



## ANDERSON GREENWOOD LCP PILOT OPERATED PRESSURE RELIEF VALVE

A full bore valve with a non-flowing pilot design that provides reliable overpressure protection in a cost effective package



### FEATURES

- Rigid pilot mounting with no tubing provides ultimate protection against vibration and careless handling.
- Balanced design ensures proper valve operation and lift are unaffected by back pressure, eliminating the need for costly and fragile metal bellows.
- Integral back flow prevention provides additional protection and safety at no added cost.
- Non-flowing pilot minimizes entrance of dirt or hydrates to provide repeatable performance during multiple relieving cycles.
- ASME Section VIII Code stamp for gas service.
- FKM soft seats and seals reduce emissions and product loss while minimizing maintenance costs. No metal seat lapping is required.
- Full bore orifices reduce upfront valve and associated piping costs.
- Integral field test connection provides safe and accurate in-place performance tests.
- Optional NACE MR0175 trim to meet sour gas requirement.

### GENERAL APPLICATION

The LCP's compact assembly enables it to handle larger capacities and optimize the entire pressure relief valve installation on almost all gases or vapors.

### TECHNICAL DATA

Sizes:	1" x 2" to 3" x 4" (DN 25 to 80)
Orifices:	0.785 to 7.069 in <sup>2</sup> (5.065 to 45.6 cm <sup>2</sup> )
Inlet ratings:	ANSI Class 150 to 900
Temperature range:	-20 to 400°F (-29 to 205°C)
Set pressures:	25 to 2200 psig (1.72 to 152 barg)
Code:	ASME VIII

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## OPERATION

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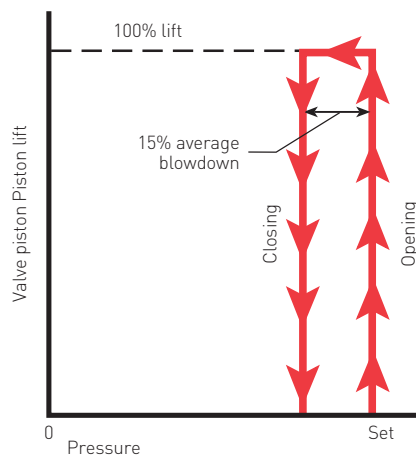
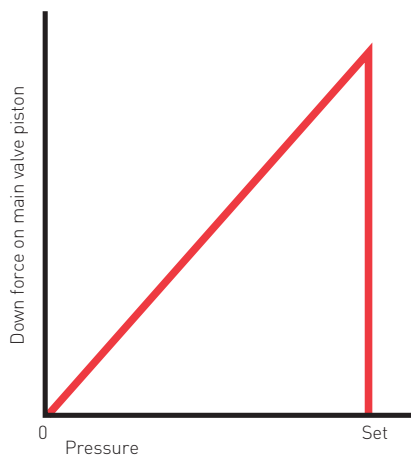
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In the normal, closed position, full system pressure is sensed through the bottom of the main valve piston. When the system pressure is higher than the back pressure, the integral backflow preventer (BFP) is sealed towards the discharge of the valve, allowing the system pressure to pass through the center of the main valve piston. The system pressure then enters the dome (volume above the main valve piston). The main valve remains closed because the piston seal area is greater than the main seat area.

If the back pressure exceeds the system pressure, or if the valve senses a vacuum, the BFP is then sealed towards the valve inlet, as shown in Figure 1. This allows the higher back pressure to enter the dome and keep the main seat closed.

When the pilot senses set pressure, the relief seat snaps open and the blowdown seat snaps closed simultaneously. This vents the dome pressure safely to atmosphere through the vent in the main valve cap, allowing the main valve to open fully at set pressure. The blowdown seat remains tightly closed during the relief cycle so no system fluid flows continuously through the pilot.

When the main valve reduces the system pressure to a level below set pressure, the relief seat snaps closed and the blowdown seat snaps open simultaneously. This fully re-pressures the dome to system pressure and closes the main valve. The reset pressure is not adjustable but will provide an average of 15% or less blowdown, as shown below.



