



Model 3100

Pressure / Vacuum Relief Vent

SECTION I

I. 3000 SERIES DESIGN AND FUNCTION

| MODEL | P | V | DESCRIPTION |
|-------|---|---|-----------------------------|
| 3100 | P | V | Vent to Atmosphere |
| 3200 | P | V | Vent to Header |
| 3300 | | V | Top Mounted |
| 3400 | P | | Vent to Atmosphere |
| 3500 | P | | Vent to Header |
| 3600 | | V | Side Mounted |
| 3700 | P | | Emergency/Manhole Cover |
| 3800 | P | | Emergency/Top Guided Relief |
| 3900 | P | | Hinged Emergency Relief |

Models 3100 thru 3600 Pressure and /or Vacuum Vents are used for the normal venting requirements. Normal venting is defined as venting required because of operational requirements (i.e. filling and emptying the tank) or atmospheric changes. The Models 3700 thru 3900 Emergency Relief Vents are used to meet venting required when an abnormal condition, such as an external fire or such as ruptured internal heating coils, exist either outside or inside the tank.

All of these devices are sized in accordance with API Standard 2000, improperly specified relief vents may result in structural damage to the tank or system, and can cause severe personal injury or death.

Figure 1 illustrates the operation of the Pressure/ Vacuum Relief Vent under overpressure conditions. As the tank pressure increases as a result of product being pumped into the tank and/or because of thermal expansion of the product and vapors the pressure pallet remains closed until the set pressure of the vent is reached. When the tank pressure reaches the pressure setting of the vent, the pressure pallet lifts allowing the tank pressure to bleed off.

Figure 2 illustrates the operation of the Pressure/ Vacuum Relief Vent under vacuum conditions. As the tank pressure decreases as a result of product being pumped out of the tank and/or because of thermal contraction of the product and vapors the vacuum pallet remains closed until the set vacuum of the vent is reached. When the tank vacuum reaches the vacuum setting of the vent, the vacuum pallet lifts allowing air to be drawn into the tank.

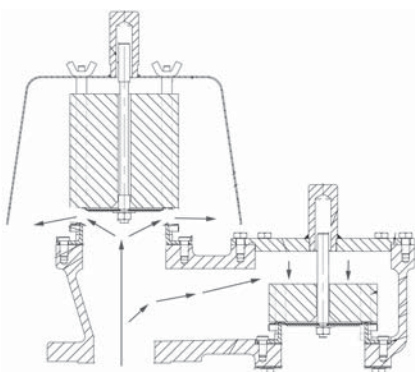


Figure 1 - Pressure Relief

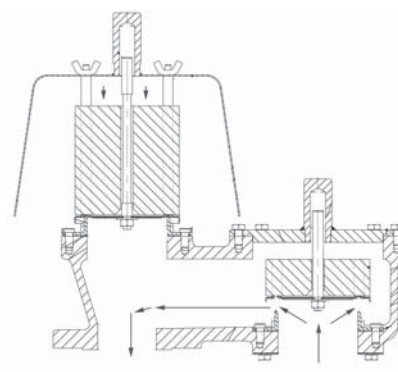


Figure 2 - Vacuum Relief

SECTION II

II. SAFETY WARNINGS:

Tank or system protection is the primary function of the weight loaded Pressure and/or Vacuum Relief Vent. It must be selected to meet the total pressure and vacuum flow requirements within the Maximum Allowable Working Pressure and Vacuum of the system on which it is installed. Consult API Standard 2000 for tank protection sizing procedures. Improperly specified relief vents may result in structural damage to the tank or system, and can cause severe personal injury or death.



CAUTION

DO NOT attempt to remove the vent from the tank or process vessel without first bleeding all pressure from the system. ALTERNATIVE MEANS OF PRESSURE RELIEF MUST BE PROVIDED WHEN THE VENT IS OUT OF SERVICE.

When Pipe-Away relief vents are used, backpressure in the header system will affect the set point of weight loaded vents by the amount of the header pressure. Maximum possible header pressure must be considered when sizing the pressure relief vent.



CAUTION

DO NOT change pressure ratings by adding additional weights to the pallet assembly without consulting the factory or your VCI representative.



CAUTION

DO NOT mix pressure/vacuum weight assemblies. Failure to ensure that both weight assemblies are installed in the correct location can change the pressure and vacuum relief settings. This can cause tank failure.

