DISCAL® deaerator

551 series

01060/17 GB
replaces dp 01060/14 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.
The circulation of fully deaerated water enables the systems to operate under optimal conditions, free from any noise, corrosion, localised overheating or mechanical damage. In the threaded versions it is available for installation on horizontal pipes, and with adjustable T-fitting for installation on horizontal and vertical pipes.

Flanged and weld-end DISCAL® deaerators are supplied complete with hot pre-formed shell insulation to ensure perfect heat insulation when used in both hot and chilled water systems.
Optional insulation is available for the threaded model with 3/4" and 2" drain.

Only applicable to threaded versions

Product range

551 series	DISCAL® deaerator for horizontal pipes, compact version	size DN 20 (3/4")
551 series	DISCAL® deaerator for horizontal pipes with olive fittings, compact version	size DN 20 (Ø 22)
551 series	DISCAL® deaerator for horizontal pipes with drain	sizes DN 20 (3/4"); DN 25 (1"); DN 32 (1 1/4"); DN 40 (1 1/2"); DN 50 (2")
551 series	DISCAL® deaerator for horizontal and vertical pipes, compact version with adjustable T-fitting	sizes DN 20 (3/4"), DN 25 (1" M and 1" F)
551 series	DISCAL® deaerator for horizontal and vertical pipes, compact version with adjustable T-fitting	sizes DN 20 (Ø 22), DN 25 (Ø 28)
551 series	DISCAL® deaerator for horizontal pipes with flanged connections and insulation with drain	sizes DN 50–DN 150
551 series	DISCAL® deaerator for horizontal pipes with flanged connections and floor-mounted supports	sizes DN 200–DN 300
551 series	DISCAL® deaerator for horizontal pipes with weld-end connections and insulation with drain	sizes DN 50–DN 150

Technical specifications

series	551 threaded	551 flanged and weld-end
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 EN 10270-3 (AISI 302)	stainless steel EN 10270-3 (AISI 302)
Spring:	stainless steel EN 10270-3 (AISI 302)	stainless steel EN 10270-3 (AISI 302)
T-fitting locking nut (5517 series):	brass EN 12420 CW617N	
T-fitting (5517 series):	brass EN 1982 CB7535	
Hydraulic seals:	EPDM	EPDM
Drain cock:	-	brass EN 12165 CW617N, chrome plated
Performance		
Media	water, non-hazardous glycol solutions excluded from the scope of directive 67/548/EC	water, non-hazardous glycol solutions excluded from the scope 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; - with adjustable T-fitting for copper pipe; Ø 22 and Ø 28 mm; - with adjustable T-fitting 3/4" F, 1" F and 1" M	DN 50-DN 150, PN 16 DN 200–DN 300, PN 10 to be coupled with flat counterflange EN 1092-1 DN 50–DN 150 weld-end
Probe holder:		DN 200–DN 300, 1/2" F inlet/outlet
Drain:	1/2" F (with cap)	DN 50–DN 150, 1" M (with cap) DN 200–DN 300, 2" F

Insulation technical specifications for threaded models codes 551005/9

Material:		closed cell expanded PE-X
Thickness:		10 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:		0–110°C
Reaction to fire (DIN 4102):		class B2

Technical specifications 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

Head covers

Heat moulded material:	PS

External cover

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

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

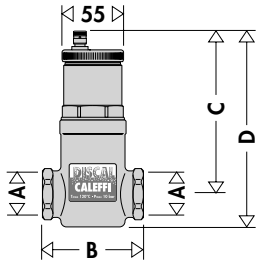
Inner part

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

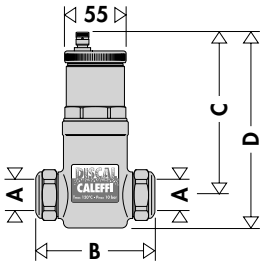
External cover

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

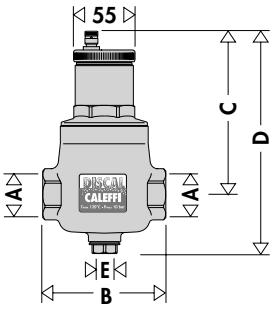
Dimensions



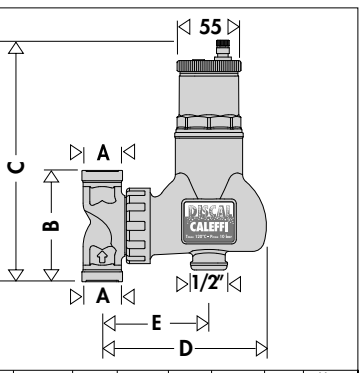
Code	Size	A	B	C	D	Mass (kg)
551003	DN 20	3/4	78	143	162	0,9



