ONI-Wärmetrafo GmbH Niederhabbach 17 D-51789 Lindlar Germany Phone: +49 2266 4748-0

Translation of the original warranty conditions





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The warranty period agreed in the order can only be granted if the following points are observed:

1 Quality of water

Depending on the type of device to be cooled, certain requirements are placed on the cooling water with regard to its purity.

Appropriate procedures for treatment, cleaning and care of the water must be implemented depending on the degree of water contamination.

We ask you to contact an authorized specialist company in this regard. On request, our customer service can arrange some appropriate contacts.

Impurities in the water	**Possible procedures**
Mechanical contamination when using cooling tower, surface or deep (ground) water	Filtering of the water through sieve filter, gravel filter, cartridge filter, pre-coat filter
Water hardness is too high.	Softening of the water by ion exchanger
Moderate content of mechanical impurities and hardness particles	Treatment of the water with chemical stabilizers or dispersants
Moderate content of chemical impurities	Treatment of the water with chemical stabilizers or dispersants
Biological contamination by slime bacteria and algae	Treatment of the water with biocide

In the interest of the design-oriented operation of a re-cooling system that is operated with water on at least one side, the quality of the water used should not deviate significantly from the attached lists of hydrological data. The recommended water values differ depending on the type of the system installed:

- Atmospherically open or semi-open systems
  (see section 5 - Recommended reference values for the quality of the circulating water in atmospherically open or semi-open systems and for the supply of temperature control and heating units - page 6)
- Closed systems
  (see section 6 - Recommended reference values for the quality of the circulating water in closed systems - page 7)
- Open systems (e.g. cooling tower circuits)
  (see section 7 - Recommended reference values for the condition of the circulating water in open systems - page 8)

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- Outdoor cooler with adiabatic functionality
  - with spray system
  - with mat system

  (see section 8 - Recommended reference values for the quality of the fresh water for the outdoor cooler with adiabatic function - page 9)

There are restrictions regarding the selected materials (as for Aluminium the max. pH value shall make 8.5) and regarding the direct use of cooling water for transformers, induction furnaces and other units that are subjected to electrical voltage (the conductivity of the cooling water should then be below 400 µs/cm, which can usually only be achieved by desalination).

If the water quality deviates, some appropriate specialist companies should be consulted. Should there be any system disruptions or damage due to deviating water qualities, these are not subject to our warranty obligation.

The water quality must be checked at regular intervals using the appropriate measuring and testing device and the results shall be recorded in protocol.
(See documents: Periodic maintenance plan)
(As for templates for documenting the water quality see the file „Examples of maintenance protocols“.)

2 Power supply

We shall not be liable for damage caused by overvoltage or undervoltage in the mains.

3 Maintaining the ONI system

In case of a warranty period beyond 12 months, ONI personnel must maintain the system 12 months after commissioning and then annually.

Maintenance includes a review of all system functions as well as possible re-adjustments and settings.

We would like to point out that wearing parts like for instance filter inserts, mechanical seals, bearings, AFM filter material, grease, oil, etc. cannot be included in the warranty. These parts shall be understood as consumables.

Wearing parts which have to be replaced will be **invoiced separately** in addition to maintenance.

The necessary cleaning works will be – *if not agreed otherwise* – **charged and invoiced separately** in addition to the cost of the maintenance services.

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4 Operators

Our systems must be operated and maintained by the customer's personnel according to our operating instructions.

Damages caused by incorrect customer's operation and/or incorrect customer's maintenance are excluded from warranty.

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5 Recommended reference values for the quality of the circulating water in atmospherically open or semi-open systems and for the supply of temperature control and heating units

based on VDI/BTGA 6044 taking into account the manufacturer-specific specifications[1)]

Status: 01st December 2023; Information provided without guarantee

Cooling water - Circuits			**Limit values** [2)]		
			up to 60°C	**from 60°C - 90°C** [4)]	**from 90°C - 180°C** [4)]
Appearance	---	---	clear, free of sedimenting substances		
Conductivity	µS/cm	---	< 800	< 800	< 600
pH value at 25°C	---	---	7 – 8.5	7 – 8.5	7 – 8.5
Total hardness	°dH	Ca / Mg	0 - 4	0 - 2	< 0.5
Chloride	g/m³	Cl	< 60	< 60	< 30
Sulphate	g/m³	SO_4	< 100	< 80	< 30
Iron	g/m³	Fe	< 0.5	< 0.5	< 0.5
Copper [6)]	g/m³	Cu	< 0.2	< 0.2	< 0.2
Product content molybdenum	g/m³	Mo	≥ 150	≥ 150	≥ 150
or polymer	g/m³	Po	≥ 80	≥ 80	≥ 80
Germ counts [3), 5)]	KBE/ml	---	< 10,000	< 10,000	---

1) The manufacturer's guidelines must be observed in every case (e.g. temperature control and heating units).
2) Depending on the materials used and the local conditions, more stringent limit values may be necessary.
3) If the colony-forming units (CFU) increase, use in addition the ONI disinfection products.
4) In cooling circuits with a low water exchange rate, a complete water exchange must be carried out regularly.
5) When dosing a biocide, regular partial water changes are required to remove the dead biology and the degradation products.
6) If copper or copper alloys are used in systems that are open to corrosion, the circulating water must have a hydrogen carbonate content of $c(HCO_3^-) > 1{,}0$ mol/m³.

