

Deaerator-dirt separator

DISCALDIRTMAG



5464 series

01387/21 EN



PCT
INTERNATIONAL
APPLICATION
PENDING

Function

Deaerators-dirt separators are used to continuously eliminate the air and dirt contained in the hydraulic circuits of heating and cooling systems. They are capable of automatically removing all the air from the system down to micro-bubble level. At the same time they separate dirt and impurities contained in the water within the circuit and collect them in the lower part of the valve body, from which they may be expelled. The magnet separates ferrous impurities.

The circulation of fully deaerated water enables the equipment to operate under optimum conditions, free from any noise, corrosion, localised overheating or mechanical damage.

Reference documentation:

- Brochure 01337 DISCALSLIM® deaerator, 551 series
- Brochure 01240 DIRTMAG® dirt separator, 5453 series
- Brochure 01123 Deaerator-dirt separator, 5461 series DISCALDIRTMAG

Product range

5464 series DISCALDIRTMAG composite deaerator-dirt separator with magnet _____ sizes DN 20 (3/4", Ø18), DN 25 (1", Ø22)

Technical specifications

Materials

Body:	PA66G30
Dirt separation chamber:	PA66G30
Locking nut for tee fitting:	PPSG40
Tee fitting:	brass EN 1982 CB 753S
Automatic air vent body:	PA66G30
Float:	PP
Float lever and spring:	stainless steel EN 10270-3 (AISI 302)
Air vent:	with hygroscopic cap
Hydraulic seals:	EPDM
Drain cock	
with hose connection:	brass EN 12165 CW617N
Shut-off valve:	brass EN 12165 CW617N

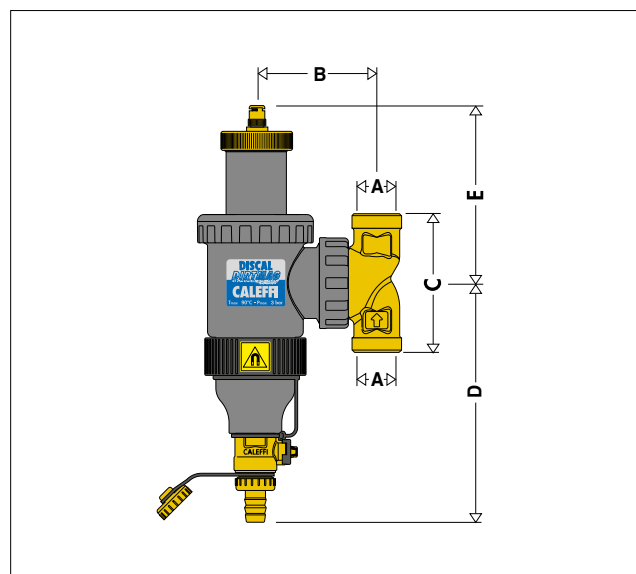
Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	30 %
Max. working pressure:	3 bar
Max. discharge pressure:	3 bar
Working temperature range:	0–90 °C
Particle separation rating:	up to 5 µm
Ring system magnetic induction:	2 x 0,3 T

Connections

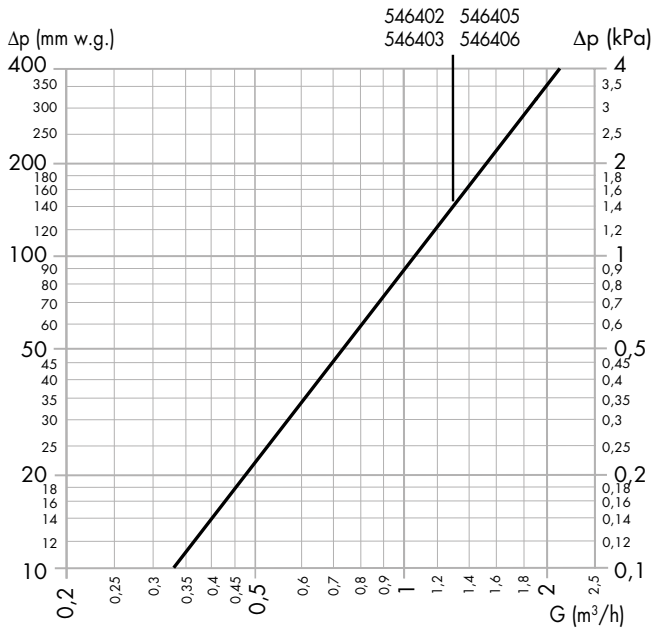
- main:	3/4" M, 1" M, Ø 22, Ø 28
- drain:	hose connection

