DIRECTIONS FOR USE OF THE PRESSURE GAUGE

DMS



Operation manual is valid since firmware version 1.14

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PRESSURE MEASUREMENTS

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1. GENERAL

These instructions for use describes the functions of the digital pressure gauge DMS and provide the user directions for its use.

1.1. SAFETY WARNING

Incorrect use of the digital pressure gauge DMS or non-performance of these instructions can result in damage of the instrument or an injury of the operator. All personnel responsible for the operation of the instrument must be properly trained and informed about the dangers and must carefully follow these instructions for use and safety directions, see further in this document.

In case you find out that you do not understand any part of these instructions for use, please contact the producer.

The producer retains the right to continue with the development of this instrument without recording any single change.

1.2. PRESSURE MEASURING AND OPERATING WARNING

1.2.1. PRESSURE MEASURING

Pressure measuring by means of the digital pressure gauge DMS starts immediately after connecting pressure on the positive pressure input (2) = measuring of the relative overpressure or the negative pressure input (1) = measuring the relative underpressure. If both the relative and negative outputs are connected at the same time to different pressures, the DMS gauge measures the pressure difference. This data is displayed on the main display (6). If the nominal pressure range is exceeded 2.4 times, the main display will show OL = overload. Overload is indicated on the secondary display by means of signs - - - -.



If the gauge cannot display the measured pressure in the chosen unit, it will display OL and - - - -. Thus pay attention to a proper setting of the unit in accordance to the nominal pressure of the gauge.

1.2.2. PERMITTED MEASURED MEDIA

The DMS gauge is constructed only for measuring non-aggressive gases and non- aggressive liquids. In case of connecting to an unsuitable media, the gauge can be irretrievably damaged. If you are not sure about the character of the measured medium, contact us on www.cressto.cz

1.2.3. SYMBOLS

The below mentioned symbols are used in these instructions for use to indicate the cases when incorrect activity might result in the following difficulties:



PROHIBITIONS – non-observance of them could result in bodily harm or to irretrievable damage of the DMS gauge.



RECOMMENDATIONS – they warn about different difficulties of the operation. Non-observance of them can result in the gauge dysfunction or wrong measurement.



TIPS – help and advise the user to use the gauge correctly.

1.3. INSTRUMENT DESCRIPTION

The digital pressure gauge series DMS is a battery portable service and workshop device, intended for a wide use in industry, energetics, medical technology, air-conditioning, laboratories, etc. It is also suitable for the 4Pa test. Its advantages are especially measuring accuracy, a wide pressure range, possibility of a ten times increase of sensibility, simple operation, small dimensions, low consumption, a big amount of additional functions, USB communication through a standard microUSB cable. The manual multifunctional pressure gauge DMS is fitted into an ergonomically shaped casing from quality ABS plastic, rubberized on the sides. The front side of the gauge is dominated by a big graphic display with white backlights, covered with a foil keyboard with nine control buttons. For measuring pressure ranges higher than 100 Pa, it is allowed to measure both gas and liquid non-aggressive media, but gauges for ranges lower than 100 Pa allow to measure only non-aggressive gases.

