POP Safety Valve

INTRODUCTION

The effects of exceeding safe pressure levels in an unprotected pressure vessel or system, can have catastrophic effects on both plant and personnel.
Safety relief valves should be used to protect any pressurised system from the effects of exceeding its design pressure limit.
A safety relief valve is designed to automatically discharge gas, vapour or liquid from any pressure containing system, preventing a predetermined safe pressure being exceeded, and protecting plant and personnel.

Safety Valve
A valve which automatically discharges gases and vapours so as to prevent a predetermined safe pressure being exceeded. It is characterised by a rapid full opening action and is used for steam, gases or vapour service.
Relief Valve
A valve which automatically discharges fluid, usually liquid, when a predetermined upstream pressure is exceeded. The term is commonly used for pressure relieving valves in which the lift is proportional to the increase in pressure above the set pressure.
Safety Relief Valve
A valve which will automatically discharge gases, vapours or liquids, to prevent a predetermined safe pressure being exceeded. It is characterised by a rapid opening action.

DEFINITIONS

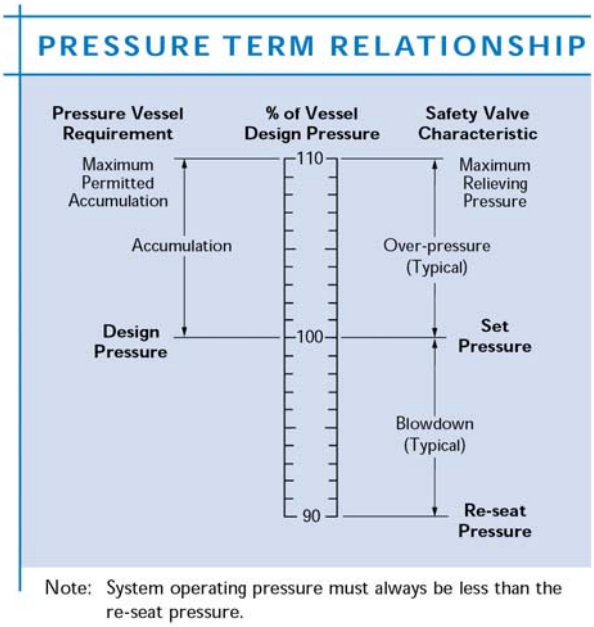
Set Pressure
The pressure measured at the valve inlet at which a safety relief valve should commence to lift under service conditions.
Overpressure
The pressure increase above set pressure at the valve inlet at which the discharge capacity is attained. Usually expressed as a percentage of set pressure.
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.

SAFETY RELIEF VALV E – APPLICATIONS

Application	Medium	Safety Relief Valve Type
Vented boilers Un-vented boilers	Hot Water	706 716 746/766 Pop 716T
Boiler, pipeline and vessel protection	Steam	706/716 746 756/766 Pop 1640B 300
Compressor pipeline and receiver protection	Air	706 716 746 POP 1640B 300
Pipeline and vessel protection	Cold Water	706 716 746 1640B 300
Pump Protection	Liquids	480/485
Process pipeline, pump and vessel protection	Process/Corrosive Liquids	716 Stainless steel 746 Stainless steel 490 Stainless steel
Clean steam and hygienic environments	Steam and Gases	716 Stainless steel 746 Stainless steel
Pipework, tank and equipment protection	Cryogenic Gases	776
Pipework, tank and equipment protection	Cold & Fine Gases	716 776
Blowers, bulk transfer, tank duty, road/rail transfers	Air	616D

The selection of figure number for each application depends on:
Pressure - capacity - material - temperature - fluid - connection required.

POP
Safety Valve

TECHNICAL SPECIFICATION

Approvals

BS6759 Pt 1, 2, & 3

PED certified Category IV

Materials

Body	- Bronze (-59 to 224°C)
Trim	- Bronze

Size Range

Size	Orifice mm^2	Min (Barg) Pressure	Max (Barg) Pressure
DN15 (1/2")	126	0.35	24
DN20 (3/4")	285	0.35	24
DN25 (1")	507	0.35	24
DN32 (1-1/4")	791	0.35	24
DN40 (1-1/2")	1140	0.35	24
DN50 (2")	2027	0.35	24
DN65 (2-1/2")	3167	0.35	12

Performance

	Kdr	Over pressure	Blow down
Steam	0.167	10%	15%*
Air / Gas	0.167	10%	15%*

*or 0.3 Barg min

Maximum Back Pressure

Barg	5.5
Constant	10%
Built-up	10%
Variable	0%

(Total % must not exceed Barg shown)

