

WI/CV Multiparameter Gas Analyzer System SG12WMTA-Series

The Process & Fuel Gas Analysis

In all industry combustion process where combustible gas are used there is a particular attention for Solutions to improve plant performance keeping quality in the production & reducing the production cost.

Any combustion requires a well defined combustion air/fuel feed ratio. Usually the control of this ratio is made through analysis of the combustion but it's also true that is not enough since is necessary to monitor also the fuel characteristics to maintain unchanged the ideal conditions of the combustion when these characteristics change.



The instability of the fuel gas (composition) is the reason of the disturbance in the combustion process since it modify the heat output and the composition of the combustion.

Measuring "the energy" in real time of the fuel gas it is possible to get **advantages & benefit:**

- reduction of energy consumption (fuel gas and electricity)
- precise measurement of the energy value
- reduction environmental emissions

The return of the investment with fast and accurate fuel gas analysis means save cost for the user. The result of the measurement are used in the process getting production optimization and maximum profitability.

Knowing the energy proprieties of the fuel gas (means CV & WI values) means knowing how much of the fuel gas is real necessary for the process. The results are money savings since gas consumption is optimized.

The SG12WMTA-Series consist of a Multiparameter Gas Analyzer that measure directly in real time the most important proprieties to monitor the gas energy: Wobbe Index (WI), Calorific Vale (CV), Specific Gravity (SG) and Combustion air Requirement Index (CARI).

Application

The System have been engineered to meet of challenging industry applications since the high speed response is usually preferred in control application.

NATURAL GAS PROCESSING
BIOGAS PROCESSING
ENERGY PRODUCTION INDUSTRY
FISCAL MEASUREMENT (PTB)
GLASS INDUSTRY

IRON & STEEL PLANT
BLAST FURNACE
LIME & CEMENTS INDUSTRY
COPPER PLANT
PETROCHEMICAL



Specification ... Ask **BAGGI**[®] measurement for your application, please contact info@baggi.com

Application Note

Application Note.01 – PETROCHEMICAL INDUSTRY

Some Petrochemical Industries often need to measure flare gases with many unknown gas components and need to meet the uptime requirements of tough environmental regulations. The SG12WMTA-Series responds to all unknown components in the process gas and reports them as heating value or Wobbe index.

Using recovery gas (means unknown and instable gas composition), the analysis of the combustion is not sufficient to monitor the process and it is necessary to know also the fuel gas characteristics to maintain unchanged the conditions in the combustion.

Application Note.02 – IRON & STEEL INDUSTRY

In application where the coke oven gas and blast furnace gas are utilized in various combustion processes (means unknown and instable gas composition) the SG12WMTA-Series works analyzing the gas property with accuracy and repeatability in continue also in presence of dust, water, naphthalene, tar.

Application Note.03 – FISCAL MEASUREMENT

The reliability and accuracy of the SG12WMTA-Series found application also for Fiscal measurement where is necessary calculate and record the quality of the fuel gas used. For the user is important to be secure of the energy of the fuel gas used to regulate and control the process. Using the right quantity of gas means getting furnace or turbine efficiency and saving money.

Application Note.04 – NATURAL GAS

The Natural Gas is the most popular fuel gas used and is important consider that it is a naturally occurring gas mixture, consisting mainly of methane.

The composition of the Natural Gas could change with the Supplier and or with the Sources since while the gas has a similar analysis, it is not entirely the same.

(Example: in Canada there are some sources for Natural Gas Supplier as western Canada, the United States and Ontario producers; in Europe could be found Middle East, Russia, ...).

Usually, the typical components & ranges that could be found for the natural gas are shown in the below table (allowing for the different sources).

There is no guarantee of the Natural Gas composition at user location or as an overall system average. Since for own local Gas Distributor (as Eni, Edison ...) the different gas supplies enter from different locations, the exact composition at any site will vary among the different regions. With the SG12WMTA-Series is it possible to monitor the Energy of the gas independent from gas composition.