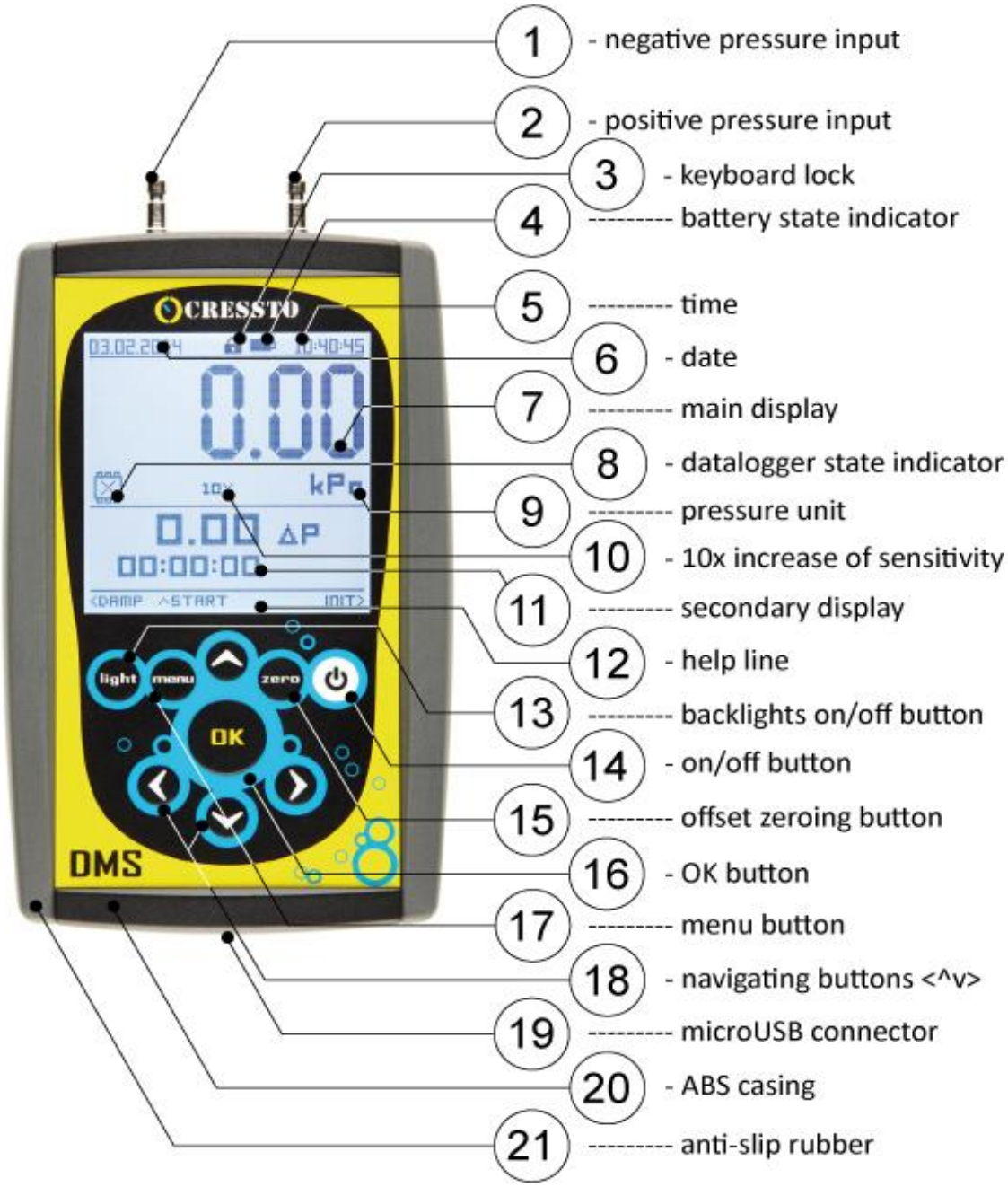


Figure 1

1.4. TECHNICAL PARAMETERS

Gauge type	DMS01	DMS1	DMS10	DMS100	DMS1000
Measuring pressure range	±200 Pa	±2 kPa	±20 kPa	-100÷200 kPa	-100÷2000 kPa
Maximum overpressure	1 kPa	10 kPa	40 kPa	200 kPa	2000 kPa
Non-destructive pressure (short-time)	20 kPa	100 kPa	100 kPa	300 kPa	3000 kPa
Setting error	max. 1%	max. 0,5%	max. 0,5%	max. 0,5%	max. 0,5%
Way of pressure measuring	Differential	Differential	Differential	Differential/absolute	Relative
Pressure connection	Nipple for a quick coupler 5mm				
Number of measuring (display)	10 (2,5) / second				
Operating temperature range	0 ÷ +50°C				
Storage temperature	-5 ÷ 55°C				
Cover	IP 41				
Power supply	2x batteries AA or accumulators				
Current consumption	50mA with backlights, 10mA without backlights				
Max. feeding current	450mA				
External dimensions	145 x 85 x 35 mm				
Weight (with a battery)	285g				



A differential pressure gauge with a disconnected negative pressure input measures relative pressure.

2. CONTROL

DMS is controlled by means of a 9-button foil keyboard, situated on the front side of the gauge.

