User's
Manual

Harmonic/Flicker Software

Yokogawa Test & Measurement Corporation

IM IS8000-63EN
1st Edition

This manual explains the features, operating procedures, and handling precautions of the Harmonic/Flicker Software (IS8011 or IS8012). To ensure correct use, please read this manual thoroughly before operation.

The Harmonic/Flicker Software consists of the following software applications.

- IEC 61000-3-2 Harmonic Measurement Software
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-12 Harmonic Measurement Software

You can start the IEC launcher of this software from the launcher or start screen of the IS8000 Integrated Software (hereafter referred to as the IS8000 Software) and select the above software applications.

* For details on how to install and activate the software, see the *Installation Manual* (IM IS8000-04EN).

After reading this manual, keep it in a safe place. The IS8000 Software, which is necessary to start this software, comes with the manuals listed on the next page. Please read all manuals.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functionality. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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1st Edition: March 2021 (YMI)

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Revisions

- 1st Edition: March 2021

Manuals

The following manuals, including the manual for this software (this manual), are provided for the IS8000 Software.

PDF Data of Manuals

The downloaded software contains the following English and Japanese manuals. For details on downloading, see page iv and section 1.2 in the *Installation Manual* (IM IS8000-04EN).

Manual Title	Manual No.	Description
IS8000 Integrated Software User's Manual	IM IS8000-01EN	Explains the features of the IS8000 Software and how to configure and operate it.
IS8000 Integrated Software Installation Manual	IM IS8000-04EN	Explains how to install and activate the IS8000 Software, which includes this software.
IS8000 Integrated Software High-speed Camera Synchronization Feature (FS1 option) User's Manual	IM IS8000-61EN	Explains the features of the IS8000 Software's High-speed Camera Synchronization Option and how to use it.
IS8000 Integrated Software ECU Monitor Synchronization Feature (EM1 option) User's Manual	IM IS8000-62EN	Explains the features of the IS8000 Software's ECU Monitor Synchronization Option and how to use it.
Harmonic/Flicker Software User's Manual	IM IS8000-63EN	This document. Explains the features of the Harmonic/Flicker Software (a dedicated application that you can start from the IS8000 Software) and how to use it.

The "-EN" in the manual number is the language code.

Viewing the Manuals from the Help Menu

The manual of this software (this manual) is incorporated in the software as a help file. For instructions on how to use the help feature, see section 13.3.

* The IS8000 Software manuals other than this manual are incorporated in the IS8000 Software as help files. For instructions on how to use the help feature, see the *User's Manual* (IM IS8000-01EN).

Notes on Usage

Notes on Using the Software

- To communicate with a PC through the USB interface of a measuring instrument (WT), you need to install a USB driver in the PC.
  You can download the USB driver from the following web page:
    https://tmi.yokogawa.com/jp/library/
- Only one WT can be controlled by this software. Also, it is not possible to connect to the same WT from multiple PCs at the same time.
- When you connect a measuring instrument to a PC and use the software to control the WT, you cannot use multiple types of communication interface at the same time.
- Do not perform the following operations while using the software. Doing so may cause errors.
  - Using another software application to operate the measuring instrument
  - Operation on the measuring instrument itself
- The software may not be able to continue if the PC enters standby or hibernation mode. Disable standby and hibernation modes when you use the software.
- If a connection error occurs, turn off the measuring instrument and then turn it back on.

How to Use This Manual

Structure of the Manual

This manual contains 14 chapters and an index.

Chapter	Title	Description
1	**Product Overview**	
		Explains the software's features and the details of its applicable standards.
2	**Preparation before Use**	
		Explains how to connect the WT to a PC.
3	**Starting the Software**	
		Explains how to start the software and describes the main window.
4	**Using the Start and Exit Pages**	
		Explains how to select a test menu and how to close the software.
5	**Using the Open Page to Load Setting Information and Measured Data**	
		Explains how to load setting information and measured data.
6	**Using the Connection Page to Establish a Connection between the PC and a WT**	
		Explains how to configure the settings for WT-PC communication.
7	**IEC 61000-3-2 Harmonic Measurement**	
		Explains the configuration, measurement, and analysis features of the IEC 61000-3-2 Harmonic Measurement Software.
		Using the Setting Page to Configure Measurement and Judgment Conditions
		Explains how to set general test conditions.
		Using the Measure Page to Make Measurements
		Explains how to execute a compliance test.
		Using the Analysis Page to Display Judgment Results and Measured Data
		Explains how to display judgment results and measured data.
8	**IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement**	
		Explains the configuration, measurement, and analysis features of the IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software with the same structure as in chapter 7.
9	**IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement**	
		Explains the configuration, measurement, and analysis features of the IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software with the same structure as in chapter 7.
10	**IEC 61000-3-12 Harmonic Measurement**	
		Explains the configuration, measurement, and analysis features of the IEC 61000-3-12 Harmonic Measurement Software with the same structure as in chapter 7.
11	**Using the Print Page to Print Reports**	
		Explains how to print a report.
12	**Using the Save Page to Save Setting Information and Measured Data**	
		Explains how to save setting information and measured data.
13	**Maintenance (Troubleshooting)**	
		Explains various error messages, how to use the help function, and how to display the software's version information.
14	**Specifications**	Lists the specifications of the software.
	Index	

Software Versions That This Manual Applies To

This manual covers versions 1.01 or later of the following software applications. If you are using an older version, some of the features described in this manual will not be available.

- IEC 61000-3-2 Harmonic Measurement Software
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-12 Harmonic Measurement Software

The version of each software is displayed in the upper right of this software's window. For details, see sections 3.2 and 13.4.

For the system environment required for operation, see section 1.2.

Conventions Used in This Manual

Prefixes k and K

This manual distinguishes prefixes k and K used before units as follows:

k: Denotes 1000.	Example: 100 kS/s (sample rate)
K: Denotes 1024.	Example: 720 KB (file size)

Displayed Characters

Bold alphanumeric characters in procedural explanations indicate characters that appear in the menus on the screen.

Notes

The notes in this manual are indicated with the following symbols.

Note Calls attention to information that is important for the proper operation of the software.

Contents

Chapter 7 IEC 61000-3-2 Harmonic Measurement

Chapter 8 IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Chapter 9 IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Chapter 10 IEC 61000-3-12 Harmonic Measurement

Chapter 11 Using the Print Page to Print Reports

Chapter 12 Using the Save Page to Save Setting Information and Measured Data

Chapter 13 Maintenance (Troubleshooting)

Chapter 14 Specifications

Index

Chapter 1

Product Overview

1.1 Explanation of Functions

The Harmonic/Flicker Software can measure the harmonic and voltage fluctuations and flickers produced by electrical equipment according to IEC standards (for an overview, see section 1.3) and display and save the judgment results. In addition, if the system includes a NF Corporation's power supply (hereinafter referred to as the NF power supply), the NF power supply can be controlled.

Compatible Instruments

Measurement Equipment

This software can be used with YOKOGAWA's WT5000 Precision Power Analyzers.
For the handling precautions, features, and operating procedures of the WT5000, see the WT5000 User's Manual.

Power Supply and Reference Impedance Network (RIN)

This software can be used with the following products made by NF Corporation.

ES series

Power Supply	Reference Impedance Network (RIN)
ES2000S	ES4152
ES2000U	ES4153

DP series

- **Power Supply**

DP □□□ □ (E)[3]
1 2

1 Output capacity: 015 (1.5 kVA) to 480 (48 kVA)
2 Output formats: S/SL: single-phase, D: single-phase three-wire, T: three-phase, M: multi-phase
3 If you specify CEE7 (outlet for Europe), an "E" is appended to the model (except for DP240/DP360S/D420LS/DP480LS).

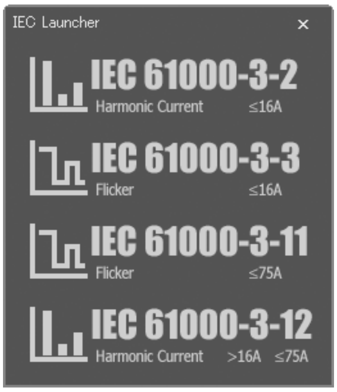
- **Reference Impedance Network (RIN)**

Model	Capacity	Wiring
DP4162	20 A	Single-phase two-wire
DP4163	20 A	Single-phase two-wire, single-phase three-wire, three-phase three-wire, three-phase four-wire
DP4164	30 A	Single-phase two-wire, single-phase three-wire
DP4165	30 A	Single-phase two-wire, single-phase three-wire, three-phase three-wire, three-phase four-wire
DP4166	50 A	Single-phase two-wire, single-phase three-wire
DP4167	50 A	Single-phase two-wire, single-phase three-wire, three-phase three-wire, three-phase four-wire
DP4168	75 A	Single-phase two-wire, single-phase three-wire
DP4169	75 A	Single-phase two-wire, single-phase three-wire, three-phase three-wire, three-phase four-wire

DP4164 to DP4169 are displayed on the software as follows:
- Single-phase: DP4162
- Three-phase: DP4163

Applicable Standards

For the applicable standards, see section 1.4.



Using the IEC launcher (figure on the right), you can choose the following software applications according to the standard.

- IEC 61000-3-2 Harmonic Measurement Software
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software
- IEC 61000-3-12 Harmonic Measurement Software

Setting Up Test Menus

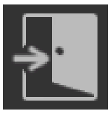
You can arrange the following steps as you like to create custom test menus.

Start	Select and edit test menus.
Open	Load measured data and WT and power supply setting information files.
Connection	Configure the connection between the PC and a WT and between the PC and power supply.
Setting	Set compatibility and measurement conditions. If you connect the power supply, set the voltage, frequency, and so on of the power supply.
Measure	Execute a measurement. If you connect a power supply, • You can turn the power output on and off. • When the power supply output is turned on, this function checks the voltage, frequency, total harmonic distortion of the voltage, and so on. (Power supply quality check function)
Analysis	Display measured results as bar and trend graphs.
Print	Print screen images and reports.
Save	Save measured data and the setting information of the WT and power supply.
Exit	Close the software. When you close the software, the power output is turned off, regardless of whether the connected power output is on or off.

You can start this software and then operate it according to the order of one of the test menus. By designing appropriate menus, you can make the testing process smoother. You can also avoid forgetting and skipping steps when you have to repeat the same process over and over again.

Here are more details about each step:

Start



Use to select and edit test menus. There are five preset standard test menus available for IEC 61000-3-2 and four preset standard test menus available for IEC 61000-3-3, IEC 61000-3-11, and IEC 61000-3-12. In addition, you can make custom test menus (located under the “User Setting” option button).

Open

Loading Setting Information

You can load setting information files that contain information such as measurement conditions,* judgment conditions, and report titles and comments (reports contain summaries of judgment results of measured data values) that you set with the software.

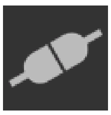
* If you connect a power supply, the measurement conditions will also include setting information of the power supply.

Loading Measured Data

You can load measured data* and setting information from a file.

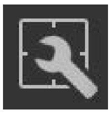
* Numeric data: Can be loaded for harmonic measurements and flicker measurements.
Waveform data: Can be loaded for harmonic measurements.
CPF graph: Can be loaded only for normal voltage fluctuation and flicker measurement.

Connection



Use to connect the PC on which this software is installed to a WT through a USB, GP-IB, or Ethernet interface.

Setting



WT Measurement Conditions

Use to set WT measurement conditions such as the range to be measured and the line filter.

NF Power Supply Measurement Conditions

Use to set the output voltage, frequency, and other measurement conditions of the NF power supply.

IEC 61000-3-2 Harmonic Measurement

Standard and Measurement Settings

You can set judgment conditions according to the IEC 61000-3-2 or JIS C 61000-3-2 standard.

Setting the Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics is set in units of 1 s in advance. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Edition Settings for IEC 61000-3-2 or JIS C 61000-3-2

IEC 61000-3-2 defines harmonics. You can set the IEC or JIS edition from the following.

Edition number of the IEC 61000-3-2	Edition number of the JIS C 61000-3-2
Edition 3.0 Amd2	2011
Edition 4.0	2019
Edition 5.0	------

Edition Settings for IEC 61000-4-7 or JIS C 61000-4-7

IEC 61000-4-7 or JIS C 61000-4-7 defines requirements for measurement instruments. You can set the IEC or JIS edition from the following. This setting affects the window function (measurement period) of the WT.

Edition number of the IEC 61000-4-7	Edition number of the JIS C 61000-4-7	The WT Window Function (Measurement Period)	
		50 Hz	60 Hz
Edition 1.0	2007JA	16 cycles (320 ms)	16 cycles (267 ms)
Edition 2.0	2007	10 cycles (200 ms)	12 cycles (200 ms)
A1 of Edition 2.0	------	10 cycles (200 ms)	12 cycles (200 ms)

IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Standard and Measurement Settings

Use to set the IEC 61000-3-3 voltage fluctuation and flicker measurement standards to use for judgment.

Edition Settings for IEC 61000-3-3

IEC 61000-3-3 specifies voltage fluctuation and flicker. You can select the IEC edition from the following.

- Edition 2.0
- Edition 3.0
- Edition 3.0 Amd1

Note

This manual explains the case when the IEC61000-3-3 edition number is set to Ed. 3.0 Amd1. If you set the edition number to Ed. 2.0, read “Tmax” as “d(t)” in the following explanations.

Edition Settings for IEC 61000-4-15

IEC 61000-4-15 specifies requirements for measurement instruments. You can select the IEC edition from the following. This setting affects the WT's flicker measurement parameters.

Edition number of the IEC 61000-4-15	Flicker Measurement Parameters of the WT			
	50 Hz		60 Hz	
	230 V	120 V	120 V	230 V
Edition 1.1	Y	—	Y	—
Edition 2.0	Y	Y	Y	Y

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Standard and Measurement Settings

Use to set the IEC 61000-3-11 voltage fluctuation and flicker measurement standards to use for judgment.

Edition Settings for IEC 61000-3-11

IEC 61000-3-11 defines voltage fluctuation and flicker. You can select the IEC edition from the following.

- Edition 1.0
- Edition 2.0

Note

This manual explains the case when the IEC61000-3-11 edition number is set to Ed. 2.0. If you set the edition number to Ed. 1.0, read “Tmax” as “d(t)” in the following explanations.

Edition Settings for IEC 61000-4-15

IEC 61000-4-15 specifies requirements for measurement instruments. You can select the IEC edition from the following. This setting affects the flicker measurement parameters of the WT.

Edition number of the IEC 61000-4-15	Flicker Measurement Parameters of the WT			
	50 Hz		60 Hz	
	230 V	120 V	120 V	230 V
Edition 1.1	Y	—	Y	—
Edition 2.0	Y	Y	Y	Y

IEC 61000-3-12 Harmonic Measurement

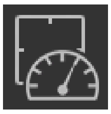
Standard and Measurement Settings

You can set judgment conditions according to the IEC 61000-3-12 standard.

Setting the Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics is set in units of 1 s in advance. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time. For other details, see Chapter 14.

Measure

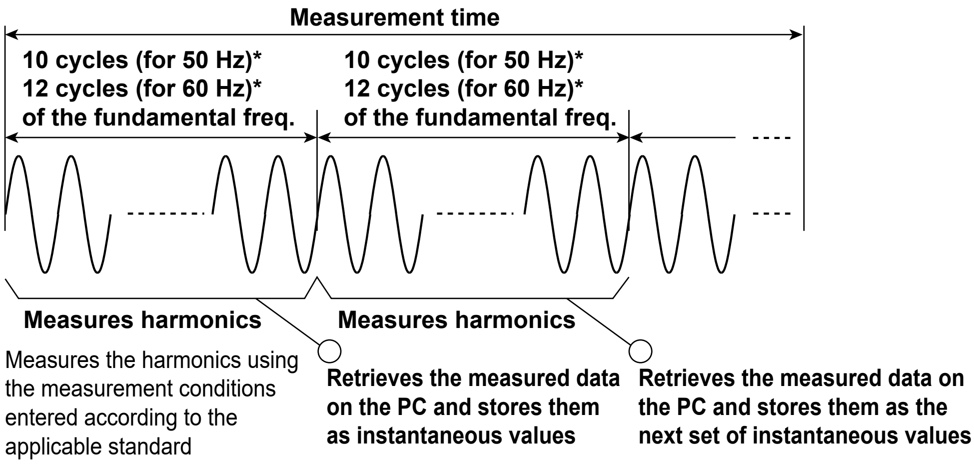


IEC 61000-3-2 Harmonic Measurement

There are two measurement modes that you can select from the Measure submenu: Compliance test and Test preview. The software acquires different types of data and performs different operations for each measurement mode.

Compliance Test

- **When in Online Mode**
  Measurement and evaluation of harmonics conforming to IEC 61000-3-2 or JIS can be made while making harmonic measurements on the WT.



  One set of harmonic measurement data (handled as instantaneous values by the software) consists of harmonic data measured every 200 ms (10 cycles for 50 Hz and 12 cycles for 60 Hz)*. The instantaneous values, the mean value, and the maximum value of the measured data retrieved within the measurement time (see next page) can be evaluated to determine whether they are within the limits of the standard.

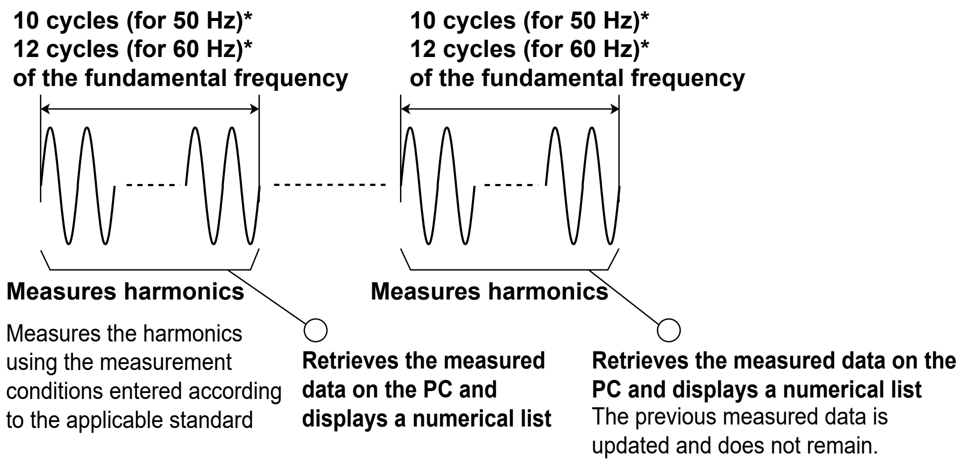
  * When the IEC 61000-4-7 edition is set to 2.0 or 2.0 A1. When the IEC 61000-4-7 edition is set to 1.0, the number of cycles is 16 (320 ms at 50 Hz or 267 ms at 60 Hz).

- **When in Offline Mode**
  Evaluation can be made on the loaded measurement data according to the method complying with IEC 61000-3-2 or JIS.

Test Preview

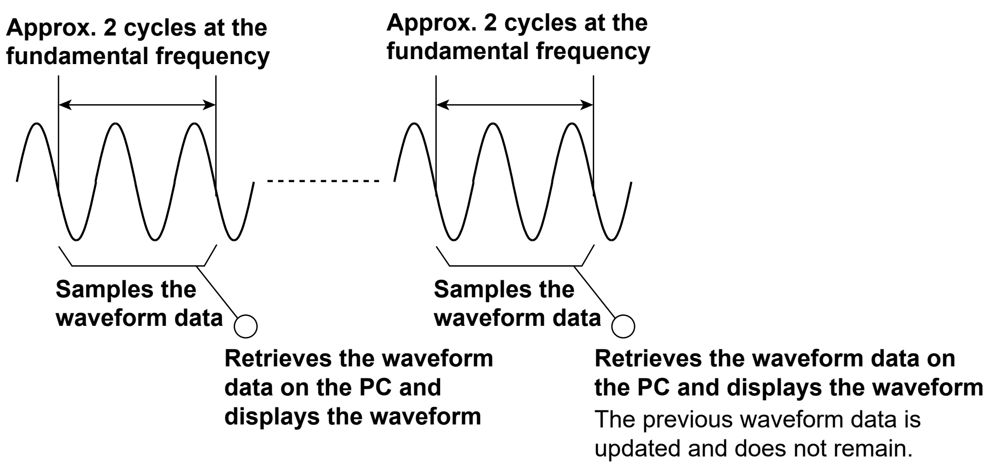
You can only select Test preview in online mode. As the WT measures the harmonic current, you can observe the harmonic fluctuations as they appear on a list of measured values. You can also observe the measured waveform. Unlike the compliance test, the harmonic preview is only for observing the state of a harmonic current. It does not determine whether or not a device conforms to certain standards. New data replaces old data. The software only retains the most recently acquired values.

- **Numeric Preview, List Preview, Bar Preview**



* When the IEC 61000-4-7 edition is set to 2.0 or 2.0 A1. When the IEC 61000-4-7 edition is set to 1.0, the number of cycles is 16 (320 ms at 50 Hz or 267 ms at 60 Hz).

- **Waveform Preview**



Starting/Stopping Measurements

Harmonic measurement on the WT can be started from your PC when in online mode. The measurement cannot be started when in offline mode.

- **Compliance Test**

  After you start WT harmonic current analysis from your PC, the PC will acquire and save the values that the WT measures. All of the data that is acquired during the specified measurement time is saved. After the specified measurement time is reached, the PC will automatically end measurement and data acquisition. You can also stop acquiring data from the PC before the measurement time is reached.

- **Test Preview**
  After you start a WT harmonic current analysis from your PC, the PC will acquire the values that the WT measures. New data replaces old data. The software only retains the most recently acquired data. Unlike the compliance test, the test preview is only for observing the state of a harmonic current. It do not determine whether or not a device conforms to certain standards.

IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Measurement Modes

There are two voltage and flicker measurement modes.

- **Normal Voltage Fluctuation and Flicker Measurement**
  In this mode, the software calculates all voltage and flicker values: dc, dmax, Tmax, Pst, and Plt. It makes an overall judgment by comparing the calculated values with the set limits.
- **Measurement of dmax Caused by Manual Switching**
  The software measures the maximum relative voltage change, dmax, when the EUT (equipment under test) is turned ON and OFF manually. After the EUT has been turned ON and OFF 24 times, the software makes a judgment by comparing the average dmax with the set limit.

Measurement Items

- Rated voltage Un
- Voltage frequency Freq
- Relative steady-state voltage change dc
- Maximum relative voltage change dmax
- Period during which relative voltage change exceeds the threshold level Tmax
- Short-term flicker value Pst
- Long-term flicker value Plt
- Instantaneous flicker sensation IFS*
- Cumulative probability function CPF

  * Displayed as PF on the trend graph

Starting/Stopping Measurements

You can start the voltage fluctuation and flicker measurement on the WT from your PC when in online mode. The measurement cannot be started when in offline mode.

During Normal Voltage Fluctuation and Flicker Measurement

If the measurement is started from your PC, the measured data of the normal voltage fluctuation and flicker measurement on the WT is retrieved and stored in your PC. When the measurement of an observation period is completed, the judgment result is displayed, and the measurement of the next observation period is started. When the specified count of measurements is completed, the measurement and data retrieval automatically stops. Then, the application displays the overall judgment result from the data measured during all observation periods and judgment results. You can also abort the measurement from the PC before the specified measurement count is reached.

During the Measurement of dmax Caused by Manual Switching

With this measurement method, you start the measurement from your PC, manually turn ON the EUT (Equipment under Test) switch, and turn OFF the switch before the measurement of an observation period (1 minute) is complete. The data of dmax caused by manual switching that the WT measures is retrieved and stored in your PC. When the measurement of an observation period is complete, the application enters the ready state. If you start the measurement again from your PC, the measurement of the next observation period is started.
You can measure the selected observation period again if it is before the judgment. When 24 measurements are completed and you execute the judgment, the judgment result is displayed. You can also abort the measurement from the PC before the specified measurement count is reached. However, if you do, all the measured data and judgment results up to that point are discarded.

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Measurement Modes

There are two voltage and flicker measurement modes.

- **Normal Voltage Fluctuation and Flicker Measurement**
  In this mode, the software calculates all voltage and flicker values: dc, dmax, Tmax, Pst, and Plt. It makes an overall judgment by comparing the calculated values with the set limits.
- **Measurement of dmax Caused by Manual Switching**
  The software measures the maximum relative voltage change, dmax, when the EUT (equipment under test) is turned ON and OFF manually. After the EUT has been turned ON and OFF 24 times, the software makes a judgment by comparing the average dmax with the set limit.

Measurement Items

- Rated voltage Un
- Voltage frequency Freq
- Relative steady-state voltage change dc
- Maximum relative voltage change dmax
- Period during which relative voltage change exceeds the threshold level Tmax
- Short-term flicker value Pst
- Long-term flicker value Plt
- Instantaneous flicker sensation IFS*
- Cumulative probability function CPF

  * Displayed as PF on the trend graph

Starting/Stopping Measurements

You can start the voltage fluctuation and flicker measurement on the WT from your PC when in online mode. The measurement cannot be started when in offline mode.

During Normal Voltage Fluctuation and Flicker Measurement

If the measurement is started from your PC, the measured data of the normal voltage fluctuation and flicker measurement on the WT is retrieved and stored in your PC. When the measurement of an observation period is completed, the judgment result is displayed, and the measurement of the next observation period is started. When the specified count of measurements is completed, the measurement and data retrieval automatically stops. Then, the application displays the overall judgment result from the data measured during all observation periods and judgment results. You can also abort the measurement from the PC before the specified measurement count is reached.

During the Measurement of dmax Caused by Manual Switching

With this measurement method, you start the measurement from your PC, manually turn ON the EUT (Equipment under Test) switch, and turn OFF the switch before the measurement of an observation period (1 minute) is complete. The data of dmax caused by manual switching that the WT measures is retrieved and stored in your PC. When the measurement of an observation period is complete, the application enters the ready state. If you start the measurement again from your PC, the measurement of the next observation period is started.
You can measure the selected observation period again if it is before the judgment. When 24 measurements are completed and you execute the judgment, the judgment result is displayed. You can also abort the measurement from the PC before the specified measurement count is reached. However, if you do, all the measured data and judgment results up to that point are discarded.

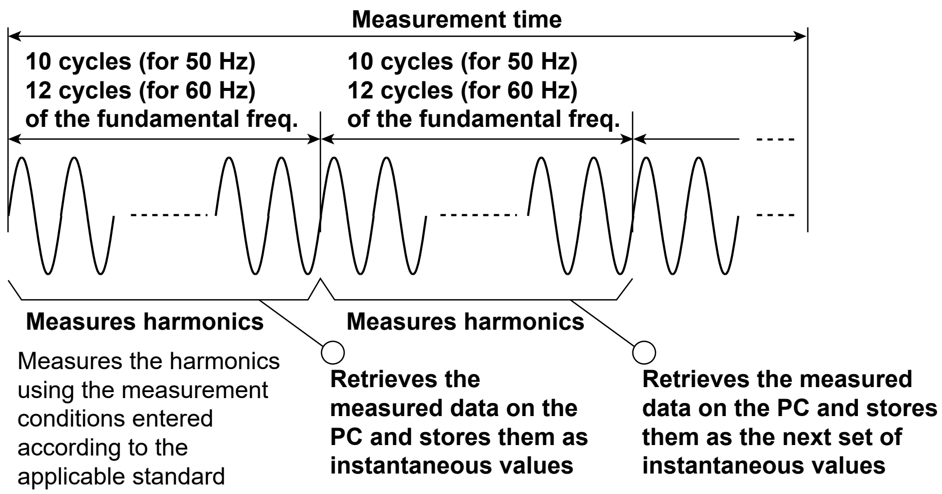
IEC 61000-3-12 Harmonic Measurement

There are two measurement modes that you can select from the Measure submenu: Compliance test and Test preview. The software acquires different types of data and performs different operations for each measurement mode.

Compliance Test

- **When in Online Mode**

  Measurement and evaluation of harmonics conforming to “IEC 61000-3-12” can be made while making harmonic measurements on the WT.



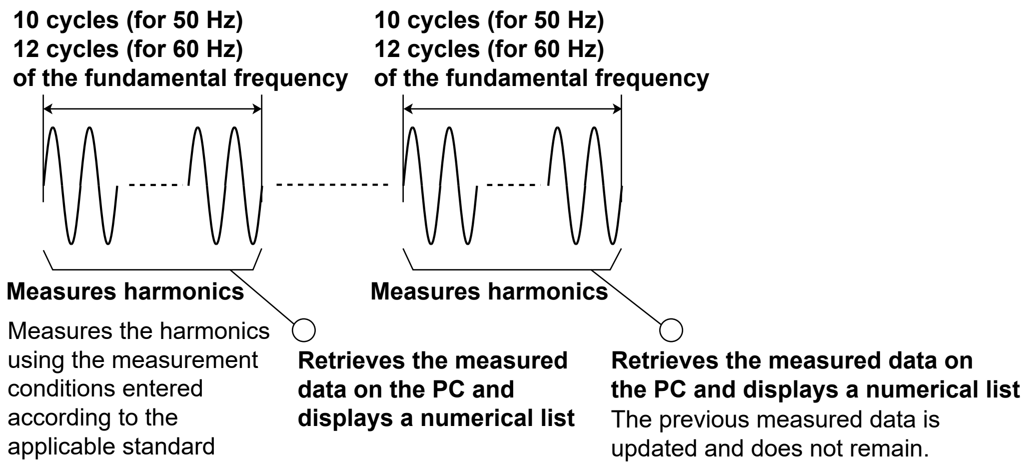
For IEC 61000-4-7 Edition 2.0 or Edition 2.0 A1, one set of harmonic measurement data (handled as instantaneous values by the software) consists of harmonic data measured every 200 ms (10 cycles for 50 Hz and 12 cycles for 60 Hz). The instantaneous values, the mean value, and the maximum value of the measured data retrieved within the measurement time (see next page) can be evaluated to determine whether they are within the limits of the standard.

- **When in Offline Mode**
  Evaluation can be made on the loaded measurement data according to the method complying with IEC 61000-3-12.

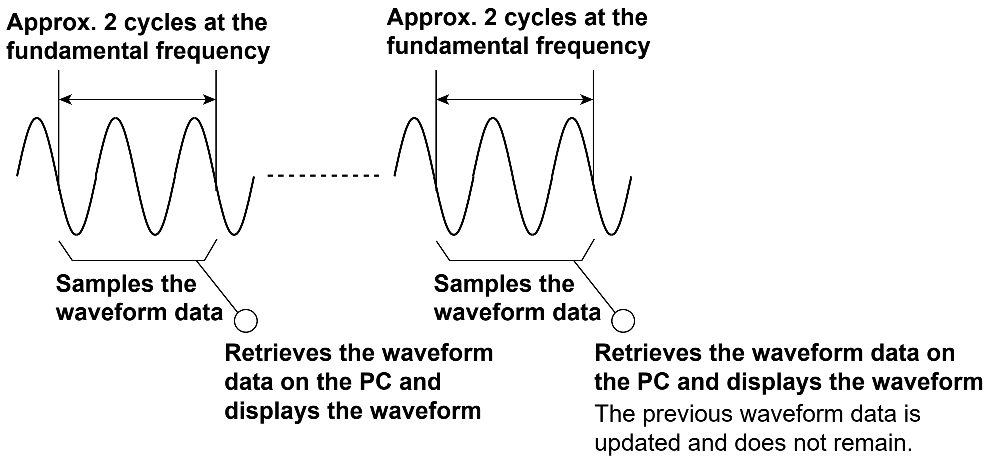
Test Preview

You can only select Test preview in online mode. As the WT measures the harmonic current, you can observe the harmonic fluctuations as they appear on a list of measured values. You can also observe the measured waveform. Unlike the compliance test, the harmonic preview is only for observing the state of a harmonic current. It does not determine whether or not a device conforms to certain standards. New data replaces old data. The software only retains the most recently acquired values.

- **Harmonic Preview**



- **Waveform Preview**



Starting/Stopping Measurements

Harmonic measurement on the WT can be started from your PC when in online mode. The measurement cannot be started when in offline mode.

- **Compliance Test**

  After you start WT harmonic current analysis from your PC, the PC will acquire and save the values that the WT measures. All of the data that is acquired during the specified measurement time is saved. After the specified measurement time is reached, the PC will automatically end measurement and data acquisition. You can also stop acquiring data from the PC before the measurement time is reached.

- **Test Preview**

  After you start a WT harmonic current analysis from your PC, the PC will acquire the values that the WT measures. New data replaces old data. The software only retains the most recently acquired data. Unlike the compliance test, the test preview is only for observing the state of a harmonic current. It do not determine whether or not a device conforms to certain standards.

Power Supply Quality Check Function

When the power supply output is turned on, this function checks the output voltage, frequency, and other power supply parameters required by the standard.

Analysis

IEC 61000-3-2 Harmonic Measurement

The result of the evaluation as to whether the harmonic current data up to order 40 is within the limits of IEC or JIS and the corresponding measured data can be displayed.

Display of the Evaluation Result within the Entire Measurement Time

Evaluation can be made as to whether all of the harmonic current data in the measurement time are within the limits according to the settings specified in “Setting the Standard and Measurement Environment” (as described earlier), and the results can be displayed collectively.

List and Bar Graph Display of Harmonic Current

A list and bar graphs of the harmonic measurement data and the standard limits can be displayed for each harmonic. Moreover, the evaluation as to whether harmonic current data is within the limits can be displayed using different colors. The harmonic current data to be evaluated is the mean value, the maximum value, and instantaneous values (one set of harmonic measurement data) of the measured data within the measured time. Harmonic current and voltage can be displayed for each input element of the WT.

Bar Graph Display of Harmonic Voltage, Current, and Phase Angle

You can display the measured data for each harmonic in a bar graph. The software will display the instantaneous values of the measured data (instantaneous values are the values that are acquired at each measurement of the harmonic current).

List Display of Harmonic Voltage, Current, and Phase Angle

You can display the measured data for each harmonic in a list. The software will display the instantaneous values of the measured data (instantaneous values are the values that are acquired at each measurement of the harmonic current).

Trend Graph Display of Harmonic Measurements

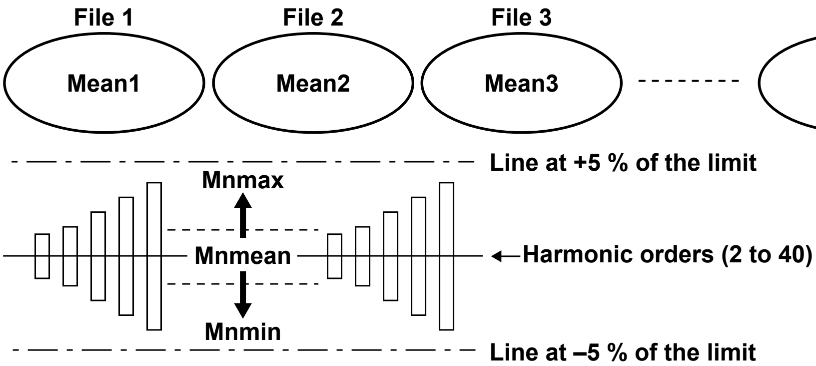
For each harmonic, you can use a trend graph to show how the harmonic measurement data fluctuates over time.

Waveform Display of Voltage and Current

You can display a waveform that is measured immediately after the measurement time finishes. The software will display approximately two waveform periods. You can click on an area to display a cursor and show the instantaneous values there.

Repeatability of Measured Data

The mean value in the harmonics measurement data saved to files can be compared, and the difference in the measured data can be displayed on a bar graph or numerical list for each harmonic. This function can be used to evaluate whether the difference between data measured under the same measurement conditions when harmonics are measured using the same product or same product model is within ±5 % of the limits (confirmation of repeatability).



- **Mnmean = (Mean1 + Mean2 + Mean3 + ... + MeanN)/N**
  (Mnmean: The value derived by summing the mean values of each file (Mean1, Mean2, Mean3, ... MeanN) and dividing by the number of summed values (N). The value can be determined for each harmonic.)

- **Mnmax = [Mean1, Mean2, Mean3, ..., MeanN]max**
  (Mnmax: The maximum value among the mean values of each file. The value can be determined for each harmonic.)

- **Mnmin = [Mean1, Mean2, Mean3, ..., MeanN]min**
  (Mnmin: The minimum value among the mean values of each file. The value can be determined for each harmonic.)

- **Judgment of the +5 % of the limit**

$$\frac{\text{Mnmax} - \text{Mnmean}}{\text{Limit}} \times 100 < 5 \quad [\%]$$

- **Judgment of the -5 % of the limit**

$$\frac{\text{Mnmin} - \text{Mnmean}}{\text{Limit}} \times 100 > -5 \quad [\%]$$

Display of Simple Test Judgment Results

Judgment can be made as to whether the measured data of the simple test is within limits, and the results of the judgment can be displayed collectively.

IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Numeric Data and Judgment

The application can display the judgment result indicating whether the measured data of normal voltage fluctuation and flicker measurement or measurement of dmax caused by manual switching is within the specified limits as well as the measured data. The judgment can be displayed for each of the selected WT elements.

Trend Graph View

The application can display the trend graph of the normal voltage fluctuation and flicker measurement. The following parameters can be displayed: dc, dmax, Tmax, idc, idmax, iTmax, and PF.

CPF Graph View

The application can display the CPF graph of the normal voltage fluctuation and flicker measurement.

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Numeric Data and Judgment

The application can display the judgment result indicating whether the measured data of normal voltage fluctuation and flicker measurement or measurement of dmax caused by manual switching is within the specified limits as well as the measured data. The judgment can be displayed for each of the selected WT elements.

Trend Graph View

The application can display the trend graph of the normal voltage fluctuation and flicker measurement. The following parameters can be displayed: dc, dmax, Tmax, idc, idmax, ITmax, and PF.

CPF Graph View

The application can display the CPF graph of the normal voltage fluctuation and flicker measurement.

IEC 61000-3-12 Harmonic Measurement

The result of the evaluation as to whether the harmonic current data up to order 40 is within the limits of IEC 61000-3-12 and the corresponding measured data can be displayed. Various displays below are possible only when in harmonic measurement mode.

Display of the Evaluation Result within the Entire Measurement Time

Evaluation can be made as to whether all of the harmonic current data in the measurement time are within the limits according to the settings specified in “Setting the Standard and Measurement Environment” (as described earlier), and the results can be displayed collectively.

List and Bar Graph Displays of Ih/Iref

The software displays the measured values of Ih/ Iref and the standard limits of those values for each harmonic order in both a list and a bar graph. You can use colors to indicate whether a value is under its limit or not. The software judges based on the average, maximum, and instantaneous values that are acquired in a period of measurement (instantaneous values are the values that are acquired at each measurement of the harmonic current).

List and Bar Graph Displays of Rsce

The software displays the measured values of Rsce for each harmonic and the limits set by the standard for those values in both a list and a bar graph. You can use colors to indicate whether a value is under its limit or not. The software judges based on the average and maximum values that are acquired in a period of measurement.

Bar Graph Display of Harmonic Voltage, Current, and Phase Angle

You can display the measured data for each harmonic in a bar graph. The software will display the instantaneous values of the measured data (instantaneous values are the values that are acquired at each measurement of the harmonic current).

List Display of Harmonic Voltage, Current, and Phase Angle

You can display the measured data for each harmonic in a list. The software will display the instantaneous values of the measured data (instantaneous values are the values that are acquired at each measurement of the harmonic current).

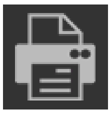
Trend Graph Display of Harmonic Measurements

For each harmonic, you can use a trend graph to show how the harmonic measurement data fluctuates over time.

Waveform Display of Voltage and Current

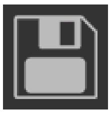
You can display a waveform that is measured immediately after the measurement time finishes. The software will display approximately two waveform periods. You can click on an area to display a cursor and show the instantaneous values there.

Print



To create reports, you can attach titles and comments to harmonic or voltage fluctuation and flicker measurement data lists and bar graphs and then save them to .pdf or .bmp files or print them.

Save



Saving Setting Information

You can save setting information—such as measurement conditions,* judgment conditions, and titles and comments of reports (reports contain a summary of the judgment results of measured data values)—that you set with the software to an .ini file.

* If you connect a power supply, the measurement conditions will also include setting information of the power supply.

Saving Measured Data

You can save measured data* that the PC has acquired from a WT to an .fdt file. When you save a measured data file, an .ini setting information file is also saved.

* Numeric data: Can be saved for harmonic measurements and flicker measurements.
Waveform data: Can be saved for harmonic measurements.
CPF graph: Can be saved only for normal voltage fluctuation and flicker measurement.

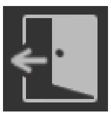
Saving a Report in CSV Format

You can use this software to save the various data* that the PC has acquired from the WT to a CSV file.

* Numeric data: Can be saved for harmonic measurements.
Waveform data: Can be saved for harmonic measurements.
Report data: Can be saved only for normal voltage fluctuation and flicker measurement.

This software cannot load CSV files, but you can use another software application on the PC to load and view the CSV files that you save.

Exit



Use to close the software.

Online Mode and Offline Mode

Online Mode

The software is in online mode when the PC is connected to the WT through a USB, GP-IB, or Ethernet interface. The software must be in online mode to acquire harmonic or voltage fluctuation and flicker data from the WT as it is measuring. You can switch to online mode from the Connection page. In online mode, you can change the WT settings from the PC.

Offline Mode

You can load previously saved measurement data into the software. You can change the settings and reanalyze the loaded data, and you can display a variety of values and graphs.

1.2 System Requirements

PC

CPU
Intel Core i5-2430M or better

Memory
4 GB or more recommended

Storage
10 GB free space or more

Operating System
English version of Windows 10

Communication Interface

Between the Measuring Instrument and PC

USB
A USB port that supports USB Revision 1.1 or higher

Ethernet
An Ethernet port that supports 10BASE-T, 100BASE-TX, or 1000BASE-T

GP-IB
- Driver NI-488.2 Version 15.5.0 and later
- NI (National Instruments)
  PCI-GPIB
  PCI-GPIB+
  PCIe-GPIB
  PCIe-GPIB+
  GPIB-USB-HS
  GPIB-USB-HS+

Between the NF Power Supply and PC

GP-IB
► See “GP-IB” under “Between the Measuring Instrument and PC.”

Display and Mouse

Display Resolution
1366 × 768 dots or higher

Operating System
Operating system mentioned above

WT

WT5000 Firmware Version

2.01 or later

WT5000 Options Required for Operation

- IEC Harmonic/Flicker measurement feature (/G7 option)
- USB, GP-IB, or Ethernet interface (standard)

Selectable IEC61000 Edition Numbers

The following edition numbers can be selected in WT5000 firmware version 2.01 and later when using this software.

Harmonic Measurement

Standard and edition number	IEC 61000-3-2	IEC 61000-3-12
	• A1 of Edition 3.0 • Edition 4.0 • Edition 5.0	• Edition 1.0 • Edition 2.0
Referenced standard	IEC 61000-4-7	
	• Edition 1.0 • Edition 2.0 • A1 of Edition 2.0	

Standard and edition number	JIS C 61000-3-2	
	2011	2019
Referenced standard	JIS C 61000-4-7	IEC 61000-4-7
	• 2007 • 2007 JA	• A1 of Edition 2.0

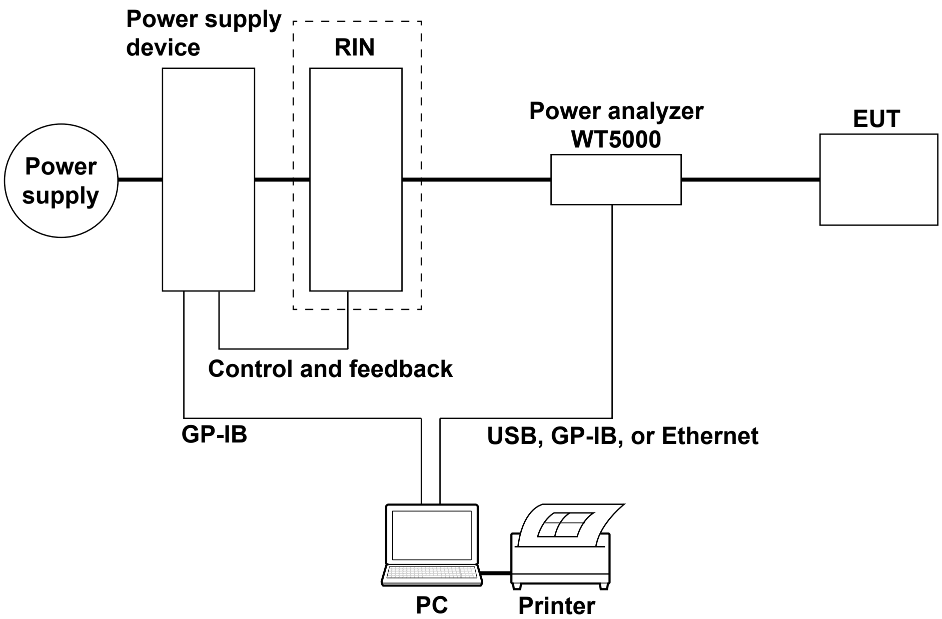
IEC 61000-4-7 or JIS C 61000-4-7 specifies requirements for measurement instruments.
For details, see Chapter 14.

Voltage Fluctuation and Flicker Measurement

Standard and edition number	IEC 61000-3-3	IEC 61000-3-11
	• Edition 2.0 • Edition 3.0 • A1 of Edition 3.0	• Edition 1.0 • Edition 2.0
Referenced standard	IEC 61000-4-15	
	• Edition 1.1 • Edition 2.0	

IEC 61000-4-15 specifies requirements for measurement instruments.
For details, see Chapter 14.

1.3 System Configuration



To use the power supply control function, connect the NF power supply to the PC via GP-IB.

To increase the power supply capacity, you need to connect a booster to the power supply unit.
For a three-phase power supply, you add a slave to the master power supply.
For details on how to connect the cables of each device, see the user's manual for the device.
Depending on the harmonics standard, a RIN may not be used. For details, check the relevant standard.

1.4 Applicable Harmonic Measurement Standard

On this software, you can select the following software applications.

- IEC 61000-3-2 Harmonic Measurement
- IEC 61000-3-12 Harmonic Measurement

IEC 61000-3-2 Harmonic Measurement

The applicable standards are shown below.

- IEC 61000-3-2 Edition 3.0:2005/A1:2008/A2:2009, IEC 61000-3-2 Edition 4.0:2014, IEC 61000-3-2 Edition 5.0:2018
- EN 61000-3-2:2006/A1:2009/A2:2009, EN 61000-3-2:2014, EN 61000-3-2:2019
- IEC 61000-4-7 Edition 1.0:1991, Edition 2.0:2002 and A1 of the Edition 2.0:2008
- JIS C 61000-3-2:2011, JIS C 61000-3-2:2019
- JIS C 61000-4-7:2007

Scope and Classification

The limits for harmonic current emissions (IEC 61000-3-2 or JIS) are applicable to electrical and electronic equipment having an input current of up to 16 A (up to 20 A for JIS) per phase and connected to public low-voltage distribution systems. Classification is made depending on the type of equipment. IEC 61000-3-2 Edition 5.0 does not define the limits for some types of equipment. For details, see the applicable standard.

— Electrical and electronic equipment having an input current up to 16 A per phase —

Class A

- **Balanced three-phase equipment**
- **Vacuum cleaners**
- **High pressure cleaners**
- **Tools, excluding portable tools (portable tools are Class B)**
- **Independent phase control dimmers**
- **Audio equipment**
- **Professional luminaires for stage lighting and studios**
- **Equipment not specified in one of the other three classes (B, C, or D)**

Class B

- **Portable tools**
- **Arc welding equipment that is not professional equipment**

Class C

Lighting equipment

Class D

- **Television receivers, personal computers (PCs), and PC monitors with rated power of 600 W or less**
- **Inverter refrigerator and refrigerator**

Limits

The limits are specified for each class. IEC 61000-3-2 assumes a phase voltage of 220 V, 230 V, and 240 V for specifying the limits. For equipment of differing rated voltage, conversion may be necessary. For the conversion equation, see “Conversion of Limits” (page 1-26).
The limits of JIS C 61000-3-2:2019 are the same as those of IEC 61000-3-2. However, limits indicated on the next page apply to air conditioners of class A whose active power exceeds 600 W.

Limits for Class A Equipment

Harmonic order n	Maximum permissible harmonic current [A]
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≤n≤39	0.15×(15/n)
Even harmonics	
2	1.08
4	0.43
6	0.30
8≤n≤40	0.23×(8/n)

In JIS C 61000-3-2:2019, the limits below apply to air conditioners whose active power exceeds 600 W.

Harmonic order n	Maximum permissible harmonic current [A]
Odd harmonics	
3	2.30+0.00283(W-600)
5	1.14+0.00070(W-600)
7	0.77+0.00083(W-600)
9	0.40+0.00033(W-600)
11	0.33+0.00025(W-600)
13	0.21+0.00022(W-600)
15≤n≤39	(0.15+0.00020(W-600))×(15/n)
Even harmonics	
2	1.08+0.00033(W-600)
4	0.43+0.00017(W-600)
6	0.30+0.00012(W-600)
8≤n≤40	(0.23+0.00009(W-600))×(8/n)

Limits for Class B Equipment

Limits for Class A equipment × 1.5

Limits for Class C Equipment

Classification is made according to the active power of the equipment shown below. For single-phase equipment, the classification is made using the active power of the single-phase power. For multi-phase equipment, the classification is made using the sum of the active powers all phases (three phases if three-phase).

- **Equipment with active input power exceeding 25 W**

  Shall not exceed the limits of Class C, which are shown below.

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency [%]
2	2
3	30×λ*
5	10
7	7
9	5
11≤n≤39 (Odd harmonics only)	3

* λ is the power factor (circuit power factor).
For the fundamental current and power factor, use the measured values under maximum load conditions of the equipment.

For equipment that includes means for control such as dimming and color, when tested under both of the following conditions, the harmonic current calculated by applying the Class C table under the condition of maximum active input power (Pmax) shall not be exceeded.

- Set the test condition to means for control that produces Pmax.
- Set the test condition to means for control that maximizes THC when the effective input power is in the range of Pmin to Pmax Calculate Pmin as follows:

  Pmin = 5 W when Pmax is 50 W or less
  Pmin is 10 % of Pmax when Pmax exceeds 50 W but is less than or equal to 250 W.
  Pmin = 25 W when Pmax exceeds 250 W

- **Equipment with active input power less than or equal to 25 W**
  Lighting equipment that produces between 5 W and 25 W shall comply with one of the following three requirements.

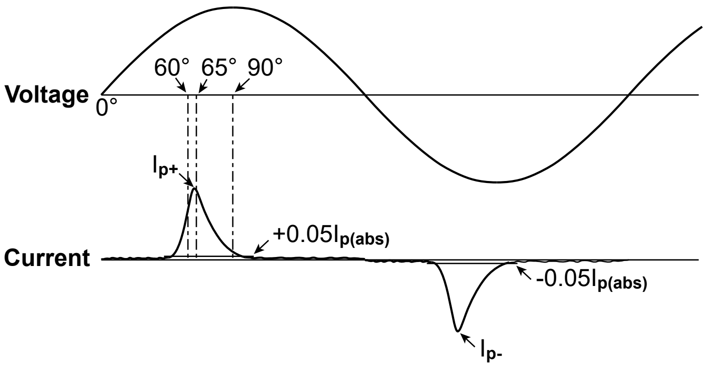
  - **Does not exceed the power ratio limits of Class D.**
  - **The third and fifth harmonics shall not exceed the limits given in the table below. Moreover, the relationship of the fundamental voltage waveform and the input current waveform shall be as shown in the figure below.**

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency [%]
3	86
5	61

The relationship of the fundamental supply voltage waveform and the input current waveform is as follows, where the zero crossing of the fundamental supply voltage is assumed to be at 0° (degrees).

- Beginning of the current flow: It reaches the 5 % current threshold before or at 60°
- Current peak: Before or at 65°
- End of the current flow: It does not fall below the 5 % current threshold before 90°.

The 5 % current threshold is defined to be 5 % of the maximum absolute peak value ($I_{p(abs)}$).



I_{p+}: Peak value of the current waveform (+)
I_{p-}: Peak value of the current waveform (-)
$I_{p(abs)}$: The higher absolute value of I_{p+} and I_{p-}

- **The THD shall not exceed 70 %. Harmonic ratios, expressed as percentages of the fundamental wave, shall not exceed the following values:**
  5 % for the 2nd harmonic;
  35 % for the 3rd harmonic;
  25 % for the 5th harmonic;
  30 % for the 7th harmonic;
  20 % for the 9th harmonic;
  20 % for the 11th harmonic.

Limits for Class D Equipment

Shall meet the maximum permissible harmonic current (power ratio limit) per watt and the maximum permissible current given in the next table. The concept of power (active power) of single- or multi-phase equipment is the same as Class C.

Harmonic order n	Maximum permissible harmonic current per watt [mA/W] (Power ratio limit)	Maximum permissible harmonic current [A]
2	3.4	2.30
3	1.9	1.14
5	1.0	0.77
7	0.5	0.40
9	0.35	0.33
$13 \leq n \leq 39$ (Odd harmonics only)	3.85/n	Same as class A.

Conversion of Limits

IEC 61000-3-2 assumes a phase voltage of 220 V, 230 V, and 240 V for specifying the limits. For equipment of differing rated voltage, conversion may be necessary. Convert the limits of all the classes using the following equations and apply them. However, conversion to a phase voltage of 220 V or 240 V is not necessary.

Phase voltage

$$\text{Converted limit} = \text{Limit of each class} \times \frac{230}{\text{Rated voltage of the equipment}}$$

Line voltage of three-phase

$$\text{Converted limit} = \text{Limit of each class} \times \frac{400}{\text{Rated voltage of the equipment}}$$

Simple Test

Equipment whose compliance test result meets the conditions below can be tested using the simple test method the next time the equipment is updated.

- Harmonic current: Below 60 % of the applicable limits
- THD of the supply current: Less than 15 %

Products that fulfill the following requirements are deemed to comply with the applicable limits.

- Active input power: Within ±20 % of that of the originally tested product
- THD of the supply current: Less than 15 %

Specifications of Supply Source, Measurement Equipment, Test Conditions, and Application Method of Limits

This section lists only the items. For detailed specifications, see the applicable standard.

Power Supply

- Supply voltage and frequency range
- Permissible range of harmonics contained in the supply voltage
- Voltage peak value and phase offset between the waveform zero crossing and the peak value
- Internal impedance of the supply source
- Angle between the fundamental voltage on each pair of phases in the case of a three-phase source

Measurement Equipment

- Error of the measurement equipment
- Input impedance of the measurement equipment
- Time constant of the internal processing when measuring harmonics

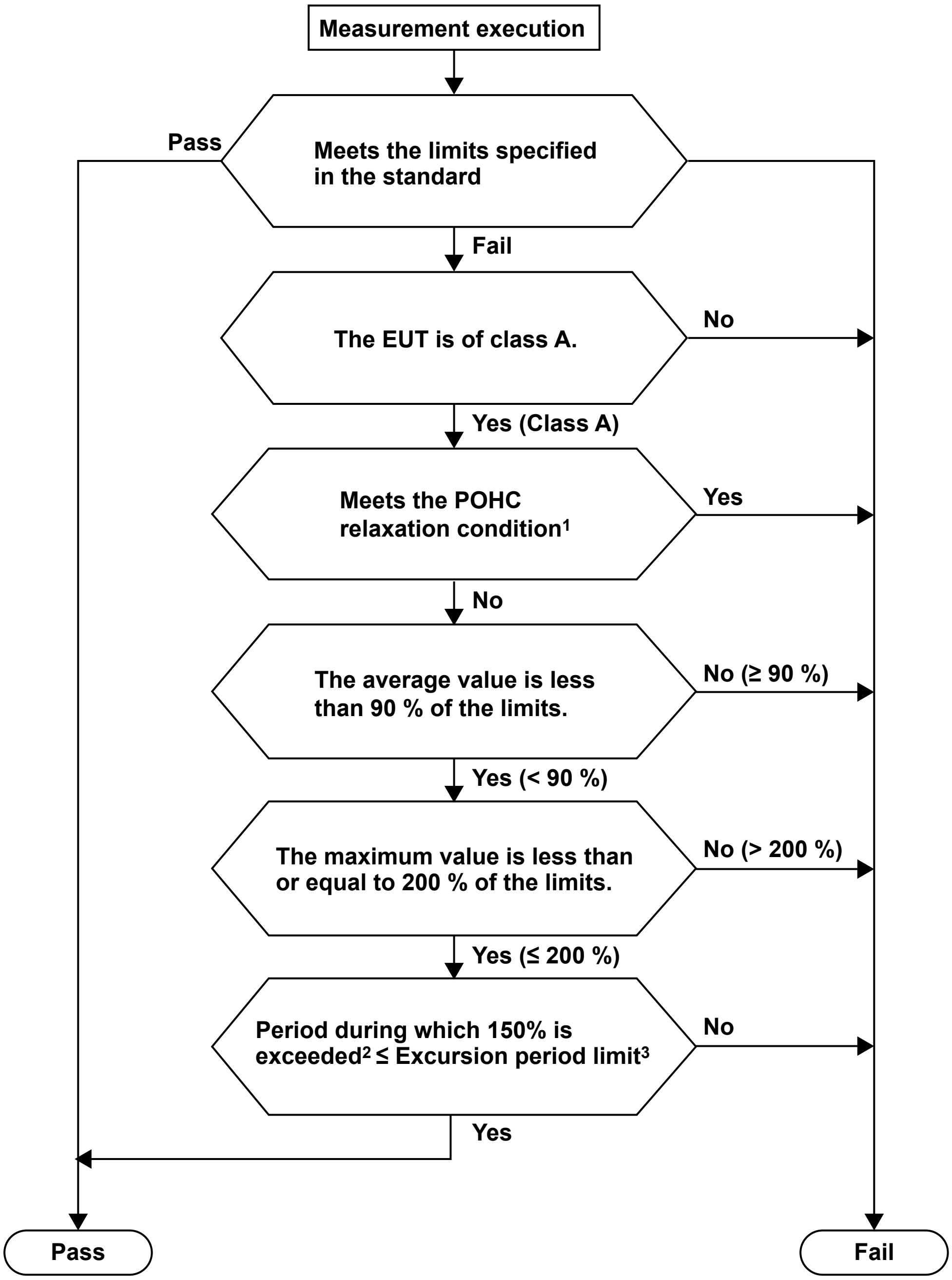
Test Conditions

- Test conditions for television/audio equipment and lighting equipment
- Test conditions for general equipment not specified in the applicable standard
  For example, performing tests by setting the equipment to a condition that produces the maximum total harmonic current (THC)
- Specification of the repeatability of the measurement results
- Specification of the observation time (measurement time) to achieve the repeatability of the measurement results

Application Method of Limits

- Derivation of the fundamental current and power factor (circuit power factor) of class C equipment
- Derivation of the power (active power) used by class D equipment
- Specifications when comparing the harmonic current limits and measured values for each harmonic
  - Compare the specified limit and the mean value of the harmonic current within the measurement time and evaluate.
  - Compare the value that is 1.5 times the specified limit and the maximum value of the harmonic current within the measurement time and evaluate.
- 200 % short-term relaxation conditions
  If all of the following conditions are met for each harmonic, up to 200 % of the specified limits is permitted.
  - The EUT belongs to Class A for harmonics.
  - The excursion beyond 150 % of the applicable limits lasts less than 10 % of the test observation period or in total 10 min (within the test observation period), whichever is smaller.
  - The average value of the harmonic current, taken over the entire test observation period, is less than 90 % of the applicable limits.
- POHC relaxation of the specification
  If the total partial odd harmonic currents (POHC) of order above and including 21 is less than the specified POHC limit, the average of the odd harmonic currents of order above and including 21 is permitted to be 1.5 times the specified limits.

Decision Process for Determining Whether 200 % Short-Term Relaxation or POHC Relaxation Is Applicable



1 The 200 % short-term relaxation and POHC relaxation cannot be applied together to a single test.
2 Period during which instantaneous values exceed 150 % of the applicable limit.
3 10 % of the test observation period or 10 minutes (within the test observation period), whichever is smaller.

Window Function of the WT (Measurement Period)

The width of the window function (measurement period) for the measurements is defined by IEC 61000-4-7. For details, see page 1-4 or Chapter 14.

IEC 61000-3-12 Harmonic Measurement

The applicable standards are shown below.

- IEC 61000-3-12: Edition 1.0:2004, Edition 2.0:2011
- EN 61000-3-12:2005, EN 61000-3-12:2011
- IEC 61000-4-7: Edition 2.0:2002/A1:2008
- EN 61000-4-7:1993, EN 61000-4-7:2002/A1:2009

This section gives an overview of the standards. For further details, see the actual text of the applicable standard.

Scope

The IEC 61000-3-12 First Edition harmonic current emission standard applies to electronic equipment that (1) operates with single-phase 230-V 50-Hz or three-phase 400-V 50-Hz public low voltage power supply systems and (2) has a rated input current that is above 16 A but not greater than 75 A.

Limits

IEC 61000-3-12 Ed. 2.0

There are four types of limits:

- Limits for equipment other than balanced three-phase equipment
- Limits for balanced three-phase equipment
- Limits for balanced three-phase equipment under specified conditions (a, b, and c)
- Limits for balanced three-phase equipment under specified conditions (d, e, and f)

Limits for Equipment Other Than Balanced Three-Phase Equipment

Minimum Rsce	Admissible Individual Harmonic Current Ih/Iref* [%]						Admissible Harmonic Current Distortion Factors [%]	
	I3	I5	I7	I9	I11	I13	THC/Iref	PWHC/Iref
33	21.6	10.7	7.2	3.8	3.1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥350	41	24	15	12	10	8	47	47

The relative values of even harmonics up to order 12 must not exceed 16/h (%). Even harmonics above order 12 are taken into account in THC and PWHC in the same way as odd harmonics.

Linear interpolation between successive Rsce values is permitted.

* Iref = reference current; Ih = harmonic current component

Limits for Balanced Three-Phase Equipment

Minimum Rsce	Admissible Individual Harmonic Current Ih/Iref* [%]				Admissible Harmonic Current Distortion Factors [%]	
	I5	I7	I11	I13	THC/Iref	PWHC/Iref
33	10.7	7.2	3.1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	26
250	31	20	12	7	37	38
≥350	40	25	15	10	48	46

The relative values of even harmonics up to order 12 must not exceed 16/h (%). Even harmonics above order 12 are taken into account in THC and PWHC in the same way as odd harmonics.

Linear interpolation between successive Rsce values is permitted.

* Iref = reference current; Ih = harmonic current component

Limits for Balanced Three-Phase Equipment under Specified Conditions (a, b, and c)

Minimum Rsce	Admissible Individual Harmonic Current Ih/Iref [%]				Admissible Harmonic Current Distortion Factors [%]	
	I5	I7	I11	I13	THC/Iref	PWHC/Iref
33	10.7	7.2	3.1	2	13	22
≥ 120	40	25	15	10	48	46

The relative values of even harmonics up to order 12 must not exceed 16/h (%). Even harmonics above order 12 are taken into account in THC and PWHC in the same way as odd harmonics.
Linear interpolation between successive Rsce values is permitted.
* Iref = reference current; Ih = harmonic current component

Limits for Balanced Three-Phase Equipment under Specified Conditions (d, e, and f)

Minimum Rsce	Admissible Individual Harmonic Current Ih/Iref* [%]												Admissible Harmonic Current Distortion Factors [%]	
	I5	I7	I11	I13	I17	I19	I23	I25	I29	I31	I35	I37	THC/Iref	PWHC/Iref
33	10.7	7.2	3.1	2	2	1.5	1.5	1.5	1	1	1	1	13	22
≥ 250	25	17.3	12.1	10.7	8.4	7.8	6.8	6.5	5.4	5.2	4.9	4.7	35	70

If the Rsce value is equal to 33, the relative values of even harmonics up to order 12 must not exceed 16/h (%). The relative values of all harmonics between I14 and I40 that are not indicated in the above table must not exceed 1 % of Iref.
If the Rsce value is equal to 250, the relative values of even harmonics up to order 12 must not exceed 16/h (%). The relative values of all harmonics between I14 and I40 that are not indicated in the above table must not exceed 3 % of Iref.
Linear interpolation between successive Rsce values is permitted.

Note

The terminology used in the tables is that used in each edition of the standard.

IEC 61000-3-12 Ed. 1.0

There are three types of limits:

- Limits for equipment other than balanced three-phase equipment
- Limits for balanced three-phase equipment
- Limits for balanced three-phase equipment under specified conditions

Limits for Equipment Other Than Balanced Three-Phase Equipment

Minimum Rsce	Admissible Individual Harmonic Current In/I1 [%]						Admissible Harmonic Current Distortion Factors [%]	
	I3	I5	I7	I9	I11	I13	THD	PWHD
33	21.6	10.7	7.2	3.8	3.1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥350	41	24	15	12	10	8	47	47

The relative values of even harmonics up to order 12 must not exceed 16/n (%).
Even harmonics above order 12 are included in THD and PWHD.
Note: Linear interpolation between successive Rsce values is permitted.

Limits for Balanced Three-Phase Equipment

Minimum Rsce	Admissible Individual Harmonic Current In/I1 [%]				Admissible Harmonic Current Distortion Factors [%]	
	I5	I7	I11	I13	THD	PWHD
33	10.7	7.2	3.1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥350	40	25	15	10	48	46

The relative values of even harmonics up to order 12 must not exceed 16/n (%).
Even harmonics above order 12 are included in THD and PWHD.
Note: Linear interpolation between successive Rsce values is permitted.

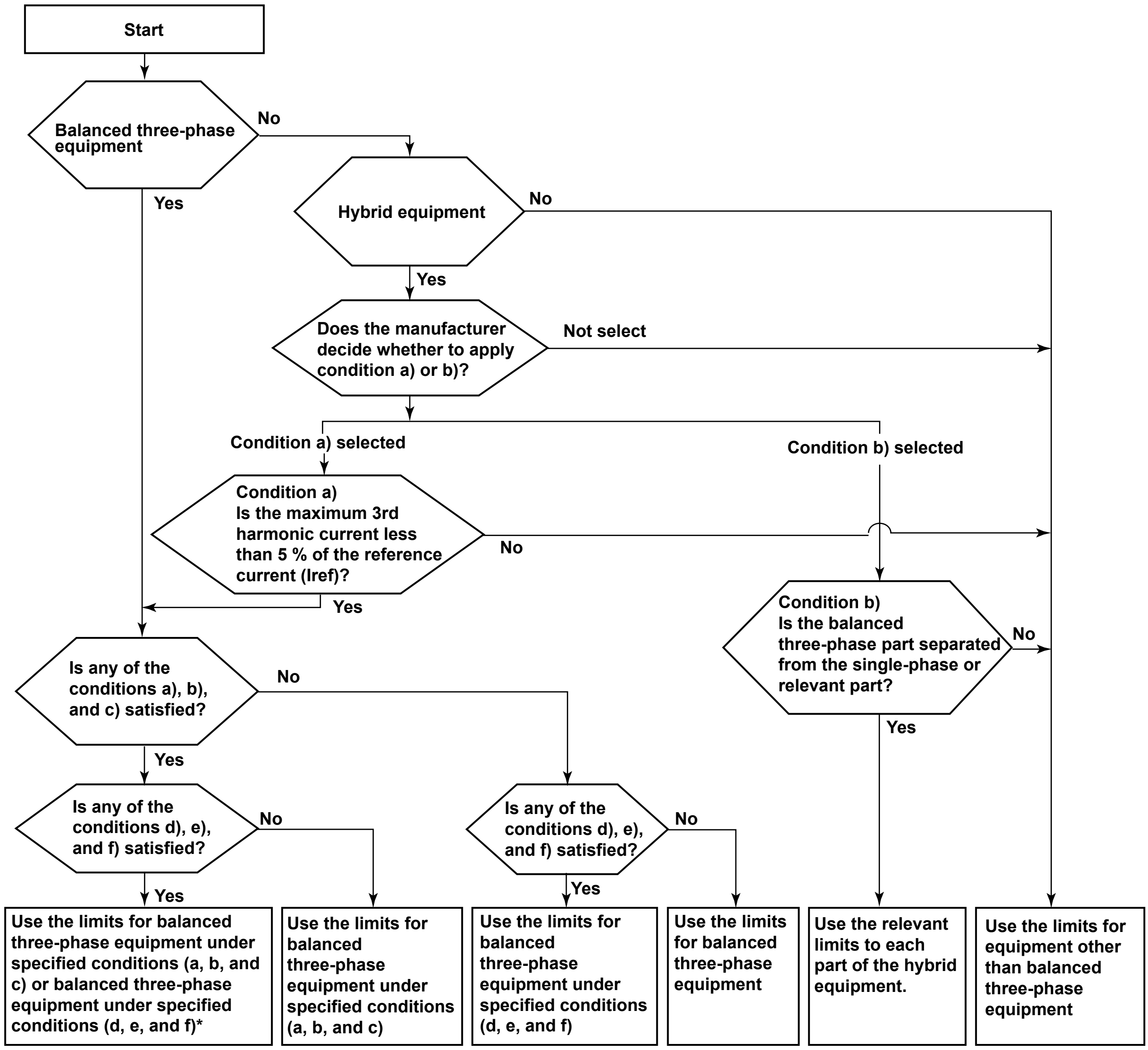
Limits for Balanced Three-Phase Equipment under Specified Conditions

Minimum Rsce	Admissible Individual Harmonic Current In/I1 [%]				Admissible Harmonic Current Distortion Factors [%]	
	I5	I7	I11	I13	THD	PWHD
33	10.7	7.2	3.1	2	13	22
≥120	40	25	15	10	48	46

The relative values of even harmonics up to order 12 must not exceed 16/n (%).
Even harmonics above order 12 are included in THD and PWHD.
Note: Linear interpolation between successive Rsce values is permitted.

Limit Application and Specified Conditions

IEC 61000-3-12 Ed. 2.0



* When limits are applied automatically by this software, the limits for balanced three-phase equipment under specified conditions (d, e, and f) are used.

There are six types of specified conditions:

a) The 5th and 7th harmonic currents are each less than 5 % of the reference fundamental current during the whole observation period.

b) The equipment is designed such that the phase angle of the 5th harmonic current has no preferential value over time and can take any value from 0 to 360°.

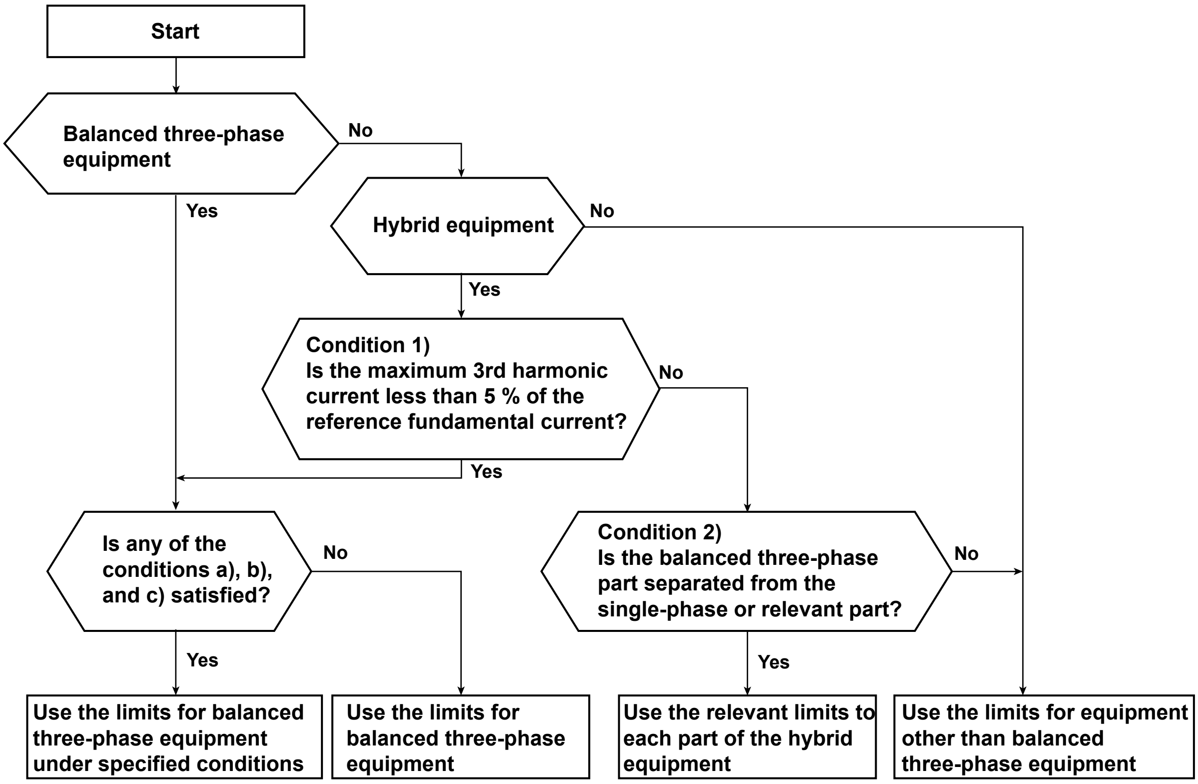
c) The phase angle of the 5th harmonic current relative to the fundamental phase voltage is in the range of 90° to 150° during the whole observation period.

d) The 5th and 7th harmonic currents are each less than 3 % of the reference fundamental current during the whole observation period.

e) The equipment is designed such that the phase angle of the 5th harmonic current has no preferential value over time and can take any value from 0 to 360°.

f) The phase angle of the 5th harmonic current relative to the fundamental phase voltage is in the range of 150° to 210° during the whole observation period.

IEC 61000-3-12 Ed. 1.0



There are three types of specified conditions:

a) The phase angle of the 5th harmonic current relative to the fundamental phase voltage is in the range of 90° to 150° during the whole observation period.

b) The equipment is designed such that the phase angle of the 5th harmonic current has no preferential value over time and can take any value from 0 to 360°.

c) The 5th and 7th harmonic currents are each less than 5% of the reference fundamental current during the whole observation period.

Window Function of the WT (Measurement Period)

The width of the window function (measurement period) for WT measurements is defined by IEC 61000-4-7. For details, see Chapter 14.

1.5 Applicable Standards for Voltage Fluctuation and Flicker Measurement

On this software, you can select the following software applications.
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

The applicable standards are shown below.

Voltage Fluctuation and Flicker Suppression Standards
- IEC 61000-3-3 Edition 2.0:2008, IEC 61000-3-3 Edition 3.0:2013/A1:2017
- EN 61000-3-3:2008, EN 61000-3-3:2013, EN 61000-3-3:2019

Flicker Meter Function and Design Specifications
- IEC 61000-4-15 Edition 1.1:2003, IEC 61000-4-15 Edition 2.0:2010
- EN 61000-4-15:1998 /A1:2003, EN 61000-4-15:2011

This section gives an overview of the standards. For further details, see the actual text of the applicable standard.

Scope

The limits of the IEC 61000-3-3 Voltage Fluctuation and Flicker Suppression Standard are applicable to electrical and electronic equipment having an input current up to and including 16 A per phase and intended to be connected to single-phase or three-phase public low-voltage distribution systems of between 220 V and 250 V at 50 Hz line to neutral.

Limits

IEC 61000-3-3 Edition 2.0, Edition 3.0, or Edition 3.0 Amd1 specifies limits for a phase voltage of 230 V and a frequency of 50 Hz.

Note

The software supports the specifications of flicker meters for 230 V and 50 Hz in IEC 61000-4-15 Edition 1.1 as well as those for 120 V and 60 Hz. For Edition 2.0, 230 V/60 Hz and 120 V/50 Hz are additionally supported. However, IEC 61000-3-3 Edition 2.0, Edition 3.0, and Edition 3.0 Amd1 do not define limits for 120 V/60 Hz, 230 V/60 Hz, or 120 V/50 Hz.

Measurement Items and Limits in IEC 61000-3-3 Ed. 2.0, Ed. 3.0 and Ed. 3.0 Amd1

Measurement Item	Limit
Relative steady-state voltage change dc	3.3 % or less
Maximum relative voltage change dmax	4 % or less (no conditions)* 6 % or less (condition 1)* 7 % or less (condition 2)*
Period during which relative voltage change exceeds 3.3 % Tmax (IEC 61000-3-3 Edition 3.0 Amd1, IEC 61000-3-3 Edition 3.0) d(t) (IEC 61000-3-3 Edition 2.0)	500 ms or less
Short-term flicker value Pst	1.0 or less
Long-term flicker value Plt	0.65 or less

* For the conditions, see the following figure.

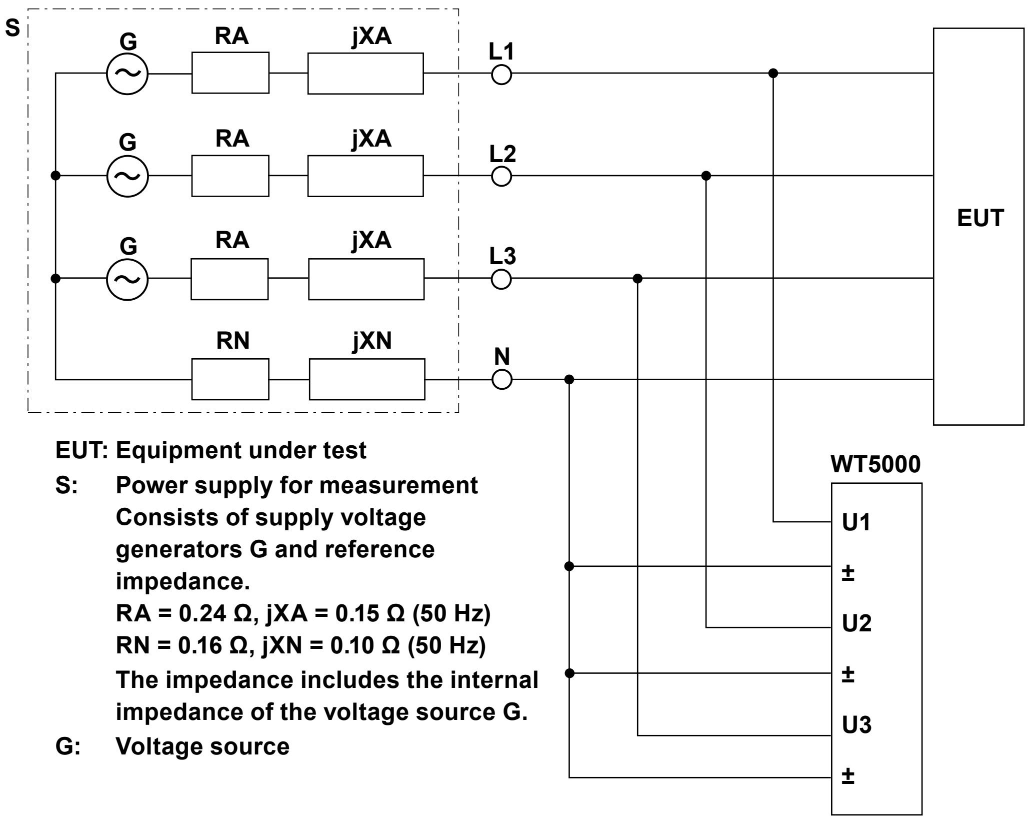
Conditions for the Limit on Maximum Relative Voltage Change dmax

No conditions	Condition 1	Condition 2
• Devices that are not classified in condition 1 or 2	• Manual switching device • Automatic switching devices that are estimated to switch OFF and ON more than two times per day that restart with a delay (delay of 20 to 30 s or more) after a power failure or devices that require manual restarting	• Devices held by human hand (examples: hair driers, vacuum cleaners, cooking appliances such as a mixer, lawn mowers, portable tools such as a electric drill) • Automatic switching devices that are estimated to switch two or less times per day or manual switching devices, which restart with a delay (delay of 20 to 30 s or more) after a power failure or require manual restarting

Note

- The Pst and Plt limits are not applicable to the voltage fluctuation due to manual switching.
- The limits are not applicable to switching and interruptions in an emergency.
- The limits are not applicable on some measurement items depending on the EUT type. For more details, see the standard.

Wiring for Voltage Fluctuation and Flicker Measurement



EUT: Equipment under test
S: Power supply for measurement
Consists of supply voltage generators G and reference impedance.
RA = 0.24 Ω, jXA = 0.15 Ω (50 Hz)
RN = 0.16 Ω, jXN = 0.10 Ω (50 Hz)
The impedance includes the internal impedance of the voltage source G.
G: Voltage source

L2 and L3 are not connected if the wiring pattern is single-phase, two-wire.

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

The applicable standards are shown below.

Voltage Fluctuation and Flicker Suppression Standards

- IEC 61000-3-11 Edition 1.0:2000, IEC 61000-3-11 Edition 2.0:2017
- EN 61000-3-11:2000, EN 61000-3-11:2019

Flicker Meter Function and Design Specifications

- IEC 61000-4-15 Edition 1.1:2003, IEC 61000-4-15 Edition 2.0:2010
- EN 61000-4-15:1998/A1:2003, EN 61000-4-15:2011

This section gives an overview of the standards. For further details, see the actual text of the applicable standard.

Scope

The IEC 61000-3-11 voltage fluctuation and flicker suppression standard limits are applicable to the following electrical and electronic equipment with line-to-neutral voltages of 220 V to 250 V, that operate with single-phase or three-phase 50-Hz public low voltage power supply systems, and that meet these criteria:

- Rated input current per phase is above 16 A and not greater than 75 A.
- Rated input current per phase is less than 16 A, but still does not meet the IEC 61000-3-3 limit.

Limits

IEC 61000-3-11 Edition 1.0 specifies limits for a phase voltage of 230 V and a frequency of 50 Hz.

Note

The software supports the specifications of flicker meters for 230 V and 50 Hz in IEC 61000-4-15 Edition 1.1 as well as those for 120 V and 60 Hz. For Edition 2.0, 230 V/60 Hz and 120 V/50 Hz are additionally supported. However, IEC 61000-3-11 does not define limits for 120 V/60 Hz, 230 V/60 Hz, or 120 V/50 Hz.

Measurement Items and Limits in IEC 61000-3-11 Edition 1.0 or Edition 2.0

Measurement Item	Limit
Relative steady-state voltage change dc	3.3 % or less
Maximum relative voltage change dmax	4 % or less (no conditions)* 6 % or less (condition 1)* 7 % or less (condition 2)*
Period during which relative voltage change exceeds 3.3 % Tmax (IEC 61000-3-11 Edition 2.0) d(t) (IEC 61000-3-11 Edition 1.0)	500 ms or less
Short-term flicker value Pst	1.0 or less
Long-term flicker value Plt	0.65 or less

* For the conditions, see the following figure.

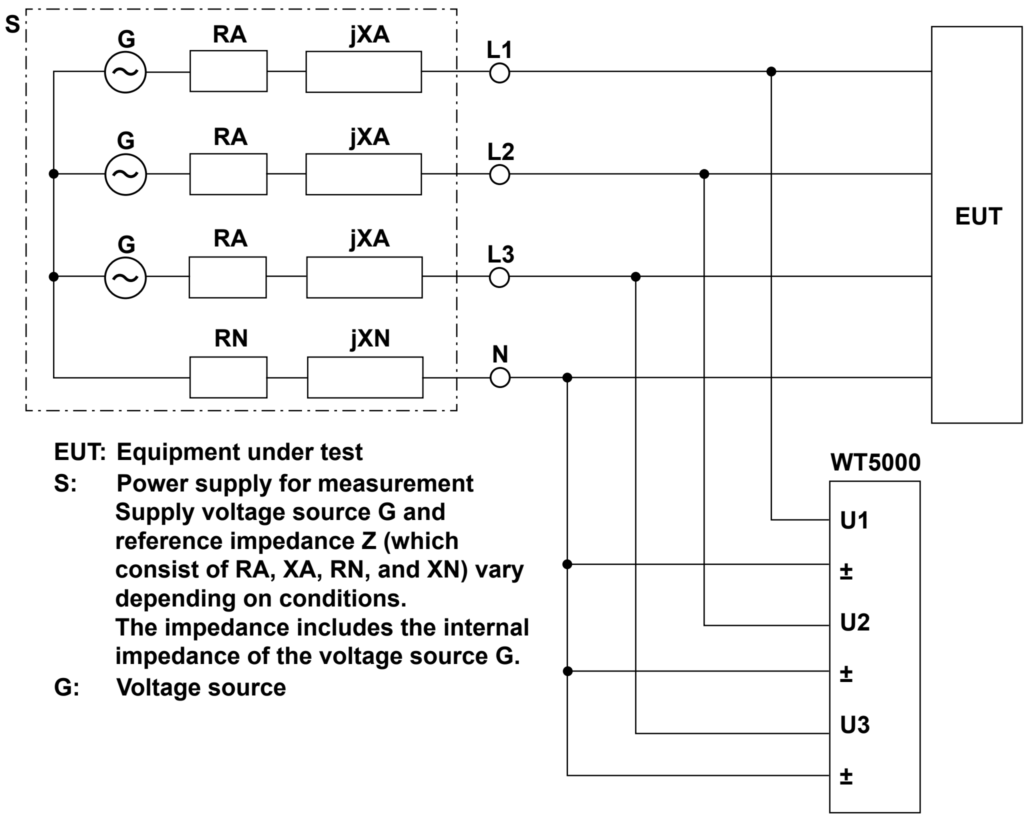
Conditions for the Limit on Maximum Relative Voltage Change dmax

No conditions	Condition 1	Condition 2
• Devices that are not classified in condition 1 or 2	• Manual switching device • Automatic switching devices that are estimated to switch OFF and ON more than two times per day that restart with a delay (delay of 20 to 30 s or more) after a power failure or devices that require manual restarting	• Devices held by human hand (examples: hair driers, vacuum cleaners, cooking appliances such as a mixer, lawn mowers, portable tools such as a electric drill) • Automatic switching devices that are estimated to switch two or less times per day or manual switching devices, which restart with a delay (delay of 20 to 30 s or more) after a power failure or require manual restarting

Note

- The Pst and Plt limits are not applicable to the voltage fluctuation due to manual switching.
- The limits are not applicable to switching and interruptions in an emergency.
- The limits are not applicable on some measurement items depending on the EUT type. For more details, see the standard.

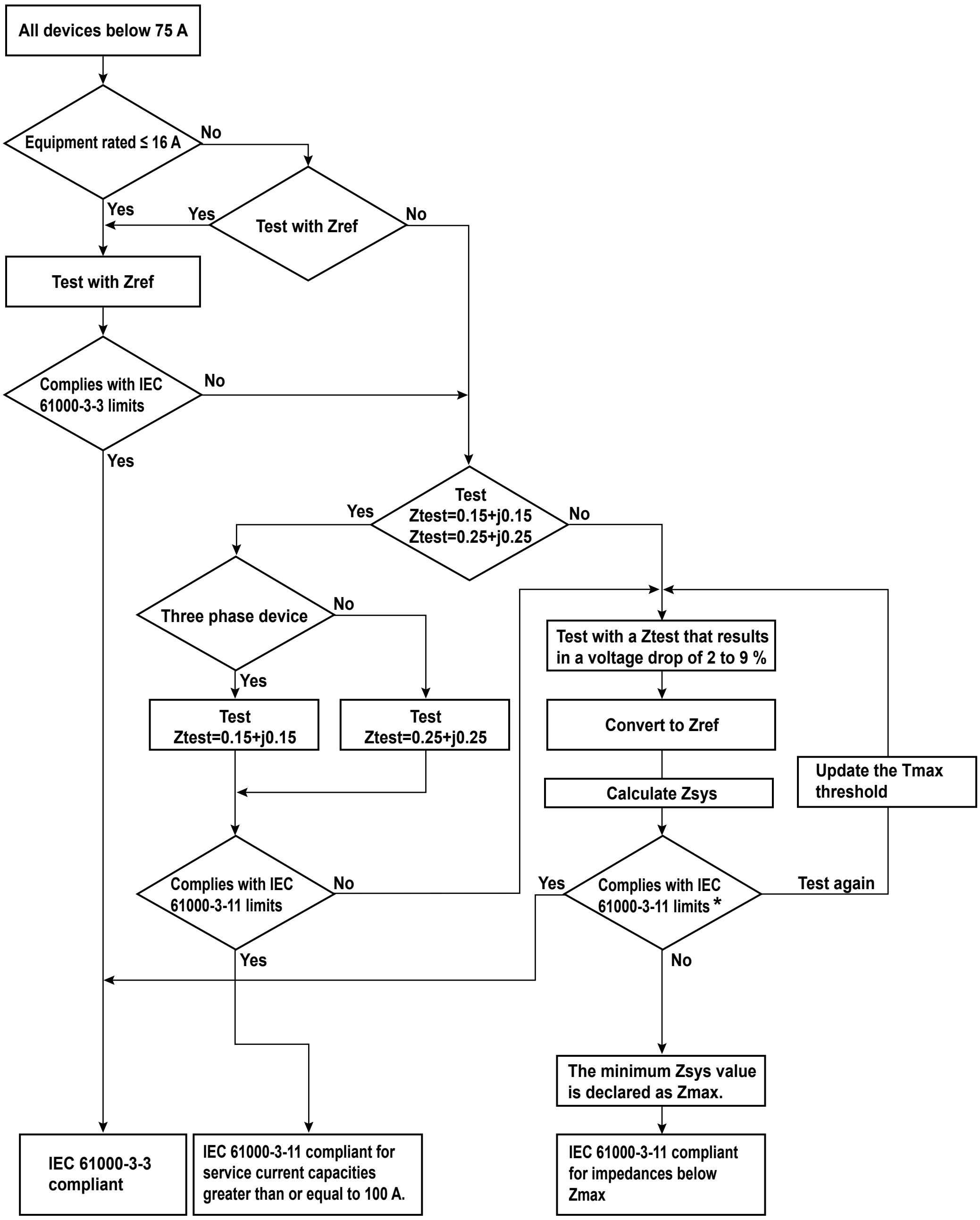
Wiring for Voltage Fluctuation and Flicker Measurement



L2 and L3 are not connected if the wiring pattern is single-phase, two-wire.

IEC 61000-3-11 Compliance Testing and Power Supply Connection Conditions

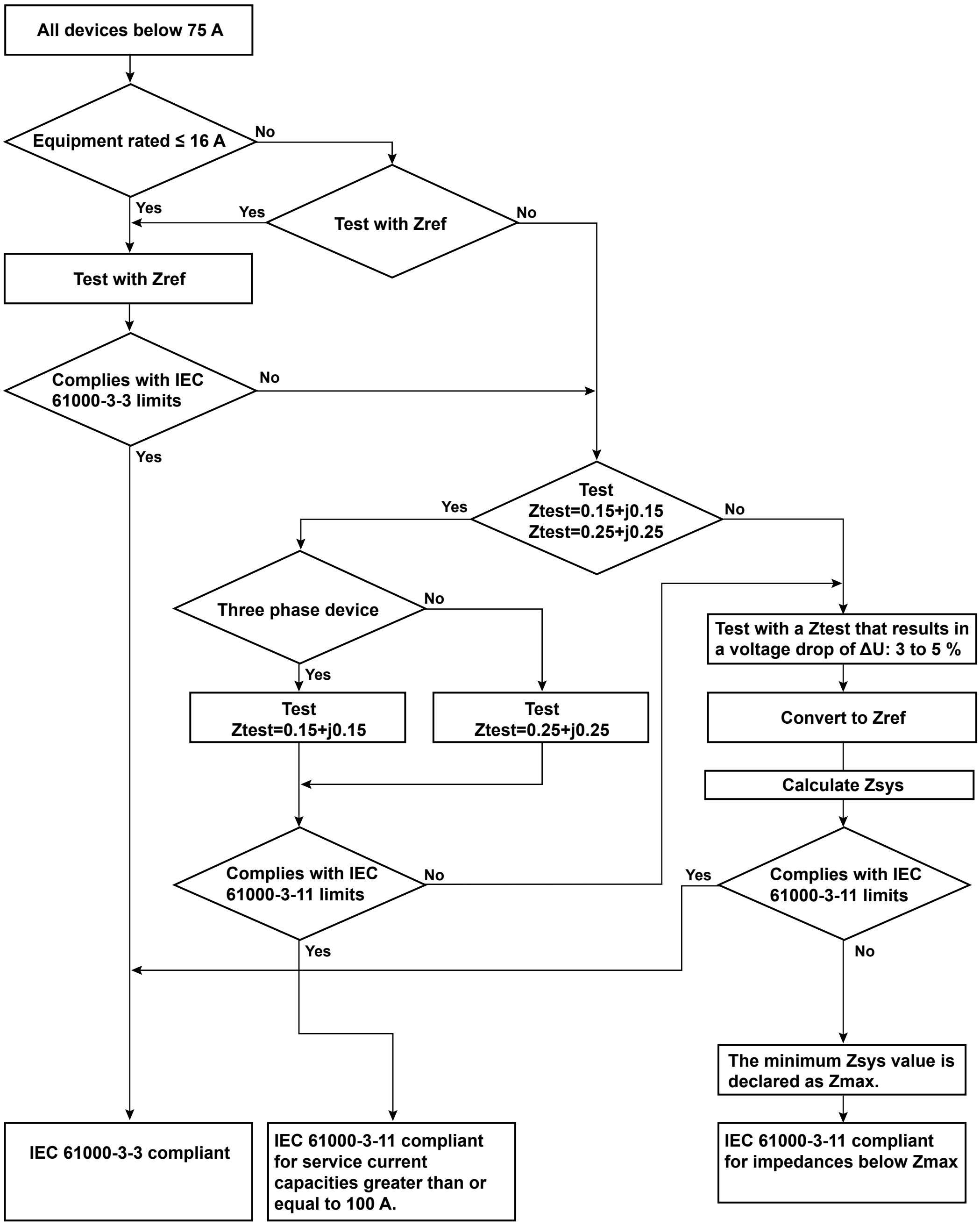
IEC 61000-3-11 Ed. 2.0



* The dmax value is verified before compliance judgment. If it is less than or equal to the dmax threshold and is greater than the Tmax threshold, Tmax is added to the judgment items.

- If Tmax is not included in the judgment items
  Tmax is excluded from judgment.
- If Tmax is included in the judgment items
  Ztest/Zmax is verified. If it is appropriate, compliance judgment is performed.
  If not, the Tmax threshold at Ztest needs to be updated, and remeasurement is required.

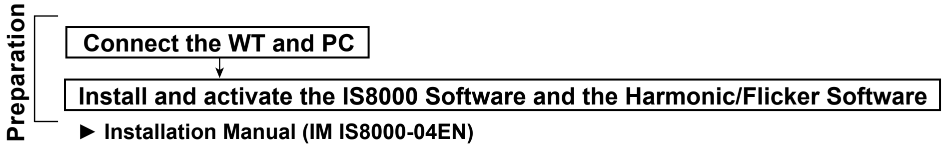
IEC 61000-3-11 Ed. 1.0



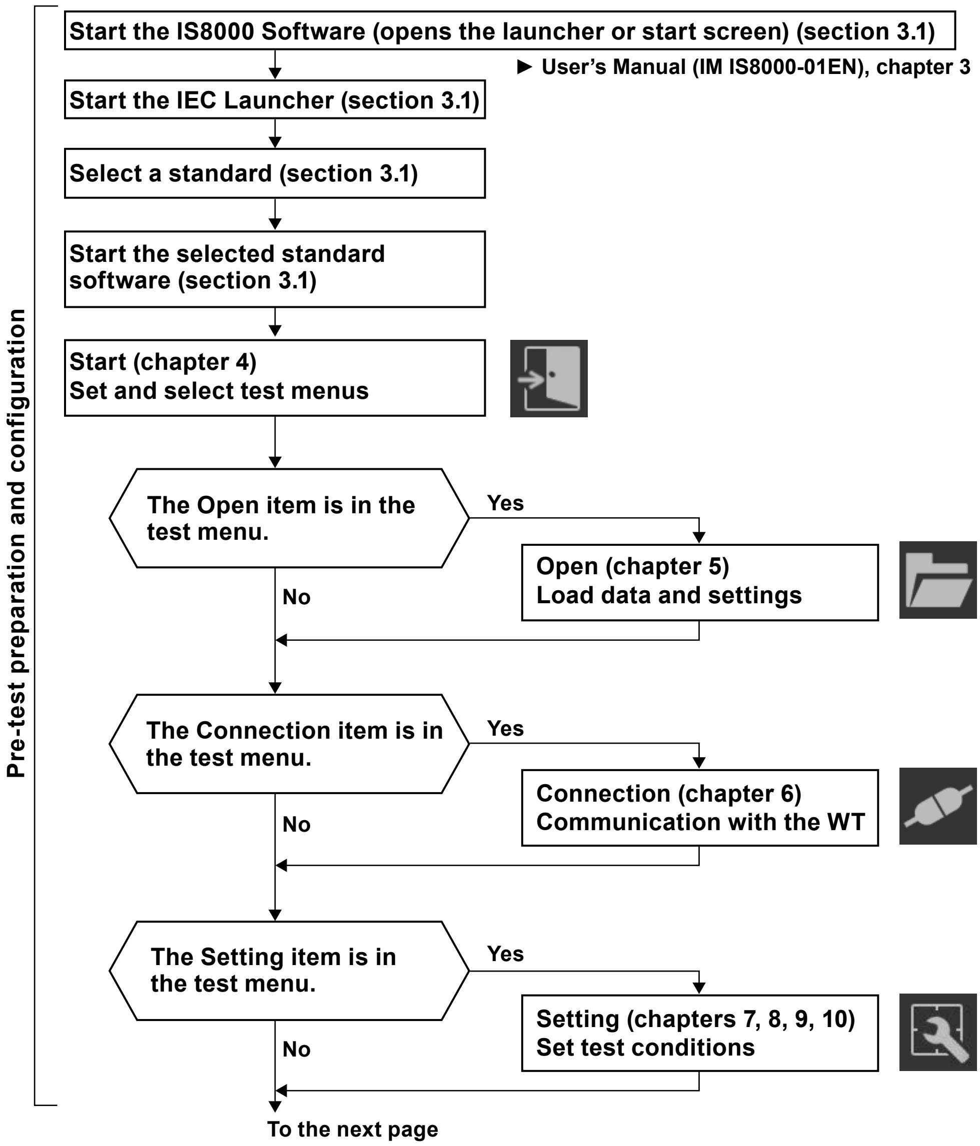
1.6 Workflow

To display and judge measurement data using this software, you need to connect the WT to a PC, install the IS8000 Software and the Harmonic/Flicker Software, and set the WT measurement conditions and judgment conditions of the applicable standard. Follow the steps below.
The available communication interfaces for connecting the WT to the PC are USB, GP-IB, and Ethernet.

Preparation Flow Chart



Test Flowchart



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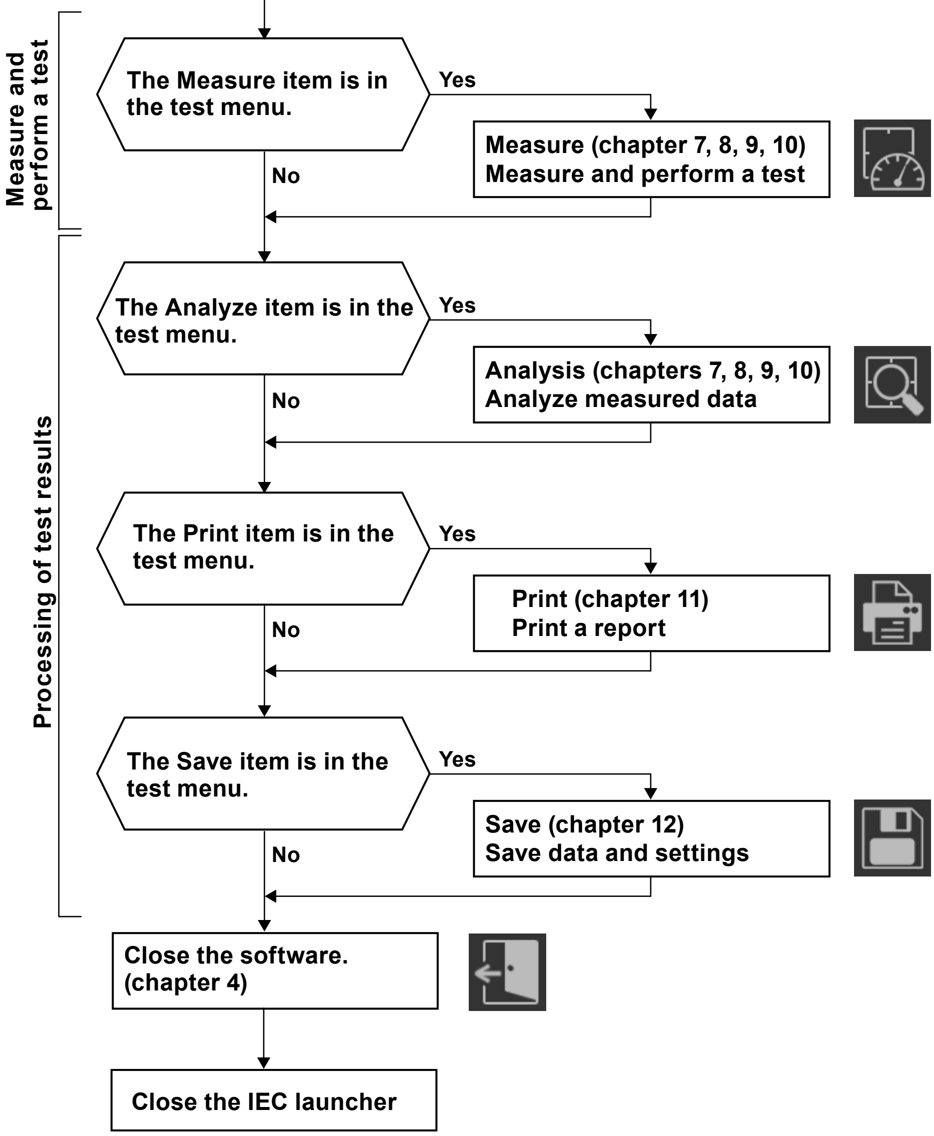


1.7 Terminology Related to Harmonics

Harmonics refer to all sine waves whose frequency is an integer multiple of the fundamental wave (normally a 50 Hz or 60 Hz sinusoidal power line signal) except for the fundamental wave itself.

This section explains the terminology of harmonics by classifying them as follows:
- Terminology common to IEC 61000-3-2 and IEC 61000-3-12
- Terminology in IEC 61000-3-2
- Terminology in IEC 61000-3-12

Terminology common to IEC 61000-3-2 and IEC 61000-3-12

Fundamental wave (fundamental component)

The sine wave with the longest period among the different sine waves derived from the periodic complex wave. Or the sine wave that has the fundamental frequency within the components of the complex wave.

Fundamental frequency

The frequency corresponding to the longest period in a periodic complex wave. The frequency of the fundamental wave.

Distorted wave

A wave that differs from the fundamental wave.

Higher harmonic

A sine wave with a frequency that is an integer multiple (twice or more) of the fundamental frequency.

Harmonic component

A waveform component with a frequency that is an integer multiple (twice or more) of the fundamental frequency.

Harmonic order

Integer ratio of the harmonic frequency with respect to the fundamental frequency. IEC defines the maximum harmonic order that is measured to be 40.

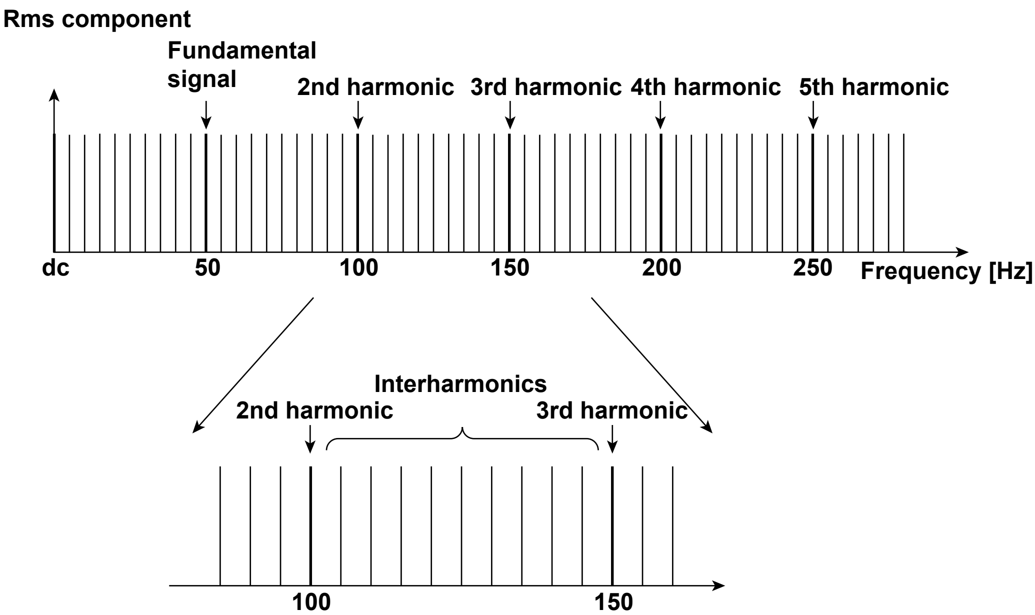
PLL source

When measuring harmonics, the fundamental period (period of the fundamental signal) must be determined in order to analyze the higher orders. The PLL (Phase Locked Loop) source is the signal that is used to determine the fundamental period.

Interharmonics

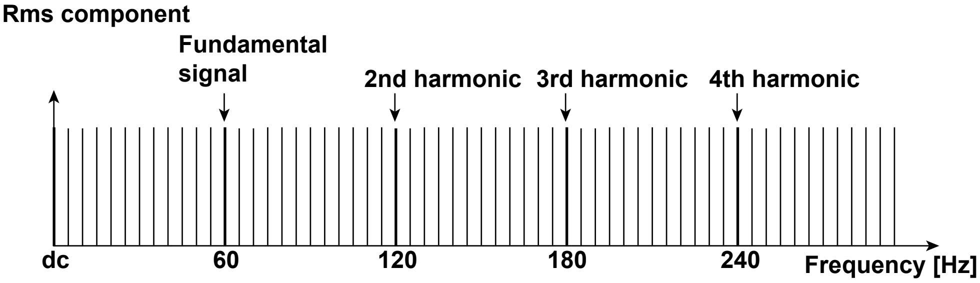
If the input signal is 50 Hz in IEC harmonic measurement, a Fourier transform is taken on 10 periods of the input signal to derive frequency components in 5-Hz resolution. Thus, the section between each harmonic order is divided into 10 frequency components. Interharmonics is the term used to refer to these intermediate frequency components.

When the fundamental signal is 50 Hz



If the input signal is 60 Hz, 12 periods of the input waveform are divided into frequency components of 5-Hz resolution. Thus, the section between each harmonic order is divided into 12 frequency components.

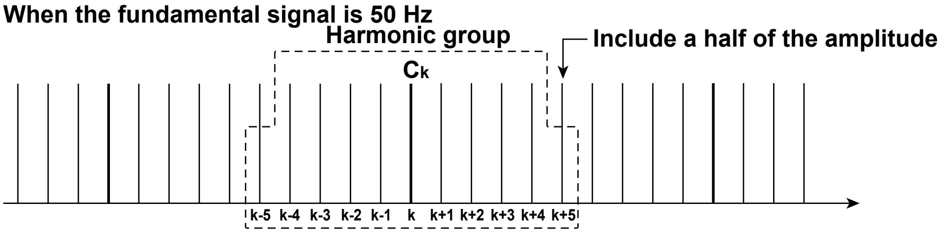
When the fundamental signal is 60 Hz



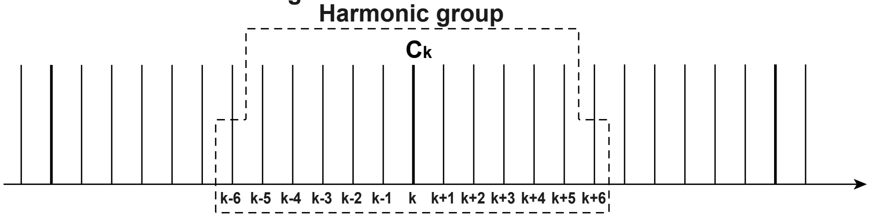
Harmonic Group

The combined value of a harmonic and its adjacent interharmonics (rms value). The computing method to combine the harmonic and its two adjacent interharmonics is not simple addition, but the square root of the sum of the square of each component. A half of the amplitude is included for the interharmonic that is in the middle of two harmonics.

When the fundamental signal is 50 Hz



When the fundamental signal is 60 Hz



$$G_{g,n} = \sqrt{\frac{C_{k-5}^2}{2} + \sum_{i=-4}^{4} C_{k+i}^2 + \frac{C_{k+5}^2}{2}} \quad \text{(for 50 Hz)}$$

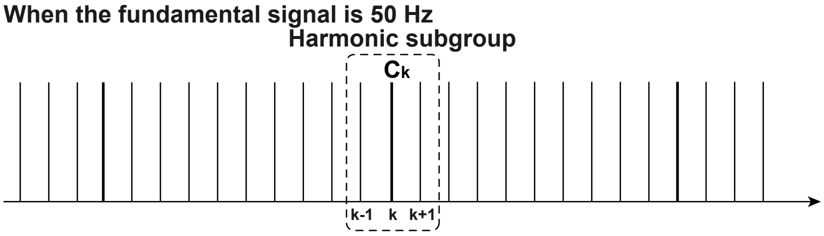
$$G_{g,n} = \sqrt{\frac{C_{k-6}^2}{2} + \sum_{i=-5}^{5} C_{k+i}^2 + \frac{C_{k+6}^2}{2}} \quad \text{(for 60 Hz)}$$

Ck: frequency component for every 5 kHz

Harmonic Subgroup

The combined value (rms value) of a harmonic and its two adjacent interharmonics. The computing method to combine the components is the average of the sum of the squares as with the harmonic group.

When the fundamental signal is 50 Hz



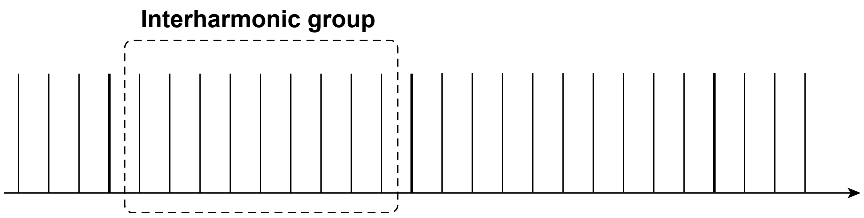
$$G_{sg,n} = \sqrt{\sum_{i=-1}^{1} C_{k+i}^2}$$

Ck: frequency component for every 5 kHz

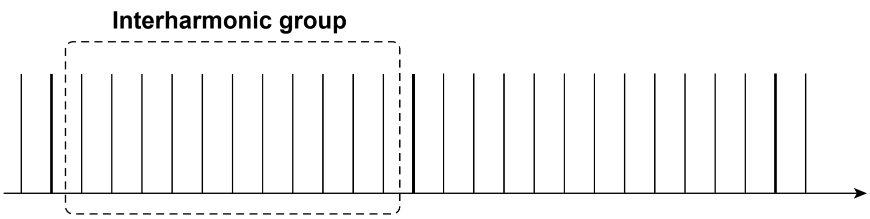
Interharmonic Group

The combined value (rms value) of all interharmonic components between two consecutive harmonic frequencies.

When the fundamental signal is 50 Hz



When the fundamental signal is 60 Hz

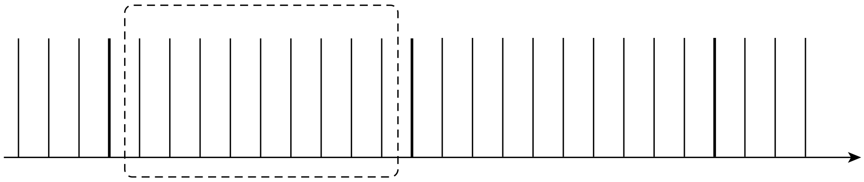


Interharmonic Center Subgroup

The combined value (rms value) of all interharmonic components between two consecutive harmonic frequencies excluding the frequency components adjacent to the harmonic frequencies.

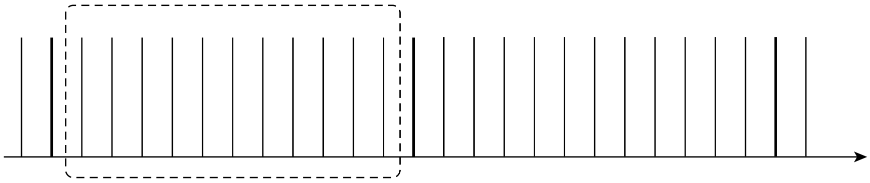
When the fundamental signal is 50 Hz

Interharmonic center subgroup



When the fundamental signal is 60 Hz

Interharmonic center subgroup



Terminology in IEC 61000-3-2

THC (Total Harmonic Component)

The sum of the rms values of harmonic current components from orders 2 to 40.

$$\sqrt{\sum_{k=2}^{40} I(k)^2}$$

I(k): rms current of each harmonic
k: harmonic order

THD (Total Harmonic Distortion)

The ratio of the rms value of all harmonics of orders 2 to 40 and the rms value of the fundamental wave.

- **V THD** $$\frac{\sqrt{\sum_{k=2}^{40} U(k)^2}}{U(1)} \times 100$$
- **A THD** $$\frac{\sqrt{\sum_{k=2}^{40} I(k)^2}}{I(1)} \times 100$$
- **P THD** $$\left|\frac{\sum_{k=2}^{40} P(k)}{P(1)}\right| \times 100$$

U(k): rms voltage of each harmonic, U(1): rms voltage of the fundamental signal
I(k): rms current of each harmonic, I(1): rms current of the fundamental signal
P(k): active power of each harmonic, P(1): active power of the fundamental signal
k: harmonic order

THDG (Group Total Harmonic Distortion)

The ratio of the sum of all harmonic groups of orders 2 to 40 with respect to the group related to the fundamental wave.

- **V THDG**

$$\frac{\sqrt{\sum_{k=2}^{40} U_g(k)^2}}{U_g(1)} \times 100$$

- **A THDG**

$$\frac{\sqrt{\sum_{k=2}^{40} I_g(k)^2}}{I_g(1)} \times 100$$

$U_g(k)$, $I_g(k)$: rms value of the harmonic group of each harmonic
k: harmonic order

THDS (Subgroup Total Harmonic Distortion)

The ratio of the sum of all harmonic sub groups of orders 2 to 40 with respect to the sub group related to the fundamental wave.

- **V THDS**

$$\frac{\sqrt{\sum_{k=2}^{40} U_{sg}(k)^2}}{U_{sg}(1)} \times 100$$

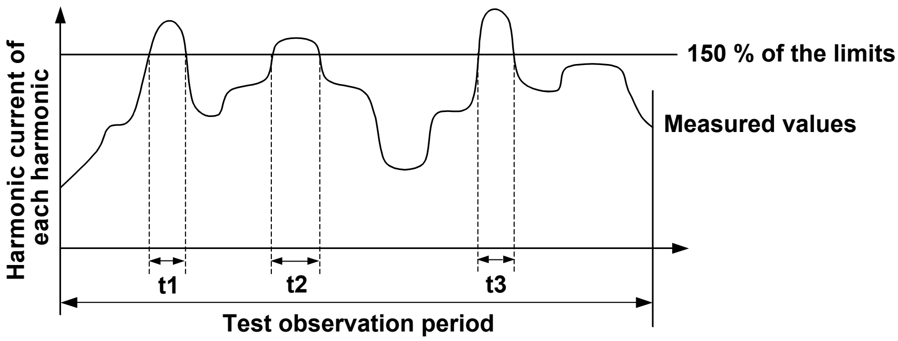
- **A THDS**

$$\frac{\sqrt{\sum_{k=2}^{40} I_{sg}(k)^2}}{I_{sg}(1)} \times 100$$

Usg(k), Isg(k): rms value of the harmonic subgroup of each harmonic
k: harmonic order

200 % Short-Term Relaxation

Calculating the period during which 150 % of the applicable limit is exceeded and determining whether or not the relaxation condition applies



When the test observation period is less than 100 minutes

t1 + t2 + t3 < 10% of the test observation period

When the test observation period is greater than or equal to 100 minutes

t1 + t2 + t3 < 10 minutes

POHC: The combined value of all odd harmonic currents greater than or equal to order 21 (Partial Odd Harmonic Current)

$$\sqrt{\sum_{k=21,23}^{39} I(k)^2}$$

I(k): rms current of odd harmonics above and including the 21st harmonic
k: harmonic order, odd value above and including 21

POHC Maximum: The maximum value of the combined value of all odd harmonic currents greater than or equal to order 21

The POHC maximum derived from individual measured data points within the measurement time. If this value is less than the POHC Limit below, the relaxation condition (see page 1-13) is applied.

POHC Limit

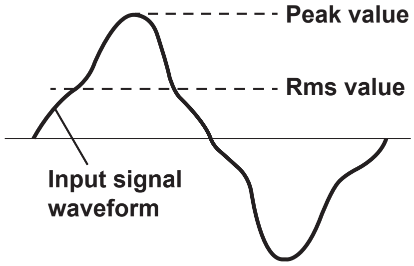
$$\sqrt{\sum_{k=21,23}^{39} I_L(k)^2}$$

$I_L(k)$: limits of odd harmonics above and including 21 as specified by the applicabl
k: harmonic order, odd value above and including 21

Crest Factor

The crest factor is defined as the ratio of the peak value of the waveform to the rms value.

$$\text{Crest factor (CF)} = \frac{\text{Peak value}}{\text{Rms value}}$$



The crest factor on the WT is determined by the maximum peak value that can be applied for rated input in terms of a multiplication factor.

$$\text{Crest factor (CF)} = \frac{\text{Peak value that can be input}}{\text{Measurement range}}$$

You can select a crest factor of 3 or 6.

For details on the measurement accuracy and crest factor of the IEC standard, see Chapter 14. Highly accurate measurements can be performed by setting the crest factor to 3.

Terminology in IEC 61000-3-12

Common to IEC 61000-3-12 Edition 1.0 and Edition 2.0

Ssc (Short Circuit Power)

$$\frac{\text{Unominal}^2}{\text{Z}}$$

Unominal: Systematic nominal line voltage
Z: System impedance of the power source frequency at the common connection point.

Sequ (Rated Apparent Power of the Equipment)

Sequ is calculated using one of the following formulas depending on the type of equipment.

a)	Up Iequ	Single-phase equipment and the single-phase components of composite equipment
b)	Ui Iequ	Interphase equipment
c)	√3 • Ui Iequ	Balanced three-phase equipment and the three-phase components of composite equipment
d)	√3 • Ui Iequ max (Ed. 2.0) 3 • Up Iequ max (Ed. 1.0)	Unbalanced three-phase equipment

Up: Rated voltage (single phase)
Ui: Rated voltage (line)
Iequ: The manufacturer-specified rated line current of a device or one of its components
Iequ max: The maximum actual current value out of the three phases

Rsce (Short circuit ratio)

Rsce is calculated using one of the following formulas depending on the type of equipment.

a)	$\frac{\text{Ssc}}{3\cdot\text{Sequ}}$	Single-phase equipment and the single-phase components of composite equipment
b)	$\frac{\text{Ssc}}{2\cdot\text{Sequ}}$	Interphase equipment
c)	$\frac{\text{Ssc}}{\text{Sequ}}$	Three-phase equipment and the three-phase components of composite equipment.

IEC 61000-3-12 Edition 2.0

THC (Total Harmonic Current) (Ed. 2.0)

The sum of the r.m.s values of harmonic current components from orders 2 to 40.

$$\text{THC} = \sqrt{\sum_{h=2}^{40} \text{Ih}^2}$$

Ih: The rms current of each harmonic
h: harmonic order

PWHC (Partial Weighted Harmonic Current) (Ed. 2.0)

$$\text{PWHC} = \sqrt{\sum_{h=14}^{40} h\cdot\text{Ih}^2}$$

Ih: The rms current of each harmonic
h: harmonic order

Iref (Reference Current)

Average r.m.s input current. Used to determine the limits.

IEC 61000-3-12 Edition 1.0

THC (Total Harmonic Component)

The sum of the rms values of harmonic current components from orders 2 to 40.

$$THC = \sqrt{\sum_{n=2}^{40} In^2}$$

In: Rms current of each harmonic
n: Harmonic

THD (Total Harmonic Distortion)

The ratio of the rms value of all harmonics of orders 2 to 40 and the rms value of the fundamental wave.

