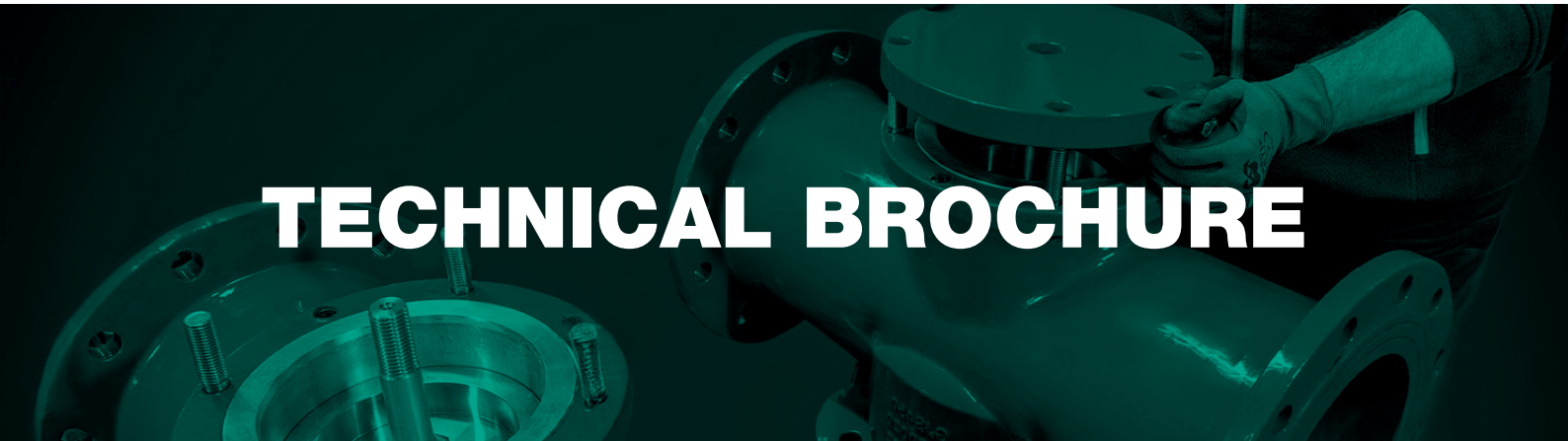
Pietro Fiorentini

WAVE

Water air valve



TECHNICAL BROCHURE

Pietro Fiorentini S.p.A.
Via E.Fermi, 8/10 | 36057 Arcugnano, Italy | +39 0444 968 511
sales@fiorentini.com

The data are not binding. We reserve the right
to make changes without prior notice.

WAVE_technicalbrochure_ENG_revB

www.fiorentini.com

Combination air valve

WAVE 3S

The WAVE series air valves are single-chamber, full-bore combined automatic devices. They ensure that the water network functions properly by managing the air volumes inside the pipelines and allowing the pressurised air to be degassed.

The WAVE 3S air valve performs three functions: degasses pressurised air during normal operation, and controls the entrance and discharge of large volumes of air during the draining and filling of pipelines.

Constructive features and advantages

- Full-bore, single chamber housing, in ductile iron; class PN 40, fitted with cast ribs for optimum guidance of the central mobile block.
- Aerodynamic deflector to prevent premature closure of the mobile block.
- Drainage valve for draining the chamber.
- Central mobile block consisting of a float and an upper plate, both cylindrical and made of solid polypropylene, joined by the nozzle and gasket holder. The solid floats avoid deformation phenomena at high pressures and, machined on the lathe, guarantee more precise sliding within the body ribs and a perfectly vertical thrust.
- Nozzle and gasket holder in AISI 316, designed to prevent gasket wear caused by excessive crushing.
- Ductile cast iron cap and stainless steel filter, in the standard configuration.
- Maintenance can be easily performed from the top, without removing the air valve from the pipeline.

Main applications

- Intake pipelines
- Distribution networks
- Irrigation systems
- It is generally used at slope changes and at the high points of the pipelines

Operating principle

Discharge of large volumes of air

During the pipe filling, it is necessary to let out as much air as water enters. Thanks to the aerodynamic shape of the full-bore body and the deflector, the WAVE 3S air valve prevents the mobile block from closing prematurely during this phase.

Pressurised air degassing

During operation, the air inside the pipeline accumulates at the top of the air valve, compresses and builds up to the same pressure as the water. As it increases in volume, it pushes the float downwards and thus allows degassing through the nozzle.

Entrance of large volumes of air

During the pipe draining or in the event of pipe burst, it is necessary to draw in as much air as there is water coming out to avoid depressions and serious damage to the network.

Optional functions

Dual-function WAVE 3S version, also called vacuum breaker**.** Suitable for locations where no air release is needed. It is used at upward slope changes and long ascending sections of the pipe; in dry and fire-prevention installations.

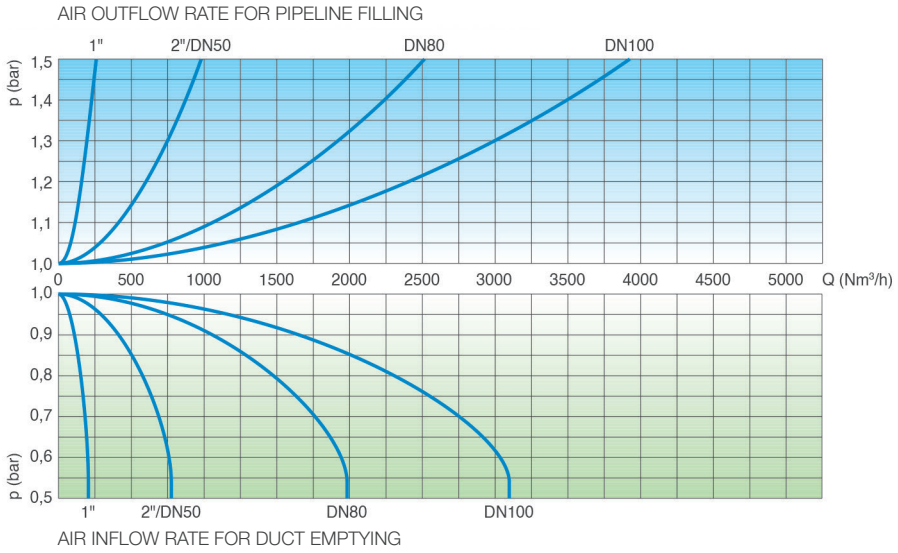
SUB version, with air conveyance, available for WAVE 2S and 3S models. The threaded bend, connected to an discharge pipe, allows the air valve to operate even in the event of flooding of the well or the installation site, without the risk of contaminated water entering the pipeline. Another advantage of the SUB model is the possibility of conveying spurts when the air valve is closing.

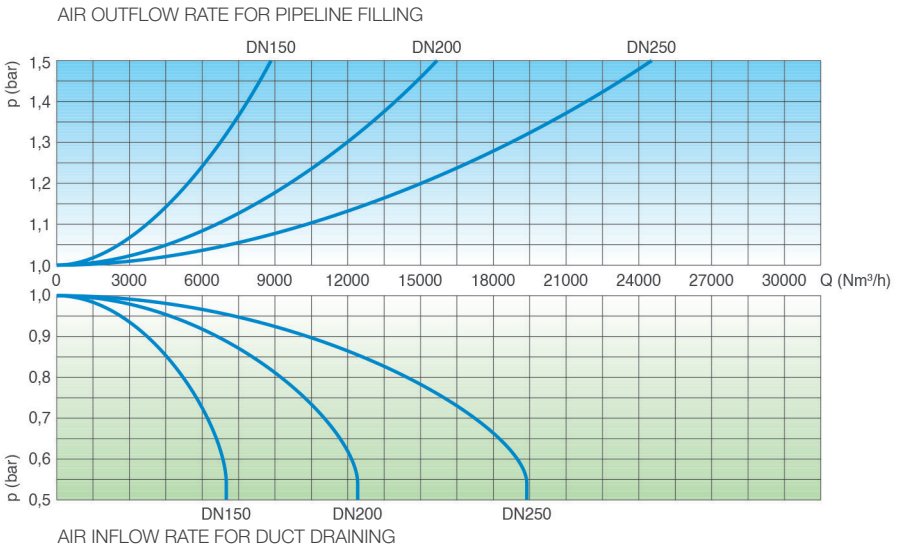
EO SERIES discharge only version, available for WAVE 2S and 3S models. This variant is designed to allow the air valve to be installed at critical points of the layout where HGL may drop below the pipe profile, thus operating under vacuum, and at any other junction where, for design reasons, air return must be absolutely avoided.

