



hobré instruments bv

WIMCompasF



Wobbe Index, Calorific Value and BTU Analyser

Measures Wobbe Index, Combustion Air Requirement Index (CARI) and Calorific Value of Natural Gas and Gaseous Fuels





Operation, Service and Maintenance

This robust analyser is suitable for outdoor installation in a harsh industrial environment. The periodically required calibration can be performed automatically on a timed interval. For calibration gases, simple 2-3 component mixtures are used to extend the certification period of the bottles and increase the fill pressure. Typically the calibration gases last multiple years. The analyser is designed in such a way that the required maintenance is minimised. With the optional available fast loop filter with Multiphobic membrane installed in the WIM, the analyser can handle the majority of the applications without the need for an external sample conditioning system.

Certification

Type approvals are available for installation of the WIM Compas F in the following hazardous areas:

- Ⓜ ATEX II 2G (Zone 1 IIC T3)
- Ⓜ ATEX II 3G (Zone 2 IIC T3) with manufacturers declaration of compliance
- Ⓜ IECEx II 2G (Zone 1 IIC T3)
- Ⓜ Class 1, Division 2, Group B,C,D
- Ⓜ KOSHA

Please consult the factory for the available options and installation requirements.



Flare Applications

The WIM Compas F with injection system is especially designed to measure flare gas. Due to the small injection volume, contamination (and therefore maintenance) to the hot section of the analyzer is minimized. Other advantages on flare gas include:

- Ⓜ Suitable for corrosive gases (high Sulphur content).
- Ⓜ Operates at atmospheric pressure, eliminating the need for a pump and preventing the condensation of water and/or heavy hydrocarbons.
- Ⓜ Suitable for zero HC emission operation without the need for an external vent gas combustion system.
- Ⓜ Direct measurement of heating value. No need for a specific gravity cell.
- Ⓜ Hot application version available (up to 150°C /300F).
- Ⓜ Injection interval is adjustable. Standard setting is 30 seconds.
- Ⓜ Measures in accordance with the USA rule 1118 and EPA Flare Emissions 40 CFR.

Zero HC Emissions

Venting hydrocarbon gas to atmosphere is considered to be an undesirable practice. Hobre Instruments has developed solutions for both the continuous and the injection version to allow zero HC emission operation without venting air into the flare. Please contact Hobre Instruments to discuss your application.

Turn Key Solution

Besides analysers, Hobre Instruments bv has over 30 years of experience in the design and supply of analyser solutions. Our designs are application specific based on gas composition, phase diagram and further requirements for your process. For instance a turnkey gas stabilisation system.

Typical Gas Analysis Systems can Include:

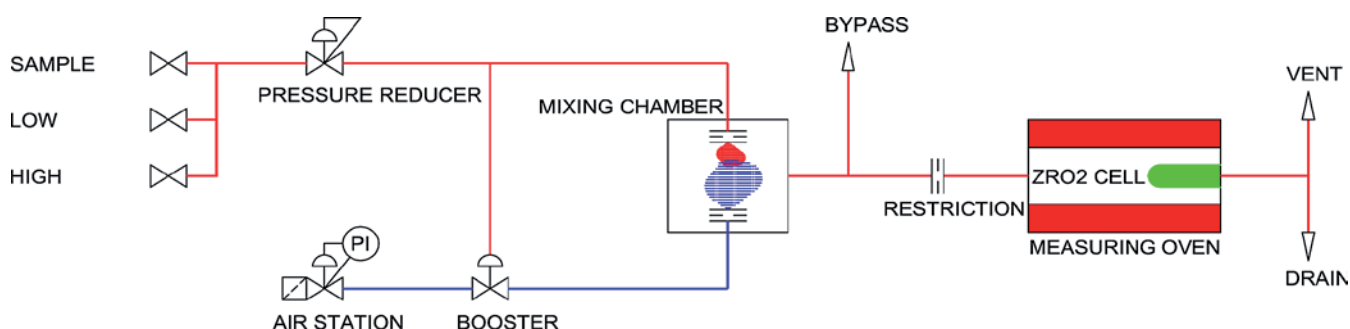
- Ⓜ Diagnostics of critical functions
- Ⓜ Proprietary Multiphobic membrane filtration resulting in long maintenance interval and minimal liquid carry over (both water and HC)
- Ⓜ Flow Impact Probe for representative sampling, fast response time and minimal liquid carry over.



