DISCAL® deaerator

551 series

ISO 9001 FM 21654
ISO 9001 No. 0003
01060/10 GB
replaces 01060/06 GB

Function

Deaerators are used to continuously remove the air contained in the hydraulic circuits of heating and cooling systems. The air discharge capacity of these devices is very high. They are capable of automatically removing all the air present in the system down to micro-bubble level, with very low head losses.
The circulation of fully deaerated water enables the equipment to operate under optimum conditions, free from any noise, corrosion, localised overheating or mechanical damage.
The threaded connection product is available in versions for installation to horizontal or vertical pipes.

Flanged and weld-end DISCAL® deaerators are supplied complete with hot pre-formed shell insulation to ensure perfect thermal insulation when used in both hot and chilled water systems.

Product range

551 series DISCAL® deaerator for horizontal pipes with drain ____ sizes 3/4"–2"
551 series DISCAL® deaerator for horizontal pipes, compact version ____ sizes 3/4"
551 series DISCAL® deaerator for horizontal pipes with olive connections, compact version ____ sizes compression ends for Ø 22 copper pipe
551 series DISCAL® deaerator for horizontal pipes with flanged connections and pre-formed insulation with drain ____ sizes DN 50–DN 150
551 series DISCAL® deaerator for horizontal pipes with weld ends and pre-formed insulation with drain ____ sizes DN 50–DN 150
551 series DISCAL® deaerator for vertical pipes, compact version ____ sizes 3/4", 1"
551 series DISCAL® deaerator for vertical pipes with olive connections, compact version ____ sizes Ø 22 with nuts for copper pipe

Technical specifications

series	551 threaded	551 flanged and weld ends
Materials:		
Body:	brass EN 12165 CW617N	epoxy resin coated steel
Internal element:	PA66G30; stainless steel (compact version)	stainless steel
Float:	PP	PP
Float guide:	brass EN 12164 CW614N	brass EN 12164 CW614N
Stem:	brass EN 12164 CW614N	brass EN 12164 CW614N
Float lever:	stainless steel	stainless steel
Spring:	stainless steel	stainless steel
Hydraulic seals:	EPDM	EPDM
Drain cock:	-	brass EN 12165 CW617N, chrome plated
Performance:		
Medium:	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC
Max. percentage of glycol:	50%	50%
Max. working pressure:	10 bar	10 bar
Max. discharge pressure:	10 bar	10 bar
Working temperature range:	0–110°C	0–110°C
Connections:		
Main:	3/4", 1", 1 1/4", 1 1/2", 2" F with compression ends for Ø 22 mm copper pipe	DN 50 - 65 - 80 - 100 - 125 - 150 weld ends; DN 50 - 65 - 80 - 100 - 125 - 150 flanged PN 16 to be coupled with counterflanges EN 1092-1
Drain:	1/2" F (with plug)	1" M (with plug)

Technical specification of insulation for flanged models from DN 50 to DN 100

Inner part

Material:	rigid closed cell expanded polyurethane foam
Thickness:	60 mm
Density:	45 kg/m³
Thermal conductivity (ISO 2581):	0,023 W/(m·K)
Working temperature range:	0–105°C

External cover

Material:	embossed unfinished aluminium
Thickness:	0,7 mm
Reaction to fire (DIN 4102):	class 1

Head covers

Heat moulded material:	PS

Technical specification of insulation for flanged models DN 125 and DN 150

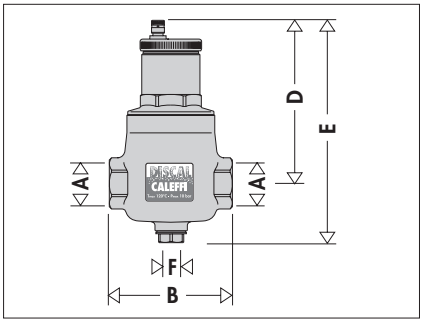
Inner part

Material:		closed cell expanded PE-X
Thickness:		60 mm
Density:	- inner part:	30 kg/m³
	- outer part:	80 kg/m³
Thermal conductivity (ISO 2581):	- at 0°C:	0,038 W/(m·K)
	- at 40°C:	0,045 W/(m·K)
Coefficient of resistance to water vapour (DIN 52615):		> 1.300
Working temperature range:		0–100°C
Reaction to fire (DIN 4102):		class B2

