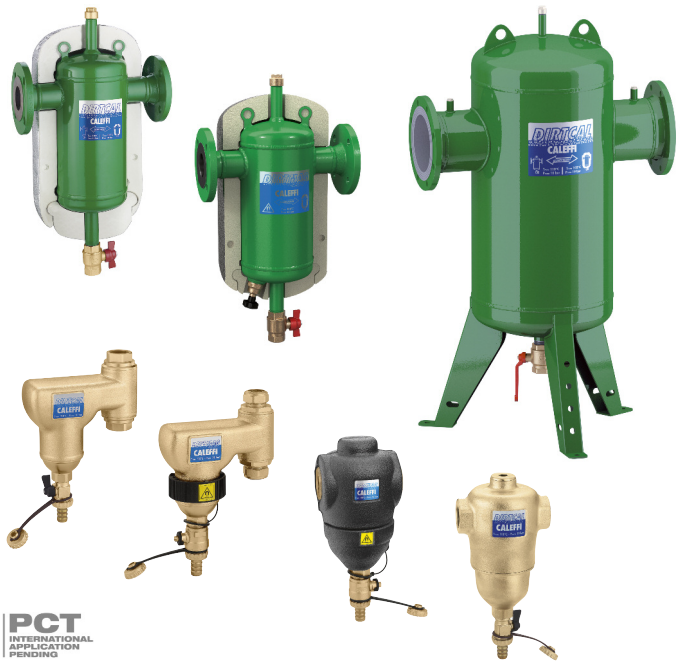
Dirt separators DIRTCAL® - DIRTMAG®

5462 - 5463 - 5465
5466 - 5468 - 5469 series

ISO 9001 FM 21654

01137/15 GB
replaces 01137/12 GB



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 system closed circuits. The impurities are collected in a large collection chamber, that requires low frequency cleaning procedures, 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 extremely limited head loss.
Flanged DIRTCAL® and DIRTMAG® dirt separators (from DN 50 to DN 150) are supplied complete with hot pre-formed shell insulation to ensure perfect thermal insulation when used with both hot and chilled water.

Reference documentation

- Tech. Broch. 01054 Automatic air vent MINICAL-VALCAL 5020 - 5021 - 5022 series
- Tech. Broch. 01031 Automatic air vent MAXCAL for heating, air-conditioning and cooling 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 pre-formed 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 with magnet — 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 compression ends — 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 pre-formed insulation — sizes DN 50–DN 150
5465 series DIRTCAL® dirt separator for horizontal pipes with flanged connections and floor supports — sizes DN 200–DN 300
5466 series DIRTMAG® dirt separator for horizontal pipes with flanged connections with magnet and pre-formed insulation — sizes DN 50–DN 150
5469 series DIRTCAL® dirt separator for vertical pipes with compression ends — sizes DN 20 (Ø 22)
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:	brass EN 1982 CB753S	epoxy resin coated steel
Dirt collection chamber:	brass EN 12165 CW617N	-
Top plug:	brass EN 12164 CW617N	brass EN 12165 CW617N
Internal element:	PA66G30 (stainless steel, 5468, 5469 series)	stainless steel EN 10088-3 (AISI 302) (5466 stainless steel EN 10088-3 (AISI 302) and HDPE
Hydraulic seals:	EPDM	non-asbestos fibre (top plug)
Drain cock:	brass EN 12165 CW617N	brass EN 12165 CW617N
Performance:		
Medium:	water, glycol solutions	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC
Max. percentage of glycol:	50%	50%
Max. working pressure:	10 bar	10 bar
Working temperature range:	0–110°C	0–110°C (5466 0–100°C)
Particle separation rating:	(5462, 5463) down to 5 µm	down to 5 µm
Magnetic induction of magnet:	(series 5463, 5468) 2 x 0,3 T	(series 5466) DN 50–DN 65 7 x 0,475 T (series 5466) DN 80–DN 150 12 x 0,475 T
Connections:		
Main:	3/4", 1", 1 1/4", 1 1/2", 2" F with compression ends for copper pipe Ø 22, Ø 28 mm	(DN 50–150) PN 16; (DN 200–300) PN 10 to be coupled with flat counterflange EN 1092-1
Probe holder:	-	DN 200–DN 300, inlet/outlet 1/2" F
Top:	1/2" F (with plug)	3/4" M (with cap)
Drain:	hose connection	(DN 50–DN 150) 1" F; (DN 200–DN 300) 2" F

