EVALUATION KIT TUBE SENSOR corTEC® KIT-xCRC03A

The new corTEC® tube sensor evaluation kit provides a preview of the range of functionality coming shortly with a new corTEC® based xCRC plattform of products. This evalution kit allows to get familiar with two areas of applications:

- Quality/fluid property detection and control (“QCRC”-products)
- Highly demanding continuos level measurement (“LCRC” -products)
- Bubble detection in tubes



SAFETY AND WARNING NOTES

Evaluation kits are solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of the products. Evaluation kits have no direct function and are not finished products. Evaluation kits shall not be directly or indirectly assembled as a part or subassembly in any finished product. Evaluation kits do not comply with any EMC or other regularatory requirements and operation is subject to the condition that this product cannot cause harme or interference.

Evaluation kits are solely for use by technically qualified, professional electronics experts who are familiar to the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. User assumes all responsibility and liability for proper and safe handling and use and agrees with the restrictions and disclaimer at the end of this document.

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DESCRIPTION

Scope of delivery sensor kit:

- USB cable
- Interface Box
- Sensor cable
- 2 QCRC sensors A3-version (US Patent Pending)
- Tube adapter with gluing tape for easy installation of QCRC sensor
- Tubber bands
- 3 Silicon tubes
- 2 Syringes



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BASIC TIPS ON ESD

Electrostatic Discharge (ESD) can damage electronic components during the handling of circuit boards. The following tips help to reduce the probability of ESD events:



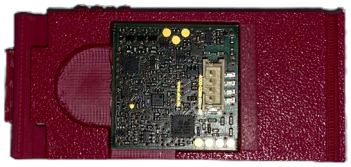
- Avoid charge separation
  - Do not wear (layers of) polyester clothes
  - Carpets – bad ←→ wood, tile or concrete flooring – good
- Support charge decay
  - Do not wear shoes with insulating (rubber) sole (e.g. Crocs)
  - Higher humidity dissipates static charge (dry heater air in winter → bad)
- Before touching the PCB, users should “ground” themselves, e.g. by touching the bare part of a radiator.

PREPARATION

- Download of EBE Control Software at https://www.ebe.de/en/downloads/
- Minimum software requirements: Windows 10 or Windows 11 and NET Framework 4.8
- Connecting the interface box via USB cable to the computer
- Connecting the sensor via sensor cable to the interface box
- For mounting of the sensor please refer to Data Sheet

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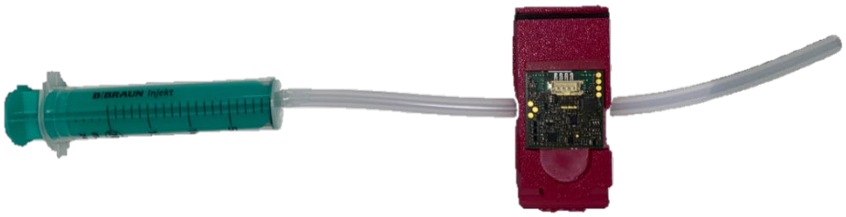
TEST SETUP TUBE ADAPTER



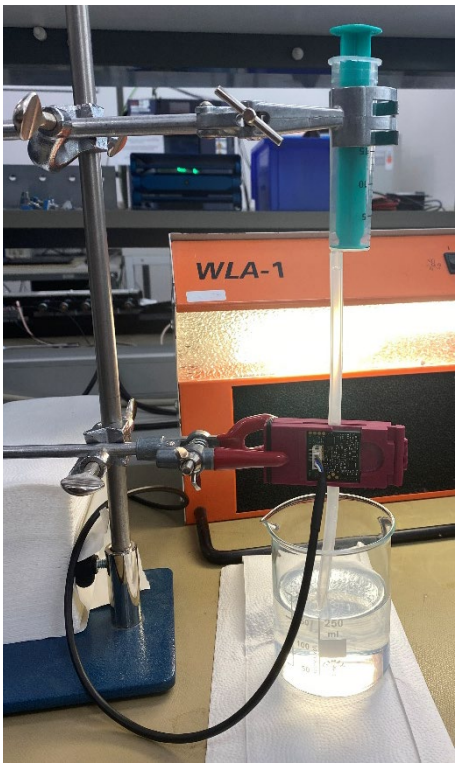
Open the tube adapter and place a silicone tube in the recess so that the adapter is positioned roughly halfway.

Close the tube adapter again and secure it with a rubber band.

Connect a syringe to one end of the tube.



You can now place the other, open end into a medium of your choice and then draw the medium into the tube using the syringe.



