

## LNG Sampling Systems

# Continuous Water Seal (Dome) Sampling System

360<sup>®</sup>  
KAS

*Our automated Continuous Water seal (Dome) LNG sampling solution, based on the ISO 8943 and ISO 10715 requirements, eliminates sample contamination by ambient air via a closed tank construction.*

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 product is that we obtain representative samples from the cryogenic flow in the main LNG transfer pipeline. The continuous water seal (dome) LNG sampler system stores the sample in a water sealed tank eliminating sample contamination from ambient air. After completion of the sample sequence, the sample is collected in transportable cylinders in accordance with the ISO 8943 paragraph 4.2 Continuous sampling.

### Functionality

The continuous water seal (dome) LNG sampler system consists of a closed outer tank (water holder) in which an inner tank (gas dome) is fixed mounted to the bottom. The outer tank is a closed construction having the advantage that no contamination of the water seal by dust or sand from the environment is possible. The holding capacity of the dome is 1000 litres gross and 760 litres net, which covers the ISO requirements with respect to flushing and filling of the three 2250 cc sample cylinders.

The outer tank needs to be partly filled with demineralised water. The (low) water level and filling level are monitored by level- switches, for which an alarm versus indication is provided.



*Example of Continuous Water Seal (Dome) LNG Sampling System.*

The actual filling of the LNG sampler to the minimum water level is manually controlled. Automatic filling is possible as option.

The gas void above the water level 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 be absorbed by the water-seal.

At the start of a sampling sequence, the water-seal will be bubbled with LNG via a gasification header mounted at the bottom of the inner tank

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 valves. Settings of the mass flow controller are calculated based on the LNG batch size and duration or loading line flowrate. This allows for either a time proportional or flow proportional sampling functionality. The pressure of the vaporised LNG from the vaporiser system will be regulated with a back pressure regulator in the LNG Sampling System. The excess vaporised LNG gas must be led to a low pressure Boil Of Gas line or atmospheric vent line.

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

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

- Three (3) duty sample cylinders (standard SS304, 2250 cc net). These cylinders include isolation valves and quick connectors.
- One (1) gas compressor.

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

Sampling System	
Frame Material	Hot Dipped Galvanised Steel
Sample holder material	SS316L
Size (HxWxD)	Approx. 2500 x 2000 x 1500mm
Weight	Approx. 3500kg
Hazardous Area classification	II 2 G ATEX Ex Zone 1 IIB T3 (except field HMI unit, which is II 3 G ATEX Ex zone 2 IIC T4 certified)
Temperature range	+10°C to 40°C
Design pressure Sample Holder	1.8 barg
Filling pressure Sample Cylinders	Approx. 6 barg
Utilities	
Power supply	230VAC/50Hz (from the control system) 400VAC/50Hz – 3 phase + N, 500VA for one gas compressor
Instrument Air	Max. 200NI/hr (intermittent) Pressure 5-7 barg Dew point < -40°C
Nitrogen	Norm. 1000NI/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 non-redundant 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 hard wired common alarm will be available to indicate below conditions:

- Low sample flow.
- High water dome level.
- Low water dome level.
- Thermal overload duty compressor motor(s).
- PLC fault.

The following control signals are available for client DCS control Modbus protocol:

- 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 System Specification	
Material	Painted steel
Size (H x W x D)	Approx. 2000 x 800 x 800mm
Weight	Approx. 300kg
Area classification	For use in climate controlled general purpose non-hazardous area
Utilities	
Power supply	230-240VAC - 50Hz
Power Consumption	Approx. 2000VA (Excluding Vaporisers) Approx. 2500VA (Including one (1) Vaporiser)
Functionality	
PLC Step control	Based upon ISO 8943 requirements
DCS Interface	MODBUS TCP/IP or RS485
Electrical interfaces	
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:

- Dual stream sampling, with mixing of the sample from both streams via MFC's.
- A rain/sun roof for the sampler skid.
- Automatically water filling of the LNG sampler.
- Spot Sampling Panel, either manual or automatically.
- A local ATEX zone 2 certified HMI panel for controlling the LNG sampling system in the field.
- IECEx certification.
- 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, based on PGC measurements.

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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