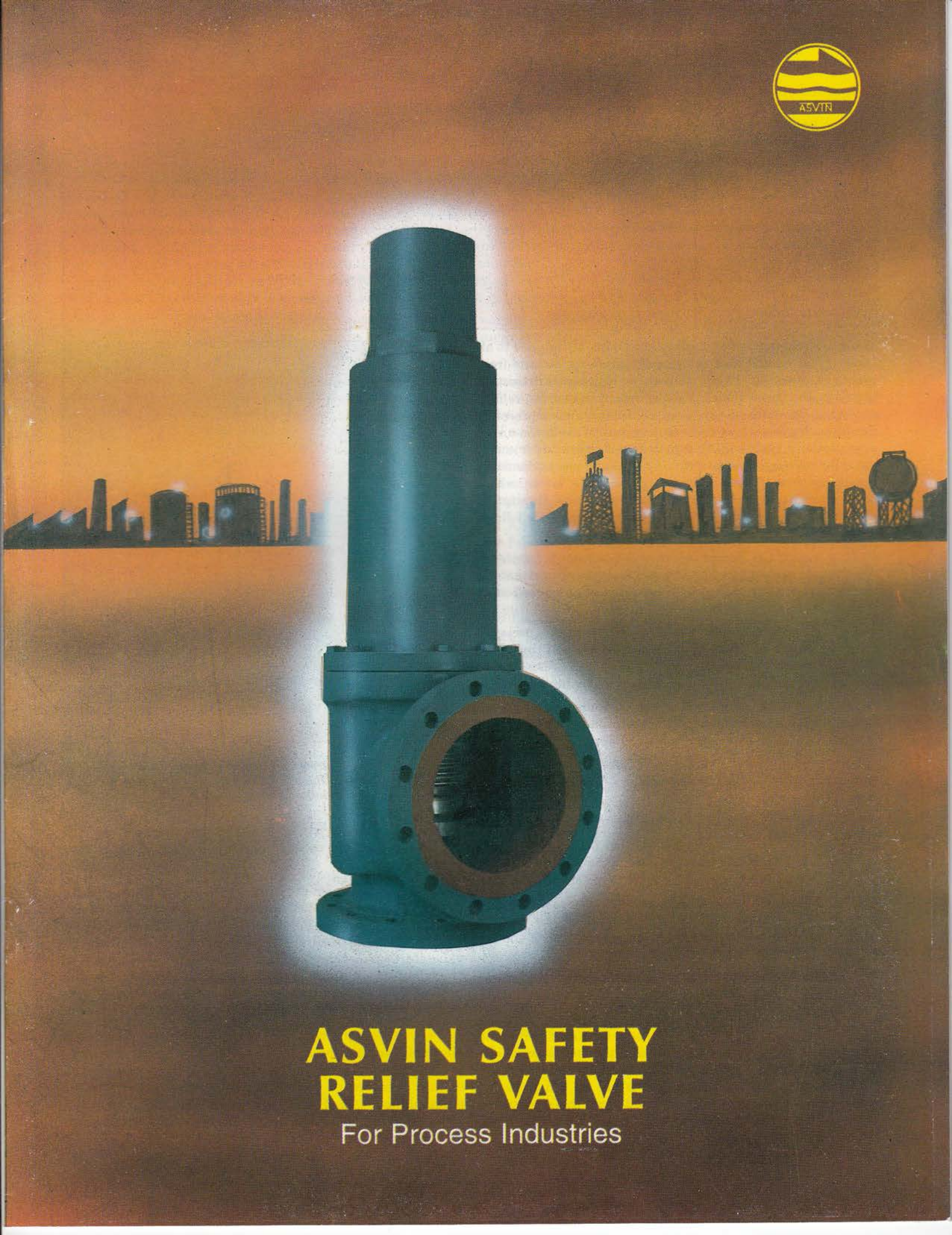


ASVIN SAFETY RELIEF VALVE

For Process Industries

Founded on necessity and built on dependability, ***ASIAN INDUSTRIAL VALVES AND INSTRUMENTS*** *have enjoyed leadership in the development and manufacture of Safety - Relief Valves. Since 1980, ASVIN has always been to produce Safety - Relief Valves which will, allow leak free operation at pressures very close to the set pressure; Relieve consistently at the same pressure; Reseat bubble-tight after a short blow down and operate through many cycles without maintenance. ASVIN series 1800 full nozzle top guided Safety - Relief Valves are manufactured in accordance with requirements of ASME Code Section VIII. Series 1800 ASVIN Safety - Relief Valves are available in sizes 1"D2" to 8"T10" with inlet flange ratings of class 150, 300, 600, 900, 1500 and 2500 ANSI. Standard outlet flanges are class 150 or class 300 ANSI depending on valve size and rating. Materials, dimensions, sizes and pressure- temperature ranges conform to API Standard 526. Optional combinations of stainless steel, monel and hastelloy C special materials are also available for unusual, difficult or corrosive applications. Designed to provide high quality standardised over pressure protection to the process and power industries, the ASVIN Series 1800 unified line of valves will handle most air, gas, steam, vapour and liquid applications. The information in this catalogue will enable the user to size and select the proper valve for suitable most application.*

The descriptions relief and safety are commonly applied to all types of valves designed to protect systems or vessels from excessive pressure. There is however a general distinction between the two. Relief Valves are designed to relieve excessive pressure in systems containing incompressible fluids (i.e. liquid), where there is no chance of explosion under over-pressure. Safety Valves are designed to provide immediate relief of over-pressure with any fluid and are particularly applicable to compressible fluids (e.g. air, gases, steam) which could cause explosion if over pressurised. A brief description of pressure - relieving devices and their performance follows herein.

Safety Valve : A Safety Valve is an automatic pressure relieving device actuated by the static pressure upstream of the valve characterised by rapid full opening or pop action. It is used for gas or vapour service.

Relief Valve : A Relief Valve is an automatic pressure relieving device actuated by the static pressure of the valve. The valve opens in proportion to the increase in pressure over the opening pressure. It is used primarily for liquid service.

Safety - Relief Valve : A Safety - Relief Valve is an automatic pressure relieving device suitable for use as either a Safety or Relief Valve, depending on application.

Pressure Relief Valve : A Pressure Relief Valve is a generic term applying to Relief Valves, Safety Valves, or Safety - Relief Valve.

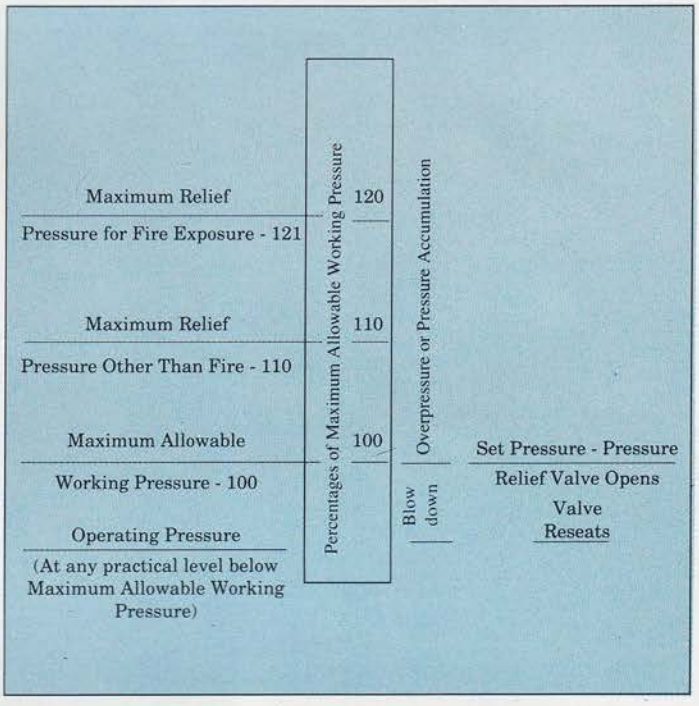
CLASSES OF SAFETY VALVES (BS : 5759)

Ordinary Safety Valve : Valve member lifts automatically a distance of atleast 1/24th of the bore of the seating member with an overpressure not exceeding 10% of the set pressure.

High Lift Safety Valve : Valve member lifts automatically a distance of atleast 1/12th of the bore of the seating member with an overpressure not exceeding 10% of the set pressure.

Full Lift Safety Valve : Valve member lifts automatically to give a discharge area between 100% and 80% of the minimum area at an overpressure not exceeding 5% of the set pressure.

Maximum allowable working pressure : As defined in the construction codes for pressure vessels, the maximum allowable working pressure depends on the type of material, its thickness and the service conditions set as the basis for design. The vessel may not be operated above this pressure or its equivalent at any metal temperature other than that used in its design.



Relationship between various terms used in connection with pressure relieving valve installation (when set pressure is the maximum allowable working pressure)

Operating Pressure : The operating pressure of a vessel is the pressure in psig. to which the vessel is usually subjected in service.

