# LABORATORY CONDUCTIVITY METER

# CC-511

USER'S MANUAL

ELMETRON

USER’S MANUAL

# LABORATORY
# CONDUCTIVITY METER

## CC-511

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 the displayed results. We believe that the measurements would not cause you any trouble and that the meter would operate without any inconvenience.
In case of conductivity measurements it is important to choose the cell with the K constant value suitable for the measuring range. Improper selection may cause larger error occurrence, what may also happen during measurements with automatic temperature compensation with an inappropriate $\alpha$ coefficient introduced.
The essential feature of our products is their low failure frequency. However, in case of the meter's failure, our firm provides its immediate repair service under the warranty conditions.
We wish you pleasant and trouble-free work with our meter.

## 2. CHARACTERISTICS OF THE METER

The **CC-511** conductivity meter belongs to the newest generation of measuring devices which offer wide range of additional functions.
The electronic elements of the newest generation used in the meter made its memory independent from power supply. The meter is equipped with large custom LCD display, which displays conductivity and temperature reading and graphic symbols facilitate working.
Main features of **CC-511** are:

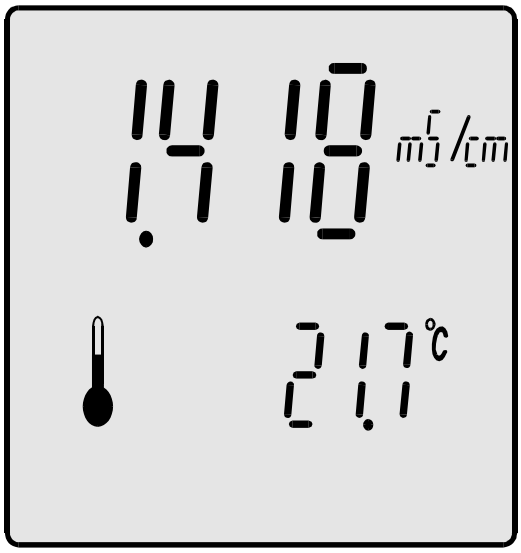
- high accuracy and stability of readings;
- automatic and manual temperature compensation;
- the conductivity cell calibration by entering the K constant value given by the manufacturer or by deterining it with use of a standard;
- wide conductivity measurement range with automatically switched subranges (autorange);
- storage of the user's settings in non-volatile memory;
- converting the conductivity into salinity in NaCl or KCl according to actual dependence to conductivity;
- calculating conductivity to TDS (total dissolved solieds) coefficient;
- possibility to enter $T_{ref}$ reference temperature and TDS coefficient.

## 3. WHAT IS THE METER DESIGNED FOR

**CC-511** conductivity meter is a precise and easy-to-use laboratory device designed for measuring conductivity in µS/cm or mS/cm and accurate measurement of the temperature of solutions and air in ℃.
The conductivity measurement result may be also displayed in concentration units (g/l) counted to NaCl, KCl or TDS. The 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 all types of conductivity cells with wide K constant range equipped with BNC-50 connector. **CC-511** cooperates with Pt-1000 temperature probe equipped with Chinch connector.

## 4. THE OUTSIDE VIEW

In the upper part of the meter there is an LCD display (Pic. 1), on which, the conductivity measurement readout is displayed. The readout may be displayed coverted to salinity in NaCl or KCl or TDS.
Simultaneously with the readout the temperature value in $^{0}$C is displayed. Symbols of units are displayed next to the readout.




Pic. 1.

Next to the temperature reading the symbol is displayed: - the symbol for automatic temperature compensation or - the symbol for manual temperature compensation. The ***CAL*** symbol in the left on the display signalises that the meter is in the calibration mode.
During calibration in the bottom part of the display the recognised calibration point number – P1 – is displayed. In the MODE mode it is possible to check the electrode parameters verified during the last calibration.

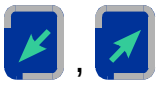
The meter's keyboard (Pic. 2) is equipped with the following buttons:.


- switches the meter on and off;


- return to the conductivity and salinity measuring function;