Dimensions



Code	Size	A	B	C	D	E	Mass (kg)
546405	DN 20	3/4"	87,5	96	172,5	125	1,3
546406	DN 25	1"	87,5	110	172,5	125	1,3
546402	DN 20	Ø18	87,5	115	172,5	125	1,3
546403	DN 25	Ø22	87,5	116,6	172,5	125	1,3

Hydraulic characteristics



The maximum recommended medium flow speed to the device connections is ~ 1,2 m/s.

The following table shows the maximum flow rates in order to meet this requirement.

Code	546405	546402	546406	546403
Connections	3/4"	Ø22	1"	Ø28
DN	DN 20		DN 25	
Kv (m³/h)	10,5			

Maximum flow rate

l/min	21,67
m³/h	1,3

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, represented by the graph in fig. 1; it 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.

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.

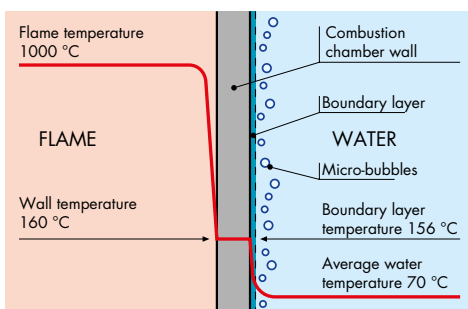
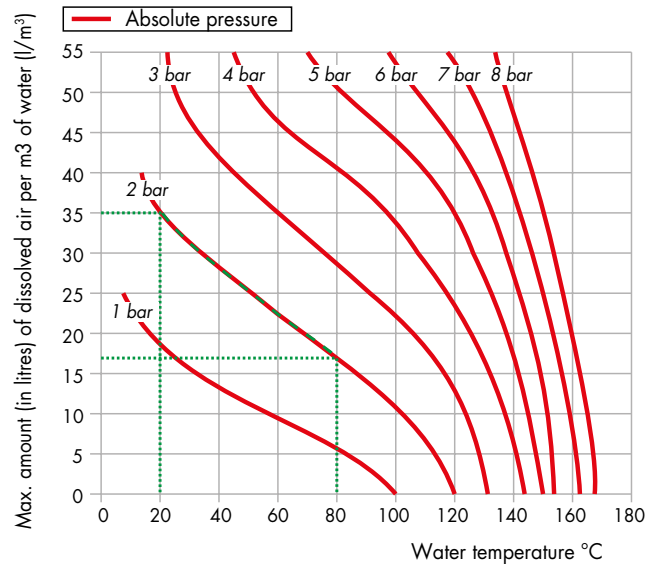


Fig. 1: graph showing solubility of air in water

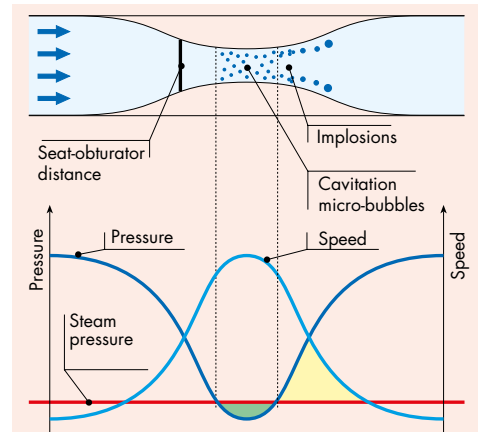


Cavitation micro-bubbles

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.

