VENT-O-MAT®

SERIES RBX

AIR RELEASE & VACUUM BREAK VALVES

OWNER'S MANUAL

VENT-O-MAT®

SERIES RBX "ANTI-SHOCK" AIR VALVE

OWNER'S MANUAL

INTRODUCTION

Thank you for your purchase of the Vent-O-Mat series RBX "Anti-Shock" air valve. This air valve design is the culmination of years of intensive research, innovative design and leading edge technology.

The Vent-O-Mat series RBX air valve has transcended the line of being a mere air valve or surge alleviation mechanism as it represents more than just the combination of these functions. In fact, it is best described as a cost effective pipeline management system incorporating the features of a double acting air valve and surge alleviation device.

This manual is intended to provide the project engineer, contractor and end user with a useful guide on how best to install operate, maintain and maximise the performance of the Vent-O-Mat series RBX air valve. Included are comments on air valve sizing and positioning, Vent-O-Mat testing procedures and useful technical data.

Note this document is specifically directed at the use of Vent-O-Mat series RBX air valves and is not intended as a comprehensive pipeline design guide or system engineering manual.

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QUALITY CONTROL

Vent-O-Mat maintains stringent manufacturing and test procedures to ensure the best possible service and reliability is given by every valve produced. At Vent-O-Mat however, quality assurance is more than just a series of product inspections and tests it is in fact our approach to growth. Whilst it is true that each valve must pass a final test before it is cleared for dispatch, our basic belief is that quality cannot be inspected into a valve but must be designed and built into each valve. Total customer satisfaction is ensured through our employment of dedicated people, solid engineering and carefully monitored manufacturing procedures. We recognise the need for and encourage individual pride and self satisfaction which is gained in producing reliable, innovative and durable valves. This attitude to quality, permeates through our company, from the directors to the newest employees.

Vent-O-Mat Quality Control Programme

Vent-O-Mat has a well established and stringent standard Production Quality Programme. The general chain of material procurement, manufacturing and testing procedures are outlined below.

The general chain of events on receipt of an order are as follows:

Quality Requirements & Tests	Specification/Acceptance
1. Planning	
2. Procurement of materials and sundries	Standard materials spec.
3. Machining of flanges/body & floats	Drawings
4. Post machining dimensional inspection	Drawings
5. Assembly	Drawings
6. Hydrostatic test	0.5 bar - 1.5 times working pressure
7. Test Certificates	Standard
8. Final inspection prior to dispatch	Visual
9. Dispatch	Works

Enclosed below, is a more detailed description of some of the procedures carried out and checks put in place to ensure that each valve produced is of the highest standard.

1. Planning
On receipt, orders are reviewed initially by the Production Director before transcribing onto internal paper work. At this stage, any new or non - standard requirements are identified and actioned as appropriate.

This is then passed to the Planning Department who procure the relevant materials and sundries .

All correspondence relating to an order is held in the sales order file which also contains copies of all material and product test certification on completion of the order .

2. Work Instructions
The Planning Department issues to the Manufacturing Department , copies of the works order , detailed piece part drawings and manufacturing route cards which indicate both manufacturing and inspection operations . Detailed method sheets are compiled for each machining operation and issued as part of the full instruction package .

Any non - standard operations , such as specialised testing or marking are either detailed in the works order or the works order refers to a separately issued procedure.

3. Records
The records maintained against standard products are material test certification for pressure containing parts and final product certification.

In - house records are maintained in respect of components and final inspection

4. Design Control
All calculations and drawings are checked and signed - off by either the Production Director or the Technical Manager.

5. Documentation and Change Control
A drawing register is maintained which reflects current issue and date of drawings available. Change to the drawings is controlled by a change note system which maintains records of all changes.

Copies of modified drawings are issued to all relevant departments and are signed for on receipt . Copies of the superseded drawings are removed and destroyed . Control of process procedures, e.g. welding, is the responsibility of the Quality Assurance Manager and are issued as necessary against the specific works order.

6. Control of Inspection, Measuring and Test Equipment
Regular checks are carried out on equipment being used.

Pressure gauges used in product testing are tightly controlled. Each gauge is identified by a unique gauge or test stand number and the dates when calibration are due are clearly shown.

Calibration records of checks against a master standard pressure gauge are maintained.

7. Control of Purchased Materials and Services

Purchased supplies usually consist of raw materials, such as stainless steel and high density polyethylene, which are procured from well established suppliers who supply as standard, material test certificates.

Sub contracted processes are limited to plating operations, specialised welding and the machining of flanges.

Supplier performance is judged from an analysis of the Goods Received inspection reports.

All purchase orders are clearly drawn up and references are given to the required specifications.

All material received is first passed to Goods Receiving Inspection for checking and acceptance.

Visual inspection, verification of identification against test certification and dimensional inspection are carried out. Responsibility for the checking and signing - for the acceptance of materials test certification lies with Quality Assurance Manager. Materials are not passed to the stores until clearance has been obtained.

Material is cleared to the Stores by an inspection sign off or the stores receipt note .

Any reject material is segregated, marked and an inspection rejection note is raised.

8. Manufacturing Control

A work packet comprising the component drawings, method sheets and route card is prepared and issued for each item or batch of items to be manufactured. The route cards indicate the intermediate and final inspection operations.

A system of first off and patrol inspection is employed in addition to a 100% final inspection on all assembled products.

9. Completed Item Inspection Test

Assembly of the final product is carried out using the parts issued from the warehouse having identifiable inspection clearance, with reference to the general arrangement drawings.

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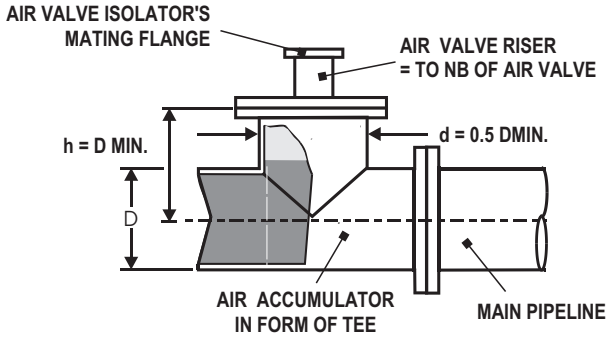
RECOMMENDED INSTALLATION ARRANGEMENTS

Air Accumulators

It is common practice amongst some design engineers to place an air valve on a riser welded directly onto the main pipeline. This method however leads to inefficient air valve operation and restrictions in the main pipeline as air that is taken in under vacuum conditions will be swept away when the pumps are restarted. It is good pipeline design practice, to provide an accumulator, as indicated below for every air valve, to facilitate efficient air valve operation.

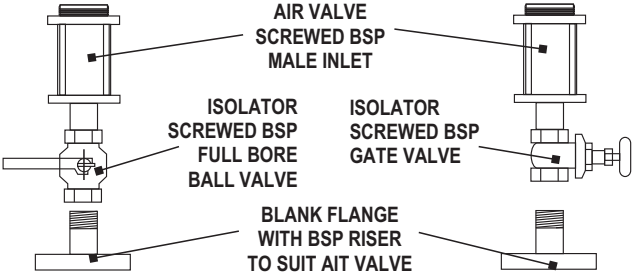


Isolator Arrangements

Every air valve installed, should have an isolator installed directly underneath it to allow the removal of the air valve in case of repairs. Indicated on the enclosed diagrams are Vent-O-Mat's recommended installation arrangements.