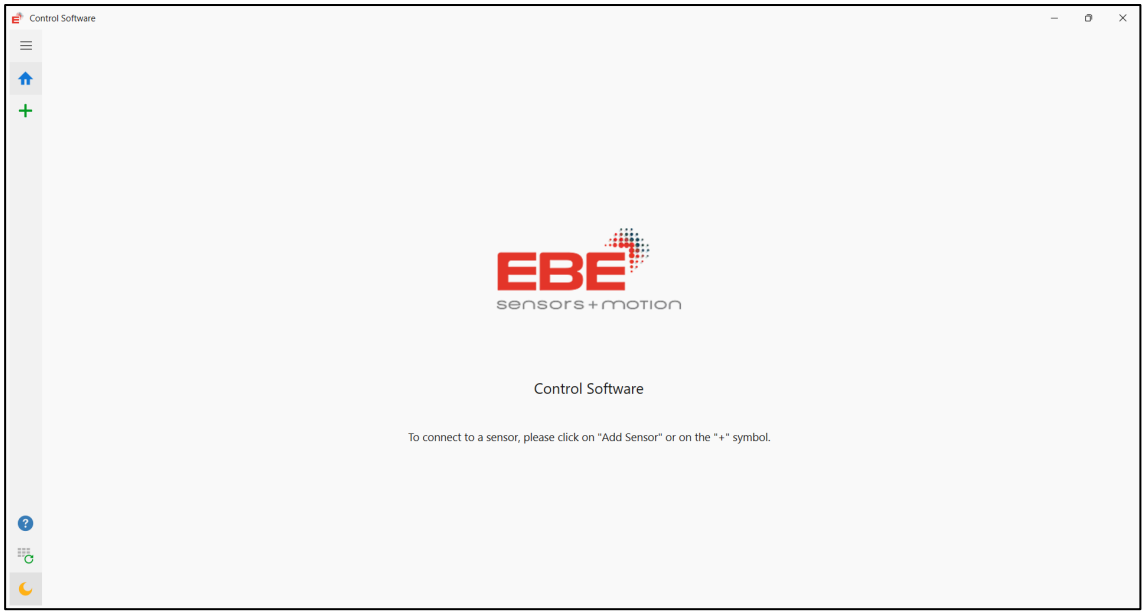
Note: You have the option of inserting an LCPB025D into the hose adapter opposite of the xCRC. This results in a changed offset of the measurement signal, but has no effect on the accuracy of the sensor as long as the LCPB is not powered.

To start the measurement, connect the sensor to a PC via the interface box and launch the control software.

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OPERATION

Starting the Control Software will lead to the following starting page:



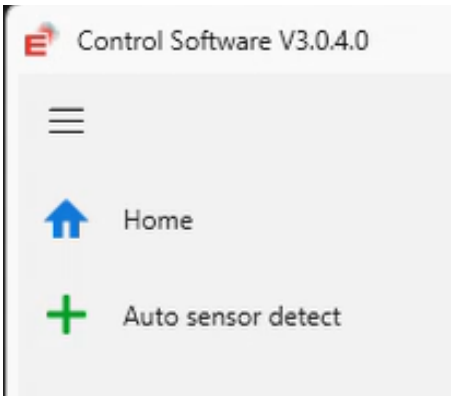
On the left side the menu band is located:

-  Allows to expanding the menu band
-  Home - Guiding back to the starting page.
-  Sensors can be added to the Control Software. Measurements can only be realised with added sensors.
-  Sensor symbol – a senor is connect to the Control Software. General information and measurement options are shown.
-  Help - Contact information of EBE.
-  This option checks if there is a new version of the Control Software available. If so, the EBE homepage will open for downloading the new version.
-  The day/night mode can be changed.

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SENSOR CONNECTION

The Control Software can detect EBE sensors automatically. Connection can be established by clicking on the green cross symbol or “Auto sensor detect” text.

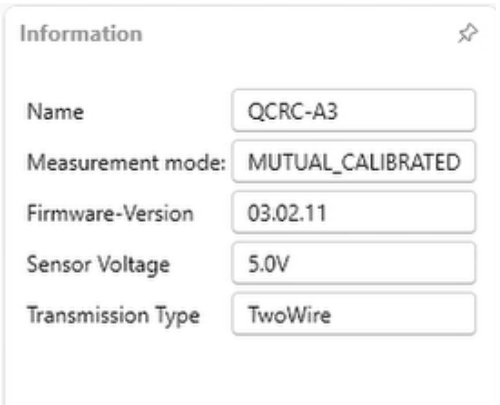


After a short time the Control Software establishes the communication with the sensor. If this operation is succesful, the sensor is added to the menu band and three windows appear: Information window, Sensor data window, Measurement and logging window.

Information window

This window provides general information about the actual used sensor:

- Name
  The EBE name of the sensor (here a QCRC-A3) sensor is used with TwoWire output.
- Measurement mode
  Shows which measurement mode the sensor is currently using
- Firmware-Version
  The firmware version of the sensor.
- Sensor Voltage
  The applied supply voltage
- Transmission Type
  One- or TwoWire communication.

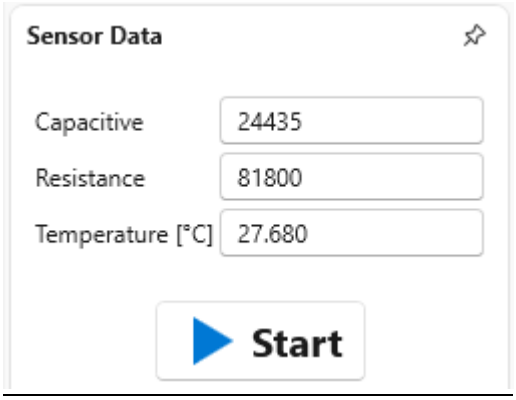


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Sensor Data window

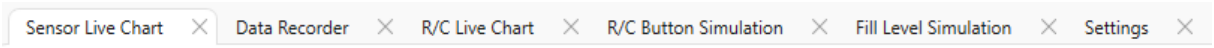
Displays the actual sensor output values – capacitive measurement value, resistance measurement value and temperature.

Data acquisition is started by pressing the button “Start”.



Measurement and Logging window

This window is divided in several tabs providing information and setting possibilities for the sensor data:



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Sensor Live Chart

After pressing the Start Button located in the Sensor Data window the Sensor Live Chart shows the capacitive and restitance measurement values and the temperature values. The temperature values are hidden by default.



Features:

- While hovering with the mouse over a graph, the timestamp and the output data are displayed.
- Zoom in and out is possible (mouse wheel).
- Fade out and fade in of graphs.
- With the clear charts button [Clear Charts] the live chart is cleared and the time stamp starting from 00:00:00 again.

