

PILOT OPERATED

RELIEF VALVE



SAFETY PRODUCTS THAT PROTECT EQUIPMENT, LIVES & THE ENVIRONMENT



MODEL NUMBER

MODEL DESCRIPTION

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PILOT OPERATED RELIEF VALVES

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ADDITIONAL GROTH PRODUCTS

Please see our other Groth Datasheets for additional product lines:



PILOT OPERATED RELIEF VALVES

PILOT OPERATED RELIEF VALVES

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.



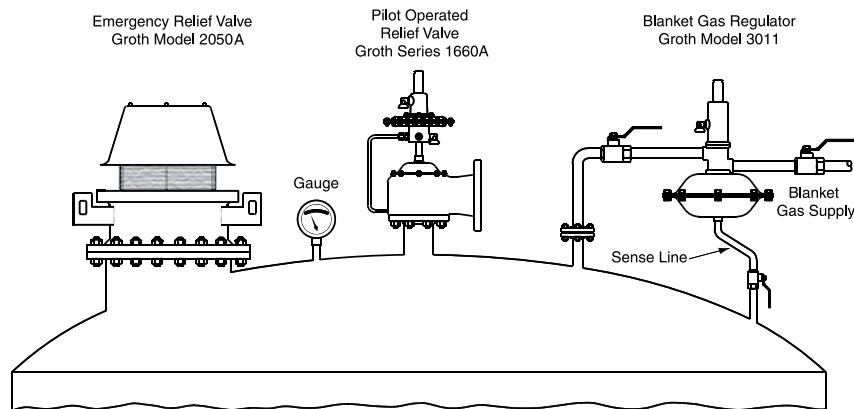
The pilot operated relief valve has a principal advantages over other types of relief valves:

- Seals in accordance with API 2000 requirements for Pilot Operated Relief Valves.
- It is fully open at 10% above set pressure.

These characteristics permit an operating pressure closer 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.

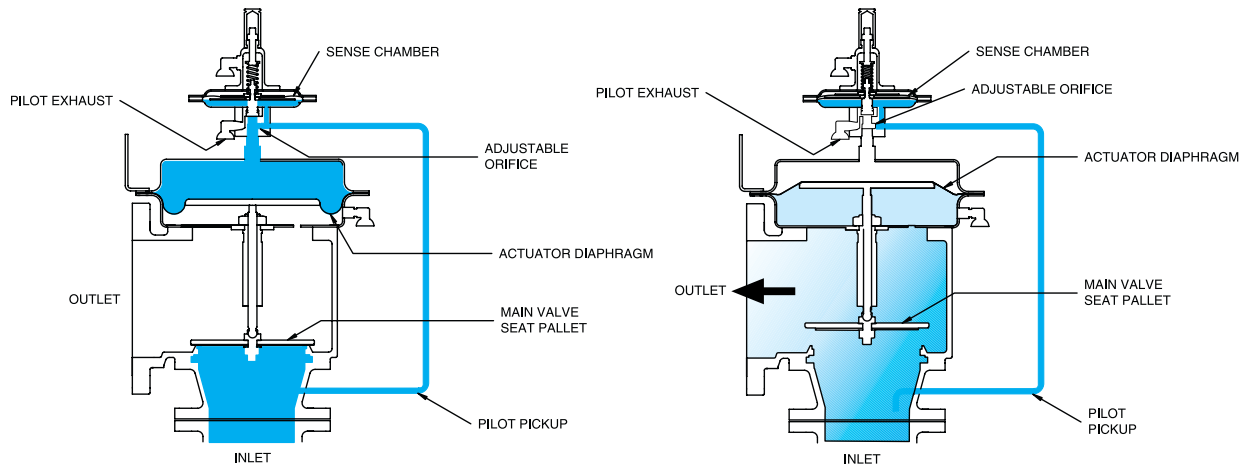
A typical tank installation as shown in the drawing below, includes a pilot operated pressure/vacuum relief valve, a gas blanketing regulator and an emergency pressure relief valve.



Typical Tank Installation

PILOT OPERATED RELIEF VALVES

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 media 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 media 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 media 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). 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.

PILOT OPERATED RELIEF VALVES

DESIGN AND FUNCTION 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.