Arrangements 1 & 2

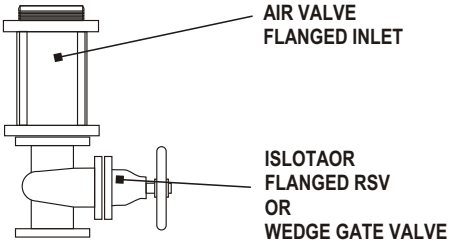
Specific to DN25 & DN50 Vent-O-Mat Series RBX valves.



Arrangement 1 **Arrangement2**

Arrangement 3

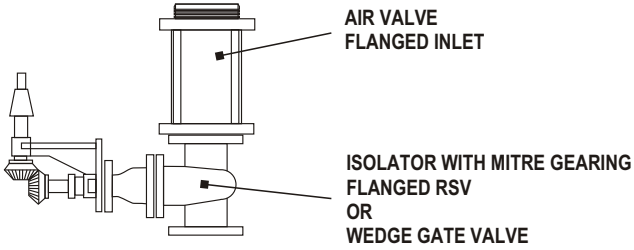
Specific to DN80,100,150 and 200 valves - Recommended for valves not installed in a valve chamber. Either a Wedge Gate or a Resilient Seal Valve can be utilised.



Arrangement 3

Arrangement 4

Specific to DN80,100,150 and 200 valves - Recommended for valves installed inside a valve chamber, to be operated by a Tee Key.



Arrangement4

Air Valve Chamber Design

A well designed air valve chamber is important and should be designed with easy access to the valve for installation and subsequent maintenance. Good support is required in the case of chamber settling. It is a common practice to place a layer of stone underneath the pipe for drainage purposes. Two vents should also be installed, in the manner indicated on the opposite page to allow free and constant air circulation.

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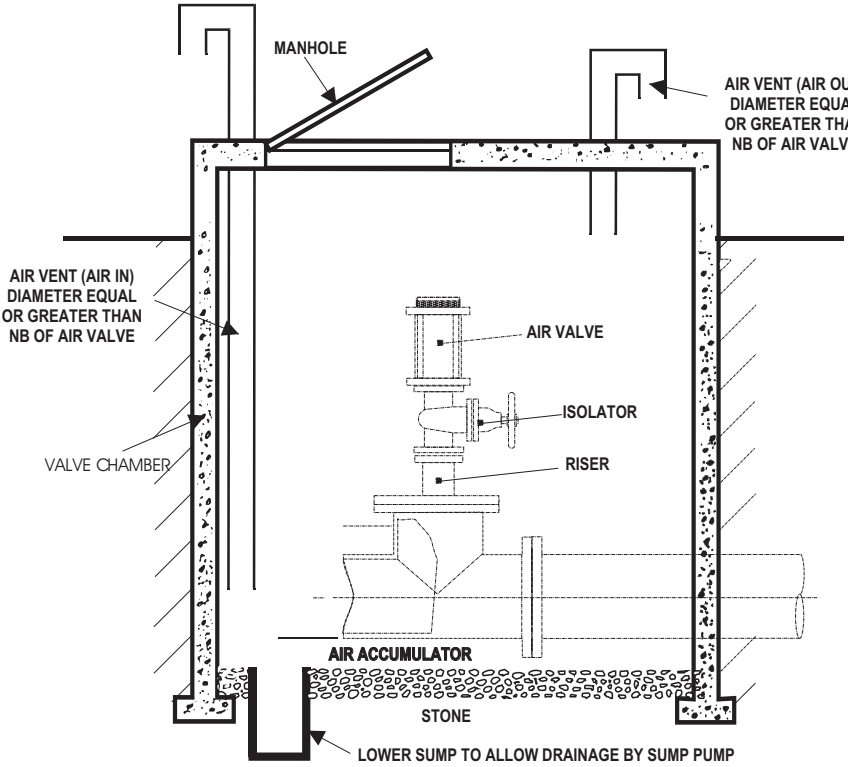

AIR VALVE CHAMBER

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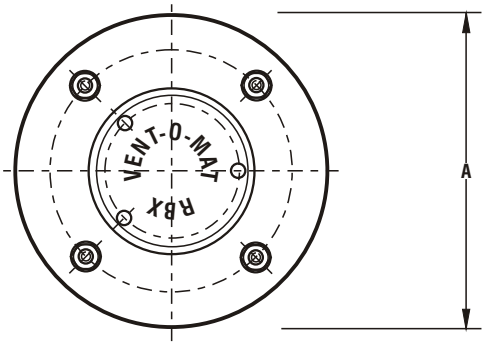
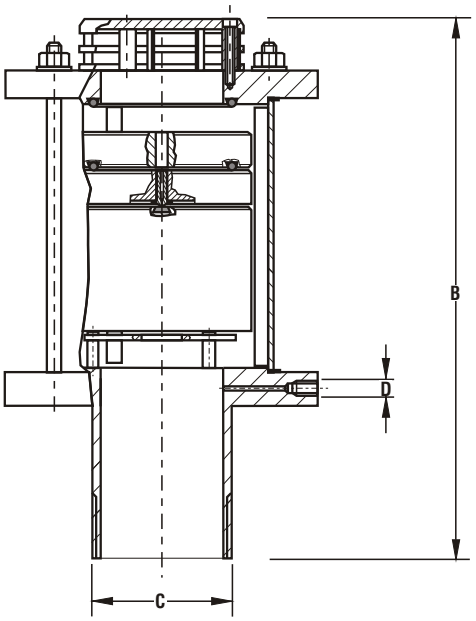
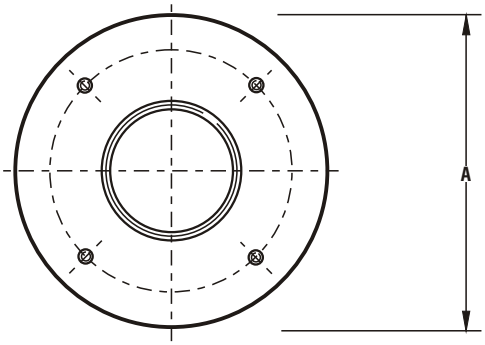
GENERAL SPECIFICATIONS

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







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

End Connection:
Screwed BSP/ NPT male

Nominal Sizes:
DN25 (1") & DN50 (2")

Model No's:	**Pressure Ratings bar (psi)**
RBX 2511& 2521	PN 25 (363 psi) ANSI #250
RBX 4011 & 4021	PN 40 (580 psi) ANSI #300

Operating Pressure Range - bar (psi):

	Min	Max.
PN25 (363 psi) ANSI #250	0.5 (7.2)	25 (363)
PN40 (580 psi) ANSI #300	0.5 (7.2)	40 (580)

Operating Temperature Range:
4◦C (40 F) to 80 C (180 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 10
Installation:- see page 6

