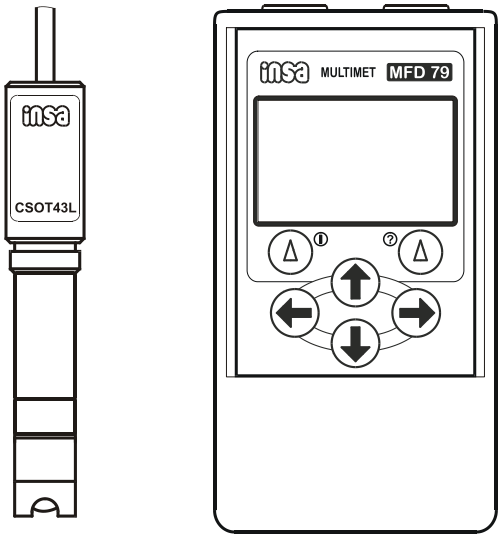
OXYGEN AND TEMPERATURE METER

MFD 79OPTO-B



Short form of operating and maintenance instruction manual

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▪ **CONTENTS**

1. INSTRUCTIONS FOR PUTTING INTO OPERATION

1.1. INSTALLATION OF THE BATTERY

The instrument is powered from two AA batteries or rechargeable batteries. Batteries are fitted in the lower rare part of the casing. We insert batteries by

taking off the lid of the battery space (secured by a screw), and putting batteries in proper polarity in. Be sure that lid is fixed correct and tight.

Lifetime of batteries is approx. 700 hours (without backlight). Lifetime of rechargeable batteries is shorter. **Backlight on, reduces lifetime considerably.**

Symbol ▭ in the bottom of the display indicates almost unloaded battery and blinking symbol ▭ means that battery is practically empty.

1.2. ARRANGEMENT OF CONTROL ELEMENTS

For communication with the operator, the instrument is equipped with six keys. Their arrangement shows fig. 1.

Functions of the keys are as follows:

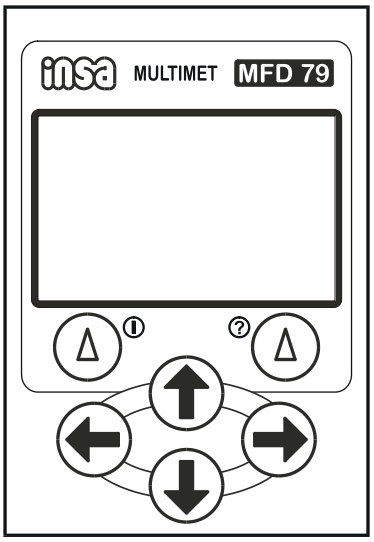

Fig.1. Control elements of the MFD 79OPTO meter

By pressing the key we execute the function marked on the display above this key - MENU, BACK, CANCEL, etc. With long pressing this key (through a few seconds) we turn instrument on and off. We **turn the instrument off always from the mode measuring** (display shows measured values).
By pressing the key we execute again the function marked on the display above this key - CALIBRATE, OK, SAVE, LIGHT ON etc. With long pressing of this key - in any mode - we raise function help to this mode.
Function of the keys ⮌, ⮍, ⮏ and ⮊ in main mode is shown on the instrument display – using these keys we choose basic modes of the instrument. In other modes by means of the keys ⮌ a ⮊ we shift choices to the left and right (with the ⮍, ⮏ keys - up and down) and/or we make constants (numbers) greater, smaller.

In the mode **Measuring** we can go by pressing ⮌ key directly to the mode calibration.
If the instrument is not in the mode measuring for time longer than 10 minutes and no key was activated, then it goes automatically to mode measuring. As long as of any reason is it not desirable, pressing of any key is necessary before elapsing of waiting time.

1.3. CONFIGURATION – SENSOR SELECTION, DISPLAY OF MEASURED VARIABLES

Prior to the beginning of measuring, we determine which variables the instrument has to measure and on which lines of the display they will be displayed.