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Data Recorder

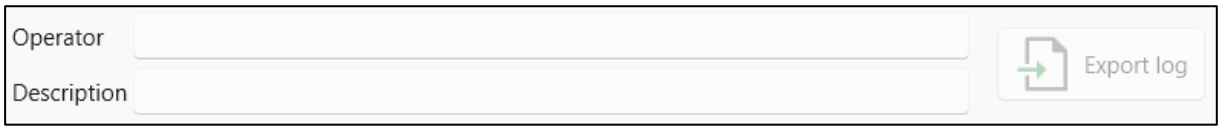
In this tab the recorded data is shown.
Data can be logged after pressing the stop button.



Features:

- Listed capacitive, resistance and temperature values with the particular timestemp.
- Clear previous logged data using the clear button 

.
- Export logging data to a .csv or .xls file. The .csv data format is recommended for taking long term measurements.
- Possibility to provide further information in the Log File by using the operator and description window.

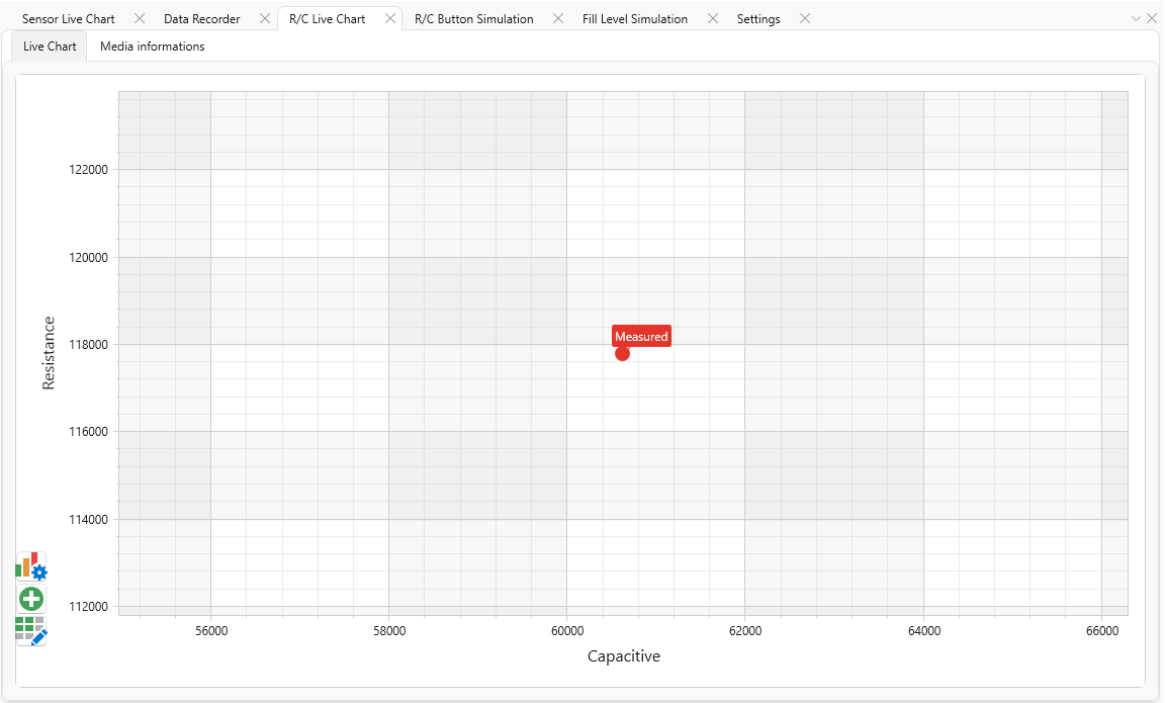


It is recommended to change the sample rate in the tab “Settings” for taking long term measurements to reduce the number of measurement and prevent the software from crashing and data from being lost.

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R/C Live Chart

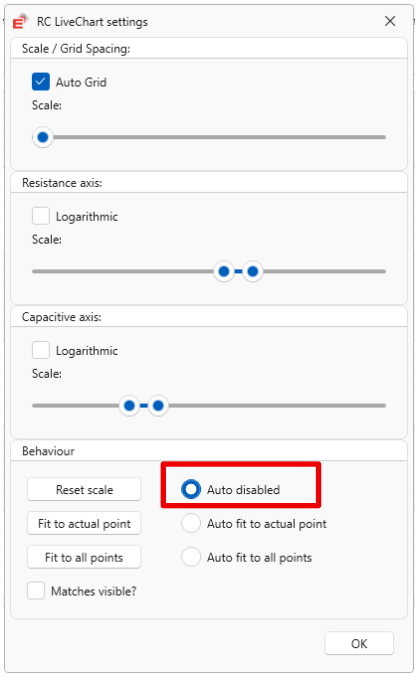
The R/C Live Chart tab shows the capacitive and resistance measured value in a two-dimensional diagram:



In addition to displaying the two measured values in a two-dimensional diagram, the R/C Live Chart offers various setting options.



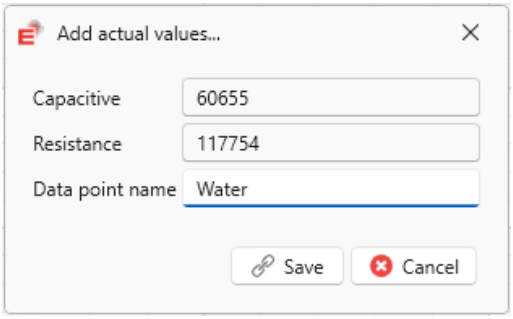
Various settings for the scaling and behavior of the graph can be made via the chart settings:



