



## About This Guide

This PDF version of the operation guide is provided so that you can print it in part or in full.

### ■ Copyrights

The contents of this guide may not be reproduced, in whole or in part, without the prior consent of the copyright holder.

The contents of this guide are subject to change without notice.

Copyright© 2011 Kikusui Electronics Corporation

## Table of Contents

<b>Introduction .....</b>	<b>3</b>
<b>About Quick Immunity Sequencer 2 .....</b>	<b>4</b>
Performance levels in immunity tests .....	5
<b>Parts of the Screen .....</b>	<b>6</b>
<b>Setting Limits .....</b>	<b>8</b>
<b>Setting Test Conditions.....</b>	<b>10</b>
Test conditions.....	10
Toolbar .....	12
Progress bar and operation status display .....	13
Output modes .....	13
Saving test conditions as files.....	14
Recalling test conditions .....	14
<b>Observing test signals .....</b>	<b>15</b>
<b>Display Options .....</b>	<b>16</b>
<b>Response Options.....</b>	<b>18</b>
<b>Executing Tests .....</b>	<b>19</b>
Before executing tests.....	19
Execution .....	20
Stop .....	21
Dealing with unusual circumstances.....	22
Result list .....	22
Saving the test result .....	23
<b>IEC61000-4-11 .....</b>	<b>24</b>
Test overview .....	24
Voltage dips and short interruptions .....	24
Voltage variations.....	26
<b>IEC61000-4-13 .....</b>	<b>27</b>
Test overview .....	27
Flat curve .....	28
Over swing .....	29
Sweep in frequency .....	30
Odd harmonics .....	31
Even harmonics .....	32
Interharmonics .....	33
Meister curve .....	34
<b>IEC61000-4-14 .....</b>	<b>38</b>
Test overview .....	38
Voltage fluctuation .....	38
Interval.....	39
Test conditions setup example.....	40
<b>IEC61000-4-17 .....</b>	<b>43</b>
Test overview .....	43
Ripple on single-phase and three-phase rectifier circuits	43
<b>IEC61000-4-27 .....</b>	<b>44</b>
Test overview .....	44
Unbalance .....	45
<b>IEC61000-4-28 .....</b>	<b>46</b>
Test overview .....	46
Variation of power frequency.....	47
<b>IEC61000-4-29 .....</b>	<b>48</b>
Test overview .....	48
DC voltage dips and short interruptions.....	48
DC power supply Voltage variations .....	49
<b>IEC61000-4-34 .....</b>	<b>50</b>
Test overview .....	50
<b>Configuring the Interface .....</b>	<b>51</b>
<b>Display Text Size .....</b>	<b>52</b>
Changing the Display Text Size .....	53
<b>List of Error Messages .....</b>	<b>54</b>
<b>Menu Reference.....</b>	<b>55</b>

# Introduction

This operation guide explains how to use Quick Immunity Sequencer 2 (QIS2) to perform immunity tests on electrical and electronic devices that are connected to low frequency power distribution systems and on electrical and electronic devices that have a DC input power port.

## ■ Product versions that this guide covers

This guide applies to Quick Immunity Sequencer 2 with version 4.x. To view the version, on the Help menu, click About Quick Immunity Sequencer 2.

## ■ Who should read this guide?

This operation guide is intended for users who will use Quick Immunity Sequencer 2 and a Kikusui AC power supply listed below to perform immunity tests on electrical and electronic devices that are connected to low frequency power distribution systems and on electrical and electronic devices that have a DC input power port. The guide is also intended for instructors who will teach these users.

AC power supplies that can be used

- PCR-LE Series
- PCR-LE2 Series
- PCR-WE Series
- PCR-WE2 Series (including the PCR-WE2R, a model with a regeneration function)

This guide assumes that the users have knowledge of immunity tests that are performed on electrical and electronic devices.

## ■ Notations used in this guide

- In this guide, Quick Immunity Sequencer 2 is also called “QIS2.”
- In this guide, the PCR-LE series and PCR-LE2 series AC power supplies are also referred to as the “PCR-LE,” and the PCR-WE series and PCR-WE2 series (including the PCR-WE2R, a model with a regeneration function) AC power supplies are also referred to as the “PCR-WE.” In addition, all the above series may be referred to collectively as the “PCR-LE/WE.”
- The term “PC” is used to refer generally to both personal computers and workstations.
- The following markings are used in the explanations in the text.



### CAUTION

Indicates a potentially hazardous situation which, if ignored, may result in damage to the product and other property.

### NOTE

Indicates information that you should know.



Indicates a reference to detailed information.

# About Quick Immunity Sequencer 2

QIS2 is application software that uses the PCR-LE/WE AC Power Supply to perform tests.

This software can simulate various phenomena that occur in AC power supply environments. It can be used to perform immunity tests with conditions that match the following standards on electrical and electronic devices that are connected to low voltage power distribution systems and on electrical and electronic devices that have a DC input power port. You can set test conditions that exceed the ranges defined in the standards, so this software can be used to perform preliminary tests before the tests for the standards, immunity allowance tests, and stress tests.

- IEC61000-4-11(2004-03)Edition2.0 Corrigendum(2010-08) Voltage dips, short interruptions, and voltage variations
- IEC61000-4-13(2015-12)Edition1.2 Harmonics and interharmonics
- IEC61000-4-14(2009-08)Edition1.2 Voltage fluctuation
- IEC61000-4-17(2009-01)Edition1.2 Ripple on d.c. input power port
- IEC61000-4-27(2009-04)Edition1.1 Unbalance
- IEC61000-4-28(2009-04)Edition1.2 Variation of power frequency
- IEC61000-4-29(2000-08)1st.Edition Voltage dips, short interruptions, and voltage variations on d.c. input power port
- IEC61000-4-34(2009-11)Edition1.1 Voltage dips, short interruptions, and voltage variations

The publication year and date and edition will be omitted from standard numbers hereafter.

The devices that these standards—excluding the IEC61000-4-29 and IEC61000-4-34 standards—apply to are those that have a rated current of 16 A or less per phase. QIS2 does not take this condition into account, so you must consider it when you use the software.

● Items that do not comply with the requirements of the standards

In QIS2, for test configurations that include hardware, there are items that do not comply with the requirements of the standards. For details, see the items of the appropriate specification.

---

**⚠ CAUTION** Output waveform data is stored in the PCR-LE/WE internal memory. The memory area for storing the data of one waveform is referred to as a waveform bank. Because QIS2 uses the waveform banks of the PCR-LE<sup>1</sup> or PCR-WE<sup>2</sup>, the waveform data stored in the waveform banks will be overwritten. If you have already used the waveform banks on the PCR-LE/WE by itself and have stored important data in the waveform banks, we recommend that you use the Wave Bank Memory application software to save the waveform data to a separate location such as a PC's hard disk.

---

- 1 In single-phase operation, QIS2 uses up to 64 (0 to 63) waveform banks of the PCR-LE. In three-phase operation, the same waveform data as the U phase is also written in the waveform banks of V and W phases. Sine wave data that is used as the PCR-LE's reference voltage waveform is stored in waveform bank 0. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0. Depending on the test conditions, QIS2 may overwrite the data in waveform bank 0 with data that is not a sine wave. This is not a problem while the PCR-LE is being used from QIS2. If you want to use the PCR-LE in a standalone manner immediately after you finish testing, turn the PCR-LE's POWER switch off and on to return the data in waveform bank 0 to the sine wave data.
- 2 In single-phase operation, QIS2 uses up to 64 (1 to 64) waveform banks of the PCR-WE. In three-phase operation, in order to write the waveform data of the V and W phases, three times as many waveform banks as in single-phase operation are used. Waveform bank 0 contains sine wave data that is used in the PCR-WE's reference voltage waveform, but QIS2 does not use waveform bank 0. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0.

## Performance levels in immunity tests



In immunity tests, the test signal is generated from a voltage generator and is applied to the EUT. The test result is determined by the operation of the EUT in this situation. The operation is classified into the following four performance levels according to the EUT's loss of functionality or decrease in performance level. The reference for this classification is the standardized performance level that has been determined by the device's manufacturer, the individual or organization that requested the tests, or between the device's manufacturer and the purchaser.

- Normal performance that is within the limits of the specifications that have been standardized by the manufacturer, the individual or organization that requested the tests, or the purchaser
- Temporary loss of functionality or decrease in performance that returns to normal without user intervention after the cause of the disturbance is removed
- Temporary loss of functionality or decrease in performance that requires the user to intervene and make modifications
- Loss of functionality, decrease in performance, or loss of data that cannot be recovered from due to hardware or software damage

# Parts of the Screen

The QIS2 window is divided into the following five panes.

The screenshot shows the QIS2 software interface with the following panes and components:

- Standard selection:** A vertical sidebar on the left containing ten test sequence icons labeled 61000-4-11 through 61000-4-34.
- Test conditions setup:** The central area containing:
  - Menu bar: File, Edit, Instruments, Options, Help
  - Toolbar: Open, Save Cond., Run, Stop, Output, Range, Zoom in, Zoom out, Abort
  - Configuration buttons: OUT MODE (ACDC), RANGE (Low), OUTPUT (OFF), PHASE (IP2W), RESPONSE (FAST)
  - Sequence list: A list of sequences (Seq 1 to Seq 10) with checkboxes and 'All Seq' (Check/Uncheck) buttons.
  - Test parameters: Freq [Hz] (50.00), Repeat (50), Repeat all (10), Wait phase-angle, Change angle (0 deg).
  - Test type selection: Voltage dips (selected), Short interruption, Voltage variation.
  - Waveform diagram: A graph showing a voltage dip with parameters: Dips (10.0 cycle), Interval (0.200 s), UT (100.0 V rms), Level (70.0 %).
- Status display:** A small area at the top right of the main window containing a 'Stop' button.
- Waveform preview:** A horizontal bar chart showing a series of rectangular pulses.
- Result list:** A table at the bottom with the following columns: No., Repeat all, Seq, Test item, UT [V], Level [%], Angle [deg], Decreasing [s], Reduced (cy:cycle), Increasing [s], Interval [s].

**NOTE**

The QIS2 window is designed to be displayed correctly when the display's text size is set to the Windows default value. If the text size is set to a larger value, the text in the window may not fit properly. For details, see "Display Text Size."

Pane	Description
Standard selection	<p>There are eight immunity test standards.</p> <ul style="list-style-type: none"> <li>• IEC61000-4-11</li> <li>• IEC61000-4-13</li> <li>• IEC61000-4-14</li> <li>• IEC61000-4-17</li> <li>• IEC61000-4-27</li> <li>• IEC61000-4-28</li> <li>• IEC61000-4-29</li> <li>• IEC61000-4-34</li> </ul>
Test conditions setup	<p>Set the test conditions that correspond to the selected standard. You can use the waveform diagram to easily set the settings.</p>
Status display	<p>There are PCR-LE/WE status indicators and a progress bar, which displays the execution progress.</p>
Waveform preview	<ul style="list-style-type: none"> <li>• This displays the waveform that is created from the test conditions that you set. This provides you with a general idea of the output waveform without having to view it on an oscilloscope. There are no scales. The waveform displayed here differs slightly from the waveform that is actually generated.</li> <li>• Due to the way the preview is drawn, one cycle of a sine wave is inserted in the beginning. The actual output is a continuous sine wave, so it is not necessary one cycle.</li> <li>• If you switch to a different Seq tab, the waveform that corresponds to that tab will be drawn on the graph. The optimum scale is calculated each time that you switch to a different tab, so the vertical scale may be different each time that you switch to a different Seq tab.</li> <li>• Only in three-phase operation, check boxes for showing and hiding the waveform of each phase appear in the left edge of the waveform preview.</li> </ul> <p>If on the Option menu, you click <b>Display Options</b> and select the Display Wave Progress check box under Wave Preview Pane Option, the display will appear in the following manner during test execution.</p> <ul style="list-style-type: none"> <li>• A waveform made up of waveform diagrams on the Seq tab concatenated together in order of execution sequence is displayed (an image of the test waveform that does not include the repetition of the Repeat all).</li> <li>• In a long test, details of voltage dips and voltage fluctuations may not be represented.</li> <li>• The waveform colors correspond to the Seq tab colors.</li> <li>• Trigger marks are not displayed.</li> <li>• The repetition of the entire sequence is displayed as “execution count/specified count” in the left edge of the waveform preview.</li> <li>• A vertical bar shows the current execution point in the sequence.</li> </ul>
Result list	<p>The test conditions that are being executed are displayed in a list where each row contains the conditions of a different Seq tab.</p>

# Setting Limits

You can set the PCR-LE/WE's voltage limit, current limit, and protection (OVP and UVP) values from QIS2.

Limits can be placed on the PCR-LE/WE output voltage setting. They prevent damage to the load caused by mistaken operations and limit the current that flows through the load. You can set limits in advance according to the load conditions.

In AC+DC mode, set AC limits and DC limits.

## NOTE

- QIS2 stores the limit values and uses them the next time it starts. Because there are no stored limit values the first time QIS2 starts, QIS2 will load the limit values from the connected PCR-LE/WE.
- If you connect a PCR-LE/WE with a different output capacity, you must change the limit values to appropriate values.

## 1 On the Instruments menu, click Setting Limits.

The Setting Limits dialog box appears.

The appropriate wiring method tab is selected on the basis of the information of the connected PCR-LE/WE.

