

On-line Analyzer for Monitoring,  
Controlling and Optimizing Industrial  
Gas Processes

## **WIM COMPAS™ RANGE**

Wobbe Index, Heating Value  
(BTU), CARI of Gaseous Fuels

## Introduction

The WIM COMPAS™ adds to Hobr 's portfolio of process analyzers for measuring Wobbe Index, Heating Value/BTU, Combustion Air Requirement Index (CARI), Air Demand, Specific Gravity and Mol Weight. The Wobbe Index and/or Heating Value are critical parameters used to optimize blending and combustion processes. Designed and manufactured in-house, the WIM COMPAS™ builds on Hobr 's experience with residual oxygen type analyzers. The analyzer is considered a market leader in the oil & gas industry.

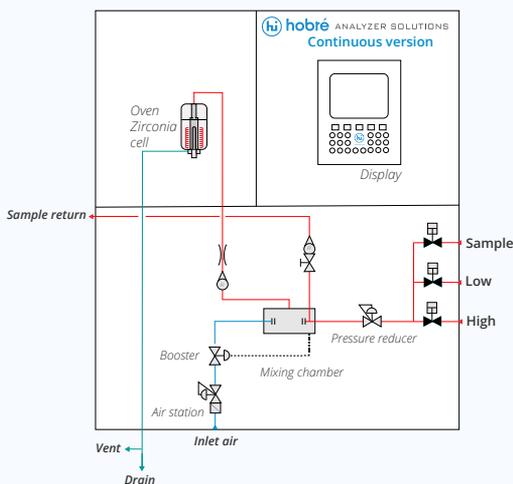
As of 1 January 2018, the WIM COMPAS™ F has been divided in four sub-models. Based on our 30+ years of experience with the WIM COMPAS™ with an installed base of +1000 units, a set of fixed configurations have been defined. The main differentiator is the configuration type, in order to provide our customers a more standardized product with more focus on each specific application field.

## Principle of Operation

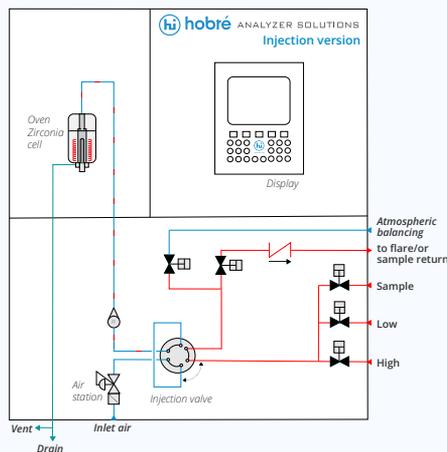
The technology of the WIM COMPAS™ is based on the measurement of the amount of air required for the complete combustion of sample gas. This method is referred to in ASTM D4891-13 and ISO 15971. Depending on the task, Hobr  can offer a continuous (fast-responding) unit or an injection version, which is capable of handling the most challenging applications.

**The continuous measurement principle** is designed for maximum performance in terms of response time and repeatability.

A small sample flow is mixed continuously with dry air over critical orifices. The air-fuel mixture is combusted in a catalytic oven and the residual oxygen is measured using a reliable, highly accurate zirconia cell. The residual oxygen is a direct measure for the CARI and correlates well to the Wobbe Index.



Infographic 1. Continuous configuration



Infographic 2. Injection configuration

**The injection measurement principle** offers a robust solution to the measurement of even the most challenging gas samples, such as sour gas and flare gas.

The measurement is based on the injection of very small amounts of gas samples at low pressure in a constant instrument air flow. The amount of oxygen required for the combustion correlates directly to the Heating Value of the sample.



## The WIM COMPAS™ Range

### WIM COMPAS™ Xpress

The WIM COMPAS™ Xpress analyzer was introduced specifically for Natural gas/LNG applications.

The Xpress operates according to the **continuous measurement principle**, and is configured for one-point calibration. The analyzer is designed for maximum performance in terms of response time, repeatability and availability. It measures Wobbe index and CARI as a standard. Optionally a Specific Gravity cell can be included for additional outputs such as Heating Value, Air Demand, Mol Weight and Specific Gravity. The analyzer is suitable for installation in Safe area, ATEX zone 1, IECEx or Class 1 Div 2.

The Xpress analyzer is configured for Zero hydro-

carbon emission as a standard, as venting of hydrocarbons into atmosphere is undesired as well as unwanted due to stricter emission regulation.