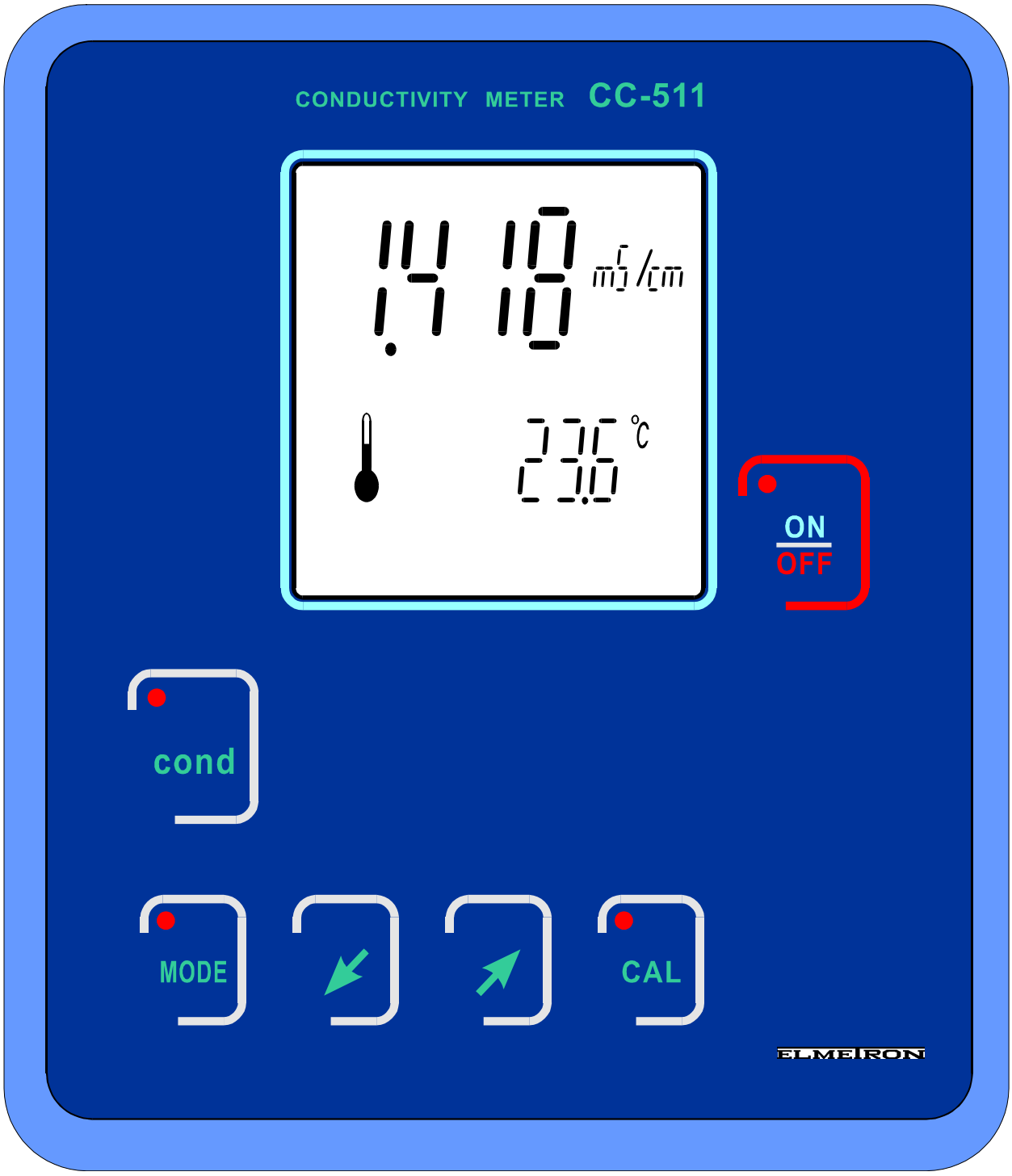

- holding this button enters the calibration mode. Short press in this mode confirms the calibration result;


- chooses parameter for entering;


, - buttons for entering parameters.

On the back wall of the meter there are inputs placed with the symbols given below:

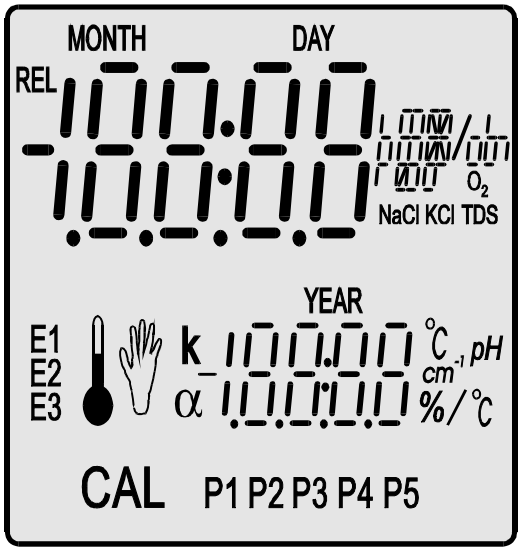
**cond** - the **BNC-50** connector for conductivity cell;
**temp** - the **Chinch** connector for temperature probe;
**POWER** - connector for power adapter.


CONDUCTIVITY METER CC-511
14.10
1.410
mS/cm
23.6 °C
ON
OFF
cond
MODE
CAL
ELMETRON

Pic. 2.

## 5. SWITCHING THE METER ON AND OFF

After switching it on by pressing the ON/OFF button the meter tests the memory and the display on which all symbols are being displayed (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. Displaying of HELP sign informs 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 cells have been lost.

After pressing the CAL button the meter adopts standard characteristics:
- K constant = 1.000 $cm^{-1}$ for conductivity cell;

and enters the measuring mode. It will be necessary to calibrate the conductivity cell.

The meter is switched off by pressing the ON/OFF button.

