De Dietrich
BOILERS

De Dietrich Water Quality Requirements

www.dedietrichboilers.com

DDRA 006 v1.0 03/2010

Introduction

In many cases central heating boilers and installations can be filled with normal tap water and water treatment is not necessary. To avoid problems with boiler and installation, the limiting values below must be used for the composition of the heating water. If one or more of the conditions cannot be met, we recommend that you treat the heating water. In addition, prior to an installation being filled and put into operation, it must be thoroughly flushed.
The guarantee may become null and void if the installation is not flushed and/or the water quality is inadequate.

It is advisable to check the water quality of a central heating installation regularly, particularly if it is topped up regularly. If the water has been treated, the supplier of the water treatment product can be consulted. The user of the installation is responsi ble for ensuring good quality installation water at all times. If the user wishes to achieve this water quality with the aid of water treatment systems, this will also be his/her responsibility.
We would advise the user to record all water treatments carried out in a good log book. This log book can also be used to record work started and performed on the central heating boiler(s) and system.

1 Heating water quality

1.1. General points to consider in relation to water quality

De Dietrich heating boilers operate best with clean, good-quality tap water. The most frequently occurring factors that have a negative effect on the heating water can be: oxygen, lime, sludge, acidity level and other substances (including chlorides and minerals). The heating water quality can be measured on the basis of the acidity level, water hardness, conductivity, chloride content, iron/iron oxide content and content of other components (these may be, for example, residues from a water treatment product used in the past).

In addition to the heating water quality, the installation also plays a significant part. When using materials that are sensitive to oxygen diffusion (such as some floor heating hoses, connecting hoses etc.), quite a lot of oxygen can get into the heating water during operation. This must be avoided at all times. Even if the installation is regularly topped up with fresh tap water, oxygen and other components (including chalk) will get into the heating water again. It is therefore essential to carry out checks when topping up with fresh tap water. A water meter and a log book for recording information will be needed for this. No more than 5% of the installation's water content may be topped up on an annual basis.

1.2. Points to consider in relation to water quality in new installations

In the case of new installations, it is first of all crucial to flush the entire installation thoroughly (without the central heating boiler) before the central heating installation is commissioned. This will remove residues from the installation process (weld slag, fitting products etc.) and preservatives (including mineral oil). To assist in the flushing process, a cleaning agent may be used (this may only be performed by an appropriate expert). Do not soften water to below 1ºf (0.1 mmol/l $Ca(HCO_3)_2$), as softened water with lower water hardness is bad for the installation. An inhibitor must be used in combination with softening.

1.3. Points to consider in relation to water quality in existing installations

If the quality of the heating water in an existing installation proves to be inadequate, certain measures must be taken.
One option for removing pollution is to install a filter. Various kinds of filters are available for this. A screen filter is designed to trap large dirt particles. This filter is usually placed in the full flow part of the system. A fabric filter, on the other hand, is designed to trap finer particles. This kind of filter is

installed in partial flow conditions, with an additional pump to control circulation over the filter. Another option for removing dirt is to flush the entire installation thoroughly.
If a new boiler is being installed in an existing installation, the system must be flushed before the new boiler is installed. The installation should be flushed by an expert; this process involves risk if not performed carefully. Loose dirt can only be removed where there is sufficient flow. Treatment will therefore take place section by section. Complications can occur if it is not possible to ensure that the sections to be cleaned have sufficient circulation and that user influences before and during cleaning can be kept under control. Special attention must also be paid to 'blind spots', where there is only a small amount of flow and a lot of dirt can accumulate.
The above points are even more important to note when flushing using chemicals. In particular, there is the possibility of chemicals being left behind, with obvious negative consequences. If the boiler is polluted with dirt or scale deposits, it may be necessary to clean the central heating boiler. Lime scale deposit occurs by far most frequently at the hottest place in the installation, i.e. in the central heating boiler. The central heating boiler must be cleaned by an expert, using a suitable agent.

2. Water treatment

If a water treatment product is used, the product must have been found suitable for all materials used in the central heating installation. The supplier of the water treatment product must be consulted in this regard. It is always important to adhere very closely to the regulations and instructions provided by the supplier of the water treatment product. This includes a periodic inspection and periodic replacement if necessary. Given that a variety of water treatment products are available, it is not feasible for De Dietrich to investigate all possible products. A number of well-known manufacturers and their products are:

Fernox
US Customer Support
Cookson Electronics
4100 6th Avenue
Altoona, PA 16602 USA
Tel: 800-289-3797
Fax: 814-944-8094
Email: fernox_americas@cooksonelectronics.com
Website: www.fernox.com

- F3 Cleaner restorer (neutral universal cleanser for existing and pre-commissioning new systems)
- F1 Protector (protects against corrosion and lime scale in mixed metal systems)
- Alphi-11 (antifreeze + protection agent)
  Fernox Protector Alphi-11 is a combined antifreeze and inhibitor, which gives long term protection of domestic central heating systems against internal corrosion and lime scale formation. It prevents corrosion of all metals found in these systems, i.e. ferrous metals, copper and copper alloys and aluminium. Fernox Protector Alphi-11 is compatible with all metals and materials commonly used in central heating systems.

Sentinel Water & Energy Solutions
Douglas Products and Packaging
1550 E. Old 210 Highway
Liberty, MO 64068 USA
Tel: 877-567-2560

- X100 (inhibitor)
- X200 (noise reducer, lime scale remover, very strong, can be left in the system permanently)
- X300 (cleaning agent for new installations)
- X400 (cleaning agent for existing installations)
- X500 (antifreeze + protection agent)

Agents from other manufacturers may also be used, provided that the relevant manufacturer guarantees that it is suitable for all materials used and is corrosion-resistant.