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 mm	DN in.	MODEL No.	PRESSURE RATING	A mm	A in.	B mm	B in.	C	D	WEIGHT kg.	WEIGHT lbs
25	1"	025RBX 2511 &2521	PN25 (363 psi) ANSI #250	120	4 3/4	265	10 7/16	1" BSP/NPT	OPTIONAL 1/4 BSP/NPT BLEED PORT FOR TEST COCK	4.6	10.1
25	1"	025RBX 4011 &4021	PN40 (580 psi) ANSI #300	120	4 3/4	317	12 1/2	1"BSP/ NPT		5.2	11.4
50	2"	050RBX 2511 &2521	PN25 (363 psi) ANSI #250	165	6 1/2	320	12 3/5	2"BSP/ NPT		9.4	20.6
50	2"	050 RBX 4011 & 4021	PN40 (580 psi) ANSI #300	165	6 1/2	335	13 3/16	2" BSP/ NPT		9.7	21.3

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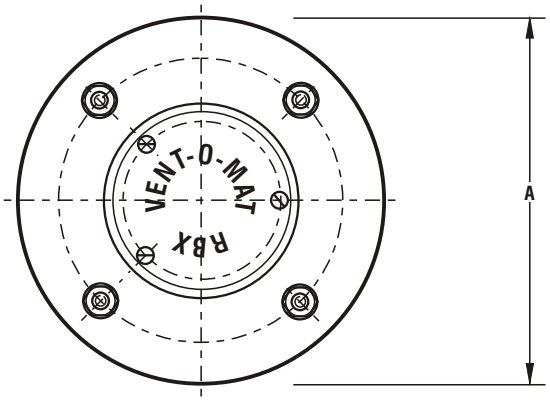
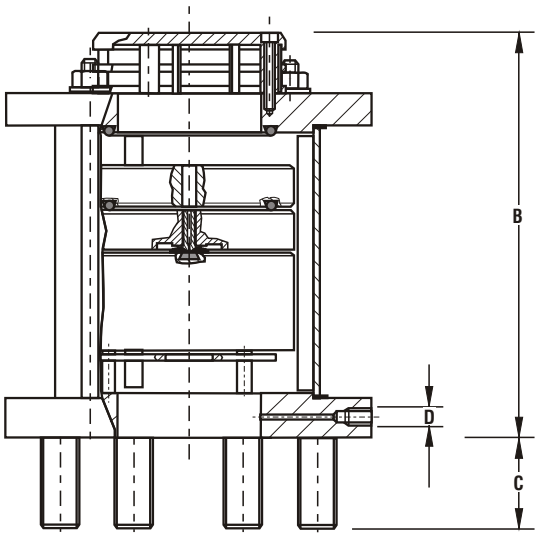
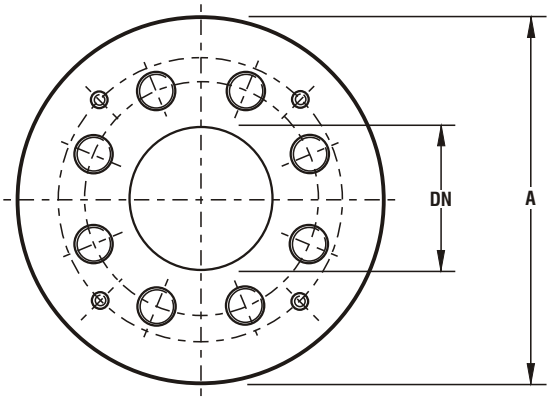
GENERAL SPECIFICATIONS

FLANGED - DN80 (3") & DN100 (4")







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

End Connection:
Flange with Screwed Studs for Alignment to;
BS 4504 PN 10, PN16, PN25 &PN40
SABS 1123 - Tables 1000/3, 1600/3, 2500/3 & 4000/3
ANSI B16. 1 Class 125, Class 250 & ANSI B16. 5 Class 300

Nominal Sizes:
DN80 (3") & DN100 (4")

Model No's:	**Pressure Ratings bar (psi):**
RBX 1601 & 1631	PN 16 (232 psi) ANSI #125
RBX 2501 & 2531	PN 25 (363 psi) ANSI #250
RBX 4001 & 4031	PN 40 (580 psi) ANSI #300

Operating Pressure Range - bar (psi):

	Min	Max.
PN25 (363 psi) ANSI #250	0.5 (7.2)	25 (363)
PN40 (580 psi) ANSI #300	0.5 (7.2)	40 (580)

Operating Temperature Range:
4 C (40 F) to 80 C (180 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 11
Installation: - see page 6

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 mm	DN in	MODEL No.	PRESSURE RATING	A mm	A in	B mm	B in	C mm	C in	D	WEIGHT kg.	WEIGHT lb
80	3	080 RBX 1601 & 1631	PN16 (232 psi) ANSI #125	235	9 1/4	305	12	50	2	OPTIONAL 1/4" BSP/ NPT BLEED PORT FOR TEST COCK	23	50.6
80	3	080 RBX 2501 & 2531	PN25 (363 psi) ANSI #250	235	9 1/4	305	12	50	2		23	50.6
80	3	080 RBX 4001 & 4031	PN40 (580 psi) ANSI #300	235	9 1/4	320	12 3/5	50	2		25	55
100	4	100 RBX 1601 & 1631	PN16 (232 psi) ANSI #125	235	9 1/4	320	12 3/5	50	2		22	48.5
100	4	100 RBX 2501 & 2531	PN25 (363 psi) ANSI #250	235	9 1/4	320	12 3/5	50	2		22	48.5
100	4	100 RBX 4001 & 4031	PN40 (580 psi) ANSI #300	235	9 1/4	353	13 7/8	50	2		26	57.2

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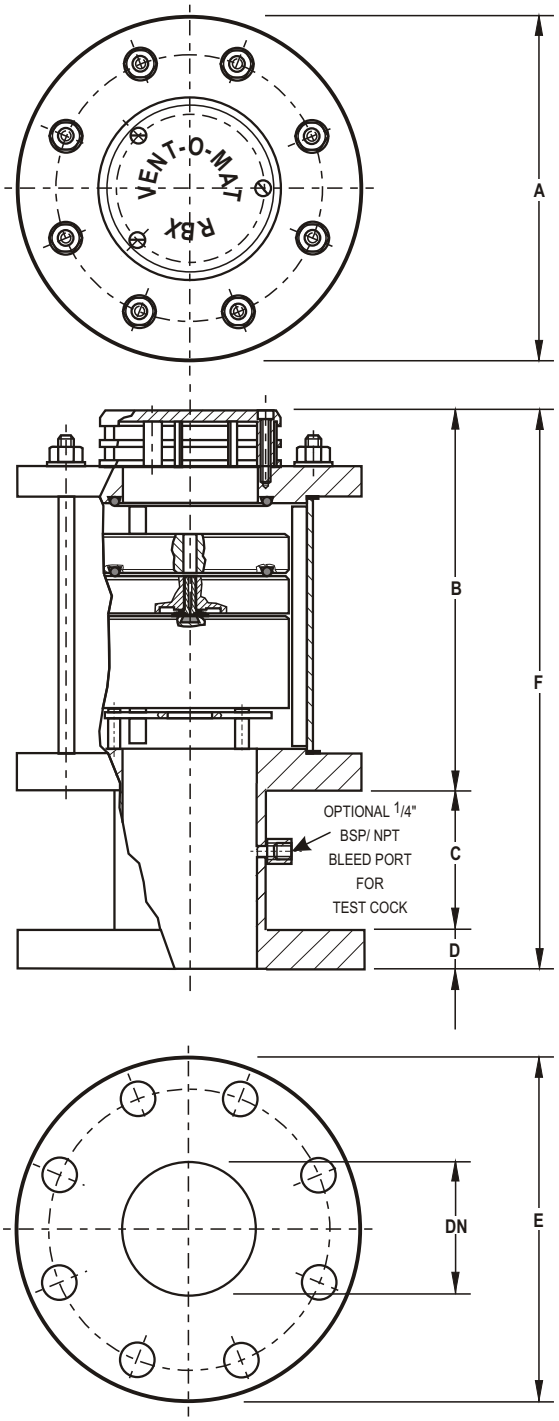
GENERAL SPECIFICATIONS
FLANGED - DN150 (6") & DN200 (8")



