Air separator

31080-31088

cert. n° 0003 ISO 9001

01060/03 NA

Function

Air separators are used to remove continuously 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 micro-bubble level.
The circulation of fully de-aerated water enables the equipment to operate under optimum conditions, free from any noise, corrosion, localised overheating or mechanical damage.
Flanged versions of DISCAL air separators can be supplied complete with pre-formed shell insulation to ensure perfect heat insulation when used in both hot and cold water systems.

Product range

Series 31080 – 31081 air separator compact with drain	Sizes 3/4” sweat; 3/4” NPTF female
Series 31082 – 31084 air separator with drain	Sizes 3/4” - 1” - 1 1/4” - 1 1/2” - 2” NPTF female
Special order air separator with flanged connections	Sizes 2” ÷ 6” ANSI
Special order air separator with flanged connections with insulation	Sizes 2” ÷ 6” ANSI

Technical specification

Threaded connections

Materials: - Body:	brass
- Int. element:	stainless steel
- Seal:	EPDM
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:	3/4” sweat; 3/4” NPTF female
	3/4” - 1” - 1 1/4” - 1 1/2” - 2” NPTF female
- Drain:	1/2” NPTF female

Flanged connections

Materials: - Body:	epoxy resin painted steel
- Int. element:	stainless steel
- Drain cock:	chrome plated brass
- Seal:	EPDM
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 PN 10:	2” ÷ 6” ANSI 150 CLASS
- Drain:	1” NPT male

Insulation characteristics

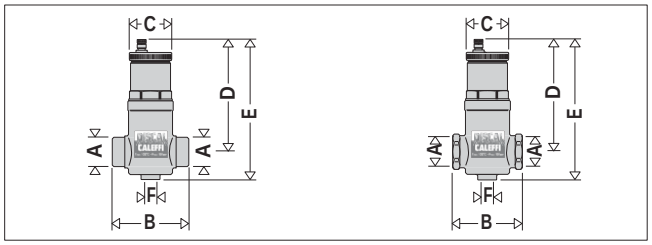
Inner part

Material:	rigid closed cell expanded polyurethane foam
Thickness:	2 2/8” (60 mm)
Density:	3 lb/ft^3 (45 kg/m^3)
Conductivity (ISO 2581):	0.16 BTU/in (0.023 W/mK)
Temperature range:	32÷220°F (0÷105°C)

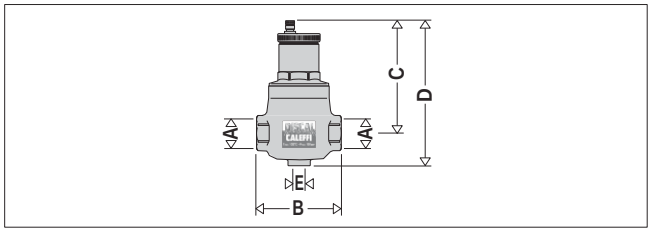
Outer part

Material:	Embossed aluminium
Thickness:	7-mil (0.70 mm)
Fire resistance (DIN 4102):	Class 1

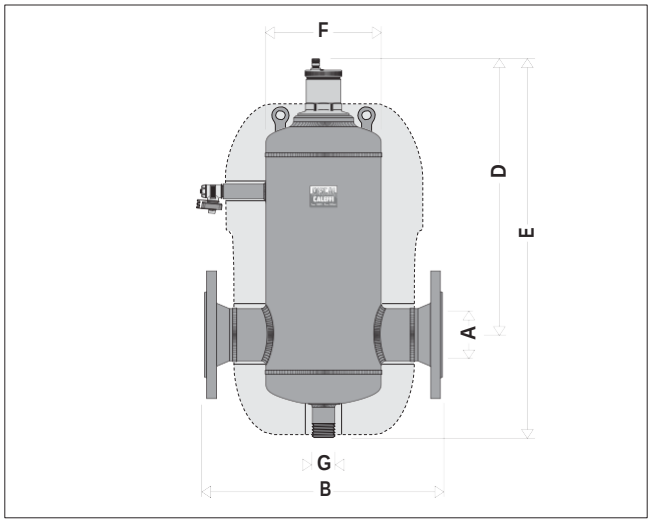
Dimensions



Code	A	B	C	D	E	F	Weight (lb)
31080	3/4”	3 1/16”	2 3/16”	5 5/8”	6 7/8”	1/2”	2.0
31080	3/4”	3 1/16”	2 3/16”	5 5/8”	6 7/8”	1/2”	2.0



