

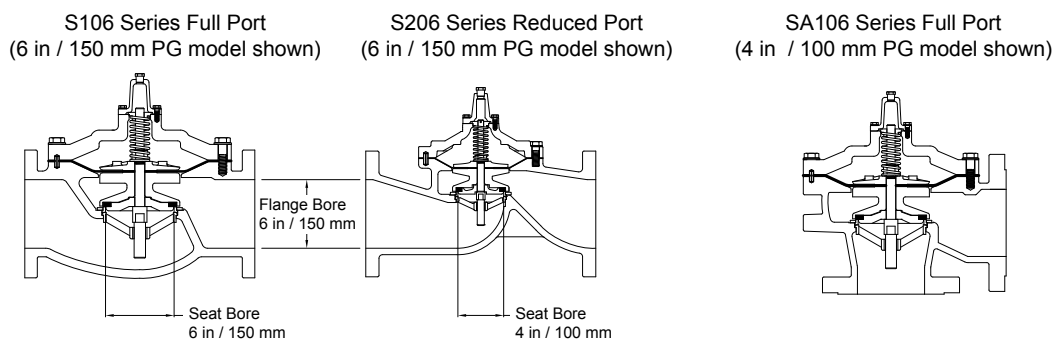
Technical & Sizing Information

Introduction

Sizing and selection of the automatic control valve that will meet all of your system design and performance requirements is critically important. Singer Valve offers the following guidelines and notes to provide a basic understanding of the operating principals and to assist in the selection process.

Full and Reduced Ports

Singer Valve manufactures two distinct model series – 106 Full Port and 206 Reduced Port valves. Model 206 series valves are similar to Model 106 series except that the seats are one standard pipe size smaller than the flange sizes. For example, a 6 in / 150 mm 206-PG valve has a 4 in / 100 mm seat diameter. The Model 206 is often a preferred selection when the flow ranges are suitable. Most sizes are also available in angle (A) pattern and valves larger than 6 in / 150 mm are also available with the Single Rolling Diaphragm (S) technology.



Guidelines for using the flow versus pressure drop curves:

106-412	1-06 Series	Full Port, Globe Style Valves
106-413	A106 Series	Full Port, Angle Style Valves
206-414	206 Series	Reduced Port, Globe Style Valves
206-414	A206 Series	Reduced Port, Angle Style Valves

C_v and K_v Factor & the Straight Line

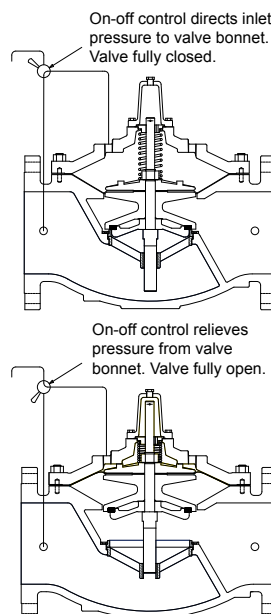
The flow through a fully open valve may be calculated using the formula:

Imperial Measure

$$Q \text{ (USGPM)} = C_v \text{ (Valve Constant)} \sqrt{\Delta P \text{ (psi)}}$$

where the C_v is the flow in USGPM when there is a 1 psi pressure drop across a fully open valve.

From the Singer performance curves, the straight lines indicate the flow vs. pressure drop through a fully open valve. The Y axis is drawn at the 1 psi pressure drop value. Consequently, the intersection between the flow curve and the Y axis represents the C_v factor for each valve size.

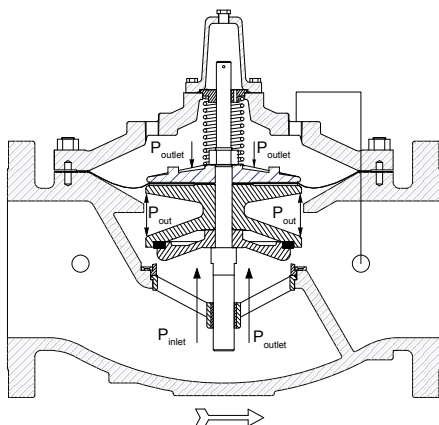


Metric Measure

$$Q \text{ (L / s)} = K_v \text{ (Valve Constant)} \sqrt{\Delta P \text{ (bar)}}$$

where the K_v is the flow in l / s when there is a 1 bar pressure drop across a fully open valve.

Valves that open fully on low pressure drop require their control chambers (bonnets) to be vented to atmosphere. Commonly, altitude and pump control valves (BPC and DW) are vented to atmosphere and may be selected from the straight line performance curves.



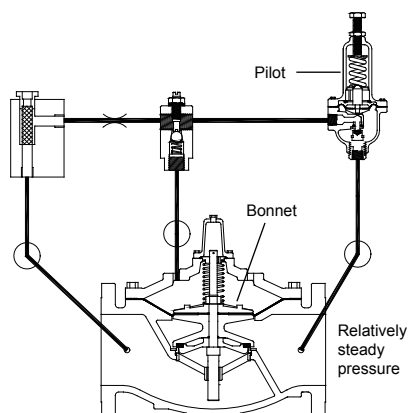
Drooping Portion of the Curves

As mentioned in the previous section, C_v and K_v Factor & the Straight Line, the straight lines represent the pressure drop for fully open valves.