- V THD

$$\sqrt{\sum_{n=2}^{40}\left(\frac{Un}{U1}\right)^2} \times 100$$

- A THD

$$\sqrt{\sum_{n=2}^{40}\left(\frac{In}{I1}\right)^2} \times 100$$

- P THD

$$\left|\frac{\sum_{n=2}^{40} Pn}{P1}\right| \times 100$$

Un: Rms voltage of each harmonic, U1: Rms value of the fundamental voltage waveform
In: Rms current of each harmonic, I1: Rms value of the fundamental current waveform
Pn: Active power of each harmonic, P1: Active power of the fundamental waveform
n: Harmonic

PWHD (Partial Weighted Harmonic Distortion)

$$\sqrt{\sum_{n=14}^{40} n\left(\frac{In}{I1}\right)^2} \times 100$$

In: Rms current of each harmonic,
I1: Rms value of the fundamental current waveform
n: Harmonic

I1 (Reference Fundamental Current)

There are two ways to determine I1:

- Measurement: Determine the average value of the fundamental current.
- Calculation: Use the following formula to calculate I1.

$$\frac{Iequ}{\sqrt{1 + THD^2}}$$

1.8 Terminology Related to Voltage Fluctuation and Flicker

Flicker

Flicker refers to the unstable impression perceived by the human eye that is induced by the fluctuating intensity or spectral distribution of light. It expresses the irritation that the people receive due to the fluctuation of brightness.

Steady-state Condition

A condition in which the rms voltage per half period is stable for 1 s or more.

Relative Steady-State Voltage Change dc

A value obtained by dividing the difference between two steady-state voltages before and after a single voltage fluctuation by the rated voltage expressed as a percentage. For example, for a power supply with a rated voltage of 230 V, the relative steady-state voltage change is as shown below if the steady-state voltage before the fluctuation is 231 V and that after the fluctuation is 232 V.

$$\left|\frac{232-231}{230}\right| \times 100\ (\%) = 0.43\ \%$$

Note

- If no voltage fluctuation occurs on the WT in the measurement period, dc is zero.
- If a steady-state condition does not occur during the measurement period on the WT, it is considered to be a fluctuating condition. The measured value of dc is displayed as follows.
  - Undef (Undefine, IEC 61000-4-15 Ed. 1.1)
  - 0 (IEC 61000-4-15 Ed. 2.0)

  And the judgment is displayed as follows.
  - Error (IEC 61000-4-15 Ed. 1.1)
  - Pass (IEC 61000-4-15 Ed. 2.0)

Maximum Relative Voltage Change dmax

For IEC 61000-4-15 Ed. 1.1

A value obtained by dividing the difference between the maximum and minimum values in a single voltage fluctuation* by the rated voltage expressed as a percentage.

For IEC 61000-4-15 Ed. 2.0

The absolute value of the difference between the maximum value and the value in the previous steady-state condition is compared with the absolute value of the difference between the minimum value and the value in the previous steady-state condition in a single voltage fluctuation.* dmax is the value obtained by dividing the larger of the two values by the rated voltage expressed as a percentage.

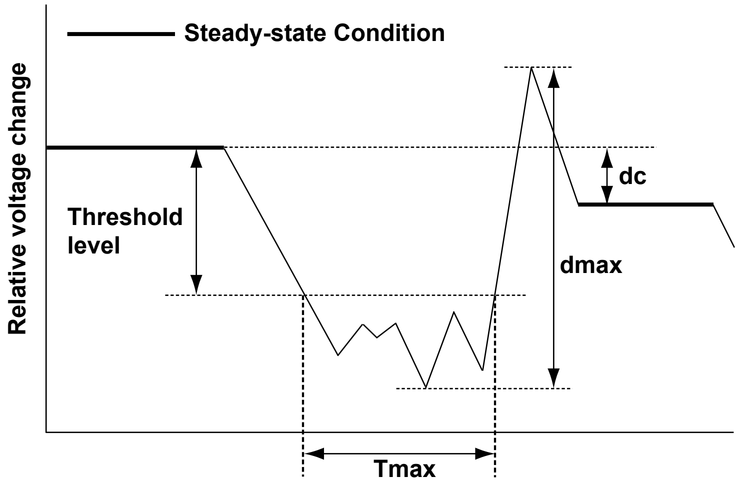
* Condition between two steady-state conditions.

Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

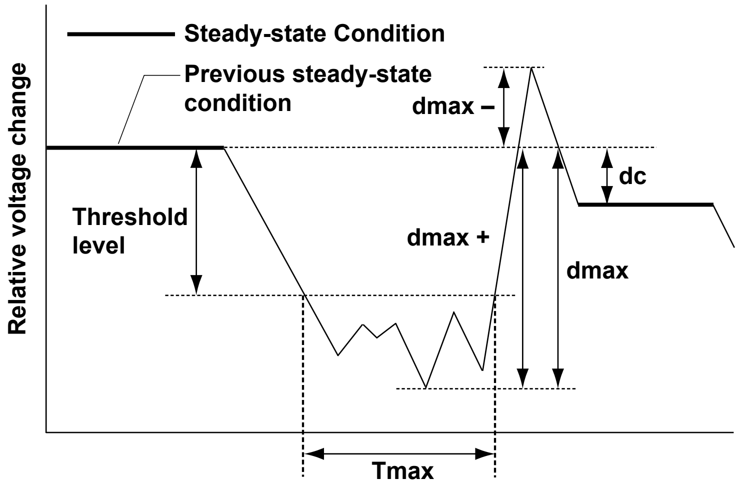
The time during which the relative voltage change during a voltage fluctuation period exceeds the threshold level.

Relationship between dc, dmax, and Tmax

For IEC 61000-4-15 Ed. 1.1



For IEC 61000-4-15 Ed. 2.0



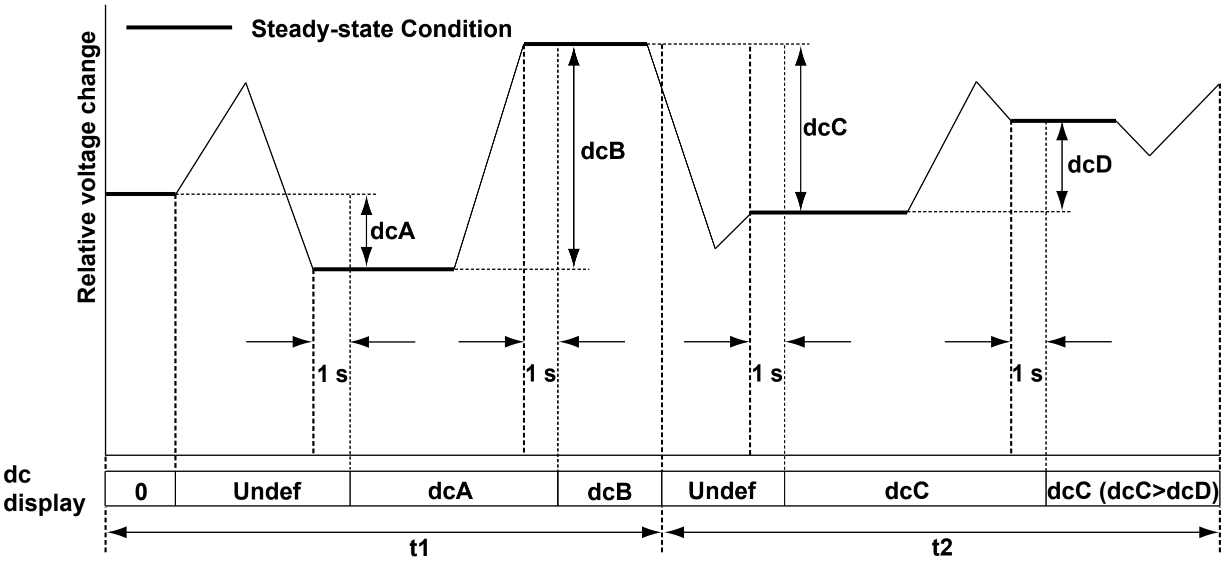
dmax +: The difference between the minimum value and the value in the previous steady-state condition

dmax –: The difference between the maximum value and the value in the previous steady-state condition

dmax: The larger of the absolute values of dmax + and dmax –

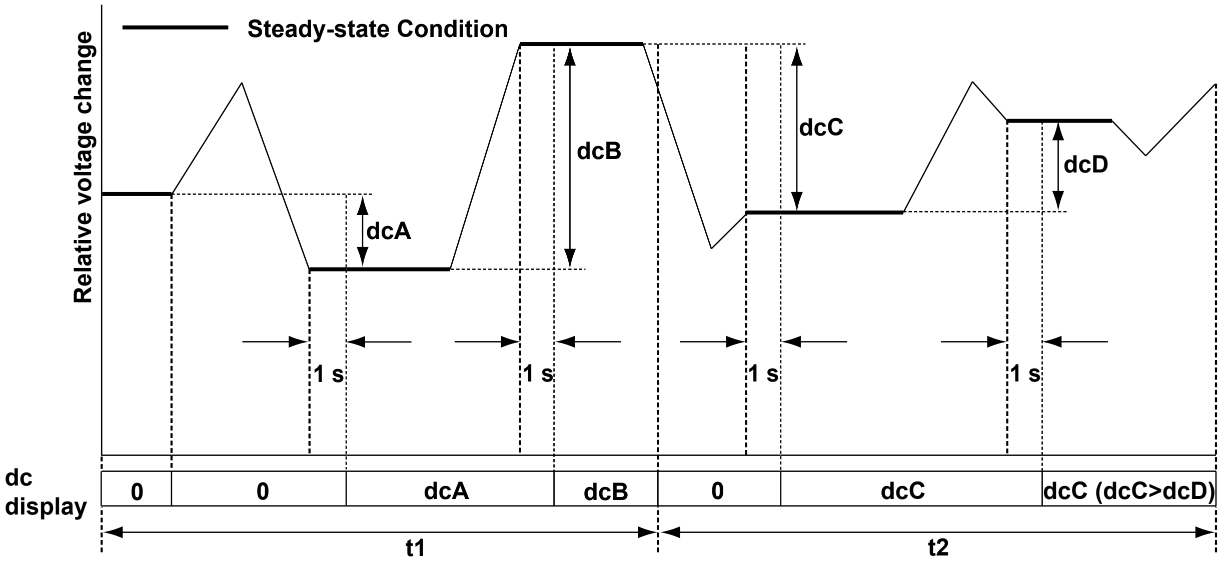
Display Example of dc

For IEC 61000-4-15 Ed. 1.1



t1: Observation period 01
t2: Observation period 02

For IEC 61000-4-15 Ed. 2.0



t1: Observation period 01
t2: Observation period 02

Short-Term Flicker Value Pst

The method using the flicker meter is standard in the voltage fluctuation and flicker suppression standards. For details on the flicker meter, see IEC 61000-4-15. The normal observation period of Pst is 10 minutes.

Long-Term Flicker Value Plt

The long-term flicker value is normally determined from 12 Pst values using the equation below. The normal observation period is 2 hours.

$$\mathbf{Plt} = \sqrt[3]{\frac{\mathbf{Pst_1^3 + Pst_2^3 + \cdots + Pst_{12}^3}}{\mathbf{12}}}$$

Pst_1: Pst of the 1st 10 minutes

Pst_2: Pst of the 2nd 10 minutes

:

Pst_{12}: Pst of the 12th 10 minutes

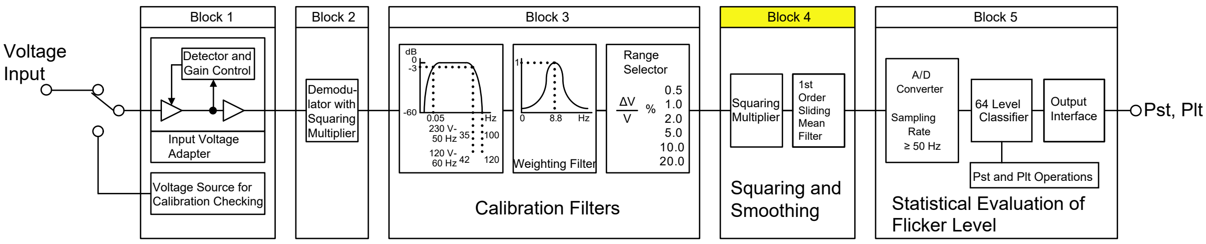
Note

If the number of observation periods is less than constant N (12) in the Plt equation, the Pst values that are not observed are computed as 0.0.

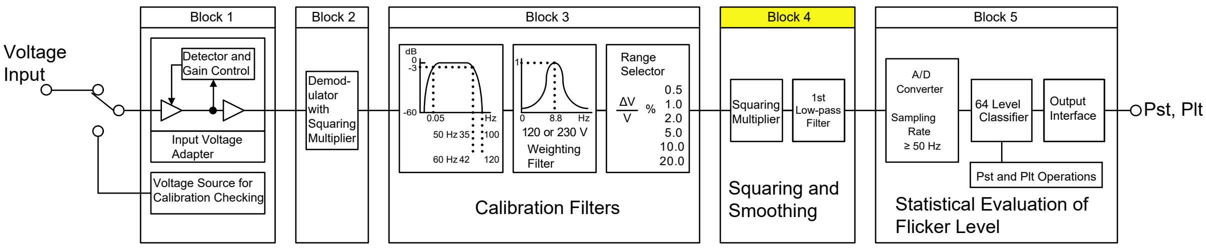
Instantaneous Flicker Sensation IFS

The output of block 4 of the flicker meter. For details on the flicker meter, see IEC 61000-4-15.

Block Diagram of the Flicker Meter in IEC 61000-4-15 Edition 1.1



Block Diagram of the Flicker Meter in IEC 61000-4-15 Edition 2.0



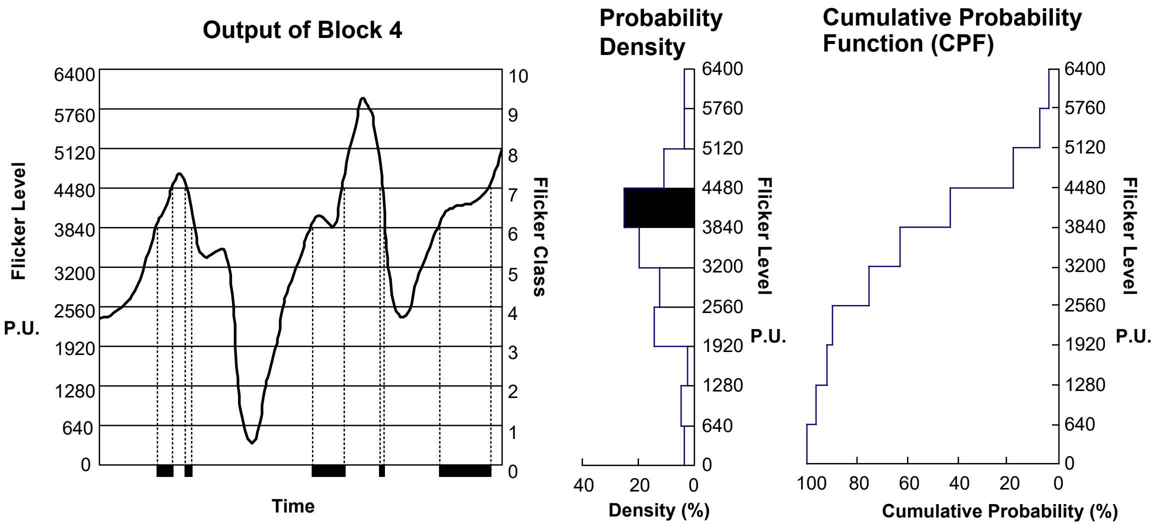
Note

This method does not necessarily match the processing method of the WT.

Cumulative Probability Function CPF

This function determines the probability density function of the flicker level from the instantaneous flicker sensation and accumulates the levels of the function from the highest level.

Example in Which Flicker Levels 0 to 6400 [P.U] Are Divided into 10 Flicker Classes



Note

The WT performs processing different from the figure above to compute the CPF more accurately.

Preparation before Use

CAUTION

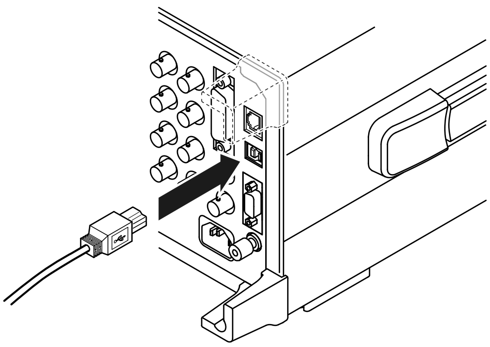
When connecting or disconnecting communication cables, make sure to turn OFF the PC and the WT. Otherwise, erroneous operation or damage to the internal circuitry may result.

2.1 Connecting the Measuring Instrument to the PC

When Controlling through the USB

Connect the USB port for PCs (type B connector) on the rear panel of the WT to the PC.
For details on the connection procedure and the specifications of the USB interface, see the WT main unit user's manual.

- Sections 2.2 and 2.3 in the *Communication Interface User's Manual* (IM WT5000-17EN)

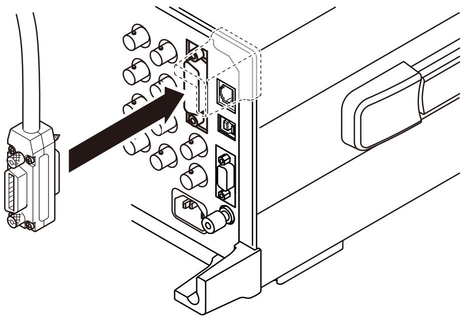


When Controlling through the GP-IB

The WT is equipped with an IEEE St'd 488-1978 24-pin GP-IB connector. Use a GP-IB cable that conforms to this standard. Connect the cable to the GP-IB connector on the rear panel of the WT.
For details on the connection procedure and the specifications of the GP-IB interface, see the WT main unit user's manual.

- Sections 3.2 and 3.3 in the *Communication Interface User's Manual* (IM WT5000-17EN)

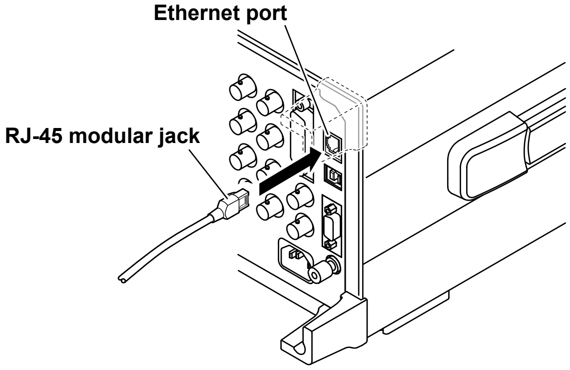
Use an appropriate connector to connect the cable to the PC.

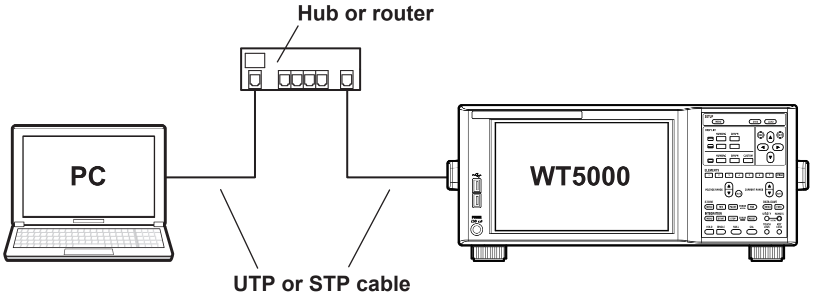


When Controlling through the Ethernet Interface

To connect the WT to the PC, use a straight UTP (Unshielded Twisted-Pair) or STP (Shielded Twisted-Pair) cable through a hub or similar device. Connect the cable to the ETHERNET port on the rear panel of the WT. Use hubs, cables, and Ethernet NIC that are appropriate for the data rate. For details on the connection procedure and the specifications of the Ethernet interface, see the WT main unit user's manual.

- Sections 1.2 and 1.3 in the *Communication Interface User's Manual* (IM WT5000-17EN)





Note

- Use a cable, hub, or router that supports the data rate of your network.
- Do not directly connect the WT to the PC without using a hub. Operations are not guaranteed for communications using direct connection.

2.2 Setting the USB Control

Procedure

Starting the WT5000

1. Turn on the WT5000 power switch to start the WT5000.
For details on how to turn on the power switch, see in the WT5000 *Getting Started Guide* (IM WT5000-03EN).

Utility Settings Overview (Utility)

You can display the remote control setting screen from the utility settings overview screen.
The utility settings overview screen can be opened mainly using the following two methods.

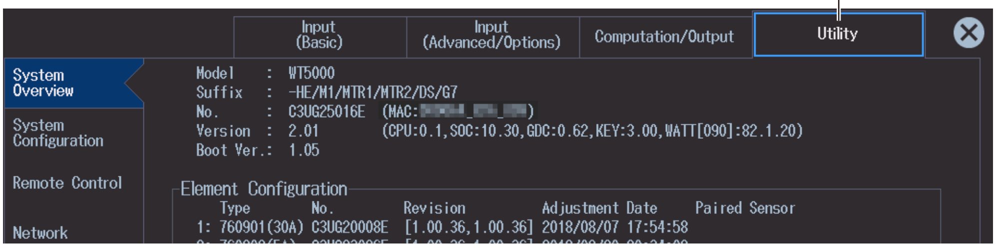
* For information about the utility settings overview screen, see section 1.4 in the *User's Manual*, IM WT5000-02EN.

Procedure Using the Setup Menu

1. Tap the **Setup** icon ( ), or press **MENU** under SETUP.

2. Tap the **Utility** tab. The utility settings overview screen appears.

Utility tab

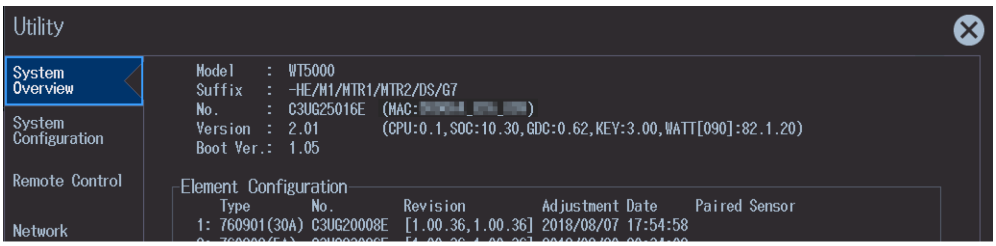


Note

You can also display the utility settings overview screen by moving the cursor on the Utility tab using the arrow keys and then pressing SET.

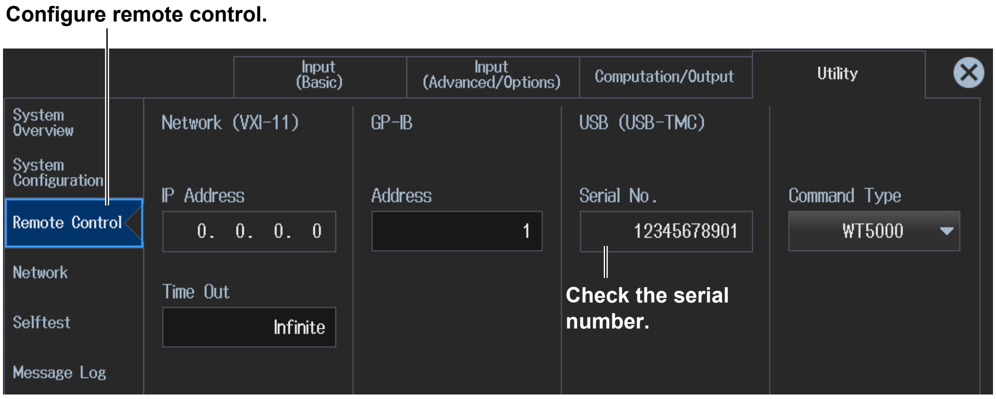
Procedure Using the UTILITY Key

1. Press **UTILITY** on the front panel. The utility settings overview screen appears.



Checking the Serial Number

Check that the serial number used for USB TMC communication is displayed under Serial No.



Explanation

Each device that is connected through USB has its own unique ID in the USB system. This ID is used to distinguish between different devices. When you connect the WT to the PC, make sure that the WT ID does not overlap with those of other devices.

Note

- Install the YOKOGAWA USB driver in your PC. For details, see section 1.2 in the *Installation Manual* (IM IS8000-04EN).
- When connecting the WT to a single PC and controlling the WT using this software, multiple communication interfaces cannot be used simultaneously.
- You can connect one WT or multiple WTs to a PC and use the software to control the them.
- The software may not operate correctly, if an adapter is inserted in the middle of the connection between the WT and the PC (for example, GP-IB-to-USB adapter).

2.3 Setting the Ethernet Control

Procedure

Starting the WT5000

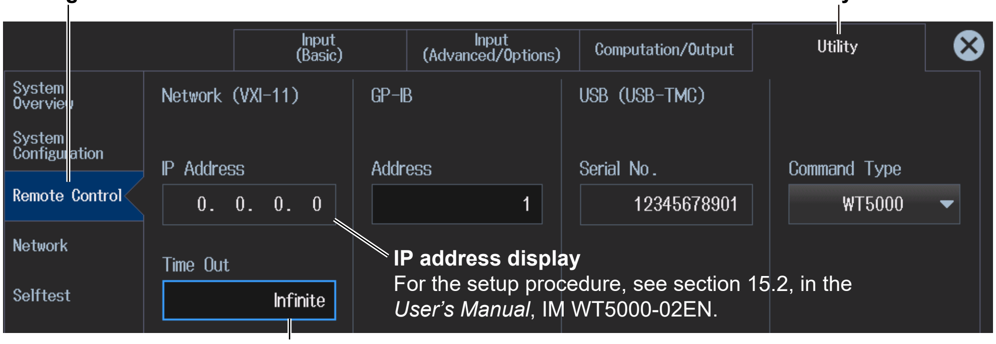
1. Turn on the WT5000 power switch to start the WT5000.

Remote Control Settings (Remote Control)

1. Refer to section 2.2, and open the utility settings overview screen.
2. Tap **Remote Control**.
   A remote control setup screen (Network (VXI-11/GP-IB/USB (USB-TMC)) appears.
3. Tap **Time Out**. Use the displayed input box to set the timeout value.

Configure remote control.

Utility tab



IP address display
For the setup procedure, see section 15.2, in the *User's Manual*, IM WT5000-02EN.

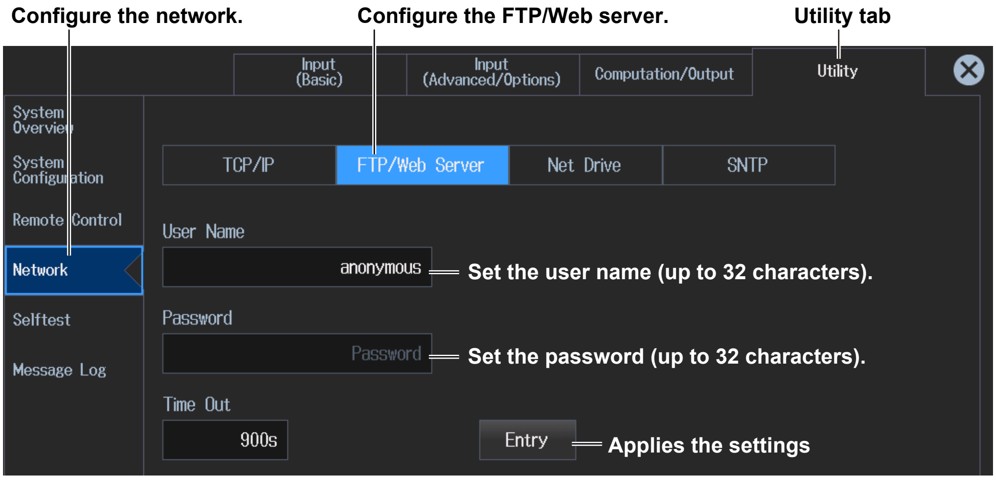
Set the timeout period (Infinite, 1 to 3600 s).

Configure the Network

Setting the User Name and Password

4. Tap **Network**. An Ethernet setup screen (TCP/IP, FTP Server, Net Drive, SNTP) appears.

5. Tap **FTP/Web Server**. An FTP/Web Server screen appears.
A password is not required if the user name is anonymous.
For the keyboard operation of the WT, see the WT user's Manual.



Configuring the TCP/IP Settings

You must enter TCP/IP settings to control the WT from a PC through the network. For the setup procedure, see the following WT user's manual.

- Features Guide (IM WT5000-01EN)
- User's Manual (IM WT5000-02EN)

Explanation

To use the software in online mode through the network, operate the WT to select Network.

Setting the User Name

- Enter the user name to allow access to the WT.
- Enter up to 32 characters.
- The characters that can be used are 0-9, A-Z, %, _, ( ) (parentheses), - (minus sign).
- If you specify anonymous, the WT can be accessed from the PC without a password.

Setting the Password

- Enter the password of the user name to allow access to the WT.
- Enter up to 32 characters.
- The characters that can be used are 0-9, A-Z, %, _, ( ) (parentheses), - (minus sign).
- If you set the user name to anonymous, the WT can be accessed from the PC without a password.

Setting the Timeout Value

The WT closes the connection to the network if there is no access for a certain period of time (timeout value).

The available settings are 1 to 3600 s, or Infinite. The default value is Infinite.

Note

- To activate the settings, you must power cycle the WT.
- When connecting the WT to a single PC and controlling the WT using this software, multiple communication interfaces cannot be used simultaneously.
- The software may not operate correctly, if an adapter is inserted in the middle of the connection between the WT and the PC (for example, GP-IB-to-USB adapter).

2.4 Setting the GP-IB Control

Procedure

Starting the WT5000

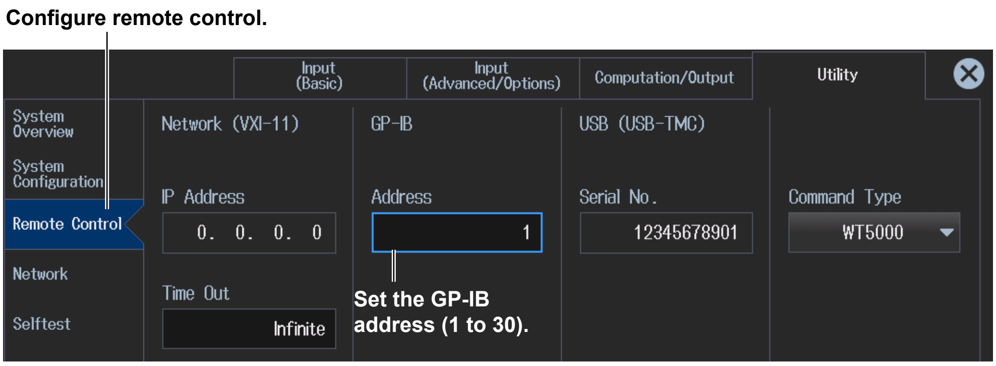
1. Turn on the WT5000 power switch to start the WT5000.

Remote Control Settings (Remote Control)

1. Refer to section 2.2, and open the utility settings overview screen.
2. Tap **Remote Control**.
   A remote control setup screen (Network (VXI-11/GP-IB/USB (USB-TMC)) appears.

Setting the GP-IB Address

3. Tap **Address**. Use the displayed input box to set the GP-IB address.



Explanation

To use the software in online mode through the GP-IB interface, operate the WT to select GP-IB.

Setting the Address

Set the WT address within the following range.
1 to 30

Each device that can be connected via GP-IB has a unique address within the GP-IB system. This address is used to distinguish the device from others. Therefore, make sure that the WT address does not overlap with other devices when connecting the WT to the PC.

Note

- Do not change the address while the controller (PC) or other devices are using the GP-IB system.
- When connecting the WT to a single PC and controlling the WT using this software, multiple communication interfaces cannot be used simultaneously.
- Use a GP-IB card by National Instruments on the PC end. For details, see section 1.2.
- The software may not operate correctly, if an adapter is inserted in the middle of the connection between the WT and the PC (for example, GP-IB-to-USB adapter).

Starting the Software

3.1 Starting the Software

Procedure

Starting the Software

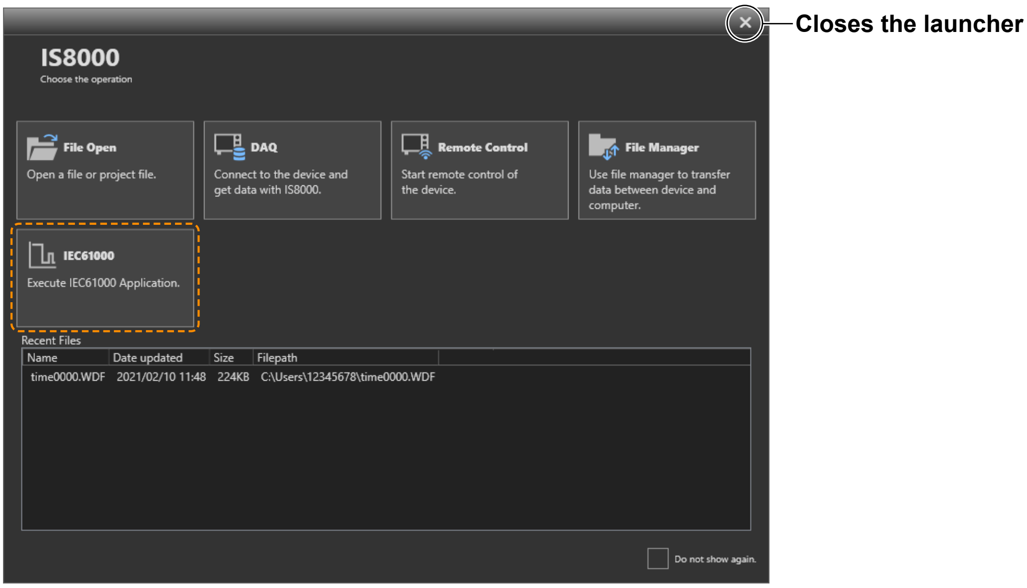
1. Use either of the following methods to start the IS8000 Software.

- Double-click the **IS8000** shortcut icon on the desktop.
- Click **Windows** (Start) > **YOKOGAWA** > **IS8000**.

The IS8000 Software launcher or start screen will appear.

► User's Manual (IM IS8000-01EN)

2. To start from the launcher, click **IEC61000**.

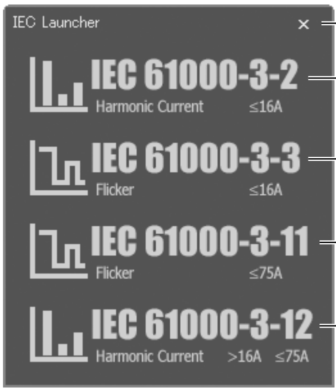


To start from the ribbon of the start screen, click the **APPs** tab and then **IEC61000**.

The IEC Launcher will appear.

Selecting a Standard

3. On the IEC Launcher, select a standard.



Close the IEC launcher

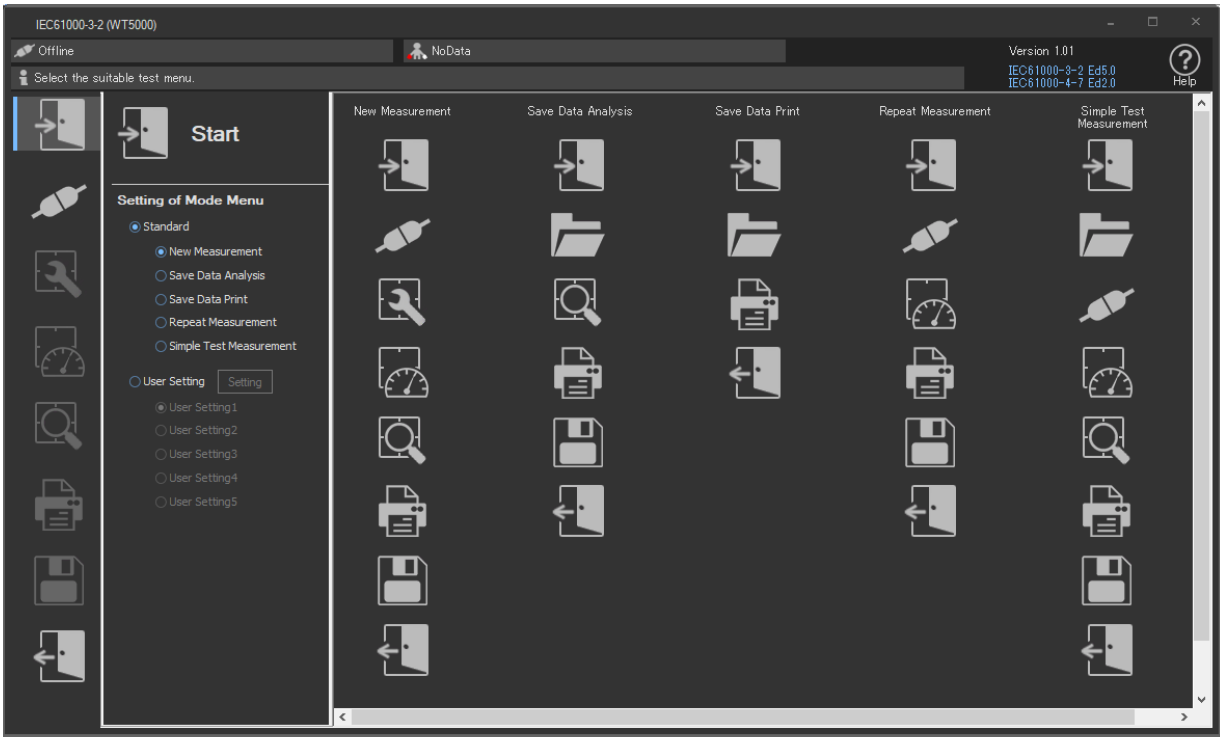
Starts the IEC 61000-3-2 Harmonic Measurement Software

Starts the IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software

Starts the IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software

Starts the IEC 61000-3-12 Harmonic Measurement Software

The software corresponding to the selected standard starts.



Explanation

You can start the IEC Launcher from the IS8000 Software launcher or from the start window ribbon.

Selecting a Standard

- When measuring the harmonics of equipment whose current is 16 A or less
  Select **IEC 61000-3-2**.
- When measuring the voltage fluctuation and flicker of equipment whose current is 16 A or less
  Select **IEC 61000-3-3**.
- When measuring the voltage fluctuation and flicker of equipment whose current is 75 A or less
  Select **IEC 61000-3-11**.
- When measuring the harmonics of equipment whose current exceeds 16 A but is less than or equal to 75 A
  Select **IEC 61000-3-12**.

3.2 Basic Operation of the Main Window

Information area

Connection status: Online/offline (see chapter 6)

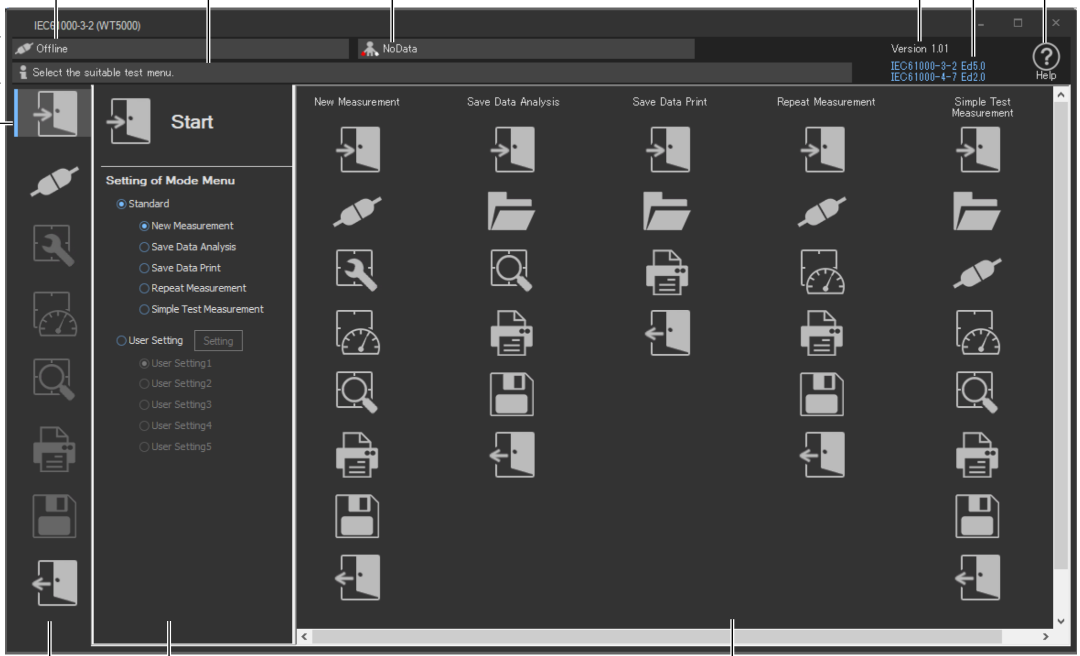
Information bar
Notices appear here.

Judgment results (chapters 7, 8, 9, 10)

Help button (chapter 13)

Compliance judgment standard number and edition

Software version



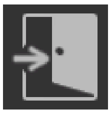
Submenu area
A submenu for the function (icon) selected in the menu area is displayed.
With the Start submenu, you can select test menus. With other submenus, a box for configuring the selected function appears.

Setting and display area
The following information is displayed.
- Configuration dialog boxes
- Measurement and judgment results
- Print previews
- Information about loaded or saved files

Menu area
The test menu items, such as Connection, Measure, and Print, appear here.
When you click an icon, its submenu appears.
Icons that cannot be selected are dimmed.

The selected icon appears highlighted.

Menu Area Icons

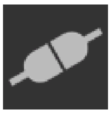


Start

Use to select and edit test menus. There are four or five preset standard test menus available in addition to custom test menus that you can make yourself (located under the "User Setting" option button).

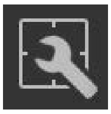
Open

Use to open the following kinds of files:
- Setting information files that contain information such as measurement conditions and judgment conditions.
- Measured data files that contain measured data acquired by the PC from a WT.



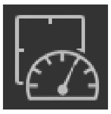
Connection

Use to connect the PC to the WT through a USB, GP-IB, or Ethernet interface.



Setting

Use to set measurement and judgment conditions.

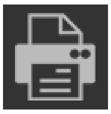


Measure

Execute a measurement.
- For harmonic measurements, you can also perform a measurement preview.
- There are two voltage and flicker measurement modes.
  - Normal voltage fluctuation and flicker measurement (General mode)
  - Measurement of dmax caused by manual switching (Manual dmax mode)

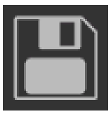
Analysis

Use to display measured results using a variety of lists and graphs.



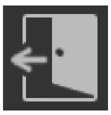
Print

You can attach comments and titles to a list of measured values and print the list as a report.



Save

Use to save the following kinds of files.
- Setting information files that contain information such as measurement conditions and judgment conditions.
- Measured data files that contain measured data acquired by the PC from a WT.
- CSV files that contain measured data.



Exit

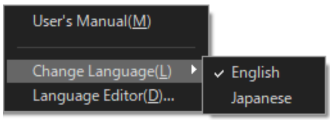
Use to close the software.

3.3 Setting and Editing the Displayed Language

Procedure

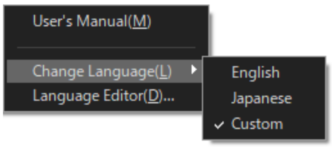
Setting the Displayed Language

1. Right-click the **help** button.
2. Click **Change Language**.
3. Select the language you want to use.



Customizing the Displayed Language

You can customize the displayed language by editing the language information file.
If there is a language information file that you create (custom file), the submenu will appear as follows. For details on editing and saving language information files, see “Editing the Displayed Language.”

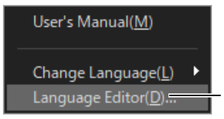


Select **Custom** to load the custom file.

Editing the Displayed Language

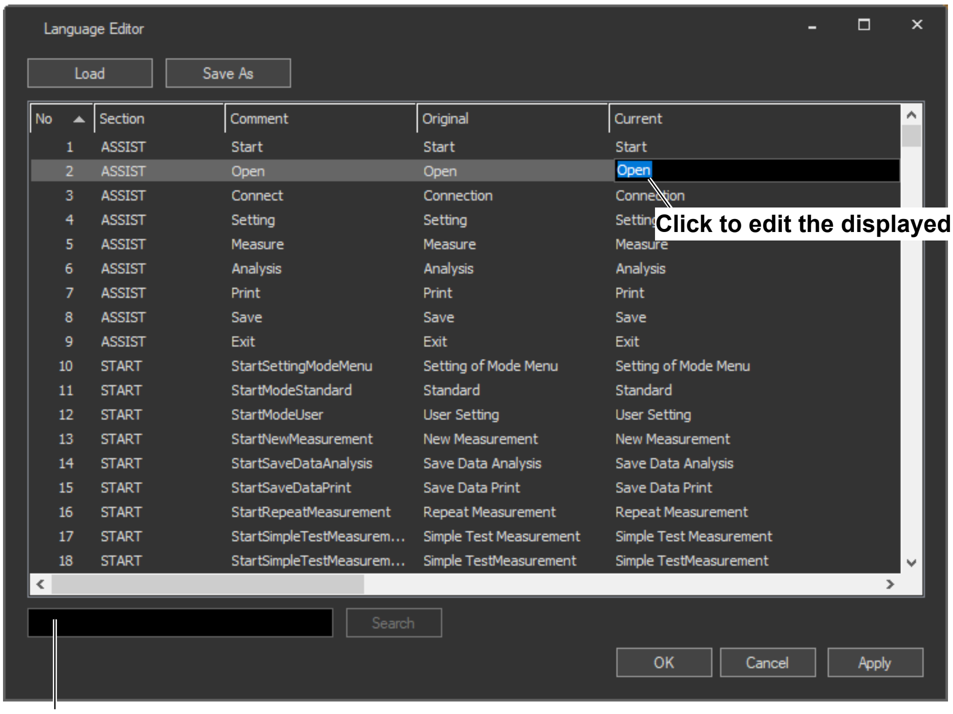
You can edit the text that is displayed in the dialog boxes and windows of the software.

1. Right-click the **help** button.
2. Click **Language Editor**.



Edit the displayed language.

3. In the Language Editor dialog box, click the cells in the Current column to edit the text to display.



Click to edit the displayed character string.

You can search for a character string by entering the string here and clicking Search.

Saving the Edited Language Information

Click **Save As** to save the edited language information to a file. The file name extension is .lang.

Note

The English and Japanese language information files are in the following folder.

C:\Users\<User>\Documents\YOKOGAWA\IEC61000 Analysis Software for WT5000\Language

Loading Saved Language Information

Click **Load** to load a language information file into the Language Editor dialog box.

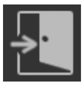
Chapter 4

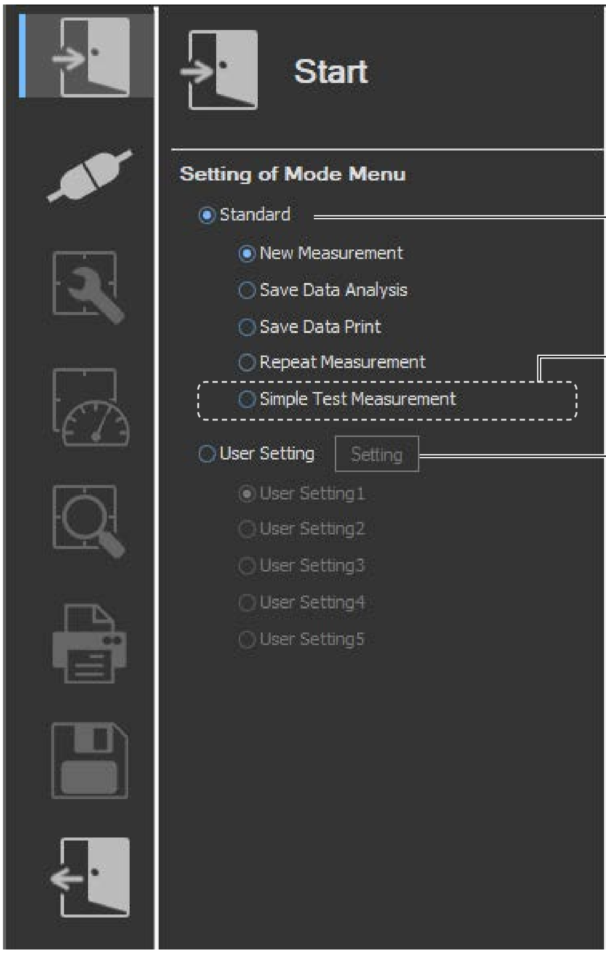
Using the Start and Exit Pages

This chapter explains how to start and close various software applications, by mainly using the screens of the IEC 61000-3-2 Harmonic Measurement Software as an example.

4.1 Selecting a Test Menu

Procedure

1. Click  in the menu area. The Start submenu appears.



Standard (page 4-2)
There are four or five test menus.

This test menu appears only for IEC 61000-3-2 harmonic measurement.

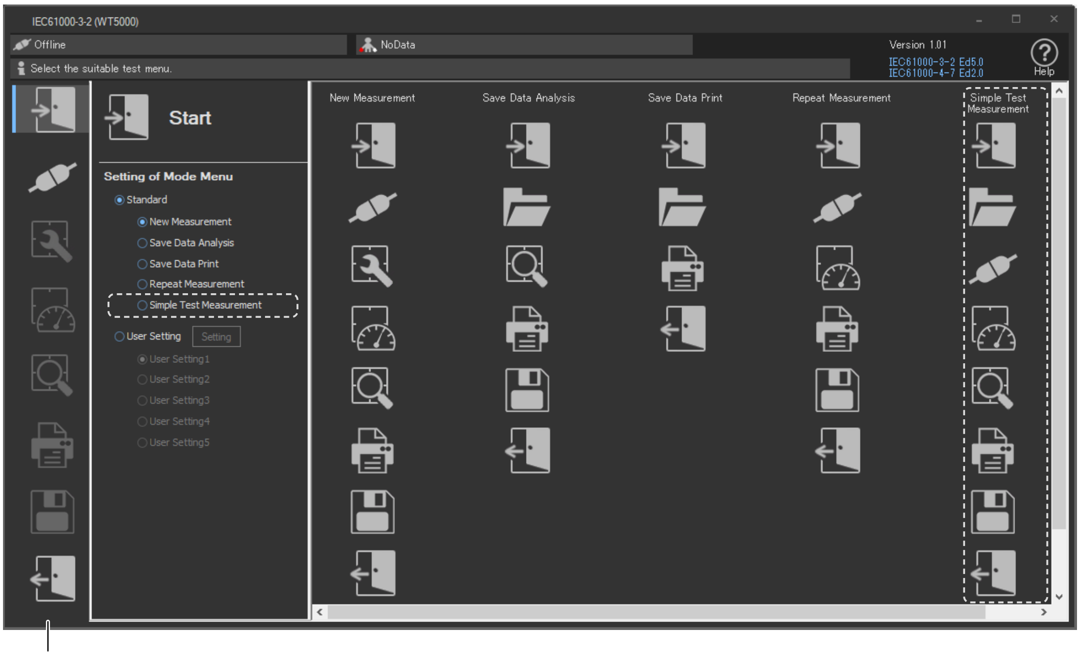
User Settings (page 4-3)
You can select and edit specific custom test menus.

Selecting One of the Standard Test Menus

2. Click **Standard**.

3. Select one of the following test menus. The test menu that you select will appear in the menu area on the left.

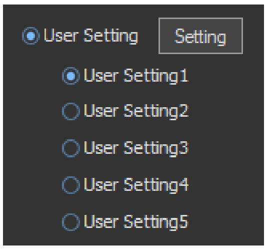
- New Measurement
- Save Data Analysis
- Save Data Print
- Repeat Measurement
- Simple Test Measurement (inside the dotted frame in the figure below; appears only for IEC 61000-3-2 harmonic measurement)



Menu area
The icons of the test menu that you select appear.

Creating Your Own Custom Test Menu (User Setting)

2. Click **User Setting**.

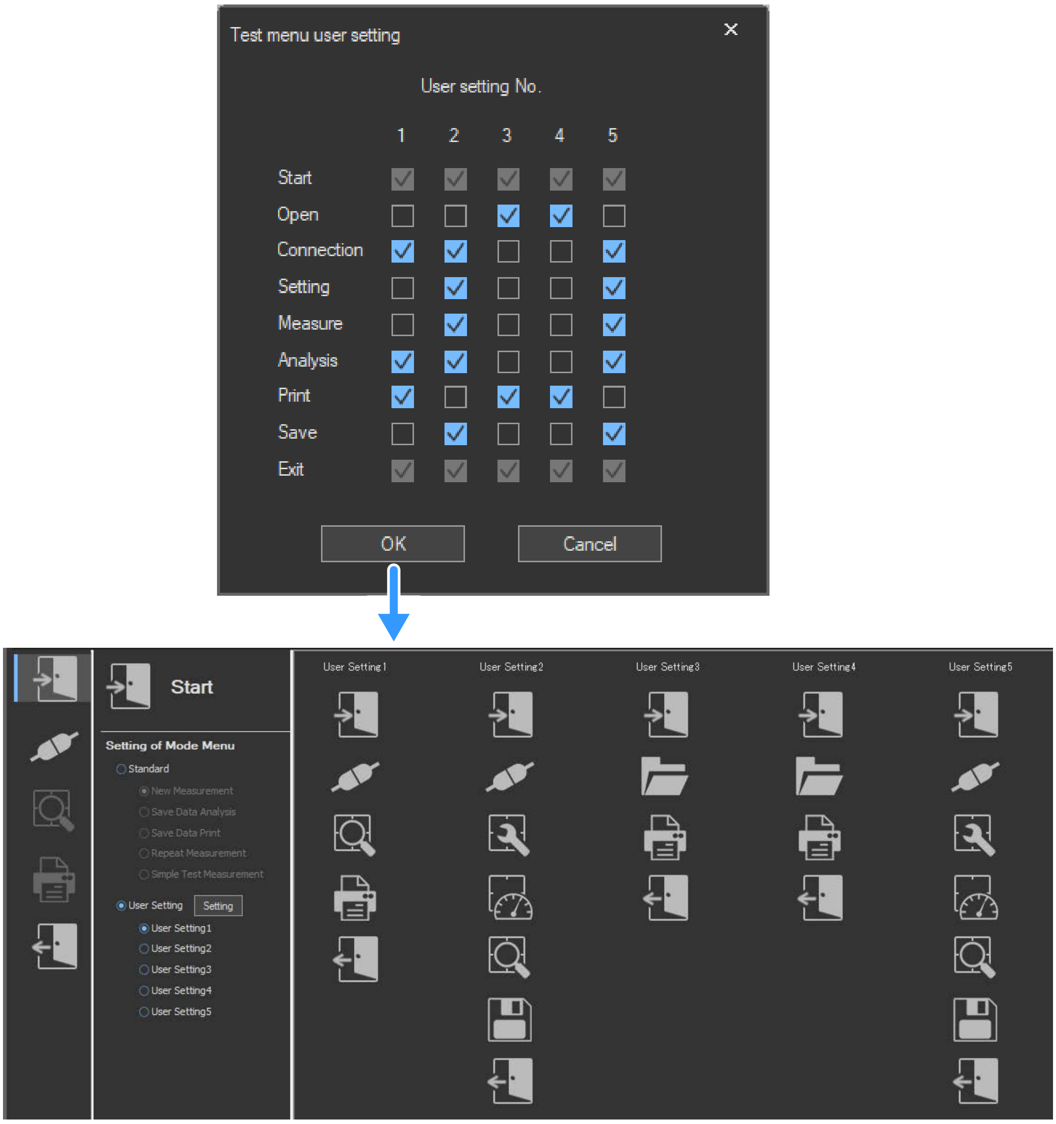


3. Click **Setting**. The menu customization dialog box opens (the dialog box is labeled “Test menu user setting”).

4. Use the check boxes to select the steps that you want to include in each of the custom test menus (labeled as “User Setting #” in the start window).

5. Click **OK**.

6. Select the custom test menu that you want to use from “User Setting” 1 to 5. The icons representing the steps that are included in the custom test menu that you select will appear in the menu area on the left.



Explanation

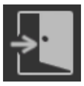
Standard Menus

For IEC 61000-3-2 harmonic measurement, five standard menus are available. For IEC 61000-3-3, IEC 61000-3-11, and IEC 61000-3-12, four standard menus are available.

Test Menu	Description
New Measurement	Set measurement and judgment conditions, make measurements, and then print and save the data.
Save Data Analysis	Analyze, print, and save data that was measured and saved in the past.
Save Data Print	Print data that was measured and saved in the past.
Repeat Measurement	Make measurements with the same measurement and judgment conditions that you used for the previous measurement, and print and save data without analyzing it.
Simple Test Measurement	This is a test menu for IEC 61000-3-2 harmonic measurement. A simple test can only be performed if the conditions for applying the simple test have been met in the previous compliance test (see section 1.3). In the simple test measurement, the input power and the THD of the input power are measured.

Selecting a Test Menu

A test menu lays out the overall test structure. You can choose from test menus that contain different combinations of the following 9 steps. For more information on each step, see “Setting Up Test Menus” (page 1-2).


Start: Select and edit test menus.


Open: Load measured data and WT setting information files.


Connection: Configure the connection between the PC and a WT.

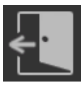

Setting: Set compatibility and measurement conditions.


Measure: Measure voltage fluctuation and flicker.


Analysis: Display measured results as bar and trend graphs.


Print: Print screen images and reports.


Save: Save measured data and setting information files.


Exit: Close the software.

Setting Up Custom Test Menus

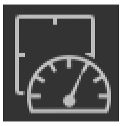
You can create custom test menus by selecting what steps to include in them. You can create up to five different custom test menus.

- Start and Exit steps are always selected. You cannot unselect them.
- The steps are arranged in the order that they appear in the menu customization dialog box. You cannot change this order.

Icon Activation/Deactivation

Some icons are not available depending on the connection status with the WT or the availability of measured data. These types of icons appear dimmed.

Selectable (activated)



Not selectable (deactivated)

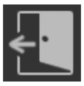
For example, the Measure icon cannot be selected when the Connection menu has been set such that the software is in offline mode. Icons such as Open, Connection, and Setting cannot be selected during measurement.

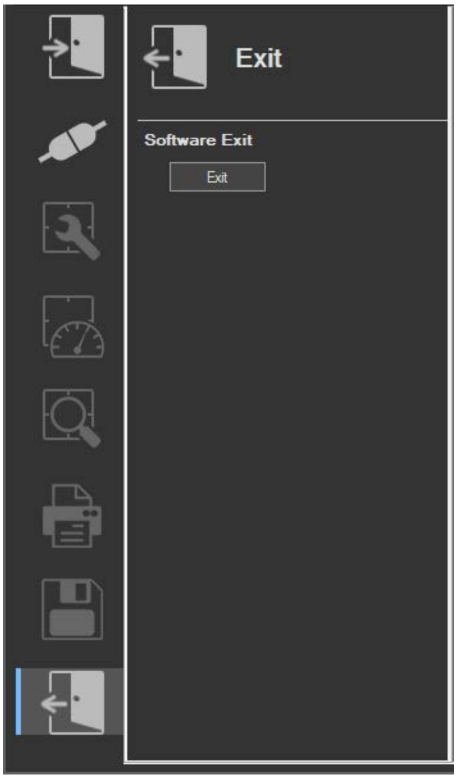
The following table shows when certain icons cannot be selected.

Start	During measurement
Open	During measurement
Connection	During measurement
Setting	During measurement
Measurement	When the software is in offline mode
Analysis	During measurement or when there is no measured data
Print	During measurement or when there is no measured data
Save	During measurement or when there is no measured data
Exit	During measurement

4.2 Closing the Software

Procedure

1. Click  in the menu area. The Exit submenu appears.

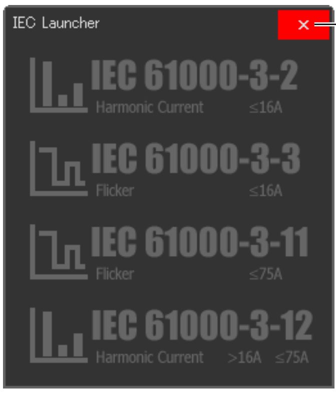


Exiting from the Software

2. Click **Exit**. The software closes.

Closing the IEC Launcher

3. Click the close button in the upper right of the window.



Closes the IEC launcher

When a Power Supply Device Is in Use

4. Turn off the power supply, regardless of the power supply on/off state.

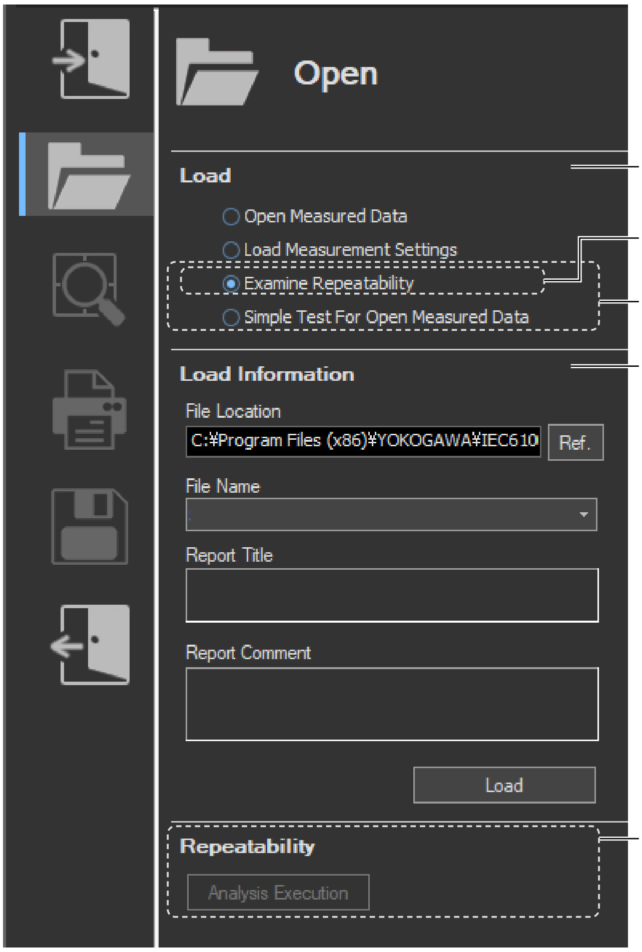
Using the Open Page to Load Setting Information and Measured Data

This chapter explains how to use the software applications to load setting information of the WT and power supply and measured data, by mainly using the screens of the IEC 61000-3-2 Harmonic Measurement Software as an example.

5.1 Loading Setting Information and Measured Data

Procedure

1. Click  in the menu area. The Open submenu appears.



Load (page 5-2)
Select the type of data to load.

Displayed for IEC 61000-3-12 harmonic measurement

Displayed for IEC 61000-3-2 harmonic measurement

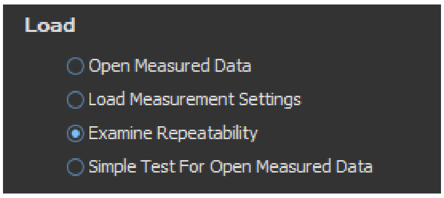
Load information (page 5-2)
Select a file to open. When you select a file, its information appears.

Repeatability (section 5.2)
Analyzes the repeatability of measured data.
(Appears only when Load (see above) is set to Examine Repeatability)

Selecting the Type of Data to Load

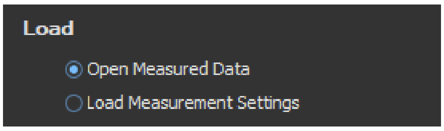
2. Select one of the two data types listed under Load.

IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software



* The Simple Test For Open Measured Data option appears only for IEC 61000-3-2.

IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software



Note

- In the test menu described in section 4.1, select Simple Test Measurement, and only if you are about to execute a simple compliance test, select the Simple Test For Open Measured Data option.
- If you have already executed a test and want to analyze the saved compliance test results or simple compliance test results, select the Open Measured Data option.
- Power supply setting information is saved in .ini files. If the power supply function is in use, the power supply setting information is loaded.

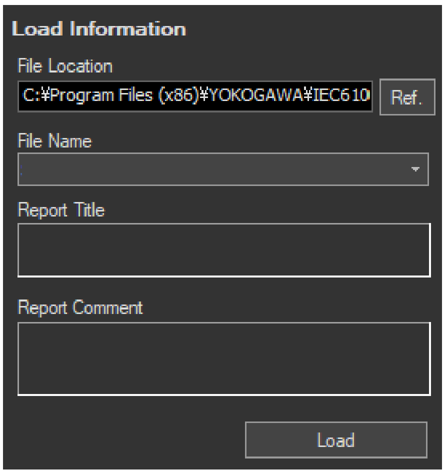
Selecting the File to Load

3. Specify the file location. There are two places where you can specify the file location.
- Under Load Information in the submenu
- At the top of the setting and display area

When you specify the file location, information about the files that can be loaded appears in the setting and display area.

4. Select a file to open. When there is more than one available file, you can select which file to open using one of the following two methods.
- Click next to the File Name box under Load Information. A list of available files appears. Select a file from the list.
- Select a file to open from one of the files listed in the setting and display area.

5. Click **Load**, or double-click the file you want to open. The software will open the measured data or setting information file.



Note

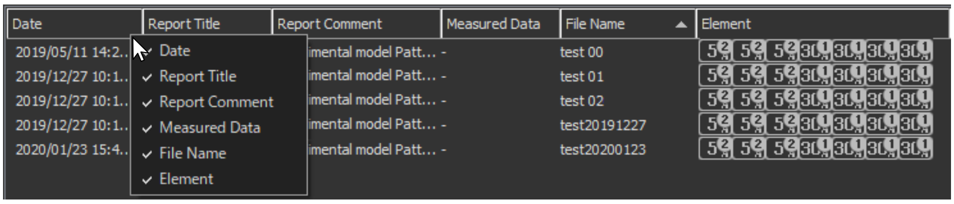
- When the software is in online mode, it will switch to offline mode if you load setting information or measured data.
- If an error occurs while loading the setting information, the settings are reset to their default values.
- If an error occurs while loading measured data or setting information, the data may not be loaded properly. Confirm the filename and extension and then reopen the file.
- You cannot load setting information, measured data, or waveform data while making measurements.

Configuring File Information Display Settings

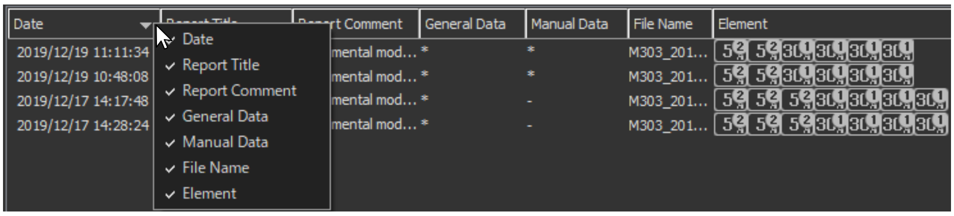
1. Right-click the file information heading area at the top of the setting and display area. A list of the different types of information that can be displayed appears.

2. Select the type of information that you want to display.

IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software



IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software



Explanation

Loading Setting Information

You can load the setting information that has been saved using the procedure given in section 11.1.

- The setting information display varies depending on the software.
  - **IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software**
    A hyphen appears in the Measured Data column of the file information display area.
  - **IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software**
    A hyphen appears in the General Data and Manual Data columns of the file information display area.
- File name extension: .ini
- Setting information files contain the following:
  - Measurement and judgment conditions
    Data that has been acquired from the WT or loaded from a file can be judged using loaded judgment conditions.
    - IEC 61000-3-2 ► sections 7.3, 7.4
    - IEC 61000-3-3 ► sections 8.3, 8.4
    - IEC 61000-3-11 ► sections 9.3, 9.4
    - IEC 61000-3-12 ► sections 10.3, 10.4

    Display settings (Measure, Analysis): Harmonic measurement only
    - IEC 61000-3-2 ► Measure: page 7-37, Analysis: page 7-71
    - IEC 61000-3-12 ► Measure: page 10-22, Analysis: page 10-35

    Trend graph and CPF graph display settings: Voltage fluctuation and flicker measurement only
    - IEC 61000-3-3 ► Trend graph: section 8.10, CPF graph: section 8.11
    - IEC 61000-3-11 ► Trend graph: section 9.10, CPF graph: section 9.11
  - Report titles and comments (see section 11.1)
  - You can put comments and titles on reports of data acquired from the WT or loaded from files, and then print and save the reports. For more information about printing and saving, see chapters Chapter 11 and Chapter 12.
  - If you used a power supply, the power supply setting information is also saved.

Loading Measured Harmonic Data

On the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software, you can load the measured data, waveform data, and setting information that has been saved using the procedure described in section 12.1. The seed to data can be analyzed and printed offline.
The following two types of measured data files are available.

Files that only contain the measured data of compliance tests (do not contain the measured data of simple tests)

- An asterisk appears in the Measured Data column of the file information display area.
- Files are composed of two types of files with the following extensions.
  Extension: .fdt Measured data (compliance test data)
  .ini Setting information

When measured data of the WT3000E/WT3000 series is loaded

- "*(Old)" appears in the Measured Data column of the file information display area.
- You cannot perform rejudgment by changing the conditions of the standard because this is an offline analysis.

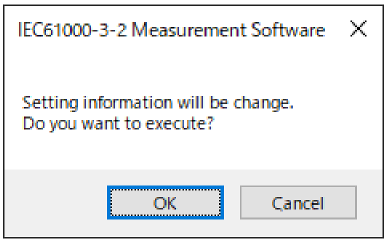
Files that contain both the measured data of compliance tests and the measured data of simple tests

- These files are saved when you select Simple Test Measurement in the test menu described in section 4.1, execute a simple compliance test, and save the measured data of the test.
- Two asterisks appear in the Measured Data column of the file information display area.
- Files are composed of two types of files with the following extensions.

  Extension: .fdt Measured data (The following two types of data are included.)
  - Simple test data
  - Compliance test data that has been specified as the test reference for the simple test

  .ini Setting information

Measurement data contains the setting information that was used to measure the data. When you load the measured data, the setting information will also be loaded.



When the data is loaded, the judgment result is displayed.

Display example: PASS

Note

- Simple test is a test menu only available for IEC 61000-3-2.
- This software cannot load CSV files.
- You cannot load measured data, waveform data, or setting information while running the harmonic or waveform preview on the Measure page.

Loading Measured Data for Simple Tests

(Only for IEC 61000-3-2)

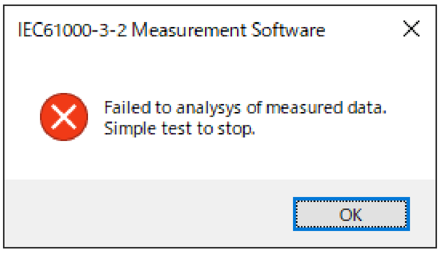
To perform a simple test on the IEC 61000-3-2 Harmonic Measurement Software, you must load the measured data of the compliance test that will be used as the test reference of the simple test.

You can load the measured data that you saved in section 12.1. The following two types of measured data files can be loaded.

- Files that only contain the measured data of compliance tests (do not contain the measured data of simple tests)
- Files that contain both the measured data of compliance tests and the measured data of simple tests

For details, see "Loading Measured Harmonic Data" on page 5-4.

When the measured data of the compliance test that will be used as the test reference is loaded, the software determines whether the conditions for applying the simple test (see section 1.4) have been met. If the conditions have not been met, the message below will appear. If this message appears, you cannot execute the simple test.



Loading Measured Data and Setting Information for Voltage Fluctuation and Flicker

On the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurements Software, you can load the measured data and setting information that has been saved using the procedure described in section 12.1.

- An asterisk appears in the General Data and Manual Data columns for files that contain measured data.
- Files that contain measured data are composed of two types of files with the following extensions.

Extension:	.fdt	Measured data
	.ini	Setting information

When measured data of the WT3000E/WT3000 series is loaded

- "*(Old)" appears in the General Data and Manual Data columns of the file information display area.
- You cannot perform rejudgment by changing the conditions of the standard because this is an offline analysis.

Note

You cannot load setting information unless the flicker measurement status is Reset. For more information about the flicker measurement status, see page 8-36 or page 8-47 for IEC 61000-3-3 or page 9-40 or page 9-51 for IEC 61000-3-11.

Kinds of File Information

Date

When the file was saved. Displayed in this format: year/month/day hour:minute:second

Report Title (See section 11.1)

Report Comment (See section 11.1)

Measured Data

Displayed on the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software

-	Setting information file
*(Old)	Setup parameter file of the WT3000E/WT3000 series
*	Files that only contain the measured data of compliance tests (do not contain the measured data of simple tests)
**	Files that contain both the measured data of compliance tests and the measured data of simple tests

General Data

Displayed on the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software

*(Old)	Setup parameter file of the WT3000E/WT3000 series
*	File containing data measured in General mode (normal voltage fluctuation and flicker measurement)

Manual Data

Displayed on the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software

*(Old)	Setup parameter file of the WT3000E/WT3000 series
*	File containing data measured in Manual dmax mode (measurement of dmax caused by manual switching).

File Name (See section 12.1)

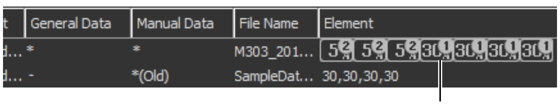
Element configuration

The WT5000 element configuration is displayed with icons in order from elements 1 to 7 from the left and.

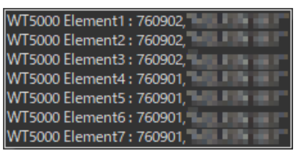
When measured data of the WT3000E/WT3000 is loaded, elements are displayed with numbers.

IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software

IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software



Moving the mouse pointer over a line in the element configuration shows the detailed element information (model, instrument number).



Sorting the file list

You can sort the list of loaded files in ascending or descending order by clicking an item heading area. The sorted item heading area shows ▲ (ascending) or ▼ (descending).

5.2 Checking the Repeatability of the Measured Data (Harmonics)

This function is available on the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software.

Procedure

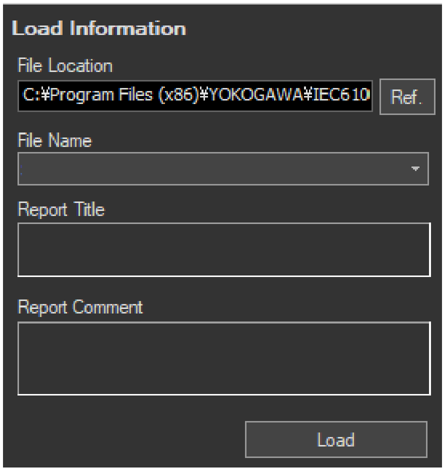
1. Click  in the menu area. The Open submenu appears. For general information about submenus, see section 5.1.

2. Select **Examine Repeatability** listed under Load.

Selecting the File to Load

3. Specify the file location. There are two places where you can specify the file location.

- Under Load Information in the submenu



- Upper portion of the setting and display area (see the figure on the next page)
  When you specify the file location, information about the files that can be loaded appears in the setting and display area.

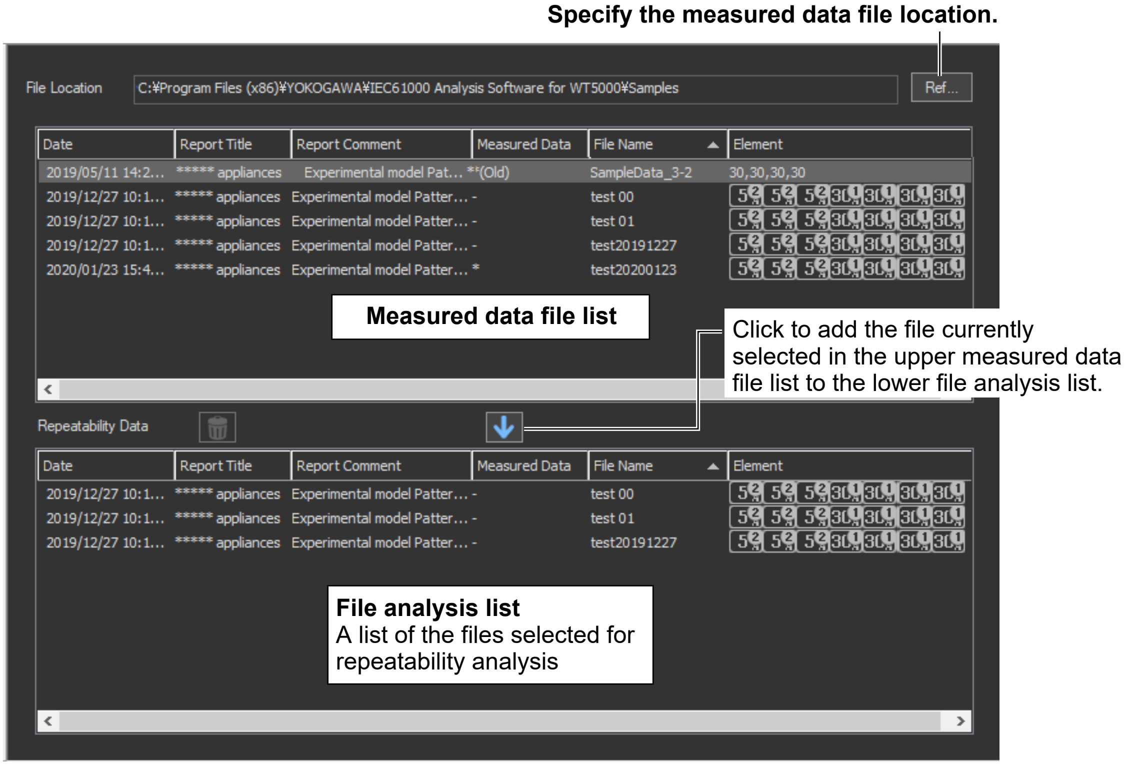
4. Select the file you want to load. You can select which file to open using one of the following five methods. Information about the selected file is displayed at the bottom of the setting and display area in the file analysis list.

- Click next to the File Name box under Load Information. A list of available files appears. Select a file from the list and Click **Load**.
- Double-click a file in the measured data file list.
- Drag a file from the measured data file list to the file analysis list.
- Click  while a file is selected in the measured data file list.
- Right-click a file in the measured data file list, and then click **Add**.

Note

This software can load data saved in files with .fdt and .ini extensions. This software cannot load CSV files (files with .csv extensions).

5. Repeat step 4 to select all of the files that you want to compare.



Unselecting a File Selected for Analysis

6. To unselect a file selected for analysis:

- Click while a file is selected in the file analysis list.
- Drag a file in the file analysis list to .
- Press **Delete** key while a file is selected in the file analysis list.
- Right-click a file in the file analysis list, and then click **Delete**.

Starting Analysis

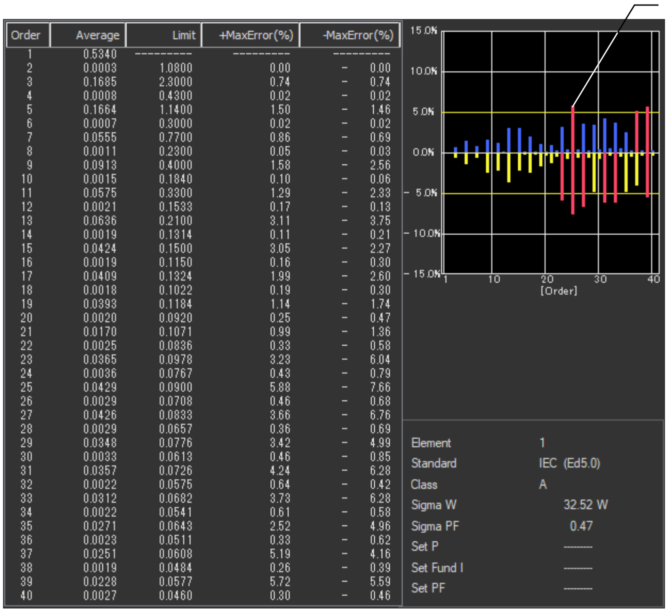
7. Click **Analysis Execution**. The analysis menu appears, and the results of the analysis of the measured data's repeatability appear.

Note

- For multi-phase equipment, it is recommended that files of the same input element (same phase) be selected and the data be compared. The repeatability cannot be evaluated correctly when using measured data of different phases.
- If only one file has been selected for analysis, the Analysis Execution button will be unavailable.
- If the software is in online mode, it will switch to offline mode when analysis starts.
- In the analysis menu, items other than repeatability will be dimmed and unavailable.
- When you start analysis, the Measure, Print, and Save menus will be dimmed and unavailable.

Example of Comparison: The difference at the 25th harmonic exceeds 5 %.

25th harmonic component

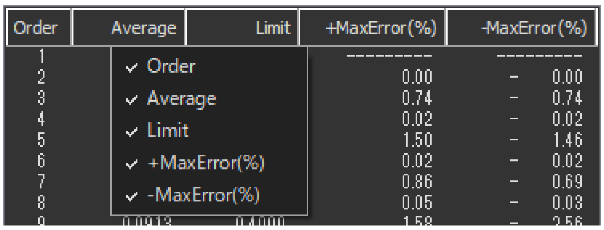


Order	Average	Limit	+MaxError(%)	-MaxError(%)
1	0.5340	----------	----------	----------
2	0.0003	1.0800	0.00	– 0.00
3	0.1685	2.3000	0.74	– 0.74
4	0.0008	0.4300	0.02	– 0.02
5	0.1664	1.1400	1.50	– 1.46
6	0.0007	0.3000	0.02	– 0.02
7	0.0555	0.7700	0.86	– 0.69
8	0.0011	0.2300	0.05	– 0.03
9	0.0913	0.4000	1.58	– 2.56
10	0.0015	0.1840	0.10	– 0.06
11	0.0575	0.3300	1.29	– 2.33
12	0.0021	0.1533	0.17	– 0.13
13	0.0636	0.2100	3.11	– 3.75
14	0.0019	0.1314	0.11	– 0.21
15	0.0424	0.1500	3.05	– 2.27
16	0.0019	0.1150	0.16	– 0.30
17	0.0409	0.1324	1.99	– 2.60
18	0.0018	0.1022	0.19	– 0.30
19	0.0393	0.1184	1.14	– 1.74
20	0.0020	0.0920	0.25	– 0.47
21	0.0170	0.1071	0.99	– 1.36
22	0.0025	0.0836	0.33	– 0.58
23	0.0365	0.0978	3.23	– 6.04
24	0.0036	0.0767	0.43	– 0.79
25	0.0429	0.0900	5.88	– 7.66
26	0.0029	0.0708	0.46	– 0.68
27	0.0426	0.0833	3.66	– 6.76
28	0.0029	0.0657	0.36	– 0.69
29	0.0348	0.0776	3.42	– 4.99
30	0.0033	0.0613	0.46	– 0.85
31	0.0357	0.0726	4.24	– 6.28
32	0.0022	0.0575	0.64	– 0.42
33	0.0312	0.0682	3.73	– 6.28
34	0.0022	0.0541	0.61	– 0.58
35	0.0271	0.0643	2.52	– 4.96
36	0.0023	0.0511	0.33	– 0.62
37	0.0251	0.0608	5.19	– 4.16
38	0.0019	0.0484	0.26	– 0.39
39	0.0228	0.0577	5.72	– 5.59
40	0.0027	0.0460	0.30	– 0.46

Configuring File Information Display Settings

1. Right-click the file information heading area at the top of the setting and display area. A list of the different types of information that can be displayed appears.

2. Select the type of information that you want to be displayed.



Note

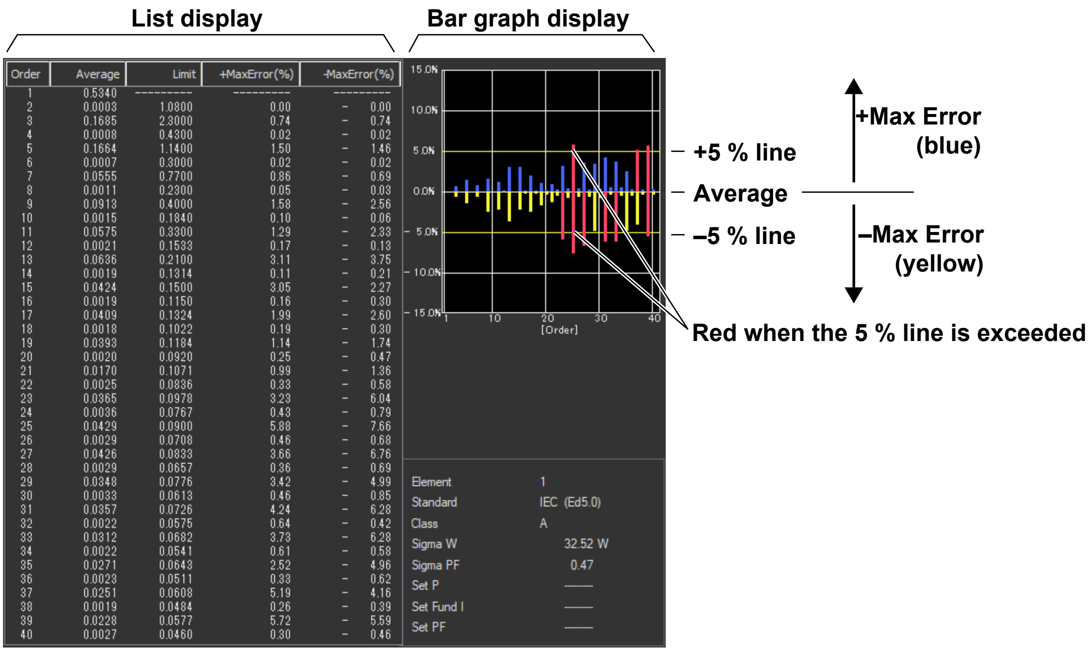
The order is always displayed. You cannot hide it.

Explanation

The mean value in the harmonics measurement data saved to files can be compared, and the difference in the measured data can be displayed on a bar graph and list for each harmonic. This function can be used to evaluate whether the difference between data measured under the same measurement conditions when harmonics are measured using the same product or same product model is within ±5 % of the limits (confirmation of repeatability).

Repeatability of Measurement Data Window

The following figure shows an example of comparison.



Order	Average	Limit	+MaxError(%)	-MaxError(%)
1	0.5340	---------	---------	---------
2	0.0003	1.0800	0.00	– 0.00
3	0.1685	2.3000	0.74	– 0.74
4	0.0008	0.4300	0.02	– 0.02
5	0.1664	1.1400	1.50	– 1.46
6	0.0007	0.3000	0.02	– 0.02
7	0.0555	0.7700	0.86	– 0.69
8	0.0011	0.2300	0.05	– 0.03
9	0.0913	0.4000	1.58	– 2.56
10	0.0015	0.1840	0.10	– 0.06
11	0.0575	0.3300	1.29	– 2.33
12	0.0021	0.1533	0.17	– 0.13
13	0.0636	0.2100	3.11	– 3.75
14	0.0019	0.1314	0.11	– 0.21
15	0.0424	0.1500	3.05	– 2.27
16	0.0019	0.1150	0.16	– 0.30
17	0.0409	0.1324	1.99	– 2.60
18	0.0018	0.1022	0.19	– 0.30
19	0.0393	0.1184	1.14	– 1.74
20	0.0020	0.0920	0.25	– 0.47
21	0.0170	0.1071	0.99	– 1.36
22	0.0025	0.0836	0.33	– 0.58
23	0.0365	0.0978	3.23	– 6.04
24	0.0036	0.0767	0.43	– 0.79
25	0.0429	0.0900	5.88	– 7.66
26	0.0029	0.0708	0.46	– 0.68
27	0.0426	0.0833	3.66	– 6.76
28	0.0029	0.0657	0.36	– 0.69
29	0.0348	0.0776	3.42	– 4.99
30	0.0033	0.0613	0.46	– 0.85
31	0.0357	0.0726	4.24	– 6.28
32	0.0022	0.0575	0.64	– 0.42
33	0.0312	0.0682	3.73	– 6.28
34	0.0022	0.0541	0.61	– 0.58
35	0.0271	0.0643	2.52	– 4.96
36	0.0023	0.0511	0.33	– 0.62
37	0.0251	0.0608	5.19	– 4.16
38	0.0019	0.0484	0.26	– 0.39
39	0.0228	0.0577	5.72	– 5.59
40	0.0027	0.0460	0.30	– 0.46

Maximum (Mnmax)

Maximum value among the average values of each harmonic

Minimum (Mnmin)

Minimum value among the average values of each harmonic

Average (Mnmean)

Average of the average values of each harmonic of the selected file

+Max Error

Ratio (%) of the difference between Mnmax and Mnmean of each harmonic

$$\frac{\text{Mnmax} - \text{Mnmean}}{\text{Limit}} \times 100$$

–Max Error

Ratio (%) of the difference between Mnmin and Mnmean of each harmonic

$$\frac{\text{Mnmin} - \text{Mnmean}}{\text{Limit}} \times 100$$

Color

Bar Graph

The bar graph that is displayed for each harmonic is displayed using a length converted from the +Max Error or –Max Error. The meaning of the colors is indicated in the following table.

Blue	Difference (error) less than the +5 % line for +Max Error.
Yellow	Difference (error) less than the –5 % line for –Max Error.
Red	Difference (error) greater than or equal to the +5 % line for +Max Error. Difference (error) greater than or equal to the –5 % line for –Max Error.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

List

The average, limit, +maximum error, and –maximum error for each harmonic are displayed using values in black.

Number of Files That Can Be Compared

To evaluate the repeatability of the measured data, multiple files must be selected.
Number of files that can be compared: 2 to 10

Note

- For multi-phase equipment, it is recommended that files of the same input element (same phase) be selected and the data be compared. The repeatability cannot be evaluated correctly when using measured data of different phases.
- Even if only one file is selected, the Repeatability of Measurement Data window will open. In this case, no comparison is made.
- To evaluate the repeatability, check that the measured data saved to the file to be compared was measured under the following conditions.
  - Same DUT (not the same model, but the same equipment).
  - Same test conditions.
  - Same test equipment.
  - Same atmospheric conditions (when the DUT is affected by them).

Chapter 6

Using the Connection Page to Establish a Connection between the PC and a WT

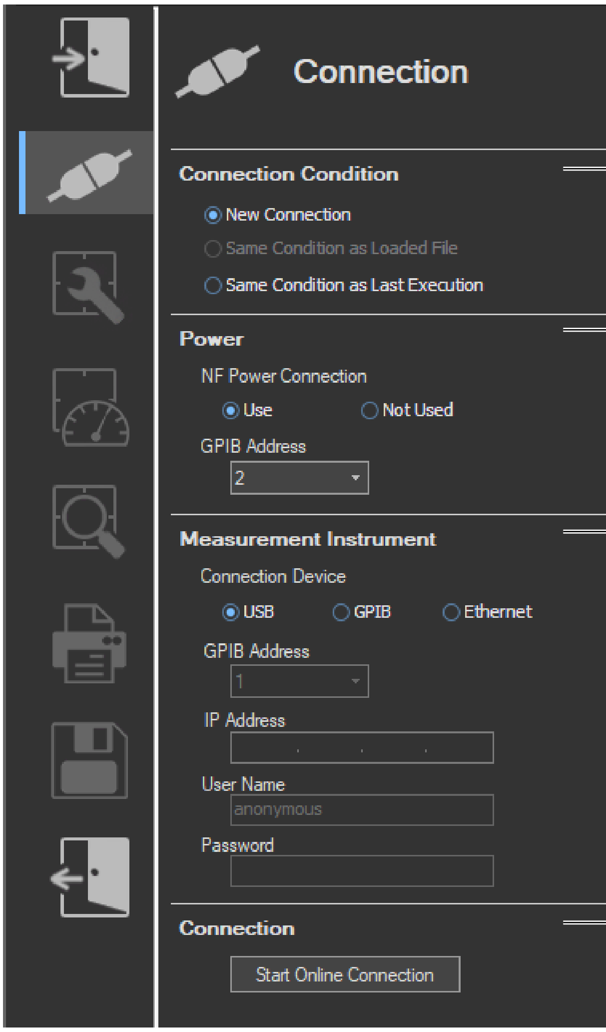
This chapter explains how to use the software applications to connect the WT to the PC as well as the power supply, by mainly using the screens of the IEC 61000-3-2 Harmonic Measurement Software as an example.

6.1 Configuring a New Set of WT-PC Communication Parameters (New connection)

Procedure

1. Click  in the menu area. The Connection submenu appears.

The connectable WTs are automatically detected when you start the software, and the information of the first connectable device found is displayed.



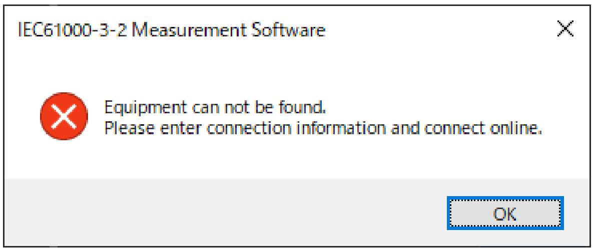
Connection condition (page 6-2)
Select the connection condition.

Connection to the power supply (page 6-2)
Configure the connection to the NF power supply.

Connection device (page 6-3)
Select the communication interface and configure the connection settings.

Connection (page 6-4)
Switch between online and offline mode.

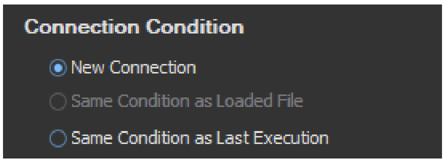
If no connectable WT is found, the following message appears.



If the above message appears, check the following items.
- Is the WT turned on?
- Is the communication interface cable connected?
- Are the communication settings (GP-IB address, IP address, etc.) of each WT unique?

Connection Condition

2. Select **New Connection**.



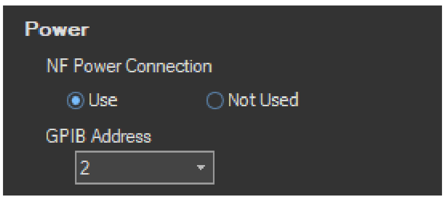
Note

- You can only select Same Condition as Loaded File if you load setting information or measured data using the procedure described in section 5.1.
- To perform a simple test, select the Same Condition as Loaded File option.
- You cannot select Same Condition as Last Execution the first time you start the software.

Configuring the Connection to the Power Supply

3. For NF Power Connection, select **Use** or **Not Used**.

4. If you select **Use**, select the GP-IB address of the target power supply.



Note

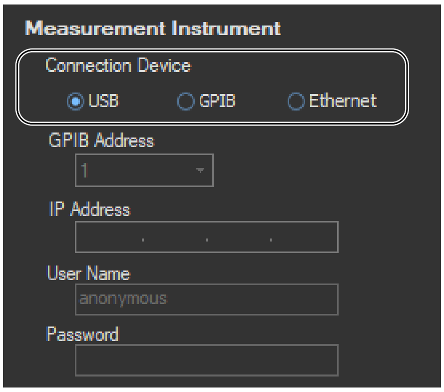
- GP-IB address 0 is reserved for the PC, so you cannot select it.
- To control the WT and NF power supply using GP-IB, set different addresses for each device. If the addresses overlap, an error dialog box will appear.

Connection Device

You can change the configuration of automatically detected devices.

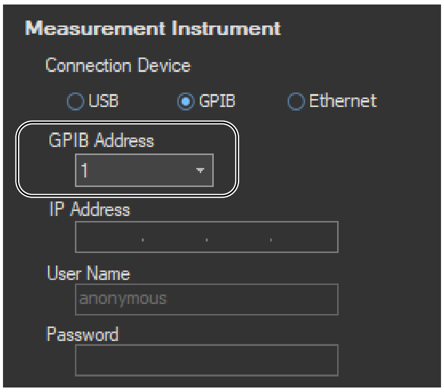
5. Select **USB**, **GPIB**, or **Ethernet**.

- If you select USB, proceed to step 8.
- If you select GP-IB, proceed to step 6.
- If you select Ethernet, proceed to step 7.



Selecting a Communication Address (GP-IB)

6. Select the GP-IB address of the WT that you intend to connect to.



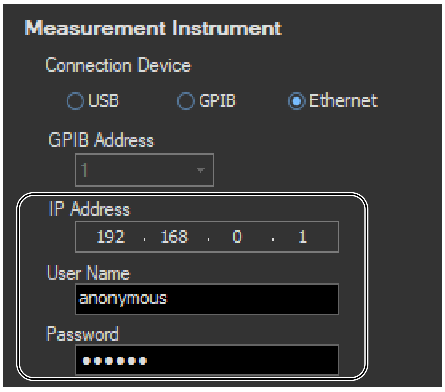
Proceed to step 8.

Note

GP-IB address 0 is reserved for the PC, so you cannot select it.

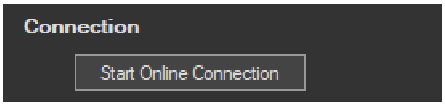
Setting the IP Address, User Name, and Password (Ethernet)

7. Set the IP address, user name, and password of the WT that you intend to connect to.



Starting the Connection

8. Click **Start Online Connection**. The software will establish a connection between the PC and the WT. When the connection is established, you can proceed to the configuration and measurement procedures explained later.



Note

- You cannot proceed to measurement, analysis, printing, or saving until an online connection has been established.
- If you click Start Online Connection and establish a connection, but the connected WT is not in a measurement-ready state, a communication error will occur. If the GP-IB address, IP address, user name, or password is wrong, or if no response is received from the WT, a communication error will occur.

Explanation

Selecting a Communication Address

GP-IB

Select the GP-IB address of the WT that you intend to connect to.

Selectable range: 1 to 30

Ethernet

- Set the IP address of the WT that you intend to connect to.
  Selectable range: 0.0.0.0 to 255.255.255.255
- You can set the user name and password of the WT that you intend to connect to.
  Usable characters: Those characters that the WT supports.

Configuring the Connection to the Power Supply

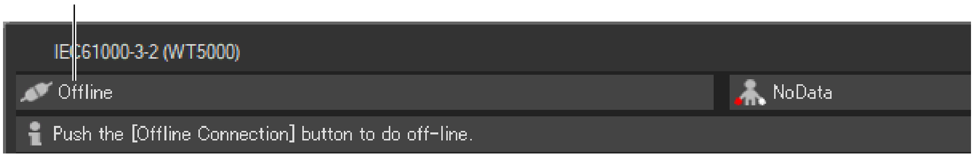
Select the GP-IB address of the target power supply.

Selectable range: 1 to 30

Connection Condition and Connection Status Display

- The connection status appears in the information area.

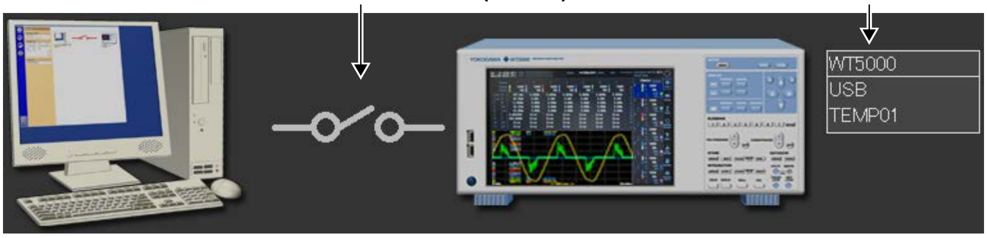
Connection state



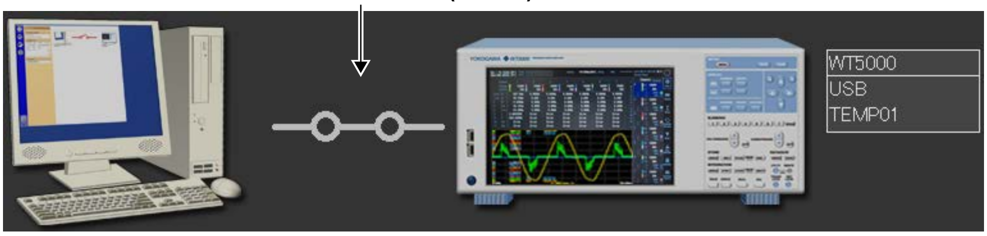
- The connection conditions that you set in the Connection submenu appear in the setting and display area along with the current connection status.

When a Power Supply Is Not in Use

Disconnected (offline) **Connection condition**



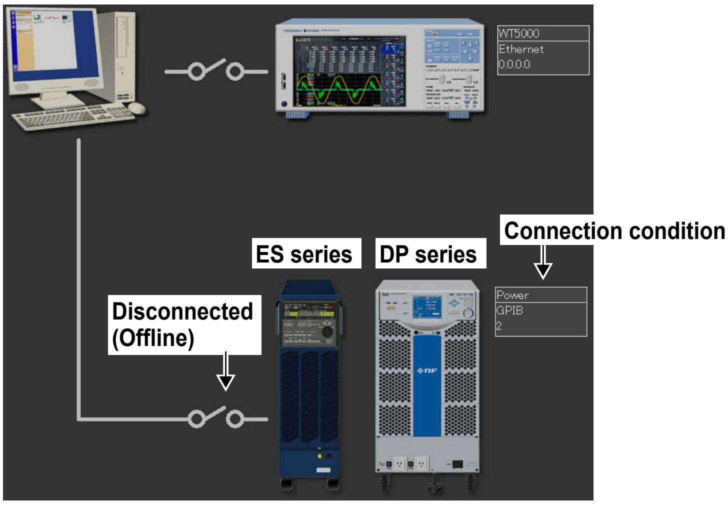
Connected (online)



When a Power Supply Is in Use

When Disconnected (offline)

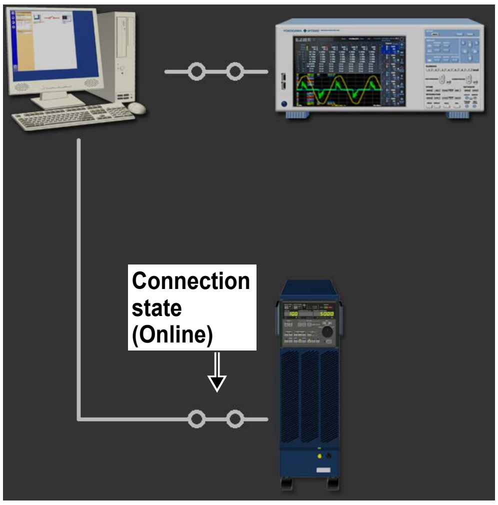
Illustration of both the ES series power supply and DP series power supply is shown.



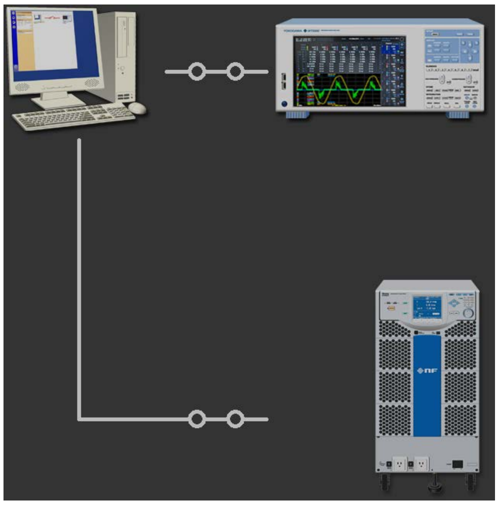
When Connected (online)

Illustration of either the ES series power supply or DP series power supply, whichever is connected, is shown.

- **When connected to an ES series power supply**



- **When connected to a DP series power supply**



Note

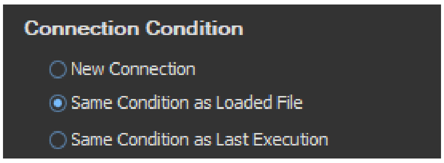
- It can take more than 10 seconds to switch from offline to online mode.
- We recommend that you use a National Instruments GP-IB card. GP-IB cards made by other companies may not function properly.

6.2 Using the Connection Settings from a Loaded File

Procedure

1. Click  in the menu area. The Connection submenu appears. For general information about submenus, see section 6.1.

2. For Connection Condition, select **Same Condition as Loaded File**.

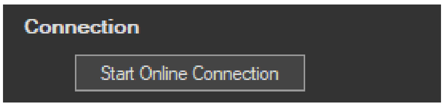


Note

- You can only select Same Condition as Loaded File if you load setting information using the process described in section 5.1.
- To perform a simple test for IEC 61000-3-2, select the Same Condition as Loaded File option.

Starting the Connection

3. Click **Start Online Connection**. The software will establish a connection between the PC and the WT. When the connection is established, you can proceed to the configuration and measurement procedures explained later.



Note

- You cannot proceed to measurement, analysis, printing, or saving until an online connection has been established.
- If you click Start Online Connection and establish a connection, but the connected WT is not in a measurement-ready state, a communication error will occur. If the GP-IB address, IP address, user name, or password is wrong, or if no response is received from the WT, a communication error will occur.

Explanation

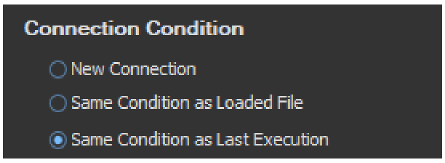
Follow this procedure to use the settings from a file that has been loaded according to the procedure described in “Loading Setting Information” in section 5.1.

6.3 Using the Same Connection Settings as Before

Procedure

1. Click  in the menu area. The Connection submenu appears. For general information about submenus, see section 6.1.

2. For Connection Condition, select **Same Condition as Last Execution**.

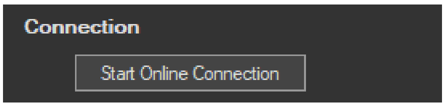


Note

- You cannot select Same Condition as Last Execution when you first start up the software.
- To perform a simple test for IEC 61000-3-2, select the Same Condition as Loaded File option.

Starting the Connection

3. Click **Start Online Connection**. The software will establish a connection between the PC and the WT. When the connection is established, you can proceed to the configuration and measurement procedures explained later.



Note

- You cannot proceed to measurement, analysis, printing, or saving until an online connection has been established.
- If you click Start Online Connection and establish a connection, but the connected WT is not in a measurement-ready state, a communication error will occur. If the GP-IB address, IP address, user name, or password is wrong, or if no response is received from the WT, a communication error will occur.

Explanation

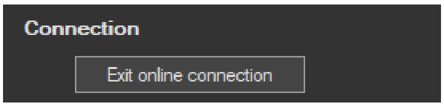
Follow this procedure to set the connection settings to the same as when you last closed this software.

6.4 Switching to Offline

Procedure

1. Click  in the menu area. The Connection submenu appears. For general information about submenus, see section 6.1.

2. When you are in online mode, click **Exit online connection**. The software will disconnect from the WT.



Chapter 7

IEC 61000-3-2 Harmonic Measurement

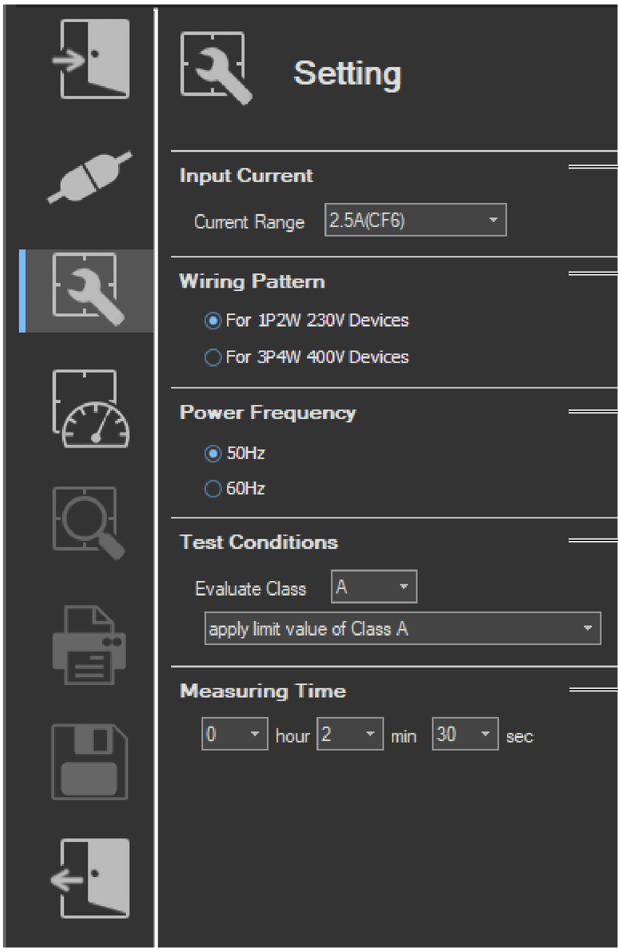
This chapter explains how to configure, measure, and analyze on the IEC 61000-3-2 Harmonic Measurement Software.

Using the Setting Page to Configure Measurement and Judgment Conditions

7.1 Setting General Test Conditions

Procedure

1. Click  in the menu area. The Setting submenu appears.



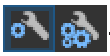
Input current
Select the current range to measure.

Wiring pattern (next page)
Select the wiring pattern of the circuit you will measure.

Power frequency ▶ section 7.2

Test conditions (next page)
Set the test conditions.

Measurement time (page 7-6)
Set the measurement time based on the conditions of the EUT.

In the setting and display area, you can switch between basic settings and advanced settings by clicking these buttons: . For details, see sections 7.2 and 7.3.

 Basic settings

 Advanced settings

Input Current

2. Select the current range to measure from the drop-down list.

Note

CF3 and CF6 indicate which value the crest factor is set to (3 or 6).

Wiring Pattern

3. Select the wiring pattern of the circuit you will measure from the following:

- For 1P2W 230V Devices
- For 3P4W 400V Devices
- For 1P2W 100V Devices (JIS)*
- For 1P2W 200V Devices (JIS)*
- For 3V3A 200V Devices (JIS)*
- For 1P3W 100V/200V Devices (JIS)*

* If the “The JIS regulation used” check box under Regulation in the Option tab is selected, you can select JIS standards.

Note

When you switch wiring patterns, the following settings, which are displayed in the setting and display area, will change to default values that are appropriate to the wiring pattern that you select. For the default values, see sections 7.3 and 7.4.

- The WT settings (the settings on the WT Measurement Instrument tab)
- The testing judgment conditions (the settings under the Standard tab)

Test Conditions

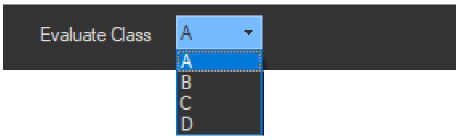
The procedure varies depending on the selected standard.

- When the standard is set to default (IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019)
- When the standard is set to IEC 61000-3-2 Ed. 4.0

For the standard settings, see section 7.4.

When the Standard Is Set to Default (IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019)

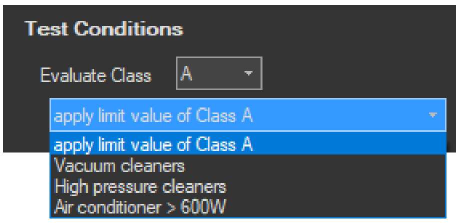
4. Set the class to A, B, C, or D.



5. If you select class A for the test conditions, select the limit to apply.

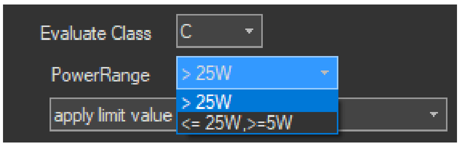
- apply limit value of Class C
- Vacuum cleaners
- High pressure cleaners
- Air conditioners > 600 W*

  * If you have set the wiring pattern to one of the items below and you select class A for the test conditions, you can select Air conditioners > 600W.
  - For 1P2W 100V Devices (JIS)
  - For 1P2W 200V Devices (JIS)
  - For 3V3A 200V Devices (JIS)
  - For 1P3W 100V/200V Devices (JIS)



6. If you select class C, specify whether the power range exceeds 25 W or whether the power range is within 25 W to 5 W.

- If you select >25W, proceed to step 7.
- If you select <=25W,>=5W, proceed to step 8.



7. If you select class C and the power range exceeds 25 W, select the limit to apply.

- apply limit value of Class C
- apply limit value of Class A (Dimming lights)

Proceed to step 11.

8. If you select class C and the power range is within 25 W to 5 W, select from the following:

- apply limit value of Class D
- judge with current wave pattern of 3rd&5th
- judge from THD, 2, 3, 5, 7, 9, 11th

Proceed to step 11.

9. If you select class D, select the limit to apply.

- apply limit value of Class D
- (with VSD) Refrigerators and freezers

Proceed to step 11.

When the Standard Is Set to IEC 61000-3-2 Ed. 4.0

4. When using Annex C of IEC61000-3-2 Ed. 4.0, select the check box, and select the equipment test conditions from the following:

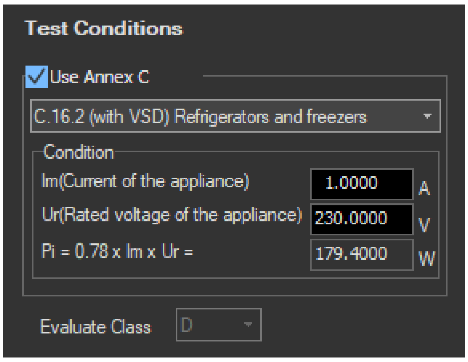
- C.7 Vacuum cleaners
- C.15 High pressure cleaners
- C.16.2 (with VSD) Refrigerators and freezers
- C.16.3 (without VSD) Refrigerators and freezers

When not using C, proceed to step 6.

Note

When using test conditions of Annex C that are not in the menu, proceed to step 6, in the same manner as when not using Annex C.

5. If you select Annex C16.2 of IEC61000-3-2 Ed4.0, specify Current of the appliance (Im) and Rated voltage of the appliance (Ur). Effective power of the appliance (Pi) is calculated automatically.

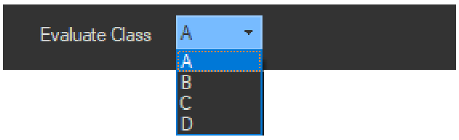


6. If selected not to use Annex C of IEC61000-3-2 Ed4.0 but selected the following items, select the DUT class from A, B, C, and D.

- Not use Annex C (check box not selected)
- Use Annex C7
- Use Annex C15

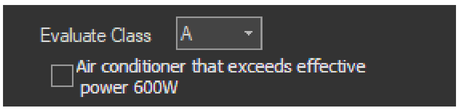
The display shown below appears when you set the wiring pattern to one of the following:

- For 1P2W 230V Devices
- For 3P4W 400V Devices



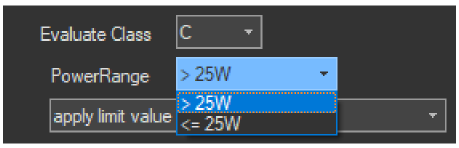
7. If you have set the wiring pattern to one of the items below and you select class A for the test conditions, select whether the equipment is an air conditioner whose active power exceeds 600 W.

- For 1P2W 100V Devices (JIS)
- For 1P2W 200V Devices (JIS)
- For 3V3A 200V Devices (JIS)
- For 1P3W 100V/200V Devices (JIS)



8. If you select class C, specify whether or not the power range exceeds 25 W.

- If you select >25W, proceed to step 9.
- If you select <=25W, proceed to step 10.



9. If you select class C and the power range exceeds 25 W, select the limit to apply.
- apply limit value of Class C
- apply limit value of Class C (Dimming lights)
- apply limit value of Class A (Dimming lights)

Proceed to step 11.

10. If you select class C and the power range is 25 W or lower, select one of the following:
- apply limit value of Class D
- judge with current wave pattern of 3rd&5th

Proceed to step 11.

Measurement Time

11. Set the measurement time.
If you selected the following items for Annex C of IEC61000-3-2 Ed. 4.0, set the measurement time.
- Not use Annex C (check box not selected)
- Use Annex C7
- Use Annex C15

Note

When you the change test conditions or the measurement time, the judgment conditions on the standard tab that are displayed in the setting and display area will change accordingly. For details, see “Explanation” in section 7.4.

Explanation

Wiring Pattern

When you are measuring using the limits specified by IEC 61000-3-2, select one of the following wiring patterns:
- For 1P2W 230V Devices
- For 3P4W 400V Devices

When you are measuring using the limits specified by JIS C 61000-3-2, select one of the following wiring patterns:
- For 1P2W 100V Devices (JIS)
- For 1P2W 200V Devices (JIS)
- For 3V3A 200V Devices (JIS)
- For 1P3W 100V/200V Devices (JIS)

Test Conditions

When the Standard Is Set to Default (IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019)

Class

Select the class from A, B, C, and D, according to the classifications specified in the standard. The setup information varies depending on the class selected here.

Class A

Select the limit to apply from the following.
- apply limit value of Class C
- Vacuum cleaners
- High pressure cleaners
- Air conditioners > 600 W*

* If you have set the wiring pattern to one of the items below and you select class A for the test conditions, you can select Air conditioners > 600W.
  - For 1P2W 100V Devices (JIS)
  - For 1P2W 200V Devices (JIS)
  - For 3V3A 200V Devices (JIS)
  - For 1P3W 100V/200V Devices (JIS)

See section 7.4 for selecting the lower power limit for applying the limits.

Class B

The setup information is the same as class A. The limits applied are 1.5 times the limits for class A.

Class C

Specify whether or not the EUT’s active power exceeds 25 W.

- When the Active Power of the EUT Exceeds 25 W (>25 W)
  You can set the limit to apply to “apply limit value of Class A” or “apply limit value of Class C.”
  - The limit of Class A (Dimming lights) is applied to incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
  - The limit value of Class C is applied to other lighting equipment.
    For details on setting the fundamental current and the power factor, see section 7.4.
- When the Active Power of the EUT Is Within 25 W to 5 W (<=25W,>=5W)
  The standard stipulates that “apply limit value of Class D,” “judge with current wave pattern of 3rd&5th,” or “judge from THD, 2, 3, 5, 7, 9, 11th” be satisfied.
  - Judging by applying the limits of Class D
    The same power ratio limit of Class D is applied.
    For details on setting the power, see section 7.4.
  - Judging with current wave pattern of 3rd&5th
    The standard specifies the current ratio of harmonic order 3 and 5 to the fundamental frequency and the relationship between the fundamental current and the current waveform (see page 1-26).
    For details on setting the fundamental current and judgment of the waveform, see section 7.4.
  - Judging from THD, 2, 3, 5, 7, 9, 11th
    The standard specifies the ratio of the total harmonic distortion (THD) and 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics.

Class D

You can set the limit to apply to “apply limit value of Class A” or “with VSD) Refrigerators and freezers.”

For details on the following settings, see section 7.4.

- Power
- Selecting the Lower Power Limit for Applying the Limits

When the Standard Is Set to IEC 61000-3-2 Ed. 4.0

Use Annex C

Select whether to use Annex C of IEC61000-3-2 Ed4.0 from the following. The settings vary depending on the test conditions of the equipment selected here.

- Not use Annex C (check box not selected)
- Annex C.7 Vacuum cleaners
- Annex C.15 High pressure cleaners
- Annex C.16.2 (with VSD) Refrigerators and freezers
- Annex C.16.3 (without VSD) Refrigerators and freezers

When using test conditions of Annex C that are not in the options, clear the Not use Annex C check box.

Current of the appliance (Im), Rated voltage of the appliance (Ur), Effective power of the appliance (Pi)

If you selected “C16.2 (with VSD) Refrigerators and freezers,” the power ratio limits of Class D are applied according to the effective power of the appliance (Pi) calculated as a result of setting Current of the appliance (Im) and Rated voltage of the appliance (Ur).

- Current of the appliance (Im)
  Selectable range: 0.0001 to 100.0000 A
  Default value: 1A
- Rated voltage of the appliance (Ur)
  Selectable range: 0.1 to 1000.0 V
  If you select the wiring system, the Ur setting is changed in sync to the default value. The default value is as follows:

Wiring Pattern	Ur
For 1P2W 230V Devices	230.00 V
For 3P4W 400V Devices	400.00 V
Other than those above	Not synchronized to the wiring system

- Effective power of the appliance (Pi)
  If you set Im and Ur, Pi is calculated automatically with the following equation.
  Pi=0.78×Im×Ur

Class

Select the class from A, B, C, and D, according to the classifications specified in the standard. The setup information varies depending on the class selected here.

Depending on the “Use Annex C” setting, the class is as follows:

Use Annex C	Class
Annex C.16.2 (with VSD) Refrigerators and freezers	Fixed to D
Annex C.16.3 (without VSD) Refrigerators and freezers	Fixed to A
Other than those above	Selectable from A, B, C, and D

Class A

- See section 7.4 for selecting the lower power limit for applying the limits.
- Selecting Whether to Apply the Limit for Air Conditioners Exceeding 600 W for JIS Class A
  In JIS Class A, special limits are defined for air conditioners that exceed 600 W. You can select whether to apply this limit.

