reflex

Thinking solutions.

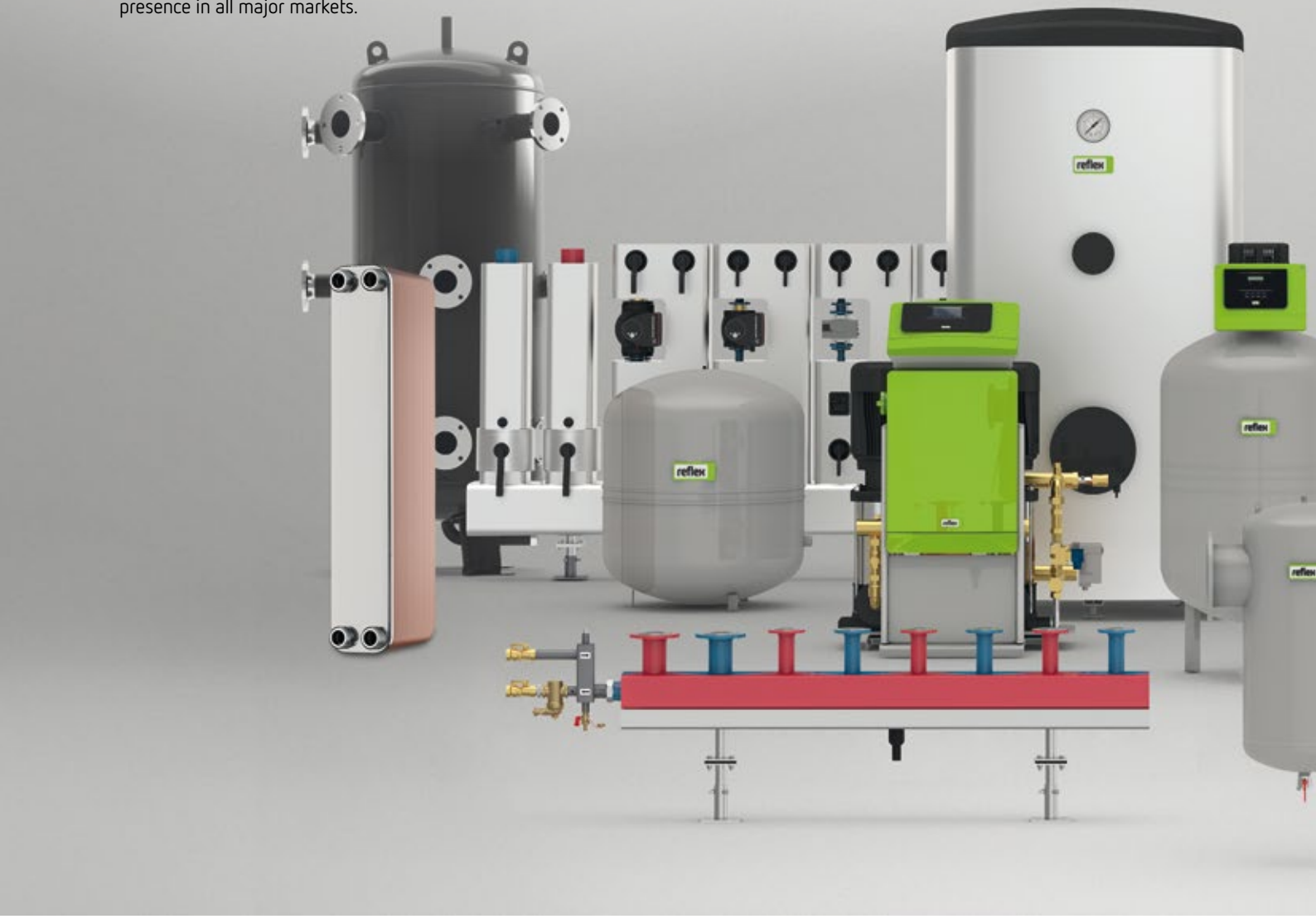
Water make-up systems & Water treatment technology

Fillset / Fillcontrol
Fillsoft

Reflex —
a powerful brand for decades

Reflex Winkelmann GmbH — part of the Building+Industry division — is a leading provider of high-quality heating and hot water supply technology systems. Under its Reflex brand, the company, which has its headquarters in Ahlen in the German region of Westphalia, develops, produces and sells not only diaphragm expansion vessels, but also innovative components and holistic solutions for pressure maintenance, water make-up, degassing and water treatment, storage water heaters and plate heat exchangers, as well as hydraulic manifold and tank components. Reflex Winkelmann GmbH has over 2,000 employees worldwide, giving it an international presence in all major markets.

With its energy-efficient and sustainable products, the company is already doing its bit to help the environment, as evidenced by its commitment to sustainability and the climate policy goals agreed by the German Federal Government. This support is built on proven technologies and future-oriented innovations. What's more, Reflex Winkelmann GmbH works together with others as equals, always maintains its focus on the customer and offers additional services such as its own factory service centre fleet and a comprehensive range of training options.



Contents

Our configuration software

Reflex Solutions **Pro**
rsp.reflex.de/en

→ Read more on page 32

Reflex City

Water make-up systems & water treatment technology
Living, shopping, working and producing: city-life means diversity. Supply technology requirements are as individual as the buildings themselves. Reflex offers products and solutions for any size and complexity ranging from a 5 kW system in a detached home or a safety-related cooling system in a computer centre. This is reflected in the Reflex City concept.

A heat transfer medium needs to be constantly available at a sufficient quantity and quality no matter what the size of the system. Local requirements such as water quality also need consideration. Reflex water make-up and water treatment technologies put you always on the safe side.

Water make-up & water treatment

A heat transfer medium needs to be constantly available at a sufficient quantity and quality. This is required in heating and cold water systems to achieve optimal heat transport with minimal loss during transfer. Reflex water make-up systems unite the three functions of system separation, water treatment and water make-up monitoring.

System separation

Water treatment

Capacity monitoring

Water make-up

Insufficient water in heating and cooling systems impairs functioning of the pressure maintenance being used. This can result in air inclusion, massive circulation faults, cavitation at the circulating pumps and, in the worst case, total failure of the system. Water make-up systems according to EN 12828 are therefore recommended which also act as pressure control devices. With its Fillcontrol series, Reflex provides a wide range of solutions for the long-term stable operation of a wide variety of system types.

- ✔ **Avoids insufficient water and thereby**
- ✔ **Prevents air problems**
- ✔ **The system separation required for potable water supply systems and DIN EN 1717 compliant**

Water treatment

Modern boilers are expected to withstand constantly increasing heating surface loads leading to an increased the risk of deposits, especially limescale. Performance is then reduced and, in the worst case, boilers can become irreparably damaged. To prevent this, Reflex Fillsoft offers a water treatment programme which treats filling and water make-up water according to standards. Reflex recommends Fillsoft for any water make-up system because it significantly contributes to system safety and requires little effort.

- ✔ **Ensures VDI 2035-compliant water quality**
- ✔ **Prevents scaling and corrosion**
- ✔ **Reduces silting in pipelines, pumps and fittings**
- ✔ **Reduces energy consumption**

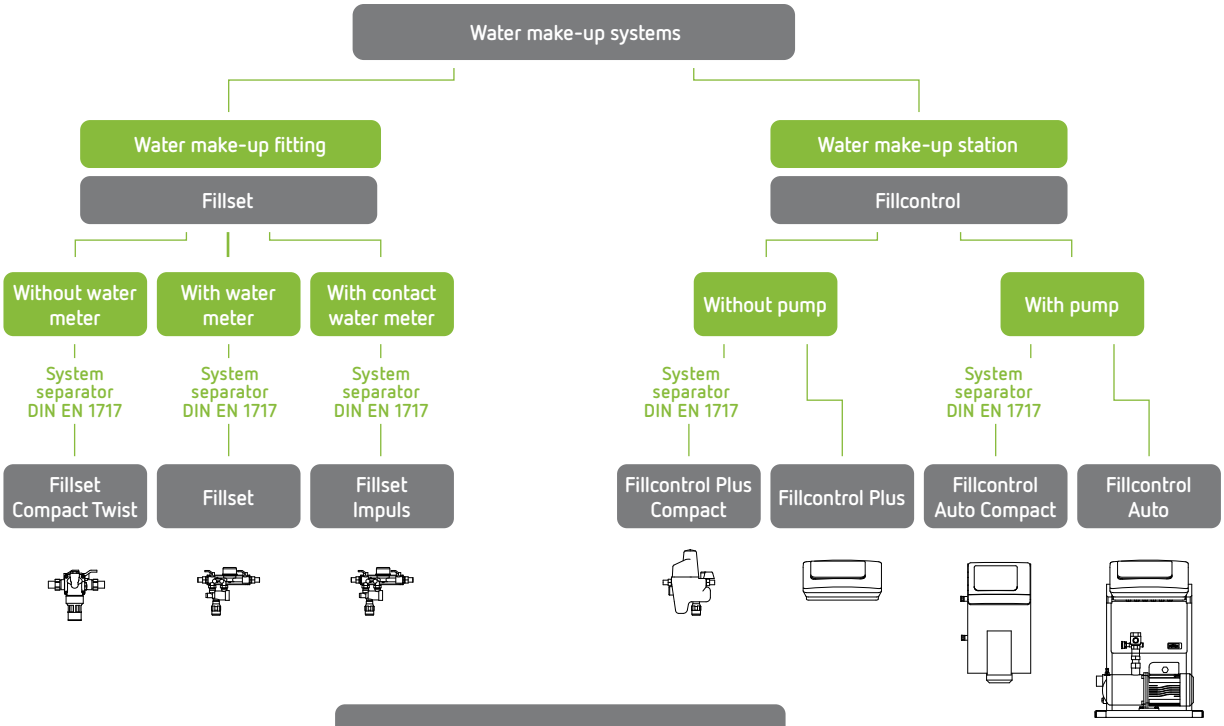
DIN EN 1717:

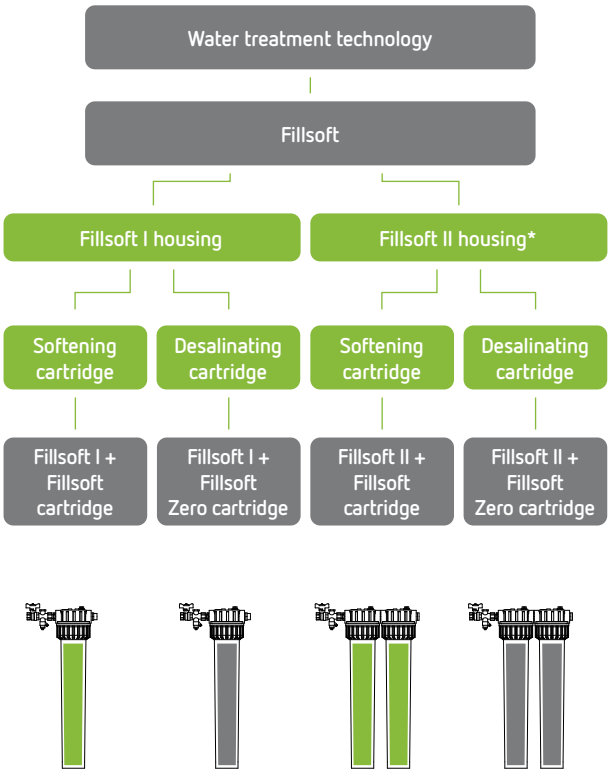
Protection against contamination in potable water systems and general requirements on safety equipment to prevent backflow contamination.
German version EN 1717:2000 Technical regulation from the DVGW

Directive of Association of German Engineers (VDI) 2035 Sheet 1:

"Prevention of damage from scaling in hot-water heating and water heating systems" and "Prevention of damage in hot water heating systems, heated-water corrosion"

Reflex water make-up systems & water treatment technology



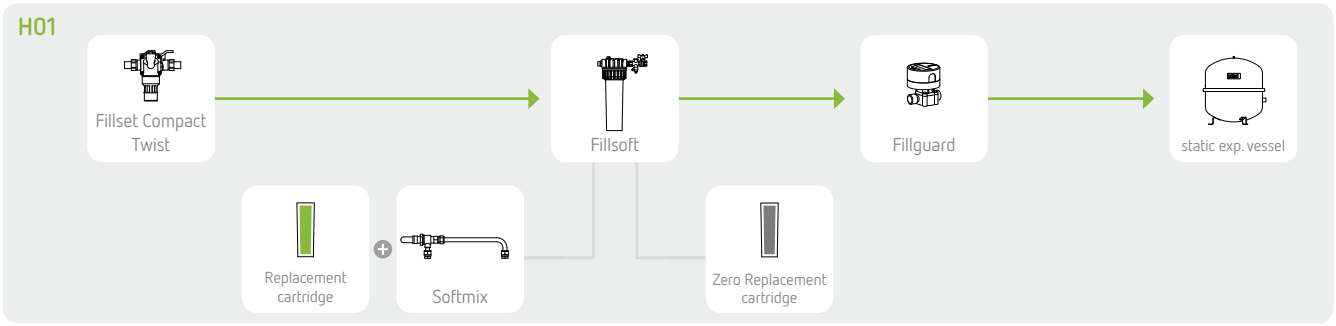


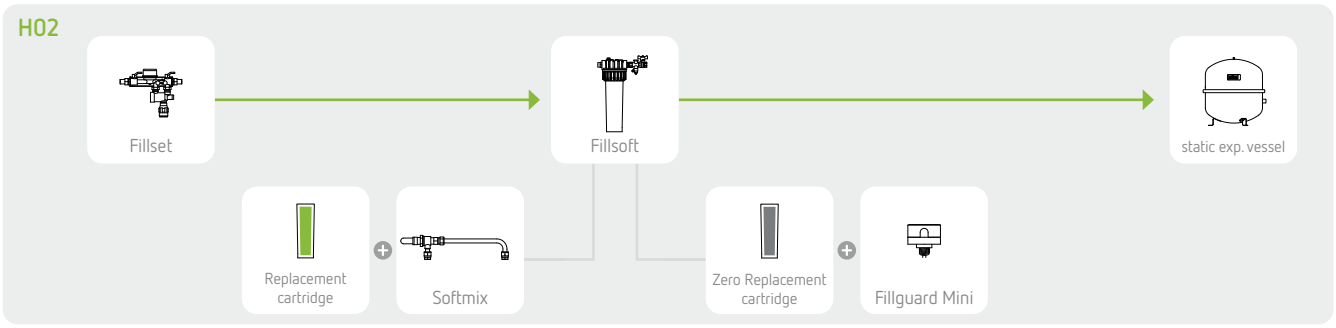
*Note: A combination of 1 softening and 1 desalinating cartridge is not possible when using Fillsoft II.

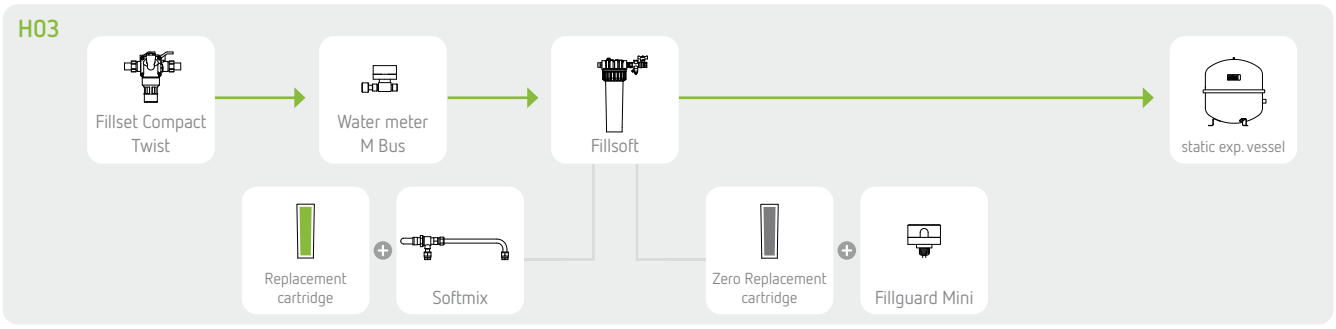
Options for application & combinations

Combining Fillcontrol water make-up systems with Fillsoft water treatment technology is as obvious as it is practical. Which combinations are specifically recommended depend on the system being planned. Example systems are presented in the following to show combinations and possible range of functions.

