

Guidelines for water quality in Danfoss brazed heat exchangers with plates of EN 1.4404 ~ AISI 316L

Danfoss has prepared this guideline for the water quality of tap water and district heating water used in plate heat exchangers of stainless steel (EN 1.4404 ~ AISI 316L) brazed with pure copper (Cu), copper -nickel (CuNi) or Stainless Steel (StS). It is important to point out that the water specification is not a guarantee against corrosion, but it must be considered as a tool to avoid the most critical water applications.

Parameter	Unit	Value or concentration	Plate	Brazing material		
			AISI 316L W.Nr. 1.4404	Cu	CuNi	StS
pH		< 6.0	o	-	-	o
		6.0 – 7.5	+	o/-	o	+
		7.5 – 10.5	+	+	+	+
		>10.5	+	o	o	+
Conductivity	µS/cm	<10	+	+	+	+
		10 – 500	+	+	+	+
		500 – 1000	+	o	+	+
		>1000	+	-	o	+
Free Chlorine	mg/l	<0.5	+	+	+	+
		0.5 – 1	o	+	+	+
		1 – 5	-	o	o	o
		>5	-	-	-	-
Ammonia (NH ₃ , NH ₄ ⁺)	mg/l	<2	+	+	+	+
		2 – 20	+	o	o	+
		>20	+	-	-	+
Alkalinity (HCO ₃ ⁻)	mg/l	<60	+	+	+	+
		60 – 300	+	+	+	+
		>300	+	o	+	+
Sulphate (SO ₄ ²⁻)	mg/l	<100	+	+	+	+
		100 – 300	+	o/-	o	+
		>300	+	-	-	+
HCO ₃ ⁻ / SO ₄ ²⁻	mg/l	>1.5	+	+	+	+
		<1.5	+	o/-	o	+
Nitrate (NO ₃)	mg/l	<100	+	+	+	+
		>100	+	o	+	+
Manganese (Mn)	mg/l	<0.1	+	+	+	+
		>0.1	+	o	o	+
Iron (Fe)	mg/l	<0.2	+	+	+	+
		>0.2	+	o	+	+
* Hardness ratio [Ca ²⁺ , Mg ²⁺]/[HCO ₃ ⁻]	/	0 – 0.3	+	-	-	+
		0.3 – 0.5	+	o/-	+	+
		>0.5	+	+	+	+

+	Good corrosion resistance
o	**Corrosion could happen when more parameters are evaluated with o
o/-	Risk of corrosion
-	Use is not recommended

* Hardness ration limits defined per experience and internal tests in Danfoss laboratory

** In case of three or more parameters evaluated with o consultancy is needed with Consultant for Corrosion & Microbiology or BU HHE Representative

Recommended Chloride concentration to avoid Stress Corrosion Cracking (SCC) in the stainless-steel plates:

Application temperature	Chloride concentration
at T ≤ 20°C	max 1000 mg/l
at T ≤ 50°C	max 400 mg/l
at T ≤ 80°C	max 200 mg/l
at T ≥ 100°C	max 100 mg/l