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

End Connection:
Flange for Alignment to;
BS 4504 PN 10, PN16, PN25 &PN40
SABS 1123 - Tables 1000/3, 1600/3, 2500/3 & 4000/3
ANSI B16. 1 Class 125, Class 250 & ANSI B16. 5 Class 300

Nominal Sizes:
DN150 (6") & DN200 (8")

Model No's:	**Pressure Ratings bar (psi):**
RBX 1601 & 1631	PN 16 (232 psi) ANSI #125
RBX 2501 & 2531	PN 25 (363 psi) ANSI #250
RBX 4001 & 4031	PN 40 (580 psi) ANSI #300

Operating Pressure Range - bar (psi):

	Min	Max.
PN25 (363 psi) ANSI #250	0.5 (7.2)	25 (363)
PN40 (580 psi) ANSI #300	0.5 (7.2)	40 (580)

Operating Temperature Range:
4 C (40 F) to 80 C (180 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 12
Installation: - see page 6

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 mm	DN in	MODEL No.	PRESSURE RATING	A mm	A in	B mm	B in	C mm	C in	D mm	D in	E mm	E in	F mm	F in	WEIGHT kg.	WEIGHT lbs
150	6	150 RBX 1601 & 1631	PN16 (232 psi) ANSI #125	340	13 3/8	440	17 5/16	120	4 3/4	22	7/8	285	11 1/4	582	22 7/8	70	154
150	6	150 RBX 2501 & 2531	PN25 (363 psi) ANSI #250	340	13 3/8	440	17 5/16	120	4 3/4	30	1 3/16	300	11 3/4	590	23 1/4	70	154
150	6	150 RBX 4001 & 4031	PN40 (580 psi) ANSI #300	340	13 3/8	440	17 5/16	120	4 3/4	30	1 3/16	300	11 3/4	590	23 1/4	78	171.6
200	8	200 RBX 1601 & 1631	PN16 (232 psi) ANSI #125	390	15 3/4	480	20 1/8	130	5 1/8	24	1 15/16	340	13 1/3	634	24 7/8	92	202.4
200	8	200 RBX 2501 & 2531	PN25 (363 psi) ANSI #250	390	15 3/4	480	20 1/8	130	5 1/8	28	1 1/8	360	14 1/6	638	25 1/8	92	202.4
200	8	200 RBX 4001 & 4031	PN40 (580 psi) ANSI #300	390	15 3/4	480	20 1/8	130	5 1/8	34	1 3/8	375	14 3/4	644	25 3/4	98	215.6

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COMPONENT DESCRIPTION & MATERIAL SPECIFICATION

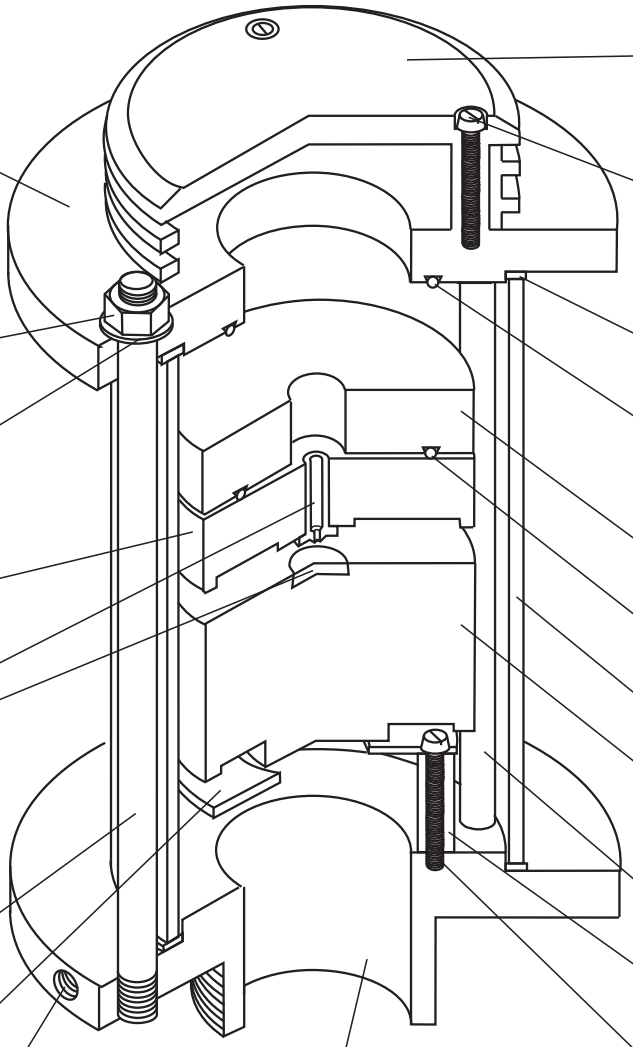
SCREWED DN25 (1") & DN50 (2")

Type:
Series RBX - Double Orifice (Small & Large Orifice) with Anti Shock Orifice Mechanism

End Connection:
Screwed BSP (ISO R7)/ NPT Male

Nominal Sizes:
DN25 (1")
DN50 (2")

Model No's:	Pressure Ratings:
RBX 2511 & 2521	PN25 (363 psi) ANSI #250
RBX 4011 & 4021	PN40 (580 psi) ANSI #300



Top Flange
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated alternatively
Stainless Steel AISI 304

Screen Mesh
Stainless Steel AISI 304

Nuts
Stainless Steel AISI 304

Washer
Stainless Steel AISI 304

Top Float
High Density Polyethylene

Nozzle
Stainless Steel AISI 304

Nozzle Seat
Natural Rubber

Guide Screws (Not Shown)
Cheesehead
Stainless Steel AISI 304
(only applicable to DN25 (1") valves)

Tie Rods
Stainless Steel AISI 304

Baffle Plate
Stainless Steel AISI 304

Optional Test Cock Connection
1/4" BSP/ NPT female

Top Cover
ABS Plastic
Polylac PA 737

Assembly Screws
Cheesehead
Stainless Steel AISI 304

Barrel Seal
CAF 400 gasket material
BS 2815 Grade A

O - Ring Seal
Nitrile Rubber

Anti Shock Orifice
High Density Polyethylene

O - Ring Seat
Nitrile Rubber

Barrel
Stainless Steel AISI 304

Lower Float
High Density Polyethylene

Float Guide
Stainless Steel AISI 304
(only applicable to DN50 (2") valves)

Baffle Spacer
Grey P.V.C.