Technical specifications of insulation for 5462 and 5463 series

Material:		closed cell expanded PE-X
Thickness:		10 mm
Density:	- inner part:	30 kg/m³
	- outer part:	80 kg/m³

Technical specifications of insulation for flanged models from DN 50 to DN 100

Inner part

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

External cover

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

Head covers

Heat moulded material:	PS

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:		0–110°C
Reaction to fire (DIN 4102):		class B2

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

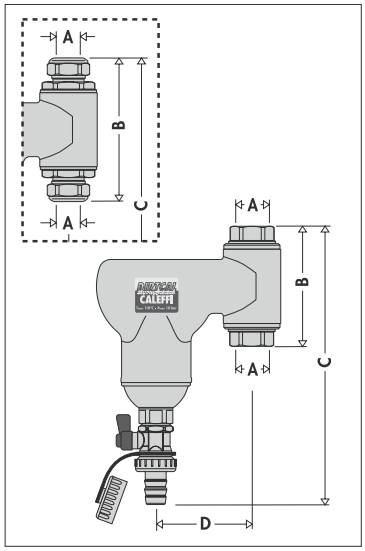
Inner part

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

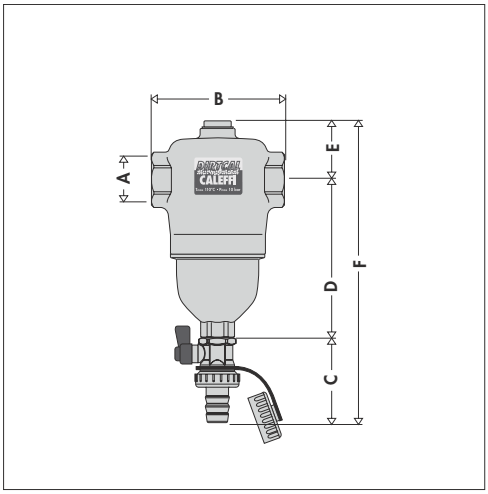
External cover

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

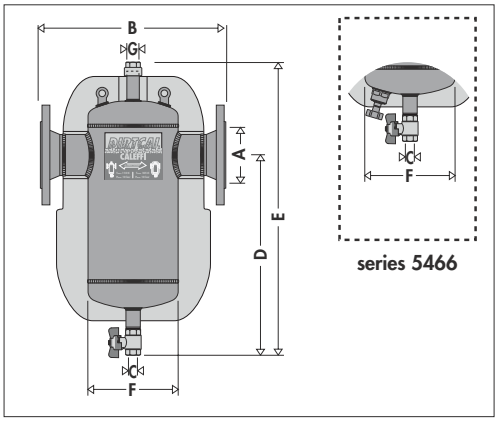
Dimensions



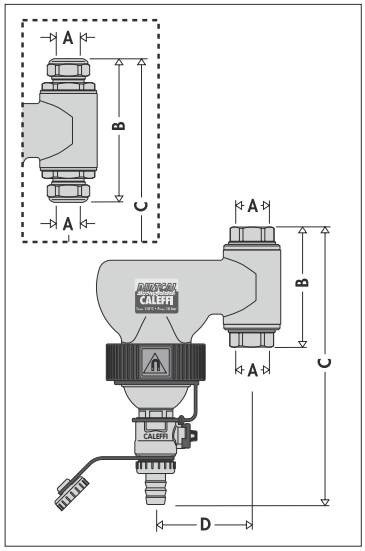
Code	Size	A	B	C	D	Mass (kg)
546902	DN 20	Ø 22	121	232,5	80	1,95
546905	DN 20	3/4"	102	223	80	1,95
546906	DN 25	1"	107	225,5	80	1,95