Should the pressure drop across the valve be low (less than 10 psi / 0.7 bar) and the control chamber be connected to downstream, the flow through the valve will be less than when the control chamber is venting to atmosphere and the valve is fully open.

When the bonnet is at the same pressure as the downstream (e.g. the same pressure is on both sides of the diaphragm) there is no resulting opening force from the diaphragm. The force of the main spring and the weight of the inner valve (stem vertical) tend to close the valve.

The opening force results from the pressure drop (between upstream and downstream) acting on the seat area. Flow commences when the pressure drop is sufficient to overcome the force of the spring and the weight of the inner valve assembly. Increasing the pressure drop increases the opening force on the inner valve, permitting greater flow; at approximately 10 psi / 0.7 bar pressure drop the valve is fully open. The drooping portion of the curves represent how the flow increases as the pressure drop increases from zero.



Singer Model 106-PR / 206-PR
Pressure Reducing Valve

- Relatively steady pressure downstream
 - Varying inlet pressure
 - Varying flow demand

When Actual Flow is Less Than the Value Shown by the Graph

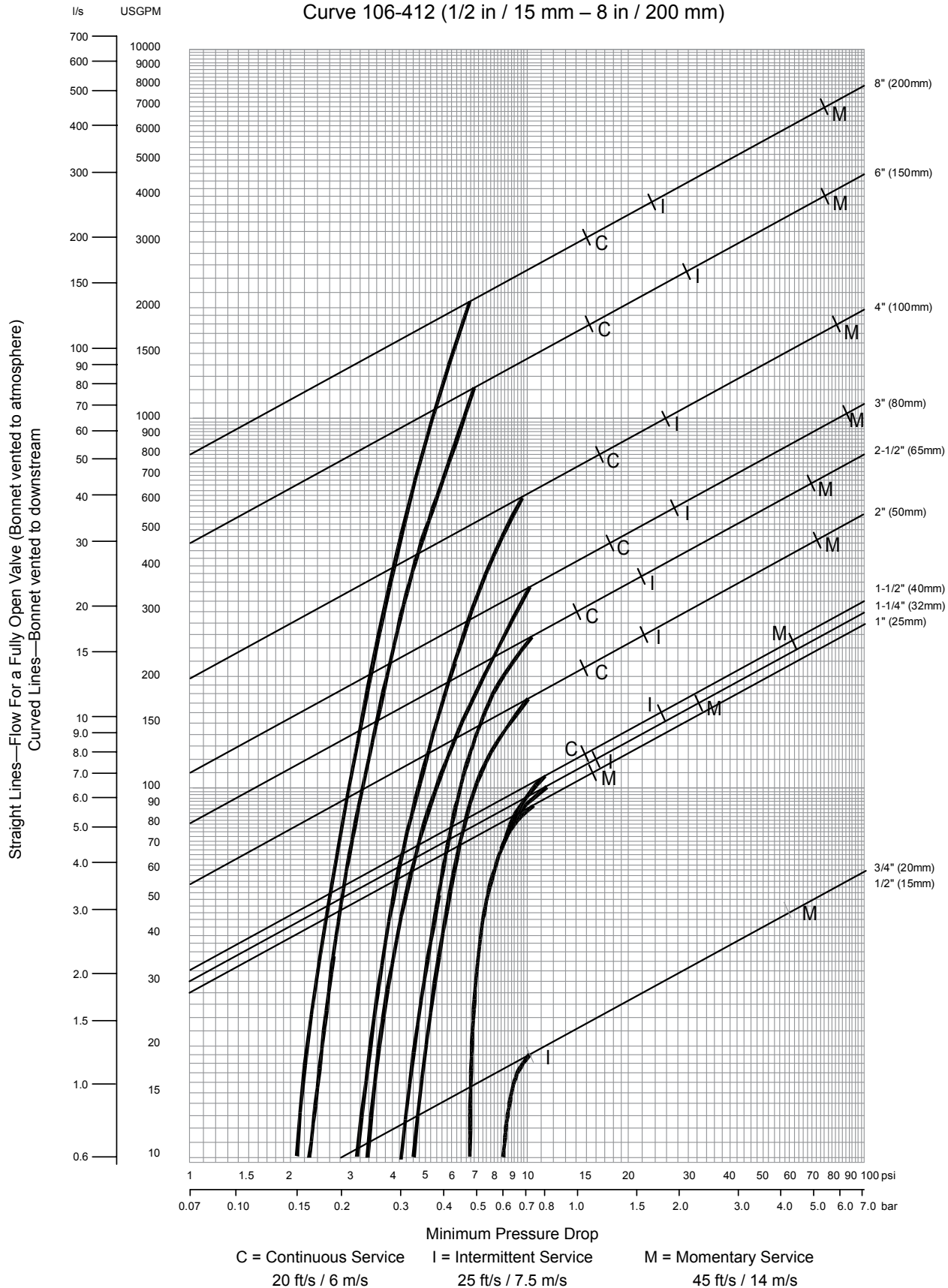
Usually, required flow is less than that shown on the curves—typically, pressure reducing valves. The curves show only the maximum flow available under a given pressure drop. When less than maximum flow is required, the valve will automatically open the required amount.

Operating Ranges

The letters C, I and M are industry standard designations for continuous, intermittent and momentary flows.

