User Guide

elector®
›Water-Treatment

Electrochemical Water Treatment for Heating Systems

elector®
›Water-Treatment

As from: 08/2015

Chapter 1 - General Information / Safety Instructions

1.1 General Information

The elector systems are used as reaction devices for the electrochemical treatment of heating water as part of a chemical-free operation of heating systems. Electrochemical water treatment contributes to a water quality that is unlikely to cause damage from the formation of limescale and corrosion in heating systems.

The functional parts are made of stainless steel, brass fittings, a high-potential magnesium alloy and high-quality plastic parts. The reaction device is made of stainless steel. As sealing materials age-resistant elastomers, hemp and ararmide fibers (KLINGERSIL C-4400) are used. The insulating material is high-quality flexible PU foam or high-quality non-woven fabric of fire class B1. The materials used comply with the recognized rules of technology.

The instructions in this user manual enable you to operate the system safely, properly and economically. In particular, basic instructions for installation, operation and maintenance must be observed.

Any person who works with this system must read these operating instructions and observe and apply the instructions listed.

In addition, the manufacturer of the reaction vessel recommends to keep a written documentation on site. You can use the form at the end of this user manual.

These operating instructions must always be available on site.

1.2 Field of Use

elector reaction devices are used for the electrochemical treatment of water as part of a chemical-free corrosion protection in systems with closed water loops, such as heating systems. They are used to achieve effective corrosion protection through ideal water quality without the addition of additional chemicals, to remove existing circulating impurities and to prevent the formation of new corrosion products.

In particular elector systems are used in heating systems, in which there is an increased risk of corrosion due to constant ingress of oxygen, as it might be found eg. in underfloor heating with non-diffusion-protected plastic pipes. Furthermore, the use of the elector systems preferably takes place in low-temperature systems (for example heat pumps) or in the context of the so-called low-salt operation of heating systems, primarily for stabilizing the pH.

Corrosion in heating systems is always caused by an interaction of several factors. elector reaction devices are not a standalone corrosion protection device. We understand it as a measure in the overall context of plant operation. Due to its positive effect on the heating water, an elector system decisively contributes to a chemical-free corrosion protection through natural formation of protective layers on the surface of metals and passivation of the metals in the system. The core functions are:

- Scavenging of dissolved oxygen by electrochemical reaction.
- Removal of ciculating air bubbles.
- Increase of the pH value >8.3 by electrochemically generated hydroxide.
- Separation of circulating contaminants from the system water.

1.3 Safety Instructions

Please read these operating instructions carefully before operating the device and follow the instructions. The operating instructions should always be kept at hand.

Personal injury and property damage resulting from non-compliance with these operating instructions are not covered by the Product Liability Act. The manufacturer assumes no liability for any other damage caused by non-compliance with these operating instructions.

Safety instructions warn against dangers and help to avoid personal injury and property damage. For your own safety, compliance with the safety instructions in this manual is essential.

The applicable national and international safety regulations must be observed.

Each operator / operator is responsible for complying with the applicable regulations and must independently strive for the latest regulations.

1.4 Safety Regulations

The commissioning of the elector system may only be carried out by qualified personnel.

For the maintenance and / or the exchange of the consumables of the plant the specifications of the manufacturer must be observed .

Conversions on the device voids the manufacturer‘s warranty.

The manufacturer assumes no liability for damage caused by improper commissioning. In addition, the warranty expires.

The elector system may not be operated in potentially explosive atmospheres or under an open flame.

The reaction container may only be put into operation in perfect condition.

The system may only be used for the treatment of water in closed heating and cooling circuits. A treatment of drinking water, acids, alkalis, etc. is not permitted.

Check the system for damage before putting it into operation.

The intended use within the performance limits must be ensured.

Before carrying out any repair work, the system must be disconnected from the water pressure or mains supply.

Damaged systems must be put out of operation immediately. Have defective or damaged reaction containers repaired only by qualified personnel authorized by the manufacturer. This happens in your own interest. They thus prevent inadequate repairs.

Observe the relevant and binding standards.

1.5 Disclaimer

Use must be performed exactly as specified in this manual. The manufacturer is not liable for any damage, including consequential damage, which may result from incorrect installation or misuse of the product.

1.6 Specific Safety and Work Instructions

The elector reaction device is only suitable for the treatment of water for technical applications. The treated circulating water is not suitable for human consumption.

To avoid technical problems, the elector system must be rinsed once a year with clear water, ideally with demineralized water. In addition, for reasons of ideal function, the high-potential magnesium anode installed in the elector should be replaced every two years as a consumable.

If the elector reaction vessel is operated with strongly calcareous water, a partial lime precipitation with the formation of lime sludge takes place due to the increase in the pH value. In this case, the reaction vessel should be cleaned twice a year. In case of sticky limescale impurities on the inner walls of the device you should use a natural acid to remove these.

The system is not resistant to highly concentrated detergents.

During operation, the system must not be opened or dismantled. The reaction container must not be opened without prior depressurization.

The reaction tank may contain hot water. Take appropriate precautions during maintenance and protect yourself against burns caused by high water temperatures.

Protect the system from mechanical damage. Do not use near sources of heat and naked flames.

The installation of all parts must be carried out according to the country-specific guidelines.

1.7 Specific Operating Instructions

The addition of chemical agents to the heating water can prevent the function of the elector system. Therefore, when using an elector, do not add any additional chemicals to the system.

Please note the information on filling water quality on the following pages of the user manual.

Do not use softened water as filling water in combination with an elector. This can lead to a malfunction or to a heavily increased pH. In the case of a high total hardness or an electrical conductivity of the drinking water> 200 μS / cm, the filling water should always be treated by means of full deionization with ion exchangers.

Check if there is any aluminum alloy in the system and if this is a limitation on the maximum pH level. When using an elector system, the pH may increase>9.

1.8 Declaration of Conformity

The elector water treatment devices are pressurized tanks under the scope of the Pressure Equipment Directive 97/23 / EC Article 3 (3). A CE marking is not allowed. The elector systems are designed and manufactured according to good engineering practice. A tightness and pressure test is performed.

Chapter 2 - Selection Process

2.1 Selection of the Correct Elector Device

The selection of an elector reaction device is based on the system volume of the heating system. In case of high degree of oxygen ingress we always recommend choosing the next larger version.

