

Technical data HYDROCAL DTM

General

Supply voltage:	45 ... 300 V AC / 45 ... 65 Hz or 65 ... 425 V DC
Power consumption:	Integrated battery with 10 min autonomy max. 100 VA
Cabinet:	Powder coated, stainless steel with lock 8 sealed cable throughs
Dimensions:	W 195 x H 405 x D 163.5 mm
Weight:	approx. 5 kg
Operation temperature: (ambient)	-55°C ... +55°C
Storage temperature: (ambient)	-20°C ... +65°C
Degree of protection:	IP-55

Measurements

Measurement	Range	Accuracy
Measuring quantity		
Oil temperature MESSKO	-20 ... +80°C	± 0,1%
Oil temperature FuehlerSysteme	-20 ... +120°C	± 1,5%
Oil temperature Magnetic-mount	-40 ... +125°C	± 0,5°C
Ambient temperature	-20 ... +120°C	± 3,0%
Load current Direct Input	1mA ... 6A	± 0,1%
Load current Flexible CTs	10mA ... 15.000A	± 1%
Load voltage	0 ... 600V	± 0,1%
Tap changer position	0 ... 100Ω/kΩ	
Online DGA	0 ... 5.000ppm	± 15% ± 20ppm

Operation principle

- CPU Module; BeEnergy IPC@CHIP SC45, LINUX RTOS Operation System
- RF Module; Magnetic-mount Temperature Sensor, Measuring range -40...+125°C, Accuracy ±0,5°C, Battery autonomy 10 years, RF 868MHz communication, (AES 128 bidirectional encryption)
- Power Quality Module; Voltages, Currents, Frequency, Power, Energy, Power Quality acc. EN IEC 61000-4-30 Class A, respectively EN IEC 62586-1/2, 3 channel voltage measurement U1, U2, U3, 4 channel current measurement I1, I2, I3, IN, Direct current 1mA...6A, Flexible current sensor up to 15.000A
- Analog Input Module 4-20mA, 8 channel incl. indicative LED, mainly for temperature, humidity, and other sensors with analog 4-20mA output


Communication


- CPU Module; 2 electrical Ethernet interfaces RJ45 (10/100BASE T), 4G/LTE CAT M1/3 Radio, SMA antenna connector, Mini SIM card slot, SD card memory
- Fibre-optical Ethernet Module; 2 fibre-optical Ethernet interface, 100BASE-LX10, SC Duplex multimode, 1 electrical Ethernet interface RJ45, 100BASE-T


Scope of delivery


- HYDROCAL DTM basic module incl. power supply and CPU module
- Optional powder coated, stainless steel cabinet with lock and 8 sealed cable throughs
- Optional communication and measurement modules
- Optional standards sensors


Standard Sensors


Oil temperature		Sensor model
Type	Range	
MESSKO® Combi Well TT	- 20 ... +80°C	

Oil temperature		Sensor model
Type	Range	
FuehlerSysteme OM4/E-I	-20 ... +120°C	

Oil temperature		Sensor model
Type	Range	
Magnetic-mount	-40 ... +125°C	

Ambient temperature		Sensor model
Type	Range	
FuehlerSysteme AM1/E-I	-20 ... +120°C	

Tap changer position		Sensor model
Type	Range	
Phoenix Contact MINI MCR-SL-R-UI	0 ... 100Ω 0 ... 100kΩ	

Online DGA		Sensor model
Type	Range	
HYDROCAL 1001+	0 ... 5.000ppm	

MTE Meter Test Equipment Inc.

HYDROCAL DTM

Distribution Transformer Monitoring System



HYDROCAL DTM is a modular online monitoring system for pad mounted or conventional distribution transformers as well as distribution substations.

It offers continuous, precision-level performance monitoring for mission-critical, high-value medium and low voltage transformers.

With the ability to monitor and trend transformer output voltage, load current by phase, temperature, and power Factor for an entire network of transformers, utilities are armed with powerful information regarding power distribution and equipment maintenance.

Thermal condition monitoring combined with load current, and voltages are one of the most important ways to detect transformer problems and to avoid transformer outages.

