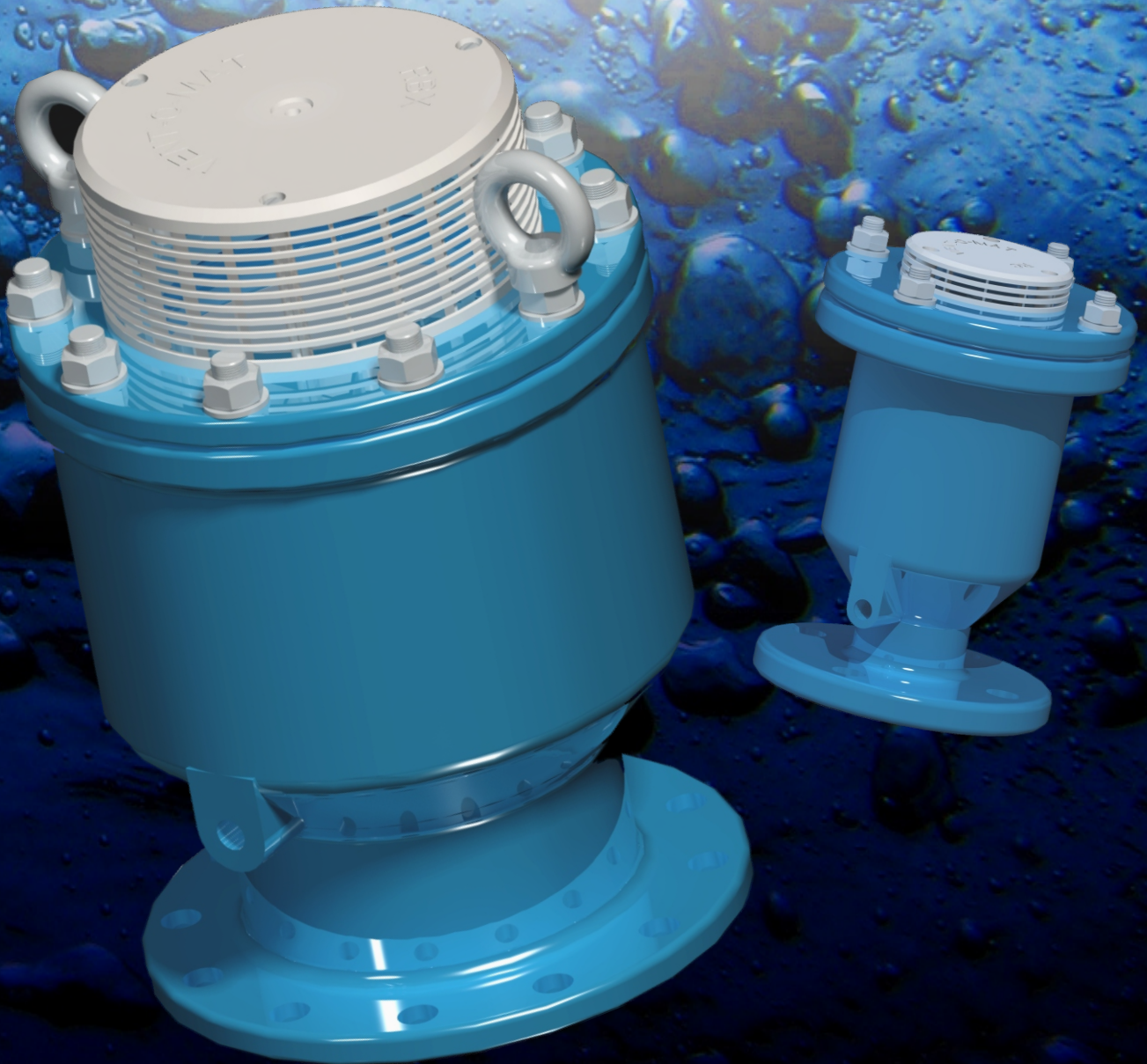


VENT-O-MAT[®]

SERIES RBXc

“ANTI-SHOCK” AIR RELEASE AND VACUUM BREAK VALVES

**FOR EFFECTIVE AIR RELEASE VACUUM PROTECTION AND
SURGE ALLEVIATION**



VENT-O-MAT®

AIR RELEASE & VACUUM BREAK VALVES RBXc “ANTI - SHOCK”

The Unique defence against pipe bursts and pipeline system damage!

Vent-O-Mat Series RBXc has evolved from a long lineage of research and development into a product that has proven unsurpassed for air release, vacuum protection, surge alleviation and pipeline flow enhancement.

The basis of the Vent-O-Mat design is in the understanding of the physical laws that govern air valve and pipeline operation. Reaction to pipeline dynamics is therefore instantaneous and protection provided is relevant to the pipeline's needs.

Vent-O-Mat Series RBXc truly represents the pinnacle of valve design evolution. This valve design provides the most comprehensive, effective and efficient pipeline protection relative to initial cost of any other available pipeline component. This can easily be gauged from the below:

Automatic Surge Protection

The unique Series RBXc valve incorporates as standard, three design features to automatically protect a pipeline, under all pipeline operating conditions, from the destructive surge and water hammer phenomena. These features are independent of any mechanical devices ensuring reaction in a very low millisecond time span.

Effective Air Release

The RBXc design ensures effective de-aeration under all pipeline flow and operating conditions, via either one of three discharge orifices.

Vacuum Protection

The RBXc series large orifice diameters equal the nominal size of the valve. This ensures the least possible resistance to the intake of air and consequently the least possible negative pressure within a draining pipeline. The use of solid, cylindrical floats ensures instantaneous reaction, discourages the "Venturi" phenomenon and is a further guarantee of effective vacuum protection.

Guaranteed Performance

The RBXc has been designed and developed to provide the optimum usable and safe performance relative to all functions. Selection data has been substantiated through third party testing and can therefore be confidently referenced.

The surge protection function of the RBXc design has been incorporated in the well-known **SURGE 2000** surge analysis software programme and can be analysed with great accuracy in other commercially available surge analysis programmes such as FLOWMASTER and TRANSAM.

Unparalleled Service

Vent-O-Mat is committed to customer service and to the selling of solutions. Our highly dedicated team is available at all times to assist with air valve sizing and positioning. Assistance is also provided in finding the most cost effective and/or efficient surge protection strategy relevant to the pipeline's needs.

International Representation

Vent-O-Mat is represented in the following countries and regions:

* USA
* Canada
* Carribean

* Thailand
* Germany
* Kenya

* South Africa
* Zimbabwe
* Tanzania

* Namibia
* Hong Kong
* Taiwan

* Kuwait
* Brazil
* France

Contents

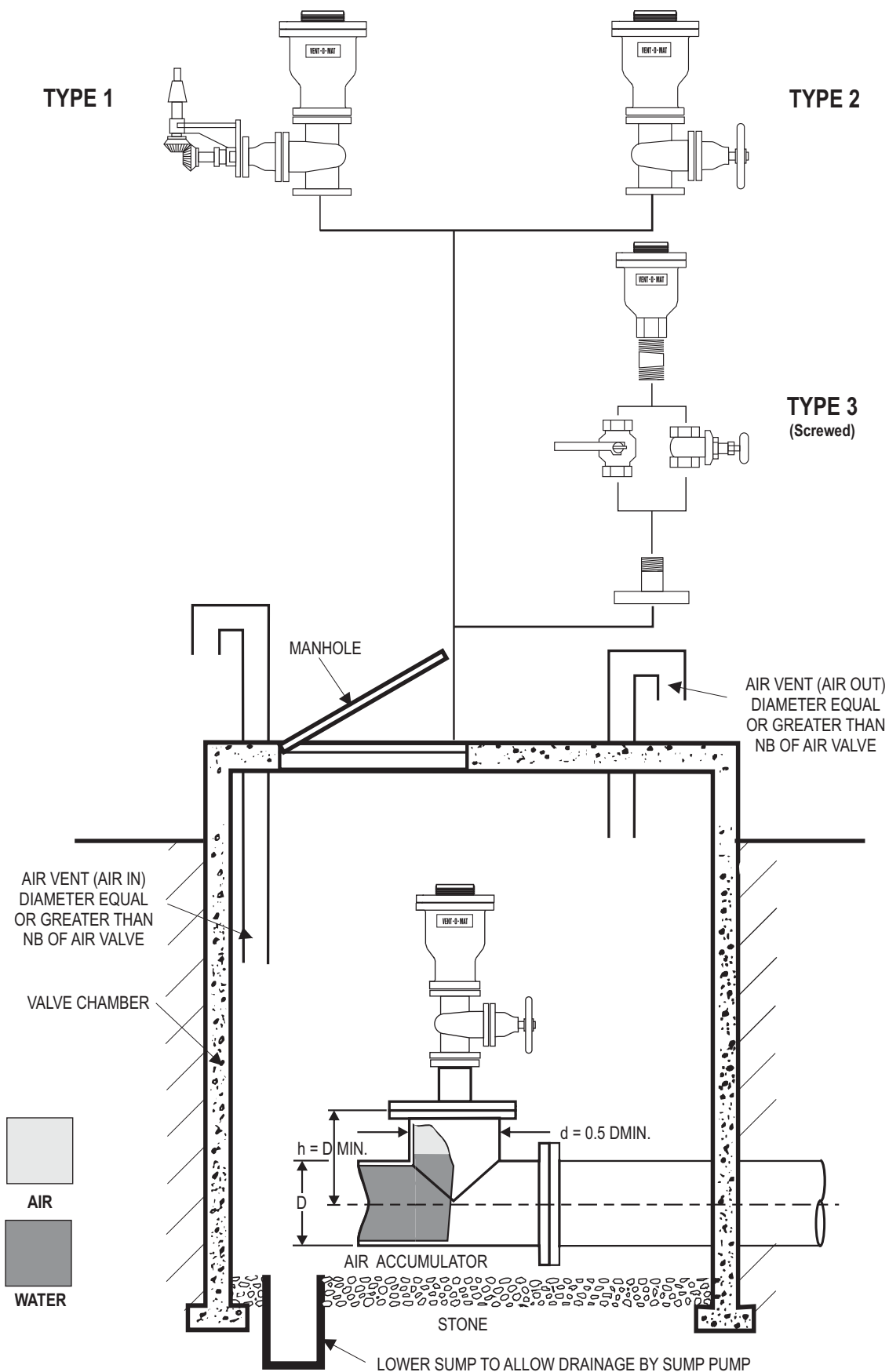
● Introduction	Page 1
● Recommended Installation Arrangements	Page 2
● Operation	Page 3
● Available Discharge Connections	Page 4
● Component Description & Material Specifications DN25 (1") & DN50 (2") - Screwed	Page 5
● Component Description & Material Specifications DN25 (1") & DN300 (12") - Flanged	Page 6
● General Specifications DN25 (1") & DN50 (2") - Screwed	Page 7
● General Specifications DN25 (1") & DN300 (12") - Flanged	Page 8
● Small Orifice Discharge Performance	Page 9
● Selection & Positioning - Series RBXc	Page 10-12
● Surge & Waterhammer Protection	Page 13-14
● Purchase Specifications	Page 15
● Ordering Guide & Test Specification	Page 16