Set Pressure : The set pressure, in psig. is the inlet pressure at which the Pressure Relief Valve is adjusted to open under service conditions. In a Relief or Safety - Relief Valve on liquid service, the set pressure is the inlet pressure at which the valve starts to discharge under service conditions. In a Safety or Safety-Relief Valve in gas or vapour service, the set pressure is the inlet pressure at which the valve pops under service conditions.

Accumulation : Pressure increase over the maximum allowable working pressure of the vessel during discharge through the Pressure - Relief Valves (expressed as a percent of that pressure or in pounds per square inch) is called accumulation. Maximum allowable accumulations are established by the applicable ASME codes for operating and fire contingencies.

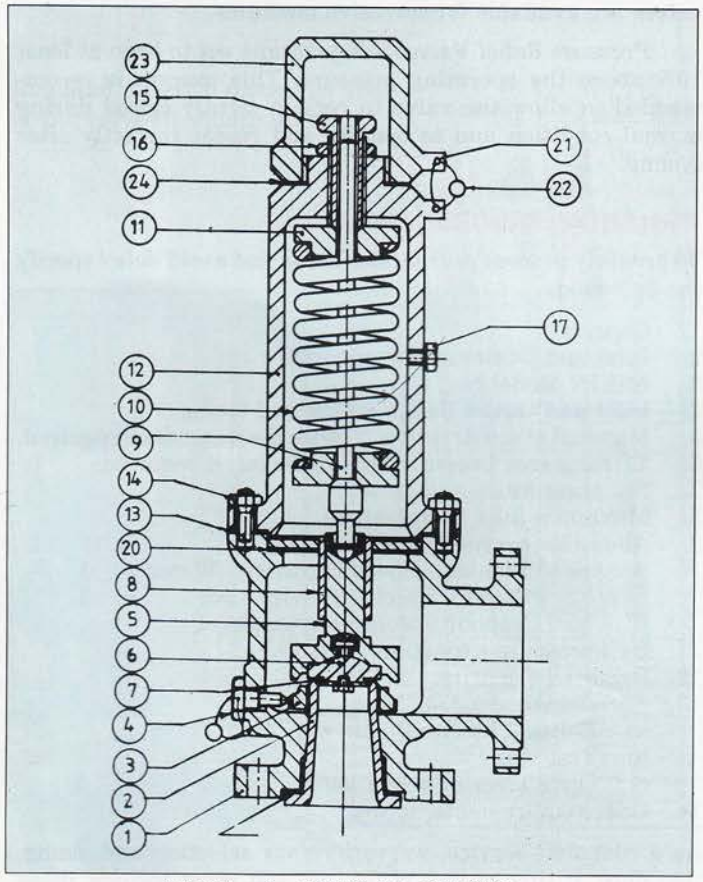
Over Pressure : Pressure increase over the set pressure of the relieving device is over pressure. It is the same as accumulation when the relieving device is set at the maximum allowable working pressure (MAWP) of the vessel. The over pressure may be greater than the allowable accumulation if the valve is set lower than MAWP of the vessel.

Blow down : Blow down is the difference between the set pressure and the reseating pressure of a pressure relief valve, expressed as percent of the set pressure or in pounds per square inch.

Lift : Lift is the actual travel of the disc away from closed position when a valve is relieving.

Back pressure : Back pressure is the static pressure existing at the outlet of a pressure relief device due to pressure in the discharge system.

ASVIN 'O' Ring seat pressure seal for conventional and balanced bellows : Although limited in pressures, the 'O' Ring design received phenomenal acceptance since it made possible complete tightness at pressures much closer to the valve set pressure than was ever possible with the standard metal to metal seats after service. ASVIN 'O'-Ring seat pressure seal design allows the use of the 'O' Ring seat seal to higher pressures and the spring load is solely carried by the metal to metal portion of the seat with the 'O' Ring becoming a pressure seal within its recessed chamber and the outer edge of the nozzle, assuring the ultimate in tightness. ASVIN 'O' Ring seat pressure seal is available in both Conventional and Balanced Bellows construction - for pressures upto a maximum of 1500 psig.



ASVIN series 1800 Safety Relief Valve

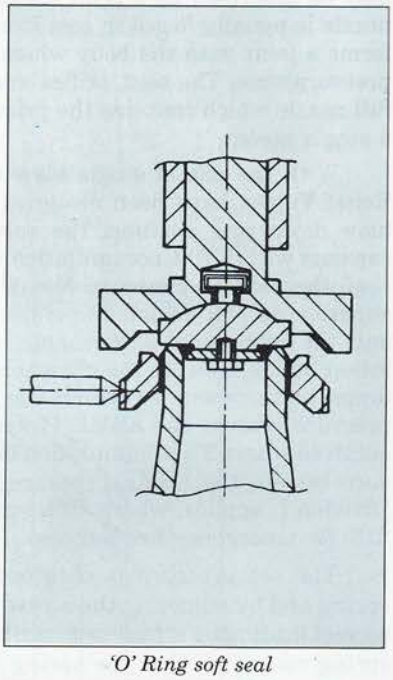
ASVIN PILOT OPERATED SAFETY VALVES : In addition to the aforementioned Safety and Safety - Relief Valves which are integral, there are various types of pilot operated Safety Valves. In ASVIN Pilot operated valve the spring provides for approximately 75 % of the disc loading; the gas or vapour supplies the remainder through a pilot valve. When the pressure in the vessel reaches the set pressure, the ASVIN Pilot Valve relieves the gas pressure, which contributes to the disc loading to the atmosphere causing the Safety Valve to open wide.

While operating characteristic may differ in detail, both safety valves and relief valves are of similar basic design normally direct action spring type. Lever and weight or dead weight types are obsolete but may still be found in use in sugar industries.

A direct spring loaded Safety Relief Valve is the basic requisite for an angle type valve body having an inlet connection capable of containing the primary inlet pressure and temperature conditions. The body and outlet connection, as well as bonnet, is designed for the lower pressure of atmosphere or the pressure relieving system, called the secondary pressure zone or back pressure. The inlet incorporates a valve seat or nozzle which is matched with a disc, for full closure of the inlet port.

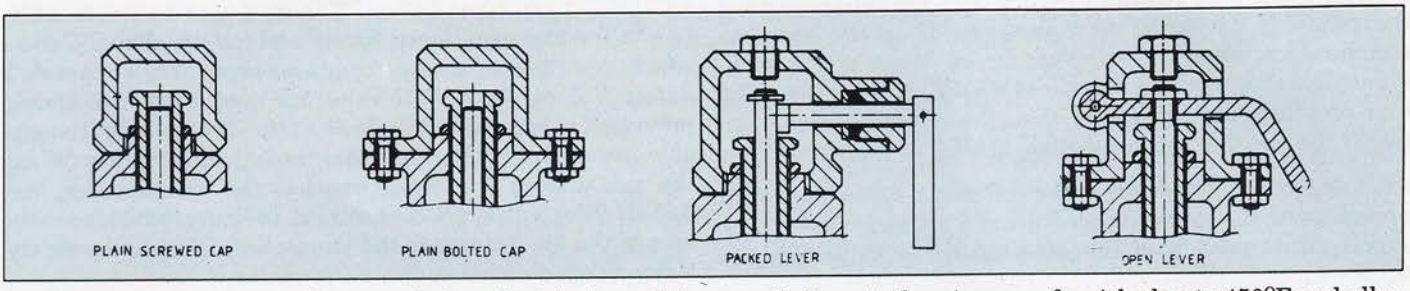
ASVIN Safety-Relief Valves are specifically designed to give full opening with a little over pressure. The static head developed by the secondary orifice over a larger area of the disc and the kinetic energy of the gas are utilised to overcome the spring force on the disc, as it lifts, resulting in pop action.

Part No.	Part Name
1.	Body
2.	Nozzle
3.	Nozzle ring
4.	Blow down screw
5.	Disc holder
6.	Disc
7.	'O' Ring
8.	Guide
9.	Spindle
10.	Spring
11.	Spring button
12.	Bonnet
13.	Bonnet stud
14.	Bonnet nut
15.	Adjusting screw
16.	Check nut
17.	Bonnet plug
18.	Nozzle gasket
19.	Screw gasket
20.	Guide gasket
21.	Seal & Wire
22.	Seal clip
23.	Cap
24.	Cap gasket



'O' Ring soft seal

Standard tightness of 'O' ring valves: No bubble at 95% of set pressure. Applies to both conventional and balanced bellows valves. At set pressures 100psig. and below, leakage test shall be made at 5psig. below the set pressure.



Safety-Relief Valve bodies are designed with the outlet sized larger than the inlet. This is necessary for expanding fluids such as gases, vapours, etc. Pressure Relief Valves must always discharge to a lower pressure. This lower outlet pressure requires an increase in pipe size, sufficient to keep the variation in back pressure from exceeding 10% of the set pressure, as a general rule for conventional valves.

The closed bonnet is used when the fluid must be contained within the valve body and discharge piping. Flanged valves for steam service usually have an open spring. All bonnet type valves have pressure tight screwed cap over the adjusting screw as standard. Bolted caps, lifting levers, either open or packed, are optional. A lifting lever is required by the codes for hot water greater than 140°F in addition to steam and air service.

