

Water Quality Guideline

For electric steam generators and superheaters

Field of application:

This Guideline is valid for electric steam generators of the series Dampfboy, NDD, CD Standard, CD Compact and CD Module¹. Differences in the necessary water quality for pressure vessels made from stainless steel are marked. If there is no marking, the water quality values apply to pressure vessels made from steel and stainless steel.

This guideline is based on long term experiences of DINO Anlage- und Maschinenbau e. K. in the field of steam generators production and maintenance as well as on the minimum requirements of EN 12953-10 and TRD 611.

Intention:

By complying with the parameters mentioned in this document, the operator of the steam generator is given the opportunity to:

Reduce the risk of corrosion,
minimise scaling and sedimentation,
and to remove scale and sediments by periodic blow-down from the pressure vessel.

Note:

During the vaporisation of the feed water in the pressure vessel, the concentration of solved, non-volatile substances in the water increases. This leads to severe corrosion.

To prevent this, the blow-down valve is to be used as stated here:

Day-to-day operation (8 hrs max.):	Shut down the steam generator and drain the steam generator by opening the blow-down valve while still under pressure.
Multi-shift operation:	Open blow-down valve every 8 hours for 5 to 10 seconds during operation. After shutdown drain the steam generator by opening the blow-down valve while still under pressure.

1: The series „CD Modul“ includes the steam generators series „Duplex“ and „Drilling“

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Feed Water Requirements:

General Requirements		
pH-value at 25° C		7 — 8
Total Water Hardness**	° dH	< 4
Iron, total (Fe)	mg/l	< 0,2
Copper, total (Cu)	mg/l	< 0,05
Oil, Fat	mg/l	< 1
Organic Substances	—	see footer ¹
Oxygen	mg/l	< 0,05
Carbin Dioxide, ligated	mg/l	< 25
Carbin Dioxide, free	mg/l	0
Chloride*	mg/l	< 250
Manganese*	mg/l	< 0,05
Ammonium*	mg/l	< 0,5
Sodium*	mg/l	< 200
Sulfate*	mg/l	< 250
Nitrate*	mg/l	< 50
Nitrite*	mg/l	< 0,5
Fluoride*	mg/l	< 1,5
Phosphate*	mg/l	< 20
Aluminium*	mg/l	< 0,2

Limit values marked with * are based on the german Trinkwasserverordnung (drinking water ordinance) as of May, 21st, 2001 (TrinkwV 2001).

** : Please see water hardness conversion table below

In addition to the limits above, the water must be:

- uncoloured
- clear and
- free of suspended solids.

Conversion of Water Hardness Units:

If your water analysis shows the total hardness in units other than German degrees of hardness (° dH), here you will find a table for conversion to other units. However, this conversion table is valid only if one assumes a standard ion ratio, as occurs in natural water.

		° dH	° e	° fH	ppm	mval/l	mmol/l	mg/l Ca
German degrees of hardness	1° dH = (10 mg/l CaO)	1,00	1,25	1,78	17,85	0,36	0,18	7,15
English degrees of hardness	1° e = (14,3 mg/l CaCO ₃)	0,80	1,00	1,43	14,30	0,29	0,14	5,73
French degrees of hardness	1° fH = (10 mg/L CaCO ₃)	0,56	0,70	1,00	10,00	0,20	0,10	4,00
ppm CaCO ₃ (USA)	1 ppm CaCO ₃ = (1 mg/l CaCO ₃)	0,06	0,07	0,10	1,00	0,02	0,01	0,40
Total alkaline earth ions	1 mval/l =	2,80	3,50	5,00	50,04	1,00	0,50	20,04
Total alkaline earth ions	1 mmol/l =	5,61	7,00	10,01	100,09	2,00	1,00	40,08

1: In general, organic substances are mixtures of different compounds. The composition of such mixtures and the behavior of its components under the conditions of boiler operation are difficult to predict. Organic substances may decompose to carbon dioxide or other acidic products, which increase the conductivity and cause corrosion and deposits. They can also cause foam and / or coating formation, which are to be kept as low as possible. Similarly, the TOC (Total Organic Carbon) must be kept as low as possible.

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Demineralized / Deionised Water:

Demineralized water (also referred to as deionized water,) is water without the minerals (salts, ions) occurring in the normal source and tap water. It may be used only in these steam generators, which are equipped with **a pressure vessel made of stainless steel** and if a clearance certificate is issued. If the use of deionized water is intended in the steam generator, this should be taken into account when configuring the steam generator, so that appropriately designed pumps and valves are used.

Water which is in **no case** is **suitable** for the use in DINO steam generators:

- Drinking water with a total hardness of more than 4° dH,
- Water with chemical additives such as hydrazine, sodium sulfide, film-forming amines and similar,
- Fully softened water (0° dH)
- Well Water
- Industrial Water
- Process Water

Warranty

The warranty is void, if the steam generator

- is operated with unsuitable water, according to this guideline,
- is operated with demineralized water without clearance certificate,
- is operated with water, whose ingredients exceed the limits specified in this guideline.
- is not blown down regularly as stated in this guideline.