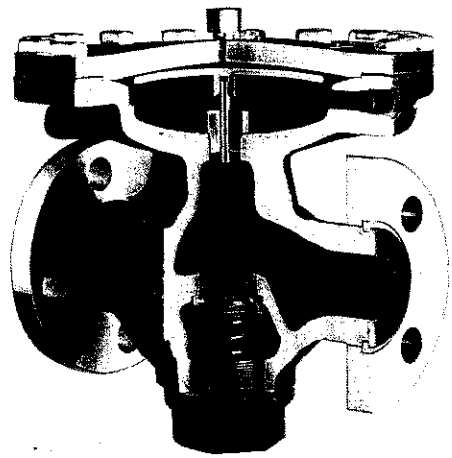
PRODUCT DATA SHEET

LESLIE CONTROLS

LESLIE CLASS GPS-1 AND VARIANTS

STEEL REDUCING VALVES

- **Fast acting**
- **High rangeability–100:1**
- **Exclusive Spiroflex® diaphragm**
- **Packless construction**
- **3 Year Warranty**



Leslie Class GPS-1, GPSS-1 and variants are air loaded steel or stainless steel reducing valves suitable for any pressure drops within body material limits. They are used in process lines, steam heat lines, steam reducing stations, and make-up supply to heaters, gland sealing systems and process equipment. They are particularly desirable where there are poor steam conditions or in standby service.

Since there are no moving parts penetrating the pressure boundary, these valves require no packing. Packless construction means low hysteresis, fast response, high rangeability, and no fugitive leak path.

For most applications, a simple air loader is all that is needed to adjust the set point. However, the GPS-1 and GPSS-1 can also be used with the Leslie PMC electro-pneumatic controller when indicating control or interface with an electronic remote set point signal is required.

SPECIFICATIONS

Classes:
GPS-1, GPS-1S, GPS-1T, GPS-1TS
GPHS-1
GPSS-1, GPSS-1S

Body material:
Cast carbon steel WCB: GP(H)S-1 and variants
Cast stainless steel CF8M: GPSS-1 and variants
Other alloys available on request

Sizes and end connections:
Threaded and SWE: 1/2, 3/4, 1, 1 1/2, 2"
Separable flanges 150# ANSI: 1, 1 1/2, 2"
Integral flanges 150# ANSI: 3, 4"
Separable flanges 300# ANSI: 1, 1 1/2, 2"
Integral flanges 300# ANSI: 3, 4"

Main valve:
Stainless steel, hardened

Seat ring:
Stainless steel with cobalt-nickel alloy hardfacing:
GPS-1S, GPS-1TS, GPHS-1, GPSS-1S and all 3" and 4" valves (Class IV shutoff)
Stainless steel with resilient insert: GPS-1, GPS-1T, GPSS-1 in 1/2–2" sizes (Class VI shutoff)

Stem guides:
Bronze (top and bottom guided) standard, copper free material optional

Main valve spring:
Stainless steel

Diaphragm:
Spiral-formed stainless steel (Spiroflex®) standard
PTFE (GPS-1T, GPS-1TS)

Diaphragm cover:
Carbon steel standard
Stainless steel optional (GPSS-1 only)

Maximum inlet pressure:
See table on next page

Reduced pressure range:
GPHS-1: 0–285 psig
GPS(S)-1 and variants with std. cover: 0–280 psig
GPSS-1 and variants with SST cover: 0–270 psig

Maximum inlet temperature:
See table on next page

Minimum pressure drop across valve: 1/2 psi

Rangeability: 100:1

GPS-1 STEEL REDUCING VALVE

PRESSURE AND TEMPERATURE RATINGS

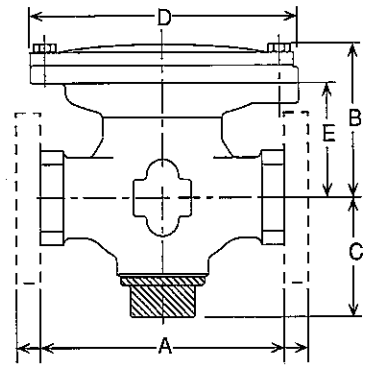
		THD.& SWE	150 FLG.	300 FLG.
GPS(S)-1 (½–2")	Max. P1 (psig)	300	285*	300
	Max. T1 (F)	450	450	450
GPS(S)-1T, -1TS	Max. P1 (psig)	300	285*	300
	Max. T1 (F)	400	400	400
GPS-1 (3-4") GPS-1S (½–2")	Max. P1 (psig)	300	285*	300
	Max. T1 (F)	600	600	600
GPHS-1	Max. P1 (psig)	600**	–	600
	Max. T1 (F)	600**	–	600

