WATERPROOF CONDUCTIVITY METER

CC- 411

USER'S MANUAL

ELMEIRON

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WATERPROOF
CONDUCTIVITY METER
CC-411

Before use please read the instruction carefully.

CONTENTS

I. INTRODUCTION

1. EXPLOITATION NOTICES

Dear User!

We present you a device distinguished by accuracy according to the technical data and by a high stability of displayed results. We believe that measurements will not cause you any trouble and that the meter will operate without any inconvenience.
Using good-quality cells and replacing them if necessary ensures obtaining high measuring parameters. We want to call your attention to the fact, that this equipment has much shorter working life than the meter.
In case of conductivity measurements it is important to choose the cell with K constant value adjusted to the measuring range. Improper selection may cause increase of the readout error.

The essential feature of our products is their low failure frequency. However, if your meter fails, our firm will immediately perform its warranty repair.

We wish you pleasant and trouble-free work with our meter.

2. CHARACTERISTICS OF THE METER

The **CC-411** conductivity meter belongs to the newest generation of measuring devices which ensure high accuracy and repeatability of readings and is easy in use. Two kinds of power source: battery and power adapter, enable work in the field and long-lasting measurements in the laboratory. Electronic elements of the newest generation used in the meter have made its memory independent from power supply and have ensured very low power consumption what greatly prolongs the operation time on 1 battery.
The meter is equipped with large custom LCD display, which displays the conductivity or the temperature value. Waterproof housing makes working in difficult conditions possible. Minimised size and weight make the meter very handy especially during the field work.

Main features of **CC-411** are:
- high accuracy and stability of readings;
- calibration of the conductivity cell by introducing the K constant or on standard solutions;
- possibility of determining the K constant of the cell;
- automatic and manual temperature compensation;
- storing parameters in non-volatile memory;
- co-operation with Pt-1000 temperature sensor;
- system protecting the meter against damages caused by connecting the battery inversely;
- information about the battery condition ();
- automatic switch off function.

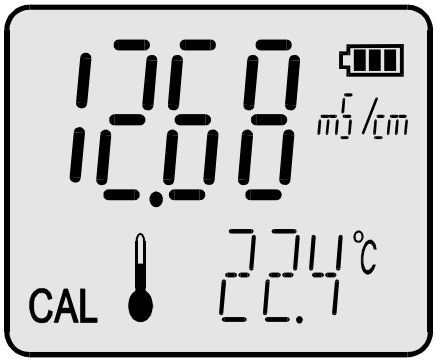
3. WHAT IS THE METER DESIGNED FOR

CC-411 waterproof conductivity meter is a precise and easy-to-use meter designed for measurements of conductivity in µS/cm or mS/cm. The meter may be also used for accurate temperature measurement of solutions and air in ℃. It is useful both for work in the field and measurements in the laboratory.
Waterproof housing enables work in difficult weather conditions or in humid environment.
The **CC-411** conductivity meter is used in food, chemical, pharmaceutical and power industries, in water treatment stations, laboratories, agriculture, universities, scientific laboratories etc.
The meter is prepared to work with many types of conductivity sensors (with wide ranged K constant) equipped with BNC-50 connector. **CC-411** co-operates with Pt-1000 temperature probe with Chinch connector.

4. THE OUTSIDE VIEW

On the front wall of the meter there is an LCD display (Pic.1) on which, depending on the chosen function, the result of conductivity measurement in µS/cm or mS/cm or temperature measurement in ºC is displayed:

A particular function is chosen by pressing the FUNCTION button.
Symbols of units are displayed next to the result.
In case of disconnecting the temperature probe the meter switches to the manual temperature compensation mode. Next to the result there will be displayed blinking ºC symbol. If the battery should be changed, a LOBAT symbol is displayed. The keyboard placed under the display is used for switching the meter on and off, choosing the measuring function, calibration and entering parameters.



Pic.1

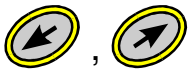
The **CAL** symbol on the left side of the display informs that the meter is in calibration mode.

The keyboard (pic. 2) placed under the screen has the following keys:

- switching the meter on and off.

- pressing shortly enters the unit choosing mode (with the  button); pressing and holding returns to the measurement mode.

- holding this button enters the calibration mode (**CAL** symbol displayed).

