F L O W I N G   E X P E R T I S E

WATER TREATMENT IN HEATING AND COOLING SYSTEMS

CALEFFI
Hydronic Solutions

www.caleffi.com

THE CALEFFI GREEN

THIS IS OUR SUSTAINABLE COMMITMENT.
A BELIEF, A WAY OF LIFE AND A WAY OF DOING THINGS.
THIS IS OUR TANGIBLE CONTRIBUTION TO ENVIRONMENTAL AND SOCIAL CHANGE.

We are building a more responsible future
to meet the demands made by the **PEOPLE** of today and tomorrow, through
PRODUCTS that will help them to save resources and that are designed to
offer a more sustainable kind of comfort.
To bring the perfect climate to life and have
a positive impact on the **ENVIRONMENT**.

CALEFFI
Hydronic Solutions

GREEN REVOLUTION

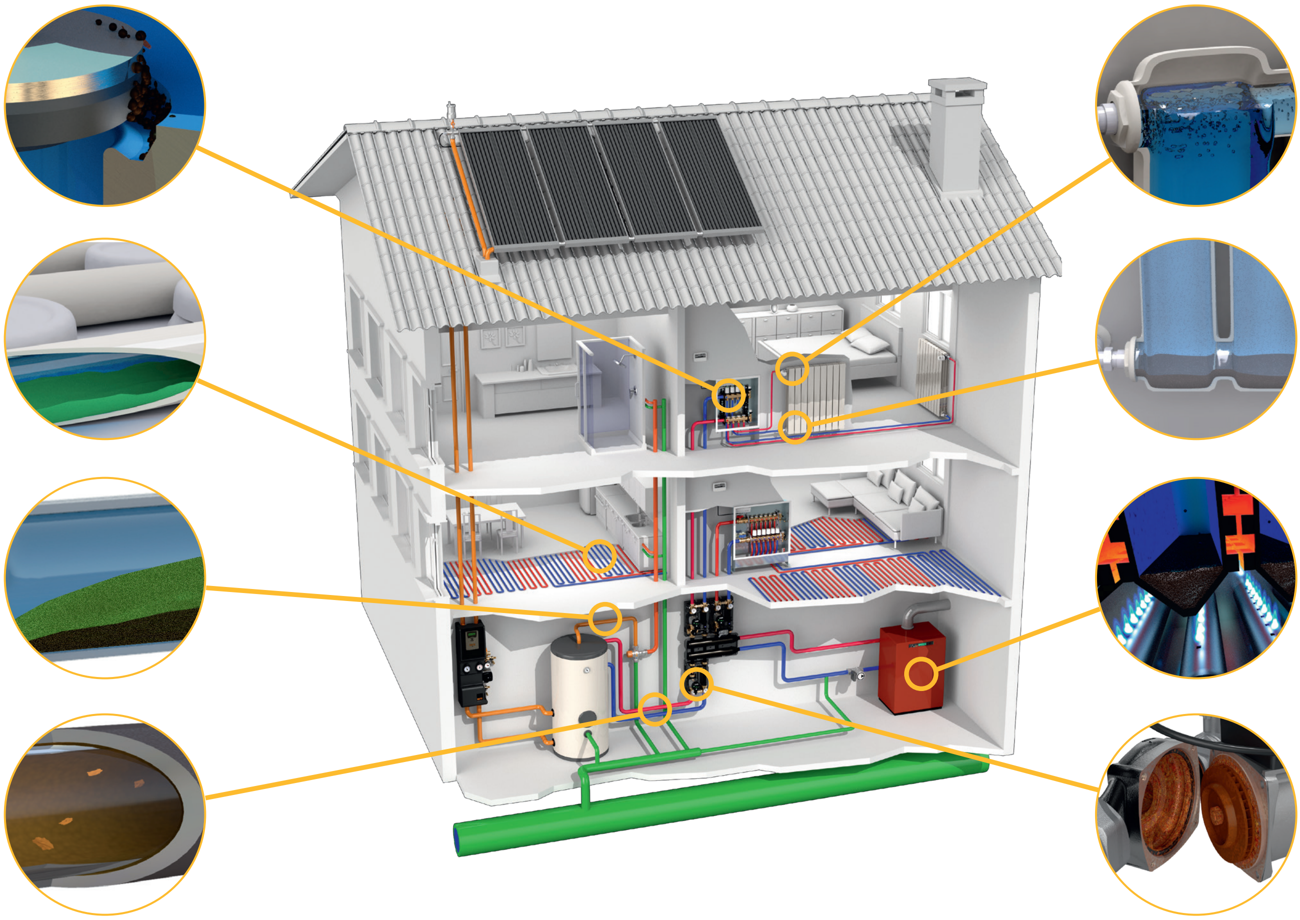
IMPROVED WATER MANAGEMENT

WATER TREATMENT DEVICES

OPTIMUM EFFICIENCY, ENERGY SAVING AND LOWER MAINTENANCE COSTS through careful management of the water within a system.

Our comprehensive range for water **TREATMENT** protects all the components in a **HEATING AND COOLING SYSTEM,** at any stage of operation.

AIR AND DIRT IN HEATING AND COOLING SYSTEMS



Problems linked to the presence of dirt

The impurities contained in the water of the hydronic circuits can cause a series of problems that should not be underestimated.

Corrosion due to differential aeration
This is due to the fact that, in the presence of water, a layer of scale on a metal surface leads to the formation of two zones (water/impurities and impurities/metal) with a different oxygen content; for this reason, localised batteries are activated with current flows that lead to corrosion of the metal surfaces.

Irregular operation of the valves
This is due to impurities, which can adhere stubbornly to the valve seats and cause deformities in regulation and leaks, for example in balancing valves.

Pumps blocking and seizing
These problems may be suspended particles circulating through the pumps which can build up inside them, due to both the particular geometry of the pumps and to the effect of the magnetic fields generated by the pumps themselves.

Lower efficiency of the heat exchangers
Deposits and scale build-up can significantly reduce both the flow rates of the fluids and the heat exchanging surfaces.

Problems linked to the presence of air

The problems caused by air contained in hydronic systems can be serious and unpleasant both for the users and for the professionals who service the system. If these problems are not analysed thoroughly, they can often lead to solutions that are not decisive in the long term.
Initially it is very important to identify the phenomena that the air in the system can provoke.

Noise in the pipes and in the terminals
The air contained in the system makes noise in the pipes and the adjustment devices. This is much more evident during system startup, i.e. when the flow begins to flow through the pipes.

Insufficient flow rates, complete circulation blockages and insufficient heat exchange between the emission terminals and the room
Circulation can be partially or totally blocked by air bubbles present in some points in the system. This phenomenon is particularly serious for radiant panel systems, but can also cause thermal imbalances and lower radiator or fan coil efficiency.

Corrosion of the system
This is provoked by the oxygen present in the air and can lead to the weakening but also the breakage of components such as pipes, radiators and boiler heat exchangers.

Cavitation
This may compromise durability and operation, especially of the pumps and regulating valves.

Devices for separating impurities

Magnetic dirt separators

- brass 5463 series
- steel 5466 series

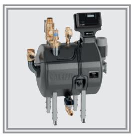

- technopolymer 5453 series
- technopolymer with double magnet 5457 series


Magnetic dirt separator filters

- under-boiler, chrome plated brass 5459 series
- under-boiler, technopolymer 5450 series
- multi-function device 5453 series



- self-cleaning, technopolymer 577 series
- self-cleaning, steel 5790 series

Air separation devices

Deaerators

- under-boiler, technopolymer 551 series
- with adjustable connections 551 series
- for horizontal pipes 551 series



Automatic air vents

- Standard 5020 - 5021 series
- High discharge pressure 5024 - 5025 - 5026 - 5027 series
- High discharge capacity 5022 - 501 - 551 series



Devices for separating air and impurities

Deaerators-dirt separators

- technopolymer with magnet 5464 series
- with magnet 5461 series
- standard 546 series



Domestic water treatment

- under-boiler polyphosphate dispenser 5459 series

Technical water treatment

- liquid chemical additives 5709 series
- pressurised chemical additives 5709 series
- automatic water treatment unit 580 series
- softening and demineralisation cartridges 580 series



Magnetic dirt separators

Operating principle

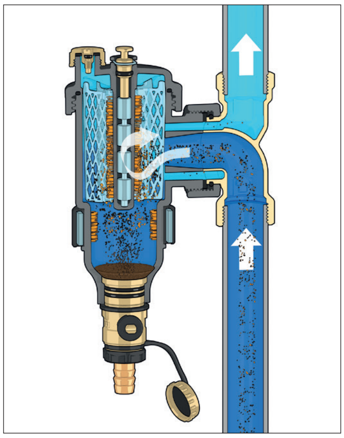
Dirt separation is a physical treatment similar to filtration but more effective from the point of view of particle dimensions. By exploiting the principle of precipitation by gravity, after just a few recirculations it is able to separate and deposit even particles with dimensions down to 0,005 mm (5 μm).
The impurity separating action of the magnetic dirt separator is based on the combined action of several phenomena.
The reduction in medium flow speed encourages the dirt particles to fall into the collection chamber as a result of gravity. The collection chamber possesses the following features:

- it is located at the bottom of the device, at such a distance from the connections that the collected impurities are not affected by the swirling of the flow through the mesh;
- it is large enough to increase the dirt storage capacity, which means emptying/draining procedures are required less often;
- it has a drain cock for draining the impurities collected in the lower part even while the system is running.

The internal element with mesh surfaces provides a low resistance to the passage of the medium while still guaranteeing separation, which takes place due to the particles colliding with the mesh surfaces and then settling.
The magnet offers greater efficiency in the separation and collection of ferromagnetic impurities, which are captured in the dirt separator collection chamber by the magnets in the device.

Pressure drops

Due to the conformation of these components (large cross section), their pressure drop is almost always negligible over the range of optimal operating flow rates. The pressure drops are kept constant within the operating time.



Sizing

Sizing a dirt separator mainly depends on the speed at which the medium flows through the device, since an excessive speed would not allow correct separation of the impurities.

As is known, the medium flow speed depends on the flow rate and the cross section. Remaining within the speed limits specified above therefore means not exceeding certain **maximum permissible flow rates** for each size.

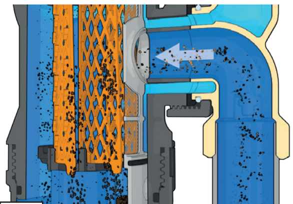
Magnetic dirt separator filters

Operating principle

The impurity separating action of the magnetic dirt separator filter is based on the combined action of several components:

- an internal mesh element **(1)**, which carries out dirt separation;
- magnets fitted directly in the flow path **(2)**, which capture and retain ferrous impurities;
- a metal filter mesh **(3)**, which separates off the impurities by means of mechanical selection.

The filter mesh is characterised by various parameters, one the most important being the mesh size (or filtering capacity), which indicates the minimum dimensions of the particles that the filter is able to intercept. Another concerns the filter mesh surface, with a larger surface area guaranteeing a lower degree of fouling.
The collection chamber at the bottom of these devices has the same special features as the chamber used in dirt separators.



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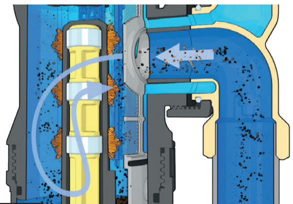

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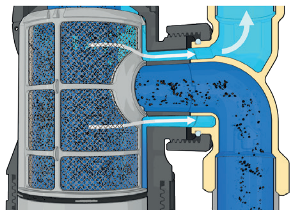

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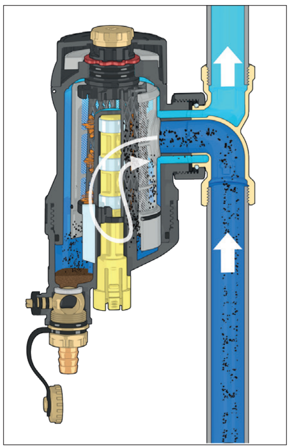
Pressure drops

Due to the passage through the filter mesh, a pressure drop is produced in the medium which increases as the degree of clogging increases.



In combined devices such as dirt separator filters, the filter mesh is better protected than that of a simple filter because some of the impurities fall into the dirt separator. This means there is less fouling than in normal filters within the same operating time.

It is important to preform regular maintenance of the dirt separator filter with magnet; in some cases this process is made easier by automatic or semi-automatic cleaning systems.

Sizing

The main parameter to assess when sizing a magnetic dirt separator filter is its **pressure drop**. In fact, as the water passes through the filter mesh, it creates a different pressure drop, depending on the filtration capacity. The greater the filtration capacity, the greater the separation efficiency, but also the pressure drop.

HEAT PUMP SYSTEMS

TECHNOPOLYMER FILTER WITH MAGNET

SEMI-AUTOMATIC CLEANING		*MANUAL CLEANING*	
	**CALEFFI *XF*** **577** 3/4" – 2" Ø22 - Ø28		**DIRTMAG*PLUS*®** **5453** 3/4" – 1 1/4" Ø22 - Ø28

WALL-MOUNTED BOILER SYSTEMS

MAGNETIC FILTER		TECHNOPOLYMER DIRT SEPARATOR WITH MAGNET AND FILTER	
	**CALEFFI *XS*®** **5459** 3/4" M x 3/4" F captive nut Ø22		**DIRTMAG*MINI*®** **5450** 3/4" F captive nut x 3/4" M Ø22

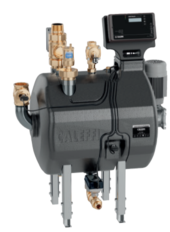
WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM - COOLING SYSTEMS

TECHNOPOLYMER DIRT SEPARATOR WITH MAGNET		TECHNOPOLYMER DIRT SEPARATOR WITH DOUBLE MAGNET		TECHNOPOLYMER FILTER WITH MAGNET	
STANDARD FLOW RATES		*HIGH FLOW RATES*		*SEMI-AUTOMATIC CLEANING*	
	**DIRTMAG®** **5453** 3/4" – 1" Ø22 - Ø28		**DIRTMAG*PRO*®** **5457** 3/4" – 1 1/4" Ø22 - Ø28		**CALEFFI *XF*** **577** 3/4" – 1 1/4" Ø22 - Ø28

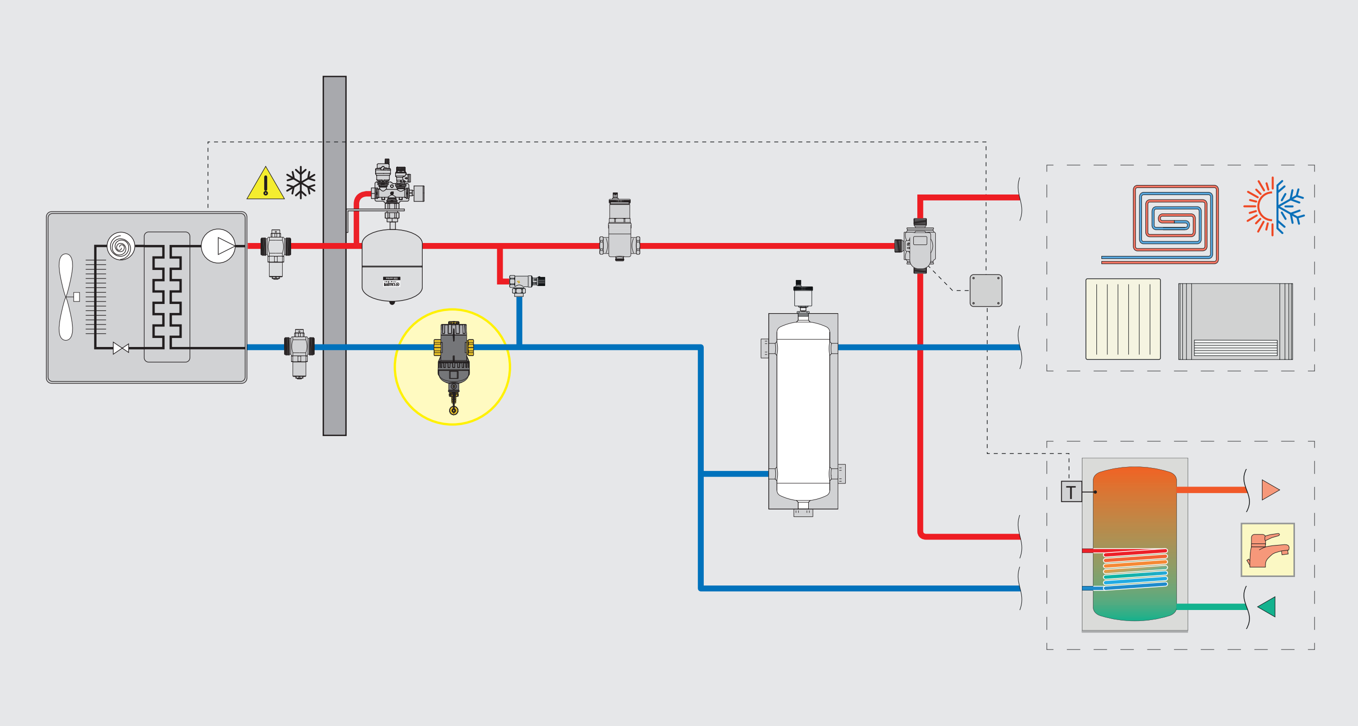
MEDIUM/LARGE SYSTEMS

TECHNOPOLYMER FILTER WITH MAGNET		BRASS DIRT SEPARATOR WITH MAGNET		STEEL DIRT SEPARATOR WITH MAGNET	
	**CALEFFI *XF*** **577** 1 1/2" – 2"		**DIRTMAG®** **5463** 3/4" – 2"		**DIRTMAG®** **5466** DN 50–DN 65

LARGE SYSTEMS

STEEL DIRT SEPARATOR WITH MAGNET		SELF-CLEANING MAGNETIC DIRT SEPARATOR FILTER	
IN-LINE INSTALLATION		*BY-PASS INSTALLATION*	
	**DIRTMAG®** **5466** DN 80–DN 300		**DIRTMAG*CLEAN*®** **5790**

HEAT PUMP SYSTEMS



IMPURITIES IN HEAT PUMP SYSTEMS

The components of a heating and cooling system are exposed to degradation caused by the impurities that circulate in the thermal medium. If the impurities are not removed as necessary, they may cause blockages and seizing of the pumps, lower efficiency of the heat exchangers, unreliable valve operation and insufficient heat exchange.

