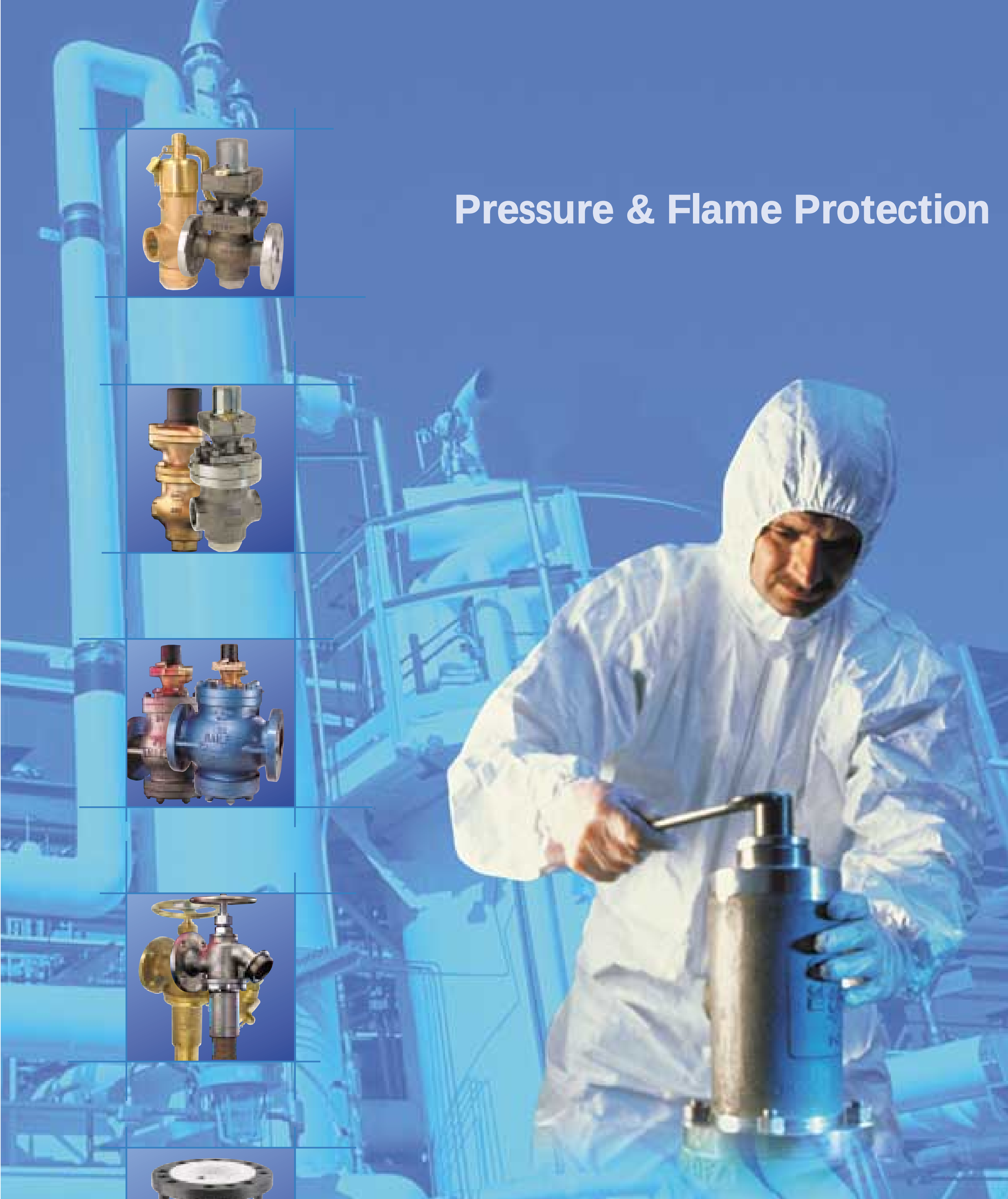


Pressure & Flame Protection

BAILEY G4

Reducing Valves

DEFINITIONS

Set Pressure

The pressure measured at the valve inlet at which a safety relief valve should commence to lift under service conditions.

Overpressure

The pressure increase above set pressure at the valve inlet at which the discharge capacity is attained. Usually expressed as a percentage of set pressure.

Accumulation

The pressure increase over a maximum safe working pressure of the vessel or system when the safety relief valve is discharging at its rated capacity is called accumulation. The term refers to the vessel or system to be protected and not to the valve. Accumulation is the same as over-pressure when the valve is set at the design pressure of the vessel.

Re-Seat Pressure

The pressure measured at the valve inlet at which the safety relief valve closes.

Blow-Down

The difference between the set pressure and the re-seating pressure expressed as a percentage of the set pressure or as a pressure difference.

Simmer

The pressure zone between the valve set pressure and the popping pressure. In this pressure zone the valve is only slightly open and therefore discharging a small percentage of its rated capacity.

Popping Pressure

The pressure at which the valve disc rapidly moves from a slightly open (simmer) position to a practically full open position.

Superimposed Back Pressure

Pressure higher than atmosphere in the safety relief valve outlet. This may result from discharge into the common disposal system of other safety relief valves or devices, or as a result of a specific design requirement. Back pressure can be either constant or variable depending on the operating conditions.

Built Up Back Pressure

The pressure existing at the outlet of a safety relief valve caused by flow through the valve into the disposal system.

Differential Set Pressure

This is the difference between the set pressure and the constant superimposed back pressure. It is applicable only when a conventional type safety relief valve is used to discharge against constant superimposed back pressure. (It is the pressure at which the safety valve is set at on the test bench without back pressure.)

Cold Differential Set Pressure

The pressure at which a safety relief valve, intended for high temperature service, is set on a test rig using a test fluid at ambient temperature. The cold differential test pressure will be higher than the set pressure, in order to compensate for the effect of elevated temperature on the valve.

Valve Lift

The actual travel of the valve disc away from the seat when the valve is relieving.

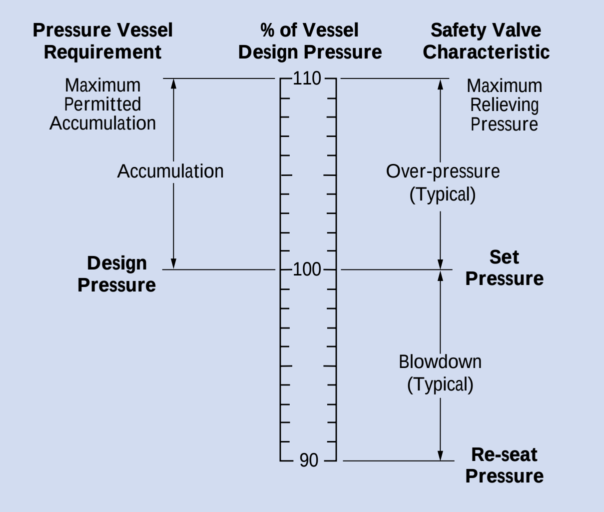
Discharge Capacity

Actual rate of discharge of service media, which can be expressed in mass flow or volumetric terms.

Equivalent Capacity

Calculated mass or volumetric flow rate of the valve of a given test fluid. The fluids commonly used for test purposes are steam, air and water.

PRESSURE TERM RELATIONSHIP



Note: System operating pressure must always be less than the re-seat pressure.

Pressure Reducing Valves

INTRODUCTION

You may be processing chemicals, producing food or drink, heating factories, sterilizing hospital equipment, supplying potable water in high rise buildings or fighting fires. Whatever the process, the chances are at some stage you will need to depend on a pressure reducing valve.

Bailey produce a wide range of dependable pressure reducing valves which independently and without intervention, monitor the supply pressure and automatically deliver a consistent reduced pressure for the operator, day and night.

When steam, air, water, liquids, gas or chemicals are to be used, boilers, pumps and compressors are quite often required to pressurise the system. The initial system pressure is usually high due to the use of small diameter cost effective piping systems, and it will be substantially higher than the pressure required by the final application. Most of these applications require reliable, constant and stable reduced pressures, without which the process would lose or produce poor quality products.

The comprehensive Bailey range of pressure reducing valves is used throughout the world on a huge array of applications; below is a guide to which valve type is best suited for a given application.

PRESSURE REDUCING VALVES – APPLICATIONS

Application	Material	Size	Recommended Valve Type
Steam	Bronze Cast Iron Cast Steel Cast Steel	15 to 50mm 65 to 150mm 65 to 150mm 15 to 150mm	2042/3 - Bailey B 2044 2045 2046
Clean Steam	Stainless Steel	15 to 50mm	2042/3 SS
Water/Liquid	Bronze Bronze Bronze Cast Iron	Screwed 15 to 50mm Screwed/Flanged 15 to 50mm Screwed/Flanged 25 to 50mm Flanged 65 to 150mm	C10 Class T Class TH Class TLP
Air	Bronze Cast Iron Cast Steel Cast Steel	15 to 50mm 65 to 150mm 15 to 50mm 65 to 150mm	2042/3 - C10/Class T 2044 2046 2045/6
Fine Gas	Bronze Cast Iron Cast Steel Cast Steel	15 to 50mm 65 to 150mm 15 to 50mm 65 to 150mm	2042/3 GN - C10/Class T 2044 GP 2046 GN 2045/6 GP
Oxygen and Methane	Bronze	15 to 50mm	2042/3 OV
Stainless Steel Environment	Stainless Steel	15 to 50mm	2042/3 SS 2042/3 SN
Fire fighting hose pressure regulator	Bronze AB2 Titanium	Flanged 40 to 80mm Screwed 50 to 65mm	Class F

Accurate selection of the valve type depends on:
inlet/outlet pressure - capacity - material - temperature - fluid - connection required.

