



MicroLog T3

**Three-channel datalogger
for soil temperature measurement.**

User's manual



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1 General information

MicroLog T3 is a small three-channel water-sealed datalogger designed for the temperature measurement with accurate Pt1000 temperature sensors. It is mainly intended for the measurement of the soil temperature in different points or depths.

The datalogger case is made from high-density polyethylene allowing its long term leaving in soil. It also survives a temporary immersion to water.

Data memory can store typically 50,000 readings what means ca 25 months of continuous measurement with three temperature sensors. One record in memory generally represents the average of more measurement within the storing interval. Both intervals can be set independently.

The datalogger memory (non-volatile type) saves data also under totally discharged or damaged battery. Two ways of memory handling it is possible to choose during datalogger initialization: (i) system stops operation when the memory is full or (ii) it keeps running rewriting the oldest data with the newest ones.

PC with a Windows[®] system is required for datalogger setting and data handling. The communication between PC and datalogger is wireless, data are transferred by infrared communication by means of a special USB cable. Therefore, the data download does not need to open the enclosure; just to remove the soil covering the datalogger.

Mini32 fancy graphical software with many useful options including base statistics is a part of delivery.

Battery duration of 3.6 V lithium battery reaches up to five years of continuous work in hourly measuring intervals. The battery replacement can be easy done directly in the field.



2 Specifications

Measuring range	-20 to 60 deg.C
Acceptable sensors	RTD Pt1000 A-class
Sensor connection	4-wire
Excitation current	ca 200 μ A
Accuracy:	\pm 0.2 deg.C
Operating range:	
- temperature	-20 to 60 °C
- relative humidity	0 to 100 %
Datalogging unit:	
- memory capacity	128 kByte
- measuring interval	10 min to 4 hrs
- averaging (storing) interval	10 min to 4 hrs
- internal clock accuracy (-10 to 40°)	\pm 1 minute per month
- input voltage resolution	16-bit
Battery lifetime:	Lithium LS14250CN 3,6 V; 900 mAh
- storage time/idle run (logging stopped)	8/6 years
- when measured every 10 minutes	2 years
- when measured every 1 hour	ca 5 years
Size (diameter x length)	70 x 52 mm (incl. connectors)
Weight (incl. battery)	110 g

3 Operation

MicroLog T3 datalogger can be used in any environment non-aggressive against polyethylene and synthetic rubber. The operating temperature should not exceed the range -20 to 60 deg.C and the overpressure 0.2 bar (two meters of water column).

MicroLog T3 has no power switch. It is ready to run immediately after inserting of the battery before dispatching. The system configuration needs a connected PC running the Mini32 software and a special USB/IrDA cable made by EMS.

When it is not in use (operation off), the battery lasts for about six years what is comparable with the total battery lifetime. Nevertheless, remove the battery from the system when the use in following months is not supposed. Note that the system will ask for initialization before next operation. See section [After battery replacement or power drop-out](#).



3.1 Temperature sensors

The datalogger supposes connection of Pt1000 sensors. Sensors have to be manufactured as watertight and equipped with 4-pin Switchcraft EN3 connectors:



3.2 Start operation

3.2.1 Basic setting

Make sure that the infrared cable is plugged into a USB port and the communication port is properly configured.

Run Mini32 software.

Put the magnetic head close to the marked point on the sensor lid. The sensor should respond with red light bellow the datalogger lid.

Hold the cable head approximately 10 to 40 centimeters far from the sensor. Make sure that the rounded optical part on the cable head roughly points to the marked point on the sensor lid.

Push "Configuration" button. Set both interval of measurement and two-character device code.

Double click on a channel line opens a channel setting window. Set channel on, and add a description.

Left mouse click on ON/OFF button starts/stops data logging.



Press "Send" button in order to send the configuration to the datalogger.