Configuration we will make in the following way:

With long pressing – of the ⍙ key - we turn instrument on. After accomplishing of the start-up diagnostic instrument goes to measuring mode – there are measured values on the display. We press the ⍙ key again – shortly this time and we have the main menu on the display (Fig. 2). By means of ⮍ key we select **DISPLAY - ITEMS** mode and there is an overview of measured variables on the particular lines on the following display. By means of ⮍, ⮏ keys we select single lines (selected line is displayed in reverse mode) and with ⮌ and ⮎ keys we select variable which will be measured and on this line displayed. There are following variables to be selected – oxygen concentration **<mg/l>**, oxygen saturation **<%>** and temperature measured by oxygen sensor **<Temp.O_2>**. If we select **- - - -** , the appropriate line will be empty and will not be displayed. Selection is not limited in any way. It is possible to display one variable in one line only or one variable in all lines e.g. If there are more than two variables (two lines) selected, than it is possible by pressing ⮍ or ⮏ keys to shift lines up and down. It is advisable to place empty lines on the last positions. These lines will not be displayed at all.

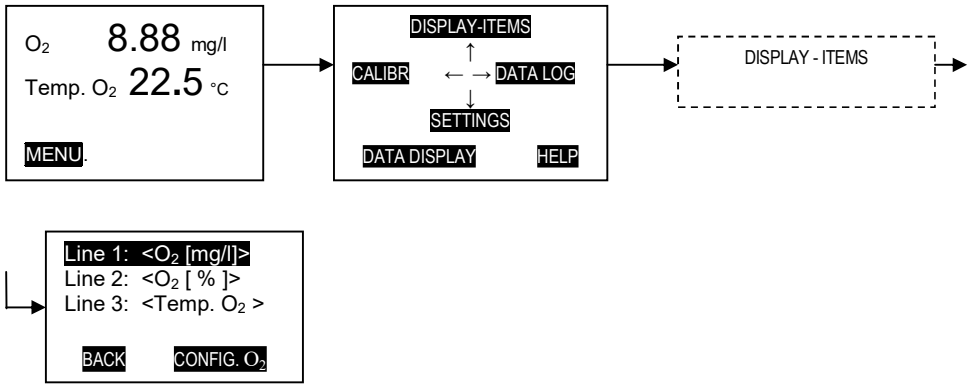

Fig. 2. Configuration – sensor selection

Oxygen we can display in mg/l and % of saturation on two lines simultaneously.

After selection of oxygen in particular line we can – by pressing ⓐ (**CONFIGURE O_2**) key - go to the display on which we can adjust actual value of barometric pressure during measurement if needed.

1.4 CONNECTION OF SENSORS

Sensors are to be connected to the instrument as shown in the fig. 3

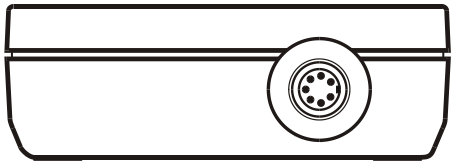

Fig. 3 Connection of sensors to the instrument

The preparation of oxygen sensor CSOT 53LZ-S is described in the in the following chapter.

To maintain IP protection it is necessary to use delivered hood for unused input (connector).

1.5 OXYGEN SENSOR PREPARATION – MEMBRANE HEAD EXCHANGE

When putting the sensor into operation or replacing the worn off membrane head, observe following procedure:

If necessary clean the sensor thoroughly.

Exchange of the membrane head is extremely easy.

We simply screw the worn-of membrane head of and screw new membrane head on.

Tighten the membrane head with delicacy **but firm**. The head must fit perfectly tightly on the silicone O-ring on which it fits. If the membrane head is not tight the sensor could be damaged irreversibly.

