

Pressure Relief Valves

The function of a Pressure Relief Valve is to protect against over-pressure. For safety reasons, excessive over-pressure in any part of the refrigeration system must be avoided

Applications

A typical application for a Henry Technologies pressure relief valve (PRV) is to protect a liquid receiver from being over-pressurised. In the event of a fire, any liquid refrigerant inside the receiver will evaporate resulting in an increase in pressure. The PRV will safely control this increase in pressure by venting the vapour from the receiver. Another application is to protect equipment from compressor over-pressure.

Henry Technologies pressure relief valves are designed to discharge vapour and should not be used to vent liquid refrigerant. The valves are "back-pressure dependent" and are therefore required to discharge to atmosphere.

The brass and stainless steel series valves are suitable for use with HCFC and HFC refrigerant gases. The stainless steel series valves are also suitable for ammonia.

Once a PRV has discharged, replacement is recommended, as the set pressure can no longer be guaranteed. Refer to Installation Section for further information.

In line with the Institute of Refrigeration Guidelines (UK), Henry Technologies recommend that a PRV should be replaced at least every 5 years. These intervals may have to be reduced if other regulations apply.

It is recommended to have a relief valve pressure setting at least 25% higher than the maximum system operating pressure. The PRV set pressure should not be higher than the design pressure (MWP) of the vessel.

How it works

A conventional PRV is designed to open at a predetermined pressure - the set pressure. A spring exerts a sealing force on a valve seat via a piston seal assembly. At a pressure equal to the set pressure, the piston will start to lift resulting in a small amount of flow through the valve. From this point, the pressure force acting on the piston increases significantly and overcomes the spring force. This imbalance of forces causes the valve to "pop" fully open. By design, the difference in pressure from the valve set point to the fully open condition is no more than 10%. System pressure is controlled/reduced by venting the refrigerant vapour through the valve. The valve then re-closes at a pressure where the spring force overcomes the piston force. Under normal system operating conditions, the pressure at the valve inlet is below the set pressure. Only under abnormal operating conditions should the PRV be open.

Main features

- Proven safe design
- Category IV PED compliant
- Precision machined parts for reliability
- High flow capacity
- Compact
- Non-stick teflon valve seal
- Blow-out proof seal design
- Seal material with high chemical resistance
- Tamper proof
- Test Certificates available on request
- Non-standard pressure settings available on request



Technical Specification

All Henry Technologies standard range PRV's are designed and manufactured to the intent of ASME VIII Division 1.

For 526, 5230 and 5231 series models:-

Set pressure range = 14 to 31 barg
Allowable operating temperature = -40°C to +107°C

For 5232 and 524 series models:-

Set pressure range = 10.3 to 31 barg
Allowable operating temperature = -40°C to +107°C

For 53 series models:-

Set pressure range = 10.3 to 31 barg
Allowable operating temperature = -29°C to +135°C

Materials of Construction

For all 52 series valves, the main body and outlet connection are made from brass. Valve internals such as the piston and adjusting gland are either made from brass, plated steel or stainless steel.

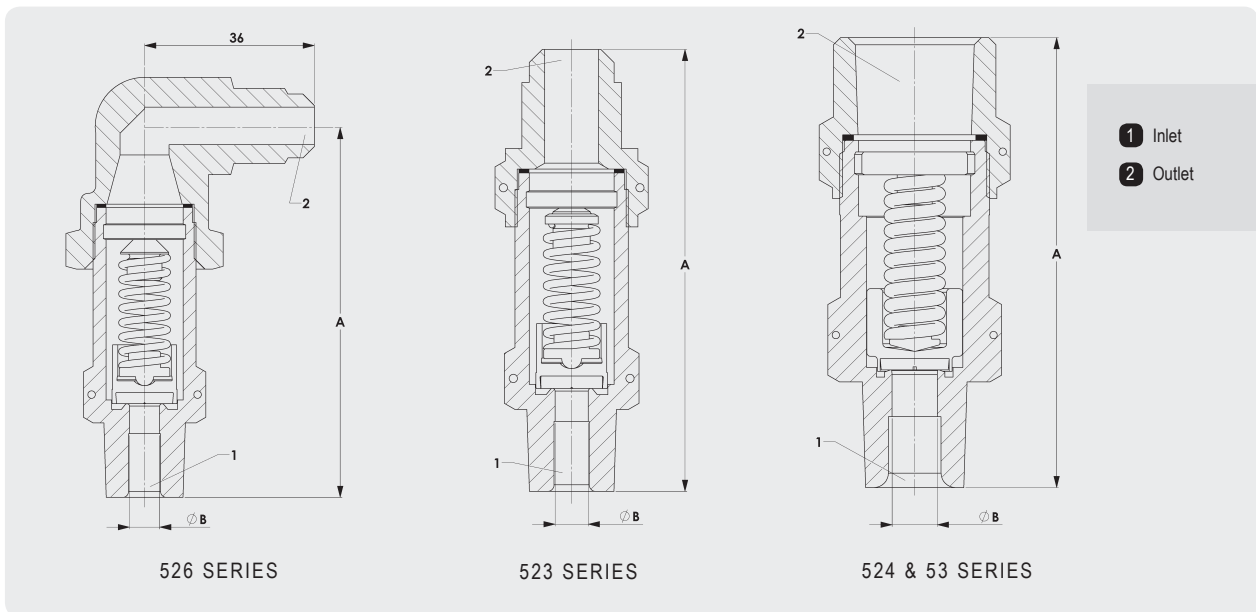
For the 53 series valves, the main body is made from stainless steel. The outlet connection and valve internals are made from either plated steel or stainless steel.

For all valves, the seal is made from premium quality teflon (PTFE). All springs are made from high strength plated alloy steel.

Angle Relief Valve - Brass								
Part No	Conn Size (inch)		Dimensions (mm)		Flow Area (mm ²)	K _{dr}	Weight (kg)	CE Cat
	Inlet	Outlet	A	ØB				
526E-xx.x BAR-CE	3/8 NPTF	3/8 SAE Flare	78	6.35	31.67	0.41	0.26	Cat IV

Straight-through Relief Valves - Brass								
Part No	Conn Size (inch)		Dimensions (mm)		Flow Area (mm ²)	K _{dr}	Weight (kg)	CE Cat
	Inlet	Outlet	A	ØB				
5230A-xx.x BAR-CE	1/4 NPTF	1/2 SAE Flare	85	6.35	31.67	0.68	0.18	Cat IV
5231A-xx.x BAR-CE	3/8 NPTF	1/2 SAE Flare	85	6.35	31.67	0.68	0.19	Cat IV
5231B-xx.x BAR-CE	1/2 NPTF	5/8 SAE Flare	91	6.35	31.67	0.68	0.22	Cat IV
5232A-xx.x BAR-CE	1/2 NPTF	3/4 SAE Flare	109	9.5	71.26	0.67	0.44	Cat IV
5240-xx.x BAR-CE	1/2 NPTF	3/4 NPTF (female)	95	9.5	71.26	0.67	0.41	Cat IV
5242-xx.x BAR-CE	3/4 NPTF	3/4 NPTF (female)	95	9.5	71.26	0.67	0.45	Cat IV
5244-xx.x BAR-CE	1 NPTF	1 NPTF (female)	106	12.7	126.68	0.68	0.66	Cat IV
5246-xx.x BAR-CE	1 1/4 NPTF	1 1/4 NPTF (female)	145	17.9	250.41	0.60	1.48	Cat IV