# 6. PREPARATION TO WORK

Before starting work:

- join the power adapter plug to the **Power** input;
- join the conductivity cell to the **cond** input (BNC-50);
- in case of using the temperature probe it should be connected with the Chinch temperature input - **temp**;
- switch the meter on by pressing the 

button.

## 6.1. Choosing the kind of temperature compensation

The meter switches to the automatic temperature compensation mode after connecting the temperature probe. Next to the reading the  symbol is displayed. 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  symbol appears). At the same time the  ,  buttons will be unlocked, what enables the temperature value changing.

**Note:** pressing the  ,  buttons simultaneously will set the compensation temperature to to the reference temperature value entered earlier.

# II. CONDUCTIVITY AND SALINITY MEASUREMENT

# 7. BASIC INFORMATION ABOUT THE CONDUCTIVITY MEASUREMENT

The conductivity measurement is based on applying electric current with a proper voltage and frequency to the measured solution. In **CC-511** the voltage comes to several dozens of mV and the frequency depends on the measuring range and may vary from 100 Hz up to 10 kHz. The electric current value is dependent on the kind of the measured liquid, its concentration and temperature. The conductivity result indirectly informs about the salt concentration in the measured liquid – when it increases, the conductivity rises (KCl, NaCl). However, this dependence doesn't concern all of the solutions. In some of them, after overdrawing certain salinity value the conductivity starts decreasing. The value of a conductivity measurement also increases together with the temperature. Measured conductivity can be displayed as salinity in g/l of NaCl or KCl assuming that the measured liquid includes homogeneous salt. There is a possibility to define approximately the concentration of salt dissolved in water on the basis of the TDS coefficient. The electrodes' surface and the distance between them are decisive factors for the cell's K constant value. This value has a great influence on the accuracy of the measurement. Depending on the measured conductivity value, cells with K constant = 0,1 $cm^{-.1}$ up to 10 $cm^{-.1}$ 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). The unit symbol in abbreviated form (µS or mS) is displayed next to the result. Conductivity changes along with temperature and salts concentration. In order to enable comparison of the results, the measured value is counted by the meter to the value which corresponds to measurement in reference temperature (it is usually the temperature 25℃). Measurement in reference temperature is the most accurate. In other temperatures the temperature compensation is used, which means that the meter calculates the influence of the temperature and $\alpha$ coefficient on the result. This coefficient describes how much (in %) the result changes with $1^0$C of the temperature change. The $\alpha$ coefficient may be introduced into the meter's storage and is equal 2% / $^o$C. For NaCl in temperatures close to 25 $^0$C it amounts to 2%/ $^0$C, e.g., in case of measurements in 30 $^0$C the result change totals to 5x2%=10%. 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 $\alpha$ coefficient, which is affected by the temperature and concentration changes.

## 8. ENTERING THE CONDUCTIVITY MEASUREMENT PARAMETERS

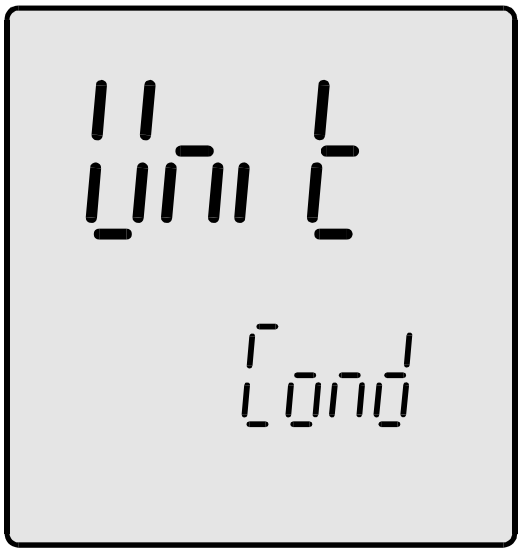
Before starting calibration and measurements it is necessary to perform all activities described in the chapter 6. Additionally, according to the chapter below, it is necessary to choose the unit in which the calibration and measurement are going to be made.

### 8.1. Choosing the unit

The measurement result is displayed in units of conductivity or salinity. Salinity can be counted to NaCl, KCl or TDS content in **g/l**. To choose the unit:

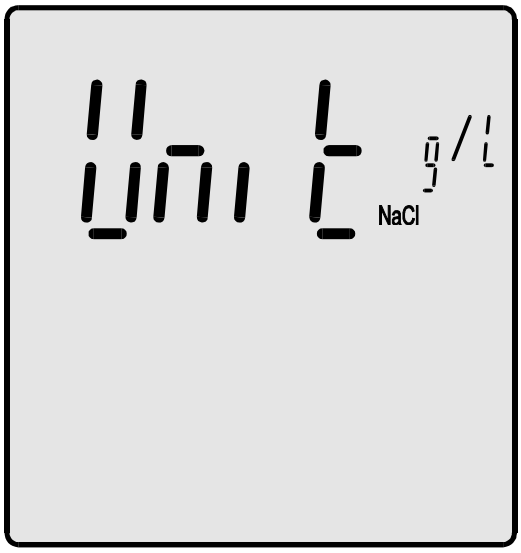
- in the conductivity measuring mode press the MODE button till the Unit (unit) symbol displays in the upper row on the LCD;
- with the , buttons choose from the lower row on LCD:

Cond - measurement in units of conductivity (Pic. 4);



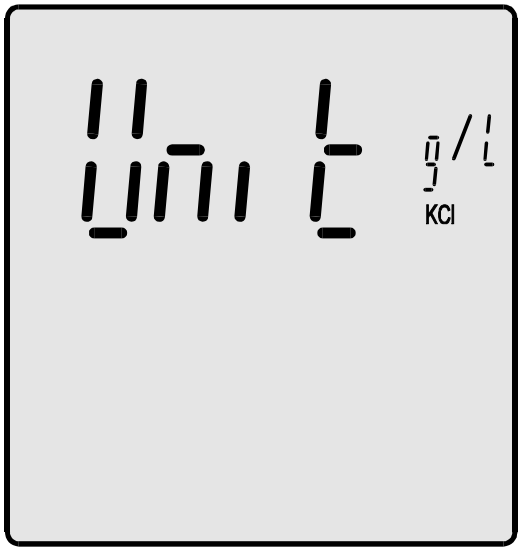

Pic. 4

**NaCl** - measurement result calculated to NaCl in **g/l** (Pic. 5);



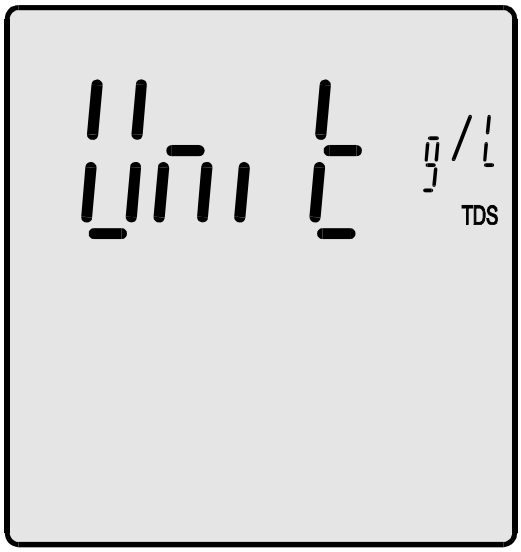

Pic. 5

**KCl** - measurement result calculated to KCl in **g/l** (Pic. 6);




Pic. 6

tds - measurement result calculated to TDS in **g/l** (Pic. 7).




Pic. 7

- enter the measurement mode by pressing the cond button

## 8.2. Entering the $W_{TDS}$ coefficient

In case of measurement of salinity with conversion to TDS it is necessary to introduce the $W_{TDS}$ coefficient:

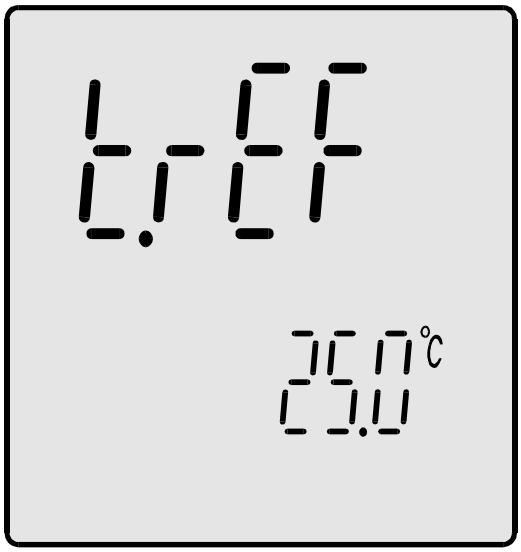
- in the conductivity measuring mode press the MODE button till the ctds symbol (TDS coefficient) displays in the upper row on the LCD (Pic. 15);
- with the ↙ , ↗ buttons enter the appropriate value of the TDS coefficient;
- enter the measuring mode by pressing the cond button.


Pic. 8.

### 8.3. Entering the reference temperature value

The range of introducing the reference temperature values is 10.0 ÷ 40.0 $^{0}$C, every 0.1 $^{0}$C. The most often used value is 25 $^{0}$C.
In order to introduce the reference temperature:

- in the conductivity measuring mode press the MODE button till the screen with a value of the reference temperature and a t.rEF sign (temperature reference) displays (pic. 9);
- with the , buttons introduce the temperature value;
- return to the measuring mode by pressing the cond button.




Pic. 9.

