

HOBRE INSTRUMENTS GATEKEEPER

Introduction

For monitoring compliance with Rule 21 at the injection point of upgraded biogas into the gas grid the Gatekeeper analyzer system offers a cost-effective, high accuracy and low maintenance solution. The system includes a TDL-PA analyzer for measuring H₂S, H₂O and CO₂ and a continuous WIM Compas analyzer for measuring CH₄, H₂, O₂ and calculating N₂. Besides these components, also Specific Gravity, Wobbe Index and Heating Value (BTU) are available as outputs. For on-line monitoring of siloxanes Hobré can offer separate a separate FTIR analyzer delivering specialized and total siloxanes (please refer to separate datasheet).

Measuring principle TISOMIC TDL with photo acoustics

A photo acoustic (PA) signal is generated by a modulated TDL with wavelength coinciding at an absorption band of the component to be measured. By absorbing light, the molecules are excited. The temperature of the gas sample increases as a result of conversion of absorbed light energy into energy, and increasing temperature increases the pressure of the gas. In a very simple way this can be compared with lightning and thunder.

Because the laser light is modulated, these temperature and pressure variations are periodic, which results in the formation of thermal and acoustic waves in the gas sample. Gas concentration measurement by PA spectroscopy is based on the detection of the generated acoustic waves; That is, the sound signal. This sound is detected by a microphone.

The measuring cell has a length of 3 inch only. With the double cell setup, used for this application, the laser

light is going through 2 cells; 1 cell with the process gas, and 1 with process gas scrubbed for H₂S and H₂O. With this setup a continuous differential measurement is done for lower range measurements (see figure 1.). The measuring cells are heated to 122F (50C) and can optionally be heated to 176F (80C) to stay well above dew-point of the process gas.

The Tisomic PA-TDL technology offers important benefits:

- Rugged design very short path length reducing sensitivity to fouling
- A single instrument measures H₂S, H₂O and CO₂
- Low maintenance (no moving or wearing parts), typically once every six months
- Low analyzer flow of ± 150 cc/min per cell, reducing emissions of unburnt hydrocarbons
- Easy field validation and calibration

