KIKUSUI

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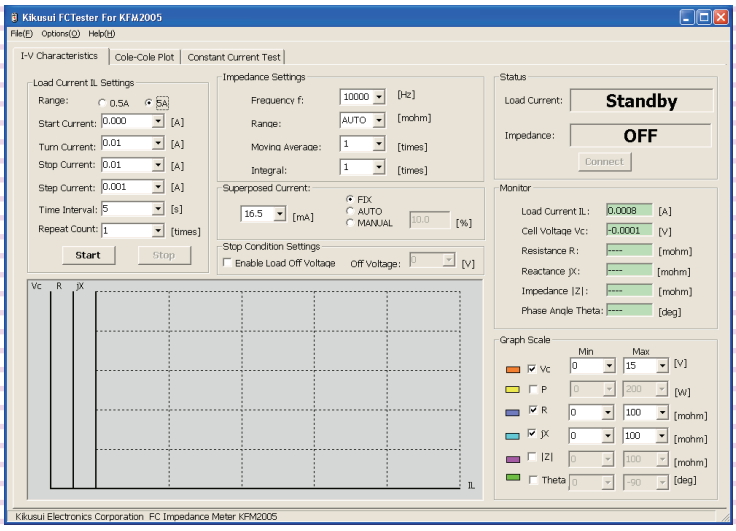
User's Manual

Application Software

FCTester for KFM2005

Ver. 1.0



Contents

About This Manual

This PDF version of the User's Manual is provided so that you can print all or any desired portion of it.

■ Copyrights

Introduction

This user's manual describes how to conduct the "I-V characteristics Test", "Cole-Cole Plot", and "Constant Current Test" by using the application software "FC Tester for KFM2005".

Product versions that this manual covers

This user's manual applies to FCTester for KFM2005 with version 1.0x.

You can check the version from the help menu **About**.

Required versions for the KFM2005

The KFM2005 with firmware version 1.0x is required. The version appears on the LCD when the KFM2005 is turned on.

Intended readers of this manual

This user's manual is intended for anyone using the KFM2005 to test a fuel cell or anyone teaching operators how to use the product.

This manual assumes that the reader has knowledge about electronic measuring instrument.

Trademarks

Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

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Notations used in this manual

- The KFM2005 FC Impedance Meter may be called the KFM2005.
- "Personal computer" and "PC" are generic terms for personal computers and workstations.
- The following symbols are used with the explanations in this manual.

⚠CAUTION This symbol indicates a potentially hazardous situation. Ignoring the symbol may result in damage to the product or other property.

NOTE Indicates information that you should know.

What is FCTester for KFM2005?

The application software "FC Tester for KFM2005" controls the KFM2005 by the PC, and conduct such fuel cell testing's. This software "FC Tester for KFM2005" can perform the following features.

- I-V characteristics test

It acquires the I-V (Load current - Cell voltage) characteristics by varying the load current in steps. At the same time, it measures the impedance of the cell at the specific frequency.

- Cole-Cole plot

It measures the impedance and creates the Cole-Cole plot by varying the frequency of the superimposed current while the specific load current is drawn by the fuel cell.

- Constant current test

The data logging for the cell voltage and impedance while the specific load current is drawn by the fuel cell.

- Saving the test result

The test result can be saved as a text file. The saved file can be used by other application software.

Connecting the KFM2005

When activating the "FCTester for KFM2005", the KFM2005 is in the status of "unconnected". To start testing, a manual operation is required to recognize for the connection between the KFM2005 and the "FCTester for KFM2005".

NOTE The connection can not be recognized if the selected communication interface of the KFM2005 were not corresponded to the **VISA Resource Name of the Connected Instrument** of the "FCTester for KFM2005".

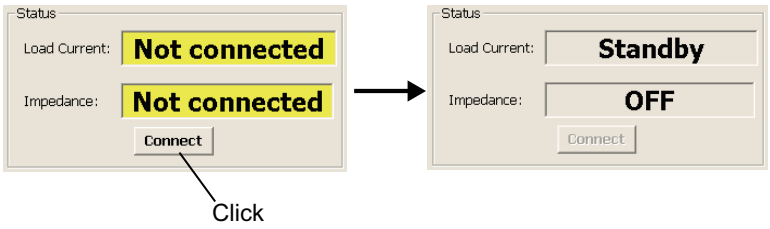
1 Select **Setup** on the **Options** menu.

See p. 22

2 Select the communication interface corresponded to the VISA Resoure Name of the Connected Instrument.

3 Click **Connect**.

If the **Status** is not changed even when you click **connect**, and the error message is displayed, please follow the step as follows.



When the KFM2005 can not be connected

If the **Status** is not changed even when you click **Connect**, and the error message is displayed, please follow the step as follows.

1 Confirm that the POWER switch of the KFM2005 is turned on.

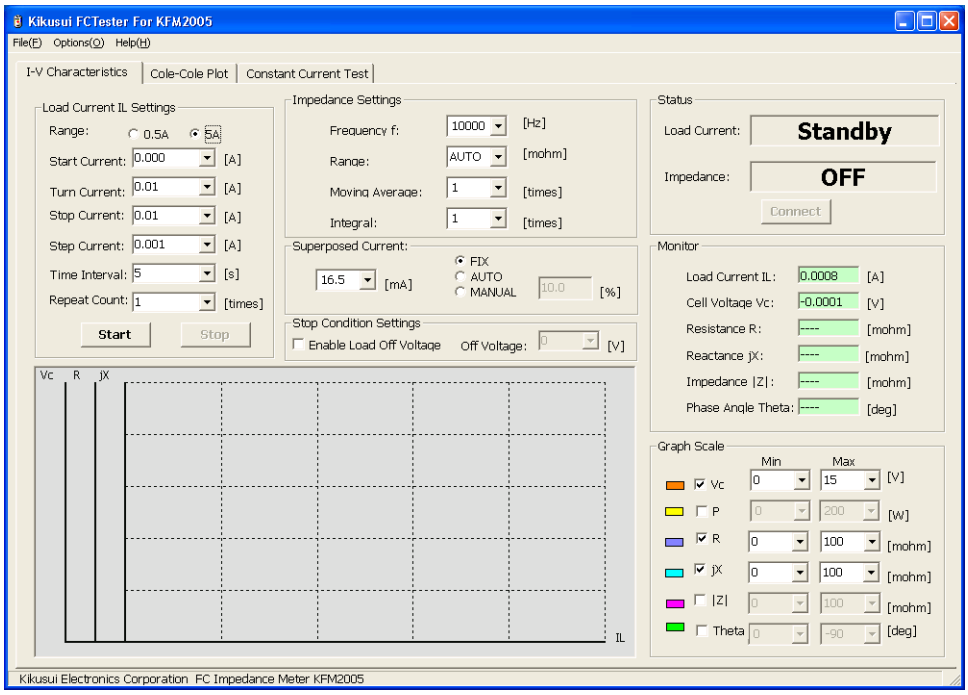
2 Confirm that the communication interface cable between the KFM2005 and the PC are properly connected.

