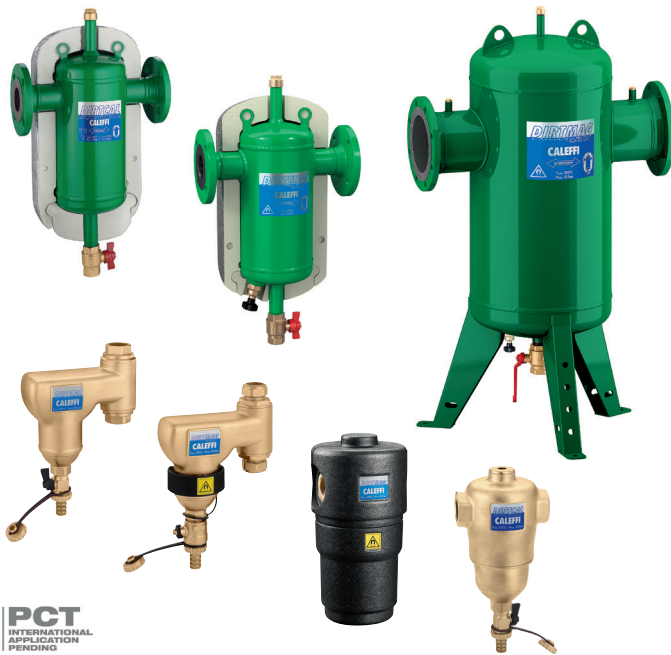


DIRTCAL® - DIRTMAG® dirt separators

5462 - 5463 - 5465 series
5466 - 5468 - 5469

PCT
 INTERNATIONAL
 APPLICATION
 PENDING

Function

The dirt separator separates off the impurities, which are mainly made up of sand and rust particles, circulating within the closed circuits of a system. They are collected in a large collection chamber that does not require frequent cleaning, and from which they can be removed even while the system is in operation.

Versions fitted with a magnet are designed for the separation of ferrous impurities.

This device is capable of efficiently removing even the smallest particles, with a very low pressure drop.

Some series of dirt separators are supplied complete with hot preformed shell insulation to ensure perfect thermal insulation when used with both hot and chilled water.

Reference documentation

- Tech. Broch. 01054 MINICAL® - VALCAL® automatic air vent valves 5020 - 5021 - 5022 series
- Tech. Broch. 01031 MAXCAL® automatic air vent valve for heating, cooling and refrigeration systems. 501 series

Product range

5462 series DIRTCAL® dirt separator for horizontal pipes _____ sizes DN 20 (3/4"); DN 25 (1"); DN 32 (1 1/4"); DN 40 (1 1/2"); DN 50 (2")

5463 series DIRTMAG® dirt separator for horizontal pipes with magnet and insulation _____

_____ sizes DN 20 (3/4"); DN 25 (1"); DN 32 (1 1/4"); DN 40 (1 1/2"); DN 50 (2")

5463 series DIRTMAG® dirt separator for horizontal pipes _____ sizes DN 20 (3/4"); DN 25 (1"); DN 32 (1 1/4"); DN 40 (1 1/2"); DN 50 (2")

5468 series DIRTMAG® dirt separator for vertical pipes with magnet and olive fittings _____ sizes DN 20 (Ø 22); DN 25 (Ø 28)

5468 series DIRTMAG® dirt separator for vertical pipes with magnet _____ sizes DN 20 (3/4"); DN 25 (1")

5465 series DIRTCAL® dirt separator for horizontal pipes with flanged connections and insulation _____ sizes DN 50–DN 150

5466 series DIRTMAG® dirt separator for horizontal pipes with flanged connections, magnet and insulation _____ sizes DN 50–DN 150

5466 series DIRTMAG® dirt separator for horizontal pipes with flanged connections and floor brackets _____ sizes DN 200–DN 300

5469 series DIRTCAL® dirt separator for vertical pipes _____ sizes DN 20 (3/4"); DN 25 (1")

Technical specifications

series	5462 - 5463 - 5468 - 5469 threaded	5465 - 5466 flanged
Materials: Body: Dirt collection chamber: Top cap: Internal element: Hydraulic seals: Drain cock: Pocket:	brass EN 1982 CB753S brass EN 12165 CW617N brass EN 12164 CW617N PA66G30 (stainless steel, 5468 5468-9 series) EPDM brass EN 12165 CW617N brass EN 12165 CW617N	epoxy resin coated steel - brass EN 12165 CW617N stainless steel EN 10088-3 (AISI 302) (5466 stainless steel EN 10088-3 (AISI 302) and HDPE non-asbestos fibre (top plug) brass EN 12165 CW617N
Performance: Medium: Maximum percentage of glycol: Max. working pressure: Working temperature range: Particle separation rating: Magnetic induction of magnet:	water, glycol solutions 50 % 10 bar 0–110 °C (5462, 5463) down to 5 µm (5463, 5468 series) 2 x 0,3 T	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC 50 % 10 bar 0–110 °C (5466 0–100 °C) down to 5 µm (5466 series) DN 50–DN 65 7 x 0,475 T (5466 series) DN 80–DN 150 12 x 0,475 T DN 200–DN 300 3 x 17 x 0,475 T
Connections: Main: Probe holder: Top: Drain:	3/4", 1", 1 1/4", 1 1/2", 2" F (5468) with olive fittings for copper pipe Ø 22, Ø 28 mm 1/2" F (with plug) hose connection	(DN 50–150) PN 16; (DN 200–300) PN 10 to be coupled with flat counterflange EN 1092-1 DN 200–DN 300, inlet/outlet 1/2" F 3/4" M (with cap) (DN 50–DN 150) 1" F; (DN 200–DN 300) 2" F