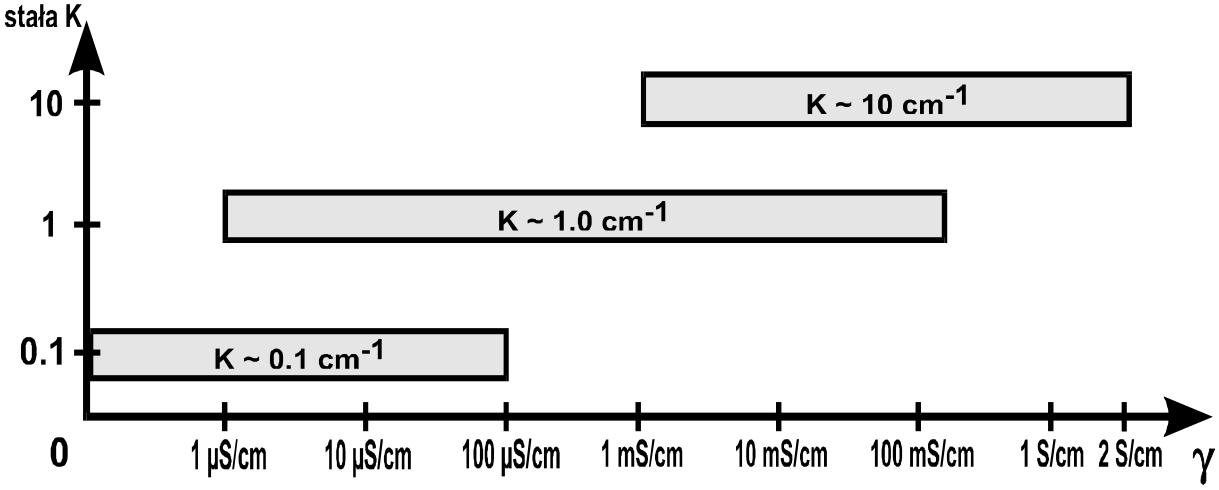
The measurement result will be calculated to the introduced reference temperature.

**Note:** pressing both , buttons simultaneously sets the temperature to 25 $^{0}$C.

# 9. CHOOSING AND MAINTAINING THE CONDUCTIVITY CELL

## 9.1. Choosing the cell

The **CC-511** meter measures conductivity in the range 0 – 1999.9 mS/cm. The meter cooperates with conductivity cells with K constant=0.010 ÷ 19.999 $cm^{-1}$ and BNC-50 connector. Depending on the required measuring range it is necessary to choose the cell with a K constant which enables receiving valid results. **Beyond its range the cell looses its linearity and the results are burdened with an increasing error.** Accurate measurements in the whole range are possible when using 3 different conductivity cells.
Depending on the expected measuring range the appropriate cell may be chosen with use of the chart below.




Pic. 10 The dependence between the measuring range and K constant of applied conductivity cells.

The standard set includes the conductivity cell with a K constant = 1. Cells with the K constant =10 should be used for measurements in liquids with conductivity higher than 100 mS/cm.

## 9.2. Maintenance of the conductivity cell

In order to receive stable results it is advisable to soak the cell for a few hours before measurement, especially in case of measurements in distilled water.
Maintenance of the conductivity cell consists mainly in washing the inside of the measuring cell accurately 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, 4-hydrofuran or detergent.
Certain norms propose universal liquid for cleaning the cells. This is a mixture of equal parts of isopropyl alcohol, ethyl ether and hydrochloric acid diluted with water in 1:1 ratio.
Broken 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. Next, wash the cell accurately with distilled water.

# 10. CALIBRATION

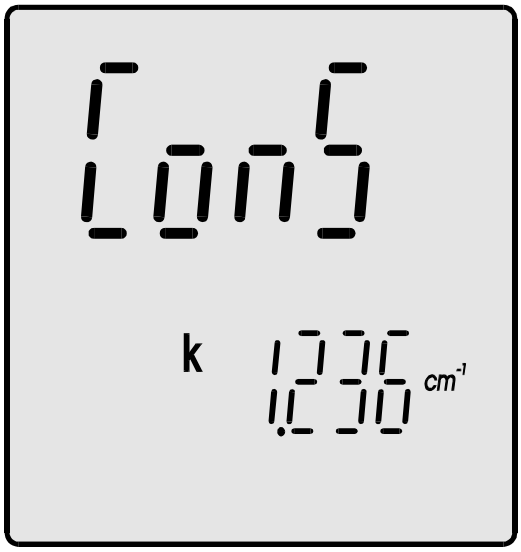
A characteristic feature of every conductivity cell is its K constant. Before the result is shown on the display, the value is multiplied by the K constant value. The value of the K constant depends on the size of the electrodes' surface and the distance between them. If the the cell is kept clean, the K constant is not changing. However, it is likely to change in case of contamination of the surface of the electrodes.
Calibration consists in introducing the K constant value into the meter's memory and is essential for obtaining accurate results. The meter may be calibrated without the standard solution, by entering the value of the K constant of the cell given by the manufacturer (recommended) or with use of standard solution with known conductivity – in order 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 the user's calibration it is necessary to apply fresh, accurately prepared standard solution. Additionally it has to be accurately thermostatic to the temperature $25^0$C. When these conditions are not kept, the calibration will be burdened with error.**

### 10.1. Calibration without standard solution

The meter has a possibility of calibration without the use of standard solution. In case of 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-511** meter after having calibrated it in the standard solution.
In order to calibrate without the standard:

- in the measuring mode press the MODE button till the screen with the value of the K constant displays (pic. 11);
- with the , buttons enter the value of the K constant;
- enter the measuring mode by pressing the cond button.




