Flamco
Flow of Innovation

Flamco *XStream*

Air and dirt separators

Technical Manual

- Unique ECO/MAX setting
- Integrated insulation
- Optimised magnetic field for the collection of magnetite
- Integrated service indicator

Disclaimer

The information provided in this Technical Manual is for informational purposes only and is therefore offered “as is”. Great care has been taken to ensure that the information in this manual is correct at the time of publication. Flamco endeavours to ensure that the information is up to date but does not provide any guarantee in respect of its accuracy or completeness. Information is subject to change without prior notification by Flamco.

We recommend that you consult our General Terms and Conditions. Additional information is available on request. It is the responsibility of the design engineer to select products that are suitable for the intended use and that satisfy the pressure values and design characteristics. The installation manual must always be read and followed.

Table of contents

Flamco and Aalberts: Industry-leading technology

Flamco is part of Aalberts, a worldwide specialist in high-quality industrial products and processes. Products of Aalberts companies are used in the automotive and process industry, in construction and installation companies, and elsewhere.

The new standard

"Technology, quality and innovation are in our DNA. This enables us to offer our customers products and services that make a positive contribution to energy saving, comfort, system reliability, optimal ease of use and simple installation.

With the introduction of Flamco XStream, we are setting the new standard in the area of air and dirt separation. Flamco XStream air and dirt separators ensure lower energy consumption, less wear, fewer faults, a longer service life and thus a higher output of heating installations. Together, we're making our contribution to a sustainable future."

Maarten van de Veen
CEO Flamco

1. Air and dirt in systems

Air bubbles and dirt particles are always present in the water of cooling and heating systems. They can have very serious consequences on the efficiency and negatively impact the lifespan of your heating or cooling system.

1.1. How does air get into the system?

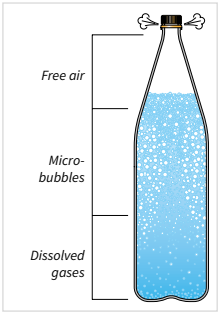
Air can enter a system in all sorts of ways. Before a system is filled with water, it is full of air. There is a large chance that air bubbles will remain in the bends and fittings of the system when it is filled.

The water used to fill/top up the system also contains dissolved air, which also finds its way into the system during the filling/topping up process. In addition, air can also enter the system as a result of maintenance activities, pressure problems, incorrectly dimensioned pipes and micro-leaks (including oxygen diffusion).

1.2 Types of air in a system

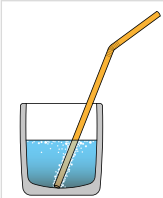
Air in systems can be subdivided into the following categories:

- Free air.
- Micro-bubbles.
- Dissolved gases.



The adjacent illustration makes a comparison with a bottle filled with carbonated (spring) water. This is also under pressure, just like a central heating system. The moment the pressure in a system drops or the temperature rises, more and more air is released from

the water in the system. Air bubbles attach themselves to an available surface, where they join together through a process known as coalescence.



Coalescence

1.3 Risks and consequences of air in systems

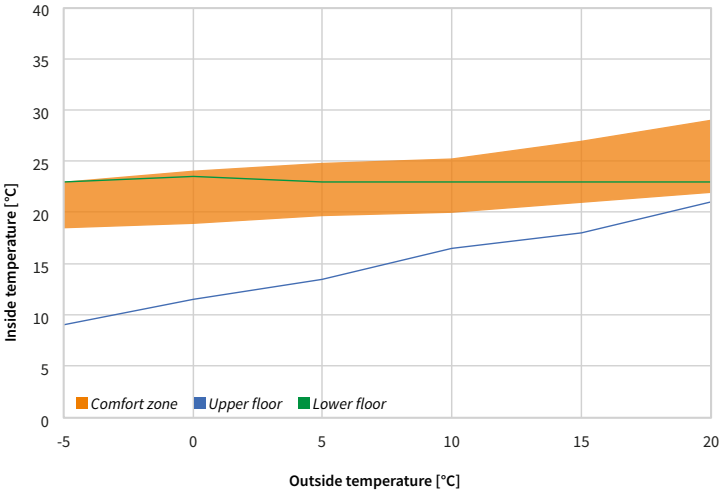
Air in a system can cause an increase in irritating tapping and bubbling noises. In addition, the oxygen present reacts with the steel parts of the system which leads to corrosion and the formation of magnetite. However, the major concern of air being in a system is inefficient operation, including both higher energy consumption and effectively lowering thermal output. This happens because air acts as an insulator and blocks the transfer of heat, which means that rooms cannot be efficiently heated.