*Max. P1=275 psig for stainless steel body (GPSS-1).
**SWE only.
NOTE: Allowable inlet pressure rating for flanges may be reduced by service temperature. See ANSI B16.34 or Leslie Engineering Data Sheet 5/0.3.3.

MAX. DIAPHRAGM LOADING PRESSURE (psig)	
GPS-1, -1T, -1S, -1TS	285
GPSS-1, -1S (CS diaphragm cover)	285
GPSS-1, -1S (SST diaphragm cover)	275
GPHS-1	300

NOTE: See Leslie Engineering Data sheet 30/4.3.1 for details on the relationship between loading pressure and reduced pressure.

DIMENSIONS



SIZE	DIMENSIONS (INCHES) A THD/SWE	A 150 FLG	A 300 FLG	B	C	D	E	WEIGHT (LB.) THD/SWE	150 FLG	300 FLG
½	8½	—	—	5½	3⅜	8⅝	3⅝	38	—	—
¾	8½	—	—	5½	3⅜	8⅝	3⅝	39	—	—
1	8½	8½	8½	5⅞	3⅜	8⅝	4	40	48	48
1½	9½	9½	9½	6⅜	4½	10¼	4⅜	70	80	80
2	11½	11½	11½	6⅜	4½	10¼	4⅜	83	95	95
3	—	11¾	12½	9	6¼	16	4 15/16	—	267	267
4	—	13⅜	14½	10¼	7⅞	16	6¼	—	335	335

*All inlet and outlet flange dimensions are per ANSI B16.5. Face-to-face dimensions are per ISA SP75.08 for ½–2" sizes (separable flanges) and ANSI B16.10 for 3–4" sizes (integral flanges).

PRINCIPLE OF OPERATION

Loading pressure—either air or inert gas—is applied to the top of the diaphragm to open the main valve against the valve spring and inlet pressure.

Reduced pressure from the downstream piping system is applied to the bottom of the diaphragm through an external sensing line.

The loading pressure keeps the valve open while the desired reduced pressure builds up under the diaphragm until the valve begins to modulate and equilibrium is reached.

The increase of loading pressure over the desired reduced pressure is directly proportional to the inlet pressure and pressure drop across the valve.

HOW TO SIZE

Reliability in service and cost of maintenance are greatly dependent on proper sizing and correct installation. Maximum steam flows must be calculated with full information and should be based on accurate data for each steam consumer including condensation losses. Sizing should be based on the true inlet and outlet pressures across the valve. If pressure is measured at a header, pressure losses through fittings and stop valves must be taken into account. Caution should also be used in making allowances for overloads or future requirements. (Leslie Engineering Data Sheets and Reference Tables provide helpful information for estimating steam flows and for calculating equipment requirements.)

GPS-1 and GPSS-1 reducing valves should be sized to operate as closely as possible to their rated capacities, although they will throttle accurately down to zero flow during load changes.

To size a reducing valve properly, the following information should be available: maximum and minimum pressure at inlet of reducing valve; reduced pressure or range at outlet of reducing valve; maximum and minimum continuous flow in pounds of steam per hour.

GPS-1 and GPSS-1 reducing valves can be sized using either the capacity chart or by calculating Cv using the Leslie Computer Sizing Program. While both methods will generally yield good results, the Cv method provides more detailed service information and allows for more flexibility.

