

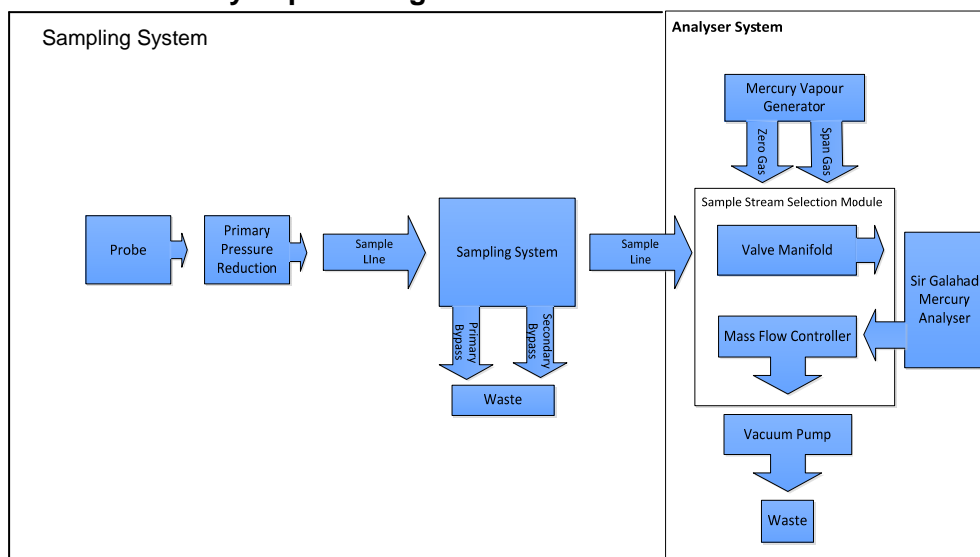
PS ANALYTICAL

PRODUCT SPECIFICATION

PSA 10.670 ONLINE DETERMINATION OF MERCURY IN PROCESS GAS STREAMS

The PSA 10.670 is specifically designed to determine total gaseous mercury (TGM) in process gas streams such as natural gas, sour gas, fuel gas, LNG, LPG, butane, ethylene, propylene, hydrogen, carbon dioxide and Syngas. The system essentially consists of two units, a sampling system and a process analyser. This is shown in Figure 1 in the form of a block diagram and typical installation in Figure 2.

Figure 1 Block diagram of instrumentation used for the online determination of Mercury in process gas streams



P S Analytical works closely with our clientele to ensure that the instrumentation supplied is suitable for specified hazardous area classification. In most cases this will involve using an air or nitrogen purged enclosure for the analyser and an ExD sampling system. In some cases a probe is required to ensure that a representative sample is extracted from the process. Sample filtration is required at the sample take off point to avoid particulate contamination of downstream components. For liquefied gas samples such as LPG, a primary pressure reduction is used to vaporize the sample at the sample take off. To avoid losses of mercury a Teflon sample line, braided with stainless steel is typically used and depending on the sample dewpoint it may be necessary to heat this line. A high primary bypass flow is recommended to ensure a representative sample is obtained and to avoid losses of mercury on sampling components.

More detailed information regarding the sampling arrangement can be found in product specification 10.540.



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Figure 2 Typical Installation - the Sampling System and Analyser in Purged Cabinet**The 10.670 Online Hg Analyser**

The pre-conditioned sample then flows to the 10.670 online Hg analyser. This consists of a Sir Galahad 10.525 series Hg Analyser, a PSA Hg Generator (10.534/6) and a stream selector (PSA S665S200) with flow measurement and control. The various modules are controlled using the PSA Online Process Control Software (PSA C210S007, see News Update 34 for more information) operating on an industrialized PC. The system may be configured for multiple sample streams.

A photograph of the internal cabinet arrangement showing the various modules are shown in Figure 3.

