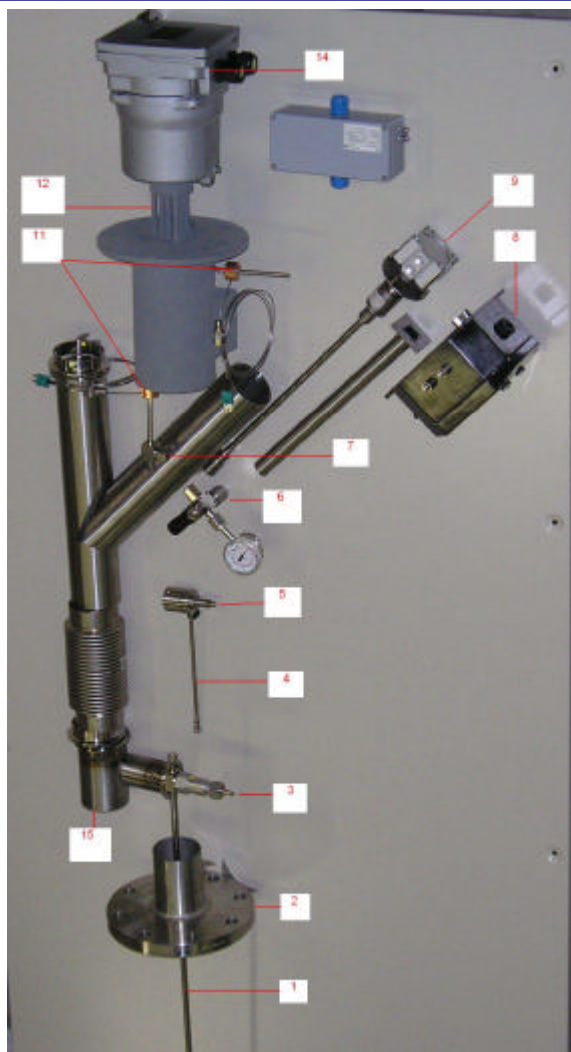


SAMPLE TAKE-OFF PROBE & VAPORIZER for LNG

SUBJECT:

For LNG custody transfer it is now a common practice to determine the composition, density and gross calorific value of LNG delivered by direct on line GC plus indirect lab analysis methods. A precise sampling is prerequisite for both analysis.



I- Sample take-off probe:

The ISOSAMPLE 8100 SAMPLE TAKE-OFF PROBE has been designed to provide a Thermal insulation of the sample take-off probe by high vacuum maintained below 1.10^{-4} torr.

The conjunction of this ultra-low residual pressure minimizing heat leak by conduction and convection with layer of radiation shield cryogenic material constitutes a superinsulation system providing apparent thermal conductivity (k) values below 0.4 milliwatt per meter-kelvin (mW/m-k), therefore the enthalpy rise can be controlled to be inferior of the subcooling degree and fractionation will not have occurred in the sampling line even for low LNG pressure in line

II- Sample vaporizer:

The LNG sample is vacuum isolated up to the sample vaporizer coil exchanger sealed in calorific block temperature controlled. At this point, sample is flashing to eliminate any fractionated distillation effect.

Inlet / outlet temperatures and pressures are monitored with interlock shut-off system

This principle focuses on improving reproducibility between lab and line GC to a value better than 0.15% (ASTM D1945) and WI repeatably beter than 0.01MJ/m³ (ISO 6976) .

III- System descriptive:

The sampling probe item 1 must be located on the top of horizontal part of pipe to withdraw the LNG from the center and the sampling tube is usually sized 3/8" OD.

The flange item 2 is supplied as per customer specifications and the vacuum jacket item 15 is welded on flange and assembled with high vacuum flanged connections.

A first sample isolation core valve item 3 is supplied and encapsulated in the vacuum jacket, this valve is only accessible by opening the flange cap to isolate the system from pipe-line if any maintenance work is required, thus, the downstream part of system can be removed and the vacuum re-established in this pre-insulation section without process service disturbance such as outage of the loading line.

A capillary assembly item 4 is provided for breaking equilibrium between the sample and pipe-line pressures and the main isolating valve item 5 is supplied with extended bonnet and pneumatic actuator item 9. This actuator is operated via the pneumatic logic unit item 8 to be installed locally: the valve is normally closed and manually turned to open/close by pneumatic switch. A pneumatic port inlet controlled by the interlock shut-off system (when acquired) is provided for switching-off the valve if the temperature at outlet of vaporizer is dropping below the application set point (vaporizer failure or sample flow abnormal increase) then new switching to open is manual.

The check valve item 7 is operating as pressure barrier between sample pressure expansion in the vaporizer and the process line and two thermocouples type K item 11 are supplied at inlet and outlet of vaporizer with 2 meters coils in the vacuum jacket to avoid heat leak by conduction.

The high purity bellows valve item 6 with vacuum pressure gauge is provided on the bonnet vacuum jacket for re-establishing the vacuum when required.

The LNG sample is vacuum isolated up to the sample vaporizer coil exchanger sealed in calorific block temperature controlled.

The vaporizer is supplied with PID temperature controller and inlet / outlet temperature interlock system for auto-shut-off the main valve item 5 if outlet temperature drops to the application set point or if pressure at vaporizer outlet exceeds 10 bar-g.