3 Confirm that the communication interface of the KFM2005 has been properly selected.

After the "Interface Menu" is displayed by pressing the SYSTEM key, you can check the status by pressing the F1 key. For details, see "Remote Control" in the KFM2005 User's Manual.

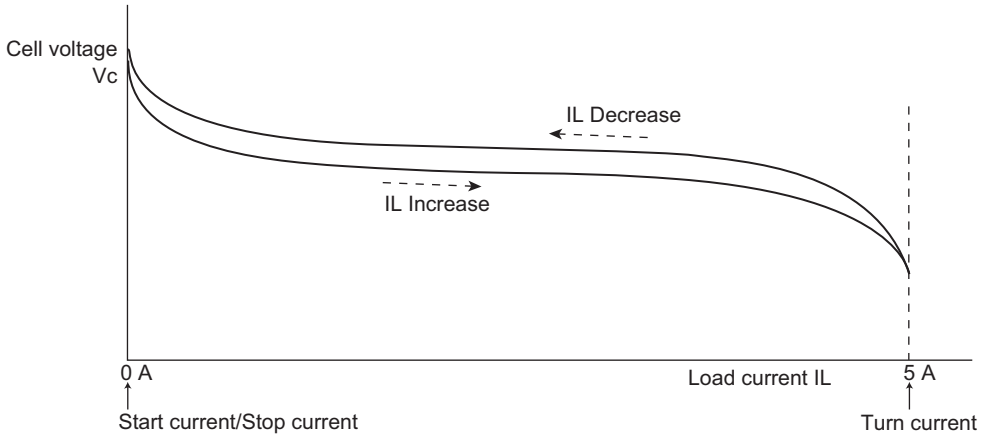
I-V Characteristics Test

Click the **I-V Characteristics** tab.



The I-V characteristics test is to measure the cell voltage by varying the load current IL in steps (current sweep) from the start current to the turn current and until the stop current.

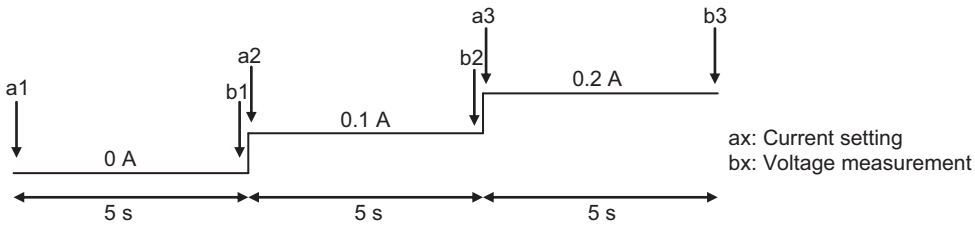
When the start current is set to 0 A, the turn current to 5 A, and the stop current to 0 A, the load current IL will be shown as follows.



If the setting of the turn current and the stop current is the same, the test will be stopped when the current reaches the turn current.

To sweep the load current, the setting for the amount of change per step (step current) and the time interval (ΔT) are required.

When it is set for the start current at 0 A, step current at 0.1 A, and the time interval at 5 s, the load current setting and the measurement point of the cell voltage will be as follows.



The voltage is measured just before the next value of the load current to be set.

Starting a Test

Before starting a I-V characteristics test, check the result file storage setting.

See p. 22

1 **Specify the Result File Storage option.**

See p. 8, p. 7

2 **Set the measurement conditions.**

See Measurement Condition Settings and Impedance Measurement Time.

See p. 9, p. 24

3 **Set the graph scale.**

See Graph Scale Settings.

To set the graph display option, point to graph from the **option** menu.

See p. 9

4 **Click Start.**

When the test starts, the Status Display changes into **Executing** and **ON**.

To stop the test, click **Stop**.

Impedance Measurement Time

The approximate time for the impedance measurement S can be expressed by the following formula.

$$\text{Impedance measurement time S} = \left(0.8 + \frac{1}{\text{Frequency f}} \times \text{Integral average count}\right) \times \text{Moving average count}$$

Set the time interval ΔT for longer than the setting time of the impedance measurement S.

Impedance measurement S < Time interval ΔT

(Example) When it is set for the Frequency at 0.1 Hz, the Integral average count for 4 times, and the Moving average count for 2 times.

The time for the impedance measurement takes (0.8 + 10 X 4) X 2 = 81.6 seconds.

When it is set for the time interval ΔT at less than 81.6 seconds, the load current will be changed before the completion of the impedance measurement. Set the time interval ΔT with extra allowance.