Information of the connected AC power supply

Wiring method tabs

## 2 Enter appropriate values in the boxes.

You can select a different wiring method tab and enter limit values so that QIS2 stores them.

## 3 Click OK.

Limit values are stored.

## CAUTION

Risk of product malfunction. If a current limit or protection function is activated, remove all the causes of the alarm before clearing the alarm. To clear the alarm, click Alarm clear on the Instruments menu.



Item	Description
Voltage Limits	You will not be able to set output voltages outside the range (defined by the lower limit and upper limit). Set the limits so that the lower limit is less than or equal to the upper limit. During single-phase three-wire operation and three-phase operation, set the limits using phase voltages.
Upper and Lower	Input range (PCR-LE) <ul style="list-style-type: none"> <li>AC: 0.0 V to 305.0 V</li> <li>DC<sup>1</sup>: -431.0 V to 431.0 V</li> </ul> <hr/> Input range (PCR-WE) <ul style="list-style-type: none"> <li>AC: 0.0V to 322.0V (0.0V to 315.0V)<sup>2</sup></li> <li>DC: -455.0V to 455.0V (-445.0V to 445.0V)<sup>2</sup></li> </ul>
Current Limits	You can set the output current's upper limit. You cannot set the lower limit. The limit operates on the rms value of the output current. If the output current exceeds the current limit, the output is turned off, and an alarm occurs.
Current Limit	Input range (PCR-LE) <ul style="list-style-type: none"> <li>AC: <math>\times 0.1</math> to <math>\times 1.1</math> of the rated current</li> <li>DC<sup>1</sup>: <math>\times 0.1</math> to <math>\times 1.1</math> of the rated current</li> </ul> <hr/> Input range (PCR-WE) <ul style="list-style-type: none"> <li><math>\times 0.1</math> to <math>\times 1.1</math> of the maximum output current</li> </ul>
+ and - Peak Current Limit	Input range (PCR-LE) <ul style="list-style-type: none"> <li>Input range: <math>\times 0.1</math> to <math>\times 4.4</math> of the rated current</li> </ul> <hr/> Input range (PCR-WE) <ul style="list-style-type: none"> <li><math>\times 0.1</math> to <math>\times 4.2</math> of the maximum output current</li> </ul>
Trip Time	If the output current exceeds the current limit, the output is turned off after the specified time elapses. The amount time until the output is turned off may become large due to the state of the load or the timing of the PCR-LE/WE internal current measurement. Depending on the current measurement response speed, there may be a delay of approximately 0.1 seconds. <ul style="list-style-type: none"> <li>Input range: 0 s to 10 s</li> </ul>
Protection Function	When the protection function is activated, the output is turned off, and an alarm occurs. During single-phase three-wire operation and three-phase operation, set the limits using phase voltages.
OVP	If the output voltage exceeds the OVP setting and remains there for approximately 1 second, the output overvoltage protection will be activated. <hr/> Input range (PCR-LE) <ul style="list-style-type: none"> <li>AC: 0.0 V to 335.0 V</li> <li>DC<sup>1</sup>: -474.1 V to 474.1 V</li> </ul> <hr/> Input range (PCR-WE) <ul style="list-style-type: none"> <li>14.0 V to 489.5 V</li> </ul>
UVP	If the output voltage drops below the UVP setting and remains there for approximately 1 second, the output undervoltage protection will be activated. <hr/> Input range (PCR-LE) <ul style="list-style-type: none"> <li>AC: 0.0 V to 335.0 V</li> <li>DC<sup>1</sup>: -474.1 V to 474.1 V</li> </ul> <hr/> Input range (PCR-WE) <ul style="list-style-type: none"> <li>0.0 V to 489.5 V</li> </ul>

1 Only when the single-phase two-wire or single-phase three-wire tab is selected

2 The values inside the parentheses apply to PCR-WEs with firmware version 1.23 up to but not including 2.00.

# Setting Test Conditions

Set the immunity test conditions. You can save the test conditions as a file, so you can recall previously created test conditions and use them when they are necessary. You can use the test conditions setup pane to set conditions for each test standard, but this section will explain how to set the settings that are common to all the tests.



All voltage settings on QIS2 are phase voltages. In single-phase three-wire operation, the voltage between lines is twice the specified voltage (phase voltage); in three-phase operation, the voltage between lines is  $\sqrt{3}$  times the specified voltage (phase voltage).

## Test conditions

Item	Description
Standard selection	<p>Click the standard number button of the standard that you want to select.</p> <ul style="list-style-type: none"><li>• IEC61000-4-11 (Voltage dips, short interruptions, and voltage variations)</li><li>• IEC61000-4-13 (Harmonics and interharmonics)</li><li>• IEC61000-4-14 (Voltage fluctuation)</li><li>• IEC61000-4-17 (Ripple on d.c. input power port)</li><li>• IEC61000-4-27 (Unbalance)</li><li>• IEC61000-4-28 (Variation of power frequency)</li><li>• IEC61000-4-29 (Voltage dips, short interruptions, and voltage variations on d.c. input power port)</li><li>• IEC61000-4-34 (Voltage dips, short interruptions, and voltage variations)</li></ul>
Seq tabs (Seq 1 to Seq 10) <sup>1</sup>	<p>You can set the test conditions on Seq tabs (Seq 1 to Seq 10). You can copy and paste values from one Seq tab to another. The tab colors correspond to the colors of the preview waveforms. To change the colors, on the Option menu, click Color.</p>
Seq check boxes (Seq 1 to Seq 10)	<p>Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.</p>
Output Off check box	<p>Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)</p>
Combo boxes	<p>To enter values, you can select from the list of representative values that are displayed in the list. Alternatively, you can enter values directly into the boxes (press Enter to confirm the value). The eight most-recent values that have been entered are saved. When you enter the ninth value, the oldest value is deleted. If you enter or select from the list a value that is the same as one of those already saved, this value is treated as the most recent value, and its position in the order of values is changed to reflect this status. Combo boxes that are not displayed on a specific Seq tab (Seq 1 to Seq 10) are shared between all Seq tabs. Set the voltage, frequency, and number of times to repeat all tests. The voltage and frequency combo boxes are displayed depending on the standard.</p>

Item	Description
Trigger check boxes	Use these check boxes to enable trigger output. Red marks (⬇) are displayed at the selected positions. These marks indicate the timing that trigger signals are generated from the PCR-LE/WE. Use these when you are using an oscilloscope to view the test signal. For details on trigger signal output, see "Observing test signals."
Repeat combo box	Set the number of times that the contents of the tab will be repeated. You can specify a value from 1 to 999.
Repeat all combo box	Set the number of repetitions of the entire sequence. One repetition consists of all the tests whose Seq check boxes have been selected. You can specify a value from 1 to 9999.
Waveform preview <sup>2</sup>	The waveform of the selected Seq tab (Seq 1 to Seq 10) is displayed. The vertical axis is scaled automatically. A maximum of approximately 90 % of the display area is used to draw the graph. You can use the Zoom in and Zoom out buttons on the toolbar to zoom in and out horizontally. You can use the scroll bar to move to the location that you want to see. The waveform colors correspond to the Seq tab colors.
Result list	The test conditions that are being executed are displayed in a list where each row contains the conditions of a different Seq tab. Rows are added to the result as the test execution moves from one Seq tab to the next one. The result is scrolled automatically so that the added rows are displayed. The displayed items vary depending on the standard.

- 1 The following IEC61000-4-13 test items can only be set on the Seq 1 tab.  
Frequency sweep, odd harmonics whose orders are not a multiple of 3, odd harmonics whose orders are a multiple of 3, even harmonics, interharmonics, and meister curve
- 2 The test start point of the selected Seq tab (Seq 1 to Seq 10) is displayed at the left edge of the waveform preview. For example, if you select Seq 6, you can display the previews of Seq 6 to Seq 10. When you zoom in horizontally, you can use the scroll bar to display the preview of the waveform that you want to see. The display area is limited, so depending on the settings, you may not be able to display all the waveforms. The Repeat all setting does not affect the waveform preview.

**NOTE**

You can configure QIS2 so that the settings that you specify with the combo boxes on the Seq tab are not easily changed. On the Options menu, click **Display Options**, and select the In a Seq tab check box under Change Values. This will cause a confirmation message to be displayed when you try to change the settings.

**■Time unit**

In test condition setup, all times are entered in units of seconds. The resolution is 0.001 s.







## Toolbar



Item	Description
Open	Displays a dialog box for selecting the test conditions file.
Save Cond.	Overwrites the open test conditions file with the present test conditions.
Run	Starts the test. Alternatively, you can first click Output to turn the PCR-LE/WE's output on, and then click Run to start the test.
Stop	Stops the test that is running. Note that this does not turn off the PCR-LE/WE's output. To turn the output off as well, click Abort.
Output	Turns the PCR-LE/WE output on and off. When the output is off, click Output to turn the output on. The initial voltage of the active Seq tab is output, so it is possible to execute tests when the output is on.
Range	Switches the voltage range. There is a low range and a high range. The voltages that can be output in each range are as follows: Low range: Up to 152.5 V (PCR-LE)/157.5 V (PCR-WE) High range: Up to 305.0 V (PCR-LE)/315.0 V (PCR-WE) <ul style="list-style-type: none"> <li>For the IEC61000-4-29 standard (voltage dips, short interruptions, and voltage variations on d.c. input power port), this is DC voltage. The voltages that can be output in each range are as follows: Low range: Up to 215.5 V (PCR-LE)/222.5 V (PCR-WE) High range: Up to 431.0 V (PCR-LE)/445.0 V (PCR-WE)</li> </ul>
Zoom in/Zoom out	Zooms horizontally the waveform that is displayed in the waveform preview. You can use the Zoom in and Zoom out buttons to zoom in and out horizontally. When you have zoomed in as far as possible, the Zoom in button is unavailable. When you have zoomed out as far as possible, the Zoom out button is unavailable. You can use the Zoom in and Zoom out buttons to change the zoom setting to one of 9 levels.
Abort	Aborts the test that is being executed and turns the PCR-LE/WE output off. <ul style="list-style-type: none"> <li>In an emergency, turn the PCR-LE/WE's POWER switch off.</li> </ul>

## Progress bar and operation status display



Item	Description
Transmission progress bar (left bar)	Indicates the wait time until the test actually starts (the time during which test conditions are sent to the PCR-LE/WE) using a green bar.
Execution progress bar (right bar)	Indicates the progress of the test since the test actually started using a blue bar. The remaining time is displayed on the right side.
	Indicates single-phase two-wire (1P2W) connection, single-phase three-wire (1P3W) connection or three-phase (3P) connection.
	Indicates the output on/off status of the PCR-LE/WE.
	Indicates the High/Low status of the PCR-LE/WE's voltage range.
	Indicates the output mode of the PCR-LE/WE.
	Indicates the response mode of the PCR-LE/WE.
	This is displayed when an alarm is detected.

## Output modes

On the Instruments menu, select the PCR-LE/WE output mode.

Standard	PCR-LE				PCR-WE <sup>1</sup>	
	1P output			3P output	1P output <sup>2</sup>	3P output
	AC	AC + DC <sup>3</sup>	DC	AC <sup>4</sup>	AC + DC	AC + DC
IEC61000-4-11	Yes	Yes	No	Yes	Yes	Yes
IEC61000-4-13	Yes	Yes	No	Yes	Yes	Yes
IEC61000-4-14	Yes	Yes	No	Yes	Yes	Yes
IEC61000-4-17	No	Yes	No	No	Yes	No
IEC61000-4-27	No	No	No	Yes	No	Yes
IEC61000-4-28	Yes	Yes	No	Yes	Yes	Yes
IEC61000-4-29	No	Yes	Yes	No	Yes	No
IEC61000-4-34	Yes	Yes	No	Yes	Yes	Yes

Yes: Can be executed, No: Can not be executed

- 1 On the PCR-WE, only AC+DC mode can be selected.
- 2 On the PCR1000WE/PCR2000WE, only single-phase output is available.
- 3 In single-phase three-wire operation, AC+DC mode cannot be selected.
- 4 In three-phase operation, only AC mode is selectable.

## Saving test conditions as files

---

### ■ Overwriting an existing file

**1 Click Save Cond.**

If you are saving a new file, the Save As dialog box appears. You cannot save the file with the default file name (untitled.xml).

### ■ Saving conditions with a new file name

**1 On the File menu, click Save As (Test Condition).**

The Save As dialog box appears.

**2 Specify the save destination and the file name.**

**3 Click Save in the dialog box.**

The test conditions are saved.

## Recalling test conditions

---

**1 Click Open.**

The Open File dialog box appears.

You can select whether to display a save confirmation message when the present test conditions file has not been saved. On the Options menu, click **Display Options**, and select the appropriate check box under Test Condition File.

**2 Specify the file that you want to recall.**

**3 Click Open in the dialog box.**

The test conditions are set to the conditions in the recalled file.

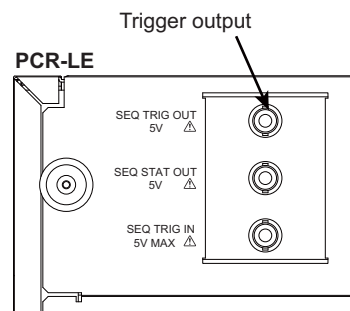
 p. 16

# Observing test signals

To observe test signals on an oscilloscope, use the trigger signal output described below. The trigger signals that you have selected with the test conditions of the standard are generated from the PCR-LE/WE.

