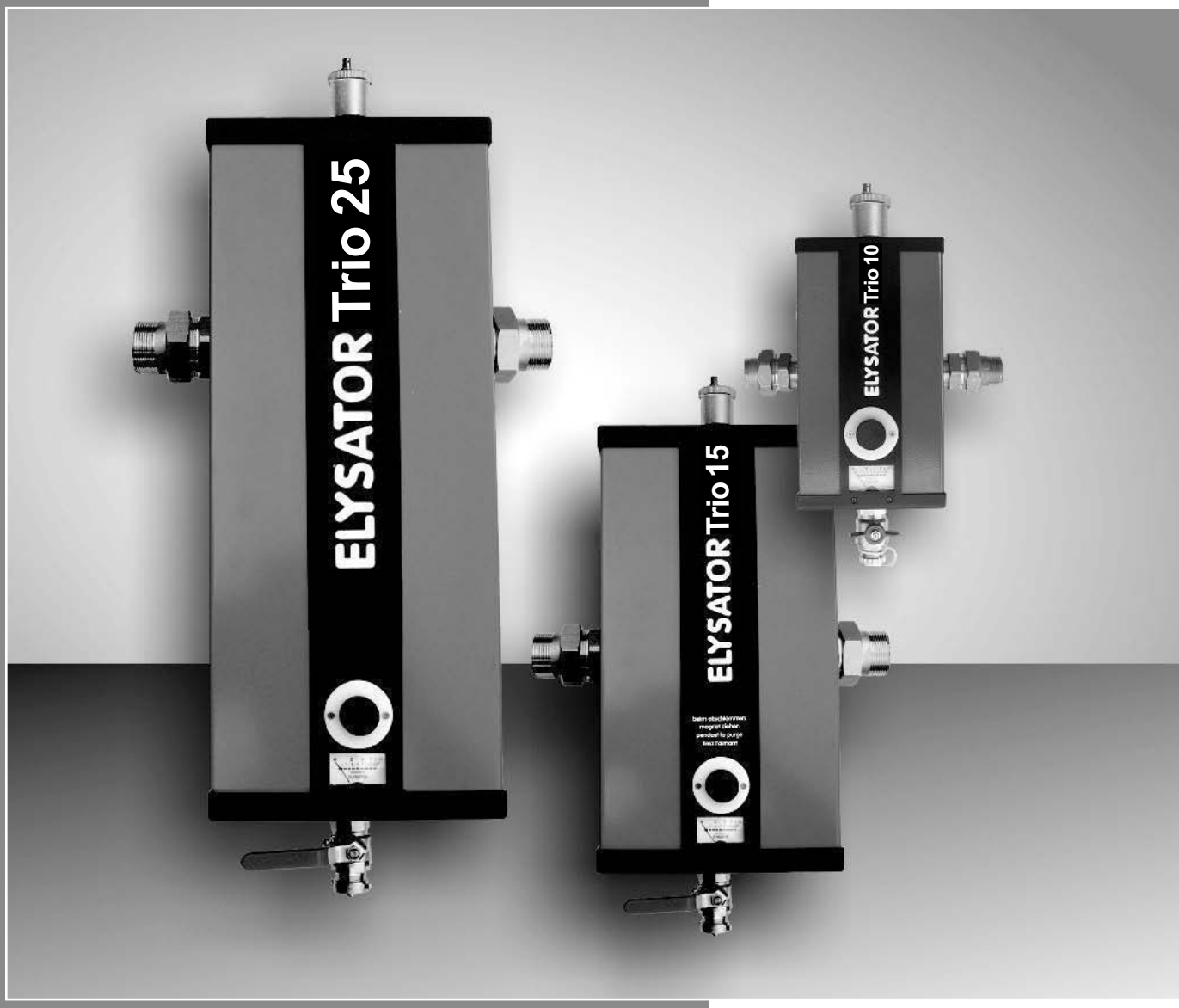
EN

Three-fold corrosion protection for heating systems

ELYSATOR trio

ELYSATOR
by ELYSATOR™

Installation
How it works
Operation
Service



ELYSATOR
engineering water

www.elysator.com

Content

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Web version supercedes print version.

