Components

Jacket water cooling pump

Jacket water cooling pumps should be of the centrifugal type.

Pump flow rate/jacket water flow	see 'CEAS report'
Pump head (see below)	3.0 bar
Delivery pressure	depends on the location of the expansion tank
Test pressure	according to Class rules
Working temperature	85°C
Max. temperature (design purpose)	100°C

The flow capacity must be within the range from 100 to 110% of the capacity stated.

Determine the pump head of the pumps based on the actual total pressure drop across the cooling water system, i.e. the pressure drop across main engine, jacket water cooler, three-way valve, valves, and other pipe components.

Section 6.04 contains a guideline for selecting centrifugal pumps.

Jacket water cooler

Often the jacket water cooler is a plate heat exchanger, but it can also be a shell and tube cooler.

Heat dissipation	see 'CEAS report'
Jacket water flow	see 'CEAS report'
Jacket water temperature, inlet	85°C
Max. working temperature	up to 100°C
Max. pressure drop on jacket water side	0.5 bar
Cooling water flow	see 'CEAS report'
Cooling water inlet temp., SW cooled	~38°C
Cooling water inlet temp., FW cooled	~43°C
Max. pressure drop on cooling side	0.5 bar

The following materials should be used for the cooler:

Seawater cooled	SW resistant (for example, titanium or copper alloy for tube coolers)
Freshwater cooled	stainless steel

The heat dissipation and flow are based on SMCR output at tropical conditions, i.e. a seawater temperature of 32°C and an ambient air temperature of 45°C.

Jacket water thermostatic regulating valve

The main engine cooling water outlet temperature should be kept at a fixed temperature of 85°C, independent of the engine load. This is done by a three-way thermostatic regulating valve.

Jacket water flow	see 'CEAS report'
Max. working temperature	up to 100°C
Max. pressure drop	~0.3 bar
Min. pressure drop	~0.1 bar
Actuator type	electric or pneumatic is recommended
Recommended leak rate	less than 0.5% of nominal flow. A low valve leak rate specified for the valve port against the cooler will provide better utilisation of the heat available for freshwater production

Valve controller specification, where a variable setpoint signal from the engine control system is required:

Remote setpoint signal standard	4-20 mA
Range	0-4 mA = 65°C; 20 mA = 95°C

Expansion tank

The expansion tank must be designed as an open tank towards the atmosphere. Venting pipes, which enter the tank, must terminate below the lowest possible water level, i.e. below the low-level alarm.

The expansion tank must be located at least 15 m above the top of the main engine exhaust gas valves.

The expansion tank volume has to be at least 10% of the total jacket cooling water (JCW) amount in the system.

The expansion tank volume is defined as the volume between the lowest level (at the low-level alarm sensor) and the overflow pipe, or high-level alarm sensor.

2025-06-23 - en

De-aerating tank and alarm device

Fig. 12.02.01 and Table 12.02.01 show the design and dimensions of the de-aerating tank and Fig 12.02.02 shows the corresponding alarm device.