#### Typical applications:

- Natural gas and LNG blending control
- Natural gas furnace / burner control
- Gas turbine control

### WIM COMPAS™ Flex

Hobré introduced the WIM COMPAS™ Flex analyzer. The improved Flex is applicable to the widest range of applications and has the most selectable options. It has the same **continuous measurement principle** as the Xpress, but offers more flexibility to your requirements such as Hazardous areas and Communication.

Please note the Flex analyzer is configured for Zero hydrocarbon emission as a standard. The Flex is configured for two-point calibration, making it suitable for a very wide range of applications.

#### Typical applications:

- Natural gas and LNG blending control
- (Refinery) fuel gas analysis
- CO<sub>2</sub>, SO<sub>2</sub> emission reporting
- Storage and transshipment
- Internal invoicing
- Biogas analysis
- Syngas analysis
- Gas turbine control
- Power to gas

## Benefits

- Fast response (T90 <5 seconds on natural gas)
- High accuracy and repeatability
- Automatic/manual calibration
- Insensitive to ambient temperature fluctuations (no need for HVAC)
- Suitable for outdoor installation in ambient temperatures of 5–40°C / 41–104°F (optional down to -20°C / -4°F and/or up to 55°C / 131°F)
- Effective measuring range of 0–100% FS.
- Output in MJ/Nm<sup>3</sup>, kcal/Nm<sup>3</sup> and BTU/scf (mass-based values available with integrated specific gravity cell)
- Minimal and easy maintenance
- Suitable for corrosive and dirty applications
- Flameless (no flame-out errors)
- Epoxy coated stainless steel (NEMA4, IP65)



## WIM COMPAS™ Pulse

The WIM COMPAS™ Pulse operates according to the **injection measurement principle**. This model offers a robust solution for difficult applications such as sour gas and flare gas.

The measurement is based on the injection of small amounts of gas at low pressure in an instrument air flow. By reducing the amount of gas, and therefore reduction of contamination, the availability of the analyzer is increased. In addition, the Pulse has a new and improved injection valve. This results in an update time of 30 seconds combined with less maintenance.

The Pulse can be configured for various hazardous areas and with a wide range of communication options. It measures Heating Value and Air Demand (Stoichiometric Air/Fuel

ratio) as a standard. Optionally a Specific Gravity cell can be included for additional outputs such as Wobbe Index, CARI, Mol Weight and Specific Gravity. The Pulse has Zero hydrocarbon emission operation per default. The WIM COMPAS™ Pulse is suitable for a wide range of applications.

### Typical applications:

- Flare gas
- Corrosive (refinery) fuel gas
- Blast furnace and Coke oven gas
- Basic oxygen furnace gas
- Sour gas



Image 1. WIM COMPAS™ Pulse - inside

## WIM COMPAS™ Pulse HT

The WIM COMPAS™ Pulse HT (High Temperature) was designed for the most difficult applications with dew points up to 150°C (300°F). This typically includes (saturated) gas compositions that include water, high percent levels Sulfur and/or contaminants. The Pulse HT has Zero hydrocarbon emission operation per default and operates according to the **injection measurement principle**.

The Pulse HT can also be equipped with an integrated device for Hydrogen measurement (FEH2). This option was designed for high-

temperature hydrogen flares. Please refer to the application section for further information.

### Typical applications:

- Flare gas
- Corrosive (refinery) fuel gas
- Blast furnace and Coke oven gas
- Basic oxygen furnace gas
- Sour gas



Image 2. WIM COMPAS™ Pulse High Temperature



## All Applications

- Flare gas analysis
- Fuel gas analysis
- Natural gas and LNG blending control
- Blast furnace and Coke gas blending
- Feed forward fired heater control
- Mixed gas analysis
- CO<sub>2</sub>, SO<sub>2</sub> emission reporting
- Storage
- Internal invoicing
- Biogas analysis
- Syngas analysis
- Gas turbine control
- Power to Gas
- Sour Gas

## Hydrogen measurement

The WIM COMPAS™ for flare gas analysis and recovery is the preferred technology at supermajor refineries because of its proven track record in challenging applications. The analyzer can handle applications with high H<sub>2</sub> fluctuations (0-100 mol%) and non-combustibles such as N<sub>2</sub>, CO<sub>2</sub>. By using the High Temperature (HT) version the WIM COMPAS™ can be kept above dew point of the gas (max. 150°C/300°F)

Optionally the WIM COMPAS™ can directly measure the H<sub>2</sub> concentration of flare gas, in accordance with 40 CFR 63.670 section J. The integrated H<sub>2</sub> measurement, FEH<sub>2</sub> (Frontal Elution Hydrogen Measurement), enables the operator to use the so called "H<sub>2</sub> credit" to increase the BTU of the flare vent gas directly. This will improve compliance even more and allow customers to save on assist gas.