- C maximum for continuous flow
- I maximum for intermittent flow (peak flow for short duration)
- M maximum for momentary flow (such as relief valve)

Flow vs. Minimum Pressure Drop – 106 Series (PG, PGX, PT / PTC, PGM)
Full Port, Globe Body, Flat Diaphragm
Curve 106-412 (1/2 in / 15 mm – 8 in / 200 mm)

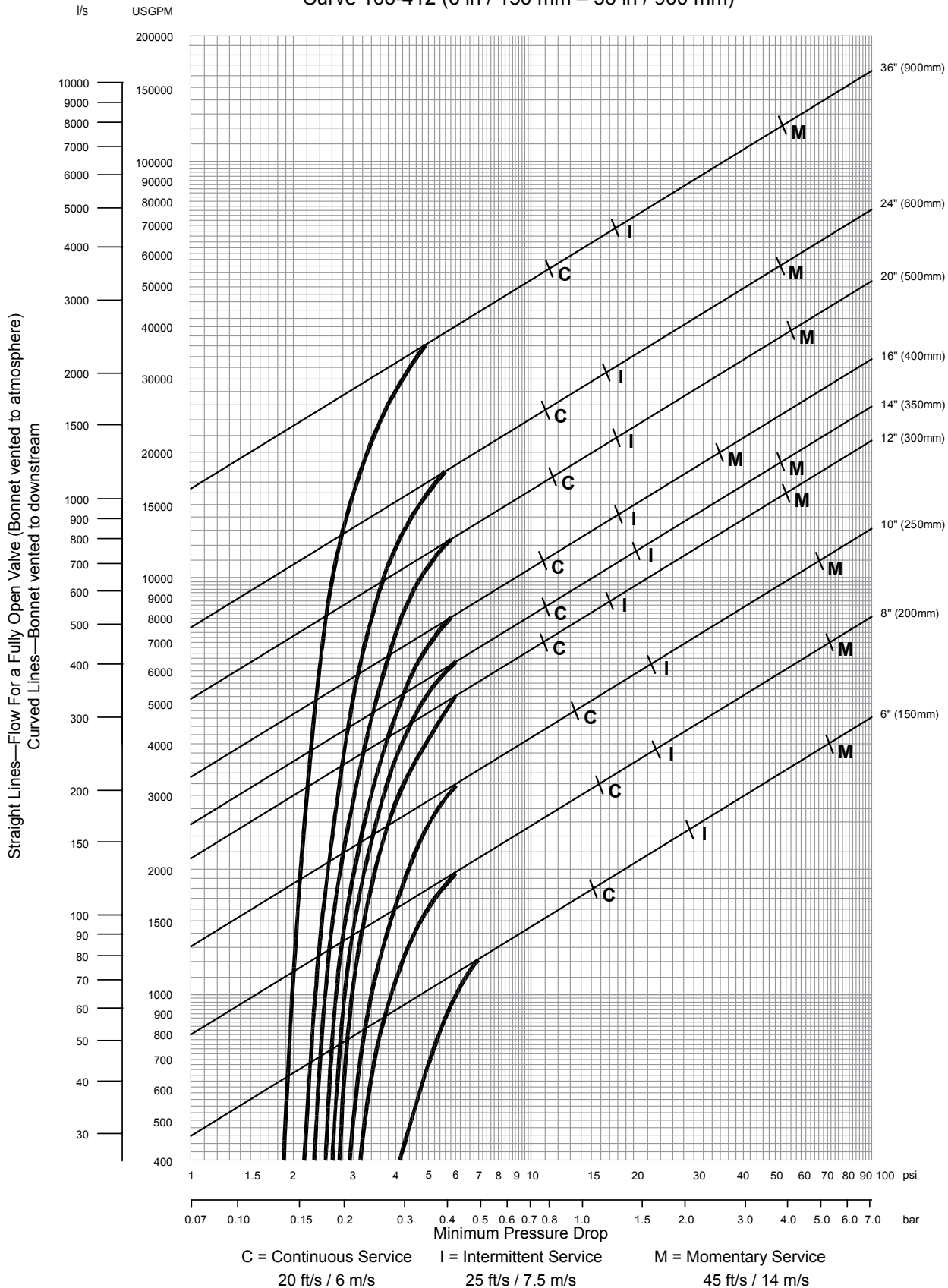


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Flow vs. Minimum Pressure Drop – 106 Series (PG, PGX, PT / PTC, PGM)

