

DISCAL® air separator



551-NA551-NA5519 series



Function

Air separators are used to continuously remove the air contained in the hydronic circuits of heating and cooling systems. The air discharge capacity of these devices is very high. They are capable of removing automatically all the air present in the system down to the micro-bubble level.

The circulation of fully de-aerated water enables the equipment to operate under optimum conditions, free from noise, corrosion, localized or mechanical damage. Micro-bubbles, fusing with each other, increase in volume (get larger) until they become large enough to rise to the top where they are automatically released.

Product range

551 series	DISCAL® air separator for horizontal pipes, in brass compact with drain	connections 3/4" sweat; 3/4" NPT female
551 series	DISCAL® air separator for horizontal pipes, in brass with drain	connections 3/4", 1", 1-1/4", 1-1/2" and 2" NPT female 1", 1-1/4", 1-1/2" and 2" sweat
551 series	DISCAL® air separator for horizontal pipes, in steel with flanged connections and drain	connections 2" to 6" ANSI
NA551 series	DISCAL® air separator for horizontal pipes, in steel with flanged connections with drain, ASME and CRN	connections 2" to 6" ANSI
NA5519 series	DISCAL® air separator for vertical pipes, in brass	connections 3/4" and 1" integral sweat

Technical specifications

Brass air separator

Materials	- body:	brass
	- internal element	
	(compact & vertical versions):	304 stainless steel
	- internal element:	glass reinforced nylon PA66GF30
	- seal:	EPDM
	- air vent float guide pin:	stainless steel

Performance

Suitable fluids:	water, glycol solution
Max. percentage of glycol:	50%
Max. working pressure:	150 psi (10 bar)
Temperature range:	32–250°F (0–120°C)

Connections	- main:	
	compact series:	3/4" sweat; 3/4" NPT female
	horizontal:	3/4", 1", 1-1/4", 1-1/2" and 2" NPT female 1", 1-1/4", 1-1/2" and 2" sweat
	vertical:	3/4" and 1" sweat
	- drain valve:	1/2" NPT female

Steel air separator

Materials	- body:	epoxy resin painted steel
	- internal element:	304 stainless steel
	- seal:	EPDM
	- air vent float guide pin:	stainless steel

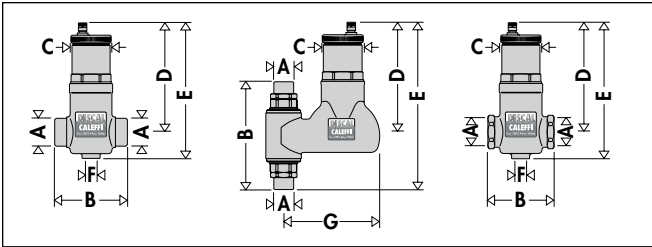
Performance

Suitable fluids:	water, glycol solution
Max. percentage of glycol:	50%
Max. working pressure:	150 psi (10 bar)
Temperature range:	32–250°F (0–120°C)

Connections	- flanged:	2"–6" ANSI B16.5 150 CLASS RF
	- drain pipe:	1" NPT male

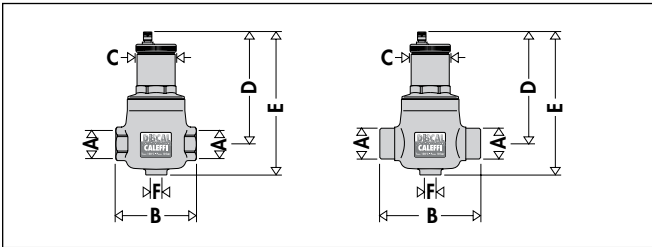
Agency Approval - NA551 series is designed and built in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code and tagged and registered with the National Board of Boiler and Pressure Vessel Inspector, and CRN registered.