- **On/Off** (14) – serves for switching on and off of the gauge. For switching it on/off, it is necessary to hold the button for 0,25s.
- **Zero** (15) – serves for taring the offset, or rather modification of the initial measuring level. When the inlets are disconnected from the measured pressure or the positive inlets (2) and the **zero** (15) button. A successful taring is confirmed by a sound signal. But if the pressure is connected and the **zero** (15) button is pressed, the gauge will be reset to the currently connected pressure level, so called taring. When the pressure is disconnected, the gauge will display the value of the tare pressure, but with the opposite sign.
  The **zero** (15) button also resets the numeric values of the adjustable items in the menu. After the cursor is clicked on the numeric value and the **zero** (15) button is held, the value will be adjusted to zero(s).



But zero does not necessarily have to be the default value!

- **Menu** (17) – serves as entry/return to the basic menu

- **Light** (13) – serves for switching on/off of the display backlights. Its adjustment is described in the chapter 3.5.
- **OK** (16) – serves for the choice confirmation in the menu or for confirmation of the adjusted values
- **<^v>** (18) – navigating buttons serve for the movement of the cursor in the menu and adjusting the requested values. They can also have different uses according to the chosen function. See the help line (12).

3. MENU

The menu is entered by means of the **menu** (17) button. This way are displayed the actual possible adjustments and accessible functions of the given version of DMS. Cursor is moved by means of the **<^v>** (18) buttons and the values are confirmed by the **OK** (16) button. For an example of a menu look, see Figure 2.

Lock the keyboard serves to prevent access to the settings (menu) of the device. To lock activates by pressing **OK** (16) + **menu** (17) on the main screen. Both buttons must be held for 3s until a beep sounds and the keyboard lock icon (3) appears in the title bar. Unlocking is carried out in the same way as locking. **OK** (16) + **menu** (17), 3second.



Figure 2

3.1. SENSITIVITY

The sensitivity function enables the user a ten times increase of the gauge sensitivity and also definition on the main display (7) by 1 digit. But the accuracy of the gauge remains unchanged, e.g. 0.5% of the nominal range. Switching on/off of the function is indicated by an icon on the main display (10).



Figure 3

3.2. DAMPING

Damping in the DMS gauge is realized by means of an adjustable time constant, in the range 0.1 – 9.9 second. It is possible to switch it on/off directly from the menu or whenever during the measuring by means of the **< DAMP** button, see the help line (12). Switching it on/off is confirmed by a sound signal.



Figure 4

3.3. UNIT

The user can choose from 17 pressure units (Pa, hPa, kPa, MPa, mbar, bar, atm, kg/cm2, mmH2O,cmH2O,mH2O, inH2O, mmHg, inHg, torr, PSI, PSF). They are units of the SI and Pascal systems and their multiples, but also units used in other different branches. The choice is executed by the **^v** arrows and the confirmation by the **OK**(16) button. The chosen unit is related to the pressure values on the main display (7), to the values on the secondary display (11) and also to the ± limit of the pressure difference in the leakage test, see **3.4.3**.



Figure 5

3.4. FUNCTIONS

3.4.1. TEMPERATURE *(number of function is 0)*

It is possible to display the temperature on the pressure sensor bridge on the secondary display (11). While measuring the medium pressure with the same temperature as the environment, we can say that it is the orienteering temperature of the environment. The temperature is given in degrees of Celsius. Calibration and the declared gauge accuracy are not related to the temperature data.



Figure 6

3.4.2. MIN / MAX *(number of function is 1)*

The max/min function is designed for detection of both positive and negative pressure peaks and impacts with the time constant >100ms. The gauge measures with a period of 1/10s, faster events might not be detected. The result of this measuring is again displayed on the secondary display (11). The actual maximum and also minimum can be reset by means of the **INIT>**(18) button.



Figure 7

3.4.3. LEAKAGE TEST *(number of function is 2)*

This enables the user measuring of a pressure change in the adjusted time period (test time). The test is started by the **^START** button. If the test time is adjusted to 00:00:00, the test runs to pressing the **vSTOP** button, otherwise it is stopped automatically according to the adjusted time. It is also possible to adjust the ± limit of the pressure difference, if it is exceeded, it is announced by a sound signal and the value of the pressure difference flashes on the secondary display. If the test is not switched on, it is possible to initialize the pre-adjusted values by the **INIT>** button.