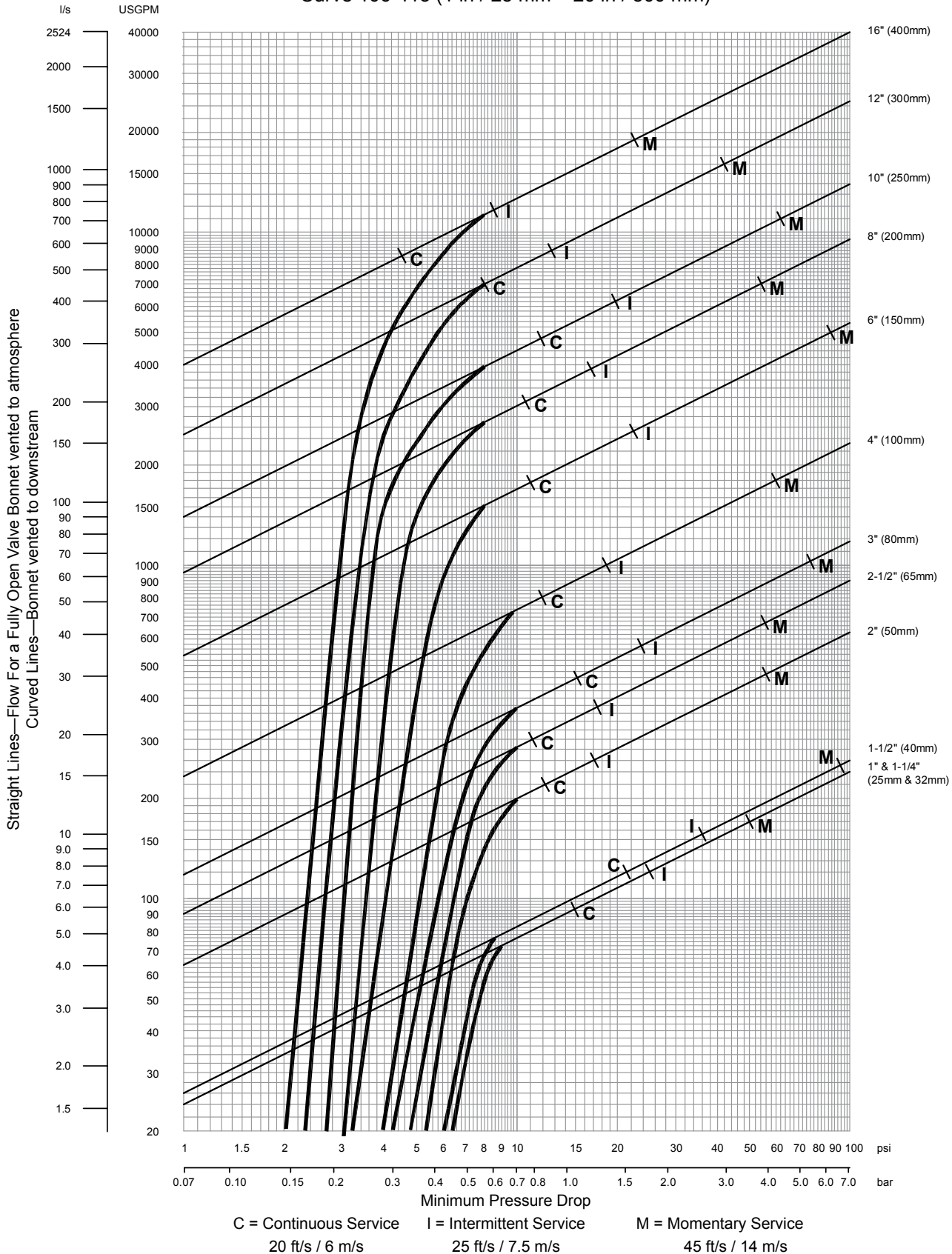
Full Port, Globe Body, Rolling Diaphragm

Curve 106-412 (6 in / 150 mm – 36 in / 900 mm)



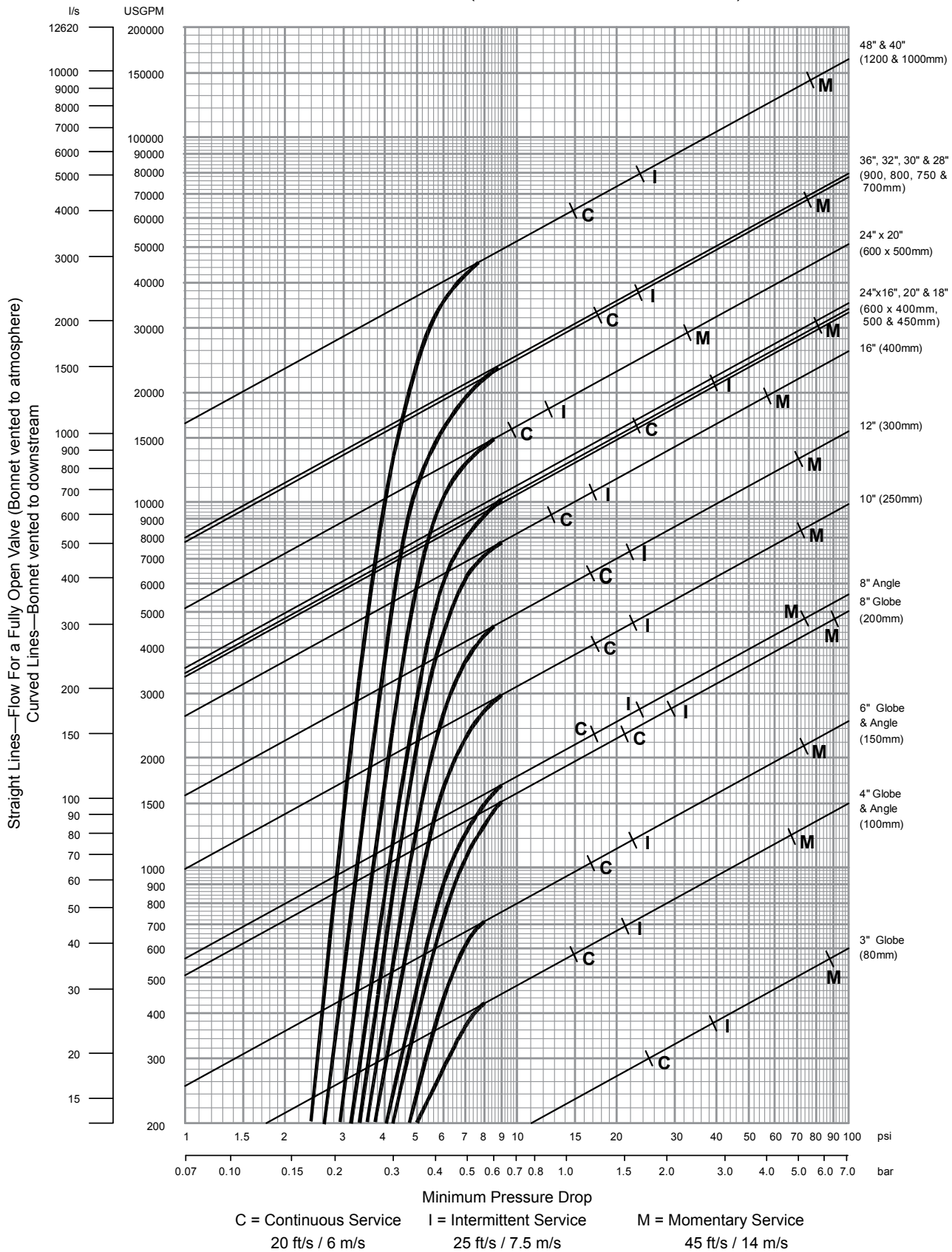
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Flow vs. Pressure Drop – 106 Series (PG, PGX, PT/PTC, PGM)
Full Port, Angle Body, Flat & Rolling Diaphragm
Curve 106-413 (1 in / 25 mm – 20 in / 500 mm)