Dimensions



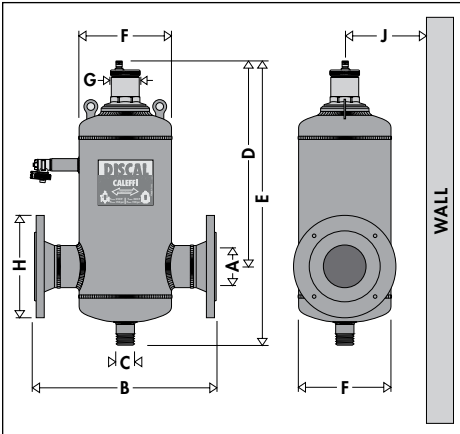
Code	A	B	C	D	E	F	Wt (lb)
551003A*	¾"	3 1/16"	2 3/16"	5 5/8"	6 7/8"	½"	2.0
551022A*	¾" SWT	3 1/16"	2 3/16"	5 5/8"	6 7/8"	½"	2.0
NA5511995	¾"	5 1/16"	2 3/16"	NA	9 9/16"	½"	4.5
NA5511996	1"	6 1/16"	2 3/16"	NA	9 9/16"	½"	4.5

*Add suffix C to sweat and NPT code number when ordering the brass DISCAL® to ship with expansion tank service check valve, code 561402A.



Code	A	B	C	D	E	F	Wt (lb)
551005A*	¾"	4 5/16"	2 3/16"	5 3/4"	7 ½"	½"	3.7
551006A*	1"	4 5/16"	2 3/16"	5 3/4"	7 ½"	½"	3.7
551007A*	1 ¼"	4 7/8"	2 3/16"	6 9/16"	8 ¼"	½"	4.9
551008A*	1 ½"	4 7/8"	2 3/16"	6 9/16"	8 ¼"	½"	4.9
551009A*	2"	5 5/8"	2 3/16"	6 9/16"	8 ¼"	½"	5.5
551028A*	1" SWT	5 1/16"	2 3/16"	5 3/4"	7 ½"	½"	3.7
551035A*	1 ¼" SWT	5 3/16"	2 3/16"	6 5/16"	8 ¼"	½"	3.7
551041A*	1 ½" SWT	5 ¾"	2 3/16"	6 9/16"	8 ¼"	½"	4.9
551054A*	2" SWT	6 5/8"	2 3/16"	6 9/16"	8 ¼"	½"	5.5

*Add suffix C to sweat and NPT code number when ordering the brass DISCAL® to ship with expansion tank service check valve, code 561402A.



Code	A	B	C	D	E	F	G	H	J†	Wt (lb)
**551050A	2"	13 ¾"	1"	14 ¾"	19 15/16"	6 5/8"	2 13/16"	6"	6 5/16"	34
**551060A	2 ½"	13 ¾"	1"	14 ¾"	19 15/16"	6 5/8"	2 13/16"	7"	6 5/16"	35
**551080A	3"	18 3/8"	1"	17 7/8"	23 7/16"	8 5/8"	2 13/16"	7 ½"	7 7/16"	62
**551100A	4"	18 ½"	1"	17 7/8"	23 7/16"	8 5/8"	2 13/16"	9"	7 7/16"	67
NA551120A	5"	25"	1"	21 1/16"	30 ½"	12 ¾"	2 13/16"	10"	9 3/8"	106
NA551150A	6"	25"	1"	21 1/16"	30 ½"	12 ¾"	2 13/16"	10"	9 3/8"	117

Size	2"	2 ½"	3"	4"	5"	6"
Cap. (Gal)	1.8	1.8	4.8	4.8	13.7	13.7

**Add prefix NA to flanged code number when ordering ASME tagged and registered with the National Board of boiler and Pressure Vessel Inspector and CRN registered.

†This dimension allows for a minimum of 3" wall clearance to accommodate insulation if used.

