



Pressure Reducing Valves



PRV Types

Steam, liquids and gases usually flow at high pressures to the points of final use. At these points, a pressure reducing valve lowers the pressure for safety and efficiency and to match the requirements of the application. There are two types of pressure reducing valves offered by Armstrong:

Direct Acting. The simplest of PRVs, the direct acting type operates with convoluted bellows. Since it is self-contained, it does not need an external sensing line downstream to operate. It is the smallest and most economical of the two types and is designed for low to moderate flows. Accuracy of direct acting PRVs is typically $\pm 10\%$ of the downstream set point.

Externally Piloted. This type of PRV incorporates two valves - a pilot and a main valve - in one unit. The pilot valve has a design similar to the direct acting valve. The discharge from the pilot valve acts on a set of double diaphragms, which controls through a piston the opening of the main valve. This high diaphragm area can open a larger main valve, allowing a greater capacity per line size than the direct acting regulators. In addition, the diaphragms are more sensitive to pressure changes, and that means accuracy of $\pm 1\%$. This greater accuracy is also due to the location of the sensing line outside of the valve, where there is less turbulence. This valve also offers the flexibility to use different types of pilot valves: pressure, temperature, air loaded, solenoid or combinations.





Externally Piloted



For Steam Service

This type of PRV incorporates two valves - a pilot and a main valve - in one unit. The pilot valve has a design similar to the direct acting valve. The discharge from the pilot valve acts on a set of double diaphragms, which controls through a piston the opening of the main valve. This increased diaphragm area can open a larger main valve, allowing a greater capacity per line size than the internally piloted piston-operated valve.

In addition, the diaphragms are more sensitive to pressure changes, which results in accuracy of $\pm 1\%$. This greater accuracy is due also to the positioning of the sensing line downstream, where there is less turbulence. This valve also offers the flexibility to use different types of pilot valves: pressure, temperature, air loaded, solenoid or combination.

Pressure and Temperature Controls

Interchangeable springs - regardless of valve size - means more flexibility in applications.

Enclosed spring chamber eliminates dirt fouling.

Dual stainless steel diaphragms provide corrosion resistance.

All cast mating parts are male and female to reduce the chance of leaks at gasket surfaces and assure proper alignment.

Ductile iron body provides a wider range of applications than cast iron and offers a less costly option to cast steel.

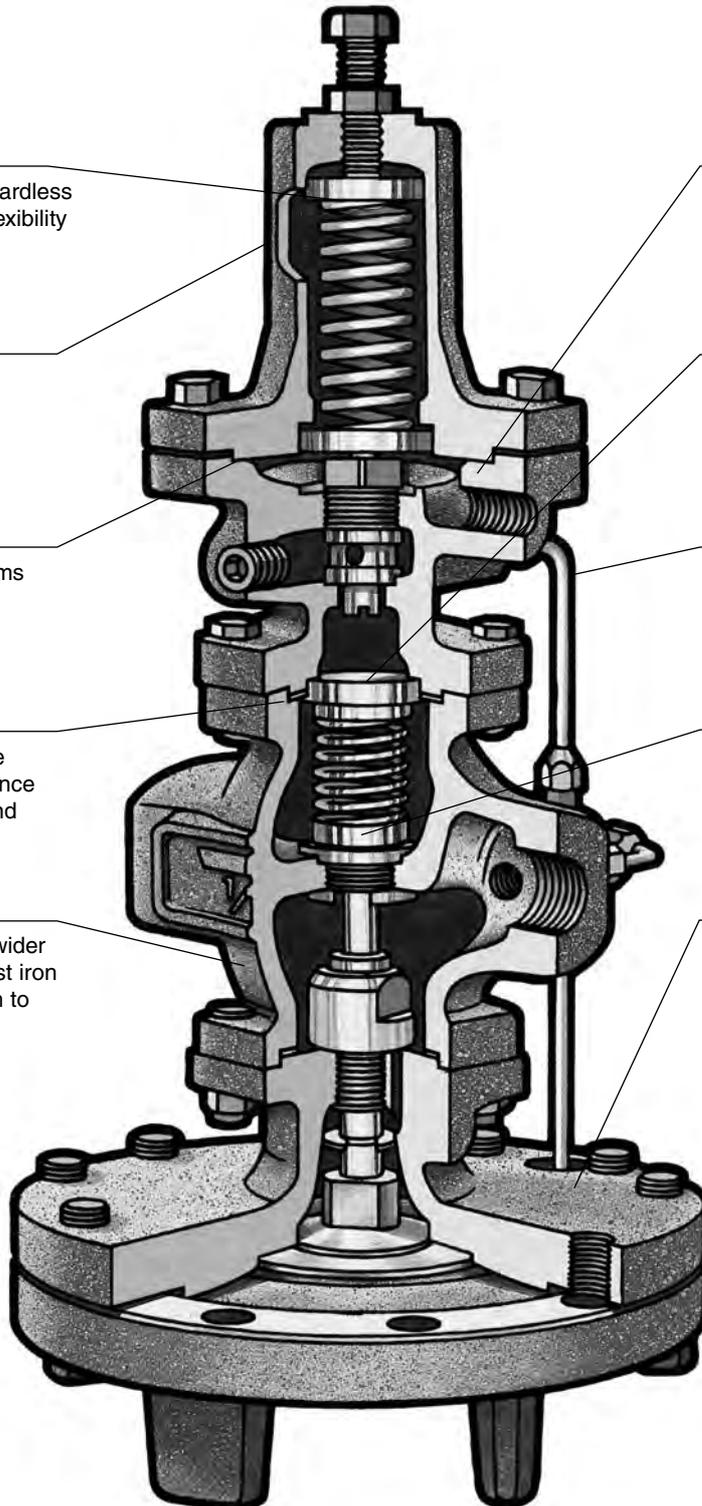
Available in both integral and remote mounted pilot.