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Flow vs. Pressure Drop – 206 Series (PG, PGX, PT / PTC, PGM)
 Reduced Port, Globe & Angle, Flat & Rolling Diaphragm
 Bodies Curve 206-414 (3 in / 80 mm – 36 in / 900 mm)

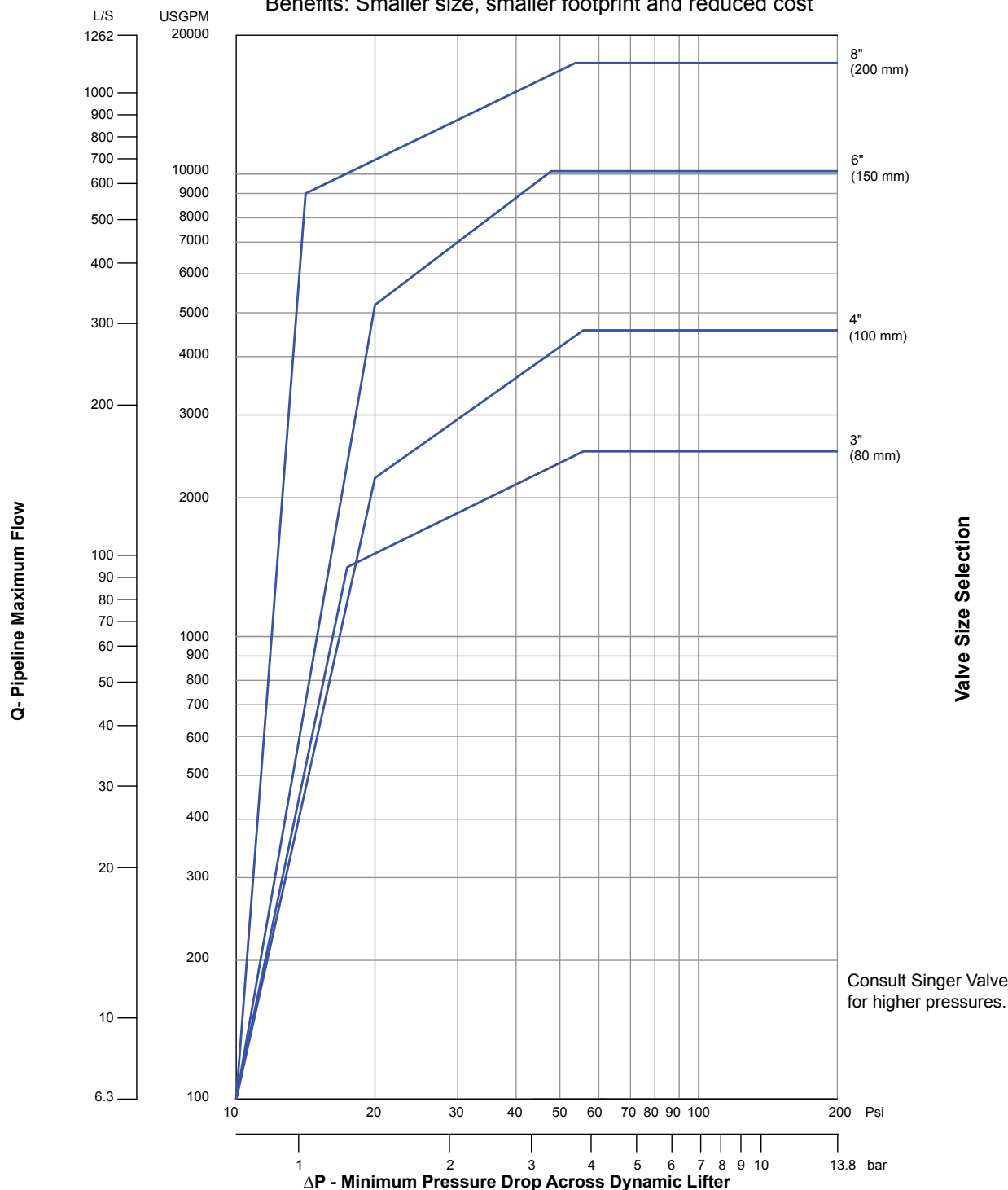


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Dynamic Lifter Sizing Graph Curve: 3 in / 80 mm – 8 in / 200 mm

Traditional relief valves for sewage are typically sized larger than a Singer Dynamic Lifter due to opening forces being lost as the inner valve leaves the seat.

