



Bailey

766 Safety Relief Valves

766 Safety Relief Valves

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.

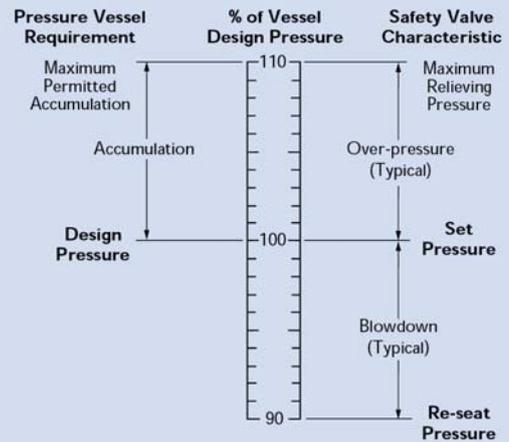
Discharge Capacity

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.

PRESSURE TERM RELATIONSHIP



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

SAFETY RELIEF VALVE – 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.

766

Safety Relief Valve



TECHNICAL SPECIFICATION

Approvals

BS6759 Pt 1

PED certified Category IV

Materials

- Body - Carbon St. gr WCB (-29 to 230°C)
- Cast Iron (-29 to 220°C)
- Trim - Stainless Steel
- EPDM (-29 to 150°C)

Size Range

Size	Orifice mm ²	Min (Barg) Pressure	Max (Barg) Pressure
DN40 (1-1/2")	2280	0.35	24
DN50 (2")	4054	0.35	24
DN65 (2-1/2")	6334	0.35	24
DN80 (3")	9121	0.35	24

Performance

	Kdr	Over pressure	Blow down
Steam	0.4	10%	10%*

*or 0.3 Barg min

Maximum Back Pressure

Barg	CS 12 / CI 6
Constant	0%
Built-up	50%
Variable	0%

(Total % must not exceed Barg shown)

Connections

Flanged In x Flanged Out

Construction

Top Guided / High Lift

Cap Options

Open lever fitted as standard

Sizing

Refer to Capacity Charts

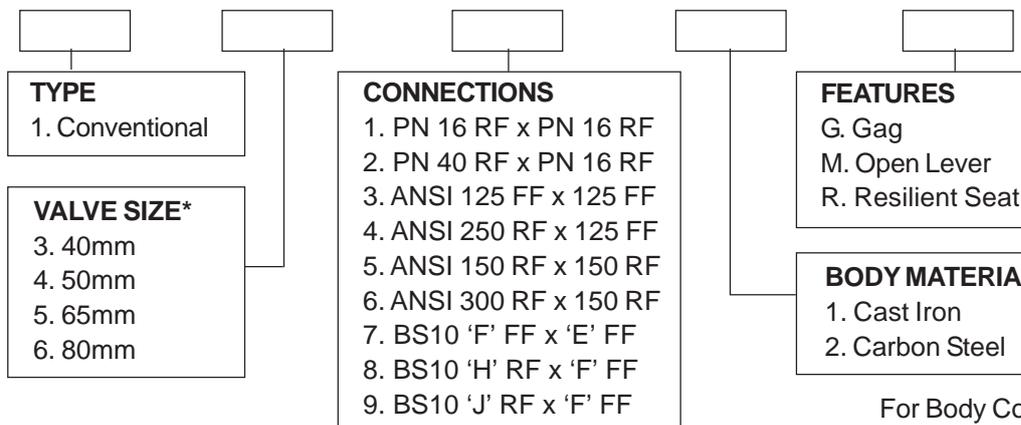
DESIGN

The 766 Safety Valve is a double spring high lift valve with high discharge capacity. The top guided piston design incorporates an adjustable blowdown ring and meets all the requirements of BS6759 Part 1.

A freely pivoting disc and precision lapped stainless steel trim gives positive re-seating for steam duty. Fitted as standard with test lever for inline testing. Ideally suited to applications on steam boilers and pipelines where blowdown tolerances are critical.