Straight-through Relief Valves - Stainless Steel								
Part No	Conn Size (inch)		Dimensions (mm)		Flow Area (mm ²)	K _{dr}	Weight (kg)	CE Cat
	Inlet	Outlet	A	ØB				
5340-xx.x BAR-CE	1/2 NPTF	3/4 NPTF (female)	94	9.5	71.26	0.67	0.39	Cat IV
5342-xx.x BAR-CE	3/4 NPTF	3/4 NPTF (female)	94	9.5	71.26	0.67	0.43	Cat IV
5344A-xx.x BAR-CE	3/4 NPTF	1 NPTF (female)	106	12.7	126.68	0.68	0.56	Cat IV
5344-xx.x BAR-CE	1 NPTF	1 NPTF (female)	106	12.7	126.68	0.68	0.62	Cat IV
5345-xx.x BAR-CE	1 NPTF	1 1/4 NPTF (female)	149	17.9	250.41	0.60	1.25	Cat IV
5346-xx.x BAR-CE	1 1/4 NPTF	1 1/4 NPTF (female)	145	17.9	250.41	0.60	1.37	Cat IV



Standard settings are (barg): 10.3, 13.8, 14.0, 16.2, 17.2, 20.7, 24.1, 24.8, 25.0, 25.9, 27.6, 29.3 and 31.0

Pressure Relief Valves - X Series

The 'X' Series of Pressure Relief Valves is based on the proven design of the standard range with some enhanced features. The valves are EN ISO 4126 compliant and will reseal within 15% of set pressure following a discharge. Consequently a minimum amount of refrigerant is lost to the atmosphere. The 523 series can also be used at pressures up to 46 bar.

NOTE:

Most systems are subject to accumulations of debris & particles of metal and dirt are generally blown onto relief valve seats during discharge.

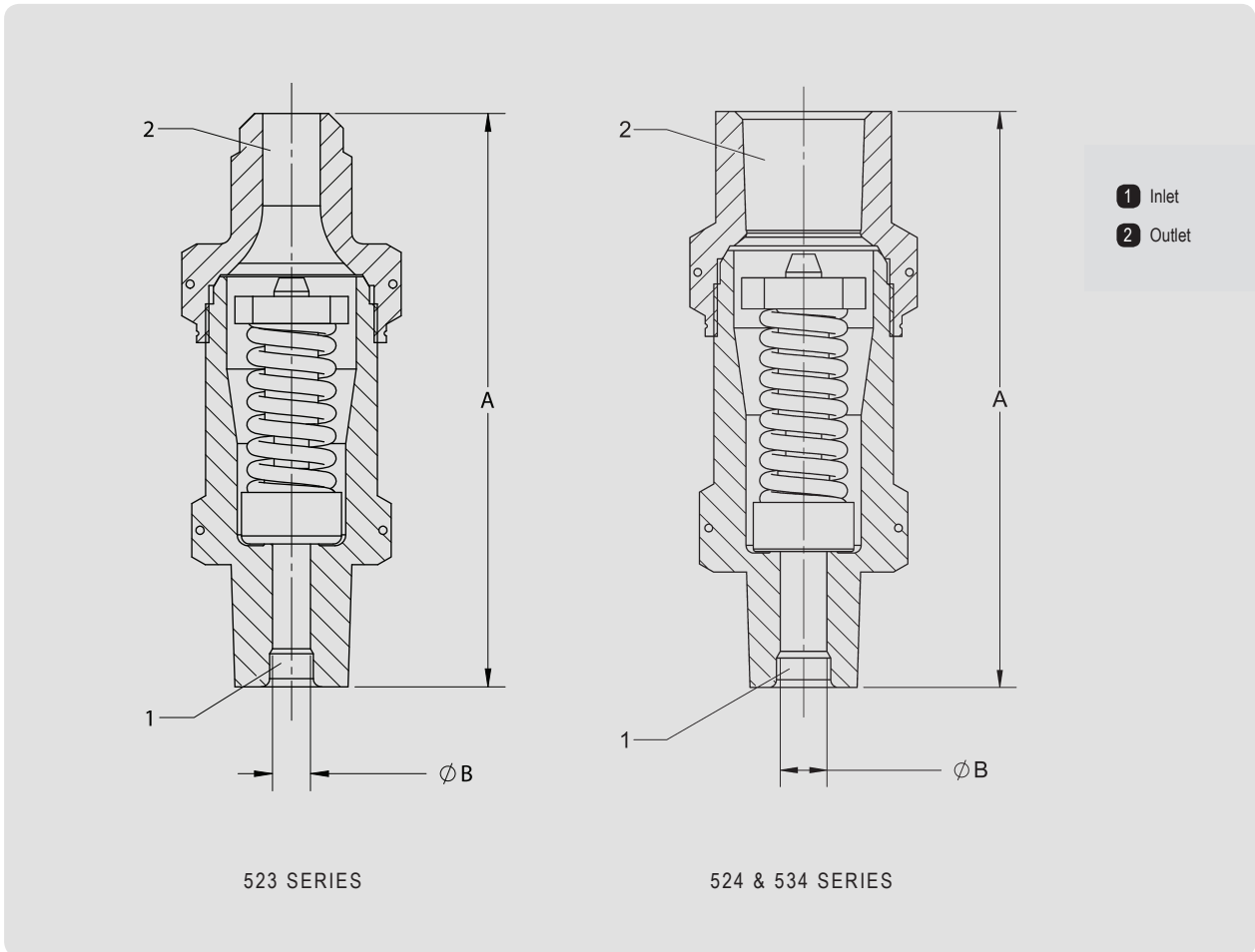
This can inhibit the relief valve from re-sealing.

