Deaerators for solar thermal systems DISCAL®

251 series

01134/10 GB
replaces 01134/07 GB

Function

Deaerators are used to discharge continuously air from the hydraulic circuits of air-conditioning or solar thermal systems. The air vent capacity of these devices is extremely high. They are able to automatically remove all the air from the circuits, down to micro-bubble level. The circulation of fully deaerated water allows the systems to work under optimal conditions without any trouble of noise, corrosion, local overheating and mechanical damage.

They are available in versions for installation to horizontal or vertical pipes.

This particular series of deaerators has been specifically designed to work at high temperature with glycol solutions, typical condition of solar thermal systems.

Product range

251 series DISCAL® Deaerator for horizontal pipes, for solar thermal systems. With drain	sizes 1" and 1 1/4"
251 series DISCAL® Deaerator for horizontal pipes, for solar thermal systems. Compact version	size 3/4"
251 series DISCAL® Deaerator for vertical pipes, for solar thermal systems. Compact version	sizes 3/4" and 1"

Technical specifications

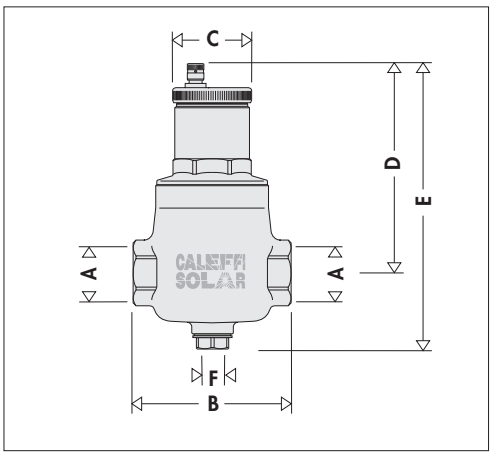
Materials

Body:	brass EN 12165 CW617N, chrome plated
Cover:	brass EN 12165 CW617N, chrome plated
Float:	high resistance polymer
Internal element:	stainless steel
Float guide:	brass EN 12164 CW614N
Obturator stem:	dezincification resistant alloy CR EN 12164 CW602N
Float lever:	stainless steel
Spring:	stainless steel
Hydraulic seals:	high-resistance elastomer

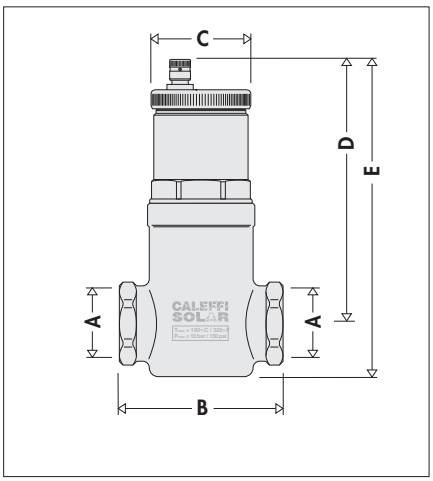
Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Working temperature range:	-30–160°C
Max. working pressure:	10 bar
Max. discharge pressure:	10 bar
Connections: - main	for horizontal pipes 3/4", 1" and 1 1/4" F for vertical pipes 3/4" and 1" F
- drain	(version 1" and 1 1/4") 1/2" F (with plug)

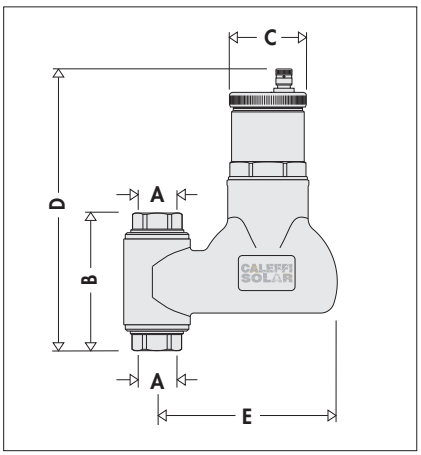
Dimensions



Code	A	B	C	D	E	F	Mass (kg)
251006	1"	110	55	146	205	1/2"	1,80
251007	1 1/4"	124	55	166	225	1/2"	2,36