Furthermore, the information from multiple analog inputs (e.g. online DGA and/or humidity sensors) can be transferred together with the other data via RS485, Ethernet (electrical or fibre-optical), Bluetooth, radio communication, IEC 61850, DNP 3.0, MQTT, etc. to the SCADA systems of the utility.

The HYDROCAL DTM offers a complete innovative transformer monitoring system in one package.

Key Advantages


- Continuous monitoring transformer state-of-health
- Transformer life prediction
- Power factor monitoring
- High performance hardware
- Modernization of older installations
- Deploy anywhere at scale

Functions

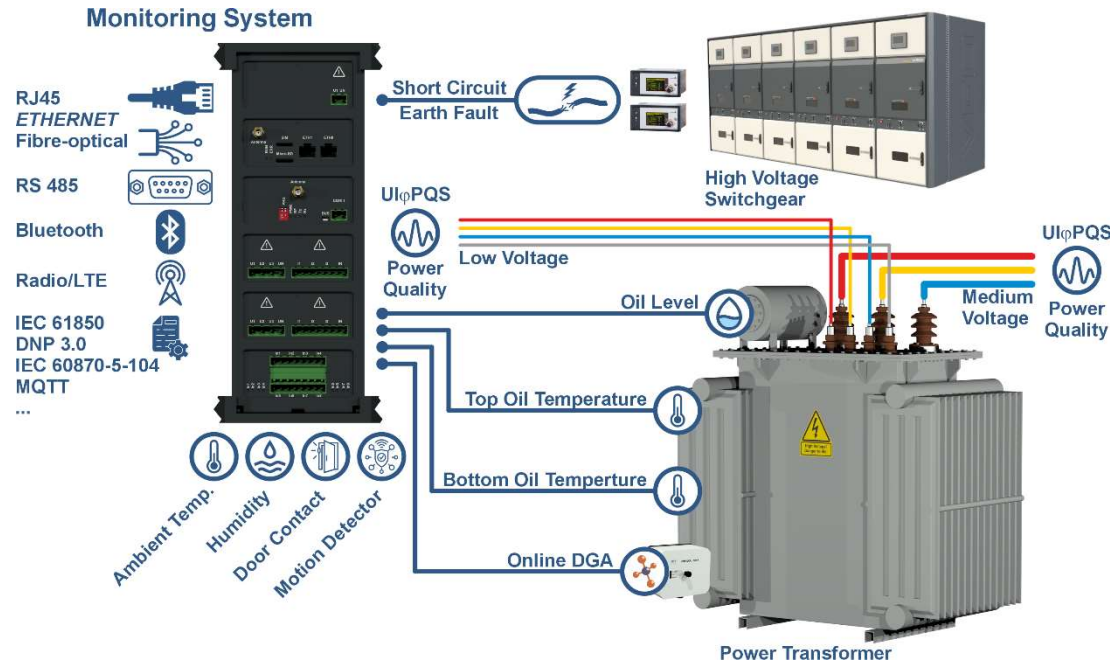
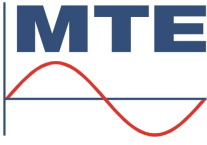
- Monitoring of distribution transformers and distribution transformer substations
- Monitoring of medium and low voltage electrical parameters
- U_φ, PQS, frequency, energy, power quality
- Monitoring of transformer parameters
- Oil temperatures, tap changer position
- Online DGA (e.g. HYDROCAL 1001+)
- Monitoring of ambient parameters
- Temperature, humidity
- Other parameters/conditions
- Door contact, motion detector
- Modular concept adaptable to customer requirements
- Proven CPU and cybersecurity concept
- Monitoring functions for HYDROCAL genX product range
- HydroSOFT Hybrid/Web App
- Integration of measurement of electrical parameters and power quality
- Support of time series database (TSDB) for large monitoring data size

MTE Meter Test Equipment Inc.

