CIRCLE SEAL CONTROLS, INC.

5100 Series

Inline Relief Valves
10 to 2400 psig (0.7 – 165 bar)

Features

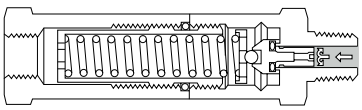
- Zero leakage up to 95% of cracking pressure
- Positive reseat at high percentage of cracking pressure
- Accurate set pressure
- Wide range of cracking pressure
- Tamper-proof adjustment
- PED certifications and CE marking available for most models

Technical Data

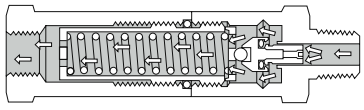
Body Construction Materials	Brass, steel, 303 or 316 stainless steel
O-ring Materials	Buna N, ethylene propylene, neoprene, Teflon®, and Viton®
Spring Material	17-7 PH stainless steel
Operating Pressure	0 to 2400 psig (166 bar)
Proof Pressure	3600 psig (248 bar)
Burst Pressure	Over 5000 psig (345 bar)
Temperature Range	–320° F to +400° F (–196° C to +204° F) *Based on O-ring material, see "How to Order"*
Connection Sizes	⅛″ to 1¼″

Note: Proper filtration is recommended to prevent damage to sealing surfaces.

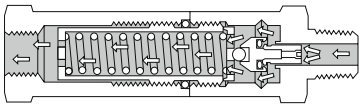
How it Works



Closed
The spring load is carried by a metal-to-metal stop. The O-ring provides a leak-tight seal. Sealing efficiency increases as the pressure increases up to the cracking pressure.



Cracking
The ports in poppet open fully and eliminate rapid increase in the pressure. The flow is throttled between the poppet shoulder and the seat, which provides regularly increasing flow area with increasing flow rates.



Open
The inline construction and full flow ports permit maximum flow with minimum increase in the system pressure.

Circle Seal Controls
2301 Wardlow Circle, Corona, CA 92880
Phone (951) 270-6200 Fax (951) 270-6201
www.circle-seal.com

Cracking Pressure Spring Ranges

Consult your local distributor or the factory for replacement spring part numbers. (Please have your complete valve part number ready when calling.)

Cracking Pressure Ranges (psig)

10–15	82–117	346–450	1201–1400
16–24	118–162	451–575	1401–1900
25–41	163–230	576–710	1901–2400
42–57	231–285	711–999	
58–81	286–345	1000–1200	

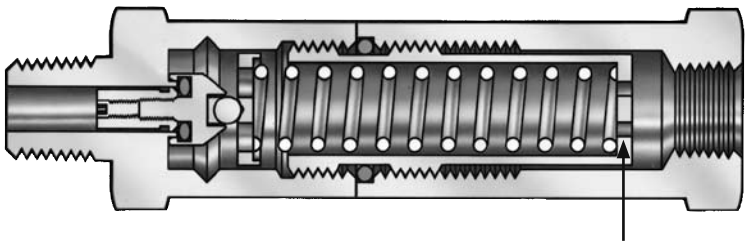
Adjustment

The 5100 Series relief valve is adjustable to ±15% of its nominal cracking pressure as follows:

1. Remove discharge line (in-line mounted unit) or override ring & rod (ASME type)
2. "Break" body joint by wrenching hexes. DO NOT USE PIPE WRENCH.
3. Insert proper size hex wrench (see table below) into the outlet end and turn clockwise to increase the cracking pressure, or counterclockwise to decrease.
4. After adjustment, hold the hex wrench stationary relative to the inlet end and turn the body to tighten the joint.
5. Test adjusted unit for cracking pressure.

Hex Wrench Size

Size	Nominal Cracking Pressure (psig)	
	450 & Under	451 & Over
⅛″	7/32″	7/32″
¼″	5/16″	¼″
⅜″	5/16″	¼″
½″	½″	⅜″
¾″	9/16″	½″
1″	9/16″	½″
1¼″	¾″	¾″



Hex adjustment screw

Air Flow Rates (5100–MP)