Pic. 11

## *10.2.* Calibration with use of standard solution

The purpose of such calibration is to determine the K constant. The meter enables one-point calibration in a freely chosen standard solution. To decrease the error it is recommended to use solutions with a value close to the estimated value of measurement. It is required to use standard solutions of high quality. Calibration is made in the chosen unit (section 8.1).
It is necessary to comply to the principles given below to obtain the exact results of calibration:

1. The temperature of the standard solution should be equal to the reference temperature (most often it is 25 $^{0}$C).
2. New, unused standard solution should be applied.
3. The cell and its electrodes should be clean and devoid of air bubbles.
4. The electrode holder should be used.

### *10.2.1. Entering the standard solution value*

In order to enter the value of the standard solution:

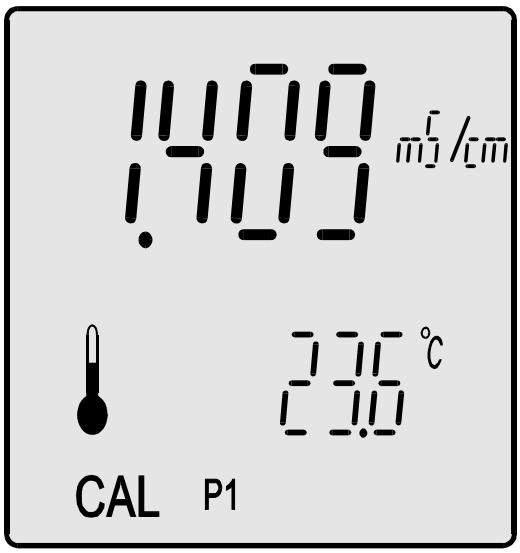
- choose the unit according to the section 8.1;
- in the conductivity measuring mode press the MODE button till the CAL symbol appears in the lower row (pic. 12);
- with the , buttons enter the value of the standard solution into the upper row;
- enter the measuring mode by pressing the cond button.


Pic. 12

### *10.2.2. Calibration with automatic temperature compensation*

It is necessary to:

- enter the value of standard solution (point 10.2.1);
- connect the conductivity cell and the temperature probe;
- immerse both of them in the standard solution, hold the conductivity cell at least 1 cm away from the bottom and walls of the vessel. The measuring cell should be filled up with the measured solution, there shouldn't be any air bubbles and the electrodes should be evenly moistened*;
- measure the temperature of solution and bring it to the introduced value of reference temperature;
- press and hold the CAL button until the ***CAL*** symbol appears on the display (pic. 13).
- wait till the value stabilises and press CAL. Flashing result informs about recording it in the memory. If the Err symbol displays, it is necessary to check the introduced value of the standard solution;
- exit the calibration mode by pressing cond.




Pic. 13

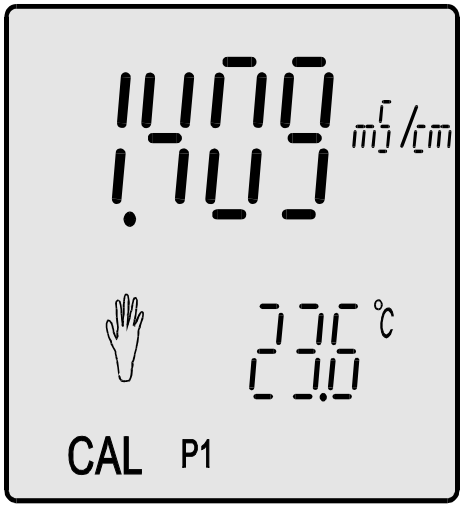
The meter is calibrated and ready to work.

* - 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.

### *10.2.3. Calibration with manual temperature compensation*

In order to calibrate the meter it is necessary to:

- turn the meter on with ON/OFF;
- choose the conductivity measuring modewith the cond button;
- disconnect the temperature probe and press the , . buttons simultaneously. Introduced reference temperature value will appear In the lower row;
- introduce the value of the standard solution (point 10.2.1);
- immerse the conductivity cell in the standard solution and hold it at least 1cm away from the bottom and walls of the vessel. The measuring cell should be filled up with the standard solution completely and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- measure the temperature of the standard solution with a lab thermometer and bring it to the introduced reference temperature;
- press and hold CAL till the ***CAL*** symbol (pic. 14) appears on the display.
- wait till the result stabilises and press CAL. Flashing result informs about recording it in the memory. If Err symbol displays it is necessary to check the introduced value of the standard solution.
- exit the calibration mode by pressing cond.




Pic. 14

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.

