

## LNG Sampling Systems

# Continuous Waterless (Membrane) LNG Sampling System

360<sup>®</sup>  
KAS

*Our automated continuous waterless (Membrane) LNG sampling solution is based on the ISO 8943 and ISO 10715 requirements and collects high integrity samples for laboratory analysis.*

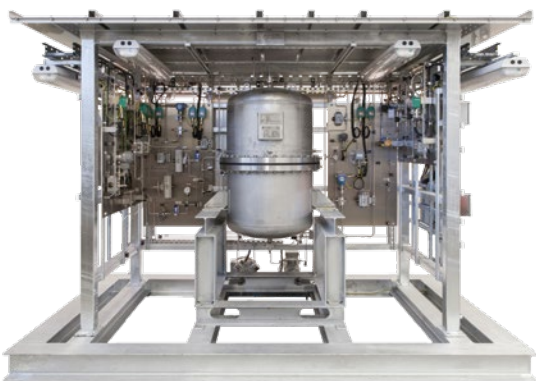
LNG Sampling Systems are used for collecting samples during the custody transfer of LNG cargo. By offline (lab) analysis of these retained samples, principal proof of the transferred LNG quality can be obtained. Together with the density and quantity transferred, the commercial value of the cargo can be determined.

360°KAS has a long track record in the development and design of Continuous and Intermittent LNG Sampling Systems since 1994. The systems are in compliance with the ISO 8943, the ISO 10715 and the guidelines stipulated in the GIIGNL.

A LNG Sampling System is typically supplied in combination with:

- A sample take-off assembly.
- A LNG probe & vaporiser system.
- Sample transport lines.
- An online Process Gas Chromatograph in combination with an Intelligent Quality Reporting Module (iQRM).

The key feature of our continuous waterless (membrane) LNG sampling system is the collection of a high integrity sample with extremely low traces of contamination. This outstanding performance is ensured by the unique design of the waterless sample holder and its internal elastomer membrane. The sample is collected in transportable cylinders in accordance with the ISO 8943 paragraph 4.2 Continuous sampling.



*Example of Continuous Waterless (Membrane) LNG Sampling System.*

## Functionality

The sample holder is split into two compartments by an elastomer membrane. The primary compartment retains the collected sample and the other, secondary gas void compartment is continuously purged with sample gas. This rules out any contamination or ingress of alien gases to the sampled product (i.e. N<sub>2</sub>) that may leak from the secondary side to the primary side, even during occurrence of an unexpected error.

Prior to start of the sample collection, the sample holder is flushed with fresh vaporised LNG and subsequently evacuated. The vacuum level will be monitored to check that evacuation is complete and no leaks are present. This procedure eliminates concerns about sample contamination by gases present from the previous batch.

Within the method as stipulated in the ISO standard, the gas required for the actual filling will be led from the vaporiser system to the sample holder via a mass flow controller and PLC controlled instrument air operated open/close valves. Settings of the mass flow controller are based on the LNG batch size, which is either time proportional or flow proportional.

Excess vaporised gas from the vaporiser system will be led via a bypass flow meter to an atmospheric pressure return line. The other part of the excess gas will be led to the secondary gas void compartment and vented after passing it.

At the end of the sampling sequence the collected sample will be transferred and pressurised via a gas compressor in to the three sample cylinders.

The holding capacity of the closed waterless sample holder will be sufficient to allow flushing and filling of these three (3) sample cylinders in accordance with the ISO 10715 requirements. Additional capacity is available to complete a second flushing and filling cycle, in case the first cycle is interrupted by a malfunction or alarm.

During sample collection, the gas sample holder totalised flow and pressure will be monitored to check smooth operation of the system.

The a closed waterless sample holder is built onto a construction with a rain/sun roof.

The LNG Sampling System is manufacturer standard and among others equipped with:

- Three (3) duty sample cylinders (standard SS304, 1000 cc net). These cylinders include isolation valves and quick connectors.
- One (1) vacuum pump.
- One (1) gas compressor.

