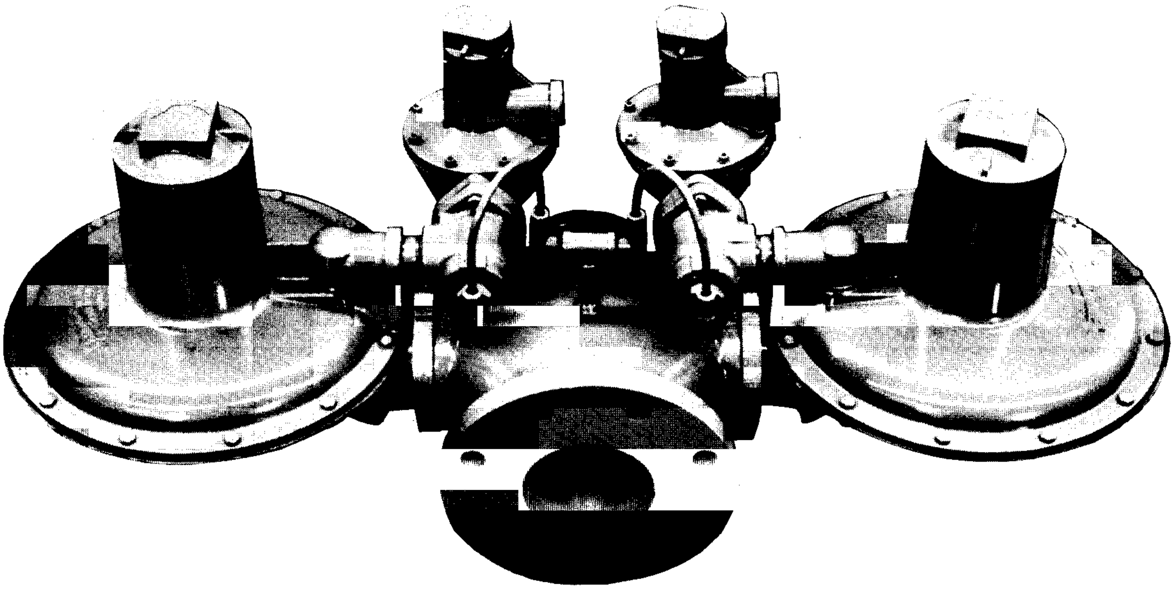
Data Sheet

- Constant Loaded High Capacity Service Regulators with Single Large Valve Body, Orifices to 1⅜"
- Parallel Regulation Unit Saves Space
- Reduces Measurement Set Installation Costs

CL-838 - 1 & 2, D1 & D2, M1 & M2 Twin Parallel Flow Dual Pilot Loaded Regulators



Model Description:

The CL-838 Regulator is a single valve body regulator with large (12 ¹⁄₁₆" dia.) twin diaphram cases, pilot loaded to insure a high degree of accuracy during fixed factor measurement. These regulators are ideal for service, commercial, industrial, and distribution regulation applications when installed in compliance with D.O.T. regulations.

The CL-838 requires an inlet pressure of only 0.5 PSIG above outlet pressure.

The CL-838 is available in 6 models; CL-838-1, CL-838-2, CL-838-D-1 & D2, CL-838-M1 & M2.

CL-838-1. Maximum inlet pressure of 150 PSIG; outlet pressure range 6" W.C. to 5 PSIG; orifice size ⅜" through 1⅜".

CL-838-2. Maximum inlet pressure of 150 PSIG; outlet pressure range 1 PSIG to 30 PSIG; orifice size ⅜" to 1⅜".

CL-838-D-1 (Downstream Control). Maximum inlet pressure 150 PSIG; outlet pressure range 6" W.C. to 5 PSIG with closed throat and equipped for downstream control tap. This unit is used when it is desirable to control the regulator from a downstream sensing point other than the regulator valve body outlet side.

All capacity curves are the same except no boost is experienced at the control point. Orifice sizes ⅜" through 1⅜".

CL-838-D-2. Maximum inlet pressure 150 PSIG. Outlet pressure range 1 PSIG to 30 PSIG. All other facets of the CL-838-D-2 are the same as the CL-838-D-1 regulator. Orifice size ⅜" through 1⅜".

CL-838-M-1. Regulator for monitor installation with closed throat and o-ring seal on the valve stem at the throat to assure positive downstream control when installed ahead of the operating regulator. This unit provides an operating safety device which assumes control over the operating regulator when failure is sensed by the monitor control line. The monitor regulator is set to take over control from the operating regulator with only a slight increase in outlet pressure. Orifice sizes ⅜" through 1⅜" and outlet pressure range from 6" to 5 PSIG. And inlet pressures of 150 PSIG max.

CL-838-M-2. Regulator for monitor installations. All facets of this regulator are the same as the CL-838-M-1 except the range of outlet pressures which are from 1 PSIG to 30 PSIG.

Construction

The construction of the main regulator in the CL-838 is the same as a standard B-838 service regulator (see 838 series General Bulletin for additional details) except the main springs are installed to *close the valve.*

This Main Regulator is the same in either the CL-838-1 or CL-838-2 model. Your selection of either model 1 or model 2 will be determined by the *outlet pressure range of the pilot regulators.*

For CL-838-1 the pilot has an adjustment of 6" W.C. to 5 psig.

For CL-838-2 the pilot has an adjustment range of 1 psig to 30 psig.

The pilots are simple reducing regulators with internal relief. Both pilot regulators are interchangeable at the throat of the pilot valve body without disconnecting any piping.

