magnetic® GmbH & Co. KG

Ermen Systems

Heating Water Treatment

(based on VDI 2035/2)

magnetic® ...einfach besser

VDI 2035/ 2

Prevention of corrosion

The 3 main drivers for corrosion in a closed circuit system:

- Conductivity (µS/ cm)
- pH value too high or too low
- Oxygen

magnetic® ...einfach besser

VDI 2035/ 2

Prevention of corrosion

The VDI 2035/2 stipulates the following:

- Conductivity < 100 µS/cm
- pH between 8,2-10 (Aluminium-Silicium 8,2-8,5)
- Oxygen 0,02mg/l (if water is demineralised 5x higher)

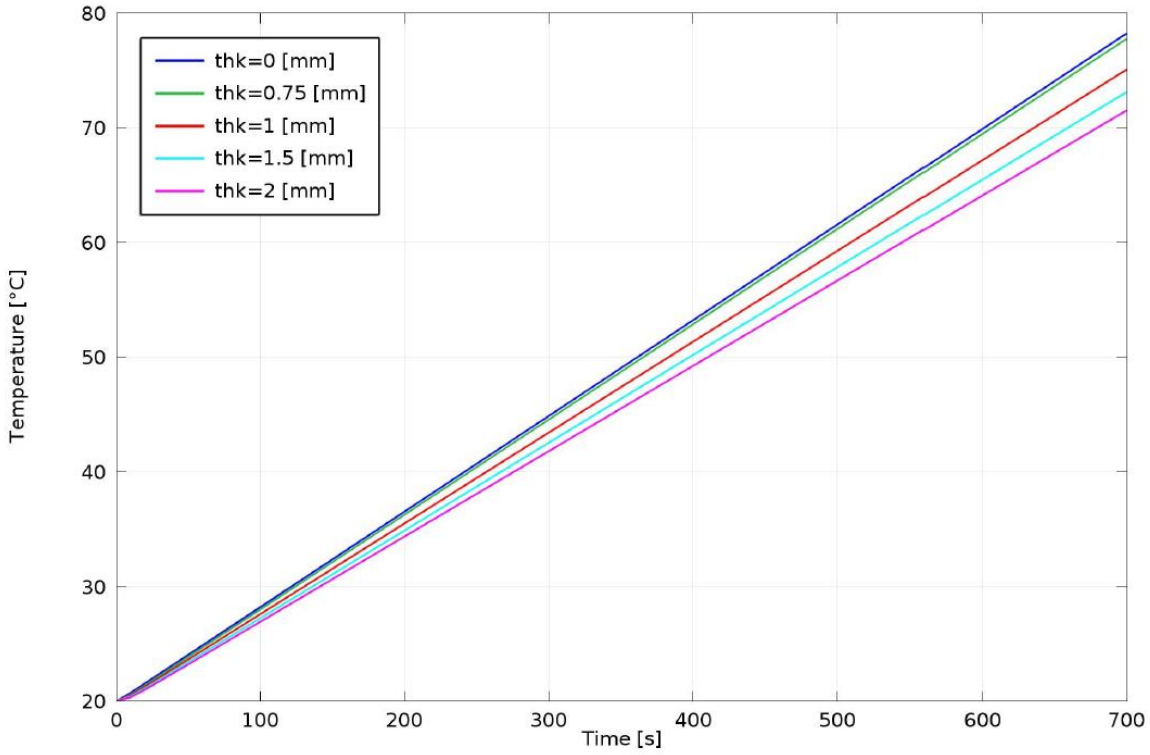
} **Demineralisation**

magnetic® ...einfach besser

VDI 2035/ 2

Prevention of loss of heat transfer

Main drivers for heat transfer loss is scale formation



magnetic® ...einfach besser

VDI 2035/ 2

Prevention of loss of heat transfer

Ermen SYSTEMS every ounce of our energy...

Main drivers for heat transfer loss is scale formation

Examples of increase in energy consumption as a result of scale formation

Scale layer (inches)	Increased energy consumption (%)
1/32 (0,79375 mm)	8.5
1/16 (1,5875 mm)	12.4
1/8 (3,175 mm)	25.0
1/4 (6,35 mm)	50.0 +

Source: https://www.wysiwash.com/downloads/ScaleSafe-Energy-Savings.pdf

magnetic® ...einfach besser

VDI 2035/ 2

Prevention of loss of heat transfer

Main drivers for heat transfer loss is scale formation

Effect of limescale on heat transfer

Example calculation for power reduction through a limescale layer with only 0,5mm

$$\text{Heat tranfer rate} = \frac{1}{\frac{1}{\alpha_1} + \frac{s_1}{\lambda_1} + \frac{s_2}{\lambda_2} + \frac{1}{\alpha_2}} \quad W/m^2K$$