If the gauge is equipped with a datalogger and it has a permitted data record, the record is started together with the leakage test by the **^START** button and is stopped by the **vSTOP** button.



Figure 8

3.4.4. SPEED/FLOW (Root function) *(number of function is 3)*

The DMS gauge carries out the calculation of the flow speed on the basis of measuring the differential pressure on the throttling element. These plates can for example be Pitot´s tube, Prandtl´s tube or another throttling element. The throttling element properties are represented by the **K** constant and a power constant **x**. The **K** constant has the default value 1 and can gain values 0 – 9.999. The **x** constant has the default value ½ (0.5000 – square root) and can be adjusted to the value 0,0001 to 0.9999. It is also necessary to set the density of the measured medium **ρ(ró)** (default air 1.29 kg/m^3) and the section of the measured pipe **S**.



Figure 9

This relation is valid for the speed calculation:

$$v = k \times \left(\frac{2dP}{\rho} \right)^x [m/s]$$

Where: v=flow speed, k=plate constant, dP= measured differential pressure, ρ=measured medium density in kg/m^3, x=power constant

For the flow calculation:

$$Q = v \times S [m^3/s]$$

Where: Q=flow, v= measured flow speed, S=section in m^2

3.4.5. NONE *(number of function is 6)*

With the choice None function, the secondary display (11) remains blank.

3.4.6. HOLD FUNCTION

The HOLD function “holds” the actual measured pressure value on the main display (7). It is active after pressing the navigating button (18) **HOLD >**. After it is released, the main display shows values according to the actual adjustment of the DMS gauge DMS.

3.5. DATALOGGER

Datalogger is not fitted in the basic version of the DMS pressure gauge. So it is an optional accessory.

- Number of records in one or up to 1024 sets.
- Measuring time 1s to 256 hours. If the measuring time is 000:00:00, the record runs till pressing the **REC OFFv** or **STOPv** button (leakage test, datalogger) or filling up the memory.
- Record period from 1s to 24 hours.

Recording to the datalogger must be allowed in the menu by pressing **recording**, subsequently menu of datalogger-settings rolls down. Which is indicated on the display by **datalogger state indicator** (8). The figure to the right of it displays % of filling up the datalogger memory. If the record is allowed, the **^REC ON** button is displayed at all functions, after its pressing the record to the memory is started. The record is indicated by a rotating arrow in the icon **datalogger state indicator** (8). The **REC OFFv** button serves for stopping the record.

Manual record is a function, that allows recording of current measured value, outside of the set logging period. The function can be started in the datalogger menu, the current record is saved by pressing the **OK** button (16) during the measurement. The indication of correct record is acoustic and at the same time the letter "R" (record) appears in the datalogger status indicator icon (8). Manual record is marked with 32 + number of selected function in the data.

The record format in the datalogger memory:

Characteristic	Date and time	Temperature	**Pressure**	Unit	Sec. value 1	Unit 1	Sec. value 2	Unit2

Record into the datalogger in the "Sleep mode". This record mode is used for long-term measuring with a longer record period with respect to the battery life. For the activation of the "sleep mode", it is necessary to start the record into the datalogger by means of the **^REC ON** or **^START** button and then it is enough to "switch off" the gauge by pressing the **Gauge on/ off** button (14). The gauge is then switched on automatically only for the record of values to the datalogger memory. If the sleep mode is active, the datalogger state indicator (8) is displayed with a 4s period.

3.6. BACKLIGHTS

The DMS gauge display backlights are switched on and off by means of the **light** (13) button. It can also be adjusted in the menu\backlights. The user can change:

- **Brightness** (1=minimal brightness, 5=maximal brightness).
- **Contrast** (0=minimum contrast, 5=maximum contrast).
- **Backlight (min.)** (0=the backlight does not turn off automatically; 1÷9=the backlight automatically turns off after elapsing of setet time in minutes)
- **Aut. Switch off (min.)** (0=the device does not turn off automatically; 1÷255= the device turns off automatically after elapsing of setet time in minutes). If data recording is running, the device will switch to the sleep mode after the setet time elapsing. If the leak test function has a preset duration time, the device will turn off

after elapsing of this time + the time set in automatic switch off. The device does not turn off automatically when the USB is connected.