Main features

- In accordance with EN ISO 4126 the valve reseats within 15% of set pressure following a discharge
- High flow capacity
- Fluoroelastomer soft seat material provides excellent sealing characteristics
- Allowable operating temperature = -40°C to +120°C
- Suitable for HFC, HCFC and CO₂ refrigerant gases
- 53 Series also suitable for R717

Part No	Connection Size (inch)		Dimensions (mm)		Flow Area (mm ²)	Kdr	Weight (kg)	CE Cat
	Inlet	Outlet	A	ØB				
	5230AX-xx.x BAR	1/4 NPTF	1/2 SAE Flare	94				
5231AX-xx.x BAR	3/8 NPTF	1/2 SAE Flare	94	7	38.48	0.71	0.39	Cat IV
5231BX-xx.x BAR	1/2 NPTF	5/8 SAE Flare	106	7	38.48	0.71	0.42	Cat IV
5232AX-xx.x BAR	1/2 NPTF	3/4 SAE Flare	119	9	63.62	0.76	0.56	Cat IV
5240X-xx.x BAR	1/2 NPTF	3/4 NPTF (female)	111	9	63.62	0.76	0.55	Cat IV
5242X-xx.x BAR	3/4 NPTF	3/4 NPTF (female)	111	9	63.62	0.76	0.58	Cat IV
5340X-xx.x BAR	1/2 NPTF	3/4 NPTF (female)	111	9	63.62	0.76	0.53	Cat IV
5342X-xx.x BAR	3/4 NPTF	3/4 NPTF (female)	111	9	63.62	0.76	0.57	Cat IV

xx.x = set pressure



Standard pressure settings (barg): 10.3, 13.8, 14.0, 16.2, 17.2, 20.7, 24.1, 24.8, 25.0, 25.9, 27.6, 29.3, 31.0, 40.0*, 42.0*, 45.0*, 46.0*
 *523 series only.

Valve Capacity Ratings (kg Air/min) @ 20°C.										
Part No	Standard Pressure setting (barg)									
	10.3	14.0	16.2	20.7	24.1	24.8	27.6	31.0	40.0	46.0
526E-CE	N/A	2.9	3.3	4.2	4.9	5.1	5.7	6.4	N/A	N/A
5230A-CE	N/A	4.8	5.5	7.0	8.2	8.4	9.4	10.5	N/A	N/A
5231A-CE										
5231B-CE										
5230AX	4.4	6.0	7.0	8.9	10.4	10.7	11.9	13.4	17.2	19.8
5231AX										
5231BX										
5232A-CE	7.8	10.5	12.2	15.6	18.2	18.7	20.8	23.4	N/A	N/A
5240-CE										
5242-CE										
5340-CE										
5342-CE	7.9	10.7	12.4	15.8	18.4	18.9	21.1	23.7	N/A	N/A
5232AX										
5240X										
5242X										
5340X										
5342X										
5244-CE	14.0	19.0	22.0	28.1	32.8	33.7	37.5	42.1	N/A	N/A
5344-CE										
5344A-CE										
5246-CE	24.4	33.2	38.4	49.1	57.1	58.8	65.4	73.5	N/A	N/A
5345-CE										
5346-CE										

N/A denotes a pressure setting unavailable for this model. See product description pages for max and min available settings.

Valve Capacity Table

Discharge capacities for each PRV model are given in the table for a range of standard pressure settings. This table is intended as a reference guide only. Final selection of a relief valve using the method described in EN13136 is recommended.

All capacities shown in the table have been calculated in accordance with the relief valve capacity calculation outlined in EN13136 and using air at 20°C as a reference medium.

If a conversion from air to refrigerant is required, the following formula can be used:

$$W_r = \frac{W_{air}}{r_w}$$

Where:-

W_r = Mass flow of refrigerant, kg/min

W_{air} = Mass flow of air, kg/min

r_w = Conversion factor

r- factors are presented for a number of common refrigerants. These can be used in conjunction with the table to provide an approximation of valve capacity.

Refrigerant	r _w
R-11	0.49
R-12	0.51
R-13	0.46
R-22	0.59
R-23	0.52
R-113	0.43
R-114	0.45
R-123	0.47
R-134a	0.56
R-236fa	0.47
R-245fa	0.50
R-290	0.84
R-404A	0.56
R-407C	0.59
R-407F	0.60
R-410A	0.62
R-500	0.56
R-502	0.52
R-507A	0.55
R-600	0.76
R-717	1.28
R-718	1.28
R-744	0.65

ANSI/ASHRAE standard 15-2007

Current European Refrigeration Standards do not use air capacity for valve selection. The information included here is presented for reference purposes and to enable a comparison between valve models to be easily attained.

In line with current European standards, the valve selection procedure outlined in EN13136 is recommended by Henry Technologies. This method uses the valve flow area, A, and de-rated coefficient of discharge, K_{dr}, which are listed in the dimension tables for each valve.

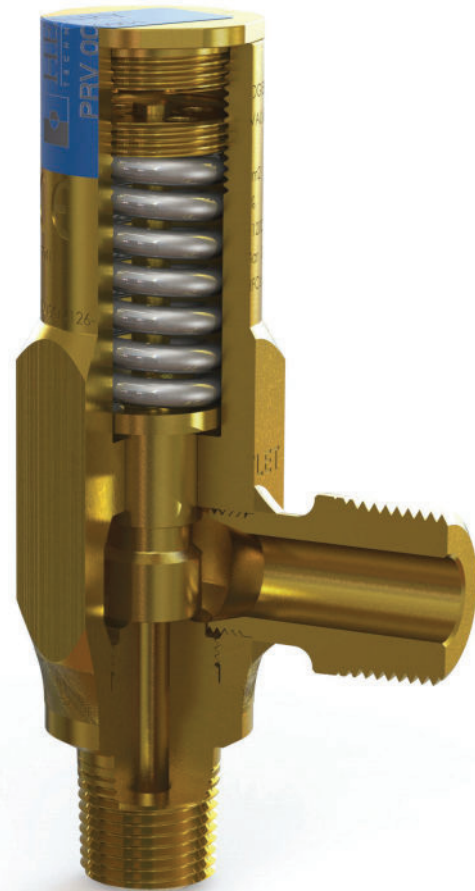
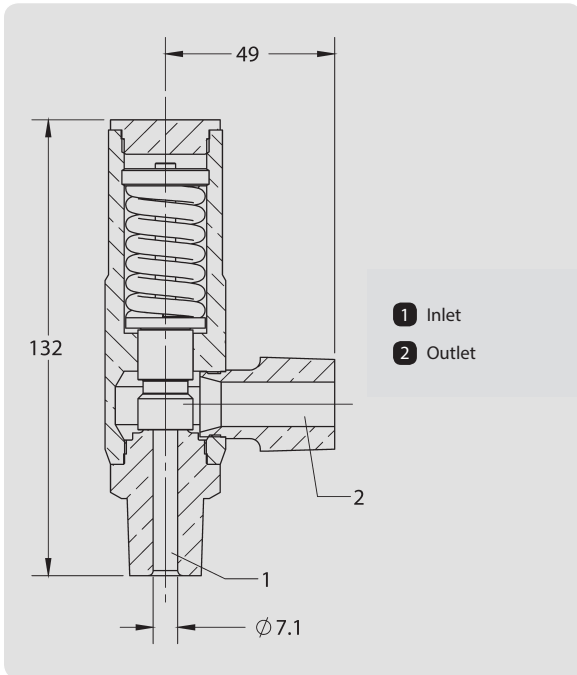
Pressure Relief Valves - Transcritical CO₂

The 5701AX pressure relief valve is specifically designed for high pressure applications from 46 bar up to 130 bar and in particular, transcritical CO₂ systems. The valve is manufactured from Brass.