 ,

- buttons used for entering the parameters

In the upper wall of the meter there are inputs placed with the symbols given below:

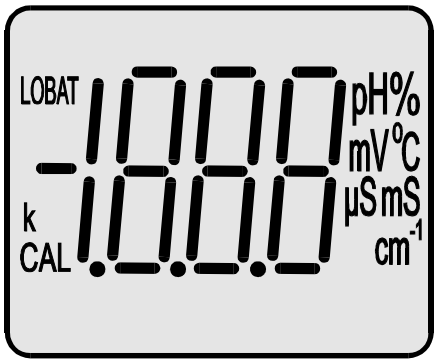
F1 - **BNC-50** input for connecting the conductivity cell;
t - **Chinch** input for connecting the temperature probe;
P - the power adapter input.


t
Fl
P
ELMEIRON
1260
12.60
mS/cm
CAL
22.4
22.4°C
FUNCTION
CAL
ON
OFF
conductivity meter CC-411
waterproof

Pic. 2

5. SWITCHING THE METER ON AND OFF

After switching it on with the ON/OFF button, the meter tests the memory and the display on which all symbols are displayed after switching it on (Pic. 3).



Pic. 3

If the test ends successfully, after about 1.5 s the meter switches automatically to the measuring mode, in which it was switched off. If a HLP sign is displayed, it means that the meter has lost the factory settings and requires service repair. If after 1,5 s all symbols are continuously displayed, it informs that the calibration parameters of the cell have been lost.

After pressing the CAL button the meter adopts the K constant of the conductivity cell K=1.000 cm^{-1} and enters to the measuring mode. It will be necessary to calibrate the conductivity cell.

The meter is switched off by pressing the ON/OFF button. In case of working on batteries, in order to save them, the meter switches automatically off after 10 minutes of non-use. This function is automatically deactivated when working with power adapter.

6. PREPARATION TO WORK

Before starting measurement:

- connect the power adapter plug to the **P** input, if work with the power adapter is planned;
- join the suitable conductivity cell to BNC-50 input (**F1**);
- in case of using the temperature probe it should be connected with the temperature input Chinch (**t**);
- switch the meter on by pressing the ON/OFF button.

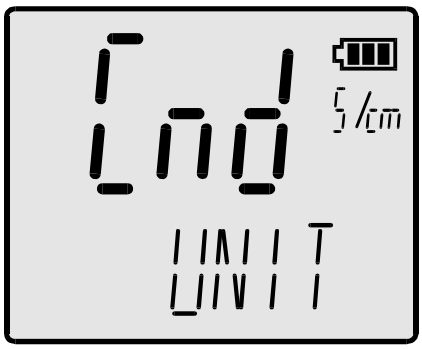
6.1. Choosing the measuring function and unit

CC-411 enables measurement of:

- conductivity at µS/cm or mS/cm converted to 25°C;
- salinity in g/l converted to NaCl (accordinfg to actual slope);
- salinity in g/l converted to TDS (with use of the W_{TDS} coefficient);
- conductivity of honey at µS/cm or mS/cm converted to 20°C;

The unit is chosen in the measuring mode by pressing and holding the FUNCTION button, in the buttom row displays the UNIT symbol and in the upper row - the Cnd (conductivity) symbol (Pic.4). Next, by pressing the button, choose:

- µS/cm - measurement in µS/cm lub mS/cm converted to 25°C;
- mg/l - measurement in g/l converted to NaCl;
- TDS - salinity in g/l converted to TDS;
- µS/cm HONEY - measurement in honey in µS/cm or mS/cm converted to 20°C.

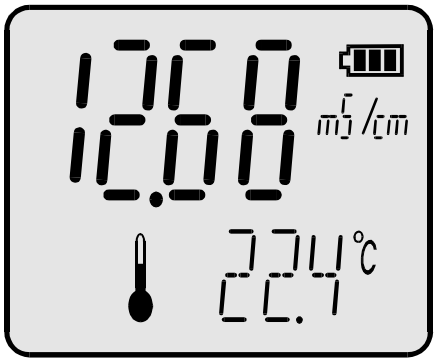


Pic. 4

By pressing the FUNCTION button return to the measuring mode.

6.2. Choosing the kind of temperature compensation

The meter switches to the automatic temperature compensation mode automatically after connecting the temperature probe. Next to the temperature reading the symbol appears. The measurement will be compensated to the value of temperature measured by the probe
Disconnecting the temperature probe switches the meter to the manual temperature compensation mode (the symbol disappears) and the value of the temperature entered by the user will be adopted for compensation.