Component	Typical Analysis (mole %)	Range (mole %)
Methane	95.2	87.0 - 96.0
Ethane	2.5	1.5 - 5.1
Propane	0.2	0.1 - 1.5
iso - Butane	0.03	0.01 - 0.3
normal - Butane	0.03	0.01 - 0.3
iso - Pentane	0.01	trace - 0.14
normal - Pentane	0.01	trace - 0.04
Hexanes plus	0.01	trace - 0.06
Nitrogen	1.3	0.7 - 5.6
Carbon Dioxide	0.7	0.1 - 1.0
Oxygen	0.02	0.01 - 0.1
Hydrogen	trace	trace - 0.02
Specific Gravity	0.58	0.57 - 0.62

Resource: UnionGas - Web

Measurement Principle

The SG12WMTA-Series used a thermal combustion analyzer (usually called Comburimeter / Calorimeter / Wobbemeter) that burn a small sample of gas and measure the temperature rise of a fluid (usually air) through the system and report this as heat release.

The goal of the System has been to improve response speed of these online units keeping the sample gas clean and dry from process impurities. Over the years, technical progress and the embodiment of smart design strategies have improved response times from around 5 minutes for the old mechanical water bath based units down to just a few seconds for the newly introduced SG12WMTA-Series.

The SG12WMTA-Series is a high-speed multiparameter thermal gas analyzer available in different design getting a configuration compatible with the customer technical requirement.

Basically the System is composed by a small industrial PC and large digital display, mounted with the combustion chamber, thermopile and other vital components in a custom enclosure.

The measurement of process gases by the SG12WMTA-Series is based on a thermopile principle that has been proven over many years in every type of industry.

A small amount of process gas is measured continuously and the temperature rise from heat of combustion is transferred from the burner to the thermopile, via the cooling air supply and is measured by its thermopile sensor as heat rise.

Measurement is based on the real time Wobbe Index and Specific Gravity values of the gas (a specific gravity sensor is built into the analyzer). The PC based microprocessor calculates Calorific Value (using the following formula $CV = \text{Wobbe Index} \cdot \sqrt{\text{Specific Gravity}}$) and Combustion air Requirement Index (CARI).

Most of the SG12WMTA-Series units are supplied to customers that need to measure the Calorific Value of their process gas and simultaneous outputs are available for both upper and lower Calorific Values as well as Wobbe index, Specific Gravity and CARI Index.

Advantages of the SG12WMTA-Series

- **high speed response time**
- **the Wobbe Index measurement is direct**
- **high accuracy**
- **measure independent by gas composition**
- **measure also with dirty and instable gas**
- **high rangeability**
- **low maintenance requirement**
- **rugged durability**
- **friendly & safety installation**
- **easy to maintain online**
- **easy and quickly installation and maintenance without needing any special tools**
- **custom design to cover different environmental conditions**

SG12WMTA-Series Design

The SG12WMTA-Series has been developed different design to meet the requirement from field, user and engineering. The System guarantee the benefit of the Thermal Technology also for application where process gas conditions (as low pressure, dirty, condense, naphthalene, tar, dust) ambient conditions (temperature, wind, rain, snow, sand) and safety requirement are critical.

A complete self diagnostic software program with automatic calibration is provided with time based process trend logging and an event recorder. The measured values are either displayed on the LCD and remotely transmitted by 4..20 mA analogue lines.

The thermal principle offer very high rangeability (40-100% typical and 10-100% as option) and the best performance also with has mixed where the composition is not stable and change during the process



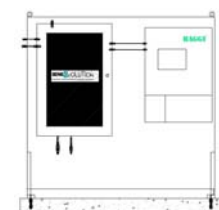
SG12WMTAU – Unit Basic Design Example



SG12WMTAP – plate design for wall assembly / indoor installation

The System is composed by two separate units for wall mounting that include the analyzer (WI, CV, SG), digital display and keypad, pressure reducer and manometer (0-100mbar) for process gas and calibration gas, cover insulation for exhaust gas, electrical panel (power distribution and outputs).