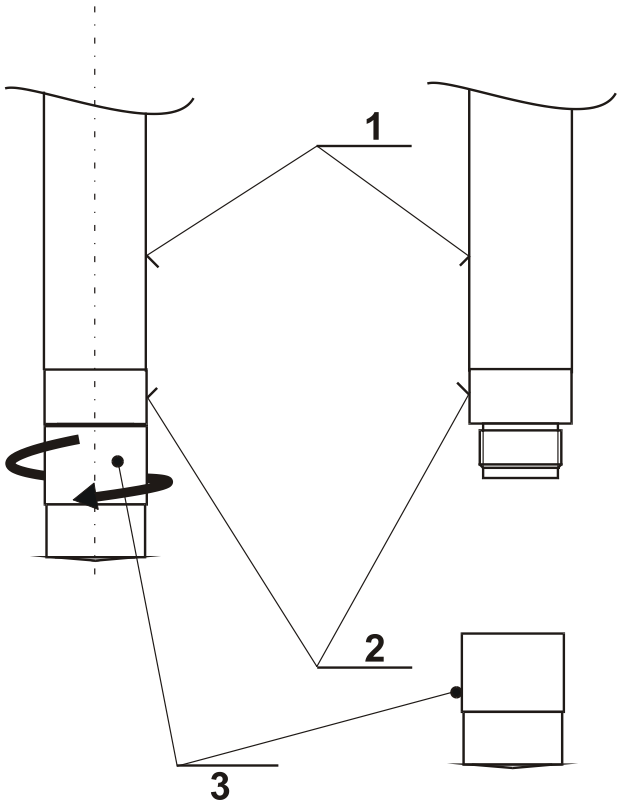

Fig. 4 Sensor CSOT 53LZ-S – membrane head exchange

2. CALIBRATION

The instrument enables three methods of calibration.

- **One point calibration** (quick calibration. We activate this calibration by pushing the ↻ key in the mode **Measuring** or choosing mode calibration in main menu.

  The oxygen is possible to calibrate also in this way, but oxygen measurement is practically calibration free.
- **Service calibration** is the basic calibration, made in the factory.

2.1 CALIBRATION - OXYGEN

Calibration of the oxygen is performed only exceptionally in the case of suspicion of incorrect function of the instrument. Calibration is also recommended after exchange of the membrane head.

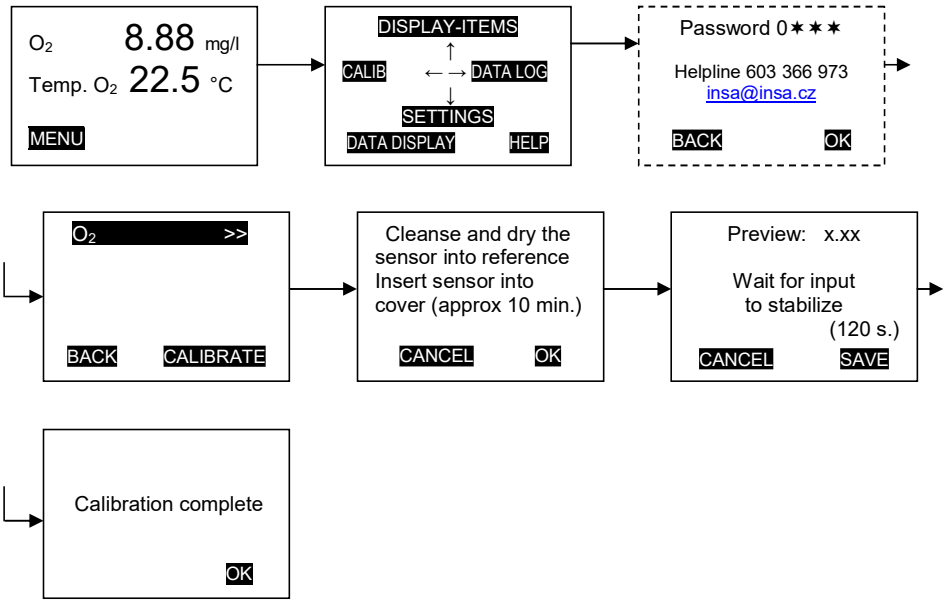

Fig. 5. Oxygen calibration

The function CALIBRATION enables an easy and error-free calibration. We go to this mode by pushing the key ↻ in the mode **measuring** or choosing CALIBRATION in main menu.
By means of the ↑, ↓ and (**CALIBRATE**) keys we choose O2 >>, on the next display 1.point (quick) and on the following display we have instruction "**Cleanse and dry the sensor**" and "**Insert sensor into cover (approx. 10 min)**". We put the sensor into protective sensor case **(provided it was not there before)** and leave it for approx. 10 minute to stabilize temperature of the sensor. The thing is that temperature of the plastic membrane

and the one of the thermometer block of the sensor - Fig.4, pos.2 – should be the same during calibration. Protective sensor case serves as a calibration block.

