VENT-TECH
CLEAN WATER AIR RELIEF VALVE
MODEL WTR

RECOMMENDED PURCHASE SPECIFICATION

VENT-TECH MODEL WTR, SERIES C, B, V, AND N

CLEAN WATER AIR RELEASE AND VACUUM RELIEF VALVES

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EXECUTIVE SUMMARY

The Vent-Tech Model WTR clean water valve combines thirteen years of manufacturing experience with advanced Patent Pending flow designs. The Model WTR was engineered to expand and improve the technological advances of the flat float air/vacuum valve.

APPLICATIONS

- Municipal Water Systems
- High Points
- Lift Stations
- Force Mains

FUNCTION

	Large Air Release at Start-Up	Controlled Air Release at Start-Up	Air Release Under Pressure	Full Port Vacuum Relief	Surge Control
Series-C	✓		✓	✓	✓
Series-B		✓	✓	✓	✓
Series-V	✓		✓		✓
Series-N				✓	

PURPOSE

- Minimize pumping energy
- Protect from pipeline collapse due to vacuum
- Air related surge protection
- Manage column separation
- Maximize the capacity of the pipeline

FEATURES

- Designed and manufactured for clean water applications.
- Manufactured in 304 and 316 Stainless Steel.
- Rated for pressures of 25 bar (362 psi), 40 bar (580 psi).
- Minimum sealing pressure at three (3) psi.
- Tubular design with direct acting floats.
- Pressure relief port.
- Self-flushing at pump shut-down and valve emptying.
- High efficiency screens prevent ingression of airborne debris and bugs.
- Inlets, outlets, and internal clearances have a cross-sectional area at least equal to that of the valve's nominal size.
- Valve flanges are designed to minimize energy losses at the transition to the valve body air passages.
- The anti-shock/surge floats automatically limit surge and transient pressure.
- Multi-orifice anti-shock/surge floats with evenly spaced orifices distribute pressurized air across the face of the float.
- The anti-shock/surge floats respond directly to any negative pressure by fully opening the large orifice of the valve.
- Orifices fitted with inserts protect from heat softening and abrasive wear.
- Inter-changeability of valve inlet components allows for efficient conversion between Series - C, B, V or N valve functions.
- Performance verification by independent testing facility.

PERFORMANCE

		01 WTR	02 WTR	03 WTR	04 WTR	54 WTR	56 WTR	06 WTR	08 WTR	10 WTR	12 WTR
Vacuum Relief Capacity	**(CFM)**	108	604	1,411	1,745	2,560	3,622	4,380	7,826	11,248	17,308
Minimum Sealing Pressure	**(psi)**	**5**	5	3	3	3	3	3	3	3	3

Notes: (1) The above table represents the performance of 25 bar (362psi) valves, the max flow of higher pressure rated valves may decrease slightly due to the decreased internal clearances dictated by the need to use thicker components.

RECOMMENDED PURCHASE SPECIFICATION FOR VENT-TECH MODEL WTR, SERIES C, B, V, AND N, CLEAN WATER AIR RELEASE AND VACUUM RELIEF VALVES

PART 1. GENERAL

This document specifies clean water Combination Air Valves, Biased Air Valves, Vacuum Restrictive Air Valves and Vacuum Only Air Valves for clean water service and hydraulic transient control system for all municipal water utilities.

Products furnished under this specification shall be tested for performance verification by an independent facility in accordance with the requirements set forth in this specification. Certified documentation of the independent test verification shall be part of the information submitted under this document. Submittals lacking the required documentation will be rejected.

SECT: 1.01 REFERENCES

This document contains references to the documents in **Table 1**. They are a part of this document as specified and modified. Where a referenced document contains references to other standards, those standards are included as references under this document as if referenced directly. In the event of conflict between the requirements of this document and those of the listed standards, the requirements of this document shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of product offer for sale. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in **Table 1** references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

TABLE 1: REFERENCE DOCUMENTS

Reference	Title
ASTM A240 / A240M -12	ASTM A240 / A240M - 12 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
AWWA C288-08	Stainless-Steel pipe flanges for water service – Sizes 2” to 72”
ASTM A36 / A36M - 12	Standard Specification for Carbon Structural Steel

SECT: 1.02 TYPES

Valves furnished under this specification shall be tubular in design with direct acting cylindrical hollow and solid float mechanisms. They shall be designed to perform efficiently in the standard clean water environments.