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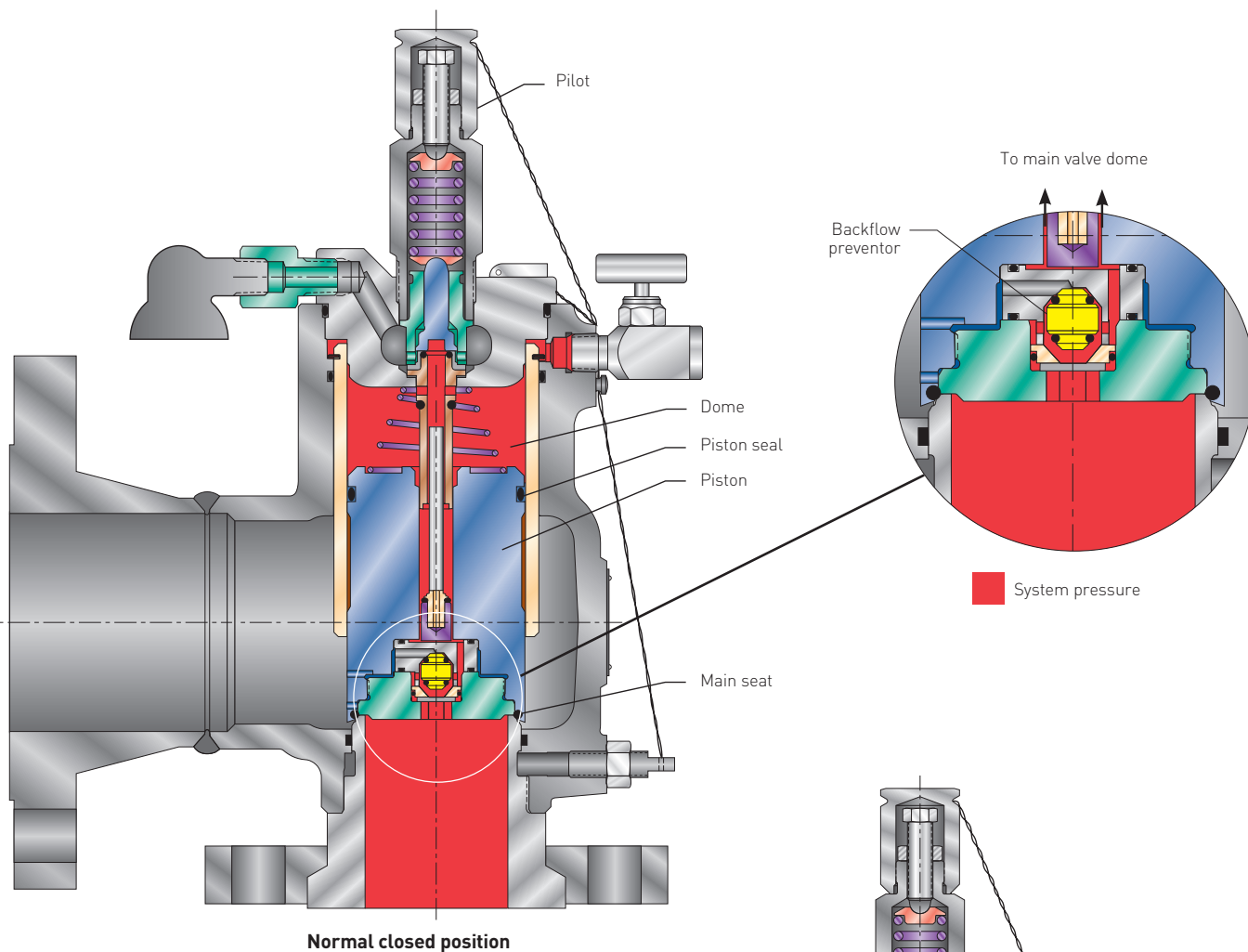
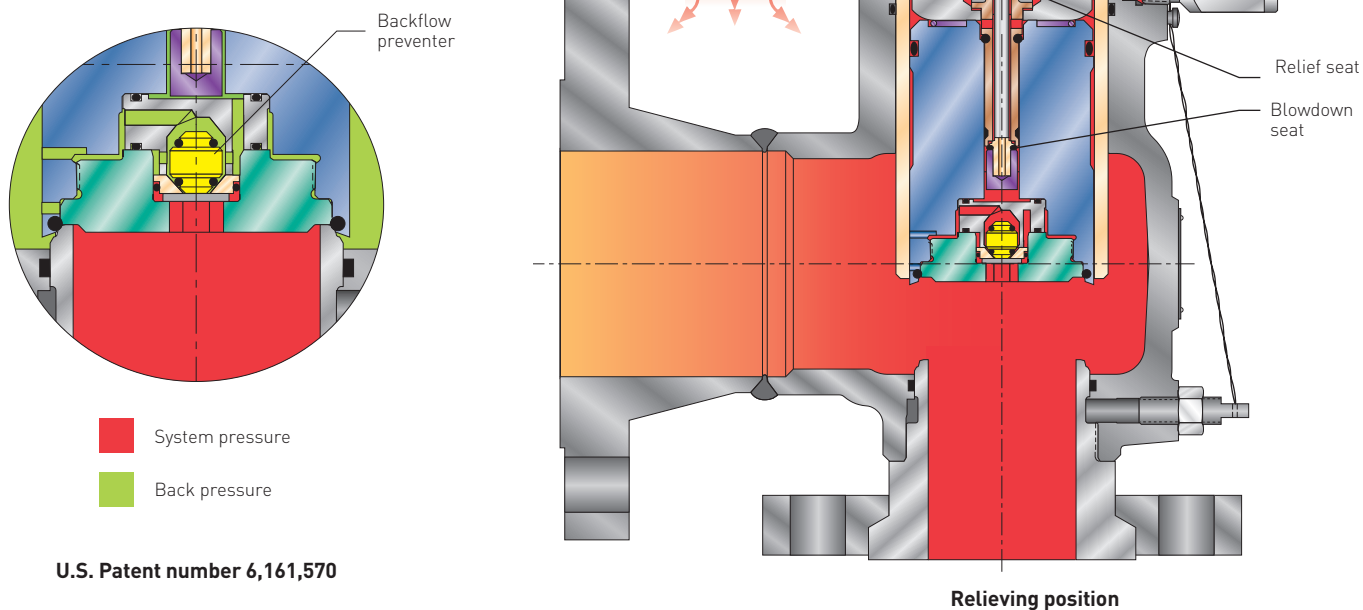


