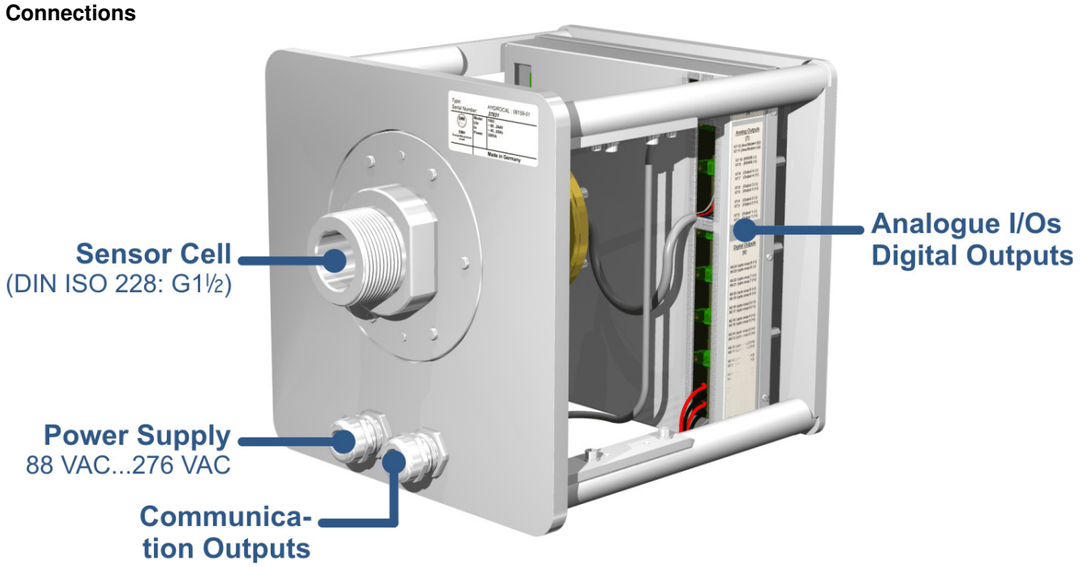
Technical data HYDROCAL 1003 Offshore

Measuring Quantities	Measuring range	Measuring accuracy H (related to ambient temperature +20°C and oil temperature of +55°C)
Hydrogen H_2:	0 ppm ... 2.000 ppm	± 15 % of the measuring value ± 25 ppm
Carbon Monoxide CO:	0 ppm ... 2.000 ppm	± 20 % of the measuring value ± 25 ppm
Moisture-in-Oil H_2O:	absolute 0 ppm … 100ppm	± 3 % of the measuring value ± 3 ppm
Measurement interval:	20 min.	
Operation Temperature:	Oil Temperature: Ambient temperature: Temperature Coefficient:	-20°C ... +90°C -50°C ... +55°C (below -10°C display function locked) 1 % / K
Oil Pressure:	0 - 800 kpa, no vacuum allowed	
Functions:	Individual gas level measurement H_2 and CO Moisture-in-oil measurement H_2O in both % and ppm Gas/Moisture trend analysis (chart / bar diagram) Different alarm level configuration RS 232 / RS 485 communication and modem communication (GSM, Modem) to central PC Windows© software HYDROSOFT	
Outputs:	3 x analogue outputs: 1 x analogue outputs: 12 x digital outputs: H_2/CO/H_2O alarm (H) H_2/CO/H_2O alarm (HH)	0/4 ... 20 mA (H_2 concentration) 0/4 ... 20 mA (CO concentration) 0/4 ... 20 mA (H_2O concentration) 0/4 ... 20 mA (free configurable) 4 x 12 V relay outputs (220 VDC / 220 VAC / 2 A / 60 W) 8 x opto-coupler outputs (1st level alarm) (2nd level alarm)
Inputs:	4 x analogue inputs: 4 x analogue inputs:	0/4 ... 20 mA 0/4 ... 20 mA / 0 ... 10 V (configurable by jumpers)
Gas in oil monitor / Moisture-in-oil Monitor:	3 x internal gas sensors (redundant system) 2 x H_2, 1 x CO: 1 x internal moisture sensor 2 x internal temperature sensors (oil temperature, gas temperature)	
Communication:	RS 232 (external connection, no unmounting of protective cover required) RS 485 (bus-operation or point-to-point operation, MODBUS or proprietary protocol) Internal on-board modem (GSM 14.4 kBit / analog 56 kBit)	
Protection class:	IP 68	
Power supply:	88 VAC_{min} … 276 VAC_{max} Optional: 88 VDC_{min} … 350 VDC_{max} max. 350 VA, 50/60 Hz	
Dimensions:	approx. 224 x 224 x 307.5 mm	
Weight:	approx. 7.5 kg	