Class B

The setup information is the same as class A. The limits applied are 1.5 times the limits for class A.

Class C

Specify whether or not the EUT's active power exceeds 25 W.

- When the Active Power of the EUT Exceeds 25 W (>25 W)
  You can set the limit to apply to "apply limit value of Class A" or "apply limit value of Class C."
  - The limit of Class A (Dimming lights) is applied to incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
  - The limit of Class C (Dimming lights) is applied to equipment other than incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
  - The limit value of Class C is applied to other lighting equipment.
    For details on setting the fundamental current and the power factor, see section 7.4.

- When the Active Power of the EUT Is Less Than or Equal to 25 W (<=25 W)
  The IEC standard specifies that either "the power ratio limits of class D" or "the conditions of harmonic order 3 and 5" are met.
  - Evaluating by Applying the Power Ratio Limits of Class D
    The same power ratio limit of Class D is applied.
    For details on setting the power, see section 7.4.
  - Evaluating on the Conditions of Harmonic Order 3 and 5
    The standard specifies the current ratio of harmonic order 3 and 5 to the fundamental frequency and the relationship between the fundamental voltage waveform and the current waveform (see page 1-24).
    For details on setting the fundamental current and judgment of the waveform, see section 7.4.

Class D

For details on the following settings, see section 7.4.

- Power
- Selecting the Lower Power Limit for Applying the Limits

Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Selectable range: 0 H 0 M 1 S to 24 H 0 M 0 S in units of 1 s.
An error occurs if a time exceeding 24 hours is specified.

When the Standard Is Set IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019

Depending on the class setting, the measurement time is as follows:

Class A	Measurement Time
Vacuum cleaners	Setting possible*
High pressure cleaners	Setting possible*
Class D	
(with VSD) Refrigerators and freezers	Fixed to 1 hour

* Settings under 2 minutes are prohibited by the standard, and therefore, a warning is displayed, and the setting change is considered invalid.

When the Standard Is Set to IEC 61000-3-2 Ed. 4.0

Depending on the “Use Annex C” setting, the measurement time is as follows:

Use Annex C	Measurement Time
Not use Annex C (check box not selected)	Setting possible
Annex C.7 Vacuum cleaners	Setting possible*
Annex C.15 High pressure cleaners	Setting possible*
Annex C.16.2 (with VSD) Refrigerators and freezers	Fixed to 1 hour
Annex C.16.3 (without VSD) Refrigerators and freezers	Fixed to 2 minutes 30 seconds

* Settings under 2 minutes are prohibited by the standard, and therefore, a warning is displayed, and the setting change is considered invalid.

Note

Depending on the environment of the PC onto which this software was installed, an error occurs if you specify a time longer than the memory area that can be reserved. If this happens, the following measures can be taken to increase the upper limit of time that can be specified.

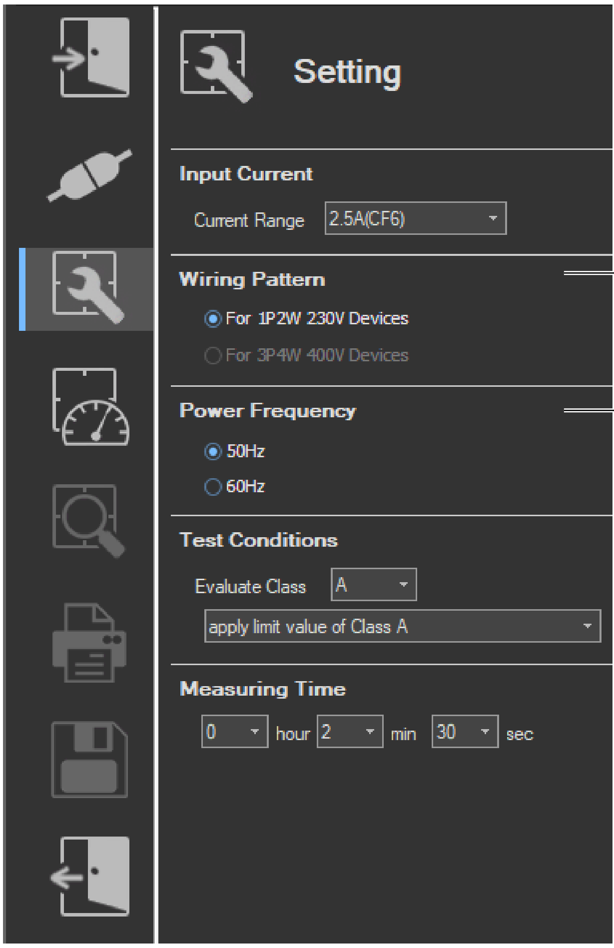
- Close other software applications
- Restart the software
- Restart the PC
- Expand the memory installed in the PC

7.2 Configuring the Power Supply

If an online connection is established with “Use” selected in “Configuring the Connection to the Power Supply” (see section 6.1), configure the power supply according to the procedure in this section.

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring pattern
Only the selectable items become available depending on the type of connected NF power supply.

Select the power frequency.

Power Frequency

1. Select the power frequency.
- 50 Hz
- 60 Hz

Various Power Supply Settings

1. In the setting and display area, select the **NF Power Supply** tab. Power supply settings are displayed.

2. Click the basic settings  or advanced settings  button.

3. Specify the settings.

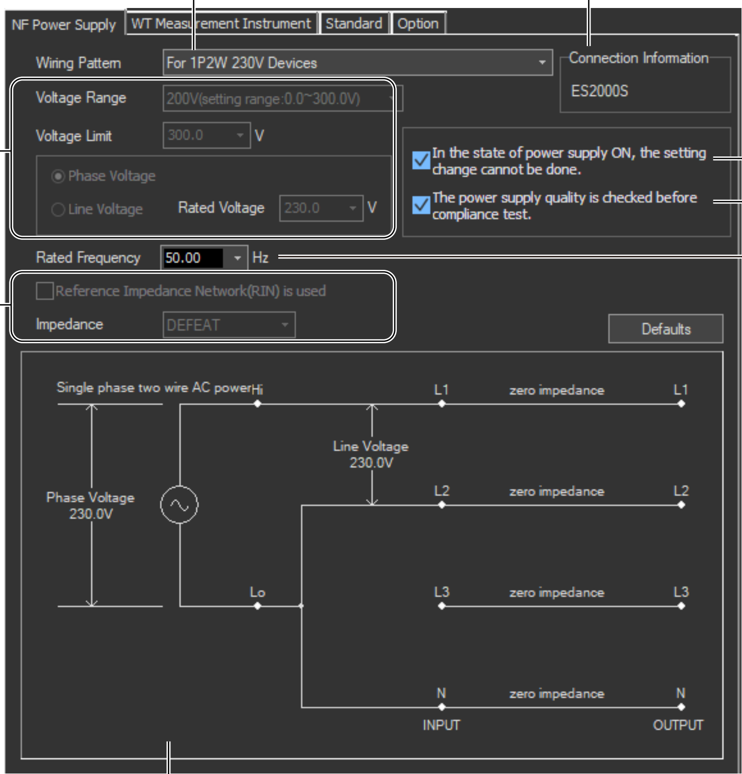
Basic Setting Mode

Click the basic button  to display the following settings.

In basic setting mode, when you set the wiring system, these boxes are set automatically. For details, see the next page. To view or change these settings, select advanced setting mode.

Power supply and reference impedance network (RIN) information
The power supply and RIN model are obtained automatically and displayed.*

Wiring pattern



Select this check box to prohibit changes to the settings when the power output is on.

Select this check box to check the power supply quality before measurement.
For details on the power supply quality check, see section 7.6.

Rated frequency
Select 50 Hz or 60 Hz from the drop-down list.
If you click the box, you can set the frequency in the range of 45.00 to 66.00.
You can select values that have been entered recently from the drop-down list.

Illustration of the setting information

* If any of the models from DP4164 to DP4169 is connected for the RIN, the software displays it as follows:
- Single-phase: DP4162
- Three-phase: DP4163

Wiring Pattern

Depending on the type of power supply that is connected, the selectable wiring systems are as follows. In addition, voltage range and other parameters are set to the following values.

When an ES2000S (Single-Phase Model) Is Connected

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	Not selected	DEFEAT
Single-phase two-wire 100 V device (JIS)	100	150.0	Phase Voltage	100.0	Not selected	DEFEAT
Single-phase two-wire 200 V device (JIS)	200	300.0	Phase Voltage	200.0	Not selected	DEFEAT

When an ES2000U (Three-Phase Model) Is Connected with the Slide Switch Set to Single-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	Not selected	DEFEAT
Single-phase two-wire 100 V device (JIS)	100	150.0	Phase Voltage	100.0	Not selected	DEFEAT
Single-phase two-wire 200 V device (JIS)	200	300.0	Phase Voltage	200.0	Not selected	DEFEAT

When an ES2000U (three-phase model) Is Connected with the Slide Switch Set to Three-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9	Not selected	DEFEAT
Three-phase three-wire 200 V device (JIS)	100	150.0	Line Voltage	200.0	Not selected	DEFEAT
Single-phase three-wire 100 V/200 V device (JIS)	100	150.0	Phase Voltage	100.0	Not selected	DEFEAT

When a DP Power Supply Single-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	1	DEFEAT
Single-phase two-wire 100 V device (JIS)	100	150.0	Phase Voltage	100.0	1	DEFEAT
Single-phase two-wire 200 V device (JIS)	200	300.0	Phase Voltage	200.0	1	DEFEAT

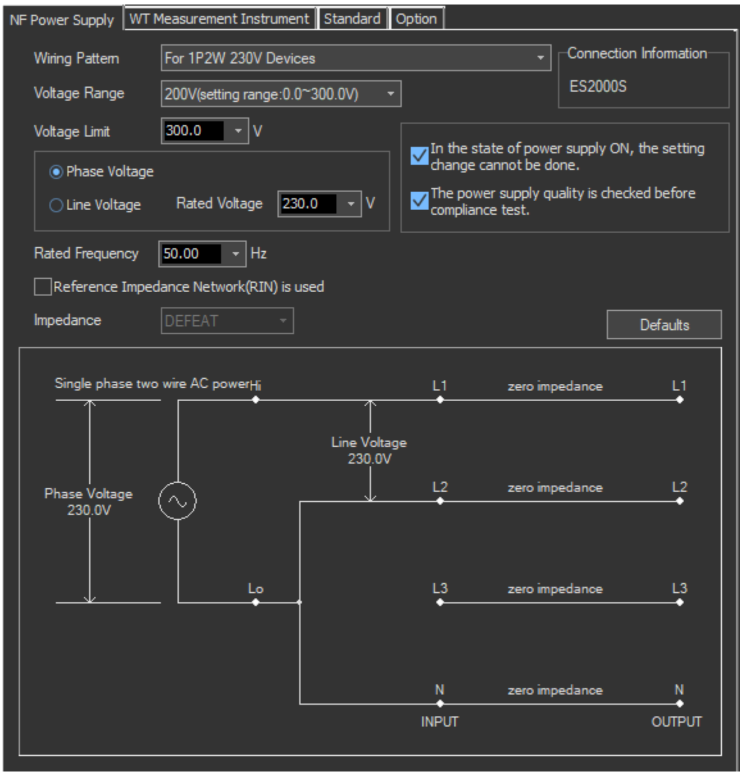
When a DP Power Supply Multi-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Not Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9	1	DEFEAT
Three-phase three-wire 200 V device (JIS)	100	150.0	Line Voltage	200.0	1	DEFEAT
Single-phase three-wire 100 V/200 V device (JIS)	100	150.0	Phase Voltage	100.0	1	DEFEAT

1 When a RIN is connected: Selected
When a RIN is not connected: Not selected

Advanced Setting Mode

Click the advanced button  to display the following settings.



Voltage Range

Select 100 V or 200 V. The range of values that you can set for the rated voltage and voltage limit is displayed.

Voltage Limit

You can select the following values from the drop-down list for the voltage limit depending on the voltage range.

Voltage Range	Voltage Limit
100 V	150.0 V
200 V	300.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

Output Voltage Setting

Set the output voltage to **Phase Voltage** or **Line Voltage**.

Rated Voltage

You can select the following values from the drop-down list for the rated voltage output depending on the Phase Voltage/Line Voltage setting and voltage range.

		Phase Voltage/Line Voltage	
		Phase Voltage	**Line Voltage**
Voltage Range	100 V	100.0 V or 115.0 V	200.0 V or 230.0 V
	200 V	200.0 V or 230.0 V	200.0 V or 400.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

If the phase voltage of the rated voltage exceeds the value in the voltage limit table, the following values are set depending on the power supply type and voltage range.

- Voltage limit: The value in the voltage limit table
- Phase voltage/line voltage: Phase Voltage
- Rated voltage: Same value as the voltage range

Note

If the rated voltage is set using a line voltage, the line voltage is converted into phase voltage according to the wiring system and compared to the value in the voltage limit table.

Impedance

If you select the “Reference Impedance Network (RIN) is used” check box, you can set the following impedances according to the connected RIN. If you do not select the check box, DEFEAT appears in the box.

When an ES4152 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4162*

- DEFEAT
- 100 V
- 200 V
- 230 V

When an ES4153 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4163*

- DEFEAT
- JPN 1φ
- JPN 3φ
- EU 1φ/3φ

* For the connection information when any of the models from DP4164 to DP4169 is connected for the RIN, see page 7-12.

If the RIN for the DP series power supply is not connected, you cannot select the “Reference Impedance Network (RIN) is used” check box. Consequently, you cannot change the impedance setting.

Defaults

The settings are reset to the following conditions (default values).

- Setting mode: basic
- Wiring Pattern
  The wiring system is set as follows according to the connected power supply.
  - When an ES2000S (Single-Phase Model) Is Connected
    For 1P2W 230 V Devices
  - When an ES2000U (three-phase model) is connected with the slide switch set to single-phase mode
    For 1P2W 230 V Devices
  - When an ES2000U (three-phase model) is connected with the slide switch set to three-phase mode
    For 3P4W 400 V Devices
  - When a DP series power supply single-phase model is connected or multi-phase model with the phase mode set to single-phase two-wire output
    For 1P2W 230 V Devices
  - When a DP series power supply multi-phase model is connected or multi-phase model with the phase mode not set to single-phase two-wire output
    For 3P4W 400 V Devices
- Voltage ranges: As shown in the table on page 7-12 according to the connected power supply and wiring system.
- Voltage limit: As shown in the table on page 7-12 according to the connected power supply and wiring system.
- Phase voltage/line voltage: As shown in the table on page 7-12 according to the connected power supply and wiring system.
- Rated voltage: As shown in the table on page 7-12 according to the connected power supply and wiring system.
- Rated frequency: 50 Hz
- The power supply quality is checked before compliance test: Selected
- Reference Impedance Network (RIN) is used
  - When an ES2000S or ES2000U is connected: Not selected
  - When a DP series power supply is connected
    When DP series RIN is connected: Selected
    When DP series RIN is not connected: Not selected
- Impedance: DEFEAT

Settings at Startup

The above settings when the software is started are set as follows depending on the connection conditions.

Connection Condition	Setting
New connection	Default values
Same conditions as those of the loaded file	Settings of the loaded file
Same conditions as the last time	Settings used the last time

7.3 Setting the WT Measurement Conditions

Procedure

1. Select the **WT Measurement Instrument** tab in the setting and display area. The WT measurement condition settings are displayed.
2. Click the basic settings  or advanced settings  button.
3. Specify the settings.

Note

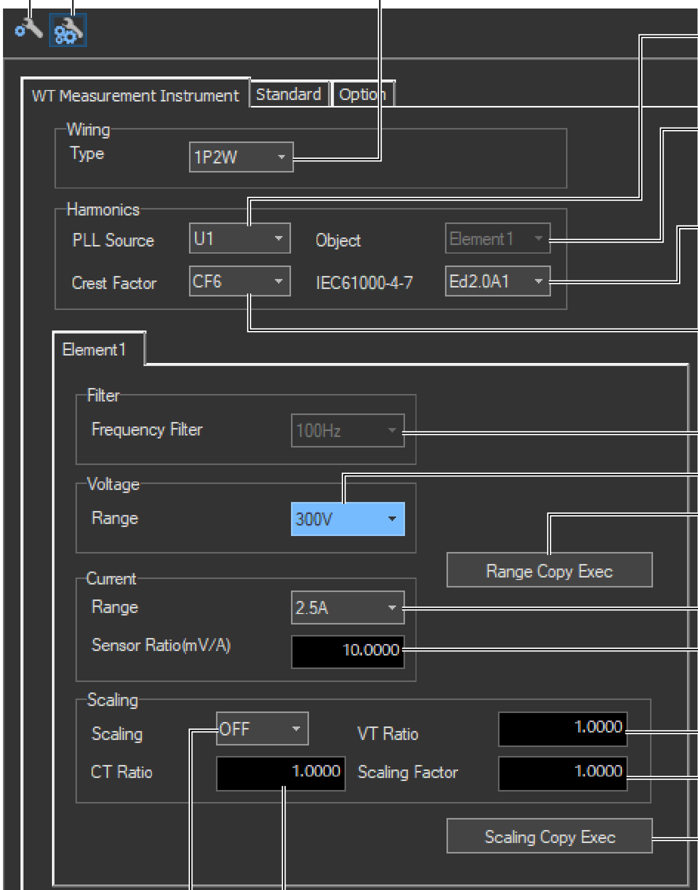
When you select the basic settings button, the following settings and buttons will be unavailable. To adjust these settings, click the advanced settings button.

- Frequency Filter
- Scaling Copy Exec
- All of the settings under Scaling

Basic settings button

Advanced settings button

Select the wiring pattern.



PLL source
Select the fundamental signal source used to determine the harmonic orders.

Object to be measured
Display the wiring units to be measured.

Edition
Select the IEC 61000-4-7 edition or the JIS C 61000-4-7 edition.

Select the crest factor.

Displays the frequency filter

Select the voltage range

Copies the range settings and external current sensor settings made here to all other elements

Select the current range.

If using external current sensors, set the conversion ratio.

Set the VT ratio.

Set the scaling factor.

Copies the scale settings made here to all other elements

Set the CT ratio.

Select the scale.

Explanation

Edition of the Standard

In WT firmware versions 2.01 and later, you can select the IEC 61000-4-7 or JIS C 61000-4-7 edition.

Edition number of the IEC 61000-4-7
- Edition 1.0
- Edition 2.0
- A1 of Edition 2.0

Edition number of the JIS C 61000-4-7
- 2007 JA
- 2007

IEC 61000-4-7 or JIS C 61000-4-7 specifies requirements for measurement instruments.
For details, see Chapter 14.

Copying the Range

You can copy the range settings configured for one element to all other elements with the same wiring. The voltage range, the current range, and the external current sensor range are copied.

Copying the Scaling Settings

You can copy the scaling settings configured for one element to all other elements with the same wiring. The settings that are copied are:
- VT ratio
- CT ratio
- Scaling factor

For information about the following settings and how to make settings from the WT, see the following manuals.

Setting	Manuals	Refer To
Wiring pattern	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.1
PLL source	Features Guide, IM WT5000-01EN	16 IEC Harmonic Measurement (Option)
	User's Manual, IM WT5000-02EN	Section 5.1
Crest factor	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.9
Frequency filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Voltage/current range	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.2 and 2.3
Scaling	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.4 and 9.1

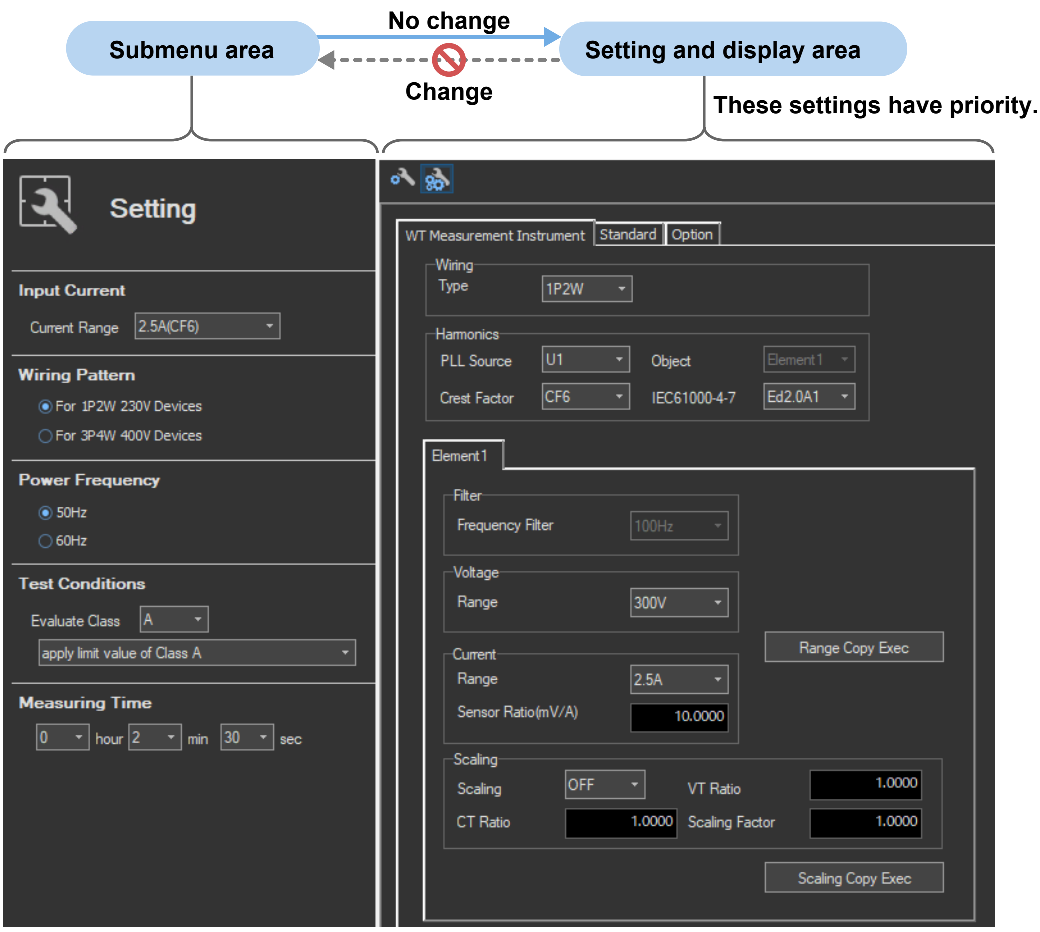
Note
- When the wiring system is pattern 1 (when all are 1P2W), range, and scaling are copied to all other elements.
- When taking measurements with this software, the antialiasing filter cutoff frequency is fixed at 30 kHz.
- The exponential average function of the WT is ON.

Shared Settings between the Submenu and the Setting and Display Area

When you change the following settings in the submenu, the settings in the setting and display area will also change.

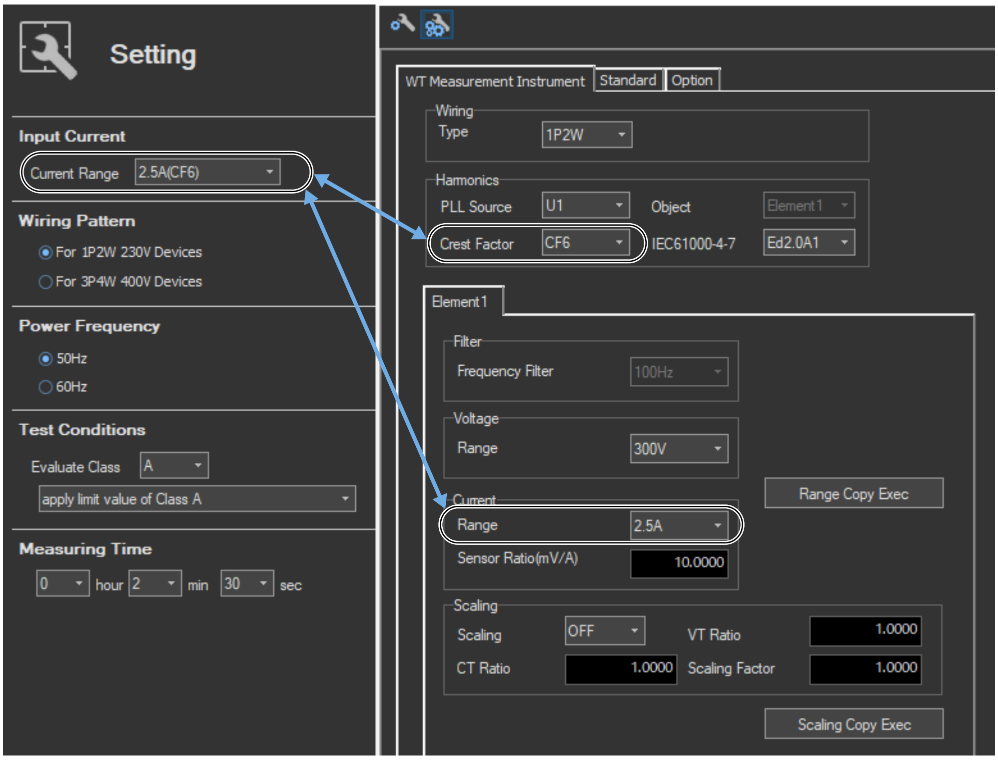
- Current range (see the next page)
- Wiring pattern (see the next page)
- Test conditions (see 7.4)
- Measurement time (see 7.4)

The settings in the submenu will not change when you change the settings in the setting and display area.
When the settings in the submenu and the setting and display area are different, the settings in the setting and display area take precedence.



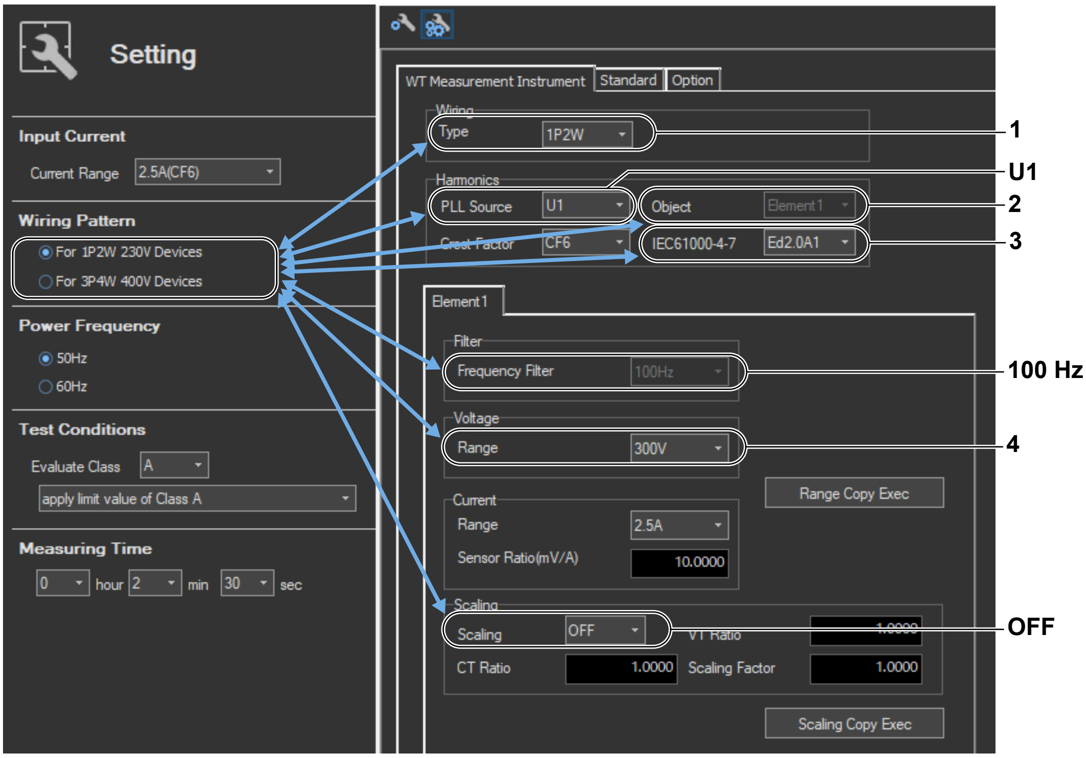
How Settings Change Based on Current Range Selection

When you select a current range in the Setting submenu, the settings marked off in the following figures will also change.



How Settings Change Based on the Selected Wiring Pattern

When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



1 The default Wiring value varies depending on the number of WT elements.

Wiring Pattern	Wiring
For 1P2W 230V Devices	1P2W
For 3P4W 400V Devices	3P4W[5]
For 1P2W 100V Devices (JIS)	1P2W
For 1P2W 200V Devices (JIS)	1P2W
For 3V3A 200V Devices (JIS)	3V3A[5]
For 1P3W 100V/200V Devices (JIS)	1P3W[5]

5 An error message appears in the following cases.
- If the number of elements is insufficient
- If the wiring of the same type of modules cannot be configured

2, 4 The default setting for Object and Voltage Range varies depending on the wiring pattern.

Wiring Pattern	Object	Voltage Range
For 1P2W 230V Devices	Element 1	300 V
For 3P4W 400V Devices	SigmaA [6]	300 V
For 1P2W 100V Devices (JIS)	Element 1	150 V
For 1P2W 200V Devices (JIS)	Element 1	300 V
For 3V3A 200V Devices (JIS)	SigmaA [6]	300 V
For 1P3W 100V/200V Devices (JIS)	SigmaA [6]	150 V

6 If the error described above in *5 occurs because of the selected wiring pattern, Object is automatically set to Element 1.

3 The default setting depends on the wiring pattern as shown below.

Wiring Pattern	Label	Setting
For 1P2W 230V Devices	IEC 61000-4-7	Ed2.0A1
For 3P4W 400V Devices	IEC 61000-4-7	Ed2.0A1
For 1P2W 100V Devices (JIS)	JIS C 61000-4-7	2007
For 1P2W 200V Devices (JIS)	JIS C 61000-4-7	2007
For 3V3A 200V Devices (JIS)	JIS C 61000-4-7	2007
For 1P3W 100V/200V Devices (JIS)	JIS C 61000-4-7	2007

7.4 Setting the WT Judgment Conditions

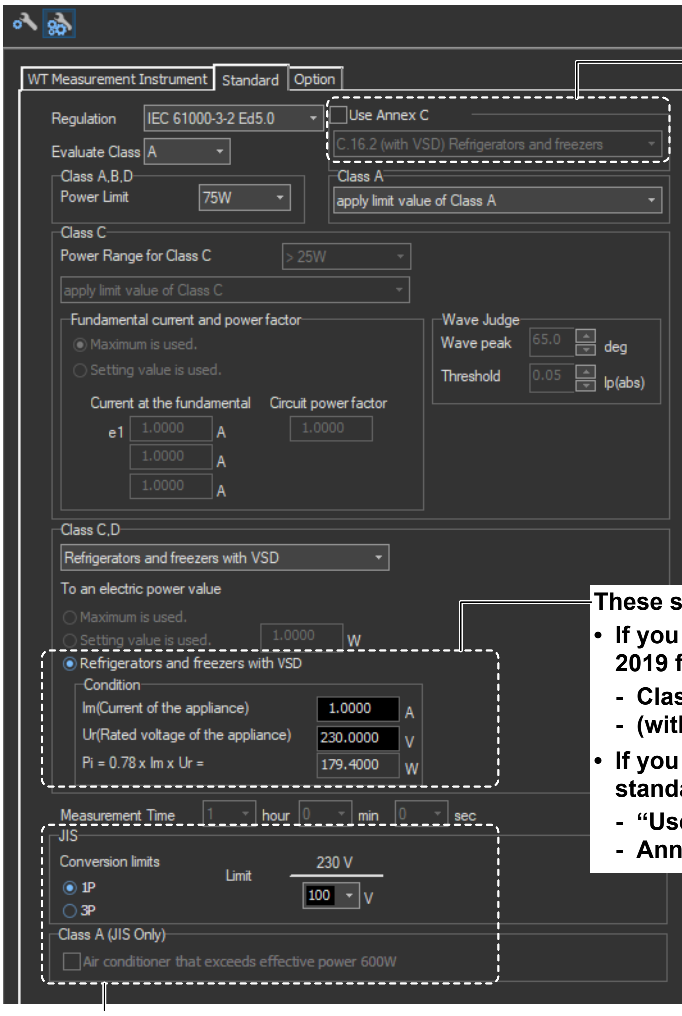
Procedure

1. Select the **Standard** tab in the setting and display area. Judgment condition settings are displayed.

2. Specify the settings.

Note

The items that you can set are the same whether you press the basic settings button  or the advanced settings button .



This setting item appears when you select "IEC61000-3-2 Ed4.0" for "Regulation."

These settings appear in the following cases.

- **If you select 61000-3-2Ed5.0 or JIS C 61000-3-2 2019 for the standard and select the following:**
  - **Class D**
  - **(with VSD) Refrigerators and freezers**
- **If you select IEC 61000-3-2 Ed4.0 for the standard and select the following:**
  - **"Use Annex C" check box**
  - **Annex C16.2**

These setting items appear when you select one of the following wiring patterns in the procedure described in section 7.1.

- **For 1P2W 100V Devices (JIS)**
- **For 1P2W 200V Devices (JIS)**
- **For 3V3A 200V Devices (JIS)**
- **For 1P3W 100V/200V Devices (JIS)**

Explanation

For explanations of these terms, see section 1.4 and 1.7.

Standard (Regulation)

The software can make measurements and evaluations according to the IEC or JIS standard (see section 1.3).

Class

Select the class from A, B, C, and D, according to the classifications specified in the standard. The setup information varies depending on the class selected here.

Class A, B, and D

Selecting the Lower Power Limit for Applying the Limits

Select 75W, 50W, None, or Infinity. When the active power of the EUT is less than the selected power, the limits are not applied.

Class A

When the standard is set to default (IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019, you can set the limit to apply to “apply limit value of Class A, ” “Vacuum cleaners,” or “High pressure cleaners.”

Class C

Power Range

Specify whether or not the EUT’s active power exceeds 25 W.

- When the Active Power of the EUT Exceeds 25 W (>25 W)
  You can set the limit to apply to “apply limit value of Class A” or “apply limit value of Class C.”
  - The limit of Class A (Dimming lights) is applied to incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
  - The limit of Class C (Dimming lights) is applied to equipment other than incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
  - The limit value of Class C is applied to other lighting equipment.
    Set the fundamental current and the power factor.
- When the Active Power of the EUT Is Within 25 W to 5 W (<=25W,>=5W)
  The standard stipulates that “apply limit value of Class D,” “judge with current wave pattern of 3rd&5th,” or “judge from THD, 2, 3, 5, 7, 9, 11th” be satisfied.
  - Evaluating by Applying the Power Ratio Limits of Class D
    The same power ratio limit of Class D is applied.
    Set the power.
  - Evaluating on the Conditions of Harmonic Order 3 and 5
    The standard specifies the current ratio of harmonic order 3 and 5 to the fundamental frequency and the relationship between the fundamental voltage waveform and the current waveform (see page 1-26).
    Set the fundamental current and judgment of the waveform (Wave peak and Threshold).

- Judging from THD, 2, 3, 5, 7, 9, 11th
  If you select IEC 61000-3-2Ed5.0 or JIS C 61000-3-2 2019 for the standard, you can set the limits to "judge from THD, 2, 3, 5, 7, 9, 11th." The standard specifies the ratio of the total harmonic distortion (THD) and 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics.

Fundamental current and power factor

Determine whether to set the EUT fundamental current and power factor values that are necessary for determining the limits by specifying them manually or by measuring them. You can also set the fundamental current and the power factor to the values that you measure according to the procedure in section 7.12. If you are going to measure the values, first set the load of the EUT as high as possible.

Wave Judge (judgment of the waveform)

You can enter the following values.

- Wave peak phase limit
- Current threshold limit
  Set the current threshold limit as a percentage of the maximum absolute current peak value Ip(abs). For example, to set 5 %, enter 0.05.

Class D

When the standard is set to default (IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019, you can set the limit to apply to "apply limit value of Class D" or "(with VSD) Refrigerators and freezers."

To an electric power value

Determine whether to set the power value that is necessary for determining the limits by specifying it manually or by measuring it.
You can also set the fundamental current and the power factor to the values that you measure according to the procedure in section 7.12. If you are going to measure the values, first set the load of the EUT as high as possible.

Use Annex C

If you select IEC61000-3-2 Ed4.0 for the standard, you can select from the following for Annex C.

- Not use Annex C (check box not selected)
- Annex C.7 Vacuum cleaners
- Annex C.15 High pressure cleaners
- Annex C.16.2 (with VSD) Refrigerators and freezers
- C16.3 (without VSD) Refrigerators and freezers

When using test conditions of Annex C that are not in the options, clear the Not use Annex C check box.

Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Selectable range: 0 H 0 M 1 S to 24 H 0 M 0 S in units of 1 s.
An error occurs if a time exceeding 24 hours is specified.

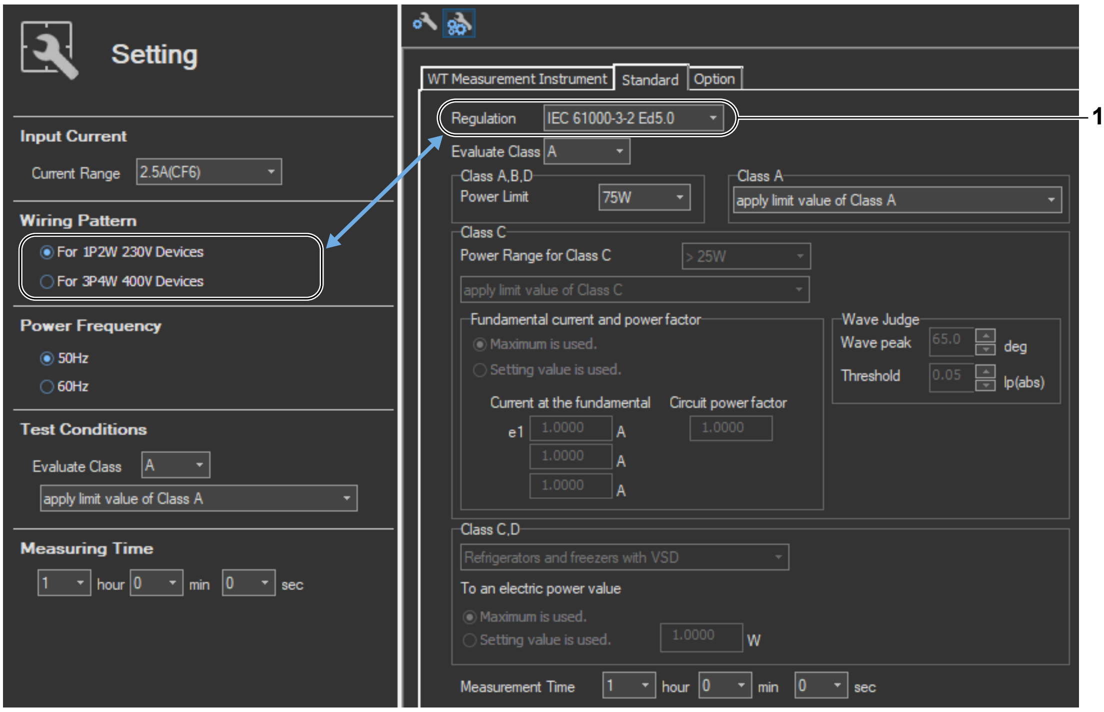
Note

Depending on the environment of the PC onto which this software was installed, an error occurs if you specify a time longer than the memory area that can be reserved. If this happens, the following measures can be taken to increase the upper limit of time that can be specified.

- Close other software applications
- Restart the software
- Restart the PC
- Expand the memory installed in the PC

How Settings Change Based on the Selected Wiring Pattern

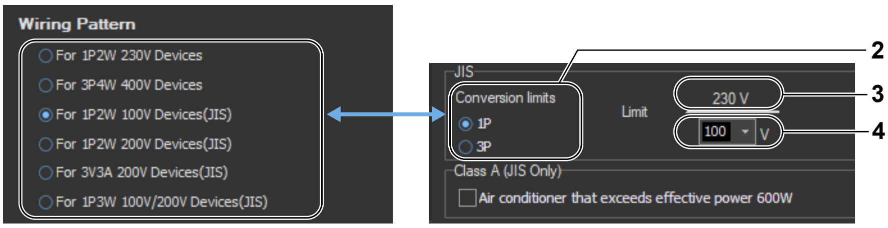
When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



Wiring Pattern	1 Standard (Regulation)
Single-phase two-wire 230 V device	IEC 61000-3-2 Ed5.0
Three-phase four-wire 400 V device	IEC 61000-3-2 Ed5.0

If the “The JIS regulation used” check box under Regulation in the Option tab is selected, you can select JIS standards.

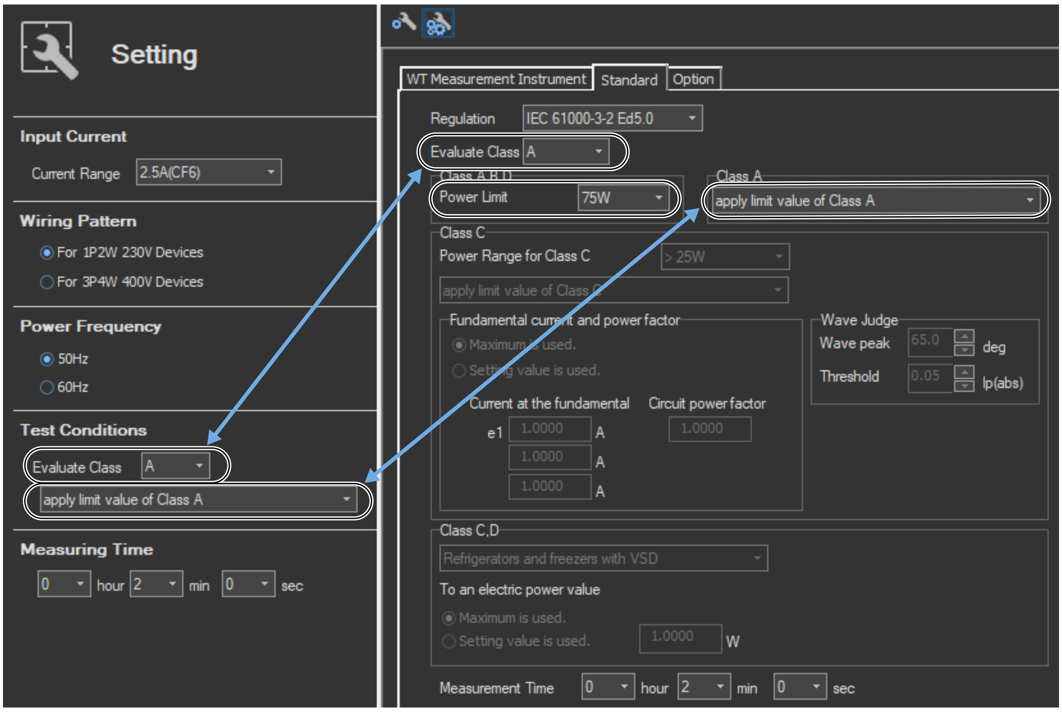
Wiring Pattern	1 Standard (Regulation)	2 Conversion Limits	3 Numerator of the limit equation	4 Denominator of the limit equation
Single-phase two-wire 230 V device	IEC 61000-3-2 Ed5.0	---	---	---
Three-phase four-wire 400 V device	IEC 61000-3-2 Ed5.0	---	---	---
Single-phase two-wire 100 V device (JIS)	JIS C 61000-3-2 2019	Single Phase	230 V	100 V
Single-phase two-wire 200 V device (JIS)	JIS C 61000-3-2 2019	Single Phase	230 V	200 V
Three-phase three-wire 200 V device (JIS)	JIS C 61000-3-2 2019	Three Phase	400 V	200 V
Single-phase three-wire 100 V/200 V device (JIS)	JIS C 61000-3-2 2019	Single Phase	230 V	100 V



How Settings Change Based on Class Selection

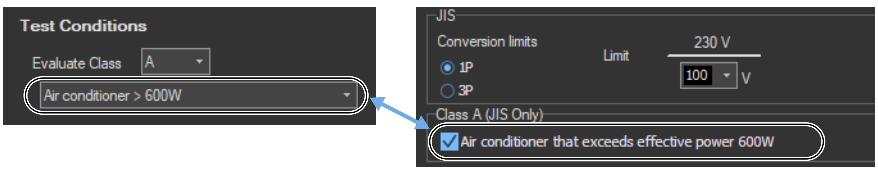
When Class A Is Selected

The settings marked off in the following figures will also change. And the lower power limit for applying the limits will change to its default value. The values in the figures are the default values.



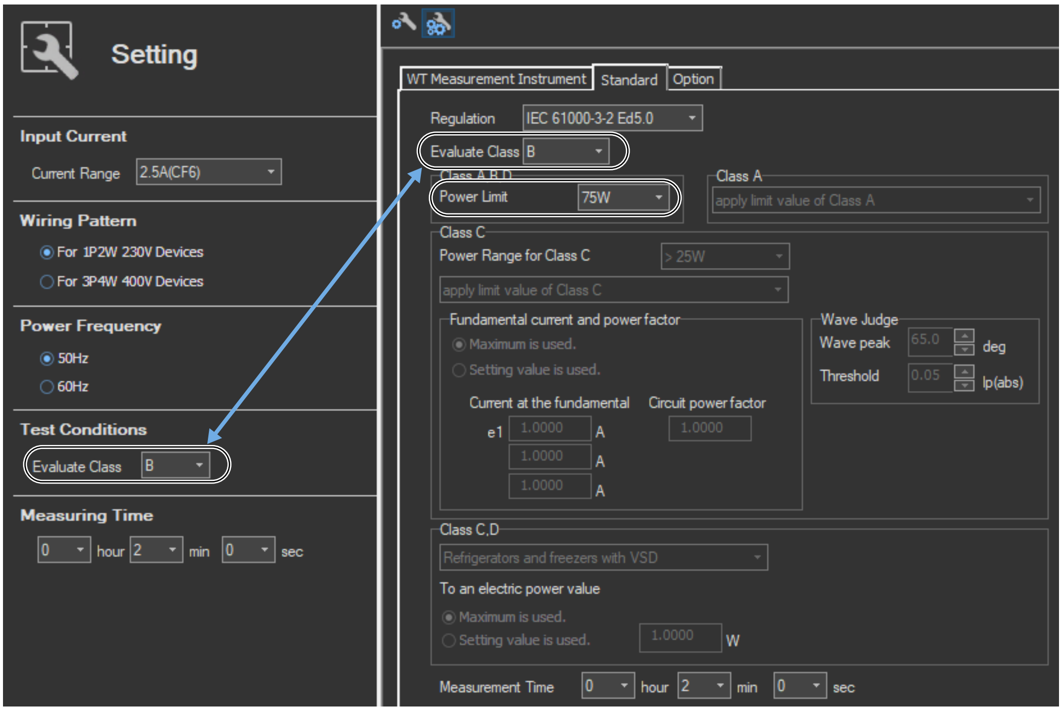
This appears when you set the wiring pattern to one of the items below (which use JIS limits) and set the class to A.

- For 1P2W 100V Devices (JIS)
- For 1P2W 200V Devices (JIS)
- For 3V3A 200V Devices (JIS)
- For 1P3W 100V/200V Devices (JIS)



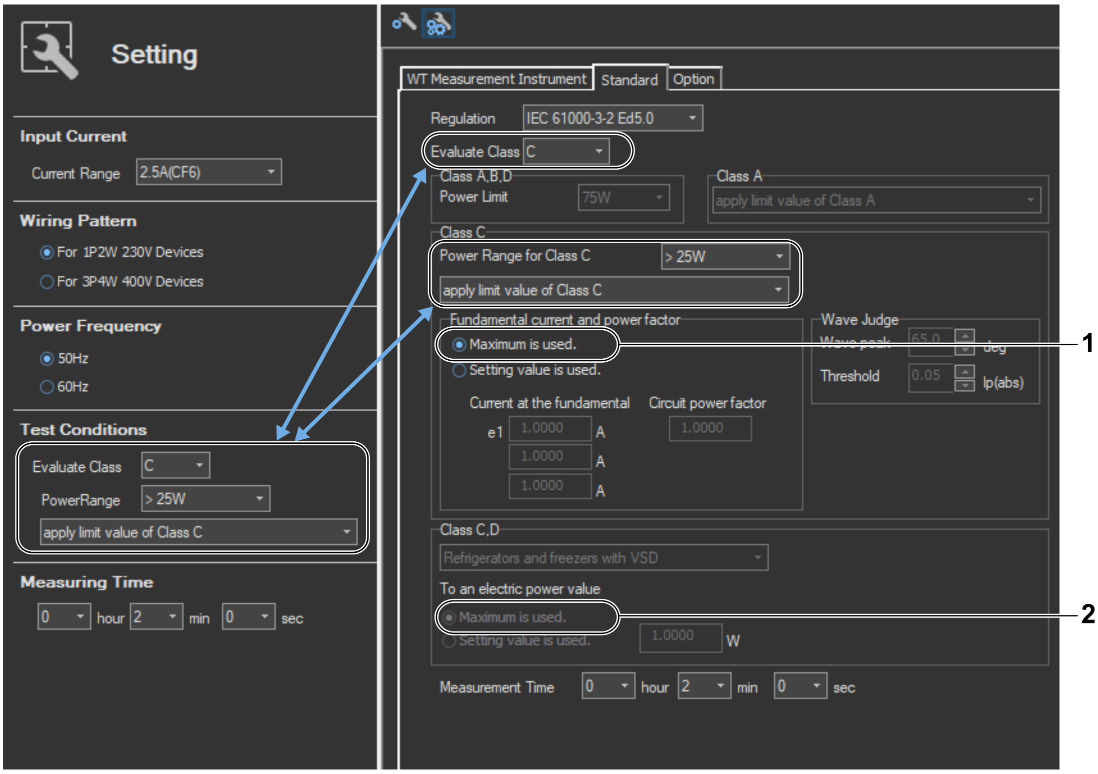
When Class B Is Selected

The settings marked off in the following figures will also change. And the lower power limit for applying the limits will change to its default value. The values in the figures are the default values.



When Class C Is Selected

The settings marked off in the following figures will also change. And the fundamental current and the power factor will change to their default values. The values in the figures are the default values.

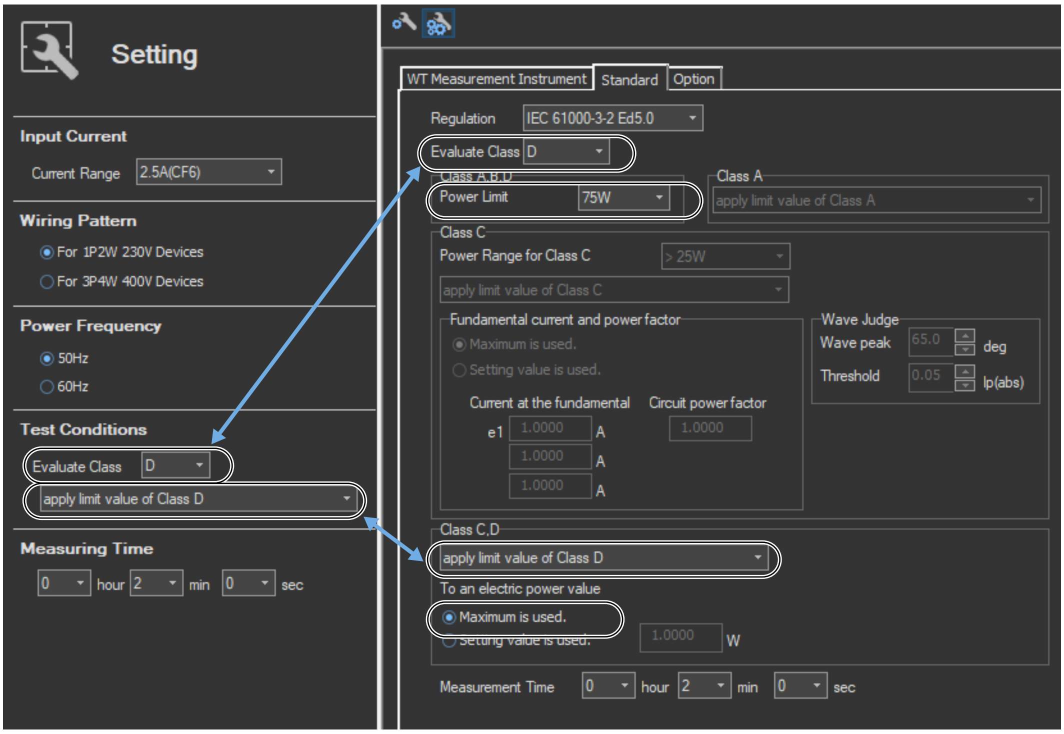


1 The setting for the fundamental current and the power factor values is set to “Maximum is used” by default when:
- You set the power class to “> 25W.”
- You set the power class to “<= 25W,>=5W” and you set the limits to “judge with current wave pattern of 3rd&5th.”

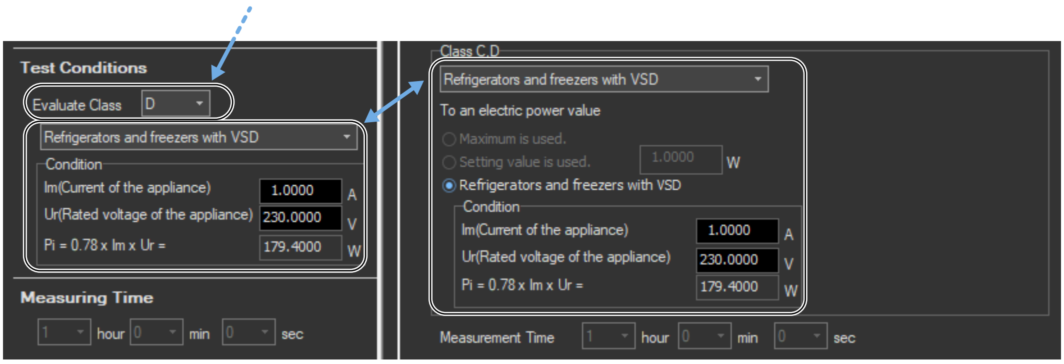
2 The setting for the power value is set to “Maximum is used” by default when:
- You set the power class to “<= 25W,>=5W” and you set the limits to “apply limit value of Class D.”

When Class D Is Selected

The settings marked off in the following figures will also change. And the lower power limit for applying the limits and the power factor will change to their default values. The values in the figures are the default values.



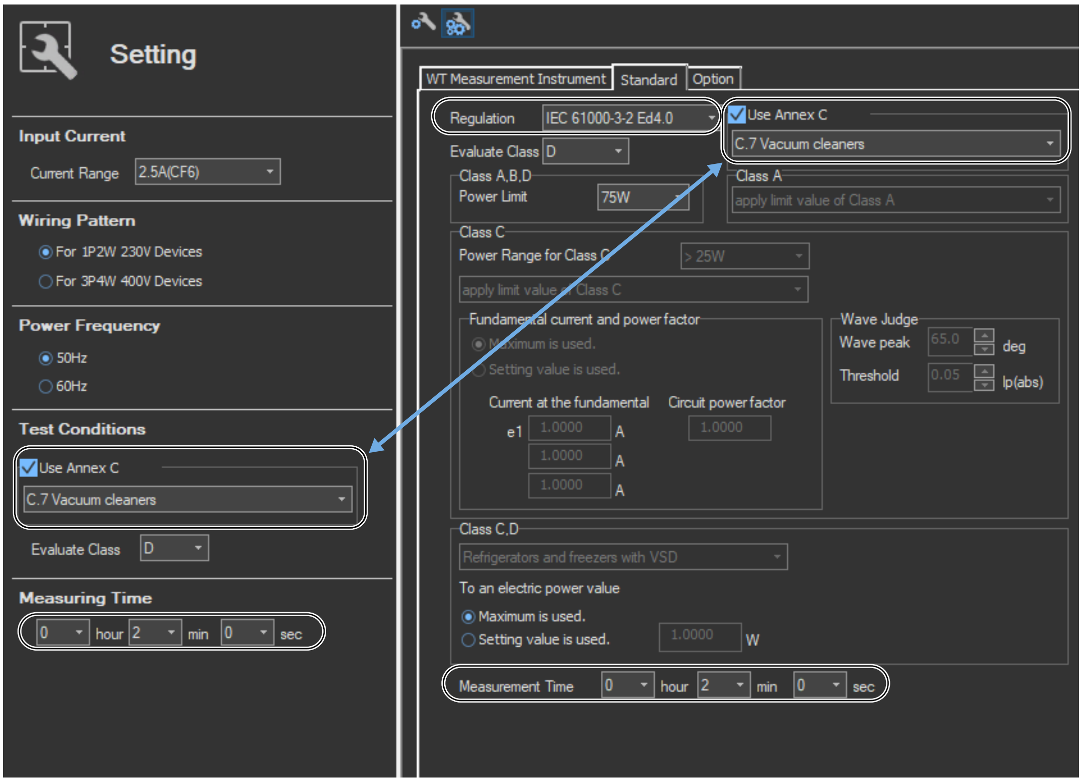
When Class D and “Refrigerators and freezers with VSD” Are Selected



How Settings Change Based on “Use Annex C”

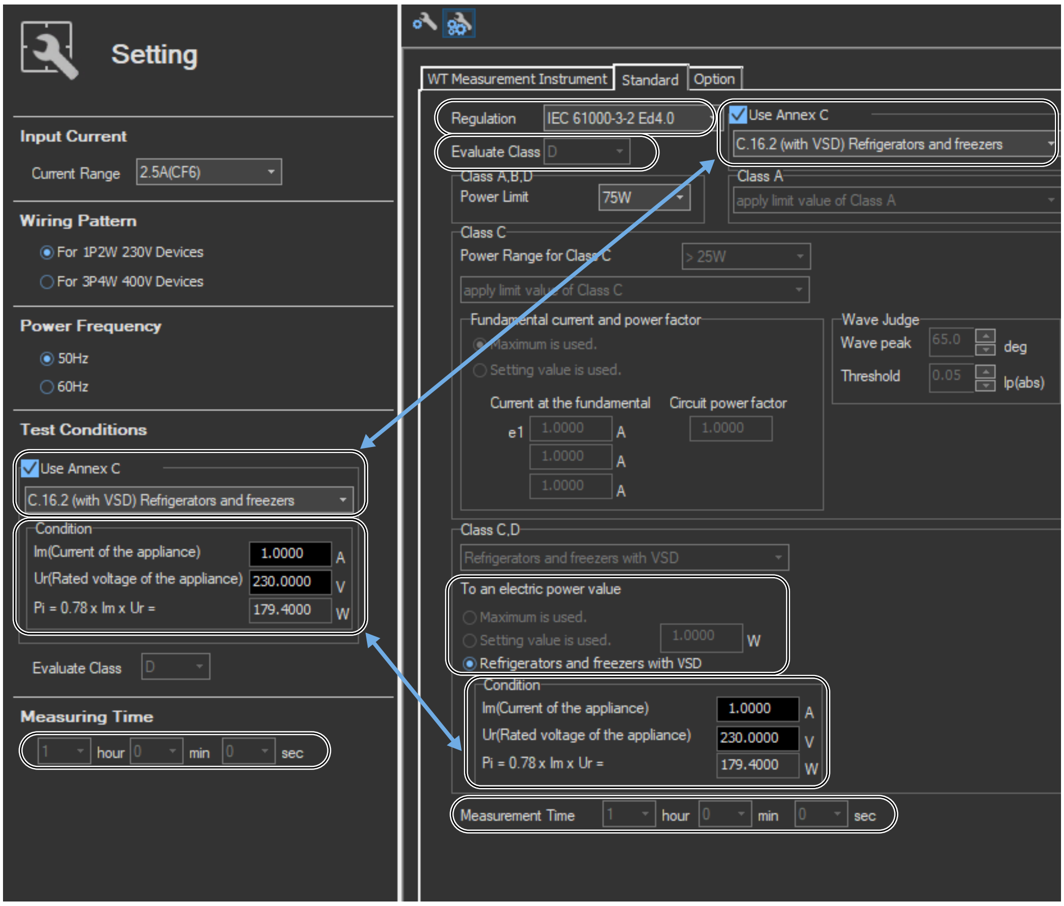
When “C.7 Vacuum cleaners” or “C.15 High pressure cleaners” Is Selected

If you select IEC 61000-3-2 Ed. 4.0 for the standard, you can select “Use Annex C.”
The settings marked off in the following figures will also change. And the regulation and the measurement time will change to its default value. The values in the figures are the default values.



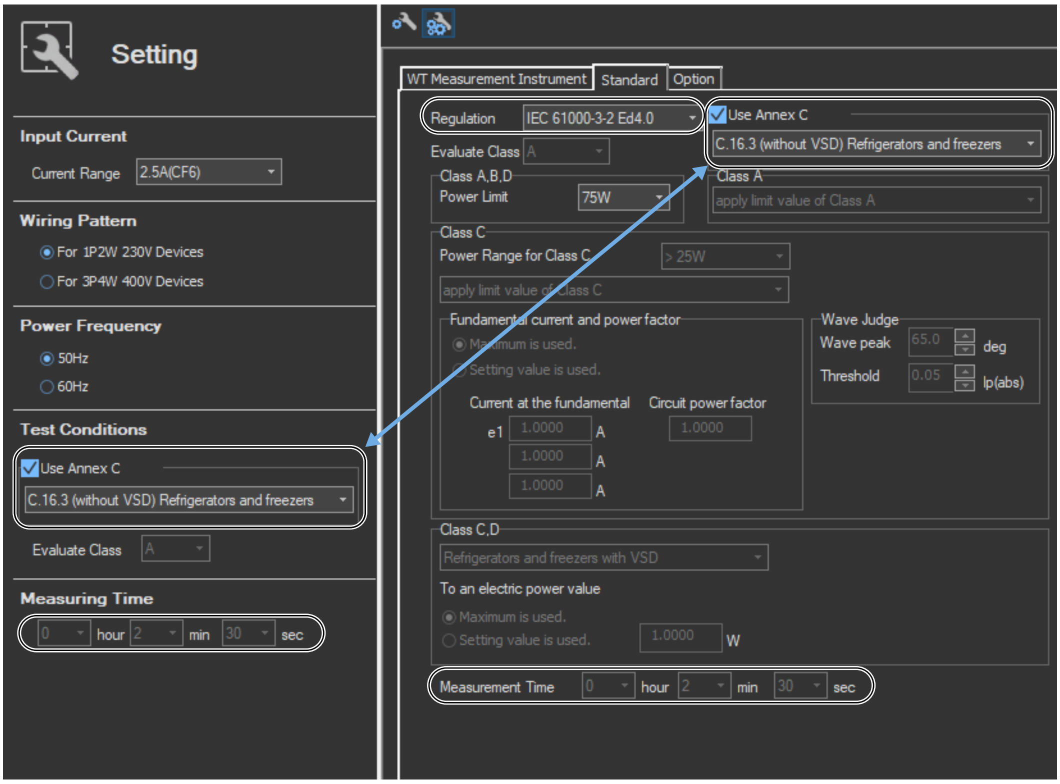
When “C.16.2 (with VSD) Refrigerators and freezers” Is Selected

If you select IEC 61000-3-2 Ed. 4.0 for the standard, you can select “Use Annex C.”
The settings marked off in the following figures will also change. And the regulation, evaluate class, to an electric power value, and measurement time will change to their default values.
The values in the figures are the default values.



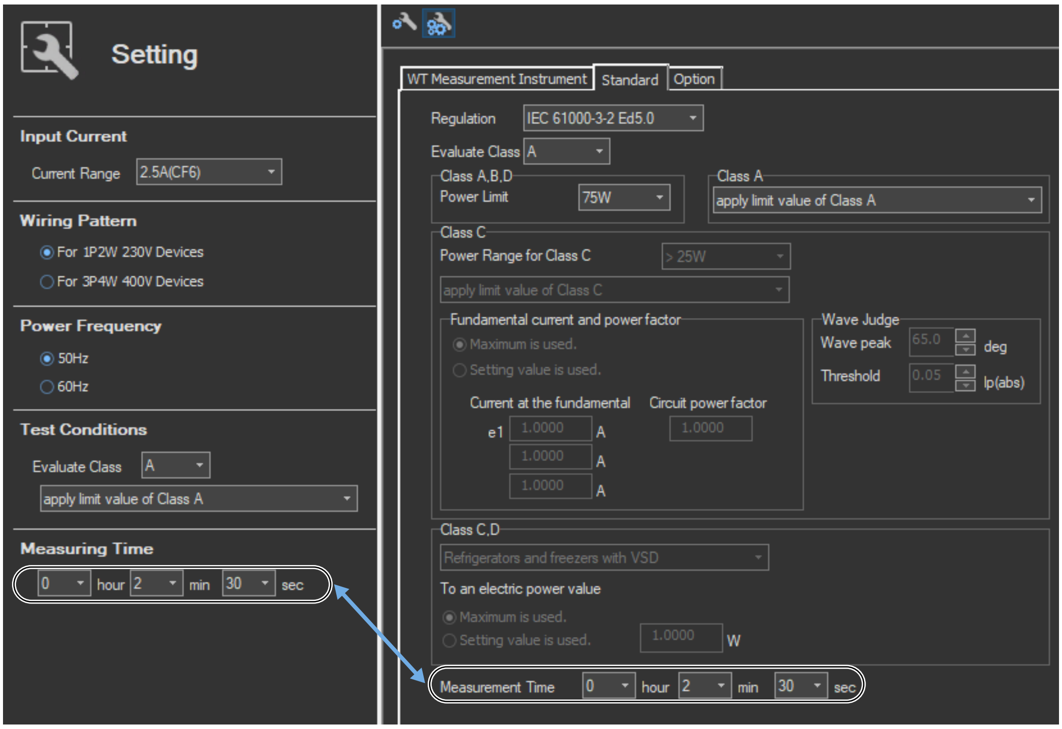
When "C.16.3 (without VSD) Refrigerators and freezers" Is Selected

If you select IEC 61000-3-2 Ed. 4.0 for the standard, you can select "Use Annex C."
The settings marked off in the following figures will also change. And the regulation, evaluate class, and measurement time will change to their default values. The values in the figures are the default values.



How Settings Change Based on Measurement Time Selection

The settings marked off in the following figures will also change.



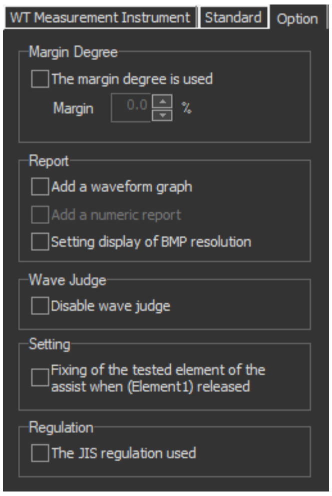
7.5 Setting the Optional Conditions

Procedure

1. Select the **Option** tab in the setting and display area. Judgment condition settings are displayed.s
2. Specify the settings.

Note

The items that you can set are the same whether you press the basic settings button  or the advanced settings button .



Explanation

For explanations of these terms, see section 1.5.

Margin Degree

The margin degree is used

Select whether or not to set a margin degree for judgment. If you choose to set a margin degree, specify it as a percentage. If you set the margin degree to 5.00 %, the limits will be narrowed by 5 %. If you set the margin degree to 0.00 %, the limits will be used as is.

Report

Add a waveform graph

Select this check box to include a waveform graph in the report.

Setting display of BMP resolution

In the BMP item under Output Form of the Print menu, the selectable output resolutions appear. (See section 11.2.)

Wave Judge

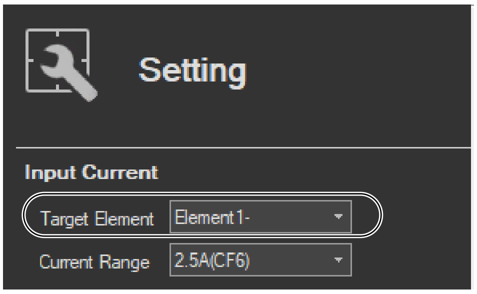
Disable wave judge

Select this check box to not include wave judgment in the overall judgment (see section 7.13).

Setting

Fixing of the tested element of the assist when (Element1) released

Select the check box to select the target element. A target element setting box appears in the Setting submenu area.



If the check box is not selected, the target element is fixed to element 1.

Standard (Regulation)

The JIS regulation used

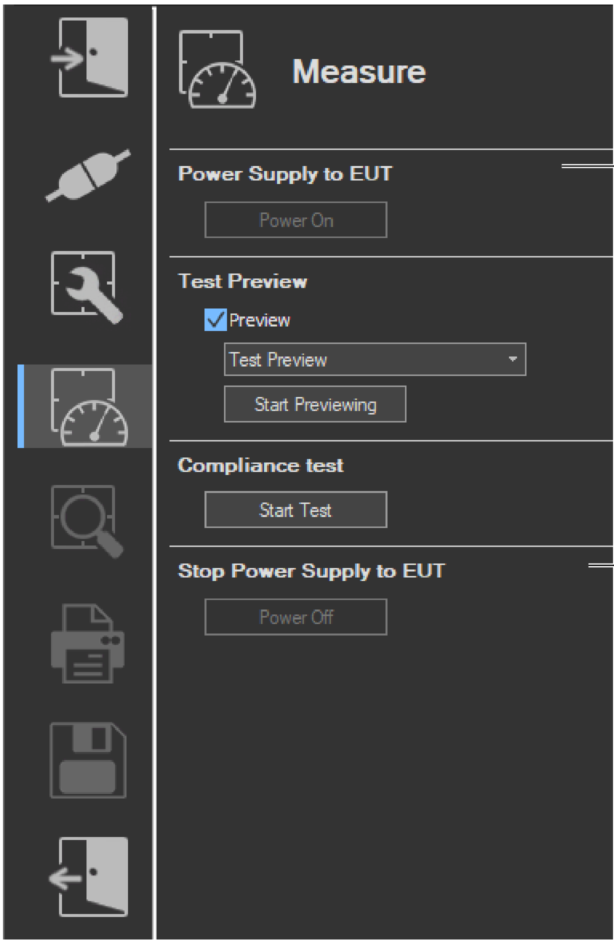
- **When the language is Japanese**
  The check box is always selected. On the Standard tab, you can select JIS in addition to IEC 61000-3-2 Ed4.0 and IEC 61000-3-2 Ed5.0.
- **When the language is not Japanese**
  The check box can be cleared. If the check box is cleared, the JIS standard is not displayed under the standard options. In this way, you can prohibit the JIS standard from being selected.

Using the Measure Page to Make Measurements

7.6 Turning the Power Output On and Off (When the power supply function is in use)

Procedure

1. Click  in the menu area. The Measure submenu appears.

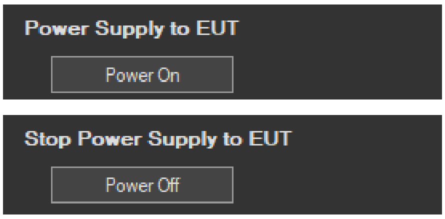


Turn on the power supply to the EUT.

Turn off the power supply to the EUT.

Turning the Power Output On and Off

To turn the power output on or off, click **Power On** or **Power Off** in the submenu area.



Whether the Power On, Power Off, and measurement start/stop buttons are enabled or disabled in each of the software states are as follows:

Harmonic Measurement

Software State	Power Supply State	Power On	Power Off	Measurement Start/Stop
Before measurement initialization (Reset)	Power on	Disabled	Enabled	Measurement start
	Power off	Enabled	Disabled	No
Measuring (Start)	Power on	Disabled	Disabled	Measurement stop
Measurement complete (Complete)	Power on	Disabled	Enabled	Measurement start
	Power off	Enabled	Disabled	No

WT states are indicated in parentheses.

Note

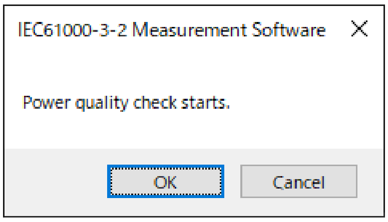
- If the software is in the Power On state and the software is switched from online to offline, the software switches to the Power Off state.
- If the software is switched from offline to online, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.
- When the software is closed, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.

Power Supply Quality Check

If the “The power supply quality is checked before compliance test” check box in the power supply settings (see page 7-12) is selected, the power supply quality is checked before the power output is turned on.

Note

If the /G7 option is not installed in the WT, the power supply quality cannot be checked.



The following items are verified.

- Measurement time 200 ms
- Power supply judgment conditions

  Rated voltage[1] Within ±2.0 %

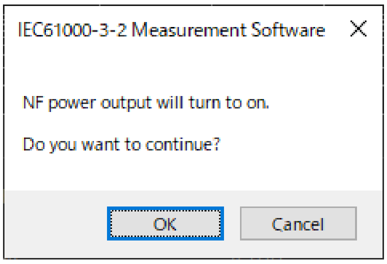
  Nominal frequency[2] Within ±0.5 %

- Relative harmonic content of output voltage U at no load

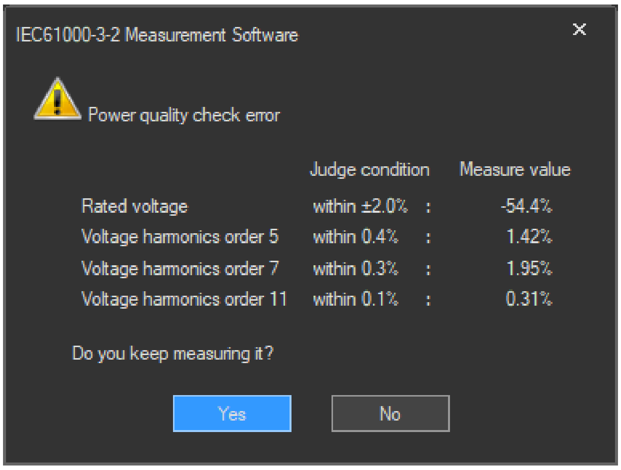
3rd	0.9 %
5th	0.4 %
7th	0.3 %
9th	0.2 %
Even harmonics between 2nd and 10th	0.2 %
Odd harmonics between 11th and 40th	0.1 %

1 For the rated voltage, the rated voltage value in the power supply settings (see page 7-12) and the measured voltage (rms) are compared.
2 For the nominal frequency, the rated frequency value in the power supply settings (see page 7-12) and the measured value are compared.

If no problems are found in the power supply quality, a power output confirmation message appears.



If problems are found in the power supply quality, an error message appears. The item that resulted in error is displayed.



Starting a Harmonic Measurement

Start harmonic measurement according to section 7.13 (test preview) or 7.14 (compliance test).

Voltage Range Validity Check

When a compliance test is started, the software checks whether the NF power supply, WT and Harmonic Measurement Software are configured as shown in the following table.

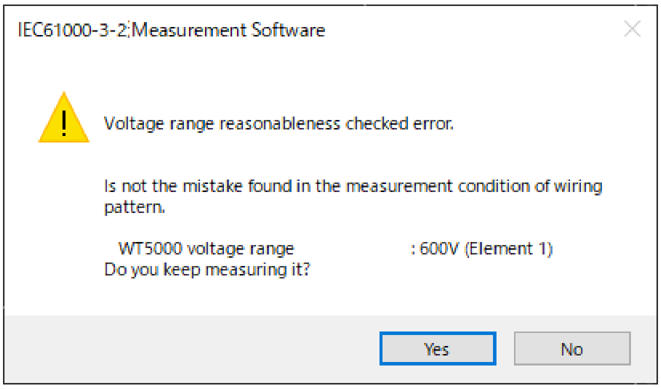
- Check items when the NF Power Connection is set to Use in “Configuring the Connection to the Power Supply” (see section 6.1)

Wiring Pattern	NF Power Supply Settings		WT Voltage Range*	Limit Conversion (For JIS)
	Rated Voltage	Rated Frequency		
Single-phase two-wire 230 V device	220 to 240 V	45 to 66 Hz	CF3:300 V CF6:300 V	———
Three-phase four-wire 400 V device	220 to 240 V	45 to 66 Hz	CF3: 300 V to 600 V CF6: 300 V to 500 V	———
Single-phase two-wire 100 V device (JIS)	100 to 115 V	45 to 66 Hz	CF3: 100 V to 150 V CF6:150 V	100 to 115 V
Single-phase two-wire 200 V device (JIS)	200 to 230 V	45 to 66 Hz	CF3:300 V CF6:300 V	200 to 230 V
Three-phase three-wire 200 V device (JIS)	110 to 120 V	45 to 66 Hz	CF3:300 V CF6:300 V	190 to 210 V
Single-phase three-wire 100 V/200 V device (JIS)	100 to 115 V	45 to 66 Hz	CF3: 100 V to 300 V CF6: 150 V to 300 V	100 to 230 V

* “CF3” in the table indicates that the crest factor is set to 3.

- If the NF Power Connection is set to Not Used in “Configuring the Connection to the Power Supply” (see section 6.1), the following items in the table above are verified.
  - WT voltage range
  - Limit Conversion (For JIS)

If the settings are different from those in the table, an error message will appear. The item that resulted in error is displayed.



Measured Element

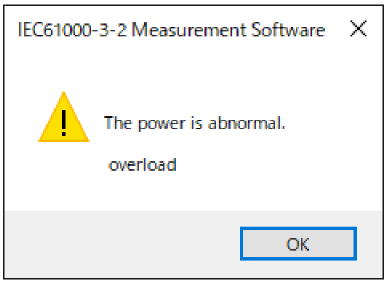
The measured element is determined by the WT measurement target (Object) setting.*

* See section 7.3.

For example, even when a three-phase power supply is being measured, if the WT measurement target (Object) is set only to Element 1, only input element 1 will be measured. Also, when a single-phase power supply is being measured, if the WT measurement target (Object) is set to Element 1 and 2, input element 2 (which is not receiving any signal) will also be measured, and the total judgment may indicate Fail.

Power Supply Error Check during Measurement

This software checks whether an error is occurring in the power supply during measurement. If an error is found, an error message appears. For example, if an overload occurs, the following error message will appear.

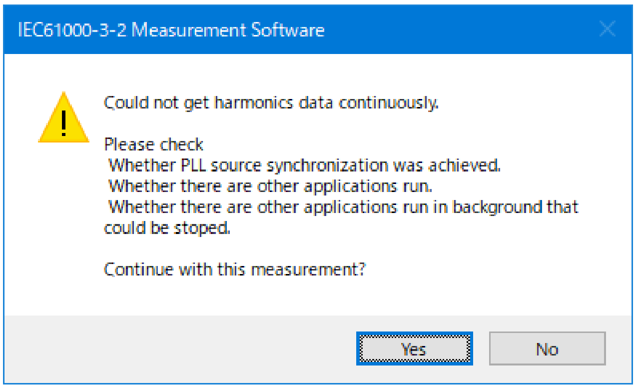


Note

The power output remains on even if the harmonic measurement is ended or aborted. (It is not automatically turned off.)

Data Acquisition Error Check during Measurement

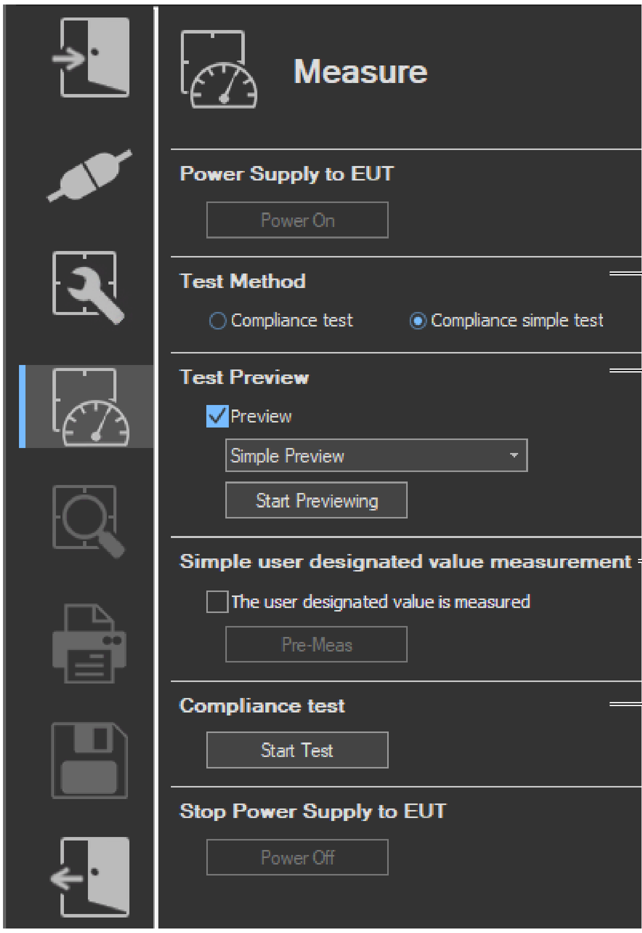
If harmonic measurement data cannot be acquired consecutively, the following error message will appear.



7.7 Previewing Harmonic Data and Waveform Data

Procedure

1. Click  in the menu area. The Measure submenu appears.



Test method (section 7.14)
Appears if you have selected Simple Test Measurement in the test menu described in section 4.1. You can execute a simple test.

Test preview (page 7-43)
Before you start a test, you can check harmonic measurement data and waveform data.
You can execute a compliance test without previewing data.

Simple user designated value measurement (section 7.12)
Appears if you set the class to C or D in the test conditions described in chapter 7. The fundamental current, circuit power factor, and power values are measured.

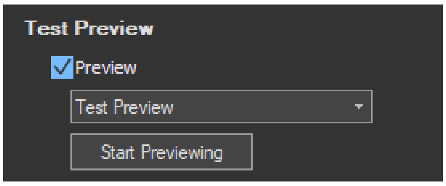
Compliance test (section 7.13)
Executes a compliance test based on harmonic measurement.

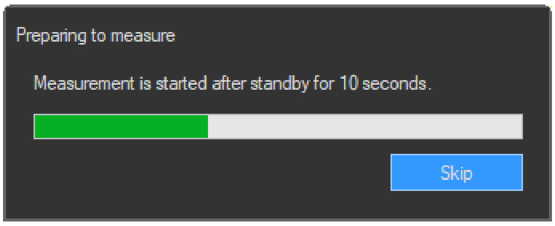
Previewing Test Data

2. Select the **Preview** check box.

3. Select the preview that you want to display.

4. Click **Start Previewing**. A message will appear to indicate that you have to wait before measurement starts. After that, the measured harmonic values will appear in the display area.



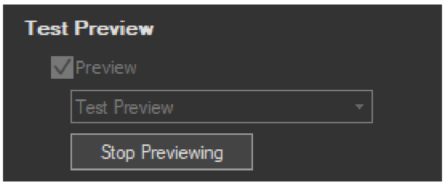


Note

When you preview the harmonics of a current, the data that had been acquired or loaded before the preview is discarded. Be sure to save any compliance test data before you begin a test preview (for information on how to save data, see chapter 11).

Stopping a Test Preview

Click **Stop Previewing**.



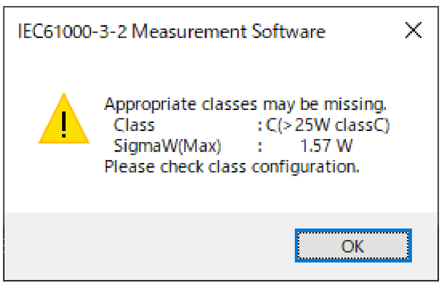
Checking the Class Setting and Active Power

When you stop previewing, the software checks whether the measured active power is within the standard limits of each class.

Class	Active Power P Range
A	No specification
A (JIS, P > 600 W, Air conditioner)	P > 600 W
B	No specification
C (P > 25 W)	P > 25 W
C (5 W ≤ P ≤ 25 W)	5 W ≤ P ≤ 25 W
D	P ≤ 600 W

A message appears if the measured active power is outside the standard limits. Check whether the class setting is correct.

Message example



7.8 Setting the Display of the Test Preview

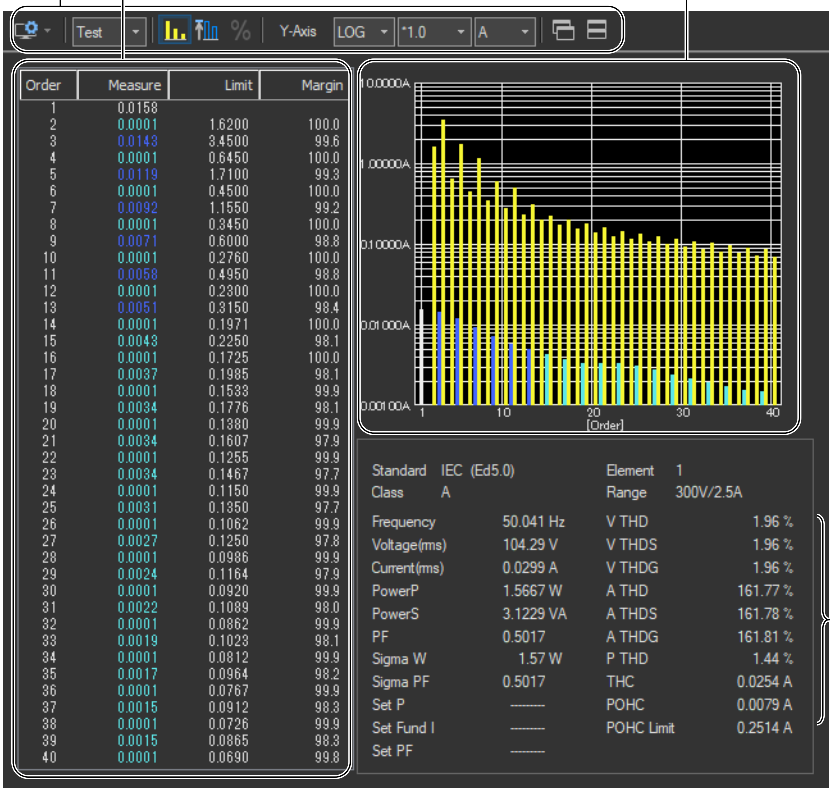
Procedure

An Example of the Test Preview

Toolbar

Numerical lists

Bar graphs

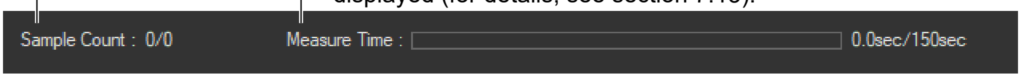


Measured value lists
For explanations of these terms, see section 1.5.

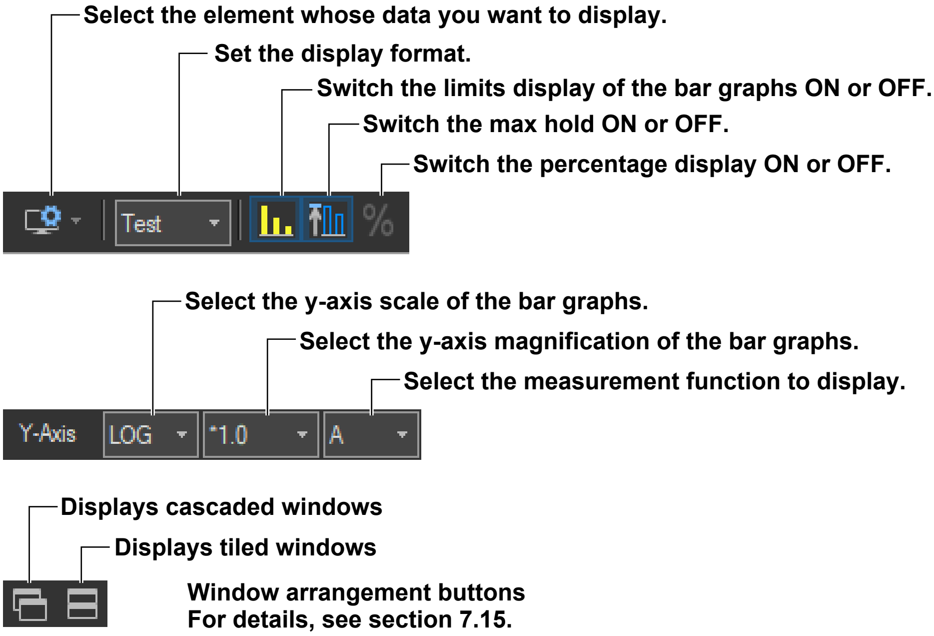
An Example of the Setting and Display Area

Sampled data number
When a preview is being displayed, the display here is 0/0. When a compliance test is being executed, the number of times measured data has been acquired is displayed (for details, see section 7.13).

Measurement time
When a preview is being displayed, the display here is 0.0 sec/[the measurement time set according to the procedure described in sections 7.1 and 7.4]. When a compliance test is being executed, the amount of time for which measured data has been acquired is displayed (for details, see section 7.13).



Toolbar



Selecting the Element Whose Data You Want to Display

Click . If input elements 1 to 3 are being measured, as you click the icon, the displayed data will switch from element 1, to element 2, to element 3, to element 1, and so on. Click ▼ to select an element directly.

Selecting the display format

Select **Test** (Bar+List), **Bar**, **List**, or **Simple**.*

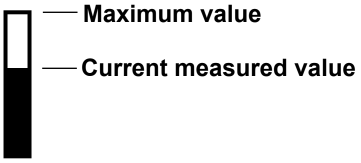
* Simple appears when you are performing a simple compliance test (see section 7.14).

Switching the Limits Display of the Bar Graphs ON or OFF.

Click . The limits are displayed using yellow bars. The limits are displayed using yellow bars. The limits are applied only to harmonic current. There are no specified limits for voltages or phase angles. So limits for these values are not displayed.

Turning MaxHold On and Off

Click . The maximum value of the measured data is held when MaxHold is ON. When MaxHold is ON, bars are displayed as shown below.



Switching the Percentage Display ON or OFF.

Click to turn the percentage display ON and display the following items as percentages.

Numerical Lists

- The relative harmonic data or content of each harmonic
- Limits

Bar Graphs

- The Y-axis scale

Measured Value Lists

- THC
- POHC
- POHC maximum
- POHC limit

- The percentage display is applied only to harmonic current.
- Percentage display is valid when the class is set to C in the test conditions and one of the following conditions is met:
  - You set the power class to “> 25W.”
  - You set the power class to “≤25W,≥5W” and the limits to “judge from THD, 2, 3, 5, 7, 9, 11th.”
  - You set the power class to “≤25W,≥5W” and you set the limits to “judge with current wave pattern of 3rd&5th.”
- On he Percentage Display, The relative harmonic content of current of each harmonic can be displayed on bar graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 7.4) taken to be 100 %.
- When limits are specified by the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics, such as the limits for Class C equipment with active input power between 5 W and 25 W, bars corresponding to the magnitude of the values are displayed.
- When the magnification of the Y-axis scale is *1.0, the maximum scale of Y-axis is 100.00 %.

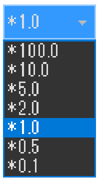
Selecting the Y-Axis (Current Magnitude) Scale

Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

Selecting the Magnification

- When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.
- When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting the Measurement Function to Display

Select **A**, **V**, or **Deg** (for current, voltage, or phase angle).

Explanation

Colors of the numerical lists and bar graphs of the current

The table below describes what the colors. Condition 1, Condition 2, 200% short-term relaxation, and POHC relaxation conditions that appear in the table are defined below.

Condition 1

The maximum harmonic current over the measurement time is within 1.5 times the specified limit. Evaluation is made on each harmonic.

Condition 2

The mean harmonic current over the measurement time is within the specified limit. Evaluation is made on each harmonic.

200% Short-Term Relaxation Conditions

If all of the following conditions are met, up to 200 % of the specified limits is permitted.

- The EUT belongs to Class A for harmonics.
- The excursion beyond 150 % of the applicable limits lasts less than 10 % of the test observation period or in total 10 min (within the test observation period), whichever is smaller.
- The average value of the harmonic current, taken over the entire test observation period, is less than 90 % of the applicable limits.

POHC Relaxation Condition

If the maximum value of the sum of partial odd harmonic currents (POHC) of order above and including 21 is less than the specified POHC limit, the mean of the odd harmonic currents of order above and including 21 is permitted to be 1.5 times the specified limit.

■	**Blue**	Limit not exceeded.
■	**Red**	Limit exceeded.
■	**Yellow (applies only to bar graph)**	Limit specified by the applicable standard.
■/□	**Black/white (applies only to numerical list)**	No applicable limit is specified. (The measured value of the fundamental frequency and orders that are not applicable is displayed in black when the software background color is set to light and white when the software background color is set to dark.) * Software background color setting ► section 3.9 in the IS8000 software User's Manual (IM IS8000-01EN.)
□	**White (applies only to bar graph)**	No applicable limit is specified. (The bar graph of the fundamental frequency and orders that are not applicable is displayed in white.)
■	**Turquoise**	The measured data is less than the larger of the two values, 0.6 % of the mean rms current and 5 mA.
■	**Aqua**	Limit exceeded. Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits or set to Infinity.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Colors of the numerical lists and bar graphs of the voltage and phase angle

There are no voltage or phase angle limits. Bar graphs of harmonic voltage or phase angle are displayed in white. The values displayed in the list are black when the software background color is set to light and white when the software background color is set to dark.

Numerical Lists

Limits

- The limits specified in the applicable standard are displayed in a list for each harmonic.
- The harmonic data shown in the Test preview consists of instantaneous values, so the listed limit values and yellow bars are shown using values that are 1.5 times larger than the limits.
- The limits are applied only to harmonic current.
- If the Percentage Display check box is selected, the relative harmonic content of the limit of each harmonic can be displayed with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 7.3) taken to be 100 %.
- When limits are specified by the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics, such as the limits for Class C equipment with active input power between 5 W and 25 W, the current value converted from the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics with the fundamental current specified in advance when making Class C evaluation (see section 7.3) taken to be 100% is displayed.

Margin Degree

- Indicates the margin to the limit. For each harmonic, the margin is derived from the following equation using the limits and measured values displayed in the list.

$$\frac{\textbf{Limit – measured value}}{\textbf{Limit}} \times 100$$

- The margin only applies to harmonic current values.
- The color of the values changes depending on whether or not you select “The margin degree is used” check box described in section 7.5.
  - The margin degree is used
    Blue indicates that a value has exceeded the margin that you specified according to the procedure in section 7.5.
    Red indicates that a value is at or below the margin that you specified according to the procedure in section 7.5.
  - When the Margin Degree Is Not Used
    Values are displayed in black.

7

IEC 61000-3-2 Harmonic Measurement

Bar Graphs

Bar Graph of Harmonic Current or Voltage

The software displays the instantaneous values acquired within the measurement time for each harmonic order.

Bar Graph of Harmonic Phase Angles

Bar graphs of the phase angle of the harmonic current with respect to the fundamental current for each harmonic can be displayed. However, the phase angle with respect to the fundamental voltage is displayed on the bar graph for the fundamental current.

- When the harmonic phase is leading the fundamental current, a positive phase angle is indicated; when the harmonic phase is lagging the fundamental current, a negative phase angle is indicated.
- When the fundamental current is leading the fundamental voltage, a negative phase angle is indicated; when the fundamental current is lagging the fundamental voltage, a positive phase angle is indicated.

Measured Value Lists

For explanations of these terms, see section 1.5.

Sigma W

Sigma W is the active power for all grouped phases (all measured input elements).

Note

- When applying the power ratio limit on Class C or D multi-phase equipment, the harmonic current per watt derived from the total active power (Sigma W) of all phases (three phases if three-phase) and the power ratio limit are compared and evaluated.
- Equipment whose Sigma W exceeds 600 W is considered Class A equipment under the standard. Use caution because the software makes evaluations using the class selected in standard and measurement environment settings (see section 7.3).

Set P, Set Fund I, and Set PF

For Set P, the power value (see section 7.4) specified in advance is displayed when making Class C or D evaluations.
For Set Fund I and Set PF, the fundamental current and power factor values (see section 7.3) specified in advance are displayed respectively when making Class C evaluations.

Note

- When the Standard Is Set IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019
  When Class D and “(with VSD) Refrigerators and freezers” Are Selected in section 7.1
- When the Standard Is Set to IEC 61000-3-2 Ed. 4.0
  When the “Use Annex C” check box and “C.16.2 (with VSD) Refrigerators and freezers” are selected in section 7.1

In the above cases, these items are displayed as follows:
Set Im: current of the appliance
Set Ur: rated voltage of the appliance
Set Pi: effective power of the appliance

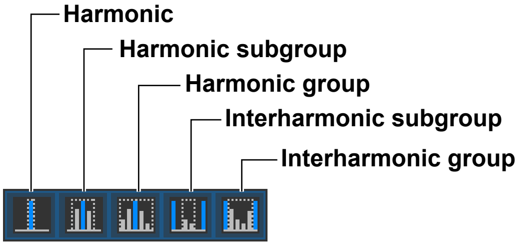
7.9 Setting the Display of the List Preview

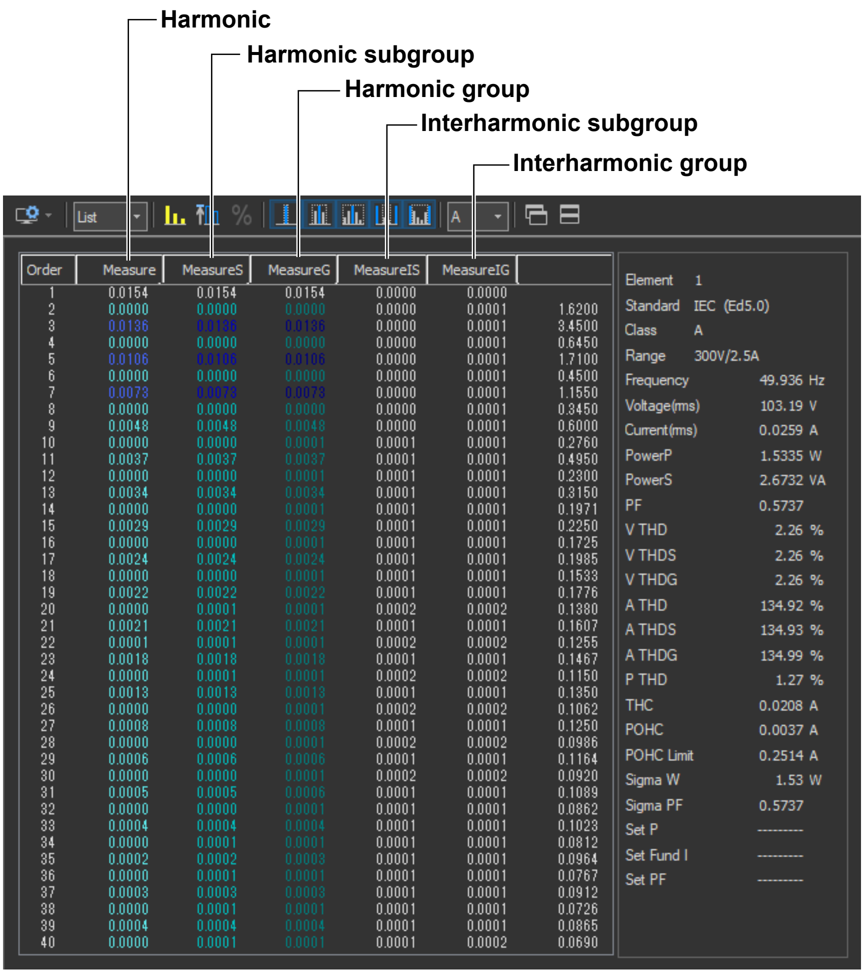
Procedure

An Example of the List Preview

For information about the functions of toolbar icons other than those listed below, see section 7.8.

Turning Each of the Measured Value Lists (Columns) ON and OFF



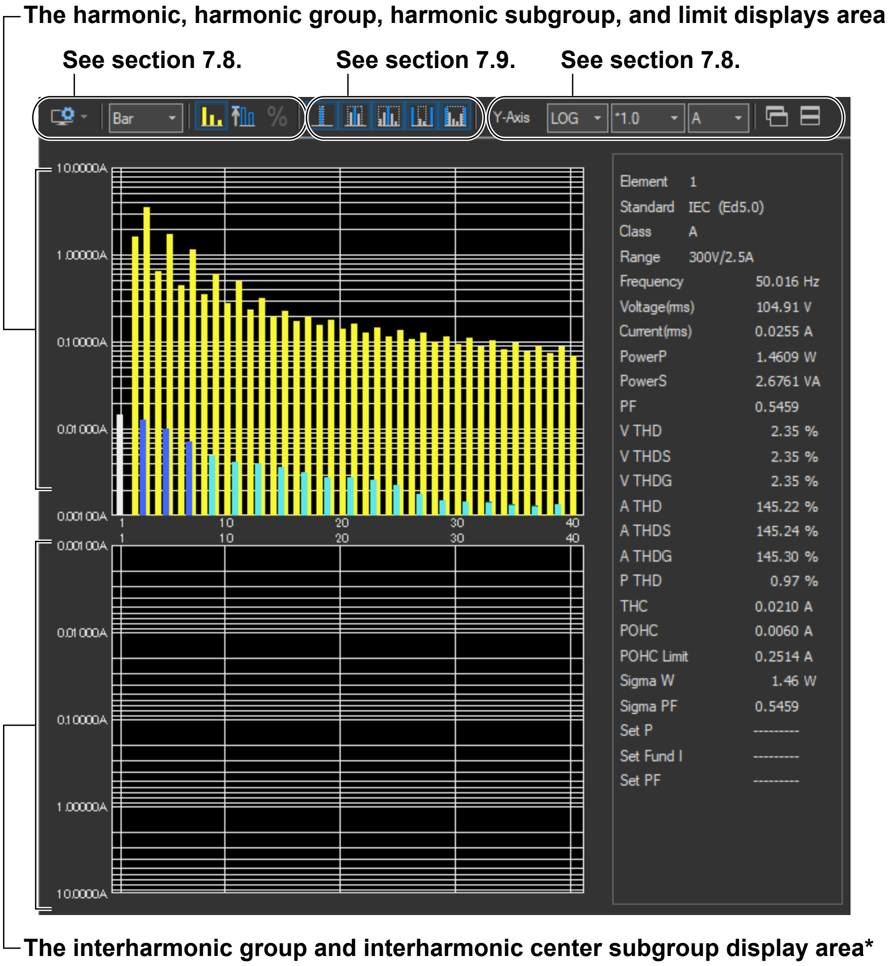


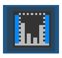
For details on the numerical lists, see section 8.2.

7.10 Setting the Display of the Bar Preview

Procedure

An Example of the Bar Preview



* Appears when the interharmonic group display button  is pressed or when the interharmonic center subgroup button  is pressed.

For details on the bar graph, see section 7.7.

Explanation

Color of Bars

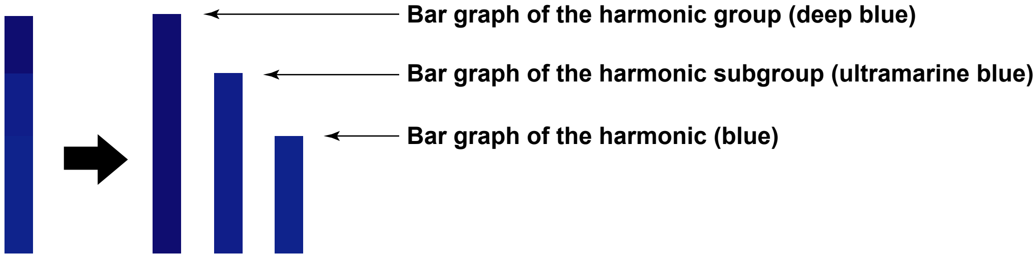
Color of the Harmonic Bar Graph

See section 7.7.

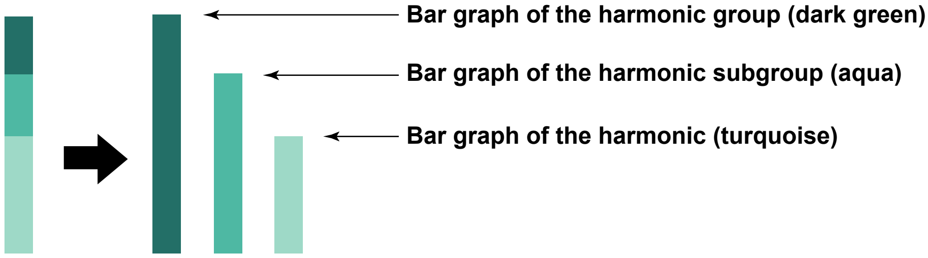
Color of the Harmonic Group and Harmonic Subgroup of Current

The harmonic, harmonic group, and harmonic subgroup are superimposed on the bar graph.

- When the Measured Values Are within the Limit

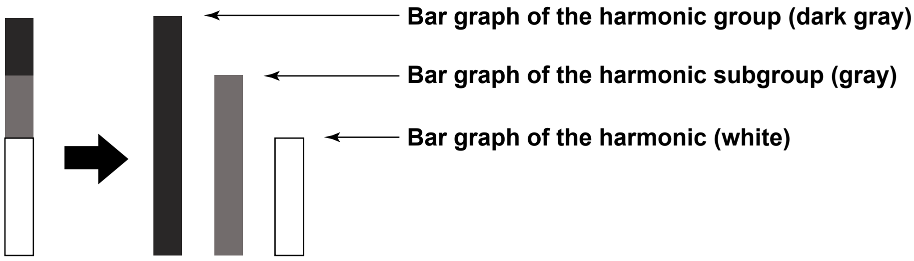


- When Evaluation Is Not Made Because the Measured Data Is Less than the Larger of the Two Values, 0.6 % of the Mean Rms Current and 5 mA



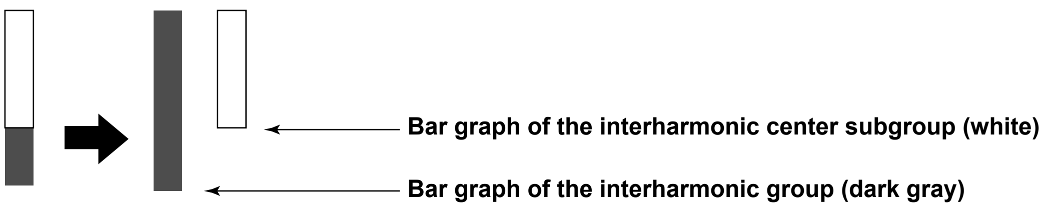
Color of the Harmonic Group and Harmonic Subgroup of Voltage

The harmonic, harmonic group, and harmonic subgroup of voltage are displayed as shown below. There is no need to compare with the limit to make evaluations.



Color of the Interharmonic Group and Interharmonic Center Subgroup

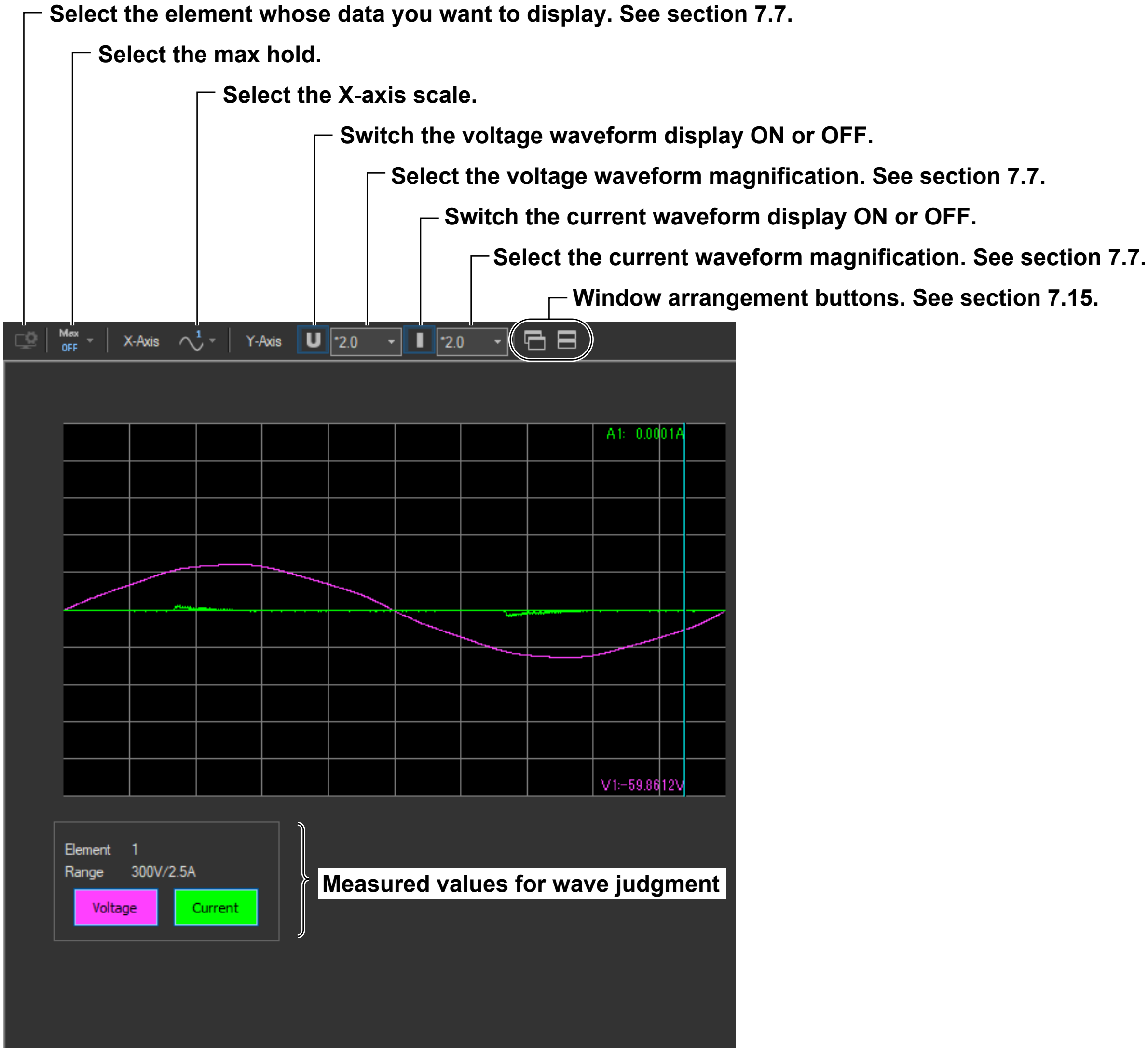
The interharmonic group and interharmonic center subgroup are displayed as shown below. There is no need to compare with the limit to make evaluations.



7.11 Setting the Display of the Wave Preview

Procedure

An Example of the Waveforms Preview



Selecting the Max Hold

Click . Select **Dotted**, **Line**, or **None**.

The button indication changes depending on the current setting.

Selecting the X-Axis Scale

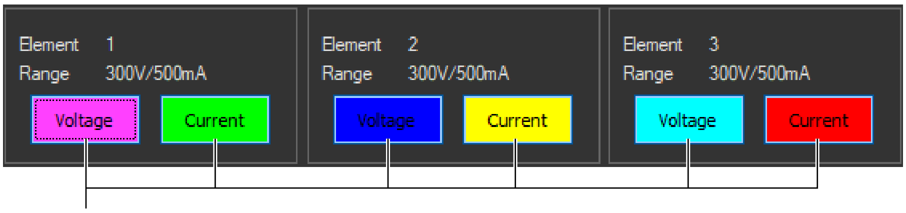
Click . Select **ALL**, **Cycle**, **Half Cycle+**, or **Half Cycle-**.

The button indication changes depending on the current setting.

Switching the Waveform Display ON or OFF.

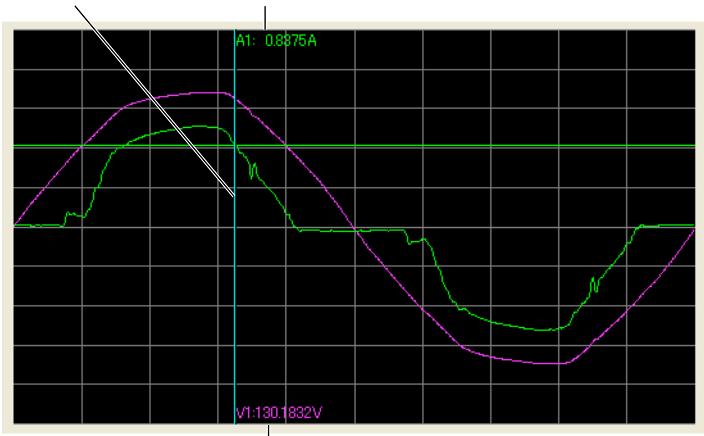
You can show or hide an element's voltage or current waveform by clicking on the Voltage and Current buttons for each element in the show/hide box.

Show/hide box (an example of the three-phase input)



Using the Cursor to Display Current and Phase Angle Values

When you click an area of the waveform, a cursor will appear there. The current and voltage at the cursor position will be displayed.



Explanation

Display Colors

The following colors are assigned to the waveforms of each input element in order, starting with the lowest numbered element. If you are previewing the waveforms of elements 1, 2, and 3, the following colors will be assigned to the element's voltage and current waveforms:

Element	Voltage	Current
Element 1	Pink	Bright green
Element 2	Blue	Yellow
Element 3	Turquoise	Red

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Measured Values for Wave Judgment

This appears when you set the following judgment conditions (see section 7.4).

- Class C
- The active power is between 5 W and 25 W (≤25 W, ≥5 W)
- Evaluating on the Conditions of 3rd and 5th Harmonics and Current Waveforms

The displayed contents are shown below. For details on wave judgment, see section 1.3.

Ip(abs)	The higher absolute value of the peak value of the current waveform (+) and (-)
Ip+	Phase angle of the peak value of the current waveform (+)
Ip-	Phase angle of the peak value of the current waveform (-)
60-90deg(+)Min	Minimum current between 60° to 90° in the positive half cycle
60-90deg(-)Max	Maximum current between 60° to 90° in the negative half cycle

Colors of measured values

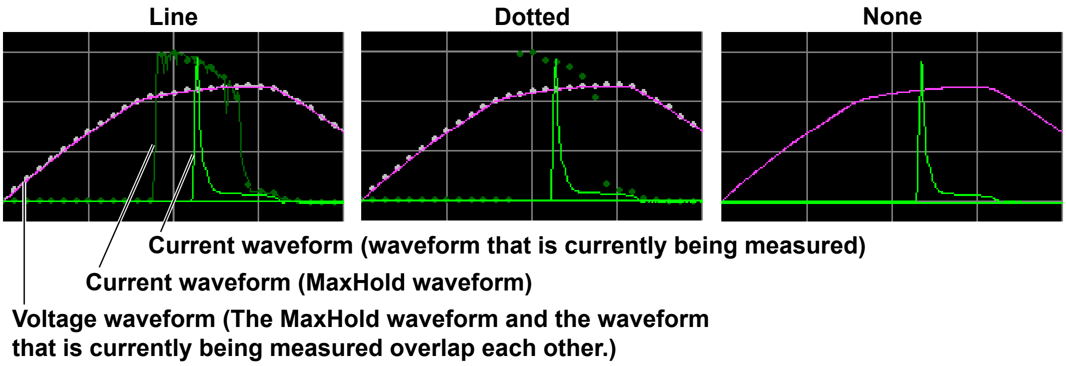
- Ip+ and Ip- are displayed in red when the “wave peak phase” set in section 7.3 is exceeded.
- 60-90deg(+)Min is displayed in red when it is less than or equal to the “current threshold” set in section 7.3.
- 60-90deg(-)Max is displayed in red when it is greater than or equal to the “current threshold” set in section 7.3.

Setting MaxHold

If MaxHold is set to Dotted or Line, the MaxHold waveform and the waveform that is currently being measured are displayed. The MaxHold waveform is a waveform derived by superimposing the waveforms measured after the start of a waveform preview and connecting the maximum values at each phase. The MaxHold waveform is displayed in the following manner.

- Dotted: The MaxHold waveform is displayed using dots.
- Line: The MaxHold waveform is displayed using a solid line with dots.
- None: The MaxHold waveform is not displayed.

The MaxHold waveform is displayed with lower intensity than the waveform that is currently being measured.



When MaxHold is set to Dotted or Line, the measured value of wave judgment takes on the following value.

- Ip(abs), Ip+, Ip-, 60-90deg(-)Max: Maximum value after the start of the waveform preview
- 60-90deg(+)Min: Minimum value after the start of the waveform preview

When MaxHold is set to Dotted or Line, the cursor value indicates the current or voltage of the MaxHold waveform.

Selecting the X-Axis Scale

- All: 50 ms
- Cycle: 1 cycle
- Half Cycle+: Half Cycle (Positive side)
- Half Cycle-: Half Cycle (Negative side)

Changing the Y-Axis Scale (the Size of the Voltage and Current Waveforms)

- Linear scaling is used. Logarithmic scaling is not supported.
- The measurement range specified for the WT is used as the maximum value, 1.0, on the Y-axis (see section 7.3 for details on setting the range).

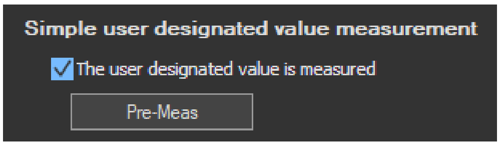
7.12 Making Simple User Designated Value Measurement

Procedure

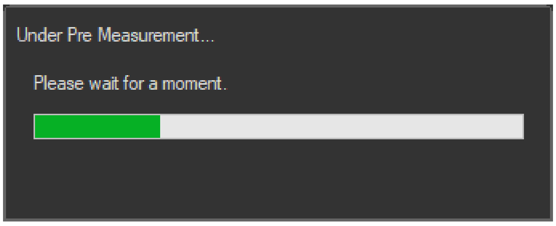
1. Click  in the menu area. The Measure submenu appears.

   For general information about submenus, see section 7.7.

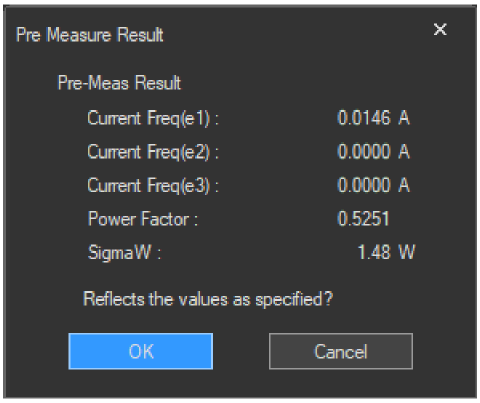
2. Select **the user designated value is measured** check box.



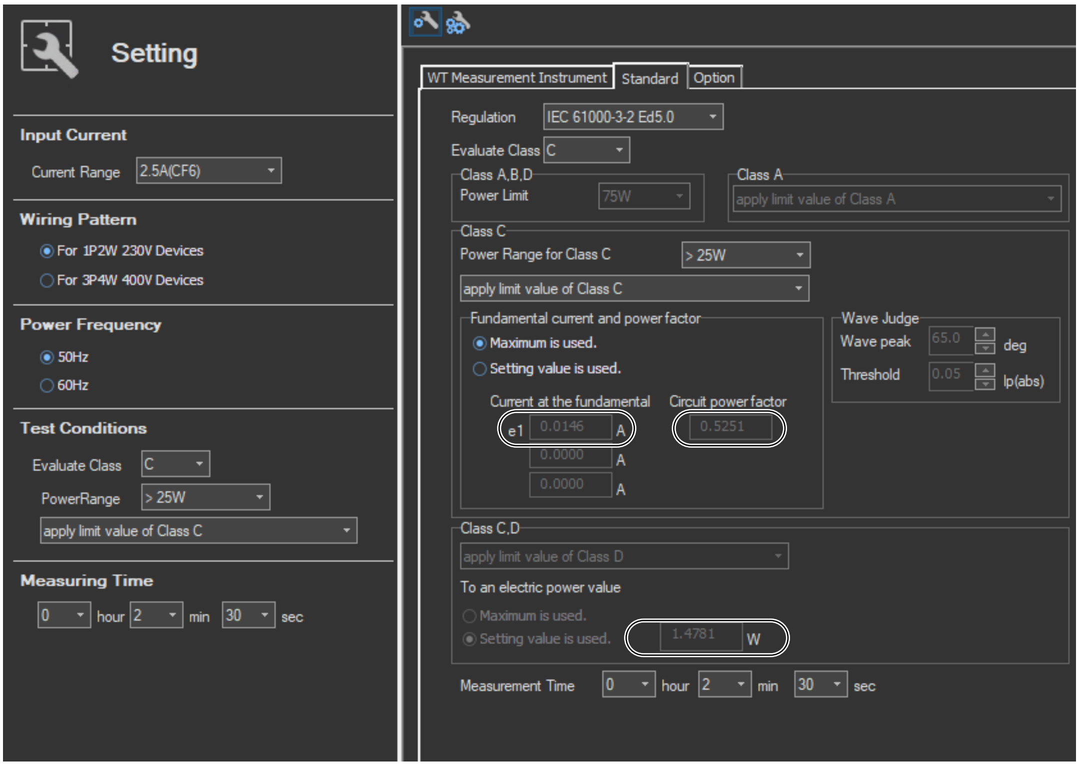
3. Click **Pre-Meas**. A message will appear to indicate that pre-measurement is taking place.