Support Screw
Cheesehead
Stainless Steel AISI 304

Lower Flange
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated alternatively
Stainless Steel AISI 304
Screwed BSP (ISO R7)/ NPT male

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COMPONENT DESCRIPTION & MATERIAL SPECIFICATION

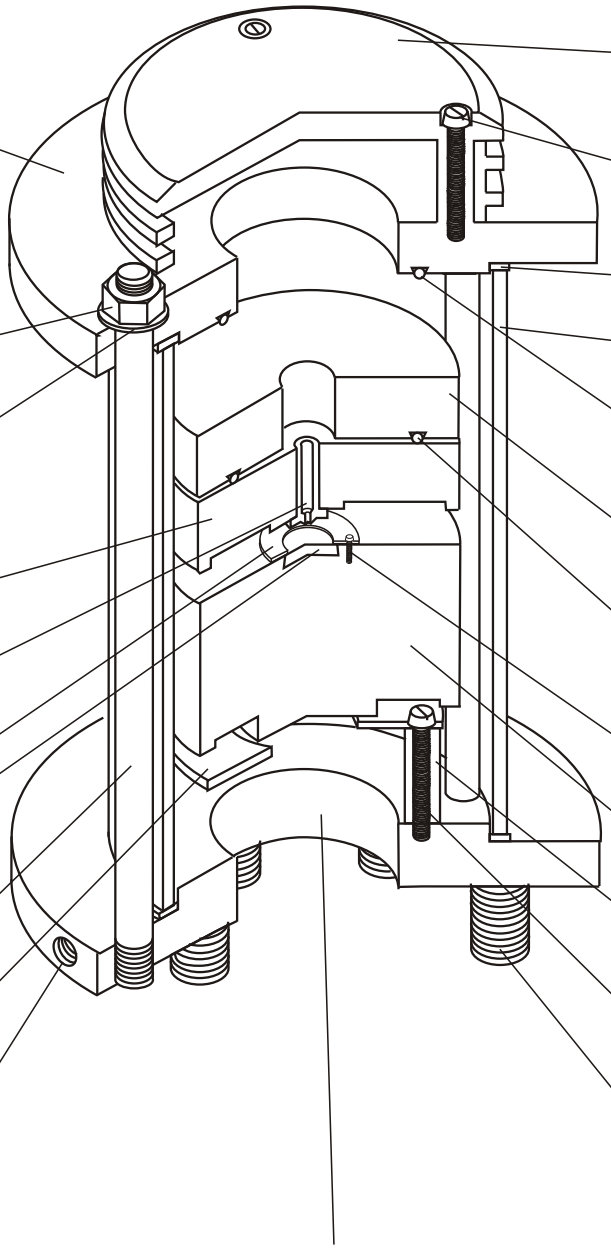
FLANGED DN80 (3") & DN100 (4")

Type:
Series RBX - Double Orifice (Small & Large Orifice) with Anti Shock Orifice Mechanism.

End Connection:
Flange with screwed studs.

Nominal Sizes:
DN80 (3")
DN100 (4")

Model No's: **Pressure Ratings:**
RBX 1601 & 1631 — PN16 (232 psi) ANSI #125
RBX 2501 & 2531 — PN25 (363 psi) ANSI #250
RBX 4001 & 4031 — PN40 (580 psi) ANSI #300



Top Flange
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated
alternatively
Stainless Steel AISI 304

Nuts
Stainless Steel AISI 304

Washer
Stainless Steel AISI 304

Top Float
High Density Polyethylene

Nozzle
Stainless Steel AISI 304

Nozzle Seat Retaining Plate
Stainless Steel AISI 304

Nozzle Seat
Natural Rubber

Tie Rods
Stainless Steel AISI 304

Baffle Plate
Stainless Steel AISI 304

Optional Test Cock Connection
1/4" BSP/ NPT female

Lower Flange
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated
alternatively
Stainless Steel AISI 304

Top Cover
ABS Plastic
Polylac PA 737

Assembly Screws
Cheesehead
Stainless Steel AISI 304

Barrel Seal
CAF 400 gasket material
BS 2815 Grade A

Barrel
Stainless Steel 304L

O - Ring Seal
Nitrile Rubber

Anti Shock Orifice
High Density Polyethylene

O - Ring Seat
Nitrile Rubber

Connecting Screws
Cheesehead
Stainless Steel 304

Lower Float
High Density Polyethylene

Baffle Spacer
Grey P.V.C.

Support Screw
Cheesehead
Stainless Steel AISI 304

Studs
Stainless Steel AISI 304L

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COMPONENT DESCRIPTION & MATERIAL SPECIFICATION

FLANGED DN150 (6") & DN200 (8")

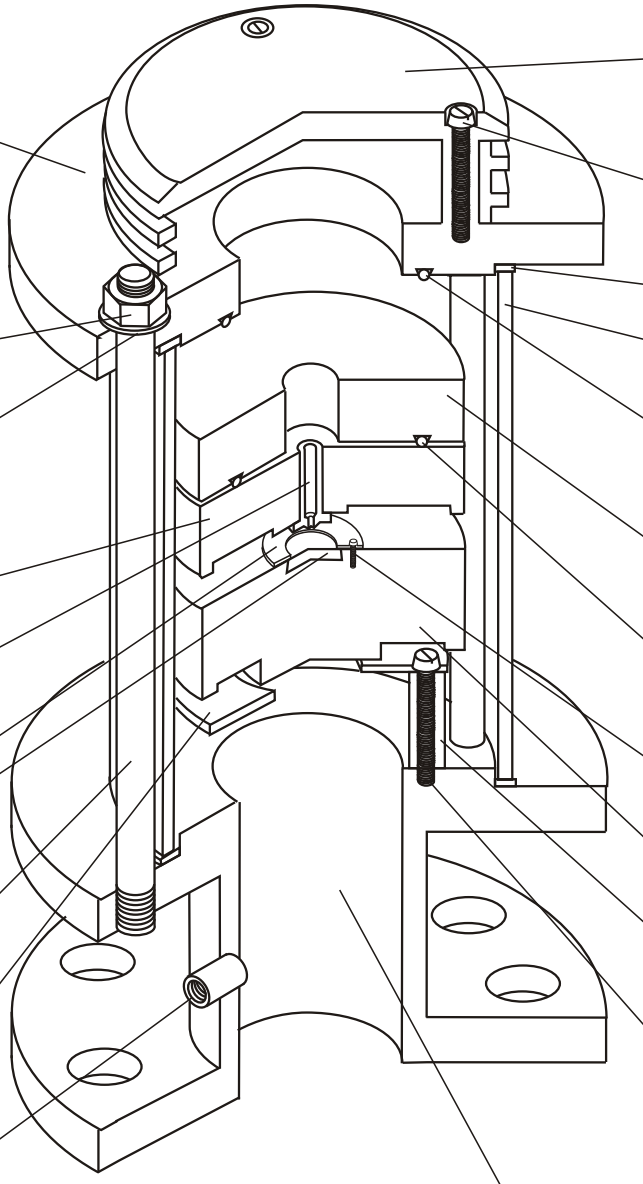
Type:
Series RBX - Double Orifice (Small & Large Orifice) with Anti Shock Orifice Mechanism.

