

Cooling and Heating Water Treatment in Accordance with VDI 2035 and VDI 6044

Technical information



Why Water Treatment?

A holistic approach to the treatment of heating and cooling water is essential and must never be overlooked. The relevant standards and guidelines, such as VDI 2035, 6044, and DIN EN 1717—which are recognized as generally accepted rules of the art—serve as the working basis for the HVAC trade.



Consequences of Non-Compliance with Guidelines

Failure to comply with the specified guidelines may result in the following disadvantages:

Refusal by the manufacturer to authorize commissioning

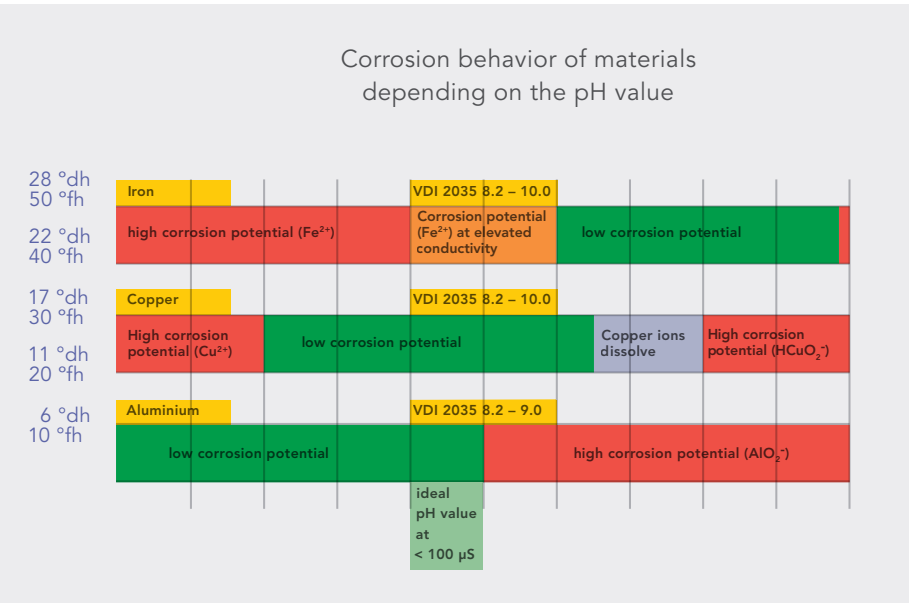
Denial of warranty coverage in the event of damage

Loss of performance and efficiency

Medium- to long-term damage to the heating system

Prevention of scale formation and corrosion in hot-water heating-systems

Scale formation and corrosion are common causes of damage in plant systems. For these reasons, VDI 2035 and VDI 6044 specify guideline values for make-up water. These form the basis for many warranty conditions, which designers, installers, and operators should always keep in mind. Water treatment ensures compliance with the specified values. Desalination and water softening are among the most common treatment methods.



Recommended measures when installing heating systems:

Take water volume into account for existing and new systems

Maintain a system logbook

Regular inspections

If necessary, implement additional protective measures by removing sludge (especially for underfloor heating systems)

Specifications according to VDI

VDI 2035 (version dated March 1, 2021):

Table 1: Guideline Values for Fill and Top-Off Water as well as Heating Water

Fill and top-off water as well as heating water, depending on heating capacity			
Total heating capacity in kW	Total alkaline earth metals in mol/m³ (Total hardness in °dH)		
	Specific system volume in l/kW ^{of heating capacity} 1		
	≤ 20	> 20 to ≤ 40	> 40
≤ 50 kW specific water content Heat generator ≥ 0.3 l per kW ¹	none	≤ 3.0 (16.8)	< 0.05 (0.3)
≤ 50 kW specific water content Heat generator < 0.3 l per kW ² (e.g., recirculating water heaters) and systems with electric heating elements	≤ 3.0 (16.8)	≤ 1.5 (8.4)	
> 50 kW to ≤ 200 kW	≤ 2.0 (11.2)	≤ 1.0 (5.6)	
> 200 kW to ≤ 600 kW	≤ 1.5 (8.4)	< 0.05 (0.3)	
> 600 kW	< 0.05 (0.3)		
Heating water, independent of heating output			
Operation	Electrical conductivity in µS/cm		
low-salt ³	> 10 to ≤ 100		
salty	> 100 to ≤ 1,500		
	Appearance		
	Clear, free of sedimenting substances		
Materials in the system	pH value		
excluding aluminum alloys	8.2 to 10.0		
including aluminum alloys	8.2 to 9.0		

¹To calculate the specific system volume for systems with multiple heat generators, use the smallest individual heating capacity.