Connections

Screwed In x Screwed Out

Construction

Bottom Guided

Cap Options

Open lever

Pressure tight dome

Sizing

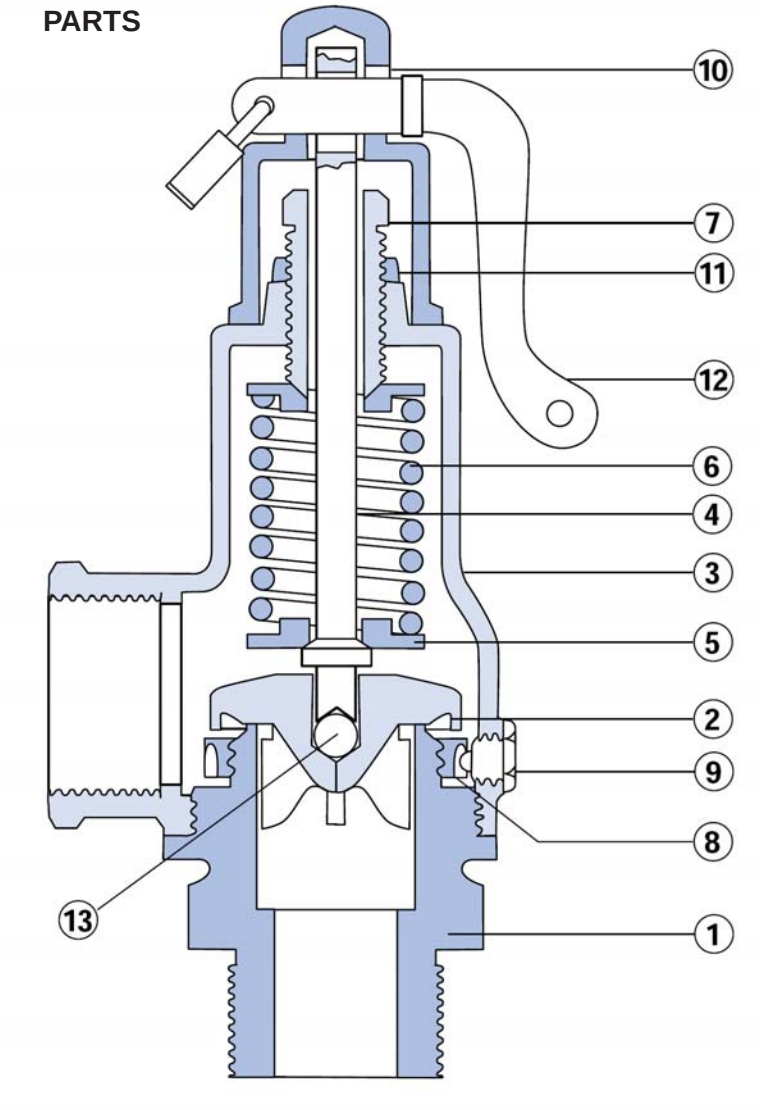
Refer to Capacity Charts

DESIGN

The pop-type safety valve is designed to give high discharge capacity. Bottom guided design, good reseating characteristics and adjustable blowdown control ensures stable performance.

Test levers are available for inline safety checking, alternatively a sealed dome can be supplied for service conditions requiring a pressure tight seal on the discharge line.

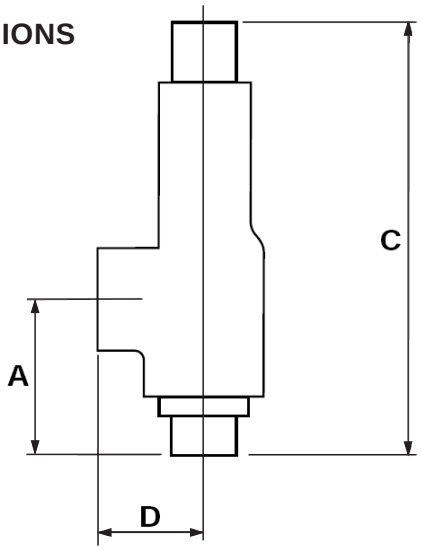
PARTS



ITEM	PART	MATERIAL
1	Seat	Bronze
2	Valve Disc	Bronze
3	Body	Bronze
4	Spindle	Brass
5	Spring End Plate	Brass
6	Spring	C. S.
7	Adjusting Screw	Brass
8	Blowdown Ring	Bronze
9	Setting Screw	Brass
10	Dome	Nylon
11	Lock Nut	Brass
12	Lever	Bronze
13	Ball	St. St.