SECTION III

III. INSPECTION AND STORAGE:

The pressure/vacuum relief vent is carefully packaged to prevent damage or contamination during shipping. Inspect the equipment when it is received and report any damage to the carrier immediately. The vent should be stored with all the protective flange covers

in place. Make sure that any loading weights that might have been shipped separately, to protect the vent during shipping, are accounted for and stored with the vent. These weights, when required, will be installed during installation, see section IV.

SECTION IV

IV. INSTALLATION



WARNING

The vent must be installed in a vertical position as shown in Figure 1. The tank nozzle on which the vent is mounted should have the same nominal diameter as the venting device. It is recommended that the tank nozzle flange face be within 1 degree of horizontal for best performance of the venting device.

The 3000 Series Vents are designed to mate with a 150 lb ASME flange. Torque guidelines are provided in Table 1. The Vents are **NOT** rated for full flange pressure and do not require high bolting torque.

Before installing the 3000 Series Vent remove all packing materials from inside and outside the vent.

If loading weights were shipped separate from the vent make sure to install on the appropriate pallet.

Inspect the gasket seating surface of the tank nozzle flange. It must be clean, free of scratches, corrosion, tool marks and flat.

FRP and Aluminum vents are furnished with flat faced flanges. It is recommended that they be installed on mating flat face flanges with a full faced gasket. If the flat face of the vent is sealing against a raised face steel flange, a spacer or filler ring must be used to fill the annular space of the raised face steel flange.

Make sure the gasket is suitable for the application and is in good condition.

**WARNING**

Minimum clearance between tank roof and vacuum inlet port must be at least equal to the vents' nominal flange bore. Tank nozzle bore must be greater than or equal to vent inlet flange bore. Inlet and outlet piping loads must be supported by appropriate structural supports, NOT by the vent body.

Fiberglass flanges 2 inch to 12 inch require the use of a full-face 150 lb. gasket. For full face gaskets, we recommend the use of a 1/8-inch Gortex gasket.

Center the gasket within the bolt circle of the tank flange and carefully set the vent on the flange nozzle and align the bolt holes.

All stud threads must be lubricated to obtain proper torque results. A washer should be used under each stud nut.

Install the studs, washers and nuts and tighten nuts hand tight. Check proper alignment of flange faces. Misalignment of flange faces will cause bending stresses at the flange and flange joint and damage may result. Correct any misalignment prior to applying torque to nuts.

All nuts must be torqued in proper sequence and equal increments. Proceed through the tightening sequence until the recommended torque is attained.

Recheck the torque on each bolt in the same sequence as bolts previously tightened may have relaxed through the torque sequence.

TABLE 1
All Torque Requirements Are Dependant On Gasket Material
Bolt Torque and Stud Specifications - ASME #150 Flange Connections

| MOUNTING FLANGE | BOLT TORQUE - Lb. In. (kg.m) | | NUMBER BOLTS TOTAL | STUD SPECIFICATIONS | | |
|-----------------|------------------------------|------------|--------------------|---------------------|---------------|------------|
| | RAISED FACE | FLAT FACE | | THREAD UNC | STUD LENGTH * | QUANTITY * |
| 2" | 30 (0.35) | 60 (0.69) | 4 | 5/8" - 11 | 2.50" | 2 |
| 3" | 54 (0.62) | 108 (1.24) | 4 | 5/8" - 11 | 2.75" | 2 |
| 4" | 42 (0.48) | 78 (0.89) | 8 | 5/8" - 11 | 2.75" | 4 |
| 6" | 90 (1.04) | 150 (1.72) | 8 | 3/4" - 10 | 3.00" | 4 |
| 8" | 126 (1.45) | 228 (2.62) | 8 | 3/4" - 10 | 3.00" | 4 |
| 10" | 138 (1.59) | 246 (2.83) | 12 | 7/8" - 9 | 3.50" | 6 |
| 12" | 186 (2.14) | 348 (4.01) | 12 | 7/8" - 9 | 3.50" | 6 |