Benefits: Smaller size, smaller footprint and reduced cost



Examples of valve size selection

1) Relief setting 80 psi / 5.5 bar - discharge to atmosphere: Max. flow in main pipeline 1,200 USGPM / 75.7 l / s - Find intersect of 80 psi / 5.5 bar ΔP and 1200 USGPM / 75.7 l / s flow. Select next larger size Dynamic Lifter, e.g., 3 in / 80 mm size.

2) Relief setting 55 psi / 3.8 bar - discharge 20 psi / 1.38 bar back pressure: Max. flow in main pipeline 4,000 USGPM / 252.4 l / s

Find intersect of 55 psi - 20 = 35 psi / 2.4 bar ΔP and 4000 USGPM / 252.4 l / s flow. Select next larger size Dynamic Lifter, e.g., 6 in / 150 mm size.

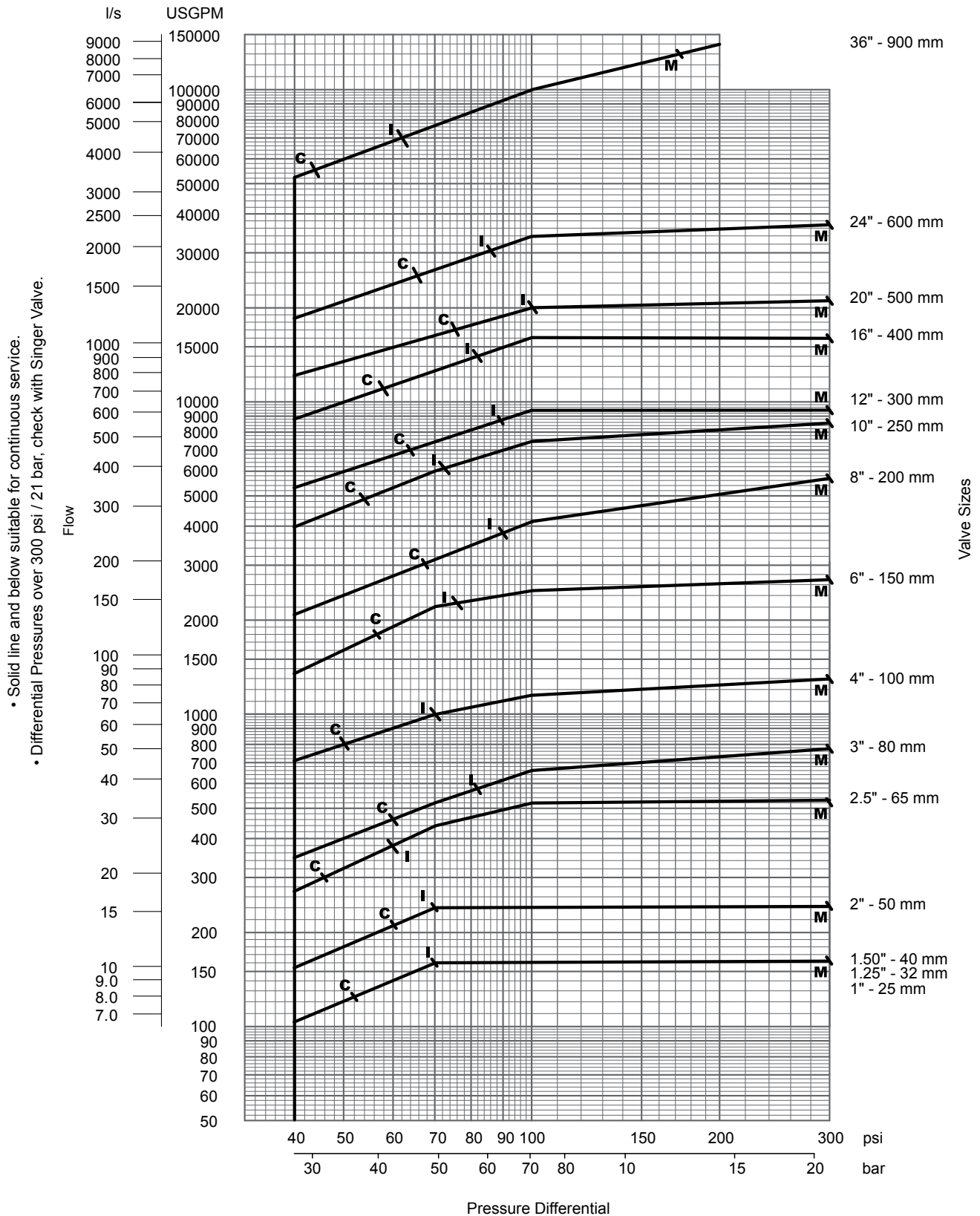
Note:

- If the discharge was to atmosphere, ΔP = 55 psi / 3.8 bar and 4 in / 100 mm size would be selected.