IO-entrance only version, available for the WAVE 2S dual-function model. This variant is designed to allow for the installation of the air valve at critical points of the layout where, for design reasons, air outflow must be avoided. It should be noted that, when using the IO version, the air valve does not provide any protection against overpressure caused by filling the pipeline.

Technical data

Air flow characteristic charts





Operating conditions

Maximum treated water	60°C
Maximum pressure	40 bar
Minimum pressure	0.2 bar (lower on request)

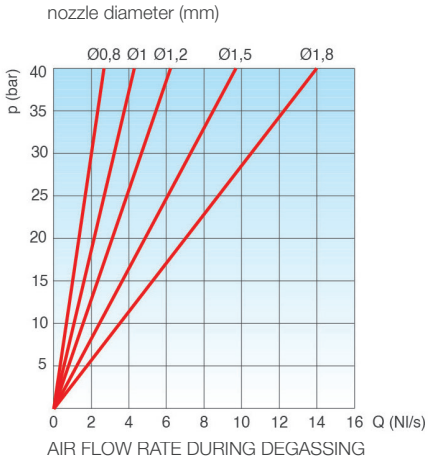
Standard

- Design according to EN 1074/4, in accordance with AWWA C-512
- Drilling according to EN 1092-2 or ANSI 150
- Fluid bed coating RAL 5005 blue

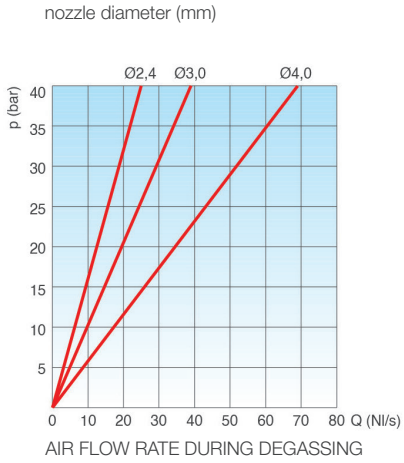
Modifications to painting and flanging standards on request.

Choice of nozzle

Nozzle diameter in mm depending on air valve size and PN.



AIR FLOW RATE DURING DEGASSING



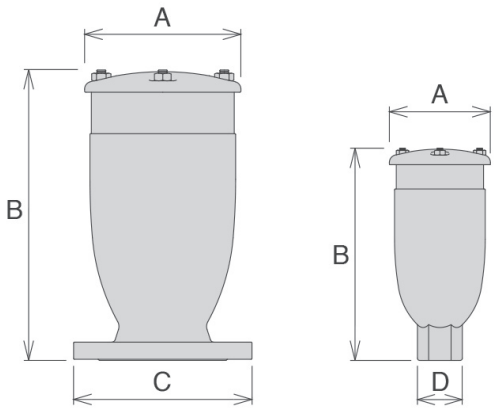
AIR FLOW RATE DURING DEGASSING

Air flow charts are obtained in Kg/s from laboratory tests and numerical analysis, without filtering, and converted to Nm3/h by applying an appropriate safety factor.

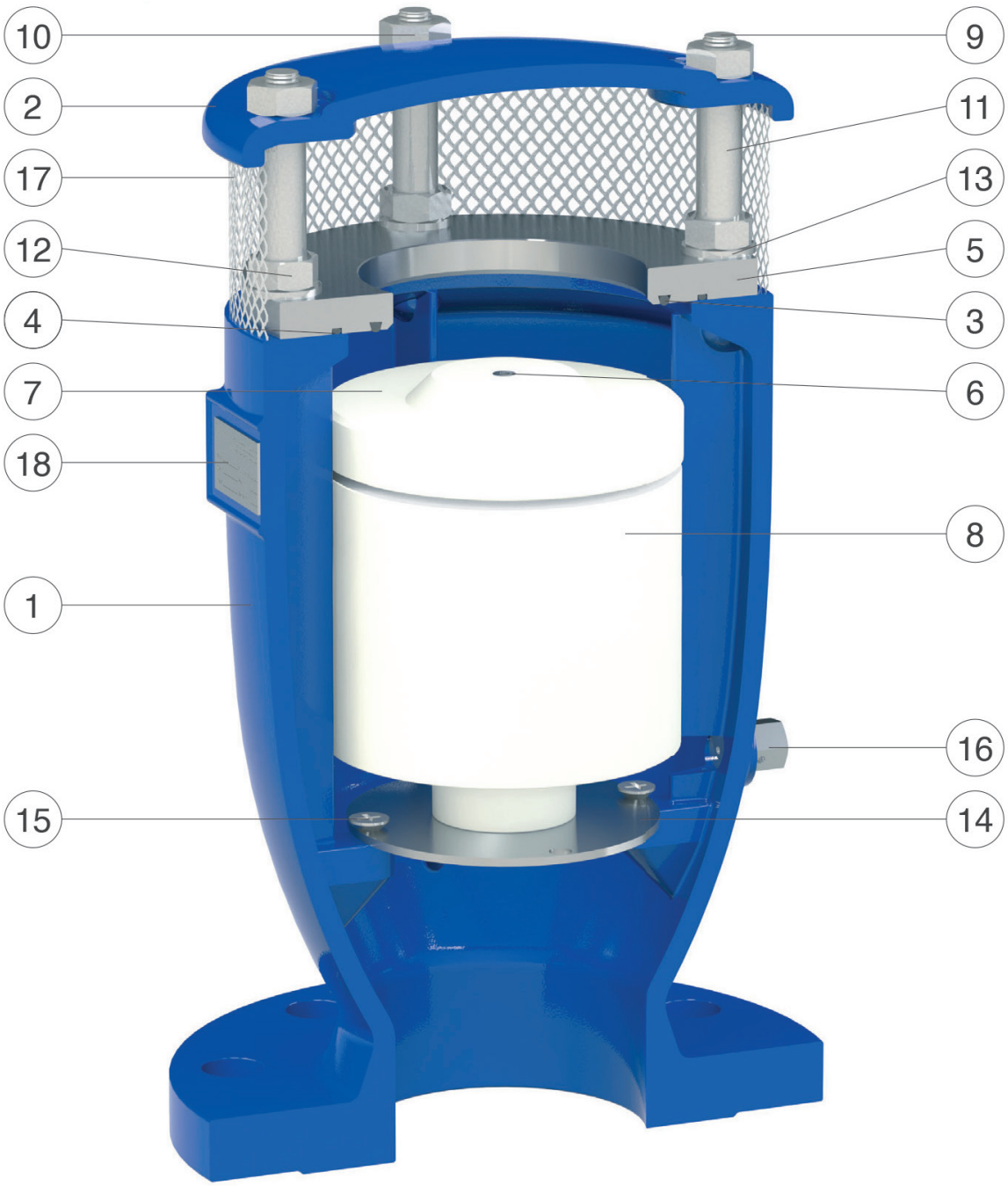
	PN 10	PN 16	PN 25	PN 40
1”	1.2	1.2	1	0.8
2”/DN 50	1.5	1.2	1	0.8
DN 80	1.8	1.5	1.2	1
DN 100	2.4	1.8	1.8	1.2
DN 150	4	3	2.4	1.8
DN 200	4	4	4	3
DN 250	4	4	4	4

Dimensions and weights

CONNECTION inches/mm	A mm	B mm	C mm		D mm	Weight Kg
Threaded 1”	117	240	-	-	CH 45	4.0
Threaded 2”	141	295	-	-	CH 70	7.5
Flanged 50	141	305	165	-	-	9.5
Flanged 80	172	322	210	205	-	13.8
Flanged 100	206	370	235	220	-	21.7
Flanged 150	285	555	305	285	-	44.5
Flanged 200	365	635	375	340	-	85.0
Flanged 250	450	785	450	405	-	134.0



