Model 3100

Pressure / Vacuum Relief Vent

Valve Concepts, Inc.
ISO Registered Company

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

Models 3100 through 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. Model 3700 Emergency Relief Vent is 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 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 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.

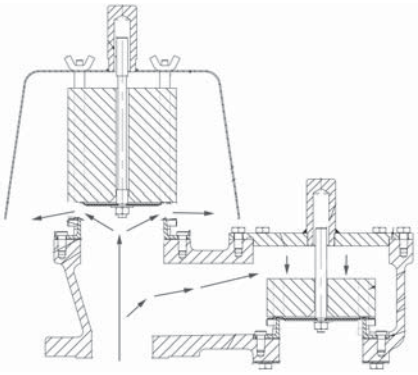


Figure 1 - Pressure Relief

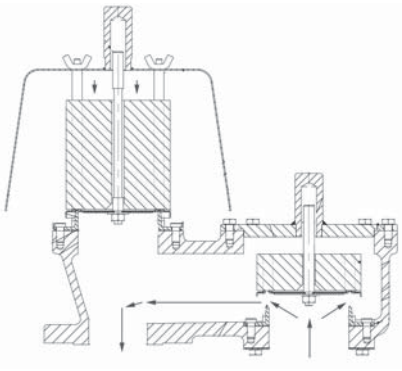


Figure 2 - Vacuum Relief

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, back pressure 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 or vacuum setpoints by adding additional weights to the pallet assembly without consulting Cashco Inc. 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. These vents are **NOT** rated for full flange pressure and do not require high bolting torque.

Before installing any 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 weights on the appropriate pallets. Tighten cover dome cap screws to 15 ft.-lbs.

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.

⚠ 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, align the bolt holes and carefully set the vent on the flange nozzle.

NOTE: *At installation, the vent valve should be carefully lifted into position using the lifting brackets (2) on the body.*

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 tightened 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 - Ft. lbs.	NUMBER BOLTS TOTAL	STUD SPECIFICATIONS		
			THREAD UNC	STUD LENGTH *	QUANTITY *
2”	47	4	5/8” - 11	2.50”	2
3”		4	5/8” - 11	2.75”	2
4”		8	5/8” - 11	2.75”	4
6”	83	8	3/4” - 10	3.00”	4
8”		8	3/4” - 10	3.00”	4
10”	134	12	7/8” - 9	3.50”	6
12”		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.

Maintenance procedures hereinafter are based upon removal of the relief vent unit from the tank where installed.

Owner should refer to Owner's procedures for removal, handling and cleaning of nonreusable parts, i.e. gaskets, suitable solvents, etc.

NOTE: *Item Numbers that are specific to FRP body material are in parenthesis and underscored; i.e. (8). See Figure 11. Item Numbers that are generic to all body materials are* **not** *underscored; i.e. (1). See Figures 3 thru 9 where applicable.*

To Dis-assemble: Remove the weatherhood wing nuts (12), (10 & 33) lift off weatherhood (13) and screen (31).

Remove vacuum cover cap screws (10), vacuum cover (8) and the TFE tape / rope seal (34).

Inspect weatherhood (13), screen (31), and cover (8) for corrosion, damage or foreign material. Clean with a suitable solvent, replace as necessary.

NOTE: *During re-assembly, install new TFE tape / rope (34).* ***For FRP material*** *- nuts (10) for cover (8) should be tightened to 50 in. - lbs. (5.6 Nm).*

Remove pressure and vacuum pallet assemblies, including any loading weights (21 & 28) that may be on the pallets (19,26). ***NOTE:*** *As the pallets 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 (18,25) and replace if necessary.

To Replace Diaphragms - Std. Construction: See Figure 4. Secure pressure or vacuum stem assembly (23,30) in a soft-jawed vise with short, threaded end up. Remove washer and nut (14).

For settings above 32oz/in² See Figure 5. Remove machine screws (43) CCW.

Lift up to remove diaphragm retainer (17,24), diaphragm (18,25) and pallet (19,26) and stiffener plate (20,27). Clean parts with a suitable solvent, replace as necessary. ***NOTE:*** *Before re-assembly, apply TFE paste to threads of the stem and around center hole on the pallets (19,26).*

Place stiffener plate (20,27) over threaded end of stem. Set diaphragm (18,25) and diaphragm retainer plate (17,24) over end of stem. Install washer and nut (14) tight on stem.

For settings above 32oz/in² See Figure 5 for assembly. Install machine screws (43).

Inspect and clean pressure / vacuum seat ring(s) (16). Check seat surface for any nicks, corrosion, pitting or foreign material. Seat surfaces must be clean and smooth for diaphragm and pallet to seal properly. ***NOTE:*** *FRP seat surfaces are integral inside the body.*

To Remove Seat Rings (except for FRP body material): Make a match mark between the seat ring and the body. Rotate cap screws (15) CCW and remove. Remove pallet guides (22,29). (Use flats on the pressure guides or the slot on top of the vacuum guides and rotate CCW to remove.) Mark the location of each guide on the seat ring (16) flange for reference at re-assembly.

Lift up to remove seat rings (16) and TFE tape / rope seal(s) (34.1). (There is no rope seal on FRP material.) Inspect guides (22,29) and inside cavity of the body (1) for any corrosion or product build up. Clean all parts as necessary.

⚠ 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 re-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.

Place new seat ring TFE tape seals (34.1) in grooves in body (1). See Figure 9. Align match marks for seat rings (16) with body and re-position seat rings back in body, resting on rope seals.

Re-install pallet guides (22,29) around the seat rings as previously marked. Install cap screws (15) - apply 15 ft.-lbs. (20.3 Nm) torque to tighten.

Place pressure and vacuum pallet stem assemblies on the correct seat ring (16).