Adjustment

The only adjustment ever needed on a CL-838 is a possible change in the outlet pressure setting when desired. This is made simply by turning the spring adjustment of the pilot regulators only.

Installation and Dimensions

The CL-838 is supplied as a completely self-contained compact unit. Installation is as simple as any screwed or flanged self-contained regulator.

You may order the CL-838 factory assembled in any of six basic installation positions – (see diagrams on back page of 838 series General Bulletin). No downstream control line is needed for the CL-838-1 or CL-838-2 regulators. A downstream control line is required for the "D" and "M" models.

For field adaptions, the main valve body or the two main diaphragm cases may be positioned in any 360° plane. This requires repiping of the pilot supply lines in some positions, and the pilot upper case vents must be in the water drain position for outdoor installations.

Principle of Operation (See Schematic Flow Diagram)

Inlet pressure, (tint 1) connected by tubing to pilot regulator, is utilized as supply pressure for pilot. Setting of pilot regulator spring (A) determines desired outlet pressure (tint 2) of main regulator. Outlet pressure of pilot regulator is applied to top of large diaphragm (B). Loading pressure (tint 3) is a constant pressure equal to desired outlet pressure plus pressure required to counterbalance light closing spring. (C).

When rate of flow is less than 100 CFH, the only regulators in operation are the pilot regulators. Main valve (D) is closed any time flow rate is less than that supplied by the pilot regulators (through the 5/32" bleed orifice (E) between upper and lower diaphragm cases) and the pressure is equalized in both upper and lower diaphragm chambers (tint 3 and 2). No flow, or lock up pressure, is the outlet pressure required to close pilot regulators.

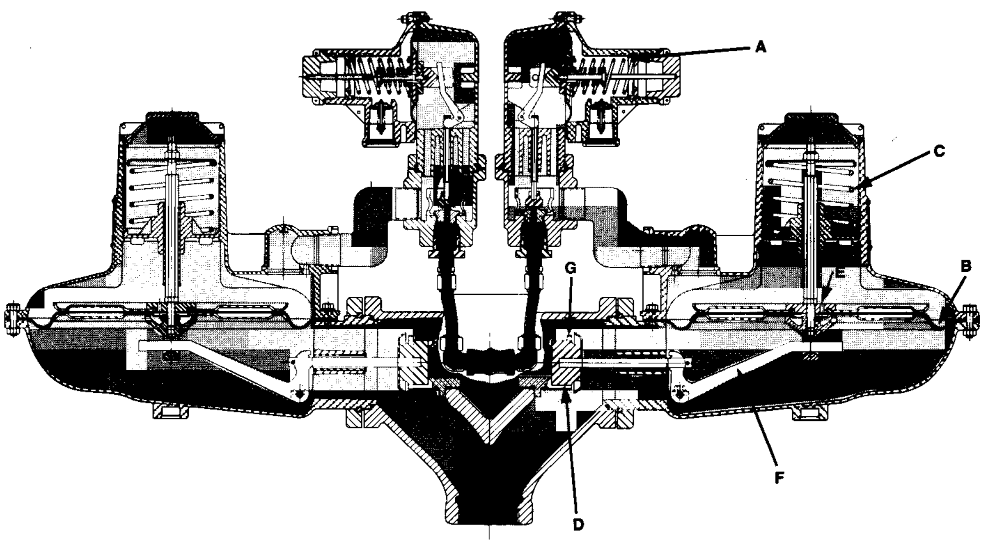
In operation, assuming rate of flow is greater than pilot regulators can supply, outlet pressure (tint 2) in lower diaphragm chambers is reduced and constant pressure (tint 3) above diaphragms forces diaphragms downward. This motion is transmitted through bell crank levers (F) to open the main valves (D) to proper position to meet flow rate and recover desired outlet pressure (tint 2).

The pressure in lower diaphragm chambers (tint 2) is reduced according to the rate of flow by the loading rings (G). The loading rings can be positioned to give straight line regulation, according to orifice size, inlet pressure, and outlet pressure.

When flow rate is decreased, outlet pressure tends to increase. Pressure (tint 2) increase is reflected to lower diaphragm chambers increasing pressure below main diaphragms, (tint 2) thereby decreasing differential in pressure across main diaphragms (B). This allows closing springs (C) to move diaphragms upward, closing the main valves (D) and throttling gas flow.