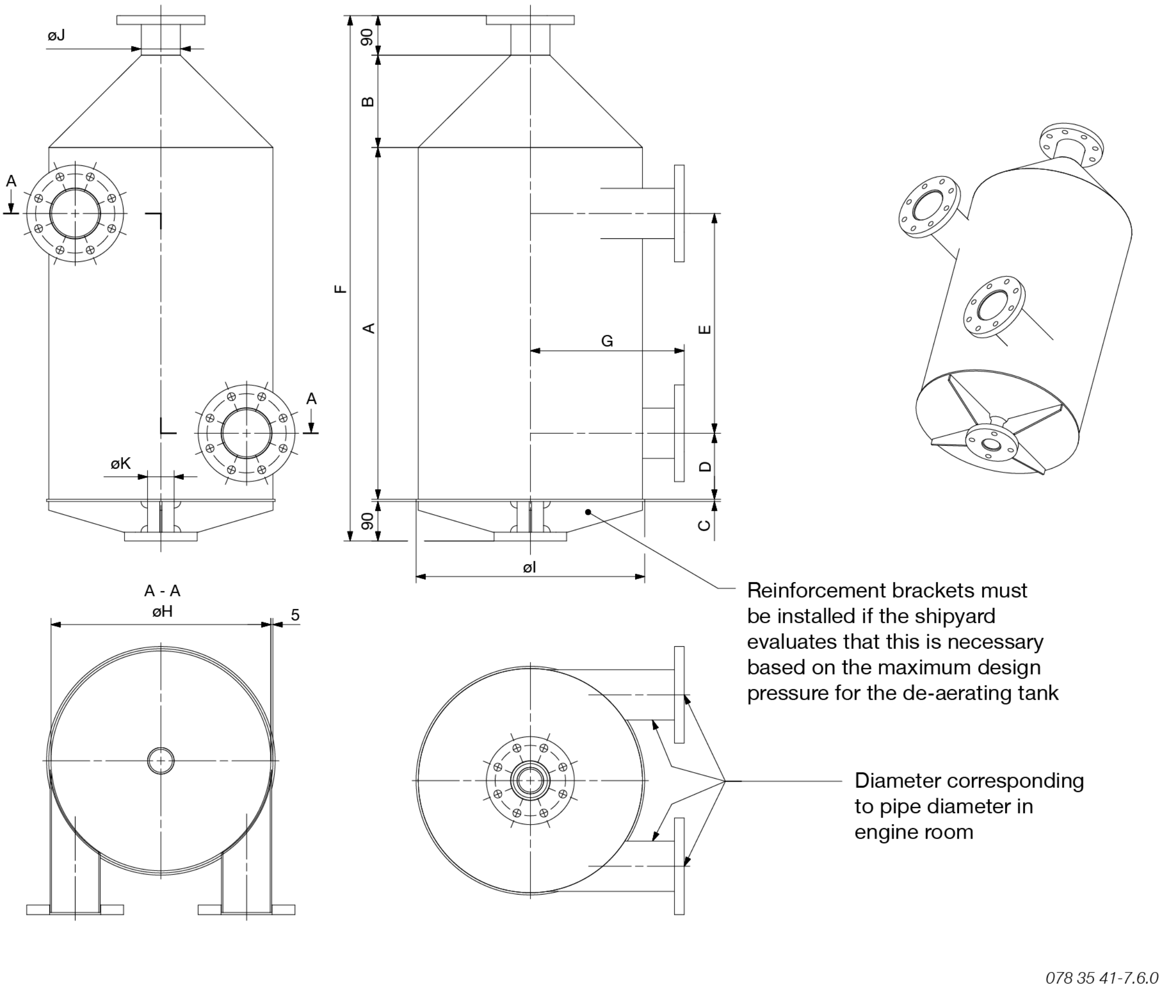

Fig. 12.02.01: De-aerating tank dimensions

2025-06-23 - en

Tank size (m^3)	0.03	0.05	0.1	0.16	0.25	0.35	0.70
Max. freshwater capacity (m^3/h)	80	130	190	300	410	520	700
Max. nominal bore (mm)	100	125	150	200	225	250	300
A (mm)	550	600	700	800	900	1000	1,200
B (mm)	100	125	175	210	260	300	340
C (mm)	5	5	5	5	8	8	8
D (mm)	125	150	150	150	200	200	200
E (mm)	270	300	400	500	550	600	800
F (mm)	835	910	1,060	1,195	1,348	1,488	1,728
G (mm)	235	250	300	350	425	450	550
øH (mm)	250	300	400	500	600	700	800
øI (mm)	270	320	420	520	620	720	820
øJ (mm)	DN 50	DN 50	DN 50	DN 80	DN 80	DN 100	DN 100
øK (mm)	DN 32	DN 32	DN 32	DN 50	DN 50	DN 80	DN 80