Where a constant back pressure exists on a conventional valve, the back-pressure is subtracted from the set pressure for a differential test pressure. Further compensation for temperature, if necessary, results in a cold differential test pressure.

Pressure Relief Valves have an inlet port and seat. This may be described as a semi nozzle or full nozzle. The semi nozzle is usually found in cast iron / carbon steel valves and forms a joint with the body which is located in the primary pressure zone. The seat, orifice and inlet flange facing of the full nozzle which contains the primary inlet pressure, will be a single piece.

With the use of single blow down ring, ASVIN Safety Relief Valves have been designed so that regardless of the blow down ring position, the valve will flow its full rated capacity within 10% accumulation which section VIII Division I of the ASME Pressure Vessel Code allows. With this superior ASVIN design the single blow down ring controls only the operational performance of the valve as the accumulation builds towards the allowable 10% and as the pressure drops to the point at which the valve reseats. For fired pressure vessels, the ASME Power Boiler Code, Section I is enforced where 3% accumulation is allowed. For unfired pressure vessels, the ASME Pressure Vessel Code, Section VIII, Division I, applies, where 10% accumulation is allowed, and 21% for emergency fire purpose.

The set pressure is obtained by selecting the proper spring and by adjusting the screw which compresses it to the correct loading by actual test. Springs are classed in different spring ranges so that the spring is never overstressed and that proper flexibility and clearance between the coils permit full lift.

The spring in a Safety or Relief Valve in service for pressures upto and including 250psi shall not be reset for any pressure more than 10% above or 10% below for which the valve is marked. For higher pressures, the spring shall not be reset for any pressure more than 5% above or 5% below for which the Safety or Relief Valve is marked.

Carbon steel springs are furnished upto 450°F and alloy steel for over 450°F on closed bonnet valves. For temperatures below minus 20°F, alloy steel springs and bodies are recommended to prevent impact failure. Bronze valves are also used for subzero service.

For corrosive service, either corrosion resistant springs or special coated springs are available to prevent stres corrosion and cracking. The use of balanced bellows valves will isolate the spring so that a carbon steel spring and bonnet may be satisfactory. However, such valves must have vented bonnets. For valves subject to icing when discharging, a knife edged seat is effective.

Test gags are available for all valves although unfired vessels are usually hydrostatically tested by blanking off the vessel nozzle. Test gags must never be left installed. There are various methods of emergency depressurising a vessel through the Pressure Relief Valve.

Screwed inlet and outlet valves are usually used for liquid thermal expansion in the process industries. This would be the Relief Valve type without blowdown ring. Steel and bronze valves are generally used but stainless steel valves are available for corrosive mediums.

Pressure Relief Valves are generally set to open at least 10% above the operating pressure. This margin is recommended to allow the valve to remain tightly closed during normal condition and to operate and reseat correctly after cycling.

ORDERING INFORMATIONS :

To properly process your tender/order and avoid delay specify the following:

1. Quantity.
2. Inlet and Outlet size.
3. ASVIN Model No.
4. Inlet and Outlet flange rating and facing.
5. Material of construction, if other than standard required.
6. 'O' Ring seat pressure seal material, if required.
7. Set pressure.
8. Maximum inlet temperature.
9. Allowable overpressure.
10. Service - Liquids - Specific gravity - Water = 1
    Gases - Specific gravity - Air = 1
    Vapour - Molecular weight
11. Backpressure - constant/variable.
12. Required Capacity.
13. Accessories :
    a) Bolted / Screwed-plain cap
    b) Test Gag
    c) Open lever / Packed lever
14. Code requirements, if any.

As a customer service, we verify your selection and sizing, therefore, if this service is desired you must include these informations.

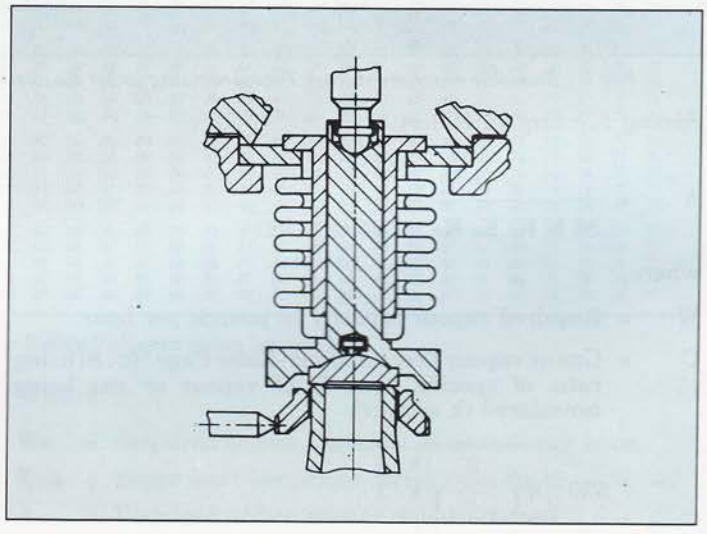
SIZING SAFETY-RELIEF VALVES

In order to establish the size of a relieving device for any application, the relief requirements must first be determined. Reasonable care should be exercised in determining the various conditions that can set up relief requirements. Given the rate of fluid flow to be relieved, the usual procedure is to calculate first the minimum area required in the valve orifice for the conditions contained in one of the following formulas.

Conventional Valves - for constant back pressure only.

The conventional valve may be used when the variation in back pressure does not exceed 10% of the set pressure, provided the corresponding variation in set pressure is acceptable. Conventional Safety-Relief Valves have been employed where the discharge is through a short tail pipe venting into the atmosphere or through a low pressure manifold system that would carry the discharge of one or more valves to a remote location for disposal. If back pressure is constant, it can be taken into account in adjusting the set pressure.

Balanced Valves - for variable or constant backpressure. Balanced Bellows Safety - Relief Valves incorporate means for minimising the effect of back pressure on the performance characteristics - opening pressure, closing pressure, lift and relieving capacity. The bellow covers the disc, guide so as to ex-clude the working fluid from the bonnet. To provide for a possible bellows failure or leak, the bonnet must be vented separately from the discharge. The balanced valve is used to prevent corrosion of the guiding surfaces of a Safety-Relief Valve, to confine the lading fluid and prevent contamination, or to make the valve suitable for variable back pressure service. When the balanced valve is used under constant or variable back pressure conditions, the valve capacity is affected, depending upon the percentage of maximum pressure to the flowing pressure of the valve, and hence a factor for the correction of the valve capacity is necessary. Since the effect on the valve capacity is different in liquid service than in vapour or gas services, correction factors are needed in each case.



Bellows details - Asvin Balanced Safety - Relief Valve

Sizing for Gas or Vapour Relief

Required effective discharge area of the valve in square inches,

$$A = \frac{W\sqrt{TZ}}{CKP\,K_b\sqrt{M}} = \frac{V\sqrt{TZM}}{6.32\,CKP\,K_b} = \frac{V\sqrt{TZG}}{1.175\,CKP\,K_b}$$

Gas or Vapour	*Vapours*	*Gases*
Mass flow with Molecular weight	Volume flow with Molecular weight	Volume flow with Specific Gravity

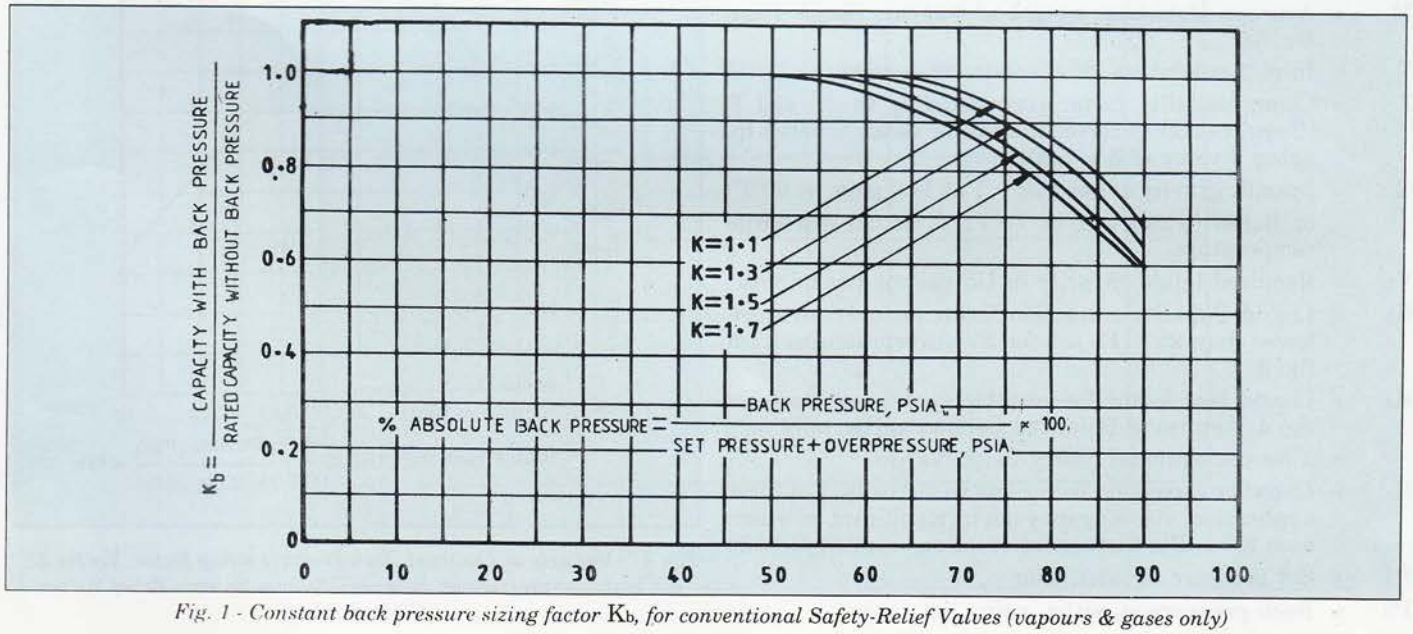


Fig. 1 - Constant back pressure sizing factor K_b, *for conventional Safety-Relief Valves (vapours & gases only)*