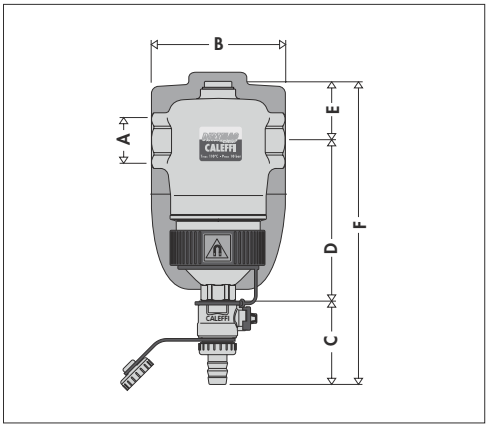
Code	Size	A	B	C	D	E	F	Mass (kg)
546205	DN 20	3/4"	110	56	131,5	49	236,5	1,87
546206	DN 25	1"	110	56	131,5	49	236,5	1,87
546207	DN 32	1 1/4"	124	56	151,5	49	256,5	2,22
546208	DN 40	1 1/2"	124	56	151,5	49	256,5	2,22
546209	DN 50	2"	127	56	145,5	55	256,5	2,36



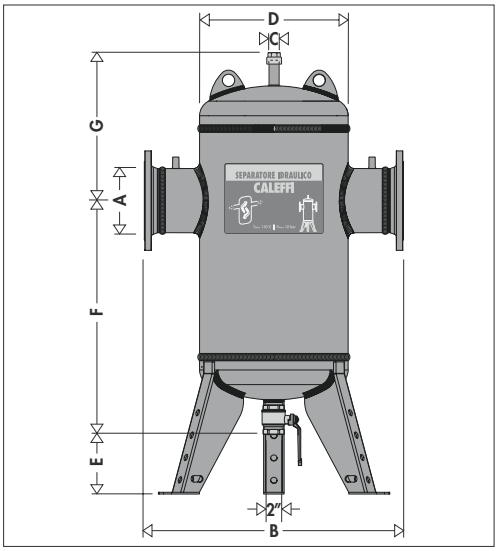
Code	A	B	C	D	E	F	G	Mass (kg)
546550/**6**50	DN 50	350	1"	425	620	169	3/4"	13
546560/**6**60	DN 65	350	1"	425	620	169	3/4"	15
546580/**6**80	DN 80	466	1"	500	740	219	3/4"	23
546510/**6**10	DN 100	470	1"	500	740	219	3/4"	25
546512/**6**12	DN 125	635	1"	600	900	324	3/4"	52
546515/**6**15	DN 150	635	1"	600	900	324	3/4"	54



Code	Size	A	B	C	D	Mass (kg)
546802	DN 20	Ø 22	121	232,5	80	1,95
546803	DN 25	Ø 28	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	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	675	151,5	49	268	2,22
546309/19	DN 50	2"	127	67,5	145,5	55	268	2,36

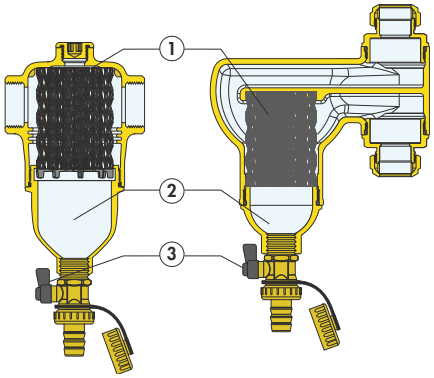


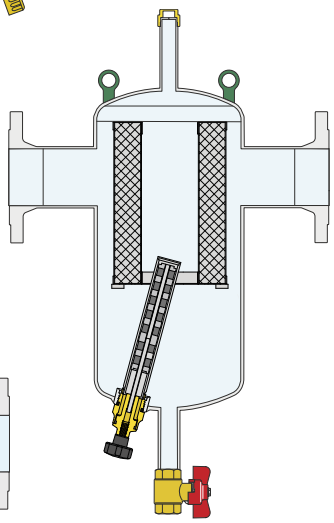
Code	A	B	C	D	E	F	G	Mass (kg)
546520	DN 200	900	3/4"	508	215	875	470	152
546525	DN 250	1060	3/4"	660	215	1015	540	280
546530	DN 300	1180	3/4"	762	215	1145	610	395