Table 12.02.01: Dimensions of de-aerating tank

DN: Diameter nominal

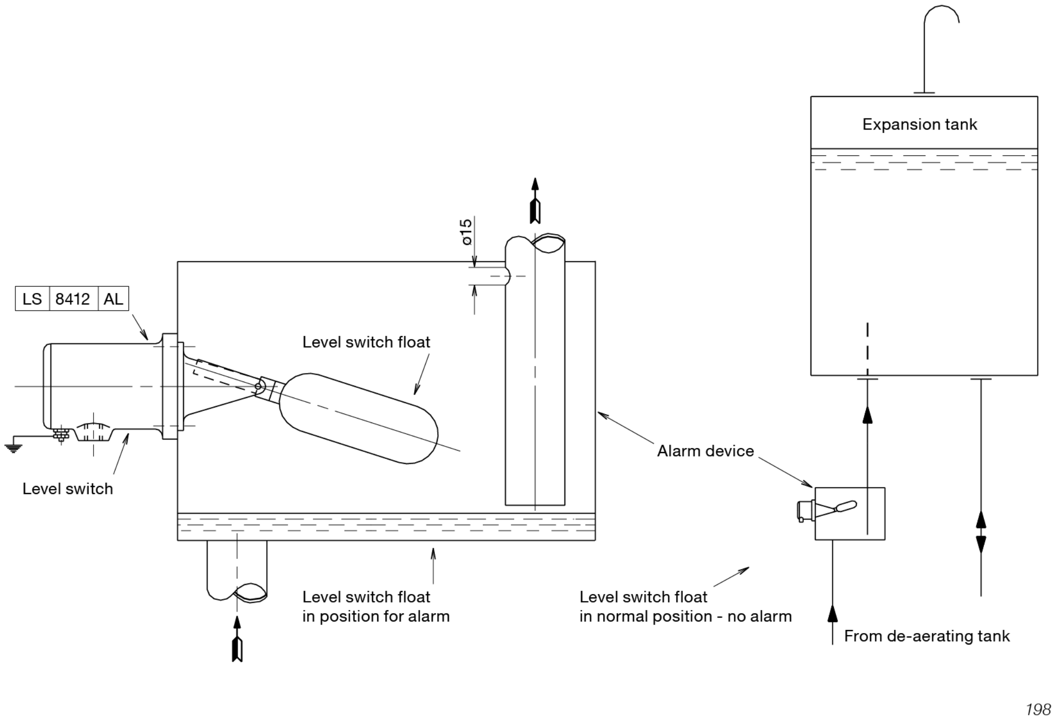

Fig. 12.02.02: De-aerating tank, alarm device

2025-06-23 - en

12.02 Components

Chemical corrosion inhibitor and dosing tank

To ensure proper mixing of the inhibitor into the JCW system, the dosing tank must be designed to receive a small flow of JCW through the tank from the jacket water pumps. The tank must be suitable for mixing inhibitors in both powder and liquid form.

Recommended tank size	0.3 m^3
Design pressure	max. JCW system pressure
Suggested size inlet orifice	ø10 mm

Other dosing point options are available, besides the above dosing tank proposal. If the following requirements are met, it is possible to use the expansion tank.

- The expansion tank must be designed as an open tank towards the engine room
- A continuous small jacket water flow is established through the tank. This means that there is a pipe connection from the jacket water pump discharge side via the expansion tank to the suction side of the jacket water pump.

Preheater components

When the preheater system in Figure 12.01.05 is installed, the components must be specified as follows.

Preheater pump (optional)

The pump should be of the centrifugal type.

Pump flow rate	10% of the JCW flow, see ‘CEAS report’
Working temperature	50-85°C
Max. working temperature	up to 100°C

Section 6.04 contains a guideline for selecting centrifugal pumps.

If a preheater pump is not installed, the preheater must be relocated, see Fig. 12.01.06.

Preheater

Heating flow rate	10% of the JCW flow, see ‘CEAS report’
Heating capacity	see below
Preheater type	steam, thermal, oil, or electrical
Working temperature	50-85°C
Max. working temperature	up to 100°C
Max. pressure drop on jacket water side	~0.2 bar

The preheater heating capacity depends on the required preheating time and the required temperature increase of the engine jacket cooling water. Fig. 12.02.03 shows temperature and time relations. In general, a temperature increase of about 35°C (from 15°C to 50°C) is required, and a preheating time of 12 hours requires a preheater capacity of about 1% of the engine NMCR power.