In the specific case of heat pump systems, the use of a magnetic dirt separator filter is recommended. The impurities may actually put the already small inner channels at risk of blockage, or prevent the internal adjustment devices from working properly.
As the heat pump is a generator employing low temperature differences, even small changes in flow rate may adversely affect its performance.
The greater the filtering action of the magnetic dirt separator filter, the longer the high efficiency of the heat pump systems will be maintained.

SIZING

DIRTMAGPLUS®

Sizing depends mainly* on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

*In multifunction devices such as DIRTMAGPLUS®, the filter mesh is more protected as some of the impurities fall into the dirt separator. For this reason, sizing is mostly determined by the maximum flow rate.

Code	Connections	Max. flow rate [l/h]	Kv* [m³/h]	Δp* [kPa] (max. flow rate)
545375	3/4”	1,130	6.7	2.84
545372	Ø 22	1130	6.7	2.84
545376	1”	1130	6.7	2.84
545373	Ø 28	1130	6.7	2.84
545377	1 1/4”	1800	9.6	3.53

CALEFFI XF

The main parameter to assess when sizing is the **pressure drop** generated in the circuit.

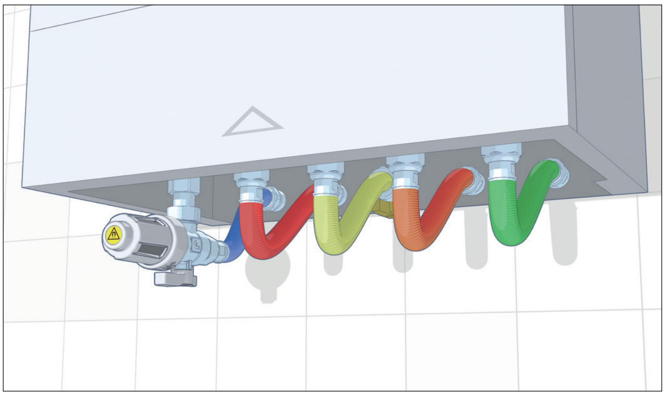
Code	Connections	Kv* [m³/h] 100 % filtration	Kv* [m³/h] 50 % filtration
577500	3/4”	10.3	
577200	Ø 22	9	
577600	1”	10.7	
577300	Ø 28	10.5	
577700	1 1/4”	10.7	
577800	1 1/2”	23	40
577900	2”	23	40

HP nominal power [kW]	3	4	5	6	7	8	9	12	14	18	22	25	28	32	35
Max. set flow rate [l/h] (ΔT = 5 °C)	516	688	860	1032	1204	1376	1,548	2064	2408	3096	3784	4300	4816	5504	6020
Nominal pipe diameter**	3/4”	3/4”	1”	1”	1”	1”	1 1/4”	1 1/4”	1 1/4”	1 1/2”	1 1/2”	1 1/2”	2”	2”	2”
DIRTMAGPLUS® 	545372 (Ø 22)		545373 (Ø 28)												
Δp* [kPa]	0.59	1.05	1.65	2.37	3.23	-									
DIRTMAGPLUS® 	545375 (3/4”)		545376 (1”)			545377 (1 1/4”)									
Δp* [kPa]	0.59	1.05	1.65	2.37	3.23	2.06	2.6	4.6	-						
CALEFFI XF 	577200 (Ø 22)		577300 (Ø 28)												
Δp* [kPa]	0.33	0.58	0.67	0.97	1.31	1.71	-								
CALEFFI XF 	577500 (3/4”)		577600 (1”)				577700 (1 1/4”)			577800 (1 1/2”)			577900 (2”)		
Δp* [kPa] (100 %)	0.25	0.45	0.65	0.93	1.27	1.66	2.09	3.73	5.06	1.81	2.7	3.5	4.38	5.72	6.85
Δp* [kPa] (50 %)	-									0.6	0.89	1.16	1.45	1.89	2.27

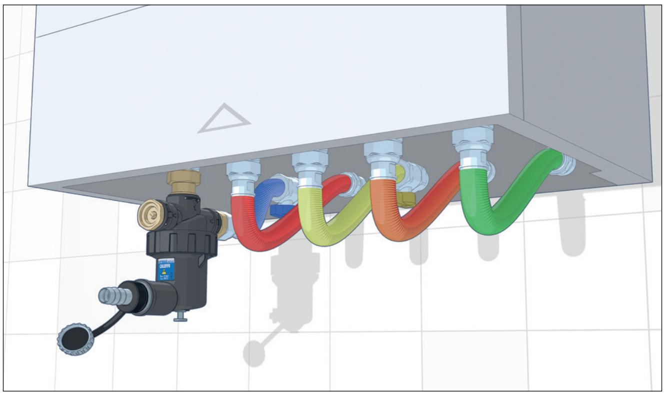
* With clean filter
** Pipe pressure drop r ~ 20-22 mm w.g./m (50 °C)

WALL-MOUNTED BOILER SYSTEMS
ANGLED INSTALLATION

CALEFFI XS®



DIRTMAGMINI®



System nominal power [kW]		8	9	10	12	14	16	18	21
System maximum flow rate [l/h] (ΔT = 20 °C)		344	387	430	516	602	688	774	903
CALEFFI XS®		**545900** (3/4" M x 3/4" F captive nut)							
	Δp* [kPa]	0.94	1.19	1.47	2.11	2.87	3.75	4.75	6.47
DIRTMAGMINI®		**545000** (3/4" M x 3/4" F captive nut)							
	Δp* [kPa]	0.78	0.98	1.22	1.75	2.38	3.11	3.94	5.36
DIRTMAGMINI®		**545022** (Ø 22)							
	Δp* [kPa]	0.78	0.98	1.22	1.75	2.38	3.11	3.94	5.36

SIZING

The main parameter to assess when sizing is the **pressure drop** generated in the circuit.

CALEFFI XS®

Code	Connections	Kv* [m³/h]
545900	3/4"	3.55

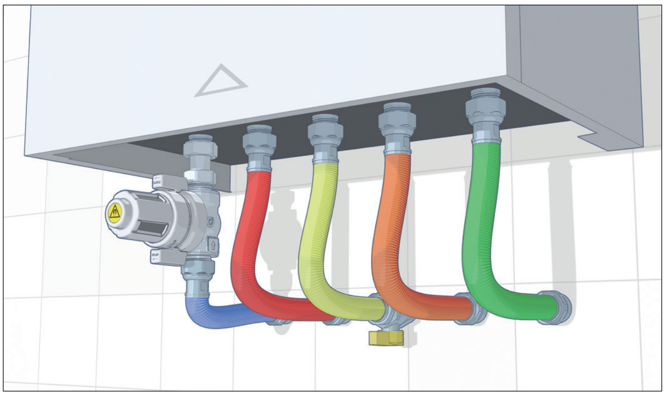
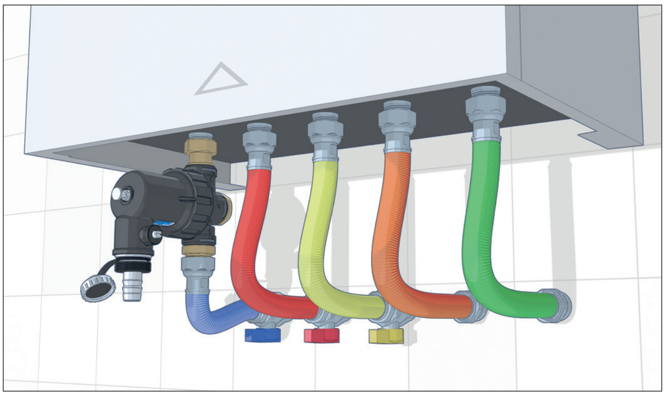
Code	Connections	Kv* [m³/h]
545910	3/4"	3.66
545912	Ø 22	3.66

DIRTMAGMINI®

Code	Connections	Kv inst. in-line* [m³/h]	Kv inst. angled* [m³/h]
545000	3/4"	4.2	3.9
545022	Ø 22	4.2	3.9

* With clean filter

WALL-MOUNTED BOILER SYSTEMS
IN-LINE INSTALLATION

CALEFFI XS®	**DIRTMAGMINI®**
	

System nominal power [kW]		*8*	*9*	*10*	*12*	*14*	*16*	*18*	*21*
System maximum flow rate [l/h] (ΔT = 20 °C)		*344*	*387*	*430*	*516*	*602*	*688*	*774*	*903*
CALEFFI XS®		***5459**10* (3/4” M x 3/4” F captive nut)							
	Δp [kPa]*	*0.88*	*1.12*	*1.38*	*1.99*	*2.71*	*3.53*	*4.47*	*6.09*
CALEFFI XS®		***5459**12* (Ø 22)							
	Δp [kPa]*	*0.88*	*1.12*	*1.38*	*1.99*	*2.71*	*3.53*	*4.47*	*6.09*
DIRTMAGMINI®		***5450**00* (3/4” M x 3/4” F captive nut)							
	Δp [kPa]*	*0.67*	*0.85*	*1.05*	*1.51*	*2.05*	*2.68*	*3.4*	*4.62*
DIRTMAGMINI®		***5450**22* (Ø 22)							
	Δp [kPa]*	*0.67*	*0.85*	*1.05*	*1.51*	*2.05*	*2.68*	*3.4*	*4.62*

IMPURITIES IN WALL-MOUNTED BOILER SYSTEMS

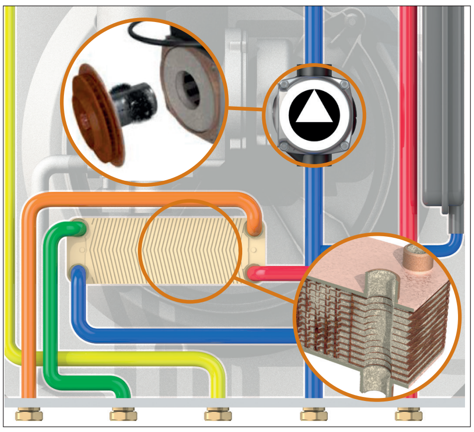
Suspended particles and corrosion residues adhere to the inner surfaces of the heat exchanger, generating a compact and strong layer which, by reducing the cross section, has a twofold negative impact:
- blocking the passages, significantly reducing the medium flow rates;
- thermally insulating the heat exchanger, reducing its efficiency.

These scale build-ups can create zones with considerable temperature differences, leading to localised overheating of the metal in the heat exchangers.

To compensate for this, the boiler regulation systems increase the power of the burner. This results in:
- an increase in flue gas temperatures;
- greater heat loss (through the flue gases and boiler walls);
- reduced flue gas condensation.

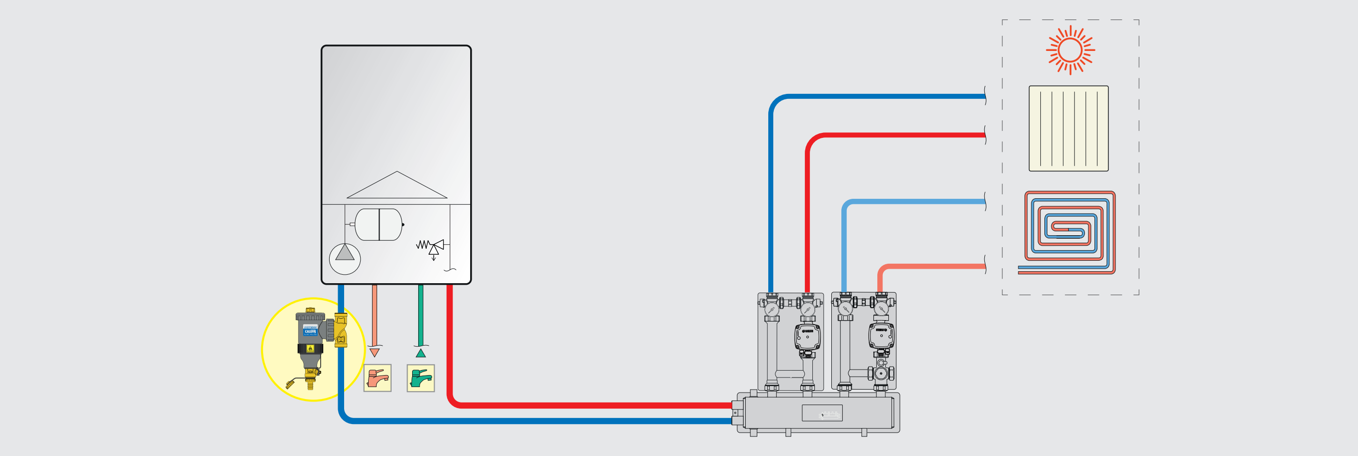
All this lowers the boiler efficiency and increases energy costs.

In condensing boilers, this phenomenon is even more evident, especially at the onset of scaling, when the deposits are still thin. In fact, increasing the flue gas temperature by just a few degrees considerably reduces the condensation capacity of boilers, and therefore their efficiency. Therefore, impurity deposits greatly affect the efficiency of condensing boilers.

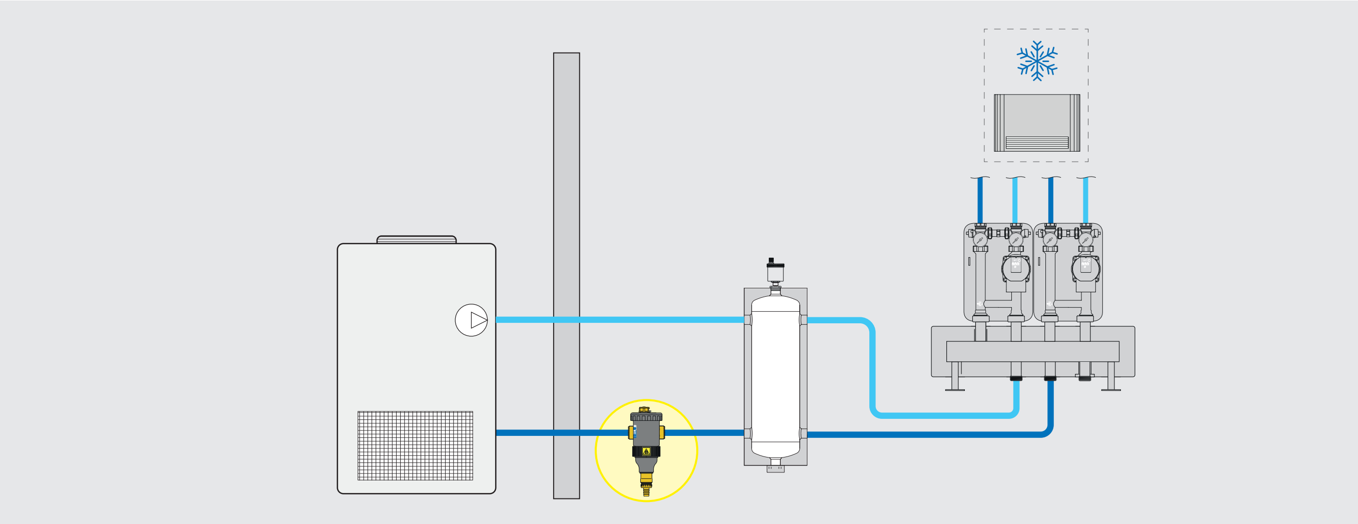


** With clean filter*

WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM



COOLING SYSTEMS



SIZING

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s** for DIRTMAG® and ≤ **1,6 m/s** for DIRTMAGPRO®. To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

DIRTMAG®

Code	Connections	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
545305	3/4”	1300	10.3	1.57
545345	3/4”	1300	7.5	3.04
545302	Ø 22	1300	9.5	1.86
545306	1”	1300	10.5	1.57
545346	1”	1300	7.5	3.04
545303	Ø 28	1300	10.6	1.47
545307	1 1/4”	2100	10.5	4.00
545347	1 1/4”	2100	9.9	4.51

DIRTMAGPRO®

Code	Connections	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
545705	3/4”	1600	9.5	2.84
545702	Ø 22	1600	8.5	3.53
545706	1”	1800	10	3.23
545703	Ø 28	1800	9.5	3.63
545707	1 1/4”	2600	10.5	6.08

System nominal power (heating) [kW]		8	12	14	16	18	22	25	30
System maximum flow rate [l/h] (ΔT = 15 °C)		459	688	803	917	1032	1261	1433	1720
Nominal pipe diameter***		3/4"	3/4"	1"	1"	1"	1"	1 1/4"	1 1/4"
DIRTMAG®		545305 - 545302 (3/4" - Ø 22)		545306 - 545303 (1" - Ø 28)				545307 (1 1/4")	
	Δp [kPa]	0.21	0.48	0.58	0.76	0.96	1.43	1.86	2.68
DIRTMAG®		545345 (3/4")		545346 (1")				545347 (1 1/4")	
	Δp [kPa]	0.37	0.84	1.15	1.49	1.89	2.83	2.1	3
DIRTMAGPRO®		545705 - 545702 (3/4" - Ø 22)		545706 - 545703 (1" - Ø 28)				545707 (1 1/4")	
	Δp [kPa]	0.26	0.59	0.59	0.89	1.12	1.68	1.86	2.68
CALEFFI XF **		577500 - 577200 (3/4" - Ø 22)		577600 - 577300 (1" - Ø 28)				577700 (1 1/4")	
	Δp* [kPa]	0.23	0.52	0.55	0.74	0.95	1.4	1.79	2.58