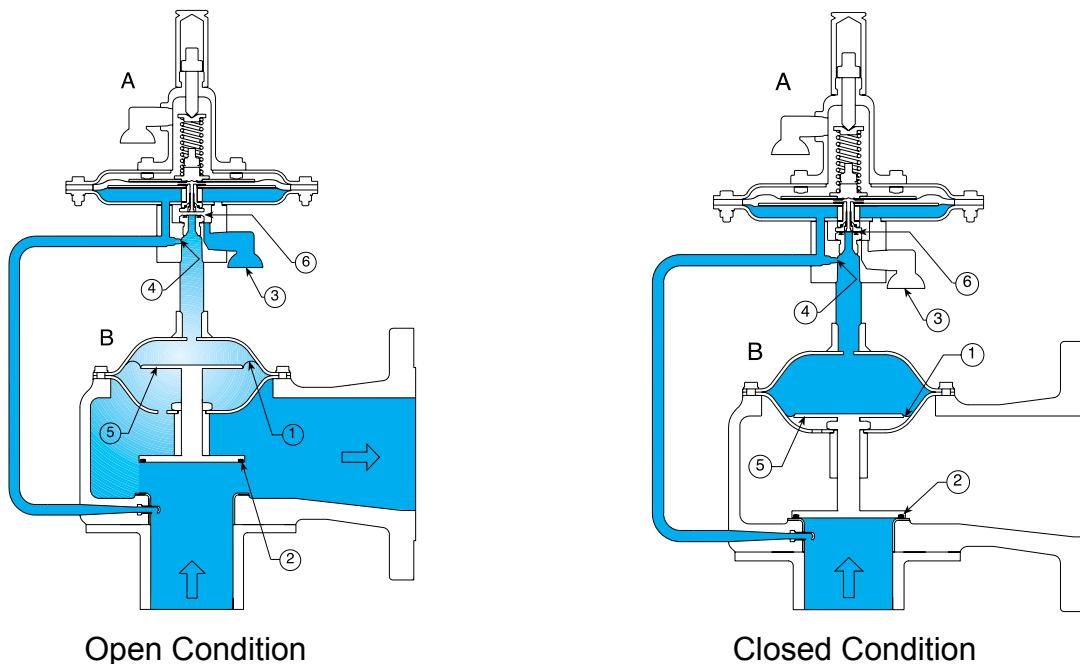
Adjustment of the blowdown needle (4) can provide either “snap-action” or “modulating” pilot valve operation. For snap-action operation, the main valve pallet lifts quickly to full open. In modulating service, the pallet will lift sufficiently to maintain set pressure regardless of the flow rate up to 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 reseal 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 14O2 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.



PILOT OPERATED RELIEF VALVES

DESIGN AND FUNCTION 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.

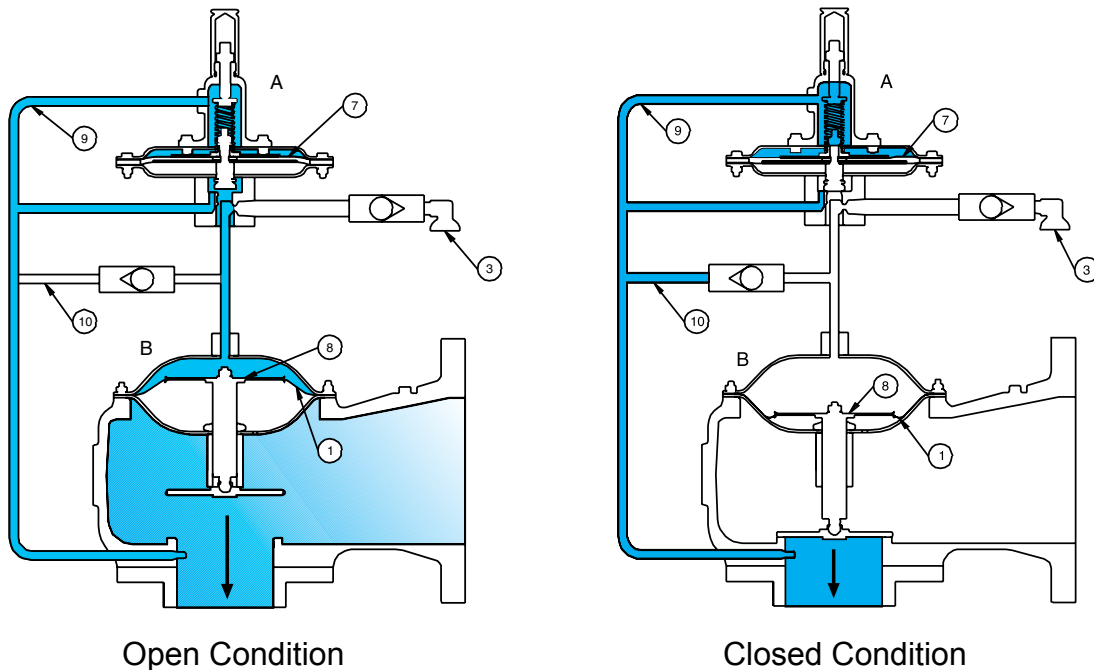
Atmospheric pressure is applied under the boost and sense diaphragms and in the upper dome (B) through the breather port (3). Below set vacuum, the spring force is greater than the lift created by tank vacuum above the sense diaphragm (7) so both the pilot valve and the main valve will remain closed.