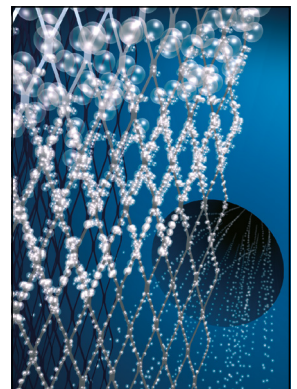


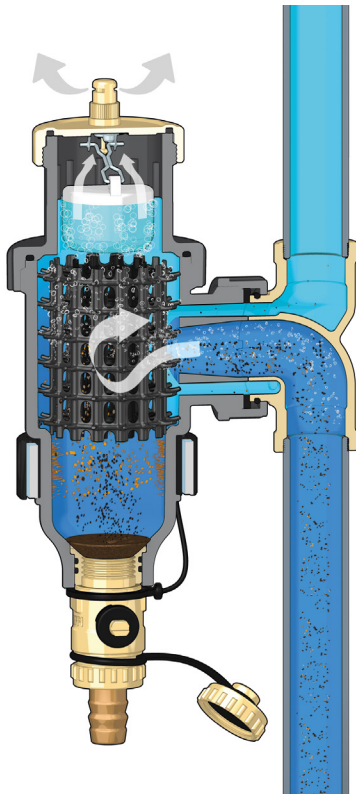
Operating principle

The deaerator-dirt separator utilises the combined action of several physics principles. The active part consists of a set of concentric mesh surfaces. 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.

The impurities in the water, colliding with the mesh surfaces used to construct the internal element is composed, are separated out and fall to the bottom of the valve body.

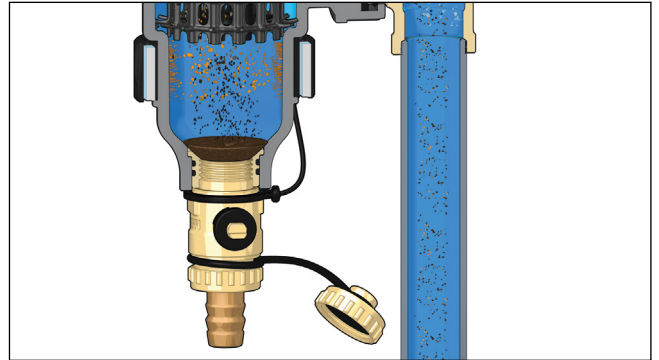




Separation of ferrous impurities

Dirt separators fitted with a magnet offer greater efficiency in the separation and collection of ferrous impurities. The impurities are trapped inside the dirt separator body by the strong magnetic field created by the magnets inserted in the special outer ring. The outer ring can also be removed from the body to allow the decantation and subsequent expulsion of sludge while the system is still running.

Since the magnetic ring is positioned outside the dirt separator body, the hydraulic characteristics of the device are not altered.



Construction details

The special construction of the DISCALDIRTMAG allows maintenance and cleaning operations to be performed without removing the device from the system.

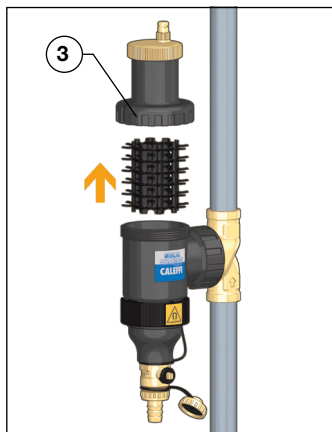
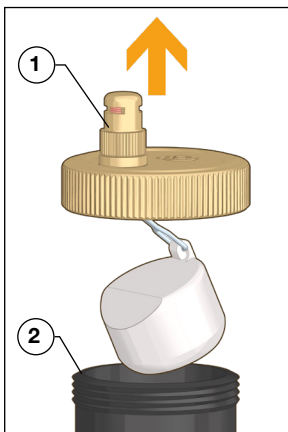
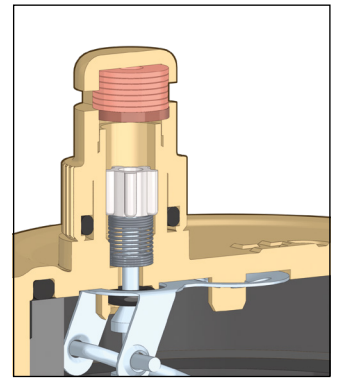
Access to the moving parts controlling the air vent is attained by simply removing the top cover (1).

The deaerator-dirt separator automatic air vent valve, located at the top of the device, is equipped with a long chamber for float movement (2). This feature prevents any impurities in the water from reaching the seal seat.