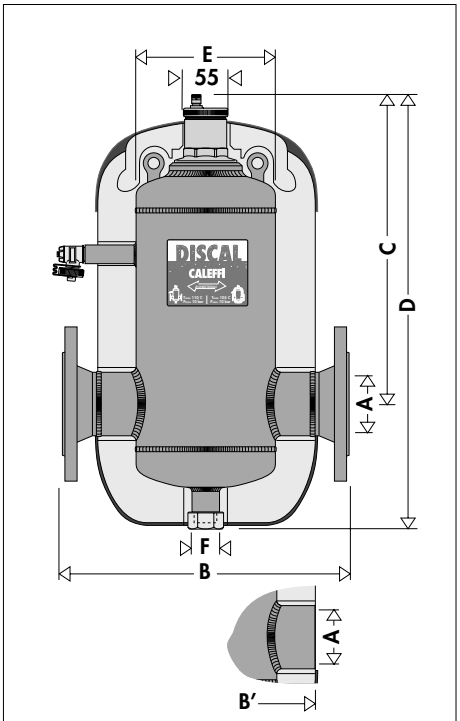
Code	Size	A	B	C	D	Mass (kg)
551002	DN 20	Ø22	97	143	162	0,9



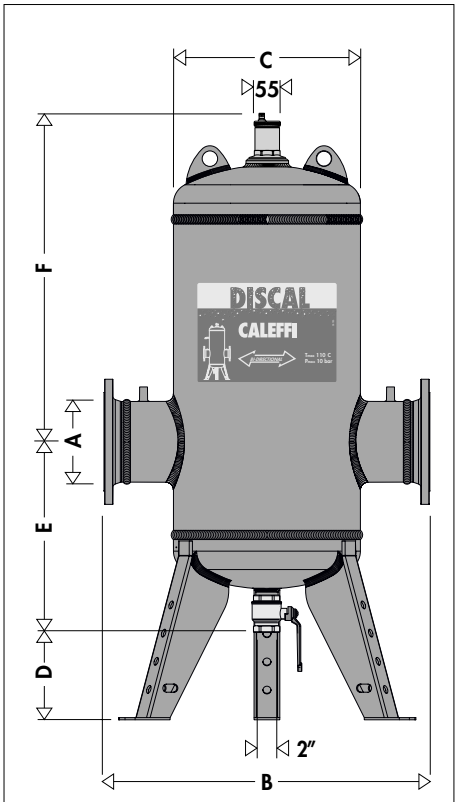
Code	Size	A	B	C	D	E	Mass (kg)
551005	DN 20	3/4	110	146	205	1/2"	1,7
551006	DN 25	1"	110	146	205	1/2"	1,7
551007	DN 32	1 1/4"	124	166	225	1/2"	2,2
551008	DN 40	1 1/2"	124	166	225	1/2"	2,2
551009	DN 50	2"zz	130	160	225	1/2"	2,5



Code	Size	A	B	C	D	E	Mass (kg)
551705	DN 20	3/4"	96	208	141,5	92	2,05
551706	DN 25	1"	140,6	230	141,5	92	2,38

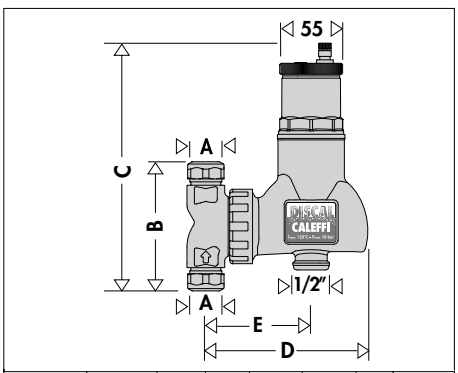


Code	A	Bâ€™B	C	D	E	F	Mass (kg)
551052/3	DN 50	260	350	374	506	169	1"	15
551062/3	DN 65	260	350	374	506	169	1"	15,5
551082/3	DN 80	366	466	435	595	219	1"	28
551102/3	DN 100	366	470	435	595	219	1"	30
551122/3	DN 125	525	635	545	775	324	1"	48
551152/3	DN 150	525	635	545	775	324	1"	53

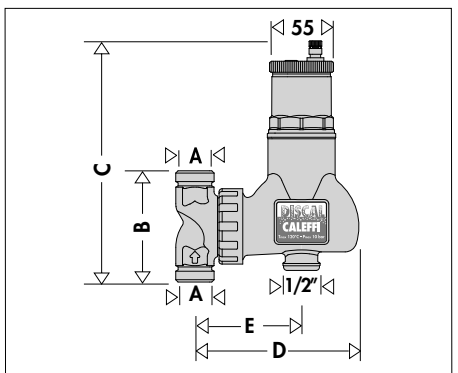


Code	A	B	C	D	E	F	Mass (kg)
551200	DN 200	900	508	215	510	825	152
551250	DN 250	1060	660	215	575	970	280
551300	DN 300	1180	762	215	645	1100	395