FIGURE NUMBERING

766



*Flange sizes are larger than the valve size, refer to the dimension table

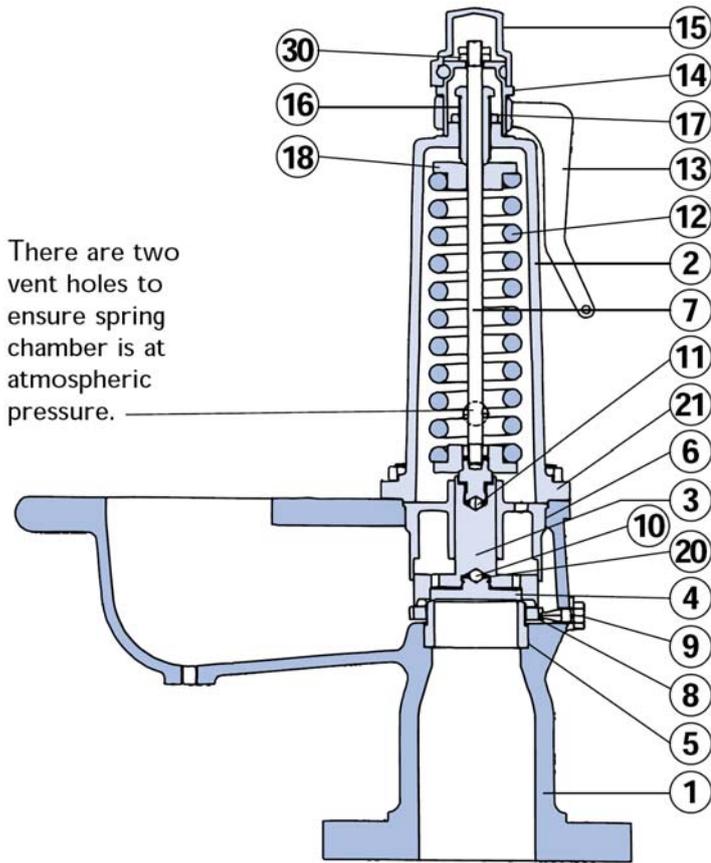
Notes:

- A. Any special requirements will be indicated by the letter X which will be agreed with the sales office. For example, paint specification or spring material.
- B. Any combination of features can be called up eg. MGR etc.
- C. Flange options are dependant on Valve Body materials, as detailed opposite.

For Body Code 1, Connection Codes 1, 3, 4, and 7, are available.

For Body Code 2, Connection Codes 1, 2, 5, 6, 7, 8 and 9 are available.

PARTS



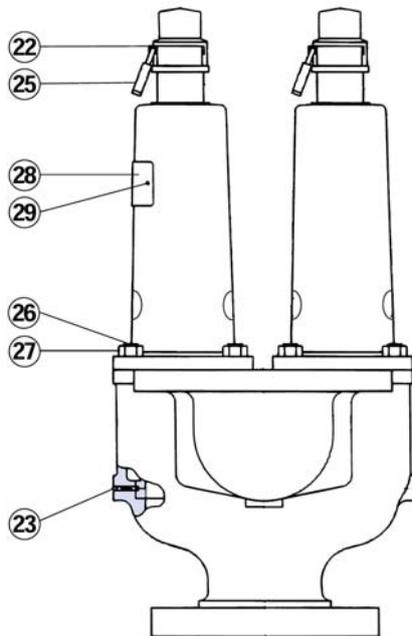
There are two vent holes to ensure spring chamber is at atmospheric pressure.

Note:

* Recommended spares.

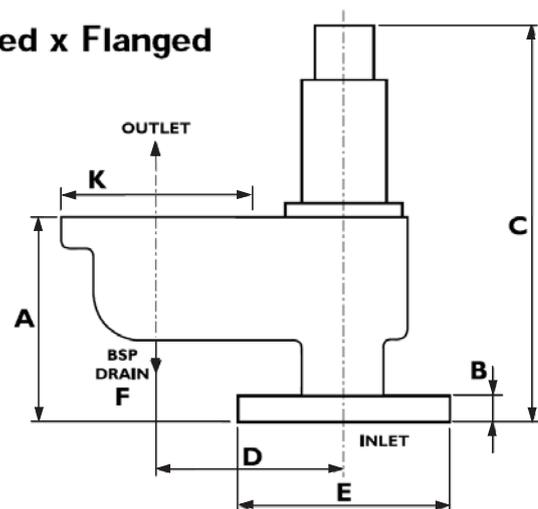
** The only difference between both options is Item 1 the body.

ITEM	PART	MATERIAL
1	Body**	Cast Iron or Carbon Steel
2	Cover	Cast Iron
3	Valve Disc Holder	Bronze
4*	Valve Disc	St.St.
5	Seat Ring	St.St.
6	Guide	Bronze
7	Spindle	St.St.
8	Blow Down Ring	St.St.
9	Setting Screw	St.St.
10*	Valve Disc Ball	St.St.
11*	Spindle Ball	St.St.
12*	Spring	Chrome Vanadium
13	Easing Lever	SG Iron
14	Dome	Bronze
15	Dome Cap	Grey Iron
16	Adjusting Screw	Brass
17	Locknut	Brass
18	Spring plate	Plated Steel
20*	Disc Retaining Clip	St.St.
21*	Body Gasket	Garlock
22	Locking Pin	Brass
23	Seat Securing Pin	St.St.
25	Padlock	Brass
26	Body Stud	Steel
27	Body Stud Nut	Steel
28	Nameplate	St.St.
29	Nameplate screw	Steel
30	Locknut	Steel



DIMENSIONS

Flanged x Flanged



Valve Type	Valve Size	Inlet	Outlet	A	B CI	B CS	C CI	C CS	D	E CI	E CS	F (BSP) DRAIN	K CI	K CS	Weight (kg)
Flanged	DN40	2-1/2"	3"	197	20	22	389	452	156	185	185	3/8"	190	200	25
	DN50	3"	4"	229	22	24	498	498	181	200	200	1/2"	210	220	38
	DN65	4"	5"	279	24	24	570	660	219	220	235	1/2"	240	250	58
	DN80	4"	6"	295	24	24	670	702	238	220	235	1/2"	265	285	83

Flange sizes listed are for :

Cast Iron Flanges PN16x6

Cast Steel Flanges PN 40x16 Others available on request.

