)	12" (305 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					37.25" (959 mm)	64.50" (1638 mm)	84.12" (2137 mm)	24.75" (629 mm)	45.25" (1149 mm)	12.50" (318 mm)	420 (190 kg)
12" (300 mm)	14" (356 mm)	16 oz/in² (70.3 gm/cm²)	16 oz/in² (70.3 gm/cm²)					42.75" (1086 mm)	71.62" (1819 mm)	91.37" (2321 mm)	28.62" (727 mm)	50.12" (1273 mm)	15" (381 mm)	600 (273 kg)

† W.P. = Working Pressure. ‡On spring loaded valves, change model number. ◊150# R.F. drilling compatibility F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

MODEL #:
- 8820A Weight Loaded
- 8821B Pressure Spring
- 8822B Vacuum Spring
- 8823A Pressure & Vacuum Springs

SIZE: 02" Thru 12"

MATERIAL:
- Flame Element Material
- Pallet Material
- Seat Material
- * Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316 SS
Z = Special

OPTIONS:
- O = No Options
- Z = Special Options

- O = No Jacket
- J = Steam Jacket
- S = Spacer
- H = Steam Jacket and Spacer

Diaphragm Material (Seat):
- B = Buna-N
- T = TEFLON®
- V = VITON®
- Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.
- * Stainless steel guides, stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

EXAMPLE 8 8 2 0 A — 0 2 — 1 1 5 1 — T 0 0

Indicates a 2" Model 8820A with Aluminum Body and Seat, 316 SS Pallet, Aluminum Flame Element, TEFLON® Seat Diaphragm, and no other options.

Model 8820A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	2.92	5.68	10.3	20.7	32.3	51.5	59.1
1.00	0.58	3.19	6.34	11.5	23.3	36.2	57.6	67.8
1.73	1.00	4.45	9.23	16.8	34.4	53.0	84.4	105
2.00	1.16	4.84	10.1	18.5	37.8	58.2	92.6	116
2.60	1.50	5.64	11.9	21.7	44.6	68.5	109	138
3.00	1.73	6.12	13.0	23.7	48.8	74.8	119	151
3.46	2.00	6.65	14.1	25.9	53.2	81.6	130	165
4.00	2.31	7.21	15.4	28.2	58.0	88.9	141	180
6.00	3.47	9.07	19.5	35.7	73.6	113	179	230
8.00	4.62	10.7	23.0	42.1	86.8	133	211	272
10.0	5.78	12.1	26.1	47.7	98.6	151	240	309
12.0	6.93	13.3	28.9	52.9	109	167	266	343
15.0	8.66	15.1	32.7	60.0	124	189	301	389
20.0	11.6	17.7	38.4	70.4	146	222	354	457
25.0	14.4	20.0	43.5	79.7	165	252	400	518
30.0	17.3	22.2	48.1	88.2	182	278	443	574

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10 20 30 40	Consult Factory									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8820A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 58,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 58,000 = 50,460 SCFH*

Model 8820A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22.0	0.08	0.17	0.31	0.62	0.96	1.53	1.80
50.0	0.14	0.29	0.52	1.07	1.65	2.62	3.28
75.0	0.17	0.37	0.67	1.38	2.12	3.37	4.27
100	0.20	0.44	0.80	1.64	2.52	4.01	5.11
150	0.26	0.55	1.01	2.08	3.19	5.07	6.51
200	0.30	0.65	1.19	2.46	3.76	5.98	7.70
250	0.34	0.74	1.35	2.79	4.27	6.79	8.75
300	0.38	0.82	1.50	3.10	4.73	7.52	9.70
375	0.43	0.93	1.70	3.51	5.36	8.53	11.0
500	0.50	1.09	2.00	4.12	6.29	10.0	13.0
625	0.57	1.23	2.26	4.67	7.13	11.3	14.7
750	0.63	1.36	2.50	5.17	7.89	12.5	16.3

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure

P_s = Set pressure

% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 67% overpressure at intersection of row 60 and column 7
"C" factor at 67% OP = 0.82

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10 20 30 40	Consult Factory									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.91	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8820A
150 mmWC Set Pressure [Ps]
250 mmWC Flowing Pressure [Pf]

1. Read flow capacity at set pressure from table — Flow = 2,080 NCMH
2. Calculate overpressure — % OP = [(250 - 150)/150] x 100 = 67%
3. Read "C" factor from table — "C" = 0.82
4. Calculate flow capacity — *Flow = 0.82 x 2,080 = 1,706 NCMH*

Model 8820A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	2.55	5.19	8.80	17.9	28.6	44.3	53.6
1.00	0.58	2.77	5.73	9.70	19.8	31.6	48.9	60.4
1.73	1.00	3.78	8.15	13.6	28.3	45.1	69.4	89.8
2.00	1.16	4.10	8.90	14.9	31.0	49.3	75.8	99.0
2.60	1.50	4.74	10.4	17.4	36.2	57.7	88.6	117
3.00	1.73	5.14	11.3	18.9	39.5	62.9	96.0	128
3.46	2.00	5.56	12.3	20.5	42.9	68.4	105	139
4.00	2.31	6.03	13.4	22.3	46.7	74.4	114	152
6.00	3.47	7.54	16.9	28.1	58.9	93.8	144	193
8.00	4.62	8.84	19.9	33.0	69.4	110	169	227
10.0	5.78	10.0	22.5	37.4	78.6	125	192	258
12.0	6.93	11.1	24.9	41.5	87.1	139	212	286
15.0	8.66	12.5	28.2	46.9	98.6	157	240	324
20.0	11.6	14.7	33.1	55.1	116	184	282	381
25.0	14.4	16.6	37.5	62.3	131	209	319	432
30.0	17.3	18.3	41.5	68.9	145	231	353	478

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10 20 30 40	**Consult Factory**									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.91	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8820A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 46,700 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 46,700 = 40,629 SCFH*

Model 8820A
Vacuum Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22.0	0.07	0.15	0.26	0.52	0.84	1.29	1.60
50.0	0.12	0.25	0.42	0.87	1.39	2.13	2.78
75.0	0.14	0.32	0.53	1.11	1.77	2.72	3.59
100	0.17	0.38	0.63	1.32	2.09	3.21	4.27
150	0.21	0.48	0.79	1.66	2.64	4.05	5.42
200	0.25	0.56	0.93	1.95	3.11	4.76	6.40
250	0.28	0.63	1.05	2.21	3.53	5.40	7.27
300	0.31	0.70	1.17	2.45	3.90	5.97	8.06
375	0.35	0.80	1.32	2.78	4.42	6.77	9.10
500	0.41	0.93	1.55	3.26	5.19	7.94	10.7
625	0.47	1.06	1.76	3.69	5.87	8.98	12.2
750	0.52	1.17	1.94	4.08	6.50	9.90	13.5

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

Consult Factory for flow capacity with fiberglass valve.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 67% Over-vacuum at intersection of row 60 and column 7
"C" factor at 67% OP = 0.82

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10 20 30 40	**Consult Factory**									
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.91	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 8820A
150 mmWC Set Vacuum [P_s]
250 mmWC Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 1,660 NCMH
2. Calculate over-vacuum — % OV = [(250 - 150)/150] x 100 = 67%
3. Read "C" factor from table — "C" = 0.82
4. Calculate flow capacity — *Flow = 0.82 x 1,660 = 1,361 NCMH*

Fiberglass
Relief Valves

- **Groth provides fiberglass products for corrosive service**
- **Available in Series 1200A, 1300A, 2000A and others**

FIBERGLASS SERIES 1200A, 1300A, 2000A AND OTHERS

Fiberglass valves are used the same as their counterparts manufactured in metal, primarily on aboveground storage tank installations. Fiberglass construction can be used where highly corrosive and toxic liquids are being stored. The fiberglass series design will protect the tank from damage created by overpressuring or excessive vacuum. Costly product evaporation losses due to normal tank "breathing" are greatly reduced. Retention of product vapors reduces the possibility of atmospheric contamination.

SPECIAL FEATURES

Fiberglass valves offer Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. These valves have a self draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids pressure or vacuum buildup due to binding or clogging of the valves. These fiberglass valves may be spring loaded when required for use on blanketed tank or other type installations requiring higher settings. To insure the proper alignment of seating surfaces there is peripheral guiding and a center stabilizing stem.

MODEL 2050

MODEL 1220A

CORROSION RESISTANCE

FIBERGLASS WITH VINYL ESTER RESIN #411

RESISTANT

ACIDS
Acetic
Acrylic
Boric
Chromic (20%)
Formic
Hydrochloric
Hydrofluoric *
Nitric (<40%)
Perchloric
Phosphoric
Sulfuric (75%)

SALTS:
Alum
Ammonium Chloride
Calcium Chloride
Ferric Chloride
Magnesium Sulfate
Sodium Chloride
Sodium Chromate

BLEACHING AGENTS:
Calcium Chlorate
Calcium Hypochlorite
Chlorine Dioxide
Chlorine Water
Hydrogen Peroxide
Potassium Permanganate
Sodium Chlorate
Sodium Hypochlorite

BASES:
Potassium Hydroxide
Sodium Hydroxide *
Ammonium Hydroxide *
Ammonium Carbonate
Potassium Carbonate *
Sodium Carbonate *

WATER:
Demineralized
Distilled

OTHERS:
Alcohols
Alum Chlorohydroxide
Glycerin
Sulfonated Detergents
Urea-Ammonium Nitrate
Fertilizers

NON RESISTANT

Solvents
Oleum
Phenol
Bromine
Furfural

* Synthetic Veil should be used in inner layer.

FIBERGLASS WITH FURAN RESIN

RESISTANT

ACIDS:
Acetic
Acrylic
Chlorophenol
Hydrochloric
Nitric (5%)
Phosphoric
Sulfonic
Sulfuric (25%, 50%)

BASES:
Aniline
Diethylamine
Potassium Carbonate
Sodium Carbonate
Sodium Hydroxide (5%, 50%)

SALTS:
Alum
Ammonium Bromide
Calcium Chloride
Ferric Chloride
Magnesium Sulfate
Sodium Chromate

WATER:
Demineralized
Distilled

SOLVENTS:
Acetone
Benzene
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Ethanol
Ethyl Acetate
Ethylene Dichloride
Methanol
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Perchloroethylene
Toluene
Trichloroethylene
Xylene

OTHERS:
Acrylonitrile
Benzyl Chloride
Cyclohexanone
Formalin
Pulp Mill Liquors
Styrene
Toluene Diisocyanate

NON RESISTANT

Bleaching Agents
Free Halogens
Peroxides

- Dimensional drawings on request.
- Chemical resistance information provided by Dow Chemical (Vinyl Ester Resin) and Qua Corr (Furan).
- End user to make final determination on suitability of chemical resistance
- Consult a chemical resistance guide or handbook for additional material compatibility information.
- For Flow Data see corresponding model literature.

Steam Jacketed Valves

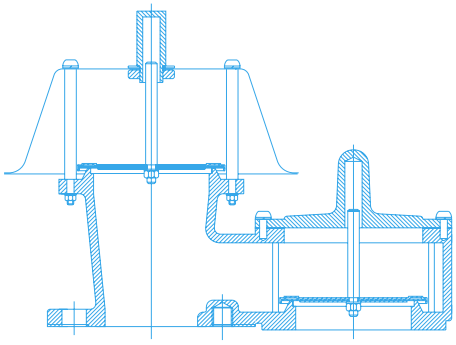
- **Prevents freezing and product buildup**
- **Designed for easy maintenance**

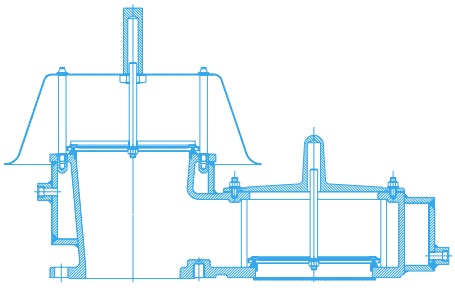
STEAM JACKETED VALVES

Steam Jacketed Valves are designed for use on tanks containing liquids whose vapors may crystallize at normal temperature. They afford protection against valve clogging. Uniform heating of the housing and valves assures the valve will remain in operating condition. Available on model numbers 1200A, 1220A, 1260A, 1300A, 1360A, 2000A, 2300A and 2400A.

SPECIAL FEATURES

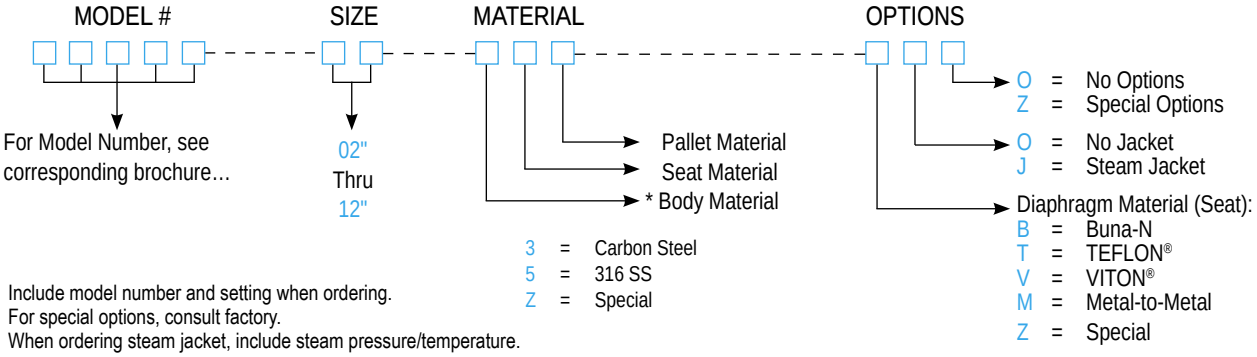
Steam Jacketed Valves are built of corrosion resistant materials throughout. Valve covers can be easily removed for convenient inspection and maintenance. Steam heated valves are suitable for steam circulation up to 100 psig saturated.





HOW TO ORDER

For easy ordering, select proper model numbers



NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.

* Stainless steel guides and stems are standard with carbon steel bodies.

EXAMPLE

1 2 0 0 A — 0 2 — 5 15 5 — T J 0

Indicates a 2" Model 1200A with 316 SS Body, Seat and Pallet, TEFLON® Seat Diaphragm, Steam Jacketed and no other options.

Models 7618/7628

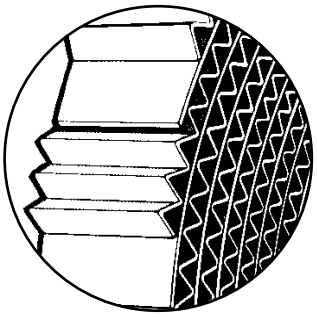
- **Flange sizes 2" through 12"**
- **Available in carbon steel, stainless steel, aluminum (type 356) and other materials**
- **Designed for quick and easy maintenance**
- **Unique recessed seating for superior protection**
- **Proven spiral wound, crimped ribbon, flame element**
- **Tapped drain and instrumentation ports available**

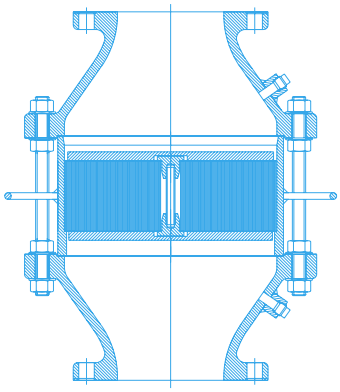
MODEL 7618 (vertical)

MODEL 7628 (horizontal)

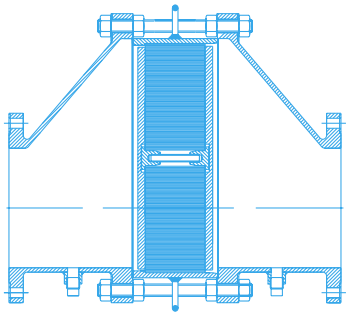
DEFLAGRATION FLAME ARRESTERS

Both models are designed to inhibit flame propagation in gas piping systems and to protect low pressure tanks containing flammable liquids. Arresters protect low flash point liquids from external sources of ignition. This provides increased fire protection and safety.





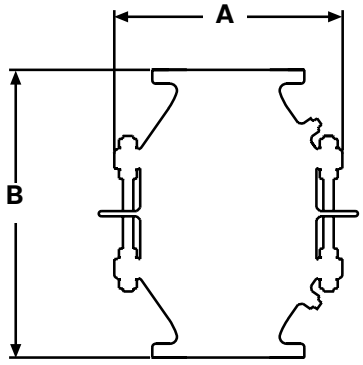
MODEL 7618

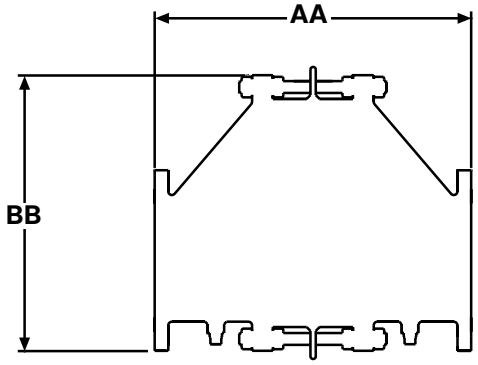


MODEL 7628

END-OF-LINE (7618 ONLY) *(Weather Hood Outlet)* • Gas Group: NEC D, IEC IIA • Operating Temperature <= 140°F (60°C) • Pre-Ignition Pressure = Atmosphere	END-OF-LINE (7618 & 7628) *(Flanged Outlet with or without Discharge Piping)* • Gas Group: NEC D, IEC IIA • Operating Temperature <= 140°F (60°C) • Pre-Ignition Pressure = Atmosphere • Discharge Piping Length <= 10 pipe diameters	IN-LINE (7618 & 7628) • Gas Group: IEC IIA1, Methane (includes most Biogas applications) • Operating Temperature <= 140°F (60°C) • Pre-Ignition Pressure <= 1 psig • Run-up Length <= 50 pipe diameters (2") • Run-up Length <= 20 pipe diameters (3") • Run-up Length <= 10 pipe diameters (4" – 12")

SPECIFICATIONS





Specifications subject to change without notice. Certified dimensions available upon request.

Size* (Metric)	A Width (Metric)	B Height (Metric)	AA Length (Metric)	BB Height (Metric)	MAWP 7618◊ Aluminum (Metric)	MAWP 7618◊ Carbon or SS (Metric)	MAWP 7628◊ Aluminum (Metric)	MAWP 7628◊ Carbon or SS (Metric)	Approx Ship. Wt. Lbs. (Aluminum)
2" (50 mm)	8.75" (221 mm)	14" (356 mm)	13.75" (349 mm)	9.50" (241 mm)	50 psig (345 kPa)	100 psig (690 kPa)	150 psig (1035 kPa)	350 psig (2415 kPa)	18 (8 kg)
3" (80 mm)	9.50" (241 mm)	16" (406 mm)	15.75" (400 mm)	11" (279 mm)	50 psig (345 kPa)	100 psig (690 kPa)	140 psig (966 kPa)	325 psig (2242 kPa)	25 (11 kg)
4" (100 mm)	11.50" (292 mm)	18.25" (464 mm)	18" (457 mm)	12.50" (318 mm)	50 psig (345 kPa)	100 psig (690 kPa)	140 psig (966 kPa)	325 psig (2242 kPa)	40 (18 kg)
6" (150 mm)	16.50" (419 mm)	21" (533 mm)	21" (533 mm)	16.50" (419 mm)	50 psig (345 kPa)	100 psig (690 kPa)	140 psig (966 kPa)	325 psig (2242 kPa)	70 (32 kg)
8" (200 mm)	21" (533 mm)	25" (635 mm)	25" (635 mm)	20.50" (521 mm)	50 psig (345 kPa)	100 psig (690 kPa)	90 psig (621 kPa)	200 psig (1380 kPa)	135 (61 kg)
10" (250 mm)	24.75" (629 mm)	30" (762 mm)	30" (762 mm)	24.50" (622 mm)	50 psig (345 kPa)	100 psig (690 kPa)	75 psig (517 kPa)	150 psig (1035 kPa)	235 (107 kg)
12" (300 mm)	28.62" (727 mm)	32.50" (826 mm)	32.50" (826 mm)	28.50" (724 mm)	50 psig (345 kPa)	100 psig (690 kPa)	75 psig (517 kPa)	150 psig (1035 kPa)	345 (156 kg)

* Larger sizes available on special application. †150# ANSI drilling compatibility, F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. ◊Pneumatic tested to 15 psig as standard.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

- MODEL #: 7618 Vertical; 7628 Horizontal
- SIZE: 02" Thru 60"
- MATERIAL: Flame element winding; Body Material
  - 1 = Aluminum
  - 3 = Carbon Steel
  - 5 = 316 SS
  - Z = Special
- OPTIONS:
  - O = No Options; Z = Special Options
  - O = No Jacket; X = ATEX Port
  - F = Flanged outlet (in-line design); W = Weatherhood (replaces flanged outlet)

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.

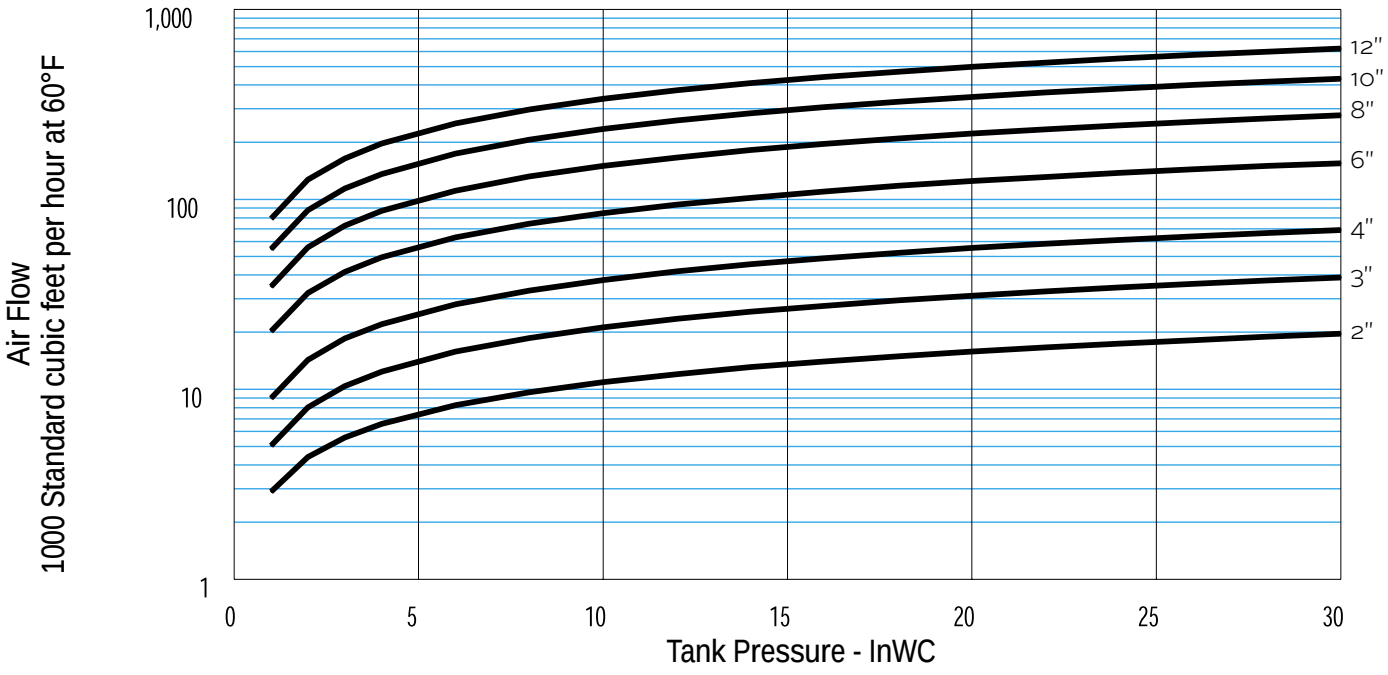
EXAMPLE 8 8 2 0 A — 0 2 — 1 1 5 1 — T 0 0

Indicates a 2" Model 8820A with Aluminum Body and Seat, 316SS Pallet, Aluminum Flame Element, TEFLON® Seat Diaphragm and no other options.

Model 7618
Flow Capacity
End of Line

Tank Pressure		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.6	2.89	5.05	8.98	20.2	34.7	54.7	79.1
2	1.2	4.40	8.03	14.3	32.1	55.9	87.8	127
3	1.7	5.58	10.4	18.5	41.5	72.7	114	164
4	2.3	6.57	12.4	22.0	49.5	87.0	136	197
6	3.5	8.25	15.8	28.0	63.1	111	174	251
8	4.6	9.66	18.6	33.1	74.5	132	206	297
10	5.8	10.9	21.2	37.6	84.7	150	235	338
12	6.9	12.0	23.5	41.7	93.8	166	260	375
14	8.1	13.1	25.6	45.5	102	182	284	409
16	9.2	14.0	27.5	49.0	110	196	306	441
18	10.4	14.9	29.4	52.2	118	209	327	470
20	11.6	15.8	31.1	55.4	125	222	346	499
22	12.7	16.6	32.8	58.3	131	234	365	525
24	13.9	17.4	34.4	61.1	138	245	383	551
26	15.0	18.1	35.9	63.9	144	256	400	576
28	16.2	18.9	37.4	66.5	150	267	416	599
30	17.3	19.6	38.8	69.0	155	277	432	622

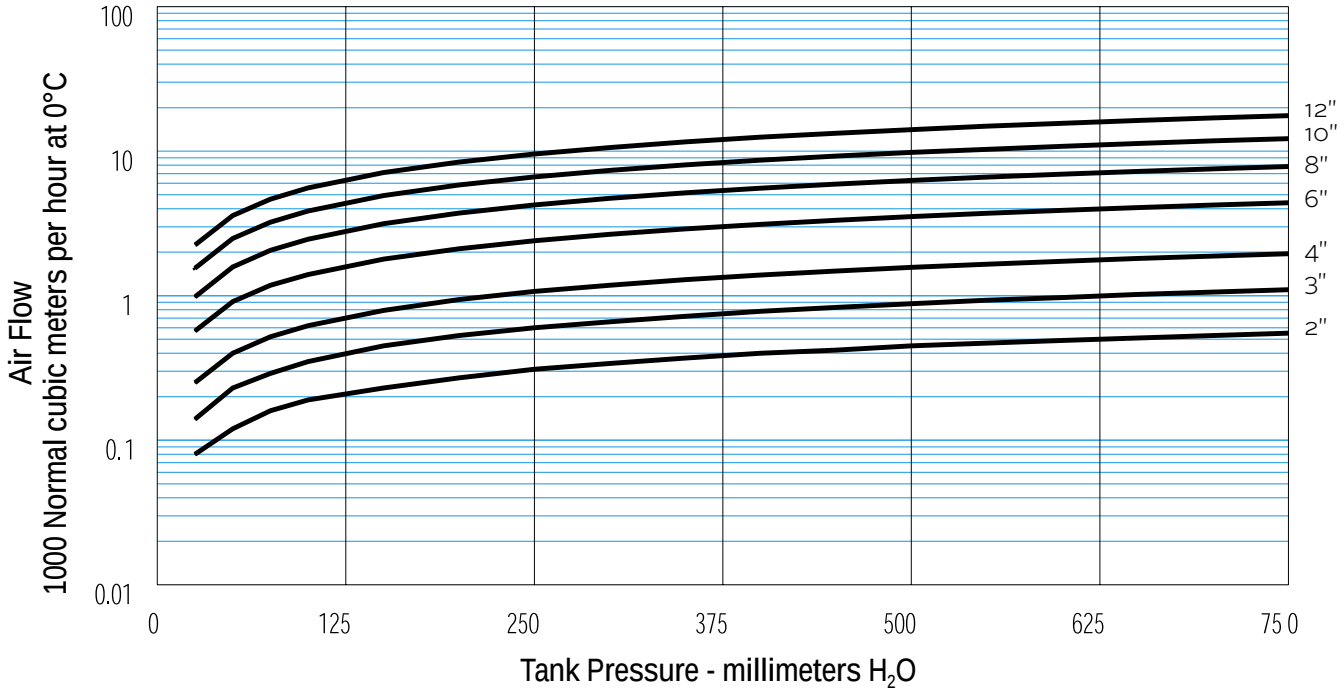
1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.
4. Flow data are for tank mounting or end of line and includes flame arrester entrance loss, exit loss, and internal losses.



Model 7618
Flow Capacity
End of Line

Tank Pressure		Air Flow - 1000 Standard Cubic Meters per Hour at 60°F						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.45	0.08	0.14	0.25	0.57	0.98	1.55	2.24
50	4.90	0.12	0.23	0.40	0.91	1.58	2.49	3.59
75	7.35	0.16	0.29	0.52	1.18	2.06	3.23	4.66
100	9.80	0.19	0.35	0.62	1.40	2.46	3.86	5.57
150	14.7	0.23	0.45	0.79	1.79	3.15	4.93	7.11
200	19.6	0.27	0.53	0.94	2.11	3.73	5.84	8.42
250	24.5	0.31	0.60	1.07	2.40	4.25	6.64	9.57
300	29.4	0.34	0.66	1.18	2.66	4.72	7.37	10.6
350	34.3	0.37	0.72	1.29	2.90	5.15	8.04	11.6
400	39.2	0.40	0.78	1.39	3.12	5.55	8.67	12.5
450	44.1	0.42	0.83	1.48	3.33	5.92	9.25	13.3
500	49.0	0.45	0.88	1.57	3.53	6.28	9.81	14.1
550	53.9	0.47	0.93	1.65	3.72	6.62	10.3	14.9
600	59	0.49	0.97	1.73	3.90	6.94	10.8	15.6
650	64	0.51	1.02	1.81	4.07	7.25	11.3	16.3
700	69	0.53	1.06	1.88	4.24	7.55	11.8	17.0
750	74	0.55	1.10	1.95	4.40	7.84	12.2	17.6

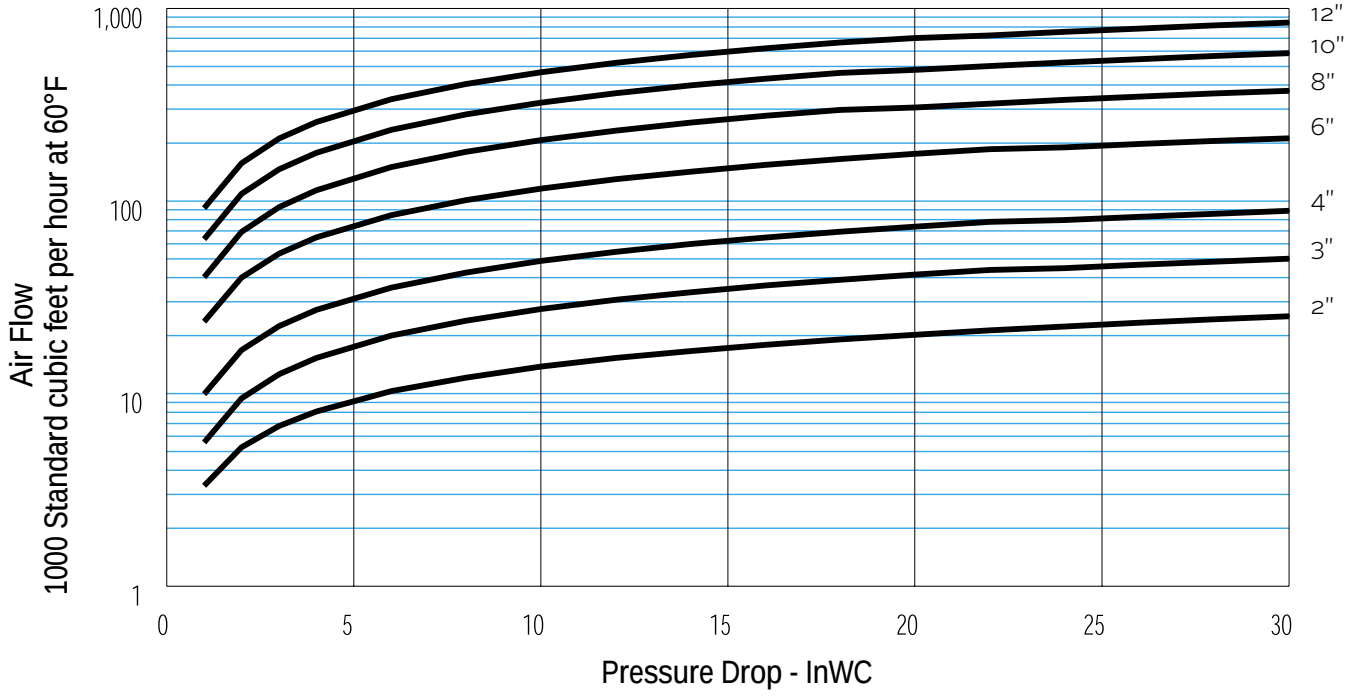
1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.
4. Flow data are for tank mounting or end of line and includes flame arrester entrance loss, exit loss and internal losses.



Model 7628
Flow Capacity
In-Line

Pressure Drop		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.6	3.32	5.58	9.92	23.6	40.2	63.4	91.8
2	1.2	5.27	9.44	16.8	40.0	69.1	109	157
3	1.7	6.79	12.6	22.4	53.3	93.0	146	211
4	2.3	8.08	15.3	27.2	64.8	113.8	178	257
6	3.5	10.3	20.0	35.5	84.5	150	234	337
8	4.6	12.1	23.9	42.5	101	180	282	405
10	5.8	13.8	27.5	48.8	116	207	324	466
12	6.9	15.3	30.7	54.5	130	232	363	522
14	8.1	16.6	33.6	59.8	142	255	398	573
16	9.2	17.9	36.4	64.7	154	277	431	620
18	10.4	19.1	39.0	69.3	165	297	463	665
20	11.6	20.2	41.5	73.7	176	306	480	701
22	12.7	21.3	43.8	77.9	186	320	502	723
24	13.9	22.3	44.8	79.7	190	335	524	756
26	15.0	23.3	46.6	82.9	198	348	545	786
28	16.2	24.3	48.4	86.0	205	362	566	816
30	17.3	25.2	50.1	89.1	212	374	586	845

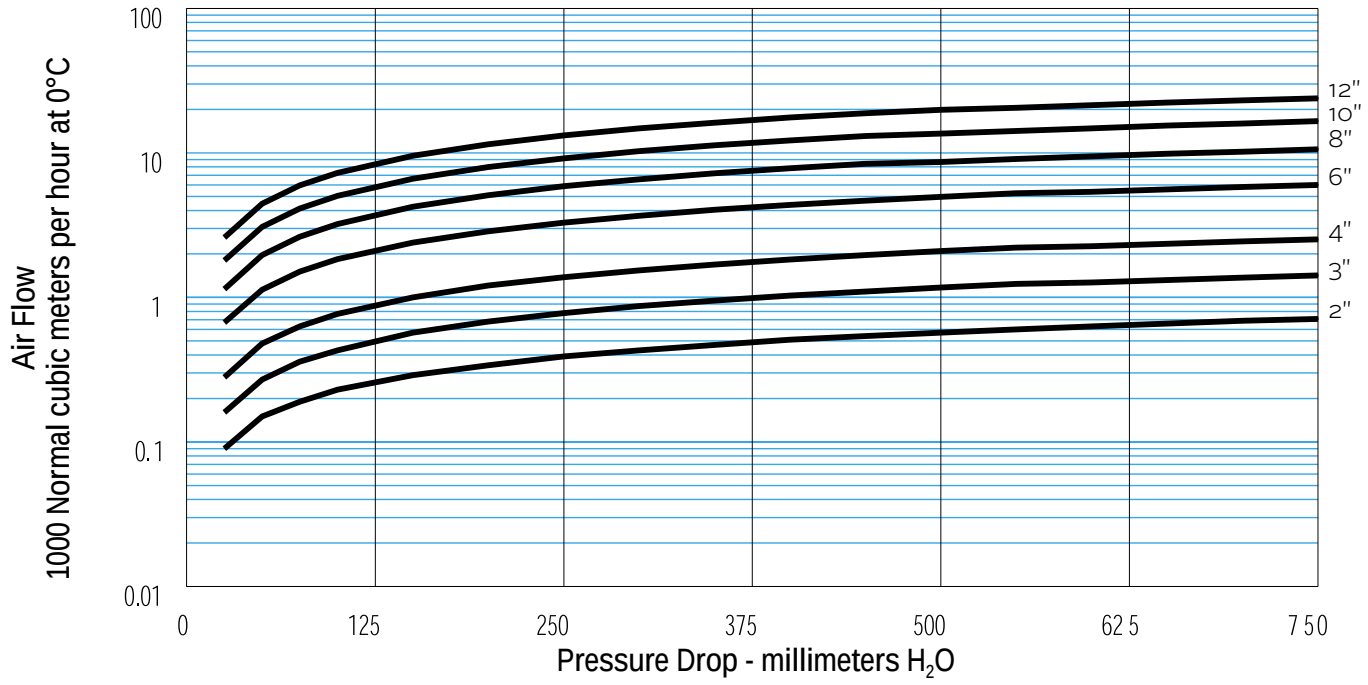
1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.
4. Flow data are for in-line mounting and does not include entrance losses or exit losses.



Model 7628
Flow Capacity
In-Line

Pressure Drop		Air Flow - 1000 Normal Cubic Meters per Hour at 0°C						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.45	0.09	0.16	0.28	0.67	1.14	1.80	2.60
50	4.90	0.15	0.27	0.48	1.13	1.96	3.08	4.45
75	7.35	0.19	0.36	0.63	1.51	2.63	4.13	5.97
100	9.80	0.23	0.43	0.77	1.84	3.22	5.05	7.29
150	14.7	0.29	0.57	1.00	2.39	4.24	6.63	9.55
200	19.6	0.34	0.68	1.21	2.87	5.10	7.98	11.5
250	24.5	0.39	0.78	1.38	3.29	5.88	9.18	13.2
300	29.4	0.43	0.87	1.54	3.68	6.58	10.3	14.8
350	34.3	0.47	0.95	1.69	4.04	7.23	11.3	16.2
400	39.2	0.51	1.03	1.83	4.37	7.84	12.2	17.6
450	44.1	0.54	1.10	1.96	4.68	8.41	13.1	18.8
500	49.0	0.57	1.17	2.09	4.97	8.66	13.6	19.9
550	53.9	0.60	1.24	2.21	5.26	9.08	14.2	20.5
600	59	0.63	1.27	2.26	5.38	9.48	14.8	21.4
650	64	0.66	1.32	2.35	5.60	9.87	15.5	22.3
700	69	0.69	1.37	2.44	5.81	10.2	16.0	23.1
750	74	0.71	1.42	2.52	6.01	10.6	16.6	23.9

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.
4. Flow data are for in-line mounting and does not include entrance losses or exit losses.