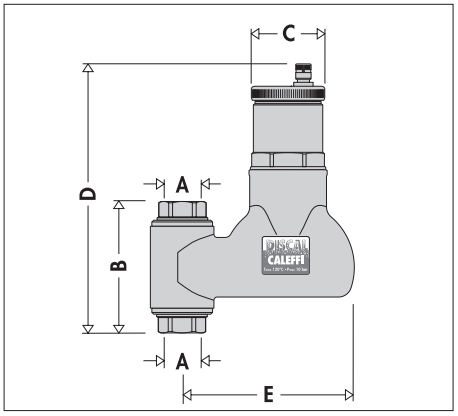
External cover

Material:	embossed unfinished aluminium
Thickness:	0,7 mm
Reaction to fire (DIN 4102):	class 1

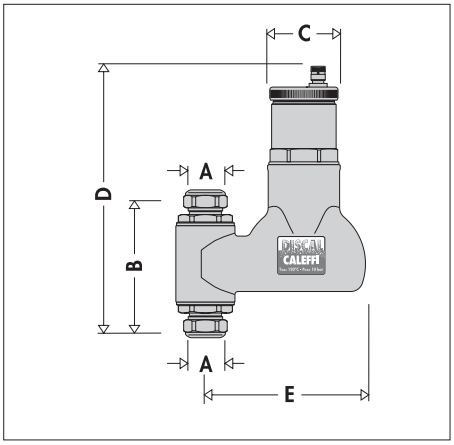
Dimensions



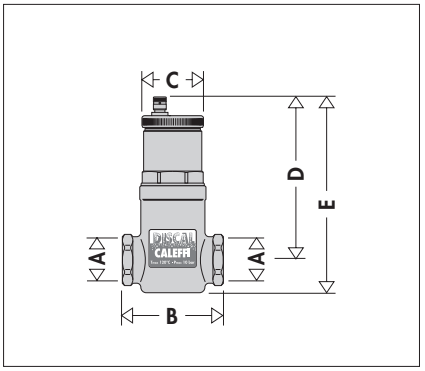
Code	A	B	D	E	F	Mass (kg)
551005	3/4"	110	146	205	1/2"	1,7
551006	1"	110	146	205	1/2"	1,7
551007	1 1/4"	124	166	225	1/2"	2,2
551008	1 1/2"	124	166	225	1/2"	2,2
551009	2"	130	160	225	1/2"	2,5



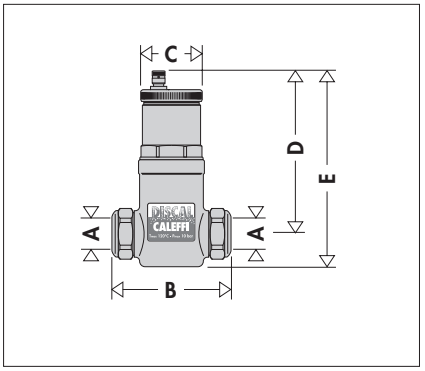
Code	A	B	C	D	E	Mass (kg)
551905	3/4"	102	55	211	130	2,05
551906	1"	107	55	213,5	130	2,05



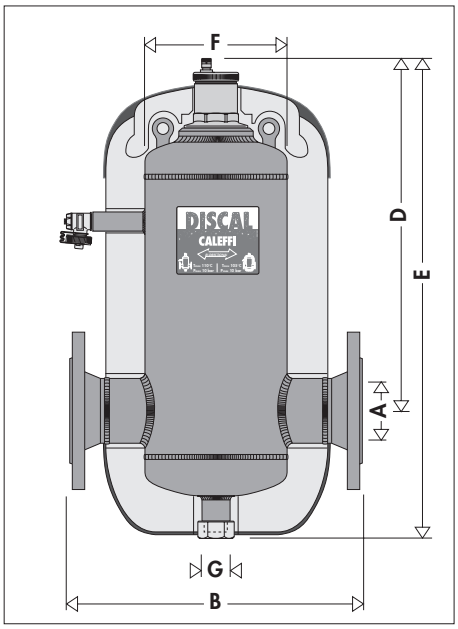
Code	A	B	C	D	E	Mass (kg)
551902	Ø 22	121	55	220,5	130	2,05