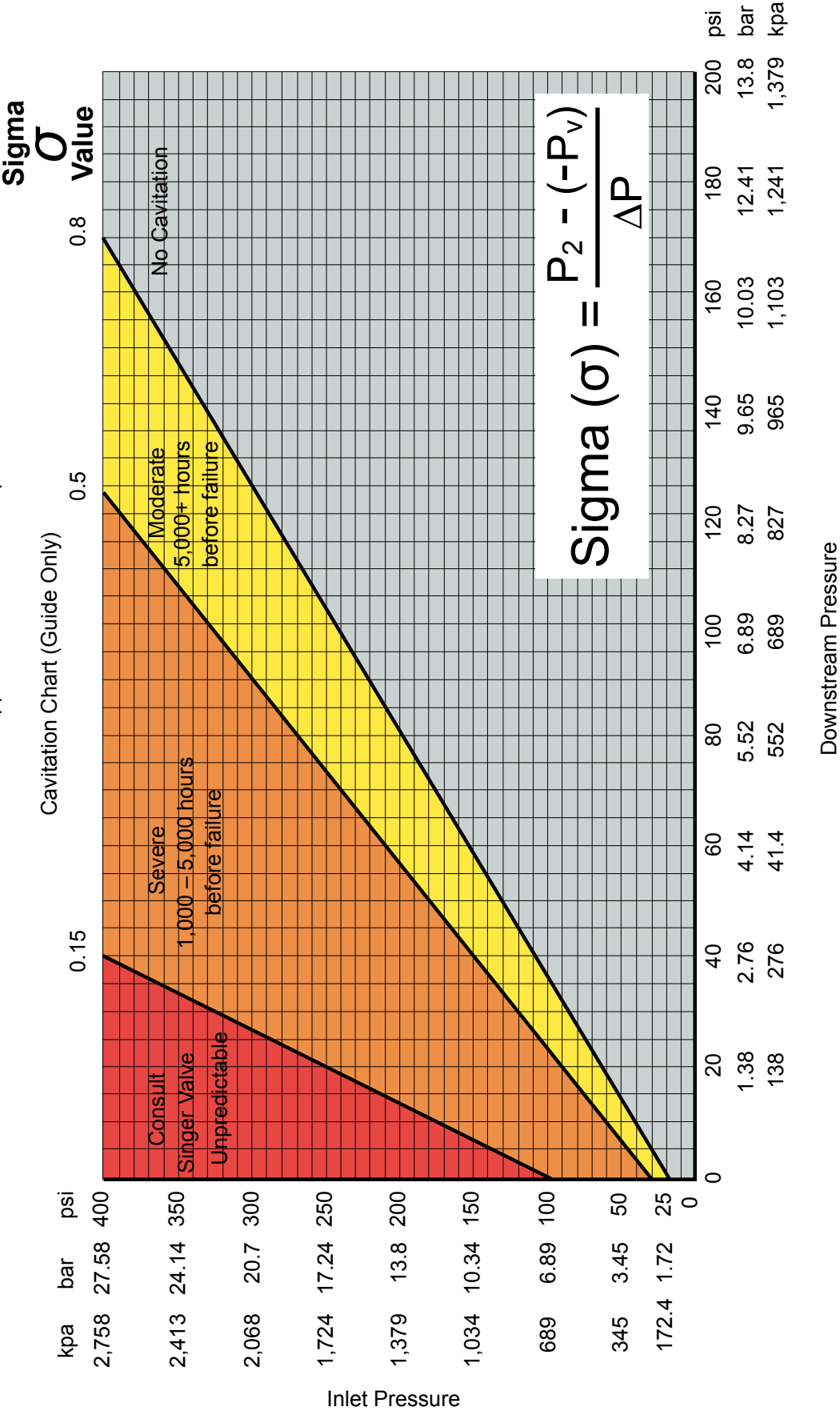
- This graph is based on current practice for standard applications. It is intended to be a guide only and no selection guarantee is implied or intended

Technical & Sizing Information

Flow vs. Pressure Differential
Model 106 Series (PG-AC, PGX-AC, PT-AC, PGM-AC) – Full Port, Globe Body, Flat / Rolling Diaphragm
 Anti-Cavitation Valve Curve 106-415 (1 in / 25 mm – 36 in / 900 mm)



This chart applies to cold water only.



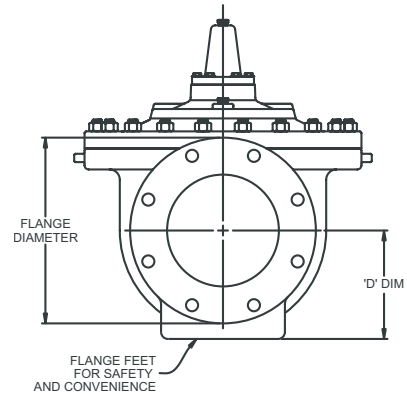
Where P_2 = Downstream pressure
 ΔP = Differential pressure
 P_v = 14.4 Psi / 1 Bar / 103 KPa