## ■PCR-LE trigger signal output (SEQ TRIG OUT)

Trigger signal output is generated from the SEQ TRIG OUT terminal on the rear panel for several tens of  $\mu\text{s}$ . High level signals are approximately 5 V. Low level signals are approximately 0 V. There is a slight time difference (approximately 100  $\mu\text{s}$ ) between the trigger signal output and changes to the actual output. Trigger signals may also be output when you change the contents of a sequence. The signal polarity is the negative logic.

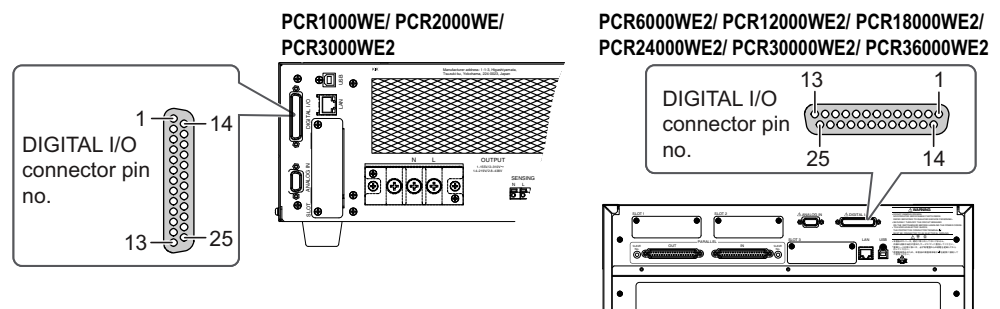


The BNC connector is isolated from the PCR-LE's INPUT and OUTPUT terminal blocks. The common line of the signals that flow through the BNC connector is shared inside of the PCR-LE. This common line is also shared by the remote interfaces, except the LAN interface. Therefore, if you use a desktop PC to control the PCR-LE remotely, the communication signal line of the PC is grounded, so the BNC connector is also grounded. If the signal line that is connected to the BNC connector has an electrical potential with respect to ground, the connected device or the PCR-LE may be damaged because of the current that flows through the signal line.

## ■PCR-WE trigger signal output (SEQ Trigger Out)

Trigger signals are output for several tens of  $\mu\text{s}$  from pin 11 (DIO.1) and pin 24 (DIO.1 COM) of the DIGITAL I/O connector on the rear panel. High level signals are approximately 5 V. Low level signals are approximately 0 V. There is a slight time difference (approximately 100  $\mu\text{s}$ ) between the trigger signal output and changes to the actual output. The signal polarity is the negative logic.

The DIGITAL I/O connector is isolated from the PCR-WE's INPUT and OUTPUT terminal blocks. The DIO.1 common line is shared inside the PCR-WE, so it is not isolated from the DIGITAL I/O connector. If the signal line that is connected to the DIGITAL I/O connector has an electrical potential with respect to ground, the connected device or the PCR-WE may be damaged because of the current that flows through the signal line.



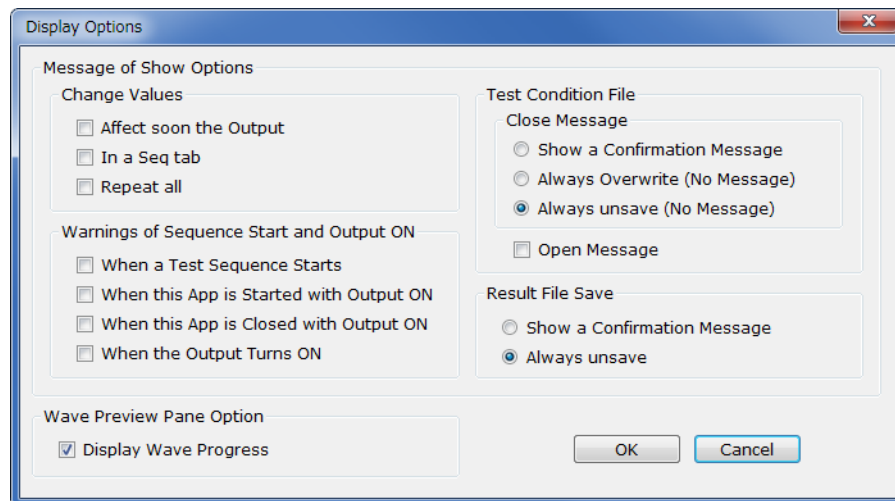
## ■DIP Simulator trigger signal output

If you are using the DSI1020/DSI3020 DIP Simulator, the trigger signal is generated from the TRIG OUT terminal (BNC connector) on the rear panel. For details, see the DIP Simulator operation manual.

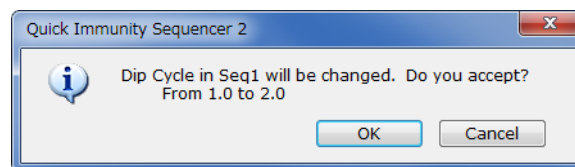
# Display Options

You can specify various options in the Display Options dialog box.

On the Options menu, click Display options.



Item	Description
Message of Show Options	
Change Values	<p>A message appears when you change the value of an item whose check box is selected.</p> <ul style="list-style-type: none"> <li>• Affect soon the Output: When you change the PCR-LE/WE output setting on the test conditions setup pane.</li> <li>• In a Seq tab: When you change a combo box value on the Seq tab.</li> <li>• Repeat all: When you change the number of repetitions of the entire sequence to be executed.</li> </ul>
Warnings of Sequence Start and Output ON	<p>A message appears when the item whose check box is selected applies to the present QIS2 condition.</p> <ul style="list-style-type: none"> <li>• When a Test Sequence Starts</li> <li>• When this App is Started with Output ON</li> <li>• When this App is Closed with Output ON</li> <li>• When this Output Turns ON</li> </ul>



Message example

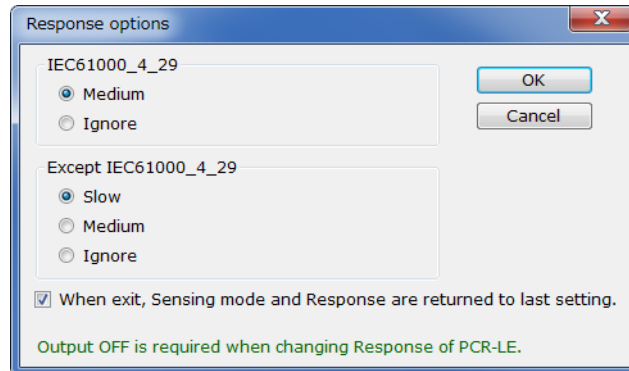


Item	Description
<b>Test Condition File</b>	
Close Message	<p>You can select how the QIS2 behaves when you close it without saving a test conditions file that has been changed or when you open a different test condition file.</p> <ul style="list-style-type: none"> <li>• Show a Confirmation Message: You can select whether to save the file.</li> <li>• Always Overwrite (No Message): The file is overwritten without a message. For a new file, you assign the file name before saving it.</li> <li>• Always unsave (No Message): The file is not updated. Nor is a message displayed.</li> </ul>
Open Message	<p>If selected, a message appears when you open a different test conditions file.</p>
Result File Save	<p>You can select how QIS2 behaves when you save a test result file.</p> <ul style="list-style-type: none"> <li>• Show a Confirmation Message: You can select whether to save the file.</li> <li>• Always unsave: A save confirmation message is not displayed.</li> </ul>
<b>Wave Preview Pane Option</b>	
Display Wave Progress	<p>If checked, only during test execution, a waveform made up of waveform diagrams on the Seq tab concatenated together in order of execution sequence is displayed in the waveform preview pane (an image of the test waveform that does not include the repetition of the Repeat all). The line cursor moves along with the test progress.</p>

# Response Options

You can specify the response speed of the PCR-LE/WE's internal amplifier in the Response options dialog box.

On the Options menu, click Response options.



Item	Description
IEC61000_4_29	If you select Medium, the PCR-LE/WE response is set to Medium (Normal speed) during IEC61000-4-29 standard tests. We recommend that you use Medium for IEC61000-4-29 standard tests.
Except IEC61000_4_29	If you select Slow or Medium, the PCR-LE/WE response is set to Slow (High stable) or Medium (Normal speed), respectively, during tests other than IEC61000-4-29 standard tests.
When exit, Sensing mode and Response are returned to last setting.	If you select this check box, QIS2 will return the PCR-LE/WE sensing mode and response settings to the original settings that were used when the PCR-LE/WE was started before QIS2 is closed.

# Executing Tests

## Before executing tests



**CAUTION** Output waveform data is stored in the PCR-LE/WE internal memory. The memory area for storing the data of one waveform is referred to as a waveform bank. Because QIS2 uses the waveform banks of the PCR-LE<sup>1</sup> or PCR-WE<sup>2</sup>, the waveform data stored in the waveform banks will be overwritten. If you have already used the waveform banks on the PCR-LE/WE by itself and have stored important data in the waveform banks, we recommend that you use the Wave Bank Memory application software to save the waveform data to a separate location such as a PC's hard disk.

- 1 In single-phase operation, QIS2 uses up to 64 (0 to 63) waveform banks of the PCR-LE. In three-phase operation, the same waveform data as the U phase is also written in the waveform banks of V and W phases. Sine wave data that is used as the PCR-LE's reference voltage waveform is stored in waveform bank 0. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0. Depending on the test conditions, QIS2 may overwrite the data in waveform bank 0 with data that is not a sine wave. This is not a problem while the PCR-LE is being used from QIS2. If you want to use the PCR-LE in a standalone manner immediately after you finish testing, turn the PCR-LE's POWER switch off and on to return the data in waveform bank 0 to the sine wave data.
- 2 In single-phase operation, QIS2 uses up to 64 (1 to 64) waveform banks of the PCR-WE. In three-phase operation, in order to write the waveform data of the V and W phases, three times as many waveform banks as in single-phase operation are used. Waveform bank 0 contains sine wave data that is used in the PCR-WE's reference voltage waveform, but QIS2 does not use waveform bank 0. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0.

## Turning the power on and off



**CAUTION** Turning the power on and off incorrectly may lead to errors or damage to the PCR-LE/WE. Follow the procedures below to turn the power on and off.

### ■ Turning the power on

- 1 **Turn on the DIP Simulator.**
- 2 **Turn on the PCR-LE/WE.**  
When you are using the DIP Simulator, you have to turn the PCR-LE/WE's output off to change the DIP Simulator settings.
- 3 **Start QIS2.**

When you are using the DIP Simulator, the PCR-LE/WE output will be turned on automatically even if it is off when you execute the test.

■Turning the power off

- 1 Exit QIS2.
- 2 Turn off the PCR-LE/WE.
- 3 Turn off the DIP Simulator.

Output on and off

If you click the Output button on the toolbar, you can start a test with the PCR-LE/WE output turned on. To turn off the output, click the Output button again.

NOTE

When the output is on, if you change the PCR-LE/WE output voltage or frequency on the test conditions pane, it is immediately reflected in the output. To configure QIS2 so that the output cannot be changed easily, on the Options menu, click **Display Options**, and select the **Affect soon the Output** check box under **Change Values**. This will cause a confirmation message to be displayed when you try to change the voltage or frequency.

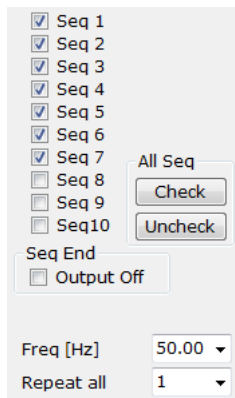
Text execution and output-on warning messages

See p. 16

In the dialog box that appears when you click **Display Options** on the Options menu, you can have warning messages appear for the following conditions (multiple conditions can be selected).

- When a test is started
- When QIS is started with the output turned on
- When QIS is closed with the output turned on
- When the output is turned on

## Execution



The tests that correspond to the selected Seq tab check boxes are executed in ascending order according to the Seq tab numbers. Any Seq tabs that you do not select will be skipped.

In the example shown on the left, Seq 1 to Seq 7 will be executed in ascending order. Repeat all is set to 1. Therefore, the test is finished when the execution of Seq 7 is complete.

The Output Off check box is not selected, so the PCR-LE/WE output will remain on when the test is finished.

**NOTE**

- The following IEC61000-4-13 tests are executed while rewriting between waveform banks. Frequency sweep, odd harmonics whose orders are not a multiple of 3, odd harmonics whose orders are a multiple of 3, even harmonics, interharmonics, and meister curve. It takes a little less than 2 seconds to rewrite between waveform banks. Waiting for waveform bank rewriting is performed with the execution timing of the integer-order harmonics. QIS2 rewrites between up to 64 (PCR-LE)/192 (PCR-WE) banks, so there is a maximum wait time of approximately 2 minutes while the integer-order harmonics are generated.
- To configure QIS2 so that the number of repetitions of the entire sequence cannot be changed easily, on the Options menu, click **Display Options**, and select the Repeat all check box under Change Values. This will cause a confirmation message to be displayed when you try to change the number.

