Dirt separators
DIRTCAL® - DIRTMAG®

5462 - 5463 - 5466 - 5468 series

Product range
5462 series DIRTICAL® 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 DIRTICAL® 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 DIRTICAL® 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”)
5466 series DIRTICAL® dirt separator for horizontal pipes with flanged connections sizes DN 20 (3/4”); DN 25 (1”); DN 32 (1 1/4”); DN 40 (1 1/2”); DN 50 (2”)
5468 series DIRTICAL® dirt separator for vertical pipes with magnet sizes DN 20 (Ø 22); DN 25 (Ø 28)
5468 series DIRTICAL® dirt separator for vertical pipes with magnet and compression ends sizes DN 20 (3/4”); DN 25 (1”)
5466 series DIRTICAL® dirt separator for horizontal pipes with flanged connections with magnet and pre-formed insulation sizes DN 50-DN 150
5466 series DIRTICAL® dirt separator for horizontal pipes with flanged connections and floor brackets sizes DN 200-DN 300

Technical specifications

<table>
<thead>
<tr>
<th>series</th>
<th>5462 - 5463 - 5468</th>
<th>5466 flanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body:</td>
<td>brass EN 1982 CB753S</td>
<td>epoxy resin coated steel</td>
</tr>
<tr>
<td>Top plug:</td>
<td>brass EN 12165 CW617N</td>
<td>brass EN 12165 CW617N</td>
</tr>
<tr>
<td>Internal element:</td>
<td>PA66G30 (stainless steel, 5468 series)</td>
<td>stainless steel EN 10088-3 (AISI 302) and HDPE</td>
</tr>
<tr>
<td>Hydraulic seals:</td>
<td>EPDM</td>
<td>non-asbestos fibre (top plug)</td>
</tr>
<tr>
<td>Drain cock:</td>
<td>brass EN 12165 CW617N</td>
<td>brass EN 12165 CW617N</td>
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</table>

| Performance: | | |
| Medium: | water, glycol solutions | water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EEC |
| Max. percentage of glycol: | 90% | 90% |
| Max. working pressure: | 10 bar | 10 bar |
| Working temperature range: | 0–110°C | 0–100°C |
| Particle separation rating: | (5462, 5463) down to 5 μm | DN 50-DN 65 7 x 0,475 T DN 80-DN 150 12 x 0,475 T DN 200-DN 300 3 x 17 x 0,475 T |
| Magnetic induction of magnet: | (series 5463, 5468) 2 x 0,3 T | down to 5 μm |

| Connections: | | |
| Main: | 3/4”, 1”, 1 1/4”, 1 1/2”, 2” F | (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 |
| Probe holder: | with compression ends for copper pipe Ø 22, Ø 28 mm | 3/4" M (with cap) |
| Top: | 1/2” F (with plug) | (DN 50–DN 150) 1” F; (DN 200–DN 300) 2” F |
| Drain: | hose connection | |

Reference documentation
- Tech. Broch. 01064 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

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 the smallest impurities, with extremely limited head loss. DIRTICAL® 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.
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

Coefficient of resistance to water vapour (DIN 52615): > 1300

Reaction to fire (DIN 4102): class B2

Working temperature range: 0–105°C

Thermal conductivity (ISO 2581): 0.023 W/(m·K)

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: 0–100°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

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: - inner part: 30 kg/m³
- outer part: 80 kg/m³

Thermal conductivity (ISO 2581): 0.023 W/(m·K)

Working temperature range: 0–105°C

Coefficient of resistance to water vapour (DIN 52615): > 1300

Reaction to fire (DIN 4102): class B2

External cover

Material: embossed unfinished aluminium

Thickness: 0.7 mm

Reaction to fire (DIN 4102): class 1
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 DIRTMAG® 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 discharge procedure, the magnet can be extracted from the pocket.
Curves are not shown in the diagram models (D), only the dirt collection chamber may be extracted for cleaning purposes. For vertical pipe models (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.

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 DI RTM AG® (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.

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

<table>
<thead>
<tr>
<th>DN</th>
<th>Connections</th>
<th>l/min</th>
<th>m³/h</th>
</tr>
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<tbody>
<tr>
<td>20</td>
<td>Ø 22 1&quot;</td>
<td>22.7</td>
<td>1.36</td>
</tr>
<tr>
<td>25</td>
<td>1&quot;</td>
<td>35.18</td>
<td>2.11</td>
</tr>
<tr>
<td>32</td>
<td>1 1/4&quot;</td>
<td>57.85</td>
<td>3.47</td>
</tr>
<tr>
<td>40</td>
<td>1 1/2&quot;</td>
<td>90.33</td>
<td>5.42</td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td>136.6</td>
<td>8.20</td>
</tr>
<tr>
<td>50</td>
<td>–</td>
<td>141.2</td>
<td>8.47</td>
</tr>
<tr>
<td>65</td>
<td>–</td>
<td>238.6</td>
<td>14.32</td>
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<tr>
<td>80</td>
<td>–</td>
<td>361.5</td>
<td>21.69</td>
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<tr>
<td>100</td>
<td>–</td>
<td>564.8</td>
<td>33.89</td>
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<tr>
<td>125</td>
<td>–</td>
<td>980.0</td>
<td>68.8</td>
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<tr>
<td>150</td>
<td>–</td>
<td>1436.6</td>
<td>96.2</td>
</tr>
<tr>
<td>200</td>
<td>–</td>
<td>2433.0</td>
<td>146.0</td>
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<tr>
<td>250</td>
<td>–</td>
<td>3966.0</td>
<td>232.0</td>
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<tr>
<td>300</td>
<td>–</td>
<td>5416.0</td>
<td>325.0</td>
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</table>

The maximum recommended speed of the medium inside the pipe is 1.2 m/s.

* Curves are not shown in the diagram.
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 DIRTICAL® 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 DIRTICAL® and DIRTAMG® dirt separator (5462, 5463, 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.

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.
**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 DIRTMAgl**
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.

**5466 series DIRTMAgl**
Dirt separator. Flanged connections DN 50 (from DN 50 to DN 150) PN 16; flanged DN 200 (from DN 200 to DN 300) 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 0–100°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 size DN 200 (from DN 200 to DN 300). Magnetic induction of magnet DN 50 and DN 65: 7x0,475 T (DN 80-DN150 12x0,475 T) (DN 200-DN300 13x17x0,475 T).

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**SPECIFICATION SUMMARY**

**Application diagram**

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