Measurement Condition Settings

Item		Description
Load Current IL Settings[*1]		
	Range	Selects the range of load current from 0.5 A or 5 A.
	Start Current	Sets the start current of the current sweep. Input range: 0.000 00 A to 0.500 00 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Turn Current	Sets the turn current of the current sweep. If the difference with the start current is not divisible by the step current, the current may not reach the specified value. Input range: 0.00000 A to 0.50000 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Stop Current	Sets the stop current of the current sweep. Input range: 0.00000 A to 0.50000 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Step Current	Sets the amount of change per step. Input range: 0.00000 A to 0.50000 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Time Interval	Sets the time per step. Input range: 1 s to 9999 s (an error of ±1 s)
	Repeat Count	Sets the repeat count of the sweep (start to turn to stop). Input range: 1 to 9999 times, or infinity
	Start button	Starts the current sweep.
	Stop button	Stops the current sweep.
Impedance Settings		
	Frequency f	Sets the frequency at which impedance is measured. Input range: 0.01 Hz to 10000 Hz (only the specified 85 points[*2])
	Range	Sets the full scale range of the impedance measurement. Input range: 100 mΩ, 300 mΩ, 1000 mΩ, or AUTO (superimposed current 50 mA) : 300 mΩ, 1000 mΩ, 3000 mΩ, or AUTO (superimposed current 16.5 mA)
	Moving Average	Sets the moving average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, 32, 64, 128, or 256 times
	Integral	Sets the integral average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, or 32 times
Superposed Current		Sets the superimposed current. Input range: 16.5 mA, 50 mA, or OFF
	FIX	Fixes the value of superimposed current.
	AUTO	To keep the terminal voltage of the DUT at 5 mVpp, it varies automatically between the range from 10 % to 100 % of the value in selected range of the superimposed current.
	MANUAL	Sets the value ratio (%) for the superimposed current of the selected range. Input range: 10 % to 100 %
Stop Condition Settings		
	Enable Load Off Voltage	Selects either to perform or not to perform the automatic stop when it goes under the cell voltage Vc.
	Off Voltage	Sets the voltage at which the test is automatically stopped. Input range: 0.000 V to 20.000 V

See p. 23

*1 In the **Setup** dialog box on the **Options** menu, you can select "Load Off at 0 (A)" for the load current IL.

*2 For details, see "Specifications" in the KFM2005 User's Manual.

Graph Scale Settings

Select graphs to display, and adjust the graph scale of the measured values.
You can enter the **Min**imum and **Max**imum values in the combo boxes.

NOTE You can change these values even while the test is in progress (load on). However, avoid doing so as it places a heavy load on the PC.

Monitor (Measured Values Display)

Load current IL and voltage Vc are displayed at approximately 2-second intervals.
Resistance R, reactance jX, impedance IZI, and phase angle θ are displayed at the time interval (ΔT).

Status Display

The **Load Current** indicates the execution status of test.
The **Impedance** indicates the status of impedance measurement.
You can double-click the status box to open the **Alarm Information** dialog box.

Status	Description
Not connected	FCTester for KFM2005 is started. (yellow)
Standby[*1]	A test is executable. (gray)
Executing[*1]	A test is in progress. (green)
Stopped[*1]	The stop button is pressed. (gray)
End[*1]	A test is completed. (gray)
Voltage stop	The test stops at the off voltage. (yellow)
Error	Communication error, etc. (red)
Load error	An error occurs at the electronic load unit. (red)
OFF[*2]	Impedance measurement is off. (gray)
ON[*2]	Impedance measurement is on. (green)
Not measurable	Measurements cannot be made due to over range, etc. (yellow)

*1 **Load current** status only
*2 **Impedance** status only

Result File

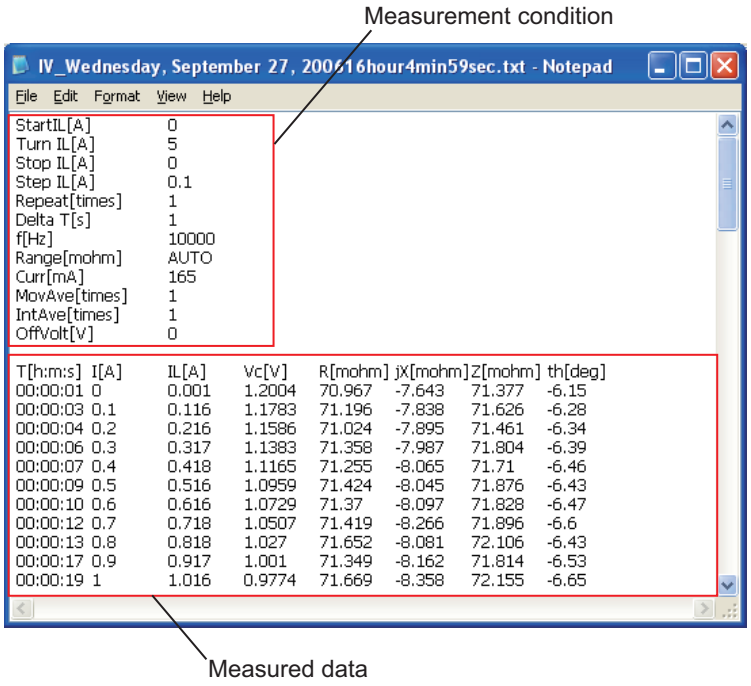
See p. 22

The result file (the I-V Characteristics Test file) will be saved in the designated file.

When the **Auto Save** is selected for the Result File Storage option, the name of file will be "IV"+"Date"+"Time".