Introduction

The WIM COMPAS™ series is the latest addition to the Hóbré Instruments portfolio of process analysers for measuring Wobbe Index, Heating value/BTU and Combustion Air Requirement Index (CARI). Designed and manufactured in The Netherlands, the WIM COMPAS™ builds on 20+ years of success and experience with residual oxygen type analysers (WIROX, WIM9600, WIM9900). Offering an unmatched combination of reliability, response time, repeatability and accuracy the WIM COMPAS™ is the best choice for your application.

The gas you use or deliver has to meet contractual specifications. In many refineries and petrochemical plants, furnaces, turbines and boilers can be exposed to frequent and sudden changes in the fuel gas composition. These changes will immediately affect the operating stability of your combustion process and can cause unwanted emissions. Users are looking for a method to control the thermal input and air/fuel ratio in such a way that disturbances are minimized and the combustion process occurs with maximum efficiency.



Typical Applications

Natural gas blending and storage. The short response time and the high accuracy and repeatability of the WIM COMPAS™ are providing many customers with a perfect signal for the feedforward control of gas blending operations as well as monitoring the quality of gas delivered to the grid including LNG regasification.

Fired heaters. Besides a rapid response time the availability of the CARI signal is a key benefit of the WIM series. While the Wobbe Index is an excellent variable for the control of the thermal lead of the furnace, it is much better to control the air/fuel ratio using the CARI. This is particularly the case when hydrogen, carbon monoxide and olefins are present in the fuel gas.

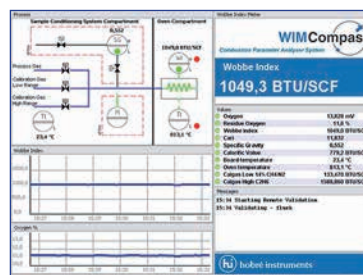
Gas turbine control. Gas turbines are sensitive to rapid changes in gas composition; besides poor fuel economy and a reduced lifetime, improper control also results in higher CO and NOx emissions. The WIM provides the Wobbe Index, Heating Value and Specific Gravity in seconds. CO2, N2 and Heat Ratio measurements are also available.

Principle of Operation

The measurement principle of the WIM COMPAS™ is based on the measurement of residual oxygen after catalytic combustion of the gas. A small sample flow is mixed continuously with dry air in a constant (fixed) ratio. This ratio depends on the gas composition and is determined on a case-by-case basis. Using an electrically heated catalytic oven the air fuel mixture undergoes complete combustion at a temperature of approximately 800°C. The residual oxygen is measured by a highly accurate and reliable zirconia oxide cell. This residual oxygen content provides an accurate measurement of the Combustion Air Requirement Index (CARI) and correlates well to the Wobbe Index of the gas.

Steel Industry and Biogas. Dirty and wet gases are common in steel and biogas monitoring applications. The WIM COMPAS™ sample handling system is kept at elevated temperature to prevent condensation and the hot section is resistant to significant sulfur levels.

Flare gas and sour gas monitoring. A special version of the WIM measures flare gas in accordance with USA Rule 1118 and is capable of dealing with very high sulfur levels. The method closely follows ASTM-4891 and complies with expected new EPA Flare Emissions 40 CFR regulations.



The WIM COMPAS™ F has a full-color graphical user interface.

Please consult factory for other applications and options including outputs for hydrogen and total sulfur in fuel gas, CO₂ emission from fuel gas and the integrated GC option.