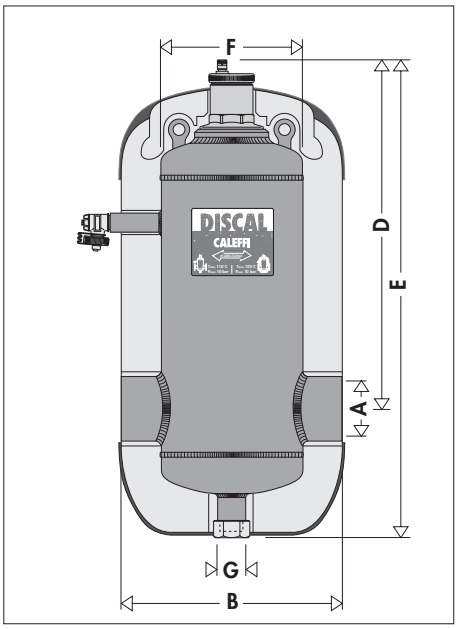
Code	A	B	C	D	E	Mass (kg)
551003	3/4"	78	55	143	162	0,9



Code	A	B	C	D	E	Mass (kg)
551002	Ø 22	97	55	143	162	0,9



Code	A	B	D	E	F	G	Mass (kg)
551052	DN 50	350	374	506	169	1"	15
551062	DN 65	350	374	506	169	1"	15,5
551082	DN 80	466	435	595	219	1"	28
551102	DN 100	470	435	595	219	1"	30
551122	DN 125	635	545	775	324	1"	48
551152	DN 150	635	545	775	324	1"	53



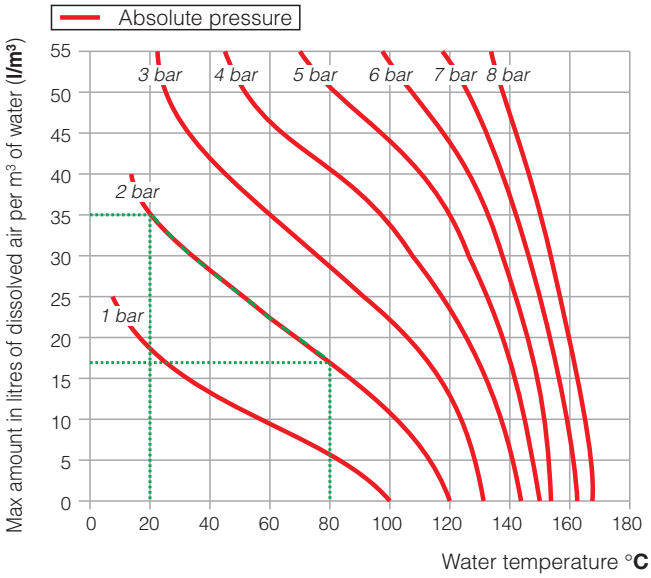
Code	A	B	D	E	F	G	Mass (kg)
551053	DN 50	260	374	506	169	1"	9,3
551063	DN 65	260	374	506	169	1"	9,4
551083	DN 80	366	435	595	219	1"	20
551103	DN 100	366	435	595	219	1"	21
551123	DN 125	525	544	775	324	1"	35
551153	DN 150	525	544	775	324	1"	38

Size	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150
Volume (l)	7	7	18	18	52	52

The process of air formation

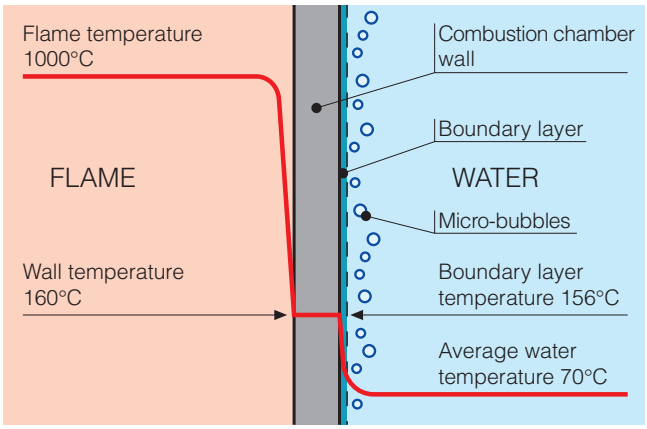
The amount of air which can remain dissolved in a water solution is a function of pressure and temperature. This relationship is governed by Henry's Law and the graph below allows the physical phenomenon of the air content release of the fluid to be quantified. As an example, at a constant absolute pressure of 2 bar, if the water is heated from 20°C to 80°C, the amount of air released by the solution is equal to 18 l per m³ 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.