Size	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300
Volume (l)	7	7	18	18	52	52	211	415	639



Code	Size	A	B	C	D	E	Mass (kg)
551702	DN 20	Ø22	113	216,5	141,5	92	2,28
551703	DN 25	Ø28	116	218	141,5	92	2,11

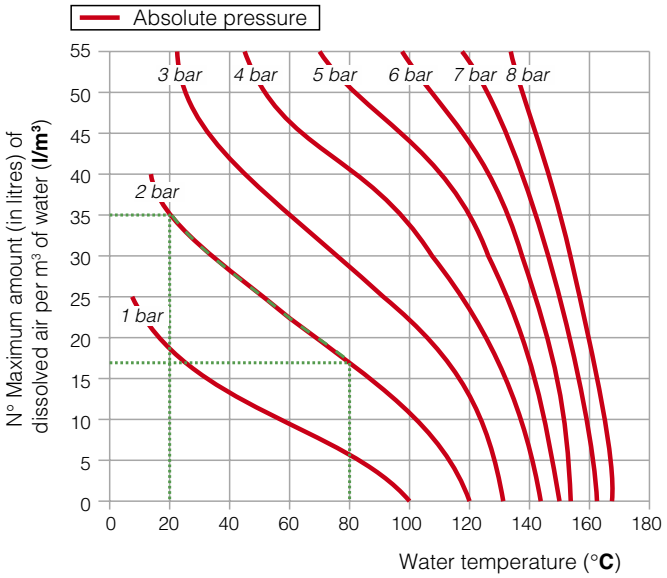


Code	Size	A	B	C	D	E	Mass (kg)
551716	DN 25	1"	96	208	141,5	92	2,07

The air formation process

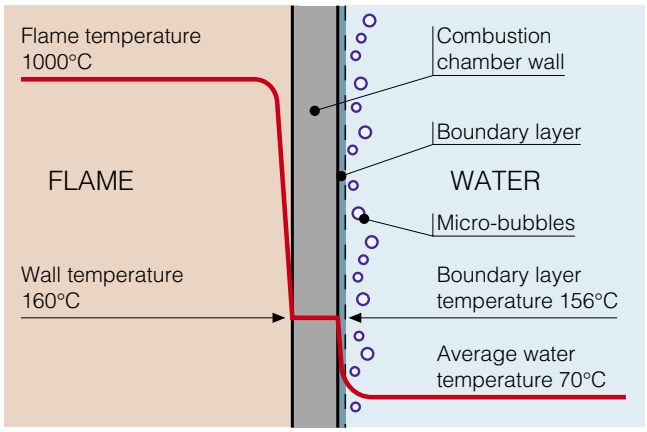
The amount of air which can remain dissolved in a water solution depends on the pressure and temperature.
This relationship is known as Henry's law; the graph below allows us to quantify the physical phenomenon of releasing the air contained in the medium.
For example: at a constant absolute pressure 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 may be noted how the amount of air released by the solution increases as the temperature rises and the pressure decreases. This air is in the form of micro-bubbles with diameters in the order of tenths of a millimetre.
In circuits of air-conditioning systems there are specific points where this micro-bubble formation process takes place continuously: inside boilers and devices which operate under conditions of cavitation.

Graph of solubility of air in water



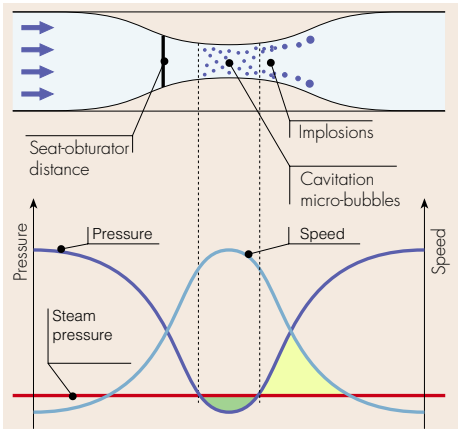
Boiler micro-bubbles

Micro-bubbles form continuously on the surfaces separating the water from the combustion chamber due to the high temperature of the medium.
This air, carried by the water, collects at critical points of the circuit, from which it must be removed. Some of it is reabsorbed where it meets colder surfaces.