End Connection:
Flange

Nominal Sizes:
DN150 (6")
DN200 (8")

Model No's:
RBX 1601 & 1631
RBX 2501 & 2531
RBX 4001 & 4031

Pressure Ratings:
PN16 (232 psi) ANSI #125
PN25 (363 psi) ANSI #250
PN40 (580 psi) ANSI



Top Flange
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated
alternatively
Stainless Steel AISI 304

Nuts
Stainless Steel AISI 304

Washer
Stainless Steel AISI 304

Top Float
High Density Polyethylene

Nozzle
Stainless Steel AISI 304

Nozzle Seat Retaining Plate
Stainless Steel AISI 304

Nozzle Seat
Natural Rubber

Tie Rods
Stainless Steel AISI 304

Baffle Plate
Mild Steel BS 4360 Gr. 43A
Fusion Bonded Epoxy Powder Coated

Optional Test Cock Connection
1/4" BSP/ NPT female

Top Cover
ABS Plastic
Polylac PA 737

Assembly Screws
Cheesehead
Stainless Steel AISI 304

Barrel Seal
CAF 400 gasket material
BS 2815 Grade A

Barrel
Stainless Steel 304L

O - Ring Seal
Nitrile Rubber

Anti Shock Orifice
High Density Polyethylene

O - Ring Seat
Nitrile Rubber

Connecting Screws
Cheesehead
Stainless Steel 304

Lower Float
High Density Polyethylene

Baffle Spacer
Grey P.V.C.

Support Screw
Cheesehead
Stainless Steel AISI 304

Lower Flange Assembley
Mild Steel BS 4360 Grade 43A
Fusion Bonded Epoxy Powder Coated
alternatively
Stainless Steel AISI 304

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MAINTENANCE

The Vent-O-Mat Series RBX valve is virtually maintenance free. There may however, on rare occasions, be the need to carry out maintenance on the valve. Enclosed is a guide providing possible reasons for maintenance requirements.

Problem	Reason	Course of Action
Valve Leaking through large orifice	Construction debris stuck in valve due to commisioning of new pipeline.	Follow enclosed Maintenance Instructions.
Valve Leaking around barrel seals.	Surge & Water Hammer problems in pipeline/ Severe undersizing of air valves	Notify manufacturer & Consulting Engineer/ Follow enclosed Maintenance Instructions.
Valve leaking through the large orifice despite no debris entrapped in valve.	Valve above the hydraulic gradeline.	Reposition valve 5 metres below hydraulic gradeline.
Small volumes of water evident on top flange during initial filling.	Normal operation of valve.	No course of action required .

The RBX design facilitates ease of service and maintenance and all maintenance spares are replaceable without special tools or skills. A complete list of tools and spares required, as well as the maintenance procedures are enclosed below.

Tool & Spare Requirements

Valve Size	Tools Required	Spares Required
DN25	M8 Spanner & Flat Screwdriver	2x Barrel Seals, 1x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat
DN50	M8 & M12 Spanner & Flat Screwdriver	2 x Barrel Seals, 1 x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat
DN80	M8 & M16 Spanner & Flat Screwdriver	2 x Barrel Seals, 1 x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat
DN100	M8 & M16 Spanner & Flat Screwdriver	2 x Barrel Seals, 1 x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat
DN150	M8 & M20 Spanner & Flat Screwdriver	2 x Barrel Seals, 1 x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat
DN200	M8 & M20 Spanner & Flat Screwdriver	2 x Barrel Seals, 1 x Small Orifice Nozzle, 1 x O-Ring Seal, 2 x O-Ring Seats, 1 x Nozzle Seat

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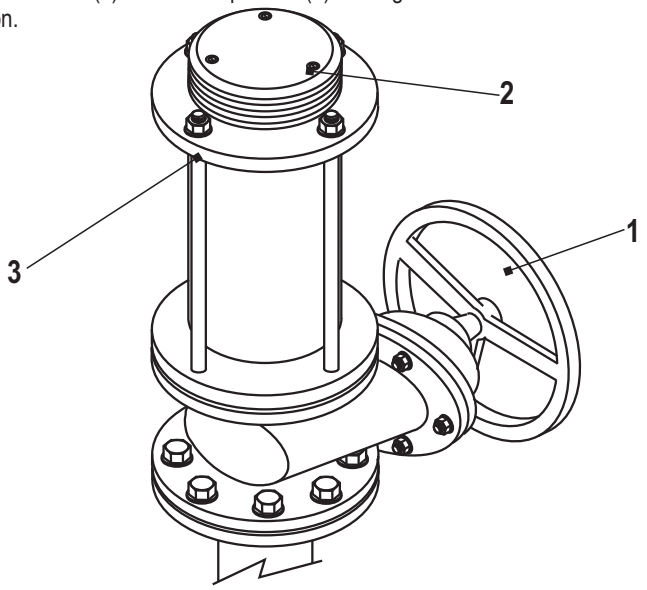
Maintenance Procedures

Step 1
Close the Isolator Valve (1). Remove Top Cover (2) utilising a flat screwdriver. Loosen Nuts (3) in a circular fashion.



Step 2
Remove the Top Flange Assembly (4) and inspect the O-Ring Seal (5) for damage. Remove the Barrel Assembly (6).

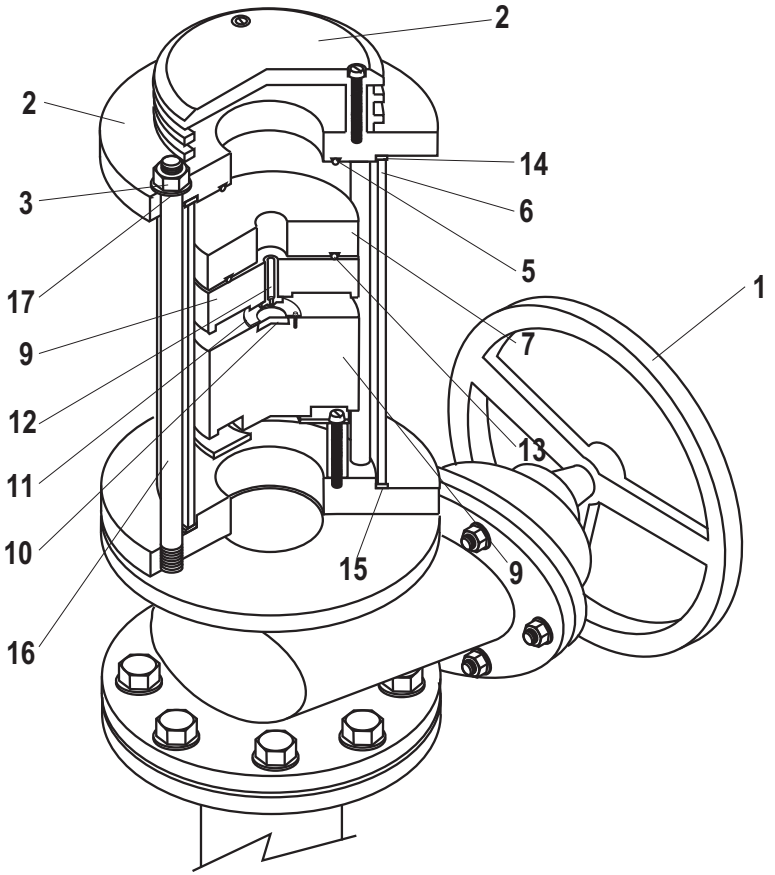
Step 3
Remove all Floats (7,8 & 9) and check for any entrapped debris. Rinse Floats in clear water.