THE TIME OF BATTERY OPERATION DEPENDS ON THE BRIGHTNESS OF THE DISPLAY BACKLIGHTS AND THE TIME IT IS SWITCHED ON.

3.7. CALENDAR/HOURS

The time is stated in the format **hh:mm:ss**
The date in the format **dd:mm:yyyy**

The information about the date and the time disappears immediately after disconnecting from the power supply – unplugging or total discharging of the batteries/accumulators or disconnecting from USB. An exception are gauges fitted with a datalogger, where the date and the time remain actual in the gauge without power supply for ca. 5 minutes.

3.8. INFO ABOUT THE INSTRUMENT

A part of the **Info** about the instrument is the type of the instrument, the pressure range of the instrument, the serial number of the instrument and the version of the firmware and also the language option. The option **Factory setting** returns by the confirmation **YES** all settings to the values saved at the construction.

4. POWER SUPPLY AND CHARGING

4.1. POWER SUPPLY

DMS can be power supplied from two pieces of AA batteries or two pieces of AA rechargeable accumulators. When inserting the batteries, it is necessary to observe the right polarity, see the label placed at the bottom of the battery space. It is also possible to power supply the gauge by means of a USB supply (5V and 500mA). Always only after the first switch on of the gauge after changing batteries, the display with the choice of batteries appears.



PAY ATTENTION TO THE PROPER CHOICE OF BATTERIES/ACCUMULATORS. AN INCORRECT CHOICE COULD DAMAGE THE GAUGE.

4.2. CHARGING

Charging is done through the USB connector (19) on the bottom side of the gauge. The supply voltage is 5V and the supply current max. 500mA. The battery state indicator (4) situated in the upper part of the display indicates the power supply. In a proper feeding cycle, the battery state indicator changes from “zero” to the full charge of the accumulators. As soon as the accumulators are fully charged, the feeding current is switched to the keeping current. Indication of this state is again displayed on the battery state indicator by flashing of the last division of the battery icon. The battery state indicator (4) is active during charging also after switching the DMS gauge off.

IT IS RECOMMENDED TO CHARGE ALWAYS BY THE WHOLE CHARGING CYCLE (ca. 6 hours at the room temperature). THIS WILL PREVENT EARLY WEAR OF THE ACCUMULATORS.

5. SERVICE

Manufacturer provides both guarantee and post-guarantee service for these devices. The routine maintenance includes the periodic battery inspection and their possible exchange. It is recommended to keep the device in cleanness, to prevent high temperature impact, excessive humidity and mechanical damage.

MANUFACTURER IS NOT RESPONSIBLE FOR ANY DAMAGES CAUSED BY MISUSE OF THE PRODUCT.

Sale comes out of standard business conditions.
See. http://www.cressto.cz/business-conditions

6. DATALOGGER DOWNLOADER – SOFTWARE

Datalogger downloader is a freeware (compatible with Win 10,7 and XP) designed to control the DMS handheld pressure gauge, but it primarily serves for retrieving and storing the data stored in the DMS data logger.