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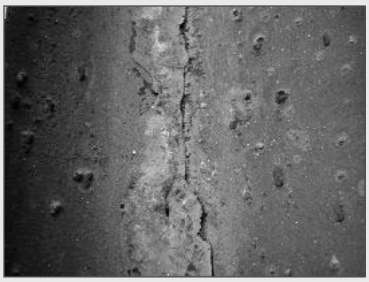
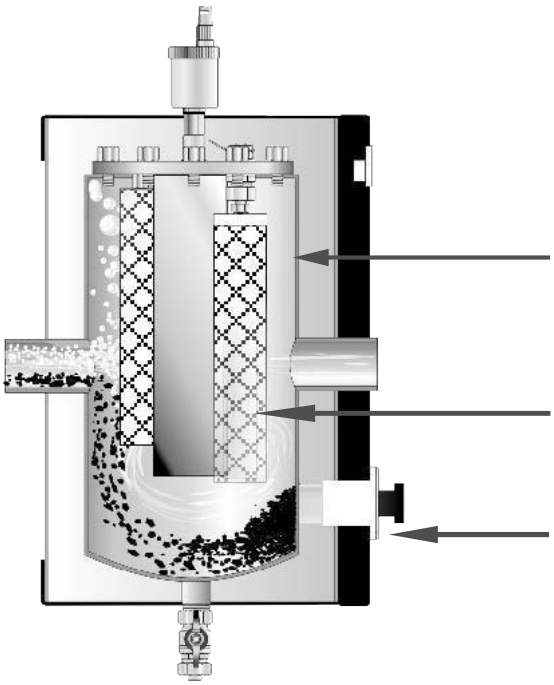


Early underfloor heating systems used plastic pipes that were permeable to oxygen. Technology has since advanced to the point where it is now possible to produce underfloor heating pipes that are practically diffusion proof. Valves, threaded joints, circulating pumps, regulators, automatic bleed devices and faulty expansion tanks, however, are still potentially important sources of oxygen uptake. Oxygen diffusing into the heating water, too low a pH value and raised electrical conductivity of the system water can all lead to corrosion and blockage of the heating system from corrosion products. In the past, the most common method of corrosion protection was to add chemical corrosion inhibitors. In many cases, however, it was found impossible to provide active protection in cracks or under deposits of dirt or rust, so this approach could not deliver a satisfactory solution to the problem. Furthermore, it is costly and time-consuming to monitor that the correct amounts of inhibitors are added. Using heat exchangers to separate the system into a heating circuit and hot-water circuit ultimately merely splits the problem into two parts without achieving active corrosion protection. Modern heating systems are more sensitive to signs of corrosion, limescale and any other deposits.

Possible Problems

- Underfloor heating pipes clogged with corrosion products
- Blockages in control valves and pumps
- Boiler corroded through
- Holes in radiators leading to water damage
- Noisy circulation from gases produced by corrosion
- Increased power consumption from irregular heat distribution

The ELYSATOR trio, for 3 times the peace-of-mind



1. Degassing
Removal of micro air-bubbles

2. Anodic protection
ELYSATOR anti-corrosion system

3. Magnetic filter
Sludge removal and cleaning

1. Degassing

Gases dissolve in cold water that are later released when the water heats up, producing little bubbles of gas, like those you can see when heating up water in a pan.

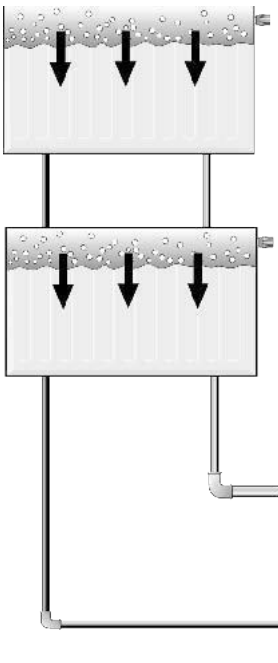
In a heating system, the water cools down in the radiators and heating circuits. Here the water "breathes in" gases, releasing them again after being heated in the boiler. Unfortunately these micro air-bubbles are carried along by the circulation because they rise to the surface too slowly compared with the flow rate. Standard automatic air vents can only remove stationary and larger air pockets.

A specially designed filter is needed to remove micro air-bubbles. The fine gas bubbles must be captured and combined. Once a large bubble is formed, it is buoyant enough to rise up into a still area, where it is then removed from the system by an automatic air vent.

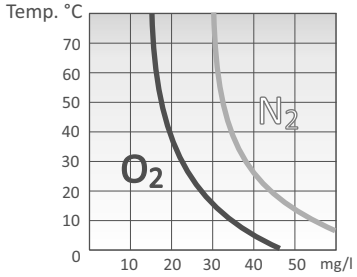
If the heating water is degassed after being heated in the boiler, this creates water that is once again ideal for gas to dissolve into.

Therefore the ELYSATOR trio acts like a "pump", exploiting the temperature difference in the circuit to remove gases from the system.
Solubility of gases in water (at 2 bar)

As the temperature rises, the water can hold less dissolved gas and gas bubbles are released.



Solubility of gases in water (at 2 bar)



At rising temperature, the solubility of gas in water is decreasing.
Micro air-bubbles are being formed.

