Air separators for solar heating systems
DISCAL SOLAR

251 series

General

The removal of dissolved gases from a solar primary circuit is an essential process in a solar heating system. The presence of dissolved oxygen in a solar circuit causes rapid localized corrosion in collectors and heat exchangers. Carbon dioxide will dissolve in water, resulting in low pH levels and the production of corrosive carbonic acid. Low pH levels in a solar circuit causes severe acid attack throughout the solar heating system. While dissolved gases and low pH levels in the solar circuit can be controlled by the addition of chemicals, it is more economical and thermally efficient to remove these gases mechanically. This mechanical process is known as air separation and will increase the life of a solar heating system dramatically.

Function

Air separators are used to continuously eliminate air from the primary circuits of solar heating systems. The air vent capacity of these devices is extremely high. They are able to automatically remove all the air from the solar circuits, including microbubbles. The circulation of fully separated fluid allows the system to work under optimal conditions without any trouble with noise, corrosion, local overheating and mechanical damage.

This particular series of air separaots has been specifically designed to work at high temperature with a glycol medium, which is typical of solar heating systems.

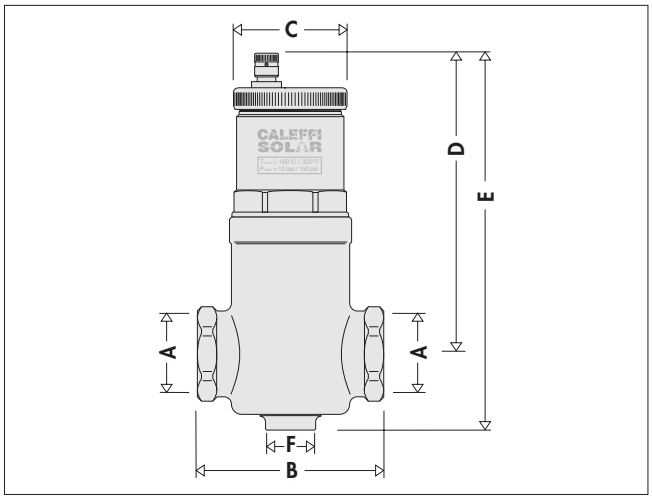
Product range

Code 251003A Air separator for solar heating systems with drain ..... size 3/4" F NPT

Technical specifications

Materials:	- body:	brass chrome plated
	- cover:	brass chrome plated
	- float:	high resistance polymer
	- internal element:	stainless steel
	- float guide:	brass
	- valve stem:	dezincification resistant brass
	- float lever:	stainless steel
	- spring:	stainless steel
	- seals:	high resistance elastomer
Medium:		water, glycol solutions
Max. percentage of glycol:		50%
Working temperature range:		-20 to 320ºF (-30 to 160ºC)
Max. working pressure:		150 psi (10 bar)
Max. discharge pressure:		150 psi (10 bar)
Connections:	- Main	3/4" F NPT
	- Drain:	1/2" F NPT

Dimensions



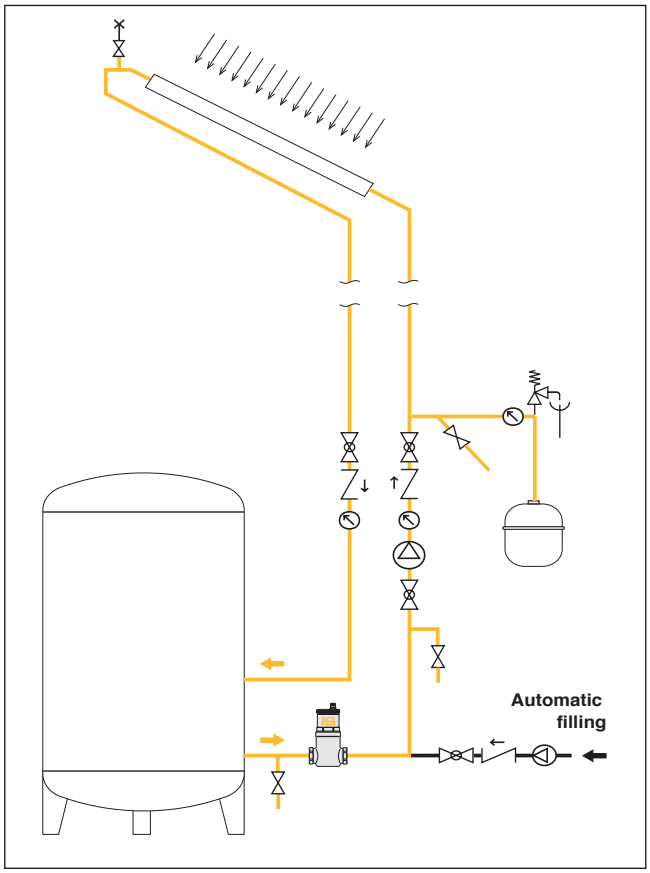
Code	A	B	C	D	E	F	Weight (lb)
251003A	3/4"	3"	2 1/8"	5 5/8"	6 7/8"	1/2"	2.0