Flange Dimensions—Ductile Iron Valves

Standard: ANSI B16.42 - 1998 - Class 150 and 300

Nominal Pipe Size	Diameter of Flange		Diameter of Bolt Circle		Number of Bolts		Diameter of Bolt Holes	
	150#	300#	150#	300#	150#	300#	150#	300#
Pressure Class								
1.5	5.00	6.12	3.88	4.50	4	4	5/8"	7/8"
2	6.00	6.50	4.75	5.00	4	8	3/4"	3/4"
2.5	7.00	7.50	5.50	5.88	4	8	3/4"	7/8"
3	7.50	8.25	6.00	6.62	4	8	3/4"	7/8"
4	9.19	10.19	7.50	7.88	8	8	3/4"	7/8"
6	11.19	12.69	9.50	10.62	8	12	7/8"	7/8"
8	13.50	15.00	11.75	13.00	8	12	7/8"	1"
10	16.00	17.50	14.25	15.25	12	16	1"	1-1/8"
12	19.00	20.50	17.00	17.75	12	16	1"	1-1/4"
14	21.00	23.00	18.75	20.25	12	20	1-1/8"	1-1/4"
16	23.50	25.50	21.25	22.50	16	20	1-1/8"	1-3/8"
18	25.00	28.00	22.75	24.75	16	24	1-1/4"	1-3/8"
20	27.50	30.50	25.00	27.00	20	24	1-1/4"	1-3/8"
24	33.00	36.00	29.50	32.00	20	24	1-3/8"	1-5/8"
30	38.75	43.00	36.00	39.25	28	28	1-3/8"	2"
36	46.50	50.00	42.75	46.00	32	32	1-5/8"	2-1/4"

Dimension in (inches)



Standard: ISO 7005-2 - 1998

Nominal Pipe Size	Diameter of Flange				Diameter of Bolt Circle				Diameter of Bolt Holes				Number of Bolts			
	PN-10	PN-16	PN-25	PN-40	PN-10	PN-16	PN-25	PN-40	PN-10	PN-16	PN-25	PN-40	PN-10	PN-16	PN-25	PN-40
40	155	155	155	155	110	110	110	110	19	19	19	19	4	4	4	4
50	152	152	152	152	125	125	125	125	19	19	19	19	4	4	4	4
65	178	178	178	178	145	145	145	145	19	19	19	19	4	4	8	8
80	200	200	200	200	160	160	160	160	19	19	19	19	8	8	8	8
100	233	233	260	260	180	180	190	190	19	19	23	23	8	8	8	8
150	285	285	310	310	240	240	250	250	23	23	28	28	8	8	8	8
200	343	343	381	381	295	295	310	320	23	23	28	31	8	12	12	12
250	406	406	445	445	350	355	370	385	23	28	31	34	12	12	12	12
300	483	483	483	520	400	410	430	450	23	28	31	34	12	12	16	16
350	533	533	584	584	460	470	490	510	23	28	34	37	16	16	16	16
400	597	597	648	648	515	525	550	585	28	31	37	40	16	16	16	16
500	699	699	775	775	620	650	660	670	28	34	37	43	20	20	20	20
600	838	838	838	915	725	770	770	795	31	37	40	49	20	20	20	20
700	895	910	960	995	840	840	875	900	31	37	43	48	24	24	24	24
800	1,015	1,025	1,085	1,140	950	950	990	1,030	34	40	49	56	24	24	24	24
900	1,115	1,125	1,185	1,285	1,050	1,050	1,090	1,170	34	40	49	56	28	28	28	28

Dimension in (mm)

Note:

ISO flange diameters may vary slightly from the standard, as the flange bolt pattern is drilled on an ANSI valve flange

Engineering Notes

In this section, you will find additional engineering notes for the main valves and also the anti-cavitation valve.

Main Valves Data (US & Metric Units & ISO)

Engineering Notes:

- Drilled as per ANSI B16.42 or threaded as per ANSI B1.20.1
- ANSI flanges drilled to ISO 7005-2 - 1998 / BS54504 PN 10, 16, 25, or 40, or threaded BSPT
- Class 150 machined flat faced / Class 300 machined raised faced.
- Castings are based on ANSI Class 150 or Class 300 standards.
- For conditions where working pressures exceed 300 psi / 20.7 bar, consult with Singer Valve
- Allow 1/8 in / 3 mm for machining tolerance.
- Allow one to three feet for installation and maintenance clearances. Consult Singer Valve for certified dimensions.
- Preferred method of stem installation is vertically; on valves 10 in / 250 mm and larger the vertical installation method is mandatory.
- Add a minimum 6 in / 150 mm on one side, for Pilot System.

Anti-Cavitation Data

106-AC / 206-AC (206 in large valve sizes only)

As a guide, if downstream pressure of an automatic control valve is less than 35% of the inlet pressure, there is a risk of cavitation damage occurring. Use 106-415 to select the valve size.

Cavitation chart on page 290 can also be used to determine if a valve is cavitating. Plot the maximum inlet pressure against the minimum outlet pressure.

- If this plotted point is to the right of the 0.8 line (e.g. you are in the “No Cavitation” zone) then use performance curves from chart 106-412, 106-413 and 106-414 on pages 284 - 287 to select the valve size.
- If this plotted point is to the left of the 0.8 line then use performance curves 106-415 to select the valve size.

Refer to Singer Performance Curves and Cavitation Charts in the Technical & Sizing Information section page 282 or contact Singer Valve.