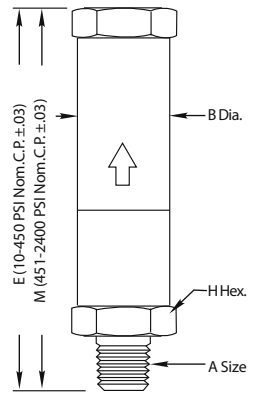
Inline valves, ⅛″–1″

Crack Pressure PSIG	Percent Over Pressure Beyond Cracking (SCFM air at room temperature)							
	10%				25%			
	1MP	2MP/3MP	4MP	6MP/8MP	1MP	2MP/3MP	4MP	6MP/8MP
15	1.0	1.5	5.0	9.0	3.0	5.0	50	52
20	1.5	2.0	10	12	4.0	5.0	60	63
25	2.0	2.7	25	27	5.4	6.5	65	67
30	2.4	4.6	30	36	6.2	13	68	71
40	3.0	5.5	34	55	6.5	25	72	100
50	3.0	10.5	40	65	8.0	29	74	110
75	4.2	14	50	70	13	38	80	114
100	6.0	25	54	90	17	55	90	130
125	8.5	32	70	120	22	58	110	136
150	10	36	72	150	27	78	115	200
200	13	40	135	190	40	96	250	375
250	16	50	150	210	43	115	280	450
300	20	60	180	225	52	127	400	600
400	25	80	270	270	68	150	600	900
500	36	46	110	190	108	120	320	700
750	45	58	130	210	90	130	420	1200
1000	47	64	170	210	160	160	620	1280
1200	67	74	240	250	200	200	1000	1500
1400	84	84	450	395	—	—	—	—
1600	110	110	720	405	—	—	—	—
1800	160	160	810	510	—	—	—	—
2000	190	190	850	515	—	—	—	—
2200	220	220	900	520	—	—	—	—
2400	240	240	990	675	—	—	—	—

5100 Series

Dimensions (inches)

MP

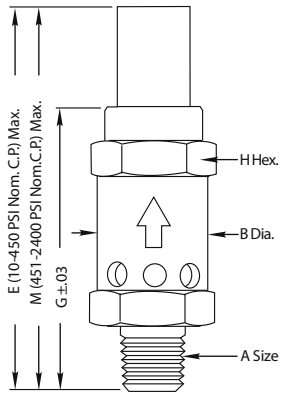


5100 Series, Inline

Prod. No.	A	E	M	B Dia. H Hex
–1MP	⅛″	2.89	3.49*	0.81*
–2MP	¼″	3.34	4.24	1.00
–3MP	⅜″	3.36	4.26	1.00
–4MP	½″	4.15	5.05	1.25
–6MP	¾″	5.61	7.11	1.50
–8MP	1″	5.79	7.29*	1.50
–10MP	1¼″*	7.46	10.22	2.00

* *⅛″ size: for cracking pressure 1201–2400 psig, 'M' is 3.95, 'B' and 'H' are 1.00*
1″ size: for cracking pressure 1201–2400 psig, 'M' is 7.32
1¼″ size: not available above 1200 psig

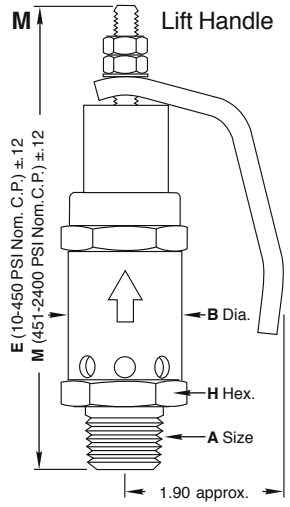
M

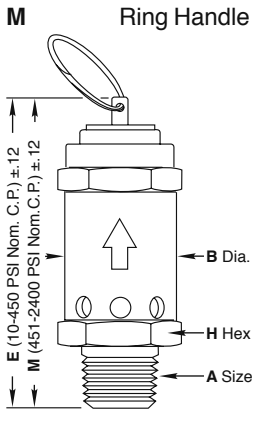


5100 Series, Popoff

Prod. No.	A	E	M	G	B Dia. H Hex
–1M	⅛″	2.56	3.16*	2.39*	0.81*
–2M	¼″	2.87	3.77	2.65	1.00
–3M	⅜″	2.89	3.79	2.74	1.00
–4M	½″	3.59	4.49	3.27	1.25
–6M	¾″	5.00	6.50	4.16	1.50
–8M	1″	5.18	6.68	4.34	1.50
–10M	1¼″*	6.70	8.65	4.96	2.00

* *⅛″ size: for cracking pressure 1201–2400 psig, 'M' is 3.58, 'G' is 2.48, 'B' and 'H' are 1.00*
1¼″ size: not available above 1200 psig