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Model 7588 // IEC IIA1
In-Line Vertical Deflagration Arrester

TECHNICAL DETAILS

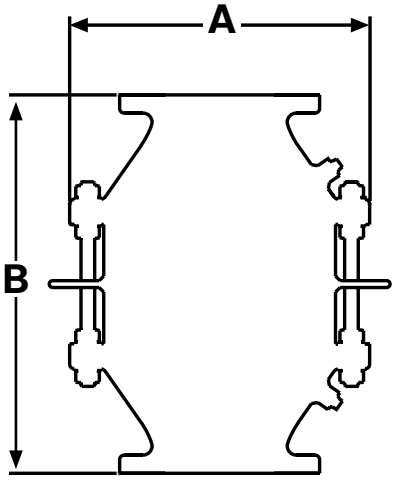
- Sizes 2" through 12"
- Housing standard material: carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356/6061)
- Flame element standard material: 316L stainless steel
- Other materials available upon request
- Good for IEC gas group IIA1 (MESG ≥ 1.14 mm)
- Certified to ATEX Directive 94/9/EC in compliance with EN ISO 16852:2010 Certificate #: **IBExU12ATEX2018 X**

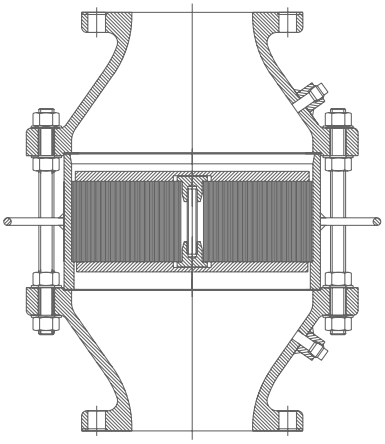
INDUSTRIES

- Oil & Gas
- Chemical
- Liquid Storage
- Food & Beverage
- Wastewater

FEATURES & BENEFITS

- Flame arrester element geometry maximizes flame quenching capability while minimizing pressure drop
- Proven spiral-wound, crimped ribbon, flame element provides reliable flame protection
- Modular design allows easy and cost-effective flame bank maintenance
- Drains and instrument ports available upon request
- Thermocouple is required for ATEX
- Exterior painting or coating available
- DIN or ASME/ANSI drilling available



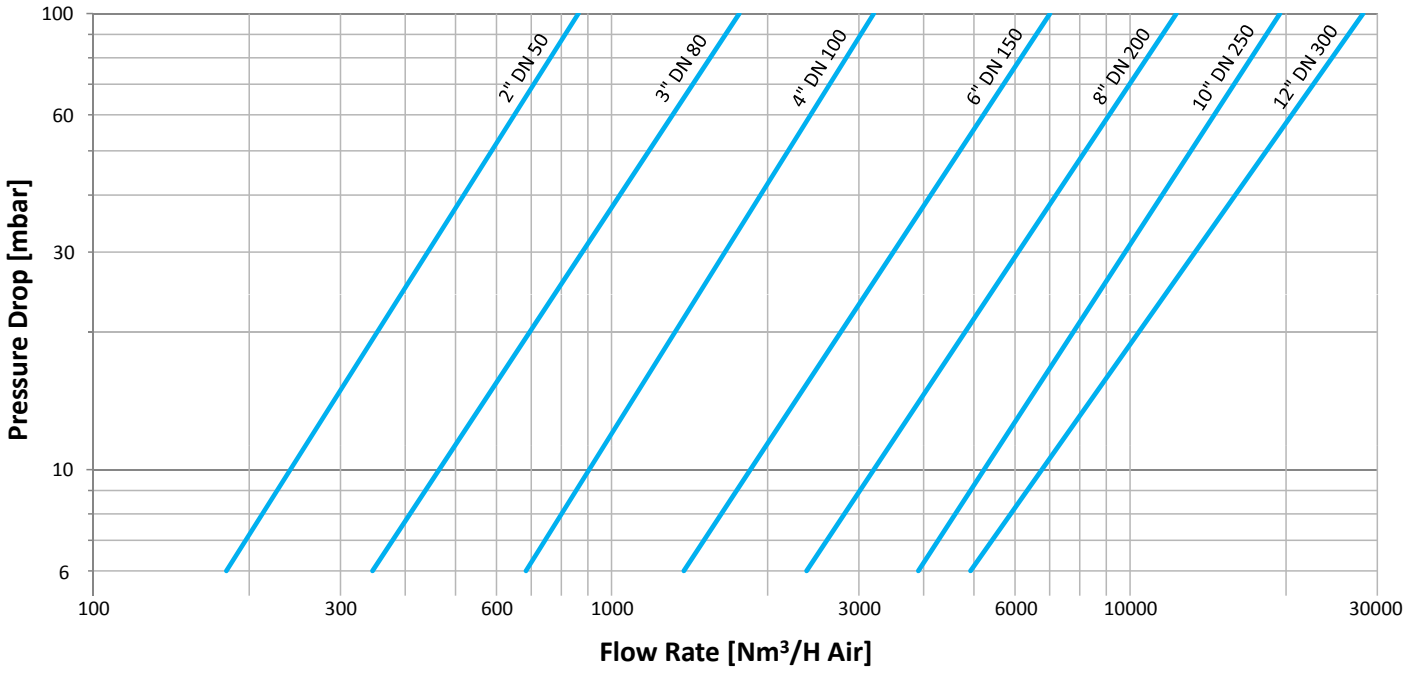


Model 7588 *(In-Line//Vertical)* SPECIFICATIONS

Nominal Size	A Width	B Height	* Maximum Operational Pressure	* Maximum Run Up (L/D)	* Gas Group	Approx. Ship. Wt. (Aluminum Body)	Approx. Ship. Wt. (Carbon or SS Body)	Operational Temperature Range	* Burn Time t_{BT}
	in (mm)	in (mm)	psia (bara)			Lbs (kg)	Lbs (kg)	°F (°C)	minutes
2" DN 50	8-3/4" (222)	14" (356)	15.7 (1.08)	50	IIA1	18 (8)	40 (18)	-4 to 140 (-20 to 60)	5
3" DN 80	9-1/2" (241)	16" (406)	15.7 (1.08)	20	IIA1	27 (12)	60 (27)	-4 to 140 (-20 to 60)	5
4" DN 100	11-1/2" (292)	18-1/4" (464)	15.7 (1.08)	10	IIA1	42 (19)	91 (41)	-4 to 140 (-20 to 60)	5
6" DN 150	16-1/2" (419)	21" (533)	15.7 (1.08)	10	IIA1	92 (42)	184 (83)	-4 to 140 (-20 to 60)	5
8" DN 200	21" (533)	25" (635)	15.7 (1.08)	10	IIA1	146 (66)	309 (140)	-4 to 140 (-20 to 60)	5
10" DN 250	24-3/4" (629)	30" (762)	15.7 (1.08)	10	IIA1	237 (108)	498 (226)	-4 to 140 (-20 to 60)	5
12" DN 300	28-5/8" (727)	32-1/2" (826)	15.7 (1.08)	10	IIA1	306 (139)	694 (314)	-4 to 140 (-20 to 60)	5

** Testing parameters based on ISO 16852*

Model 7588 FLOW CAPACITY



Model 7598 // IEC IIA1
In-Line Horizontal Deflagration Arrester

TECHNICAL DETAILS

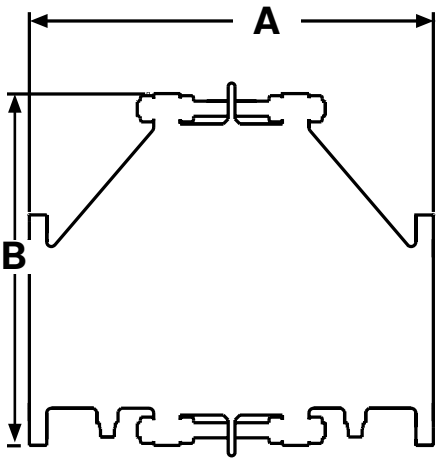
- Sizes 2" through 12"
- Housing standard material: carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356/6061)
- Flame element standard material: 316L stainless steel
- Other materials available upon request
- Good for IEC gas group IIA1 (MESG ≥ 1.14 mm)
- Certified to ATEX Directive 94/9/EC in compliance with EN ISO 16852:2010 Certificate #: **IBExU12ATEX2017 X**

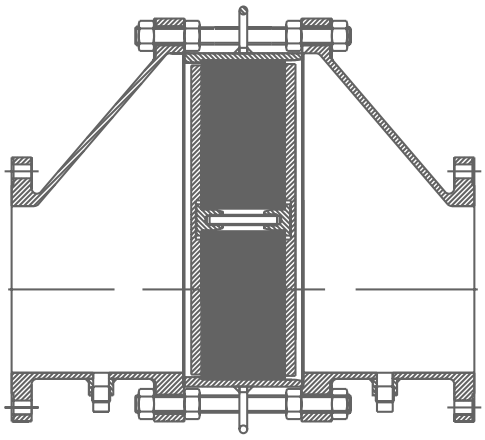
INDUSTRIES

- Oil & Gas
- Chemical
- Liquid Storage
- Food & Beverage
- Wastewater

FEATURES & BENEFITS

- Flame arrester element geometry maximizes flame quenching capability while minimizing pressure drop
- Proven spiral-wound, crimped ribbon, flame element provides reliable flame protection
- Modular design allows easy and cost-effective flame bank maintenance
- Drains and instrument ports available upon request
- Thermocouple is required for ATEX
- Exterior painting or coating available
- DIN or ASME/ANSI drilling available
- Eccentric design allows for horizontal installation by preventing liquid accumulation



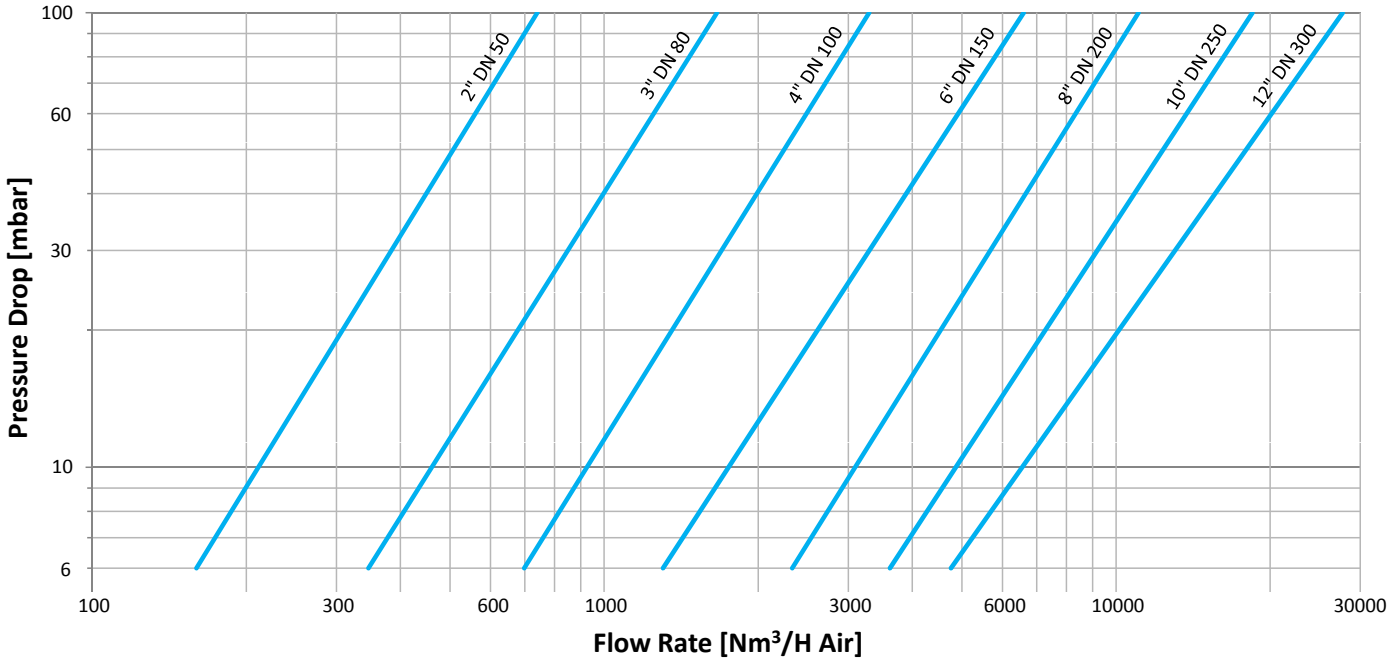


Model 7598 *(In-Line//Horizontal)* SPECIFICATIONS

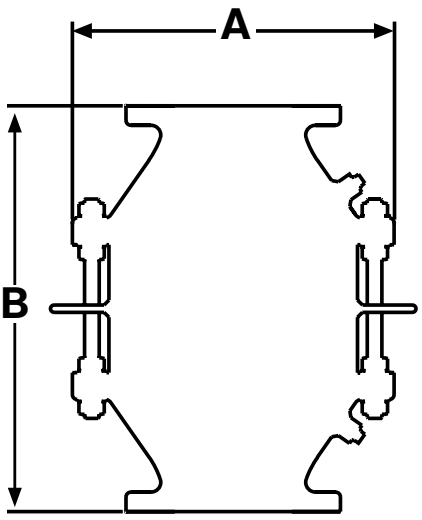
Nominal Size	A Width	B Height	* Maximum Operational Pressure	* Maximum Run Up (L/D)	* Gas Group	Approx. Ship. Wt. (Aluminum Body)	Approx. Ship. Wt. (Carbon or SS Body)	Operational Temperature Range	* Burn Time t_{BT}
	in (mm)	in (mm)	psia (bara)			Lbs (kg)	Lbs (kg)	°F (°C)	minutes
2" DN 50	13-3/4" (349)	9-1/2" (241)	15.7 (1.08)	50	IIA1	31 (14)	69 (31)	-4 to 140 (-20 to 60)	5
3" DN 80	15-3/4" (400)	11" (279)	15.7 (1.08)	20	IIA1	40 (18)	85 (38)	-4 to 140 (-20 to 60)	5
4" DN 100	18" (457)	12-1/2" (318)	15.7 (1.08)	10	IIA1	53 (24)	112 (51)	-4 to 140 (-20 to 60)	5
6" DN 150	21" (533)	16-1/2" (419)	15.7 (1.08)	10	IIA1	111 (50)	216 (98)	-4 to 140 (-20 to 60)	5
8" DN 200	25" (635)	20-1/2" (521)	15.7 (1.08)	10	IIA1	213 (97)	413 (187)	-4 to 140 (-20 to 60)	5
10" DN 250	30 (762)	24-1/2" (622)	15.7 (1.08)	10	IIA1	306 (139)	622 (282)	-4 to 140 (-20 to 60)	5
12" DN 300	32-1/2" (826)	28-1/2" (724)	15.7 (1.08)	10	IIA1	378 (171)	693 (314)	-4 to 140 (-20 to 60)	5

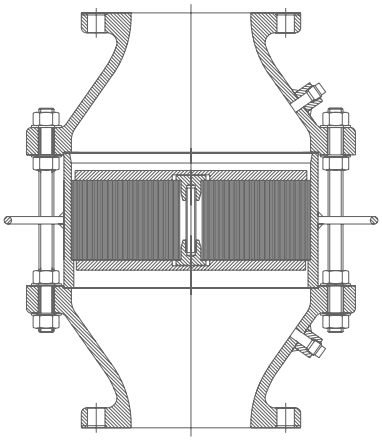
** Testing parameters based on ISO 16852*

Model 7598 FLOW CAPACITY



Model 7688 // IEC IIA
In-Line Vertical Deflagration Arrester





TECHNICAL DETAILS
- Sizes 2" through 12"
- Housing standard material: carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356/6061)
- Flame element standard material: 316L stainless steel
- Other materials available upon request
- Good for IEC gas group IIA (MESG > 0.90 mm)
- Certified to ATEX Directive 94/9/EC in compliance with EN ISO 16852:2010 Certificate #: **IBExU12ATEX2016 X**

INDUSTRIES
- Oil & Gas
- Chemical
- Liquid Storage
- Food & Beverage
- Wastewater

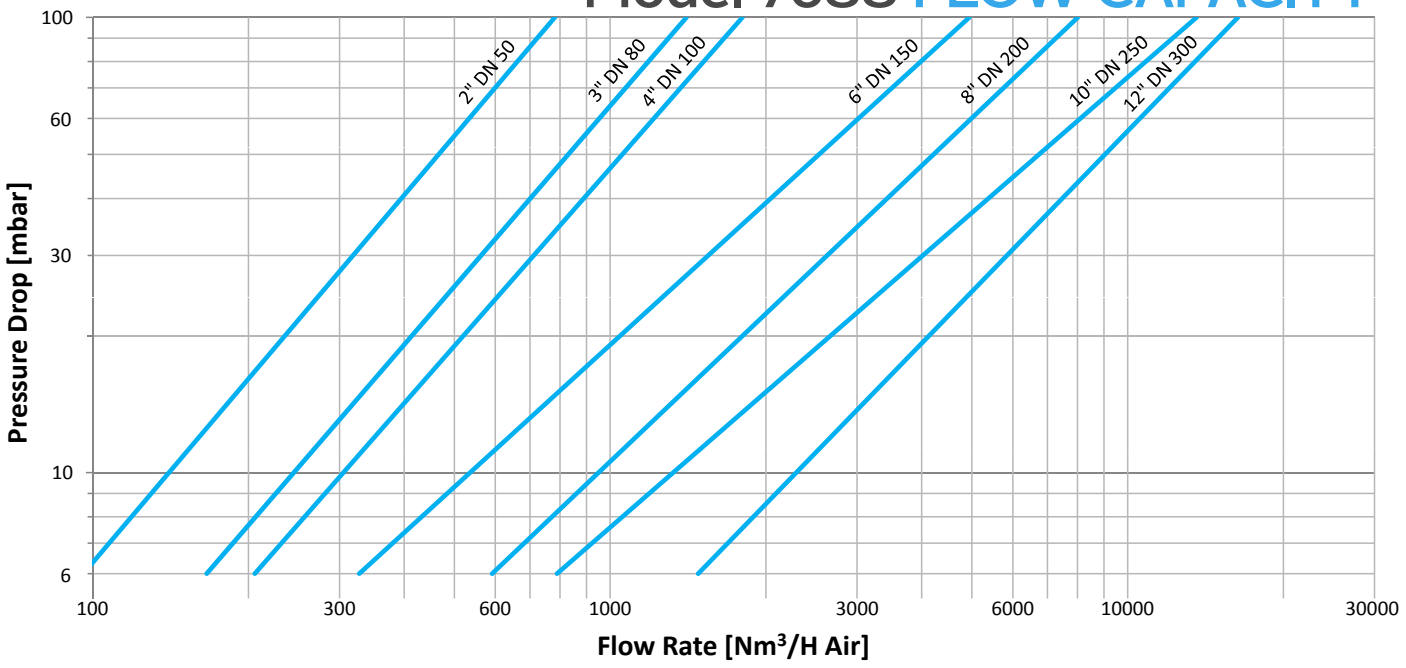
FEATURES & BENEFITS
- Flame arrester element geometry maximizes flame quenching capability while minimizing pressure drop
- Proven spiral-wound, crimped ribbon, flame element provides reliable flame protection
- Modular design allows easy and cost-effective flame bank maintenance
- Drains and instrument ports available upon request
- Thermocouple is required for ATEX
- Exterior painting or coating available
- DIN or ASME/ANSI drilling available

Model 7688 *(In-Line//Vertical)* SPECIFICATIONS

Nominal Size	A Width	B Height	* Maximum Operational Pressure	* Maximum Run Up (L/D)	* Gas Group	Approx. Ship. Wt. (Aluminum Body)	Approx. Ship. Wt. (Carbon or SS Body)	Operational Temperature Range	* Burn Time t_{BT}
	in (mm)	in (mm)	psia (bara)			Lbs (kg)	Lbs (kg)	°F (°C)	minutes
2" DN 50	8-3/4" (222)	14" (356)	23.2 (1.60)	50	IIA	19 (9)	41 (18)	-4 to 140 (-20 to 60)	10
3" DN 80	9-1/2" (241)	16" (406)	23.2 (1.60)	50	IIA	28 (13)	61 (28)	-4 to 140 (-20 to 60)	10
4" DN 100	11-1/2" (292)	18-1/4" (464)	17.4 (1.20)	50	IIA	44 (20)	93 (42)	-4 to 140 (-20 to 60)	10
6" DN 150	16-1/2" (419)	21" (533)	17.4 (1.20)	50	IIA	98 (44)	189 (86)	-4 to 140 (-20 to 60)	10
8" DN 200	21" (533)	25" (635)	17.4 (1.20)	50	IIA	155 (70)	317 (144)	-4 to 140 (-20 to 60)	2
10" DN 250	24-3/4" (629)	30" (762)	17.4 (1.20)	50	IIA	250 (113)	512 (232)	-4 to 140 (-20 to 60)	2
12" DN 300	28-5/8" (727)	32-1/2" (826)	17.4 (1.20)	50	IIA	324 (147)	712 (323)	-4 to 140 (-20 to 60)	2

** Testing parameters based on ISO 16852*

Model 7688 FLOW CAPACITY



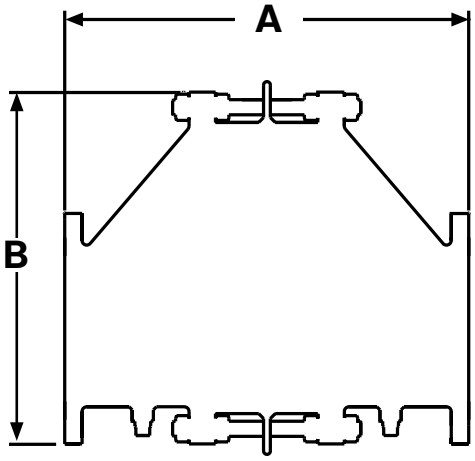
Model 7698 // IEC IIA
In-Line Horizontal Deflagration Arrester

TECHNICAL DETAILS

- Sizes 2" through 12"
- Housing standard material: carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356/6061)
- Flame element standard material: 316L stainless steel
- Other materials available upon request
- Good for IEC gas group IIA (MESG > 0.90 mm)
- Certified to ATEX Directive 94/9/EC in compliance with EN ISO 16852:2010 Certificate #: **IBExU12ATEX2015 X**

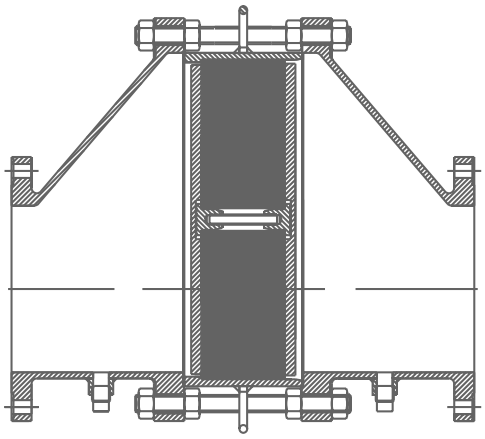
INDUSTRIES

- Oil & Gas
- Chemical
- Liquid Storage
- Food & Beverage
- Wastewater



FEATURES & BENEFITS

- Flame arrester element geometry maximizes flame quenching capability while minimizing pressure drop
- Proven spiral-wound, crimped ribbon, flame element provides reliable flame protection
- Modular design allows easy and cost-effective flame bank maintenance
- Drains and instrument ports available upon request
- Thermocouple is required for ATEX
- Exterior painting or coating available
- DIN or ASME/ANSI drilling available
- Eccentric design allows for horizontal installation by preventing liquid accumulation

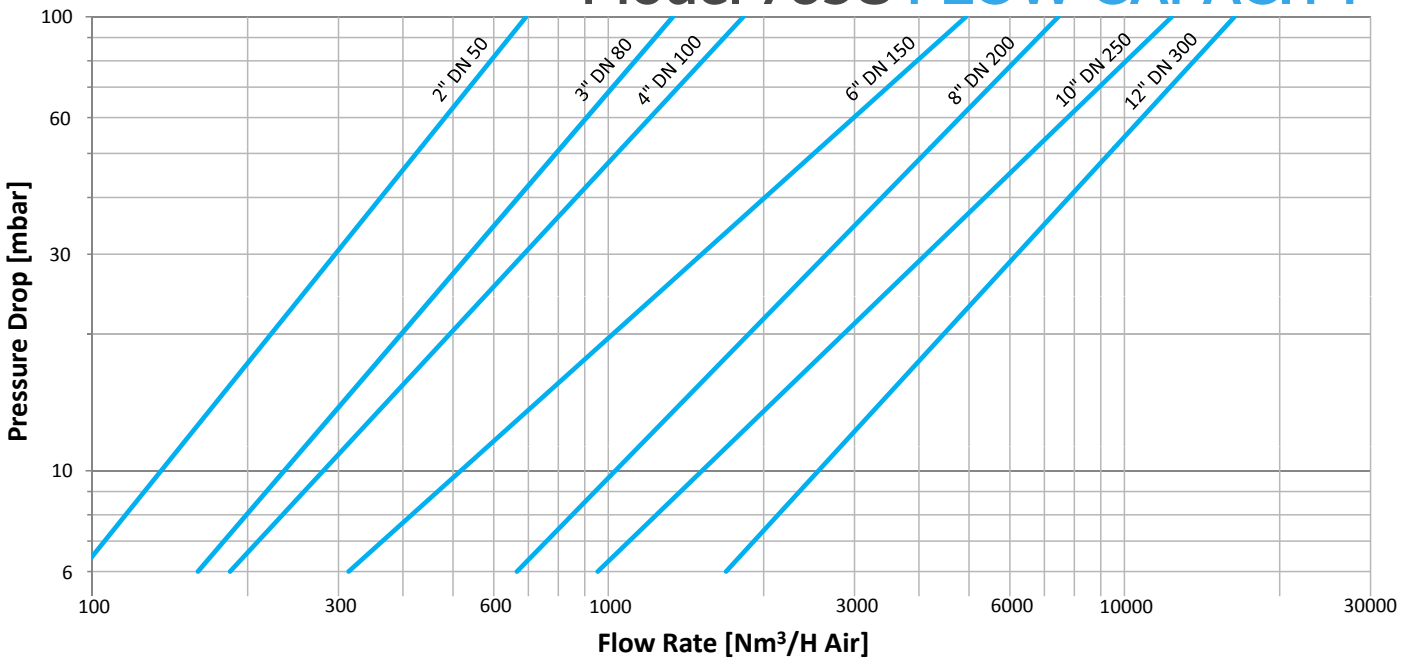


Model 7698 *(In-Line//Horizontal)* SPECIFICATIONS

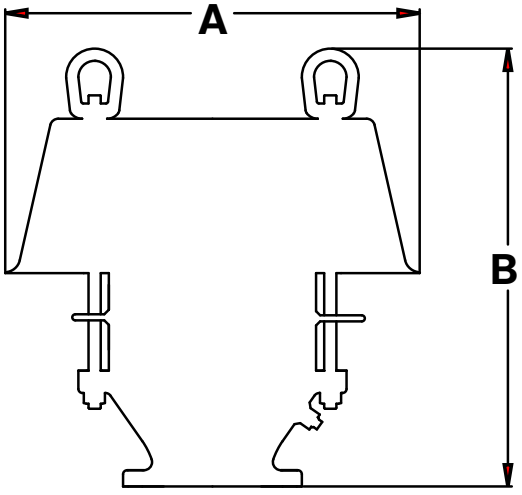
Nominal Size	A Width	B Height	* Maximum Operational Pressure	* Maximum Run Up (L/D)	* Gas Group	Approx. Ship. Wt. (Aluminum Body)	Approx. Ship. Wt. (Carbon or SS Body)	Operational Temperature Range	* Burn Time t_{BT}
	in (mm)	in (mm)	psia (bara)			Lbs (kg)	Lbs (kg)	°F (°C)	minutes
2" DN 50	13-3/4" (349)	9-1/2" (241)	23.2 (1.60)	50	IIA	32 (14)	70 (32)	-4 to 140 (-20 to 60)	10
3" DN 80	15-3/4" (400)	11" (279)	23.2 (1.60)	50	IIA	41 (19)	86 (39)	-4 to 140 (-20 to 60)	10
4" DN 100	18" (457)	12-1/2" (318)	17.4 (1.20)	20	IIA	55 (25)	114 (52)	-4 to 140 (-20 to 60)	10
6" DN 150	21" (533)	16-1/2" (419)	17.4 (1.20)	20	IIA	116 (53)	222 (101)	-4 to 140 (-20 to 60)	10
8" DN 200	25" (635)	20-1/2" (521)	17.4 (1.20)	20	IIA	221 (100)	422 (191)	-4 to 140 (-20 to 60)	2
10" DN 250	30 (762)	24-1/2" (622)	17.4 (1.20)	20	IIA	320 (145)	635 (288)	-4 to 140 (-20 to 60)	2
12" DN 300	32-1/2" (826)	28-1/2" (724)	17.4 (1.20)	20	IIA	397 (180)	836 (379)	-4 to 140 (-20 to 60)	2

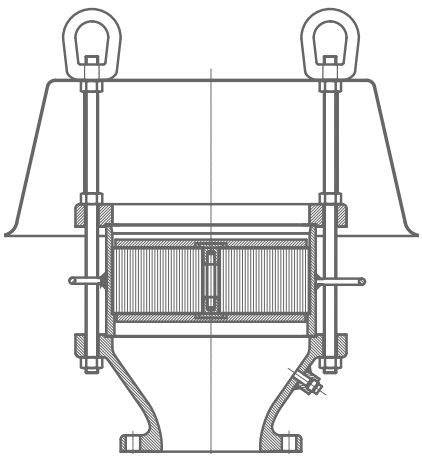
** Testing parameters based on ISO 16852*

Model 7698 FLOW CAPACITY



Model 7678 // IEC IIA
End-of-Line Vertical Deflagration Arrester





TECHNICAL DETAILS

- Sizes 2" through 12"
- Housing standard material: carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356/6061)
- Flame element standard material: 316L stainless steel
- Other materials available upon request
- Good for IEC gas group IIA (MESG > 0.90 mm)
- Certified to ATEX Directive 94/9/EC in compliance with EN ISO 16852:2010 Certificate #: **IBExU12ATEX2019 X**

INDUSTRIES

- Oil & Gas
- Chemical
- Liquid Storage
- Food & Beverage
- Wastewater

FEATURES & BENEFITS

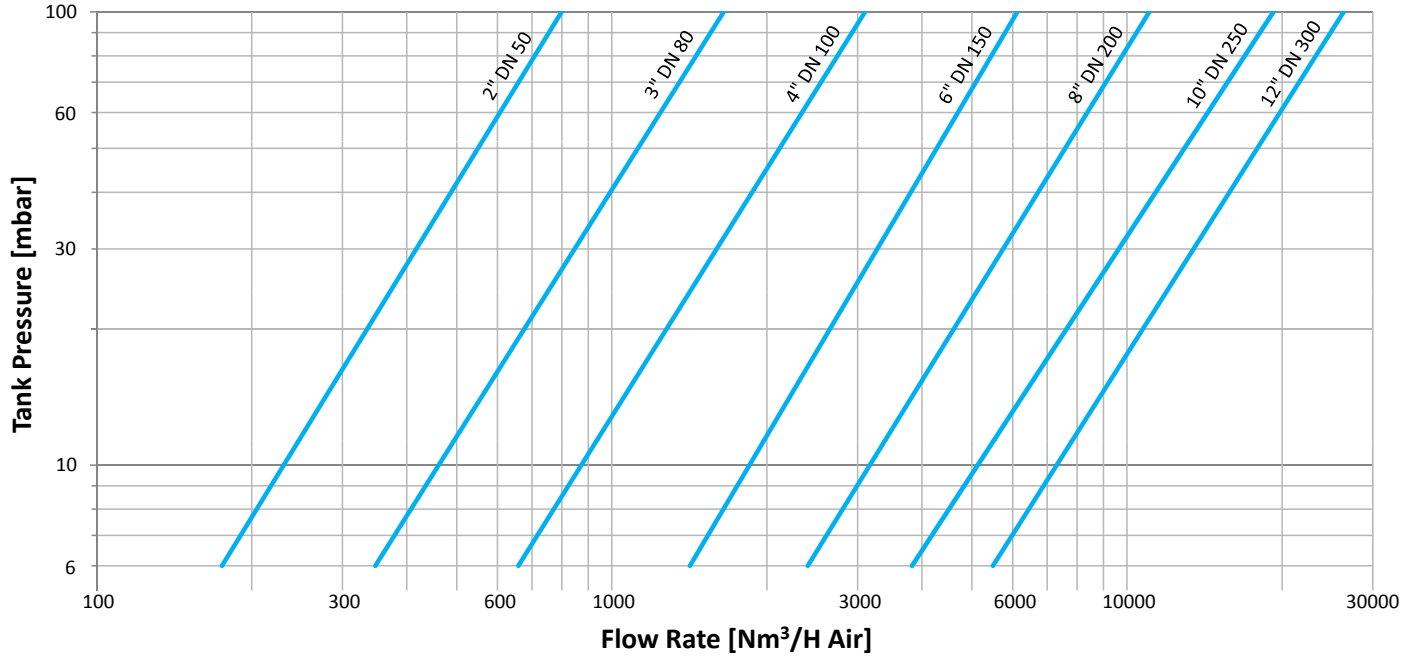
- Flame arrester element geometry maximizes flame quenching capability while minimizing pressure drop
- Proven spiral-wound, crimped ribbon, flame element provides reliable flame protection
- Modular design allows easy and cost-effective flame bank maintenance
- Drains and instrument ports available upon request
- Thermocouple is required for ATEX
- Exterior painting or coating available
- DIN or ASME/ANSI drilling available

Model 7678 *(End-Of-Line//Vertical)* SPECIFICATIONS

Nominal Size	A Width	B Height	* Gas Group	Approx. Ship. Wt. (Aluminum Body)	Approx. Ship. Wt. (Carbon or SS Body)	Operational Temperature Range	* Burn Time t_{BT}
	in (mm)	in (mm)		Lbs (kg)	Lbs (kg)	°F (°C)	minutes
2" DN 50	13 (5.90)	18 (8.16)	IIA	22 (10)	37 (17)	-4 to 140 (-20 to 60)	2
3" DN 80	15 (6.80)	16 (7.3)	IIA	35 (16)	65 (29)	-4 to 140 (-20 to 60)	2
4" DN 100	19.5 (8.85)	21.1 (9.6)	IIA	49 (22)	90 (41)	-4 to 140 (-20 to 60)	2
6" DN 150	23.5 (10.7)	24.2 (11)	IIA	105 (48)	168 (76)	-4 to 140 (-20 to 60)	2
8" DN 200	28.3 (12.8)	32 (14.5)	IIA	160 (73)	280 (127)	-4 to 140 (-20 to 60)	2
10" DN 250	30 (13.6)	34 (15.4)	IIA	244 (111)	417 (189)	-4 to 140 (-20 to 60)	2
12" DN 300	40 (18.1)	38 (17.2)	IIA	314 (142)	567 (257)	-4 to 140 (-20 to 60)	2

** Testing parameters based on ISO 16852*

Model 7678 FLOW CAPACITY



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Model 7658A

- **Sizes 2"x5" through 12"x24"**
- **Low pressure drop with multiple element sizes available for each flange size**
- **Easy cleaning**
- **Bi-directional flame arresting**
- **Vertical or horizontal installation**
- **Standard materials of construction are carbon steel or stainless steel**
- **316SS element is standard**
- **Multiple flow selections per pipe size**
- **In-line maintenance available**

MODEL 7658A

FLAME ARRESTER

The Groth Model 7658A Deflagration & Detonation Flame Arrester inhibits flame propagation in gas piping systems. The design of the Model 7658A Flame Arrester makes it ideal to protect liquid storage tanks containing both NEC Group D (IEC Class IIA) with a Maximum Experimental Safe Gap (MESG) equal to or greater than 0.90 mm.

These Type II Detonation/Flame Arresters were tested in accordance with the applicable requirements of U.S. Coast Guard requirements of the Federal Register, Volume 55, Number 120 (Thursday, June 21st, 1990)...Appendix A to Part 154 - Guidelines for Detonation Flame Arresters.

FEATURES

Housings are available in carbon steel, 316 SS, and HASTELLOY C® and elements in 316 SS, HASTELLOY C® and other corrosion resistant alloys.

These arresters are compact with high flow capacity and low pressure drop. Elements are easily removed in-line for cleaning and maintenance and are economical to replace if necessary.

APPLICATIONS

Models are available in flange sizes from 2" through 12" (50 - 300 mm) for the following applications:

- In-line or end-of-line deflagrations
- Stable detonations
- Unstable detonations in element sizes <=12"
- Pre-ignition system pressure up to 15.7 psia (1.08 bara)
- Pre-ignition system temperature to 140° F (60° C)
- Bi-directional with respect to flow and ignition source
- Factory installed integral flame sensors are available

OPTIONS

- In-line cleaning
- Other materials available
- Large inspection and cleaning ports
- Testing to customer specifications available
- Swing bolts for fast element removal

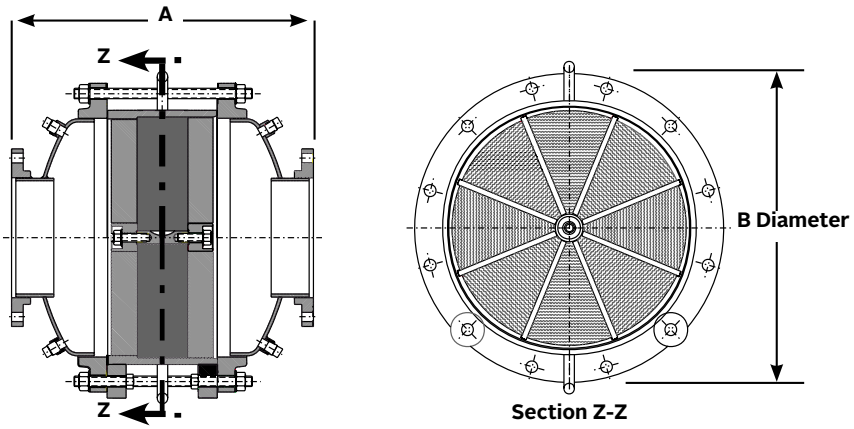
Model 7658A

SPECIFICATIONS

Specifications subject to change without notice. Certified dimensions available upon request.

Housing Size	5"	6"	8"	12"	16"	20"	24"	28"	30"	32"	36"	42"	48"
"A" Length (in)	17.19	20.31	22.43	25.94	29.63	32.43	38.75	35.75	42.88	39.25	42.00	50.00	56.00
	437 mm	516 mm	570 mm	659 mm	753 mm	824 mm	984 mm	908 mm	1089 mm	997 mm	1067 mm	1270 mm	1422 mm
"B" Diameter (in)	9.00	11.00	13.50	19.00	23.50	27.50	32.00	36.50	38.75	41.75	46.00	53.00	59.50
	229 mm	279 mm	343 mm	483 mm	597 mm	699 mm	813 mm	927 mm	984 mm	1060 mm	1168 mm	1346 mm	1511 mm
Est. Weight (lbs)	75	100	175	350	550	850	1200	1600	1900	2200	2900	4100	5300
	34 kg	45 kg	79 kg	159 kg	249 kg	386 kg	544 kg	726 kg	862 kg	998 kg	1315 kg	1860 kg	2404 kg

* Larger sizes available on special applications. All units with ANSI 150 RF flanges standard (other flange drillings available).



Air Flow Capacity
1000 Standard Cubic Feet per Hour at 60° F

		Pressure Drop [oz/in²]	0.58	1	1.16	1.73	2	2.31	3.47	4.62	5.78	6.93	9.24	11.6	13.9	16.0
		Pressure Drop [InWC]	1	1.73	2	3	3.46	4	6	8	10	12	16	20	24	27.7
NOMINAL PIPE SIZE	NOMINAL ELEMENT DIAMETER															
2	5		0.63	1.08	1.24	1.82	2.08	2.39	3.46	4.48	5.45	6.37	8.11	9.72	11.2	12.6
2	6		0.89	1.50	1.72	2.50	2.84	3.23	4.60	5.85	7.02	8.12	10.1	12.0	13.7	15.2
2	8		1.48	2.40	2.72	3.81	4.27	4.79	6.54	8.07	9.46	10.7	13.0	15.1	17.0	18.6
3	6		0.92	1.58	1.82	2.70	3.11	3.57	5.27	6.90	8.49	10.0	13.0	15.8	18.5	20.9
3	8		1.61	2.73	3.14	4.60	5.25	6.00	8.66	11.1	13.5	15.7	19.9	23.7	27.3	30.4
3	10		2.43	4.05	4.63	6.64	7.52	8.52	11.9	15.0	17.9	20.5	25.4	29.7	33.7	37.2
3	12		3.32	5.40	6.11	8.57	9.61	10.8	14.7	18.2	21.3	24.1	29.3	33.9	38.2	41.8
4	8		1.63	2.81	3.23	4.81	5.52	6.35	9.36	12.3	15.1	17.8	23.1	28.1	32.9	37.2
4	10		2.52	4.30	4.95	7.29	8.34	9.55	13.9	17.9	21.8	25.5	32.4	38.9	44.9	50.2
4	12		3.57	6.01	6.88	9.99	11.4	12.9	18.4	23.4	28.1	32.5	40.5	47.9	54.7	60.7
4	16		5.91	9.60	10.9	15.2	17.1	19.2	26.1	32.3	37.8	42.9	52.1	60.3	67.8	74.3
6	12		3.67	6.31	7.3	10.8	12.4	14.3	21.1	27.6	34.0	40.2	52.0	63.3	74.1	83.7
6	16		6.43	10.9	12.5	18.4	21.0	24.0	34.6	44.6	53.9	62.8	79.4	94.8	109	122
6	20		9.72	16.2	18.5	26.6	30.1	34.1	47.8	60.1	71.5	82.1	101	119	135	149
6	24		13.3	21.6	24.5	34.3	38.4	43.1	58.8	72.6	85.1	96.6	117	136	153	167
8	16		6.53	11.2	12.9	19.2	22.1	25.4	37.4	49.1	60.4	71.4	92.5	113	132	149
8	20		10.1	17.2	19.8	29.1	33.3	38.2	55.4	71.7	87.2	102	130	156	180	201
8	24		14.3	24.0	27.5	40.0	45.4	51.7	73.6	93.6	112	130	162	192	219	243
10	20		10.2	17.5	20.2	30.0	34.5	39.7	58.5	76.7	94.4	112	145	176	206	233
10	24		14.6	24.9	28.7	42.3	48.4	55.5	80.9	105	128	150	191	230	267	299
12	24		14.7	25.2	29.1	43.3	49.7	57.2	84.2	110	136	161	208	253	297	335

Note: Consult factory for flow on other sizes.

Model 7658A

FLOW CAPACITY METRIC

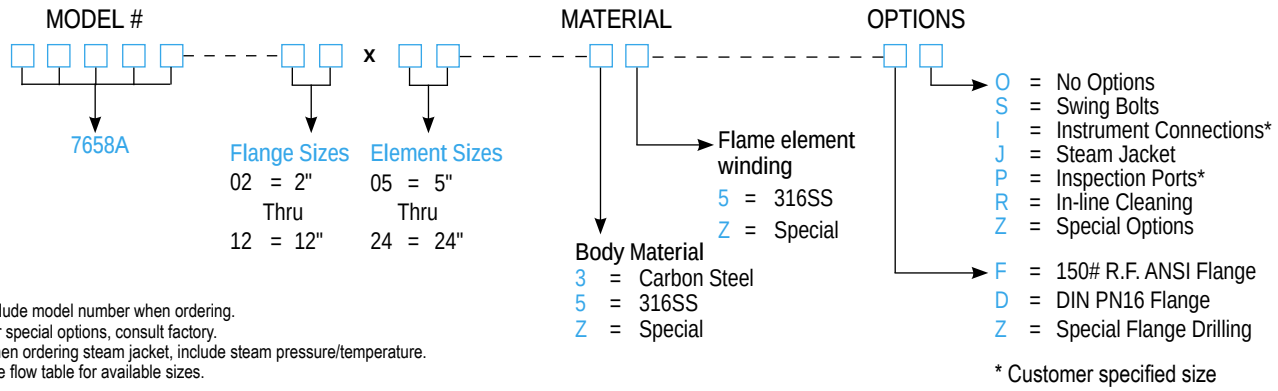
Air Flow Capacity
Normal Cubic Meters per Hour at 0° C

NOMINAL PIPE SIZE	NOMINAL ELEMENT DIAMETER	Pressure Drop [mmWC] / [mbar] 20.4 / 2	40.7 / 4	61.1 / 6	81.5 / 8	102 / 10	153 / 15	204 / 20	255 / 25	306 / 30	356 / 35	407 / 40	509 / 50	611 / 60	713 / 70
2	5	14.8	29.2	43.1	56.6	69.8	101	131	159	186	212	237	284	328	370
2	6	21.0	40.8	59.5	77.4	94.5	134	171	205	237	267	296	350	400	446
2	8	35.2	65.6	92.6	117	140	191	236	276	313	348	380	440	495	546
3	6	21.5	42.7	63.6	84.2	104	154	202	248	293	337	380	463	542	617
3	8	37.8	74.1	109	143	175	253	326	394	459	521	580	692	797	895
3	10	57.5	110	159	205	249	349	439	522	599	672	740	868	985	1094
3	12	79.3	148	208	264	315	430	530	621	705	783	856	991	1114	1228
4	8	38.3	76.0	113	150	186	274	359	441	522	600	676	822	963	1097
4	10	59.3	117	172	226	279	405	524	637	745	848	947	1136	1313	1480
4	12	84.0	163	238	310	378	537	684	820	948	1069	1184	1400	1599	1785
4	16	141	262	370	469	560	764	943	1105	1254	1392	1522	1762	1980	2183
6	12	86.1	171	254	337	418	616	807	993	1174	1349	1520	1851	2166	2469
6	16	151	296	436	571	702	1012	1302	1576	1836	2083	2321	2768	3186	3579
6	20	230	441	637	821	996	1396	1757	2089	2398	2688	2962	3472	3940	4377
6	24	317	590	833	1055	1260	1718	2121	2486	2820	3132	3424	3964	4456	4911
8	16	153	304	452	599	743	1095	1435	1766	2086	2399	2703	3290	3851	4390
8	20	237	467	689	906	1116	1620	2096	2548	2979	3392	3790	4544	5251	5920
8	24	336	653	953	1238	1512	2150	2736	3282	3794	4278	4738	5599	6395	7140
10	20	239	475	707	935	1161	1710	2243	2759	3260	3748	4223	5141	6017	6859
10	24	342	675	999	1314	1623	2363	3067	3738	4381	4999	5594	6728	7795	8807
12	24	344	684	1018	1347	1671	2463	3229	3972	4695	5397	6082	7402	8665	9877

Note: Consult factory for flow on other sizes.

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES
- Include model number when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.
- See flow table for available sizes.

EXAMPLE 7 6 5 8 A — 0 3 x 0 6 — 3 5 — F 0

Indicates a 3" Model 7658A with Carbon Steel body, 316SS Flame Element, ANSI Flanged Outlet and no other options.

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DEFLAGRATION & DETONATION FLAME ARRESTER

Model 7758A

- **Sizes 2" through 12" (50-300 mm)**
- **Available in carbon steel, stainless steel, Hastelloy C, and other materials**
- **Wafer mesh element design for quick and easy maintenance**

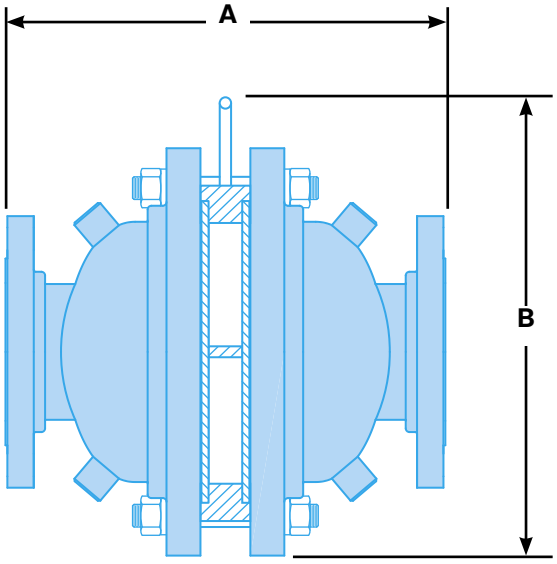
FLAME ARRESTER

The Groth Model 7758A Deflagration & Detonation Flame Arrester inhibits flame propagation in gas piping systems. The design of the Model 7758A Flame Arrester makes it ideal to protect liquid storage tanks containing both NEC Group D and Group C vapors (IEC Class IIA and IIB1 through IIB3 vapors) with a Maximum Experimental Safe Gap (MESG) equal to or greater than 0.026" [0.65 mm].

APPLICATIONS

Models are available in flange sizes from 2" through 12" (50 - 300 mm) for the following applications:

- In-line or end-of-line deflagrations in any piping configuration
- Stable detonations in any piping configuration
- Unstable detonations in any piping configuration (element sizes <=12")
- Pre-ignition system pressure up to 19.7 psia (1.36 bara) (see specifications table)
- Pre-ignition system temperature to 140° F (60° C)
- Bi-directional with respect to flow and ignition source
- Factory installed integral flame sensors are available



MODEL 7758A

FEATURES

Housings are available in carbon steel, 316SS, and HASTELLOY® C and elements in 316SS, HASTELLOY® C, and other corrosion resistant alloys.

These arresters are compact with high flow capacity and low pressure drop. Elements are easily removed in-line for cleaning and maintenance and are economical to replace if necessary. Contact the factory for additional features and options.