Temperature control set point is automatically changed if temperature at coil inlet warms up.

The sample vaporizer is so constructed that the LNG is flashing at the coil inlet and the heavier components of the LNG do not remain in the vaporizer.

The capacity of the LNG vaporizer is sufficient to gasify the whole volume of LNG which is being withdrawn for sampling and keeping the enthalpy rise below of subcooling degree compliance

The vaporizer is provided in a stainless steel box, protecting code is ATEX II 2G EEx de IICT4

IV- Main specifications:

Pipe-line pressure: 1.5 to 5 bar-g

Pipe-line temperature: - 160 °C

Volume of gas sample vaporized: approx 1200 Sl/h

Lag time through sampling probe and vaporizer: 30 sec approx.

Thermal conductivity of probe: 0.4 milliwatt per meter-kelvin (mW/m-k)

Heating capacity of vaporizer: 0.5 Kw

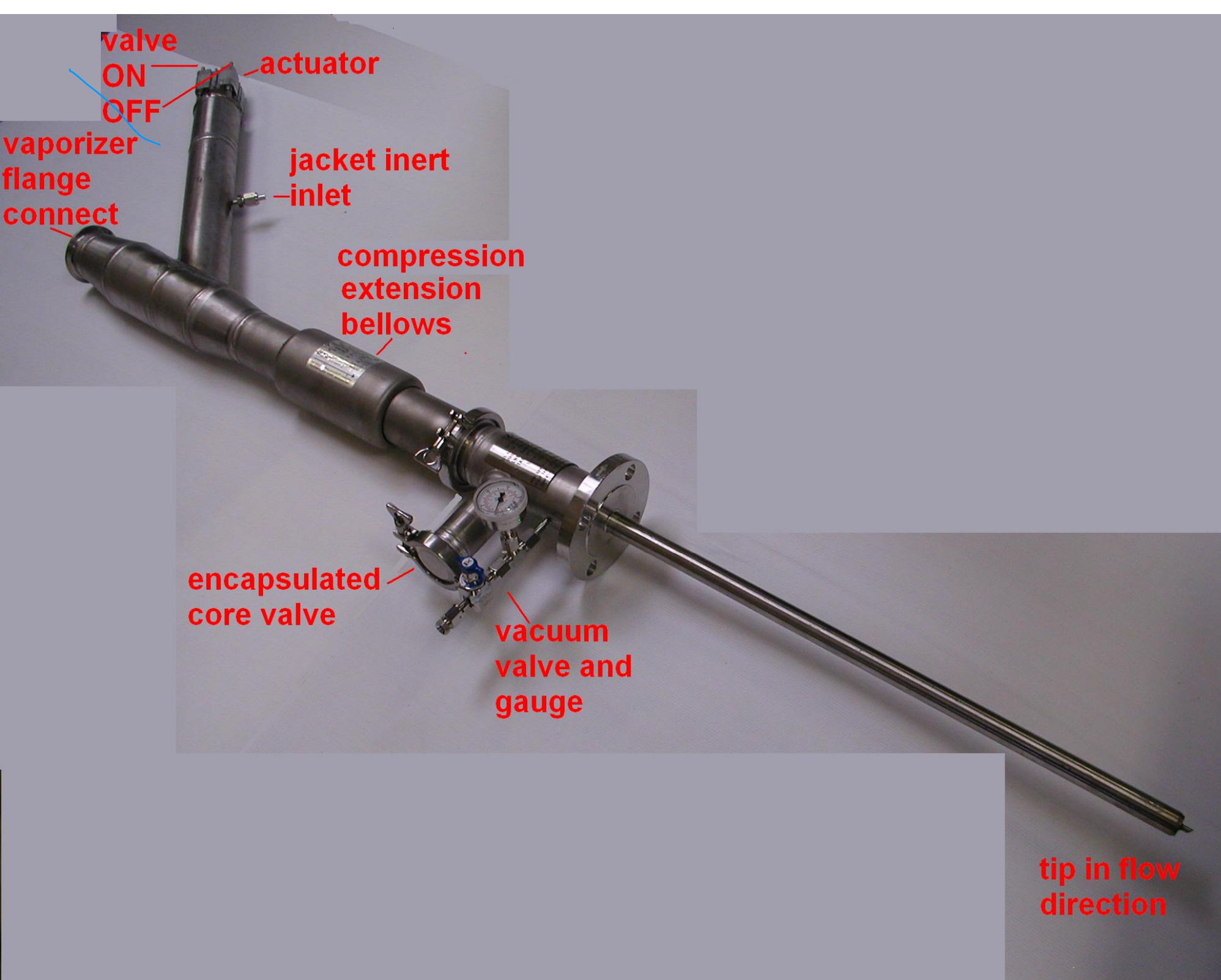
Sample outlet connection: 1/4" NPTF

Protecting electrical code: ATEX II 2G EEx de IICT3

Enclosure rating: IP65 or NEMA 4x



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valve
ON
OFF

actuator

vaporizer
flange
connect

jacket inert
inlet

compression
extension
bellows

encapsulated
core valve

vacuum
valve and
gauge

tip in flow
direction