Anderson Greenwood™ Type 4040HP Pressure and Vacuum Relief Valve

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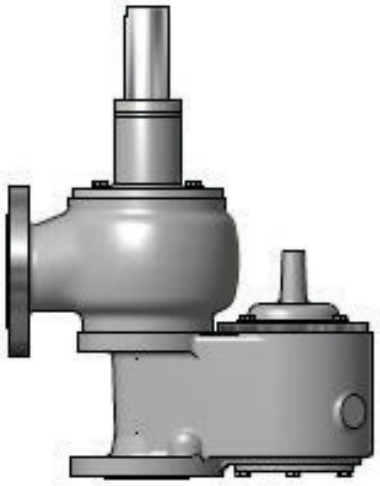


Figure 1. *Type 4040HP Pressure and Vacuum Relief Valve*

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

Anderson Greenwood Pressure and Vacuum Relief Valve must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Pressure Management.

The relief valve must be isolated from tank pressure before servicing. All gas/vapour must be blocked and pressure safely vented. Wear appropriate protective clothing and breathing apparatus if hazardous gas/vapours are present. Use appropriate lifting equipment where required.

Introduction

Scope of the Manual

This manual provides instructions for installation, operation, maintenance and parts ordering of the Type 4040HP Pressure and Vacuum Relief Valve (PVRV).

Specifications

This section lists the specifications for the Type 4040HP PVRV. Factory specification is stamped on the nameplate fastened on the Type 4040HP PVRV at the factory.

Valve Sizes

2, 3, 4, 6, 8, 10 and 12 in. /
DN 50, 80, 100, 150, 200, 250 and 300

Pallet Designs

VLP: For very low pressure or vacuums
LP: For low pressure or vacuums
HP: For use up to the high pressure or vacuums

Vacuum Pallet Ranges(1)

See Table 4

Equivalent Weights for Vacuum Settings

See Table 6

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

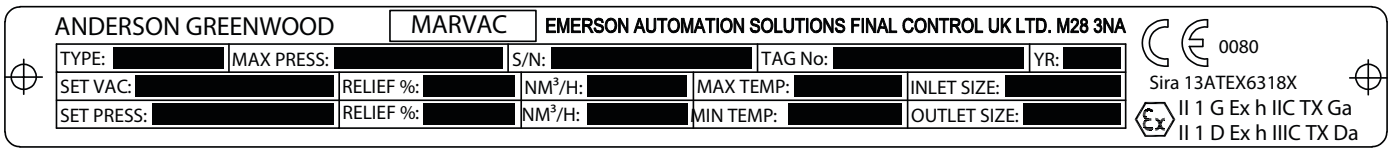


Figure 2. *Type 4040HP ATEX Nameplate*

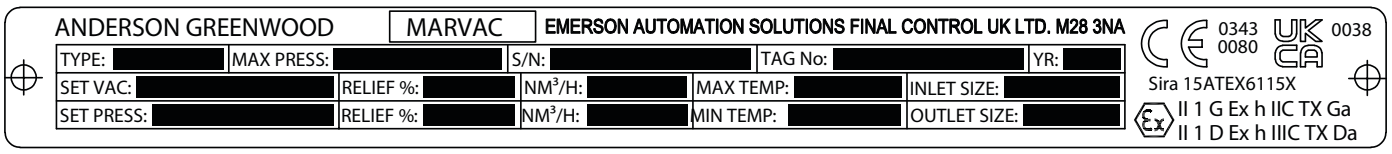


Figure 3. *Type 4040HP PED/PED(S)R and ATEX Nameplate*

Product Description

The Anderson Greenwood™ Type 4040HP PVRV is employed in gas/vapour service applications for low pressure storage tanks, vessels or applications requiring combined low pressure and vacuum protection with high capacity flow requirements. This product helps to prevent damage to the tank and also prevents the tank's contents from escaping, ensuring the safety of personnel and the surrounding environment.

Pressure/Vacuum valves are designed to limit the maximum pressure or vacuum that can exist in a tank due to inflow or outflow of the tank contents or due to changes in temperature as a result of environmental conditions.

The Anderson Greenwood Type 4040HP PVRV consists of a common inlet connection with two separate seats, pressure and vacuum. The vacuum seat draws atmospheric pressure into the tank being protected and the pressure seat discharges via a flanged discharge line.

- For ease of maintenance, both pressure and vacuum seats are removable.
- PTFE coated internals are supplied as an all-weather option.

Principle of Operation

The Anderson Greenwood Type 4040HP PVRV is a direct acting vent valve with a spring-loaded pallet on the pressure side and a weighted loaded pallet on the vacuum side to keep the valve closed. When tank pressure or vacuum acting on the seat sealing area equals the opposing force acting on the pallet, the valve is on the threshold of opening. Any further increase in pressure will cause the pressure pallet to lift allowing the contents of the tank to vent through the valve (out-breathing).

Any further increase in vacuum will cause the vacuum pallet to begin to lift thus breaking the vacuum by allowing atmospheric air to be drawn into the tank (in-breathing).

In order for the valve to open and achieve its design lift, an overpressure will be required. The Type 4040HP PVRV has been designed to achieve this design lift and rated capacity within 10% overpressure. Set pressures are adjusted by altering the compression on the pressure setting spring and set vacuums are adjusted by varying the weight on the pallet.

Set Pressure and Vacuum Verification

CAUTION

Whenever the cover is removed and refitted, ensure correct engagement of the pallet stem in the cover guide.

If the pressure or vacuum settings are to be verified prior to installation, it is recommended that a test rig with a suitable accumulator be used having the following general features:

- Connection to the accumulator tank should ensure a negligible pressure drop between the accumulator and the test valve.
- Observed pressure shall be measured in the accumulator tank.
- The flange on which the valve is mounted shall be level.
- The valve should be tested using clean air or nitrogen.

Remove valve from shipping container and remove all packaging. Check that the set pressure/vacuum, the rated capacities and other details on the nameplate are correct.

Set Pressure Verification

For set pressure verification, the test apparatus needs to limit the maximum flow rate into the accumulator such that a pressure drop measured in the accumulator can be observed when the valve set pressure is reached.