PILOT OPERATED PRESSURE REDUCING VALVES

...Extremely sensitive and accurate

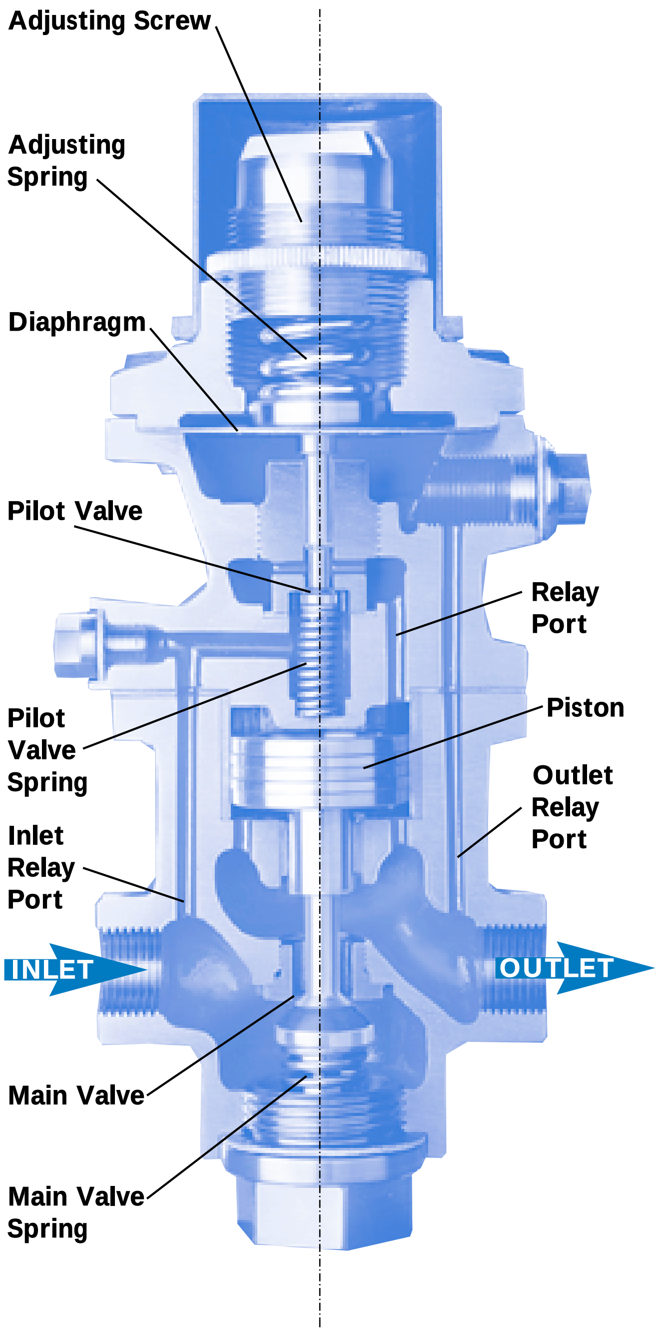
The 'G4' pressure reducing valve is designed for use on steam, air and gases. It will maintain a constant outlet pressure irrespective of variations in the inlet pressure or demand from the system.

Initially with no compression on the adjusting screw, both the pilot and main valve seats are closed due to the action of the springs in the pilot and main valve. Fluid at the inlet pressure passes up the inlet relay port to the pilot valve seat which is opened by clockwise (viewed from above) rotation of the adjusting screw. This compresses the adjusting spring and applies load to the topside of the diaphragm, pushing open the pilot valve. Fluid now passes through the pilot valve seat, through the relay port to the top of the large diameter piston, which in turn pushes the main valve open.

The pressure of the fluid is reduced as it passes through the open main valve from the inlet to the valve outlet. At the same time fluid passes up the outlet relay port to the underside of the diaphragm, from where the outlet pressure is controlled.

The outlet pressure is a result of the balancing of the forces acting on the diaphragm, from the adjusting spring above and the reduced pressure from below.

The 'G4' is extremely sensitive and accurate, due to the large diaphragm. Inlet variations, or demand from the system, will attempt to affect the outlet pressure. Such attempts will result in movement of the pilot valve, which in turn minutely moves the piston and main valve. Thus the outlet pressure is maintained and the controlling cycle starts again.



PRESSURE EQUIPMENT DIRECTIVE (PED)

The G4 pressure reducing valve is fully compliant/certified to the PED as follows:

Sizes DN15 to DN25 in accordance with article 3, paragraph 3 (sound engineering practice) hence do not require the CE mark.

Sizes DN32 to DN100 to Category II, group 1 gases (CE marked)

Sizes DN32 to DN150 to Category II, group 2 gases (CE marked)

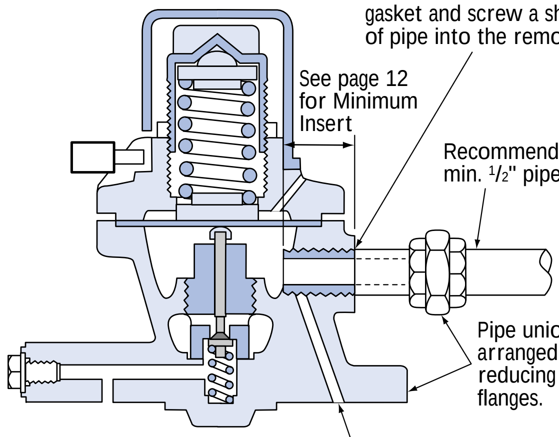
For Steam Applications

The 'G4' is a self-actuated, pilot operated pressure reducing valve and it relies upon a stable pressure signal from the outlet pipe work in order to maintain stable control of the outlet pressure.

However, under certain conditions the signal pressure may be unstable in the immediate vicinity of the valve outlet and as a result may cause erratic control.

This can easily be overcome by installing a balance pipe from the remote sensing port to a straight section of the outlet pipe where stable flow has been resumed (see diagram below).

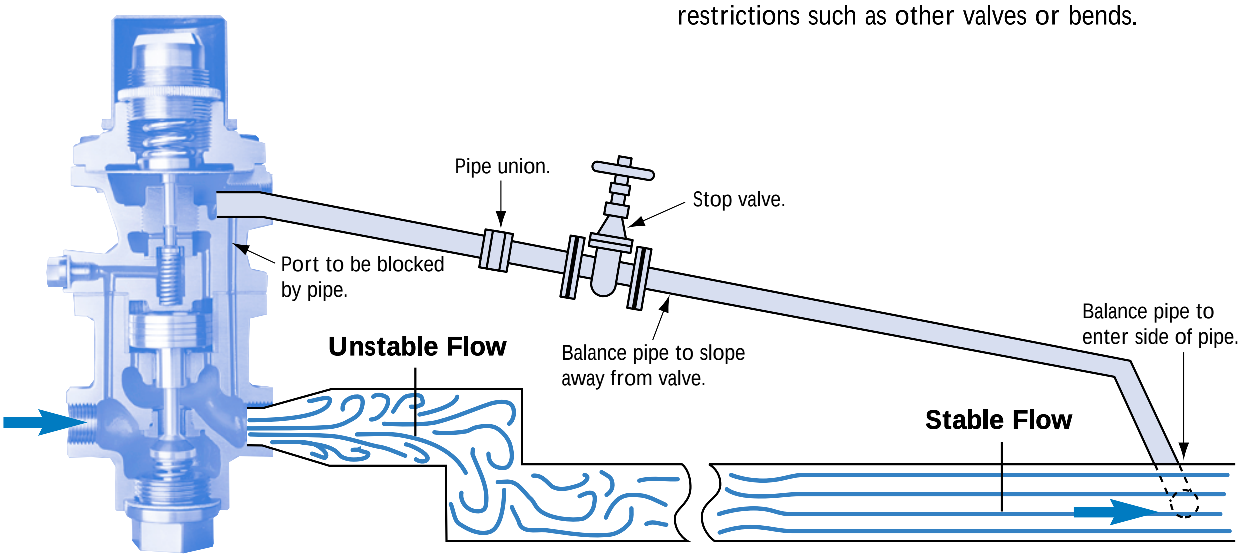
Ideally the balance pipe should be a minimum of 2 metres (6 feet) long and must be screwed into the remote sensing port to the required depth, see page 12. It should also include a pipe union and stop valve to allow dismantling and isolation. It should be installed with a steady fall away from the reducing valve, to facilitate self drainage of condensate.



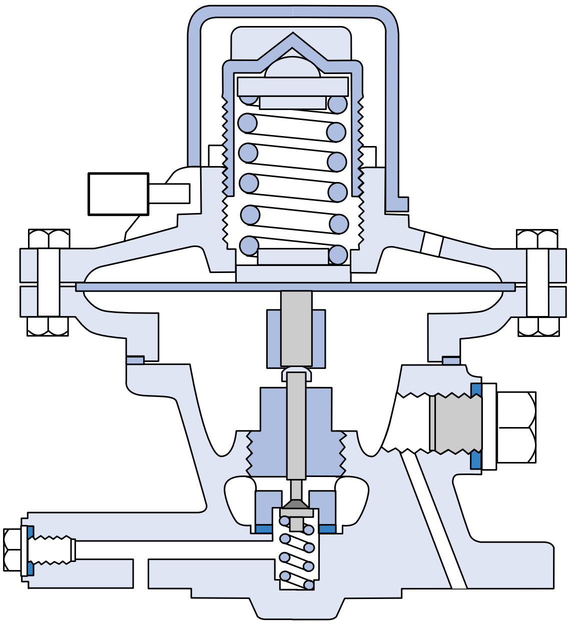
We recommend fitting a balance pipe:

1. When the reduced pressure is below 55% of the inlet pressure.
2. When a low pressure top is fitted.
3. When difficult outlet pipe work conditions occur.

We do not recommend fitting a balance pipe on air/gas applications. To ensure correct operation the G4 should be mounted at least 10 pipe diameters from restrictions such as other valves or bends.



LOW PRESSURE TOP



The standard 'G4' pilot top can reduce pressures down to 0.35 Barg (5 Psig). For pressures below this, a bronze low pressure pilot top can be fitted in place of the standard top. It is suitable for outlet pressures from 0.07 to 0.35 Barg (1 to 5 Psig) using the yellow spring. The low pressure top is available for fitting on to valve sizes 15 to 100mm (½ to 4 inch), and a balance line should always be fitted to a low pressure top, on steam duty and never on air/gas duty.

Note: A low pressure top is only suitable for inlet pressure up to a maximum of 7 Barg (100 Psig).
Higher inlet pressures can be accommodated by use of two G4 valves 'in-series'.

The low pressure top can also be supplied as a **conversion kit**, allowing existing valves and stock to be modified quickly should the need suddenly arise.

GAS AND OXYGEN DUTIES

The 'G4' has successfully been used for many years with metal seats on demanding steam applications. However soft seated versions are available for industrial fine gas applications, involving such gases as carbon dioxide, nitrogen and oxygen. Typical application areas would include pharmaceuticals, food processing and brewing.

The 'G4' utilises a range of soft elastomer seat materials to meet the ever growing demand for these specialist applications.

In addition, valves for active gases, such as oxygen and methane, can be supplied fully assembled and tested to "oxygen service" standard in Bailey's state of the art clean room facility. This facility complies fully with the "Industrial Gas Committee" guidelines.

All soft seat options can also be supplied as **conversion kits**, allowing existing valves and stock to be modified quickly should the need suddenly arise.

We do not recommend fitting a balance pipe on gas applications. To ensure correct operation the G4 should be mounted at least 10 pipe diameters from restrictions such as other valves or bends.

STAINLESS STEEL

The 'G4' is available in a fully stainless steel version, sizes 15 to 50mm, both screwed and flanged.