GPS-1 STEEL REDUCING VALVE

Press. psig	Inlet	10 (239 F)		15 (250 F)		20 (259 F)		25 (267 F)		50 (298 F)		75 (320 F)		100 (338 F)		
	Outlet	2	5	2	5	0-2	10	0-5	10	0-17	25	0-30	40	0-42	50	75
Valve size—inches	½	135	115	175	165	210	180	235	225	380	360	520	495	665	645	520
	¾	225	190	290	270	350	300	395	370	635	600	870	825	1110	1070	870
	1	400	340	520	485	625	540	710	665	1140	1070	1550	1470	1980	1920	1550
	1½	785	665	1020	950	1220	1050	1390	1300	2230	2100	3040	2880	3870	3760	3040
	2	925	785	1200	1120	1440	1240	1630	1530	2620	2470	3580	3390	4550	4430	3570
	3	2060	1750	2670	2490	3200	2760	3630	3410	5840	5510	7980	7570	10150	9860	7960
	4	2740	2330	3550	3320	4260	3670	4840	4540	7780	7330	10620	10070	13510	13130	10600

Press. psig	Inlet	125 (239 F)		150 (250 F)		175 (378 F)		200 (398 F)			225 (397 F)			250 (406 F)		
	Outlet	0-55	75	0-67	100	0-80	125	0-92	125	150	0-105	150	175	0-117	150	200
Valve size—inches	½	800	745	945	830	1085	915	1220	1130	990	1360	1210	1050	1500	1410	1120
	¾	1340	1240	1570	1380	1800	1520	2040	1880	1640	2270	2020	1760	2490	2360	1870
	1	2390	2220	2810	2480	3230	2720	3650	3360	2940	4060	3610	3140	4460	4220	3340
	1½	4680	4340	5500	4850	6320	5320	7140	6570	5750	7940	7070	6150	8730	8250	6530
	2	5510	5100	6470	5710	7430	6260	8410	7730	6770	9350	8320	7240	10270	9710	7680
	3	12270	11370	14430	12720	16570	13960	18730	17230	15090	20830	18550	16140	22880	21640	17130
	4	16340	15140	19210	16930	22060	18580	24940	22940	20090	27740	24690	21480	30460	28810	22800

Press. psig	Inlet	275 (414 F)		300 (421 F)		350 (436 F)		400 (448 F)		450 (459 F)		500 (469 F)		600 (489 F)	
	Outlet	0-130	175	0-142	200	0-167	250	0-192	250	0-217	270	0-242	267	0-285	
Valve size—inches	½	1640	1510	1780	1590	2060	1760	2340	2190	2630	2500	2900	3170	3480	
	¾	2730	2510	2970	2660	3440	2940	3900	3640	4370	4160	4830	5290	5790	
	1	4880	4500	5310	4750	6150	5260	6970	6510	7830	7450	8630	9460	10360	
	1½	9550	8800	10390	9300	12030	10290	13650	12750	15320	14580	16900	18510	20280	
	2	11230	10350	12220	10940	14150	12100	16060	15000	18020	17160	19880	21780	23860	Shaded area for GPHS-1 only
	3	25040	23070	27230	24380	31540	26970	35790	33430	40170	38240	44310	48550	53170	
	4	33330	30710	36260	32460	41990	35910	47650	44510	53470	50910	58990	64630	70790	

CAPACITY CHART METHOD

Enter the capacity table at the inlet pressure reading corresponding to the minimum expected inlet pressure and select the reduced pressure column closest to but not lower than the required outlet pressure. Find the smallest capacity figure equal to or greater than the estimated maximum flow. The size of the reducing valve required is shown in the left-hand column horizontally opposite the capacity figure.

- All pressures are in psig.
- Rated capacities do not increase for reduced pressures lower than shown for each inlet pressure.
- Capacities are in pounds of saturated steam per hour. Saturated steam temperature is shown for each inlet pressure. For superheated steam, use the Cv method.
- Rated capacities are based on 95% accuracy of regulation at constant air load.

Refer to Leslie Engineering Data Sheet 5/0.3.4 to estimate expected noise levels.