Technical specifications of insulation for 5462* and 5463 series

Material: PPE
 Thickness: 25 mm
 Density: 60 g/l
 Thermal conductivity (ISO 8301): at 10 °C: 0,039 W/(m·K)
 Coefficient of resistance to water vapour (DIN 52615): ≥ 39700
 Working temperature range: 0–110 °C
 Reaction to fire (UL-94): HBF class
 * Optional insulation, code CBN5462..

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

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

Head covers

Heat moulded material: PS

External cover

Material: embossed unfinished aluminium
 Thickness: 0.7 mm
 Reaction to fire (DIN 4102): class 1

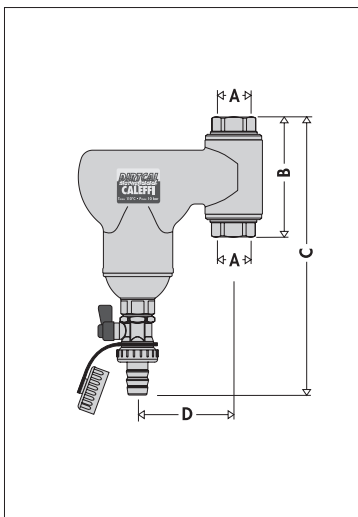
Technical specifications of insulation for flanged models DN 125 and DN 150

Inner part
 Material: closed cell expanded PE-X
 Thickness: 60 mm
 Density: - inner part: 30 kg/m³
 - outer part: 80 kg/m³
 Thermal conductivity (ISO 2581): - at 0 °C: 0,038 W/(m·K)
 - at 40 °C: 0,045 W/(m·K)
 Coefficient of resistance to water vapour (DIN 52615): > 1300
 Working temperature range: 0–100 °C
 Reaction to fire (DIN 4102): class B2

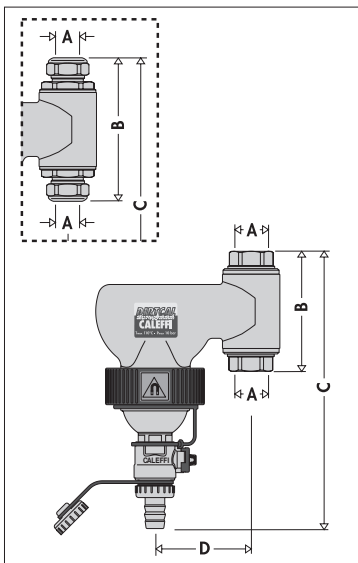
External cover

Material: embossed unfinished aluminium
 Thickness: 0.7 mm
 Reaction to fire (DIN 4102): class 1

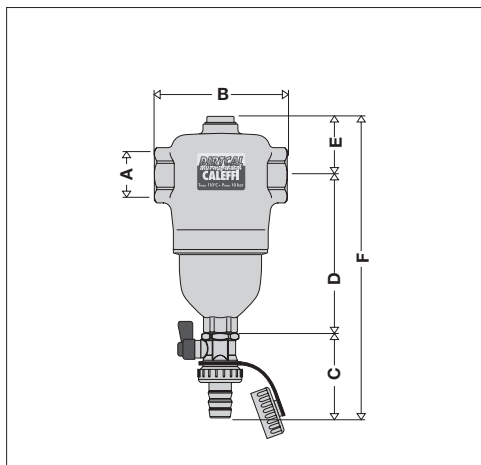
Dimensions



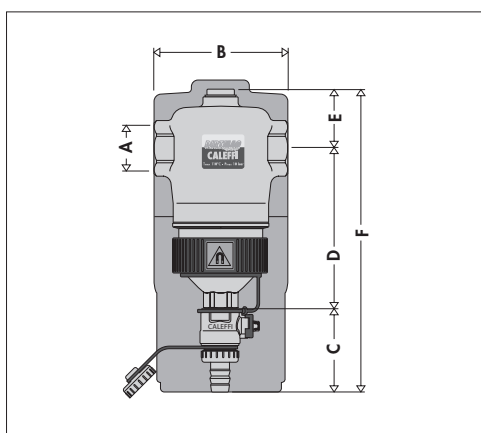
Code	Size	A	B	C	D	Mass (kg)
546905	DN 20	3/4"	102	223	80	1,95
546906	DN 25	1"	107	225,5	80	1,95