Select the appropriately tagged set of weights (21,28) and carefully lower each set of loading weights on the pallet stem assembly, Exercise care so as not to damage the pallet diaphragms and seat surfaces.

NOTE: *When installing the weatherhood (13) and vacuum cover (8), ensure the pressure stem assembly (30) and vacuum stem assembly (23) are inserted in the guides.*

Place a new piece of TFE tape / rope seal (34, 34.1) on the face of the body flange on the vacuum side. See Figure 9. Place cover (8) over stem of vacuum pallet assembly, align bolt holes with the body (1) and install cap screws (10). Using a star crossing pattern, tighten nuts to 15 ft. lbs. (20.3 Nm).
See Figure 11. **For FRP material - install (10,33)** *and tighten to 50 in. - lbs. (5.6 Nm).*

Place screen (31) over the guides (29) and around the O.D of the seat ring (16). Lay one washer (33) on top for each support guide. **For FRP body material** - the washers (33) are installed after the weatherhood (13) is put in place.

Position the weatherhood (13) over the threaded ends of the pallet guides (29) and the stem assembly (30). Re-install wing nuts (12), hand tighten. **For FRP material - install (10,33)** *and tighten to 50 in. - lbs. (5.6 Nm).*

To Remove Flame Screen: Rotate cap screws (42) CCW and remove cap screws and ring (41). Inspect and clean screen (40), replace as necessary. Re-secure screen and ring to body with cap screws. See Figure 10.

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/in^2

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

So the pallet assembly for a 5 oz/in^2 setting would weigh: 2.05 lbs/oz/in^2 x 5.0 oz./in^2 - 10.25 lbs

Valve Concepts allows a deviation from this theoretical weight of ± 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 ½ 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/in^2 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, attached to the unit. This information can also be found on the Bill of Material ("BOM"), a parts list that was provided when unit was originally shipped. (Serial Number typically 6 digits).

Product Code ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

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 proposed 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 "BOM" sheet that was provided when unit was originally shipped.