Article no.	elector Type	Installation	System Volume *max.
14010	elector XS5	Full flow	0,5 m^3
14020	elector S10-V	Full flow	1,5 m^3
14040	elector S10-B	Bypass	1,5 m^3
14050	elector M25		5,0 m^3
14060	elector L60		10 m^3
14070	elector XL130		30 m^3
14080	elector XL+300		80 m^3
14090	elector XL+500		150 m^3

2.2 Estimation of the System Volume in Heating Systems

The exact system volume in heating systems is not known in many cases. The system volume can be estimated under consideration of the heating power. There is an average of <20 liters water volume per kW heating power at present heating systems without buffer.

Based on experiences the volume of underfloor heating systems is <18.5 l/kW, for radiators <12.1 l/kW and for panel radiators <8.5 l/kW including riser tubes and volume of the heater.

Please pay attention at old systems with new heaters that these modern components heat-up the same water volume by less energy consumption. You should consider 15 – 20% for the estimation of the system volume.

2.3 Water Volume of Buffers

Amongst other factors the size of the elector is influenced by the assumable oxygen ingress within the whole system which appears mainly at fittings, plastic parts, regulation valves an other parts. The volume of an buffer made from steel is not considered as there is normally no measurable oxygen ingress at such parts. For systems with a water volume of >50 l/kW a bigger elector reduces the treatment time of the total system volume.

You should always select the next bigger elector in border-cases or whenever you are not sure about the exact system volume.

2.4 Local and District Heating Networks

In widely spread pipe networks, the entire system volume can be divided into several elector reaction devices. These are installed distributed throughout the system to ensoure ideal water treatment in the whole system.

For example, one elector can be connected directly to a buffer tank in the central heating system and more elector devices in the sub-manifold stations of the heating system.

Chapter 3 - Installation Location

3.1 Installation Instructions

The ideal position of the electors is always close to the source of oxygen entry.

If the elector is installed in a bypass, the diameter of the supply line should be at least equal to the diameter of the main line and not less than 1 „for large diameters.

For systems with large pressure fluctuations, the elector in bypass installation must always be integrated with its own feed pump.

Always connect the elector where there is a good flow of water.

The use of a micro bubble separator at the warmest point in the system is a useful addition to electrochemical water treatment.

3.2 Installation in Bypass or Full Flow

In heating systems up to a system volume of 1.5 m^3, the design of the reaction vessels allows installation either in the full flow of the heating system or in a bypass (auxiliary connection).

If the system is operated in a low-salt mode and the focus is on stabilisation of the pH, the elector can be installed in full flow.

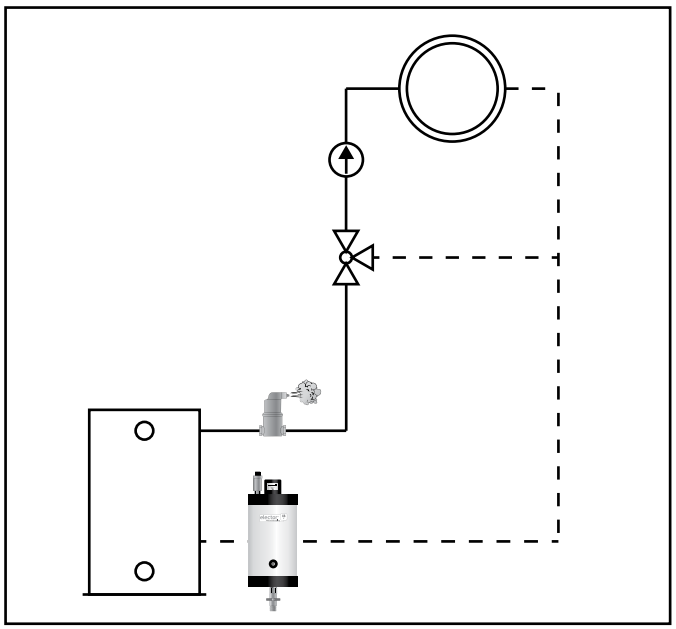
In systems with a high oxygen input, if the installation purpose is primarily based on the electrochemical oxygen consumption, we always recommend the proven bypass installation.

3.3 Possible Installation Locations

Please note that only the elector XS5 and elector S10 versions are suitable for full-flow or bypass installation. All other versions of our elector reaction devices are designed exclusively for installation in the bypass. The following diagrams show some installation variants.

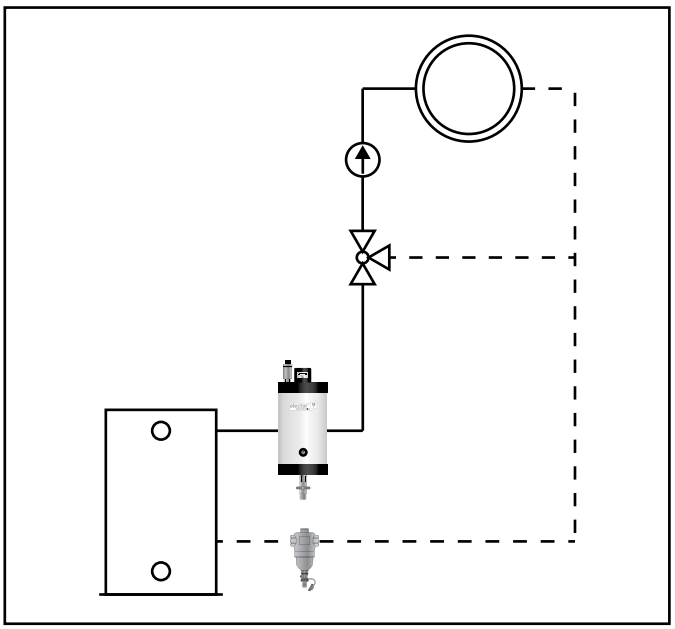
3.3.1 Mains Return

Close to the source of oxygen ingress, ideal for circulating contaminants.