Main features

- Maximum pressure setting of 130 bar
- In accordance with EN ISO 4126, the valve reseats within 15% of set pressure following a discharge
- High flow capacity
- Fluoroelastomer soft seat material provides excellent sealing characteristics
- Allowable operating temperature = -40°C to +120°C
- Suitable for HFC, HCFC and CO₂ refrigerant gases

Standard pressure settings (barg): 46, 60, 80, 100, 120, 130



Valve Capacity Ratings (kg Air/min) @ 20°C						
Part No.	Standard Pressure Setting					
	46.0	60.0	80.0	100.0	120.0	130.0
5701AX	20.4	26.6	35.5	44.4	53.2	57.7

High Pressure Angle Relief Valve - Brass						
Part No.	Conn Size (inch)		Flow Area (mm ²)	K _{dr}	Weight (kg)	CE Cat
	Inlet	Outlet				
5701AX	1/2 NPTF	3/4 NPTF	39.59	0.71	0.82	Cat IV

Note: High pressure rupture disc (with pressure settings up to 130 barg) available on request.

Selection Guidelines

For safety reasons, relief valve selection should only be carried out by suitably qualified engineers.

Henry Technologies pressure relief valves are designed to discharge refrigerant vapour and are not recommended for liquid use.

The European Standards EN378 (reference 1) and EN13136 (reference 2) are recommended for PRV selection.

Example

A liquid receiver is to be protected from over-pressure due to fire.

Receiver dimensions = 2.016m long (L) x 0.841m outside diameter (D)

Refrigerant = R744 (CO₂)

Pressure Setting = 50.0 barg

$$Q_{md} = \frac{3600 \times \theta \times A_{surf}}{h_{vap}}$$

Q_{md} = Minimum required discharge capacity, of refrigerant, of the pressure relief valve (kg/hour).

θ = Density of heat flow rate (kW/m²). The standards assume a value to 10 kW/m² but state that a higher value can be used if necessary. This figure relates to an un-lagged vessel.

A_{surf} = External surface area of the vessel (m²)

h_{vap} = Heat of vaporisation calculated at 1.1 times the set pressure, in bar a, of the pressure relief valve (kJ/kg)

Note:

When the relief valve setting is close to the critical pressure of the refrigerant, this sizing method may not be applicable.

$$A_{surf} = (\pi \times D \times L) + 2 \left(\frac{D^2 \times \pi}{4} \right)$$

$$A_{surf} = (\pi \times 0.841 \times 2.016) + 2 \left(\frac{0.841^2 \times \pi}{4} \right) = 6.44 \text{ m}^2$$

Calculate the heat of vaporisation, h_{vap} , taken at 1.1 times set pressure:

$$P_o = (P_{set} \times 1.1) + P_{atmos} = (50.0 \times 1.1) + 1.013 = 56.01 \text{ bar a}$$

From refrigerant property tables, use saturated vapour and liquid enthalpies at P_o .

Vapour = 410.59 kJ/kg

Liquid = 252.44 kJ/kg

$$h_{vap} = 410.59 - 252.44 = 158.15 \text{ kJ/kg}$$

The minimum required discharge rate of R744 can now be calculated for this vessel and set pressure:

$$Q_{md} = \frac{3600 \times \theta \times A_{surf}}{h_{vap}} = \frac{3600 \times 10 \times 6.44}{158.15} = 1,465.95 \text{ kg/hr, R744}$$

For relief valve discharge capacity, Q_m :

$$Q_m = 0.2883 \times C \times A \times K_{dr} \times K_b \times \sqrt{\frac{P_o}{V_o}}$$

Q_m = Discharge capacity, of refrigerant, of the pressure relief valve (kg/hr)

C = Function of the isentropic exponent

A = Flow area of PRV (mm²)

K_{dr} = De-rated coefficient of discharge of PRV

K_b = Theoretical capacity correction factor for sub-critical flow.
A value of 1 is used for critical flow.

P_o = Actual relieving pressure of PRV (bar a)

V_o = Specific volume of saturated vapour at P_o (m³/kg)

Refrigerant data should be referenced for values of C and V_o .

The objective is to select a PRV which results in $Q_m > Q_{md}$. In this way, the relieving capacity of the PRV is greater than required thus avoiding excessive vessel pressure.

For this example, a 5701AX has been selected:

$A = 39.59 \text{ mm}^2$

$K_{dr} = 0.71$

$$Q_m = 0.2883 \times 2.63 \times 39.59 \times 0.71 \times 1 \times \sqrt{\frac{56.01}{0.0054}} = 2,170.6 \text{ kg/hr, R744}$$

$Q_m > Q_{md}$, therefore the 5701AX would be suitable for this system.

Important selection notes:

1. It is important not to grossly over-size a PRV so that Q_m is many times greater than Q_{md} as the performance of the PRV can be affected. Contact Henry Technologies for further guidance.
2. Henry Technologies recommends inlet and outlet piping for all PRVs are sized in accordance with EN13136 (reference 2) to avoid excessive pressure losses which can affect valve performance.
3. If a Henry Technologies rupture disc is used in conjunction with a Henry Technologies PRV, the PRV capacity should be de-rated by 10%. In the above example, the PRV capacity would be de-rated to 1,953.5 kg/hr (2,170.6 x 0.9).

References:-

1. BS EN 378-2:2008+A2:2012*
2. BS EN 13136:2001*

*Latest revisions at the time of publication. The user should ensure the latest revisions are referenced.

Installation – Main issues

1. Connect the relief valve at a location above the liquid refrigerant level, in the vapour space. Stop valves should not be located between the vessel and the relief valve except the three-way type.
2. Do not discharge the relief valve prior to installation or when pressure testing the system.
3. Pressure relief valves should be mounted vertically.
4. Relief valves should be changed out after discharge. Most systems are subject to accumulations of debris and particles of metal and dirt are generally blown onto relief valve seats during discharge. This can inhibit the relief valve from re-sealing at the original set pressure. A valve can also relieve at a lower pressure than the stamped setting due to the force of the re-closing action.
5. The pipe-work must not impose loads on the relief valve. Loads can occur due to misalignment, thermal expansion, discharge gas thrust, etc.
6. Transcritical CO₂ systems should generally be sized with the shortest length and largest bore outlet pipe work practical to avoid solids forming downstream of the PRV during a discharge.

Rupture Discs

The function of a Rupture Disc is to protect against over-pressure. For safety reasons, excessive over-pressure in any part of the refrigeration system must be avoided. A rupture disc is generally used in combination with a Henry Technologies pressure relief valve.

Applications

A rupture disc protects against any leakage or weeping of refrigerant through a relief valve. A rupture disc can also be used in combination with a pressure gauge and/or pressure switch to detect if a relief valve has discharged.

Henry Technologies rupture discs are designed to operate with gases and should not be used to prevent liquid over-pressure.

The brass 55 series models are suitable for use with HCFC, HFC and CO₂ refrigerant gases. The stainless steel 56 series models are also suitable for ammonia.

In line with the Institute of Refrigeration Guidelines (UK), it is recommended that at least every 2 years all high side bursting discs should be replaced. At least every 5 years all low side bursting discs should be replaced. These intervals may have to be reduced if other regulations apply.

