# EMERSON™

## ANDERSON GREENWOOD RESERVE CAPACITY RELIEF VALVE

Designed to provide overpressure relief for large cryogenic storage volumes; enables emergency capacities protecting against adverse conditions.



### FEATURES

- Large orifice area reduces dramatically the number of valves needed to provide safety.
- O-ring seat provides bubble-tight performance to 90% of set pressure.
- A combination of tension link and spring force holds the valve closed to provide positive opening at set pressure and bubble tight shut-off at reseat.
- Full open at set pressure with no overpressure required for rated capacity.
- Easy maintenance as all parts can be replaced with the valve installed, with the tank pressure at 50% or less of set.
- Flange mounting with a flat face, smooth finish.
- Reseat pressure is 50% of set.

### GENERAL APPLICATIONS

The RCRV is used typically for LNG or LPG storage tank applications to relieve excessive pressures generated by overfill, mechanical failure, rollover or loading errors.

### TECHNICAL DATA

Sizes:     24" and 36" (DN 600 and DN 900)

Flange mounting:
        24" = 150# Class/ANSI 16.5
        36" = 125# Class/ANSI 16.1

Set pressure range:
        24": 1.5 to 5.0 psig (103 to 345 mbarg)
        36": 1.5 to 3.0 psig (103 to 207 mbarg)

Consult factory for higher pressures.

# ANDRESON GREENWOOD RESERVE CAPACITY RELIEF VALVE

## Product overview

Certain special emergency venting situations could require relief capacities far greater than that provided by the primary pressure relief valves. The large orifice area of the RCRV makes it possible to use one or two valves instead of perhaps ten or twenty valves to assure this additional safety.

## APPLICATIONS

### Overfill

The RCRV is capable of relieving the excessive vapor that may be generated under some level control failure conditions, where cold liquid could be pumped over the top of the inner wall and into the warm insulation space.
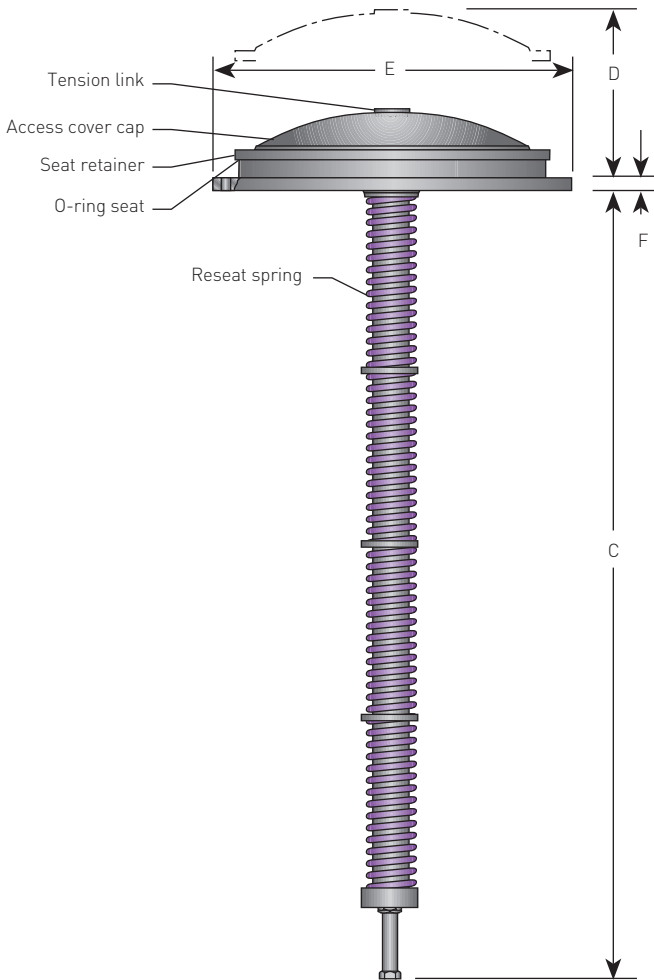
### Mechanical failure

Should the inner wall on a double wall tank fail and permit liquid to pass through into the insulation space, excessive vapor will be generated rapidly and this can be relieved by the RCRV.

### Rollover

The RCRV provides the very large orifice area needed to prevent excessive overpressure caused by boil-off of lower density product rolling up and over higher density product.

### Loading error

The RCRV can provide the large capacity necessary to relieve the dangerous quantities of vapor produced when loading propane into a partially filled butane tank.