Valve designs employing float guide brackets, levers, springs and ball type floats are specifically prohibited. Valves furnished under this specification shall be fitted with provisions for connection to piping or system fittings and direct vents with threaded or flanged outlets as specified for connection to discharges for direction of exhaust flows as indicated in this specification. Valves shall be rated for internal working pressures of 25 bar (362 psi) or 40 bar (580 psi) and provide compatibility with connections to specified piping systems.

Table 3 specifies the minimum acceptable performance for venting air or relieving vacuum conditions for a given size valve under the differential pressure conditions stated. Should a proposed manufacturer's standard product for a stated size be incapable of meeting the indicated performance requirements as demonstrated by the specified independent test results, then the next larger available standard size valve shall be used.

(a) VALVE SERIES

(i) C – Series:

Series-C clean water Combination Air Valves shall be four function valves designed to exhaust large quantities of air at start-up during the filling of a pipeline system, to release accumulated air in a pipeline system while the system is operational and under pressure, to open and admit large quantities of air into the pipeline system during draining or if negative pressure occurs and to prevent the development of hydraulic transients (surge control) during start-up and pressure surges and shall operate automatically.

(ii) B – Series:

Series-B clean water Biased Air Valves shall be four function valves designed to exhaust small quantities of air at start-up during the filling of a pipeline system, to release accumulated air in a pipeline system while the system is operational and under pressure, to open and admit large quantities of air into the pipeline system during draining or if negative pressure occurs and to prevent the development of hydraulic transients (surge control) during start-up and pressure surges and shall operate automatically. When specifying Series-B valves, flow data in Table 3 is reduced by 8%.

(iii) V – Series:

Series-V clean water Vacuum-Restrictive Air Valves shall be three function valves designed to exhaust small quantities of air at start-up during the filling of a pipeline system, to release accumulated air in a pipeline system while the system is operational and under pressure, and to prevent the development of hydraulic transients (surge control) during start-up and pressure surges and shall operate automatically. Series V valves do NOT open or admit air into the pipeline system during draining or if negative pressure occurs. When specifying Series-V valves, flow data in Table 3 is reduced by 8%.

(iv) N – Series:

Series N clean water Vacuum-Only Air Valve shall be single function valves allowing full port vacuum relief during draining or if negative pressure occurs.

PART 2. CONSTRUCTION / MATERIAL

SECT: 2.01 VALVE CONSTRUCTION

(a) GENERAL

Valve construction shall be specifically designed and manufactured and designed for clean water applications. Valve bodies shall be certified not to experience leakage or deformation at not less than 1.5 times the system pressure specified. The valve inlet is stated to be the passageway through which air will flow from atmosphere into the valve (top) when the valve is functioning in its vacuum relief state. The valve outlet is stated to be the passageway through which air will flow from valve into the pipeline (bottom) when the valve is functioning in its vacuum relief state. The valve size (e.g.: 2-inch) shall be the nominal size of the valve outlet connection fitting. The valve inlet, outlet, and internal clearance shall each have a cross-sectional area greater than or equal to the cross-sectional area of the valve's nominal size. The valve shall have a built in anti-surge device with relief openings that are between $1/30^{th}$ and $1/40^{th}$ the cross sectional area of the nominal valve size, designed to automatically limit the surge and transient pressure.

(b) BODY

The valve body shall be a tubular body internally constructed to provide an unobstructed circular space between the UHMW floats and inner valve body wall. Valves shall include a pressure release port and the port shall be of the same material as the valve body.

(c) AIR INLET/OUTLET FITTING

(i) Flanges

Flanges for valves with working pressures of 10 bar and not exceeding 16 bar (232 psi)

Studded stainless steel connection flanges shall comply with the minimum thickness requirements of 'Class SD ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service.'

Threaded valves shall have Schedule 40 NPT connections on flanges that comply with the minimum thickness requirements of 'Class SD ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service.' Similarly, body and top-flanges shall comply with the minimum thickness requirements of 'Class SD ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service.' where applicable.

Flanges for valves with working pressures of 16 bar and thru 25 bar (363 psi)

Studded stainless steel connection flanges shall comply with the minimum thickness requirements of 'Class SF ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service.'