The sensor membrane must be dry, during the calibration – the sensor must measure the oxygen concentration in the air. If the sensor was in the water, prior to the calibration, wipe top of it slightly. The water drops on the other parts of the sensor make no problem.

After some 10 minutes (after placing into cover) we press key and the value of oxygen concentration calculated due to the constants acquired during the last calibration on the upper line of the display, and the instruction "**Wait for input to stabilize**" on the lower part, will appear, as well as the time, for which the calibration will run, still. When the necessary time expired, the instrument accomplish calibration automatically, on the display appears for a few seconds "**Calibration complete**" and will pass into the measuring mode.

Note When working with the sensor, after some time (approx. 18 months if the sensor is not mechanically damaged) the membrane begins to lose its mechanical properties. This process appears by an unstable sensor signal and by increasing signal when the sensor is in the oxygen-free solution (e.g. in a sulphite solution), instrument wouldn't show value 0.0, but a higher one. If the value on the instrument with sensor is higher than 0.20 mg/ (approx 2,5%), it is advisable to replace the membrane head.

Preparing the sulphite solution is in following way: *Add approx. 3 g (roughly a full teaspoon – a bigger amount doesn't make a problem) of natrium sulphite - $Na_2SO_3 7\ H_2O$ - to 1 l of water (potable water is good enough). Prepare the solution at least 6 hours before the test. On this way prepared solution can be used for about 3 months.*

If no damage of the plastic membrane occurs, its life-span is 18 months, at least.

If it is a problem for the user to prepare the sulphite, it's recommended a preventive replacement of the membrane head after approx. 18 months.

3. INSTRUCTIONS FOR MEASURING

3.1 DAMPING SETTING

The instrument enables to set the magnitude of damping of signals from the sensors to the optimal value. If the damping is too small, the statement (measured value) on the display will get stable quickly, but after the stabilization it is not very stable. If the damping is too big, the stabilization of the measured value on the display is slow.

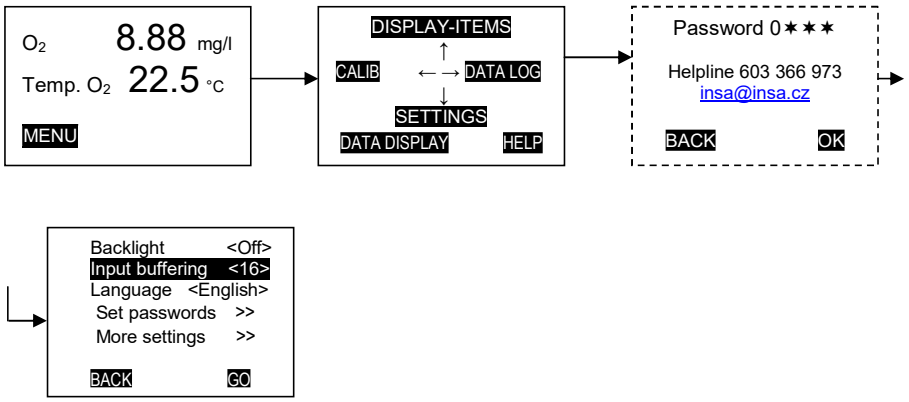

Fig. 6. Display of function damping and backlight switching

From the production, the damping is set on the value 16. If this value is inconvenient, it is possible to change it in the mode **SETTINGS→ Input buffering**. By means of the ↶ and ↷ keys (Fig. 6) we set the required damping. The bigger is the damping – the slower the stabilization of the measured value and the more stable the statement on the display will be.

3.2 BACKLIGHT SETTING

Instruments display is provided with backlight, that makes us possible to read measured values and also other information on display in dark light conditions comfortably. As backlight **reduces lifetime of batteries** it is possible the backlight switch on and off. As far as the backlight is on than after each pressing of any key backlight switches on for a few seconds. Backlight is possible to turn off and on according Fig.6 - **SETTINGS→ Backlight** by means of the ↶ and ↷ keys.

