

# GAS 3100P Syngas Analyser

## Up to 6 gases + Calorific value

CO% + CO<sub>2</sub>% + CH<sub>4</sub>% + C<sub>n</sub>H<sub>m</sub>% + H<sub>2</sub>% + O<sub>2</sub>% + GHV

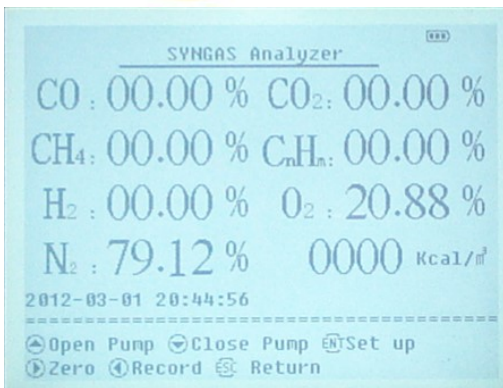


### Standard configurations (other models on request)

<b>GAS 3160P</b>	CO + CO <sub>2</sub> + CH <sub>4</sub> + C <sub>n</sub> H <sub>m</sub> + H <sub>2</sub> + O <sub>2</sub>
<b>GAS 3150P</b>	CO + CO <sub>2</sub> + CH <sub>4</sub> + C <sub>n</sub> H <sub>m</sub> + H <sub>2</sub>
<b>GAS 3140P</b>	CO + CO <sub>2</sub> + CH <sub>4</sub> + H <sub>2</sub>
<b>Calculations</b>	Gas heating value + N <sub>2</sub>

### Standard measurement ranges

CO (NDIR dual beam)	0-10%, 30%, 50%, 75%, 100%
CO <sub>2</sub> (NDIR dual beam)	0-5%, 10%, 25%, 30%, 50%, 100%
H <sub>2</sub> (TCD)	0-10%, 20%, 25%, 30%, 50%, 75%, 100%
CH <sub>4</sub> (NDIR dual beam)	10%, 15%, 30%, 40%, 100%
O <sub>2</sub> (ECD)	0-5%, 25%
C <sub>n</sub> H <sub>m</sub> (NDIR dual beam)	0-5%, 10%, 20%



### Typical applications

- Biomass, wastes and coal gasification/pyrolysis processes
- Coal chemical process,
- Blast furnace, Converter, Coking,
- Direct iron smelting reduction process

### Measurement of C<sub>n</sub>H<sub>m</sub> in the syngas

- C<sub>n</sub>H<sub>m</sub> are measured as the sum of C<sub>2</sub>H<sub>6</sub>+C<sub>3</sub>H<sub>8</sub>+C<sub>4</sub>H<sub>10</sub> equivalent to C<sub>3</sub>H<sub>8</sub>.
- C<sub>n</sub>H<sub>m</sub> measurement is important even if present in low concentrations because they weights 5.5x more than CO and H<sub>2</sub> and 1.77x more than CH<sub>4</sub> in the calculation of the Gas Heating Value
- Depending on the expected C<sub>n</sub>H<sub>m</sub> composition in the syngas we can replace our std. C<sub>n</sub>H<sub>m</sub> detector by a specific NDIR detector for C<sub>2</sub>H<sub>2</sub> or for C<sub>2</sub>H<sub>4</sub>

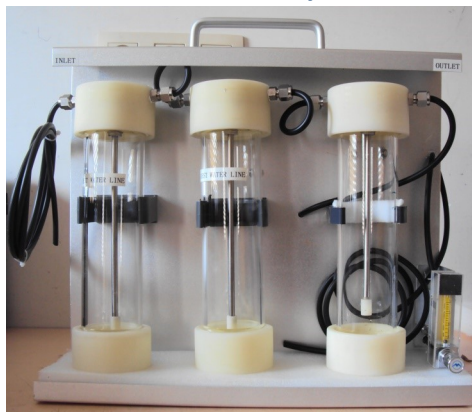
### Key features

- Up to 6 gases + GHV/N<sub>2</sub> calculation in one analyser
- Real time measurement in gas analysis mode
- No need of carrier gas and combustion air
- Different NDIR detectors for CH<sub>4</sub> and C<sub>n</sub>H<sub>m</sub>
- Fast, accurate and reliable syngas measures
- Temperature control for NDIR and TCD detectors (integration into a heated enclosure)
- Large LCD display and easy to use tactile keyboard interface
- Powerful internal gas sampling pump
- Internal battery with measuring autonomy > 6h
- Internal data logger, RS232 COM port

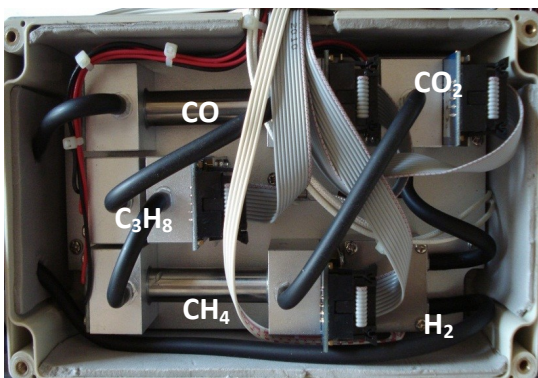
### Standard accessories

- Black nylon carrying and protective bag with shoulder strap, transparent window above the display and front pocket for accessories
- Gas sampling line (2m) ; Gas venting tubing (2m)
- Power cable and battery charger adaptor
- RS232/DB9 cable + Data software for PC (USB cable interface in option)