Threaded valves shall have Schedule 80 NPT connections on flanges that comply with the minimum thickness requirements 'Class SF ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service.' Similarly, body and top-flanges shall comply with the minimum thickness requirements of 'Class SF ANSI/AWWA C228-08 Stainless Steel Pipe Flanges for Water Service' where applicable.

(ii) Inlet (Upper)

The air inlet (upper) opening shall have a cross sectional area greater or equal to the valve size and shall be screened with a high efficiency punched screen to prevent ingression of airborne debris and bugs. This screen shall be removable to allow external piping for direction of flow. The connection from the air inlet cap chamber to the valve body shall be a smooth toroidal transition to facilitate movement from the cap to the body with minimal energy losses by gradual acceleration to the connection with the valve body air passages. The valve shall be designed to form an airtight seal at an internal pressure of three (3) psi.

(iii) Outlet (Lower - Pipe Connection)

The valve's outlet fitting at the connection to the piping shall be formed to provide a smooth toroidal transition from the valve body to the valve outlet to facilitate movement from the valve body with minimal energy losses by gradual acceleration to the connection of the recommended isolation valve or pipeline connection.

(d) ANTI-SHOCK/SURGE FLOATS

The anti-shock/surge float shall be standard on all Series-C and Series-V valves and shall have not less than four (4) tubular orifices to evenly distribute pressurized air across the face of the float. The tubular orifices shall have protective inserts to protect the orifices from heat softening and abrasive wear. Specifically, the valve shall incorporate apparatus that shall increase the durability of flow restricting orifices within the valve floats such that transient high pressure conditions that can cause rapid adiabatic heating of the discharging gases are prevented from causing flow erosion and wear from debris induced by the high velocities and thermal softening of the valve components. The protective inserts shall be more conductive than the valve component to better distribute the heat. The anti-shock/surge float shall be designed to respond directly to any negative pressure created by sudden pump stoppage or column separation by fully opening the large orifice of the valve.

Series-B valves shall incorporate an anti-shock/surge float and it shall be biased in the seated and sealed position via a bias rod and spring assembly. Spring tension shall be sufficient to support the anti-shock/surge float seated and sealed against the top flange while automatically permitting the valve inlet to open and

expose the valve body and serviced pipeline to the full cross sectional area of the valve inlet in response to any negative pressure created by sudden pump stoppage or column separation.

Series – N valves (No air-out valves) shall be constructed identically to Series-B valves except Series-N valves shall have zero (0) tubular orifices, shall not have control or nozzle floats and shall limit valve function to vacuum relief only.

(e) NOZZLE FLOAT

The nozzle float shall be smooth and flat across its surface. The nozzle float shall contain internal threads to accept the external threads of the small nozzle. The combination of the nozzle float and the control float shall constitute the control float assembly. An air-tight seal shall be maintained throughout the mating thread length of the nozzle and the nozzle float. The nozzle float shall be constructed such that relative wobble between the control float and the nozzle float is limited to 20^{o}.

(f) CONTROL FLOAT

The lower control float shall be tubular in construction and open ended or solid. It shall be fitted with a nozzle and nozzle seat centering guide. The nozzle face shall be constructed so that repeated seating does not damage the rubber seat. Discharge of pressurized air/gas shall be accomplished by the seating and unseating of the small nozzle on the rubber seat. The lower control float shall be dimensioned and streamlined relative to the valve body to achieve the necessary physical characteristics of buoyancy and lift to create a seal between the nozzle float and anti-surge float and between itself and the nozzle float. The lower control float shall have sufficient weight to drop away from the nozzle float as air accumulates in the valve chamber at the valve's full rated pressure.

(g) MECHANICAL INTERCHANGEABILITY

Series C-B-V-N valve bodies and sealing flanges shall be constructed to allow for all functions described in section 1.02 to be interchangeable without a valve or valve body replacement. The valve series functions shall be accomplished by means of replacing the upper flange assembly and/or the internal float configuration.

SECT: 2.02 MATERIAL

Materials specified are considered the minimum acceptable for the purpose of durability, strength, and resistance to erosion and corrosion. International Valve may offer alternative materials for the purpose of providing greater strength, for meeting required stress limitations or customer specified performance characteristics. However alternate materials shall provide at least the same qualities as those specified for the purpose. Standard materials of construction are listed in **Table 2**.