SCHEMATIC FLOW DIAGRAM

CAPTIONS FOR SCHEMATIC



CAPACITY TABLE CL-838 2 x 2

ORIFICE SIZE		3/8	1/2	5/8	3/4	1	1-1/4	1-3/8
INLET PRESSURE PSIG	OUTLET PRESSURE	ORIFICE CONSTANT FACTOR K						
		510	780	990	1350	1850	2280	2510
		CAPACITY IN 1000 SCFH 0.6 SP. GR. GAS*						
2	7" W.C.	2.55	3.55	4.55	6.0	8.65	10.0	11.7
	11" W.C.	2.55	3.5	4.5	5.95	8.35	1.7	11.3
	1 PSIG	2.1	2.95	3.75	4.8	6.9	8.05	9.3
	1.5 PSIG	1.65	2.4	3.35	4.3	5.6	7.0	7.95
3	7" W.C.	3.15	4.2	5.8	7.5	10.6	12.7	14.4
	11" W.C.	2.95	4.2	5.8	7.35	10.4	12.5	14.1
	1 PSIG	2.8	3.9	5.2	6.65	9.45	11.2	12.7
	2 PSIG	2.15	3.0	4.1	5.15	7.1	8.55	9.7
5	7" W.C.	4.05	5.65	7.65	9.75	13.9	17.0	18.8
	11" W.C.	4.05	5.65	7.55	9.65	13.7	16.8	18.6
	1 PSIG	3.8	5.65	7.2	9.2	13.1	16.0	17.7
	2 PSIG	3.45	5.25	6.5	8.3	11.8	14.4	15.9
	3 PSIG	3.1	4.15	5.55	7.1	10.0	12.3	13.6
10	7" W.C.	5.8	8.45	10.8	13.9	19.7	24.2	26.7
	11" W.C.	5.8	8.45	10.8	13.8	19.7	24.1	26.6
	1 PSIG	5.7	8.35	10.7	13.7	19.4	23.8	26.3
	2 PSIG	5.55	8.1	10.4	13.3	18.9	23.2	25.6
	5 PSIG	4.8	7.0	9.05	11.5	16.4	20.1	22.2
	8 PSIG	3.35	4.95	6.35	8.1	11.5	14.1	15.6
15	1 PSIG or less	7.05	10.3	13.3	17.0	24.2	29.7	32.8
	2 PSIG	7.0	10.3	13.2	16.9	24.0	29.5	32.6
	5 PSIG	6.75	9.85	12.6	16.2	23.0	28.2	31.1
	8 PSIG	6.05	8.9	11.4	14.6	20.8	25.4	28.1
	10 PSIG	5.35	7.9	10.1	13.0	18.4	22.6	25.0
	13 PSIG	3.75	5.5	7.1	9.05	12.9	15.8	17.4
20	3.5 PSIG or less	8.2	12.1	15.6	19.9	28.3	34.7	38.3
	5 PSIG	8.15	12.0	15.4	19.7	28.1	34.4	38.0
	10 PSIG	7.5	11.0	14.2	18.2	25.8	31.6	34.9
	15 PSIG	5.9	8.7	11.2	14.3	20.3	24.9	27.5
	18 PSIG	4.1	6.05	7.8	9.95	14.1	17.3	19.1
30	9 PSIG or less	10.6	15.6	20.1	25.7	36.4	44.7	49.3
	10 PSIG	10.5	15.5	20.0	25.5	36.3	44.5	49.1
	15 PSIG	10.0	14.8	19.0	24.3	34.6	42.4	46.8
	20 PSIG	8.95	13.1	16.9	21.6	30.7	37.7	41.6
	25 PSIG	6.9	10.1	13.1	16.7	23.7	29.1	32.1
40	14 PSIG or less	12.9	19.1	24.6	31.4	44.6	54.7	60.4
	15 PSIG	12.9	19.0	24.5	31.3	44.5	54.5	60.2
	20 PSIG	12.5	18.5	23.7	30.4	43.1	52.8	58.4
	30 PSIG	10.2	15.0	19.3	24.7	35.4	43.0	47.5
50	19.5 PSIG or less	15.3	22.6	29.1	37.2	52.8	64.7	71.4
	20 PSIG	15.3	22.6	29.0	37.1	52.7	64.5	71.3
	30 PSIG	14.2	21.0	27.0	34.5	49.1	60.1	66.4
60	24.5 PSIG or less	17.7	26.1	33.6	42.9	60.9	74.7	82.5
	25 PSIG	17.7	26.1	33.5	42.8	60.9	74.5	82.4
	30 PSIG	17.4	25.6	33.0	42.2	59.9	73.4	81.1
75	30 PSIG or less	21.3	31.3	40.3	51.5	73.2	89.7	99.0
100	30 PSIG or less	27.2	40.1	51.6	65.9	93.6		
125	30 PSIG or less	33.1	48.8	62.8	80.3			

MAXIMUM RECOMMENDED INLET PRESSURE – PSI TO INCHES REGULATION – LEFT OF HEAVY BLACK LINE

K values are wide open for each orifice size.

Figures below heavy line may show differentials above allowable limits. Check closing spring tables to be sure.

Loading Ring set at 0° for psig outlet pressures. Loading Ring set at 25° for inches w.c. outlet pressures. Exact settings may vary with individual applications of pressures and load conditions.

All capacities at 1% outlet pressure absolute pressure drop.

*Capacities based on 0.6 Sp. Gr. Gas at 14.7 PSIA and 60°F. Set point at each outlet pressure was 500 cfh.