### Recommended accessory



Syngas must be measured on clean and dry gas at ambient temperature ( $\leq 20^{\circ}\text{C}$ ). Our **Portable syngas pre-treatment unit** removes tars and moisture from the gas. Composed of 3 refillable water scrubbers, 1 refillable charcoal filter, 1 precision filter with replaceable 0.3 $\mu\text{m}$  filter element for tar removal, 1 flow meter 0-1.5L/m, DFM safety filter. Spare parts : Set of 5x 0.3 $\mu\text{m}$  tar filter elements and 5x DFM filters



## Technical specifications

### Measuring principles

CO, CO<sub>2</sub>, CH<sub>4</sub>, C<sub>n</sub>H<sub>m</sub>: Non dispersive dual beam infrared detectors (NDIR)

H<sub>2</sub>: Thermal conductivity detector (TCD)

O<sub>2</sub>: Industrial galvanic fuel cell (ECD) or paramagnetic detector (PMG)

### Remarks for the measurement of H<sub>2</sub> in syngas

1. The interferences generated by CH<sub>4</sub> (up to 80%vol) and CO<sub>2</sub> on the TCD H<sub>2</sub> detector are compensated in real time by the software of the gas analyser.

2. CH<sub>4</sub> concentrations  $\geq$  80% induce non-linear interferences on the H<sub>2</sub> measurement that cannot be fully compensated by software and reduce the precision of the H<sub>2</sub> measurement to  $\pm$  5% FS

3. Gas flow variations has negligible effects on H<sub>2</sub> measurement

### Remarks for the measurement of C<sub>n</sub>H<sub>m</sub> in syngas

1. C<sub>n</sub>H<sub>m</sub> are measured after pre-treatment at room temperature ( $\pm$  20°C). At this temperature alkanes/alkenes up to C<sub>4</sub> are in gaseous phase.

2. C<sub>n</sub>H<sub>m</sub> are measured as a mix of alkanes [C<sub>2</sub>H<sub>6</sub>+ C<sub>3</sub>H<sub>8</sub>+ C<sub>4</sub>H<sub>10</sub>] expressed as C<sub>3</sub>H<sub>8</sub> equivalent.

3. The standard calibration of the C<sub>n</sub>H<sub>m</sub> detector is on C<sub>3</sub>H<sub>8</sub>. Depending on the respective nominal concentration of the 3 measured alkanes, a specific calibration of the detector on C<sub>2</sub>H<sub>6</sub> or C<sub>4</sub>H<sub>10</sub> might be advised to increase the measurement accuracy.

4. C<sub>n</sub>H<sub>m</sub> detector has no response to C<sub>2</sub>H<sub>2</sub> and a negligible response to CH<sub>4</sub> and C<sub>2</sub>H<sub>4</sub>.

5. A specific detector for C<sub>2</sub>H<sub>2</sub> or for C<sub>2</sub>H<sub>4</sub> can be used in replacement of our std. C<sub>n</sub>H<sub>m</sub> detector

6. C<sub>n</sub>H<sub>m</sub> detector has a response to C<sub>3</sub>H<sub>6</sub> that cannot be compensated yet in real time by the software of the gas analyser. If present in the gas, preliminary response tests on its nominal concentration shall be done in order to evaluate the error induced by the C<sub>3</sub>H<sub>6</sub> on the C<sub>n</sub>H<sub>m</sub> measurement.

7. C<sub>n</sub>H<sub>m</sub> 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 H<sub>2</sub> and 1.77x more than CH<sub>4</sub>.

GHV [Gas Heating (or calorific) Value] in MJ/m<sup>3</sup> or kcal/m<sup>3</sup> / N<sub>2</sub>: 0-100%

### Calculated values

#### Measuring ranges

See table at previous page

#### No effect of Tamb variations

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

#### Response time T<sub>90</sub>

NDIR/PMG < 15s - TCD /ECD : < 30s

#### 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/PMG technologies do 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 CH<sub>4</sub>, H<sub>2</sub>, CO<sub>2</sub>, CO or C<sub>3</sub>H<sub>8</sub> and 2000 ppm H<sub>2</sub>S

### Display

#### Display resolution (gases)

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

#### Precision / Repeatability

On 4 digits: Range 0-10% (NDIR only): 0.001% / TCD and O<sub>2</sub> + Range NDIR > 10% : 0.01%

#### Warm up time

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

#### Zero & Span Drift

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

#### Auto zero function

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

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

### Response time (T<sub>90</sub>)

$\leq$  15 s (NDIR/ ECDO<sub>2</sub>) /  $\leq$  30 s (TCD)

### Gas sampling

Internal gas sampling pump, external flow meter with needle valve

### Calibration

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

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

### Gas pre-conditioning unit

Portable syngas washing unit with 3 gas bubblers, one charcoal filter and one safety filter

### Operation conditions

T<sub>AMB</sub>: 0 to 50°C / P<sub>AMB</sub>: 86 to 108kPa (860 to 1080 mbar) / R<sub>H</sub>:  $\leq$  95%

### Communication interface

RS232 with real time and memory software for data transfer to an external PC

### Recording function

Memory capacity: 2560 sets of up to 8 data + time; adjustable logging rate from 3 to 99 sec;

Identification of 10 different sites and up to 100 measuring points

### Mechanical

Robust design with synthetic moulded parts and stainless steel plate; nylon protective carrying bag

### Dimensions and weight

Analyser: L 380 x D 140 x H 255 mm,  $\pm$  6 kg / Gas pre-treatment unit: L 400 x D 120 x H 380 mm;  $\pm$  4kg

### Power supply

220 VAC-50Hz/12.6 VDC-3A power adapter; internal battery with autonomy of > 8h of operation

### Options

RS232-USB cable adapter - Portable gas pre-conditioning unit

*Non contractual pictures and specifications - Subject to change without prior notification - Document Issue EN17v3*



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