

## LNG Sampling Systems

# Intermittent (CP/FP) LNG Sampling System

360<sup>®</sup>  
KAS

*Our automated intermittent LNG sampling solution is based on the ISO 8943 and ISO 10715 requirements and reduces room for human errors to a minimum.*

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 and 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 can obtain representative samples from the cryogenic flow in the main LNG transfer pipeline. The Intermittent (CP/FP) LNG Sampling System does this by collecting a sample in transportable Constant Pressure, Floating Piston (CP/FP) cylinders in accordance with the ISO 8943 paragraph 4.3 Intermittent sampling.

### Functionality

A CP/FP cylinder is split into two compartments by a floating piston. One compartment retains the collected sample and the other compartment is filled with a pre-charge gas. The pre-charge gas compartment is connected to a feed line that receives supply gas from a high-pressure container with gas alien to the sampled product, e.g. Helium.

Per sample-grab from the vaporised LNG flow, a fixed volume of product (e.g. 1 cc) is transferred by means of a positive displacement-pump into the compartment for the collected sample. Based on the flow in the main LNG transfer pipeline, the grab-samples are collected either time proportional or flow weight averaged.

Prior to the start of sampling, each CP/FP cylinder is automatically purged by flushing the cylinders, the interconnecting tubing between the pumps and cylinders, and the pump internals with vaporised LNG gas flowing through the sample lines. At the start of sampling the pre-charge gas compartment will be blocked from the Helium supply line.



*Example of an Intermittent LNG Sampling System with 3 CP/FP cylinders, a fourth cylinder is available as option.*

During sampling, the floating piston in the CP/FP cylinder starts to move downwards, resulting in a simultaneous rise of pressure in both compartments. The pressure in the cylinder is continuously measured, providing a degree of filling for each of the cylinders.

Each sample cylinder is connected to a dedicated sample pump, to obtain a maximum in redundancy. Pump strokes are synchronised to ensure equal gas composition in each of the three sample cylinders.

The sample pumps are connected in series and are continuously purged by the flow through the LNG sample line. Hence, the intake-conditions of the product will be equal for all three sampling pumps. The intake pressure is controlled by a (back) pressure regulator for each sample supply line. The system includes diagnostics to monitor sample flow, performance of the sample pumps and filling rate of the sample cylinders.

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

- Three (3) duty sample cylinders (standard SS-316, 1.000/800 cc net). These cylinders include isolation valves, pressure gauges (0 - 10 bar), quick connectors and a safety bursting disk.
- A Helium gas bottle facility (for one (1) bottle) at the back of the sampling cabinet by means of wall mounted clamps or chains to provide pre-charge pressure in the CP/FP cylinders. The gas bottle connection will have a two-stage pressure regulator, complete with pig-tail or flexible hose,

relief valve, pressure indicators and isolation valve  
360°KAS supplies this LNG sampling system with auxiliary equipment in accordance with the following technical specifications:

Sampling System	
Material	SS316
Size (HxWxD)	Approx. 2000 x 1600 x 500 mm
Weight	Approx. 350 kg
Hazardous Area classification	II 2 G ATEX Ex Zone 1 IIB T3
Temperature range	-10°C to 40°C
Filling pressure Sample Cylinders	Approx. 8 barg
Utilities (required)	
Power supply	230 - 240 VAC - 50 Hz and 24 VDC (from the control system)
Instrument Air	Max. 130 NI/hr (intermittent per batch) Pressure 5 - 7 barg Dew point < - 40°C
Helium	Max. 15 NI/hr (intermittent per batch)
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 common alarm will be available to DCS consisting of:

- Instrument air pressure low.
- Pre-charge pressure low.
- Purge flow low.
- Sample flow low.
- No cylinder present.
- Cylinder pressure sensor fail.
- Cylinder filling level deviation.
- PLC fault.

Signals required from DCS:

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

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

Control System 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. 1400 VA (Excluding Vaporisers) Approx. 1900 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 Vaporiser System and Control System	8 pr x 0.75 mm <sup>2</sup> cable digital signals (Non-IS) 4 pr x 0.75 mm <sup>2</sup> cable analogue signals (Non-IS)
Between Control System and LNG Sampling System	8 pr x 1.5 mm <sup>2</sup> solenoid valve cable (Non-IS) 16 pr x 1.5 mm <sup>2</sup> cable digital signals (IS) 4 pr x 1.5 mm <sup>2</sup> cable analogue signals (IS)
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.
- Sulfinert® coating of major sample wetted components downstream the vaporiser, e.g. sample transport tubing, grab sample pumps, CP/FP sample cylinders to enable client to perform H<sub>2</sub>S analysis on the collected samples. Tube connectors, valves etc. will not be Sulfinert® coated.
- Spot Sampling Panel.
- A pressure switch to detect pre-alarm for a changing gas bottle.
- A local ATEX zone 2 certified HMI panel for controlling the LNG sampling system in the field.
- IECEx certification.
- On-line Process Gas Chromatograph with associated equipment.
- An Intelligent Quality Reporting Module, a tool to automatically generate indisputable Certificates of Origin.

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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