How it works

A foil disc is clamped in a holder. The disc is designed to burst at a pre-determined pressure - the set pressure. A reverse acting disc is used.

This means that the disc is domed against the direction of the fluid pressure and designed to buckle due to compression forces, prior to bursting. Advantages of a reverse acting disc include being less sensitive to temperature, high operating pressures and improved fatigue life. Each disc is manufactured with a precision score mark. This score mark in combination with the buckling action causes the disc to burst. At burst, the disc is designed to hinge resulting in a large available flow area. The disc is designed to be non-fragmenting after rupturing.

Main features

- Proven safe design
- CE marked
- High flow capacity
- Compact
- Reverse acting, non-fragmenting disc
- 2 x 1/8 NPT pressure ports
- Helium leak tested
- Pressure settings up to 130 barg available on request
- EN ISO 4126-2 Compliant

Technical Specification

Set pressure range = 10.3 to 31 barg
Set pressure range = 10.3 to 130 barg (5526 series)
Allowable operating temperature = -40°C to +107°C

Materials of Construction

For 55 and 56 series, the main bodies are made from brass and stainless steel respectively.

The foil disc is made from Nickel alloy.



Tolerance Guidelines

As per industry standards, rupture disc rated burst pressures are subject to a performance tolerance.

When specifying a disc, the nominal pressure setting should be quoted as part of the part number (see table below). The rupture disc will be provided with a rated burst pressure stamped on the body, which is the average of all burst tests carried out on the batch of discs. As a result, the rated burst pressure may differ slightly from the nominal setting depending on the manufacturing tolerance for the specific batch of discs. This manufacturing tolerance will never be greater than +/-5% and in the majority of cases is significantly less.

The rated burst pressure is subject to a performance tolerance of +/-5%. Examples of actual burst pressure ranges are shown in the table below for a selection of typical rated pressure settings.

Performance Tolerance Examples	
Rated Burst Pressure (barg)	Burst Pressure Range (barg)
10.3	9.8 - 10.8
14	13.3 - 14.7
16.2	15.4 - 17.0
17.2	16.3 - 18.0
20.7	19.7 - 21.7
24.1	22.9 - 25.3
24.8	23.6 - 26.0
25.9	24.6 - 27.2
27.6	26.2 - 29.0
31	29.5 - 32.6
40	38 - 42

Part No	Conn Size (inch)		Dimensions (mm)					Nominal rupture disc setting at 22°C (barg)	Weight (kg)	CE Cat
	Inlet	Outlet	A	B	ØC	D	MNFA, mm² (note 1)			
5525-16.2 Bar-CE	3/8 MPT	3/8 FPT	65	31.8 A/F	9.7	20	64.5	16.2	0.28	Cat IV
5525-20.7 Bar-CE								20.7		
5525-24.1 Bar-CE								24.1		
5525-25.9 Bar-CE								25.9		
5525-27.6 Bar-CE								27.6		
5525-31.0 Bar-CE								31.0		
5525-40.0 Bar-CE								40.0		
5526-14.0 Bar-CE	1/2 MPT	1/2 FPT	73	31.8 A/F	12.7	23	109.7	14.0	0.30	Cat IV
5526-16.2 Bar-CE								16.2		
5526-20.7 Bar-CE								20.7		
5526-24.1 Bar-CE								24.1		
5526-24.8 Bar-CE								24.8		
5526-25.9 Bar-CE								25.9		
5526-27.6 Bar-CE								27.6		
5526-31.0 Bar-CE								31.0		
5526-40.0 Bar-CE								40.0		
5626-10.3 Bar-CE								10.3		
5626-17.2 Bar-CE	1/2 MPT	1/2 FPT	73	Ø28.6	12.7	23	109.7	17.2	0.20	Cat IV
5626-20.7 Bar-CE								20.7		
5627-10.3 Bar-CE								10.3		
5627-17.2 Bar-CE	3/4 MPT	3/4 FPT	81	Ø38.1	19	29	187.1	17.2	0.34	Cat IV
5627-20.7 Bar-CE								20.7		
5628-10.3 Bar-CE								10.3		
5628-17.2 Bar-CE	1MPT	1FPT	93	Ø44.5	25.5	32	335.5	17.2	0.56	Cat IV
5628-20.7 Bar-CE								20.7		
5629-10.3 Bar-CE								10.3		
5629-17.2 Bar-CE	1 1/4 MPT	1 1/4 FPT	95	50.8 A/F	33.3	33	683.9	17.2	0.76	Cat IV
5629-20.7 Bar-CE								20.7		

Note 1: MNFA = Minimum net flow area. The MNFA is the net area after a complete disc burst, taking into account any structural members which reduce the nominal flow area. MNFA should be used as the flow area, A, in flow capacity calculations

Selection Guidelines

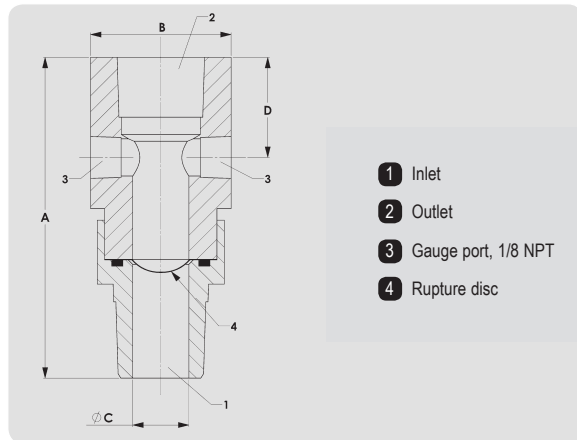
1. The rupture disc pressure setting should be the same as the Henry Technologies pressure relief valve setting.
2. The rated burst pressure is subject to a performance tolerance of +/-5 %. This tolerance should be taken into account when specifying a rupture disc setting (refer to table).
3. The burst pressure is affected by operating fluid temperature. Refer to table for temperature adjustment factors. At higher operating temperatures the disc burst pressure is reduced while at sub-zero temperatures it is increased. This factor should be taken into account when specifying a rupture disc setting.

Temperature range, °C	Temperature adjustment factor
-40 to -18	1.05
-17 to -1	1.04
0 to +45	1
+46 to +80	0.98
+81 to +107	0.97

4. It is recommended that the maximum operating pressure of the system is no more than 80% of the rated burst pressure, in order to minimise the risk of premature fatigue failure of the disc. If operating pressures exceed 90% of the rated burst pressure, the disc should be replaced immediately.
5. The design fatigue strength of each disc is 100,000 pressure cycles. Fatigue life will be reduced by excessive pressures or temperatures, corrosion, damage, etc.

Example

Rupture disc rated burst pressure = 31 barg @ 22°C
 Minimum actual burst pressure, using performance tolerance = 0.95 x 31 = 29.45 barg
 Maximum actual burst pressure, using performance tolerance = 1.05 x 31 = 32.55 barg
 Maximum operating fluid temperature = 40°C



To determine the recommended maximum operating pressure, the user should consider the -5% performance tolerance and the de-rate factors for both temperature and fatigue life.