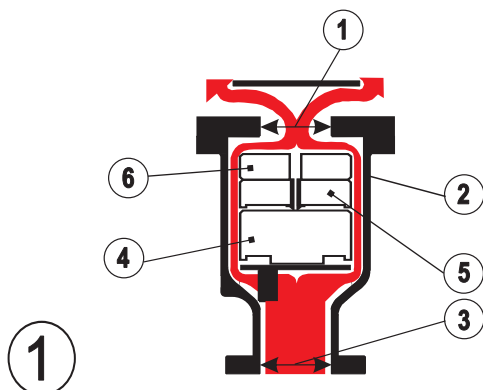
Introduction

- **"ANTI - SHOCK" - "ANTI - SURGE"** - The RBXc is the only air release valve available that is supplied as standard with a mechanism which operates automatically to prevent pipeline damage from the high induced pressure transients associated with high velocity air discharge. Surge resulting from liquid column separation and liquid oscillation is dramatically reduced as an automatic function of this mechanism.
- **PERFORMANCE** - The RBXc has been designed and developed to provide the optimum usable and safe performance relative to all functions. Selection data has been substantiated through CSIR* and other testing and can therefore, be confidently referenced.
- **QUALITY** - The RBXc economically offers the highest quality construction and materials available in an air release and vacuum break valve. Stringent manufacturing and test procedures are maintained to ensure the best possible service and reliability is given by every valve produced.
- **SERVICEABILITY** - The RBXc design facilitates extreme ease of service and maintenance. Components are in corrosion free materials to allow problem free disassembly and reassembly even after many years of operation. All maintenance spares are replaceable without special tools or skills.
- **VACUUM BREAK** - The RBXc series offers large orifice diameters equal the nominal size of the valve, i.e., a 200mm (8") valve has a 200mm (8") orifice. This ensures the least possible resistance to the intake of air and consequently the least possible negative pressure within a draining pipeline.
- **COMPACTNESS** - Although extremely robust the RBXc valve's lightweight and compact construction offers handling transport and installation advantages.
- **BACK UP** - Vent -O- Mat provides highly committed customer orientated sales, service, spares and technical back up - TRY US!!!

* Council for Scientific and Industrial Research

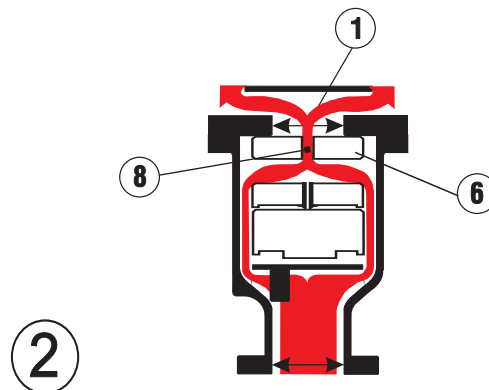
RECOMMENDED INSTALLATION ARRANGEMENTS





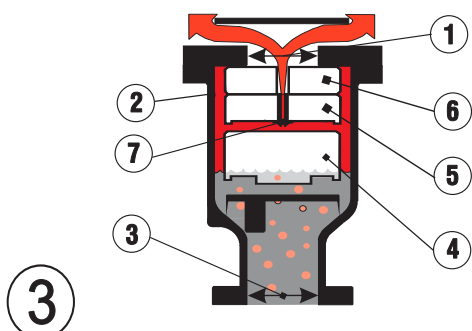
VENTING OF A FILLING PIPELINE (SUB CRITICAL WATER APPROACH VELOCITY)

Air enters Orifice (3), travels through the annular space between the cylindrical floats (4), (5), and (6) and the valve Chamber B Barrel (2) and discharges from the Large Orifice (1) into atmosphere.



VENTING OF A FILLING PIPELINE (EXCESSIVE WATER APPROACH VELOCITY)

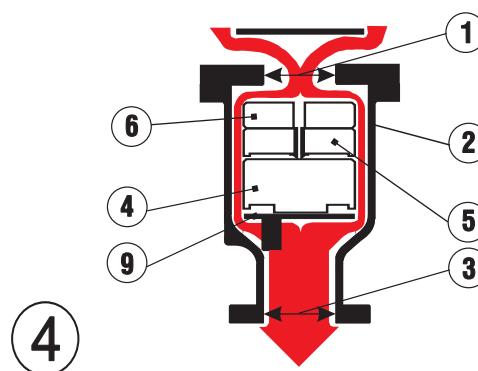
In reaction to increased air flow, Float (6) closes Large Orifice (1) and air is forced through the Anti Shock Orifice (8) resulting in deceleration of the approaching water due to the resistance of rising air pressure in the valve.



PRESSURISED AIR RELEASE FROM A FULL PIPELINE

Subsequent to the filling of a pipeline, liquid enters the valve Barrel Chamber (2) and the Floats (4), (5) and (6) are buoyed so that the Large Orifice (1) is closed by Float (6). The valve will then become internally pressurised. A minimal working pressure of < 0.5 bar (7.3 psi) acting on the relatively large area of the Orifice (1) will lock Float (6) into the closed position across the Large Orifice (1).

Disentrained air rises through the liquid and accumulates in the valve chamber. When the volume of air is sufficient to displace the liquid, Float (4) will no longer be buoyant and will gravitate downwards thereby opening the Small Orifice (7) and allowing accumulated air to be discharged into atmosphere. As air is discharged the liquid raises the Float (4) and re-seals the Small Orifice (7) and prevents the escape of liquid.

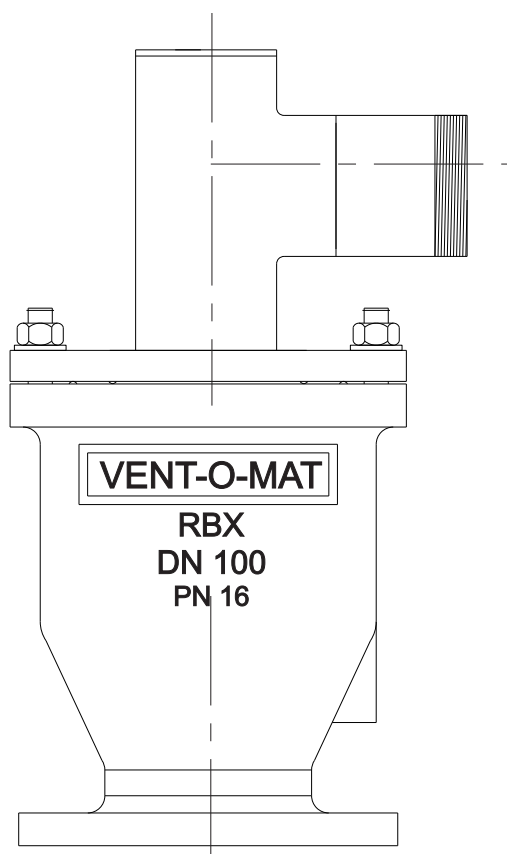


VACUUM RELIEF (AIR INTAKE) OF A DRAINING PIPELINE

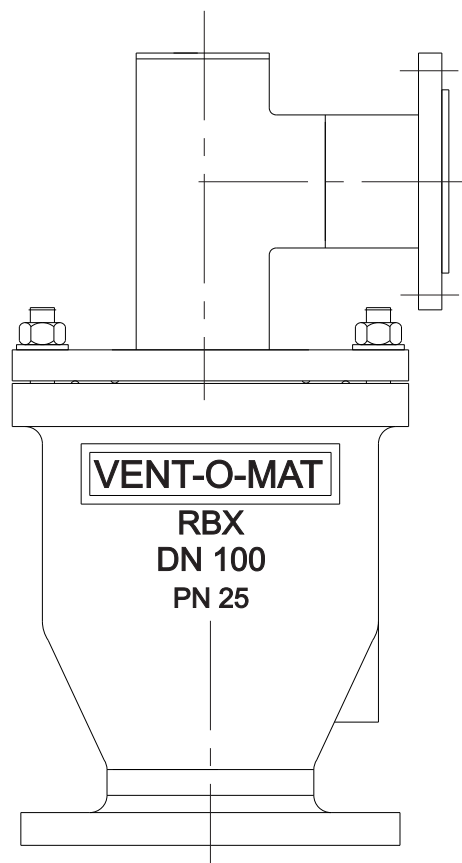
Simultaneous drainage of liquid from Valve Chamber (2) causes Floats (4), (5) and (6) to gravitate downwards into the Baffle Plate (9), thereby allowing atmospheric air through the valve to rapidly displace draining liquid in the pipeline and prevent potentially damaging internal negative pressure.