Integral strainer protects the pilot valve from failure due to dirt.

Easily removable copper tubing permits troubleshooting while valve is in-line.

Easy access to main valve for quick inspection or maintenance by removing main valve spring and screen and lifting valve from stem. No special tools needed.

Design eliminates copper tubing from passing around the bottom diaphragm housing, minimizing chance of damage during shipping or installation.



GP-2000



For Steam Service

The GP-2000 is a high performance, externally piloted reducing valve for large capacity requirements. Typical use is on intermittent service, including applications such as heat exchangers, steam coils, rotating dryers, process equipment and heating systems. With a 20:1 rangeability and high Cv, the

GP-2000 is reliable and accurate ($\pm 1\%$ of pressure set point from 5% to 100% of flow) over a long, trouble-free service life. Hardened stainless steel working parts are renewable in-line. Single seated for dead-end service. Available with both BSPT ($1/2'' - 2''$) and flanged connections in DN15 - DN150 sizes.

Table PTC-265-1. GP-2000 Specifications

Application	Inlet Pressure (barg)	Reduced Pressure (barg)	Spring Color	Maximum Temperature (°C)	Minimum Differential (barg)	Materials				
						Body	Main Valve /Seat	Pilot Valve / Seat	Diaphragm	Color
Steam	1 - 20	0,1 - 0,2*	Yellow	232	0,5	Ductile Iron ASTM A536	Stainless Steel AISI 420	Stainless Steel AISI 301	Dark Gray	
		0,2 - 1,5	Yellow							
		1 - 14	Green							

* **Note:** When using this spring range, remove one (1) pilot diaphragm. Capacities are reduced by 1/2 of capacity chart when this spring is being used.

Table PTC-265-2. GP-2000 Dimensions and Weights

Size	Face-to-Face (L)		A	F	H Integral	H Remote	H ₁	H ₂	Weight		Cv
	BSPT	PN 25/40							BSPT	PN 25/40	
	mm	mm							kg	kg	
15 - 1/2"	150	150	200	176	398	362	170	244	14	16	5,0
20 - 3/4"	150	150	200	176	398	362	170	244	14	17	7,2
25 - 1"	160	160	226	180	404	367	175	254	19	23	10,9
32 - 1 1/4"	180	180	226	180	434	384	192	283	22	26	14,3
40 - 1 1/2"	180	200	226	180	434	384	192	283	22	26	18,8
50 - 2"	230	230	276	197	498	406	216	321	33	38	32,0
65 - 2 1/2"	-	290	352	211	552	440	251	375	-	67	60,0
80 - 3"	-	310	352	222	575	456	264	400	-	73	78,00
100 - 4"	-	350	401	240	658	511	321	489	-	114	120,0
150 - 6"	-	480	502	-	806	-	414	673	-	252	250,0

