1.5" Flanged "Uniact" Rail Car Vacuum Relief Valve

Overview
The 1.5" Flanged Uniact valve is a direct spring-loaded, single-acting vacuum relief valve designed for DOT111 rail tank cars. The valve shall be connected to the vessel in the vapour space above any contained liquids. The flanged tank connection is raised face and is drilled 4 holes 0.63" diameter equi-spaced on a 3.87" PCD (1.5" ASA 150). The valve will operate at the vacuum setting indicated on the valve markings. It is suitable for a vacuum range of between 0.5"Hg and 26"Hg. A variety of seal materials is available, depending upon the cargo. The valve body is fitted with a stainless steel cowl and gauze, secured with anti-tamper wire.

The minimum temperature condition for the valve is -67°F and the maximum temperature condition for the valve is +500°F. It must be noted that the vacuum poppet seal material may restrict this temperature range. (See **Valve Identification** below)

The valve is designed in accordance with ASME VIII Div.1 and AAR M 1002 Appendix A.

Installation and testing of this product must be conducted by a "qualified person".

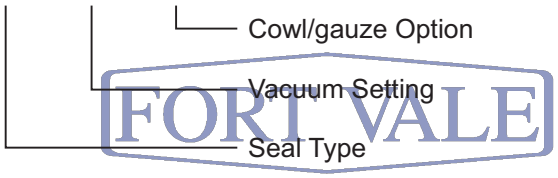
"Qualified Person"
The term "qualified person" relates to a person who is familiar with the installation, assembly and operation of the equipment. The person should have the qualifications corresponding to their responsibilities, such as instruction and awareness to comply with all operational, regional and in-company regulations and requirements.

Material of Construction
Valve contact parts are manufactured in 316 and 304 austenitic stainless steel. Valve non-contact parts are manufactured in stainless steel. Valve springs are manufactured in 302 stainless steel. The wire seal is manufactured in lead.

Vacuum poppet O ring : Variable

Valve Identification
The digits in the part number indicate the seal type and vacuum setting. The suffix letters indicate the supplemental components.

Eg: **48 / X 00 XX C XX**



Seal Type

Code	Seal Type	Temp. Range °F	Temp. Range °C
0	Viton A ® (FKM)	-4° to 399°	-20° to 204°
B	Viton B ® (FKM)	+5° to 392°	-15° to 200°
1	Fortyt (Silicone/FEP)	-67° to 392°	-55° to 200°
7	Perfluoroelastomer (FFKM)	+5° to 500°	-15° to 260°
9	EPDM	-58° to 302°	-50° to 150°
T	Hi-Temp Fortyt (Silicone/PFA)	-67° to 500°	-55° to 260°

Vacuum Setting Vacuum setting multiplied by 2, eg. 10"Hg *2 = 20

Cowl/Gauze

Part No.	Valve Configuration
48/X00XXC	Valve with no cowl and no gauze
48/X00XXCC	Valve with cowl
48/X00XXCGZ	Valve with cowl and gauze

Mounting
It is imperative that the vessel internal surfaces are clean and free from debris prior to mounting the valve to prevent the ingress of foreign bodies into the valve seals. Once the valve is in-situ, if any remedial work is carried out to the inside of the vessel, ensure that no debris remains.

The valve shall be mounted vertically to a weld-in flange with the corresponding pitch circle tapping as above. The flange bore shall be at least the area of the valve inlet and shall be designed to ensure unobstructed flow between the vessel and the valve. No stop valves shall be fitted between the relief valve and the vessel.

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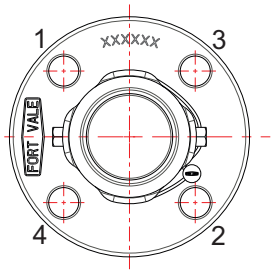
The relief valve shall be so positioned that its function will not be hindered. Any discharge lines from the relief valve shall be so designed to facilitate drainage and the size of the lines shall be such that any pressure that may develop will not reduce the relieving capacity of the valve. No additional mountings may be used that will induce additional loads on the relief valve.

An intermediary gasket is required : Recommended M = 2, Recommended Y = 13.8 MPa
Ensure that the gasket does not interfere with the valve inlet bore.

Prior to installation, inspect the weld-in flange, valve inlet flange and gasket to ensure that the surfaces are clean and free from defects. The nuts shall be tightened evenly following the sequence below. See Figure 1.

Recommended bolting torque : This should be assessed by the user, taking the following criteria into consideration - bolt material, gasket material and lubricant type.

Figure 1 - Valve inlet flange bolting sequence



These calculations are based on a flat flange to within 0.15mm. Excessive weld-in flange weld distortion will affect the sealing and may require increased torques to successfully create a reliable joint.

It is possible for the bolt stress to decrease after initial tightening because of slow creep or relaxation of the gasket, particularly with soft gaskets such as CNAF/PTFE envelopes. Good practice and flange bolting convention advises that, after initial bolt up, the joint is left for a period then re-tightened. Most gasket manufacturers recommend 24 hours. However, the ASME PCC-1-2000 GUIDELINES FOR PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY recommend at least 4 hours. Below is an extract of the bolting procedure from ASME PCC-1.

Step Loading
Install
Hand tighten the nuts. Check flange gap around circumference for uniformity. If the gap around the circumference 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 around the circumference 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 around the circumference 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 around the circumference is not reasonably uniform, make the appropriate adjustments by selective tightening before proceeding.