Pic. 5

6.3. Entering the temperature value for manual temperature compensation

To enter the temperature value for manual temperature compensation:

- disconnect the temperature probe (the symbol disappears);
- with the , buttons enter the requested temperature value;

II. CONDUCTIVITY MEASUREMENT

7. BASIC INFORMATION ABOUT THE CONDUCTIVITY MEASUREMENT

The conductivity measurement is based on applying electric current with proper voltage and frequency between two electrodes and measuring it. In **CC-411** the frequency depends on the measuring range and may vary from 1 kHz up to 12 kHz. The voltage is dependent from the kind of the measured liquid, its concentration and temperature. The conductivity result informs indirectly about the salt concentration in the measured liquid. The greater it is, the higher conductivity (KCl, NaCl). This dependence doesn't concern all of the solutions. In some cases, after exceeding certain salinity value conductivity starts decreasing. Temperature has also a great influence on the results of conductivity measurement, which increases together with the temperature rise.

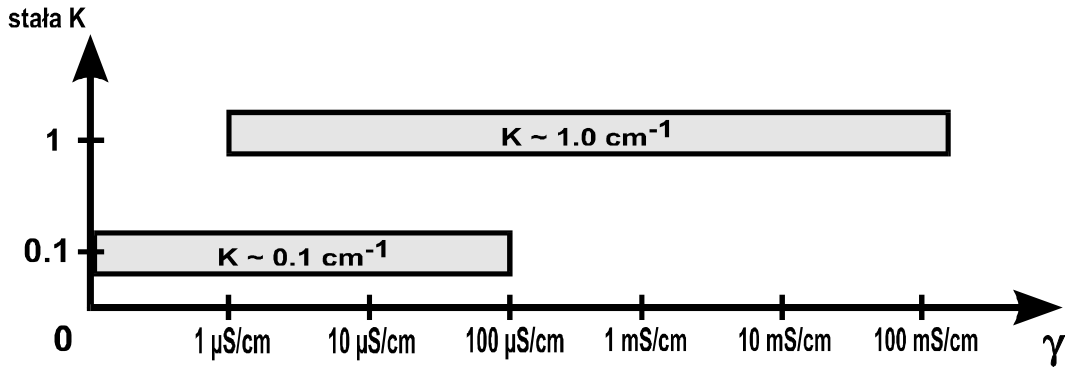
The electrodes' surface and the distance between them have decisive influence on the K constant value of the cell. This value has a great influence on the accuracy of the measurement. Depending on the measured conductivity value cells with K constant = 0.05 cm^{-1} up to 1.500 cm^{-1} are used. During measurement the meter multiplies the measured value by the K constant introduced to the meter's memory and displays the result in units of conductivity (µS/cm or mS/cm). Shortened symbol of the unit is displayed next to the result (µS or mS). **Conductivity is affected by the temperature and salts concentration.** In order to enable comparing of the results, measured value is counted by the meter to the value which corresponds to measurement in 25 ^{0}C. Measurement in this temperature is the most accurate. In other temperatures there is temperature compensation used, which means that the meter takes currently measured temperature and α coefficient into consideration. This coefficient describes how much the result will change when the temperature change is 1 ^{0}C. The α coefficient in this meter is constant and equal 2% / ^{0}C. This is the closest value to that of most of the salts in 25°C. For example if measurements are made in liquid of temperature coming to 30 ^{0}C, the result change will total up to 5 x 2% = 10%.

The conversion is made automatically and this change is counted into the result. The conductivity measurement should always be treated as burdened with a certain error, which depends on the conductivity cell (its linearity) and temperature. When measurements are not made in the reference temperature, the error is dependent mainly on the α coefficient, which is affected by the temperature and concentration changes.

8. CHOICE AND MAINTENANCE OF THE CONDUCTIVITY CELL

8.1. Choice of the conductivity cell

Conductivity in **CC-411** meter can be measured in range 0 – 100 mS/cm. The meter co-operates with conductivity cells with K constant = 0.050 ÷ 1.500 cm^{-1} and equipped with BNC-50 connector. Depending on the required measuring range it is necessary to choose appropriate cell with K constant which enables obtaining accurate results. Beyond the range the cell looses its linearity and the results have greater error. Accurate measurements in the whole range are possible with use of 2 different conductivity cells.
In range 1 – 100 mS/cm the standard conductivity cell with K constant =1 cm^{-1} should be used.
For measurements of ultra pure water with conductivity below 1 µS/cm a cell with K constant = 0.1 cm^{-1} should be used.
Depending on the expected measuring range, choose the appropriate cell using the chart below (Pic.6).



Pic. 6. Dependence between the measuring range and of applied conductivity cells.

