CALEFFI eCAL® electrolytic anti-scale device with filter and magnet

5377 series

01425/25 EN

Function

The electrolytic anti-scale device with filter and magnet, installed directly on the domestic cold water pipe, limits limescale formation within the domestic water system and the devices connected to it. It helps to maintain the original heat exchange performance levels of the boiler and heat exchanger in the DHW production circuit over time. It also separates impurities in the system to a size of 50 µm. The magnet, suitably positioned in the flow, separates ferromagnetic particles and helps to improve device efficiency.

The anti-scale device offers continuous protection without the use of chemical substances, thereby preserving the characteristics of potable water and maintaining its hardness level. Furthermore, it does not require electricity and does not need to be replaced or serviced frequently.

Product range

Code 537761 Electrolytic anti-scale device with filter and magnet — DN 25 (1")

Technical specifications

Materials

Body:	dezincification-resistant alloy CR EN 1982 CC768S
Hydraulic seals:	EPDM
Transparent filter container:	PA12
External protection cover:	PA6G30
Internal elements:	Cu alloy - Zn/Ti
Filter:	stainless steel EN 10088-2 (AISI 304)
Connections:	G 1" (ISO 228-1) F

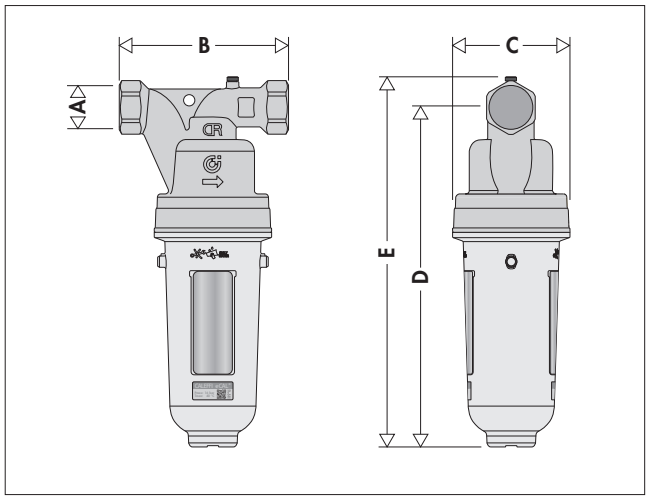
Performance

Medium:	potable water
Maximum working pressure:	16 bar
Maximum differential pressure on cartridge Δp:	3 bar
Working temperature range:	5–40 °C
Filter mesh size:	50 µm
Magnetic induction of magnet:	1 T

General specifications recommended for the water

Hardness:	<45 °f
pH:	6,5-8,5
Iron:	<0,5 mg/l
Conductivity:	<1500 µS/cm

Dimensions



Code	A	B	C	D	E	Mass (kg)
537761	1"	150	104	300	328	2,1

Water parameters

The hardness of water is determined by its calcium and magnesium salt content.
Temporary hardness is caused by the presence of calcium bicarbonate $Ca(HCO_3)_2$ and magnesium bicarbonate $Mg(HCO_3)_2$, which are soluble salts. As the temperature increases, up to the boiling point, the temporary hardness decreases until finally it disappears completely.

Permanent hardness is caused by the presence of other salts in addition to calcium and magnesium bicarbonate, and remains even after the boiling point has been reached.

Total hardness is the sum of the two and is the value which is normally measured when establishing the characteristics of the water.
Specific indices may be used to measure the hardness. One of the most used is French degrees (°f).
1 °f corresponds to 10 mg of $CaCO_3$ for every litre of water
(1 °f = 10 mg/l = 10 ppm).

