# StirLNG-1 Cryogenerator

## Liquefier for nano scale LNG production

### Stirling Technology

For over sixty years Stirling Cryogenics has been designing and manufacturing gas liquefaction systems, serving customers all over the world under all possible conditions. This experience is incorporated in our Methane liquefiers called StirLNG. They have two specific fields of application:

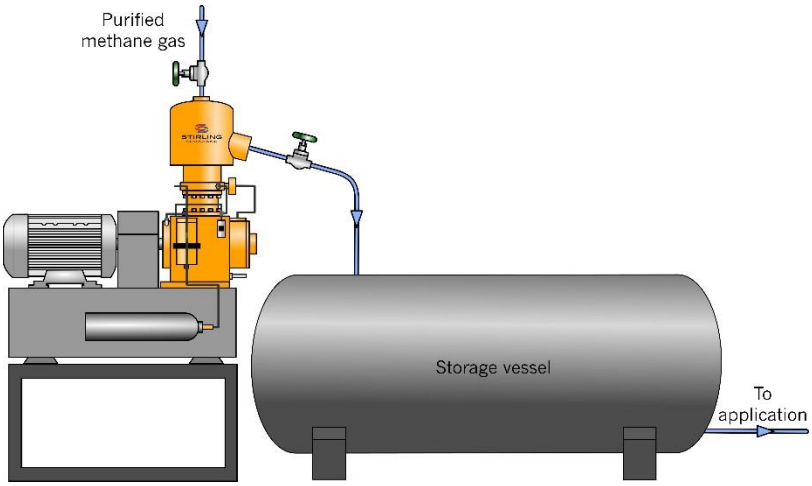
- Nano scale production of LNG from a purified gas source such as pipe line or biogas.
- Re-liquefaction of boil off gas to compensate for losses in a cryogenic (storage) system (fuel stations, storage tanks, etc.).
- Re-liquefaction of boil-off gas on vessels. The StirLNG-4 is available in an adapted version specifically for maritime use.

The cooling power of the StirLNG is created by the so called reversed Stirling cycle: compression and expansion of helium gas in a closed cycle by mechanical pistons. The gas to be liquefied is not used to create this cold: it will just flow through a cold heat exchanger where energy is extracted and the gas will liquefy. The gas will only encounter a phase change and there is no pressure difference between the gas and the liquid.

### LNG production with StirLNG-1

The StirLNG-1 is our SPC-1 Cryogenerator specifically modified for nano scale LNG production and re-liquefaction. Depending on the gas pressure, the StirLNG-1 produces around 250 kg/day of LNG (185 gal/day).

The Stirling Cryogenerator operates stand-alone, driven by an electrical motor and can have its own control unit. Clean Methane gas, with a maximum pressure of 20 barg (290 psi), either from a well, biogas production plant or pipeline is fed to the StirLNG-1 liquefier. In the cold head, energy is extracted from the gas until it liquefies. By gravity, the formed liquid drains into an (intermediate) storage tank for further use.

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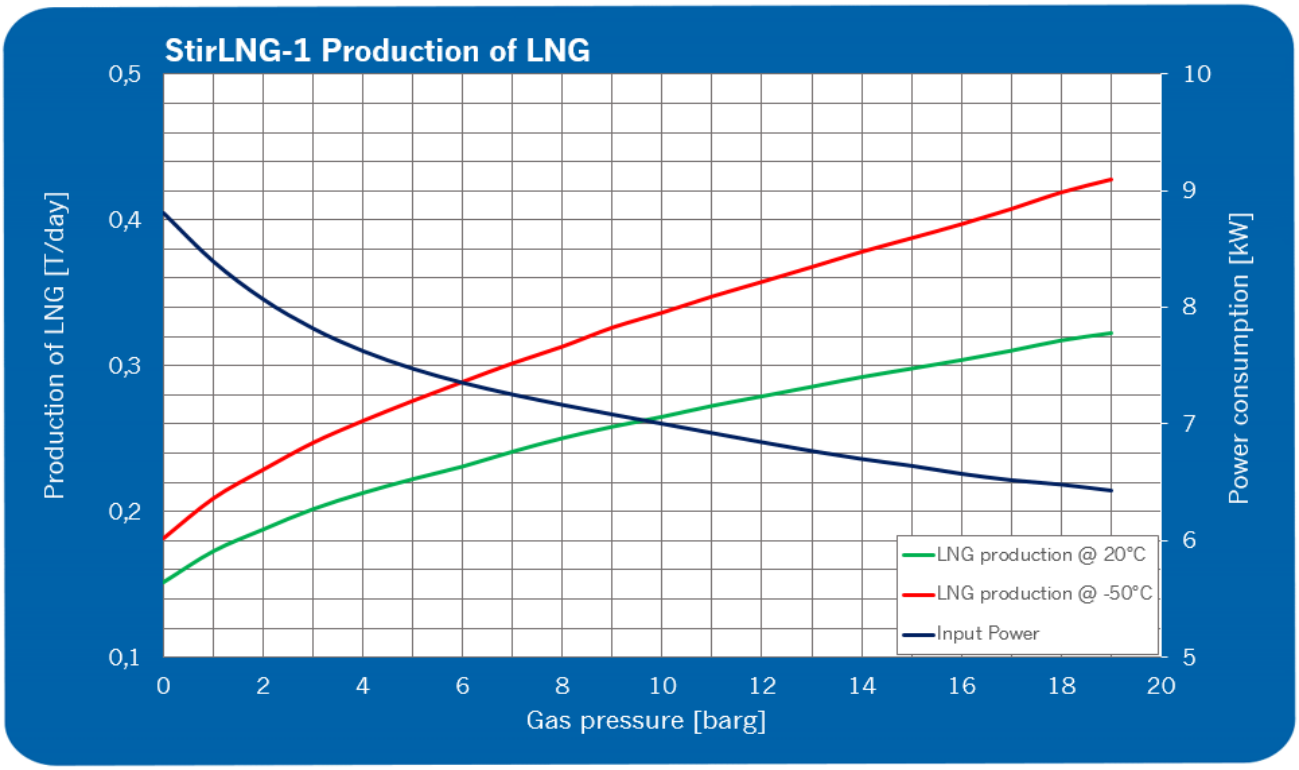
# StirLNG-1 Specifications