Figure 3 Inside the 10.670 series Analyser

When a stream is selected the sample gas flows over trap 2 using a vacuum pump and mass flow controller arrangement. The sample flowrate is controlled using a mass flow controller operating in the range of 100 to 1000ml/min. Once the required amount of sample has passed over trap 2 the mercury collected from the sample is released by thermal desorption into a carrier gas, which transfers the mercury onto trap 1. The mercury on trap 1 is then released by thermal desorption into the AFS detector. The whole period takes approximately 4 minutes per run plus the collection and flush time. In dual amalgamation mode the collection temperature of trap 2 can be controlled, so we can sample above the dew point of the gas. The Cavkit is used to deliver a high span of elemental mercury and blank to the valve manifold so that automated calibration can be achieved. Alternatively the Sir Galahad can be calibrated in an absolute fashion using the vapour injection technique onto trap 1. The process analyser is shown schematically in Figures 4a-d. A summary of the specifications is provided in Table 1.

Figures 4A-4D Sir Galahad Analyser Schematics

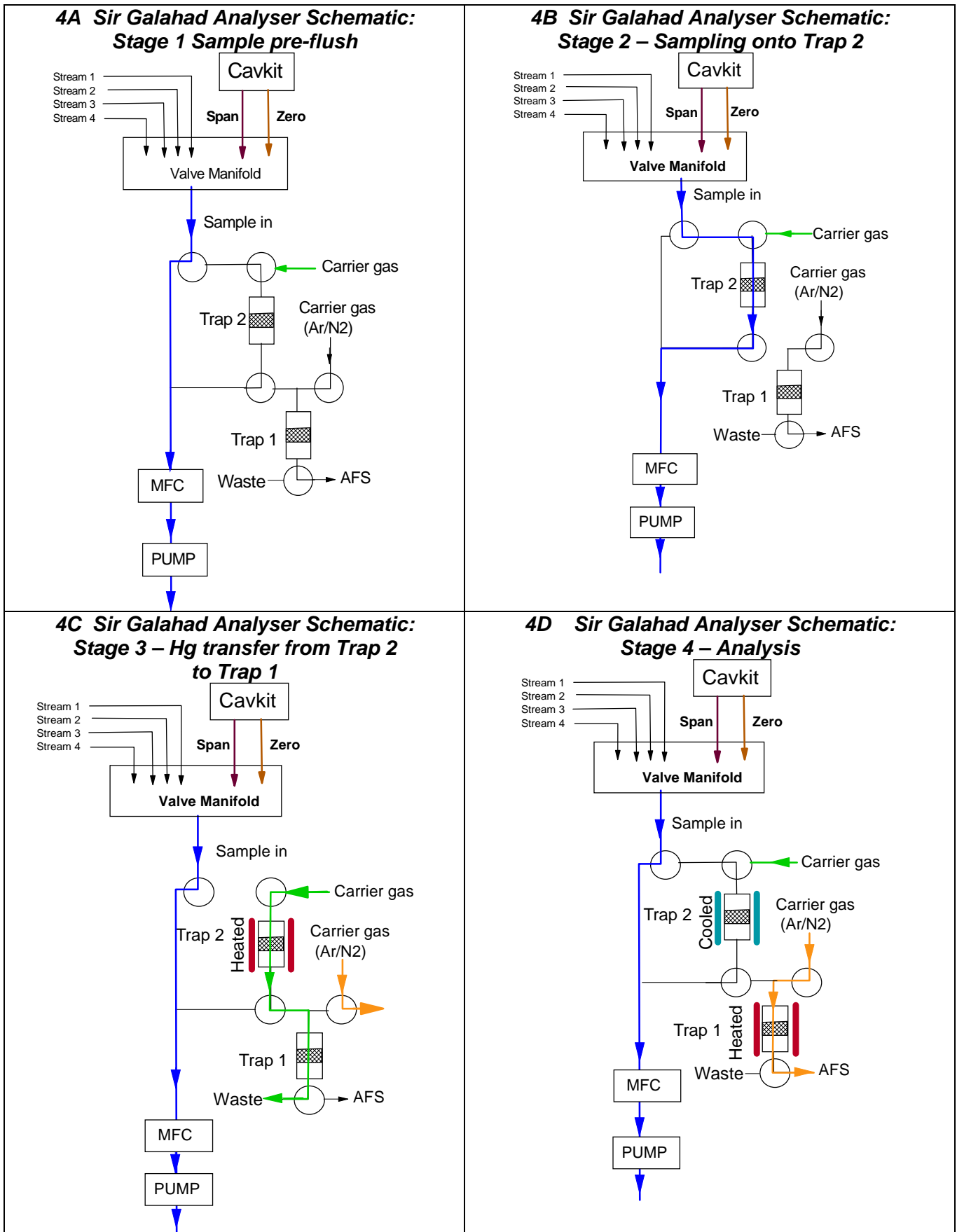


Table 1 Specifications – Analyser

Analyser Model/Make/Principle	Model: PSA 10.670 Make: P S Analytical Principle: Dual amalgamation with atomic fluorescence spectrometry. Mercury is collected on a heated gold Amasil™ trap and is subsequently released into an AFS via an additional collection trap using thermal de-sorption. Compliant to ASTM 6350 and ISO 6978 part B.
Probe Type	Various – Insertion probe with isolation, Insertion probe with double-block and bleed isolation, Genie probe,
Sample Connection to Process/Material	316 stainless steel to Primary Pressure Reduction then stainless steel-braided Teflon® hoses
Sample Flow Rate	Primary bypass is optional but highly recommended at max flow. Secondary bypass bypasses is typically 2 l min ⁻¹ , analyser flow max is 800 ml min ⁻¹
