GAS LIQUEFIER FOR CONDITIONING OF LNG

General design specifications

Methane liquefaction rate	Depending process conditions, refer to the graph Appendix 2
Power consumption	Depending process conditions, refer to the graph Appendix 2
Maximum gas pressure	20 bar(g)
Electricity supply	3 Ph 400 V (+/- 5%), 50 Hz (+/- 2%), OR 3 Ph 480 V (+/- 5%), 60 Hz (+/- 2%), Others upon request
Ambient operating conditions	Between 5°C and 45°C (40 to 110F) The Cryogenerator can be stored (protected from the elements) between -15°C and 85°C (-4 to 185F). Below freezing provisions need to be made to prevent freezing of the cooling water.
Ambient humidity	20 – 95%
Explosion proof classification	ATEX, Zone 2
Dimensions	See enclosed drawing (dimensions in mm) Appendix 1
Weight	~550kg (1200 lbs)

(dimensions and weights are subjected to scope of supply)

Cooling water specifications

Water quality	Flow rate	Pressure drop
0% anti-freeze/inhibitor	1000 l/h	2.4 bar
10% anti-freeze/inhibitor	1100 l/h	3.2 bar
20% anti-freeze/inhibitor	1200 l/h	3.7 bar
30% anti-freeze/inhibitor	1300 l/h	4.4 bar

Inlet pressure	Specification
Minimum	Depends on pressure drop and flow rate, refer to paragraph above
Maximum	6 bar(g)

Temperature	Specification
Nominal*	15 °C
Range	0-25 °C

* The cryogenic cooling capacity is specified at 15 °C. The cooling water temperature affects the cryogenic cooling capacity.

Cooling water quality	Specification
The machine requires drinking (potable) water quality. Drinking water is not regarded as an oxidizing liquid, therefore do **not** use deionized, distilled, demineralized or reverse osmosis water. Drinking (potable) water with the next specification:	
Acidity	between pH 7 and 9
Chlorine (Cl)	< 200 mg/l
Iron (Fe)	< 0.5 ppm
Manganese (Mg)	< 0.5 ppm
Hardness (CACO3)	< 5 °D
Sediment	< 600 ppm

Methane feed gas specification

Methane feed gas specifications

- Main stream CH4
- CxHy (C2 to C4) < 10%
- CxHy (C5+) < 1 ppm
- CO2 < 50 ppm @ atm. pressure, refer to Note 1
- H2O < -70°C dew point
- H2S < 3,3 ppm
- Oil content < 0,01 mg/m3
- Particles < 0,1 micron
- N2/O2 < 10%, refer to Note 2

NOTES:

Note 1:
The 50 ppm CO2 stated above is not a specific requirement for the StirLNG, but (possibly) for the entire LNG logistic chain:
50 ppm is the maximum solubility of CO2 in LNG at atmospheric pressure. At higher pressures, the solubility increases and thus more CO2 can be allowed in the feed-gas to the StirLNG. However, it must be considered that when, down-stream in the logistic chain, the LNG pressure is decreased, solid CO2 will deposit. This will collect in vessels and potentially block or damage valves and pumps. Therefore, the lowest pressure in the logistic chain determines the maximum CO2 content of the feed-gas.

Note 2:
Oxygen and nitrogen will be liquefied only partially in the LNG flow, dependent on their solubility. The remainder needs to be vented from the liquefaction heat-exchanger. This will be a mixture of methane/oxygen/nitrogen gas that needs to be processed. This venting will have minor effect on liquefaction rate, but it will increase the rate of gas consumption against liquid production, depending on the quantity of N2/O2.

Note 3:
In case of re-liquefaction of boiled-off methane gas, or when cooling a liquid flow, the gas the composition will, generally, be correct for use.

Installation of a Cryogenerator is relatively simple. It involves placing the Cryogenerator at its position and connecting it to the several interfaces:

- Methane gas inlet line
- LNG outlet line
- Cooling water lines
- Signal cables to the control box.
- Power cables from mains supply to the electric motor via a star/delta switch or frequency convertor.

The Cryogenerator can be placed in a hazardous area for which its components are suited. Recommended installation footprint is approx. 3 x 3 meter, refer to the drawing.

The control box, optionally supplied by Stirling Cryogenics, must be placed in the non-hazardous area. From here wiring for signals are directed to the Cryogenerator termination box.

Feed of power to the Cryogenerator electric motor is part of the customer preparation according local regulations.

Installation by a Stirling Cryogenics engineer is offered separately and is recommended for users not familiar with this equipment.