Graph: Solubility of air in water



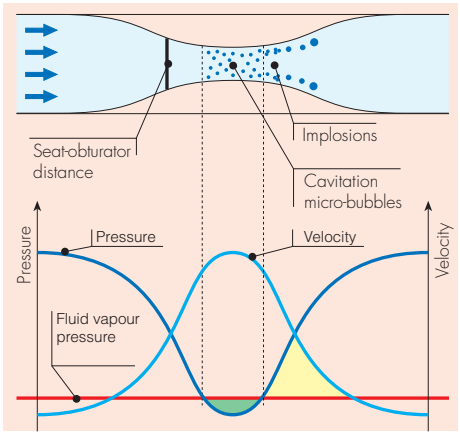
Boiler micro-bubbles

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.

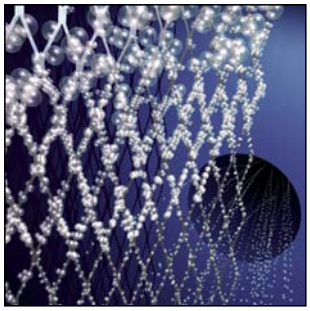


Cavitation micro-bubbles

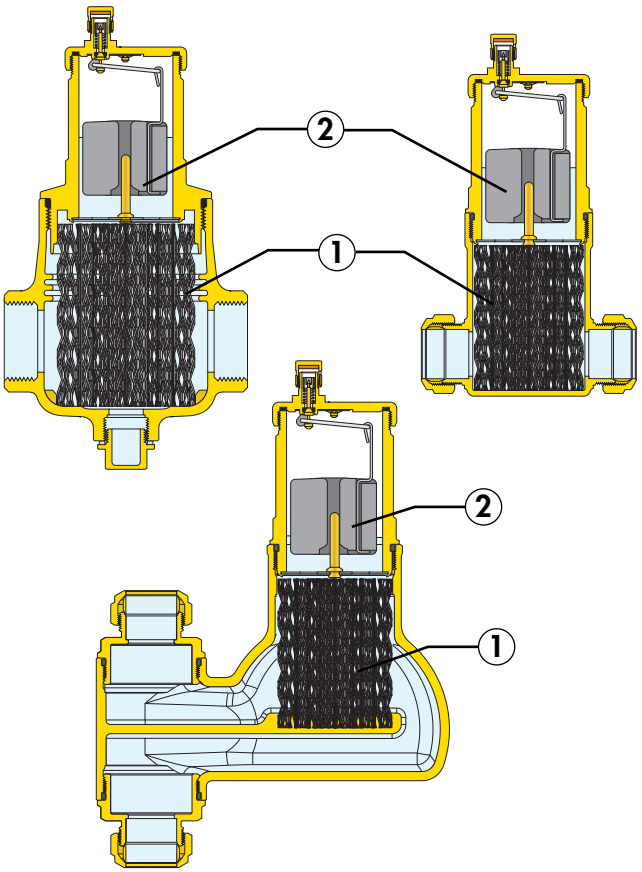
Micro-bubbles develop where the fluid velocity is very high with the corresponding reduction in pressure.
These points are typically the pump impeller and the regulating valve seating. These air and vapour micro-bubbles, the formation of which is enhanced in the case of non de-aerated water, may subsequently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

