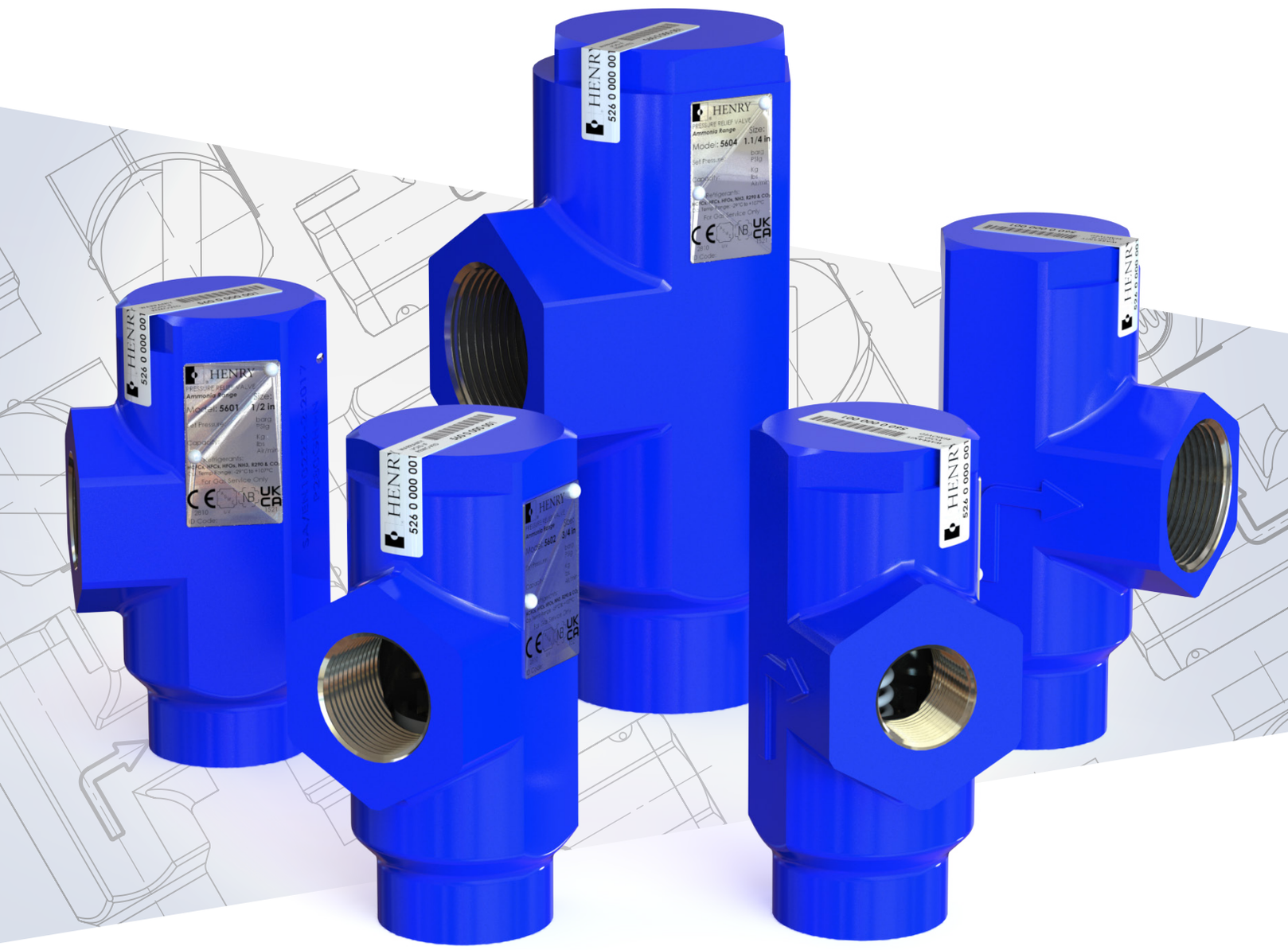
HENRY GROUP®




# PRESSURE RELIEF VALVES

## Ammonia Range

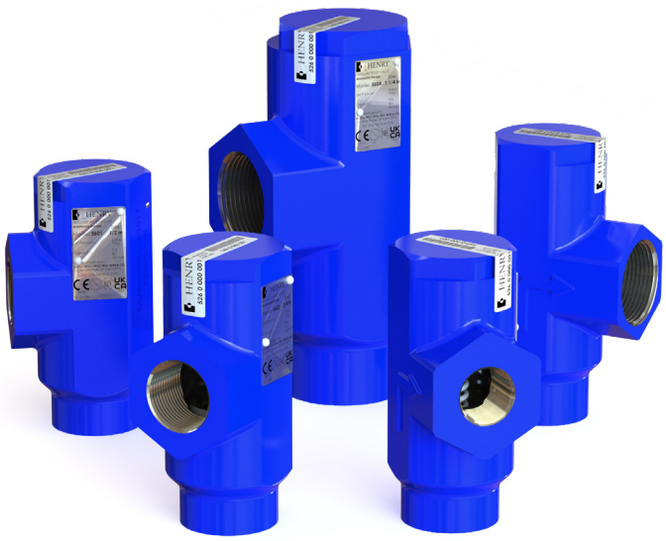
INTELLIGENT MANUFACTURING. INTELLIGENT PRODUCTS.

# AMMONIA RANGE

### How It Works

The Ammonia Range of PRVs takes the proven technology employed in the standard range and encases it in a robust forged steel body, suitable for the demands of an Ammonia refrigeration system. The female NPTF connections allow for maximum sealing against leaks, whilst the angled layout gives more flexibility when routing the discharge piping required in Ammonia systems.

All models are fully designed and certified to the ASME BPVC Section XIII as UV-stamped Pressure Relief Valves, as well as being CE and UKCA certified Category IV safety devices.

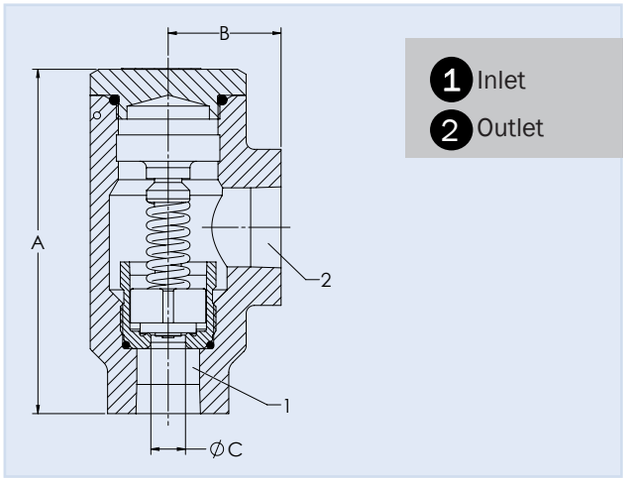


### Materials of Construction

The main pressure shell of the valve is made from forged steel. All internal components are manufactured from plated or stainless steel. The seal is a bespoke non-stick and chemically-inert PTFE design.

### Additional Features

- Suitable for HFC, HCFC, HFO, Ammonia and $CO_2$ Refrigerant Gases