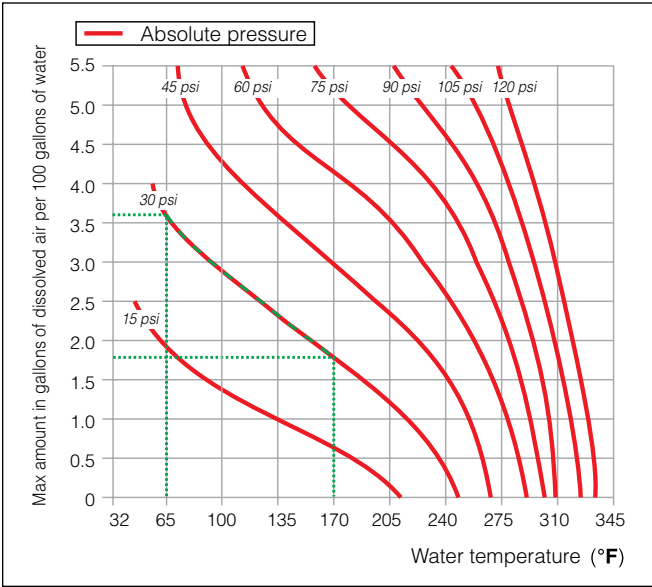
The process of air formation

The amount of air which can remain dissolved in a water solution is a function of pressure and temperature.

This relationship is governed by Henry's Law and the graph to the right demonstrates the physical phenomenon of the air release from water. As an example, at a constant absolute pressure of 30 psi (2 bar), if the water is heated from 65°F (18°C) to 170°F (75°C), the amount of air released by the solution is equal to 1.8 gallons of air per 100 gallons of water.

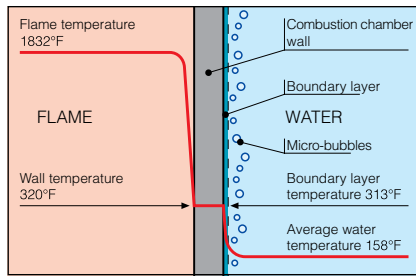
According to this law it can be seen that the amount of air released increases with temperature rise and pressure reduction. The air comes in the form of micro-bubbles of diameters in the order of tenths of a millimeter.

In heating and cooling systems there are specific points where this process of formation of micro-bubbles takes place continuously: in the boiler and in any device which operates under conditions of cavitation.



Boiler micro-bubbles

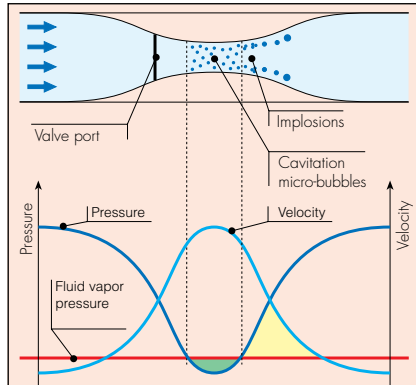
Micro-bubbles are formed continuously on the surface separating the water from the combustion chamber due to the fluid temperature. This air, carried by the water, collects in the critical points of the circuit from where it must be removed.



Some of this air is reabsorbed in the presence of colder surfaces.

Cavitation and micro-bubbles

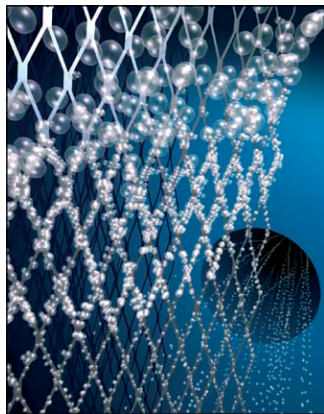
Micro-bubbles develop where the fluid velocity is very high with the corresponding reduction in pressure. These points are typically the pump impeller and the valve port.



These air and vapor micro-bubbles, the formation of which is enhanced in the case of non de-aerated water, may subsequently implode due to the cavitation phenomenon.

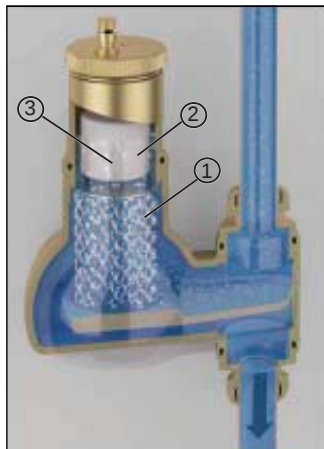
Operating principles

The DISCAL® air separator is used to continuously remove the air contained in hydronic circuits of heating and cooling systems. The air discharge capacity is very high. They are capable of removing automatically all the air present in the system down to micro-bubble level with low head loss due the special internal shape of the separator body. Flow direction of the DISCAL® air separator is bidirectional; flow in either direction is permitted.

