THE PORTABLE CEMS

HIGH ACCURACY & EXTREME PORTABILITY FOR INDUSTRIAL APPLICATIONS

O₂ CO₂ CO₂ calc CO CO HIGH NO NO₂ NOx SO₂ H₂S H₂ CH₄ C₅H₈
Suitable for industrial applications using combined infrared (NDIR) technology and electrochemical sensors for maximum versatility.

Complies with USEPA methods CTM-030 and CTM-034 and international ASTM D6522
Certified according to DIN EN 50379-1 and DIN EN 50379-2

Functions of the VARIO PLUS INDUSTRIAL

>> Simultaneous measurements of up to 9 gas components!
   E.g. O2, CO, NO, NO2, NOx, SO2, CO-high, CO-very high, H2S or H2, CH4 or C3H8
   Up to 6 electrochemical sensor configurations are possible!
   Plus additional 3 gas NDIR bench with CO2, CO-high, CH4 (C3H8).

>> Emission calculations including: mg/m$^3$, NOx as mg/m$^3$ NO2, true measurement of NOx = NO + NO2, including O2 referencing (normalization) to user definable values

>> Gas temperature measurement up to 2,012°F (use stainless steel up to 1,200°F, use Inconel tubes up to 2,012°F)

>> Integrated gas cooler and automatic condensate draining pump / PTFE filter

>> Air purging pump for CO-sensor protection

>> Built-in speed printer with easy paper loading

>> Internal data storage for up to 8,500 measurements!

>> RS 232 port

>> RS 485 port

>> 8 channel analog outputs 4 ... 20mA

>> Differential pressure measurement ± 40 inH2O (100 hPa)

>> Automatic self test of software and hardware functions

>> Large, high-contrast and backlit graphic display with ZOOM function

Continuous analysis of:

O$_2$ Long-life (0...21.0 Vol.-%)
CO H$_2$-compensated (0 ... 4,000 / Overload 10,000 ppm)
Combustion air temperature (short plug included)
Stack gas temperature
Stack pressure
Differential pressure
Differential temperature

Combustion calculations (fuel type dependent):

CO$_2$
CO/CO$_2$ ratio
Dew point
Excess air and air ratio (Lambda)
Combustion efficiency
Heat losses

Interfaces:

RS232 / RS485
Data transfer

4 to 20 mA*:
Connect to PLC

SD card*:
4 GB
Data Memory

Bluetooth*:
Data transfer

AUX*:
For additional external sensors
SIMULTANEOUS MEASUREMENT OF UP TO 9 GAS COMPONENTS

ADDITIONAL OPTIONS

- SD card 4 GB for large volume data logging
- External battery for measurement operation up to 6 hours
- Sample probe with heated filter
- Heated gas sample line, length 120" or 200" (only with grid voltage supply)
- Sample probe tubes with length from 12" to 80"
- Gas velocity measurement using Pitot tube [Nm³/s] and mass flow calculation [mg/s]
- 8 channel analog outputs 4 ... 20 mA
- External 12 Vdc power supply cable from cigarette lighter
- Robust aluminum framed transport case with dolly
- Analyzer heating device (freeze protection)

Different probes available

1. Draft
2. Differential pressure
3. Heated hose and T-Gas
4. Sample gas inlet
5. Dust and particle filter
6. Condensate outlet
7. Combustion air temp.
8. AUX connector
9. Ventilation gas cooler
10. Eye for shoulder strap
11. Easy load speed printer
12. SD card
13. External keyboard
14. Ext.12Vdc power supply
15. Grid power supply
16. Analog outputs
17. RS 485
18. RS 232
**TECHNICAL SPECIFICATIONS**

VARIO plus IND.