3.3 OXYGEN MEASURING

For the oxygen measuring, we must use the optical sensors CSOT 53LZ-S, manufactured and delivered by the company inSa s.r.o. Those sensors have zero consumption of oxygen, during the measuring, and it is possible to measure with them precisely, even in those cases, when the water motion is very small or zero.

It is necessary to be aware, that quality of measuring results can be obtained with a clean sensor, only. The function of sensor is disturbed mainly by oil or fat layers, deposited on the sensor membrane. Also biological deposits on the membrane can considerably influence the function. We clean the sensor membrane so, that we wipe it slightly with cotton wool, wetted with clean potable water or in alcohol.

During the measuring, the sensor must be immersed in the measured water 10 mm above the metallic block (Fig. 4, pos. 2), at least, in which the temperature sensors are placed. The sensor may be immersed in the measured water completely; **nevertheless sensor is not designed for continuous immersing in water**.

If taking measurement in nitrification basin of WWTP be aware that fluctuation of oxygen concentration due to aeration cause always an unstable measurement.

After finishing measurement we clean oxygen sensor, if necessary, flick rest of water off (in similar way as we do it with a thermometer) and screw protective sensor case on.

The separation membrane of the oxygen sensor is ageing. Therefore, it is necessary to replace it as soon as the signal in sulphite is bigger than 0,2 mg/l of the signal, corresponding with the saturated state at the given temperature, as long as we measure in percents, it is approx. 0,25%.

If no damage of the sensor membrane during manipulation or if no sensor exposition outside of the range of temperature occurred, the lifespan of the membrane is 18 months at least.

If it is a problem for the user to prepare the sulphite, it's recommended a preventive replacement of the membrane head after approx. 18 months.

The description of the membrane head replacement can be seen in the chapter 4.5,

We keep the sensors, which are out of measuring, in a sensor protecting case.

The oxygen sensor must not be exposed to temperatures lower than -4,0°C and higher than 50,0°C.

3.4 TEMPERATURE MEASURING

When measuring temperature, we take care that the sensor is immersed by 30 mm, at least.

4. RECORDING OF MEASURED VALUES - GRAPH

The instrument enables to record approx 600 measured values. Each measured value is completed by a time stamp. There are two possible modes of recording. Basic one is **Advanced** mode. The instrument enables to choose any combination of measured values for recording in this mode. It is possible to record either at regular time intervals (mode **Time**) or at the moment when the determined levels of measured variable are exceeded.

If we work with this mode (and choose at least one variable for recording) than there is mark **M** to the right of the every recorded variable and information **START LOGGING** / **STOP LOGGING** in the right bottom corner of the display. In this mode we can choose whether, after complete filling of instruments memory, instrument further recording stops or recording will continue and the oldest recorded values will be overwritten.

Recorded values are recorded to single files – blocks. Start and end of block is determined by **START LOGGING** / **STOP LOGGING** key. Recorded values remain in memory after instrument is switched of. During exchange of batteries remain recorded values saved for approx 24 hours still.

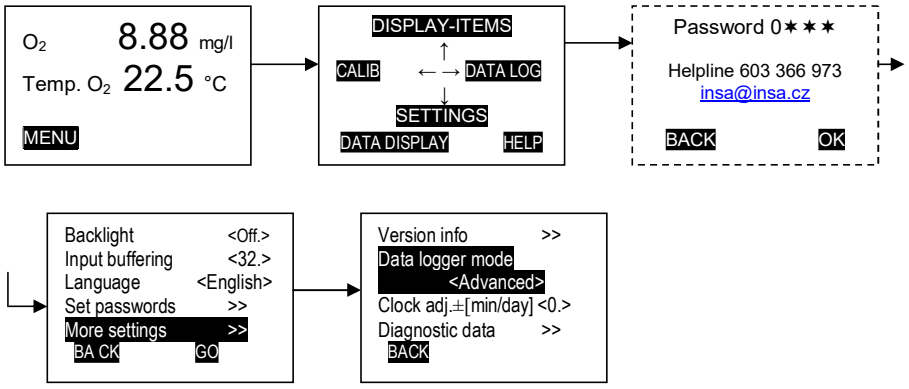

Fig. 7. Recording mode setting, clock adjustment

Second recording mode is **Back-trace xx hrs.** mode. In this mode instrument records **all** measured variables in 1 minute, 10 minutes or 1 hour interval. After memory is being full, the oldest values are overwritten with latest ones. Total time of recording depends on number of recorded variables and selected interval. **After the instrument is switched off, all recorded values are deleted automatically**. Recording starts automatically after switching instrument on. During measurement there is no information about recording on display.