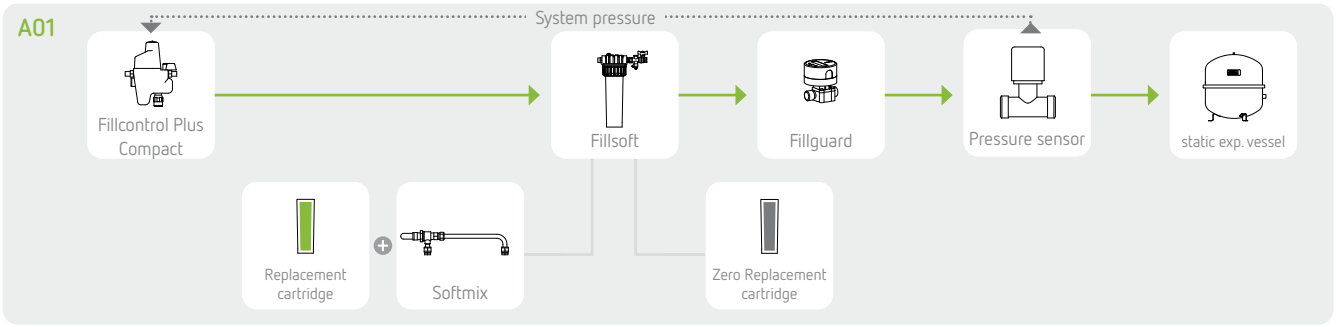
Manual water make-up

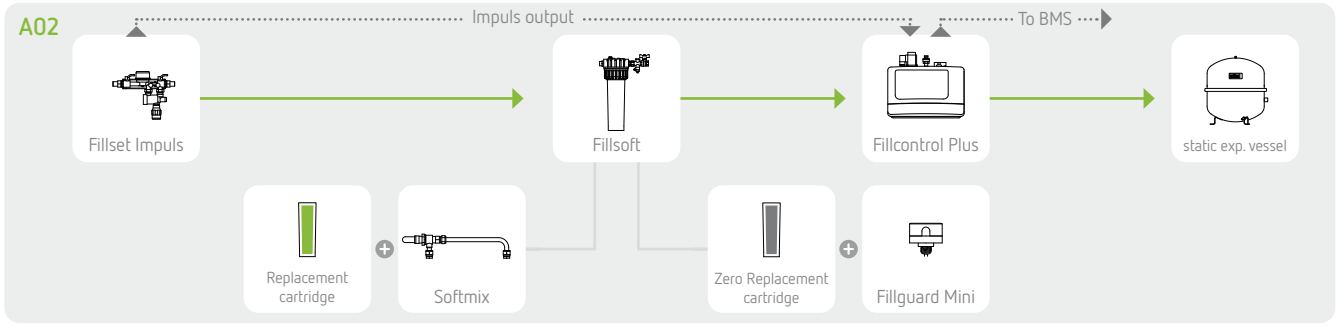


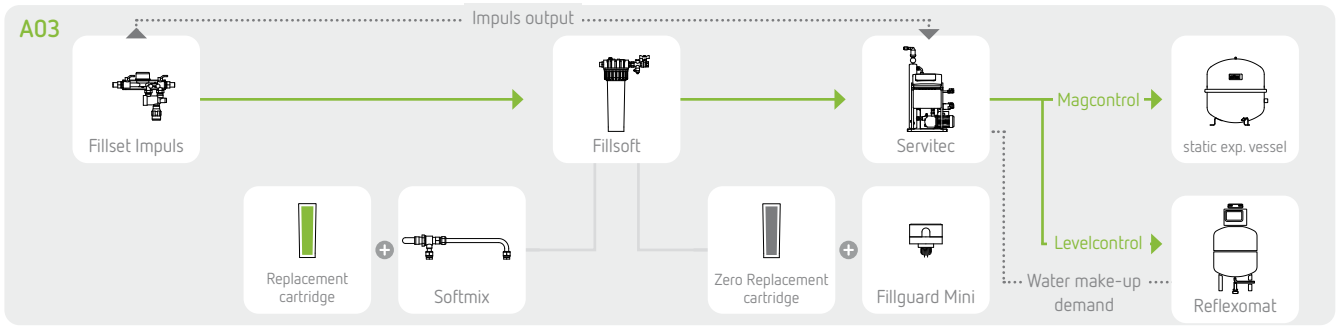


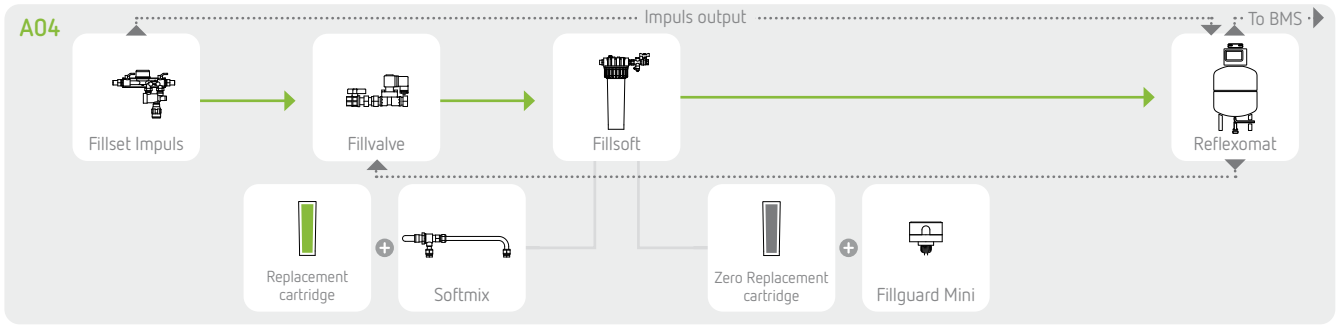


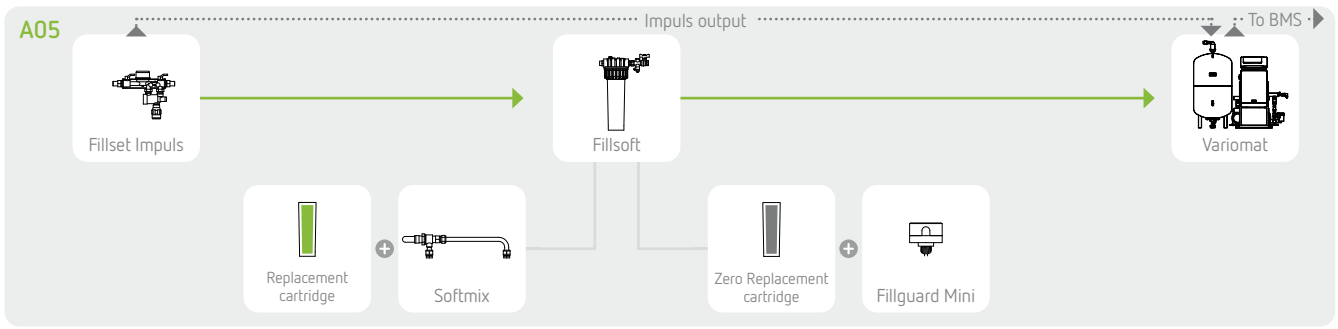
Automatic water make-up

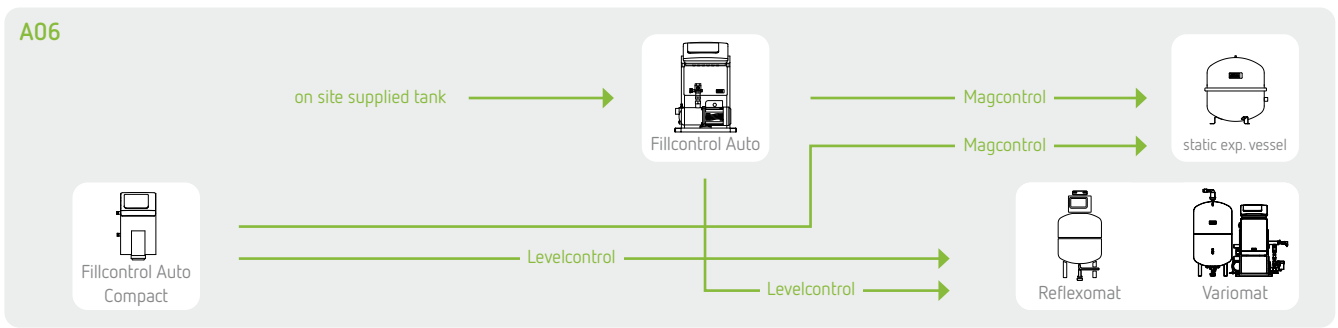



A02
Impuls output
To BMS
Fillset Impuls
Fillsoft
Fillcontrol Plus
static exp. vessel
Replacement cartridge
Softmix
Zero Replacement cartridge
Fillguard Mini


A03
Impuls output
Fillset Impuls
Fillsoft
Servitec
Magcontrol
static exp. vessel
Levelcontrol
Water make-up demand
Reflexomat
Replacement cartridge
Softmix
Zero Replacement cartridge
Fillguard Mini


A04
Impuls output
To BMS
Fillset Impuls
Fillvalve
Fillsoft
Reflexomat
Replacement cartridge
Softmix
Zero Replacement cartridge
Fillguard Mini


A05
Impuls output
To BMS
Fillset Impuls
Fillsoft
Variomat
Replacement cartridge
Softmix
Zero Replacement cartridge
Fillguard Mini

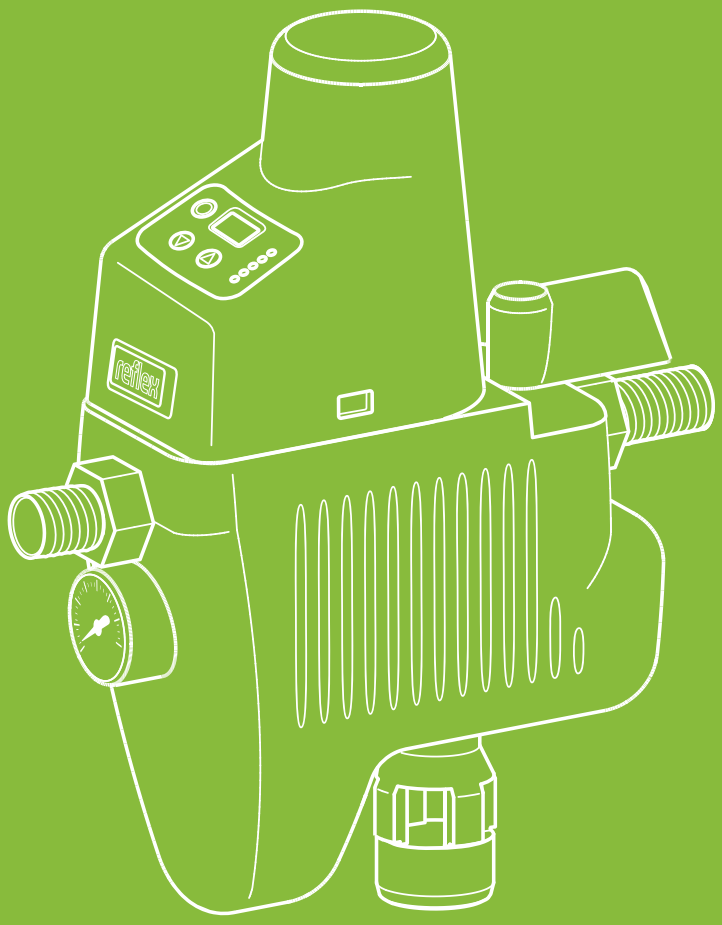

A06
on site supplied tank
Fillcontrol Auto
Magcontrol
Magcontrol
static exp. vessel
Fillcontrol Auto Compact
Levelcontrol
Levelcontrol
Reflexomat
Variomat

Fillset & Fillcontrol

Key advantages

Solutions for every requirement

- Monitoring system pressure and water make-up for insufficient pressure
- Reliably preventing air problems by a sufficient water seal in the expansion vessel
- Fulfilling requirements for a safe water make-up from potable water supply systems in accordance with DIN EN 1717 and DIN 1988
- Version with water meter and impulse output available; combinable with all Reflex Control controllers, and simultaneously evaluates total water make-up quantities / controls capacity from a Fillsoft water treatment fitting



Function, application, construction

Fillset system separation & manual water make-up

DIN EN 1717

Fillset water make-up fittings provide DIN EN 1717 compliant system separation to enable heating or cooling water systems to be connected to potable water systems. Fillset can be used directly for manual water make-up or installed upstream from automatic solutions such as the Fillcontrol Auto.

- Flow rate: 0.8 m^3/h
- Permissible operating temperature: 60 °C
- Permissible operating pressure: 10 bar

Function

Manual water make-up is performed by hand by opening and closing the shut-off. When combined with automatic water make-up systems, the shut-off is permanently open. When a contact water meter is used, it is wired to the Reflex controller which calculates the required water make-up quantities.

Application

Can be used for direct manual water make-up or as an upstream system separator for automatic water make-up systems.

Fillset Compact Twist

- Particularly space-saving, basic variant without water meter
- System separator according to DIN 1988-100 or DIN EN 1717 (BA), with integrated dirt trap

Fillset

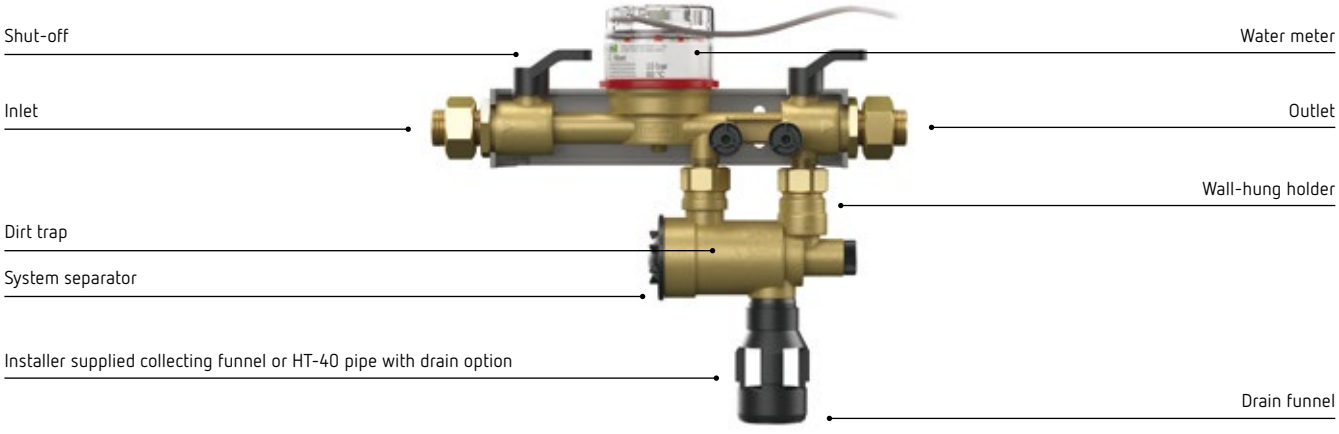
- With integrated water meter for monitoring water make-up quantities
- System separator according to DIN 1988-100 or DIN EN 1717 (BA), with integrated dirt trap

Fillset Impuls

- With contact water meter, which can be evaluated by all Reflex Control controllers
- System separator according to DIN 1988-100 or DIN EN 1717 (BA), with integrated dirt trap

Construction

Construction of a water make-up fitting based on the Fillset Impuls



Fillcontrol water make-up station **without pump**

Function

Water make-up takes place using the pressure of the fresh water system. If the pressure falls below the initial pressure or the filling pressure at the pressure sensor, the water make-up control valve opens and allows fresh water to flow into the system.