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

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

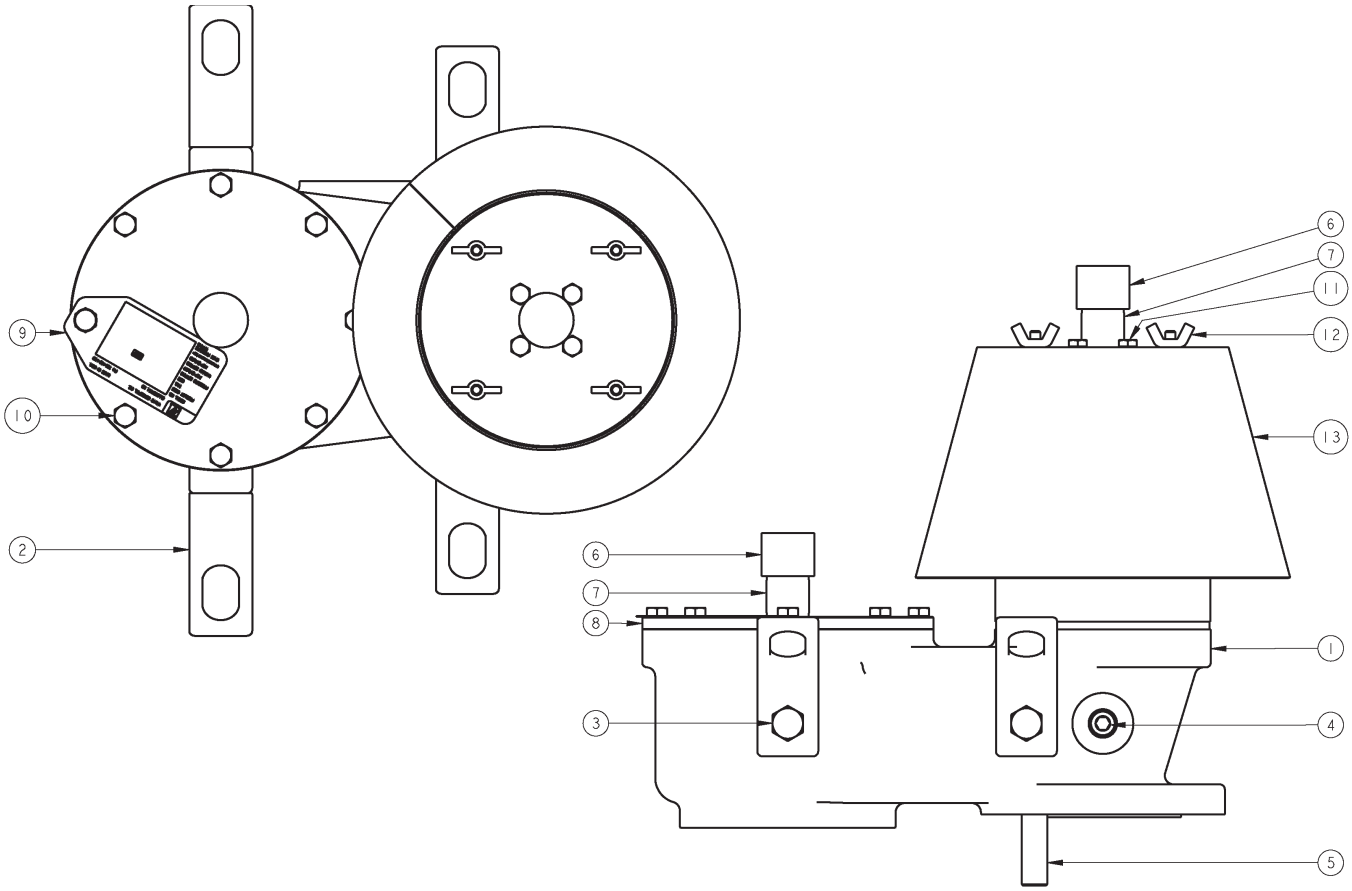
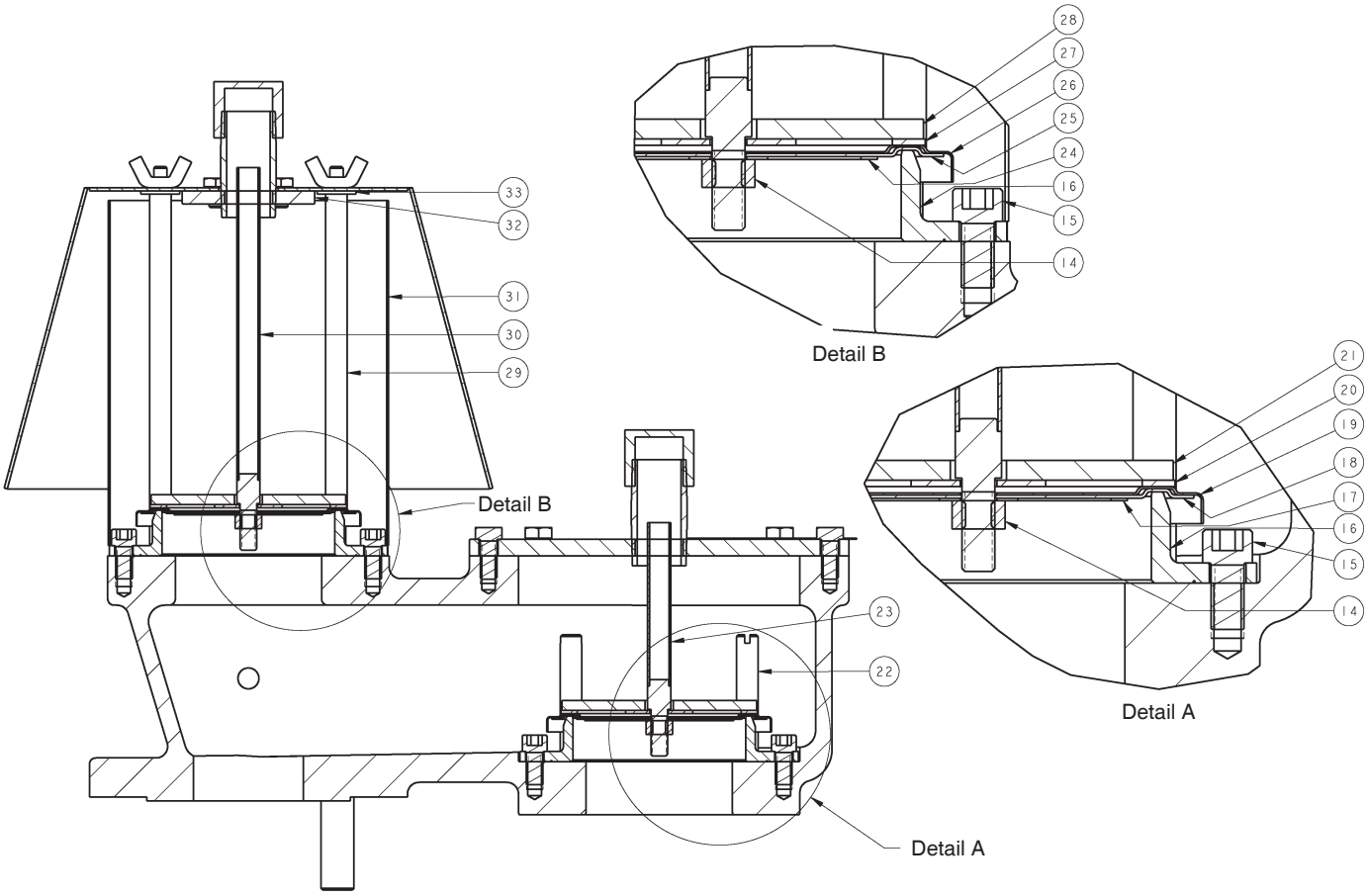


Figure 3 - View with Lifting brackets

Figure 4 - Standard Vent
Aluminum, Carbon Steel, Stainless Steel



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Body	15	Socket Cap Screw	29	Pallet Guide - Press
2	Lift Brackets	16	Seat Rings	30	Stem Assy - Press
3	Cap Screws	17	Diaphragm Retainer - Vac	31	Screen
4	Plug	18	Pallet Diaphragm - Vac ‡	32	Guide Adapter
5	Studs	19	Pallet - Vac	33	Washer (Flat)
6	Cap	20	Stiffener Plate - Vac	34	Joint Tape (Not Shown - See Figure 9) ‡
7	Nipple	21	Pallet Weights - Vac		
8	Cover	22	Pallet Guide - Vac		
9	Name Plate (Not Shown)	23	Stem Assy - Vac		
10	Cap Screws / Nut	24	Diaphragm Retainer - Press		
11	Cap Screws	25	Pallet Diaphragm - Press ‡		
12	Wing nuts	26	Pallet - Press		
13	Weather Hood	27	Stiffener Plate - Press		
14	Lock Nuts *	28	Pallet Weights - Press		

‡ Recommended Spare Part

* Early Models included a lock washer, plain washer and a cotter pin.