| Gas Pressure | Temp. Liquid | $CO_2$(1) | Cooling Power | Electrical Input | Capacity Inlet gas temperature 20°C based on pure methane | | | | | Capacity Inlet gas temperature -50°C based on pure methane | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barg | K | PPM | W | kW | Nm³/hr | kg/hr | l/hr | T/day | Gal/day | Nm³/hr | kg/hr | l/hr | T/day | Gal/day |
| 0 | 111 | 66 | 1550 | 8,9 | 8,7 | 6,2 | 14,8 | 0,15 | 94 | 10,5 | 7,5 | 17,8 | 0,18 | 113 |
| 2 | 126 | 230 | 1820 | 8,1 | 10,9 | 7,8 | 19,6 | 0,19 | 124 | 13,3 | 9,6 | 23,9 | 0,23 | 152 |
| 4 | 135 | 486 | 1980 | 7,7 | 12,3 | 8,8 | 22,9 | 0,21 | 145 | 15,2 | 10,9 | 28,3 | 0,26 | 180 |
| 6 | 141 | 800 | 2080 | 7,5 | 13,4 | 9,6 | 25,8 | 0,23 | 163 | 16,7 | 12,0 | 32,1 | 0,29 | 204 |
| 8 | 146 | 1213 | 2170 | 7,2 | 14,4 | 10,3 | 28,4 | 0,25 | 180 | 18,1 | 13,0 | 35,7 | 0,31 | 226 |
| 10 | 151 | 1837 | 2250 | 7,0 | 15,3 | 11,0 | 30,8 | 0,26 | 195 | 19,4 | 13,9 | 39,2 | 0,33 | 248 |
| 12 | 155 | 2562 | 2315 | 6,9 | 16,1 | 11,5 | 33,2 | 0,28 | 211 | 20,6 | 14,8 | 42,6 | 0,36 | 270 |
| 14 | 158 | 3287 | 2360 | 6,7 | 16,9 | 12,1 | 35,6 | 0,29 | 226 | 21,8 | 15,7 | 46,1 | 0,38 | 292 |
| 16 | 161 | 4217 | 2410 | 6,6 | 17,6 | 12,6 | 38,0 | 0,30 | 241 | 23,0 | 16,5 | 49,7 | 0,40 | 315 |
| 18 | 164 | 5412 | 2460 | 6,5 | 18,3 | 13,2 | 40,4 | 0,32 | 256 | 24,2 | 17,4 | 53,4 | 0,42 | 339 |
| 20 | 167 | 6944 | 2505 | 6,4 | 19,0 | 13,7 | 42,9 | 0,33 | 272 | 25,4 | 18,2 | 57,3 | 0,44 | 363 |

| Specifications | |
|---|---|
| Explosion proof classification | ATEX Zone 2 or 1<br>Nec 500, Class 1 Div 2 or 1, gas group D<br>Other, upon request |
| Max. gas pressure | 20 barg<br>290 psig |
| Water consumption (incl. 20% EG) | 750 l/hr @ 15°C |
| System size (l x w x h) | 1,10 m<br>0,80 m<br>1,20 m |

| Feed gas composition limits | |
|---|---|
| Deviations from pure methane will affect capacity above.<br><br>Please contact us with your gas composition for a specific calculation | Main stream: $CH_4$<br>CxHy (C2 to C4) 10%<br>CxHy (C5+) < 1 ppm<br>$H_2O$ < -70°C dew point<br>$H_2S$ < 3,3 ppm<br>Oil content < 0,01 mg/m³<br>Particles < 0,1 micron<br>$N_2/O_2$ < 10%,(2) |

1: Solubility of CO2 as function of liquid TEMPERATURE.
Pressure for indication only, relative to pure methane. Other components such as N2 will lower the liquid temperature relative to the saturated pressure, decreasing the allowable $CO_2$ level.

2: The actual re-liquefaction capacity might be lower, based on the composition of the boil off gas. Especially $N_2$ and $O_2$ will lower the re-liquefaction temperature and therefor will reduce the available cooling power and liquefaction

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