Code	A	B	C	D	E	Weight (lb)
31080	3/4”	4 5/16”	5 3/4”	7 1/2”	1/2”	3.7
31082	1”	4 5/16”	5 3/4”	7 1/2”	1/2”	3.7
31084	1 1/4”	4 7/8”	6 9/16”	8 1/4”	1/2”	4.9
31087	1 1/2”	4 7/8”	6 9/16”	8 1/4”	1/2”	4.9
31088	2”	5 1/8”	6 5/16”	8 1/4”	1/2”	4.9

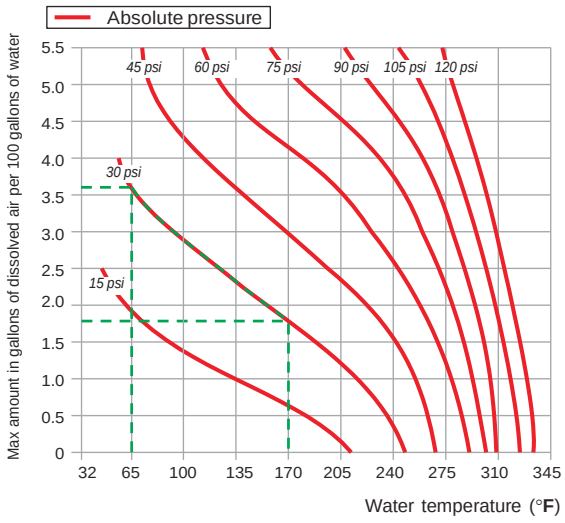


Code	A	B	D	E	F	G	Weight (lb)
	2”	13 3/4”	14 3/4”	19 15/16”	6 5/8”	1"	33.1
	2 1/2”	13 3/4”	14 3/4”	19 15/16”	6 5/8”	1"	34.2
	3”	18 3/8”	17 1/8”	23 7/16”	8 5/8”	1"	61.7
	4”	18 1/2”	17 1/8”	23 7/16”	8 5/8”	1"	66.1
	5”	25	21 7/16”	30 1/2”	12 3/4”	1"	105.8
	6”	25	21 7/16”	30 1/2”	12 3/4”	1"	116.8

Size	2”	2 1/2”	3”	4”	5”	6”
Cap. (gal)	1.8	1.8	4.8	4.8	13.7	13.7

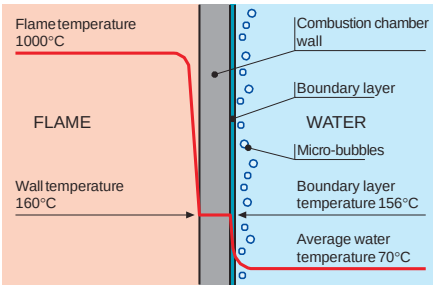
The process of air formation

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 below allows the physical phenomenon of the air content release of the fluid to be quantified.
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 millimetre.
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.



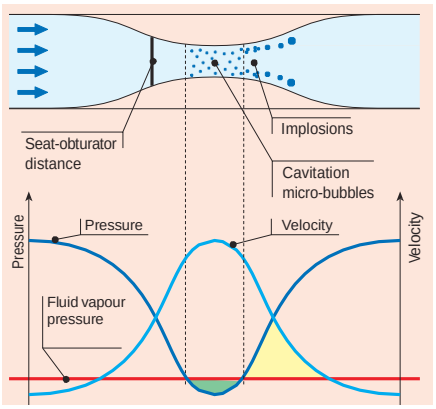
Boiler micro-bubbles

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.



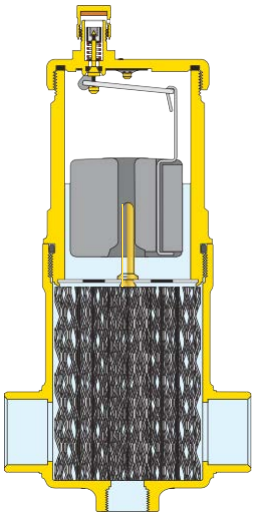
Cavitation and micro-bubbles

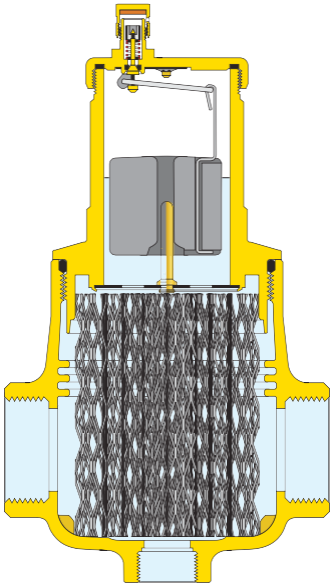
Micro-bubbles develop where the fluid velocity is very high with the corresponding reduction in pressure.These points are typically the pump impeller and the regulating valve seating. These air and vapour micro-bubbles, the formation of which is enhanced in the case of non de-aerated water, may subsequently implode due to the cavitation phenomenon.