Water classification	Hardness (°f)	Risk
Very soft	0–8	Very low
Soft	8–15	Low
Slightly hard	15–20	Medium
Medium hard	20–32	Medium - high
Hard	32–50	High
Very hard	> 50	Severe

Problems associated with water hardness

Limescale deposits

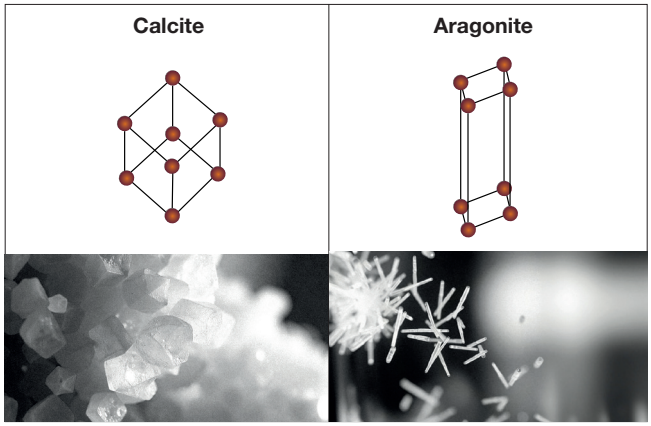
Limescale deposits are primarily caused by the precipitation of calcium and magnesium carbonates. Water contains calcium, magnesium and carbon dioxide in the form of bicarbonates (soluble substances).
When the water temperature approaches 60 °C, the calcium and magnesium bicarbonates transform into carbonates, which are less soluble and prone to precipitation, depending on the reaction:

$$\underset{\text{CALCIUM BICARBONATE}}{Ca(HCO_3)_2} \rightleftharpoons \underset{\text{CALCIUM CARBONATE}}{CaCO_3} + \underset{\text{CARBON DIOXIDE}}{CO_2} + \underset{\text{WATER}}{H_2O}$$

The resulting limescale obstructs passages and builds up on electrical resistors and heat exchangers, where it acts as a heat insulator, thereby increasing energy consumption.
Limescale deposits in pipes, furthermore, reduce the effective flow cross-section and can also cause spot corrosion and failure.

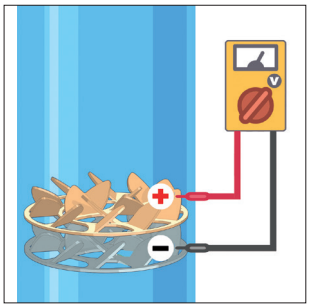
Calcite-aragonite

Limescale is caused by calcium carbonate being deposited in the form of calcite. It sticks to the walls, forming a compact and strong structure which is difficult to remove.
In certain conditions, calcium carbonate may be deposited in the form of aragonite. This takes the form of a fine powder and can easily be removed from the equipment.
Calcite and aragonite are two different crystal forms in which calcium carbonate is manifested. Calcite has a stable trigonal/rhombohedral crystal structure, while aragonite has a less stable rhombic/prismatic structure.
Aragonite remains for up to 2-3 days, depending on the characteristics of the water, after which it tends to transform into its more stable form, i.e. calcite.

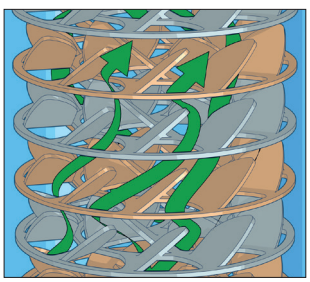


Electrolytic device

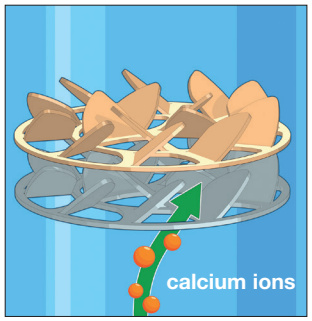
The electrolytic device utilises the battery effect. The internal elements, consisting of discs in a copper alloy-zinc/titanium, are arranged in series and immersed in a flow of water to generate an electric potential difference. An electromagnetic field is created; this is capable of changing the crystal structure of the calcium and magnesium salts in the water.