Construction details



No.	Component	Standard material	Optional
1	Body	ductile cast iron GJS 450-10	
2	Cap	ductile cast iron GJS 450-10	
3	Seal seat gasket	NBR	EPDM/Viton/silicone
4	Seal seat O-ring	NBR	EPDM/Viton/silicone
5	Seal seat	AISI 304 stainless steel	AISI 316 stainless steel
6	Nozzle unit	AISI 316 stainless steel	
7	Plug plate	polypropylene	
8	Float	polypropylene	
9	Studs	AISI 304 stainless steel	AISI 316 stainless steel
10	Nuts	AISI 304 stainless steel	
11	Spacers	AISI 304 stainless steel	AISI 316 stainless steel
12	Nuts	AISI 304 stainless steel	AISI 316 stainless steel
13	Washers	AISI 304 stainless steel	AISI 316 stainless steel
14	Deflector (not in 1")	AISI 304 stainless steel	AISI 316 stainless steel
15	Screws	AISI 304 stainless steel	AISI 316 stainless steel
16	Unloading valve	AISI 303 stainless steel	AISI 316 stainless steel
17	Filter	AISI 304 stainless steel	
18	Label	AISI 304 stainless steel	

The table of materials and components is subject to change without notice.

Automatic combination anti-water hammer air valve **WAVE 3S-AWH**

The WAVE series air valves are single-chamber, full-bore combined automatic devices. They ensure that the water network functions properly by managing the air volumes inside the pipelines and allowing the pressurised air to be degassed.

The WAVE 3S-AWH air valve ensures degassing, the re-entry of large volumes of air during draining operations, and the outflow of air at a controlled speed to avoid the risk of water hammer.

Constructive features and advantages

- Full-bore, single chamber housing, in ductile cast iron; class PN 40, fitted with cast ribs for optimum guidance of the central mobile block.
- Drainage valve for draining the chamber.
- Central mobile block consisting of a float and an upper plate, both cylindrical and made of solid polypropylene, joined by the nozzle and gasket holder. The solid floats avoid deformation phenomena at high pressures and, machined on the lathe, guarantee more precise sliding within the body ribs and a perfectly vertical thrust.
- Nozzle and gasket holder made of AISI 316 stainless steel.
- Anti-shock system (AWH) consisting of a stainless steel spring and guide shaft, and a plate with sizable holes to control the air outflow.
- AWH insert can be supplied separately, to assemble on WAWE air valves already in operation.
- Ductile cast iron cap and stainless steel filter, in the standard configuration.
- Maintenance can be easily performed from the top, without removing the air valve from the pipeline.

Main applications

- Intake pipelines
- Distribution networks
- Irrigation systems
- It is generally used at pumps, slope changes on ascending sections and at high points of pipelines subject to water hammer

Operating principle

Controlled air outflow

During air outflow, the anti-shock system (AWH) reduces the speed of the incoming water column by decreasing the outflow. This avoids rapid air valve closures, the resulting overpressure and the risk of water hammer.

Pressurised air degassing

During operation, the air inside the pipeline accumulates at the top of the air valve, compresses, and arrives at the same pressure as the water. By increasing its volume, it pushes the float down and thus allows degassing through the nozzle.

Entrance of large volumes of air

During the pipe draining or in the event of pipe burst, it is necessary to draw in as much air as there is water coming out to avoid depressions and serious damage to the network.

Optional functions

Dual-function WAVE 3S-AWH version, also called vacuum breaker. Suitable for locations where no air release is needed. It is used at upward slope changes and long ascending sections of the pipe; in dry and fire-prevention installations.

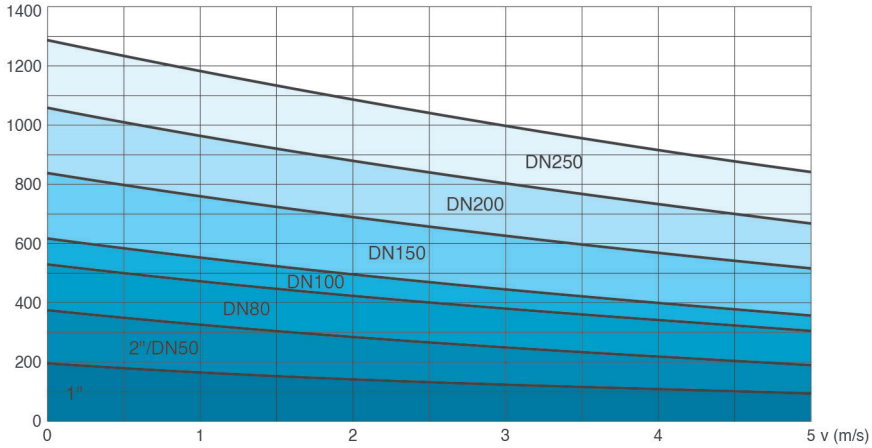
SUB version, with air conveyance, available for WAVE 2S-AWH and 3S-AWH models. The threaded bend, connected to an discharge pipe, allows the air valve to operate even in the event of flooding of the well or the installation site, without the risk of contaminated water entering the pipeline. Another advantage of the SUB model is the possibility of conveying spurts when the air valve is closing.

The force of the **counter spring** as well as **sonic nozzles**, both responsible of the proper operation of the AWH, can be modified according to the to the project conditions and the transient analysis.

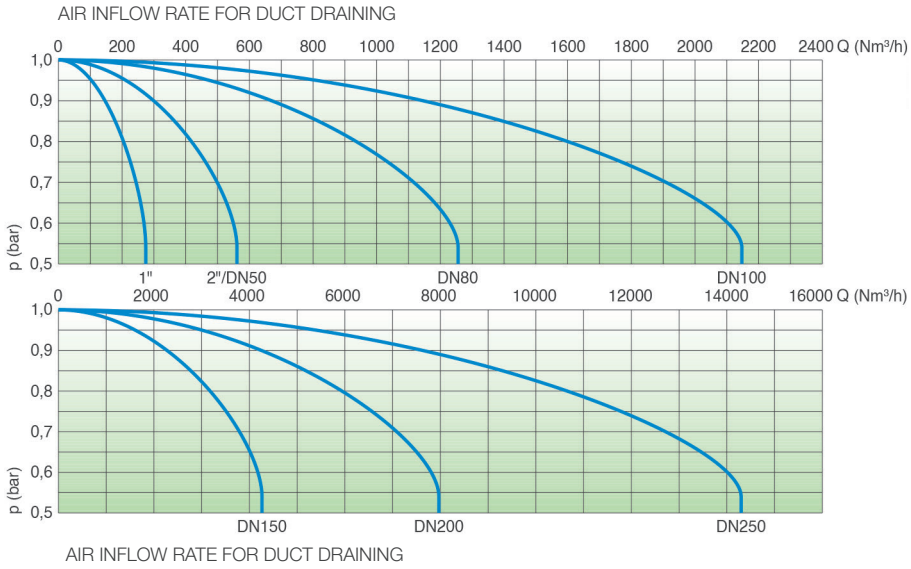
Technical data

Air valve selection chart

Preliminary dimensioning according to pipeline diameter and required air outflow speed.
Pipeline DN (mm)



Air flow characteristic charts



Operating conditions

Maximum treated water	60°C
Maximum pressure	40 bar
Minimum pressure	0.2 bar (lower on request)

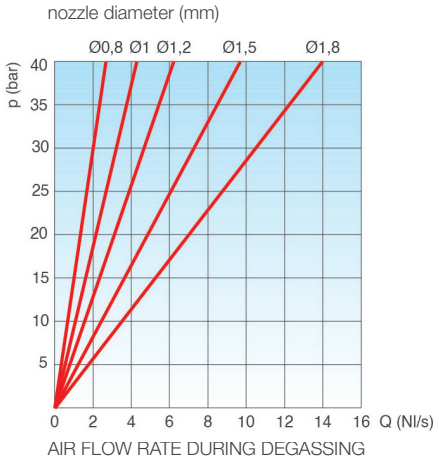
Standard

- Design according to EN 1074/4, in accordance with AWWA C-512
- Drilling according to EN 1092-2 or ANSI 150
- Fluid bed coating RAL 5005 blue

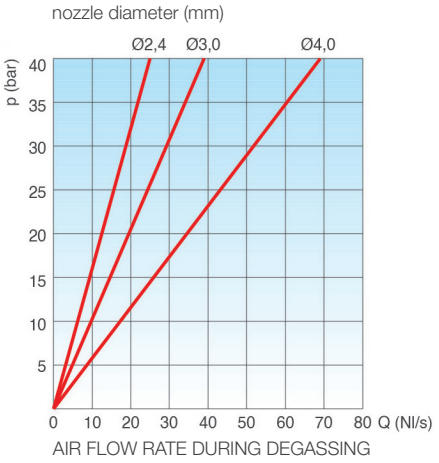
Modifications to painting and flanging standards on request.