All dimensions in mm.

SATURATED STEAM CAPACITY CHART (kg/h)

Set Pressure (Barg)	Metal Seat Valve Type 766 (BS6759 Pt1 @ 10% Overpressure)*			
	DN40	DN50	DN65	DN80
0.35	402	716	1119	1611
1.0	893	1587	2480	3571
2.0	1485	2640	4125	5940
3.0	2065	3673	5738	8262
4.0	2592	4609	7201	10369
5.0	3119	5545	8664	12475
6.0	3645	6482	10127	14582
7.0	4172	7418	11591	16689
8.0	4699	8355	13054	18795
9.0	5226	9291	14517	20902
10.0	5752	10228	15980	23009
12.0	6806	12100	18906	27222
12.5	7069	12569	19638	28276
14.0	7859	13974	21832	31436
16.0	8912	15847	24759	35649
18.0	9965	17720	27685	39863
20.0	11019	19593	30612	44076
22.0	12072	21466	33538	48289
24.0	13126	23338	36464	52503
26.0				
28.0				
30.0				
32.0				
34.0				
36.0				
38.0				
40.0				

* Minimum overpressure = 0.07 Barg at set pressure less than 0.7 Barg.

Minimum overpressure = 0.07 Barg at set pressure less than 1.0 Barg.

The 746 can be sized/certified to ASME VIII and AD Merkblatt A2 - contact factory for details.

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%

700 SERIES TECHNICAL SPECIFICATION

Fig. No	706	716	746	756	766	776
Body Material	Bronze	Bronze Cast Iron Stainless Steel	Cast Steel Stainless Steel	Cast Iron	Cast Steel Cast Steel	Bronze
Code		BS6759				ADMERKBLATT A2
Approvals Part	1, 2, & 3	1, 2, & 3	1, 2, & 3#	1	1	
Top Guided	Yes	Yes	Yes	Yes	Yes	Yes
Lift	High Lift	Full Lift	Full Lift	Full Lift	High Lift	Full Lift
Size Range	DN15-50 1/2" – 2"	DN15-50 1/2" – 2"	DN25-100 1" – 4"	DN25-80 1" – 3"	DN40-80 1-1/2" – 3"	DN15-50 1/2" – 2"
Orifice Areas (mm ²)						Sizing data to TUV available on request.
DN15	126	109	—	—	—	
DN20	364	314	—	—	—	
DN25	481	415	415	415	—	
DN32	791	660	660	660	—	
DN40	1240	1075	1075	1075	2280	
DN50	1943	1662	1662	1662	4054	
DN65	—	—	2827	2827	6334	
DN80	—	—	4301	4301	9121	
DN100	—	—	6648	—	—	
Pressure Range† (Barg)	0.35 to 12.5	0.35 to 32	0.35 to 40	0.35 to 24	0.35 to 24	1 to 41.3
Temp Range (°C) (with suitable material)	–59 to +220	–90 to +260	–40 to +427	–29 to +300	–29 to +230	–196 to +60
Connection	Screwed Flanged	Screwed Flanged	Flanged	Flanged	Flanged	Screwed
Trim Options	Brass EPDM (WRC) Viton	Stainless Aflas EPDM	Stainless Aflas EPDM	Stainless EPDM	Stainless EPDM	KEL F (PCTFE)
Cap Options	Dome Open lever	Dome Open lever	Dome Open lever Packed lever	Open lever	Open lever	Dome
Kdr. Cert. Coeff. Steam/Hot Water/Gases	0.173	0.7	0.7	0.716	0.4	—
Kdr. Cert. Coeff. Liquids	0.149	0.46	0.46	—	—	—
Pressure Maximum Constant	Brz 5.5 Barg 80%	SS 5.5 Barg 80%	SS 16 Barg 80%	CS 12 Barg —	CS 12 Barg —	SS 5.5 Barg 80%
Back Pressure* Built-up	10%	10%	10%	50%	50%	10%
Pressure* Variable	—	—	40%	—	—	—

*For higher back pressures consult factory. **Resilient 766 is limited to 10%.

†For maximum pressure per size and material refer to capacity and spring charts, pages 14 to 23.

††716 EPDM Seat, max pressure of 12.5 Barg on DN 15, 20, 25 and 18 Barg on DN 32, 40, 50.

#746 is also available ASME VIII and AD Merkblatt A2 certified, details available on request.

Material	Seat	Body	
Temperature Limitations	EPDM (WRC)	Bronze BSI 400 - LG2	–196 c to 232 °C
	EPDM	Cast Iron BSI 452-260	–10 C to 300 °C
	Aflas	Carbon Steel SA216-WCB	–29 C to 427 °C
	Brass	Stainless Steel 316/CF8M	–90 C to 427 °C
	Stainless Steel		