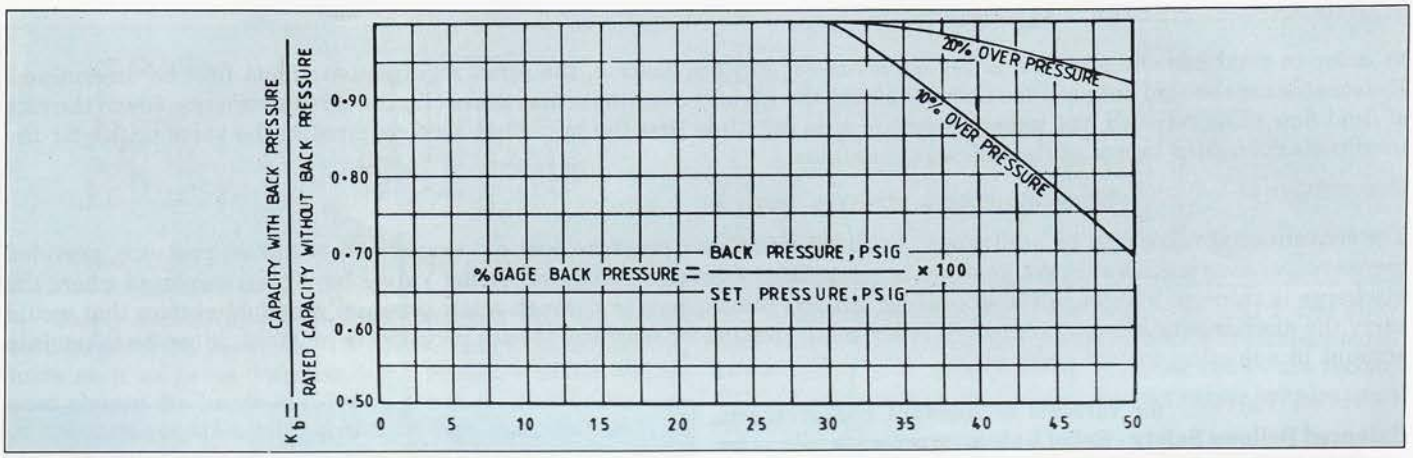


Fig. 2 : Variable or constant Back Pressure sizing factor K_b, for Balanced Bellows Safety - Relief Valves (Vapours and Gases only)

Sizing for Liquid Relief

$$A = \frac{V_L \sqrt{G}}{38\ K\ K_p\ K_v\ K_w \sqrt{1.25\ (P1 - P2)}}$$

where,

W = Required vapour capacity in pounds per hour.

C = Gas or vapour flow constant (Refer Page No : 8) using ratio of specific heat 'k' of vapour or gas being considered (k = cp/cv).

$$520\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}$$

K = Effective co-efficient of discharge (0.953 for air, steam, vapour, gases & 0.64 for liquids)

V = Required gas capacity in scfm., at 14.7 psia. and 60°F.

P = Relieving pressure in psia.
= Set pressure in psig. + over pressure + 14.7

K_b = Capacity correction factors due to back pressure. Refer fig.1 for conventional valves and fig.2 for Balanced Bellows valves.

M = Average Molecular weight of Vapour. (Refer Page No. 8)

T = Inlet temperature °F absolute (°F + 460).

Z = Compressibility factor corresponding to T and P (Compressibility correction can be safely ignored by using a value of Z = 1.00)

G = Specific gravity of gas (Air = 1 at 14.7 psia. at 60°F) or liquid (water = 1 at 70°F) at actual discharge temperature.

V_L = Required liquid capacity in US gallons per minute

K_p = Liquid Capacity correction factor for over pressure lower than 25% (K_p = 1 for 25% overpressure) from fig. 3

K_w = Liquid flow factor for variable back pressure from fig. 4. Applies to Balanced Bellows valves only
= 1 for conventional Safety-Relief Valves.

K_v = Capacity correction factor due to viscosity. For most application, viscosity may not be significant in which case K_v=1. For further information, see API RP 520

P1 = Set pressure at inlet, psig.

P2 = Back pressure at outlet, psig.

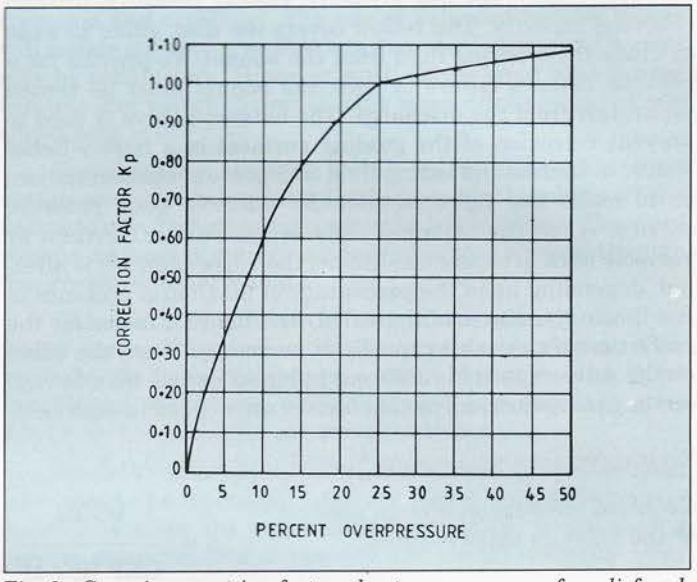


Fig. 3 : Capacity correction factors due to over pressure for relief and Safety--Relief Valves in liquid Service K_p

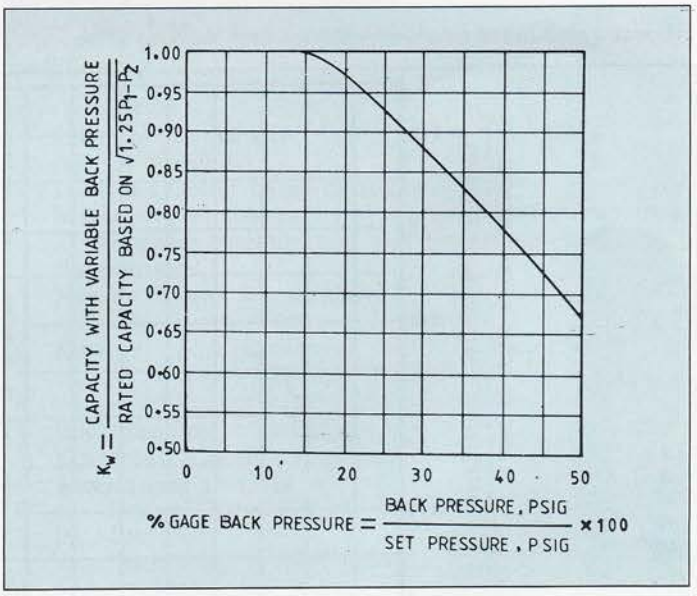


Fig. 4 : Variable or Constant Back Pressure sizing factor, K_w for 25 per cent over pressure on Balanced Bellows Safety - Relief Valves (Liquid only)