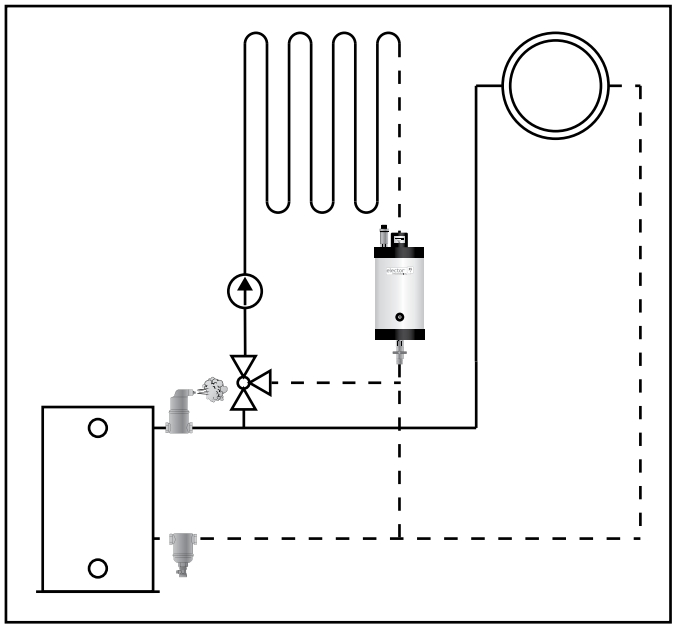
3.3.2 Mains Flow

If the elector should also be used as an air collecting tank or for venting.



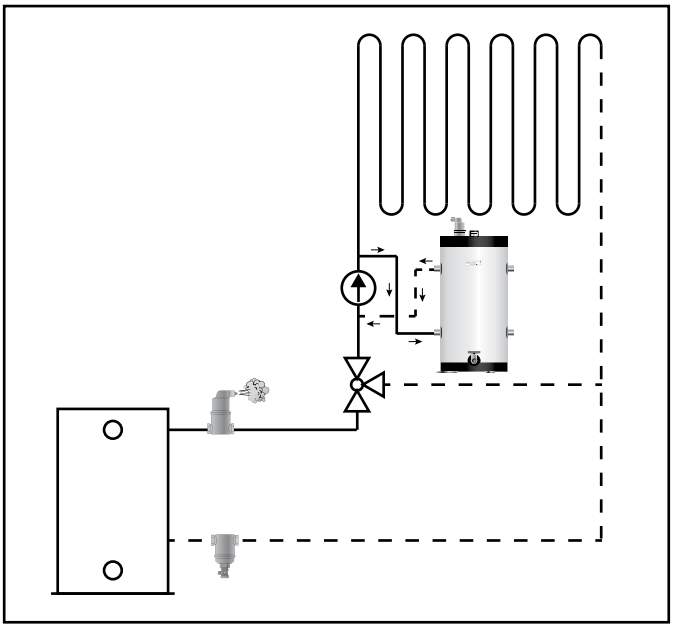
3.3.3 Mains Return System Group Underfloor

Preferred installation option for multiple heating circuits due to the proximity to the source of oxygen ingress.



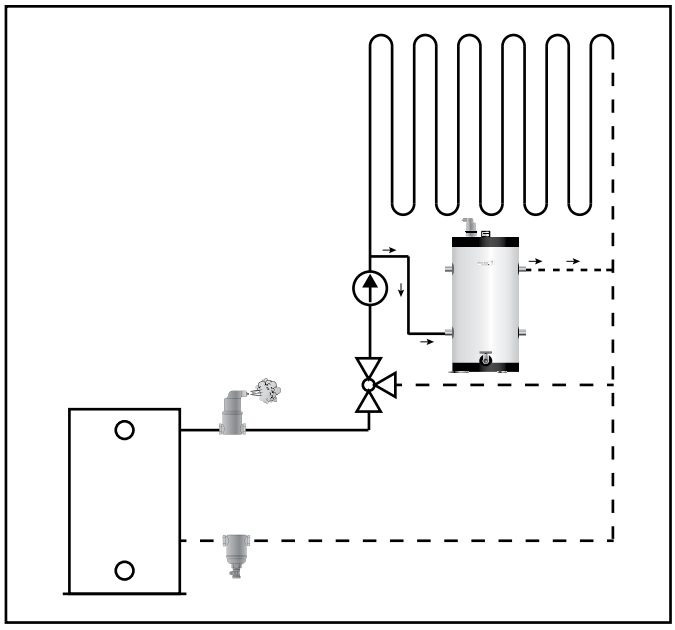
3.3.4 System Group Flow-Flow

Bypass installation using the circulation pump.



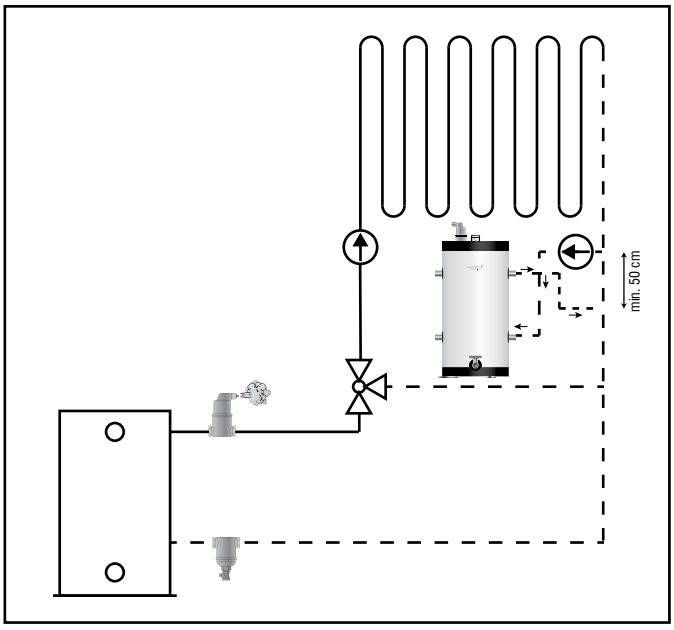
3.3.5 System Group Fow-Return

Classic bypass installation using the main circulation pump. The advantage is that treated water directly reaches other parts of the system. Due to the possible raise of the return temperature this method is not suitable for condensing technology.