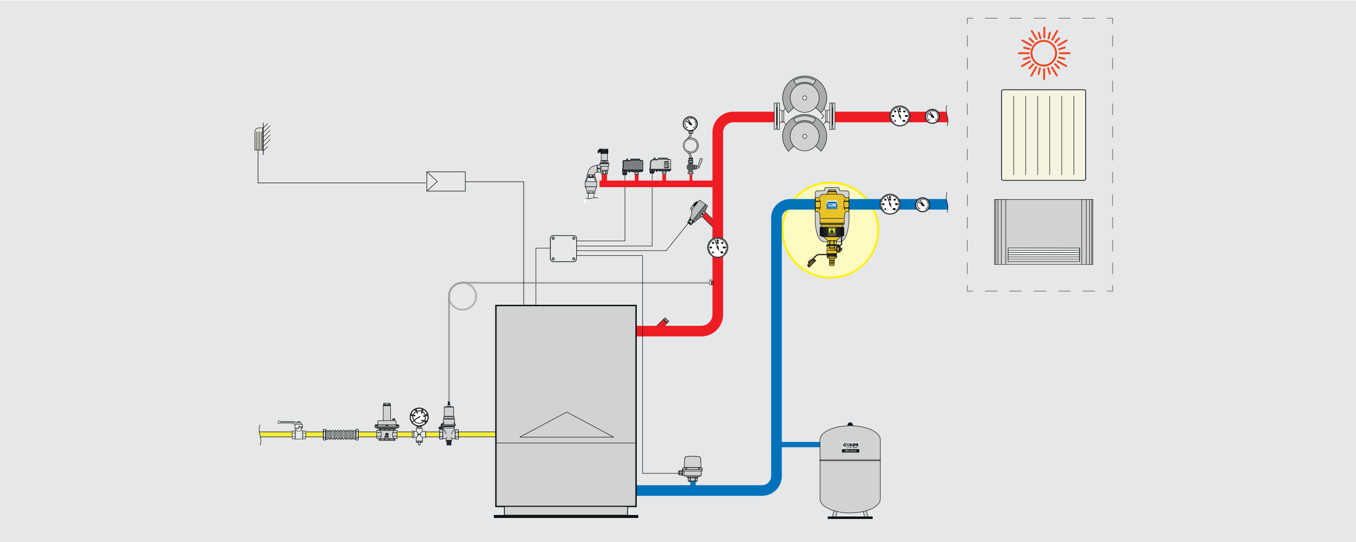
System nominal power (cooling) [kW]		2	3	5	7	9	11	13	15
System maximum flow rate [l/h] (ΔT = 5 °C)		344	516	860	1204	1548	1892	2236	2580
Nominal pipe diameter***		3/4"	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
DIRTMAG®		545305 - 545302 (3/4" - Ø 22)		545306 - 545303 (1" - Ø 28)		545307 (1 1/4")			
	Δp [kPa]	0.12	0.27	0.67	1.30	2.19	3.24	-	
DIRTMAG®		545345 (3/4")		545346 (1")		545347 (1 1/4")			
	Δp [kPa]	0.21	0.47	1.31	2.58	4.26	6.36	-	
DIRTMAGPRO®		545705 - 545702 (3/4" - Ø 22)		545706 - 545703 (1" - Ø 28)		545707 (1 1/4")			
	Δp [kPa]	0.15	0.33	0.78	1.53	2.17	3.24	4.54	6.04
CALEFFI XF **		577500 - 577200 (3/4" - Ø 22)		577600 - 577300 (1" - Ø 28)		577700 (1 1/4")			
	Δp* [kPa]	0.12	0.28	0.66	1.29	2.1	3.13	4.37	5.81

* With clean filter

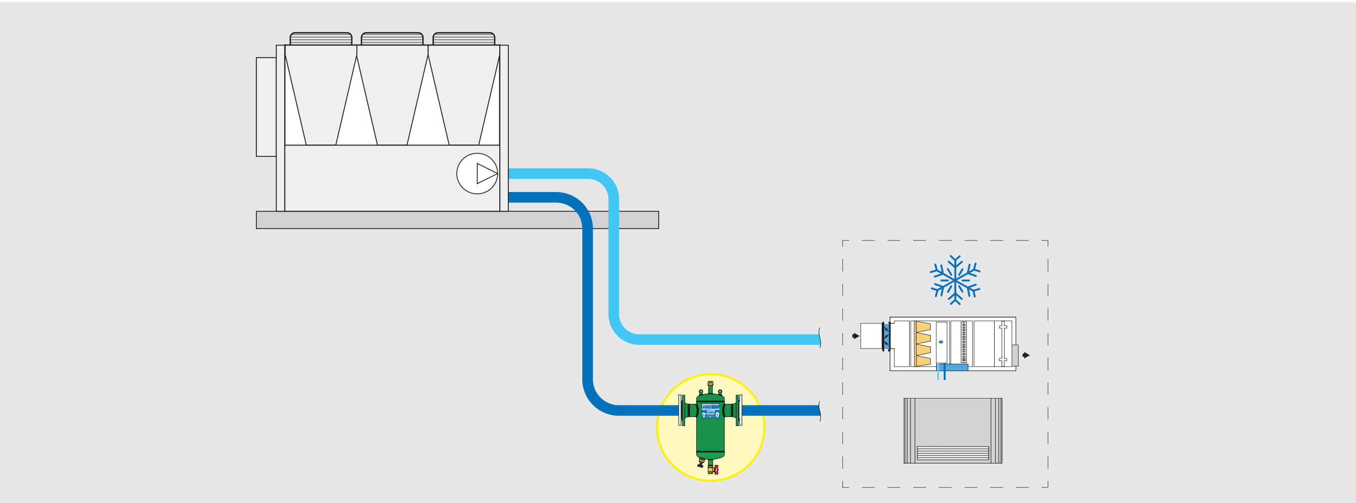
**Sizing CALEFFI XF page 9

***Pipe pressure drop r ~ 20-22 mm w.g./m (50 °C)

MEDIUM/LARGE SYSTEMS - HEATING



MEDIUM/LARGE SYSTEMS - COOLING



SIZING

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

DIRTMAG®

Code	Connections	Max. flow rate [l/h]	Kv $[m^3/h]$	Δp [kPa] (max. flow rate)
546315	3/4”	1360	16.2	0.7
546316	1”	2110	28.1	0.56
546317	1 1/4”	3470	48.8	0.51
546318	1 1/2”	5420	63.2	0.74
546319	2”	8200	70	1.37

DIRTMAG®

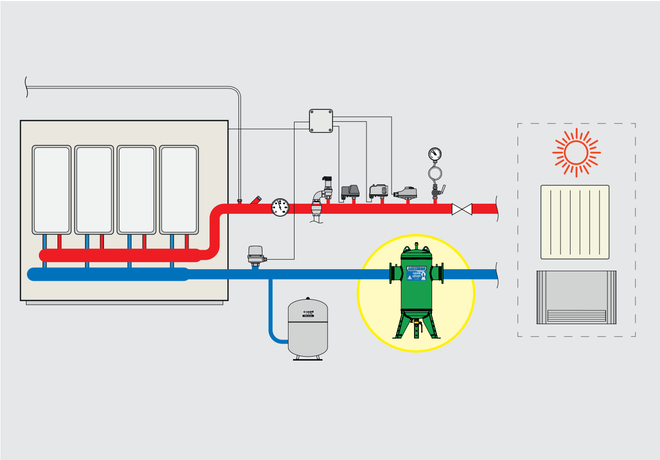
Code	Size	Max. flow rate [l/h]	Kv $[m^3/h]$	Δp [kPa] (max. flow rate)
546650	DN 50	8470	60.5	1.96
546660	DN 65	14320	110	1.69
546680	DN 80	21690	160	1.86
546610	DN 100	33890	216	2.45
546612	DN 125	58800	365	2.6
546615	DN 150	86200	535	2.6

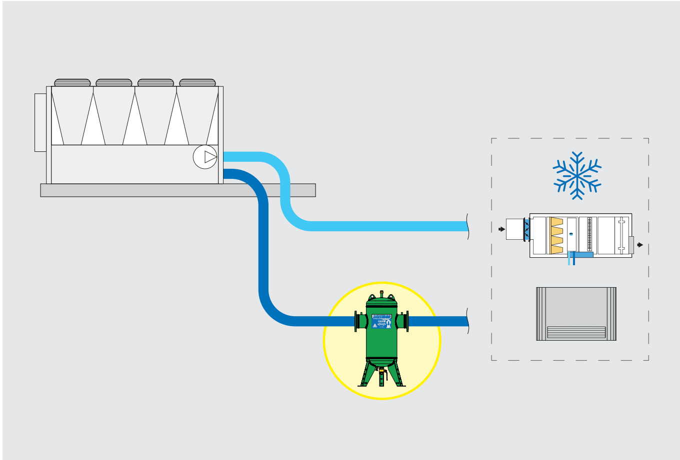
System nominal power (heating) [kW]		35	40	45	55	65	75	85	100
System maximum flow rate [l/h] (ΔT = 15 °C)		2007	2293	2580	3153	3727	4300	4873	5733
Nominal pipe diameter***		1 1/4”	1 1/4”	1 1/4”	1 1/2”	1 1/2”	1 1/2”	2” DN 50	2” DN 50
CALEFFI XF **		577800 (1 1/2”)						577900 (2”)	
	Δp* [kPa] (100 %)	0.76	0.99	1.26	1.88	2.63	3.5	4.49	6.21
	Δp* [kPa] (50 %)	0.25	0.33	0.42	0.62	0.87	1.16	1.48	2.05
DIRTMAG®		546317 (1 1/4”)			546318 (1 1/2”)			546319 (2”)	
	Δp [kPa]	0.17	0.22	0.28	0.25	0.35	0.46	0.48	0.67
DIRTMAG®								546650 (DN 50)	
	Δp [kPa]	-						0.65	0.9

System nominal power (cooling) [kW]		20	25	30	35	40	50	60	70
System maximum flow rate [l/h] (ΔT = 5 °C)		3440	4300	5160	6020	6880	8600	10320	12040
Nominal pipe diameter***		1 1/2”	1 1/2”	2” DN 50	2” DN 50	2” DN 50	DN 65	DN 65	DN 65
CALEFFI XF **		577800 (1 1/2”)		577900 (2”)					
	Δp* [kPa] (100 %)	2.24	3.5	5	6.85	8.95	-		
	Δp* [kPa] (50 %)	0.74	1.16	1.66	2.27	2.96	-		
DIRTMAG®		546318 (1 1/2”)		546319 (2”)					
	Δp [kPa]	0.3	0.46	0.54	0.74	0.97	-		
DIRTMAG®				546650 (DN 50)			546660 (DN 65)		
	Δp [kPa]	-		0.73	0.99	1.29	2.02	2.91	3.96

* With clean filter
**Sizing CALEFFI XF page 9
***Pipe pressure drop r ~ 20-22 mm w.g./m (50 °C)

LARGE SYSTEMS -
HEATING/COOLING - IN-LINE INSTALLATION





SIZING

DIRTMAG®

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

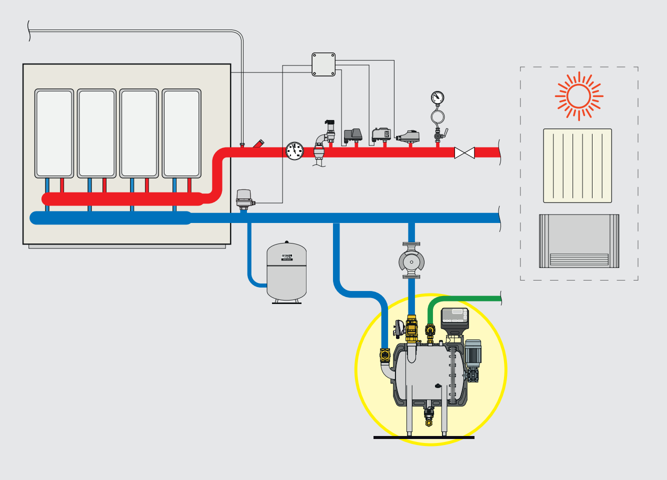
Code	Size	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
546650	DN 50	8470	60.5	1.96
546660	DN 65	14320	110	1.66
546680	DN 80	21690	160	1.86
546610	DN 100	33890	216	2.45
546612	DN 125	58800	365	2.55
546615	DN 150	86200	535	2.55
546620	DN 200	146000	900	2.63
546625	DN 250	232000	1200	3.74
546630	DN 300	325000	1500	4.7

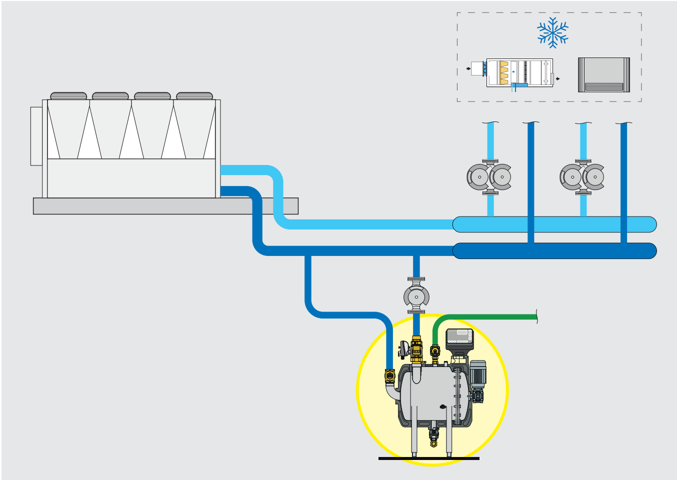
System nominal power (heating) [kW]	300	500	1000	1300	1800	2200	2500	3000	3500
System maximum flow rate [l/h] (ΔT = 15 °C)	17200	28667	57333	74533	103200	126133	143333	172000	200667
Nominal pipe diameter*	DN 80	DN 100	DN 125	DN 150	DN 200	DN 200	DN 200	DN 250	DN 250
DIRTMAG® 	546680 (DN 80)	546610 (DN 100)	546612 (DN 125)	546615 (DN 150)	546620 (DN 200)			546625 (DN 250)	
Δp [kPa]	1.16	1.76	2.47	1.94	1.31	1.96	2.53	2.05	2.8

System nominal power (cooling) [kW]	100	150	300	400	800	1000	1200	1400	1600
System maximum flow rate [l/h] (ΔT = 5 °C)	17200	25800	51600	68800	137600	172000	206400	240800	275200
Nominal pipe diameter*	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 250	DN 300	DN 300
DIRTMAG® 	546680 (DN 80)	546610 (DN 100)	546612 (DN 125)	546615 (DN 150)	546620 (DN 200)	546625 (DN 250)		546630 (DN 300)	
Δp [kPa]	1.16	1.43	2	1.65	2.34	2.05	2.96	2.58	3.37

*Water maximum speed v ~ 1,2 m/s

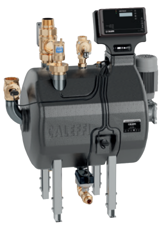
LARGE SYSTEMS - HEATING/COOLING - BY-PASS INSTALLATION





SIZING

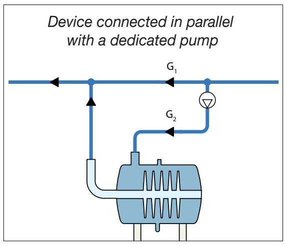
DIRTMAGCLEAN®

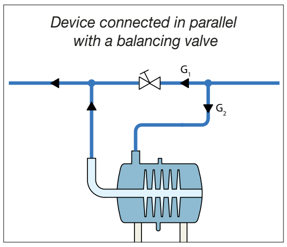


With this type of by-pass connection, the flow rate through the device G_2 is only a fraction of the total system flow rate G_1.
The flow rate that needs to be treated by the device G_2 varies from 15 to 80 % of the total flow rate G_1.

By-pass connection can be performed in two ways:
- device connected in parallel with a dedicated pump;
- device connected in parallel with a balancing valve.

Code	Connections	Kv* [m³/h]	Max. flow rate [l/h]	Δp* [kPa] (max. flow rate)
579000	2”	45	20000	19.8
579001	2”	45	20000	19.8





System nominal power (heating) [kW]	500	550	600	650	700	800	1000	1500	2000
System maximum flow rate [l/h] (ΔT = 15 °C)	28667	31533	34400	37267	40133	45867	57333	86000	114667
Max. flow rate in by-pass [l/h]	20000	20000	20000	20000	20000	20000	20000	20000	20000
DIRTMAGCLEAN® 	**579**000 | **579**001								

System nominal power (cooling) [kW]	250	300	350	400	450	500	600	700	800
System maximum flow rate [l/h] (ΔT = 5 °C)	43000	51600	60200	68800	77400	86000	103200	120400	137600
Max. flow rate in by-pass [l/h]	20000	20000	20000	20000	20000	20000	20000	20000	20000
DIRTMAGCLEAN® 	**579**000 | **579**001								

* With clean filter

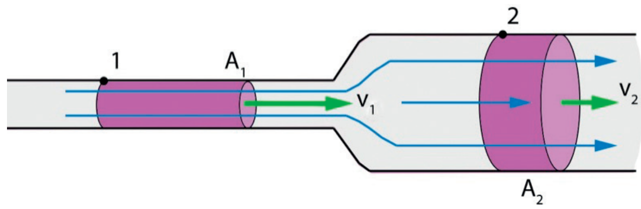
Deaerators

Operating principle

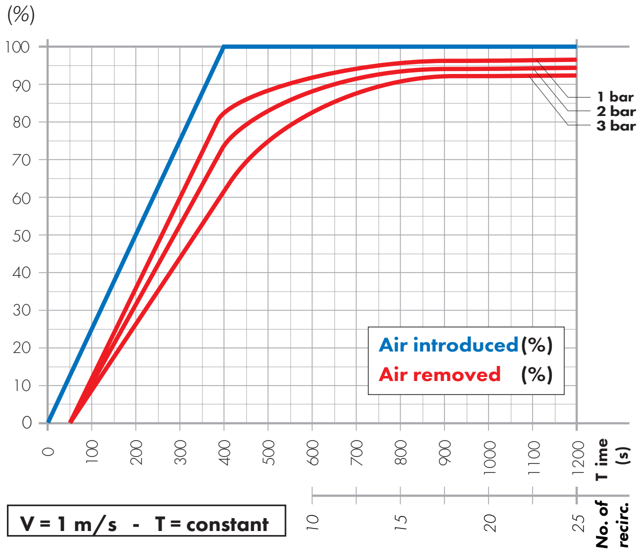
The deaerator utilises the combined action of several physics principles. The active part consists of a set of concentric mesh surfaces. These elements create the swirling motion required to facilitate the release of micro-bubbles and their adhesion to the surfaces. The bubbles, fusing with each other, 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.