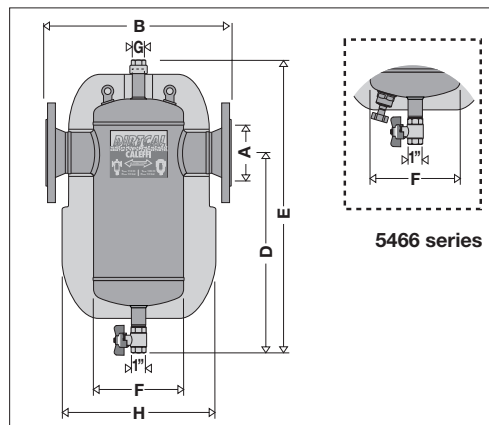
Code	Size	A	B	C	D	Mass (kg)
546802	DN 20	Ø22	121	232,5	80	1,95
546803	DN 25	Ø28	121	242	80	1,95
546805	DN 20	3/4"	102	223	80	1,95
546806	DN 25	1"	107	225,5	80	1,95



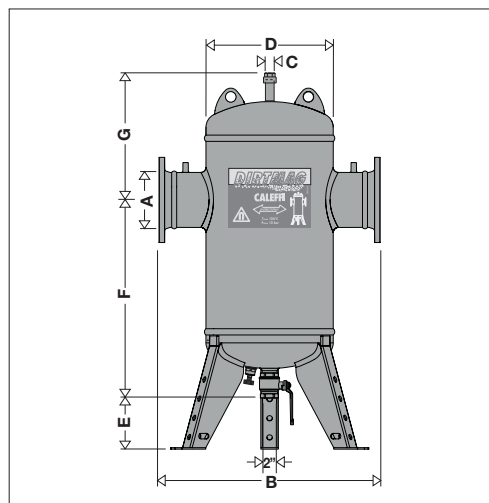
Code	Size	A	B	C	D	E	F	Massa (kg)
546205	DN 20	3/4"	110	56	131,5	49	236,5	1,87
546206	DN 25	1"	110	56	131,5	49	236,5	1,87
546207	DN 32	1 1/4"	124	56	151,5	49	256,5	2,22
546208	DN 40	1 1/2"	124	56	151,5	49	256,5	2,22
546209	DN 50	2"	127	56	145,5	55	256,5	2,36



Code	Size	A	B	C	D	E	F	Mass (kg)
546305/15	DN 20	3/4"	110	67,5	131,5	49	248	1,87
546306/16	DN 25	1"	110	67,5	131,5	49	248	1,87
546307/17	DN 32	1 1/4"	124	67,5	151,5	49	268	2,22
546308/18	DN 40	1 1/2"	124	67,5	151,5	49	268	2,22
546309/19	DN 50	2"	127	67,5	145,5	55	268	2,36



Code	A	B	D	E	F	G	H	Mass (kg)
546550/650	DN 50	350	425	620	169	3/4"	300	13
546560/660	DN 65	350	425	620	169	3/4"	300	15
546580/680	DN 80	466	500	740	219	3/4"	370	23
546510/610	DN 100	470	500	740	219	3/4"	370	25
546512/612	DN 125	635	600	900	324	3/4"	480	52
546515/615	DN 150	635	600	900	324	3/4"	480	54



Code	A	B	C	D	E	F	G	Mass (kg)
546620	DN 200	900	3/4"	508	265	865	480	210
546625	DN 250	1060	3/4"	660	265	1015	540	365
546630	DN 300	1180	3/4"	762	265	1145	610	470