SPECIFICATIONS

Flange Size* (Metric)	Element Size (Metric)	A Length (Metric)	B Height (Metric)	Maximum Burn Time minutes	Maximum Pre-Ignition Pressure			Ship. Wt. Lbs.
					Deflagrations psia (bara)	Stable Detonations psia (bara)	Unstable Detonations psia (bara)	
2” (50 mm)	4” (100 mm)	10.75” (273 mm)	9” (229 mm)	30	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	54 (25 kg)
2” (50 mm)	6” (150 mm)	12.75” (324 mm)	11” (279 mm)	30	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	77 (35 kg)
2” (50 mm)	8” (200 mm)	14.50” (368 mm)	13.50” (343 mm)	5	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	114 (52 kg)
3” (80 mm)	6” (150 mm)	12.75” (324 mm)	11” (279 mm)	30	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	88 (40 kg)
3” (80 mm)	8” (200 mm)	14.50” (368 mm)	13.50” (343 mm)	5	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	125 (57 kg)
3” (80 mm)	12” (300 mm)	18.31” (465 mm)	19” (483 mm)	5	18.0 (1.24)	18.0 (1.24)	18.0 (1.24)	269 (122 kg)
4” (100 mm)	8” (203 mm)	14.50” (368 mm)	13.50” (343 mm)	5	19.7 (1.36)	19.7 (1.36)	19.7 (1.36)	134 (61 kg)
4” (100 mm)	12” (300 mm)	18.31” (465 mm)	19” (483 mm)	5	18.0 (1.24)	18.0 (1.24)	18.0 (1.24)	275 (125 kg)
4” (100 mm)	20” (500 mm)	23.69” (602 mm)	27.50” (699 mm)	30	17.2 (1.188)	17.2 (1.188)		645 (293 kg)
6” (150 mm)	12” (300 mm)	18.31” (465 mm)	19” (483 mm)	5	18.0 (1.24)	18.0 (1.24)	18.0 (1.24)	287 (130 kg)
6” (150 mm)	20” (500 mm)	23.69” (602 mm)	27.50” (699 mm)	30	17.2 (1.188)	17.2 (1.188)		657 (299 kg)
6” (150 mm)	26” (650 mm)	29.06” (738 mm)	34.25” (870 mm)	30	17.2 (1.188)	17.2 (1.188)		1062 (483 kg)
6” (150 mm)	30” (750 mm)	32.31” (821 mm)	38.75” (984 mm)	30	17.2 (1.188)	17.2 (1.188)		1407 (640 kg)
8” (200 mm)	20” (500 mm)	23.69” (602 mm)	27.50” (699 mm)	30	17.2 (1.188)	17.2 (1.188)		677 (308 kg)
8” (200 mm)	26” (650 mm)	29.06” (738 mm)	34.25” (870 mm)	30	17.2 (1.188)	17.2 (1.188)		1082 (492 kg)
8” (200 mm)	30” (750 mm)	32.31” (821 mm)	38.75” (984 mm)	30	17.2 (1.188)	17.2 (1.188)		1427 (649 kg)
10” (250 mm)	26” (650 mm)	29.06” (738 mm)	34.25” (870 mm)	30	17.2 (1.188)	17.2 (1.188)		1100 (500 kg)
10” (250 mm)	30” (750 mm)	32.31” (821 mm)	38.75” (984 mm)	30	17.2 (1.188)	17.2 (1.188)		1445 (657 kg)
12” (300 mm)	30” (750 mm)	32.31” (821 mm)	38.75” (984 mm)	30	17.2 (1.188)	17.2 (1.188)		1491 (678 kg)

* Consult factory for larger sizes.

FLOW CAPACITY

Model 7758A

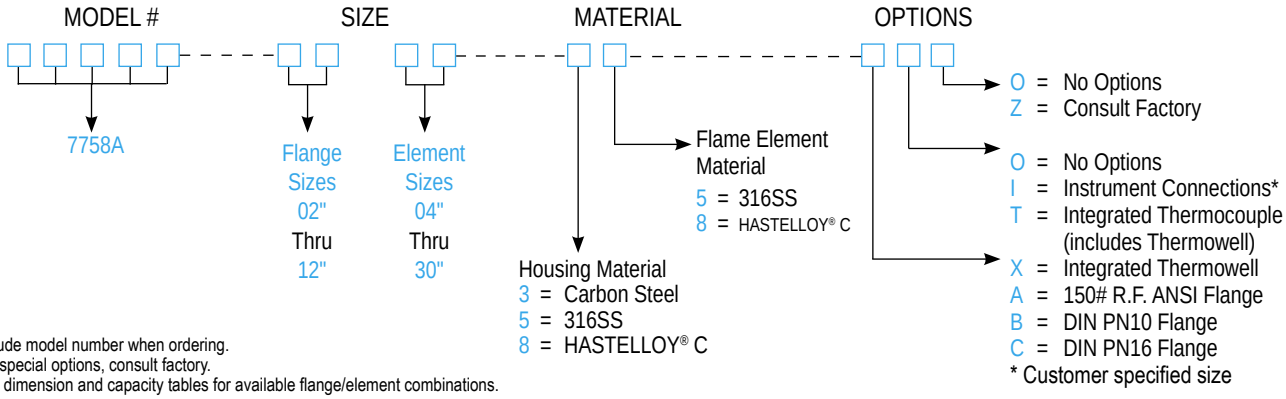
Flow Capacity (1000 SCFH at 60°F)													
Pressure drop [InWC] / Pressure drop [oz/in²]		1 / .58	2 / 1.2	3 / 1.7	4 / 2.3	6 / 3.5	8 / 4.6	10 / 5.8	12 / 6.9	16 / 9.2	20 / 12	24 / 14	28 / 16
NOMINAL PIPE SIZE (IN)	NOMINAL ELEMENT DIAMETER (IN)												
2	4	1.14	1.70	2.15	2.54	3.20	3.77	4.28	4.76	5.61	6.37	7.07	7.71
2	6	1.92	2.80	3.50	4.09	5.09	5.95	6.70	7.39	8.63	9.69	10.7	11.6
2	8	2.29	3.31	4.09	4.76	5.89	6.84	7.69	8.46	9.79	11.0	12.2	13.1
3	6	2.52	3.76	4.76	5.61	7.09	8.36	9.50	10.5	12.4	14.2	15.7	17.1
3	8	3.53	5.22	6.55	7.70	9.60	11.3	12.8	14.2	16.6	18.8	20.7	22.6
3	12	4.87	7.06	8.76	10.17	12.6	14.7	16.5	18.2	21.2	23.8	26.2	28.5
4	8	4.07	6.09	7.70	9.11	11.5	13.6	15.5	17.2	20.3	23.1	25.7	28.
4	12	6.54	9.60	12.1	14.2	17.8	20.8	23.6	26.0	30.5	34.4	38.0	41.4
4	20	8.84	12.7	15.9	18.4	22.8	26.6	29.9	32.9	38.3	43.0	47.3	51.3
6	12	7.87	11.8	15.0	17.8	22.4	26.6	30.2	33.6	39.8	45.2	50.4	55.0
6	20	13.0	19.3	24.3	28.6	35.9	42.2	47.8	52.9	62.1	70.4	77.9	84.8
6	26	14.1	20.8	26.1	30.7	38.5	45.1	51.1	56.5	66.2	74.9	82.8	90.2
6	30	15.0	22.1	27.7	32.5	40.7	47.7	53.9	59.6	69.7	78.9	87.0	94.7
8	20	14.6	22.0	27.9	33.0	41.8	49.4	56.2	62.5	73.9	84.1	93.5	103
8	26	16.2	24.2	30.7	36.3	45.9	54.2	61.7	68.5	80.8	92.0	102	111
8	30	17.7	26.4	33.3	39.4	49.8	58.7	66.7	74.1	87.3	98.8	110	121
10	26	17.0	25.6	32.5	38.5	48.9	58.0	66.1	73.6	87.1	99.8	110	121
10	30	18.7	28.1	35.7	42.3	53.7	63.6	72.4	80.6	95.0	108	121	132
12	30	19.1	28.8	36.7	43.5	55.3	65.6	74.9	83.4	98.8	113	125	138

Flow Capacity (NCMH at 0°C)													
Pressure drop [mmWC] / Pressure drop [oz/in²]		25 / 2.5	50 / 4.9	75 / 7.4	100 / 9.8	150 / 14.7	200 / 19.6	250 / 24.5	300 / 29	400 / 39	500 / 49	600 / 59	700 / 69
NOMINAL PIPE SIZE (MM)	NOMINAL ELEMENT DIAMETER (MM)												
50	100	32.7	48.7	61.5	72.7	91.8	108	123	136	161	183	203	221
50	150	55.0	80.3	100	117	146	170	192	212	247	278	308	332
50	200	65.6	94.8	117	136	169	196	220	242	280	316	349	376
75	150	72.2	108	136	161	203	240	272	302	357	406	449	490
75	200	101	150	188	221	275	324	368	406	477	539	594	648
75	300	140	202	251	291	362	422	474	523	607	684	752	817
100	200	117	175	221	261	330	389	444	493	583	662	735	803
100	300	187	275	346	406	509	596	675	746	874	986	1089	1187
100	500	253	365	455	528	654	762	858	942	1097	1234	1356	1471
150	300	225	338	430	509	643	762	866	964	1141	1296	1443	1577
150	500	373	553	697	820	1029	1209	1370	1517	1781	2018	2233	2432
150	650	403	596	749	880	1103	1294	1465	1620	1898	2146	2375	2584
150	750	430	634	795	931	1166	1367	1544	1707	1999	2260	2494	2715
200	500	419	632	801	945	1198	1416	1612	1792	2119	2410	2680	2941
200	650	463	694	880	1040	1315	1555	1767	1963	2317	2636	2914	3186
200	750	507	757	956	1130	1427	1683	1912	2124	2503	2832	3159	3458
250	650	487	733	931	1103	1402	1661	1895	2110	2497	2859	3159	3458
250	750	536	806	1024	1212	1539	1822	2075	2309	2723	3104	3458	3785
300	750	547	825	1051	1247	1585	1882	2146	2391	2832	3241	3595	3949

1. Flow facility and equipment comply with API 2000.
2. Flow capacities were determined from actual tests.
3. Flow data are for inline mounting and do not include external piping losses.

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES

- Include model number when ordering.
- For special options, consult factory.
- See dimension and capacity tables for available flange/element combinations.

EXAMPLE

7 7 5 8 A — 0 3 — 0 8 — 3 5 — A 0 0

Indicates a 3" Model 7758A with Carbon Steel body, 8" 316SS Flame Element, ANSI Flanged Outlet and no options or special options.

BACK PRESSURE CHECK VALVE
Model 8110

- **Sizes 2" through 12"**
- **Full flow with low pressure drop**
- **Standard aluminum (type 356-T6)**

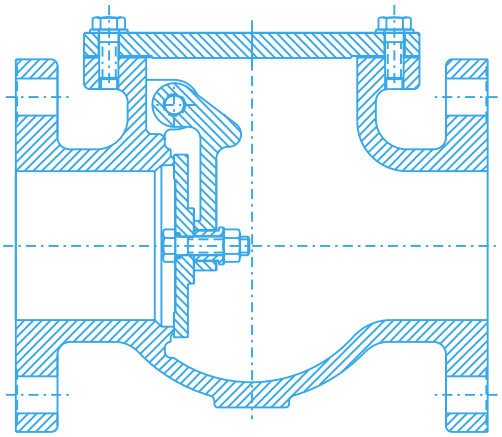
BACK PRESSURE CHECK VALVE

Model 8110 is used specifically in low pressure gas control lines where minimum pressure drops and maximum flow capacity are required.

SPECIAL FEATURES

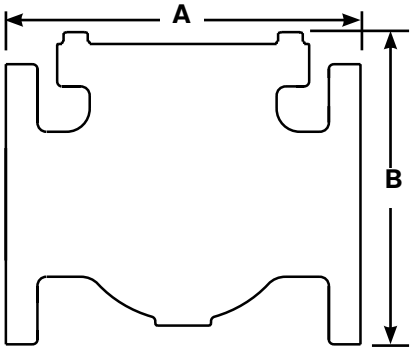
Model 8110 valves are built of corrosion resistant material throughout. Furnished standard in aluminum with free swinging aluminum pendulum type pallet. By removing the cover, easy access is provided for quick inspection and maintenance. Model 8110 check valves should be installed in your low pressure line downstream of meters, regulators and other gas control devices that may be otherwise damaged by an accidental reversal of the pressure in the system due to pressure waves from an explosion or such mishap.

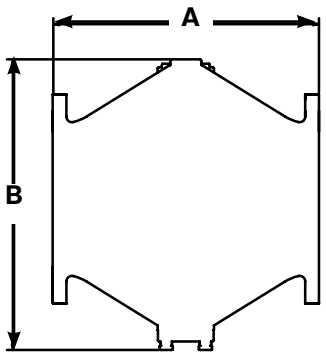
MODEL 8110



MODEL 8110

SPECIFICATIONS





Specifications subject to change without notice. Certified dimensions available upon request.

Size (Metric)	Length Flange A (Metric)	Heigth Flange B (max) (Metric)	Max W.P.[1]	Approx. Shipping Lbs. (Aluminum) Flanged
2" (50 mm)	8" (203 mm)	8.12" (206 mm)	10 PSIG 0.689 barg	9 (4 kg)
3" (80 mm)	9.50" (241 mm)	10.50" (267 mm)		15 (7 kg)
4" (100 mm)	11.50" (292 mm)	11.50" (292 mm)		28 (13 kg)
6" (150 mm)	14" (356 mm)	13.50" (343 mm)		50 (23 kg)
8" (200 mm)	19.50" (495 mm)	16.50" (419 mm)		90 (41 kg)
10" (250 mm)	25.69" (653 mm)	19" (480 mm)		111 (50 kg)
12" (300 mm)	**34.82"** (884 mm)	**22.50"** (572 mm)		**150** (68 kg)

* 150# ASME compatibility. F.F. on aluminum. 1. W.P. = Working Pressure

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

- MODEL #: 8110
- SIZE: 02" Thru 12"
- MATERIAL: Body Material
  - 1 = Aluminum
- OPTIONS
  - Z = Special Options
  - O = No Specials
  - N = FNPT Thread
  - F = Flanged

NOTES

- For special options, consult factory.

EXAMPLE 8 1 1 0 — 0 4 — 1 — F 0

Indicates a 4" Model 8110 with an aluminum body, flanged connections and no other options.

BACK PRESSURE CHECK VALVE

Model 8110

Pressure	Air Flow Capacity 1000 Standard Cubic Feet per Hour at 60° F						
InWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.25	1.11	2.50	4.44	10.0	17.8	27.8	40.0
0.50	2.22	5.00	8.89	20.0	35.6	55.6	80.0
0.75	3.33	7.50	13.3	30.0	53.3	83.3	120
1.00	4.44	10.0	17.8	40.0	71.1	111	160
1.50	6.67	15.0	26.7	60.0	107	167	240
2.00	7.70	17.3	30.8	69.3	123	192	277
3.00	9.43	21.2	37.7	84.9	151	236	339
4.00	10.9	24.5	43.5	98.0	174	272	392
5.00	12.2	27.4	48.7	110	195	304	438
6.00	13.3	30.0	53.3	120	213	333	480
8.0	15.4	34.6	61.6	139	246	385	554
10.0	17.2	38.7	68.9	155	275	430	620
12.0	18.9	42.4	75.4	170	302	471	679
14.0	20.4	45.8	81.5	183	326	509	733
16.0	21.8	49.0	87.1	196	348	544	784
18.0	23.1	52.0	92.4	208	370	577	831
20.0	24.3	54.8	97.4	219	389	609	876
25.0	27.2	61.2	109	245	435	680	980
30.0	29.8	67.1	119	268	477	745	1073

Pressure	**Flow Capacity of 0.7 SG Digester Gas** 1000 Standard Cubic Feet per Hour at 60° F						
InWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.25	1.33	2.99	5.31	12.0	21.2	33.2	47.8
0.50	2.66	5.98	10.6	23.9	42.5	66.4	95.6
0.75	3.98	8.96	15.9	35.9	63.7	100	143
1.00	5.31	12.0	21.2	47.8	85.0	133	191
1.50	7.97	17.9	31.9	71.7	127	199	287
2.00	9.20	20.7	36.8	82.8	147	230	331
3.00	11.3	25.4	45.1	101	180	282	406
4.00	13.0	29.3	52.0	117	208	325	468
5.00	14.5	32.7	58.2	131	233	364	524
6.00	15.9	35.9	63.7	143	255	398	574
8.0	18.4	41.4	73.6	166	294	460	662
10.0	20.6	46.3	82.3	185	329	514	741
12.0	22.5	50.7	90.1	203	361	563	811
14.0	24.3	54.8	97.4	219	389	609	876
16.0	26.0	58.6	104	234	416	651	937
18.0	27.6	62.1	110	248	442	690	994
20.0	29.1	65.5	116	262	466	727	1047
25.0	32.5	73.2	130	293	520	813	1171
30.0	35.6	80.2	143	321	570	891	1283

BACK PRESSURE CHECK VALVE

Model 8110

Pressure	Air Flow Capacity Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
5	24.8	55.8	99.1	223	397	620	892
10	49.6	112	198	446	793	1239	1784
15	74.4	167	297	669	1190	1859	2677
20	99.1	223	397	892	1586	2478	3569
40	194	435	774	1742	3096	4838	6966
60	237	533	948	2133	3792	5925	8532
80	274	616	1095	2463	4379	6842	9852
100	306	688	1224	2754	7895	7649	11015
150	375	843	1499	3373	5996	9368	13490
200	433	974	1731	3894	6923	10817	15577
250	484	1088	1935	4354	7740	12094	17416
300	530	1192	2120	4770	8479	13249	19078
350	572	1288	2290	5152	9159	14310	20607
400	612	1377	2448	5507	9791	15298	22029
450	649	1460	2596	5841	10385	16226	23366
500	684	1539	2737	6157	10947	17101	24630
600	749	1686	2998	6745	11991	18736	26980
700	810	1821	3238	7286	12952	20238	29142
800	865	1947	3462	7789	13846	21635	31154

Pressure	**Flow Capacity of 0.7 SG Digester Gas** Normal Cubic Meters per Hour at 0° C						
mmWC	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
5	30.4	68.5	122	274	487	761	1095
10	60.8	137	243	548	974	1521	2190
15	91.3	205	365	821	1460	2282	3286
20	122	274	487	1095	1947	3042	4381
40	238	534	950	2138	3801	5938	8551
60	291	655	1164	2618	4655	7273	10473
80	336	756	1344	3023	5375	8398	12093
100	376	845	1502	3380	6009	9389	13521
150	460	1035	1840	4140	7360	11500	16560
200	531	1195	2125	4780	8498	13279	19121
250	594	1336	2375	5345	9501	14846	21378
300	651	1464	2602	5855	10408	16263	23419
350	703	1581	2811	6324	11242	17566	25295
400	751	1690	3005	6760	12019	18779	27042
450	797	1793	3187	7171	12748	19918	28682
500	840	1890	3359	7558	13437	20995	30233
600	920	2070	3680	8280	14720	22999	33119
700	994	2236	3975	8943	15899	24842	35773
800	1062	2390	4249	9561	16997	26557	38243

Model 1260A

- **Sizes 2" through 12"**
- **Pressure settings 0.5 oz/in² to 15 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel, fiberglass and other materials**
- **Modular construction**

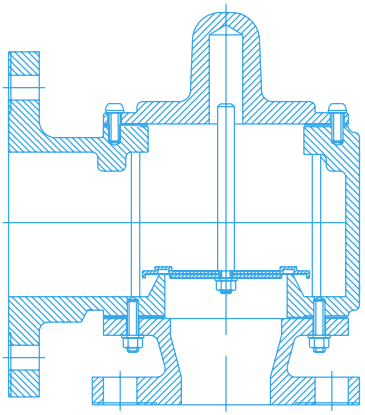
PRESSURE RELIEF VALVE

Pressure Relief Valve Model 1260A is for use where pressure relief is required and all relieving vapors must be piped away. Tank relief, to avoid tank damage, is controlled by a spring or weight loaded pallet in the valve housing. Pressure relief valves help provide increased fire protection and safety. The Model 1260A can also be used for in-line vacuum relief where flanged inlet connection is required. Back pressure in the system must be considered when using flow curves.

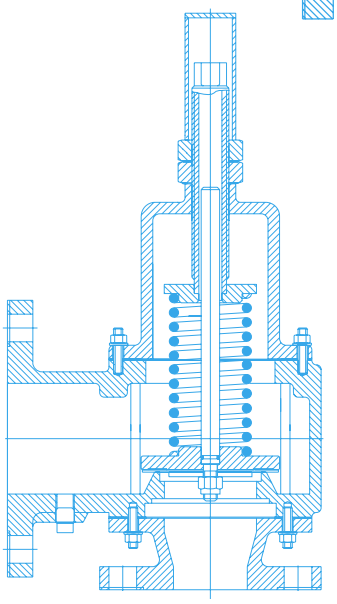
SPECIAL FEATURES

Model 1260A offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The Model 1260A has a self-draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids pressure or vacuum buildup due to binding or clogging of the valve. Buna-N, VITON® and other seating diaphragms can be provided when required.

MODEL 1260A

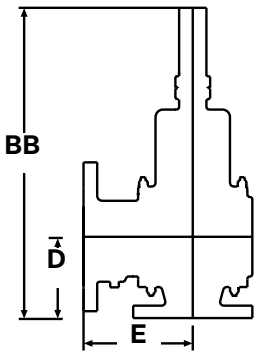


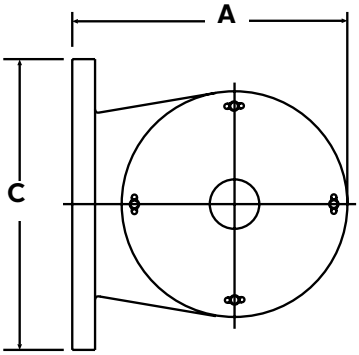
MODEL 1260A

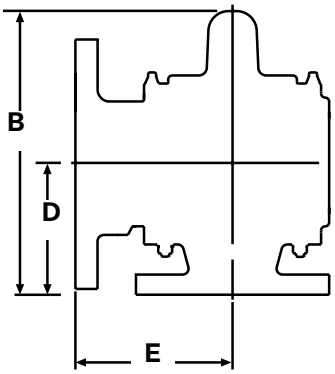


MODEL 1261A

SPECIFICATIONS







Specifications subject to change without notice. Certified dimensions available upon request.

Inlet Flg◊ (Metric)	Outlet Flg◊ (Metric)	Max. Set Pressure Weight Loaded	Max. Set Pressure Spring Loaded	Min. Setting Weight Loaded	A Length (Metric)	B Height (Metric)	C Width (Metric)	D (Metric)	E (Metric)	BB (Metric)	Approximate Shipping Weight Lbs. (Aluminum)
2" (50 mm)	3" (80 mm)	11 oz/in² (48.3 gm/cm²)	15 psig SPRING LOADED PRESSURE (1.05 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	8.62" (219 mm)	9.37" (238 mm)	7.50" (191 mm)	4.12" (105 mm)	5.50" (140 mm)	16.62" (422 mm)	16 (7 kg)
3" (80 mm)	4" (100 mm)	13 oz/in² (57.1 gm/cm²)			10" (254 mm)	11.12" (282 mm)	9" (229 mm)	5" (127 mm)	6" (152 mm)	20.25" (514 mm)	22 (10 kg)
4" (100 mm)	6" (150 mm)	16 oz/in² (70.3 gm/cm²)			11" (279 mm)	13.87" (352 mm)	11" (279 mm)	6.50" (165 mm)	6.50" (165 mm)	25.62" (651 mm)	29 (13 kg)
6" (150 mm)	8" (200 mm)	16 oz/in² (70.3 gm/cm²)			14.50" (368 mm)	17.37" (441 mm)	13.50" (343 mm)	8.50" (216 mm)	8.50" (216 mm)	34.50" (876 mm)	55 (25 kg)
8" (200 mm)	10" (250 mm)	16 oz/in² (70.3 gm/cm²)			18" (457 mm)	21.25" (540 mm)	16" (406 mm)	9.75" (248 mm)	10.75" (273 mm)	39.75" (1010 mm)	92 (42 kg)
10" (250 mm)	12" (300 mm)	16 oz/in² (70.3 gm/cm²)			20.75" (527 mm)	23.62" (600 mm)	19" (483 mm)	10.25" (260 mm)	12.50" (318 mm)	46.37" (1178 mm)	105 (48 kg)
12" (300 mm)	14" (350 mm)	16 oz/in² (70.3 gm/cm²)			24.75" (629 mm)	26.62" (676 mm)	21" (533 mm)	11" (279 mm)	15" (381 mm)	49.25" (1251 mm)	149 (68 kg)

‡ On spring loaded valves, change model number. ◊ 150# R.F. drilling compatibility F.F. on aluminum and R.F. on carbon steel and stainless steel alloys.
Fiberglass dimensions on request. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

1260A Weight Loaded
1261A Pressure Spring

02" Thru 12"

Pallet Material
Seat Material
Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316SS
6 = Vinyl Ester Resin
7 = Furan
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket
S = Spacer
H = Steam Jacket and Spacer

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.

*Stainless steel guides, stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

EXAMPLE 1 2 6 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 1260A with Aluminum Body and Seat, 316SS Pallet, TEFLON® Seat Diaphragm and no other options.

Model 1260A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	6.87	13.3	25.2	52.7	82.6	135	175
1.00	0.58	7.39	14.3	27.1	56.6	88.8	145	188
1.73	1.00	9.71	18.8	35.6	74.3	117	190	247
2.00	1.16	10.4	20.2	38.2	79.8	125	205	265
2.60	1.50	11.9	23.0	43.5	90.8	143	233	302
3.00	1.73	12.8	24.7	46.8	97.5	153	250	324
3.46	2.00	13.7	26.6	50.2	105	164	268	348
4.00	2.31	14.7	28.6	53.9	112	177	288	374
6.00	3.47	18.0	35.0	65.9	137	215	351	456
8.00	4.62	20.7	40.4	75.8	157	248	404	525
10.0	5.78	23.1	45.1	84.6	175	276	450	584
12.0	6.93	25.2	49.4	92.4	191	301	491	638
15.0	8.66	28.1	55.2	103	211	335	546	709
20.0	11.6	32.2	63.7	118	241	383	625	811
25.0	14.4	35.8	71.2	131	267	424	692	898
30.0	17.3	39.0	77.9	143	289	460	751	975

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s =Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1260A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 112,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 112,000 = 97,440 SCFH*

Model 1260A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.19	0.37	0.71	1.48	2.33	3.80	4.93
50	4.90	0.29	0.56	1.07	2.23	3.50	5.72	7.42
75	7.35	0.36	0.69	1.31	2.72	4.28	6.99	9.10
100	9.80	0.41	0.80	1.51	3.14	4.93	8.05	10.4
125	12.3	0.46	0.89	1.68	3.50	5.51	8.99	11.7
150	14.7	0.50	0.98	1.84	3.82	6.02	9.80	12.7
175	17.2	0.54	1.06	1.99	4.12	6.49	10.6	13.7
200	19.6	0.58	1.13	2.12	4.39	6.92	11.3	14.7
225	22.1	0.61	1.20	2.25	4.65	7.33	12.0	15.5
250	24.5	0.65	1.26	2.36	4.89	7.71	12.6	16.3
275	27.0	0.68	1.32	2.48	5.11	8.07	13.2	17.1
300	29.4	0.70	1.38	2.58	5.33	8.42	13.7	17.8
375	36.8	0.78	1.54	2.88	5.91	9.40	15.3	19.8
500	49.0	0.90	1.78	3.30	6.75	10.7	17.5	22.7
625	61.3	1.00	1.99	3.67	7.46	11.9	19.4	25.1
750	73.5	1.09	2.18	3.99	8.07	12.9	21.0	27.3

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1260A
100 mmWC Set Pressure [P_s]
175 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 3,140 NCMH
2. Calculate overpressure — % OP = [(175 - 100)/100] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 3,140 = 2,732 NCMH*

Model 1261A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	28.0	53.4	92.5	210	345	529	739
2.00	40.3	77.4	134	304	500	767	1070
3.00	50.2	96.9	168	381	625	960	1340
4.00	58.8	114	198	448	736	1130	1577
5.00	66.5	130	225	510	838	1286	1794
6.00	73.7	144	250	568	932	1431	1997
7.00	80.4	158	274	622	1022	1568	2188
8.00	86.7	171	297	674	1107	1699	2371
9.00	92.8	184	319	724	1189	1825	2546
10.0	98.6	196	340	772	1267	1945	2714
11.0	104	208	360	818	1343	2062	2877
12.0	110	219	380	863	1417	2176	3036
13.0	115	231	400	907	1489	2286	3189
14.0	120	241	418	949	1559	2393	3339
15.0	125	252	437	991	1627	2498	3486

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation		
	1. Read flow capacity at set pressure from table	Flow = 448,000 SCFH
6" Model 1261A	2. Calculate overpressure	% OP = [(7 - 4)/4] x 100 = 75%
4 psig set pressure [P_s]	3. Read "C" factor from table	"C" = 0.83
7 psig flowing pressure [P_f]	4. Calculate flow capacity	*Flow = 0.83 x 448,000 = 371,840 SCFH*

Model 1261A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.82	1.57	2.72	6.16	10.1	15.5	21.7
0.10	0.99	1.89	3.28	7.45	12.2	18.8	26.2
0.15	1.23	2.36	4.09	9.28	15.2	23.4	32.6
0.20	1.43	2.76	4.80	10.9	17.9	27.4	38.3
0.25	1.62	3.14	5.44	12.3	20.3	31.1	43.4
0.30	1.79	3.48	6.04	13.7	22.5	34.5	48.2
0.35	1.95	3.81	6.61	15.0	24.6	37.8	52.7
0.40	2.10	4.12	7.14	16.2	26.6	40.9	57.0
0.45	2.25	4.41	7.66	17.4	28.5	43.8	61.1
0.50	2.39	4.70	8.16	18.5	30.4	46.6	65.1
0.55	2.52	4.98	8.64	19.6	32.2	49.4	68.9
0.60	2.65	5.25	9.10	20.6	33.9	52.1	72.6
0.70	2.89	5.76	10.0	22.7	37.2	57.2	79.7
0.80	3.13	6.25	10.8	24.6	40.4	62.1	86.5
0.90	3.35	6.72	11.7	26.5	43.5	66.7	93.1
1.00	3.56	7.18	12.5	28.3	46.4	71.2	99.4

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1261A
0.4 barg Set Pressure [P_s]
0.7 barg Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 16,200 NCMH
2. Calculate overpressure — % OP = [(0.7 - 0.4)/0.4) x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 16,200 = 13,446 NCMH*

Model 2300A

- **Sizes 2" through 12"**
- **Pressure settings 0.5 oz/in² to 15 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel and other materials**

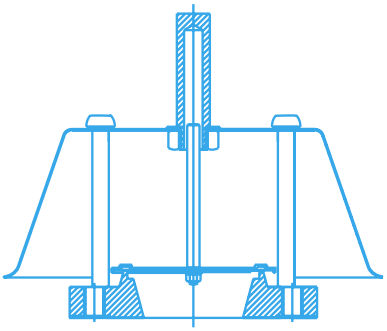
EMERGENCY RELIEF VALVE

Model 2300A is designed for emergency relief capacity above that supplied by a standard operating valve used on tanks, piping, and low pressure vessels. Emergency relief valves provide relief from excessive internal pressures which may cause tank damage.

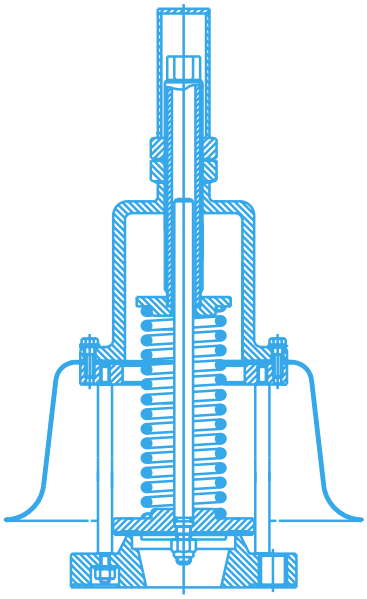
SPECIAL FEATURES

Model 2300A is built of corrosion resistant material throughout. Groth's self-closing special TEFLON® "cushioned air" pallet with center stabilizing stem and peripheral guiding provides uniform seating and alignment. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The guides support a spun weatherhood which covers and protects the entire valve structure. As added protection against the entry of foreign matter, a mesh screen encircles the valve under the weatherhood. Buna-N, VITON® and other seating diaphragms can be provided when required.

MODEL 2300A

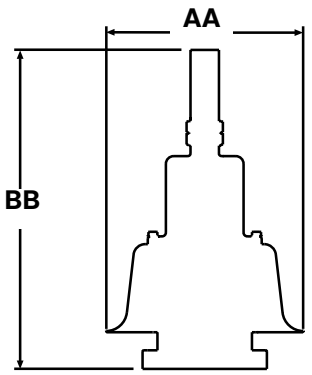


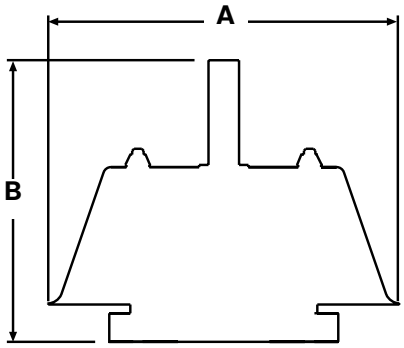
MODEL 2300A



MODEL 2301A

SPECIFICATIONS





Specifications subject to change without notice. Certified dimensions available upon request.

Size* Flange (Metric)	Max. Set Pressure	Minimum Set Pressure	A Diameter (Metric)	AA Diameter (Metric)	B Height (Metric)	BB Height (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	16 oz/in² WEIGHT LOADED (70.3 gm/cm²) 15 psig SPRING LOADED (1.05 kg/cm²)	**0.5 oz/in² (2.2 gm/cm²) WEIGHT LOADED	9.50" (241 mm)	9.50" (241 mm)	6.62" (168 mm)	16.50" (419 mm)	12 (5 kg)
3" (80 mm)			11.50" (292 mm)	13" (330 mm)	8.62" (219 mm)	18.62" (467 mm)	15 (7 kg)
4" (100 mm)			13" (330 mm)	13" (330 mm)	10.56" (268 mm)	22.50" (572 mm)	20 (9 kg)
6" (150 mm)			19" (480 mm)	19.50" (495 mm)	15" (381 mm)	30.50" (784 mm)	30 (14 kg)
8" (200 mm)			23.62" (600 mm)	23.50" (597 mm)	16.62" (422 mm)	35.37" (899 mm)	45 (20 kg)
10" (250 mm)			30.75" (781 mm)	25.50" (648 mm)	17" (431 mm)	41.37" (1051 mm)	65 (30 kg)
12" (300 mm)			36" (914 mm)	25.50" (648 mm)	18" (457 mm)	42.37" (1076 mm)	100 (45 kg)

‡ On spring loaded valves, change to model 2301A. † Larger sizes available - consult factory. * 150# ANSI. drilling compatibility, F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. Fiberglass dimensions on request. **Some sizes require non-ferrous components to achieve 0.5 oz/in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

2300A Weight Loaded
2301A Spring Loaded

02" Thru 12"

Pallet Material
Seat Material
Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316SS
6 = Vinyl Ester Resin
7 = Furan
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket
S = Spacer
H = Steam Jacket and Spacer

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
Z = Special

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure / temperature.

* Stainless steel guides and stems are standard with aluminum and carbon steel bodies. Stainless steel seats standard with carbon steel bodies.

Aluminum body not available on 2301A.

EXAMPLE 2 3 0 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 2300A with Aluminum Body and Seat, 316SS Pallet, TEFLON® Seat Diaphragm and no other options.

Model 2300A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	6.98	15.4	26.1	58.5	88.4	143	211
1.00	0.58	7.50	16.5	28.0	62.8	95.0	154	227
1.73	1.00	9.85	21.7	36.8	82.5	125	203	298
2.00	1.16	10.6	23.3	39.6	88.6	134	218	320
2.60	1.50	12.1	26.6	45.1	101	153	248	365
3.00	1.73	12.9	28.6	48.4	108	164	266	392
3.46	2.00	13.9	30.7	52.0	116	176	285	420
4.00	2.31	14.9	33.0	55.8	125	189	307	451
6.00	3.47	18.2	40.4	68.2	152	230	374	550
8.00	4.62	21.0	46.6	78.5	175	265	430	633
10.0	5.78	23.4	52.1	87.6	194	295	479	705
12.0	6.93	25.6	57.1	95.7	212	322	523	769
15.0	8.66	28.5	63.8	107	235	358	581	855
20.0	11.6	32.7	73.6	122	268	409	665	979
25.0	14.4	36.3	82.2	136	296	454	736	1084
30.0	17.3	39.5	89.9	148	321	492	799	1177

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear
interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s =Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 2300A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table
2. Calculate overpressure
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 125,000 SCFH
% OP = [(7 - 4)/4] x 100 = 75%
"C" = 0.87
Flow = 0.87 x 125,000 = 108,750 SCFH

Model 2300A
Pressure Relief Capacity

Set Pressure (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.20	0.43	0.73	1.65	2.49	4.04	5.95
50	4.90	0.30	0.65	1.11	2.48	3.75	6.08	8.95
75	7.35	0.36	0.80	1.35	3.03	4.58	7.43	10.9
100	9.80	0.42	0.92	1.56	3.49	5.28	8.57	12.6
125	12.3	0.47	1.03	1.74	3.89	5.89	9.56	14.1
150	14.7	0.51	1.13	1.91	4.25	6.44	10.5	15.4
175	17.2	0.55	1.22	2.06	4.58	6.94	11.3	16.6
200	19.6	0.59	1.30	2.19	4.88	7.40	12.0	17.7
225	22.1	0.62	1.38	2.32	5.16	7.84	12..7	18.7
250	24.5	0.65	1.46	2.45	5.43	8.25	13.4	19.7
275	27.0	0.69	1.53	2.56	5.68	8.63	14.0	20.6
300	29.4	0.72	1.59	2.67	5.92	9.00	14.6	21.5
375	36.8	0.80	1.78	2.98	6.57	10.0	16.2	23.9
500	49.0	0.91	2.06	3.42	7.49	11.4	18.6	27.4
625	61.3	1.02	2.30	3.80	8.28	12.7	20.6	30.3
750	73.5	1.11	2.51	4.13	8.97	13.8	22.4	32.9

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.87

"C" Factor Table										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 2300A
100 mmWC Set Pressure [P_s]
175 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 3,490 NCMH
2. Calculate overpressure — % OP = [(175 - 100)/100] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x ,490 = 3,036 NCMH*

Model 2301A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	27.1	59.9	104	198	345	529	739
2.00	39.7	87.7	152	296	500	767	1070
3.00	50.1	111	192	379	625	960	1340
4.00	59.5	131	228	456	736	1130	1577
5.00	68.3	151	261	530	838	1286	1794
6.00	76.5	169	293	601	932	1431	1997
7.00	84.3	186	323	670	1022	1568	2188
8.00	91.9	203	352	737	1107	1699	2371
9.00	99.3	219	380	804	1189	1825	2546
10.0	107	235	407	869	1267	1945	2714
11.0	113	250	434	934	1343	2062	2877
12.0	120	265	460	998	1417	2175	3036
13.0	127	280	485	1061	1489	2286	3189
14.0	134	295	510	1124	1559	2393	3339
15.0	140	309	535	1186	1627	2498	3486

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 2301A
4 psig set pressure [P_s]
7 psig flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 456,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 456,000 = 378,480 SCFH*

Model 2301A
Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.80	1.76	3.05	5.83	10.1	15.5	21.7
0.10	0.97	2.13	3.70	7.13	12.2	18.8	26.2
0.15	1.21	2.67	4.64	9.05	15.2	23.4	32.7
0.20	1.43	3.16	5.48	10.8	17.9	27.4	38.3
0.25	1.63	3.60	6.25	12.5	20.3	31.1	43.4
0.30	1.82	4.02	6.98	14.0	22.5	34.5	48.2
0.35	2.00	4.42	7.68	15.6	24.6	37.8	52.7
0.40	2.18	4.81	8.34	17.1	26.6	40.8	57.0
0.45	2.35	5.18	8.99	18.6	28.5	43.8	61.1
0.50	2.51	5.54	9.62	20.0	30.4	46.6	65.1
0.55	2.67	5.89	10.2	21.4	32.2	49.4	68.9
0.60	2.83	6.24	10.8	22.8	33.9	52.0	72.7
0.70	3.13	6.90	12.0	25.6	37.3	57.1	79.8
0.80	3.42	7.55	13.1	28.3	40.4	62.0	86.6
0.90	3.70	8.17	14.2	31.0	43.5	66.7	93.2
1.00	3.98	8.78	15.2	33.6	46.4	71.2	99.4

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 2301A
0.4 barg Set Pressure [P_s]
0.7 barg Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 17,100 NCMH
2. Calculate overpressure — % OP = [(0.7 - 0.4)/0.4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 17,100 = 14,193 NCMH*

Model 1300A
VACUUM RELIEF VALVE

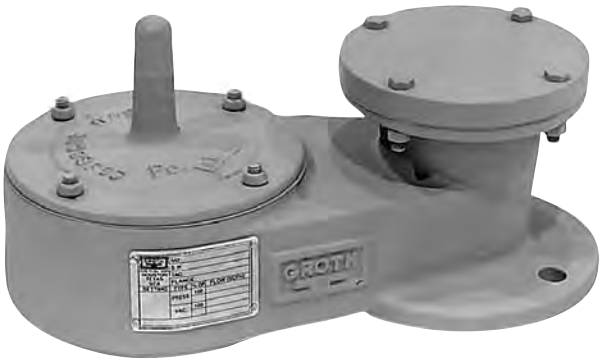
- **Sizes 2" through 12"**
- **Pressure settings 0.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel, and other materials**
- **Modular construction**

VACUUM RELIEF VALVE

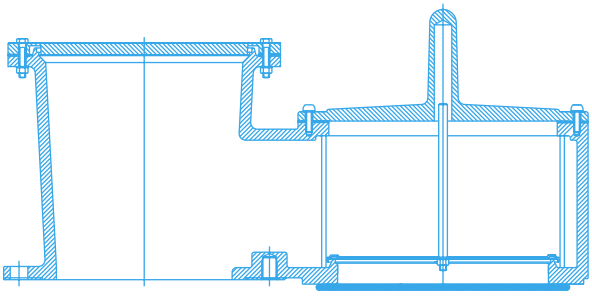
Model 1300A is used when vacuum relief is the only requirement. Intake relief necessary under working conditions is achieved by a spring or weight loaded pallet. This feature of the Model 1300A reduces the possibility of tank damage. The Model 1300A helps to provide increased fire protection and safety. Valve size must be selected to perform required vacuum relief under operating and thermal conditions. Flow curves for vacuum relief are provided.

SPECIAL FEATURES

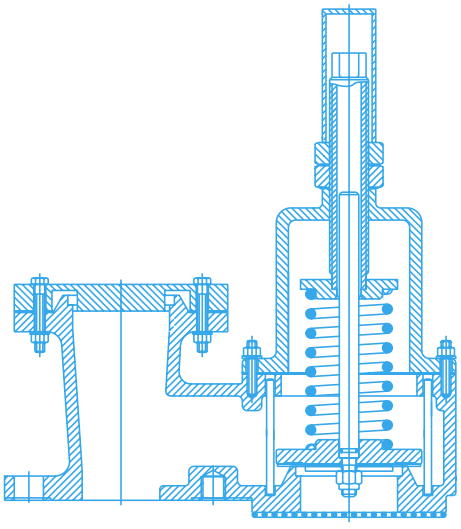
Model 1300A offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The Model 1300A has a self draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids vacuum buildup due to binding or clogging of the vent. Metal-to-metal, Buna-N, VITON® and other seating diaphragms can be provided when required.



MODEL 1300A

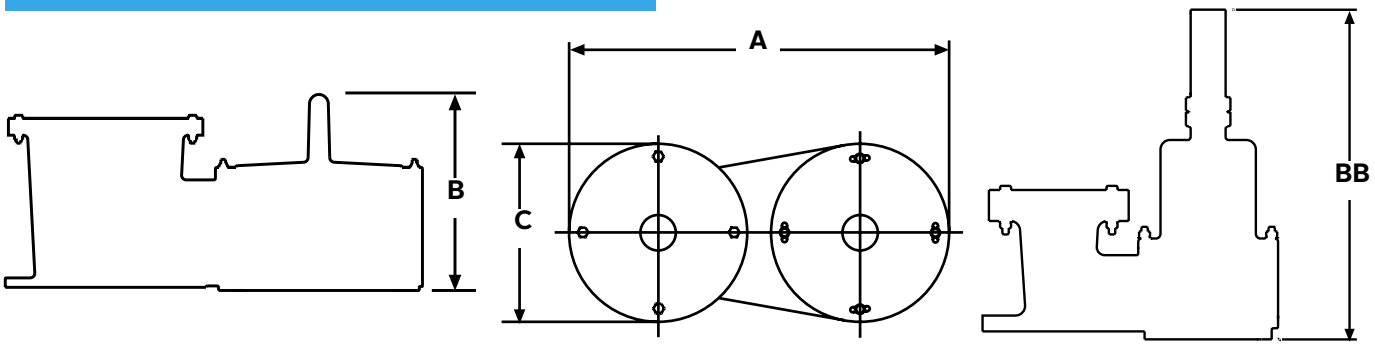


MODEL 1300A



MODEL 1301A

SPECIFICATIONS



Specifications subject to change without notice. Certified dimensions available upon request.