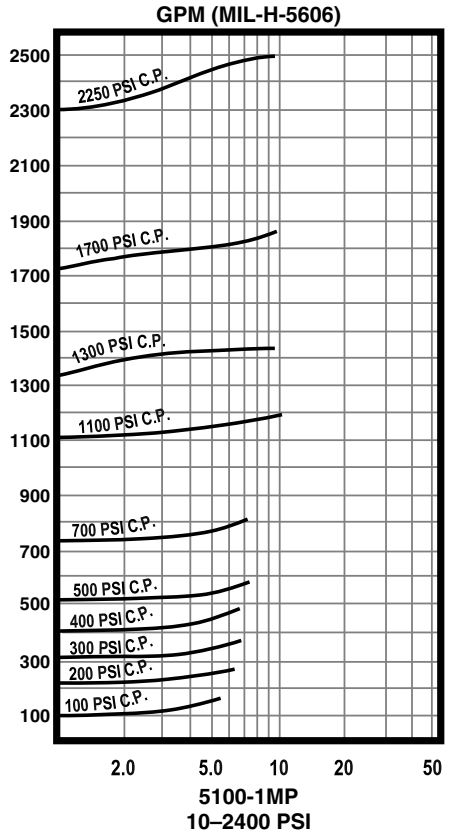
M5100 Series, Popoff with Manual Override

Prod. No.*	A	E	M	B Dia. H Hex
–1M	⅛″	2.84	3.45**	0.81**
–2M	¼″	3.16	4.06	1.00
–3M	⅜″	3.19	4.09	1.00
–4M	½″	3.86	5.51	1.25
–6M	¾″	5.41	7.54	1.50
–8M	1″	5.59	7.72	1.50
–10M	1¼″*	6.95	10.42	2.00

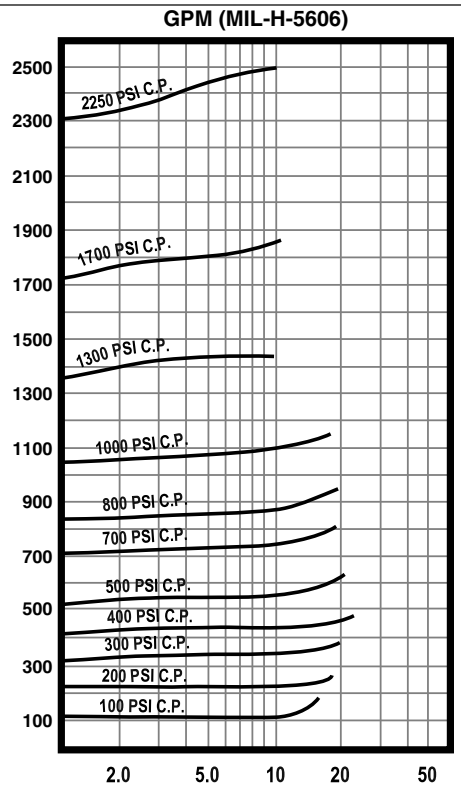
* *Ring handle is supplied for 1M, 2M, and 3M. For larger sizes, ring handle only supplied for cracking pressure up to 450 psi.*
** *⅛″ size: for cracking pressure 1201–2400 psig, 'M' is 3.84, 'B' and 'H' are 1.00*
1¼″ size: not available above 1200 psig