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

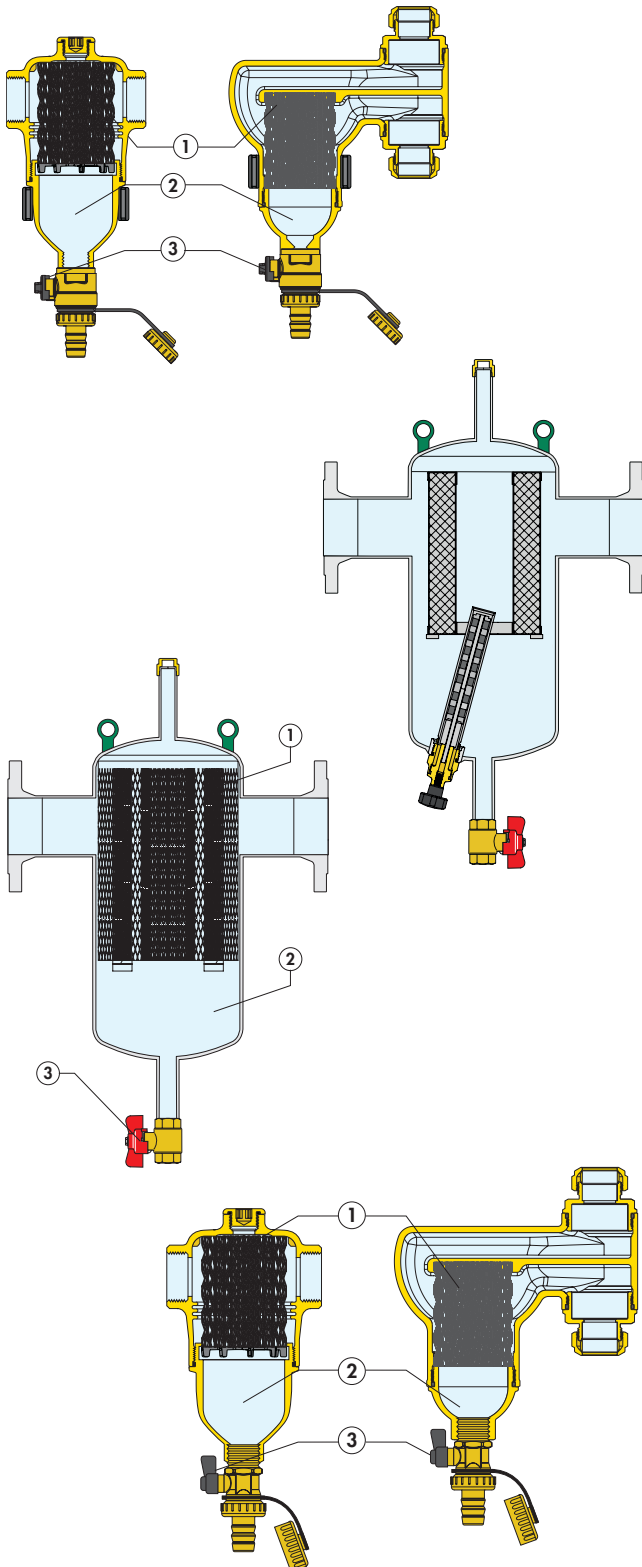
Operating principle

The dirt separator operating principle is based on the combined action of a number of physical phenomena.

The internal element (1) consists of a set of mesh surfaces. The impurities in the water, on striking these surfaces, get separated, dropping into the bottom of the body (2) where they are collected. Plus, the large internal volume of DIRTCAL® slows down the flow speed of the medium that, by gravity, helps to separate the particles it contains.

The collected impurities are discharged, even with the system running, by opening the drain cock (3).

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



Construction details

Low pressure drops and performance maintained over time

The high performance of the dirt separator is based on the use of the internal element with mesh surfaces. The principle of collision and decantation of particles makes the dirt separation action more efficient if compared to the common strainers. This performance is constant over time, unlike common strainers which instead get clogged by the trapped sludge, thus changing the functional features.

The geometrical structure of DIRTCAL® is such that the flow speed of the medium inside it is slowed down to help separate the particles of impurities.

Geometric structure and large dirt collection chamber

The dirt collection chamber has the following features:

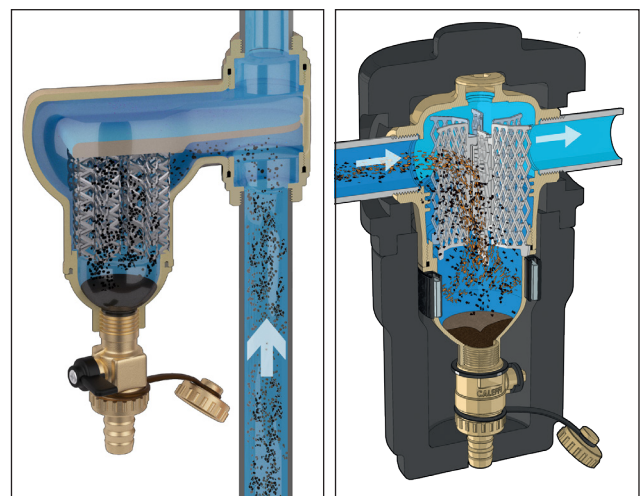
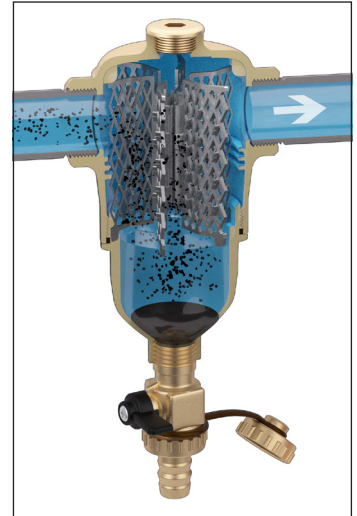
- it is located at the bottom of the device, at such a distance from the connections that the collected impurities are not affected by the swirling of the flow through the mesh.
- it is large enough to increase the amount of collected dirt, which means emptying/discharging procedures are required less often (in contrast to strainers, which need to be frequently cleaned).
- it is easy to inspect, by unscrewing it from the valve body for any maintenance of the internal element required in the event of clogging by fibres or large dirt particles.

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.