Choice of nozzle

Nozzle diameter in mm depending on air valve size and PN.



AIR FLOW RATE DURING DEGASSING



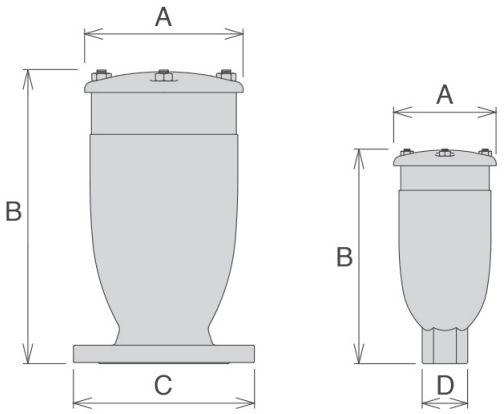
AIR FLOW RATE DURING DEGASSING

Air flow charts are obtained in Kg/s from laboratory tests and numerical analysis, without filtering, and converted to Nm3/h by applying an appropriate safety factor.

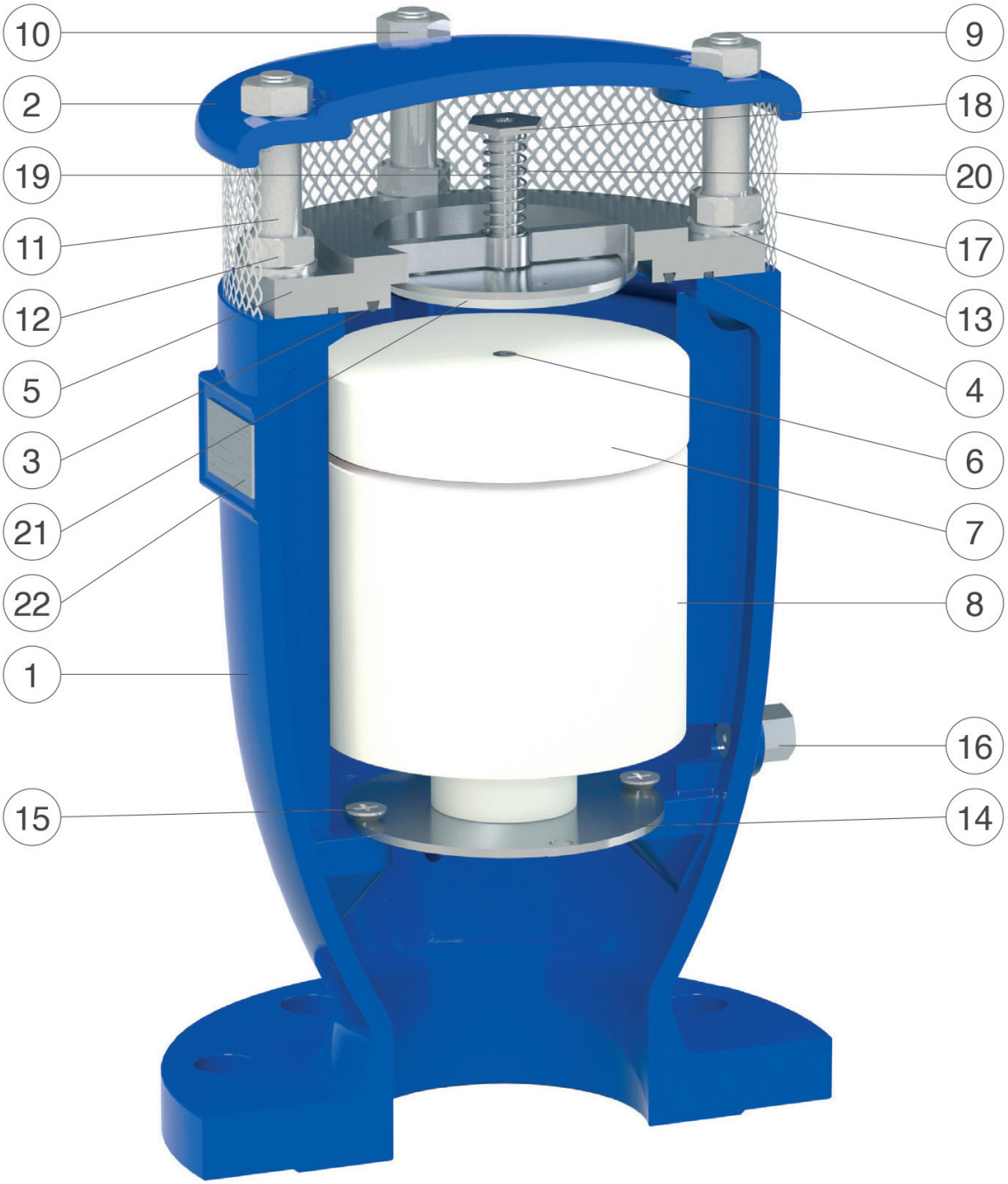
	PN 10	PN 16	PN 25	PN 40
1”	1.2	1.2	1	0.8
2”/DN 50	1.5	1.2	1	0.8
DN 80	1.8	1.5	1.2	1
DN 100	2.4	1.8	1.8	1.2
DN 150	4	3	2.4	1.8
DN 200	4	4	4	3
DN 250	4	4	4	4

Dimensions and weights

CONNECTION inches/mm	A mm	B mm	C mm		D mm	Weight Kg
Threaded 1”	117	240	-	-	CH 45	4.0
Threaded 2”	141	295	-	-	CH 70	7.5
Flanged 50	141	305	165	-	-	9.5
Flanged 80	172	322	210	205	-	13.8
Flanged 100	206	370	235	220	-	21.7
Flanged 150	285	555	305	285	-	44.5
Flanged 200	365	635	375	340	-	85.0
Flanged 250	450	785	450	405	-	134.0



Construction details



No.	Component	Standard material	Optional
1	Body	ductile cast iron GJS 450-10	
2	Cap	ductile cast iron GJS 450-10	
3	Seal seat gasket	NBR	EPDM/Viton/silicone
4	Seal seat O-ring	NBR	EPDM/Viton/silicone
5	Seal seat	AISI 304 stainless steel	AISI 316 stainless steel
6	Nozzle unit	AISI 316 stainless steel	
7	Plug plate	polypropylene	
8	Float	polypropylene	
9	Studs	AISI 304 stainless steel	AISI 316 stainless steel
10	Nuts	AISI 304 stainless steel	
11	Spacers	AISI 304 stainless steel	AISI 316 stainless steel
12	Nuts	AISI 304 stainless steel	AISI 316 stainless steel
13	Washers	AISI 304 stainless steel	AISI 316 stainless steel
14	Deflector (not in 1")	AISI 304 stainless steel	AISI 316 stainless steel
15	Screws	AISI 304 stainless steel	AISI 316 stainless steel
16	Drain valve	AISI 303 stainless steel	AISI 316 stainless steel
17	Filter	AISI 304 stainless steel	
18	Clamping nut (from DN 100)	AISI 303 stainless steel	AISI 316 stainless steel
19	Spring	AISI 302 stainless steel	
20	Guide shaft	AISI 303 stainless steel	AISI 316 stainless steel
21	AS plate	AISI 304 stainless steel	AISI 316 stainless steel
22	Label	AISI 304 stainless steel	

The table of materials and components is subject to change without notice.