CAPACITY TABLE CL-838 2 x 3

ORIFICE SIZE		3/8	1/2	5/8	3/4	1	1-1/4	1-3/8
INLET PRESSURE PSIG	OUTLET PRESSURE	ORIFICE CONSTANT FACTOR K						
		550	930	1290	1610	2075	2515	2710
		CAPACITY IN 1000 SCFH 0.6 SP. GR. GAS*						
2	7" W.C.	2.7	4.3	5.6	7.45	9.9	12.4	13.5
	11" W.C.	2.6	4.15	5.4	7.2	9.6	12.0	13.0
	1 PSIG	2.1	3.45	4.5	5.95	7.95	9.95	10.8
	1.5 PSIG	1.75	2.65	3.65	4.7	6.1	7.65	8.3
3	7" W.C.	3.4	5.6	7.1	9.2	12.4	15.3	16.6
	11" W.C.	3.35	5.5	6.95	9.0	12.1	15.0	16.3
	1 PSIG	3.0	4.9	6.3	8.15	11.0	13.6	14.7
	2 PSIG	2.25	3.6	4.75	6.15	8.3	10.3	11.1
5	7" W.C.	4.5	7.3	9.35	12.3	16.3	20.2	22.3
	11" W.C.	4.45	7.2	9.25	12.2	16.2	20.0	22.0
	1 PSIG	4.25	6.85	8.8	11.6	15.4	19.0	21.0
	2 PSIG	3.7	6.1	7.95	10.4	13.9	17.1	18.9
	3 PSIG	3.2	5.15	6.75	8.95	11.8	14.6	16.1
10	7" W.C.	6.45	10.2	13.9	18.1	23.6	28.7	31.7
	11" W.C.	6.45	10.2	13.8	18.1	23.5	28.6	31.6
	1 PSIG	6.35	10.1	13.7	17.8	23.2	28.3	31.2
	2 PSIG	6.2	9.85	13.3	17.4	22.6	27.5	30.4
	5 PSIG	5.2	8.55	11.5	15.1	19.6	23.9	26.3
	8 PSIG	3.6	6.0	8.1	10.6	13.7	16.8	18.5
15	1 PSIG or less	7.95	13.3	17.8	23.0	29.3	35.2	38.9
	2 PSIG	7.9	13.2	17.7	22.8	29.1	35.0	38.6
	5 PSIG	7.5		16.9	21.8	27.8	33.4	36.9
	8 PSIG	6.75	11.4	15.2	19.7	25.1	30.2	33.3
	10 PSIG	5.95	10.1	13.5	17.5	22.3	26.9	29.6
	13 PSIG	4.0	7.1	9.45	12.2	15.6	18.7	20.7
20	3.5 PSIG or less	9.4	15.6	21.1	27.3	34.7	41.2	45.4
	5 PSIG	9.3	15.4	21.0	27.1	34.4	40.8	45.1
	10 PSIG	8.5	14.2	19.3	24.9	31.6	37.5	41.4
	15 PSIG	6.6	11.2	15.2	19.6	24.9	29.6	32.6
	18 PSIG	4.4	7.8	10.5	13.6	17.3	20.6	22.7
30	9 PSIG or less	12.2	20.1	27.4	35.2	44.7	53.4	58.5
	10 PSIG	12.1	20.0	27.3	35.0	44.5	53.1	58.2
	15 PSIG	11.5	19.0	26.0	33.4	42.4	50.6	55.5
	20 PSIG	10.2	16.9	23.1	29.6	37.7	45.0	49.3
	25 PSIG	7.7	13.1	17.9	22.9	29.1	34.8	38.1
40	14 PSIG or less	14.9	24.6	33.9	43.0	54.7	65.3	71.6
	15 PSIG	14.9	24.5	33.8	42.9	54.5	65.1	71.4
	20 PSIG	14.4	23.7	32.7	41.6	52.8	63.1	69.2
	30 PSIG	11.5	19.3	26.6	33.8	43.0	51.3	56.3
50	19.5 PSIG or less	17.7	29.1	40.1	50.9	64.7	77.3	84.7
	20 PSIG	17.6	29.0	40.0	50.8	64.5	77.1	84.5
	30 PSIG	16.3	27.0	37.3	47.3	60.1	71.8	78.8
60	24.5 PSIG or less	20.4	33.6	46.3	58.8	74.7	89.2	97.8
	25 PSIG	20.3	33.5	46.2	58.7	74.5	89.1	97.7
	30 PSIG	20.0	33.0	45.5	57.8	73.4	87.7	96.1
75	30 PSIG or less	24.5	40.3	55.6	70.6	90.0	107.1	117.5
100	30 PSIG or less	31.3	51.6	71.1	90.2	115.0		
125	30 PSIG or less	38.1	62.8	86.6	109.0			

MAXIMUM RECOMMENDED INLET PRESSURE – PSI TO INCHES REGULATION – LEFT OF HEAVY BLACK LINE

K values are wide open for each orifice size.

Figures below heavy line may show differentials above allowable limits. Check closing spring tables to be sure.

Loading Ring set at 0° for psig outlet pressures. Loading Ring set at 25° for inches w.c. outlet pressures. Exact settings may vary with individual applications of pressures and load conditions.

All capacities at 1% outlet pressure absolute pressure drop.

*Capacities based on 0.6 Sp. Gr. Gas at 14.7 PSIA and 60°F. Set point at each outlet pressure was 500 cfh.