²For systems with multiple heat generators having different specific water contents, the smallest specific water content shall be used.

³Full water softening is not recommended for systems with aluminum alloys; see also Section 6.4.4 in VDI 2035.

Conductivity and Hardness with the Low-Salt Treatment Method:

Required . Total hardness: **see table**
Conductivity: **< 100 µS/cm**
If additives such as inhibitors are used:
1,000–1,500 µS/cm

In low-salt treatment with Vadion pH-Control, total hardness levels averaging < 0.3 °dH are achieved at values < 100 µS/cm.

Corrosion experts assume that even when corrosion inhibitors are added, the conductivity should not exceed 1,000 µS/cm.

pH value

Without aluminum: **8.2–10.04**
with aluminum components: **8.2–9.04**

⁴ Measurement tolerance of max. ± 0.2 when the conditions specified in VDI 2035 are met

For modern aluminum alloys, pH values up to =< 9.0 are tolerated according to the manufacturer's specifications.

For other materials, the pH value can range between 8.2 and 10.0.

Oxygen content when low-salt operation:

< 0.1 mg/l

This is due to the fact that, under low-salt operating conditions, the conductivity is < 100 µS/cm, which significantly reduces the corrosion rate due to the impeded transport of charges. The oxygen content during operation in a salt-containing environment must be < 0.02 mg/l.

The specific system volume is therefore the decisive factor for calculating hardness!

Note:
Manufacturer specifications, which are higher than the specifications according to VDI, ÖNORM, and SWKI must be followed and are permissible. Many manufacturers require a-Conductivity values below 100 µS/cm and therefore a low-salt driving style.

In the VdTÜV information sheet "Explanations on VDI Guideline 2035, Sheet 2", under points 6 and 7, low-salt filling is considered the preferred solution, since this operating method also allows for higher oxygen levels (see table) in the water.

Operator obligations according to VDI 2035 (in particular Sheet 1)
The following summarizes the operator's key obligations:

- 1. Ensuring the quality of the heating water**
Details on this are provided in the following sections.
- 2. Documentation**
 - All measures related to water preparation and treatment (e.g., filling procedures, desalination, chemical additives) must be documented.
 - The use of technologies must be made traceable.
- 3. Regular Inspection / Monitoring**
 - The operator is required to regularly monitor water parameters.
 - Measurements of: pH, conductivity, oxygen content, and, if applicable, hardness during refilling.
- 4. Maintenance and Upkeep**
 - The technologies used must be regularly maintained and kept in good working order.
 - The operator must ensure that the **system's functionality** is checked, e.g., by qualified personnel.
- 5. Training / Expertise**
 - The operator should possess the necessary expertise or hire qualified personnel to correctly implement the requirements.
- 6. Liability for Noncompliance**
 - If corrosion or lime scale damage occurs due to poor water quality, the operator is generally liable , **if no measures were taken in accordance with VDI 2035.**

Ensuring Heating Water Quality

Four components in the heating water circuit are primarily responsible for corrosion and scale formation:

Component 1
Water hardness

Water hardness, in combination with the volume of fill and make-up water as well as the wall temperature of the heat generator, is primarily responsible for scale formation in the heating system. The following applies: The higher the temperature, the greater the risk of scale formation.

Component 3
pH value

The pH value is a measure of the acidity or alkalinity of water and is expressed on a scale from 0 to 14. It is important to note that the pH value is the result of a conversion formula that includes a common logarithm. This means that a pH jump (a change in pH by 1) represents a factor of 10 in the acid/base concentration: Water with a pH of 7 therefore contains 10 times more H+ ions than water with a pH of 8 and as many as 100 times more than water with a pH of 9 (10 × 10 = 100).

Component 2
Oxygen

If too much oxygen enters the heating system, it inevitably leads to corrosion. However, this does not refer to the oxygen that enters via the water during the initial fill—which is typically consumed by the existing metal—but rather to the oxygen that enters beyond that amount. The most common cause of uncontrolled oxygen ingress is an incorrectly adjusted or defective expansion tank.