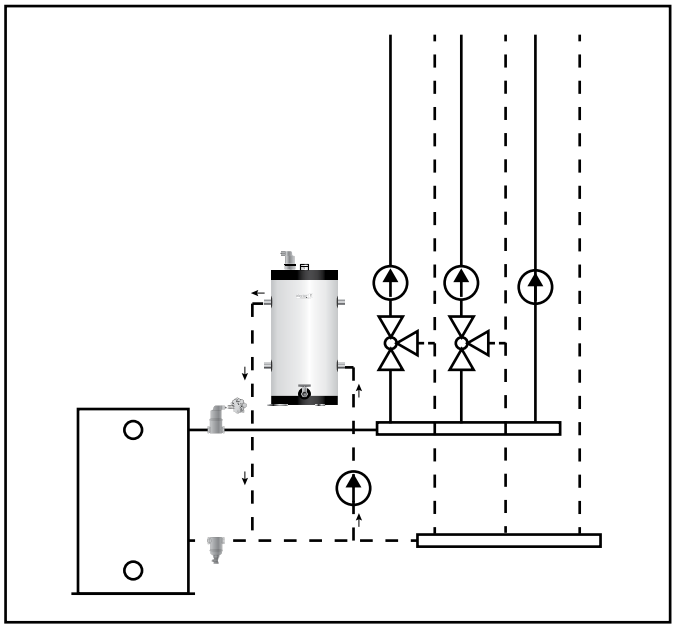
3.3.6 System Group Return-Return

Proven bypass installation with its own feed pump, which is connected to the main circulation pump. Preferably also in mixed installations of radiators and floor heating circuits due to the proximity to the source of oxygen ingress.



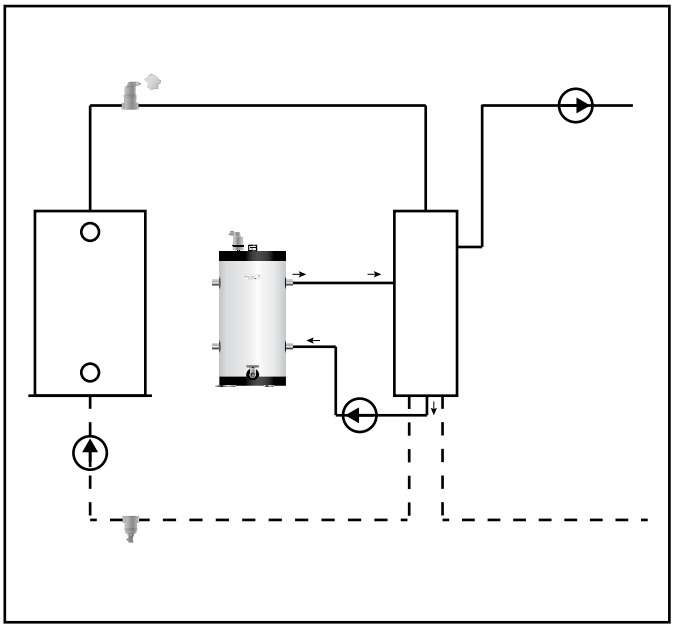
3.3.7 Bypass Mains Return-Mains Return

Installation in systems with circulating impurities and high oxygen input in several floor heating circuits.



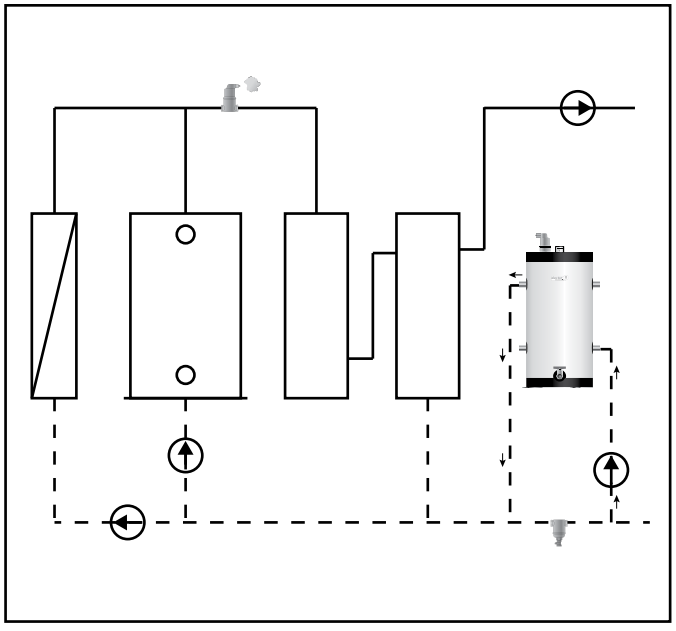
3.3.8 Bypass Buffer

Installation directly on the buffer tank. This installation variant allows effective treatment of the largest possible amount of water and prevents settling of impurities in the buffer tank.



3.3.9 Bypass Main Return in Front of the Buffer

Installation in the main return in front of buffer tanks, if there is ingress of oxygen to be expected or circulating impurities are present.

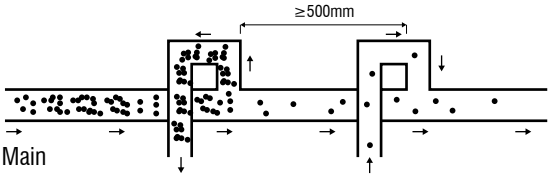


3.3.10 Notes on the Bypass Installation

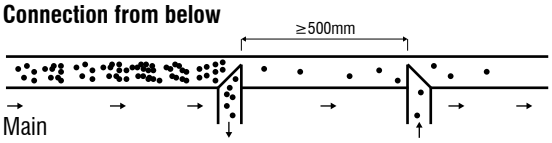
If the elector is connected to a bypass installation on a pipeline, ideally the following points should be considered:

- Shortest possible supply line.
- Distance between inlet and outlet ~500 mm.
- Supply line = nominal dia main line or 1“.
- Connection from below with dip tube.
- Connection from above or on the side.
- Connection from below or from the side with a large amount of circulating impurities.

Connection from above or the side



Connection from below



Chapter 4 - Make-up Water Quality

4.1 Water Quality by use of an elector

An elector reaction device is usually installed in heating systems, whenever a constant low pH is measured or an constant oxygen ingress is to be expected.