α_1	= 10.000 W/m²K	Primary circuit
α_2	= 4.600 W/m²K	Secondary circuit
s_1	= 1 mm	Wall thickness of the heat exchanger
λ_1	= 20 W/m²K	Thermal conductivity of the exchanger
s_2	= 0,5 mm	Thickness of limescale
λ_2	= 0,81 W/mK	Thermal conductivity of limescale

Without limescale
Heat transfer rate

$$\frac{1}{\frac{1}{10.000} + \frac{0{,}001}{20} + \frac{0}{0.81} + \frac{1}{4.600}} = \underline{2.721} \quad W/m^2K$$

½ mm limescale
Heat transfer rate

$$\frac{1}{\frac{1}{10.000} + \frac{0{,}001}{20} + \frac{0{,}0005}{0.81} + \frac{1}{4.600}} = \underline{1.015} \quad W/m^2K$$

Reduction of heat transfer rate = 62%

Source: ECOTHERM

magnetic® ...einfach besser

VDI 2035/ 2

Prevention of corrosion and optimization of heat transfer

The tools to manage corrosion and optimal heat transfer for domestic/small scale

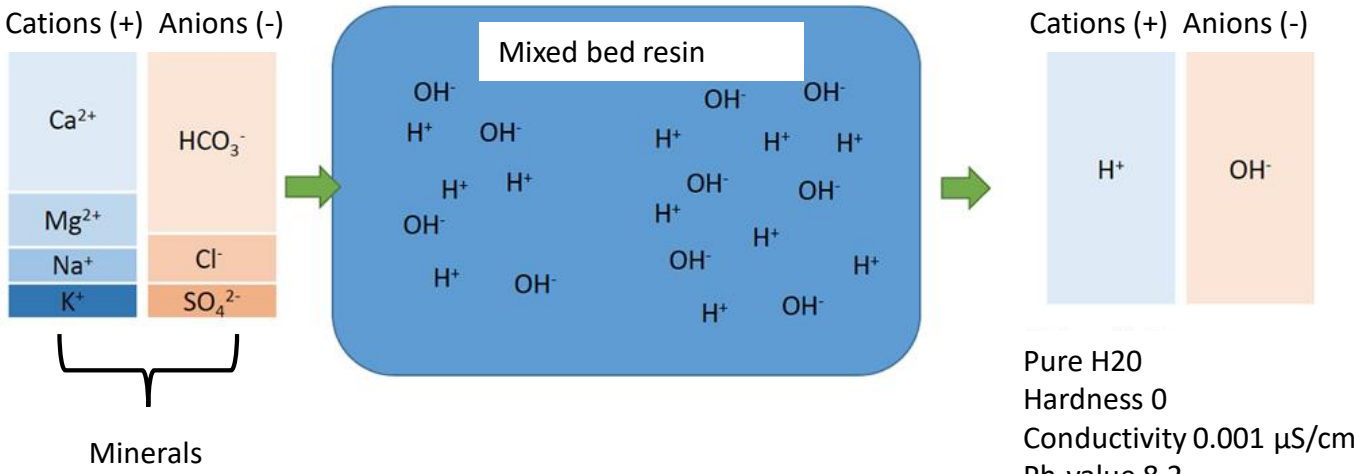
Demineralisation Cartridge

Heating Water Regulator

magnetic® ...einfach besser

Process Demineralisation

Demineralisation in one single step



Pure H20
Hardness 0
Conductivity 0.001 µS/cm
Ph-value 8.2

magnetic® ...einfach besser

Advantages of complying to the VDI 2035/2 by Demineralisation

Demineralized water has a hardness below ~0,001°dH which **prevents damage caused by scale formation**

Removal of chlorides, sulphates and nitrates **prevents corrosion** and formation of insoluble residue

By removing of all exchangeable ions the **electrical coductivity drops below <10µS/cm** which makes corrosion unlikely. At the same time a higher concentration of oxygen can be tolerated

Adding checmicals which are only hard to handle is **not** necessary. Only if the ph-value does not reach a range from 8,2-8,5 after 12 weeks a conditioning is necessary

Full manufacturer‘s warranty (most boiler manufacturer‘s ask for compliance to VDI2035 in warranty cases)

magnetic® ...einfach besser

The tools to demineralize the water

The Premium Class
Convenient and Simple.

magnetic® demineralization profi mobil plus

- Monitoring of the filling water by a precise measuring computer at inlet and outlet (visual and audio indication)
- High filling rate: 1500 l/h
- Filling capacity of up to 2400 litres at 20° dH / 35.6° fH
- Fast resin replacement at the worksite due to practical collecting sack and drain tap
- Frost protection due to drain tap
- Long service life thanks to a stainless steel construction

Demineralization of heating system water during heating system operation

Perfect for the subsequent demineralization of existing heating systems without having to replace the heating system water. Conductivity measurement with a measuring computer at the inlet and outlet which allows a circulation demineralization with an inline connection to the heating circuit.