1. Ensure that the test rig is clean and fasten the valve securely to the test flange.
2. Check nameplate for required set pressure.
3. Establish a steady flow into the test vessel to increase the inlet pressure slowly. The adjusted set pressure is the pressure at which no further rise is observed. Repeat a further two times to ensure repeatability.

Set Pressure Adjustment (see Figure 12)

The valve has been factory set to the required setting, however, if it is necessary to make a set pressure adjustment this can be done as follows:

1. Remove cap (key P21) and release locknut (key P19).
2. The set pressure can be increased or reduced using adjusting screw (key P17). Turning clockwise will increase set pressure and anticlockwise will decrease set pressure. After adjustment, secure adjusting screw (key P17) using locknut (key P19), ensure cap gasket (key P20) is in place and refit cap (key P21).
3. Repeat set pressure verification and repeat set pressure adjustment if required.

Set Vacuum Verification

For verification of the vacuum setting, the flow rate out of the accumulator should be limited such that when the vacuum setting is reached, the point at which atmospheric pressure is admitted to the accumulator can be observed.

1. Ensure that the test rig is clean and fasten the valve securely to the test flange.
2. Check nameplate for required vacuum setting.
3. Increase the inlet vacuum slowly until the pallet assembly can be seen to be gently lifting and reseating on the seat. The inlet vacuum at this point is the adjusted setting and should coincide with the point at which no further increase in inlet vacuum is observed. Repeat a further two times to ensure repeatability.

Vacuum Setting Adjustment (see Figure 12)

The valve has been factory set to the required setting, however, if it is necessary to make a vacuum setting adjustment this can be done as follows:

1. Remove cover hex set screws (key V10), washers (key V9) then remove cover (key V2) with O-ring (key V8).
2. The vacuum setting can be increased or reduced by adding or removing lead weights which can be supplied in various settings.
3. Refit cover (key V2) ensuring O-ring (key V8) is correctly installed and secure using hex set screws (key V10) and washers (key V9).
4. Repeat set vacuum verification and repeat adjustment, if required.

If it is not possible to verify the set vacuum on a test rig, the required setting can be verified by measuring the combined weight of the pallet and installed weights. Refer to Table 6 for combined weight and equivalent set vacuums.

Table 1. *Inlet Flange Thread Forms*

VALVE SIZE, in. / DN	IMPERIAL, ANSI 125, 150	METRIC PN10	METRIC PN16
2 / 50	5/8 – 11 UNC	M16 x 2	M16 x 2
3 / 80	5/8 – 11 UNC	M16 x 2	M16 x 2
4 / 100	5/8 – 11 UNC	M16 x 2	M16 x 2
6 / 150	3/4 – 10 UNC	M20 x 2.5	M20 x 2.5
8 / 200	3/4 – 10 UNC	M20 x 2.5	M20 x 2.5
10 / 250	7/8 – 9 UNC	M20 x 2.5	M24 x 3
12 / 300	7/8 – 9 UNC	M20 x 2.5	M24 x 3

Installation

⚠ WARNING

Personal injury, property damage, equipment damage or leakage due to escaping steam or bursting of pressure containing parts may result if this equipment is over pressured or is installed where service conditions could exceed the limits given in the specifications or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting device.The mating connection to the tank should be flat machined horizontal flange and should be thoroughly cleaned to remove all foreign matter which could lead to valve leakage if trapped between the valve seat and the pallet. The bore diameter of the tank connection nozzle should be at least equal to the inlet bore of the valve connection.

Fit an inlet gasket to the mating flange ensuring it does not obstruct the flow path and install the valve. Ensure that the main axis of the valve is perpendicular. Flange bolting should be tightened uniformly to ensure a good seal.

Note

The valve connection flange will have a combination of plain through holes, tapped through holes and blind tapped holes. The thread form of the tapped holes can be found from Table 1.

For valves of aluminium construction, appropriate flat face flanges should be used and a full face gasket fitted.

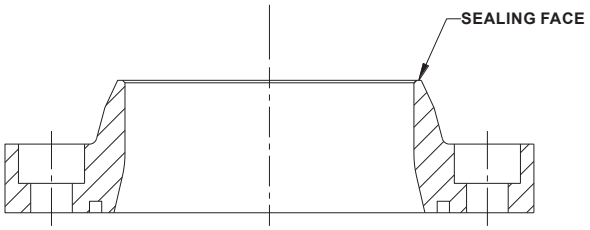


Figure 4. *Sealing Face of Valve Seat*

Table 2. *Seat Lap Band Widths*

VALVE SIZE, in. / DN	NOMINAL WIDTH, in. / mm	MAXIMUM WIDTH, in. / mm
2 / 50	0.039 / 1	0.059 / 1.5
3 / 80	0.039 / 1	0.059 / 1.5
4 / 100	0.047 / 1.2	0.071 / 1.8
6 / 150	0.059 / 1.5	0.071 / 1.8
8 / 200	0.059 / 1.5	0.087 / 2.2
10 / 250	0.079 / 2	0.12 / 3
12 / 300	0.079 / 2	0.12 / 3

Note

Storage tank inlet piping configurations should conform to recognised standards. Different configurations will develop different inlet pressure losses when the valve is flowing. This should be taken into consideration when sizing the valve for the application.

Any discharge pipework connected to the valve outlet should be adequately supported to prevent any loads being applied to the valve body and should have proper drainage to prevent accumulation of liquids on the downstream side.

It is recommended that the external surfaces of carbon steel valves are painted immediately after installation.

Discharge pipework must be at least equal in size to the valve outlet and any built up back pressure in the discharge line should be limited to 10% of the valve set pressure. Discharge lines should be positioned so as to allow safe disposal of tank contents under relief conditions.

Valve Refurbishment

With valve in component parts thoroughly clean all surfaces with a suitable solvent and check for wear, corrosion or other forms of damage. Particular attention should be given to the sealing face of the valve seat.

Slight damage can be removed by lapping the seat face (removing guide or vacuum posts); however, care should be taken not to increase the width of the seat face beyond those given in Table 2. If

successive refurbishments or severe damage requires the seat to be re-machined, consult the factory for approved dimensions.