**1 Set the test conditions.**

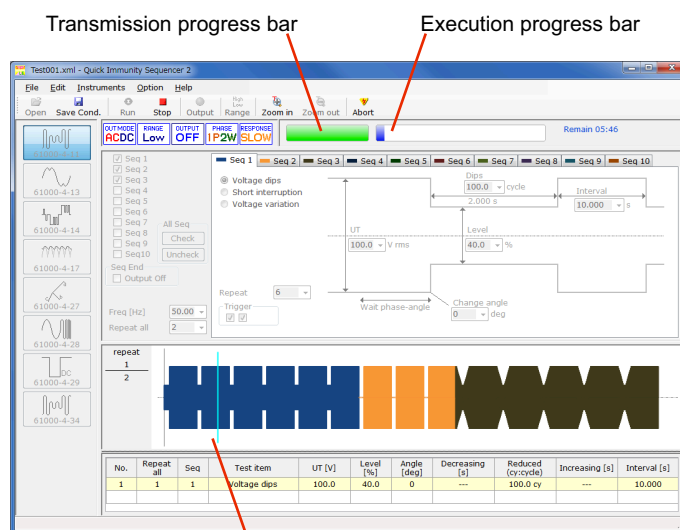
**2 On the toolbar, click Run.**

First, the transmission of test conditions to the PCR-LE/WE begins. The transmission progress bar shows the progress.

When the transmission is complete, the test begins. The execution progress bar shows the progress. The remaining test time is displayed to the right of the execution progress bar.

The display in the **Waveform preview** pane varies depending on whether the Display Wave Progress check box is selected under Wave Preview Pane Option in the **Display Options** dialog box.

See p. 7, p. 16



When the "Display Wave Progress" check box is checked

**Stop**

**1 On the toolbar, click Stop.**

## Dealing with unusual circumstances

If an unusual circumstance occurs on the EUT, stop the test from QIS2 and the hardware. To ensure that the EUT is protected, we recommend that you stop the test from the hardware.

- From QIS2

To stop the test, press function key F9 or click Abort on the toolbar. This will turn the PCR-LE/WE output off.

- From the hardware

Turn the PCR-LE/WE POWER switch off.

## Result list

The test conditions that are being executed are displayed in a list where each row contains the conditions of a different Seq tab or a different superimposed harmonic. Rows are added to the result as the test execution moves from one Seq tab or superimposed harmonic to the next one. The result is scrolled automatically so that the added rows are displayed. The displayed items vary depending on the specification.

Here we will show a representative example of a test. Unrelated values are displayed as a blank or as 0. A number, which is displayed under "No.," is assigned for each test condition. This number increases with each new test condition. The number of repetitions that is set on the Seq tab is not displayed.

- Voltage variations, voltage dips, and short interruptions example

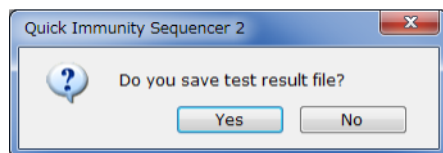
No.	Repeat all	Seq	Test item	UT [V]	Level [%]
1	1	1	Voltage variations	230.0	40.0
2	1	2	Voltage dips	230.0	70.0
3	1	3	Short interruptions	230.0	0.0

Angle [°]	Decreasing [s]	Reduced (cy: cycles)	Increasing [s]	Interval [s]
---	2.000	1.000 s	2.000	10.000
0	---	1.0 cy	---	10.000
0	---	0.5 cy	---	10.000

## Saving the test result

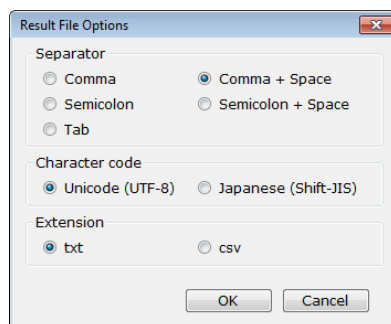
### NOTE

If you do not need to save the test results, on the Options menu, click Display Options, and select the Always unsave check box under Result File Save. The save confirmation message will no longer appear.



### ■ Configuring the test result file options

- 1 On the File menu, click Test result file Options.**  
The Result File Options dialog box appears.



- 2 Specify the Separator, Character code, and Extension.**
- 3 Click OK.**

### ■ Saving the result with a new file name

- 1 On the File menu, click Save as (Test Result).**  
The Save As dialog box appears.
- 2 Specify the save destination and the file name.**
- 3 Click Save.**  
The test results are saved.

## Test overview

The voltage dips, short interruptions, and voltage variation immunity tests test the immunity of a device against sudden and gradual power supply voltage drops.

This standard is divided into two standards depending on the input current per phase. IEC61000-4-11 is the standard for currents of 16 A or less. IEC61000-4-34 is the standard for currents that exceed 16 A. QIS2 does not differentiate test conditions according to the input current per phase. One test result file is created for each standard.

### NOTE

For IEC61000-4-11 tests, we recommend that you use the DIP Simulator for the following reasons. The standard's specifications for the voltage generator's voltage rise and fall times (1  $\mu$ s to 5  $\mu$ s) will be met. The performance when the dip simulator is not used is approximately 30  $\mu$ s (when the response is MEDIUM) on the PCR-LE series and approximately 55  $\mu$ s (when the response is FAST) on the PCR-WE series.

## Voltage dips and short interruptions

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Test item	Select Voltage dips or Short interruption.
Phase select (Three-phase operation only) <sup>1</sup>	Select the phase (phase voltage or line voltage) for setting the test conditions. The selection of phase voltage or line voltage applies to all Seq tabs. To use a DIP simulator, set it in each Seq tab. If you select the short interruptions test, short interruptions will occur at the same time on all phases.  If phase voltage is selected in the voltage dips test <ul style="list-style-type: none"><li>• Select which phase to dip the voltage, Ua, Ub, or Uc (multiple sections allowed). To apply this setting to all Seq tabs, click the Copy button.</li></ul> If line voltage is selected in the voltage dips test <ul style="list-style-type: none"><li>• Select between which two lines to dip the voltage, Ua-Ub, Ub-Uc, or Uc-Ua (multiple selections not allowed). To apply this setting to all Seq tabs, click the Copy button.</li></ul>



Item	Description
UT (Phase) [Vrms]	<p>Enter the initial voltage (the recovery voltage is the same value). Normally enter the rated voltage of the EUT.</p> <ul style="list-style-type: none"> <li>Input range: 50.0 V to 305.0 V</li> <li>Input range (when using the DIP Simulator): 50.0 s to 288.0 V</li> <li>You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.</li> <li>Check the Seq tabs' UT settings that will be used when the test is executed. If the UT settings are different on different Seq tabs, unintended voltage variations will occur depending on the Seq tabs that have been selected for execution.</li> </ul> <p>In single-phase, three-wire operation or if Phase select is set to Line voltage in three-phase operation, the phase voltage that you enter is converted to a line voltage and displayed in blue under the box.</p>
Level (Phase or Line) [%]	<p>For the voltage dips test, enter the level that the voltage will be reduced to as a percentage of UT. For the short interruptions test, this is fixed to 0 % (you cannot enter the value).</p> <ul style="list-style-type: none"> <li>Input range (voltage dips): 0.0 % to 200.0 % (0.0 % to 100.0 % with setting of line voltage)</li> <li>Input value (when using the DIP Simulator): 0.0 %, 40.0 %, 70.0 % or 80.0 %</li> </ul>
Change angle [°]	<p>Enter the starting phase angle for the voltage dip or short interruption.</p> <ul style="list-style-type: none"> <li>Input range: 0 ° to 359 °</li> </ul>
Dips or Short [cycles]	<p>Enter the number of cycles of the voltage dip or short interruption. The number of cycles that you enter is converted to time and displayed in blue under the box.</p> <ul style="list-style-type: none"> <li>Input range (voltage dips): 0.1 cycles to 10000.0 cycles</li> <li>Input range (short interruptions): 0.1 cycles to 10000.0 cycles</li> <li>Input range (when using the DIP Simulator): The DIP Simulator can be set to -0.5 cycles, 0.5 cycles or a value from 1 cycle to 300 cycles.</li> </ul>
Interval [s]	<p>Enter the interval between the time when the voltage returns to the recovery voltage (UT) and the time when the next voltage drop will occur. The last interval is the transition time to the next Seq tab.</p> <ul style="list-style-type: none"> <li>Input range: 0.020 s to 360000.000 s</li> <li>Input range (when using the DIP Simulator): 10.000 s to 100.000 s (The resolution is 1 s, rounded to the nearest integer.)</li> <li>To detect zero crossings, depending on the settings, the actual interval may be the interval that you set plus the time of one period.</li> </ul>
Repeat	<p>Enter the number of repetitions of the Seq tab.</p> <ul style="list-style-type: none"> <li>Input range<sup>2</sup>: 1 repetitions to 999 repetitions</li> </ul>
Trigger	<p>Select the trigger signal output. Red marks (⬇) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview.</p>
Seq check boxes (Seq 1 to Seq 10)	<p>Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.</p>
Output Off	<p>Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)</p>
Freq [Hz]	<p>Enter the rated frequency of the EUT.</p> <ul style="list-style-type: none"> <li>Input range: 50.00 Hz or 60.00 Hz</li> </ul>
Repeat all	<p>Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10.</p> <ul style="list-style-type: none"> <li>Input range: 1 repetition to 9999 repetitions</li> </ul>

- To use the IT01-PCR-L Immunity Tester, you need to change the connection.  
Phase voltage: Connect an Immunity Tester to each phase.  
Line voltage: Connect an Immunity Tester between each line.
- 3 repetitions to 999 repetitions (multiples of 3 only) for the IT01-PCR-L.

## Voltage variations

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Voltage dips and short interruptions."
Test item	Select Voltage variations.
Phase select (Three-phase operation only)	<p>Select the phase (phase voltage or line voltage) for setting the test conditions. The selection of phase voltage or line voltage applies to all Seq tabs. To use a DIP simulator, set it in each Seq tab.</p> <p>If phase voltage is selected</p> <ul style="list-style-type: none"> <li>Select which phase to dip the voltage, Ua, Ub, or Uc (multiple sections allowed).</li> </ul> <p>To apply this setting to all Seq tabs, click the Copy button.</p> <p>If line voltage is selected</p> <ul style="list-style-type: none"> <li>Select between which two lines to dip the voltage, Ua-Ub, Ub-Uc, or Uc-Ua (multiple selections not allowed).</li> </ul> <p>To apply this setting to all Seq tabs, click the Copy button.</p>
UT (Phase) [Vrms] Level (Phase or Line) [%]	The same as the description given under "Voltage dips and short interruptions."
Decreasing [s]	<p>Enter the time for decreasing the initial voltage (UT) to the low voltage.</p> <ul style="list-style-type: none"> <li>Input range: 0.0 s to 360000.000 s</li> </ul>
Reduced [s]	<p>Enter the duration of the low voltage.</p> <ul style="list-style-type: none"> <li>Input range: 0.01 s to 360000.000 s</li> </ul>
Increasing [s]	<p>Enter the time for recovering the voltage from the low voltage to a value that is the same as the initial voltage (UT).</p> <ul style="list-style-type: none"> <li>Input range: 0.01 s to 360000.000 s</li> </ul>
Interval [s] Repeat Trigger	The same as the description given under "Voltage dips and short interruptions."
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off Freq [Hz] Repeat all	The same as the description given under "Voltage dips and short interruptions."

### NOTE

At the start of a test, the phases are aligned so that they start with the same phase, but depending on the time setting, the starting phases may be different in the next sequence or repetition.

## Test overview

---

The harmonics and interharmonics immunity tests test the immunity of a device against power supply voltage waveform distortion. The test items are shown below.

- Flat curve
- Over swing
- Frequency sweep
- Odd harmonics whose orders are not a multiple of 3
- Odd harmonics whose orders are a multiple of 3
- Even harmonics
- Interharmonics
- Meister curve

### ■ Test order

The standard indicates a recommended test order of the test items in a flow chart. This test order has not been incorporated in QIS2 so that it can be used for other purposes such as preliminary testing. QIS2 has been designed so that each test item can be tested individually.

### ■ Electromagnetic class

QIS2 is not designed for a particular class. It also does not have conditions for setting the class. Set appropriate test conditions for your EUT.

### ■ Three-phase operation

The test conditions are all set in relation to U-phase. Test signals change simultaneously in three-phases on the basis of U-phase.