8.2. The conductivity cell maintenance

In order to receive stable results, it is advisable to store the cell in water for a few hours before the measurement, this is especially required in case of distilled water measurements.
The conductivity cell maintenance consists mainly in accurate washing the inside of the measuring cell with distilled water. The platinum electrodes must not be cleaned mechanically, because this results in rubbing off the platinum layer, what can cause decreasing of accuracy, lowering of stability and changing of the K constant.
Measurements of liquids with oils and heavy-sediment content may cause platinum contamination, make the measurement impossible and irreparably damage the electrodes. In case of fat content in the measured liquids it is possible to clean the electrodes by immersing the cell in acetone, chloroform, fourhydrofuran or detergent.
Certain norms recommend universal liquid for cleaning cells. This is a mixture of equal parts of isopropyl alcohol, ethyl ether and hydrocholic acid, diluted with water in 1:1 ratio.
Breaking of the measuring cell hinders any further measurements due to significant change of the K constant, unstable results and increase of the dependence of the result on the position of the cell in the measuring vessel.
The cell should be immersed in such a way for the solution to fill it up and not to include any air bubbles (single bubbles or silver coating). It is essential for obtaining accurate results of measurements. The best way is to immerse the cell, make a few vertical moves and thus to remove air bubbles through holes in the upper part of the cell. If the air bubbles appear each time after the cell has been immersed and they are difficult to remove, it is advisable to immerse the cell in a water – washing up liquid mixture, what will lower the surface tension and disable air bubbles to stick to the surface of the cell walls or electrodes. After such action the cell should be washed accurately in distilled water.

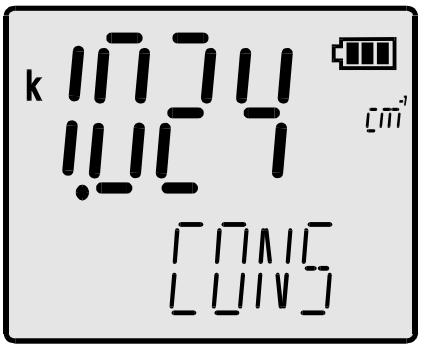
9. CALIBRATION OF THE CONDUCTIVITY CELL

Characteristic feature of every conductivity cell is its K constant. Before displaying the result on the display the value is multiplied by the K constant value. The value of the K constant depends on the size of the electrodes' surface and the distance between them. If the user keeps the cell clean, the K constant does not change. In case of contamination of the surface of the electrodes, the K constant will change.
Calibration may be performed without the sample solution, by entering the value of the K constant of the cell given by the manufacturer to the meter's memory (we recommend this kind of calibration) or with use of standard solution with known conductivity, to determine the K constant.
The K constant is precisely determined by the cell manufacturer and using this value will be the most reliable.
In case of calibration performed by the user, fresh, accurately prepared standard solution is required. Additionally it has to be accurately thermostatic to 25^{0}C. If the conditions won't be kept the calibration may be burdened with error.

9.1. Calibration without the standard solution

The meter has a possibility of calibration without the use of standard solution. For such calibration, it is necessary to know the K constant of the conductivity cell. This value may be given by the cell manufacturer or may be determined using the **CC-411** meter after calibrating it in the standard solution.
In order to calibrate:

- in the conductivity measuring mode press the FUNCTION button till the moment of displaying the CONS symbol in the bottom row and the **k** symbols and the value of the K constant introduced earlier in the upper row.
- with the ◄ , ► buttons enter the value of the K constant;
- return to the measuring mode by pressing and holding the FUNCTION button.



Pic. 7

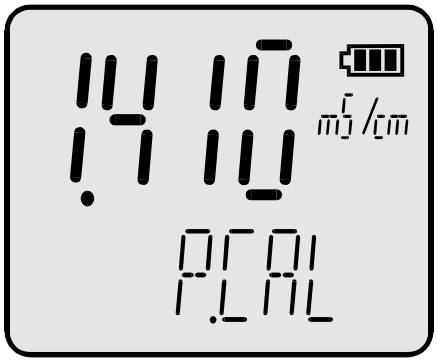
9.2. Calibration with use of standard solution

The meter enables one-point calibration in a freely chosen standard solution, to determine the K constant of the cell. In order to decrease the error, it is recommended to use solutions with value close to the estimated value of measurement. It is required to use standard solutions of a high quality.