AVAILABLE DISCHARGE CONNECTIONS DN25 (1") to DN300 (12")

Screwed NPT / BSP
Discharge
25mm to 100mm



Swivel Discharge
25mm to 300mm



*NOTE
Discharge Connections Are Equal to Valve Pressure Rating

COMPONENT DESCRIPTION & MATERIAL SPECIFICATION DN25 & DN50 - SCREWED

Type:

Series RBXc - Double Orifice (Small & Large Orifice)
with Anti Shock Orifice Mechanism

End Connection:

Screwed BSP Female BS21 (ISO R7)
Screwed NPT Female ASME B1.20.1

Nominal Sizes:

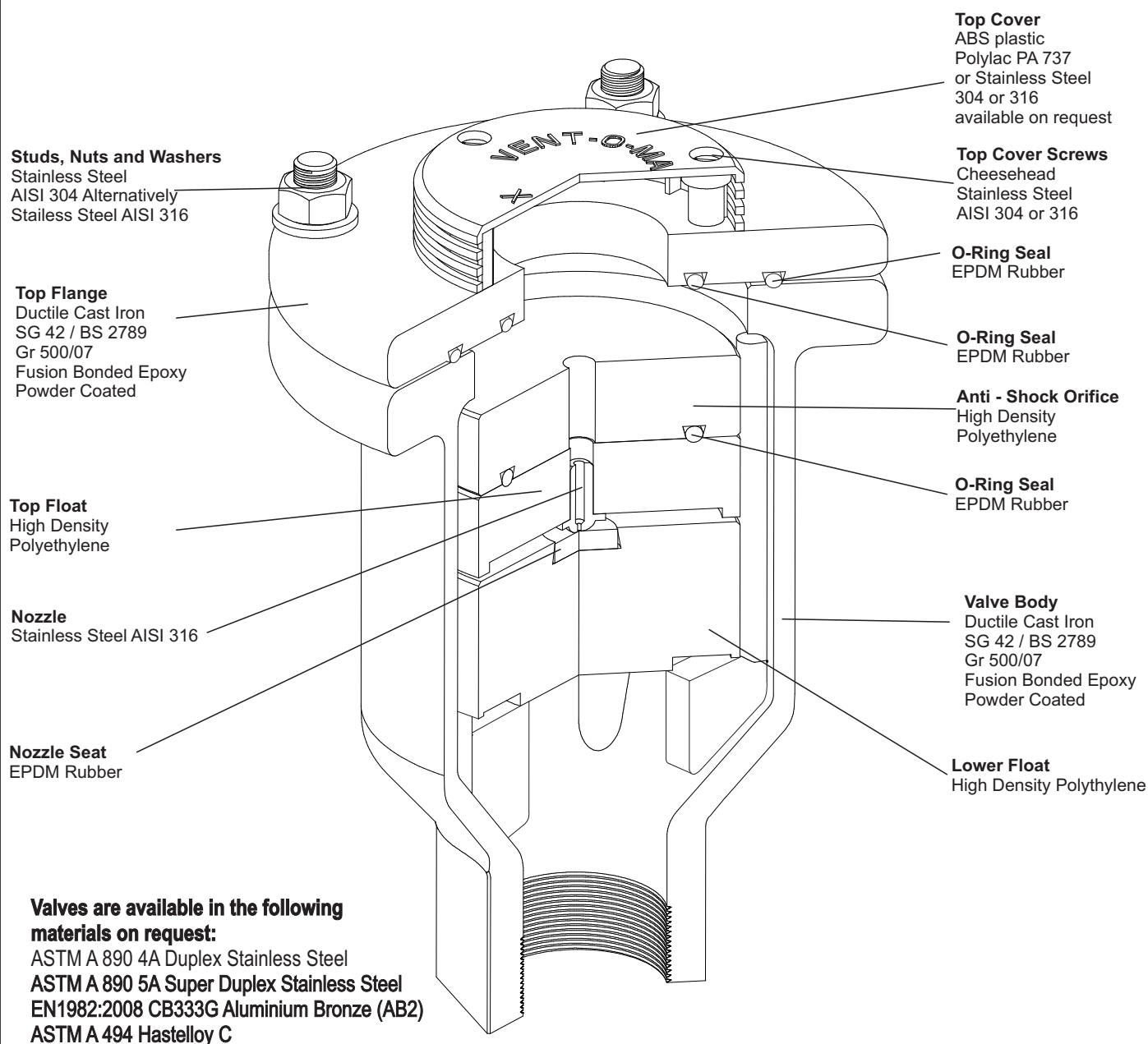
DN 25 (1")
DN 50 (2")

Model No's:

RBXc 1611 & 1621 _____
RBXc 2511 & 2521 _____

Pressure Ratings:

PN 16 (232 PSI)
PN 25 (363 PSI)



COMPONENT DESCRIPTION & MATERIAL SPECIFICATION DN25 (1") to DN300 (12") - FLANGED

Type:

Series RBXc - Double Orifice (Small & Large Orifice)
with Anti Shock Orifice Mechanism

End Connection:

Flanged

Nominal Sizes:

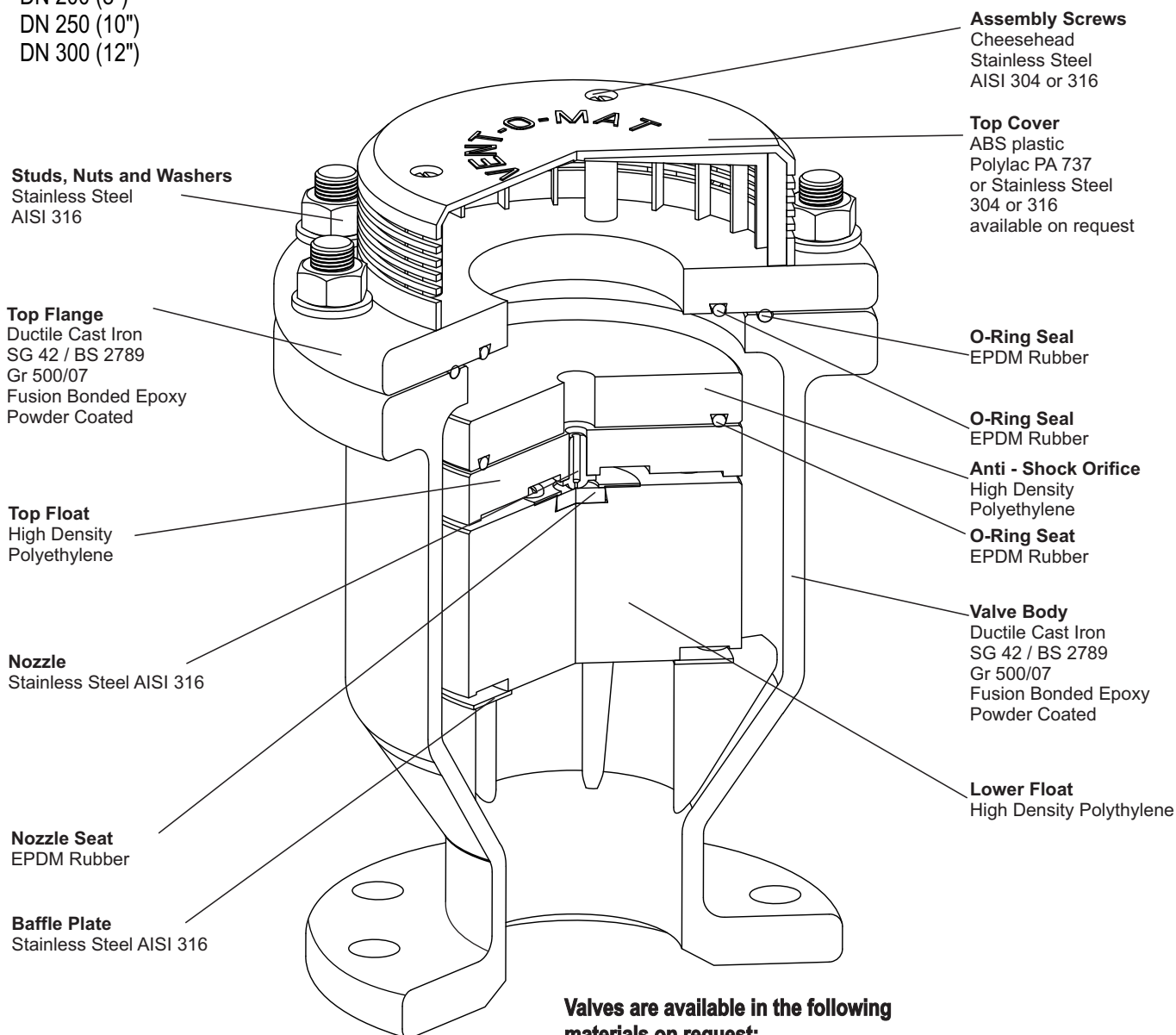
DN 25 (1")
DN 50 (2")
DN 80 (3")
DN 100 (4")
DN 150 (6")
DN 200 (8")
DN 250 (10")
DN 300 (12")