Order Code	WIM Compas™ F
P	No internal pump required for application
LP	Sample pump and fast loop installed in analyser
C	Continuous measurement principle (sample pressure > 1,5 barG)
D	High sulphur version with continuous measurement and dilution system (sample pressure > 1,5 barG)
I	High sulphur version with Injection system suitable for low sample pressures
115	Power supply 115 VAC, 50/60 Hz
230	Power supply 230 VAC, 50/60 Hz
0	No specific gravity meter
SGU	Integrated SG cell for conversion to Heating Value
0	No sample pressure monitoring
SPM	Sample pressure monitoring
OFA	Oven flow alarm
FPM	Oven flow alarm + Sample pressure monitoring
0	Safe area version
1	⊗ II 2G Ex px [ib] IIC T3 Gb version (Zone 1, excluding back-up purge)
2	⊗ II 2G Ex px [ib] IIC T3 Gb version (Zone 1, including back-up purge and freestanding frame)
3	⊗ II 3G Ex px [ib] IIC T3 Gb version (Zone 2) *
3A	⊗ II 3G (Zone 2 IIC T3) Incl. Power- and signal isolation on purge alarm
Z	Class 1, Div. 2, Group B, C, D T3 version
E1	Ex px [ib] IIC T3 Gb version (IEC Ex certified, excluding back-up purge)
E2	Ex px [ib] IIC T3 Gb version (IEC Ex certified, including back-up purge and freestanding frame)
2	2 analog outputs
4	4 analog outputs
0	No serial communication
R	Remote operation via TCP/IP (incl. software for communication)
RM	Modbus and/or remote operation via TCP/IP (incl. software for communication)
RO	Remote operation via optical fiber (incl. software for communication)
RMO	Modbus and/or remote operation via optical fiber (incl. software for communication)
M	Modbus RTU via RS485
MO	Modbus RTU via optical fiber
0	No extra isolated relays added
R	8 off extra isolated relays added (already included in ⊗ II 2G version)
0	No additional fast loop inside the analyser
F	Fast loop installed inside analyser
FA	Fast loop with alarm installed inside analyser
0	Standard ambient temperature range +5 up to +40°C
H	Heated electronics for low ambient temperatures (down to -20°C)
C	Cooling for high ambient temperatures (up to +55°C)
HC	Version for ambient temperature range of -20 up to +55°C
1	No additional frame included
2	Analyser mounted on free standing frame (SS304)

* Please consult Hobre for installation requirements

Note: Not all combinations are possible for all hazardous area classifications. Consult Hobré Instruments B.V.

SPECIFICATIONS CONTINUOUS VERSION

Service	Natural Gas, Fuel Gas, Flare Gas, Biogas, BFG, COG, etc.
Measuring principle	Residual Oxygen Method
Sample wetted parts	SS316, Inconel and Platinum
Installation options	- Safe area
	- Ⓜ II 3G Ex px [ib] IIC T3 Gb
	- Ⓜ II 2G Ex px [ib] IIC T3 Gb
	- Class 1, Div. 2, Group B, C, D T3
	- IECEx Ex px [ib] IIC T3 Gb

Measuring ranges

Wobbe Index	50 MJ/Nm ³ span in 0 – 100 MJ/Nm ³ range
Accuracy	± 0,4% of full scale for natural gas
Repeatability	± 0,05% of full scale or ± 30 kJ/Nm ³ (whichever is higher)
Drift	< ± 0,05% or ± 30 kJ per day (whichever is higher)
Response time	T90 < 5 seconds on natural gas (includes lag time and rise time)
CARI ¹⁾	Span of 15 in 0 – 25 range
Calorific Value (SG cell option)	Span of 50 MJ/Nm ³ in 0 – 120 MJ/Nm ³ range
Response time CV signal	T90 < 5 seconds (typically on natural gas)