Application

- For pressure-dependent, water make-up in systems with expansion vessels
- The inlet pressure p must be at least 1.3 bar above the system's minimum operating pressure (p_0), otherwise a Fillcontrol with pump needs to be used.

Fillcontrol Plus Compact

The compact solution for small systems with an expansion vessel. It has a DIN EN 1717 compliant system separator already integrated, and the controller functions fully independently via an integrated system pressure sensor.

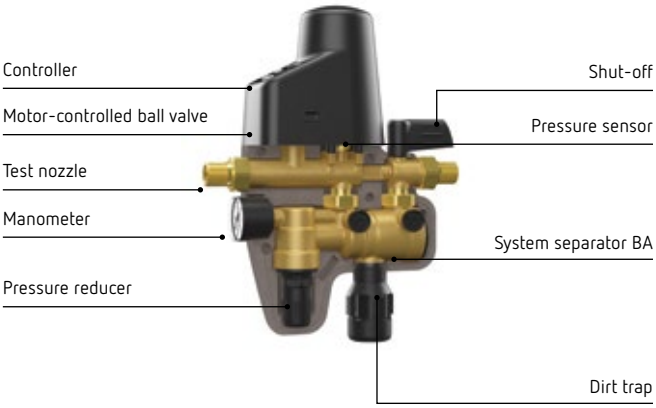
- Flow rate: 0.4 m^3/h
- Permissible operating temperature: 70 °C
- Permissible operating pressure: 10 bar

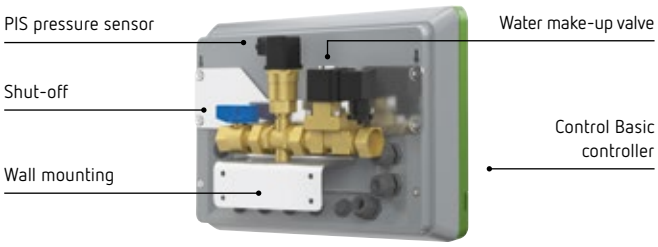
Fillcontrol Plus

The Fillcontrol Plus provides the full operating range of the Reflex Control Basic controller including for small systems. It can be operated as both pressure- and level-dependent. System separation to potable water supply systems requires an upstream Fillset connection.

- Flow rate: 1.4 m^3/h
- Permissible operating temperature: 90 °C
- Permissible operating pressure: 10 bar

Construction





Fillcontrol water make-up station **with pump**

Function

The pressure generated by the pump enables water make-up in systems with minimum operating pressures (p_0) of up to around 7 bar. When operated with an expansion vessel, the water make-up control valve opens when the filling pressure at the pressure sensor is insufficient — as in a system without a pump. When operated with a pressure maintenance station, insufficient fill-levels in the expansion vessel ensures the control valve opens.

Application

- For pressure-dependent make-up with expansion vessels as well as for level-dependent make-up with pressure maintenance stations
- Used when the fresh water supply pressure is too low for direct feeding without a pump, or when an intermediate tank is required to separate the system from the potable water supply system
- The flow rate is not suitable for filling systems

Fillcontrol Auto Compact

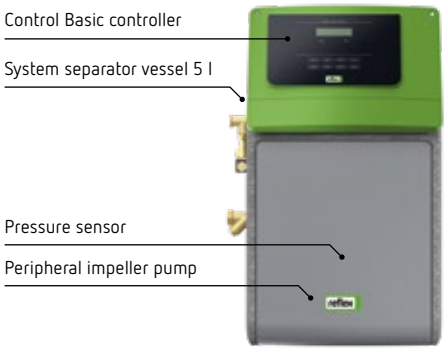
The Fillcontrol Auto Compact works fully independently from the pressure in a fresh water network. It can be operated as both pressure- and level-dependent with the relevant setting easily made via the Control controller. For level-dependent operation, the pressure maintenance station and water make-up are directly connected together via the controller. The Fillcontrol Auto can be directly connected to the potable water supply system according to DIN 1988 thanks to the integrated system separator vessel.

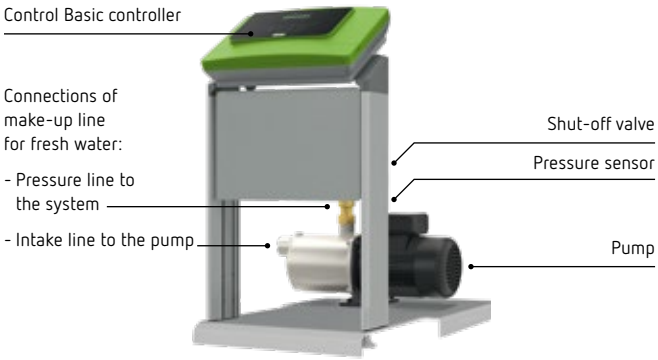
- Water make-up quantity: 0.12 – 0.18 m³/h
- Permissible operating temperature: 30 °C
- Permissible operating pressure: 10 bar
- Operating range: Up to 8.5 bar

Fillcontrol Auto (glycol-compatible)

For special applications, the Fillcontrol Auto is also available in a glycol-compatible variant. The range of functions corresponds to that of the Fillcontrol Auto but without a system separator vessel due to installer-supplied water make-up tanks generally being used, e.g. mixing tanks in solar systems.

- Water make-up quantity: ≤ 4 m³/h
- Permissible operating temperature: 70 °C
- Permissible operating pressure: 8 bar
- Operating range: Up to 5.5 bar





Fillset products

Fillset

Fillset

Technical Features

- Connection assembly for water make-up systems according to DIN 1988 and DIN EN 1717
- For direct connection to drinking water supply systems
- With DVGW-tested system separator of Type BA
- Isolating fixtures at inlet and outlet
- Incl. standard or contact water meter and wall-hung holder
- Minimal flow pressure p_0+1.3 bar
- Max. operating pressure 10 bar
- Max. operating temperature 60 °C

	Type	Art. No.	Connection inlet/outlet	Flow rate k_{vs} [m³/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 60 °C	Standard 0.8	6811105	R ½" / R ½"	0.8	226	293	110	1.70
	Impuls 0.8	6811205	R ½" / R ½"	0.8	226	293	110	2.80

Fillset Compact Twist

Fillset Compact Twist

Technical Features

- Connection assembly for water make-up systems according to DIN 1988 and DIN EN 1717
- For direct connection to drinking water supply systems
- With DVGW-tested system separator of Type BA
- Isolating fixtures at inlet and outlet
- Without water meter or with M-Bus water meter
- Variable rotation (non-ratcheting) by hand
- Minimal flow pressure p_0+1.5 bar
- Max. operating pressure 10 bar
- Max. operating temperature 65 °C

	Type	Art. No.	Connection inlet/outlet	Flow rate k_{vs} [m³/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 65 °C	Compact Twist	6811805	R ½" / R ½"	0.86	157	175	117	2.42
	Compact Twist M-Bus	6811855	R ½" / R ½"	0.86	157	175	117	2.42

Fillcontrol products

Fillcontrol Plus

Fillcontrol Plus

Technical Features

- For monitoring xxpansion vessels and automatic water make-up of the specified supply pressure
- Incl. wall-hung holder and Control Basic control unit
- Also available in stainless steel
- RS-485 interface, optional connection of bus and expansion modules
- Capacity monitoring of a Fillsoft water treatment system possible
- Connection voltage 230 V / 50 Hz
- Minimal flow pressure p_0 + 1.3
- Permissible maximum inlet pressure 10 bar
- Max. operating pressure 10 bar
- Max. operating temperature 90 °C

	Type	Art. No.	Connection inlet/outlet	Flow rate k_{vs} [m³/h]	Flow rate k_{vs} with Fillset [m³/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 90 °C	Plus 1.4	8812100	G ¾" / G ½"	1.4	0.7	292	340	270	2.50
	Plus 1.4 E	8812200	G ¾" / G ½"	1.4	0.7	320	340	270	2.50
Commissioning									
–	Fillcontrol Plus	7945723	–	–	–	–	–	–	–

Fillcontrol Plus Compact

Fillcontrol Plus Compact

Fillcontrol Plus Compact Detail

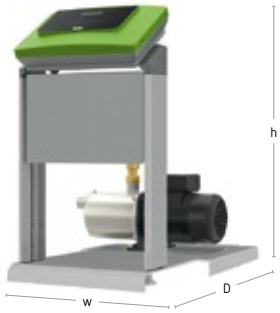
Technical Features

- Compact automatic water make-up station, suitable for systems with a membrane expansion vessel according to DIN 1988 and DIN EN 1717
- With DVGW-tested system separator of Type BA
- Controlled water make-up
- Connection voltage 230 V / 50 Hz
- Water make-up capacity approx. 0.5 m^3/h at Δp = 1.5 bar
- Minimal flow pressure p_0 + 1,3
- Permissible maximum inlet pressure 10 bar
- Max. operating temperature 70 °C

	Type	Art. No.	Output pressure [bar]	Connection inlet / outlet	Flow rate k_{vs} [m^3/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 70 °C	Plus Compact	6811500	0.5 – 5.0 bar	R ½" / R ½"	0.4	304	240	90	3.00

External pressure sensor FE can be found under accessories

Fillcontrol Auto



Fillcontrol Auto

Technical Features

- Automatic make-up system with integrated pump
- Fillcontrol Auto for water make-up, e.g. from containers or conditioning systems
- Systems equipped with Control Basic for easy operation
- RS-485 interface, optional connection of bus and expansion modules
- Fillcontrol Auto suitable for applications with max. 50% anti-freeze
- Permissible maximum inlet pressure 10 bar
- Max. operating pressure 10 bar
- Maximum delivery pressure 5.5 bar
- Minimal supply rate 360 l/h
- Max. operating temperature 70 °C

	Type	Art. No.	Connection inlet/outlet	Delivery rate [m³/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 70 °C	Auto 5.5	8812300	G 1 ¼"/G1"	4.2	683	471	440	18.60

Fillcontrol Auto Compact

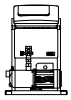
Fillcontrol Auto Compact

Technical Features

- Automatic make-up system with integrated pump
- Fillcontrol Auto for water make-up, e.g. from containers or conditioning systems
- Systems equipped with Control Basic for easy operation
- RS-485 interface, optional connection of bus and expansion modules
- Including system separation to DIN 1988 and DIN EN 1717
- Permissible maximum inlet pressure 10 bar
- Max. operating pressure 10 bar
- Maximum delivery pressure 8.5 bar
- Maximum inlet pressure 5,5 bar
- Minimal supply rate 360 l/h
- Max. operating temperature 30 °C