## CO<sub>2</sub> / SO<sub>2</sub> Emission reporting

With worldwide increasing focus on emission control, companies are placing a higher importance on monitoring flue gases coming from their processes before being released into the atmosphere. Regulations are captured in directives such as EU-ETS and US-EPA.

Hobré combines Wobbe Index/Heating Value/BTU measurement with CO<sub>2</sub> or SO<sub>2</sub> emission monitoring by coupling the WIM COMPAS™ with a Stand-alone analyzer. This also enables the use of a single sample take-off and sample handling system.

## Gas Stabilization System

The WIM COMPAS™ Gas Stabilization System creates a constant furnace atmosphere by stabilizing the Wobbe Index of fuel gas, using compressed air or another auxiliary gas.

The system continuously monitors the mixing ratio of incoming natural gas and injected air. The ratio itself is controlled by the WIM COMPAS™ analyzer. In this way the integrated WIM COMPAS™ Wobbe Index analyzer ensures a very constant gas quality and rapid variations in gas demand can be dealt with safely. Typical application fields are steel and glass manufacturing.

## WIM COMPAS™ Customized Solutions

Finally Hobré can also offer the WIM COMPAS™ analyzer with:

- 3-sided shelter
- Fully enclosed cabinet
- Sample probe / Hobré Flow Impact probe
- Pressure reduction system
- Sample conditioning system
- Gas bottle facilities
- Heat traced tubing
- Stream switching cabinet
- Compact GC (component measuring)
- Other customer specific solutions (Turn-key)

## Operation, service and maintenance

### Operation, service and maintenance

Protected against sun and rain, this robust analyzer is suitable for outdoor installation in a harsh industrial environment. The periodically required calibration can be performed manually or automatically on a timed interval. Generally, the calibration gases last many years. The analyzer only has a few parts that require regular servicing, and it is designed for safe and easy maintenance.

## Certificates

Type approvals are available for installation of the WIM COMPAS™ in the following hazardous areas:

- ATEX II 2G (Zone 1 IIC T3/T4)
- ATEX II 3G (Zone 2 IIC T3/T4)
- IECEx II 2G (Zone 1 IIC T3/T4)
- Class 1, Division 2, Group B,C,D (Zone 2 compliant)
- KCS (Zone 1 IIC T3/T4)
- TRCU/EAC (Zone 1 IIC T3/T4)