FIGURE 1



U.S. Patent number 6,161,570

# ANDERSON GREENWOOD LCP PILOT OPERATED PRESSURE RELIEF VALVE

## SIZING DATA

### NOMENCLATURE

Symbol	Description	English units	Metric units
A	Calculated orifice area	in <sup>2</sup>	cm <sup>2</sup>
V	Required capacity	SCFM	Nm <sup>3</sup> /hr
M	Molecular weight	-	-
T	Relieving temperature (°R = °F + 460 or °K = °C + 273)	°R	°K
Z	Compressibility factor	-	-
C	Gas constant (if unknown, use C = 315, see Table A)	-	-
K	ASME nozzle coefficient (90% of actual) = 0.860	-	-
P	Set pressure	psig	barg
P <sub>1</sub>	Inlet flowing pressure [P + allowable overpressure - inlet pressure loss + atmospheric pressure]	psia	bara
P <sub>2</sub>	Outlet flowing pressure	psia	bara
K <sub>b</sub>	Back pressure correction factor	-	-
k	Ratio of Specific heats $\left(k = \frac{C_p}{C_v}\right)$	-	-

### SIZING FORMULAS

English units

$$A = \frac{V\sqrt{MTZ}}{6.32 C K P_1 K_b}$$

Metric units

$$A = \frac{V\sqrt{MTZ}}{17.02 C K P_1 K_b}$$

### ASME ORIFICE AREAS

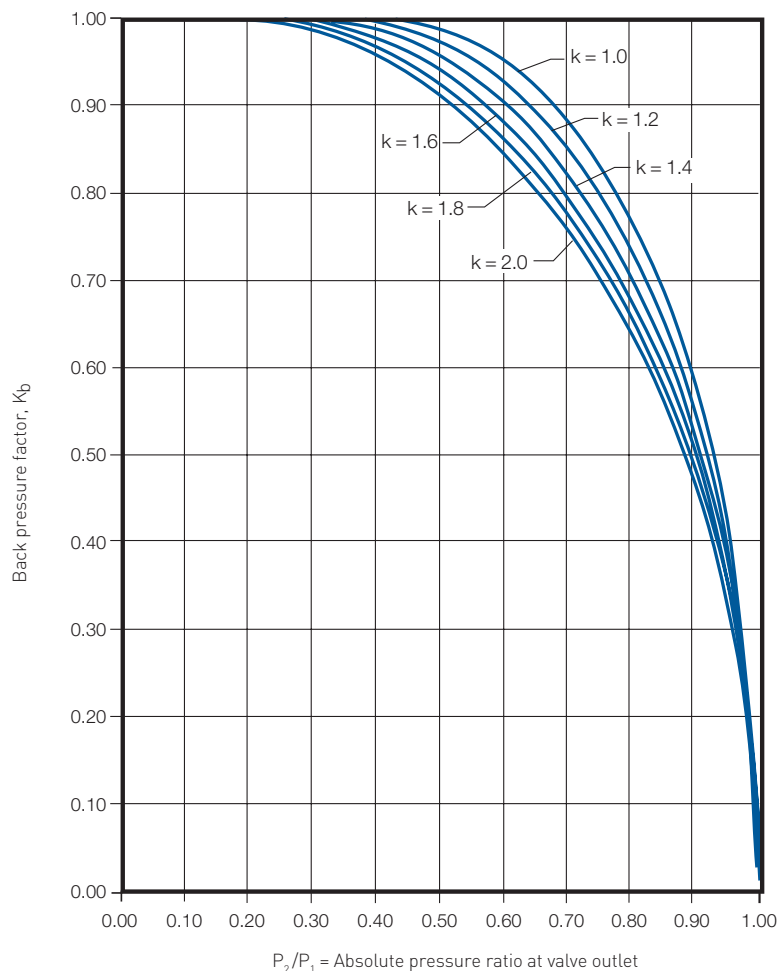
Valve size		Orifice area	
in	(DN)	in <sup>2</sup>	(cm <sup>2</sup> )
1 x 2	(25 x 50)	0.785	(5.06)
1.5 x 2	(40 x 50)	1.767	(11.40)
2 x 3	(50 x 80)	3.142	(20.27)
3 x 4	(80 x 100)	7.069	(45.61)

### COEFFICIENTS OF DISCHARGE

**ASME nozzle coefficient of discharge for 90% of actual capacity**

Gases/vapors      K = 0.860

### BACK PRESSURE CORRECTION FACTOR



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## SPECIFICATIONS