Component 4
Conductivity

The higher the conductivity in the water, the greater the likelihood of corrosion. Conversely, this means that low conductivity reduces or slows down corrosion in the heating system. Conductivity is determined by the salinity of the make-up and top-off water. As a general rule, a high salt content results in high conductivity. Oxygen scavengers and corrosion inhibitors also increase conductivity.

Measurement: The Foundation for Efficiency & Safety

Precise measurement with WaterBoy—the first step toward optimal water quality



- Features**
- The WaterBoy is a smart dual-meter for analyzing heating-water quality
 - It detects problems early on, such as corrosion, excessive hardness levels, or deviations in conductivity
 - Automatic generation of PDF-Measurement reports – ideal for documentation for owners, inspection agencies, and insurance companies
 - Incl. App and cloud portal

- Your benefits**
- Transparent records of technical inspections
 - Prevention of follow-up costs through early diagnosis
 - Legal certainty through documented water quality
 - Automatic generation of measurement reports and centralized management in the cloud portal

NOTE

Water treatment is important! It's the only way to safeguard your warranty claims and reduce the risk of breakdowns!

Common problems caused by unsuitable heating water:

- ✗ Corrosion on heat exchangers and pumps
- ✗ Scale formation due to high water hardness
- ✗ Magnetite deposits in underfloor heating systems
- ✗ Loss of performance and energy waste

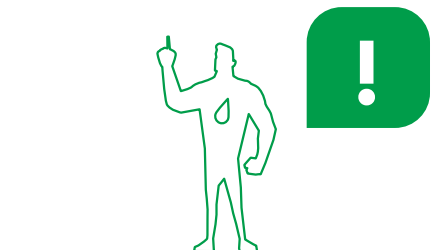


- Consequences:**
- Shortened service life of the system
 - Loss of warranty coverage
 - Higher maintenance costs
 - Energy losses due to inefficient heat transfer



Convincing figures:

- Up to **30 %** longer service life of the heat generators
- Up to **15 %** less energy consumption
- 100 % standard-compliant** heating water in a single step



Maximize capacity with demineralized water

The VDI recommends water softening or desalination as measures for heating water treatment. The key differences are:

Softening	Desalination
Removes the hardness-causing elements calcium and Magnesium (part of the cations) and replaces them with sodium	Removes all salts (cations and anions)
Prevents scale formation	Prevents scale formation
Conductivity does not decrease. Negatively charged ions (anions), such as chloride, are not removed. Due to the presence of sodium ions, conductivity can even increase by up to 20%.	Conductivity drops significantly because all Cations and anions—and thus conductive Salts are removed.

Fully demineralized water with the Vadion pH-Control Mixed-Bed Resin

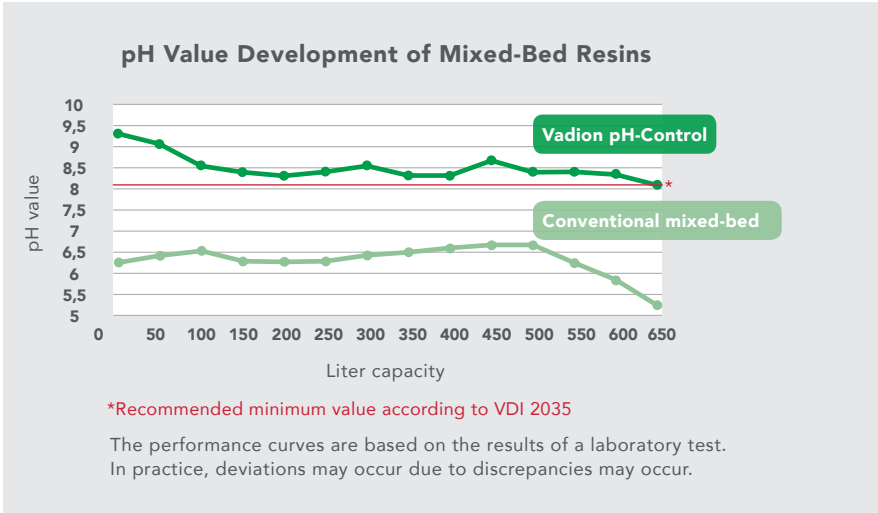
Our **Vadion pH-Control** is a mixed-bed resin that not only demineralizes the water to < 100 µS/cm (equivalent to 0–2 °dH) but also maintains the pH* of the feed water within the required range. It can be used at water temperatures ranging from 3 to 80 °C**. This also makes it possible to remove any residual hardness and dissolved salts in the heating water of a heating system in the bypass system up to temperatures of 80 °C.