Operating principle

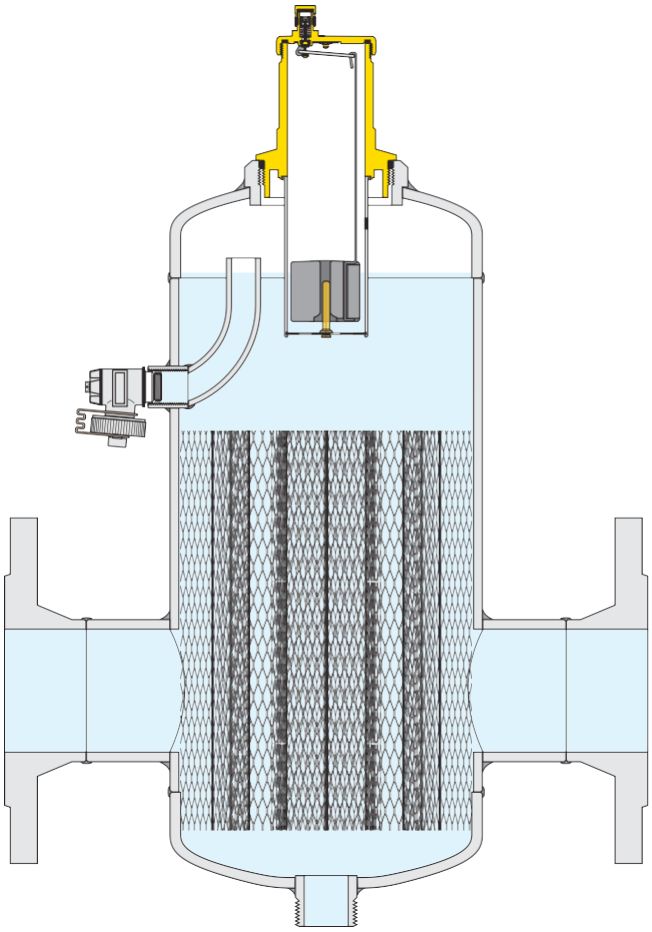
The air separator uses the combined action of several physical principles. The active part consists of an assembly of concentric metal mesh surfaces. These elements create the whirling movement required to facilitate the release of micro-bubbles and their adhesion to these surfaces.
The bubbles, fusing with each other, increase in volume until the hydrostatic thrust is such as to overcome the adhesion force to the structure. They rise towards the top of the unit from which they are released through a float-operated automatic air release valve.





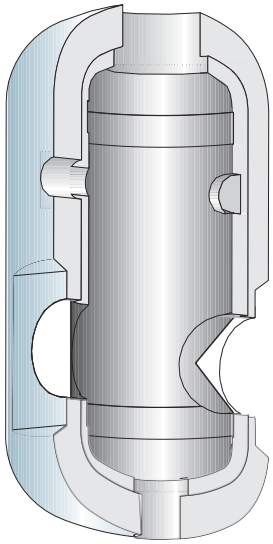
Construction details

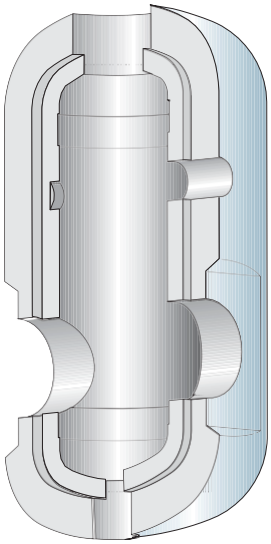
DISCAL devices are constructed in such a way as to allow maintenance and cleaning operations to be carried out without having to remove the valve body from the pipework. All valves are fitted with a bottom connection for fitting a drain valve. All internal air release control components are fully accessible in all the models.
The automatic air release valve, 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. In threaded models, the valve may be removed in order to have full access to the steel separating element.
Flanged models are fitted with a further cock to drain large amounts of air when filling the circuit and to remove any debris present above the water level.