TOTAL STEAM TEMPERATURE IN DEGREES FAHRENHEIT

Set pressure p.s.i.g.	Saturated steam Temp. °F	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000
15	250	1.00	1.00	1.00	.99	.99	.98	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.83	.82	.81	.81	.80	.79	.79	.78	.78	.77	.76	.76	.75	.75
20	259	1.00	1.00	1.00	.99	.99	.98	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.83	.82	.81	.81	.80	.79	.79	.78	.78	.77	.77	.76	.75	.75
40	287	—	1.00	1.00	1.00	.99	.99	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.87	.86	.85	.84	.84	.83	.82	.82	.81	.80	.79	.79	.78	.78	.77	.77	.76	.75	.75
60	308	—	—	1.00	1.00	.99	.99	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.87	.86	.85	.84	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.76	.75
80	324	—	—	—	1.00	1.00	.99	.99	.98	.97	.96	.94	.93	.92	.91	.90	.89	.89	.88	.87	.86	.85	.84	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.76	.75
100	338	—	—	—	—	1.00	1.00	.99	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.85	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.76	.75
120	350	—	—	—	—	1.00	1.00	.99	.98	.97	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.85	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.76	.75
140	361	—	—	—	—	—	1.00	1.00	.99	.98	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.85	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.76	.75
160	371	—	—	—	—	—	1.00	1.00	.99	.98	.97	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.82	.82	.81	.80	.80	.79	.79	.78	.77	.77	.76	.76	.75
180	380	—	—	—	—	—	—	1.00	.99	.98	.97	.96	.95	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.82	.82	.81	.80	.80	.79	.79	.78	.77	.77	.76	.76	.75
200	388	—	—	—	—	—	—	1.00	.99	.99	.97	.96	.95	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.83	.82	.81	.81	.80	.79	.79	.78	.77	.77	.76	.76	.75
220	395	—	—	—	—	—	—	1.00	1.00	.99	.98	.96	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.84	.84	.83	.82	.81	.81	.80	.79	.79	.78	.78	.77	.76	.76	.75
240	403	—	—	—	—	—	—	—	1.00	.99	.98	.97	.95	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.84	.84	.83	.82	.81	.81	.80	.79	.79	.78	.78	.77	.76	.76	.75
260	409	—	—	—	—	—	—	—	1.00	.99	.98	.97	.96	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.85	.84	.83	.82	.81	.81	.80	.79	.79	.78	.78	.77	.76	.76	.75
280	416	—	—	—	—	—	—	—	1.00	1.00	.99	.97	.96	.95	.93	.92	.91	.90	.89	.88	.87	.86	.85	.35	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.75
300	422	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.95	.93	.92	.91	.90	.89	.88	.87	.86	.86	.85	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.77	.76	.75
350	436	—	—	—	—	—	—	—	—	1.00	1.00	.99	.97	.96	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.84	.83	.83	.82	.81	.81	.80	.79	.78	.78	.77	.77	.76	.76
400	448	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.95	.93	.92	.91	.90	.89	.88	.87	.86	.85	.84	.84	.83	.82	.81	.81	.80	.79	.79	.78	.77	.77	.76	.76
450	460	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.96	.94	.93	.92	.91	.89	.88	.87	.86	.86	.85	.84	.83	.82	.82	.81	.80	.79	.79	.78	.78	.77	.76	.76
500	470	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.94	.93	.92	.91	.90	.89	.88	.87	.86	.85	.84	.83	.82	.82	.81	.80	.79	.79	.78	.78	.77	.76	.76
550	480	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.95	.94	.92	.91	.90	.89	.88	.87	.86	.85	.84	.83	.82	.82	.81	.80	.80	.79	.78	.78	.77	.76	.76
600	489	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.94	.93	.92	.90	.89	.88	.87	.86	.85	.84	.84	.83	.82	.81	.80	.80	.79	.78	.78	.77	.76	.76
650	497	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.95	.94	.92	.91	.90	.89	.87	.86	.86	.85	.84	.83	.82	.81	.81	.80	.79	.78	.78	.77	.77	.76
700	506	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.96	.94	.93	.91	.90	.89	.88	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.79	.78	.77	.77	.76
750	513	—	—	—	—	—	—	—	—	—	—	—	—	1.00	1.00	.98	.96	.95	.93	.92	.90	.89	.88	.87	.86	.85	.84	.83	.83	.82	.81	.80	.79	.79	.78	.77	.77	.76
800	520	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.95	94	.92	[illegible]	.90	.88	.87	.86	.85	.84	.84	.83	.82	.81	.80	.80	.79	.78	.78	.77	.76
850	527	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	94	.93	.92	.90	.89	.88	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.78	.78	.77	.76
900	533	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	1.00	.99	.97	.95	.93	.92	.90	.89	.88	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.79	.78	.77	.77
950	540	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.95	.94	.92	.91	.89	.88	.87	.86	.85	.84	.83	.82	.82	.81	.80	.79	.79	.78	.77	.77
1000	546	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.94	.93	.91	.90	.89	.87	.86	.85	.84	.83	.83	.82	.81	.80	.79	.79	.78	.77	.77
1050	552	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	1.00	.99	.97	.95	.93	.92	.90	.89	.88	.87	.86	.85	.84	.83	.82	.81	.80	.80	.79	.78	.77	.77
1100	558	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.95	.94	.92	.91	.89	.88	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.78	.78	.77
1150	563	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.96	.94	.92	.91	.90	.88	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.78	.78	.77
1200	569	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.98	.97	.95	.93	.91	.90	.89	.87	.86	.85	.84	.83	.82	.81	.81	.80	.79	.78	.78	.77
1250	574	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00	.99	.97	.95	.93	.92	.90	.89	.88	.87	.85	.85	.84	.83	.82	.81	.80	.79	.79	.78	.77

Fig. :5 Superheat correction factors for Safety Valves in steam service, Ksh

Sizing for Steam Relief

$$A = \frac{Ws}{50P\ Ksh}$$

Sizing for Gas expansion due to external fire

$$A = \frac{F'\ A_3}{\sqrt{P}}$$

where

Ws = Required Steam Capacity in pounds per hour.

Ksh = Super heat correction factor from fig. 5

A = Required orifice area in square inches.

P = Set pressure in psia.

= Set pressure in psig. + Over pressure + 14.7

F' = an operating factor determined from fig. 6

A_3 = Expósed Surface area of the vessel, in square feet.

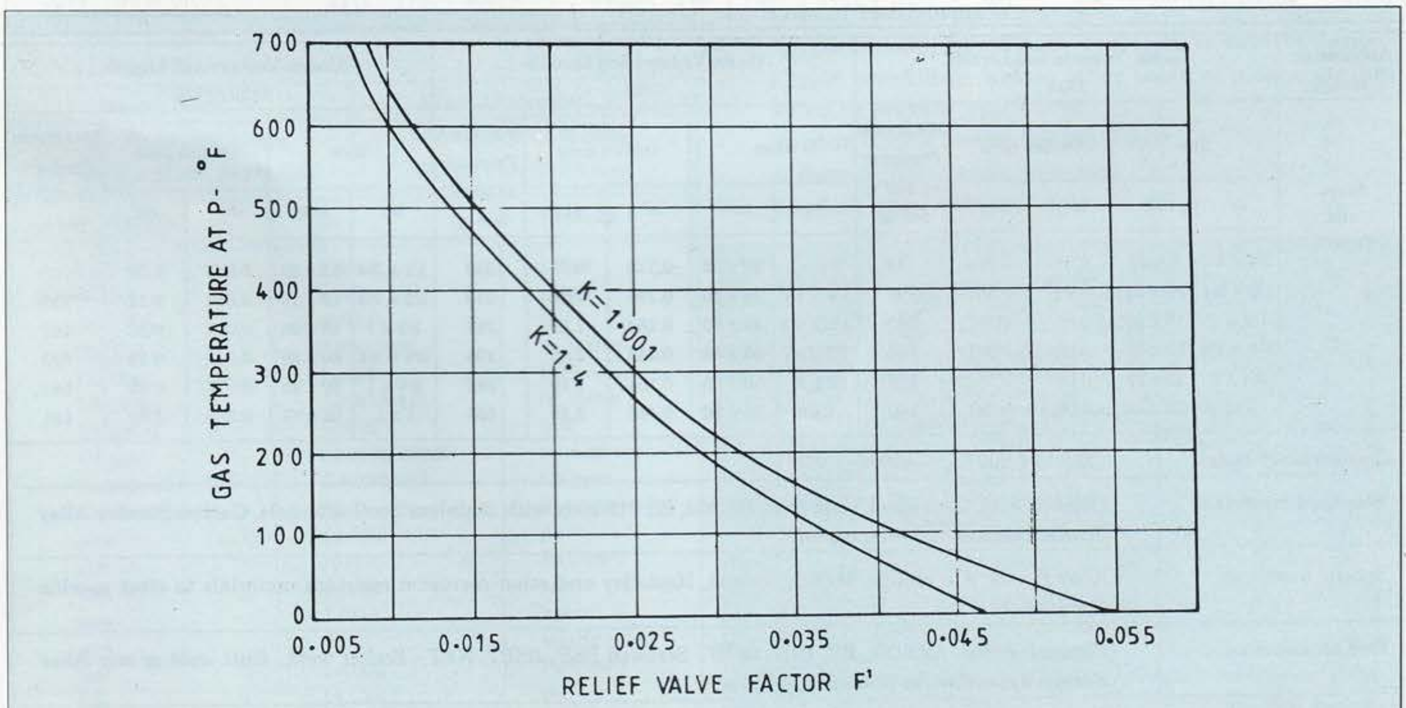
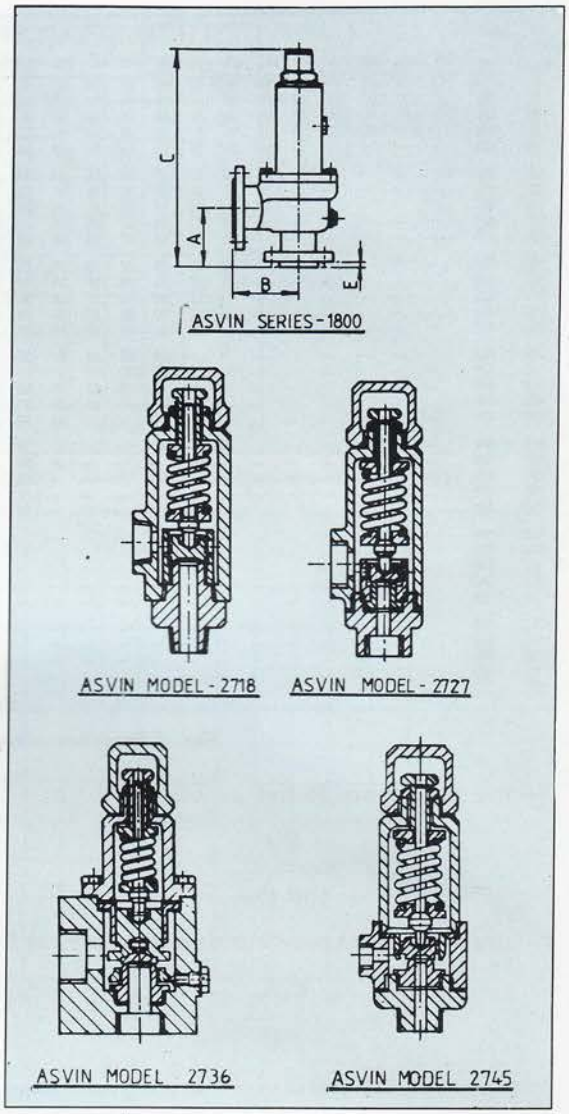