Figure 5 - Pallet Assembly

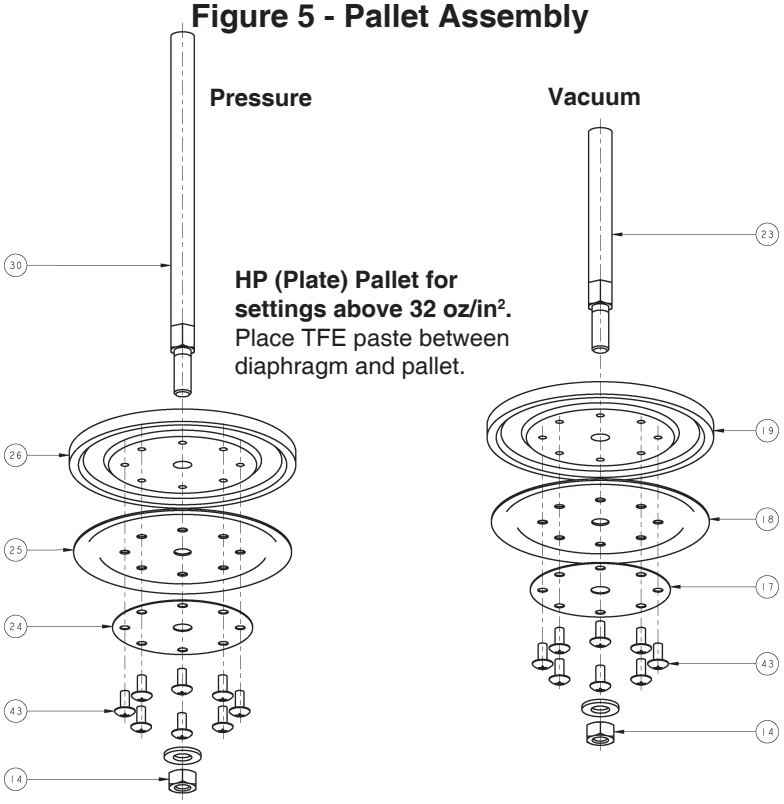
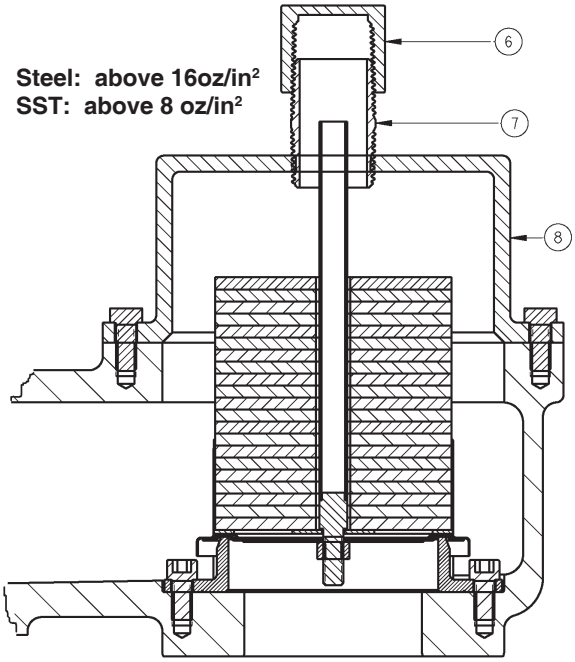


Figure 6 - Extended Cover Vacuum Settings



ITEM NO.	DESCRIPTION
14	Lock Nuts
17	Diaphragm Retainer - Vac
18	Pallet Diaphragm -Vac ‡
19	Pallet - Vac
22	Pallet Guide - Vac

ITEM NO.	DESCRIPTION
23	Stem Assy - Vac
24	Diaphragm Retainer - Press
25	Pallet Diaphragm - Press ‡
26	Pallet - Press
30	Stem Assy - Press

ITEM NO.	DESCRIPTION
35	Indicator Housing
36	Indicator
37	Cable - ATEX
38	Cable - ATEX
39	Cap Screw
43	Machine Screws