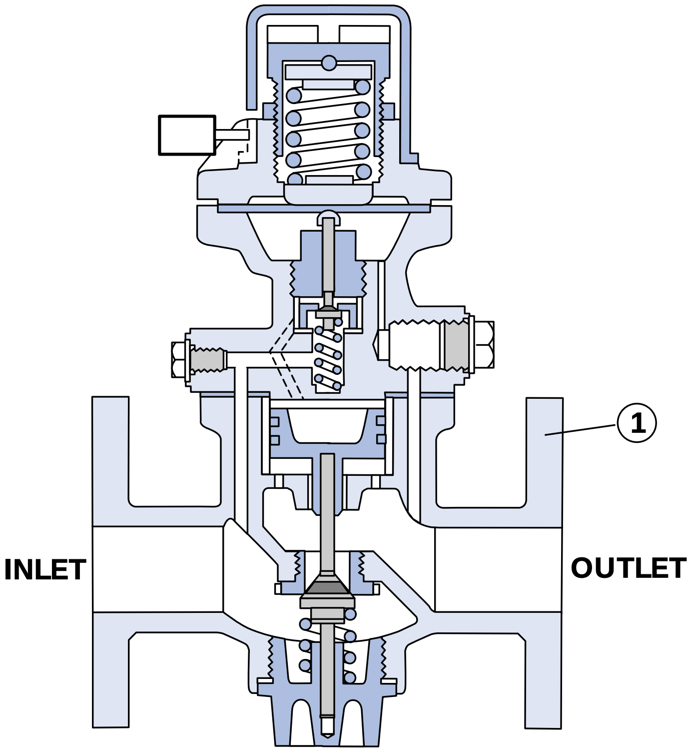
Hygienic Environments

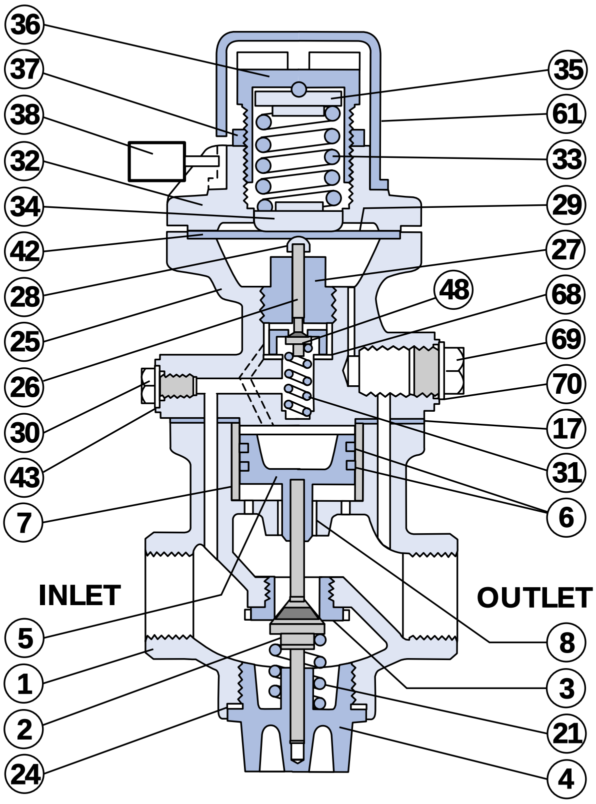
Changing regulations in the food, drink and pharmaceutical industries around the world now often require all stainless steel pipe work systems to be used in hygienic environments, which in turn require the use of stainless steel pressure reducing valves.

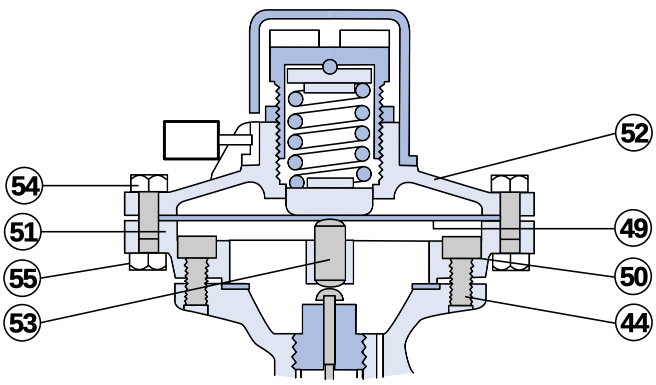
Clean Steam Applications

Regulations for hospitals, pharmaceutical, food and drink companies also require clean steam to be used for sterilisation and decontamination processes. Clean steam is very corrosive and requires stainless steel pressure reducing valves.

PARTS







ITEM	PART
1	Body
2	Main Valve
3	Main Valve Seat
4	Bottom Plug
5	Piston
6	Piston Rings
7	Piston Liner
8	Piston Guide
17	Valve Body Top Joint
21	Main Valve Spring
24	Bottom Plug Joint
25	Pilot Valve Top
26	Pilot Valve
27	Pilot Valve Plug
28	Pilot Valve Cap
29	Diaphragm
30	H.P. Port Plug
31	Pilot Valve Spring
32	Pilot Valve Top Cover
33	Adjusting Spring
34	Adjusting Spring Bottom Plate
35	Adjusting Spring Top Plate
36	Adjusting Screw
37	Locking Ring
38	Padlock
42	Diaphragm Joint
43	H.P. Port Plug Joint
44	Cap Headed Screws
48	Pilot Valve Head
49	L.P. Diaphragm
50	L.P. Screw Joint
51	L.P. Adaptor Flange
52	L.P. Top Cover
53	L.P. Push Rod
54	L.P. Top Cover Bolts
55	L.P. Top Cover Nuts
61	Top Cap
68	Pilot Valve Plug Joint
69	Remote Control Plug
70	Remote Control Plug Joint

Note: A variety of elastomeric or PTFE seats and gaskets are available to suit various applications.

MATERIALS

ITEM	2042 & 2043 Bronze	2042 & 2043 Stainless Steel	2044 Cast Iron	2045 Carbon Steel	2046 Carbon Steel
1	Bronze	Stainless Steel	Cast Iron	Carbon Steel	Carbon Steel
2	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
3	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
4	Bronze	Stainless Steel	Bronze	Stainless Steel	Stainless Steel
5	Bronze	Stainless Steel	Bronze	Bronze	Stainless Steel
6	Bronze	PTFE coated St. St.	Bronze	Bronze	Chrome Iron
7	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
8	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
17	NAF	NAF	NAF	NAF	NAF
21	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
24	NAF	NAF	NAF	NAF	NAF
25	Bronze	Stainless Steel	Bronze	Bronze	Steel
26	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
27	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
28	Brass	Stainless Steel	Brass	Brass	Brass
29	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
30	Bronze	Stainless Steel	Bronze	Bronze	Carbon Steel
31	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
32	Bronze	Stainless Steel	Bronze	Bronze	Carbon Steel
33	Steel	Stainless Steel	Steel	Steel	Steel
34	Brass	Stainless Steel	Brass	Brass	Brass
35	Brass	Stainless Steel	Brass	Brass	Brass
36	Bronze	Stainless Steel	Bronze	Bronze	Bronze
37	Bronze	Stainless Steel	Bronze	Bronze	Bronze
38	Brass	Brass	Brass	Brass	Brass
42	NAF	NAF	NAF	NAF	NAF
43	NAF	NAF	NAF	NAF	NAF
44	Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
48	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
49	Bronze	N/A	Bronze	Bronze	N/A
50	Copper	N/A	Copper	Copper	N/A
51	Bronze	N/A	Bronze	Bronze	N/A
52	Bronze	N/A	N/A	N/A	N/A
53	Monel	N/A	Monel	Monel	N/A
54	Steel	N/A	Steel	Steel	N/A
55	Steel	N/A	Steel	Steel	N/A
61	Nylon	Zinc alloy	Nylon	Nylon	Nylon
68	Copper	NAF	Copper	Copper	Copper
69	Brass	Stainless Steel	Bronze	Bronze	Carbon Steel
70	NAF	NAF	NAF	NAF	NAF

Safety Systems UK Ltd.

TECHNICAL SPECIFICATION - G4 reducing valves

Figure Number	Size Range mm	Connections	Body	MATERIALS Pilot Top	Main Valve Trim	PRESSURE Barg Inlet Min-Max	Outlet Min-Max	TEMP. Deg.C Min-Max
2042	15–50	Screwed	Bronze	Bronze	St Steel	0.7–35§	0.07–21	–20 to +260
†2042GN	15–50	Screwed	Bronze	Bronze	Nitrile	0.7–31	0.07–21	–20 to +100
†2042GV	15–50	Screwed	Bronze	Bronze	Viton	0.7–31	0.07–21	–18 to +150
†2042GP	15–50	Screwed	Bronze	Bronze	PTFE	0.7–35	0.07–21	–20 to +170
2042SS	15–50	Screwed	St Steel	St Steel	St Steel	0.7–42	0.35–21‡	–20 to +260
2042SN	15–50	Screwed	St Steel	St Steel	Nitrile	0.7–42	0.35–21‡	–20 to +100
2042SP	15–50	Screwed	St Steel	St Steel	PTFE	0.7–42	0.35–21‡	–20 to +170
2043	15–50	Flanged	Bronze	Bronze	St Steel	0.7–35§	0.07–21	–20 to +260
†2043GN	15–50	Flanged	Bronze	Bronze	Nitrile	0.7–31	0.07–21	–20 to +100
†2043GV	15–50	Flanged	Bronze	Bronze	Viton	0.7–31	0.07–21	–18 to +150
†2043GP	15–50	Flanged	Bronze	Bronze	PTFE	0.7–35	0.07–21	–20 to +170
2043SS	15–50	Flanged	St Steel	St Steel	St Steel	0.7–42	0.35–21‡	–20 to +260
2043SN	15–50	Flanged	St Steel	St Steel	Nitrile	0.7–42	0.35–21‡	–20 to +100
2043SP	15–50	Flanged	St Steel	St Steel	PTFE	0.7–42	0.35–21‡	–20 to +170
2044	65–150	Flanged	Cast Iron	Bronze	St Steel	0.7–16π§	0.07–15π§	–20 to +220
2044GP	65–150	Flanged	Cast Iron	Bronze	PTFE	1.0–16	0.07–15π	–20 to +170
2045	65–150	Flanged	Carbon St.	Bronze	St Steel	0.7–35π§	0.35–21π§	–20 to +260
2045GP	65–150	Flanged	Carbon St.	Bronze	PTFE	1.0–35	0.07–21§	–20 to +170
2046	15–150	Flanged	Carbon St.	Carbon St.	St Steel	0.7–42π§	0.35–21π§	–20 to +400
#2046GN	15–50	Flanged	Carbon St.	Carbon St.	Nitrile	0.7–31	0.35–21	–20 to +100
#2046GV	15–50	Flanged	Carbon St.	Carbon St.	Viton	0.7–31	0.35–21	–18 to +150
#2046GP	15–150	Flanged	Carbon St.	Carbon St.	PTFE	1.0–42	0.35–21π	–20 to +170

The pressures and temperatures in this table are the maximum for the model shown, restrictions apply as shown below.