### NATURAL GAS CAPACITIES

(SCFM, 10% overpressure, 60°F, 90% of actual, Z = 1.0, 0.60 SP gravity)

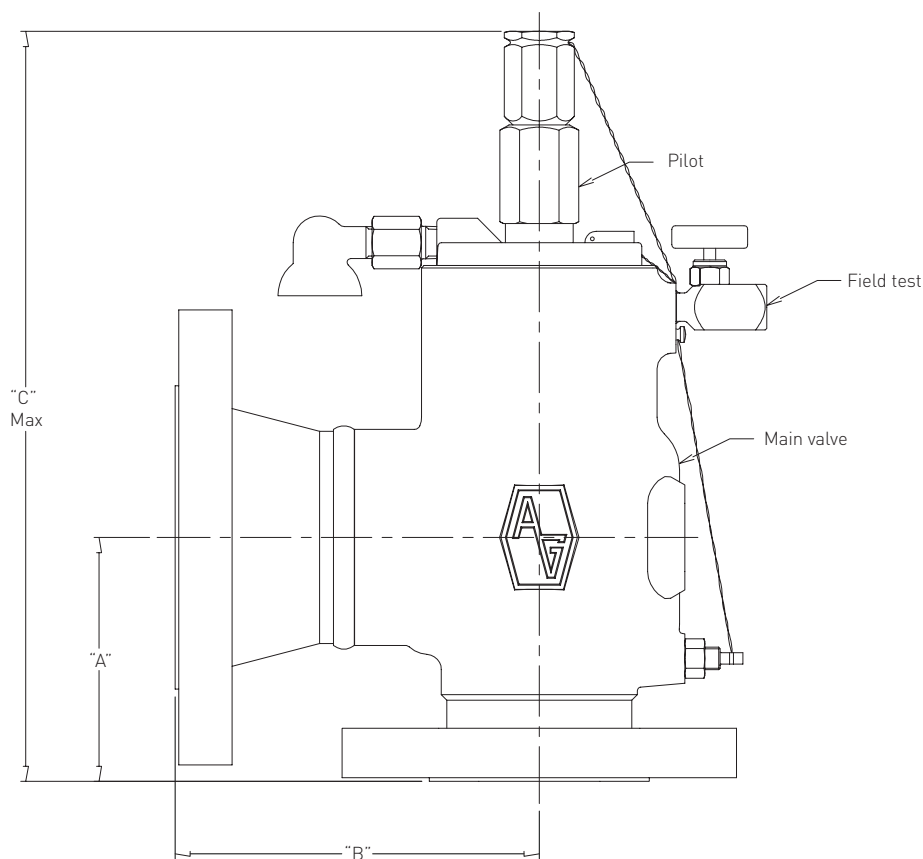
Set pressure (psig)	1 x 2 0.785 in <sup>2</sup>	1.5 x 2 1.767 in <sup>2</sup>	2 x 3 3.142 in <sup>2</sup>	3 x 4 7.069 in <sup>2</sup>
25	659	1483	2637	5933
30	736	1657	2946	6628
40	906	2039	3625	8156
50	1075	2421	4305	9685
60	1245	2803	4984	11213
70	1415	3185	5663	12742
80	1585	3567	6343	14270
90	1754	3949	7022	15799
100	1924	4331	7701	17327
120	2264	5095	9060	20384
140	2603	5859	10419	23441
160	2943	6623	11778	26498
180	3282	7388	13136	29554
200	3621	8152	14495	32611
220	3961	8916	15854	35668
240	4300	9680	17212	38725
260	4640	10444	18571	41782
285	4979	11208	19930	44839
300	5319	11972	21289	47896
320	5658	12736	22647	50953
340	5998	13500	24006	54010
360	6337	14265	25365	57066
380	6677	15029	26723	60123
400	7016	15793	28082	63180
420	7356	16557	29441	66237
440	7695	17321	30799	69294
460	8034	18085	32158	72351
480	8374	18849	33517	75408
500	8713	19613	34876	78465
600	10411	23434	41669	93749
700	12108	27254	48463	109033
800	13805	31075	55256	124318
900	15503	34896	62050	139602
1000	17200	38716	68843	154887
1100	18897	42537	75637	170171
1200	20594	46357	82430	185455
1300	22292	50178	89224	200740
1400	23989	53998	96018	216024
1480	25347	57055	101452	228252
1500	25686	57819	102811	-
2000	34173	76922	136779	-
2200	37568	84563	150336	-