For a system with air problems, we can see in the temperature graphs (Situation 1,2 & 3) how the room temperature behaves compared to the set comfort temperature. A distinction is made here between the upper and lower floors.

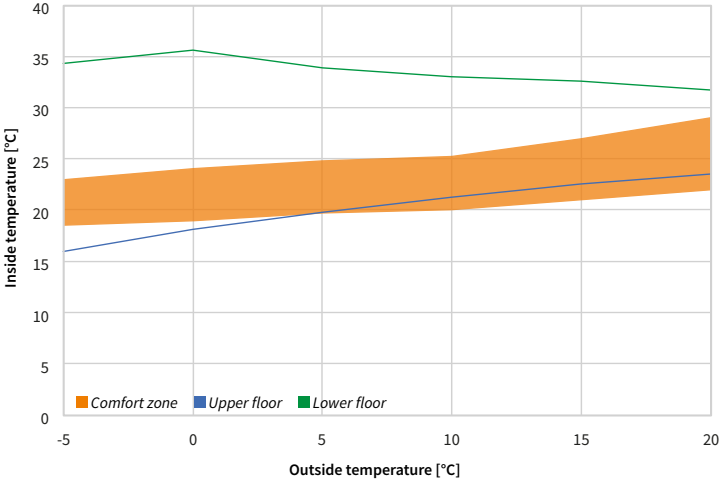
The accompanying graphics are in accordance with ATG method EN 15251. The Adaptive Temperature Limits (ATG) method is an assessment of the thermal comfort in a room. In this model, the set comfort temperature in a room depends on the outside temperature. This always tracks the inside temperature. For example, if it is warm outside, a warmer comfort temperature is also accepted inside.

*Calculated using the Hysopt method on the basis of a system with a wall-mounted condensing gas boiler and manually operated radiator valves.

Situation 1:
The system contains air and the boiler runs at normal output. The result is that the lower floor has the required climate but it is too cold on the upper floor..

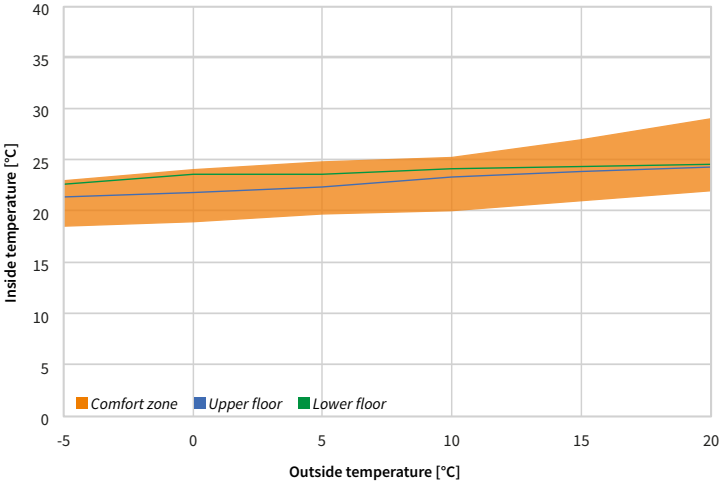


Situation 2:
If the radiators give off less heat due to excess air in the system, the upper floor remains too cold. By raising the setting on the boiler, it is possible – despite the air problems – to improve the comfort on the upper floor. However, at the same time, the room temperature on the lower floor will increase to well above 35 °C, with an associated higher level of energy consumption.



Only by shutting off various radiators on the lower floor is it possible to improve the comfort temperature somewhat, but the system will still continue running very inefficiently in terms of energy consumption (average losses of 15% compared to a properly degassed system).

Situation 3:
In this situation, the air is removed from the system by installing a Flamco XStream. We can see that the temperature on both floors are evenly spread and in the optimal zone, regardless of the outside temperature. This can result in up to 15% lower energy consumption and an improvement in heating output of up to 6%.



ANALYSIS OF ENERGY EFFECTS AND COMFORT WITH AIR PROBLEMS

On 12/11/2019 Hysopt identified the energy saving effects for air separation on behalf of Flamco. A representative apartment complex has been simulated for this purpose. An analysis has been done on the system without the use of air separators, and with the use of air separators such as the Flamco Smart or Flamco XStream.