Fig. 6 : Relief Valve factors for non-insulated vessels in Gas Service Exposed to open fire. F'

Orifice Designation, Valve size, pressure rating, Dimensions and Weight of Safety - Relief Valve- ASVIN series 1800

Valve size & Desig-nation	Orifice area		USASI maximum Flange rating-lbs		Centre to * Face dimension		Max. ht. of valve cm 'C'	'E' (mm)	Approx. weight kgs.
	sq. inch	sq. cm.	inlet	outlet	inlet* mm A	outlet* mm B			
1 D2	0.110	0.709	600	150	105.0	114.5	46.7	12.7	19.0
1½ D2	0.110	0.709	1500	300	105.0	140.0	57.5	17.5	22.7
1½ D2½	0.110	0.709	2500	300	140.0	165.0	57.8	17.5	36.3
I E2	0.196	1.265	600	150	105.0	114.5	46.7	12.7	19.0
1½E2	0.196	1.265	1500	300	105.0	140.0	57.5	17.5	22.7
1½ E2½	0.196	1.265	2500	300	140.0	165.0	57.8	17.5	36.3
1½F2	0.307	1.980	600	150	124.0	152.5	47.3	17.5	19.9
1½F 2½	0.307	1.980	2500	300	140.0	165.0	56.5	17.5	22.7
1½G2½	0.503	3.245	900	300	124.0	152.5	56.5	17.5	27.2
2 G3	0.503	3.245	2500	300	156.0	171.5	59.4	17.5	38.5
1½ H3	0.785	5.065	300	150	130.0	124.0	49.5	17.5	24.5
2 H3	0.785	5.065	1500	300	154.0	162.0	59.4	17.5	31.7
2 J3	1.287	8.303	300	150	136.5	124.0	56.5	17.5	26.3
2½ J4	1.287	8.303	600	150	156.0	171.5	61.9	17.5	68.0
3 J4	1.287	8.303	1500	300	184.0	181.0	84.1	17.5	79.4
3 K4	1.838	11.858	300	150	156.0	162.0	65.4	17.5	65.7
3 K4	1.838	11.858	900	150	184.0	181.0	82.2	17.5	79.4
3 K6	1.838	11.858	1500	300	197.0	216.0	87.3	17.5	104.4
3 L4	2.853	18.406	300	150	156.0	165.0	65.4	17.5	65.7
4 L6	2.853	18.406	600	150	179.5	203.0	94.6	17.5	104.4
4 L6	2.853	18.406	1500	150	197.0	222.5	101.3	17.5	113.4
4 M6	3.600	23.226	300	150	178.0	184.0	78.7	17.5	86.2
4 M6	3.600	23.226	600	150	178.0	203.0	105.7	17.5	113.4
4 M6	3.600	23.226	900	150	197.0	222.5	105.7	17.5	113.4
4 N6	4.340	28.000	300	150	197.0	210.0	78.7	17.5	86.2
4 N6	4.340	28.000	900	150	197.0	222.5	105.7	17.5	113.4
4 P6	6.380	41.161	300	150	181.0	228.5	78.7	17.5	86.2
4 P6	6.380	41.161	900	150	225.5	254.0	105.7	17.5	113.4
6 Q8	11.050	71.290	600	150	240.0	241.5	110.8	20.6	195.0
6 R8	16.000	103.226	300	150	240.0	241.5	99.7	20.6	156.5
6 R10	16.000	103.226	600	150	240.0	266.5	110.8	20.6	226.8
8 T10	26.000	167.742	300	150	276.0	279.5	120.7	20.6	442.0



Application Model	Gases, Vapours and Liquids 2718					Gases,Vapours and Liquids 2727					Gases, Vapours and Liquids 2736 / 2745				
Sizes and Orifice area	Size		Orifice area		Maximum Pressure at 400°C bar (g)	Size		Orifice area		Maximum Pressure at 400°C bar (g)	Size		Orifice area		Maximum Pressure at 400°C bar (g)
	in	mm	in²	cm²		in	mm	in²	cm²		in	mm	in²	cm²	
	1/4 x 3/4	6 x 20	0.04	0.258	140	3/4 x1	20 x 25	0.110	0.71	350	1/2 x 3/4	15 x 20	0.077	0.50	140
	1/2 x 3/4	15 x 20	0.06	0.387	140	1 x 1 1/2	25 x 40	0.196	1.26	210	1/2 x 1/2	15 x 15	0.019	0.12	700
	1/2 x 1	15 x 25	0.06	0.387	140	1 1/2 x 2	40 x 50	0.184	1.19	245	1/2 x 1	15 x 25	0.077	0.50	140
	3/4 x 3/4	20 x 20	0.06	0.387	140	1 1/2 x2	40 x 50	0.442	2.85	105	3/4 x 3/4	20 x 20	0.019	0.12	700
	3/4 x 1	20 x 25	0.06	0.387	140	2 x 2	50 x 50	0.184	1.19	245	3/4 x 1	20 x 25	0.077	0.50	140
	1x1	25 x 25	0.06	0.387	140	2 x 2	50 x 50	0.442	2.85	105	1 x 1	25 x 25	0.250	1.60	140

Temperature range	- 268 to + 400°C, - 450 to + 750°F
Standard materials	Carbon Steel, Cast Steel, Cast Iron, SS 304, SS 316 body with Stainless Steel internals, Carbon Steel or Alloy Steel springs to suit temperature
Special materials	Alloy Steels, Alu-bronze, Monel, Inconel, Hastelloy and other corrosion resistant materials to meet specific requirements.
End connections	Flanged, ANSI, AFNOR, BS, DIN, or IS - Screwed BSP, BSPT, NPT - Socket weld, Butt weld or any other standard specified by customer.
Accessories	Packed Cap & Lever or Open Cap & Lever, Test Gag, Steam Jacketted bodies

Gas or Vapour	Molecular Weight	k (cp/cv) at 60° F	C (Constant)
Air	28.970	1.410	356.0
Acetylene	26.040	1.260	343.0
Ammonia	17.030	1.310	348.0
Argon	39.944	1.668	377.8
Benzene	78.110	1.118	328.8
N-Butane	58.120	1.094	326.4
Iso-Butane	58.120	1.097	326.7
Carbon Di Sulphide	76.130	1.210	338.0
Carbon Di Oxide	44.010	1.300	347.0
Carbon Monoxide	28.010	1.404	356.4
Chlorine	70.910	1.355	351.6
Cyclohexene	84.156	1.089	324.9
Dowtherm 'A'	165.000	—	—
Dowtherm 'J'	134.000	—	—
N Ethane	30.068	1.193	336.3
Ethylene	28.052	1.243	341.3
Freon-11	137.371	1.136	330.6
Freon-12	120.920	1.137	330.7
Freon-22	86.480	1.184	336.4
Freon-114	170.930	1.088	336.2
Helium	4.003	1.660	377.0
N. Heptane	100.198	1.052	321.2
Hexane	86.172	1.062	322.2
Hydro chloric Acid	36.470	1.410	357.0
Hydrogen	2.016	1.410	357.0
Hydrogen Sulphide	34.076	1.320	349.0
Methane	16.042	1.308	347.8
Ethyl Alcohol	46.069	1.130	330.0
Methyl Alcohol	32.000	1.203	337.3
Methyl Chloride	50.480	1.200	337.0
Natural gas (typical)	19.000	1.270	344.0
Nitrogen	28.016	1.404	356.4
Nitrous oxide	44.020	1.303	347.3
N-Octane	114.224	1.046	320.6
Oxygen	32.000	1.401	356.1
Paracymene	134.210	—	—
N-Pentane	72.146	1.074	323.4
Iso-Pentane	72.146	1.076	323.6
Propane	44.094	1.133	330.3
Sulphur Dioxide	64.070	1.240	341.0
Toluene	92.130	1.090	326.0