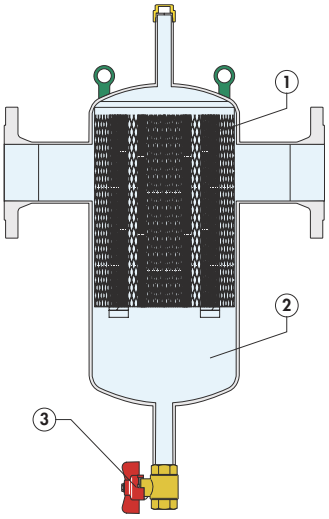
Size	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300
Volume (l)	7	7	18	18	52	52	211	415	639

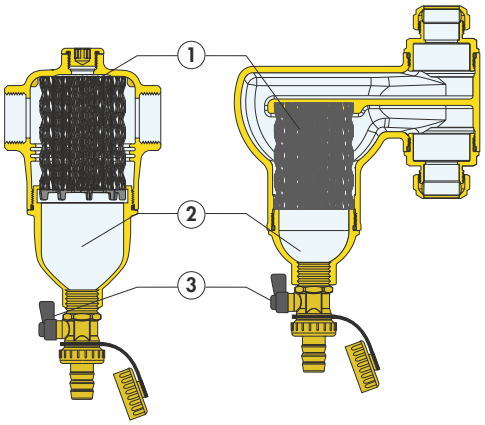
Operating principle

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 radial reticular surfaces. The impurities in the water, on striking these surfaces, get separated, dropping into the bottom of the body (2) where they are collected.
In addition, the large internal volume of DIRTCAL® slows down the flow speed of the medium thus helping, by gravity, to separate the particles it contains.
The collected impurities are discharged, even with the system running, by opening the drain cock (3); this procedure can even be performed while the system is in operation.
The dirt separator is designed in such a way that the direction in which the medium is flowing inside makes no difference.









Construction details

Low head losses and performance maintained over time

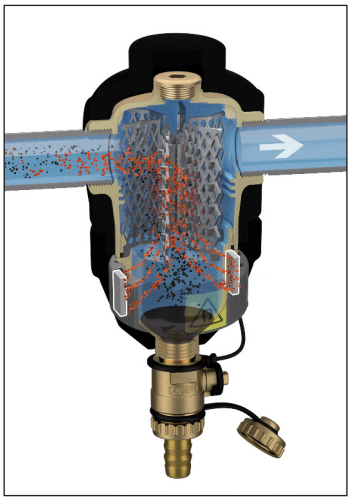
The high performance of the dirt separator is based on using the internal element with reticular surfaces. The principle of collision and decantation of particles makes the dirt separation action more efficient if compared to the common strainers. This performance is constant over time unlike common 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 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 offer an increased amount of collected dirt, which means emptying / discharging procedures are required less often (in contrast to strainers, which need to be cleaned frequently).
- it is easy to inspect, by unscrewing it from the valve body for any servicing of the internal element required in the event of obstruction by fibres or large particles of dirt.

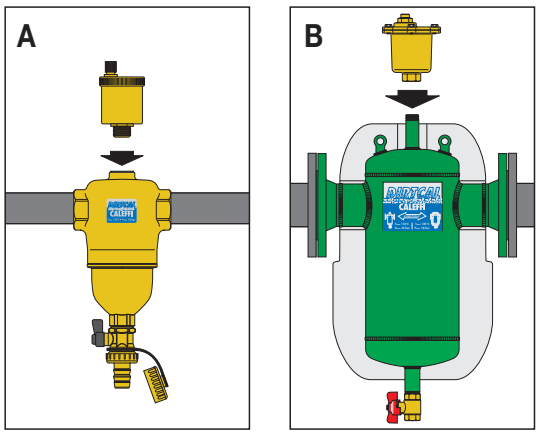
Separation of ferrous impurities

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.
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.
As the magnetic ring is positioned outside the dirt separator body, the hydraulic characteristics of the device are not altered.
The magnet of the flanged version is fitted into a pocket. For dirt dischange procedure, the magnet can be extracted from the pocket.