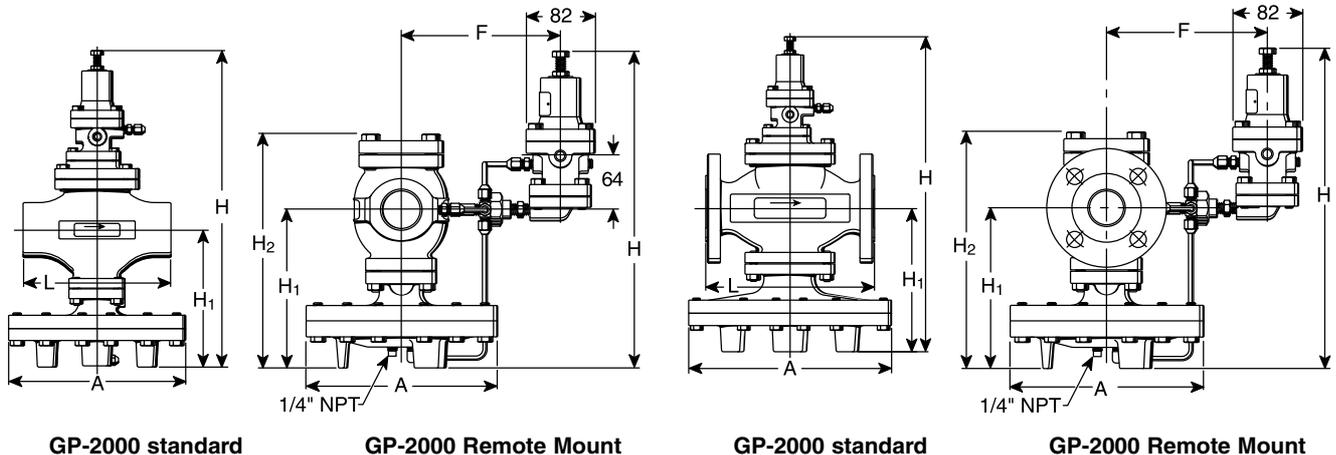
Shade indicates products that are CE Marked according to the PED (97/23/EC). All the other sizes comply with the Article 3.3 of the same directive.

Note: DN150 valve is available in integral version only.

For capacities see page PTC-267.

External Sensing Line is not included as standard, but could be delivered on request. Internal Sensing Kit is also available.

Pressure sensing line size: 1/4"



All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

GP-2000, GP-2000K-1, 3 & 6, GDK-2000, GP-2000R



Capacities for Steam

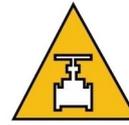
Table PTC-267-1. GP-2000, GP2000K-1, GP2000K-3, GP2000K-6, GDK-2000, GP-2000R Capacities for Steam (kg/h)