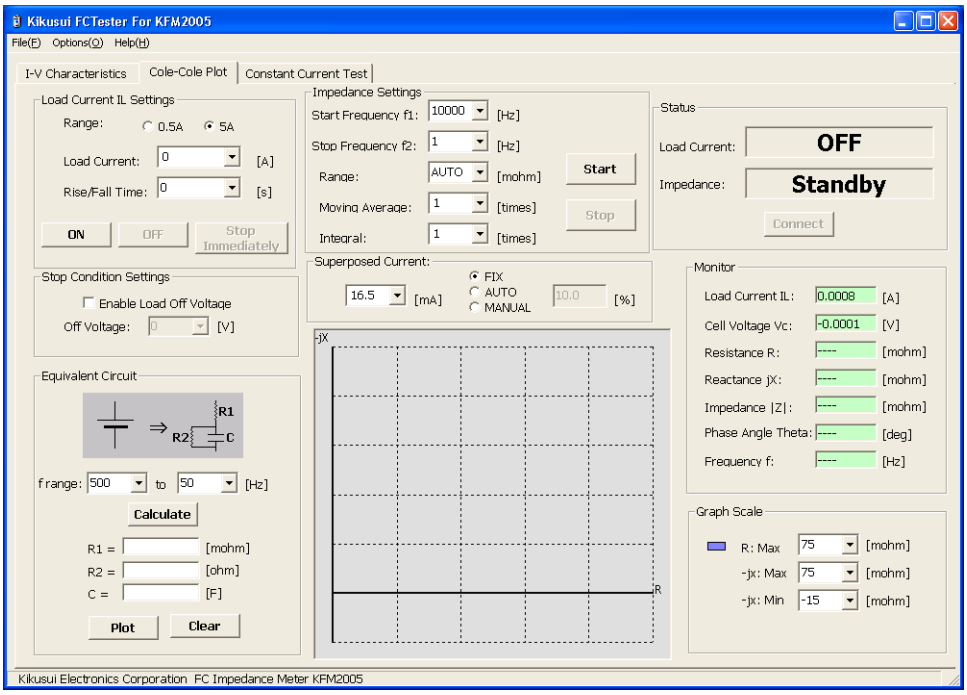
The data can be created in the text format by the TSV (Tab Separated Value).

When you select **Open** on the **File** menu and specify the I-V Characteristics Test file , the graph will be displayed with the condition of measurement setting.

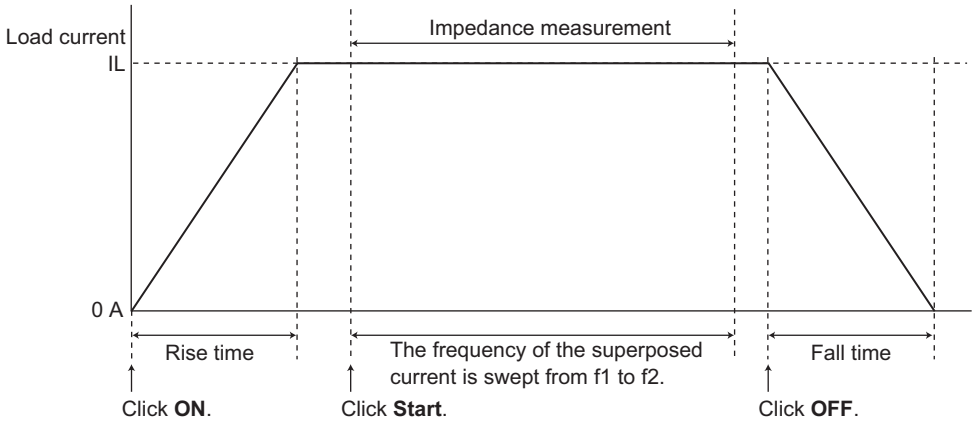


Cole-Cole Plot

Click the **Cole-Cole Plot** tab.



To create the Cole-Cole plot, the impedance measurement will be executed when the load current IL reaches the setting value while gradually increasing the load current to the fuel cell. The impedance will be measured by varying the frequency of superimposed current (frequency sweep) from the start frequency f1 to the stop frequency f2. When you restart the measurement at the time of completion for the measurement of f2, the new result file will be created. To terminate the Cole-Cole plot, click the **OFF** and gradually decrease the load current down to 0 A.



For example, if you set the load current to 2 A, the rise/fall time to 60 s, and click **ON**, the load current is gradually increased to 2 A over 60 seconds.

The time interval is approximately 1 s. The step current is equal to 2/60 which is approximately 0.0333 A.

Starting a Plot

⚠CAUTION When you click the **Stop Immediately** while the load current is drawn, it makes immediately load off and cut off the load current. Pay attention, when you use the **Stop Immediately**, it may lead to destroy the fuel cell.

Before starting a Cole-Cole plot, check the result file storage setting.

See p. 22

1 **Specify the Result File Storage option.**

See p. 13

2 **Set the measurement conditions.**

See Measurement Condition Settings.

3 **Set the graph scale.**

See p. 14, p. 24

See Graph Scale Settings.

To set the graph display option, point to graph from the **option** menu.

4 **Click ON.**

See p. 14

The **Load current** status changes into **Rising**.

5 **After the Load current status changes into ON, Click Start.**

The **Impedance** status changes into **Executing**.

To stop the Cole-Cole plot, click **Stop**.

6 **After the Impedance status changes into Stopped, Click OFF.**

If you click **Start**, a Cole-Cole plot starts again and new result file is created.

If you click **OFF**, the **Load current** status changes into **Falling**. When the load current decreased to 0 A, the status changes into **OFF**.