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 reset 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.

CAUTION:

See Modes of Failure



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.”

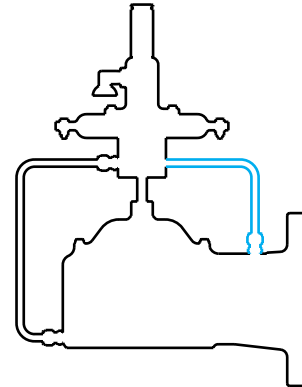
PILOT OPERATED RELIEF VALVES

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

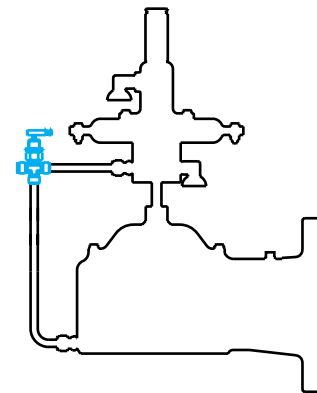
The exhaust port of the pilot valve may be piped to the outlet body to avoid any vapor emission to the atmosphere.



Field Test Connection

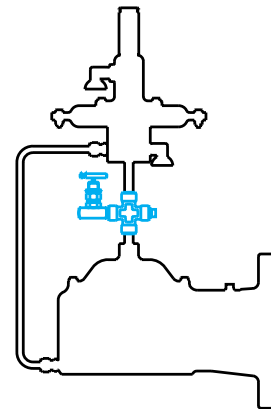
A 1/2" FNPT Connection and 3-way valve is provided for field testing the pilot valve pressure setting. This is accomplished with an independent pressure source; the 3-way valve prevents back flow into the tank during testing.

Note: Field test connection shown is for a pressure relief valve. Field test connections for vacuum and pressure/vacuum relief are also available.



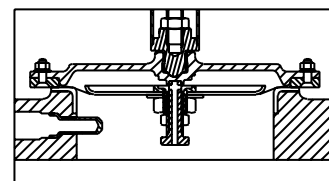
Manual Blowdown

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.

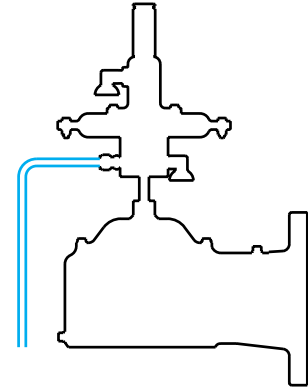


PILOT OPERATED RELIEF VALVES

OPTIONS

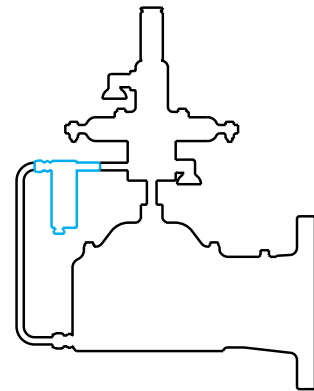
Remote Sense

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.



LOW TEMPERATURE SERVICES

MODEL 1660A

- Tested with supply media at -320° F
- Snap action at lowest temperatures
- Tight shut-off with conical film seat
- No freeze-up for safe operation
- All fluoropolymer diaphragms

The Groth Series 1660A pilot operated valves are designed to provide the safest and most reliable operation for low temperature service. With the incorporation of an 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.



1600 SERIES

TECHNICAL DETAILS

- Sizes 2" through 12" (50-300mm)
- Pressure settings from 2.0 InWC to 15 psig
- Vacuum settings from 7.0 InWC to 12 psig
- Standard body materials are carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356)
- Supply Media Temperature range from -320° F to 300° F
- ISO 9001 Certified manufacturing process
- ATEX and PED Approval



1600 SERIES PILOT OPERATED RELIEF VALVE

The Groth 1600 Series valves provide safe, dependable, and accurate low pressure and/or vacuum protection. Seals in accordance with API 2000 requirements for Pilot Operated Relief Valves. This design prevents fugitive emissions and conserves stored product. Rated flow at 10% overpressure provides the ability to operate closer to the tank MAWP, increasing the operating range of the process. This reduces the need for a large overpressure and saves product, which translates into profit. Flexibility in terms of film or o-ring seat and snap or modulating action allows product customization to specific application requirements. The Model 1662A incorporates a vacuum breaker.