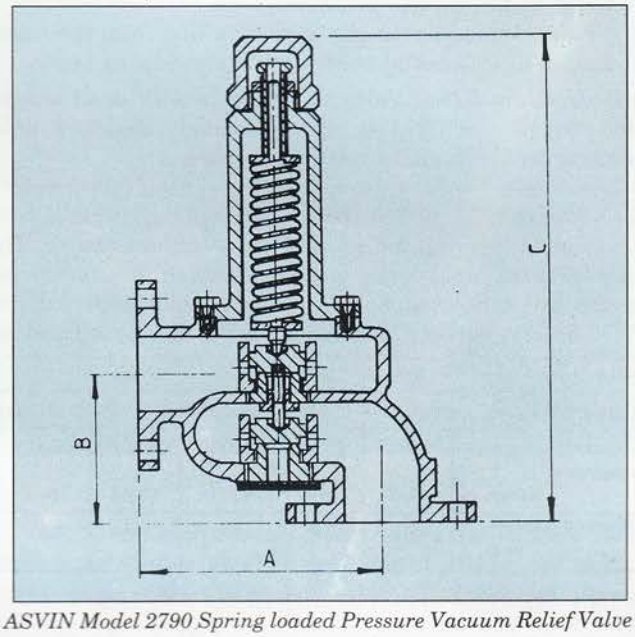
CONVERSION FORMULAS

Degrees celsius, °C	Degrees Fahrenheit, °F
°C + 273.15 = °K, kelvin	°F + 459.67 = °R, Rankine
(°C x 9/5) + 32 = °F, Fahrenheit	(°F-32) 5/9 = °C, Celsius

Multiply	By	To obtain
kg	2.2046	pound
oz	0.0625	pound
oz	0.02835	kg
Cu. foot	0.02831685	cu. metre
Cu. foot	7.4806	US gallon
US gallon	0.003785412	cu. metre
US gallon	3.7854	litre
US gpm	0.00006309020	cu. metre/sec
Cu.metre/hr	4.402866667	US gpm
Cu. foot/minute	28.32	litre/minute
atm	14.6959	psi
atm	101325	Pa (N/m^2)
atm	1.0132	bar
atm	1.0332	kg/cm^2
atm	760	mmHg (torr)
bar	100000	Pa (N/m^2)
bar	14.50377	psi
bar	1.0197	kg/cm^2
kg/cm^2.	14.22334	psi

PRESSURE CUM VACUUM RELIEF VALVE:

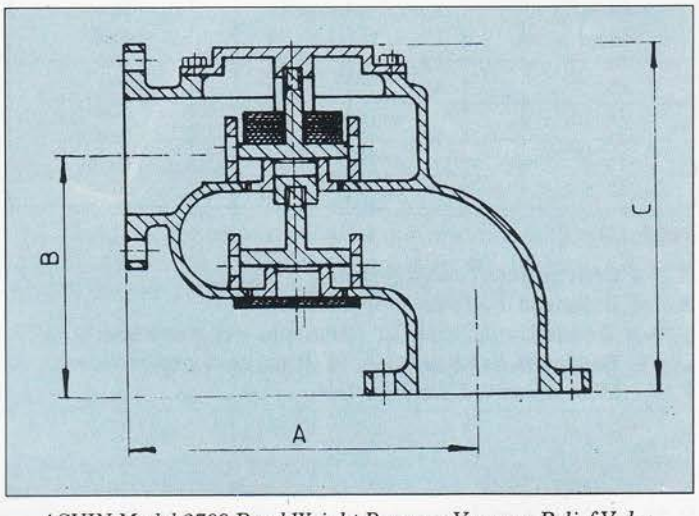
ASVIN Pressure Vacuum Relief Valves have been designed to provide emergency venting requirements in storage tanks, pressure vessels and blow down lines. These are available in two versions, dead weight pallet type for both pressure and vacuum side or spring loaded pressure pallet and dead weight vacuum pallet type. Spring loading is given for higher pressure setting. All valves are provided with protecting screens at vacuum side.



ASVIN Model 2790 Spring loaded Pressure Vacuum Relief Valve

The pressure relief device shall be suitable to relieve the flow capacity determined for but not limited to the largest single contingency listed below or any reasonable and probable combination of the contingencies

- Loss of Refrigeration
- An operational upset such as failure of control device.
- Liquid overfilling, unless other positive means are provided to prevent overfilling.
- Vapour displacement during filling
- A drop in barometric pressure
- Rupture of an internal coil



ASVIN Model 2709 Dead Weight Pressure Vacuum Relief Valve

A tank that may be damaged by internal vacuum shall be provided with Vacuum Relief device set and sized to open at a partial vacuum that is sufficient to protect the tank from damage. A Vacuum Relief device shall be installed to permit the entry of air or another gas or vapour to avoid excessive vacuum that may result from the following :

- Withdrawal of the stored liquid at the maximum rate.
- Withdrawal of vapour from the tank at the maximum compressor suction rate.
- A rise in barometric pressure.
- A reduction in vapour pressure resulting from the introduction of subcoolled product into the vapour space.

ASVIN Vacuum Relief Valve is available with dead weight loaded (Model : 2709V) or spring loaded (Model: 2790V) depending on the vacuum setting specified.

Size mm	Model 2709			Model 2790		
	A mm	B mm	C mm	A mm	B mm	C mm
50	220	145	145	220	145	445
80	240	165	230	240	165	540
100	300	210	330	300	210	645
150	390	270	415	390	270	700
200	600	355	555	600	355	820

Specify working pressure, settings (Pressure or/and Vacuum) required, vapours handled, flow capacity required, special materials, if any required, connection type desired. Available as standard in all material in aluminum, cast iron body/ carbon steel body with stainless steel trim, or as any other material on special request.

ASVIN Model 2754 full lift Safety Valves for gaseous service are designed for minimum and easy maintenance. The available valve sizes with orifice area and maximum set pressure are tabulated below. Dead weight type full lift ASVIN Safety Valves (Model 2754 DW) can be offered on request for lower set pressure i.e. below 50 psig. These are much useful in sugar Industries. Material combinations are determined by operating conditions of temperature and corrosive atmospheres. For any additional information, ask for certified drawings.

Valve size inch	4x6	6x8	6x10	8x10	8x12	8x14	10x12	10x14	10x16	12x14	12x16	12x20	14x24
Inlet x Outlet mm	100x150	150x200	150x250	200x250	200x300	200x350	250x300	250x350	250x400	300x350	300x400	300x500	350x600
Orifice area Sq. in	7.211	10.520	14.730	19.010	29.220	23.840	29.220	39.370	34.320	39.370	58.900	48.650	67.200
Sq mm	4652	6790	95035	12265	18850	15380	18850	25400	22140	25400	37400	31390	43355
Maximum Set pr. psig.	225	155	140	115	100	370	140	100	255	140	85	185	140

ASVIN - SERIES 1800 NUMBERING SYSTEM :

First Two Digits

Always 18 : Designates series 1800 ASVIN flanged Safety Relief Valve

Third and Fourth Digits : Valve size with orifice designation letter

Designation 3rd & 4th digit	Valve size & orifice letter	Designation 3rd & 4th digit	Valve size & orifice letter
01	1D2	14	2 1/2J4
02	1 D2	15	3J4
03	1 D2	16	3K4
04	1E2	17	3K6
05	1 E2	18	3L4
06	1 E2	19	4L6
07	1 F2	20	4M6
08	1 F2	21	4N6
09	1 G2	22	4P6
10	2G3	23	6Q8
11	1 H3	24	6R8
12	2H3	25	6R10
13	2J3	26	8T10

Fifth Digit :

A - Conventional construction
B - Balanced Bellows construction
C - Conventional with 'O' Ring seat pressure seal
D - Balanced Bellows with 'O' Ring seat pressure seal
P - Pilot operated construction.