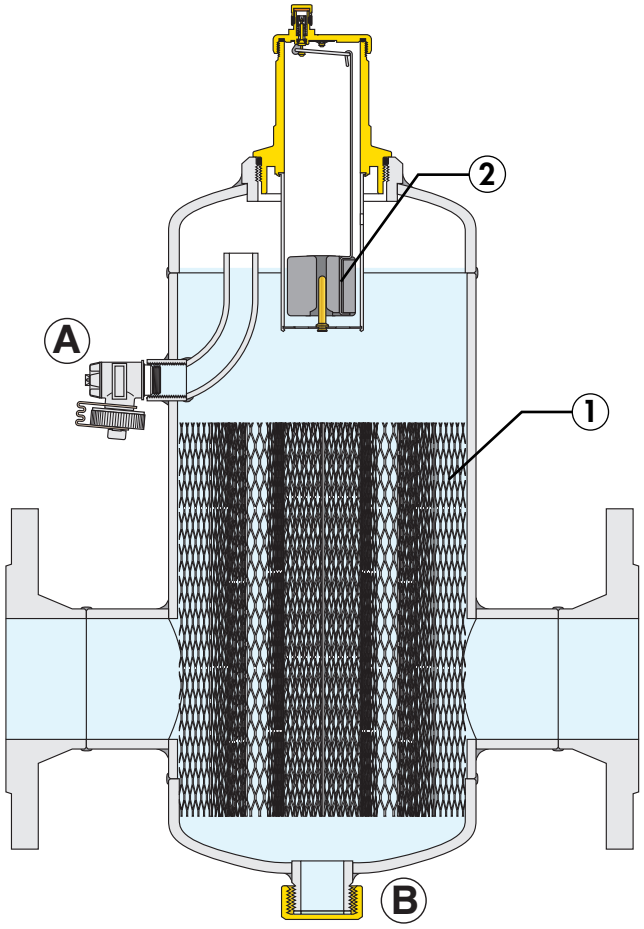


Operating principle



The deaerator 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.It is designed in such a way that the direction in which the medium is flowing inside it makes no difference.



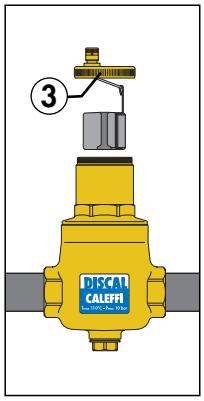


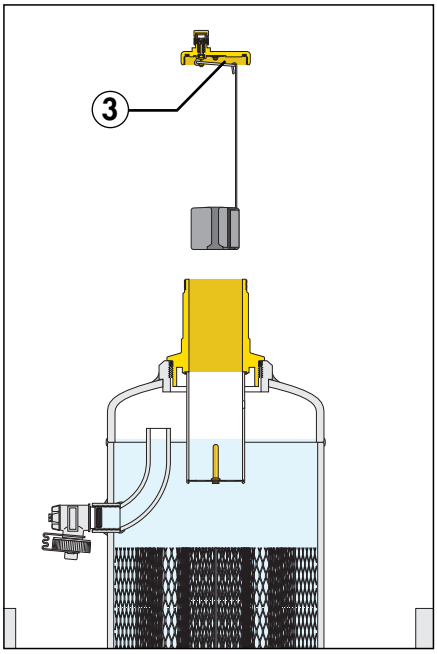
Construction details

The automatic air vent is located at the top of the unit and is equipped with a long chamber for the floating action. This feature prevents the impurities present in the water from reaching the seal seat.

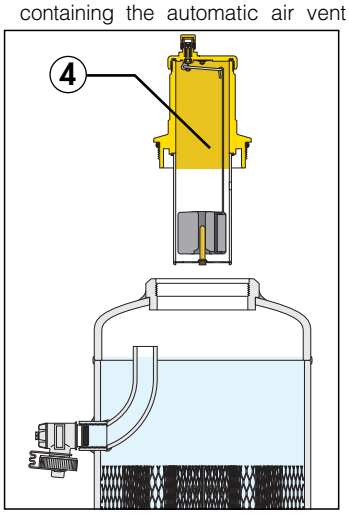
The construction of the DISCAL® deaerator allows it to be maintained and cleaned without removing the device from the system. Note the following:

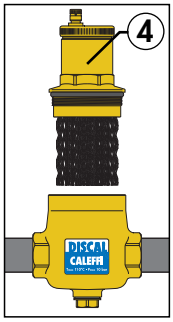
- The moving parts that control the air venting are accessed simply by removing the upper cover.(3).

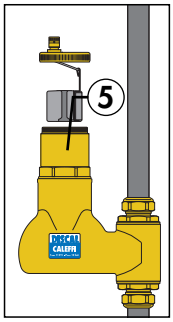




- When cleaning, simply unscrew the part of the body containing the automatic air vent (4). On threaded models without a drain, this part cannot be removed (5).