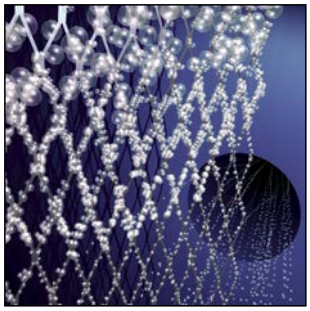


Cavitation micro-bubbles

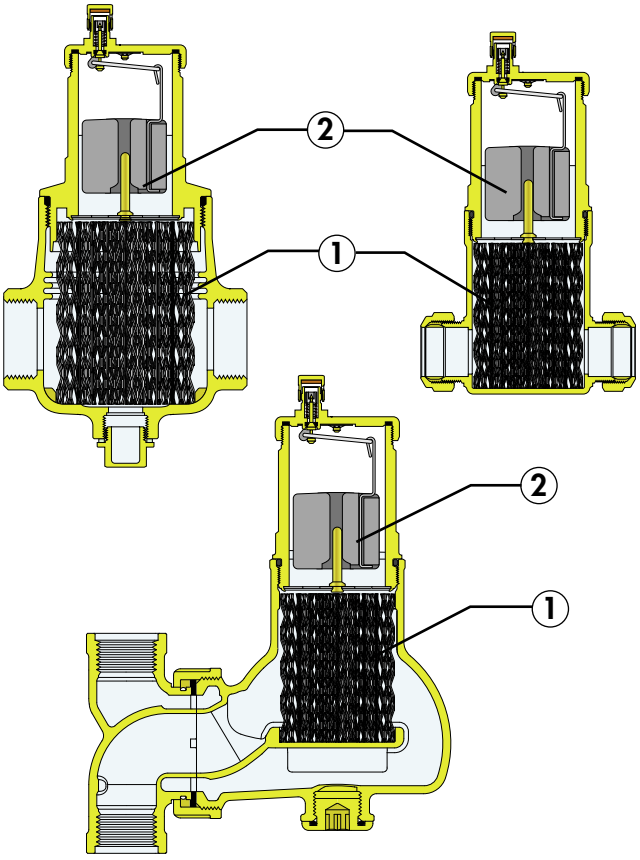
Micro-bubbles develop where the speed of the medium is particularly high, with a corresponding reduction in pressure.
These points are usually the pump impellers and the water orifices of the regulating valves.
These micro-bubbles of air and steam, the formation of which is accentuated in non-deaerated water, may subsequently implode as a result of the cavitation effect.

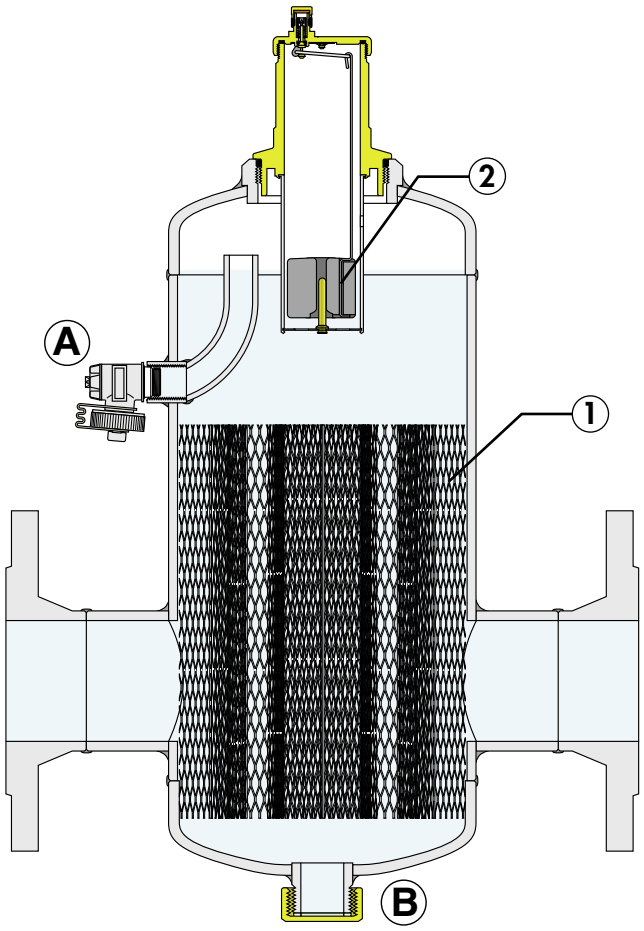


Operating principle



The deaerator utilises the combined action of several physics principles. The active part consists of a set of concentric metal mesh surfaces (1). These elements create the swirling motion required to facilitate the release of micro-bubbles and their adhesion to the surfaces.
The bubbles, fusing with each other, increase in volume until the hydrostatic thrust is sufficient to overcome the force of adhesion to the structure. They then rise towards the top of the device and are expelled through a float-operated automatic air vent valve (2). It is designed in such a way that the direction in which the medium is flowing inside it makes no difference.