Model No's:

RBXc 1631, 1641 & 1661
RBXc 2531 & 2551

Pressure Ratings:

PN16 (232 PSI)
PN25 (363 PSI)



**Valves are available in the following
materials on request:**

ASTM A 890 4A Duplex Stainless Steel
ASTM A 890 5A Super Duplex Stainless Steel
EN1982:2008 CB333G Aluminium Bronze (AB2)
ASTM A 494 Hastelloy C

GENERAL SPECIFICATIONS

DN25 (1") & DN50 (2") - SCREWED

Type:

Double Orifice (Small & Large Orifice) with Anti Shock Orifice mechanism.

End Connection:

Screwed BSP/ NPT female

Nominal Sizes:

DN25 (1") & DN50 (2")

Model No's:

RBXc 1611 & 1621 _____ 16 bar (232 psi)
RBXc 2511 & 2521 _____ 25 bar (363 psi)

Pressure Ratings bar (psi):

Operating Pressure Range - bar (psi):

	Min	Max.
16 bar (232 psi)	0.5 (7.2)	16 (232)
25 bar (363 psi)	0.5 (7.2)	25 (363)

Operating Temperature Range:

0 °C (35 °F) to 85 °C (185 °F)

Acceptable Media:

Potable or strained raw water.

Function:

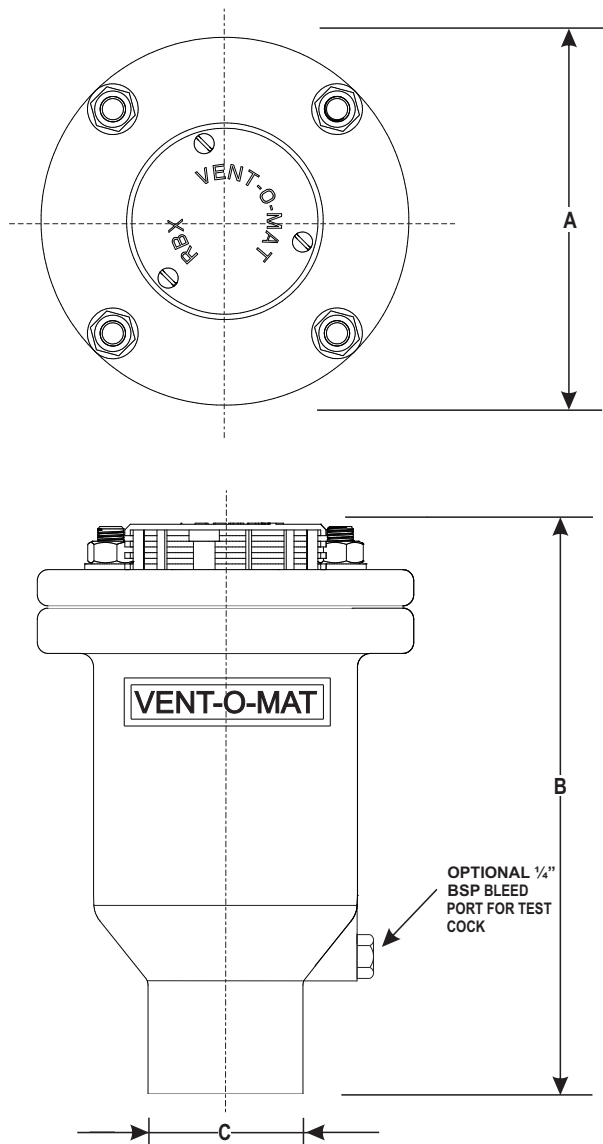
- i) High volume air discharge - pipeline filling.
- ii) High volume air intake - pipeline draining
- iii) Pressurized air discharge - pipeline filled.
- iv) Surge dampening - high velocity air discharge, water column separation & liquid oscillation.

Materials of Construction: - see page 4

Installation: - see page 3

Standard Factory Tests:

- i) Hydrostatic - 1.5 x max. rated working pressure
- ii) Low head leak - 0.5 bar (7.2 psi)
- iii) Small orifice function at max. rated working pressure (minimum 1 valve in 10).



OVERALL DIMENSIONS & WEIGHTS

DN	MODEL No.		A		B		C	WEIGHT	
	mm	in.	mm	in.	mm	in.		kg.	lbs.
025	1"	025RBXc 1611/21 & 2511/21	154	6.06	235	9.25	1" BSP/ 1" NPT	10	22
050	2"	050RBXc 1611/21 & 2511/21	174	6.85	249	9.79	2" BSP/ 2" NPT	13	29

GENERAL SPECIFICATIONS DN25 (1") TO DN300 (12") - FLANGED

Type:

Double Orifice (Small & Large Orifice) with Anti Shock Orifice mechanism.

End Connection:

Flanged - ASME B16.5 Class 150
- AS 4087 ; BS EN 1092

Nominal Sizes:

DN25 (1") to DN300 (12")

Model No's:

RBXc 1631 & 1641

RBXc 2531 & 2551

Pressure Ratings bar (psi):

PN 16 (232 psi)

PN 25 (363 psi)

Operating Pressure Range - bar (PSI):

	Min	Max.
16 bar (232 psi)	0.5 (7.2)	16 (232)
25 bar (363 psi)	0.5 (7.2)	25 (363)

Operating Temperature Range:

0 °C (35 °F) to 85 °C (185 °F)

Acceptable Media:

Potable or strained raw water.

Function:

- High volume air discharge - pipeline filling.
- High volume air intake - pipeline draining
- Pressurized air discharge - pipeline filled.
- Surge dampening - high velocity air discharge, water column separation & liquid oscillation.

Materials of Construction: - see page 6

Installation: - see page 3

Standard Factory Tests:

- Hydrostatic - 1.5 x max. rated working pressure
- Low head leak - 0.5 bar
- Small orifice function at max. rated working pressure (min. 1 valve in 10).

OVERALL DIMENSIONS & WEIGHTS

DN mm in.	MODEL No.	A		B		WEIGHT CAST	
		mm	in.	mm	in.	kg.	lbs.
025 1"	025RBXc1641	154	6.06	249	9.79	11	24
025 1"	025RBXc2551	154	6.06	252	9.92	13	29
050 2"	050RBXc1641	174	6.85	253	9.96	16	35
050 2"	050RBXc2551	174	6.85	265	10.09	18	40
080 3"	080RBXc1641	225	8.86	331	13.02	24	53
080 3"	080RBXc2551	225	8.86	336	13.23	29	64
100 4"	100RBXc1641	230	9.06	341	13.43	30	66
100 4"	100RBXc2551	230	9.06	349	13.74	33	73
150 6"	150RBXc1641	340	13.39	469	18.46	62	137
150 6"	150RBXc2551	340	13.39	480	18.90	68	150
200 8"	200RBXc1641	355	13.98	523	20.58	72	159
200 8"	200RBXc2551	355	13.98	535	21.06	80	176
250 10"	250RBXc1641	550	21.65	559	22.01	146	322
250 10"	250RBXc2551	550	21.65	565	22.24	156	344
300 12"	300RBXc1641	646	25.43	715	28.13	250	550
300 12"	300RBXc2551	646	25.43	723	28.46	267	588

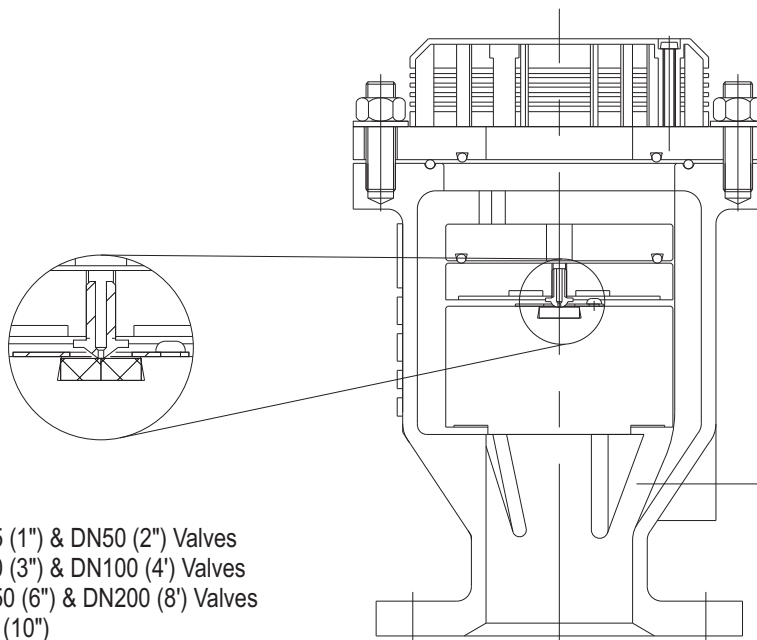
SMALL ORIFICE DISCHARGE PERFORMANCE

Type:

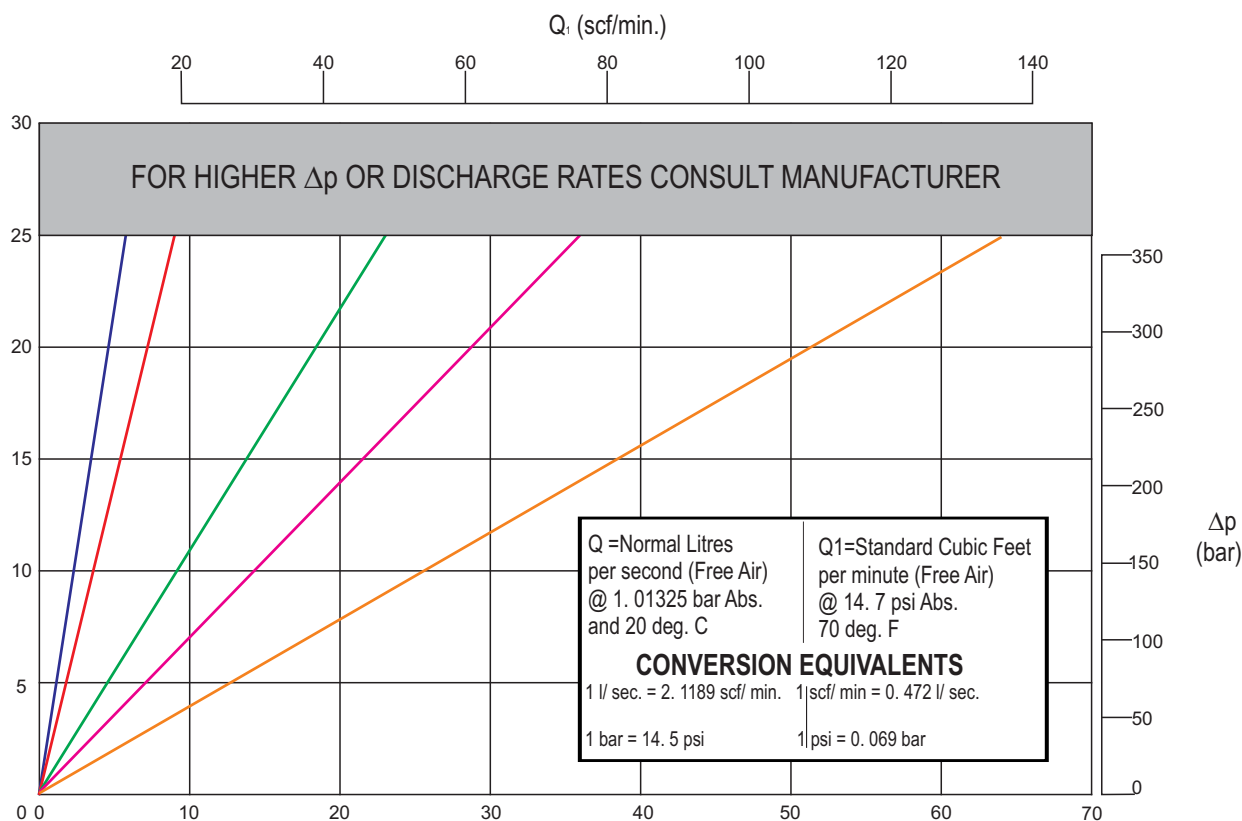
Series RBXc - Double Orifice (Small & Large Orifice)
with 'Anti Shock Orifice' Mechanism

Model No's:

RBXc 1631/1641
RBXc 2531/2551



- \varnothing 1.2 mm (\varnothing 0.047") small orifice - DN25 (1") & DN50 (2") Valves
- \varnothing 1.5 mm (\varnothing 0.059") small orifice - DN80 (3") & DN100 (4") Valves
- \varnothing 2.4 mm (\varnothing 0.094") small orifice - DN150 (6") & DN200 (8") Valves
- \varnothing 3 mm (\varnothing 0.125") small orifice - DN250 (10")
- \varnothing 4 mm (\varnothing 0.157") small orifice - DN300 (12")



SELECTION & POSITIONING

VALVE SELECTION FROM GRAPH

All the relevant information has been condensed into one graph to enable valve selection to be simple and easy and at the same time to allow flexibility to the designer to move within certain parameters which eventually allows the most suited and economically viable valve to be selected.

IMPORTANT NOTE: The graph is based on vacuum breaking and limiting vacuum to 0.34 bar (5 psi) below atmospheric. It is not good practice to go below 0.69 bar (10 psi) absolute (0.303bar (4.4 psi) differential in pipeline at sea level). The graph allows for change in altitude and hence change in atmospheric pressure and is based on the assumption that more than one valve per section is used for vacuum protection and venting

ACTUAL SELECTION (GRAVITY OR PUMPED PIPELINES)

Selection is based on the premise that pipelines are generally filled at a slower rate than they are drained, scoured or at which separation occurs (a maximum fill/ drain ratio of 1:1).

1. Determine the maximum drainage rate in m/s either for scouring, pipe rupture or column separation for a particular pipeline section.
2. Move vertically on the graph from the m/s point and move horizontally from the pipe size finding the intersecting point.
3. This point should fall within the operating band of a particular valve size. Consideration must be given to the fact that the upper portion of the band approaches -0.34 bar (5 psi) and the lower portion -0.1 bar (1.45 psi) for each valve size, this allows the designer to see at a glance if the valve is too close to its operating limits and to select the next valve size.

EXAMPLE OF VALVE SIZING (ASSUMING AN INDIVIDUAL SECTION)

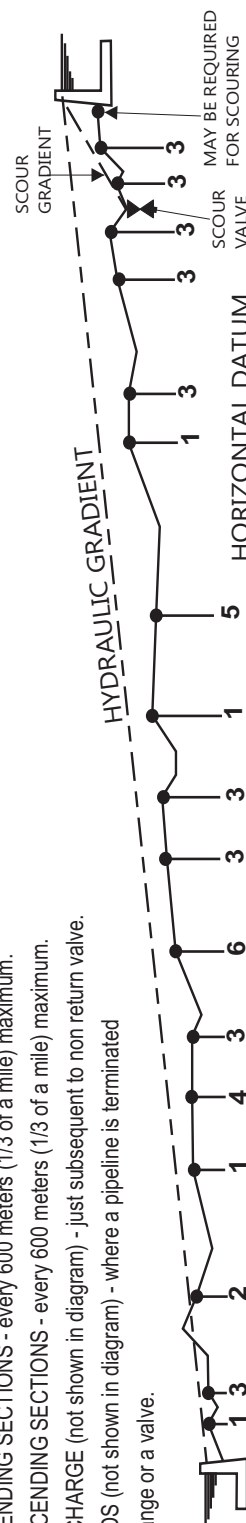
A ϕ 400mm (16") pipeline draining at 377l/sec which equates to 3m/sec (10ft/s) what valve size should be selected?

From the 3m/sec (10ft/s) point, move vertically until the ϕ 400mm (16") pipe size horizontal line is intersected. This places the intersection point squarely in the centre of the operating band of a DN80 (3") Vent -O- Mat RBXc valve. But, if for example, the drainage rate is 503l/sec which equates to 4m/sec (13.2ft/s), the valve would be operating on its limit and it may be prudent to change to a DN100 (4") Vent -O- Mat RBXc.

VALVE POSITIONING

1. ON APEX POINTS (relative to hydraulic gradient).
2. 5 METERS (16 FEET) BELOW APEX POINTS FORMED BY INTERSECTION OF PIPELINE AND HYDRAULIC GRADIENT - i.e. where pipeline siphoning over gradient a air release valve positioned on the apex would break the siphon. If positioning on apex is required a modified VENT-O- MAT Series RBXc can be supplied.

3. NEGATIVE BREAKS (increase in downward slope or decrease in upward slope).
4. LONG HORIZONTAL SECTIONS - every 600 meters (1/3 of a mile) maximum.
5. LONG ASCENDING SECTIONS - every 600 meters (1/3 of a mile) maximum.
6. LONG DESCENDING SECTIONS - every 600 meters (1/3 of a mile) maximum.
7. PUMP DISCHARGE (not shown in diagram) - just subsequent to non return valve.
8. BLANK ENDS (not shown in diagram) - where a pipeline is terminated by a blind flange or a valve.



SELECTION & POSITIONING

PRE-NOTES

The functional limits of an air valve are governed by three physical laws namely: Joukowski's Equation Boyle's Law and Pascal's Law. Air valve operation however is also dependent on design and internal configuration, and can vary dramatically from manufacturer's product to manufacturer's product, within the parameters of what is physically possible. The basis of the Vent -O- Mat design is in the understanding of these laws, which have been used to design an air release and vacuum break valve that provides the optimum usable safe performance relative to all functions. The following summary is a general guideline of factors to consider when sizing air valves.

Sizing for Vacuum

Calculate necessary valve orifice sizes independently for each apex point.