Figure 7 - Indicators

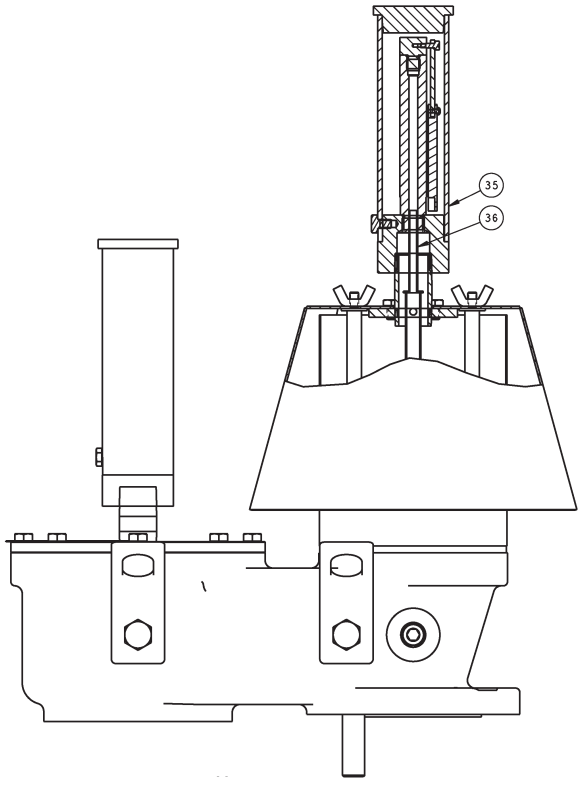


Figure 8 - Atex Cable Connections

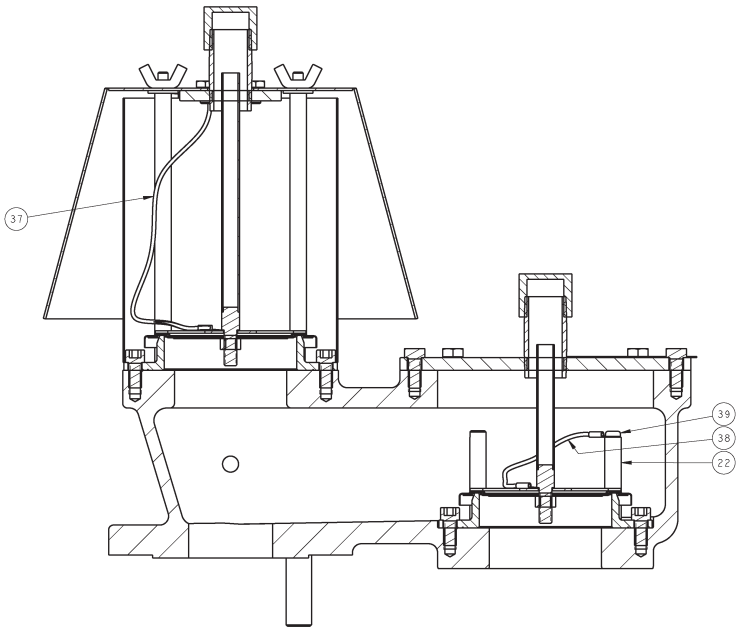
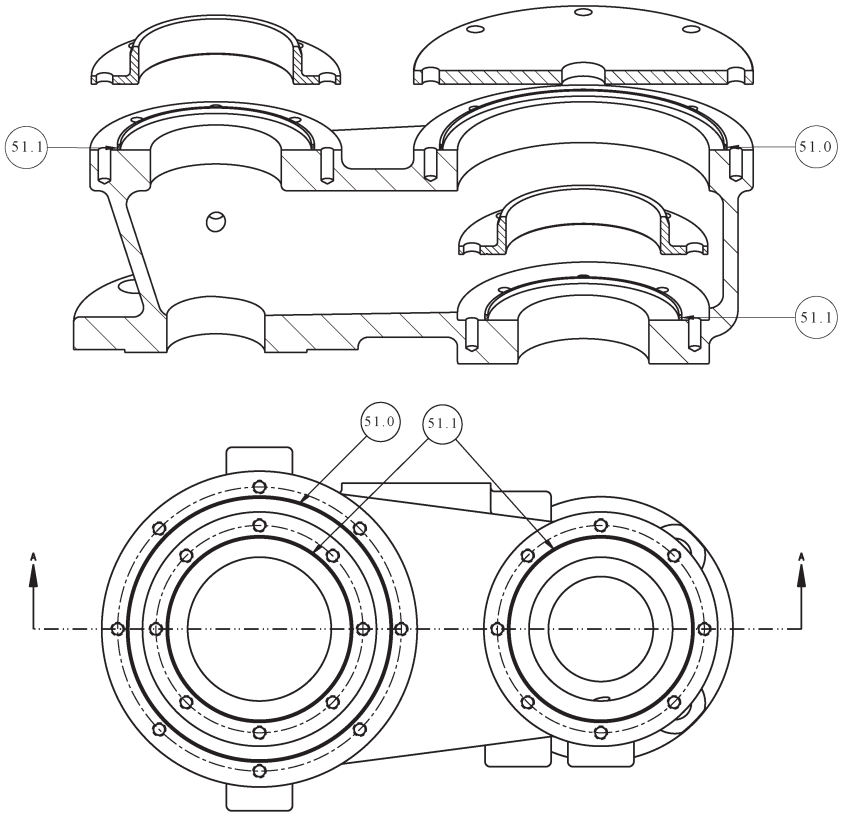


Figure 9 - Joint Tape Application

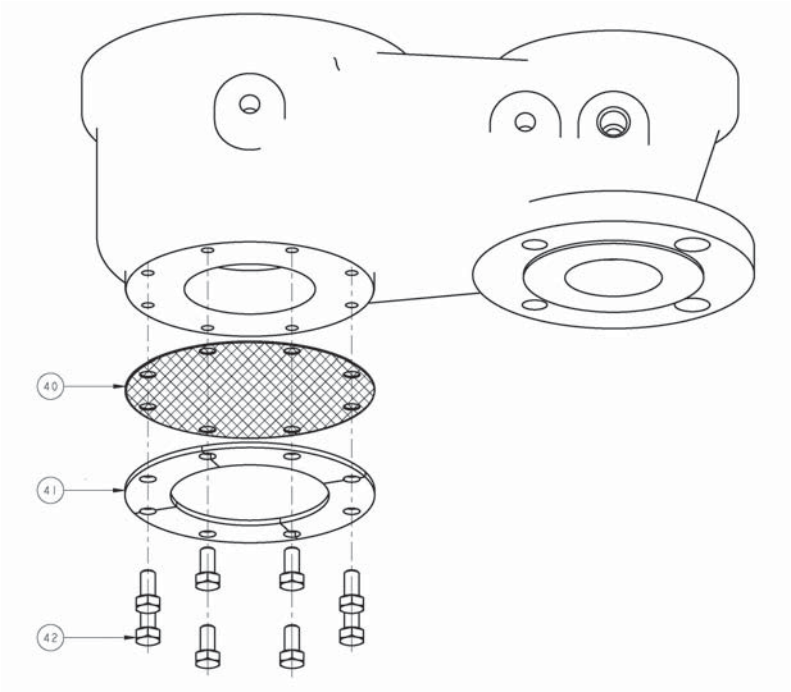


TFE TAPE LENGTH

Size	Item 34.0 *	Item 34.1 **
2”	23”	17”
3”	25”	20”
4”	33”	28”
6”	38”	34”
8”	46”	41”
10”	56”	47”
12”	58”	51”