Size◊ (Metric)	Max. Set Vacuum Weight Loaded	Max. Set Vacuum Spring Loaded	Min. Set Vacuum Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting for Max. W.P.†	A Length (Metric)	B Height (Metric)	BB Height (Metric)	C Width (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
2" (50 mm)	12 oz/in2 (52.7 gm/cm2)	12 psig SPRING LOADED PRESSURE (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 for Vacuum Settings and MAWP		11.62" (295 mm)	6.87" (174 mm)	14" (356 mm)	6" (152 mm)	15 (7 kg)
3" (80 mm)	11 oz/in2 (48.3 gm/cm2)					15.75" (400 mm)	7.75" (196 mm)	16.25" (413 mm)	7.75" (197 mm)	21 (10 kg)
4" (100 mm)	11 oz/in2 (48.3 gm/cm2)					17.25" (438 mm)	9.62" (244 mm)	19.87" (505 mm)	9" (229 mm)	32 (14 kg)
6" (150 mm)	16 oz/in2 (70.3 gm/cm2)					23.50" (597 mm)	11.87" (301 mm)	27" (686 mm)	12" (305 mm)	61 (28 kg)
8" (200 mm)	16 oz/in2 (70.3 gm/cm2)					28.50" (724 mm)	15.50" (394 mm)	31.87" (810 mm)	14.50" (368 mm)	81 (37 kg)
10" (250 mm)	16 oz/in2 (70.3 gm/cm2)					33.25" (845 mm)	18.62" (473 mm)	37.87" (962 mm)	16.50" (419 mm)	121 (55 kg)
12" (300 mm)	16 oz/in2 (70.3 gm/cm2)					37.25" (946 mm)	21.62" (549 mm)	42" (1067 mm)	19" (483 mm)	165 (75 kg)

† W.P. = Working Pressure. ‡ On spring loaded valves, change model number. ◊ 150# ANSI. drilling compatibility, F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. Fiberglass dimensions on request. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz./in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

1300A Weight Loaded
1301B Spring Loaded

02" Thru 12"

Pallet Material
Seat Material
*Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316SS
6 = Vinyl Ester Resin
7 = Furan
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket
S = Spacer
H = Steam Jacket and Spacer

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
M = Metal-to-Metal
Z = Special

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure / temperature.
- * Stainless steel guides and stems are standard with aluminum and carbon steel bodies.

EXAMPLE

1 3 0 0 A — 0 2 — 1 1 5 — T 0 0

Indicates a 2" Model 1300A with Aluminum Body and Seat, 316SS Pallet, TEFLON® Seat Diaphragm and no other options.

Model 1300A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in^2	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.87	0.50	4.70	10.3	16.0	34.7	60.5	91.1	129
1.00	0.58	5.05	11.0	17.2	37.3	65.0	97.9	138
1.73	1.00	6.63	14.5	22.6	49.0	85.3	129	182
2.00	1.16	7.12	15.6	24.2	52.6	91.6	138	195
2.60	1.50	8.10	17.7	27.6	59.8	104	157	222
3.00	1.73	8.70	19.0	29.6	64.2	112	169	238
3.46	2.00	9.33	20.4	31.8	68.9	120	181	256
4.00	2.31	10.0	21.9	34.1	74.0	129	194	274
6.00	3.47	12.2	26.7	41.5	90.1	157	237	334
8.00	4.62	14.0	30.6	47.7	103	180	272	384
10.0	5.78	15.6	34.0	53.0	115	200	302	427
12.0	6.93	17.0	37.1	57.8	125	218	329	465
15.0	8.66	18.8	41.1	64.0	139	242	365	516
20.0	11.6	21.4	46.8	72.9	158	276	415	587
25.0	14.4	23.6	51.5	80.3	174	304	457	646
30.0	17.3	25.4	55.6	86.6	188	327	493	697

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1300A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 74,000 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 74,000 = 64,380 SCFH*

Model 1300A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
22	2.16	0.13	0.29	0.45	0.98	1.71	2.58	3.65
50	4.90	0.20	0.44	0.68	1.48	2.58	3.88	5.48
75	7.35	0.24	0.53	0.83	1.81	3.15	4.74	6.70
100	9.80	0.28	0.62	0.96	2.08	3.62	5.46	7.72
125	12.3	0.31	0.69	1.07	2.32	4.04	6.09	8.60
150	14.7	0.34	0.75	1.17	2.53	4.41	6.65	9.40
175	17.2	0.37	0.81	1.26	2.73	4.75	7.16	10.1
200	19.6	0.39	0.86	1.34	2.91	5.07	7.64	10.8
225	22.1	0.42	0.91	1.42	3.08	5.36	8.08	11.4
250	24.5	0.44	0.96	1.49	3.23	5.64	8.49	12.0
275	27.0	0.46	1.00	1.56	3.38	5.90	8.88	12.6
300	29.4	0.48	1.04	1.62	3.52	6.14	9.25	13.1
375	36.8	0.53	1.16	1.80	3.91	6.81	10.3	14.5
500	49.0	0.60	1.32	2.05	4.45	7.75	11.7	16.5
625	61.3	0.66	1.45	2.26	4.90	8.54	12.9	18.2
750	73.5	0.72	1.57	2.44	5.29	9.22	13.9	19.6

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1300A
100 mmWC Set Vacuum [P_s]
175 mmWC Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table
2. Calculate over-vacuum
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 2,080 NCMH
% OV = [(175 - 100)/100] x 100 = 75%
"C" = 0.87
Flow = 0.87 x 2,080 = 1,810 NCMH

Model 1301A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
psig	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1.00	13.8	30.5	52.9	120	197	302	422
1.10	14.5	31.9	55.4	126	206	316	442
1.20	15.1	33.2	57.7	131	215	330	460
1.30	15.7	34.5	59.9	136	223	342	478
1.40	16.2	35.7	62.0	141	231	355	495
1.50	16.8	36.9	64.0	145	239	366	511
1.75	18.0	39.6	68.7	156	256	393	548
2.00	19.1	42.0	73.0	166	272	417	582
2.25	20.1	44.3	76.9	174	286	439	613
2.50	21.0	46.3	80.4	183	300	460	641
2.75	21.9	48.2	83.7	190	312	478	667
3.00	22.7	49.9	86.6	197	323	495	691
3.25	23.4	51.4	89.3	203	333	511	713
3.50	24.0	52.8	91.8	208	342	525	732
>3.50	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 3.5 PSIG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.83

"C" Factor Table										
%OV	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1301A
2 psig set vacuum [P_s]
3.5 psig flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table
2. Calculate over-vacuum
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 166,000 SCFH
% OV = [(3.50 - 2.0)/2.0] x 100 = 75%
"C" = 0.83
Flow = 0.83 x 166,000 = 137,780 SCFH

Model 1301A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
barg	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07	0.41	0.90	1.55	3.52	5.77	8.87	12.4
0.10	0.48	1.06	1.83	4.16	6.83	10.5	14.6
0.11	0.51	1.11	1.92	4.35	7.14	11.0	15.3
0.12	0.53	1.15	1.99	4.53	7.43	11.4	15.9
0.13	0.55	1.20	2.07	4.69	7.70	11.8	16.5
0.14	0.56	1.24	2.14	4.85	7.96	12.2	17.1
0.15	0.58	1.27	2.20	5.00	8.21	12.6	17.6
0.16	0.60	1.31	2.27	5.14	8.44	13.0	18.1
0.17	0.61	1.35	2.33	5.28	8.66	13.3	18.6
0.18	0.63	1.38	2.38	5.41	8.88	13.6	19.0
0.19	0.64	1.41	2.44	5.53	9.08	13.9	19.4
0.20	0.66	1.44	2.49	5.65	9.27	14.2	19.8
0.22	0.68	1.49	2.58	5.86	9.62	14.8	20.6
0.24	0.70	1.54	2.67	6.05	9.93	15.2	21.3
>0.24	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 0.24 BARG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 42% Over-vacuum at intersection of row 40 and column 2
"C" factor at 42% OV = 0.55

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1301A
0.12 barg Set Vacuum [P_s]
0.17 barg Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 4,530 NCMH
2. Calculate over-vacuum — % OV = [(0.17 - 0.12)/0.12] x 100 = 42%
3. Read "C" factor from table — "C" = 0.55
4. Calculate flow capacity — *Flow = 0.55 x 4,530 = 2,492 NCMH*

VACUUM RELIEF VALVE
Model 1360A

- **Sizes 3" through 14"**
- **Pressure settings 0.5 oz/in² to 12 psig**
- **Available in aluminum (type 356), carbon steel, stainless steel, fiberglass, and other materials**

VACUUM RELIEF VALVE

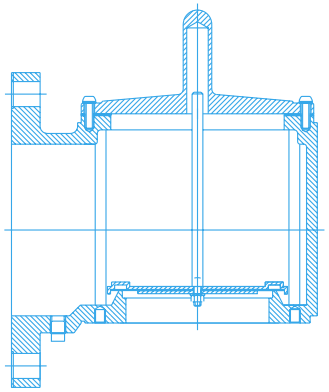
Model 1360A is used when vacuum relief is the only requirement. The Model 1360A may be side mounted on the tank body or piped in. Intake relief necessary under working conditions is achieved by a spring or weight loaded pallet in the valve housing. The Model 1360A reduces the possibility of tank damage.

Valve size must be selected to meet required vacuum relief under operating and thermal conditions. Flow curves for vacuum relief are provided.

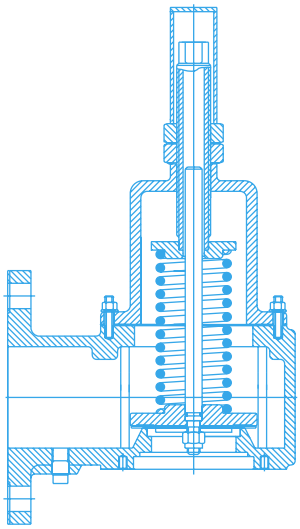
SPECIAL FEATURES

Model 1300A offers Groth's special "cushioned Model 1360A offers Groth's special "cushioned air" seating. Superior performing TEFLON® seating diaphragms are standard to minimize sticking caused by resinous vapors and atmospheric moisture. The Model 1360A has a self draining housing body and drip rings to protect seating surfaces from condensate and freezing. This design also avoids vacuum buildup due to binding or clogging of the vent. Metal-to-metal, Buna-N, VITON® and other seating diaphragms can be provided when required.

MODEL 1360A

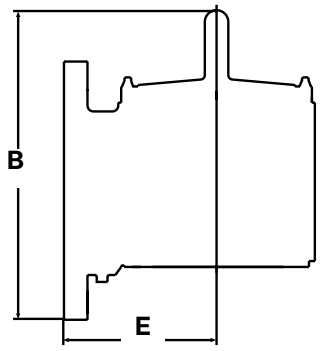


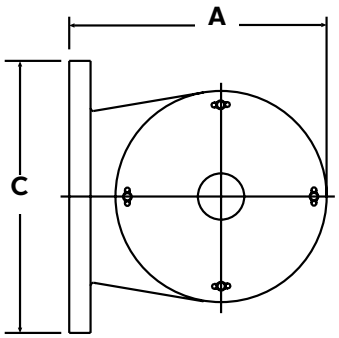
MODEL 1360A

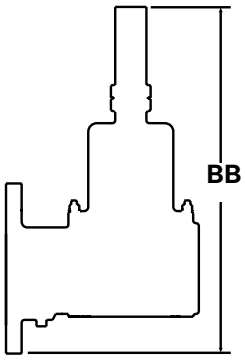


MODEL 1361A

SPECIFICATIONS







Specifications subject to change without notice. Certified dimensions available upon request.

Size◊ Flange (Metric)	Max. Set Vacuum Weight Loaded	Max. Set Vacuum Spring Loaded	Min. Set Vacuum Weight Loaded	Max. W.P.† for Min. Vacuum Setting	Min. Vac. Setting vs. Max. W.P.†	A Length (Metric)	B Height (Metric)	BB Height (Metric)	E (Metric)	BB Height (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
3" (80 mm)	11 oz/in2 (48.2 gm/cm2)	12 psig SPRING LOADED VACUUM (0.84 kg/cm²)	*0.5 oz/in² WEIGHT LOADED (2.20 gm/cm²)	See TPD2 for Vacuum Settings and MAWP		8.62" (219 mm)	9.25" (235 mm)	7.50" (191 mm)	5.50" (140 mm)	16.25" (413 mm)	12 (6 kg)
4" (100 mm)	13 oz/in2 (57.0 gm/cm2)					10" (254 mm)	11.50" (292 mm)	9" (229 mm)	6" (152 mm)	19.75" (502 mm)	17 (8 kg)
6" (150 mm)	16 oz/in2 (70.3 gm/cm2)					11" (279 mm)	14.25" (362 mm)	11" (279 mm)	6.50" (165 mm)	24.62" (625 mm)	23 (10 kg)
8" (200 mm)	16 oz/in2 (70.3 gm/cm2)					14.50" (368 mm)	17.75" (451 mm)	13.50" (343 mm)	8.50" (216 mm)	32.75" (832 mm)	42 (19 kg)
10" (250 mm)	16 oz/in2 (70.3 gm/cm2)					18" (457 mm)	21.25" (540 mm)	16" (406 mm)	10.75" (273 mm)	38" (965 mm)	71 (32 kg)
12" (300 mm)	16 oz/in2 (70.3 gm/cm2)					20.75" (527 mm)	25.75" (654 mm)	19" (483 mm)	12.50" (318 mm)	45.37" (1152 mm)	83 (38 kg)
14" (350 mm)	16 oz/in2 (70.3 gm/cm2)					24.75" (629 mm)	29.25" (743 mm)	21" (533 mm)	15" (381 mm)	48.75" (1238 mm)	118 (54 kg)

† W.P. = Working Pressure. ‡ On spring loaded valves, change model number. ◊ 150# R.F. drilling compatibility F.F. on aluminum and R.F. on carbon steel and stainless steel alloys. Fiberglass dimensions on request. 16 oz/in² set with spacer. SS set weights-consult factory. *Some sizes require non-ferrous components to achieve 0.5 oz./in² setting.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

1360A Weight Loaded
1361A Spring Loaded

03" Thru 14"

Pallet Material
Seat Material
*Body Material

1 = Aluminum
3 = Carbon Steel
5 = 316SS
6 = Vinyl Ester Resin
7 = Furan
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket
S = Spacer
H = Steam Jacket and Spacer

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
Z = Special

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure / temperature.
- * Stainless steel guides and stems are standard with aluminum and carbon steel bodies.

EXAMPLE

1 3 6 0 A — 0 3 — 1 1 5 — T 0 0

Indicates a 3" Model 1360A with Aluminum Body and Seat, 316SS Pallet, TEFLON® Seat Diaphragm and no other options.

Model 1360A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in²	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)	14" (350 mm)
0.87	0.50	8.01	14.8	27.8	57.4	99.4	136	182
1.00	0.58	8.61	15.9	29.9	61.6	107	146	195
1.73	1.00	11.3	20.8	39.3	80.9	140	192	257
2.00	1.16	12.1	22.4	42.2	86.9	151	207	276
2.60	1.50	13.8	25.5	48.0	98.9	171	235	314
3.00	1.73	14.8	27.3	51.5	106	184	252	337
3.46	2.00	15.9	29.3	55.3	114	197	271	361
4.00	2.31	17.1	31.5	59.3	122	212	291	388
6.00	3.47	20.8	38.4	72.3	149	258	354	472
8.00	4.62	23.9	44.0	83.0	171	297	407	542
10.0	5.78	26.6	49.0	92.3	190	330	452	603
12.0	6.93	28.9	53.4	101	207	359	492	657
15.0	8.66	32.1	59.1	111	230	398	546	728
20.0	11.6	36.5	67.3	127	261	453	621	829
25.0	14.4	40.2	74.1	140	288	499	684	913
30.0	17.3	43.4	80.0	151	311	538	738	985

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1360A
4 InWC set vacuum [P_s]
7 InWC flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 59,300 SCFH
2. Calculate over-vacuum — % OV = [(7 - 4)/4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.87
4. Calculate flow capacity — *Flow = 0.87 x 59,300 = 1,591 SCFH*

Model 1360A
Vacuum Relief Capacity

Set Vacuum (P_s)		Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)	14" (350 mm)
22	2.16	0.23	0.42	0.78	1.62	2.80	3.84	5.12
50	4.90	0.34	0.63	1.18	2.43	4.21	5.77	7.70
75	7.35	0.41	0.76	1.44	2.97	5.14	7.05	9.41
100	9.80	0.48	0.88	1.66	3.42	5.92	8.12	10.8
125	12.3	0.53	0.98	1.85	3.81	6.61	9.06	12.1
150	14.7	0.58	1.07	2.02	4.16	7.22	9.89	13.2
175	17.2	0.63	1.16	2.18	4.49	7.78	10.7	14.2
200	19.6	0.67	1.23	2.32	4.78	8.29	11.4	15.2
225	22.1	0.71	1.30	2.45	5.06	8.77	12.0	16.0
250	24.5	0.74	1.37	2.58	5.32	9.22	12.6	16.9
275	27.0	0.78	1.43	2.70	5.56	9.64	13.2	17.6
300	29.4	0.81	1.49	2.81	5.79	10.0	13.8	18.4
375	36.8	0.90	1.65	3.12	6.42	11.1	15.3	20.4
500	49.0	1.02	1.88	3.55	7.31	12.7	17.4	23.2
625	61.3	1.13	2.08	3.91	8.06	14.0	19.1	25.5
750	73.5	1.21	2.24	4.22	8.70	15.1	20.7	27.6

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OV = 0.87

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50
20	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58
30	0.59	0.59	0.60	0.61	0.61	0.62	0.63	0.64	0.64	0.65
40	0.66	0.66	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.72
50	0.72	0.73	0.73	0.74	0.75	0.75	0.76	0.77	0.77	0.78
60	0.78	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.84
70	0.84	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89
80	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.94	0.94
90	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1360A
100 mmWC Set Vacuum [P_s]
175 mmWC Flowing Vacuum [P_f]

1. **Read flow capacity at set vacuum from table** — **Flow = 1,660 NCMH**
2. Calculate over-vacuum — % OV = [(175 - 100)/100] x 100 = 75%
3. **Read "C" factor from table** — **"C" = 0.87**
4. **Calculate flow capacity** — *Flow = 0.87 x 1,660 = 1,444 NCMH*

Model 1361A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Standard Cubic Feet per Hour at 60° F						
psig	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)	14" (350 mm)
1.00	22.6	49.8	86.4	196	322	494	689
1.10	23.6	52.0	90.2	204	336	516	720
1.20	24.5	54.0	93.8	213	349	536	748
1.30	25.4	56.0	97.2	220	362	556	775
1.40	26.2	57.8	100	227	374	574	801
1.50	27.0	59.6	103	234	385	591	825
1.75	28.8	63.5	110	250	411	631	880
2.00	30.4	67.0	116	264	433	665	928
2.25	31.8	70.1	122	276	453	696	971
2.50	33.1	72.8	126	287	471	723	1009
2.75	34.1	75.2	131	296	486	747	1042
3.00	35.1	77.3	134	304	500	767	1070
3.25	35.9	79.0	137	311	511	785	1095
3.50	36.5	80.5	140	317	520	799	1115
>3.50	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 3.5 PSIG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% Over-vacuum at intersection of row 70 and column 5
"C" factor at 75% OV = 0.83

"C" Factor Table										
%OV	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1361A
2 psig set vacuum [P_s]
3.5 psig flowing vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 116,000 SCFH
2. Calculate over-vacuum — % OV = [(3.50 - 2.0)/2.0] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 116,000 = 96,280 SCFH*

Model 1361A
Vacuum Relief Capacity

Set Vacuum (P_s)	Air Flow Capacity at 100% Over-Vacuum (Double Set Vacuum) 1000 Normal Cubic Meters per Hour at 0° C						
barg	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)	14" (350 mm)
0.07	0.66	1.46	2.53	5.74	9.39	14.4	20.2
0.10	0.77	1.71	2.96	6.72	11.0	16.9	23.7
0.11	0.81	1.78	3.09	7.00	11.5	17.6	24.7
0.12	0.84	1.85	3.20	7.26	11.9	18.3	25.6
0.13	0.86	1.91	3.31	7.50	12.3	18.9	26.4
0.14	0.89	1.96	3.41	7.72	12.6	19.4	27.2
0.15	0.91	2.02	3.50	7.93	13.0	19.9	27.9
0.16	0.94	2.07	3.58	8.12	13.3	20.4	28.6
0.17	0.96	2.11	3.66	8.30	13.6	20.9	29.3
0.18	0.98	2.15	3.73	8.47	13.9	21.3	29.8
0.19	0.99	2.19	3.80	8.62	14.1	21.7	30.4
0.20	1.01	2.23	3.86	8.76	14.3	22.0	30.9
0.22	1.04	2.29	3.97	9.01	14.7	22.7	31.7
0.24	1.06	2.34	4.06	9.21	15.1	23.2	32.4
>0.24	**CONSULT FACTORY FOR VACUUM SETTINGS GREATER THAN 0.24 BARG**						

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000.
Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% over-vacuum.

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

Read the flow capacity at 100% over-vacuum directly from the table above. Use linear interpolation if the set vacuum is not listed. (Ref: TPD1)

If the allowable over-vacuum is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable over-vacuum is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage over-vacuum by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OV = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% over-vacuum according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 42% Over-vacuum at intersection of row 40 and column 2
"C" factor at 42% OV = 0.55

"C" Factor Table										
%OV	0	1	2	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

6" Model 1361A
0.12 barg Set Vacuum [P_s]
0.17 barg Flowing Vacuum [P_f]

1. Read flow capacity at set vacuum from table — Flow = 3,200 NCMH
2. Calculate over-vacuum — % OV = [(0.17 - 0.12)/0.12] x 100 = 42%
3. Read "C" factor from table — "C" = 0.55
4. Calculate flow capacity — Flow = 0.55 x 3,200 = 1,760 NCMH

FREE VENTS
Model 5000

- **Sizes 2" through 12"**
- **Available in carbon steel, stainless steel and other materials**
- **High flow capacity**

FREE VENTS

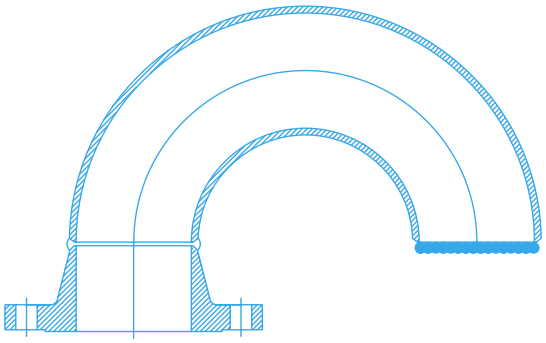
Model 5000 Series are designed to be used on tanks containing non-volatile liquids and on vent pipe extremities. Groth Free Vents offer efficient flow capacity for the protection of the tank.

SPECIAL FEATURES

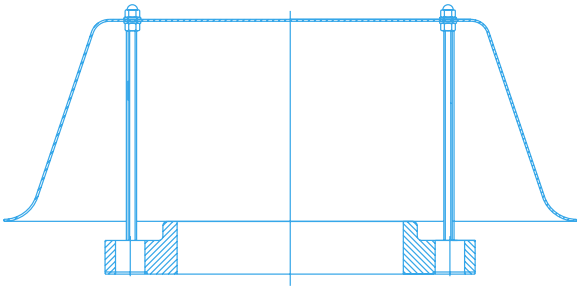
Model 5000 Series are built of corrosion resistant materials throughout. A wire mesh screen prevents foreign matter from entering the tank or pipe opening. Weather hoods are easily removable for inspection of vent and wire mesh screen.

MODEL 5100

MODEL 5000

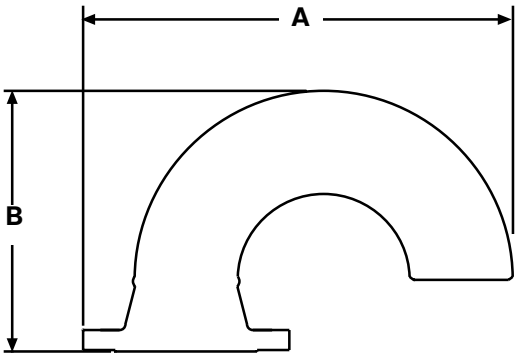


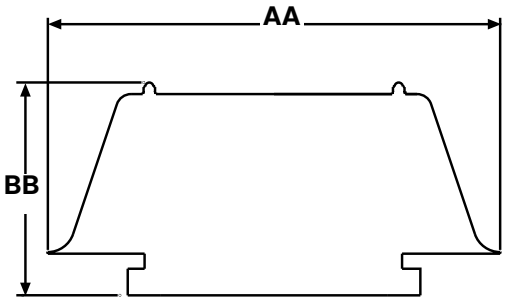
MODEL 5000



MODEL 5100

SPECIFICATIONS





Specifications subject to change without notice. Certified dimensions available upon request.

MODEL 5000

Size◊ Flange (Metric)	A Width (Metric)	B Height (Metric)	Approx. Ship Wt. Lbs.
2"	10.25"	6.87"	8
(50 mm)	(260 mm)	(174 mm)	(4 kg)
3"	14.50"	9.25"	20
(80 mm)	(368 mm)	(235 mm)	(9 kg)
4"	18.75"	11.37"	35
(100 mm)	(476 mm)	(289 mm)	(16 kg)
6"	26.87"	15.68"	70
(150 mm)	(682 mm)	(398 mm)	(32 kg)
8"	35.12"	20.12"	135
(200 mm)	(892 mm)	(511 mm)	(61 kg)
10"	43.37"	24"	235
(250 mm)	(1102 mm)	(610 mm)	(107 kg)
12"	51.87"	28.43"	350
(300 mm)	(1317 mm)	(722 mm)	(159 kg)

MODEL 5100

Size◊ Flange (Metric)	AA Width (Metric)	BB Height (Metric)	Approx. Ship Wt. Lbs.
2"	9.50"	5.37"	11
(50 mm)	(241 mm)	(136 mm)	(5 kg)
3"	11.50"	5.81"	14
(80 mm)	(292 mm)	(148 mm)	(6 kg)
4"	13"	6.31"	18
(100 mm)	(330 mm)	(160 mm)	(8 kg)
6"	17"	7.37"	28
(150 mm)	(432 mm)	(187 mm)	(13 kg)
8"	19.50"	9.25"	42
(200 mm)	(495 mm)	(235 mm)	(19 kg)
10"	23.50"	10.62"	60
(250 mm)	(597 mm)	(270 mm)	(27 kg)
12"	25.50"	11.12"	95
(300 mm)	(648 mm)	(282 mm)	(43 kg)

* Larger sizes available on special application.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

- MODEL #: 5000, 5100
- SIZE: 02" Thru 12"
- MATERIAL (Body Material): 3 = Carbon Steel; 5 = 316SS; Z = Special
- OPTIONS: O = No Options; Z = Special Options

NOTES

- Include model number when ordering.
- For special options, consult factory.

EXAMPLE 5 0 0 0 — 0 2 — 3 — 0

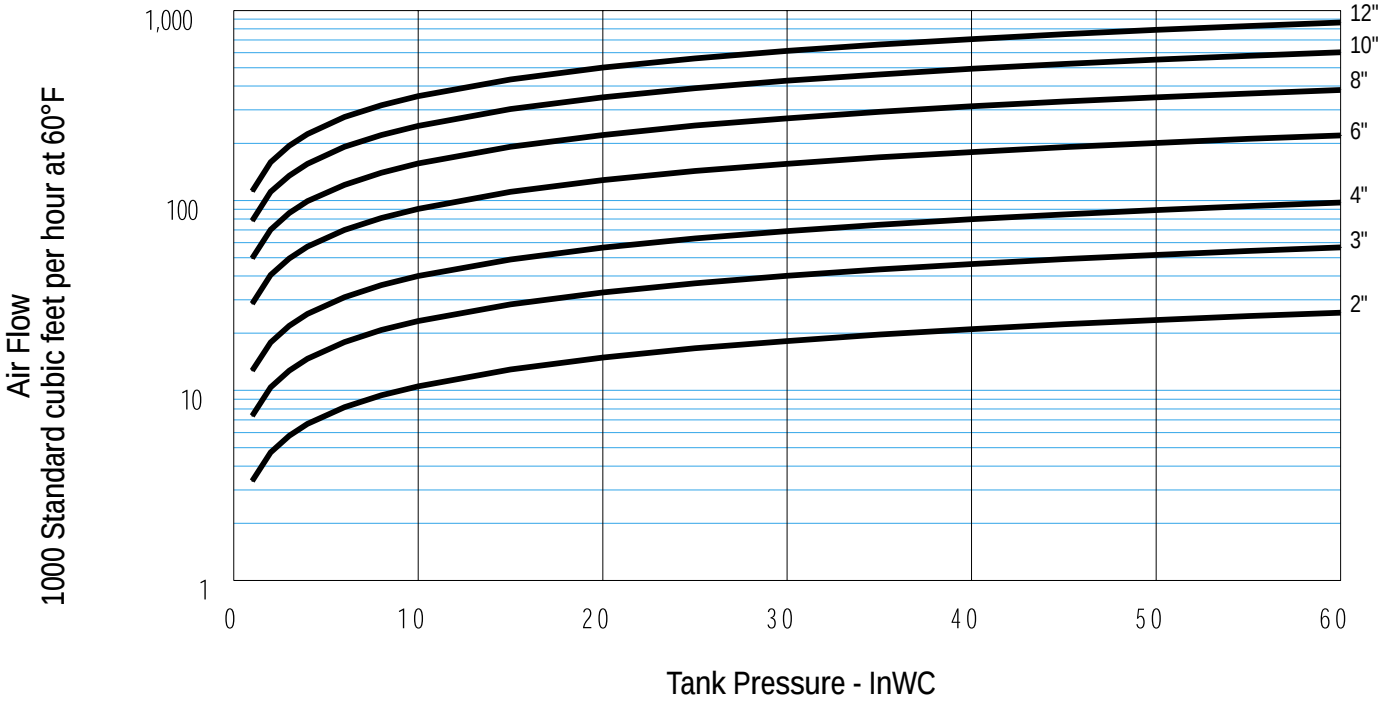
Indicates a 2" Model 5000 with Carbon Steel body and no options.

FREE VENTS

Model 5000
Flow Capacity

Tank Pressure		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.58	3.34	7.34	12.7	28.6	49.6	78.2	112
2	1.16	4.72	10.4	17.9	40.5	70.2	111	159
3	1.73	5.78	12.7	21.9	49.5	85.9	135	194
4	2.31	6.67	14.7	25.3	57.2	99.2	156	224
6	3.47	8.17	18.0	31.0	70.0	121	192	275
8	4.62	9.44	20.8	35.8	80.9	140	221	317
10	5.78	10.5	23.2	40.0	90.4	157	247	354
15	8.66	12.9	28.4	48.9	111	192	303	434
20	11.6	14.9	32.8	56.5	128	221	349	501
25	14.4	16.7	36.6	63.1	143	248	390	560
30	17.3	18.2	40.1	69.1	156	271	427	613
35	20.2	19.7	43.3	74.6	169	293	461	662
40	23.1	21.0	46.3	79.7	180	313	493	707
45	26.0	22.3	49.1	84.5	191	332	523	750
50	28.9	23.5	51.7	89.1	201	349	551	790
55	31.8	24.6	54.2	93.4	211	366	577	828
60	34.7	25.7	56.6	97.5	220	382	603	864

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

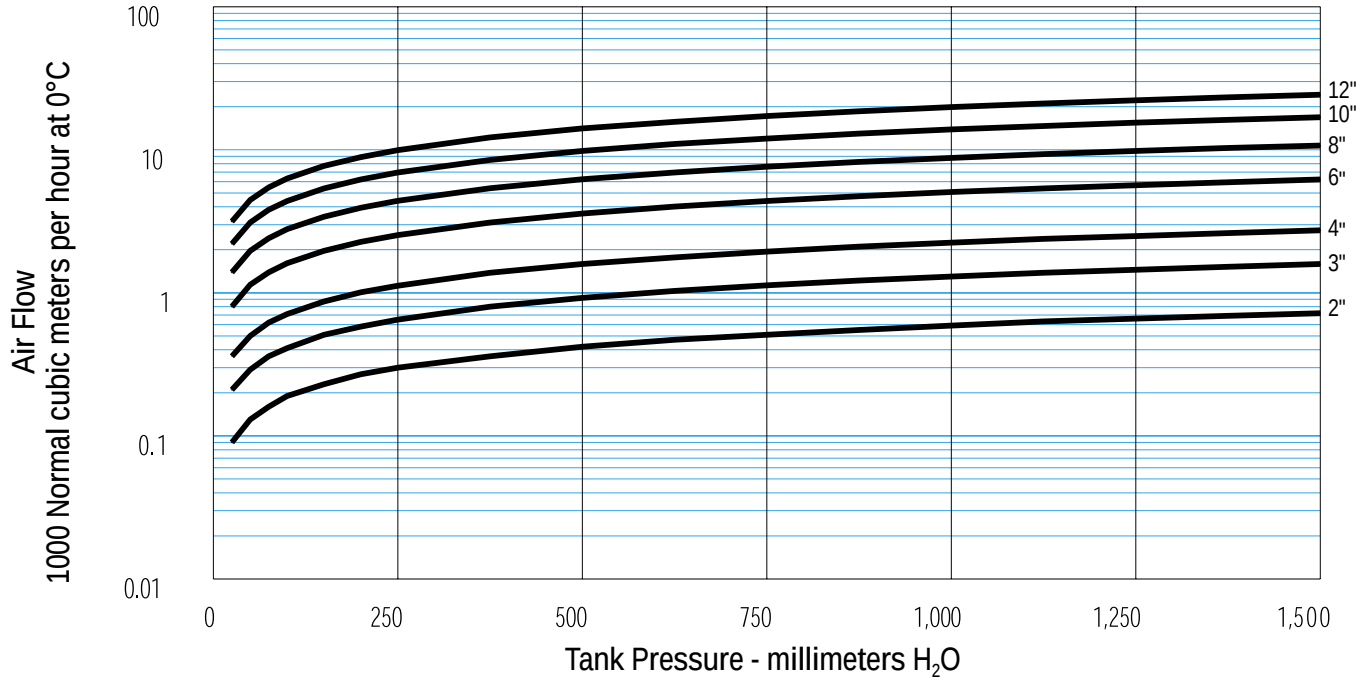


FREE VENTS

Model 5000
Flow Capacity

Tank Pressure		Air Flow - 1000 Normal Cubic Meters per Hour at 0°C						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.45	0.09	0.21	0.36	0.80	1.39	2.20	3.15
50	4.90	0.13	0.29	0.50	1.14	1.97	3.11	4.46
75	7.35	0.16	0.36	0.62	1.39	2.41	3.81	5.46
100	9.80	0.19	0.41	0.71	1.61	2.79	4.40	6.30
150	14.7	0.23	0.51	0.87	1.97	3.41	5.38	7.72
200	19.6	0.27	0.58	1.01	2.27	3.94	6.21	8.91
250	24.5	0.30	0.65	1.12	2.54	4.41	6.95	9.96
375	36.8	0.36	0.80	1.38	3.11	5.39	8.50	12.2
500	49.0	0.42	0.92	1.59	3.59	6.23	9.81	14.1
625	61.3	0.47	1.03	1.77	4.01	6.96	11.0	15.7
750	73.5	0.51	1.13	1.94	4.39	7.62	12.0	17.2
875	85.8	0.55	1.22	2.10	4.74	8.22	13.0	18.6
1000	98.0	0.59	1.30	2.24	5.07	8.79	13.9	19.9
1125	110	0.63	1.38	2.38	5.37	9.32	14.7	21.1
1250	123	0.66	1.45	2.50	5.66	9.82	15.5	22.2
1375	135	0.69	1.52	2.62	5.94	10.3	16.2	23.3
1500	147	0.72	1.59	2.74	6.20	10.7	16.9	24.3

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

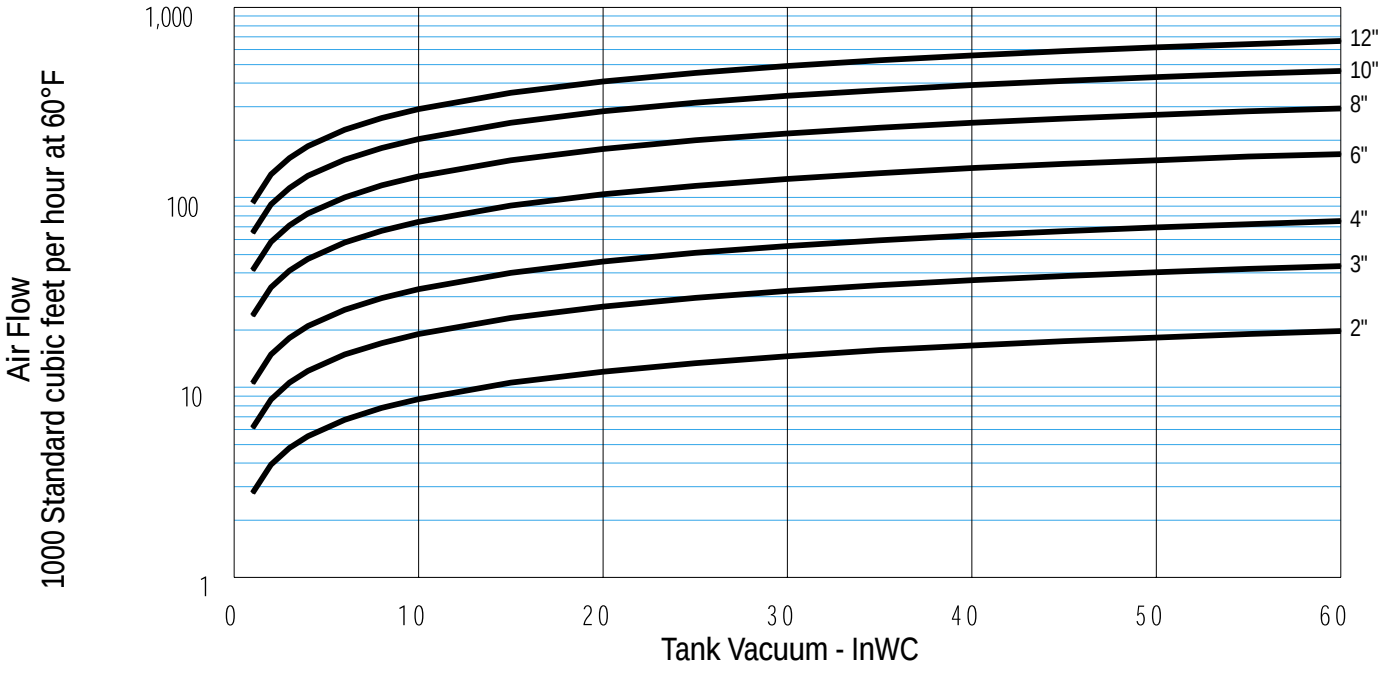


FREE VENTS

Model 5000
Flow Capacity

Tank Vacuum		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.58	2.78	6.11	10.5	23.8	41.3	65.1	93.4
2	1.16	3.92	8.63	14.9	33.6	58.3	91.9	132
3	1.73	4.80	10.6	18.2	41.1	71.3	112	161
4	2.31	5.53	12.2	21.0	47.4	82.3	130	186
6	3.47	6.76	14.9	25.6	57.9	100	158	227
8	4.62	7.79	17.1	29.5	66.7	116	182	262
10	5.78	8.68	19.1	32.9	74.4	129	203	292
15	8.66	10.6	23.2	40.0	90.5	157	247	355
20	11.6	12.1	26.6	45.9	104	180	284	407
25	14.4	13.4	29.6	51.0	115	200	315	452
30	17.3	14.6	32.2	55.4	125	217	343	491
35	20.2	15.7	34.5	59.4	134	233	367	527
40	23.1	16.6	36.6	63.1	143	247	390	559
45	26.0	17.5	38.5	66.4	150	260	411	589
50	28.9	18.3	40.3	69.5	157	272	430	616
55	31.8	19.1	42.0	72.3	164	284	447	641
60	34.7	19.8	43.5	75.0	169	294	463	665

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

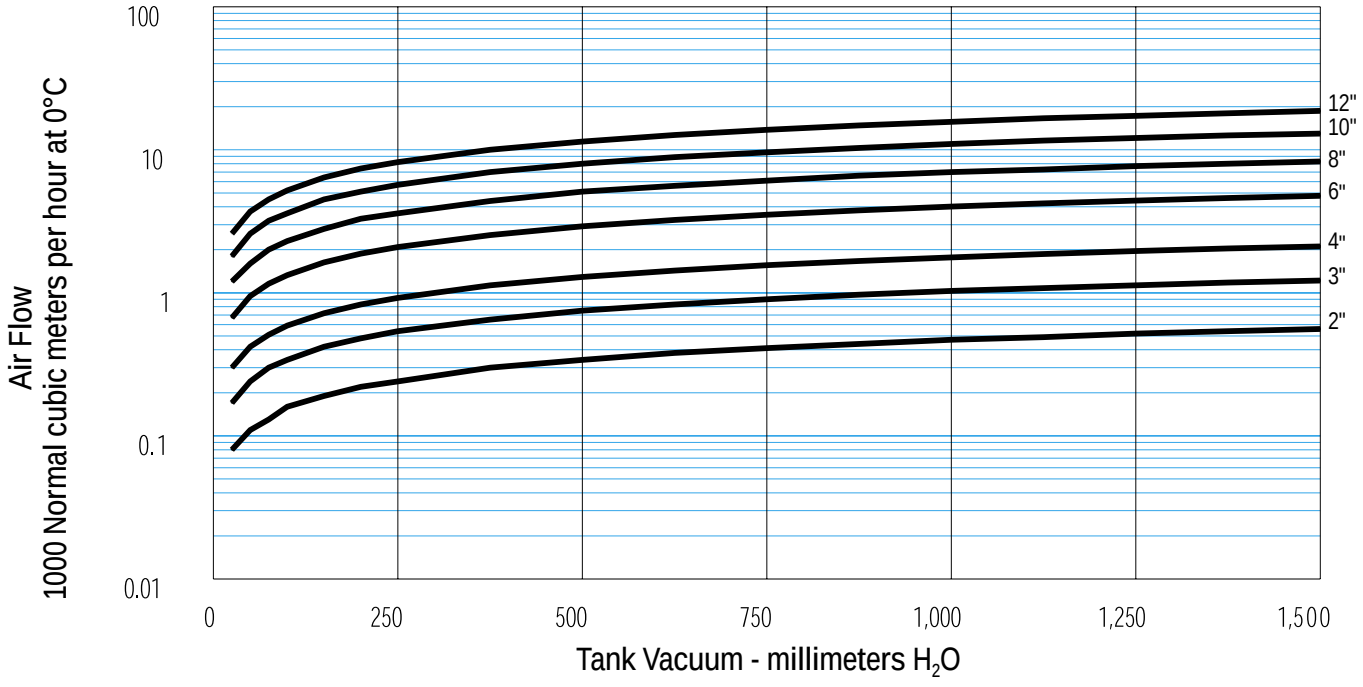


FREE VENTS

Model 5000
Flow Capacity

Tank Vacuum		Air Flow - 1000 Normal Cubic Meters per Hour at 0°C						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.5	0.08	0.17	0.30	0.67	1.2	1.8	2.6
50	4.9	0.11	0.24	0.42	0.95	1.6	2.6	3.7
75	7.4	0.13	0.30	0.51	1.16	2.0	3.2	4.5
100	9.8	0.16	0.34	0.59	1.33	2.3	3.6	5.2
150	14.7	0.19	0.42	0.72	1.63	2.8	4.5	6.4
200	19.6	0.22	0.48	0.83	1.88	3.3	5.1	7.4
250	24.5	0.24	0.54	0.92	2.09	3.6	5.7	8.2
375	36.8	0.30	0.65	1.13	2.54	4.4	7.0	10.0
500	49.0	0.34	0.75	1.29	2.92	5.1	8.0	11.4
625	61.3	0.38	0.83	1.43	3.24	5.6	8.9	12.7
750	73.5	0.41	0.90	1.56	3.52	6.1	9.6	13.8
875	85.8	0.44	0.97	1.67	3.78	6.6	10.3	14.8
1000	98.0	0.47	1.03	1.77	4.01	7.0	11.0	15.7
1125	110	0.49	1.08	1.87	4.23	7.3	11.6	16.6
1250	123	0.52	1.13	1.96	4.42	7.7	12.1	17.3
1375	135	0.54	1.18	2.04	4.60	8.0	12.6	18.0
1500	147	0.56	1.22	2.11	4.77	8.3	13.0	18.7