Sixth Digit - Temperature and Material

Designation 6th digit	Inlet Temperature Range °F	Material	
		Body & Bonnet	Spring
1	- 20 to 450	Carbon Steel	Carbon Steel
2	451 to 800	Carbon Steel	High temp. alloy
3	801 to 1000	Chrome Moly Steel	High temp. alloy
4	-21 to -75	3 1/2% Ni. Steel	Carbon Steel
5	-76 to -150	3 1/2% Ni. Steel	Austenitic S.S.
6	-151 to -450	Austenitic S.S.	Austenitic S.S.

Seventh Digit - Inlet ratings in lbs.

Designation 7th digit	Inlet flange rating	Designation 7th digit	Inlet flange rating
1	150	4	900
2	300	5	1500
3	600	6	2500

With these informations ASVIN Safety Relief Valves (series 1800) can be specified as follows.

Type 1812 A12 indicates a conventional series 1800 flanged Safety Relief Valve with 'H' orifice, 2" inlet and 3" outlet, carbon steel body, bonnet and spring with 300 # inlet rating.

Accessories :

- Test Gag
- Cap and lever construction
  Screwed/Bolted plain cap, packed lever, open lever.
- Steam Jacketted body

NOTE : BS/DIN/IS/ and other flange standards can also be given on special request. Standard flange ratings will be ANSI B 16.5,. Semi Nozzle construction shall also be offered. For any additional information contact ASVIN.

TEST PRESSURE AND APPLICATION :

The bodies, closed bonnets and caps of all ASVIN Safety-Relief Valves are subjected to a pressure test to ensure the integrity of the parts. A test pressure of 1.5 times the maximum pressure, for which the Safety-Relief Valve is designed, shall be applied to the part of the body on the inlet side of the seat. Valve bodies shall be vented to remove entrapped air before testing. No valve or part thereof undergoing pres-sure testing shall be subjected to any form of shock loading. Test pressure shall be applied and maintained at the required pressure for a sufficient length of time (Refer BS : 5759) to permit a visual examination to be made of all surface joints.

Unlike line valves which are tested in the open position, Pressure Relief Valves are tested in the closed position and comprise two pressure zones, primary and secondary. Applying liquid pressure to the inlet at 1.5 times the set pressure is the primary pressure zone. The secondary pressure zone may be tested by applying pressure to the outlet at 1.5 times the back pressure specified by the design specification. This test is not performed when back pressure is zero or not stated. In any case closed bonnet valves designed for discharge to a closed system are leak tested with air at 30 psig. in the secondary pressure zone.

All valves are subjected individually to these tests although detailed procedures may vary somewhat depending upon the construction, type and end use.

Setting of cold differential test pressure : Using air or other suitable gas, each ASVIN Safety - Relief Valve is set which will ensure accuracy and respeatability of the setting. The setting will not be carriedout unless ASVIN Safety-Relief Valve pressure containing components have previously been pressure tested.

Repeatability Test : This will be carried out by lifting and reseating the valve three times. The lift will be achieved either by fluid pressure or a combination of fluid pressure and lifting lever arrangement. This lift achieved during the test will not be less than 50% of the lift at the certified discharge capacity of the valve. Following this test, set pressure will be checked and should comply with tolerance requirements. If any adjustments are necessary, the procedure will be repeated.

Tolerances on set pressure : The permitted tolerances on set pressure will be:

For set pressure below 5 bar	:	± 0.14 bar
From 5 bar upto 20 bar	:	± 3%
From 20 bar upto 100 bar	:	± 2%
From 100 bar & above	:	± 1.5%

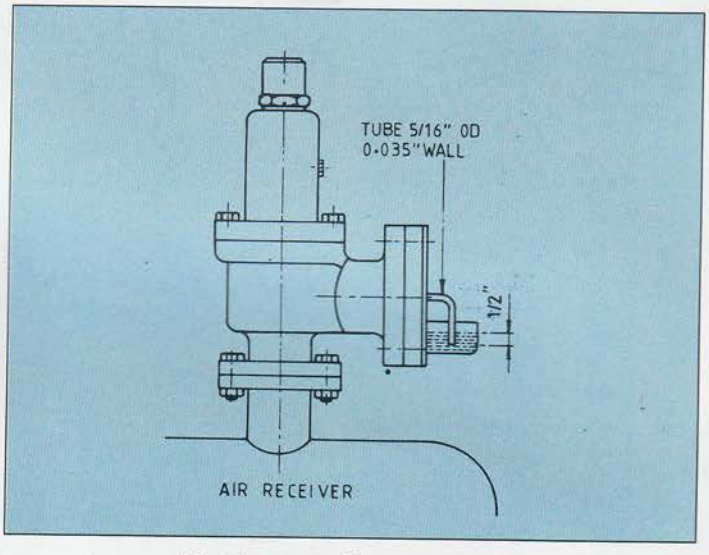
PREPARATION FOR DESPATCH:

External coating : Exterior surfaces of the valve will be protected against corrosion either according to the ASVIN standard procedure or as required by the customer.

End protection : Both inlet and outlet flanges will be fitted with suitable end closures to protect the flange face and to prevent the ingress of foreign matter. Threaded connection will be protected against damage in transit and the packing used shall prevent ingress of foreign matter.

Commerical seat tightness of Safety-Relief Valve with metal-to-metal seats

The maximum acceptable leakage rates are defined for commercial Safety-Relief Valves with metal-to-metal seats for set pressures upto 6000 pounds per square inch. gauge. A typical test arrangement for determining seat tightness for Safety-Relief Valves is shown below in figure.



Test Apparatus for seat tightness

With the valve mounted vertically, the leakage rate in bubbles per minute shall be determined with pressure at the Safety-Relief Valve inlet held at 90% of the set pressure immediately after poping. For valves set at 50 psig. or below, the pressure shall be held at 5 psig. below the set pressure immediately after poping. Air at approximately atmospheric temperature shall be used as pressure medium.

All opening from the secondary pressure zone shall be closed before counting the bubble rate. This includes such items like caps, drain holes, vents and outlets. A soap solution shall be applied to Secondary joints to detect escape of air other than that being measured.

Leakage Rates for Safety-Relief Valves for set pressure to 1000 PSIG at 15.6 °C

Type of Valve	Orifice Designation letter	Max. leakage rate (Bubbles per minute)
Conventional	F and smaller	40
	G and larger	20
Balanced Bellows	F and smaller	50
	G and larger	30

The leakage rate in bubbles per minute shall not exceed the number listed above for set pressure to 1000 psig. For set pressure over 1000 psig, refer API standard 527.

Note: The cover plate should be fitted with a suitable device to relieve body pressure in case of accidental poping of the valve.

GUARANTEE : ASVIN Safety-Relief Valves manufactured by ASIAN INDUSTRIAL VALVES AND INSTRUMENTS are guaranteed for trouble free operation against defective material and workmanship for a period of 18 months from the date of despatch or 12 months from the date of commissioning whichever is earlier.

ASVIN - Range of Products

VALVES

- SAFETY / RELIEF VALVES
- PRESSURE REDUCING VALVES / STATION
- PRESSURE CUM VACUUM RELIEF VALVES
- BREATHER VALVES
- EXCESS FLOW CHECK VALVES
- UNDERGROUND SAFETY VALVES FOR WATER TANK / WATER FLOW CANAL AS PER BS - 4558 : 1983
- NON-RETURN VALVES
- BALL VALVES
- DIAPHRAGM VALVES
- NEEDLE VALVES / MANIFOLDS / THROTTLING VALVES
- FLUSH BOTTOM VALVES

TANK EQUIPMENTS

- TANK BLANKETTING VALVES
- EMERGENCY PRESSURE RELIEF VALVES (Air Vent)
- GAUGE HATCHES (Lock Down / Spring Loaded)
- VACUUM BREAKERS

INSTRUMENTS

- LEVEL GAUGES (Tubular / Reflex / Transparent)
- LEVEL INDICATORS (Magnetic / Float & Chord)
- ORIFICE ASSEMBLIES / FLOW NOZZLES / VENTURIES
- PITOT TUBES
- MANOMETERS
- LEVEL SWITCHES
- THERMOWELLS
- CONDENSING POTS
- CONSTANT HEAD CHAMBERS
- AIR / MOISTURE SEPERATORS

PIPE LINE EQUIPMENTS

- STEAM TRAPS
- STRAINERS ('T' / 'Y' / Basket / Simplex / Duplex type)
- FLAME / DETONATION ARRESTORS
- SIGHT GLASSES (Full View / Double Window / Flapper / Rotating Wheel)
- RUPTURE DISC

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ABS, BHEL, Bax Council, Bureau Veritas, Controller of Explosives, DNV, EIL, IBR, IRS, Lloyds, MECON, NPC, RITES, SGS, TPL etc.,

ASIAN INDUSTRIAL VALVES AND INSTRUMENTS

B - 17, Industrial Area,
Mogappair East,
Chennai - 600 037.
India.
www.asianindustrialvalves.com

Phone : 044-2653 1137, 2653 1689, 2653 3519
Mktg. : 044-2501 9240, 5517 2940
Fax : +91-44-2653 0906, 2653 1926
E-mail : asvin@md2.vsnl.net.in
asianvalves@eth.net

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