## Flat curve

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Test item	Select Flat curve.
$\times U1 \times Ky \times \sqrt{2}$ (flat voltage)	Enter the clipping voltage as a percentage of the U1 peak value, " $\times U1 \times Ky \times \sqrt{2}$ ." To not clip the signal, set this to 1. Even if the test level is changed, the Ky value is automatically adjusted to maintain the RMS value at the U1 value. <ul style="list-style-type: none"> <li>Input range: 0.40 to 1.00</li> </ul>
Duration [s]	Enter the duration of the flat-curve waveform. <ul style="list-style-type: none"> <li>Input range: 0.020 s to 360000.000 s</li> <li>Waveforms are switched when the fundamental wave's phase angle is 0°. In other words, the present waveform is not switched when the set time elapses, but when the fundamental wave's phase angle next becomes 0°.</li> </ul>
Interval [s]	Enter the interval between the time when the voltage returns to the recovery voltage (U1) and the time when the next waveform clipping will occur. The last interval is the transition time to the next Seq tab. <ul style="list-style-type: none"> <li>Input range: 0.020 s to 360000.000 s</li> <li>Waveforms are switched with the same timing as was explained for the duration.</li> </ul>
Repeat	Enter the number of repetitions of the Seq tab. <ul style="list-style-type: none"> <li>Input range: 1 repetition to 999 repetitions</li> </ul>
Trigger	Select the trigger signal output. Red marks (▼) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview.
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
U1 [V]	Enter the initial voltage (the recovery voltage is the same value). Normally enter the rated voltage of the EUT. <ul style="list-style-type: none"> <li>Input range: 50.0 V to 305.0 V</li> <li>You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.</li> </ul>
Freq [Hz]	Enter the rated frequency of the EUT. <ul style="list-style-type: none"> <li>Input range: 50.00 Hz or 60.00 Hz</li> </ul>
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. <ul style="list-style-type: none"> <li>Input range: 1 repetition to 9999 repetitions</li> </ul>

## Over swing

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Flat curve."
Test item	Select Over swing.
Level [%]	Enter the voltage levels of the third-order and fifth-order harmonics that will be superimposed on the fundamental wave as percentages of U1rms. <ul style="list-style-type: none"> <li>• Input range: 0.0 % to 100.0 %</li> <li>• Even if you change the test level, RMS is maintained at the U1 value.</li> </ul>
Angle [°]	Enter the phase angles of the third-order and fifth-order harmonics that will be superimposed on the fundamental wave. <ul style="list-style-type: none"> <li>• Input range: 0 ° to 360 °</li> </ul>
Duration [s]	
Interval [s]	
Repeat	
Trigger	
Seq check boxes (Seq 1 to Seq 10)	The same as the description given under "Flat curve."
Output Off	
U1 [V]	
Freq [Hz]	
Repeat all	

## Sweep in frequency

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq 1 tab only.
Test item	Select Sweep in frequency.
$\Delta f$ (harmonic step)	Enter the step of the sweeping of the harmonics or interharmonics that will be superimposed on the fundamental wave (enter this as a difference of orders). The sweep proceeds in ascending order from lower orders to higher orders. <ul style="list-style-type: none"> <li>Input range: 0.1 to 1.0</li> </ul>
Level [%]	Enter the levels of the harmonics that will be superimposed on the fundamental wave as percentages of the fundamental wave. <ul style="list-style-type: none"> <li>Input range: 0.0 % to 100.0 %</li> </ul>
Time [s/block]	For each frequency range, enter the duration of the sweeping of the harmonics or interharmonics that will be superimposed on the fundamental wave. <sup>1</sup> <ul style="list-style-type: none"> <li>Input range: 300.000 s to 360000.000 s</li> <li>Waveforms are switched when the fundamental wave's phase angle is 0°. In other words, the present waveform is not switched when the set time elapses, but when the fundamental wave's phase angle next becomes 0°.</li> </ul>
Trig Out (trigger output)	Select the trigger signal output. A trigger signal is generated when the multi-layering of integer-order harmonics starts. On the waveform preview, red marks (▼) are displayed at the positions that you select with the check boxes.
Seq check boxes (Seq 1 to Seq 10)	You can only select the Seq 1 check box. All check boxes other than Seq 1 are unavailable.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
U1 [V]	Enter the initial voltage (the recovery voltage is the same value). Normally enter the rated voltage of the EUT. <ul style="list-style-type: none"> <li>Input range: 50.0 V to 305.0 V</li> <li>You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.</li> </ul>
Freq [Hz]	Enter the rated frequency of the EUT. <ul style="list-style-type: none"> <li>Input range: 50.00 Hz or 60.00 Hz</li> </ul>

1 The available frequency ranges are the five frequency ranges in the "Harm order" column: 0.33 to 2.0, 2.0 to 10.0, 10.0 to 20.0, 20.0 to 30.0, and 30.0 to 40.0).  
If  $\Delta f$  is 0.1, the value after 0.33 is 0.4.  
Regardless of the  $\Delta f$  setting, QIS2 always superimposes integer orders.  
The next waveform is created while integer-order harmonics are being generated.

## Odd harmonics

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Sweep in frequency."
Test item	Select "Odd, non multiple of 3" or "Odd, multiple of 3."
Harm.	<p>Enter the harmonics that will be superimposed on the fundamental wave. Individual harmonic changes are performed starting from the top-most row in the table and proceeding to the bottom.</p> <ul style="list-style-type: none"> <li>Input range (Odd, non multiple of 3): The setting is fixed to the following sequence: 5, 5, 7, 7, 11, 13, 17, 19, 23, 25, 29, 31, 35, 37. You cannot change this setting.</li> <li>Input range (Odd, multiple of 3): The setting is fixed to the following sequence: 3, 3, 9, 9, 15, 21, 27, 33, 39. You cannot change this setting.</li> </ul>
Level [%]	<p>Enter the levels of the harmonics that will be superimposed on the fundamental wave as percentages of the fundamental wave.</p> <ul style="list-style-type: none"> <li>Input range: 0.0 % to 100.0 %</li> </ul>
Angle [°]	<p>Enter the phase angles of the harmonics that will be superimposed on the fundamental wave.</p> <ul style="list-style-type: none"> <li>Input range: 0 ° to 360 °</li> </ul>
Duration [s]	<p>Enter the duration of the harmonics that will be superimposed on the fundamental wave.</p> <ul style="list-style-type: none"> <li>Input range: 0.000 s to 360000.000 s</li> <li>Waveforms are switched when the fundamental wave's phase angle is 0 °. In other words, the present waveform is not switched when the set time elapses, but when the fundamental wave's phase angle next becomes 0 °.</li> </ul>
Interval	<p>Enter the wait time until the next harmonic is superimposed. During this interval, only the fundamental wave is generated.</p> <ul style="list-style-type: none"> <li>Input range: 0.000 s to 360000.000 s</li> <li>Waveforms are switched with the same timing as was explained for the duration.</li> </ul> <p>If you set the duration or the interval to 0.000 s, the corresponding step will be skipped.</p>
Trig Out (trigger output)	Select the trigger signal output. Trigger signals are generated at the start of the superimposing of the harmonics that you select with the check boxes. On the waveform preview, red marks (⬇) are displayed at the positions that you select with the check boxes.
Seq check boxes (Seq 1 to Seq 10)	
Output Off	
U1 [V]	The same as the description given under "Sweep in frequency."
Freq [Hz]	
Repeat all	

## Even harmonics

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Sweep in frequency."
Test item	Select Even harmonics.
Harm.	Enter the harmonics that will be superimposed on the fundamental wave. Individual harmonic changes are performed starting from the top-most row in the table and proceeding to the bottom. <ul style="list-style-type: none"> <li>• Input range: Even numbers from 2 to 40</li> </ul>
Level [%]	
Angle [°]	
Duration [s]	The same as the description given under "Odd harmonics."
Interval	
Trig Out (trigger output)	
Seq check boxes (Seq 1 to Seq 10)	
Output Off	
U1 [V]	The same as the description given under "Sweep in frequency."
Freq [Hz]	
Repeat all	



## Interharmonics

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Sweep in frequency."
Test item	Select Interharmonics.
$\Delta f$ (harmonic step)	The same as the description given under "Sweep in frequency."
Level [%]	Enter the levels of the harmonics that will be superimposed on the fundamental wave as percentages of the fundamental wave. • Input range: 0.0 % to 100.0 %
Time [s/step]	Enter the duration (per step) of the interharmonics that will be superimposed on the fundamental wave. • Input range: 5.000 s to 360000.000 s
Interval [s/step]	Enter the wait time until the next interharmonic is superimposed (the wait time until the next step). During this interval, only the fundamental wave is generated. • Input range: 0.000 s to 360000.000 s
Trig Out (trigger output)	
Seq check boxes (Seq 1 to Seq 10)	
Output Off	The same as the description given under "Sweep in frequency."
U1 [V]	
Freq [Hz]	

## Meister curve

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "Sweep in frequency."
Test item	Select Meister curve.
$\Delta f$ (harmonic step)	See "IEC61000-4-13 Meister curve."
Level [%]	Enter the levels of the harmonics that will be superimposed on the fundamental wave as percentages of the fundamental wave. If you specify a value between 0.0 and 99.9, that value will become the level percentage. If you specify a value between 100 and 5000, the level percentage will be calculated from "input value/f."
Time [s/block]	For each frequency range, enter the duration of the sweeping of the harmonics or interharmonics that will be superimposed on the fundamental wave. • Input range: 300.000 s to 360000.000 s
Trig Out (trigger output)	
Seq check boxes (Seq 1 to Seq 10)	
Output Off	The same as the description given under "Sweep in frequency."
U1 [V]	
Freq [Hz]	

### IEC61000-4-13 Meister curve

The Meister curve for 50 Hz is as follows:

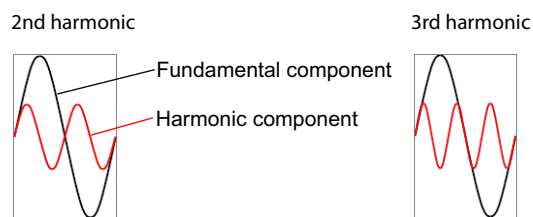
Frequency range f [Hz]	Step $\Delta f$ [Hz]	Class 1 [%]	Class 2 [%]	Class 3 [%]	Class x [%]
16.5 to 100	5	No test	3	4	Open
100 to 500	10	No test	9	10	Open
500 to 1000	10	No test	4500/f	4500/f	Open
1000 to 2000	25	No test	4500/f	4500/f	Open

Separating this, we obtain:

Frequency f [Hz]	Harmonics	Step $\Delta f$ [Hz]	Class2 Amplitude [%]	Class3 Amplitude [%]
16.5	0.33	5	3	4
20.0	0.4			
25.0	0.5			
:	:			
90.0	1.8			
95.0	1.9			

Frequency f [Hz]	Harmonics	Step $\Delta f$ [Hz]	Class2 Amplitude [%]	Class3 Amplitude [%]
100.0	2.0	10	9	10
110.0	2.2			
120.0	2.4			
:	:			
480.0	9.6			
490.0	9.8			
500.0	10.0	10	$4500/500 = 9.0$	$4500/500 = 9.0$
510.0	10.2		$4500/510 = 8.8$	$4500/510 = 8.8$
520.0	10.4		$4500/520 = 8.7$	$4500/520 = 8.7$
:	:		:	:
980.0	19.6		$4500/980 = 4.6$	$4500/980 = 4.6$
990.0	19.8		$4500/990 = 4.5$	$4500/990 = 4.5$
1000.0	20.0	25	$4500/1000 = 4.5$	$4500/1000 = 4.5$
1025.0	20.5		$4500/1025 = 4.4$	$4500/1025 = 4.4$
1050.0	21.0		$4500/1050 = 4.3$	$4500/1050 = 4.3$
:	:		:	:
1950.0	39.0		$4500/1950 = 2.3$	$4500/1950 = 2.3$
1975.0	39.5		$4500/1975 = 2.3$	$4500/1975 = 2.3$
2000.0	40.0		$4500/2000 = 2.3$	$4500/2000 = 2.3$

If you want to output harmonics using QIS2, the waveform banks of the PCR-LE/WE are used. For integer-order harmonics, a harmonic component can be added to a waveform bank.

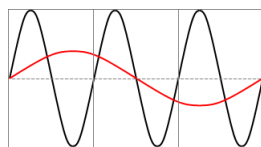


The black waveform is the fundamental component, and the red waveform is the harmonic component.

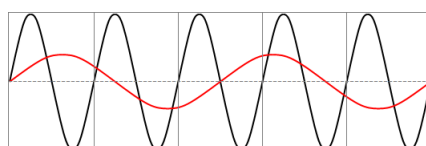
The waveform obtained by combining the fundamental component and the harmonic component with a given amplitude (%) is written to a waveform bank.

Interharmonics can be obtained by combining multiple waveform banks.

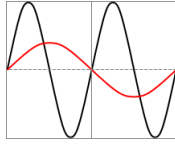
Using three 0.33th harmonic (16.5 Hz/50 Hz) waveform banks



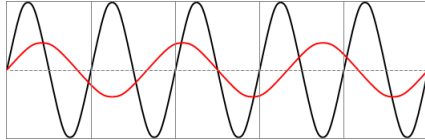
Using five 0.4th harmonic (20 Hz/50 Hz) waveform banks



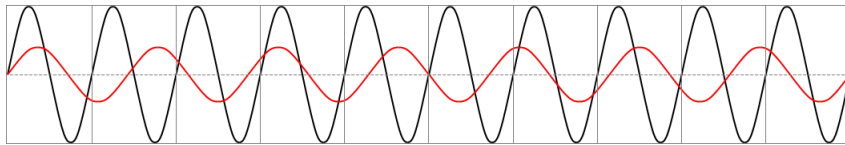
Using two 0.5th harmonic (25 Hz/50 Hz) waveform banks



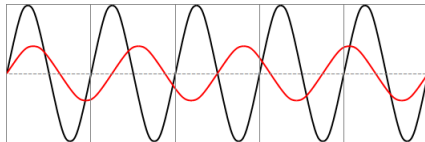
Using five 0.6th harmonic (30 Hz/50 Hz) waveform banks



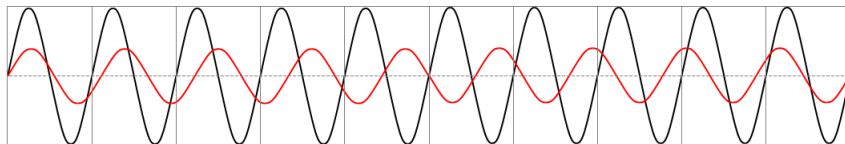
Using ten 0.7th harmonic (35 Hz/50 Hz) waveform banks



Using five 0.8th harmonic (40 Hz/50 Hz) waveform banks



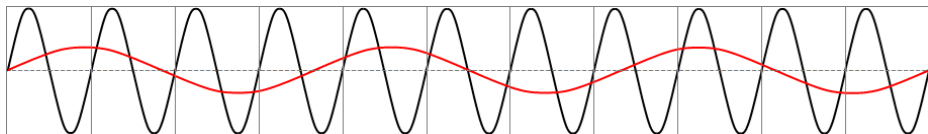
Using ten 0.9th harmonic (45 Hz/50 Hz) waveform banks



As indicated above, for 50 Hz, all the harmonics can be output by using a maximum of 10 banks. However, for 60 Hz, 16.5 Hz/60 Hz yields the 0.275th harmonic, and this harmonic cannot be obtained no matter how many waveform banks are used.