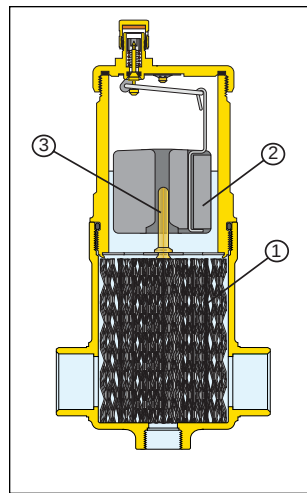


The air separator uses the combined action of several physical principles. The active part consists of an assembly of concentric mesh surfaces (1). These elements create the whirling movement required to facilitate the release of micro-bubbles and their adhesion to these surfaces.

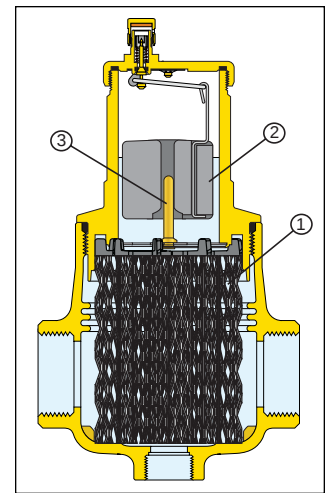
The bubbles, fusing with each other, increase in size until the hydrostatic thrust overcomes the adhesion force to the mesh. They rise towards the top of the unit from which they are released through a float-operated automatic air vent, with stainless steel float guide pin (3).



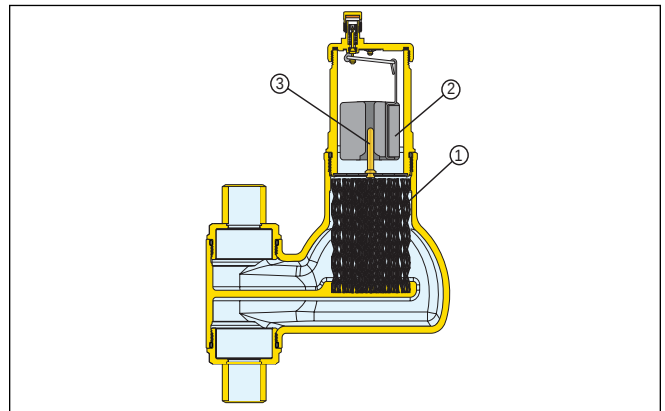
551 compact series



551 brass series



NA551 vertical series

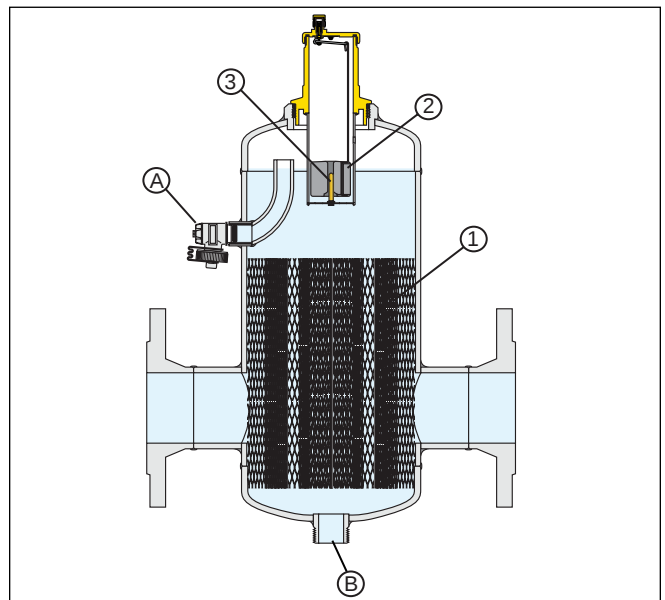


Steel models

Steel flanged models come standard with a side drain valve (A) to drain large amounts of air when filling the circuit and to remove any debris present above the water level.