Therefore:-

Minimum actual burst pressure = 29.45 barg
 Temperature de-rate factor = 1.0
 Fatigue life de-rate factor = 0.8

Recommended maximum operating pressure for rupture disc = 29.45 x 1.0 x 0.8 = 23.6 barg.

Installation – Main Issues

1. Connect the rupture disc either directly to the pressure vessel or to a three-way valve above the liquid refrigerant level in the vapor space.
2. The rupture disc comprises of a two-piece body design. To avoid damage during assembly or removal, the product Installation Instructions must be followed.
3. The pipework must not impose loads on the rupture disc. Loads can occur due to misalignment, thermal expansion, discharge gas thrust, etc.

Three Way Dual Shut-Off Valves

The function of a three-way valve is to permit replacement of one of the pressure relief devices while the other is protecting the pressure vessel. In this way, a vessel is protected from over-pressure during servicing. It also allows a pressure relief device to be replaced in-situ, without removing the system refrigerant charge.

Applications

All three-way valves are suitable for HCFC and HFC refrigerants along with their associated oils. The 802 series is also suitable for ammonia.

Refrigeration standard, EN378, specifies that a three-way valve is required on vessels of a certain size. EN378, or an equivalent National Standard, should be consulted for further guidance. It should be recognised however that a three-way valve can be fitted to a vessel of any size, to enable safe, easy and economical replacement of pressure relief devices.

Main features

- Proven robust design
- Compact

Technical Specification

Allowable operating pressure = 0 to 31 barg (802 series)

Allowable operating pressure = 0 to 46 barg (92 series)

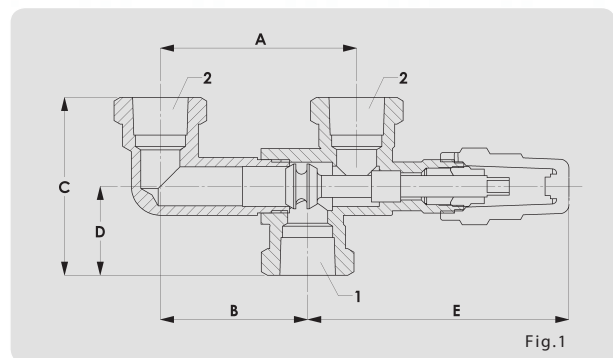
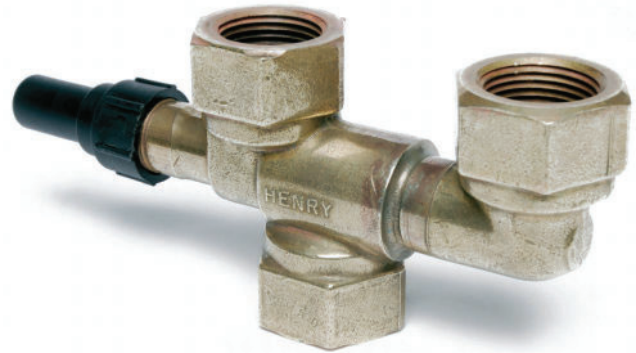
Allowable operating temperature = -29°C to +149°C

Materials of Construction

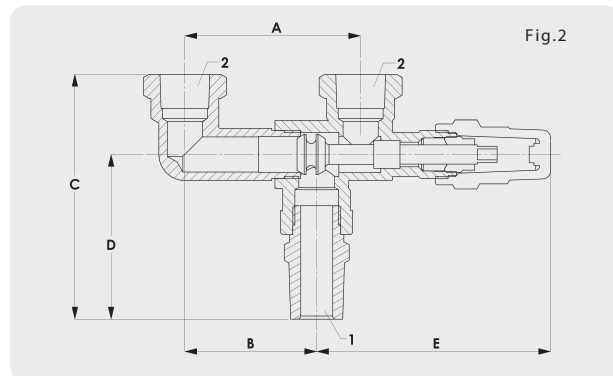
The 92 and 802 series valve bodies are made from brass and carbon steel respectively. The stem is made from plated steel. The stem seal packing is made from either PTFE or graphite based material. The seal cap is made from moulded plastic.

Installation – Main issues

1. Assemble the three-way valve to a vessel using a high strength pipe nipple.
2. The pipework must not impose loads on the valve. Loads can occur due to misalignment, thermal expansion, discharge gas thrust, etc



- 1 Inlet
- 2 Outlet



Type	Part No	Inlet Conn Size (inch)	Outlet Conn Size (inch)	Dimensions (mm)					Drawing reference	Weight (kg)	Kv (m ³ /hr)	CE Cat
				A	B	C	D	E				
92	923	3/8 FPT	3/8 FPT	70	52	64	32	93	fig.1	0.51	2.80	SEP
92	923M	3/8 MPT	3/8 FPT	70	52	90	57	93	fig.2	0.57	2.80	SEP
92	925	1/2 FPT	1/2 FPT	70	52	64	32	93	fig.1	0.47	2.83	SEP
92	925M	1/2 MPT	1/2 FPT	70	52	97	65	93	fig.2	0.57	2.83	SEP
92	927	3/4 FPT	3/4 FPT	70	52	70	35	100	fig.1	0.70	3.48	SEP
802*	8021A	1/2 FPT	1/2 FPT	92	59	86	44	146	fig.1	1.47	4.78	SEP
802*	8022A	3/4 FPT	3/4 FPT	92	59	86	44	146	fig.1	1.33	7.60	SEP
802*	8024-CE	1 FPT	1 FPT	148	94	99	51	191	fig.1	3.70	10.07	SEP (Cat I)
802*	8025-CE	1 1/4 FPT	1 1/4 FPT	148	94	99	51	191	fig.1	3.25	14.36	Cat I (Cat II)

*Suitable for Ammonia. Brackets indicate CE category for Ammonia use.

Pressure Indicator

The function of the Pressure Indicator is to provide visual indication in the event of a rupture disc burst. If the disc has ruptured, the pressure relief valve will have discharged and must be replaced. (refer to Sentry safety device information).

Applications

The G16 Pressure Indicator is intended to be used as part of the Henry Sentry safety device assembly.

The unit is suitable for use with HCFC, HFC and ammonia refrigerants, along with their associated oils.