Bolt Torque and Stud Specifications for FRP Flanges Drilled to ASME #150 Flange Connections

| MOUNTING FLANGE | BOLT TORQUE - Ft. lbs. | NUMBER BOLTS TOTAL | STUD SPECIFICATIONS | | |
|-----------------|------------------------|--------------------|---------------------|---------------|------------|
| | FLAT FACE | | THREAD UNC | STUD LENGTH * | QUANTITY * |
| 2" | 20 | 4 | 5/8" - 11 | 2.50" | 2 |
| 3" | 20 | 4 | 5/8" - 11 | 2.75" | 2 |
| 4" | 20 | 8 | 5/8" - 11 | 2.75" | 4 |
| 6" | 30 | 8 | 3/4" - 10 | 3.00" | 4 |
| 8" | 30 | 8 | 3/4" - 10 | 3.00" | 4 |
| 10" | 30 | 12 | 7/8" - 9 | 3.50" | 6 |
| 12" | 30 | 12 | 7/8" - 9 | 3.50" | 6 |

* Blind tapped holes only (Models 3100, 3200, and 3300). Use standard ASME stud length for other holes.

SECTION V

V. MAINTENANCE:

Tank or system protection is the primary function of the weight loaded Pressure and/or Vacuum Relief Vent. As a safety device it is very important that maintenance/inspection be done on a regular interval. Maintenance should only be done by a qualified technician. Valve Concepts recommends that all service be performed at the factory or a factory authorized repair center. For information on repair centers in your area, please contact factory.

To Dis-assemble: - Remove the weatherhood wing nuts (7) and washers (72) and lift off weatherhood (17) and bug screen (27).

Remove vacuum cover bolts (22), vacuum cover (2) and vacuum cover gasket (12).

Inspect weatherhood, bug screen, and cover for corrosion, damage, or product build up. Clean with a suitable solvent, replace as necessary.

NOTE: During re-assembly, install new cover gasket (12) (5/32-inch diameter Gortex rope joint sealant). For FRP material - bolting (22) for cover (2) should be torqued to 50 in. - lbs.

Remove pressure and vacuum pallet assemblies, including any loading weights (18) that may be on the pallets (4). **NOTE:** As the pallet(s) are removed from the vent, identify each assembly (including the stack of weights) by tagging as "pressure" side or "vacuum" side.

Clean and inspect pallet assemblies. Inspect the diaphragms (5) and replace if necessary.

To Replace Diaphragms: - Place stems (9,10) in a vise with threaded end up. Remove cotter pin (61), nut (23), lock-washer (19) and washer (24). Lift up to remove diaphragm plate (6,28) and diaphragms (5). **NOTE:** Apply TFE paste to threads of the stem and around hole on the pallets (4).

Install new diaphragms (5). Re-install diaphragm plate (6,28), washer (24), lock-washer (19) and tighten nut (23) on stem. Insert cotter pin (61) through hole in stem and secure.

Inspect and clean pressure / vacuum seat ring(s) (3). Check seat surface for any nicks, corrosion, pitting or product build up. Seat surfaces must be clean and smooth for vent to perform properly.

To Remove Seat Rings/Gaskets: - Rotate bolts (11) CCW and remove. Remove guides (8) and supports (16), spacers (69) - (Use flats on the supports or the slot on top of guides and rotate CCW.) Mark the location of these items on the seat ring(s) (3) for reference at re-assembly.

Lift up to remove seat rings (3) and gaskets (13). Inspect guides (8) and supports (16) and inside of the body cavity (1) for any corrosion or product build up. Clean if necessary.

Apply TFE paste to both sides of new gaskets and install in body (1).

Re-assemble vent in reverse order, making sure that the pressure and vacuum pallet(s) and loading weights are in their proper location. Tighten bolts (11), guides (8) and supports (16) to 15 ft. lbs. When installing the weatherhood and vacuum cover ensure the pressure stem (10) and vacuum stem (9) are inserted in the stem guides.



WARNING

When assembling a P/V vent, always put the pressure (long stem) and vacuum (short stem) pallet assemblies back in their original location and ensure that the stem is straight and fits into the guide in the cover or weatherhood.

If the pressure and vacuum pallet assemblies are mixed at assembly, the settings will be changed and the flow for the vacuum side will be restricted.

If the stem is cocked at an angle, pallet lift may be completely blocked. An over-pressure can occur if any of these three conditions happens. This can cause a tank failure, severe personal injury and material damage.