Code	A	B	C	D	E	Mass (kg)
251003	3/4"	78	55	143	162	0,91



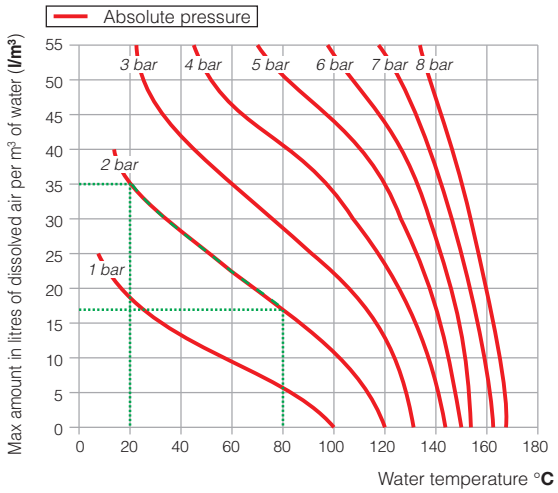
Code	A	B	C	D	E	Mass (kg)
251905	3/4"	102	55	211	130	2,05
251906	1"	107	55	213,5	130	2,05

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 relationship is known as Henry's law, whose graph below permits quantifying the physical phenomenon of releasing the air contained in the medium.

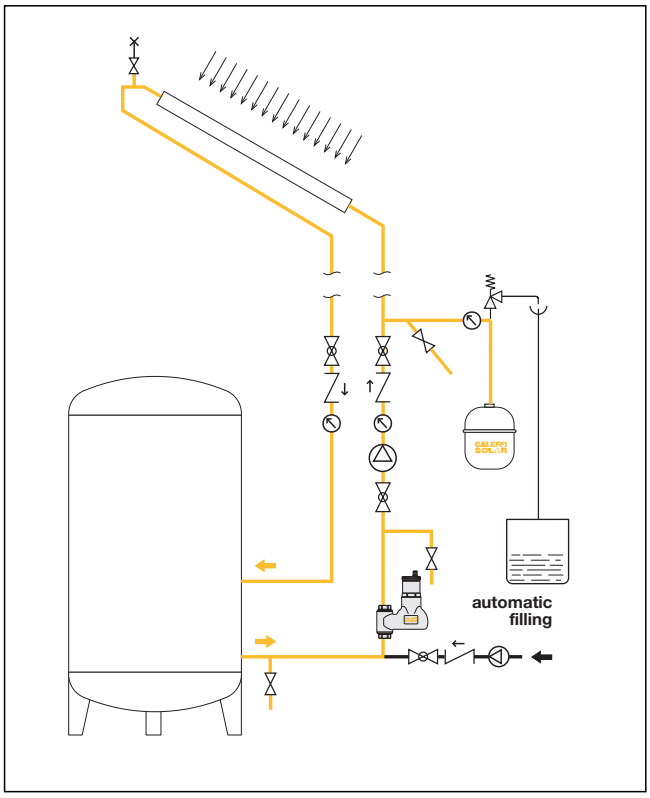
By way of example: at the constant absolute pressure of 2 bar, heating the water from 20°C to 80°C, the quantity of air released by the solution is equal to 18 l per m³ of water.
In accordance with this law it may be noted how there is a greater release of air from the solution as the temperature increases and the pressure decreases. This air is in the form of micro-bubbles with diameters in the order of tenths of a millimetre.
The micro-bubbles form continuously in the water of the solar thermal systems on the top of the panels, that is at the points in the circuit where the highest temperatures are reached.
This air is partly reabsorbed as the medium reaches the parts of the circuit at a lower temperature, partly remaining in the medium and therefore must be extracted.