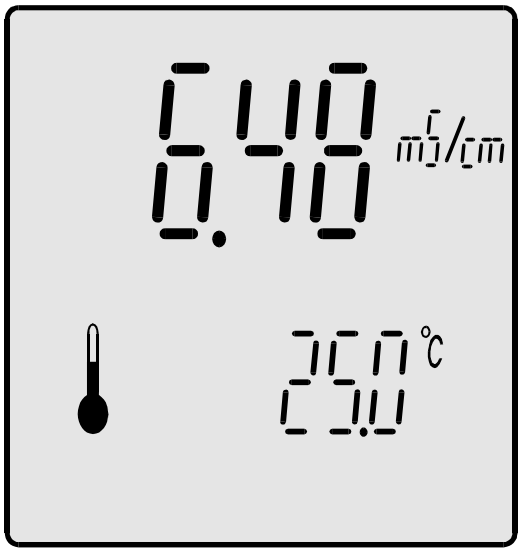
# 11. THE CONDUCTIVITY MEASUREMENT

## 11.1. Measurement without the temperature compensation

An accurate conductivity measurement should be made without the temperature compensation. The measured solution should be brought to the reference temperature value introduced earlier. When controlling, it is possible to use the temperature probe. In case of work without the temperature probe it is necessary to introduce the temperature value with the , .buttons.

In order to make a measurement without the temperature compensation:

- connect the conductivity cell and the temperature probe to the **cond** and **temp** connectors respectively;
- turn the meter on with ;
- choose the conductivity measuring mode and the unit (section 8.1);
- if the conductivity cell wasn't calibrated, calibrate it according to the chapter 10;
- place both probes in the measured solution, the conductivity cell can't touch the walls and the bottom. The measuring cell should be filled up with the standard solution and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- bring the temperature of the measured solution to the value of the reference temperature.
- read the result after it has stabilised (pic. 15).



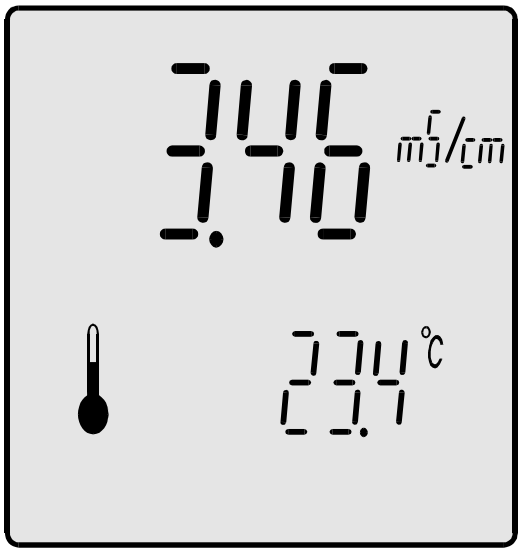

Pic. 15

* - 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.

## 11.2. Measurement with automatic temperature compensation

In order to make measurement with automatic temperature compensation:

- connect the conductivity cell and the temperature probe to the **cond** and **temp** connectors respectively;
- turn the meter on with the ON/OFF button;
- choose the conductivity measuring mode with the cond button and the unit according to the section 8.1;
- if the conductivity cell is not calibrated, calibrate it according to the chapter 10;
- check or change the value of the reference temperature;
- place both probes in the measured solution, the conductivity cell can't touch the walls and the bottom. The measuring cell should be filled up with the standard solution and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- wait till the result stabilises and read it (pic. 16).




Pic. 16

**Note:** in case of exceeding the range of temperature compensation the result a nd the symbol start flashing even though the conductivity measuring range has not been exceeded.

Displaying of the symbol instead of next to the value informs that the temperature probe is broken.

* - 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.

### 11.3. Measurement with manual temperature compensation

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 of the temperature probe switches the meter to manual temperature compensation.
In case of measurement with manual temperature compensation:

- connect the conductivity cell to the **cond** connector;
- disconnect the temperature probe;
- turn the meter on with the ON/OFF button;
- choose the conductivity measurement unit (section 8.1);
- if the conductivity cell has not been calibrated earlier, calibrate it according to the chapter 10;
- check or change the value of the reference temperature;
- place the cell in the measured solution, the conductivity cell can't touch the walls and bottom. The measuring cell should be filled up with the standard solution and shouldn't include any air bubbles, the electrode's surface should be evenly moistened*;
- measure the temperature of the solution and introduce its value with the , buttons.
- after stabilisation read the result (pic. 17).


Pic. 17

**Notice:** pressing of the , buttons simultaneously sets the compensation temperature to the reference temperature value that has been entered earlier.

* - 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.

## 12. SALINITY AND TOTAL DISSOLVED SOLIDS 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 to determine, after certain calculations, salinity of the measured solution in concentration units (g/l or %), or TDS (Total Dissolved Solids). Received values are always approximate and 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, salinity amounts to 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 3 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) | Real 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-511 microcontroller takes into consideration actual dependence between conductivity and salinity what greatly reduces the error. There is a possibility of counting the salinity in NaCl or KCl, because the dependence for these salts is slightly different.**

## 12.1. Salinity measurement with conversion to NaCl or KCl content

The measurement of salinity with conversion to NaCl or KCl content is made in the following way:

- choose the salinity measurement with conversion to NaCl or KCl content according to the section 8.1;
- then act as during the conductivity measurement (chapter 11);
- after stabilisation read the result.