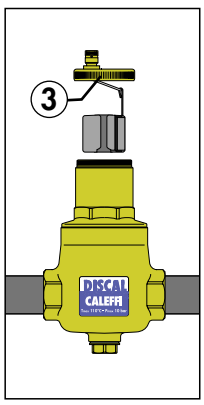


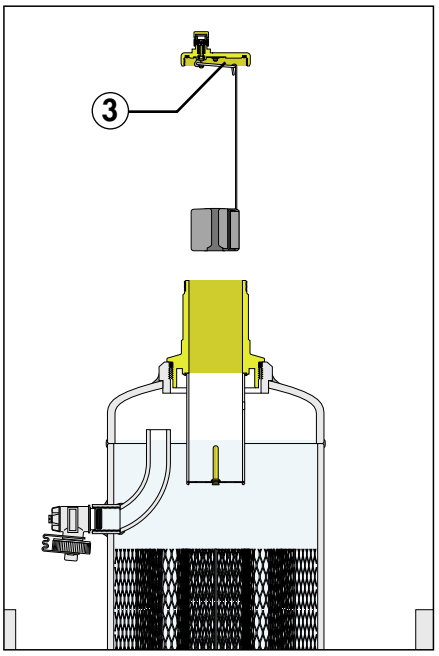
Construction details

The automatic air vent valve, located at the top of the device, is equipped with a long chamber for float movement. This feature prevents any impurities in the water from reaching the seal seat.

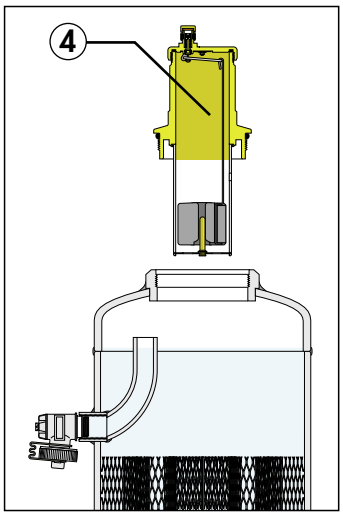
The special construction of the DISCAL® deaerator allows maintenance and cleaning procedures to be performed without removing the device from the system. Note in particular:

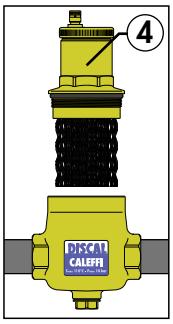
- Access to the moving parts controlling the air vent is attained by simply removing the top cover (3).

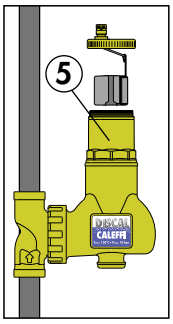




- When cleaning, simply unscrew the portion of the body containing the automatic air vent valve (4). On threaded models without drain and in the 5517 series with adjustable T-fitting, this part is not removable (5).



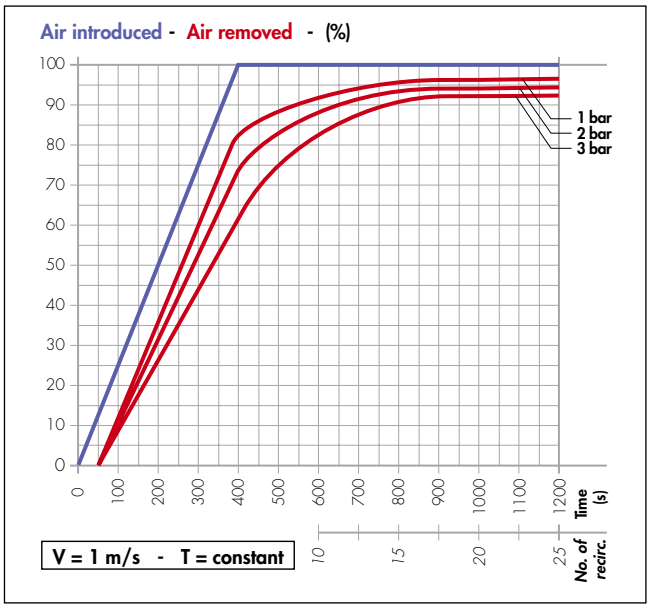




Flanged and weld-end deaerators are equipped with a cock (A) which performs the dual function of releasing large amounts of air while the system is being filled and eliminating any impurities floating on top of the water.
The lower part is fitted with a plug (B) which can be connected to a drain valve, for the elimination of any impurities which 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 that can be removed from a circuit depends on different parameters: it increases as the circulation speed and the pressure decrease.
As illustrated on the graph below, after just 25 recirculations at the maximum recommended speed, almost all the air artificially released into the circuit (blue curve on the graph) is eliminated by the deaerator, with percentages which vary on the basis of 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.

