



## Alfa Laval FCM One Gas

### Fuel conditioning system for ME-GI dual-fuel engines

The Alfa Laval Fuel Conditioning Module (FCM) One Gas is an automated fuel gas supply system for the treatment of liquefied natural gas (LNG) to meet the cleanliness, pressure, temperature and flow rate specified by ME-GI dual-fuel engine manufacturers. Up to two high-pressure reciprocating pumps and one high-pressure vaporizer are included in a marine design suitable for installation in an ATEX Zone 1 area.

The use of ME-GI dual-fuel engines that are able to run on LNG efficiently, sustainably and cost-effectively provides the marine industry with a viable solution to meet increasingly stringent emission control regulations.

#### Application

The FCM One Gas is designed for LNG conditioning in accordance with the pressure, temperature and flow guidelines for dual-fuel ME-GI engines. From cryogenic tanks at approximately  $-164^{\circ}\text{C}$ , the LNG is delivered to high-pressure pumps that raise it to 250–320 bar(g) before it enters the vaporizer. The transition phase that takes place in the vaporizer is of particular importance. It is here that the cryogenic LNG reaches supercritical condition due to the temperature and high pressure required by ME-GI engines.

#### Benefits

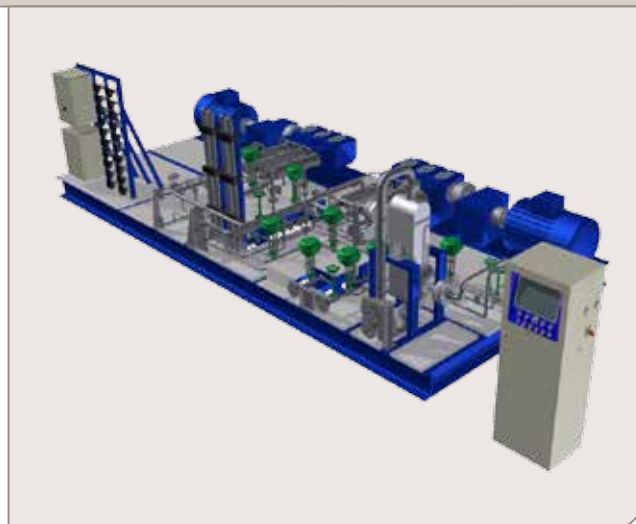
- *Superior engine protection*

The FCM One Gas offers unmatched engine protection through proper treatment of LNG and automatic routines that maintain constant dialogue with the ME-GI engines. These routines oversee the entire fuel conditioning process. All components (including heating and cooling components) are carefully selected and tested to ensure reliability and proper function.

- *Ease of use*

The FCM One Gas is fully enclosed, fully automated and thoroughly integrated with the ship's fuel gas supply system. Crews that have experience using other Alfa Laval systems will find its Alfa Laval Touch Control user interface familiar, despite the new fuel requirements.

The automatic cooling, start, stop, emergency shutdown and purging sequences are all controlled by Alfa Laval automation.



- *Safe operation*

The FCM One Gas is an inline system whose major components are engineered for safety. Fully automatic control of the entire fuel conditioning process ensures protection of the ship hull structure from extreme low-temperature thermal shock. In addition, it ensures protection from LNG expansion and transient over-pressurization of the module interior during standby and stop sequences.

- *Flexible, modular arrangement*

The design of the FCM One Gas benefits from Alfa Laval's vast experience in designing marine modules to meet requirements for a minimal footprint and optimal maintenance space in hazardous areas.

- *Lowest possible operating costs*

The FCM One Gas provides the lowest operating costs of any high-pressure fuel gas supply system available today. VFD-driven pumps and the use of the market's most efficient vaporizer, the Alfa Laval printed circuit heat exchanger (PCHE), both contribute to its cost efficiency.

## Design

The FCM One Gas consists of carefully selected equipment, including the control unit, piping, valves, instruments, electrical cables and all relevant accessories.

### • High-pressure (HP) pump

The cryogenic reciprocating pump has a modular assembly, from simplex (one piston) to quintuplex (five pistons). An integrated cartridge seal system allows straightforward and quick maintenance procedures for overhauling the cold end. The pressure ranges and flow rates covered by the HP pump comply fully with high-pressure ME-GI engines.

### • Filter block

A filter is installed to ensure that particles of more than 10 microns in size are removed from the fuel gas at the outlet of the FCM One Gas.

### • High-pressure (HP) vaporizer

Alfa Laval designs and manufactures the vaporizers installed on the FCM One Gas. Three vaporizer technologies are available, depending on the process and thermal profile: printed circuit, spiral or shell-and-tube heat exchangers.

The printed circuit heat exchanger (PCHE) is the latest technology introduced to the Alfa Laval range of heat exchangers. It combines superior robustness and integrity with an

exceptionally high heat transfer rate in a unit up to 85% smaller and lighter than traditional shell-and-tube heat exchangers. Its unique design results in excellent performance, lower installation and operational costs, and improved safety. Each unit can be fully customized according to the exact needs of the customer (see box below).

### • Intermediate glycol-water heating circuit

The intermediate circuit guarantees the right thermal energy for the vaporization process in the HP vaporizer, thereby preventing any contact between the LNG and the ship water or steam circuit.

### • Control cabinet

The control cabinet has a touchscreen with a graphical user interface to integrate the control of all FCM One Gas functionality. System status and process control are made available to the ship integrated automation system, as well as all necessary signals received from the ship engine control system and integrated in the FCM One Gas control cabinet.

While the FCM One Gas module is suitable for placement in an ATEX Zone I area, the control cabinet is placed in a safe area normally accessible to the crew.

## Alfa Laval printed circuit heat exchanger (PCHE)

The Alfa Laval PCHE operates with two or more media on opposite sides of a bonded plate. High-pressure flows are possible on both sides.

Its 3D pattern, which is unique to Alfa Laval, is a patented technology that eliminates the risk of freezing and allows the use of glycol water in LNG heating. The pattern is optimized to provide the required thermal length and pressure drop within an extremely compact design.

- Exceptional savings in footprint, volume, weight and structural support costs
- Very wide capacity range
- Design temperatures from cryogenic to 800°C (1472°F) and design pressures up to 650 bar(g) (9,430 psig).
- Exceptionally high heat transfer rate for maximum operating efficiency
- Safe operation – no pressure relief valve required
- Easy maintenance ensuring maximum uptime



Alfa Laval reserves the right to change specifications without prior notification.

### How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com)