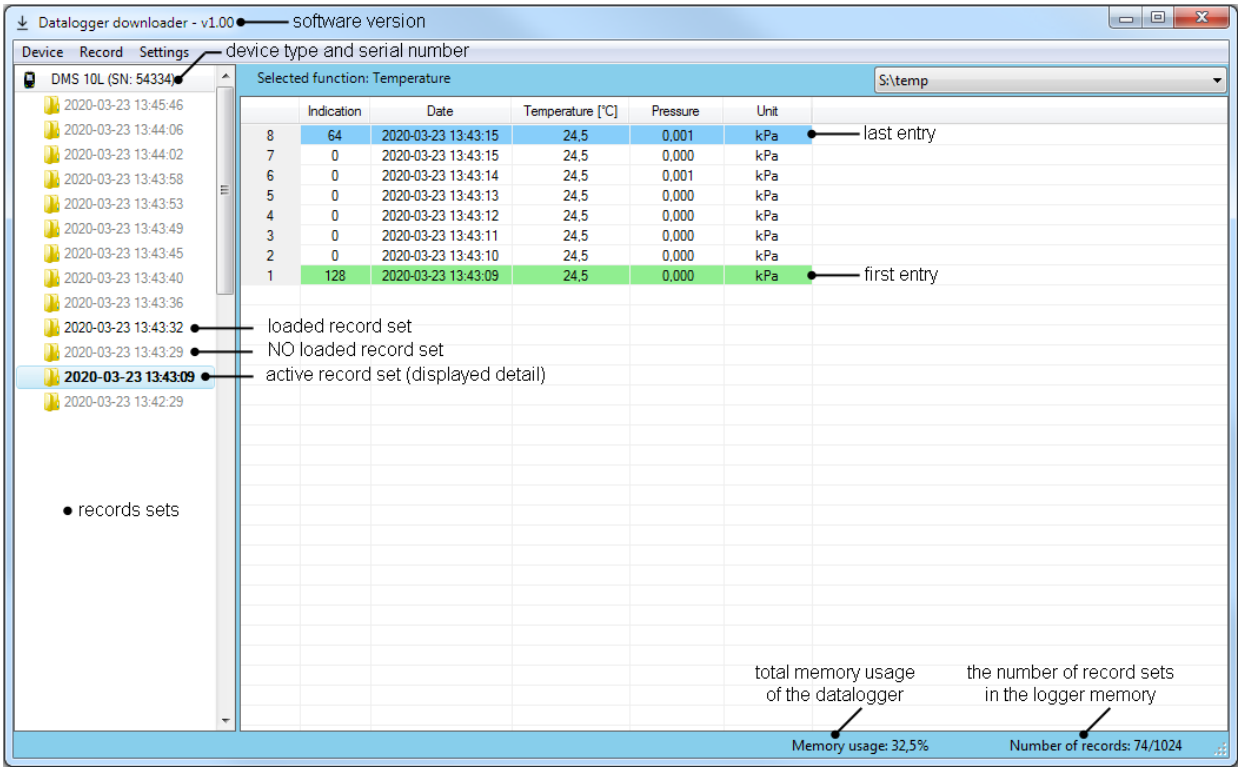


Figure 10

6.1. CONNECTION

After starting up Datalogger downloader (no need to install) and before the DMS is connected to the PC, a green progress bar is running in the lower left corner of the window.

The device connection is implemented by microUSB cable. After inserting the cable into the connector (19), basic data are automatically uploaded from device memory up to 4s.

6.2. DESCRIPTION

The Datalogger downloader window is divided into two logical parts. In the left column, the device type is displayed and the individual records files are shown below (Figure 10).

- **NO loaded record set** (gray) - view file name only (date and time)
- **Loaded record set** (black) – records from file are visible in PC.

FILE IS LOADED (USER CAN SEE IT), BUT NOT SAVED.

- **The active record set** (black, bold) - applies the same as the loaded record set, with the difference, that the values of the active file are displayed in the right section of the Datalogger downloader window.

The right section shows specific records from the current record set. The individual data logger records are clearly displayed in the table (Figure 10).

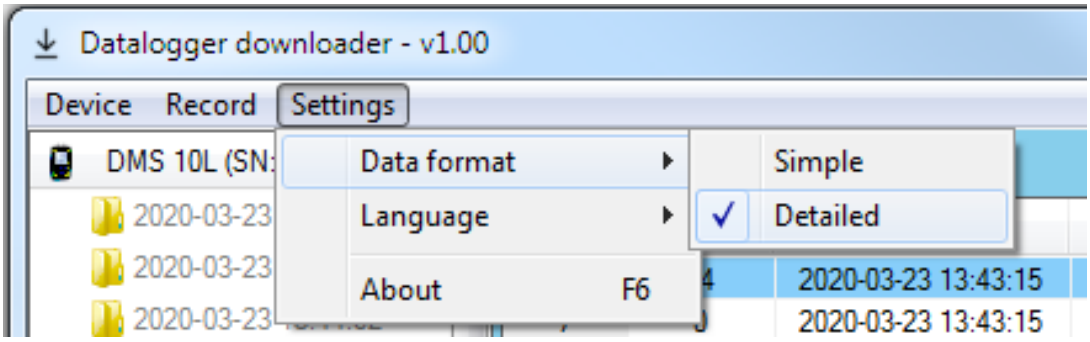


Figure 11

The display format can be changed in the menu (Figure 11). Settings \ Data Format \ Simple or Detailed.