Graph of solubility of air in water



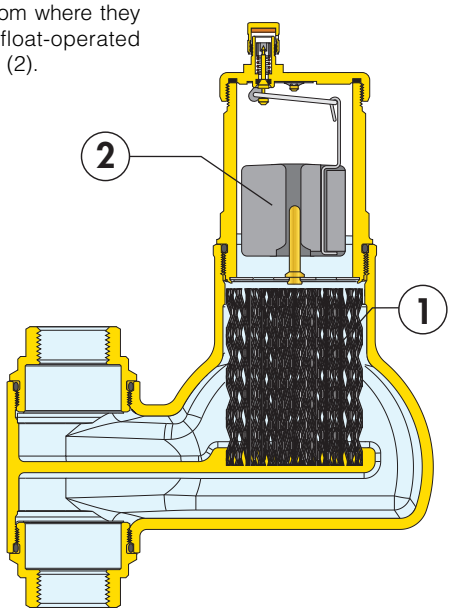
System operation

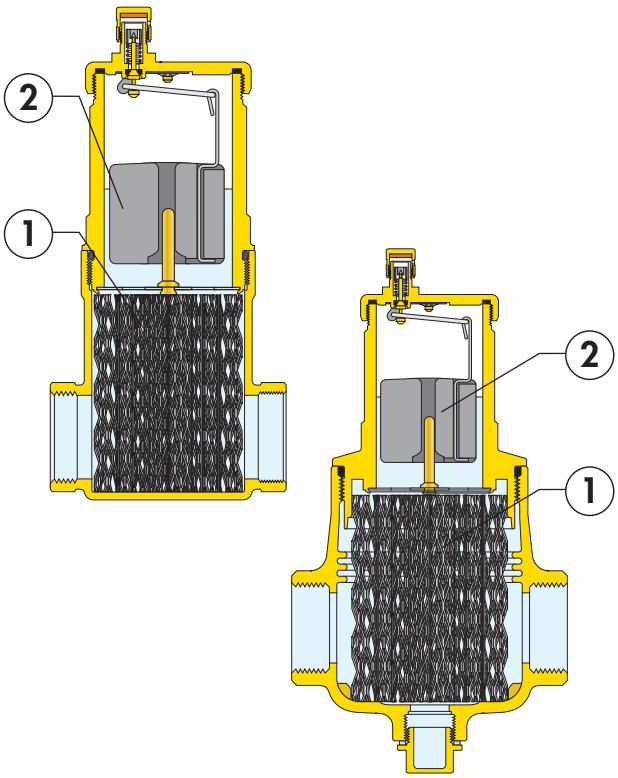
In solar panel thermal systems with forced circulation it is necessary to expel all the air in the medium during the phases of starting up and operating the system.
The deaerator permits separating and expelling this air from the medium continuously and safely.
This means that the circuit stays completely deaerated automatically; any decrease in pressure due to the release of air is compensated by a suitable filling unit.



Operating principle

The deaerator utilises the combined action of several physical principles. The active part is composed of a set of metal screen surfaces arranged like spokes (1). These elements create such swirling motion as to facilitate the release of micro-bubbles and their adhesion to the surfaces.
The bubbles, joining together, increase in volume until the hydrostatic thrust is such as to overcome the force of adhesion to the structure. They then rise towards the top of the device from where they are released by a float-operated automatic air vent valve (2).