Note: When outlet pressure is less than 0.35 Barg a low pressure top will be fitted.

† 'G' for gas duty can be replaced by 'O' for oxygen duty.

‡ When a stainless steel spring is fitted the maximum outlet pressure is 10.5 Barg.

15/20/25mm are all fitted into the 25mm body (1" flanges).
32/40/50mm are all fitted into the 50mm body (2" flanges).

π Air service restrictions see below.

§ Steam service restrictions see below.

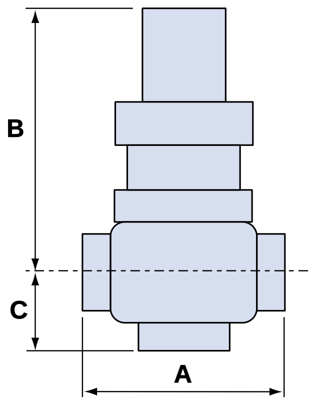
§ - Steam Service Restrictions

Figure Number	Restriction on:	Restriction
2042	Inlet	25 Barg to 225ºC/17 Barg to 260ºC
2043	Inlet	25 Barg to 225ºC/17 Barg to 260ºC
2044	Inlet	13 Barg Max
2044	Outlet	12 Barg Max
2045	Inlet	65-150mm 25 Barg to 225ºC/17 Barg to 260ºC
2045	Outlet	65-100mm 21 Barg to 225ºC/16 Barg to 260ºC
2045	Outlet	125-150mm 12 Barg Max
2046	Inlet	42 Barg to 280ºC/32 Barg to 400ºC
2046	Outlet	125-150mm 12 Barg Max

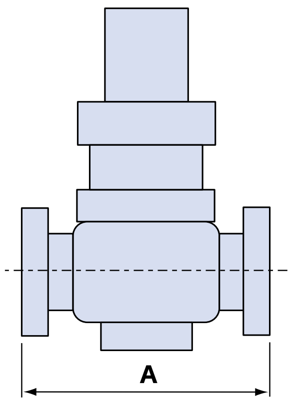
π - Air Service Restrictions

Figure Number	Restriction on:	Restriction
2044	Inlet	16 Barg to 120ºC/13 Barg to 220ºC
2044	Outlet	65-100mm 15 Barg to 120ºC/12 Barg to 220ºC
2044	Outlet	125-150mm 12 Barg
2045	Inlet	65-150mm 35 Barg to 170ºC/17 Barg to 260ºC
2045	Outlet	65-100mm 21 Barg to 170ºC/16 Barg to 260ºC
2045	Outlet	125-150mm 12 Barg Max
2046	Inlet	42 Barg to 280ºC/32 Barg to 400ºC
2046	Outlet	125-150mm 12 Barg

DIMENSIONS



Screwed



Flanged

CONNECTION OPTIONS

Screwed
BSP** API/NPT

Flanged
BS4504 PN** ANSI, BS10

**Standard item.

Valve type	Size	Connection	A ins	A mm	A DIN flange mm	B ins	B mm	C ins	C mm	Weight kg
Fig 2042 Screwed Bronze or Stainless Steel	15mm	½" BSP	4.125	105	–	8	203	2.375	60	6
	20mm	¾" BSP	4.125	105	–	8.25	210	2.5	64	6.8
	25mm	1" BSP	4.5	114	–	8.375	213	2.625	67	7
	32mm	1¼" BSP	4.875	124	–	9.625	244	3	76	10.8
	40mm	1½" BSP	5.25	133	–	9.875	251	3.125	79	12.7
	50mm	2" BSP	6.375	162	–	10.25	260	3.25	83	15.4
Fig 2043 Flanged Bronze or Stainless Steel	15mm	½"	5.5	140	130*	8	203	2.375	60	8
	20mm	¾"	5.625	143	150*	8.25	210	2.5	64	8.6
	25mm	1"	6.75	171	160*	8.375	213	2.625	67	9
	32mm	1¼"	7	178	180*	9.625	244	3	76	13.6
	40mm	1½"	7.5	191	200*	9.875	251	3.125	79	16.3
	50mm	2"	8.5	216	230*	10.25	260	3.25	83	20.8
Fig 2044 Flanged Cast Iron (Brz. top)	65mm	2½"	10	254	254	11.75	298	5.25	133	35
	80mm	3"	11.25	286	286	12	305	5.75	146	47
	100mm	4"	13.5	343	343	13.375	340	6.875	175	79
	125mm	5"	16	406	406	16.75	425	9	229	112
	150mm	6"	16.5	419	419	17.625	448	9.75	248	159
Fig 2045 Flanged Cast Steel (Brz. top)	65mm	2½"	10	254	254	11.25	286	5.125	130	38
	80mm	3"	11.25	286	286	11.25	286	5.75	146	56
	100mm	4"	13.5	343	343	12.75	324	7	178	80
	125mm	5"	16	406	406	15.75	400	8.625	219	107
	150mm	6"	16.5	419	419	16.5	419	9.75	248	174
Fig 2046 Flanged Cast Steel (C.S. top)	15mm	1"	6.75	171	230†	8.375	213	2.75	70	13.5
	20mm	1"	6.75	171	230†	8.375	213	2.75	70	13.5
	25mm	1"	6.75	171	230†	8.375	213	2.75	70	13.5
	32mm	2"	9	229	229	10.5	267	3.5	89	26.3
	40mm	2"	9	229	229	10.5	267	3.5	89	26.3
	50mm	2"	9	229	229	10.5	267	3.5	89	26.3
	65mm	2½"	10	254	254	11.25	286	5.125	130	42
	80mm	3"	11.25	286	286	11.25	286	5.75	146	52
	100mm	4"	13.5	343	343	12.75	324	7	178	87
	125mm	5"	16	406	406	15.75	400	8.625	219	124
	150mm	6"	16.5	419	419	16.5	419	9.75	248	173

Face to face dimensions are in accordance with *Din 3300 (PN40)
†Din 3300 (PN64)

‘IN SERIES’ INSTALLATIONS

Multiple valves installed ‘In Series’ should be considered for applications when high pressure drops are required. If the required outlet pressure is less than the minimum shown in the charts two valves can be used.

An ‘In Series’ installation should be designed to drop the pressure in at least two steps/stages.

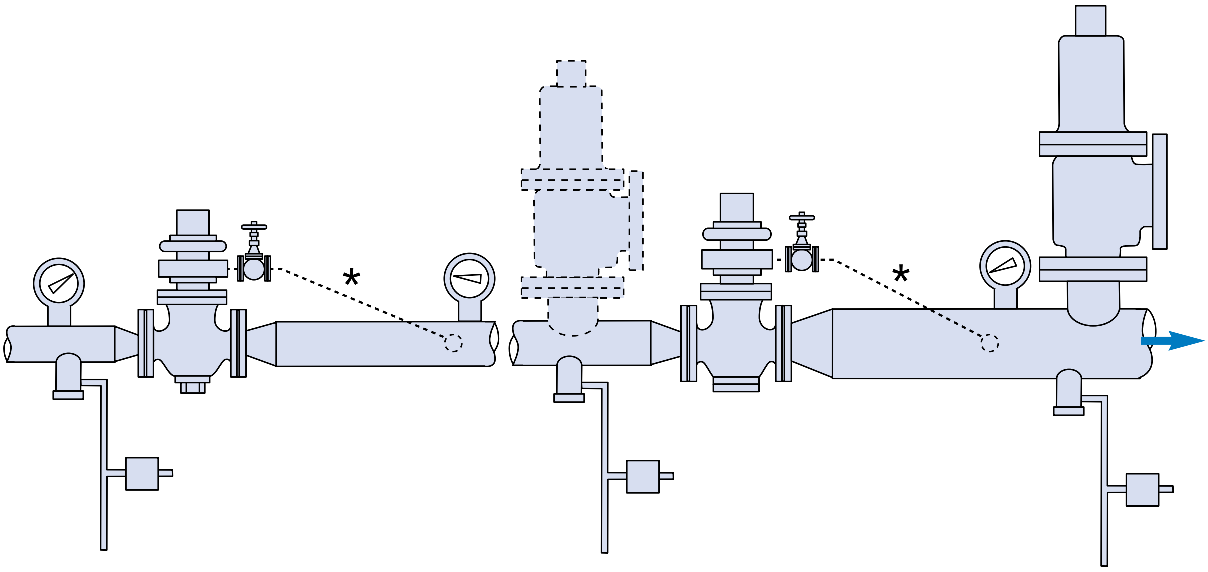
‘IN PARALLEL’ INSTALLATIONS

Multiple valves can be installed as an ‘in parallel’ system when the system has a very large variation in the required capacity. On such a system one large and one small valve should be installed, with a combined capacity greater than the maximum required demand, the smaller valve having a capacity just greater than the minimum required demand.

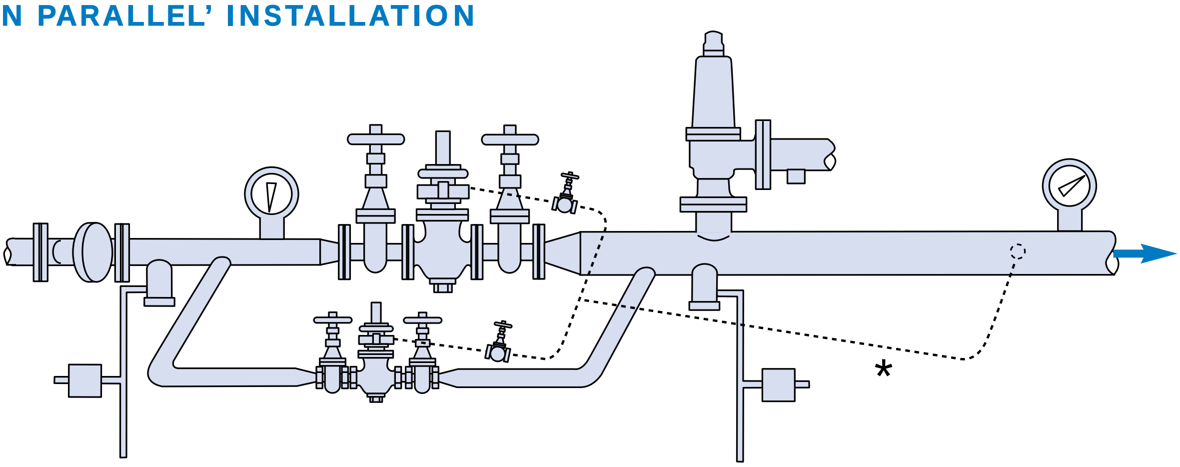
Setting the smaller valve slightly higher than the larger valve, will ensure that the larger valve is closed at low flow rates. Increasing demand will then open the larger valve as outlet pressure falls to its set point.