To Remove Inlet Screen: - Rotate bolts (15) CCW and remove. Inspect and clean screen (14) and reinstall to body (1).

SECTION VI

VI. TEST PROCEDURE:

To Calculate Weight of Pallet Assembly:

Table 2 shows the pallet weight per unit of pressure or vacuum setting. The total pallet assembly weight is determined by multiplying the desired set point (in the appropriate units) by the incremental weight per unit listed in Table 2.

For Example:

4" Model 3104 CS - if the desired setting is 5 oz/in²

Table 2 shows that for a 4" vent, the pallet would weigh 2.05 lb per oz/in²

So the pallet assembly for a 5 oz/in² setting would weigh: 2.05 lbs/oz/in² x 5.0 oz./in² - 10.25 lbs

Valve Concepts allows a deviation from this theoretical weight of $\pm 3.0\%$.

To Determine Diaphragm/Seat Leakage:

After both pallets' weight has been determined and verified for the required setting, reassemble the vent and mount on a Tank Vent Test Stand and slowly raise the pressure at the flow rate of 1.0 SCFH.

ACCEPTANCE CRITERIA: The pressure gauge shall maintain a pressure equal to or greater than 90% of set pressure for a one minute period while the specified flow rate is maintained. Note: Valve Concepts acceptance criteria exceed the requirements of API. API 2521 states that if the rate of leakage does not exceed $\frac{1}{2}$ SCFH for 6 inch size and smaller, or 5 SCFH for 8 inch and larger, at 75% of set point, then a vent is considered satisfactory for all practical purposes.

If the vent fails to meet the 90% criteria, it must be disassembled and the seat, pallet, and or diaphragms repaired or replaced.

A test report should be completed for each vent. The report should indicate the total pallet weight and the pressure achieved at the Test Flow Rate for both pressure and vacuum. Other general information such as serial number, model number, material of construction, set pressure and vacuum, etc. should be included in the report.

The test report should be kept with the Valve Maintenance Records.

TABLE 2
Nominal Pallet Assembly Weight Per Unit of Pressure lbs (kg)

| SET Point Units | VALVE SIZE | | | | | | | |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2" VTA | 2" PV | 3" | 4" | 6" | 8" | 10" | 12" |
| | Lb (kg) | Lb (kg) | Lb (kg) | Lb (kg) | Lb (kg) | Lb (kg) | Lb (kg) | Lb (kg) |
| 1.0 oz/in ² | 0.25 (0.11) | 0.55 (0.25) | 0.93 (0.42) | 2.05 (0.93) | 3.50 (1.59) | 5.45 (2.47) | 7.71 (3.50) | 9.17 (4.16) |
| 1.0 in WC | 0.15 (0.07) | 0.32 (0.14) | 0.54 (0.24) | 1.18 (0.53) | 2.03 (0.92) | 3.15 (1.43) | 4.46 (2.02) | 5.30 (2.40) |
| 1.0 mbar | 0.13 (0.06) | 0.13 (0.06) | 0.22 (0.10) | 0.48 (0.22) | 0.81 (0.37) | 1.26 (0.57) | 1.79 (0.81) | 2.13 (0.97) |

TABLE 3
Maximum Pressure Setting in oz/in² Vs. Diaphragm mil

| Line Size | 10 mil | 20 mil | 30 mil | 40 mil |
|-----------|--------|--------|--------|--------|
| 2" VTA | 7.00 | 34.00 | 40.00 | n/a |
| 2" P/V | 4.50 | 23.50 | 33.00 | 40.00 |
| 3" P/V | 3.50 | 18.00 | 25.00 | 40.00 |
| 4" P/V | 2.25 | 12.00 | 17.00 | 40.00 |
| 6" P/V | 1.75 | 9.25 | 13.25 | 40.00 |
| 8" P/V | 1.75 | 7.50 | 10.50 | 40.00 |
| 10" P/V | 1.25 | 6.25 | 8.75 | 40.00 |
| 12" P/V | 1.00 | 5.75 | 8.00 | 40.00 |

SECTION VII

VII. ORDERING INFORMATION:

NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material (parts list) that was provided when unit was originally shipped.) (Serial Number typically 6 digits).