Pressure Regulator in Sample Conditioning	Heated pressure regulators, input pressure 300 bar gauge maximum. Output pressure for: Primary Pressure Reduction: 0-35 bar gauge Sampling System: 0-2 bar gauge.
Line Filter	7 µm at both primary pressure reduction and sampling system
Heat Tracing within Sample Conditioning	+5C above dew point at process and environmental conditions is recommended
Hazardous Area Certificates	Client specific. ATEX and IECEx both available, suitable for zone 1, class 1, div 1, gas groups A, B, C and D,
Enclosure Type & IP Class	Pressurized enclosure type X, IP66, (For the Primary Pressure Reduction and Sampling System, the internal components, not the enclosure are IP66 rated.)
Purge Override	Optional
Air Cooling	Optional – either Air Conditioner or Vortex Cooler
Sunshade and Lighting	Optional
Purge Rate	Defined by number of streams and gas type, ranging from 90L/min to 225L/min. Nitrogen purge gas operates in leakage compensation mode after initial purge period to reduce the consumption of purge gas.
Analogue output from analyser	4-20 mA HART (optional)
Digital Output Options	RS232, RS432, Modbus,
Sensor Status/ Fault Digital Output	Digital output – (quantity defined by client)
Provision for Modbus Output	Optional
Range	Maximum working range is 0-3000 µg m ⁻³ , 4 selectable gain ranges. Adjustment of sample collection volume to cover wide range
Accuracy	Within 5% of expected value from NIST certified Hg reference gas (Cavkit 10.534/10.536)
Sensitivity/ Drift	Sensitivity - On Range 100 with N ₂ carrier gas, 0.5 pg/AF Unit Drift: Zero and span less than 10 %
Detection Limit	0.1 pg absolute with argon equating to 0.1 ng m ⁻³ for a 10 L sample volume 0.5 pg absolute with nitrogen equating to 0.5 ng m ⁻³ for a 10 L sample volume.
Speed of Response	Within 1 cycle time (4 min + sample collection time)
Size	600mm wide x 1000mm deep x 1810mm high + 150mm plinth (standard unit)
Weight	160Kg (standard unit)
Power	115/230V at 50/60Hz, 1200VA excluding optional heaters (standard unit)
Plinth	Optional