In order to protect the heating system from corrosion and sludge, the consideration of the general water quality is of utmost importance and should not be neglected even when installing an elector reaction device.

In connection with the installation of an elector, the water quality should comply with the following guideline values, however, with regard to the fulfillment of any warranty conditions, the specifications of the respective component manufacturers must be observed in the first place.

Heating water treatment - Treatment of make-up and feed water	The treatment of heating water or the treatment of make-up and feed water is necessary, if damage due to formation of limescale or corrosion can be expected as a result of poor water quality. In conjunction with an elector device only untreated tap water or demineralised (deionized) or partly demineralised water should be used.
Addition of chemicals	Do not dose additional chemicals, such as inhibitors, into the system, when using an elector.
Residues of chemicals	If a system is pretreated or heavily contaminated with chemicals, it has to be flushed completely before installing an elector device. This requires the use of our cleaning and dispersing agent OXILIN-P20.
Sludge	Basically the sludge in the system is removed by the function of the elector and can easily be flushed out of the device. If heavy sludge problems have to be removed quickly, then the system has to be flushed by using our cleaning and dispersing agent OXILIN-P20 and an water-air-pulse flushing device.
pH	The pH of the water gets automatically adjusted to 8.5 to 10 due to the function of the electrochemical water treatment. This mechanism may be disturbed by chemicals or due to atypical acid reactions which requires a case-by-case analysis.
Total hardness	The amount of dissolved alkaline earth ions should not exceed 3 mol/m³ (~16,8°dH) at 1 m³ system volume and should decrease at higher system volumes.
Sodium	Lowest possible value of sodium (<20 mg/l) is recommended. Sodium increases the conductivity and can contribute in combination with hydroxide ions (OH-) to severe corrosion problems.
Chlorides	Chlorides increase the conductivity and can cause corrosion, even on stainless steel. A value of <30 mg/l is recommended.
Sulphates / Nitrates	Sulphates and nitrates increase the conductivity of the water and can contribute to pitting corrosion on copper. A value of <50 mg/l should be maintained.
Dissolved metals	Dissolved metals such as iron or manganese should not be dissolved in the make-up and feed water.
Dissolved gases	The content of dissolved gases such as oxygen and carbon dioxide is reduced by the use of an elector device. In case of heavy oxygen input, e.g. by non diffusion protected underfloor heating, a microbubble dearator should be installed additionally.
TOC (organic carbon dioxide)	The TOC-value expresses the amount of organic impurities in the water and as such indicates the MIC (microbiologically inducted corrosion). A value of <30 mg/l is acceptable. In case of copper installations a value of 1,5 mg/l shall not be exceeded.
Electrical conductivity	By use of an elector, the electrical conductivity of the system water should be 50 - 200 μS/cm.
Appearance	The make-up water and the system water must be clear and clean.

4.2 Necessity of Make-up Water Treatment

In heating systems with a constructive oxygen ingress a low electrical conductivity of the heating water should be realized, as corrosion processes are slowed down by a low electrical conductivity. Since an elector is used in most cases in systems with a high oxygen input, we recommend, along with the installation of the elector, a reduction in electrical conductivity to a level of 50 - 200 μS / cm.

The need for make-up water treatment can also arise from the requirements of other component manufacturers, or whenever a guideline, such as VDI 2035, must be observed.

4.3 Method of Make-up Water Treatment

If the filling water has to be treated, only a full or partial deionization of the filling water of heating systems should be used in combination with an elector. A residual conductivity of 50 - 100 μS / cm must be maintained.

When using an elector reaction device, the filling water should not be treated by softening with ion exchange. A reduction of the total hardness of the water can also be achieved by a partial desalination, if the system is filled, for example with 20% of the system volume with tap water and 80% of the system volume with deionized water.

4.4 Use fo Antifreeze Agents

In combination with an elector, classic antifreezes should not be used as these agents usually contain chemical inhibitors. These inhibitors can completely stop the function of the elector.

If a heating system are subject to freeze, ethylene glycol with the quality notation „chemically pure“ can be used in addition to the use of an elector.

It should be noted that the aging of ethylene glycol causes the formation of acids that are bound by the elector. At very high temperatures, acid formation may exceed the level of buffering by the elector, allowing temporary low pH. This can be remedied by installing a larger elector reaction tank.

When using antifreeze, the antifreeze as well as the pH of the water should be checked annually.

4.5 Influence of the Electrochemical Water Treatment on the Total Hardness

Experience has shown that, depending on the water composition, the overall hardness of the system water drops slightly as a result of the increase in the pH value and the associated precipitation of calcium carbonate in the elector reaction devices.

Any available free carbonic acid can be bound as magnesium hydrogen carbonate by the magnesium ion electrochemically generated in the elector. An uncontrolled increase in hardness is not to be feared, as there is no more free carbonic acid in the heating water from a pH value of 8.2. In contrast to calcium carbonate, the good solubility of magnesium carbonate does not cause an additional risk of damage caused by scaling.

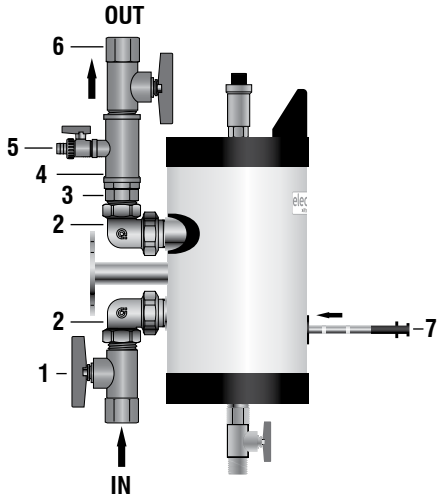
To avoid damage caused by formation of limescale, a heating system should not be filled with water that has a total hardness> 16.8 ° dH.

Chapter 5 - Assembly of the Connection-Set

The installation of the elector device into the system should always be done via the elector connection set. The connection set is tailored to the device and provides its function. The connection-set differs in accordance to installation in full flow and in the bypass.
Please refer to the data sheet which kind of installation is suitable for your elector.