CAPACITY TABLE CL-838 2 x 4

ORIFICE SIZE		3/8	1/2	5/8	3/4	1	1-1/4	1-3/8
INLET PRESSURE PSIG	OUTLET PRESSURE	ORIFICE CONSTANT FACTOR K						
		565	950	1350	1710	2190	2625	3050
		CAPACITY IN 1000 SCFH 0.6 SP. GR. GAS*						
2	7" W.C.	2.85	4.6	6.25	8.2	11.0	13.3	14.3
	11" W.C.	2.8	4.55	6.25	7.9	10.7	12.9	13.8
	1 PSIG	2.35	3.7	5.1	6.55	8.8	10.6	11.4
	1.5 PSIG	1.85	3.1	4.2	5.3	7.0	8.2	8.8
3	7" W.C.	3.55	5.75	7.95	10.1	13.6	16.3	19.7
	11" W.C.	3.5	5.7	7.8	9.9	13.4	16.0	19.4
	1 PSIG	3.25	5.05	7.05	8.9	12.1	14.4	18.5
	2 PSIG	2.3	4.0	5.35	7.05	9.15	10.9	13.1
5	7" W.C.	4.65	7.7	10.2	13.1	17.7	21.6	25.7
	11" W.C.	4.65	7.6	10.1	13.0	17.6	21.5	25.5
	1 PSIG	4.35	7.15	9.65	12.4	16.6	20.5	23.4
	2 PSIG	3.95	6.55	8.7	11.2	15.0	17.9	19.9
	3 PSIG	3.35	5.55	7.45	9.55	12.3	15.6	17.5
10	7" W.C.	6.7	10.8	15.4	20.4	25.9	30.2	35.8
	11" W.C.	6.7	10.8	15.4	20.4	25.9	30.1	35.5
	1 PSIG	6.6	10.6	15.1	20.1	25.5	29.7	35.0
	2 PSIG	6.4	10.3	14.7	19.5	24.8	28.9	34.1
	5 PSIG	5.4	8.95	12.8	16.9	21.5	25.0	29.5
	8 PSIG	3.8	6.3	9.0	11.9	15.1	17.6	20.7
15	1 PSIG or less	8.3	13.8	19.0	24.6	31.1	37.8	43.0
	2 PSIG	8.25	13.7	18.8	24.4	30.8	37.5	42.7
	5 PSIG	7.85	13.0	17.9	23.3	30.1	35.8	40.8
	8 PSIG	7.1	11.8	16.2	21.0	27.2	32.4	30.9
	10 PSIG	6.3	10.5	14.4	18.7	24.2	28.8	32.8
	13 PSIG	4.4	7.3	10.0	13.0	16.9	20.1	22.9
20	3.5 PSIG or less	9.65	16.0	22.5	28.7	37.3	44.2	50.3
	5 PSIG	9.6	15.8	22.3	28.4	36.8	43.8	49.9
	10 PSIG	8.8	14.5	20.5	26.1	33.8	40.3	45.9
	15 PSIG	6.95	11.5	16.1	20.6	26.6	31.7	36.1
	18 PSIG	4.85	8.0	11.2	14.3	18.5	22.1	25.1
30	9 PSIG or less	12.4	20.6	29.0	36.9	48.0	56.9	64.8
	10 PSIG	12.4	20.5	28.8	36.8	47.7	56.6	64.5
	15 PSIG	11.8	19.8	27.5	35.0	45.4	53.9	61.5
	20 PSIG	10.5	17.3	24.4	31.2	40.4	48.0	54.6
	25 PSIG	8.1	13.4	18.8	24.1	31.2	37.0	42.2
40	14 PSIG or less	15.2	25.7	35.5	45.2	58.8	70.4	79.3
	15 PSIG	15.2	25.6	35.4	45.1	58.5	70.1	79.0
	20 PSIG	14.7	24.5	34.3	43.7	56.7	68.0	76.6
	30 PSIG	12.0	19.9	27.9	35.5	46.1	55.3	62.3
50	19.5 PSIG or less	18.0	30.4	42.0	53.5	69.5	82.4	93.8
	20 PSIG	18.0	30.3	41.9	53.4	69.2	82.2	93.6
	30 PSIG	16.8	27.9	39.0	49.7	64.5	76.6	87.2
60	24.5 PSIG or less	20.8	35.1	48.5	61.8	80.3	95.2	108.3
	25 PSIG	20.8	34.9	48.4	61.7	80.0	95.0	108.1
	30 PSIG	20.5	34.1	47.6	60.7	78.7	93.4	106.4
75	30 PSIG or less	25.0	42.1	58.3	74.2	96.4	114.3	130.0
100	30 PSIG or less	32.0	53.9	74.5	94.9	123.3		
125	30 PSIG or less	39.0	65.6	90.8	115.6			

MAXIMUM RECOMMENDED INLET PRESSURE – PSI TO INCHES REGULATION – LEFT OF HEAVY BLACK LINE

K values are wide open for each orifice size.

Figures below heavy line may show differentials above allowable limits. Check closing spring tables to be sure.

Loading Ring set at 0° for psig outlet pressures. Loading Ring set at 25° for inches w.c. outlet pressures. Exact settings may vary with individual applications of pressures and load conditions.

All capacities at 1% outlet pressure absolute pressure drop.

*Capacities based on 0.6 Sp. Gr. Gas at 14.7 PSIA and 60°F. Set point at each outlet pressure was 500 cfh.