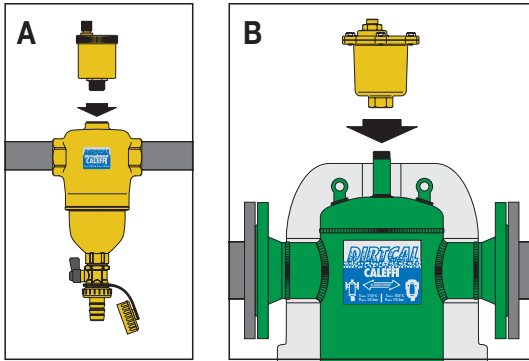
Since the magnetic ring is positioned outside the dirt separator body, the hydraulic characteristics of the device are not altered.

In the flanged version, the magnet is inserted in a special pocket and can be removed so that impurities can be extracted easily.



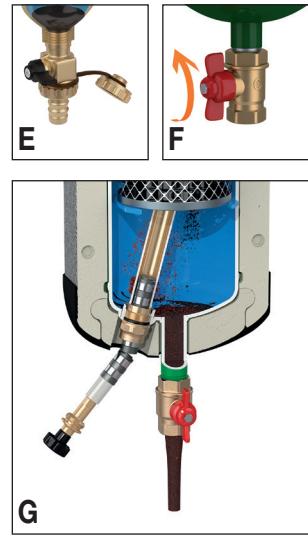
Top connection

The connection on the top of the dirt separator can be used to install an automatic air vent valve, code 502040 MINICAL® for the threaded version (A) or code 501500 MAXCAL® for the flanged version (B).



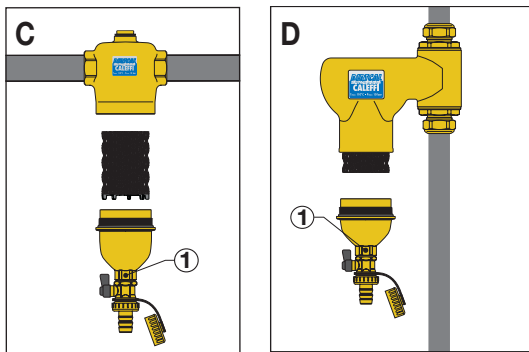
Draining off with the system running

The dirt separator collection chamber is equipped with a ball shut-off cock with special lever in the threaded version (E), and with a ball shut-off valve with butterfly handle in the flanged version (F). These valves can be used to drain off the impurities which have collected at the bottom of the dirt separator, even while the system is in operation. In the version with a magnet, the procedures described must be carried out after the magnet has been removed (G and H). In the flanged version, the magnet is taken out after the knob has been unscrewed (G). To make its extraction easier, the magnet splits into several segments.



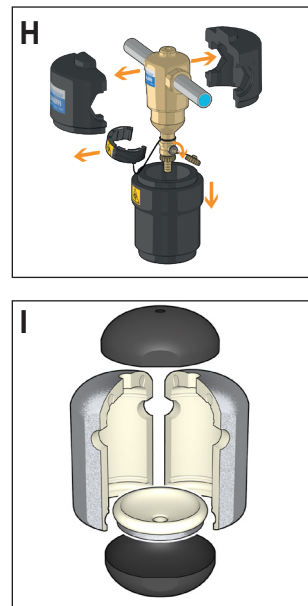
Maintenance

To carry out maintenance (in threaded models for horizontal pipes) (C), simply use a 26 mm hexagonal wrench (1) to unscrew the dirt collection chamber to which the internal element is fixed, in order to extract it for cleaning purposes. For vertical pipe models (D), only the dirt collection chamber may be unscrewed for cleaning procedures, without the whole internal element being removed.

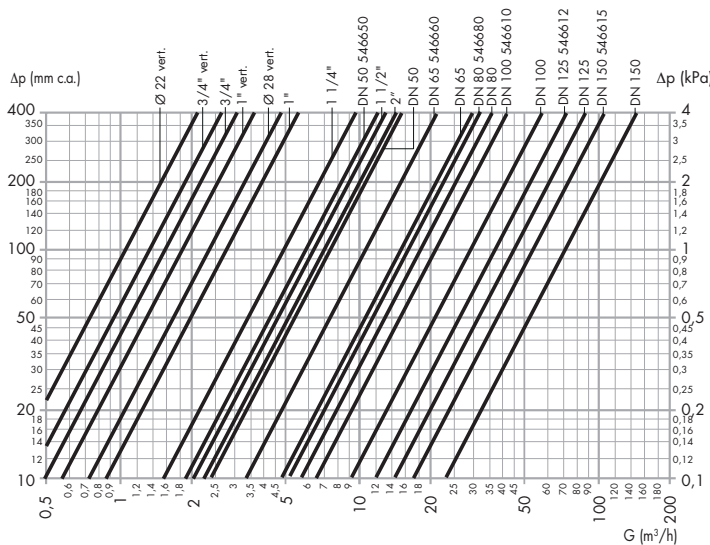


Insulation

Flanged DIRTCAL® (DN 50–DN 150) and DIRTMAG® devices are supplied complete with hot pre-formed shell insulation (H - I). This system ensures not only perfect thermal insulation, but also the watertightness required to prevent water vapour entering the device from outside. For this reason, this type of insulation may also be used in chilled water circuits as it prevents condensation from forming on the surface of the valve body.