Air separation efficiency

The amount of air that can be removed from a circuit increases as the circulation speed and the pressure decrease.
The enlargement of the device cross-section ($A_2 > A_1$) allows a decrease in speed ($V_2 < V_1$). This feature, combined with the swirling movements created by a concentric mesh surface, allows an efficient air separation and the release of micro-bubbles.



After just 25 recirculations at the maximum recommended speed, almost the air introduced into the circuit is eliminated by the DISCAL® deaerator, w variable percentages according to the pressure within the circuit.
The small amount which remains is then gradually eliminated during norr system operation. In conditions where the speed is slower or the temperatu of the medium is higher, the amount of air separated is even greater.



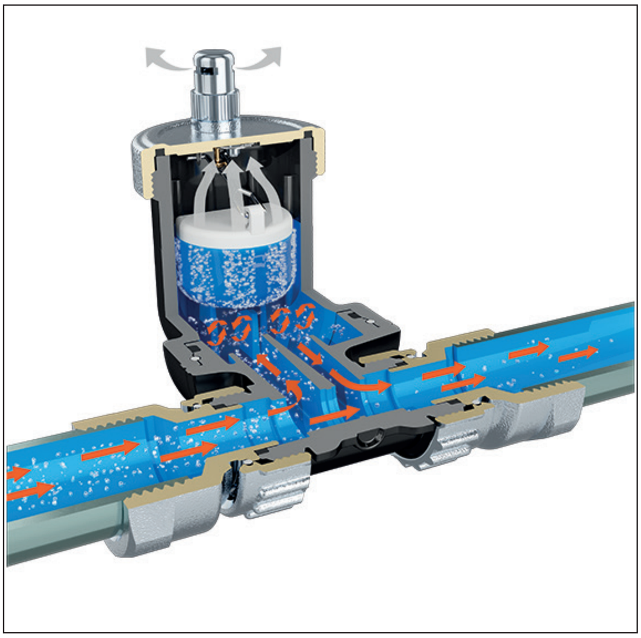
Systems with glycol solutions

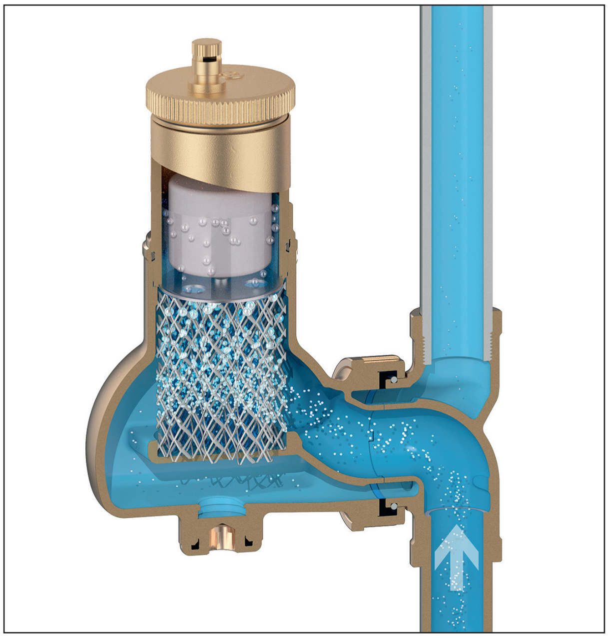
It is also useful to use deaerators in systems with antifreeze mixtu water and glycol.
Water-glycol mixtures are highly viscous and therefc have a strong tendency to trap both air bubbles and micro-bubbles, prevent their elimination.

Sizing

Sizing a deaerator mainly depends on the speed at which the medium flows through the device, since an excessive speed would not allow correct air separation and releasing of the micro-bubbles.

As is known, the medium flow speed depends on the flow rate and the cross section. Remaining within the speed limits specified above therefore means not exceeding certain **maximum permissible flow rates** for each size.





WALL-MOUNTED BOILER SYSTEMS

TECHNOPOLYMER DEAERATOR

DISCAL*SLIM*®
551
3/4" – 1"
Ø18 - Ø22

WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM

BRASS DEAERATOR WITH ADJUSTABLE CONNECTIONS

DISCAL®
551
3/4" – 1"
Ø22 - Ø28

MEDIUM/LARGE SYSTEMS

BRASS DEAERATOR

DISCAL®
551
3/4" – 2"

STEEL DEAERATOR

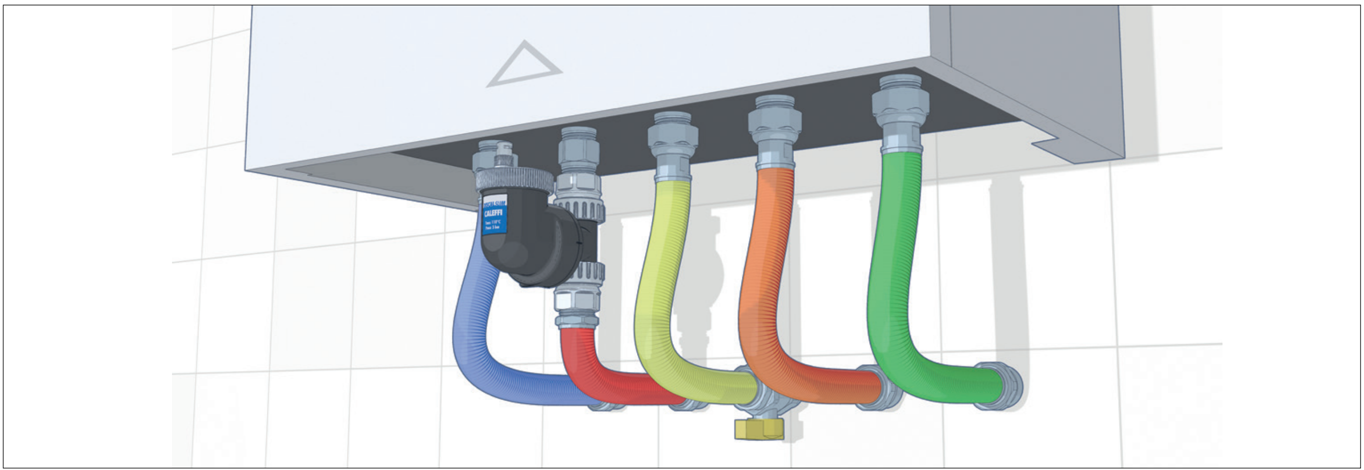
DISCAL®
551
DN 50–DN 65

LARGE SYSTEMS

STEEL DEAERATOR

DISCAL®
551
DN 80–DN 300

WALL-MOUNTED BOILER SYSTEMS



System nominal power [kW]		8	9	10	12	14	16	18	21
System maximum flow rate [l/h] (ΔT = 20 °C)		344	387	430	516	602	688	774	903
DISCALSLIM®		551805 (3/4" F)				551806 (1" F)			
	Δp [kPa]	0.07	0.09	0.11	0.16	0.21	0.28	0.35	0.48
DISCALSLIM®		551801 (Ø 18)				551802 (Ø 22)			
	Δp [kPa]	0.15	0.18	0.23	0.33	0.21	0.28	0.35	0.48

SIZING

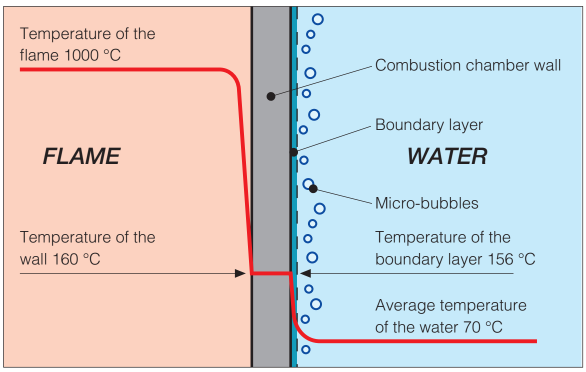
DISCALSLIM®

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

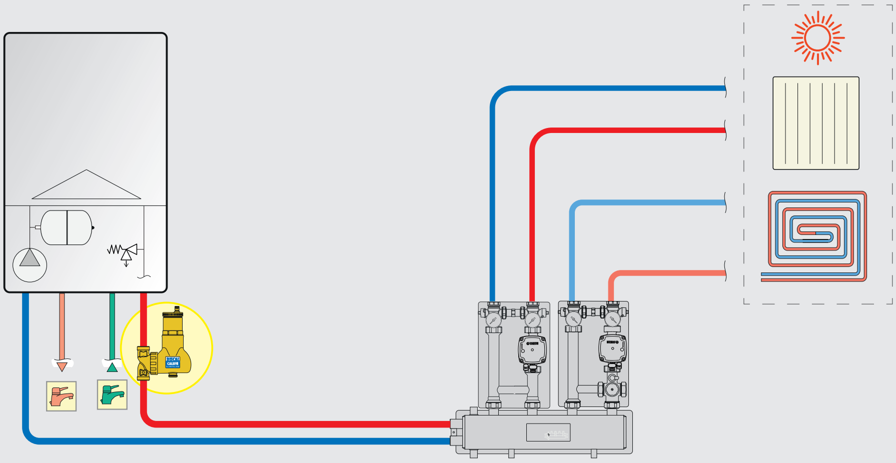
Code	Connections	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
551801	Ø 18	1300	9	2.1
551805	3/4"	1300	13	1
551802	Ø 22	1300	13	1
551806	1"	1300	13	1

FORMATION OF AIR MICRO-BUBBLES IN THE BOILER

Micro-bubbles form continuously on the surfaces separating the water from the combustion chamber due to the high temperature of the medium. The phenomenon is similar to the one we can observe on the walls of a pan when we are heating water. 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.



WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM



System nominal power [kW]	10	12	14	16	18	22	25	30
System maximum flow rate [l/h] (ΔT = 15 °C)	573	688	803	917	1032	1261	1433	1720
Nominal pipe diameter*	3/4"	3/4"	1"	1"	1"	1"	1 1/4"	1 1/4"
DISCAL® 	**551**702 (Ø 22)		**551**703 (Ø 28)					
Δp [kPa]	0.23	0.33	0.45	0.58	0.74	1.10	1.43	2.05
DISCAL® 	**551**705 (3/4" F)		**551**706 (1" F)					
Δp [kPa]	0.23	0.33	0.45	0.58	0.74	1.10	1.43	2.05
DISCAL® 			**551**716 (1" M)					
Δp [kPa]	-		0.45	0.58	0.74	1.10	1.43	2.05

* Pressure drop r ~ 20-22 mm w.g./m (50 °C)

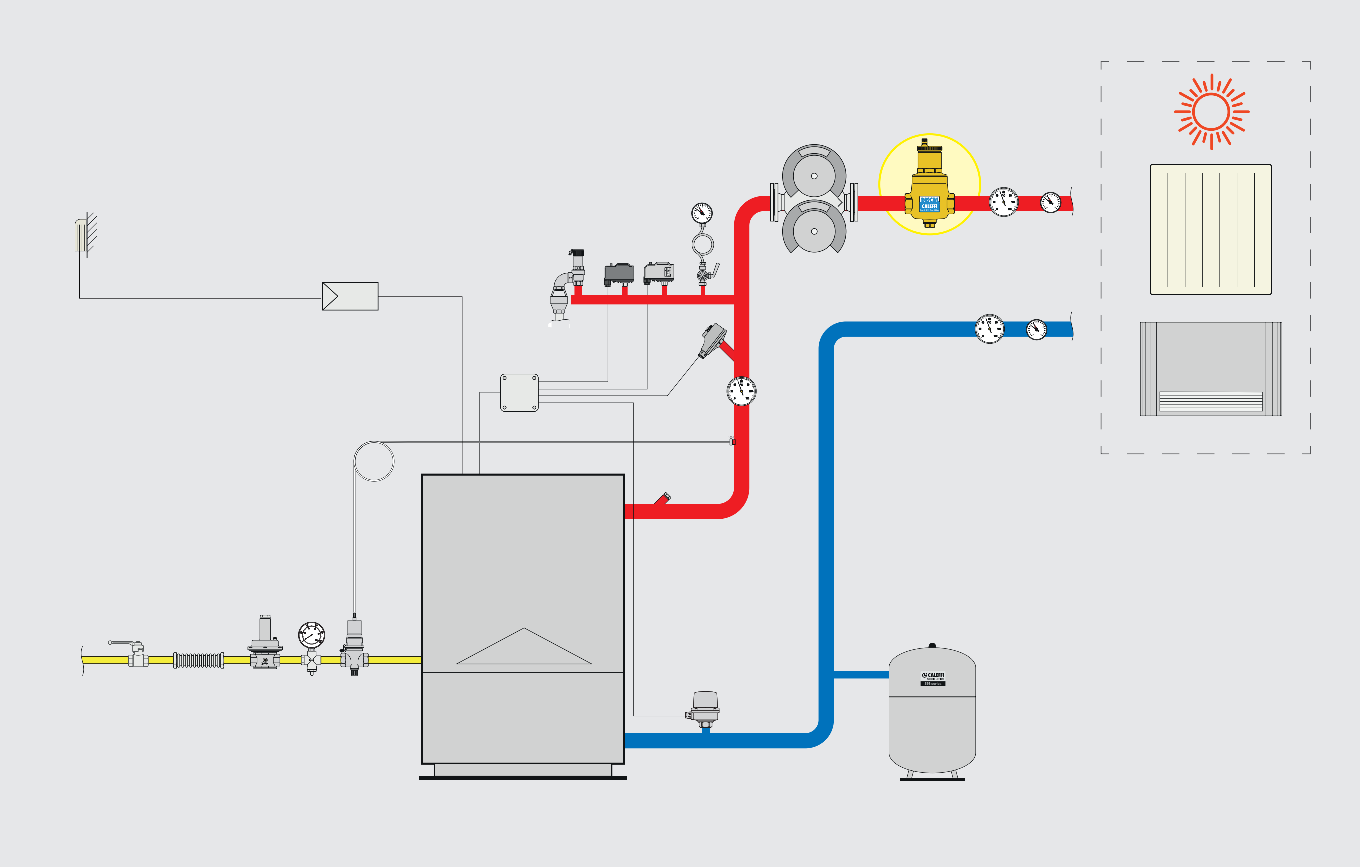
SIZING

DISCAL®

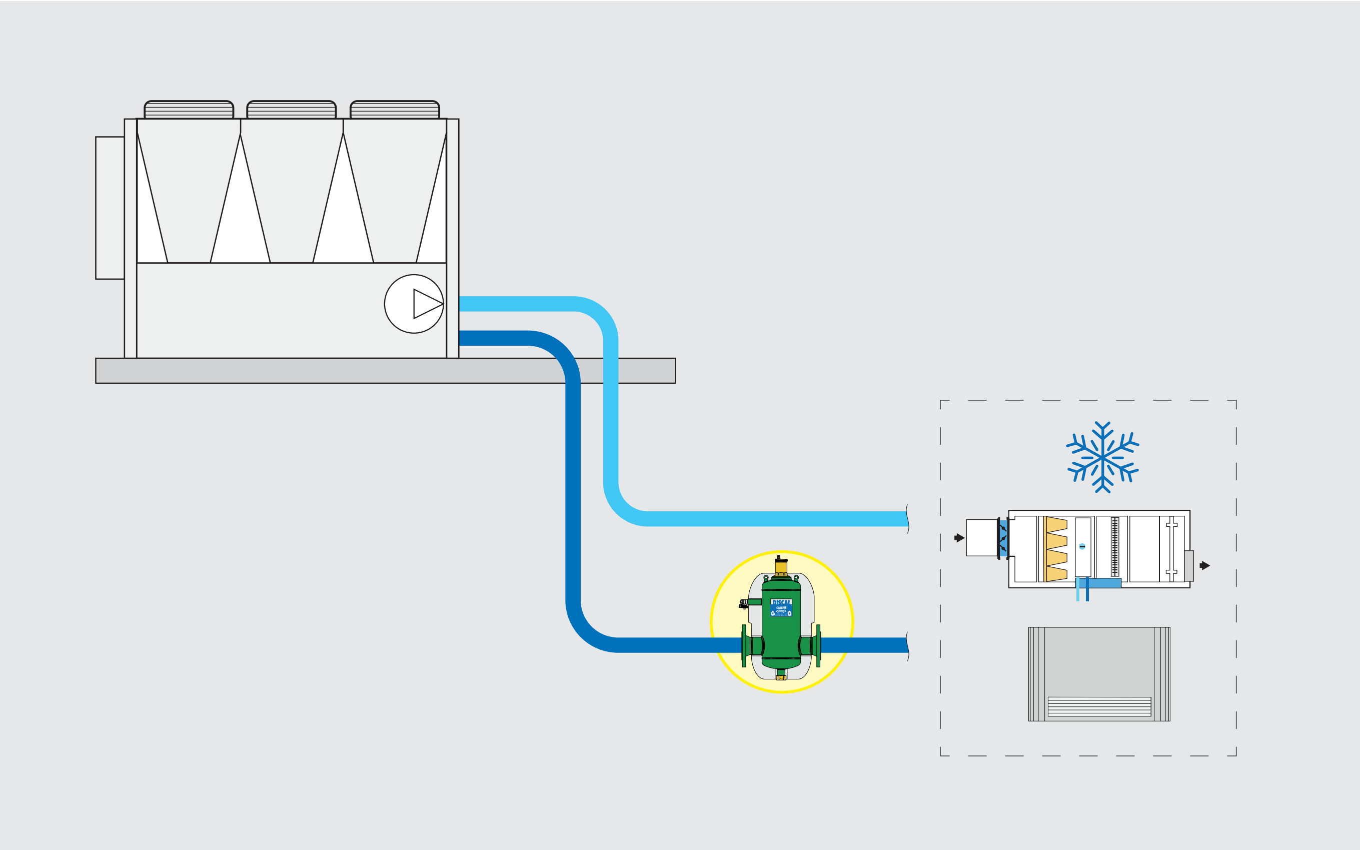
Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