9.2.1. Entering the standard solution value

To enter the standard solurion value:

- choose the measurement unit according to the point 6.1;
- in the measurement mode press the FUNCTION button until the P.CAL symbol displays in the bottom row abd the upper row displays the current calibration point value pic. 8);
- enter new standard solution value with the , buttons;
- press and hold the FUNCTION button to return to the measurement mode.

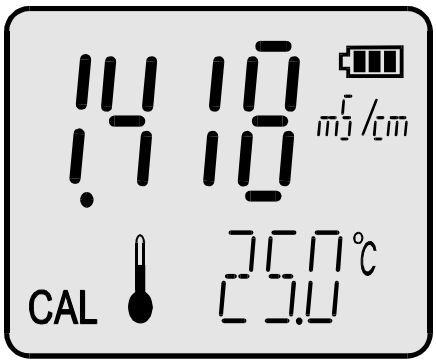


Pic. 8

9.2.2. Calibration without the temperature compensation

Accurate calibration should be processed without the temperature compensation. The sample solution should be brought to 25°C. It is possible to use the temperature probe for controlling.

In order to calibrate, follow the steps:
- connect the conductivity cell and the temperature probe to the meter;
- enter the standard solution value (point 9.2.1)
- immerse both probes in the standard solution, hold the conductivity cell at least 1 cm away from the bottom and the walls of the vessel. The measuring cell should be filled with the measured solution, there shouldn't be any air bubbles and the electrodes should be evenly moistened*;
- measure the temperature of the solution and bring it to 25 °C;
- in the conductivity measuring mode press and hold the CAL button till the **CAL** symbol displays on the screen (Pic.9);
- after the value stabilises the **P1** symbol (calibration point) will be displayed. Press the CAL button. Blinking of the reading signalises recording the calibration value, at the same time the measuremet value will be adjusted to the applied standard value. If the applied standard value is different then the value stored in the memory, the meter does not recognise it or the cell connected with the meter is broken, the Err symbol will display.
- return to the measuring mode by pressing the FUNCTION button.



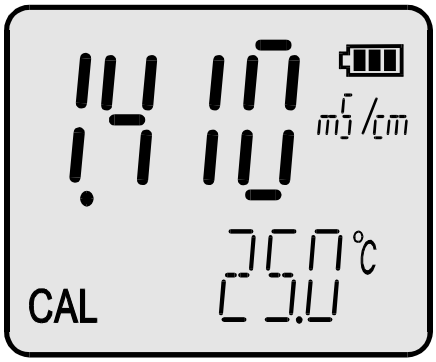
Pic. 9

The meter is calibrated and ready to work.

9.2.3. Calibration with manual temperature compensation

In order to calibrate the meter:

- turn the meter on with the ON/OFF button;
- enter the standard solution value (point 9.2.1)
- disconnect the temperature probe (the symbol disappears);
- enter the 25°C value with the , buttons;
- immerse the conductivity cell in the sample solution and hold it at least 1cm away from the bottom and the walls of the vessel. The measuring cell should be filled with the sample solution and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- measure the temperature of the sample solution with lab thermometer and bring it to 25°C;
- in the conductivity measuring mode press and hold the CAL button till displaying the **CAL** symbol on the screen (Pic.10);
- after the value stabilises the **P1** symbol (calibration point) will be displayed. Press the CAL button. Blinking of the reading signalises recording the calibration value, at the same time the measuremet value will be adjusted to the applied standard value. If the applied standard value is different then the value stored in the memory, the meter does not recognise it or the cell connected with the meter is broken, the Err symbol will display;
- return to the measuring mode by pressing the FUNCTION button.



Pic. 10

The meter is calibrated and ready to work.

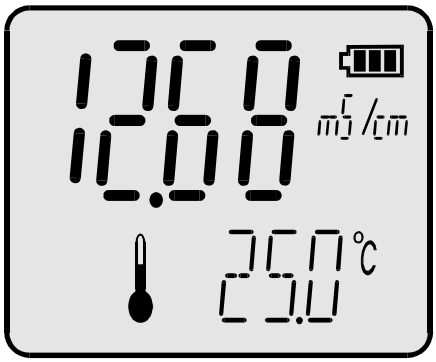
* - air bubbles may be removed by moving the immersed cell. In order to make moistening of the electrodes easier, it is recommended to immerse the cell in distilled water with washing-up liquid, and than wash it in distilled water.

10. CONDUCTIVITY MEASUREMENT

10.1. Conductivity measurement without temperature compensation

Accurate conductivity measurement should be made without the temperature compensation. The measured solution should be brought to 25 ^{o}C. It is possible to use the temperature probe for controlling.