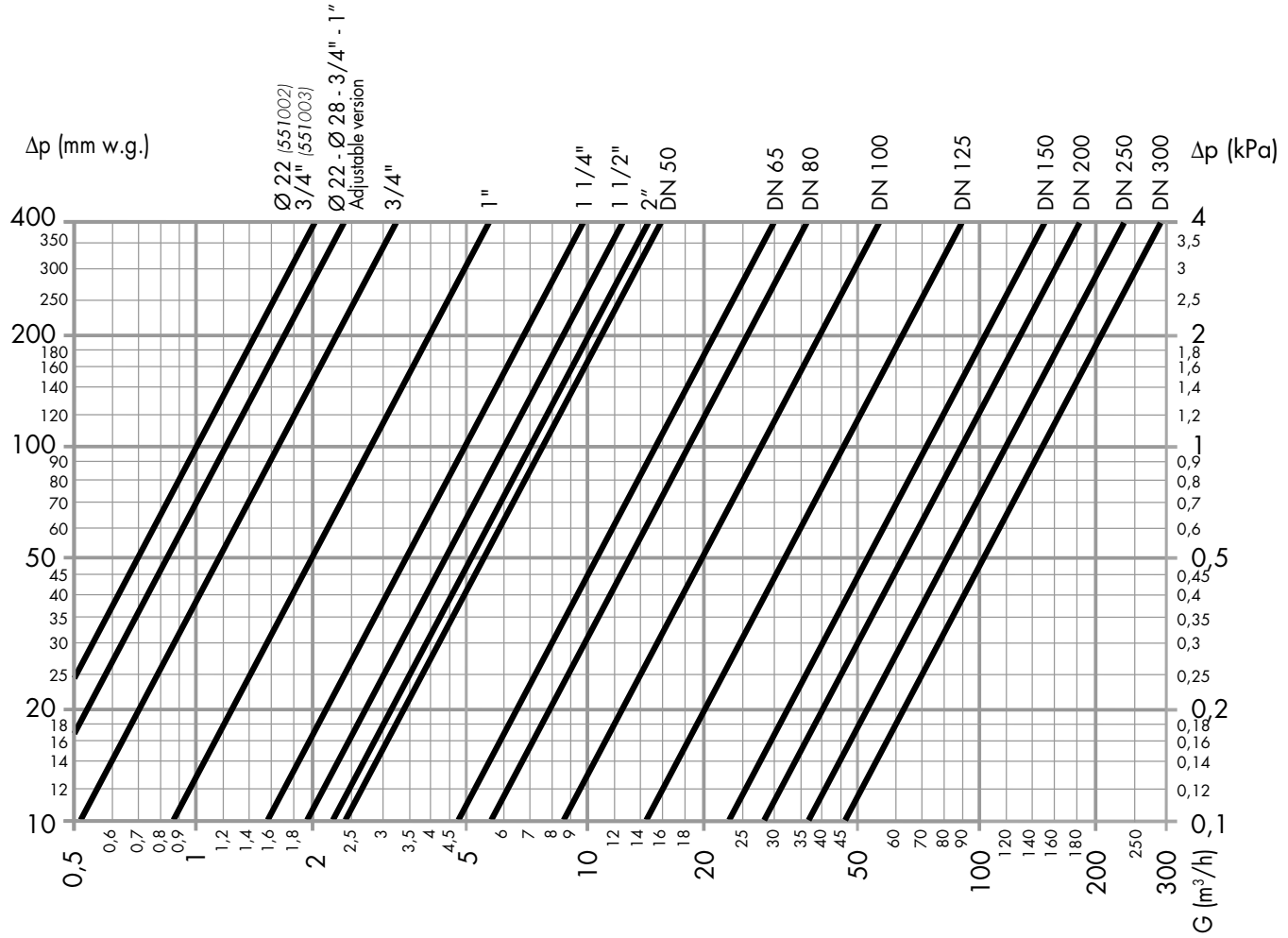


Insulation

Flanged (DN 50–DN 150) and weld-end DISCAL® devices are supplied complete with hot pre-formed shell insulation. The threaded models codes 551005-6-7-8-9 can be equipped with hot pre-formed shell insulation as an option. This system ensures not only perfect thermal insulation, but also the tightness required to prevent water vapour entering the device from the ambient. For this reason, this type of insulation may also be used in chilled water circuits as it prevents condensation from forming on the surface of the valve body.



