HYDROCAL 1008-3
Multi-Gas-in-Oil Analysis System for monitoring a bank of three single phase transformers located next to each other

The HYDROCAL 1008-3 is designed for multi-gas-in-oil analysis on a bank of three single phase transformers located next to each other. This new wall mounted system allows for the individual measurement of Moisture (H₂O) and the key gases Hydrogen (H₂), Carbon Monoxide (CO), Carbon Dioxide (CO₂), Methane (CH₄), Acetylene (C₂H₂), Ethylene (C₂H₄) and Ethane (C₂H₆) dissolved in transformer oil utilizing a sampling system that samples oil from each tank via three separate oil channels expertly engineered to provide negligible mixing of oil.

As Hydrogen (H₂) is involved in nearly every fault of the insulation system of power transformers and Carbon Monoxide (CO) is a sign of an involvement of the cellulosic / paper insulation the presence and increase of Acetylene (C₂H₂) and Ethylene (C₂H₄) further classifies the nature of a fault as overheating, partial discharge or high energy arcing.

It is further equipped with digital outputs for the transmission of alarms or the execution of control functions (e.g. control of a cooling system of a transformer):

- 8 digital relay outputs (optional)
- 5 digital opto-coupler outputs (optional)

Key Advantages

- Hydrogen (H₂), Carbon Monoxide (CO), Carbon Dioxide (CO₂), Methane (CH₄), Acetylene (C₂H₂), Ethylene (C₂H₄) and Ethane (C₂H₆) measurement
- Moisture-in-oil (H₂O) measurement
- Monitor three tanks with one HYDROCAL 1008-3
- Communication interfaces ETHERNET 10/100 Mbit/s (copper-wired / RJ 45 or fibre-optical / SC Duplex) and RS 485 to support MODBUS®RTU/ASCII, MODBUS®TCP.
- Optional 2G/3G modem with external adhesive antenna
- Optional DNP3 serial modem for SCADA connection
- Optional IEC 61850 modem for SCADA connection
- Optional HV and LV bushing sensors for HV and LV bushing monitoring applications via communication interface
Technical data HYDROCAL 1008-3

General
Optional nominal voltages of auxiliary supply:
- 120 V -20% +15% AC 50/60 Hz
- 230 V -20% +15% AC 50/60 Hz
- 120 V +15% DC
- 230 V -20% +15% DC
Other nominal voltages on request!
Power consumption: max. 900 VA
Housing: Mild Steel
Dimensions: W 600 x H 800 x D 400 mm
Weight: approx. 80 kg
Operation temperature:
- (ambient) -55°C ... +55°C
- (below -10°C display function locked)
Oil temperature:
- (in the transformer) -20°C ... +105°C
Storage temperature:
- (ambient) -20°C ... +65°C
Connection to valve:
- All Valves possible / pipe with diameter of 6mm connectable without adapters
- 2 valves necessary (in/out) / max. distance 30m

Safety
CE certified
Insulation protection: IEC 61010-1:2011-07
Degree of protection: IP -65

Measurements

<table>
<thead>
<tr>
<th>Gas/Moisture in oil Measurement</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen H₂</td>
<td>± 15 % ± 25 ppm</td>
</tr>
<tr>
<td>Carbon Monoxide CO</td>
<td>± 20 % ± 25 ppm</td>
</tr>
<tr>
<td>Carbon Dioxide CO₂</td>
<td>± 20 % ± 25 ppm</td>
</tr>
<tr>
<td>Methane CH₄</td>
<td>± 15 % ± 25 ppm</td>
</tr>
<tr>
<td>Acetylene C₂H₂</td>
<td>± 15 % ± 5 ppm</td>
</tr>
<tr>
<td>Ethylene C₂H₄</td>
<td>± 15 % ± 10 ppm</td>
</tr>
<tr>
<td>Ethane C₂H₆</td>
<td>± 15 % ± 15 ppm</td>
</tr>
<tr>
<td>Moisture H₂O (aw)</td>
<td>± 3 %</td>
</tr>
<tr>
<td>Moisture in Mineral Oil</td>
<td>± 3 % ± 3 ppm</td>
</tr>
<tr>
<td>Moisture in synt. Ester¹</td>
<td>± 3 % of MSC²</td>
</tr>
</tbody>
</table>

¹optional ²Moisture Saturation Content

Operation principle
- Miniaturized gas sample production based on headspace principle (no membrane, negative pressure proofed)
- Patent-pending oil sampling system (EP 1 950 560 A1)
- Near-infrared gas sensor unit for CO, CO₂, CH₄, C₂H₂, C₂H₆, and C₂H₄
- Micro-electronic gas sensor for H₂
- Thin-film capacitive moisture sensor H₂O
- Temperature sensors (for oil and gas temperature)

Analog and digital outputs (optional)

<table>
<thead>
<tr>
<th>12/24/36 x Analog DC outputs</th>
<th>Default concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Range</td>
</tr>
<tr>
<td>1 x Current DC</td>
<td>0/4 ... 20 mADC</td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td>-</td>
</tr>
<tr>
<td>1 x Current DC</td>
<td>0/4 ... 20 mADC</td>
</tr>
<tr>
<td>Acetylene C₂H₂</td>
<td>-</td>
</tr>
<tr>
<td>1 x Current DC</td>
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</tr>
<tr>
<td>Ethylene C₂H₄</td>
<td>-</td>
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<td>1 x Current DC</td>
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</tr>
<tr>
<td>Carbon Monoxide CO</td>
<td>-</td>
</tr>
<tr>
<td>1 x Current DC</td>
<td>0/4 ... 20 mADC</td>
</tr>
<tr>
<td>Moisture in Oil H₂O</td>
<td>-</td>
</tr>
<tr>
<td>1 x Current DC</td>
<td>0/4 ... 20 mADC</td>
</tr>
<tr>
<td>Ethane C₂H₆</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12/24/36 x Digital outputs</th>
<th>Max. Switching capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Control voltage</td>
</tr>
<tr>
<td>12/24/36 x Relay</td>
<td>12 VDC</td>
</tr>
<tr>
<td>220 VDC/VAC / 2 A / 60 W</td>
<td></td>
</tr>
</tbody>
</table>

Communication
- RS 485 (proprietary or MODBUS® RTU/ASCII protocol)
- ETHERNET 10/100 Mbit/s copper-wired / RJ 45 or fibre-optical / SC Duplex (proprietary or MODBUS® TCP protocol)
- 2G/3G modem with external adhesive antenna (Option) (proprietary protocol)
- DNP3 serial modem (Option)
- IEC 61850 modem for SCADA connection (Option)

Notes
1) 120 V = 120 V
2) 230 V = 230 V -20% = 184 V
3) Accuracy for moisture in oil for mineral oil types
4) Default jumper configuration: Current

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