360°KAS supplies this LNG sampling system with auxiliary equipment in accordance with the following technical specifications:

Sampling System	
Material - Frame	Hot Dipped Galvanised Steel
Material - Sample Holder	SS316L/CR
Size (HxWxD)	Approx. 2500 x 2000 x 1500 mm
Weight	Approx. 3500 kg
Hazardous Area classification	II 2 G ATEX Ex Zone 1 IIB T3 for electrical equipment and T4 for instrumentation
Temperature range	-10°C to 40°C (50°C is possible as option)
Design pressure Sample Holder	3.5 barg (PED certified)
Filling pressure Sample Cylinders	Approx. 6 barg
Utilities (required)	
Power supply	230 V/50 Hz and 24 VDC 415 VAC/50 Hz - 3 phase + N, 500 VA for one gas compressor
Instrument Air	Max. 200 NI/hr (intermittent) Pressure 5-7 barg Dew point < -40°C
Nitrogen	Norm. 1000 NI/hr (Maintenance)
Connections	Metric or imperial

## Control system

The control unit is a standard standalone unit suitable for a climate controlled non-hazardous area location and is typically located in a Field Auxiliary Room. It is built into a free standing cabinet with front and back access.

Our LNG sampling systems use a dedicated nonredundant controller (Siemens PLC type S7-1500 with touch screen HMI), based on an industrial PLC that monitors and controls the progress of the sampling and the alarm handling as appropriate. The set up and operation of the LNG sampling system can be done via the interface panel on the Control System. Step control will be based upon the requirements as set forth in the ISO 8943.

A common alarm will be available to DCS consisting of:

- Low sample flow.
- Vacuum failure.
- Thermal overload duty compressor motor.
- Thermal overload stand-by compressor motor (if applicable).
- Thermal overload Vacuum pump motor.
- Thermal overload stand-by Vacuum pump motor (if applicable).
- PLC fault.

The following signals are required from DCS via Modbus:

- Start/Stop sampling sequence.
- Suspend/Continue sampling sequence.
- Flow signal LNG Transfer Line.
- Batch size.

360°KAS supplies the control system in accordance with the following technical specifications:

Control Cabinet Specification	
Material	Painted steel
Size (HxWxD)	Approx. 2000 x 800 x 800 mm
Weight	Approx. 300 kg
Area classification	For use in climate controlled general purpose non-hazardous area
Utilities	
Power supply	230-240 VAC - 50 Hz
Power Consumption	Approx. 2000 VA (Excluding Vaporisers) Approx. 2500 VA (Including one (1) Vaporiser)
Functionality	
PLC Step control	Based upon ISO 8943 requirements
DCS Interface	MODBUS TCP/IP or RS485
Cable interfaces (Typical, actual depending on cable length)	
Between Control System and DCS	LNG Sampling & Control cabinet common alarm, vaporiser common alarm Modbus TCP/IP or Modbus RS485 to DCS

## Options

The following options can be quoted upon request:

- Automatic stream selection by means of a pneumatic operated 4-way ball valve to make the sampler suitable for sampling of two (2) main LNG transfer pipelines.
- Spot Sampling Panel.
- A local ATEX zone 2 certified HMI panel for controlling the LNG sampling system in the field (T4) IECEx certification.
- Second (standby) vacuum pump.
- Second (standby) gas compressor.
- On-line Process Gas Chromatograph with associated equipment.
- An Intelligent Quality Reporting Module, a tool to automatically generate indisputable Certificates of Quality.

The following LNG Sampling product sheets are available:

- LNG Probe & Vaporiser System >2.5 barg
- LNG Probe & Vaporiser System (CryoSamp) > 0.7 barg
- Intermittent (CP/FP) Sampling System
- Continuous Water Seal (Dome) Sampling System
- Continuous Waterless (Membrane) Sampling System
- Intelligent Quality Reporting Module (iQRM)



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