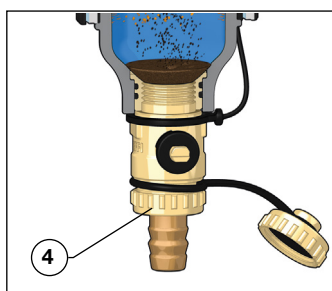
When checking the internal element, simply unscrew the cover protecting the air vent (3).

Hygroscopic safety cap

The deaerator is equipped with a hygroscopic safety cap. The operating principle is based on the properties of the cellulose fibre disks forming the retaining cartridge. These discs increase in volume by 50 % when they come into contact with water, thus closing the valve. This avoids any damage in the event of water leakage.



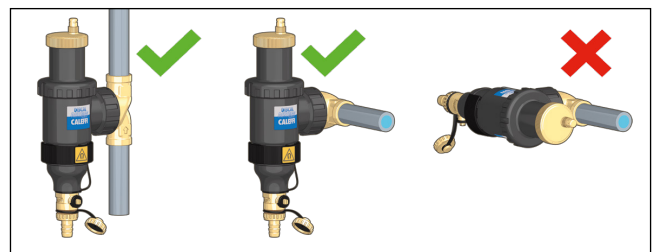
The DISCALDIRTMAG dirt collection chamber has a drain cock equipped with a hose connection with cap. This means impurities can even be expelled while the system is in operation.



Installation

DISCALDIRTMAG devices may be used in both heating and cooling circuits, to guarantee progressive elimination of the impurities and air which form continuously.

DISCALDIRTMAG deaerators-dirt separators can be installed both vertically and horizontally, thanks to the adjustable TEE fitting.



Dispensing of chemical additives

It is possible to use the device as an access point for introducing chemical additives into the circuit, to protect the system (volume 0.4 l), after having shut it off.



Separation efficiency

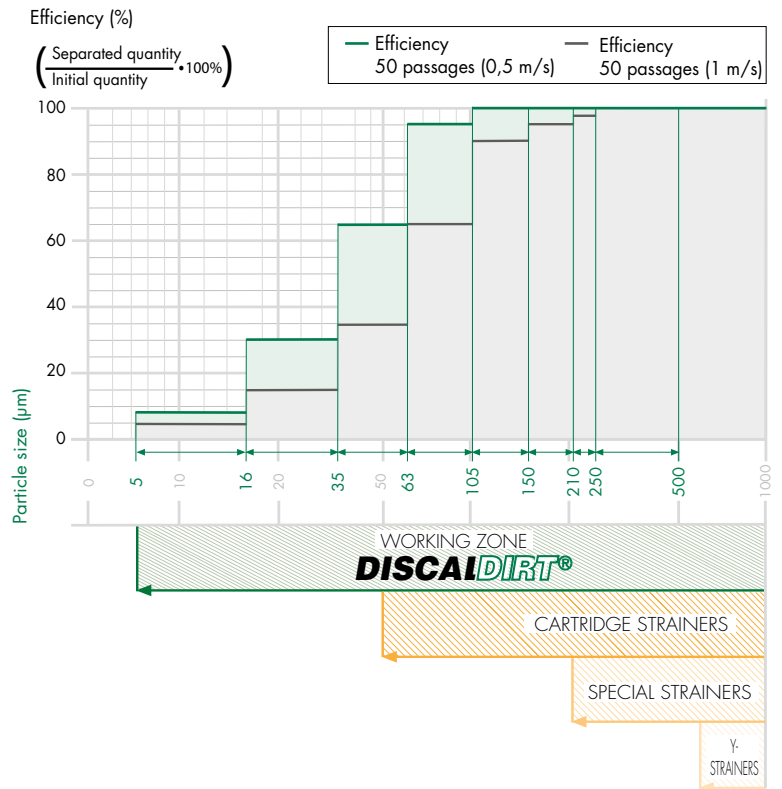
The capacity for separating the impurities in the medium circulating in the closed circuits of the systems basically depends on three parameters:

- 1) it increases as particle size and mass increases. The larger and heavier particles drop before the lighter ones.
- 2) it increases as the speed decreases. If the speed decreases, there is a calm zone inside the dirt separator and the particles separate more easily.
- 3) it increases as the number of recirculations increases. The medium in the circuit, which flows through the dirt separator a number of times during operation, is subjected to a progressive separation action until all impurities have been completely eliminated.