Hydraulic characteristics



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

DN	Connections	l/min	m³/h
20	Ø 22–1"	22,7	1,36
25	1"	35,18	2,11
32	1 1/4"	57,85	3,47
40	1 1/2"	90,33	5,42
50	2"	136,6	8,20
50	–	141,2	8,47
65	–	238,6	14,32
80	–	361,5	21,69
100	–	564,8	33,89
125	–	980,0	58,8
150	–	1436,6	86,2
200	–	2433,0	146,0
250	–	3866,0	232,0
300	–	5416,0	325,0

DIRTCAL® - DIRTMAG®

DN	DN 20 vertical	DN 25 vertical	DN 25 vertical	DN 20	DN 25	DN 32	DN 40	DN 50
Connections	Ø 22	3/4"	1"	Ø 28	3/4"	1"	1 1/4"	1 1/2"
Kv (m³/h)	10,7	13,8	18,2	24,7	16,2	28,1	48,8	63,2

DIRTCAL®

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

DIRTMAG®

DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300
546650	546660	546680	546610	546612	546615	–	–	–
60,5	110	160	216	365	535	900	1200	1500

* curves not represented on the diagram

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 DIRTCAL® and DIRTMAG® dirt separators, thanks to the special design of the internal element, are able to completely separate the impurities in the circuit down to a minimum particle size of 5 µm.

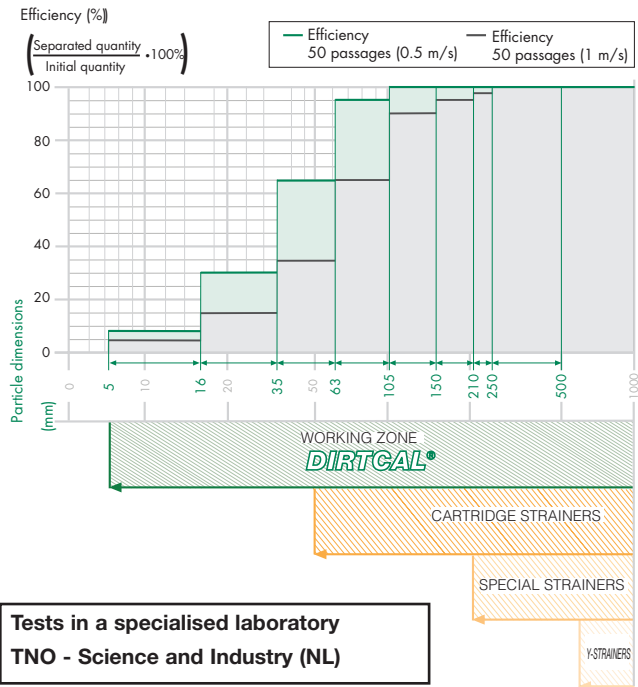
The graph shown opposite, summarising the tests conducted in a specialised laboratory (TNO - Science and Industry), illustrates how the DIRTCAL® and DIRTMAG® dirt separators (5462, 5463, 5465 and 5466 series) are capable of quickly separating almost all the impurities present. After only 50 recirculations - approximately one day of operation - up to 100 % of particles with a diameter over 100 µm are effectively removed from the circuit, and on average up to 80 % when taking the smallest particles into account. The continual passage of the medium during normal operation of the system gradually leads to complete dirt separation.

Reduced pressure drops

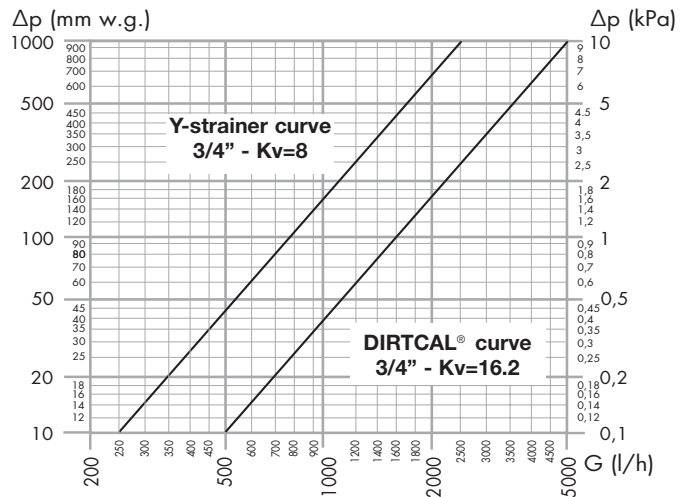
A normal Y-strainer performs its function via a metal mesh selected for the size of the largest particle. The medium therefore has a consequent initial pressure drop that increases as the degree of clogging increases.

Whereas, the dirt separator carries out its action by the particles striking the internal element and subsequently dropping into the collection chamber as a result of gravity. The consequent pressure drops are greatly reduced and are not affected by the amount of impurities collected. The graph opposite shows a comparison of the differences in pressure drop between the two types of device.