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

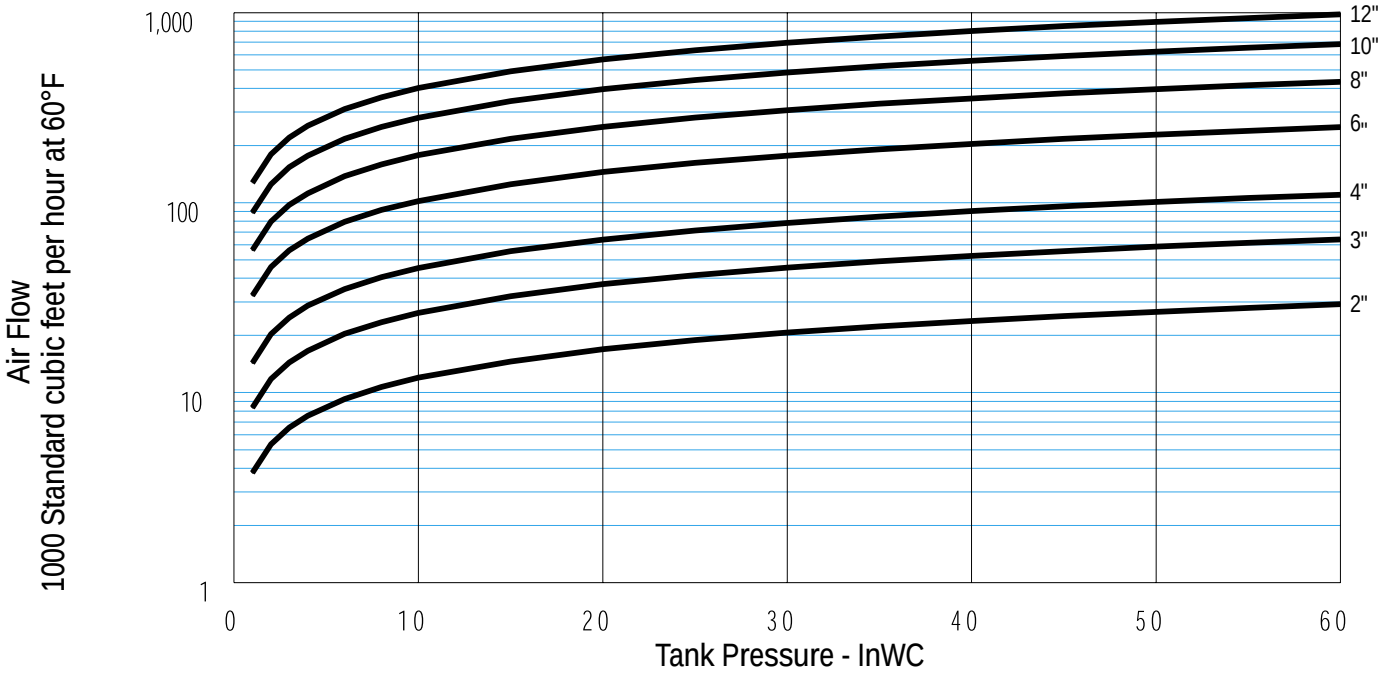


FREE VENTS

Model 5100
Flow Capacity

Tank Pressure		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.58	3.78	8.32	14.3	32.4	56.2	88.6	127
2	1.16	5.35	11.8	20.3	45.8	79.5	125	180
3	1.73	6.55	14.4	24.8	56.1	97.4	154	220
4	2.31	7.56	16.6	28.7	64.8	112	177	254
6	3.47	9.26	20.4	35.1	79.4	138	217	311
8	4.62	10.7	23.5	40.5	91.7	159	251	359
10	5.78	12.0	26.3	45.3	102	178	280	402
15	8.66	14.6	32.2	55.5	125	217	343	492
20	11.6	16.9	37.2	64.0	145	251	396	568
25	14.4	18.9	41.5	71.5	162	281	442	634
30	17.3	20.7	45.5	78.3	177	307	484	695
35	20.2	22.3	49.1	84.6	191	332	523	750
40	23.1	23.8	52.4	90.4	204	354	559	801
45	26.0	25.3	55.6	95.8	217	376	592	850
50	28.9	26.6	58.6	101	228	396	624	895
55	31.8	27.9	61.4	106	239	415	654	938
60	34.7	29.2	64.1	110	250	433	683	980

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

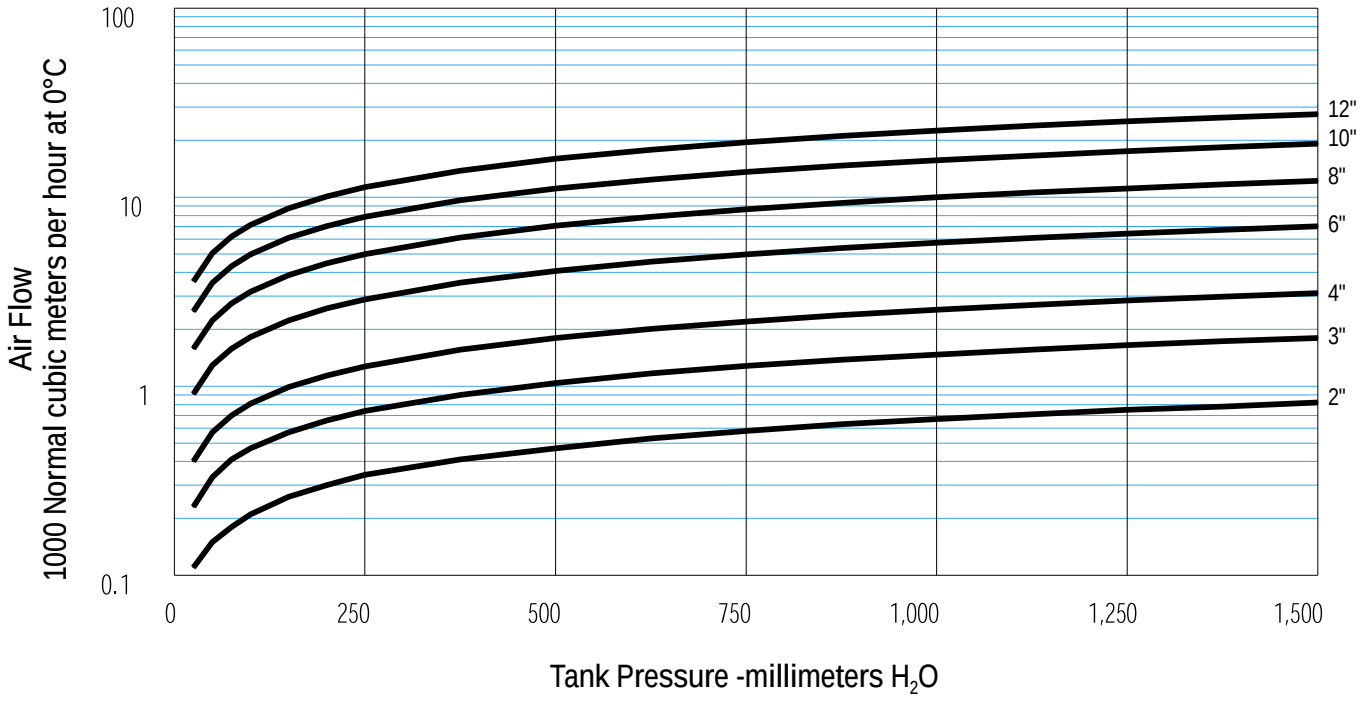


FREE VENTS

Model 5100
Flow Capacity

Tank Pressure		Air Flow - 1000 Normal Cubic Meters per Hour at 0°C						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.45	0.11	0.23	0.40	0.91	1.58	2.49	3.57
50	4.90	0.15	0.33	0.57	1.29	2.23	3.52	5.05
75	7.35	0.18	0.41	0.70	1.58	2.74	4.31	6.19
100	9.80	0.21	0.47	0.81	1.82	3.16	4.98	7.14
150	14.7	0.26	0.57	0.99	2.23	3.87	6.10	8.75
200	19.6	0.30	0.66	1.14	2.58	4.47	7.04	10.1
250	24.5	0.34	0.74	1.27	2.88	4.99	7.87	11.3
375	36.8	0.41	0.90	1.56	3.53	6.11	9.64	13.8
500	49.0	0.47	1.04	1.80	4.07	7.06	11.1	16.0
625	61.3	0.53	1.17	2.01	4.55	7.88	12.4	17.8
750	73.5	0.58	1.28	2.20	4.98	8.63	13.6	19.5
875	85.8	0.63	1.38	2.38	5.38	9.32	14.7	21.1
1000	98.0	0.67	1.47	2.54	5.74	10.0	15.7	22.5
1125	110	0.71	1.56	2.69	6.09	10.6	16.6	23.9
1250	123	0.75	1.65	2.84	6.42	11.1	17.5	25.2
1375	135	0.78	1.73	2.97	6.73	11.7	18.4	26.4
1500	147	0.82	1.80	3.11	7.02	12.2	19.2	27.5

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

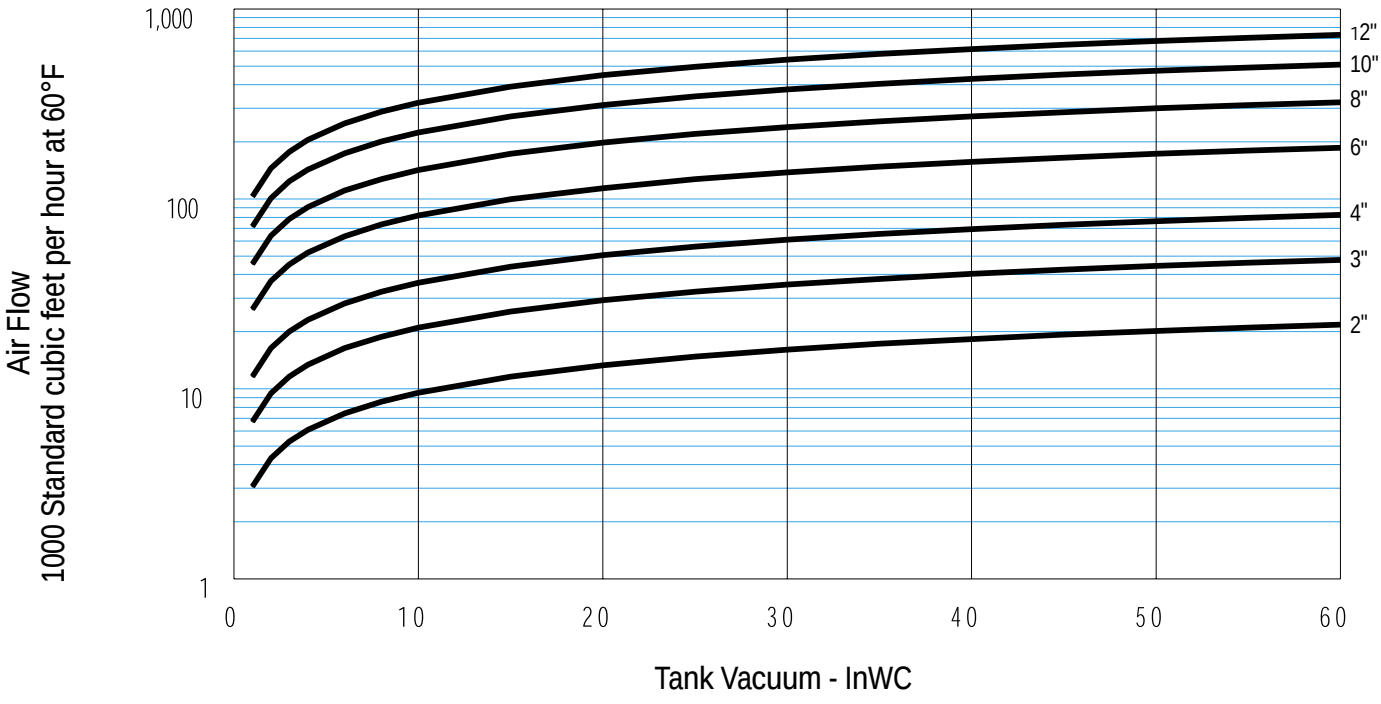


FREE VENTS

Model 5100
Flow Capacity

Tank Vacuum		Air Flow - 1000 Standard Cubic Feet per Hour at 60°F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
1	0.58	3.06	6.72	11.6	26.2	45.4	71.6	103
2	1.16	4.32	9.49	16.4	37.0	64.1	101	145
3	1.73	5.28	11.6	20.0	45.2	78.5	124	177
4	2.31	6.09	13.4	23.1	52.2	90.5	143	205
6	3.47	7.44	16.4	28.2	63.7	111	174	250
8	4.62	8.56	18.8	32.5	73.4	127	201	288
10	5.78	9.55	21.0	36.2	81.8	142	224	321
15	8.66	11.6	25.5	44.0	99.6	173	272	390
20	11.6	13.3	29.3	50.5	114	198	312	448
25	14.4	14.8	32.5	56.1	127	220	347	497
30	17.3	16.1	35.4	61.0	138	239	377	541
35	20.2	17.3	37.9	65.4	148	256	404	580
40	23.1	18.3	40.3	69.4	157	272	429	615
45	26.0	19.3	42.4	73.1	165	286	452	648
50	28.9	20.2	44.4	76.4	173	300	473	678
55	31.8	21.0	46.2	79.6	180	312	492	705
60	34.7	21.8	47.8	82.5	186	323	510	731

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.

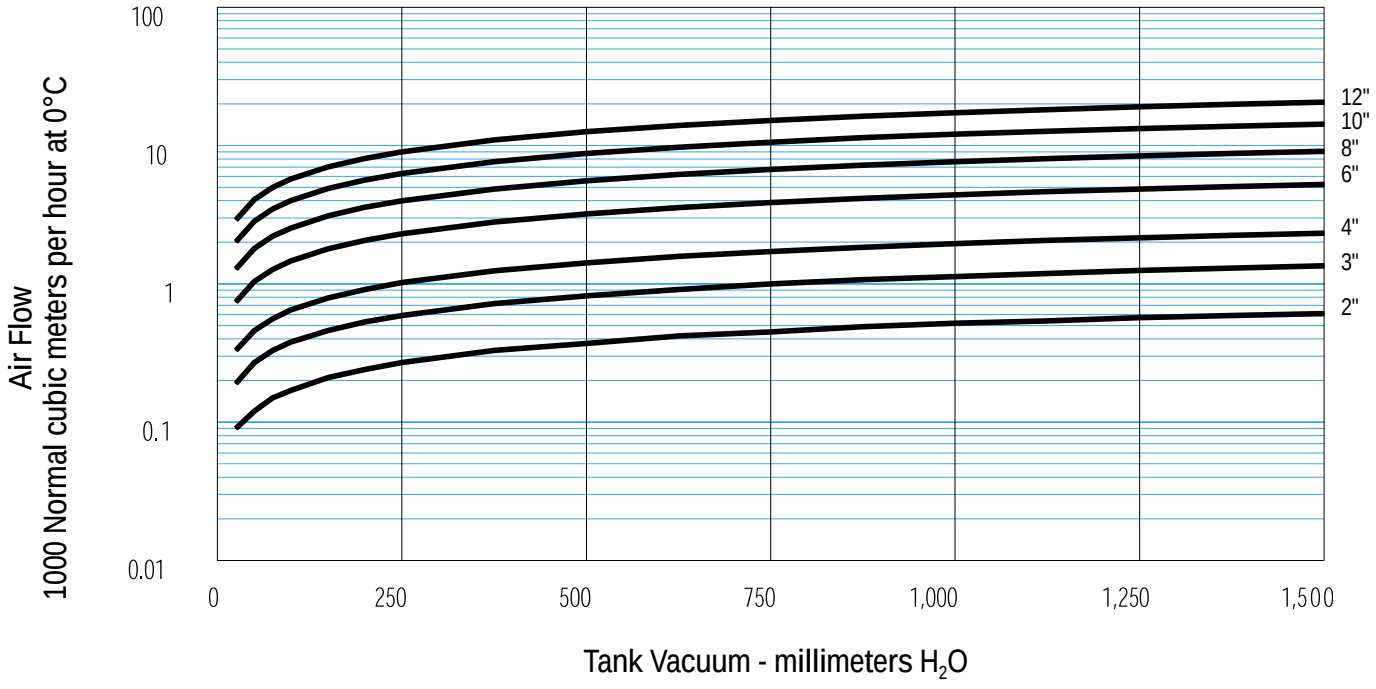


FREE VENTS

Model 5100
Flow Capacity

Tank Vacuum		Air Flow - 1000 Normal Cubic Meters per Hour at 0°C						
mm H_2O	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
25	2.45	0.09	0.19	0.33	0.74	1.28	2.01	2.89
50	4.90	0.12	0.27	0.46	1.04	1.80	2.84	4.08
75	7.35	0.15	0.33	0.56	1.27	2.21	3.48	4.99
100	9.80	0.17	0.38	0.65	1.47	2.54	4.01	5.75
150	14.7	0.21	0.46	0.79	1.79	3.11	4.90	7.02
200	19.6	0.24	0.53	0.91	2.06	3.58	5.64	8.09
250	24.5	0.27	0.59	1.02	2.30	3.99	6.29	9.02
375	36.8	0.33	0.72	1.24	2.80	4.85	7.65	11.0
500	49.0	0.37	0.82	1.42	3.21	5.57	8.78	12.6
625	61.3	0.42	0.91	1.58	3.56	6.18	9.74	14.0
750	73.5	0.45	1.00	1.71	3.88	6.72	10.6	15.2
875	85.8	0.49	1.07	1.84	4.16	7.21	11.4	16.3
1000	98.0	0.52	1.13	1.95	4.41	7.65	12.1	17.3
1125	110	0.54	1.19	2.06	4.65	8.06	12.7	18.2
1250	123	0.57	1.25	2.15	4.86	8.43	13.3	19.1
1375	135	0.59	1.30	2.24	5.06	8.78	13.8	19.9
1500	147	0.61	1.35	2.32	5.25	9.10	14.3	20.6

1. Flow facility and equipment comply with API 2000.
2. Flow measurement accuracy verified by an independent research organization.
3. Flow capacity is based on actual tests and certified by Groth Corporation.



Model 6000/6100
GAUGE HATCHES

- **Sizes 4" through 10"**
- **Available in aluminum, carbon steel, stainless steel and additional materials**
- **Available in free lift or lockdown cover**
- **Designed to assure uniform seating**

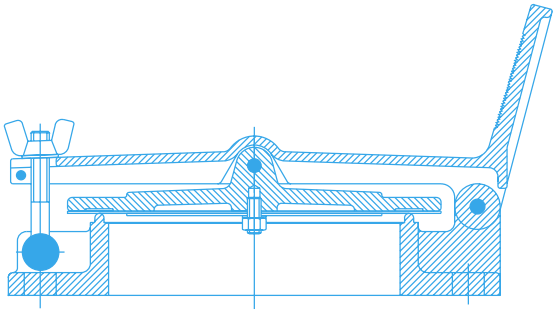
GAUGE HATCH

Model 6000 Series provide access for gauging or obtaining product samples from storage tanks. The Model 6000 also provides pressure relief as emergency venting. The Model 6100 incorporates a positive cover hold down which assures a premium tight seal on tanks with internal pressures up to 3 psig. Gasketed covers are recommended on tanks with high pressure settings. Model 6100 offers lockdown capability.

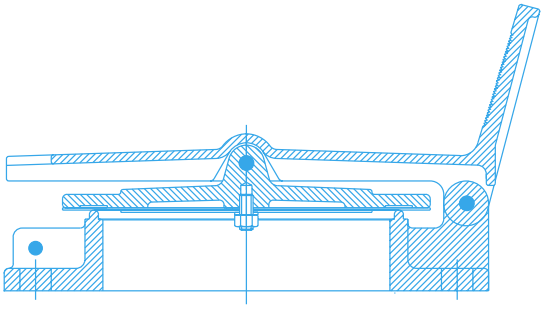
SPECIAL FEATURES

Model 6000 Series is designed with a serrated foot lever surface to avoid foot slippage when opening. This model permits the use of both hands during gauging or sampling. Gravity will close the cover upon removal of pressure on the foot treadle. Groth's special "cushioned-air" seating or metal-to-metal seatings available.

MODEL 6100

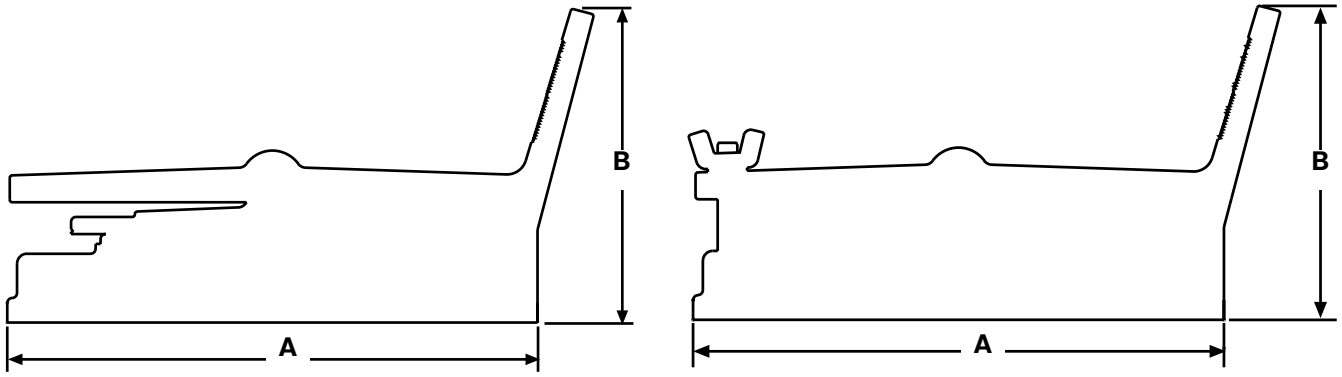


MODEL 6100



MODEL 6000

SPECIFICATIONS



Specifications subject to change without notice. Certified dimensions available upon request.

Size (Metric)	A Width (Metric)	B Height (Metric)	Approx. Ship Wt. Lbs. (Aluminum)
4" (100 mm)	10" (250 mm)	6" (152 mm)	7 (3 kg)
6" (150 mm)	12.50" (318 mm)	8" (203 mm)	10 (5 kg)
8" (200 mm)	15" (381 mm)	8" (203 mm)	13 (6 kg)
10" (250 mm)	17.75" (451 mm)	9" (229 mm)	17 (8 kg)

‡ When gauge hatch includes the lockdown feature, change model number to 6100. † 150 # ANSI. drilling compatibility, F.F. on aluminum, carbon steel, and stainless steel alloys.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — OPTIONS

- MODEL #: 6000, 6100
- SIZE: 04" Thru 10"
- MATERIAL:
  - 1 = Aluminum
  - 3 = Carbon Steel
  - 5 = 316SS
  - Z = Special
- OPTIONS:
  - O = No Options
  - Z = Special Options
  - D = Drilled 150 # ANSI
  - U = Undrilled
  - Diaphragm Material (Seat):
    - B = Buna-N
    - T = TEFLON®
    - V = VITON®
    - M = Metal-to-Metal
    - Z = Special

NOTES

- Include model number when ordering.
- For special options, consult factory.

EXAMPLE 6 0 0 0 — 0 4 — 1 — T 0 0

Indicates a 4" Model 6000 with Aluminum material, TEFLON® Diaphragm, Drilled Flange and no other options.

EMERGENCY PRESSURE RELIEF VALVE
Model 2000A

- **Sizes 16", 20" and 24"**
- **Pressure settings 1.5 - 16 oz/in²**
- **Vacuum settings 0.5 - 4 oz/in²**
- **Available in carbon steel, stainless steel, fiberglass and other materials**
- **Easy access manway combined with emergency relief**

EMERGENCY PRESSURE RELIEF VALVE

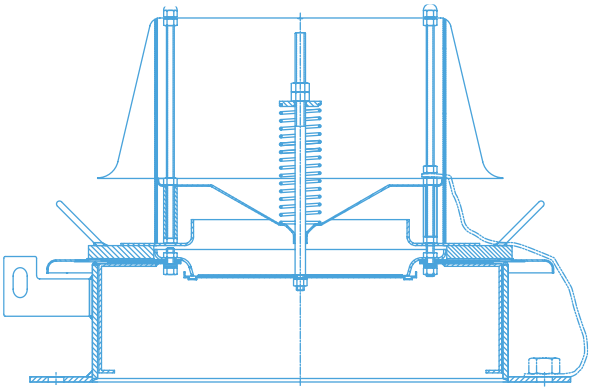
Model 2000A is designed to provide emergency relief capacity beyond that furnished by the normal operating pressure relief valve on the tank. The valve protects the tank against rupture or explosion that could result from excessive internal pressures caused by fire, etc. As excessive pressure builds up, the Groth Model 2000A relieves excess pressure, then reseats when pressure has been dissipated. Removable stops can be provided which restrict the lift of the cover.

SPECIAL FEATURES

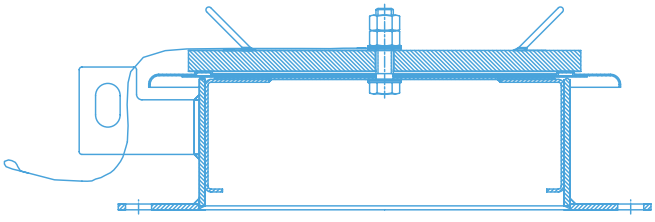
Model 2000A is built of corrosion resistant materials throughout. A grounding cable connects the head and flange. Groth's special TEFLON® "cushioned air" pallet and peripheral guiding insures proper alignment and integrity of seating. Model 2050A incorporates a vacuum breaker for added vacuum relief capability.

MODEL 2000A (pressure)

MODEL 2050A (pressure & vacuum)

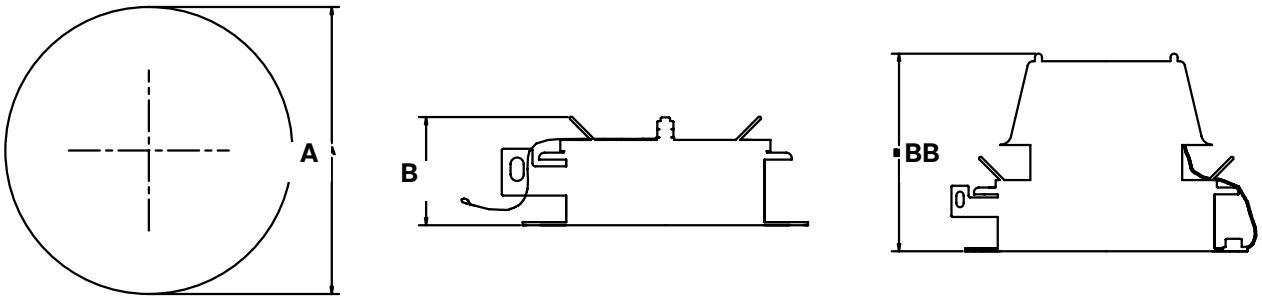


MODEL 2050A



MODEL 2000A

SPECIFICATIONS



MODEL 2000A

Specifications subject to change without notice. Certified dimensions available upon request.

Size* (Metric)	Minimum Pressure Setting Weight Loaded	Maximum Pressure Setting Weight Loaded	A Width (Metric)	B Height† (Metric)	Approx. Ship Wt. Lbs. (At min. setting)
16" (406 mm)	1.50 oz/in² (6.5 mbar)	16 oz/in² (69 mbar)	23.50" (597 mm)	11" (279 mm)	62 (28 kg)
20" (508 mm)	1.50 oz/in² (6.5 mbar)		27.50" (699 mm)	11" (279 mm)	88 (40 kg)
24" (610 mm)	1.50 oz/in² (6.5 mbar)		32" (813 mm)	11" (279 mm)	114 (52 kg)

MODEL 2050A

Specifications subject to change without notice. Certified dimensions available upon request.

Size* (Metric)	Minimum Setting		Maximum Settings	A Width (Metric)	BB Height Closed (Metric)	Approx. Ship Wt. Lbs. (At min. setting)
	Pressure Weight Loaded	Vacuum Spring Loaded	Pressure[s] ◊ Weight Loaded			
16" (406 mm)	2.6 oz/in² (11.2 mbar)	0.5 oz/in² (2.2 mbar)	0.8 oz/in² (34.5 mbar)	23.50" (597 mm)	17.75" (451 mm)	69 (31 kg)
20" (508 mm)	2.1 oz/in² (9.1 mbar)			27.50" (699 mm)	17.75" (451 mm)	95 (43 kg)
24" (610 mm)	1.9 oz/in² (8.2 mbar)			32" (813 mm)	17.75" (451 mm)	120 (55 kg)

* 150# ANSI. or API 650 drilling compatibility. "Caution" — See IOM when mounting to API 650 flange. [s] Maximum pressure setting on 16" size = 4 oz/in²
◊ Max. vacuum setting is 4 oz./in² Fiberglass dimensions on request.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

- 2000A Pressure only
- 2050A Pressure/vacuum

SIZE: 16" / 20" / 24"

* Material:
- 3 = Carbon Steel
- 5 = 316SS
- 6 = Vinyl Ester Resin
- 7 = Furan
- Z = Special

OPTIONS:
- O = No Options
- Z = Special Options
- O = No Jacket
- J = Steam Jacket
- 1 = ANSI. 150# drilled
- 2 = A.P.I. 650 drilled
- Diaphragm Material (Seat):
  - B = Buna-N
  - T = TEFLON®
  - V = VITON®
  - Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure / temperature.
- * Stainless steel guides and stems are standard with aluminum and carbon steel bodies.

EXAMPLE 6 0 0 0 — 0 4 — 1 — T D 0

Indicates a 20" Model 2000A with 316 SS Material, TEFLON® Seat Diaphragm, ANSI 150# Drilled, Steam Jacket and no other options.

EMERGENCY PRESSURE RELIEF VALVE

Model 2000A/2050A
Emergency Pressure and Vacuum Relief Capacity

Set Pressure/Vacuum (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure/Vacuum) 1000 Standard Cubic Feet per Hour at 60° F				
InWC	oz/in^2	16" Pressure	20" Pressure	24" Pressure	All Vacuum	2050 Only
0.87	0.50*				65	For Vacuum **Flow,** Use the "C1" Factor Table Located with Model 2100
1.73	1.00*				91	
2.60	1.50	422	668	970		
3.00	1.73	454	718	1043		
3.46	2.00*	487	771	1120	129	
4.00	2.31	524	829	1204		
4.33	2.50	545	862	1252		
5.00	2.89	585	926	1345		
5.19	3.00*	597	944	1371	157	
6.93	4.00*	689	1090	1583	180	
10.4	6.00	843	1334	1937		
13.9	8.00	973	1539	2236		
17.3	10.0	1087	1720	2498		
20.8	12.0	1190	1883	2735		
24.2	14.0	1284	2033	2952		
27.7	16.0	1372	2172	3154		

* Standard vacuum settings, consult factory for other settings.

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Vacuum flow rating applies only to Model 2050A.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.95

"C4" Factor Table - Pressure Only										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.74	0.75
20	0.75	0.76	0.76	0.77	0.77	0.78	0.78	0.79	0.79	0.80
30	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85
40	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.89	0.90
50	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.92	0.92
60	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.94	0.94
70	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.96	0.96
80	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.98	0.98
90	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00

Example—Flow Capacity Calculation

20" Model 2000A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 829,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75
3. Read "C4" factor from table — "C" = 0.95
4. Calculate flow capacity — *Flow = 0.95 x 829,000 = 787,550 SCFH*

Type	2000A	2050A
Pressure	✓	✓
Vacuum		✓

EMERGENCY PRESSURE AND VACUUM RELIEF VALVE

Model 2000A/2050A
Emergency Pressure and Vacuum Relief Capacity

Set Pressure/Vacuum (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure/Vacuum) 1000 Normal Cubic Meters per Hour at 0° C				
mmWC	mb	16" Pressure	20" Pressure	24" Pressure	All Vacuum	2050 Only
22	2.16*				1.83	For Vacuum **Flow,** Use the "C1" Factor Table Located with Model 2100
44	4.31*				2.58	
88	8.63*	13.8	21.9	31.7	3.63	
100	9.80	14.7	23.3	33.8		
132	12.9*	16.9	26.8	38.9	4.42	
176	17.3*	19.5	30.9	44.9	5.08	
200	19.6	20.8	32.9	47.8		
250	24.5	23.2	36.8	53.4		
300	29.4	25.5	40.3	58.5		
350	34.3	27.5	43.5	63.2		
400	39.2	29.4	46.5	67.5		
500	49.0	32.8	51.9	75.4		
600	58.8	35.9	56.9	82.6		
700	68.6	38.8	61.4	89.1		

* Standard vacuum settings, consult factory for other settings.

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Vacuum flow rating applies only to Model 2050A.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:

Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.95

"C4" Factor Table - Pressure Only										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.74	0.75
20	0.75	0.76	0.76	0.77	0.77	0.78	0.78	0.79	0.79	0.80
30	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85
40	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.89	0.90
50	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.92	0.92
60	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.94	0.94
70	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.96	0.96
80	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.98	0.98
90	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00

Example—Flow Capacity Calculation

20" Model 2000A
100 mmWC Set Pressure [P_s]
175 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table
2. Calculate overpressure
3. Read "C4" factor from table
4. Calculate flow capacity

Flow = 23,300 NCMH
% OP = [(175 - 100)/100] x 100 = 75%
"C" = 0.95

Flow = 0.95 x 23,300 = 22,135 NCMH

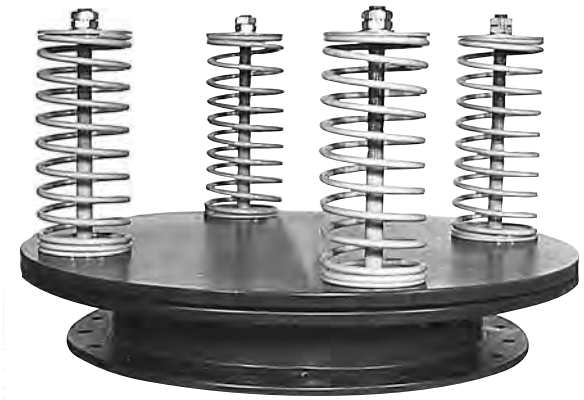
Type	2000A	2050A
Pressure	✓	✓
Vacuum		✓

EMERGENCY PRESSURE RELIEF VALVE
Model 2100

- **Sizes 16", 20" and 24"**
- **Pressure settings 1 - 15 psig**
- **Available in carbon steel, stainless steel and other materials**
- **Unique design – spring loaded cover**

EMERGENCY PRESSURE RELIEF VALVE

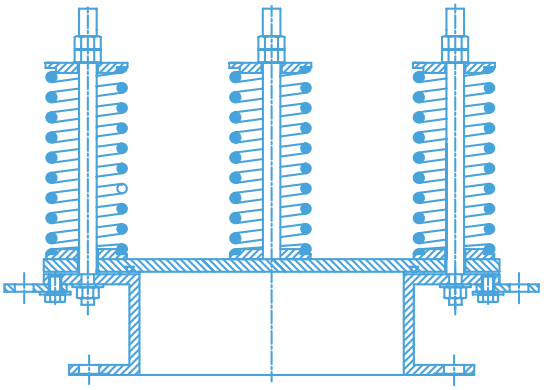
Model 2100 is designed to provide emergency relief capacity beyond that furnished by the normal operating pressure relief valve on the tank. The valve protects the tank against rupture or explosion that could result from excessive internal pressures caused by fire, etc. Model 2100 is designed to be self-closing. As excessive pressure builds up, Model 2100 relieves, then reseats when the overpressure has been dissipated.



MODEL 2100

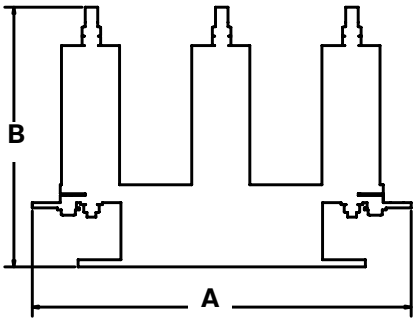
SPECIAL FEATURES

Model 2100 is built of corrosion resistant materials throughout. It is designed with independently adjustable springs which load the cover and keep the valve tightly sealed until set pressure is reached. The Model 2100 features a VITON® seating to ensure a tight seal.



MODEL 2100

SPECIFICATIONS



Specifications subject to change without notice. Certified dimensions available upon request.

Size* Flange (Metric)	Minimum Setting Pressure Spring Loaded	Maximum Setting Pressure Spring Loaded	A Width (Metric)	B Height† (Metric)	Approx. Ship Wt. Lbs.	
					(At min. set.)	(At max. set.)
16" (406 mm)			**36.75"** (933 mm)	**23"** (584 mm)	310 (141 kg)	490 (223 kg)
20" (508 mm)	1 psig (69 mbar)	15 psig (1.03 bar)	**36.75"** (933 mm)	**23"** (584 mm)	335 (152 kg)	500 (227 kg)
24" (610 mm)			**40.75"** (1035 mm)	**27"** (686 mm)	420 (190 kg)	670 (304 kg)

* 150# ANSI. drilling compatibility, or API 650 drilled flange option

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — 2100

SIZE — 16" 20" 24"

MATERIAL — * Material
3 = Carbon Steel
5 = 316SS
Z = Special

OPTIONS
O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket

1 = ANSI. 150# drilled
2 = A.P.I. 650 drilled

O-Ring Material (Seat)#
B = Buna-N
V = VITON®
Z = Special

NOTES
- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.

* Seat material on carbon steel base is 316 Stainless Steel weld overlay.
\# TEFLON® O-ring not available.

EXAMPLE 2 1 0 0 — 2 0 — 5 — V 1 J 0

Indicates a 20" Model 2100 with 316 SS Material, VITON® Seat O-Ring, ANSI 150# Drilled, Steam Jacket and no other options.

GROTH CORPORATION
a Continental Disc company

EMERGENCY PRESSURE RELIEF VALVE

Model 2100
Emergency Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Standard Cubic Feet per Hour at 60° F		
psig	16" (406 mm)	20" (508 mm)	24" (610 mm)
1.00	609	952	1371
2.00	857	1340	1930
3.00	1045	1633	2352
4.00	1201	1877	2704
5.00	1337	2089	3009
6.00	1458	2278	3282
7.00	1568	2450	3529
8.00	1669	2608	3757
9.00	1763	2755	3969
10.0	1851	2893	4167
11.0	1934	3022	4353
12.0	2012	3145	4530
13.0	2087	3261	4697
14.0	2158	3372	4857
15.0	2226	3478	5010

Flow capacity values listed above are based on full open valves at 100% overpressure.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C1" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

20" Model 2100
4 psig set pressure [P_s]
7 psig flowing pressure [P_f]

1. Read flow capacity at set pressure from table
2. Calculate overpressure
3. Read "C" factor from table
4. Calculate flow capacity

Flow = 1,877,000 SCFH
% OP = [(7 - 4)/4] x 100 = 75%
"C" = 0.83
Flow = 0.83 x 1,877,000 = 1,557,910 SCFH

EMERGENCY PRESSURE RELIEF VALVE

Model 2100
Emergency Pressure Relief Capacity

Set Pressure (P_s)	Air Flow Capacity at 100% Overpressure (Double Set Pressure) 1000 Normal Cubic Meters per Hour at 0°C		
barg	16" (406 mm)	20" (508 mm)	24" (610 mm)
0.07	17.8	27.8	39.9
0.10	21.2	33.1	47.6
0.15	25.8	40.4	58.1
0.20	29.7	46.5	66.8
0.25	33.1	51.8	74.5
0.30	36.2	56.6	81.3
0.35	38.9	60.9	87.5
0.40	41.5	64.9	93.3
0.45	43.9	68.6	98.6
0.50	46.1	72.1	104
0.55	48.2	75.4	108
0.60	50.2	78.5	113
0.70	53.9	84.3	121
0.80	57.3	89.6	129
0.90	60.5	94.6	136
1.00	63.4	99.2	143

Flow capacity values listed above are based on full open valves at 100% overpressure.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.83

"C1" Factor Table										
%OP	0	1	3	3	4	5	6	7	8	9
10	•••Consult Factory•••									
20	0.27	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.40
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.52
40	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
50	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71
60	0.72	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79
70	0.80	0.80	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86
80	0.87	0.87	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
90	0.94	0.94	0.95	0.96	0.96	0.97	0.97	0.98	0.99	1.00

Example—Flow Capacity Calculation

20" Model 2100
0.4 barg Set Pressure [P_s]
0.7 barg Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 64,900 NCMH
2. Calculate overpressure — % OP = [(0.7 - 0.4)/0.4] x 100 = 75%
3. Read "C" factor from table — "C" = 0.83
4. Calculate flow capacity — *Flow = 0.83 x 64,900 = 53,867 NCMH*

EMERGENCY PRESSURE RELIEF VALVE

Model 2400A/2450A

- **Sizes 16", 20" and 24"**
- **Pressure settings 1.5 - 8 oz/in²**
- **Vacuum settings 0.5 - 4 oz/in²**
- **Hinged with lift stop for positive reseating**
- **Available in carbon steel, stainless steel, and other materials**
- **Easy access manway combined with emergency relief**

EMERGENCY PRESSURE RELIEF VALVE

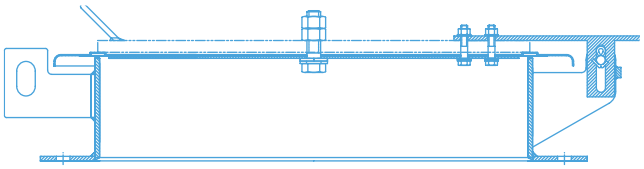
Series 2400A is designed to provide emergency relief capacity beyond that furnished by the normal operating pressure/vacuum relief valve on the tank. The valve protects the tank against rupture or internal pressures caused by fire exposure. Series 2400A is designed to be self-closing. As excessive pressure builds up, Series 2400A relieves, then reseats when overpressure has been dissipated. Counter weights are available for lower settings.

SPECIAL FEATURES

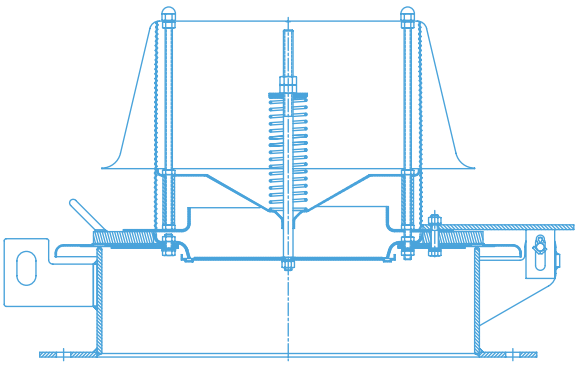
Series 2400A is built of corrosion resistant material throughout. Groth's special TEFLON® "cushioned air" pallet provides integrity of seating. The Model 2450A incorporates a vacuum breaker.

MODEL 2400A (pressure)

MODEL 2450A pressure/vacuum

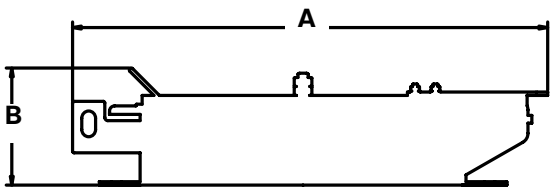


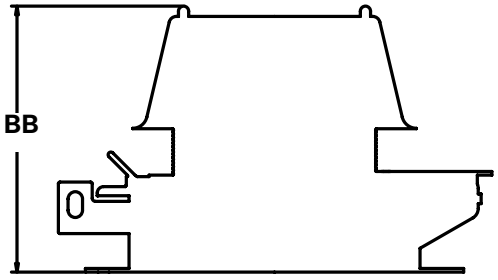
MODEL 2400A



MODEL 2450A

SPECIFICATIONS





Model 2400A

Specifications subject to change without notice. Certified dimensions available upon request.

Size* (Metric)	Standard Setting Pressure Weight Loaded	Maximum Setting Pressure Weight Loaded	A Width (Metric)	B Height (At max. setting)		Approx. Ship Wt. Lbs. (At min. setting)
				Closed (Metric)	Open (Metric)	
16" (406 mm)	1.5 oz/in2 (6.5 mbar)	8 oz/in² (34.5 mbar)	23.50" (597 mm)	11" (279 mm)	20.50" (521 mm)	72 (33 kg)
20" (508 mm)	1.5 oz/in2 (6.5 mbar)		28.75" (730 mm)		22.50" (572 mm)	98 (45 kg)
24" (610 mm)	1.5 oz/in2 (6.5 mbar)		33.25" (845 mm)		24.50" (622 mm)	124 (56 kg)

MODEL 2450A

Specifications subject to change without notice. Certified dimensions available upon request.