A drain valve (code NA39753) can be connected (B) at the bottom of the steel flanged DISCAL® to drain collected dirt particles.

551 and NA551 steel series



Construction details

DISCAL® air separators are designed to allow maintenance and cleaning without having to remove the valve body from the pipework. All DISCAL® air separators (except vertical versions) come standard with a bottom connection for installing a drain valve. All internal air release control components are fully accessible in all the models.

The automatic air vent, located at the top of the units, has a long chamber for the movement of the float. This feature prevents any debris present in the water from reaching the sealing seat. A stainless steel float guide pin (3) prevents the float from sticking due to accumulating residue in the flowing fluids, even when the DISCAL® air separator is not installed perfectly vertical.

A replacement air vent assembly for the DISCAL® brass 551 series (except vertical and compact) is code 59829; for the DISCAL® steel 551 and NA551 series is code 59756.

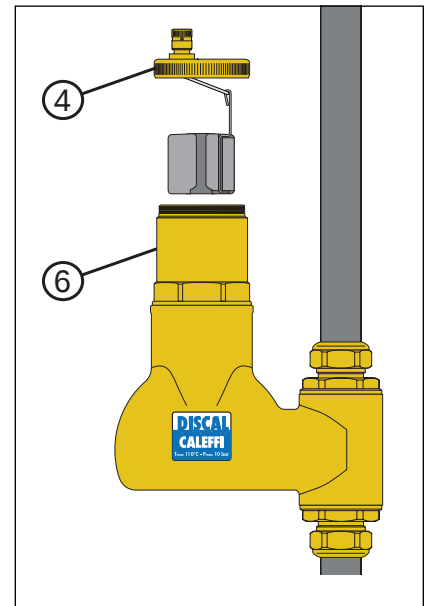
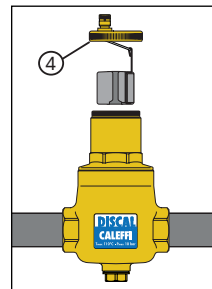
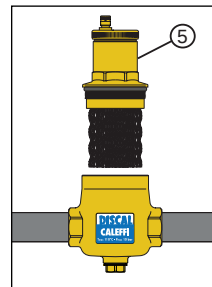
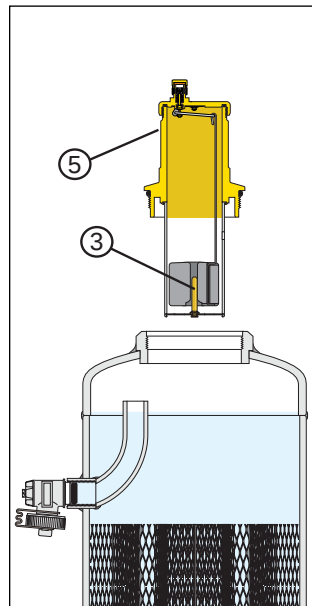
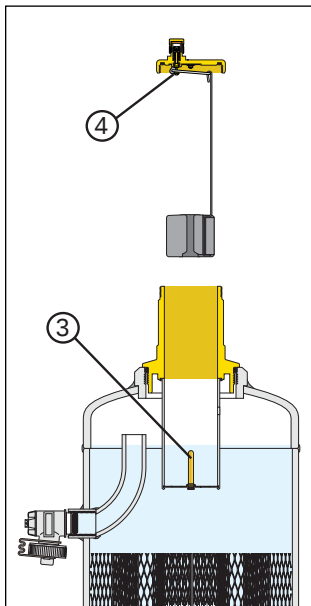


The moving parts that control air venting are accessed simply by removing the upper cover (4). Replacement cap and float assembly for all versions of the brass DISCAL® 551 and NA551 series is code F39807.

When cleaning, simply unscrew the portion of the body containing the automatic air vent (5). For the vertical and compact models without a drain, the element can be removed by removing the upper cover (4). There is no need to remove the air vent body for these models.