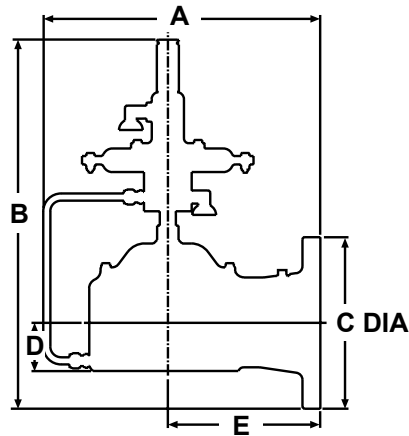
OPTIONS

- 150# ANSI, PN10, PN16, JIS drilling classes available
- Pilot exhaust piped to discharge header
- Field test connection
- Manual blow down
- Conical film seat pallet
- Remote sense pickup
- Pilot supply filter

FEATURES AND BENEFITS

- | | |
|--|--|
| PILOT OPERATED | <ul style="list-style-type: none">• Ease of precision settings.• Only the pilot needs to be set.• Remote pilot sensing option allows the pilot to sense the true system pressure.• Remote or manual blowdown available. |
| EXTRA TIGHT SEAL | <ul style="list-style-type: none">• Main valve remains tight to set pressure. |
| FULL FLOW | <ul style="list-style-type: none">• Full open at 10% overpressure. |
| SNAP-ACTION OR MODULATING ACTION | <ul style="list-style-type: none">• Modulating action conserves product since valve opening is proportional to overpressure.• Noise is reduced since the valve only opens fully when required. |
| SOFT SEATED | <ul style="list-style-type: none">• Soft seats seal tight to conserve product and minimize valve wear which improves reliability. |
| TOP ENTRY | <ul style="list-style-type: none">• Reduces maintenance costs since the valve can be completely serviced without removal from its mounting. |
| CHOICE OF MATERIALS FOR THE MAIN BODY | <ul style="list-style-type: none">• Wide range of materials to meet most corrosive media and temperature applications at the lowest possible cost. |
| SIZES 2" THROUGH 12" | <ul style="list-style-type: none">• There is a size to meet your relieving capacity requirements without the need of expensive oversizing. |
| HIGH CAPACITY DESIGN | <ul style="list-style-type: none">• Groth pilot operated valves have more capacity for your money. |
| PRESSURE SETTINGS
2 InWC to 15 psig | <ul style="list-style-type: none">• Setting range covers all atmospheric and low pressure storage tanks. |
| VACUUM SETTINGS
3 InWC to 12 psig | <ul style="list-style-type: none">• Wide setting range to meet your design requirements. |

1600 SERIES // SPECIFICATIONS



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

SIZE		A (Metric)	B (Metric)	C (Metric)	D (Metric)	E (Metric)	APPROX. SHIP WT. ALUMINUM LBS.
INLET (Metric)	OUTLET (Metric)						
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)

MODEL 1660A // PRESSURE RELIEF CAPACITY

Air Flow Capacity at 10% Overpressure 1000 Standard Cubic Feet per Hour at 60° F								
Set Pressure (P _s)		Size						
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)
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
10.0	5.78	12.3	27.1	46.9	105	184	289	417
15.0	8.66	15.1	33.3	57.7	129	227	356	512
20.0	11.6	17.5	38.6	66.8	150	262	412	594
25.0	14.4	19.6	43.3	75.0	168	294	462	666

Air Flow Capacity at 10% Overpressure 1000 Standard Cubic Feet per Hour at 60° F								
Set Pressure (P _s)		Size						
psig		2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
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 1660A // PRESSURE RELIEF CAPACITY

Air Flow Capacity at 10% Overpressure 1000 Normal Cubic Meters per Hour at 0° C								
Set Pressure (P _s)		Size						
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

Air Flow Capacity at 10% Overpressure 1000 Normal Cubic Meters per Hour at 0° C								
Set Pressure (P _s)		Size						
barg		2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07		0.61	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 // VACUUM RELIEF CAPACITY

Air Flow Capacity at 10% Over-Vacuum 1000 Standard Cubic Feet per Hour at 60° F								
Set Vacuum (P _s)		Size						
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)
3.00	1.73	6.66	14.7	25.5	57.1	100	157	226
3.50	2.00	6.82	15.1	26.1	58.5	102	161	232
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
10.0	5.78	12.1	26.7	46.3	104	182	285	411
12.0	6.93	13.3	29.2	50.6	114	199	312	450
16.0	9.27	15.3	33.7	58.3	131	229	360	518
20.0	11.6	17.0	37.6	65.0	146	255	401	578
25.0	14.4	19.0	41.9	72.5	163	285	447	644