Determine the smallest air release and vacuum break valve capable of admitting air into the pipeline equal to the potential water flow out of the pipeline whilst not exceeding a differential pressure that would put the pipeline and gasket joints at risk. We recommend 0.35 bar (5psi) Dp for steel pipe or lower if GRP, uPVC or HDPE pipe is being utilised. This exercise is simplified on pages 9 and 10 of this catalogue. **Be cautious of air valve designs with spherical floats as a low pressure zone is created above the float which causes it to partially close off the large orifice during air intake.**

Note that vacuum protection is dependent on valve size selection and orifice size relative to the nominal size of the valve. In sizing air valves be cautious of designs with restricted orifice diameters, i.e., orifice diameters that are smaller than the nominal size of the valve, as this could lead to insufficient vacuum protection and pipe collapse if not accommodated for. Vent -O- Mat large orifice diameters and flow path through the valve is equal to the nominal size of the valve e.g. a DN100 (4") valve has a 100mm (4") orifice. This ensures the least possible resistance to the intake of air and consequently the least possible negative pressure within a draining pipeline.

Sizing for Discharge

If a Vent -O- Mat air valve is sized correctly for air intake, discharge should not be a factor in sizing as all air will be discharged through the large orifice or "Anti-Shock" orifice (refer to RBXc operation on pages 1 and 2 of this catalogue). If this information is used for the sizing of air valves other than Vent-O-Mat recommend that valve be selected that is capable of discharging air equal to the filling rate, whilst not exceeding a differential of 0.05 bar (0.7) psi across the large orifice in order to prevent pressure surge and water hammer.

Pressurized Air Discharge

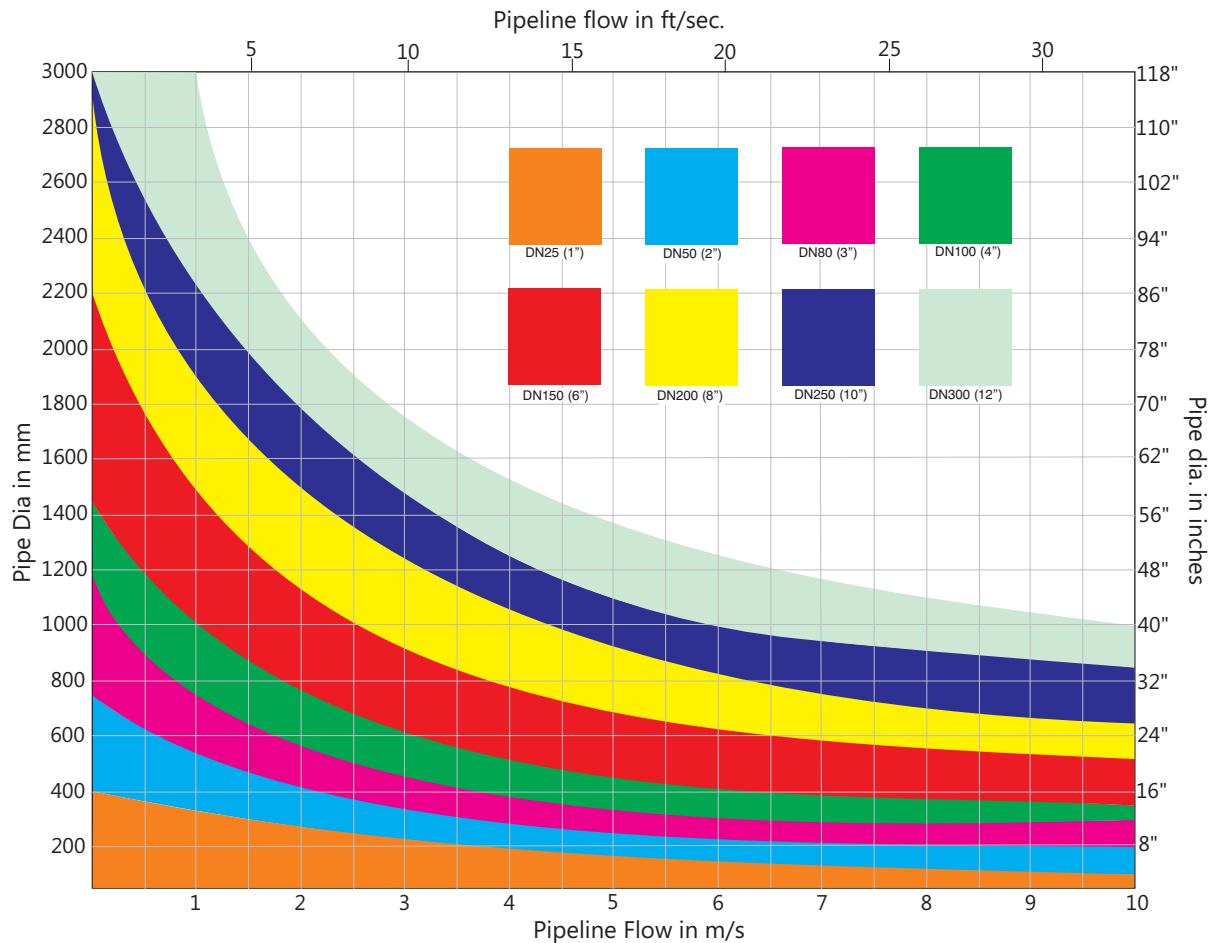
Effective discharge by an air release and vacuum break valve of pressurized air depends on the existence of a "Critical Relationship" between the area of the small orifice and the mass of the control float, i.e., the mass of the float must be greater than the force created by the working pressure acting on the orifice area. If the float is relatively too light or the orifice area relatively too great, the float will be held against the orifice even when not buoyed, and air discharge will not take place.

Surge Alleviation

It is imperative, due to the unpredictable nature of pipeline operation, that every air release and vacuum break valve should as standard, incorporate a surge and water hammer alleviation mechanism. This mechanism should only be activated in the instance of high velocity air discharge or pump trip (where the separated liquid columns rejoin at excessive velocities). The alleviation of surge and/or water hammer must be achieved by deceleration of the approaching liquid prior to valve closure (see operation of RBXc on pages 1 and 2 of this catalogue). Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable (refer to pages 11 and 12 of this catalogue).

Kindly contact the manufacturer for a free Air valve Sizing Disc and a copy of the Vent -O- Mat publication; "Air Valve Technology Reviewed", which gives a comprehensive guideline on air valve sizing as well as an in-depth look at air valve research and development over the past 35 years. Vent-O-Mat in addition provides assistance on air valve sizing and positioning.

SELECTION & POSITIONING



Pipe Dia mm	Pipeline Velocity in Metres per sec															
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8
100	4	8	12	16	20	24	27	31	35	39	43	47	51	55	59	63
150	9	18	27	35	44	53	62	71	80	88	97	106	115	124	133	141
200	16	31	47	63	79	94	110	126	141	157	173	188	204	220	236	251
250	25	49	74	98	123	147	172	196	221	245	270	295	319	344	368	393
300	35	71	106	141	177	212	247	283	318	353	389	424	459	495	530	565
350	48	96	144	192	241	289	337	385	433	481	529	577	625	673	722	770
400	63	126	188	251	314	377	440	503	565	628	691	754	817	880	942	1005
450	80	159	239	318	398	477	557	636	716	795	875	954	1034	1113	1193	1272
500	98	196	295	393	491	589	687	785	884	982	1080	1178	1276	1374	1473	1571
550	119	238	356	475	594	713	832	950	1069	1188	1307	1425	1544	1663	1782	1901
600	141	283	424	565	707	848	990	1131	1272	1414	1555	1696	1838	1979	2121	2262
650	166	332	498	664	830	995	1161	1327	1493	1659	1825	1991	2157	2323	2489	2655
700	192	385	577	770	962	1155	1347	1539	1732	1924	2117	2309	2501	2694	2886	3079
750	221	442	663	884	1104	1325	1546	1767	1988	2209	2430	2651	2872	3093	3313	3534
800	251	503	754	1005	1257	1508	1759	2011	2262	2513	2765	3016	3267	3519	3770	4021
850	284	567	851	1135	1419	1702	1986	2270	2554	2837	3121	3405	3688	3972	4256	4540
900	318	636	954	1272	1590	1909	2227	2545	2863	3181	3499	3817	4135	4453	4771	5089
950	354	709	1063	1418	1772	2126	2481	2835	3190	3544	3899	4253	4607	4962	5316	5671
1000	393	785	1178	1571	1963	2356	2749	3142	3534	3927	4320	4712	5105	5498	5890	6283
1100	475	950	1425	1901	2376	2851	3326	3801	4276	4752	5227	5702	6177	6652	7127	7603
1200	565	1131	1696	2262	2827	3393	3958	4524	5089	5655	6220	6786	7351	7917	8482	9048
1300	664	1327	1991	2655	3318	3982	4646	5309	5973	6637	7300	7964	8628	9291	9955	10619
1400	770	1539	2309	3079	3848	4618	5388	6158	6927	7697	8467	9236	10006	10776	11545	12315
1500	884	1767	2651	3534	4418	5301	6185	7069	7952	8836	9719	10603	11486	12370	13254	14137
1600	1005	2011	3016	4021	5027	6032	7037	8042	9048	10053	11058	12064	13069	14074	15080	16085
1700	1135	2270	3405	4540	5675	6809	7944	9079	10214	11349	12484	13619	14754	15889	17024	18158
1800	1272	2545	3817	5089	6362	7634	8906	10179	11451	12723	13996	15268	16540	17813	19085	20358
1900	1418	2835	4253	5671	7088	8506	9924	11341	12759	14176	15594	17012	18429	19847	21265	22682
2000	1571	3142	4712	6283	7854	9425	10996	12566	14137	15708	17279	18850	20420	21991	23562	25133
2100	1732	3464	5195	6927	8659	10391	12123	13854	15586	17318	19050	20782	22513	24245	25977	27709
2200	1901	3801	5702	7603	9503	11404	13305	15205	17106	19007	20907	22808	24709	26609	28510	30411
2300	2077	4155	6232	8310	10387	12464	14542	16619	18696	20774	22851	24929	27006	29083	31161	33238
2400	2262	4524	6786	9048	11310	13572	15834	18096	20358	22619	24881	27143	29405	31667	33929	36191
2500	2454	4909	7363	9817	12272	14726	17181	19635	22089	24544	26998	29452	31907	34361	36816	39270
2600	2655	5309	7964	10619	13273	15928	18583	21237	23892	26546	29201	31856	34510	37165	39820	42474
2700	2863	5726	8588	11451	14314	17177	20039	22902	25765	28628	31491	34353	37216	40079	42942	45804
2800	3079	6158	9236	12315	15394	18473	21551	24630	27709	30788	33866	36945	40024	43103	46181	49260
2900	3303	6605	9908	13210	16513	19816	23118	26421	29723	33026	36329	39631	42934	46236	49539	52842
3000	3534	7069	10603	14137	17671	21206	24740	28274	31809	35343	38877	42412	45946	49480	53014	56549