Therefore, 11 waveform banks are used to achieve the 0.273th harmonic, which is a close value.

Using eleven 0.273th harmonic (16.5 Hz/60 Hz) waveform banks



From here, unachievable harmonics follow: 25 Hz/60 Hz = 0.417th, 35 Hz/60 Hz = 0.583th, and so on. Therefore, the values are changed slightly from the standard values for only 60 Hz as follows:

Standard				QIS2			
Frequency range	Step	Class 2 [%]	Class 3 [%]	Frequency range	Step	Class 2 [%]	Class 3 [%]
16.5 to 100	5	3.0	4.0	16.5 to 120	6	3.0	4.0
100 to 500	10	9.0	10.0	120 to 600	12	9.0	10.0
500 to 1000	10	4500/f	4500/f	600 to 1200	12	4500/f	4500/f
1000 to 2400	25	4500/f	4500/f	1200 to 2400	30	4500/f	4500/f

Separating for 60 Hz, we obtain:

Frequency f [Hz]	Harmonics	Step Δf [Hz]	Class2 Amplitude [%]	Class3 Amplitude [%]
16.5	0.275	6	3	4
24.0	0.4			
30.0	0.5			
:	:			
108.0	1.8			
114.0	1.9			
120.0	2.0	12	9	10
132.0	2.2			
144.0	2.4			
:	:			
576.0	9.6			
588.0	9.8			
600.0	10.0	12	4500/600 = 7.5	4500/600 = 7.5
612.0	10.2		4500/612 = 7.4	4500/612 = 7.4
624.0	10.4		4500/624 = 7.2	4500/624 = 7.2
:	:		:	:
1176.0	19.6		4500/1176 = 3.8	4500/1176 = 3.8
1188.0	19.8		4500/1188 = 3.8	4500/1188 = 3.8
1200.0	20.0	30	4500/1200 = 3.8	4500/1200 = 3.8
1230.0	20.5		4500/1230 = 3.7	4500/1230 = 3.7
1260.0	21.0		4500/1260 = 3.6	4500/1260 = 3.6
:	:		:	:
2340.0	39.0		4500/2340 = 1.9	4500/2340 = 1.9
2370.0	39.5		4500/2370 = 1.9	4500/2370 = 1.9
2400.0	40.0		4500/2400 = 1.9	4500/2400 = 1.9

The standard is not strictly followed for 60 Hz, but a similar test can be performed.

# IEC61000-4-14

## Test overview

The voltage fluctuation immunity test tests the immunity of a device against power supply voltage fluctuation.

### ■Electromagnetic class

QIS2 is not designed for a particular class. It also does not have conditions for setting the class. Set appropriate test conditions for your EUT.

### ■Three-phase operation

The test conditions are all set in relation to U-phase. Test signals change simultaneously in three-phases on the basis of U-phase.

## Voltage fluctuation

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Test item	Select the Voltage fluctuation.
Un [%]	Enter the center value of the voltage fluctuation. Enter this as a percentage of the EUT's rated voltage. <ul style="list-style-type: none"><li>• Input range: 50.0 % to 150.0 %</li><li>• Check the Seq tabs' Un settings that will be used when the test is executed. If the Un settings are different on different Seq tabs, unintended voltage variations will occur depending on the Seq tabs that have been selected for execution.</li></ul>
Delta1, Delta2, and Delta3 [%]	Enter the voltage fluctuation ranges. Enter these as percentages of the EUT's rated voltage. <ul style="list-style-type: none"><li>• Input range: -50.0 % to 50.0 %</li><li>• The duration is fixed to 2 s.</li></ul>
Repetition (Repetition1, Repetition2, and Repetition3) [s]	Enter the repetition intervals of the voltage fluctuation. Enter these in units of seconds or in the format of hours:minutes:seconds. <ul style="list-style-type: none"><li>• Input range: 3.000 s to 360000.000 s</li></ul>
Repeat	Enter the number of repetitions of the Seq tab. <ul style="list-style-type: none"><li>• Input range: 1 repetition to 999 repetitions</li></ul>
Trigger	Select the trigger signal output. Red marks (▼) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview.
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
Un [V]	Enter the rated voltage of the EUT. <ul style="list-style-type: none"><li>• Input range: 0.0 V to 300.0 V</li><li>• You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.</li></ul>

Item	Description
Freq [Hz]	Enter the rated frequency of the EUT. • Input range: 50.00 Hz or 60.00 Hz
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. • Input range: 1 repetition to 9999 repetitions

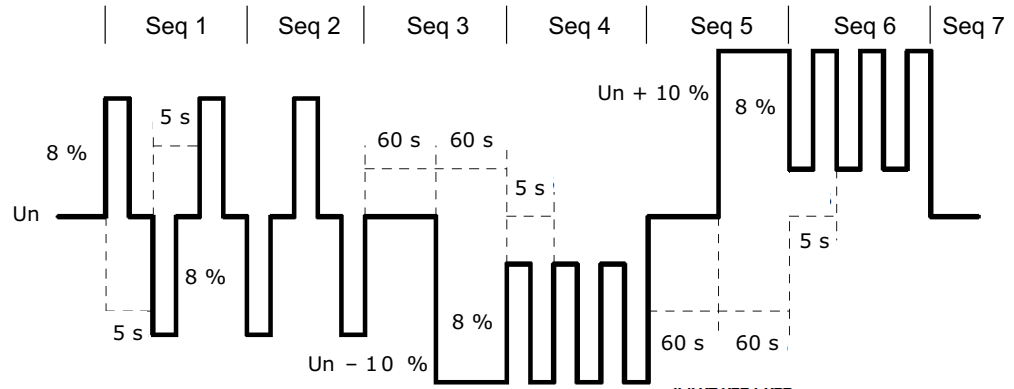
## Interval

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under “Voltage variations.”
Test item	Select Interval.
Un × [%] (Interval1)	Enter the center value of the voltage fluctuation. Enter this as a percentage of the EUT’s rated voltage. Normally, this is the same as the Un percentage on the previous Seq tab. • Input range: 1.0 % to 150.0 % • Check the Seq tabs’ Un settings that will be used when the test is executed. If the Un settings are different on different Seq tabs, unintended voltage variations will occur depending on the Seq tabs that have been selected for execution.
Un × [%] (Interval2)	Enter the center value of the voltage fluctuation. Enter this as a percentage of the EUT’s rated voltage. Normally, this is the same as the Un percentage on the next Seq tab. • Input range: The same as the description given under “Un × [%] (Interval1).”
Interval1 and Interval2 [s]	Enter the intervals. • Input range: 0.0010 s to 360000.0000 s
Repeat	
Trigger	
Seq check boxes (Seq 1 to Seq 10)	
Output Off	The same as the description given under “Voltage variations.”
Un [V]	
Freq [Hz]	
Repeat all	

## Test conditions setup example

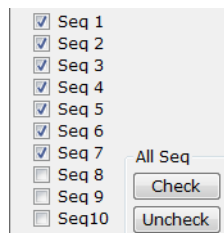
This section explains the procedure for setting the test conditions to generate the sequential voltage variations shown below.



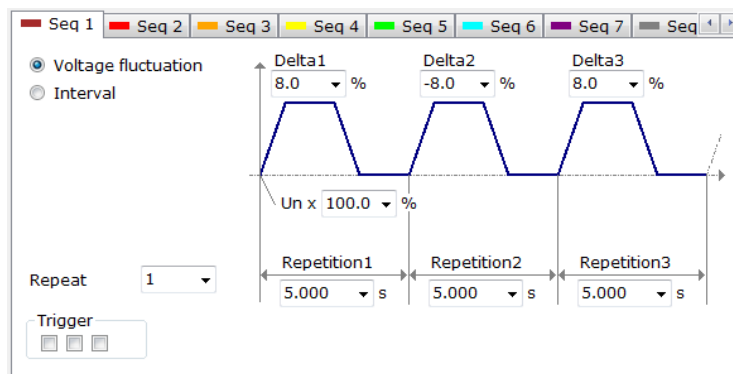
Example of sequential voltage variations

### 1 Select the Seq 1 to Seq 7 check boxes.

This procedure uses seven Seq tabs

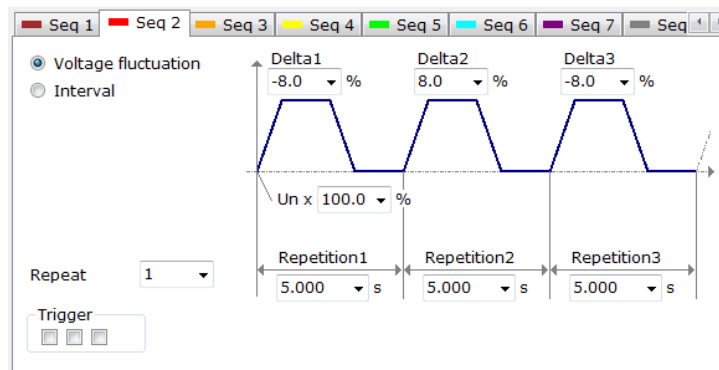


### 2 Configure the Seq 1 tab settings as indicated below.

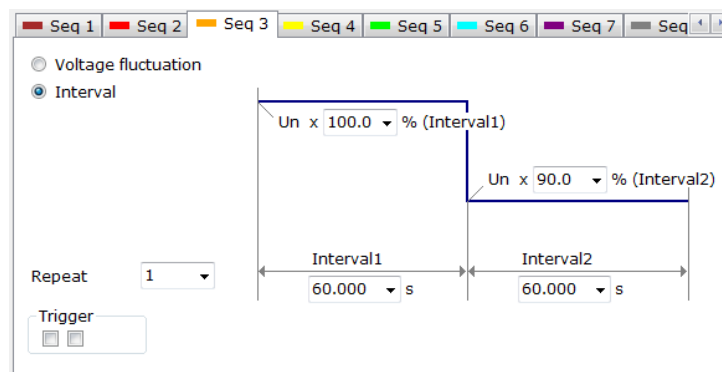




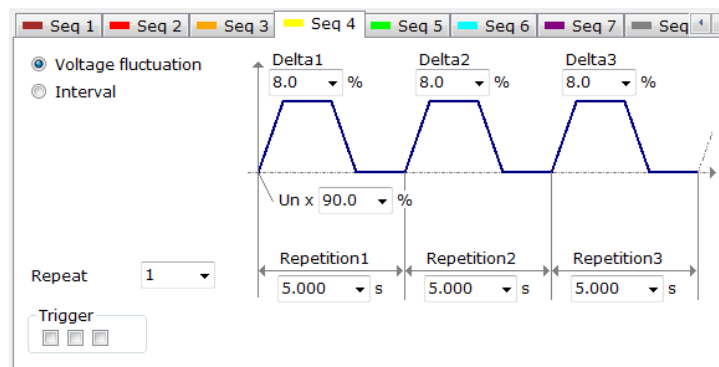
### 3 Configure the Seq 2 tab settings as indicated below.



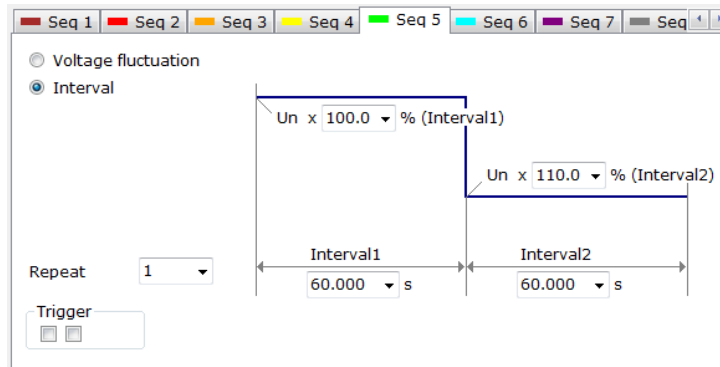
### 4 Configure the Seq 3 tab settings as indicated below.



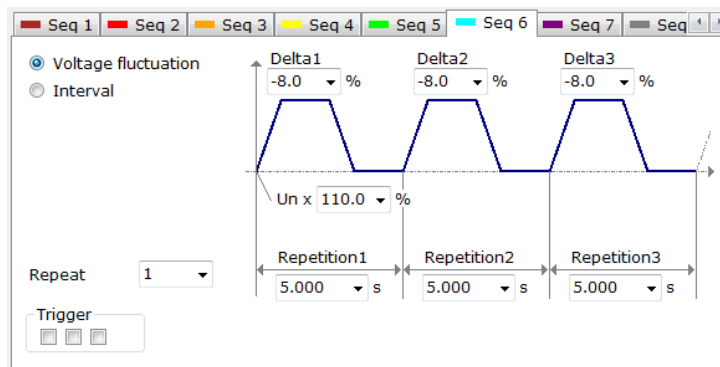
### 5 Configure the Seq 4 tab settings as indicated below.