Air Flow Capacity at 10% Over-Vacuum 1000 Standard Cubic Feet per Hour at 60° F								
Set Vacuum (P _s)		Size						
psig		2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
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

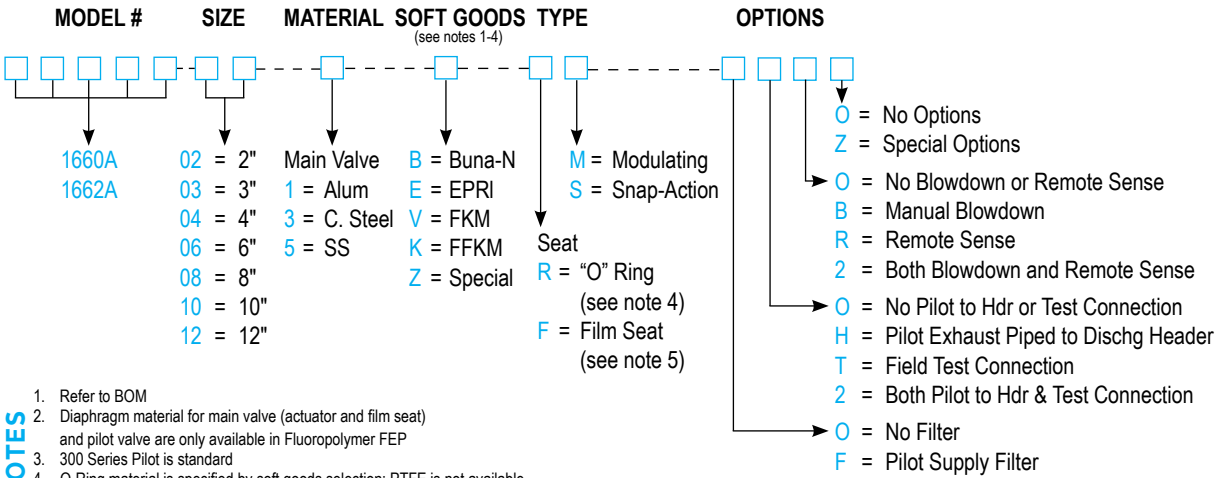
MODEL 1662A // VACUUM RELIEF CAPACITY

Air Flow Capacity at 10% Over-Vacuum 1000 Normal Cubic Meters per Hour at 0° C								
Set Vacuum (P _s)		Size						
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	9.8	0.22	0.49	0.85	1.90	3.33	5.24	7.54
150	14.7	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

Air Flow Capacity at 10% Over-Vacuum 1000 Normal Cubic Meters per Hour at 0° C								
Set Vacuum (P _s)		Size						
barg		2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
0.07		0.58	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

HOW TO ORDER

For easy ordering, select proper model numbers



- NOTES**
1. Refer to BOM
 2. Diaphragm material for main valve (actuator and film seat) and pilot valve are only available in Fluoropolymer 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; FFKM O-Rings in pilot valve
 6. In low temperature service applications a film seat is required

