



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 (Option)) 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 (proprietary or MODBUS[®] TCP protocol)
- ETHERNET 10/100 Mbit/s modem fibre-optical / SC Duplex (proprietary or MODBUS[®] TCP protocol) (Option)
- 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

- ¹⁾ 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