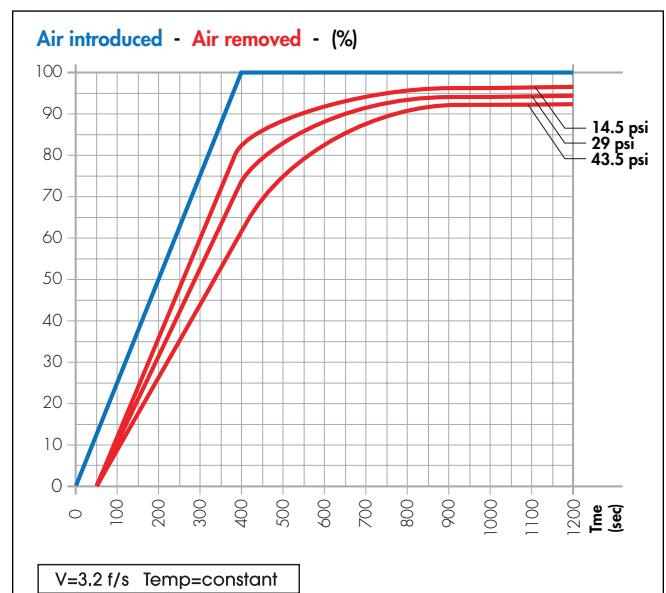
F39807



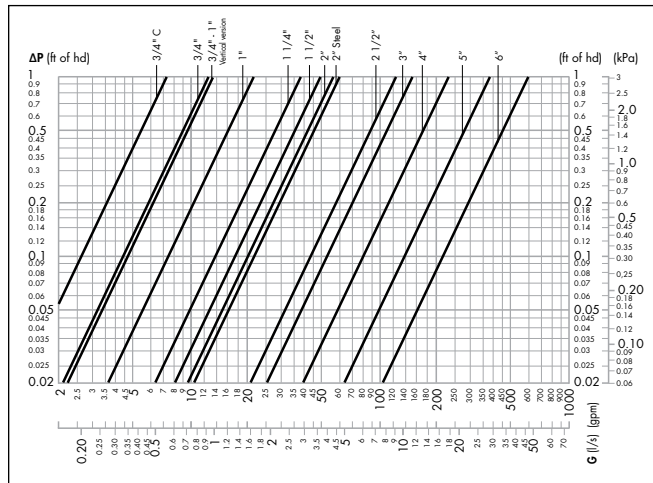
Air separation efficiency

DISCAL® air separators continuously remove entrapped air in hydronic systems with very high efficiency. The amount of air removed from a system varies depending on fluid velocity and system pressures. As illustrated on the graph, after just 25 recirculations at the 3.2 feet per second fluid velocity, almost all the air artificially introduced into the circuit is eliminated by the DISCAL® air separator, with percent removed varying based on system pressure and fluid temperature.

The small amount which remains is then gradually eliminated during normal system operation. In conditions where the fluid velocity is slower or the temperature of the medium is higher, the amount of air separated is even greater.



Hydraulic characteristics



Flow capacity

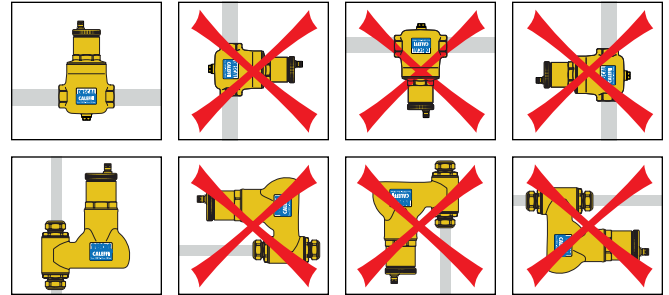
The fluid velocity at connections for DISCAL® 551 series air separators is recommended to not exceed 10.0 f/s. Above this speed, heavy internal turbulence and noise can occur and air and dirt elimination efficiency begins to fall measurably. Optimal air elimination performance occurs at fluid velocities of 4.0 f/s or less. See the flow capacity charts below.