Inlet Pressure (barg)	Outlet Pressure (barg)	Connection Size (inches or mm)									
		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
		15	20	25	32	40	50	65	80	100	150
1	0,5	89	128	194	255	335	571	1 071	1 392	2 142	4 465
	1,5	101	145	220	289	380	648	1 215	1 580	2 430	5 063
1,5	0,2	146	210	318	418	549	936	1 755	2 282	3 510	7 313
	2	111	161	243	320	420	716	1 343	1 745	2 686	5 597
2	0,2 - 0,5	175	252	382	501	659	1 123	2 105	2 737	4 210	8 769
	3	130	188	284	373	491	836	1 568	2 038	3 136	6 536
3	0,2 - 1,0	234	336	510	669	879	1 497	2 808	3 651	5 616	11 691
	4	202	291	441	579	761	1 296	2 430	3 159	4 860	10 125
4	0,2 - 1,5	292	421	637	836	1 099	1 872	3 510	4 563	7 020	14 614
	5	223	322	487	640	841	1 432	2 685	3 493	5 370	11 194
5	3	301	434	658	863	1 134	1 931	3 621	4 709	7 242	15 093
	0,5 - 2	351	505	765	1 003	1 319	2 246	4 211	5 475	8 422	17 537
	6	243	350	530	695	914	1 557	2 919	3 795	5 838	12 169
6	3,5	361	521	788	1 035	1 360	2 316	4 342	5 645	8 684	18 096
	0,5 - 2,5	409	589	892	1 171	1 539	2 620	4 913	6 386	9 826	20 460
	7	314	453	686	900	1 183	2 014	3 776	4 909	7 552	15 740
7	4	421	606	918	1 205	1 584	2 697	5 059	6 574	10 118	21 077
	0,5 - 3,0	468	673	1 020	1 338	1 759	2 995	5 615	7 300	11 230	23 383
	8	335	483	732	960	1 262	2 149	4 030	5 238	8 060	16 790
8	5	452	652	987	1 295	1 702	2 897	5 434	7 062	10 868	22 640
	0,5 - 3,5	526	758	1 147	1 505	1 979	3 369	6 319	8 214	12 638	26 306
	10	374	538	815	1 070	1 407	2 395	4 493	5 840	8 986	18 715
10	7	509	733	1 110	1 457	1 916	3 261	6 114	7 949	12 228	25 481
	0,5 - 4,5	643	926	1 402	1 840	2 419	4 118	7 721	10 038	15 442	32 151
	12	467	673	1 019	1 337	1 758	2 992	5 612	7 295	11 224	23 383
12	8	633	911	1 380	1 810	2 380	4 052	7 597	9 877	15 194	31 660
	1,0 - 5,5	760	1 095	1 657	2 175	2 859	4 867	9 126	11 863	18 252	37 997
	14	559	805	1 220	1 600	2 104	3 581	6 714	8 731	13 428	27 984
14	9	754	1 086	1 645	2 158	2 837	4 829	9 056	11 771	18 112	37 734
	1,0 - 6,5	877	1 263	1 912	2 509	3 299	5 616	10 530	13 689	21 060	43 843
	15	579	834	1 263	1 657	2 179	3 709	6 956	9 043	13 912	28 984
15	10	784	1 129	1 709	2 242	2 948	5 019	9 441	12 233	18 822	39 214
	1,0 - 7,0	936	1 347	2 040	2 676	3 519	5 990	11 231	14 600	22 462	46 765
	17,5	730	1 052	1 593	2 090	2 748	4 677	8 771	11 403	17 542	36 545
17,5	12	888	1 279	1 936	2 540	3 340	5 686	10 661	13 860	21 322	44 423
	1,0 - 8,0	1 082	1 558	2 359	3 095	4 069	6 926	12 986	16 882	25 972	54 113
	20	992	1 428	2 162	2 837	3 729	6 348	11 904	15 476	23 808	49 602
20	12	1 113	1 603	2 426	3 183	4 185	7 124	13 358	17 365	26 716	55 662
	1,0 - 9,5	1 228	1 769	2 678	3 513	4 619	7 862	14 741	19 164	29 482	61 380

Note: Maximum pressure reduction 20:1, except for GDK-2000 (10:1).
Minimum pressure reduction is 85% of inlet pressure.