Automatic combination anti-water hammer air valve **WAVE 3S-CSF**

The WAVE series air valves are single-chamber, full-bore combined automatic devices. They ensure that the water network functions properly by managing the air volumes inside the pipelines and allowing the pressurised air to be degassed.

The WAVE 3S-CSF air valve ensures degassing during operation, and the return of large volumes of air when emptying pipelines. In addition, during the filling phase, it keeps the air outflow speed within a preset safety limit to avoid the risk of water hammer.

Constructive features and advantages

- Uncontrolled filling of the pipeline and transient events cause the system air valves to close quickly, resulting in damage. In such cases, the WAVE 3S-CSF air valve, by automatically decreasing the outflow capacity, reduces the speed of the incoming water column, thus minimising the risk of water hammer.
- Compared to normal combined air valves, it reduces water leakage during closure, and the risk of flooding of the air valve during possible rapid filling of the pipeline at low pressure.
- Full-bore, single chamber housing, in ductile cast iron; class PN 40, fitted with cast ribs for optimum guidance of the central mobile block.
- Central mobile block consisting of a cylindrical solid polypropylene float and upper plate joined by the nozzle and gasket holder, and a CSF anti-water hammer plate.
- AISI 316 stainless steel nozzle and gasket holder, designed to prevent gasket wear due to excessive crushing.
- Ductile cast iron cap and stainless steel filter, in the standard configuration.

Main applications

- Intake pipelines
- Distribution networks
- Irrigation systems
- It is generally used as an alternative to WAVE 3S-AWH at slope changes and high points in pipelines.

Operating principle

Discharge of large volumes of air

During the pipe filling, it is necessary to let out as much air as water enters. Thanks to the aerodynamic shape of the full-bore body and the deflector, the WAVE 3S-CSF air valve prevents the mobile block from closing prematurely during this phase.

Pressurised air degassing

During operation, the air produced by the pipeline accumulates at the top of the air valve, compresses, and arrives at the same pressure as the water. By increasing in volume, it pushes the float down and thus allows degassing.

Controlled air outflow

During the filling of the pipeline, if the air pressure rises above a certain value, with the risk of water hammer and damage to the system, the CSF upper plate automatically rises, reducing the outflow and consequently the speed of the approaching water column.

Entrance of large volumes of air

In the event of emptying or rupture of a pipeline, it is necessary to draw in as much air as there is water coming out to avoid depressions and possible serious damage to the network.

Optional functions

Dual-function WAVE 2S-CSF version, also called vacuum breaker. Suitable for locations where no air release is needed. It is used at upward slope changes and long ascending sections of the pipe; in dry and fire-prevention installations.

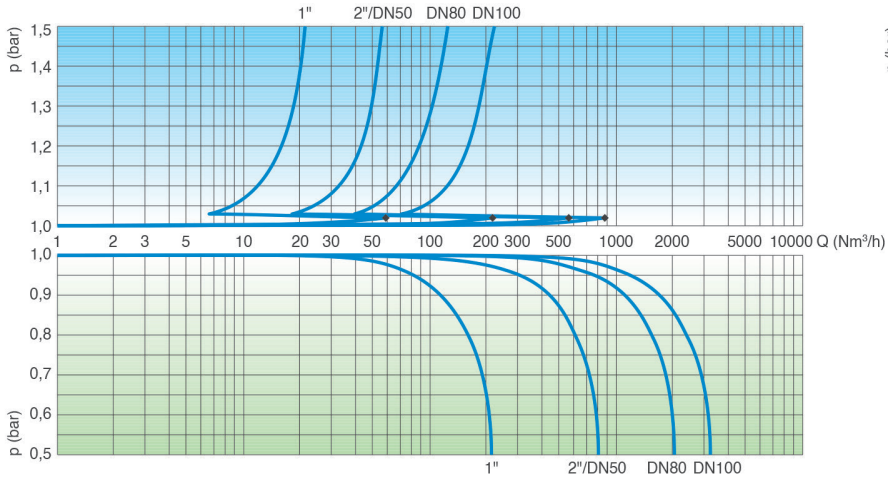
SUB version, with air conveyance, available for both WAVE 2S-CSF and 3S-CSF models. The threaded bend, connected to an discharge pipe, allows the air valve to operate even in the event of flooding of the well or the installation site, without the risk of contaminated water entering the pipeline. Another advantage of the SUB model is the possibility of conveying spurts when the air valve is closed.

EO SERIES discharge only version, available for WAVE 2S-CSF and 3S-CSF models. This variant is designed to allow the air valve to be installed at critical points of the layout where HGL may drop below the pipe profile, thus operating under vacuum, and at any other junction where, for design reasons, air return must be absolutely avoided.

Technical data

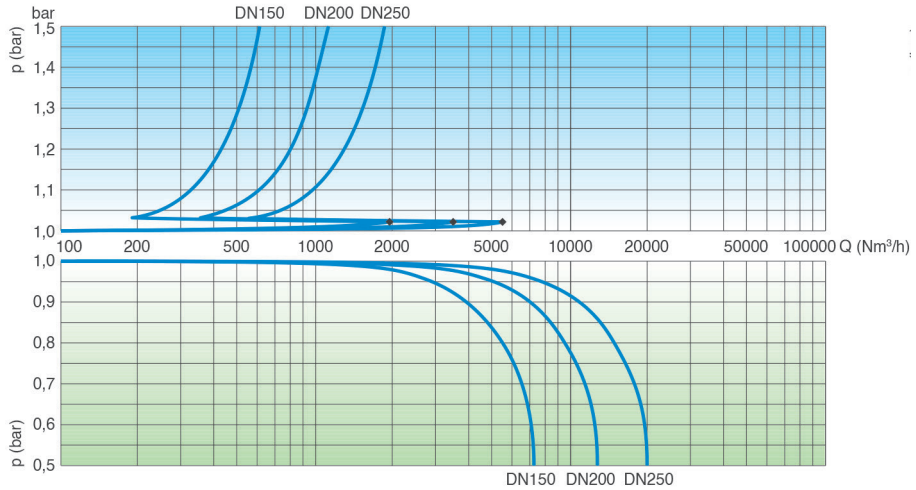
Air flow characteristic charts

AIR OUTFLOW RATE FOR PIPELINE FILLING



AIR INFLOW RATE FOR DUCT DRAINING

AIR OUTFLOW RATE FOR PIPELINE FILLING



AIR INFLOW RATE FOR DUCT DRAINING

Operating conditions

Maximum treated water	60°C
Maximum pressure	40 bar
Minimum pressure	0.2 bar (lower on request)

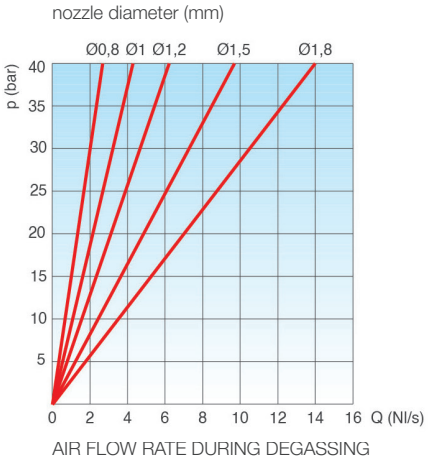
Standard

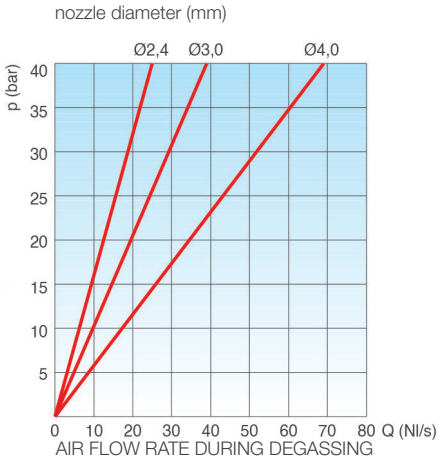
- Design according to EN 1074/4, in accordance with AWWA C-512
- Drilling according to EN 1092-2 or ANSI 150
- Fluid bed coating RAL 5005 blue

Modifications to painting and flanging standards on request.