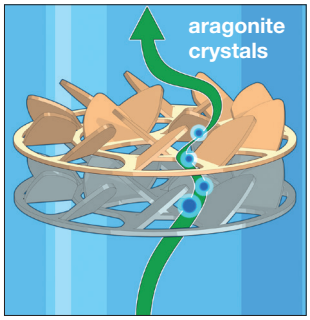


The shape of the internal elements creates a vortex effect inside the device, heightening the phenomenon altering the crystal structure.



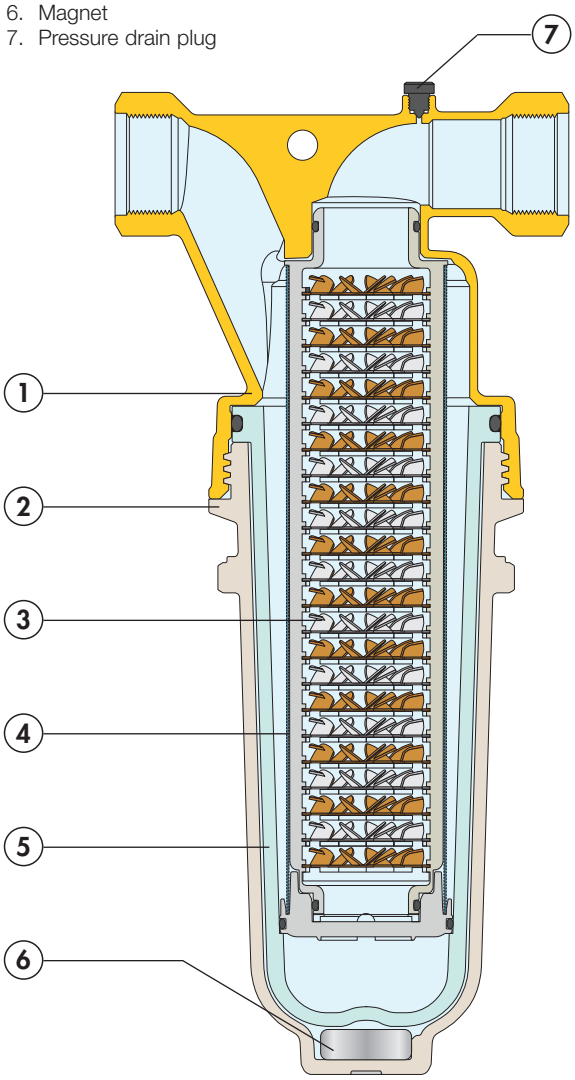
The device does not alter the water hardness level.
The electrolytic action on the calcium ions dissolved in the water prevents calcite crystals from forming. Aragonite crystals begin to form instead.
When calcium carbonate forms due to the heat, it is not deposited as calcite (the cause of limescale build-up), but in the form of aragonite instead.



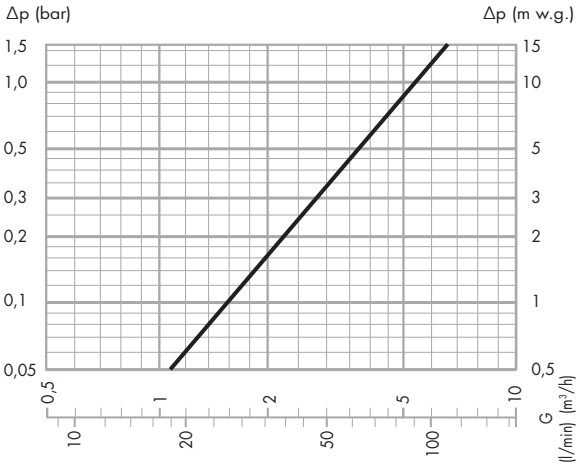


Characteristic components

1. Body
2. Outer protection cover
3. Internal elements
4. Filter
5. Transparent filter container
6. Magnet
7. Pressure drain plug