2. ELYSATOR anodic protection

The reaction with the sacrificial metal (magnesium), which goes into solution, reduces the concentration of atmospheric oxygen diffusing into the water to a negligible level. The magnesium hydroxide produced in this process helps to raise the pH value to an optimum range.

Depending on the composition of the water in the system, its electrical conductivity then drops thanks to partial precipitation which reduces the water hardness. The result is alkaline water that is low in salts and has a minimum oxygen concentration.

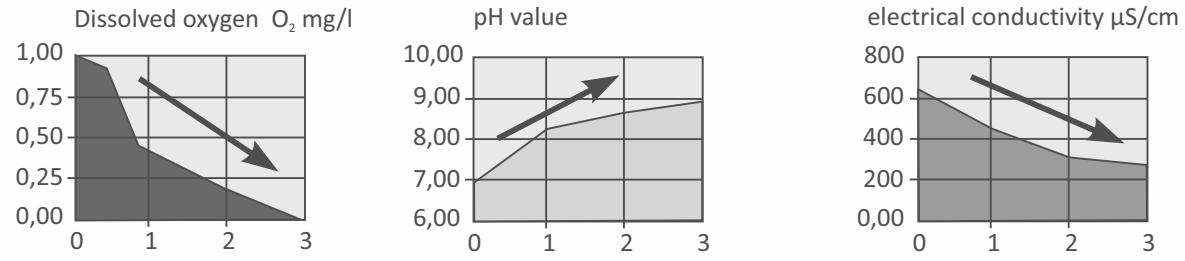
Corrosion damage is unlikely in systems containing water with these properties.

Corrosion residues that are carried along by the flow of water are deposited in the ELYSATOR for removal as sludge in the restoration phase, until the water is clear.

Old systems, however, that are heavily contaminated or treated with chemicals must be flushed through thoroughly before fitting the ELYSATOR (e.g. using SANOL H-15).

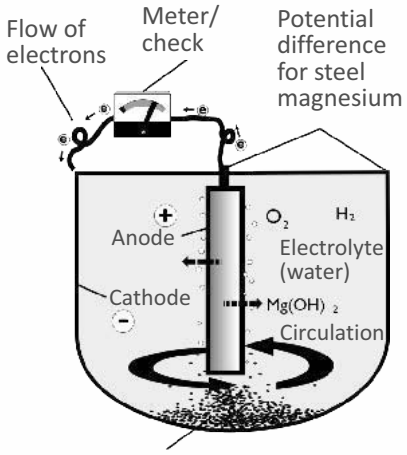
Subsequent maintenance simply involves changing the anodes every 3 to 5 years; the ELYSATOR works without an external power supply and without chemical additives.

The ELYSATOR is the market leader in this field of corrosion protection, and has been used successfully for over 30 years in heating and cooling systems. The process is equally suited to protecting new installations and restoring existing systems to health.



lower oxygen + higher pH value + lower electrical conductivity = more reliable corrosion protection

Block diagram, simplified



Chemical equation:

$Mg + 2H_2O + ½O_2 \rightarrow Mg(OH)_2 + H_2O$

magnesium, water and dissolved oxygen produce

magnesium hydroxide and water

Impurities filtered out by suitable circulation

3. The magnetic filter

In order to prevent deposits of sludge from clogging heating circuits and providing favourable sites for corrosion, the sludge must be filtered out of the heating system.

Conventional sludge collectors work on the gravity principle; they do not pick up small particles at full flow rates however.

The new ELYSATOR trio magnetic filter provides additional active filtration using an extremely powerful permanent magnet. The appliance makes use of the magnetic attraction of corrosion particles.
The unique feature of the ELYSATOR trio is that the magnet is located outside the appliance and has a massive pulling force of 220 Newtons.

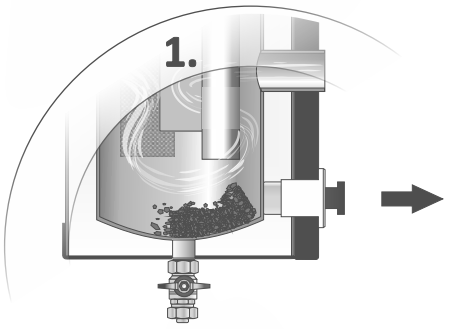
This lets you remove the sludge while the heating is still running.

Retracting the magnet releases the corrosion particles, which can then be removed easily through the sludge-removal drain. There is no need to open up the appliance or to remove the magnet.