4.1. TIME SETTING

There is no real time clock in the instrument. That means that all time data are relative. In advanced mode they are related to the start of the relevant file (block). In back trace mode time is related to the moment of opening of the recording. Time data are negative.

As instrument does not possess full-value clock, time data are rather not accurate. It is possible to precise them in **Settings** and further **More settings** and Clock adj. ±[min/day] <0.>.

In the same display we can select recording mode – either Advanced or Back trace one and time interval of back trace mode.

4.2. VARIABLES FOR RECORDING AND INTERVAL SETTING (ADVANCED MODE)

We go to the **Data logger** mode from measuring mode by pressing ➲ key or choosing data logger mode in main menu. On the display we have either (No data) or recorded data and in the right bottom corner **OPTIONS**.
After pressing the ⓐ (**OPTIONS**) key we activate **Data-logger setup** on the next display and now we see display on which we can choose way of recording and variables to be recorded. By means of the ↑, ↓ keys we activate **Trigger** and we can choose recording of all selected variables in regular time intervals irrespective changes of the measured value – **Time** mode - or recording by determined changes of selected variable. Selection we make by ➲ and ➲ keys.

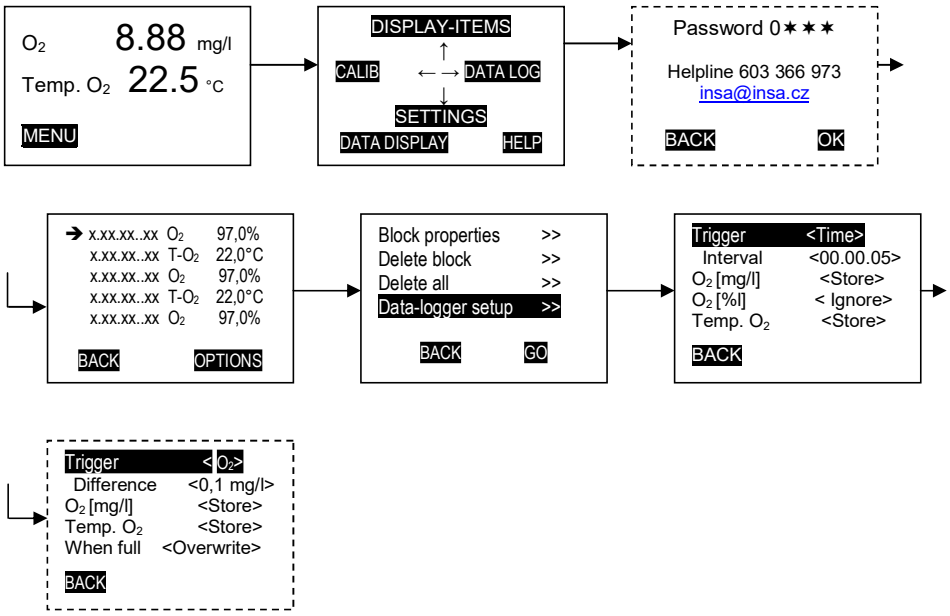

Fig. 8. Recording mode – variables for recording and interval setting

If we select time, than we set on the next line, again by means of ➲ and ➲ keys, interval of recording from one second to 99 hours, 59 minutes, 59 seconds. If we choose recording derived of changes of selected variable (by pressing ➲ and ➲ keys are single variables gradually offered and in the same time also differences on the next line) we can on the next line set **Difference**, by exceeding of which the instrument will carry out a recording of **all** values, we

have chosen for recording. We enter the difference e.g. 0,1 mg/l. That means, that the instrument will record the measured values always, when the level 0,1 mg/l will be exceeded, from above or from below. If, e.g., the measured value alternates between 5.5 to 6,0 mg/l the values 5,5, 5,6, 5,7, 5,8, 5,9 and 6,0 mg/l and **the actual values of all variables selected for recording (**°C, % of saturation) are recorded, simultaneously.