Discard and replace any damaged parts plus all soft goods including:

- O-rings
- Diaphragms
- Backing Discs
- Spacer Discs
- Gaskets
- Skid ring (if fitted)

Also discard and replace the pallet disc.

Testing Set Pressure and Vacuum

The pressure and vacuum settings should be checked and if necessary adjusted as described.

Maintenance

⚠ WARNING

The relief valve must be isolated from tank pressure before servicing or removing. All gas/vapour must be blocked and pressure safely vented. Wear appropriate protective clothing and breathing apparatus if hazardous gas/vapours are present.

Regular inspection should be carried out to ensure that the pressure and vacuum ports is free from debris and that nothing preventing the correct operation of the valve is present. Maintenance should be performed at regular intervals and should be carried out by suitably qualified personnel in an appropriately equipped workshop. Alternatively; the valve should be returned to the manufacturer or suitably authorised agent for service/repair. During transport to the workshop the valve should be kept vertical to prevent damage to the internals.

Valve Disassembly (see Figure 12)

⚠ CAUTION

During disassembly, it is important to identify the pressure and vacuum pallets so that on reassembly they are returned to the correct seat.

Before the valve is disassembled it should be thoroughly cleaned to remove potential hazards from process contamination.

Pressure Side

1. Remove cap (key P21), cap gasket (key P20) and release locknut (key P19). Remove all load from spring by removing adjusting screw (key P17) complete with locknut (key P19). Remove hex set screws (key P10), washers (key P9), casing (key P2) and casing O-ring (key P8).
2. Remove upper spring plate (key P16). For valves 6 in. / DN 150 and above, recover skid ring (key P18) which is fitted between the adjusting screw and upper spring plate. Remove spring (key P15) and stem (key P14) complete with lower spring plate (key P13). Remove shroud (key P5), ball (key P12) then lift out pressure pallet assembly (key P11).
3. Remove seat (key P3) complete with guide posts (key P4) by removing cap screws (key P6). This will separate the upper body (key P1) from the lower body (key V1), (ensure upper body is adequately supported when the two bodies are separated). Remove gasket (key P22) and seat O-ring (key P7). Identify pallet assembly and seat as pressure side parts.

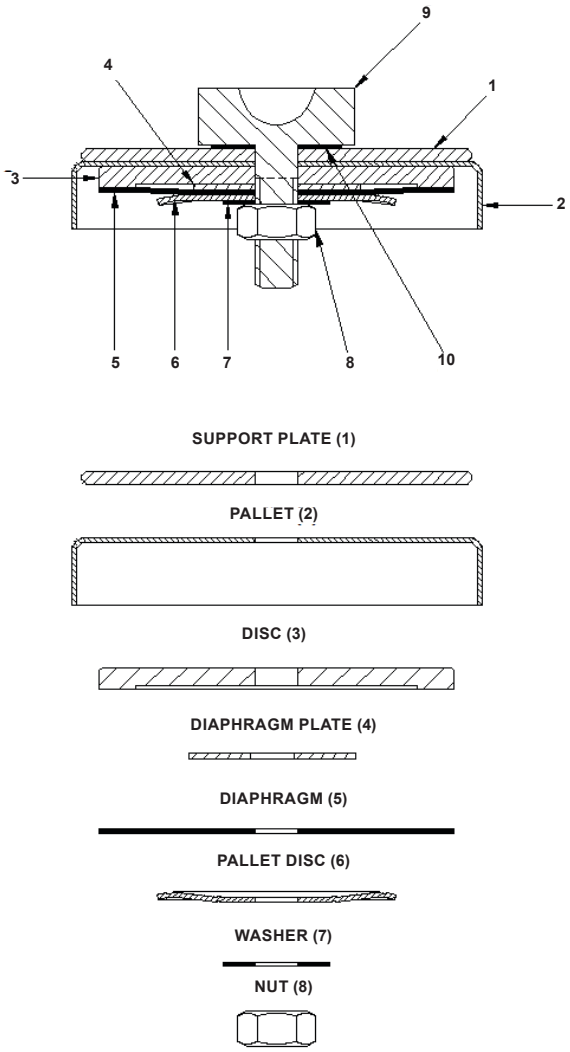
Vacuum Side

1. Remove hex set screws (key V10), washers (key V9), cover (key V2) and O-ring (key V8). Remove shroud (key V5) and lift out vacuum pallet assembly (key V11) complete with vacuum setting weights (for higher set valves, remove some of the lead before lifting out the pallet assembly).
2. For 8, 10 and 12 in. sizes, cover (key V2) has separate guide. If required, remove guide tube (key V16) and guide tube gasket (key V15).
3. Remove vacuum seat (key V3) complete with vacuum posts (key V4) by removing cap screws (key V6). Remove seat O-ring (key V7). Identify pallet assembly, weights and seat as vacuum side parts.
4. If required, unscrew hex set screws (key V14), remove mesh plate (key V13) and recover vacuum mesh (key V12).

Pallet Disassembly

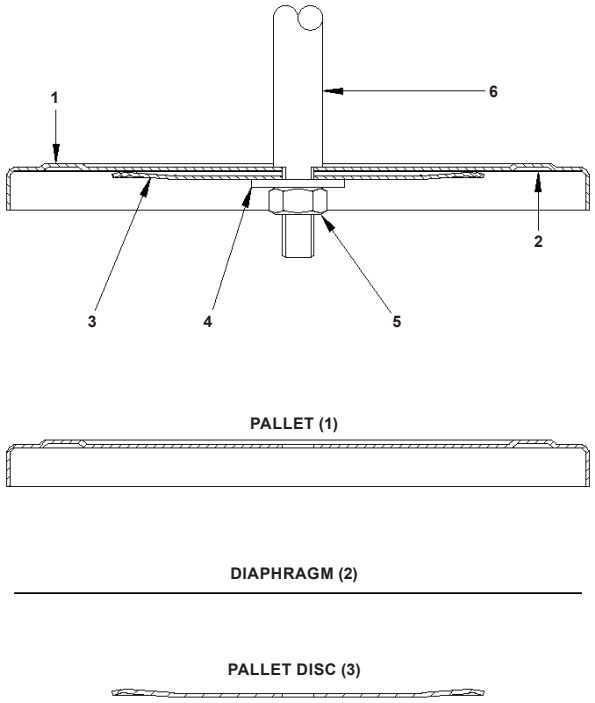
Pressure Pallet (see Figure 5)

Remove nut (key 8) and washer (key 7), where used to release pivot point (key 9) from assembly. Separate pallet disc (key 6), diaphragm (key 5), diaphragm plate (key 4), disc (key 3), pallet (key 2) and support plate (key 1). Remove pivot point gasket (key 10).