After 10 seconds of pre-measurement, the Pre Measure Result message appears.



4. Select whether or not to use the results of pre-measurement to set the fundamental current, circuit power factor, and power values described in section 7.3. If you select **Yes**, the values will be set to the pre-measured values.



Explanation

Simple User Designated Value Measurement

For class C and class D, to perform compliance tests, users can specify the fundamental current and circuit power factor, or the power value to perform compliance tests. If you measure the fundamental current, circuit power factor, and power value using the procedure described in this section, you can apply the measured results to the fundamental current, circuit power factor, and power value in the judgment conditions described in section 7.3.

7.13 Making Compliance Test (Harmonic Measurements)

Procedure

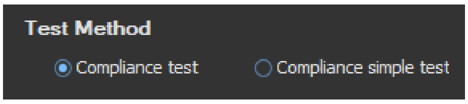
1. Click  in the menu area. The Measure submenu appears.

For general information about submenus, see section 7.7.

Selecting the Test Method

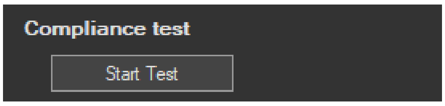
This only appears if you have selected Simple Test Measurement in the test menu described in section 4.1.

2. Select **Compliance test**.



Starting a Test

3. Click **Start Test**. A dialog box opens that indicates that you have to wait before measurement starts. Then measured harmonic values appear in the measured harmonic values list window.



- When the Standard Is Set IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019
  When Class D and “(with VSD) Refrigerators and freezers” Are Selected in section 7.1
- When the Standard Is Set to IEC 61000-3-2 Ed. 4.0
  In section 7.1, if you selected the “Use Annex C” check box and selected “C.7 Vacuum cleaners” or “C.15 High pressure cleaners”

In the above case, the test is performed three times for maximum, 50%, and minimum.

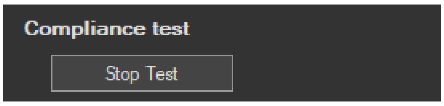
Stopping a Test

Stopping Automatically

The software will stop testing automatically once the specified measurement time has been reached.

Stopping Manually

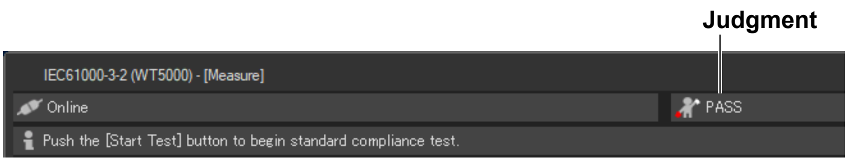
Click **Stop Test**. If the WT is measuring, it will stop when measurement ends normally and data has been acquired.



Once the test is finished, the overall judgment appears.

Display example: PASS

The overall judgment also appears in the information area.



Explanation

An Example of the Setting and Display Area during a Compliance Test

Sampled data number
One sample count is equivalent to 200 ms (10 cycles for 50 Hz and 12 cycles for 60 Hz)* worth of measured instantaneous data values. This data is acquired by the software and displayed. In this example, 750 samples have been acquired.

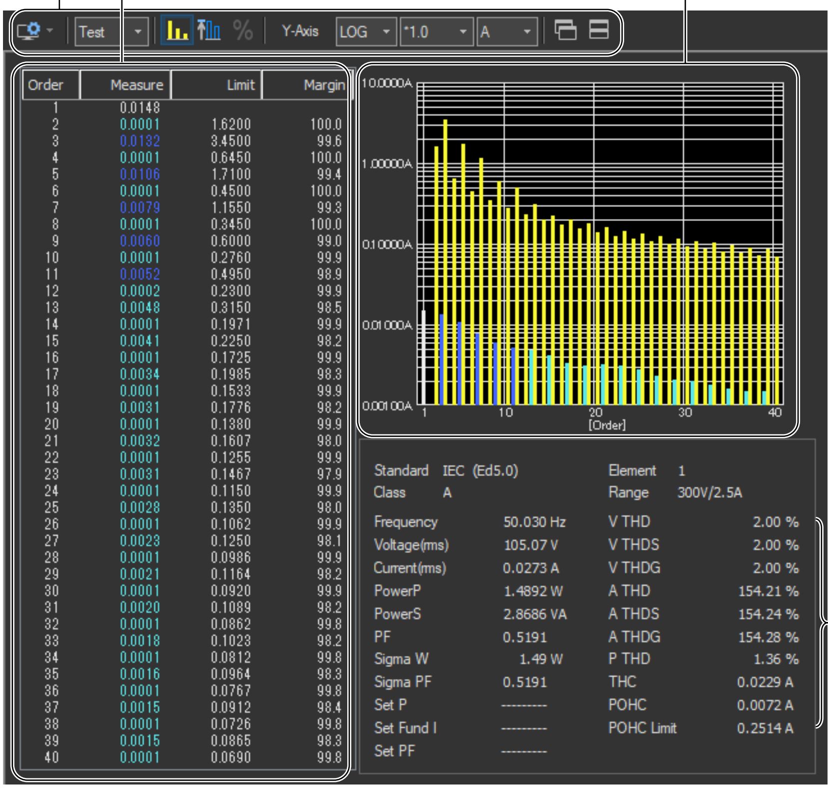
Measurement time
The amount of time that has elapsed since the start of measurement/the measurement time set according to the procedure described in section 7.4.

* When the IEC 61000-4-7 edition is set to 2.0 or 2.0 A1. When the IEC 61000-4-7 edition is set to 1.0, the number of cycles is 16 (320 ms at 50 Hz or 267 ms at 60 Hz).

Toolbar

Numerical lists

Bar graphs



Measured value lists
For explanations of these terms, see section 1.6.

Selecting the display format of the setting and display area

Only Test(Bar+List) is valid. Even if you select a different display format (Bar or List) by clicking one of the display format selection icons in the toolbar, measured data will not be displayed.

Judgment

If all of the elements that are tested pass, PASS appears. Otherwise, FAIL appears.

PASS

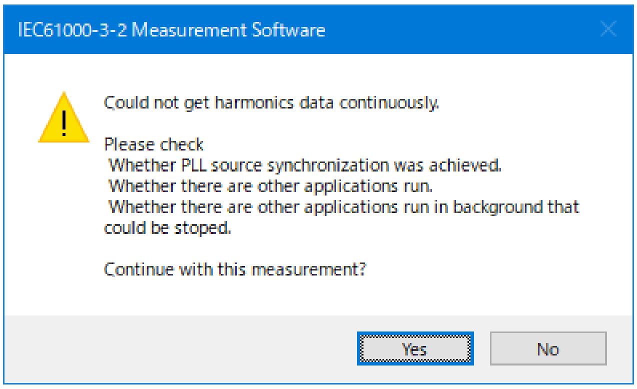
FAIL

The limit has not been exceeded, but the margin specified in section 7.4 has been exceeded.

No data

Error Messages during Measurement

The following error message may appear when measurement is executed in Compliance Test.



This software retrieves large amount of measured data from the WT. The error message may appear if the CPU on the PC is overloaded and cannot keep up with the data transfer. Lighten the load placed on the CPU on the PC by checking the points listed below.

- Do not operate or run other programs.
- Close memory-resident programs (turn them OFF).
- Disable the standby mode.
- Use the software on a PC that satisfies the system requirements given in section 1.2.

Checking the Test Conditions

When the test is finished, before making an overall judgment, the software checks the following items to determine whether the test conditions are appropriate.

- Class setting and active power
- Fundamental current and circuit power factor for class C
- Active power for class D

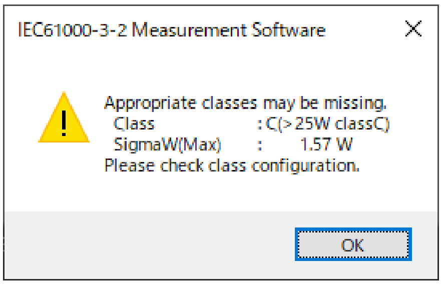
Class setting and active power

The software checks whether the measured active power is within the standard limits of each class.

Class	Active Power P Range
A	No specification
A (JIS, P > 600 W, Air conditioner)	P > 600 W
B	No specification
C (P > 25 W)	P > 25 W
C (5 W ≤ P ≤ 25 W)	5 W ≤ P ≤ 25 W
D	P ≤ 600 W

A message appears if the measured active power is outside the standard limits. Check whether the class setting is correct.

Message example



After you confirm the message, the overall judgment is displayed.

Fundamental current and circuit power factor for class C

When you specify the fundamental current and circuit power factor for a class C test, the software checks the fundamental current and circuit power factor.

- Fundamental current check

  The software checks whether the measured value of the fundamental current is greater than or equal to 90 % and less than or equal to 110 % of the specified value.
- Circuit power factor check

  The software checks whether the measured value of the circuit power factor is greater than or equal to 90 % and less than or equal to 110 % of the specified value.

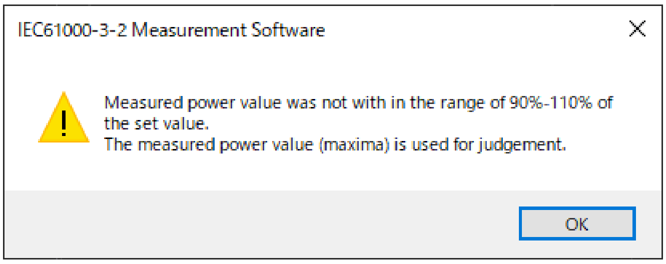
When the Standard Is Set IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019

Classifications in Class C		Fundamental current check	Circuit power factor check
P > 25 W	Apply limit value of class C	Yes	Yes
	Apply limit value of class A (dimming lights)	No	No
P ≤ 25 W, ≥ 5 W	Apply limit value of class D	No	No
	Judge with current wave pattern of 3rd & 5th	Yes	No
	Judge from THD, 2, 3, 5, 7, 9, 11th	Yes	No

When the Standard Is Set to IEC 61000-3-2 Ed. 4.0

Classifications in Class C		Fundamental current check	Circuit power factor check
P > 25 W	Apply limit value of class C	Yes	Yes
	Apply limit value of class C (dimming lights)	No	No
	Apply limit value of class A (dimming lights)	No	No
P ≤ 25 W	Apply limit value of class D	No	No
	Judge with current wave pattern of 3rd & 5th	Yes	No

A message appears if the measured values are outside the above ranges. Check whether the specified values are correct.



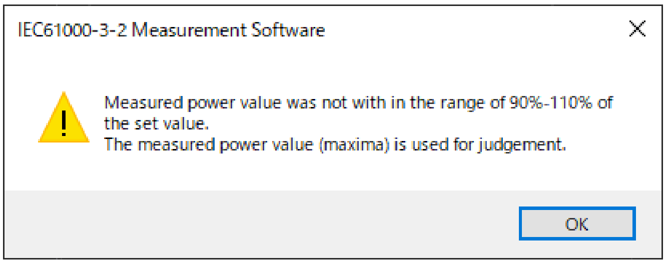
After you confirm the message, the overall judgment is displayed.

- If the fundamental current is outside the above range, judgment is performed with the maximum measured value of the fundamental current of input element 1 as the reference.
- If the circuit power factor is outside the above range, judgment is performed with the maximum measured value of the circuit power factor of the wiring unit as the reference.

Active power for class D

When you specify the active power for a class D test, the software checks whether the measured active power is greater than or equal to 90 % and less than or equal to 110 % of the specified value.

A message appears if the measured values are outside the above ranges. Check whether the specified values are correct.



After you confirm the message, the overall judgment is displayed.

If the active power is outside the above range, judgment is performed with the maximum measured active power as the reference.

7.14 Making Compliance Simple Test

Procedure

1. Click  in the menu area. The Measure submenu appears.

For general information about submenus, see section 7.7.

Selecting the Test Method

This only appears if you have selected Simple Test Measurement in the test menu described in section 4.1.

2. Select **Compliance simple test**.

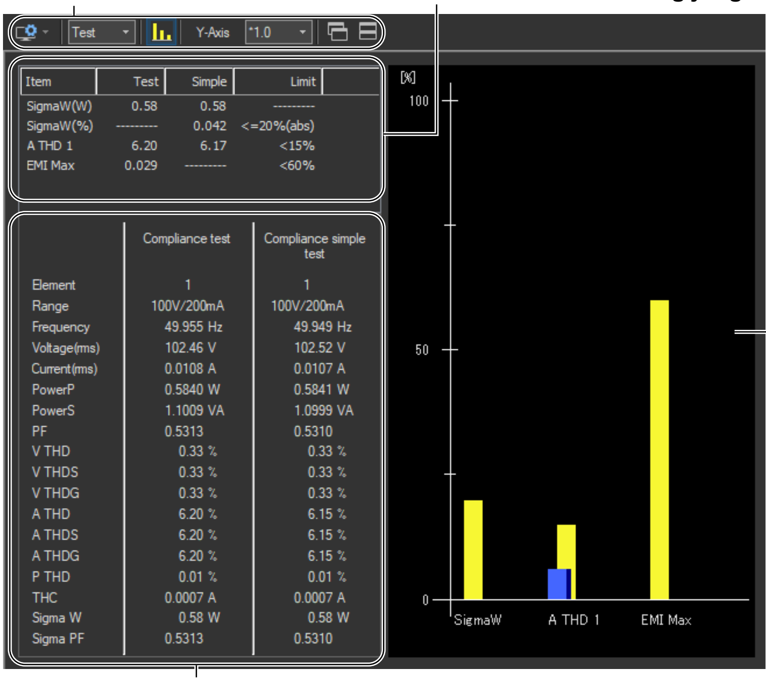
Previewing Test Data

3. Follow the procedure in section 8.1 to select the preview you want to execute, and click **Start Previewing**.

This section will explain what happens when you execute the simple test preview. For information about other previews, see the appropriate sections indicated below.

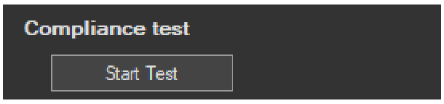
- Test preview Section 8.2
- List preview Section 8.3
- Bar preview Section 8.4
- Waveform preview Section 8.5

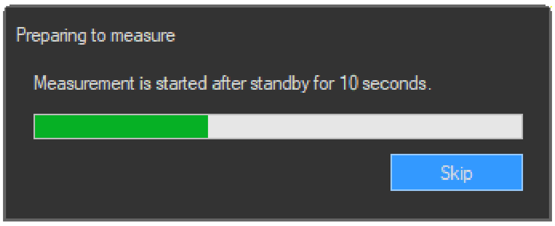
Example of a Simple Test Preview



Starting a Test

4. Click **Start Test**. A dialog box opens that indicates that you have to wait before measurement starts. Then measured harmonic values appear in the measured harmonic values list window.





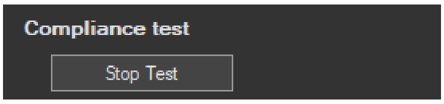
Stopping a Test

Stopping Automatically

The software will stop testing automatically once the specified measurement time has been reached.

Stopping Manually

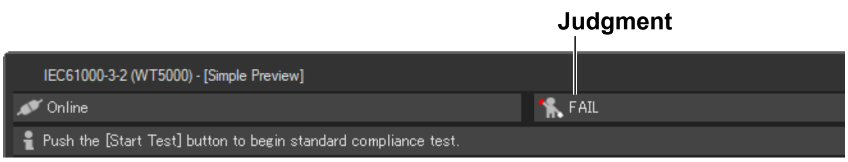
Click **Stop Test**. If the WT is measuring, it will stop when measurement ends normally and data has been acquired.



Once the test is finished, the overall judgment appears.

Display example: PASS

The overall judgment also appears in the information area.



Explanation

List of Values for Making Judgments in the Simple Test

The list consists of the following items.

- Test: Measured data of the compliance test that has been specified as the test reference for the simple test
- Simple: Measured values of the simple test

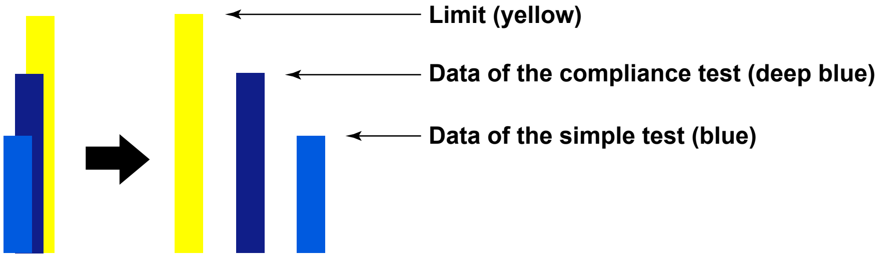
- SigmaW(W)
  Maximum measured active power
- SigmaW(%)
  Magnitude of the active power of the simple test in reference to the active power of the compliance test
  $$\left(\frac{\textbf{Maximum SigmaW of the simple test}}{\textbf{Maximum SigmaW of the compliance test}} - 1\right) \times 100$$
- A THD
  Measured current THD at the point where SigmaW(W) is at its maximum value (the number of displayed elements varies depending on the wiring pattern)
- EMI Max
  Magnitude of the measured harmonic current in the compliance test compared to the harmonic current limit
  100 – the minimum margin degree (%)

The value colors are as follows:

- A THD and EMI Max of the compliance test
  Deep blue (the conditions for executing simple tests are met)
- SigmaW(%) of the simple test
  Blue if the value is within the limit and red if the value exceeds the limit
- A THD of the simple test
  Blue if the value is less than the limit and red if the value is greater than or equal to the limit

Bar Graphs

The listed judgment values of the simple test are displayed in a bar graph. The bar colors are the same as the colors of the values described above. The limit is displayed in yellow.



7.15 Window Arrangement Function

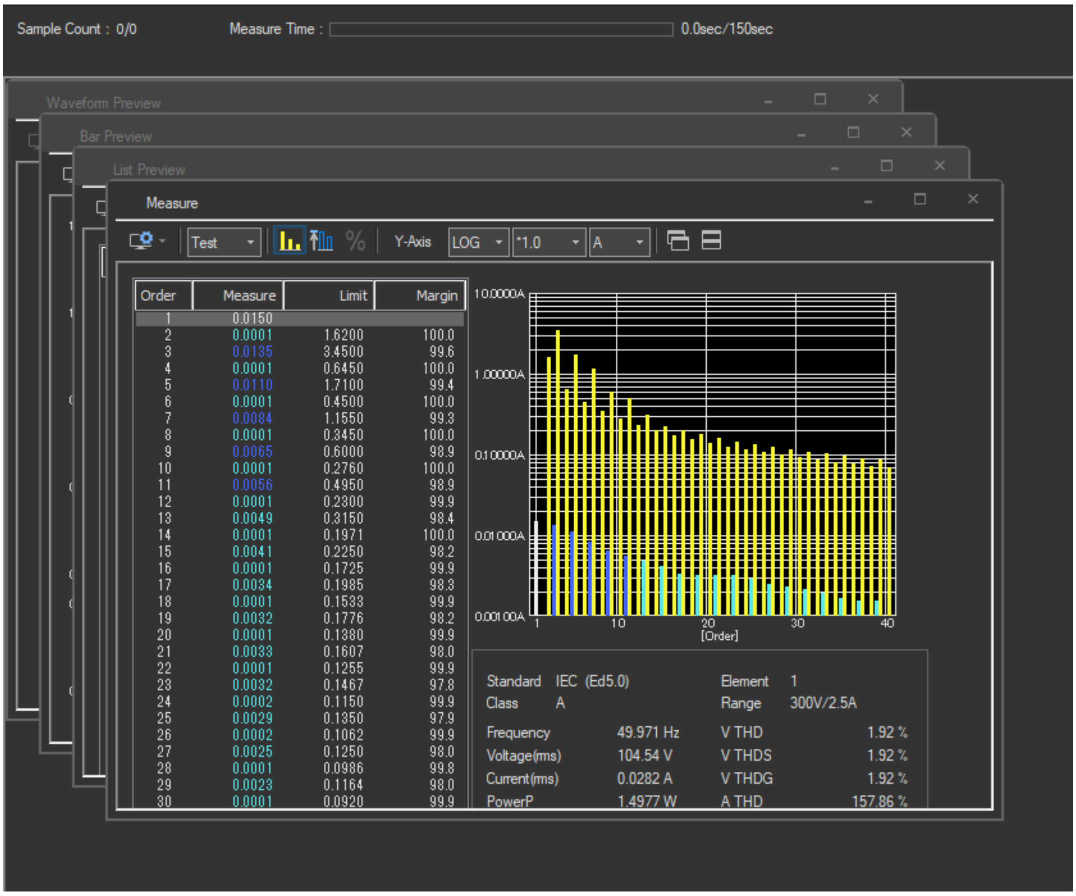
This is a function common to the Harmonic Measurement Software (IEC 61000-3-2, IEC 61000-3-12) and Voltage Fluctuation and Flicker Measurement Software (IEC 61000-3-3, IEC 61000-3-11).

Procedure

Cascading Windows

Click . The windows are cascaded so that you can see the title of each window.

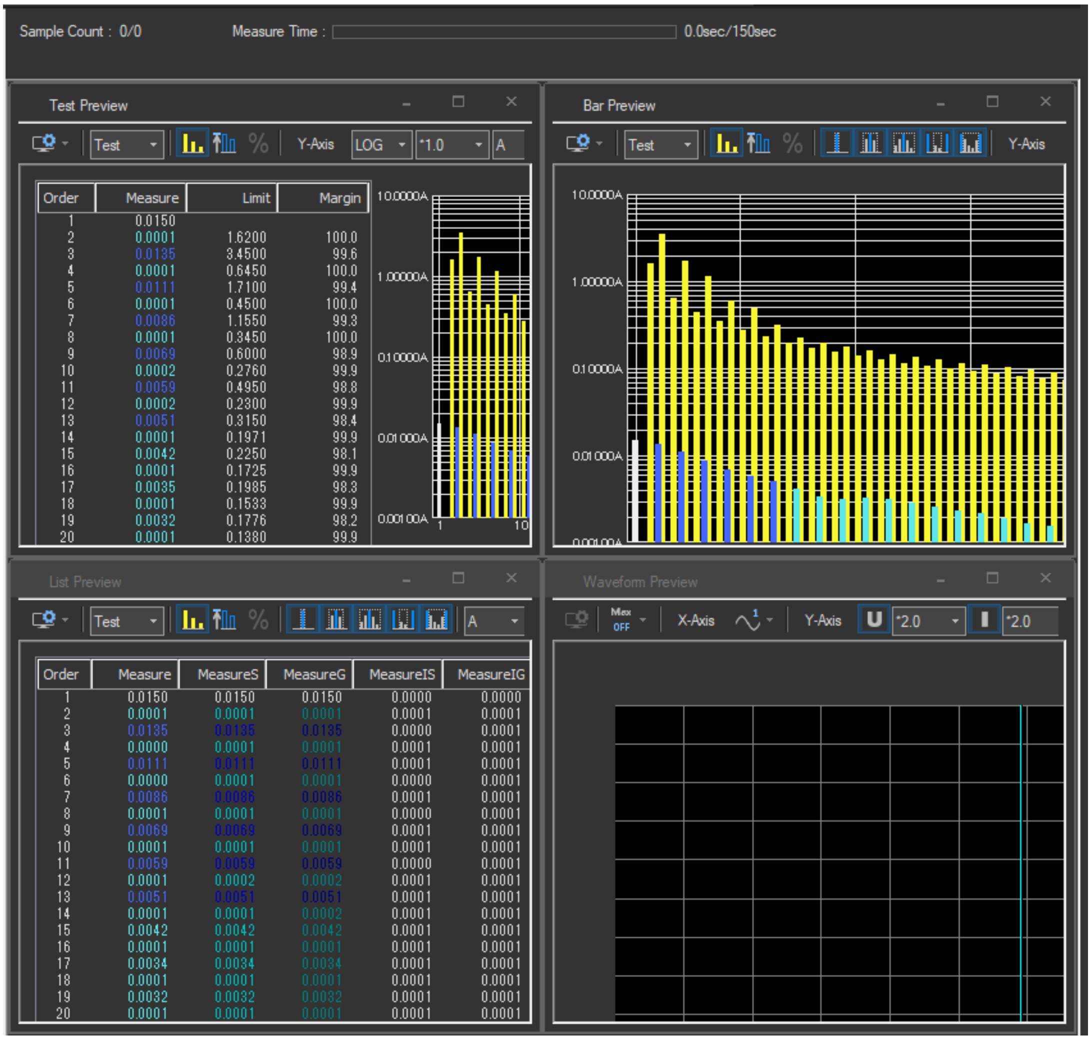
An Example of Cascaded Windows within the Analysis Window



Tiling Windows

Click . The windows are tiled so that they do not overlap with each other.

An Example of Tiled Windows within the Analysis Window



Explanation

Cascading Windows

- The windows are cascaded so that you can see the title of each window.
- The active graph or list window becomes the front window after the cascade operation.
- The cascade order varies depending on the type of displayed window.

Tiling Windows

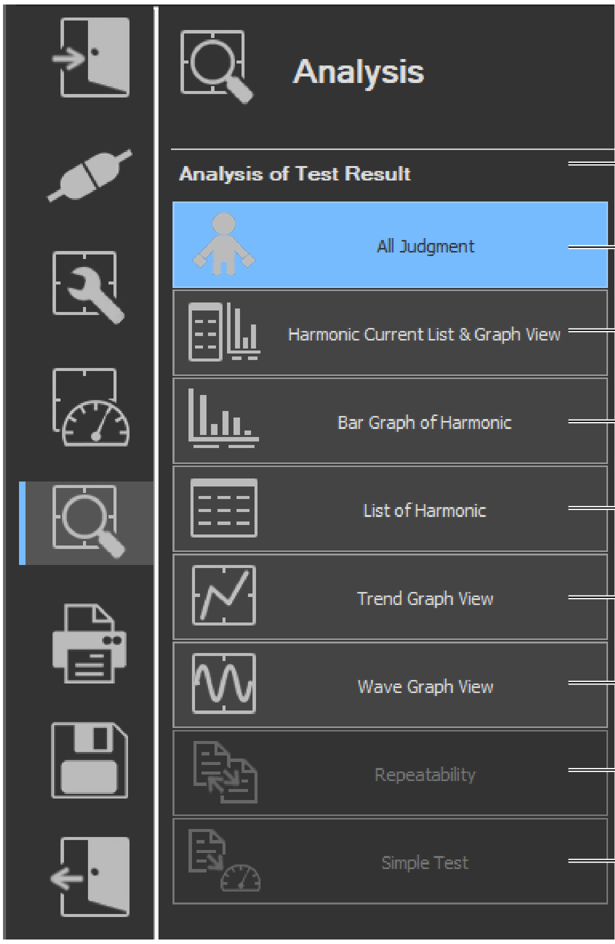
- All the displayed windows are tiled so that the windows do not overlap each other.
- The active graph or list becomes the active window after carrying out the tile operation.
- The arrangement order varies depending on the type of displayed windows.

Using the Analysis Page to Display Judgment Results and Measured Data

7.16 Displaying a Graph of All Judgments

Procedure

1. Click  in the menu area. The Analysis submenu appears.



Analysis of test results
Measured data can be displayed.

All Judgment (page 7-72)

Harmonic Current List & Graph View (section 7.17)

Bar Graph of Harmonic (section 7.18)

List of Harmonic Measurements (section 7.19)

Trend Graph View (section 7.20)

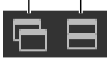
Wave Graph View (section 7.21)

Repeatability (section 5.2)

Simple Test (section 7.22)
This will be available if you select Simple Test Measurement in the test menu described in section 4.1.

Displays cascaded windows

Displays tiled windows



Window arrangement buttons
For details, see section 7.15.

Note

Notes when switching to the Measure window

While in the Analysis window, if you click the Measure icon and switch to the Measure window, the measured data will be discarded. Save the data if you do not want it to be discarded (see chapter Chapter 12 for information on how to save data).

Displaying a Graph of All Judgments

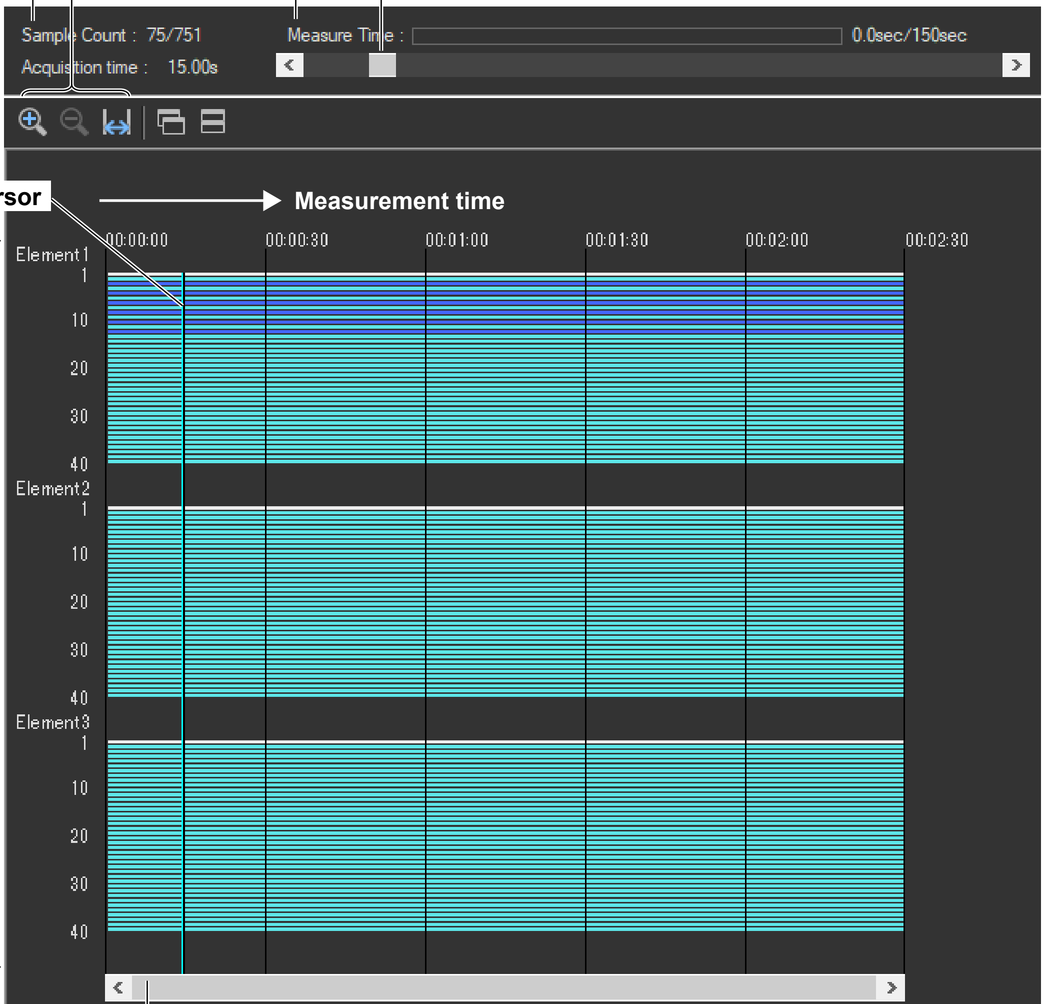
2. Click **All Judgment**. A graph of all judgments appears.

Sampled data number

Zoom in/zoom out/display all (page 9-5)

Scroll bar
You can drag (the slider) with the mouse or click < > to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and cursor position change accordingly.

Measurement time



Cursor

Display range bar
This bar indicates where the currently displayed period of time is within the measurement time.

Judgment graph
This graph shows the judgment results for all data within the measurement time. The judgments for each element are displayed in different colors, depending on the judgment results. The judgment results that are displayed here will change if you shift the displayed time range using the display range bar.

Explanation

The software displays a graph that shows whether each of the values for current harmonic that are measured within the specified measurement time are within their limits according to the settings described in section 7.4, “Setting the Judgment Conditions.”

The input elements that are measured vary depending on the Wiring Pattern setting (see section 7.1 for details). The software makes judgments for every input element that is set in the Wiring Pattern setting.

Display Colors

The table on the next page describes what the colors in the evaluation graph indicate. Condition 1, Condition 2, 200 % short-term relaxation, and POHC relaxation conditions that appear in the table are defined below.

Condition 1

The maximum harmonic current over the measurement time is within 1.5 times the specified limit. Evaluation is made on each harmonic.

Condition 2

The mean harmonic current over the measurement time is within the specified limit. Evaluation is made on each harmonic.

200% Short-Term Relaxation Conditions

If all of the following conditions are met, up to 200 % of the specified limits is permitted.

- The EUT belongs to Class A for harmonics.
- The excursion beyond 150 % of the applicable limits lasts less than 10 % of the test observation period or in total 10 min (within the test observation period), whichever is smaller.
  The average value of the harmonic current, taken over the entire test observation period, is less than 90 % of the applicable limits.

POHC Relaxation Condition

If the maximum value of the sum of partial odd harmonic currents (POHC) of order above and including 21 is less than the specified POHC limit, the mean of the odd harmonic currents of order above and including 21 is permitted to be 1.5 times the specified limit.

Blue	Both Conditions 1 and 2 are met.
White	No applicable limit is specified.
Bright green	• Condition 1 is met. • Condition 2 is not met. • POHC Relaxation Condition is met.
Yellow	• Condition 1 is met. • Condition 2 is not met. • POHC Relaxation Condition is not met.
Green	• Condition 1 is not met. • Condition 2 is met. • The 200 % short-term relaxation conditions are met.
Orange	• Condition 1 is not met. • Condition 2 is met.
Pink	• Condition 1 is not met. • Condition 2 is not met. • POHC Relaxation Condition is met.
Red	None of the Condition 1, Condition 2, 200 % short-term relaxation, or POHC relaxation conditions is met.
Turquoise	The measured data is less than the larger of the two values, 0.6 % of the mean rms current and 5 mA.
Aqua	• None of the Condition 1, Condition 2, 200 % short-term relaxation, or POHC relaxation conditions is met. • Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits or set to Infinity.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

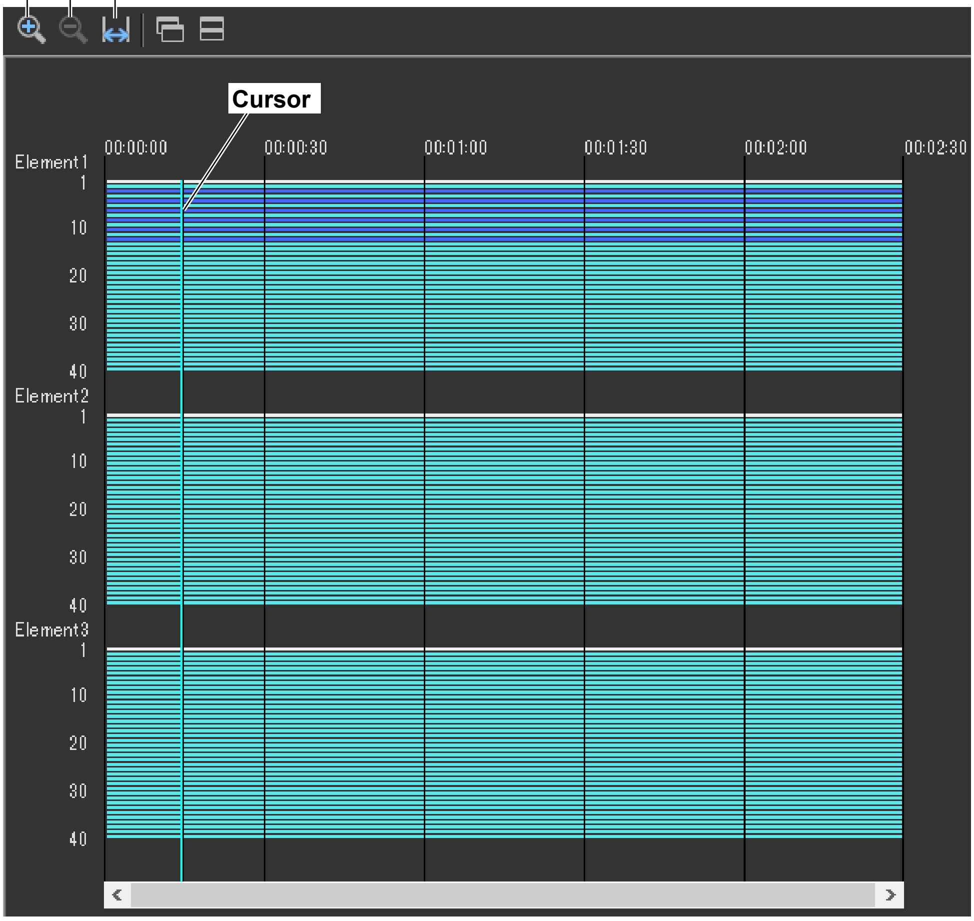
If the evaluation of all the data points over the measurement time is blue, bright green, green, turquoise, or aqua, Judgment on the Overall Evaluation Graph window indicates PASS. If the evaluation of any data point is yellow, orange, pink, or red, Judgment indicates FAIL.

Zooming In and Out

Zoom in

Zoom out

Display all: Displays the whole measurement time



The Zoom In and Zoom Out Icons

Each time you click one of the zoom icons, the software will zoom in or zoom out from the cursor. The zoom levels are:

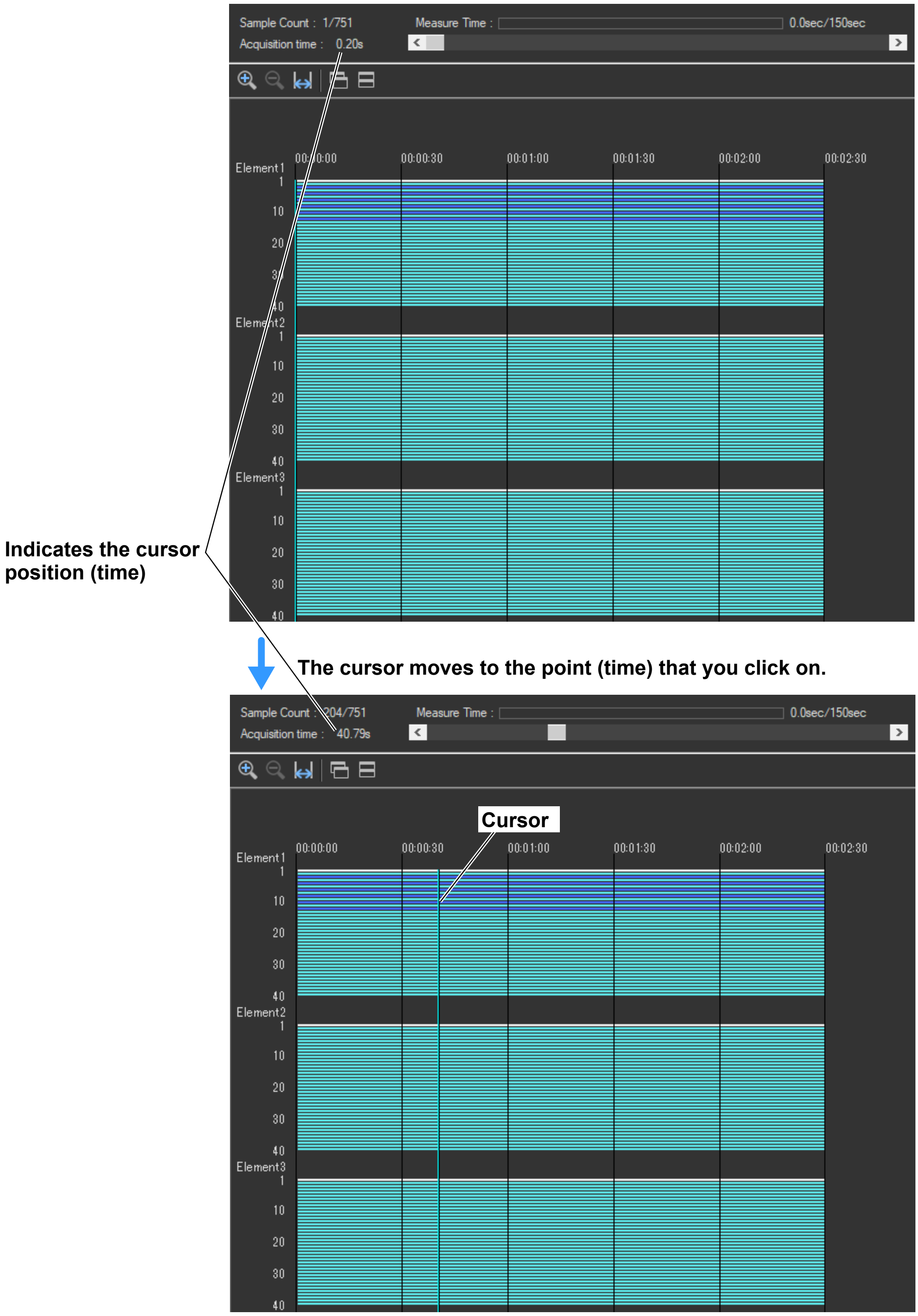
25 s
50 s
100 s (1 min40 s)
200 s (3 min20 s)
400 s (6 min40 s)
800 s (13 min20 s)
1600 s (26 min40 s)
3200 s (53 min20 s)
•
•
•
The entire measurement time

If a zoom out would cause the zoomed display to show more than 75 % of the measurement time, the entire measurement time will be displayed. For example, if the measurement time is 1 h, the 3200 s (53 min 20 s) level will not be displayed because it would show 89% of the entire measurement time.

Using the Graph of All Judgments Effectively

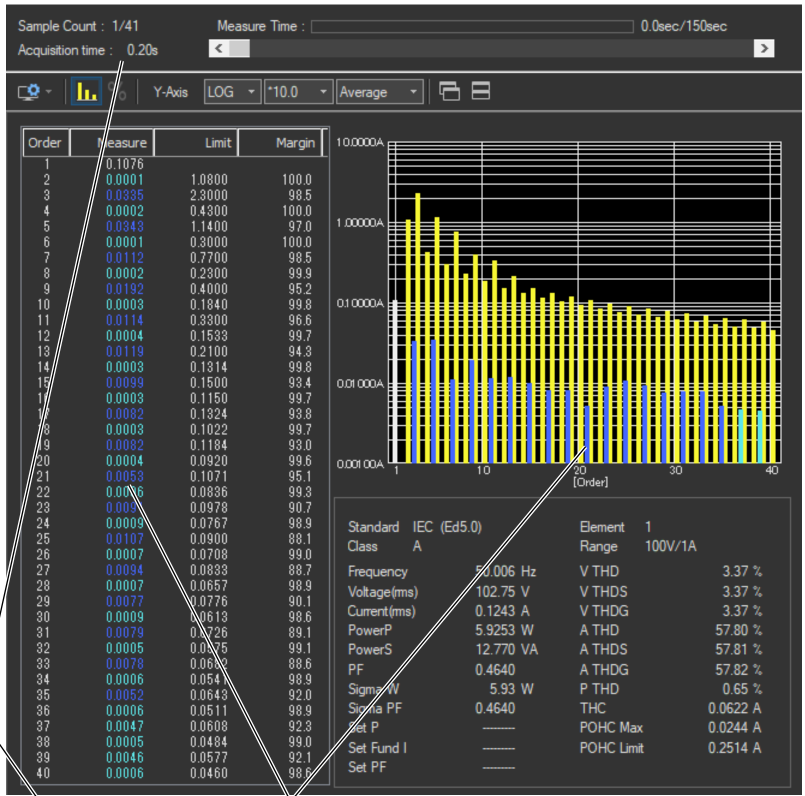
You can select specific measured data that you want to examine more closely on the graph of all judgments to display bar graphs and lists of the measured data. The following example shows how to display a harmonic current list and bar graph for element 1.

1. Use the mouse to click the appropriate area. The cursor will shift to the time position that you click.



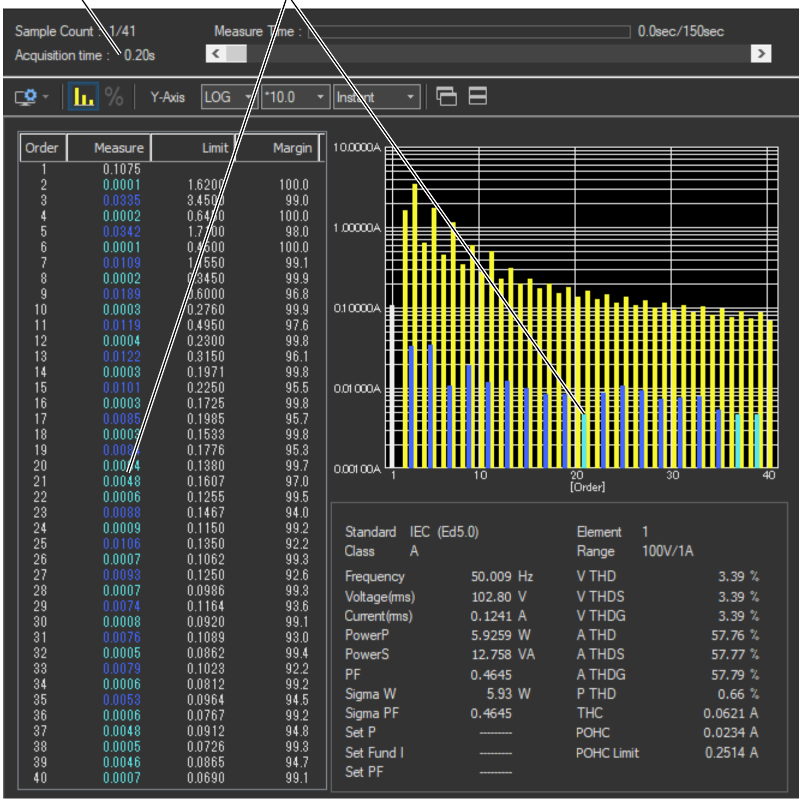
2. In the submenu, select **Harmonic Current List & Graph View**, and then select Instant from the list in the setting and display area. A bar graph for the instantaneous harmonic current values from the cursor position will appear.

For detailed information about the bar graph display, see section 7.18.



Indicates the cursor position (time)

The level of the 21st harmonic order changes, and the judgment changes from blue to turquoise.



7.17 Displaying a List and Graph of Harmonic Current Values

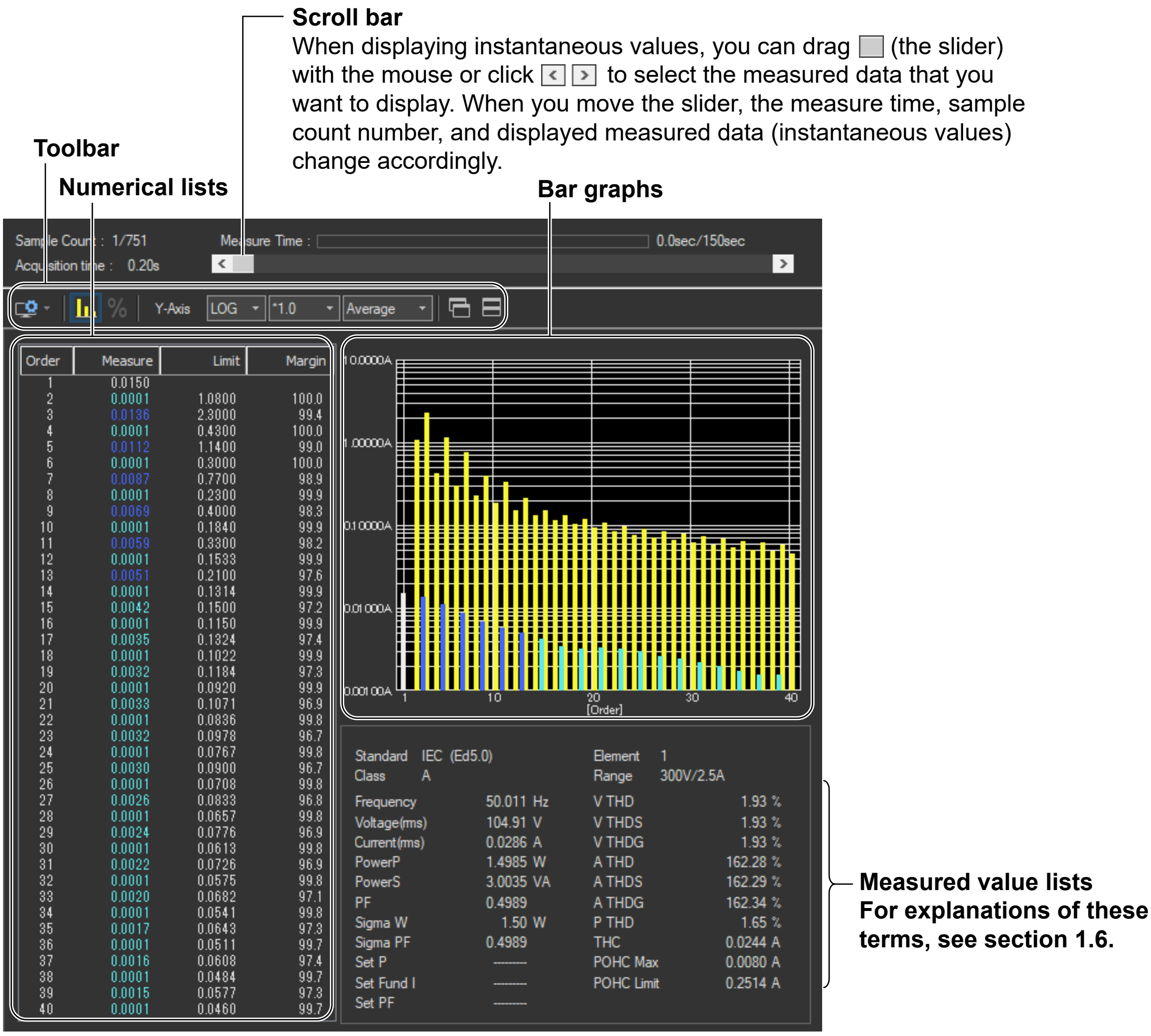
Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

For general information about submenus, see section 7.16.

Displaying a List and Graph of Harmonic Current Values

2. Click **Harmonic Current List & Graph View**. A list and graph of harmonic current values appear.



Toolbar

Selecting the Element Whose Data You Want to Display

Click . If input elements 1 to 3 are being measured, as you click the icon, the displayed data will switch from element 1, to element 2, to element 3, to element 1, and so on. Click ▼ to select an element directly.

Switching the Limits Display of the Bar Graphs ON or OFF.

Click . The limits are displayed using yellow bars. The limits are displayed using yellow bars. The limits are applied only to harmonic current. There are no specified limits for voltages or phase angles. So limits for these values are not displayed.

Switching the Percentage Display ON or OFF.

Click 

to turn the percentage display ON and display the following items as percentages.

Numerical Lists

- The relative harmonic data or content of each harmonic
- Limits

Bar Graphs

- The Y-axis scale

Measured Value Lists

- THC
- POHC
- POHC maximum
- POHC limit

- The percentage display is applied only to harmonic current.
- Percentage display is valid when the class is set to C in the test conditions and one of the following conditions is met:
  - You set the power class to “> 25 W.”
  - You set the power class to “≤25 W, ≥ 5 W” and set the limits to “judge from THD, 2, 3, 5, 7, 9, 11th.”
  - You set the power class to “≤25 W, ≥ 5 W” and you set the limits to “judge with current wave pattern of 3rd&5th.”
- On the Percentage Display, the relative harmonic content of current of each harmonic can be displayed on bar graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 7.3) taken to be 100 %.
- When limits are specified by the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics, such as the limits for Class C equipment with active input power between 5 W and 25 W, bars corresponding to the magnitude of the values are displayed.
- When the magnification of the Y-axis scale is *1.0, the maximum scale of Y-axis is 100.00 %.

Changing the Y-Axis Scale (the Size of the Current Waveform)

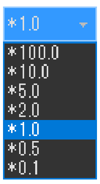
Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

Selecting the Magnification

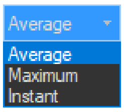
When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.

When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting Average, Maximum, or Instantaneous Values

Select Average, Maximum, or Instant.



Explanation

List Display

Limits

- The limits specified in the applicable standard are displayed in a list for each harmonic.
- The limits are applied only to harmonic current.
- If the Percentage Display check box is selected, the relative harmonic content of the limit of each harmonic can be displayed with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 7.3) taken to be 100 %.
- When limits are specified by the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics, such as the limits for Class C equipment with active input power between 5 W and 25 W, the current value converted from the relative harmonic content or THD of the 3rd and 5th harmonics or the relative harmonic content of the 2nd, 3rd, 5th, 7th, 9th, and 11th harmonics with the fundamental current specified in advance when making Class C evaluation (see section 7.3) taken to be 100% is displayed.

Margin Degree

- Indicates the margin to the limit. For each harmonic, the margin is derived from the following equation using the limits and measured values displayed in the list.

$$\frac{\textbf{Limit} - \textbf{measured value}}{\textbf{Limit}} \times 100$$

- The margin only applies to harmonic current values.
- The color of the values changes depending on whether or not you select “The margin degree is used” check box described in section 7.4.
  - The margin degree is used
    Blue indicates that a value has exceeded the margin that you specified according to the procedure in section 7.4.
    Red indicates that a value is at or below the margin that you specified according to the procedure in section 7.4.
  - When the Margin Degree Is Not Used
    Values are displayed in black.

Bar Graph Display

Average/Maximum/Instantaneous Value

The software displays bar graphs and lists in three ways depending on whether you select to display average, maximum, or instantaneous values. This section explains the differences between each display.

Average Value Display

- Values and bars for each harmonic order
  The software averages the measured data (instantaneous values) of each harmonic order that is acquired within the measurement time and displays those averages.
- Measured items that appear to the right of the list
  The software averages the values acquired for each measured item within the measurement time and displays those averages.
- Limit values and bars
  The software displays numbers and yellow bars that indicate the values of the limits.

Maximum Value Display

- Values and bars for each harmonic order
  The software finds and displays the maximum value from each harmonic order's measured values by comparing the instantaneous values that have been acquired within the measurement time.
- Items that appear to the right of the list
  The software finds and displays the maximum value for each measured item by comparing the instantaneous values that have been acquired within the measurement time.
- Limit values and bars
  The software displays numbers and yellow bars that are 1.5 times greater than the values of the limits.

Instantaneous Value Display

- Values and bars for each harmonic order
  The software displays the instantaneous values acquired within the measurement time for each harmonic order.
- Measured items that appear to the lower right of the list
  The software displays the instantaneous values acquired within the measurement time.
- Limit values and bars
  The software displays numbers and yellow bars that are 1.5 times greater than the values of the limits.
- Selecting values
  Use the scroll bar to change the displayed instantaneous values.

Note

When the software is displaying average or maximum values, using the scroll bar will have no effect on the harmonic current list and graph displays.

Colors of the Numerical Lists and Bar Graphs of the Current

The lengths for the bar graphs are determined by the size of the measured data that they represent. The meanings of bar colors are as follows:

■	**Blue**	Limit not exceeded.
■	**Bright green (applies only to average list)**	When the same conditions of bright green on page 7-74 applies.
■	**Green (applies only to maximum list and Instantaneous list)**	When the same conditions of green on page 7-74 applies.
■	**Red**	Limit exceeded.
■	**Yellow (applies only to bar graph)**	Limit specified by the applicable standard.
■/□	**Black/white (applies only to numerical list)**	No applicable limit is specified. (The measured value of the fundamental frequency and orders that are not applicable is displayed in black when the software background color is set to light and white when the software background color is set to dark.) * Software background color setting ▶ section 3.9 in the IS8000 software User's Manual (IM IS8000-01EN.)
□	**White (applies only to bar graph)**	No applicable limit is specified. (The bar graph of the fundamental frequency and orders that are not applicable is displayed in white.)
■	**Turquoise**	The measured data is less than the larger of the two values, 0.6 % of the mean rms current and 5 mA.
■	**Aqua**	• Limit exceeded. • Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits or set to Infinity.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Colors of the numerical lists and bar graphs of the voltage and phase angle

There are no voltage or phase angle limits. Bar graphs of harmonic voltage or phase angle are displayed in white. The values displayed in the list are black when the software background color is set to light and white when the software background color is set to dark.

Measured Value Lists

For explanations of these terms, see section 1.5.

Sigma W

Sigma W is the active power for all grouped phases (all measured input elements).

Note

- When applying the power ratio limit on Class C or D multi-phase equipment, the harmonic current per watt derived from the total active power (Sigma W) of all phases (three phases if three-phase) and the power ratio limit are compared and evaluated.
- Equipment whose Sigma W exceeds 600 W is considered Class A equipment under the standard. Use caution because the software makes evaluations using the class selected in standard and measurement environment settings (see section 7.3).

Set P, Set Fund I, and Set PF

For Set P, the power value (see section 7.3) specified in advance is displayed when making Class C or D evaluations.

For Set Fund I and Set PF, the fundamental current and power factor values (see section 7.3) specified in advance are displayed respectively when making Class C evaluations.

Note

- When the Standard Is Set IEC 61000-3-2 Ed. 5.0 or JIS C 61000-3-2 2019
  When Class D and "(with VSD) Refrigerators and freezers" Are Selected in section 7.1
- When the Standard Is Set to IEC 61000-3-2 Ed. 4.0
  When the "Use Annex C" check box and "C.16.2 (with VSD) Refrigerators and freezers" are selected in section 7.1

In the above cases, these items are displayed as follows:

Set Im : current of the appliance
Set Ur: rated voltage of the appliance
Set Pi: effective power of the appliance

Mutual Relationship of Graphs and Lists

When using the scroll bar to select the time of acquisition and displaying the measured data on a graph window or list window displaying a certain instantaneous value, the other graph window or list window also shows the measured data at the same time of acquisition.

7.18 Displaying a Harmonic Bar Graph

Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

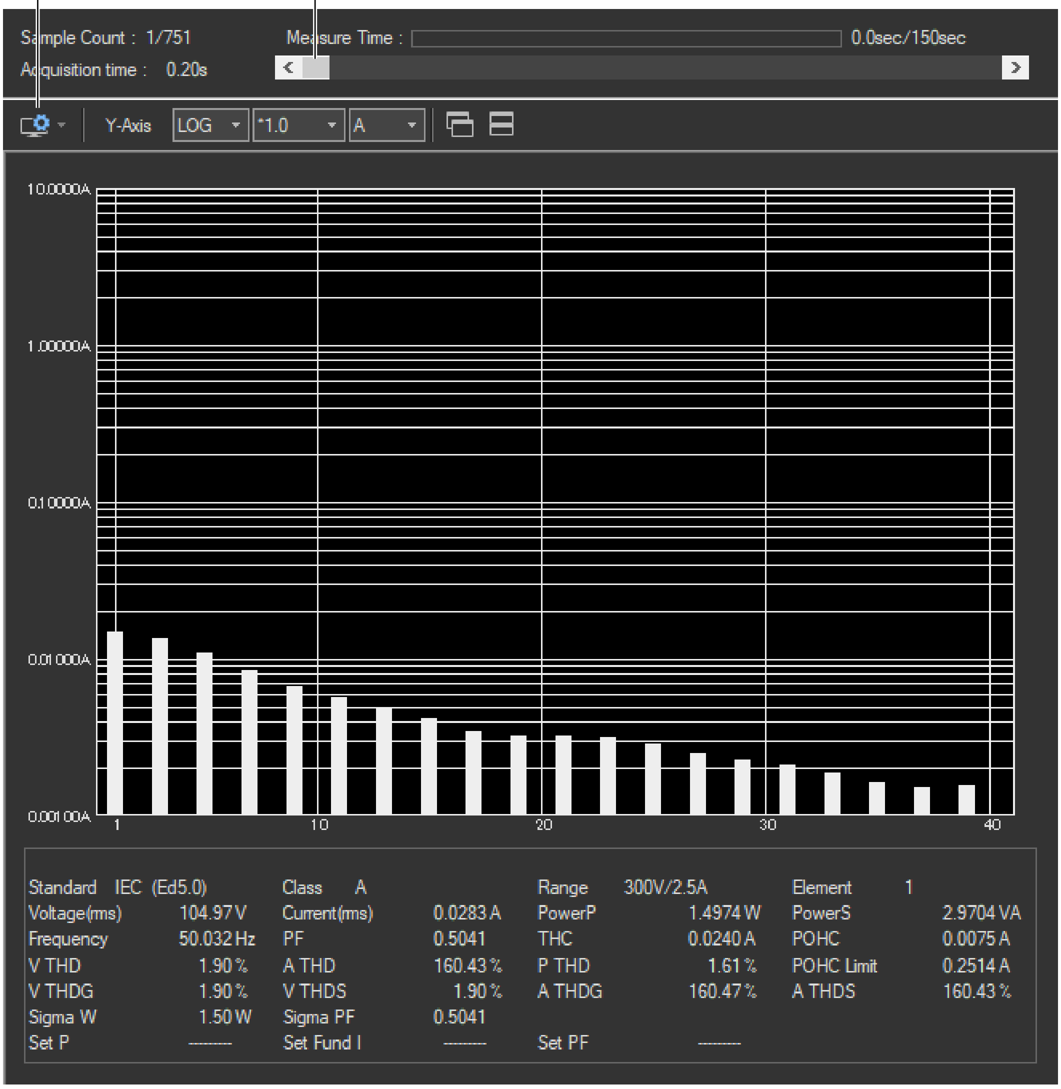
For general information about submenus, see section 7.16.

Displaying a Harmonic Bar Graph

2. Click **Bar Graph of Harmonic.** A harmonic bar graph appears.

Select the element whose data you want to display.

Scroll bar
You can drag [slider] (the slider) with the mouse or click [<] [>] to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and displayed measured data (instantaneous values) change accordingly.



Changing the Y-Axis Scale (the Size of the Current Waveform)

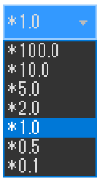
Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

Selecting the Magnification

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.

When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting the Measurement Function to Display

Select **A**, **V**, or **Deg** (for current, voltage, or phase angle).

Explanation

Bar Graph of Harmonic Current or Voltage

The software displays the instantaneous values acquired within the measurement time for each harmonic order.

Bar Graph of Harmonic Phase Angles

Bar graphs of the phase angle of the harmonic current with respect to the fundamental current for each harmonic can be displayed. However, the phase angle with respect to the fundamental voltage is displayed on the bar graph for the fundamental current.

- When the harmonic phase is leading the fundamental current, a positive phase angle is indicated; when the harmonic phase is lagging the fundamental current, a negative phase angle is indicated.
- When the fundamental current is leading the fundamental voltage, a negative phase angle is indicated; when the fundamental current is lagging the fundamental voltage, a positive phase angle is indicated.

Bar Graph Display Color

The bar graph is displayed in white.

Note

This bar graph does not display limits.

Selecting Instantaneous Values

Use the scroll bar to change the displayed instantaneous values.

7.19 Displaying a List of Measured Harmonic Values

Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

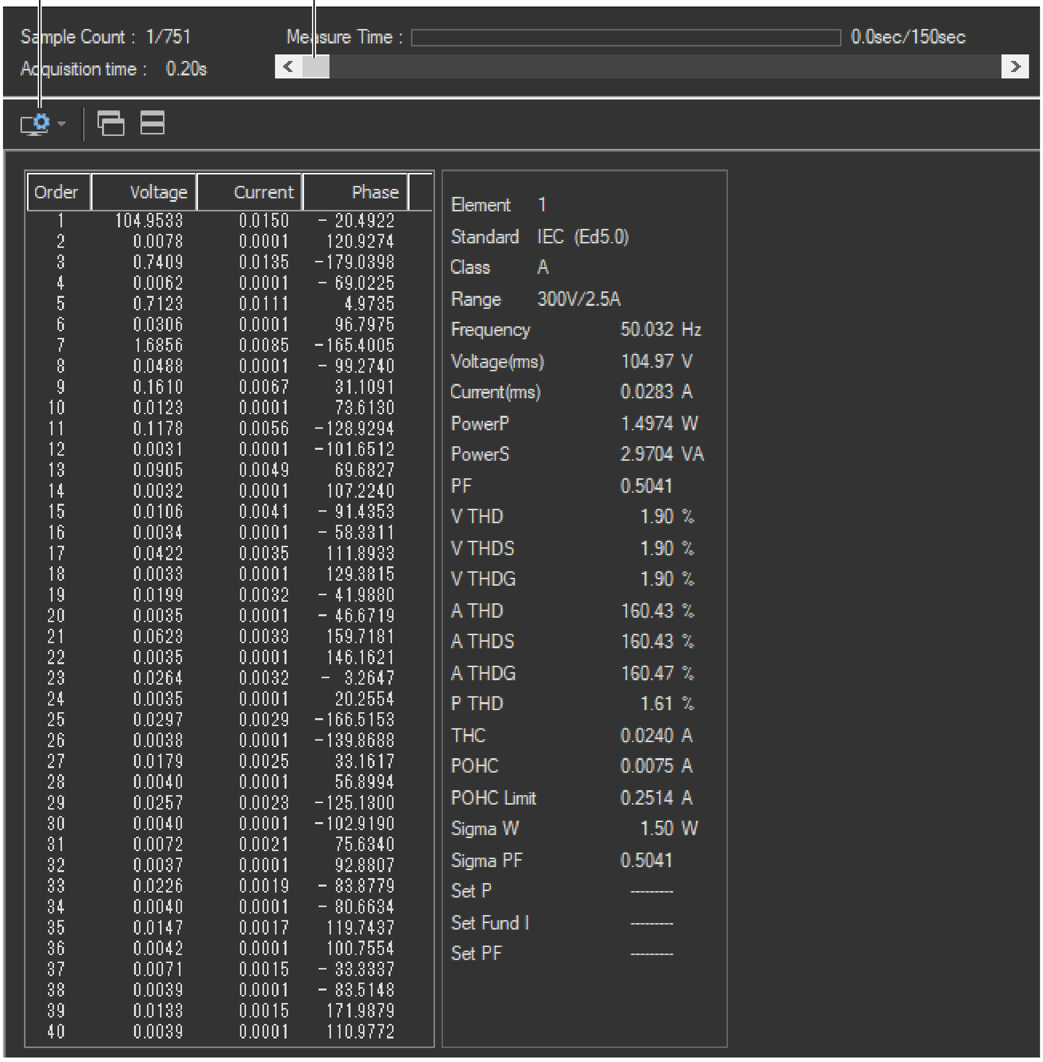
For general information about submenus, see section 7.16.

Displaying a List of Measured Harmonic Values

2. Click **List of Harmonic**. A list of measured harmonic (instantaneous) values appears.

Select the element whose data you want to display.

Scroll bar
You can drag [slider] (the slider) with the mouse or click [<] [>] to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and displayed measured data (instantaneous values) change accordingly.



Order	Voltage	Current	Phase
1	104.9533	0.0150	− 20.4922
2	0.0078	0.0001	120.9274
3	0.7409	0.0135	−179.0398
4	0.0062	0.0001	− 69.0225
5	0.7123	0.0111	4.9735
6	0.0306	0.0001	96.7975
7	1.6856	0.0085	−165.4005
8	0.0488	0.0001	− 99.2740
9	0.1610	0.0067	31.1091
10	0.0123	0.0001	73.6130
11	0.1178	0.0056	−128.9294
12	0.0031	0.0001	−101.6512
13	0.0905	0.0049	69.6827
14	0.0032	0.0001	107.2240
15	0.0106	0.0041	− 91.4353
16	0.0034	0.0001	− 58.3311
17	0.0422	0.0035	111.8933
18	0.0033	0.0001	129.3815
19	0.0199	0.0032	− 41.9880
20	0.0035	0.0001	− 46.6719
21	0.0623	0.0033	159.7181
22	0.0035	0.0001	146.1621
23	0.0264	0.0032	− 3.2647
24	0.0035	0.0001	20.2554
25	0.0297	0.0029	−166.5153
26	0.0038	0.0001	−139.8688
27	0.0179	0.0025	33.1617
28	0.0040	0.0001	56.8994
29	0.0257	0.0023	−125.1300
30	0.0040	0.0001	−102.9190
31	0.0072	0.0021	75.6340
32	0.0037	0.0001	92.8807
33	0.0226	0.0019	− 83.8779
34	0.0040	0.0001	− 80.6634
35	0.0147	0.0017	119.7437
36	0.0042	0.0001	100.7554
37	0.0071	0.0015	− 33.3337
38	0.0039	0.0001	− 83.5148
39	0.0133	0.0015	171.9879
40	0.0039	0.0001	110.9772

7.20 Displaying a Trend Graph

Procedure

1. Click  in the menu area. The Analysis submenu appears.

For general information about submenus, see section 7.16.

Displaying a Trend Graph

2. Click **Trend Graph View**. A trend graph appears.

Configuring a Trend Graph

Auto range
- **When the auto range button is pressed**
  The range changes automatically to match the acquired data.
- **When the auto range button is not pressed**
  When you click the Upper or Lower column headings, a combo box appears that allows you to set the display range upper and lower limits for each trace.

Grid
You can select the type of grid that will be displayed in the trend display area from Dotted, Line, and None.
- Dotted: A grid with dotted lines is displayed.
- Line: A grid with solid lines is displayed.
- None: No grid is displayed.

Show/hide trace settings box (page 7-89)

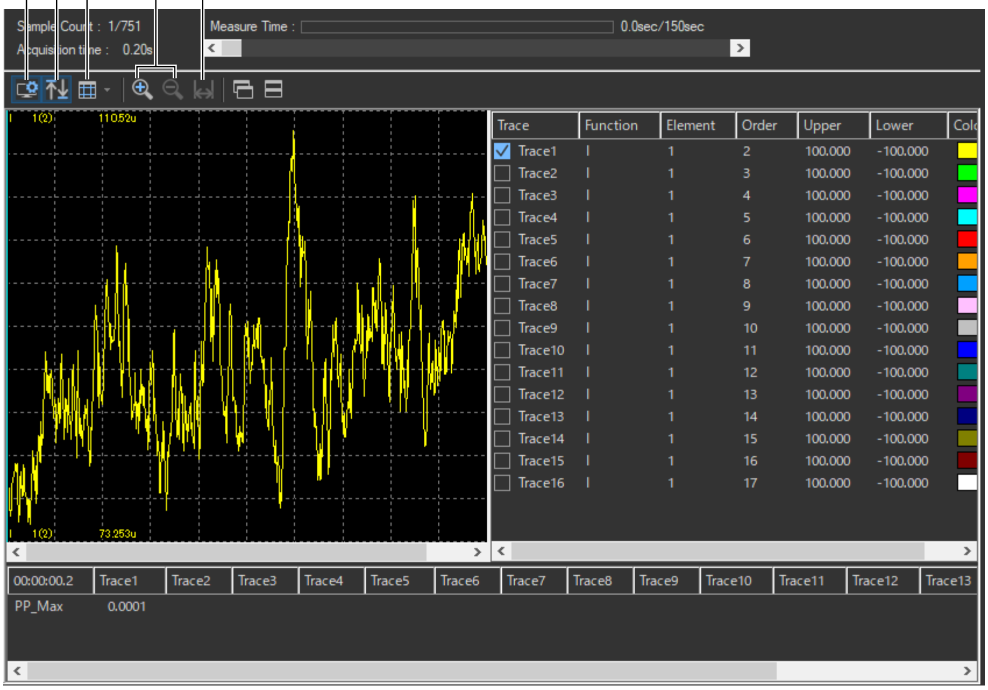
Zoom in/zoom out (see page 7-91)

Main Screen
Displays the whole measurement time

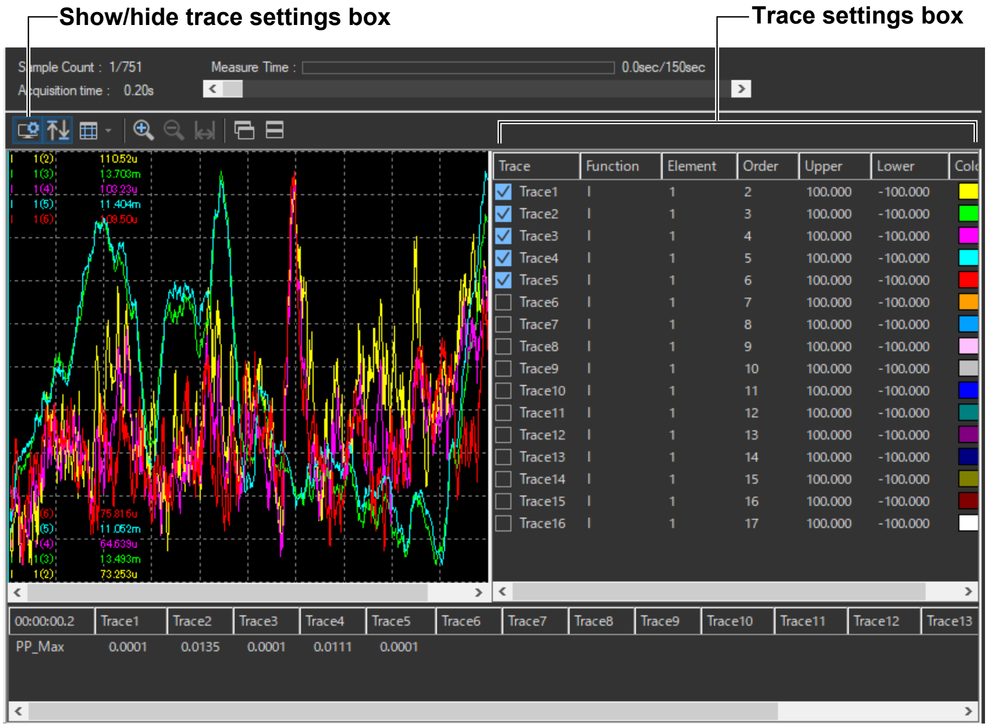
Upper limit of display range

Lower limit of display range

Cursor (page 7-91)



Configuring Traces



Trace

Select the trends you want to display (select or clear the check boxes).

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

U	Voltage
I	Current
P	Power
S	Apparent power
SigmaW	Active power of all phases
SigmaPF	Power factor of all phases
Freq	Fundamental frequency of the PLL source
LAMBDA	Power factor
POHC	Sum of odd harmonic currents of order above and including 21
THC	Total harmonic current
PHI	Phase angle
Vthd	Total harmonic distortion of voltage
VthdS	Total harmonic distortion of the voltage subgroup
VthdG	Total harmonic distortion of the voltage group
Athd	Total harmonic distortion of current
AthdS	Total harmonic distortion of the current subgroup
AthdG	Total harmonic distortion of the current group
PTHD	Total harmonic distortion of power

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Order

Select the harmonic order that you want to display.

1. Click the **Order** column heading. A combo box opens.
2. Select the harmonic order.

Upper and Lower

If the Auto Ranging check box is not selected, set the Upper and Lower limit of the display range.

1. Click the **Upper** or **Lower** column. A edit box opens.
2. Set the upper or lower limit value of the display range.

Color

Select the display color of the trend.

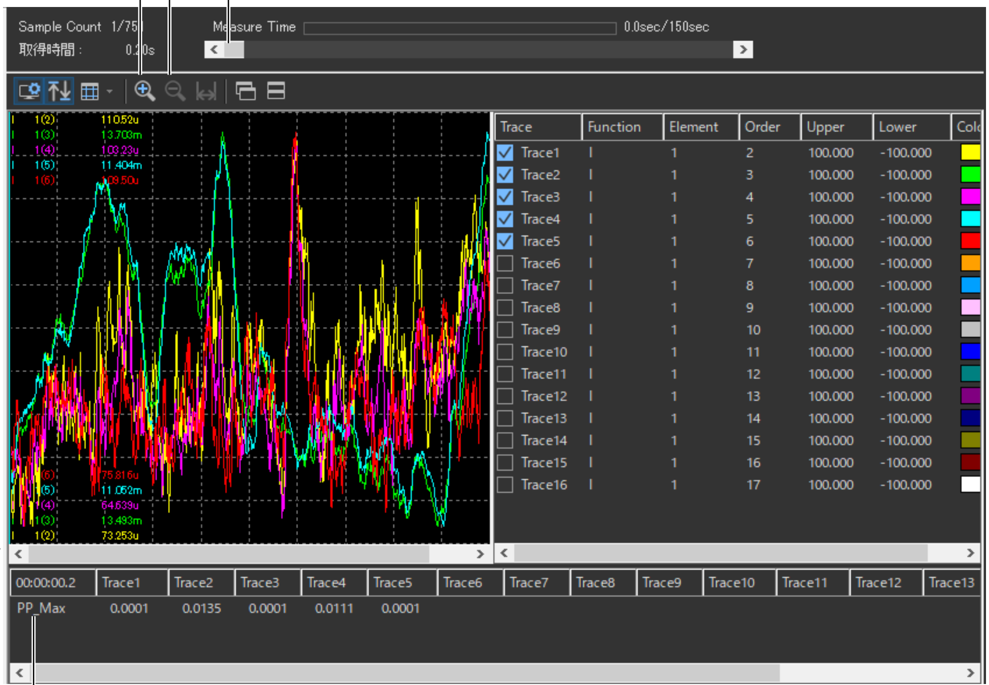
1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Zooming In and Out

Zoom in
Click to zoom in. You can zoom in until the trend display area contains 2 s worth of data.

Zoom out
Click to zoom out. You can zoom out until the trend display area contains the data for all of the elapsed time.

Scroll bar
You can drag ▢ (the slider) with the mouse or click [<] [>] to select the measured data that you want to display.



PP_Max
In the trend display, if not all the measured values can be displayed because the specified time axis value is set too high, measured values are P-P compressed and displayed.* When this occurs, PP_Max is displayed here.
To display values without P-P compression, zoom in on the time axis.

* P-P Compression (Peak-to-Peak Compression)
In P-P compression, a maximum and minimum value are extracted from the values measured over a given period of time and are used to produce a compressed measured value.
For details, see the WT5000 Features Guide, IM WT5000-01EN.

Cursor
When you click somewhere on the trend display area, a cursor will appear there.
You can move the cursor by dragging it.

Slider
Move along the time axis to the waveform that you want to display.

7.21 Displaying a Waveform Graph

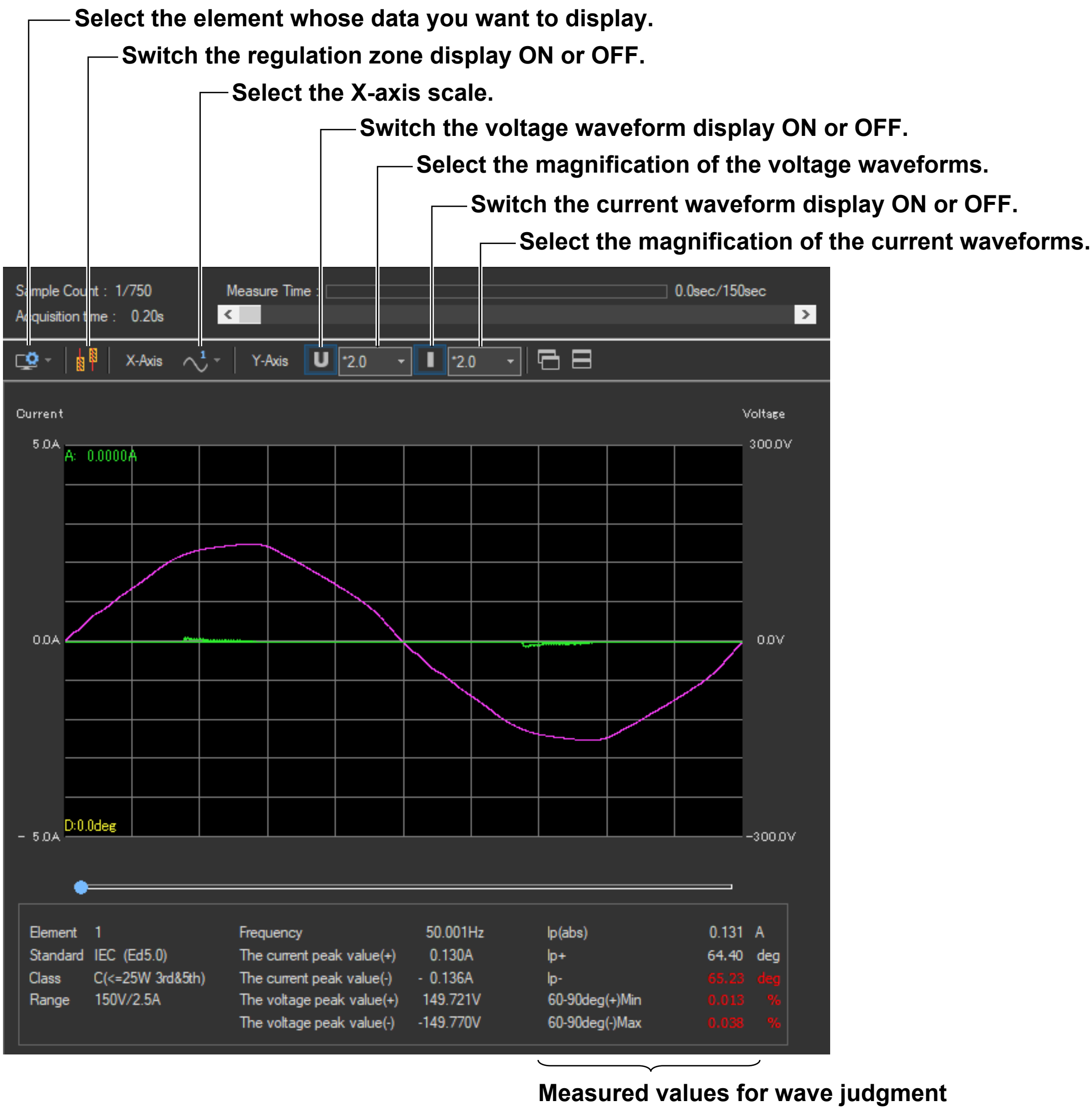
Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

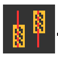
   For general information about submenus, see section 7.16.

Displaying a Waveform Graph

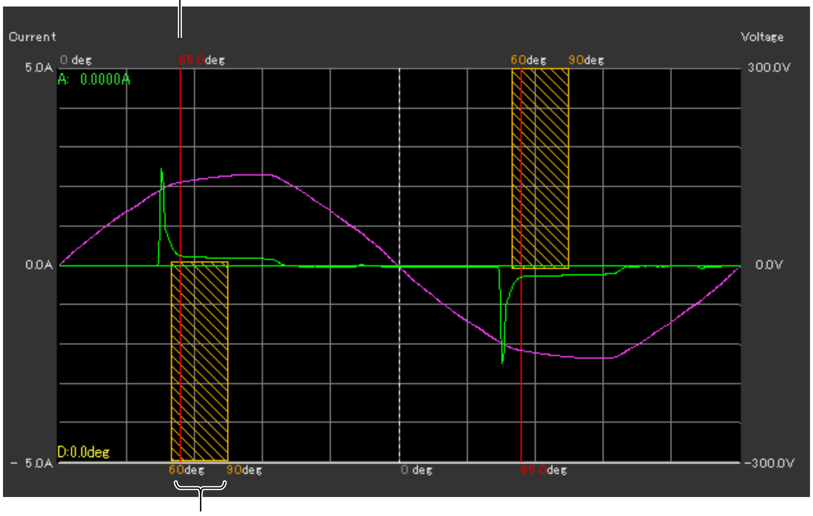
2. Click **Wave Graph View.** A waveform graph appears.



Switching the Regulation Zone Display ON or OFF.

Click . You can select whether to display the wave judgment regulation zones. There are the following two regulation zones.

Current peak: Before or at 65°



Beginning of the current flow to the end of the current flow: 5 % between 60° to 90°

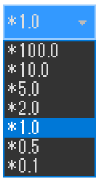
Selecting the X-Axis Scale

Click . Select **ALL**, **Cycle**, **Half Cycle+**, or **Half Cycle-**.

The button indication changes depending on the current setting.

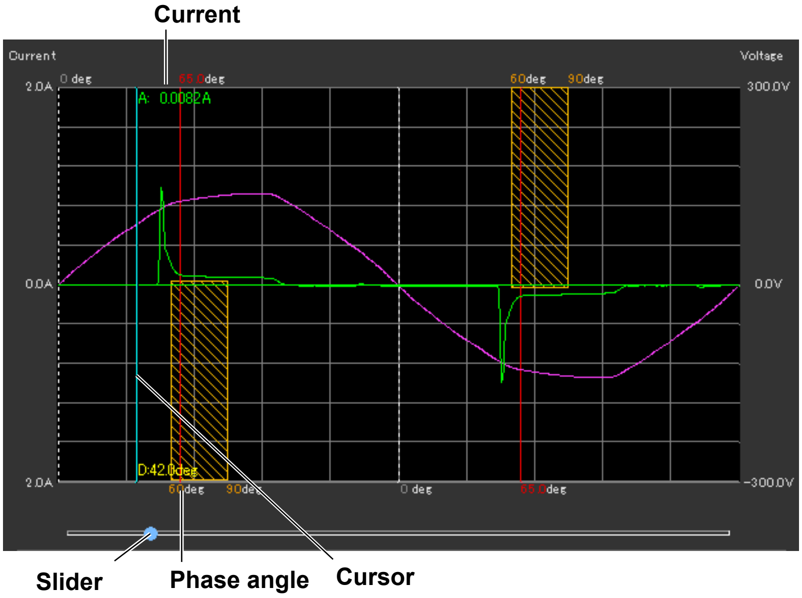
Changing the Y- Axis Scale (the Size of the Voltage and Current Waveforms)

Select ***100.0**, ***10.0**, ***50**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.



Using the Cursor to Display Current and Phase Angle Values

When you click an area of the waveform, a cursor will appear there. The current and phase angle values at the cursor position will be displayed.



Explanation

The waveform data is acquired immediately after the measurement for a compliance test is finished. The software acquires and displays a waveform graph of about two periods using 8000 points of current and voltage waveform data. You can display waveform graphs for each WT input element. This waveform data is different than the waveform data that is displayed in the waveform preview.

Note

Using the scroll bar will have no effect on the waveform graph display.

Switching the Regulation Zone Display ON or OFF

You can show or hide the regulation zone display when you set the following judgment conditions (see section 7.4).

- Class C
- The active power is between 5 W and 25 W (≤25 W, ≥5 W)
- Evaluating on the Conditions of 3rd and 5th Harmonics and Current Waveforms

Numeric Value Displays below the Graph

- Frequency
  The average value of all frequencies (frequency of the fundamental signal of the PLL source) within the measurement time.
- Current Peak (+)
  Maximum positive value of the current waveform displayed.
- Current Peak (–)
  Maximum negative value of the current waveform displayed.
- Voltage Peak (+)
  Maximum positive value of the voltage waveform displayed.
- Voltage Peak (–)
  Maximum negative value of the voltage waveform displayed.

Measured Values for Wave Judgment

This appears when you set the following judgment conditions (see section 7.3).
- Class C
- The active power is between 5 W and 25 W (≤25 W, ≥5 W)
- Evaluating on the Conditions of 3rd and 5th Harmonics and Current Waveforms

The displayed contents are shown below. For details on wave judgment, see section 1.3.

Ip(abs)	The higher absolute value of the peak value of the current waveform (+) and (-)
Ip+	Phase angle of the peak value of the current waveform (+)
Ip-	Phase angle of the peak value of the current waveform (-)
60-90deg(+)Min	Minimum current between 60° to 90° in the positive half cycle
60-90deg(-)Max	Maximum current between 60° to 90° in the negative half cycle

Colors of measured values

- Ip+ and Ip- are displayed in red when the “wave peak phase” set in section 7.3 is exceeded.
- 60-90deg(+)Min is displayed in red when it is less than or equal to the “current threshold” set in section 7.3.
- 60-90deg(-)Max is displayed in red when it is greater than or equal to the “current threshold” set in section 7.3.

7.22 Displaying the Results of Simple Compliance Tests

Procedure

1. Click  in the menu area. The Analysis submenu appears.

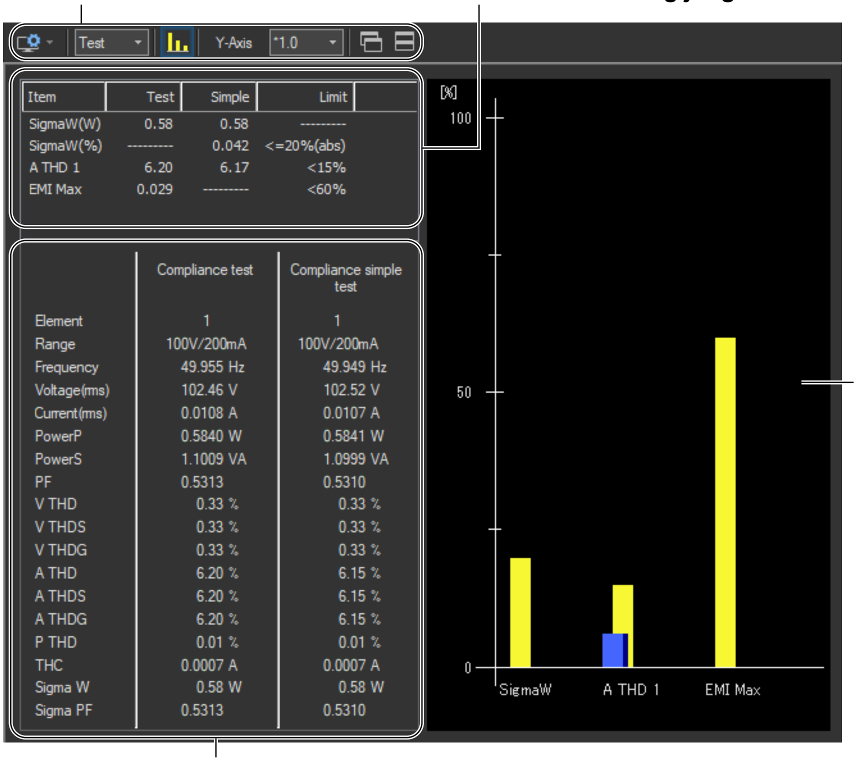
For general information about submenus, see section 7.16.

Displaying the Results of Simple Compliance Tests

2. Click **Simple Test**. The results of simple compliance tests appears.

See section 7.17.

List of values for making judgments in the simple test



Bar graph

Measured value lists
For explanations of these terms, see section 1.6.

Explanation

List of Values for Making Judgments in the Simple Test

The list consists of the following items.

- Test: Measured data of the compliance test that has been specified as the test reference for the simple test
- Simple: Measured values of the simple test

- SigmaW(W)
  Maximum measured active power

- SigmaW(%)
  Magnitude of the active power of the simple test in reference to the active power of the compliance test

$$\left(\frac{\textbf{Maximum SigmaW of the simple test}}{\textbf{Maximum SigmaW of the compliance test}} - 1\right) \times 100$$

- A THD
  Measured current THD at the point where SigmaW(W) is at its maximum value (the number of displayed elements varies depending on the wiring pattern)

- EMI Max
  Magnitude of the measured harmonic current in the compliance test compared to the harmonic current limit
  100 – the minimum margin degree (%)

The value colors are as follows:

- A THD and EMI Max of the compliance test
  Deep blue (the conditions for executing simple tests are met)

- SigmaW(%) of the simple test
  Blue if the value is within the limit and red if the value exceeds the limit

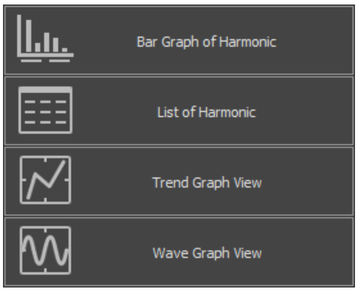
- A THD of the simple test
  Blue if the value is less than the limit and red if the value is greater than or equal to the limit

Bar Graphs

The listed judgment values of the simple test are displayed in a bar graph. The bar colors are the same as the colors of the values described above. The limit is displayed in yellow.

Displaying Other Analysis Results

When you execute a simple compliance test, the following buttons become available in addition to the simple test button. The analysis results that appear when you click these buttons are the measured data of the simple compliance test. The data is not the measured data of the compliance test that has been specified as the test reference for the simple test.



Chapter 8

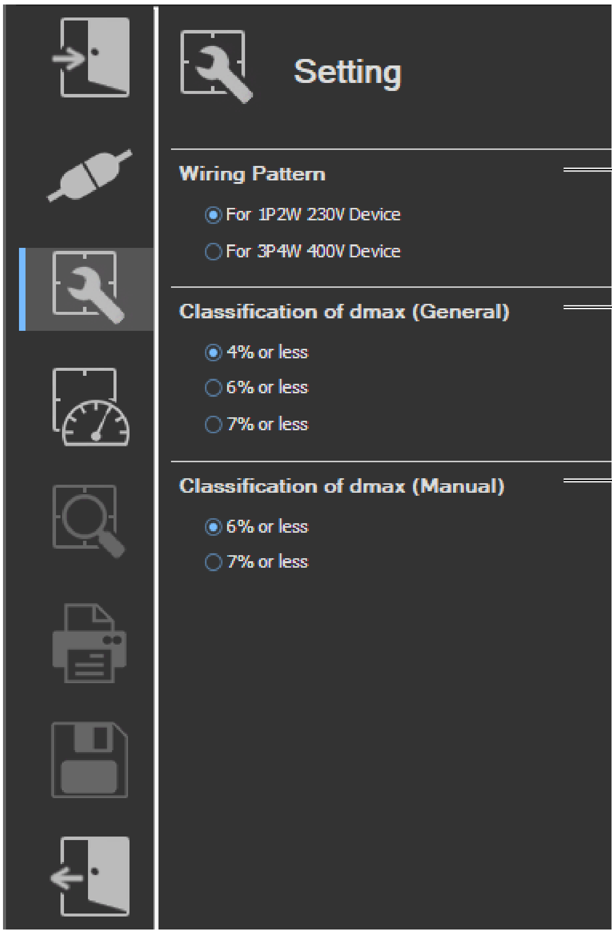
IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

This chapter explains how to configure, measure, and analyze on the IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software.

8.1 Setting General Test Conditions

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring Pattern (see page 8-3)
Select the wiring pattern of the circuit you will measure.

Classification of dmax (General) (page 8-3)
When making normal voltage fluctuation and flicker measurements (General mode), select the dmax classification here.

Classification of dmax (Manual) (page 8-3)
When measuring dmax caused by manual switching (Manual dmax mode), select the dmax classification here.

In the setting and display area, you can switch between basic settings and advanced settings by clicking these buttons: . For details, see sections 8.3 and 8.4.

 Basic settings

 Advanced settings

Wiring Pattern

2. Select the wiring pattern of the circuit you will measure.
- For 1P2W 230V Device
- For 3P4W 400V Device

Note

When you switch wiring patterns, the following settings, which are displayed in the setting and display area, will change to default values that are appropriate to the wiring pattern that you select. For the default values, see sections 8.3 and 8.4.
- The WT settings (the settings on the WT Measurement Instrument tab)
- The testing judgment conditions (the settings under the Standard tab)

Classification of dmax (General)

3. When making normal voltage fluctuation and flicker measurements (General mode), select the dmax classification here.
- 4% or less
- 6% or less
- 7% or less

Note

When you change this setting, the dmax setting that is displayed under Judge (General) on the WT Measurement Instrument tab in the setting and display area will also change. For details, see “Explanation” in section 8.4.

Classification of dmax (Manual)

4. When measuring dmax caused by manual switching (Manual dmax mode), select the dmax classification here.
- 6% or less
- 7% or less

Note

When you change this setting, the dmax setting that is displayed under Judge (Manual) on the WT Measurement Instrument tab in the setting and display area will also change. For details, see the explanation in section 7.3.

Explanation

Classification of dmax

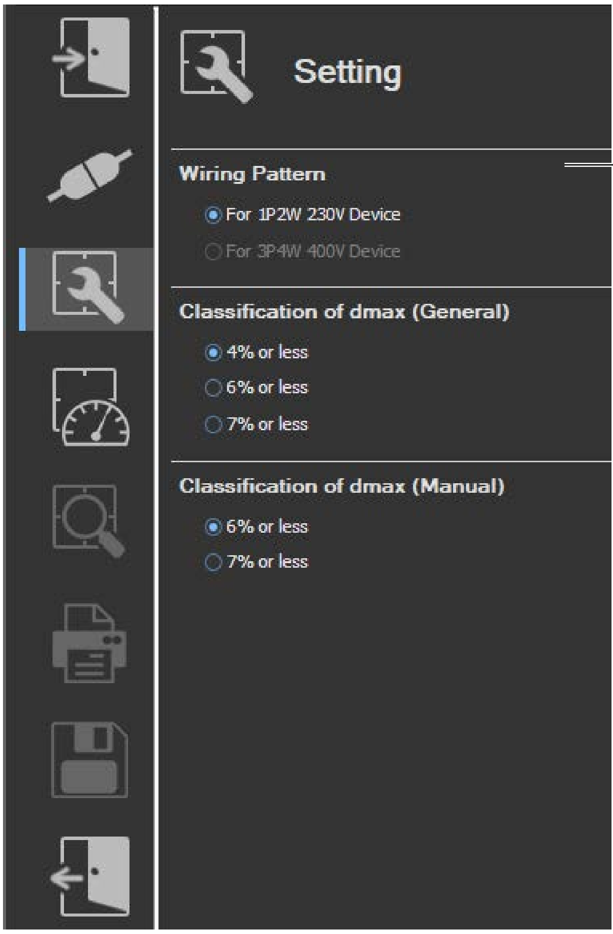
The limit dmax is 4 %, 6 %, or 7 % depending on the conditions. For the conditions, see page 1-35.

8.2 Configuring the Power Supply

If an online connection is established with “Use” selected in “Configuring the Connection to the Power Supply” (see section 6.1), configure the power supply according to the procedure in this section.

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring pattern
Only the selectable items become available depending on the type of connected NF power supply.

Various Power Supply Settings

1. In the setting and display area, select the **NF Power Supply** tab. Power supply settings are displayed.

2. Click the basic settings  or advanced settings  button.

3. Specify the settings.

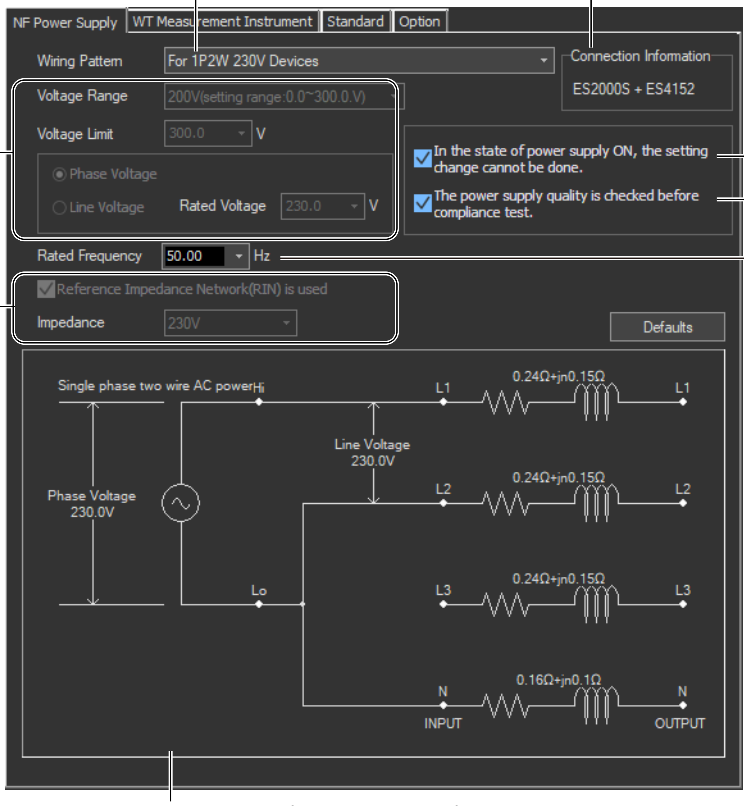
Basic Setting Mode

Click the basic button to display the following settings.

In basic setting mode, when you set the wiring system, these boxes are set automatically. For details, see the next page.
To view or change these settings, select advanced setting mode.

Power supply and reference impedance network (RIN) information
The power supply and RIN model are obtained automatically and displayed.*

Wiring pattern



Select this check box to prohibit changes to the settings when the power output is on.

Select this check box to check the power supply quality before measurement.
For details on the power supply quality check, see section 8.6.

Rated frequency
Select 50 Hz or 60 Hz from the drop-down list.
If you click the box, you can set the frequency in the range of 45.00 to 66.00.
You can select values that have been entered recently from the drop-down list.

Illustration of the setting information

* If any of the models from DP4164 to DP4169 is connected for the RIN, the software displays it as follows:
- Single-phase: DP4162
- Three-phase: DP4163

Wiring Pattern

Depending on the type of power supply that is connected, the following wiring system is selected automatically. In addition, voltage range and other parameters are set to the following values.

When an ES2000S (Single-Phase Model) Is Connected

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When an ES2000U (Three-Phase Model) Is Connected with the Slide Switch Set to Single-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When an ES2000U (three-phase model) Is Connected with the Slide Switch Set to Three-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9

When a DP Power Supply Single-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Set to Single-Phase Two-Wire Output

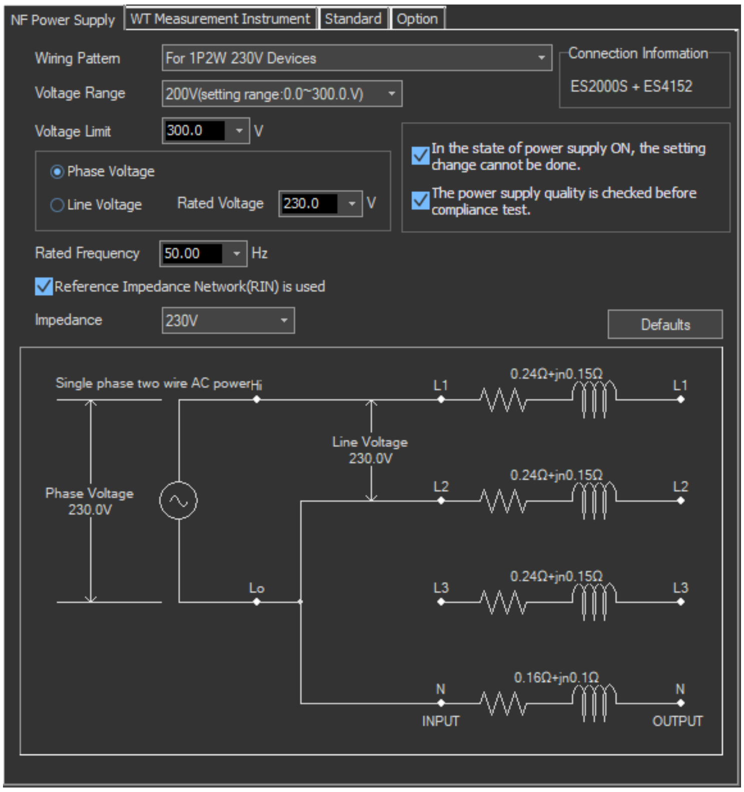
Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When a DP Power Supply Multi-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Not Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9

Advanced Setting Mode

Click the advanced button  to display the following settings.



Voltage Range

Select 100 V or 200 V. The range of values that you can set for the rated voltage and voltage limit is displayed.

Voltage Limit

You can select the following values from the drop-down list for the voltage limit depending on the voltage range.

Voltage Range	Voltage Limit
100 V	150.0 V
200 V	300.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

Output Voltage Setting

Set the output voltage to **Phase Voltage** or **Line Voltage**.

Rated Voltage

You can select the following values from the drop-down list for the rated voltage output depending on the Phase Voltage/Line Voltage setting and voltage range.

		Phase Voltage/Line Voltage	
		Phase Voltage	Line Voltage
Voltage Range	100 V	100.0 V or 115.0 V	200.0 V or 230.0 V
	200 V	200.0 V or 230.0 V	200.0 V or 400.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

If the phase voltage of the rated voltage exceeds the value in the voltage limit table, the following values are set depending on the power supply type and voltage range.

Voltage limit: The value in the voltage limit table
Phase voltage/line voltage: Phase Voltage
Rated voltage: Same value as the voltage range

Note

If the rated voltage is set using a line voltage, the line voltage is converted into phase voltage according to the wiring system and compared to the value in the voltage limit table.

Impedance

If you select the “Reference Impedance Network (RIN) is used” check box, you can set the following impedances according to the connected RIN. If you do not select the check box, DEFEAT appears in the box.

When an ES4152 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4162*

- DEFEAT
- 100 V
- 200 V
- 230 V

When an ES4153 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4163*

- DEFEAT
- JPN 1φ
- JPN 3φ
- EU 1φ/3φ

* For the connection information when any of the models from DP4164 to DP4169 is connected for the RIN, see page 8-5.

Depending on the connected power supply type, the impedance is set to the following default values.

	Power Supply Type	
	• ES2000S **• DP series** - Single-phase model - When phase mode on a multi-phase model is set to single-phase two-wire	**• ES2000U** **• DP series** - Three-phase model - When phase mode on a multi-phase model is not set to single-phase two-wire
Impedance	230 V	EU1φ/3φ

If the RIN for the DP series power supply is not connected, you cannot select the “Reference Impedance Network (RIN) is used” check box. Consequently, you cannot change the impedance setting.

Defaults

The settings are reset to the following conditions (default values).

- Setting mode: basic
- Wiring Pattern
  The wiring system is set as follows according to the connected power supply.
  - When an ES2000S (Single-Phase Model) Is Connected
    For 1P2W 230V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to single-phase mode
    For 1P2W 230V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to three-phase mode
    For 3P4W 400V Device
  - When a DP series power supply single-phase model is connected or multi-phase model with the phase mode set to single-phase two-wire output
    For 1P2W 230V Device
  - When a DP series power supply multi-phase model is connected or multi-phase model with the phase mode not set to single-phase two-wire output
    For 3P4W 400V Device
- Voltage ranges: As shown in the table on page 8-6 according to the connected power supply and wiring system.
- Voltage limit: As shown in the table on page 8-6 according to the connected power supply and wiring system.
- Phase voltage/line voltage: As shown in the table on page 8-6 according to the connected power supply and wiring system.
- Rated voltage: As shown in the table on page 8-6 according to the connected power supply and wiring system.
- Rated frequency: 50 Hz
- The power supply quality is checked before compliance test: Selected
- Reference Impedance Network (RIN) is used
  - When an ES2000S or ES2000U is connected: Selected
  - When a DP series power supply is connected
    When DP series RIN is connected: Selected
    When DP series RIN is not connected: Not selected
- Impedance: As shown in the table on page 8-8 according to the connected power supply and compatibility condition.

Settings at Startup

The above settings when the software is started are set as follows depending on the connection conditions.

Connection Condition	Setting
New connection	Default values
Same conditions as those of the loaded file	Settings of the loaded file
Same conditions as the last time	Settings used the last time

8.3 Setting the WT Measurement Conditions

Procedure

1. Select the **WT Measurement Instrument** tab in the setting and display area. The WT measurement condition settings are displayed.

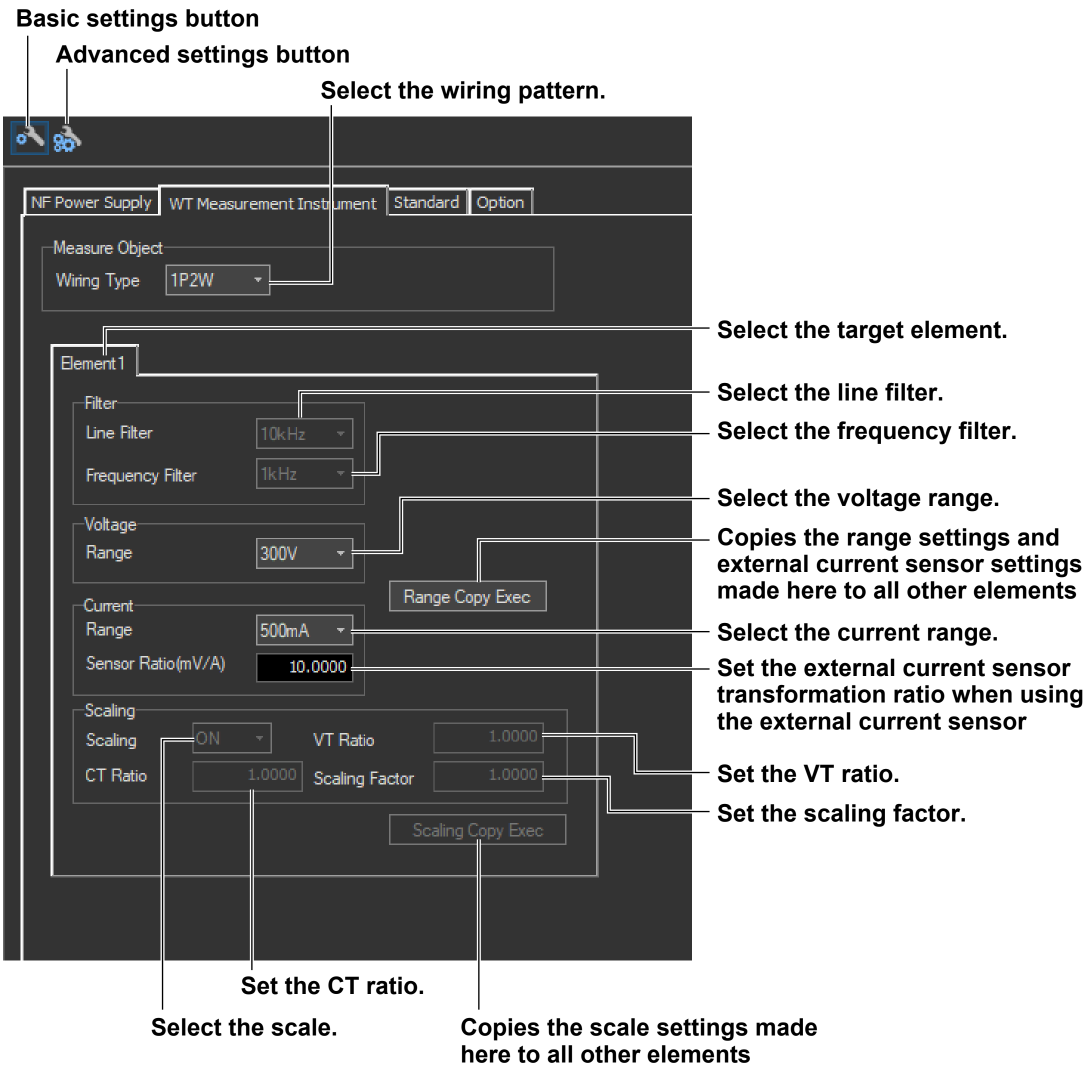
2. Click the basic settings  or advanced settings  button.

3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust this setting, click the advanced settings button.

- Scaling ON/OFF



Explanation

Wiring Pattern

Set the element to perform voltage fluctuation and flicker measurement on. The installed elements are displayed as configurable devices depending on the selected wiring system.

Copying the Range

You can copy the range settings configured for one element to all other elements with the same wiring. The voltage range, the current range, and the external current sensor range are copied.

Copying the Scaling Settings

You can copy the scaling settings configured for one element to all other elements with the same wiring. The settings that are copied are:

- VT ratio
- CT ratio
- Scaling factor

For information about the following settings and how to make settings from the WT5000, see the following manuals.

Setting	Manuals	Refer To
Line filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Frequency filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Voltage/current range	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.2 and 2.3
Scaling	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.4 and 9.1

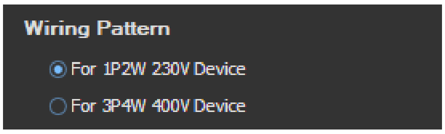
Note

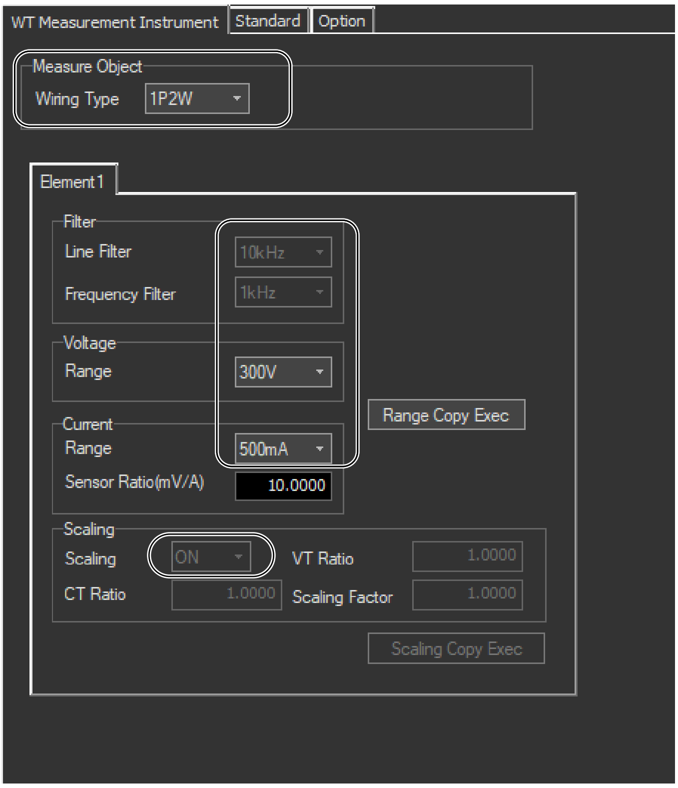
You can only change measurement conditions in online mode with the flicker measurement status set to Reset. For more information about the flicker measurement status, see sections 8.7 and 8.8.

How Settings Change Based on the Selected Wiring Pattern

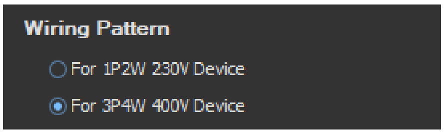
When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.

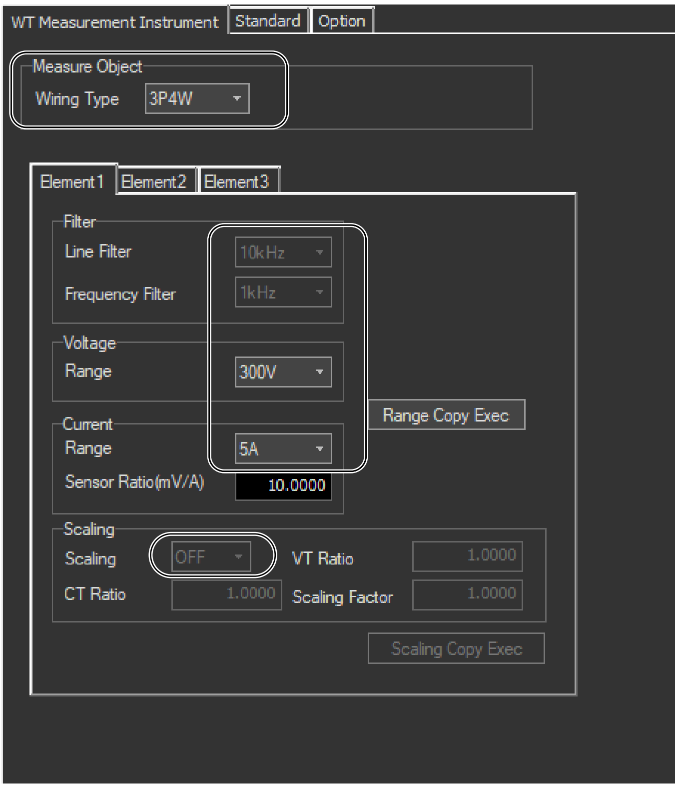
Changes Made When "For 1P2W 230V Device" Is Selected





Changes Made When "For 3P4W 400V Device" Is Selected





8.4 Setting the WT Judgment Conditions

Procedure

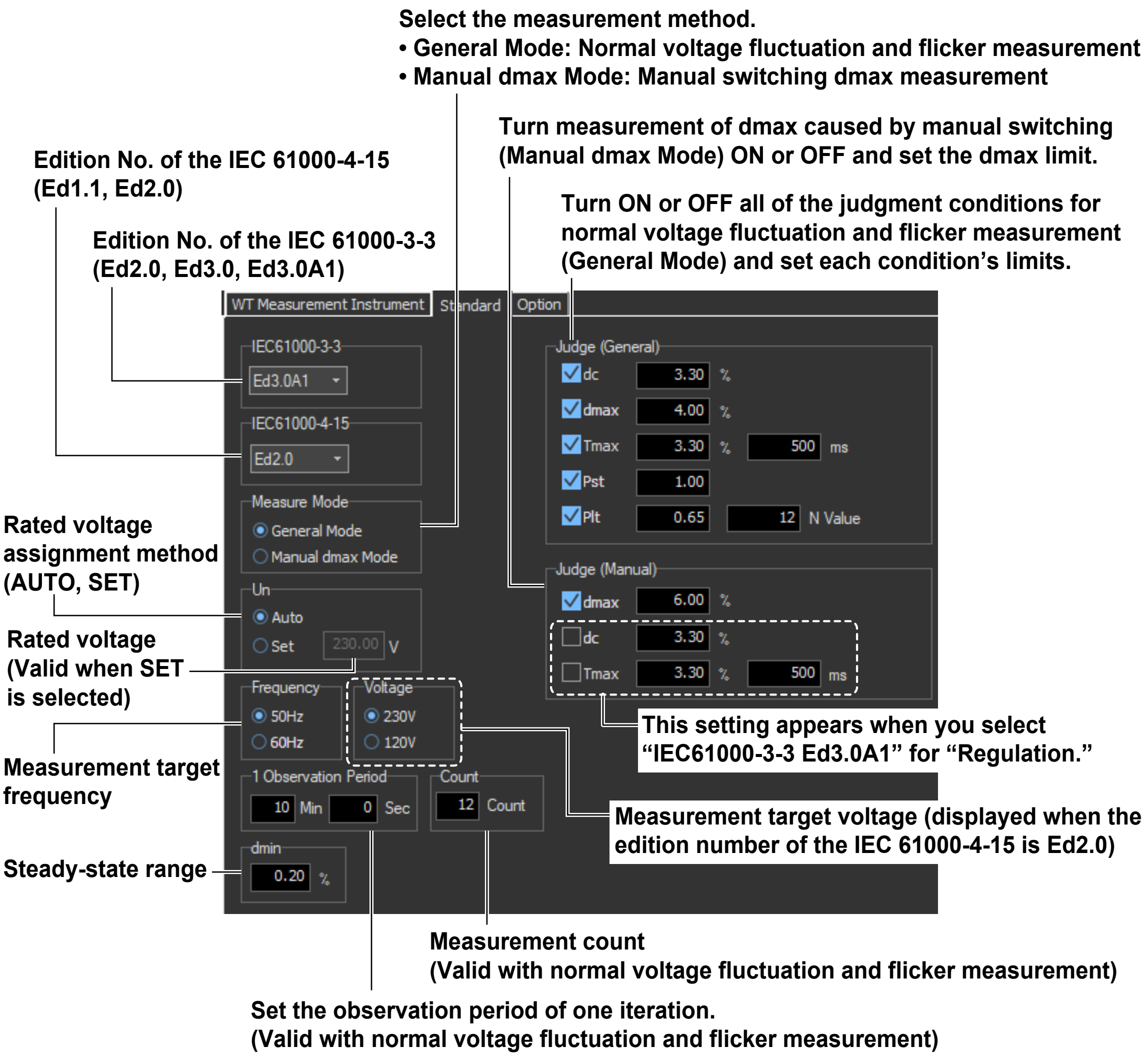
1. Select the **Standard** tab in the setting and display area. Judgment condition settings are displayed.
2. Click the basic settings [icon] or advanced settings [icon] button.
3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust these settings, click the advanced settings button.

- Measure Mode
- Un
- Frequency
- 1 Observation Period
- Count
- dmin
- dc, Tmax, Pst, Plt of the Judge (General)

When measured data has been loaded, the normal voltage fluctuation and flicker measurement judgment condition Tmax, located under Judge (General), is unavailable.



Explanation

For explanations of these terms, see section 1.5 and 1.8.