All components are pre-mounted and tested in factory. The connection between the two units has to be made on site. All components in contact with gas are in stainless steel series, teflon, zinc and neoprene.



SG12WMTAP – Plate Design Example



SG12WMTAK – skid design for standalone positioning / indoor installation

The System is composed by one unit for standalone installation and include the analyzer (WI, CV, SG), digital display and keypad, pressure reducer and manometer (0-100mbar) for process gas and calibration gas, cover insulation for exhaust gas, electrical panel (power distribution and outputs).

All components are pre-mounted and tested in factory. All components in contact with gas are in stainless steel series, teflon, zinc and neoprene.



SG12WMTAK – Skid Design Example



SG12WMTAC – cabinet design for indoor installation

The System is composed by one unit for standalone installation and include the cabinet, internal light, analyzer (WI, CV, SG), digital display and keypad, pressure reducer and manometer (0-100mbar) for process gas and calibration gas, cover insulation for exhaust gas, gas detector (LEL) for cabinet monitoring, electrical panel (power distribution and outputs), air conditioner and water filtration.

All components are pre-mounted and tested in factory. All components in contact with gas are in stainless steel series, teflon, zinc and neoprene.



SG12WMTAC Cabinet Example



SG12WMTAS – shelter design for outdoor installation

The System is composed by one unit for standalone installation and include the shelter for outdoor positioning, internal light, analyzer (WI, CV, SG), digital display and keypad, pressure reducer and manometer (0-100mbar) for process gas and calibration gas, cover insulation for exhaust gas, gas detector (LEL) for shelter monitoring, electrical panel (power distribution and outputs), power junction box, air conditioner and water filtration.

All components are pre-mounted and tested in factory. All components in contact with gas are in stainless steel series, teflon, zinc and neoprene.



SG12WMTAS Shelter - Example

The final design of the SG12WMTA-Series could be customized to satisfy the specific requirement saving cost during the on-site installation and maintenance.

Safety accessories are available to monitor the System Operation and the Ambient Conditions. All signals could be control by the System with own plc for an automatic self-test operation.

Accessories/Options

- 1000-ACC-Air Conditioner
- 1001-ACC-Gas Detector (internal and/or external) ATEX-IIC (depends by design)
- 1002-ACC-Water Filter (single)
- 1003-ACC-Water Filter (double)
- 1004-ACC-Tar, naphthalene filter
- 1005-ACC-Dust Filter (single)
- 1006-ACC-Dust Filter (double)
- 1007-ACC-dp alarm Filter (water filter) ATEX-IIC
- 1008-ACC-dp alarm Filter (dust filter) ATEX-IIC
- 1009-ACC-gas purge line with manual ball valve
- 1010-ACC-gas purge line with EVP-3way electrovalve ATEX-IIC
- 1011-ACC-plc for cabinet management
- 1012-ACC-Loop for fast response time
- 1013-ACC-Pump Inox 65lpm ATEX-IIC
- 1014-ACC-Heater Line + Thermostat (internal) ATEX-IIC
- 1015-ACC-Heater Line + Thermostat (external) ATEX-IIC
- 1016-ACC-EVI-2way electrovalve ATEX-IIC
- 1017-ACC-Sample probe
- 1018-ACC-Calibration bottle + regulator + certificate
- 1019-ACC-Exhaust external stainless steel pipe kit
- 1093-ACC-Cari index
- 1094-ACC-Additional analog outputs (nr.7 total)
- 1095-ACC-PLUS design for fiscal measurement
- 1096-ACC-CT design with PTB certification
- 1097-ACC-Power junction box (Exd)
- 1098-ACC-Pump Inox 65lpm (safety)
- 1099-ACC-Pump Inox 115lpm ATEX-IIC
- 1100-ACC-Pump Inox 115lpm (safety)
- 1101-ACC-Documentation (nr.1 book quality/vendor + nr.1 cd-rom pdf)
- 1102-ACC-PMI (positive material identification – material crt)
- 1103-ACC-FAT Factory acceptance Test in Baggi Site
- 1104-ACC-SAT commissioning on site
- 1105-ACC-Double Range (for higher rangeability and/or very low range)
- 1106-ACC-Carrier Gas (for very low range)
- 1107-ACC-Atex Study (evaluation of the risk that the System introduce in the place of the installation)
- 1108-ACC-Packing (for system, wood case for sea export)
- 1109-ACC-Packing (for bottle, wood case ISPM15 /ADR conformity)