NOTE:
WASHER ITEM (7) NOT FITTED TO 2 AND 3 in. / DN 50 AND 80 SIZES.

Figure 5. *Pallet Assembly*



NOTE:
WASHER ITEM (4) NOT FITTED TO 2 AND 3 in. / DN 50 AND 80 SIZES.

Figure 6. *VLP/LP Vacuum Pallet 2, 3, 4 in.*

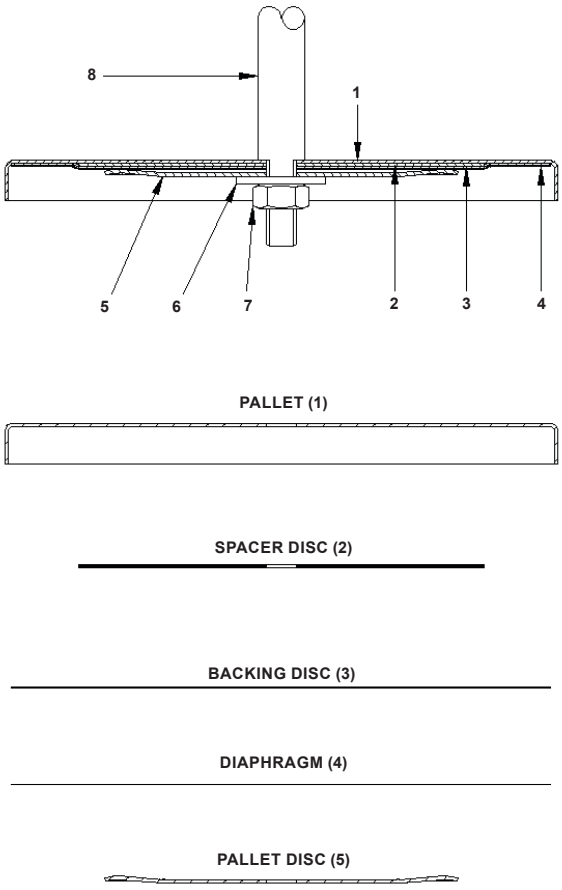
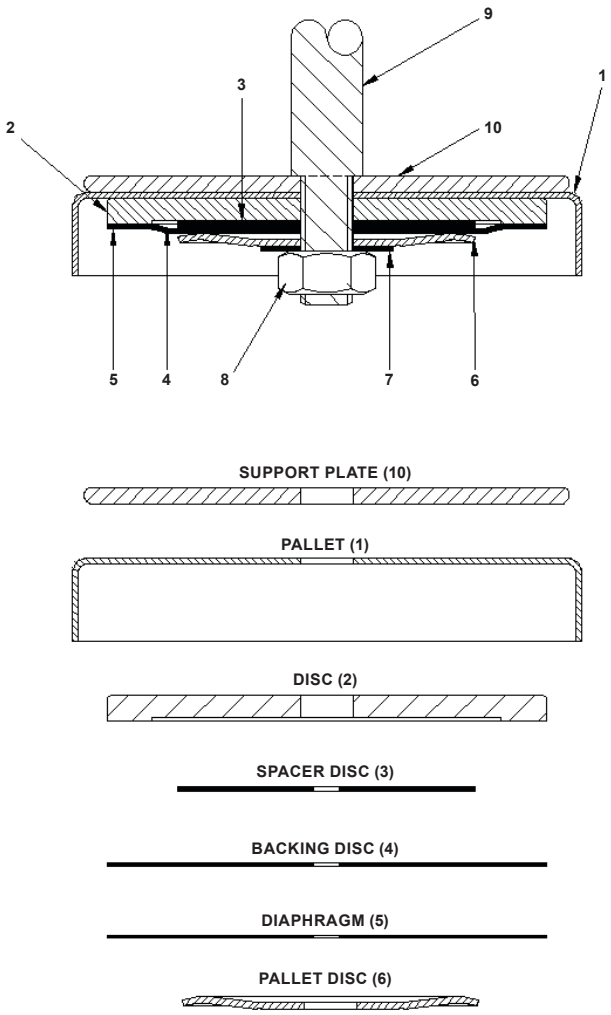


Figure 7. *VLP/LP Vacuum Pallet 6, 8, 10, 12 in.*



NOTES:
WASHER ITEM (7) NOT FITTED TO 2 AND 3 in. / DN 50 AND 80 SIZES AND SUPPORT PLATE (10) USED ON 8, 10 AND 12 IN. / DN 200, 250 AND 300 ONLY.

FOR HP VACUUM PALLETS SUBJECT TO 200MBAR OR MORE IN SERVICE POSITIVE PRESSURE, USE DIAPHRAGM PLATE AND DIAPHRAGM CONSTRUCTION AS PER SPRING LOADED PALLET SHOWN IN FIGURE 6.

Figure 8. *HP Vacuum Pallet*

Vacuum Pallet

Note

The vacuum pallet construction will depend on size and vacuum setting. The VLP and LP have a similar construction whereas the HP as a significant disc for strength. Refer to Table 5 for vacuum pallet ranges.

VLP/LP Vacuum Pallet 2, 3, 4 in. / DN 50, 80, 100 (see Figure 6)

Remove nut (key 5), washer (key 4) where used, to release stem (key 6) from assembly. Separate pallet disc (key 3), diaphragm (key 2), pallet (key 1) and any weights taking care to identify weights removed to help reassembly.