	Type	Art. No.	Connection inlet/outlet	Overflow connection	Delivery rate [m³/h]	Height h [mm]	Width w [mm]	Depth D [mm]	Weight [kg]
10 bar 30 °C	Auto Compact 8.5	8688500	G ⅜"/G ⅜"	DN32/PN16	0.12 – 0.18	619	579	287	19.10

Overview

	Water make-up fittings			Automatic water make-up systems		Automatic water make-up with pump	
							
	Fillset Compact Twist	**Fillset**	**Fillset Impuls**	**Fillcontrol Plus**	**Fillcontrol Plus Compact**	**Fillcontrol Auto Compact**	**Fillcontrol Auto**
DVGW-tested system separation	yes	yes	yes	no — upstream system separator installation	yes	System separator vessel	no — upstream system separator installation
K_{VS}	0.8 m³/h	0.8 m³/h	0.8 m³/h	1.4 m³/h	0.4 m³/h	0.12 – 0.18 m³/h	4.2 m³/h
Pump	–	–	–	–	–	8.5 bar	8.5 bar
Integrated shut-off	yes	yes	yes	yes	yes	yes	yes
Wall-hung holder		yes	yes	yes		yes	
Automatic water make-up				time, cycle, or total-quantity dependent		time, cycle, or total-quantity dependent	time, cycle, or total-quantity dependent
				Level control on pressure maintenance systems		Level control on pressure maintenance systems	Level control on pressure maintenance systems
				Magcontrol pressure-dependent	Magcontrol pressure-dependent	Magcontrol pressure-dependent	Magcontrol pressure-dependent
Fault message				yes	yes	yes	yes
Water meter		yes	Contact water meter				
Evaluation water softening				with contact water meter		with contact water meter	with contact water meter

Intelligent alternative
The Reflex Servitec vacuum spray pipe degassers and Variomat pressure maintenance stations have integrated, automatic make-up. Find out more in the corresponding product brochure or at **www.reflex-winkelmann.com/en**

Installation & commissioning

Pressure setting

System pressures are shown on a display and monitored in the controller. When falling below the supply pressure $p < p_0 + 0.3$ bar, controlled make-up takes place. Malfunctions such as burst pipes or leakages are shown and can be forwarded via a signal contact. Pressures immediately prior to make-up must be at least 1.3 bar above the inlet pressure of the expansion vessel. Make-up quantities V can be determined from the k_{VS} value.

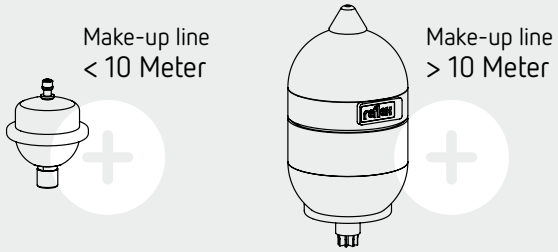
Minimum flow pressure $p \geq p_0^* + 1{,}3$ bar

Make-up quantity $\dot{V} \approx \sqrt{p^* - (p_0 + 0{,}3)} \times k_{VS}$

Note on make-up line

Depending on the length of the make-up line (after the system separator, system side), thermal expansion of the cold make-up water may cause fluctuations in volume.

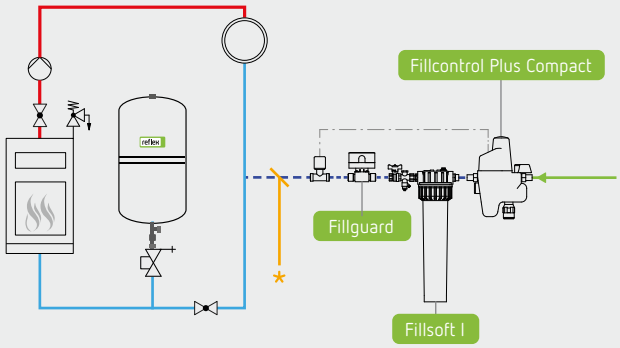
- If the length is less than 10 m, a Reflex water shock arrestor is to be used.
- From a length of 10 m, we recommend the use of a small reflex expansion vessel to guarantee reliable operation.



Integration

Reflex Fillcontrol Plus Compact

- The DVGW-tested system separator permits connection directly to potable water supply systems.
- An external pressure sensor must be included on the system side to measure the required make-up pressure.
- Water meter and electrical conductivity measure-ment of Fillsoft for softening and demineralisation is based on the flow rate from the Reflex Fillguard.

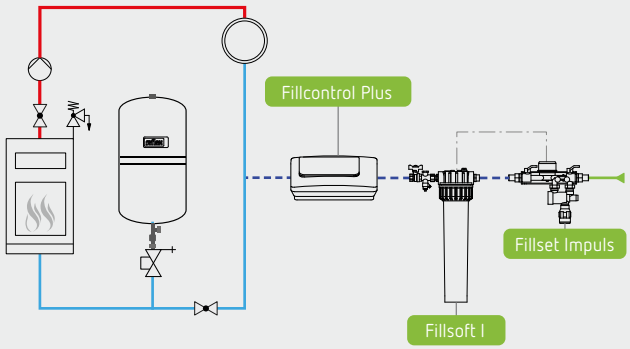


* DN 15 < 2 m connection pipe
DN 20 < 10 m connection pipe
DN 25 > 10 m connection pipe

The diagrams serve only as illustrations of the connections.
They are to be amended to local conditions and to be made more specific.

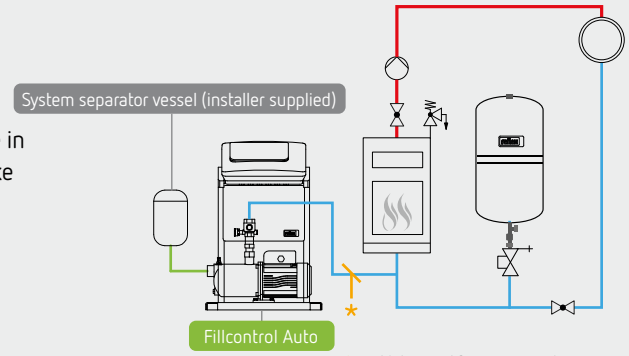
Reflex Fillcontrol Plus

- Connecting the Reflex Fillcontrol Plus to potable water supply systems requires upstream connection of a Reflex Fillset with a DVGW-tested system separator.
- The contact water meter from Fillset Impuls transmits filling and water make-up quantities to the Fillcontrol Plus controller.
- The make-up line therefore needs to be integrated into the system so that the safety valve on the system side provides pressure protection against excessive pressure from the potable water supply system. Alternatively, a pressure reducer with a safety valve must be installed in the make-up line.



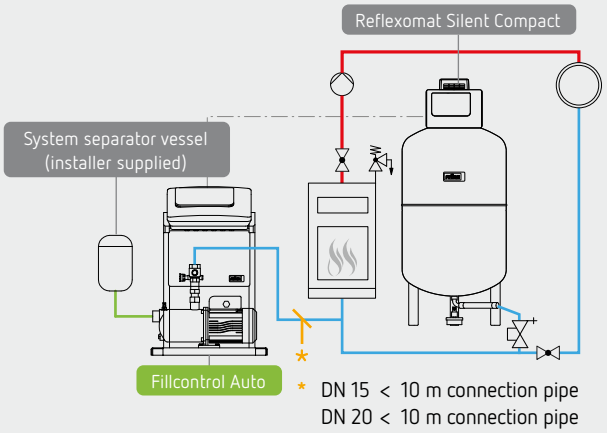
Reflex Fillcontrol Auto with pressure-dependent control in a system with an expansion vessel

- In systems with expansion vessels, Fillcontrol Auto is set to pressure-dependent control. Water make-up then takes place at insufficient filling pressure or supply pressure in the expansion vessel. Integrating the make-up line must take place near the expansion vessel.
- The connection pipes from the system separator vessel to the pump (intake line) and from the pump to the system (pressure line) are installer supplied.



Reflex Fillcontrol Auto with level-dependent control in a system with compressor pressure maintenance

- In systems with pump- or compressor-controlled pressure maintenance stations, Fillcontrol Auto is set to level-dependent control. Water make-up then takes place depending on the LS filling level in the pressure maintenance station's expansion vessel. A 230 V input is available for this purpose.
- The connection pipes from the system separator vessel to the pump (intake line) and from the pump to the system (pressure line) are installer supplied.



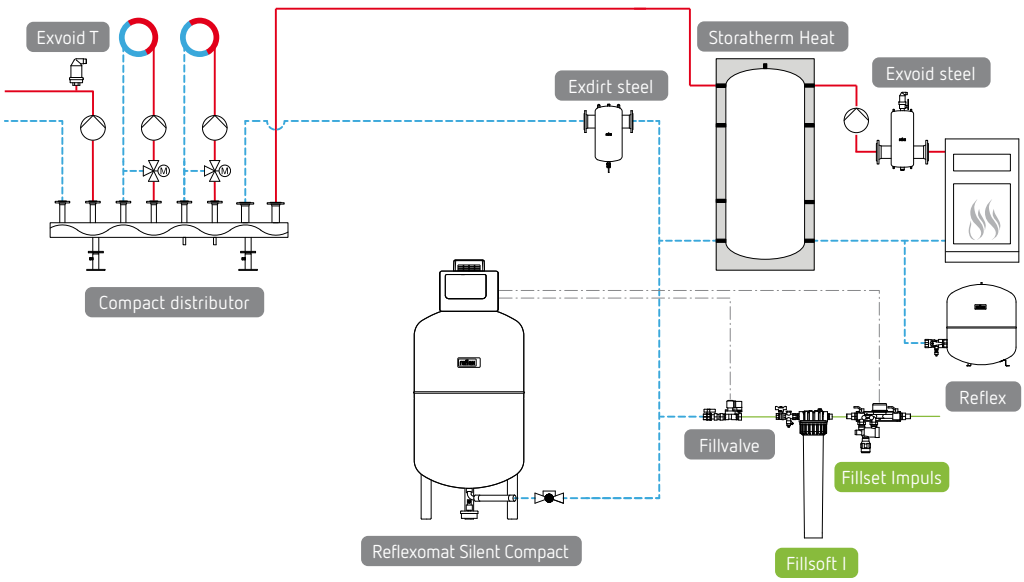
Installation examples

Solution № 05 Fillset Impuls and automatic make-up via Fillvalve

Reflexomat pressure maintenance stations are equipped with a logic integrated in the Reflex Control controller for softening and make-up.

An upstream solenoid valve with ball valve (Fillvalve) integrated in the controller is sufficient as a make-up control valve.

Further information can be found in the brochure on "pressurisation systems".