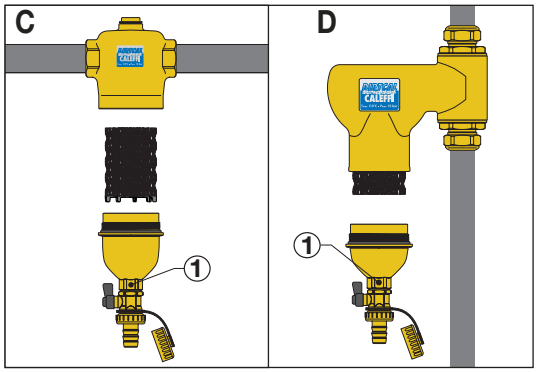
Top connection

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



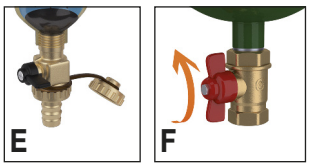
Maintenance

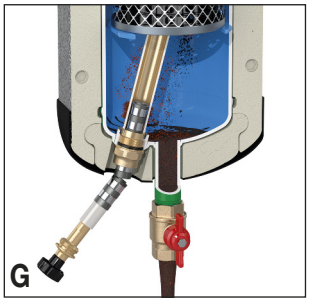
To carry out maintenance operation (in threaded models for horizontal pipes) (C), simply use a 26 mm hexagonal wrench (1) to unscrew the dirt collection chamber to which the internal element is fixed, in order to extract it for cleaning purposes. For vertical pipe models (D), only the dirt collection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

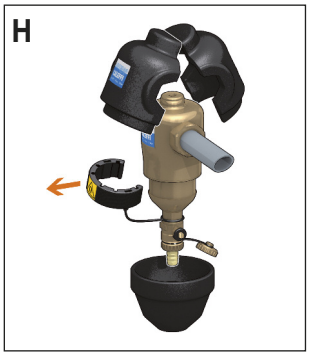


Draining off with the system running

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 magnet, the procedures described must be carried out after the magnet has been removed (G and H). In the flanged version, the magnet can be removed after unscrewing the knob (G). To make this operation easier, the magnet is divided into several pieces.

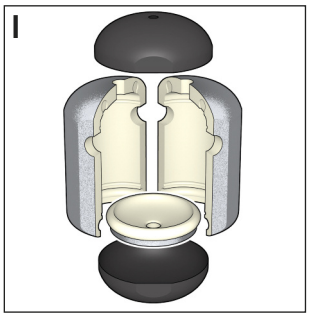




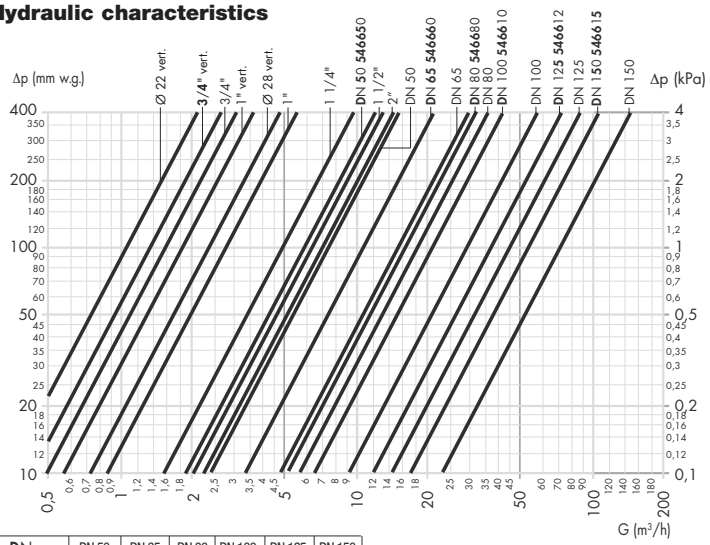


Insulation

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



Hydraulic characteristics



DN	DN 50 546650	DN 65 546660	DN 80 546680	DN 100 546610	DN 125 546612	DN 150 546615
Connections	–	–	–	–	–	–
Kv (m³/h)	60,5	110	160	216	365	535