Size* (Metric)	Standard Setting		Maximum Setting	A Width (Metric)	B Height		Approx. Ship Wt. Lbs. (At min. setting)
	Pressure † Weight Loaded	Vacuum Spring Loaded	Pressure s◊ Weight Loaded		Closed (Metric)	Open (Metric)	
16" (406 mm)	2.7 oz/in² (11.6 mbar)	0.5 oz/in² (2.2 mbar)	8 oz/in² (34.5 mbar)	23.50" (597 mm)	18.50" (470 mm)	24.50" (622 mm)	79 (36 kg)
20" (508 mm)	2.3 oz/in² (9.9 mbar)			28.75" (730 mm)		**26"** (660 mm)	105 (48 kg)
24" (610 mm)	2.0 oz/in² (8.6 mbar)			33.25" (845 mm)		27.50" (699 mm)	130 (59 kg)

* 150# ANSI. or API 650 drilling compatibility. † Minimum pressure setting 1.0 oz/in² on special application.
s Maximum pressure setting on 16" size = 4 oz/in2. Fiberglass dimensions on request.
"Caution" — See IOM when mounting to API 650 flange. ◊ Max. vacuum setting is 4 oz./in². **Minimum pressure setting 1.5 oz/in2 on special application.

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # | SIZE | MATERIAL | OPTIONS

2400A Pressure only
2450A Pressure/vacuum

16"
20"
24"

* Material
3 = Carbon Steel
5 = 316SS
Z = Special

O = No Options
Z = Special Options

O = No Jacket
J = Steam Jacket

1 = ANSI. 150# drilled
2 = A.P.I. 650 drilled

Diaphragm Material (Seat):
B = Buna-N
T = TEFLON®
V = VITON®
Z = Special

NOTES

- Include model number and setting when ordering.
- For special options, consult factory.
- When ordering steam jacket, include steam pressure/temperature.
- * Seat material on a carbon steel base is type 316 Stainless Steel weld overlay.

EXAMPLE 2 4 0 0 A — 2 0 — 5 — T 1 J 0

Indicates a 20" Model 2400A with 316 SS Material, TEFLON® Seat Diaphragm, ANSI 150# Drilled, Steam Jacket and no other options.

EMERGENCY PRESSURE RELIEF VALVE

Model 2400A/2450A
Emergency Pressure and Vacuum Relief Capacity

Set Pressure/Vacuum (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure/Vacuum) 1000 Standard Cubic Feet per Hour at 60° F				
InWC	oz/in^2	16" Pressure	20" Pressure	24" Pressure	All Vacuum	2450 Only
0.87	0.50				65	For Vacuum **Flow,** Use the "C1" Factor Table Located with Model 2100
1.73	1.00				91	
2.60	1.50	422	668	970		
3.00	1.73	454	718	1043		
3.46	2.00	487	771	1120	129	
4.00	2.31	524	829	1204		
4.33	2.50	545	862	1252		
5.00	2.89	585	926	1345		
5.19	3.00	597	944	1371	157	
6.93	4.00	689	1090	1583	180	
10.4	6.00	843	1334	1937		
13.9	8.00	973	1539	2236		

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

[#] Other vacuum settings available on special order.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Vacuum flow rating applies only to Model 2450A.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.95

"C4" Factor Table - Pressure Only										
%OP	0	1	2	3	4	5	6	7	8	9
0	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.74	0.75
20	0.75	0.76	0.76	0.77	0.77	0.78	0.78	0.79	0.79	0.80
30	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85
40	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.89	0.90
50	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.92	0.92
60	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.94	0.94
70	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.96	0.96
80	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.98	0.98
90	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00

Example—Flow Capacity Calculation

20" Model 2400A
4 InWC set pressure [P_s]
7 InWC flowing pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 829,000 SCFH
2. Calculate overpressure — % OP = [(7 - 4)/4] x 100 = 75
3. Read "C4" factor from table — "C" = 0.95
4. Calculate flow capacity — *Flow = 0.95 x 829,000 = 787,550 SCFH*

Type	2400A	2450A
Pressure	✓	✓
Vacuum		✓

EMERGENCY PRESSURE AND VACUUM RELIEF VALVE

Model 2400A/2450A
Emergency Pressure and Vacuum Relief Capacity

Set Pressure/Vacuum (P_s)		Air Flow Capacity at 100% Overpressure (Double Set Pressure/Vacuum) 1000 Normal Cubic Meters per Hour at 0° C				
mmWC	mb	16" Pressure	20" Pressure	24" Pressure	All Vacuum	2450 Only
22	2.16				1.83	For Vacuum **Flow,** Use the "C1" Factor Table Located with Model 2100
44	4.31				2.58	
88	8.63	13.8	21.9	31.7	3.63	
100	9.80	14.7	23.3	33.8		
132	12.9	16.9	26.8	38.9	4.42	
176	17.3	19.5	30.9	44.9	5.08	
200	19.6	20.8	32.9	47.8		
250	24.5	23.2	36.8	53.4		
300	29.4	25.5	40.3	58.5		
351	34.3	27.5	43.5	63.2		

Flow capacity is certified by Groth Corporation, based on actual tests conducted in compliance with API Std. 2000. Flow measurement accuracy has been verified by an independent testing laboratory.

[#] Other vacuum settings available on special order.

Flow capacity values listed above are based on full open valves at 100% overpressure.

Vacuum flow rating applies only to Model 2450A.

Read the flow capacity at 100% overpressure directly from the table above. Use linear interpolation if the set pressure is not listed. (Ref: TPD1)

If the allowable overpressure is less than 100%, modify the flow capacity using the appropriate "C" factor from the table. If allowable overpressure is more than 100%, consult TPD1 or your Groth Representative.

Calculate the percentage overpressure by the following formula. Note that all pressures are gauge pressure expressed in the same units of measure.

P_f = Flowing pressure
P_s = Set pressure
% OP = $[(P_f - P_s)/P_s] \times 100$

Calculate flow capacity at less than 100% overpressure according to the following example.

Example—To find "C" factor from table:
Read "C" factor for 75% overpressure at intersection of row 70 and column 5
"C" factor at 75% OP = 0.95

"C4" Factor Table - Pressure Only										
%OP	0	1	2	3	4	5	6	7	8	9
10	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.74	0.75
20	0.75	0.76	0.76	0.77	0.77	0.78	0.78	0.79	0.79	0.80
30	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85
40	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.89	0.90
50	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.92	0.92
60	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.94	0.94
70	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.96	0.96
80	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.98	0.98
90	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00

Example—Flow Capacity Calculation

20" Model 2400A
100 mmWC Set Pressure [P_s]
175 mmWC Flowing Pressure [P_f]

1. Read flow capacity at set pressure from table — Flow = 23,300 NCMH
2. Calculate overpressure — % OP = [(175 - 100)/100] x 100 = 75%
3. Read "C4" factor from table — "C" = 0.95
4. Calculate flow capacity — *Flow = 0.95 x 23,300 = 22,135 NCMH*

Type	2400A	2450A
Pressure	✓	✓
Vacuum		✓

Model 210 Test Stand

STANDARD

- **Pressure/Vacuum testing**
- **Digital gauges**
- **Flowmeters**
- **Manometers**
- **Pressure vessel directly under test flange for smooth regulated pressure or vacuum**
- **Heavy steel construction**
- **SS tubing**
- **Mounting adapters and gaskets included**

OPTIONS

- **Pilot valve kit**
- **Blanket gas regulator kit**

MODEL 210

MODEL 210 TEST STAND

The Groth Model 210 test stand contains all valves and gauges necessary to accurately verify settings for both pressure and vacuum conditions. Seat leakage is monitored using flow meters ranging from 0.1 - 100 SCFH.

The Model 210 is designed to assist in meeting the requirements of the 1990 Clean Air Act Amendments.

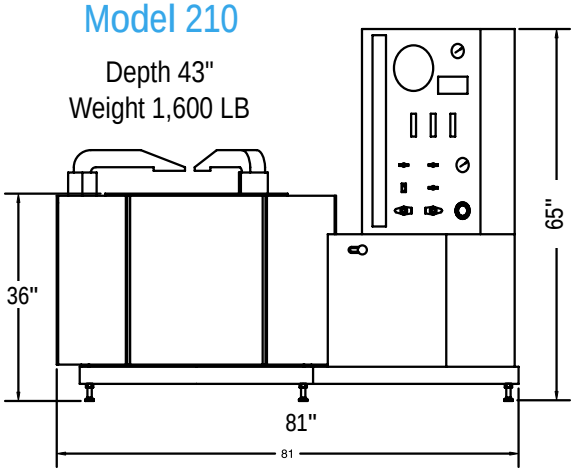
SPECIFICATIONS

Test System Specifications
Valve Size Range – 2" -24"
MAWP = 30 PSIG
Test Pressure = 12 PSI vacuum
= 15 PSI pressure

Utility Requirements
Compressed Air 80 -150 psig
½" nominal line size
Electric Power = 100/115/230VAC
Single Phase
50/60HZ
10 amp
Note: Alternate electric configurations available

Model 210

Depth 43"
Weight 1,600 LB



HOW TO ORDER

For easy ordering, select proper model numbers

MODEL #	CLAMPING	GAUGES	OTHER
210	3 = Hydraulic clamps (210)	1 = Dial 2 = Digital 3 = Both	O = No Special Options Z = Special Options

EXAMPLE 2 1 0 — 3 — 3 — 0

Indicates a Model 210, hydraulic clamps, digital and dial gauges and no other options.

Specifications subject to change without notice.

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Model 1660A

Pressure and/or vacuum relief valves are used on liquid storage tanks and other process vessels or systems to prevent structural damage due to excess internal pressure or vacuum.

Storage tanks are pressurized when liquid is pumped in and compresses the existing vapor or when increasing temperature causes increased evaporation or expansion of existing vapor. Conversely, vacuum may be created when pumping out or decreasing temperature. To prevent damage, vapor must be allowed to escape or enter the tank at a specified pressure or vacuum. The volume rate of venting depends upon the tank size, volatility of the contents, the pumping rate, and the temperature. See API Standard 2000 for the procedures to determine venting requirements.

The pilot operated relief valve has two principal advantages over other types of relief valves:

1. It is bubble tight to set pressure.
2. It is fully open at less than 10% above set pressure.

These characteristics permit an operating pressure nearer to the maximum allowable working pressure of the tank. High operating pressures reduce evaporation and total venting volume, thereby reducing product loss and cost of processing emissions.

A tank may also have provisions for emergency pressure relief due to fire exposure and/or an inert gas blanket in the vapor space.

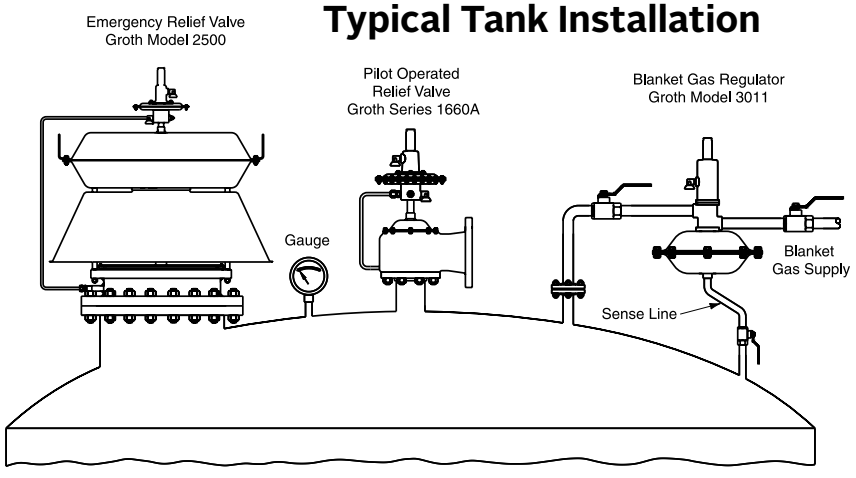
Model 1660A

A typical tank installation as shown in the drawing below, includes a pilot operated pressure/vacuum relief valve, a gas blanketing regulator and a pilot operated emergency pressure relief valve.

The Groth Series 1660A Pilot Operated Valve is available in the following configurations:

	RELIEF SERVICE	
	PRESSURE	VACUUM
1660A	✓	DIRECT ACTUATED
1661A	✓	✓ PILOT OPERATED
1662A		✓ PILOT OPERATED

Typical Tank Installation



Model 1660A

FEATURES

- Sizes 2" through 12"
- Full pipe bore seat nozzle
- Standard pressure settings from 2.0 InWC to 15 psig
- Temperature range from -323° F to 300° F
- Designed for easy maintenance
- Minimal spare parts requirements
- Inherent backflow prevention
- ISO 9001 Certified manufacturing process
- Easily adjustable blowdown
- Snap action or modulating pilot
- Premium seat tightness to set pressure
- Standard body materials are aluminum, carbon steel or 316SS
- Film seat design meets EPA Method 21

APPLICATIONS

LOW PRESSURE STORAGE TANKS

The Groth Model 1660A Pilot Operated Valves can meet seat tightness requirements of environmental regulations, even when the operating pressure is close to the set pressure, such as when gas blanketing is used.

CRYOGENIC STORAGE TANKS

Leaking pressure relief valves on low temperature tanks cause unsafe freeze-ups. Tight pilot operated valves with snap action are the safest devices known. Modulating valves must not be used on cryogenic service.

NATURAL GAS

Some natural gas production facilities require large volume relief capacities at low pressures and pilot operated valves are ideal for these applications. When the relief valve is installed downstream of a pressure reducing valve, the modulating mode can prevent destructive interaction between the two valves.

AIR SEPARATION PLANTS

Pilot operated valves prevent the accidental loss of gases when used in both low pressure process and storage applications.

AIR BLOWERS

Air blowers for conveyor systems and waste water treatment plants, as well as other uses, often require accurate relief for both pressure and vacuum. Pilot operated relief valves—both pressure valves and vacuum valves—are extremely well suited for such services.

APPLICATIONS

MODEL 1660A
PRESSURE RELIEF-PILOT ACTUATED

The function of the pilot valve (A) is to control pressure in the main valve actuator (B) or upper dome of the main valve. The effective area of the actuator diaphragm (1) is significantly larger than the pallet seat area (2). Tank pressure is applied both on top of the actuator diaphragm and below the main valve seat area. Because of the area ratio, the downward force (actuator) is greater than the opening force (pallet) and results in a tight main valve seat.

When tank pressure reaches set pressure, the force acting upward on the pilot valve sense diaphragm overcomes the downward spring force. The pilot valve begins to flow through the seat (6) to the breather port (3). This flow results in a pressure drop in the upper dome (B). As a result, pressure acting under the main valve pallet will open the valve and relieve the overpressure condition.

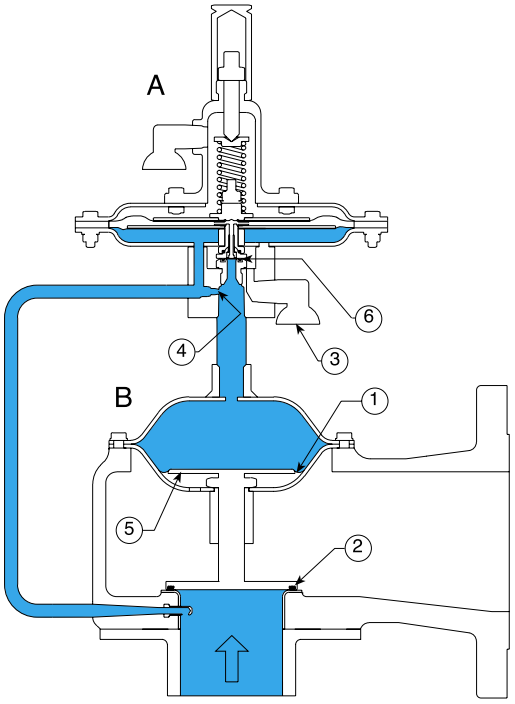
Adjustment of the blowdown needle (4) can provide either “snap-action” or “modulating” pilot valve operation. For snap-action operation, the main valve pallet lifts quickly to full open. In modulating service, the pallet will lift sufficiently to maintain set pressure regardless of the flow rate up to the rated capacity of the valve at the specified set pressure.

The main valve remains open (and flowing) as long as the tank pressure is higher than the pilot valve set pressure.

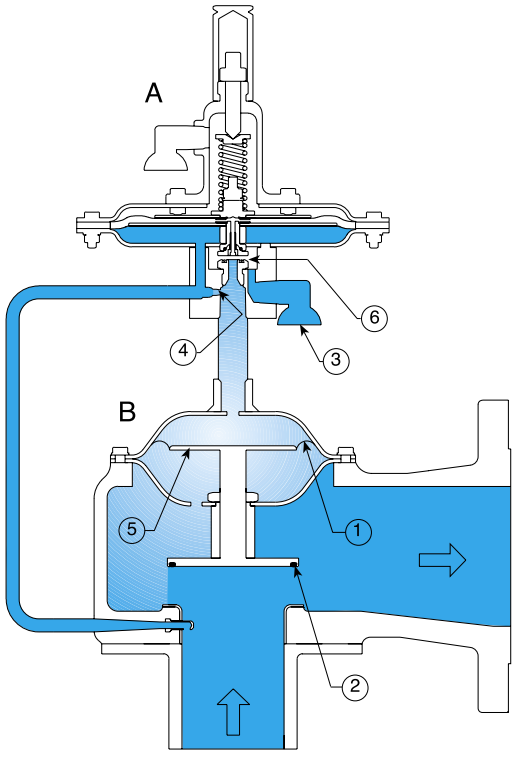
As tank pressure decreases to the pilot valve reseat pressure, the pilot valve closes allowing tank vapors to flow back into the upper dome (B). As the upper dome pressure rises, the pallet assembly is tightly closed against the seat.

The adjustable orifice or blowdown needle (4) affects the closing of the pilot valve. Blowdown can vary from zero for modulating operation to 10% for snap-action operation.

Note: The actuator diaphragm (1) is not attached to the support plate (5) unless vacuum relief or low set 1402 Pilot is specified. This design provides “inherent back-flow prevention” when the discharge header pressure exceeds tank pressure. No additional hardware is required for this protection.



Closed Condition



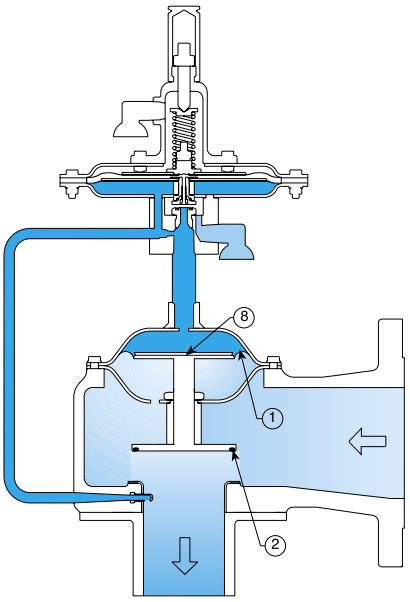
Open Condition

DESIGN AND FUNCTION

MODEL 1661A
PRESSURE RELIEF-PILOT ACTUATED
VACUUM RELIEF-DIRECT ACTUATED

Vacuum relief is provided by attachment of the actuator diaphragm to the pallet/support plate assembly. This provides pressure and vacuum protection with a single main valve and a single pilot valve.

The valve opens when the tank vacuum acting on the actuator diaphragm overcomes the weight of the pallet assembly. The vacuum applied to the area differential between the actuator diaphragm (1) and the pallet seat area (2) provides the lifting force. The vacuum cracking pressure is approximately 1.0 InWC - 2.0 InWC, and is determined by the weight of the pallet assembly and related components. Full open flow is achieved in the 1.7 InWC to 3.5 InWC range, depending on valve size, pressure setting, and materials of construction. The diaphragm is attached by the upper support plate (8), so backflow prevention is not provided by this valve.

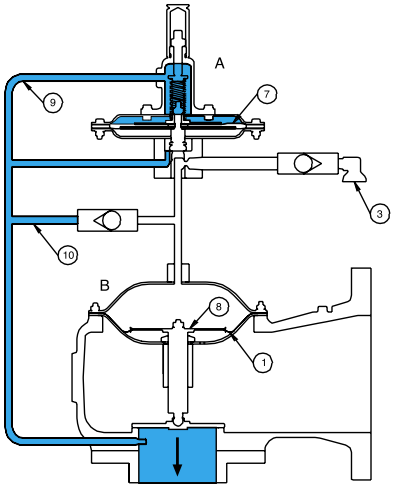


Open Condition—Direct Actuated

MODEL 1662A
VACUUM RELIEF-PILOT VALVE ACTUATED

Operation of a Pilot Actuated Vacuum Relief Valve is similar to pressure relief except for the physical connections between the pilot and main valve. The vacuum sense lines (9 & 10) connect the spring chamber breather port and the pilot valve exhaust port to the main valve total pressure pickup as shown.

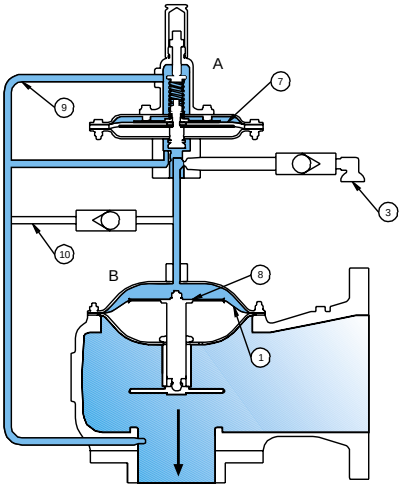
Atmospheric pressure is applied under the boost and sense diaphragms and in the upper dome (B) through the breather port (3). Below set vacuum, the spring force is greater than the lift created by tank vacuum above the sense diaphragm (7) so both the pilot valve and the main valve will remain closed.



Closed Condition

At set vacuum, the pilot valve opens and the upper dome is reduced to tank vacuum. The diaphragm is attached by a second actuator support plate (8) for vacuum operated valves. Main valve internal pressure under the actuator diaphragm (1) opens the main valve. The valve remains open and flowing until the system reaches the pilot valve reseat pressure.

Note: Backflow pressure relief prevention is provided for pilot operated vacuum relief valves in case positive system pressure can occur. A bypass line with a check valve is used to apply pressure to the upper dome. Another check valve prevents pressure discharge from the pilot vent.

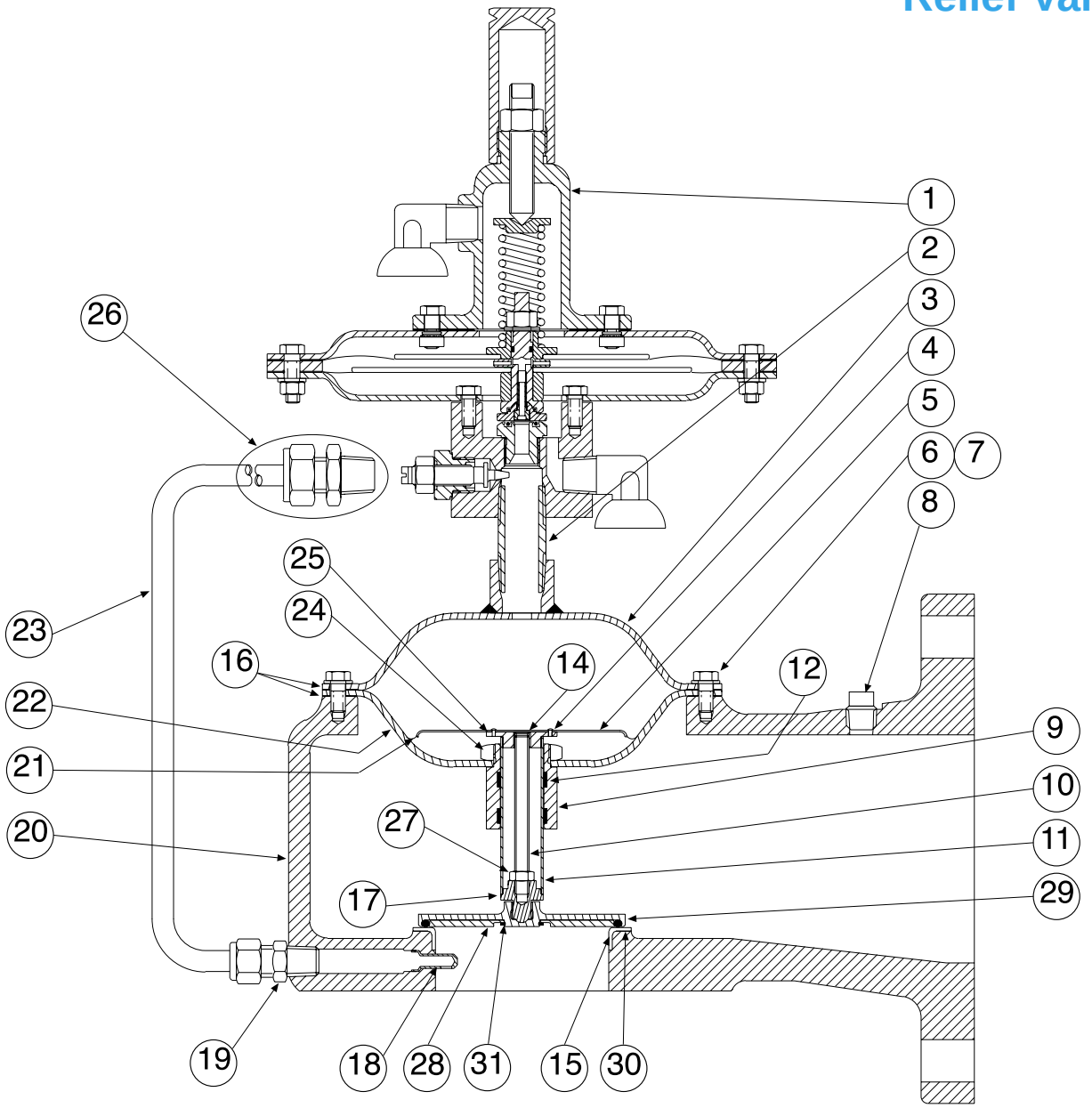


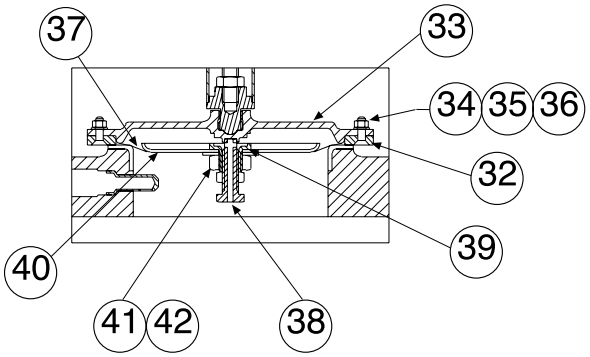
Open Condition

CAUTION:
See TPD3 for Modes of Failure

ASSEMBLY

Model 1660A Pilot Operated Relief Valve





Film Seat Detail

NOTE:
Pilot Valve is rotated 90° to show blowdown needle and exhaust port

ASSEMBLY

Model 1660 Pilot Operated Relief Valve

Item	Description	Materials of Construction		
		Aluminum	Carbon Steel	Stainless Steel
1	Pilot	SS	SS	SS
2	Nipple, Pipe	316 SS	316 SS	316 SS
3	Housing, Upper Actuator	316 SS	316 SS	316 SS
4	Rivet	SS	SS	SS
5	Plate, Diaphragm	AL	316 SS	316 SS
6	Bolt, Hex	316 SS	316 SS	316 SS
7	Washer, Lock	316 SS	316 SS	316 SS
8	Plug, Pipe	316 SS	316 SS	316 SS
9	Guide, Spindle	AL	316 SS	316 SS
10	Rod, Spindle	316 SS	316 SS	316 SS
11	Spindle	316 SS	316 SS	316 SS
12	Bearing, Spindle	PTFE	PTFE	PTFE
13	Stud/Nut (not shown)	316 SS	316 SS	316 SS
14	Insert, Locking	316 SS	316 SS	316 SS
15	Seat, Body	See Note 3	316 SS	See Note 3
16	Gasket, Actuator	TEFLON® FEP	TEFLON® FEP	TEFLON® FEP
17	Cap Spindle, Lower	AL	316 SS	316 SS
18	Pickup, Pressure	316 SS	316 SS	316 SS
19	Tube Connector	316 SS	316 SS	316 SS
20	Body	AL	CS	CF8M (316 SS)
21	Diaphragm, Actuator	TEFLON® FEP	TEFLON® FEP	TEFLON® FEP
22	Housing, Lower Actuator	316 SS	316 SS	316 SS
23	Tubing	316 SS	316 SS	316 SS
24	Nut, Hex Jam	316 SS	316 SS	316 SS
25	Cap, Spindle-Upper	AL	316 SS	316 SS
26	Connector, Tube	316 SS	316 SS	316 SS
27	Nut, Hex Jam	316 SS	316 SS	316 SS
28	Retainer Plate, O-Ring	AL	316 SS	316SS
29	Pallet, O-Ring	AL	316 SS	316 SS
30	O-Ring	See Note 1	See Note 1	See Note 1
31	Retainer, Snap Ring	SS	SS	SS
FILM SEAT COMPONENTS (ITEMS 1-27 ARE SAME AS ABOVE)				
32	Ring, Film Seat	AL	316 SS	316 SS
33	Plate, Film Seat	AL	316 SS	316 SS
34	Screw, Hex Skt Flt Hd	SS	SS	SS
35	Nut, Hex	SS	SS	SS
36	Washer, Lock	SS	SS	SS
37	Seat, Film	TEFLON® FEP	TEFLON® FEP	TEFLON® FEP
38	Jackscrew	316 SS	316 SS	316 SS
39	Bushing, Jackscrew	316 SS	316 SS	316 SS
40	Retainer, Film Seat	AL	316 SS	316 SS
41	Nut, Hex Jam	316 SS	316 SS	316 SS
42	Washer, Flat	316 SS	316 SS	316 SS

1. Elastomer material options are specified by the soft goods option in the part number.
2. Consult factory for material options not listed above.
3. 316SS Seat Insert optional.

PILOT OPERATED VALVE/MODES OF FAILURE

A pilot operated pressure relief valve uses tank pressure acting on the actuator diaphragm to hold the valve closed, while tank pressure acting on the pallet attempts to force it open. The pilot directs tank pressure into the valve actuator below set pressure and atmospheric pressure into the actuator above set pressure.

If any part of the pilot operated system fails, the valve actuator pressure will be vented and tank pressure on the pallet will force the valve open, for example:

- If the actuator diaphragm fails, the actuator will be vented to the valve outlet.
- If the pilot valve diaphragm fails, actuator pressure will be vented to atmosphere through the failed diaphragm.
- If a pilot valve component [spring, seat/seal, etc.] fails which prevents the pilot from holding tank pressure, the actuator will be vented to atmosphere.

Therefore, the mode of failure is “fail open.”

A pilot operated vacuum relief valve uses tank vacuum acting on the actuator diaphragm to force the valve open, while tank vacuum acting on the pallet attempts to hold it closed. The pilot valve directs atmospheric pressure into the valve actuator below set pressure and tank vacuum into the actuator above set pressure.

If a pilot valve component [spring, seat/seal, etc.] fails which allows the pilot to supply tank vacuum to the actuator, the valve will open prematurely.

However, if a part of the system fails which prevents the supply of tank vacuum to the valve actuator above set pressure, tank vacuum acting on the pallet will hold the valve closed indefinitely, for example:

- If the actuator diaphragm fails, the actuator will be vented to the valve outlet.
- If the pilot valve diaphragm fails, the pilot valve will not open, and will continue to direct atmospheric pressure to the actuator above set pressure.

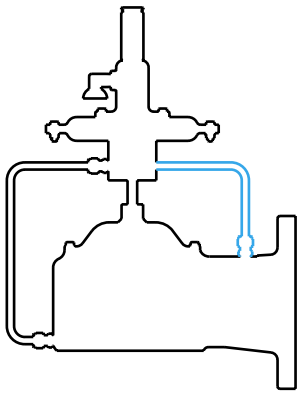
Therefore, the mode of failure may be “fail closed.”

OPTIONS

The following options are frequently utilized to reduce vapor emissions, improve serviceability, or expand the capabilities of a pilot operated relief valve.

Pilot Exhaust Piped To Discharge Header

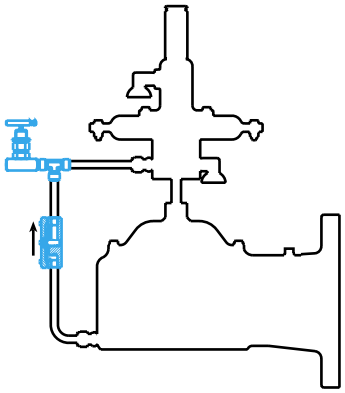
The exhaust port of the pilot valve may be piped to the outlet body to avoid any vapor emission to the atmosphere.



Field Test Connection

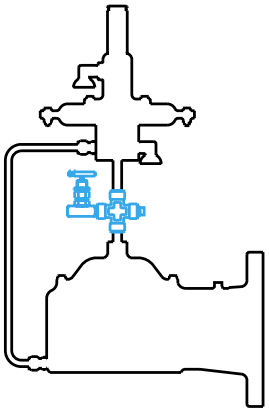
A 1/2" FNPT Connection, block valve, and check valve is provided for field testing the pilot valve pressure setting. This is accomplished with an independent pressure source; the check valve prevents back flow into the tank during testing.

Note: Field test connection shown is for a pressure relief valve. Field test connections for vacuum and pressure/vacuum relief are also available.



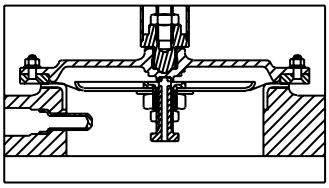
Manual Blowdown

A manually controlled block valve is provided to allow the upper dome pressure to be bled to atmosphere or a process vapor discharge system. If the tank is pressurized, releasing the dome pressure will open the main valve. An electric solenoid valve can be provided for remote blowdown control.



Conical Film Seat

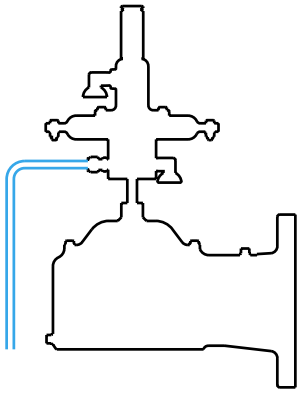
To provide maximum tight shut-off "Conical Film Seat" is available with Groth pilot operated valves. This unique design will avoid fugitive emissions and will exceed the requirements of "Method 21" in the EPA Regulation, CFR 40, Part 60.



OPTIONS

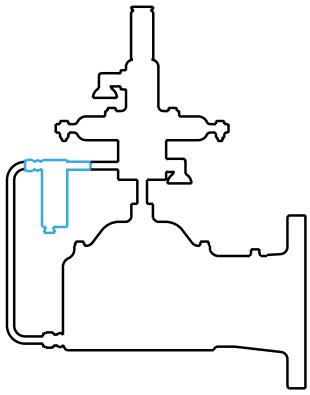
Remote Sense

Normally pilot operated relief valves have a total pressure pickup in the main valve inlet. For applications where inlet piping losses are significant, a remote sense connection will assure that the main valve will open fully at the specified pressure regardless of inlet piping pressure loss. Note that the valve sizing must take into account the reduced flow because of the inlet pressure drop. Remote sense is recommended for applications that have entrained particulates (tubing/fittings provided by others).



Pilot Supply Filter

A 1/2" FNPT Connection, block valve, and An auxiliary filter for the pilot supply line is recommended for services with an unusual amount of foreign particulates. The standard filter is equipped with a 35 micron stainless steel screen that can be easily cleaned.



OPTIONS

MODEL 1660A SERIES CRYOGENIC SERVICES

- Tested and proven reliable below minus 300° F
- Snap action at lowest temperatures
- Tight shut-off with conical film seat
- No freeze-up for safe operation
- All TEFLON® diaphragms

The Groth Series 1660A pilot operated valves are designed to provide the safest and most reliable operation for cryogenic service. With the incorporation of a TEFLON® FEP diaphragm and aluminum or 316SS seat materials, the low temperature does not affect valve operation or valve seat tightness. Tight shut-off and dependable service is assured.

OPTIONS

Model 1660A, 1661A Pilot Operated Valve Pressure Relief Capacity

Set Pressure (P_S)		Air Flow Capacity at 10% Overpressure 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
2.00	1.16	5.46	12.0	20.9	46.8	81.9	129	185
4.00	2.31	7.73	17.1	29.5	66.3	116	182	262
6.00	3.47	9.48	20.9	36.2	81.3	142	223	322
8.00	4.62	11.0	24.2	41.9	94.0	165	258	372
10.00	5.78	12.3	27.1	46.9	105	184	289	417
15.00	8.66	15.1	33.3	57.7	129	227	356	512
20.00	11.6	17.5	38.6	66.8	150	262	412	594
25.00	14.4	19.6	43.3	75.0	168	294	462	666
psig								
1		20.7	45.7	79.0	177	311	488	702
2		29.8	65.8	114	255	447	702	1011
3		37.1	81.9	142	318	557	875	1260
4		43.6	96.1	166	373	654	1027	1478
5		49.4	109	189	424	742	1165	1677
6		54.9	121	210	471	824	1294	1863
8		65.1	144	248	557	976	1533	2207
10		74.4	164	284	638	1117	1754	2525
12		83.2	184	318	713	1249	1961	2825
14		91.6	202	350	785	1375	2159	3109
15		95.7	211	366	820	1436	2255	3247

Model 1662A Pilot Operated Valve Vacuum Relief Capacity

Set Vacuum (P_S)		Air Flow Capacity at 10% Over-vacuum 1000 Standard Cubic Feet per Hour at 60° F						
InWC	oz/in²	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
3.00	1.73	6.66	14.7	25.5	57.1	100	157	226
4.00	2.31	7.69	17.0	29.4	65.9	115	181	261
6.00	3.47	9.41	20.8	35.9	80.6	141	222	319
8.00	4.62	10.8	23.9	41.4	93.0	163	256	368
10.00	5.78	12.1	26.7	46.3	104	182	285	411
12.00	6.93	13.3	29.2	50.6	114	199	312	450
16.00	9.27	15.3	33.7	58.3	131	229	360	518
20.00	11.6	17.0	37.6	65.0	146	255	401	578
25.00	14.4	19.0	41.9	72.5	163	285	447	644
psig								
1		19.9	44.0	76.1	171	299	470	676
2		27.7	61.0	106	237	415	652	938
3		33.2	73.2	127	284	498	781	1125
4		37.4	82.5	143	320	561	881	1268
5		40.7	89.8	155	349	610	959	1380
6		43.2	95.3	165	370	648	1018	1466
7		45.0	99.3	172	386	675	1060	1527

Air Flow Capacity at 3.5 InWC (2 oz/in²) Vacuum 1000 Standard Cubic Feet per Hour at 60° F						
2"	3"	4"	6"	8"	**10”**	**12”**
6.82	15.1	26.1	58.5	102	161	232

Actual setting depends on size, material and pallet type and varies from 1.0 - 2.0 InWC

CAPACITY

Model 1660A, 1661A Pilot Operated Valve Pressure Relief Capacity

Set Pressure (P_S)		Air Flow Capacity at 10% Overpressure 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
50	4.90	0.16	0.35	0.60	1.34	2.35	3.69	5.31
100	9.80	0.22	0.49	0.85	1.90	3.33	5.22	7.52
150	14.7	0.27	0.60	1.04	2.33	4.08	6.41	9.23
200	19.6	0.31	0.69	1.20	2.69	4.72	7.41	10.7
300	29.4	0.42	0.93	1.61	3.62	6.34	9.95	14.3
400	39.2	0.46	1.02	1.76	3.95	6.93	10.9	15.7
500	49.0	0.50	1.11	1.92	4.30	7.52	11.8	17.0
600	58.8	0.54	1.19	2.06	4.63	8.10	12.7	18.3
barg								
0.07		0.61	1.35	2.34	5.24	9.18	14.4	20.8
0.10		0.63	1.39	2.40	5.39	9.44	14.8	21.4
0.20		1.05	2.31	3.99	8.96	15.7	24.6	35.5
0.30		1.38	3.04	5.27	11.8	20.7	32.5	46.8
0.40		1.67	3.68	6.38	14.3	25.1	39.4	56.7
0.50		1.93	4.26	7.38	16.6	29.0	45.5	65.6
0.60		2.06	4.55	7.87	17.7	30.9	48.6	69.9
0.70		2.20	4.85	8.40	18.8	33.0	51.8	74.6
0.80		2.34	5.17	8.95	20.1	35.2	55.2	79.5
0.90		2.49	5.49	9.50	21.3	37.3	58.6	84.4
1.00		2.69	5.94	10.3	23.1	40.4	63.5	91.4

Model 1662A Pilot Operated Valve Vacuum Relief Capacity

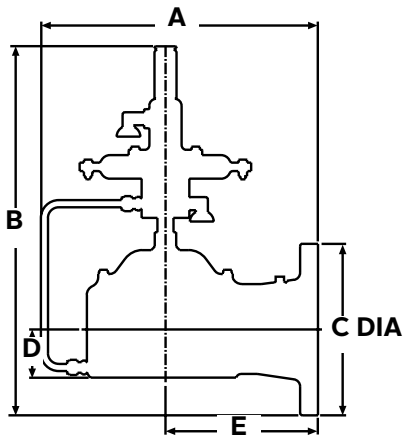
Set Vacuum (P_S)		Air Flow Capacity at 10% Over-vacuum 1000 Normal Cubic Meters per Hour at 0° C						
mmWC	mb	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
75	7.35	0.19	0.42	0.74	1.65	2.89	4.54	6.53
100	9.80	0.22	0.49	0.85	1.90	3.33	5.24	7.54
150	14.70	0.27	0.60	1.04	2.33	4.08	6.40	9.22
200	19.6	0.31	0.69	1.20	2.69	4.70	7.39	10.6
250	24.5	0.35	0.77	1.34	3.00	5.25	8.25	11.9
300	29.4	0.38	0.84	1.46	3.28	5.75	9.02	13.0
400	39.2	0.44	0.97	1.68	3.78	6.62	10.4	15.0
500	49.0	0.49	1.09	1.88	4.21	7.38	11.6	16.7
600	58.8	0.54	1.19	2.05	4.61	8.07	12.7	18.2
barg								
0.07		0.58	1.29	2.23	5.01	8.77	13.8	19.8
0.10		0.69	1.53	2.65	5.94	10.4	16.3	23.5
0.15		0.84	1.85	3.20	7.17	12.6	19.7	28.4
0.20		0.95	2.10	3.63	8.15	14.3	22.4	32.3
0.30		1.12	2.48	4.30	9.64	16.9	26.5	38.2
0.40		1.24	2.75	4.75	10.7	18.7	29.3	42.2
0.50		1.32	2.91	5.04	11.3	19.8	31.1	44.8

Model 1661A Direct Actuated Valve Vacuum Relief Capacity

Air Flow Capacity at 50 mmWC (5.0 mb) Vacuum 1000 Normal Cubic Meters per Hour at 0° C						
2"	3"	4"	6"	8"	**10”**	**12”**
0.20	0.44	0.76	1.70	2.98	4.68	6.75

Actual setting depends on size, material and pallet type and varies from 1.0 - 2.0 InWC

SPECIFICATIONS



Specifications subject to change without notice. Certified dimensions available upon request.