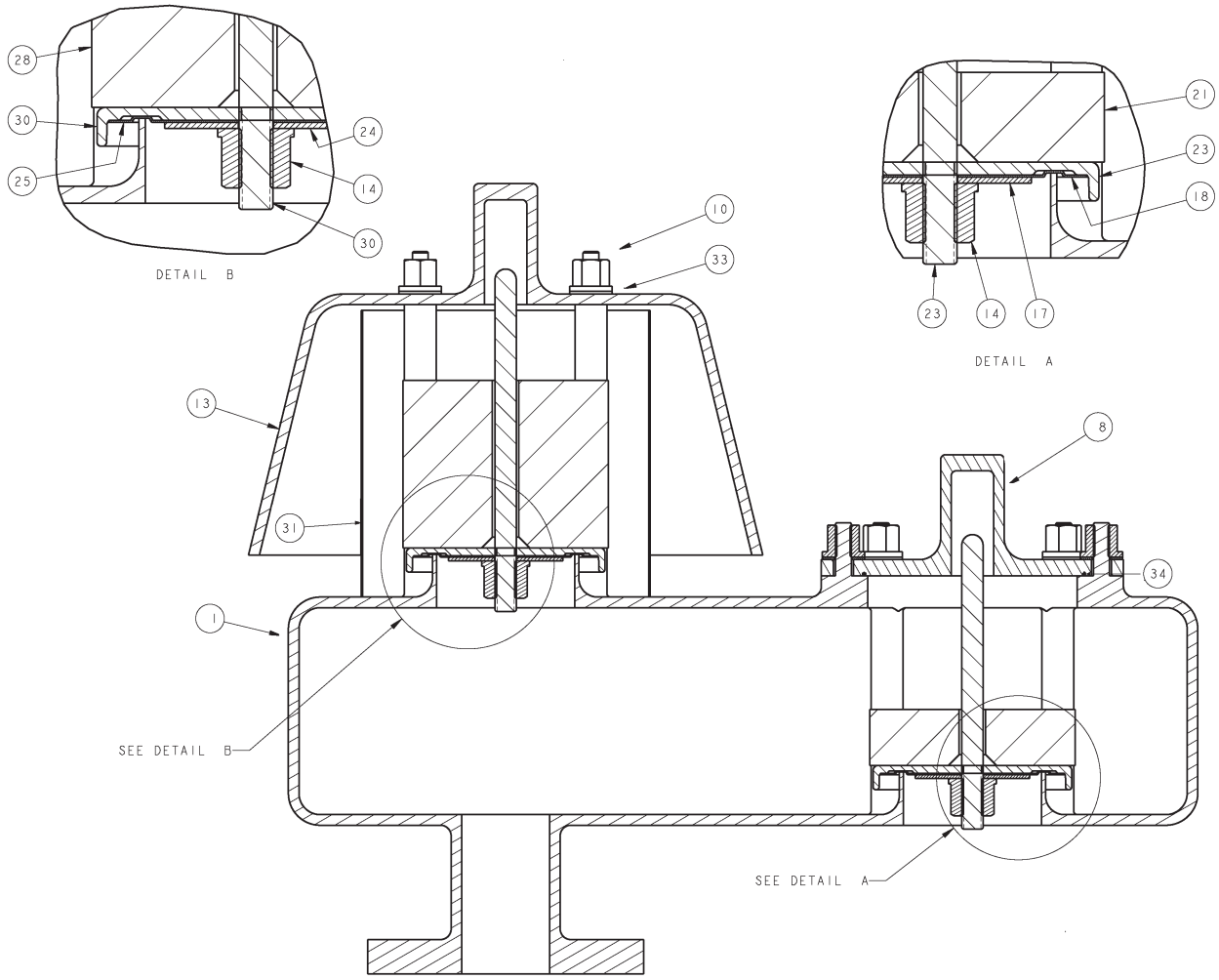
* Quantity 1 per unit.
** Quantity 2 per unit.

Figure 10 - Flame Screen



ITEM NO.	DESCRIPTION
40	Flame / Bug Screen
41	Flame Screen Ring
42	Cap Screws

Figure 11 - FRP Vent



ITEM NO.	DESCRIPTION
1	Body
8	Cover
10	Fibrenut
13	Weather Hood
14	Fibrenut
17	Diaphragm Retainer - Vac
18	Pallet Diaphragm - Vac ‡
21	Pallet Weights - Vac
23	Stem Assy - Vac

ITEM NO.	DESCRIPTION
24	Diaphragm Retainer - Press
25	Pallet Diaphragm - Press ‡
28	Pallet Weights - Press
30	Stem Assy - Press
31	Screen
33	Washer (Flat)
34	TFE Rope ‡

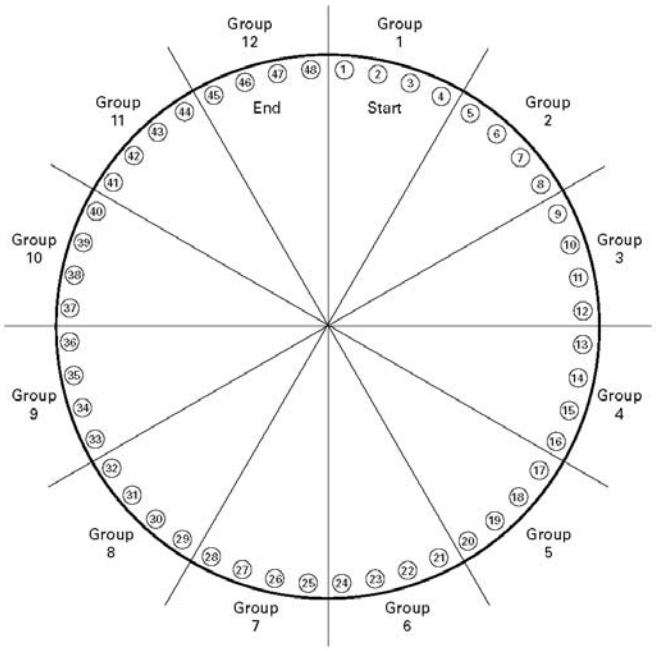
‡ Recommended Spare Part

TFE ROPE LENGTH	
Size	Item 34
2”	21”
3”	24”
4”	31”
6”	37”
8”	44”
10”	50”
12”	54”

ADDENDUM - A
TIGHTENING SEQUENCE FOR FLANGE BOLTING

GUIDELINES FOR BOLTED FLANGE JOINT ASSEMBLY ACCORDING TO ASME PCC-1 SPECS

STEP	LOADING
Install	Hand tighten. Check flange gap around circumference for uniformity. If the gap is not reasonably uniform, make the appropriate adjustments by selective tightening before proceeding.
Round 1	Tighten to 20% to 30% of target torque. Check flange gap around circumference for uniformity. If the gap is not reasonably uniform, make the appropriate adjustments by selective tightening before proceeding.
Round 2	Tighten to 50% to 70% of target torque. Check flange gap around circumference for uniformity. If the gap is not reasonably uniform, make the appropriate adjustments by selective tightening before proceeding.
Round 3	Tighten to 100% of target torque. Check flange gap around circumference for uniformity. If the gap is not reasonably uniform, make the appropriate adjustments by selective tightening.