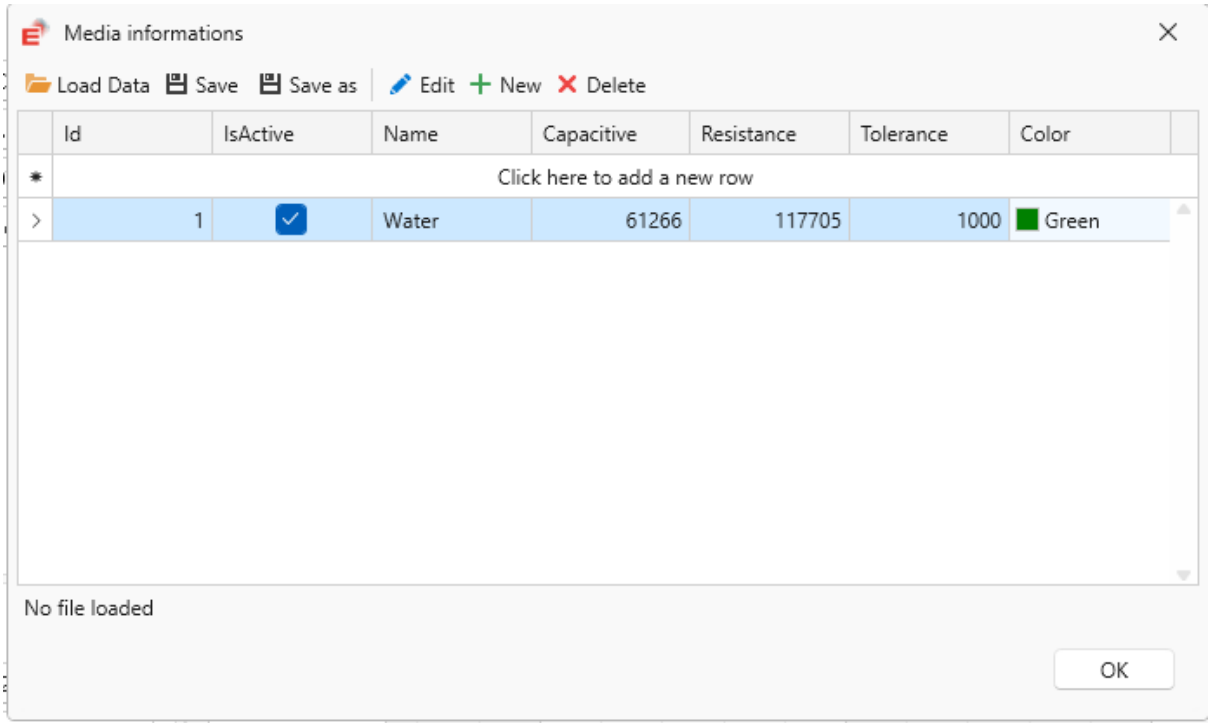
Click on auto disable to make custom settings.

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The green plus symbol can be used to save and name data points, for example for different media, which are then displayed in the diagram.



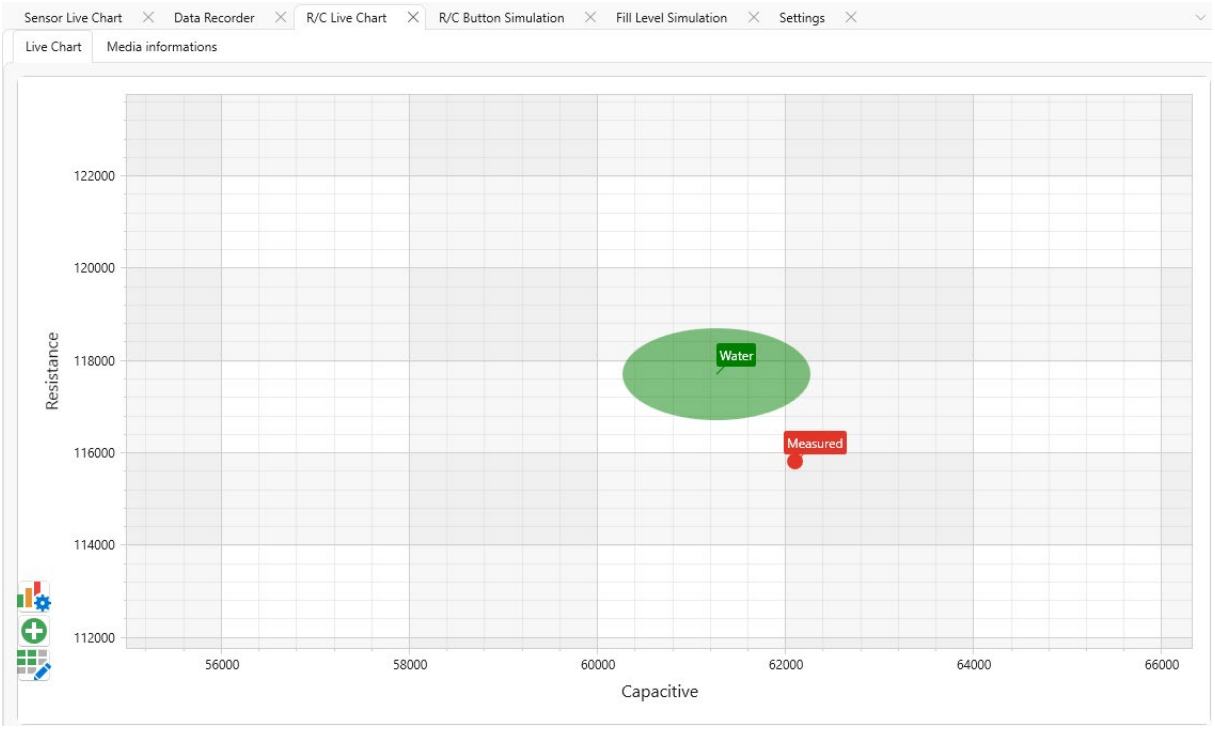

All saved values can be viewed and edited via this symbol or the Media Information tab above the graph. Individual points can be differentiated by color, set to active/inactive and a tolerance field can be defined around the measurement point. New measured values can also be created manually. Tables with saved values can also be exported so that they can be imported again at a later date:



For media detection, a tolerance value can be defined. If a measured value is in the area of the defined tolerance, the assigned media is shown in the R/C chart.