VLP/LP Vacuum Pallet 6, 8, 10, 12 in. / DN 150, 200, 250, 300 (see Figure 7)

Remove nut (key 7), washer (key 6) where used, to release stem (key 8) from assembly. Separate pallet disc (key 5), diaphragm (key 4), backing disc (key 3), spacer disc (key 2), pallet (key 1) and any weights taking care to identify weights removed to help reassembly.

HP Vacuum Pallet (see Figure 8)

Remove nut (key 8), washer (key 7), where used, to release stem (key 9) from assembly. Separate pallet disc (key 6), diaphragm (key 5), backing disc (key 4), spacer disc (key 3), disc (key 2), pallet (key 1), support plate (key 10) where fitted and any weights taking care to identify weights removed to help reassembly.

Valve Re-assembly (see Figure 12)

CAUTION

Whenever the cover is removed and re-fitted, ensure correct engagement of the pallet stem.

Vacuum Side

1. If previously removed, assemble vacuum mesh (key V12), mesh plate (key V13) and secure using hex set screws (key V14).
2. Reassemble vacuum posts (key V4), if removed, and seat O-ring (key V7) to seat (key V3).
3. Secure seat to body (key V1) using cap screws (key V6) ensuring that seat O-ring is not dislodged during assembly.
4. Reinstall vacuum pallet as identified during valve disassembly ensuring the pallet slides easily between the vacuum posts.
5. Return vacuum setting weights again as identified during disassembly. Assemble shroud (key V5) which should be installed over the vacuum posts (key V4).
6. For 8, 10 and 12 in. / DN 200, 250 and 300 sizes, cover (key V2) has separate guide. If previously removed, fit new guide tube gasket (key V15) and assemble guide tube (key V16).
7. Assemble cover O-ring (key V8) to cover (key V2) and assemble cover to body (key V1) ensuring that O-ring is not dislodged during assembly. Secure using washers (key V9), and hex set screws (key V10).

Pressure Side

1. Reassemble guide posts (key P4) if removed, and seat O-ring (key P7) to seat (key P3).
2. Fit gasket (key P22) between upper body (key P1) and lower body (key V1); secure seat and upper body to lower body using cap screws (key P6) ensuring that O-ring is not dislodged during assembly.
3. Reinstall pressure pallet as identified during valve disassembly ensuring the pallet slides easily between the guide posts.
4. Place ball (key P12) in socket of pivot point (key 9).
5. Assemble shroud (key P5) over guide posts (key P4) then assemble stem (key P14) complete with bottom spring plate (key P13) to locate on ball.
6. Assemble spring (key P15), and top spring plate (key P16). For valves 6 in. / DN 150 and larger, fit skid ring (key P18) in recess of top spring plate.
7. Assemble casing O-ring (key P8) to casing (key P2) and assemble over stem (key P14) securing with washers (key P9) and hex set screws (key P10).
8. Assemble adjusting screw (key P17) over stem and screw into casing (key P2). Apply nominal load to spring and secure locknut (key P19). Assemble cap gasket (key P20) and cap (key P21).

Pallet Re-assembly

Check identification to ensure pressure and vacuum components are returned to respective seats.

Pallets should be identified during disassembly; however, they can also be identified by thickness and length (see Tables 3 and 4).

Vacuum Pallet

VLP/LP Vacuum Pallet 2, 3, 4 in. / DN 50, 80, 100 (see Figure 6)

Assemble pallet (key 1), diaphragm (key 2), and pallet disc (key 3), to stem (key 6) and secure using washer (key 4) if fitted and nut (key 5).

VLP/LP Vacuum Pallet 6, 8, 10, 12 in. / DN 150, 200, 250, 300 (see Figure 7)

Assemble pallet (key 1), spacer disc (key 2), backing disc (key 3), diaphragm (key 4), and pallet disc (key 5), to stem (key 8) and secure using washer (key 6) if fitted and nut (key 7).

HP Vacuum Pallet (see Figure 8)

Assemble support plate, where used (key 10), pallet (key 1), disc (key 2), spacer disc (key 3), backing disc (key 4), diaphragm (key 5), and pallet disc (key 6), to stem (key 9) and secure using washer (key 7) if fitted and nut (key 8).

Pressure Pallet (see Figure 5)

Assemble pivot point gasket (key 10), support plate (key 1), pallet (key 2), disc (key 3), diaphragm plate (key 4), diaphragm (key 5), and pallet disc (key 6), to pivot point (key 9) and secure using washer if fitted (key 7) and nut (key 8).

If required, PTFE tape can be applied to stem threads and locking compound used to secure the nut.

Parts Ordering

When corresponding with your local Sales Office about this pressure relief valve, include the type number, serial number and other information stamped on the nameplate.

When ordering replacement parts, specify relief valve by model number, pipe size and serial number. identify replacement parts by part number, description and material where possible.

Parts List

Pressure Side

Key	Description
P1	Pressure Seat Body
P2	Pressure Spring Casing
P3	Pressure Seat
P4	Guide Post
P5	Shroud
P6	Cap Screw
P7	Seat O-ring
P8	Casing O-ring
P9	Casing Washer
P10	Casing Hex Set Screw
P11	Pressure Pallet Assembly
P12	Ball
P13	Lower Spring Plate
P14	Stem
P15	Pressure Compression Spring
P16	Upper Spring Plate
P17	Pressure Adjusting Screw
P18	Skid Ring (6 in. / DN 150 and Larger)
P19	Locknut
P20	Cap Gasket
P21	Pressure Cap
P22	Body Gasket

Vacuum Side

Key	Description
V1	Vacuum Seat Body
V2	Cover
V3	Vacuum Seat
V4	Vacuum Post
V5	Shroud
V6	Cap Screw
V7	Seat O-ring
V8	Cover O-ring
V9	Cover Washer
V10	Cover Hex Set Screw
V11	Vacuum Pallet Assembly
V12	Vacuum Mesh
V13	Mesh Plate
V14	Mesh Plate Hex Set Screw
V15	Guide Tube Gasket
V16	Guide Tube
V17	Taper Plug

Table 3. *Pallet Thickness*

PALLET MATERIAL THICKNESS, mm							
	2 in.	3 in.	4 in.	6 in.	8 in.	10 in.	12 in.
HP	1.0	1.0	1.0	1.5	1.5	1.5	1.5
LP	1.0	1.0	1.0	1.5	1.5	1.5	1.5
VLP	0.6	0.6	0.6	0.6	0.6	0.6	0.6