DN	DN 20 vertical	DN 20 vertical	DN 25 vertical	DN 25 vertical	DN 20	DN 25	DN 32	DN 40	DN 50	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200*	DN 250*	DN 300*
Connections	Ø 22	3/4"	1"	Ø 28	3/4"	1"	1 1/4"	1 1/2"	2"	–	–	–	–	–	–	–	–	–
Kv (m³/h)	10,7	13,8	18,2	24,7	16,2	28,1	48,8	63,2	70,0	75,0	150,0	180,0	280,0	450,0	720,0	900,0	1200,0	1500,0

The maximum recommended speed of the medium inside the pipe 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

Separation efficiency

The capacity for separating the impurities in the medium circulating in the system closed circuit basically depends on three parameters:

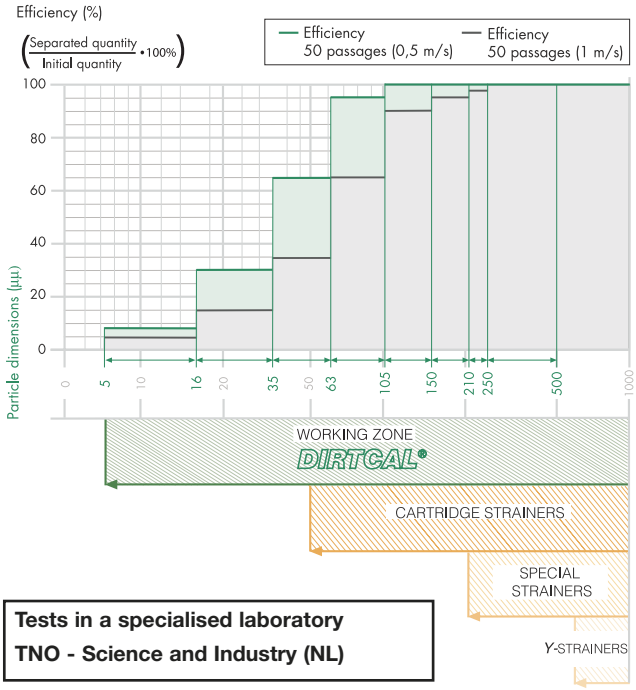
1) It increases as the size and mass of the particle increase. The larger and heavier particles drop before the lighter ones.
2) It increases as the speed decreases. If the speed decreases, there is a calm zone inside the dirt separator and the particles separate more easily.
3) It increases as the number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

The Caleffi DIRTCAL® and DIRTAMG® dirt separator, thanks to the special design of its internal element, is able to completely separate the impurities in the circuit down to a minimum particle size of 5 μm.
The graph alongside, summarising the tests carried out in a specialised laboratory (TNO - Science and Industry), illustrates how the DIRTCAL® and DIRTAMG® dirt separator (5462, 5463, 5465 and 5466 series) is able to quickly separate nearly all the impurities. After only 50 recirculations, approximately one day of operation, up to 100% is effectively removed from the circuit for particles of diameter greater than 100 μm and on average up to 80% taking account of the smallest particles. The continual passing of the medium during normal operation of the system gradually leads to complete dirt removal.

Reduced head losses

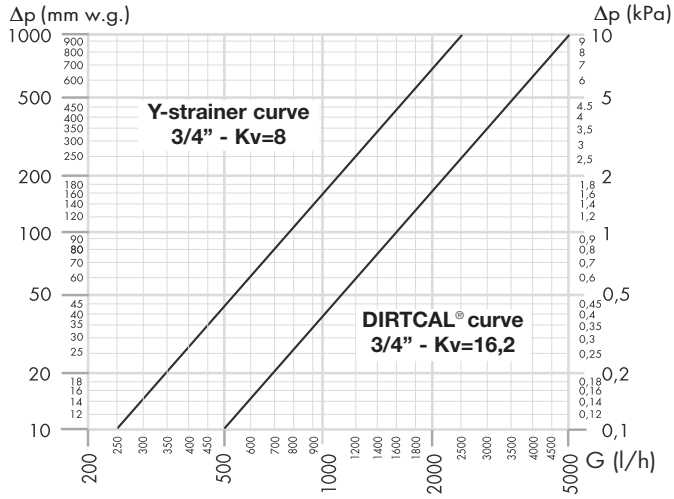
A normal Y strainer performs its function via a metal mesh selected for the size of the largest particle. The medium therefore has a consequent initial head loss that increases as the degree of clogging increases.
Whereas, the dirt separator carries out its action by the particles striking the internal element and subsequently dropping into the collection chamber as a result of gravity. The consequent head losses are greatly reduced and are not affected by the amount of impurities collected.
The graph alongside shows a comparison of the differences in head loss between the two types of device.