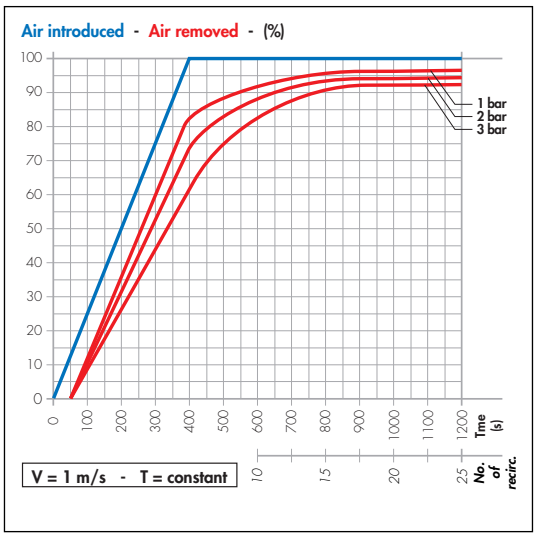




Flanged and weld-end deaerators are equipped with a cock (A) that has the dual function of releasing large quantities of air when the system is being filled and of removing the impurities that float on top of the water.
A drain valve (B) can be connected at the bottom of the unit to drain the impurities that have collected at the bottom of the deaerator.

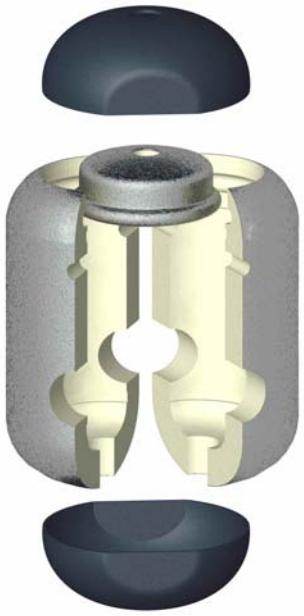
Air separation efficiency

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.

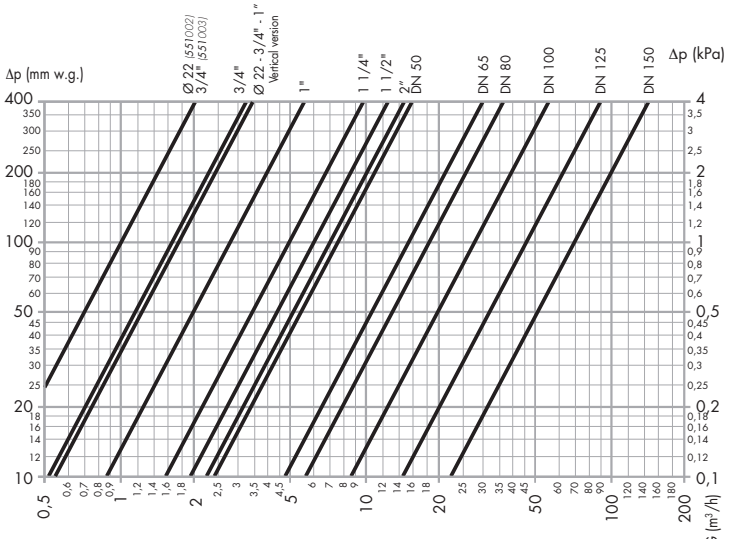


Insulation

Flanged and weld-end DISCAL® devices are supplied complete with hot pre-formed shell insulation.
This system ensures not only perfect thermal 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.



Hydraulic characteristics



DN	Ø 22 - 3/4"	3/4"	Ø 22 - 3/4" - 1" Vertical version	1"	1 1/4"	1 1/2"	2"
Kv (m³/h)	10,0	16,2	17,0	28,1	48,8	63,2	70,0

DN	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150
Kv (m³/h)	75,0	150,0	180,0	280,0	450,0	720,0

The maximum recommended speed of the medium at the device connections is ~ 1,2 m/s. The following table gives the maximum flow rates to meet this condition.