Hydraulic characteristics



DN	20	25	20/25 Adjustable version	25	32	40	50
Connection	Ø 22 - 3/4"	3/4"	Ø 22 - Ø 28 - 3/4" - 1"	1"	1 1/4"	1 1/2"	2"
Kv (m³/h)	10,0	16,2	12,0	28,1	48,8	63,2	70,0

DN	50	65	80	100	125	150	200	250	300
Kv (m³/h)	75,0	150,0	180,0	280,0	450,0	720,0	900	1200,0	1500,0

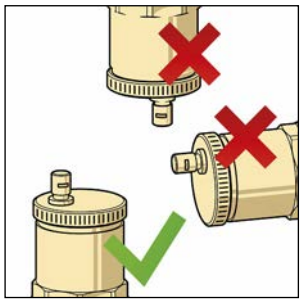
The maximum recommended flow speed at the device connections is ~1,2 m/s. The following table shows the maximum flow rates in order to meet this requirement.

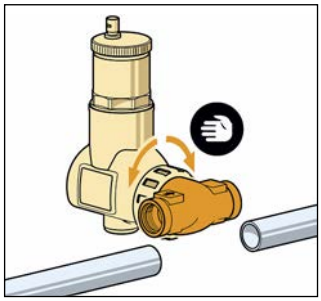
DN	20 / 25	20 adjustable	25 adjustable	25	32	40	50
Connections	Ø 22 - 3/4"	Ø 22 - 3/4"	Ø 28 - 1"	1"	1 1/4"	1 1/2"	2"
l/min	22,7	22,7	35,18	35,18	57,85	90,33	136,6
m³/h	1,36	1,36	2,11	2,11	3,47	5,42	8,20

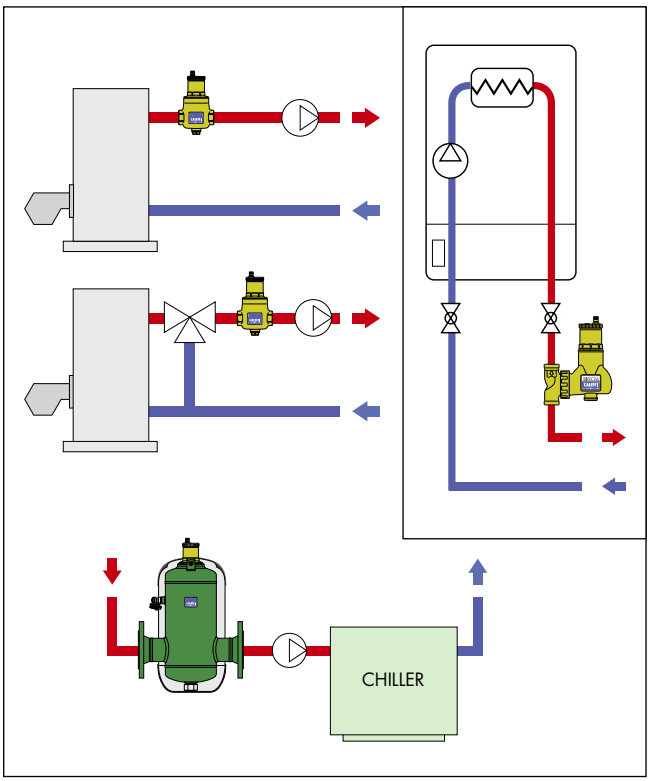
DN	50	65	80	100	125	150	200	250	300
l/min	141,20	238,6	361,5	564,8	980,0	1436,6	2433,0	3866,0	5416,0
m³/h)	8,47	14,32	21,69	33,89	58,8	86,2	146,0	232,0	325,0