Particle separation rating - Dirt separator efficiency



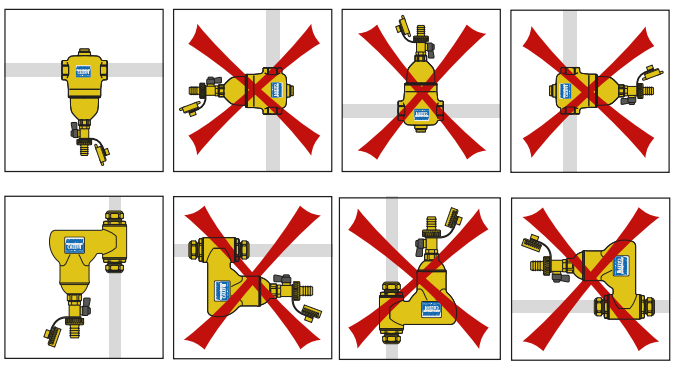
Tests in a specialised laboratory
TNO - Science and Industry (NL)

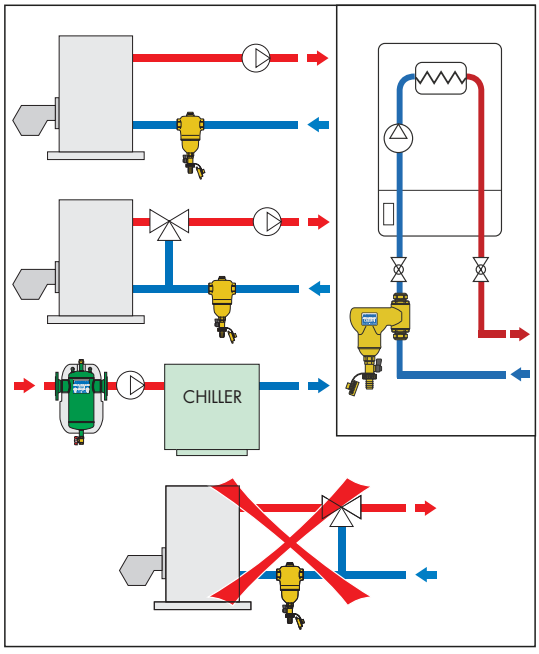
Comparison of head losses: DIRT SEPARATOR - Y-STRAINERS