On the following lines we select variables for recording so that we choose either **Store** or (**Ignore**). On the bottom line we determine whether – when memory is full – instrument stops recording – **When full <Stop>** or begins overwrite the oldest values – **When full <Overwrite>**.

4.3. START AND TERMINATING OF RECORDING

In Back-trace mode recording is starting automatically by switching instrument on and terminating also automatically by turning instrument off.

In Advanced mode recording is starting and terminating by **START LOGGING** / **STOP LOGGING** key. By each new start are recorded values stored in new file – block determined by new number.

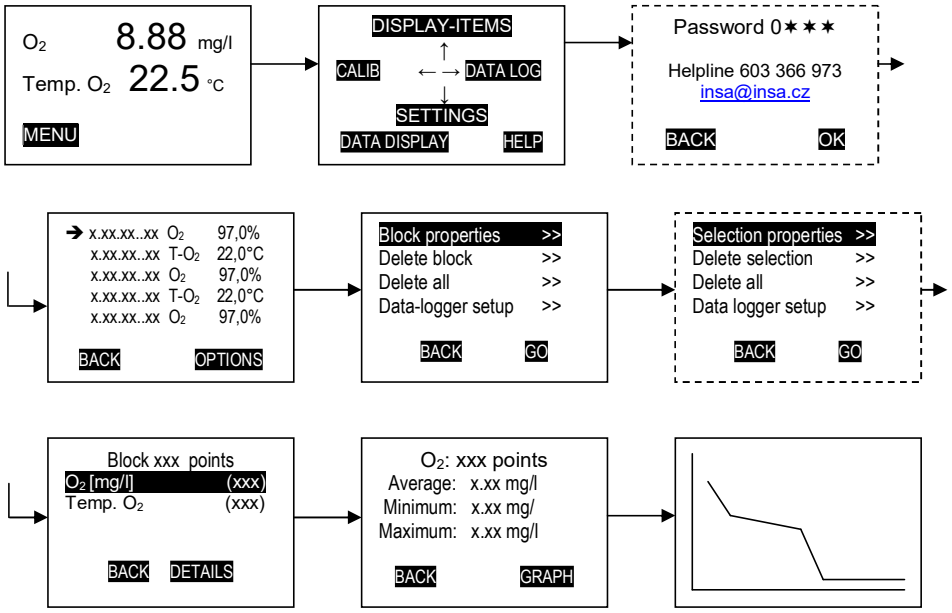

Fig. 9. Recording mode – recording viewing

4.4. MEASURED VALUES RECORD VIEWING AND DELETING

Back-trace mode.

When we record in Back-trace mode and we are in measurement mode (there are measured values on the display) then after **short** pressing of the ➲ key we have on the display graph of the variable placed on the **first line of the display**. If we want display graph of other variable,

we shift by means of the ↑, ↓ keys to the top line and press the ⊃ key again.

Scales on the both coordinate axes are set automatically; in the graph there are displayed all recorded values of the single variable. If the display is not optimal we can by **long** pressing of the ⊂ and ⊃ keys scale of horizontal axis (by the ↑, ↓ keys on vertical axis) increase and/or decrease. By **short** pressing of the keys we shift graph to the right/left.

To have display not disturbed by markings we can remove them by **short** pressing of the Δ key.

W e abandon graph by Δ key.

Advanced mode.

We have measured values on the display. There is mark **M** to the right side of the lines of the registered variables. The mark changes (blinks) slightly in the moment of recording. By short pressing of the ⊃ key we display recorded values divided into single files – blocks with cursor - ➔ - on the beginning of the first block (in case we browsed through logging before, the cursor is on the place it was by the end of browsing). By means of ↑, ↓ keys we go through the logging.

After pressing the Δ **OPTIONS** key we have display with offer **Block properties** etc. When we open "Block properties" we can select single variable and open another display on which we see how many points of the variable were recorded, average, maximal and minimal values of it and after pressing Δ **GRAPH** key to display graph. With the graph we behave in the same way as by "Back-trace" mode.