- Supplied with an installation date sticker
- Dedicated hole for attachment of additional third-party tags.
- Available marked in either metric (barg and kg Air/min) or imperial (PSIg and lbs Air/min) units




### Technical Specifications

| Set Pressure Range: | Temperature Range: |
|---|---|
| 10.3 barg to 31.0 barg* | -29°C to +107°C |
| 150 PSIg to 450 PSIg* | -20°F to +225°F |

*Maximum setting on 5604 model is 24.1 barg (350 PSIg)

Relief Valves Ammonia Range

| Part No. | Connection Type | | Dimmensions (mm) | | | Flow Area ($mm^2$) | kdr | Weight (kg) | ASME (uv) | CE/ UKCA Cat |
|---|---|---|---|---|---|---|---|---|---|---|
| | Inlet | Outlet | A | B | ØC | | | | | |
| 5600 | 1/2" NPTF (Female) | 3/4" NPTF (Female) | 127 | 40.6 | 12.7 | 126.68 | 0.63 | 1.8 | Yes | Cat IV |
| 5601 | 1/2" NPTF (Female) | 1" NPTF (Female) | 127 | 40.6 | 12.7 | 126.68 | 0.73 | 1.8 | | |
| 5602 | 3/4" NPTF (Female) | 1" NPTF (Female) | 127 | 40.6 | 12.7 | 126.68 | 0.73 | 1.7 | | |
| 5603 | 1" NPTF (Female) | 1.1/4" NPTF (Female) | 140 | 50.8 | 12.7 | 126.68 | 0.77 | 1.8 | | |
| 5604 | 1.1/4" NPTF (Female) | 1.1/2" NPTF (Female) | 188 | 58.4 | 17.9 | 250.41 | 0.74 | 3.1 | | |