Code	Connections	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
551705	3/4" F	1360	12	1.28
551702	Ø 22	1360	12	1.28
551706	1" F	2110	12	3.1
551716	1" M	2110	12	3.1
551703	Ø 28	2110	12	3.1

MEDIUM/LARGE SYSTEMS - HEATING



MEDIUM/LARGE SYSTEMS - COOLING



SIZING

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

DISCAL®

Code	Connections	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
551005	3/4”	1360	16.2	0.7
551006	1”	2110	28.1	0.56
551007	1 1/4”	3470	48.8	0.51
551008	1 1/2”	5420	63.2	0.74
551009	2”	8200	70	1.37

DISCAL®

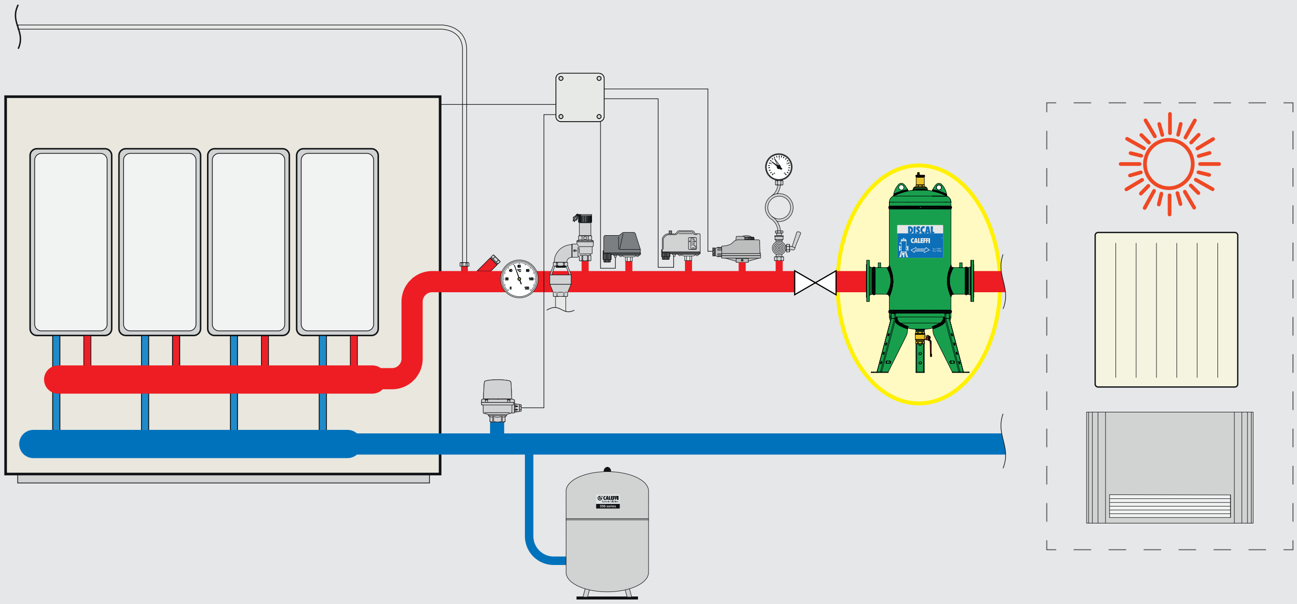
Code	Size	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
551052	DN 50	8470	75	1.28
551062	DN 65	14320	150	0.91
551082	DN 80	21690	180	1.45
551102	DN 100	33890	280	1.46
551122	DN 125	58800	450	1.71
551152	DN 150	86200	720	1.43

System nominal power (heating) [kW]	35	40	45	55	65	75	85	100
System maximum flow rate [l/h] (ΔT = 15 °C)	2007	2293	2580	3153	3727	4300	4873	5733
Nominal pipe diameter*	1 1/4”	1 1/4”	1 1/4”	1 1/2”	1 1/2”	1 1/2”	2” DN 50	2” DN 50
DISCAL® 	**551**007 (1 1/4” F)			**551**008 (1 1/2” F)			**551**009 (2” F)	
Δp [kPa]	0.17	0.22	0.28	0.25	0.35	0.46	0.48	0.67
DISCAL® 							**551**052 (DN 50)	
Δp [kPa]	-						0.42	0.58

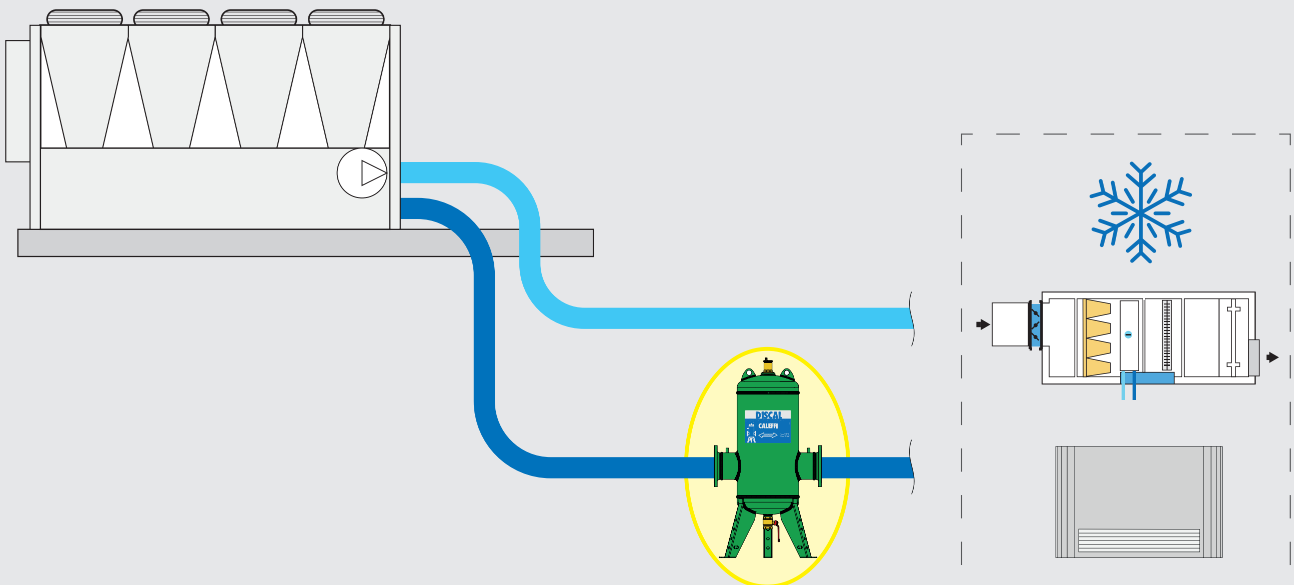
System nominal power (cooling) [kW]	20	25	30	35	40	50	60	70
System maximum flow rate [l/h] (ΔT = 5 °C)	3440	4300	5160	6020	6880	8600	10320	12040
Nominal pipe diameter*	1 1/2”	1 1/2”	2” DN 50	2” DN 50	2” DN 50	DN 65	DN 65	DN 65
DISCAL® 	**551**008 (1 1/2” F)		**551**009 (2” F)					
Δp [kPa]	0.3	0.46	0.54	0.74	0.97	-		
DISCAL® 			**551**052 (DN 50)			**551**062 (DN 65)		
Δp [kPa]	-		0.47	0.64	0.84	0.33	0.47	0.64

** Pressure drop r ~ 20-22 mm w.g./m (50 °C)*

LARGE SYSTEMS - HEATING



LARGE SYSTEMS - COOLING



DISCAL®

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

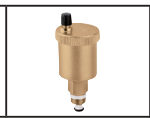
Code	*Size*	*Max. flow rate [l/h]*	*Kv [m³/h]*	*Δp [kPa] (max. flow rate)*
551052	*DN 50*	*8470*	*75*	*1.28*
551062	*DN 65*	*14320*	*150*	*0.91*
551082	*DN 80*	*21690*	*180*	*1.45*
551102	*DN 100*	*33890*	*280*	*1.46*
551122	*DN 125*	*58800*	*450*	*1.71*
551152	*DN 150*	*86200*	*720*	*1.43*
551200	*DN 200*	*146000*	*900*	*2.63*
551250	*DN 250*	*232000*	*1200*	*3.74*
551300	*DN 300*	*325000*	*1500*	*4.7*

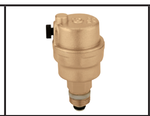
System nominal power (heating) [kW]		*300*	*500*	*1000*	*1300*	*1800*	*2200*	*2500*	*3000*	*3500*
System max. flow rate [l/h] (ΔT = 15 °C)		*17200*	*28667*	*57333*	*74533*	*103200*	*126133*	*143333*	*172000*	*200667*
*Nominal pipe diameter**		*DN 80*	*DN 100*	*DN 125*	*DN 150*	*DN 200*	*DN 200*	*DN 200*	*DN 250*	*DN 250*
DISCAL®		551082 (DN 80)	551102 (DN 100)	551122 (DN 125)	551152 (DN 150)	551200 (DN 200)			551250 (DN 250)	
	Δp [kPa]	*0.91*	*1.05*	*1.62*	*1.07*	*1.31*	*1.96*	*2.53*	*2.05*	*2.8*

System nominal power (cooling) [kW]		*100*	*150*	*300*	*400*	*800*	*1000*	*1200*	*1400*	*1600*
System max. flow rate [l/h] (ΔT = 5 °C)		*17200*	*25800*	*51600*	*68800*	*137600*	*172000*	*206400*	*240800*	*275200*
*Nominal pipe diameter**		*DN 80*	*DN 100*	*DN 125*	*DN 150*	*DN 200*	*DN 250*	*DN 250*	*DN 300*	*DN 300*
DISCAL®		551082 (DN 80)	551102 (DN 100)	551122 (DN 125)	551152 (DN 150)	551200 (DN 200)	551250 (DN 250)		551300 (DN 300)	
	Δp [kPa]	*0.91*	*0.85*	*1.31*	*0.91*	*2.34*	*2.05*	*2.96*	*2.58*	*3.37*

**Water maximum speed v ~ 1,2 m/s*

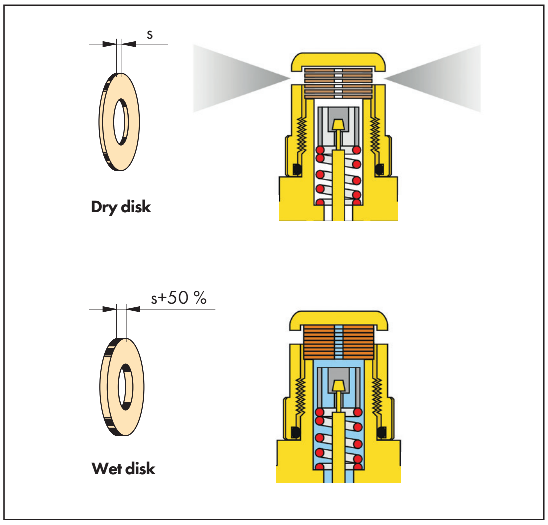
Automatic air vents

	Standard automatic air vents							
Code	502030/40	502031/41	502050/60	502051/61	502130/40	502131/41	502132/42	502133
	MINICAL®							
								
Material	brass	chrome plated brass	brass	chrome plated brass	brass	chrome plated brass	chrome plated brass	brass
Maximum discharge pressure	2.5 bar							
Maximum working pressure	10 bar							
Maximum working temperature	120 °C				110 °C			
Automatic shut-off	optional		-		✔			
Hygroscopic cap	optional		✔		optional		✔	-
Anti-suction valve	optional		optional		optional		optional	✔
Connections	3/8" - 1/2"	3/8" - 1/2"	3/4" - 1"	3/4" - 1"	3/8" - 1/2"	3/8" - 1/2"	3/8" - 1/2"	3/8"

	Automatic air vents with high discharge pressure			
Code	502420/30	502530/33/43	502630/40/41	502730
	ROBOCAL®			
				
Material	brass	brass	chrome plated brass	brass
Maximum discharge pressure	4 bar		6 bar	
Maximum working pressure	10 bar			
Maximum working temperature	115 °C	110 °C	115 °C	110 °C
Automatic shut-off	optional	✔	optional	✔
Hygroscopic cap	-	-	-	-
Anti-suction valve	-	-	optional	optional
Connections	1/4" - 3/8"	3/8" - 1/2"	3/8" - 1/2"	3/8"

Hygroscopic cap

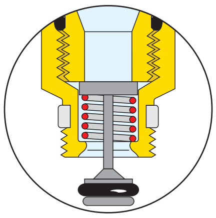
The discs increase in volume by 50 % when they come into contact with water. This leads to valve closure, in order to avoid potential leaks of water.



	Automatic air vents with high discharge capacity		
Code	501500	551004	502221/31/41
	MAXCAL®	**DISCALAIR®**	**VALCAL®**
			
Material	brass	brass	chrome plated brass
Maximum discharge pressure	6 bar	10 bar	4 bar
Maximum working pressure	16 bar	10 bar	10 bar
Maximum working temperature	120 °C	110 °C	120 °C
Automatic shut-off	-	-	optional
Hygroscopic cap	-	optional	optional
Anti-suction valve	-	optional	optional
Connections	3/4"	1/2"	1/4"- 3/8"- 1/2"

Automatic shut-off cock

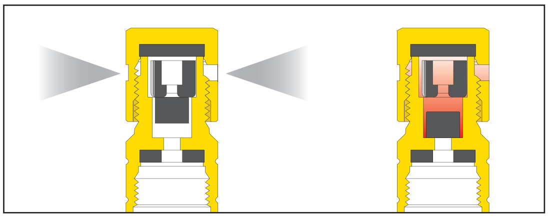
This facilitates maintenance operations by inhibiting the flow of water when the valve is deactivated, and makes it easier to make sure the air vent device is working.



Anti-suction valve

Installed on the air vent line, it functions as a check valve: it only allows air to be released.

In a situation where the system experiences negative pressure, the internal element closes off the outlet channel to prevent unwanted air from entering.

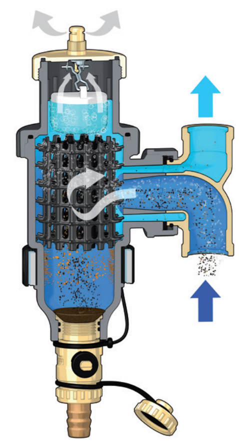


Deaerators-Dirt separators

These are made by assembling, in a single product, a deaerator and a dirt separator. A single product can therefore be used both to separate air and to separate the impurities present in the system water.

Operating principle

The device makes use of the combined action of the deaerator and the dirt separator. The internal element creates swirling movements that facilitate the release of micro-bubbles and the subsequent creation of bubbles that then rise to the top of the device, from which they are evacuated by means of an automatic air vent with float. Moreover, the impurities in the water, striking against the surfaces of the internal element, are separated and fall to the bottom of the valve body.
Deaerators-dirt separators fitted with a magnet offer greater efficiency in the separation and collection of ferrous impurities. The impurities are captured inside the dirt separator body by the strong magnetic field created by the magnets inserted in the special outer ring.
With respect to the solutions that call for the installation of separate deaerators and dirt separators, the deaerators-dirt separators present the following advantages: they take up less space and require a smaller number of connections, and are therefore ideal for systems where it is not possible to install the two separate components. Nevertheless, two separate devices will always guarantee a higher performance level.



Sizing

Sizing a deaerator-dirt separator mainly depends on the speed at which the medium flows through the device, since an excessive speed would not allow correct separation of air and impurities.

As is known, the medium flow speed depends on the flow rate and the cross section. Remaining within the speed limits therefore means not exceeding certain **maximum permissible flow rates** for each size.