This analysis has shown that when applying separators, **14% to 18% less energy** is used than a system without air separators. Because the upper apartments remain too cold caused by air in the radiators, the user is forced to increase the boiler temperature as compensation. The result is that due to the water temperature increase the lower apartments become too warm. A higher supply temperature also entails an increase in the return temperature, which has an unfavourable impact on the efficiency of condensing boilers, with a decrease of 5.5 percentage points.

In addition to the effects of air problems on energy consumption, the consequences of this on comfort are also evident. On the basis of the ATG method, the comfort temperatures of the inhabited spaces have been identified, for example, the upper apartments will be too cold at cold outside temperatures. Only after increasing the heating line will the desired temperatures be achieved.

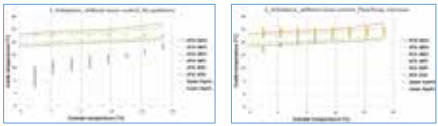


Figure 1: Left, installation with air problems;

Right, installation with air problems and boiler temperature increase

Air problems in radiators resulted in apartments that are too cold at low outside air temperatures and to extremely high energy costs when the boiler temperature is increased as compensation, without an effective solution to the problem itself.

Dr. Ing. Roel Vandenbulcke
Founder, CEO

Hysopt nv
Bredabaan 837,
2170 Merksem
Belgium

Performance through transparency

hysopt hydronic system optimisation

Hysopt declaration of the Flamco XStream effect

1.4 How does dirt get into the system?

Unwanted dirt particles can enter a system during the installation process. These contaminants can create poor pH levels, that have high conductivity characteristics, accelerate corrosion and are the reasons why it is recommended that systems are flushed prior to commissioning. Ideally, the system water has a pH of between 7 and 10. To minimise the amount of dirt in the system, right from the outset, it is important for the system to be flushed thoroughly before being filled.

1.5 Types of dirt in systems

Dirt particles that are found in a system include, for example:

- Magnetic iron particles (magnetite) as a consequence of corrosion.
- Non-magnetic metal particles, such as, for example, copper, brass and aluminium.
- Limescape deposits as a consequence of hard water.
- Rubber and plastic particles of, for example, seals.
- Sand.

1.6 Risks and consequences of dirt in systems

Dirt can accumulate in parts of the system such as pumps, heat exchangers, threeway valves, (underfloor heating) pipes, radiators and heat meters. This increases the risk of system failure, maintenance and repair costs. This reduces the lifespan of the overall system. Expensive system components such as pumps are put under greater strain to ensure that the system can meet the demand for heat. This results in a lower output. Finally, dirt particles, just like air, cause a reduction in the transfer of energy. This negatively impacts on systems efficiency and output.

1.7 Overview of risks and consequences of dirt in systems

Radiator with trapped air at the top and dirt blockages at bottom

Radiator without air or dirt

1. Boiler faults
2. Damage to fittings
3. Clogged underfloor heating groups
4. Noise nuisance
5. Radiators that do not get sufficiently warm
6. Cold upper floor
7. Higher energy bill

2 Flamco XStream

The removal of air and dirt is critical to the efficiency and lifespan of the system. With considerably lower energy consumption, higher output and longer lifespan of heating systems, we are able to guarantee the performance of Flamco XStream air and dirt separators with a warranty of 15 years.

Cross-section of Flamco XStream Vent

Cross-section of Flamco XStream Clean

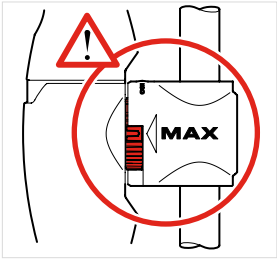
2.1 ECO/MAX

The Flamco XStream gives you the option to determine how much system water is sent in the direction of the separation mechanisms. You can set this using the ECO/MAX lever.

2.2 MAX position

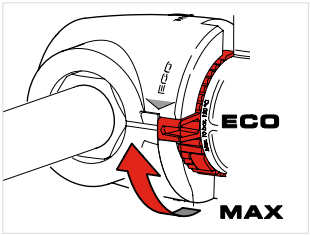
Setting the red lever to the MAX position sends all of the system water through the Flamco XStream. This setting is primarily used when commissioning the system. In the MAX position, air, dirt and magnetite are captured effectively and efficiently. It enables the system to operate at the optimum level of efficiency in a short space of time. It addition, the MAX position setting can be used where the XStream has been retrofitted on systems which have had long term issues with air and dirt.