TABLE A - Gas constant, C

k	C	k	C
1.00	315	1.52	366
1.02	318	1.54	368
1.04	320	1.56	369
1.06	322	1.58	371
1.08	324	1.60	372
1.10	327	1.62	374
1.12	329	1.64	376
1.14	331	1.66	377
1.16	333	1.68	379
1.18	335	1.70	380
1.20	337	1.72	382
1.22	339	1.74	383
1.24	341	1.76	384
1.26	343	1.78	386
1.28	345	1.80	387
1.30	347	1.82	388
1.32	349	1.84	390
1.34	351	1.86	391
1.36	352	1.88	392
1.38	354	1.90	394
1.40	356	1.92	395
1.42	358	1.94	397
1.44	359	1.96	398
1.46	361	1.98	399
1.48	363	2.00	400
1.50	364	2.02	401

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## DIMENSIONS



### DIMENSIONS AND WEIGHTS

Size	Rating	A in	B in	C in	Orifice area in <sup>2</sup>	Weight lbs
1 x 2	150 x 150	3.72	5.37	16.45	0.785	25.5
	300 x 150	3.89	5.37	16.62		26.5
	600 x 150	4.34	5.37	17.07		26.5
	900 x 300	4.98	5.62	17.71		34.5
1.5 x 2	150 x 150	3.25	5.37	15.98	1.767	26.9
	300 x 150	4.02	5.62	16.75		32.9
	600 x 150	4.48	5.62	17.21		33.9
	900 x 300	4.97	5.75	17.70		41.9
2 x 3	150 x 150	4.12	6.00	16.50	3.142	37.4
	300 x 150	4.81	6.00	17.19		40.4
	600 x 150	4.81	6.38	17.19		48.4
	900 x 300	6.17	6.38	18.55		61.4
3 x 4	150 x 150	4.92	7.00	18.17	7.069	64.0
	300 x 150	5.82	7.38	19.07		79.0
	600 x 150	5.82	7.38	19.07		87.0

### NOTE

1. ASME K = 0.860

### RECOMMENDED SOFT GOODS LIMITS

Material	Continuous process temperature °F (°C)	Pressure range psig (barg)
FKM	-20 to +400 [-29 to +205]	25 to 2200 (1.72 to 153)

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## ORDERING INFORMATION

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### SELECTION GUIDE

<b>Example:</b>	<b>LCP -</b>	<b>06</b>	<b>12 -</b>	<b>N</b>
<b>Valve inlet size</b>				
04	1"			
06	1.5"			
08	2"			
12	3"			
<b>Valve inlet flange</b>				
05	150# RF			
10	300# RF			
12	600# RF			
14	900# RTJ			
<b>Valve trim option</b>				
Blank	Standard trim			
N	NACE trim (2002 edition)			

