

# RelaxIS 3 – Basic Tutorial

## Contents of this Tutorial

In this tutorial you will learn the following steps:

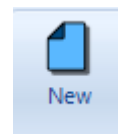
- Creating a new project folder
- Loading of an unknown data file into RelaxIS
- Plotting the spectrum in different representations
- Assigning the spectrum to a model, here: an equivalent circuit
- Fitting the spectrum
- Examining the fit results

Please follow the steps to get a basic idea of how to work with RelaxIS 3. Please install and start RelaxIS 3 to begin.

## Step 1 – Creating the Project Folder

On the Welcome Screen click “**Create new project**” or, if you deactivated the Welcome Screen, choose **Main > Project Folder > New** from the ribbon bar.

This creates a new, empty project folder.



## Step 2 – Adding the Data

Click the **Data and Quality > Data Files > Add** button on the main ribbon bar.

In the Filename field, enter: `%relaxis_appdata%\Tutorials\Basic` and press *Enter*.

Select **Data.txt** in the folder view and click **Open**.

This opens the data file and displays the **Unknown Data File** dialog.

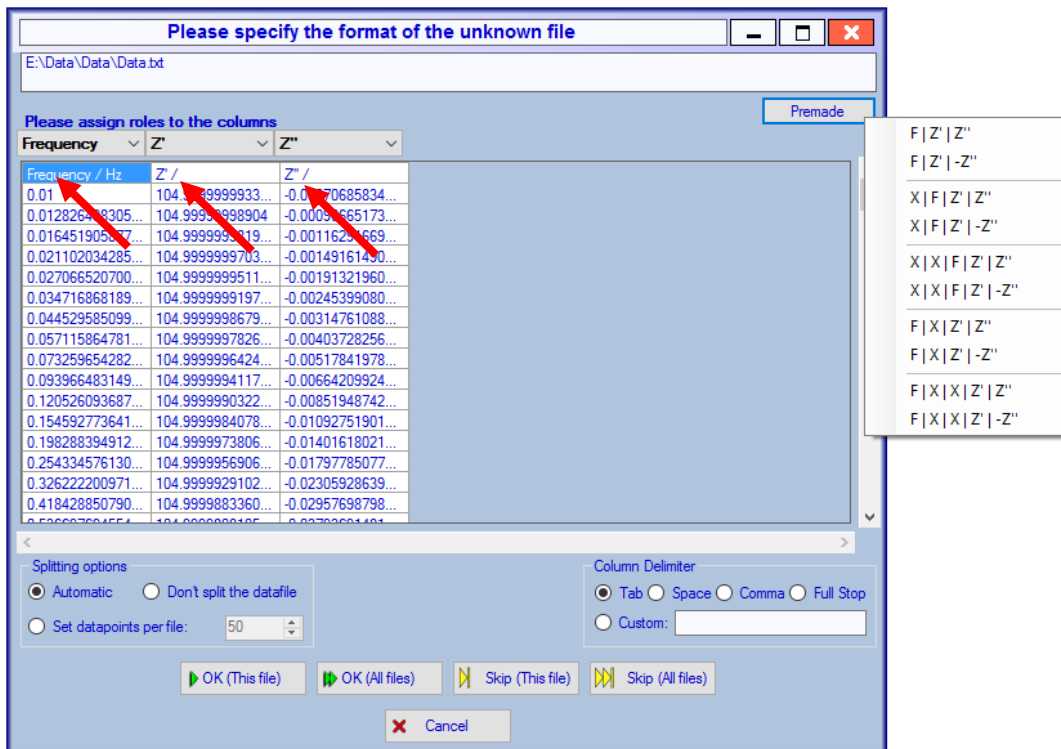


## Step 3 – Designating the File Format

Using the drop-down menus above each column, select **Frequency > Z' > Z''** as the column designations.

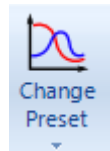
Alternatively, use the **Premade** button to select **F | Z' | Z''** to auto-assign the correct designations.