Flamco XStream in MAX position



2.3 ECO position

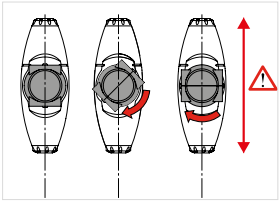
Setting the red lever of the Flamco XStream to the ECO position sends a partial flow of the system water (approx. 25%) through the Flamco XStream. The ECO position has a low resistance and pressure drop. The effect of this is that the pump does not have to overcome a higher resistance. In this way, the Flamco XStream functions like a partial flow filter. Air, dirt and magnetite are captured in an effective and energy-efficient manner using this setting.



Flamco XStream in ECO position

2.4 100% ease of installation

Because the Flamco XStream has a 360˚ rotatable connection, it can be installed in any pipe configuration. This makes it possible for the Xstream to be installed in a horizontal, vertical or diagonal position. The rotatable connection is made from high-quality, low-lead brass EN-CW617N (CuZn40Pb2).



360˚ rotatable connection

The body of the Flamco XStream must be placed upright for the most effective separation or air and dirt removal.

The Flamco XStream does not have a preset direction of flow. This is due to the unique manner in which the system water is passed into the body in the Flamco XStream. This ensures that installation errors are avoided.

The Flamco XStream is available with 3 different connection options:

- Inner thread short cylindrical (G), according to ISO 228-1.
- Compression fitting: with the soft VSH compression ring and robust union nut, for an optimal compression seal.
- Outer thread flat sealing, for use in combination with flat-sealing system couplings. The advantage of this connection is that the Flamco XStream can be installed in existing systems in a simple and compact manner.

VSH compression seal

Inner thread

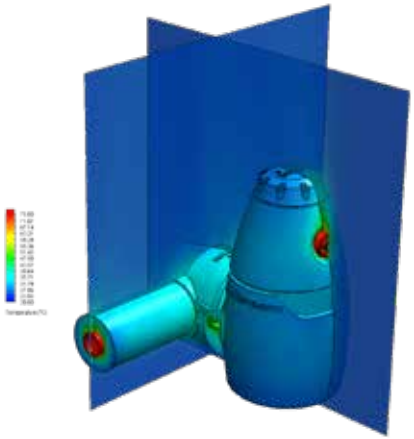
Compression fitting

Outer thread (flat-sealing)

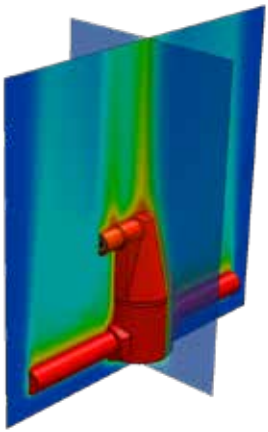
Installation of Flamco XStream with flat-sealing outer thread for VSH XPress swivel coupling

2.5 Integrated insulation

From an engineering and commercial perspective it is common knowledge that heat losses in a system should be minimised as much as possible. Heat that is lost through uninsulated pipework and fittings increases system inefficiency and subjects the boiler to unnecessary heat loads. To insure that heat losses are minimised the Flamco XStream is supplied with insulation as an integral component of the filter. The EPP insulation of the Flamco XStream has an average thickness of 20 mm and an insulation value (λ) of 0.036 W/mK. Thanks to the integral insulation, the Flamco XStream contributes actively to reducing heat and energy losses in the system.



Minimal heat loss thanks to integrated insulation



Air separator without insulation

2.6 Advanced magnet function

Magnetite is one of the most common types of contamination in systems. In order to be able to effectively capture the magnetite, the Flamco XStream has powerful neodymium magnets with a strength of 13,200 Gauss.

The magnets are located in the main collection chamber and are placed with matching poles pointing towards each other. This ensures an optimal magnetic field and an optimal capture rate of even the smallest particles of magnetite.

Optimal magnetic field with Flamco XStream

Conventional magnetic field

The magnets have a high temperature resistance. This means the magnetic field never loses its strength. The magnets have a nickel-plated finish to protect them against any corrosion and potential damage.

Size	Magnets	Surface area [mm²]
DN20 (22 mm, G¾"F, G1"M)	12	7,300
DN25 (G1"F, G1¼"M)	8	6,500
DN32 (G1¼"F)	8	6,500
DN40 (1½"F)	8	9,000
DN50 (2"F)	8	9,000

2.7 Service indicator

The integrated service indicator shows when the Flamco XStream Clean was last flushed. On the Flamco XStream Vent, the service indicator shows when the system was last vented in the MAX position. Thanks to the service indicator, there is no longer any need to work with separate service stickers that eventually get lost or discarded.