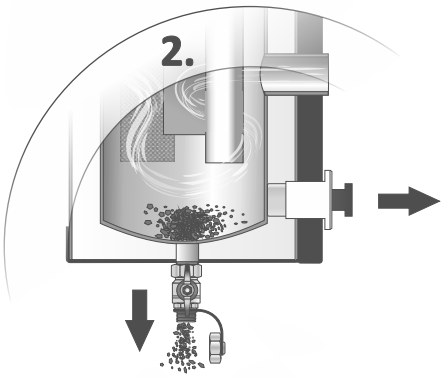
This technically elegant ELYSATOR trio solution posed a real challenge to our development engineers.
The entire filter needed to be constructed of stainless steel, because regular steel would have blocked the magnetic field.

The high-tech magnet is also made of a rare-earth alloy (NdFeB) that packs an incredible attractive force of 22 kg into the size of a coin.

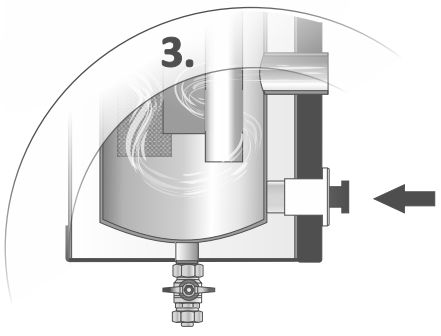
This means that the ELYSATOR trio deals with even the smallest sludge particles.



Retract magnet

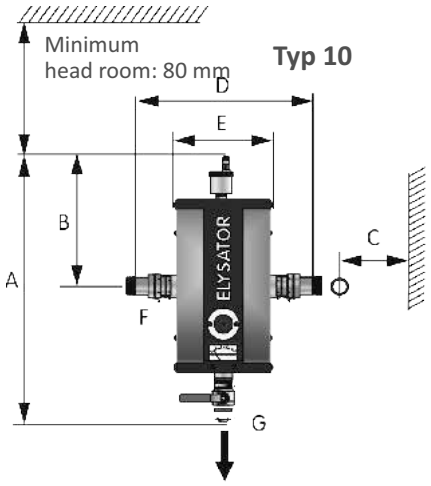


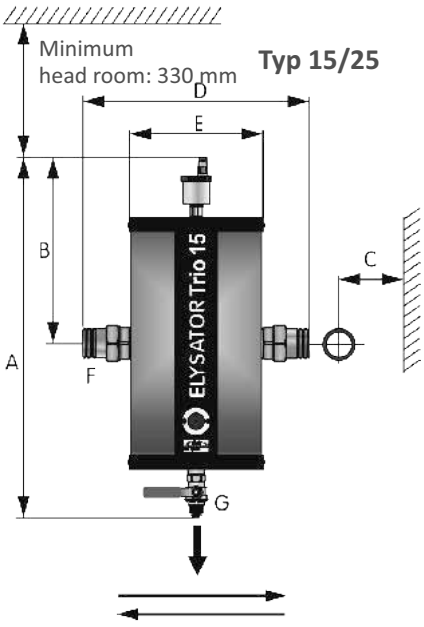
Open the drain



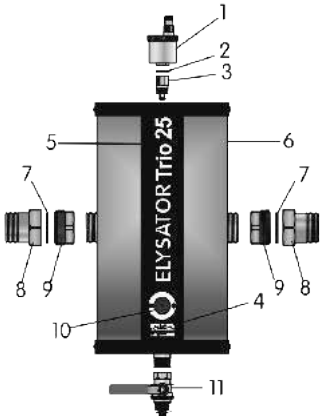
Close the drain

Technical data





Flow direction left or right

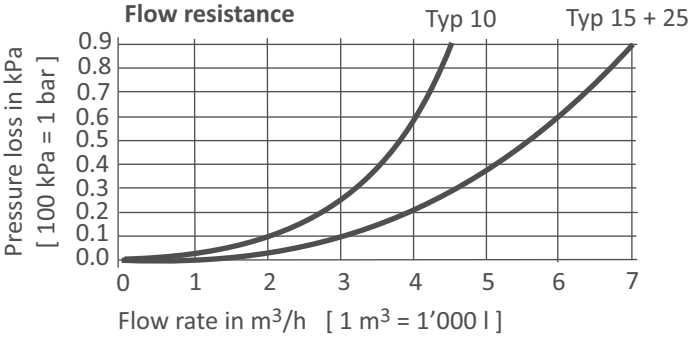


Material of vessel: stainless steel

Insulation: foam with coated metal sheet

Dimensions in mm		**Type 10**	**Type 15**	**Type 25**
A	Height over all	420 mm	580 mm	750 mm
B	Top - conneciton	210 mm	290 mm	290 mm
C	wall - connection	72 mm	107.5mm	107.5mm
D	Length over all Incl. couplings	260 mm	360 mm	360 mm
E	Breadth	145 mm	225 mm	225 mm
F	Connections	1 “	1 1/2“	1 1/2“
G	Drain	3/4 “	3/4 “	3/4 “