WT Firmware Versions and Selectable IEC 61000 Edition Numbers

The following edition numbers can be selected in firmware version 2.01 and later.

Edition number of the IEC 61000-3-3
- Edition 2.0 (Ed2.0)
- Edition 3.0 (Ed3.0)
- Edition 3.0 Amd1 (Ed3.0A1)

Edition number of the IEC 61000-4-15
- Edition 1.1 (Ed1.1)
- Edition 2.0 (Ed2.0)

IEC 61000-4-15 specifies requirements for measurement instruments.
For details, see Chapter 14.

Measure Mode

Select the voltage fluctuation and flicker measurement method from the two methods below.

General Mode (normal voltage fluctuation and flicker measurement)

Judges whether values such as dc, dmax, Tmax, and Pst are within the specified limits.

Manual dmax Mode (measurement of dmax caused by manual switching)

You manually turn the EUT switch ON. The WT measures the voltage fluctuation caused by the inrush current that flows when the power is turned on or off, and judges whether the dmax average is within the specified limits.
If you select IEC 61000-3-3 **Ed3.0A1**, you can add dc and Tmax to be judged.

Rated Voltage

You can select the assignment method of the rated voltage.

AUTO

Automatically retrieves the measured voltage at the start of the voltage fluctuation and flicker measurement as the rated voltage.

SET

You can set the rated voltage in the range of 0.01 to 999.99 V.

Measurement Target Frequency

You can set the measurement target frequency to 50 Hz or 60 Hz.
Set the measurement source frequency appropriately as the transfer function of the flicker meter and other parameters change accordingly.

If the measurement mode is set to General Mode (normal voltage fluctuation and flicker measurement), you must set the single observation period, measurement count, and steady-state range.

Measurement Target Voltage (Displayed when IEC 61000-4-15 Ed2.0 is selected)

You can set the measurement target voltage to 230 V or 120 V.
Set the measurement source voltage appropriately as the transfer function of the flicker meter and other parameters change accordingly.

1 Observation Period

You can set the single observation period of short-term flicker value Pst in unit of minutes and seconds in the following range. The range is as follows.
00:30 to 15:00 (only even values can be specified for the seconds)

Measurement Count

You can set the measurement count of short-term flicker value Pst in the range of 1 to 99.

Steady-State Range (dmin: Allowable Range of Relative Voltage Change to Be Considered Steady-State)

You can set steady-state range dmin in the range of 0.10 to 9.99 %.

Normal Voltage Fluctuation and Flicker Measurement (General Mode)

Judgment Conditions for Relative Steady-State Voltage Change dc

Turning ON/OFF the Judgment of Relative Steady-State Voltage Change dc

You can select whether to include relative steady-state voltage change dc in the flicker measurement judgment.

Limit on Relative Steady-State Voltage Change dc

You can set the limit in the range of 1.00 to 99.99 %.

Judgment Conditions for Maximum Relative Voltage Change dmax

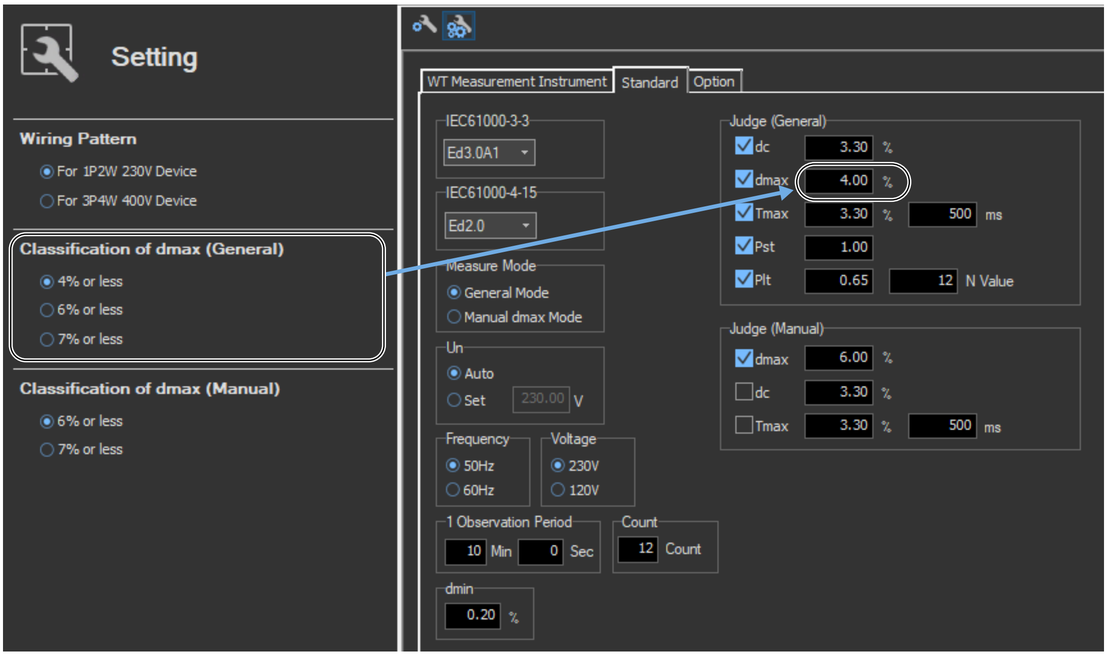
Turning ON/OFF the Judgment of Maximum Relative Voltage Change dmax

You can select whether to include maximum relative voltage change dmax in the flicker measurement judgment.

Limit on Maximum Relative Voltage Change dmax

You can set the limit in the range of 1.00 to 99.99 %.

However, after you set a value, if you perform step 3 on page 8-3, the limit will be changed to the value you set there.



Judgment Conditions for Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

Turning ON/OFF the Judgment of Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can select whether to include the period during which the relative voltage change exceeds the threshold level Tmax in the flicker measurement judgment.

Threshold Level

You can set the threshold level in the range of 1.00 to 99.99 %.

Limit on the Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can set the limit in the range of 1 to 99999 ms.

Judgment Conditions for Short-Term Flicker Value Pst

Turning ON/OFF the Judgment of Short-Term Flicker Value Pst

You can select whether to include short-term flicker value Pst in the flicker measurement judgment.

Limit on Short-Term Flicker Value Pst

You can set the limit in the range of 0.10 to 99.99.

Judgment Conditions for Long-Term Flicker Value Plt

Turning ON/OFF the Judgment of Long-Term Flicker Value Plt

You can select whether to include long-term flicker value Plt in the flicker measurement judgment.

Limit on Long-Term Flicker Value Plt

You can set the limit in the range of 0.10 to 99.99.

Constant N of the Calculating Equation of Long-Term Flicker Value Plt

You can set constant N in the range of 1 to 99.

Note

- The long-term flicker value (Plt) is computed using the following equation.

$$\mathrm{Plt} = \sqrt[3]{\frac{\sum_{i=1}^{\mathrm{Count}} \mathrm{Psti}^3}{N}}$$

  The variable Count in the equation is the measurement count of short-term flicker value (Pst). The variable N in the equation is the constant of the calculating equation of long-term flicker value (Plt). In general, set Count and N to the same value. If N is set greater than Count, the short-term flicker value is measured the number of times specified by Count. The short-term flicker values (Pst) that are not measured are substituted with zeros in the above equation to calculate the long-term flicker value (Plt). N is set greater than Count such as when the measured source automatically stops within the specified observation time.
- You can change the judgment conditions only in online mode when the flicker measurement status is Reset or Complete. For more information about the flicker measurement status, see sections 8.7 and 8.8.
- You can set judgment conditions on dmax, dc, and Tmax during the measurement of dmax caused by manual switching, but judgment is not performed on Pst or Plt.

Judgment Conditions for Measurement of dmax Caused by Manual Switching (Manual dmax mode)

Judgment Conditions for Maximum Relative Voltage Change dmax

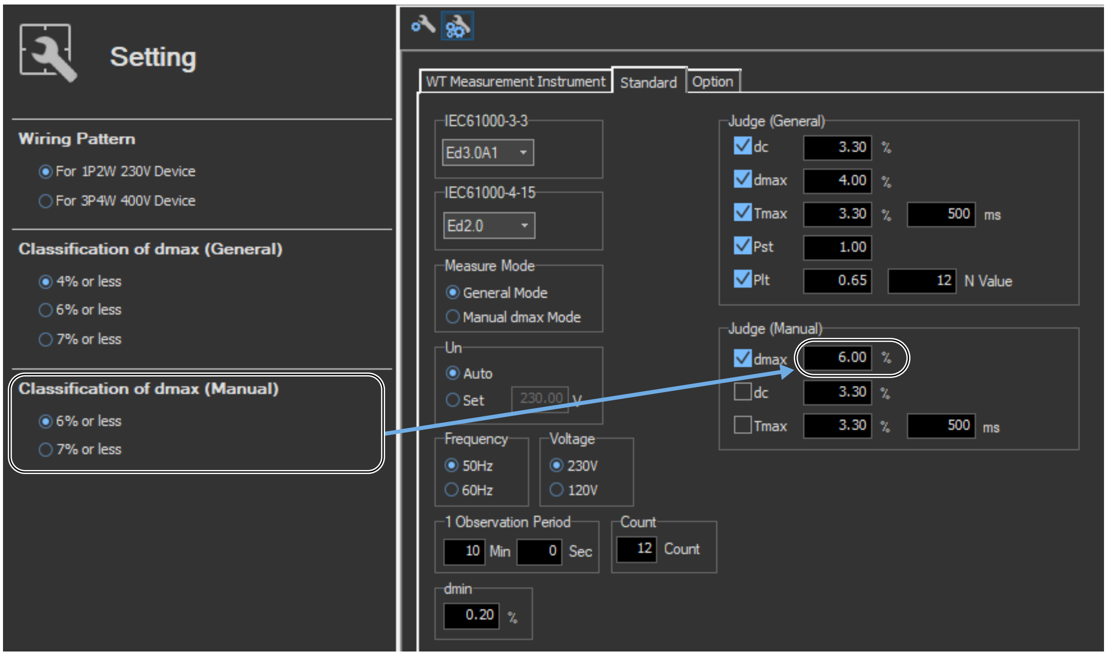
Turning ON/OFF the Judgment of Maximum Relative Voltage Change dmax

You can select whether to include maximum relative voltage change dmax in the flicker measurement judgment.

Limit on Maximum Relative Voltage Change dmax

You can set the limit in the range of 1.00 to 99.99 %.

However, after you set a value, if you perform step 4 on page 8-3, the limit will be changed to the value you set there.



Judgment Conditions for Relative Steady-State Voltage Change dc

Turning ON/OFF the Judgment of Relative Steady-State Voltage Change dc

You can select whether to include relative steady-state voltage change dc in the flicker measurement judgment.

Limit on Relative Steady-State Voltage Change dc

You can set the limit in the range of 1.00 to 99.99 %.

Judgment Conditions for Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

Turning ON/OFF the Judgment of Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can select whether to include the period during which the relative voltage change exceeds the threshold level Tmax in the flicker measurement judgment.

Threshold Level

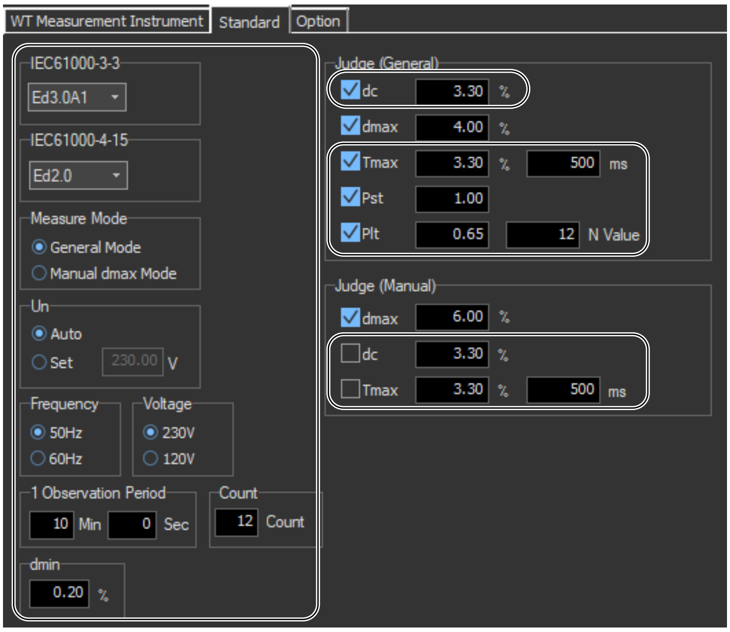
You can set the threshold level in the range of 1.00 to 99.99 %.

Limit on the Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can set the limit in the range of 1 to 99999 ms.

How Settings Change Based on the Selected Wiring Pattern

When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



8.5 Setting the Optional Conditions

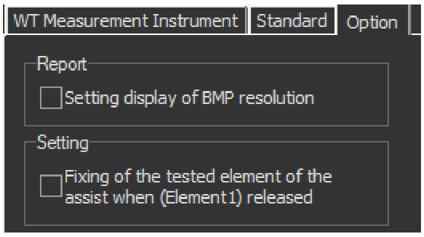
Procedure

1. Select the **Option** tab in the setting and display area. Judgment condition settings are displayed.

2. Specify the settings.

Note

The items that you can set are the same whether you press the basic settings button  or the advanced settings button .



Explanation

Report

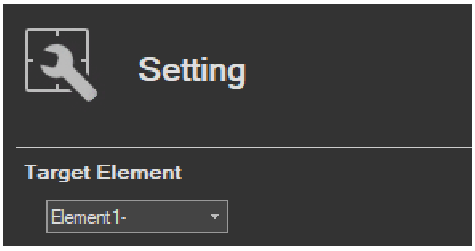
Setting display of BMP resolution

In the BMP item under Output Form of the Print menu, the selectable output resolutions appear. (See section 11.2.)

Setting

Fixing of the tested element of the assist when (Element1) released

Select the check box to select the target element. A target element setting box appears in the Setting submenu area.

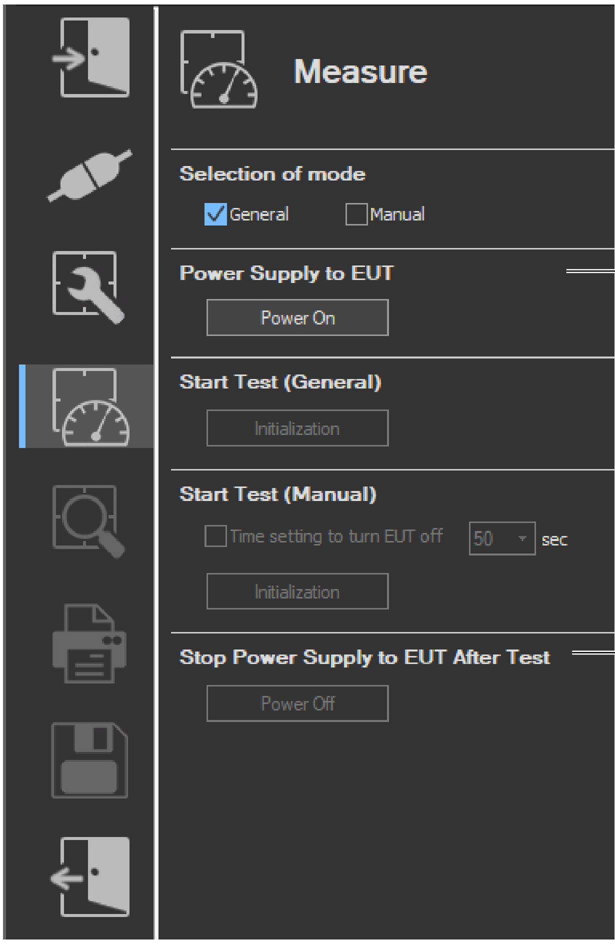


If the check box is not selected, the target element is fixed to element 1.

Using the Measure Page to Make Measurements

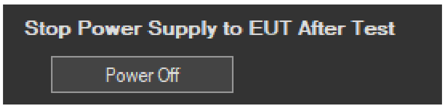
8.6 Turning the Power Output On and Off (When the power supply function is in use)

1. Click  in the menu area. The Measure submenu appears.



Turning the Power Output On and Off

To turn the power output on or off, click **Power On** or **Power Off** in the submenu area.



Whether the Power On, Power Off, Initialize, Start, Reset, and Move buttons are enabled or disabled in each of the software states are as follows:

Flicker Measurement

Software State	Power Supply State	Power On	Power Off	Initialize	Start	Reset
Before measurement initialization (Reset)	Power On	Disabled	Enabled	Enabled	Disabled	Disabled
	Power Off	Enabled	Disabled	Disabled	Disabled	Disabled
Measurement initialization complete (Ready)	Power On	Disabled	Enabled	Disabled	Enabled	Enabled
Measuring (Start)	Power On	Disabled	Enabled	Disabled	Disabled	Enabled
Measurement complete (Complete)	Power On	Disabled	Enabled	Disabled	Disabled	Enabled
	Power Off	Enabled	Disabled	Disabled	Disabled	Disabled

WT states are indicated in parentheses.

Manual dmax Measurement

Software State	Power Supply State	Power On	Power Off	Initialize	Start	Reset	Move
Before measurement initialization (Reset)	Power On	Disabled	Enabled	Enabled	Disabled	Disabled	Disabled
	Power Off	Enabled	Disabled	Disabled	Disabled	Disabled	Disabled
Measurement initialization complete (Ready)	Power On	Disabled	Enabled	Disabled	Enabled	Enabled	Enabled
Measuring (Start)	Power On	Disabled	Enabled	Disabled	Disabled	Enabled	Disabled
Measurement complete (Complete)	Power On	Disabled	Enabled	Disabled	Disabled	Enabled	Enabled
	Power Off	Enabled	Disabled	Disabled	Disabled	Disabled	Disabled

WT states are indicated in parentheses.

Note

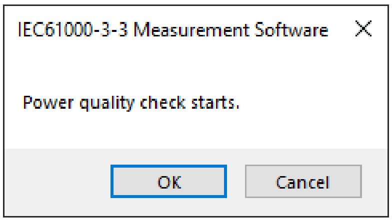
- If the software is in the Power On state and the software is switched from online to offline, the software switches to the Power Off state.
- If the software is switched from offline to online, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.
- When the software is closed, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.

Power Supply Quality Check

If the “The power supply quality is checked before compliance test” check box in the power supply settings (see page 8-5) is selected, the power supply quality is checked before the power output is turned on.

Note

If the /G7 option is not installed in the WT, the power supply quality cannot be checked.



The following items are verified.

- Measurement time 500 ms
- Power supply judgment conditions

Rated voltage[1]	Within ±2.0 %[4]
Nominal frequency[2]	Within ±0.5 %[4]
Total harmonic distortion of supply voltage[3]	Less than 3 %[4]

1 For the rated voltage, the rated voltage value in the power supply settings (see page 8-5) and the measured voltage (rms) are compared.
2 For the nominal frequency, the rated frequency value in the power supply settings (see page 8-5) and the measured value are compared.
3 Total harmonic distortion of supply voltage is calculated as follows with the denominator of the equation set to the fundamental voltage waveform.

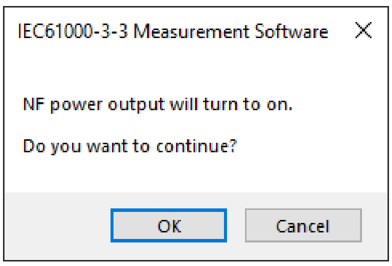
Total harmonic distortion of voltage
Uthd [%]

$$\frac{\sqrt{\sum_{k=2}^{max} U(k)^2}}{U(1)} \cdot 100$$

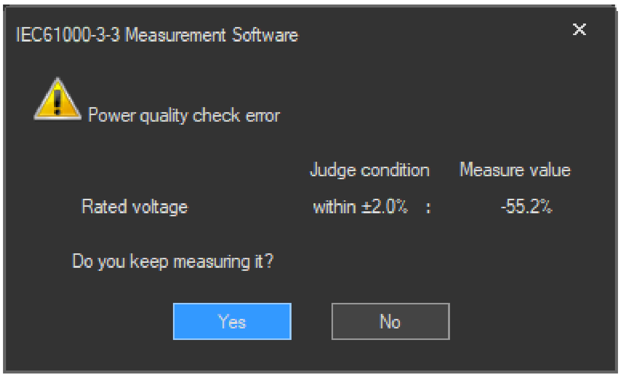
k: harmonic order
max: upper limit of harmonic analysis

4 Judgment is performed in normal measurement mode of the WT. For details on the measurement specifications, see the *Features Guide*, IM WT5000-01EN, and the *User’s Manual*, IM WT5000-02EN.

If no problems are found in the power supply quality, a power output confirmation message appears.



If problems are found in the power supply quality, an error message appears. The item that resulted in error is displayed.



Starting Voltage Fluctuation/Flicker Measurements

Starts a voltage fluctuation/flicker measurement according to section 8.7 or 8.8.

Voltage Range Validity Check

When a voltage fluctuation/flicker measurement is started, the software checks whether the NF power supply, WT, and Voltage Fluctuation/Flicker Measurement Software are configured as shown in the following table.

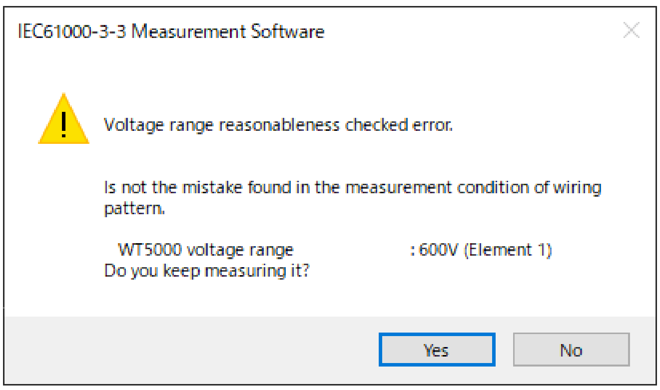
- Check items when the NF Power Connection is set to Use in “Configuring the Connection to the Power Supply” (see section 6.1)

Wiring Pattern	NF Power Supply Settings		WT Voltage Range*
	Rated Voltage	Rated Frequency	
Single-phase two-wire 230 V device	100 to 230 V	45 to 66 Hz	CF3: 100 V to 300 V
Three-phase four-wire 400 V device	220 to 240 V	45 to 66 Hz	CF3: 300 V to 600 V

* “CF3” in the table indicates that the crest factor is set to 3.

- If the NF Power Connection is set to Not Used in “Configuring the Connection to the Power Supply” (see section 6.1), the WT voltage ranges in the table above are verified.

If the settings are different from those in the table, an error message will appear. The item that resulted in error is displayed.



Measured Element

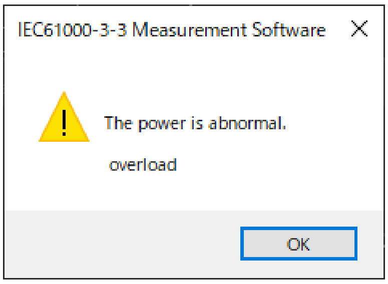
The measured element is determined by the WT measurement target (Object) setting.*

* See section 8.3.

For example, even when a three-phase power supply is being measured, if the WT measurement target (Object) is set only to Element 1, only input element 1 will be measured. Also, when a single-phase power supply is being measured, if the WT measurement target (Object) is set to Element 1 and 2, input element 2 (which is not receiving any signal) will also be measured, and the total judgment may indicate Fail.

Power Supply Error Check during Measurement

This software checks whether an error is occurring in the power supply during measurement. If an error is found, an error message appears. For example, if an overload occurs, the following error message will appear.



Note

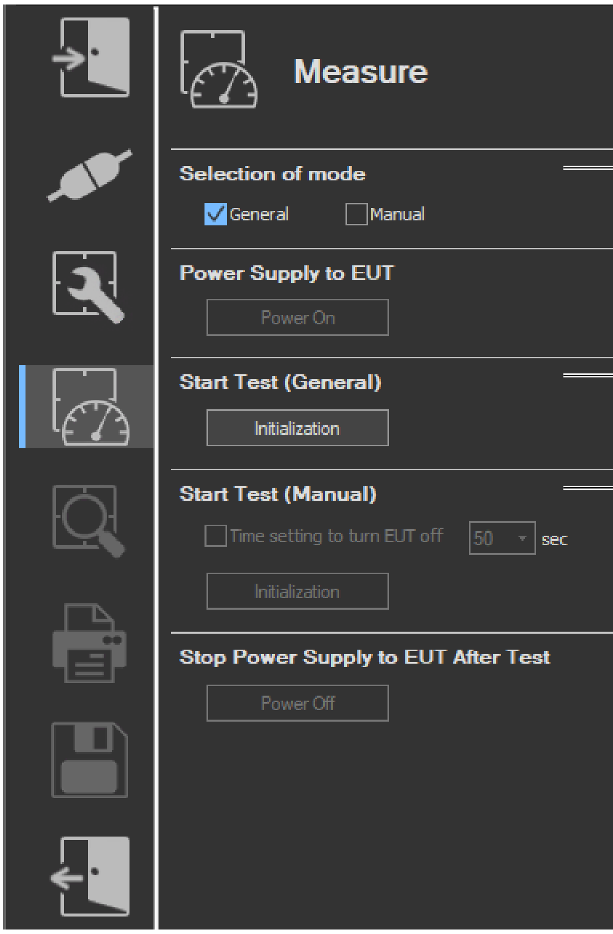
The power output remains on even if the voltage fluctuation/flicker measurement is ended or aborted. (It is not automatically turned off.)

8.7 Executing the Normal Voltage Fluctuation and Flicker Measurement

A normal voltage fluctuation and flicker measurement complying with IEC 61000-3-3 is executed. In this mode, the software calculates all voltage and flicker values: dc, dmax, Tmax, Pst, and Plt. It makes an overall judgment by comparing the calculated values with the set limits.

Procedure

1. Click  in the menu area. The Measure submenu appears.



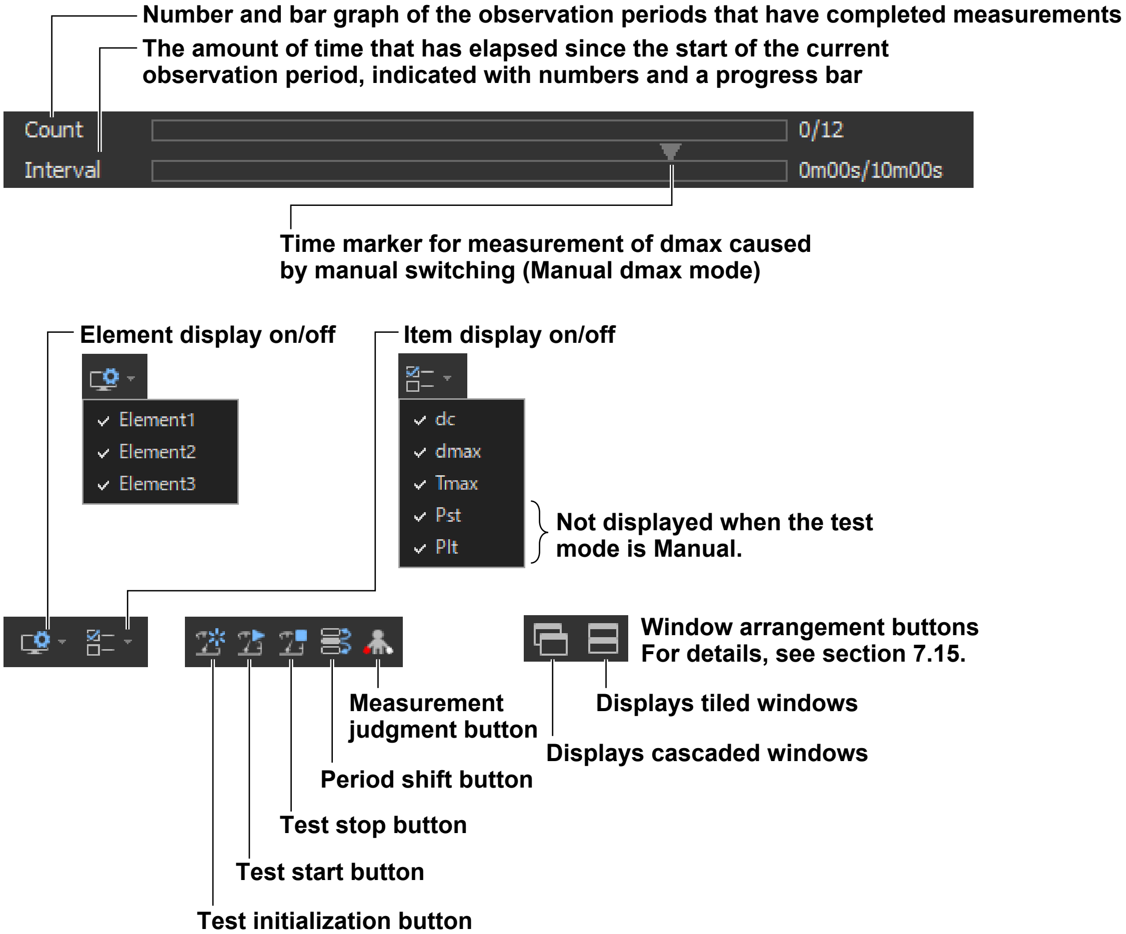
Selection of mode (page 8-28)
Select which kind of measurement to perform.

Start Test (General) (page 8-29)
Perform normal voltage fluctuation and flicker measurement (General mode).

Start Test (Manual) (section 8.8)
Perform measurement of dmax caused by manual switching (Manual mode).

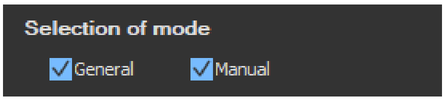
Upper portion of the setting and display area

* Icons that cannot be selected are dimmed.



Selecting a Test Mode

2. Select **General**. You can also select both General and Manual.

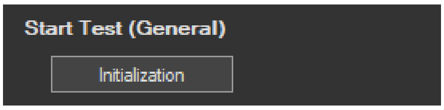


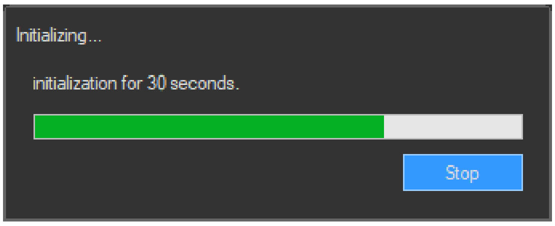
Starting a Compliance Test

Check that the software is in online mode and that the flicker measurement status is indicating Reset (condition in which the measured value is reset and initialization can be executed). If not, set the flicker measurement status to Reset according to the procedure in “Resetting a Test” on page 8-32.

Initializing a Test

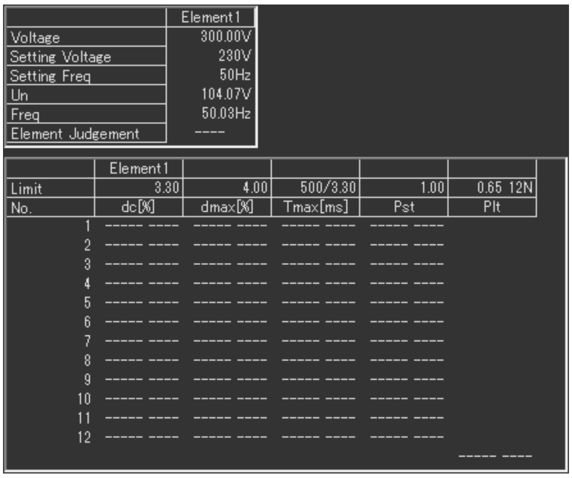
3. Click **Initialization** under Start Test (General) or click the button on the toolbar. The initialization dialog box appears, and initialization begins.





Once initialization is complete, the initialization dialog box will automatically close, initialization button turns start test button. And the Numeric View window will display:

- The current measured values for Un[V] and Freq[Hz].
- “----” for dc[%], dmax [%], Tmax[ms], and Pst.



	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	104.07V
Freq	50.03Hz
Element Judgement	----

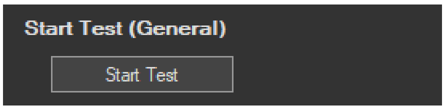
	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	----- ----	----- ----	----- ----	----- ----	
2	----- ----	----- ----	----- ----	----- ----	
3	----- ----	----- ----	----- ----	----- ----	
4	----- ----	----- ----	----- ----	----- ----	
5	----- ----	----- ----	----- ----	----- ----	
6	----- ----	----- ----	----- ----	----- ----	
7	----- ----	----- ----	----- ----	----- ----	
8	----- ----	----- ----	----- ----	----- ----	
9	----- ----	----- ----	----- ----	----- ----	
10	----- ----	----- ----	----- ----	----- ----	
11	----- ----	----- ----	----- ----	----- ----	
12	----- ----	----- ----	----- ----	----- ----	
					----- ----

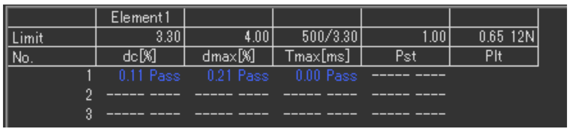
Starting a Test

4. Click **Start Test** under Start Test (General) or click the button on the toolbar. The Numeric View window will display:

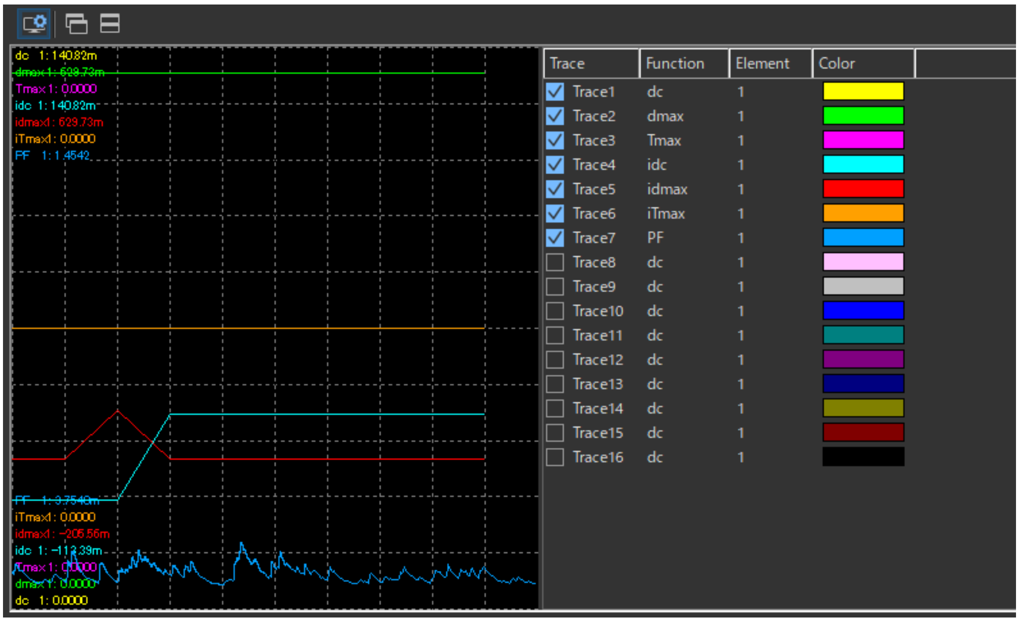
- Fixed values for Un[V] and Freq[Hz]
- The maximum measured values within the observation period for dc[%], dmax [%], Tmax[ms], and Pst.

The bar and numbers next to Interval indicate how much time has passed. The bar and numbers next to Count indicate how many observation periods have finished. The measurement results appear in the Trend Graph View window.

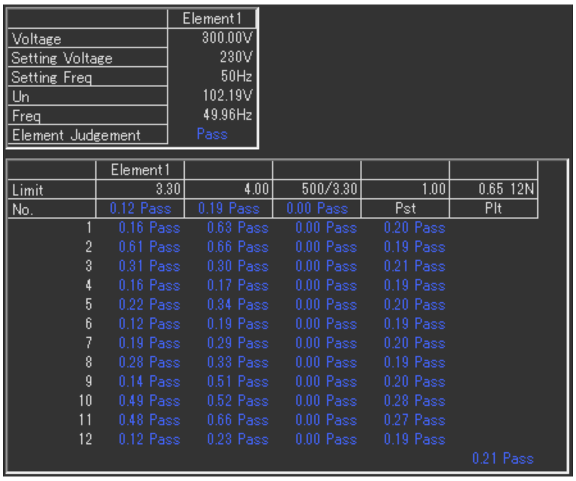




	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.11 Pass	0.21 Pass	0.00 Pass	----- ----	
2	----- ----	----- ----	----- ----	----- ----	
3	----- ----	----- ----	----- ----	----- ----	



When the measurement of all observation periods is complete, the normal voltage fluctuation and flicker measurement automatically stops. The result and judgment are displayed.

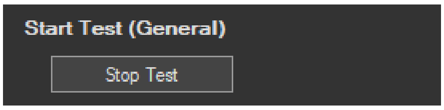


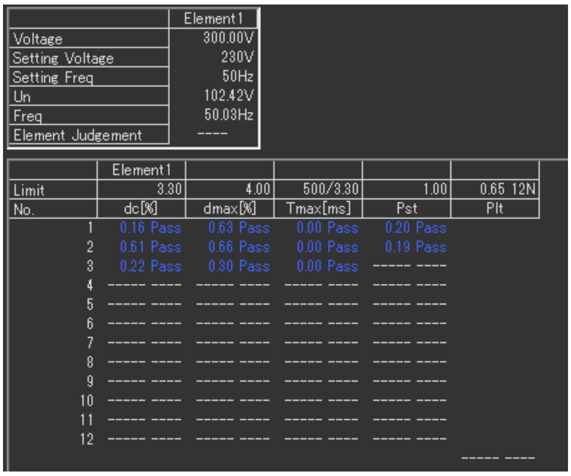
	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	102.19V
Freq	49.96Hz
Element Judgement	Pass

	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	0.12 Pass	0.19 Pass	0.00 Pass	Pst	Plt
1	0.16 Pass	0.63 Pass	0.00 Pass	0.20 Pass	
2	0.61 Pass	0.66 Pass	0.00 Pass	0.19 Pass	
3	0.31 Pass	0.30 Pass	0.00 Pass	0.21 Pass	
4	0.16 Pass	0.17 Pass	0.00 Pass	0.19 Pass	
5	0.22 Pass	0.34 Pass	0.00 Pass	0.20 Pass	
6	0.12 Pass	0.19 Pass	0.00 Pass	0.19 Pass	
7	0.19 Pass	0.29 Pass	0.00 Pass	0.20 Pass	
8	0.28 Pass	0.33 Pass	0.00 Pass	0.19 Pass	
9	0.14 Pass	0.51 Pass	0.00 Pass	0.20 Pass	
10	0.49 Pass	0.52 Pass	0.00 Pass	0.28 Pass	
11	0.48 Pass	0.66 Pass	0.00 Pass	0.27 Pass	
12	0.12 Pass	0.23 Pass	0.00 Pass	0.19 Pass	
					0.21 Pass

Stopping a Test

1. Click **Stop Test** in the Start Test (General) box or click on the toolbar to stop the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.





	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	102.42V
Freq	50.03Hz
Element Judgement	----

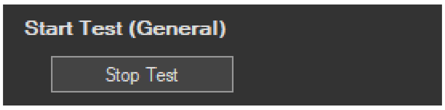
	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.16 Pass	0.63 Pass	0.00 Pass	0.20 Pass	
2	0.61 Pass	0.66 Pass	0.00 Pass	0.19 Pass	
3	0.22 Pass	0.30 Pass	0.00 Pass	------ ----	
4	------ ----	------ ----	------ ----	------ ----	
5	------ ----	------ ----	------ ----	------ ----	
6	------ ----	------ ----	------ ----	------ ----	
7	------ ----	------ ----	------ ----	------ ----	
8	------ ----	------ ----	------ ----	------ ----	
9	------ ----	------ ----	------ ----	------ ----	
10	------ ----	------ ----	------ ----	------ ----	
11	------ ----	------ ----	------ ----	------ ----	
12	------ ----	------ ----	------ ----	------ ----	
					------ ----

Changing the Judgment Conditions and Re-judging the Measured Data

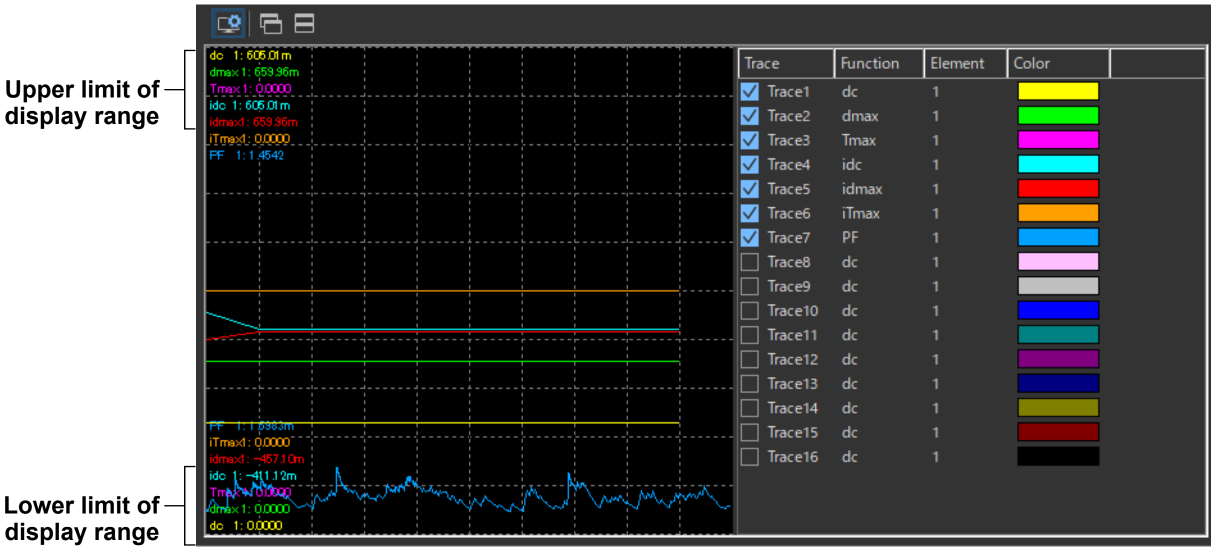
When the normal voltage fluctuation and flicker measurement is complete, change the judgment conditions according to the procedure given in “Setting the Judgment Conditions” in section 8.4. If you change the judgment conditions, the measured voltage fluctuation and flicker data is re-judged, and the judgment is updated.

Resetting a Test

1. Click **Stop Test** in the Start Test (General) box or click on the toolbar to reset the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.



Setting the Trend Graph Traces



Trace

Select the trends you want to display (select or clear the check boxes).

Up to 16 trends can be displayed.

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
iTmax	Period during which instantaneous relative voltage change exceeds the threshold level
PF	Instantaneous flicker sensation (IFS)

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

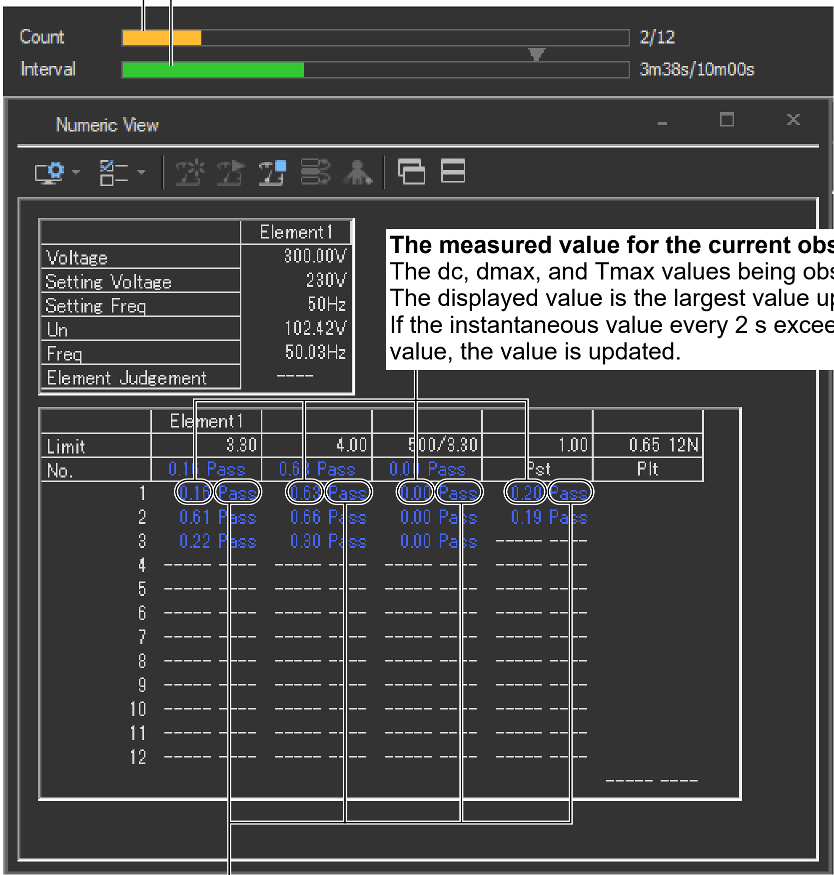
Explanation

Display during Measurement

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Number and bar graph of the observation periods that have completed measurements

The amount of time that has elapsed since the start of the current observation period, indicated with numbers and a progress bar



The measured value for the current observation period.
The dc, dmax, and Tmax values being observed are displayed.
The displayed value is the largest value up to that point.
If the instantaneous value every 2 s exceeds the maximum value, the value is updated.

Judgments displayed for completed observation periods

- The final values of dc, dmax, and Tmax are compared with the respective limits, and the judgment (pass or fail) is displayed.
- If a steady-state condition does not occur during the measurement period, it is considered to be a fluctuating condition. The measured value of dc is displayed as Undef (undefined, IEC 61000-4-15 Ed1.1) or 0 (IEC 61000-4-15 Ed2.0), and the judgment is displayed as Error (IEC 61000-4-15 Ed1.1) or Pass (IEC 61000-4-15 Ed2.0).
- The short-term flicker value, Pst, is calculated, compared to the limit, and the judgment (pass or fail) is displayed.
- The judgment of items whose judgment is turned OFF is displayed as Undef.

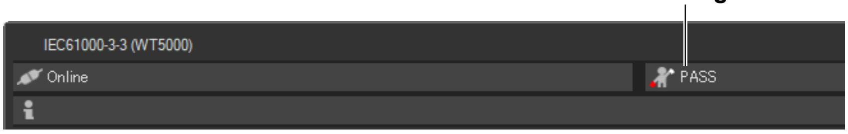
Judge Display When the Measurement Is Complete

Once the test is finished, the overall judgment appears.

Display example: PASS

The overall judgment appears in the information area.

Judgment



If all of the elements that are tested pass, PASS appears. Otherwise, FAIL appears.

	PASS
	Measurement ended without the relative voltage change ever having exceeded steady-state range dmin. (The measured values for dc, dmax, and Tmax were all 0.)
	A steady-state condition did not occur in one or more observation periods (equivalent to dc = Undef in IEC 61000-4-15 Ed. 1.1). * Does not appear when Ed1.1 is selected.
	FAIL
	No data

Selecting the Test

- To perform a normal voltage fluctuation and flicker measurement (General mode), select General.
- To measure dmax caused by manual switching (Manual dmax mode), select Manual.
- You can also select both General and Manual.

Initializing the Measurement

- The initialization takes approximately 30 s.
- Rms voltage Un and voltage frequency Freq are updated every 2 s while the initialization is in progress in the same manner as when the voltage fluctuation and flicker measurement is reset.
- Keep the voltage of the power supply to be measured in steady-state condition while the initialization is in progress.

Rated Voltage Un and Voltage Frequency Freq

- If the assignment method of rated voltage is AUTO, the rms voltage at the start of measurement is used as rated voltage Un. The measured data is calculated with respect to rated voltage Un.
- If the assignment method of rated voltage is SET, the rated voltage setting is displayed as Un(Set).
- Rated voltage Un and voltage frequency Freq are not updated after the flicker measurement is started.

Resetting the Test

To initialize and restart the measurement, reset the measurement after the normal voltage fluctuation and flicker measurement is complete and the flicker measurement status is indicating Complete. You cannot initialize or start the measurement in the Complete status.
In addition, reset the measurement to change the measurement conditions of the normal voltage fluctuation and flicker measurement (section 8.3).

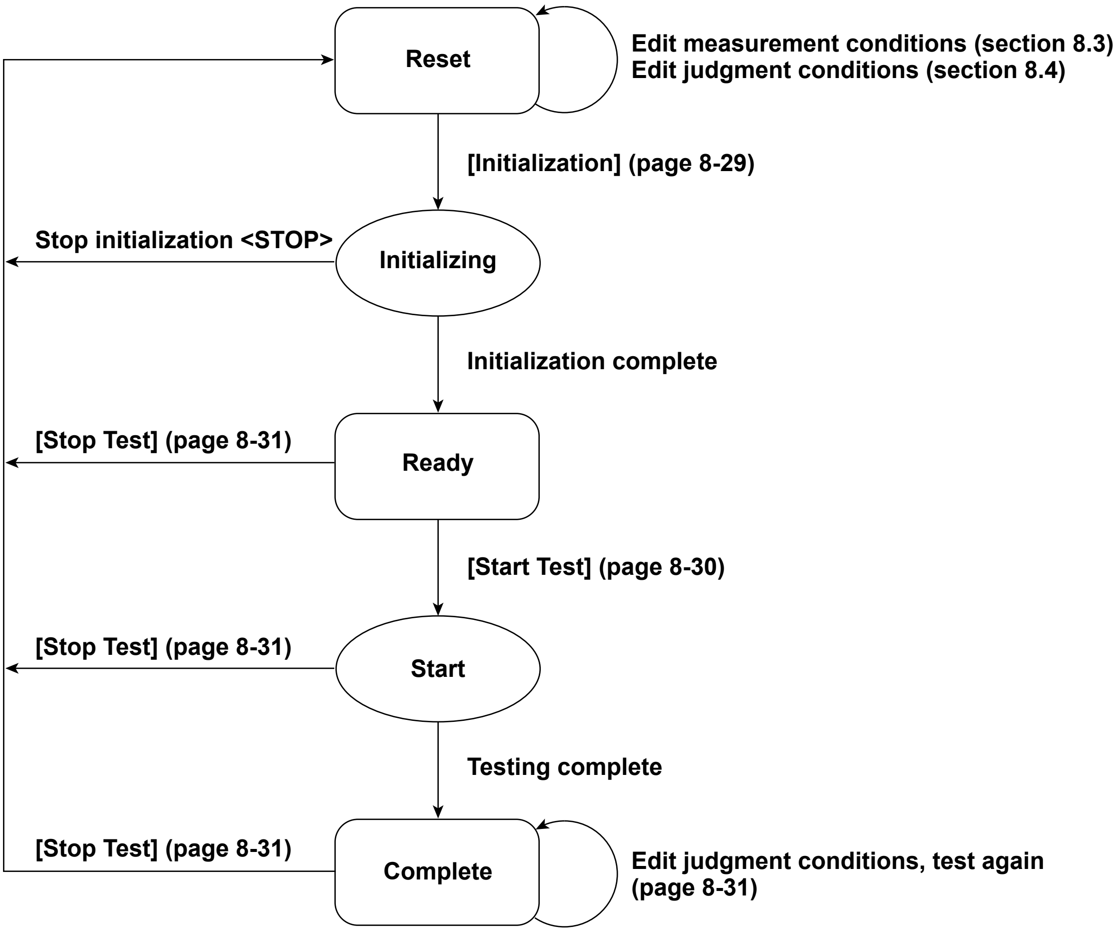
Flicker Measurement Status

The following five flicker measurement statuses are available.

Status	Meaning
Reset	Condition in which the measured value is reset and initialization can be executed.
Initializing	Initializing the measurement.
Ready	Initialized condition in which measurement can be started.
Start	Measurement in progress: Displays the elapsed time.
Complete	Displays the result (judgment by measurement item) and judgment (element judgment and overall judgment).

Normal Voltage Fluctuation and Flicker Measurement Flowchart

(Transition Diagram of the Flicker Measurement Status)



Numbers in parenthesis indicate relevant sections or pages in the manual.
Brackets are used to indicate buttons or icons.
Greater than and less than signs are used to indicate buttons (i.e. <Stop Test>).

8.8 Executing the Measurement of dmax Caused by Manual Switching

Measurement of dmax caused by manual switching is executed.
The software measures the maximum relative voltage change, dmax, when the EUT (equipment under test) is turned ON and OFF manually. After the EUT has been turned ON and OFF 24 times, the software makes a judgment by comparing the average dmax with the set limit.

If the standard is IEC 61000-3-3 Ed3.0A1, you can add dc and Tmax to be measured.
(Max and Min of dc, dmax, and Tmax are excluded.)

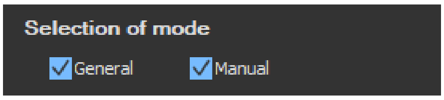
Procedure

1. Click in the menu area. The Measure submenu appears.

For general information about submenus, see section 8.1.

Selecting a Test Mode

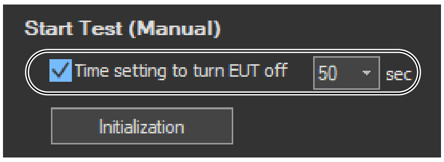
2. Select Manual. You can also select both General and Manual.



Setting the Time Marker

3. Select the **Time setting** check box under Start Test (Manual). appears above the Interval bar in the upper portion of the setting and display area.

4. Set **Time setting** to 1 to 60 seconds.



When the Standard Is IEC 61000-3-3 Ed3.0A1 and dc and Tmax Are Excluded from Measurement

5. Click on the toolbar. From the item display on/off menu, click dc and Tmax to clear the check boxes.

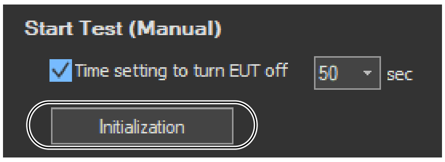
► page 8-28

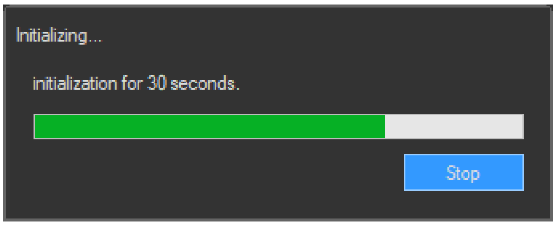
Starting a Compliance Test

Check that the software is in online mode and that the flicker measurement status is Reset (when the status is Reset, the measured values are reset and initialization can be performed). If not, set the flicker measurement status to Reset according to the procedure in “Resetting a Test” on page 8-43.

Initializing a Test

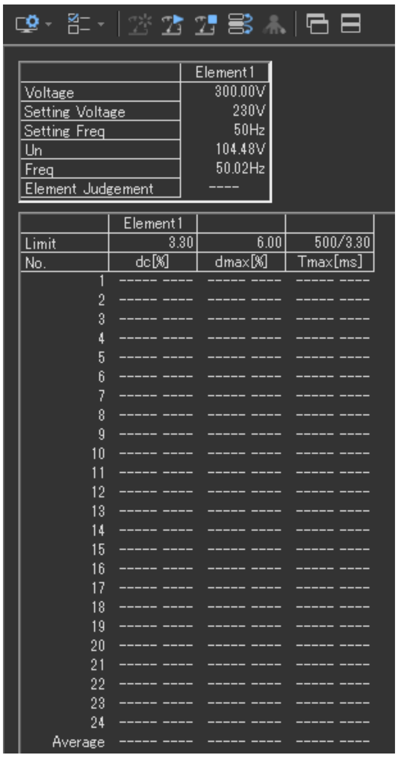
Click **Initialization** under Start Test (Manual) or click the button on the toolbar. The initialization dialog box appears, and initialization begins.





Once initialization is complete, the initialization dialog box will automatically close, and the Numeric View window will display:

- The current measured values for Un[V] and Freq[Hz].
- “----” for dc[%], dmax [%], Tmax[ms], and Pst.

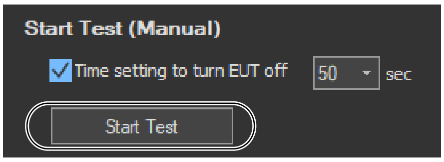


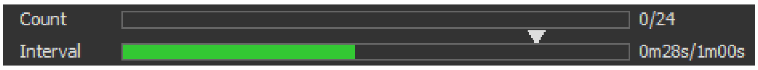
Starting a Test

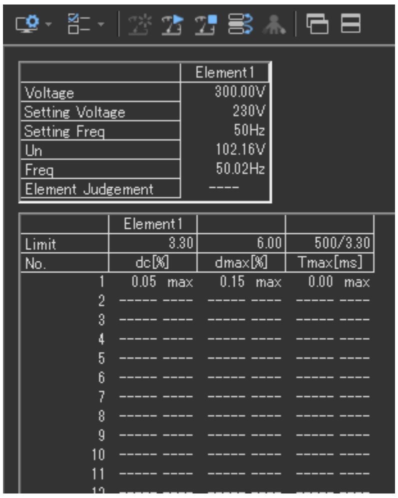
1. Click **Start Test** under Start Test (Manual) or click the button on the toolbar. The Numeric View window will display:

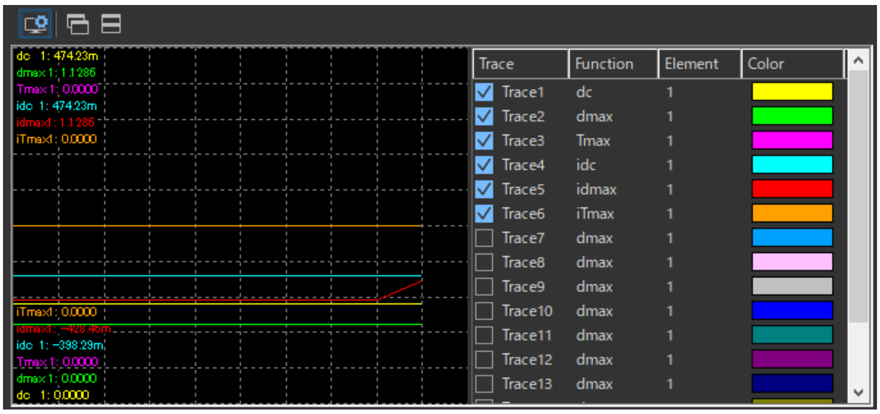
- Fixed values for Un[V] and Freq[Hz]
- The maximum value for dmax during the current observation period.

The bar and numbers next to Interval indicate how much time has passed. The bar and numbers next to Count indicate how many observation periods have finished. The measurement results appear in the Trend Graph View window.





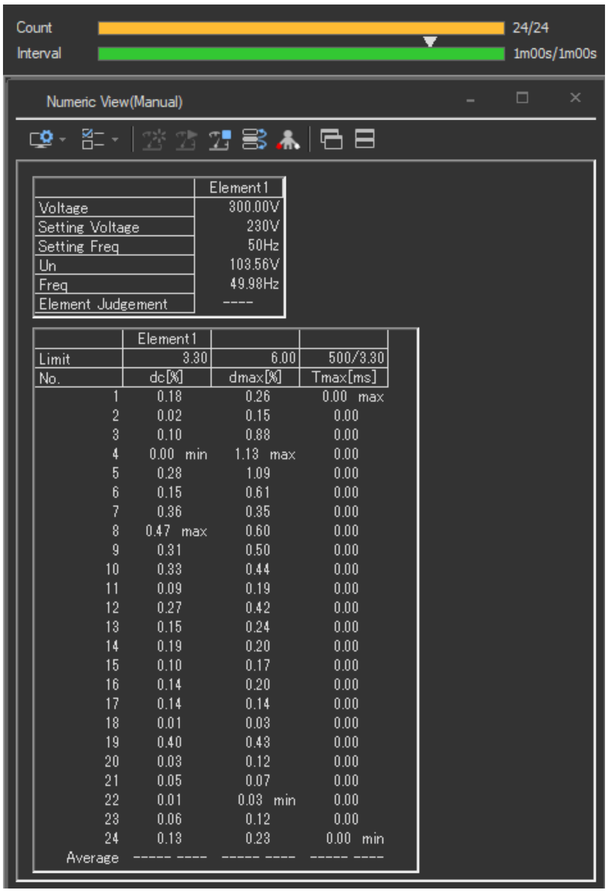




2. Turn the EUT ON to achieve normal operation. Operate the EUT in the normal condition as long as possible in the measurement period of one observation period (1 minute).

3. Turn the EUT OFF before the measurement of one observation period (1 minute) completes.

4. Repeat steps 1 and 3 to measure dmax 24 times.



	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	103.56V
Freq	49.98Hz
Element Judgement	----

	Element1		
Limit	3.30	6.00	500/3.30
No.	dc[%]	dmax[%]	Tmax[ms]
1	0.18	0.26	0.00 max
2	0.02	0.15	0.00
3	0.10	0.88	0.00
4	0.00 min	1.13 max	0.00
5	0.28	1.09	0.00
6	0.15	0.61	0.00
7	0.36	0.35	0.00
8	0.47 max	0.60	0.00
9	0.31	0.50	0.00
10	0.33	0.44	0.00
11	0.09	0.19	0.00
12	0.27	0.42	0.00
13	0.15	0.24	0.00
14	0.19	0.20	0.00
15	0.10	0.17	0.00
16	0.14	0.20	0.00
17	0.14	0.14	0.00
18	0.01	0.03	0.00
19	0.40	0.43	0.00
20	0.03	0.12	0.00
21	0.05	0.07	0.00
22	0.01	0.03 min	0.00
23	0.06	0.12	0.00
24	0.13	0.23	0.00 min
Average	----- ----	----- ----	----- ----

Remeasuring by Shifting the Observation Period

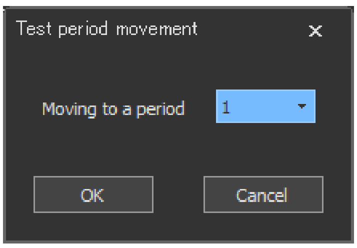
If a measurement of a given observation period is not performed correctly, you can change the observation period to be measured by carrying out to the procedure below and redo the measurement.

1. Click  on the toolbar. The Move dialog box opens.

2. Select the number of the observation period you want to re-measure.

Note

You can only shift to and remeasure observation periods that have already been measured.

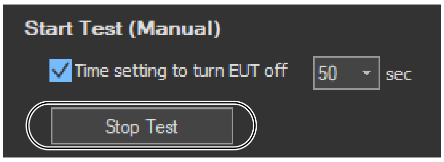


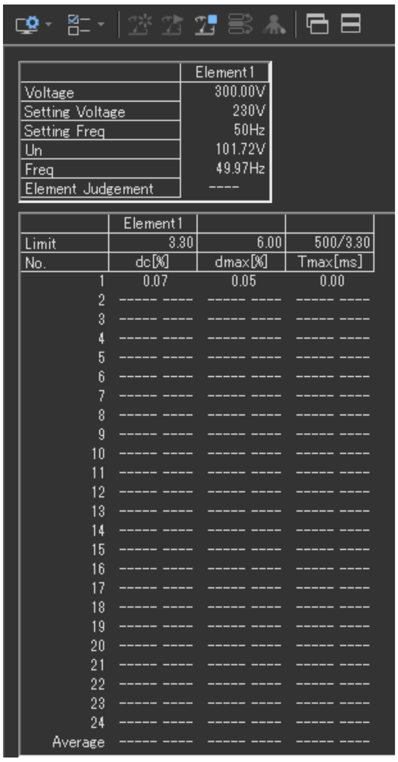
3. Carry out steps 2 to 4 to measure dmax.
   If you start the re-measurement, the measurement count and graph display shown in Count decrease by one. In addition, the total elapsed time of measurement decreases by one observation period.

4. If you want to continue with the measurement, repeat steps 2 to 4. To change the observation period to be measured, return to step 6.

Stopping a Test

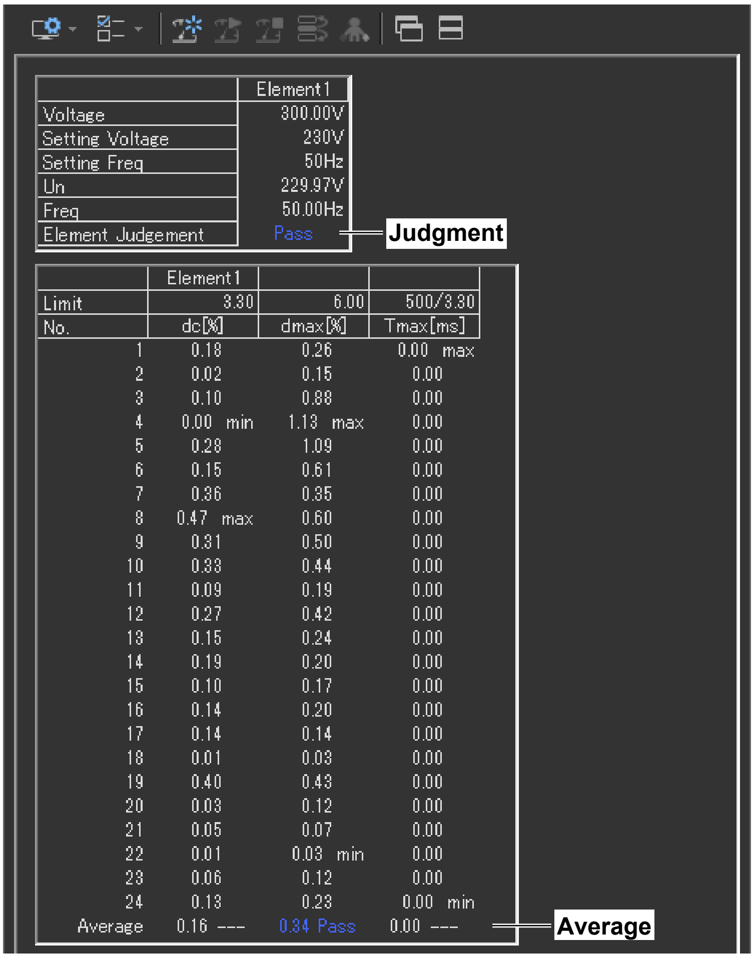
1. Click **Stop Test** in the Start Test (Manual) box or click the toolbar button on the toolbar to stop the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.





Completing the Measurement and Displaying the Judgment

1. Check that the measurement of all observation periods (24) is complete, and that the dmax data of each observation period is displayed.
2. Click **Start Judgment** under Start Test (Manual) or click the  button on the toolbar. The dmax data of all observation periods is confirmed, and the measurement of dmax caused by manual switching is complete. The flicker measurement status changes to Complete, and the result and judgment of the average of the measured dmax are displayed.



	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	229.97V
Freq	50.00Hz
Element Judgement	Pass

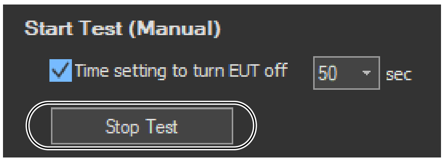
	Element1		
Limit	3.30	6.00	500/3.30
No.	dc[%]	dmax[%]	Tmax[ms]
1	0.18	0.26	0.00 max
2	0.02	0.15	0.00
3	0.10	0.88	0.00
4	0.00 min	1.13 max	0.00
5	0.28	1.09	0.00
6	0.15	0.61	0.00
7	0.36	0.35	0.00
8	0.47 max	0.60	0.00
9	0.31	0.50	0.00
10	0.33	0.44	0.00
11	0.09	0.19	0.00
12	0.27	0.42	0.00
13	0.15	0.24	0.00
14	0.19	0.20	0.00
15	0.10	0.17	0.00
16	0.14	0.20	0.00
17	0.14	0.14	0.00
18	0.01	0.03	0.00
19	0.40	0.43	0.00
20	0.03	0.12	0.00
21	0.05	0.07	0.00
22	0.01	0.03 min	0.00
23	0.06	0.12	0.00
24	0.13	0.23	0.00 min
Average	0.16 ---	0.34 Pass	0.00 ---

Changing the Judgment Conditions and Re-judging the Measured Data

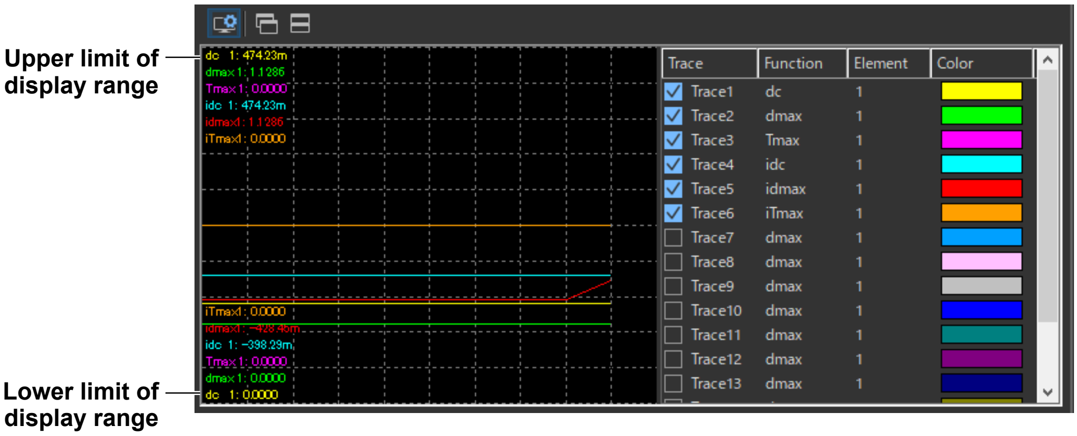
When the measurement of dmax caused by manual switching is complete, change the judgment conditions according to the procedure given in section 8.4, “Setting the WT Judgment Conditions.” If you change the judgment conditions, the average data of the measured dmax is re-judged, and the judgment is updated.

Resetting a Test

1. Click **Stop Test** in the Start Test (Manual) box or click  on the toolbar to reset the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.



Setting the Trend Graph Traces



Trace

Select the trends you want to display (select or clear the check boxes).

Up to 16 trends can be displayed.

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
iTmax	Period during which instantaneous relative voltage change exceeds the threshold level

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Explanation

Time Marker

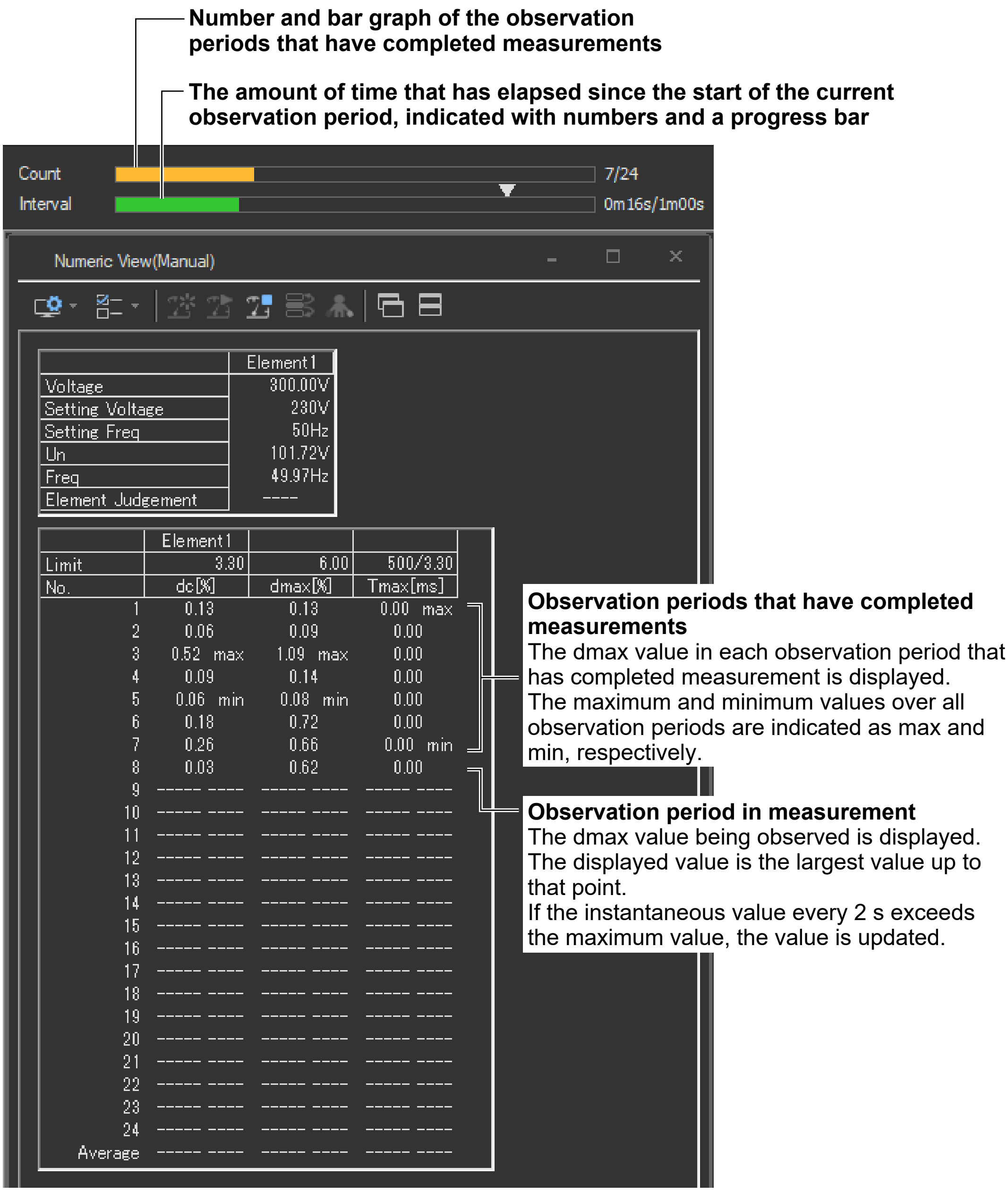
One way you can use the time marker is as a reminder of when to turn OFF the power supply of an EUT that does not turn OFF immediately after it is switched OFF.

 appears above the Interval bar at the top of the setting and display area when you select the Time setting check box.

You can set the time marker to a value from 1 to 60 seconds.

Display during Measurement

The following figure shows an example of a display during a measurement of dmax caused by manual switching.

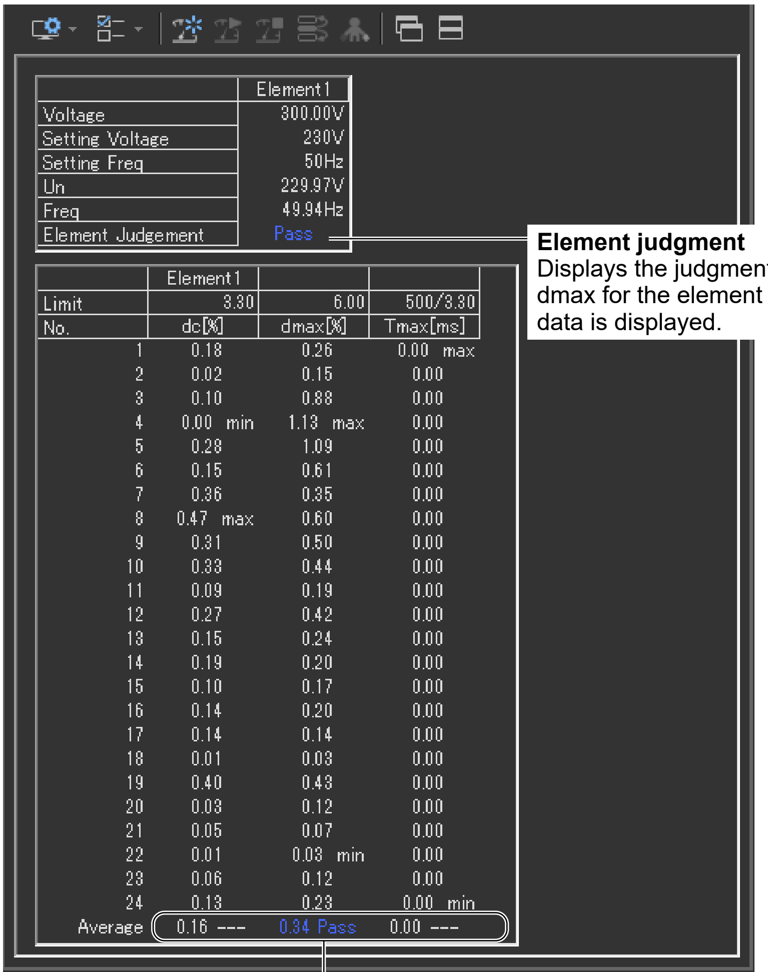


8

IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Judge Display When the Measurement Is Complete

The following figure shows an example of a display when a measurement of dmax caused by manual switching is completed.



	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	229.97V
Freq	49.94Hz
Element Judgement	Pass

	Element1		
Limit	3.30	6.00	500/3.30
No.	dc[%]	dmax[%]	Tmax[ms]
1	0.18	0.26	0.00 max
2	0.02	0.15	0.00
3	0.10	0.88	0.00
4	0.00 min	1.13 max	0.00
5	0.28	1.09	0.00
6	0.15	0.61	0.00
7	0.36	0.35	0.00
8	0.47 max	0.60	0.00
9	0.31	0.50	0.00
10	0.33	0.44	0.00
11	0.09	0.19	0.00
12	0.27	0.42	0.00
13	0.15	0.24	0.00
14	0.19	0.20	0.00
15	0.10	0.17	0.00
16	0.14	0.20	0.00
17	0.14	0.14	0.00
18	0.01	0.03	0.00
19	0.40	0.43	0.00
20	0.03	0.12	0.00
21	0.05	0.07	0.00
22	0.01	0.03 min	0.00
23	0.06	0.12	0.00
24	0.13	0.23	0.00 min
Average	0.16 ---	0.34 Pass	0.00 ---

Element judgment
Displays the judgment of the average of dmax for the element whose measured data is displayed.

Judgment of the average of dmax
Of the 24 dmax values, the average of 22 data values, which excludes the maximum (max) and minimum (min) values, is displayed. The value is compared to its limit value, and the judgment (Pass/Fail) is displayed.

Note

If an element that is not being measured is assigned to a display target element, Off is displayed by the element number, and all measured data are displayed as blank.

Initializing the Measurement

- The initialization takes approximately 30 s.
- Rms voltage Un and voltage frequency Freq are updated every 2 s while the initialization is in progress in the same manner as when the voltage fluctuation and flicker measurement is reset.
- Keep the voltage of the power supply to be measured in steady-state condition while the initialization is in progress.

Rated Voltage Un and Voltage Frequency Freq

- If the assignment method of rated voltage is AUTO, the rms voltage at the start of the first measurement is used as rated voltage Un. The measured data is calculated with respect to rated voltage Un.
- If the assignment method of rated voltage is SET, the rated voltage setting is displayed as Un(Set).
- Rated voltage Un and voltage frequency Freq are fixed to the first measured values after the measurement of dmax caused by manual switching is started and are not updated.

Resetting the Test

To initialize and restart the measurement, reset the measurement after the measurement of dmax caused by manual switching is complete and the flicker measurement status is indicating Complete. You cannot initialize or start the measurement in the Complete status.
In addition, reset the measurement to change the measurement conditions of the the measurement of dmax caused by manual switching (section 8.3).

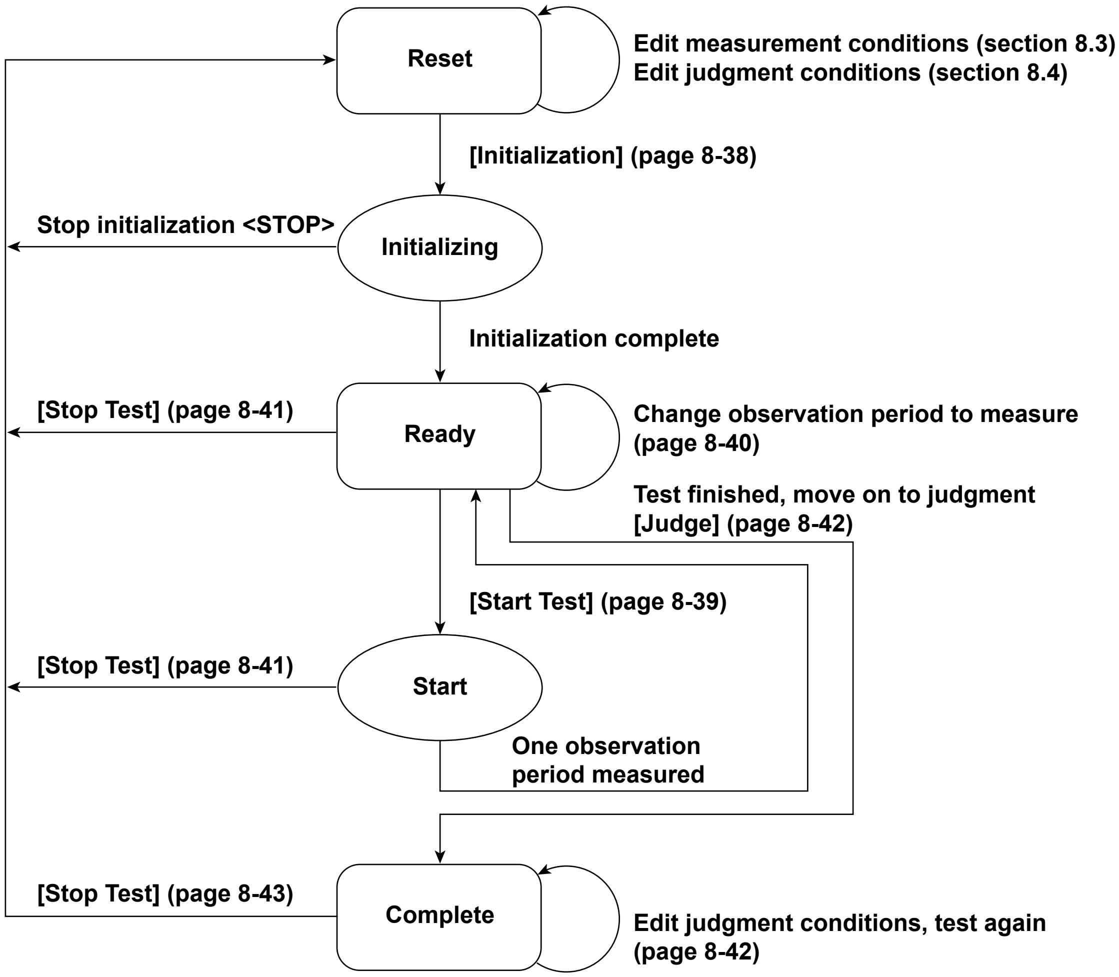
Flicker Measurement Status

The following five flicker measurement statuses are available.

Status	Meaning
Reset	Condition in which the measured value is reset and initialization can be executed.
Initializing	Initializing the measurement.
Ready	Initialized condition in which measurement can be started.
Start	Measurement in progress: Displays the elapsed time.
Complete	Displays the result (judgment by measurement item) and judgment (element judgment and overall judgment).

Flow Chart of the Measurement of dmax Caused by Manual Switching

(Transition Diagram of the Flicker Measurement Status)



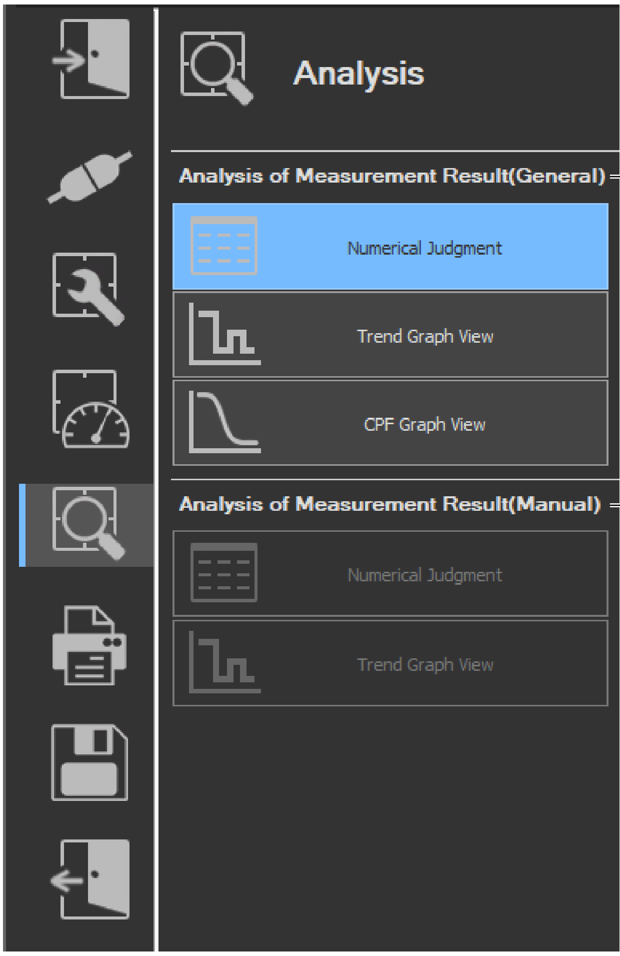
Numbers in parenthesis indicate relevant sections or pages in the manual.
Brackets are used to indicate buttons or icons.
Greater than and less than signs are used to indicate buttons (i.e. <Stop Test>).

Using the Analysis Page to Display Judgment Results and Measured Data

8.9 Displaying Numerical Judgments

Procedure

1. Click  in the menu area. The Analysis submenu appears.

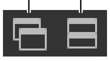


Analysis of Measurement Result (General)
You can view normal voltage fluctuation and flicker measurement (General mode) results using the following displays:
- Numerical judgment (page 8-50)
- Trend graph (section 8.10)
- CPF graph (section 8.11)

Analysis of Measurement Result (Manual)
You can view measurement of dmax caused by manual switching (Manual dmax mode) results using the following displays:
- Numerical judgment (page 8-51)
- Trend graph (section 8.10)

Displays cascaded windows

Displays tiled windows



Window arrangement buttons
For details, see section 7.15.

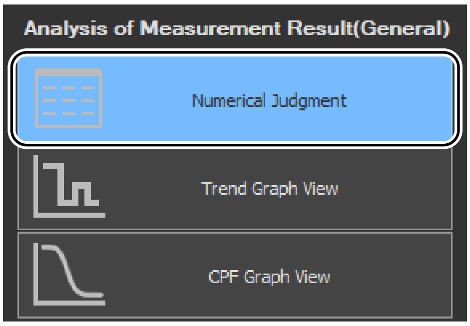
Note

Notes when switching to the Measure window

While in the Analysis window, if you click the Measure icon and switch to the Measure window, the measured data will be discarded. Save the data if you do not want it to be discarded (see chapter 11 for information on how to save data).

Displaying Numerical Judgments for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **Numerical Judgment** under Analysis of Measurement Result (General). The numerical judgment display window will appear.

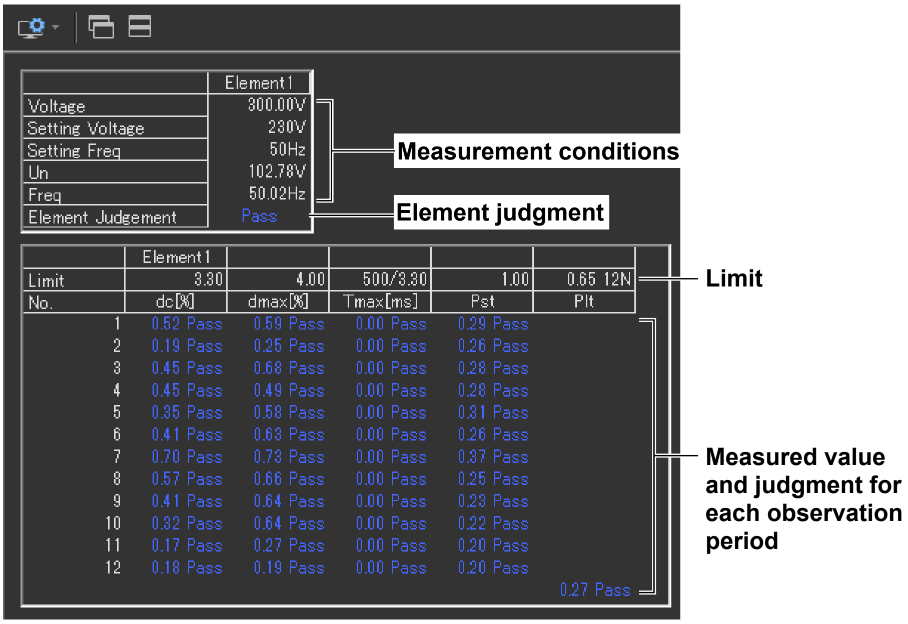


3. Click  on the toolbar, and select which element's numerical judgment you want to display.

Note

- You can only select Numeric Data and Judgment in offline mode with the measured data loaded.
- In online mode, the numeric data and judgment view is displayed for the element that is selected in the measurement conditions of the WT.

Normal Voltage Fluctuation and Flicker Measurement

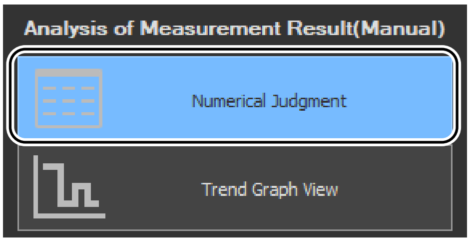


	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	102.78V
Freq	50.02Hz
Element Judgement	Pass

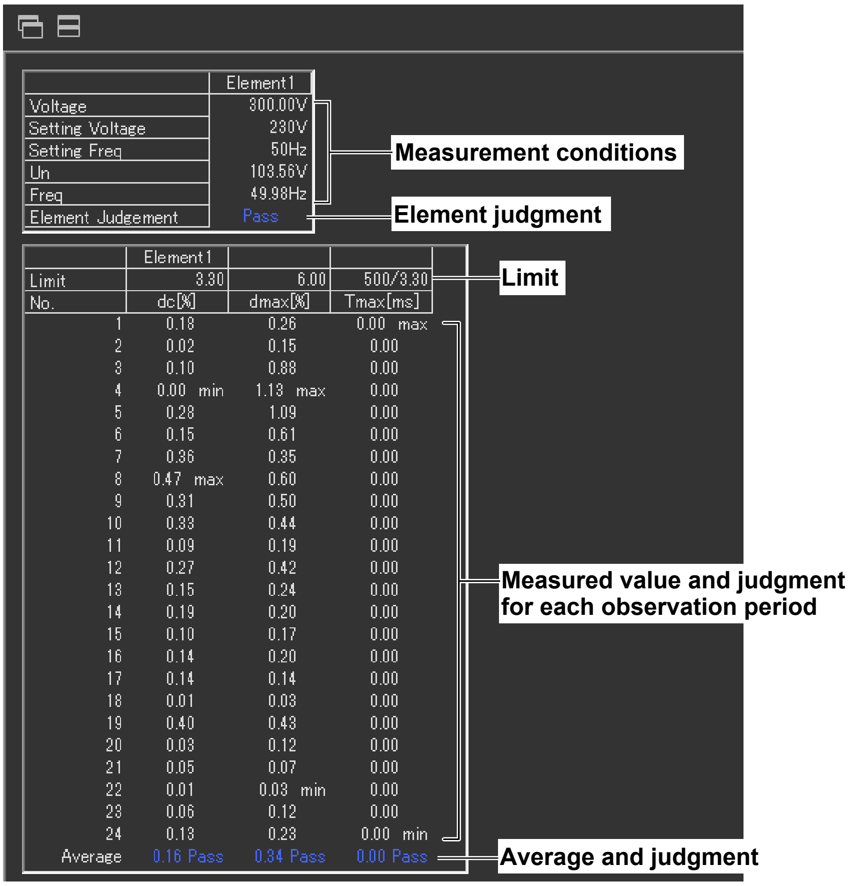
	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.52 Pass	0.59 Pass	0.00 Pass	0.29 Pass	
2	0.19 Pass	0.25 Pass	0.00 Pass	0.26 Pass	
3	0.45 Pass	0.68 Pass	0.00 Pass	0.28 Pass	
4	0.45 Pass	0.49 Pass	0.00 Pass	0.28 Pass	
5	0.35 Pass	0.58 Pass	0.00 Pass	0.31 Pass	
6	0.41 Pass	0.63 Pass	0.00 Pass	0.26 Pass	
7	0.70 Pass	0.73 Pass	0.00 Pass	0.37 Pass	
8	0.57 Pass	0.66 Pass	0.00 Pass	0.25 Pass	
9	0.41 Pass	0.64 Pass	0.00 Pass	0.23 Pass	
10	0.32 Pass	0.64 Pass	0.00 Pass	0.22 Pass	
11	0.17 Pass	0.27 Pass	0.00 Pass	0.20 Pass	
12	0.18 Pass	0.19 Pass	0.00 Pass	0.20 Pass	
					0.27 Pass

Displaying Numerical Judgments for Measurements of dmax Caused by Manual Switching (Manual dmax mode)

2. Click **Numerical Judgment** under Analysis of Measurement Result (Manual). The numerical judgment display window will appear.



Measurement of dmax Caused by Manual Switching



	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	103.56V
Freq	49.98Hz
Element Judgement	Pass

	Element1		
Limit	3.30	6.00	500/3.30
No.	dc[%]	dmax[%]	Tmax[ms]
1	0.18	0.26	0.00 max
2	0.02	0.15	0.00
3	0.10	0.88	0.00
4	0.00 min	1.13 max	0.00
5	0.28	1.09	0.00
6	0.15	0.61	0.00
7	0.36	0.35	0.00
8	0.47 max	0.60	0.00
9	0.31	0.50	0.00
10	0.33	0.44	0.00
11	0.09	0.19	0.00
12	0.27	0.42	0.00
13	0.15	0.24	0.00
14	0.19	0.20	0.00
15	0.10	0.17	0.00
16	0.14	0.20	0.00
17	0.14	0.14	0.00
18	0.01	0.03	0.00
19	0.40	0.43	0.00
20	0.03	0.12	0.00
21	0.05	0.07	0.00
22	0.01	0.03 min	0.00
23	0.06	0.12	0.00
24	0.13	0.23	0.00 min
Average	0.16 Pass	0.34 Pass	0.00 Pass

Explanation

Measure Conditions

The element number for which the measured data is displayed, the voltage, the rated voltage (Un), the target frequency (specified frequency), the voltage frequency, and the measurement interval of each observation period are displayed.

Limits

- Displays dc, dmax, Tmax, Pst, and Plt for normal voltage fluctuation and flicker measurement.
- Displays dc, dmax, and Tmax for measurement of dmax caused by manual switching.

Measured Value and Judgment for Each Observation Period

Normal Voltage Fluctuation and Flicker Measurement

- The last dc, dmax, and Tmax values are compared to their limit values, and the judgments (Pass/Fail) are displayed to the right of the last values.
- If a steady-state condition does not occur during the measurement period, it is considered to be a fluctuating condition. The measured value of dc is displayed as Undef (undefined, IEC 61000-4-15 Ed1.1) or 0 (IEC 61000-4-15 Ed2.0), and the judgment is displayed as Error (IEC 61000-4-15 Ed1.1) or Pass (IEC 61000-4-15 Ed2.0).
- Short-term flicker value Pst is calculated and compared to its limit value, and the judgment (Pass/Fail) is displayed.
- The judgment of items whose judgment is turned OFF is displayed as Undef.

Measurement of dmax Caused by Manual Switching

The words max and min are indicated to the right of the maximum and minimum dc, dmax, and Tmax values over all observation periods, respectively.

Judgment by Measurement Item (Normal Voltage Fluctuation and Flicker Measurement)

- For dc, dmax, Tmax, and Pst, the judgment is Pass if the judgments of all observation periods are Pass; otherwise it is Fail. The items whose judgment is turned OFF are displayed as Undef.
- Compares the long-term flicker value, Plt, to the limit, and displays the judgment (pass or fail). The items whose judgment is turned OFF are displayed as Undef.

Judgment of the Average of dmax (Measurement of dmax Caused by Manual Switching)

Displays the average of 22 dmax values excluding the maximum and minimum dc, dmax, and Tmax values. The values are compared with limit, and the judgment (pass or fail) is displayed.

Element Judgment

Normal Voltage Fluctuation and Flicker Measurement

For elements whose measured data is displayed, the judgment is Pass if the judgments of all items whose judgment is set to ON are Pass; otherwise it is Fail. However, if dc is error, Error is indicated.

Measurement of dmax Caused by Manual Switching

Displays the judgment of the average of dmax for the element whose measured data is displayed.

Overall Judgment

The judgment is Pass if the judgments of all elements under measurement are Pass; otherwise it is Fail. However, if dc is error, Error is indicated in normal voltage fluctuation and flicker measurement.

Note

If an element that is not being measured is assigned to a display target element, Off is displayed by the element number, and all measured data are displayed as blank.

8.10 Displaying Trend Graphs

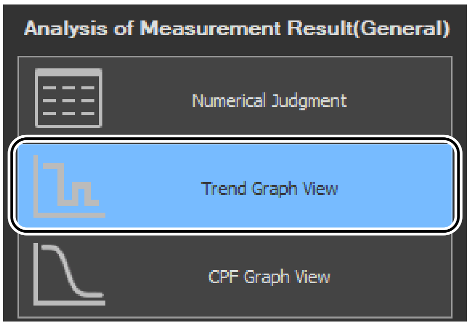
Procedure

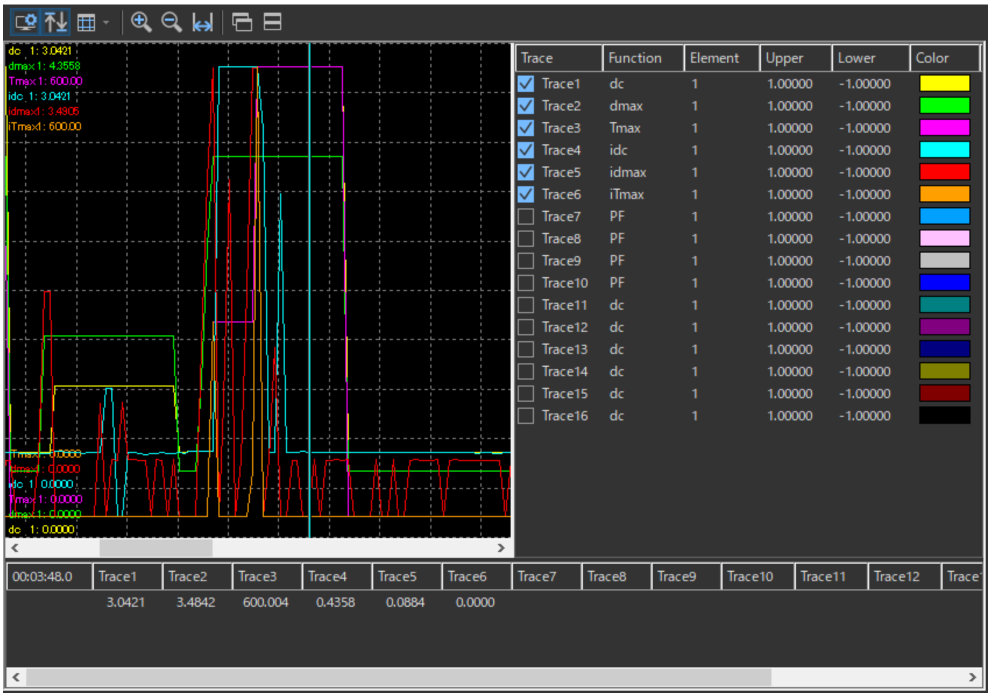
1. Click  in the menu area. The Analysis submenu appears.

For general information about submenus, see section 8.9.

Displaying Trend Graphs for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **Trend Graph View** under Analysis of Measurement Result (General). The trend graph display window appears.



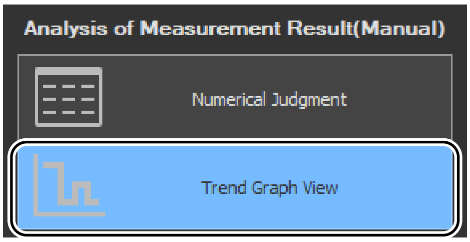


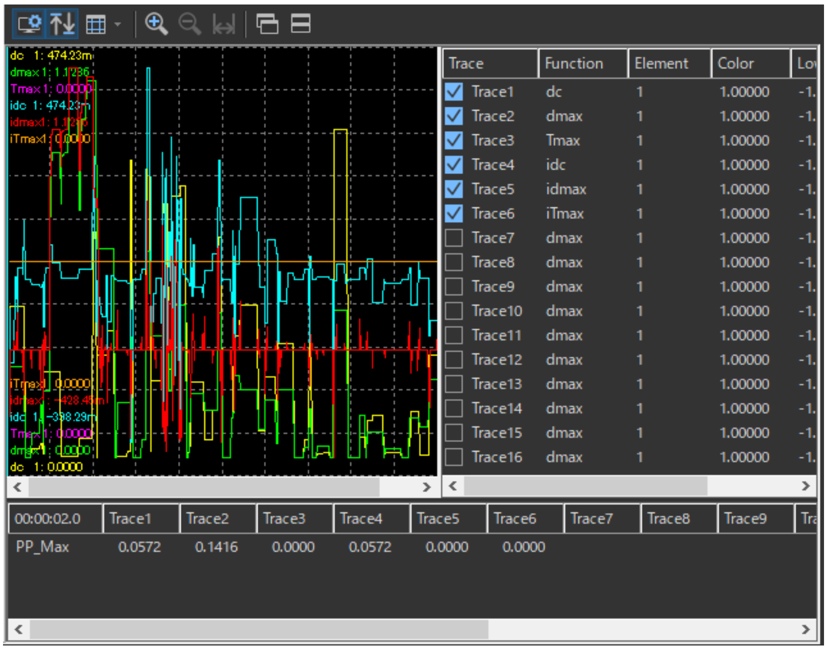
Note

- You can only select Trend Graph View in offline mode with the measured data loaded.
- If you change the size of the trend window while the trend graph is displayed, the size of the trend display area also changes.

Displaying Trend Graphs for Measurements of dmax Caused by Manual Switching (Manual dmax mode)

2. Click **Trend Graph View** under Analysis of Measurement Result (Manual). The trend graph display window appears.





Note

- You can only select Trend Graph View in offline mode with the measured data loaded.
- If you change the size of the trend window while the trend graph is displayed, the size of the trend display area also changes.

Configuring a Trend Graph

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Auto range

- **When the auto range button is pressed**
  The range changes automatically to match the acquired data.
- **When the auto range button is not pressed**
  When you click the Upper or Lower column headings, a combo box appears that allows you to set the display range upper and lower limits for each trace.

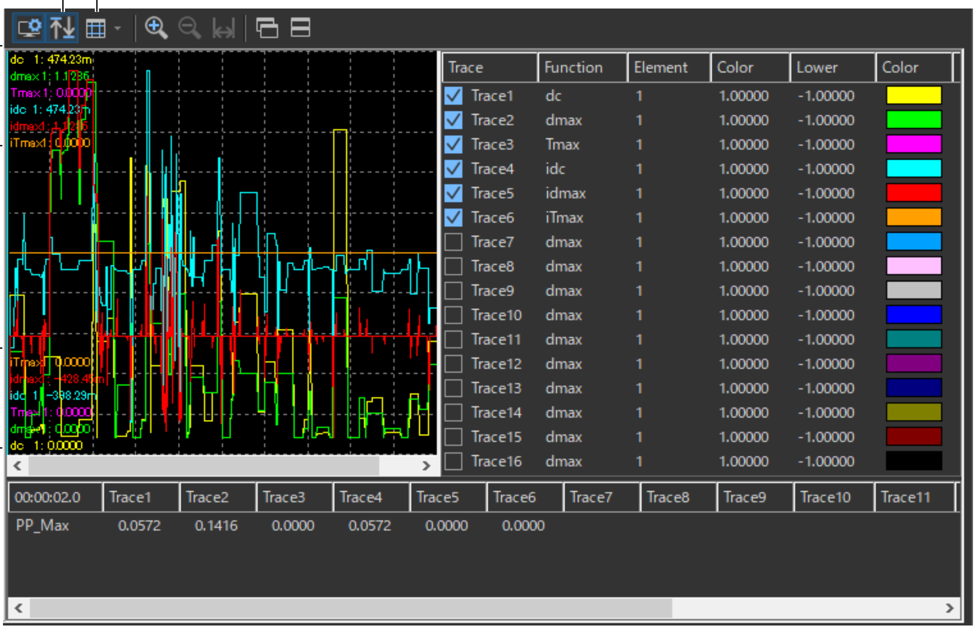
Grid

You can select the type of grid that will be displayed in the trend display area from Dotted, Line, and None.

- Dotted: A grid with dotted lines is displayed.
- Line: A grid with solid lines is displayed.
- None: No grid is displayed.

Upper limit of display range

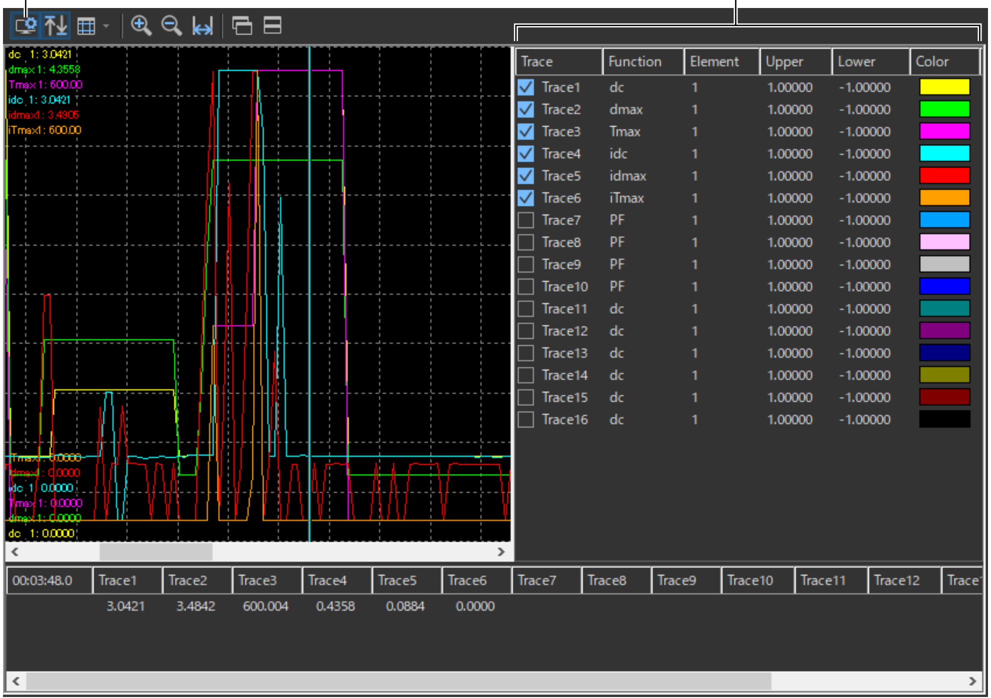
Lower limit of display range



Setting the Trace

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Show/hide trace settings box **Trace settings box**



Trace

Select the trends you want to display (select or clear the check boxes).

Function

Select the measurement function to be displayed. You can only select what measurement functions to display for normal voltage fluctuation and flicker measurement (General mode). In Manual dmax mode (measurement of dmax caused by manual switching), the only function that is displayed is dmax.

1. Click the **Function** column. A combo box opens.

2. Select the measurement function.

Note

- You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
iTmax	Period during which instantaneous relative voltage change exceeds the threshold level
PF	Instantaneous flicker sensation (IFS)

- The measured value for PF is displayed at every 1-ms interval.
- The measured values for all measurement functions other than PF are displayed at every 2-s interval.

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Upper and Lower

If the Auto Ranging check box is not selected, set the Upper or Lower limit of the display range. You can only select what measurement functions to display for normal voltage fluctuation and flicker measurement (General mode). In Manual dmax mode (measurement of dmax caused by manual switching), the display range of the trend display is fixed to auto range.

1. Click the **Upper** or **Lower** column. A combo box opens.
2. Set the upper or lower limit value of the display range.

Color

Select the display color of the trend.

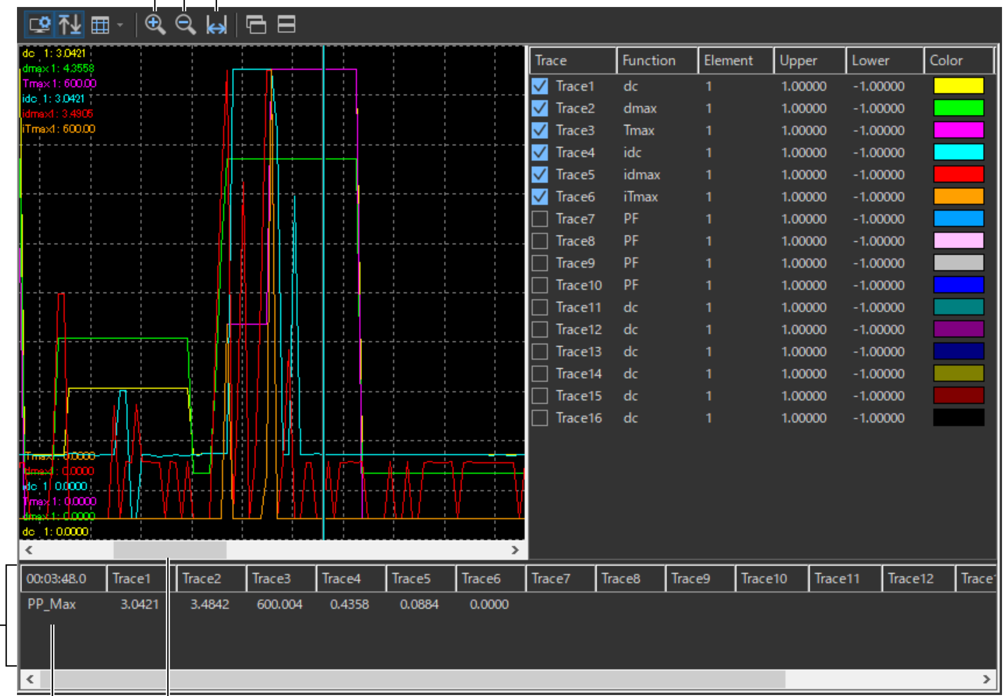
1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Zooming In and Out

Zoom in
Click to zoom in. You can zoom in until the trend display area contains 2 s worth of data.

Zoom out
Click to zoom out. You can zoom out until the trend display area contains the data for all of the elapsed time.

Display all: Displays the whole measurement time



Slider
Move along the time axis to the waveform that you want to display.

PP_Max
In the trend display, if not all the measured values can be displayed because the specified time axis value is set too high, measured values are P-P compressed and displayed.* When this occurs, PP_Max is displayed here. For example, if the measured values for PF are being displayed but the measured values for every 1-ms interval will not fit on the trend graph, the P-P compressed measured values are displayed. To display values without P-P compression, zoom in on the time axis.

* P-P Compression (Peak-to-Peak Compression)
In P-P compression, a maximum and minimum value are extracted from the values measured over a given period of time and are used to produce a compressed measured value. For details, see the WT5000 Features Guide, IM WT5000-01EN.

Cursor
When you click somewhere on the trend display area, a cursor will appear there. You can move the cursor by dragging it.

Note

When you zoom in on the time axis display, you can move the cursor in 1-ms intervals. The measured data at the cursor location will be displayed in the following ways:

- The measured value for PF is displayed at every 1-ms interval.
- The measured values for all measurement functions other than PF are displayed using values interpolated from the data measured at every 2-s interval according to the cursor position.

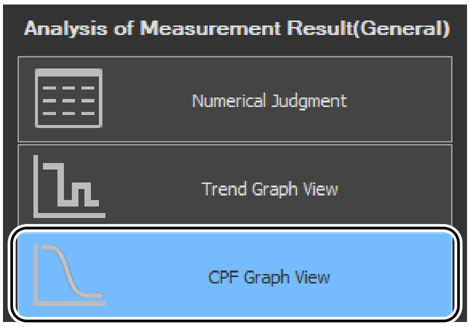
8.11 Displaying a CPF Graph

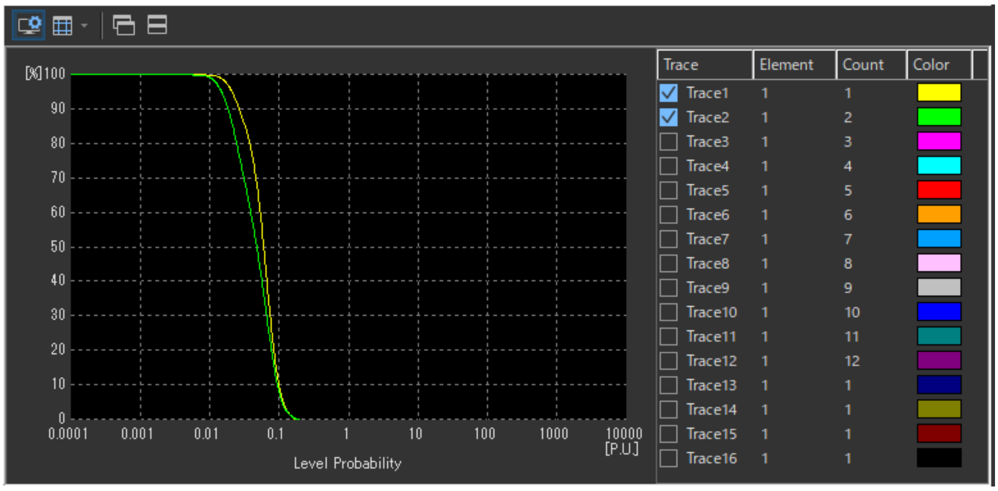
1. Click  in the menu area. The Analysis submenu appears.

For general information about submenus, see section 8.9.

Displaying a CPF Graph for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **CPF Graph View** under Analysis of Measurement Result (General). The CPF graph display window appears.





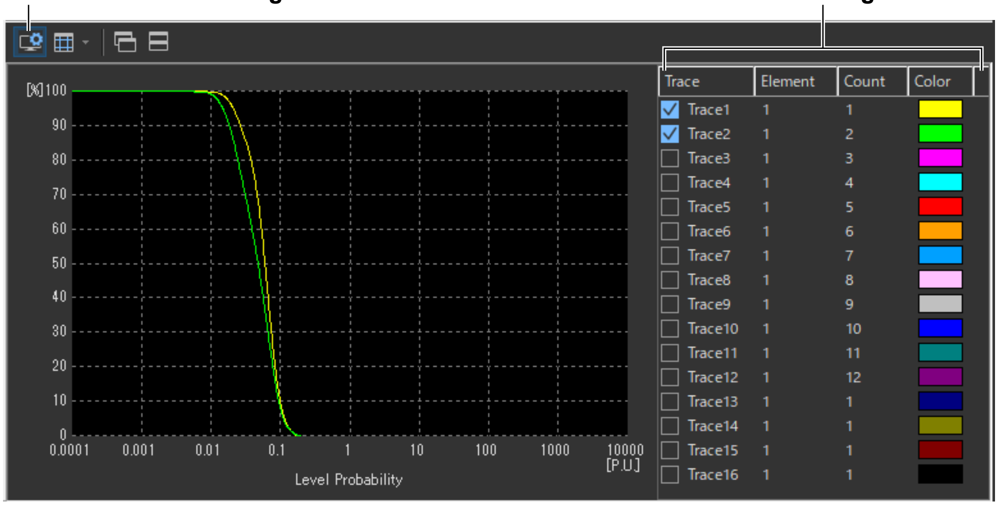
Note

- This view is available only for normal voltage fluctuation and flicker measurement.
- You can only select CPF Graph View in offline mode with the measured data loaded.
- The CPF graph is displayed for each observation period selected by the period number.
- You cannot display the CPF graph during measurement.

Setting the Trace

Show/hide trace settings box

Trace settings box



Trace

Select the trends you want to display (select or clear the check boxes).

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Count

Selects the observation period to be displayed on the CPF graph.
If you select a non-existing observation period, the waveform is not displayed.

Chapter 9

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

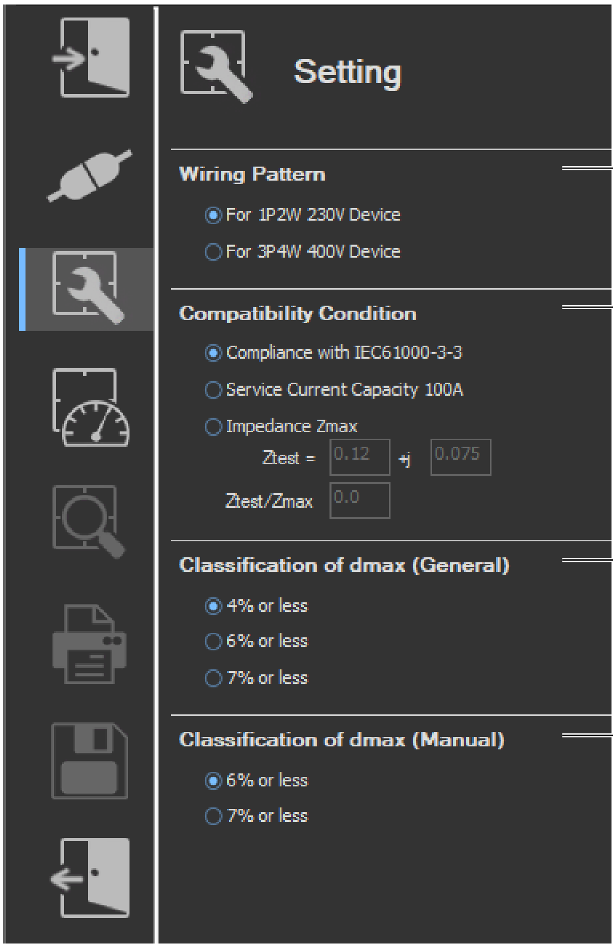
This chapter explains how to configure, measure, and analyze on the IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software.

Using the Setting Page to Configure Measurement and Judgment Conditions

9.1 Setting General Test Conditions

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring Pattern (see page 9-3)
Select the wiring pattern of the circuit you will measure.

Compatibility Condition (page 9-3)
Select the appropriate compatibility condition.

Classification of dmax (General) (page 9-3)
When making normal voltage fluctuation and flicker measurements (General mode), select the dmax classification here.

Classification of dmax (Manual) (page 9-4)
When measuring dmax caused by manual switching (Manual dmax mode), select the dmax classification here.

In the setting and display area, you can switch between basic settings and advanced settings by clicking these buttons: . For details, see sections 9.3 and 9.4.

 Basic settings

 Advanced settings

Wiring Pattern

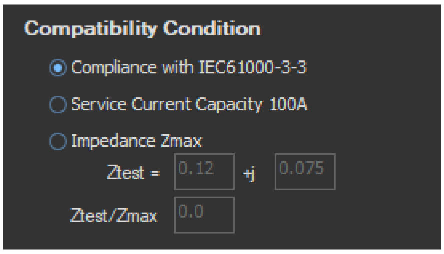
2. Select the wiring pattern of the circuit you will measure.
- For 1P2W 230V Device
- For 3P4W 400V Device

Note

When you switch wiring patterns, the following settings, which are displayed in the setting and display area, will change to default values that are appropriate to the wiring pattern that you select. For the default values, see sections 9.3 and 9.4.
- The WT settings (the settings on the WT Measurement Instrument tab)
- The testing judgment conditions (the settings under the Standard tab)

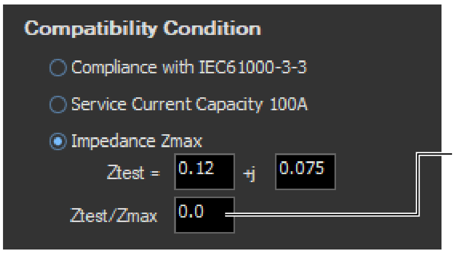
Compatibility Condition

3. Select the appropriate compatibility condition.
If you select Impedance Zmax, proceed to step 4.
Otherwise, proceed to step 5.



4. Set Ztest.

5. To add Tmax to the judgment, set Ztest/Zmax.



Ztest/Zmax setting
Because Tmax is added automatically whenever necessary, if you do not know the setting, leave it at [0.0].

Classification of dmax (General)

6. When making normal voltage fluctuation and flicker measurements (General mode), select the dmax classification here.
- 4% or less
- 6% or less
- 7% or less

Note

When you change this setting, the dmax setting that is displayed under Judge (General) on the WT Measurement Instrument tab in the setting and display area will also change. For details, see “Explanation” in section 9.4.