Integrated service indicator

2.8 Body

The Flamco XStream is made from a combination of brass and components of high quality (polyphthalamide) with a 30% fibreglass filing. This unique combination not only makes the Xstream extremely strong but also makes it lighter than conventional air and dirt separators. The weight saving can amount to up to a 45%. Using fibreglass-reinforced PPA also makes it possible to positively influence internal flow properties to ensure that optimal separation takes place.

2.9 Body zone distributor

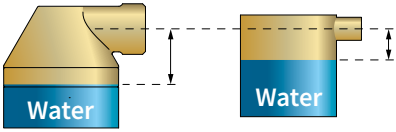
The Body zone distributor is made from high quality plastic and provides a flow separation within the equipment. Effectively the system fluid, containing air and dirt particles, is directed through an active flow zone, maintaining the system fluid velocity. Once through the active zone the flow passes into a quiet zone where the velocity will drop allowing particles to settle and released air bubbles to rise.

The active zone is where the dirt cannot collect and air is not held. The quiet zone is where the water velocity is significantly lower and dirt can settle out, bubbles are free to rise and be released.

Body zone distributor

2.10 Flamco XStream Vent Automatic Air Vent

The air release chamber of the Flamco XStream Vent and Vent-Clean is conical in shape. The advantage of this is that the distance between the water level and the release valve is larger than in a straight air chamber. This minimises the chance of contamination..

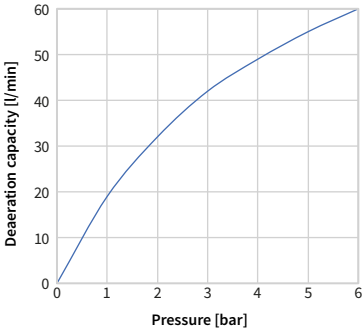


XStream breather head *Adjusting the breather head*

Flamco XStream breather head

The venting capacity can be adjusted using a screwdriver to vary the adjusting screw or to close it completely.

The automatic air vent valve head is manufactured from high-quality, low-lead brass ENCW617N (CuZn40Pb2). The float is protected by a special basket during transport and normal operation.

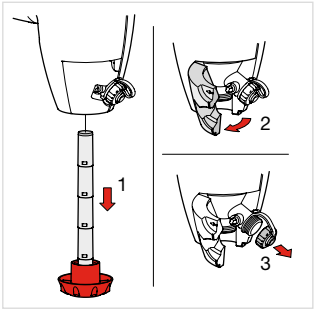


Adjusting the venting capacity

2.11 Flamco XStream Clean dirt collector

The Flamco XStream Clean and the Vent-Clean have a dirt collector with drain tap for the removal of the captured dirt and magnetite from the system. To ensure that all the steps are followed for the removal of dirt and magnetite the Flamco XStream has a mandatory sequence of steps:

1) First, screw the magnet holder out of the Flamco XStream. Magnetic dirt will sink to the bottom into the Clean dirt collector. So you don't have to clean the magnet yourself.
2) By removing the magnet, the insulation door can be opened to reach the drain tap.
3) Next, the cap of the drain tap can be unscrewed.
4) The cap can be used as a key for opening and closing the drain tap. In this way, you can be sure that both the magnetite and the rest of the dirt is removed during draining.



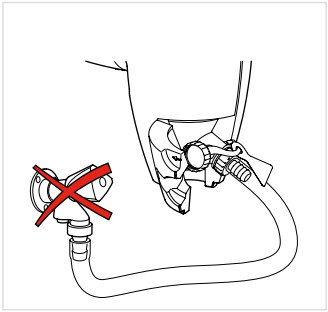
Sequence of actions

Draining

Because the drain tap is placed at an angle, it can always be easily connected.

CAUTION: The drain tap is not intended for topping up the system. Attempting to top up the system via the drain tap poses a large risk of blowing any dirt and magnetite present in the dirt trap back into the system. This can cause wear and damage to the system components.

The dirt collector is made from high-quality, low-lead brass EN-CW617N (CuZn40Pb2).



