

GAS 3100R Syngas Analyser



Typical applications

Biomass, wastes and coal gasification & pyrolysis processes
 Coal chemical process
 Blast furnace, Converter, Coking,
 Direct Iron Smelting reduction process, ...

Key features

The world unique NDIR analyser to perform simultaneously and in real time the measurement of the 6 typical compounds of the syngas + the calculation of the Gas Heating Value (GHV) and the N₂ content.

No need of carrier gas/ combustion air
 Different NDIR detectors for CH₄ and C_nH_m
 Fast, accurate and reliable syngas measures

Syngas measurement

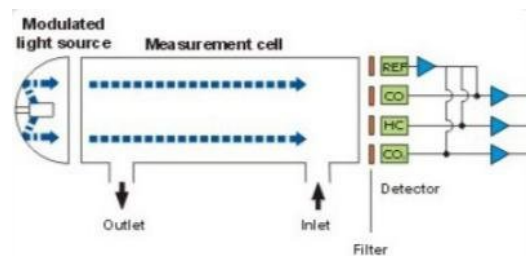
Syngas is cleaned before analysis into a specific gas pre-treatment unit for the removal of tars. After this pre-treatment the syngas is at Tamb (± 20°C).

Only a few hydrocarbons (C₁ to C₄) are in gaseous state at 20°C. Our gas analyser has a special C_nH_m NDIR detector for the measurement of a gas mixture made of C₂H₆, C₃H₈ and C₄ H₁₀. This detector has no response to CH₄ and C₂H₄ and interferences from C₂H₂ are compensated by an exclusive software.

Calculated of Gas Heating (calorific) Value

The measurement of C_nH_m in the clean and dry syngas (even if present in low concentrations) is important for the calculation of the GHV value as C_nH_m respectively weight 5.5x more than CO and H₂ and 1.77x more than the CH₄.

NDIR dual beam NDIR technology



Standard configurations

GAS 3160R CO + CO₂ + CH₄ + C_nH_m⁽¹⁾ + H₂ + O₂

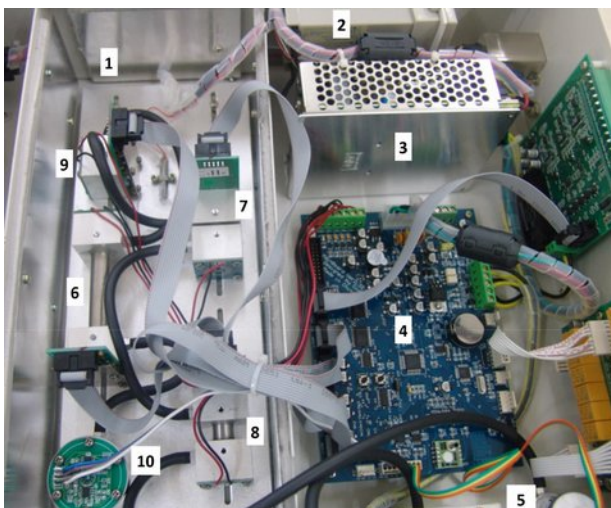
GAS 3150R CO + CO₂ + CH₄ + C_nH_m + H₂ **GAS**

3140R CO + CO₂ + CH₄ + H₂

Many other configurations also available

Calculations Gas heating value (BTU) + N₂%

(1) Can be replaced by a specific NDIR detector for C₂H₄ measurement.



Internal view GAS 3160R

1. Heated enclosure (50°C)
2. Temperature controller
3. Power supply
4. Mainboard
5. Oxygen sensor
- 6,7,8,9. 4x NDIR detectors
10. TCD detector for H₂

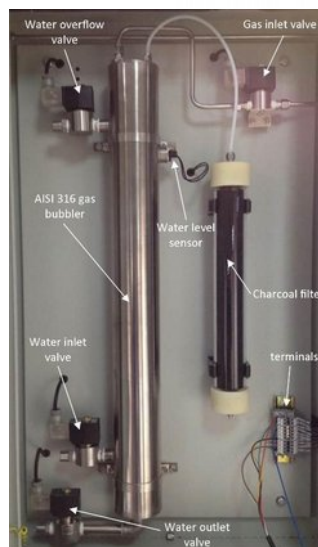


System integration

Pollutek gas analysis offers full solutions for syngas & coal gas analysis applications:

- II Gas extraction from process duct
- II Gas pre-treatment units for tar removal
- II Gas analysis cabinet (H1600 x W700 x D600 mm)

including gas sampling, conditioning, control & safety components, S7-1200 PLC for system operation and communication with client's DCS systems and the syngas analyser.