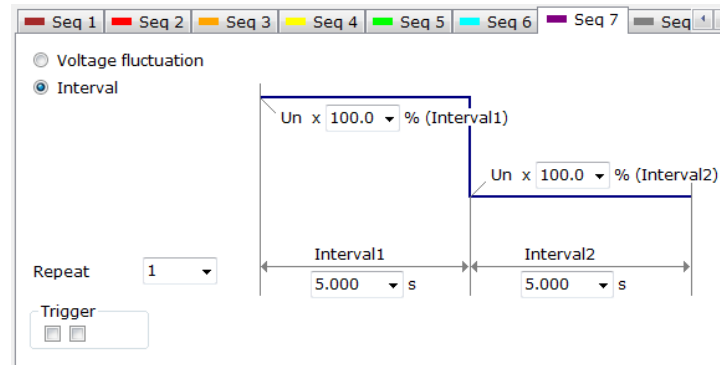
## 6 Configure the Seq 5 tab settings as indicated below.



## 7 Configure the Seq 6 tab settings as indicated below.



## 8 Configure the Seq 7 tab settings as indicated below.



## Test overview

The ripple immunity test tests the immunity of a device against the ripple on its DC input power port.

You cannot select this test in three-phase operation.

### ■ Electromagnetic class

QIS2 is not designed for a particular class. It also does not have conditions for setting the class. Set appropriate test conditions for your EUT.

## Ripple on single-phase and three-phase rectifier circuits

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Test item	Select the appropriate rectifier circuit.
Udc [V]	Enter the nominal DC voltage. • Input range: 10.0 V to 360.0 V
Level [%]	Enter the ripple pp (peak-to-peak) value as a percentage of the nominal DC voltage (of the fundamental wave). • Input range: 0.0 % to 20.0 %
Duration [s]	Enter the duration. • Input range: 1.000 s to 360000.000 s
Interval [s]	Enter the interval from the end of the duration to the start of the next duration. The last interval is the transition time to the next Seq tab. • Input range: 0.000 s to 360000.000 s
Repeat	Enter the number of repetitions of the Seq tab. • Input range: 1 repetition to 999 repetitions
Trigger	Select the trigger signal output. Red marks (↓) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview.
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
Freq [Hz]	Enter the rated frequency of the EUT. • Input range: 50.00 Hz or 60.00 Hz
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. • Input range: 1 repetition to 9999 repetitions
Instruments menu	Select AC + DC mode. • You cannot execute this test in AC mode or DC mode.

## Test overview

---

The unbalance immunity test tests the immunity of a device against unbalance in three-phase.

### ■ Electromagnetic class

QIS2 is not designed for a particular class. It also does not have conditions for setting the class. Set appropriate test conditions for your EUT.

## Unbalance

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Reference	Select the phase that will be used as the reference for setting U <sub>a</sub> , U <sub>b</sub> , U <sub>c</sub> , and Phase angles. Select Reference first because it will affect the U <sub>a</sub> , U <sub>b</sub> , U <sub>c</sub> , and Phase angle settings.
U <sub>a</sub> [%]	Enter a ratio of a quantity to the rated voltage of the EUT. The positions where U <sub>a</sub> , U <sub>b</sub> , and U <sub>c</sub> are displayed vary depending on Reference setting. • Input range: 0.0 % to 150.0 %
U <sub>b</sub> [%]	
U <sub>c</sub> [%]	
Phase angle ab/bc/ca [°]	Enter the phase angle. The suffixes (phase pairs) that are displayed vary depending on Reference setting. ab: U <sub>a</sub> -U <sub>b</sub> phase angle bc: U <sub>b</sub> -U <sub>c</sub> phase angle ca: U <sub>c</sub> -U <sub>a</sub> phase angle • Input range: 0° to 359°
Phase angle ac /ba/cb [°]	Enter the phase angle. The suffixes (phase pairs) that are displayed vary depending on Reference setting. ac: U <sub>a</sub> -U <sub>c</sub> phase angle ba: U <sub>b</sub> -U <sub>a</sub> phase angle cb: U <sub>c</sub> -U <sub>b</sub> phase angle • Input range: 0° to 359°
Duration [s]	Enter the duration. • Input range: 1.000 s to 360000.000 s
Interval [s]	Enter the repetition interval of unbalance. In this period, each phase voltage is set to 100 %, the ab phase angle is set to 120°, and the ac phase angle is set to 240°. • Input range: 0.000 s to 360000.000 s
Repeat	Enter the number of repetitions of the Seq tab. • Input range: 1 repetition to 999 repetitions
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
UN [V]	Enter the rated voltage of the EUT. • Input range: 50.0 V to 305.0 V • You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.
Freq [Hz]	Enter the rated frequency of the EUT. • Input range: 50.00 Hz or 60.00 Hz
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. • Input range: 1 repetition to 9999 repetitions

## Test overview

---

The variation of power frequency immunity test tests the immunity of a device against variations of power frequencies.

### ■Electromagnetic class

QIS2 is not designed for a particular class. It also does not have conditions for setting the class. Set appropriate test conditions for your EUT.

### ■Three-phase operation

The test conditions are all set in relation to U-phase. Test signals change simultaneously in three-phases on the basis of U-phase.

## Variation of power frequency

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Frequency 1 (f1) [Hz]	Enter the power supply frequency of the EUT. • Input range: 45.00 Hz to 65.00 Hz
Frequency 1 (f1) duration [s]	Enter the duration of frequency 1 (f1). • Input range: 0.001 s to 360000.000 s
Transition time 1 (tp1) [s]	Enter the transition time. • Input range: 0.001 s to 360000.000 s
f1 + delta f [%]	Enter the frequency variation ratio. • Input range: -50.0 % to 50.0 %
Duration of f1 + delta f [s]	The same as the description given under "Frequency 1 (f1) duration [s]."
Transition time 2 (tp2) [s]	Enter the transition time (the recovery time). The input range is the same as the description given under "Transition time 1 (tp1) [s]."
Frequency 2 (f2) [Hz]	The same as the description given under "Frequency 1 (f1) [Hz]."
Frequency 2 (f2) duration [s]	The same as the description given under "Frequency 1 (f1) duration [s]."
Repeat	Enter the number of repetitions of the Seq tab. • Input range: 1 repetition to 999 repetitions
Trigger	Select the trigger signal output. Red marks (⬇) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview. The trigger signal is output at the specified time, regardless of the phase angle.
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
UT [V]	Enter the rated voltage of the EUT. • Input range: 50.0 V to 305.0 V • You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. • Input range: 1 repetition to 9999 repetitions

## Test overview

The DC voltage dips, short interruptions, and voltage variation immunity tests test the immunity of a device against sudden and gradual DC voltage drops.

You cannot select this test in three-phase operation.

See p. 18

For this test, we recommend that you set the PCR-LE/WE response to Medium (Normal speed). For details on the setting, see [Response Options](#).

## DC voltage dips and short interruptions

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	You can set the test conditions on the Seq tabs (Seq 1 to Seq 10).
Test item	Select DC voltage dips or DC short interruptions.
UT [V]	Enter the initial voltage (the recovery voltage is the same value). <ul style="list-style-type: none"> <li>• Input range: 50.0 V to 431.0 V</li> <li>• You have to select an appropriate voltage range. Use the toolbar or the Instruments menu to set the voltage range.</li> <li>• Check the Seq tabs' UT settings that will be used when the test is executed. If the UT settings are different on different Seq tabs, unintended voltage variations will occur depending on the Seq tabs that have been selected for execution.</li> </ul>
Level [%]	For the DC voltage dips test, enter the level that the voltage will be reduced to as a percentage of UT. For the DC short interruptions test, this is fixed to 0 % (you cannot enter the value). <ul style="list-style-type: none"> <li>• Input range: 0.0 % to 200.0 %</li> </ul>
Impedance	For the DC short interruptions test, enter the impedance condition. <ul style="list-style-type: none"> <li>• Input value: Select High (high impedance) or Low (low impedance).</li> <li>• If you select High, the reverse current from the EUT will be blocked. If you select Low, the in-rush current from the EUT will be absorbed.</li> </ul>
Duration [s]	Enter the DC voltage dip or DC short interruption duration. <ul style="list-style-type: none"> <li>• Input range: 0.001 s to 360000.000 s</li> </ul>
Interval [s]	Enter the interval between the time when the voltage returns to the recovery voltage (UT) and the time when the next voltage drop will occur. The last interval is the transition time to the next Seq tab. <ul style="list-style-type: none"> <li>• Input range: 0.001 s to 360000.000 s</li> </ul>
Repeat	Enter the number of repetitions of the Seq tab. <ul style="list-style-type: none"> <li>• Input range: 1 repetition to 999 repetitions</li> </ul>
Trigger	Select the trigger signal output. Red marks (▼) are displayed at the positions that you select with the check boxes. They are also displayed on the waveform preview.
Seq check boxes (Seq 1 to Seq 10)	Select the check boxes that correspond to the Seq tabs whose tests you want to execute. The tests are executed in order starting from Seq 1. Any Seq tabs that you do not select will be skipped.



Item	Description
Output Off	Select this check box to turn off the test signal when tests are finished. (This turns off the PCR-LE/WE output.)
Repeat all	Enter the number of repetitions of the entire sequence, which is made of the selected tabs from Seq 1 to Seq 10. • Input range: 1 repetition to 9999 repetitions

## DC power supply Voltage variations

Select or enter values that are within the selectable ranges for the values shown on the screen. If you enter a value, press Enter to confirm it.

Item	Description
Seq tab	The same as the description given under "DC voltage dips and short interruptions."
Test item	Select DC voltage variations.
UT [V]	The same as the description given under "DC voltage dips and short interruptions."
Level [%]	Enter the level that the voltage will be changed to as a percentage of UT. • Input range: 0.0 % to 200.0 %
Decreasing [s]	Enter the time for decreasing the initial voltage (UT) to the low voltage. • Input range: 0.001 s to 360000.000 s
Reduced [s]	Enter the duration of the low voltage. • Input range: 0.001 s to 360000.000 s
Increasing [s]	Enter the time for recovering the voltage from the low voltage to a value that is the same as the initial voltage (UT). • Input range: 0.001 s to 360000.000 s
Interval [s]	
Repeat	
Trigger	
Seq check boxes (Seq 1 to Seq 10)	The same as the description given under "DC voltage dips and short interruptions."
Output Off	
Freq [Hz]	
Repeat all	

# IEC61000-4-34

## Test overview

---

The voltage dips, short interruptions, and voltage variation immunity tests test the immunity of a device against sudden and gradual power supply voltage drops.

This standard is divided into two standards depending on the input current per phase. IEC61000-4-11 is the standard for currents of 16 A or less. IEC61000-4-34 is the standard for currents that exceed 16 A. QIS2 does not differentiate test conditions according to the input current per phase. One test result file is created for each standard.

---

**NOTE**

To protect the DIP Simulator elements, you cannot use the DIP Simulator during IEC61000-4-34 tests.

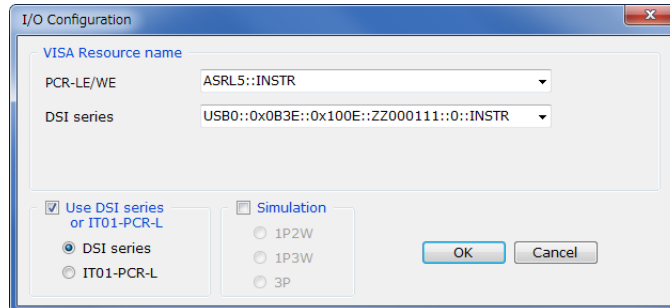
---

 p. 24

For details on the setup items of the [voltage dips](#), [short interruptions](#), and [voltage variation immunity](#) tests, see the corresponding items under [IEC61000-4-11](#).

# Configuring the Interface

You can configure the interface to the PCR-LE/WE and DIP Simulator using the I/O configuration dialog box. On the Instruments menu, click I/O configuration.



## ■ VISA Resource name

Select an ID from the list, and click OK.

For RS232, USB and LAN the string “ASRL”, “USB” or “TCPIP” is displayed together with the retrieved strings.

Example: USB0::0x0B3E::0x1015::12345678::INSTR

- The number after "GPIB" is the GPIB address.
- To use RS232 control, set the RS232 protocol on the AC power supply as follows.

Baudrate: 19200 bps, Data: 8bits, Stop: 1 bit, Flow Ctrl: OFF

### NOTE

- If you are using the LAN interface with KI-VISA and the PCR-LE/WE ID string does not appear in the list, perform the procedure below.  
On the Windows taskbar, click Start, Kikusui IO Software, Instrument Explorer, and KI-VISA IO Config. Select the LAN tab, and click Search Now.
- If the resource name displayed in the KI-VISA IO Config dialog box changes every time KI-VISA is started with the above procedure, this behavior may be resolved by performing the following procedure.  
Select Network and Sharing Center, Ethernet, Ethernet Status, and Properties, and clear the Internet Protocol Version 6 (TCP/IPv6).
- If the connection is already established, you cannot select the resource name. If you want to use another interface, reconnect and then restart QIS2.

## ■ Use the DSI series or IT01-PCR-L

Select DSI series.