1001-ACC – Gas Detector
1095-ACC – Power Junction Box



1013-ACC – Pump



1017-ACC – Sample Probe



1019-ACC – Exhaust external pipe kit



SG12WMTAS
Shelter - Example



1018-ACC – Calibration Kit

Specification of SG12WMTA-Series

- Fluid:** natural gas, coke oven gas, blast furnace gas, mixture gas, ...
- Impurities:** 50mg/nm³ or less (dust, tar and naphthalene)
5% water (or less)
- Range:** WI/CV (min) = 3000 ...6000 KJ/Nm³ 720 ...1435 Kcal/Nm³ 75 ... 150 btu/ft³
less than 3000 KJ/Nm³ only with carrier gas
WI/CV (max) = 60000 ...130000 KJ/Nm³ 14350 ...31050 Kcal/Nm³ 1503 ...3251 btu/ft³
Density = 0.2 to 2.2
- Pressure:** at the inlet of the System ≥ 400 to 600mbar
If the operative pressure is less than 400 mbar, a pump is necessary; also the pressure drop of the sample probe and the sample line have to be considered.
Design pressure 700mbar (Tested at 1.050bar)
For higher pressure contact B.A.G.G.I.Srl
- Temperature:** +40 to +110°C (other available on request)
- Units:** pressure = mbar (other available on request)
WI/CV = kcal/nm³, KJ/nm³, btu/ft³ (other available on request)
- Connection:** 12mm tube (compression fitting) for process (and purge if ordered)
6mm tube (compression fitting) for calibration gas bottle
6mm tube (compression fitting) for vent connection
- Response Time:** 20s to 90s at 90% 45s to 115s at 99% (at the inlet of the thermal cell; depends by accessories used)
- Power Supply:** 1 x 220VAC (or 110VAC on request)
- Analog Outputs:** 3 x 4-20mA linear (available up to 7 x 4-20mA on request)
- Digital Outputs:** 4 x programmable relay contacts (available up to 16 on request; depends by accessories used)
- Dimensions:** depends by design – contact BAGGI for additional information or details
- Materials:** stainless steel 316ss, zinc, teflon, nbr ...
- Ambient:** depends by design – contact BAGGI for additional information or details
Typical Temperature = Min 5°C Max 40°C ($\pm 1^\circ\text{C}$ change per hour)
Atmosphere free from dust
- Utilities:** calibration gas bottle (with gas composition certificate) and own pressure regulator (output < 1bar)
If some accessories are used: water (3 litres), nitrogen (0.4/0.5 bar)

Notes: The Multiparameter Analyzer System SG12MTA-Series requires a periodical maintenance that has to be performed by a local operator in fast and easy way. During the maintenance the process gas is stopped by internal ball valve and the analyzer will be unable to measure the gas sending "zero" to remote control unit. The System requires an ambient with stable temperature (typical installation in a room (+/- 1°C per hour) and approximately 30 m³/h of change-air. This air must be picked from outside the ambient (room) from safety area using suitable ventilation via heater/conditioner or a roundabout route (the inside ambient temperature has to be maintained stable with slow temperature variations).
Safety accessories recommended: Gas LEL/CO detector for the room where will be installed the system (up/down depends by gas composition) and Atex electrovalves in process and calibration pipe line.

Service

BAGGI Service is available for **SAT & Commissioning** in every part of the world for:

- start-up
- training
- maintenance



Commissioning in China (Skid Design)



Maintenance in Italy (Shelter Design)



Maintenance in Italy (Shelter Design)

Specification ... Ask **BAGGI**[®] measurement for your application, please contact info@baggi.com