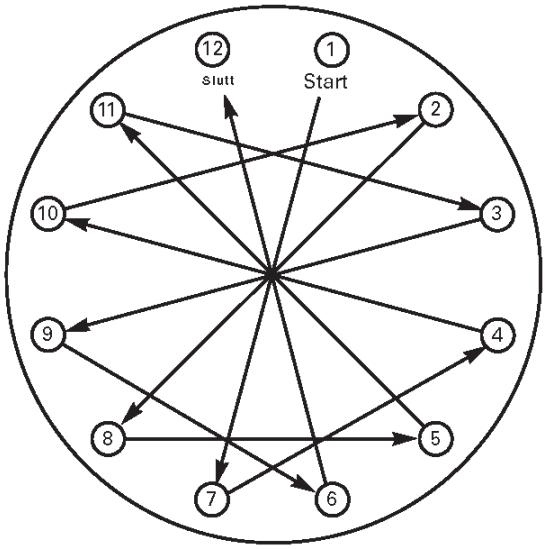


Group	Bolts
1	1-2-3-4
2	5-6-7-8
3	9-10-11-12
4	13-14-15-16
5	17-18-19-20
6	21-22-23-24
7	25-26-27-28
8	29-30-31-32
9	33-34-35-36
10	37-38-39-40
11	41-42-43-44
12	45-46-47-48

Tightening sequence for 12 Groups:

1-7-4-10 ↵
2-8-5-11 ↵
3-9-6-12

The 12-group sequence is the same as a 12-bolt sequence



1-7-4-10 → 2-8-5-11 → 3-9-6-12

RECOMMENDATIONS FOR PROPER GASKET INSTALLATION

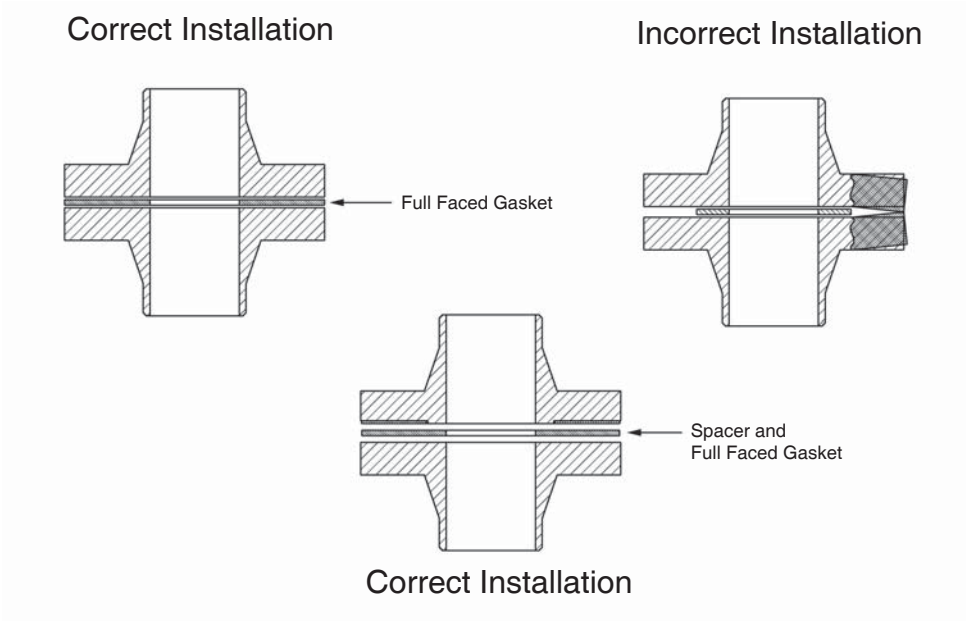
Gasket seating surfaces for tank nozzle flange must be clean, free of scratches, corrosion, tool marks and flat. Use either a full faced or ring gasket for steel and stainless steel raised face flanges

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.

Refer to Gasket Dimension Table.

Ensure that the gasket material is suitable for the service. Make sure that the gasket is compressed evenly and the flanges are not distorted. Utilizing proper torquing techniques will ensure a tight seal and prevent leakage around the gasket. See preceding page.

NOTE: *Incorrect positioning and/or selection of gasket(s) between the flanges will cause bending stresses at the flange that may damage the flange joint as bolting is tightened. This is more likely to occur with aluminum or cast iron materials.*



ATEX 94/9/EC: Explosive Atmospheres and Cashco Inc. Regulators

NOTICE

Only for Product Codes wherein hazard category ATEX has been selected.

These valves satisfy the safety conditions according to EN 13463-1 and EN 13463-5 for equipment group IIG 2 c.

Caution: Because the actual maximum temperature depends not on the equipment itself, but upon the fluid temperature, a single temperature class or temperature cannot be marked by the manufacturer.

Specific Precaution to Installer: Electrical grounding of valve must occur to minimize risk of effective electrical discharges.

Specific Precaution to Installer: Atmosphere vent holes should be plugged to further minimize the risk of explosion.