### NOTE

- On the PCR-LE, you can also use the IT01-PCR-L Immunity Tester in place of the DSI1020. For details, contact your Kikusui agent or distributor.
- Kikusui does not guarantee proper operation when the PCR-WE and IT01-PCR-L are used in combination.

## ■ Simulation

If you select the Simulation check box, you can simulate the operation of QIS2 without connecting it to a PCR-LE/WE. You can select single-phase two-wire (1P2W), single-phase three-wire (1P3W) or three-phase (3P). In this manner, QIS2 can be used for demonstration.

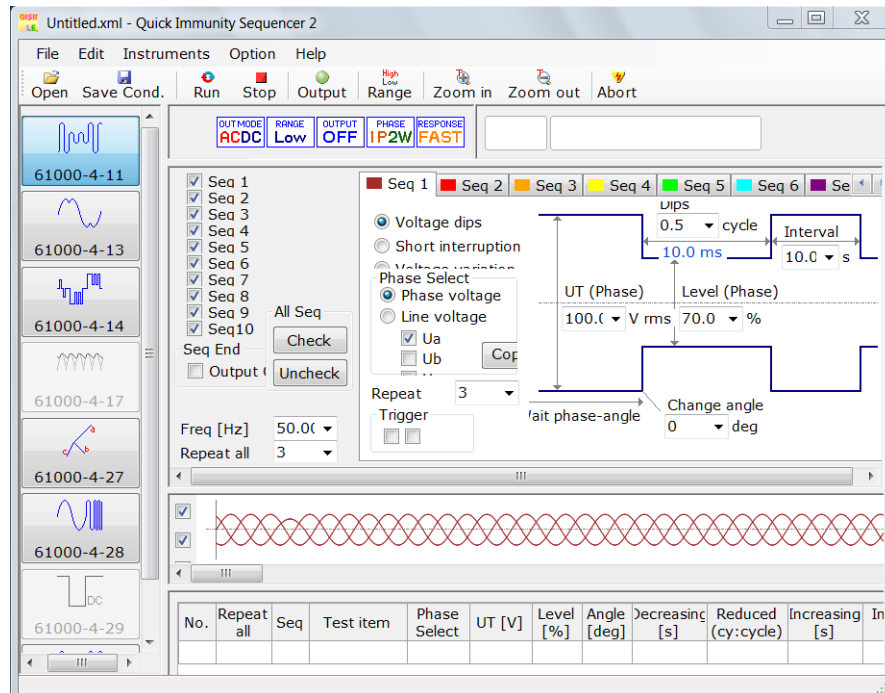
# Display Text Size

If the display's text size is set to a value greater than the Windows default value, the text in the QIS2 window may not fit properly, as shown in the figure below.

If this happens, set the text size to its default value.

Default value

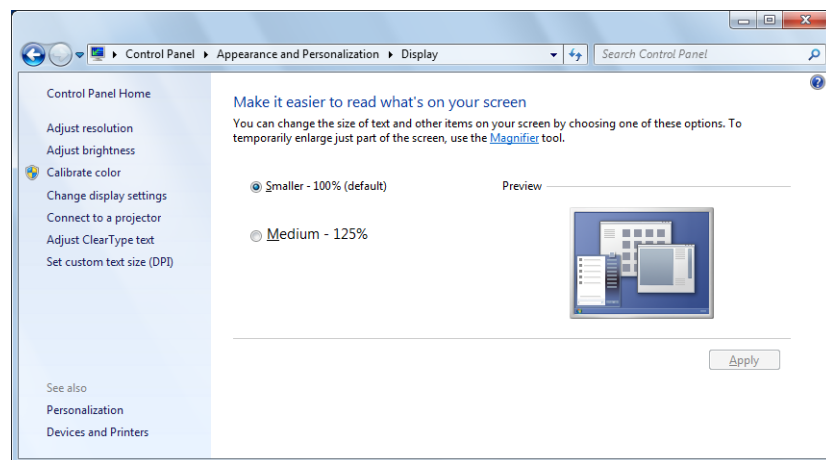
- Windows 7: Smaller - 100% (default)
- Windows 10: 100% (Recommended)



## Changing the Display Text Size

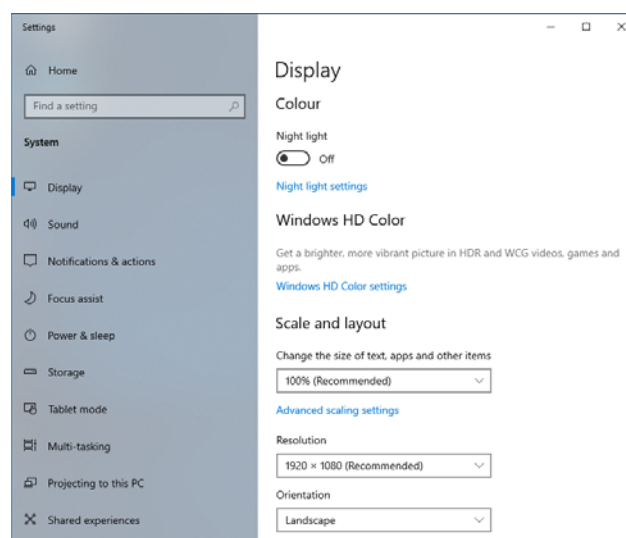
### Windows 7

- 1 Right-click the desktop, and click Personalize.
- 2 Click Display, which is located in the lower left of the Personalization window.
- 3 Click Smaller - 100% (default).
- 4 Click Apply.



### Windows 10

- 1 Right-click the desktop, and then click Display settings.
- 2 On the display screen, select 100% (Recommended) from the "Change the size of text, apps and other items" drop-down list.



# List of Error Messages

Message	Cause	Remedy
As an interface error has occurred at <PCR-LE/WE>, Quick Immunity Sequencer 2 is closed. Turn off the power switch of the <PCR-LE/WE>.	<ul style="list-style-type: none"> <li>The PCR-LE/WE power turned off while QIS2 was running.</li> <li>The communication cable disconnected while QIS2 was running.</li> </ul>	Check the PCR-LE/WE power supply and communication cable.
As an interface error has occurred at <DIP simulator>, Quick immunity Sequencer 2 is closed. Turn off the power switch of the <PCR-LE/WE> and <DIP simulator>.	<ul style="list-style-type: none"> <li>The DIP simulator power turned off while QIS2 was running.</li> <li>The communication cable disconnected while QIS2 was running.</li> </ul>	Check the DIP simulator power supply and communication cable.
I/O connection of <PCR-LE/WE> is failed. Do you want to set up I/O Configuration?	<ul style="list-style-type: none"> <li>The PCR-LE/WE power was off when QIS2 started.</li> <li>The communication cable was not connected when QIS2 started.</li> </ul>	Check the PCR-LE/WE power supply and communication cable.
I/O connection of <DIP simulator> is failed. Do you want to set up I/O Configuration?	<ul style="list-style-type: none"> <li>The DIP simulator power was off when QIS2 started.</li> <li>The communication cable was not connected when QIS2 started.</li> <li>The DIP switch on the rear panel of the DIP simulator was not set properly when QIS2 started.</li> </ul>	Check the DIP simulator power supply, communication cable, and DIP switch settings.
Signal cable error occurred at <DIP simulator>. Do you close Quick Immunity Sequencer 2?	The phase signal cable between the PCR-LE/WE and DIP simulator is disconnected.	Check the signal cable.
In the simulation mode, QIS2 cannot perform access to PCR-LE/WE.	Simulation is selected in the I/O Configuration dialog box. This setting is used to simulate the QIS2 operation without connecting to the PCR-LE/WE.	Refer to " <a href="#">Configuring the Interface</a> ," and clear the Simulation check box.
An OHP error occurred on the <DIP simulator>. The PCR-LE/WE output was turned off.	The dip simulator's overheat protection was activated.	Wait for the dip simulator to cool down, and resume the test.
An error occurred on the <DIP simulator>.	A dip simulator malfunction.	Stop using it immediately, and have it repaired.
Failed to load the file "<file name>"	When QIS2 starts, the test condition file that was in use when QIS2 was closed previously is loaded. The file may have been moved, deleted, or renamed.	Check the presence of the file. Or, create a new test condition file by selecting Save As from the File menu.

<PCR-LE/WE>: The PCR-LE/WE model in use will be displayed.

<DIP simulator>: The DIP simulator model in use will be displayed.

<File name>: The path and name of the file to be loaded is displayed.

# Menu Reference

Menu	Description
<b>File</b>	
New	Creates a new test conditions file with the default values and no file name (Untitled).
Open <sup>1</sup>	Selects the test conditions file that you want to open.
Save (Test Condition) <sup>1</sup>	Overwrites the open test conditions file with the present test conditions. The settings of all the standards are saved.
Save As (Test Condition)	Assigns a name to the conditions file and save it in the folder that you specify. The settings of all the standards are saved.
Test result file Options	Configures the test result file format by setting the separator, character code, and extension.
Save as (Test Result)	Assigns a name to the execution result file and save it in the folder that you specify.
Recently Test Conditions Files	Displays the most recently used test conditions files (up to eight files) on a sub menu. Click one of the displayed file names to open the file.
Exit	Exits QIS2.
<b>Edit</b>	
Copy of Seq tab	Copies all the items on the selected Seq tab to memory.
Paste of Seq tab	Pastes the items that you copied to memory with Copy of Seq tab in the selected tab. This command is unavailable when no items have been copied to memory.
Copy to Next Seq tab	Performs a function that is a combination of the Copy of Seq tab and Paste of Seq tab functions. All the items on the selected Seq tab are copied to memory and pasted in the next tab.
Default data for Class1	Test levels 1 to 8 are displayed on a sub menu. Classes and test levels that are not applicable are unavailable. Click the displayed test levels to set the values of the selected standard to the default values.
Default data for Class2	
Default data for Class3	
Zoom in <sup>1</sup>	Zooms horizontally the waveform that is displayed in the waveform preview.
Zoom Out <sup>1</sup>	Zooms horizontally out of the waveform that is displayed in the waveform preview.
<b>Instruments</b>	
Run <sup>1</sup>	Starts the test.
Stop <sup>1</sup>	Stops the test that is running. Note that this does not turn off the PCR-LE/WE's output.
Abort <sup>1</sup>	Aborts the test that is being executed and turn the PCR-LE/WE output off. <ul style="list-style-type: none"> <li>In an emergency, turn the PCR-LE/WE's POWER switch off.</li> </ul>
Output <sup>1</sup>	Turns on the PCR-LE/WE output. Tests can be started with the output turned on. When the output is off, click Output to turn the output on.
Voltage Range <sup>1,2</sup>	The PCR-LE/WE voltage ranges are displayed on a sub menu. Select one of these ranges. A check mark appears to the left of this value when it is selected. <ul style="list-style-type: none"> <li>Low (100 V range)</li> <li>High (200 V range)</li> </ul>
Output mode <sup>2</sup>	The PCR-LE output modes are displayed on a sub menu. Select one of these modes. A check mark appears to the left of this value when it is selected. <ul style="list-style-type: none"> <li>AC mode</li> <li>DC mode</li> <li>AC +DC mode</li> </ul> There is no mode selection on the PCR-WE. AC+DC mode will be selected.

Menu	Description
Wiring Method	Select the wiring method of the PCR-LE2 or PCR-WE2 series. A check mark appears to the left of this value when it is selected. <ul style="list-style-type: none"> <li>• 1P2W</li> <li>• 1P3W</li> <li>• 3P</li> </ul>
Alarm clear	Clears the detected alarm. Before you clear the alarm, remove all the causes of the alarm.
Setting Limits	Sets the voltage limits, current limits and protection functions (OVP and UVP.)
I/O Configuration <sup>3</sup>	Configures the settings for communicating with devices such as the PCR-LE/WE. This displays the I/O Configuration dialog box.
Options	
Factory default	Clears the history of the combo boxes and reset them to their default values.
Color	Changes the preview waveform color, background color, wave progress bar color and line width.
Display options	Sets whether confirmation messages and waveform progress will be displayed.
Response options	Selects the response speed of the PCR-LE/WE's internal amplifier.
Help	
Contents (J)	Displays the Japanese QIS2 operation guide.
Contents (E)	Displays the English QIS2 operation guide.
User's manual (J)	Displays the PDF of the Japanese QIS2 operation guide.
User's manual (E)	Displays the PDF of the English QIS2 operation guide.
About Quick Immunity Sequencer 2	Displays the QIS2 version information.

- 1 A button that performs the same function is available on the toolbar.
- 2 This can only be selected when the PCR-LE/WE output is off.
- 3 When Use DSI series or IT01-PCR-L is selected, you cannot perform the IEC61000-4-11 voltage variation test. In this situation, you can only select the voltage dips and short interruptions options.





If you find any misplaced or missing pages in the manuals, they will be replaced. If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact your Kikusui agent or distributor. At that time, inform your agent or distributor of the "Part No." written on the front cover of this manual.

Every effort has been made to ensure the accuracy of this manual. However, if you have any questions or find any errors or omissions, please contact your Kikusui agent or distributor.

After you have finished reading this manual, store it so that you can use it for reference at any time.

## **KIKUSUI ELECTRONICS CORP.**

---

1-1-3 Higashiyamata, Tsuzuki-ku, Yokohama,  
224-0023, Japan

Phone: +81-45-482-6353

Facsimile: +81-45-482-6261

**[www.kikusui.co.jp/en/](http://www.kikusui.co.jp/en/)**