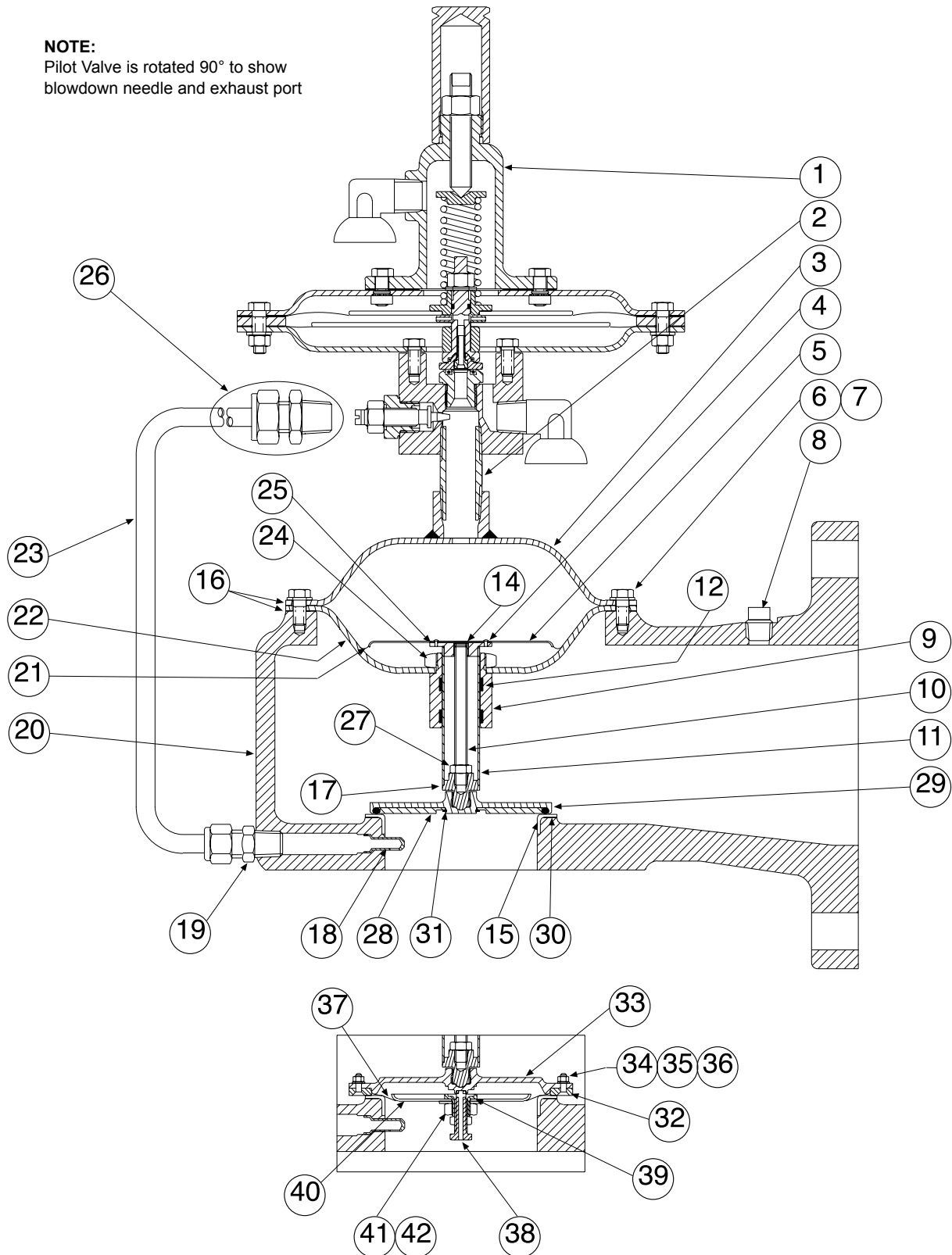
EXAMPLE

1 6 6 0 A — 0 6 — 3 — V — R S — O O R O

Indicates a 6" Model 1660A with carbon steel body and "O-Ring" seat using FKM soft goods with snap-action pilot with remote pilot sense connection and no specials.

MODEL 1660A // ASSEMBLY

NOTE:
Pilot Valve is rotated 90° to show
blowdown needle and exhaust port



Film Seat Detail

Materials of Construction				
Item	Description	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	Screw, Nut	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	FEP	FEP	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	FEP	FEP	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	FEP	FEP	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.

1400 SERIES

TECHNICAL DETAILS

- Sizes 2" through 12" (50-300mm)
- Pressure settings from *2.0 InWC to 15 psig
- Vacuum settings from 0.5 oz to 12 psig
- Standard body materials are carbon steel (WCB/CS), stainless steel (CF8M/316), aluminum (356)
- Snap action or modulating pilot
- Designed for easy maintenance
- ISO 9001 Certified manufacturing process
- ATEX and PED Approval



1400 SERIES PILOT OPERATED RELIEF VALVE

The Groth 1400 Series valves provide safe, dependable, and accurate low pressure and/or vacuum protection. Seals in accordance with API 2000 requirements for Pilot Operated Relief Valves. This design prevents fugitive emissions and conserves stored product. Rated flow at less than 10% overpressure provides the ability to operate closer to the tank MAWP, increasing the operating range of the process. This reduces the need for a large overpressure and saves product, which translates into profit. Flexibility in snap or modulating action allows product customization to specific application requirements. Blowdown may be adjusted to requirements between 0 and 10% of set pressure. The Models 1400 and 1420 incorporate a vacuum breaker.