Note: The 65mm valve has a bolted body design and replaceable seat

DIMENSIONS



DIMENSIONS

Valve Type	Valve Size	Inlet & Outlet (BSP)	A	'C' Dome	'C' Lever	D	Weight (kg)
Male x Female	DN15	1/2"	49	137	154	33	1
	DN20	3/4"	57	147	172	40	1
	DN25	1"	64	186	212	48	2
	DN32	1-1/ 4"	78	195	222	57	3
	DN40	1-1/2"	83	207	235	65	3
	DN50	2"	105	262	293	79	6
	DN65	2-1/2"	106	322	360	106	9

All dimensions in mm.

FIGURE NUMBERING

SIZE (mm)	CONNECTIONS		CAP	FIGURE No.
15 to 50	Screwed Male x Female		Dome Lever	3373 3376 1643
65	Screwed Male x Female		Dome Lever	3373A 3376A

AIR CAPACITY CHART (l/s) @ 10% Overpressure and 15°C

Set Pressure (Barg)	Valve Type Pop (Inc. 3373/6 & 1643) (BS6759 part 2)						
	DN15	DN20	DN25	DN32	DN40	DN50	DN65
1.0	8.60	19.40	34.52	53.85	77.61	138	216
1.5	10.81	24.45	43.50	67.87	97.81	174	272
2.0	13.04	29.50	52.48	81.88	118	210	328
3.0	17.51	39.60	70.44	110	158	282	440
4.0	21.97	49.70	88.41	138	199	353	552
5.0	26.43	59.79	106	166	239	425	664
6.0	30.90	69.89	124	194	280	497	777
7.0	35.36	79.99	142	222	320	569	889
8.0	39.83	90.09	160	250	360	641	1001
9.0	44.29	100	178	278	401	713	1113
10.0	48.76	110	196	306	441	784	1225
12.0	57.68	130	232	362	522	928	1450
12.5	59.92	136	241	376	542	964	1506
14.0	66.61	151	268	418	603	1072	1674
16.0	73.54	171	304	474	683	1215	1899
18.0	84.47	191	340	530	764	1359	2123
20.0	93.40	211	376	586	845	1503	-
22.0	102	231	412	642	926	1646	-
24.0	111	252	448	698	1007	1790	-

Useful Conversions

Nm3/hr = 1/sec x 3.60

SCFM = 1/sec x 2.12

Other Gases

If you wish to use the valve on other compatible gases, the sizing details above can be used. The valve capacity will however change depending on the specific gravity of the flowing gas. Multiply the valve air capacity by $1/\sqrt{SG}$ to give the gas capacity. SG = specific gravity (relative to air = 1)

SATURATED STEAM CAPACITY CHART (kg/h) @ 10% overpressure

Set Pressure (Barg)	Saturated Steam Temp. °C	Valve Type Pop (Inc. 3373/6 & 1643) (BS6759 part 1)						
		DN15	DN20	DN25	DN32	DN40	DN50	DN65
1.0	120	21.39	48.38	86.07	134	194	344	538
1.5	127	28.37	64.17	114	178	257	456	713
2.0	134	35.50	80.30	143	223	321	571	892
3.0	144	47.65	108	192	299	431	767	1198
4.0	152	59.81	135	241	375	541	962	1503
5.0	159	71.96	163	290	452	651	1158	1808
6.0	165	84.11	190	338	528	761	1353	2114
7.0	170	96.26	218	387	604	871	1549	2420
8.0	175	108	245	436	681	981	1744	2725
9.0	180	121	273	485	757	1091	1940	3030
10.0	184	133	300	534	833	1201	2135	3336
12.0	192	157	355	632	986	1421	2526	3947
12.5	193	163	369	656	1024	1476	2624	4099
14.0	198	181	410	730	1138	1641	2917	4558
16.0	204	206	465	827	1291	1860	3308	5168
18.0	210	230	520	925	1443	2080	3699	5779
20.0	215	254	575	1023	1596	2300	4090	-
22.0	220	279	630	1121	1749	2520	4481	-
24.0	224	303	685	1219	1901	2740	4872	-

Useful Conversions
lbs/h = kg/h x 2.2046

Other Temperatures
The steam tables on these pages are based on saturated steam, at the temperatures shown. For steam systems operating at higher temperatures, the above capacities will need to be derated by using the super heat correction factor.

