TKE
TECHNISCHER KUNDENDIENST & ENTWICKLUNG
NORBERT GERHARDT

# TMM-1 Trace Moisture Meter

## Product Summary


The TMM-1 Trace Moisture Meter is a universal gauge for the measurement of water in gases by the help of a phosphorus pentoxide ($P_2O_5$) electrolytic cell. Cells of most manufacturers can be used.

In conjunction with the TKE Trace Moisture Cell and the Q-Moisture Software the user gets a comprehensive analysis solution.

## Typical Applications

- Moisture evolution experiments (MEA) in the laboratory.
- Water permeation experiments through films and membranes for quality control.
- Process control and monitoring, process gas analysis in the chemical industry.
- Air intrusion detection, testing of moisture sensors in the field.

## Hardware Features

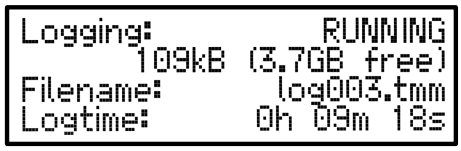
- Extremely high dynamic range of 1 ppb out of 2000 ppm allows the monitoring of very slow signal changes.
- Adjustable voltage converter provides the cell voltage of up to 25 V / 100 mA.
- microSD card slot for data recording.
- USB interface: No driver installation required. Accessed through COM port emulation or directly with DLL API.
- Isolated 4-20 mA current loop output: Diverse signals (current, voltage, moisture etc.) and scaling of the signals selectable.
- Two independent relay contacts: Diverse signal sources and switching threshold selectable.
- Redundant power supply via USB and DC jack.
- Graphic display: shows the reading and operational state. The display illumination can be turned on and off.
- A red / green LED signalizes an overcurrent condition of the cell.
- A pushbutton to step through the display pages and start actions.

# Local Operation


**Current gauge:** The electrical current multiplied with a conversion factor is equivalent to the water concentration, for instance in units of ppmV. Factor and unit can be changed by the user.


**Integral gauge:** The current is continuously integrated which results in the charge count. Multiplication with a conversion factor makes the amount of water, e.g. in units of µg. Factor and unit can be changed by the user.


**Operational state:** Informs about cell current and voltage, relay switch states, signal level of the 4-20 mA output, supply voltage and USB connection state.

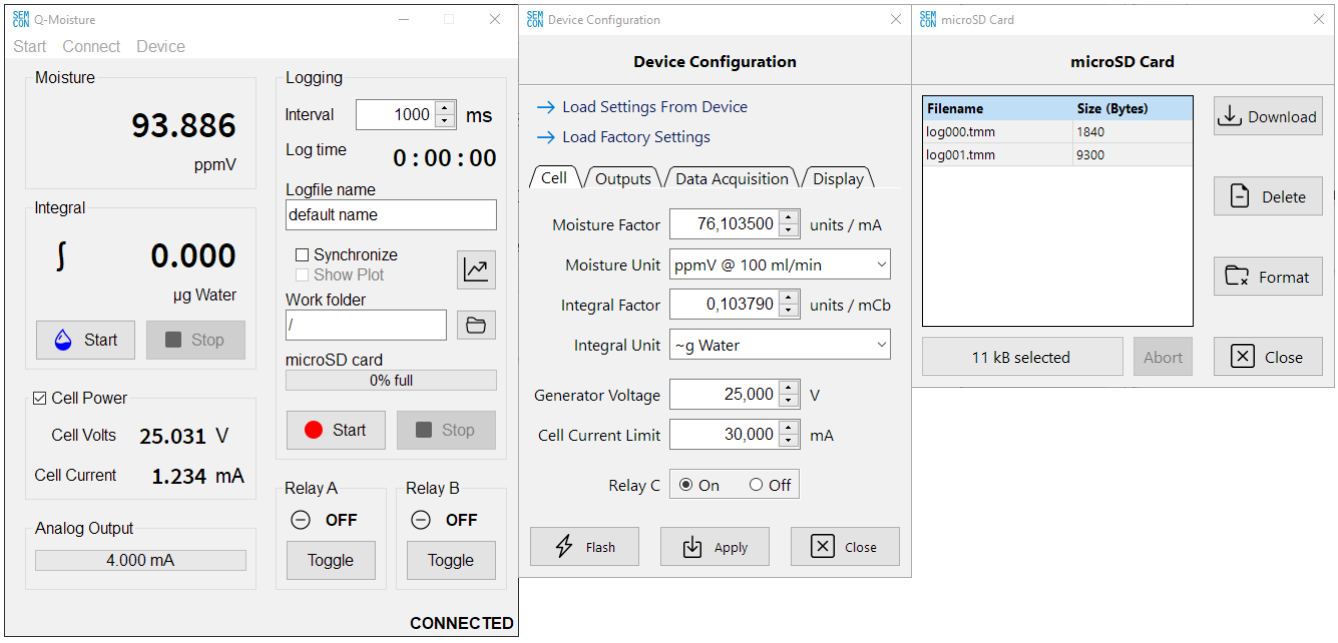



**Data logger:** Shows name, momentary size and elapsed time of the log file and the remaining free space on the memory card. A press on the pushbutton starts a new log file.