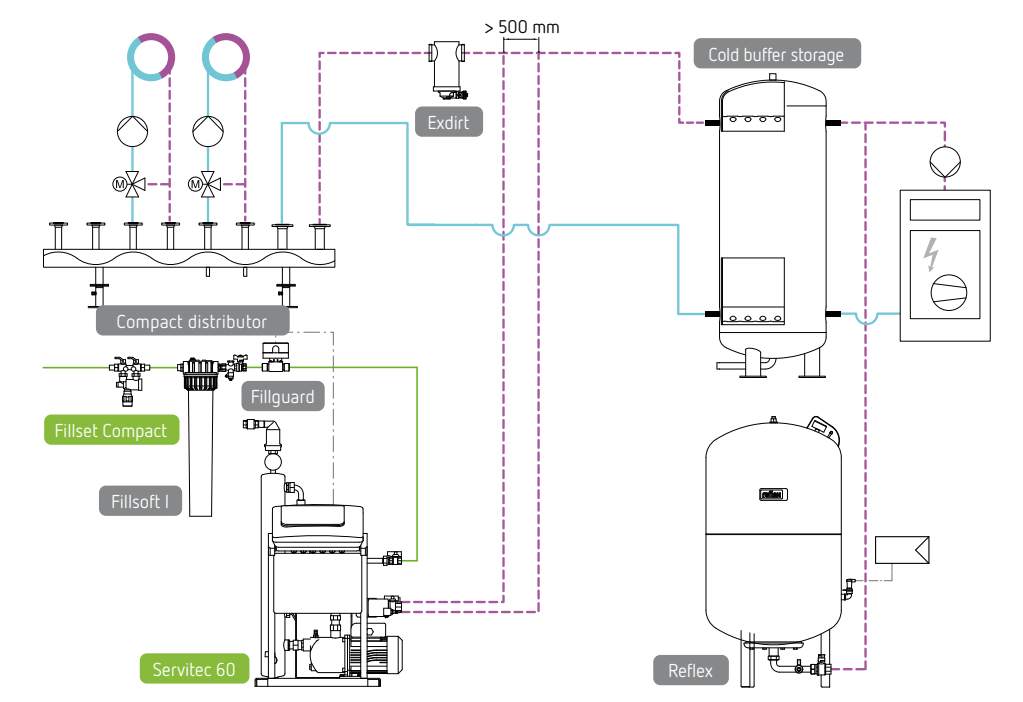


Solution № 16 Automatic make-up via Servitec

Automatic make-up takes place via the Servitec vacuum spray-tube degassing system.

Fillset Impuls acts as a system separator to the potable water supply system. The contact water meter for determining filling and make-up quantities is connected with the Servitec controller and evaluated by it.

Further information can be found in the brochure on "vacuum spray-tube degassing".



The diagrams serve only as illustrations of the connections.
They are to be amended to local conditions and to be made more specific.

Fillsoft

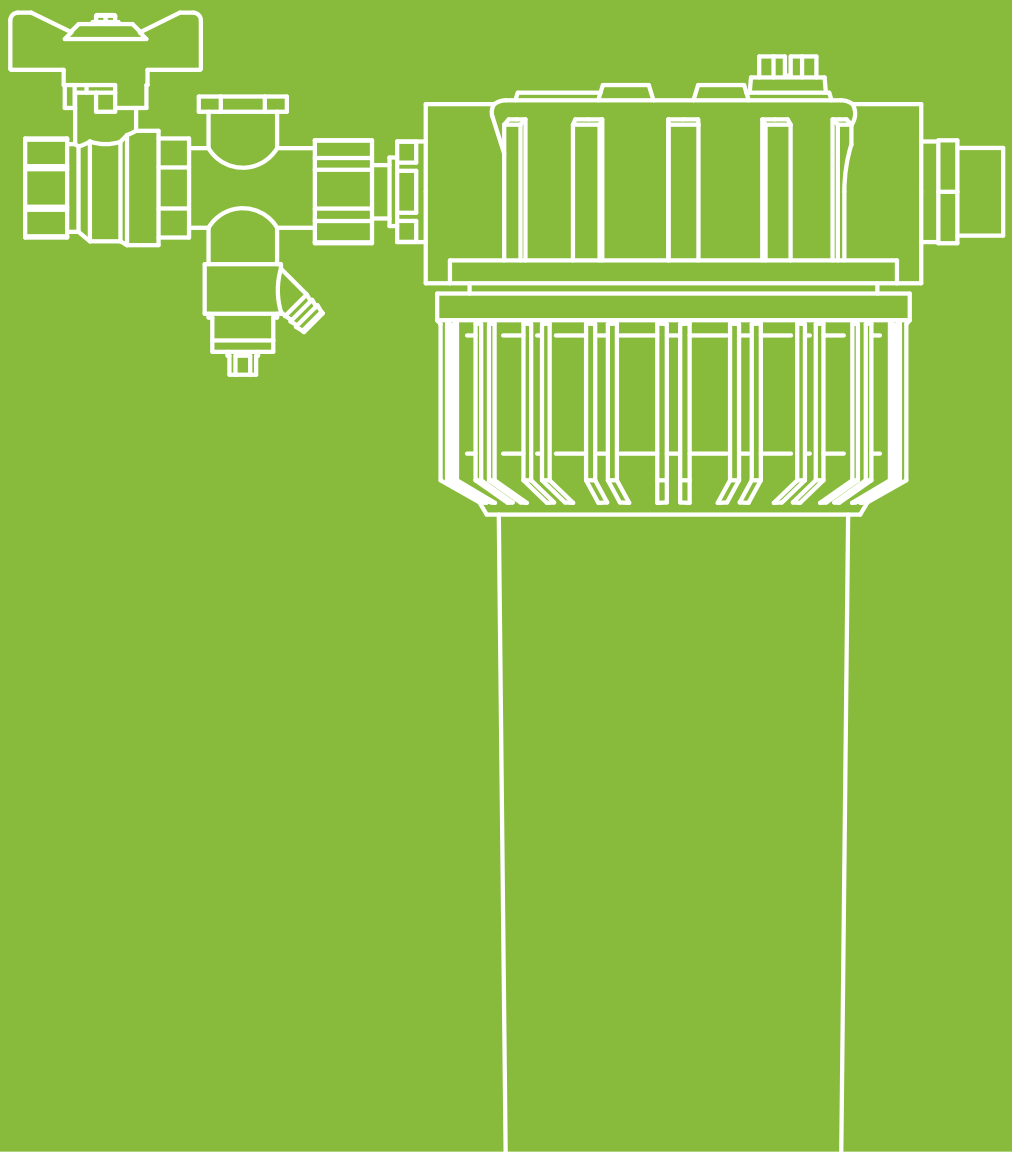
Key advantages

Fillsoft softening

- Sustainable system protection and energy saving through the reduction of limescale deposits
- VDI 2035 compliant
- Prevents thermal and mechanical overloading
- Simple and compact assembly as well as easy handling due to simple cartridge changing
- Low acquisition costs for extra system safety

Fillsoft demineralisation

- Reduces limestone deposits and corrosion from chlorides, sulphates, nitrates, phosphates
- VDI 2035 compliant
- Efficient heat transfer and reduced silting of system components
- Easy capacity monitoring using Reflex Fillguard

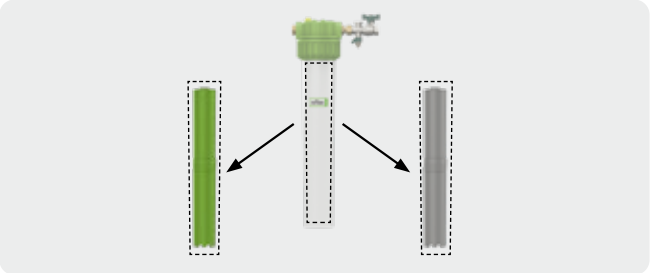


Construction, function & application

Fillsoft construction

The Fillsoft housing accepts either a softening (Fillsoft) or a demineralisation cartridge (Fillsoft Zero) and complements all Reflex make-up systems so that filling and top-up water is fed, controlled and treated, into the system.

With the aid of a highly efficient Na-ion exchanger, the requirements of VDI 2035 Sheet 1 "Prevention of damage in hot water heating systems" are met.



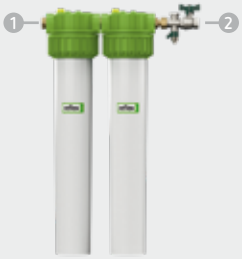
Fillsoft

Fillsoft housing

Fillsoft I

or

Fillsoft II



+

Fillsoft cartridge

Softening cartridge

or

Desalinating cartridge

1 Connections for fresh water and filling/make-up water
2 Shut-off ball valve with test valve on the make-up side

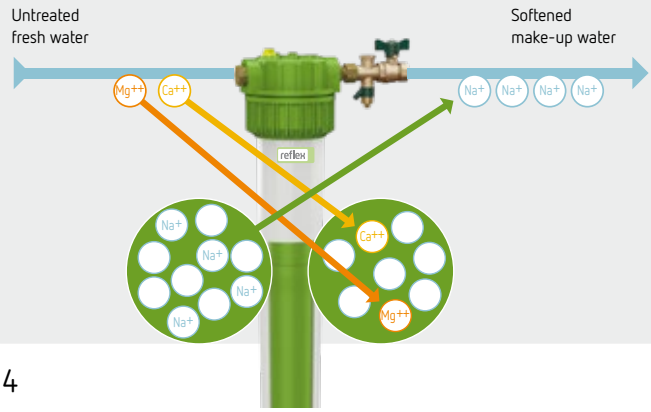
Softening with Fillsoft
Prevents scaling up to a total hardness ≈ 0 °dH

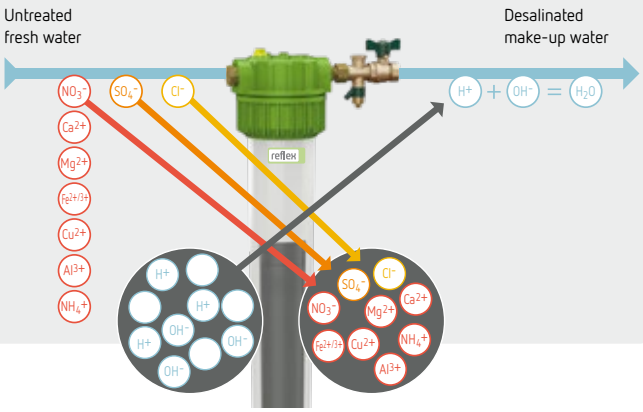
Demineralisation with Fillsoft Zero
Prevents scaling and corrosion up to an electrical conductivity of 10 µS/cm.