OR

The Compact Solution
Handy and cost efficient.

magnetic® demineralization basic mobil plus

- Efficient water feed and water supply system
- Monitoring of the filling water by a precise measuring computer (visual and audio indication)
- Resettable digital water quantity counter
- High filling rate: 1000 l/h
- Filling capacity of up to 1200 litres at 20° dH / 35.6° fH
- Fast resin replacement at the worksite due to practical collecting sack and large opening
- Frost protection due to drain tap
- Long service life thanks to a stainless steel construction

magnetic® ...einfach besser

Premium resin to demineralize and top up water

Effective and Long Service Life
Premium Mixed Bed Resin.

The first mixed bed resin with quality certification

The quality of the resin determines the quality of the heating system water. It is therefore very important to not accept any compromise in respect of resin quality. That is why we supply only resin of the highest quality standard.

- Vacuum-packed for retention of the capacity
- Optimum mix ratio
- Supports the self-alkalinization (pH value increase)
- Certification checkable by QR code
- Suitable for all materials including aluminium.
- 100% non-regenerated resin

2-component mixed bed resin.

- Reduces the conductivity
- Conforms to current directives and standards
- With practical collecting bag
- Disposal with domestic waste

magnetic® ...einfach besser

Equipment for topping up water

Integrated components in the device:

2 shut-off valves allow depressurized and easy replacement of the mixed bed resin.

Water inlet: temporary easy hose connection or permanent installation with an already installed pipe separator

Pressure vessel with screw coupling

Outlet: demineralized water

Measuring computer, battery-powered. Measures the electrical conductivity and counts the flow quantity of the demineralized water.

Different sizes for every requirement

TOP-Seller

Water Demineralization Cartridge

magnetic® Demineralization Cartridge 300 with indicator

- Excellent value for money
- Reliable topping-up of heating systems with demineralized water as per VDI 2035
- Suitable for topping-up with small heating system water quantities – ideal for maintenance
- No measuring device for monitoring the capacity necessary
- Permanent availability of demineralized water for the house

Practical bracket with ball valve

The magnetic® assembly-kit allows you to get demineralized water direct from the tap

magnetic® ...einfach besser

magnetic® ...einfach besser

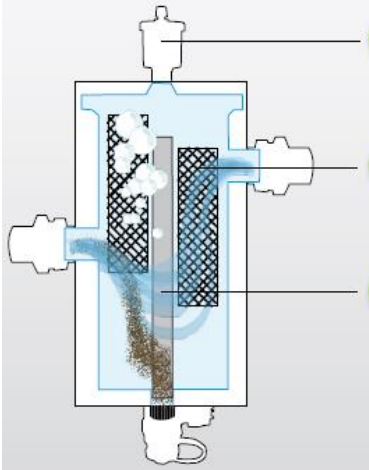
Tools to regulate and manage heating water quality

magnetic® HWR plus heating water regulator

Degasser, Sludge Remover,
pH-Protection, Filter

magnetic® HWR plus
Triple Safety

The optimum device that combines 3 proven corrosion protection methods.



Degassing
Removes oxygen and gases.
Removes circulating bubbles and released gases with a vent.

Anode protection
Regulates the pH value and converts oxygen.
Improves contact time due to water guidance through the entire vessel.

Magnetic flux and sludge filter
Removes sludge and cleans
The magnetic flux has an effect in the entire vessel.

magnetic® ...einfach besser

The Problems with Limescale in DHW

- Damage to hot water systems.
- Damaged pipes.
- Shorter life for appliances.
- Increase in energy consumption.

magnetic® ...einfach besser

Competitors Solutions

- Other competitors solutions include the use of either:
  - Chemicals
  - Salts.
- Both solutions have adverse effects:
  - Salts can cause and increase the rate of corrosion and health problems,
  - Chemical discharge can cause problems in the municipal water plants.
  - Both require monitoring and maintenance.