# Q-Moisture Software

The Q-Moisture software is an easy setup and control tool for the TMM-1 Moisture Meter. It is used to prepare the device for standalone operation in the field. In the laboratory Q-Moisture serves as monitor and control terminal.

Coming soon: Data visualisation and chart analysis. Export of log files to other file formats.

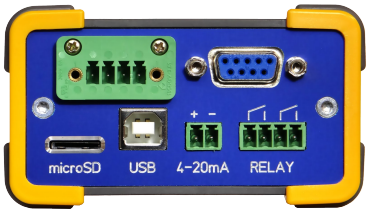
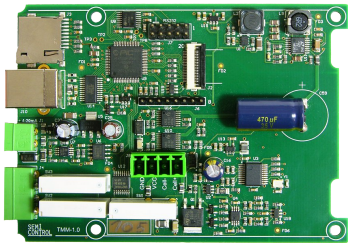
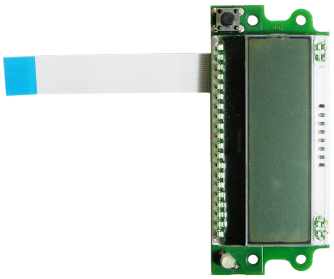
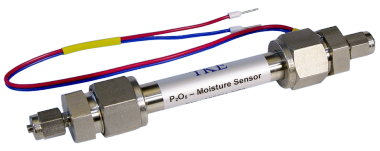



## Software Features

- Start / Stop data acquisition and water integration.
- Set cell voltage, current limit, sampling rate.
- Configure 4-20 mA signal source and scaling.

- Configure relay signal sources and thresholds. Toggle relays manually.
- Setup the TMM-1 power on default behaviour.
- Configure measurement reporting via RS232 or USB.
- Calibrate all analogue circuitry of the TMM-1.
- Manage files on microSD card, download log files.
- Written in Python, available free of charge.

# Ordering Information

| | |
|---|---|
|  | **TMM-1 Trace Moisture Meter LAB**<br>*Article No. 2001*<br>Laboratory rear panel with spring clamps and DC jack.<br>Phoenixcontact terminal blocks and USB cable included. |
|  | **TMM-1 Trace Moisture Meter IND**<br>*Article No. 2002*<br>Industry rear panel with screw terminals and RS232 I/O.<br>Phoenixcontact terminal blocks and USB cable included. |
|  | **TMM-1 Trace Moisture Meter PCB**<br>*Article No. 2010*<br>Printed circuit board, tested and calibrated, without display.<br>Phoenixcontact terminal blocks included. |
|  | **TMM-1 LCD Display**<br>*Article No. 2011*<br>Features signal LED, pushbutton and white backlight.<br>Shipment normally includes 75 mm FFC cable. Please specify the desired cable length. |
|  | **TKE Trace Moisture Cell**<br>*Article No. 2100*<br>Cell is shipped in dry condition, test report included.<br>Standard fittings are 1/8" Swagelok, 130 mm cable length. Please specify the desired cable length and fittings. |

# Technical Specifications

| | |
|---|---|
| Dimensions | 52 mm x 90 mm x 113 mm |
| Weight (with case) | 300 g |
| Power supply voltage | 5 ... 24 V ± 10% |
| Max. power demand | 3.3 Watt |
| Hold up time at 24V | 200 ms (worst case), 750 ms (open load) |
| Generator voltage | 0 ... 25 V |
| Accuracy of the generator voltage | 0.1% ± 10 mV |
| Current limiter | 0.1 ... 100 mA |
| Accuracy of the current limiter | ±0.2 mA |
| Maximal output power | 1 Watt |
| Measuring accuracy of the cell voltage | 10 Bit ± 1 LSB |
| Sampling interval | 1000 s ... 100 Hz |
| Resolution of the cell current ADC | 24 Bit, 1 kHz |
| Absolute accuracy of the cell current | ±(0.1% + 100 nA) |
| Current measuring resistor | 10 Ohm, 0.1% |
| Resolution 4-20mA output | 13 Bit |
| Rise time 4-20mA output | 100 ms (10-90%) |
| Voltage drop range 4-20mA output | min. 6 V, max. 26V |
| Quiescent current 4-20mA output | 3.0 mA while device is powered off |
| Relay contacts | 250 V AC or 30 V DC, max. 3 A |
| Measurement accuracy of supply voltage | 10 Bit ± 1 LSB |
| Display resolution | 6 digit floating point |
| USB interface | FTDI serial port, Full Speed USB, 12 MBit/s |
| RS232 interface | ±10 V, 115.2 kBit/s, 8N1 |
| microSD card | SPI Mode, 24 MHz, FAT16/32 |
| Display | 32 x 132 Pixel LCD, white backlight |
| MCU | 32 Bit MIPS, 48 MHz, 32 kB RAM |

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