Classification of dmax (Manual)

7. When measuring dmax caused by manual switching (Manual dmax mode), select the dmax classification here.

- 6% or less
- 7% or less

Note

When you change this setting, the dmax setting that is displayed under Judge (Manual) on the WT Measurement Instrument tab in the setting and display area will also change. For details, see “Explanation” in section 9.4.

Explanation

Compatibility Condition

Choose from one of the following three compatibility conditions (see section 1.5 for information about the standards).

Compliance with IEC 61000-3-3

The test impedance is the reference impedance Zref specified in IEC 61000-3-3. The limits used for judgments are also the same as those specified in IEC 61000-3-3.
If a device passes a test when this condition is selected, it can be called “IEC 61000-3-3 compliant.”

Service Current Capacity 100A

The impedances used in the test are as follows:

- Single-phase device: Ztest = 0.25 + j0.25
- Three-phase device: Ztest = 0.15 + j0.15

The limits used for judgments are the same as those specified in IEC 61000-3-11. If a device passes a test when this condition is selected, it can be said to be compliant with IEC 61000-3-11 requirements for service current capacities greater than or equal to 100 A.

Impedance Zmax

Ztest equations are as follows:

Ztest = Rtest (resistance) + jXtest (reactance)

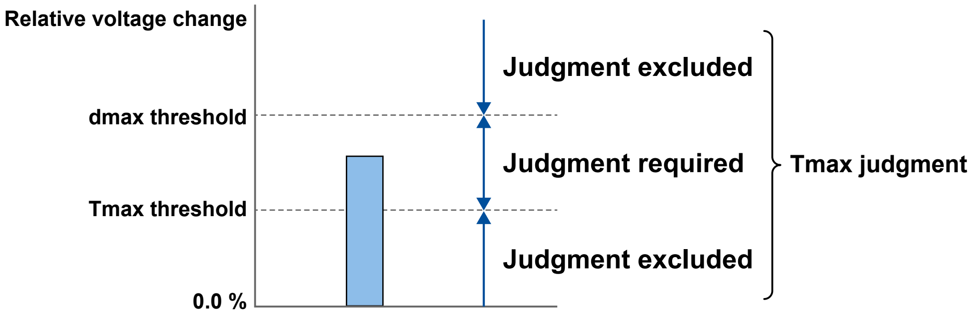
The settable range for Rtest and Xtest is 0.00 to 1.00.
Set the values such that:

- The EUT voltage drop is 3 % to 5 %.
- The ratio of Xtest over Rtest is 0.5 to 0.75.

The test will be performed using the impedance Ztest. The software calculates what the results of the test would have been had it been performed with the impedance Zref, and it compares those results with the IEC 61000-3-11 limits.
If a device passes a test when this condition is selected, it can be called “IEC 61000-3-3 compliant.”
If the device does not pass this test, the minimum value for Zsys will be calculated and displayed as the value Zmax. Then, you can say that the device is compliant with IEC 61000-3-11 for impedances below Zmax.

When IEC 61000-3-11 Is Set to Ed2.0

Tmax is automatically added to the judgment if necessary.



If Tmax is added to the judgment, a Ztest/Zmax check is performed to verify whether the Tmax threshold is appropriate. If it is inappropriate, the Tmax threshold is updated, and measurement is performed again.

- The following is verified in a Ztest/Zmax check.
  [Ztest/Zmax setting] < [Ztest/Zmax measurement] ± setting %

When IEC 61000-3-11 Is Set to Ed1.0

d(t) is excluded from judgment.

dmax, Classification

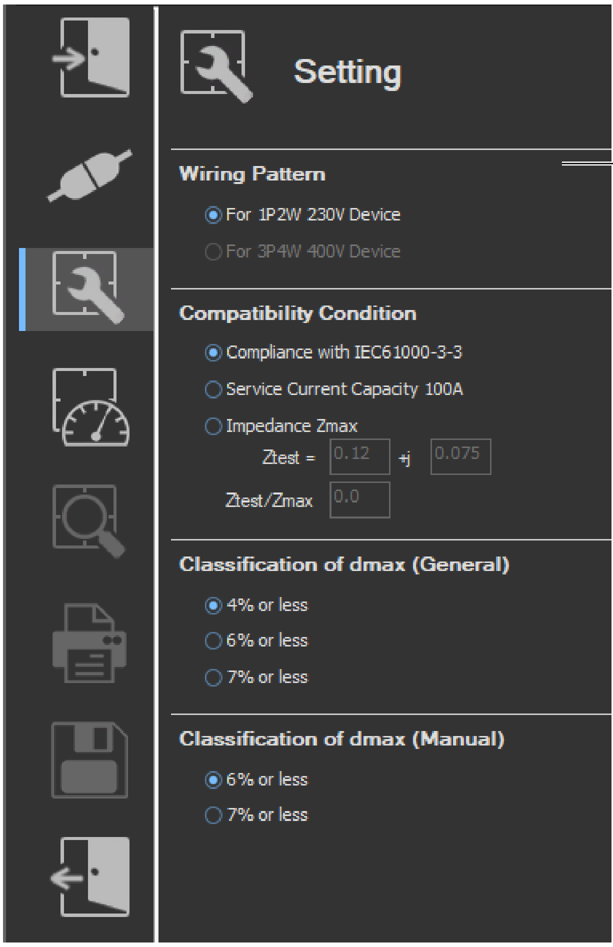
The limit dmax is 4 %, 6 %, or 7 % depending on the conditions. For information about the conditions that affect dmax, see section 1.5.

9.2 Configuring the Power Supply

If an online connection is established with “Use” selected in “Configuring the Connection to the Power Supply” (see section 6.1), configure the power supply according to the procedure in this section.

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring pattern
Only the selectable items become available depending on the type of connected NF power supply.

Various Power Supply Settings

1. In the setting and display area, select the **NF Power Supply** tab. Power supply settings are displayed.
2. Click the basic settings  or advanced settings  button.
3. Specify the settings.

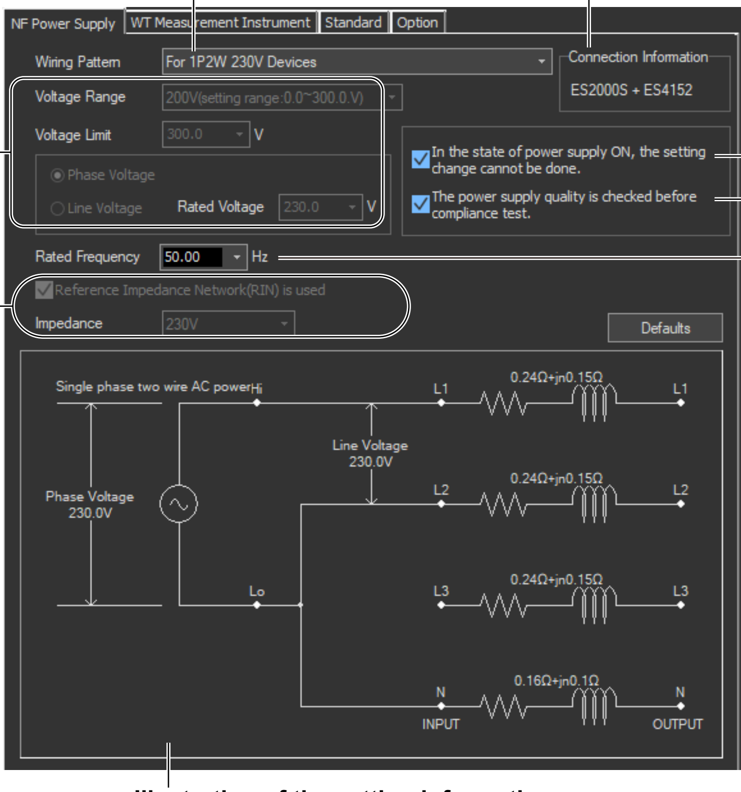
Basic Setting Mode

Click the basic button to display the following settings.

In basic setting mode, when you set the wiring system, these boxes are set automatically. For details, see the next page. To view or change these settings, select advanced setting mode.

Wiring pattern

Power supply and reference impedance network (RIN) information
The power supply and RIN model are obtained automatically and displayed.*



Select this check box to prohibit changes to the settings when the power output is on.

Select this check box to check the power supply quality before measurement. For details on the power supply quality check, see section 9.6.

Rated frequency
Select 50 Hz or 60 Hz from the drop-down list.
If you click the box, you can set the frequency in the range of 45.00 to 66.00.
You can select values that have been entered recently from the drop-down list.

Illustration of the setting information

* If any of the models from DP4164 to DP4169 is connected for the RIN, the software displays it as follows:
- Single-phase: DP4162
- Three-phase: DP4163

Wiring Pattern

Depending on the type of power supply that is connected, the following wiring system is selected automatically. In addition, voltage range and other parameters are set to the following values.

When an ES2000S (Single-Phase Model) Is Connected

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When an ES2000U (Three-Phase Model) Is Connected with the Slide Switch Set to Single-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When an ES2000U (three-phase model) Is Connected with the Slide Switch Set to Three-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Three-phase four-wire 400 V device	200	300.0	Line Voltage	400.0

When a DP Power Supply Single-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Set to Single-Phase Two-Wire Output

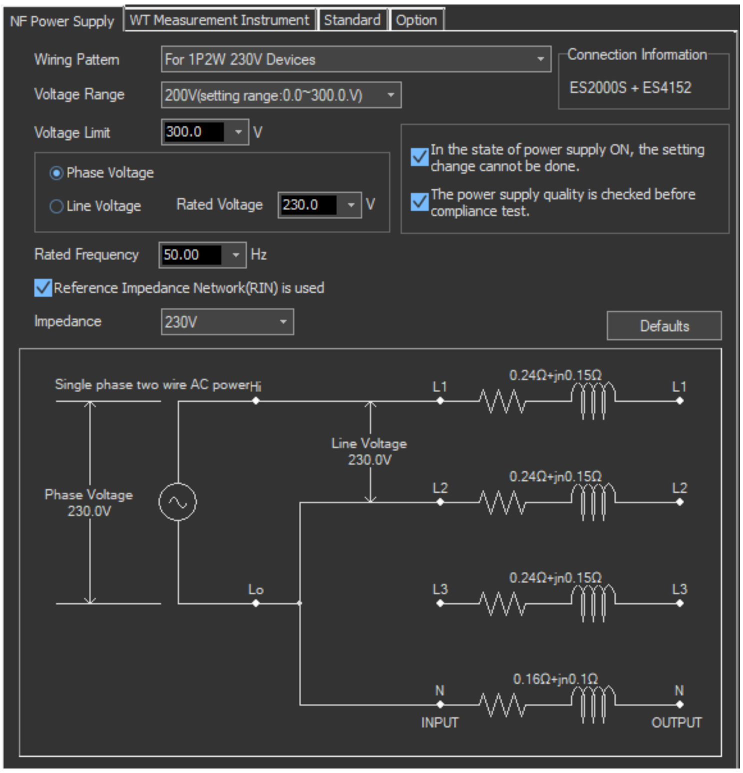
Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0

When a DP Power Supply Multi-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Not Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9

Advanced Setting Mode

Click the advanced button  to display the following settings.



Voltage Range

Select 100 V or 200 V. The range of values that you can set for the rated voltage and voltage limit is displayed.

Voltage Limit

You can select the following values from the drop-down list for the voltage limit depending on the voltage range.

Voltage Range	**Voltage Limit**
100 V	150.0 V
200 V	300.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

Output Voltage Setting

Set the output voltage to **Phase Voltage** or **Line Voltage**.

Rated Voltage

You can select the following values from the drop-down list for the rated voltage output depending on the Phase Voltage/Line Voltage setting and voltage range.

		Phase Voltage/Line Voltage	
		Phase Voltage	**Line Voltage**
Voltage Range	100 V	100.0 V or 115.0 V	200.0 V or 230.0 V
	200 V	200.0 V or 230.0 V	200.0 V or 400.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

If the phase voltage of the rated voltage exceeds the value in the voltage limit table, the following values are set depending on the power supply type and voltage range.

Voltage limit: The value in the voltage limit table
Phase voltage/line voltage: Phase Voltage
Rated voltage: Same value as the voltage range

Note

If the rated voltage is set using a line voltage, the line voltage is converted into phase voltage according to the wiring system and compared to the value in the voltage limit table.

Impedance

If you select the “Reference Impedance Network (RIN) is used” check box, you can set the following impedances according to the connected RIN.
If you do not select the check box, DEFEAT appears in the box.

When an ES4152 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4162*

- DEFEAT
- 100 V
- 200 V
- 230 V

When an ES4153 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4163*

- DEFEAT
- JPN 1φ
- JPN 3φ
- EU 1φ/3φ

* For the connection information when any of the models from DP4164 to DP4169 is connected for the RIN, see page 9-7.

Depending on the connected power supply type and compatibility condition, the impedance is set to the following default values.

		Power Supply Type	
		• ES2000S **• DP series** - Single-phase model - When phase mode on a multi-phase model is set to single-phase two-wire	**• ES2000U** **• DP series** - Three-phase model - When phase mode on a multi-phase model is not set to single-phase two-wire
Compatibility Condition	IEC 61000-3-3 compliant	230 V	EU1φ/3φ
	Service Current Capacity 100 A	DEFEAT	DEFEAT
	Impedance Zmax	DEFEAT	DEFEAT

If the RIN for the DP series power supply is not connected, you cannot select the "Reference Impedance Network (RIN) is used" check box. Consequently, you cannot change the impedance setting.

Defaults

The settings are reset to the following conditions (default values).

- Setting mode: basic
- Wiring pattern
  The wiring system is set as follows according to the connected power supply.
  - When an ES2000S (Single-Phase Model) Is Connected
    For 1P2W 230V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to single-phase mode
    For 1P2W 230V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to three-phase mode
  - For 3P4W 400V Device
  - When a DP series power supply single-phase model is connected or multi-phase model with the phase mode set to single-phase two-wire output
    For 1P2W 230V Device
  - When a DP series power supply multi-phase model is connected or multi-phase model with the phase mode not set to single-phase two-wire output
    For 3P4W 400V Device
- Voltage ranges: As shown in the table on page 9-8 according to the connected power supply and wiring system.
- Voltage limit: As shown in the table on page 9-8 according to the connected power supply and wiring system.
- Phase voltage/line voltage: As shown in the table on page 9-8 according to the connected power supply and wiring system.
- Rated voltage: As shown in the table on page 9-8 according to the connected power supply and wiring system.
- Rated frequency: 50 Hz

- The power supply quality is checked before compliance test: Selected
- Reference Impedance Network (RIN) is used
  - When an ES2000S or ES2000U is connected: Selected
  - When a DP series power supply is connected
    When DP series RIN is connected: Check
    When DP series RIN is not connected: Not selected
- Impedance: As shown in the table on page 9-8 according to the connected power supply and compatibility condition.

Settings at Startup

The above settings when the software is started are set as follows depending on the connection conditions.

Connection Condition	Setting
New connection	Default values
Same conditions as those of the loaded file	Settings of the loaded file
Same conditions as the last time	Settings used the last time

9.3 Setting the WT Measurement Conditions

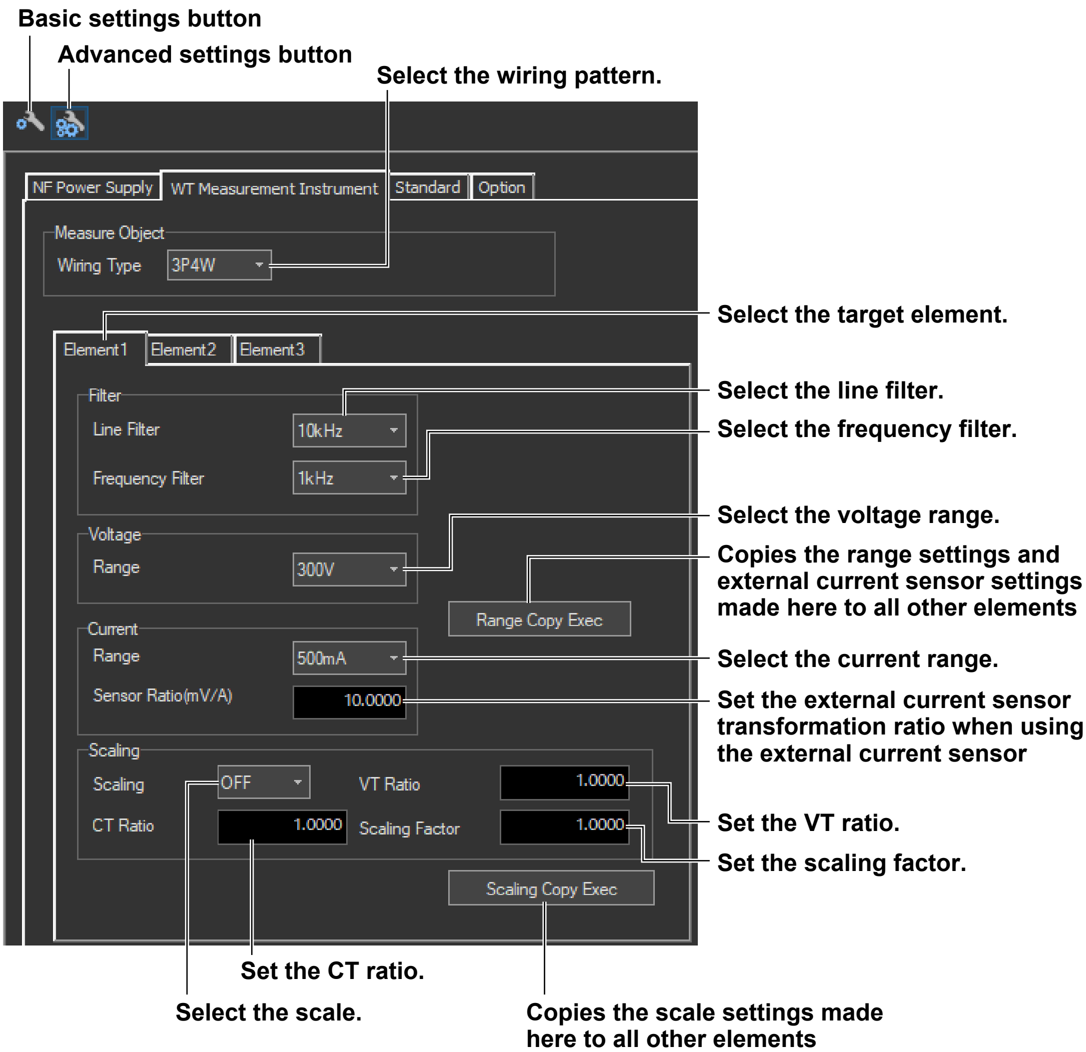
Procedure

1. Select the **WT Measurement Instrument** tab in the setting and display area. The WT measurement condition settings are displayed.
2. Click the basic settings  or advanced settings  button.
3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust this setting, click the advanced settings button.

- Scaling ON/OFF



Explanation

Wiring Pattern

Set the element to perform voltage fluctuation and flicker measurement on. The installed elements are displayed as configurable devices depending on the selected wiring system.

Copying the Range

You can copy the range settings configured for one element to all other elements with the same wiring. The voltage range, the current range, and the external current sensor range are copied.

Copying the Scaling Settings

You can copy the scaling settings configured for one element to all other elements with the same wiring. The settings that are copied are:

- VT ratio
- CT ratio
- Scaling factor

For information about the following settings and how to make settings from the WT, see the following manuals.

Setting	Manuals	Refer To
Line filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Frequency filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Voltage/current range	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.2 and 2.3
Scaling	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.4 and 9.1

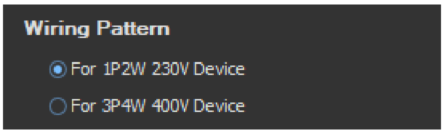
Note

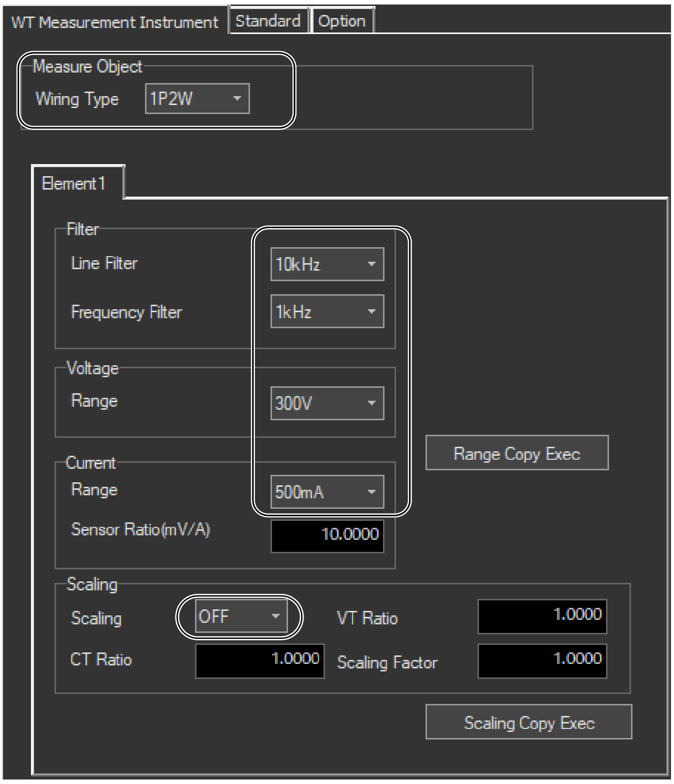
You can only change measurement conditions in online mode with the flicker measurement status set to Reset. For details on the flicker measurement status, see section 9.7 or 9.8.

How Settings Change Based on the Selected Wiring Pattern

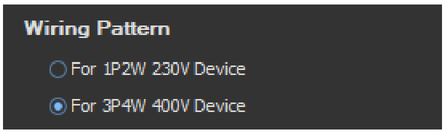
When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.

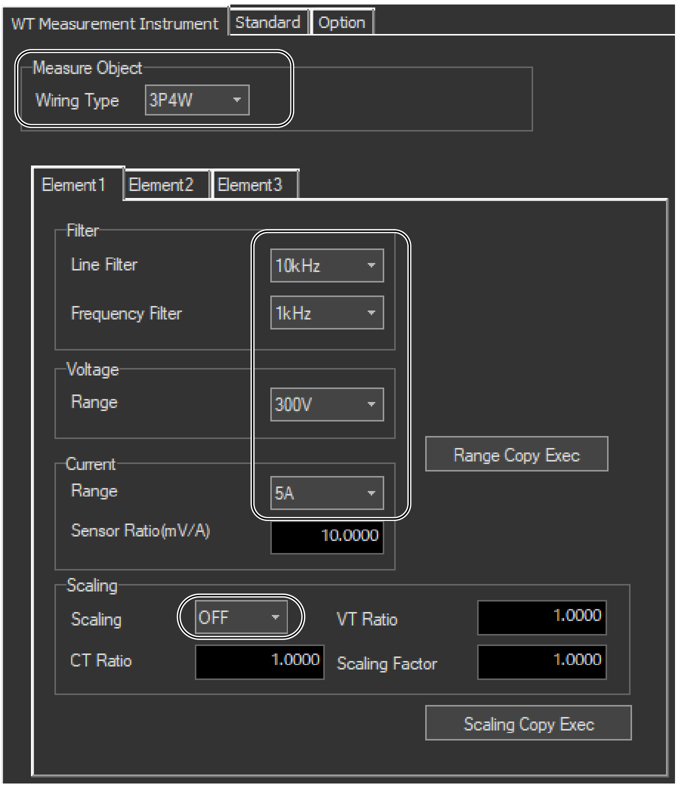
Changes Made When “For 1P2W 230V Device” Is Selected





Changes Made When “For 3P4W 400V Device” Is Selected





9.4 Setting the WT Judgment Conditions

Procedure

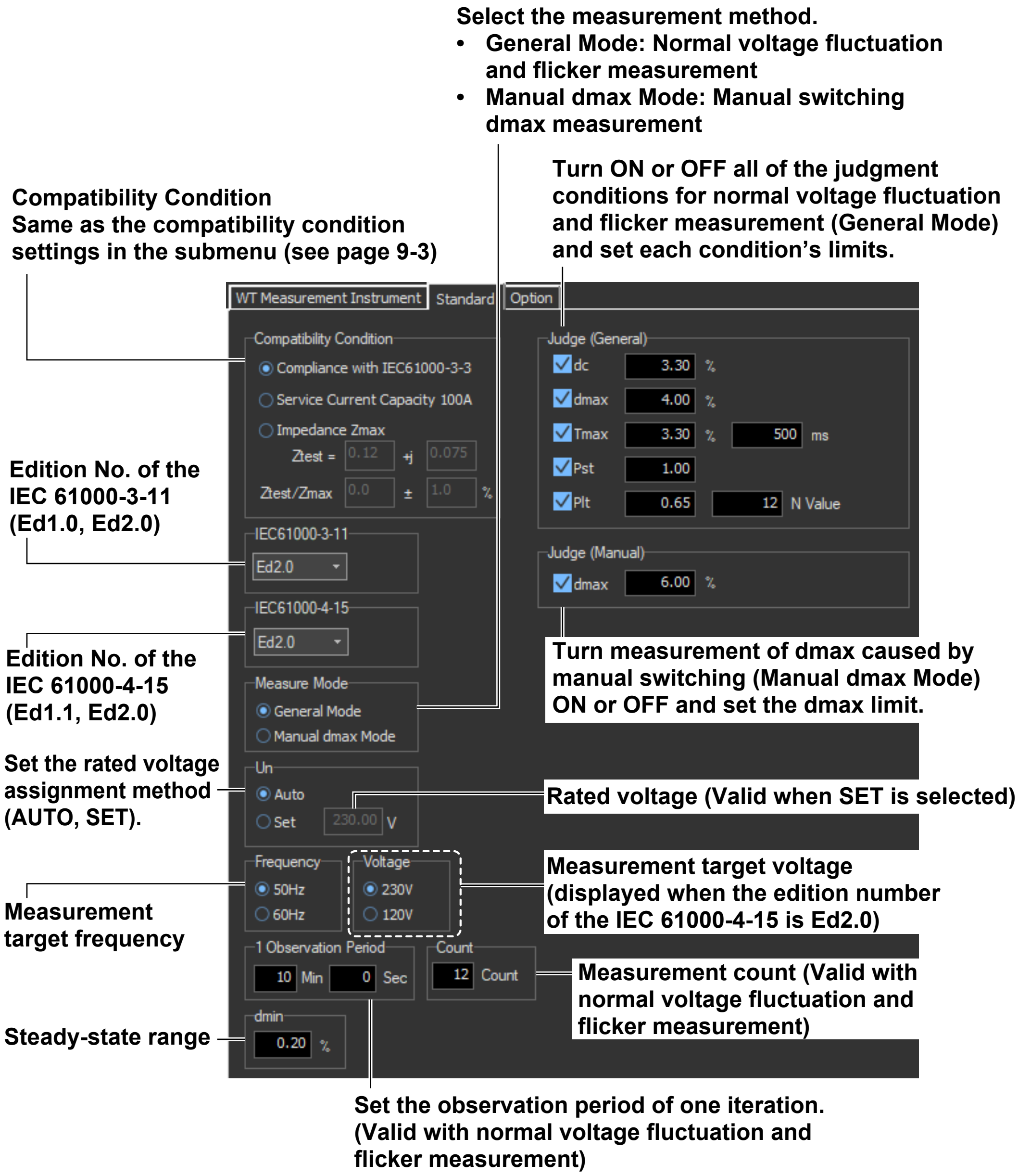
1. Select the **Standard** tab in the setting and display area. Judgment condition settings are displayed.
2. Click the basic settings button or advanced settings button.
3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust these settings, click the advanced settings button.

- Compatibility Condition
- Frequency
- Measure Mode
- Count

When measured data has been loaded, the normal voltage fluctuation and flicker measurement judgment condition Tmax, located under Judge (General), is unavailable.



Explanation

For explanations of these terms, see section 1.8.

WT Firmware Versions and Selectable IEC 61000 Edition Numbers

The following edition numbers can be selected in firmware version 2.01 and later.

Edition number of the IEC 61000-3-11
- Edition 1.0 (Ed1.0)
- Edition 2.0 (Ed2.0)

Edition number of the IEC 61000-4-15
- Edition 1.1 (Ed1.1)
- Edition 2.0 (Ed2.0)

IEC 61000-4-15 specifies requirements for measurement instruments.
For details, see Chapter 14.

Measure Mode

Select the voltage fluctuation and flicker measurement method from the two methods below.

General Mode (normal voltage fluctuation and flicker measurement)

Judges whether values such as dc, dmax, d(t), and Pst are within the specified limits.

Manual dmax Mode (measurement of dmax caused by manual switching)

You manually turn the EUT switch ON. The WT measures the voltage fluctuation caused by the inrush current that flows when the power is turned on or off, and judges whether the dmax average is within the specified limits.

Rated Voltage

You can select the assignment method of the rated voltage.

AUTO

Automatically retrieves the measured voltage at the start of the voltage fluctuation and flicker measurement as the rated voltage.

SET

You can set the rated voltage in the range of 0.01 to 999.99 V.

Measurement Target Frequency

You can set the measurement target frequency to 50 Hz or 60 Hz.
Set the measurement source frequency appropriately as the transfer function of the flicker meter and other parameters change accordingly.

If the measurement mode is set to General Mode (normal voltage fluctuation and flicker measurement), you must set the single observation period, measurement count, and steady-state range.

Measurement Target Voltage (Displayed when IEC 61000-4-15 Ed2.0 is selected)

You can set the measurement target voltage to 230 V or 120 V.
Set the measurement source voltage appropriately as the transfer function of the flicker meter and other parameters change accordingly.

1 Observation Period

You can set the single observation period of short-term flicker value Pst in unit of minutes and seconds in the following range. The range is as follows.
00:30 to 15:00 (only even values can be specified for the seconds)

Measurement Count

You can set the measurement count of short-term flicker value Pst in the range of 1 to 99.

Steady-State Range (dmin: Allowable Range of Relative Voltage Change to Be Considered Steady-State)

You can set steady-state range dmin in the range of 0.10 to 9.99 %.

Normal Voltage Fluctuation and Flicker Measurement (General Mode)

Judgment Conditions for Relative Steady-State Voltage Change dc

Turning ON/OFF the Judgment of Relative Steady-State Voltage Change dc

You can select whether to include relative steady-state voltage change dc in the flicker measurement judgment.

Limit on Relative Steady-State Voltage Change dc

You can set the limit in the range of 1.00 to 99.99 %.

Judgment Conditions for Maximum Relative Voltage Change dmax

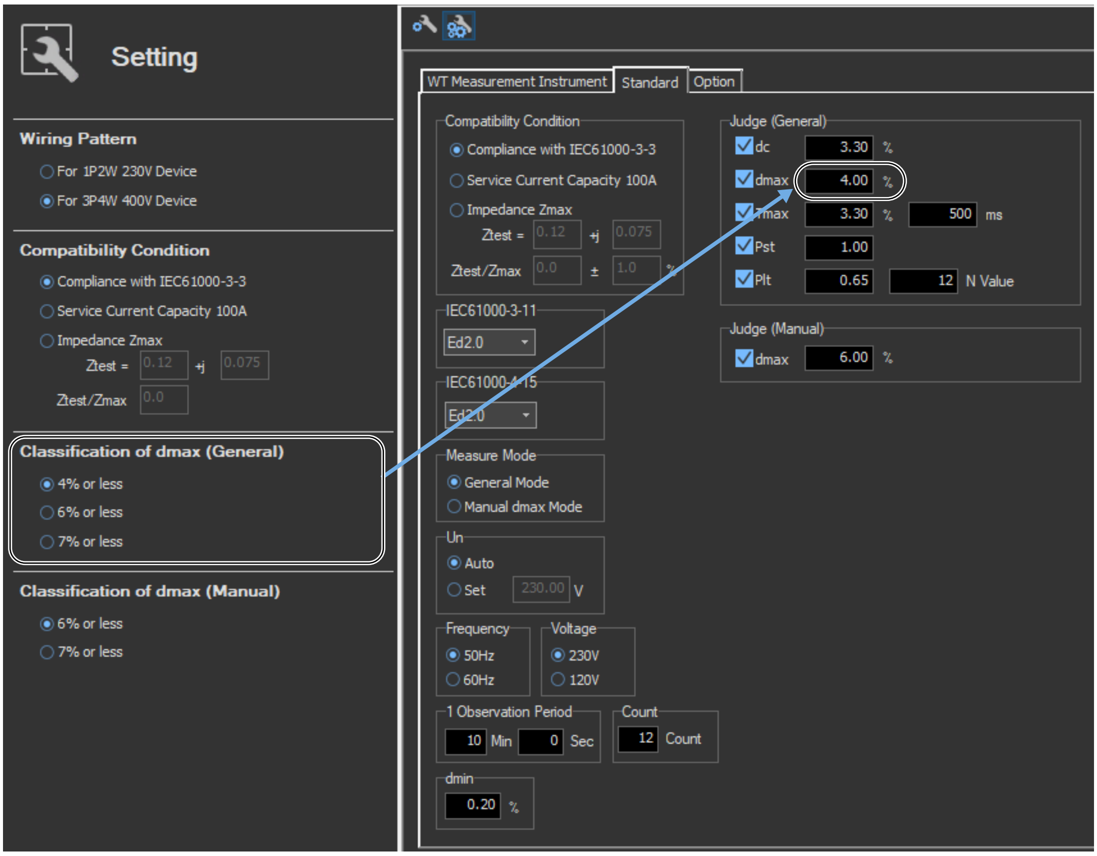
Turning ON/OFF the Judgment of Maximum Relative Voltage Change dmax

You can select whether to include maximum relative voltage change dmax in the flicker measurement judgment.

Limit on Maximum Relative Voltage Change dmax

You can set the limit in the range of 1.00 to 99.99 %.

However, after you set a value, if you perform step 5 on page 9-3, the limit will be changed to the value you set there.



Judgment Conditions for Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

Turning ON/OFF the Judgment of Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can select whether to include the period during which the relative voltage change exceeds the threshold level Tmax in the flicker measurement judgment.

Threshold Level

You can set the threshold level in the range of 1.00 to 99.99 %.

Limit on the Period during Which Relative Voltage Change Exceeds the Threshold Level Tmax

You can set the limit in the range of 1 to 99999 ms.

Judgment Conditions for Short-Term Flicker Value Pst

Turning ON/OFF the Judgment of Short-Term Flicker Value Pst

You can select whether to include short-term flicker value Pst in the flicker measurement judgment.

Limit on Short-Term Flicker Value Pst

You can set the limit in the range of 0.10 to 99.99.

Judgment Conditions for Long-Term Flicker Value Plt

Turning ON/OFF the Judgment of Long-Term Flicker Value Plt

You can select whether to include long-term flicker value Plt in the flicker measurement judgment.

Limit on Long-Term Flicker Value Plt

You can set the limit in the range of 0.10 to 99.99.

Constant N of the Calculating Equation of Long-Term Flicker Value Plt

You can set constant N in the range of 1 to 99.

Note

- The long-term flicker value (Plt) is computed using the following equation.

$$\mathrm{Plt} = \sqrt[3]{\frac{\sum_{i=1}^{\mathrm{Count}} \mathrm{Psti}^3}{N}}$$

  The variable Count in the equation is the measurement count of short-term flicker value (Pst).
  The variable N in the equation is the constant of the calculating equation of long-term flicker value (Plt).
  In general, set Count and N to the same value.
  If N is set greater than Count, the short-term flicker value is measured the number of times specified by Count. The short-term flicker values (Pst) that are not measured are substituted with zeros in the above equation to calculate the long-term flicker value (Plt). N is set greater than Count such as when the measured source automatically stops within the specified observation time.
- You can change the judgment conditions only in online mode when the flicker measurement status is Reset or Complete. For more information about the flicker measurement status, see sections 9.7 and 9.8.

Judgment Conditions for Measurement of dmax Caused by Manual Switching (Manual dmax mode)

Judgment Conditions for Maximum Relative Voltage Change dmax

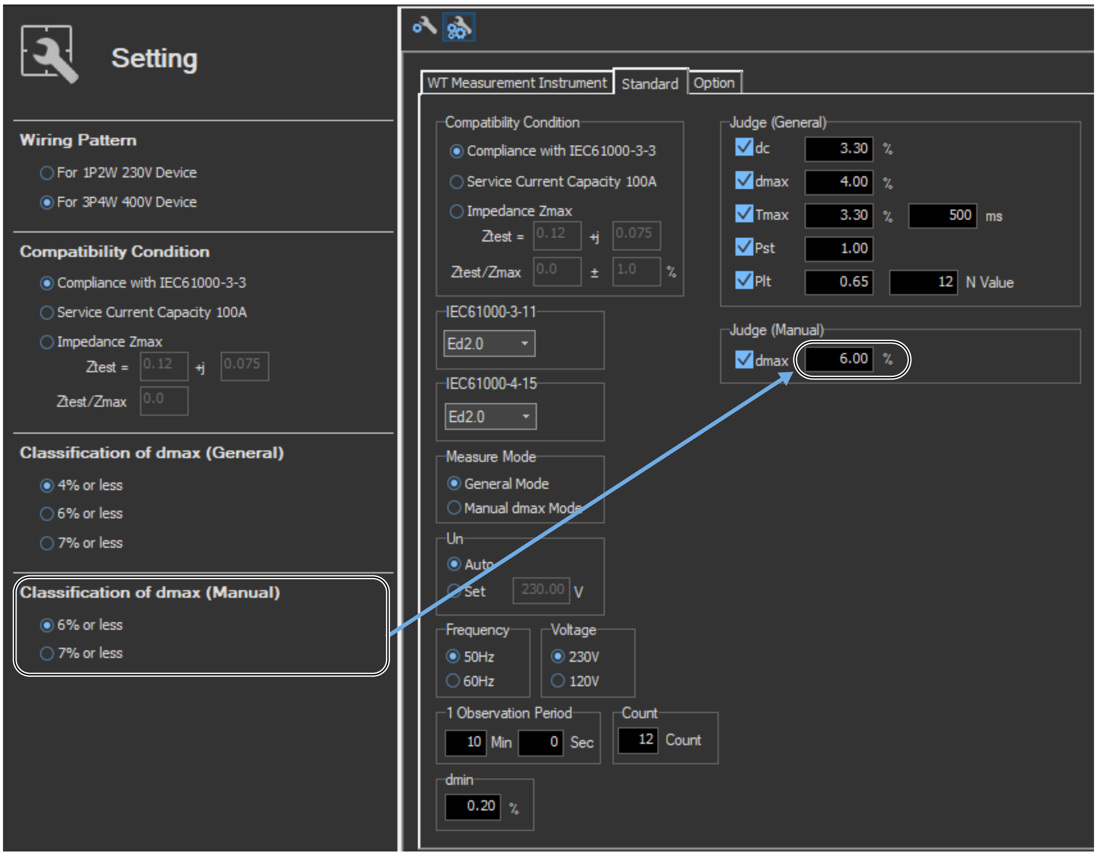
Turning ON/OFF the Judgment of Maximum Relative Voltage Change dmax

You can select whether to include maximum relative voltage change dmax in the flicker measurement judgment.

Limit on Maximum Relative Voltage Change dmax

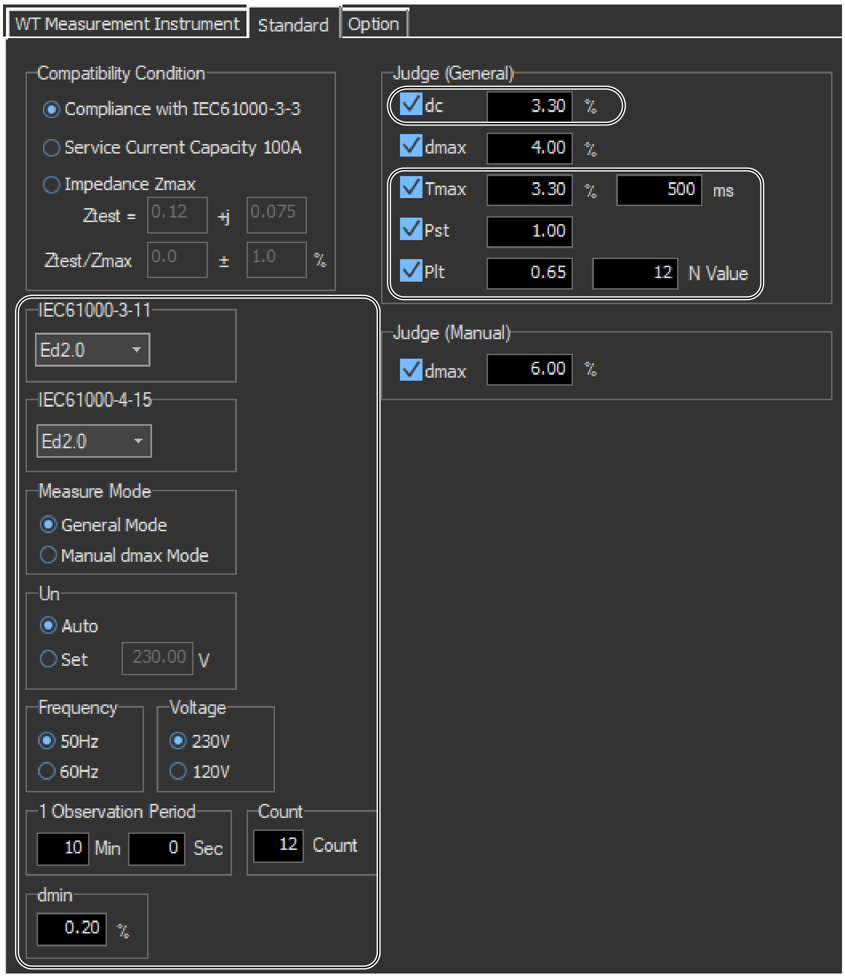
You can set the limit in the range of 1.00 to 99.99 %.

However, after you set a value, if you perform step 6 on page 9-4, the limit will be changed to the value you set there.



How Settings Change Based on the Selected Wiring Pattern

When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



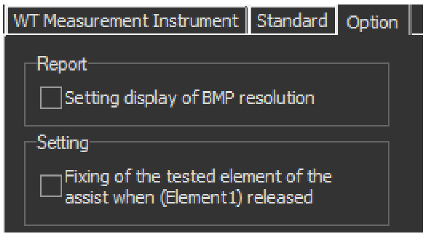
9.5 Setting the Optional Conditions

Procedure

1. Select the **Option** tab in the setting and display area. Judgment condition settings are displayed.
2. Specify the settings.

Note

The items that you can set are the same whether you press the basic settings button  or the advanced settings button .



Explanation

Report

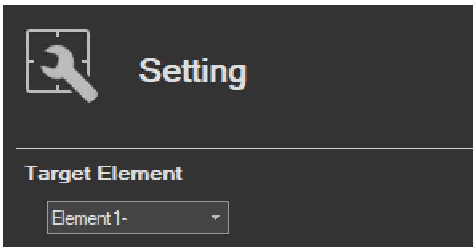
Setting Display of BMP Resolution

In the BMP item under Output Form of the Print menu, the selectable output resolutions appear. (See section 10.2.)

Setting

Fixing of the Tested Element of the Assist When (Element1) Released

Select the check box to select the target element. A target element setting box appears in the Setting submenu area.



If the check box is not selected, the target element is fixed to element 1.

Using the Measure Page to Make Measurements

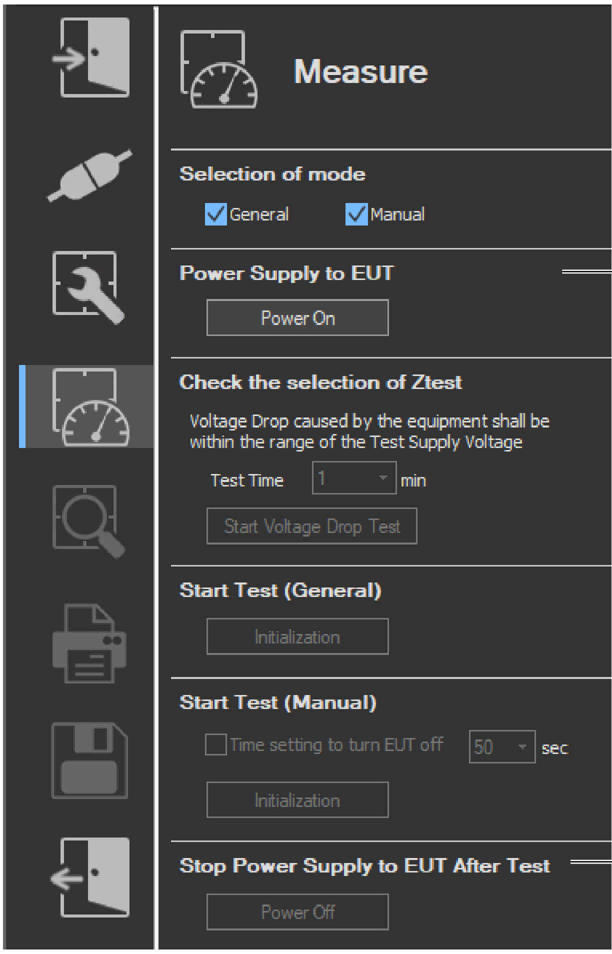
9.6 Turning the Power Output On and Off (When the power supply function is in use)

1. Click  in the menu area.

The submenu that appears will vary depending on the compatibility condition that you select according to the procedure described in section 9.1.

- If Compatibility Condition is set to Impedance Zmax, the detailed measurement menu shown in the following figure appears.
- If Compatibility Condition is set to Compliance with IEC61000-3-3 or Service Current Capacity 100A, the detailed measurement menu shown on the next page appears.

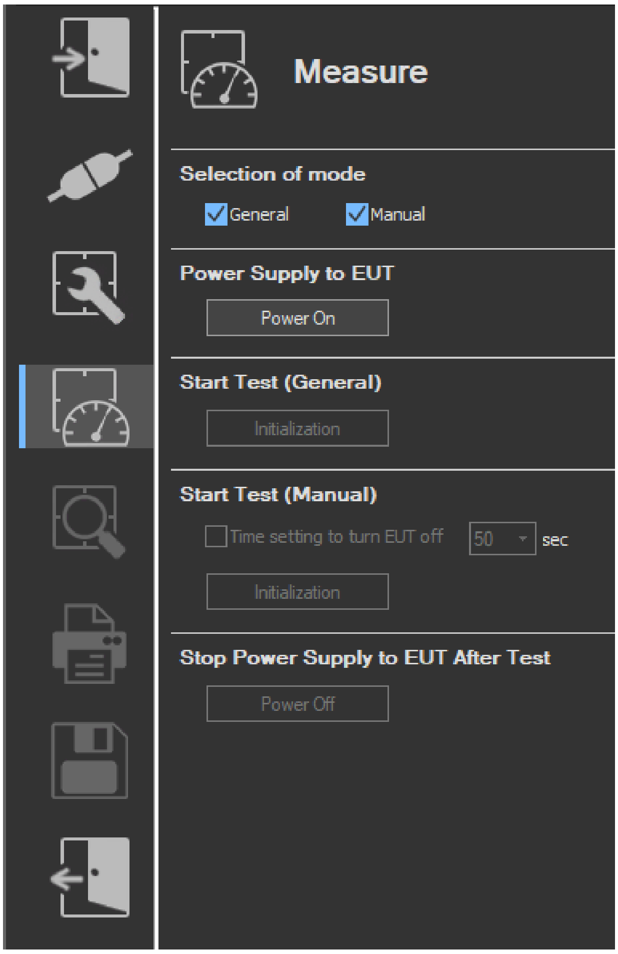
• When the compatibility condition is Impedance Zmax



Turn on the power supply to the EUT.

Turn off the power supply to the EUT.

- **When the compatibility condition is Compliance with IEC 61000-3-3 or Service Current Capacity 100A**



Turning the Power Output On and Off

To turn the power output on or off, click **Power On** or **Power Off** in the submenu area.

Whether the Power On, Power Off, Initialize, Start, Reset, and Move buttons are enabled or disabled in each of the software states are as follows:

Flicker Measurement

Software State	Power Supply State	Power On	Power Off	Initialize	Start	Reset
Before measurement initialization (Reset)	Power On	Diabled	Enabled	Enabled	Diabled	Diabled
	Power Off	Enabled	Diabled	Diabled	Diabled	Diabled
Measurement initialization complete (Ready)	Power On	Diabled	Enabled	Diabled	Enabled	Enabled
Measuring (Start)	Power On	Diabled	Enabled	Diabled	Diabled	Enabled
Measurement complete (Complete)	Power On	Diabled	Enabled	Diabled	Diabled	Enabled
	Power Off	Enabled	Diabled	Diabled	Diabled	Diabled
Offline		Diabled	Diabled	Diabled	Diabled	Diabled

WT states are indicated in parentheses.

Manual dmax Measurement

Software State	Power Supply State	Power On	Power Off	Initialize	Start	Reset	Move
Before measurement initialization (Reset)	Power On	Diabled	Enabled	Enabled	Diabled	Diabled	Diabled
	Power Off	Enabled	Diabled	Diabled	Diabled	Diabled	Diabled
Measurement initialization complete (Ready)	Power On	Diabled	Enabled	Diabled	Enabled	Enabled	Enabled
Measuring (Start)	Power On	Diabled	Enabled	Diabled	Diabled	Enabled	Diabled
Measurement complete (Complete)	Power On	Diabled	Enabled	Diabled	Diabled	Enabled	Enabled
	Power Off	Enabled	Diabled	Diabled	Diabled	Diabled	Diabled
Offline		Diabled	Diabled	Diabled	Diabled	Diabled	Diabled

WT states are indicated in parentheses.

Note

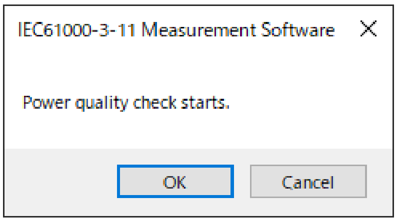
- In the measurement initialization complete (Power Off) or measurement complete (Power Off) states, if the state is changed from Power Off to Power On, a power supply quality check is not performed regardless of whether the check box is selected.
- If the software is in the Power On state and the software is switched from online to offline, the software switches to the Power Off state.
- If the software is switched from offline to online, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.
- When the software is closed, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.

Power Supply Quality Check

If the “The power supply quality is checked before compliance test” check box in the power supply settings (see page 9-7) is selected, the power supply quality is checked before the power output is turned on.

Note

If the /G7 option is not installed in the WT, the power supply quality cannot be checked.



The following items are verified.

- Measurement time 500 ms
- Power supply judgment conditions

Rated voltage[1]	Within ±2.0 %[4]
Nominal frequency[2]	Within ±0.5 %[4]
Total harmonic distortion of supply voltage[3]	Less than 3 %[4]

1 For the rated voltage, the rated voltage value in the power supply settings (see page 9-7) and the measured voltage (rms) are compared.
2 For the nominal frequency, the rated frequency value in the power supply settings (see page 9-7) and the measured value are compared.
3 Total harmonic distortion of supply voltage is calculated as follows with the denominator of the equation set to the fundamental voltage waveform.

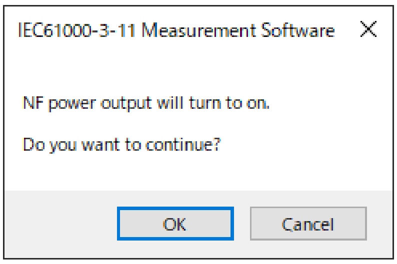
Total harmonic distortion of voltage Uthd [%]

$$\frac{\sqrt{\sum_{k=2}^{max} U(k)^2}}{U(1)} \cdot 100$$

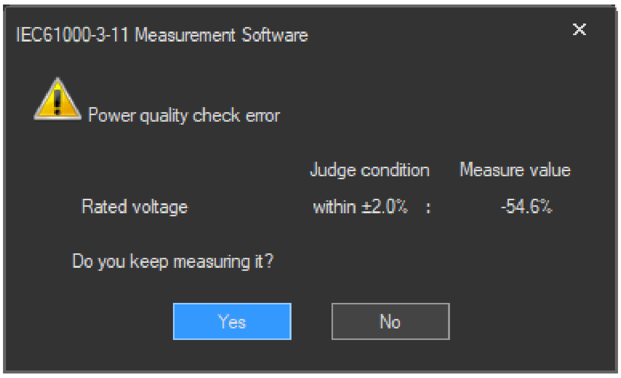
k: harmonic order
max: upper limit of harmonic analysis

4 Judgment is performed in normal measurement mode of the WT. For details on the measurement specifications, see the *Features Guide*, IM WT5000-01EN, and the *User’s Manual*, IM WT5000-02EN.

If no problems are found in the power supply quality, a power output confirmation message appears.



If problems are found in the power supply quality, an error message appears. The item that resulted in error is displayed.



Starting Voltage Fluctuation/Flicker Measurements

Starts a voltage fluctuation/flicker measurement according to section 9.7 or 9.8.

Voltage Range Validity Check

When a voltage fluctuation/flicker measurement is started, the software checks whether the NF power supply, WT, and Voltage Fluctuation/Flicker Measurement Software are configured as shown in the following table.

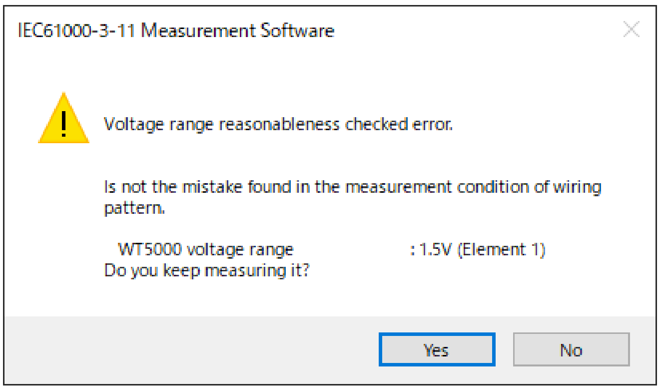
- Check items when the NF Power Connection is set to Use in “Configuring the Connection to the Power Supply” (see section 6.1)

Wiring Pattern	NF Power Supply Settings		WT Voltage Range*
	Rated Voltage	Rated Frequency	
Single-phase two-wire 230 V device	100 to 230 V	45 to 66 Hz	CF3: 100 V to 300 V
Three-phase four-wire 400 V device	220 to 240 V	45 to 66 Hz	CF3: 300 V to 600 V

* “CF3” in the table indicates that the crest factor is set to 3.

- If the NF Power Connection is set to Not Used in “Configuring the Connection to the Power Supply” (see section 6.1), the WT voltage ranges in the table above are verified.

If the settings are different from those in the table, an error message will appear. The item that resulted in error is displayed.



Measured Element

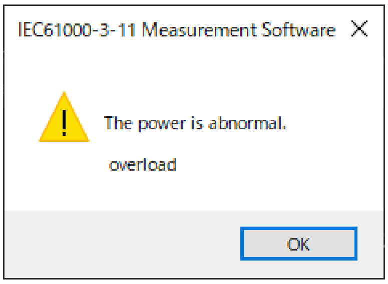
The measured element is determined by the WT measurement target (Object) setting.*

* See section 9.3.

For example, even when a three-phase power supply is being measured, if the WT measurement target (Object) is set only to Element 1, only input element 1 will be measured. Also, when a single-phase power supply is being measured, if the WT measurement target (Object) is set to Element 1 and 2, input element 2 (which is not receiving any signal) will also be measured, and the total judgment may indicate Fail.

Power Supply Error Check during Measurement

This software checks whether an error is occurring in the power supply during measurement. If an error is found, an error message appears. For example, if an overload occurs, the following error message will appear.



Note

The power output remains on even if the voltage fluctuation/flicker measurement is ended or aborted. (It is not automatically turned off.)

9.7 Executing the Normal Voltage Fluctuation and Flicker Measurement

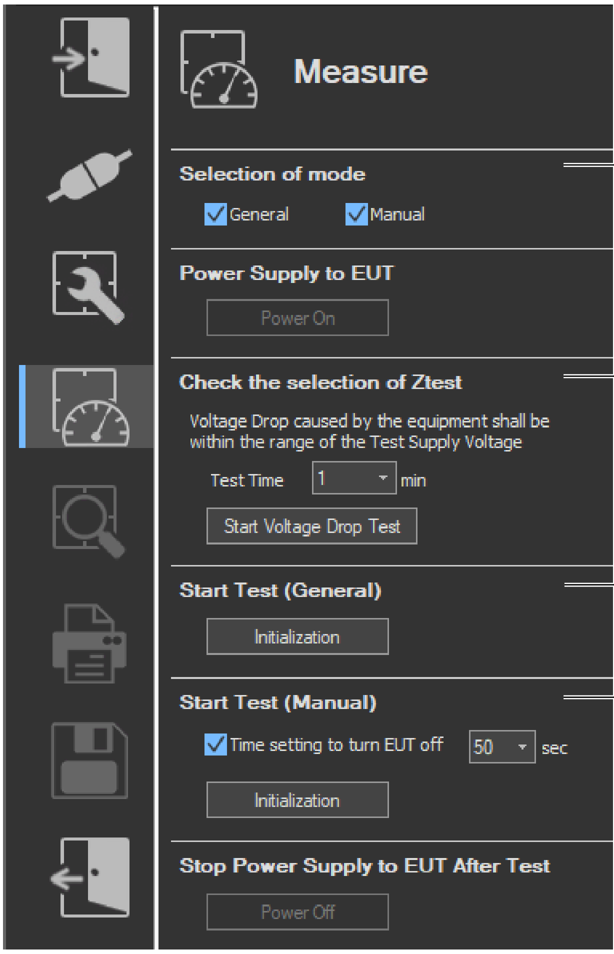
A normal voltage fluctuation and flicker measurement complying with IEC 61000-3-11 is executed. In this mode, the software calculates all voltage and flicker values: dc, dmax, Tmax, Pst, and Plt. It makes an overall judgment by comparing the calculated values with the set limits.

Procedure

1. Click  in the menu area. The submenu that appears will vary depending on the compatibility condition that you select according to the procedure described in section 9.1.

- If Compatibility Condition is set to Impedance Zmax, the detailed measurement menu shown in the following figure appears.
- If Compatibility Condition is set to Compliance with IEC61000-3-3 or Service Current Capacity 100A, the detailed measurement menu shown on the next page appears.

• When the compatibility condition is Impedance Zmax



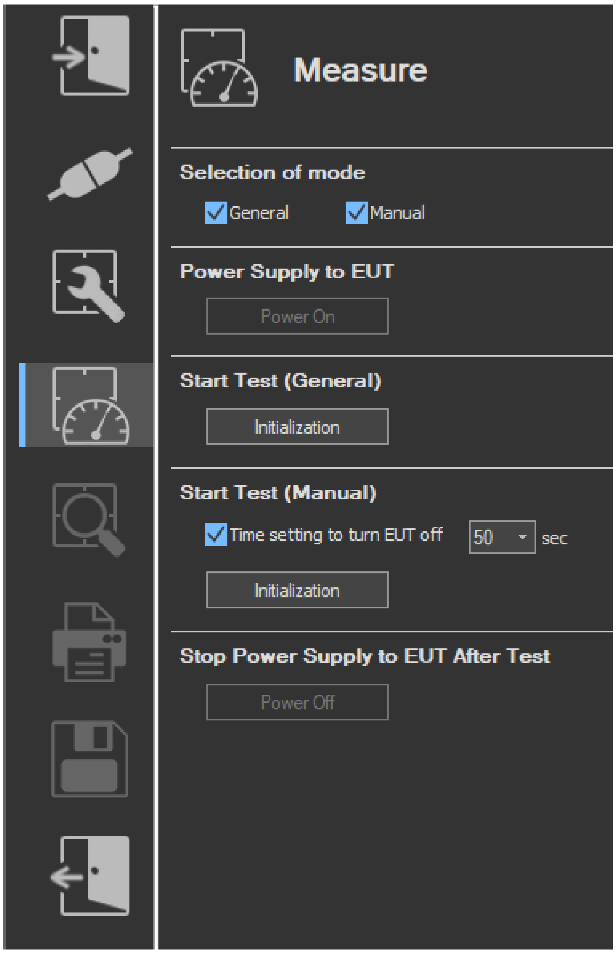
Selection of mode (page 9-33)
Select which kind of measurement to perform.

Check the selection of Ztest (page 9-33)
The software will confirm whether or not the voltage drop caused by the EUT is within the range of the test supply voltage.

Start Test (General) (page 9-34)
Perform normal voltage fluctuation and flicker measurement (General mode).

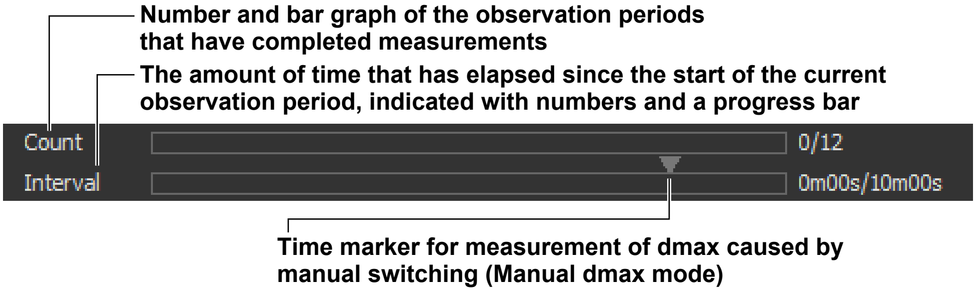
Start Test (Manual) (page 9-41)
Perform measurement of dmax caused by manual switching (Manual mode).

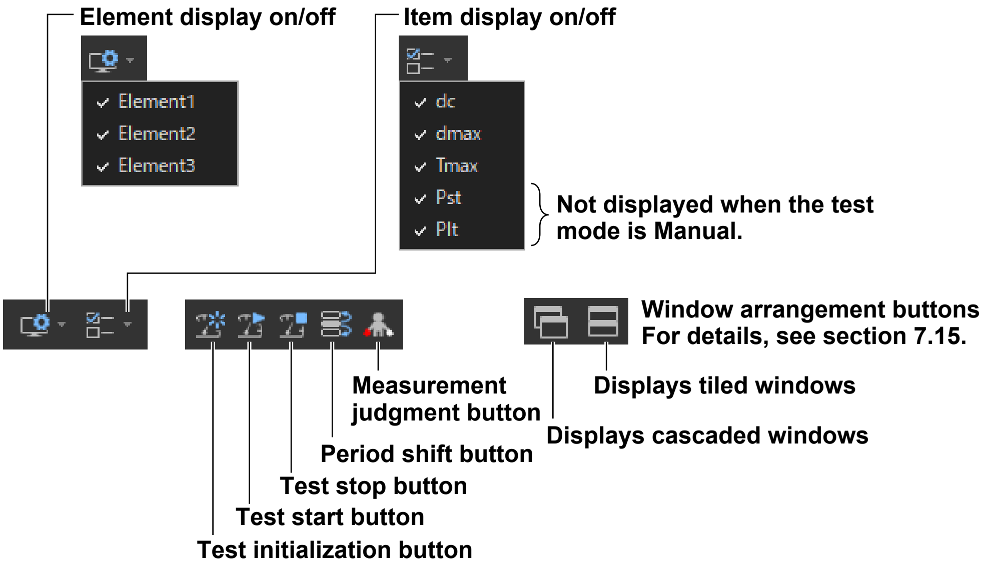
- **When the compatibility condition is Compliance with IEC 61000-3-3 or Service Current Capacity 100A**



Upper portion of the setting and display area

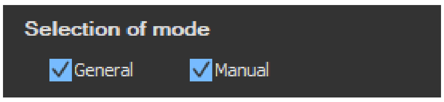
* Icons that cannot be selected are dimmed.





Selecting a Test Mode

2. Select General. You can also select both General and Manual.



Checking the Ztest Selection

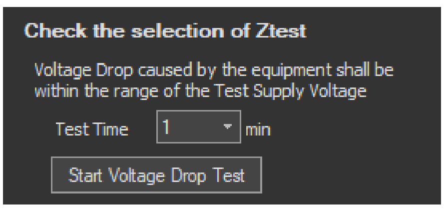
This item appears when you have selected Impedance Zmax as the compatibility condition according to the procedure described in section 9.1.

The software will confirm whether or not the voltage drop caused by the EUT is within the range of the test supply voltage.

- dc: 2 % to 9 % for IEC 61000-3-11 Ed. 2.0
- ΔU: 3 % to 5 % for IEC 61000-3-11 Ed. 1.0

3. Set the test time.

4. Click **Start Voltage Drop Test**.

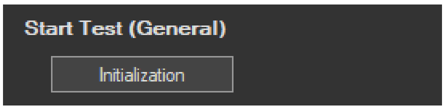


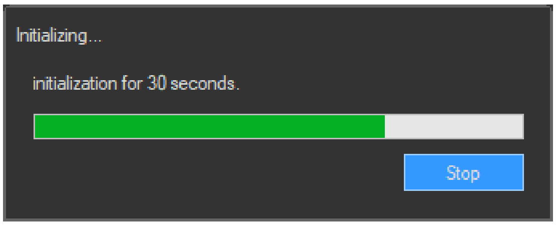
Starting a Compliance Test

Check that the software is in online mode and that the flicker measurement status is indicating Reset (condition in which the measured value is reset and initialization can be executed). If not, set the flicker measurement status to Reset according to the procedure in “Resetting a Test” on page 9-36.

Initializing a Test

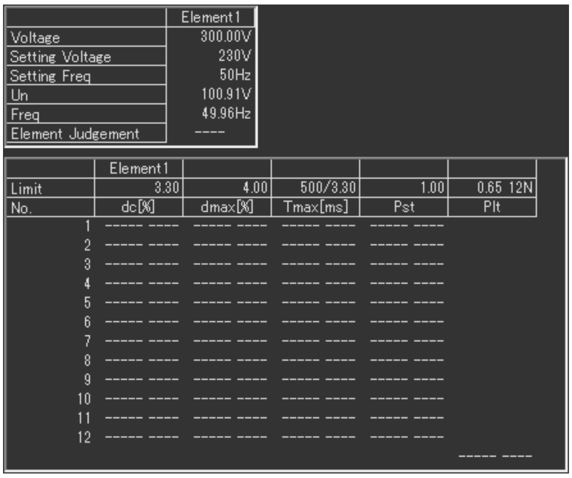
5. Click **Initialization** under Start Test (General) or click the button on the toolbar. The initialization dialog box appears, and initialization begins.





Once initialization is complete, the initialization dialog box will automatically close, and the Numeric View window will display:

- The current measured values for Un[V] and Freq[Hz].
- “----” for dc[%], dmax [%], Tmax[ms], and Pst.



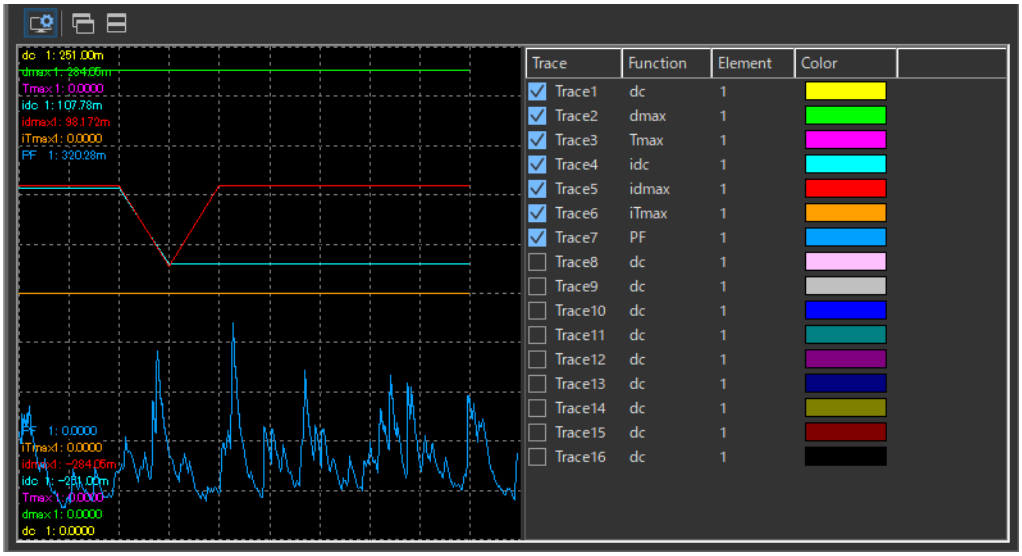
Starting a Test

6. Click **Start Test** under Start Test (General) or click the button on the toolbar. The Numeric View window will display:

- Fixed values for Un[V] and Freq[Hz]
- The maximum measured values within the observation period for dc[%], dmax [%], Tmax[ms], and Pst.

The bar and numbers next to Interval indicate how much time has passed. The bar and numbers next to Count indicate how many observation periods have finished. The measurement results appear in the Trend Graph View window.

	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.25 Pass	0.28 Pass	0.00 Pass	----- ----	
2	----- ----	----- ----	----- ----	----- ----	
3	----- ----	----- ----	----- ----	----- ----	



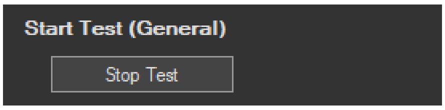
When the measurement of all observation periods is complete, the normal voltage fluctuation and flicker measurement automatically stops. The result and judgment are displayed.

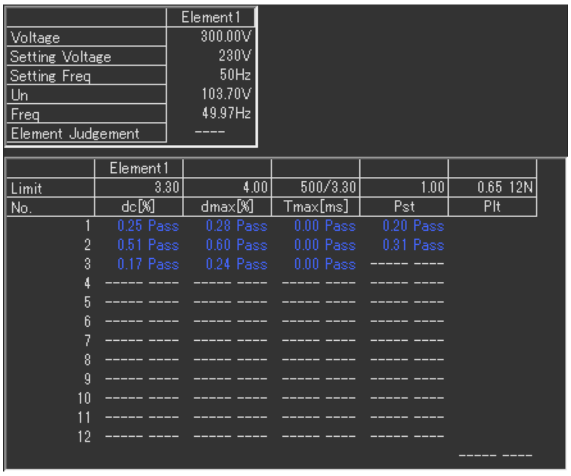
	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	103.70V
Freq	49.97Hz
Element Judgement	-----

	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.25 Pass	0.28 Pass	0.00 Pass	0.20 Pass	
2	0.51 Pass	0.60 Pass	0.00 Pass	0.31 Pass	
3	0.21 Pass	0.29 Pass	0.00 Pass	0.21 Pass	
4	0.52 Pass	0.62 Pass	0.00 Pass	0.28 Pass	
5	0.61 Pass	0.66 Pass	0.00 Pass	0.29 Pass	
6	0.52 Pass	0.69 Pass	0.00 Pass	0.23 Pass	
7	0.13 Pass	0.20 Pass	0.00 Pass	----- ----	
8	----- ----	----- ----	----- ----	----- ----	
9	----- ----	----- ----	----- ----	----- ----	
10	----- ----	----- ----	----- ----	----- ----	
11	----- ----	----- ----	----- ----	----- ----	
12	----- ----	----- ----	----- ----	----- ----	
					----- ----

Stopping a Test

1. Click **Stop Test** in the Start Test (General) box or click  on the toolbar to stop the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.





	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	103.70V
Freq	49.97Hz
Element Judgement	----

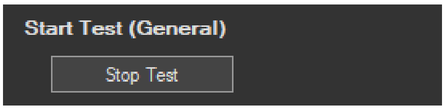
	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	0.25 Pass	0.28 Pass	0.00 Pass	0.20 Pass	
2	0.51 Pass	0.60 Pass	0.00 Pass	0.31 Pass	
3	0.17 Pass	0.24 Pass	0.00 Pass	----- ----	
4	----- ----	----- ----	----- ----	----- ----	
5	----- ----	----- ----	----- ----	----- ----	
6	----- ----	----- ----	----- ----	----- ----	
7	----- ----	----- ----	----- ----	----- ----	
8	----- ----	----- ----	----- ----	----- ----	
9	----- ----	----- ----	----- ----	----- ----	
10	----- ----	----- ----	----- ----	----- ----	
11	----- ----	----- ----	----- ----	----- ----	
12	----- ----	----- ----	----- ----	----- ----	
					----- ----

Changing the Judgment Conditions and Re-judging the Measured Data

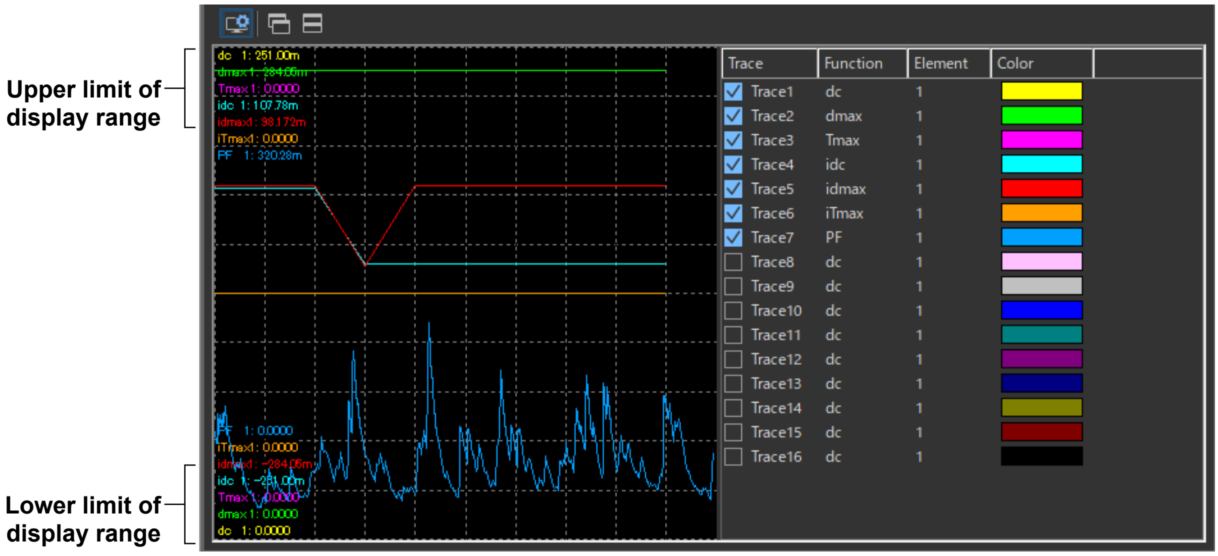
When the normal voltage fluctuation and flicker measurement is complete, change the judgment conditions according to the procedure given in "Setting the Judgment Conditions" in section 9.4. If you change the judgment conditions, the measured voltage fluctuation and flicker data is re-judged, and the judgment is updated.

Resetting a Test

1. Click **Stop Test** in the Start Test (General) box or click  on the toolbar to reset the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.



Setting the Trend Graph Traces



Trace

Select the trends you want to display (select or clear the check boxes).

Up to 16 trends can be displayed.

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
id(t)	Period during which instantaneous relative voltage change exceeds the threshold level
PF	Instantaneous flicker sensation (IFS)

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

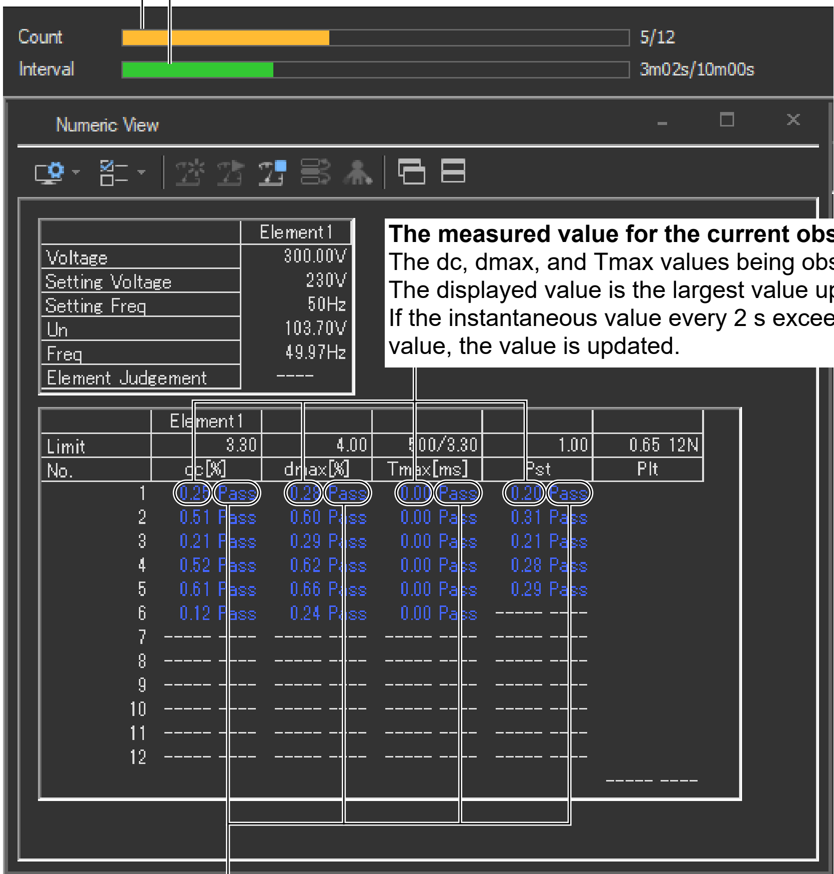
Explanation

Display during Measurement

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Number and bar graph of the observation periods that have completed measurements

The amount of time that has elapsed since the start of the current observation period, indicated with numbers and a progress bar



The measured value for the current observation period.
The dc, dmax, and Tmax values being observed are displayed.
The displayed value is the largest value up to that point.
If the instantaneous value every 2 s exceeds the maximum value, the value is updated.

Judgments displayed for completed observation periods

- The final values of dc, dmax, and Tmax are compared with the respective limits, and the judgment (pass or fail) is displayed.
- If a steady-state condition does not occur during the measurement period, it is considered to be a fluctuating condition. The measured value of dc is displayed as Undef (undefined, IEC 61000-4-15 Ed1.1) or 0 (IEC 61000-4-15 Ed2.0), and the judgment is displayed as Error (IEC 61000-4-15 Ed1.1) or Pass (IEC 61000-4-15 Ed2.0).
- The short-term flicker value, Pst, is calculated, compared to the limit, and the judgment (pass or fail) is displayed.
- The judgment of items whose judgment is turned OFF is displayed as Undef.

Judge Display When the Measurement Is Complete

Once the test is finished, the overall judgment appears.

Display example: PASS

The overall judgment appears in the information area.

Judgment

If all of the elements that are tested pass, PASS appears. Otherwise, FAIL appears.

PASS

Measurement ended without the relative voltage change ever having exceeded steady-state range dmin. (The measured values for dc, dmax, and Tmax were all 0.)

A steady-state condition did not occur in one or more observation periods (equivalent to dc = Undef in IEC 61000-4-15 Ed. 1.1).
* Does not appear when Ed1.1 is selected.

FAIL

No data

Select the test.

- To perform a normal voltage fluctuation and flicker measurement (General mode), select General.
- To measure dmax caused by manual switching (Manual dmax mode), select Manual.
- You can also select both General and Manual.

Initializing the Measurement

- The initialization takes approximately 30 s.
- Rms voltage Un and voltage frequency Freq are updated every 2 s while the initialization is in progress in the same manner as when the voltage fluctuation and flicker measurement is reset.
- Keep the voltage of the power supply to be measured in steady-state condition while the initialization is in progress.

Rated Voltage Un and Voltage Frequency Freq

- If the assignment method of rated voltage is AUTO, the rms voltage at the start of measurement is used as rated voltage Un. The measured data is calculated with respect to rated voltage Un.
- If the assignment method of rated voltage is SET, the rated voltage setting is displayed as Un(Set).
- Rated voltage Un and voltage frequency Freq are not updated after the flicker measurement is started.

Resetting the Test

To initialize and restart the measurement, reset the measurement after the normal voltage fluctuation and flicker measurement is complete and the flicker measurement status is indicating Complete. You cannot initialize or start the measurement in the Complete status.
In addition, reset the measurement to change the measurement conditions of the normal voltage fluctuation and flicker measurement (section 9.3).

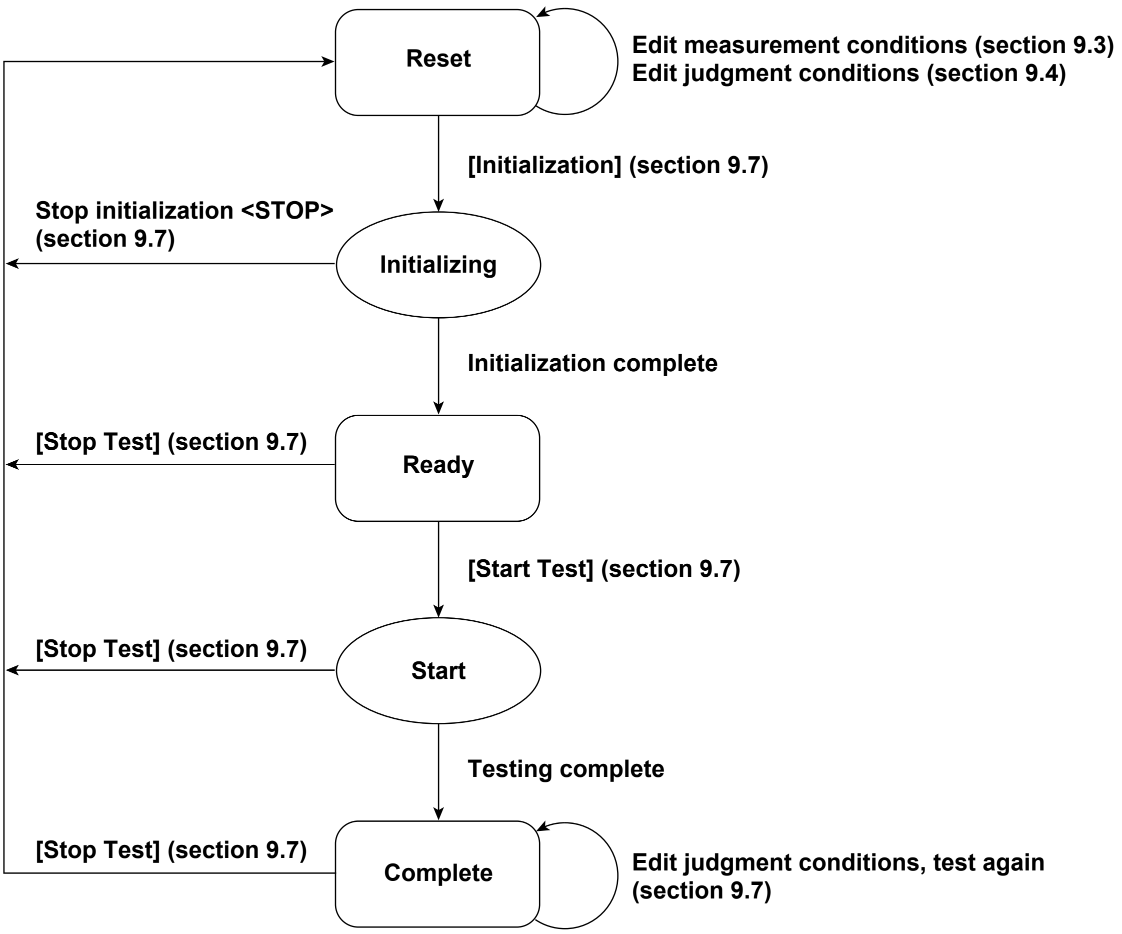
Flicker Measurement Status

The following five flicker measurement statuses are available.

Status	Meaning
Reset	Condition in which the measured value is reset and initialization can be executed.
Initializing	Initializing the measurement.
Ready	Initialized condition in which measurement can be started.
Start	Measurement in progress: Displays the elapsed time.
Complete	Displays the result (judgment by measurement item) and judgment (element judgment and overall judgment).

Normal Voltage Fluctuation and Flicker Measurement Flowchart

(Transition Diagram of the Flicker Measurement Status)



Numbers in parenthesis indicate relevant sections in the manual.
Brackets are used to indicate buttons or icons.
Greater than and less than signs are used to indicate buttons (i.e. <Stop Test>).

9.8 Executing the Measurement of dmax Caused by Manual Switching

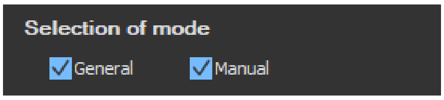
Measurement of dmax caused by manual switching is executed.
The software measures the maximum relative voltage change, dmax, when the EUT (equipment under test) is turned ON and OFF manually. After the EUT has been turned ON and OFF 24 times, the software makes a judgment by comparing the average dmax with the set limit.

Procedure

1. Click  in the menu area. The Measure submenu appears. For general information about submenus, see section 9.7.

Selecting a Test Mode

2. Select Manual. You can also select both General and Manual.

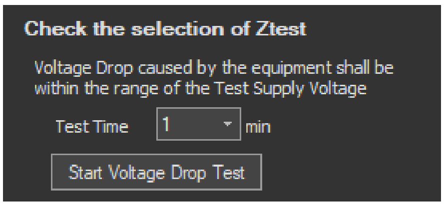


Checking the Ztest Selection

This item appears when you have selected Impedance Zmax as the compatibility condition according to the procedure described in section 9.1.
The software will confirm whether or not the voltage drop caused by the EUT is within the range of the test supply voltage.

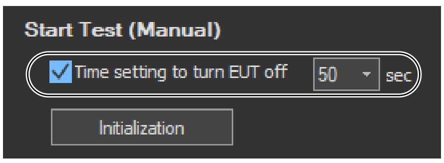
- dc: 2 % to 9 % for IEC 61000-3-11 Ed. 2.0
- ΔU: 3 % to 5 % for IEC 61000-3-11 Ed. 1.0

3. Set the test time.
4. Click **Start Voltage Drop Test**.



Setting the Time Marker

5. Select the **Time setting** check box under Start Test (Manual).  appears above the Interval bar in the upper portion of the setting and display area.
6. Set **Time setting** to 1 to 60 seconds.

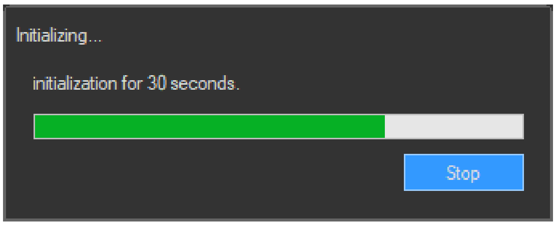


Starting a Compliance Test

Check that the software is in online mode and that the flicker measurement status is indicating Reset (condition in which the measured value is reset and initialization can be executed). If not, set the flicker measurement status to Reset according to the procedure in “Resetting a Test” on page 9-47.

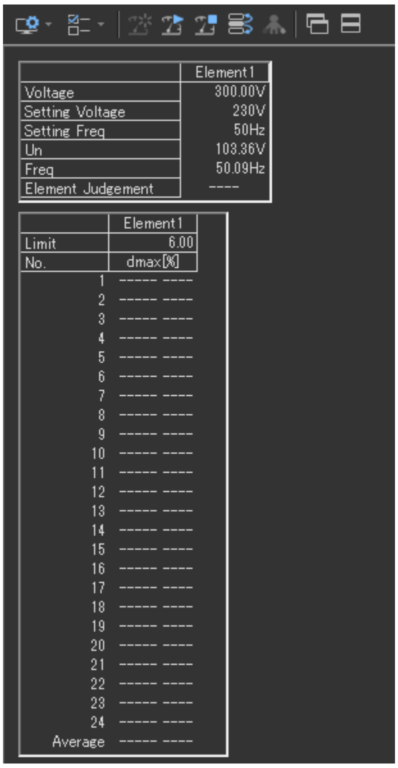
Initializing a Test

Click **Initialization** under Start Test (Manual) or click the button on the toolbar. The initialization dialog box appears, and initialization begins.



Once initialization is complete, the initialization dialog box will automatically close, and the Numeric View window will display:

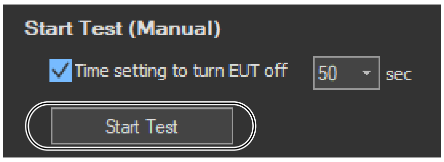
- The current measured values for Un[V] and Freq[Hz].
- “----” for dmax[%].

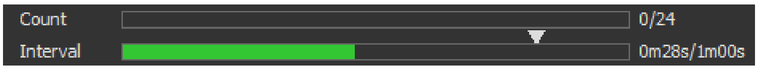


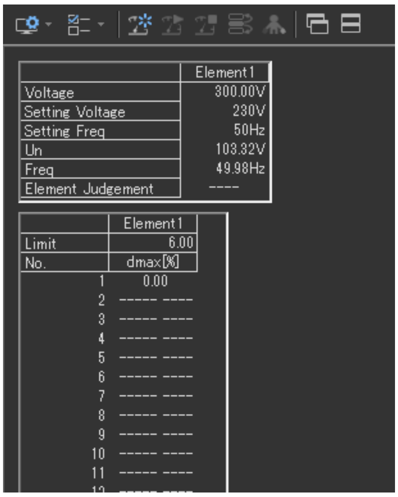
Starting a Test

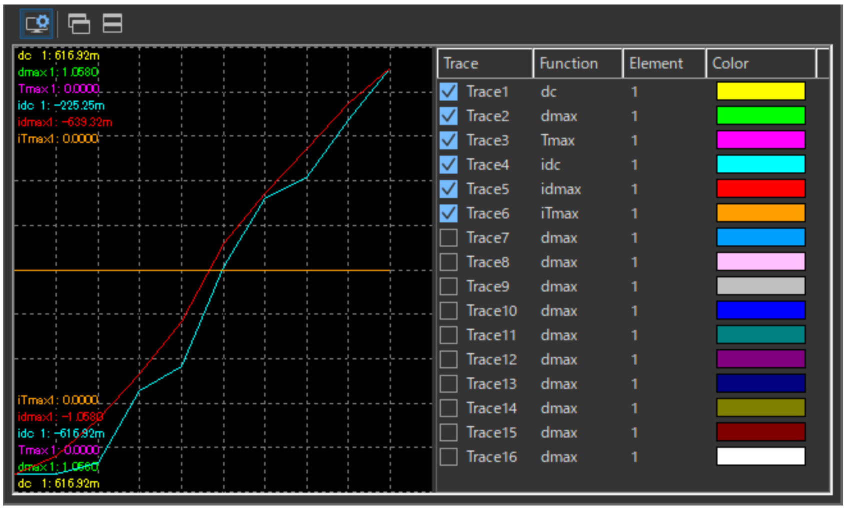
1. Click **Start Test** under Start Test (Manual) or click the  button on the toolbar. The Numeric View window will display:
   - Fixed values for Un[V] and Freq[Hz]
   - The maximum value for dmax during the current observation period.

   The bar and numbers next to Interval indicate how much time has passed. The bar and numbers next to Count indicate how many observation periods have finished. The measurement results appear in the Trend Graph View window.





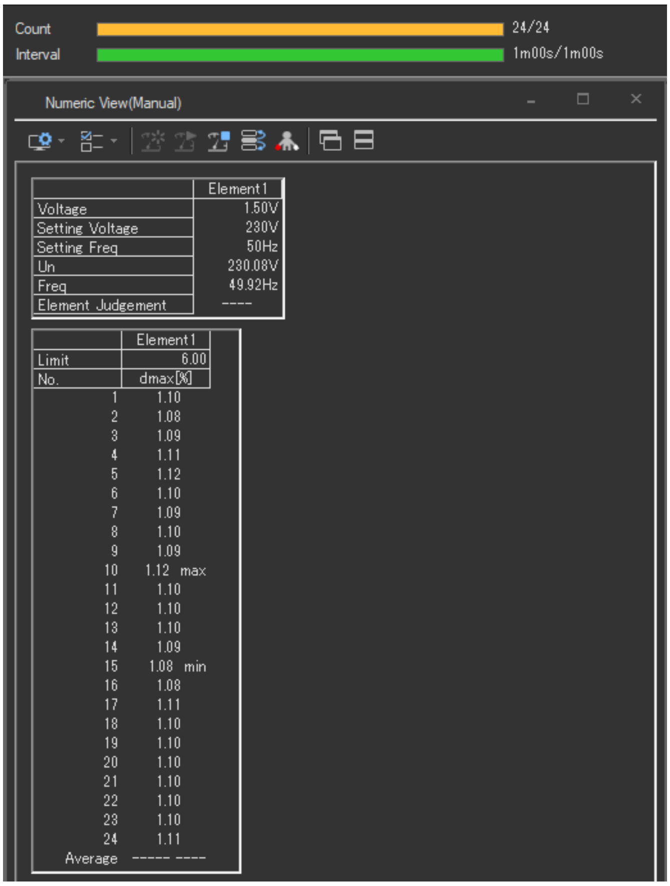




2. Turn the EUT ON to achieve normal operation. Operate the EUT in the normal condition as long as possible in the measurement period of one observation period (1 minute).

3. Turn the EUT OFF before the measurement of one observation period (1 minute) completes.

4. Repeat steps 1 and 3 to measure dmax 24 times.



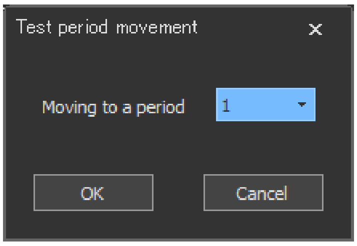
Remeasuring by Shifting the Observation Period

If a measurement of a given observation period is not performed correctly, you can change the observation period to be measured by carrying out to the procedure below and redo the measurement.

1. Click  on the toolbar. The Move dialog box opens.
2. Select the number of the observation period you want to re-measure.

Note

You can only shift to and remeasure observation periods that have already been measured.



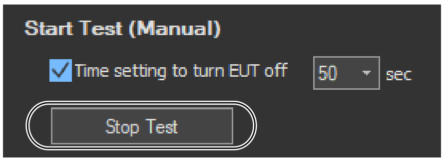
3. Carry out steps 2 to 4 to measure dmax.

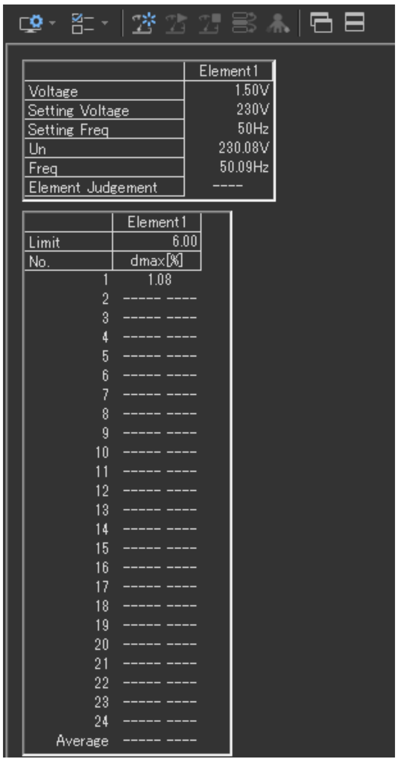
   If you start the re-measurement, the measurement count and graph display shown in Count decrease by one. In addition, the total elapsed time of measurement decreases by one observation period.

4. If you want to continue with the measurement, repeat steps 2 to 4. To change the observation period to be measured, return to step 6.

Stopping a Test

1. Click **Stop Test** in the Start Test (Manual) box or click on the toolbar to stop the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.

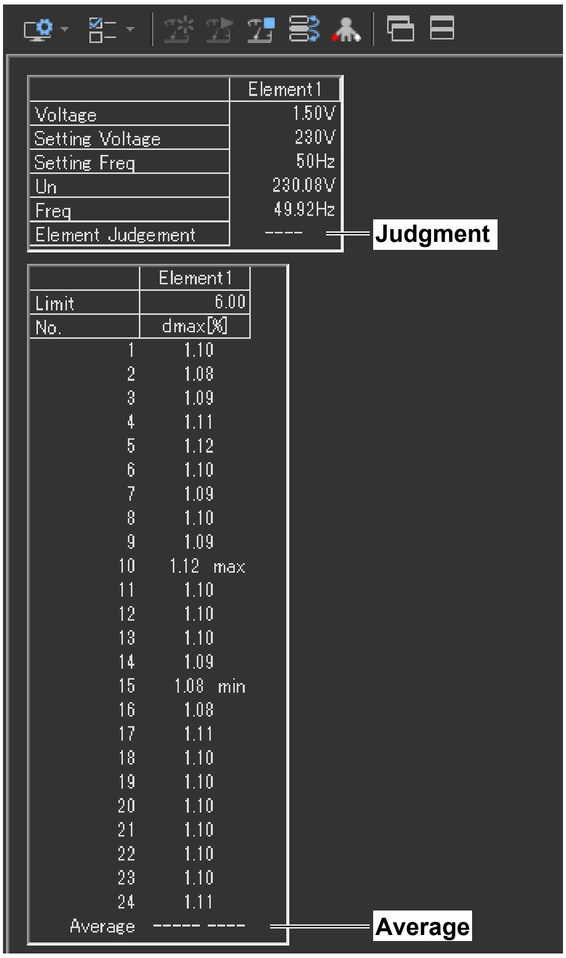




Completing the Measurement and Displaying the Judgment

1. Check that the measurement of all observation periods (24) is complete, and that the dmax data of each observation period is displayed.

2. Click **Start Judgment** under Start Test (Manual) or click the  button on the toolbar. The dmax data of all observation periods is confirmed, and the measurement of dmax caused by manual switching is complete. The flicker measurement status changes to Complete, and the result and judgment of the average of the measured dmax are displayed.

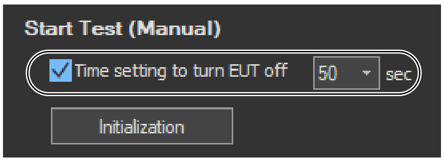


Changing the Judgment Conditions and Re-judging the Measured Data

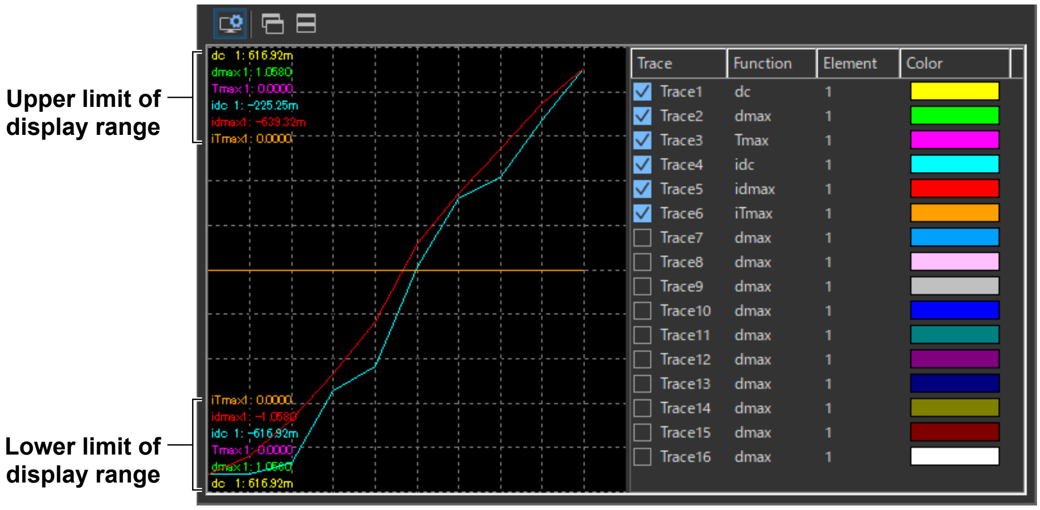
When the measurement of dmax caused by manual switching is complete, change the judgment conditions according to the procedure given in section 9.3, “Setting the WT Judgment Conditions”. If you change the judgment conditions, the average data of the measured dmax is re-judged, and the judgment is updated.

Resetting a Test

1. Click **Stop Test** in the Start Test (Manual) box or click on the toolbar to reset the measurement. The measured data and test results are discarded, and Interval and Count in the Numeric View window are cleared.



Setting the Trend Graph Traces



Trace

Select the trends you want to display (select or clear the check boxes).

Up to 16 trends can be displayed.

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
iTmax	Period during which instantaneous relative voltage change exceeds the threshold level

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Explanation

Time Marker

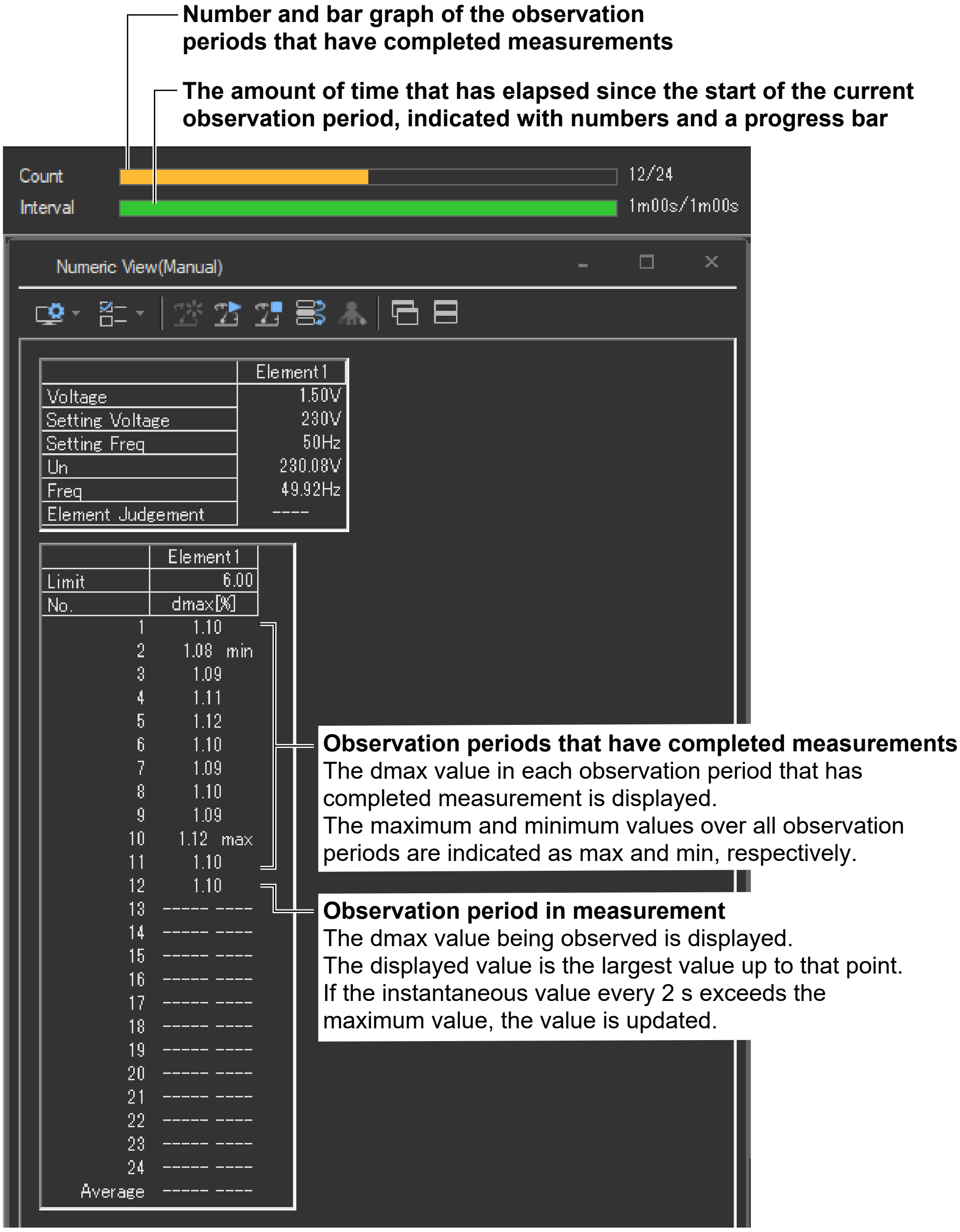
One way you can use the time marker is as a reminder of when to turn OFF the power supply of an EUT that does not turn OFF immediately after it is switched OFF.

 appears above the Interval bar at the top of the setting and display area when you select the Time setting check box.

You can set the time marker to a value from 1 to 60 seconds.

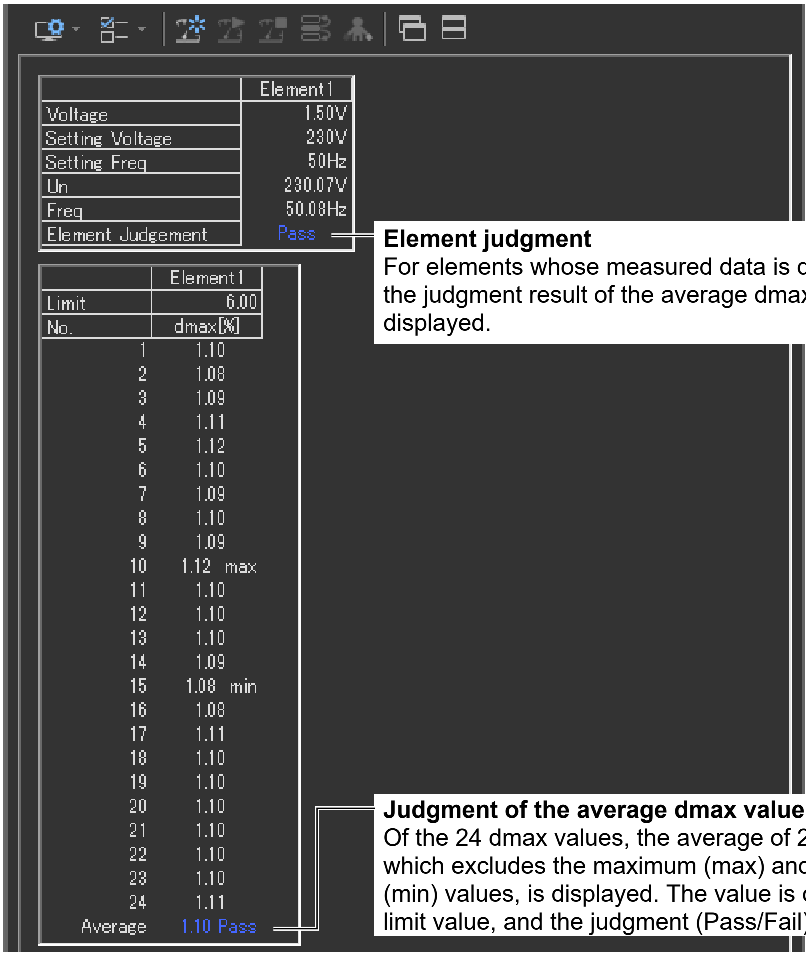
Display during Measurement

The following figure shows an example of a display during a measurement of dmax caused by manual switching.



Judge Display When the Measurement Is Complete

The following figure shows an example of a display when a measurement of dmax caused by manual switching is completed.



Element judgment
For elements whose measured data is displayed, the judgment result of the average dmax value is displayed.

Judgment of the average dmax value
Of the 24 dmax values, the average of 22 data values, which excludes the maximum (max) and minimum (min) values, is displayed. The value is compared to its limit value, and the judgment (Pass/Fail) is displayed.

Note

If an element that is not being measured is assigned to a display target element, Off is displayed by the element number, and all measured data are displayed as blank.

Initializing the Measurement

- The initialization takes approximately 30 s.
- Rms voltage Un and voltage frequency Freq are updated every 2 s while the initialization is in progress in the same manner as when the voltage fluctuation and flicker measurement is reset.
- Keep the voltage of the power supply to be measured in steady-state condition while the initialization is in progress.

Rated Voltage Un and Voltage Frequency Freq

- If the assignment method of rated voltage is AUTO, the rms voltage at the start of the first measurement is used as rated voltage Un. The measured data is calculated with respect to rated voltage Un.
- If the assignment method of rated voltage is SET, the rated voltage setting is displayed as Un(Set).
- Rated voltage Un and voltage frequency Freq are fixed to the first measured values after the measurement of dmax caused by manual switching is started and are not updated.

Resetting the Test

To initialize and restart the measurement, reset the measurement after the measurement of dmax caused by manual switching is complete and the flicker measurement status is indicating Complete. You cannot initialize or start the measurement in the Complete status.
In addition, reset the measurement to change the measurement conditions of the the measurement of dmax caused by manual switching (section 9.3).

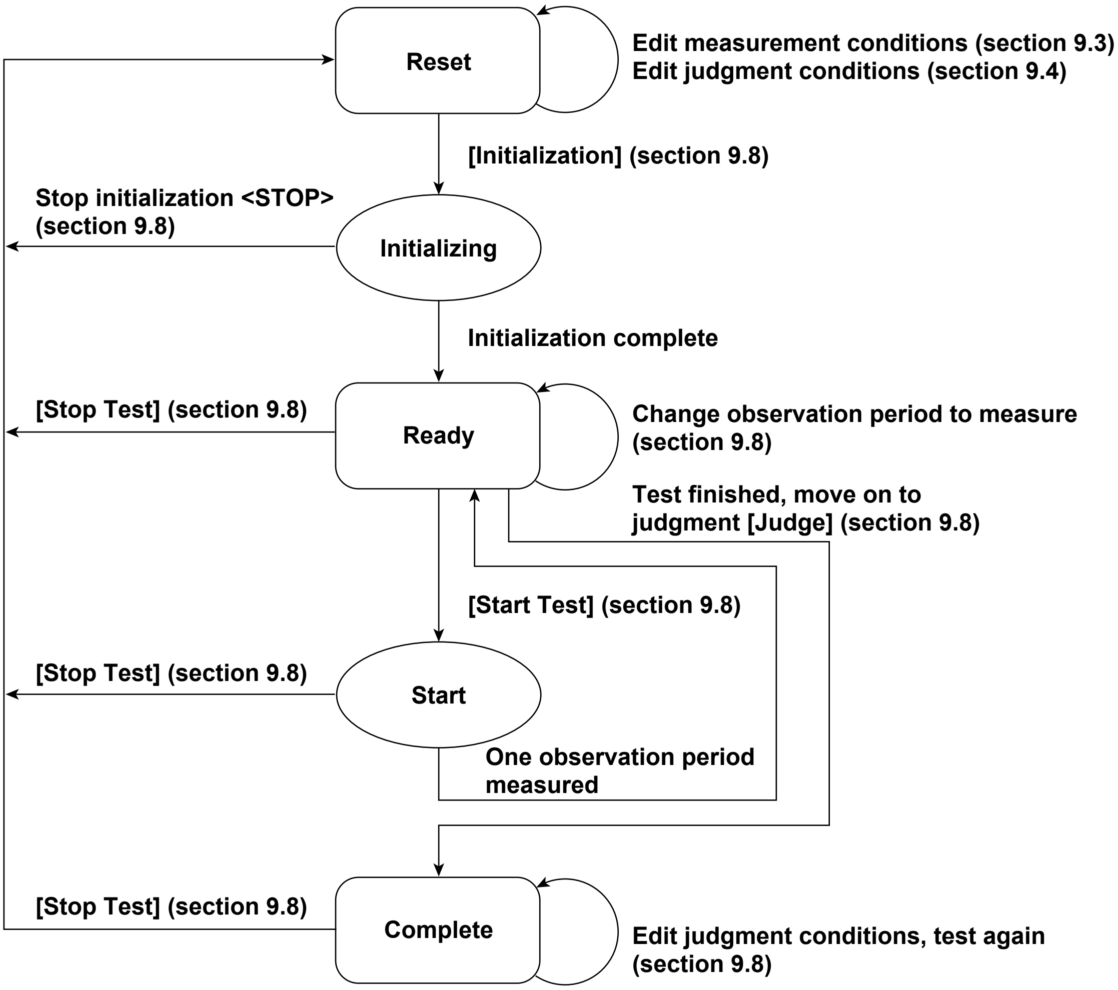
Flicker Measurement Status

The following five flicker measurement statuses are available.

Status	Meaning
Reset	Condition in which the measured value is reset and initialization can be executed.
Initializing	Initializing the measurement.
Ready	Initialized condition in which measurement can be started.
Start	Measurement in progress: Displays the elapsed time.
Complete	Displays the result (judgment by measurement item) and judgment (element judgment and overall judgment).

Flow Chart of the Measurement of dmax Caused by Manual Switching

(Transition Diagram of the Flicker Measurement Status)



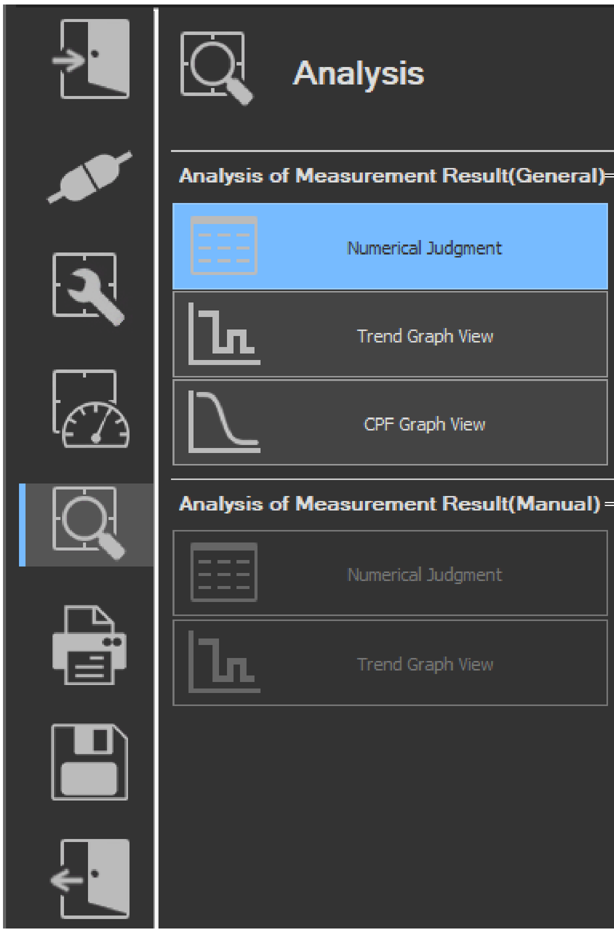
Numbers in parenthesis indicate relevant sections or pages in the manual.
Brackets are used to indicate buttons or icons.
Greater than and less than signs are used to indicate buttons (i.e. <Stop Test>).

Using the Analysis Page to Display Judgment Results and Measured Data

9.9 Displaying Numerical Judgments

Procedure

1. Click  in the menu area. The Analysis submenu appears.

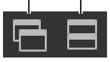


Analysis of Measurement Result (General)
You can view normal voltage fluctuation and flicker measurement (General mode) results using the following displays:
- Numerical judgment (page 9-54)
- Trend graph (page 9-58)
- CPF data (page 9-64)

Analysis of Measurement Result (Manual)
You can view measurement of dmax caused by manual switching (Manual dmax mode) results using the following displays:
- Numerical judgment (page 9-55)
- Trend graph (page 9-59)

Displays cascaded windows

Displays tiled windows



Window arrangement buttons
For details, see section 7.15.

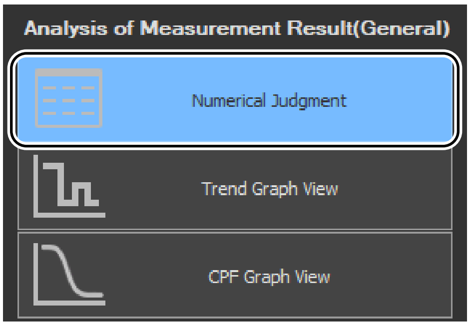
Note

Notes when switching to the Measure window

While in the Analysis window, if you click the Measure icon and switch to the Measure window, the measured data will be discarded. Save the data if you do not want it to be discarded (see chapter 11 for information on how to save data).

Displaying Numerical Judgments for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **Numerical Judgment** under Analysis of Measurement Result (General). The numerical judgment display window will appear.

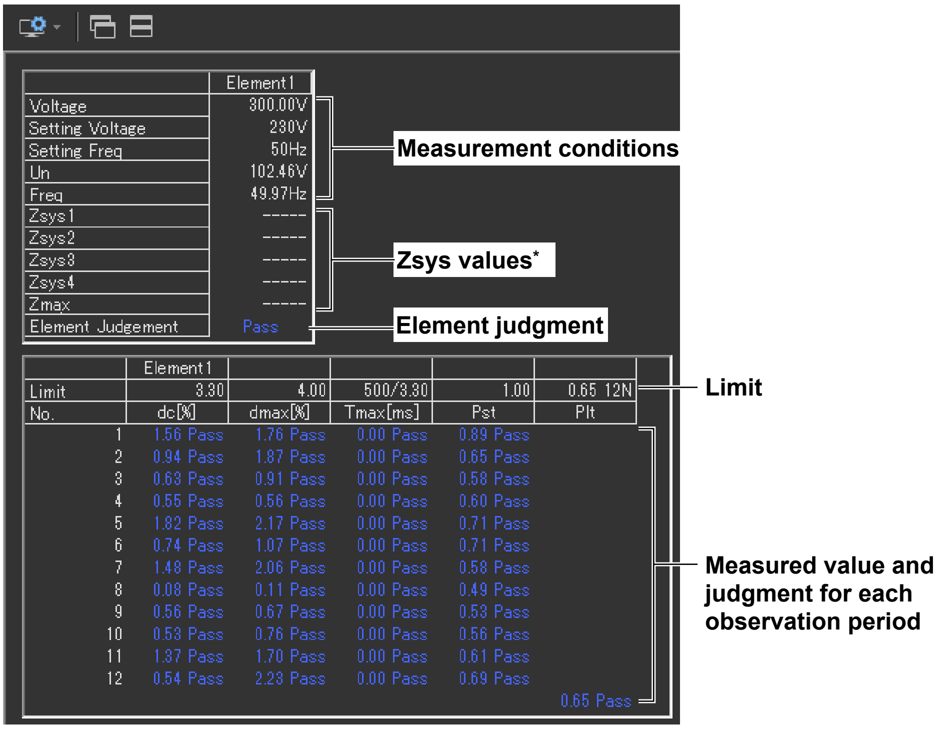


3. Click  on the toolbar, and select which element's numerical judgment to display.

Note

- You can only select Numeric Data and Judgment in offline mode with the measured data loaded.
- In online mode, the numeric data and judgment view is displayed for the element that is selected in the measurement conditions of the WT.

Normal Voltage Fluctuation and Flicker Measurement



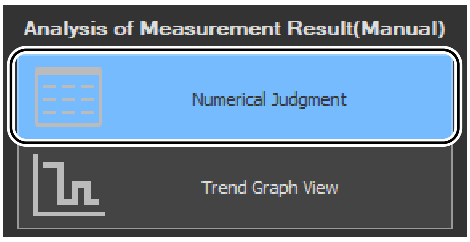
	Element1
Voltage	300.00V
Setting Voltage	230V
Setting Freq	50Hz
Un	102.46V
Freq	49.97Hz
Zsys1	-----
Zsys2	-----
Zsys3	-----
Zsys4	-----
Zmax	-----
Element Judgement	Pass

	Element1				
Limit	3.30	4.00	500/3.30	1.00	0.65 12N
No.	dc[%]	dmax[%]	Tmax[ms]	Pst	Plt
1	1.56 Pass	1.76 Pass	0.00 Pass	0.89 Pass	
2	0.94 Pass	1.87 Pass	0.00 Pass	0.65 Pass	
3	0.63 Pass	0.91 Pass	0.00 Pass	0.58 Pass	
4	0.55 Pass	0.56 Pass	0.00 Pass	0.60 Pass	
5	1.82 Pass	2.17 Pass	0.00 Pass	0.71 Pass	
6	0.74 Pass	1.07 Pass	0.00 Pass	0.71 Pass	
7	1.48 Pass	2.06 Pass	0.00 Pass	0.58 Pass	
8	0.08 Pass	0.11 Pass	0.00 Pass	0.49 Pass	
9	0.56 Pass	0.67 Pass	0.00 Pass	0.53 Pass	
10	0.53 Pass	0.76 Pass	0.00 Pass	0.56 Pass	
11	1.37 Pass	1.70 Pass	0.00 Pass	0.61 Pass	
12	0.54 Pass	2.23 Pass	0.00 Pass	0.69 Pass	
					0.65 Pass

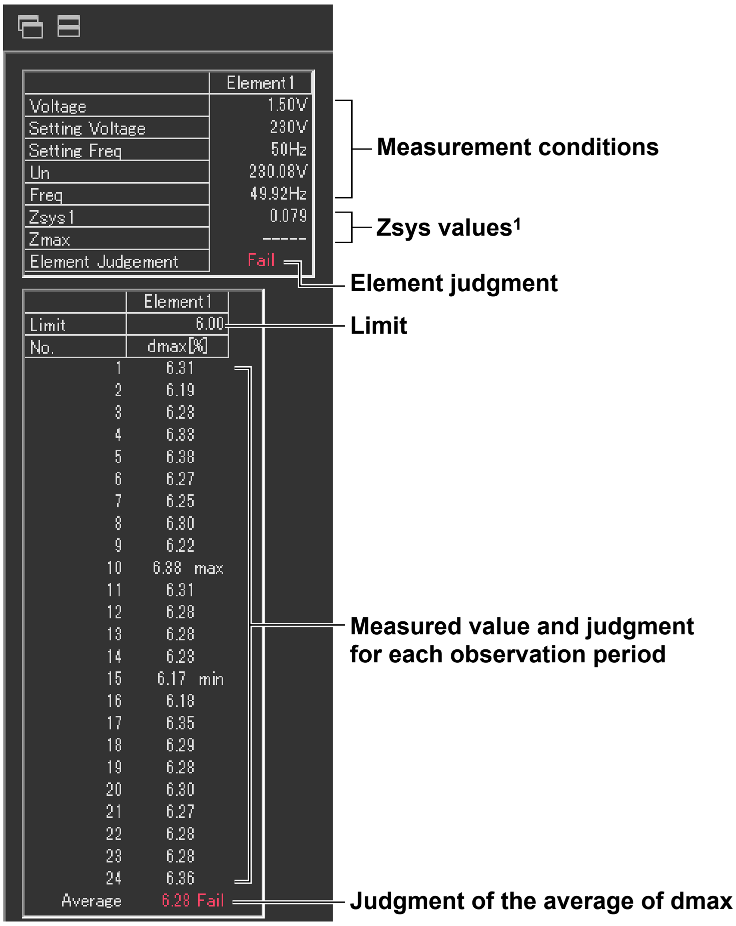
* When Impedance Zmax is selected as the Compatibility Condition, Zsys will be displayed. For ordinary voltage fluctuation and flicker measurements, Zsys1 to Zsys4, and Zmax are displayed.