In order to make a measurement:
- connect the conductivity cell and the temperature probe to the connectors **F1** and **t** respectively (pic.2);
- turn the meter on with the ON/OFF button;
- choose the conductivity measuring mode according to the subchapter 6.1;
- if the conductivity cell has not been calibrated earlier calibrate it according to the chapter 9;
- place both probes in the measured solution, the conductivity cell cannot touch the walls and the bottom. The measuring cell should be filled with the sample solution and should not include any air bubbles, the electrode's surface should be evenly moistened*;
- bring the temperature of the measured solution to 25 ^{o}C;
- read the result after it has stabilised (pic.11).



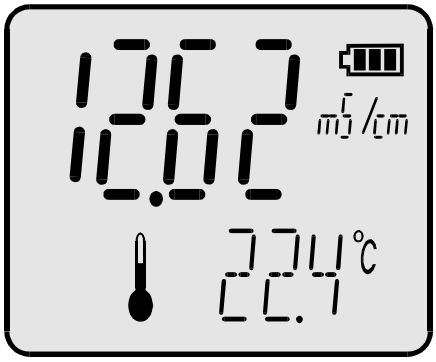
Pic. 11

* - air bubbles may be removed by moving the immersed cell. In order to make moistening of the electrodes easier, it is recommended to immerse the cell in distilled water with washing-up liquid, and than wash it in distilled water.

10.2. Conductivity measurement with automatic temperature compensation

In case of measurement with automatic temperature compensation:

- connect the conductivity cell and the temperature probe to the connectors **F1** and **t** respectively (pic.2);
- turn the meter on with the ON/OFF button;
- choose the conductivity measurement unit according to the subchapter 6.1;
- if the conductivity cell has not been calibrated earlier, calibrate it according to the chapter 9;
- place both probes in the measured solution, the conductivity cell cannot touch the walls and the bottom. The measuring cell should be filled with the sample solution and should not include any air bubbles, the electrode's surface should be evenly moistened*;
- wait till the result stabilises and read it (pic.12).



Pic. 12

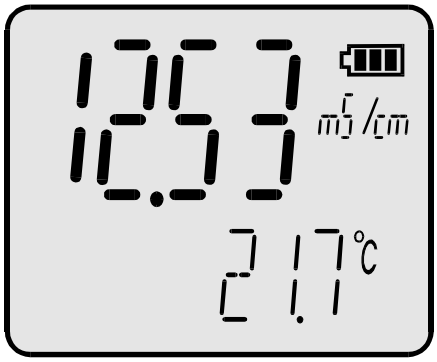
Note: in case of exceeding the range of temperature compensation the conductivity reading and the symbol start blinking

* - air bubbles may be removed by moving the immersed cell. In order to make moistening of the electrodes easier, it is recommended to immerse the cell in distilled water with washing-up liquid, and than wash it in distilled water.

10.3. Conductivity measurement with manual temperature compensation

The measurement with manual temperature compensation may be made in stable work conditions, e.g. during measurements in laboratory, especially with use of thermostat, or in case of the temperature probe damage. Disconnecting the temperature probe switches the meter to manual temperature compensation.
In case of measurement with manual temperature compensation:

- connect the conductivity cell to the **F1** connector (pic.2);
- disconnect the temperature probe;
- turn the meter on with the ON/OFF button;
- choose the conductivity measurement unit according to the subchapter 6.1;
- if the conductivity cell has not been calibrated earlier, calibrate it according to the chapter 9;
- measure the temperature of the solution with thermometer;
- enter the measured temperature value for manual compensation according to the point 6.2.1 ;
- place the cell in the measured solution, it canot touch the walls and the bottom. The measuring cell should be filled with the sample solution and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- after stabilisation read the result (pic.13).



Pic. 13

* - air bubbles may be removed by moving the immersed cell. In order to make moistening of the electrodes easier, it is recommended to immerse the cell in distilled water with washing-up liquid, and than wash it in distilled water.

10.4. Conductivity measurement in honey

The unit of conductivity of honey given by literary sources is 10^{-4}S/cm, which means that one unit of conductivity of honey is equal 100 µS/cm. If the meter indicates 250 µS/cm, it will inform about 2,5 units of honey conuctivity. If the readout is equal 1,5 mS/cm, it will be equal 15 units of the conductivity of honey. The table below contains conductivity values typical for different types of honey.

Table 1.