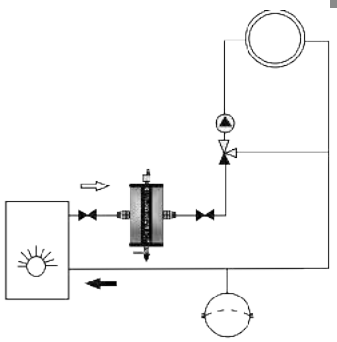
Performance data:	**Type 10**	**Type 15**	**Type 25**
Plant volume:	< 500 l	< 1'500 l	< 5'000 l
max. circulation rate:	< 3 m³/h	< 5 m³/h	< 7 m³/h
Connection :	1 “	1 1/2 “	1 1/2 “
Working pressure max.:	< 10 bar	< 10 bar	< 10 bar
Working temp max.:	< 90° C	< 90° C	< 90° C



Delivery content

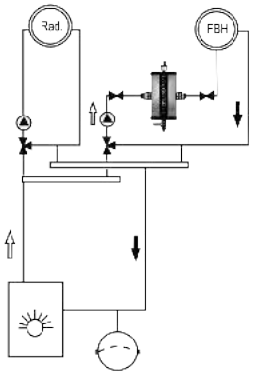
1 air vent
2 gasket
3 safety valve
4 anode indicator
5 steel housing
6 reaction vessel
7 gaskets
8 coupling male 1 1/2”
9 coupling female 1 1/2”
10 super magnet
11 drain valve

Correct installation



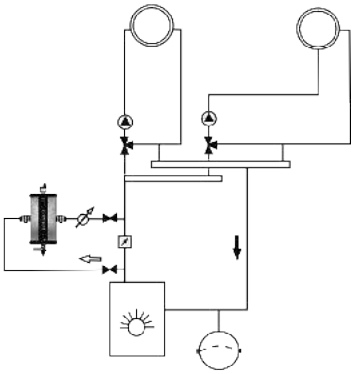
☑ Degassing ☑ Anodic protection ☑ Sludge removal

Installing in the main flow line
To achieve maximum filtration of micro gas-bubbles, fit the appliance in the main flow line (full flow) of the heating system. Circulating impurities are also filtered out efficiently in the flow line.



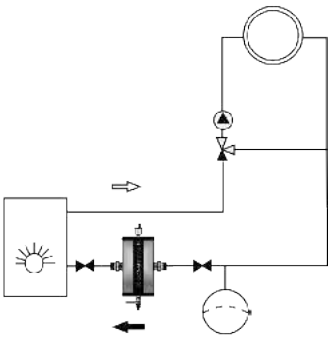
☑ Degassing ☑ Anodic protection ☑ Sludge removal

Installing in a subsystem (heating unit)
If you know the source of oxygen diffusion (e.g. the underfloor heating unit), the ELYSATOR trio can also be sited in the heating-unit circuit.



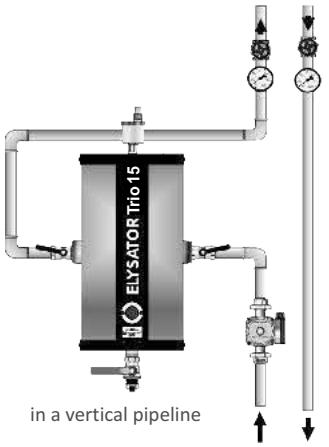
☑ Degassing ☑ Anodic protection ☑ Sludge removal

Installing in the bypass circuit
The ELYSATOR trio can be fitted in the bypass circuit. A flowmeter must also be used in this case. The lower the flow rate through the branch circuit, the weaker the degassing and filtration action. Water conditioning by the sacrificial anode is still effective, however, down to a minimum flow rate of 2 l/min.