Displaying Numerical Judgments for Measurements of dmax Caused by Manual Switching (Manual dmax mode)

2. Click **Numerical Judgment** under Analysis of Measurement Result (Manual). The numerical judgment display window will appear.



Measurement of dmax Caused by Manual Switching



1 When Impedance Zmax is selected as the Compatibility Condition, Zsys will be displayed. In manual dmax mode, Zsys1 and Zmax are displayed.

9

IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Explanation

Measure Conditions

The element number for which the measured data is displayed, the voltage, the rated voltage (Un), the target frequency (specified frequency), the voltage frequency, and the measurement interval of each observation period are displayed.

Limits

- Displays dc, dmax, Tmax, Pst, and Plt for normal voltage fluctuation and flicker measurement.
- Displays dmax for measurement of dmax caused by manual switching.

Measured Value and Judgment for Each Observation Period

Normal Voltage Fluctuation and Flicker Measurement

- The last dc, dmax, and Tmax values are compared to their limit values, and the judgments (Pass/Fail) are displayed to the right of the last values.
- If a steady-state condition does not occur during the measurement period, it is considered to be a fluctuating condition. The measured value of dc is displayed as Undef (undefined, IEC 61000-4-15 Ed1.1) or 0 (IEC 61000-4-15 Ed2.0), and the judgment is displayed as Error (IEC 61000-4-15 Ed1.1) or Pass (IEC 61000-4-15 Ed2.0).
- Short-term flicker value Pst is calculated and compared to its limit value, and the judgment (Pass/Fail) is displayed.
- The judgment of items whose judgment is turned OFF is displayed as Undef.

Measurement of dmax Caused by Manual Switching

The words max and min are indicated to the right of the maximum and minimum dmax values over all observation periods, respectively.

Judgment by Measurement Item (Normal Voltage Fluctuation and Flicker Measurement)

- For dc, dmax, Tmax, and Pst, the judgment is Pass if the judgments of all observation periods are Pass; otherwise it is Fail. The items whose judgment is turned OFF are displayed as Undef.
- Compares the long-term flicker value, Plt, to the limit, and displays the judgment (pass or fail). The items whose judgment is turned OFF are displayed as Undef.

Judgment of the Average of dmax (Measurement of dmax Caused by Manual Switching)

Displays the average of 22 dmax values excluding the maximum and minimum values. The values are compared with limit, and the judgment (pass or fail) is displayed.

Element Judgment

Normal Voltage Fluctuation and Flicker Measurement

For elements whose measured data is displayed, the judgment is Pass if the judgments of all items whose judgment is set to ON are Pass; otherwise it is Fail. However, if dc is error, Error is indicated.

Measurement of dmax Caused by Manual Switching

Displays the judgment of the average of dmax for the element whose measured data is displayed.

Overall Judgment

The judgment is Pass if the judgments of all elements under measurement are Pass; otherwise it is Fail. However, if dc is error, Error is indicated in normal voltage fluctuation and flicker measurement.

Note

If an element that is not being measured is assigned to a display target element, Off is displayed by the element number, and all measured data are displayed as blank.

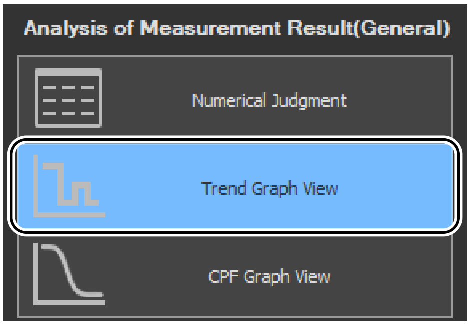
9.10 Displaying a Trend Graph

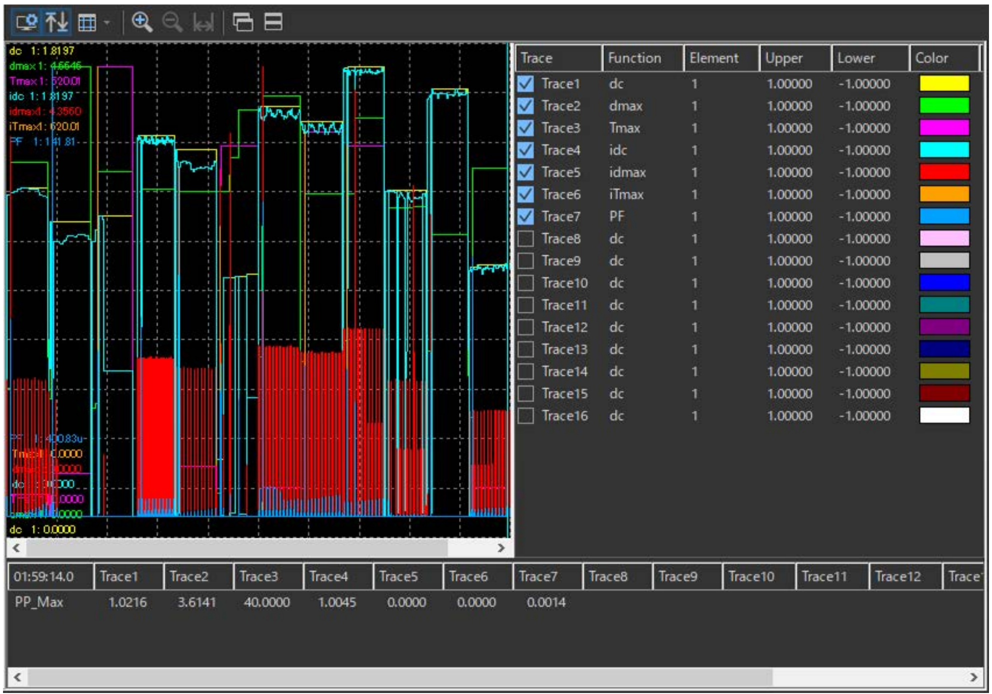
Procedure

1. Click  in the menu area. The Analysis submenu appears. For general information about submenus, see section 9.1.

Displaying Trend Graphs for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **Trend Graph View** under Analysis of Measurement Result (General). The trend graph display window appears.



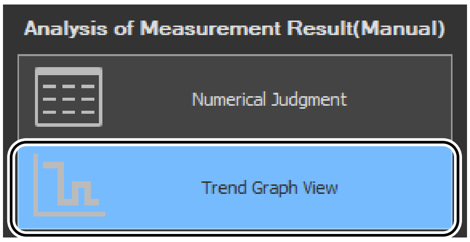


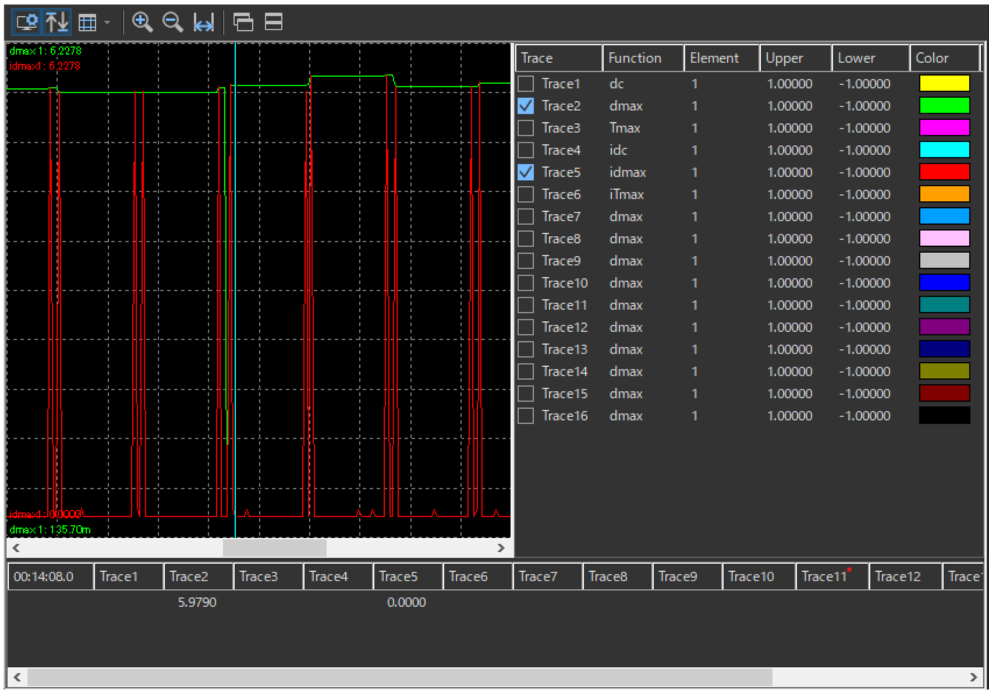
Note

- You can only select Trend Graph View in offline mode with the measured data loaded.
- If you change the size of the trend window while the trend graph is displayed, the size of the trend display area also changes.

Displaying Trend Graphs for Measurements of dmax Caused by Manual Switching (Manual dmax mode)

2. Click **Trend Graph View** under Analysis of Measurement Result (Manual). The trend graph display window appears.





Note

- You can only select Trend Graph View in offline mode with the measured data loaded.
- If you change the size of the trend window while the trend graph is displayed, the size of the trend display area also changes.

Configuring a Trend Graph

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Auto range

- **When the auto range button is pressed**
  The range changes automatically to match the acquired data.
- **When the auto range button is not pressed**
  When you click the Upper or Lower column headings, a combo box appears that allows you to set the display range upper and lower limits for each trace.

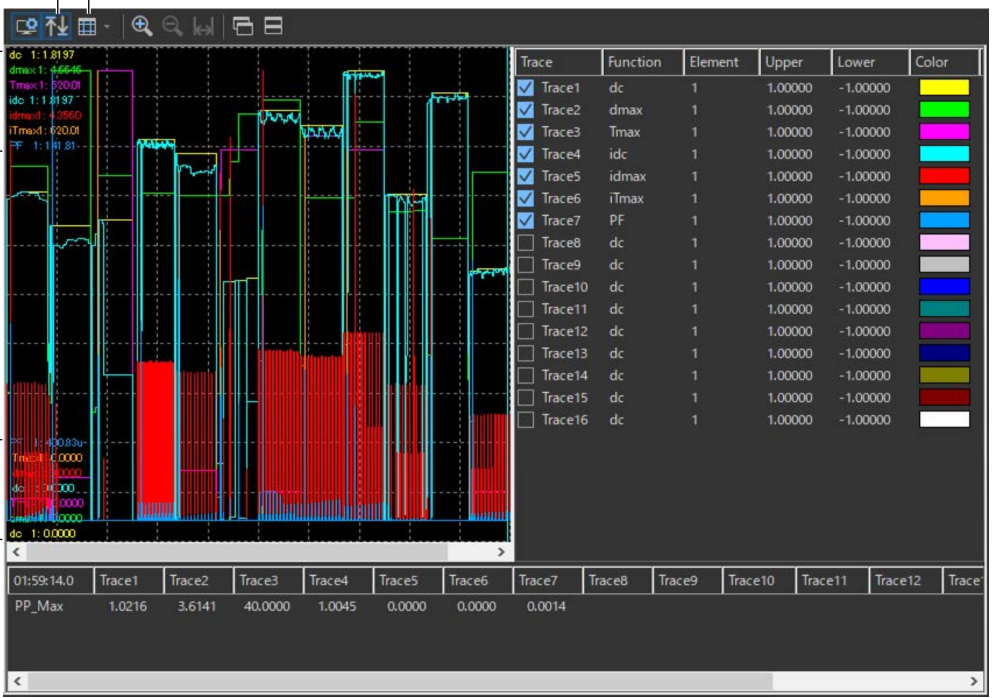
Grid

You can select the type of grid that will be displayed in the trend display area from Dotted, Line, and None.

- Dotted: A grid with dotted lines is displayed.
- Line: A grid with solid lines is displayed.
- None: No grid is displayed.

Upper limit of display range

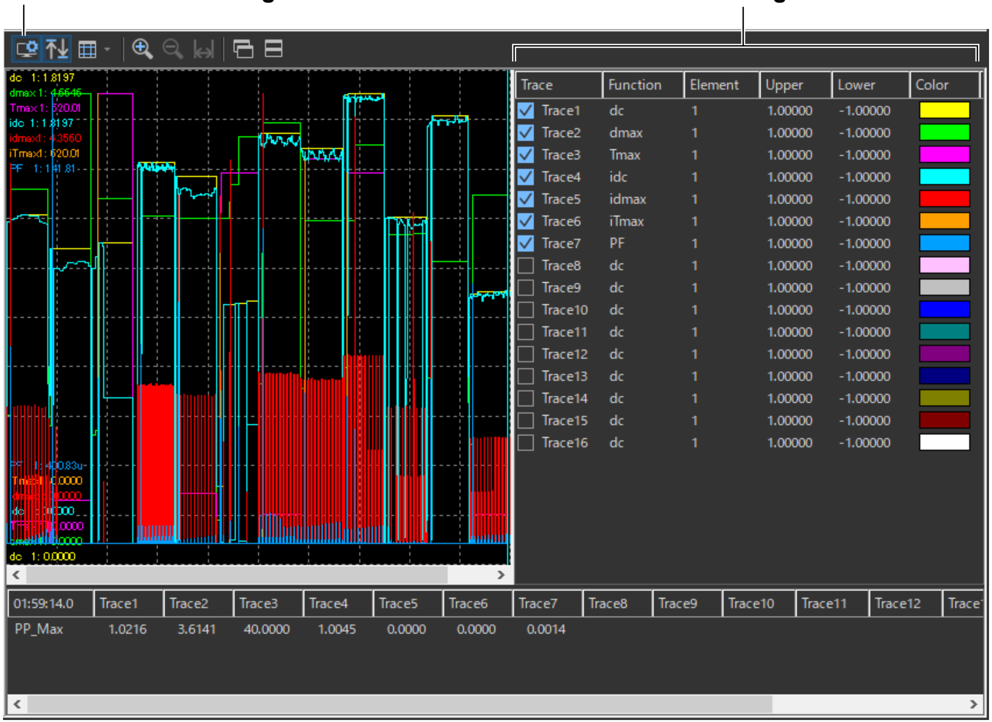
Lower limit of display range



Setting the Trace

The figure below is a display example of normal voltage fluctuation and flicker measurement in progress.

Show/hide trace settings box **Trace settings box**



Trace

Select the trends you want to display (select or clear the check boxes).

Function

Select the measurement function to be displayed. You can only select what measurement functions to display for normal voltage fluctuation and flicker measurement (General mode). In Manual dmax mode (measurement of dmax caused by manual switching), the only function that is displayed is dmax.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

- You can select from the following measurement functions.

dc	Relative steady-state voltage change
dmax	Maximum relative voltage change
Tmax	Period during which relative voltage change exceeds the threshold level
idc	Instantaneous relative steady-state voltage change
idmax	Instantaneous maximum relative voltage change
iTmax	Period during which instantaneous relative voltage change exceeds the threshold level
PF	Instantaneous flicker sensation (IFS)

- The measured value for PF is displayed at every 1-ms interval.
- The measured values for all measurement functions other than PF are displayed at every 2-s interval.

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Upper and Lower

If the Auto Ranging check box is not selected, set the Upper or Lower limit of the display range.

1. Click the **Upper** or **Lower** column. A combo box opens.
2. Set the upper or lower limit value of the display range.

Color

Select the display color of the trend.

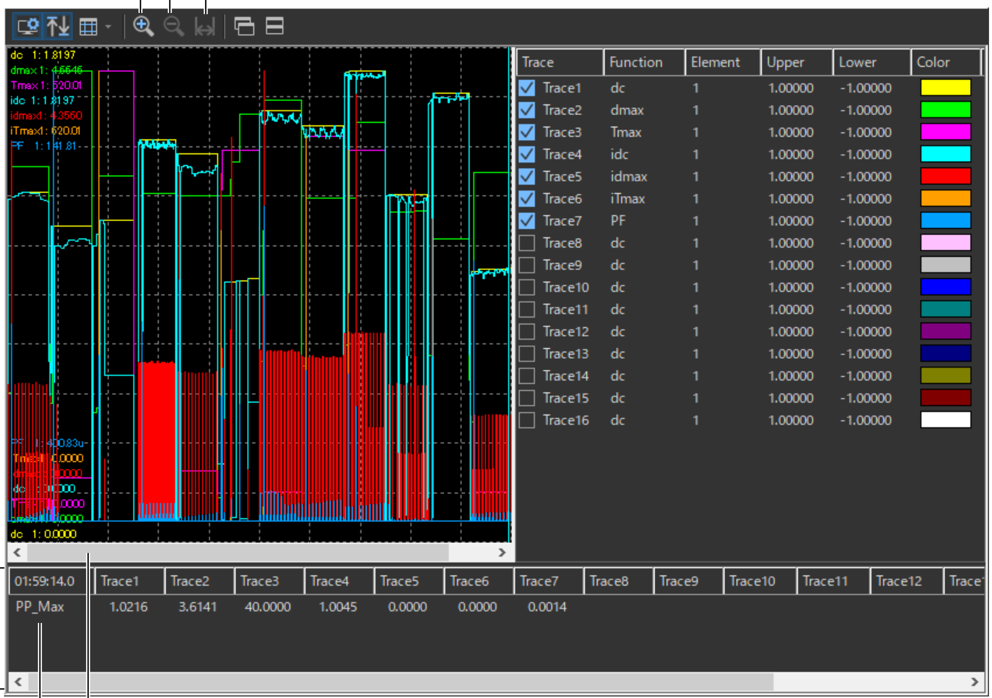
1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Zooming In and Out

Zoom in
Click to zoom in. You can zoom in until the trend display area contains 2 s worth of data.

Zoom out
Click to zoom out. You can zoom out until the trend display area contains the data for all of the elapsed time.

Display all: Displays the whole measurement time



Slider
Move along the time axis to the waveform that you want to display.

PP_Max
In the trend display, if not all the measured values can be displayed because the specified time axis value is set too high, measured values are P-P compressed and displayed.*
When this occurs, PP_Max is displayed here. For example, if the measured values for PF are being displayed but the measured values for every 1-ms interval will not fit on the trend graph, the P-P compressed measured values are displayed.
To display values without P-P compression, zoom in on the time axis.

* P-P Compression (Peak-to-Peak Compression)
In P-P compression, a maximum and minimum value are extracted from the values measured over a given period of time and are used to produce a compressed measured value.
For details, see the WT5000 Features Guide, IM WT5000-01EN.

Cursor
When you click somewhere on the trend display area, a cursor will appear there.
You can move the cursor by dragging it.

Note

When you zoom in on the time axis display, you can move the cursor in 1-ms intervals. The measured data at the cursor location will be displayed in the following ways:

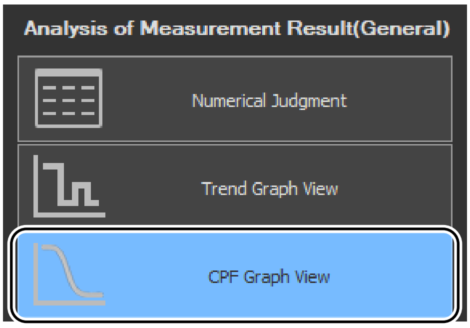
- The measured value for PF is displayed at every 1-ms interval.
- The measured values for all measurement functions other than PF are displayed using values interpolated from the data measured at every 2-s interval according to the cursor position.

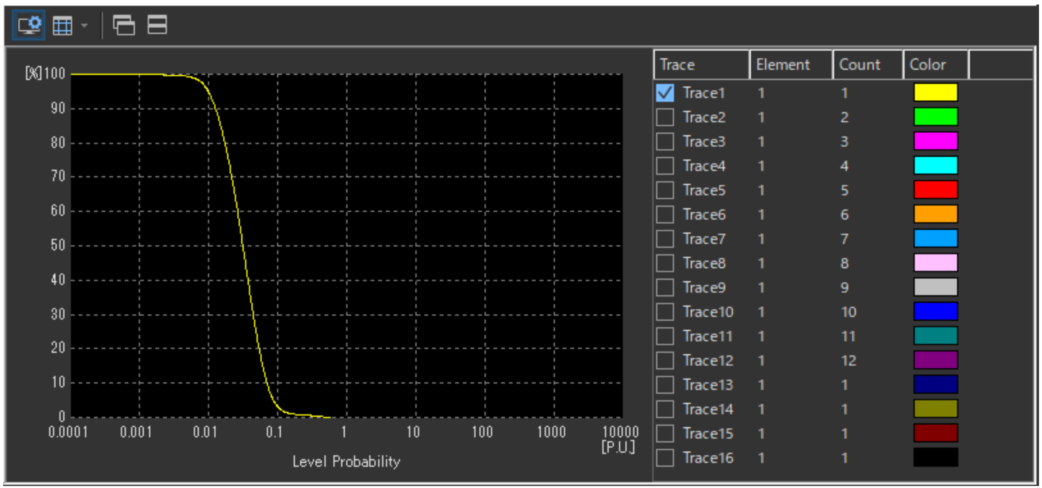
9.11 Displaying a CPF Graph

1. Click  in the menu area. The Analysis submenu appears. For general information about submenus, see section 9.1.

Displaying a CPF Graph for Normal Voltage Fluctuation and Flicker Measurements (General Mode)

2. Click **CPF Graph View** under Analysis of Measurement Result (General). The CPF graph display window appears.

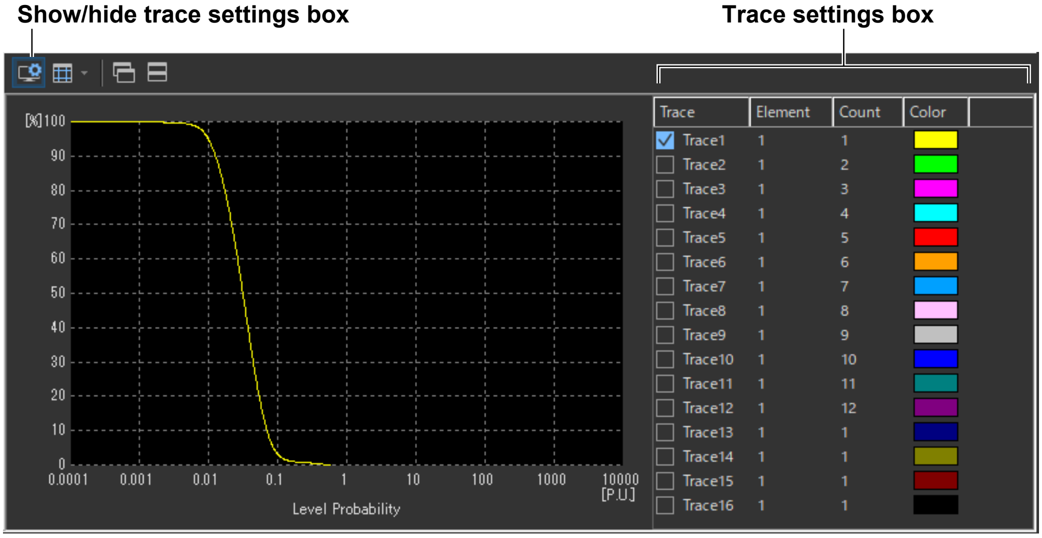




Note

- This view is available only for normal voltage fluctuation and flicker measurement.
- You can only select CPF Graph View in offline mode with the measured data loaded.
- The CPF graph is displayed for each observation period selected by the period number.
- You cannot display the CPF graph during measurement.

Setting the Trace



Trace

Select the trends you want to display (select or clear the check boxes).

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Color

Select the display color of the trend.

1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Count

Selects the observation period to be displayed on the CPF graph.
If you select a non-existing observation period, the waveform is not displayed.

Chapter 10

IEC 61000-3-12 Harmonic Measurement

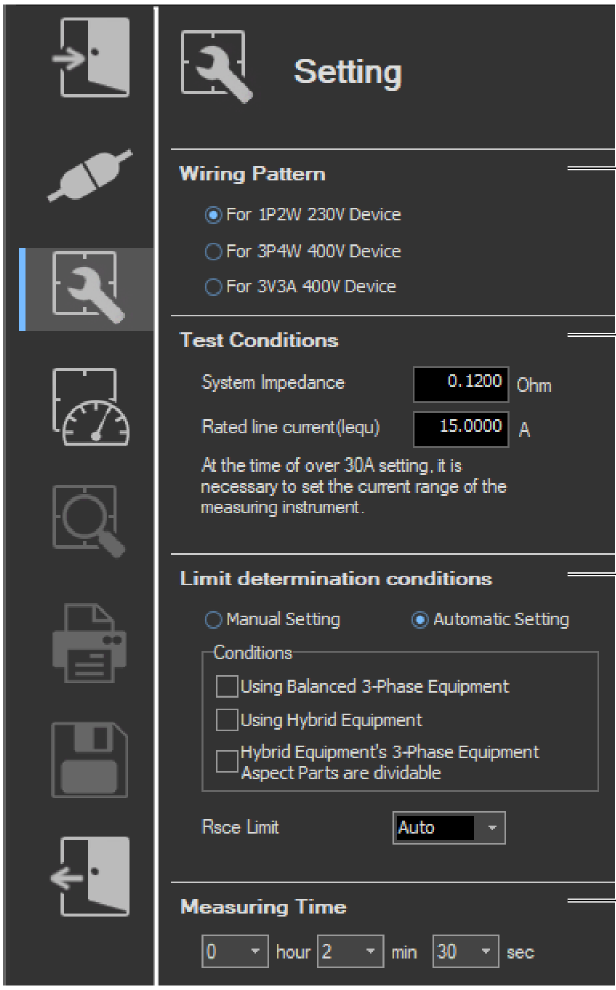
This chapter explains how to configure, measure, and analyze on the IEC 61000-3-12 Harmonic Measurement Software.

Using the Setting Page to Configure Measurement and Judgment Conditions

10.1 Setting General Test Conditions

Procedure

1. Click  in the menu area. The Setting submenu appears.

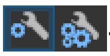


Wiring Pattern (see page 10-3)
Select the wiring pattern of the circuit you will measure.

Test conditions (page 10-3)
Set the test conditions.

Conditions for applying limits (page 10-3)
Set the conditions that determine the limits. This setting determines what limits will be applied when testing.

Measurement time (page 10-3)
Set the measurement time based on the conditions of the EUT.

In the setting and display area, you can switch between basic settings and advanced settings by clicking these buttons: . For details, see sections 10.3 and 10.4.

 Basic settings

 Advanced settings

Wiring Pattern

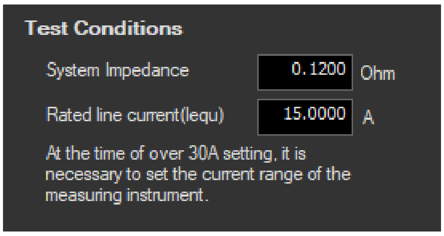
2. Select the wiring pattern of the circuit you will measure from the following:
- For 1P2W 230V Device
- For 3P4W 400V Device
- For 3V3A 400V Device

Note

When you switch wiring patterns, the following settings, which are displayed in the setting and display area, will change to default values that are appropriate to the wiring pattern that you select. For the default values, see sections 10.3 and 10.4.
- The WT settings (the settings on the WT Measurement Instrument tab)
- The testing judgment conditions (the settings under the Standard tab)

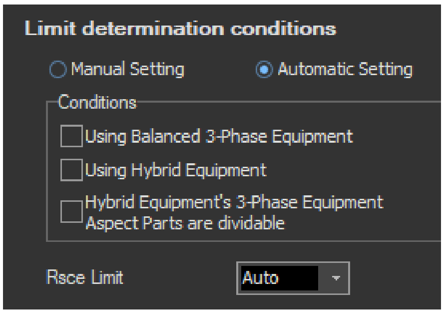
Test Conditions

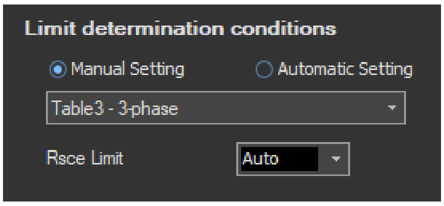
3. Set the System Impedance (Z) and the Rated Line Current (Iequ).



Limit Determination Conditions

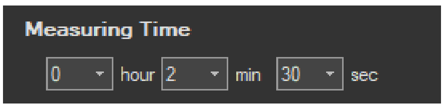
4. Set the conditions that determine the limits.





Measurement Time

5. Set the measurement time.



Note

When you change test conditions, limit determination conditions, or the measurement time, the judgment conditions on the standard tab that are displayed in the setting and display area will change accordingly. For details, see the explanation in section 10.3.

Explanation

Test Conditions

You can set the system impedance (Z) and the rated line current (Iequ) within these ranges:
System impedance (Z): 0.01 to 1000 Ω
Rated line current (Iequ): 0 to 1000 A

If you set the rated line current (Iequ) to a value greater than 20 A, in order to keep the voltage drop caused by the input impedance of the current input circuit to 0.15 Vrms or less, use a current sensor to measure the current rather than directly connecting the current to the WT. Set the WT current range and sensor ratios according to the procedure in section 7.2.

Limit Determination Conditions

Set the conditions that determine the limits. This setting determines what limits will be applied when testing. For details about the values of the limits, see section 1.3.

Measurement time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Selectable range: 0 H 0 M 1 S to 24 H 0 M 0 S in units of 1 s.

- An error occurs if a time exceeding 24 hours is specified.
- If the measurement time is set to 0 H 0 M 0 S and a measurement is started, the measurement continues until you choose Stop Test from the Measure menu or click the stop test icon on the toolbar.

Note

Depending on the environment of the PC onto which this software was installed, an error occurs if you specify a time longer than the memory area that can be reserved. If this happens, the following measures can be taken to increase the upper limit of time that can be specified.

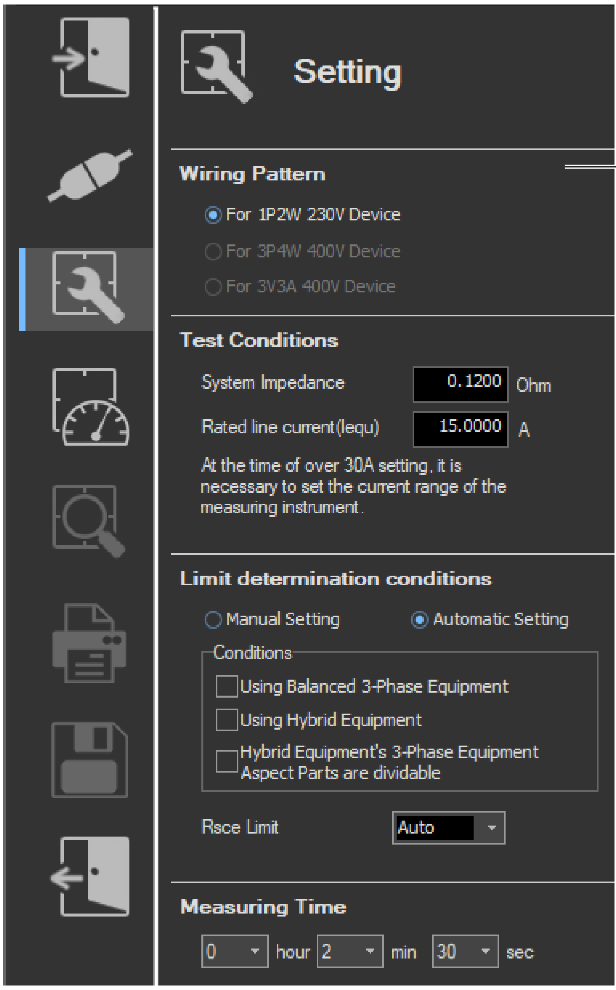
- Close other software applications
- Restart the software
- Restart the PC
- Expand the memory installed in the PC

10.2 Configuring the Power Supply

If an online connection is established with “Use” selected in “Configuring the Connection to the Power Supply” (see section 6.1), configure the power supply according to the procedure in this section.

Procedure

1. Click  in the menu area. The Setting submenu appears.



Wiring pattern
Only the selectable items become available depending on the type of connected NF power supply.

Various Power Supply Settings

1. In the setting and display area, select the **NF Power Supply** tab. Power supply settings are displayed.
2. Click the basic settings  or advanced settings  button.
3. Specify the settings.

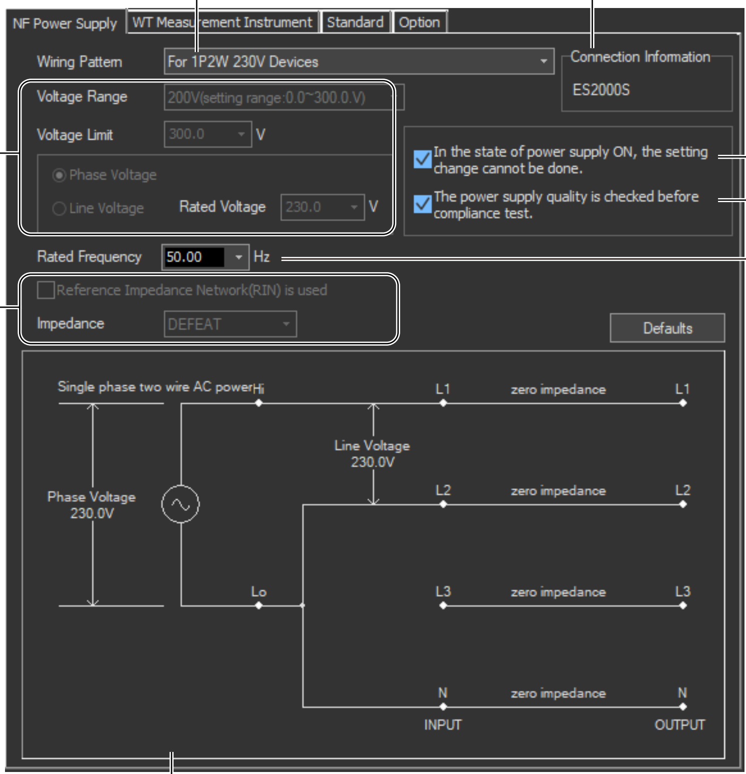
Basic Setting Mode

Click the basic button  to display the following settings.

In basic setting mode, when you set the wiring system, these boxes are set automatically. For details, see the next page. To view or change these settings, select advanced setting mode.

Power supply and reference impedance network (RIN) information
The power supply and RIN model are obtained automatically and displayed.*

Wiring pattern



Select this check box to prohibit changes to the settings when the power output is on.

Select this check box to check the power supply quality before measurement.
For details on the power supply quality check, see section 10.6.

Rated frequency
Select 50 Hz or 60 Hz from the drop-down list.
If you click the box, you can set the frequency in the range of 45.00 to 66.00.
You can select values that have been entered recently from the drop-down list.

Illustration of the setting information

* If any of the models from DP4164 to DP4169 is connected for the RIN, the software displays it as follows:
- Single-phase: DP4162
- Three-phase: DP4163

Wiring Pattern

Depending on the type of power supply that is connected, the selectable wiring systems are as follows. In addition, voltage range and other parameters are set to the following values.

When an ES2000S (Single-Phase Model) Is Connected

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	Not selected	DEFEAT

When an ES2000U (Three-Phase Model) Is Connected with the Slide Switch Set to Single-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	Not selected	DEFEAT

When an ES2000U (three-phase model) Is Connected with the Slide Switch Set to Three-Phase Mode

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9	Not selected	DEFEAT
Three-phase three-wire 400 V device	200	300.0	Line Voltage	400.0	Not selected	DEFEAT

When a DP Power Supply Single-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Single-phase two-wire 230 V device	200	300.0	Phase Voltage	230.0	1	DEFEAT

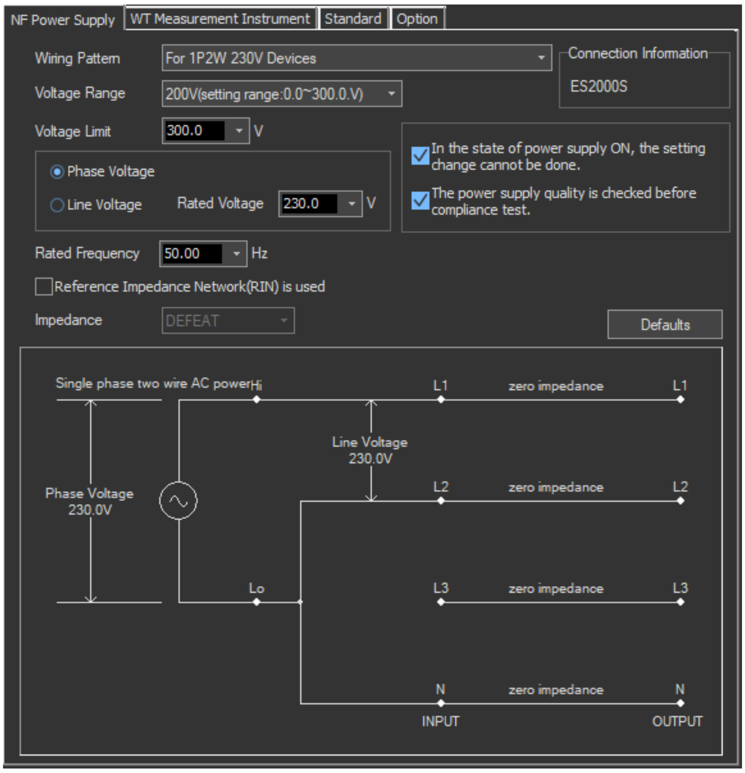
When a DP Power Supply Multi-Phase Model Is Connected or Multi-Phase Model with the Phase Mode Not Set to Single-Phase Two-Wire Output

Wiring Pattern	Voltage Range	Voltage Limit	Phase Voltage/ Line Voltage	Rated Voltage	Use RIN	Impedance
Three-phase four-wire 400 V device	200	300.0	Phase Voltage	230.9	1	DEFEAT
Three-phase three-wire 400 V device	200	300.0	Line Voltage	400.0	1	DEFEAT

1 When a RIN is connected: Selected
When a RIN is not connected: Not selected

Advanced Setting Mode

Click the advanced button  to display the following settings.



Voltage Range

Select 100 V or 200 V. The range of values that you can set for the rated voltage and voltage limit is displayed.

Voltage Limit

You can select the following values from the drop-down list for the voltage limit depending on the voltage range.

Voltage Range	Voltage Limit
100 V	150.0 V
200 V	300.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

Output Voltage Setting

Set the output voltage to **Phase Voltage** or **Line Voltage**.

Rated Voltage

You can select the following values from the drop-down list for the rated voltage output depending on the Phase Voltage/Line Voltage setting and voltage range.

		Phase Voltage/Line Voltage	
		Phase Voltage	**Line Voltage**
Voltage Range	100 V	100.0 V or 115.0 V	200.0 V or 230.0 V
	200 V	200.0 V or 230.0 V	200.0 V or 400.0 V

By clicking the box, you can set the value down to the first decimal place within the range shown in the Voltage Range box.

If the phase voltage of the rated voltage exceeds the value in the voltage limit table, the following values are set depending on the power supply type and voltage range.

- Voltage limit: The value in the voltage limit table
- Phase voltage/line voltage: Phase Voltage
- Rated voltage: Same value as the voltage range

Note

If the rated voltage is set using a line voltage, the line voltage is converted into phase voltage according to the wiring system and compared to the value in the voltage limit table.

Impedance

If you select the “Reference Impedance Network (RIN) is used” check box, you can set the following impedances according to the connected RIN. If you do not select the check box, DEFEAT appears in the box.

When an ES4152 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4162*

- DEFEAT
- 100 V
- 200 V
- 230 V

When an ES4153 is connected or when the RIN under Connection Information in the upper right of the tab sheet is DP4163*

- DEFEAT
- JPN 1φ
- JPN 3φ
- EU 1φ/3φ

* For the connection information when any of the models from DP4164 to DP4169 is connected for the RIN, see page 10-6.

If the RIN for the DP series power supply is not connected, you cannot select the “Reference Impedance Network (RIN) is used” check box. Consequently, you cannot change the impedance setting.

Defaults

The settings are reset to the following conditions (default values).

- Setting mode: basic
- Wiring pattern
  The wiring system is set as follows according to the connected power supply.
  - When an ES2000S (Single-Phase Model) Is Connected
    For 1P2W 230 V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to single-phase mode
    For 1P2W 230 V Device
  - When an ES2000U (three-phase model) is connected with the slide switch set to three-phase mode
    For 3P4W 400 V Device
  - When a DP series power supply single-phase model is connected or multi-phase model with the phase mode set to single-phase two-wire output
    For 1P2W 230 V Device
  - When a DP series power supply multi-phase model is connected or multi-phase model with the phase mode not set to single-phase two-wire output
    For 3P4W 400 V Device
- Voltage ranges: As shown in the table on page 10-7 according to the connected power supply and wiring system.
- Voltage limit: As shown in the table on page 10-7 according to the connected power supply and wiring system.
- Phase voltage/line voltage: As shown in the table on page 10-7 according to the connected power supply and wiring system.
- Rated voltage: As shown in the table on page 10-7 according to the connected power supply and wiring system.
- Rated frequency: 50 Hz
- The power supply quality is checked before compliance test: Selected
- Reference Impedance Network (RIN) is used
  - When an ES2000S or ES2000U is connected: Not selected
  - When a DP series power supply is connected
    When DP series RIN is connected: Check
    When DP series RIN is not connected: Not selected
- Impedance: DEFEAT

Settings at Startup

The above settings when the software is started are set as follows depending on the connection conditions.

Connection Condition	Setting
New connection	Default values
Same conditions as those of the loaded file	Settings of the loaded file
Same conditions as the last time	Settings used the last time

10.3 Setting the WT Measurement Conditions

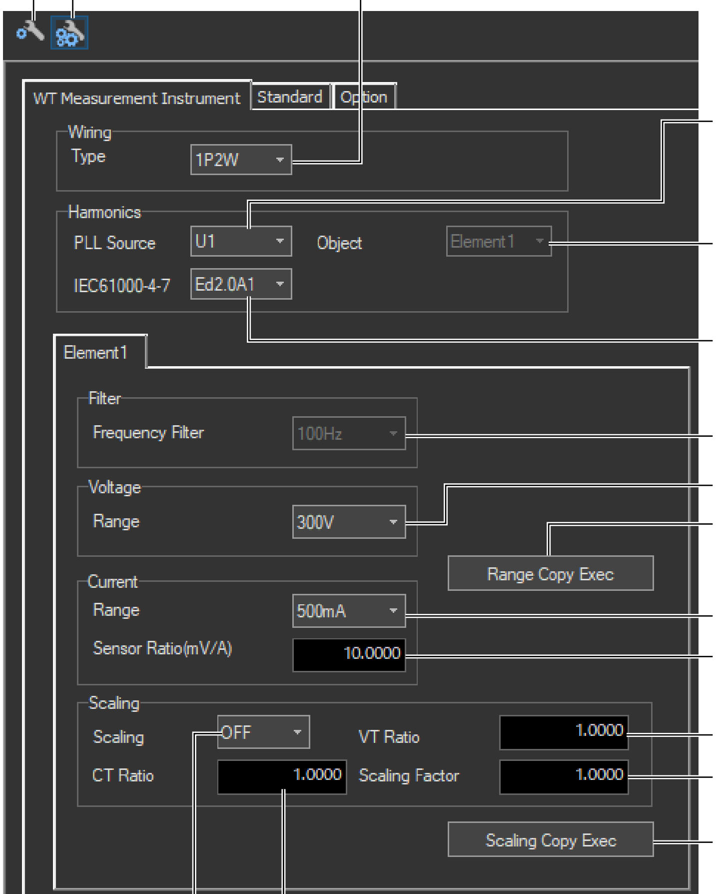
Procedure

1. Select the **WT Measurement Instrument** tab in the setting and display area. The WT measurement condition settings are displayed.
2. Click the basic settings  or advanced settings  button.
3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust these settings, click the advanced settings button.

- Frequency Filter
- Scaling Copy Exec
- All of the settings under Scaling



Explanation

Edition of the Standard (IEC 61000-4-7)

The following edition numbers can be selected in WT firmware version 2.01 and later.

- Edition 1.0
- Edition 2.0
- Edition 2.0 A1

IEC 61000-4-7 specifies requirements for measurement instruments.
For details, see Chapter 14.

Copying the Range

You can copy the range settings configured for one element to all other elements with the same wiring. The voltage range, the current range, and the external current sensor range are copied.

Copying the Scaling Settings

You can copy the scaling settings configured for one element to all other elements with the same wiring. The settings that are copied are:

- VT ratio
- CT ratio
- Scaling factor

For information about the following settings and how to make settings from the WT, see the following manuals.

Setting	Manuals	Refer To
Wiring Pattern	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.1
PLL source	Features Guide, IM WT5000-01EN	16 IEC Harmonic Measurement (Option)
	User's Manual, IM WT5000-02EN	Section 5.1
Frequency filter	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Section 2.7
Voltage/current range	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.2 and 2.3
Scaling	Features Guide, IM WT5000-01EN	4 Input Settings (Advanced/Options)
	User's Manual, IM WT5000-02EN	Sections 2.4 and 9.1

Note

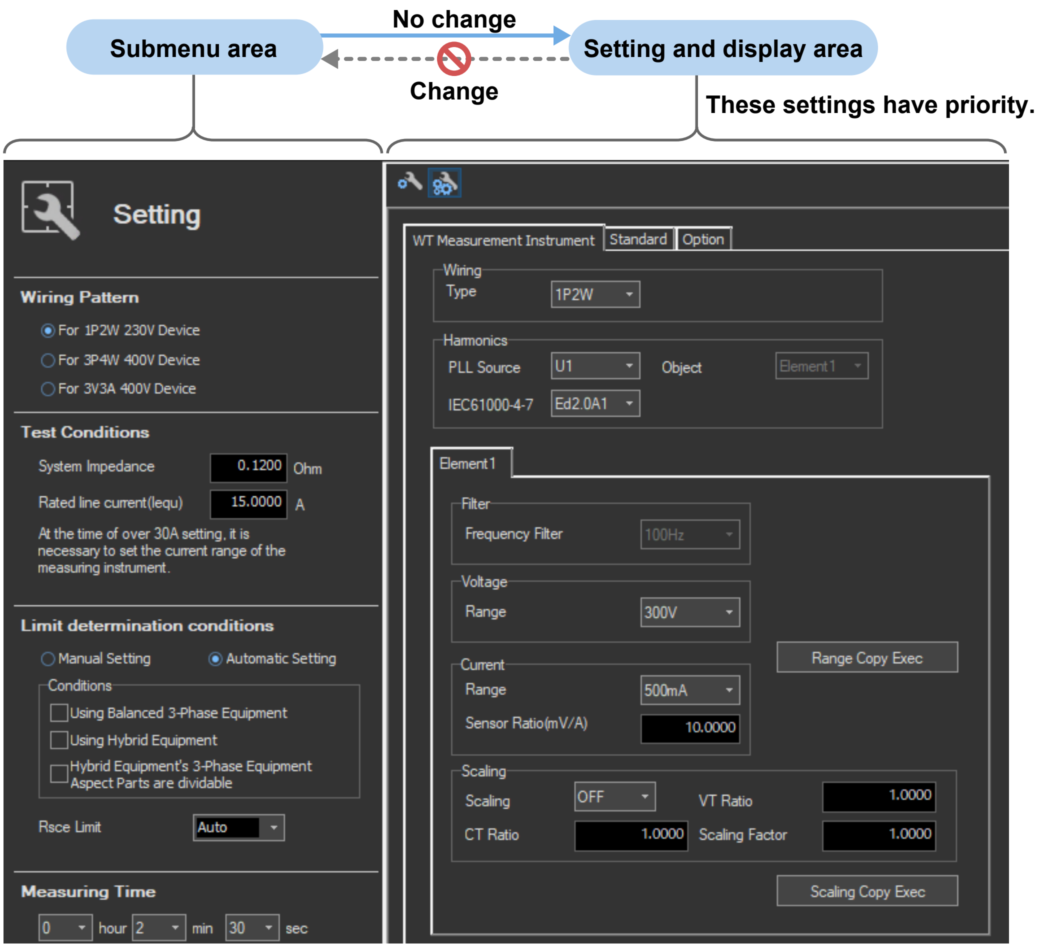
- When the wiring system is pattern 1 (when all are 1P2W), range, and scaling are copied to all other elements.
- When taking measurements with this software, the antialiasing filter cutoff frequency is fixed at 30 kHz.
- The exponential average function of the WT is ON.

Shared Settings between the Submenu and the Setting and Display Area

When you change the following settings in the submenu, the settings in the setting and display area will also change.

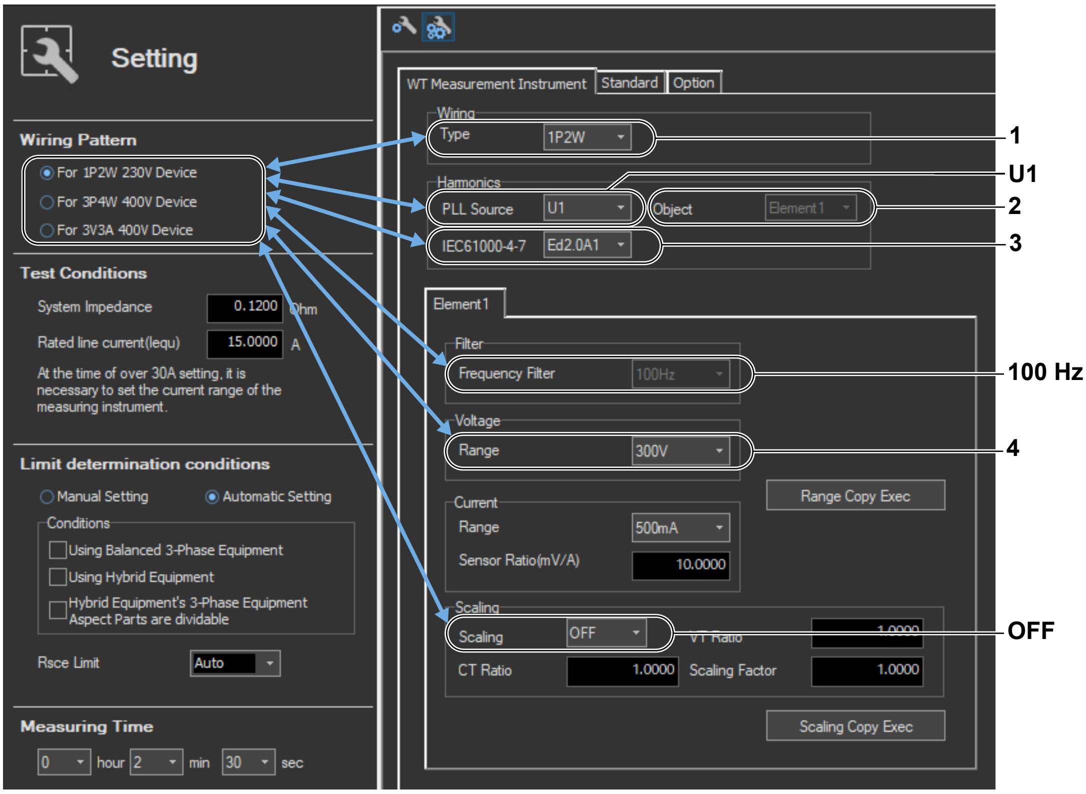
- Wiring system (see page 10-14)
- Test conditions (see section 10.1)
- Conditions for applying limits (see section 10.1)
- Measurement time (see 10.1)

The settings in the submenu will not change when you change the settings in the setting and display area.
When the settings in the submenu and the setting and display area are different, the settings in the setting and display area take precedence.



How Settings Change Based on the Selected Wiring Pattern

When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



1 The default Wiring value varies depending on the number of WT elements.

Wiring Pattern	Wiring
For 1P2W 230V Device	1P2W
For 3P4W 400V Device	3P4W[5]
For 3V3A 400V Device	3V3A[5]

5 An error message appears in the following cases.
- If the number of elements is insufficient
- If the wiring of the same type of modules cannot be configured

2, 4 The default setting for Object and Voltage Range varies depending on the wiring pattern.

Wiring Pattern	Object	Voltage Range
For 1P2W 230V Device	Element 1	300V
For 3P4W 400V Device	SigmaA [6]	300V
For 3V3A 400V Device	SigmaA [6]	600V

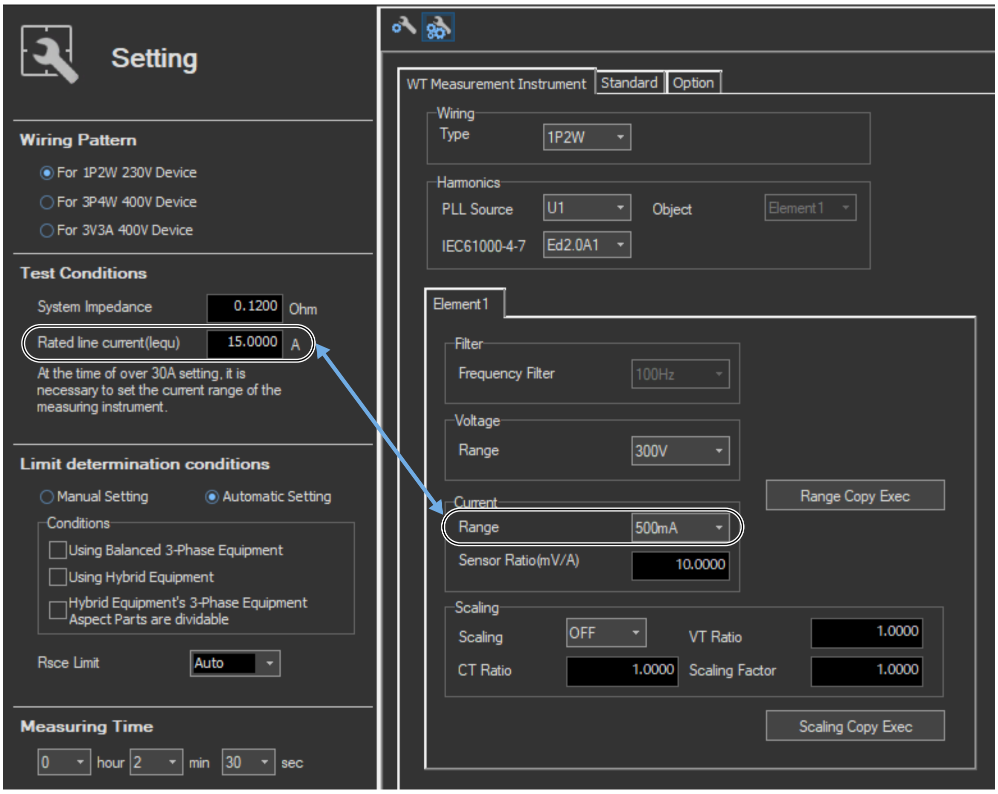
6 If the error described above in *5 occurs because of the selected wiring pattern, Object is automatically set to Element 1.

3 The default setting depends on the wiring pattern as shown below.

Wiring Pattern	Label	Setting
For 1P2W 230V Device	IEC 61000-4-7	Ed2.0A1
For 3P4W 400V Device	IEC 61000-4-7	Ed2.0A1
For 3V3A 400V Device	IEC 61000-4-7	Ed2.0A1

How Settings Change Based on Current Range Selection

When you select a current range in the Setting submenu, the settings marked off in the following figures will also change.



10.4 Setting the WT Judgment Conditions

Procedure

1. Select the **Standard** tab in the setting and display area. Judgment condition settings are displayed.

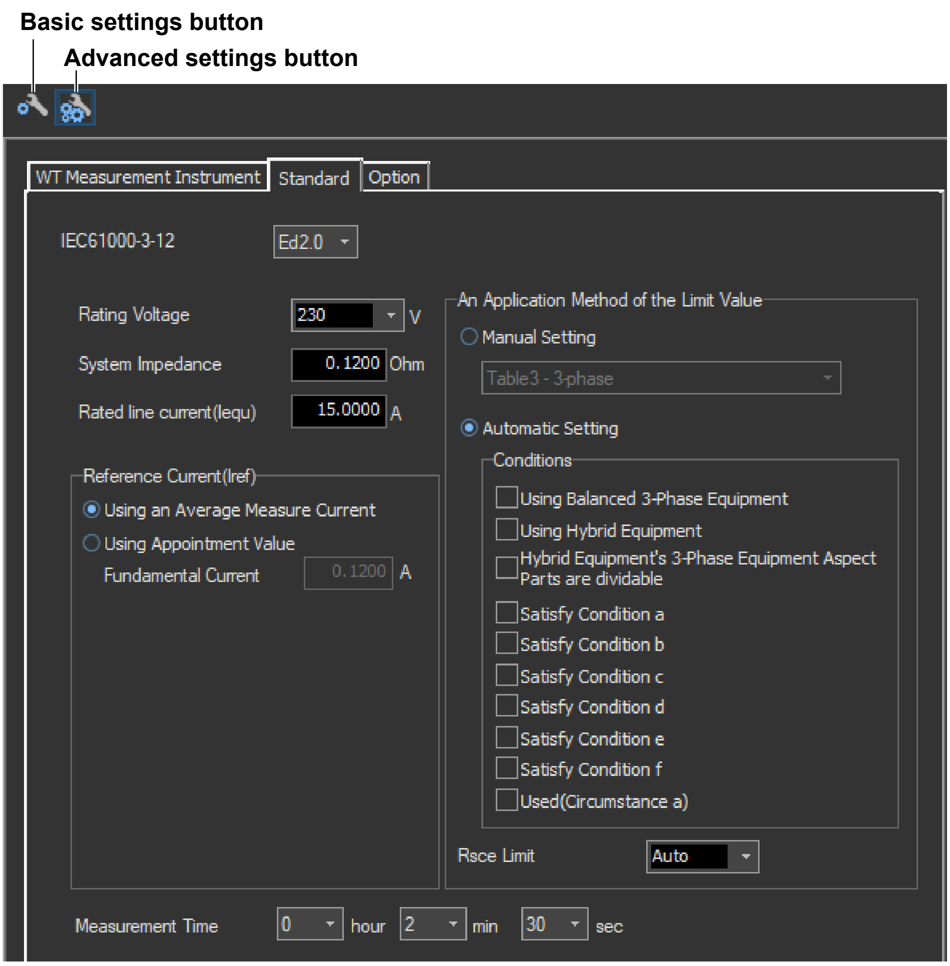
2. Click the basic settings button or advanced settings button.

3. Specify the settings.

Note

When you select the basic settings button, the following settings and buttons will be unavailable. To adjust these settings, click the advanced settings button.

- Fundamental Current box
- Manual Setting under An Application Method of the Limit Value
- The following items under Conditions
  - Satisfy Condition a
  - Satisfy Condition b
  - Satisfy Condition c
  - Satisfy Condition d
  - Satisfy Condition e
  - Satisfy Condition f



Explanation

For explanations of these terms, see section 1.4 and 1.7.

Rated Voltage

Select the rated voltage from the drop-down list. You can also set a value of your choice.

- When the selected wiring pattern is 1P2W 230 V device: 100, 200, or 230
- When the selected wiring pattern is 3P4W 400 V device: 115, 230, or 400
- When the selected wiring pattern is 3V3A 400 V device: 200 or 400

System Impedance (Z), and Rated Line Current (Iequ)

You can set the system impedance (Z) and the rated line current (Iequ) within these ranges:

- System impedance (Z): 0.01 to 1000 Ω
- Rated line current (Iequ): 0 to 1000 A

If you set the rated line current (Iequ) to a value greater than 20 A, in order to keep the voltage drop caused by the input impedance of the current input circuit to 0.15 Vrms or less, use a current sensor to measure the current rather than directly connecting the current to the WT. Set the WT current range and sensor ratios according to the procedure in section 10.3.

Reference Current (Iref)

You can select the reference current from the following options.

- Using an Average Measure Current
- Using Appointment Value

Rsce Limit

For the limit value, you can select how to apply the Rsce limit.

- Auto
- Fixed (select from the drop-down menu)
- Fixed (a specific value): 1 to 999

If you set the Rsce limit using a method other than Auto and a value exceeding the range of limit to be applied is specified, compliance is determined using the maximum or minimum value within the range.

Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Selectable range: 0 H 0 M 1 S to 24 H 0 M 0 S in units of 1 s.

- An error occurs if a time exceeding 24 hours is specified.
- If the measurement time is set to 0 H 0 M 0 S and a measurement is started, the measurement continues until you choose Stop Test from the Measure menu or click the stop test icon on the toolbar.

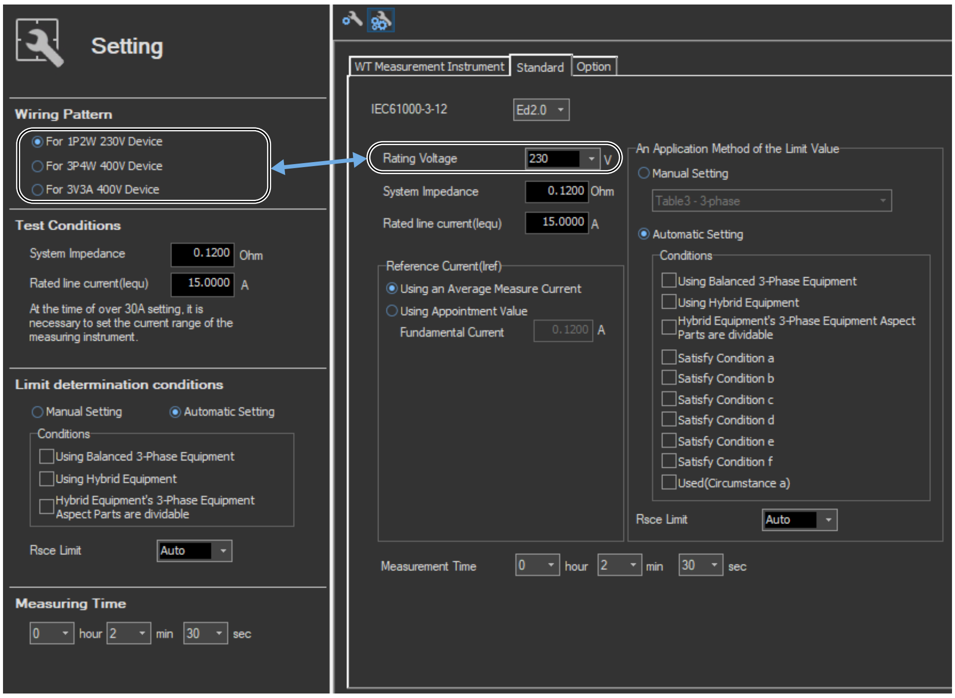
Note

Depending on the environment of the PC onto which this software was installed, an error occurs if you specify a time longer than the memory area that can be reserved. If this happens, the following measures can be taken to increase the upper limit of time that can be specified.

- Close other software applications
- Restart the software
- Restart the PC
- Expand the memory installed in the PC

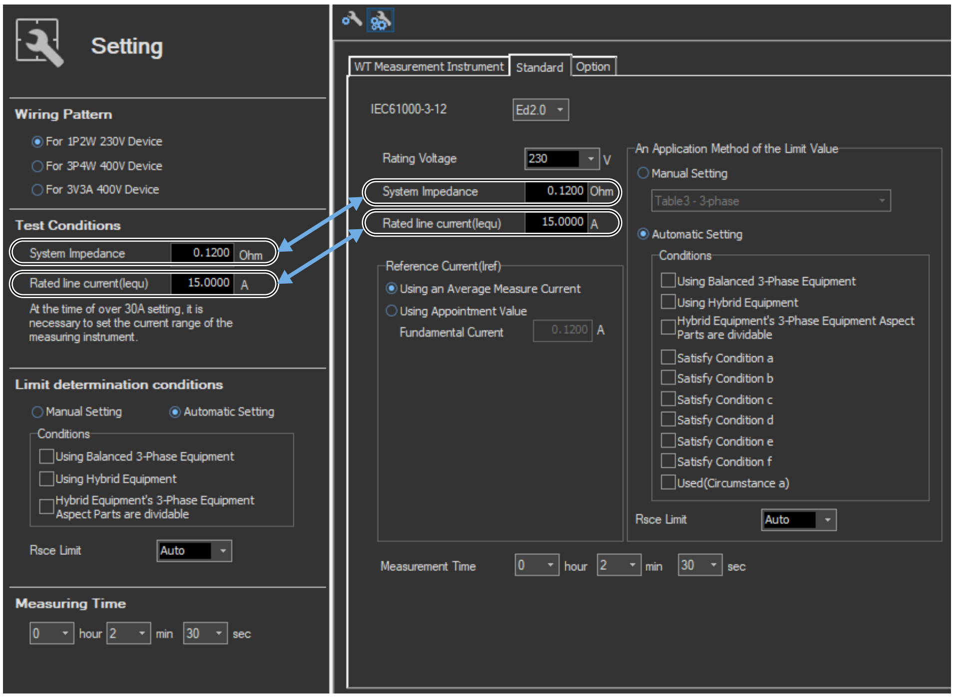
How Settings Change Based on the Selected Wiring Pattern

When you select a wiring pattern in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



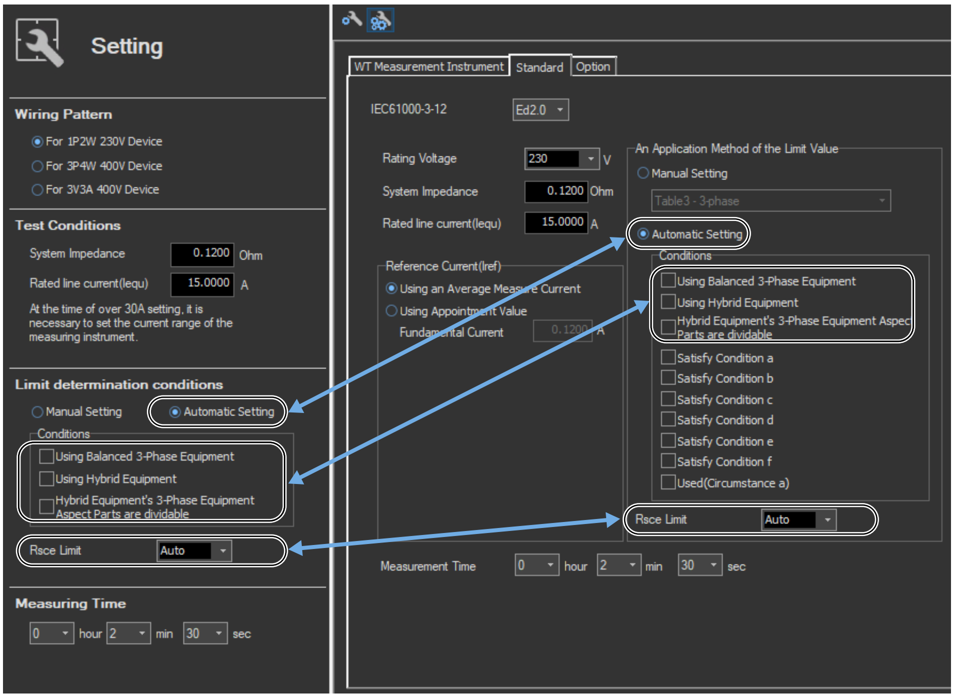
How Settings Change Based on Test Condition

When you set test condition in the Setting submenu, the settings marked off in the following figures change to their default values. The values in the figures are the default values.



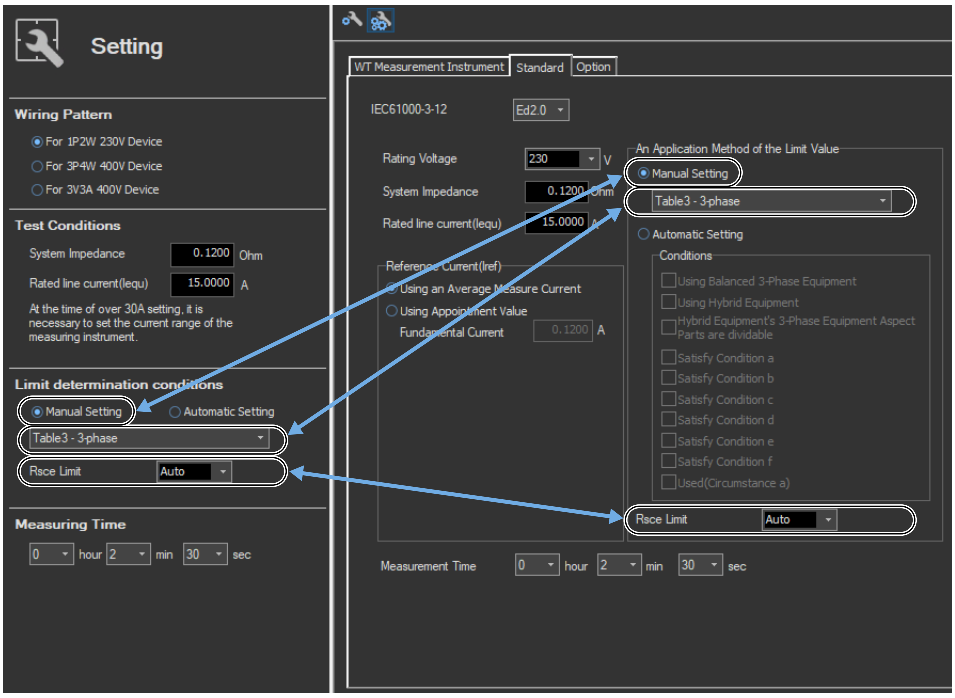
How Settings Change Based on Limit Determination Condition (Automatic Setting)

If you set the conditions for applying limits to auto, the settings marked off in the following figures will also change.



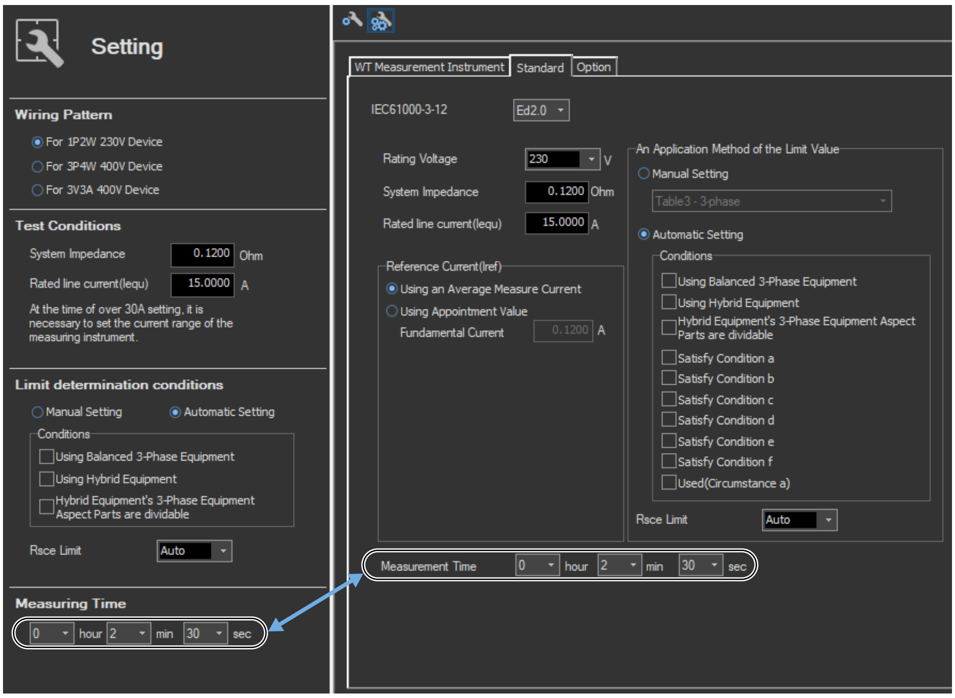
How Settings Change Based on Limit Determination Condition (Manual Setting)

When you set limit determination condition in the Setting submenu, the settings marked off in the following figures change to their default values.



How Settings Change Based on Measurement Time Selection

When you set Measuring time in the Setting submenu, the settings marked off in the following figures change to their default values.



10.5 Setting the Optional Conditions

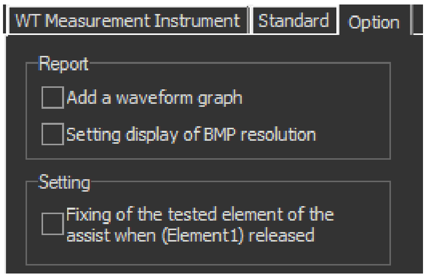
Procedure

1. Select the **Option** tab in the setting and display area. Judgment condition settings are displayed.

2. Specify the settings.

Note

The items that you can set are the same whether you press the basic settings button  or the advanced settings button .



Explanation

For explanations of these terms, see section 1.5.

Report

Add a waveform graph

Select this check box to include a waveform graph in the report.

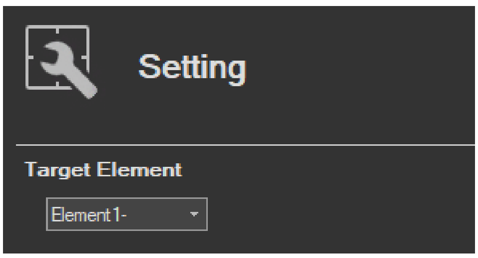
Setting display of BMP resolution

In the BMP item under Output Form of the Print menu, the selectable output resolutions appear. (See section 11.2.)

Setting

Fixing of the tested element of the assist when (Element1) released

Select the check box to select the target element. A target element setting box appears in the Setting submenu area.

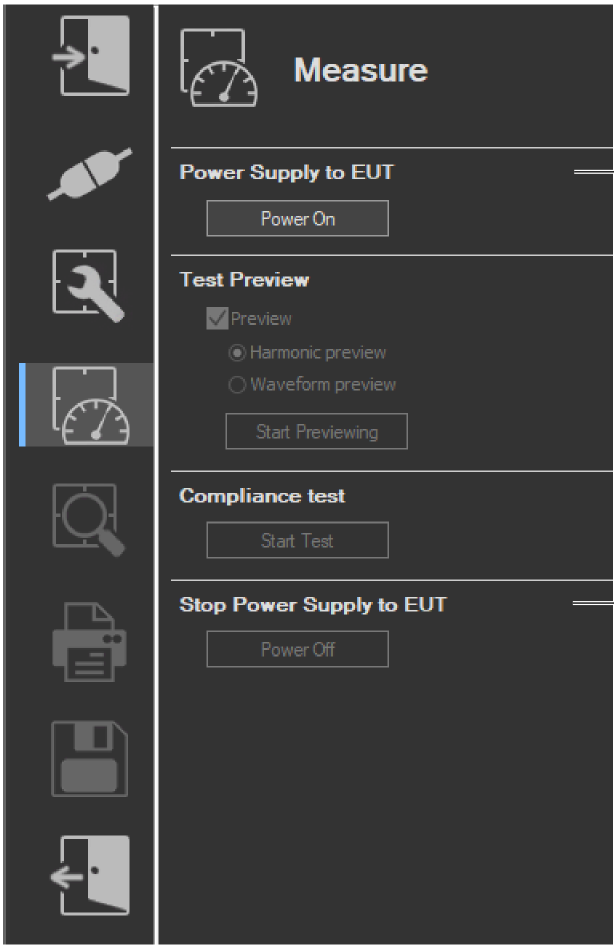


If the check box is not selected, the target element is fixed to element 1.

10.6 Turning the Power Output On and Off (When the power supply function is in use)

Procedure

1. Click  in the menu area. The Measure submenu appears.



Turn on the power supply to the EUT.

Turn off the power supply to the EUT.

Turning the Power Output On and Off

To turn the power output on or off, click **Power On** or **Power Off** in the submenu area.

Whether the Power On, Power Off, and measurement start/stop buttons are enabled or disabled in each of the software states are as follows:

Harmonic Measurement

Software State	Power Supply State	Power On	Power Off	Measurement Start/Stop
Before measurement initialization (Reset)	Power On Power Off	Disabled Enabled	Enabled Disabled	Measurement start Disabled
Measuring (Start)	Power On	Disabled	Disabled	Measurement stop
Measurement complete (Complete)	Power On Power Off	Disabled Enabled	Enabled Disabled	Measurement start Disabled

WT states are indicated in parentheses.

Note

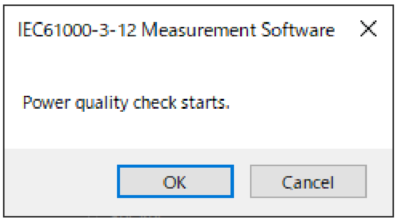
- If the software is in the Power On state and the software is switched from online to offline, the software switches to the Power Off state.
- If the software is switched from offline to online, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.
- When the software is closed, the software is set to the Power Off state regardless of whether the software is in the Power On or Power Off state.

Power Supply Quality Check

If the "The power supply quality is checked before compliance test" check box in the power supply settings (see page 10-6) is selected, the power supply quality is checked before the power output is turned on.

Note

If the /G7 option is not installed in the WT, the power supply quality cannot be checked.



The following items are verified.

- measurement time 200 ms
- Power supply judgment conditions

  Rated voltage[1] Within ±2.0 %

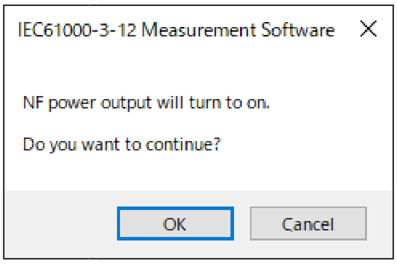
  Nominal frequency[2] Within ±0.5 %

- Relative harmonic content of output voltage U at no load

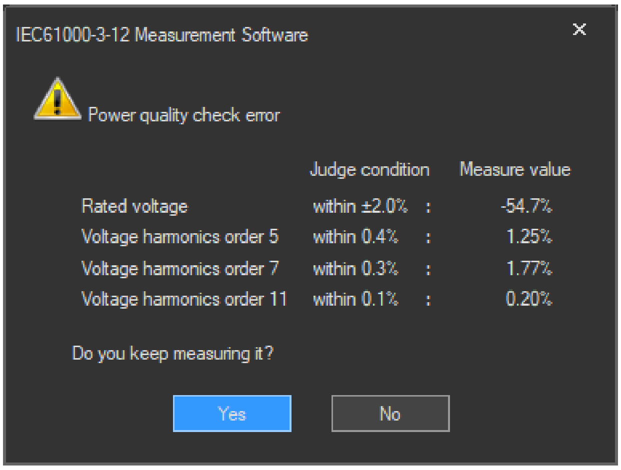
5th	1.5 %
3rd, 7th	1.25 %
11th	0.7 %
9th, 13th	0.6 %
Even harmonics between 2nd and 10th	0.4 %
12th, 14th to 40th	0.3 %

1 For the rated voltage, the rated voltage value in the power supply settings (see page 10-6) and the measured voltage (rms) are compared.
2 For the nominal frequency, the rated frequency value in the power supply settings (see page 10-6) and the measured value are compared.

If no problems are found in the power supply quality, a power output confirmation message appears.



If problems are found in the power supply quality, an error message appears. The item that resulted in error is displayed.



Starting a Harmonic Measurement

Start harmonic measurement according to section 10.7 (test preview) or 10.8 (compliance test).

Voltage Range Validity Check

When a compliance test is started, the software checks whether the NF power supply, WT and Harmonic Measurement Software are configured as shown in the following table.

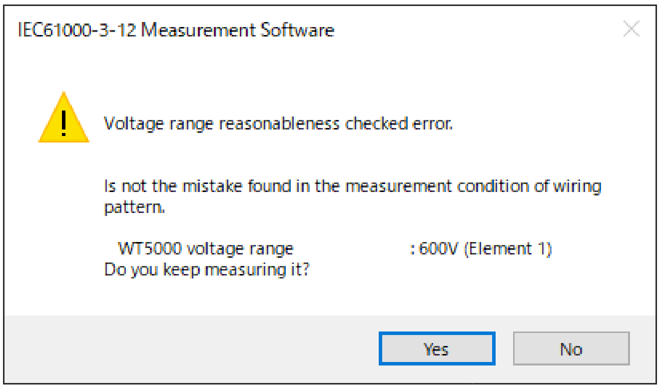
- If the NF Power Connection is set to Not Used in “Configuring the Connection to the Power Supply” (see section 6.1), the software checks whether the NF power supply, WT, and Harmonic Measurement Software are configured as shown in the following table before starting the harmonic measurement.

Wiring Pattern	NF Power Supply Settings			WT Voltage Range*
	Voltage Range	Rated Voltage	Rated Frequency	
Single-phase two-wire 230 V device	———	100 to 230 V	45 to 66 Hz	CF3: 100 V to 300 V
Three-phase four-wire 400 V device	200 V	220 to 240 V	45 to 66 Hz	CF3: 300 V to 600 V
Three-phase three-wire 400 V device	200 V	100 to 240 V	45 to 66 Hz	CF3: 300 V to 600 V

* “CF3” in the table indicates that the crest factor is set to 3.

- If the NF Power Connection is set to Not Used in “Configuring the Connection to the Power Supply” (see section 6.1), the WT voltage ranges in the table above are verified.

If the settings are different from those in the table, an error message will appear. The item that resulted in error is displayed.



Measured Element

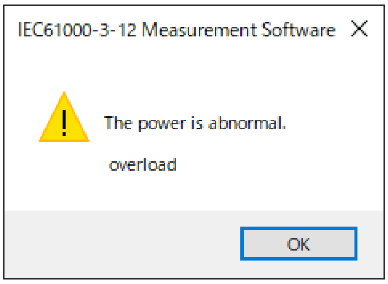
The measured element is determined by the WT measurement target (Object) setting.*

* See section 10.3.

For example, even when a three-phase power supply is being measured, if the WT measurement target (Object) is set only to Element 1, only input element 1 will be measured. Also, when a single-phase power supply is being measured, if the WT measurement target (Object) is set to Element 1 and 2, input element 2 (which is not receiving any signal) will also be measured, and the total judgment may indicate Fail.

Power Supply Error Check during Measurement

This software checks whether an error is occurring in the power supply during measurement. If an error is found, an error message appears. For example, if an overload occurs, the following error message will appear.

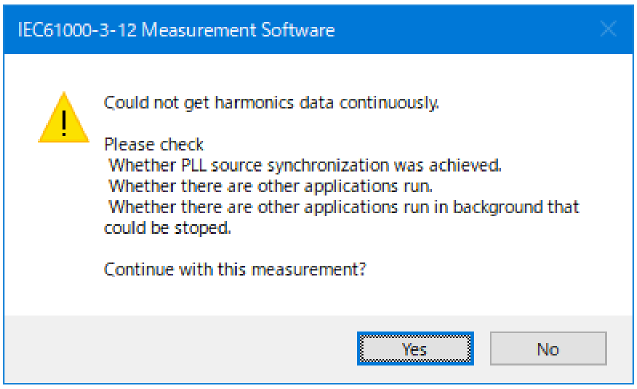


Note

The power output remains on even if the harmonic measurement is ended or aborted. (It is not automatically turned off.)

Data Acquisition Error Check during Measurement

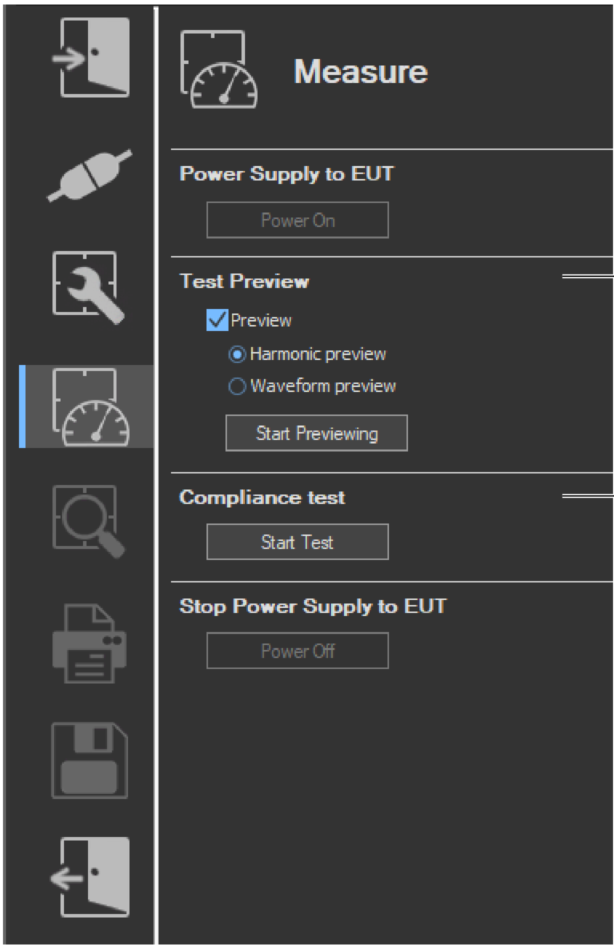
If harmonic measurement data cannot be acquired consecutively, the following error message will appear.



10.7 Previewing Harmonic Data and Waveform Data

Procedure

1. Click  in the menu area. The Measure submenu appears.



Test preview (page 10-28)
Before you start a test, you can check harmonic measurement data and waveform data.
You can execute a compliance test without previewing data.

Compliance test (page 10-32)
Executes a compliance test based on harmonic measurement.

An Example of the Setting and Display Area during a Preview

Sampled data number
When a preview is being displayed, the display here is 0/0. When a compliance test is being executed, the number of times measured data has been acquired is displayed (for details, see section 10.8).

Measure time
When a preview is being displayed, the display here is 0.0 sec/[the measurement time set according to the procedure described in section 10.1]. When a compliance test is being executed, the amount of time for which measured data has been acquired is displayed (for details, see section 10.8).

Displays cascaded windows

Displays tiled windows

Window arrangement buttons
For details, see section 7.15.

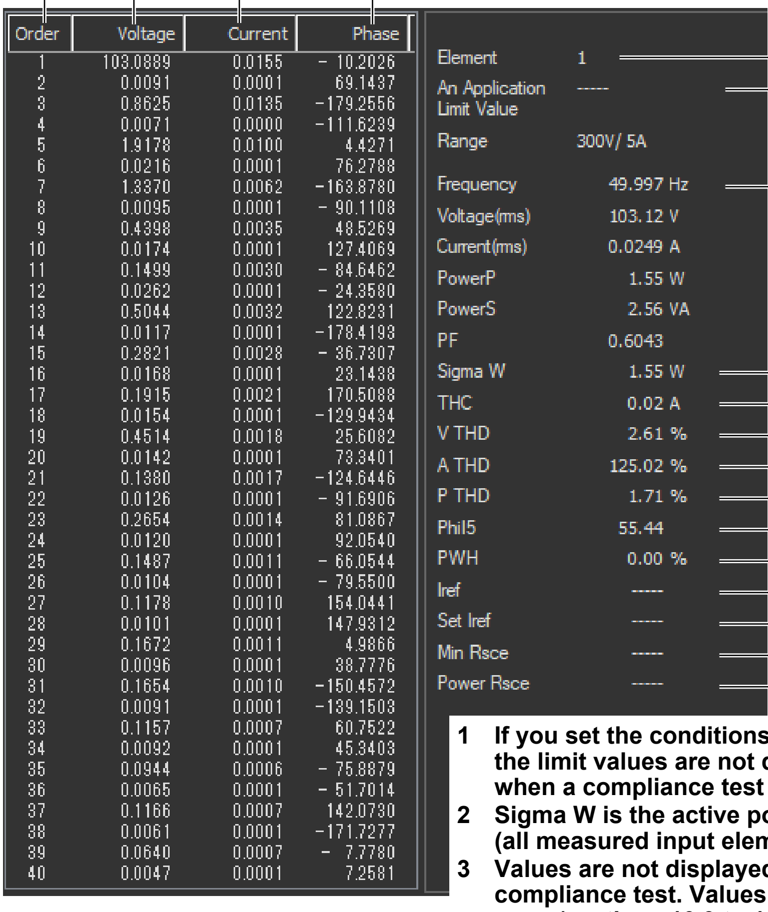
Select the element to display the data of.

Harmonic orders (1 to 40)

Rms voltage values for each harmonic

Rms current values for each harmonic

The current phase angle of each harmonic order relative to the fundamental current
However, the phase angle shown in the line for order 1 (–10.2026° in this example) is the phase angle of the fundamental current waveform relative to the fundamental voltage waveform.



Order	Voltage	Current	Phase
1	103.0889	0.0155	-10.2026
2	0.0091	0.0001	69.1437
3	0.8625	0.0135	-179.2556
4	0.0071	0.0000	-111.6239
5	1.9178	0.0100	4.4271
6	0.0216	0.0001	76.2788
7	1.3370	0.0062	-163.8780
8	0.0095	0.0001	-90.1108
9	0.4398	0.0035	48.5269
10	0.0174	0.0001	127.4069
11	0.1499	0.0030	-84.6462
12	0.0262	0.0001	-24.3580
13	0.5044	0.0032	122.8231
14	0.0117	0.0001	-178.4193
15	0.2821	0.0028	-36.7307
16	0.0168	0.0001	23.1438
17	0.1915	0.0021	170.5088
18	0.0154	0.0001	-129.9434
19	0.4514	0.0018	25.6082
20	0.0142	0.0001	73.3401
21	0.1380	0.0017	-124.6446
22	0.0126	0.0001	-91.6906
23	0.2654	0.0014	81.0867
24	0.0120	0.0001	92.0540
25	0.1487	0.0011	-66.0544
26	0.0104	0.0001	-79.5500
27	0.1178	0.0010	154.0441
28	0.0101	0.0001	147.9312
29	0.1672	0.0011	4.9866
30	0.0096	0.0001	38.7776
31	0.1654	0.0010	-150.4572
32	0.0091	0.0001	-139.1503
33	0.1157	0.0007	60.7522
34	0.0092	0.0001	45.3403
35	0.0944	0.0006	-75.8879
36	0.0065	0.0001	-51.7014
37	0.1166	0.0007	142.0730
38	0.0061	0.0001	-171.7277
39	0.0640	0.0007	-7.7780
40	0.0047	0.0001	7.2581

Input element

Application Limit[1]

The fundamental frequency of the PLL source

Active power of all phases[2]

Total harmonic current

Total harmonic distortion of voltage

Total harmonic distortion of current

Total harmonic distortion of power

Phase angle of the 5th harmonic current

Partial weighted harmonic current

Reference fundamental current[3]

Specified reference current

Minimum short circuit ratio[3]

Power supply short circuit ratio[3]

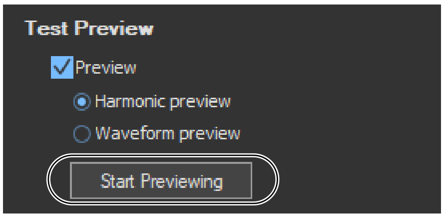
1. **If you set the conditions for applying limits to auto, the limit values are not displayed in the preview or when a compliance test is executed.**
2. **Sigma W is the active power for all grouped phases (all measured input elements).**
3. **Values are not displayed during a preview or compliance test. Values appear on the Analysis page (sections 10.9 to 10.15).**

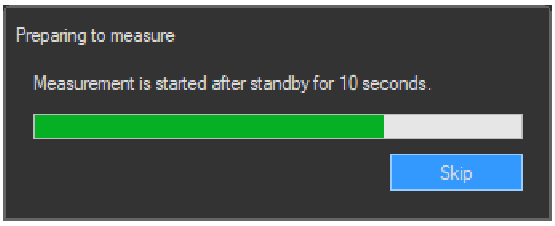
Previewing Harmonic Data

2. Select the **Preview** check box.

3. Select **Harmonic preview**.

4. Click **Start Previewing**. A message will appear to indicate that you have to wait before measurement starts. After that, the measured harmonic values will appear in the display area.



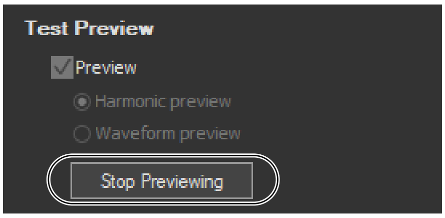


Note

When you preview the harmonics of a current, the data that had been acquired or loaded before the preview is discarded. Be sure to save any compliance test data before you begin a harmonic preview (for information on how to save data, see chapter Chapter 12).

Stopping a Harmonic Preview

Click **Stop Previewing**.



Selecting the Element Whose Data You Want to Display

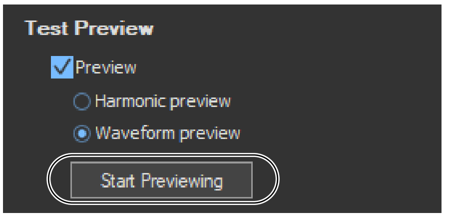
Click . If input elements 1 to 3 are being measured, as you click the icon, the displayed data will switch from element 1, to element 2, to element 3, to element 1, and so on. Click ▼ to select an element directly.

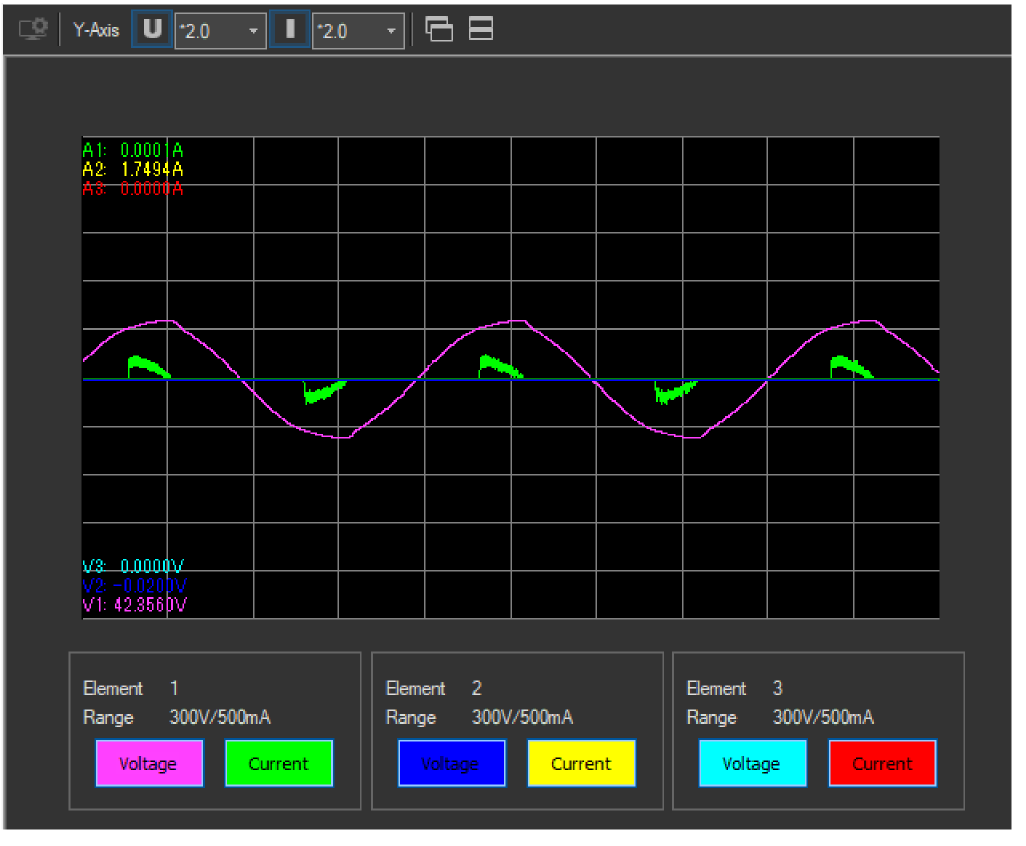
Previewing Waveforms

2. Select the **Preview** check box.

3. Select **Waveform preview**.

4. Click **Start Previewing**. Voltage and current waveform previews appear in the waveform observation window.





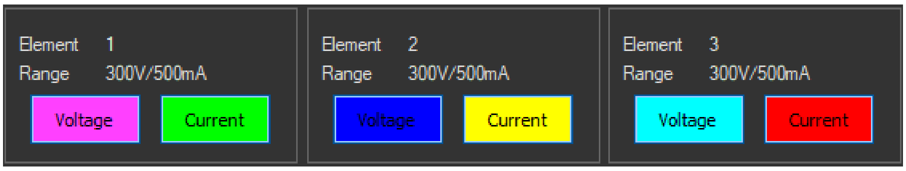
Note

When you preview waveforms, the data that had been acquired or loaded before the preview is lost. Be sure to save any compliance test data before you begin a waveform preview (for information on how to save data, see chapter Chapter 12).

Showing/Hiding Specific Waveforms

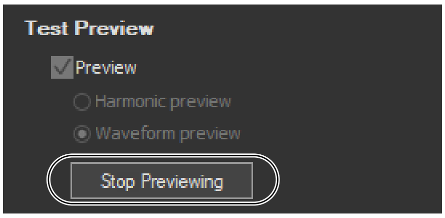
You can show or hide an element's voltage or current waveform by clicking on the Voltage and Current buttons for each element in the show/hide box.

Show/hide box



Stopping a Waveform Preview

Click **Stop Previewing**.



Explanation

Display Colors

The following colors are assigned to the waveforms of each input element in order, starting with the lowest numbered element. If you are previewing the waveforms of elements 1, 2, and 3, the following colors will be assigned to the element's voltage and current waveforms:

Element	Voltage	Current
Element 1	Pink	Bright green
Element 2	Blue	Yellow
Element 3	Turquoise	Red

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

10.8 Making Compliance Test (Harmonic Measurements)

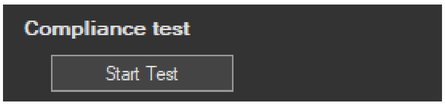
Procedure

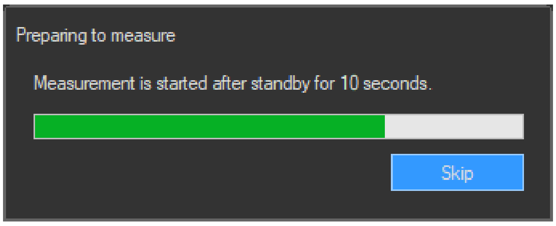
1. Click  in the menu area. The Measure submenu appears.

For general information about submenus, see section 10.7.

Starting a Test

2. Click **Start Test**. A dialog box opens that indicates that you have to wait before measurement starts. Then measured harmonic values appear in the measured harmonic values list window.





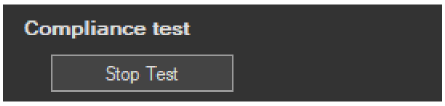
Stopping a Test

Stopping Automatically

The software will stop testing automatically once the specified measurement time has been reached.

Stopping Manually

Click **Stop Test**. If the WT is measuring, it will stop when measurement ends normally and data has been acquired.



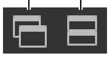
An Example of the Setting and Display Area during a Compliance Test

Sampled data number
One sample count is equivalent to 200 ms (10 waves for 50 Hz and 12 waves for 60 Hz) worth of measured instantaneous data values.
This data is acquired by the software and displayed. In this example, 145 samples have been acquired.

Measure time
The amount of time that has elapsed since the start of measurement/the measurement time set according to the procedure described in section 10.1.

Displays cascaded windows

Displays tiled windows



Window arrangement buttons
For details, see section 7.15.

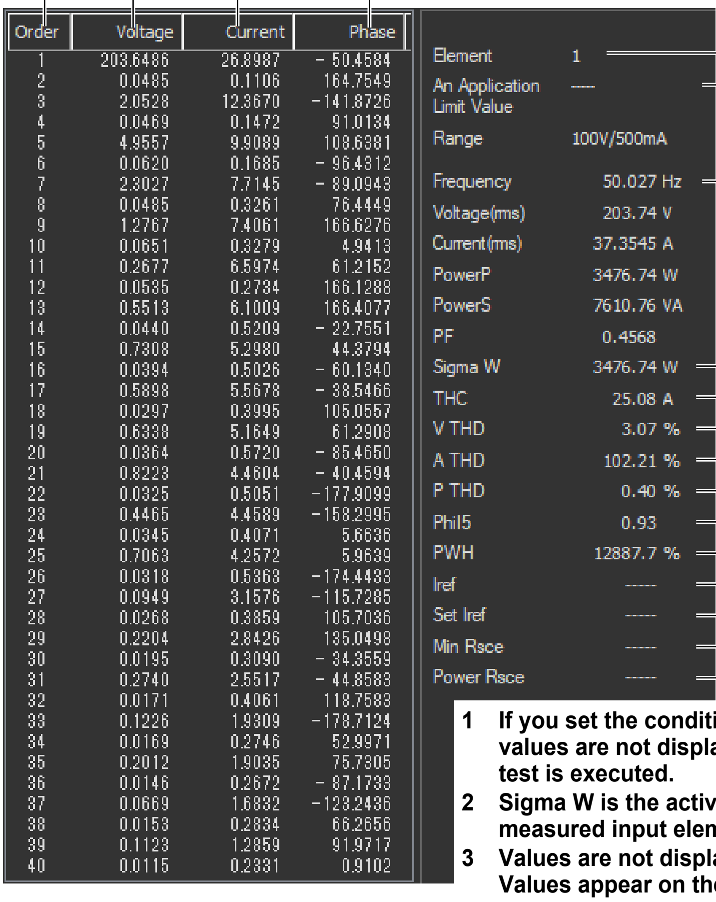
Select the element to display the data of.

Harmonic orders (1 to 40)

Rms voltage values for each harmonic

Rms current values for each harmonic

The current phase angle of each harmonic order relative to the fundamental current
However, the phase angle shown in the line for order 1 (–50.4583° in this example) is the phase angle of the fundamental current waveform relative to the fundamental voltage waveform.



Order	Voltage	Current	Phase
1	203.6486	26.8987	− 50.4584
2	0.0485	0.1106	164.7549
3	2.0528	12.3670	−141.8726
4	0.0469	0.1472	91.0134
5	4.9557	9.9089	108.6381
6	0.0620	0.1685	− 96.4312
7	2.3027	7.7145	− 89.0943
8	0.0485	0.3261	76.4449
9	1.2767	7.4061	166.6276
10	0.0651	0.3279	4.9413
11	0.2677	6.5974	61.2152
12	0.0535	0.2734	166.1288
13	0.5513	6.1009	166.4077
14	0.0440	0.5209	− 22.7551
15	0.7308	5.2980	44.3794
16	0.0394	0.5026	− 60.1340
17	0.5898	5.5678	− 38.5466
18	0.0297	0.3995	105.0557
19	0.6338	5.1649	61.2908
20	0.0364	0.5720	− 85.4650
21	0.8223	4.4604	− 40.4594
22	0.0325	0.5051	−177.9099
23	0.4465	4.4589	−158.2995
24	0.0345	0.4071	5.6636
25	0.7063	4.2572	5.9639
26	0.0318	0.5363	−174.4433
27	0.0949	3.1576	−115.7285
28	0.0268	0.3859	105.7036
29	0.2204	2.8426	135.0498
30	0.0195	0.3090	− 34.3559
31	0.2740	2.5517	− 44.8583
32	0.0171	0.4061	118.7583
33	0.1226	1.9309	−178.7124
34	0.0169	0.2746	52.9971
35	0.2012	1.9035	75.7305
36	0.0146	0.2672	− 87.1733
37	0.0669	1.6832	−123.2436
38	0.0153	0.2834	66.2656
39	0.1123	1.2859	91.9717
40	0.0115	0.2331	0.9102

Element	1	**Input element**
An Application Limit Value	-----	**Application Limit**[1]
Range	100V/500mA	
Frequency	50.027 Hz	**The fundamental frequency of the PLL source**
Voltage(rms)	203.74 V	
Current(rms)	37.3545 A	
PowerP	3476.74 W	
PowerS	7610.76 VA	
PF	0.4568	
Sigma W	3476.74 W	**Active power of all phases**[2]
THC	25.08 A	**Total harmonic current**
V THD	3.07 %	**Total harmonic distortion of voltage**
A THD	102.21 %	**Total harmonic distortion of current**
P THD	0.40 %	**Total harmonic distortion of power**
PhiI5	0.93	**Phase angle of the 5th harmonic current**
PWH	12887.7 %	**Partial weighted harmonic current**
Iref	-----	**Reference fundamental current**[3]
Set Iref	-----	**Specified reference current**
Min Rsce	-----	**Minimum short circuit ratio**[3]
Power Rsce	-----	**Power supply short circuit ratio**[3]

1 **If you set the conditions for applying limits to auto, the limit values are not displayed in the preview or when a compliance test is executed.**
2 **Sigma W is the active power for all grouped phases (all measured input elements).**
3 **Values are not displayed during a preview or compliance test. Values appear on the Analysis page (sections 10.9 to 10.15).**

10

IEC 61000-3-12 Harmonic Measurement

Judgment Display

Once the test is finished, the overall judgment appears in the information area.

If all of the elements that are tested pass, PASS appears. Otherwise, FAIL appears.

	**PASS**
	**FAIL**
	**No data**

Explanation

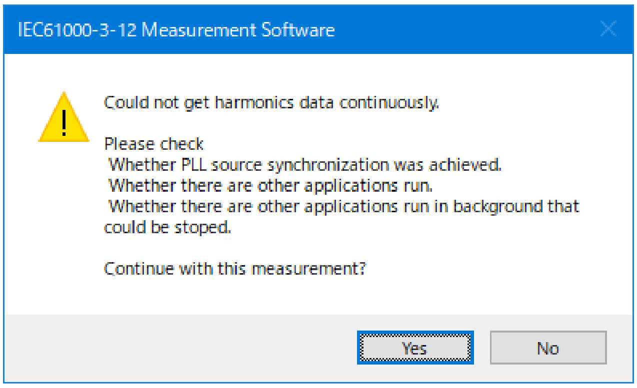
Judgment

PASS will appear in the following circumstances. Confirm the minimum measured Rsce from the Analysis page (see sections 10.9 to 10.14).

- The equipment passed with the limit for Rsce=33.
- The equipment did not pass with the limit for Rsce=33, but it did pass with the limit for the minimum Rsce that was calculated based on measurements.
- The equipment did not pass with the limit for Rsce=33, but it did pass with the limit for the specified minimum Rsce.

Error Messages during Measurement

The following error message may appear when measurement is executed in Compliance Test.



This software retrieves large amount of measured data from the WT. The error message may appear if the CPU on the PC is overloaded and cannot keep up with the data transfer. Lighten the load placed on the CPU on the PC by checking the points listed below.

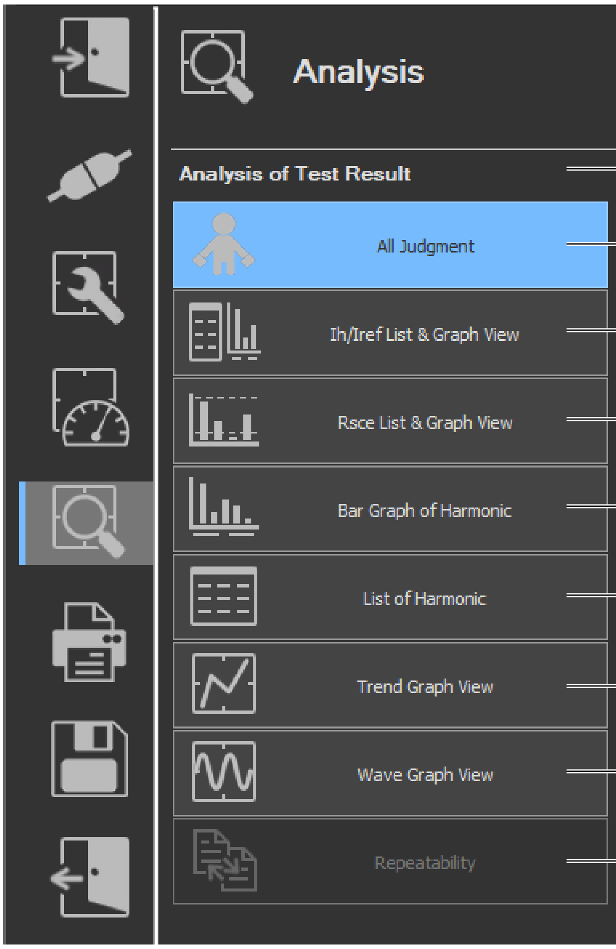
- Do not operate or run other programs.
- Close memory-resident programs (turn them OFF).
- Disable the standby mode.
- Use the software on a PC that satisfies the system requirements given in section 1.2.

Using the Analysis Page to Display Judgment Results and Measured Data

10.9 Displaying a Graph of All Judgments

Procedure

1. Click  in the menu area. The Analysis submenu appears.



Analysis of test results
Measured data can be displayed.

All Judgment (page 10-36)

List and graph of Ih/Iref values (section 10.10)

List and graph of Rsce values (section 10.11)

Bar graph of harmonic data (section 10.12)

List of measured harmonic values (section 10.13)

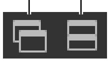
Trend graph (section 10.14)

Waveform graph (section 10.15)

Repeatability (section 5.2)

Displays cascaded windows

Displays tiled windows



Window arrangement buttons
For details, see section 7.15.

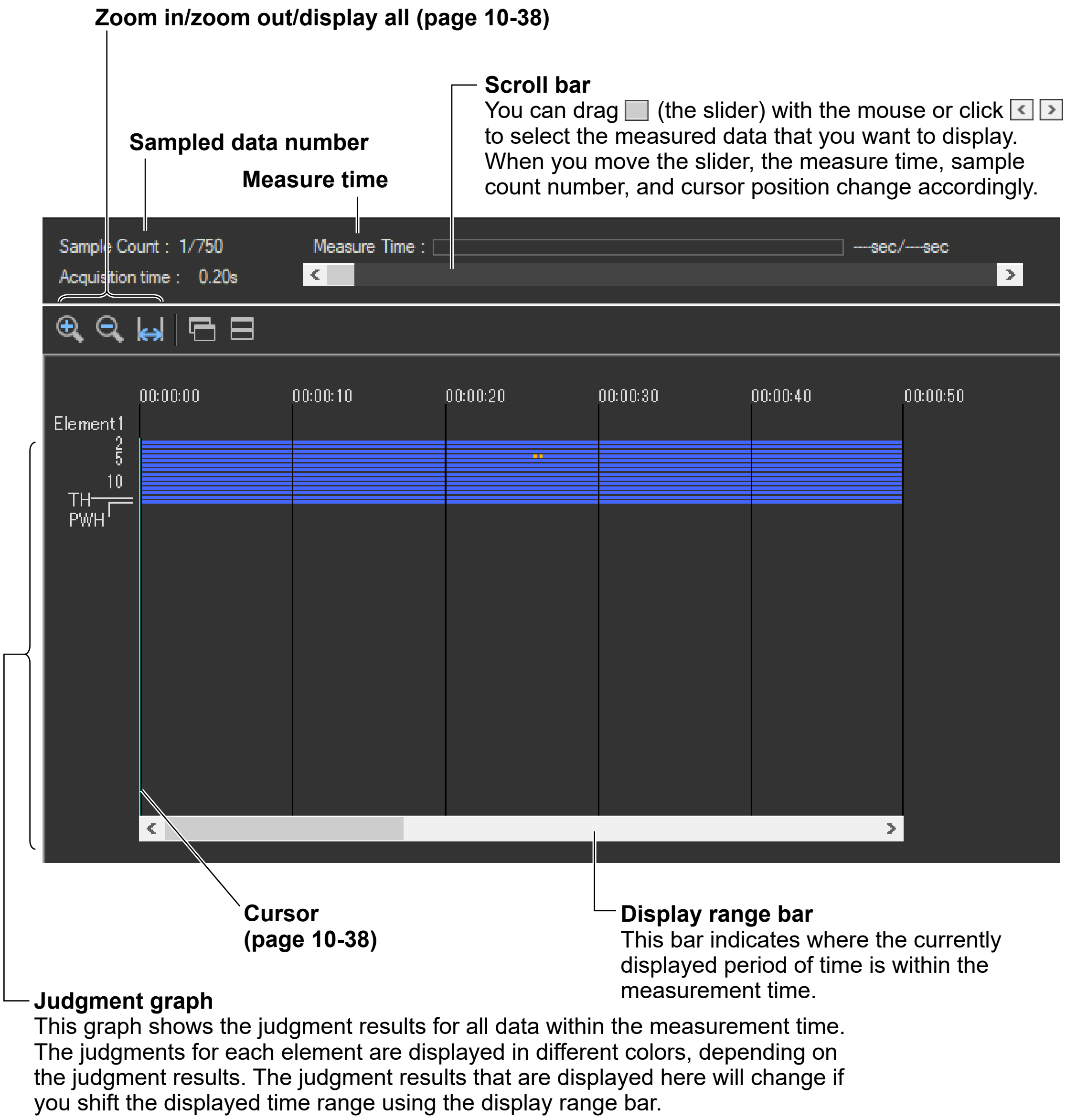
Note

Notes when switching to the Measure window

While in the Analysis window, if you click the Measure icon and switch to the Measure window, the measured data will be discarded. Save the data if you do not want it to be discarded (see chapter Chapter 12 for information on how to save data).

Displaying a Graph of All Judgments

2. Click **All Judgment**. A graph of all judgments appears.



Explanation

The software displays a graph that shows whether each of the values for current harmonic that are measured within the specified measurement time are within their limits according to the settings described in section 10.3, “Setting the WT Measurement Conditions”.

The input elements that are measured vary depending on the Wiring Pattern setting (see chapter 7 for details). The software makes judgments for every input element that is set in the Wiring Pattern setting.

Display Colors

The table below describes what the colors in the evaluation graph indicate. Below are the conditions of Condition 1 and Condition 2.

Condition 1

The maximum harmonic current over the measurement time is within 1.5 times the specified limit. Evaluation is made on each harmonic.

Condition 2

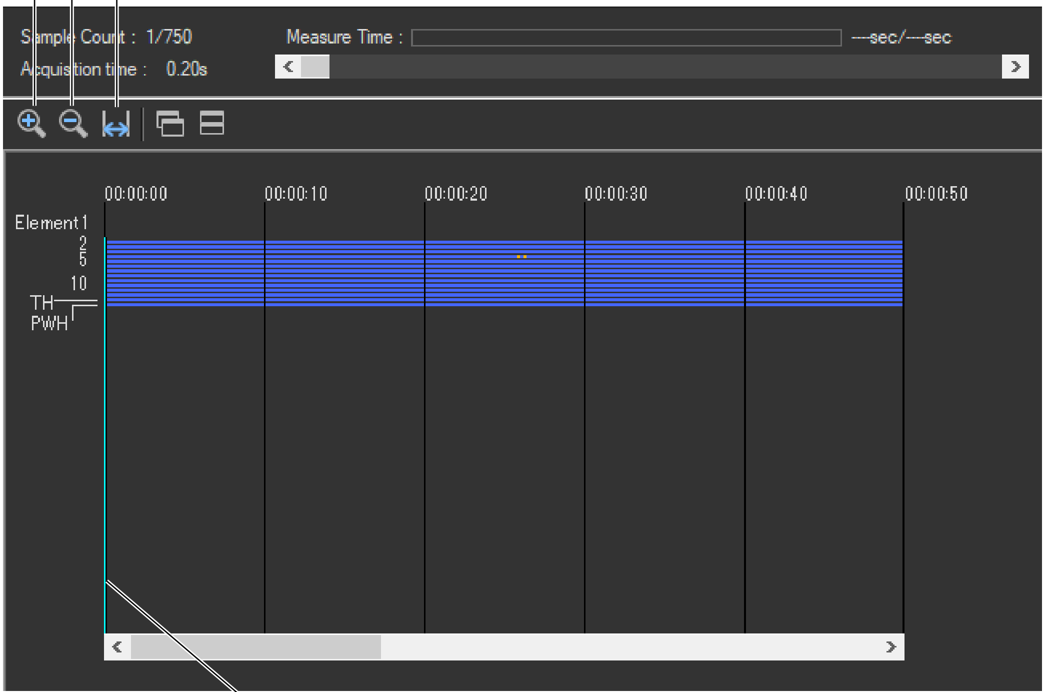
The mean harmonic current over the measurement time is within the specified limit. Evaluation is made on each harmonic.

■	**Blue**	Both Conditions 1 and 2 are met.
□	**White**	No applicable limit is specified.
■	**Yellow**	• Condition 1 is met. • Condition 2 is not met.
■	**Orange**	• Condition 1 is not met. • Condition 2 is met.
■	**Red**	Neither condition 1 or 2 is met.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

If the display of the measured data within the measurement time only contains blue, white, and turquoise, the overall judgment result will be PASS. If any of the data within the measurement time is yellow, orange, or red, the displayed judgment result will be FAIL.

Zooming In and Out



The Zoom In and Zoom Out Icons

Each time you click one of the zoom icons, the software will zoom in or zoom out from the cursor. The zoom levels are:

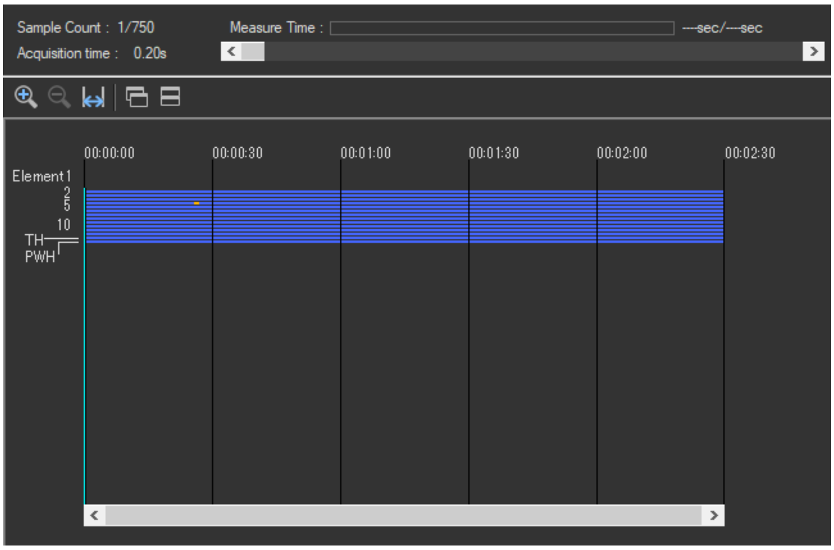
25 s
50 s
100 s (1 min 40 s)
200 s (3 min 20 s)
400 s (6 min 40 s)
800 s (13 min 20 s)
1600 s (26 min 40 s)
3200 s (53 min 20 s)
•
•
•
The entire measurement time

If a zoom out would cause the zoomed display to show more than 75 % of the measurement time, the entire measurement time will be displayed. For example, if the measurement time is 1 h, the 3200 s (53 min 20 s) level will not be displayed because it would show 89 % of the entire measurement time.