Compared to the VDI guideline 2035, new values were included in the VDI guideline 6044, such as for chloride, sulfate and nitrate as well as TOC, iron, zinc, copper, aluminum and ammonium. The general total hardness requirement of < 8.4 °dH is broader than in the VDI guideline 2035 due to the lower operating temperature prevailing in larger systems. These specifications must be taken into account in future planning, construction, and operation to prevent operational disruptions or damage to the system.

Conclusion:
Advantages of low conductivity and, consequently, desalination

- Higher tolerable oxygen concentration
- Significantly reduced likelihood of corrosion
- All manufacturers’ specifications are met

UWS – Guaranteed to meet standards!
Thanks to Vadion pH-Control mixed-bed resin, both the pH value and conductivity are adjusted in a single step and without chemicals or other additives.



^{*)} A prerequisite for an optimal pH value is a residue-free system (glycol, cleaners, etc.), with no microbiological or other bacterial contamination. The systems must be state-of-the-art. Depending on the system’s characteristics, it may be necessary to stabilize the pH value.
^{**)} At temperatures of 50 °C or higher, hot-water-compatible units from the Heaty series must be used.

Treatment and Top-off

Professional water treatment prevents corrosion in the cooling system through desalination, softening, and filtration. That is why UWS has developed mobile and stationary treatment units that combine all necessary components into a unit. Furthermore, UWS offers mobile UWS filtration units, vacuum degassers, and stationary side-stream filters as needed. The filtration and treatment units are also ideally suited for cleaning sludge-clogged **underfloor heating systems**.



Professional replenishments Why refill?

Ensuring the correct water quality during makeup is crucial for preventing damage and to maintain warranty coverage. In order for a heating or cooling system to function optimally, there must always be a sufficient amount of water available. However, a reduction in system pressure and a loss of the carrier medium to a certain extent are unavoidable. The system operator must therefore regularly top off the water. Three parameters play a role here: **system separation, water treatment, and monitoring.** This ensures long-term, functional, and safe operation of the System. Our makeup systems comply **with the VDI 2035 and VDI 6044 guidelines**, protect against corrosion and scale formation, and maintain the pH value within the optimal range.

DID YOU KNOW?

The fully automatic **Heaty Complete PROfessional** make-up system ensures constant pressure conditions and thus ideal efficiency in the heating system. The leakage protection prevents uncontrolled water leakage and costly damage to buildings.



Your advantages with UWS

- Quality of treated water in accordance with standards
- Clarification of object-related features
- Approaches to solving problems
- Providing the right equipment
- Documentation of measurement and analysis values in the cloud portal



Magnetite and fine filters

The dual filters of the MAGella twister series are unique, highly efficient system filters for magnetic and non-magnetic contaminants in heating and cooling systems. They contain fine filters up to 1 µm and powerful magnetite filters. With a magnetic field strength of 11 x 12,000 gauss, the MAGella twister10 is the most powerful compact filter in the world. Contaminants in heating and cooling systems lead to wear and premature failure of pumps, valves, and heat exchangers. The magnetic separators, dual filters, and side-stream filters in our MAGella series protect your systems from all types of contaminants. This saves your customers energy and costs.



DID YOU KNOW?

The UWS dual filters in the Twister series meet the requirements of DIN EN 14336 for the installation and acceptance testing of water-based heating systems.



Compact and powerful

- ✗ Contaminants circulating in heating and cooling systems can lead to wear and premature failure of pumps, valves, and heat exchangers.
- ✓ The MAGella MG 100 and MG 200, mounted on the return line at the boiler, protect the system from all types of contaminants.