NEW REPLACEMENT UNIT:

Contact your local Cashco, Inc., Sales Representative with the Serial Number, Product code and the pressure/vacuum settings. With this information they can provide a quotation for a new unit including a complete description, price and availability.



CAUTION

Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accommodate the recommended part(s) changes.

PARTS "KIT" for FIELD REPAIR:

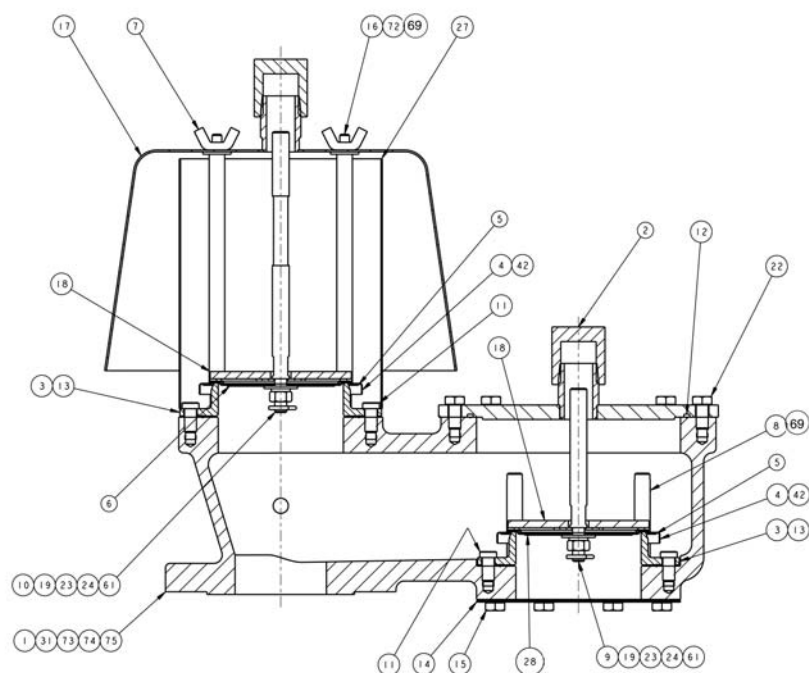
Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the Bill of Materials sheet that was provided when unit was originally shipped.

NOTE: *Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".*

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

MODEL 3100 PRESSURE/VACUUM RELIEF VENT



| ITEM NO. | METAL PARTS LIST | FRP PARTS LIST |
|----------|-------------------------------------|-------------------------------------|
| 1 | Body | Body |
| 2 | Cover Assembly | Cover Assembly |
| 3 | Seat Ring | Integral Part of Item 1 |
| 4 | Pallet | Pallet |
| 5 | Diaphragm | Diaphragm |
| 6 | Diaphragm Retainer Plate - Pressure | Diaphragm Retainer Plate - Pressure |
| 7 | Weather Hood Nut | Weather Hood Nut |
| 8 | Vacuum Pallet Guide | Integral Part of Item 1 |
| 9 | Vacuum Pallet Stem | Integral Part of Item 4 |
| 10 | Pressure Pallet Stem | Integral Part of Item 4 |
| 11 | Seat Ring Bolts | Not Required |
| 12 | Cover Gasket (Gortex Rope) | Cover Gasket (Gortex Rope) |
| 13 | Seat Ring Gasket | Not Required |
| 14 | Inlet Screen Assembly | Not Required |
| 15 | Inlet Screen Bolts | Not Required |
| 16 | Weather Hood Support | Integral Part of Item 1 |
| 17 | Weather Hood Assembly | Weather Hood Assembly |
| 18 | Weight | Weight |
| 19 | Lock Washer | Not Required |
| 22 | Cover Bolts | Studs, Nuts, and Washers |
| 23 | Pallet Nut/Bolt | Pallet Nut |
| 24 | Plain Washer | Not Required |
| 27 | Outlet Screen | Outlet Screen |
| 28 | Diaphragm Retainer Plate - Vacuum | Diaphragm Retainer Plate - Vacuum |
| 31 | Pipe Plug | Not Required |
| 42 | Stiffener Plate | Not Required |
| 61 | Cotter Pin | Not Required |
| 69 | Stud Spacer | Not Required |
| 72 | Flat Washer | Not Required |
| 73 | Washer | Washer |
| 74 | Nut | Nut |
| 75 | Stud | Stud |

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