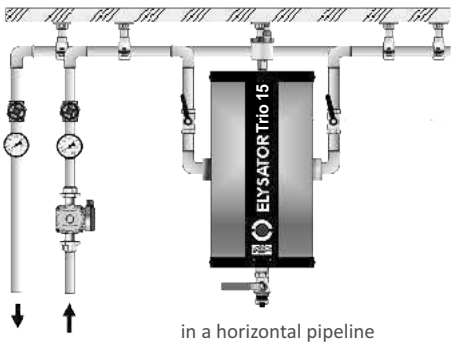


☐ Degassing ☑ Anodic protection ☑ Sludge removal

Installing in the main return line
If sludge collection is the priority then the ELYSATOR trio can be fitted in the main return line. Water conditioning by the sacrificial anode also works in the return line, but it is practically impossible to trap micro gas-bubbles here.



in a vertical pipeline



in a horizontal pipeline

Requirements of the water used to fill the appliance

☑ **Hard water can cause damage**

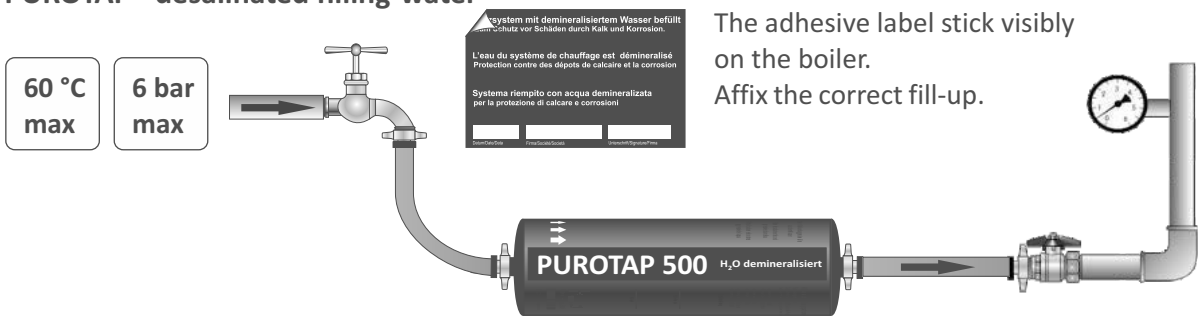
The quantity of dissolved calcium carbonate CaCO3 (chalk, lime etc.) should not exceed a certain amount per m3 of system water, otherwise this may produce limescale deposits that can cause stress fractures in the boiler or blockages in heat exchangers. Particular care is needed in heating systems fitted with high-performance heat exchangers, heat pumps, capillary tube systems (plastic pipes with a small diameter) and heat storage tanks.

If possible always ask your boiler manufacturer or system supplier about the water quality levels for their products. Normally there is no need to treat top-up water. Please note that if claiming for system components under warranty, the requirements stipulated by the relevant manufacturer apply, not our recommendations.

☑ **If the water needs pre-treating, use fully d e s a l i n a t e d water**

If the hardness of the water means that it must be pre-treated, please do not use a water softener. The ion exchanger in the water softener unit only replaces the calcium and magnesium with sodium. This does not change the overall level of salts in the water, which remains high, resulting in a raised electrical conductivity that promotes corrosion. Fully desalinated water, on the other hand, contains neither encrusting carbonates (limescale) nor materials that encourage corrosion (chlorides, sulphates, nitrates etc.), and has a minimum electrical conductivity. The relatively low pH value of fully desalinated water, however, means that it does have a temporary corrosive effect. The pH value needs to be corrected (e.g. using the ELYSATOR).

PUROTAP - desalinated filling-water



The adhesive label stick visibly on the boiler.
Affix the correct fill-up.

Requirements of the system water

☑ **No chemical additives**

The ELYSATOR corrosion-protection system must not be used in combination with chemical water additives. Corrosion inhibitors can impede the action of the sacrificial anode and create unwanted chemical compounds. If you plan to use an ELYSATOR, the system must be flushed through thoroughly to remove any residual inhibitors. A cleaning and dispersing agent such as SANOL H-15 is ideal for this purpose.

☑ **Flushing through clogged systems**

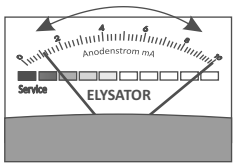
Systems that have become so clogged with sludge that hydraulic problems have occurred should be flushed through when the ELYSATOR is installed.
The boiler and any hot-water storage tanks must always be flushed through as well. Despite protective measures, damage could still occur in the boiler under excessively large accumulations of limescale and corrosion residues, because these will impair heat exchange and water circulation.

Operating meter

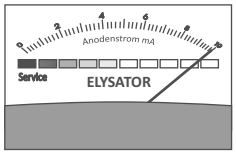
The ELYSATOR meter measures the current emitted from the anode as a proportion of the current emitted from the cathode. It is a direct measure of the corrosiveness of the system water. The ELYSATOR system is self regulating. The anode automatically works harder with corrosive water than with water that is no longer reactive, and the needle then shows a stronger deflection on the meter. The operating meter is permanently on.