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6 Recommended reference values for the quality of the circulating water in closed systems

based on VDI/BTGA 6044 taking into account the manufacturer-specific specifications[1)]

Status: 01st December 2023; Information provided without guarantee

Closed circuits with glycol or anti-corrosion agents			Limit values[2)]
Appearance	---	---	clear, free of sedimenting substances
Conductivity	µS/cm	---	< 1500
pH value at 25°C	---	---	7 – 8.5
Total hardness	°dH	Ca / Mg	0 - 2
Chloride	g/m³	Cl	< 60
Sulphate	g/m³	SO_4	< 100
Iron	g/m³	Fe	< 0.5
Copper [4)]	g/m³	Cu	< 0.2
Product content (ethylene glycol))	%	---	≥ 35
or molybdenum	g/m³	Mo	≥ 150
or polymer	g/m³	Po	≥ 80
Bacterial counts	KBE/ml	---	< 10,000

based on VDI 2035, taking into account the manufacturer-specific specifications[1)]

Status: 01st December 2023; Information provided without guarantee

Closed circuits with degassing station			Limit values[2)]	
			Low in salt	Salty
Appearance	---	---	clear, free of sedimenting substances	
Conductivity	µS/cm	---	< 100	< 1500
pH value at 25°C	---	---	8.2–10.0[3)]	8.2–10.0[3)]
Total hardness	°dH	Ca / Mg	< 0.5	0 - 2
Chloride	g/m³	Cl	< 60	< 60
Sulphate	g/m³	SO_4	< 80	< 80
Iron	g/m³	Fe	< 0.5	< 0.5
Copper [4)]	g/m³	Cu	< 0.2	< 0.2
Oxygen content	g/m³	O_2	< 0.1	< 0.02
Bacterial counts	KBE/ml	---	< 10,000	< 10,000

1) The manufacturer's guidelines must be observed in every case.
2) Depending on the materials used and the local conditions, more stringent limit values may be necessary.
3) With aluminium or aluminium alloys, the pH value range is limited (8.2 - 8.5 or 9.0).
4) If copper or copper alloys are used in systems that are open to corrosion, the circulating water must have a hydrogen carbonate content of $c(HCO_3^-) > 1{,}0$ mol/m³.

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7 Recommended reference values for the condition of the circulating water in open systems

based on VDI 3803, taking into account the manufacturer-specific specifications[1)]

Status: 20th September 2023; Information provided without guarantee

			C - Steel, non-ferrous metals and stainless steels[6)]
Appearance **Colour** **Odour** **pH value** at 20°C		- - - -	clear, without sediment colourless without 7,5 - 9,0 [2)]
Electrical conductivity (25°C) **Alkaline earth** **Total hardness**	mS/m mol/m³ °dH	LF Ca^{2+}; Mg^{2+} GH	< 220 < 0.5 – 11 [3)] < 2.8 - 20 [3)]
Acid capacity up to pH 4,3 **Carbon hardness** when using hardness stabilizers **Acid capacity** up to pH 4,3 **Carbon hardness** without using hardness stabilizers **Chloride** **Sulphate**	mol/m³ °dH mol/m³ °dH g/m³ g/m³	$KS_{4,3}$ KH $KS_{4,3}$ KH CL - SO_4^{2-}	< 7 [3)] < 20 [3)] < 1.4 < 4 < 150 [7)] < 325
Colony forming units **Legionella**	KBE / ml KBE/1 00ml	KBE KBE	< 10,000 [4)] < 10

1) The manufacturer's guidelines must be observed in every case.
2) In the case of aluminium or aluminium alloys, the pH value must not exceed 8.5.
3) When using softened water, the values for the carbon hardness or the acid capacity may be higher up to pH 4.3. In this case, however, the total hardness should be limited to a maximum of 20°d (alkaline earths max. 3.5 mol/m³) and a hardness stabilizer added.
4) Use biocide, if the number of germs increases. If, inadmissibly, the cooling tower vapours impinge on the office and common areas of people or are in the intake area of HVAC systems, the permissible germ count must be < 1,000 KBE/ml (a location-dependent assessment). A manual sensory test must be carried out separately to check for slime-forming deposits in the cooling tower pan.
5) When using treated water (e.g. fully de-mineralized water, reverse osmosis water), thickening numbers of up to 10 can also be permissible.
6) Mixed installation: Irrespective of the type of the mixed installation, the use of unprotected carbon steel is only permitted with suitable corrosion inhibition.
7) Upper limit of the chloride content to avoid the chloride-induced pitting corrosion tendency of Cr-Ni-Mo steels, taking into account their molybdenum content and the metal wall temperature that occurs. Higher chloride loads require the Cr-Ni-Mo steels with increased pitting resistance due to increased molybdenum content. If the Cr-Ni steels without a molybdenum content, e.g. 1.4301 / 1.4307 / 1.4371, are used, the maximum values of the circulating water in ONI cooling water systems shall be applied.
8) See also the product data sheets.

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8 Recommended reference values for the quality of the fresh water for the outdoor cooler with adiabatic function

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		with spray system[1)]	with mat system[1)]
pH value		7.0 - 8.2	6.5 - 8.2
Electrical conductivity (25°C)	mS/m	< 50	< 80
Total hardness	°dH	< 2	< 14
Chloride	g/m³	< 50	< 100
Sulphate	g/m³	< 90	< 250
Ammonium	g/m³	< 0.5	< 0.5
Legionella	KBE/100ml[2)]	< 100	< 100

The adiabatic system, designed as a spraying system, should only be used in conjunction with a water softening system and with corrosion-protected fins!

The fresh water should be free of iron (Fe) and copper (Cu). It is also important to ensure that the chemicals used do **not** cause stress corrosion or even damage the materials used in the system.

If the recommended water quality is observed and the recommended treatment products are used, deposits, corrosion and microbiological infestation are not or only minimally to be expected.

If the water values deviate, appropriate countermeasures must be taken immediately and spraying is prohibited in this case.

1) The manufacturer's guidelines must be observed in every case.
2) according to VDI 2047