HEAT PUMP SYSTEMS

TECHNOPOLYMER MAGNETIC DEAERATOR-DIRT SEPARATOR

DISCAL*DIRTMAG*®
5464
3/4" – 1"
Ø22 - Ø28

WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM - COOLING SYSTEMS

BRASS MAGNETIC DEAERATOR-DIRT SEPARATOR

DISCAL*DIRTMAG*®
5461
3/4" – 1"

MEDIUM/LARGE SYSTEMS

STEEL MAGNETIC DEAERATOR-DIRT SEPARATOR

DISCAL*DIRTMAG*®
5461
1 1/2" – 2"

STEEL DEAERATOR-DIRT SEPARATOR

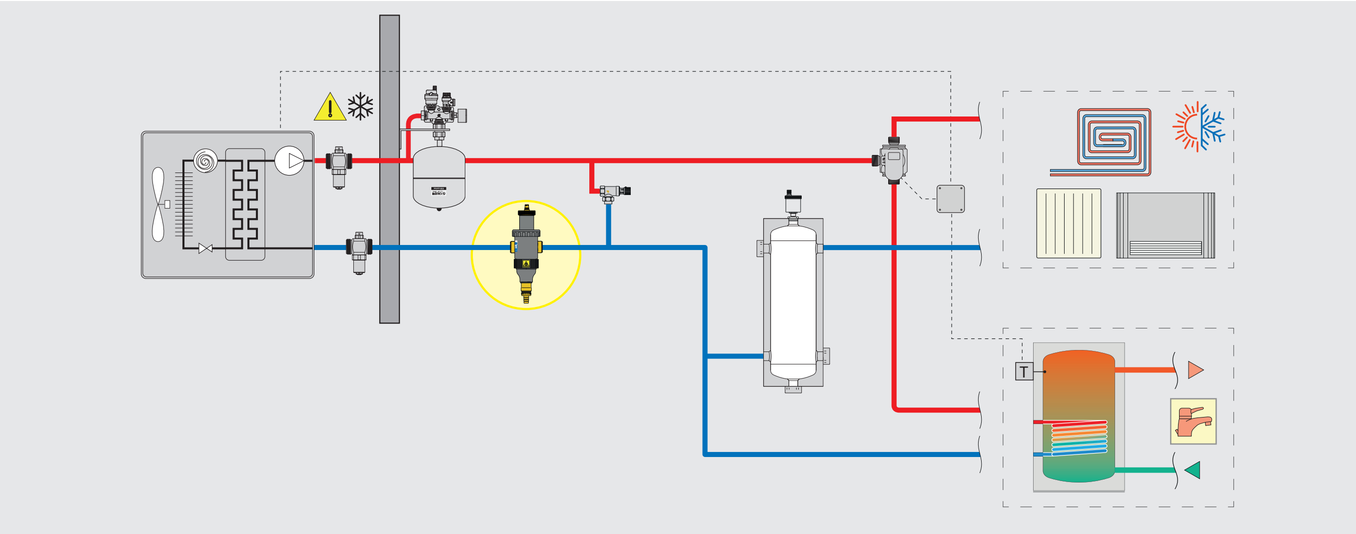
DISCAL*DIRT*®
546
DN 50–DN 65

LARGE SYSTEMS

STEEL DEAERATOR-DIRT SEPARATOR

DISCAL*DIRT*®
546
DN 80–DN 300

HEAT PUMP SYSTEMS



SIZING

DISCALDIRTMAG®

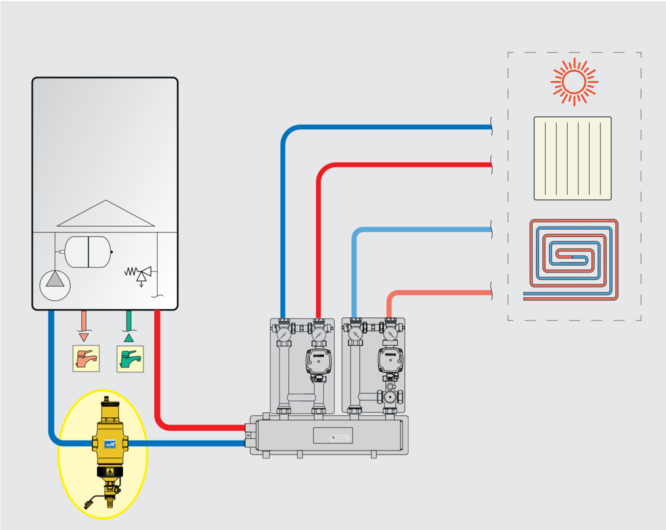
Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

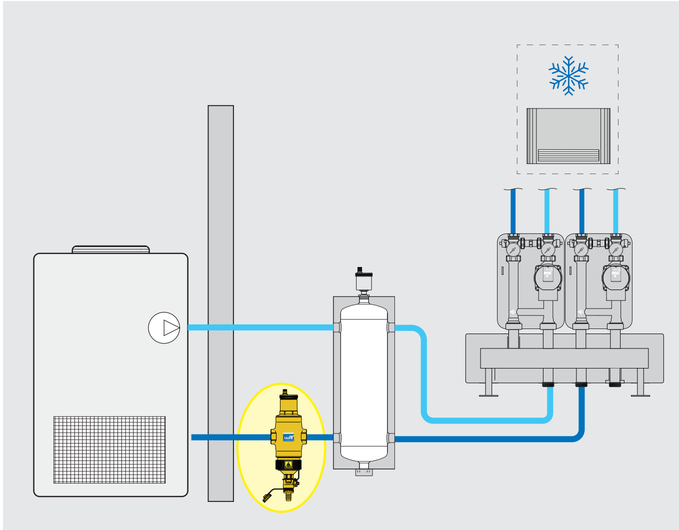
Code	Connections	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
546405	3/4”	1300	10.5	1.53
546402	Ø 22	1300	10.5	1.53
546406	1”	1300	10.5	1.53
546407	1 1/4”	2100	10.5	4.00
546403	Ø 28	1300	10.5	1.53

HP nominal power [kW]	3	4	5	6	7	8	9	12	14	18	22	25	28	32	35
Max. set flow rate [l/h] (ΔT = 5 °C)	516	688	860	1032	1204	1376	1,548	2064	2408	3096	3784	4300	4816	5504	6020
Nominal pipe diameter*	3/4”	3/4”	1”	1”	1”	1”	1 1/4”	1 1/4”	1 1/4”	1 1/2”	1 1/2”	1 1/2”	2”	2”	2”
DISCALDIRTMAG® 	546402 (Ø 22)		546403 (Ø 28)												
Δp [kPa]	0.24	0.43	0.67	0.97	1.31	1.72	-								
DISCALDIRTMAG® 	546405 (3/4”)		546406 (1”)				546407 (1 1/4”)								
Δp [kPa]	0.24	0.43	0.67	0.97	1.31	1.72	2.17	3.86							

* Pressure drop r ~ 20-22 mm w.g./m (50 °C)

WALL-MOUNTED BOILER SYSTEMS WITH TECHNICAL ROOM - COOLING SYSTEMS





SIZING

DISCALDIRTMAG®

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

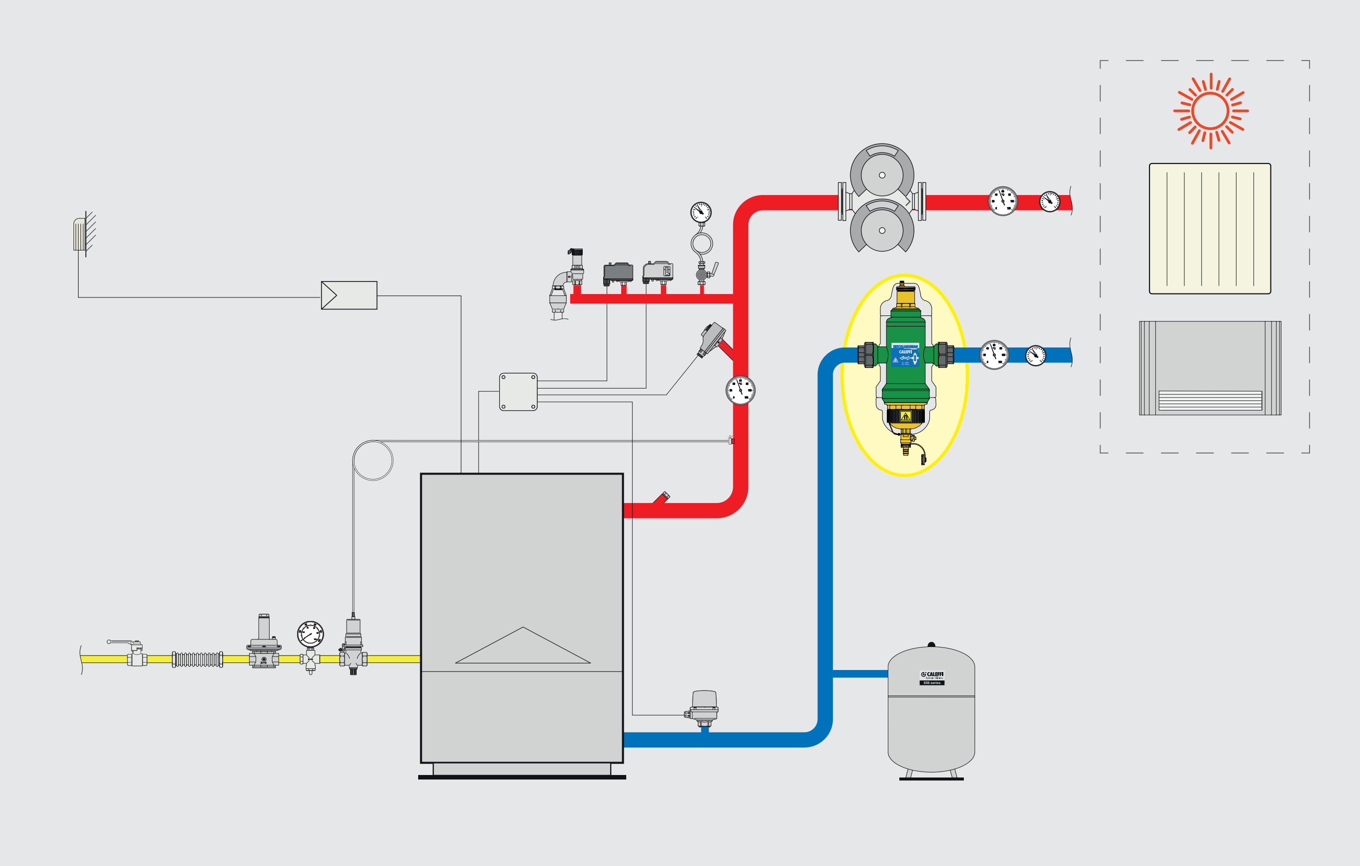
Code	Connections	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
546105	*3/4"*	*1360*	*16.2*	*0.7*
546106	*1"*	*2110*	*28.1*	*0.56*
546107	*1 1/4"*	*3470*	*46.7*	*0.55*

System nominal power (heating) [kW]	***10***	***12***	***14***	***16***	***18***	***22***	***25***	***30***
System maximum flow rate [l/h] (ΔT = 15 °C)	***573***	***688***	***803***	***917***	***1032***	***1261***	***1433***	***1720***
Nominal pipe diameter*	***3/4"***	***3/4"***	***1"***	***1"***	***1"***	***1"***	***1 1/4"***	***1 1/4"***
DISCALDIRT-MAG® 	*546105 (3/4")*		*546106 (1")*				*546107 (1 1/4")*	
Δp [kPa]	***0.12***	***0.18***	***0.03***	***0.11***	***0.13***	***0.2***	***0.09***	***0.14***

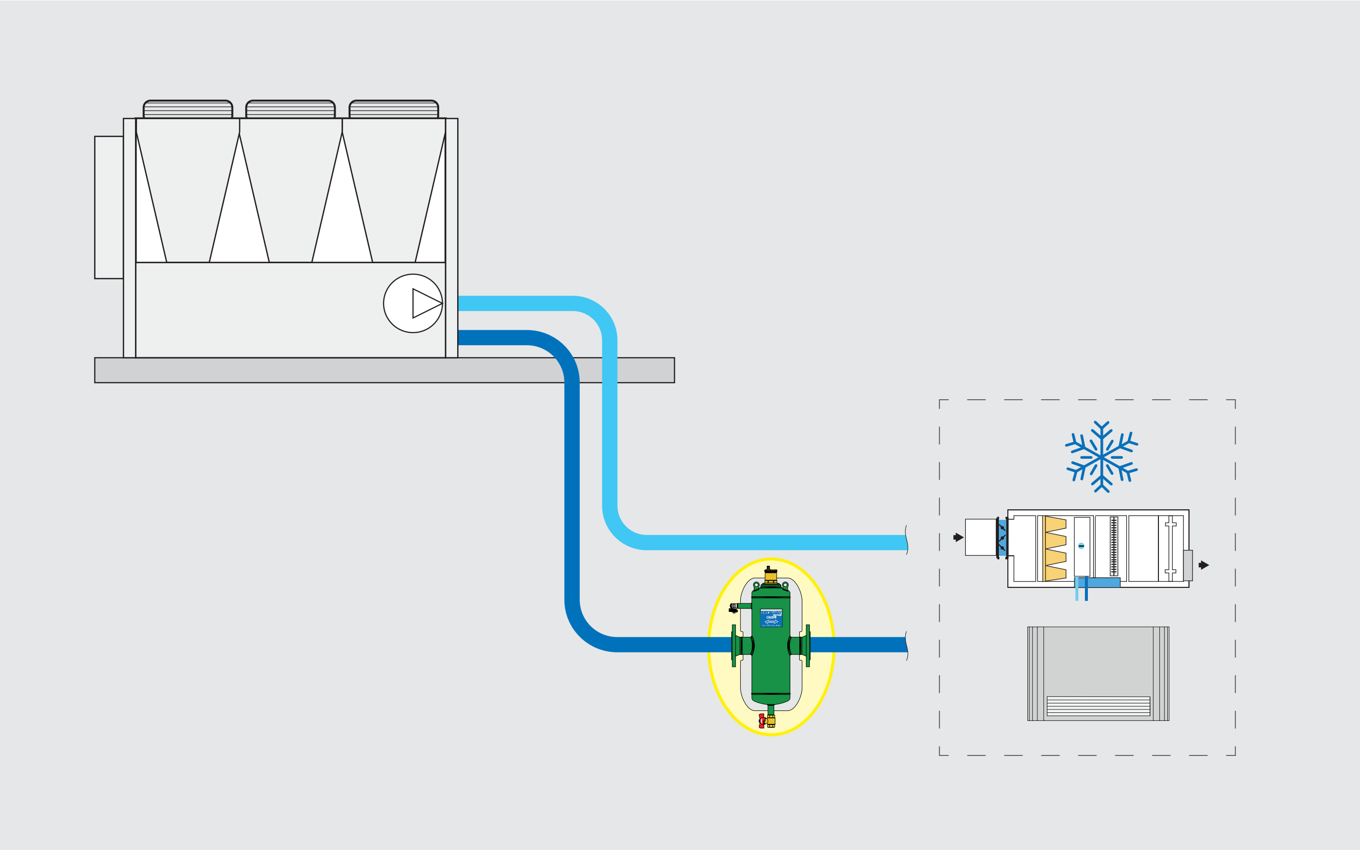
System nominal power (cooling) [kW]	***2***	***3***	***5***	***7***	***9***	***11***	***13***	***15***
System maximum flow rate [l/h] (ΔT = 5 °C)	***344***	***516***	***860***	***1204***	***1548***	***1892***	***2236***	***2580***
Nominal pipe diameter*	***3/4"***	***3/4"***	***1"***	***1"***	***1 1/4"***	***1 1/4"***	***1 1/4"***	***1 1/4"***
DISCALDIRT-MAG® 	*546105 (3/4")*		*546106 (1")*		*546107 (1 1/4")*			
Δp [kPa]	***0.04***	***0.1***	***0.09***	***0.18***	***0.11***	***0.16***	***0.23***	***0.30***

** Pressure drop r ~ 20-22 mm w.g./m (50 °C)*

MEDIUM/LARGE SYSTEMS - HEATING



MEDIUM/LARGE SYSTEMS - COOLING



SIZING

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

DISCALDIRTMAG®

Code	Connections	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
546118	1 1/2”	3410	43.2	0.62
546119	2”	5680	68.3	0.69

DISCALDIRT®

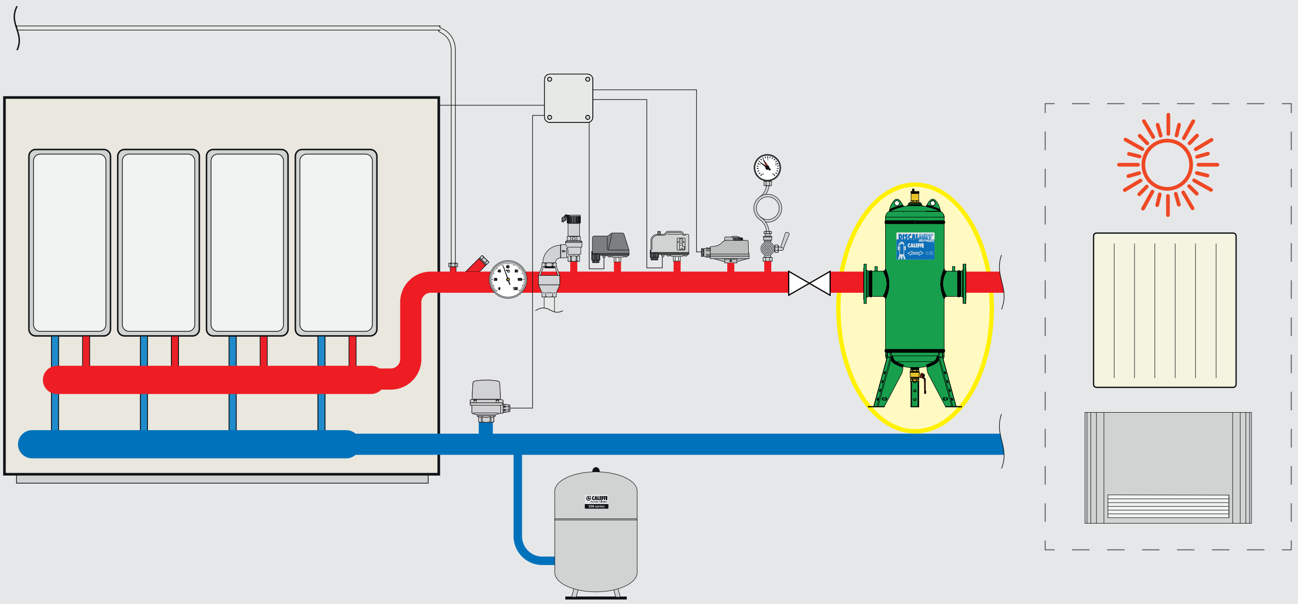
Code	Size	Max. flow rate [l/h]	Kv [m^3/h]	Δp [kPa] (max. flow rate)
546052	DN 50	8470	75	1.28
546062	DN 65	14320	150	0.91
546082	DN 80	21690	180	1.45
546102	DN 100	33890	280	1.46
546122	DN 125	58800	450	1.71
546152	DN 150	86200	720	1.43