Pressure and Temperature Controls



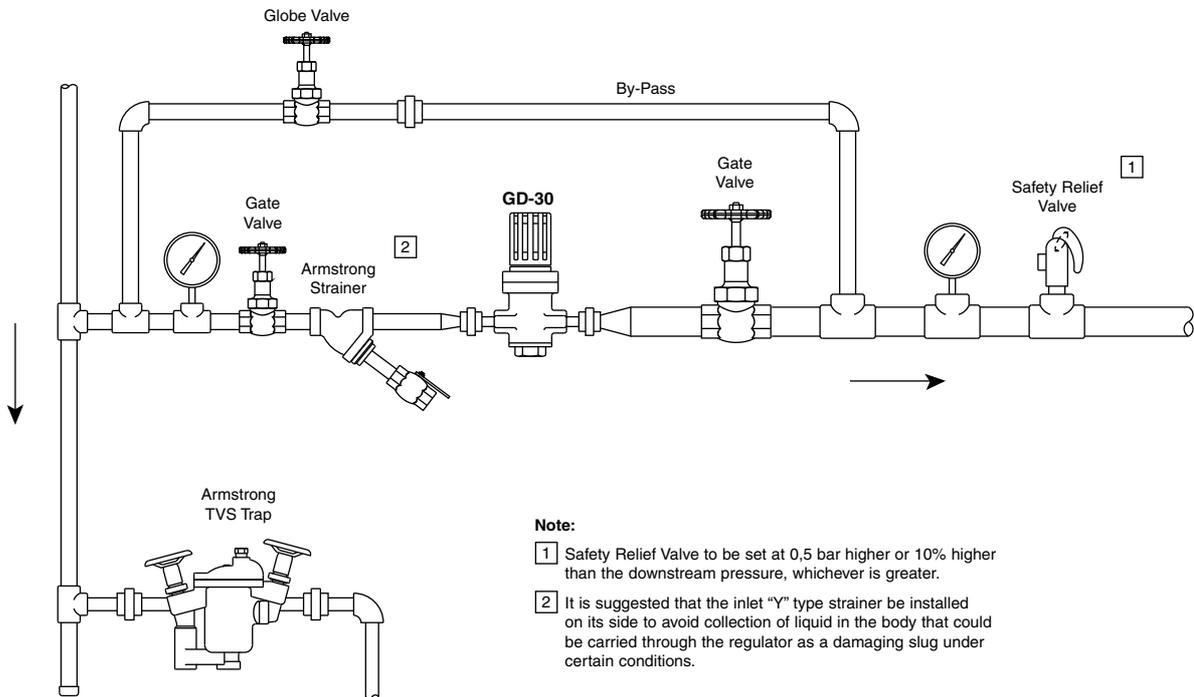


Application Data - Pressure Reducing Valves

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Armstrong®

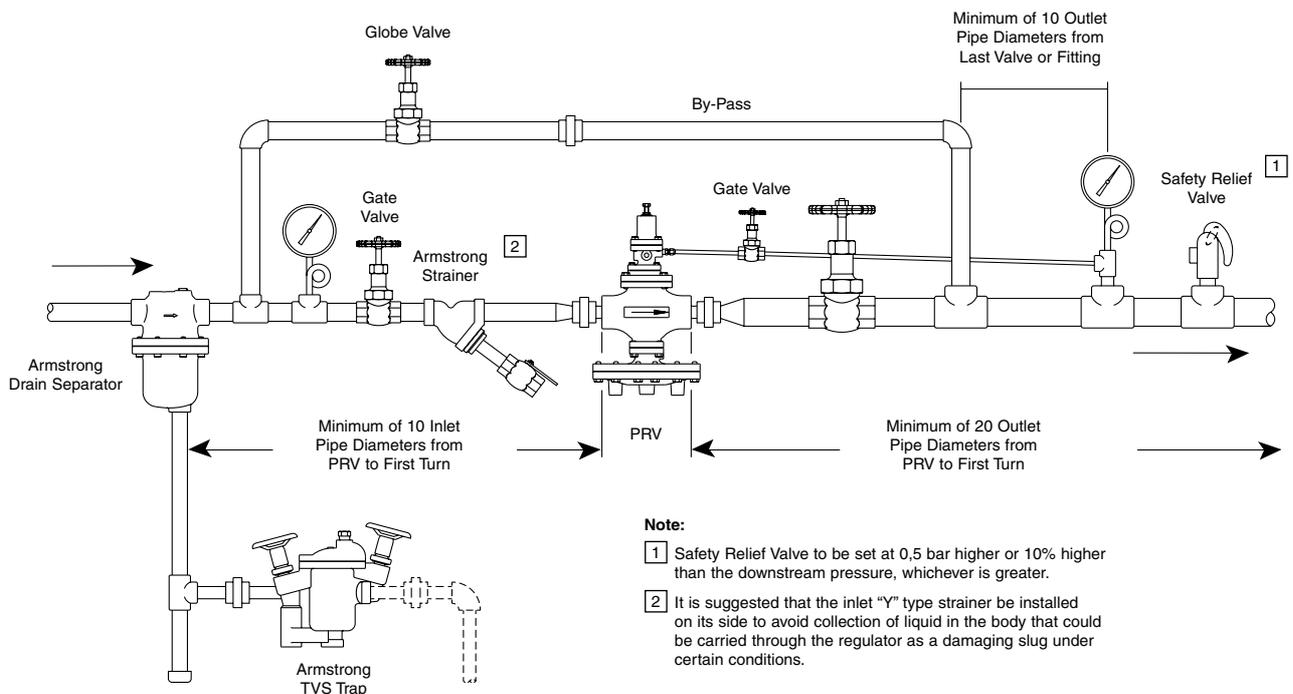