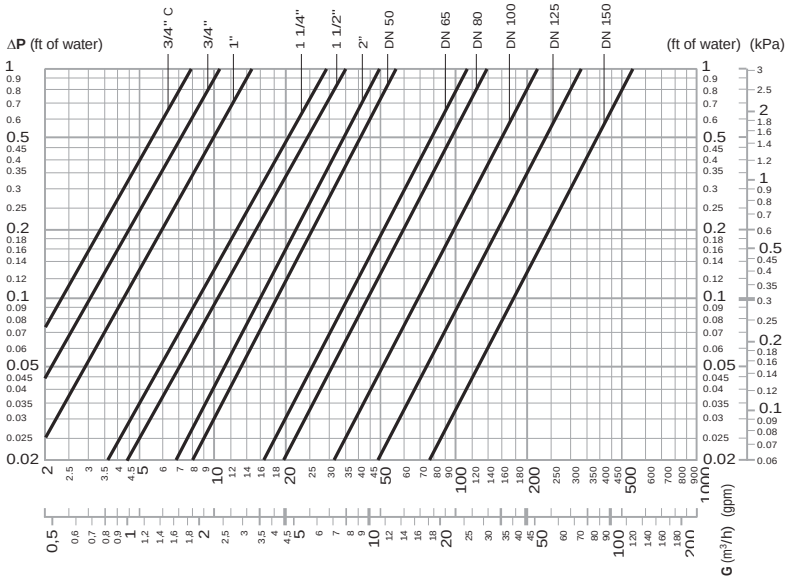
Insulation

DISCAL flanged units are available complete with heat-preformed shell insulation. This system ensures not only perfect heat insulation but also the tightness required to prevent atmospheric water vapour from entering the unit. For this reason, this type of insulation may also be used in cooling water circuits, as it prevents condensation from forming on the surface of the valve body.





Hydronic characteristics



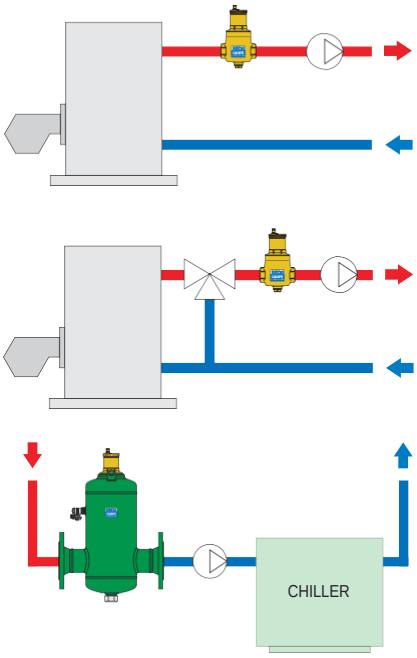
The maximum fluid velocity recommended at the unit connections is ~ 4.2 f/s. The following table shows the maximum flow rates to comply with this condition.

	THREADED						FLANGED					
Size	**3/4" C**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**2"**	**2 1/2"**	**3"**	**4"**	**5"**	**6"**
gpm	6	8	10	15	24	36	38	65	95	150	260	380
m³/h	1.36	1.81	2.11	3.47	5.42	8.20	8.47	14.32	21.69	33.89	58.8	86.2

	THREADED						FLANGED					
Size	**3/4" C**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**2"**	**2 1/2"**	**3"**	**4"**	**5"**	**6"**
Cv	14	19	21	43	51	78	86	179	211	345	520	809

Installation

DISCAL units may be used in both heating and 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 must be installed vertically. In installation conditions where inspection is not possible, it is recommended that the venting valve cap is replaced by a Caleffi Code nr. 59681 hygroscopic safety vent.



SPECIFICATION SUMMARIES

DISCAL Series

Air separator. Connections 3/4" F threads or 3/4" sweat. Bottom 1/2" F. Brass body. EPDM seal. Internal mesh element of stainless steel, removable for cleaning operations. Maximum working pressure, 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL Series

Air separator. Threaded connections 3/4" (from 3/4" to 2") F x F. Bottom connection 1/2" F for drain cock. Brass body. EPDM seal. Internal mesh element of stainless steel, removable for cleaning operations. Maximum working pressure, 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL Series

Air separator without insulation, complete of drain cock. Flanged 150 CLASS ANSI connections from 2" to 6". Body of epoxy resin painted steel. EPDM seal. Internal mesh element of stainless steel. Maximum working pressure, 150 psi (10 bar). Temperature range 32 to 250°F (0 to 120°C). Glycol maximum 50%.

DISCAL Series

Air separator complete with insulation and drain cock. Flanged 150 CLASS ANSI connections from 2" to 6". Body of epoxy resin painted steel. EPDM seal. Internal mesh element of stainless steel. Maximum working pressure, 150 psi (10 bar). Temperature range 32 to 220°F (0 to 105°C). Glycol maximum 50%.