Main features

- Easy to read large indicator dial
- Stainless steel movement

Technical Specification

Allowable operating pressure = 0 to 55 barg

Allowable operating temperature = -40°C to + 65°C

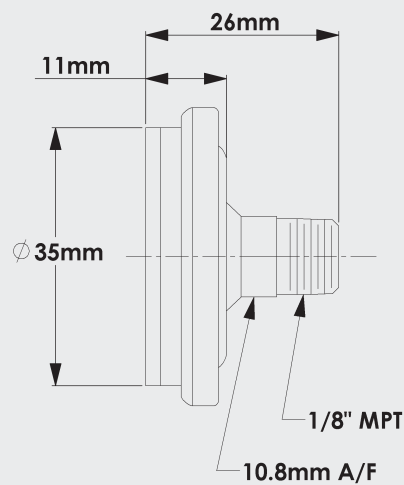
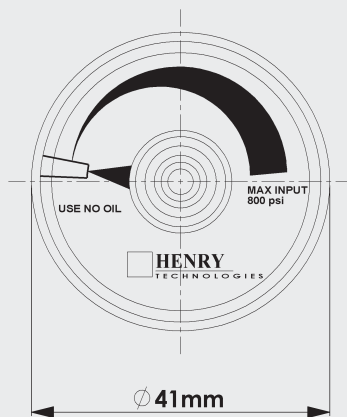
Materials of Construction

Stainless steel case and movement.

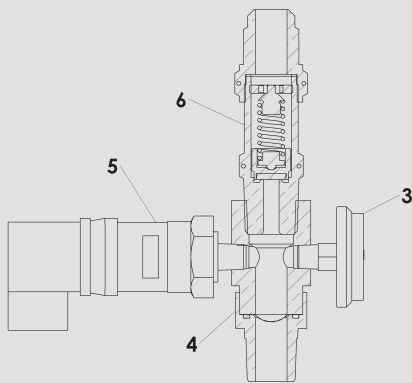
Plexiglas dial window.



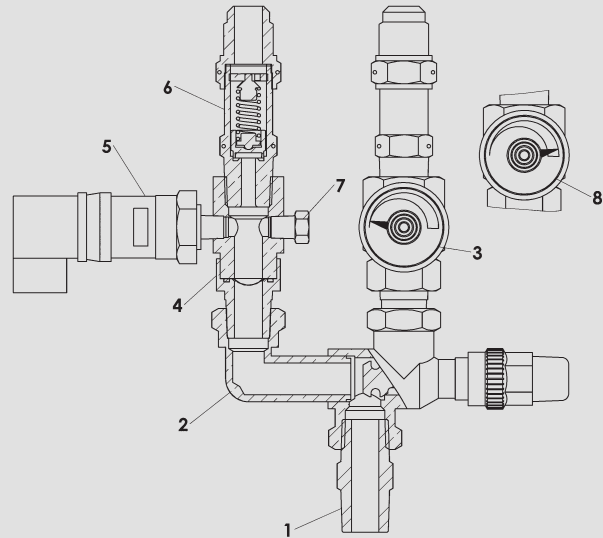
Part No	Weight (g)	CE Cat
G16	27	SEP



Sentry Safety Device Assemblies



SENTRY SINGLE SAFETY
DEVICE ASSEMBLY



SENTRY DUAL SAFETY
DEVICE ASSEMBLY

- | | | | |
|-------------------|-----------------------------------|------------------------------|--------------------------------|
| 1 Pipe nipple | 3 G16 gauge (no pressure applied) | 5 Pressure switch (optional) | 7 Plug, 1/8" NPT |
| 2 Three-way valve | 4 Rupture disc | 6 Relief valve | 8 G16 gauge (pressure applied) |

Refer to relevant catalogue pages for information on each component.

The primary purpose of a Sentry safety device assembly is to provide a positive seal between the system and atmosphere and facilitate an indicating device to be fitted. The indicating device notifies the user if the pressure relief valve has discharged. This is a requirement of Refrigeration Standard EN378.

A dual Sentry safety device assembly also provides a safe and economical method for replacing safety devices on a pressure vessel. Typically, this vessel will be a refrigerant liquid receiver. The Sentry assembly protects the receiver from over-pressure.

The Sentry safety device assemblies comprise a number of items from the Henry Technologies product range. There are two versions; a single safety device assembly and a dual safety device assembly.

The single safety device assembly comprises of a pressure relief valve, rupture disc, pressure indicator gauge and an optional pressure switch.

The dual safety device assembly comprises two pressure relief valves, two rupture discs, two pressure indicator gauges, two optional pressure switches and a three way valve.

Note: Each pressure relief device must have the required capacity to protect the vessel from over-pressure.

For both assemblies, a 1/8" NPT rupture disc blanking plug is required if the user does not fit both the pressure gauge and pressure switch. For the dual assembly, a pipe nipple is normally required to assemble the three-way valve to the pressure vessel.

In general, the user needs to order the individual items in each assembly. For popular combinations, SDK safety device kits are available.

Applications and Features

In line with the Institute of Refrigeration Guidelines (UK), Henry Technologies recommend that pressure relief valves and low side rupture discs be replaced at least every 5 years. All high side rupture discs should be replaced every 2 years. These intervals may have to be reduced if other regulations apply. The dual Sentry assembly provides a convenient solution for the replacement of safety devices along with other user benefits.

The features of a dual Sentry Assembly are:-

1. Safe, easy and economical maintenance: The three-way valve permits replacement of one of the relief devices, while the other is protecting the pressure vessel. In this way, a vessel is protected from over-pressure during servicing. It also allows a pressure relief device to be replaced in-situ, without removing the system refrigerant charge.
2. Protection against over-pressure: the rupture disc and relief valve will open at a pre-determined value to prevent excessive pressure.
3. Code Compliance: Refrigeration Codes specify that a three-way valve is required on vessels of a certain size.
4. Hermetic sealing: During normal operation, the rupture disc prevents any leakage or weeping of refrigerant through the relief valve.
5. Warning of safety device discharge: Both the pressure gauge and pressure switch indicate if the relief valve has discharged. The pressure gauge provides a visual indication. The pressure switch provides an electrical signal which can be used as an alarm.
6. Inter-space monitoring: The pressure gauge and pressure indicator can be used to check that the bursting disc is intact. This provides a warning in case there is a build up of pressure behind the disc, as a result of damage. Any back pressure will increase the design relief pressure of the rupture disc.

In comparison, the features of a single Sentry assembly are; protection against over-pressure, hermetic sealing, warning of safety device discharge and inter-space monitoring.