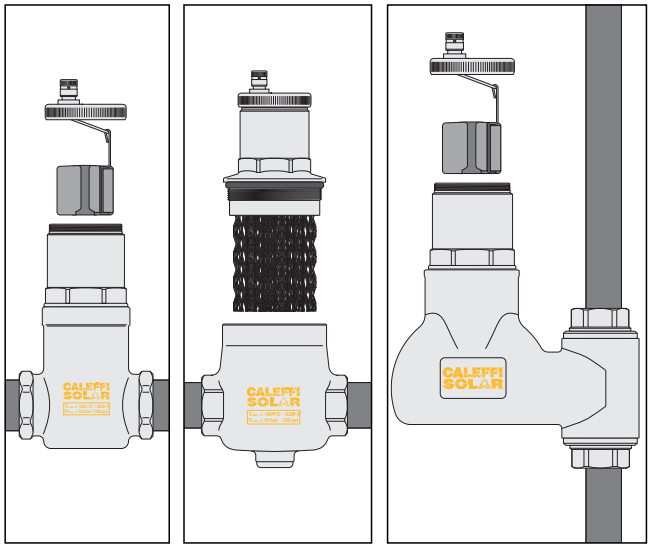
Construction details

Resistance to heat and high discharge pressure

The high performance of this series of deaerators, moreover required in solar thermal systems, is guaranteed by the use of particularly heat resistant materials.
They allow maintaining the functional features of the deaerator with glycol water temperatures up to 160°C. The internal geometry of the deaerator has been designed to be able to discharge the air up to a pressure of 10 bar.

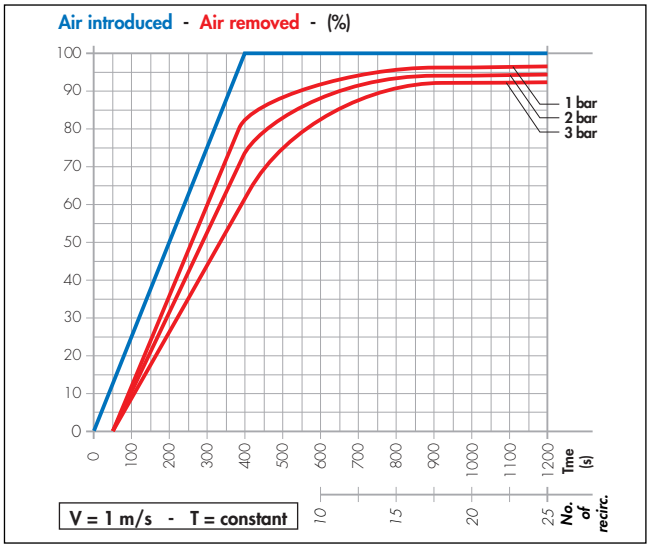
Facilitated maintenance operations

DISCAL® devices are built so that maintenance and cleaning procedures can be performed without having to remove the valve body from the pipe.
Access to the moving parts controlling the air vent is attained simply by removing the top cover.

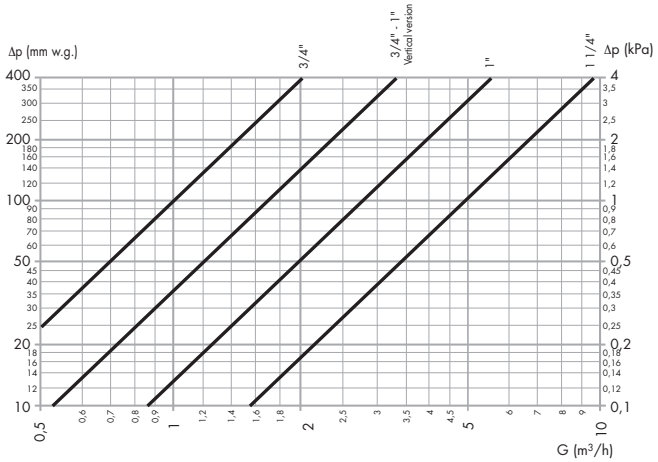


Air separation efficiency

DISCAL® devices are capable of continuously removing the air contained within a hydraulic circuit, with a high degree of separation efficiency.
The amount of air which may be removed from a circuit depends on various parameters: it increases as the circulation speed and pressure values fall.
As illustrated on the graph below, after just 25 recirculations at the maximum recommended speed, almost all the air artificially introduced into the circuit is eliminated by the deaerator, with variable percentages according to the pressure within the circuit.
The small amount which remains is then gradually eliminated during normal system operation. In conditions where the speed is slower or the temperature of the medium is higher, the amount of air separated is even greater.