Click **OK (This File)** once you have entered the correct column designations.



### Step 4 – Selecting Different Plots

Click the **Plotting > Data Explorer > Change Preset** button to change the type of plot to show the data in. You can cycle between the Nyquist Plot and Bode Plots of  $Z' / -Z''$  or  $|Z| / \text{Phase Angle}$ .



Alternatively, you can click the bottom-part of the button and select the plot you wish to use directly.

When you have tried the different plot types, please return to the **Nyquist Plot**.

### Step 5 – Selecting Different Transfer Functions

Click the **Fitting > Fit Components > Transfer Function** button to change the transfer function that the data is represented in. You can cycle between the Impedance, Admittance, Complex Capacitance and Elastance.

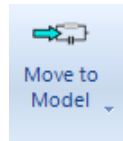


Alternatively, you can click the bottom-part of the button and select the transfer function directly.

When you have tried the different transfer functions, please return to the **Impedance**.

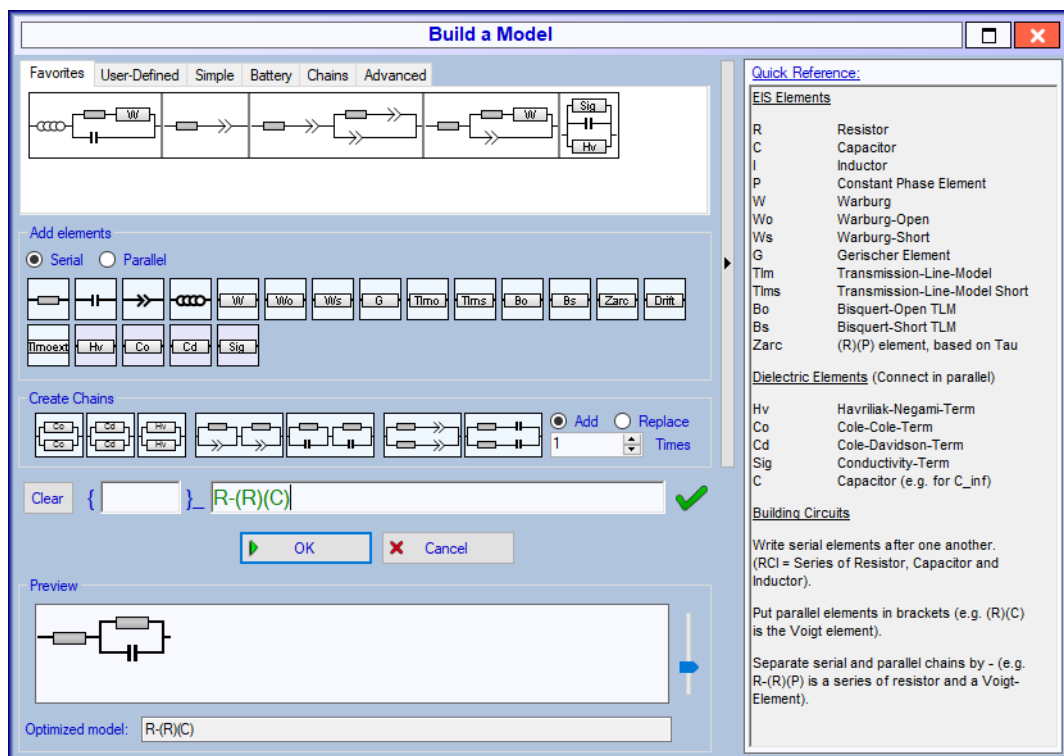
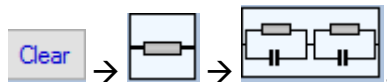
## Step 6 – Assigning the Spectrum to a Model

Click the top part of the **Data and Quality > Spectra > Move to Model** button to assign the spectrum to an equivalent circuit.



In the **Build a Model** dialog that is displayed, type **R-(R)(C)** into the input box.

Alternatively, click the following button combination:



Please click **OK** once you are done.