CL - 838M 2 x 2 MONITOR SPECIFICATIONS

ORIFICE DIAMETER	INLET PRESS. PSIG	CAPACITY, SCFH DROP IN PRESSURE ACROSS ORIFICE, PSIG								
		0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	5.0
	1	3100	4400	5350	6200	6900				
	2	3200	4550	5550	6400	7100	9900			
	3	3300	4650	5700	6600	7350	10200	14000		
	5	3500	4950	6050	6950	7750	10800	14900	17700	
1 3/8"	8	3750	5300	6500	7450	8350	11600	16100	19200	23600
K = 2510	10	3900	5550	6750	7800	8700	12200	16900	20200	24900
	15	4300	6050	7450	8550	9550	13400	18600	22400	27800
	25	4950	7050	8600	9950	11100	15600	21700	26300	33000
	35	5550	7850	9650	11100	12400	17500	24500	29700	37500
	50	6350	9000	11000	12700	14200	20000	28100	34100	43300
	75	7500	10600	12900	15000	16700	23600	33200	40400	51600
	1	2800	4000	4900	5600	6250				
	2	2900	4100	5050	5800	6450	9000			
	3	3000	4250	5200	5950	6650	9300	12700		
	5	3150	4500	5500	6300	7050	9850	13500	16100	
1 1/4"	8	3400	4800	5900	6800	7550	10600	14600	17500	21400
K = 2280	10	3550	5000	6150	7100	7900	11000	15300	18300	22600
	15	3900	5500	6750	7800	8700	12200	16900	20400	25300
	25	4500	6400	7800	9000	10000	14100	19700	23900	30000
	35	5050	7150	8750	10100	11300	15900	22200	26900	34000
	50	5750	8150	10000	11500	12900	18100	25500	31000	39300
	75	6800	9600	11800	13600	15200	21400	30100	36700	46900
	1	2300	3250	3950	4550	5100				
	2	2350	3350	4100	4700	5250	7300			
	3	2450	3450	4200	4850	5400	7550	10300		
	5	2550	3650	4450	5100	5700	8000	11000	13000	
1"	8	2750	3900	4750	5500	6150	8600	11900	14200	17400
K = 1850	10	2900	4050	5000	1750	6400	9000	12400	14900	18300
	15	3150	4450	5450	6300	7050	9900	13700	16500	20500
	25	3650	5150	6350	7300	8150	11500	16000	19400	24300
	35	4100	5800	7100	8200	9150	12900	18000	21800	27600
	50	4700	6600	8100	9350	10400	14700	20700	25100	31900
	75	5500	7500	9550	11000	12300	17400	24500	29800	38000
	100	6250	8850	10800	12500	13900	19700	27700	33800	43300

CL - 838M 2 x 3 MONITOR SPECIFICATIONS

ORIFICE DIAMETER	INLET PRESS. PSIG	CAPACITY, SCFH DROP IN PRESSURE ACROSS ORIFICE, PSIG								
		0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	5.0
	1	3350	4750	5800	6700	7450				
	2	3450	4900	6000	6900	7700	10700			
	3	3550	5050	6150	7100	7900	11000	15100		
	5	3750	5350	6500	7500	8350	11700	16100	19100	
1 3/8"	8	4050	5700	7000	8050	9000	12600	17400	20800	25400
K = 2710	10	4250	5950	7300	8400	9400	13100	18200	21800	26800
	15	4650	6550	8000	9250	10300	14500	20100	24200	30100
	25	5350	7600	9300	10700	11900	16800	23500	28400	35600
	35	6000	8500	10400	12000	13400	18900	26400	32000	40500
	50	6850	9700	11900	13700	15300	21600	30300	36800	46800
	75	8100	11400	14000	16100	18000	25500	35800	43700	55700
	1	3100	4400	5400	6200	6900				
	2	3200	4550	5550	6400	7150	9950			
	3	3300	4700	5700	6600	7350	10200	14000		
	5	3500	4950	6050	6950	7750	10800	14900	17800	
1 1/4"	8	3750	5300	6500	7500	8350	11700	16100	19300	23600
K = 2515	10	3900	5550	6800	7800	8700	12200	16900	20200	24900
	15	4300	6100	7450	8600	9600	13400	18700	22500	27900
	25	5000	7050	8600	9950	11100	15600	21800	26300	33100
	35	5600	7900	9650	11100	12400	17500	24600	29700	37500
	50	6350	9000	11000	12700	14200	20000	28100	34200	43400
	75	7500	10600	13000	15000	16700	23600	33300	40500	51700
	1	2550	3650	4450	5100	5700				
	2	2650	3750	4600	5250	5900	8200			
	3	2750	3850	4700	5450	6050	8450	11600		
	5	2900	4050	5000	5750	6400	8950	12300	14600	
1"	8	3150	4400	5350	6150	6900	9650	13300	15900	19500
K = 2075	10	3250	4550	5600	6450	7200	10100	13900	16700	20500
	15	3550	5000	6150	7100	7900	11100	15400	18500	23000
	25	4100	5800	7100	8200	9150	12900	18000	21700	27300
	35	4600	6500	7950	9200	10200	14400	20200	24500	31000
	50	5250	7450	9100	10500	11700	16500	23200	28200	35800
	75	6200	8750	10700	12400	13800	19500	27400	33400	42700
	100	7000	9900	12100	14000	15600	23500	31100	37900	49500