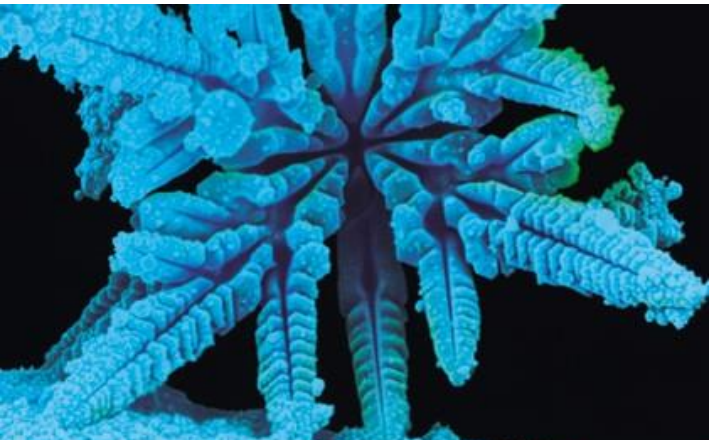
magnetic® ...einfach besser

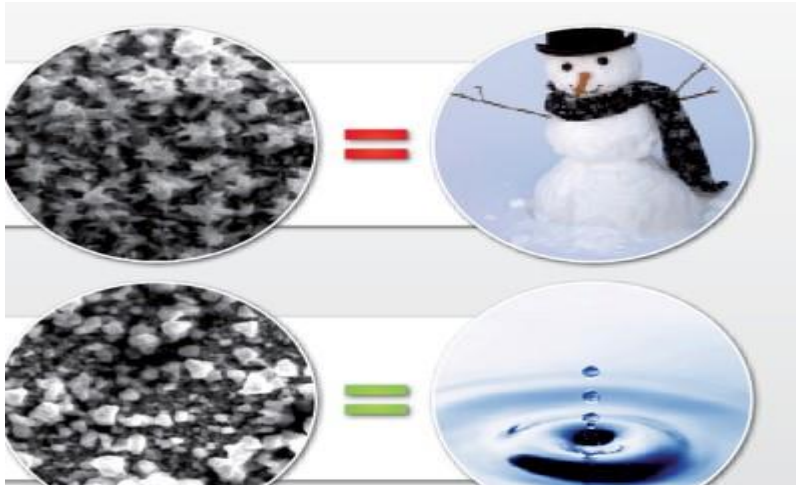
Our Solution:
Magnetic's Limescale transformer

Less is More!!

How it works:

- Limescale as seen under a microscope, has a snowflake like structure allowing the jagged edges to stick together and accumulate.
- After passing through the Magnetic's Limescale transformer, the molecular shape of limescale is transformed into a spherical shape.
- In turn, this allows the Limescale to now pass through and not accumulate, keeping the vitality of the water while protecting appliances.

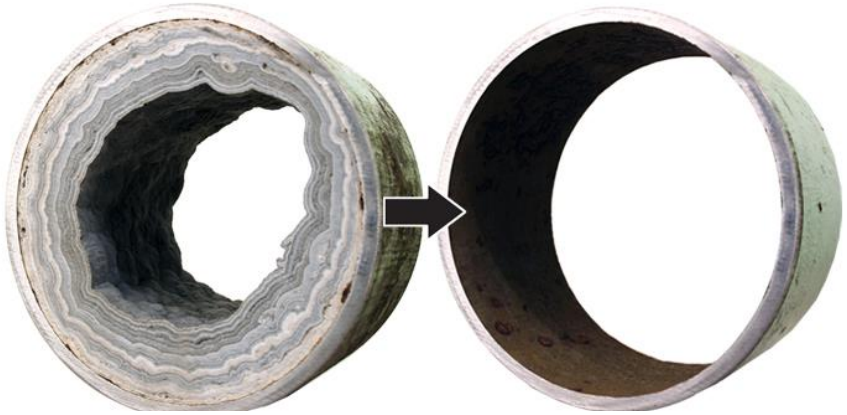




magnetic® ...einfach besser

Why Magnetic?

- Protection for Pipes and Appliances.
- Reduction in Energy Costs.
- Increased Thermal Efficiency.
- 20 Year Warranty.
- No Chemicals introduced to water.
- No Installation ,Maintenance or



magnetic® ...einfach besser

Conclusion: Less is More

By changing the structure of Limescale (Calcium), and not removing it from the water the following benefits occur:

- Less Energy needed to heat water, Fuel and Electricity
- Less Carbon Emissions
- Less appliances breaking down
- Less heating elements needing replacement
- Less (No) chemicals
- Less installation costs
- Less maintenance/running costs
- Less spare parts needed
- Less call outs, reducing carbon emissions from Service Vehicles
- Less (No) salts
- Less (No)Plastic bags used with no salt
- Less requirement for Calcium supplements
- Less detergents, shampoos and conditioners
- Less Packaging/Plastic containers
- Less water usage, no Regeneration

Conclusion: Less is More

And by using our demineralised water system we can guarantee:

- Less Energy needed, Fuel and Electricity
- Less Carbon Emissions
- Less components breaking down in circuit
- Less (No) Chemicals
- Less Maintenance Running Costs
- Less spare parts needed, no corrosion
- Less call outs, reducing carbon emissions from Service Vehicles
- Less Packaging needed for reduction in parts
- Less Air Miles transporting Spare Parts
- Less Disposal/Scrappage costs
- Less Noise in system
- Less Environmental impact