DN	Ø 22 - 3/4" - 1"	3/4"	1"	1 1/4"	1 1/2"	2"
l/min	22,7	22,7	35,18	57,85	90,33	136,6
m³/h	1,36	1,36	2,11	3,47	5,42	8,20

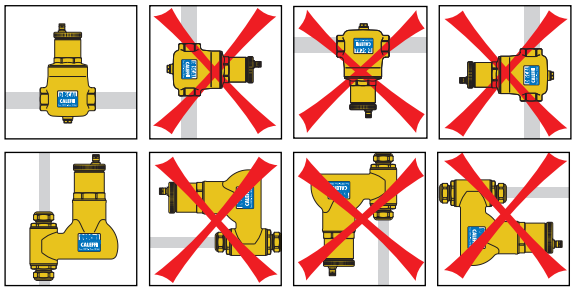
DN	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150
l/min	141,20	238,6	361,5	564,8	980,0	1436,6
m³/h	8,47	14,32	21,69	33,89	58,8	86,2

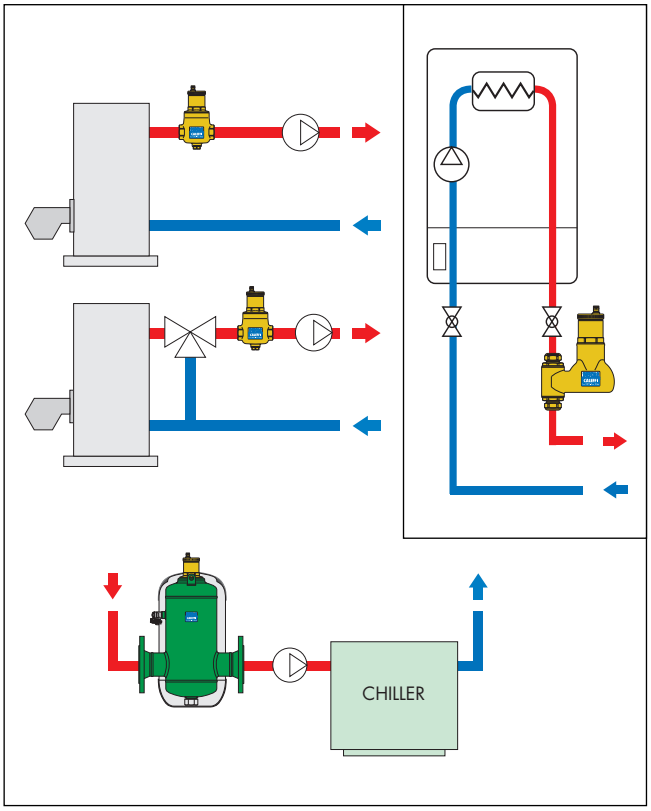
Installation

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® deaerators must be installed in a vertical position, and preferably:

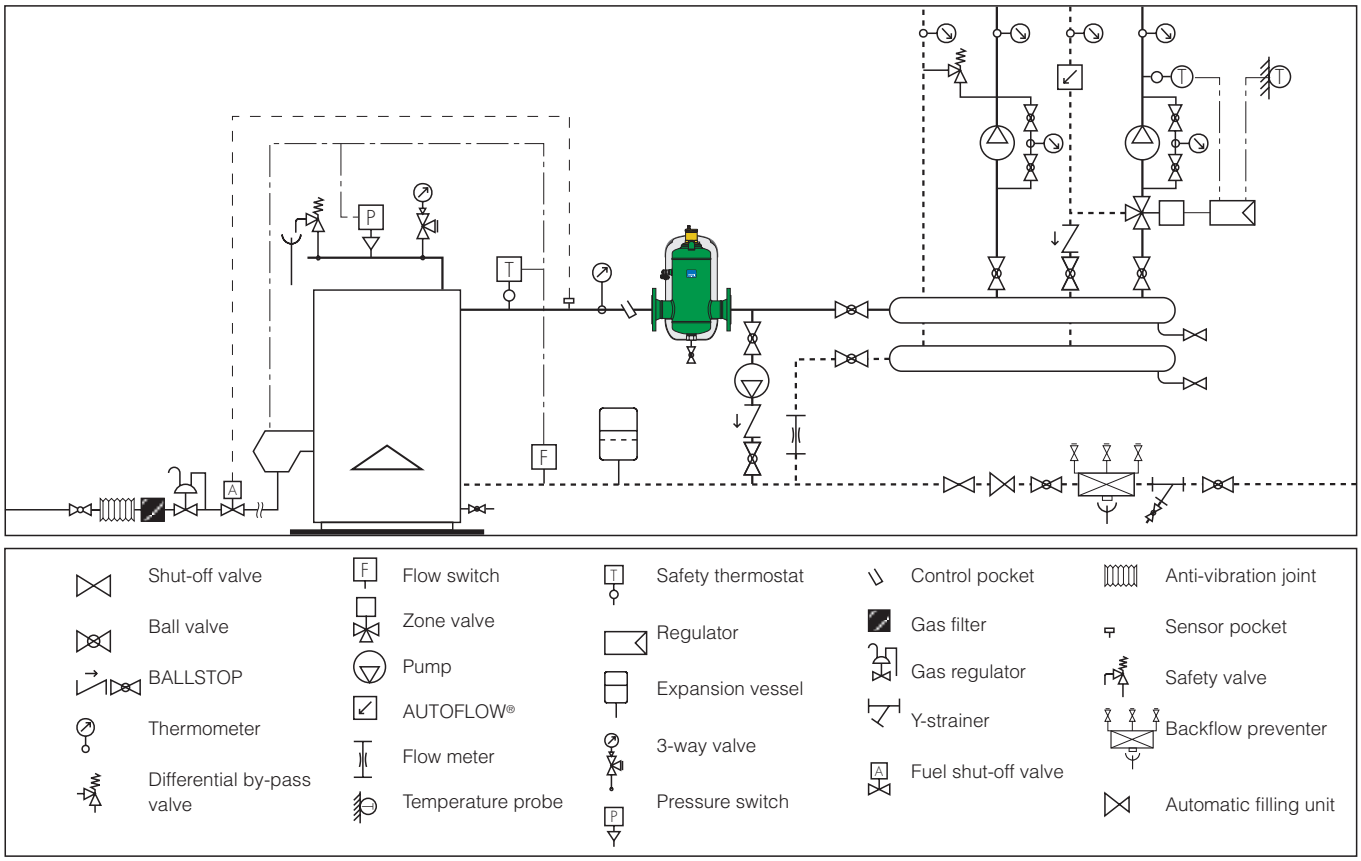
- upstream of the pump where, due to the high speed of the medium and the ensuing drop in pressure, air micro-bubbles develop more easily.

The flow direction of the medium is not important in DISCAL® devices.
In installation sites where inspection is not possible, it is recommended that the air vent cap is replaced with a Caleffi 5620 series hygroscopic safety cap.





Application diagram



SPECIFICATION SUMMARY

DISCAL® 551 series
Deaerator, version with drain. Connections for horizontal pipes 3/4" F (from 3/4" to 2") with union. Drain 1/2" F (with plug). Brass body. PA66G30 internal element. PP float. Brass float guide and stem. Stainless steel float lever and spring. EPDM hydraulic seals. Medium water and non-hazardous glycol solutions excluded from the guidelines of EC directive 67/548; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Maximum discharge pressure 10 bar. Working temperature range 0–110°C. Patented.

DISCAL® 551 series
Deaerator. Flanged connections DN 50 (from DN 50 to DN 150) PN 16; to be coupled with counterflanges EN 1092-1. Weld end connections DN 50 (from DN 50 to DN 150). Drain 1" M (with plug). Epoxy resin coated steel body. Stainless steel internal element. EPDM hydraulic seals. Medium water and non-hazardous glycol solutions excluded from the guidelines of EC directive 67/548; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Maximum discharge pressure 10 bar. Working temperature range 0–110°C. Patented.
Complete with:
- automatic air vent: brass body, PP float, brass float guide and stem, stainless steel float lever and spring;
- chrome plated brass drain cock;
- rigid closed cell expanded polyurethane foam insulation for sizes up to DN 100 (closed cell expanded PE-X for DN 125 and DN 150) and embossed unfinished aluminium external cover. Working temperature range 0–105°C (0-100°C for DN 125 and DN 150).

DISCAL® 551 series
Deaerator, compact version. Connection for horizontal or vertical pipes with compression ends for Ø 22 copper pipe, threaded connections 3/4" F (and 1") for vertical pipes, threaded connections 3/4" F for horizontal pipes. Brass body. Stainless steel internal element. PP float. Brass float guide and stem. Stainless steel float lever and spring. EPDM hydraulic seals. Medium water and non-hazardous glycol solutions excluded from the guidelines of EC directive 67/548; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Maximum discharge pressure 10 bar. Working temperature range 0–110°C.

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 ·