

System components

Configuring

Water cooling (1LH1/1MH1 and 1LN1/1MN1 motors)

Overview

Cooling circuit in the application

When water-cooled motors of the SIMOTICS FD series (1LH1/1MH1, 1LN1/1MN1) are operated in the application, they become part of the overall cooling circuit. Apart from the cooling unit, this can include other heat sources.

The particular version of the cooling materials demands two completely different cooling concepts for the overall cooling circuit in the application.

For the coolant circuit in water-cooled motors SIMOTICS FD, the materials listed in the table "Materials used in the motor (cooling circuit)" can be employed which provides the user with a range of possibilities for configuring the cooling circuit.

The electrochemical processes that take place in a cooling system must be minimized by choosing the right materials. For this reason, mixed installations, i.e. a combination of different materials, such as copper, brass, iron, zinc, or halogenated plastics (PVC hoses and seals), should not be used or should be limited to the absolutely essential minimum.

Please read the following definitions for clarification:

1. Closed cooling circuit:

The pressure compensator is closed (no ingress of oxygen) and fitted with a pressure-relief valve (6 bar for 1LN1 and 1LH1 motors); it is always connected on the suction side of the pump. The coolant is only routed through the SIMOTICS FD motors, the components required for cooling and, if necessary, a converter. The materials used in the cooling circuit comply with the recommendations in the table "Admissible materials for the overall cooling circuit".

2. Semi-open cooling circuit:

Oxygen can only enter the coolant through the pressure compensator, otherwise the cooling circuit corresponds to a closed cooling circuit.

3. Open cooling circuit:

The coolant is guided through the motors and the cooling components required for heat dissipation as well as through components external to the cooling circuit. The materials used comply with the minimum requirements specified in the table "Admissible materials for the overall cooling circuit".

Possible cooling circuits of the SIMOTICS FD motor series

Type	Type of cooling circuit		
	Closed	Semi-open	Open
1LH1/1MH1	✓	–	–
1LN1/1MN1	✓	✓	–

For further information on the construction of a cooling circuit, see the Manual "SINAMICS S120 – Chassis Liquid Cooled Power Units".

Assignment, connection thread water-cooled 1LH1/1MH1 motors

Type	Frame size	Connection thread
1LH1/1MH1	315	G 1/2"
	355	G 1/2"
	400	G 3/4"
	450	G 3/4"

Water-cooled motors with 1LN1/1MN1 air-water heat exchanger

The air-water heat exchanger has two flange connections. One each for the water inlet and water outlet.

Type	Frame size	Water connection
1LN1/1MN1	315	Flange EN 1092-1/11/B1/DN32/PN16
	355	Flange EN 1092-1/11/B1/DN32/PN16
	400	Flange EN 1092-1/11/B1/DN32/PN16
	450	Flange EN 1092-1/11/B1/DN50/PN16

Cooling water quality

The water-cooled versions of the SIMOTICS FD series offer solutions for different qualities of cooling water. The optimum cooling water quality can therefore be selected in accordance with the location and application. The following tables contain the water properties defined for the various motor versions.

Definition of water properties

		Water quality		
		Potable water	Fresh water	Sea water
pH value	–	6.5 to 8.0	6.0 to 9.5	6.5 to 10
Carbon-related hardness	mMol/l	–	–	< 0.9
Total hardness	mMol/l	< 2.5	< 1.7	< 1.8
Chloride ions (Cl ⁻)	mg/l	< 50	< 200	< 3000
Sulfate ions (SO ₄ ²⁻)	mg/l	< 50	< 240	< 3000
Sulfide ions (S ₂ ⁻)	mg/l	–	–	< 1
Nitrate ions (NO ₃ ⁻)	mg/l	< 50	< 50	< 50
Iron (Fe ³⁺)	mg/l	–	–	< 1
Ferromanganese ions (Fe ³⁺ Mn ²⁺)	mg/l	–	–	< 50
Ammonia (NH ₃) Ammonium (NH ₄ ⁺)	mg/l	–	–	< 15
Alkalinity	mg/l	< 300	–	–
Dissolved substances	mg/l	< 340	< 340	< 340
Electrical conductivity	µS/cm	< 500	< 2000	< 32000
Size of entrained particles (sand)	mm	< 0.1	< 0.1	< 0.1
Biological growth	resistant	No	No	Yes

Assignment of motor versions to cooling water quality

Water quality to motor cooling	Motor type	
	1LH1/1MH1	1LN1/1MN1
Potable water	✓	✓
Fresh water	✓ ¹⁾	✓
Sea water	–	✓

¹⁾ With order code **M85**.

Overview**Materials used in the motor cooling circuit**

Motors of the 1LH1/1MH1 series are equipped with built-in cooling pipes constructed from copper as standard, or as an option from stainless steel (order code **M85**).

Motors of the 1LN1/1MN1 series are equipped with an air-to-water heat exchanger. The materials used in the 1LH1/1MH1 and 1LN1/1MN1 series are listed in the table below.

Materials used in the motor (cooling circuit)

Motor type	Materials
1LH1/1MH1 (standard)	Cu, stainless steel (V2A), CuZn39Pb3
1LN1/1MN1 (standard)	CuNi (90/10) RILSAN plastic-coated steel

Admissible materials for the overall cooling circuit

Material	1LH1/1MH1	1LH1/1MH1 With order code M85 , 1LN1/1MN1	Comment
Aluminum	–	✓	
Zinc	✓	✓	Can be used in closed circuits with inhibitor.
Brass	✓	✓	Can be used in closed circuits with inhibitor.
Copper	✓	✓	Can be used in closed circuits with inhibitor.
Common steel (e.g. St 37)	✓	✓	Permissible in closed circuits with inhibitors or anti-freeze, check for oxide formation, inspection window is recommended.
Cast steel/cast iron	✓	✓	Closed circuit and use of strainers and flushback filters.
High-alloy steel, Group 1 (V2A)	✓	✓	
PVC	–	–	
Hoses	✓	✓	Reduce use to a minimum. Must not be used as the main pipe for the whole system.

- ✓ Admissible
– Inadmissible

Inhibitors, anti-freeze, biocides**Coolant additives**

Material	1LH1/1MH1	1LH1/1MH1 with order code M85	1LN1/1MN1
Inhibitor without anti-freeze effect	Required NALCO TRAC100 0.2 % < X ≤ 0.25 %	Not required	Not required
Anti-freeze	Antifrogen N 20 % < X ≤ 45 % Antifrogen L 25 % < X ≤ 48 % Varidos FSK 25 % < X ≤ 45 %		
Biocide ¹⁾	Antifrogen N, minimum quantity 20 % Antifrogen L, minimum quantity 30 % Varidos FSK, minimum quantity 30 %		
Anti-freeze + biocide	When Antifrogen N 20 % or Antifrogen L/Varidos FSK 30 % is used, an adequate biocidal effect exists.		

¹⁾ Effectiveness regarding the growth of microorganisms.