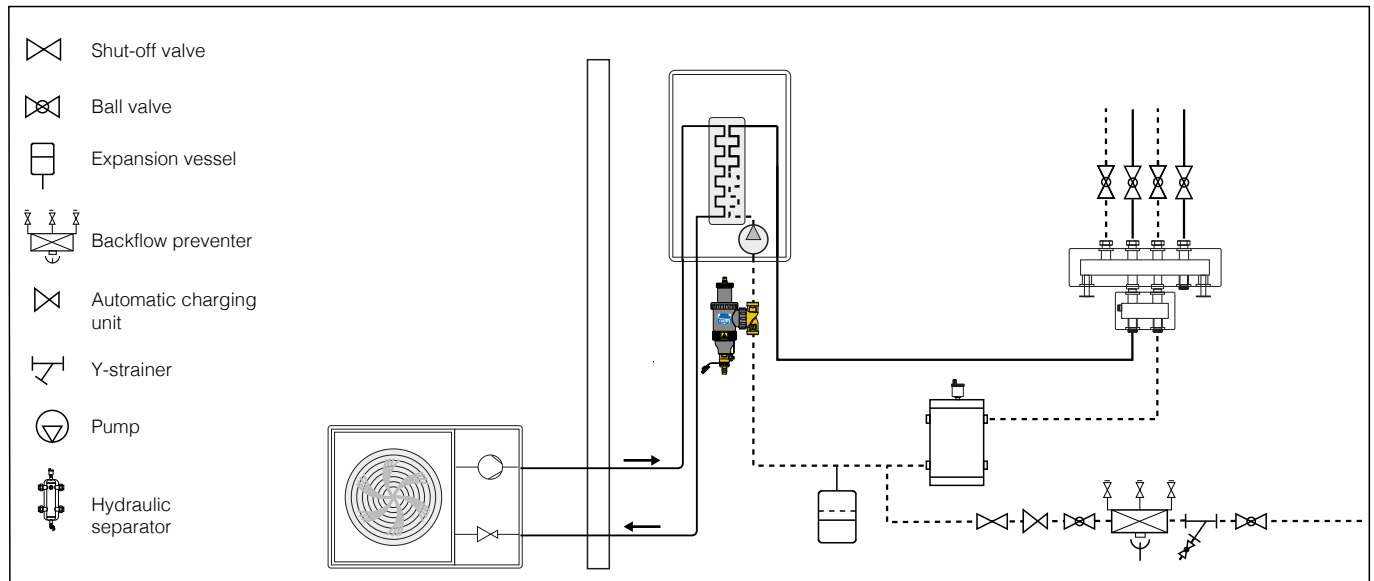
The Caleffi DISCALDIRTMAG deaerator-dirt separator, thanks to the special design of its internal element, is able to completely separate the impurities in the circuit down to a minimum particle size of 5 µm.

The adjacent graph, which summarises the tests carried out in a specialised laboratory (TNO - Science and Industry), illustrates how DISCALDIRT/DISCALDIRTMAG deaerators-dirt separators are able to quickly separate almost all impurities within the circuit. After only 50 recirculations, approximately one day of operation, up to 100 % of particles with a diameter greater than 100 µm are effectively removed from the circuit; this figure is up to 80 % (on average) for the smaller particles. The continual passing of the medium during normal operation of the system gradually leads to complete dirt separation.

Particle separation rating / Deaerator-dirt separator efficiency



Application diagram



SPECIFICATION SUMMARY

DISCALDIRTMAG 5464 series

Deaerator-dirt separator with magnet. DN size 20 (from DN 20 to DN 25); connections 3/4" (from 3/4" to 1") F (ISO 228-1). DN size 20 (from DN 20 to DN 25); connections Ø 22 (from Ø 22 to Ø 28) with a olive fittings for copper pipe. Composite dirt separation chamber and body. Composite automatic air vent valve body. Hygroscopic safety cap. PA66G30 internal element. PP float. Stainless steel float lever and spring. EPDM hydraulic seals. Brass drain cock with hose connection. Medium: water and glycol solutions; maximum percentage of glycol 30 %. Maximum working pressure 3 bar. Maximum discharge pressure 3 bar. Working temperature range 0–90 °C. Particle separation rating down to 5 µm. Ring system magnetic induction: 2 x 0,3 T. PATENT.

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