Your benefits

- 4 x 9,000 Gauss
- Magnetic particles are reliably removed from the water
- 360 degree mountable
- Flexible installation, even in confined spaces
- 2 shut-off valves included
- Connection block made entirely of brass

Benefits and Devices for all Applications

	Floor heating systems	Single-family homes	Multi-family housing	Commercial and public buildings	Data centers
Advantages	• 10-15% savings in energy and costs • Ideal for customer-service and small fill volumes • Convenient to use thanks to integration into a trolley • Magnetic filter small and compact	• 10–15% savings in energy and costs • Powerful magnetite filter	• 10-15% savings in energy and costs • Extended service life • Compliance with Manufacturer warranties • Thanks to the bypass-system, no downtime	• 10–15% savings in energy and costs • Immediate and lasting protection of the system • Reduces the risk of system failures • Integration into GLT • Automatic shutdown possible (Racun)	• 10–15% savings in energy and costs • Continuous monitoring • Magnetite filtration with up to 11 × 12,000 gauss
Treatment	Heaty Mobile, Heaty Smart Box	Heaty Mobile, Heaty Mini, Heaty Smart Box, Heaty Ferriline	Heaty Ferriline No. 2, Heaty Profileline No. 2, Racun Series	Heaty Ferriline No. 2, Heaty Profileline No. 2, Racun Series	Racun Series, Side Stream Filter
Filtration	MAGella MG 100/200	MAGella MG 100/200/300	MAGella MG 200/300	MAGella MG 300 twister 5/10	MAGella twister 5/10, Side Stream Filter
replenishment		Heaty Complete Home, Advanced, and PROFESSIONAL Series	Heaty Complete Home, Advanced, and PROFESSIONAL Series	Heaty Complete Fix and GLT Series	Heaty Complete Fix and GLT Series, Racun Series
Measurement Technology	UWS WaterBoy	UWS WaterBoy	UWS WaterBoy	UWS WaterBoy	UWS WaterBoy

Documentation made easy: with Heaven7 UWS Cloud Solutions

With Heaven7 UWS Cloud Solutions, UWS Technologie GmbH offers a comprehensive digital solution for heating and cooling circuits. From precise measurement and intelligent water treatment to fully automated makeup, all relevant processes are centrally recorded, documented, and consolidated in the UWS Cloud Portal. This results in a new standard of VDI-compliant system documentation - transparent, audit-proof, and available at all times.

The solution is based on three seamlessly integrated components: The **UWS WaterBoy** precisely measures all relevant water parameters on-site. Via the **WaterBoy app**, the measurement data is transmitted directly to the UWS Cloud Portal, where it is immediately available. Optimal water quality is ensured by the intelligent treatment systems of the **Racun series**, which automatically document all treatment processes. The system is complemented by **Heaty Complete PROfessional**, the fully automatic makeup system for heating and cooling systems. It maintains a constant system fill level and comprehensively logs all makeup water operations.

At the heart of the solution is the **UWS Cloud Portal**. This is where all data from measurement, treatment, and makeup feed converge. Specialized technicians, system operators, and facility managers thus gain a central platform for the complete documentation of their systems—compliant with standards, clearly organized, and accessible at any time.



Your benefits

- End-to-end digital documentation of all relevant system processes
- Centralized data collection in the UWS Cloud Portal
- Greater transparency through measurement and operating data accessible at any time
- Greater operational reliability through automated monitoring and makeup feeding
- Support for standards-compliant, audit-proof documentation
- Time savings and reduced manual effort in plant operations

With Heaven7 UWS Cloud Solutions, UWS lays the foundation for a networked, efficient, and future-proof water treatment system.

Equipment and service from a single source

Together, we'll find the optimal solution for your system

Our services cover the entire spectrum of the heating and HVAC industry, as well as numerous subsidiaries of our parent company, Aalberts Hydronic Flow Control.

Whether it's maintenance, repair, rental, or system optimization, our team is the right partner for your project.

Here's how simple it is:

Step 1: Together with building services

We assess the existing system, conduct a comprehensive water analysis in accordance with applicable standards, and develop a recommendation for action.

Step 2: Treatment of System water and preventive

Depending on the size of the system, mobile or permanently installed units can be used. Our TÜV-certified service team supports the building services and ensures that the required water quality is achieved. Depending on the initial conditions, this optimization can yield savings of 10–15%.

Step 3: Documentation

We document water quality in accordance with standards, thereby ensuring that any warranty claims remain valid.

Added Value of the UWS Group in Water treatment

Analysis, implementation, and documentation - all from a single source upon request

Compatible with all Manufacturers and materials

- Cooling and heating water treatment
- Bulk filling
- Rental
- Product services/maintenance

Compliance with standards
VDI 2035 & 6044
ÖNORM H 5195-1
SWKI BT 102-1
DIN EN 14336

We'd also be happy to train your building services team and teach them everything they need to know about proper water treatment



TÜV-certified and true Experts in standard-compliant Water treatment

our water. safe.

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