Direct Acting Single Stage Reduction



Typical Direct Acting PRV Installation

Pressure and Temperature Controls

External Pressure Pilot Single Stage Reduction



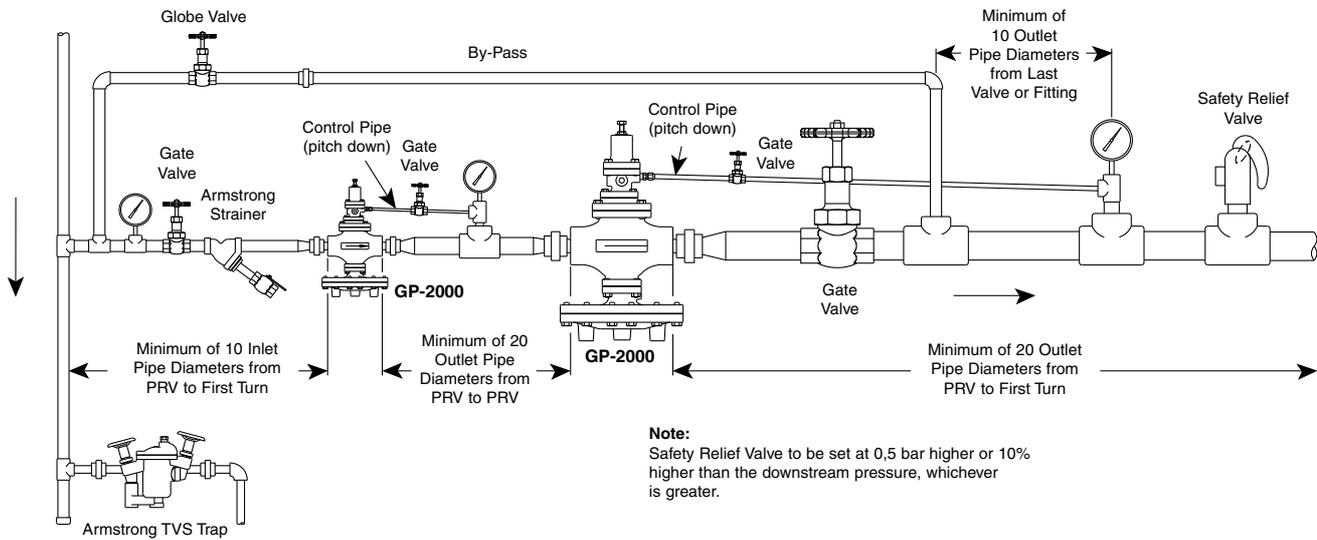
Typical External Pressure Pilot PRV Installation