Specific Precaution to Maintenance: The Valve Body/ Housing must be regularly cleaned to prevent buildup of dust deposits.

Specific Precaution to Maintenance: Conduct periodic Continuity Check between Valve Body/ Housing and Tank to minimize risk of electrical discharges.

Attention: When repairing or altering explosion-protected equipment, national regulations must be adhered to. For maintenance and repairs involving parts, use only manufacturer's original parts.

ATEX requires that all components and equipment be evaluated. Cashco pressure regulators are considered components. Based on the ATEX Directive, Cashco considers the location where the pressure regulators are installed to be classified Equipment-group II, Category 3 because flammable gases would only be present for a short period of time in the event of a leak. It is possible that the location could be classified Equipment-group II, Category 2 if a leak is likely to occur. Please note that the system owner, not Cashco, is responsible for determining the classification of a particular installation.

Product Assessment

Cashco performed a conformity assessment and risk analysis of its pressure regulator and control valve models and their common options, with respect to the Essential Health and Safety Requirements in Annex II of the ATEX directive. The details of the assessment in terms of the individual Essential Health and Safety Requirements, are listed in Table 1. Table 2 lists all of the models and options that were evaluated and along with their evaluation.
Models and options not listed in Table 2 should be assumed to not have been evaluated and therefore should not be selected for use in a potentially explosive environment until they have been evaluated.
Standard default options for each listed model were evaluated even if they were not explicitly listed as a separate option in the table. Not all options listed in the tables are available to all models listed in the tables. Individual TB's must be referenced for actual options.
When specifying a regulator that is to be used in a potentially explosive environment one must review the evaluations in Table 1 and 2 for the specific model and each and every option that is being specified, in order to determine the complete assessment for the unit.
A summary of the models and options found to have an impact on ATEX assessment due to potential ignition sources or other concerns from the ATEX Essential Health and Safety Requirements, are listed below.

1. The plastic knob used as standard on some models, (P1, P2, P3, P4, P5, P7, 3381, 4381, 1171, and 2171) is a potential ignition source due to static electricity. To demonstrate otherwise, the knob must be tested to determine if a transferred charge is below the acceptable values in IEC 60079-0 Section 26.14 (See items 25, 27, and 28 in Appendix A). Until the plastic knob has been shown to be acceptable, then either the metal knob option, or a preset outlet pressure option is required to eliminate this ignition source (See items 45 and 64 in Tables).

2. The pressure gauges offered as options on a few of the regulator models (DA's, P1-7, D, 764, 521), use a plastic polycarbonate window that is a potential ignition source due to static electricity. To demonstrate that the gauges are not a potential source of ignition, the gauges would need to be tested to determine if a transferred charge is below the acceptable values in IEC 60079-0 Section 26.14 or the pressure gauge supplier must provide documentation

indicating the gauge is compliant with the ATEX Directive (See items 26, 27, and 28 in Appendix A). Until compliance is determined, regulators should not be ordered with pressure gauges for use in potentially explosive environments.

3. Tied diaphragm regulators with outlet ranges greater than 100 psig should be preset to minimize the risk that improper operation might lead to an outboard leak and a potentially explosive atmosphere (See item 6 in Table 1).

4. Regulators must be ordered with the non-relieving option (instead of the self-relieving option) if the process gas they are to be used with is hazardous (flammable, toxic, etc.). The self-relieving option vents process gas through the regulator cap directly into the atmosphere while the non-relieving option does not. Using regulator with the self- relieving option in a flammable gas system could create an explosive atmosphere in the vicinity of the regulator.

5. Regulators with customer supplied parts are to be assumed to not have been evaluated with regard to ATEX and thus are not to be used in a potentially explosive environment unless a documented evaluation for the specific customer supplied parts in question has been made. Refer to Table 1 for all models and options that have been evaluated.

Product Usage

A summary of ATEX related usage issues that were found in the assessment are listed below.

1. Pressure regulators and control valves must be grounded (earthed) to prevent static charge build-up due to the flowing media. The regulator can be grounded through any mounting holes on the body with metal to metal contact or the system piping can be grounded and electrical continuity verified through the body metal seal connections. Grounding of the regulator should follow the same requirements for the piping system. Also see item 30 in Table 1.

2. The system designer and users must take precautions to prevent rapid system pressurization which may raise surface temperatures of system components and tubing due to adiabatic compression of the system gas.

3. Heating systems installed by the user could possibly increase the surface temperature and must be evaluated by the user for compliance with the ATEX Directive. User installation of heating systems applied to the regulator body or system piping that affects the surface temperature of the pressure regulator is outside the scope of this declaration and is the responsibility of the user.

4. The Joule-Thomson effect may cause process gases to rise in temperature as they expand going through a regulator. This could raise the external surface temperature of the regulator body and downstream piping creating a potential source of ignition. Whether the Joule-Thomson effect leads to heating or cooling of the process gas depends on the process gas and the inlet and outlet pressures. The system designer is responsible for determining whether the process gas temperature may rise under any operating conditions. If a process gas temperature rise is possible under operating conditions, then the system designer must investigate whether the regulator body and downstream piping may increase in temperature enough to create a potential source of ignition.

The process gas expansion is typically modeled as a constant enthalpy throttling process for determining the temperature change. A Mollier diagram (Pressure – Enthalpy diagram with constant temperature, density, & entropy contours) or a Temperature – Entropy diagram with constant enthalpy lines, for the process gas, can be used to determine the temperature change. Helium and hydrogen are two gases that typically increase in temperature when expanding across a regulator. Other gases may increase in temperature at sufficiently high pressures.

Product Declaration

If the above issues are addressed by selecting options that do not have potential sources of ignition, avoiding options that have not been assessed, and by taking the proper usage issue precautions, then Cashco regulators can be considered to be a mechanical device that does not have its own source of ignition and thus falls outside the scope of the ATEX directive.

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