## MATERIALS

| | | |
|---|---|---|
| Cap | Aluminum | B26-356-T6 |
| Tension link cover | 316 SS | A479-316 |
| Flange | Aluminum | B26-356-T6 |
| Seat | NBR | Nitrile |
| Seat retainer | Aluminum | B36-356-T6 |
| Spring | Inconel® | AMS 5699 X-750 |
| Internals | SS | B36-356-T6 |

### NOTE

1. Inconel® is a registered trademark of International Nickel Company.

## DIMENSIONS, INCHES (mm)

| Valve size | C | D | E | F | Weight lb (kg) |
|---|---|---|---|---|---|
| 24 | 29 | 17 | 32 | 1.88 | 350 |
| (600) | (737) | (432) | (813) | (48) | (159) |
| 36 | 100 | 29 | 46 | 1.63 | 600 |
| (900) | (2540) | (737) | (1168) | (41) | (273) |

# ANDRESON GREENWOOD RESERVE CAPACITY RELIEF VALVE

## VALVE SIZING – NOMENCLATURE

**English units**

$$W = \frac{735 \, KAP_1 \, F\sqrt{M}}{\sqrt{TZ}}$$

$$V = \frac{4645 \, KAP_1 \, F}{\sqrt{MTZ}}$$

**Metric units**

$$W = \frac{558 \, KAP_1 \, F\sqrt{M}}{\sqrt{TZ}}$$

$$V = \frac{12510 \, KAP_1 \, F}{\sqrt{MTZ}}$$

where:

$$F = \sqrt{\frac{k}{k-1}\left[\left(\frac{P_2}{P_1}\right)^{\frac{2}{k}} - \left(\frac{P_2}{P_1}\right)^{\frac{k+1}{k}}\right]}$$

### GAS FLOW

| Symbol | Description | Inch pounds | Metric units |
|---|---|---|---|
| $P_1$ | Absolute pressure at valve inlet connection under relieving conditions and equal to set pressure, p + overpressure + atmospheric pressure | lb/in² absolute (psia) | Bar absolute (bara) |
| $P_2$ | Absolute atmospheric pressure at valve outlet | lb/in² absolute (psia) | Bar absolute (bara) |
| T | Absolute relieving temperature, equal to relieving temperature plus base temperature where: T (°Rankin = t (°F) + 460 and T (°Kelvin) = t (°C) + 273 | Degrees Rankin (°R) | Degrees Kelvin (°K) |
| V | Gas flow capacity expressed in volumetric units per time unit. The formula for SCFM is based on an atmospheric pressure of 14.7 psia and a temperature of 60°F. The formula for Nm³/hr is based on an atmospheric pressure of 1.013 bara and 0°C | Standard cubic feet per minute (SCFM) | Normal cubic meter per hour (Nm³/hr) |
| W | Gas flow capacity expressed in weight units per time unit | Pounds per hour (lb/hr) | Kilograms per hour (kg/hr) |
| F | Subsonic flow factor, based on the ratio of specific heats and pressure drop across the valve | | |
| k | The ratio of specific heats of gas, where $k = C_p/C_v$ | | |
| KA | The valve flow factor (refer to chart below) | In² | Cm² |
| M | Molecular weight of the flowing gas | | |

**SCFM AIR 0% OVERPRESSURE, 60°F**

| Pressure (psig) | 24" | 36" |
|---|---|---|
| 1.5 | 51,000 | 126,000 |
| 2.0 | 58,800 | 145,000 |
| 2.5 | 65,700 | 162,000 |
| 3.0 | 71,900 | 177,000 |
| 5.0 | 92,300 | - |

**NM³/HR AIR 0% OVERPRESSURE, 0°C**

| Pressure (barg) | 600 mm | 900 mm |
|---|---|---|
| 0.100 | 82,900 | 204,000 |
| 0.150 | 101,000 | 250,000 |
| 0.200 | 117,000 | 288,000 |
| 0.345 | 148,400 | - |

| Gas or vapor | K | M |
|---|---|---|
| Air | 1.40 | 29 |
| N-Butane | 1.09 | 58 |
| Ethane | 1.19 | 30 |
| Ethylene | 1.24 | 28 |
| Methane | 1.31 | 16 |
| Natural gas | 1.27 | 17.4 |
| Nitrogen | 1.40 | 28 |
| Oxygen | 1.40 | 32 |
| Propane | 1.13 | 44 |
| Propylene | 1.15 | 42 |

| Size (mm) | KA English | KA metric |
|---|---|---|
| 24" (600) | 288 | 1858 |
| 36" (900) | 710 | 4580 |