Table 4. *Pallet Lengths, in. / mm*

VALVE NOMINAL INLET SIZE, in. / DN	DIMENSIONS			
	PRESSURE PALLET		VACUUM PALLET	
	A	B	A	B
2 / 50	3.03 / 77	0.2 / 5	3.03 / 77	0.31 / 8
3 / 80	4.41 / 112	0.3 / 7.5	4.41 / 112	0.47 / 12
4 / 100	5.79 / 147	0.39 / 10	5.79 / 147	0.63 / 16
6 / 150	8.7 / 221	0.59 / 15	8.7 / 221	0.94 / 24
8 / 200	11.6 / 294	0.79 / 20	11.6 / 294	1.26 / 32
10 / 250	14.5 / 368	0.98 / 25	14.5 / 368	1.57 / 40
12 / 300	17.4 / 441	1.18 / 30	17.4 / 441	1.89 / 48

Table 5. *Vacuum Pallet Ranges, in. w.c. / mbar*

NOMINAL SIZE, in. / DN	TRIM MATERIAL	VLP PALLET		LP PALLET		HP PALLET	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
2 / 50	Aluminium	0.48 / 1.2	0.96 / 2.4	0.96 / 2.4	2.81 / 7.0	2.81 / 7.0	40 / 100
	316 SST	1.0 / 2.5	2.33 / 5.8	2.33 / 5.8	5.62 / 14	5.62 / 14	40 / 100
3 / 80	Aluminium	0.44 / 1.1	0.68 / 1.7	0.68 / 1.7	2.81 / 7.0	2.81 / 7.0	40 / 100
	316 SST	1.0 / 2.5	1.57 / 3.9	1.57 / 3.9	5.62 / 14	5.62 / 14	40 / 100
4 / 100	Aluminium	0.44 / 1.1	0.64 / 1.6	0.64 / 1.6	2.81 / 7.0	2.81 / 7.0	40 / 100
	316 SST	1.0 / 2.5	1.41 / 3.5	1.41 / 3.5	5.62 / 14	5.62 / 14	40 / 100
6 / 150	Aluminium	0.44 / 1.1	0.80 / 2.0	0.80 / 2.0	2.81 / 7.0	2.81 / 7.0	40 / 100
	316 SST	1.0 / 2.5	1.77 / 4.4	1.77 / 4.4	5.62 / 14	5.62 / 14	40 / 100
8 / 200	Aluminium	0.44 / 1.1	0.92 / 2.3	0.92 / 2.3	5.22 / 13	5.22 / 13	40 / 100
	316 SST	1.0 / 2.5	1.93 / 4.8	1.93 / 4.8	8.03 / 20	8.03 / 20	40 / 100
10 / 250	Aluminium	0.44 / 1.1	1.04 / 2.6	1.04 / 2.6	5.22 / 13	5.22 / 13	40 / 100
	316 SST	1.0 / 2.5	1.85 / 4.6	1.85 / 4.6	8.83 / 22	8.83 / 22	40 / 100
12 / 300	Aluminium	0.44 / 1.1	0.84 / 2.1	0.84 / 2.1	5.22 / 13	5.22 / 13	40 / 100
	316 SST	1.0 / 2.5	1.77 / 4.4	1.77 / 4.4	9.64 / 24	9.64 / 24	40 / 100