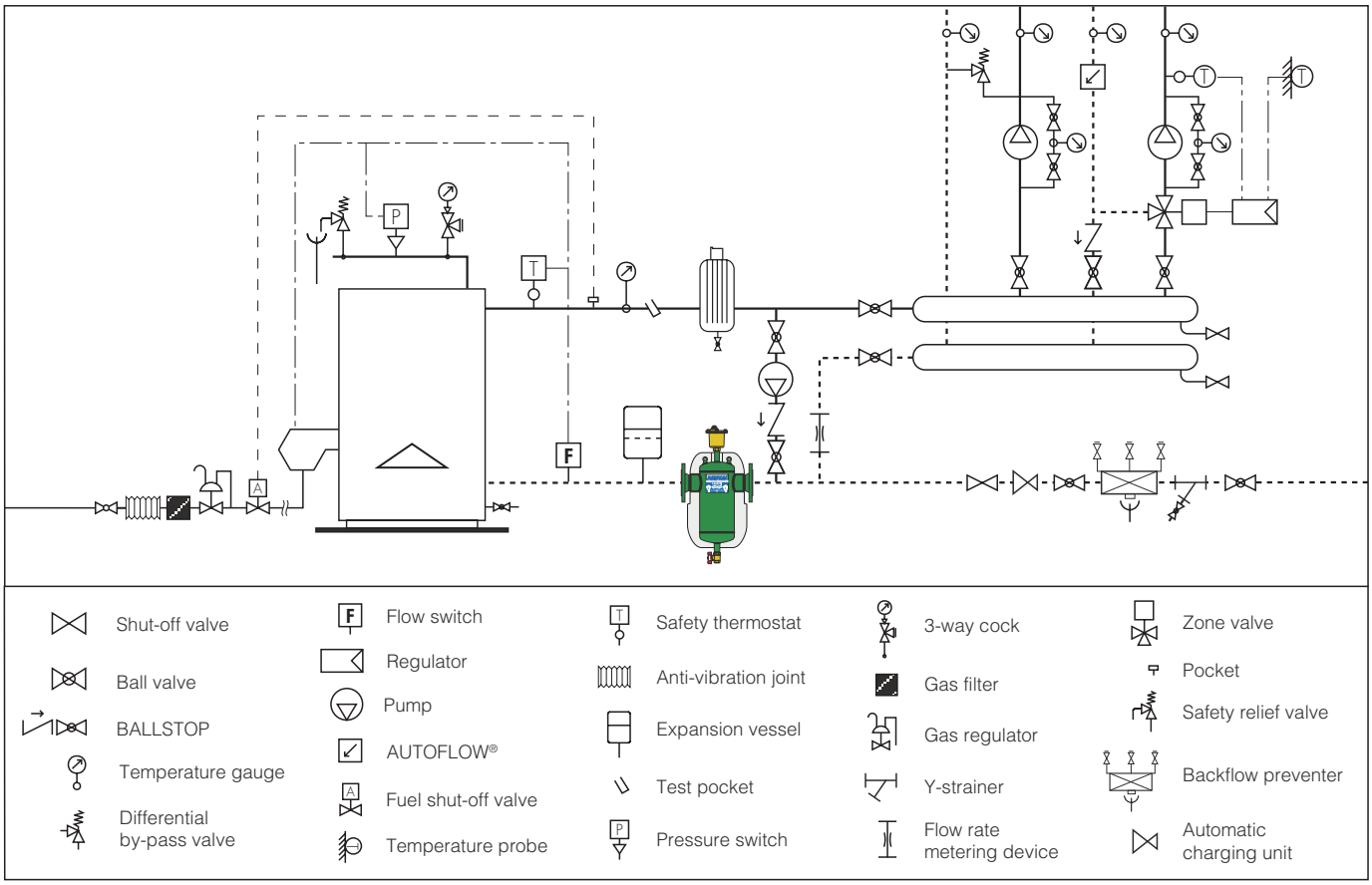
Installation

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. For 5466 series a space of at least 16 cm is needed underneath the dirt separator to allow the magnet extraction.





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 plug). Drain with hose connection. Brass dirt collection chamber and body. PA66G30 internal element. EPDM hydraulic seals. Brass drain valve. Medium water and glycol solutions; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Working temperature range 0–110°C. Particle separation rating down to 5 μm.

5463 - 5468 series DIRTMAG®

Dirt separator with magnet for horizontal and vertical pipes. For horizontal pipes: size DN 20 (from DN 20 to DN 50); connections 3/4" (from 3/4" to 2") F (ISO 228-1). For vertical pipes: size DN 20 (from DN 20 to DN 32); connections 3/4" (and 1") F (ISO 228-1) and compression ends for Ø 22 (and Ø 28) copper pipes. Top connection 1/2" F (with plug). Drain with hose connection. Brass dirt collection chamber and body. PA66G30 internal element. EPDM hydraulic seals. Brass drain valve. Medium water and glycol solutions; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Particle separation rating down to 5 μm (5463). Closed cell expanded PE-X hot preformed shell insulation. 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, only 5465 series) PN 10, can be coupled with counterflanges EN 1092-1. Top connection 3/4" (with plug). Brass drain valve 1" F (from DN 50 to DN 150); 2" (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 (0-100°C for 5466 series). 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 size DN 200 (from DN 200 to DN 300). Magnetic induction of magnet for 5466 series DN 50 and DN 65: 7x0,475 T (DN 80–DN150 12x0,475 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). Size DN 20; connections Ø 22 with compression ends for copper pipe. Brass dirt collection chamber and body. Steel internal element. EPDM hydraulic seals. Brass drain valve. Medium water and glycol solutions; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Working temperature range 0–110°C.

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