Honey	Conductivity x 10^{-4}S/cm	The meter's indication
Fir honeydew	>10	>1mS/cm
Leaf honeydew	~9	~900 µS/cm
Honeydew-nectar	~8	~800 µS/cm
Chestnut honey	>10	>1mS/cm
Linden honey	6,8 ÷ 7,8	680 ÷ 780 µS/cm
Heath honey	2,9 ÷ 8,0	290 ÷ 800 µS/cm
Golden rod honey	~5,8	~580 µS/cm
Buckwheat honey	~4,9	~490 µS/cm
Borage honey	~1,27	~127 µS/cm

10.5. Preparation of the measurement sample

Because of honey's density, it is necessary to prepare water - honey solution for the measurement. To do it, dilute 12g of honey in 50 ml of distilled water. Next, choose the unit (the µS/cm HONEY symbols, next to Cnd symbol, point 6.1) and make the measurement according to the chapter 10.

11. SALINITY MEASUREMENT

Salts and minerals dissolved in natural water influence the conductivity, which in principle is proportional to the quantity of dissolved substances. This dependence enables, after certain calculations, to determine the salinity of the measured solution in concentration units (g/l or %). Received values are always approximate and the total accuracy depends on the way of making calculations, concentration of the measured solution and its temperature. In most salinity meters a simplification is used, that dependence between conductivity and salinity in the solution is linear in the whole measuring range. Usually a 0.5 coefficient is used, the conductivity result in mS/cm is multiplied by this coefficient and the result of salinity is received in g/l, e.g., if the conductivity value is 2 mS/cm the salinity is 1g/l. In practice the dependence between conductivity and salinity isn't linear and the conversion coefficient is changing together with the concentration and temperature. Table 1 shows the dependence between conductivity and actual salinity of NaCl solution in temperature 25 ^{0}C and values of salinity counted for constant coefficient 0.5. This comparison shows that using a constant coefficient for greater concentrations introduces significant error.

Table 1.

Conductivity (mS/cm)	Actual salinity (g/l)	Salinity (g/l) Counted for coefficient = 0.5	Error (%) by using the coefficient = 0.5
1.00	0.495	0.500	0.01
2.00	1.006	1.000	0.60
4.00	1.976	2.000	1.21
10.00	5.400	5.000	7.40
30.00	18.174	15.000	17.46

In CC-411 microcontroller takes into consideration the actual dependence between the conductivity and salinity what greatly reduces the error.

11.1. Salinity measurement with conversion to NaCl

The measurement of salinity with conversion to NaCl or KCl content should be done as follows:
- choose the salinity measurement with conversion to NaCl content according to the chapter 6.1;
- then act as during conductivity measurement (chapter 10);
- read the result after it has stabilised.

Caution: next to the reading the unit symbol on turn with the  symbol displays.

11.2. Salinity measurement with conversion to TDS

The meter enables simplified way of determining the Total Dissolved Solids (TDS) content. For calculations the constant coefficient is used (W_{TDS} = 0.5). The measurement of salinity with conversion to TDS should be done as follows :
-- choose the measurement of salinity with conversion to TDS according to the subchapter 6.1;
- act as during the conductivity measurement (chapter 10).
- after it has stabilised, read the result in g/l.

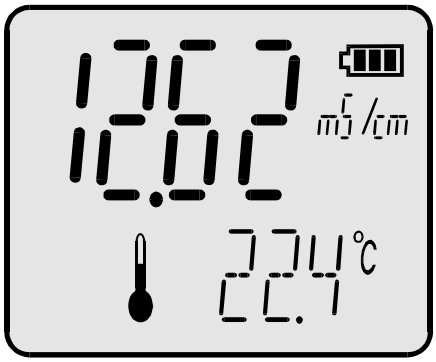
Caution: next to the reading the unit symbol on turn with the  symbol displays.

III. TEMPERATURE MEASUREMENT

12. TEMPERATURE MEASUREMENT

The temperature measurement is made in the following way:
- connect the temperature probe to the Chinch connector;
- by pressing the ON/OFF button switch the meter on;
- choose the temperature measuring mode using the FUNCTION button;
- put the temperature probe to the measured solution;
- wait till the value stabilises and read the result.

The meter co-operates with platinum resistor sensor PT-1000 and the final accuracy of the temperature measurement depends on its class.



Pic. 14

NOTICE: break in the circuit or disconnecting of the temperature probe is signalised by disappearing of the . In such case the meter shows the temperature value introduced by the user for manual temperature compensation. Blinking -50°C value during measurement in positive temperatures informs about short circuit in the temperature probe.