SIZE							APPROX. SHIP WT.
INLET (Metric)	OUTLET (Metric)	A (Metric)	B (Metric)	C (Metric)	D (Metric)	E (Metric)	(ALUMINUM) LBS.
2" (50 mm)	3" (80 mm)	11.75" (298 mm)	19.75" (502 mm)	7.50" (191 mm)	2.75" (70 mm)	6.00" (152 mm)	30 (14 kg)
3" (80 mm)	4" (100 mm)	14.75" (375 mm)	21.50" (546 mm)	9.00" (229 mm)	2.53" (64 mm)	8.00" (203 mm)	45 (20 kg)
4" (100 mm)	6" (150 mm)	18.00" (457 mm)	21.75" (552 mm)	11.00" (279 mm)	4.00" (102 mm)	10.00" (254 mm)	56 (25 kg)
6" (150 mm)	8" (200 mm)	21.25" (540 mm)	26.00" (660 mm)	13.50" (343 mm)	4.32" (110 mm)	12.00" (305 mm)	80 (36 kg)
8" (200 mm)	10" (250 mm)	25.50" (648 mm)	28.00" (711 mm)	16.00" (406 mm)	5.31" (135 mm)	14.00" (356 mm)	130 (59 kg)
10" (250 mm)	12" (300 mm)	31.75" (806 mm)	31.50" (800 mm)	19.00" (483 mm)	6.65" (169 mm)	18.00" (457 mm)	170 (77 kg)
12" (300 mm)	16" (400 mm)	36.50" (927 mm)	35.00" (889 mm)	23.50" (597 mm)	8.00" (203 mm)	20.10" (511 mm)	230 (104 kg)

HOW TO ORDER

For easy ordering, select proper model numbers

MODEL # — SIZE — MATERIAL — SOFT GOODS (see notes 1-4) — TYPE — OPTIONS

- MODEL #: 1660A, 1661A, 1662A
- SIZE: 02 = 2", 03 = 3", 04 = 4", 06 = 6", 08 = 8", 10 = 10", 12 = 12"
- MATERIAL: Main Valve; 1 = Alum, 3 = C. Steel, 5 = SS
- SOFT GOODS: B = Buna-N, E = EPRI, V = VITON®, K = KALREZ®, Z = Special
- TYPE: M = Modulating, S = SnapAction; Seat: R = "O" Ring (see note 4), F = Film Seat (see note 5)
- OPTIONS: O = No Options, Z = Special Options
  - O = No Blowdown or Remote Sense, B = Manual Blowdown, R = Remote Sense, 2 = Both Blowdown and Remote Sense
  - O = No Pilot to Hdr or Test Connection, H = Pilot Exhaust Piped to Dischg Header, T = Field Test Connection, 2 = Both Pilot to Hdr & Test Connection
  - O = No Filter or Low Set 1402 Pilot, F = Pilot Supply Filter, L = Low Set 1402 Pilot, 2 = Both Filter and Low Set 1402 Pilot

NOTES

1. Refer to BOM
2. Diaphragm material for main valve (actuator and film seat) and pilot valve are only available in TEFLON® FEP
3. 300 Series Pilot is standard
4. O-Ring material is specified by soft goods selection; PTFE is not available
5. FEP film only; KALREZ® O-Rings in pilot valve
6. In cryogenic applications a film seat is required

EXAMPLE 1660A — 06 — 3 — V — RS — 00R0

Indicates a 6" Model 1660A (pressure relief only) with carbon steel body and "O-Ring" seat using VITON® soft goods with snap action pilot with remote pilot sense connection and no specials.

PILOT OPERATED VALVES
Series 1400

Pilot operated valves are used to replace weight loaded or spring loaded valves in many applications to increase efficiency and reduce evaporation losses. Several advantages are obtained over the traditional type. For example, the process pressures may be closer to the set pressure than would be considered prudent and safe with the traditional valve. Additionally, greater conservation is obtained due to minimum product loss which in turn provides increased profits.

The Groth 1400 Series valves provide safe, dependable, and accurate low pressure and/or vacuum protection. Full flow is attained at no more than 10% overpressure. This reduces the need for a large overpressure and saves product, which translates into profit. Blowdown may be adjusted to requirements between 0 and 10% of set pressure. The Models 1400 and 1420 incorporate a vacuum breaker.

Model 1400

Model 1420

Model 1430

Model 1460

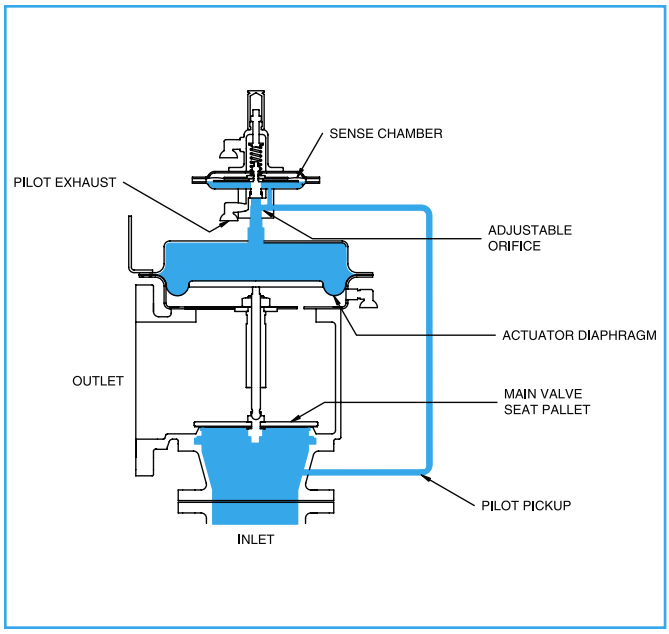
FEATURES AND BENEFITS

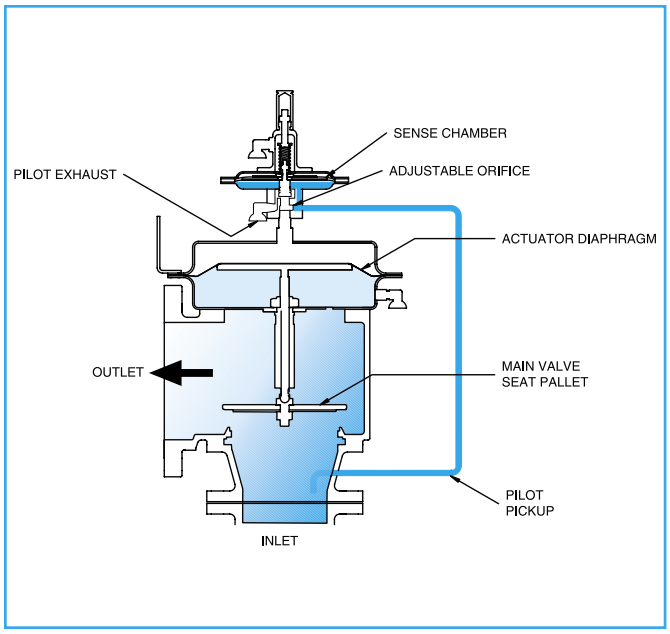
Model 1400 Series

Pilot operated valves for atmospheric and low pressure storage tanks

FEATURES	BENEFITS
PILOT OPERATED	• Ease of precision settings. • Only the pilot needs to be set. • Lower profile and weight than spring operated models for high settings. • Remote pilot sensing option allows the pilot to sense the true system pressure. • Remote or manual blowdown available.
EXTRA TIGHT SEAL	• Main valve remains tight to set pressure.
FULL FLOW	• Full open at less than 10% overpressure.
SNAP ACTION OR MODULATING ACTION	• Modulating action conserves product since valve opening is proportional to overpressure. • Noise is reduced since the valve only opens fully when required.
SOFT SEATED	• Soft seats seal tight to conserve product and minimize valve wear which improves reliability.
TOP ENTRY	• Reduces maintenance costs since the valve can be completely serviced without removal from its mounting.
CHOICE OF ALUMINUM, CARBON STEEL, STAINLESS STEEL, OR SPECIAL MATERIALS FOR THE MAIN BODY.	• Wide range of materials to meet most corrosive media and temperature applications at the lowest possible cost.
SIZES 2" THROUGH 12"	• There is a size to meet your relieving capacity requirements without the need of expensive oversizing.
HIGH CAPACITY DESIGN	• Groth pilot operated valves have more capacity for your money.
PRESSURE SETTINGS ♦ 2 InWC to 15 psig	• Setting range covers all atmospheric and low pressure storage tanks. ♦ Requires 1402 Pilot for minimum settings
VACUUM SETTINGS 0.5 oz. to 12 psig	• Wide setting range to meet your design requirements. • Direct acting or pilot operated vacuum relief available.

OPERATION





The pilot operated valve is a self-contained system which does not require any external power or pressure source. The pilot valve, using system medium and pressure, automatically controls the actuator pressure to either open or close the main valve depending on the pressure setting of the pilot vs. the actual system pressures.

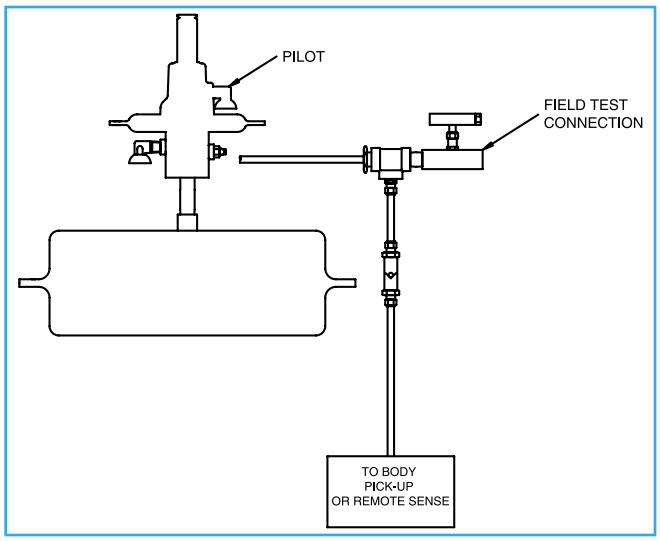
System medium and pressure is sensed at the pickup fitting just above the inlet flange. In the case of remote sensing, the pickup point is directly on the vessel and usually close to the valve inlet. The medium and pressure is then channeled to the pilot inlet and is redistributed to the sense chamber and to the actuator.

Under normal system operating conditions, the same pressure is acting downward against the actuator and upwards against the seat pallet. Since the actuator has a larger area than the seat pallet, the net force is downward which will press the pallet against the seat and thus keep the main valve closed. While the pilot and main valve are closed, there is no bleed to the atmosphere.

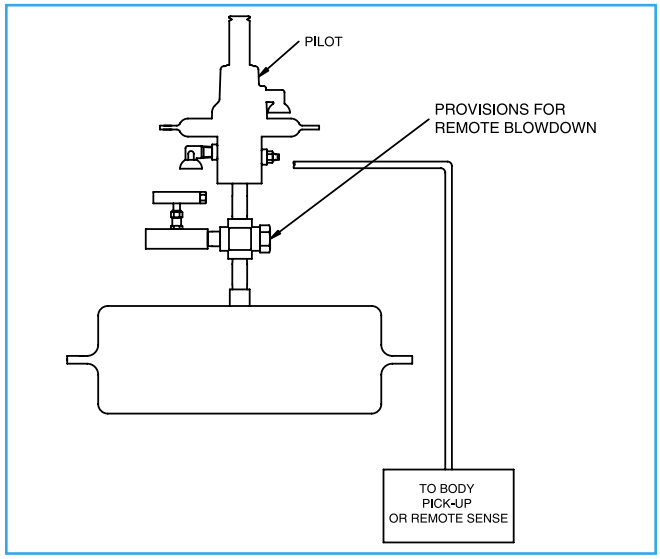
When the system pressure rises to the pilot set point due to an overpressure condition, the upward force in the pilot sense chamber will overcome the downward spring force to lift the pilot stem. As the stem lifts, it opens the pilot seat to allow flow through the pilot and out to the atmosphere (in applications where nothing is permitted to discharge directly into the atmosphere, the pilot discharge may be plumbed to the main valve outlet for channeling to a collection header. Notify the vendor if this is the situation in case compensating adjustments need to be made). The flow through the pilot and adjustable orifice will cause a pressure drop downstream of the orifice which in turn causes the pressure in the actuator to drop. When the actuator pressure decreases to a point where the upward force on the seat pallet is greater than the downward force of the actuator, the main valve will open. The amount the main valve opens depends on the system overpressure. The greater the overpressure, the wider the main valve opens, until full open is obtained at approximately 10% overpressure.

After the excess pressure has been relieved and the system pressure is again below the set point of the pilot, the valve will return to its normal closed position.

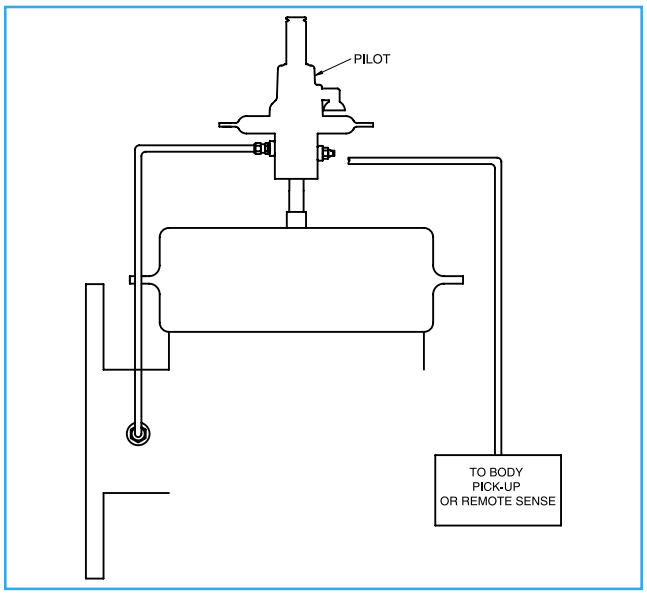
CONFIGURATIONS



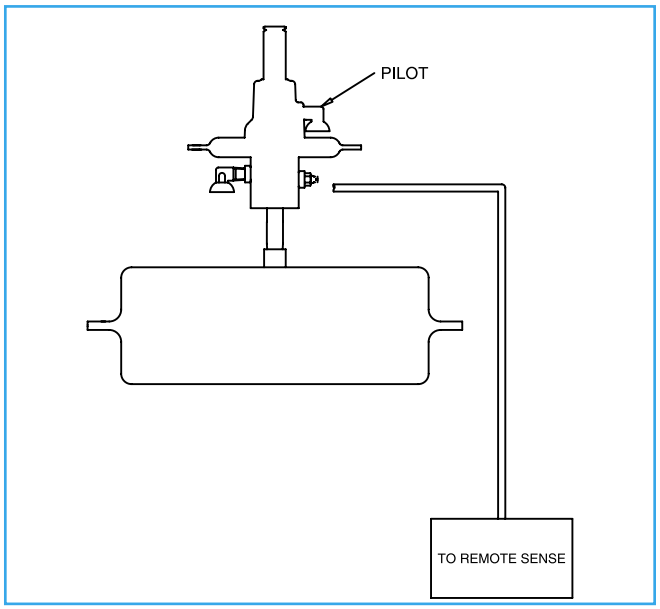
FIELD TEST CONNECTION
(Backflow Prevention Included)



MANUAL OR REMOTE BLOWDOWN



PILOT DISCHARGE TUBED TO MAIN VALVE OUTLET



REMOTE PICKUP FOR PILOT

SIZING TABLES

Tables are provided to allow you to select the proper size valve for your application. It is suggested that API Standard 2000 be utilized to obtain the required flow capacity.

TABLE I
Model 1400/1430
SCFH Air Capacity @10% Overpressure and 60°F

Pressure Setting psig	VALVE SIZE (ORIFICE SIZE)						
	2" (2.976 in²)	3" (7.013 in²)	4" (12.35 in²)	6" (28.51 in²)	8" (49.65 in2)	10" (78.47 in²)	12" (112.7 in²)
0.07	5082	12000	21180	48840	85080	134460	193080
0.2	8460	19980	35220	81300	141600	223800	321360
0.4	12420	29280	51600	119100	207420	327840	470820
0.6	15540	36600	64500	148860	259260	409800	588540
0.8	18180	42900	75540	174420	303720	480000	689400
1.0	20580	48480	85380	197160	343320	542400	779340
1.2	22740	53580	94380	217920	379440	599700	861300
1.4	24780	58320	102720	237120	412920	652620	937260
1.6	26640	62760	110520	255120	444240	702120	1008420
1.8	28380	66900	117840	272100	473820	748860	1075500
2.0	30060	70920	124860	288180	501900	793260	1139280
3.0	37500	88440	155700	359520	626040	989460	1421100
4.0	43860	103380	182040	420240	731820	1156620	1661100
5.0	49500	116580	205320	474000	825540	1304700	1873860
6.0	54060	127440	224460	518160	902340	1426140	2048220
7.0	58260	137340	241800	558240	972180	1536480	2206680
8.0	62160	146400	257880	595260	1036680	1638420	2353080
9.0	65760	154920	272820	629820	1096800	1733460	2489640
10.0	69120	162900	286860	662220	1153320	1822740	2617860
11.0	72300	170460	300120	692880	1206660	1907100	2739000
12.0	75360	177600	312720	721980	1257300	1987140	2853960
13.0	78240	184440	324780	749700	1305600	2063400	2963520
14.0	81000	190920	336240	776220	1351740	2136360	3068280
15.0	83700	197160	347220	801600	1395960	2206320	3168720

TABLE II
Model 1420/1460
SCFH Air Capacity @10% Overpressure and 60°F

Pressure Setting psig	VALVE SIZE (ORIFICE SIZE)						
	2" (2.976 in²)	3" (7.013 in²)	4" (12.35 in²)	6" (28.51 in²)	8" (49.65 in2)	10" (78.47 in²)	12" (112.7 in²)
0.07	4614	10860	19200	44220	76080	118800	168540
0.2	7680	18120	31920	73620	126660	197760	280500
0.4	11040	26040	45840	105840	182100	284280	403200
0.6	13680	32220	56760	130980	225360	351840	499080
0.8	15900	37500	66060	152520	262380	409560	580920
1.0	17940	42240	74340	171660	295320	460980	653880
1.2	19740	46500	81960	189120	325920	507960	720480
1.4	21420	50520	88980	205380	353340	551580	782340
1.6	23040	54240	95580	220620	379500	592500	840360
1.8	24540	57840	101820	235020	404340	631200	895320
2.0	25980	61200	107760	248760	427980	668160	947700
3.0	32400	76320	134400	310260	533760	833220	1181820
4.0	37980	89460	157560	363720	625740	976860	1385520
5.0	43020	101400	178560	412140	709080	1106940	1570080
6.0	47700	112440	198000	457080	786360	1227600	1741260
7.0	52140	122820	216300	499380	859140	1341240	1902420
8.0	56340	132720	233760	539640	928440	1449360	2055780
9.0	60360	142260	250500	578280	994860	1553100	2202900
10.0	64260	151380	266640	615540	1058940	1653120	2344800
11.0	68040	160320	282300	651600	1121040	1750080	2482320
12.0	71700	168960	297480	681780	1172100	1828380	2591340
13.0	75240	177360	310620	707940	1217040	1898520	2690820
14.0	78480	184920	321600	732960	1260060	1965660	2785980
15.0	81060	190980	332100	756960	1301340	2030040	2877180

TABLE III
Vacuum Flow Capacity
Model 1400/1420
SCFH Air Capacity @100% Overpressure and 60°F

Vacuum Setting InWC	VALVE SIZE						
	2"	3"	4"	6"	8"	10"	12"
0.87	4680	10320	16020	34680	60480	91080	129000
1.00	5040	10980	17220	37320	64980	97920	138000
1.73	6660	14520	22620	49020	85320	129000	181980
2.00	7140	15600	24180	52620	91620	138000	195000
3.00	8700	19020	29580	64200	112020	169020	238020
4.00	10020	21900	34080	73980	129000	193980	274020
6.00	12180	26700	41520	90120	157020	237000	334020
8.00	13980	30600	47700	103020	180000	271980	384000
10.00	15600	34020	52980	115020	199980	301980	427020

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

SIZING TABLES

Tables are provided to allow you to select the proper size valve for your application. It is suggested that API Standard 2000 be utilized to obtain the required flow capacity.

TABLE I
Model 1400/1430
NCMH Air Capacity @10% Overpressure and 0° C

Pressure Setting mbar	VALVE SIZE (ORIFICE SIZE)						
	2"	3"	4"	6"	8"	10"	12"
5	148	350	618	1428	2484	3924	5634
10	210	496	876	2016	3510	5550	7980
20	308	726	1278	2952	5142	8100	11700
30	385	906	1602	3690	6420	10140	14580
40	451	1062	1872	4326	7560	11880	17100
50	511	1200	2118	4890	8520	13440	19320
100	726	1716	3024	6960	12120	19200	27600
150	900	2118	3726	8580	15000	23700	34020
200	1044	2460	4332	10020	17400	27540	39540
250	1170	2766	4872	11220	19560	30960	44460
300	1290	3048	5364	12360	21540	34080	48960
350	1422	3348	5898	13620	23700	37500	53820
400	1536	3624	6360	14760	25680	40560	58260
450	1644	3876	6840	15780	27480	43380	62340
500	1728	4080	7200	16560	28860	45660	65580
550	1812	4272	7500	17340	30240	47760	68580
600	1890	4446	7860	18060	31500	49740	71460
650	1962	4620	8160	18780	32700	51660	74220
700	2028	4782	8400	19440	33840	53460	76800
750	2094	4938	8700	20040	34920	55200	79320
800	2160	5088	8940	20700	36000	56880	81720
850	2220	5232	9180	21240	37020	58500	84060
900	2280	5370	9480	21840	37980	60060	86280
1000	2394	5646	9960	22980	39960	63180	90720

TABLE II
Model 1420/1460
NCMH Air Capacity @10% Overpressure and 0° C

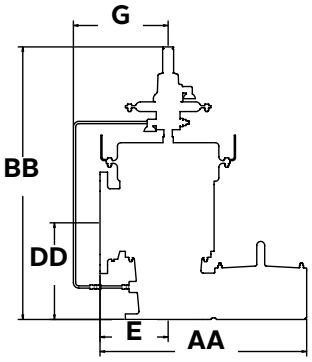
Pressure Setting mbar	VALVE SIZE (ORIFICE SIZE)						
	2"	3"	4"	6"	8"	10"	12"
5	134	318	560	1290	2220	3468	4920
10	190	449	792	1824	3138	4902	6960
20	274	648	1134	2622	4518	7020	10020
30	339	798	1410	3246	5586	8700	12360
40	394	930	1638	3780	6480	10140	14400
50	445	1050	1842	4254	7320	11460	16200
100	630	1488	2622	6060	10440	16260	23040
150	780	1836	3228	7440	12840	20040	28380
200	906	2124	3750	8640	14880	23220	32940
250	1014	2388	4206	9720	16740	26100	37020
300	1116	2628	4626	10680	18360	28680	40680
350	1230	2892	5088	11760	20220	31560	44760
400	1332	3138	5526	12780	21960	34260	48600
450	1434	3372	5940	13740	23580	36840	52260
500	1530	3600	6360	14640	25200	39300	55740
550	1620	3816	6720	15540	26700	41700	59160
600	1710	4032	7080	16380	28200	44040	62460
650	1800	4242	7440	17220	29640	46260	65640
700	1884	4440	7800	18060	31080	48480	68820
750	1968	4644	8160	18840	32460	50700	71880
800	2052	4836	8520	19500	33540	52380	74220
850	2136	5028	8820	20100	34500	53820	76320
900	2208	5202	9060	20580	35460	55260	78360
1000	2322	5466	9480	21660	37260	58140	82380

TABLE III
Vacuum Flow Capacity Model 1400/1420
NCMH Air Capacity @100% Overpressure and 0° C

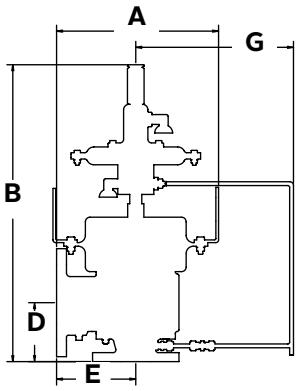
Vacuum Setting InWC	VALVE SIZE						
	2"	3"	4"	6"	8"	10"	12"
2	132	288	449	972	1698	2556	3612
3	161	353	549	1194	2076	3126	4422
4	186	406	630	1374	2394	3606	5094
5	208	454	708	1536	2676	4026	5694
7	245	536	834	1812	3156	4752	6720
10	292	636	996	2160	3762	5664	7980
15	356	780	1212	2628	4584	6900	9780
20	409	894	1392	3018	5262	7920	11220
25	455	996	1548	3354	5850	8820	12480

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

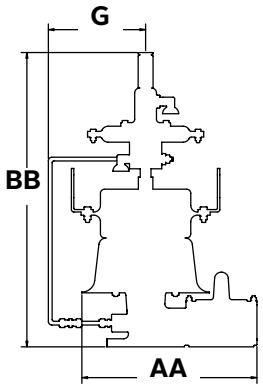
SPECIFICATIONS



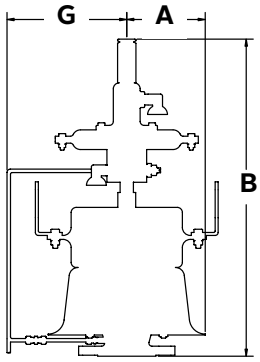
Model 1420



Model 1460



Model 1400



Model 1430

MODELS 1420 AND 1460

Specifications subject to change without notice. Certified dimensions available on request.

SIZE (Metric)		STANDARD SETTINGS PRESSURE		STANDARD SETTINGS VACUUM		A (Metric)	B (Metric)	D (Metric)	E (Metric)	G (Metric)	AA (Metric)	BB (Metric)	DD (Metric)	APPROX. SHIP WT. LBS.*
INLET	OUT.	MAX.	**MIN.	MAX.	MIN.									
2" (50 mm)	3" (80 mm)	15 psig (1.035 barg)	7 InWC (17.5 mb)	12 psig (.828 barg)	0.5 oz/in² (2.16 mb) See page 179	10.50" (267 mm)	23.50" (597 mm)	4.12" (105 mm)	5.50" (140 mm)	7" (178 mm)	14.50" (368 mm)	26.50" (673 mm)	7" (178 mm)	35 (16 kg)
3" (80 mm)	4" (100 mm)					11.50" (292 mm)	25.50" (648 mm)	5" (127 mm)	6" (152 mm)	7.50" (191 mm)	18" (457 mm)	28.75" (730 mm)	8.12" (206 mm)	40 (18 kg)
4" (100 mm)	6" (150 mm)					12.50" (318 mm)	28.50" (724 mm)	6.50" (165 mm)	6.50" (165 mm)	8" (203 mm)	19.25" (489 mm)	31.50" (800 mm)	9.50" (241 mm)	50 (23 kg)
6" (150 mm)	8" (200 mm)					16.75" (425 mm)	32.25" (819 mm)	8.50" (216 mm)	8.50" (216 mm)	10.25" (260 mm)	26.50" (673 mm)	36.50" (927 mm)	12.75" (324 mm)	70 (32 kg)
8" (200 mm)	10" (250 mm)					20.50" (521 mm)	36.75" (933 mm)	9.75" (248 mm)	10.75" (273 mm)	11.75" (298 mm)	32.50" (826 mm)	42.25" (1073 mm)	15.25" (387 mm)	90 (41 kg)
10" (250 mm)	12" (300 mm)					20.25" (514 mm)	38.75" (984 mm)	10.25" (260 mm)	12.50" (318 mm)	13.75" (349 mm)	37.75" (959 mm)	46.50" (1181 mm)	18" (457 mm)	125 (57 kg)
12" (300 mm)	14" (350 mm)					27.75" (705 mm)	42.75" (1086 mm)	11" (279 mm)	15" (381 mm)	14.75" (375 mm)	42.75" (1086 mm)	52.50" (1334 mm)	20.62" (524 mm)	150 (69 kg)

*Approximate weight of aluminum Model 1420. **2 InWC minimum set with 1402 Pilot.

MODELS 1400 AND 1430

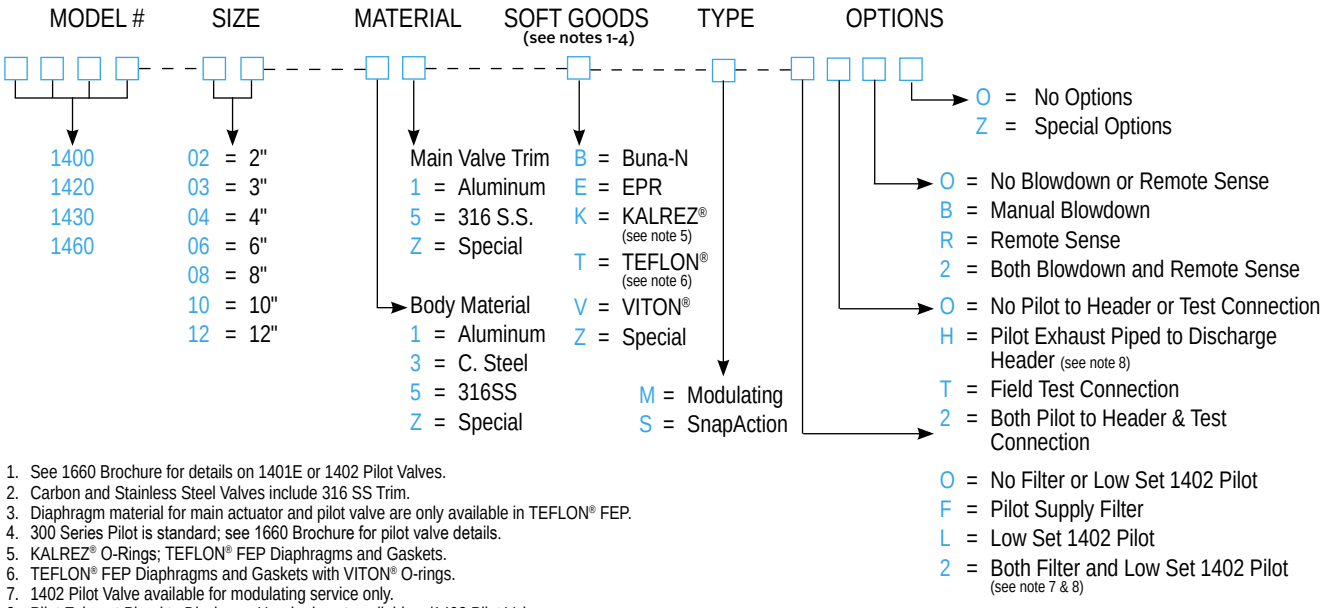
Specifications subject to change without notice. Certified dimensions available on request.

SIZE (Metric)	STANDARD SETTINGS PRESSURE		STANDARD SETTINGS VACUUM		A (Metric)	B (Metric)	G (Metric)	AA (Metric)	BB (Metric)	APPROX. SHIP WT. LBS.*
	MAX.	**MIN.	MAX.	MIN.						
2" (50 mm)	15 psig (1.035 barg)	7 InWC (.17.5 mb)	12 psig (.828 barg)	0.5 oz/in² (2.16 mb) See page 179	4.75" (121 mm)	25.50" (648 mm)	7" (178 mm)	13.50" (343 mm)	27.50" (699 mm)	30 (14 kg)
3" (80 mm)					5.75" (146 mm)	26.50" (673 mm)	7.75" (197 mm)	17.75" (451 mm)	29" (737 mm)	35 (16 kg)
4" (100 mm)					6.50" (165 mm)	27.50" (699 mm)	8.50" (216 mm)	19.50" (495 mm)	30.25" (768 mm)	40 (18 kg)
6" (150 mm)					8.50" (216 mm)	29.50" (749 mm)	10.50" (267 mm)	26.50" (673 mm)	34" (864 mm)	50 (23 kg)
8" (200 mm)					9.75" (248 mm)	32.50" (826 mm)	11.75" (298 mm)	31.50" (800 mm)	40" (1016 mm)	65 (30 kg)
10" (250 mm)					11.75" (298 mm)	34.50" (876 mm)	13.75" (349 mm)	37" (940 mm)	43.75" (1111 mm)	95 (43 kg)
12" (300 mm)					12.75" (324 mm	36.50" (927 mm)	14.75" (375 mm)	40.50" (1029 mm)	48" (1219 mm)	125 (57 kg)

*Approximate weight of aluminum Model 1400. **2 InWC minimum set with 1402 Pilot

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES

1. See 1660 Brochure for details on 1401E or 1402 Pilot Valves.
2. Carbon and Stainless Steel Valves include 316 SS Trim.
3. Diaphragm material for main actuator and pilot valve are only available in TEFLON® FEP.
4. 300 Series Pilot is standard; see 1660 Brochure for pilot valve details.
5. KALREZ® O-Rings; TEFLON® FEP Diaphragms and Gaskets.
6. TEFLON® FEP Diaphragms and Gaskets with VITON® O-rings.
7. 1402 Pilot Valve available for modulating service only.
8. Pilot Exhaust Piped to Discharge Header is not available w/1402 Pilot Valve. Pilot will only exhaust vapors in the dome.

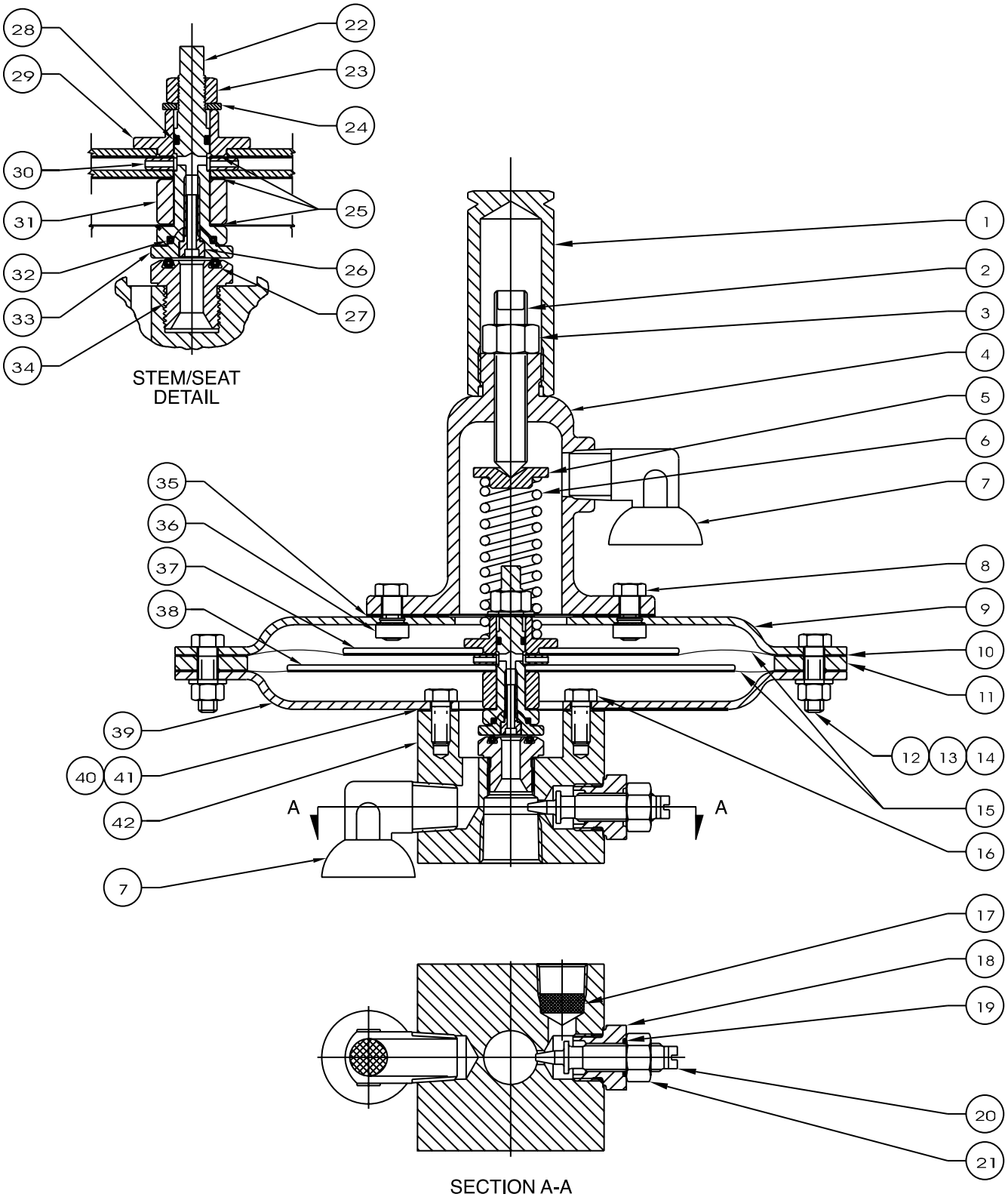
EXAMPLE

1 4 3 0 — 0 6 — 3 5 — V — S — 0 0 R 0

Indicates a 6" Model 1430 with carbon steel body and 316SS trim using VITON® soft goods, snap action with remote pilot pickup and no other options.

ASSEMBLY

Model 1401E Pilot Valve



ASSEMBLY

Model 1401E Pilot Valve

Item	Description	Qty.	Materials of Construction
			All 316 SS
1	Cap, Adjustment Screw	1	316 SS
2	Screw, Adjustment	1	316 SS
3	Nut, Hex	1	316 SS
4	Bonnet, Spring	1	316 SS
5	Button, Spring	1	316 SS
6	Spring	1	316 SS (Note 2)
7	Vent, Breather	2	Plastic
8	Bolt, Hex	4	316 SS
9	Case, Diaphragm-Upper	1	316 SS
10	Gasket, Actuator	1	TEFLON® FEP
11	Spacer, Actuator Housing	1	316 SS
12	Bolt Hex	12	316 SS
13	Nut, Hex	12	316 SS
14	Washer, Lock	12	316 SS
15	Diaphragm, Actuator	1	TEFLON® FEP
16	Bolt, Hex	8	316 SS
17	Screen, Filter	1	316 SS
18	Bushing, Blowdown	1	316 SS
19	O-Ring	1	PTFE
20	Needle, Blowdown	1	316 SS
21	Nut, Hex Jam	1	316 SS
22	Stem	1	316 SS
23	Nut, Hex	1	316 SS
24	Washer, Lock	1	316 SS
25	Washer	1	TEFLON® FEP
26	Screw, Stem	1	316 SS
27	O-Ring	1	Note 1
28	O-Ring	1	Note 1
29	Guide, Spring	1	316 SS
30	Spacer, Central	1	316 SS
31	Spacer, Lower	1	316 SS
32	O-Ring	1	Note 1
33	Disc, Stem	1	316 SS
34	Bushing, Seat	1	316 SS
35	Gasket, Spring Bonnet	1	Note 1
36	Nut, Swage	4	304 SS
37	Plate, Support-Upper	1	316 SS
38	Plate, Support-Lower	1	316 SS
39	Case, Diaphragm-Lower	1	316 SS
40	Diaphragm, Body	1	TEFLON® FEP
41	Gasket, Body	1	TEFLON® FEP
42	Body	1	316 SS

1. Elastomer material options for the pilot valve(s) are specified by the soft goods designation in the “How to Order Section” section.
2. 17-7 PH SS or chrome vanadium for set pressure greater than 8 psig.
3. Consult factory for material options not listed above.

OPTIONS

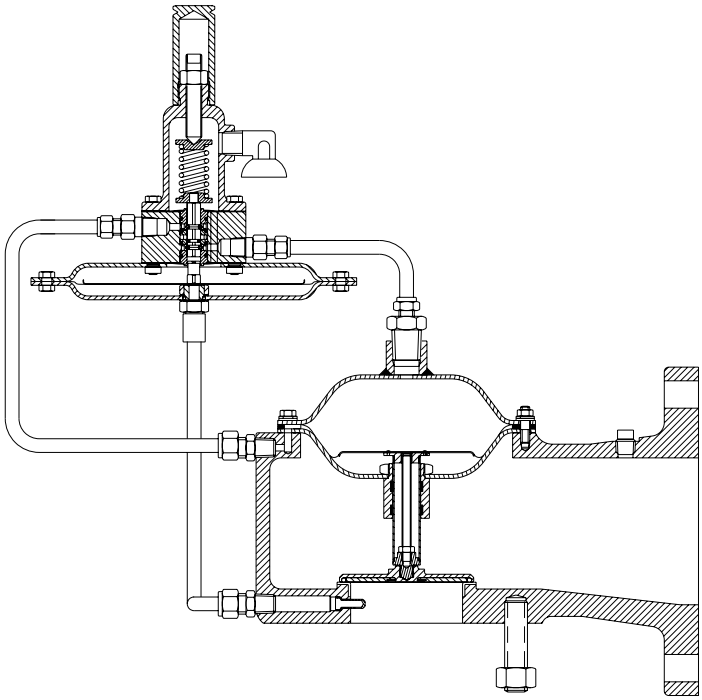
Model 1402 Low Set Pilot Operated Relief Valve

The Model 1402 Pilot Valve allows the effective pressure range of all Groth pilot operated valves to be as low as 2.0 InWC (depending on valve model, size and materials of construction).

The Model 1402 Pilot Valve functions as a 4-way valve and the main valve is supplied with a double acting actuator. Below set pressure, the pilot uses tank pressure to pressurize the upper chamber of the actuator and vents the lower chamber. At set pressure, the pilot exhausts the upper chamber and pressurizes the lower chamber, applying sufficient upward force to overcome the weight of the valve stem assembly.

The action is modulating and non-flowing (the pilot only emits vapors while the main valve actuator is being exhausted).

The pilot valve pressure setting is adjustable throughout the range of 2.0 InWC to 8.0 InWC. It is used for pressure relief only and is available with all applicable materials and options shown.



TECHNICAL DATA

MATERIAL OPTION	ALUMINUM	CARBON STEEL	STAINLESS STEEL
Sizes	2" - 12"	2" - 12"	2" - 12"
Pressure Settings	*2 InWC to 15 psig 5.0 mb to 1.0 barg	**2 InWC to 15 psig 5.0 mb to 1.0 barg	**2 InWC to 15 psig 5.0 mb to 1.0 barg
Vacuum Settings	***3 InWC to 12 psig 7.5 mb to 0.83 barg	***3 InWC to 12 psig 7.5 mb to 0.83 barg	***3 InWC to 12 psig 7.5 mb to 0.83 barg
Temperature Limits	- 323°F to 300°F - 197°C to 150°C	- 20°F to 300°F - 29°C to 150°C	- 323°F to 300°F - 197°C to 150°C

* Model 1402 pilot required for settings less than 3 InWC [7.5 mb].
** Model 1402 pilot required for settings less than 7 InWC [17.2 mb].
*** Direct acting vacuum [Model 1661A] achieves rated capacity at 3.5 InWC (8.6 mb)

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- **Severe service application**
- **Premium tight seal**
- **Snap acting**
- **Instrument air operated**

AIR OPERATED VALVES

Series 1500
Model 1520, Model 1560, Model 1530, Model 1500

Model 1520
Air Operated
Pressure / Vacuum Relief Valves
Pipe-away design

Model 1530
Air Operated Pressure Relief Valve
Relief to atmosphere design

Model 1560
Air Operated
Pressure Relief Valves
Pipe-away design

Model 1500
Air Operated
Pressure / Vacuum Relief Valves
Relief to atmosphere design

FEATURES AND BENEFITS

Series 1500

Air operated valves for atmospheric and low pressure storage tanks

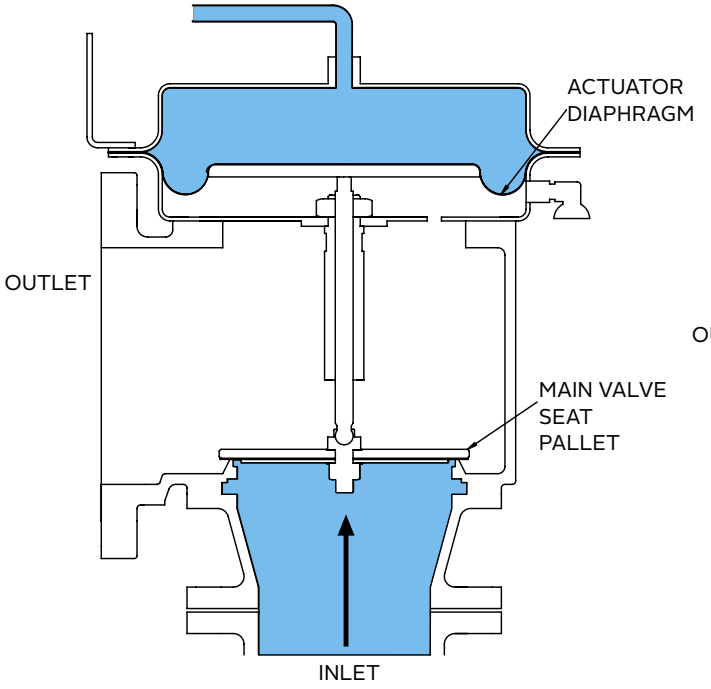
(Models 1500 and 1520 ONLY)

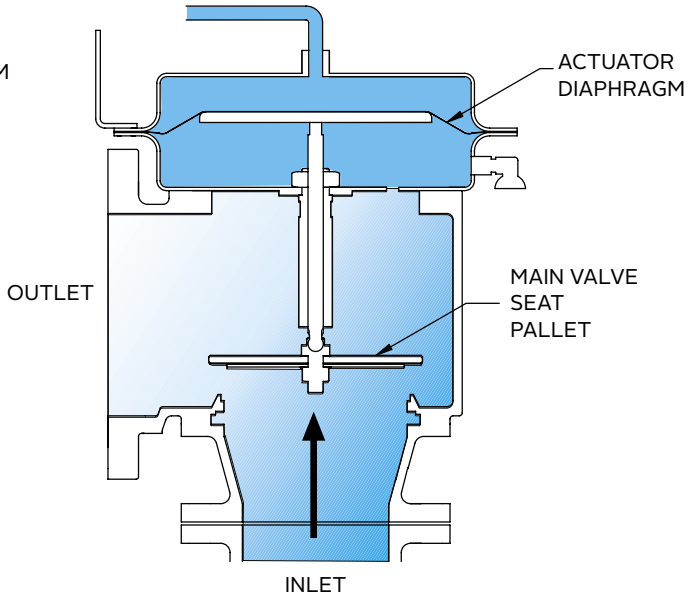
FEATURES	BENEFITS
AIR OPERATED	• Use instrument air or N2 • Non-corrosive and non-plugging • Lower profile and weight than spring operated models for high settings • Remote pilot sensing from pressure switch • Remote or manual blowdown available
EXTRA TIGHT SEAL	• Main valve remains tight to set pressure
FULL FLOW	• Full open at set point
SNAP ACTION	• Snap acting for immediate efficiency
SOFT SEATED	• Soft seats seal tight to conserve product and minimize valve wear which improves reliability
TOP ENTRY	• Reduces maintenance costs since the valve can be completely serviced without removal from its mounting
CHOICE OF Aluminum, Carbon Steel, Fiberglass (FRP), or special materials for the main body	• Wide range of materials to meet most corrosive media and temperature applications at the lowest possible cost
SIZES 2" THROUGH 12"	• There is a size to meet your relieving capacity requirements without the need of expensive oversizing
HIGH CAPACITY DESIGN	• Groth air pilot operated valves have higher capacity, size for size, than most other relief valves. You get more capacity for your money
PRESSURE SETTINGS 5 InWC TO 15 psig	• Setting range covers all atmospheric and low pressure storage tanks
VACUUM SETTINGS 0.5 oz/in² TO 12 psig	• Wide setting range to meet your design requirements. • Weight or spring loaded valve

Air operated valves are used to replace weight loaded, spring loaded, and pilot operated valves in severe application where polymerization and crystallization may take place and plug as well as corrode the control orifices. The air operated valve increases valve efficiency and reduces evaporation losses. The pressure switch coupled with a solenoid valve and using plant instrument air instead of corrosive product vapor provides a bubble tight seal in the valve. Additionally, the use of clean air greatly reduces maintenance time when compared with the pilot operated valve. By using the air operated valve, remote sensing is provided by the pressure switch. This valve provides greater conservation due to minimum product loss which in turn adds to the profits at the bottom line.