Choice of nozzle

Nozzle diameter in mm depending on air valve size and PN.



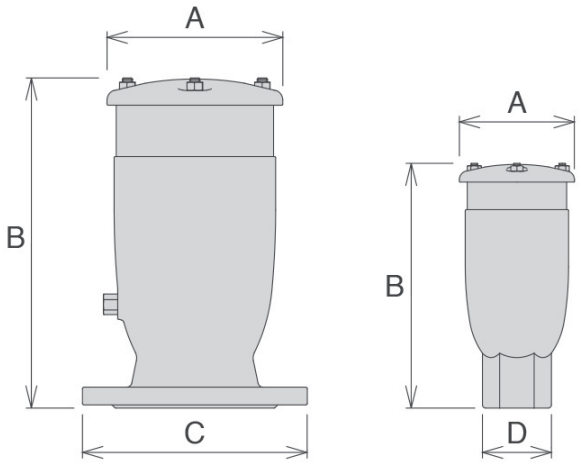


Air flow charts are obtained in Kg/s from laboratory tests and numerical analysis, without filtering, and converted to Nm3/h by applying an appropriate safety factor.

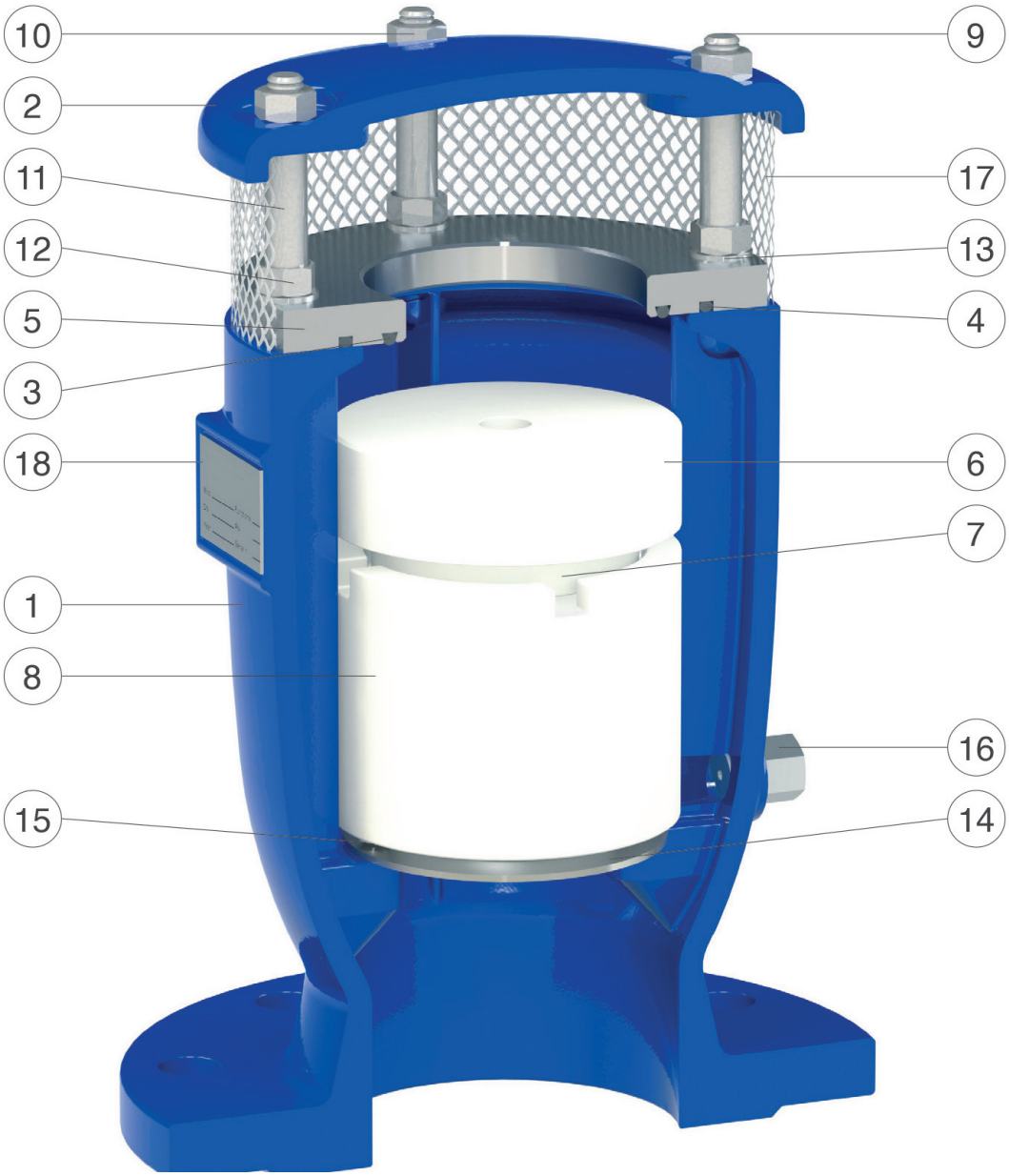
	PN 10	PN 16	PN 25	PN 40
1”	1.5	1.2	1	0.8
2”/DN 50	1.8	1.5	1.2	1
DN 80	1.8	1.5	1.2	1
DN 100	3	2.4	1.8	1.2
DN 150	4	3	2.4	1.8
DN 200	4	4	4	3
DN 250	4	4	4	4

Dimensions and weights

CONNECTION inches/mm	A mm	B mm	C mm		D mm	Weight Kg
Threaded 1”	117	240	-	-	CH 45	4.0
Threaded 2”	141	295	-	-	CH 70	7.5
Flanged 50	141	305	165	-	-	9.5
Flanged 80	172	322	210	205	-	13.8
Flanged 100	206	370	235	220	-	21.7
Flanged 150	285	555	305	285	-	44.5
Flanged 200	365	635	375	340	-	85.0
Flanged 250	450	785	450	405	-	134.0



Construction details

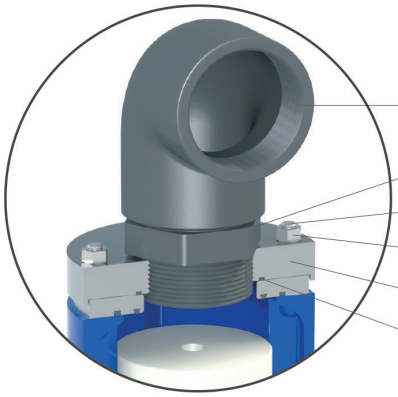


No.	Component	Standard material	Optional
1	Body	ductile cast iron GJS 450-10	
2	Cap	ductile cast iron GJS 450-10	
3	Seal seat gasket	NBR	EPDM/Viton/silicone
4	Seal seat O-ring	NBR	EPDM/Viton/silicone
5	Seal seat	AISI 304 stainless steel	AISI 316 stainless steel
6	RFP plate with O-ring	polypropylene and NBR	EPDM/Viton/silicone
7	Plug plate with nozzle	polypropylene and AISI 316 stainless steel	
8	Float	polypropylene	
9	Studs	AISI 304 stainless steel	AISI 316 stainless steel
10	Nuts	AISI 304 stainless steel	AISI 316 stainless steel
11	Spacers	AISI 304 stainless steel	AISI 316 stainless steel
12	Nuts	AISI 304 stainless steel	AISI 316 stainless steel
13	Washers	AISI 304 stainless steel	AISI 316 stainless steel
14	Deflector (not in 1")	AISI 304 stainless steel	AISI 316 stainless steel
15	Screws	AISI 304 stainless steel	AISI 316 stainless steel
16	Drain valve	AISI 303 stainless steel	AISI 316 stainless steel
17	Filter	AISI 304 stainless steel	
18	Label	AISI 304 stainless steel	

The table of materials and components is subject to change without notice.