Hydraulic characteristics



Size	3/4"	3/4" - 1" Vertical version	1"	1 1/4"
Kv (m³/h)	10	17	28,1	48,8

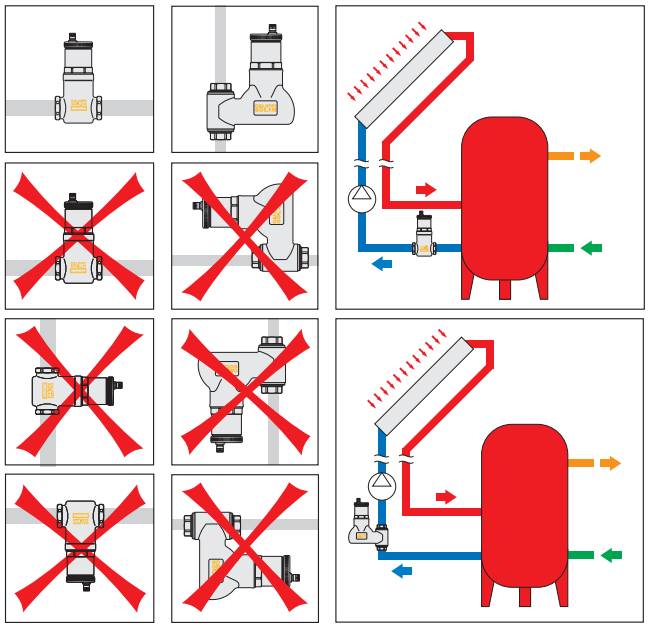
The maximum recommended speed of the medium inside the pipe is 1,2 m/s. The following table shows the maximum flow rates in order to meet this requirement.

Size	3/4"	3/4" - 1" Vertical version	1"	1 1/4"
l/min	22,7	22,7	35,18	57,85
Kv (m³/h)	1,36	1,36	2,11	3,47