INSTALLATION

Safety Relief Valves should always be installed in an upright position with their spring chamber vertical.
All packing materials should be removed from the valve connections prior to installation.

Pressure Vessels

When fitting a Safety Relief Valve onto pressure vessels, the inlet connection pipe should be as short as possible and the bore should be at least equivalent to the nominal bore size of the valve.
The pressure drop between the vessel and the valve should be no more than 3% at rated capacity.
A pressure-tight dome should be specified when:
1) A back pressure must be contained within the relieving system.
2) A head of liquid is built up within the valve body and consequently needs to be contained.
3) The relieving medium is toxic, corrosive or environmentally unfriendly.

Pipelines

When fitting a Safety Relief Valve into a pipeline, the inlet connecting pipe leading from the main pipeline to the Safety Relief Valve should be as short as possible, so that the inlet pressure drop is no more than 3% of rated capacity.
In addition, it is advised that the Safety Relief Valve is placed a sufficient distance downstream of the pressure source. This will protect the valve from the adverse effects of pressure pulsations.

Discharge Pipelines

These should be equal to or larger than the valve outlet, with adequate supports, minimum number of bends and overall length. Unless balanced bellows valves are installed, the maximum built up backpressure should not exceed 10% of the set pressure, although the 746, 756 and the 766 can handle higher back pressure if required. Steam service valves should be adequately drained.
Alignment of the discharge or drain should present no risk to persons or property. Protection from the collection of rainwater or condensation in the discharge pipe is advisable.

System Cleansing

It is essential that new installations are fully flushed and all debris removed prior to installing the valve as serious damage can be caused to valve seats, resulting in subsequent leakage.

Pressure Adjustment

Every valve is fitted with a suitable spring and tested before leaving the factory. Valves can be preset on request but to alter the set pressure, the adjusting screw, when viewed from the top, should be screwed downwards in a clockwise direction to increase the set pressure and upwards in an anti-clockwise direction to decrease it. Set pressure adjustment must be carried out by experienced and approved personnel. Any change in set pressure must be within the range of the existing spring, if it exceeds the range, a new spring will be required. The cap lead seal must be re-made after any adjustment to the set pressure.

Blow-down Adjustment (POP, 756 & 766 valves only)

The blow-down ring (part no. 8) is set before the valve leaves the factory and normally no further adjustment will be necessary. However, if the reseating pressure has to be altered in service, the blow-down ring should be screwed (downwards) clockwise to raise the re-seat, popping and simmer pressures. If the blowdown ring is screwed (upwards) anti-clockwise the re-seat, popping and simmer pressures will lower. When re-inserting the setting screw (part no 9.) it should always be placed to engage a slot in the blow-down ring. The standard blowdown is 5% for 756, 10% for 766 and 10% for a POP type valve (minimum 0.3 Barg for all three valve types).
For recommended settings, please contact our technical sales office who will be pleased to help.

COLD DIFFERENTIAL TEST PRESSURE

When setting a valve intended for use at high temperature on a test rig using a test fluid at ambient temperatures, it is necessary to set the valve at a slightly higher pressure, so that it will open at the correct set pressure under operating conditions. The necessary allowance is shown in the following table.

Operating temperature	Increase in set pressure at ambient temperature
Up to 121°C	None
122°C to 316°C	1%
317°C to 427°C	2%

STANDARD SERIES SPRING SELECTION CHARTS

The valves are fitted with a suitable spring. Every valve is tested thoroughly for efficient operation before leaving our factory. Ensure the set pressure is within the range of the existing spring. If not, select and fit the correct spring from the tables below. All our springs are low stressed and painted to minimise corrosion.

Pop-Type Spring Range and Selection

Barg	Psig	Colour Code
0.35 - 0.52	5.0 - 7.5	Red
0.52 - 0.86	7.5 - 12.5	Yellow
0.86 - 1.38	12.5 - 20.0	Blue
1.38 - 2.59	20.0 - 37.5	Orange
2.59 - 4.31	37.5 - 62.5	Purple
4.31 - 6.03	62.5 - 87.5	Green/Blue
6.03 - 8.62	87.5 - 125.0	Green
8.62 - 12.00	125.0 - 175.0	White
12.00 - 15.52	175.0 - 225.0	Red/Yellow
15.52 - 18.97	225.0 - 275.0	Red/Green
18.97 - 22.41	275.0 - 325.0	Red/Orange
22.41 - 24.00	325.0 - 350.0	Yellow/Blue