Particle separation rating - Dirt separator efficiency

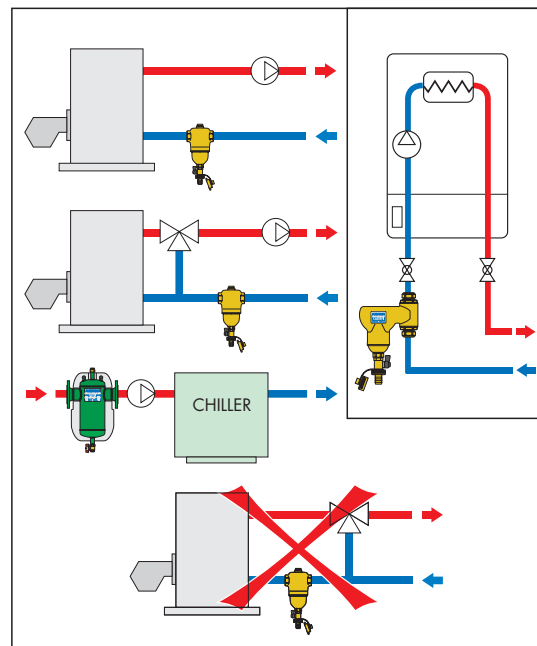
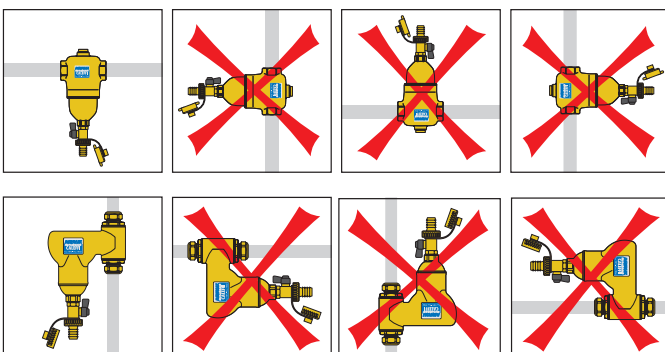


Comparison of pressure drops: DIRT SEPARATOR - Y-STRAINERS

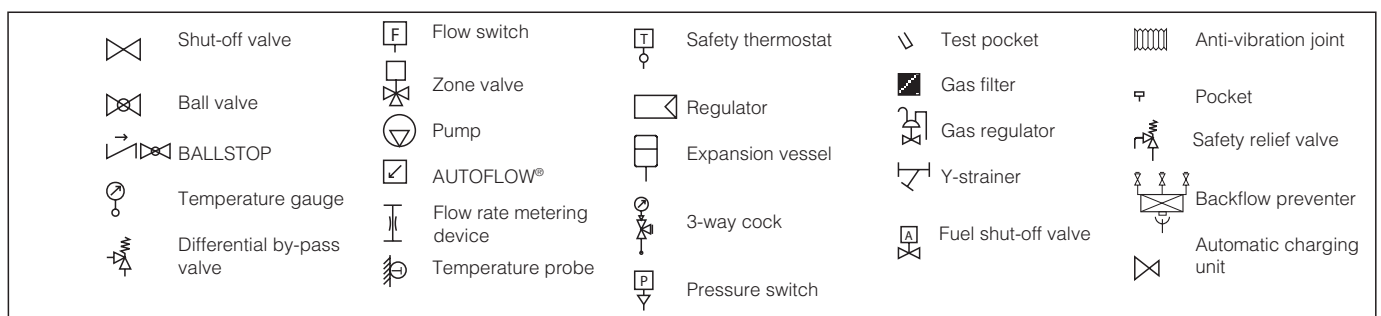
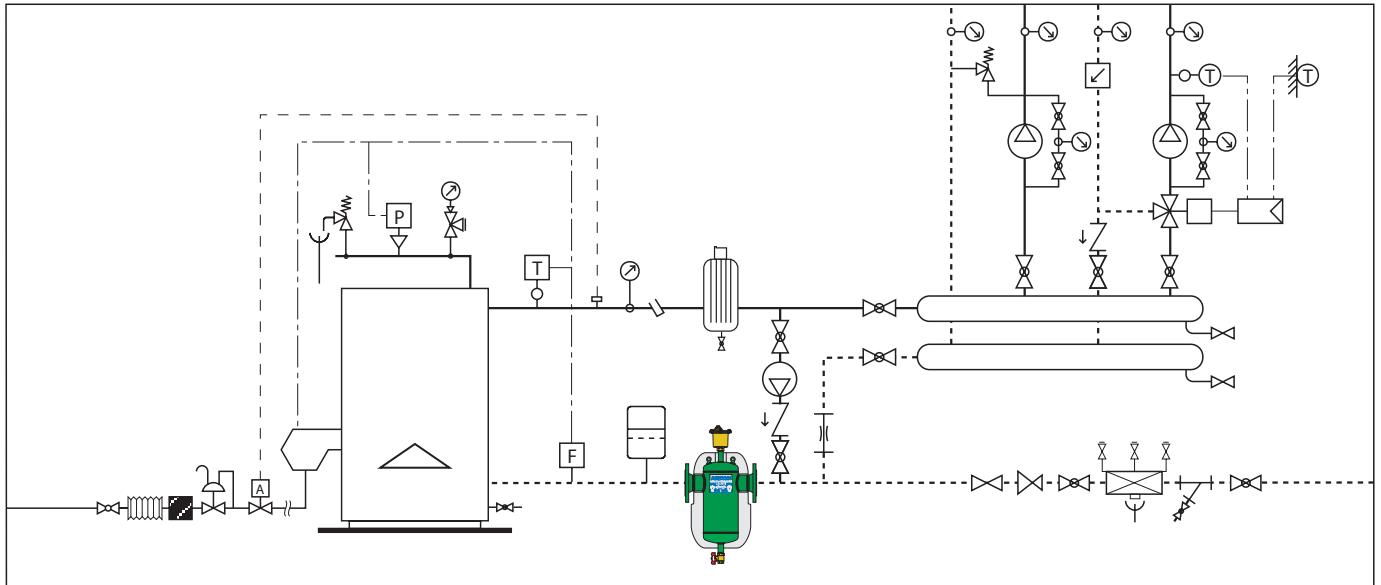