Application Data - Pressure Reducing Valves



External Pressure Pilot Two Stage Reduction

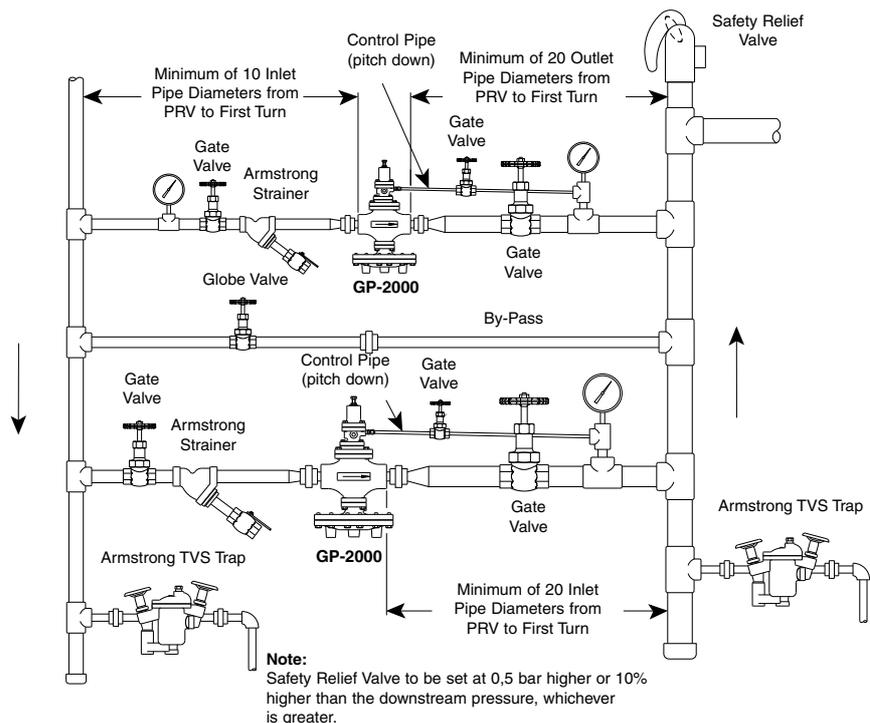


This piping application is used when the pressure turndown ratio is greater than that of a single valve. Pressure reduction is accomplished by using two valves in series to reduce the pressure in stages. Depending on the volume of fluid required and pressure reduction, the second stage valve typically will be larger in size than the first stage valve.

Unless a specific intermediate pressure of the fluid is required, this intermediate pressure is typically selected so as to keep the pressure turndown ratios of both valves as similar as possible. This will help equalize and maximize the service life of both valves.

External Pressure Pilot One-Third to Two-Third Reduction Station

This piping application is used when the flow rangeability is greater than that of a single valve. Better control is achieved by piping two valves in parallel and sizing one to handle 1/3 the maximum load and the other 2/3 the maximum load. These two valves are staged by offsetting their pressure set points by 0,2 barg. The smaller valve is usually the lead valve and would have a pressure set point at the desired pressure. The larger valve is usually the lag valve and would have a pressure set point of 0,2 barg below the lead valve. This offset of set points will stage the valves so that the lag valve will remain closed until the lead valve can no longer pass the required flow and is wide open. This lack of flow will cause the set pressure to drop slightly until the lag valve opens and regulates at the higher demands of flow.





Sizing Data


Table PTC-272-1. Selection Formulas

C_v Value and Calculation	$\frac{\Delta P}{G}$	K_v Value and Calculation (K_v = 0,86 C_v)
1. For Saturated Steam / Q = kg/h, P = bar (a) When $P_2 > \frac{P_1}{2}$ $Q = C_v 13,5 \sqrt{\Delta P (P_1 + P_2)}$ When* $P_2 < \frac{P_1}{2}$ $Q = C_v 11,7 P_1$ P ₁ = Inlet pressure in bar (a) P ₂ = Outlet pressure in bar (a) ΔP = Differential Pressure (P ₁ - P ₂) Q = Maximum flow capacity G = Specific gravity C _v = Valve flow coefficient		1. For Saturated Steam / Q = kg/h, P = bar (a) When $P_2 > \frac{P_1}{2}$ $Q = K_v 15,88 \sqrt{\Delta P (P_1 + P_2)}$ When* $P_2 < \frac{P_1}{2}$ $Q = K_v 13,76 P_1$ * Formula applies to piloted valves only . With direct acting valves, at critical flow or sonic flow, capacities decrease with greater differential pressure.

Ordering Information

Table PTC-272-2. Cv Values

Model	Connection Size														
	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
						-			-	-	-	-	-	-	-
GP-2000 series	-	-	5,0	7,2	10,9	14,3	18,8	32,0	60,0	78,0	120,0	-	250,0	-	-

Note: 50% reduced ports are available for all 2000 Series - capacities and Cv are reduced by 50%

* GD-30 only

When ordering please specify:

1. Model number
2. Connection size and type
3. Quantity
4. Service fluid
5. Specific gravity (if other than steam, air, water)
6. Fluid temperature
7. Maximum inlet pressure
8. Desired reduced pressure or controlled temperature
9. Flow rate
10. Special conditions (if any)