IV. OTHER

13. READOUT OF THE SOFTWARE VERSION NUMBER

In order to check the software version number turn the meter off and next, holding the FUNCTION button, turn the meter on by pressing the ON/OFF button. Instead of the display test, the screen as in the picture below will appear (Pic. 15). In the upper row the software version will appear and in the lower row a type of internal power supply, to which the meter has been adjusted:

Accu - internally powered by two rechargeable R6/AA batteries;;
bAtt - internally powered by two standard R6/AA batteries.

Pic. 15

After about 1,5 s. the meter enters the measurement mode.

14. POWER SOURCE AND CHANGING THE BATTERY

The meter is powered by 9V battery or 12V stabilised power adapter. The adapter should be joined with the **P** connector (Pic.2). Connecting the power adapter disconnects the battery and is signalised by the symbol.
The symbol informs about the battery condition. Flashing of the symbol informs that the battery should be changed. In order to do so, it is necessary to undo two screws in the lower wall of the meter, pull out the whole wall and replace the battery.
The next thing is to put the new battery into the meter and mount the wall.
The wall has a sealing ring at the edge. While closing the meter, it is very important to pay attention if the ring is put inside the housing in the whole perimeter. Next, do the screws till the moment of resistance (not too hard). Leaving the wall improperly screwed may cause the meter's inundation, which is not repaired under the warranty conditions.

15. TECHNICAL DATA

CONDUCTIVITY MEASUREMENT:

ranges	resolution	accuracy * (±1 digit)	Frequency
0.000 ÷ 199.9 µS/cm	0.1 µS/cm	±0.25 %	1 kHz
200 ÷ 1999 µS/cm	1 µS/cm	±0.25 %	1.6 kHz
2.00 ÷ 19.99 mS/cm	0.01 mS/cm	±0.25 %	4.6 kHz
20.0 ÷ 100.0 mS/cm	0.1 mS/cm	±0.25 %	12 kHz

* Accuracy given for the upper value of the range.

Ranges of frequency changes were given for constant K = 1. For other values of the K constant the values will change proportionally to changes of this constant.

Temperature compensation: manual/automatic
Compensation range: -5.0 ÷ 70.0 °C
K constant range 0.05 ÷ 1.500 cm^{-1}
α coefficient constant 2 %/ °C
W_{TDS} coefficient constant 0,5 %/ °C
Cell calibration: one-point

1. by introducing the K constant of the cell
2. with use of calibration solution

TEMPERATURE MEASUREMENT:

range	resolution	accuracy* (±1 digit)
- 50.0 ÷ 199.9 °C	0.1 °C	±0.1 °C

* accuracy of the meter. Final accuracy of the measurement depends on the accuracy of the used PT-1000 probe

TEMPERATURE PROBE: platinum resistor Pt-1000

ACCURACY OF THE PROBE IN RANGE 0 ÷ 100 ^{0}C:
FOR PT1000B RESISTOR: ±0.8 ^{0}C
FOR PT1000 $^1/_3$B RESISTOR: ±0.3 ^{0}C

OTHER:

OPERATING TEMPERATURE:	-5 ÷ 45 oC
POWER:	1. 9V battery type 6F22 2. 12V power adapter
POWER CONSUMPTION:	60 mW
DISPLAY:	Custom LCD 55 x 45 mm
DIMENSIONS:	149 x 82 x 22 mm
WEIGHT:	220 g

16. EQUIPMENT

Standard set:
1. Conductivity cell;
2. Pt-1000B temperature probe (standard);
3. 9V battery;
4. Plastic case for the meter, cell and temperature sensor;
5. User‘s manual with warranty.

Additional equipment:
1. 12V/100mA stabilised power adapter;
2. Pt-1000 1/3B temperature probe with higher accuracy.

W A R R A N T Y

The “ELMETRON” company gives 24 months of warranty for the **CC-411** conductivity meter number

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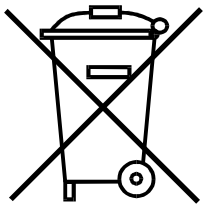
In case of damage the manufacturer will repair the meter within 14 days from the day of delivery.
The warranty doesn’t cover the damages caused by usage not in conformity with the users manual, using wrong power adapter, mechanical damages and damages caused by repairs made by unauthorised persons.
The conductivity cell and temperature probe have 12-month manufacturer’s warranty.

NOTICE: Before sending the meter to us for servicing please contact the firm by phone.

Please attach the cell, temperature probe and the power adapter to the meter.

We also provide after-warranty repair service.

Date of production.....
Date of sale.....
Date of expiry.....



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