Subject to alterations

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The HYDROCAL DTM basically consist of a power supply module and a CPU module, which can be extended with several modules for different purposes

Modular Concept



- Power Supply
- Wide-range power supply 45..300 VAC/ 65..425V DC
- Integrated battery with 10min autonomy
- BeEnergy SGIM CPU (IPC@CHIP SC145 with LINUX RTOS)
- Radio communication
- RF communication to battery-powered wireless temperature sensors (et. al.)
- Measurement of electrical parameters
- Voltages, currents, frequency, power, energy
- Power quality acc. EN IEC 61000-4-30 Class A / EN IEC 62586-1/2
- 3 channel voltage measurement U1, U2, U3
- 4 channel current measurement I1, I2, I3, IN
- 8 channel analog inputs 4-20mA

Communication Modules



- RF Module
- Magnetic-mount temperature sensor
- Measuring range 40..+125°C
- Accuracy ±0,5°C
- Battery autonomy 10 years
- RF 868MHz communication
- (AES 128 bidirectional encryption)
- Fibre-optical Ethernet Module
- 2 fibre-optical Ethernet interface
- 100BASE-LX10
- SC Duplex multimode
- 1 electrical Ethernet interface RJ45
- 100BASE-T

Standard Modules



- Power Supply Module
- Wide ranger power supply
- 45..300V AC
- 65..425V DC
- 45..65Hz
- Integrated battery with 10min autonomy

Measurement Modules



- Power Quality Module
- Voltages, currents, frequency, power, energy
- Power quality acc. EN IEC 61000-4-30 Class A / EN IEC 62586-1/-2
- 3 channel voltage measurement U1, U2, U3
- 4 channel current measurement I1, I2, I3, IN
- Direct current 1mA..6A
- Flexible current sensor up to 15.000A



- CPU Module
- BeEnergy IPC@CHIP SC45
- LINUX RTOS Operation System
- 2 electrical Ethernet interfaces RJ45 (10/100BASE T)
- LTE CAT M1/3 Radio
- SMA antenna connector
- Mini SIM card slot
- SD card memory



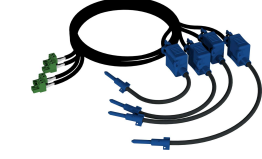
- Analog Input Module 4-20mA
- 8 channel incl. indicative LED
- mainly for temperature, humidity and other sensors with analog 4-20mA output

HYDROCAL DTM Standard Configurations

The modular concept of HYDROCAL DTM allows to select between 4 standard models:

Modules	HYDROCAL DTM			
Power Supply Module	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CPU Module	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RF Module	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SGIM PQ Module	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Analog Input 4-20mA Module	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Set-Up				

Accessories



- Flexible Clip-on CTs
- Measuring range 10mA ... 15.000A

- Magnetic-mount Temperature Sensor
- Measuring range -40°C ... +125°C
- Accuracy ±0,5°C
- Battery autonomy 10 years
- RF 868 MHz communication (AES 128 bidirectional encryption)

Cybersecurity

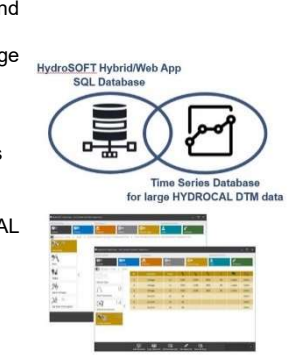
- **beenergy** SG SGIM Data Broker
- can be hosted in ISO 27000 certified data centers with access control, video supervision, security service, fire protection or on utility premises
- Horizontal scalability > 100.000 concurrent connections
- Data encryption acc. TLS V1.2/1.3 AES128/256, PFS over IP port 443
- Firewall with Ethernet port blocking
- **ean** certified
- by Cyber Threat Intelligence (CTI) / Offensive Security Team
- Methods
 - OWASP Testing Guide
 - ATT&CK Matrix
 - German BSI Guidelines

Main Parameters and Functions



- Monitoring of distribution transformers and distribution transformer substations
- Monitoring of medium and low voltage electrical parameters
 - UIP, PQS, frequency, energy
 - Power quality
- Monitoring of transformer parameters
 - Oil temperatures
 - Tap changer position
 - Online DGA (e.g. HYDROCAL 1001+)
- Monitoring of ambient parameters
 - Temperature
 - Humidity
- Other parameters/conditions
 - Door contact
 - Motion detector
 - Short circuit/Earth fault

HydroSOFT Hybrid App



- Database
 - Relational database (e.g. SQL)
 - structured in rows/columns
 - versatile for any application
 - Time series database (e.g. Apache)
 - good performance for large time-stamped sensor data