Installation

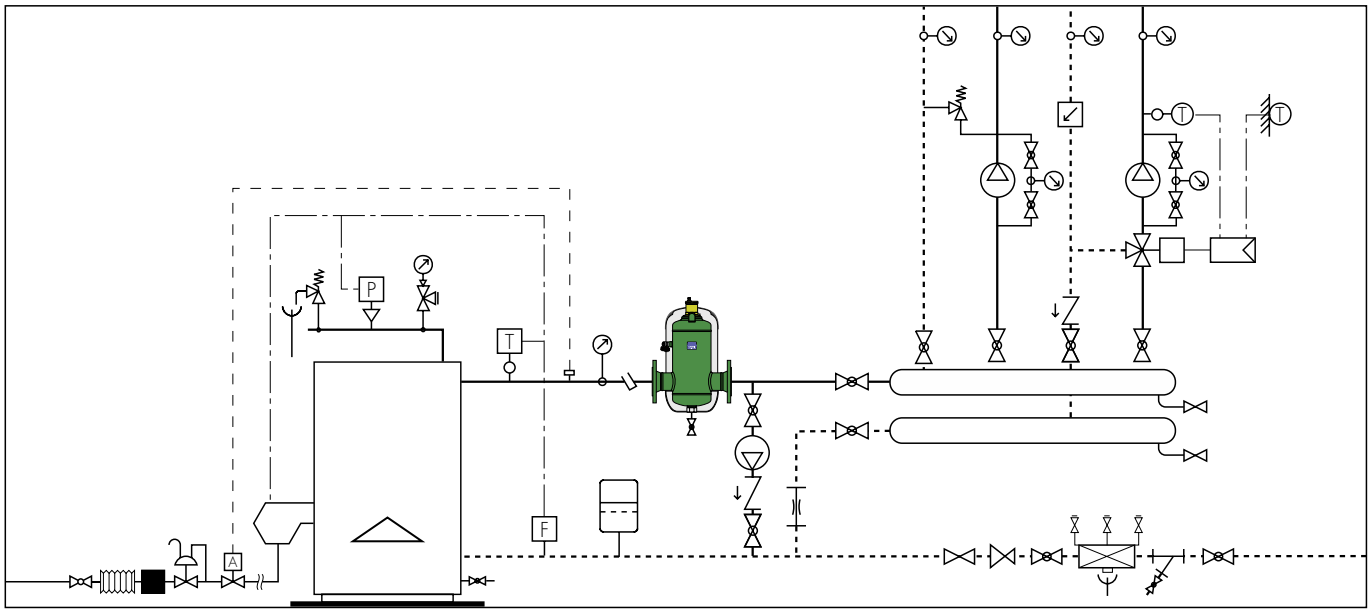
DISCAL® devices may be used in both heating and cooling circuits, to guarantee progressive elimination of the air which forms continuously. They should preferably be installed after the boiler, on the pump suction side, as this is where the formation of micro-bubbles is most prolific. The DISCAL® deaerator must be installed vertically and preferably upstream from the pump where, due to the high speed of the medium and the ensuing drop in pressure, micro-bubbles of air develop more easily. In DISCAL® devices, the thermal medium can flow in either direction, except on the 5517 series adjustable version, for which the correct direction of flow is shown by the arrow on the T-fitting. In the 5517 series, turn the T-fitting by hand to adapt the connections for use with horizontal or vertical pipes. It is recommended that the air vent valve cap is replaced with a Caleffi 5620 series hygroscopic safety cap if the device is installed in a location that cannot be inspected.







Application diagram



- Shut-off valve
- Ball valve
- BALLSTOP
- Temperature gauge
- Differential by-pass valve
- Flow switch
- Zone valve
- Pump
- AUTOFLOW®
- Flow rate metering device
- Temperature probe
- Safety thermostat
- Regulator
- Expansion vessel
- 3-way cock
- Pressure switch
- Test pocket
- Gas filter
- Gas regulator
- Y-strainer
- Fuel shut-off valve
- Anti-vibration joint
- Pocket
- Safety relief valve
- Backflow preventer
- Automatic filling unit

SPECIFICATION SUMMARY

DISCAL® 551 series
Deaerator for horizontal pipes, version with drain. Size DN 20 (DN 20 to DN 50); 3/4" connections (3/4" to 2") F (ISO 228-1). 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. Rigid closed-cell expanded polyurethane foam insulation shell available as an option for codes 551005-6-7-8-9. 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.

DISCAL® 551 series
Deaerator for horizontal pipes, compact version. Horizontal size DN 20, 3/4" F connections (ISO 228-1); size DN 20, Ø 22 connections with compression ends. 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.

DISCAL® 551 series
Deaerator for horizontal or vertical pipes, compact version with adjustable T-fitting. Size DN 20, 3/4" F connections (ISO 228-1); size DN 25, 1" M (and 1" F) connections (ISO 228-1); size DN 20 (and DN 25), Ø 22 (and Ø 28) connections with compression ends for copper pipe. 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.

DISCAL® 551 series
Deaerator. Flanged connections DN 50 (from DN 50 to DN 150) PN 16, flanged connections DN 200 (from DN 200 to DN 300) PN 10, to be coupled with flat counterflange EN 1092-1. Weld end connections DN 50 (from DN 50 to DN 150). 1" M brass drain valve with cap (from DN 50 to DN 150), 2" F (from DN 200 to DN 300). 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. Automatic air vent: brass body, PP float, brass float guide and stem, stainless steel float lever and spring. 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).

We reserve the right to make changes and improvements to the products and related data in this publication, at any time and without prior notice.

CALEFFI Hydronic Solutions

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