The change in the needle position over time also gives an indication of the anode condition. Some examples of this:

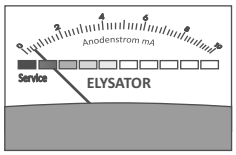
– If the meter reads 100 % over 1 to 2 years, but suddenly drops to 0 %, it is highly likely that the anode is spent (rapid usage)
– If the meter reads 50 % over 3 to 6 years, but now reads 0 %, it is highly likely that the anode is spent (standard usage)
– If the meter sits at a low reading e.g. for more than 6 years then this indicates slow usage. You should rule out a possible fault in the meter, however.
– If the meter already reads in the red region after just a few weeks, then oxidation of the anode is likely. This should be checked.
– In the summer season the anode reading drops as expected, because there is no circulation through the ELYSATOR.



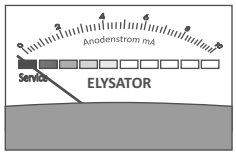
The needle swing lies between 10 % and 100 %
This is the normal operating region. The lower the reading, the less the anode needs to work.



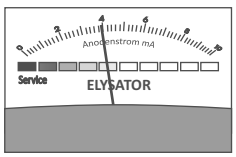
The needle always reads 100 %
The anode is working hard. If the needle remains in this position for longer than one heating season, the ELYSATOR may not be big enough or the water may contain too many corrosive substances.
Action: Analyse the heating water, talk to your heating adviser



The needle lies continuously close to the red region; when the ELYSATOR is emptied it drops towards "0".
The anode no longer needs to work because the chemical reactions in the water have finished, or the anode can no longer work because it is coated in a barrier layer.
Action: Analyse the heating water, talk to your heating adviser



The needle drops into the red region within a few weeks
The anode is spent or coated in a barrier layer
Action: Open up the appliance and clean or replace the anode.

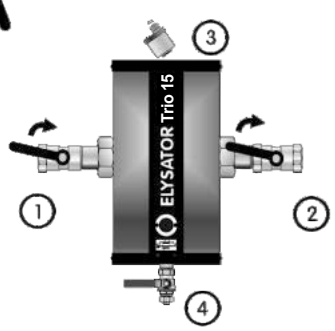


The meter continues to show an absolutely constant reading over a long period
The operating meter might be faulty.
Action: Shut off and empty the ELYSATOR; the needle must drop towards zero. If there is no change in the needle position, the meter is probably faulty.

Sludge removal

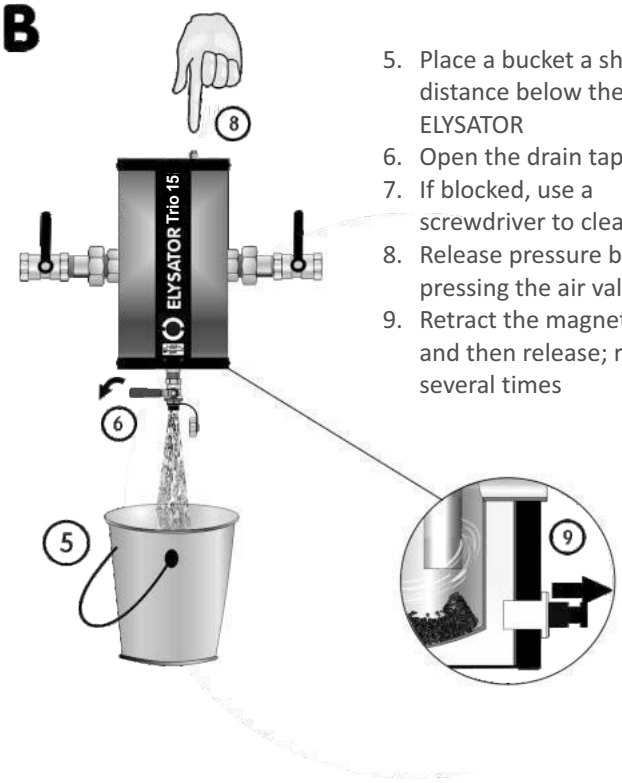
If the ELYSATOR is installed in the main circuit, switch off the circulation pump to sludge the appliance

A



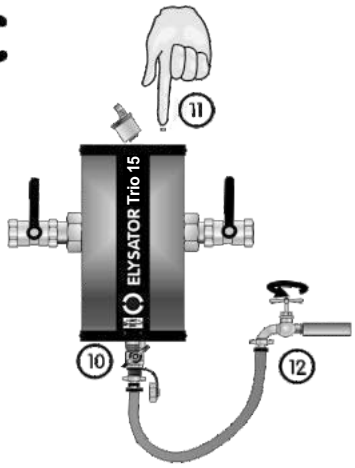
1. Close stopcock in supply line
2. Close stopcock in output line
3. Unscrew air vent
4. Remove cap from drain tap