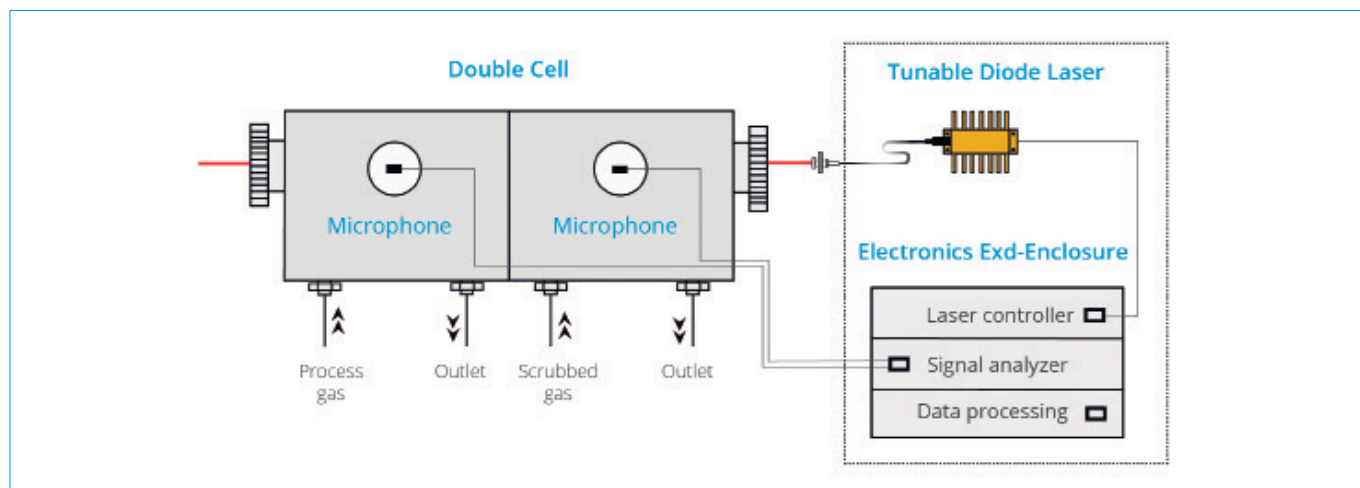


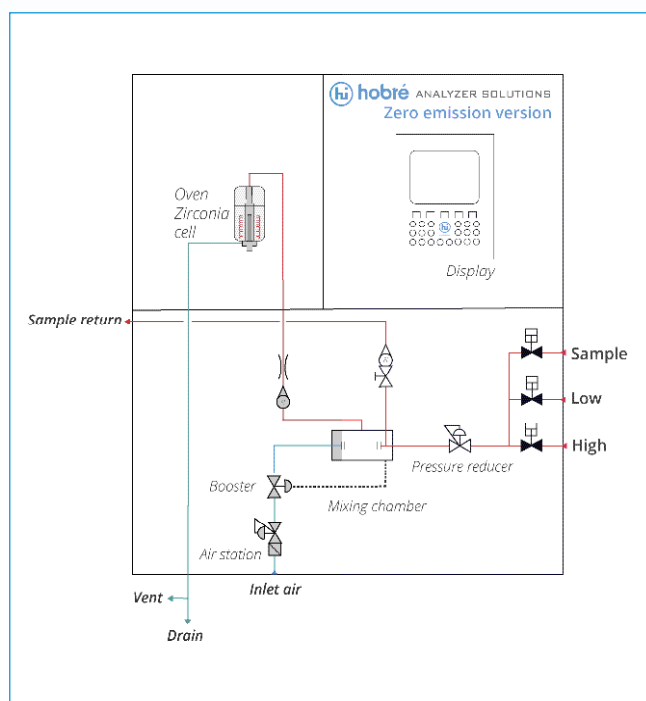
Figure 1: Schematic Hobré TDL with PA for low ppm H₂S and H₂O



Tisomic TDL analyzer



WIM Compas analyzer



*Figure 2: Schematic overview WIM Compas Flex
(GC module not shown)*

Measuring principle WIM COMPAS

The WIM Compas™ is an on-line process gas analyzer for measuring the Wobbe Index, Heating value (BTU) and the Combustion Air Requirement Index (CARI) for natural gas, biogas, fuel gas and flare gas applications. Designed and manufactured in-house, the WIM Compas™ builds on Hobré's 40+ years of success and experience with residual oxygen type analyzers.

In the WIM, a small sample flow is mixed continuously with air under well-controlled conditions. The air-fuel mixture undergoes catalytic combustion followed by measurement of the residual oxygen. This provides a direct measure of CARI and correlates to the Wobbe Index as per ASTM 4891-13 and ISO 15971. The integrated Specific gravity cell enables calculation of the Methane content and the heating value. In the GATEKEEPER biogas monitoring system a Micro GC analyzer is integrated inside the WIM Compas™ analyzer to enable H₂ and O₂ measurement as required for Rule 21 compliance. The Micro GC uses a TCD detector, carrier gas flow (N₂ 5.0 quality) is only 20 cc/minute.

TECHNICAL SPECIFICATION

Type	GATEKEEPER
Make	Hobré Instruments BV
Mounting	Wall mounted, free standing frame optional
Dimensions	TISOMIC PA-TDL: H 50", W 23", D 20" WIM COMPAS: H 50", W 43", D 17"
Weight	TISOMIC: 325 Lbs (150Kg) WIM COMPAS 220 Lbs (100Kg)
Measured components/ranges	H2S 0-10 ppmv H2O 0-150 ppmv CO2 0-2 %vol CH4 80-100 %vol N2 0-5 %vol O2 0-1 %vol H2 0-1 %vol please consult factory for other ranges
Communication	- MODBUS over TCP/IP or MODBUS over RS-485 - 8 x 4-20mA analogue outputs
Common alarm	Maintenance and general fault
Response time	120s – 180s
Repeatability (2sigma) for H2S	± 0.25 ppm (moving average)
Repeatability (2sigma) for H2O	± 0.1 ppm (moving average)
Repeatability (2sigma) for CO2	± 150 ppm (moving average)
Repeatability (2sigma) for CH4	± 0.2 %vol
Repeatability (2sigma) for N2	± 0.2 %vol
Repeatability (2sigma) for O2	± 0.05 %vol
Repeatability (2sigma) for H2	± 0.01 %vol
Area Classification in accordance with	TISOMIC: CSA Class 1 Zone 1 BCD T3 WIM COMPAS: CSA Class 1 Div. 2 BCD T3 (Ex-purge) – Zone 2 compliant
IP rating	IP 65 / NEMA4X compliant
Sample flow GATEKEEPER	<1 lpm
Sample requirements	0.5micron filtered dry gas, with continuous flow and stable pressure
Sample inlet	6mm OD (Swagelok)
Sample outlet	12mm OD (Swagelok)
Calibration gas inlet	6mm OD (Swagelok)
Ambient temperature	Max. 40°C
Power requirement	110 VAC (40 – 60 Hz), 1500 VA max
Instrument air requirement	2 SCFM at 60 psiG
Carrier gas requirement	Nitrogen at 20 cc/min, quality 5.0

Hobré Instruments is a leader in the design, manufacturing, marketing and maintenance of on-line analyzers, sample systems and complete turnkey analyzer systems and shelters. Established in 1978, our company focuses on providing solutions for the Oil and Gas industry and Petrochemical sector for analyzer packages, we design and build fit-for-purpose and cost-effective solution packages, meeting local requirements and satisfying each client's unique specifications.



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