A typical diagram is shown (using close coupled parallel slide isolating valves).

‘IN SERIES’ INSTALLATION



‘IN PARALLEL’ INSTALLATION

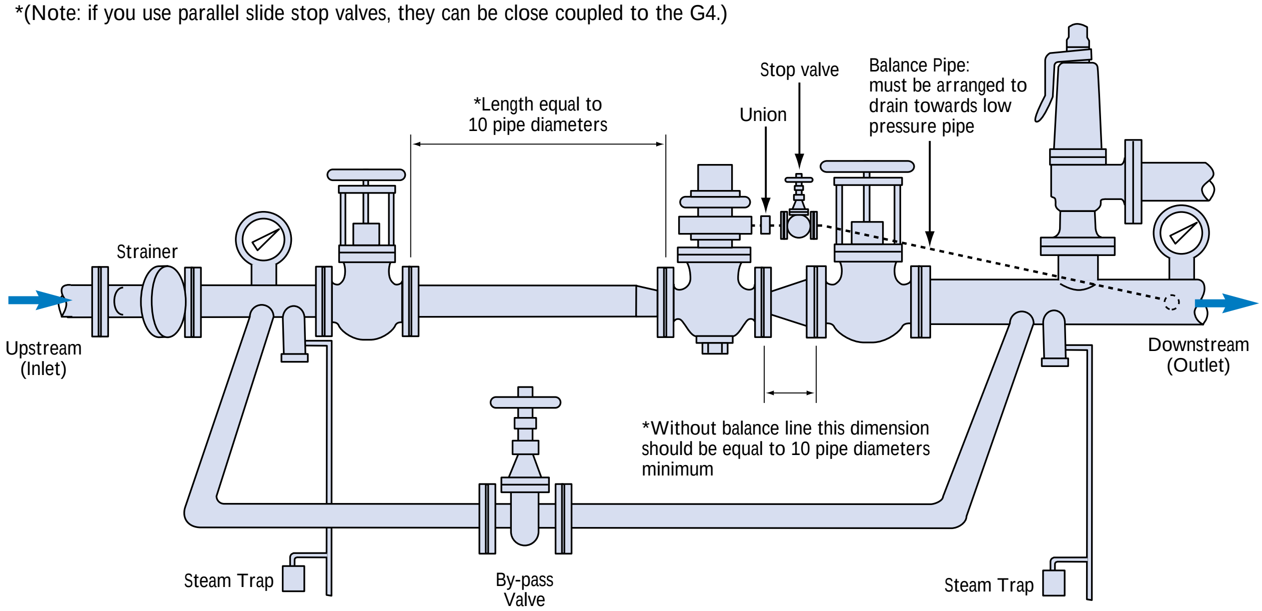


* Balance lines are only required on some steam applications, they are not required on air/gas applications.

Safety Systems UK Ltd.

TYPICAL STEAM REDUCING VALVE INSTALLATION USING GLOBE STOP VALVES

*(Note: if you use parallel slide stop valves, they can be close coupled to the G4.)



The majority of troubles experienced with pressure regulators can be attributed to installation faults. These can be avoided by giving attention to the following points:

Sizing

The correct sizing and layout of regulators, pipework, stop valves, strainers and other fittings is extremely important for good performance.

Inlet Strainer

Dirt, grit and pipe scale are common causes of regulator failure. A strainer of upstream pipe size should be fitted at least 10 pipe diameters before the regulator.

Steam Traps

Steam reducing valve stations should have steam traps fitted on the inlet and outlet pipes, to prevent build up of condensate in the regulator, particularly under no flow conditions.

Safety Valve

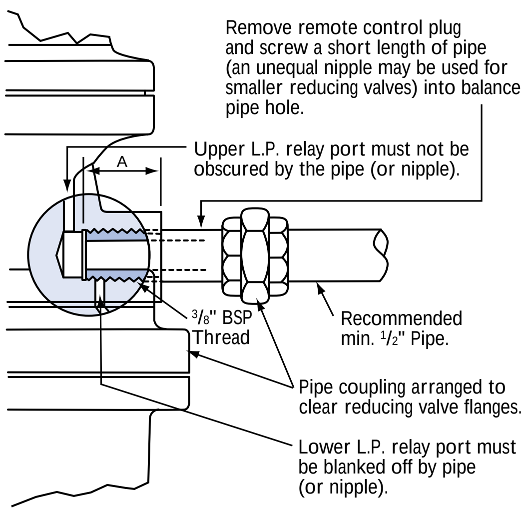
Every installation should be fully protected against regulator failure by a safety valve. Care should be taken that the discharge from such a valve cannot cause damage to property or create a hazard to personnel. The safety valve should be sized to pass the maximum capacity of the regulator.

Pipe work

All pipework and fittings should be properly supported and free from any strain or vibrations which could affect their correct operation. All flanges should be correctly aligned and joints carefully fitted to avoid blockage of valve ports.
If a jointing compound is used it should not be allowed to foul the internal ports or working parts of the valve.

Balance Pipe (Steam applications only)

A balance pipe should be fitted when the reduced pressure is 55% or less of the inlet pressure, or to help counteract difficult turbulent downstream conditions caused by pipe fittings, valves or bends. The method of connecting the balance pipe to the reducing valve is shown in the sketch. It should drain downwards and be connected into the side of the downstream pipe at a point where smooth flow occurs (preferably downstream of the safety valve). Where isolation of the regulator is desired, a stop valve should be fitted in the balance line.



'A' dimension must be 15⁄16" ± 1⁄16" on all stainless steel valves or CS Fig 2046. All other valves with bronze pilot tops, the pipe should penetrate 1" minimum.

Before putting a regulator into service

Prior to installing the valve all pipes should be thoroughly blown-through to remove any dirt, grit or pipe scale. Additional cleaning can be done by removing the regulator bottom plug, main valve and spring, and then carefully opening the inlet stop valve by a small amount. Remove any dirt lodged in the valve body and replace all parts.

SETTING

Setting under no flow conditions

This is the more accurate method and may be carried out as follows:

1. Any condensate remaining in the pipeline should be removed by first applying a little tension to the regulator adjusting spring (by rotating the adjusting screw clockwise for a few turns) and then slowly opening the outlet and inlet stop valves. When the downstream pressure starts to rise, close the inlet stop valve and remove all tension from the regulator adjusting spring.

2. Close the outlet stop valve and slowly open the inlet stop valve. Wait for about one minute to confirm that the reduced pressure is maintained at zero. This is a check that the regulator gives ‘dead-tight’ shut-off under no flow conditions.

3. Slowly raise the reduced pressure (by rotating the regulator adjusting screw clockwise) until the desired pressure is obtained. (Do not forget to set the safety valve 15% above the reduced pressure, if necessary.) The valve is now correctly set and the adjusting screw should be locked with the lock-nut provided.

4. Slowly bring the outlet stop valve to ‘full open’ and apart from a possible initial ‘fall back’ of the reduced pressure (whilst the systems is warmed through) the regulator should continue to maintain the reduced pressure.

Setting On Flow

With the inlet and outlet stop valves closed, apply a little tension to the regulator adjusting spring (by rotating the adjusting screw clockwise for a few turns). Open the inlet and all downstream stop valves and then wait until all condensate has been removed and the system properly warmed through. Then slowly raise the reduced pressure by clockwise rotation of the adjusting screw until the desired reduced pressure is obtained. (Do not forget to set the Safety Valve, if necessary.) If the flow is varying, some trial and error may be necessary before the correct setting is finally achieved. The reduced pressure under no-flow conditions should be checked as soon as convenient.

We strongly recommend that the inlet strainer and reducing valve should be cleaned out one week after commissioning, and the strainer and steam traps checked at regular intervals thereafter.

Outlet Pressure Regulation

Up to 80mm (3") size ± ½% of outlet pressure
[± 0.035 Barg (½ Psig) below 6.9 Barg (100 Psig)]

Above 80mm (3") size ±1% of outlet pressure
[± 0.07 Barg (1 Psig) below 6.9 Barg (100 Psig)]

Pressure rise at dead end (steam only) = 1%.

SPRING SELECTION

If possible it is advisable to select a spring which has at least 10% additional adjustment above the required set pressure. As can be seen from the chart, the springs have overlapping ranges. Where possible the spring with the lowest range should be selected.

15-100mm (½" - 4") VALVES		
Barg	**(Psig)**	**Colour Code**
0.07-3.5	(1-50)	Yellow
0.7-7.0	(10-100)	Black
2.8-10.5	(40-150)	White
3.5-14.0	(50-200)	Green
7.0-21.0	(100-300)	Red
125-150mm (5"- 6") VALVES		
Barg	**(Psig)**	**Colour Code**
0.35-1.4	(5-20)	Red
0.7-3.5	(10-50)	Yellow
2.8-7.0	(40-100)	Black
3.5-12.0	(50-175)	Green

The G4 Pressure Regulator can give its best performance when correctly sized to match the maximum demand of the system. It is therefore important that the size of regulator is decided from the known or estimated consumption and never fitted just as a line size valve. It is useful to remember that the G4 is a full lift, high capacity valve and correctly sized will almost invariably be smaller than the size of the pipe work.

The valve sizing charts illustrate that the maximum capacity occurs when the outlet pressure is less than 55% of the inlet pressure (critical pressure drop sizing). When the outlet pressure is above 55% sub critical flow occurs and the capacity will be reduced.

Critical pressure drop sizing is only true when both the inlet and outlet pipework is sized correctly in accordance with our pipe sizing charts.

It is important to remember that the outlet pipe is invariably larger than the inlet pipe, in order to pass the same quantity of steam, air or gas at a lower pressure.

Note Undersized pipe work and fittings cause unnecessary and uncontrolled pressure losses and are a major cause of unstable control.

Capacity Variations

The sizing charts give the maximum capacities which can be handled by the regulator for the given inlet and outlet pressures.

For trouble free operation the minimum flow rate should be considered to be 10% of the maximum.

Steam

If no steam capacity is given, size the regulator based on the maximum flow which can be achieved through the inlet pipe, according to our pipe sizing charts.

Alternatively, if the maximum heat requirement of the system is known, the following approximate relationship can be used.

Steam Capacity:

Kg/h = Kcals ÷ 554

kg/h = kW x 0.6446

lbs/h = B.T.U's/h ÷1000

Superheated Steam

If the steam temperature is greater than the saturated steam temperature, the capacities shown in our tables will need to be reduced.

DEGREES OF SUPERHEAT		
°C	°F	Factor
0 to 10	0 to 50	multiply by 0.96
10 to 50	50 to 100	multiply by 0.92
50 to 75	100 to 150	multiply by 0.89
75 to 100	150 to 200	multiply by 0.86
100 to 150	200 to 300	multiply by 0.82

Air and Gases

For gases other than air, divide the chart air capacity by $\sqrt{SG}$ (SG of Air = 1) to give the equivalent gas capacity.