Functionality

Water softening with Fillsoft
Softening (reduction of water hardness, °dH) takes place according to the cation exchange principle. Hard fresh water is fed over an exchanger column. Hardness-forming magnesium and calcium ions are replaced by sodium ions from resin beads and the water becomes soft. When the sodium ions are depleted, the cartridge requires replacement. pH values and conductivity are not affected by the process.

Demineralisation with Fillsoft Zero
Demineralisation is carried out according to the principle of cation and anion exchange. Fillsoft Zero enables demineralization of filling and top-up water. All minerals are absorbed by the cartridge. If conductivity, and thus the number of ions, increases, the cartridge's capacity decreases and the cartridge requires replacement. Conductivity can be read from the Fillguard.





Fillsoft — application

When is **softening** necessary?

Problem

- Scale formation

Objective

- Prevention of scale formation in heat generation systems (boilers and heat exchangers) to protect against limescale deposits

Area of application

- In small and medium-sized heating and cooling water systems

Basis for assessment

- Overall regional water hardness
- Thresholds based on system size and according to VDI 2035 norm
- Information from heat generator manufacturers and system operators who may have their own requirements for filling and top-up water

Compliance with guidelines

- VDI 2035 Part 1 (formerly VDI 2035 Part 1)

VDI 2035 guidelines

Overall water hardness (according to table)

- Recommended thresholds for overall water hardness according to VDI 2035 (Part 1)

		Limits for total hardness [°dH] as a function of the spec. system volume V_A according to VDI 2035 T1*		
Group	Total heat output	< 20 l/kW	≥ 20 l/kW and < 40 l/kW	≥ 40 l/kW
1	< 50 kW	≤ 16.8 °dH**	≤ 8.4 °dH	< 0.3 °dH
2	50 kW – 200 kW	≤ 11.2 °dH	≤ 5.6 °dH	< 0.3 °dH
3	200 kW – 600 kW	≤ 8.4 °dH	≤ 0.3 °dH	< 0.3 °dH
4	> 600 kW	≤ 0.3 °dH	< 0.3 °dH	< 0.3 °dH

* Spec. system volume V_A [l/kW] = system vol./smallest individual heating capacity
** for circulating water heaters and systems with electric heating elements

Determining water status

- Water hardness can be obtained from local supply companies or determined using the Reflex hardness measuring set.

When is it necessary to **demineralise**?

Problem

- Scale formation and water-side corrosion

Objective

- Prevention of scale formation and corrosion to reduce the interaction of different materials, such as limescale deposits and siltation of tubelines, pumps and fittings

Area of application

- In small and medium-sized heating and cooling water systems
- When aluminium materials are used in heat generators or in systems with special water requirements softened water is usually insufficient and low-salt operation is required, instead

Basis for assessment

- Water conductivity (through correlation iteratively also water hardness; exact values only via conductivity measurement)
- Low- or high-salt operation according to VDI 2035 norm
- Information from heat generator manufacturers and system operators who may have their own requirements for filling and top-up water

Compliance with guidelines

- VDI 2035 Part 1 (formerly VDI 2035 Part 1 and 2)

VDI 2035 guidelines

Conductivity

- Conductivity of < 100 µS/cm is required
- Some manufacturers require that make-up water be demineralised to < 10 µS/cm

Conductivity values for heating water

	Low salinity	Saline
Electric conductivity at 25 °C	< 100 µS/cm	100 – 1,500 µS/cm
Appearance	Appearance free of sedimenting substances	
pH value at 25 °C	8.2 – 10.0	
Oxygen	< 0.1 mg/l	< 0.02 mg/l

Determining water status

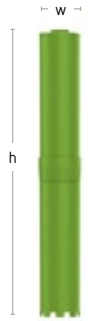
- Conductivity defines the total salt content (or the total amount of minerals in the water) and is easy to measure using a conductivity sensor or Reflex Fillguard.

Fillsoft products

Fillsoft CE

Fillsoft I housing

Fillsoft II Housing



Fillsoft cartridge

Fillsoft Zero cartridge

Technical Features

- Water treatment fitting for heating water make-up according to VDI 2035
- Fillsoft softening (green) cartridge capacity 6,000 l × °dH
- Fillsoft demineralisation (grey) cartridge capacity 3,000 l × °dH
- Including monting materials
- Max. operating pressure 8 bar
- Max. operating temperature 40 °C

	Type	Art. No.	PQ [pce]	Colour	Capacity* [l × °dH]	Cartridge slots [St.]	max. continous flow rate [l/h]	Connection inlet/outlet	Height h [mm]	Width w [mm]	Weight [kg]
Fillsoft housing											
8 bar 40 °C	FG I	9125660	80	–	–	1	360	Rp ½" / Rp ½"	600	260	1.90
	FG II	9125661	32	–	–	2	360	Rp ½" / Rp ½"	600	380	3.60
Fillsoft cartridges											
8 bar 40 °C	FSP 6000	6811800	100	green	6,000	–	–	–	513	–	1.50
	FZP 3000	9125662	100	grey	3,000	–	–	–	513	–	1.50

* Use of two cartridges doubles the capacity

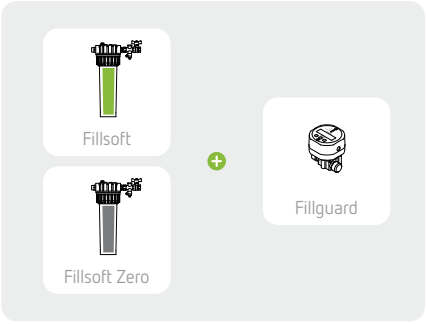
⊕ Accessories Fillsoft & Fillsoft Zero

Fillguard

The Fillguard continuously measures the capacity and/or conductivity of Fillsoft softening and demineralising. The light signal switches on if too high.

- All in one combination of water meter and electrical conductivity measurement for monitoring softening or demineralisation via Fillsoft or Fillsoft Zero
- Continuous capacitance and/or conductivity measurement
- Light signal upon exceeding
- Simple and flexible installation
- Rotatable display
- Can be connected to Servitec S and Servitec Touch control unit

For Fillsoft or Fillsoft Zero

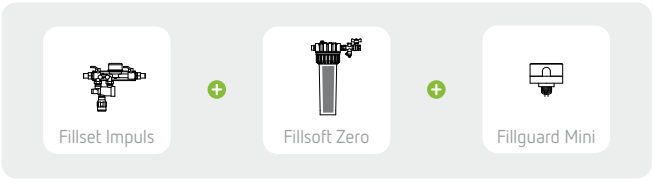


Fillguard Mini

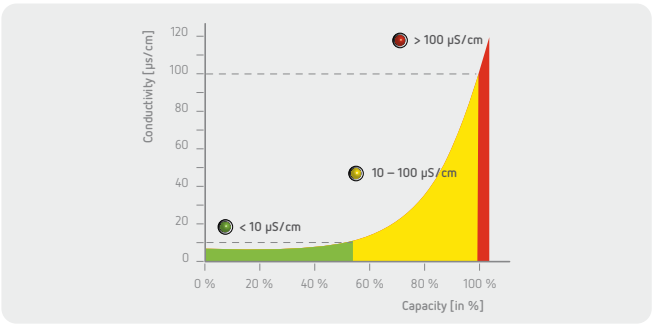
The Fillguard Mini is a conductivity measuring cell to monitor the capacity of the "Fillsoft Zero" demineralisation process and is installed directly on top of the cartridge of the Fillsoft Zero.

- Is delivered as a fully functional device and is immediately ready for use
- Continuously measures the conductivity of the make-up water
- A display with three LEDs indicates the conductivity range and, depending on the required conductivity, the threshold value can be read off
- According to VDI 2035, any conductivity less than 100 µS/cm is considered as low-salt operation
- Cartridges should be replaced once the conductivity has reached 100 µS/cm but in any event, no later than after 18 months
- The battery is designed for 10 years' operation

For Fillsoft Zero in combination with Fillset Impuls



Conductivity display from the Fillguard Mini

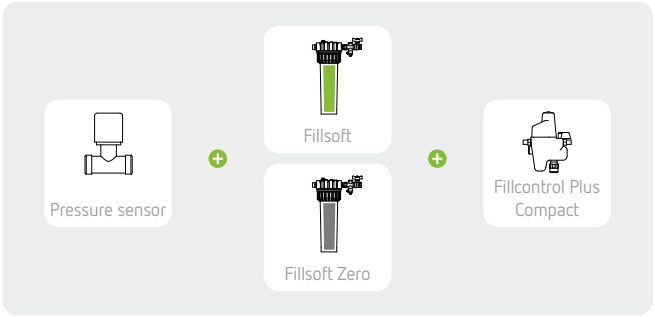


⊕ Accessories Fillsoft & Fillsoft Zero

Fillsoft Pressure sensor FE

- for use of Fillsoft in combination with Fillcontrol Plus Compact

For Fillsoft or Fillsoft Zero in combination with Fillcontrol Plus Compact

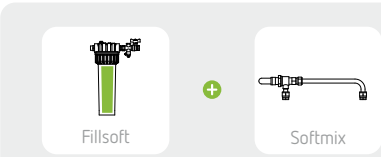


Softmix

- Mixing mechanism for Fillsoft softening

The hardness of soft water is determined after Fillsoft softening is reduced to values below 0.11 °dH. This is often below the required target water hardness and also leads to increased consumption of Fillsoft cartridges. With the Softmix blending device, target water hardness can be adjusted via controlled mixing of fresh water, enabling optimised consumption.

For Fillsoft



Commissioning

- **7945722**: Reflex commissioning for Fillsoft in combination with Fillguard and Fillcontrol Plus Compact
- **7945723**: Reflex commissioning for Fillcontrol Plus Compact

Fillsoft Tool

- Assembly key for safe opening and closing of Fillsoft filter head

Type	Art. No.	Weight [kg]
Fillsoft Accessories (Softening)		
Fillsoft °dH-Set	6811900	0,10
Fillsoft Softmix	9119219	0,20
Fillsoft Accessories (Demineralisation)		
Fillsoft Fillguard Mini	9125762	0,06
Accessories for Fillsoft (softening) and Fillsoft Zero (demineralisation)		
Fillsoft FE*	9112004	0,30
Fillsoft Fillguard	9127968	0,40
Fillsoft Tool	9200276	0,40
Commissioning		
Commissioning Cat. 4	7945722	–

* In combination with Fillsoft, an external pressure sensor must be planned on the system side for measuring the required make-up pressure

Selection & calculation

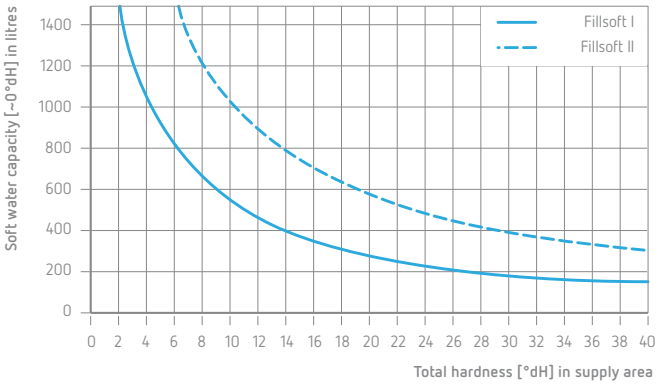
Capacity calculation

Depending on the capacity, Fillsoft I is recommended to be used with one resin cartridge or with Fillsoft II, two cartridges. Critera for deciding whether softening or demineralisation is necessary can be found on page 23.