5.1 Connection-Set Full Flow – elector XS5, elector S10-V

The connection set contains:
(1) Ball valve
(2) Elbow fitting
(3) Double nipple
(4) T-piece
(5) Drain valve
(6) Ball valve
(7) Filter magnet

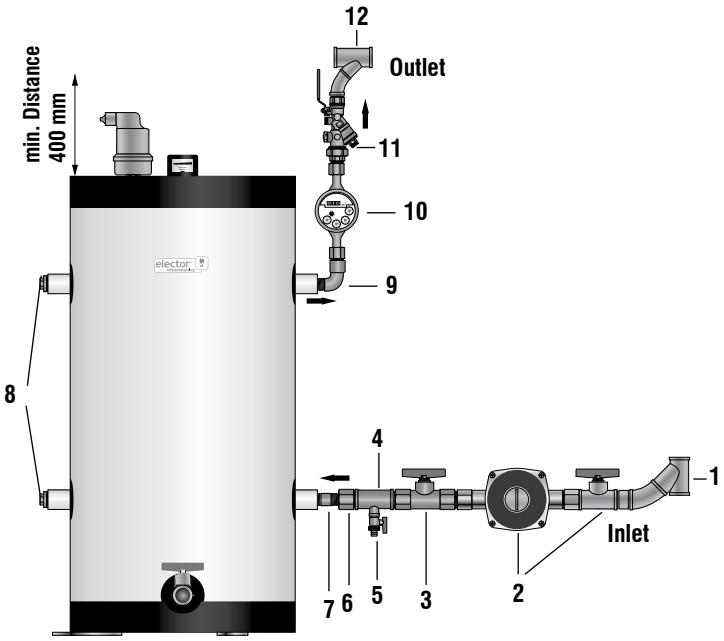


5.2 Connection-Set Bypass – elector S10-B, elector M25, elector L60, elector XL130, elector XL+

The required components vary depending on the installation.

On site must be provided (depending on the installation):
(1) Weld on socket or t-piece for elector inlet connection, min. 1“.
(2) possibly 1“ feed pump with ball valve.
(12) Weld on socket of t-piect for elector outlet.

The connection set contains:
(3) Ball valve.
(4) T-pice.
(5) Drain valve.
(6) Reduction (if necessary).
(7) Double nipple.
(8) Blind plug.
(9) Elbwo 90°.
(10) Water meter (rotatable) with fitting.
(11) Regulating valve with automatic flow control and deaerator.



When installing the elector corrosion protection system in the bypass, the flow must be regulated. The flow rate can be checked and documented via the provided water meter.

elector Type	S10-B	M25	L60	XL130	XL+300	XL+500
Flow rate l/min	2	5	10	20	50	100

5.3 Additional Components

A useful additional components is the installation of a microbubble separator.

Chapter 6 - Functional Guarantee

6.1 Explanation of the Functional Guarantee

As part of the structural design and manufacturing of our elector reaction devices, we take the utmost care to provide you with a high-quality and reliable product for the corrosion protection of your heating and/or cooling system.

In addition to the statutory warranty period of 2 years as described in our General Terms and Conditions we give a 5-year functional guarantee on the elector corrosion protection devices. This functional guarantee states that the elector device will remain functional within the first 5 years from the date of purchase to perform the electrochemical water treatment. Excluded from the functional guarantee arre wearing parts and fittings, such as anodes, ball valves and similar equipment. Condition for the commencement of the functional guarantee is that the device is registered with us withing the legal warranty period, stating the installation site, the owner and installer and that the owner can prove a professional use of the device.

In order to obtain a claim to the functional guarantee, the operator must pay particular attention to the following points:

Flushing	If the hydraulic functionality of the heating system is disturbed by impurities and sludge or if the water is soiled with chemicals we suggest to flush the whole system before the installation of the elector. Flushing is not necessary if there are impurities but no chemicals and no problems with the functionality of the system.
Predamages	In case of renovation of old systems the system has to be checked for hidden corrosion which are covered by deposits (eg boiler return in horizontal sections, rust bubbles on pipes and manifolds) before installing the elector. By removing the deposits as a function of the elector hidden corrosion damage may cause a discharge of water from the system. We take no liability for consequential damages due to hidden corrosion predamages.
Maintenance	The device must be flushed 4 weeks after installation according to our maintenance instructions. In the refurbishment phase this maintenance procedure has to be repeated two times with an interval of 4 weeks. It is important that the pumps circulate the water through the system during the refurbishment phase. The water should be clean at the last maintenance. If not, the maintenance operation has to be repeated every 8 weeks until the water is clear. Afterwards the refurbishment phase is completed an a maintenance of the device once a year during the regular heatings system maintenance is sufficient for the sustained protection against corrosion.
Function control	The elector-devices have an indicator that shows the activity of the anode. This indicator must be monitored regularly.
Control of success	The success of the electrochemical water treatment is measurable. You should prepare a water analysis once a year and run a constant documentation.
Professional use	By a professional use of the elector devices we understand as follows: • Installation of the device in accordance with our instructions, so that the flow of system water through the device is ensured. • Consideration of our recommendations for make-up and feeding water. • Maintenance of the elector in accordance with our instructions every 4-8 weks in the refurbishment phase. • Maintenance of the elector once a year in normal operation. • Regularly control of the anode function. • The replacement of the anode immediately after it is used up, but in the best possible manner in a rythm of 2 years. • Verification and documentation of water values in terms of pH and conductivity during maintenance and consulting with us, if these values strongly differ from our recommendations. • Traceable documentation of maintenance, eg on our maintenance form.
Registration	To activate the functional guarantee, the elector device must be registered with us within 2 years of the date of purchase.

Chapter 7 - Maintenance

7.1 Functional Control - Flow Rate

Of fundamental importance is the uniform and constant flow through the elector reaction vessels.

In full-flow installation, the flow rate is always guaranteed depending on the volume flow.

In bypass installation, the flow through the elector reaction vessels must be set according to the following values.

elector Type	S10-B	M25	L60	XL130	XL+300	XL+500
Flow rate l/min	2	5	10	20	50	100

Check and correct the water flow during maintenance.

If the flow rate does not match the values in the table, check the following points:

- The supply line to the device must be at least 1 „in size. A smaller line cross-section can result in insufficient water flow and problems with contaminants.
- The supply line must not be regulated, the regulating valves must be open.
- Is the flow regulated via an angle seat valve or is the regulating valve with flow control open?

