



HYDROCAL 1001+

Composite Gas-in-Oil Sensor with Moisture in Oil Measurement



The HYDROCAL 1001+ is a permanently installed composite gas-in-oil sensor for the analysis of the following dissolved key fault gases (TDCG = **T**otal **D**issolved **C**ombustible **G**ases):

| Fault gas | TDCG contribution |
|--|--------------------------|
| Hydrogen (H ₂) | approx. 20 % |
| Carbon Monoxide (CO) | approx. 30 % |
| Methane (CH ₄) | < 5 % |
| Acetylene (C ₂ H ₂) | 100 % |
| Ethylene (C ₂ H ₄) | approx. 32 % |
| Ethane (C ₂ H ₆) | < 5 % |

To provide an even more comprehensive transformer monitoring solution, the HYDROCAL 1001+ analyses additionally the content of Moisture (H₂O) in the transformer oil.

The integration of 6 relevant key gases into a total weighted gas concentration and the measurement of Moisture in oil enables the HYDROCAL 1001+ to react to most transformer faults and makes the device to a compact and cost effective tool used in particular for early transformer fault detection and preventative maintenance.

The HYDROCAL 1001+ is equipped with 2 analog 0/4 ... 20 mA outputs for the dissolved composite gas-in-oil and moisture in oil analysis results and 4 digital relay outputs (Hi-alarm, Hi-Hi-alarm, Moisture-alarm and system function alarm)

Key advantages:

- Composite measurement of Hydrogen (H₂), Carbon Monoxide (CO), Methane (CH₄), Acetylene (C₂H₂), Ethylene (C₂H₄), Ethane (C₂H₆) and dissolved Moisture (H₂O) in the transformer oil
- Relay outputs with light indicators showing potential alerts
- Easy and fast installation without any operational interruption of the transformer
- Compact and resistant design for long lasting usage
- Communication interfaces ETHERNET 10/100Mbit/s (copper-wired or fibre-optical) and RS 485 to support proprietary communication protocols and sub-station communication protocols MODBUS[®]TCP

General

| | |
|--|---|
| Optional nominal voltages of auxiliary supply: | 120 V -20% +15% AC 50/60 Hz ¹⁾ or 230 V -20% +15% AC 50/60 Hz ¹⁾ or 120 V -20% +15% DC ¹⁾ or 230 V -20% +15% DC ¹⁾ Other nominal voltages on request! |
| Power consumption: | max. 250 VA |
| Housing: | Aluminium |
| Dimensions: | W 224 x H 195 x D 218 mm |
| Weight: | approx. 4 kg |
| Operation temperature (ambient): | -55°C ... +55°C |
| Oil temperature (inside Transformer): | -20°C ... +90°C |
| Storage temperature (ambient): | -20°C ... +65°C |
| Oil pressure: | Up to 800 kpa (no negative pressure allowed) |
| Connection to valve: | G 1½" DIN ISO 228-1 or 1½" NPT ANSI B 1.20.1 |
| Safety | CE certified |
| Insulation protection: | IEC 61010-1:2002 |
| Degree of protection: | IP-55 |

Measurements

| Gas-in-oil measurement | | | |
|---|-----------------|----------------------------|-------------------|
| Measuring Quantity | Range | Accuracy ^{2) 3)} | TDCG-Contribution |
| TDCG | 0 ... 5.000 ppm | ± 15 % ± 20 ppm | |
| Hydrogen H ₂ | | ± 10 % ± 15 ppm | approx. 20 % |
| Carbon Monoxide CO | | ± 20 % ± 25 ppm | approx. 30 % |
| Methane CH ₄ | | ± 20 % ± 25 ppm | < 5 % |
| Acetylene C ₂ H ₂ | | ± 20 % ± 25 ppm | 100 % |
| Ethylene C ₂ H ₄ | | ± 20 % ± 25 ppm | approx. 32 % |
| Ethane C ₂ H ₆ | | ± 20 % ± 25 ppm | < 5 % |
| Moisture H ₂ O (aw) | 0 ... 100 % | ± 3 % | |
| Moisture in Mineral Oil | 0 ... 100 ppm | ± 3 % ± 3 ppm | |
| Moisture in synt. Ester ⁵⁾ | 0 ... 2.000 ppm | ± 3 % of MSC ⁶⁾ | |
| Measurement cycle | 20 min | | |

⁵⁾Option ⁶⁾Moisture Saturation Content

Analog and digital outputs

| 2 x Analog DC output | | |
|----------------------|-----------------|--|
| Type | Control range | Default function (Free assignment) |
| 1 x Current DC | 0/4 ... 20 mADC | TDCG Concentration |
| 1 x Current DC | 0/4 ... 20 mADC | Moisture in oil H ₂ O Concentration |

| 4 x Digital outputs | | |
|-------------------------|-----------------|--------------------------|
| Type | Control voltage | Max. Switching capacity |
| 4 x Relay ⁴⁾ | 12 VDC | 220 VDC/VAC / 2 A / 60 W |

Communication

- ETHERNET 10/100 Mbit/s modem copper-wired / RJ 45 or fibre-optical / SC Duplex (proprietary or MODBUS[®] TCP protocol)
- RS 485

Operation principle

- Diffusion principle with gas-permeable TEFLON membrane
- Fuel cell-gas sensor for H₂, CO, CH₄, C₂H₂, C₂H₄ and C₂H₆
- Thin-film capacitive moisture sensor for H₂O measurement

Notes

- 120 V ⇒ 120 V -20% = 96 V_{min} 120 V +15% = 138 V_{max}
230 V ⇒ 230 V -20% = 184 V_{min} 230 V +15% = 264 V_{max}
- ²⁾ Related to temperatures ambient +20°C and oil +55°C
- ³⁾ Accuracy for moisture in oil for mineral oil types
- ⁴⁾ Relay 1: Hi alarm / Relay 2: Hi-Hi alarm / Relay 3: Moisture alarm / Relay 4: System alarm