Step 4
Replace Lower Float (9) with Nozzle Seat (10) facing upwards as indicated. Inspect the Nozzle Seat (10) for damage. Use a flat screwdriver to remove the Seat Retainer Plate (11), should the Seat Retainer Plate (11) need replacing (for DN80, 100, 150 and 200 only).

Step 5
Inspect the Small Orifice Nozzle (12) for any blockages or damage. Use a M8 spanner to remove the Small Orifice Nozzle (12) if necessary. Replace Upper Float (8) in the manner indicated. Ensure that the Small Orifice Nozzle (12) makes contact with the Nozzle Seat (10).

Step 6
Inspect the O-Ring Seat (13) for damage. Replace the "Anti-Shock" Float (7) in the manner indicated. Ensure that the O-Ring Seat (13) is facing down.

Step 7
Inspect Upper and Lower Barrel Seals (14 & 15) for damage.
Step 8
Replace the Barrel Assembly (6) ensuring that the Lower Barrel Seal (15) is in place.
Step 9
Replace the Top Flange Assembly (4), ensuring that the Upper Barrel Seal (14) is in place.
Step 10
Replace the Nuts (3) and Washers (17) ensuring that each Tie Road (16) has a Washer (17) and that the Upper Barrel Seal (14) is correctly positioned. First hand tighten Nuts (3), then "cross" tighten. Torque to the correct specification as outlined on page16. Replace Top Cover (2). Reopen Isolator (1).



Vent-O-Mat Series RBX - Tie Rod Torque Settings

Valve Press. Rating	Model No.	Tie Rod No.	Nut Size	Torque in N/metres	Torque in ft/lbs
PN25	025 RBX2511	4	M8	39	29
PN40	O25 RBX4011	4	M8	39	29
PN25	050 RBX 2511	4	M12	136	100
PN40	050 RBX 4011	4	M12	136	100
PN16	080 RBX 1611	4	M16	271	200
PN25	080 RBX 2501	4	M16	271	200
PN40	080 RBX 4001	8	M16	271	200
PN16	100 RBX 1601	4	M16	271	200
PN25	100 RBX 2501	4	M16	271	200
PN40	100 RBX 4001	8	M16	271	200
PN16	150 RBX 1601	8	M20	610	450
PN25	150 RBX 2501	8	M20	610	450
PN40	150 RBX 4001	12	M20	610	450
PN16	200 RBX 1601	8	M20	610	450
PN25	200 RBX 2501	8	M20	610	450
PN40	200 RBX 4001	12	M20	610	450

Vent-O-Mat Identity Labels

Each Vent-O-Mat valve sold has an identity label attached to the barrel, providing pertinent information on the valve. A sample of the label is provided below. For maintenance and technical assistance, kindly contact the agent that services your area (see page 16 for Vent-O-Mat's agent list), or the manufacturer (details on label), quoting the information on the label.

1. SEQ. No: Refers to sequential number of batch valves for specific orders/ contracts.
2. MODEL: Refer to page 17 for explanation of Model Numbers.
3. MAX WORKING PRESSURE: Indicates the valve's designed working pressure in kPa.
4. REF. No: Serial number that reefers to Vent-O-Mat's internal paperwork, including test compliance that can be crossed referenced to any test carried out on valve.

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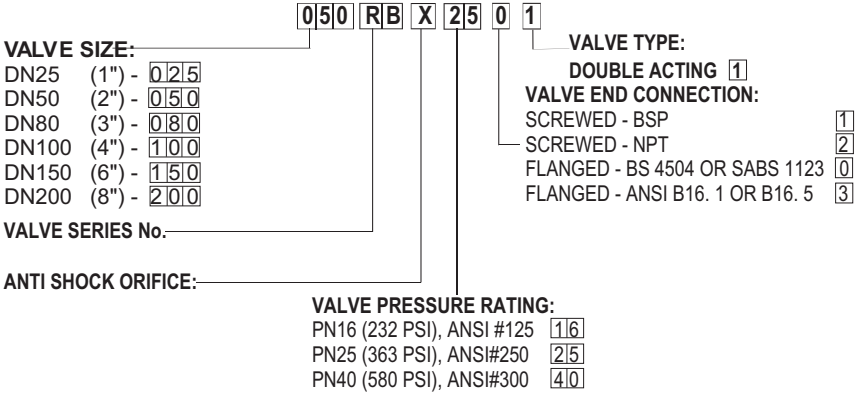
EXPLANATION OF MODEL NUMBERS

Vent-O-Mat model numbers are a series of numbers providing information on valve size, valve type, valve pressure rating and valve end connection.



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AIR VALVE SIZING AND POSITIONING

The presence of air in a water main in service or in the process of being filled is well known to be the cause of serious problems such as delay in filling, throttling and reduction in discharge capacities, risk of surge and water hammer and corrosion.

The indiscriminate selection and positioning of double acting air valves, without thorough evaluation of the system characteristics and dynamics will not solve the problem of air in the main but can and will lead to the aggravation of phenomena associated with it's presence as well as introduce other destructive phenomena.

Air valve selection and positioning is a complex exercise because of the unpredictable nature of air as it is influenced by many factors such as pressure, temperature, pipeline velocities etc., and it in turn influences the pipeline dynamics dramatically, making it difficult to quantify.

This section of the document provides the engineer with a guideline of where to position and how to size Vent-O-Mat air valves to ensure the maximum performance and protection is gained from every valve installation. Reference should also be made to Vent-O-Mat's other publications and Vent-O-Mat's computer sizing disc for a more comprehensive guide on air valve sizing and positioning.

Positioning of Air Valves

Air valves are positioned primarily on peak points to discharge air during initial filling and to draw air into the pipeline under drainage conditions. There are however, a number of other locations where air valves need to be installed to ensure effective pipeline operation and protection against phenomena such as surge and water hammer. The table below provides a quick check reference on where to position air valves.

Recommended Air Valve Locations
On apex points relative to the hydraulic gradeline.
5 metres below the apex points formed by the intersection of the hydraulic gradeline.
Negative breaks - increase in downward slope or decrease in upward slope.
Long horizontal sections - every 600 metres.
Long ascending sections - every 600 metres.
Long descending sections - every 600 metres.
Pump discharge - subsequent to a pump non return valve.
Prior to a pump non return valve - pump without positive suction head.
Prior to a pump non return valve - deepwell application.
Blank ends - where a pipeline is terminated by a blank flange or a valve.

Sizing of Air Valves for air Intake (Vacuum Conditions)
Air valves are first and foremost sized for vacuum conditions (drainage) which may result from scouring of pipeline, pipeline rupture or instantaneous pump stoppage causing column separation.

The objective in sizing an air valve for vacuum conditions is to determine the smallest air release and vacuum break valve capable of admitting air into the pipeline whilst not exceeding a differential pressure that would put the pipeline and gasket joint at risk due to negative internal pressure.

Good pipeline design practice dictates that the following negative pressures not be exceeded for various pipe material to ensure that pipe collapse or seal failure does not occur.

Pipe Material	Recommended Negative Differential
Steel	35 kPa
Ductile Iron	35kPa
Fibre Cement	35 kPa
GRP	20 kPa
uPVC	15 kPa - 20 kPa
HDPE	15 kPa - 20 kPa
Concrete	35 kPa

Air valves are generally sized on scouring velocities or partial rupture to economise on the valve size selected. The following rupture rates (as a percentage of pipeline area), are generally used. Note all these factors are taken into consideration in the Vent-O-Mat Sizing Disc which is freely available to any interested party.