### Availability

A number of common valve and pressure setting combinations are produced as standard models - built to stock. If a system recquires an uncommon pressure setting, non-standard pressure settings are available on all valve models upon request.

| Valve Model / Setting Combinations | | | | | | |
|---|---|---|---|---|---|---|
| Setting (PSIg) | Setting (barg) | 5600 | 5601 | 5602 | 5603 | 5604 |
| 150 | 10.3 | | | | | |
| 225 | 15.5 | | | | | |
| 250 | 17.2 | | | | | |
| 275 | 19.0 | | | | | |
| 300 | 20.7 | | | | | |

Note: Blue indicates build-to-stock models

### Refrence Flow Capacities and Model Selection

The table below shows the rated flow capacity of each model on Air at various set pressures. This can be used as a quick comparison of each valve, but for selection purposes it is recommended to follow the calculation methodology given in the EN 13136 Standard, an example of which is given on the following page.

| Valve Reference Flow Capacity Table (kg Air/min) @ 20°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Setting (barg/*PSIg*) | | | | | | | | | | |
| Model | 10.3 | 14 | 16.2 | 17.2 | 20.7 | 24.1 | 24.8 | 25.9 | 27.6 | 31 |
| | *150* | *203* | *235* | *250* | *300* | *350* | *360* | *375* | *400* | *450* |
| 5600 | 13.9 | 18.5 | 21.3 | 22.5 | 26.9 | 31.1 | 32.0 | 33.3 | 35.5 | 39.7 |
| 5601 / 5602 | 16.2 | 21.5 | 24.7 | 26.1 | 31.1 | 36.0 | 37.0 | 38.6 | 41.1 | 46.0 |
| 5603 | 17.0 | 22.7 | 26.0 | 27.5 | 32.8 | 38.0 | 39.1 | 40.7 | 43.3 | 48.5 |
| 5604 | 32.4 | 43.1 | 49.4 | 52.3 | 62.4 | 72.2 | N/A | | | |

**Selection Guidelines**

For safety reasons, relief valve selection should only be carried out by suitably qualified engineers.
The European Standard; EN 378 and EN 13136 are recommended and are used as a reference for all below calculations.
A liquid receiver containing R717 (Ammonia) refrigerant is to be protected from overpressure due to fire. The receiver is 5.0m long (L) and 1.68m in diameter (D). The set pressure ($P_{set}$) of the PRV is to be 225PSIg (15.5barg).

Calculate actual relieving pressure ($p_0$):
$p_0 = (p_{set} \times 1.1) + p_{atmos}$
$p_{atmos}$ = atmospheric pressure

$p_0 = (15.5 \times 1.1) + 1.013 =$ **18.06 *bara***

Calculate vessel external surface area ($A_{surf}$):
$A_{surf} = (\pi \times D \times L) + 2(D^2 \times \pi/4)$
$A_{surf} = (\pi \times 1.68 \times 5.0) + 2(1.68^2 \times \pi/4) =$ **30.82 m²**

Calculate the minimum required discharge capacity ($Q_{md}$):

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

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

$$Q_{md} = \frac{3600 \times \varphi \times A_{surf}}{h_{vap}} = \frac{3600 \times 10 \times 30.82}{1,072.98} =$$ **1,034kg/hr**

Select an appropriate PRV to exceed $Q_{md}$. For this example, a 5601 has been used.

Calculate the discharge capacity of the PRV ($Q_m$):
$Q_m = 0.2883 \times C \times A \times K_{dr} \times K_b \times \sqrt{(p_0/v_0)}$
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.
$v_0$ = Specific volume of saturated vapour at $p_0$ (m³/kg)

$Q_m = 0.2883 \times 2.64 \times 126.68 \times 0.73 \times 1 \times \sqrt{18.06/0.07148} =$ **1,119 kg/hr**

$Q_m > Q_{md}$ so the 5601 would be a suitable PRV for this application.

**Important Selection Notes**

1. It is important not to grossly over-size a PRV so that $Q_m$ is five or more 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 EN 13136 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%.



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