Softening

Softening capacity

The capacity of the Fillsoft cartridge depends on the overall regional water hardness. The cartridge must be replaced when the capacity has been reached. The following diagrams show this dependency for Fillsoft I and Fillsoft II.



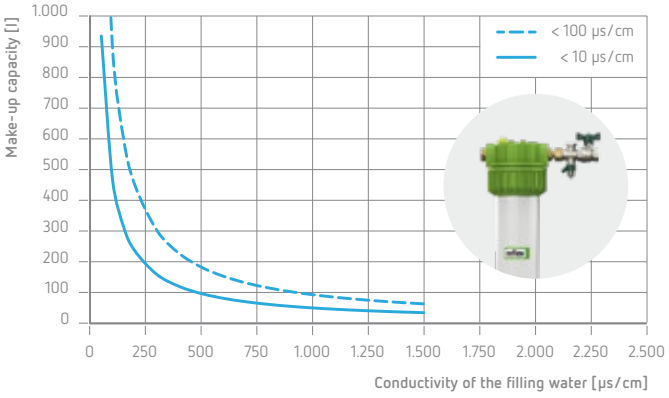
Softening capacity with **Fillsoft I & Fillsoft II**

Demineralisation

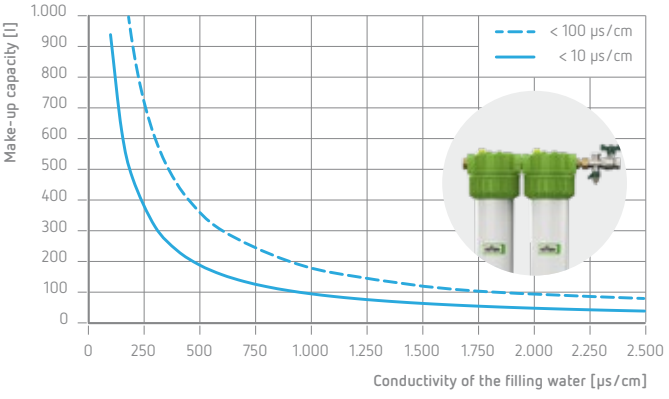
Fillsoft Zero cartridge with a basic capacity of 3000 lx °dH.

Demineralisation capacity

The capacity of the Fillsoft Zero cartridge depends on the conductivity of the filling water. The following diagrams show this dependency for Fillsoft I and Fillsoft II.



Demineralisation capacity with **Fillsoft I**



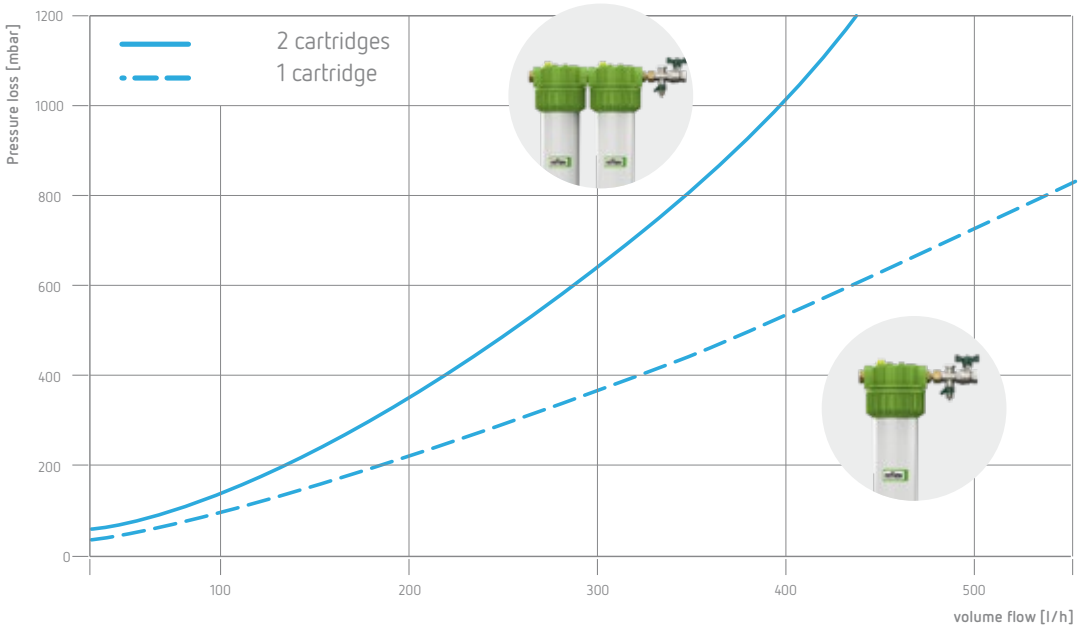
Demineralisation capacity with **Fillsoft II**

The actual yield of the cartridge in the case of demineralisation is dependent on the local water conditions and can only be checked by measuring the conductivity during the filling or water make-up.

If a low-salt operation is needed, there are also special requirements for oxygencontent. We then recommend using degassing via Servitec or Variomat.

Pressure loss

Pressure loss when using Fillsoft can be determined with the aid of the diagram.
A distinction is made here between Fillsoft I and Fillsoft II. Whether a softening or demineralisation cartridge is used is not relevant here.



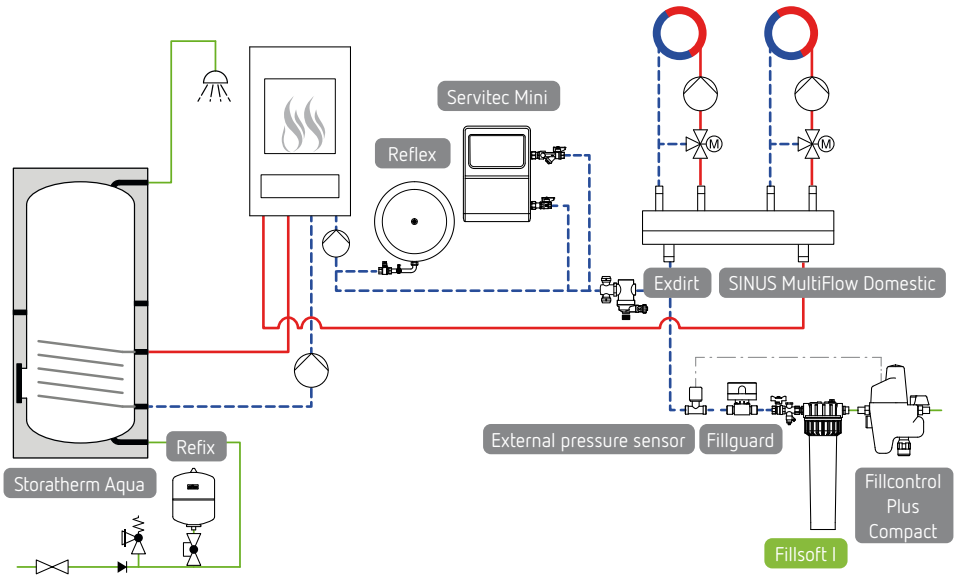
Customised planning with the
Reflex Pro calculation

Reflex Solutions **Pro**
rsp.reflex.de/en

Installation examples

Fillsoft I with Fillguard make-up monitoring

Solution № 01



Fillsoft is integrated into the make-up line.

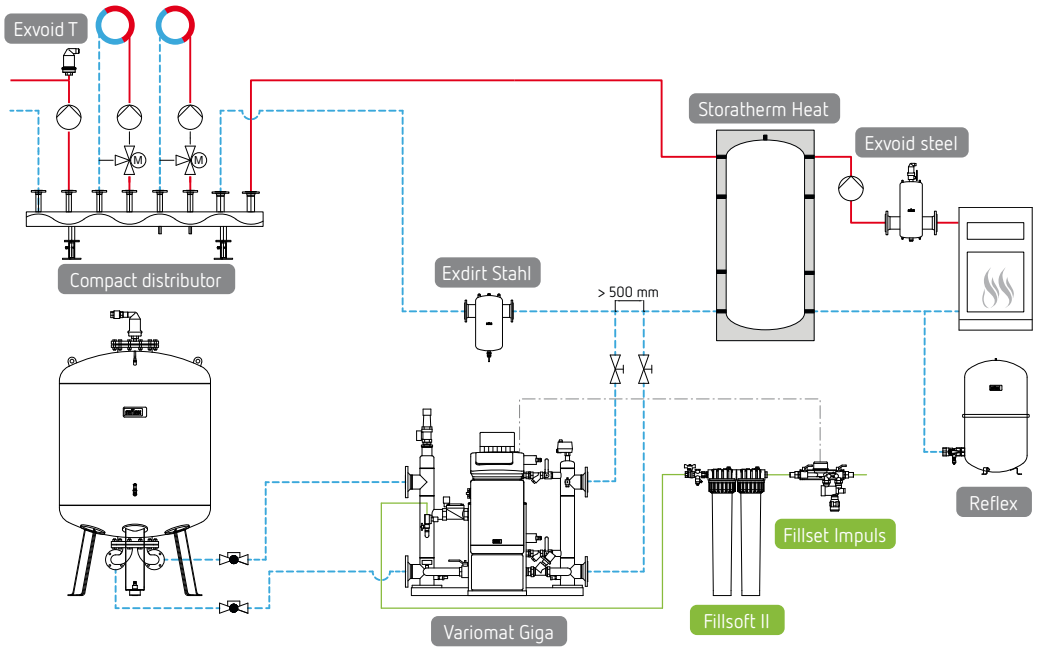
For small single-boiler systems, which may be equipped with a wall mounted unit, softening at < 50 kW may already be necessary.

When using Fillsoft Plus Contact, an external pressure sensor is to be planned on the system side to measure the correct make-up pressure.

Fillguard as capacity control indicates an empty cartridge.

Fillsoft II with Fillset Impuls make-up fitting

Solution № 13



Fillsoft II can be used for higher capacities.

Fillset Impuls with a contact water meter is connected upstream to protect the potable water supply system and is evaluated by the Variomat controller.

The diagrams serve only as illustrations of the connections.
They are to be amended to local conditions and to be made more specific.

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