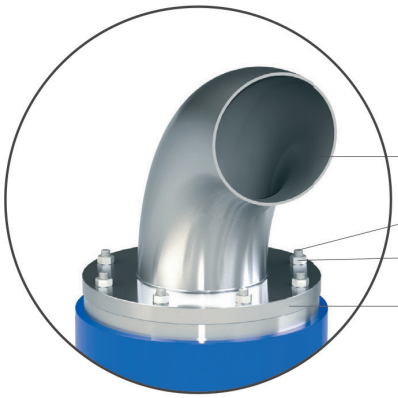
Conveyor system of **WAVE SUB** air valves

The SUB system, with ducted discharge, is available on request for all WAVE models, excluding the EO variants. A threaded bend, to be connected to a discharge pipe, allows the air valve to operate even in the event of flooding of the well or the installation site, without the risk of contaminated water entering the pipe.
Another advantage of the SUB model is the possibility of conveying water leakage when the air valve is closing.



1”-2”, DN 50 - 150

- PVC threaded bend (PP for DN 25-50)(mm)
- PVC fitting (PP for DN 25-50)
- Stainless steel studs
- Stainless steel nuts
- SUB plate in PP or stainless steel
- O-rings in EPDM, NBR, Viton or silicone



DN 200 - 250 *

- Stainless steel bend
- Stainless steel studs
- Stainless steel nuts
- Stainless steel SUB plate

Technical data

Operating conditions

Maximum treated water	60°C
Maximum pressure	40 bar
Minimum pressure	0.2 bar (lower on request)

Standard

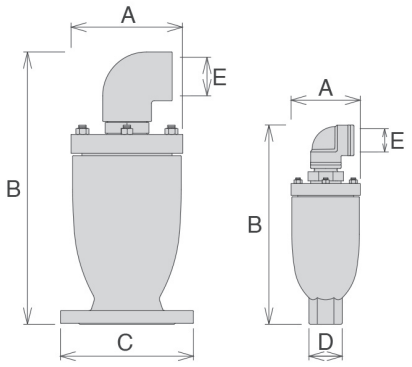
- Design according to EN 1074/4, in accordance with AWWA C-512
- Drilling according to EN 1092-2 or ANSI 150
- Fluid bed coating RAL 5005 blue

Modifications to painting and flanging standards on request.

Dimensions and weights

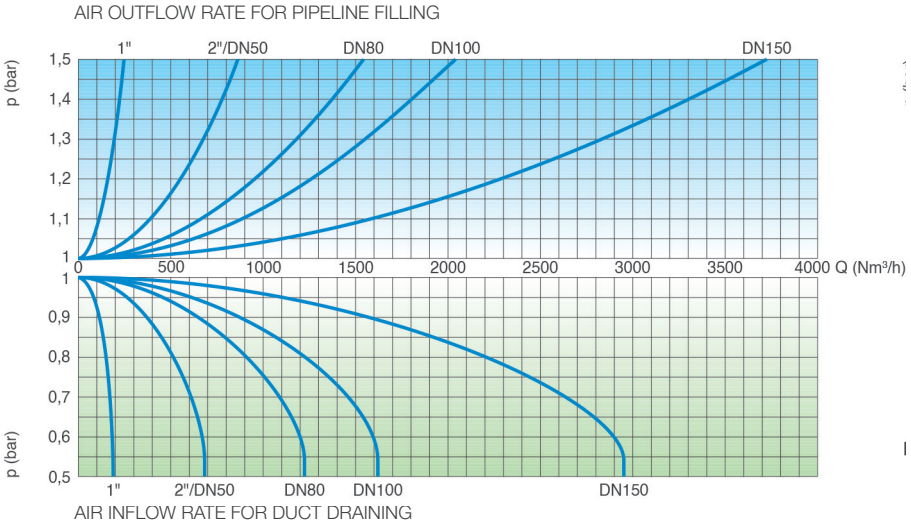
CONNECTION inches/mm	A mm	B mm	C mm		D mm	E inches	Weight Kg
Threaded 1”	105	302	-	-	CH 45	1"	4.0
Threaded 2”	128	385	-	-	CH 70	2"	7.5
Flanged 50	128	395	165	-	-	2"	9.5
Flanged 80	158	439	210	205	-	2" 1/2	13.8
Flanged 100	192	507	235	220	-	3"	21.7
Flanged 150	272	648	305	285	-	4"	44.5
Flanged 200	359	828	375	340	-	*	92.5
Flanged 250	430	1060	450	405	-	*	147.0

Approximate values. *: the SUB system is available up to DN 150.



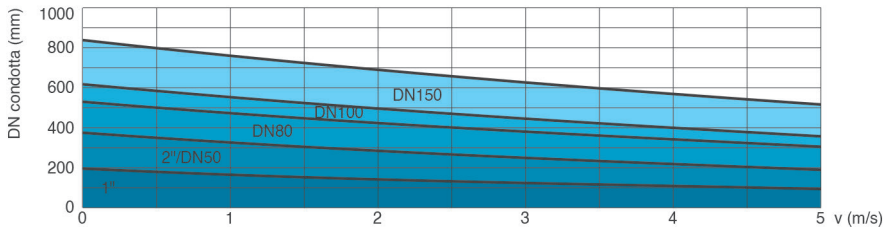
Technical data

WAVE 3S-SUB Air flow characteristic charts

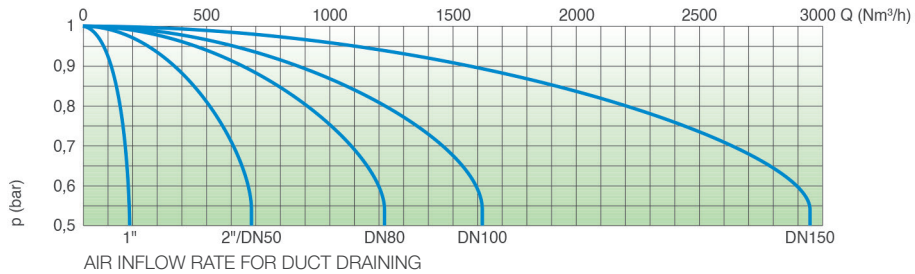


WAVE 3S-AWH SUB - Air valve selection chart

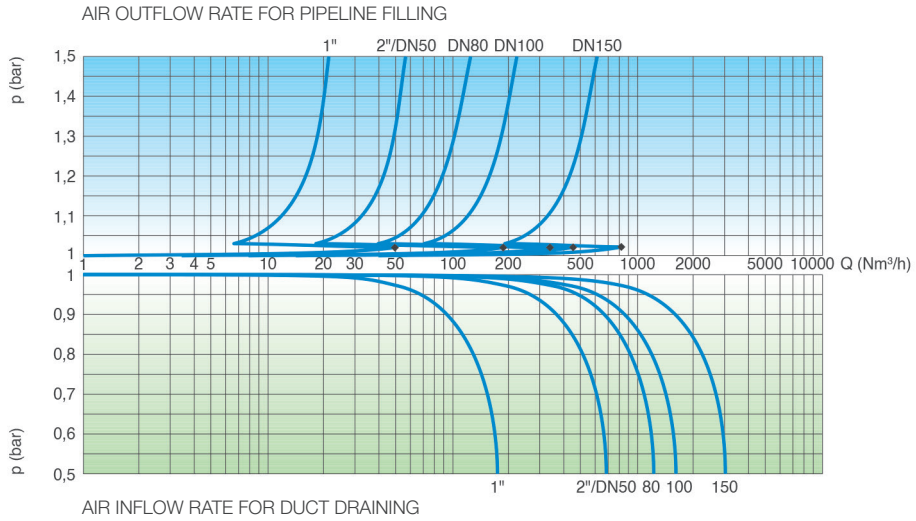
Preliminary dimensioning according to pipeline diameter and required air outflow speed.