CL - 838M 2 x 4 MONITOR SPECIFICATIONS

ORIFICE DIAMETER	INLET PRESS. PSIG	CAPACITY, SCFH DROP IN PRESSURE ACROSS ORIFICE, PSIG								
		0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	5.0
1 3/8" K = 3050	1	3800	5350	6550	7500	8400				
	2	3900	5500	6750	7750	8650	12000			
	3	4000	5700	6950	8000	8900	12400	17000		
	5	4250	6000	7350	8450	9450	13100	18100	21500	
	8	4550	6450	7900	9100	10100	14200	19600	23400	28600
	10	4750	6750	8250	9500	10600	14800	20500	24600	30200
	15	5200	7400	9050	10400	11600	16300	22700	27200	33800
	25	6050	8550	10400	12000	13500	18900	26400	32000	40100
	35	6750	9550	11700	13500	15100	21200	29700	36100	45500
	50	7750	10900	13400	15400	17200	24300	34100	41400	52600
	75	9100	12900	15700	18200	20300	28700	40300	49100	62700
1 1/4" K = 2625	1	3250	4600	5600	6450	7200				
	2	3350	4750	5800	6700	7450	10400			
	3	3450	4900	5950	6900	7650	10700	14700		
	5	3650	5150	6300	7250	8100	11300	15600	18500	
	8	3900	5550	6800	7800	8700	12200	16800	20100	24600
	10	4100	5800	7100	8150	9100	12700	17600	21100	26000
	15	4500	6350	7750	8950	10000	14000	19500	23400	29100
	25	5200	7350	9000	10400	11600	16300	22700	27500	34500
	35	5800	8250	10100	11600	13000	18300	25600	31000	39200
	50	6650	9400	11500	13300	14800	20900	29300	35700	45300
	75	7850	11100	13500	15600	17500	24700	34700	42300	54000
1" K = 2190	1	2700	3850	4700	5400	6000				
	2	2800	3950	4850	5550	6200	8650			
	3	2900	4050	5000	5750	6400	8900	12200		
	5	3050	4300	5250	6050	6750	9450	13000	15900	
	8	3250	4600	5650	6500	7250	10200	14000	16800	20600
	10	3400	4800	5900	6800	7600	10600	14700	17600	21700
	15	3750	5300	6500	7450	8350	11700	16300	19600	24300
	25	4350	6150	7500	8650	9650	13600	19000	22900	28800
	35	4850	6850	8400	9700	10800	15200	21300	25900	32700
	50	5550	7850	9600	11100	12400	17400	24500	29700	37800
	75	6550	9250	11300	13000	14600	20600	29000	35300	45000
	100	7400	10400	12800	14800	16500	23300	32800	40000	51200

How to use the tables for sizing CL-838 regulators
Typical Problems

Problem No. 1

Max. Flow: 50 MSCFH
Inlet Pressure Range: 30-60 PSIG
Outlet Pressure: 10 PSIG

1. Select Model CL-838-2 based on 10 PSIG outlet pressure requirement.
2. Select correct ORIFICE size based on lowest inlet pressure (30 PSIG), required outlet pressure (10 PSIG) and 50 MSCFH. ORIFICE = 1¼" in a 2" x 3" or 2" x 4" Valve Body. (Max. capacity = 53.1 MSCFH).
3. Select correct MAIN REGULATOR CLOSING SPRING based on Max. differential pressure across the 1¼" orifice. 60 PSIG – 10 PSIG = 50 PSIG. Correct Closing Spring = BLACK. The black spring will close against a differential pressure of 54 PSIG across a 1¼" orifice.
4. Select correct PILOT SPRING for a CL-838-2 using a Black Closing Spring and produce 10 PSIG outlet pressure. The correct Pilot Spring = BLACK with a range of 5.0 to 14.3 PSIG.

Problem No. 2
Downstream Monitor Installation

Max. Flow: 30 MSCFH
Inlet Pressure Range: 30-60 PSIG
Outlet Pressure: 10 PSIG

1. Select Model CL-838-2M as the *first* or *upstream* regulator and it will be the *OPERATING REGULATOR.*
2. Select Model CL-838-2 as the *second* or *downstream* regulator and it will be the *MONITOR REGULATOR.*
3. Select largest available orifice for the *MONITOR* regulator that will close against a 60-10=50 PSI differential pressure.
   Orifice=1¼" K=2280 for a 2" x 2" Valve Body.
4. Since MONITOR regulator will be normally wide open, calculate the pressure drop required to pass 30 MSCFH.

Below Critical Velocity

$$*Q = K\sqrt{Pout\ \ P}$$

where: Q = scfh
K = Regulator Flow Constant
Pout = Outlet Pressure – PSIA
Δ P = Differential Pressure – PSI

*Below critical velocity

**Based on flow and pressure drop, it may be possible to match the valve body of the upstream regulator to the inlet of the downstream regulator.

$$\sqrt{\Delta P} = \frac{Q}{\sqrt{Pout \times K}}$$

$$\sqrt{\Delta P} = \frac{30{,}000}{\sqrt{10 + 14.4} \times 2280} = 2.66$$

$$\Delta P = 7.10 \text{ PSIG}$$

5. Select correct MONITOR MAIN REGULATOR CLOSING SPRING based on possible max. differential pressure across the 1¼" orifice. 60 PSIG – 10 PSIG = 50 PSIG. Correct closing spring = BLACK. The Black spring will close against a differential pressure of 54 PSI.
6. Select correct MONITOR PILOT SPRING using a Black Closing Spring.
   Correct Pilot Spring = BLACK if up to 14.3 PSIG outlet take-over pressure is required or BLUE if more than 14.3 PSIG outlet take-over pressure is required.
7. Select correct OPERATING REGULATOR ORIFICE. Since the downstream monitor regulator requires 7.10 PSI pressure drop to flow 30,000 scfh, the outlet pressure from the operating regulator or inlet pressure to the monitor regulator must be at least 17.10 PSIG. Select smallest orifice for 30 PSIG inlet and 17.10 PSIG outlet. Since the downstream monitor valve body has been sized as a 2" x 2" it is desirable to also select the operator with a 2" x 2" valve body to keep piping cost to a minimum.
   Correct orifice = 1"
   Check by interpolation of capacity table,
   Q = 33,000 scfh.
8. Select correct OPERATING REGULATOR CLOSING SPRING based on possible max. differential pressure across the 1" orifice.
   60 PSIG – 10 PSI = 50 PSI
   Correct closing spring = BLACK. The Black spring will close against a differential pressure of 85 PSI through a 1" orifice.
9. Select correct PILOT SPRING for the OPERATING REGULATOR using the Black closing spring.
   Correct Pilot Spring = BLACK for a set point of 10 PSIG and with a range of 5.0 to 14.3 PSIG.