Afterwards, the **Spectra Selection** dialog is shown. Select the **Current Model** radiobutton to select all spectra from the current model (which is just the one in this example).

Please click **OK** to continue. Your spectrum is now assigned to the equivalent circuit, but it is not yet fitted.

## Step 7 – Setting Initial Parameters

Notice that a new graph has appeared in the **Data Explorer** window. This shows the plot of the equivalent circuit with the current parameters, displayed in the **Parameter Explorer** window.

Notice further, that the plot is still a bit off of the data.

In the **Parameter Explorer** window, click the **Resistance 1 > Value** cell and enter **30**. Press Enter to confirm.

Click the **Resistance 2 > Value** cell and enter **70**. Press Enter to confirm.

While entering the values you can notice two things:

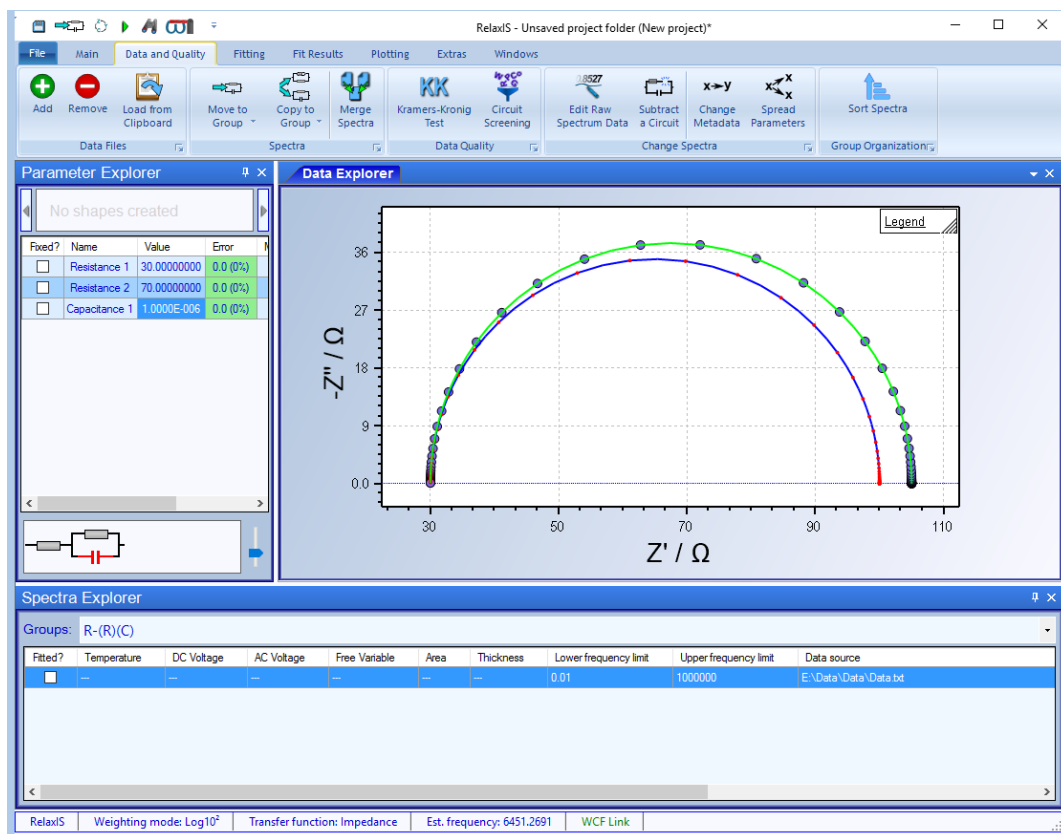
- The blue fit plot changes according to the entered values (the circle moves left and increases in width).
- Another **light-green line** appears and should be aligned over the data points.

The light-green line is a **Test Fit**. This shows you what would happen if you fit the data right now with the current settings (parameter values, transfer function, weights, algorithm, etc.).