The process of air formation

The quantity of air that can remain dissolved in solution in the water depends on the pressure and temperature.
This is known as Henry's law. It may be noted that there is a greater release of air from the solution as the temperature increases and the pressure decreases. This air is in the form of microbubbles with diameters of approximately tenths of a millimeter.
The microbubbles form continuously in the water of the solar heating systems on the top of the panels, because that is the point in the circuit where the highest temperatures are reached.
A portion of the air is re-absorbed as the medium reaches the parts of the circuit at a lower temperature. Because air remain the medium it must be extracted.

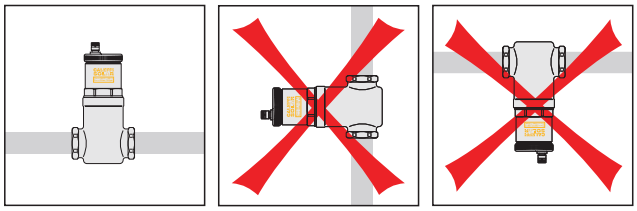
System operation

In solar panel heating systems with forced circulation, it is necessary to expel all the air in the medium during the phases of start up and operation.
The air separator permits separating and expelling this air from the fluid continuously and automatically. Any decrease in pressure due to the release of air is compensated by the expansion tank or automatic filling unit.



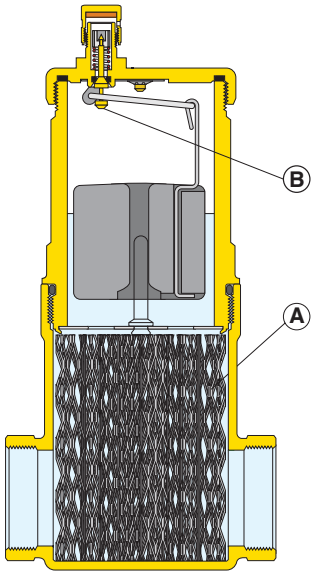
Installation

The air separator must always be installed vertically and preferably:
- before the pump to ensure a drop in pressure so microbubbles of air can develop.
- on the return and in the bottom portion of the solar circuit where there is no potential for formation of steam.

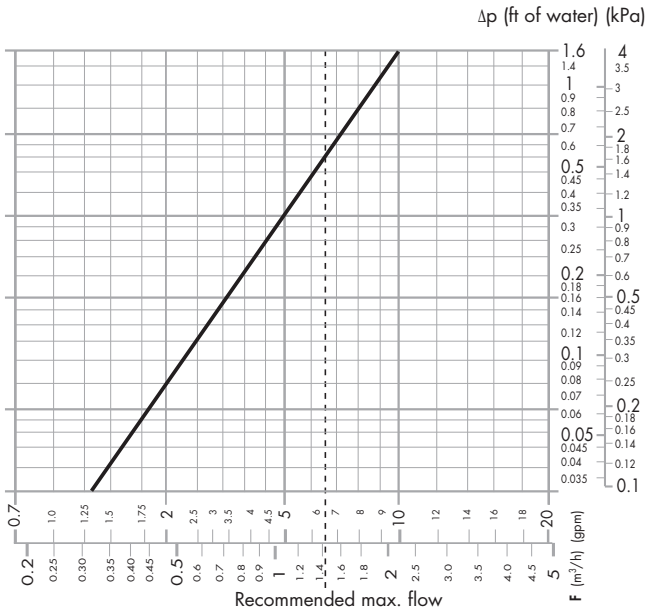


Operating principle

The air separator is composed of a set of metal screen surfaces arranged like spokes (A). This screen creates a swirling motion to assist the release of micro-bubbles and their adhesion to the metal screen. The bubbles join and increase in size until the hydrostatic force increases to overcome the force of adhesion to the screen.
Next, they rise to the top of the chamber where they are released by the float-operated automatic air vent valve (B).



Hydraulic characteristics



The maximum recommended speed of the fluid in the piping is 4.2 ft/sec, which is equivalent to a flow rate of 6.5 gallons per minute.

Construction details

Resistance to heat and high discharge pressure, allows the maintenance of the functional features of the air separator with glycol water temperatures up to 320°F. The internal geometry of the air separator has been designed to discharge the air up to a pressure of 150 psi.

Discal air separator is built to permit maintenance and cleaning operations without having to remove the valve body from the pipe.
Access to the moving parts that control the air vent is attained by simply removing the top cover.