MTE Meter Test Equipment

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_2H_2)	100 %
Ethylene (C_2H_4)	approx. 32 %
Ethane (C_2H_6)	< 5 %

To provide an even more comprehensive transformer monitoring solution, the HYDROCAL 1001+ analyses additionally the content of Moisture (H_2O) 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 (H_2), Carbon Monoxide (CO), Methane (CH_4), Acetylene (C_2H_2), Ethylene (C_2H_4), Ethane (C_2H_6) and dissolved Moisture (H_2O) 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

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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_2H_2		± 20 % ± 25 ppm	100 %
Ethylene C_2H_4		± 20 % ± 25 ppm	approx. 32 %
Ethane C_2H_6		± 20 % ± 25 ppm	< 5 %
Moisture in oil H_2O	0 ... 100 ppm	± 3 % ± 3 ppm	
Measurement cycle	20 min		

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_2O 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

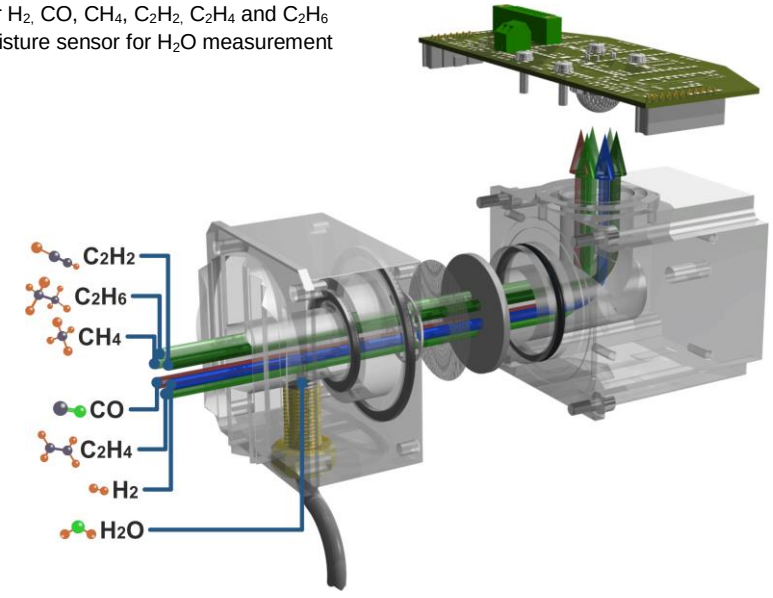
Operation principle

- Diffusion principle with gas-permeable TEFLON membrane
- Fuel cell-gas sensor for H_2, CO, CH_4, C_2H_2, C_2H_4 and C_2H_6
- Thin-film capacitive moisture sensor for H_2O 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