Measurement Condition Settings

Item		Description
Load Current IL Settings[*1]		
	Range	Selects the range of load current from 0.5 A or 5 A.
	Load Current	Sets the load current. Except when the impedance measurement is performed (while the frequency sweep), it is possible to set the load current even during the load on status. Under the condition of load on status, the load current can be confirmed when the value is entered and press the "Enter" key. Input range: 0.00000 A to 0.50000 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Rise/Fall Time	Sets the rise and fall time to reach the setting value of load current. The step transition is the interval of one second. The minimum step can be set in 0.00001A for the "0.5 A" range, and 0.0001A for the "5 A" range Input range: 0 s to 999 s
	ON button	Increases the load current.
	OFF button	Decreases the load current.
	Stop Immediately button	Cuts off the load current.
Stop Condition Settings		
	Enable Load Off Voltage	Selects either to perform or not to perform the automatic stop when it goes under the cell voltage Vc.
	Off Voltage	Specifies the voltage at which the test is automatically stopped. Input range: 0.000 V to 20.000 V
Impedance Settings		
	Start Frequency f1	Sets the frequency at which the frequency sweep starts. Input range: 0.01 Hz to 10000 Hz (only the specified 85 points[*2])
	Stop Frequency f2	Sets the frequency at which the frequency sweep stops. Input range: 0.01 Hz to 10000 Hz (only the specified 85 points[*2])
	Range	Sets the full scale range of the impedance measurement. Input range: 100 mΩ, 300 mΩ, 1000 mΩ, or AUTO (superimposed current 50 mA) : 300 mΩ, 1000 mΩ, 3000 mΩ, or AUTO (superimposed current 16.5 mA)
	Moving Average	Sets the moving average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, 32, 64, 128, or 256 times
	Integral	Sets the integral average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, or 32 times
	Start button	Starts the frequency sweep and starts the retrieval of the Cole-Cole plot data. When the frequency sweep completes, the test automatically stops.
	Stop button	Stops the retrieval of the Cole-Cole plot data.
Superposed Current		Sets the superimposed current. Input range: 16.5 mA, or 50 mA
	FIX	Fixes the value of superimposed current.
	AUTO	To keep the terminal voltage of the DUT at 5 mVpp, it varies automatically between the range from 10 % to 100 % of the value in selected range of the superimposed current.
	MANUAL	Sets the value ratio (%) for the superimposed current of the selected range. Input range: 10 % to 100 %

See p. 23

*1 In the **Setup** dialog box on the **Options** menu, you can select "Load Off at 0 (A)" for the load current IL.

*2 For details, see "Specifications" in the KFM2005 User's Manual.

Graph Scale Settings

Adjust the R and jX graph scales of the Cole-Cole plot.

You can enter the **Min**imum and **Max**imum values in the combo boxes.

NOTE You can change these values even while the impedance measurement is in progress. However, avoid doing so as it places a heavy load on the PC.

Monitor (Measured Values Display)

Load current IL and voltage Vc are displayed at approximately 2-second intervals.

Resistance R, reactance jX, impedance IZI, and phase angle θ are synchronized to the impedance measurement time.

The measurement takes longer for lower frequencies.

Status Display

The **Load Current** indicates the execution status of test.

The **Impedance** indicates the status of impedance measurement.

You can double-click the status box to open the **Alarm Information** dialog box.

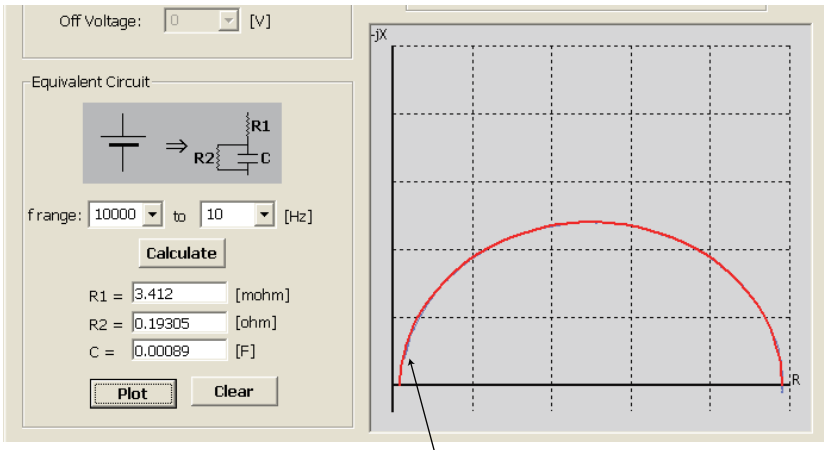
Status	Description
Not connected	FCTester for KFM2005 is started. (yellow)
Standby[*1]	A impedance is able to measure. (gray)
Executing[*1]	A impedance measurement is in progress. (green)
Stopped[*1]	The stop button is pressed. (gray)
End[*1]	A impedance measurement is completed. (gray)
Voltage stop	The impedance measurement stops at the off voltage. (yellow)
Error	Communication error, etc. (red)
Load error	An error occurs at the electronic load unit. (red)
OFF[*2]	Load current not running. (gray)
ON[*2]	Load current running. (green)
Rising[*2]	Load current is gradually increasing. (green)
Falling[*2]	Load current is gradually decreasing. (green)
Not measurable	Measurements cannot be made due to over range, etc. (yellow)

*1 **Impedance** status only
*2 **Load current** status only

Equivalent Circuit

An equivalent circuit of the fuel cell under test can be calculated backward from the retrieved Cole-Cole plot data.

Item	Description
f Range	Indicates the range of the applied data to the specified frequency. By default, all the data (f1 to f2) are used. This item can be used to exclude +jX data at high frequencies.
Calculate button	Calculates the equivalent circuit constants (R1, R2, and C.)
Plot button	Draws the ideal circle of the Cole-Cole plot from the calculated constants. You can type the values into boxes of constants to change the ideal circle.
Clear button	Clears the ideal circle of the Cole-Cole plot.



Display to overlay the Cole-Cole plot drawn by the equivalent circuit on the measurement data .