Automatic syngas washing unit

H 1600 x 700 x 600 mm Syngas analysis cabinet

Please contact us for discussing your syngas analysis projects

Technical specifications

Measuring principles

CO, CO₂, CH₄, C_nH_m : Non dispersive dual beam infrared detectors (NDIR)

H₂ : Thermal conductivity detector (TCD)

O₂ : Industrial galvanic fuel cell (ECD)

Remarks for the measurement of H₂ in syngas

1. The interferences generated by CH₄ (up to 80%vol) and CO₂ on the TCD H₂ detector are compensated in real time by the software of the gas analyser.
2. CH₄ concentrations \geq 80% induce non-linear interferences on the H₂ measurement that cannot be fully compensated by software and reduce the precision of the H₂ measurement to \pm 5% FS
3. Gas flow variations has negligible effects on H₂ measurement

Remarks for the measurement of C_nH_m in syngas

1. C_nH_m are measured after pre-treatment and on cooled gas (\pm 4°C). At this temperature only alkanes/alkenes up to C₄ are in gaseous phase.
2. C_nH_m are measured as a mix of alkanes [C₂H₆+ C₃H₈+ C₄H₁₀] expressed as C₃H₈ equivalent.
3. The standard calibration of the C_nH_m detector is on C₃H₈. A specific calibration on C₂H₆ or C₄H₁₀ might be advised to increase the measurement accuracy.
4. C_nH_m detector has no response to C₂H₂, C₂H₄ and CH₄
5. A specific NDIR detector for response to C₂H₄ is available on request
6. Please consult us if C₃H₆ is present in your syngas; preliminary response tests might be necessary to evaluate the possible interference of C₃H₆ on the C_nH_m measurement.
7. C_nH_m measurement (even if present in low concentrations) is important for the calculation of the GHV value because they respectively weight 5.5x more than CO and H₂ and 1.77x more than CH₄.

Calculated values

Measuring ranges

GHV [Gas Heating (or calorific) Value] in MJ/m³ or kcal/m³ / N₂: 0-100% (depending on model)

Lowest CO₂, C_nH_m, O₂ : 0-5%vol / CO, CH₄, H₂: 0-10%vol

Highest CO, CO₂, CH₄, H₂ and O₂: 0-100% ⁽¹⁾ / C_nH_m : 0-20% ⁽¹⁾ mostly improbable in syngas)

NDIR and TCD detectors are inside an heated enclosure with temperature regulation (+50°C)

No effect of Tamb variations

NDIR/ECD: T₉₀ < 10s - TCD : T₉₀ < 20s

Response time T₀ -T₉₀

Real time process analysis

Real time measurements are impossible to achieve with GC-FID gas analysers

No need of external carrier gas and combustion air

Our NDIR/TCD/ECD technology does not require any carrier gas and combustion air to operate as required by GC-FID analysers.

Accurate measure of oxygen

We implement a highly performant and long life (> 3 years) galvanic fuel cell that is not affected by the presence of up to 100% vol CH₄, H₂, CO₂, CO or C₃H₈ and 2000 ppm H₂S

Display

LCD 320 x 240 display with back-lit function; display of up to 8 values and units; all gas units in %

Display resolution (gases)

On 4 digits: Range 0-10% (NDIR only): 0.001% / TCD/O₂ + Range NDIR > 10% : 0.01%

Precision / Repeatability

$\leq \pm$ 2% FS / \leq 1% FS

Warm up time

800 seconds (30 minutes to full specifications or before gas calibration)

Zero & Span Drift

\pm 1% FS/week (with daily auto-zero cycle)

Auto zero function

Auto-zero function on ambient air during the last 100 seconds of the warm-up time

Programmable auto-zero function on ambient air via setting menu

Note : 4-20mA outputs are frozen during the zeroing cycle + 120 sec.

Response time (T₉₀)

\leq 15 s (NDIR/ ECD O₂) / \leq 30 s (TCD)

Gas sampling

Standard configuration without gas pump. Internal pump available in option

Calibration

5 points factory calibration stored in the microprocessor of the gas analyzer

2 points (zero and span) user calibration

Sample Gas Conditions at analyser inlet

Flow rate Nominal 1L/min (0.7 to 1.2 L/min)

Inlet pressure 20 mbar mini - 500 mbar maxi

Outlet pressure Atmospheric pressure

Gas temperature Max. 50°C / Gas dew point +4°C

Quality Free of dust, tars, water, oil traces

Operation conditions

T_{AMB} : 0 to 50°C / P_{AMB}: 86 to 108kPa (860 to 1080 mbar) / RH: \leq 95%

Communication interface

RS232/485 with proprietary communication protocol

Analogue output signals

6x 4-20 mA outputs (one per gas measurement channel)

Digital output signals

2x output relay per gas measurement channel (threshold level freely adjustable on the full range)

Mechanical

19"- 3U rack or desk type Dimensions /weight L485 x W457 x H 132 mm - Weight : < 15kg

Power supply

220 \pm 44 VAC - 50Hz \pm 1 Hz (power cable included)

Options

Internal gas sampling pump / RS232 cable / RS232-USB cable adapter

Non contractual pictures and specifications - Subject to change without prior notification - Document Issue EN17v2



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