		Flow capacity — brass						
	Size	¾" C	¾"	¾"-1"	1"	1¼"	1½"	2"
Optimal (4.0 f/s)	GPM	6.0	8.0	9.0	9.3	15.3	23.9	36.1
	l/s	0.4	0.5	0.57	0.6	1.0	1.5	2.3
Max. (10.0 f/s)	GPM	14.3	19.0	20.0	22.1	36.4	56.8	86.0
	l/s	0.9	1.2	1.26	1.4	2.3	3.6	5.4
	Cv	11.6	19.1	19.1	32.5	56.4	73.1	81

		Flow capacity — steel					
	Size	2"	2½"	3"	4"	5"	6"
Optimal (4.0 f/s)	GPM	37.3	63.0	95.5	149	259	380
	l/s	2.4	4.0	6.0	9.4	16.3	24.0
Max. (10.0 f/s)	GPM	88.8	150.1	227.4	355.3	616.4	903.6
	l/s	5.6	9.5	14.3	22.4	38.9	57.0
	Cv	87	174	208	324	520	832

Installation

DISCAL® units may be used in heating or cooling systems to ensure the progressive removal of air which is continuously formed. The units should preferably be installed after the boiler and on the pump suction side, as these are the points where the formation of micro-bubbles is greatest. DISCAL® air separators for horizontal pipes must be installed vertically. Flow direction of the DISCAL® air separator is bidirectional: flow in either direction is permitted. In installation conditions where inspection is not possible, it is recommended that the venting valve cap is replaced by a Caleffi Code R59681 hygroscopic safety vent. The standard replacement cap code is 59119.



Installation shells

Insulation shells for brass DISCAL® series for horizontal pipes. These are not designed for the compact or vertical series DISCAL®.

Code	Size
CBN551005	For ¾" and 1"
CBN551007	For 1¼" and 1½"
CBN551009	For 2"