OPTIONS

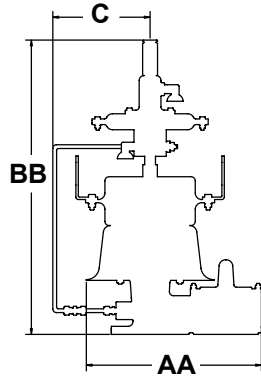
- 150# ANSI, PN10, PN16, JIS drilling classes available
- Pilot exhaust piped to discharge header
- Field test connection
- Manual blow down
- Conical film seat pallet
- Remote sense pickup
- Pilot supply filter

* Requires 1402 Pilot for minimum settings

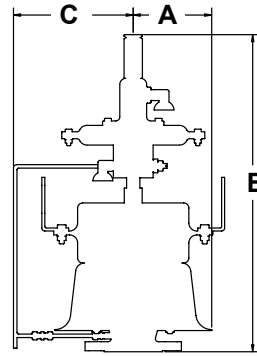
FEATURES AND BENEFITS

- | | |
|--|--|
| PILOT OPERATED | <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• Main valve remains tight to set pressure. |
| FULL FLOW | <ul style="list-style-type: none">• Full open at 10% overpressure. |
| SNAP-ACTION OR MODULATING ACTION | <ul style="list-style-type: none">• Modulating action conserves product since valve opening is proportional to overpressure.• Noise is reduced since the valve only opens fully when required. |
| SOFT SEATED | <ul style="list-style-type: none">• Soft seats seal tight to conserve product and minimize valve wear which improves reliability. |
| TOP ENTRY | <ul style="list-style-type: none">• Reduces maintenance costs since the valve can be completely serviced without removal from its mounting. |
| CHOICE OF MATERIALS FOR THE MAIN BODY | <ul style="list-style-type: none">• Wide range of materials to meet most corrosive media and temperature applications at the lowest possible cost. |
| SIZES 2" THROUGH 12" | <ul style="list-style-type: none">• There is a size to meet your relieving capacity requirements without the need of expensive oversizing. |
| HIGH CAPACITY DESIGN | <ul style="list-style-type: none">• Groth pilot operated valves have more capacity for your money. |
| PRESSURE SETTINGS
* 2 InWC to 15 psig | <ul style="list-style-type: none">• Setting range covers all atmospheric and low pressure storage tanks. * Requires 1402 Pilot for minimum settings |
| VACUUM SETTINGS
0.5 oz. to 12 psig | <ul style="list-style-type: none">• Wide setting range to meet your design requirements.• Direct acting or pilot operated vacuum relief available. |

MODEL 1400, 1430 // SPECIFICATIONS



Model 1400



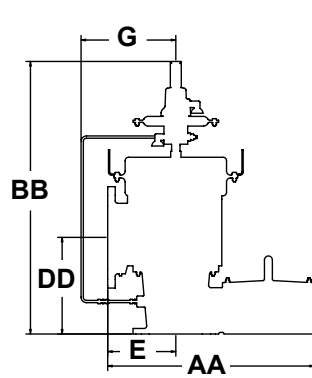
Model 1430

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

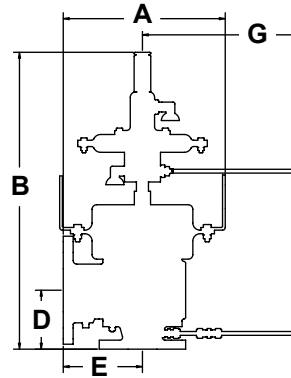
SIZE (Metric)	STANDARD SETTINGS				A (Metric)	B (Metric)	C (Metric)	AA (Metric)	BB (Metric)	APPROX. SHIP WT. LBS.*
	PRESSURE		VACUUM							
	MAX.	**MIN.	MAX.	MIN.						
2" (50 mm)					4.75" (121 mm)	25.50" (648 mm)	7" (178 mm)	13.50" (343 mm)	27.50" (699 mm)	30 (14 kg)
3" (80 mm)					5.75" (146 mm)	26.50" (673 mm)	7.75" (197 mm)	17.75" (451 mm)	29" (737 mm)	35 (16 kg)
4" (100 mm)	15 psig (1.035 barg)	7 InWC (-17.5 mb)	12 psig (.828 barg)	0.5 oz/in ² (2.16 mb)	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

MODEL 1420, 1460 // SPECIFICATIONS



Model 1420



Model 1460

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

SIZE (Metric)		STANDARD SETTINGS				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)					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)	15 psig (1.035 barg)	7 InWC (17.5 mb)	12 psig (.828 barg)	0.5 oz/in ² (2.16 mb)	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.