System nominal power (heating) [kW]	35	40	45	55	65	75	85	100
System max. flow rate [l/h] (ΔT = 15 °C)	2007	2293	2580	3153	3727	4300	4873	5733
Nominal pipe diameter*	1 1/4”	1 1/4”	1 1/4”	1 1/2”	1 1/2”	1 1/2”	2” DN 50	2” DN 50
DISCALDIRTMAG® 	546118 (1 1/2”)				546119 (2”)			
Δp [kPa]	0.22	0.28	0.36	0.53	0.29	0.4	0.51	0.7
DISCALDIRT® 							546052 (DN 50)	
Δp [kPa]	-						0.42	0.58

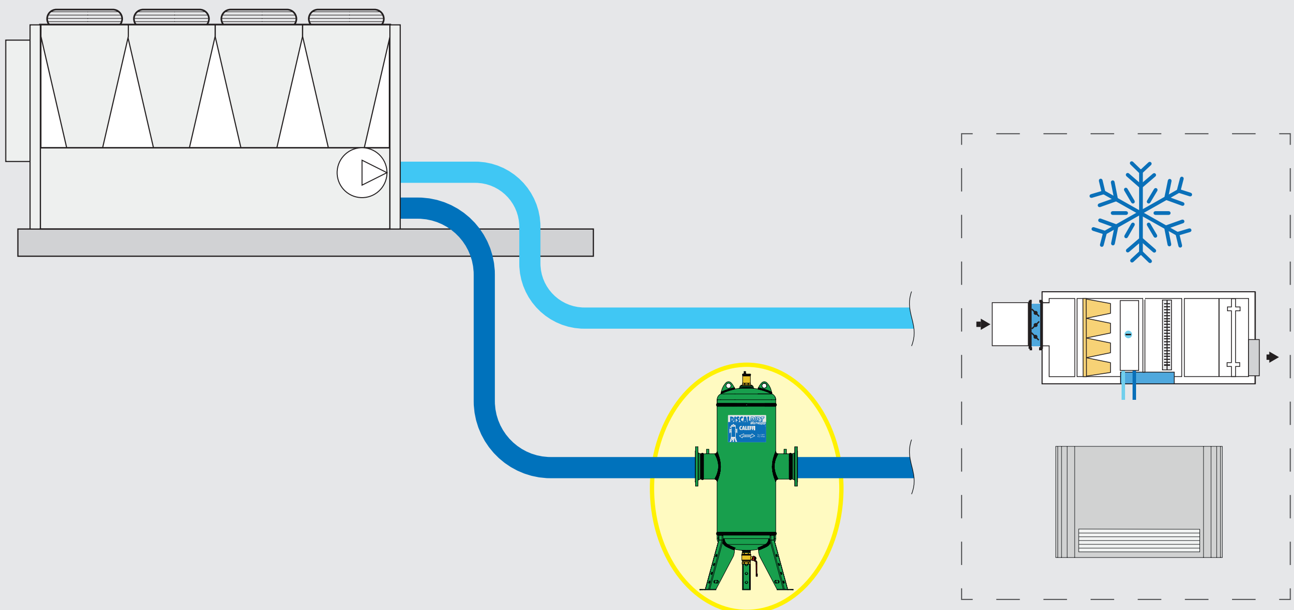
System nominal power (cooling) [kW]	20	25	30	35	40	50	60	70
System max. flow rate [l/h] (ΔT = 5 °C)	3440	4300	5160	6020	6880	8600	10320	12040
Nominal pipe diameter*	1 1/2”	1 1/2”	2” DN 50	2” DN 50	2” DN 50	DN 65	DN 65	DN 65
DISCALDIRTMAG® 	546119 (2”)							
Δp [kPa]	0.25	0.4	0.57	-				
DISCALDIRT® 			546052 (DN 50)			546062 (DN 65)		
Δp [kPa]	-		0.47	0.64	0.84	0.33	0.47	0.64

* Pressure drop r ~ 20-22 mm w.g./m (50 °C)

LARGE SYSTEMS - HEATING



LARGE SYSTEMS - COOLING



DISCALDIRT®

Sizing depends on the speed at which the medium flows through the device.
To guarantee optimal operation, the **maximum speed** on entering the device should be ≤ **1,2 m/s**.
To remain within the speed limits specified above, the specific **maximum permissible flow rate** values for each size must not be exceeded.

Code	Size	Max. flow rate [l/h]	Kv [m³/h]	Δp [kPa] (max. flow rate)
546052	DN 50	8470	75	1.28
546062	DN 65	14320	150	0.91
546082	DN 80	21690	180	1.45
546102	DN 100	33890	280	1.46
546122	DN 125	58800	450	1.71
546152	DN 150	86200	720	1.43
546200	DN 200	146000	900	2.63
546250	DN 250	232000	1200	3.74
546300	DN 300	325000	1500	4.7

System nominal power (heating) [kW]	300	500	1000	1300	1800	2200	2500	3000	3500
System max. flow rate [l/h] (ΔT = 15 °C)	17200	28667	57333	74533	103200	126133	143333	172000	200667
Nominal pipe diameter*	DN 80	DN 100	DN 125	DN 150	DN 200	DN 200	DN 200	DN 250	DN 250
DISCALDIRT® 	546082 (DN 80)	546102 (DN 100)	546122 (DN 125)	546152 (DN 150)	546200 (DN 200)			546250 (DN 250)	
Δp [kPa]	0.91	1.05	1.62	1.07	1.31	1.96	2.53	2.05	2.8

System nominal power (cooling) [kW]	100	150	300	400	800	1000	1200	1400	1600
System max. flow rate [l/h] (ΔT = 5 °C)	17200	25800	51600	68800	137600	172000	206400	240800	275200
Nominal pipe diameter*	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 250	DN 300	DN 300
DISCALDIRT® 	546082 (DN 80)	546102 (DN 100)	546122 (DN 125)	546152 (DN 150)	546200 (DN 200)	546250 (DN 250)		546300 (DN 300)	
Δp [kPa]	0.91	0.85	1.31	0.91	2.34	2.05	2.96	2.58	3.37

*Water maximum speed v ~ 1,2 m/s

Domestic water treatment - Polyphosphate dispenser

Operating principle

Scaling is the result of calcium and magnesium (the salts that determine water hardness) becoming deposited on the pipe walls, heat exchanger surfaces and control and regulation components. The amount of deposit depends on:
- the water temperature
- the water hardness
- the volume of water used.

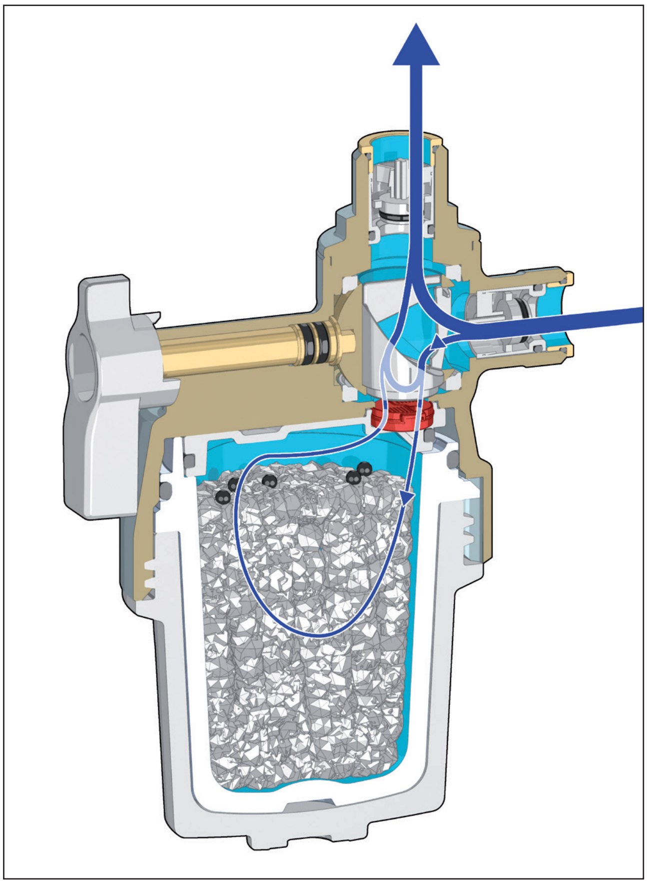
Unlike other salts, calcium and magnesium salts become less soluble as temperature increases. For this reason, all systems in which water is heated, especially those used for domestic hot water production, are at risk of scaling.
The parameter to monitor is the total hardness, the sum of the concentration of calcium and magnesium ions responsible for scaling. Calcium and magnesium bicarbonates are chemically balanced with the calcium and magnesium carbonates, water and carbon dioxide. As temperature increases, the soluble bicarbonates become insoluble carbonates, forming limescale and releasing carbon dioxide.

Sodium and potassium polyphosphates (food polyphosphates) inside the container combine with calcium and magnesium ions (in the water) to form a chemical compound similar to limescale but which cannot adhere to pipe surfaces.
A shielding is then formed which prevents the precipitation of calcium and magnesium and the consequent formation of limescale deposits.
The polyphosphates, moreover, get deposited on the surface of the pipes, forming a protective film to protect them from scaling.

Construction details

Double Venturi proportional dosage

To keep the polyphosphate dosage efficient, dispensing must take place continuously and in a controlled manner, both with the minimum flow rate at the tap and with a variable water flow rate. This dosage maintains the protective film on the pipes and combats the precipitation of salts.
The Caleffi double Venturi proportional dispensing system features full mechanical operation and does not require an electric supply. Part of the inlet water flow passes through the first Venturi and only a minimal part passes through the second Venturi.
This innovative double Venturi proportional dispensing system allows a very precise dosing of polyphosphates, just underneath the average value of 5 mg/l (expressed as P_2O_5).



Check valve

The dispenser has two check valves: one at the inlet, upstream of the shut-off ball, to ensure the non-return of the water treated in the system and one downstream, to limit excessive dispersion of salts inside the pipes in the case of prolonged inactivity.

Air vent

The air vent makes it possible to eliminate air from the container and to lower the pressure inside the device before refilling takes place.

Design

The special white and chrome-plated finish means that the dispenser easily adapts to the domestic environment. Its very small dimensions make it suitable for installation on most wall-mounted boilers, regardless of whether they are installed in new or renovated systems. It can be installed underneath the boiler, next to the 5459 series magnetic filter.

Equipment for domestic use, for the treatment of potable water.

When using the polyphosphate crystal treatment, check current national regulations.
Italy: the use of polyphosphates is classed as a chemical conditioning treatment (as expressed in UNI 8065) which is based on the dispensing of salts in proportion to the amount of cold water passing through the device, without changing the water hardness.

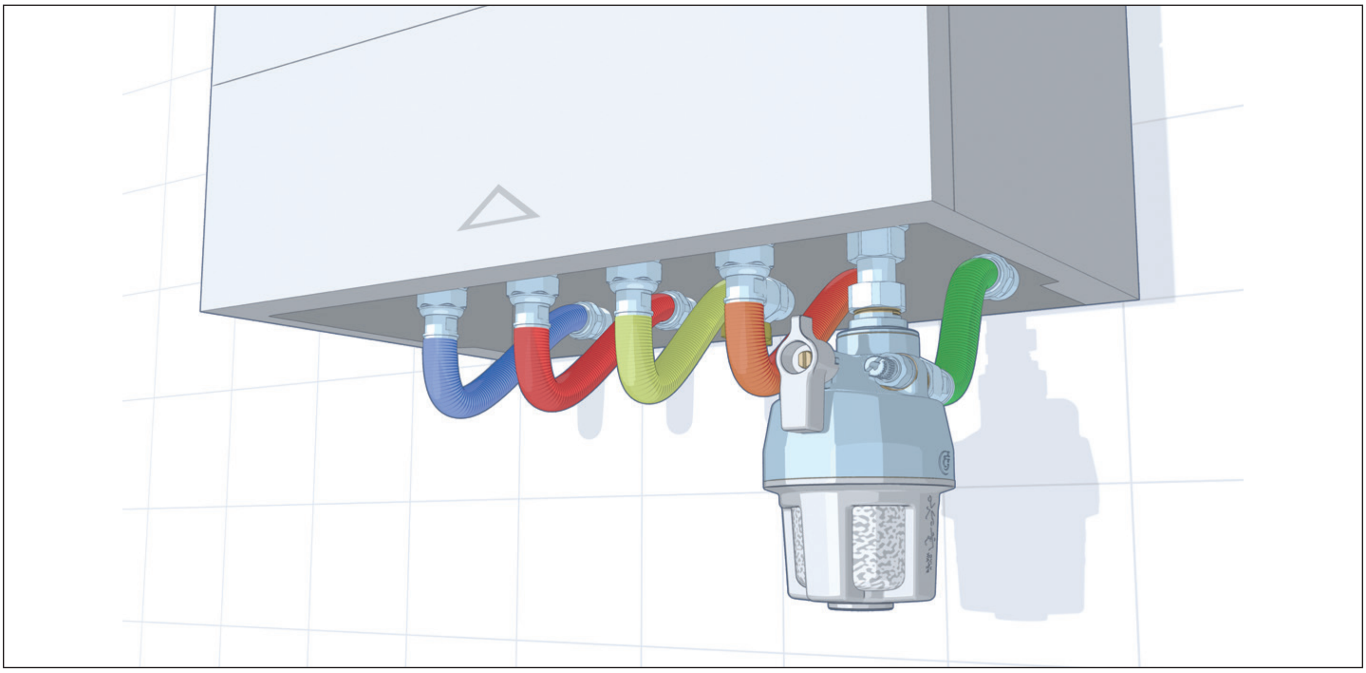
Caleffi XP - 5459 series

Crystal refill duration

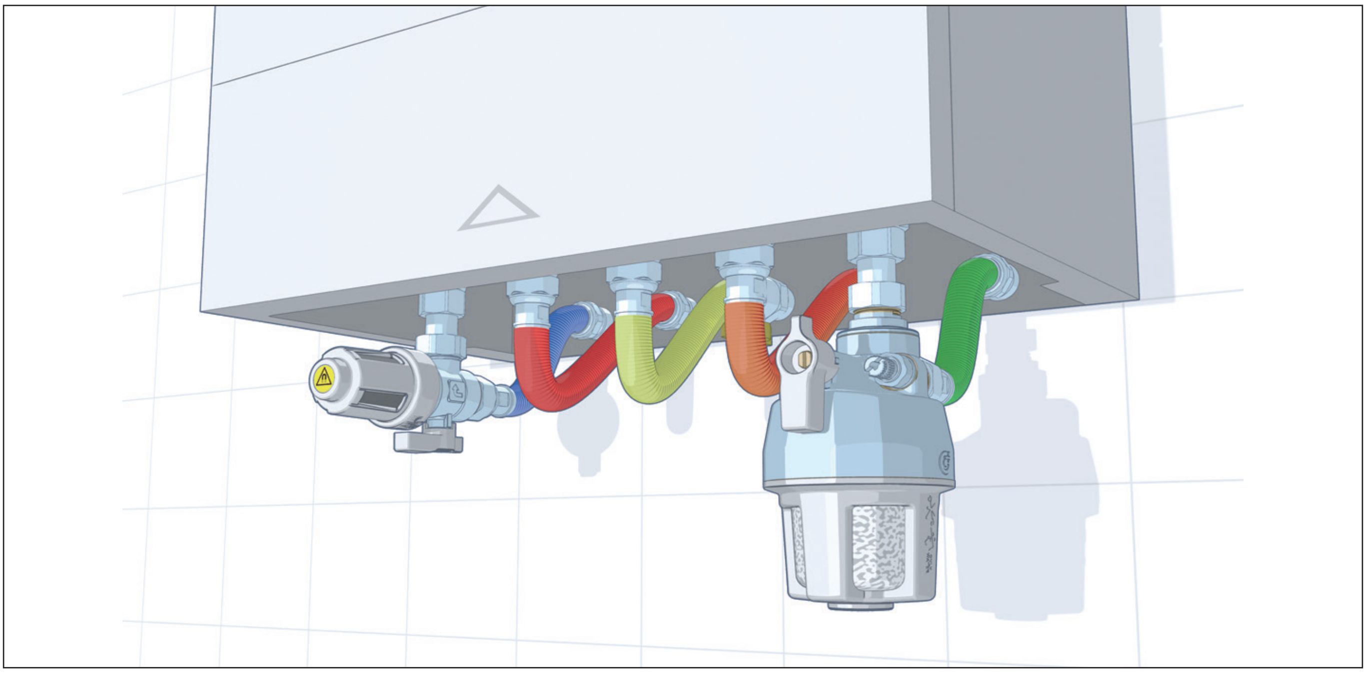
Average value: 35–40 m^3 domestic hot water. Data refers to water with an average hardness of 12 °f, pH 7, temperature 20 °C and average domestic hot water usage. The polyphosphate fill status can be monitored easily through the clear windows, which can be used to check the level of the dark-coloured pellets.

We do not recommend heating domestic hot water to over 70 °C, to avoid compromising the properties of the polyphosphates.