- **Order of the record** - sorting from oldest to latest
- **Index** – information about selected function
  - The first entry is marked in green and the index is 128 + number of the selected function
  - The last entry is marked in blue and the index is 64 + number of the selected function
  - Manual record index is 32 + number of the selected function
  - Unfinished record is marked in red (recording is still running, or batteries have run out during recording)
- **Date** – in format YYYY-MM-DD hh:mm:ss
- **Temperature** – mentioned in °C
- **Pressure** – main measured value
- **Unit** – of main measured value
- The other columns refer to the selected additional function.

In the bottom right corner of the Datalogger downloader, you will find information about the current usage of the data logger memory and the number of records (max. 1024).

6.3. FUNCTION

- **Update the records** – use F5 button for reload of records
- **Delete memory** – or button Delete deletes data from DMS data logger. Deleting is blocked by question, whether user really wants to delete data.
- **End** – ends Datalogger downloader.

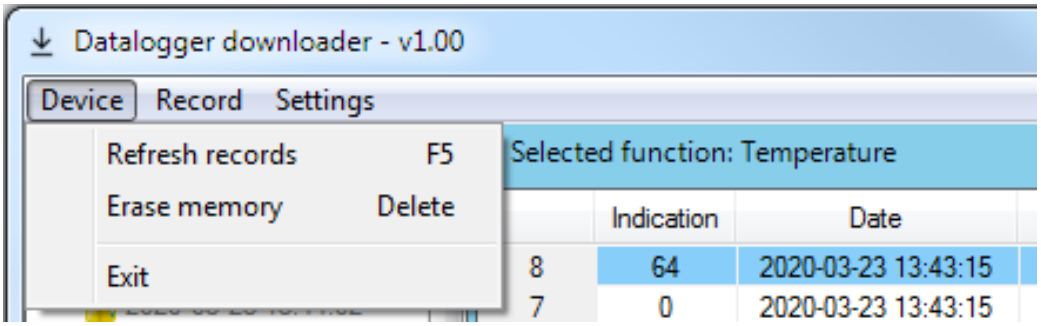


Figure 12

6.3.1. LOADING DATA

Record files can be retrieved individually or in bulk. Clicking the left mouse button selects the file. Double click on the device type marks all records files. Loading can be made by right mouse button clicking or button F2.

6.3.2. SAVING DATA

Data is stored in * .CSV format and values are separated with tabs. Record files can be saved individually or in bulk. Right-click on the record file is selected to **Save** (F3 key) or **Save as** (F4 key).

- **Save** - automatically saves the records file to the path selected in the upper right corner of the DMS Control window.
- **Save as** - records files can´t be stored in bulk. And always asks for the save path.

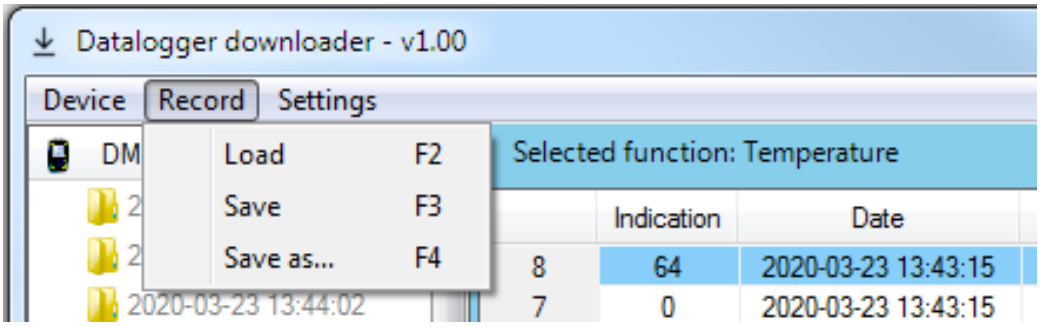


Figure 13

7. DISPOSAL NOTIFICATION

- Devices nor batteries must not be disposed of with household waste.
- Devices for liquidation has to be stored in a place intended for the collection of waste electrical equipment or send them back to the supplier, who will forward it to the manufacturer for proper disposal.

8. NOTE

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