Displays "Block properties" and "Graph" are created to the block before which cursor is placed (can be on any place).

Graph we can display by long pressing of the ⊃ key in measurement mode also. In this case we have on the display graph of the variable placed on the **first line of the display** and on which we have displayed all values recorded in all blocks (files). **When variable displayed on the first line is not recorded – no graph appears.**

On the display with recorded values we can create even new block (selection) of recorded values, so that we place cursor ➔ on the beginning of the selection and by pressing of the ⊃, (⊂) key we create a selection. Information on "Block properties", "Graph" are related to this new block (selection). Deleting of the block we make by ↑ or ↓ key.

5. PASSWORDS SETTING

The access to some instrument functions can be conditioned by the password to avoid setting from unwanted changes (either by mistake or unauthorized person) or to hide unused functions. By passwords we can lock **Calibration, Display configuration** (is not possible to switch of/on measured variables, to change order of measured variables on the display), **Settings** (is not possible to change settings) and **Main menu** (access to main menu is locked, is possible to read display only).

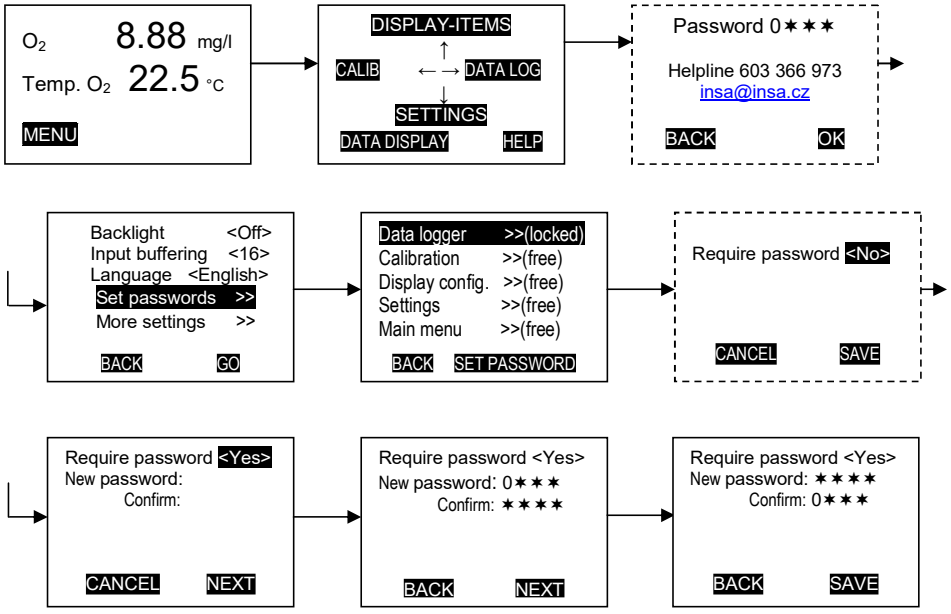

Fig. 10. Display of function passwords

- **Enter password into the system**

By pushing the key ⓐ we pass from the mode **Measuring** to **Main menu,** select the function SETTINGS and **Set passwords** by pressing keys ❨, ❩ and ⓐ on following one. On the actual display we select function we want to lock by password. Password consist of four signs 0 to 9 and ✶. Symbol ✶ is identical with number 0.

After opening the display **Set passwords** we can see all modes protected by passwords. At the and off every line is either **(free)** – mode is not protected by password or **(locked)** – mode is protected by password.

6. PROTECTING THE ENVIRONMENT

Dispose of packaging material at a public waste disposal site.

This instrument shall not be treated as household waste. Please, dispose it at your applicable collection point for the recycling electric & electronic equipment waste. The correct disposal of this product will help save valuable natural resources and help in preventing the potential negative impact on the environment and human health, which could be caused as a result of improper liquidation of waste. Please, ask your local authorities or the nearest waste collection centre for further details.

Odstraněno: VYŘAZENÍ PŘÍSTROJE

Odstraněno: INSTRUMENT DISCARDING