5100 Series

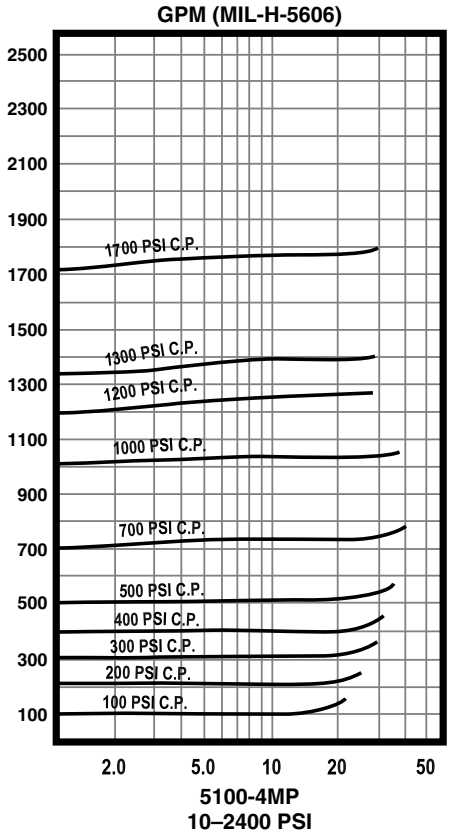
Hydraulic Flow Curves



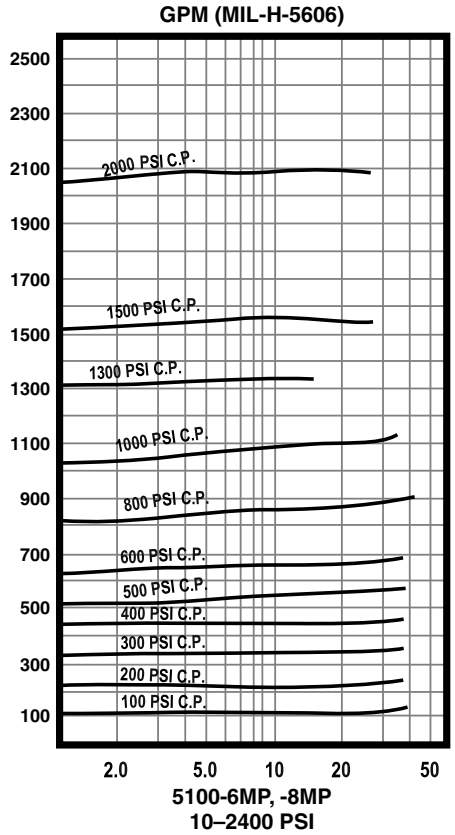
5100-1MP
10–2400 PSI



5100-2MP, -3MP
10–2400 PSI

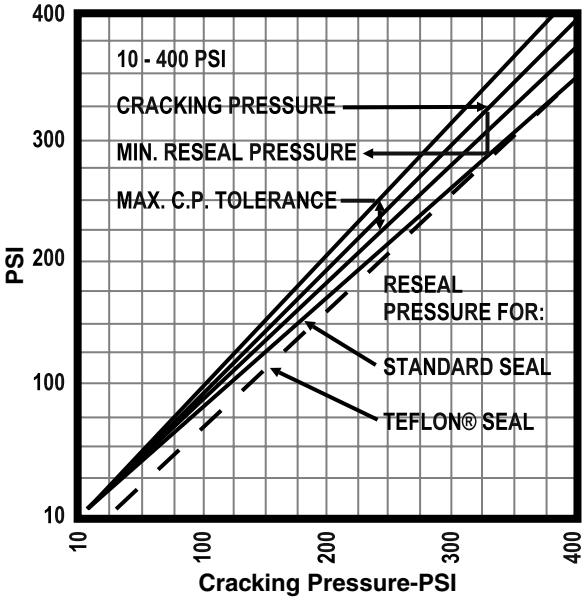


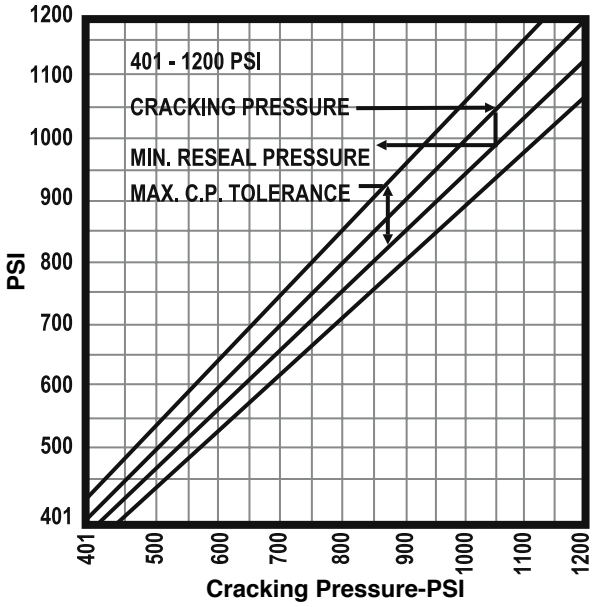
5100-4MP
10–2400 PSI

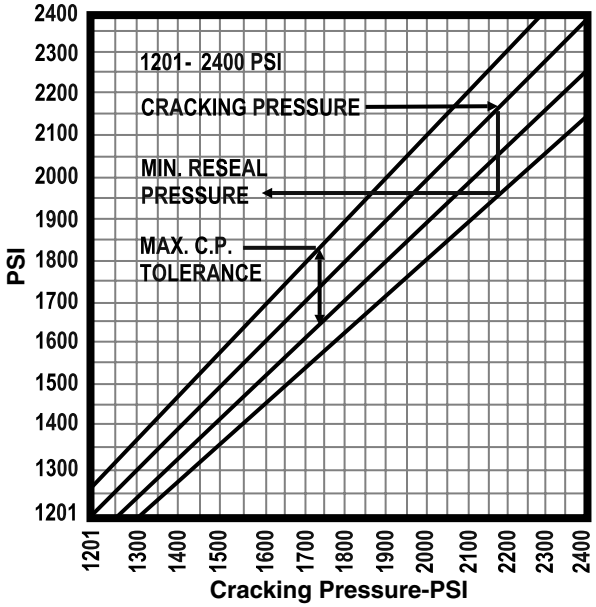


5100-6MP, -8MP
10–2400 PSI

Cracking & Reseal Pressure







Definitions

1. *Cracking pressure* is defined as 5cc/min with gas (0.2 scfm for 5120 Series)
2. *Reseat point* is the point at which the valve closes, cutting off virtually all flow.
3. The *reseal point* is the point at which the valve seals absolutely tight so that there is no leakage detectable by normal means of measurement.

5100 Series

How to Order

M 51 59 B – 2 MP (L) – 20

VARIATION**
- **K** Cryogenic service, special cleaning and testing (stainless steel valves only)
- **M** Manual

O-RING MATERIAL, TEMPERATURE & CRACKING PRESSURE RANGE
- **20** Teflon®
  5120 Series*: -100° to +400° F (-73° to +204°C)
  K520 Series: -320° to +165° F (-196° to +74°C)
- **32** Viton®, -20° to +400° F (-29° to +204°C)
- **33** Neoprene, -40° to +300° F (-40° to +149°C)
- **59** Buna N, -65° to +275° F (-54° to +135°C)
- **62** Ethylene propylene, -65° to +300° F (-54° to +149°C)
- **80** Teflon®*, -320° to +165° F (-196° to +74°C)

BODY MATERIAL
- **B** Brass††
- **S** Steel†
- **T** 303 stainless steel†
- **T1** 316 stainless steel

CRACKING PRESSURE*
Specify cracking pressure setting in psig (20 – 2400 psig)

SPECIAL CHARACTERISTICS
- **L** Lockwire
- **R** Resonance dampener (standard for 1201–2400 cracking pressures with elastomeric seals)

CONNECTIONS—INLET/OUTLET
- **M** Male pipe
- **MP** Inline male pipe by female pipe

VALVE SIZE
Pipe sizes in ⅛″ increments
- **1** ⅛″
- **2** ¼″
- **3** ⅜″
- **4** ½″
- **6** ¾″
- **8** 1″
- **10** 1¼″

* *Unit is not rated for liquid cryogenic service below –100° F (-73° C).*
** *Blank if not required*
† *Not available for PED applications*