Result File

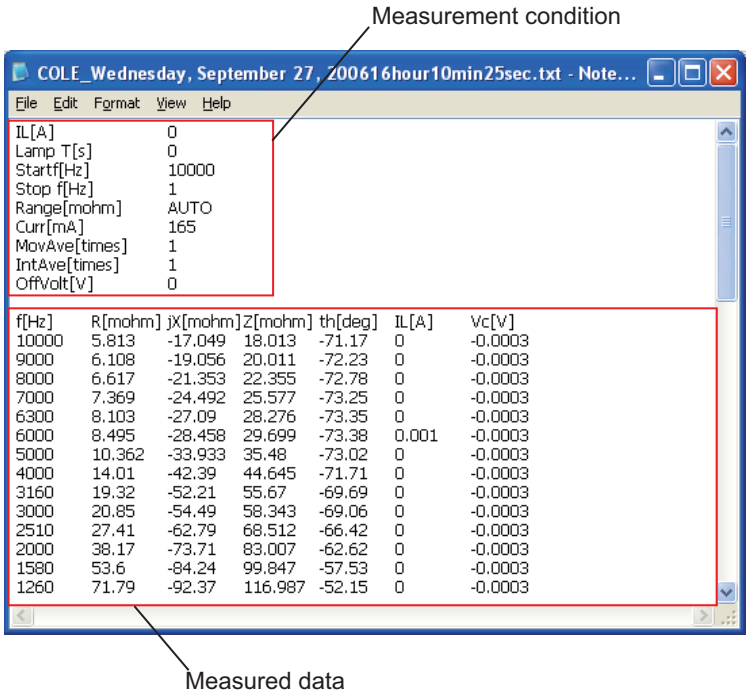
See p. 22

The result file (the Cole-Cole plot file) will be saved in the designated file.

When the **Auto Save** is selected for the Result File Storage option, the name of file will be "COLE"+"Date"+"Time".

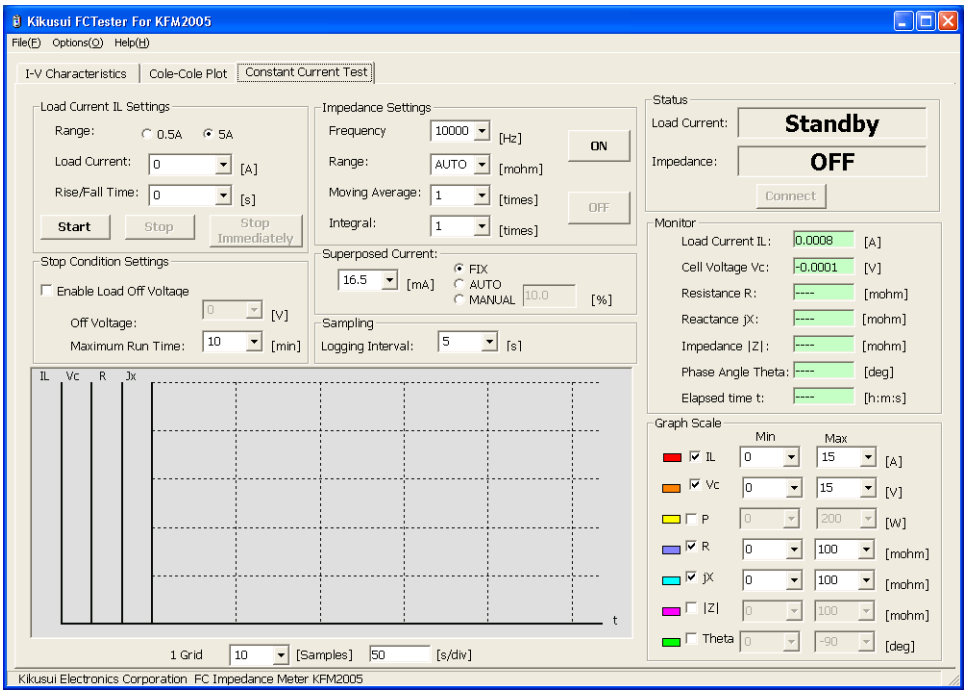
The data can be created in the text format by the TSV (Tab Separated Value).

When you select **Open** on the **File** menu and specify the Cole-Cole plot file , the graph and Equivalent Circuit will be displayed with the condition of measurement setting.

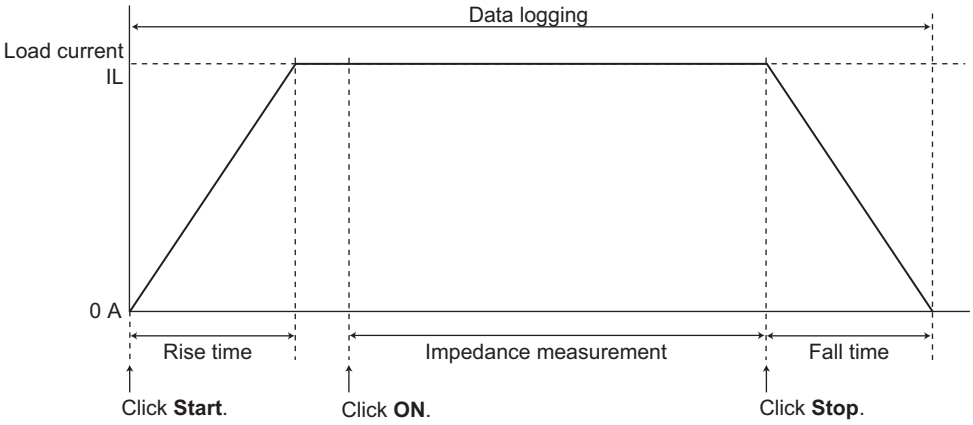


Constant Current Test

Click the **Constant Current Test** tab.



For the constant current test, draw the load current gradually to the fuel cell and keep the load current when it reaches to the setting amount of value (IL). The impedance will be measured under the condition of constant current. When the constant current test is finished, gradually decrease the load current down to 0 A.



For example, if you set the load current to 2 A, the rise/fall time to 60 s, and click **Start**, the load current is gradually increased to 2 A over 60 seconds.

The time interval is approximately 1 s. The step current is equal to 2/60 which is approximately 0.0333 A.

Starting a Test

⚠CAUTION When you click the **Stop Immediately** while the load current is drawn, it makes immediately load off and cut off the load current. Pay attention, when you use the **Stop Immediately**, it may lead to destroy the fuel cell.

Before starting a constant current test, check the result file storage setting.

See p. 22

1 **Specify the Result File Storage option.**

See p. 19, p. 18

2 **Set the measurement conditions.**

See Measurement Condition Settings and Impedance Measurement Time.

See p. 9, p. 24

3 **Set the graph scale.**

See Graph Scale Settings.

To set the graph display option, point to graph from the **option** menu.