WAVE 3S-AWH SUB - Air flow characteristic charts

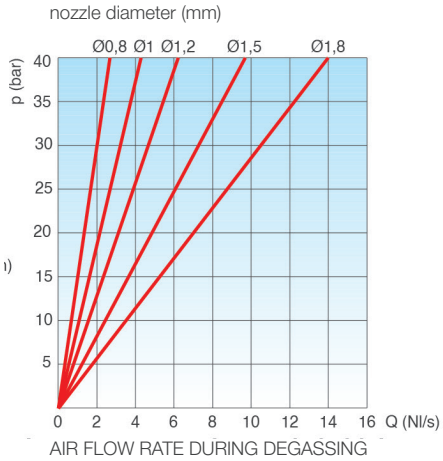


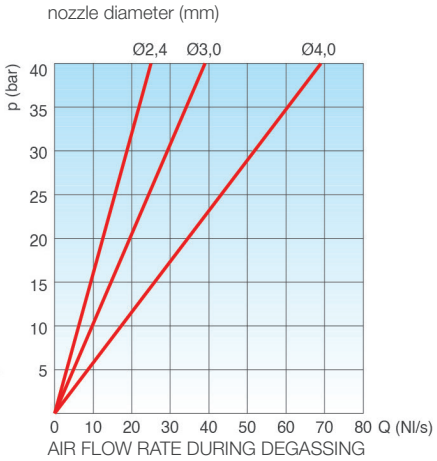
WAVE 3S-CSF SUB - Air flow characteristic charts



Choice of nozzle

Please refer to the data sheets of the WAVE 3S, WAVE 3S-AWH and WAVE 3S-CSF models for nozzle selection.

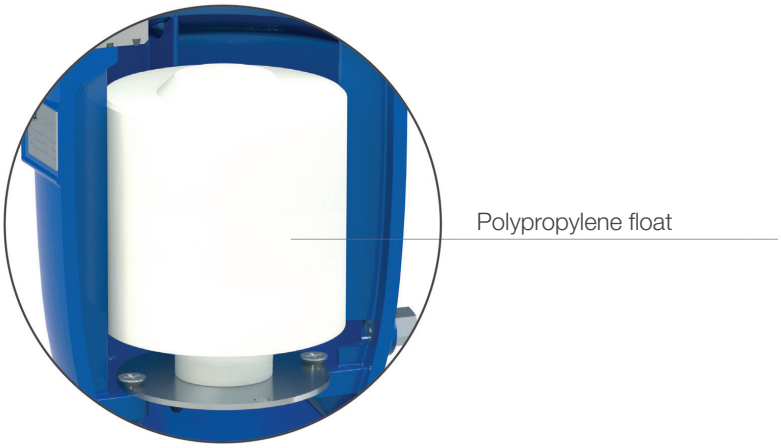




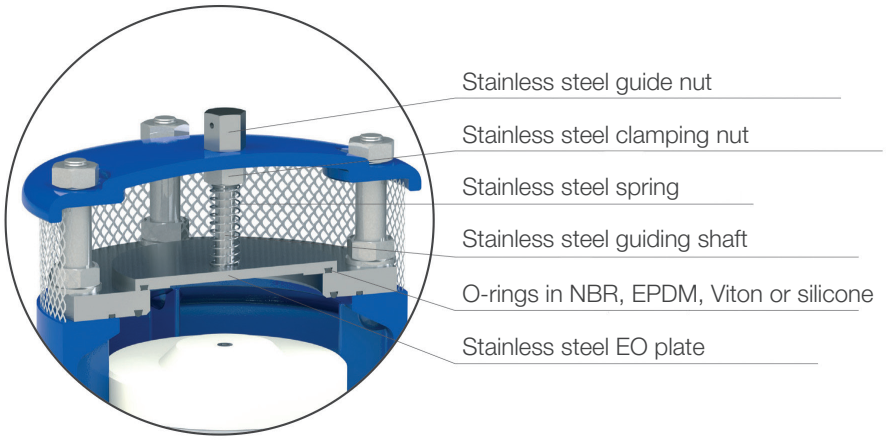
Air flow charts are obtained in Kg/s from laboratory tests and numerical analysis, without filtering, and converted to Nm3/h by applying an appropriate safety factor.

Optional functions

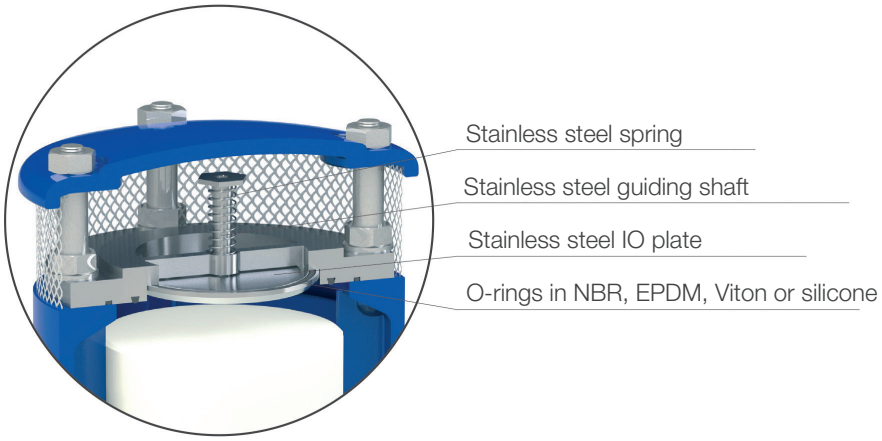
Dual-function 2S version, also called vacuum breaker. Suitable for locations where no accumulated air pockets are required to be expelled during operation. It is used at upward slope changes and long ascending sections of the pipe; in dry and fire-prevention installations.



EO SERIES discharge only version, available for WAVE 2S and 3S models. This variant is designed to allow the air valve to be installed at critical points of the layout where HGL may drop below the pipe profile, thus operating under vacuum, and at any other junction where, for design reasons, air return must be absolutely avoided.



IO-entrance only version, available for 2S and 3S dual-function models. This variant is designed to allow for the installation of the air valve at critical points of the layout where, for design reasons, air outflow must be avoided. It should be noted that, when using the IO version, the air valve does not provide any protection against overpressure caused by filling the pipeline.



Customer Centricity

Customer centricity is a way of running your business — implementing a perfect customer experience at each stage of the pipeline. Pietro Fiorentini is one of the main Italian international company with high focus on product and service quality.

The main strategy is to create a stable, long-term relationship, putting the customer's needs first. Lean management and customer centricity are used to improve and maintain the highest level of customer experience.

Support

Pietro Fiorentini's top priority is to provide support to the client in all phases of project development, during installation, start up and operation. Pietro Fiorentini has developed a highly standardized Intervention-Management-System (IMS), which helps to facilitate the entire process and putting the customer at the forefront of every decision in our process while manufacturing or developing a product to help improve the product and service. With our IMS business model many services are available remotely, avoiding long waiting times, improving service, and avoiding unnecessary expenses.

Training

Pietro Fiorentini offers training services available for both experienced operators and new customers. The training is offered for all levels of our customers which can include one or all of the following: sizing of equipment, application, installation, operation, maintenance and is prepared according to the level of use and the customer's need.

Customer Relation Management (CRM)

The service and care of our customers are one of the main missions and vision of Pietro Fiorentini. For this reason, Pietro Fiorentini has enhanced the customer relation management system. This enables us to track every opportunity and request from our customers into one single information point and allows us to coordinate information allowing us to give the customer improved service.

Sustainability

Here at Pietro Fiorentini, we believe in a world capable of improvement through technology and solutions that can shape a more sustainable future. That is why respect for people, society and the environment form the cornerstones of our strategy.

Our commitment to the world of tomorrow

While in the past we limited ourselves to providing products, systems and services for the oil & gas sector, today we want to broaden our horizons and create technologies and solutions for a digital and sustainable world. We have a particular focus on renewable energy projects to help make the most of our planet's resources and create a future in which the younger generations can grow and prosper.

The time has come to understand how and why we operate now.

Pietro Fiorentini

TB0186ENG

The data are not binding. We reserve the right
to make changes without prior notice.

WAVE_technicalbrochure_ENG_revB

www.fiorentini.com

Product designed and manufactured by **CSA S.r.l.** and distributed by **Pietro Fiorentini S.p.A.**