Portable analyzer with up to 6 electrochemical sensors and 3 gas NDIR bench

**Fuel types**

Natural gas, liquid gas, oil light, pellets, wood, coal, user definable fuels

**Measurement components**

**Electrochemical sensors**

<table>
<thead>
<tr>
<th>Component</th>
<th>Measuring range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2</td>
<td>0 ... 21.0 Vol-%</td>
<td>± 0.2 Vol-% abs.</td>
</tr>
<tr>
<td>CO</td>
<td>0 ... 4,000 ppm</td>
<td>± 10 ppm or overload 10,000 ppm * 5 % reading &lt; 4,000 ppm / 10 % reading &gt; 4,000 ppm</td>
</tr>
<tr>
<td>CO (H2 compensated)</td>
<td>0 ... 4.0%</td>
<td>± 0.02% or overload 10.0% * 5 % reading &lt; 0.4% / 10 % reading &gt; 0.4%</td>
</tr>
<tr>
<td>NO</td>
<td>0 ... 1,000 ppm</td>
<td>± 5 ppm or overload 5,000 ppm * 5 % reading &lt; 1,000 ppm / 10 % reading &gt; 1,000 ppm</td>
</tr>
<tr>
<td>NO2</td>
<td>0 ... 200 ppm</td>
<td>± 5 ppm or overload 1,000 ppm * 5 % reading &lt; 200 ppm / 10 % reading &gt; 200 ppm</td>
</tr>
<tr>
<td>SO2</td>
<td>0 ... 2,000 ppm</td>
<td>± 10 ppm or overload 5,000 ppm * 5 % reading &lt; 2,000 ppm / 10 % reading &gt; 2,000 ppm</td>
</tr>
<tr>
<td>H2S</td>
<td>0 ... 1 %</td>
<td>±0.02 % or 5 % reading &lt;1 % overload up to 2 % 10 % reading &gt;1 %</td>
</tr>
</tbody>
</table>

*overload range recommend only for short time measurements

**3 Gas NDIR Bench with either CH4 or C3H8**

<table>
<thead>
<tr>
<th>Component</th>
<th>Measuring range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0 ... 10,000 ppm up to 10%</td>
<td>± 0.03% or ±3% of reading</td>
</tr>
<tr>
<td>CO2</td>
<td>0 ... 3% up to 30%</td>
<td>± 0.5% or ±3% of reading</td>
</tr>
<tr>
<td>CH4</td>
<td>0 ... 10,000 ppm up to 3%</td>
<td>± 0.03% or ±3% of reading</td>
</tr>
<tr>
<td>C3H8</td>
<td>0 ... 2,000 ppm up to 5,000 ppm</td>
<td>± 30 ppm or ±3% of reading</td>
</tr>
</tbody>
</table>

**Stack / Flue gas temperature**

0 ... 1,200°F / 2,012°F (with stainless steel / Inconel steel tube) ± 4°F ... < 392°F / 1 % reading > 392°F

**Primary-air / Ambient temperature**

0 ... 572°F ± 2°F

**Stack / Differential pressure**

+/− 40 inH2O (100hPa) ± 0.01 inH2O or 3% reading

**Gas flow velocity measurement**

1 ... 100 m/s (using Pitot tube) ±1m/s or 3 % reading

**Calculated values (fuel type dependent)**

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<tr>
<th>Component</th>
<th>Measuring range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide (calculated without NDIR)</td>
<td>0 ... CO2 max.</td>
<td>Air Ratio (Lambda) 1 ... 9.99</td>
</tr>
<tr>
<td>Heat losses QA</td>
<td>0 ... 99.9 %</td>
<td>Excess Air 0 ... 99.9</td>
</tr>
<tr>
<td>Efficiency</td>
<td>0 ... 100 % / 120 %</td>
<td>CO/CO2 ratio 0 ... 10</td>
</tr>
</tbody>
</table>

**General specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation temperature</td>
<td>40°F ... 100°F, max. 95 % RH, non condensing</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-4°F ... 120°F</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>not in aggressive, corrosive or high dust environments, not for use in hazardous areas</td>
</tr>
<tr>
<td>Power supply</td>
<td>approx. 2 hours battery operation with gas cooler, without heated gas sampling line</td>
</tr>
<tr>
<td>Grid power supply</td>
<td>100 ... 250 Vac / 47 ... 63 Hz</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP21</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 15.4 lbs. (without transport case, bag, trolley)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>(W x H x D) 21&quot; x 19&quot; x 12&quot;</td>
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</tbody>
</table>