See p. 20

4 **Click Start.**

The **Load current** status changes into **Rising**.

5 **After the Load current status changes into Executing, Click ON.**

The **Impedance** status changes into **ON**.

To stop the constant current test, click **Stop**.

If you click **Stop**, the **Load current** status changes into **Falling**. When the load current decreased to 0 A, the status changes into **Stopped**.

Impedance Measurement Time

The approximate time for the impedance measurement S can be expressed by the following formula.

$$\text{Impedance measurement time S} = \left(0.8 + \frac{1}{\text{Frequency f}} \times \text{Integral average count}\right) \times \text{Moving average count}$$

Set the logging interval T for longer than the setting time of the impedance measurement S.

Impedance measurement S < Logging interval T

When the impedance measurement is not completed during the logging interval period with the setting of "S > T", the data just prior to the present measurement will be displayed in the graph, and it will be saved in the file.

Measurement Condition Settings

Item		Description
Load Current IL Settings[*1]		
	Range	Selects the range of load current from 0.5 A or 5 A.
	Load Current	Sets the load current. It is possible to set the load current even while the test is in progress (load on). During the test, the load current can be confirmed when the value is entered and press the "Enter" key. Input range: 0.00000 A to 0.50000 A (0.5 A range) : 0.0000 A to 5.0000 A (5 A range)
	Rise/Fall Time	Sets the rise and fall time to reach the setting value of load current. The step transition is the interval of one second. The minimum step can be set in 0.00001A for the "0.5 A" range, and 0.0001A for the "5 A" range Input range: 0 s to 999 s
	Start button	Starts the data retrieval. The load current is increased.
	Stop button	Stops the data retrieval. The load current is decreased.
	Stop Immediately button	Stops the data retrieval. Cuts off the load current.
Stop Condition Settings		
	Enable Load Off Voltage	Selects either to perform or not to perform the automatic stop when it goes under the cell voltage Vc.
	Off Voltage	Specifies the voltage at which the test is automatically stopped. Input range: 0.000 V to 20.000 V
	Maximum Run Time	If the elapsed time exceeds this value, the test is completed. Input range: 1 min to 1440 min, or infinity
Impedance Settings		
	Frequency f	Sets the frequency at which impedance is measured. Input range: 0.01 Hz to 10000 Hz (only the specified 85 points[*2])
	Range	Sets the full scale range of the impedance measurement. Input range: 100 mΩ, 300 mΩ, 1000 mΩ, or AUTO (superimposed current 50 mA) : 300 mΩ, 1000 mΩ, 3000 mΩ, or AUTO (superimposed current 16.5 mA)
	Moving Average	Sets the moving average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, 32, 64, 128, or 256 times
	Integral	Sets the integral average count of the impedance measurement. Input range: 1, 2, 4, 8, 16, or 32 times
	ON button	Starts the impedance measurement.
	OFF button	Stops the impedance measurement.
Superposed Current		Sets the superimposed current. Input range: 16.5 mA, or 50 mA
	FIX	Fixes the value of superimposed current.
	AUTO	To keep the terminal voltage of the DUT at 5 mVpp, it varies automatically between the range from 10 % to 100 % of the value in selected range of the superimposed current.
	MANUAL	Sets the value ratio (%) for the superimposed current of the selected range. Input range: 10 % to 100 %
Sampling		
	Logging Interval	Sets the data retrieval interval. This setting is synchronized to the graph display. Input range: 1 s to 86400 s (an error of ±1 s)

See p. 23

*1 In the **Setup** dialog box on the **Options** menu, you can select "Load Off at 0 (A)" for the load current IL.

*2 For details, see "Specifications" in the KFM2005 User's Manual.

Graph Scale Settings

Select graphs to display, and adjust the graph scale of the measured values with respect to time t.

You can enter the **Min**imum and **Max**imum values in the combo boxes.

Enter values in the **Logging Interval** and **1 Grid** boxes to determine the scale (s/div) of the graph display.

NOTE You can change these values even while the test is in progress (load on). However, avoid doing so as it places a heavy load on the PC.

- 1 Grid

It sets the sampling number per grid of the graph.

Input range: 1 to 1000 samples

Monitor (Measured Values Display)

Load current IL and voltage Vc are displayed at approximately 2-second intervals.

Resistance R, reactance jX, impedance IZI, and phase angle θ are synchronized to the logging interval.

Status Display

The **Load Current** indicates the execution status of test.

The **Impedance** indicates the status of impedance measurement.

You can double-click the status box to open the **Alarm Information** dialog box.

Status	Description
Not connected	FCTester for KFM2005 is started. (yellow)
Standby[*1]	A test is executable. (gray)
Executing[*1]	A test is in progress. (green)
Stopped[*1]	The stop button is pressed. (gray)
Rising[*1]	Load current is gradually increasing. (green)
Falling[*1]	Load current is gradually decreasing. (green)
Voltage stop	The test stops at the off voltage. (yellow)
Error	Communication error, etc. (red)
Load error	An error occurs at the electronic load unit. (red)
OFF[*2]	Impedance measurement is off. (gray)
ON[*2]	Impedance measurement is on. (green)
Not measurable	Measurements cannot be made due to over range, etc. (yellow)