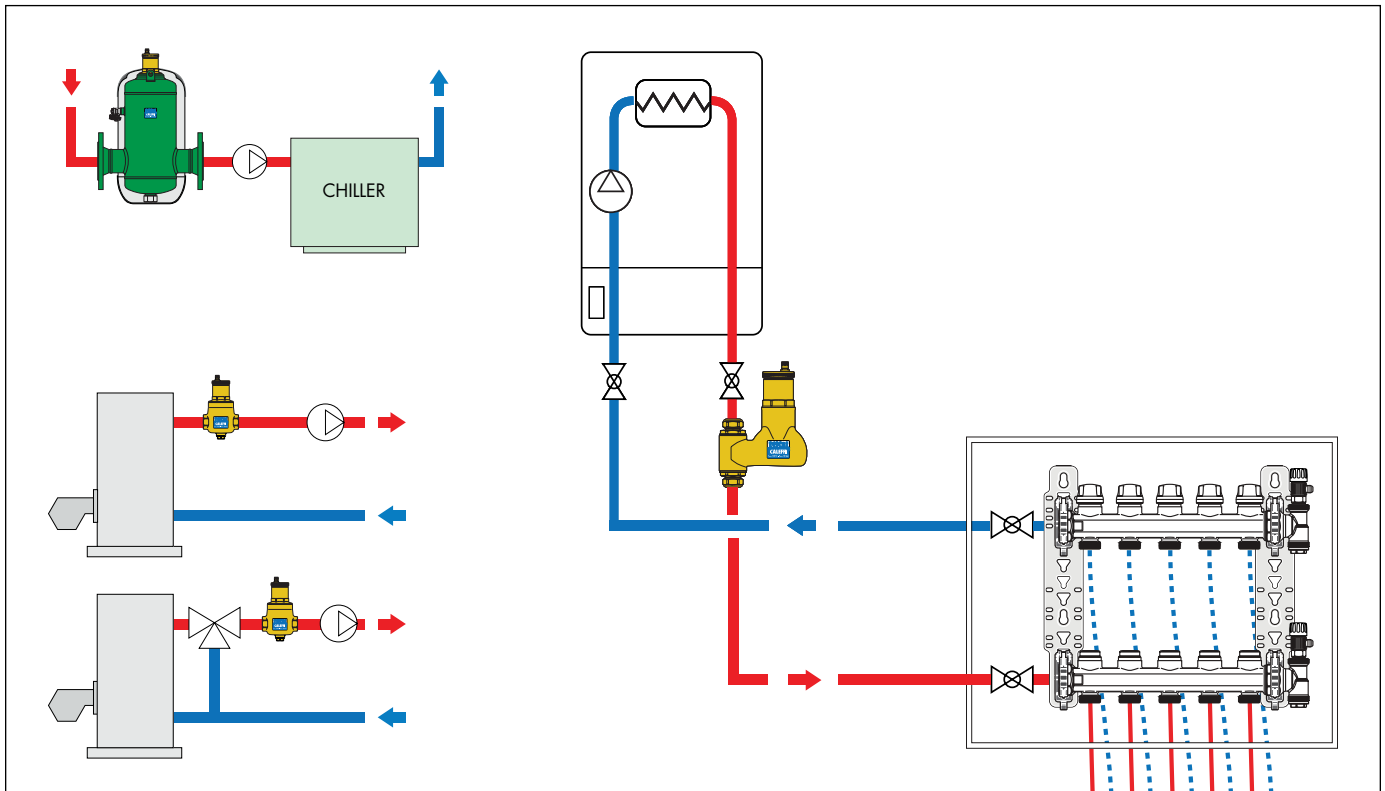
Insulation

Material: closed cell expanded PE-X
 Thickness: 25/64" (10 mm)
 Density - inner part: 1.9 lb/ft³ (30 kg/m³)
 - outer part: 3.1 lb/ft³ (50 kg/m³)
 Thermal conductivity (DIN 52612)
 - at 32°F (0°C): 0.263 BTU·in/hr·ft²·°F (0.038 W/(m·K))
 - at 104°F (40°C): 0.312 BTU·in/hr·ft²·°F (0.045 W/(m·K))
 Coefficient of resistance to water vapor (DIN 52615): >1,300
 Working temperature range: 32–212°F (0–100°C)
 Reaction to fire (DIN 4102): class B2

Accessories

Item	Code	Description
	561402A	Check valve for expansion tanks. 1/2" NPT connections.
	R59681	Hydroscopic safety vent cap.
	562100	Small anti-vacuum vent cap.
	59119	Replacement DISCAL® air vent cap.

Application diagram



SPECIFICATION SUMMARIES

DISCAL® 551 Series — Compact

Air separator in brass. Connections for horizontal pipes, 3/4" NPT female threads or 3/4" sweat. Bottom 1/2" NPT female thread for drain. Models available with pre-installed service check valve. Brass body. Stainless steel float guide pin. EPDM seal. 304 stainless steel internal mesh element. Maximum working pressure 150 psi (10 bar), Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL® 551 Series

Air separator in brass. Connections for horizontal pipes, 3/4" to 2" NPT female threads or 1" to 2" sweat. Bottom 1/2" NPT female thread for drain. Models available with pre-installed service check valve. Brass body. Stainless steel float guide pin. EPDM seal. Glass reinforced nylon PA66G30 internal mesh element. Maximum working pressure 150 psi (10 bar), Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%. Pre-formed insulation shells available separately for field installation.

DISCAL® NA551 Series — Vertical

Air separator in brass. Connections for vertical pipes, 3/4" to 1" sweat. Brass body. Stainless steel float guide pin. EPDM seal. 304 stainless steel internal mesh element. Maximum working pressure 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL® 551 Series — Flanged

Air separator in steel. Connections for horizontal pipes, 2" to 6" flanged ANSI B16.5 150 Class RF. Bottom 1" NPT male thread for drain. Epoxy resin painted steel body. Stainless steel float guide pin. EPDM seal. 304 stainless steel internal mesh element. Maximum working pressure 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL® NA551 Series — Flanged, ASME & CRN

Air separator in steel. Connections for horizontal pipes, 2" to 6" flanged ANSI B16.5 150 Class RF, designed and built in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code and tagged and registered with the National Board of Boiler and Pressure Vessel Inspector, and CRN registered. Bottom 1" NPT male thread for drain. Epoxy resin painted steel body. Stainless steel float guide pin. EPDM seal. 305 stainless steel internal mesh element. Maximum working pressure 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

We reserve the right to change our products and their relevant technical data, contained in this publication, at any time and without prior notice.



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