Problem No. 3
Upstream Monitor Installation

Max. Flow: 10 Mscfh
Inlet Pressure Range: 10-25 PSIG
Outlet Pressure: 2 PSIG

1. Select Model CL-838-1M as the *first* or *upstream* regulator and it will be the MONITOR REGULATOR.
2. Select Model CL-838-1R as the *second* or *downstream* regulator and it will be the *OPERATING* REGULATOR.
3. Select the largest practical ORIFICE for the *MONITOR* regulator to produce a reasonable pressure drop. See Monitor Specs. for a 2" x 2" valve body. With 10 PSIG inlet pressure, the 1⅜" orifice will pass 12,200 scfh with a 1 PSIG drop and 8,700 scfh with a .5 PSIG drop. By interpolation 10,000 scfh flow rate will create a .69 PSIG drop. The outlet pressures of the MONITOR REGULATOR will then be 9.31 PSIG with 10 PSIG inlet and 24.56 PSIG with 25 PSIG inlet pressure.

Problem No. 3 (continued)

4. Select correct MONITOR MAIN REGULATOR CLOSING SPRING based on 1⅜" orifice and 23 PSI differential pressure.
   Correct Closing Spring = BLACK. The black closing spring will close against a differential pressure of 45 PSIG through a 1⅜" orifice. (Necessary under failed conditions).
5. Select correct PILOT SPRING or the MONITOR REGULATOR with a Black Closing Spring.
   Correct Pilot Spring = RED/WHITE with a range of 2.2 to 4.0 PSIG.
6. Select correct OPERATING REGULATOR ORIFICE based on 9.31 PSIG inlet, 2 PSIG outlet pressure and 10,000 scfh with a 2" x 2" valve body.
   Correct smallest orifice = ¾".
7. Select correct OPERATING MAIN REGULATOR CLOSING SPRING based on possible 25 PSIG inlet and 2 PSIG outlet pressure across a ¾" orifice.
   Correct closing spring = ORANGE. The orange closing spring will close against a differential pressure of 27 PSIG through a ¾" orifice.
8. Select correct OPERATING REGULATOR PILOT SPRING using an orange closing spring. Correct PILOT SPRING = YELLOW/WHITE with a range of 1.8 to 2.7 PSIG.

CL-838-1 & -2

MAIN REGULATOR CLOSING SPRING DATA

Closing Spring Color	ORIFICE SIZE ⅜"	½"	⅝"	¾"	1"	1¼"	1⅜"
	MAXIMUM DIFFERENTIAL PRESSURE ACROSS ORIFICE, PSIG*						
Orange	75	70	53	27	13	9	6
Brown	250	140	90	46	34	21	15
Black	–	250	230	150	85	54	45

*The Maximum Recommended Pressure Differential and Closing Spring are based on a 2:1 Safety Factor.

NOTE: The Maximum *emergency* Pressure Differential is 75% of Two Times the Values Shown in the Table Above.

CL-838-1

Pilot Loading Spring	CLOSING SPRING OUTLET PRESSURE RANGE Orange	Brown	Black
Grn./Wht.	5.6-8.1" W.C.	–	–
Blue/Wht.	8.2-16.6" W.C.	5.3-12.8" W.C.	–
Dark Grn.	13.3-18.2" W.C.	8.6-14.8" W.C.	6.6-7.0" W.C.
Sil./Wht.	0.75-1.5 PSIG	0.5-1.35 PSIG	9.3-29.0" W.C.
Yel./Wht.	1.8-2.7 PSIG	1.7-2.5 PSIG	1.5-2.2 PSIG
Red/Wht.	2.6-4.6 PSIG	2.4-4.3 PSIG	2.2-4.0 PSIG
White	3.8-5.0 PSIG	3.3-5.0 PSIG	3.2-5.0 PSIG

The Maximum Recommended Outlet Pressure from a CL-838-1 is 5 PSIG.

CL-838-2

Pilot Loading Spring	CLOSING SPRING OUTLET PRESSURE RANGE Orange	Brown	Black
Brown	0.75-2.7 PSIG	0.75-2.25 PSIG	0.75-1.8 PSIG
Green	1.5-9.5 PSIG	1.5-9.5 PSIG	1.5-8.0 PSIG
Black	5.0-14.8 PSIG	5.0-14.6 PSIG	5.0-14.3 PSIG
Blue	9.0-29 PSIG	9.0-29 PSIG	9.0-29 PSIG
Silver	25-30 PSIG	25-30 PSIG	25-30 PSIG

The Maximum Recommended Outlet Pressure from a CL-838-2 is 30 PSIG.

CL-838 Specifications
Max. Inlet 125 PSIG
Outlet Pressure Range:
6 inches to 30 PSIG

Inlet Connections:
2" SCR, 2" Flanged

Outlet Connections:
2" SCR, 2", 3", 4" flanged
Screwed and Flanged connections can not be mixed.

Orifice Sizes:
⅜", ½", ⅝",¾", 1", 1¼", 1⅜"

ORIFICE SIZE	MAXIMUM INLET PRESSURE
⅜", ½", ⅝", ¾"	150
1"	100
1¼", 1⅜"	75

Consult Capacity Tables and Closing Spring Data for limitations.

Shipping Weight:

2 x 2 NPT	88 lbs.
2 x 2 Flanged	98 lbs.
2 x 3 Flanged	115 lbs.
2 x 4 Flanged	125 lbs.

Loading Ring Settings
See capacity tables

Carton Quantities:
1 per box