Do not top up via the drain tap

3 Operating conditions

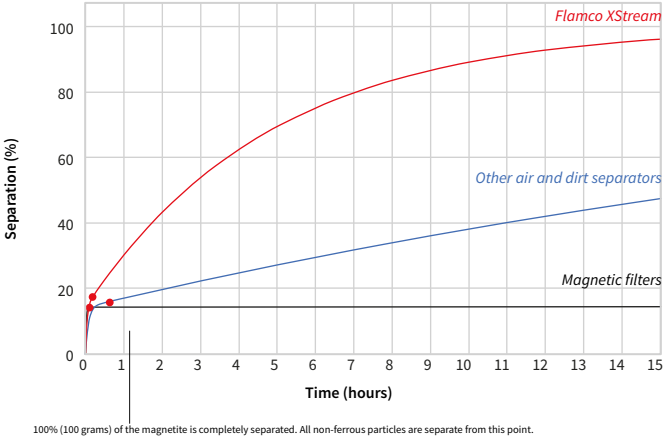
The Flamco XStream is suitable for heating and cooling systems within the following operational conditions:

Operating condition	Min.	Max.
Working pressure [bar]	0.2	10
Operating temperature [°C]	-10	120
Suitable for glycol solutions	-	50%
Flow velocity [m/s]	0.2	3
pH value	5	10

4 Efficiency in separation technology

4.1 Separation graph at 1.0 m/s

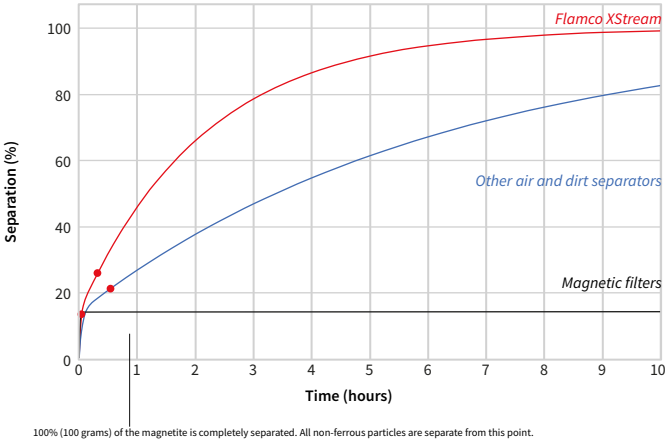
For non-ferrous particles, the Flamco XStream in the ECO position, the below graph is a comparison of system debris collection performance against competing air and dirt separators.



Measuring method verified by Deltares (report 1207599-000), size 2". v = 1.5 m/s, 600 gram silica particles (size = 40 - 70 µm), 100 grams of magnetite (size = 10 - 60 µm).

4.2 Separation graph at 1.5 m/s

For non-ferrous particles, the Flamco XStream in the ECO position, the below graph is a comparison of system debris collection performance against competing air and dirt separators.

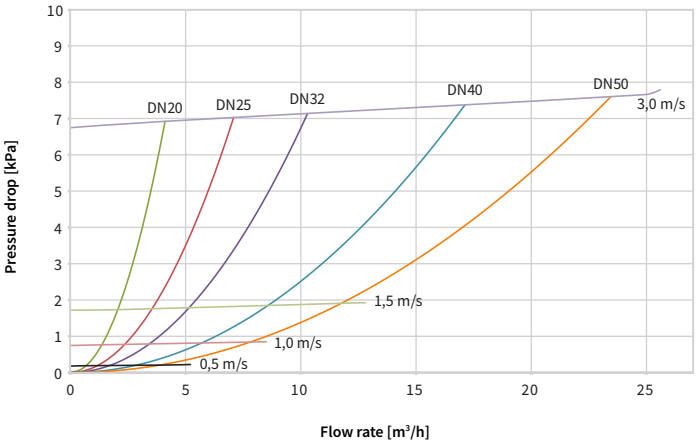


Measuring method verified by Deltares (report 1207599-000), size 2". v = 1.5 m/s, 600 gram silica particles (size = 40 - 70 µm), 100 grams of magnetite (size = 10 - 60 µm).

5 Pressure drop graphs

5.1 In ECO position

Graph for Flamco XStream DN20-DN50 in ECO position.