MODEL 1400, 1430 // PRESSURE RELIEF CAPACITY

Air Flow Capacity at 10% Overpressure							
1000 Standard Cubic Feet per Hour at 60° F							
Pressure Setting	VALVE SIZE (ORIFICE SIZE)						
psig	2" (2.976 in ²)	3" (7.013 in ²)	4" (12.35 in ²)	6" (28.51 in ²)	8" (49.65 in ²)	10" (78.47 in ²)	12" (112.7 in ²)
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

Air Flow Capacity at 10% Overpressure							
1000 Normal Cubic Meters per Hour at 0° C							
Pressure Setting	VALVE SIZE (ORIFICE SIZE)						
mbar	2" (2.976 in ²)	3" (7.013 in ²)	4" (12.35 in ²)	6" (28.51 in ²)	8" (49.65 in ²)	10" (78.47 in ²)	12" (112.7 in ²)
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

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

MODEL 1420, 1460 // PRESSURE RELIEF CAPACITY

Air Flow Capacity at 10% Overpressure							
1000 Standard Cubic Feet per Hour at 60° F							
Pressure Setting	VALVE SIZE (ORIFICE SIZE)						
psig	2" (2.976 in ²)	3" (7.013 in ²)	4" (12.35 in ²)	6" (28.51 in ²)	8" (49.65 in ²)	10" (78.47 in ²)	12" (112.7 in ²)
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

Air Flow Capacity at 10% Overpressure							
1000 Normal Cubic Meters per Hour at 0° C							
Pressure Setting	VALVE SIZE (ORIFICE SIZE)						
mbar	2" (2.976 in ²)	3" (7.013 in ²)	4" (12.35 in ²)	6" (28.51 in ²)	8" (49.65 in ²)	10" (78.47 in ²)	12" (112.7 in ²)
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

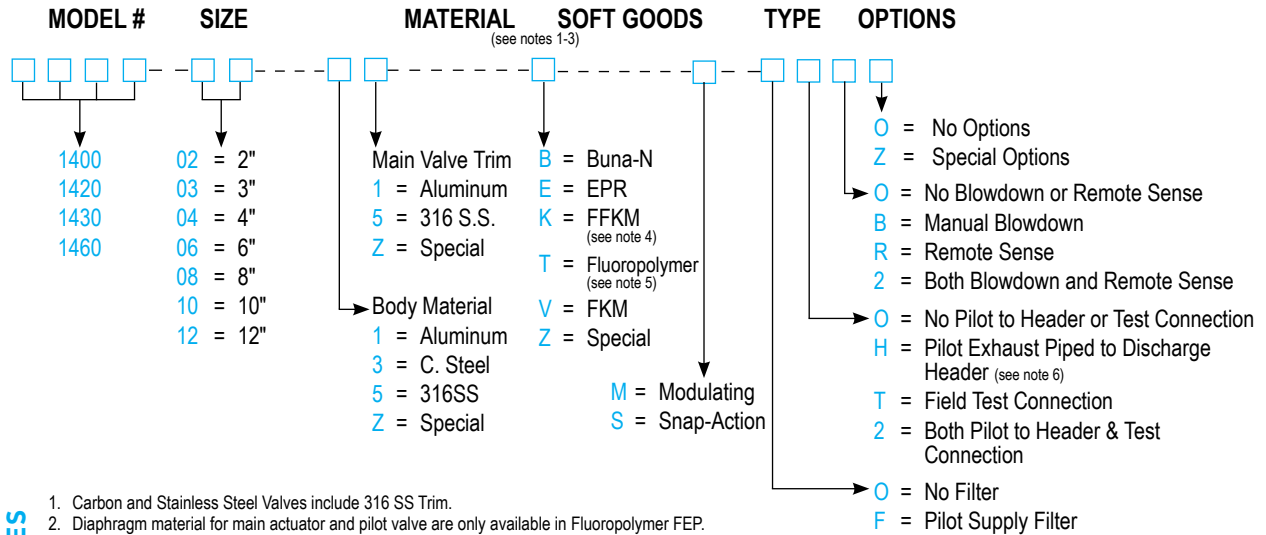
MODEL 1400, 1420 // VACUUM RELIEF CAPACITY

Air Flow Capacity at 100% Over-Vacuum (Double set vacuum)							
1000 Standard Cubic Feet per Hour at 60° F							
Vacuum Setting	VALVE SIZE						
InWC	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

Air Flow Capacity at 100% Over-Vacuum (Double set vacuum)							
1000 Normal Cubic Meters per Hour at 0° C							
Vacuum Setting	VALVE SIZE						
mmWC	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

HOW TO ORDER

For easy ordering, select proper model numbers



NOTES

1. Carbon and Stainless Steel Valves include 316 SS Trim.
2. Diaphragm material for main actuator and pilot valve are only available in Fluoropolymer FEP.
3. 300 Series Pilot is standard; see 1660 Brochure for pilot valve details.
4. FFKM O-Rings; Fluoropolymer FEP Diaphragms and Gaskets.
5. Fluoropolymer FEP Diaphragms and Gaskets with FKM O-rings.
6. Pilot Exhaust Piped to Discharge Header, 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 FKM soft goods, snap-action with remote pilot pickup and no other options.



GROTHCORP.COM