Dendrometer Increment Sensor

DRL 26D

User's Manual

January 2024

Content:

General description

Logging stem increment sensor DRL 26D is designed for long-term registration of tree trunk circumference changes via stainless tape that encircles the tree trunk. Its length variations are measured with a rotary position sensor and stored into the datalogger memory in regular time periods. Also, the internal temperature of the electronic part of the sensor is measured and it can be stored into the memory, too.

The sensor is fixed to the trunk just by the strength of the tape – no sharp or invasive fixing parts are used.

The sensor is made from UV resistant plastic, metal parts are made from stainless steel or anodized aluminum. The internal space for the electronics is water-sealed.

The sensor is powered with a Lithium-ion battery for up to five years of continuous measurement. Communication with PC is based on infrared wireless transmission; however, a special USB/IrDA communication cable is necessary for data access.

The datalogger memory stores up to 100,000 measured values what means more than five years for of continuous recording of both increment and temperature variables stored in hourly intervals. Both time intervals of measurement and storing to memory are generally different so one value can represent the average of more readings.

The memory is non-volatile type, so the measured data are safely stored even in case of full battery discharge of battery damage. There are two memory operating modes: (i) the oldest data are overwritten with the actual ones or (ii) the logger stops operation when the memory is full.

Datalogger is supported with powerful graphical software for data viewing, pre-processing and export to common file formats (text, Excel). The software contains also advanced statistic module intended for processing of long-time data series, user define calculation and other options available for all EMS products.

1 Specifications

Increment sensors type	rotary position
Range	64 mm of circumference
Linearity	1 % of full scale
Resolution	1 μm
Internal temperature accuracy	± 0.3 °C
Tape strength	15 to 20 N in the whole range, stem diameter independent
Tape temperature coefficient	16 μm/m, K
Operating environment temperature	-40 to 60 °C
Operating environment humidity	0 to 100 %
Memory size (capacity)	256 kB (ca 100,000 readings)
Battery lifetime with measurement every 10 min	ca 4 years
Measuring interval	5 min to 4 hrs
Storing interval	5 min to 4 hrs
Clock accuracy (-10 to 40 °C)	better than ±15 sec/month
Battery	SAFT LS14250CNA
Size	100 x 70 x 100 mm
Weight (incl. battery)	ca 350 g
Protection	IP 63

2 Operation

2.1 Sensor installation

The unit is fixed to the tree trunk with 12 mm wide stainless tape. The tape is cut from the spool containing 20 m of tape by a scissors. Tape length should exceed the trunk circumference for 25 cm. The installation procedure is shown in the separate document.

Datalogger has no power switch. It is running after switching on the data logging by software. The system configuration is made from the PC running the Mini32 software by an infrared connection.

2.2 Infrared communication

For the communication is necessary:
- Actual version of Mini32 software (download at http://www.emsbrno.cz/p.axd/en/Software.html or Mini32>Related EMS software>Mini32 update)
- IrDA/USB communication cable
- Installed driver for communication cable (Mini32>Related EMS software>USB Drivers)


Communication process:
- run Mini32
- check that the correct COM port is selected (IrDA)

- bring the cable head close to the datalogger at the point marked as "IrDA access point and magnetic activation area"
- magnet inside the IrDA/USB cable head activates the communication and light up red indicator light under the dendrometer lid. Check the red light.
- now is possible to communicate (On-line, download, configurate) with the device
- communication process is indicated by progress bar:
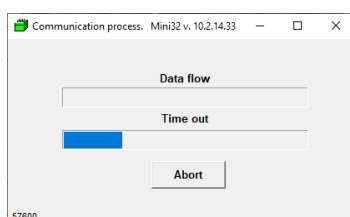
Background explanation:

The datalogger is activated by magnet inside the IrDA/USB cable head and is waiting for communication attempt from PC (command for *Download*, *Configuration* or *On-line*) for ca 20 seconds. If the datalogger does not receive any command during this time, the communication is deactivated and must be then reactivated by moving this cable head 60 cm away for few seconds and bringing it back.

Note: Indicator light indicates also the measurement and data storing of the device, thus the accessibility of the sensor to communication is relevant only as a response to the magnet inside the head of the IrDA/USB cable.

Troubleshooting:

The indicator light is not responding to the magnet

Possible Cause:
- Battery is dead – device does not have enough power for communication, replace the battery.
- Device is damaged – send to manufacturer for repair.

The indicator light is lighting, but communication does not work

Possible Cause:
- Trouble with the communication port – the driver is not installed or the actually connected cable is not installed to the chosen port – install driver and check the chosen port in Mini32 main screen
- Device is busy (measuring or storing) or in an indeterminate state (long delay between attaching the IrDA/USB cable and the attempt from the computer) – move cable head 60 cm away until the light go out and than bring it back.
- Battery is dead or almost dead – communication can be activated, but the device does not have enough power for other tasks, replace the battery.
- Device is damaged – we recommend checking the device at the manufacturer.
- IrDA/USB communication cable is damaged – check up-to-dateness of Mini32 software, drivers, selection of COM port in Mini32. If possible, check the cable functionality on other infrared communicating device.

