M-Log5W Wireless Temperature Data Logger

Handling

The logger consists of the electronics (housing: Stainless Steel, 20x120 mm) and the Sensor (M8 waterproof connector, PUR cable, length by default 50 cm).

Important: The connector sensor<->logger is critical. Avoid to open this connection! The connector is only waterproof and reliable, if completely closed (factory delivery state). If the cable must be removed, please use Spray Vaseline (like „Kontakt 701" as sealant before reassembling.

If the enclosure must be opened (e.g. for battery replacement), please check the o-ring (sealing) very carefully! Use lubricant (to protect the o-ring) before reassembling.

We recommend to lubricate the enclosure additionally after reassembling and before using in the field (e.g. by Spray Vaseline). Please ensure, that no force affects the connector sensor<->logger in the field.

If required (as additional protection against smut), we recommend to use a small piece of fabric (like cotton) to cover the enclosure before putting under the soil. Do not cover the enclosure with plastic material, because of the risk of accumulating liquid water!

About the range: Optimal range (line of sight in open environment) could be up to 300 meters for loggers with separate antennas. If the sensor cable (like here) is used as antenna, a range of 100 meters is realistic. In this case the first 20 cm of the sensor cable are mostly important for the transmission. Hence in the picture on the right (a logger under soil) the cable is routed as a loop. Normally depths of 20-30 cm still allow a range of 10-30 meters. On request, special beam antennas with very high gain are available from us.
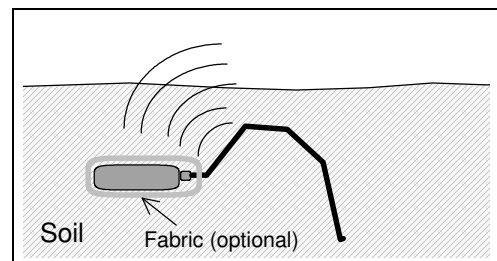
Technical Data

Logger: Temperature range: -40°C to +85°C. Radio transmission frequency: 433.92 MHz (harmonised frequency for license free operation within the EC, Switzerland, Norway, Iceland. (for other countries please check the local regulations. Technically 433.92 MHz is available for Europe (including Russia), Africa and China)). Effective emitted energy < 5mW

Memory: 512kB (non volatile) Flash memory. Up to 100.000 measures: 1 measure typically uses 5.5 Bytes (Software Version 1.1, will be reduced to 2-3 Bytes in a following revision). Each HK-record (time stamp and optional HK-data) typically requires another 6 to 9 bytes. Since HK-values are recorded only

after a selectable number of measures, (factory default is 6).

Example: 24 measures per day require 24*5.5 = 132 Bytes. Additionally 4 HK-records require additional 4 * 9 = 36 Bytes. Sum: 168 Bytes. Conclusion: 512kB will be good for abt. 8.5 years without clearing the memory. The memory has a duty cycle of >100 000 clearing cycles.

HK-data: Internally the battery voltage and internal temperature can be recorded. The internal temperature is <u>only</u> calibrated on demand. Calibrated accuracy is +/- 1°C in the range -20°C to +40°C. The battery voltage is measured with a resolution of 1 mV.

Sensor: „PT1000 1/3 DIN": Platinum based temperature sensor, accuracy at 0°C: +/- 0.1°C. Internal resolution: 0.01°C. Range: -90°C to +90°C. Typical accuracy < +/- 0.2°C in the range -20°C to +40°C. Long term stability: < +/- 0.02°C / year. The sensor is connected in 4-wire technology. Sensor cable possible from 20 cm to 1 meter, factory default is 50 cm. Cable: PUR (Polyurethane) .Sensor cover: Stainless Steel. Connector: „Hirschmann M8". Sensor: Male, Logger: Female.

Battery: SB-AA11 from www.vitzrocell.com :
                3.6 Volt Lithium (Li-SoCl2), 2400mAh.
                Max. Pulse load: <20 mA
                Size: AA with solder terminal
                Low self discharge rate (less than 1% after 1 year of storage at +20"C)
                Non flammable
                Non restricted for transport

                The battery can be replaced by the user. Similar types of battery are available from all major battery production companies. A word about the battery voltage: The voltage is around 3.4-3.6 V at 20°C, but „drops down" to 3.1-3.3°C at -40°C. The battery voltage does not significantly reflect the remaining power of the battery, the „temperature drops" show this better.

Calculation the battery capacity

4 main factors impact the battery capacity/lifetime:

- Constant load: about 10µA for the current version Mode „Sleeping" with periodically checking the radio. So 1 mAh is good for ca. 100 hours of „Sleeping"
- Pulse load: about 9mA for 0.2 seconds per measure, so 1 mAh is good for ca. 2000 measures
- Self discharge: about 10% after 10 years
- Temperature cycles: difficult to predict, could be up to 50% (worst case)

As a rough estimation: Theoretically 2400 mAh are good for >25 years of „Sleeping" or >4000000 measures (this is almost 500 years for 1 measure per hour), if no self discharge is assumed. Practically we normally calculate only with 1/3 of the capacity (the rest is for spare): For 1 measure per hour each year requires 5 mAh, with the rest of 2400 mAh / 3 =

800 mAh still almost 8 years of operation should be possible. Hence we would recommend to replace the battery with these settings after 5 years or later, if „temperature drops" for cold phases rises significantly.