Connections



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Subject to alterations

Edition 04.2011

MTE Meter Test Equipment

HYDROCAL 1003 Offshore

Transformer Online Monitoring System with Gas-in-Oil and Moisture-in-Oil Measurement for Offshore Wind Power Applications

Analysis of the gases dissolved in power transformer oil is recognized as the most useful tool for early detection and diagnosis of incipient faults in transformers.

In addition water contamination deteriorates the performance of the oil as high moisture content increases the risk of corrosion and overheating. This is in particular when the water content reaches the saturation point of the oil and free water is formed.

Besides regular gas chromatographic analysis and off-line moisture analysis of the isolation oil of power transformers online monitoring systems gain more and more importance worldwide.

By online monitoring of the key fault gases hydrogen (H_2) and carbon monoxide (CO) and moisture an additional potential of cost reductions and safety improvements can be achieved.

Key Advantages

- **Individual analysis** of the dissolved gas contents hydrogen (**H_2**) and carbon monoxide (**CO**)
- Analysis of moisture (**H_2O**) dissolved in transformer oil (**both** relative humidity **in %** and absolute humidity **in ppm**)
- Special design for Offshore Wind Power Applications:
  - Housing without window painted C5M
  - Back plate with 2 PG cable screw connectors (chrome-nickel steel, IP 68, corrosion-free and acid-resistant)
  - Back plate, oil entrance and closing screws made of stainless steel V4A
- Simple, lightweight and **easy-to-mount solution** on any valve on the transformer (connection to DIN ISO 228: G 1½, optional: NPT 1½)
- **Installation** on the operational transformer **without** any **supply interruption**
- **Sophisticated graphical-oriented software** (on the device and via PC)
- **Various communication interfaces** (RS 232, RS 485, MODBUS, integrated GSM- and analog modem)
- **Maintenance-free system**

Transformer monitoring functions

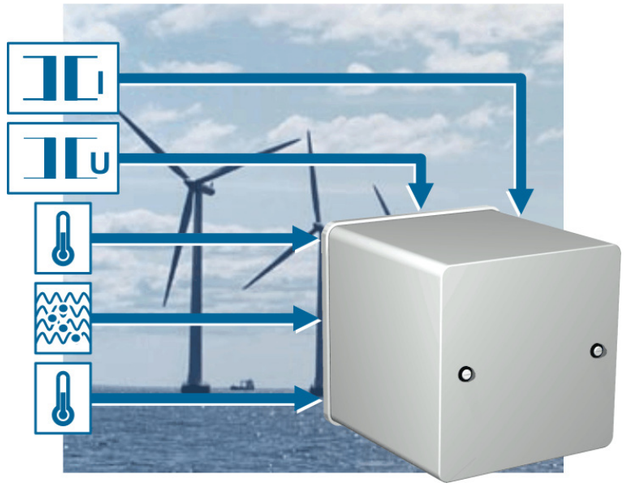
Voltages and Currents
(via voltage and current transformers / transducer)

Temperature Monitoring
Bottom and oil temperature
(via additional temperatures sensors)

Oil humidity
(via additional humidity sensor)

Free configuration
Analogue inputs can be free allocated to any additional sensor

Further Calculations:
Hot-Spot, **Loss-of-Life**, **Ageing Rate** } joint development with PAUWELS Belgium
Cooling Stage / **Tap Changer Position**
(e.g. via current transducer)



Remote Communication

RS 485

- Bus-Operation or point-to-point operation
- MODBUS- or proprietary protocol
- Bus length up to 1000 m
- Communication with up to 31 units HYDROCAL 1003 Offshore
- Configuration via internal software or PC software HYDROSOFT