Round 4
Continue tightening the bolts, but on a rotational clockwise pattern until no further nut rotation occurs at the Round 3 Target Torque value. For indicator bolting, tighten bolts until the indicator rod retraction readings for all bolts are within the specified range.

Round 5
Time permitting, wait a minimum of 4 hr and repeat Round 4; this will restore the short-term creep relaxation/embedment losses. If the flange is subjected to a subsequent test pressure higher than its rating, it may be desirable to repeat this round after the test is completed.

Operating Media
The valve is designed without corrosion allowance consideration. It is the responsibility of the client to ascertain the suitability of the media with the materials of construction and to ensure that they will not contribute to the degradation of the valve.

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Servicing

Prior to commencing any remedial work, please observe Fort Vale Maintenance Safety Advice (see OPIN41 supplied separately). It is recommended that the relief valve is checked regularly for correct operation. Fort Vale recommends the use of ONLY proprietary spare parts. Using spare parts not supplied by Fort Vale may cause damage to the valve and will invalidate any warranty. Any unauthorised modification to the valve may invalidate warranty. All measuring devices must be calibrated.

Client Responsibilities

Relief Valve Compatibility - When the relief valve is installed, provision must be made to ensure that the relief valve settings are compatible with the equipment it is to protect and that the valve or combination of valves has sufficient venting capacity

48/X00XXCX Net Flow Area : 0.71 inch² (458mm²)

External Fire - When the valve is to be installed in an area where the risk of external fire is heightened, suitable accessories shall be fitted to limit damage to the valve.

Material Compatibility - All components attached to the relief valve shall be constructed from compatible materials that will not cause degradation to the valve.

Mis-Use - The valve is to be used, installed and serviced in accordance with these operating instructions and valve markings. Use/operation outside these instructions and the indicated pressure/temperature range marked on the valve is at the risk of the user and Fort Vale Engineering Ltd. shall bear no responsibility for such actions.

Troubleshooting - This list is indicative but not exhaustive.

Problem - Leakage between tank weld in flange and valve

Cause	Solution
Deformed weld in flange	Re-face the flange or remove and replace with new
Debris between gasket & flange/defective gasket	Clean the area. Replace the gasket if necessary
Insufficient torque on nuts	Assess the required bolting torque criteria (see page 2) and adjust the nuts accordingly

Problem - Leakage from valve vacuum poppet

Cause	Solution
Debris in poppet area	Perform a Risk Assessment. Remove the valve and inspect the poppet area and remove any debris. If the poppet is damaged, replace with new. Test the valve prior to re-mounting to the vessel.
Damage to poppet O ring	Perform a Risk Assessment. Remove the valve and inspect the poppet O ring. If the O ring is damaged, replace with new. Test the valve prior to re-mounting to the vessel.

Problem - Valve will not open at the set pressure

Cause	Solution
Debris eg. Congealed cargo in poppet area/body bore/between the spring guide	Perform a Risk Assessment. Remove the valve and inspect the poppet area and remove any debris. If the poppet is damaged, replace with new. Test the valve prior to re-mounting to the vessel.
Damage to spring	Perform a Risk Assessment. Remove the valve and inspect the spring for obstruction or corrosion. If the spring is damaged, replace with new. Test the valve prior to re-mounting to the vessel.
Incorrect set pressure	Perform a Risk Assessment. Remove the valve and adjust the spring pad to achieve the valve set pressure. Test the valve prior to re-mounting to the vessel.
Incorrect tank weld in flange bore	Check the bore of the weld in flange – the bore must not be smaller than 1.75” (44.5mm)

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Problem - Valve will not close

Cause	Solution
Debris eg. Congealed cargo in poppet area/body bore/between the spring guide	Perform a Risk Assessment. Remove the valve and inspect the poppet area and remove any debris. If the poppet is damaged, replace with new. Test the valve prior to re-mounting to the vessel.
Damage to spring	Perform a Risk Assessment. Remove the valve and inspect the spring for obstruction or corrosion. If the spring is damaged, replace with new. Test the valve prior to re-mounting to the vessel.
Incorrect tank weld in flange bore	Check the bore of the weld in flange – the bore must not be smaller than 1.75" (44.5mm)

Warranty

All Fort Vale products are represented and guaranteed to be free from defect in material and workmanship at the time of despatch. Fort Vale agree to replace or repair, free-of-charge, any of its products which prove to be defective under normal and proper use, with the exclusion of non-metallic seals and/or gaskets, on claims received in writing within one year of the date of shipment. Fort Vale will not, however, be held responsible for any costs incurred in stripping or re-fitting the product from the tank, IBC, rail car or installation. Fort Vale's liability for any such defective product is limited solely and only to the replacement and/or repair as set out above and Fort Vale should not be liable for any other losses, damages or injuries of any kind or nature, consequential or otherwise.

Repair/refurbishment/resetting of Fort Vale valves may be carried out only by trained and authorised personnel. Fort Vale Engineering Limited shall not, in any circumstances, be liable for injuries, losses, expenses or damage, direct or consequential, sustained by the buyer or any person which may in any degree be attributable to the adoption, either by the buyer or any third party, of technical or other information, data or advice given on behalf of Fort Vale Engineering Limited or however otherwise caused in relation to the use of its products in accordance with Fort Vale Engineering Limited's recommendation.

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