†† *For PED applications, brass bodies are limited to a maximum temperature use of +100° F (+38° C)*
O-rings of Teflon®: Minimum cracking pressure is 20 psi; not available for use above 1200 psi in ¾″ and larger sizes.

To specify PED certification, add PED prefix to the part number.

Repair Kit
In normal service, the only part(s) which may require replacement is(are) the seal(s). A repair kit may be ordered by placing a 'K/' in front of the complete part number (i.e. K/5159B–2MP–20).

Please consult your Circle Seal Controls Distributor or our factory for information on special connections, materials, sizes, o-rings, operating pressures and temperature ranges.

Cracking Pressure Tolerance: ±5%
Cracking pressures below 20 psig have a tolerance of ±20%.

Flow at cracking pressure: Elastomeric seals = 5cc/min
Teflon® seals = 0.02 scfm

Reseal pressure***

	Crack Pressure	Reseal Pressures
Elastomeric seals	C.P. > 100 psi	90% of C.P.
	C.P. <100 psi	70% to 89% of C.P.
Teflon® seals	C.P. > 450 psi	90% of C.P.
	C.P. < 450 psi	52% to 90% of C.P.

*** *The reseal point is the point at which the valve seals absolutely tight so that there is no leakage detectable by normal means of measurement. The point at which the valve closes, cutting off virtually all flow, is called the reseat point. The reseat point is substantially above the reseal.*

Leakage at reseal pressure

Elastomeric seals	Ascending pressure = zero up to 95% of cracking pressure
	Descending pressure = zero at reseal and below
Teflon® seals	Ascending pressure = zero up to reseal pressure, then 10cc/min between reseal and cracking pressure
	Descending pressure = zero at reseal, except with cracking pressure below 451 psi, then 1cc/min maximum

First crack pressure after standing unactuated for a prolonged period

Set pressure of…	5–19 psi	125% of cracking pressure
	20–29 psi	120% of cracking pressure
	30–49 psi	115% of cracking pressure
	50 psi and higher	110% of cracking pressure