

## MIRAI 90 LNG

**MIRAI LNG 90** - a refrigeration machine for the liquefaction of methane. A new development that provides revolutionary power.

Modifications include but are not limited to:

- » High pressure protection
- » Water supply cut-off protection
- » Over-current protection
- » High-temperature protection
- » Sensor failure protection

The **MIRAI LNG 90** is inverter-driven for peak part load performance. Works with a natural and environmentally friendly refrigerant – **Nitrogen**

Key Feature of **MIRAI LNG 90** is flexibility and ability to be connected to any process of liquefaction without additional reworking of system. Can be used in a modular configuration for increasing liquefaction capacity.

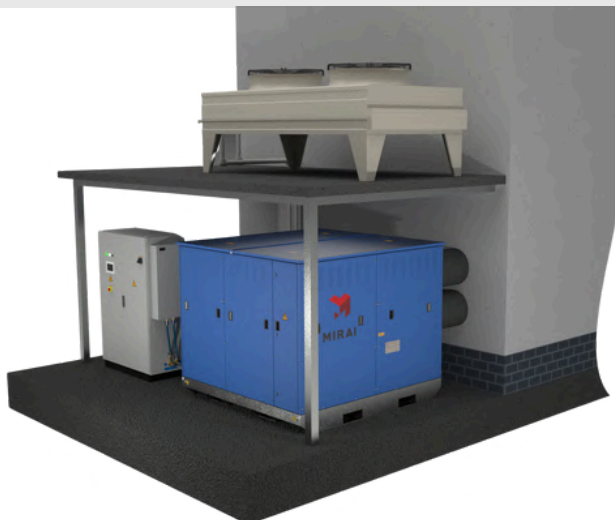
## AIR-CYCLE TECHNOLOGY\*

The technology is based on the heating capability of nitrogen during compression and cooling down during the expansion process. Repetition of compression and expansion cycles allows to reach and maintain ultra-low temperatures. A key technological feature is that the turbo expander and compressor are located on the same shaft.

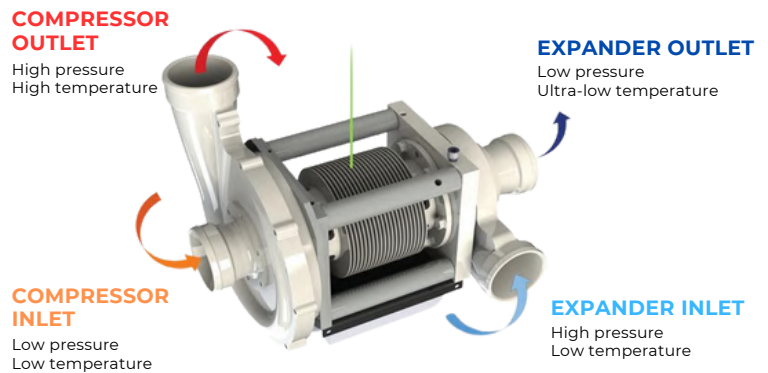
*\*Used Nitrogen instead of Air for LNG models*

## APPLICATIONS









- » Small scale BioLNG/LNG productions
- » Reliquefaction of BioLNG/LNG



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## MAIN ADVANTAGES

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**NITROGEN AS REFRIGERANT**
  - 0 GWP, 0 ODP, and 0 TFA
  - Environmentally friendly
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**REDUCED OPERATING COSTS**
  - Long equipment lifecycle
  - Low maintenance
- 
**TEMPERATURE STABILITY**
  - Frequency inverter allows maintaining 0.5 K accuracy
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**SAFE SOLUTION**
  - No chemically active substances
  - No risk of fire or explosion
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**ENERGY EFFICIENCY**
  - Energy recovery
  - Automatic RPM control
- 
**NO VIBRATION OR NOISE**
  - Turbo-compressor design reduces noise and vibrations
- 
**OIL-FREE**
  - No oil in the system
  - Reduced maintenance costs
  - Reduced operation costs
- 
**OPERATING STABILITY**
  - Stable continuous operation
  - Stable loads on cooling water and power grid

## TECHNICAL SPECIFICATIONS

MACHINE PARAMETERS	
REFRIGERANT	Nitrogen
COMPRESSOR	Mirai Turbo-Compressor (water-cooled)
MAXIMUM ROTATION SPEED	45 000 rpm
RATED MOTOR POWER	90 kW
MAXIMUM OPERATING PRESSURE	10 barg
POWER SUPPLY	~3 PE, 400 V, 50 Hz
NOMINAL CURRENT	180 A
TOTAL POWER	98 kW
CONNECTION SIZE COOLING/ CONDENSER in   out	DN150   DN150
CONNECTION SIZE COOLING WATER END-COOLER in   out	DN80   DN80
CONNECTION SIZE COOLING WATER MACHINE COOLING in   out	DN25   DN25
CONNECTION SIZE COOLING WATER INVERTER COOLING in   out	Ø13   Ø19
COOLING WATER MASS FLOW RATE END-COOLER	from 12 000 to 18 000 kg/h
COOLING WATER MASS FLOW RATE MACHINE	2 500 (3 500 if electrical enclosure connected to machine) kg/h
COOLING WATER MASS FLOW RATE ELECTRICAL ENCLOSURE	1000 kg/h
COOLING WATER PRESSURE DROP	20 kPa (END-COOLER)   150 kPa (MACHINE COOLING)   300 kPa (ELECTRICAL ENCLOSURE)
NOISE LEVEL	75 dB
CONTROL PANEL	7" color touch screen display, data record, temperature control
CONTROL SYSTEM	KEB system compatible with digital communication protocols ProfiNET, EtherCAT, EtherNET/IP, and Powerlink
SAFETY PROTECTION	High pressure protection, water supply cut-off protection, over-current protection, high temperature protection, sensor failure protection
PIPING MATERIAL	Stainless steel
CASE MATERIAL	Steel
MACHINE   ELECTRICAL CABINET DIMENSIONS (L x W x H)	229 x 243 x 193 cm (± 1.5 cm)   66 x 136 x 191 cm (± 0.5 cm)
MACHINE   ELECTRICAL CABINET WEIGHT	3 900 kg   410 kg
TECHNICAL REQUIREMENTS FOR OPERATION REFRIGERANT	The machine must be installed under a shelter, operating temperature -20...+35 °C
	Connection with a cooling water circuit, pressure max 6 barg
	2 or 3 separate cooling water circuits (dependson the config.)
	Inverter cooling water temperature must be higher than dew point, but maximum +30 °C in case of separate water circuit for electrical enclosure
OPTIONAL ACCESSORIES	Connection to nitrogen pressure 6-8 barg Remote monitoring system