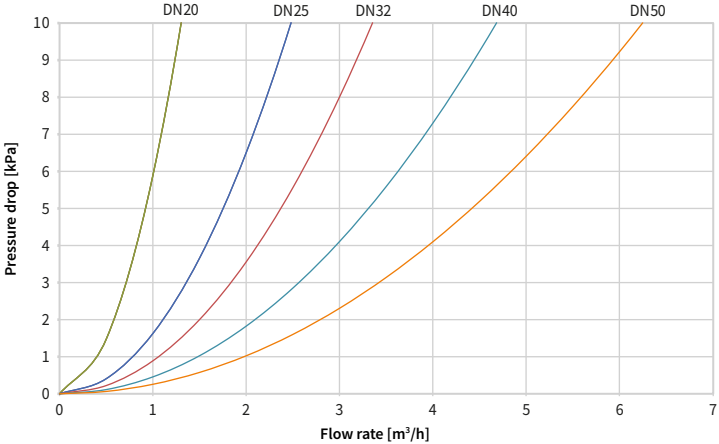


Flamco XStream selection tool. Simply determine the correct size on the basis of the flow rate.

www.flamcogroup.com/xstream/selectiontool

5.2 In MAX position

Graph for Flamco XStream DN20-DN50 in MAX position.



5.3 Kv value for Flamco XStream

The Kv value is the flow rate in m^3 per hour that flows through the Flamco XStream at a pressure loss of 1 bar.

[DN]	Connection	Kv *[m^3/h] (ECO)	Kv *[m^3/h] (MAX)
20	22 mm	15.6	4.12
20	G¾"F	15.6	4.12
20	G1"M	15.6	4.12
25	G1"F	26.7	7.84
25	G¼"M	26.7	7.84
32	G¼"F	38.5	10.60
40	G½"F	63.0	14.80
50	G2"F	85.0	19.79

** $Kv = Q / \sqrt{\Delta P}$*

Q: Flow rate [m^3/h]

ΔP: Pressure loss through the Flamco XStream (1 bar)

6 System examples

6.1 Application specifications

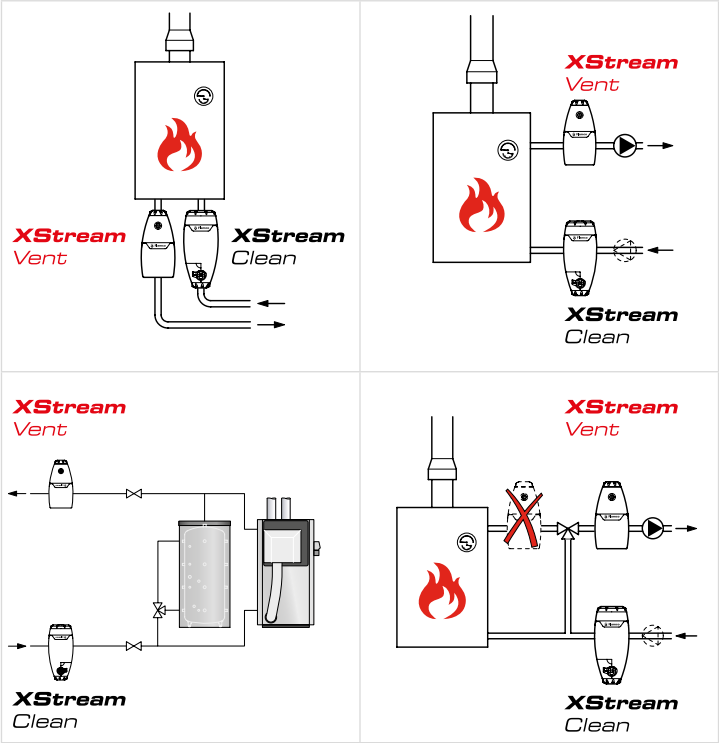
In order to achieve the best-possible separation performance, we recommend placing a Flamco XStream Vent in the flow side of the central heating system. The free air present, caused by the higher flow temperatures, can be collected and released more effectively in this position.

In contrast, the Flamco XStream Clean is preferably placed on the return side of the system so that the magnetite and dirt are filtered out before they reach the boiler. This prevents damage to the central heating boiler and system.

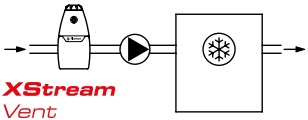
When installing a Flamco XStream Vent-Clean, we recommend placing it in the position of the Flamco XStream Vent shown in the schematic. Doing so will prevent the formation of corrosion and magnetite.

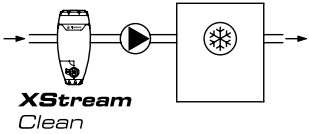
In cooling systems, the Flamco XStream Vent-Clean should be placed upstream of the system pump.