Pipeline Material	Rupture Rate on which to base Size of Air Valve
Steel	10 - 15 %
GRP	10 - 15 %
Fibre Cement	50 - 100 %
Ductile Iron	10- 15%
uPVC	10 - 20 %
HDPE	10 - 20 %

Scouring rates are generally 11 to 12% of pipeline area.

Sizing of Air Valves for Air Discharge (Initial Filling Conditions)
It is prudent to size an air valve for both filling and drainage for a particular point on the pipeline and always to select the larger valve.

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Sizing an air valve for filling is based on the velocity through the pipeline, the diameter of the pipeline and the pipeline material. Below is a quick check guide to determine if the valve on your pipeline is sized correctly. Vent-O-Mat recommends however, that air valve sizing should be done, utilising the Vent-O-Mat sizing programme, and with reference to Vent-O-Mat's document titled "Air Valve Technology Reviewed".

Pipeline Velocity	Pipeline Diameter	Recommended Valve Size
1 m/sec.	DN50 to DN200DN25	
1 m/sec.	DN200 to DN400	DN50
1 m/sec.	DN400 to DN600	DN80
1 m/sec	DN600 to DN700	DN100
1 m/sec.	DN700 to DN900	DN150
1 m/sec.	DN900 to DN1400	DN200
2 m/sec.	DN100 to DN200	DN50
2 m/sec.	DN200 to DN400	DN80
2 m/sec.	DN400 to DN500	DN100
2 m/sec.	DN500 to DN800	DN150
2 m/sec.	DN800 to DN1000	DN200

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TECHNICAL FEATURES & FINANCIAL BENEFITS

The criteria for assessing the merits of any form of pipeline equipment are capital costs and operating and maintenance requirements. It is likely if all the below are taken into account, Vent-O-Mat valves will be seen as a cheap, reliable and efficient form of pipeline protection.

Vacuum Protection
All Vent-O-Mat valves have large orifice diameters equal to the nominal size of the valve i.e., a DN200 valve has a 200mm orifice. This ensures the least possible resistance to the intake of air and consequently the least possible negative pressure within a draining pipeline.

Discharge Performance
The Vent-O-Mat valve design is not limited to the velocity within the pipeline and the differential across the large orifice as conventional air valves are. This ensures the effective removal of all air from a filling pipeline whilst eliminating the possibilities of surge and water hammer on closure of the large orifice.

Serviceability
The Vent-O-Mat valve is virtually maintenance free, but facilitates extreme ease of service and maintenance in the rare instances when required. Components are in corrosion free materials to allow problem free disassembly and reassembly even after years of operation. All maintenance spares are replaceable without special tools or skills.

Performance
Vent-O-Mat series RBX has been designed and developed to provide the optimum usable and safe performance relative to all functions. Selection data has bee substantiated through the council of Scientific and Industrial Research - South Africa and other testing and can be confidently referenced.

Surge & Water Hammer Protection
Vent-O-Mat offers a cost effective and efficient solution to destructive phenomena such as surge and water hammer as all valves are supplied as standard, with an integral "Anti-Shock" surge alleviation mechanism. This device only operates in instances such as rapid filling or column separation to effectively and efficiently eliminate surge and water hammer, very much like an air bag in a motor vehicle in that it only operates in emergencies.

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Financial Benefits
The "" mechanism together with other features of the vent-o-mat design provides a number of financial benefits some of which are:

Reduction in Size or Total Elimination of Traditional Surge Protection Devices
The valve acts both as an effective double acting air valve and as a cost effective surge alleviation mechanism. Accommodating the vent-o-matseries RBX air valve in total surge protection strategy renders total protection to a pipeline at a fraction of the cost of any conventional method.

Shortening of Operational Procedures
Lengthy operational procedures can be dramatically shortened when utilising Vent-O-Mat air valves with out the risk of pipeline collapse, premature closure or water hammer. This allows for major time saving.

Cost Saving on Overspecified Pipe
Very many design engineers overspecify on pipe thickness to prevent unforeseen pipeline damage. This is unnecessary when utilising Vent-O-Mat air valves as it efficiently manages air within the pipeline therefore greatly minimising the possibility of unforeseen accidents.

Increase of Flow Through Existing Infrastructure
Many pipeline operate very inefficiently because of restriction created by air that is not released effectively by air valves. Vent-O-Mat valves are designed to discharge all air in a pipeline regardless of flow velocities, without the inducement of water hammer and other destructive phenomena associated with kinetic air valves. This feature allows for the increase of flow of up to 30% through existing infrastructure, by the mere replacement of conventional air valves with the Vent-O-Mat design.

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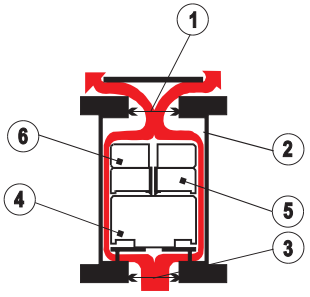
VENT-O-MAT SERIES RBX OPERATION

The Vent-O-Mat Series RBX valve, under normal conditions,operates as a standard air valve with the exception that it does not have the drawbacks such as: restricted large orifice diameters, is not affected by phenomena such as the "Venturi Effect" or "Dynamic Closure" and does not induce surge and water hammer on closure of the large orifice.

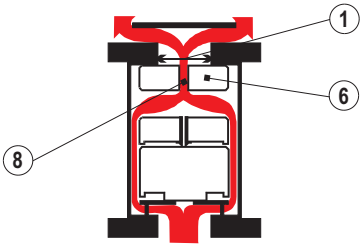
The valve reacts, in instances of rapid filling or column separation as an effective surge alleviation mechanism, in that it automatically controls the rate of air discharge, thereby effectively dissipating the energy of the surge whilst decelerating the approaching water column. The operation of the valve under these conditions can be compared to a safety air bag in a motor vehicle.

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 Barrel (2) and discharges from the Large Orifice (1) into atmosphere.

Venting of a Filling Pipeline (Excessive Water Approach Velocity



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



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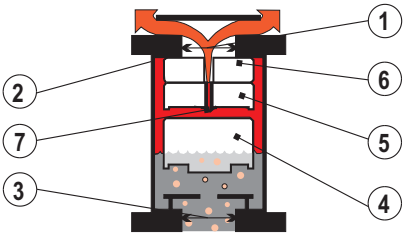
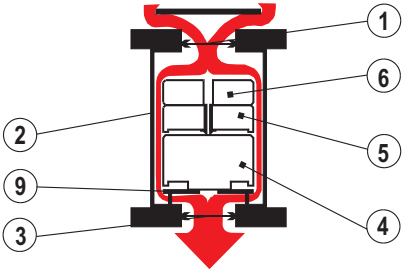
Pressurised Air Release from a Full Pipeline



Subsequent to the filling of a pipeline, liquid enters the valve Barrel Chamber (2) and the Float (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 acting on a relatively large area of the Orifice (1) will lock Floats (5) and (6) into a 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 Float (4) and reseals 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 onto 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.

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VENT-O-MAT®

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