Other Temperatures

The air/gas capacity tables are based on air at 15°C. If the actual flowing temperature is different, the chart capacity will need to be divided by $\sqrt{(T/288)}$

Where: T= flowing temperature °C + 273°k.

Safety Systems UK Ltd.

G4 DRY SATURATED STEAM CAPACITY - Kg/h

Inlet Pressure Barg	Outlet Pressure Barg	R15mm	15mm	20mm	25mm	32mm	40mm	50mm	65mm	80mm	100mm	125mm	150mm
0.70	0.35	14.4	42.5	86.7	143	215	310	534	NA	NA	NA	NA	NA
	0.07*	14.4	42.5	86.7	143	215	310	534	NA	NA	NA	NA	NA
1.00	0.65	15.3	46.7	95.3	157	239	346	594	NA	NA	NA	NA	NA
	0.55	16.3	49.5	101	166	254	367	630	NA	NA	NA	NA	NA
	0.32*	16.3	49.5	101	166	254	367	630	1072	1337	2397	NA	NA
	0.07*	16.3	49.5	101	166	254	367	630	1072	1337	2397	NA	NA
2.00	1.65	19.2	58.7	120	197	300	434	747	NA	NA	NA	NA	NA
	1.30	22.8	69.5	141	233	356	514	884	1418	1769	3171	4590	6538
	1.10	24.8	75.5	154	254	386	559	960	1540	1920	3442	4981	7095
	0.35	24.8	75.5	154	254	386	559	960	1540	1920	3442	4981	7095
	0.07*	24.8	75.5	154	254	386	559	960	1540	1920	3442	NA	NA
5.00	4.30	35.4	108	220	363	553	799	1374	NA	NA	NA	NA	NA
	4.00	39.9	121	248	408	623	900	1547	2347	2388	2978	5338	7727
	2.75	51.8	158	322	530	808	1168	2007	3219	4015	7196	10415	14834
	0.35	51.8	158	322	530	808	1168	2007	3219	4015	7196	10415	14834
	0.07*	51.8	158	322	530	808	1168	2007	3219	4015	7196	NA	NA
10.00	9.00	56.7	172	352	580	884	1279	2198	3024	3771	6759	9783	13934
	5.50	95.4	291	593	977	1489	2152	3699	5932	7398	13260	19193	27335
	1.20	95.4	291	593	977	1489	2152	3699	5932	7398	13260	19193	27335
	0.35	95.4	291	593	977	1489	2152	3699	5932	7398	13260	NA	NA
15.00	14.00	67.9	207	422	695	1059	1531	2633	3216	4011	7190	NA	NA
	12.00	108	330	673	1109	1690	2443	4199	6629	8267	14819	21448	30548
	8.25	139	423	862	1420	2164	3128	5377	8624	10755	19277	27901	39739
	2.90	139	423	862	1420	2164	3128	5377	8624	10755	19277	27901	39739
	0.80*	139	423	862	1420	2164	3128	5377	8624	10755	19277	NA	NA
20.00	19.00	78.3	238	487	802	1222	1767	3037	3360	4190	7511	NA	NA
	12.00	177	539	1101	1814	2764	3995	6868	11014	13736	24621	35636	50755
	11.00	181	552	1126	1855	2827	4086	7024	11265	14048	25180	36445	51906
	4.60	181	552	1126	1855	2827	4086	7024	11265	14048	25180	36445	51906
	3.10	181	552	1126	1855	2827	4086	7024	11265	14048	25180	NA	NA
	1.28	181	552	1126	1855	2827	4086	7024	NA	NA	NA	NA	NA
25.00	20.70	164	500	1020	1680	2560	3700	6359	9717	12118	21720	NA	NA
	13.75	220	684	1395	2297	3500	5059	8696	13946	17392	31174	45120	64261
	12.00	220	684	1395	2297	3500	5059	8696	13946	17392	31174	45120	64261
	6.30	220	684	1395	2297	3500	5059	8696	13946	17392	31174	45120	64261
	2.80	220	684	1395	2297	3500	5059	8696	NA	NA	NA	NA	NA
30.00	20.70	243	743	1516	2497	3805	5500	9454	15162	18908	33891	NA	NA
	16.50	268	817	1667	2746	4184	6047	10395	16671	20789	37264	NA	NA
	12.00	268	817	1667	2746	4184	6047	10395	16671	20789	37264	53934	76816
	8.00	268	817	1667	2746	4184	6047	10395	16671	20789	37264	53934	76816
	6.90	268	817	1667	2746	4184	6047	10395	16671	20789	37264	NA	NA
	4.60	268	817	1667	2746	4184	6047	10395	NA	NA	NA	NA	NA
35.00	20.70	305	930	1898	3126	4763	6884	11834	18979	23668	42425	NA	NA
	19.25	309	943	1923	3168	4827	6977	11993	19234	23986	42993	NA	NA
	12.00	309	943	1923	3168	4827	6977	11993	19234	23986	42993	62227	88627
	9.60	309	943	1923	3168	4827	6977	11993	19234	23986	42993	62227	88627
	7.50	309	943	1923	3168	4827	6977	11993	19234	23986	42993	NA	NA
	6.20	309	943	1923	3168	4827	6977	11993	NA	NA	NA	NA	NA
40.00	20.70	353	1074	2195	3615	5508	7961	13684	21945	27367	49055	NA	NA
	12.00	353	1074	2195	3615	5508	7961	13684	21945	27367	49055	71000	101121
	10.30	353	1074	2195	3615	5508	7961	13684	21945	27367	49055	71000	101121
	8.07	353	1074	2195	3615	5508	7961	13684	21945	27367	49055	NA	NA
	6.20	353	1074	2195	3615	5508	7961	13684	NA	NA	NA	NA	NA
42.00	20.70	369	1125	2295	3780	5760	8325	14310	22950	28619	51299	NA	NA
	12.00	369	1125	2295	3780	5760	8325	14310	22950	28619	51299	74249	105748
	10.30	369	1125	2295	3780	5760	8325	14310	22950	28619	51299	74249	105748
	8.30	369	1125	2295	3780	5760	8325	14310	22950	28619	51299	NA	NA
	6.20	369	1125	2295	3780	5760	8325	14310	NA	NA	NA	NA	NA

Useful Conversions

lbs/h = kg/h x 2.2046

* Low pressure top required for outlet pressures below 0.35 Barg

1. The Max. & Min. outlet pressure for a given inlet pressure and valve size, can be determined from the above table. E.g. a 100mm valve with an inlet pressure of 40 Barg has a maximum available outlet pressure of 20.7 Barg and a minimum of 8.07 Barg.
2. To ensure the above flows, it is critical the correct size of outlet pipe is used.
3. For super heated steam the above capacities need to be derated.

G4 AIR CAPACITY - l/s @ 15°C

Inlet Pressure Barg	Outlet Pressure Barg	R15mm	15mm	20mm	25mm	32mm	40mm	50mm	65mm	80mm	100mm	125mm	150mm
0.70	0.35	4.6	14	28.6	47.1	71.8	104	178	NA	NA	NA	NA	NA
	0.07*	4.6	14	28.6	47.1	71.8	104	178	NA	NA	NA	NA	NA
1.00	0.65	5.0	15.5	31.5	52.0	79.2	114	196	NA	NA	NA	NA	NA
	0.55	5.4	16.4	33.5	55.2	84.2	122	209	NA	NA	NA	NA	NA
	0.32*	5.4	16.4	33.5	55.2	84.2	122	209	357	445	797	NA	NA
	0.07*	5.4	16.4	33.5	55.2	84.2	122	209	357	445	797	NA	NA
2.00	1.65	6.3	19.3	39.5	65.0	99.1	143	246	NA	NA	NA	NA	NA
	1.30	7.6	23.2	47.3	77.9	118	171	295	473	590	1057	1530	2180
	1.10	8.3	25.3	51.6	85.0	129	187	322	516	643	1153	1819	2377
	0.35	8.3	25.3	51.6	85.0	129	187	322	516	643	1153	1819	2377
	0.07*	8.3	25.3	51.6	85.0	129	187	322	516	643	1153	NA	NA
5.00	4.30	11.2	34.3	70.1	115	176	254	437	NA	NA	NA	NA	NA
	4.00	12.8	39.1	79.8	131	200	289	497	765	954	1711	2477	3528
	2.75	17.0	51.8	106	174	265	383	659	1057	1318	2363	3803	4871
	0.35	17.0	51.8	106	174	265	383	659	1057	1318	2363	3803	4871
	0.07*	17.0	51.8	106	174	265	383	659	1057	1318	2363	NA	NA
10.00	9.00	17.4	53.3	108	179	272	394	678	912	1137	2039	2951	4204
	5.50	31.0	94.5	193	317	484	699	1202	1928	2404	4309	7008	8882
	1.20	31.0	94.5	193	317	484	699	1202	1928	2404	4309	7008	8882
	0.35	31.0	94.5	193	317	484	699	1202	1928	2404	4309	NA	NA
15.00	14.00	20.2	61.7	125	207	316	456	785	908	1132	2029	NA	NA
	12.00	34.3	104	213	351	536	775	1332	2099	2618	4692	6792	9673
	8.25	45.0	137	280	460	702	1014	1743	2796	3486	6249	10187	12882
	2.90	45.0	137	280	460	702	1014	1743	2796	3486	6249	10187	12882
	0.80*	45.0	137	280	460	702	1014	1743	2796	3486	6249	NA	NA
20.00	19.00	22.8	69.7	142	234	356	515	886	892	1112	1994	NA	NA
	12.00	57.5	175	357	589	897	1297	2229	3579	4459	7993	11569	16478
	11.00	58.9	180	366	603	920	1329	2284	3664	4569	8190	13307	16882
	4.60	58.9	180	366	603	920	1329	2284	3664	4569	8190	13307	16882
	3.10	58.9	180	366	603	920	1329	2284	3664	4569	8190	NA	NA
	1.28	58.9	180	366	603	920	1329	2284	NA	NA	NA	NA	NA
25.00	20.70	51.7	157	321	530	807	1167	2006	3049	3802	6815	NA	NA
	13.75	72.9	222	453	746	1137	1664	2826	4532	5651	10130	NA	NA
	12.00	72.9	222	453	746	1137	1664	2826	4532	5651	10130	14662	20882
	6.30	72.9	222	453	746	1137	1664	2826	4532	5651	10130	14662	20882
	2.80	72.9	222	453	746	1137	1664	2826	NA	NA	NA	NA	NA
30.00	20.70	78.3	238	487	802	1222	1767	3038	4872	6076	10891	NA	NA
	16.50	86.8	265	540	889	1355	1959	3367	5400	6734	12070	NA	NA
	12.00	86.8	265	540	889	1355	1959	3367	5400	6734	12070	17470	24882
	8.00	86.8	265	540	889	1355	1959	3367	5400	6734	12070	17470	24882
	6.90	86.8	265	540	889	1355	1959	3367	5400	6734	12070	NA	NA
	4.60	86.8	265	540	889	1355	1959	3367	NA	NA	NA	NA	NA
35.00	20.70	99.3	302	617	1017	1550	2241	3852	6178	7705	13811	NA	NA
	19.25	101	307	627	1032	1573	2274	3908	6268	7817	14011	NA	NA
	12.00	101	307	627	1032	1573	2274	3908	6268	7817	14011	20279	28882
	9.60	101	307	627	1032	1573	2274	3908	6268	7817	14011	20279	28882
	7.50	101	307	627	1032	1573	2274	3908	6268	7817	14011	NA	NA
	6.20	101	307	627	1032	1573	2274	3908	NA	NA	NA	NA	NA
40.00	20.70	115	350	714	1175	1791	2589	4450	7136	8899	15951	NA	NA
	12.00	115	350	714	1175	1791	2589	4450	7136	8899	15951	23088	32882
	10.30	115	350	714	1175	1791	2589	4450	7136	8899	15951	23088	32882
	8.07	115	350	714	1175	1791	2589	4450	7136	8899	15951	NA	NA
	6.20	115	350	714	1175	1791	2589	4450	NA	NA	NA	NA	NA
42.00	20.70	120	367	748	1233	1878	2715	4666	7483	9332	16728	NA	NA
	12.00	120	367	748	1233	1878	2715	4666	7483	9332	16728	24211	34482
	10.30	120	367	748	1233	1878	2715	4666	7483	9332	16728	24211	34482
	8.30	120	367	748	1233	1878	2715	4666	7483	9332	16728	NA	NA
	6.20	120	367	748	1233	1878	2715	4666	NA	NA	NA	NA	NA