Result:

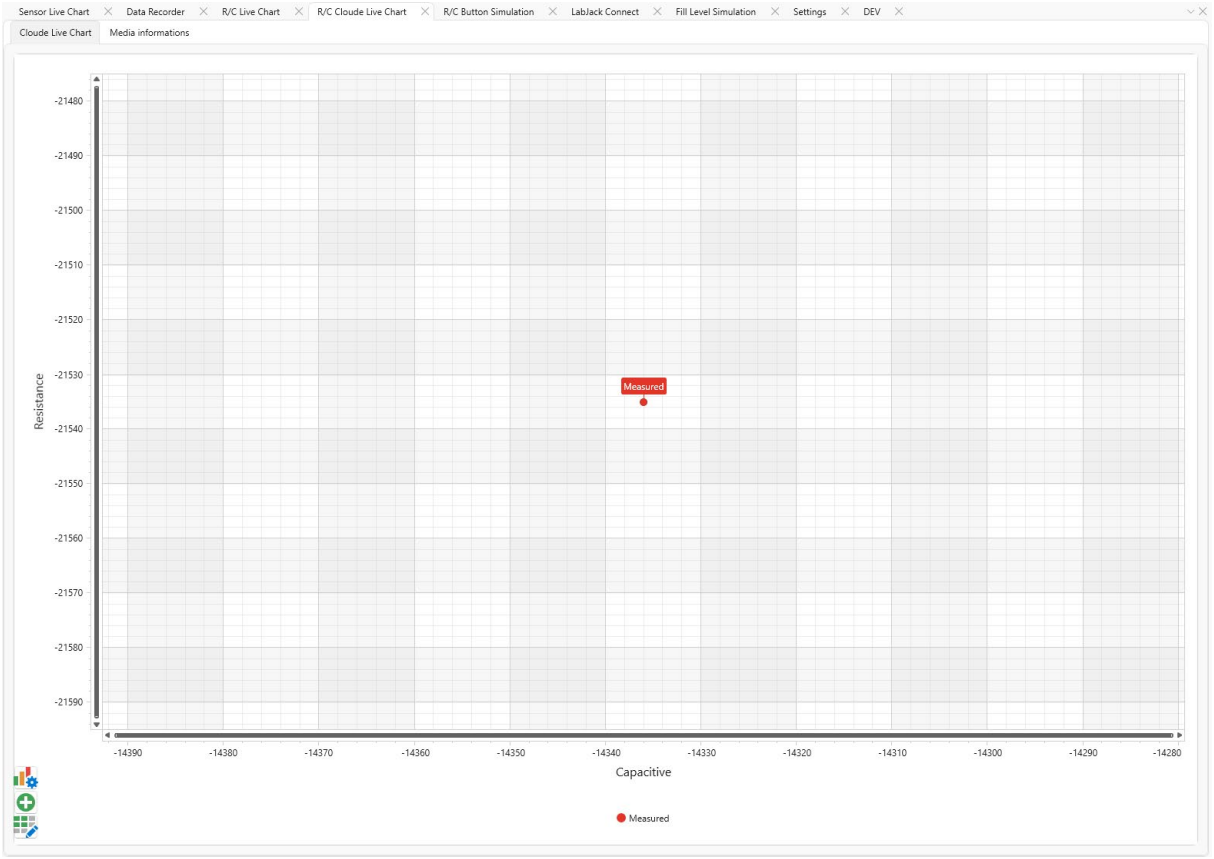
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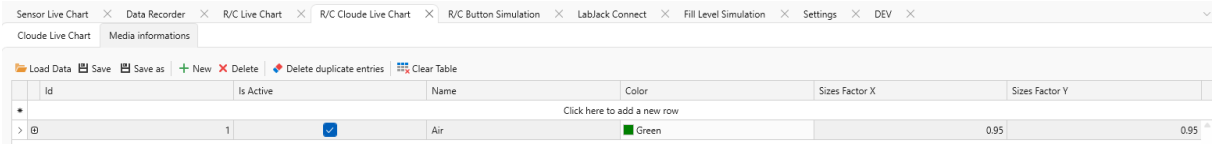
R/C Cloude Live Chart

Another way to define specific areas is to create a point cloud.

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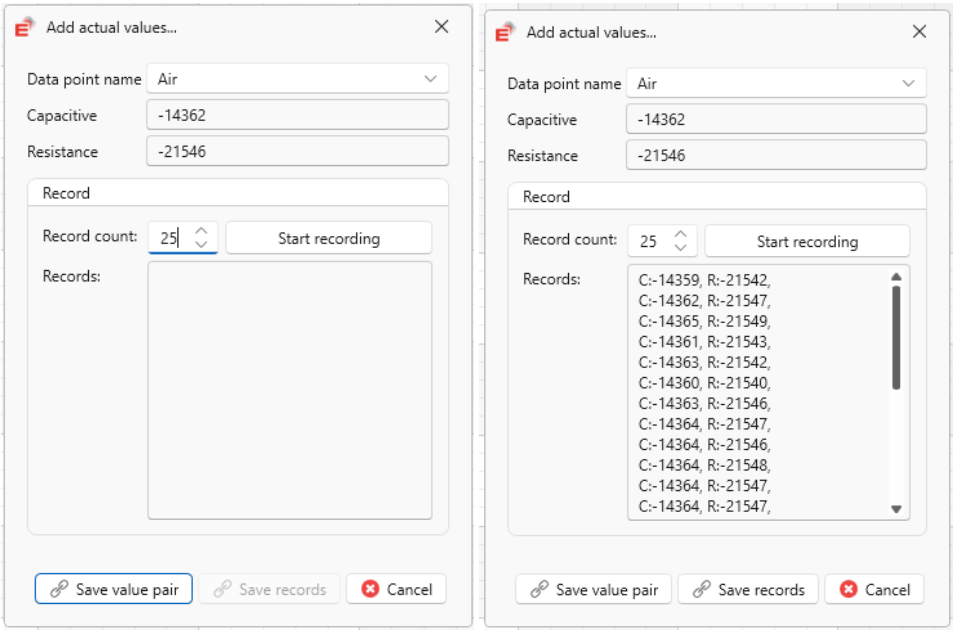


To do this, first define a new medium under “Media Information” in the “R/C Cloud Live Chart” tab without specifying any measurement values.