Installation

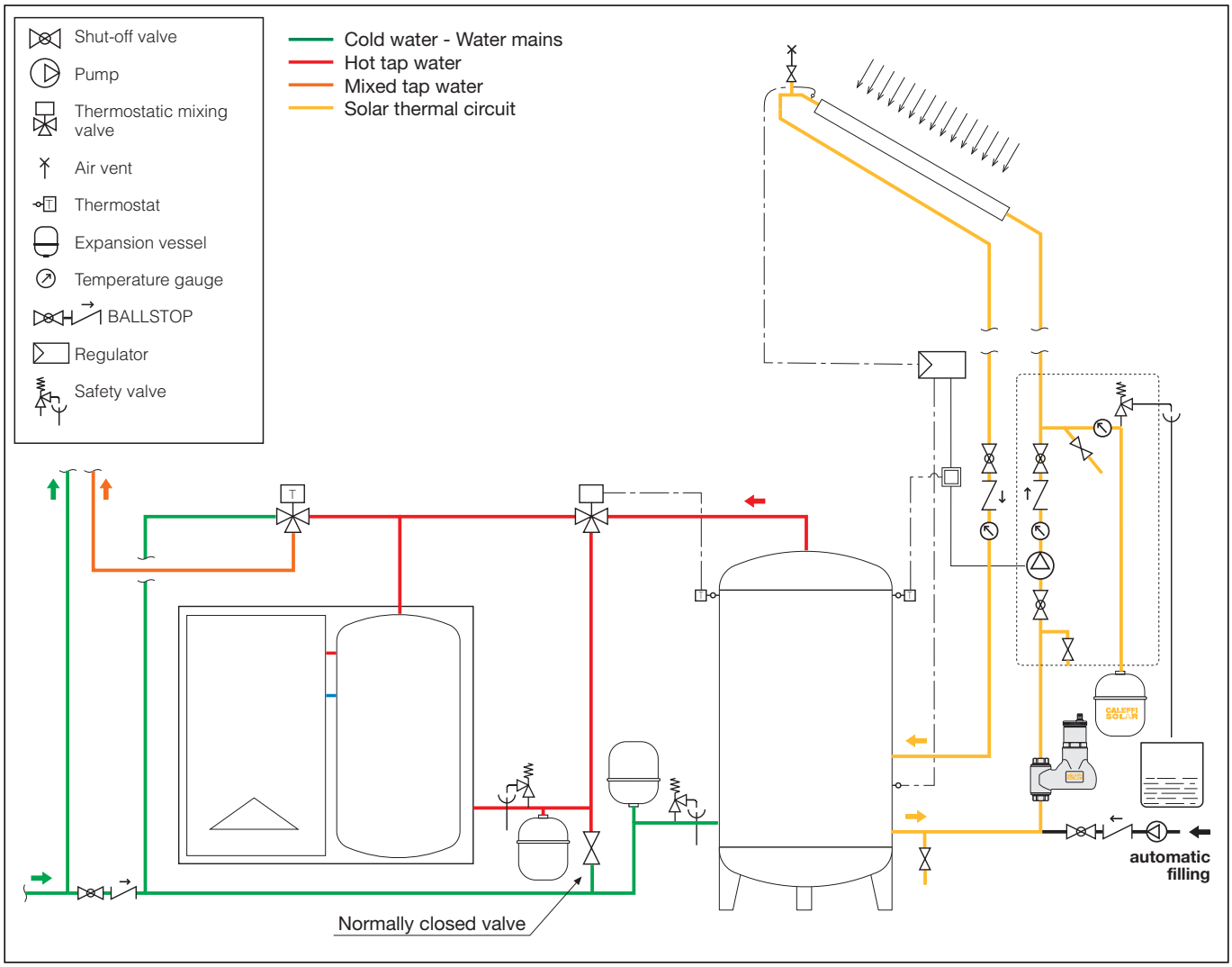
The deaerator must always be installed vertically and preferably:
- upstream of the pump where, due to the high speed of the medium and the ensuing drop in pressure, the air micro-bubbles develop more easily;
- on the return and in the bottom part of the solar thermal circuit, with no formation of steam.

The flow direction of the medium is not important in DISCAL® devices.



Application diagram

Solar thermal system with thermal integration, with boiler and hot water storage



SPECIFICATION SUMMARY

DISCAL® 251 series

Deaerator for solar thermal systems. Connections 1" (and 1 1/4") F for horizontal pipes, version with drain; 3/4" F, compact version. Brass body, chrome plated. High-resistance polymer float. Stainless steel internal element, float lever and spring. Brass float guide. Dezincification resistant alloy obturator stem. High-resistance elastomer hydraulic seals. Medium water and glycol solutions; maximum percentage of glycol 50%. Working temperature range -30–160°C. Maximum working pressure 10 bar. Maximum discharge pressure 10 bar.

DISCAL® 251 series

Deaerator for solar thermal systems. Connections 3/4" (and 1") F for vertical pipes, compact version. Brass body, chrome plated. High-resistance polymer float. Stainless steel internal element, float lever and spring. Brass float guide. Dezincification resistant alloy obturator stem. High-resistance elastomer hydraulic seals. Medium water and glycol solutions; maximum percentage of glycol 50%. Working temperature range -30–160°C. Maximum working pressure 10 bar. Maximum discharge pressure 10 bar.

CALEFFI S.p.A. · S.R.229, N.25 · 28010 Fontaneto d'Agogna (NO) · Italy · Tel. +39 0322 8491 · Fax +39 0322 863723
· www.caleffi.com · info@caleffi.com ·