B



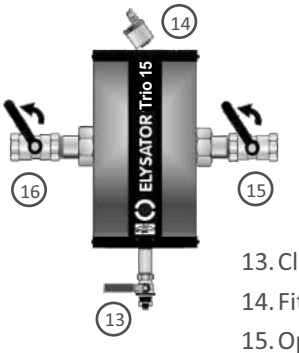
5. Place a bucket a short distance below the ELYSATOR
6. Open the drain tap
7. If blocked, use a screwdriver to clear it
8. Release pressure by pressing the air valve
9. Retract the magnet, hold and then release; repeat several times

C



10. Connect water refill hosepipe to the drain tap
11. Keep pressing the air valve or screw the air vent back on
12. Fill the ELYSATOR with fresh water and repeat procedure B as many times as is necessary until the ELYSATOR is clean. After filling the ELYSATOR go to procedure D.

D



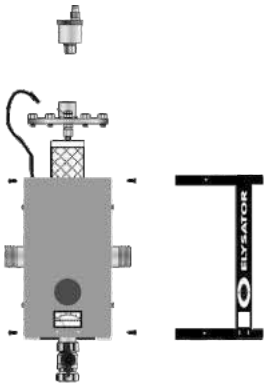
13. Close drain tap and replace cap
14. Fit air vent
15. Open stopcock in input line
16. Open stopcock in output line

How often should sludge be removed?

Corrosion residues that are carried along by the flow of water are deposited in the ELYSATOR for removal as sludge in the restoration phase. Heavily clogged heating systems and those containing chemical additives must be flushed through thoroughly before installing the ELYSATOR. Fresh water contains about 100 times more oxygen than is allowed in the heating system for operation. It is not advisable to remove the sludge too frequently because this increases oxygen corrosion.

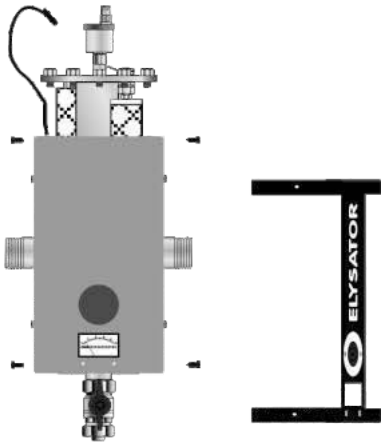
So check the amount of accumulating sludge and adjust the sludge-removal interval accordingly. Do not de-sludge the ELYSATOR more than twice in a heating season or less than once every two years. There are various ways of removing sludge from the appliance. The method described above is reliable, simple and introduces only a small amount of fresh water into the system.

Replacing the anode



Preliminary steps for type 10 appliance

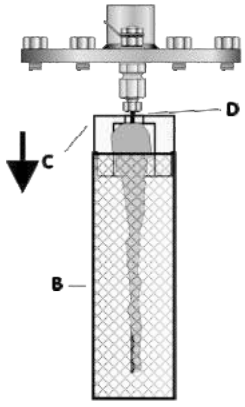
1. Shut off and empty the ELYSATOR
2. Remove front cover
3. Unscrew air vent
4. Remove top insulation (lid)
5. Remove connector from the anode blade terminal
6. Open the flange



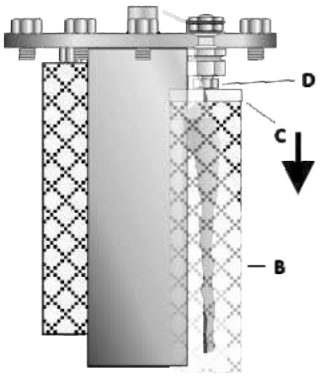
Preliminary steps for type 15 appliance

1. Shut off and empty the ELYSATOR
2. Remove front cover, disconnect cable (remove connector)
3. Unscrew air vent
4. Remove top insulation (lid)
5. Remove connector from the anode blade terminal
6. Unscrew 2 " plug (A)

Type 10 flange



Type 15/25 plug



Replacing the anode

7. Pull the filter holder (C) downwards to expose the cone screw (D).
8. Using a size 17 spanner to hold insulating screw (6) firmly, unscrew cone screw (D)
9. Fit new EPDM O-ring seal (G)
10. Fit new anode (H), re-assembling in the reverse order
11. After fitting the anode, check the insulating screw (E) is seated firmly and tighten slightly if necessary.

Cleaning tasks

12. If necessary clean the filter with a descaling agent
13. Flush the ELYSATOR through until it is clean
14. Wipe the outside of the appliance with a damp cloth

ELYSATOR
engineering water

Service Journal

Installer: Project:

date of installation: Device №.

Drain interval:

Service interval:

Date	Job	Watermeter m^3	mA	Company/Sign