Caution!
Care must be taken when treating the water. If the instructions accompanying the water treatment product are not fully observed, or a particular product is used and/or dosed incorrectly, this may result in damage to health, the environment, the central heating boiler or the central heating installation.

3. Recommendations for the water quality (according VDI 2035-1)

Cast Iron Heat Exchanger

Total output	Total hardness °f*		
	According to the specific volume of the installation (volume of the installation/smallest unit output)		
	< 20l/kW	≥ 20 l/kW and < 50 l/kW	≥ 50 l/kW
≤ 50 kW	≤ 30 °f**	≤ 20 °f	≤ 0,2 °f
> 50 kW and ≤ 200 kW	≤ 20 °f	≤ 15 °f	≤ 0,2 °f
> 200 kW and ≤ 600 kW	≤ 15 °f	≤ 0,2 °f	≤ 0,2 °f
> 600 kW	≤ 0,2 °f	≤ 0,2 °f	≤ 0,2 °f

* 1 °f = 0,1 mmol/l $Ca(HCO_3)_2$
** for boilers with low water capacity

The necessity of the water treatment depends on the hardness of the locally distributed water and the capacity of the installation.

Acidity (not treated water	7 - 9 pH
Acidity (treated water	7 - 8,5 pH
conductivity	≤ 800µS/cm (at 25 °C)
chlorides	≤ 150 mg/l
Other components	< 1 mg/l

For installations with output ≤ 50 kW and specific capacity ≤ 20 l/kW, the recommendation is valid for boilers with low water capacity. Under this term we include the wall hung boilers and the condensing boilers in aluminium or stainless steel. For cast iron boilers there is no requirement.

For the calculation of the specific volume of the installation, the smallest unit output must be taken into account. Thus, for cascade installations, the output to take into account is this of the smallest boiler.

For example: for an installation with a total output of 100 kW, with a capacity of 1200 litres consisting of 2 boilers of 50 kW, the specific volume of the installation is: 1200/50 = 24 l/kW

Do not forget to take into account the capacity of a possible buffer tank (e.g. for an installation working with solid fuel)

Heating Water Treatment

Aluminium Heat Exchangers

Acidity level (untreated water)	7–9 pH
Acidity level (treated water)	7–8.5 pH
Conductivity	≤ 800µS/cm (at 25°C)
Chlorides	≤ 150 mg/l
Other components	< 1 mg/l

Water hardness

	Maximum total water hardness of the installation water and make-up water*		
Total installed heat output kW	mmol/l	°dH	°f
≤ 70	0.1–3.5	0.5–20	1–35
70–200	0.1–2.0	0.5–11.2	1–20
200–550	0.1–3.5	0.5–8.4	1–15
> 550	0.1–0.5	0.5–2.8	1–5

Please note: For installations that are heated at constant high temperatures up to a maximum of 200 kW installed heat output, a maximum total water hardness of 8.4ºdH (1.5 mmol/l, 15ºf) applies. For installations that are heated at constant high temperatures above 200 kW, a maximum total water hardness of 2.8ºdH (0.5 mmol/l, 5ºf) applies.

Stainless Steel Heat Exchangers

Acidity level (untreated water)	7–9 pH
Acidity level (treated water)	7–8.5 pH
Conductivity	≤ 800µS/cm (at 25°C)
Chlorides	≤ 150 mg/l
Other components	< 1 mg/l

Water hardness

	Maximum total water hardness of the installation water and make-up water*		
Total installed heat output kW	mmol/l	°dH	°f
≤ 70	0.1–2.0**	0.5–11.2**	1–20**
> 70	0.1–0.5	0.5–2.8	1–5

Please note: For installations that are heated at constant high temperatures, a maximum total water hardness of 2.8ºdH (0.5 mmol/l, 5ºf) applies.

* Up to a maximum annual make-up volume of 5% of the installation water content

** Up to a maximum installation water content of 6 litres per kW installed heat output. For higher water contents a maximum total water hardness of 8.4ºdH (1.5 mmol/l, 15ºf) applies.

Water addition:

The maximum quantity of water which can be added in the installation (1st filling + adding) without treatment can be calculated whit the formula:

$$V_{max} = 0{,}0235 \times \frac{Q\ (kW)}{Ca(HCO_3)_2\ (mol/m^3)}$$

V_{max}: Maximum volume of water (1st filling + adding) for the whole life of the boiler
Q: total output (kW)
$Ca(HCO_3)_2$: concentration of carbon hydrogen carbonate (mol/m^3)

Final Note

It is advisable to check the water quality of a central heating installation regularly, particularly if it is topped up regularly. If the water has been treated, the supplier of the water treatment product can be consulted.
The user of the installation is responsible for ensuring good-quality installation water at all times. If the user wishes to achieve this water quality with the aid of water treatment systems, this will also be his/her responsibility. We would advise the user to record all water treatments carried out in a good log book. This log book can also be used to record work started and performed on the central heating boiler(s) and system.

Conversion Factors

Temperature Conversion Formula
Temperature °C = (temperature °F - 32) x 5/9
Temperature °F = 9/5°C + 32

Heating Output Conversion Formula
1 kW = 3,413 Btu/hr

Hardness Conversion Formula
1 grain $CaCO_3$ /US Gallon = 17.1 ppm $CaCO_3$/L
1 dH = 17.9 ppm $CaCO_3$/L
1 ppm $CaCO_3$/L = 1 mg $CaCO_3$/L
1 mol/m^3 = 1 mmol/L = 100 ppm $CaCO_3$/L

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