*1 **Load current** status only
*2 **Impedance** status only

Result File

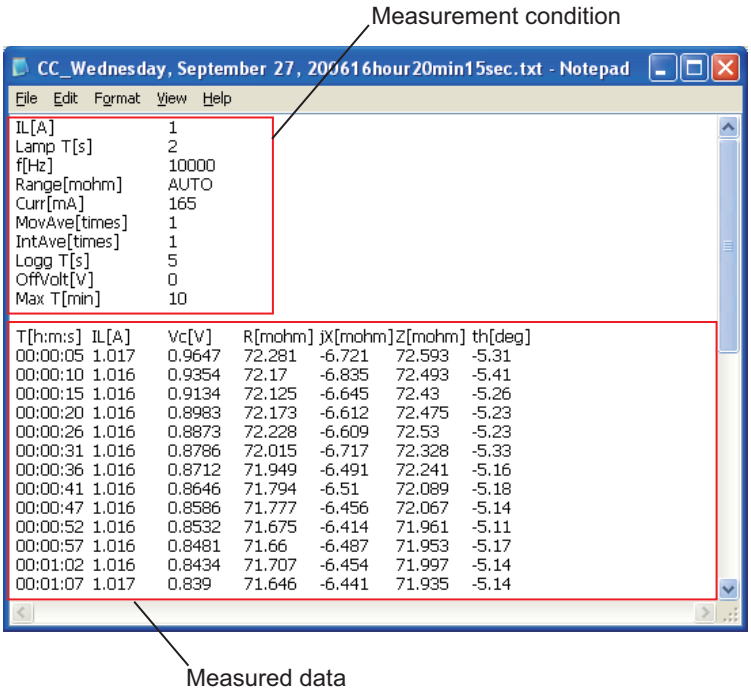
See p. 22

The result file (the Constant Current Test file) will be saved in the designated file.

When the **Auto Save** is selected for the Result File Storage option, the name of file will be "CC"+"Date"+"Time".

The data can be created in the text format by the TSV (Tab Separated Value).

The file for the constant current test can not be opened by the "FC Tester for KFM2005".



Option Settings

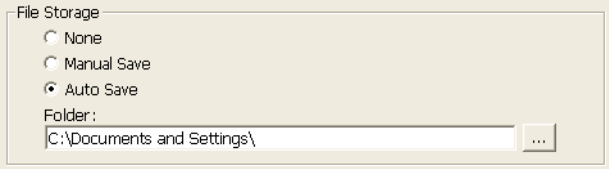
The following settings are available on the **Option** menu.

These settings are common to all of the I-V characteristic test, the Cole-Cole plot and the constant current test.

- Result File Storage
- VISA Resource (Interface) Selection
- Load off when the load current at 0A
- Graph Setting

Result File Storage

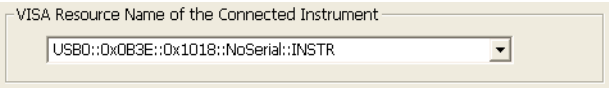
Select **Setup** on the **Options** menu.



File Storage Setting	Description
None	The Result file is not created.
Manual Save	Every time you click the **Start**, the dialog box displays to specify the file name and the folder for saving the result file.
Auto Save	Every time you click the **Start**, the result file is created automatically with the following file name in the specified folder. • I-V characteristics test: "IV" + "Date" + "Time" • Cole-Cole plot: "COLE" + "Date" + "Time" • Constant current test: "CC" + "Date" + "Time"

VISA Resource (Interface) Selection

Select **Setup** on the **Options** menu.



Select the VISA resource for the connection of measuring instruments. If the selected interface used for the KFM2005 and the VISA resource are not corresponded, the communication is functioned even when you click **Connect** in the **Status**, the status becomes **Not connected**.

The drop-down box of **VISA Resource Name of the Connected Instrument** displays the available VISA resource.

The VISA resource string representation varies depending on the interface type (GPIB, ASRL, USB, etc.). The table below gives typical examples.

Resource String	Description
GPIB0::3::INSTR	Measuring instrument connected to GPIB0 with a primary address set to 3.
GPIB1::4::INSTR	Measuring instrument connected to GPIB1 with a primary address set to 4.
ASRL1::INSTR	Measuring instrument connected to serial port 1.
USB0::0x0B3E::0x1018::NJ003545::INSTR	Measuring instrument connected to a USB port with vendor ID 2878 (hex 0B3E), product ID 4120 (hex 1018), and serial number NJ003545.

In case of using RS232C (ASRL), the setting of the PC shall be as follows. Set the same condition for the KFM2005.

- Bit rate: 19200 bps
- Data bits: 8 bits
- Flow control: OFF

Load off when the load current at 0A

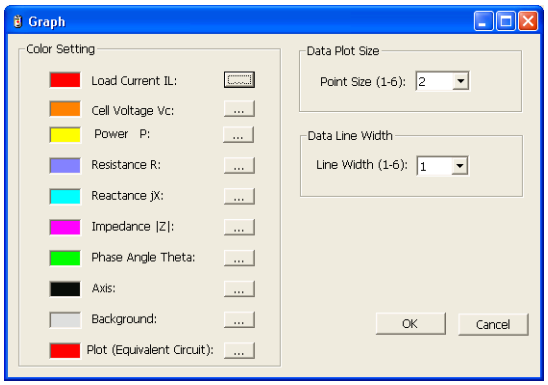
Select **Setup** on the **Options** menu.

If you select the **Load Off at 0 [A]** check box, the load turns off when the load current setting is 0 A.

NOTE When the load turns on with the setting of 0 A, the load current IL operates like 0 A, but there exist an offset, so it can not go down to absolutely 0 A. The specification for the "offset" of the KFM2005 shall be referred to within 2.5 mA (in 5 A range) or 0.5 mA (in 0.5 A range).
When you select **Load Off at 0 [A]** check box, the load current will be cut off electronically because of that the load turns off when the load current setting is 0 A. If you wish to set as low as 0 A, please use this option.

Graph Setting

Select **Graph** on the **Options** menu.



You can set the background and axes colors, the point size of data plots, and the width and color of data lines.

Menu Reference

Menu		Description
File	Open...	Opens the test result file. Sets the measurement conditions when the file is acquired, and displays the graph. The test result file of the Constant Current Test can not be opened.
	Exit	Exit from FCTester for KFM2005.
Options	Setup...	Sets the saving file, VISA resource, and load off when the load current at 0 A.
	Graph...	Sets the background and axes colors, the point size of data plots, and the width and color of data lines.
Help	About...	Displays the version of FCTester for KFM2005.
	Application Manual...	Opens the FCTester for KFM2005 User's Manual.