If the function of the water meter or the flow is not given despite the above points, the elector must be rinsed. If an automatic regulating valve is used as flow control, its function can be prevented by particles. The valve would have to be opened and cleaned in this case. Often a vertical installation of the water meter helps to protect it from possible damage. Under certain circumstances, the water meter must be removed, cleaned or replaced.

7.2 Functional Control - Anode Function

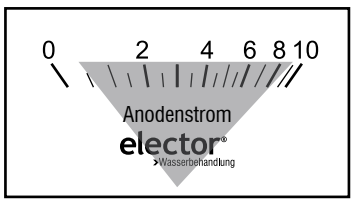
The electrochemical water treatment function can be checked via the analog display device. The elector system is self-regulating. For high-conductivity water or a large amount of dissolved oxygen, the electrochemical cell will automatically work harder than when the water is completely depleted. The display indicates the intensity (milliampere - mA), with which intensity the elector works.

The following interpretations of the ad are possible:

Pointer deflection ≤0,5 mA

Outside the heating season, this can happen when the water has reacted. Within the heating period, the anode would be without function and must be controlled.

Pointer deflection 0,5 - 9 mA



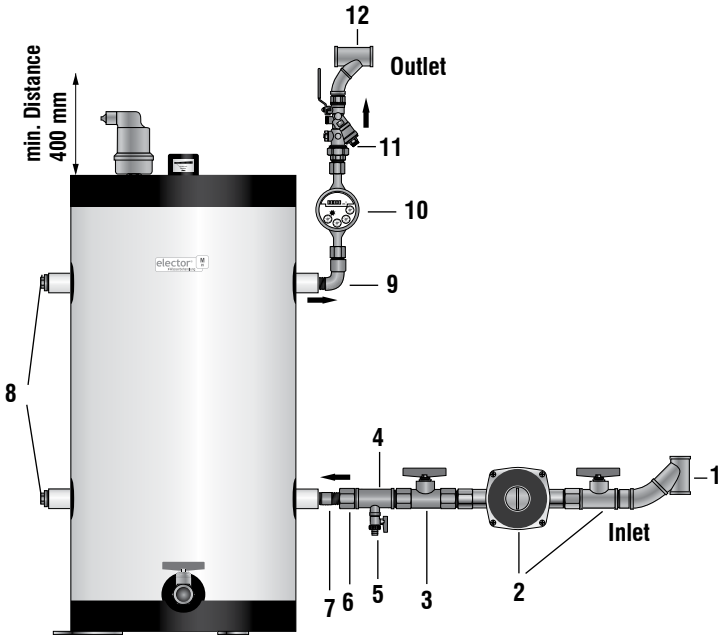
Normal workspace of the elector. The further the pointer falls to the left, the less work the elector has to do to treat the water.

Pointer deflection ≥10 mA

After installing an elector, then decreasing. Constant with high conductivity of the heating water and / or high oxygen input into the system.

7.3 Backwash, Blowdown, Tank Cleaning

The flushing should be done by a specialist.



1. Stop the water flow.
2. Close the valves (1) both in inlet and outlet.
3. Connect a water hose for backwash with the drain valve (2). Open the drain valve (2). Use, if possible, only deionized water for best results.
4. Open the valve at the bottom of the elector and drain the flushing water.

   If no water comes out of the valve please stick a wire carfully through the valve into the elector to release sludge and impurities. If you have no success with this procedure you have to open the elector as described in the chapter anode replacement. The elector has to be cleaned through the opening on the top in this case.
   In case of impurities which stick to the inner surface of the tank you should consider using a dilluted natural acid for cleaning, eg. citric acid.

   CAUTION!! Always neutralize the tank after cleaning with acid!

   Please flush the elector as long as only clean water comes out of the device. Close the valve at the bottom of the elector and the drain valve (2) as soon as the elector is filled with water completely.

5. Open the valves (1) after flushing and take the pumps into operation. Control the water flow at elector devices in bypass installation.

6. Please record the measurement values in the elector maintenance form.
   The following intervals should be considered:
   - 1. flushing 4 weeks after installation of the elector.
   - 2. flushing after 4 additional weeks.

   As soon as the flushing water is clean and clear from the very first beginning you should switch into an annual flushing interval. Otherwise you need to flush in 4 to 8 weeks again.

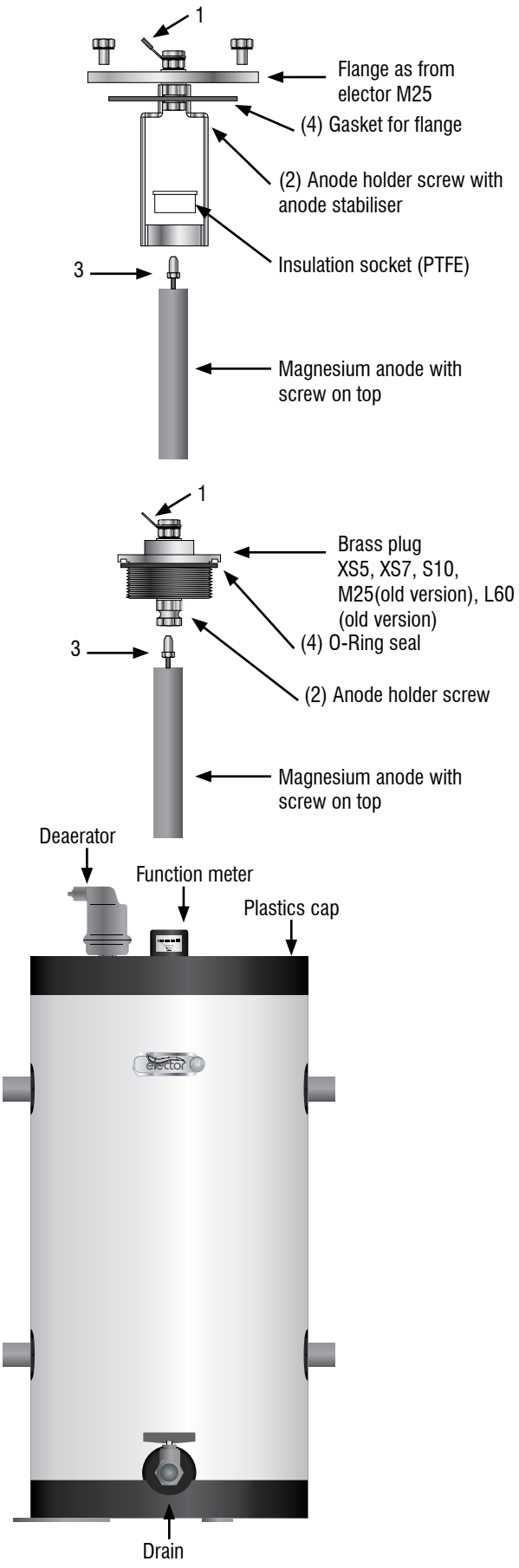
   Under normal operation the elector has to be maintained once a year as part of the annular heating system check.