## 12.2. Salinity measurement with conversion to TDS content

The measurement of salinity with conversion to TDS should be made in the following way:

- according to section 8.2 introduce the $W_{TDS}$ coefficient;
- choose the measurement of salinity with conversion to TDS and the unit (g/l);
- then act as during conductivity measurement;
- after stabilisation read the result in g/l.

# III. TEMPERATURE MEASUREMENT

## 13. TEMPERATURE MEASUREMENT

The temperature measurement is made as follows:

- switch the meter on by pressing the 

button;
- connect the temperature probe to the Chinch connector on the display the  symbol will be displayed;
- put the temperature probe to the measured solution;
- wait till the value stabilises and read the result from the lower row.

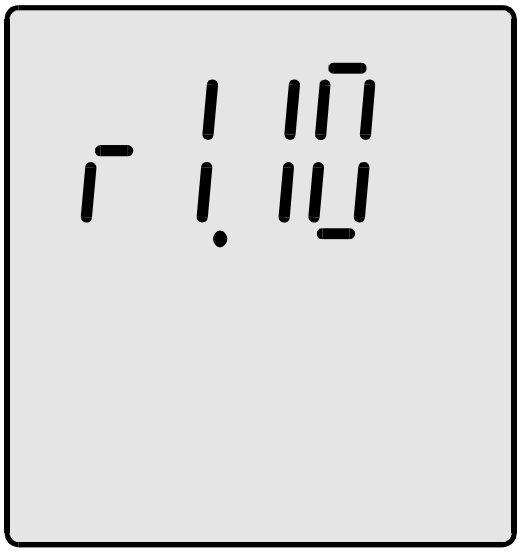
The meter cooperates with the Pt-1000 platinum resistor sensor and the final accuracy of the temperature measurement depends on its class.

**NOTE:** lack of the  symbol on the display signalises disconnecting the temperature probe or break in its circuit. In such case the meter shows the temperature value introduced by the user for manual temperature compensation (the  symbol). Blinking -50℃ value during measurement at positive temperature informs about short-circuit in the temperature probe.

# IV. OTHER

## 14. READOUT OF THE SOFTWARE VERSION NUMBER

In order to check the software version number turn the meter off and next, holding the MODE 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. 18). In the upper row the software version will appear.



Pic. 18

After about 1.5 s. the meter enters the measurement mode.

# 15. TECHNICAL DATA

## CONDUCTIVITY MEASUREMENT:

| Ranges * | Resolution | Accuracy** (±1 digit) | Frequency |
|---|---|---|---|
| 0.00 ÷ 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 ÷ 199.9 mS/cm | 0.1 mS/cm | ±0.25 % | 12 kHz |
| 200 ÷ 1000 mS/cm | 1 mS/cm | ±0.25 % | 12 kHz |

* Range for K=1 up to 100 mS/cm; above for K=10.
**Accuracy given for the end value of the range.

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

TEMPERATURE COMPENSATION: manual/automatic
COMPENSATION RANGE: -5.0 ÷ 70.0 $^{0}$C
K CONSTANT RANGE: 0.010 ÷ 19.999 cm$^{-1}$
α COEFFICIENT: 2.00 %/ $^{0}$C
TDS COEFFICIENT RANGE: 0.20 ÷ 1.00
MEASURING RANGE KCl: 0 ÷ 200 g/l
MEASURING RANGE NaCl: 0 ÷ 250 g/l
PROBE CALIBRATION: one-point

1. by entering the K constant of the probe
2. using the 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 applied Pt-1000 probe

TEMPERATURE PROBE: Pt-1000 platinum resistor

ACCURACY OF THE PROBE IN RANGE 0 ÷ 100 $^{0}$C:

for Pt-1000B resistor: ±0.8 $^{0}$C
for Pt-1000$^{1}/_{3}$B resistor: ±0.3 $^{0}$C

**OTHER:**

OPERATING TEMPERATURE: 0 ÷ 40 °C
POWER SUPPLY: 12V/100mA power adapter.
POWER CONSUMPTION: 120 mW
DISPLAY: LCD 69 x 73 mm
DIMENSIONS: 200 x 180 x 50 mm
WEIGHT: 600g

## 16. EQUIPMENT

The standard set includes:

1. ECF-1 conductivity cell (K constant=0.45);
2. Pt-1000B temperature probe (standard);
3. 12V/100mA power adapter;
4. User's manual with warranty.

Additional equipment:

1. Conductivity cells adjusted to the required measurement range;
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-511** conductivity meter number

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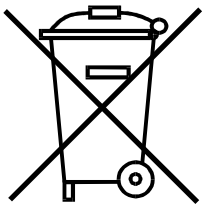
The electrode and the conductivity cell have a 12-month warranty.

In case of damage the manufacturer will repair the meter within 14 days of 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.

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

When sending the meter, please include the cell, the temperature probe and the power adapter.
We also provide after-warranty repair service.

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



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