SIZE	Standard Cv[1]	Extended Cv[2]
½	3.65	5.67
¾	6.08	10.0
1	10.9	15.7
1½	21.3	29.1
2	25.1	29.1
3	55.8	84.6
4	74.3	103.0

[1] 95% accuracy (2 psi min. droop)

[2] 90% accuracy (3 ½ psi min. droop)

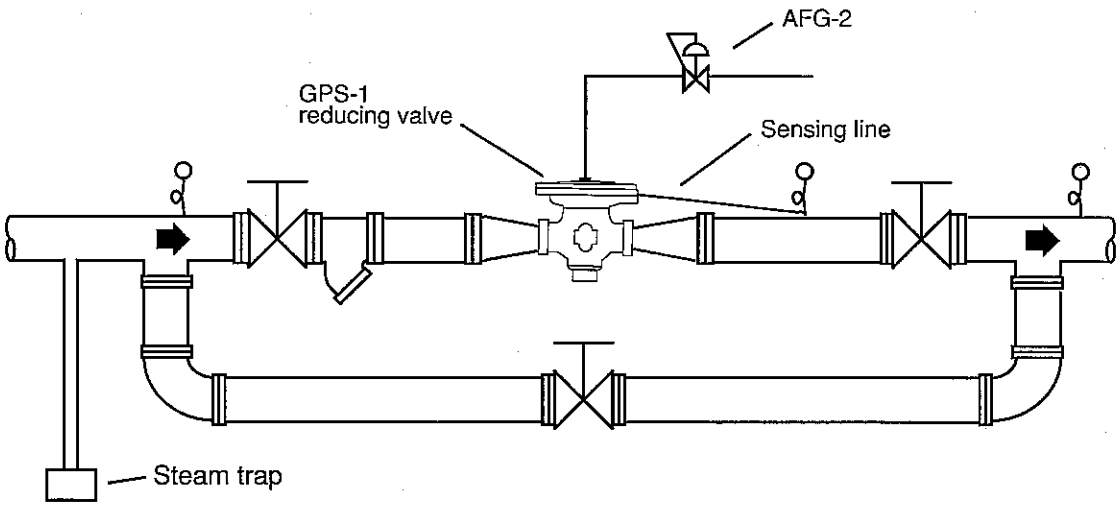
Cv METHOD

Enter the service conditions into the Leslie Computer Sizing Program, and calculate the required Cv. Using the Cv chart above, select the smallest size valve with a Cv equal to or greater than the required Cv. Note that Cv's are provided for two levels of accuracy: 95% and 90%.

Noise level calculations provided by the Leslie Computer Sizing Program should be taken into account when sizing. To avoid excessive noise, a valve should be chosen that is larger than the minimum sonic body size calculated by the Leslie Computer Sizing Program.

GPS-1 STEEL REDUCING VALVE

TYPICAL INSTALLATION



HOW TO SPECIFY THE GPS-1 PRESSURE REDUCING VALVE

Provide air loaded steam pressure reducing valve capable of being set by adjusting the air pressure to the diaphragm by means of a filter regulator.

The body material shall be [*cast carbon steel grade WCB* or *cast stainless steel grage CF8M*].

The throttling surfaces of the main valve shall consist of a valve plug and seat ring. The valve plug and stem shall be of one piece construction of 17-4PH hardened stainless steel. The seat ring shall be stainless steel with resilient seat insert up to 2". Above 2" and for applications above 400°F on sizes below 2", the seat ring shall be stainless steel with cobalt-nickel alloy hardfacing.

The actuating diaphragm shall be specially formed stainless steel providing longer travel and lower diaphragm stress than a flat diaphragm.

The reducing valve shall be capable of operating with a minimum pressure drop of ½ psig and and a maximum pressure drop equal to the maximum allowable inlet pressure. The control rangeability shall be 100:1, providing accurate pressure control down to 1% of the valve's maximum rated steam capacity.

The reducing valve, when installed and operated in accordance with manufacturer's instructions, will be repaired or replaced free of charge, should failure occur within three years due to materials, workmanship, or normal wear.

Since LESLIE CONTROLS was founded in 1900, we have been an industry leader in quality fluid control equipment. We have developed a full line of engineered products to suit your requirements, including diaphragm control valves, control instrumentation, pressure and temperature regulators, and steam water heaters.

Cost effectiveness—initial, operating, and maintenance cost—is the focus of our approach, whether we're designing a single product or complete system. You can count on LESLIE CONTROLS.

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