The test fit is automatically done every time you alter significant settings. This is called the **Live Test** function.

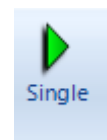
Since the light-green line aligns with the data, we can be sure that the fit will succeed.



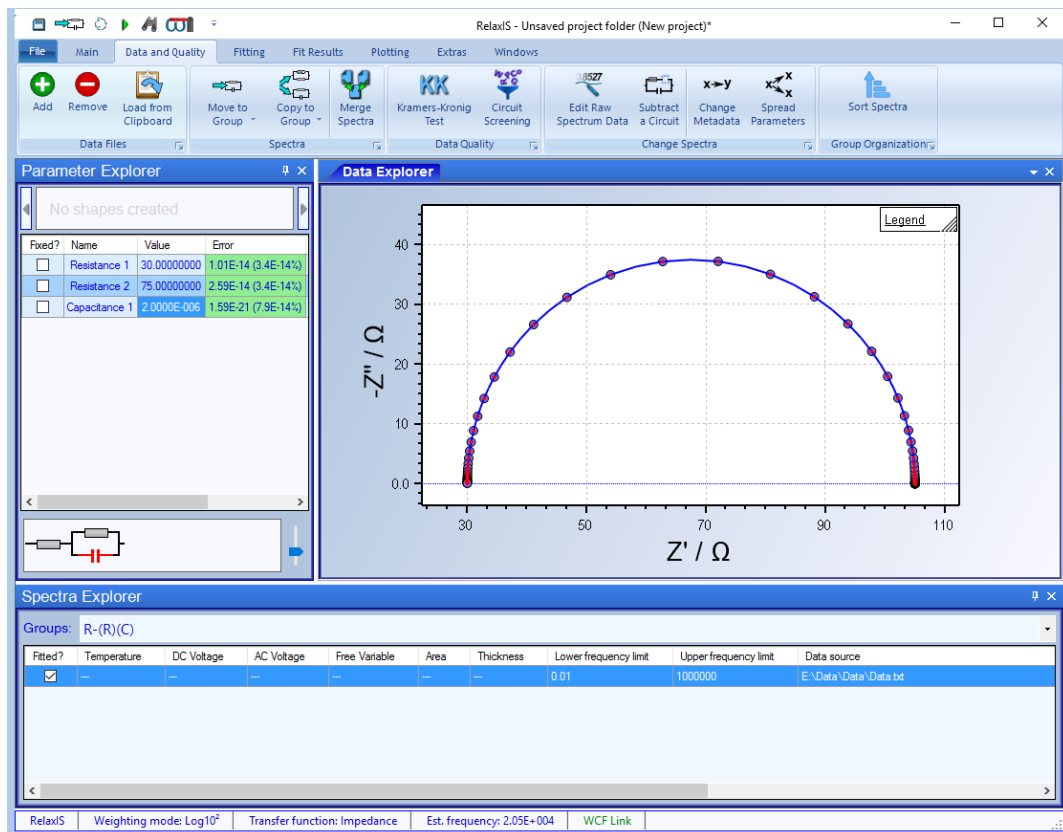
## Step 8 – Fitting the Data

Press the **Fitting > Perform Fits > Single** button to execute the fit with the current settings.

Notice the following:



- The Test Fit disappeared.
- The blue Fit graph now aligns with the data.
- The values in the Parameter Explorer table have changed and now show the **fit results**.
- The Error values for all parameters in the Parameter Explorer window now show (very small) values indicating the uncertainty of the fit for each parameter.



## Step 9 – Examining the Fit Quality

Click the **Fit Results > Results > Fit Information** button.

Here you can find many additional information about the recently performed fit for the selected spectrum.

## Summary

You have seen how to load data into a project folder in RelaxIS. Afterwards you have examined the spectrum in different representations before assigning it to a suitable equivalent circuit.

You have set up the fit using manual entry of parameter values with the help of the live fit graph as well as the Live Test function.

Finally, you have examined the fit quality using the Fit Information feature.