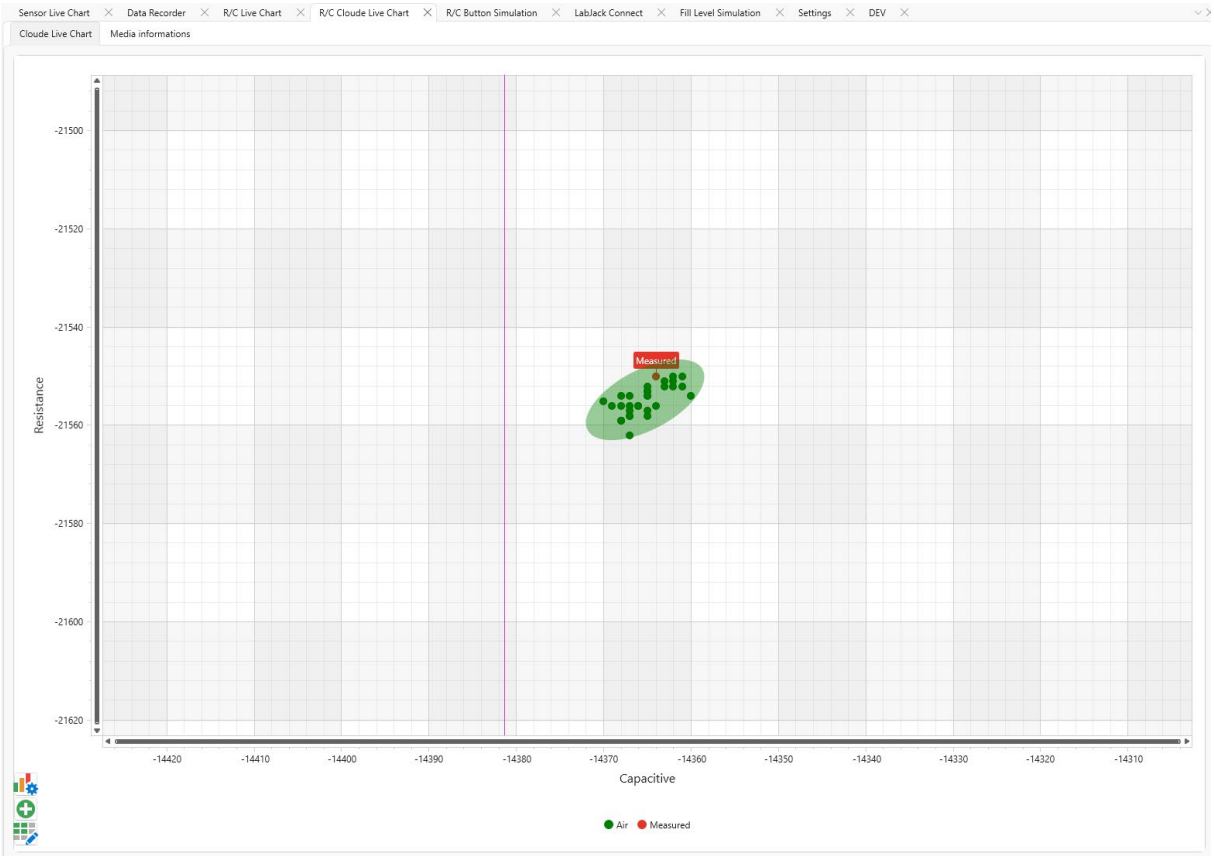


You can then use the green plus button in the graph to add individual measurement values or automatically add a certain number of data points to the respective medium.