STANDARD MAINTENANCE PLAN (for each repeating cycle of operating hours)	Every day	Visual inspection, check of alarms and alerts
	Mandatory 9 000 h	Electrical cabinet desiccant replacement
	Recommended 9 000 h or once a year Mandatory 18 000 h	Visual inspection of the electrical cabinet and machine parameters. Check the tightening torques of the terminals and grounding points.
	36 000 h	Electrical cabinet cooler cooling fan replacement
	90 000 h	General inspection
<b>HEAT EXCHANGER REQUIREMENTS (MACHINE SIDE, NOMINAL POINT<sup>2</sup>)</b>		
WORKING MEDIUM	Nitrogen	
MASS FLOW	5400 kg/h	
WORKING PRESSURE (abs)	400 kPa	
MEDIUM TEMPERATURE in   out	-113 <sup>3</sup>   -90 °C	
PRESSURE DROP (no more) at mass flow 5400 kg/h, absolute pressure 410 kPa, temperature -80 °C	10 kPa	
MAXIMUM ALLOWED PRESSURE (Ps)	10 bar	

MIRAI Intex is not responsible for potential mistakes in the provided data.

- 1) Purity class 5.0 or more. Average one 50-liter nitrogen cylinder per year
- 2) Cooling water temperature 12 °C
- 3) Machine inlet temperature range -80...-140 °C is selected based on customer requirements, outlet temperature is determined by cooling capacity of machine


**LEGISLATIVE COMPLIANCE**

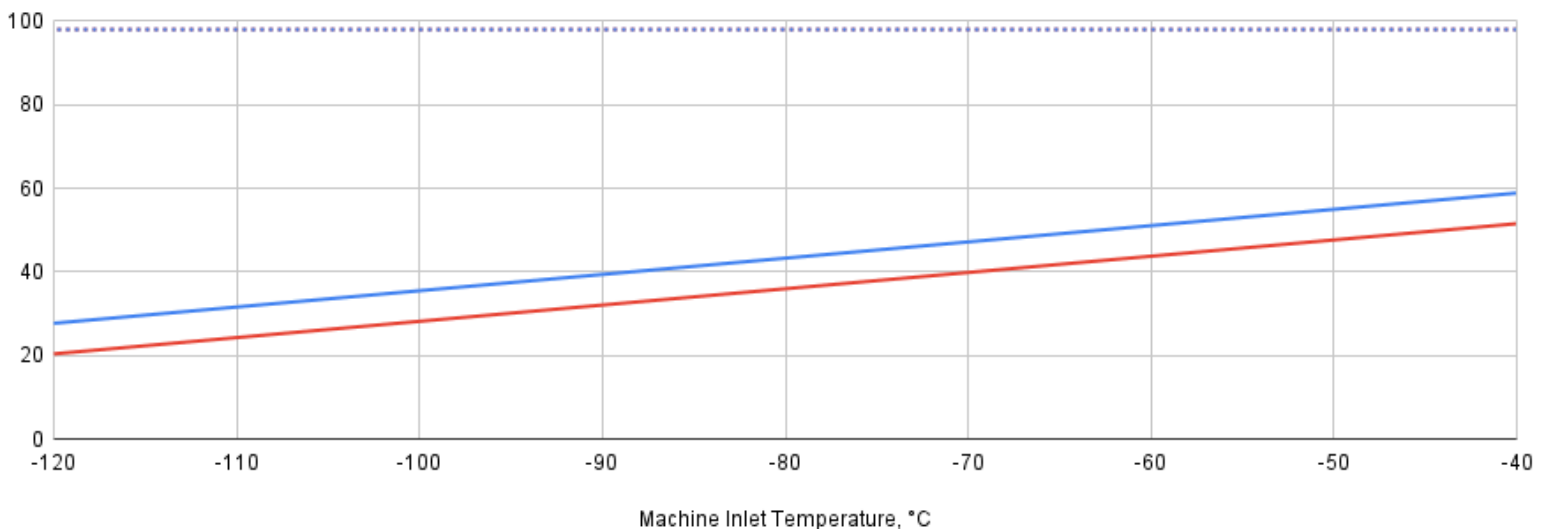
- Compliance with all international standards / regulations
- No special safety requirements

## COOLING CAPACITY

Cooling capacity of LNG 90 C/W/L, at an inlet water temperature of 6°C and 30°C

**Cooling Capacity - 90 LNG**

- Total Power, kW (Cooling water temperature 30°)
- Cooling Capacity, kW (Cooling water temperature 30°)
- Total Power, kW (Cooling water temperature 6°)
- Cooling Capacity, kW (Cooling water temperature 6°)



**DIMENSIONS**