2.3 Start operation

2.3.1 Basic setting

Run Mini32 software which is a part of delivery. Push "Configuration" button and activate IR connection by magnetic head. 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 tree description.

Left mouse click on ON/OFF button activates/deactivates data logging.

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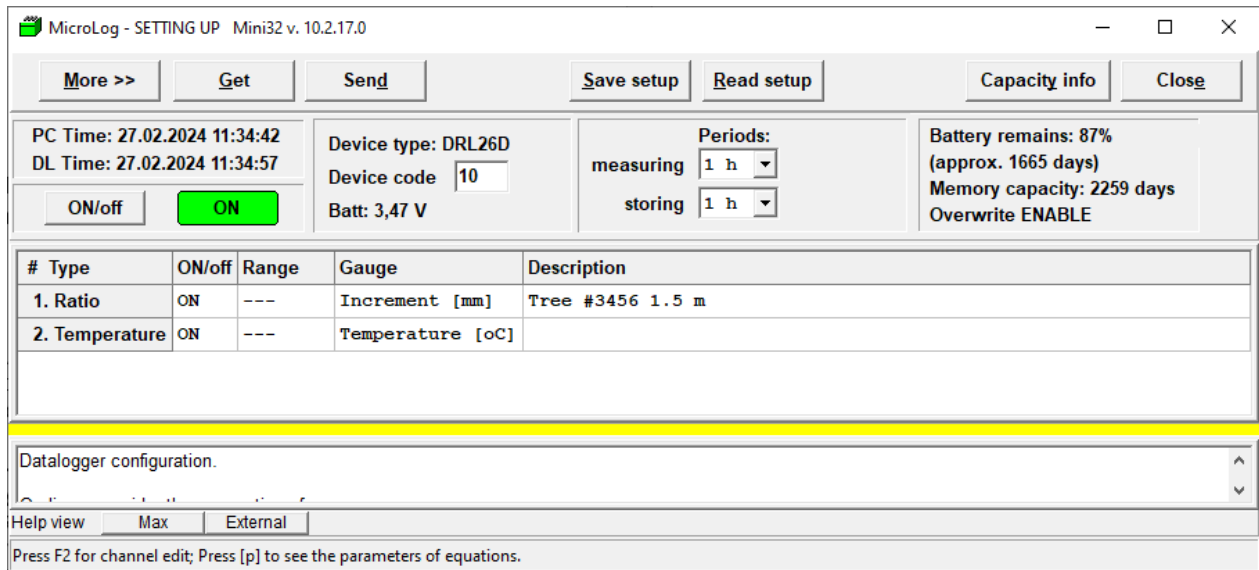
2.3.2 Advanced setting

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

- Initialization ("Init") resets all system variables to default values, changes datalogger time and password, erases the data from memory and sets the memory operation mode – see General description. The actual configuration can be kept otherwise a factory setting will be entered.

- Memory erase ("RAM clear") should be done when the memory is full, and the data overwriting is disabled and also when the data continuity is senseless or misleading – when the sensor in moved to different location for instance. Make sure the 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 the producer for free encoding.

- Password. A four-character string can be introduced. Password disables unauthorized changes of configuration.

2.3.3 After power drop-out

The battery status is continuously calculated since the last low voltage occurrence which normally indicates battery replacement according to the time of operation (measurement, communication with PC, data download). Naturally, the full capacity of the new battery is supposed. Therefore, the battery duration will be overestimated in case of using a used one or very old battery. Refer to separate manual describing the battery replacement.

2.4 Memory capacity

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

N = 100 000/(n*k)

where

N = memory capacity in days

n = number of averaged values within a day

k = number of channels in use

Example: Stem increment and temperature values stored in memory each hour fills up the memory after 5.7 years.

2.5 Data processing

EMS Mini32 universal software supports also 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_2024_04_28.hex where XY is device code (see [Base setting](#)) and 2024_04_28 is computer date (YYYY_MM_DD). 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_2024_04_28.dcv). This file contains the same information as the HEX one. It is typically four times larger than HEX file but it is 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 allows 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 *.bmp format
- drawing of depth/height profiles
- printing of graphs
- basic statistical analysis

- regression data analysis
- user defined calculation
- non-linear multi-regression analysis
- line-up function for increment record

3 Maintenance

DRL 26D unit does not need any special maintenance. Avoid shifting the sensor during the operation. Use the cable holder for convenient access.

3.1 Battery replacement

The battery replacement is easy and can be done even without removing the sensor from its original position on tree trunk. For detailed information see the Battery replacement manual.

After screwing out the six screws and opening the white plastic lid, you get to the electronics with battery on the main cylindrical body. Screwdriver PH 1 is necessary for screwing the battery terminals.

Please short circuit the old battery terminals with a metal tool (screwdriver, knife, door key…) before removing the old battery to make sure that the battery energy counter is reset.

4 Warranty

The producer warrants the right function of the measuring system for two 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 fright to producer is paid by customer; the sending back is paid by producer.

Brno, January 2024