Installation

The dirt separator should preferably be installed on the return circuit upstream of the boiler. This enables it to intercept any impurities already present in the circuit, particularly when it is first started, before they reach the boiler. The dirt separator should always be installed vertically and ideally upstream of the pump. Use the specific versions designed for installation on horizontal or vertical pipes. The flow direction of the thermal medium is not important in dirt separators. A space of at least 16 cm should be left underneath the dirt separator for the 5466 series, to allow removal of the magnet.



Application diagram



SPECIFICATION SUMMARY

5462 series DIRTCAL®

Dirt separator for horizontal pipes. Size DN 20 (from DN 20 to DN 50); connections 3/4" (from 3/4" to 2") F (ISO 228-1). Top connection 1/2" F (with cap). Drain with hose connection. Brass dirt collection chamber and body. PA66G30 internal element. EPDM hydraulic seals. Brass drain cock. Medium water and glycol solutions; max. percentage of glycol 50 %. Maximum working pressure 10 bar. Working temperature range 0–110 °C. Particle separation rating down to 5 µm. PATENT.

5463 - 5468 series DIRTMAG®

Dirt separator with magnet for horizontal or vertical pipes. Horizontal size DN 20 (from DN 20 to DN 50); connections 3/4" (from 3/4" to 2") F (ISO 228-1). Vertical size DN 20 (from DN 20 to DN 32); Ø 22 mm connections with olive fittings for copper pipe (Ø 22 and Ø 28). Top connection 1/2" F (with cap). Drain with hose connection. Brass dirt collection chamber and body. PA66G30 internal element. EPDM hydraulic seals. Brass drain cock. Medium water and glycol solutions; max. percentage of glycol 50 %. Maximum working pressure 10 bar. Particle separation rating down to 5 µm (5463). Hot pre-formed shell insulation in expanded closed cell PE-X. Working temperature range 0–110 °C. PCT - INTERNATIONAL APPLICATION PENDING.

5465 series DIRTCAL® - 5466 series DIRTMAG®

Dirt separator. Flanged connections DN 50 (from DN 50 to DN 150), PN 16, flanged DN 200 (from DN 200 to DN 300, 5466 only) PN 10, to be coupled with flat counterflange EN 1092-1. Top connection 3/4" (with plug). Brass drain valve 1" F (from DN 50 to DN 150); 2" F (from DN 200 to DN 300). Epoxy resin coated steel body. Stainless steel internal element. Hydraulic seals in non-asbestos fibre. Medium water and non-hazardous glycol solutions excluded from the guidelines of EC directive 67/548; maximum percentage of glycol 50 %. Maximum working pressure 10 bar. Working temperature range 0–110 °C (5466 series 0–100 °C). Particle separation rating down to 5 µm. Rigid closed cell expanded polyurethane foam shell insulation for sizes up to DN 100 (closed cell expanded PE-X for DN 125 and DN 150). Embossed unfinished aluminium external cover. Working temperature range 0–105 °C (0–100 °C for DN 125, DN 150 and 5466 series). Floor supports for sizes DN 200 (from DN 200 to DN 300). Magnetic induction of the magnet for 5466 series, DN 50-65: 7 x 0,475 T (DN 80–150 12 x 0,475 T) (DN 200–DN 300 3 x 17 x 0,475 T).

5469 series DIRTCAL®

Dirt separator for vertical pipes. Size DN 20 (DN 20 and DN 25); connections 3/4" (3/4" And 1") F (ISO 228-1). Brass dirt collection chamber and body. Steel internal element. EPDM hydraulic seals. Brass drain cock. Drain with hose connection. Medium water and glycol solutions; max. percentage of glycol 50 %. Maximum working pressure 10 bar. Working temperature range 0–110 °C.

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