Useful Conversions

SCFM = 1/sec x 2.12

Nm^3/h = 1/sec x 3.60

* Low pressure top required for outlet pressures below 0.35 Barg

1. The Max. & Min. outlet pressure for a given inlet pressure and valve size, can be determined from the above table. E.g. a 100mm valve with an inlet pressure of 40 Barg has a Maximum available outlet pressure of 20.7 Barg and a minimum of 8.07 Barg.
2. To ensure the above flows, it is critical the correct size of outlet pipe is used. See page 17.
3. For gases other than air and temperatures other than 15°C refer to page 14

CAPACITIES FOR STEAM IN kg/h (For lbs/h multiply capacity by 2.2046.) See opposite for air capacities

Pressure in Psig	Pressure in Barg	PIPE SIZE (millimetres) 15	20	25	32	40	50	65	80	100	125	150	200	250	300	350
7.5	0.5	9 *0.03*	18 *0.03*	30 *0.03*	45 *0.03*	88 *0.03*	159 *0.03*	308 *0.03*	476 *0.03*	705 *0.03*	1270 *0.03*	1540 *0.03*	3080 *0.02*	4620 *0.02*	6810 *0.02*	9430 *0.02*
15	1.0	12 *0.04*	22 *0.04*	39 *0.04*	59 *0.04*	118 *0.04*	218 *0.04*	400 *0.04*	590 *0.04*	975 *0.04*	1630 *0.04*	2270 *0.04*	4000 *0.03*	6430 *0.03*	9480 *0.03*	13100 *0.03*
30	2.0	16 *0.05*	33 *0.06*	55 *0.06*	88 *0.06*	177 *0.06*	305 *0.06*	545 *0.06*	840 *0.06*	1475 *0.06*	2450 *0.06*	3500 *0.06*	6140 *0.05*	8920 *0.04*	13100 *0.04*	18200 *0.04*
45	3.0	20 *0.07*	44 *0.08*	75 *0.08*	118 *0.09*	241 *0.10*	419 *0.10*	795 *0.09*	1180 *0.08*	1900 *0.08*	3080 *0.08*	4400 *0.08*	8160 *0.07*	12400 *0.06*	16700 *0.05*	23200 *0.05*
60	4.0	24 *0.10*	54 *0.10*	97 *0.11*	147 *0.12*	309 *0.13*	545 *0.12*	1040 *0.12*	1500 *0.12*	2450 *0.11*	4080 *0.11*	5670 *0.11*	10200 *0.10*	16900 *0.09*	23500 *0.08*	30400 *0.07*
75	5.0	29 *0.11*	67 *0.12*	116 *0.13*	180 *0.14*	359 *0.14*	625 *0.14*	1180 *0.14*	1820 *0.14*	2950 *0.13*	4760 *0.13*	6670 *0.13*	13100 *0.12*	20300 *0.11*	28600 *0.10*	37500 *0.09*
90	6.0	36 *0.12*	76 *0.14*	136 *0.15*	211 *0.16*	427 *0.16*	750 *0.16*	1400 *0.16*	2130 *0.16*	3450 *0.16*	5800 *0.16*	7950 *0.15*	15000 *0.14*	23700 *0.13*	33600 *0.12*	44500 *0.11*
100	7.0	43 *0.14*	91 *0.16*	154 *0.18*	245 *0.18*	490 *0.19*	864 *0.19*	1650 *0.19*	2450 *0.18*	3950 *0.18*	6600 *0.18*	9300 *0.17*	17200 *0.16*	27100 *0.15*	38600 *0.14*	51500 *0.13*
115	8.0	48 *0.15*	104 *0.17*	182 *0.20*	272 *0.21*	545 *0.22*	955 *0.22*	1860 *0.22*	2640 *0.20*	4300 *0.20*	7270 *0.20*	10200 *0.19*	19000 *0.18*	30500 *0.17*	43700 *0.16*	58500 *0.15*
130	9.0	52 *0.18*	113 *0.20*	200 *0.24*	309 *0.25*	613 *0.26*	1140 *0.26*	2180 *0.26*	3090 *0.25*	5080 *0.25*	8650 *0.25*	12200 *0.23*	21800 *0.22*	34800 *0.20*	50000 *0.19*	65500 *0.17*
145	10.0	57 *0.20*	123 *0.23*	222 *0.27*	336 *0.30*	668 *0.30*	1200 *0.30*	2360 *0.29*	3400 *0.28*	5580 *0.28*	9550 *0.28*	13400 *0.27*	25000 *0.26*	39900 *0.24*	57500 *0.23*	76100 *0.21*
175	12.0	67 *0.23*	136 *0.27*	259 *0.31*	418 *0.34*	818 *0.35*	1450 *0.35*	2900 *0.37*	4090 *0.36*	6850 *0.35*	11500 *0.35*	16100 *0.34*	30000 *0.31*	47500 *0.29*	68700 *0.28*	91700 *0.26*
220	15.0	75 *0.29*	168 *0.33*	318 *0.39*	510 *0.42*	1020 *0.44*	1820 *0.45*	3640 *0.46*	5220 *0.46*	8600 *0.46*	14300 *0.46*	19700 *0.43*	33200 *0.41*	59000 *0.39*	84600 *0.37*	113900 *0.35*
260	18.0	93 *0.35*	227 *0.40*	395 *0.46*	617 *0.49*	1230 *0.51*	2270 *0.52*	4300 *0.54*	6450 *0.55*	10900 *0.55*	17700 *0.55*	24500 *0.53*	47600 *0.51*	74100 *0.49*	106900 *0.47*	144800 *0.45*
290	20.0	107 *0.38*	250 *0.44*	435 *0.50*	680 *0.55*	1360 *0.57*	2460 *0.59*	4760 *0.62*	7030 *0.64*	12200 *0.64*	20000 *0.64*	28200 *0.63*	54000 *0.61*	85400 *0.59*	123600 *0.57*	168100 *0.55*
360	25.0	134 *0.47*	287 *0.54*	522 *0.61*	838 *0.66*	1680 *0.68*	2890 *0.71*	5400 *0.74*	8790 *0.76*	14700 *0.78*	24200 *0.78*	36100 *0.78*	66600 *0.76*	106000 *0.74*	154000 *0.72*	210000 *0.70*
435	30.0	159 *0.56*	342 *0.64*	619 *0.72*	995 *0.78*	2010 *0.82*	3450 *0.85*	6470 *0.89*	10500 *0.91*	17600 *0.93*	28900 *0.93*	43100 *0.93*	79600 *0.91*	127100 *0.89*	185000 *0.87*	253400 *0.85*
510	35.0	186 *0.66*	399 *0.75*	721 *0.84*	1170 *0.92*	2370 *0.98*	4060 *1.01*	7550 *1.04*	12200 *1.06*	20400 *1.08*	33500 *1.08*	50100 *1.08*	92700 *1.06*	148200 *1.04*	216200 *1.02*	296400 *1.00*
580	40.0	214 *0.76*	456 *0.86*	820 *0.95*	1320 *1.03*	2690 *1.10*	4610 *1.14*	8550 *1.17*	13900 *1.20*	23300 *1.23*	38200 *1.23*	57100 *1.23*	105800 *1.21*	169400 *1.19*	247500 *1.17*	339700 *1.15*
610	42.0	221 *0.79*	420 *0.89*	847 *0.99*	1360 *1.07*	2770 *1.14*	4750 *1.18*	11900 *2.20*	14400 *1.26*	24100 *1.29*	39700 *1.29*	59200 *1.29*	109800 *1.27*	175800 *1.25*	256900 *1.23*	352800 *1.21*

Safety Systems UK Ltd.

Estimated Air capacities – multiply chart capacities as follows:

(1) Multiply chart capacity by 0.66 to give Air flow in SCFM

(2) Multiply chart capacity by 1.2 to give Air flow in Nm^3/h

Estimated Air pressure drops:

For guidance multiply the chart pressure drop by 1.23 to give an approximate Air pressure drop.

Note (1) Figures in *blue italics* show pressure drops (Barg) for equivalent lengths equal to 360 pipe diameters. When using this table, allowance should be made for the effects of bends and fittings in the pipe line.

Note (2) All capacity values are based on acceptable pressure drops, not velocity per unit length of pipe. Higher pressure drops will result in higher steam velocities and increased noise levels.

Example

Question: What size pipe will pass 800 kg/h of dry saturated steam at 7 Barg?

50mm pipe will pass 864 kg/h at 7 Barg (Pressure drop over 18m (360 pipe diameters) will be approximately *0.19* Barg).

SIZING EXAMPLE

Requirement

Fluid - Steam @ 184°C

Inlet Pressure - 10 Barg

Outlet Pressure - 5.5 Barg

Required Capacity - 1100 kg/h

Sizing

Refer to the sizing chart on page 15 At an inlet pressure of 10 Barg and at an outlet pressure of 5.5 Barg.