Conversion Table l/sec. to m/sec. of Pipeline Velocity

Information subject to change without prior notice

SURGE & WATERHAMMER PROTECTION

Introduction

The Vent-O-Mat Series RBXc "Anti-Surge" air release and vacuum break valve, is an evolution of market feedback and the incorporation of the already proven Vent-O-Mat technology which itself resulted from years of extensive research. The valve unlike many others is not just an adaption of an air valve to handle sewage, but the result of over 30 years of dealing with water and seeing what works and adapting it to the needs of the end user.

Surge Protection - Initial Filling

The RBXc is always biased in the "Anti-Surge" mode meaning all air release is controlled through the "Anti-Surge" Orifice which is aerodynamically engineered to throttle air discharge when liquid approach velocity would otherwise become too great and induce an unacceptable pressure rise. The air throttling action increases resistance to the flow of the approaching liquid which consequently decelerates to a velocity which reduces the pressure rise when the valve closes (see operation of valve on pages 3). Vent-O-Mat series RBXc is an essential precaution for pipeline priming.

Surge Protection - Pump Trip Conditions

In instances where a pipeline experiences liquid column separation due to pump stoppage, high shock pressures can be generated when the separated liquid column rejoins.

The Vent-O-Mat series RBXc takes in air through the unobstructed large orifice when liquid column separation occurs, but controls the discharge of air through the "Anti-Surge" Orifice as the separated column commences to rejoin. The rejoining impact velocity is thereby considerably reduced to alleviate high surge pressures in the system (see operation of valve on page 3).

Other surge control measures may, dependant on pipeline profile, diameter and operating conditions, be needed to provide the primary surge alleviation function with the Vent-O-Mat air-valves forming an integral and valuable addition in a combined strategy for further reducing surge pressures. The benefit of the "Anti-Surge" Orifice can be readily demonstrated by suitable surge modelling software.

Surge Protection - Pipeline Operating

The operation of valves and similar flow control devices can cause high-pressure transients in an operating pipeline.

The unique, single chamber design of the Vent-O-Mat series RBXc valve enables a pocket of air to be trapped in the valve chamber. Automatic operation of the small orifice control float regulates the volume of air entrapped.

The volume maintained in the valve will provide a cushioning benefit to the pipeline for short duration transient pressure "spikes". This effect can be modelled by the design engineer using suitable surge software.

Computer Modelling

The effectiveness of Vent-O-Mat "Anti-Surge" technology has been substantiated by independent third party testing and by thousands of applications globally. Effective computer modelling, based on practical tests, has been ensured in the well-known and respected commercially available surge analysis software programmes such as AFT impulse, FLOWMASTER, WATHAM and SURGE 2000.

Technical and Financial Benefits

1. Improved alleviation of surge behaviour including reduction of:
 - Surge pressure magnitudes by slowing surge velocities
 - Duration of oscillation following a pump trip, as the air-valve continuously absorbs and dissipates the energies of the surge.
2. Potential for reduction in size and/or quantity of conventional surge protection devices such as surge vessels etc.
3. Automatic protection during initial filling when most surge protection devices are not operational.
4. Holistic protection as each sewage air valve installed has design features to automatically damp surges.
5. The valve is virtually maintenance free.

PURCHASE SPECIFICATION

VENT -O- MAT MODEL NO.

Page 7 - Series RBXc - DN25 or DN50 with BSP / NPT, Screwed Female Connection

Page 8 - Series RBXc - DN25 to DN300 Flanged Connection

CONSTRUCTION & DESIGN

The air release & vacuum break valve shall be of the compact single chamber design with solid cylindrical H.D.P.E. control floats housed in a tubular ductile cast iron body, epoxy powder coated to 300 microns, secured by means of stainless steel 304 or 316 fasteners.

The valve shall have an integral 'Anti - Shock' Orifice mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure to 1.5 x valve rated working pressure.

The intake orifice area shall be equal to the nominal size of the valve i.e., a 150mm (6") valve shall have a 150mm (6") intake orifice.

Large orifice sealing shall be effected by the flat face of the control float seating against a E.P.D.M. rubber 'O' ring housed in a dovetail groove circumferentially surrounding the orifice.

Discharge of pressurized air shall be controlled by the seating & unseating of a small orifice nozzle on a E.D.P.M. rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that the damage to the rubber seal is prevented.

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

Connection to the valve inlet shall be facilitated by a screwed BSP (ISO R7) or NPT female end (DN25 (1") & DN50 (2") only) or a flanged end conforming to PN10, 16 & 25 ratings of BS 4504 or SABS 1123 Standards, ANSI B16. 5 Class 150 & 300 & AS 4087.

Nuts, bolts, washers, or jointing gaskets shall be excluded.

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to 1.5 times the designed working pressure.

OPERATION

1. Prior to the ingress of liquid into the valve chamber, as when the pipeline is being filled, valves shall vent through the "Anti-Surge" orifice at all times.
2. Valves shall be tested and not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 0,5 bar (7.2 psi) to 1.5 x valve rated working pressure.
3. When the pipeline is fully charged valves shall respond to the presence of air/gas by discharging it through the small orifice at the pressures within the specified design range, and shall remain leak tight in the absence of air.
4. Valves shall react immediately to pipeline drainage or liquid column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.

ORDERING GUIDE

VALVE SIZE: DN25 (1") - <input type="text" value="025"/> DN50 (2") - <input type="text" value="050"/> DN80 (3") - <input type="text" value="080"/> DN100 (4") - <input type="text" value="100"/> DN150 (6") - <input type="text" value="150"/> DN200 (8") - <input type="text" value="200"/> Dn250 (10") - <input type="text" value="250"/> DN300 (12") - <input type="text" value="300"/>		VALVE TYPE: DOUBLE ACTING <input type="text" value="1"/>	
VALVE SERIES No: _____		VALVE END CONNECTION: SCREWED - BSP <input type="text" value="1"/> SCREWED - NPT <input type="text" value="2"/> FLANGED - BS 4504 OR SABS 1123 <input type="text" value="0"/> FLANGED - ANSI B16.5 <input type="text" value="3"/> FLANGED - AS 4087 Fig B5 <input type="text" value="4"/> FLANGED - AS 4087 Fig B6 <input type="text" value="5"/> FLANGED - AS 2129 TABLE E <input type="text" value="6"/>	
ANTI SHOCK ORIFICE: _____		VALVE PRESSURE RATING: PN16 ANSI#150 <input type="text" value="16"/> PN25 ANSI#300 <input type="text" value="25"/>	
CAST BODY: _____			

TEST SPECIFICATION

All air release valves supplied shall be subjected to the following testing procedures in the order laid down:

(A) A high pressure strength and leak test whereby the valve is filled with water and pressurized to 1.5 times the rated working pressure which shall be held for a period of 2 minutes. Any leaking, weeping or sweating shall be reason for rejection.

(B) A low head leak test whereby the valve is filled with water and pressurized to a maximum of 0.5 bar (7.3 psi) using a visible water column connected to the test rig. The valve shall be rejected if leak tightness is not maintained for 2 minutes

(C) Every tenth air release valve of the same size and pressure rating must be subjected to a small orifice function test - "DROP TEST" - whereby the valve is filled with water, pressurized to above rated working pressure and isolated from the test rig by closure of an isolating valve. A chamber in the test rig immediately prior to the isolating valve must be filled with compressed air at a pressure equal to that being maintained in the air release valve. The isolating valve is then opened so as to allow the air to rise in the air release valve without the pressure dropping lower than 2-3 bar (29-44 psi) above rated working pressure of the air release valve. The "DROP TEST" is then carried out by slowly bleeding off the pressure through a suitable cock until rated working pressure is reached and the float drops away from the orifice to allow discharge. Failure of the air release valve to function in the manner described will be reason for rejection.