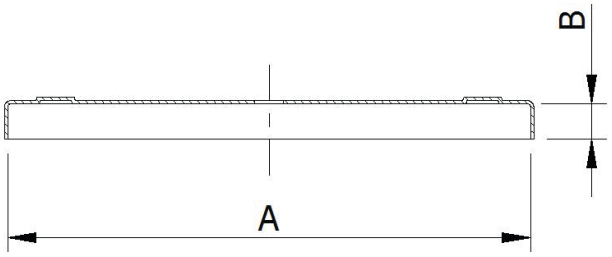


Figure 9. *VLP/LP Pressure Pallet 2, 3, 4 in. / DN 50, 80, 100*

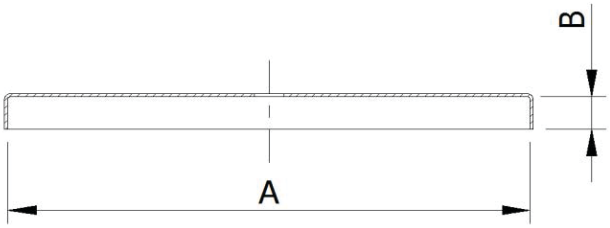


Figure 10. *VLP/LP Pressure Pallet 6, 8, 10, 12 in. / DN 150, 200, 250, 300*

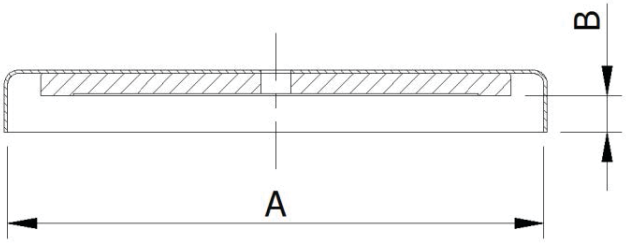


Figure 11. *HP Pressure Pallet*

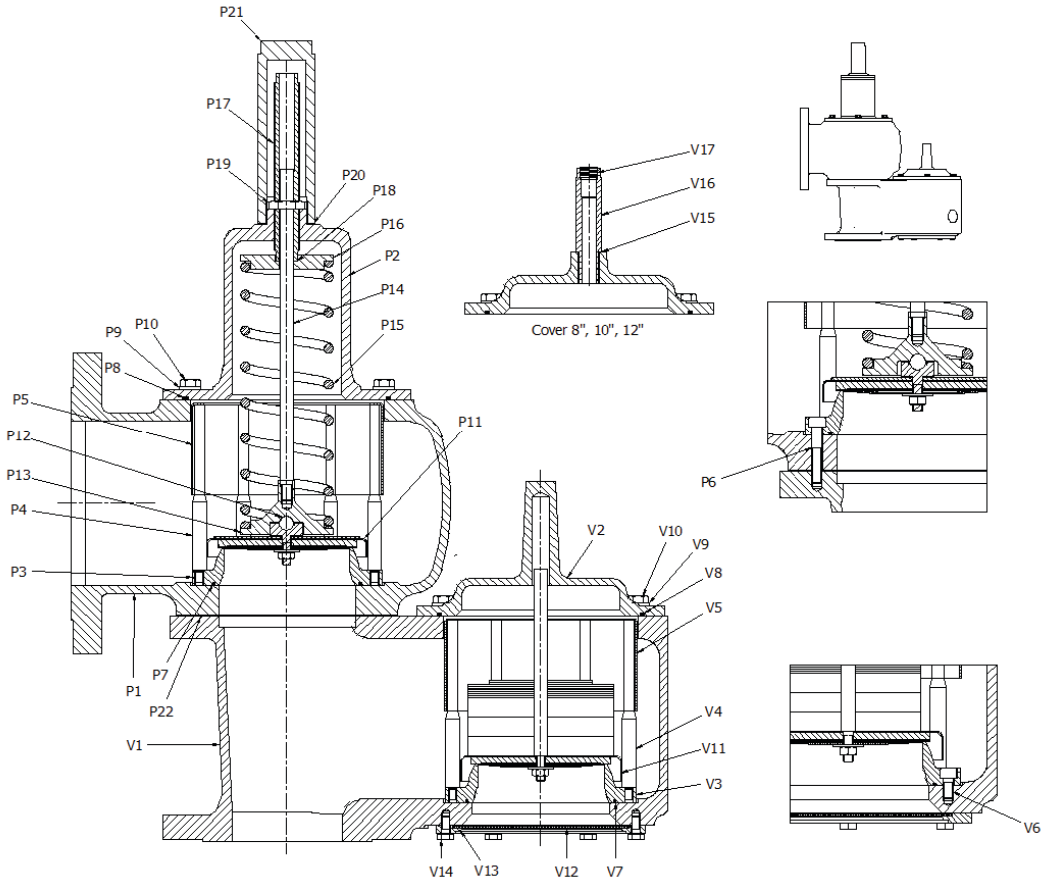


Figure 12. *Type 4040HP Pressure and Vacuum Relief Valve Assembly*

Table 6. *Equivalent Weights for Vacuum Settings*

INLET SIZE, in. / DN	2 / 50		3 / 80		4 / 100		6 / 150		8 / 200		10 / 250		12 / 300	
MEAN SEALING AREA, $in.^2$ / mm^2	4.53 / 2923		9.971 / 6433		17.603 / 11,357		39.662 / 25,588		69.829 / 45,051		109.563 / 70,686		156.894 / 101,222	
SETTING, mbar	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz
1	0	1.1	0	2.3	0	4.1	0	9.2	1	0.2	1	9.4	2	4.4
2	0	2.1	0	4.6	0	8.2	1	2.4	2	0.4	3	2.9	4	8.9
3	0	3.2	0	6.9	0	12.3	1	11.6	3	0.6	4	12.3	6	13.3
4	0	4.2	0	9.3	1	0.4	2	4.8	4	0.9	6	5.8	9	1.7
5	0	5.3	0	11.6	1	4.4	2	14.0	5	1.1	7	15.2	11	6.2
6	0	6.3	0	13.9	1	8.5	3	7.3	6	1.3	9	8.7	13	10.6
7	0	7.4	1	0.2	1	12.6	4	0.5	7	1.5	11	2.1	15	15.0
8	0	8.4	1	2.5	2	0.7	4	9.7	8	1.7	12	11.5	18	3.5
9	0	9.5	1	4.8	2	4.8	5	2.9	9	1.9	14	5.0	20	7.9
10	0	10.5	1	7.2	2	8.9	5	12.1	10	2.2	15	14.4	22	12.3
12	0	12.6	1	11.8	3	1.1	6	14.5	12	2.6	19	1.3	27	5.2
14	0	14.7	2	0.4	3	9.2	8	0.9	14	3.0	22	4.2	31	14.1
16	1	0.8	2	5.0	4	1.4	9	3.4	16	3.5	25	7.1	36	6.9
18	1	2.9	2	9.7	4	9.6	10	5.8	18	3.9	28	10.0	40	15.8
20	1	5.0	2	14.3	5	1.8	11	8.2	20	4.3	31	12.9	45	8.7
22	1	7.1	3	2.9	5	9.9	12	10.6	22	4.8	34	15.7	50	1.5
24	1	9.2	3	7.6	6	2.1	13	13.1	24	5.2	38	2.6	54	10.4
26	1	11.3	3	12.2	6	10.3	14	15.5	26	5.6	41	5.5	59	3.3
28	1	13.5	4	0.8	7	2.5	16	1.9	28	6.0	44	8.4	63	12.2
30	1	15.6	4	5.5	7	10.6	17	4.3	30	6.5	47	11.3	68	5.0
32	2	1.7	4	10.1	8	2.8	18	6.7	32	6.9	50	14.2	72	13.9
34	2	3.8	4	14.7	8	11.0	19	9.2	34	7.3	54	1.1	77	6.8
36	2	5.9	5	3.4	9	3.2	20	11.6	36	7.8	57	3.9	81	15.6
38	2	8.0	5	8.0	9	11.3	21	14.0	38	8.2	60	6.8	86	8.5
40	2	10.1	5	12.6	10	3.5	23	0.4	40	8.6	63	9.7	91	1.4
42	2	12.2	6	1.2	10	11.7	24	2.8	42	9.1	66	12.6	95	10.2
44	2	14.3	6	5.9	11	3.9	25	5.2	44	9.5	69	15.5	100	3.1
46	3	0.4	6	10.5	11	12.0	26	7.7	46	9.9	73	2.4	104	12.0
48	3	2.5	6	15.1	12	4.2	27	10.1	48	10.4	76	5.3	109	4.8
50	3	4.6	7	3.8	12	12.4	28	12.5	50	10.8	79	8.1	113	13.7