The first valve to pass more than 1100 kg/h is the 32mm (1¼"), which will pass 1489kg/h.

Selection

We can choose between figures 2042, 2043 or 2046. The choice will then depend on the customer's requirements on connections and materials. The most economical choice would be the 2042 screwed bronze valve.

At 5.5 Barg a standard top is acceptable (ref. page 6), only one diaphragm is required (see opposite) and the black spring (ref. page 13) should be fitted with a range of 0.7 to 7.0 Barg.

Inlet Pipe Size

Refer to page 17, at 10 Barg the smallest pipe to pass our required flow of 1100kg/h is 50mm (2").

Outlet Pipe Size

Refer to page 17, at 5.5 Barg the smallest pipe to pass our required flow of 1100kg/h is 65mm (2 ½").

SPARES

Routine Service Pack:

1 Diaphragm
1 Set of Piston Rings
1 Pilot Valve Cap
1 Set of Joints

Complete Repair kit:

1 Diaphragm
1 Set of Piston Rings
1 Pilot Valve Assembly
1 Main Valve
1 Main Valve Seat
1 Main Valve Spring
1 Set of Joints
1 Pilot Valve Cap

Each carton of spares contains a leaflet, which not only identifies the parts supplied, but also has a recommended list of 'check-points' to help identify common causes of reducing valve trouble.

DIAPHRAGMS

One diaphragm is required for reduced pressures up to 10.5 Barg (150 Psig), but two are required for reduced pressure above this figure.

The 'G4 surplus' valve can also be described as a 'pressure maintaining' or 'pressure sustaining' valve.

In these days of high energy costs and environment emission controls, steam and air systems can be very expensive to install and run. Often most industrial applications need steam or air for the main process plant and it is critical to maintain the supply to these processes. Additionally, such plants will also have other demands of a less critical nature such as compressed air lines, heating and cleaning systems.

Obviously two separate systems could be employed, providing that the necessary funds are available to install and run both. Alternatively the secondary and less critical applications can be run from the surplus generated from the main system. However, during periods of extreme demand the main process could be starved of steam or air, resulting in production disruption and product loss. (See figure 1).

The solution is to fit a 'G4 surplus' valve.

The 'G4 surplus' valve is designed to be installed in branch lines to non-essential equipment (see figure 1), to maintain the upstream pressure, thus maintaining the supply to the more vital process and subsequently maintaining production from the system. Alternatively to dump flow surplus to requirements, to a drain or atmosphere.

Additionally if the pressure in a boiler or air accumulator is allowed to fall too low, a lot of energy will be required to build up the pressure once again (see figure 2).

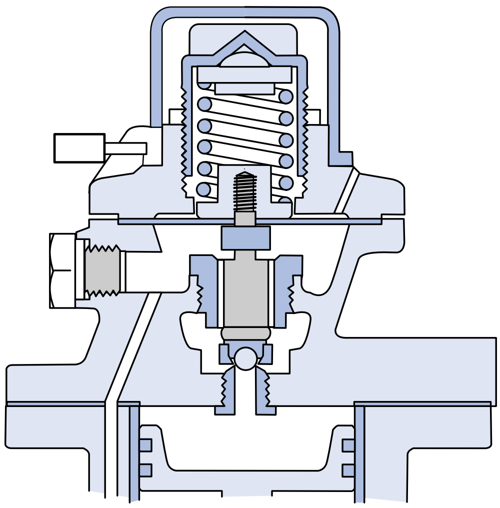
The solution is to fit a 'G4 Maintaining' valve.

The 'G4 Maintaining' valve is designed to be installed in the main pipeline from the boiler or an air compressor (see figure 2), to maintain the pressure in the boiler or accumulator, thus preventing the boiler or accumulator from becoming exhausted.

Operation

The inlet pressure is directed under the diaphragm. A small increase in pressure above the set pressure lifts the diaphragm and opens the pilot valve, which in turn opens the main valve. Subsequently when excess demand drops the pressure below the required level, the adjusting spring will overcome the pressure under the diaphragm and close the pilot valve. This in turn causes the main valve to close, thus cutting the surplus supply and/or maintaining pressure in the main line, boiler or accumulator.

This duty and valve type is known by many names. As can be seen in this text the valve 'maintains' or 'sustains' pressure in the main line, boiler or accumulator and can use 'surplus' pressure for non-essential services.



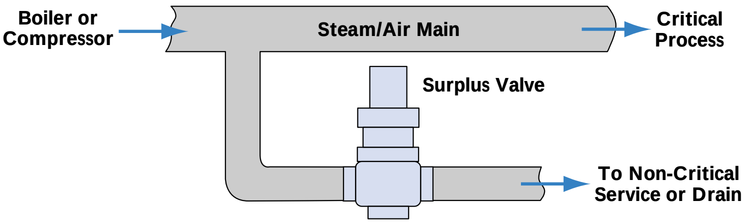


Figure 1

When the G4 surplus valve is closed, the full flow from boiler/compressor goes to the critical process.

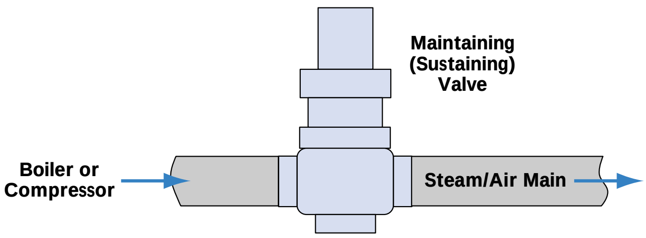


Figure 2

When the G4 maintaining valve is closed, the full flow from boiler/compressor is stopped and the minimum pressure of the boiler/accumulator is maintained.

G4 SURPLUS/MAINTAINING VALVE SELECTION

Example 1: Surplus duty (see figure 1, page 20)

A steam boiler normally working at a pressure of 10 Barg, delivers steam to a critical process which must not fall below 8 Barg (closing pressure) in order to preserve correct operation. The excess (surplus) capacity produced can be used for a non-critical service. If this non-critical service requires 3500 Kg/h of saturated steam, what size of G4 surplus valve will be required?

A surplus valve is normally sized on the minimum allowable pressure drop across the valve ie: at an equivalent pressure equal to the maximum outlet setting of the valve. Looking at page 15 and the 10 Barg inlet pressure, the maximum outlet setting is 9 Barg. The required flow is 3500kg/h by 0.48 and it can be seen that the 80mm (3") valve will pass a maximum flow of 3771kg/h.

Example 2: Pressure maintaining duty (see figure 2, page 20).

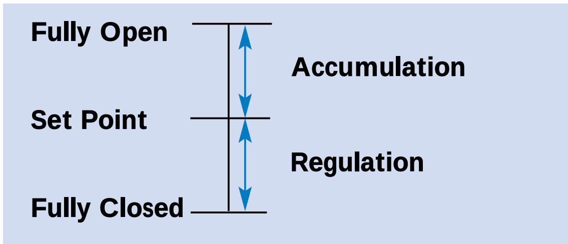
A steam boiler, normally working at a pressure of 10 Barg, delivers steam to a process. It is determined that the boiler pressure must not fall below 8 Barg. The process normally requires 3500 Kg/h of saturated steam, what size of G4 maintaining valve will be required?

Selecting a pressure maintaining valve is the same as selecting a surplus valve, therefore follow the same sizing procedure.

SURPLUS/MAINTAINING VALVE PERFORMANCE

A small pressure rise (accumulation) above the set point is required to fully open the valve, and a small pressure drop (regulation) below the set pressure is required to close the valve. It is therefore important to set the valve higher than the pressure at which the valve must be closed, to allow for this regulation.

In the above examples the valve must be set at a minimum of 8.15 Barg. This allows for the regulation of 0.15 Barg to ensure the valve is fully closed at 8 Barg. It can also be seen that the valve will be fully open by 8.35 Barg (i.e. 0.2 Barg accumulation above the set point of 8.15 Barg).



Closing Pressure		Accumulation		Regulation	
Barg	(Psig)	Barg	(Psig)	Barg	(Psig)
0.35 - 3.5	(5 - 50)	0.10	(1.5)	0.04	(0.5)
3.5 - 7.0	(50 - 100)	0.10	(1.5)	0.10	(1.5)
7.0 - 10.3	(100 - 150)	0.20	(3.0)	0.15	(2.0)
10.3 - 20.7	(150 - 300)	0.50	(7.0)	0.70	(10.0)

Spring selection

If possible, it is advisable to select a spring which has at least 10% adjustment above the required set pressure. As can be seen from the chart, the springs have overlapping ranges and therefore, where possible, the spring with the lowest pressure range should be selected.

In the examples we require a spring for a pressure of 8.15 Barg (ideally plus 10%, say 9 Barg). As can be seen the white, green and red springs can do this pressure, however the white spring should be selected as it has the lower range.

Spring Colour Code	Spring Pressure Range	
	Barg	(Psig)
Yellow	0.35 - 3.5	(5 - 50)
Black	0.7 - 7.0	(10 - 100)
White	2.8 - 10.3	(40 - 150)
Green	3.5 - 14.0	(50 - 200)
Red	7.0 - 20.7	(100 - 300)

Valve selection

Referring to the charts on page 3 and page 22, it can be seen that the figures 2044 and 2045 are suitable for the given conditions.

DIAPHRAGMS

For pressures above 10.3 Barg (150 Psig) two diaphragms must be fitted. Below this pressure only one diaphragm is fitted.

TECHNICAL SPECIFICATION – G4 SURPLUS/MAINTAINING VALVES

Figure No.		2042	2043	2044	2045
Size		15 – 50mm (½ – 2ins)	15 – 50mm (½ – 2ins)	65 – 100mm (2½ – 4ins)	65 – 100mm (2½ – 4ins)
Connections		Screwed	Flanged	Flanged	Flanged
Material		Bronze	Bronze	Cast Iron	Cast Steel
Max. inlet pressure		20.7 Barg (300 Psig)	20.7 Barg (300 Psig)	20.7 Barg (300 Psig)	20.7 Barg (300 Psig)
Min. inlet pressure		0.7 Barg (10 Psig)	0.7 Barg (10 Psig)	1.03 Barg (15 Psig)	1.03 Barg (15 Psig)
Temperature range	**Min.**	**Max.**	**Max.**	**Max.**	**Max.**
Stainless steel seat	–20°C (–68°F)	260°C (500°F)	260°C (500°F)	220°C (430°F)	260°C (500°F)
Nitrile seat	–20°C (–68°F)	100°C (212°F)	100°C (212°F)	NA	NA
Viton seat	–18°C (–64°F)	150°C (302°F)	150°C (302°F)	NA	NA
PTFE seat	–20°C (–68°F)	170°C (338°F)	170°C (338°F)	170°C (338°F)	170°C (338°F)