# Portable IR Gas Analyser PHOTON

Photon is a flue gas analyser designed to use mostly infrared sensors, but can also be fitted with further electrochemical sensors.
The modular construction allows the instrument to be configured to suit practically any user needs.
In addition to this it is possible to set the range of each sensor as required for the measuring system.
The analyser also has an ample number of digital inputs and outputs to ensure ease of data transfer in both directions and documentation of all results.
The analyser can thus also be used for various control operations.

## Properties

Measurement of gas concentrations

- The following gases can be measured using NDIR technology (max. 6): CO, $CO_2$, $CH_4$, NO, $NO_2$, $N_2O$, $SO_2$ . Please call for information on other gases
- O2 concentration: measured using an electrochemical sensor.
- O2 concentration: measured using an partial press. sensor - option.
- O2 concentration: measured using an paramagnetic sensor - option.
- The following toxic gases can be measured using electrochemical sensors: H2, H2S. Please call for information on other gases.

Measurement of further parameters:

- Flue gas and ambient temperature measurement. Thermocouples supported: K, J, S, E
- Pressure, draught, and differential pressure measurement with a resolution of 0.1 Pa.
- Ambient pressure measurement with a resolution of 0.1 hPa.
- 8 Temperature channels (4 thermocouples and 4 thermistors) - option

Calculations

- CO2 concentration if no CO2 sensor is fitted.
- Calculation of all relevant combustion parameters.
- Calculation of absolute and relative mass concentrations for all measured gases.
- Calculation of absolute and relative volumetric concentrations for all measured gases.

Preparation and display of measured values:

- All measured and calculated values can be displayed as averaged values as well. Averaging time can be chosen from the series: 2, 10, 20, 30, 60, 120, and 180 seconds.
- Cyclic measurement (Zeroing – Measurement – Wait)
- Measurements according to time schedule. Repeat time: 24 hours.
- Single and triple long-term measurements (XL measurements). Period for long-term measurements chosen from the series: 5 min., 10 min., 15 min., 20 min., 30 min.
- Multi-point measurements
- Single or continuous storage of results. One set of data will contain all measured and calculated values.
- Storage of all measurement values within the last 60 minutes
- Memory 1M sets of data. Depending on the size of the Compact Flash
- Complete software package for the PC to process readings and communicate on-line.

Software features

- Automatic zero calibration on switch-on
- All parameters can be freely programmed
- Complete list of 10 standard fuels
- Freely programmable fuels
- Continuous automatic monitoring of instrument function with acoustic warning and detailed information under "Control List"
- Cross-sensitivity and temperature drift of gas sensors is fully compensated
- Temperature and ambient pressure compensation for IR sensors

Hardware features

- Control over internal computer with Windows CE
- Data logger for continuous storage of readings. Stored readings can be transferred to a computer via USB
- Flash memory for all instrument settings
- Flash programme memory allows simple programme upload from PC
- Integral clock/calendar with separate buffer battery
- Mains supply 110/230 VAC, 50-60Hz
- LCD colour display (640 x 480) with backlighting
- Touchscreen operation
- External printer over USB – option
- Interface RS 232 C. For communication with the dryer

Technical data

- Size (W x H x D) 500 x 410 x 180 mm
- Weight approx. 9.5 kg
- Colour display 640 x 480 Pixel
- Power supply 110/230 VAC 50/60 Hz
- Membrane pump
- Use only with gas conditioner PGD-100
- Operating temperature 10 °C ÷ 50°C
- Storage temperature -20 °C ÷ +55 °C

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# Measuring technology

| NDIR sensors | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Indication ranges** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **CO** - carbon monoxide<br>**NO** - nitrogen oxides<br>**$NO_2$** - nitrogen dioxide | min. range:<br>0…2000 ppm | 1 ppm | 1 ppm | ±3 ppm abs.,<br>or 3 % rel. | 45 s |
| | max. range:<br>0…100 % | 0.1 % | 0.1 % | ±0.3 % abs.,<br>or 3 % rel. | 45 s |
| **$CO_2$** - carbon dioxide<br>**$CH_4$** - Methane | min. range:<br>0…5 % | 0.01 % | 0.01 % | ±0.03 % abs.,<br>or 3 % rel. | 45 s |
| | max. range:<br>0…100 % | 0.1 % | 0.1 % | ±0.3 % abs.,<br>or 3 % rel. | 45 s |

| Electrochemical sensors | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Indication range** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **$O_2$** - oxygen | 0...25 % | 0.01 % | 0.01 % | ±0.2 % abs.,<br>or 2 % rel. | 45 s |
| **$H_2S$** - Hydrogen sulphide | 0...5000 ppm | 1 ppm | 1 ppm | ±3 ppm abs.,<br>or 3 % rel. | 45 s |
| **$H_2$** - Hydrogen | 0...1000 ppm | 1 ppm | 1 ppm | ±3 ppm abs.,<br>or 3 % rel. | 45 s |

| Other sensors | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Method** | **Indication range** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **$O_2$** – oxygen | Paramagnetic sensor | 0...25 % | 0.01 % | 0.01 % | ±0.2 % abs.,<br>or 2 % rel. | 45 s |
| **$O_2$** – oxygen | Partial press. sensor | 0...100 % | 0.1 % | 0.1 % | ±0.2 % abs.,<br>or 2 % rel. | 45 s |

| Temperature measurements | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Method** | **Indication range** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **Tgas** - flue gas temperature | Thermocouple | -10..1000 °C | 0.1 °C | 1 °C | ±2 °C abs.,<br>or 1.5 % rel. | 30 s |
| **Tamb** - ambient temperature | Thermistor | -10..100 °C | 0.1 °C | 1 °C | ±1 °C abs.,<br>or 1.5 % rel. | 30 s |

| Other measured values | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Method** | **Indication range** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **Pressure** | DMS bridge | -20...+20 hPa | 0.1 Pa | 0.1 Pa | ±2 Pa abs.,<br>or 5 % rel. | 10 s |
| **Diff. Pressure** | DMS bridge | -20...+20 hPa | 0.1 Pa | 0.1 Pa | ±2 Pa abs.,<br>or 5 % rel. | 10 s |
| **Ambient pressure** | DMS bridge | 800...1200 hPa | 0.1 hPa | 0.1 hPa | ±0.5 hPa abs.,<br>or 5 % rel. | 10 s |

| Calculated parameters | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Method** | **Indication range** | **Resolution** | **Detection limit** | **Accuracy** | **Response time (t90)** |
| **Lambda** - excess air number | calculated | 1...10 | 0.01 | 0.01 | 0.01 | 5 s |
| **qA** - combustion losses | calculated | 0...100 % | 0.1 % | 0.1 % | 0.1 % | 5 s |
| **Eta** - efficiency | calculated | 0...100 % | 0.1 % | 0.1 % | 0.1 % | 5 s |