Outputs

Local HMI	8,4" full colour display with touchpad (all functions)
Analogue outputs	2 off isolated 0 / 4 – 20 mA (optionally up to 4)
Digital outputs	- 2 off relay SPST for malfunction, calibration status, etc. - 8 off 24 VDC / 1 A or potential free relays (optional)
Digital input	Start calibration, start validation, etc.
Communication options	- Remote control via TCP/IP or optical fiber incl. software for remote operation - MODBUS RTU via RS485, TCP/IP or optical fiber

Utilities

Power supply	115/230 VAC, 50/60 Hz
Power consumption	Depending on configuration (typically 1.000W)
Instrument air	- 15 NI/min at 4 barG minimum, 10 barG maximum - 50 NI/min for Ex purge option ATEX ²⁾ - 80 NI/min for Ex purge option IECEx ²⁾
Sample flow	± 1 NI/min
Sample pressure	Depending on configuration (typically 1,5 to 5 Barg)

Installation

Mounting	Wall mounting
Dimensions (HxWxD)	1000 x 800 x 400 mm (non-Ex version)
Weight	80 – 250 kg, depending on version
Enclosure protection	IP65 design (outdoor installation: protected against direct sunlight and rain)
Ambient temperature range	+5..+40°C (Optional -20..+55°C ³⁾)

SPECIFICATION INJECTION VERSION

Measuring ranges

Heating Value	50 MJ/Nm ³ span in 0 – 120 MJ/Nm ³ (0 – 3000 BTU/SCF) range
Air Demand	0 – 50 range
Wobbe Index (SG cell option)	50 MJ/Nm ³ span in 0 – 100 MJ/Nm ³ (0 – 2500 BTU/SCF) range
Accuracy	± 1% of full scale typical
Repeatability	± 0,5% of full scale or ± 50 kJ/Nm ³ (whichever is higher)
Response time	Typical 30 seconds (depending on injection interval)

Utilities

Instrument air	- 0,5 NI/min at 4 barG minimum - 50 NI/min for Ex purge option ⁴⁾
Sample flow	< 0,5 NI/min
Sample pressure	5 bar maximum ⁴⁾

¹⁾ CARI = Combustion Air Requirement Index

²⁾ Pre-purge: total flush volume 500 litre, pre-purge flow 70 NI/min. (80 NI/min for IECEx)

³⁾ Note: Instrument air temperature should not exceed max. ambient temperature.

⁴⁾ Consult factory for different sample pressures.



Analyser Specifications and Options

- Ⓜ Fast response ($T_{90} < 5$ sec on natural gas)
- Ⓜ High accuracy and repeatability
- Ⓜ Automatic calibration
- Ⓜ Insensitive to ambient temperature fluctuations
- Ⓜ Suitable for outdoor installation
- Ⓜ Effective measuring range 0-100% FS
- Ⓜ Output in MJ/Nm³, kcal/Nm³ and BTU/scf
- Ⓜ Minimal maintenance
- Ⓜ Suitable for corrosive and dirty applications
- Ⓜ Flameless analyser
- Ⓜ Residual oxygen content principle
- Ⓜ Epoxy coated stainless steel enclosure
- Ⓜ Rugged design
- Ⓜ Options available for corrosive gases
- Ⓜ Versions available for installation in hazardous areas
 - DEKRA 11ATEX0277X and
 - IECEx DEK 11.0057X
 - KOSHA
 - CSA Class 1, Div.2
- Ⓜ Optional Zero HC Emission version
- Ⓜ Optional remote control and Modbus over TCP/IP
- Ⓜ Optional MOD BUS RTU (RS485)
- Ⓜ Optional specific gravity output
- Ⓜ Optional high dew point and low pressure version

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Contact

Hobre Instruments BV
Netwerk 4, 1446 WK Purmerend
The Netherlands
Telephone +31 299 420871
Telefax +31 299 423302
info@hobre.com
www.hobre.com

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analytical instruments for the process industry, sampling systems and components