The Groth 1500 Series group provides safe, dependable, and accurate low pressure and/or vacuum on your storage tank. A range of pressure and vacuum requirements may be easily set. Full flow is obtainable at set point and the snap acting feature provides immediate efficiency. This reduces the requirement for large overpressure and saves product, translating into profit. The standard valve may incorporate a vacuum breaker when desired.

OPERATION





The 1500 Series Air Operated Valve is available in five basic models: the 1500, 1520, 1530, 1560 and 1580. The 1500 and 1520 are combination pressure/vacuum valves. The 1500 discharges to the atmosphere and 1520 has an outlet flange for pipe-away applications. The 1530 is a pressure only valve that discharges to atmosphere. The 1560 may be used for pressure or vacuum for pipe-away applications. All valves are held in the closed position by low pressure plant air. When the air pressure is removed, the valve is forced open by the process pressure or vacuum. Full open position is achieved as low as 5 InWC pressure or vacuum in some cases.

The system is composed of the air operated valve, a pressure switch and a three-way solenoid valve. The pressure switch is attached to the tank or vessel and connected to the solenoid valve which controls the instrument air or N2 line. This is the normal configuration but if desired or necessary more than one switch or solenoid valve may be used. Placement on the tank for the pressure switch and placement of the solenoid valve may be located to meet your requirements.

The pressure switch is adjusted to the desired valve set point. When the pressure in the tank reaches the set point, a signal is sent to the solenoid valve which is de-energized and the plant air is cut off and exhausted. This releases the pressure on the valve actuator allowing the main valve seat pallet to move up thereby venting the tank.

In a similar manner, the reverse takes place when the set point pressure is reached when the valve is open. The pressure switch energizes the solenoid valve which is then energized to open. This opening permits the line to open and plant instrument air enters the actuator forcing the main valve seat pallet to move down closing the valve which eliminates the tank vapor flow.

SIZING TABLES

Tables are provided to allow you to select the proper size valve for your application. It is suggested that API Standard 2000 be utilized to obtain the required flow capacity.

TABLE I
Model 1500/1530
SCFH Air Capacity
@10% Overpressure
and 60°F

Pressure Setting psig	VALVE SIZE (ORIFICE SIZE)						
	2"	3"	4"	6"	8"	10"	12"
0.2	8460	19980	35220	81300	141600	223800	321360
0.4	12420	29280	51600	119100	207420	327840	470820
0.6	15540	36600	64500	148860	259260	409800	588540
0.8	18180	42900	75540	174420	303720	480000	689400
1.0	20580	48480	85380	197160	343320	542400	779340
1.2	22740	53580	94380	217920	379440	599700	861300
1.4	24780	58320	102720	237120	412920	652620	937260
1.6	26640	62760	110520	255120	444240	702120	1008420
1.8	28380	66900	117840	272100	473820	748860	1075500
2.0	30060	70920	124860	288180	501900	793260	1139280
3.0	37500	88440	155700	359520	626040	989460	1421100
4.0	43860	103380	182040	420240	731820	1156620	1661100
5.0	49500	116580	205320	474000	825540	1304700	1873860
6.0	54060	127440	224460	518160	902340	1426140	2048220
7.0	58260	137340	241800	558240	972180	1536480	2206680
8.0	62160	146400	257880	595260	1036680	1638420	2353080
9.0	65760	154920	272820	629820	1096800	1733460	2489640
10.0	69120	162900	286860	662220	1153320	1822740	2617860
11.0	72300	170460	300120	692880	1206660	1907100	2739000
12.0	75360	177600	312720	721980	1257300	1987140	2853960
13.0	78240	184440	324780	749700	1305600	2063400	2963520
14.0	81000	190920	336240	776220	1351740	2136360	3068280
15.0	83700	197160	347220	801600	1395960	2206320	3168720

TABLE II
MODEL 1520/1560
SCFH Air Capacity
@10% Overpressure
and 60°F

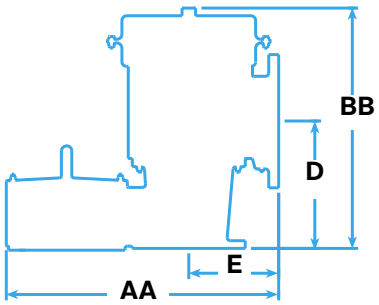
Pressure Setting psig	VALVE SIZE (ORIFICE SIZE)						
	2"	3"	4"	6"	8"	10"	12"
0.2	7680	18120	31920	73620	126660	197760	280500
0.4	11040	26040	45840	105840	182100	284280	403200
0.6	13680	32220	56760	130980	225360	351840	499080
0.8	15900	37500	66060	152520	262380	409560	580920
1.0	17940	42240	74340	171660	295320	460980	653880
1.2	19740	46500	81960	189120	325920	507960	720480
1.4	21420	50520	88980	205380	353340	551580	782340
1.6	23040	54240	95580	220620	379500	592500	840360
1.8	24540	57840	101820	235020	404340	631200	895320
2.0	25980	61200	107760	248760	427980	668160	947700
3.0	32400	76320	134400	310260	533760	833220	1181820
4.0	37980	89460	157560	363720	625740	976860	1385520
5.0	43020	101400	178560	412140	709080	1106940	1570080
6.0	47700	112440	198000	457080	786360	1227600	1741260
7.0	52140	122820	216300	499380	859140	1341240	1902420
8.0	56340	132720	233760	539640	928440	1449360	2055780
9.0	60360	142260	250500	578280	994860	1553100	2202900
10.0	64260	151380	266640	615540	1058940	1653120	2344800
11.0	68040	160320	282300	651600	1121040	1750080	2482320
12.0	71700	168960	297480	681780	1172100	1828380	2591340
13.0	75240	177360	310620	707940	1217040	1898520	2690820
14.0	78480	184920	321600	732960	1260060	1965660	2785980
15.0	81060	190980	332100	756960	1301340	2030040	2877180

TABLE III
Vacuum Flow Capacity
Model 1500/1520
SCFH Air Capacity
@100% Overpressure
and 60°F

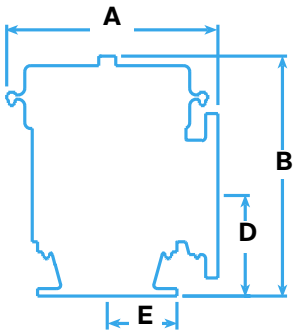
Vacuum Setting InWC	VALVE SIZE						
	2"	3"	4"	6"	8"	10"	12"
0.87	4680	10320	16020	34680	60480	91080	129000
1.00	5040	10980	17220	37320	64980	97920	138000
1.73	6660	14520	22620	49020	85320	129000	181980
2.00	7140	15600	24180	52620	91620	138000	195000
3.00	8700	19020	29580	64200	112020	169020	238020
4.00	10020	21900	34080	73980	129000	193980	274020
6.00	12180	26700	41520	90120	157020	237000	334020
8.00	13980	30600	47700	103020	180000	271980	384000
10.00	15600	34020	52980	115020	199980	301980	427020

For an equivalent size fiberglass valve, reduce tabulated capacities by 32%.

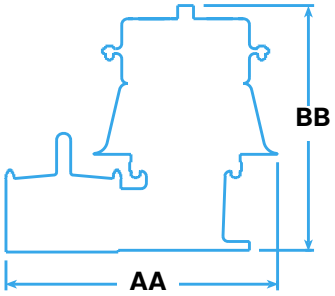
SPECIFICATIONS



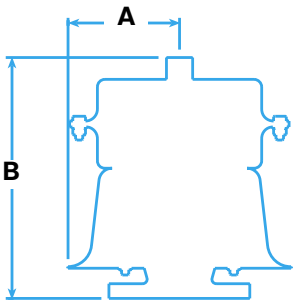
Model 1520



Model 1560



Model 1500



Model 1530

MODELS 1520 AND 1560

Specifications subject to change without notice. Certified dimensions available on request.

SIZE (Metric)		STANDARD SETTINGS PRESSURE		STANDARD SETTINGS VACUUM		A (Metric)	B (Metric)	D (Metric)	E (Metric)	AA (Metric)	BB (Metric)	DD (Metric)	APPROX. SHIP WT. LBS.*
INLET	OUT.	MAX	MIN	MAX	MIN								
2" (50 mm)	3" (80 mm)	15 psig (1.05 kg/cm²)	3 oz/in² (13.2 gm/cm²)	10 oz/in² (43.9 gm/cm²)	0.5 oz/in² (2.2 gm/cm²)	11.50" (292 mm)	14.50" (368 mm)	4.12" (105 mm)	5.50" (140 mm)	14.50" (368 mm)	17.50" (445 mm)	7" (178 mm)	35 (13.75 kg)
3" (80 mm)	4" (100 mm)			12 oz/in² (52.7 gm/cm²)		12.50" (318 mm)	16.50" (419 mm)	5" (127 mm)	6" (152 mm)	18" (457 mm)	19.75" (502 mm)	8.12" (206 mm)	35 (15.75 kg)
4" (100 mm)	6" (150 mm)			12 oz/in² (52.7 gm/cm²)		13.37" (340 mm)	19.50" (495 mm)	6.50" (165 mm)	6.50" (165 mm)	19.12" (486 mm)	22.50" (572 mm)	9.50" (241 mm)	45 (20.75 kg)
6" (150 mm)	8" (200 mm)			14 oz/in² (61.5 gm/cm²)		17.75" (451 mm)	23.25" (591 mm)	8.50" (216 mm)	8.50" (216 mm)	26.50" (673 mm)	27.50" (699 mm)	12.75" (324 mm)	65 (29.75 kg)
8" (200 mm)	10" (250 mm)			16 oz/in² (70.3 gm/cm²)		21.50" (546 mm)	27.75" (705 mm)	9.75" (248 mm)	10.75" (273 mm)	32.50" (826 mm)	33.25" (845 mm)	15.25" (387 mm)	85 (38.75 kg)
10" (250 mm)	12" (300 mm)			16 oz/in² (70.3 gm/cm²)		25.25" (641 mm)	29.75" (756 mm)	10.25" (260 mm)	12.50" (318 mm)	37.75" (959 mm)	37.50" (953 mm)	18" (457 mm)	120 (54.75 kg)
12" (300 mm)	14" (350 mm			16 oz/in² (70.3 gm/cm²)		28.75" (730 mm)	33.75" (857 mm)	11" (279 mm)	15" (381 mm)	42.75" (1086 mm)	43.50" (1105 mm)	20.62" (524 mm)	145 (66.25 kg)

*Approximate weight of aluminum Model 1520.

MODELS 1500 AND 1530

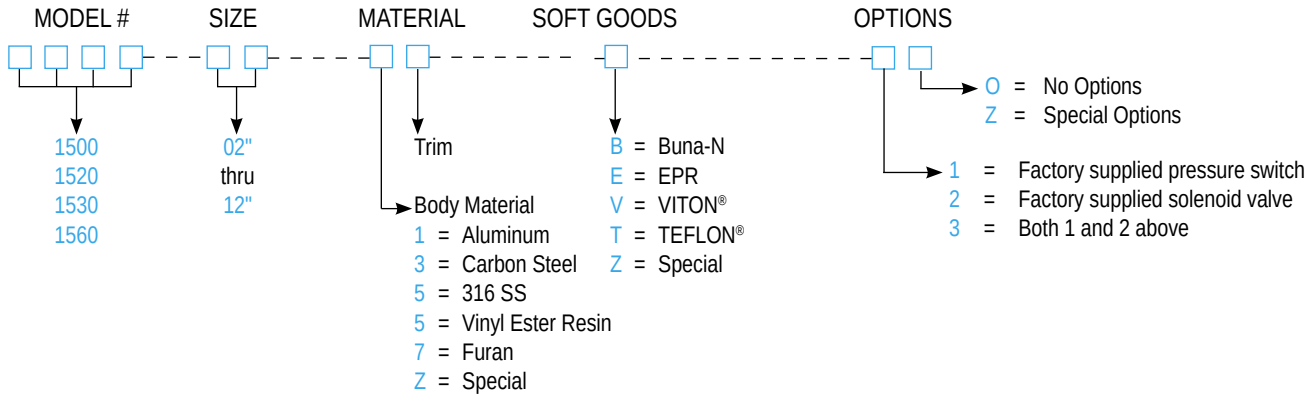
Specifications subject to change without notice. Certified dimensions available on request.

SIZE (Metric)	STANDARD SETTINGS PRESSURE		STANDARD SETTINGS VACUUM		A (Metric)	B (Metric)	AA (Metric)	BB (Metric)	APPROX. SHIP WT. LBS.*
	MAX	MIN	MAX	MIN					
2" (50 mm)	15 psig (1.05 kg/cm2)	3 oz/in² (.17.5 mb)	10 oz/in² (43.9 gm/cm²)	0.5 oz/in² (2.2 gm/cm²	4.75" (121 mm)	16.50" (419 mm)	13.50" (343 mm)	18.50" (470 mm)	25 (11.75 kg)
3" (80 mm)			12 oz/in² (52.7 gm/cm²)		5.75" (146 mm)	17.75" (451 mm)	17.75" (451 mm)	20" (508 mm)	30 (13.75 kg)
4" (100 mm)			12 oz/in² (52.7 gm/cm²)		6.50" (165 mm)	18.50" (470 mm)	19.50" (495 mm)	21.25" (540 mm)	35 (15.75 kg)
6" (150 mm)			14 oz/in² (61.5 gm/cm²)		8.50" (216 mm)	20.50" (521 mm)	26.50" (673 mm)	25" (635 mm)	45 (20.75 kg)
8" (200 mm)			16 oz/in² (70.3 gm/cm²)		9.75" (248 mm)	23.50" (597 mm)	31.50" (800 mm)	31" (787 mm)	60 (27.75 kg)
10" (250 mm)			16 oz/in² (70.3 gm/cm²)		11.75" (298 mm)	25.50" (648 mm)	37" (940 mm)	34.75" (883 mm)	90 (40.75 kg)
12" (250 mm)			16 oz/in² (70.3 gm/cm²)		12.75" (324 mm)	27.50" (699 mm)	40.50" (1029 mm)	39" (991 mm)	120 (54.75 kg)

*Approximate weight of aluminum Model 1500.

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES

- Aluminum body will include stainless steel and/or aluminum trim.
- Carbon steel and stainless steel body will include stainless steel trim.
- Aluminum and carbon steel will include carbon steel actuator housing, all other are stainless steel.

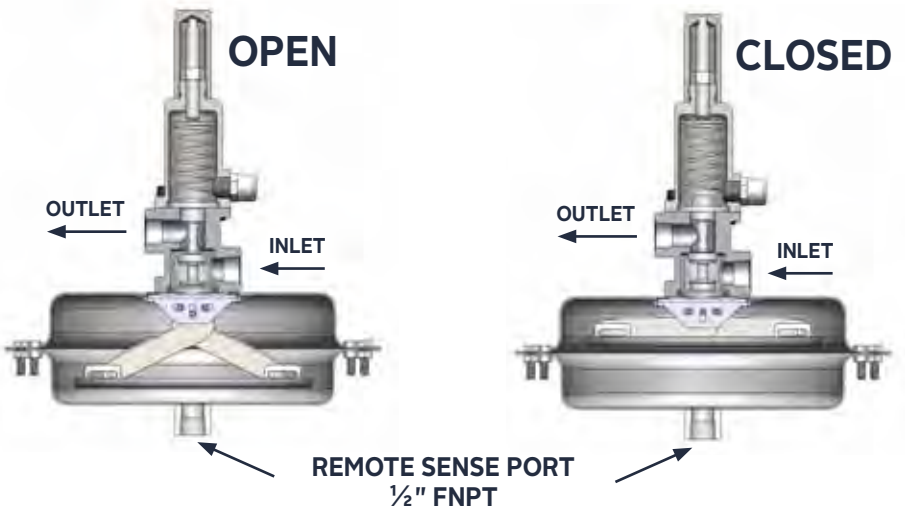
EXAMPLE

1 5 3 0 — 0 6 — 3 5 — V — 1 0

Indicates a 6" Model 1530 with carbon steel body and 316SS trim using VITON® soft goods with factory supplied pressure switch and solenoid.

Model 3000 Series

- **Low maintenance cost**
- **Provides optimum gas blanketing of tank and product being stored**
- **Prevents evaporation of product and reduces corrosion of tank by providing blanketing gas in vapor space**
- **Prevents a flammable or explosive environment in the tank vapor space**
- **Ensures pressure is maintained in the vapor space of a storage tank**
- **Eliminates the need for a multiple regulator system or for complicated pilot operated blanketing**



WHY BLANKET GAS REGULATORS?

Blanket Gas Regulators from Groth Corporation ensure that a constant gas pressure is maintained in the vapor space of a storage tank. A blanket gas regulator supplies an inert gas to prevent a vacuum from developing when liquid is removed from a tank, to maintain the desired blanket pressure when the temperature drops, and to prevent outside air from contaminating the tank or creating a flammable or explosive environment. A blanket gas pressure as low as 0.5 InWC prevents outside air and moisture from entering the storage vessel and reduces evaporation of the stored product to a negligible amount. The end result: product conservation and significant reduction in tank emissions.

The simple design of a Groth blanket gas regulator eliminates the need for a multiple regulator system or complicated pilot operated blanketing valves. Groth units have totally balanced chambers to offer high accuracy and reliability, and ensure a leak-tight design without the need for a pilot valve to operate the unit, thus reducing maintenance costs.

APPLICATIONS

Groth blanket gas regulators provide a controlled gas environment in storage tanks for the following applications:

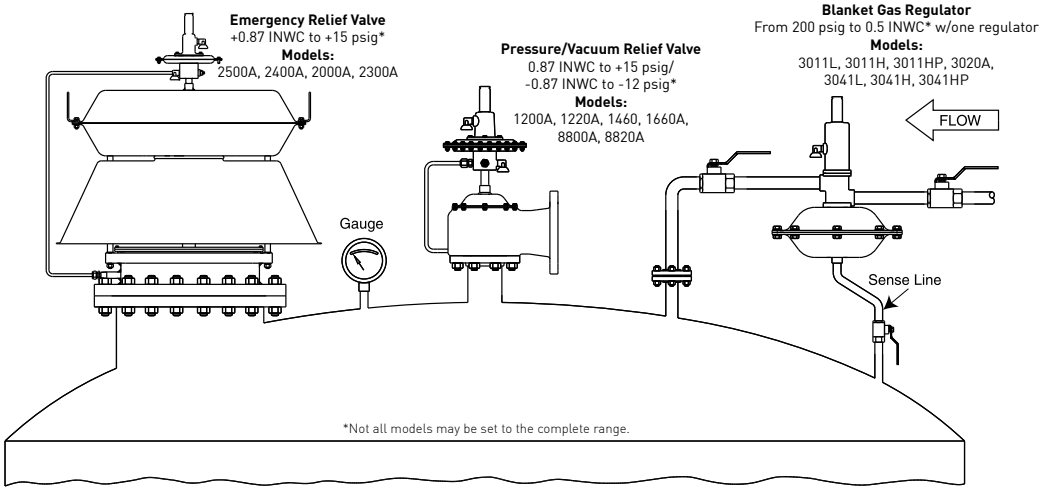
- Refineries
- Liquid Bulk Storage Terminals
- Pulp & Paper Plants
- Food & Beverage Storage
- Chemical & Petrochemical Plants

FEATURES

- Simple operation, spring-loaded “push-push” balanced piston design
- Bubble-tight shut-off
- Variable orifice, field-adjustable flow capacity
- Single stage regulator
- Setting ranges from 0.5 InWC to 15 psig
- Set pressure is field adjustable
- Modulating opening
- Minimal lockup and droop

MATERIALS

Available in 316SS or other material by request



OPTIMUM PROTECTION

For optimum protection of a tank and to meet all regulatory requirements, each tank should be protected by 1) a properly-sized blanket gas regulator, to maintain the vapor pressure in the tank, 2) a properly-sized pressure/vacuum relief valve or pilot operated valve, to release the vapor during pump-in or thermal expansion, and 3) a properly-sized emergency relief valve to protect against pressure rise due to external fire. Tank protection systems can be combined across multiple tanks, but careful consideration must be given to provide adequate relief and input capacity and to prevent fouling or clogging of system piping. Consult the factory for assistance in these situations.

A Groth blanket gas regulator will prevent evaporation or contamination of product by maintaining the proper atmosphere and pressure on the product stored in a tank. A Groth pressure/vacuum relief valve or pilot operated valve with vacuum relief will prevent vapor from escaping into the atmosphere until the set pressure is exceeded, and provide vacuum protection in case of a gas supply failure. The emergency relief valve will provide vessel protection under control system failure or external fire conditions. The complete system can be provided by Groth Corporation.

Benefits of storage tank blanketing are recognized by the following government regulations and industrial standards:

- API Standard 2000
- ISO 28300
- EPA Publication AP-42
- NFPA 69 - Standard on Explosion Prevention Systems
- OSHA Part 1910.110

OPERATION

The Groth blanket gas regulator maintains vapor pressure in a tank by opening the supply gas valve when tank pressure (through a sense port) falls below the specified set pressure. When tank pressure is at or above the set pressure, the plate diaphragm is held up by tank pressure. Through the force-multiplying actuator arms, the piston is held up against the spring pressure, and the supply valve is closed bubble-tight. When the tank pressure falls below the set pressure, the spring force overcomes the pressure. The piston moves down, and supply gas is released into the tank.

The actuating piston has identical effective areas on the lower piston seal and the o-ring. This balances the opening and closing forces caused by supply pressure; variable gas supply pressure will not have an effect on regulator operation, which eliminates the need for an external pilot control. Pressure against the diaphragm provides direct action against the spring. This “push-push” design provides maximum force to operate the regulator and to provide a bubble-tight seal.

The flow capacity can be limited by the rotatable orifice selector sleeve. Reducing the blanket gas flow capacity may reduce the need for excessive pressure relieving capacity on smaller tanks. The sleeve is field adjustable from 100% to 5% capacity, and can be locked down to prevent tampering.

Flow Capacity

Required flow capacity should be determined by using API 2000 | ISO 28300 or the relevant sizing standard. To find the rated capacity for your application, please refer to Table 1, Flow Capacity. Capacity is listed as a function of supply pressure for three typical blanket gases: CO_2, nitrogen, and natural gas. The flow capacities in the table are achieved with the 100% orifice selection. For reduced capacity, multiply the table values by the reduced percentage.

Table 1 — FLOW CAPACITY (APPLIES TO MODELS 3011L, 3011H, 3011HP, 3020A, 3041L, 3041H, AND 3041HP)

Supply Pressure		Flow Capacity 1/2"						Flow Capacity 1"					
		Carbon Dioxide		Nitrogen		"Natural Gas 0.6 S.G."		Carbon Dioxide		Nitrogen		"Natural Gas 0.6 S.G."	
psig	barg	SCFH	NCMH	SCFH	NCMH	SCFH	NCMH	SCFH	NCMH	SCFH	NCMH	SCFH	NCMH
5	0.34	2160	58	2810	75	3660	98	4600	123	5800	155	7400	198
10	0.69	3250	87	4230	113	5490	147	7100	190	8800	236	11300	303
15	1.03	4370	117	5690	152	7390	198	9200	246	11500	308	14600	391
20	1.38	5130	137	6680	179	8680	233	11200	300	14000	375	17900	480
30	2.07	6630	178	8630	231	11210	300	15100	405	18900	506	24000	643
40	2.76	8140	218	10590	284	13760	369	18800	504	23600	632	30000	804
50	3.45	9650	259	12560	336	16320	437	22500	603	28200	756	35800	959
60	4.14	11160	299	14520	389	18860	505	26000	697	32600	873	41500	1110
80	5.52	14180	380	18440	494	23950	642	33000	884	41300	1110	52600	1410
100	6.89	17200	461	22370	599	29060	779	40000	1070	50100	1340	63700	1710
120	8.27	20210	541	26290	704	34150	915	47000	1260	58800	1580	74800	2000
140	9.65	23230	622	30220	810	39250	1050	53900	1440	67500	1810	85900	2300
160	11.0	26240	703	34140	915	44340	1190	60900	1630	76300	2040	97000	2600
180	12.4	29260	784	38060	1020	49440	1320	67900	1820	85000	2280	108100	2900
200	13.8	32280	865	41990	1120	54540	1460	74900	2010	93700	2510	119200	3190

Note: Unless otherwise specified, the orifice selector sleeve is factory set at 100% capacity.

Table 2 POSITIVE PRESSURE MODEL SELECTION GUIDES

1/2" BLANKET GAS REGULATOR

PRESSURE SETTING	Supply Pressure psig / barg			
	5 to 50 0.34 to 3.4	>50 to 100 3.4 to 6.9	>100 to 150 6.9 to 10.3	>150 to 200 10.3 to 13.8
0.5 InWC to >1.0 InWC 1.2 to 2.5 mbarg	3011H			3011L
1.0 InWC to >1.5 InWC 2.5 to 3.7 mbarg				
1.5 InWC to >2.0 InWC 3.7 to 5.0 mbarg				
2.0 InWC to 6.5 InWC 5.0 to 16 mbarg				

1" BLANKET GAS REGULATOR

PRESSURE SETTING	Supply Pressure psig / barg			
	5 to 50 0.34 to 3.4	>50 to 100 3.4 to 6.9	>100 to 150 6.9 to 10.3	>150 to 200 10.3 to 13.8
0.5 InWC to <1.0 InWC 1.2 to 2.5 mbarg	3011H	3011L		
1.0 InWC to <1.5 InWC 2.5 to 3.7 mbarg				
1.5 InWC to <2.0 InWC 3.7 to 5.0 mbar				
2.0 InWC to <6.5 InWC 5.0 to 16 mbarg				
6.5 InWC to <2.0 psig 16 to 140 mbarg	3011HP			
2.0 psig to 15 psig 0.14 to 1.0 barg	3020A			

Table 3 VACUUM MODEL SELECTION GUIDES

1/2" BLANKET GAS REGULATOR

VACUUM SETTING	Supply Pressure psig / barg			
	5 to 50 0.34 to 3.4	>50 to 100 3.4 to 6.9	>100 to 150 6.9 to 10.3	>150 to 200 10.3 to 13.8
0.5 InWC to <1.0 InWC 1.2 to 2.5 mbarg	3041H			3041L
1.0 InWC to <1.5 InWC 2.5 to 3.7 mbarg				
1.5 InWC to <2.0 InWC 3.7 to 5.0 mbarg				
2.0 InWC to 6.5 InWC 5.0 to 16 mbarg				

1" BLANKET GAS REGULATOR

VACUUM SETTING	Supply Pressure psig / barg			
	5 to 50 0.34 to 3.4	>50 to 100 3.4 to 6.9	>100 to 150 6.9 to 10.3	>150 to 200 10.3 to 13.8
0.5 InWC to <1.0 InWC 1.2 to 2.5 mbarg	3041H	3041L		
1.0 InWC to <1.5 InWC 2.5 to 3.7 mbarg				
1.5 InWC to <2.0 InWC 3.7 to 5.0 mbarg				
2.0 InWC to <6.5 InWC 5.0 to 16 mbarg				
6.5 InWC to <2.0 psig 16 to 140 mbarg	3041HP			

SPECIFICATIONS

Table 4 — MIN/MAX PRESSURES

1/2" BLANKET GAS REGULATOR

Model Number	Actuator Maximum Allowable Working Pressure (MAWP)	Shipping Weight
	psig barg	lb kg
3011L	2.0 0.13	13 5.9
3041L	2.0 0.13	13 5.9
3011H	8.0 0.55	10 4.5
3041H	8.0 0.55	10 4.5

1" BLANKET GAS REGULATOR

Model Number	Actuator Maximum Allowable Working Pressure (MAWP)	Shipping Weight Lb (kg)
3011L	2 psig 0.13 barg	33 15
3011H	8 psig 0.55 barg	24 11
3011HP	25 psig 1.7 barg	24 11
3020A	75 psig 5.1 barg	15 7
3041L	2 psig 0.13 barg	33 15
3041H	8 psig 0.55 barg	29 13
3041HP	25 psig 1.7 barg	24 11

SPRING RANGES

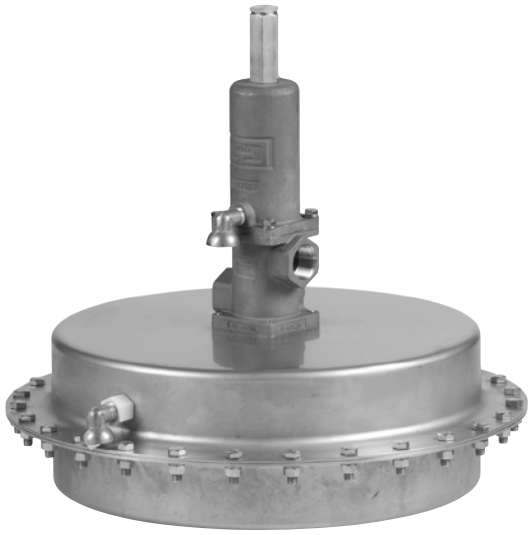
Table 5 — SPRING RANGES

1/2" BLANKET GAS REGULATOR

Model No.	Max Supply	Min Setting	Max Setting	Spring Range
	psig barg	InWC mbarg	InWC mbarg	
3011L/ (3041L)	200 13.8	0.5 1.2	0.8 2.0	2
	200 13.8	0.8 2.0	1.0 2.5	3
3011H/ (3041H)	150 10.3	0.5 1.2	0.7 1.7	1
	200 13.8	0.7 1.7	1.7 4.2	2
	200 13.8	1.7 4.2	3.0 7.5	3
	200 13.8	3.0 7.5	4.5 11.2	4
	200 13.8	4.5 11.2	6.5 16.0	5

NOTES:

- When spring ranges overlap, select the lighter spring
- Consult the factory for vacuum regulator with setting greater than 2 psig



3011L BGR

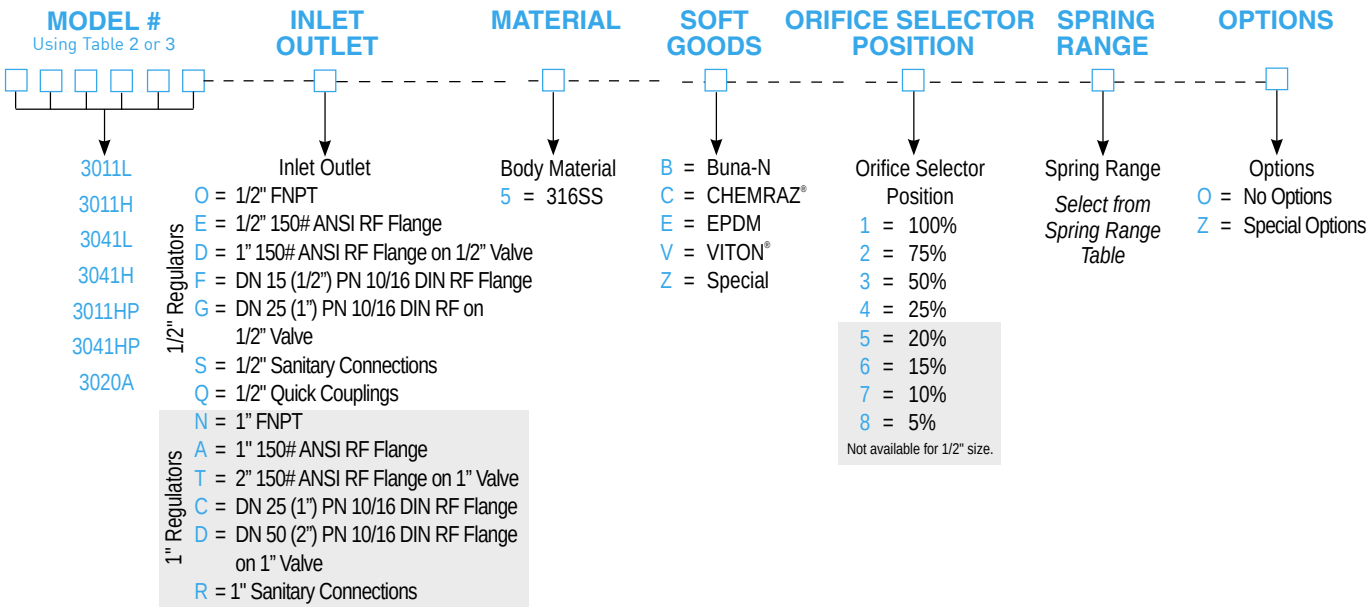
1" BLANKET GAS REGULATOR

Model Number	Max Supply	Min Setting	Max Setting	Spring Range
	psig barg	InWC mbarg	InWC mbarg	
3011L/ (3041L)	200 13.8	0.5 1.2	0.8 2.0	3
	200 13.8	0.8 2.0	1.0 2.5	4
	200 13.8	1.0 2.5	2.0 5.0	5
3011H/ (3041H)	50 3.4	0.5 1.2	1.0 2.5	1
	100 6.9	1.0 2.5	1.5 3.7	2
	150 10.3	1.5 3.7	2.0 5.0	3
	200 13.8	2.0 5.0	3.5 8.7	4
	200 13.8	3.5 8.7	6.5 16.0	5

Model Number	Max Supply	Min Setting	Max Setting	Spring Range
	psig barg	InWC mbarg	InWC mbarg	
3011HP/ (3041HP)	200 13.8	6.5 16	11.1 28	2
	200 13.8	11.1 28	18.6 46	3
	200 13.8	18.6 46	1.00 psig 69	4
	200 13.8	1.0 psig 69	1.38 psig 95	5
	200 13.8	1.38 psig 95	2.0 psig 140	6
3020A	200 13.8	2.0 psig 140	3.3 psig 230	4
	200 13.8	3.3 psig 230	5.1 psig 350	5
	200 13.8	5.1 psig 350	7.3 psig 500	6
	200 13.8	7.3 psig 500	15.0 psig 1000	7

HOW TO ORDER STANDARD BGRs

For easy ordering, select proper model number



EXAMPLE 3 0 1 1 H — N — 5 — V — 1 — 2 — 0

Indicates a Model 3011H Regulator with 1" FNPT body connections, 316 SS construction, VITON® elastomers, full capacity orifice, set pressure range from 1.0 InWC to 1.5 InWC and no special requirements.

ORDERING NOTES

- Include model number when ordering
- For special options, consult factory
- See flow table for available sizes
- Consult the factory for regulators with settings less than -2 psig
- Actuator diaphragm is only available in TEFLON® PFA

ADDITIONAL DATA FOR USE WITH GROTH'S FLOW TABLE

TPD1

In response to the many requests for an easy reference, which will permit the quick determination of flow and pressure quantities that are between the stated flow capacities shown on the flow tables or beyond those included on the tables, we are providing the following formulas and information.
These formulas assume that the valve is full open (100% overpressure)

INTERPOLATION ON FLOW TABLES

1. To obtain flow capacities that are in between stated flow capacities on the chart, use the following formula:

$$F_n = \left[\frac{(P_n - P_l) \times (F_h - F_l)}{(P_h - P_l)}\right] + F_l$$

P_n = Set pressure to be interpolated

F_n = Flow corrected to correspond to the new set pressure P_n

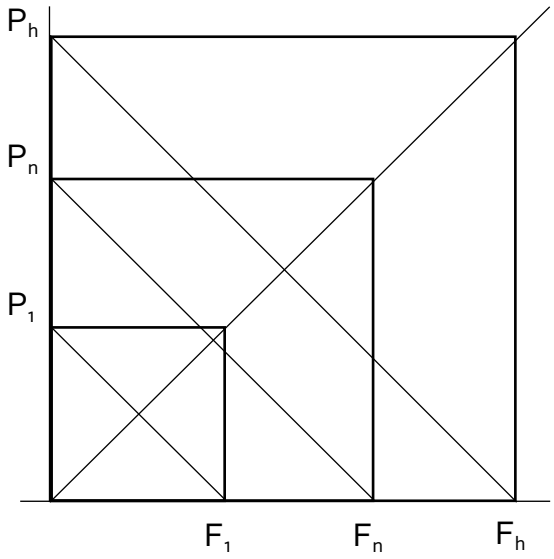
P_h = Next higher set pressure shown on table above P_n

F_h = Flow at P_h ; shown on table

P_l = Next lower set pressure shown on table below P_n

F_l = Flow at P_l ; shown on table

NOTE: All pressures are gauge pressure. "C" factor must then be applied, if applicable.



2. To determine flow at a pressure (vacuum) beyond the limit of the flow capacity table, use the following formula:

$$sqrt\ (P_a/P_{max}) * F_{max} = CF$$

3. To determine pressure (vacuum) at a flow beyond the limit of the flow capacity table, use the following formula:

$$(F_r^2/F_{max}^2) * P_{max} = CP$$

P_a = Allowable pressure (vacuum), beyond the limits of the table

F_r = Required flow, beyond the limits of the table

P_{max} = Maximum tank pressure or pressure drop shown in the table for flame arresters and free vents

P_{max} = 2x maximum set pressure shown in the table for all other valves

F_{max} = Maximum flow shown in the table

C_P = Pressure at required flow

C_F = Flow at allowable pressure

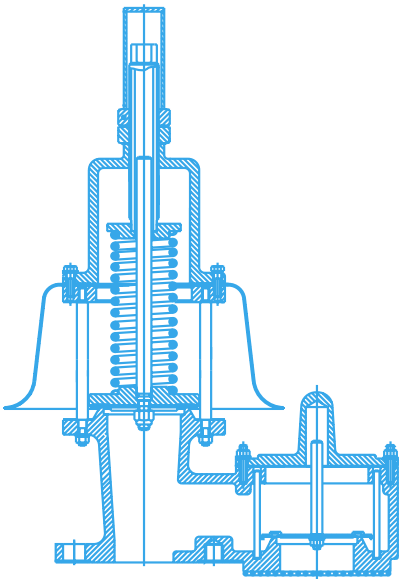
4. To approximate flow through a larger unit, multiply the 12" unit capacity (at the desired flow pressure) by the following constants:

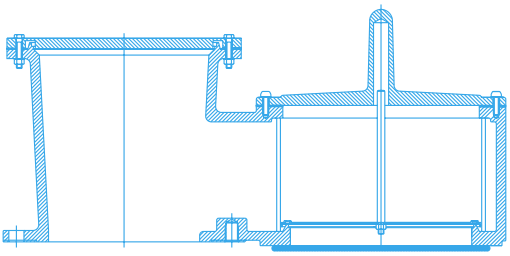
Size	14"	16"	18"	20"	24"	30"
Constant	1.36	1.78	2.25	2.78	4.00	6.25

Flow verification can be provided by Groth Corporation.

STANDARD SETTINGS AND MAXIMUM TANK WORKING PRESSURE

TPD2
1200A Series Valves





Due to the modular construction of Groth pressure/vacuum relief valves, internal components can be utilized which permit settings as low as 0.5 oz/in2 and as high as 15 psig. Similarly, vacuum relief valves may withstand tank working pressures as high as 100 psig (special construction required).

However, the light weight formed pallets required for low vacuum settings may not withstand the high working pressures, and the heavier machined plate pallets required for high working pressures may not permit low vacuum settings.

The following table defines the minimum vacuum setting as a function of the maximum tank working pressures for Models 1201B, 1221B, 1300A and 1360A valves based on the dead weight of each pallet assembly.

TABLE 1 — MINIMUM VACUUM SETTINGS VERSUS MAXIMUM TANK WORKING PRESSURE

Size (inches)	Spun Pallet		Stamped Pallet		Machined Pallet	
	Minimum* Vacuum Setting [oz/in^2]	Maximum Tank Pressure [psig]	Minimum Vacuum Setting [oz/in^2]	Maximum Tank Pressure [psig]	Minimum Vacuum Setting [oz/in^2]	Maximum Tank Pressure [psig]◊
2"	0.50	15	1.2	25	1.9	30
3"	0.50	15	1.2	25	1.8	30
4"	0.50	12	1.0	20	1.5	30
6"	0.50	12	1.3	20	2.4	30
8"	0.50	5	1.3	15	2.2	30
10"	0.50	5	1.2	15	3.2	30
12"	0.50	5	1.1	15	3.1	30

*Some sizes require non-ferrous components to achieve 0.5 oz/in^2 setting. ◊Consult factory for MAWP >30 psig.

PILOT OPERATED VALVE/MODES OF FAILURE

TPD3

A pilot operated pressure relief valve uses tank pressure acting on the actuator diaphragm to hold the valve closed, while tank pressure acting on the pallet attempts to force it open. The pilot directs tank pressure into the valve actuator below set pressure and atmospheric pressure into the actuator above set pressure.

If any part of the pilot operated system fails, the valve actuator pressure will be vented and tank pressure on the pallet will force the valve open, for example:

- If the actuator diaphragm fails, the actuator will be vented to the valve outlet.
- If the pilot valve diaphragm fails, actuator pressure will be vented to atmosphere through the failed diaphragm.
- If a pilot valve component [spring, seat/seal, etc.] fails which prevents the pilot from holding tank pressure, the actuator will be vented to atmosphere.

Therefore, the mode of failure is “fail open.”

A pilot operated vacuum relief valve uses tank vacuum acting on the actuator diaphragm to force the valve open, while tank vacuum acting on the pallet attempts to hold it closed. The pilot valve directs atmospheric pressure into the valve actuator below set pressure and tank vacuum into the actuator above set pressure.

If a pilot valve component [spring, seat/seal, etc.] fails which allows the pilot to supply tank vacuum to the actuator, the valve will open prematurely.

However, if a part of the system fails which prevents the supply of tank vacuum to the valve actuator above set pressure, tank vacuum acting on the pallet will hold the valve closed indefinitely, for example:

- If the actuator diaphragm fails, the actuator will be vented to the valve outlet.
- If the pilot valve diaphragm fails, the pilot valve will not open, and will continue to direct atmospheric pressure to the actuator above set pressure.

Therefore, the mode of failure may be “fail closed.”

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All Groth manufacturing facilities are ISO 9001 approved.

The products in this catalog may qualify for some, none or all of these certifications:

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