Hydraulic characteristics

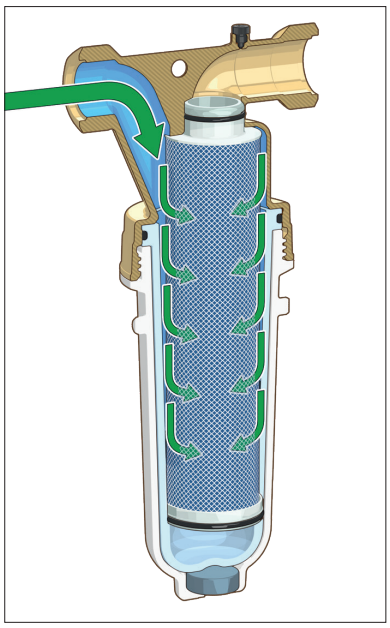


Kv (m³/h)	5,1
Minimum recommended flow rate	300 l/h
Maximum recommended flow rate	4000 l/h

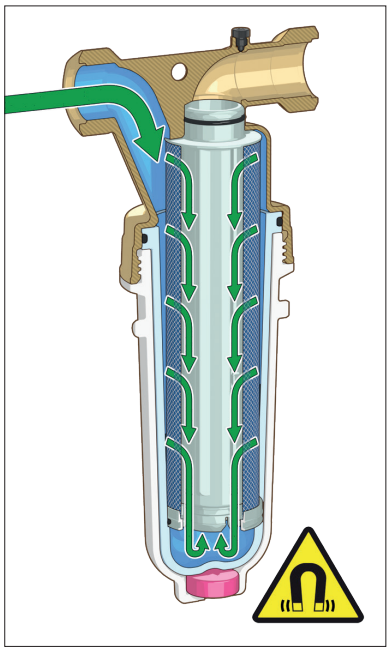
Operating principle

Device operation is divided into three phases:

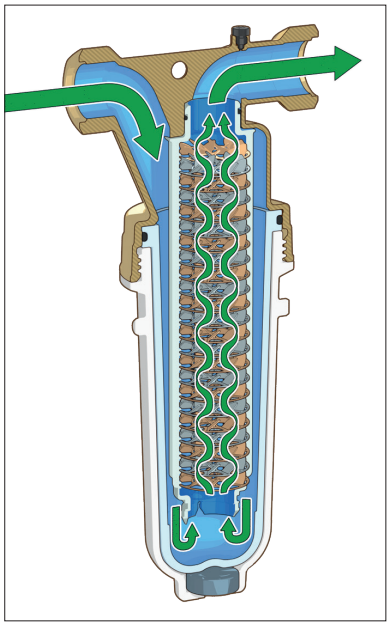
1) The water enters the device and passes through the filter mesh, which retains the impurities by mechanically selecting the particles according to their size. The large filter mesh surface with a mesh size of 50 µm makes the device less prone to clogging.



2) The water is channelled towards to bottom of the device, where the magnet is located. The magnet, which does not come into direct contact with the water, captures and retains the ferromagnetic impurities and helps to improve the efficiency of the device. The flow is reversed at the bottom and all the water is therefore channelled into the cartridge.



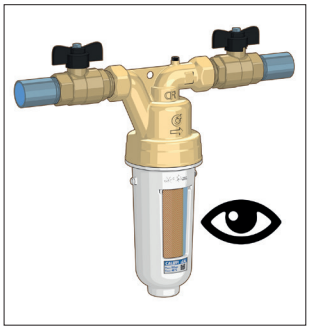
3) The water passes through the centre of the cartridge and comes into contact with the internal elements (Cu alloy - Zn/Ti), where the battery effect and whirling motion cause the first aragonite crystals to form.



Construction details

Transparent filter container

The external protection cover features transparent windows which can be used at any time to check whether the filter needs cleaning. The filter should be cleaned in accordance with the specifications set out in standard EN 806-5 or in line with applicable standards.
The device comes with a label for recording the maintenance frequency.