## Product code

		Xpress <sup>5)</sup>	Flex	Pulse	Pulse HT
WIM COMPAS™		√	√	√	√
P	Standard	√	√	√	√
C	Continuous measurement version (1.5 - 5 barg / 21.3 - 72.5 psig)	√	√	-	-
I <sup>1)</sup>	Injection version (-0.3 - 1.0 barg / - 4.4 - 14.5 psig)	-	-	√	√
115	Power supply 115 VAC, 50/60 Hz	√	√	√	√
230	Power supply 230 VAC, 50/60 Hz - N/A for Class 1 Div 2	√	√	√	√
0	No specific gravity meter	√	√	√	√
SGU	Hobré specific gravity meter up to 55°C / 130°F	√	√	-	-
SGC	Oscillation type specific gravity meter up to 80°C / 176°F	√	√	√	√
SGC HT	Oscillation type specific gravity meter (High Temperature)	-	-	-	√
0	No sample pressure monitoring / flow alarm	√	√	√	√
SPM <sup>2)</sup>	Sample pressure monitoring	-	√	√	√
OFA <sup>3)</sup>	Oven Flow alarm	-	√	√	-
FPM <sup>2,3)</sup>	Oven flow alarm and Sample pressure monitoring	-	√	√	-
0	Safe area version (non-hazardous)	√	√	√	√
1	ATEX II 2G Ex Zone 1 IIC T3/T4 Gb (incl. Power/Signal isolation, excl. Backup purge)	√	√	√	√
3	ATEX II 3G Ex Zone 2 IIC T3/T4 Gb (incl. Power/Signal isolation, excl. Backup purge)	-	√	√	√
Z	CSA Class 1, Div. 2, Group B, C, D T3 version	√	√	√	√
E1	IEC Ex px [ib] IIC T3/T4 Gb (incl. Power/Signal isolation, excl. Backup purge)	√	√	√	√
K	KCS Ex px [ib] IIC T3/T4 Gb (incl. Power/Signal isolation, excl. Backup purge)	-	√	√	√
T	TRCU/EAC Ex px [ib] IIC T3/T4 Gb (incl. Power/Signal isolation, excl. Backup purge)	-	√	√	√
2	2 analog outputs	-	√	√	√
4	4 analog outputs	√	√	√	√
0	No serial communication / remote operation	-	√	√	√
R	Remote operation / Modbus TCP/IP over Ethernet	-	√	√	√
RO	Remote operation / Modbus TCP/IP over Optical fiber	-	√	√	√
M	Modbus RTU over RS485	-	√	√	√
MO	Modbus RTU over RS485	-	√	√	√
RM	Remote operation / Modbus TCP/IP over Ethernet and Modbus RTU over RS485	√	√	√	√
RMO	Remote operation / Modbus TCP/IP and Modbus RTU over Optical fiber	-	√	√	√
0	No extra isolated relays (standard 2 off isolated relays)	√	√	√	√
R	8 off isolated relays	-	√	√	√
0	No fastloop inside the analyzer	√	√	√	√
F	Fastloop installed inside analyzer	√	√	√	√
FA <sup>3)</sup>	Fastloop with alarm installed inside analyzer	-	√	√	-
0	Standard ambient temperature range (5 - 40°C / 41 - 104°F)	√	√	√	√
H	Heated electronics for low ambient temperature (down to -20°C / -4°F)	√	√	√	√
C	Cooler for high ambient temperature (up to 55°C / 130°F)	√	√	√	√
HC	Version for extended ambient temperature range (-20 - 55°C / -4 - 130°F)	√	√	√	√
1	Analyzer suitable for wall mounting	√	√	√	√
HT	High Temperature version (max. 150°C / 300°F)	-	-	-	√
ZE <sup>4)</sup>	Zero HC Emission	√	√	-	-
FEH2	Hydrogen measurement (frontal elution H <sub>2</sub> )	-	-	-	√

<sup>1)</sup>Consult Hobré if the pressure is <0,5 barg for proven solution.

<sup>2)</sup>The SPM option is mandatory in case of the Injection version in combination with a Specific Gravity meter. The FPM option can be included alternatively.

<sup>3)</sup>The standard flow alarm cannot be used in the High Temperature application.

Please consult Hobré if required.

<sup>4)</sup>The Injection version is suitable for Zero HC emission operation by design.

<sup>5)</sup>The Xpress model is suitable for Natural gas / LNG application only (based on 1-point calibration).

## Technical Specifications

Application	Natural Gas, Fuel Gas, Flare Gas, Biogas, BFG, COG, LNG, etc.
Measuring principle	Residual Oxygen technology
Sample wetted parts	SS316, Inconel and Platinum
Installation options	- Safe area
	- ATEX II 2G/3G Ex px [ib] IIC T3/T4 Gb (Zone 1 / 2)
	- Class 1, Div. 2, Group B, C, D T3 (Zone 2 compliant)
	- IECEx Ex px [ib] IIC T3/T4 Gb
	- KCS Ex px [ib] IIC T3/T4 Gb
	- TRCU Ex px [ib] IIC T3/T4 Gb, EAC

### MEASURING RANGES (CONTINUOUS VERSION)

Wobbe Index	0 – 100 MJ/Nm <sup>3</sup> / 0 - 2500 BTU/scf range (50 MJ/Nm <sup>3</sup> / 1250 BTU/scf span) <sup>1)</sup>
Accuracy	< ± 0,4% of full scale for Natural Gas
Repeatability	< ± 0,05% of full scale or ± 30 kJ/Nm <sup>3</sup> (whichever is higher) <sup>1)</sup>
Response time	T90 < 5 seconds on Natural Gas
CARI <sup>2)</sup>	0 – 25 range
Calorific Value (SG cell option)	0 – 120 MJ/Nm <sup>3</sup> / 0 - 3000 BTU/scf range (50 MJ/Nm <sup>3</sup> / 1250 BTU/scf span) <sup>1)</sup>
Response time CV signal	T90 < 5 seconds (typically on Natural Gas)