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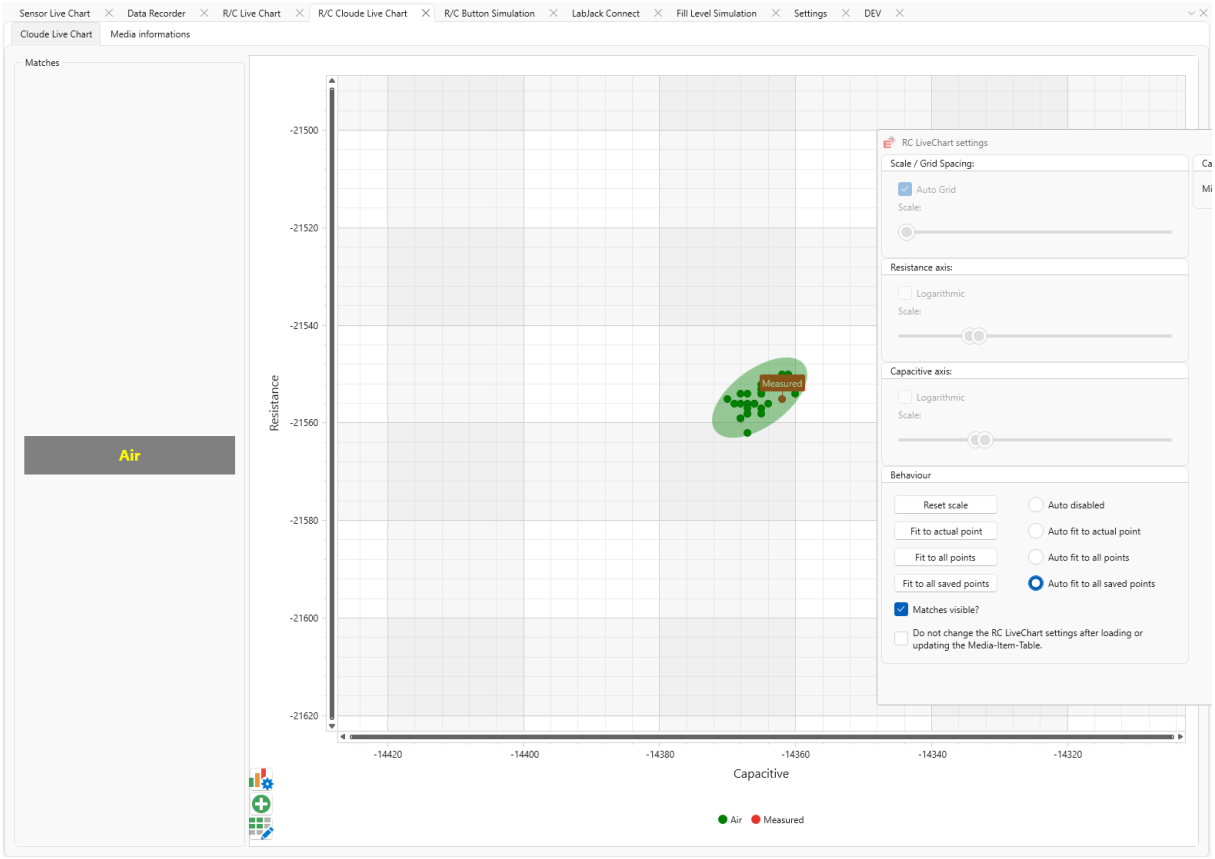


After saving the measurement data, a scatter plot appears in the graph around all measurement points.



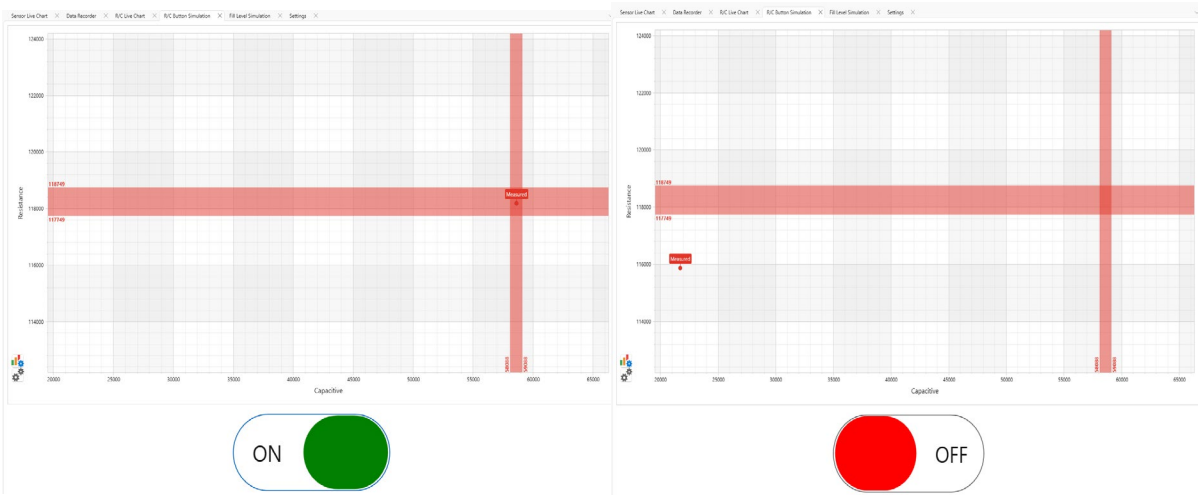
By checking the “Matches visible?” checkbox, you can display which medium is currently being recognized.

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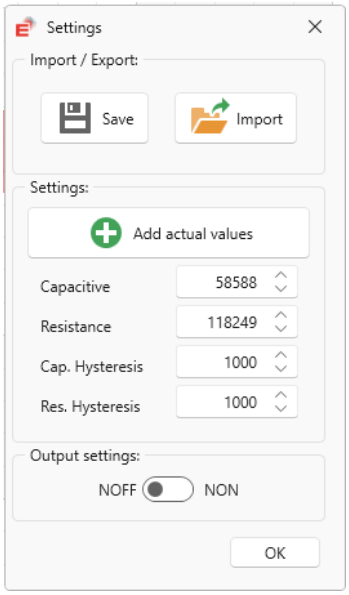
R/C Button Simulation

The R/C Button Simulation tab allows you to simulate the function of the QCRC as a capacitive button. A relevant switching range can be defined for both the capacitive and the resistive measured value. The intersection of the two ranges defines the switching range.