Neodymium magnet

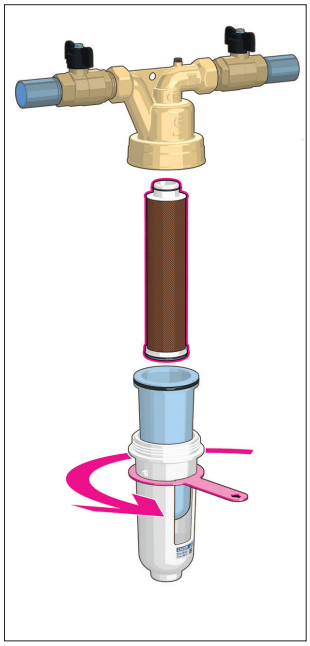
The neodymium magnet is positioned so that the ferromagnetic particles are very effectively attracted.
As it is not in direct contact with the medium, cleaning procedures are more straightforward. The magnet helps to improve device efficiency.

Lifespan of the internal elements

The internal elements are designed to ensure device efficiency throughout its operating lifespan, which is on average 7 years from the date of installation. After this period, we recommend replacing the self-contained internal cartridge.

Easy maintenance

After checking how clogged the filter is, it can be cleaned in a few simple steps. The self-contained filtering cartridge can be washed under running water or replaced (spare part code F0002304).



Maximum pressure

The device has been developed using materials suitable for use at a maximum pressure of 16 bar.

Material

Pb LOW LEAD

Dezincification resistant material with very low lead content.

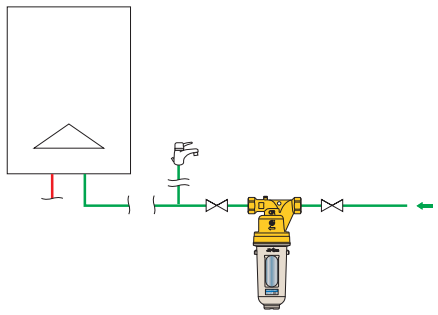
Product efficiency

The standard test procedure compares DHW systems with storage with and without an anti-scale device installed.
At the end of the test procedure, the limescale build-up is weighed to determine the efficiency in scale reduction of the device. A device efficiency of around 85 % is detected.

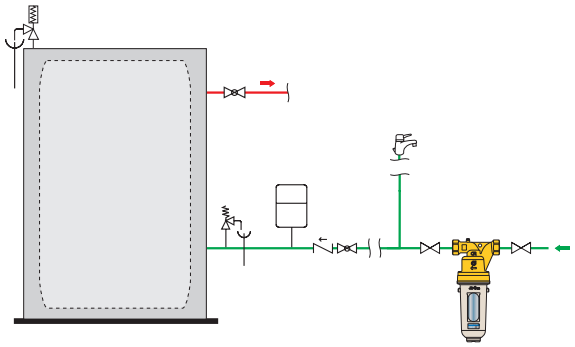
$$\text{Efficiency [\%] } = \frac{\text{Mass of deposited limescale (without device)} - \text{Mass of deposited limescale (with device)}}{\text{Mass of deposited limescale (without device)}} \cdot 100$$

Application diagrams

Instantaneous DHW production system



System with DHW storage



SPECIFICATION SUMMARY

Code 537761

Electrolytic anti-scale device with filter and magnet. Complete with key for removal. Connection: G 1" (ISO 228-1) F. Maximum working pressure: 16 bar. Working temperature range: 5–40 °C. Medium: potable water. Filter mesh size Ø: 50 µm. Kv: 5,1 m³/h. Material: "low lead" DR dezincification resistant brass.

CALEFFI Hydronic Solutions

Caleffi S.p.A.
S.R. 229 n. 25 · 28010 Fontaneto d'Agogna (NO) · Italy
Tel. +39 0322 8491 · Fax +39 0322 863305
info@caleffi.com · www.caleffi.com