Sentry Assembly Combinations

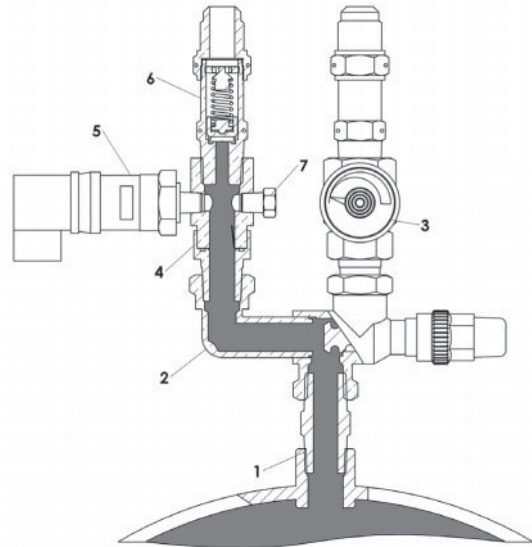
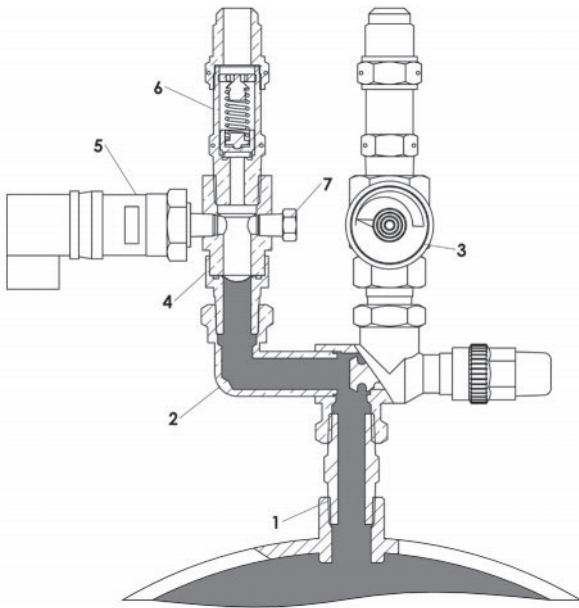
The table shows the recommended relief valve, rupture disc and three-way valve combinations. Please refer to the relief valve catalogue pages for outlet connection sizes.

Relief Valve	Rupture Disc	Three-Way Valve	Conn Size, inch (NPT)
Part No	Part No	Part No	
526E	5525	923	3/8
5231A	5525	923	3/8
5231AX	5525	923	3/8
5231B	5526	925	1/2
5231BX	5526	925	1/2
5232A, 5240, 5232AX, 5240X	5526	8021A or 925 (see note)	1/2
5340, 5340X	5626	8021A	1/2
5242, 5242X	5627	8022A or 927 (see note)	3/4
5342, 5342X, 5344A	5627	8022A	3/4
5244, 5344, 5345	5628	8024-CE	1
5246, 5346	5629	8025-CE	1 1/4

Note: Where possible, it is best to select the three way valve model with the larger K_v value.

How it works

The diagram (below) shows the rupture disc intact. Normal system pressure acts on the rupture disc. There is no pressure in the chamber between the rupture disc and relief valve. Note that the pressure is diverted to one side of the three-way valve only, allowing the valve to be safely removed, if required.



The diagram (above) shows the rupture disc burst. The pressure is now contained by the relief valve only. The pressure switch would now detect the pressure in the chamber between the rupture disc and relief valve. The gauge, if fitted, would indicate that pressure is acting in this chamber. In this condition, the relief valve will have discharged due to system over-pressure. Both the relief valve and rupture disc now need to be replaced.

Safety Device Kits

The function of a Safety Device Kit is to protect against over-pressure. For safety reasons, excessive over-pressure in any part of the refrigeration system must be avoided. The 'X' denotes that the kit includes an 'X' series PRV.

Four kits are available, SDK1, SDK2, SDK1X and SDK2X.

The SDK1X kit is a single safety device assembly. It comprises of a pressure relief valve, rupture disc, pressure indicator gauge and a 1/8" NPT rupture disc blanking plug.

The SDK2X kit is a dual safety device assembly. It comprises of two pressure relief valves, two rupture discs, two pressure indicator gauges, two blanking plugs, a three-way valve and a 1/2" NPT pipe nipple.

Applications

A typical application for a Henry Technologies Safety Device Kit is to protect a liquid receiver from being over-pressurised. Refer to the catalogue pages for a description on the function of each individual component. The kits are designed for use with HCFC and HFC refrigerants, along with their associated oils

Main features

- Combines Henry Technologies relief devices in one easy-to-order kit
- Components packed into compact display carton
- Easy to store

Technical Specification

Refer to the catalogue pages for the maximum operating pressures and temperatures for each item.

Materials of Construction

The main components for the SDK kits are made from brass and steel. Refer to individual catalogue pages for details on each component.

Selection Data

Selection of relief devices should be as outlined in respective catalogue pages. Ensure that relief valve selection guidance is followed prior to ordering of kits.



Part No	Relief Valve		Rupture Disc		Indicator Gauge	
	Part No	Qty	Part No	Qty	Part No	Qty
SDK1-14.0BAR-CE	5231B-14.0BAR-CE	1	5526-14.0BAR-CE	1	G16	1
SDK1-16.2BAR-CE	5231B-16.2BAR-CE	1	5526-16.2BAR-CE	1	G16	1
SDK1-17.2BAR-CE	5231B-17.2BAR-CE	1	5526-17.2BAR-CE	1	G16	1
SDK1-20.7BAR-CE	5231B-20.7BAR-CE	1	5526-20.7BAR-CE	1	G16	1
SDK1-24.1BAR-CE	5231B-24.1BAR-CE	1	5526-24.1BAR-CE	1	G16	1
SDK1-24.8BAR-CE	5231B-24.8BAR-CE	1	5526-24.8BAR-CE	1	G16	1
SDK1-25.9BAR-CE	5231B-25.9BAR-CE	1	5526-25.9BAR-CE	1	G16	1
SDK1-27.6BAR-CE	5231B-27.6BAR-CE	1	5526-27.6BAR-CE	1	G16	1
SDK1-31.0BAR-CE	5231B-31.0BAR-CE	1	5526-31.0BAR-CE	1	G16	1
*SDK1X-40.0BAR-CE	5231BX-40.0BAR-CE	1	5526-40.0BAR-CE	1	G16	1

SDK1X versions also available. *SDK1X only at this pressure.

Part No	Relief Valve		Rupture Disc		Indicator Gauge		Three-way Valve	
	Part No	Qty	Part No	Qty	Part No	Qty	Part No	Qty
SDK2-14.0BAR-CE	5231B-14.0BAR-CE	2	5526-14.0BAR-CE	2	G16	2	925	1
SDK2-16.2BAR-CE	5231B-16.2BAR-CE	2	5526-16.2BAR-CE	2	G16	2	925	1
SDK2-17.2BAR-CE	5231B-17.2BAR-CE	2	5526-17.2BAR-CE	2	G16	2	925	1
SDK2-20.7BAR-CE	5231B-20.7BAR-CE	2	5526-20.7BAR-CE	2	G16	2	925	1
SDK2-24.1BAR-CE	5231B-24.1BAR-CE	2	5526-24.1BAR-CE	2	G16	2	925	1
SDK2-24.8BAR-CE	5231B-24.8BAR-CE	2	5526-24.8BAR-CE	2	G16	2	925	1
SDK2-25.9BAR-CE	5231B-25.9BAR-CE	2	5526-25.9BAR-CE	2	G16	2	925	1
SDK2-27.6BAR-CE	5231B-27.6BAR-CE	2	5526-27.6BAR-CE	2	G16	2	925	1
SDK2-31.0BAR-CE	5231B-31.0BAR-CE	2	5526-31.0BAR-CE	2	G16	2	925	1
*SDK2X-40.0BAR-CE	5231BX-40.0BAR-CE	2	5526-40.0BAR-CE	2	G16	2	925	1

SDK2X versions also available. *SDK2X only at this pressure.