Table 6. *Equivalent Weights for Pressure Settings (continued)*

INLET SIZE, in. / DN	2 / 50		3 / 80		4 / 100		6 / 150		8 / 200		10 / 250		12 / 300	
MEAN SEALING AREA, $in.^2$ / mm^2	4.53 / 2923		9.971 / 6433		17.603 / 11,357		39.662 / 25,588		69.829 / 45,051		109.563 / 70,686		156.894 / 101,222	
SETTING, mbar	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz	lb	oz
50	3	4.6	7	3.8	12	12.4	28	12.5	50	10.8	79	8.1	113	13.7
52	3	6.7	7	8.4	13	4.6	29	14.9	52	11.2	82	11.0	118	6.6
54	3	8.8	7	13.0	13	12.7	31	1.4	54	11.6	85	13.9	122	15.4
56	3	10.9	8	1.7	14	4.9	32	3.8	56	12.1	89	0.8	127	8.3
58	3	13.0	8	6.3	14	13.1	33	6.2	58	12.5	92	3.7	132	1.2
60	3	15.1	8	10.9	15	5.3	34	8.6	60	12.9	95	6.6	136	10.0
62	4	1.2	8	15.6	15	13.4	35	11.0	62	13.4	98	9.5	141	2.9
64	4	3.3	9	4.2	16	5.6	36	13.5	64	13.8	101	12.3	145	11.8
66	4	5.4	9	8.8	16	13.8	37	15.9	66	14.2	104	15.2	150	4.6
68	4	7.5	9	13.5	17	6.0	39	2.3	68	14.7	108	2.1	154	13.5
70	4	9.6	10	2.1	17	14.1	40	4.7	70	15.1	111	5.0	159	6.4
72	4	11.7	10	6.7	18	6.3	41	7.1	72	15.5	114	7.9	163	15.2
74	4	13.8	10	11.3	18	14.5	42	9.6	74	16.0	117	10.8	168	8.1
76	4	15.9	10	16.0	19	6.7	43	12.0	77	0.4	120	13.7	173	1.0
78	5	2.1	11	4.6	19	14.8	44	14.4	79	0.8	124	0.5	177	9.9
80	5	4.2	11	9.2	20	7.0	46	0.8	81	1.3	127	3.4	182	2.7
82	5	6.3	11	13.9	20	15.2	47	3.2	83	1.7	130	6.3	186	11.6
84	5	8.4	12	2.5	21	7.4	48	5.7	85	2.1	133	9.2	191	4.5
86	5	10.5	12	7.1	21	15.5	49	8.1	87	2.6	136	12.1	195	13.3
88	5	12.6	12	11.8	22	7.7	50	10.5	89	3.0	139	15.0	200	6.2
90	5	14.7	13	0.4	22	15.9	51	12.9	91	3.4	143	1.9	204	15.1
92	6	0.8	13	5.0	23	8.1	52	15.4	93	3.8	146	4.7	209	7.9
94	6	2.9	13	9.7	24	0.3	54	1.8	95	4.3	149	7.6	214	0.8
96	6	5.0	13	14.3	24	8.4	55	4.2	97	4.7	152	10.5	218	9.7
98	6	7.1	14	2.9	25	0.6	56	6.6	99	5.1	155	13.4	223	2.5
100	6	9.2	14	7.5	25	8.8	57	9.0	101	5.6	159	0.3	227	11.4

Table 7. *Replacement Parts*

DESCRIPTION	USAGE	MATERIAL	NOMINAL SIZE, in. / DN						
			2 / 50	3 / 80	4 / 100	6 / 150	8 / 200	10 / 250	12 / 300
Pallet Disc	Very Low Pressure	Stainless Steel	11183378	11183398	11183420	11183439	11183457	11183475	11183493
	Low Pressure		11182941	11182943	11182945	11182946	11183009	11183092	11183133
	High Pressure								
	Spring Loaded								
Diapraghm	Very Low Pressure	PFA	11183880	11183882	11183884	11183266	- - - -	- - - -	- - - -
		Polytetrafluoroethylene (PTFE)	11183257	11183260	11183263	11183267	11183271	11183275	11183279
	Low Pressure	PFA	11183881	11183883	11183885	11411605	- - - -	- - - -	- - - -
		PTFE	11183258	11183261	11183264	11411606	11411607	11411612	11411614
	High Pressure	PTFE	11183259	11183262	11183265	11183269	11183273	11183277	11183281
	Spring Loaded <200 mbar	PTFE	11281485	11280622	11281490	11281493	11281496	11281498	11281500
	Spring Loaded >200 mbar	PTFE	11281489	11280624	11281492	11281495	11281497	11280837	11281502
Backing Disc	Very Low Pressure	General Service Gasket	- - - -	- - - -	- - - -	11183856	11183886	11183887	11183888
	Low Pressure		- - - -	- - - -	- - - -	11411623	11411631	11411634	11411636
	High Pressure		11183282	11183284	11183285	11183286	11183287	11183288	11183289
Spacer Disc	Very Low Pressure	General Service Gasket	- - - -	- - - -	- - - -	11183857	11183889	11183890	11183891
	Low Pressure		- - - -	- - - -	- - - -	11183294	11183295	11183296	11183297
	High Pressure		11183290	11183292	11183293				
Gasket	Body	General Service Gasket	11182947	11182948	11182949	11182247	11183010	11183093	11183134
	Guide Tube		- - - -	- - - -	- - - -	- - - -	11183311		
	Cap		11411641			11411646		11411649	
	Pivot Point		11272778			11405355	11272733		
O-ring	Seat	Viton®	11183351	11183354	11183320	11180110	11183326	11182024	11180089
		Nitrile (NBR)	11183350	11183353	11183319	11180109	11183325	11182023	11180088
		PTFE	11183349	11183352	11183318	11180108	11183324	11182022	11180087
	Cover	Viton®	11183314	11183317	11183323	11183326	11183334	11183337	11183340
		Nitrile (NBR)	11183313	11183316	11183322	11183325	11183333	11183336	11183339
		PTFE	11183312	11183315	11183321	11183324	11183332	11183335	11183338
Skid Ring	- - - -	PTFE	- - - -	- - - -	- - - -	11405352	11272734	11275612	

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