WALL-MOUNTED BOILER SYSTEMS
CALEFFI XP POLYPHOSPHATE DISPENSER (5459 series)



WALL-MOUNTED BOILER SYSTEMS
CALEFFI XS® (5459 series) + CALEFFI XP (5459 series)



The chemical treatment of "technical" water

The purely chemical treatment of water is considered an internal treatment and requires the addition of specific products able to perform different functions.

Cleaning the system

This category includes all products dedicated to removing dirt and deposits, metal oxides, greases, oils and residues from work in new and existing systems. Depending on their formulation they can be more or less "aggressive" in order to remove dirt and sludge even in totally compromised systems.

System protection

This category is very wide but among the most known and used products there are corrosion and encrustation inhibitors for radiator or radiant panel systems, biocides and products with antifreeze function.

Maintaining system efficiency

This category includes all the products that perform targeted actions such as sealants (to eliminate small water leaks from the system), noise reducers and pH regulators.

Products for cleaning the system
CLEANER

On the market there are three macro categories of products for the systems cleaning and flushing:

- **acids,** weak or strong. They allow circuit functionality to be restored in a short time but are not recommended in the presence of circuits with galvanised or metal components in general because the risk of corrosion is high.
- **sequestrants.** They bind to the substances present in the water with more or less stable bonds but are still able to remove the particles from the water solution and prevent them from aggregating. They are not aggressive products and do not affect metals. Since they act at ion (molecular particle) level, the "sequestered" particles cannot, however, be captured by conventional filtration systems because of their very small size. Therefore, when using sequestrants, it is necessary to completely drain the system after flushing.
- **dispersants.** These adhere to any substance in the water, inducing an electrical charge that prevents the particles from aggregating and creating a sort of repulsion between them. Since they act on the particles, it is possible to capture and eliminate them using common filtration systems.
  They also have a corrosion-proof effect and are kept stable with temperature. It is therefore not necessary to drain these products after cleaning the system. However, it is advisable to drain the impurities retained by the filtration systems during the cleaning process.

Corrosion and encrustation inhibitors
INHIBITOR

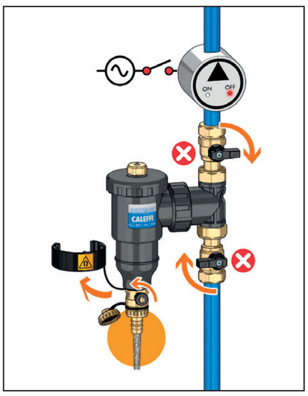
They are the most popular products among those dedicated to system protection.
Corrosion and encrustation inhibitors can act by:

- **power consumption**. A chemical-physical interaction is created between the product and the metal.
- **precipitation.** Also called "filming" because they create a protective film on pipes and component surfaces within the system to prevent the materials from being deposited.

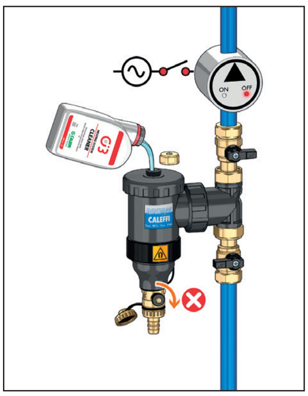
Often these products also contain chemicals that can regulate the water pH.
As heating and cooling systems are made of many different materials, the corrosion inhibitor must be compatible with all metal materials, plastics, rubber, diaphragms and seals.
It is preferable to add the inhibitors after having carried out an accurate cleaning and flushing of the system with specific products, in order to eliminate most of the impurities present in the circuit.
Once a year it is useful to check the concentration of the product inside the system in order to keep it always within the optimal working limits.

System flushing and water treatment

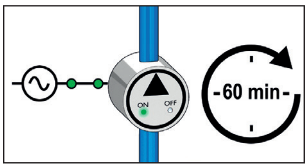
Stop the circulator, close the ball shut-off valves and drain the water out of the dirt separator.



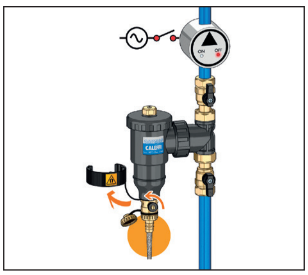
Add C3 CLEANER, using the dirt separator as a convenient point of access to the circuit.



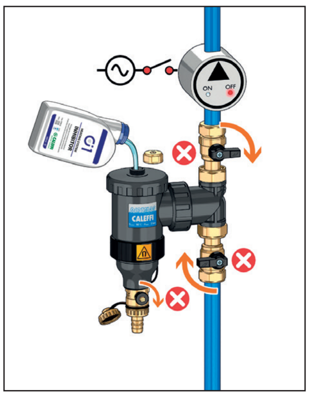
Let the product circulate within the circuit.



Stop the circulator and drain the circuit until clean water comes out.



Close the ball shut-off valves and add C1 INHIBITOR via the dirt separator.



CHEMICAL ADDITIVES 5709 SERIES

Dispensing of C3 CLEANER / C3 FAST CLEANER

The entire contents of a bottle or a canister is enough to treat 150 litres of water in the system (approximately 15 radiators or 120 m^2 of radiant panels). No problems have been recorded in the event of overdosage. The water temperature affects the duration of treatment.
Circulate for:
- minimum 1 hour with high temperature water (T ≥ 50 °C)
- minimum 4 hours with low temperature water (30 °C < T < 50 °C)
- up to 1 week with cold water (T ≤ 30 °C).

Dispensing of C1 INHIBITOR / C1 FAST INHIBITOR

The entire contents of a bottle or a canister is enough to treat 150 litres of water in the system (approximately 15 radiators or 120 m^2 of radiant panels). No problems have been recorded in the event of overdosage. It is nevertheless preferable to overdose rather than underdose, given that in the event of underdosing the treatment is no longer effective.
Use a double dose for systems filled with softened water.

Dispensing of C7 BIOCIDE

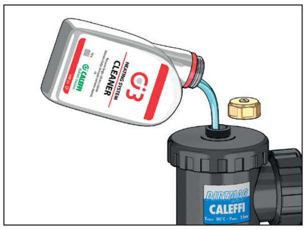
The entire contents of a bottle or a canister is enough to treat 150 litres of water in the system (approximately 15 radiators or 120 m^2 of radiant panels). No problems have been recorded in the event of overdosage. It is nevertheless preferable to overdose rather than underdose, given that in the event of underdosing the treatment is no longer effective. For protective usage, leave the product in the system together with C1 INHIBITOR or C1 FAST INHIBITOR. For washing or sanitising usage, leave the product in the system together with C3 CLEANER or C3 FAST CLEANER. *Repeat the application once a year.*

Dispensing of C4 LEAK SEALER

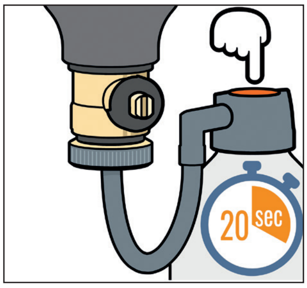
The entire contents of a bottle or a canister is enough to treat 150 litres of water in the system (approximately 15 radiators or 120 m^2 of radiant panels). No problems have been recorded in the event of overdosage. It is nevertheless preferable to overdose rather than underdose, given that in the event of underdosing the treatment is no longer effective. Shake before use; use the whole contents. Use preferably in combination with C1 INHIBITOR or C1 FAST INHIBITOR.

When using the chemical additive treatment, check current national regulations.

The dirt separator or under-boiler magnetic filter can be used as an access point to inject the circuit with liquid chemical additives designed to wash and protect the system.



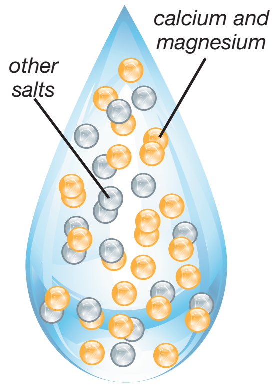
The dirt separator or under-boiler magnetic filter can be used as an access point to inject the circuit with pressurised liquid chemical additives designed to wash and protect the system.



Treatment summary

	System cleaning	Washing and sanitising	Protection against corrosion and limescale	Protection against bacterial growth	Repair of micro-fissures
C3 CLEANER	●	●			
C3 FAST CLEANER	●	●			
C1 INHIBITOR			●		
C1 FAST INHIBITOR			●		
C7 BIOCIDE		●		●	
C4 LEAK SEALER					●
	Cleaning and washing treatments: pour into the system and leave to circulate for the required time. Then drain the system to eliminate the impurities collected in the dirt separator.		*Protective treatments: use in the system and check once a year.*		*Treatment "as needed" for minor leaks. Leave in the system.*

Devices for the demineralisation and softening of "technical water"



Untreated water

Problems such as corrosion and encrustations in the circuit of the heating/cooling system are due to the poor quality of the water circulating within the system. The systems are filled with water from the potable water mains, which guarantees its supply with controlled parameters: there are a large amount of salts including calcium and magnesium (hardness minerals), sodium and many others (chlorine, bicarbonate, sulphate).

Limescale deposits

Limescale deposits are more or less coherent formations (hard and compact) due to the hardness of the water, that is to its content of calcium and magnesium salts.
The limescale formation process can be summarized as follows:

1. In the water the calcium and magnesium bicarbonates (soluble substances) are in equilibrium with calcium carbonates and magnesium and with carbon dioxide.
2. An ***increase in the water*** temperature ***releases*** part of the ***carbon dioxide and upsets the previous equilibrium.***
3. To restore the equilibrium and produce new carbon dioxide, the ***calcium*** and magnesium carbonates ***are transformed into calcium and magnesium*** carbonates.
4. ***Carbonates*** are poorly soluble substances that ***precipitate*** to form the encrustation known as ***"limescale"***.

Corrosion

As mentioned with regard to the presence of impurities in the system, corrosion is an electrochemical phenomenon, favoured by the presence of oxygen and other causes that contribute to its evolution to a varying extent.
Corrosion generally affects the system as a whole and not just individual parts of it. The appearance of corrosion in one point may therefore be symptomatic of general corrosion of the entire system.
The causes of corrosion are many but they are generally favoured by the concomitant presence of deposits on metal surfaces.
The onset of corrosion is particularly fast in hot water systems, because the oxygen/metal reaction speed is directly proportional to temperature.
To avoid these problems it is advisable to check the parameters of the feed water used for filling and to adopt a suitable water treatment. Some parameters to keep under control in a thermal system are:

HARDNESS

The hardness refers mainly to the content of calcium and magnesium salts.
The more the content of these minerals increases, the harder the water.

UNIT OF MEASUREMENT: French degree (°f) which corresponds to 10 mg of calcium carbonate per litre of water.
1 °f = 10 mg/l = 10 ppm

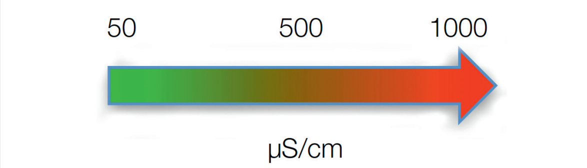
Classification	Concentration	Hardness (°F)
Very soft	0–80	0–8
Soft	80–150	8–15
Slightly hard	150–200	15–20
Medium hardness	200–320	20–32
Hard	320–500	32–50
Very hard	>500	> 50

ELECTRICAL CONDUCTIVITY

The electrical conductivity supplies an indirect measurement of the concentration of the substances dissolved in the water and is therefore suitable for giving an indication of the purity and salinity of the water.

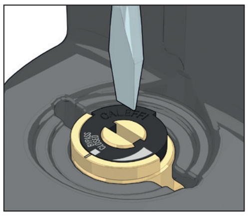
UNIT OF MEASUREMENT: µS/cm.

The salts dissolved in the water are "broken" into two parts (ions): cations having positive electric charge and anions having negative electric charge.
The water is consequently an electrical conductor. Its conductivity depends on the concentration of ions present, that is on the concentration of salts.

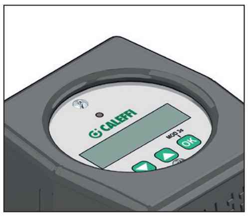


AUTOMATIC WATER TREATMENT UNIT

Function
The automatic water treatment unit, installed on the inlet pipe, is used to treat water in the closed circuits of heating and cooling systems.
It comes complete with a by-pass regulator for adjusting the hardness level of the outlet water in the softening treatment.

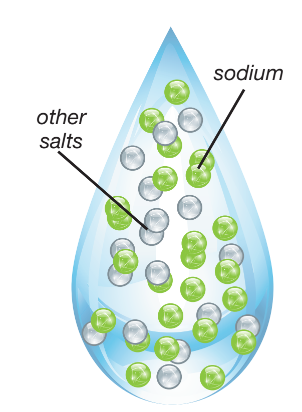


Electronic controller
Parameters and data relating to a specific treatment can be set directly from the front panel of the controller.
The software will automatically calculate the parameters for correct operation, such as conductivity and litres, to be aware of when the softening cartridge will need to be replaced.



SOFTENING

The most common and most widely-known treatment is softening, which eliminates encrustations but leaves the full salinity and and pH completely unchanged, meaning the risk of corrosion is not reduced.



Softened water

The treatment, using a single type of resin, replaces calcium and magnesium (minerals responsible for the hardness of the water and poorly soluble) with sodium (more soluble).

Does not alter the water salinity.

Does not reduce the risk of corrosion.

Prevents the formation of limescale deposits.

Specific additives need to be added to the heating circuit in order to neutralise water aggressivity and prevent potential corrosion.

SOFTENING CARTRIDGES
580 series

Code	Sizing coeff. (hardness °f)	Sizing coeff. (hardness °dH)
580902	26	14
580903	43	24

Softening cartridge sizing
The volume of treatable water depends on the hardness of the filling water and must be calculated as follows:

$$\textit{Volume of treatable water } (m^3) = \frac{\textit{Sizing coeff.}}{\textit{hardness IN - hardness OUT}}$$

hardness IN = untreated water hardness (°f/°dH)
hardness OUT = treated water hardness target (°f/°dH)

When using the softening or demineralisation treatment cartridges, check current national regulations.

DEMINERALISATION

A more efficient treatment is demineralisation, applicable only on the closed circuits of heating systems, but extremely effective in eliminating salts and electrical conductivity.


Demineralised water

The treatment, through two types of resins, completely eliminates the salts present in the water releasing pure water.

Eliminates water salinity.

Reduces the risk of corrosion.

Prevents the formation of limescale deposits.

The result is a water with a high degree of purity, an extremely low electrical conductivity and a balanced pH which stabilizes in a short time on values between 7 and 8.

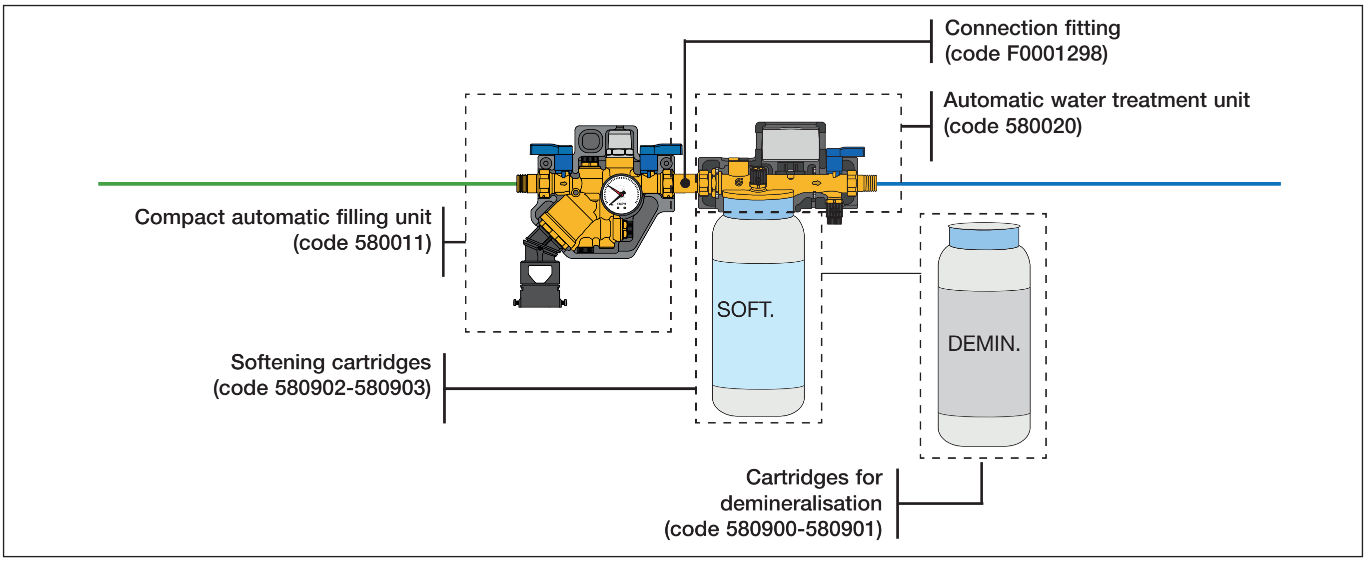
DEMINERALISATION CARTRIDGES
580 series

Code	Sizing coeff. (residual cond. < 10 µS/cm)	Sizing coeff. (residual cond. < 50 µS/cm) (*)
580900	140	220
580901	180	280

(*) If a full demineralisation treatment is not required (residual conductivity < 10 µS/cm), it is preferable to use the sizing coefficient for residual conductivity < 50 µS/cm.

Demineralisation cartridge sizing
The volume of treatable water depends on the electrical conductivity of the filling water and must be calculated as follows:

$$\textit{Volume of treatable water } (m^3) = \frac{\textit{Sizing coefficient}}{\textit{Electrical conductivity } (\mu S/cm)}$$



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