TABLE 2: MATERIALS

Component	Material	
	(Standard)	(Upgrade)
Body and Flanges – All Stainless	ASTM A240 304 SS	ASTM A240 316 SS
Body and Flanges – Epoxy Coated	ASTM A36 / A36M - 12	
Hardware	ASTM A240 304 SS	ASTM A240 316 SS
Trim and Venting Orifices	ASTM A240 304 SS	ASTM A240 316 SS
Primary and Secondary Floats	HDPE / UHMW-PE	

PART 3. QUALITY ASSURANCE

SECT: 3.01 PERFORMANCE CONFIRMATION

The Contractor shall cause the manufacturer of the valves to provide certified performance information documenting the performance curve for the air release/vacuum relief rates for each size valve to be furnished under this contract. The performance curves shall be the product of an independent testing facility located in the U.S.A. and current to within two-years from the date of the submittal, specific to the construction details to the model proposed, and confirming performance not less than that required by this specification. In lieu of actual physical testing, the test methodology may use Computational Fluid Dynamics (CFD) mathematical modeling techniques (using a minimum mesh fidelity of 6 million computational cells, and at least one level of in-situ mesh refinement), to affirm specific model size performance.

Software employed for the mathematical model shall be commercially available and shall be developed specifically for applications similar to the fluid flows encountered in the products to be furnished under this specification, i.e., compressible fluid flow at ambient temperatures under pressure ranges to be encountered in the proposed application. The performance confirmation report shall be dated, signed by the author responsible for the test information and notarized as true and correct.

SECT: 3.02 ACCEPTABLE PRODUCTS

Valves known to be capable of meeting the requirements of this specification include Vent-Tech Series WTR, as furnished by International Valve Marketing. Equal products, as determined by the restrictions set forth in the following paragraphs, will be accepted so long as the requirements set forth in this specification are met in all respects and the required documentation has been provided.

Alternative manufacturers' products will be considered, provided the following information has been submitted and accepted as proof the proposed substitution provides equal or improved performance over that of the specified product and materials. Any submittal requesting substitution shall include the information specified under Part 3: Quality Assurance and the following:

1) Detailed construction and functional description of operation with bill of materials and detailed graphics showing construction features and step-by step operation demonstrating compliance with the features and operational characteristics specified in this specification.
2) Performance results shall be verified through third-party physical testing or computational fluid dynamics (CFD) and the performance results shall be:
    a) Produced by an independent testing facility located in the United States.
    b) Dated and signed by the author responsible for the test information.
    c) Notarized as true and correct.
    d) Current to within two years from the date of offer for sale.
    e) Specific to the construction details for the model, series and size offered.

SECT: 3.03 SUBMITTALS

The following information shall be available and provided upon customer request:

1) A copy of the customer specification with each paragraph check marked (✓) to indicate compliance or marked (X) to indicate requested deviations to the customer specification. Deviations to the customer specification shall be detailed and include a justification for each deviation.
2) Catalog information shall be furnished for each size valve.
3) Air venting and vacuum venting curves for each size valve to be provided. Performance curves shall be certified and notarized correct by an independent testing facility. Refer to Table 3 for minimum requirements.
4) Operation and Maintenance Manual
5) Quality control inspection and test reports verifying the results of the following:

a) Hydrostatic leakage test at ½, 1, and 1 ½, times the valves rated pressure. Each test pressure level shall be held for not less than 5 minutes. Valves showing signs of leakage or weeping shall be rejected.

b) Low head leakage test at 3 psi. The valve shall be rejected if the valve shows any leakage after 2 minutes.

c) Pressurized air release test at the valves rated pressure ("Drop Test"). The valve shall be filled with water and pressurized within 10% of the valve rated pressure.. Gas shall be introduced into the valve from a source pressurized above the test pressure. The pressure shall be slowly reduced to working pressure and maintained using a pressure relief valve. While maintaining a test within 10% of the valves working pressure, gas shall continue to be introduced into the valve displacing the water until the control float loses buoyancy, "drops," and un-seats the small nozzle orifice from the nozzle seat and releases pressurized air. Valves which fail to release air at full pressure rating shall be rejected.