3.2.2 Advanced setting

Push "More" button in "Configuration" window in order to approach advanced setting screen. This option enables:

- Datalogger reset (initialization). Initializing resets all system variables to default values, changes datalogger time and password, erases all the data from memory and sets the memory operation mode – see [General information](#). System calls for initializing automatically always when the supply voltage has dropped below 2.9 Volts, i.e. after battery replacement or after its total discharge. In such a case the user is asked for initializing by each communication attempt. Warning – save data always before initializing – they will be erased during the initialization!
- Memory erase (RAM clear) should be performed when the memory is full and the data overwriting is disabled and also when the data continuity is senseless or misleading – when the sensor is moved to different location for instance. Make sure that data were successfully saved before memory erasing!
- Hardcopy of memory (HCM). The whole memory content will be saved to file. Use it in case of problem with data conversion after downloading which could be caused by damaged data structure due to external factors. Send the file to producer for free encoding.
- Password. A four-character word can be introduced. Password disables unauthorized changes of configuration.

3.3 After battery replacement or power drop-out

It is necessary to initialize the datalogger always when the battery voltage drops below 2.9 Volt. This comes usually after the battery replacement or after its removing. See [Advanced setting](#).

Note: The battery status is continuously calculated since the time of the last system reset. Naturally, the full capacity of the new battery (900 mAh) is supposed. Therefore, the battery duration will be overestimated in case of using a partially discharged battery. See also [Battery replacement](#).

3.4 Memory capacity

Maximum number of days of the measurement stored in memory can be estimated according to formula

$$N = 50000 / (n * k)$$

where

n = number of records stored each day

k = number of channels in use

Example: Soil temperature measured by all three sensors stored to the memory in hourly intervals will fill up the memory in 790 days.



Note: When storing the data of fewer channels less often, the real memory capacity slightly decreases due to 15 bytes long system information stored into the data memory every day. When measuring in one channel once 4 hours (maximum time period of storing to the memory), the memory lasts for six years "only" instead of theoretically calculated 34 years.

4 Data processing

EMS Mini32 universal software supports also the data handling and processing.

Data download and saving process is activated after pushing "Download" button. All data from memory are saved in the file XY_2005_04_28.hex where XY is device code (see [Basic setting](#)) and 2005_04_28 is computer date (YMD). This HEX file contains the stored data and complete configuration information including the last battery voltage and datalogger time in a compressed format suitable for fast transfer to computer. Since this format is not usable for next data processing, the file is subsequently converted to another format - DCV (XY_2005_04_28.dcv). This file contains the same information as HEX one, it is typically four time larger but suitable for fast processing as file mixing and chaining, time averaging, drawing, editing, statistical processing etc. In case of accidental wrong data processing in DCV file it is easy to create the DCV file again after opening the original HEX file. Therefore, please save the original HEX files for archive purposes.

Mini32 software offers a wide range of data operation, mainly:

- connection files of the same configuration coming from different time periods
- mixing files of different systems
- calculation mean values of different time intervals (hours, days)
- drawing selected variables in time with the possibility of easy erasing of irrelevant values
- export of data to text, Excel or Lotus format
- export of graphs to JPG format
- drawing of vertical profiles of variables at a certain time
- printing of graphs
- basic statistical analysis
- regression data analysis
- user defined calculation
- non-linear multi-regression analysis



5 Maintenance

Datalogger *MicroLog SP* does not need any special maintenance except of cable and sensor checking.

5.1 Battery replacement

The battery replacement is easy so it can be done directly in the field (not under rainy condition if possible).

- Screw out the datalogger lid (use original tool supplied by manufacturer)
- Screw-out the battery from the battery terminals
- Short circuit the battery terminals with a metal part (screwdriver, pocket knife) in order to safely reset the battery life counter
- Screw-in a new battery, replace the desiccant bag
- Screw up the lid
- Make system reset. See [After power drop-out](#).

6 Warranty

The producer warrants right function of the measuring system for three years after it is accepted by a customer. All the faults will be removed free of charge during this time, at the measuring device itself as well as at sensors. The producer is not responsible for the faults originated by careless manipulation, incorrect operations, wrong applications or theft. The warranty covers the battery failure for three months only. The freight to producer is paid by customer; the sending back is paid by manufacturer.