6.2 Heating systems



6.3 Cooling systems





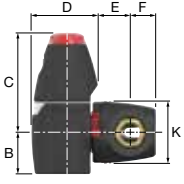
7 Warranty statement

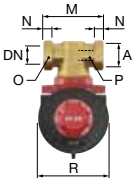
The Flamco brand is synonymous with quality, and it is with this in mind that we offer a 15-year warranty on all XStream air and dirt separators*.

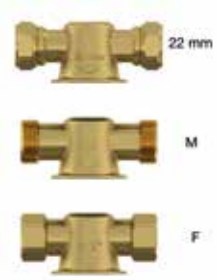
*Warranty subject to our normal terms and conditions.

8 Product range

8.1 Flamco XStream Vent

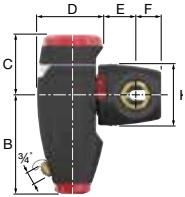


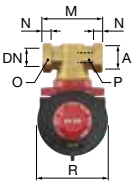


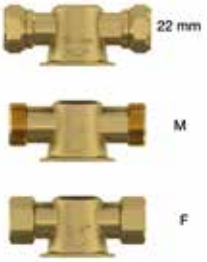


[DN]	Connec-tion	Art. no.	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	K [mm]	M [mm]	N [mm]	O [mm]	P [mm]	R [mm]
20	22 mm	11011	59	149	106	44	41	102	119	24	32	24	114
20	G¾"F	11001	59	149	106	44	41	102	100	14	32	-	114
20	G1"M	11021	59	149	106	44	41	102	100	13	-	27	114
25	G1"F	11002	76	181	121	53	45	114	110	16	41	-	130
25	G1¼"M	11022	76	181	121	53	45	114	110	14	-	34	130
32	G1¼"F	11003	76	181	125	57	48	114	110	18	50	-	130
40	G1½"F	11004	86	208	139	62	51	132	129	18	55	-	145
50	G2"F	11005	86	208	139	65	58	132	140	23	70	-	145

8.2 Flamco XStream Clean

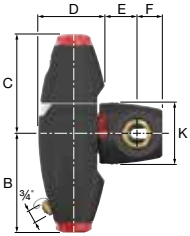


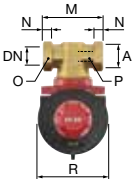


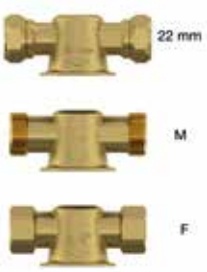


[DN]	Connec-tion	Art. no.	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	K [mm]	M [mm]	N [mm]	O [mm]	P [mm]	R [mm]
20	22 mm	11041	149	98	106	44	41	102	119	24	32	24	114
20	G¾"F	11031	149	98	106	44	41	102	100	14	32	-	114
20	G1"M	11051	149	98	106	44	41	102	100	13	-	27	114
25	G1"F	11032	181	110	121	53	45	114	110	16	41	-	130
25	G1¼"M	11052	181	110	121	53	45	114	110	14	-	34	130
32	G1¼"F	11033	181	110	125	57	48	114	110	18	50	-	130
40	G1½"F	11034	208	124	139	62	51	132	129	18	55	-	145
50	G2"F	11035	208	124	139	65	58	132	140	23	70	-	145

8.3 Flamco XStream Vent-Clean







[DN]	Connec-tion	Art. no.	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	K [mm]	M [mm]	N [mm]	O [mm]	P [mm]	R [mm]
20	22 mm	11071	149	149	106	44	41	102	119	24	32	24	114
20	G¾"F	11061	149	149	106	44	41	102	100	14	32	-	114
20	G1"M	11081	149	149	106	44	41	102	100	13	-	27	114
25	G1"F	11062	181	181	121	53	45	114	110	16	41	-	130
25	G1¼"M	11082	181	181	121	53	45	114	110	14	-	34	130
32	G1¼"F	11063	181	181	125	57	48	114	110	18	50	-	130
40	G1½"F	11064	208	208	139	62	51	132	129	18	55	-	145
50	G2"F	11065	208	208	139	65	58	132	140	23	70	-	145

Notes

Other Flamco products

Flexcon Premium Expansion

Flexconsole and Flexcontrol

Flexcon PA AutoFill

Prescor Safety Valve

Flexofit Water Hammer Arrestor

Prescor BFP Backflow Preventer

Simplex Design Thermostatic Head

Simplex Secos Manifold for Underfloor Heating

Meibes MeiFlow Top Pump Group

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