   If the elector is installed in a new system, the flushing intervals can be omitted after installation. In this case, a flushing in the annual rhythm is sufficient.

7.4 Control of Water Quality

As part of the maintenance, the pH value and the electrical conductivity of the heating water must be documented. We also recommend a comprehensive water analysis in the laboratory.

7.5 Anode Replacement



1. Inspection of the elector for anode replacement
As soon as the function meter of the elector indicates „0“ during the heating period the anode needs to be inspected and possibly replaced. Proceed as follows:

- Close the in- and outlet of the elector
- Put a bucket to the drain of the elector
- Remove the deaerator (if detachable), open the drain valve and drain the elector
- Remove the plastics cap to the top
- Disconnect the orange plug contact
- Remove the insulation fleece and the electrical contact
- Depending on the elector version the housing is closed by a flange or a brass plug. Remove either the flange or the plug together with the old anode. Check the anode
  a) If the anode is worn out you should install a new anode.
  b) If the anode still looks good but the indicator has shown „0“ there might be on oxide or chemical layer on the anode surface blocking the flow of the electrons. Clean the anode with a wire brush to remove the layer on the anode surface. If the indicator does not show any reaction test the indicator with a 1.5 V battery on its function. Replace the indicator if it does not show any reaction while testing it with a battery.

2. Installation of a new anode
If the anode is completely used install a new one as follows:

- he anode is fixed at the anode stabiliser screw that goes either straight through the flange or the brass plug. **Do not remove the anode stabiliser screw.**
- Sometimes you cannot see the stabilsier screw due to heavy impurities. Clean the screw with a wire brush for full access to the construction.
- Fix the anode holder screw and release only the small screw on top of the anode.
- Replace the old anode with a new one and make sure that the small screw on top of the anode and the anode stabiliser screw have good electrical contact with each other.
- Make sure that the anode stabiliser screw is fixed thightly to the flange or the brass plug.
- Replace the flange gasket or the o-ring seal.
- Reinstall all electrical contacts, the insulation fleece and the cap.
- Refill the elector with water and open the in- and outlet of the device.

Chapter 8 - Troubleshooting and Control of Success

8.1 What to do if...

...there are aluminium components in the system?
For aluminum components in water-bearing systems, manufacturers usually specify a maximum pH of 8.5. However, it is known that aluminum components can remain stable even at a higher pH, insofar as the molar concentration in the water is low. If an elector is installed in a system with aluminum components, the filling and make-up water of the system must be treated by means of deionization. The system water should have a conductivity of $<10\ \mu$S/cm. Nevertheless, a pH of$>$ 8.5 can occur. Regarding receipt of any warranty claims, we refer to corresponding manufacturer‘s specifications.

...there is an unusually high oxygen ingress?
Please check that the expansion vessels are fine. If a 4-way mixing valve is used most attention has to be paid to proper pressure maintenance to avoid an unnecessary oxygen ingress.

...the system water is still not clear one year after installation of the elector?
If single system parts are throttled so that only insufficient circulation takes places the cleaning of the water by function of the elector cannot work. All system parts have to be opened completely when retrofitting an old system. If this is not possible, all parts have to be flushed properly.

...no water comes out of the elector during flushing the device?
If the flushing water does not leak out of the elector the lower outlet is blocked. In this case please insert carefully a strong wire into the opened lower valve to remove the blockage. CAUTION! Sudden leakage of a large amount of hot water from the elector is possible. Protect yourself and supply a suitable bucket to collect the water below the elector.

...water leaks out of the elector?
If water is dripping out of the insulation of the elector, usually the automatic air vent is broken. This part needs to be replaced in this case.

...the water meter is not turning?
Check that the pumps are in operation and that all valves are opened. If the water meter still does not work remove it together with the automatic regulation valve and clean both parts. Please replace the water meter with a new one if cleaning does not help.

...the function meter does not work even though there is a new anode?
Check the indicator with a battery. If it shows no reaction you need to replace it with a new one. If the indicator shows reaction there is possibly no water in the elector or the anode has not been installed correctly - possibly the anode is covered with an oxide layer. The anode has to be cleaned with a brass wire brush in this case.

...Corrosion and appearance of sludge take place despite elector?
Please check first if the elector has been selected properly after our specifications and has been installed so that a water flow takes place. Contact us an arrange for a water analysis for troubleshooting.

8.2 Control of Succss

To verify that a corrosion protection is established by the elector you can check that by control of certain water parameters. Simply analyse the heating water once a year on pH, conductivity, hardness and dissolved metals and you will get a long-term statistics from which you can learn the improvement of the water quality and the corrosion related values. The regular water analysis also serves as a warning notice, if trouble should arise.

Chapter 9 - Maintenance Report

Installer

Installation Site

Date of Installation:

pH at Installation:

Conductivity at Installation

Serial no.:

elector type:

Date	Color of flushing water	Undissolved solids yes/ no	Water Meter, if applicable	Conductivity μS/cm	pH	mA Meter function %	Anode replace-ment yes/no	Operator

Date	Color of flushing water	Undissolved solids yes/ no	Water Meter, if applicable	Conductivity μS/cm	pH	mA Meter function %	Anode replace-ment yes/no	Operator

Note!
Be sure to keep this document on the device. It serves as proof of service in the context of functional guarantee.

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