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This symbol can be used to set the measured values of the switching point and their hysteresis:

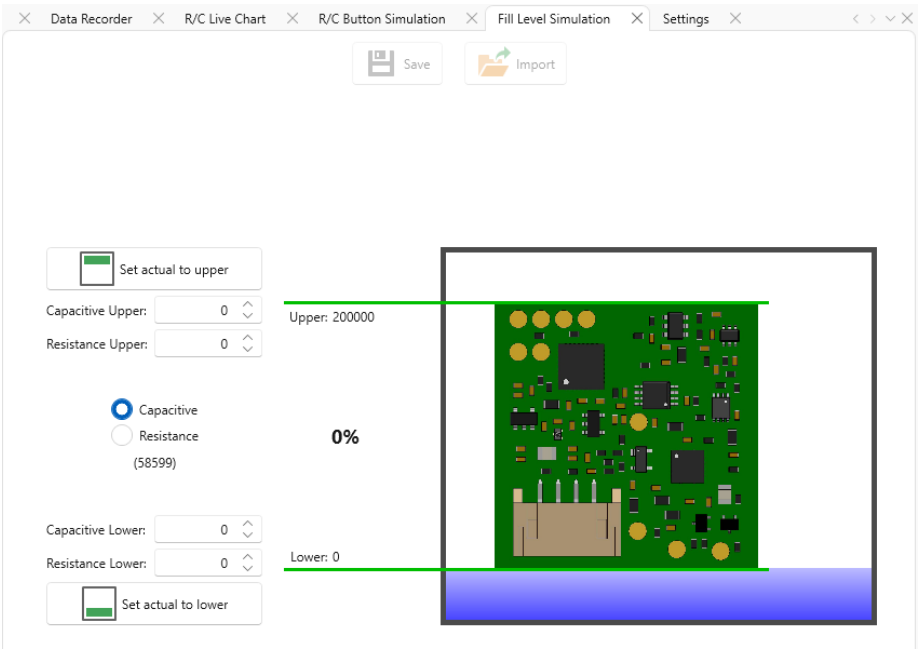


The determined settings can be saved as a .json-File so that they can be imported again at a later date

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Fill Level Simulation

The Fill Level Simulation tab will demonstrate the possibility to use the QCRC as a continuous level sensor. It enables direct output of the sensor values as a percentage.



To be able to simulate a fill level, you must first define the limit values. To do this, follow the steps below:

Step 1: Fill the target medium in the application to the lower sensor electrode edge like shown in the picture above and press the button “Set actual to lower”

Step 2: Fill the target medium in the application to the upper sensor electrode edge like shown in the picture above and press the button “Set actual to upper”

Step 3: You can now fill the application to a various level and the fill level is shown in percent in die picture. You can also choose, if you want to use the capacitive or the resistance measurement value for the demonstration.

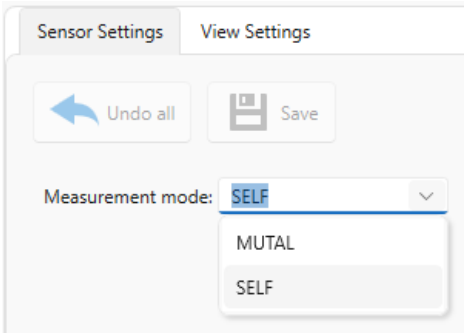
Step 4: The determined limits can be saved as a .json-File so that they can be imported again at a later date.

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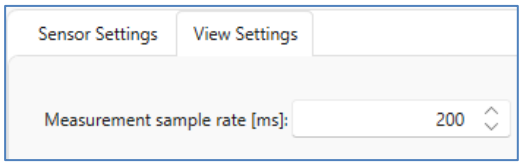
Settings

The Settings tab is seperatet in two more tabs: the Sensor Settings and the View Settings.

With the Sensor Settings tab, you can switch the measurement mode from SELF (standard) to MUTUAL. As mentioned on page 2 this option is only available for QCRC-A1 prototypes. The change of the measurement mode is only possible while the measurement is not active and has to be saved to the sensor by using the Save button.



The View Settings tab provides the posibility to change the sample rate of the sensor. The sample rate can be changed from 200ms (0,2s) to 10.000ms (10s).



It is recommended to change the sample rate for taking long term measurements to reduce the number of measurement and prevent the software from crashing and data from being lost.

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DISCLAIMER

The Evaluation-Kit is expressly intended for use under supervision and in a controlled environment that is not accessible to the public for the purpose of evaluating the component. The Evaluation-Kit does not comply with all relevant regulations, in particular safety regulations. It is expressly not intended to be placed on the market or operated unsupervised, in public spaces or on a permanent basis. The Evaluation-Kit is intended solely to enable developers and engineers, to test, demonstrate, and evaluate the functionality and performance of the component for prototyping purposes.

The Evaluation-Kit is not intended for productive use or installation in end products, for medical, life-saving, or safety-related applications. The use of the Evaluation-Kit is also not permitted and expressly prohibited in vehicles of any kind (including trailers and watercraft), as a component in aerospace products (including radio transmitter for aerospace purposes), or in offshore structures.

The technical values stated are based on laboratory tests. Tests are always carried out in a free field and do not comply with any standard, why approximate values are given. The user is responsible for determining the suitability of the technical information referred to herein for his evaluation. The information contained in this document is for general guidance only. On delivery of the Evaluation-Kit, Manufacturer is only obliged to implement those properties set out and agreed upon in this document. Further properties are not included. No guarantee is given. Warranty is limited to below mentioned extent.

User assumes all responsibility and liability to determine whether the Evaluation-Kit is subject to any applicable international, federal, state, or local laws and regulations related to user's handling and use of the Evaluation-Kit and, if applicable, user assumes all responsibility and liability for compliance in all respects with such laws and regulations.

Disclaimer for improper use

Manufacturer accepts no liability for damage resulting from improper, inappropriate, or non-compliant use of the Evaluation-Kit. Any liability for direct or indirect damage, consequential damage or loss resulting from improper use is excluded. The Customer (user) is obliged to use the Evaluation-Kit exclusively in accordance with the instructions and information given in this document.

The limitation of liability described above does not apply in the case of mandatory statutory liability such as under the German Product Liability Act (Produkthaftungsgesetz) or in the case that a guarantee is given or in the case of wilful deceit or fraudulent misrepresentation or with regard to claims for an injury of the life or limb or health or in the case of intentional or grossly negligent breach of fundamental contractual duties (“wesentliche Vertragspflichten”).