GPS/GPRS modem communication

- Integrated on-board modem
- Magnetic antenna to place on top of HYDROCAL 1003 Offshore

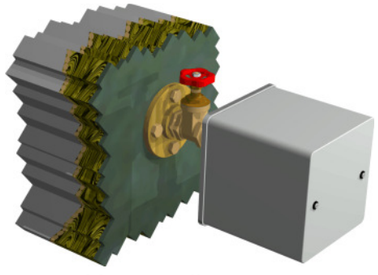
Analogue modem communication

- Integrated on-board modem

Direct communication

- Via integrated RS 232 interface
  (accessible without opening of HYDROCAL 1003 Offshore cover)
- On-site, e.g. by notebook

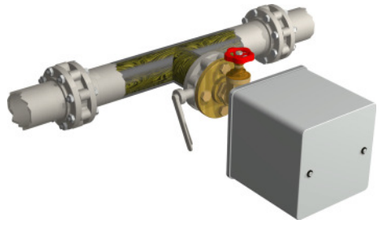
Sensor mounting



Transformer without cooling system

Mounting of the HYDROCAL 1003 Offshore sensor on a valve on the transformer tank.

Intrinsic oil circulation is assuring accomplishment of the oil in the sensor cell



Transformer with cooling system and forced oil flow

The HYDROCAL 1003 Offshore sensor is mounted on a T-tube valve on the return flow from the cooling system

Sensor firmware main menu

User menu

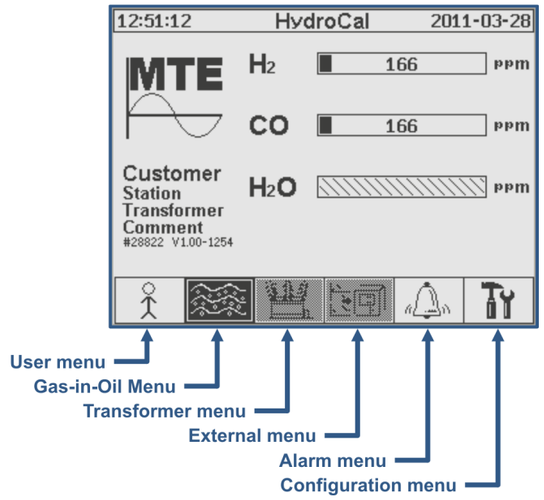
- Transformer administrator data
- Customer / Site administrator data

Gas-in-Oil menu

- Chart diagram H_2 and CO
- Result table H_2 and CO

Transformer menu

- Aging rate
- Hot spot temperature
- Loss-of-Live



External menu

- Voltage and current measurement
- Bottom and top oil measurement
- Oil humidity measurement

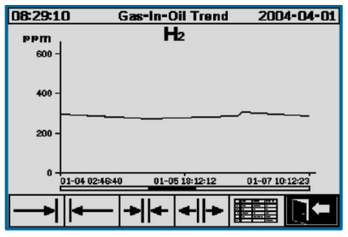
Alarm menu

- Report table
- Alarm acknowledgement

Configuration menu

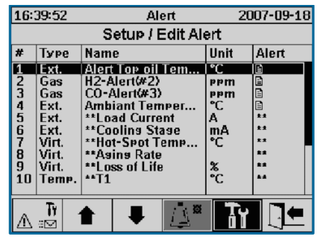
- Alarm level setting
- Communication setting
- Transformer setting Installation

Gas-in-Oil menu



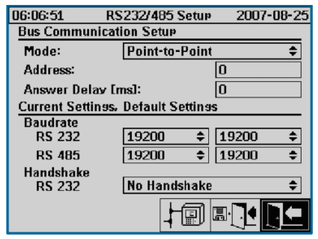
Individual chart diagram for hydrogen H_2, carbon monoxide CO and moisture-in-oil (H_2O in ppm and %)

Alarm menu



Display of alarm list. Details of each alarm and individual settings

Communication menu



Transmission speed adjustment for the RS 232 / RS 485 connection

Different adjustments / settings for the modem communication

PC-Software

Transformer administration data

- All administration data of a transformer can be entered
- Network of different power plants and transformer banks can be configured
- Selective contact to each transformer in the network
- Obtaining information of total transformer situation