### MEASURING RANGES (INJECTION VERSION)

Calorific value	0 – 120 MJ/Nm <sup>3</sup> / 0 - 3000 BTU/scf range (50 MJ/Nm <sup>3</sup> / 1250 BTU/scf span) <sup>1)</sup>
Accuracy	± 1,0% of full scale
Repeatability	± 0,5% of full scale or ± 300 kJ/Nm <sup>3</sup> (whichever is higher)
Update time	Default ~30 seconds (injection interval)
Air Demand	0 – 50 range
Wobbe Index (SG cell option)	0 – 100 MJ/Nm <sup>3</sup> / 0 - 2500 BTU/scf range (50 MJ/Nm <sup>3</sup> / 1250 BTU/scf span) <sup>1)</sup>
Update time WI Signal	Default ~30 seconds (Injection interval)

### OUTPUTS (CONTINUOUS/INJECTION)

Local HMI	Full color display with capacitive touchpad (all functions)
Analogue outputs	2 off isolated 0 / 4 – 20 mA (optionally up to 4), max. 500 Ω load (active)
Digital outputs	- 2 isolated relays (250 VAC) and 8 transistor outputs (24 VDC) standard available - Additional isolated relays, total of 8 (250 VAC)
Digital inputs	8 digital inputs (e.g. start calibration, start validation, etc.)
Communication options	- Remote operation / Modbus TCP/IP over Ethernet or Optical fiber - Modbus RTU over RS485 or Optical fiber

UTILITIES	Continuous version	Injection version
Instrument air <sup>3)</sup>	15 NI/min	0,2 NI/min
	50 NI/min for Ex purge option ATEX / IECEx / KCS / TR CU <sup>4)</sup>	50 NI/min for Ex purge option ATEX / IECEx / KCS / TR CU <sup>4)</sup>
Sample flow	± 1 NI/min	± 0.5 NI/min
Sample pressure	Depending on configuration (typically 1,5 to 5 barg / 21,8 to 72,5 psig)	Depending on configuration (typically -0.3 to 1.0 barg / -4,4 to 14,5 psig) <sup>5)</sup>
Power supply	115/230 VAC, 50/60 Hz	
Power consumption	Depending on configuration (typically 1000 W, max. 2000 W)	

### INSTALLATION (CONTINUOUS/INJECTION)

Mounting	Wall mounting
Dimensions (HxWxD)	1000 x 950 x 450 mm (non-Ex version), 1200 x 900 x 450 mm (HT version)
Weight	80 kg (non - Ex version), 120 kg (HT version)
Enclosure protection	Epoxy coated stainless steel (NEMA4, IP65)
Ambient temperature range	5°C - 40°C / 41°F - 104°F (optional down to -20°C / -4°F and/or up to 55°C / 131°F)

<sup>1)</sup> Also available in Kcal/Nm<sup>3</sup>, kWh/Nm<sup>3</sup> etc.

<sup>2)</sup> CARI= Combustion Air Requirement Index

<sup>3)</sup> At 4 barg minimum, 10 barg maximum, dry and clean

<sup>4)</sup> Pre-purge flow ATEX / IECEx / KCS / TR CU: 70 NI/min. / Class 1 div 2: 1. scfm.

<sup>5)</sup> Consult factory for different sample pressures

<sup>6)</sup> Note: Instrument air temperature should not exceed max. ambient temperature



## HOBRE INSTRUMENTS

SINCE 1978 HOBRE IS A WORLDWIDE MARKET LEADER IN THE DESIGN, MANUFACTURING AND MAINTENANCE OF ONLINE ANALYZERS AND SAMPLING SOLUTIONS. HOBRE SERVES THE OIL, GAS, DAIRY, METAL MINING & REFINING, ENERGY, RENEWABLES, STEEL AND GLASS INDUSTRY. ENSURING OUR CUSTOMERS OPTIMAL EFFICIENCY, WHILE CONTRIBUTING TO ENVIRONMENTAL PROTECTION.



## HOBRE SERVICES

- FEASIBILITY STUDY & ENGINEERING
- COMMISSIONING, SAT AND START-UP
- TRAINING
- PREVENTATIVE AND CORRECTIVE FIELD SERVICES
- IN-HOUSE MAINTENANCE AND REPAIR
- SPARE PARTS AND SUPPLY
- REMOTE SUPPORT



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