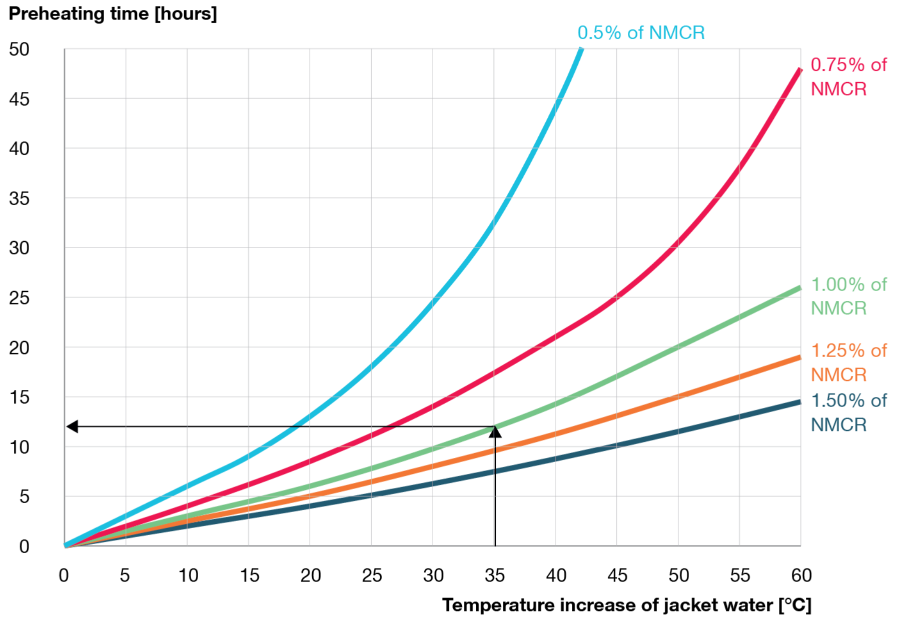

Fig. 12.02.03: Temperature increase and corresponding preheating time curves shown for different preheater sizes in percentage of engine nominal maximum continuous rating (NMCR) power

Freshwater generator installation

The CEAS report provides the engine heat energy available for freshwater production as a function of engine load (%SMCR).

Note that the heat energy specified in CEAS for the jacket water heat exchanger must not be used for dimensioning the freshwater generator.

Figs. 12.01.01–12.01.04 show freshwater generator installations.

Calculation of estimated freshwater production

For freshwater generators with either two-stage, or single-stage vacuum evaporators, the estimated freshwater production rate per day (M) can for guidance be calculated based on the available jacket cooling water heat for design purposes (Q_d) multiplied with a factor (K). To obtain a more precise freshwater production rate, consult the freshwater generator supplier.

$M = Q_d \times K$ (tonnes/24 hours)

Definition of Q_d:

The design heat used in the calculation can be selected in CEAS from the jacket water cooler heat column in the cooler capacities tables, as a function of the engine SMCR load in percentage. The design heat can be selected at, for example, normal continuous rating (NCR) engine load, but can also be selected at other percentages of SMCR load. When selecting the design heat from the table, it is important to use only 85% of the heat figure stated in CEAS to account for -15% uncertainty.

Factor K:

For a single-stage freshwater generator type, use the approx. K factor:	K ≈ 0.03
For a two-stage freshwater generator type, use the approx. K factor:	K ≈ 0.06

Example:

Engine type:	6G50ME-C9.6-LGIM LL-EGB
Rating SMCR:	7,600 kW at 84.4 r/min.
NCR at 85% SMCR:	6,460 kW at 79.9 r/min.
NCR jacket water heat (Q_d) according to CEAS tables:	1,080 kW

Calculation of M:

Estimated production rate for a single-stage freshwater generator:	1,080 x 0.85 x 0.03 ≈ 28 tonnes/24 hours
Estimated production rate for a two-stage freshwater generator:	1,080 x 0.85 x 0.06 ≈ 55 tonnes/24 hours

2025-06-23 - en