On request the manufacturer shall provide batch certificates of test compliance which shall be cross referenced to serial numbers indelibly marked onto the identity label of each valve.

IMPORTANT NOTE: It is impossible to inject air into an incompressible liquid, air injection can only be achieved if the liquid can be displaced which implies that the pressure in the test rig must be reduced to atmospheric, and absolutely nothing is proven by discharge through the small orifice of the air release valve at atmospheric pressure. "DROP TESTING" in this manner is not acceptable.

STANDARD TERMS AND CONDITIONS

Vent-O-Mat Australia takes pride in the quality of its products and its services to customers. Customers are requested to inform Vent-O-Mat Australia if an order is incorrectly delivered or if there is dissatisfaction with the goods.

As a part of our quality procedures, it is important that Vent-O-Mat Australia and the customer agree on the terms on which business is to be transacted. These terms and conditions are current for trading with Vent-O-Mat Australia at the time of issue, however the terms and conditions may vary from time to time.

1. Interpretation

In these conditions unless the contrary intention appears:

"Additional Charges" includes all delivery, handling and storage charges, goods and services tax, stamp duty, interest, legal and other costs of recovery of unpaid money and all other government imposts and all money, other than the Purchase Price, payable by the Customer to Vent-O-Mat Australia arising out of the sale of the Goods.

"Customer" means the person to or for whom the Goods are to be supplied by Vent-O-Mat Australia.

"Goods" means the goods sold to the Customer by Vent-O-Mat Australia.

"Vent-O-Mat Australia" means Vent-O-Mat Australia Pty Limited, ABN 20 114 575 101.

"Purchase Price" means the list price for the goods as charged by Vent-O-Mat Australia at the date of delivery or such other price as may be agreed by Vent-O-Mat Australia and the Customer prior to delivery of the Goods.

2. Order for Goods

2.1 An order given to Vent-O-Mat Australia is binding on Vent-O-Mat Australia and the Customer, if:

2.1.1 a written acceptance is signed for or on behalf of Vent-O-Mat Australia; or
2.1.2 the Goods are supplied by Vent-O-Mat Australia in accordance with the order.
2.2 An acceptance of the order by Vent-O-Mat Australia is then to be an acceptance of these conditions of sale by Vent-O-Mat Australia and the Customer and these conditions of sale will override any conditions contained in the Customer's order. Vent-O-Mat Australia reserves the right to accept a part only of any order by notifying the Customer in writing or by delivering the Goods to the Customer. No order is binding on Vent-O-Mat Australia until accepted by it.

2.3 An order which has been accepted in whole or in part by Vent-O-Mat Australia cannot be cancelled by the Customer without obtaining the prior written approval of Vent-O-Mat Australia, which it may refuse in its absolute discretion.

3. Warranties

3.1 Certain laws imply terms, conditions and warranties ("Prescribed Terms") into contracts for the supply of goods and prohibit the exclusion, restriction or modification of such terms, conditions and warranties. The liability of Vent-O-Mat Australia in respect of a breach of a Prescribed Term or any warranty made under these terms and conditions is limited, to the extent permissible by law and at the option of Vent-O-Mat Australia, to the:

3.1.1 replacement of the Goods;

3.1.2 payment of the cost of replacing the Goods; or

3.1.3 refund of the Purchase Price paid by the Customer.

3.2 Any claims to be made against Vent-O-Mat Australia for short delivery of Goods must be lodged with Vent-O-Mat Australia in writing within 7 days of the delivery date.

3.3 Vent-O-Mat Australia warrants that it will repair or make good any defects in the materials or workmanship of the Goods arising under normal and reasonable condition of use within ninety (90) days of the date of delivery of the Goods provided written notice of the claim is received by Vent-O-Mat Australia as soon as reasonably possible after the defect is discovered.

3.4 Unless the terms and warranties are included in these standard terms and conditions, all prior discussions, quotations, warranties and Prescribed Terms, to the extent permitted by law, are excluded.

4. Product Testing

4.1 In the event that the Customer, in its order, has requested that Vent-O-Mat Australia conduct special tests on the Goods prior to delivery, or that tests on the Goods be conducted in the presence of the Customer prior to delivery, Vent-O-Mat Australia may, in its discretion, increase the Additional Charges for the cost of such tests.

4.2 The Customer must attend Vent-O-Mat Australia's premises for any testing of the Goods upon the written notice of Vent-O-Mat Australia. Should the Customer not attend Vent-O-Mat Australia's premises within 7 days of such notice, Vent-O-Mat Australia may deliver to and invoice the Customer for the Goods.

5. Delivery

5.1 The times quoted for delivery are estimates only and Vent-O-Mat Australia accepts no liability for failure or delay in delivery of Goods. The Customer is not relieved of any obligation to accept or pay for Goods by reason of any delay in delivery. Goods may be delivered by instalments at the discretion of Vent-O-Mat Australia.

5.2 Risk in accepting the Goods passes on delivery to the Customer.

5.3 All Additional Charges are payable by the Customer in addition to the Purchase Price of the Goods.

5.4 Return of Goods will not be accepted by Vent-O-Mat Australia except by prior agreement in writing with Vent-O-Mat Australia. Any Goods returned will be subject to a restocking charge of 15% of the Purchase Price of those Goods.

6. Price and Payment

6.1 The Customer must pay the Purchase Price and the Additional Charges to Vent-O-Mat Australia.

6.2 If the Customer is in default, Vent-O-Mat Australia may at its option withhold further deliveries or cancel a contract without prejudice to any of its existing rights.

6.3 All payments are due within 30 days from invoice date. Interest may be charged at the rate of 1.5% per month or part of a month from the expiry of that period until the date payment is received by Vent-O-Mat Australia.

7. Retention of Title

7.1 Ownership, title and property of the Goods remains with Vent-O-Mat Australia until payment in full for the Goods and all sums due and owing by the Customer to Vent-O-Mat Australia on any account has been made. Until the date of payment:

7.1.1 the Customer has the right to sell the Goods in the ordinary course of business;

7.1.2 until the Goods have been sold by the Customer in the ordinary course of the Customer's business, the Customer holds the Goods as bailee for Vent-O-Mat Australia;

7.1.3 the Goods are always at the risk of the Customer.

7.2 The Customer is deemed to be in default immediately upon the happening of any of the following events:

7.2.1 if any payment to Vent-O-Mat Australia is not made promptly before the due date for payment;

7.2.2 if the Customer ceases to carry on business or stops or suspends payment or states its intention of so doing or is unable to pay its debts as they fall due or if any cheque or bill of exchange drawn by the Customer payable to Vent-O-Mat Australia is dishonoured;

7.3 In the event of a default by the Customer, then without prejudice to any other rights which Vent-O-Mat Australia may have at law or under this contract:

7.3.1 Vent-O-Mat Australia or its agents may without notice to the Customer enter the Customer's premises or any premises under the control of the Customer for the purposes of recovering the Goods.

7.3.2 Vent-O-Mat Australia may recover and resell the Goods;

7.3.3 if the Goods cannot be distinguished from similar Goods which the Customer has or claims to have paid for in full, Vent-O-Mat Australia may in its absolute discretion seize all goods matching the description of the Goods and hold same for a reasonable period so that the respective claims of Vent-O-Mat Australia and the Customer may be ascertained. Vent-O-Mat Australia must promptly return to the Customer any goods the property of the Customer and Vent-O-Mat Australia is in no way liable or responsible for any loss or damage to the Goods or for any loss, damage or destruction to the Customer's business howsoever arising from the seizure of the Goods.

7.3.4 In the event that the Customer uses the Goods in some manufacturing or construction process of its own or some third party, then the Customer must hold such part of the proceeds of sale of such manufacturing or construction process as relates to the Goods in trust for Vent-O-Mat Australia. Such part will be an amount equal in dollar terms to the amount owing by the Customer to the Vent-O-Mat Australia at the time of the receipt of such proceeds. The Customer will pay Vent-O-Mat Australia such funds held in trust upon the demand of Vent-O-Mat Australia.

8. Goods and Services Tax

Goods and Services Tax (GST) will be shown separately in the tax invoice for the sale of the Goods. The amount of GST payable in respect of the supply of the Goods is payable by the Customer. The Customer must indemnify Vent-O-Mat Australia in respect of GST paid and payable by Vent-O-Mat Australia for the supply of the Goods.

9. General

9.1 These terms and conditions are to be construed in accordance with the laws from time to time in the State of New South Wales and the Commonwealth of Australia.

9.2 These standard trading conditions contain all of the terms and conditions of the contract between the parties and may only be varied by agreement in writing between the parties.

9.3 Any conditions found to be void, unenforceable or illegal may, to that extent be severed from the Agreement.

9.4 No waiver of any of these terms and conditions or failure to exercise a right or remedy by Vent-O-Mat Australia will be considered to imply or constitute a further waiver by Vent-O-Mat Australia of the same or any other term, condition, right or remedy.



VENT-O-MAT AUSTRALIA (PTY) LTD
P. O. Box 156
SEVEN HILLS
NSW1730
SYDNEY
AUSTRALIA

Tel: (+61 2) 8814 9699
Fax: (+61 2) 8814 9666

www.ventomat.com.au
jkerrigan@ventomat.com.au



Revision Date August 2014 Catalogue RBXc 0001