Using the Graph of All Judgments Effectively

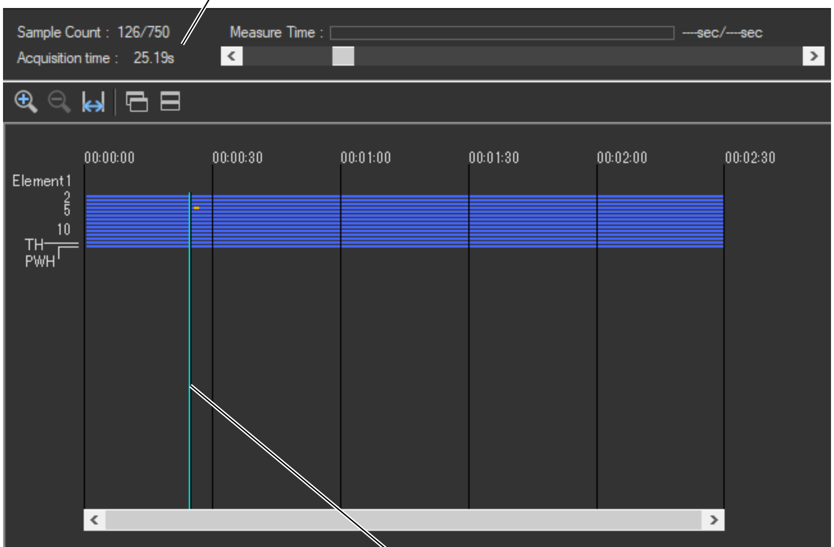
You can select specific measured data that you want to examine more closely on the graph of all judgments to display bar graphs and lists of the measured data. The following example shows how to display an Ih/Iref list and bar graph for element 1.

1. Use the mouse to click the appropriate area. The cursor will shift to the time position that you click.



The cursor moves to the point (time) that you click on.

Indicates the cursor position (time)

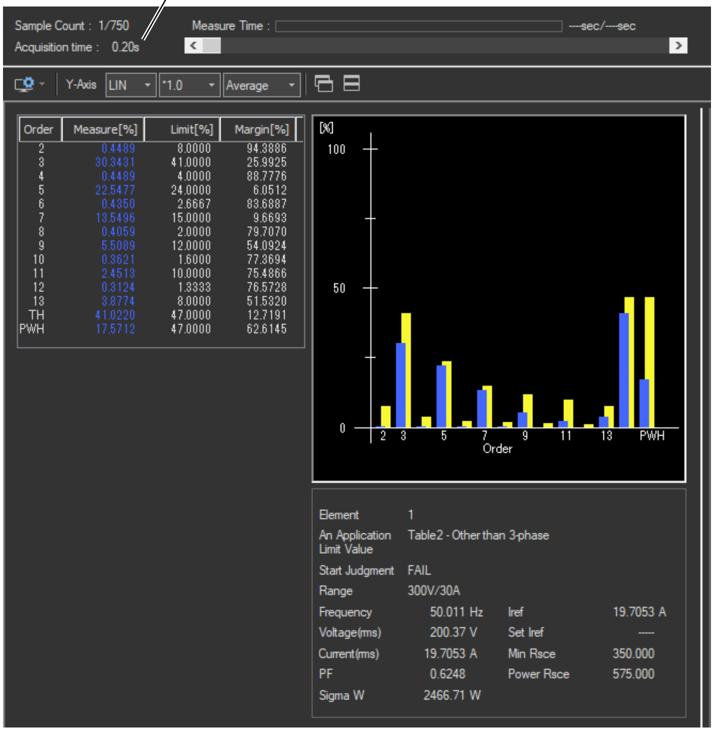


Cursor

2. In the submenu, select **Ih/Iref List & Graph View**, and then select Instant from the list in the setting and display area. A bar graph for the instantaneous harmonic current values from the cursor position will appear.

For detailed information about the bar graph display, see section 10.12.

Indicates the cursor position (time)



10.10 Displaying a List and Graph of Ih/Iref Values

Procedure

1. Click  in the menu area. The Analysis submenu appears.

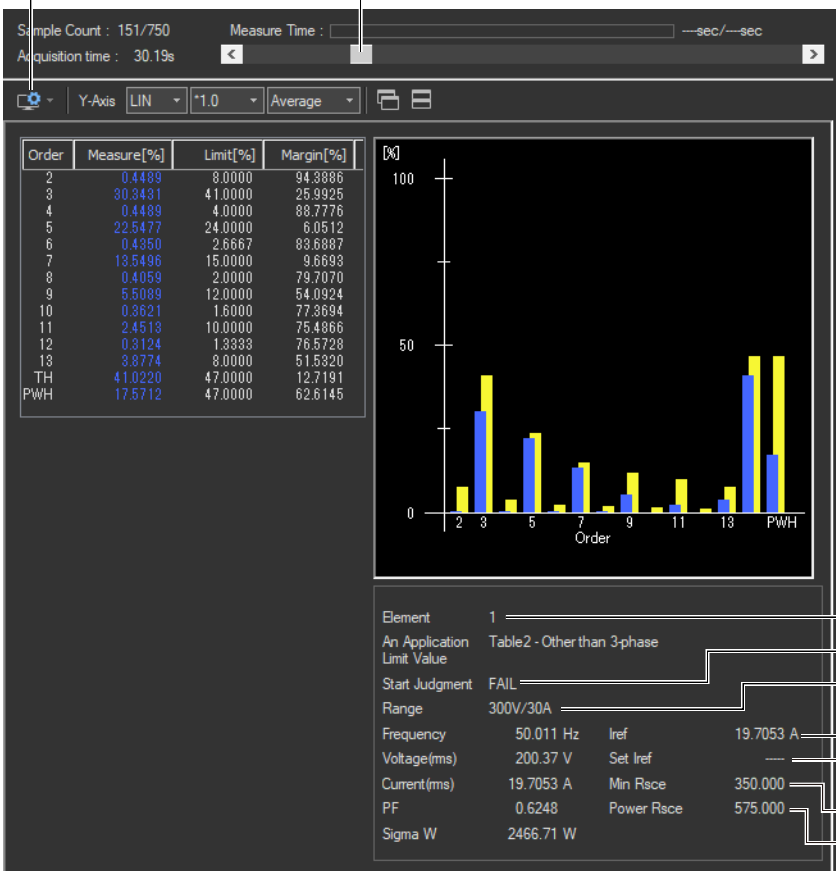
For general information about submenus, see section 10.9.

Displaying a List and Graph of Ih/Iref Values

2. Click **Ih/Iref List & Graph View**. A list and graph of Ih/Iref values appear.

Scroll bar
When displaying instantaneous values, you can drag (the slider) with the mouse or click < > to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and displayed measured data (instantaneous values) change accordingly.

Select the element whose data you want to display.



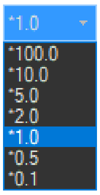
Changing the Y-Axis Scale (the Size of the Current Waveform)

Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

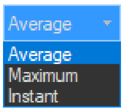
Selecting the Magnification

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.
When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting Average, Maximum, or Instantaneous Values

Select Average, Maximum, or Instant.



Selecting the Element Whose Data You Want to Display

Click . If input elements 1 to 3 are being measured, as you click the icon, the displayed data will switch from element 1, to element 2, to element 3, to element 1, and so on. Click ▼ to select an element directly.

Explanation

List Display

Measured Value (%)

The software calculates the measured current values for each harmonic order using the following formula:

$$\frac{Ih}{Iref} \times 100[\%]$$

Ih: Harmonic current component
Iref: Reference current

Limit (%)

The software calculates the limits according to the standard based on the settings described in sections 10.1 to 10.5.

Margin Degree

Indicates the margin to the limit. For each harmonic, the margin is derived from the following equation using the limits and measured values displayed in the list.

$$\frac{\text{Limit} - \text{measured value}}{\text{Limit}} \times 100$$

Bar Graph Display

Average/Maximum/Instantaneous Value

The software displays bar graphs and lists in three ways depending on whether you select to display average, maximum, or instantaneous values. This section explains the differences between each display.

Average Value Display

- Values and bars for each harmonic order
  The software averages the measured data (instantaneous values) of each harmonic order that is acquired within the measurement time and displays those averages.
- Measured items that appear to the right of the list
  The software averages the values acquired for each measured item within the measurement time and displays those averages.
- Limit values and bars
  The software displays numbers and yellow bars that indicate the values of the limits.

Maximum Value Display

- Values and bars for each harmonic order
  The software finds and displays the maximum value from each harmonic order's measured values by comparing the instantaneous values that have been acquired within the measurement time.
- Items that appear to the right of the list
  The software finds and displays the maximum value for each measured item by comparing the instantaneous values that have been acquired within the measurement time.
- Limit values and bars
  The software displays numbers and yellow bars that are 1.5 times greater than the values of the limits.

Instantaneous Value Display

- Values and bars for each harmonic order
  The software displays the instantaneous values acquired within the measurement time for each harmonic order.
- Measured items that appear to the lower right of the list
  The software displays the instantaneous values acquired within the measurement time.
- Limit values and bars
  The software displays numbers and yellow bars that are 1.5 times greater than the values of the limits.
- Selecting Instantaneous Values
  Use the scroll bar to change the displayed instantaneous values.

Note

When the software is displaying average or maximum values, using the scroll bar will have no effect on the harmonic current list and graph displays.

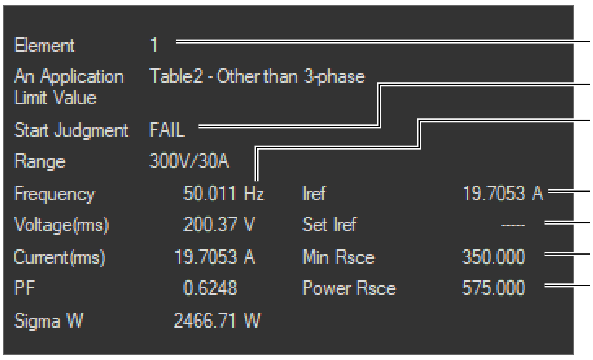
Color of Bars

The lengths for the bar graphs are determined by the size of the measured data that they represent. The meanings of bar colors are as follows:

■	**Blue**	Limit not exceeded.
■	**Red**	Limit exceeded.
□	**White**	No applicable limit is specified.
■	**Yellow**	Limit specified by the applicable standard.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Items that appear below the bar graphs.



Element Judgment

If the software returns a PASS judgment for each item in the currently displayed element, PASS appears here. Otherwise FAIL appears.

PASS will appear in the following circumstances. Confirm the minimum measured Rsce.

- The equipment passed with the limit for Rsce=33.
- The equipment did not pass with the limit for Rsce=33, but it did pass with the limit for the minimum Rsce that was calculated based on measurements.
- The equipment did not pass with the limit for Rsce=33, but it did pass with the limit for the specified minimum Rsce.

Minimum Rsce (Minimum Short Circuit Ratio)

See the explanation under “Rsce Limit (Minimum Rsce)” in section 10.12.

Ssc (Short Circuit Power)

Corresponds to the minimum Rsce, which is calculated based on measurement.

Power Supply Rsce (Power Supply Short Circuit Ratio)

The short circuit ratio of the power supply of the testing device. According to the standard, the relationship between the minimum Rsce and the power supply Rsce must be as described below. Confirm that the results are in compliance with the standard.

- Equipment other than balanced three-phase equipment
  Minimum Rsce < Power supply Rsce

- Balanced three-phase equipment
  Minimum Rsce < Power supply Rsce

- Balanced three-phase equipment under specified conditions
  Minimum Rsce × 1.6 < Power supply Rsce

Mutual Relationship of Graphs and Lists

When using the scroll bar to select the time of acquisition and displaying the measured data on a graph window or list window displaying a certain instantaneous value, the other graph window or list window also shows the measured data at the same time of acquisition.

10.11 Displaying a List and Graph of Rsce Values

Procedure

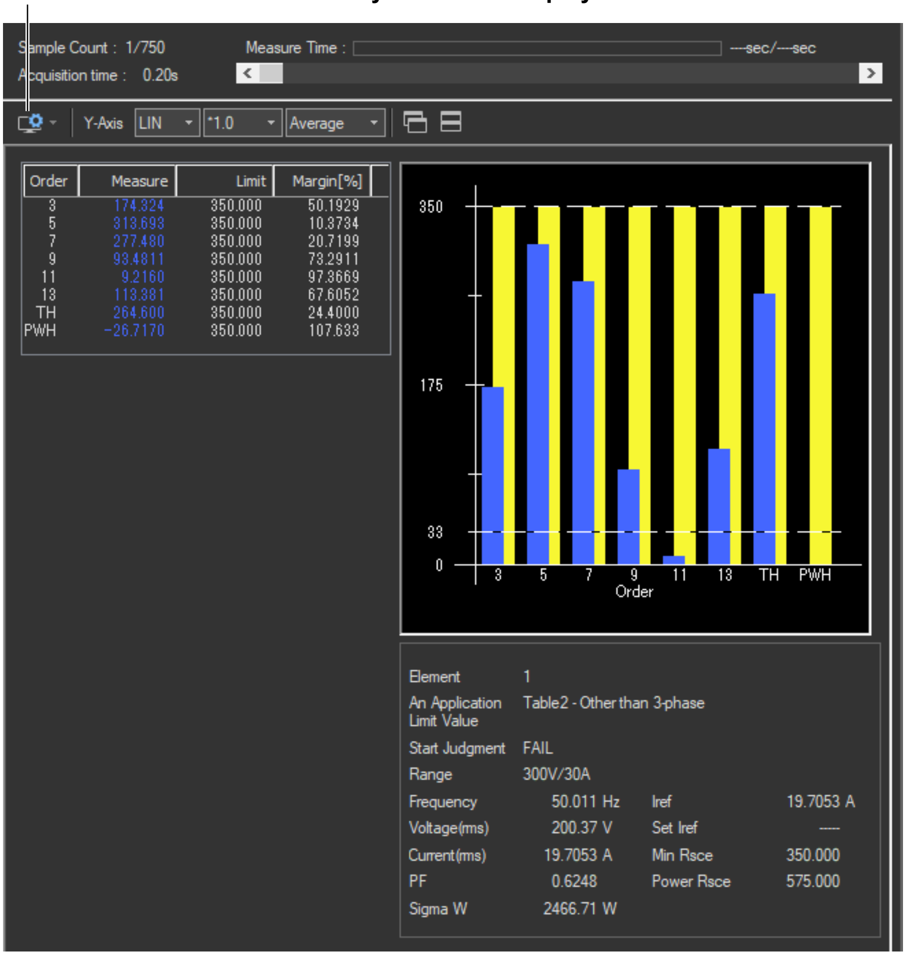
1. Click  in the menu area. The Analysis submenu appears.

For general information about submenus, see section 10.9.

Displaying a List and Graph of Rsce Values

2. Click **Rsce List & Graph View**. A list and graph of Rsce values appear.

Select the element whose data you want to display.



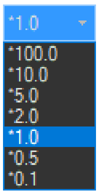
Changing the Y-Axis Scale (the Size of the Current Waveform)

Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

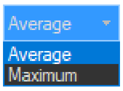
Selecting the Magnification

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.
When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting to Display Average or Maximum Values

Select Average or Maximum.



Explanation

List Display

Measured Values

For each harmonic order, the measured values of Rsce are calculated based on the measured data according to linear interpolation.

Rsce Limit (Minimum Rsce)

The greatest value out of the three values listed below will be used to calculate the Rsce limit (minimum Rsce). For more details, see the standard.

- Ih•Iref (average) of each harmonic
- TH: THC/Iref
- PWH: PWHC/Iref

On the example on the previous page, the measured TH value of 264.600 is the greatest, so it is used as the limit for each measured value (minimum Rsce).

Margin Degree

Indicates the margin to the limit. For each harmonic, the margin is derived from the following equation using the limits and measured values displayed in the list.

$$\frac{\textbf{Limit – measured value}}{\textbf{Limit}} \times 100$$

Bar Graph Display

Average/Maximum

The software displays bar graphs and lists in three ways depending on whether you select to display average, maximum, or instantaneous values. This section explains the differences between each display.

Average Value Display

- Values and bars for each harmonic order
  The software averages the measured data (instantaneous values) of each harmonic order that is acquired within the measurement time and displays those averages.
- Measured items that appear to the right of the list
  The software averages the values acquired for each measured item within the measurement time and displays those averages.
- Limit values and bars
  The software displays numbers and yellow bars that indicate the values of the limits.

Maximum Value Display

- Values and bars for each harmonic order
  The software finds and displays the maximum value from each harmonic order's measured values by comparing the instantaneous values that have been acquired within the measurement time.
- Items that appear to the right of the list
  The software finds and displays the maximum value for each measured item by comparing the instantaneous values that have been acquired within the measurement time.
- Limit values and bars
  The software displays numbers and yellow bars that are 1.5 times greater than the values of the limits.

Note

Using the scroll bar will have no effect on the Rsce list and bar graph displays.

Color of Bars

The lengths for the bar graphs are determined by the size of the measured data that they represent. The meanings of bar colors are as follows:

■	**Blue**	Limit not exceeded.
■	**Red**	Limit exceeded.
□	**White**	No applicable limit is specified.
■	**Yellow**	Limit specified by the applicable standard.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

10.12 Displaying a Harmonic Bar Graph

1. Click  in the menu area. The Analysis submenu appears.

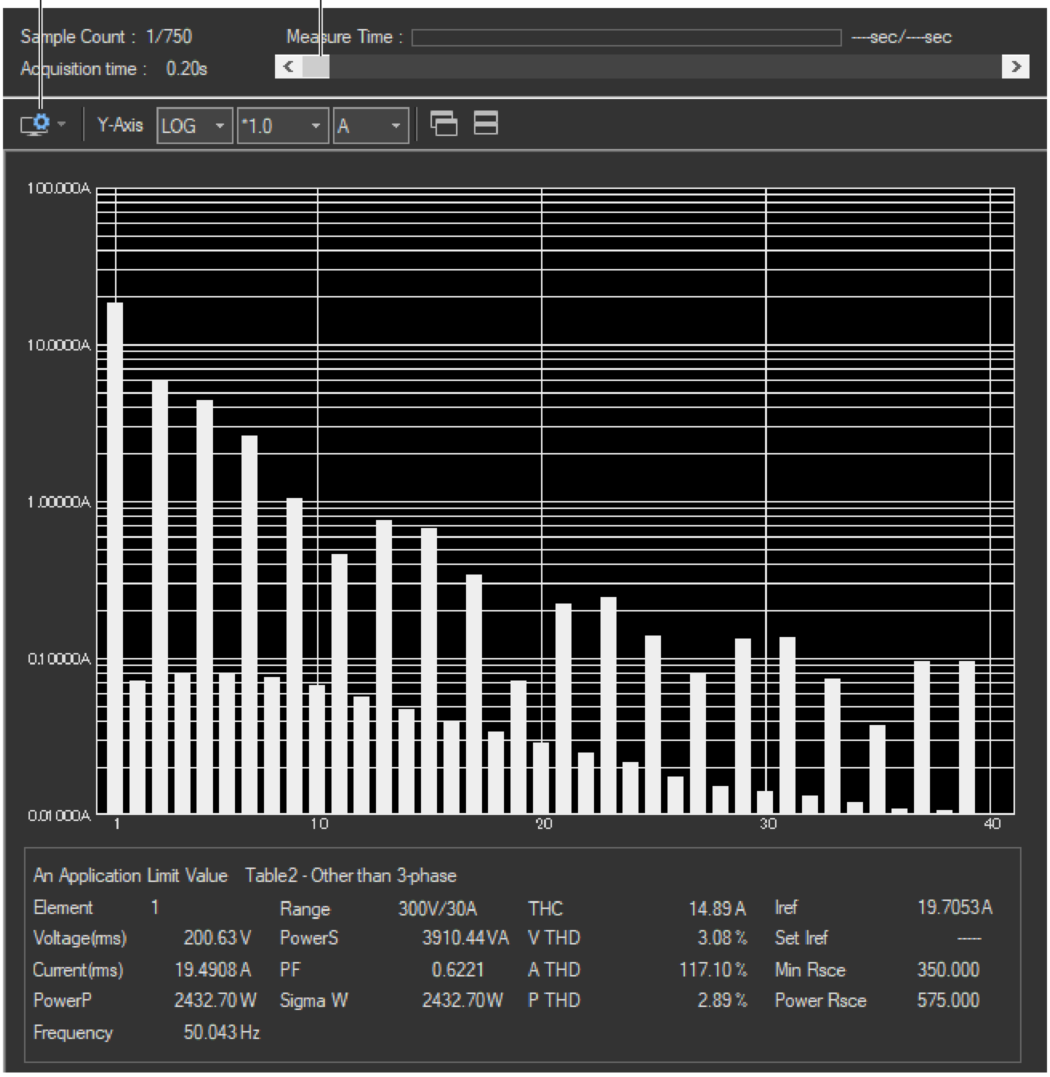
For general information about submenus, see section 10.9.

Displaying a Harmonic Bar Graph

2. Click **Bar Graph of Harmonic**. A harmonic bar graph appears.

Select the element whose data you want to display.

Scroll bar
You can drag (the slider) with the mouse or click to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and displayed measured data (instantaneous values) change accordingly.



Changing the Y-Axis Scale (the Size of the Current Waveform)

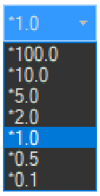
Selecting the Type of Y-Axis Scale

Select **LIN** (linear) or **LOG** (logarithmic).

Selecting the Magnification

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.

When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



Selecting the Measurement Function to Display

Select A, V, or Deg (for current, voltage, or phase angle).

Explanation

Bar Graph of Harmonic Current or Voltage

The software displays the instantaneous values acquired within the measurement time for each harmonic order.

Bar Graph of Harmonic Phase Angles

Bar graphs of the phase angle of the harmonic current with respect to the fundamental current for each harmonic can be displayed. However, the phase angle with respect to the fundamental voltage is displayed on the bar graph for the fundamental current.

- When the harmonic phase is leading the fundamental current, a positive phase angle is indicated; when the harmonic phase is lagging the fundamental current, a negative phase angle is indicated.
- When the fundamental current is leading the fundamental voltage, a negative phase angle is indicated; when the fundamental current is lagging the fundamental voltage, a positive phase angle is indicated.

Bar Graph Display Color

The bar graph is displayed in white.

Note

There are no specified limits for voltages, currents, or phase angles. So limits for these values are not displayed.

Selecting Instantaneous Values

Use the scroll bar to change the displayed instantaneous values.

10.13 Displaying a List of Measured Harmonic Values

Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

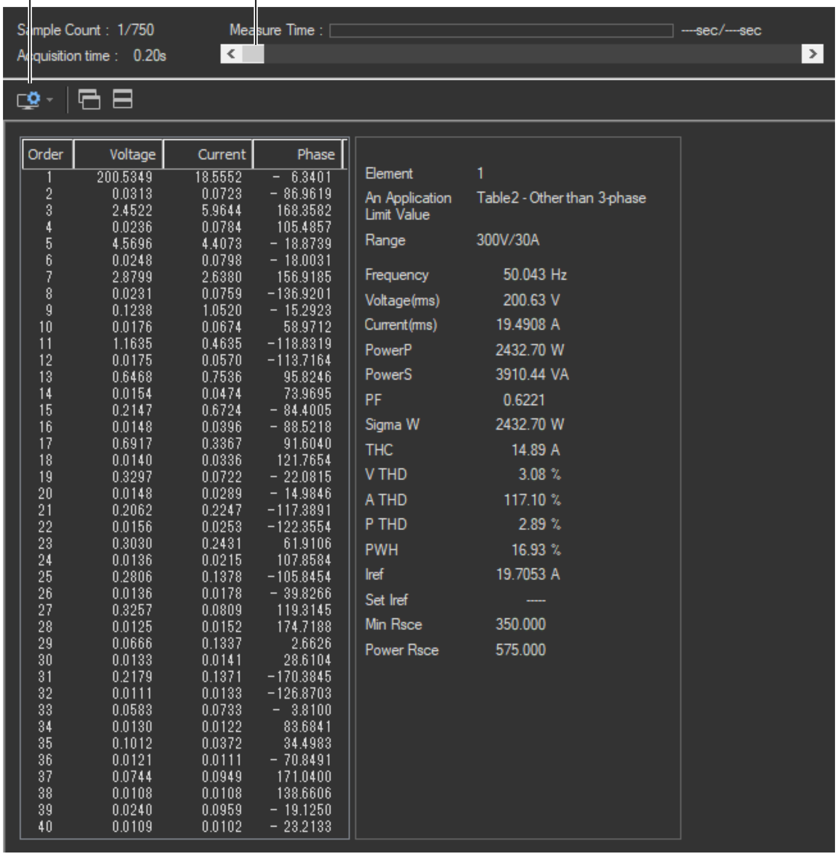
For general information about submenus, see section 10.9.

Displaying a List of Measured Harmonic Values

2. Click **List of Harmonic.** A list of measured harmonic (instantaneous) values appears.

Select the element whose data you want to display.

Scroll bar
You can drag [slider] (the slider) with the mouse or click [<] [>] to select the measured data that you want to display. When you move the slider, the measure time, sample count number, and displayed measured data (instantaneous values) change accordingly.



10.14 Displaying a Trend Graph

Procedure

1. Click [icon] in the menu area. The Analysis submenu appears.

For general information about submenus, see section 10.9.

Displaying a Trend Graph

2. Click **Trend Graph View**. A trend graph appears.

Configuring a Trend Graph

Auto range
- **When the auto range button is pressed**
  The range changes automatically to match the acquired data.
- **When the auto range button is not pressed**
  When you click the Upper or Lower column headings, a combo box appears that allows you to set the display range upper and lower limits for each trace.

Grid
You can select the type of grid that will be displayed in the trend display area from Dotted, Line, and None.
- Dotted: A grid with dotted lines is displayed.
- Line: A grid with solid lines is displayed.
- None: No grid is displayed.

Show/hide trace settings box (page 10-54)

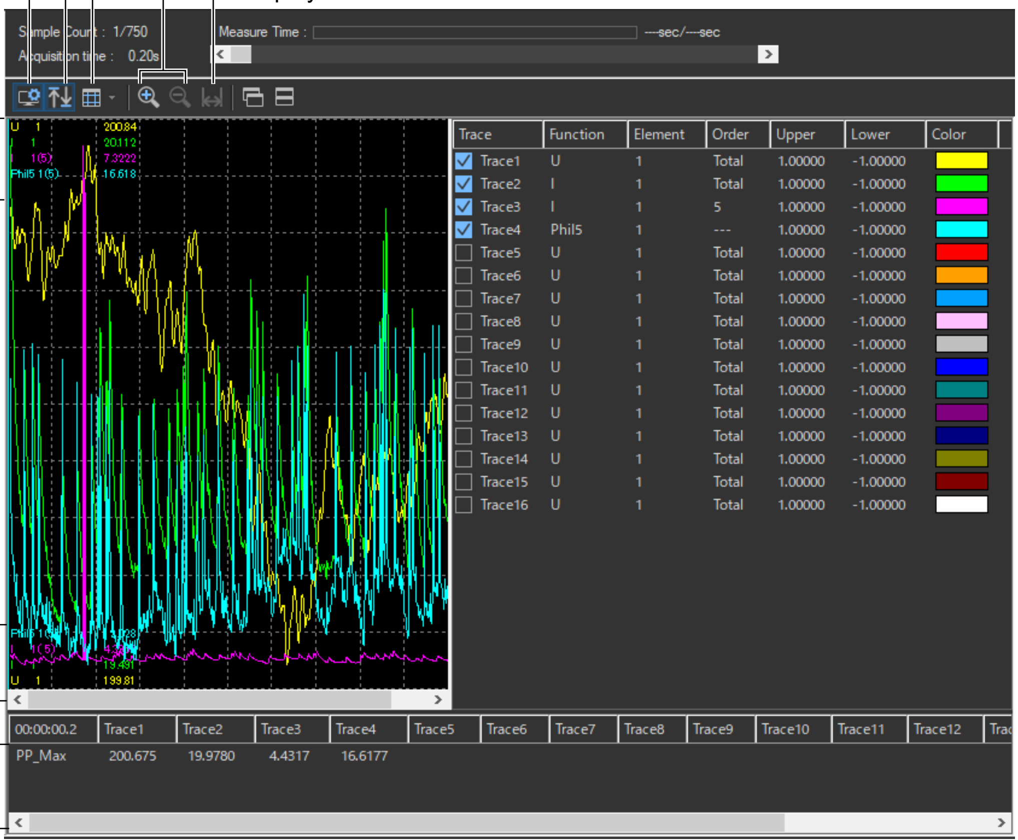
Zoom in/zoom out (see page 10-56)

Main Screen
Displays the whole measurement time

Upper limit of display range

Lower limit of display range

Cursor (page 10-56)



Configuring Traces

Trace

Select the trends you want to display (select or clear the check boxes).

Function

Select the measurement function to be displayed.

1. Click the **Function** column. A combo box opens.
2. Select the measurement function.

Note

You can select from the following measurement functions.

U	Voltage
I	Current
P	Power
PhiI5	The phase angle of the 5th harmonic current.
THC	Total harmonic current
TH	THC/Iref
PWH	PWHC/Iref

Element

Select the element to be displayed.

1. Click the **Element** column. A combo box opens.
2. Select the element.

Order

Select the harmonic order that you want to display.

1. Click the **Order** column heading. A combo box opens.
2. Select the harmonic order.

Upper and Lower

If the Auto Ranging check box is not selected, set the Upper or Lower limit of the display range.

1. Click the **Upper** or **Lower** column. A edit box opens.
2. Set the upper or lower limit value of the display range.

Color

Select the display color of the trend.

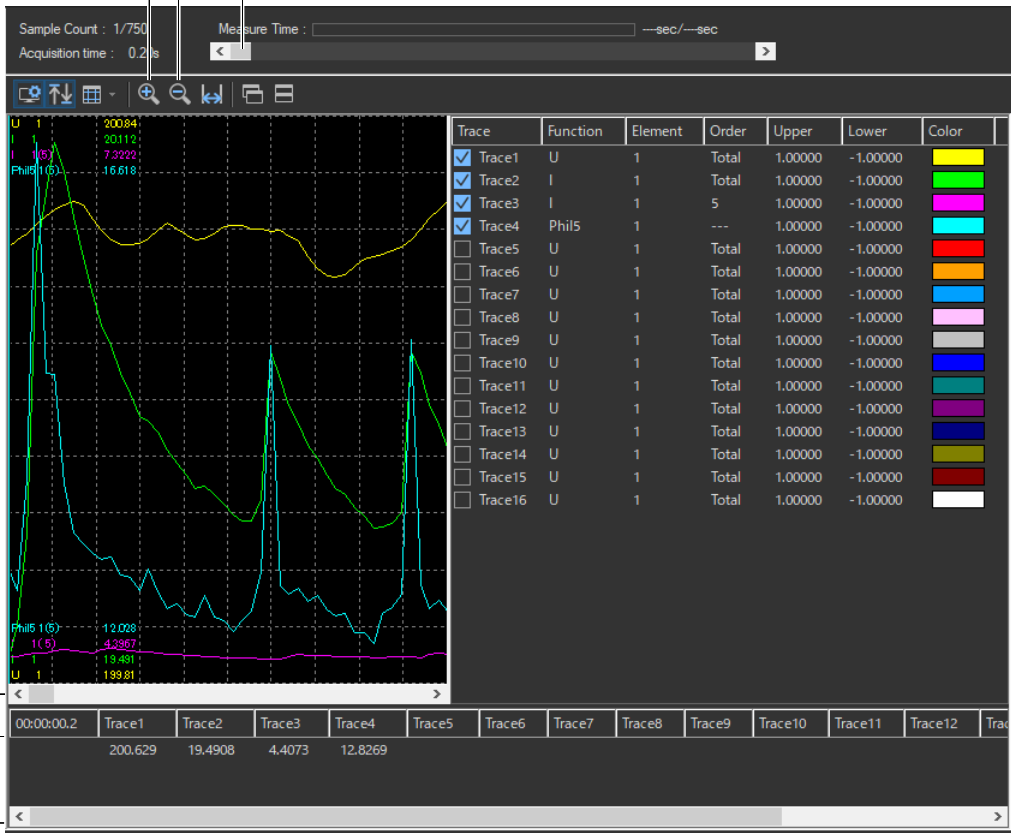
1. Click the **Color** column. A combo box opens.
2. Select the display color of the trend.

Zooming In and Out

Zoom in
Click to zoom in. You can zoom in until the trend display area contains 2 s worth of data.

Zoom out
Click to zoom out. You can zoom out until the trend display area contains the data for all of the elapsed time.

Scroll bar
You can drag (the slider) with the mouse or click < > to select the measured data that you want to display.



Cursor
When you click somewhere on the trend display area, a cursor will appear there.
You can move the cursor by dragging it.

Slider
Move along the time axis to the waveform that you want to display.

10.15 Displaying a Waveform Graph

Procedure

1. Click in the menu area. The Analysis submenu appears.

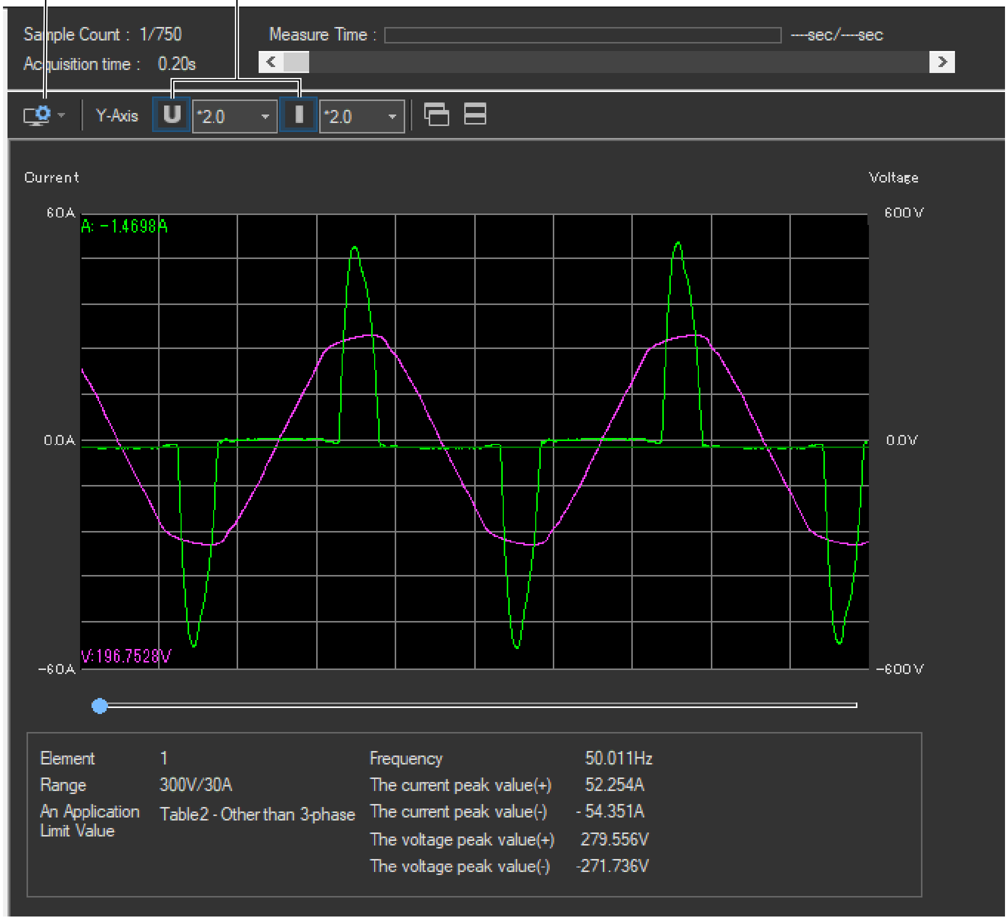
For general information about submenus, see section 10.9.

Displaying a Waveform Graph

2. Click **Wave Graph View**. A waveform graph appears.

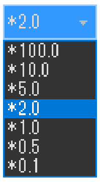
Select the element whose data you want to display.

Switch the waveform displays ON or OFF.



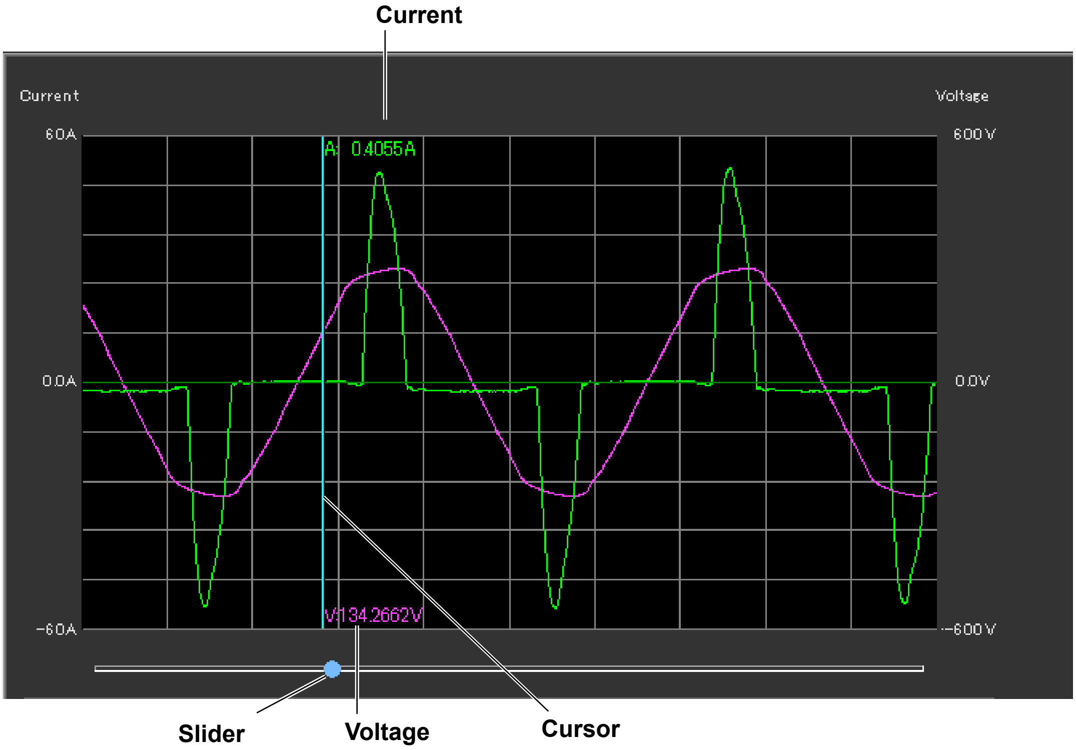
Changing the Y- Axis Scale (the Size of the Voltage and Current Waveforms)

Select ***100.0**, ***10.0**, ***50**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.



Using the Cursor to Display Current and Phase Angle Values

When you click an area of the waveform, a cursor will appear there. The current and phase angle values at the cursor position will be displayed.



Explanation

The waveform data is acquired immediately after the measurement for a compliance test is finished. The software acquires and displays a waveform graph of about two periods using 8000 points of current and voltage waveform data. You can display waveform graphs for each WT input element. This waveform data is different than the waveform data that is displayed in the waveform preview.

Note

Using the scroll bar will have no effect on the waveform graph display.

Numeric Value Displays below the Graph

- Frequency
  The average value of all frequencies (frequency of the fundamental signal of the PLL source) within the measurement time.
- Current Peak (+)
  Maximum positive value of the current waveform displayed.
- Current Peak (–)
  Maximum negative value of the current waveform displayed.
- Voltage Peak (+)
  Maximum positive value of the voltage waveform displayed.
- Voltage Peak (–)
  Maximum negative value of the voltage waveform displayed.

Chapter 11

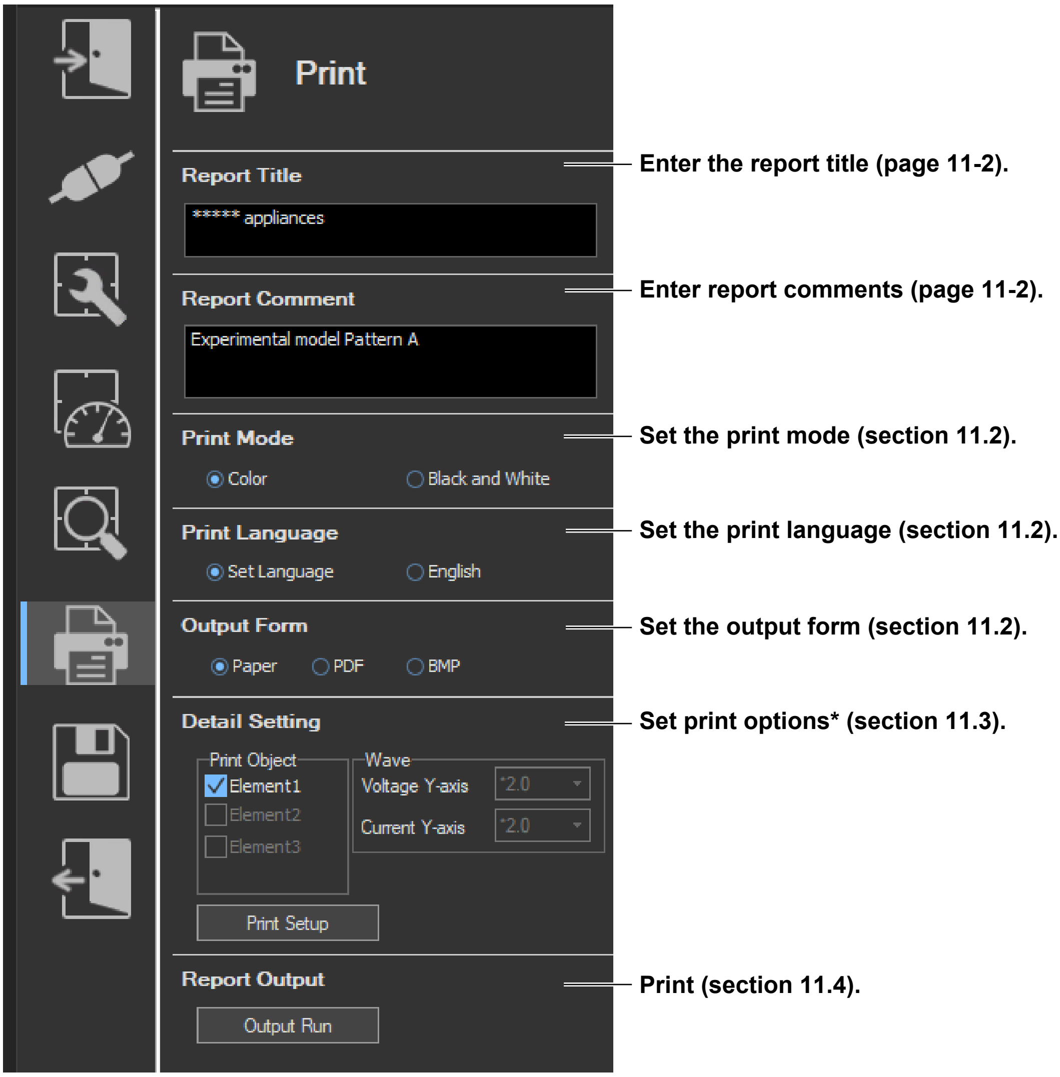
Using the Print Page to Print Reports

This chapter explains how to print a report.

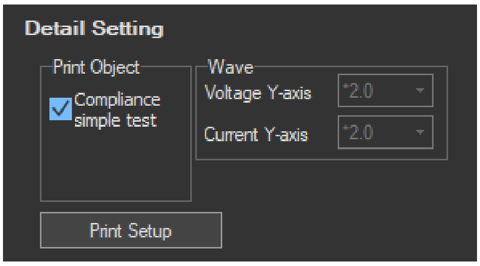
11.1 Setting a Report's Title and Comments

Procedure

1. Click  in the menu area. The Print submenu appears.



* If the standard is IEC 61000-3-2, the following appears if you have selected Simple Test Measurement in the test menu described in section 4.1.

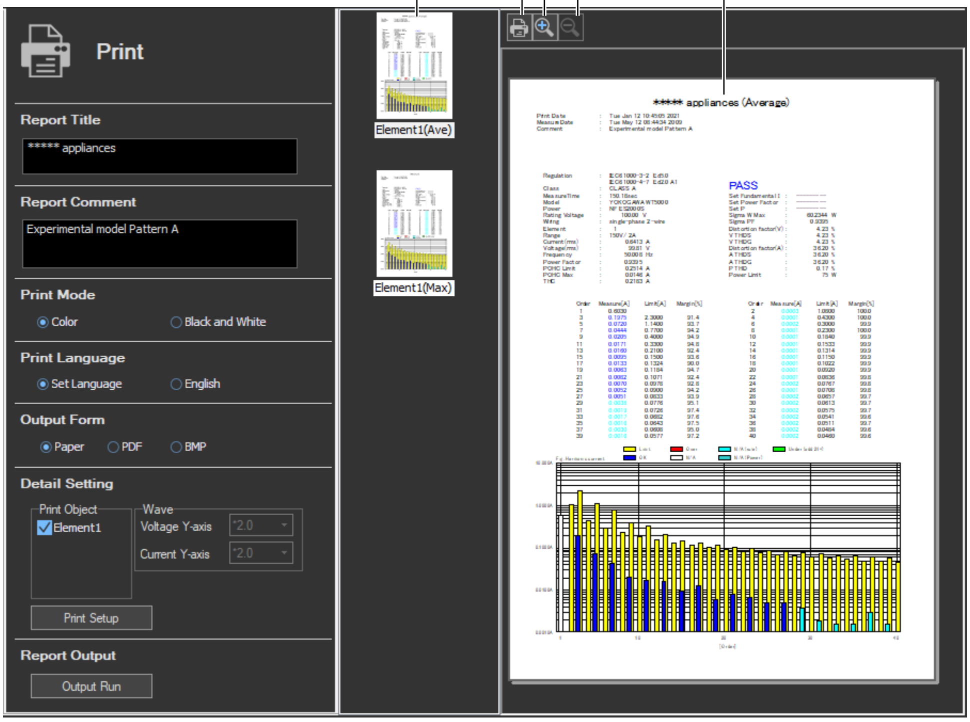


Print

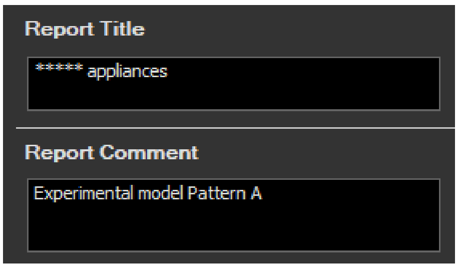
Zooms the print preview in or out

Switch the print preview page.
Click the page you want to preview.

Print preview



2. Enter the report title and the report comments in their respective boxes.



Explanation

You can create reports using the data measured with the software.

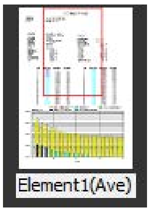
Switching the Print Preview Page

The following pages can be displayed in the print preview.

- Compliance simple test (Simple)
  (Only for IEC 61000-3-2)
  This appears if you have selected Simple Test Measurement in the test menu described in section 4.1.
- Compliance test
  (Only for IEC 61000-3-2)
  - Element (Element)
  - Average data (Ave), Maximum data (Max)
- Waveform data (Wave)
  (Only for IEC 61000-3-2, IEC 61000-3-12)
  To display waveforms in the print preview and print them, select the "Add a waveform graph" check box under "Report" in the Option tab described in section 7.5 or 10.5.

Print Preview Display Area

If the print preview is being zoomed in on, the displayed area is indicated with a red frame.



Moving the Print Preview Display Area

Drag the red frame (which indicates the display area) to move the display area.

Setting the Title and Comment of Reports

As necessary, you can set the title and comment of a report.

Number of Characters That Can Be Entered

See the table below.

Item	Number of Characters That Can Be Entered
Title	Up to 40 characters can be entered.
Comment	You can enter up to 1000 characters. Up to 90 characters can be displayed on one line. Up to 6 lines can be displayed.

11.2 Setting the Print Mode, Print Language, and Output Form

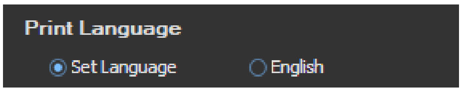
Procedure

Selecting the Print Mode

1. Select Color or Black and White under Print Mode. When you change the print mode, the print preview in the setting and display area will change accordingly.

Selecting a Print Language

2. Select English or Set Language under Print Language. When you change the print language, the print preview in the setting and display area will change accordingly.



Selecting a Output Form

3. Select Paper, PDF or BMP under Output Form.

Selecting the BMP Resolution

4. On the Option tab in the setting and display area, if you selected the “Setting display of BMP resolution” check box, select the BMP resolution.

* For the optional condition settings in the setting menu of each software, see the following:

IEC 61000-3-2 Harmonic Measurement	Section 7.5
IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement	Section 8.5
IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement	Section 9.5
IEC 61000-3-12 Harmonic Measurement	Section 10.5

Explanation

Selecting the BMP Resolution

You can select the resolution from the following:

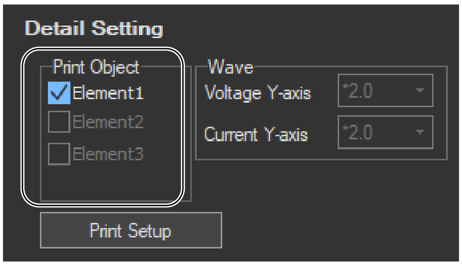
- Lowest   Approx. 2MB, 768 x 1024
- Low   Approx. 9MB, 1536 x 2048
- High   Approx. 36MB, 3072 x 4096
- Highest   Approx. 147MB, 6144 x 8192

11.3 Setting Print Details (Detail Setting)

Procedure

Selecting the Elements Whose Data You Want to Print

1. In the Print Object box, select the elements whose data you want to print.



Selecting Whether or Not to Use the Margin Degree in Judgment

(Only for IEC 61000-3-2)

2. To print judgments that use the margin degree, select "The margin degree is used" check box under "Margin Degree" in the Option tab described in section 7.5.

Selecting Whether or Not to Print Waveforms

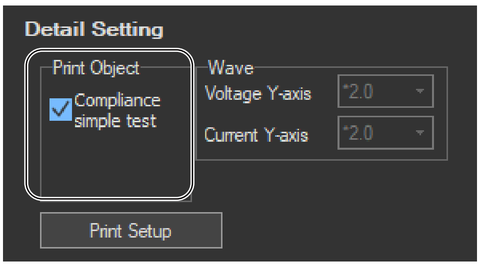
(Only for IEC 61000-3-2, IEC 61000-3-12)

3. To print waveforms, select the "Add a waveform graph" check box under "Report" in the Option tab described in section 7.5 or 10.5.

Selecting the Type of Measured Data to Print

(Only for IEC 61000-3-2)

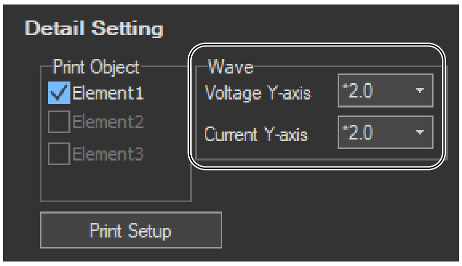
4. When you have selected Simple Test Measurement in the test menu described in section 4.1 and have executed a simple compliance test, select the type of data to print.



Changing the Y-Axis Scale (the Size of the Voltage and Current Waveforms)

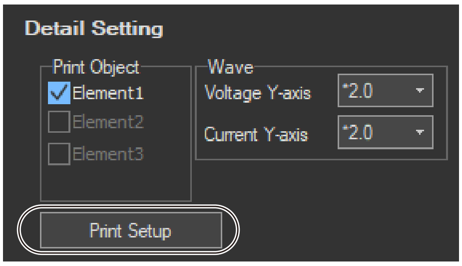
(Only for IEC 61000-3-2, IEC 61000-3-12)

5. Select *100.0, *10.0, *50, *2.0, *1.0, *0.5, or *0.1.



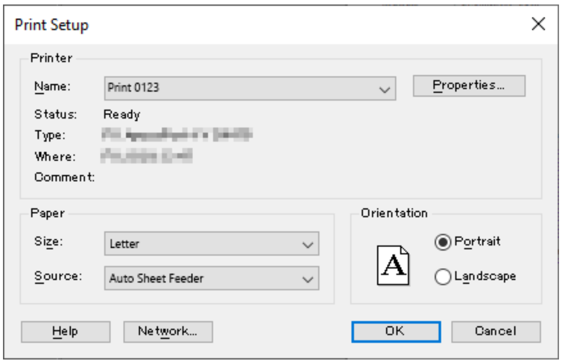
Setting Up the Printer

6. Choose **Print Setup**. The Print Setup dialog box opens.



7. Enter appropriate settings for **Printer**, **Size**, **Source**, and **Orientation**.

8. Click **OK**.



Explanation

Selecting the Elements Whose Data You Want to Print

The elements that you can select are determined by the options that you select for Wiring and Object.

* For the Wiring and Object settings of each software, see the following:

IEC 61000-3-2 Harmonic Measurement	Section 7.3
IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement	Section 8.3
IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement	Section 9.3
IEC 61000-3-12 Harmonic Measurement	Section 10.3

Margin Degree Judgments

(Only for IEC 61000-3-2)

If you select “The margin degree is used” check box under “Margin Degree” in the Option tab described in section 7.5, the judgments based on the margin values for each harmonic will be printed in red and blue (for information about what each color means, see section 7.17).

Type of Measured Data to Print

(Only for IEC 61000-3-2)

- Compliance simple test: Measured data of the simple test
- Compliance test: Measured data of the compliance test that has been specified as the test reference for the simple test.

Changing the Y-Axis Scale (the Size of the Voltage and Current Waveforms)

(Only for IEC 61000-3-2, IEC 61000-3-12)

If you select the “Add a waveform graph” check box under “Report” in the Option tab described in section 7.5 or 10.5, you can select the Y-axis (voltage or current amplitude) scale of the waveform graph in reports.

Print Setup

Configure the printer according to your system environment.

11.4 Printing

Procedure

Printing Reports

You can print a report when measured data has been acquired or has been loaded from memory.

1. Click **Output Run**.
   - If Paper has been selected, proceed to step 2.
   - If PDF or BMP has been selected, proceed to step 3.

2. Enter appropriate settings for **Printer**, **Range**, **Copies**, etc. Click **OK**. The report is printed.
3. Set the location and file name to save to. Click **Save**. The report is saved in the specified output format (PDF or BMP).

Printing a Report Using the Print Button

1. Click  on the toolbar. A Print dialog box appears.
2. Enter appropriate settings for **Printer**, **Range**, **Copies**, etc. Click **OK**. The report is printed.

Explanation

Configure the printer according to your system environment.

Printing Reports

You can print a report when the measured data has been retrieved (or loaded). You can print a report for each input element (see section 11.3).

Power Supply Information

If the NF Power Connection is set to Used in “Configuring the Connection to the Power Supply” (see section 6.1), the following items are included in the report.

- Power: The type of power supply and reference impedance network (RIN)*
- Impedance: Reference impedance network (RIN) setting*

* This is displayed if you select the “Reference Impedance Network (RIN) is used” check box in the power supply settings.
For the power supply settings of each software, see the following:

IEC 61000-3-2 Harmonic Measurement Software	page 7-12
IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement Software	page 8-5
IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software	page 9-7
IEC 61000-3-12 Harmonic Measurement Software	page 10-6

Examples of Printed Reports

IEC 61000-3-2 Harmonic Measurement

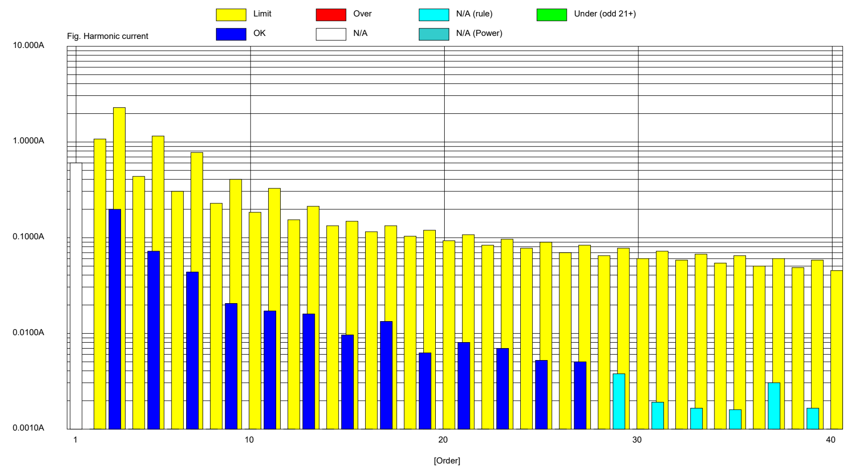
***** appliances (Average)

Print Date	:	Wed Dec 23 21:45:21 2020
MeasureDate	:	Tue May 12 08:44:34 2009
Comment	:	Experimental model Pattern A

Power supply information

Regulation	:	IEC61000-3-2 Ed5.0 IEC61000-4-7 Ed2.0 A1	PASS		
Class	:	CLASS A			
MeasureTime	:	150.18sec	Set Fundamental I	:	---------
Model	:	YOKOGAWA WT5000	Set Power Factor	:	---------
Power	:	NF ES2000S	Set P	:	---------
Rating Voltage	:	100.00 V	Sigma W Max	:	60.2344 W
Wiring	:	single-phase 2-wire	Sigma PF	:	0.9395
Element	:	1	Distortion factor(V)	:	4.23 %
Range	:	150V/ 2A	V THDS	:	4.23 %
Current(rms)	:	0.6413 A	V THDG	:	4.23 %
Voltage(rms)	:	99.81 V	Distortion factor(A)	:	36.20 %
Frequency	:	50.008 Hz	A THDS	:	36.20 %
Power Factor	:	0.9395	A THDG	:	36.20 %
POHC Limit	:	0.2514 A	P THD	:	0.17 %
POHC Max	:	0.0146 A	Power Limit	:	75 W
THC	:	0.2183 A			

Order	Measure[A]	Limit[A]	Margin[%]	Order	Measure[A]	Limit[A]	Margin[%]
1	0.6030			2	0.0003	1.0800	100.0
3	0.1975	2.3000	91.4	4	0.0001	0.4300	100.0
5	0.0720	1.1400	93.7	6	0.0002	0.3000	99.9
7	0.0444	0.7700	94.2	8	0.0001	0.2300	100.0
9	0.0205	0.4000	94.9	10	0.0001	0.1840	99.9
11	0.0171	0.3300	94.8	12	0.0001	0.1533	99.9
13	0.0160	0.2100	92.4	14	0.0001	0.1314	99.9
15	0.0095	0.1500	93.6	16	0.0001	0.1150	99.9
17	0.0133	0.1324	90.0	18	0.0001	0.1022	99.9
19	0.0063	0.1184	94.7	20	0.0001	0.0920	99.9
21	0.0082	0.1071	92.4	22	0.0001	0.0836	99.8
23	0.0070	0.0978	92.8	24	0.0002	0.0767	99.8
25	0.0052	0.0900	94.2	26	0.0001	0.0708	99.8
27	0.0051	0.0833	93.9	28	0.0002	0.0657	99.7
29	0.0038	0.0776	95.1	30	0.0002	0.0613	99.7
31	0.0019	0.0726	97.4	32	0.0002	0.0575	99.7
33	0.0017	0.0682	97.6	34	0.0002	0.0541	99.6
35	0.0016	0.0643	97.5	36	0.0002	0.0511	99.7
37	0.0030	0.0608	95.0	38	0.0002	0.0484	99.6
39	0.0016	0.0577	97.2	40	0.0002	0.0460	99.6



IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

General Measurement (when the power supply function is in use)

***** appliances

Print Date	:	Wed Dec 23 21:47:13 2020
MeasureDate	:	Thu Mar 26 13:56:32 2009
Comment	:	Experimental model Pattern A

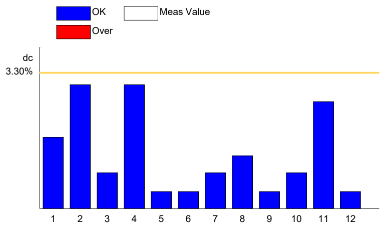
Power supply information

Regulation	:	IEC61000-3-3	Ed3.0 am1
		IEC61000-4-15	Ed2.0
Interval	:	10Min0Sec	
Model	:	YOKOGAWA WT5000	
Power	:	NF ES2000S+ES4152	
Impedance	:	230V	
Wiring	:	single-phase 2-wire	
Voltage Range	:	300.00V	
Set Voltage	:	230V	
Set Frequency	:	50Hz	
Voltage U1	:	229.97V	
Frequency U1	:	49.999Hz	
Element	:	1	
dmin	:	0.20%	

FAIL

Element1		: Fail
dc	(3.30%)	: Pass
dmax	(4.00%)	: Fail
Tmax	(500ms)	: Fail
Pst	(1.00)	: Fail
Plt	(0.65)	: Fail

No.	dc[%]	dmax[%]	Tmax[ms]	Pst
1	1.74	1.75	0.00	0.47
2	3.04	3.49	360.01	0.48
3	0.88	1.75	0.00	0.51
4	3.04	3.48	600.00	0.52
5	0.44	0.45	0.00	0.47
6	0.44	4.36	120.01	2.15
7	0.87	1.31	0.00	0.51
8	1.30	1.74	0.00	0.50
9	0.44	3.28	0.00	1.27
10	0.87	0.87	0.00	0.46
11	2.61	3.49	220.01	0.51
12	0.44	0.87	0.00	0.48



Manual Measurement

***** appliances

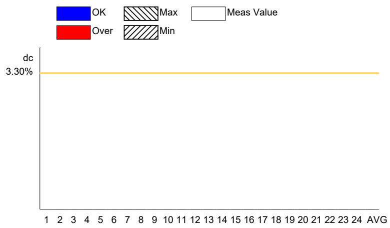
Print Date	:	Wed Dec 23 21:48:05 2020
MeasureDate	:	Mon Jan 7 15:09:04 2008
Comment	:	Experimental model Pattern A

Regulation	:	IEC61000-3-3	Ed3.0 am1
		IEC61000-4-15	Ed2.0
Interval	:	1Min	
Model	:	YOKOGAWA WT5000	
Power	:	NF ES2000S+ES4152	
Impedance	:	230V	
Wiring	:	single-phase 2-wire	
Voltage Range	:	300.00V	
Set Voltage	:	230V	
Set Frequency	:	50Hz	
Voltage U1	:	229.97V	
Frequency U1	:	50.000Hz	
Element	:	1	
dmin	:	0.20%	

PASS

Element1		: Pass
dc	(3.30%)	: ----
dmax	(7.00%)	: Pass
Tmax	(500ms)	: ----
Pst	(-----)	: ----
Plt	(-----)	: ----

No.	dc[%]	dmax[%]	Tmax[ms]	Pst
1	0.00 max	6.28	0.00 max	-----
2	0.00	6.28	0.00	-----
3	0.00	6.28	0.00	-----
4	0.00	6.28	0.00	-----
5	0.00	6.28	0.00	-----
6	0.00	6.28	0.00	-----
7	0.00	6.28	0.00	-----
8	0.00	6.28	0.00	-----
9	0.00	6.28	0.00	-----
10	0.00	6.28	0.00	-----
11	0.00	6.28	0.00	-----
12	0.00	6.28	0.00	-----
13	0.00	6.28	0.00	-----



IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

General Measurement (when the power supply function is in use)

******* appliances**

Print Date : Wed Dec 23 21:51:59 2020
MeasureDate : Wed Jan 9 15:36:48 2008
Comment : Experimental model Pattern A

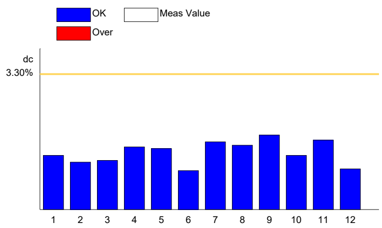
Power supply information

Regulation : IEC61000-3-11 Ed2.0
IEC61000-4-15 Ed2.0
Interval : 10Min0Sec
Model : YOKOGAWA WT5000
Power : NF 4430+4151
Impedance : EU 1f/3f
Wiring : single-phase 3-wire
Voltage Range : 300.00V
Set Voltage : 230V
Set Frequency : 50Hz
Voltage U1 : 231.52V
Frequency U1 : 49.999Hz
Element : 1
dmin : 0.20%

FAIL

Compatibility Condition : Compliance with IEC61000-3-3
Element1 : Fail
dc (3.30%) : Pass
dmax(4.00%) : Fail
Tmax(500ms) : Fail
Pst (1.00) : Fail
Plt (0.65) : Fail

No.	dc[%]	dmax[%]	Tmax[ms]	Pst
1	1.33	3.68	30.01	0.68
2	1.19	4.66	60.00	0.97
3	1.21	3.58	620.01	0.83
4	1.54	3.40	100.00	1.17
5	1.49	3.37	70.00	0.87
6	0.98	4.21	510.01	0.91
7	1.66	4.36	40.00	1.38
8	1.60	3.35	530.01	1.35
9	1.82	4.13	510.01	1.30
10	1.32	3.21	0.00	0.92
11	1.73	2.92	0.00	0.92
12	1.02	3.61	40.00	0.87



Manual Measurement

******* appliances**

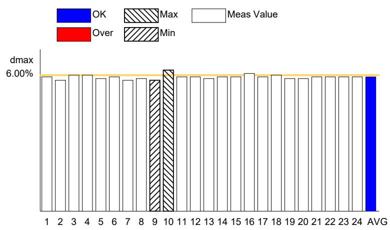
Print Date : Wed Dec 23 21:53:41 2020
MeasureDate : Wed Jan 9 13:05:20 2008
Comment : Experimental model Pattern A

Regulation : IEC61000-3-11 Ed2.0
IEC61000-4-15 Ed2.0
Interval : 1Min
Model : YOKOGAWA WT5000
Power : NF 4430+4151
Impedance : EU 1f/3f
Wiring : single-phase 3-wire
Voltage Range : 300.00V
Set Voltage : 230V
Set Frequency : 50Hz
Voltage U1 : 229.88V
Frequency U1 : 49.999Hz
Element : 1
dmin : 0.20%

PASS

Compatibility Condition : Compliance with IEC61000-3-3
Element1 : Pass
dc (-----) : ----
dmax(6.00%) : Pass
Tmax(-----) : ----
Pst (-----) : ----
Plt (-----) : ----

No.	dc[%]	dmax[%]	Tmax[ms]	Pst
1	-----	5.93	-----	-----
2	-----	5.84	-----	-----
3	-----	6.03	-----	-----
4	-----	6.01	-----	-----
5	-----	5.92	-----	-----
6	-----	5.93	-----	-----
7	-----	5.84	-----	-----
8	-----	5.90	-----	-----
9	-----	5.83 min	-----	-----
10	-----	6.23 max	-----	-----
11	-----	5.93	-----	-----
12	-----	5.93	-----	-----
13	-----	5.88	-----	-----



11
Using the Print Page to Print Reports

IEC 61000-3-12 Harmonic Measurement

***** appliances

Print Date	:	Wed Dec 23 21:56:25 2020
MeasureDate	:	Wed Jan 9 14:14:35 2008
Comment	:	Experimental model Pattern A

Power supply information

Regulation	:	IEC61000-3-12 Ed2.0 IEC61000-4-7 Ed2.0 A1
MeasureTime	:	150sec
Model	:	YOKOGAWA WT5000
Power	:	NF ES2000S
Wiring	:	single-phase 2-wire
Element	:	1
Range	:	300V/30A
Rating Voltage	:	230 V
Iequ	:	20.0000 A
Z Impedance	:	0.0200 ohm
Iref	:	19.7053 A
Set Iref	:	---------
Power Rsce	:	575.000
Max Rsce	:	369.312

FAIL

Ssc	:	5096504.08
Min Rsce	:	>= 350.0000
Apply Limit	:	Table2-Other than balanced 3-phase
Circumstance a	:	30.86% (Fail)
Term a(I5)	:	37.16% (Fail)
Term a(I7)	:	13.69% (Fail)
Term c	:	12.03 - 16.62deg (Fail)
Term d(I5)	:	37.16% (Fail)
Term d(I7)	:	13.69% (Fail)
Term f	:	12.03 - 16.62deg (Fail)

[Average]

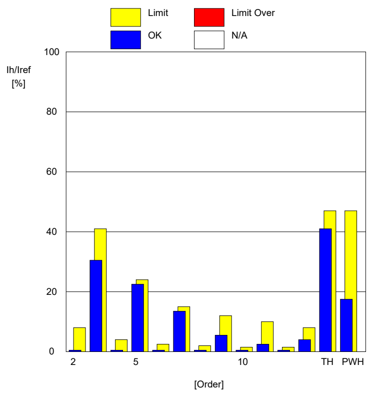
Voltage(rms)	:	200.37 V
Current(rms)	:	19.71 A
Frequency	:	50.01 Hz
Power Factor	:	0.62
Sigma W	:	2466.71 W
THC	:	15.01 A
V THD	:	3.11 %
A THD	:	117.51 %
P THD	:	2.92 %

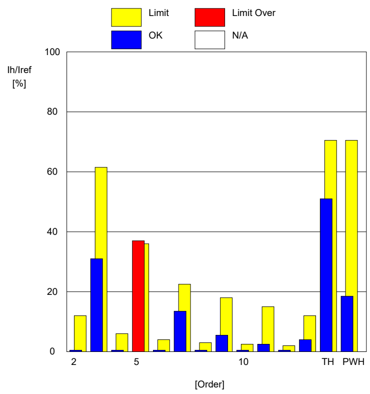
[Maximum]

Voltage(rms)	:	200.84 V
Current(rms)	:	20.11 A
Frequency	:	50.06 Hz
Power Factor	:	0.63
Sigma W	:	2530.20 W
THC	:	15.28 A
V THD	:	3.14 %
A THD	:	118.48 %
P THD	:	2.96 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.4489	8.0000	94.4
3	30.3431	41.0000	26.0
4	0.4489	4.0000	88.8
5	22.5477	24.0000	6.1
6	0.4350	2.6667	83.7
7	13.5496	15.0000	9.7
8	0.4059	2.0000	79.7
9	5.5089	12.0000	54.1
10	0.3621	1.6000	77.4
11	2.4513	10.0000	75.5
12	0.3124	1.3333	76.6
13	3.8774	8.0000	51.5
TH	41.0220	47.0000	12.7
PWH	17.5712	47.0000	62.6

Order	Measure[%]	Limit[%]	Margin[%]
2	0.5770	12.0000	95.2
3	30.8618	61.5000	49.8
4	0.5435	6.0000	90.9
5	37.1587	36.0000	-3.2
6	0.4992	4.0000	87.5
7	13.6851	22.5000	39.2
8	0.4604	3.0000	84.7
9	5.7087	18.0000	68.3
10	0.4211	2.4000	82.5
11	2.6209	15.0000	82.5
12	0.3630	2.0000	81.9
13	4.0100	12.0000	66.6
TH	50.9534	70.5000	27.7
PWH	18.2901	70.5000	74.1





Chapter 12

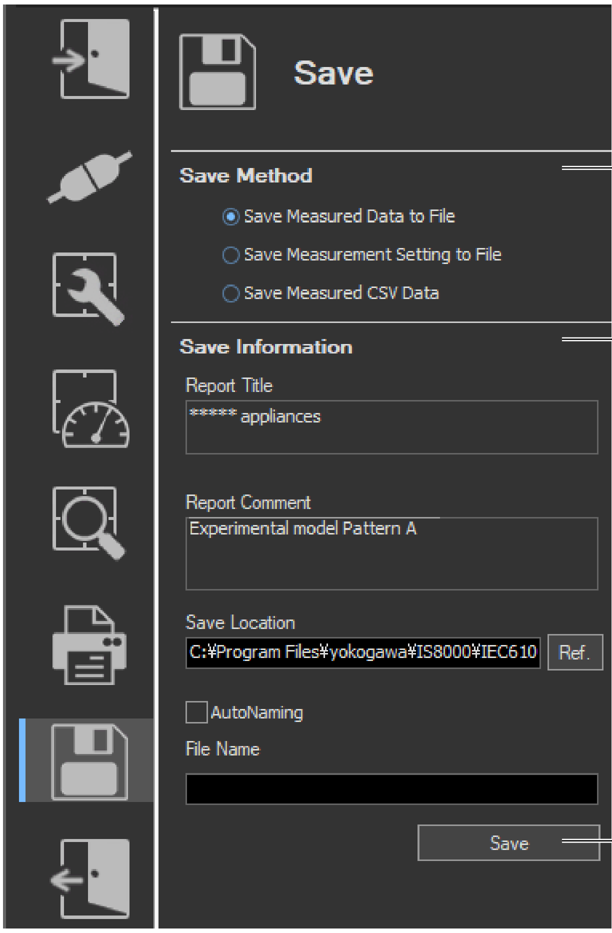
Using the Save Page to Save Setting Information and Measured Data

This chapter explains how to save setting information and measure data.

12.1 Saving Setting Information and Measured Data

Procedure

1. Click  in the menu area. The Save submenu appears.



Save Method (page 12-2)
Select the type of data to save and the file format to save it to. Select the file type.

Save Information (page 12-2)
Set the location and file name to save to.

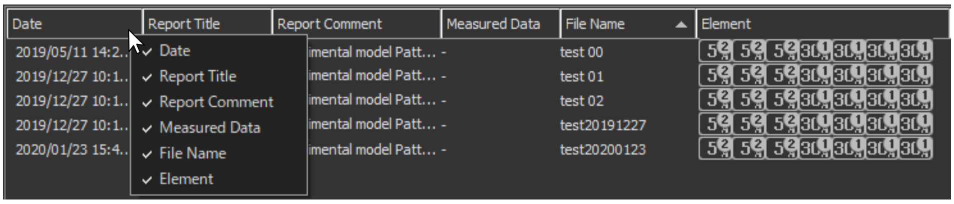
Save (page 12-2)

Configuring File Information Display Settings

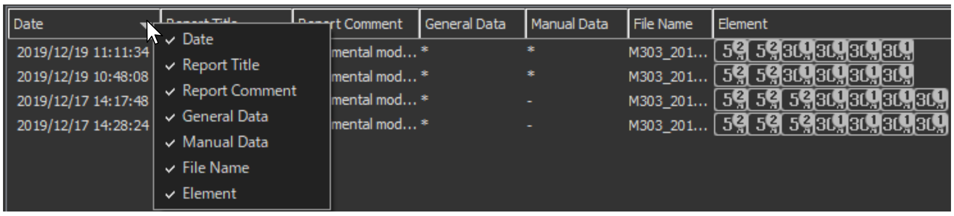
1. Right-click the file information heading area at the top of the setting and display area. A list of the different types of information that can be displayed appears.

2. Select the type of information that you want to display.

IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software



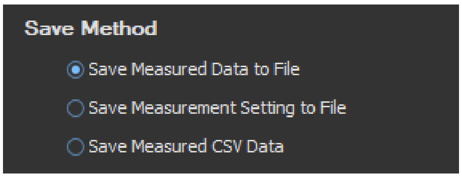
IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software



Saving Measured Data

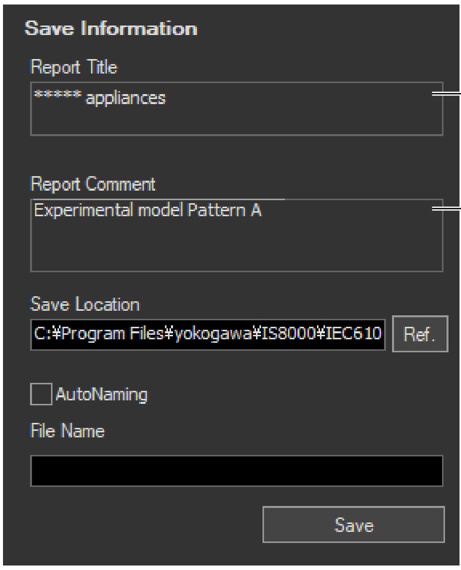
You can save the measured data when the measured data has been retrieved (or loaded).

1. Select **Save Measured Data to File**.



2. After selecting a folder in the **Save Location** box, enter the name of the file you want to save in the File Name box.

3. Click **Save**. The measured data is saved.



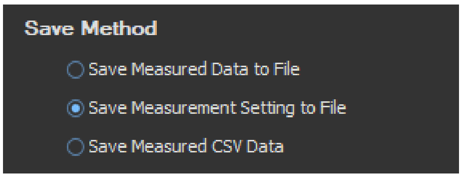
Section 11.1 explains how to set report titles and comments.

Note

You cannot save the measured data while the measurement is in progress.

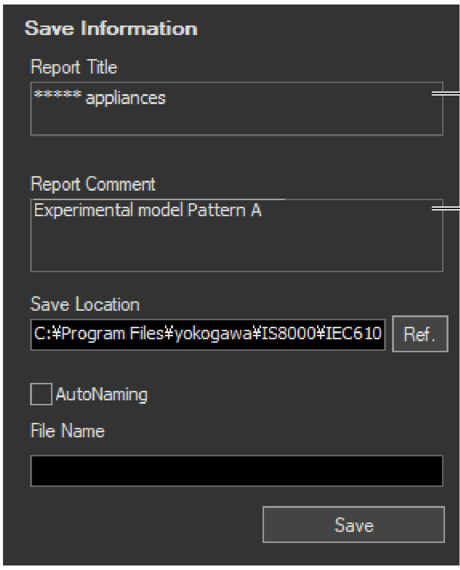
Saving the Setting Information

1. Select **Save Measurement Setting to File**.



2. After selecting a folder in the **Save Location** box, enter the name of the file you want to save in the File Name box.

3. Click **Save** to save the setting information.



Section 11.1 explains how to set report titles and comments.

Note

You cannot save the setting information while the measurement is in progress.

Explanation

Kinds of File Information

Date and time

When the file was saved. Displayed in this format: year/month/day hour:minute:second

Report Title (See section 11.1)

Report Comment (See section 11.1)

Measured Data

Displayed on the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software

-	Setting information file
***(Old)**	Setup parameter file of the WT3000E/WT3000 series
*****	Files that only contain the measured data of compliance tests (do not contain the measured data of simple tests)
******	Files that contain both the measured data of compliance tests and the measured data of simple tests

General Data

Displayed on the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software

***(Old)**	Setup parameter file of the WT3000E/WT3000 series
*****	File containing data measured in General mode (normal voltage fluctuation and flicker measurement)

Manual Data

Displayed on the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software

***(Old)**	Setup parameter file of the WT3000E/WT3000 series
*****	File containing data measured in Manual dmax mode (measurement of dmax caused by manual switching).

Element (See section 5.1)

When measured data of the WT3000E/WT3000 series is loaded

- On the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software, "*(Old)" appears in the Measured Data column of the file information display area.
- On the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software, "*(Old)" appears in the General Data and Manual data columns of the file information display area.
- You cannot perform rejudgment by changing the conditions of the standard because this is an offline analysis.

Sorting the file list

You can sort the list of loaded files in ascending or descending order by clicking an item heading area. The sorted item heading area shows ▲ (ascending) or ▼ (descending).

Saving Measured Data

Saving Measured Harmonic Data

You can use the IEC 61000-3-2, IEC 61000-3-12 Harmonic Measurement Software to save the harmonic measurement data and waveform data that the PC has acquired from the WT to a file. When the Harmonic Measurement Software saves this data, it will also save the WT harmonic measurement conditions along with the setting information described below.
The following two types of measured data files are available.

- Files that only contain the measured data of compliance tests (do not contain the measured data of simple tests)
  - An asterisk appears in the Measured Data column of the file information display area.
  - The following two types of files are created.

    .fdt   Measured data (compliance test data)
    .ini   Setting information

- Files that contain both the measured data of compliance tests and the measured data of simple tests
  - These files are saved when you select Simple Test Measurement in the test menu described in section 4.1, execute a simple compliance test, and save the measured data of the test.
  - Two asterisks appear in the Measured Data column of the file information display area.
  - The following two types of files are created.

    .fdt   Measured data (The following two types of data are included.)
    - Simple test data
    - Compliance test data that has been specified as the test reference for the simple test

    .ini   Setting information

Saving Measured Data for Voltage Fluctuation and Flicker

You can use the IEC 61000-3-3, IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement Software to save the measured voltage fluctuation and flicker data that the PC has acquired from the WT to a file. When the Voltage Fluctuation and Flicker Measurement Software saves this data, it will also save the WT voltage fluctuation and flicker measurement conditions along with the setting information.

File Name/Extension

When you choose to save a file, two files will be saved with the same file names but with these different extensions:

.fdt   Measured Data
.ini   Setting information

File Name

You can select any file name that the PC will recognize.

Saving Setting Information

When in online mode, the software can save the following setting information to a file.

- Measurement and judgment conditions
  - IEC 61000-3-2 ► sections 7.3, 7.4
  - IEC 61000-3-3 ► sections 8.3, 8.4
  - IEC 61000-3-11 ► sections 9.3, 9.4
  - IEC 61000-3-12 ► sections 10.3, 10.4
- Display settings (Measure, Analysis): Harmonic measurement only
  - IEC 61000-3-2 ► Measure: page 7-37, Analysis: page 7-71
  - IEC 61000-3-12 ► Measure: page 10-22, Analysis: page 10-35
- Trend graph and CPF graph display settings: Voltage fluctuation and flicker measurement only
  - IEC 61000-3-3 ► Trend graph: section 8.10, CPF graph: section 8.11
  - IEC 61000-3-11 ► Trend graph: section 9.10, CPF graph: section 9.11
- Report titles and comments (see section 11.1)
- If you used a power supply, the power supply setting information is also saved.

File Name/Extension

You can select any file name that the PC will recognize.

Extension: .ini

12.2 Saving Measured Data in CSV Format

Procedure

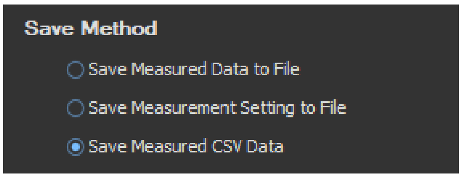
Once the following kinds of data has been acquired or loaded, it can be saved to CSV file format.

- Numeric data
- Waveform data

Note

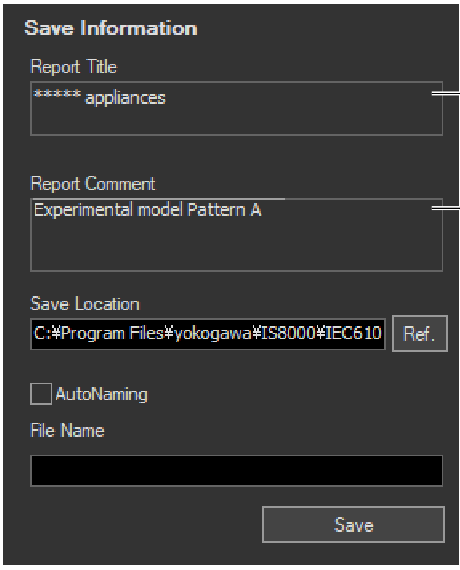
You cannot save measured data in CSV format while measurement is taking place.

1. Select **Save Measured CSV Data**.



2. After selecting a folder in the **Save Location** box, enter the name of the file you want to save in the File Name box.

3. Click **Save**. The measured data is saved to CSV format.



Section 11.1 explains how to set report titles and comments.

Explanation

You can save data to CSV file format after it has been acquired or loaded. When you save the data in CSV format, you can view it using a PC spreadsheet program (such as Microsoft Excel).

Note

This software cannot load data saved to CSV format.

File Name/Extension

You can select any file name that the PC will recognize.
Extension: .csv

If AutoNaming is not used when saving to a CSV file, the file is saved with the following name.
”Text written in the file name box”+”_CSV”.csv

Data Types

The following data is saved for each measured input element:

Voltage
Current
Active power
Φ (phase angle)
Apparent power
Circuit power factor
FreqPLL
None (Blank column)
Uthd: Voltage THD
UthdG
UthdS
Ithd: Current THD
IthdG
IthdS
Distortion factor (P THD)
Phi
FreqU
Thc
Pohc
Voltage waveform data (8000 points)
Current waveform data (8000 points)

For IEC 61000-3-2 harmonic measurements, when you save the measured data of a simple compliance test in CSV format, the data is saved in the following order.

- Measured data of the simple compliance test
- Measured data of the compliance test that has been specified as the test reference for the simple test

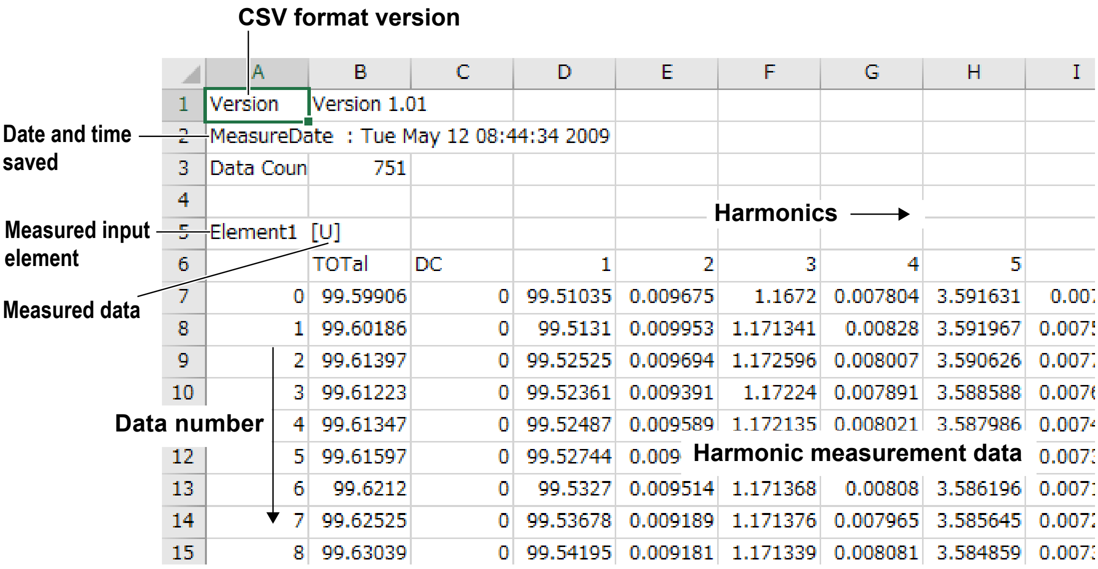
Data Size

Under the following circumstances, the software will produce an approximately 9-MB file with about 18000 lines.

- Compliance test
- Wiring pattern set to 3P4W 400 V device, and the measured input elements set to 1 to 3
- Measurement time set to 2 min 30 s

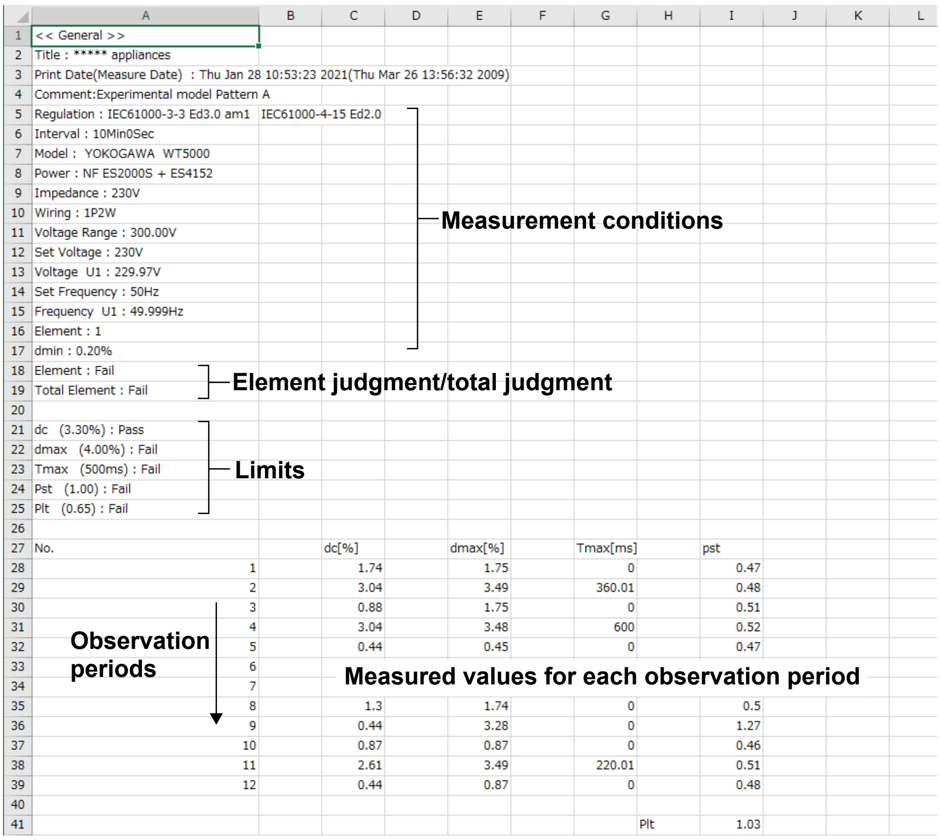
Example of Numeric Data Saved to CSV Format and Then Opened Using Microsoft Excel

- **IEC 61000-3-2**



	A	B	C	D	E	F	G	H	I
1	Version	Version 1.01							
2	MeasureDate	: Tue May 12 08:44:34 2009							
3	Data Coun	751							
4									
5	Element1	[U]							
6		TOTal	DC	1	2	3	4	5	
7	0	99.59906	0	99.51035	0.009675	1.1672	0.007804	3.591631	0.00
8	1	99.60186	0	99.5131	0.009953	1.171341	0.00828	3.591967	0.0075
9	2	99.61397	0	99.52525	0.009694	1.172596	0.008007	3.590626	0.007
10	3	99.61223	0	99.52361	0.009391	1.17224	0.007891	3.588588	0.0076
	4	99.61347	0	99.52487	0.009589	1.172135	0.008021	3.587986	0.0074
12	5	99.61597	0	99.52744	0.009				0.007
13	6	99.6212	0	99.5327	0.009514	1.171368	0.00808	3.586196	0.007
14	7	99.62525	0	99.53678	0.009189	1.171376	0.007965	3.585645	0.007
15	8	99.63039	0	99.54195	0.009181	1.171339	0.008081	3.584859	0.007

- **IEC 61000-3-3**



	A	B	C	D	E	F	G	H	I
1	<< General >>								
2	Title : ***** appliances								
3	Print Date(Measure Date) : Thu Jan 28 10:53:23 2021(Thu Mar 26 13:56:32 2009)								
4	Comment:Experimental model Pattern A								
5	Regulation : IEC61000-3-3 Ed3.0 am1	IEC61000-4-15 Ed2.0							
6	Interval : 10Min0Sec								
7	Model : YOKOGAWA WT5000								
8	Power : NF ES2000S + ES4152								
9	Impedance : 230V								
10	Wiring : 1P2W								
11	Voltage Range : 300.00V								
12	Set Voltage : 230V								
13	Voltage U1 : 229.97V								
14	Set Frequency : 50Hz								
15	Frequency U1 : 49.999Hz								
16	Element : 1								
17	dmin : 0.20%								
18	Element : Fail								
19	Total Element : Fail								
20									
21	dc (3.30%) : Pass								
22	dmax (4.00%) : Fail								
23	Tmax (500ms) : Fail								
24	Pst (1.00) : Fail								
25	Plt (0.65) : Fail								
26									
27	No.		dc[%]		dmax[%]		Tmax[ms]		pst
28	1		1.74		1.75		0		0.47
29	2		3.04		3.49		360.01		0.48
30	3		0.88		1.75		0		0.51
31	4		3.04		3.48		600		0.52
32	5		0.44		0.45		0		0.47
33	6								
34	7								
35	8		1.3		1.74		0		0.5
36	9		0.44		3.28		0		1.27
37	10		0.87		0.87		0		0.46
38	11		2.61		3.49		220.01		0.51
39	12		0.44		0.87		0		0.48
40									
41								Plt	1.03

- **IEC 61000-3-11**

	A	B	C	D	E	F	G	H	I
1	<< General >>								
2	Title : ***** appliances								
3	Print Date(Measure Date) : Thu Jan 28 10:43:29 2021(Wed Jan 9 15:36:48 2008)								
4	Comment:Experimental model Pattern A								
5	Regulation : IEC61000-3-11 Ed2.0	IEC61000-4-15 Ed2.0							
6	Interval : 10Min0Sec								
7	Model : YOKOGAWA WT5000								
8	Power : NF 4430 + 4151								
9	Impedance : EU 1f/3f								
10	Wiring : 3P4W								
11	Voltage Range : 300.00V								
12	Set Voltage : 230V								
13	Voltage U1 : 231.52V								
14	Set Frequency : 50Hz								
15	Frequency U1 : 49.999Hz								
16	Element : 1								
17	dmin : 0.20%								
18	Compatibility Condition : Compliance with IEC61000-3-3								
19	Element : Fail								
20	Total Element : Fail								
21									
22	dc (3.30%) : Pass								
23	dmax (4.00%) : Fail								
24	Tmax (500ms) : Fail								
25	Pst (1.00) : Fail								
26	Plt (0.65) : Fail								
27									
28	No.		dc[%]		dmax[%]		Tmax[ms]		pst
29	1		1.33		3.68		30.01		0.68
30	2		1.19		4.66		60		0.97
31	3		1.21		3.58		620.01		0.83
32	4		1.54		3.4		100		1.17
33	5		1.49		3.37		70		0.87
34	6								
35	7								
36	8		1.6		3.35		530.01		1.35
37	9		1.82		4.13		510.01		1.3
38	10		1.32		3.21		0		0.92
39	11		1.73		2.92		0		0.92
40	12		1.02		3.61		40		0.87
41									
42								Plt	1.06

Measurement conditions (rows 5–17)

Element judgment/total judgment (rows 19–20)

Limits (rows 22–26)

Observation periods

Measured values for each observation period

- **IEC 61000-3-12**

	A	B	C	D	E	F	G	H	I
1	Version	Version 1.01							
2	MeasureDate : Wed Jan 9 14:14:35 2008								
3	Data Coun	750							
4									
5	Element1 [U]								
6		TOTal	DC	1	2	3	4	5	6
7	0	200.6296	9.91E+37	200.5349	0.031284	2.4522	0.023639	4.569618	0.0248
8	1	200.6434	9.91E+37	200.5487	0.031366	2.454565	0.023539	4.568487	0.025426
9	2	200.6569	9.91E+37	200.5622	0.030696	2.456206	0.023833	4.569323	0.025304
10	3	200.6757	9.91E+37	200.5808	0.029646	2.457534	0.023864	4.57153	0.025135
	4	200.6928	9.91E+37	200.5979	0.0293!				.025306
12	5	200.7036	9.91E+37	200.6086	0.029671	2.460165	0.023993	4.575976	0.025075
13	6	200.7137	9.91E+37	200.6187	0.029369	2.46045	0.024694	4.577101	0.024926
14	7	200.7213	9.91E+37	200.6262	0.029871	2.462351	0.024685	4.579212	0.025557
15	8	200.7146	9.91E+37	200.6194	0.032011	2.463609	0.025311	4.582656	0.026255
16	9	200.6849	9.91E+37	200.5896	0.034345	2.469575	0.026729	4.580076	0.027516

Date and time saved (row 2)

Measured input element (row 5)

Measured data

Harmonics

Data number

Harmonic measurement data

Chapter 13

Maintenance (Troubleshooting)

This chapter describes the following items.

- Troubleshooting
- Error messages
- Help
- Version information

13.1 Troubleshooting

If a message appears on the PC screen, see section 13.2, "Error Messages."

Problems and Solutions	
Unable to communicate with the WT using USB.	
	Using Device Manager, check whether the USB driver is appropriate for the WT series. If the driver is not appropriate, switch to the appropriate USB driver. ► section 1.2 in the *Installation Manual* (IM IS8000-04EN)
Unable to communicate with the WT using GP-IB.	
	Communication may not work properly on GP-IB cards other than those of NI (National Instruments). Use a GP-IB card by NI (see section 1.2).
Measurement stops suddenly.	
	Close the memory-resident software running on the PC. For example, if virus checking software frequently checks the communications between this software and the PC, the performance of the PC may decline drastically. If you choose to stop the virus check and use the PC, please do so in a network environment that is well protected against viruses.

13.2 Error Messages

Message	Corrective Action
Measured data will be initialized. Do you want to execute?	Select OK to initialize the measured data. Otherwise, select Cancel.
Data was lost. Please check your settings and try again.	The communication may be disconnected. Check the cable, noise, etc.
Connection error. Please check your settings and try again.	Check the following items. • Is the WT turned on? • The USB, GP-IB, or Ethernet cable is connected properly. • For USB, check that a USB hub is not being used. • For GP-IB, check that a unique GP-IB address is assigned within the system. Check that the GP-IB address specified on the WT matches the address specified on the software. Is the GP-IB driver installed correctly in your PC? • For Ethernet, check that the IP address, user name, and password specified on the WT match those specified on the software.
Peak over. Please check your settings and try again.	Check that the voltage or current range is appropriate.
Frequency error. Please check your settings and try again.	Check the frequency and voltage range.
Unrecognized error. Please check your settings and try again.	An unexpected error occurred.
All the data will be discarded. Do you want to execute?	Select OK to discard the current data. Otherwise, select Cancel.
Write failed.	Check the destination medium. • Check that the storage medium is present. • Check that there is enough free space on the storage medium. • Check that the storage medium is formatted. • Check that the storage medium is not write-protected.
Please input a value from 0.0001 to 99999.9999. Please input a value from 0.01 to 999.99. Please input a value from 1.00 to 99.99. Please input a value from 0.10 to 99.99. Please input value from 0:30 to 15:00. Please input a value from 1 to 99999. Please input a value from 1 to 99. Please input a value from 0.10 to 9.99.	The value that you tried to set is outside the allowed range. Set a value within the allowed range.

13.3 Using the Help Function

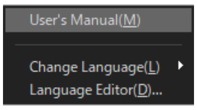
Procedure

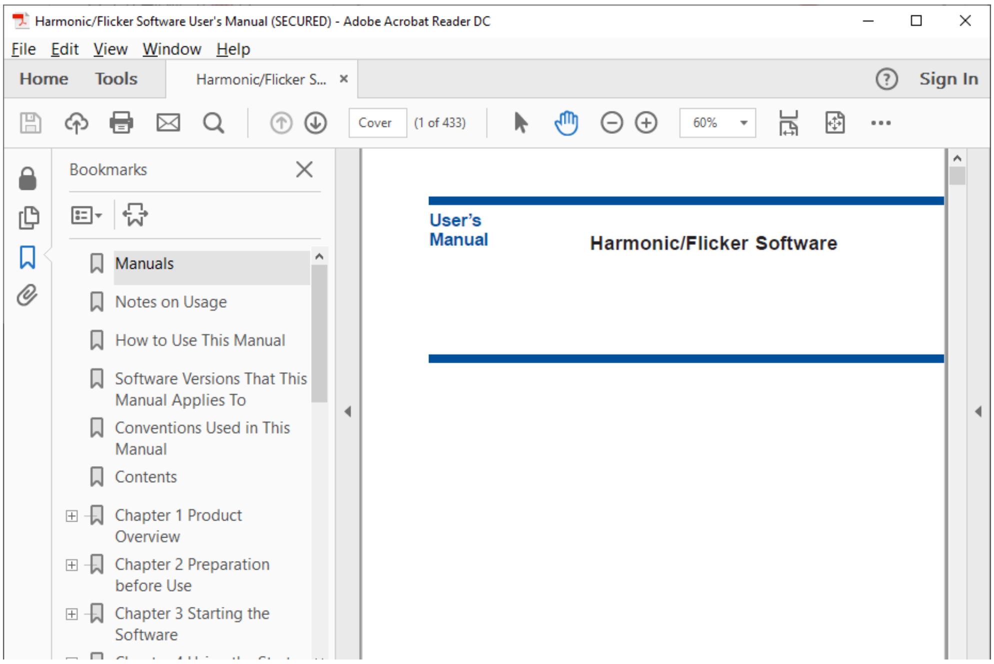
Viewing Manuals

1. Right-click the **Help**  button.

2. Click **User's Manual**.

If Adobe Acrobat Reader is installed on the PC, it will start up and open the PDF User's Manual for this software.





Explanation

Help

The user's manual is displayed as a help document in PDF. You can find information about operating procedures of this software and terminology.

* To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

Viewing the Latest User's Manual

1. To obtain the latest PDF file of the user's manual, go to the following Web page, and then browse to the download page. Then, download the user's manual for the software from this page.

https://tmi.yokogawa.com/library/

2. Rename the downloaded user's manual as indicated below, and copy (overwrite) the file in the software installation folder that you specified when you installed the software.

► section 1.2 in the *Installation Manual* (IM IS8000-04EN)

User's manual file name: IMIS8000-63EN.pdf

3. Then, you will be able to view the file by clicking **User's Manual** on the **Help** menu.

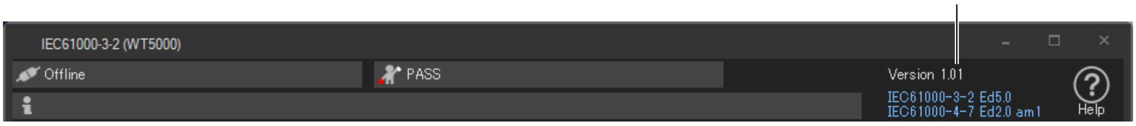
Note

- You can download Adobe Acrobat Reader from Adobe System's Web page.
- The latest user's manual that you can download from YOKOGAWA's Web page corresponds to the latest version of this software program. Update the software program as necessary. The program for updating the software can be downloaded from YOKOGAWA's Web page above.

13.4 Viewing Version Information

The version information of each software is displayed in the information area.

Software version



Note

The software version is different for each operation mode indicated below.

- IEC 61000-3-2 Harmonic Measurement
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement
- IEC 61000-3-12 Harmonic Measurement

If any function is updated, the version of the other function may not change.

For the latest version of the software, check the YOKOGAWA's Web page below.

https://tmi.yokogawa.com/library/

The program for updating the software as well as the latest user's manual (see section 13.3) can be downloaded from YOKOGAWA's Web page above.

Specifications

This chapter explains the specifications of the following software applications.

- IEC 61000-3-2 Harmonic Measurement
- IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement
- IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement
- IEC 61000-3-12 Harmonic Measurement

14.1 IEC 61000-3-2 Harmonic Measurement

Item	Specifications
Software*	Harmonic measurement/judgment software that can measure harmonic currents and judge the results of those measurements based on IEC or JIS standards. Displays and prints measurements and judgments. The executable file name is IEC61000.exe.
Compatible measurement devices*	WT5000 (Model: WT5000)
Applicable standards*	IEC 61000-3-2 Edition 3.0:2005/A1:2008/A2:2009, IEC 61000-3-2 Edition 4.0:2014, IEC 61000-3-2 Edition 5.0:2018 • EN 61000-3-2:2006/A1:2009/A2:2009, EN 61000-3-2:2014, EN 61000-3-2:2019 • IEC 61000-4-7 Edition 1.0:1991, Edition 2.0:2002 and A1 of the Edition 2.0:2008 • EN 61000-4-7:1993, EN 61000-4-7:2002/A1:2009 • JIS C 61000-3-2:2011, JIS C 61000-3-2:2019 • JIS C 61000-4-7:2007
Features	Acquisition and loading of measured data and waveform data to be judged. • Configuration of WT measurement conditions • Online acquisition of measured data and waveform data from the WT (online mode) • Loading of previously saved measured data and waveform data (offline mode)
	Measurement modes* • Compliance test, Simple test - In online mode Measures the harmonics of the data acquired from the WT, and judges those harmonics based on IEC or JIS. - In offline mode Judges the measured data loaded from a file according to IEC or JIS. • Test preview Only available in online mode. As the WT measures the harmonic appear on a list or bar graph of measured values and waveform.
	Standard and measurement settings Sets the classification of the equipment under test (EUT) as defined in IEC or JIS and evaluation conditions within each class.
	Measurement time The time from the start to the end of measurement. Measurement time can be set in one-second intervals within the range of 0 h 0 min 1 s to 24 h 0 min 0 s.
	Report titles/comments Report titles and comments can be entered. Report formats: color/black and white; English/Japanese. Reports are printed and saved to .bmp or .pdf files along with measured data.
	Measure start/stop Measurement can be started in online mode.

Item	Specifications
	Display of judgment results, measured data, and waveform data When a compliance test is performed, the software will display judgments as to whether or not the data complies with IEC or JIS, along with the measured data and waveform data that was judged. • Display of the Evaluation Result within the Entire Measurement Time Determines whether or not all of the data within the measurement time is within the set limits, and displays the result. • Harmonic current list and graph display Displays the measured harmonic values and the limits for each harmonic set by the standard for those values in both a list and a bar graph. • Bar graph display of harmonic voltage, current, and phase angle Displays the measured data for each harmonic in a color-coded bar graph. • List display of harmonic voltage, current, and phase angle values Displays the measured data for each harmonic in a color-coded list. • Trend Graph View Displays a graph that shows data fluctuations over time. • Waveform Display of Voltage and Current Displays a waveform of data measured immediately after the measurement time (displays approximately two waveform periods). • Repeatability of measured data The measured harmonic data values saved in a file are compared against each other, and their differences are displayed in a bar graph and numeric list. Displays whether the differences between the measured data values are within 5 % (repeatability), as defined in the standard. • Display of simple test judgment results Judges whether the measured data of the simple test is within limits and displays the results collectively.
	Loading of measured data, waveform data, and setting information • Loading and saving of setting information Setting information files that contain measurement settings, the measurement time setting, and report titles and comments can be saved. Saved setting information files can be loaded. • Loading and saving of measured data and waveform data Harmonic measurement data and waveform data files can be saved. Measurement settings, the measurement time setting, and report titles and comments are also saved, along with the WT harmonic measurement conditions set using the software. The saved measured data, waveform data, harmonic measurement conditions, and setting information can be loaded. • Saving of measured data and waveform data to CSV format Harmonic measurement data and waveform data can be saved to CSV files. Saved CSV files can be opened with PC programs that support CSV file format.
	Printing and saving of reports Reports can be saved to .pdf or .bmp files. Report files can also be printed.
PC System Requirements	See section 1.2.

* The width of the window function (measurement period) for measurements on the WT5000 is the same as defined by IEC 61000-4-7 or JIS C 61000-4-7.

IEC 61000-4-7 Edition Number	JIS C 61000-4-7 Edition Number	Window Function of the WT (Measurement Period)	
		50 Hz	60 Hz
Edition 1.0	2007 JA	16 cycles (320 ms)	16 cycles (267 ms)
Edition 2.0	2007	10 cycles (200 ms)	12 cycles (200 ms)
Edition 2.0 A1	------	10 cycles (200 ms)	12 cycles (200 ms)

Compatibility between the WT5000 Precision Power Analyzer and IEC

In the EN 61000-3-2:2006/A2:2009 (IEC 61000-3-2 Edition 3.0:2005/A2:2009), EN 61000-3-2:2014 (IEC 61000-3-2 Edition 4.0:2014), and EN 61000-3-2:2019 (IEC 61000-3-2 Edition 5.0:2018) standards, the requirements for measurement instruments are specified in EN 61000-4-7 (IEC 61000-4-7).

The WT5000 complies with the items related to EN 61000-3-2:2006/A2:2009 (IEC 61000-3-2 Edition 3.0:2005/A2:2009), EN 61000-3-2:2014 (IEC 61000-3-2 Edition 4.0:2014), or EN 61000-3-2:2019 (IEC 61000-3-2 Edition 5.0:2018) of EN 61000-4-7 shown below in the range indicated in the referenced section.

- EN 61000-4-7:1993 (IEC 61000-4-7 Edition 1.0:1991) ► “Standard Compliance Range 1” on page 14-8
- EN 61000-4-7:2002 (IEC 61000-4-7 Edition 2.0:2002) ► “Standard Compliance Range 2” on page 14-9
- EN 61000-4-7:2002 and A1:2009 (IEC 61000-4-7 Edition 2.0:2002 and A1:2008) ► “Standard Compliance Range 3” on page 14-10

Compatibility between the WT5000 Precision Power Analyzer and JIS

In the JIS C 61000-3-2:2011 standard, the requirements for measurement instruments are specified in JIS C 61000-4-7.

The WT5000 complies with the items related to JIS C 61000-3-2:2011 (IEC 61000-3-2 Edition 3.0:2005/A2:2009) of JIS C 61000-4-7 shown below in the range indicated in the referenced section.

- JIS C 61000-4-7:2007 (appendix JA) ► “Standard Compliance Range 1” on page 14-8
- JIS C 61000-4-7:2007 ► “Standard Compliance Range 2” on page 14-9

In the JIS C 61000-3-2:2019 standard, the requirements for measurement instruments are specified in IEC 61000-4-7.

The WT5000 complies with the items related to JIS C 61000-3-2:2019 (IEC 61000-3-2 Edition 3.0:2005/A2:2009) of IEC 61000-4-7 shown below in the range indicated in “Standard Compliance Range 3” on page 14-10.

- IEC 61000-4-7 Edition 1.0:1991
- IEC 61000-4-7 Edition 2.0:2002/A1:2008

14.2 IEC 61000-3-3 Voltage Fluctuation and Flicker Measurement

Item	Specifications
Software	The voltage fluctuation and flicker measurement software measures the voltage fluctuation and flicker of electrical or electronic equipment according to the IEC Standard and indicates/saves the results of judgments made according to the standard. The executable file name is IEC61000.exe.
Applicable instruments	WT5000 (Model: WT5000)
Applicable standards	Voltage fluctuation and flicker suppression standards • IEC 61000-3-3 Edition 2.0:2008, IEC 61000-3-3 Edition 3.0:2013/A1:2017 • EN 61000-3-3:2008, EN 61000-3-3:2013, EN 61000-3-3:2019 Flicker meter function and design specifications • IEC 61000-4-15 Edition 1.1:2003, IEC 61000-4-15 Edition 2.0:2010 • EN 61000-4-15:1998/A1:2003, EN 61000-4-15:2011
Features	Retrieve and load the measured data to be judged • WT Measurement Conditions • Retrieve measured data from the WT connected online (online mode) • Load measured data already saved (offline mode)
	Measurement mode • Normal voltage fluctuation and flicker measurement Calculates all the voltage fluctuation and flicker values of dc, dmax, d(t), Tmax, Pst, and Plt, compares them to the preset limits, and indicates the overall judgment. • Measurement of dmax caused by manual switching Measures the voltage change, dmax, dc, and Tmax when the EUT switch is manually turned ON and OFF, determines the average over 24 measurements, and compares and judges against the limit.
	Standard and measurement settings Judgment conditions for voltage fluctuation and flicker measurement and measurement of dmax caused by manual switching in accordance with IEC
	Setting the Title and Comment of Reports Report titles and comments can be entered. Report formats: color/black and white; English/Japanese. Reports are printed and saved to .bmp or .pdf files along with measured data.
	Measure start/stop Measurement can be started in online mode.
	Numeric Data and Judgment Display the judgment result indicating whether the measured data of voltage fluctuation and flicker measurement is within the specified limits as well as the measured data.
	Trend Graph View • Display the trend graph of the normal voltage fluctuation and flicker measurement (dc, dmax, d(t), Tmax, idc, idmax, id(t), iTmax, and IFS). • Display the trend graph of measurement of dmax caused by manual switching (dmax, dc, Tmax, idmax, idc, iTmax).
	CPF Graph View Display the CPF graph of the normal voltage fluctuation and flicker measurement.
	Save and load the setting information and measured data • Loading and saving of setting information Save various types of setting information including measurement conditions, judgment conditions, title and comment of reports. Saved setting information files can be loaded. • Save and load the measured data Save the measured data of the voltage fluctuation and flicker to files. The setting information above is also saved. The voltage fluctuation and flicker measurement data and setting information saved to a file can also be loaded. • Save measured data in CSV format Save measured voltage fluctuation and flicker data reports in CSV format. The saved data can be loaded in a software application on the PC.
	Printing and saving of reports Reports can be saved to .pdf or .bmp files. Report files can also be printed.
PC System Requirements	See section 1.2.

14.3 IEC 61000-3-11 Voltage Fluctuation and Flicker Measurement

Item	Specifications
Software	The voltage fluctuation and flicker measurement software measures the voltage fluctuation and flicker of electrical or electronic equipment according to the IEC Standard and indicates/saves the results of judgments made according to the standard. The executable file name is IEC61000.exe.
Applicable instruments	WT5000 (Model: WT5000)
Applicable standards	Voltage fluctuation and flicker suppression standards • IEC 61000-3-11 Edition 1.0:2000, IEC 61000-3-11 Edition 2.0:2017 • EN 61000-3-11:2000, EN 61000-3-11:2019 Flicker meter function and design specifications • IEC 61000-4-15 Edition 1.1:2003, IEC 61000-4-15 Edition 2.0:2010 • EN 61000-4-15:1998/A1:2003, EN 61000-4-15:2011
Features	Retrieve and load the measured data to be judged • WT Measurement Conditions • Retrieve measured data from the WT connected online (online mode) • Load measured data already saved (offline mode)
	Measurement mode • Normal voltage fluctuation and flicker measurement Calculates all the voltage fluctuation and flicker values of dc, dmax, d(t), Tmax, Pst, and Plt, compares them to the preset limits, and indicates the overall judgment. • Measurement of dmax caused by manual switching Measures the maximum relative voltage change, dmax, when the EUT switch is manually turned ON and OFF, determines the average over 24 measurements, and compares and judges against the limit.
	Standard and measurement settings Judgment conditions for voltage fluctuation and flicker measurement and measurement of dmax caused by manual switching in accordance with IEC
	Setting the Title and Comment of Reports Report titles and comments can be entered. Report formats: color/black and white; English/Japanese. Reports are printed and saved to .bmp or .pdf files along with measured data.
	Measure start/stop Measurement can be started in online mode.
	Numeric Data and Judgment Display the judgment result indicating whether the measured data of voltage fluctuation and flicker measurement is within the specified limits as well as the measured data.
	Trend Graph View • Display the trend graph of the normal voltage fluctuation and flicker measurement (dc, dmax, d(t), Tmax, idc, idmax, id(t), iTmax, and IFS). • Display the trend graph of measurement of dmax caused by manual switching (dmax, dc, Tmax, idmax, idc, iTmax).
	CPF graph view Display the CPF graph of the normal voltage fluctuation and flicker measurement.
	Save and load the setting information and measured data • Loading and saving of setting information Save various types of setting information including measurement conditions, judgment conditions, title and comment of reports. Saved setting information files can be loaded. • Save and load the measured data Save the measured data of the voltage fluctuation and flicker to files. The setting information above is also saved. The voltage fluctuation and flicker measurement data and setting information saved to a file can also be loaded. • Save measured data in CSV format Save measured voltage fluctuation and flicker data reports in CSV format. The saved data can be loaded in a software application on the PC.
	Printing and saving of reports Reports can be saved to .pdf or .bmp files. Report files can also be printed.
PC System Requirements	See section 1.2.

14.4 IEC 61000-3-12 Harmonic Measurement

Item	Specifications
Software*	Harmonic measurement/judgment software that can measure harmonic currents and judge the results of those measurements based on IEC standards. Displays and prints measurements and judgments. The executable file name is IEC61000.exe.
Compatible measurement devices*	WT5000 (Model: WT5000)
Applicable standards*	The IEC 61000-3-12 Edition 1.0:2004, and Edition 2.0:2011 EN 61000-3-12:2005, EN 61000-3-12:2011 IEC 61000-4-7 Edition 2.0:2002/A1:2008 EN 61000-4-7:1993, EN 61000-4-7:2002/A1:2009
Features	Acquisition and loading of measured data and waveform data to be judged. • Configuration of WT measurement conditions • Online acquisition of measured data and waveform data from the WT (online mode) • Loading of previously saved measured data and waveform data (offline mode)
	Measurement modes* • Compliance test In online mode Measures the harmonics of the data acquired from the WT, and judges those harmonics based on IEC 61000-3-12. In offline mode Judges the measured data loaded from a file according to IEC 61000-3-12. • Harmonic preview Only available in online mode. As the WT measures the harmonic current, the harmonic fluctuations appear on a list of measured values. • Waveform preview Only available in online mode. The measured waveform appears as it is measured on the WT.
	Standard and measurement settings Judgment conditions configurable in accordance with IEC 61000-3-12.
	Measurement time The time from the start to the end of measurement. Measurement time can be set in one-second intervals within the range of 0 h 0 min 1 s to 24 h 0 min 0 s.
	Report titles/comments Report titles and comments can be entered. Report formats: color/black and white; English/Japanese. Reports are printed and saved to .bmp or .pdf files along with measured data.
	Measure start/stop Measurement can be started in online mode.

Item	Specifications
	Display of judgment results, measured data, and waveform data When a compliance test is performed, the software will display judgments as to whether or not the data complies with IEC 61000-3-12, along with the measured data and waveform data that was judged. • Display of all judgment results within the measurement time Determines whether or not all of the data within the measurement time is within the set limits, and displays the result. • Ih/Iref list and graph display Displays the measured values of Ih/Iref for each measured harmonic and the limits set by the standard for those values in both a list and a bar graph. • Rsce list and graph display Displays the measured values of Rsce for each measured harmonic and the limits set by the standard for those values in both a list and a bar graph. • Bar graph display of harmonic voltage, current, and phase angle Displays the measured data for each harmonic in a color-coded bar graph. • List display of harmonic voltage, current, and phase angle values Displays the measured data for each harmonic in a color-coded list. • Trend Graph View Displays a graph that shows data fluctuations over time. • Waveform Display of Voltage and Current Displays a waveform of data measured immediately after the measurement time (displays approximately two waveform periods). • Repeatability of measured data The measured harmonic data values saved in a file are compared against each other, and their differences are displayed in a bar graph and numeric list. Displays whether the differences between the measured data values are within 5 % (repeatability), as defined in the standard.
	Loading of measured data, waveform data, and setting information • Loading and saving of setting information Setting information files that contain measurement settings, the measurement time setting, and report titles and comments can be saved. Saved setting information files can be loaded. • Loading and saving of measured data and waveform data Harmonic measurement data and waveform data files can be saved. Measurement settings, the measurement time setting, and report titles and comments are also saved, along with the WT harmonic measurement conditions set using the software. The saved measured data, waveform data, harmonic measurement conditions, and setting information can be loaded. • Saving of measured data and waveform data to CSV format Harmonic measurement data and waveform data can be saved to CSV files. Saved CSV files can be opened with PC programs that support CSV file format.
	Printing and saving of reports Reports can be saved to .pdf or .bmp files. Report files can also be printed.
PC System Requirements	See section 1.2.

* The width of the window function (measurement period) for measurements on the WT5000 is 200 ms (10 cycles at 50 Hz and 12 cycles at 60 Hz) as defined by IEC 61000-4-7 Edition 2.0 or A1 of Edition 2.0.

Compatibility between the WT5000 Precision Power Analyzer and IEC

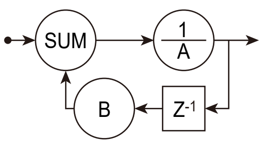
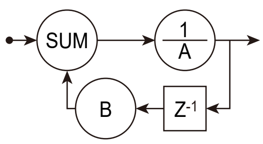
In the EN 61000-3-12:2011 (IEC 61000-3-12 Edition 2.0) standard, the requirements for measurement instruments are specified in EN 61000-4-7 (IEC 61000-4-7).

The WT5000 complies with the items related to EN 61000-3-12:2011 (IEC 61000-3-12 Edition 2.0) of EN 61000-4-7 in the range indicated in “Standard Compliance Range 2” on page 14-9 and “Standard Compliance Range 3” on page 14-10.

14.5 Compatibility between the WT and Harmonic Standards

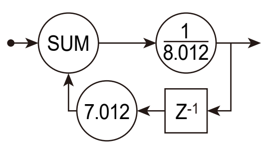
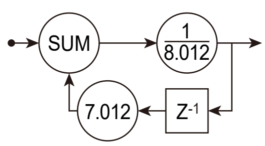
Standard Compliance Range 1

EN 61000-4-7:1993 (IEC 61000-4-7 Edition 1.0:1991) and JIS C 61000-4-7:2007 (appendix JA)

<table>
<tr><th>Item</th><th>EN 61000-4-7:1993
IEC 61000-4-7 Edition 1.0:1991
JIS C 61000-4-7:2007 (appendix JA)</th><th>WT5000</th><th>Compliance</th></tr>
<tr><td>Current measurement error</td><td>5 % of the permissible limits or 0.15 % Ir of the rated current Ir, whichever is greater</td><td>Frequency of the 40th order of the fundamental frequency 60 Hz
When the crest factor is 3,
0.3 % of reading+0.05 % of range
→ Error within 5 % at the limit that is greater than or equal to 1.1 % of the input range
When the crest factor is 6,
0.3 % of reading+0.1 % of range
→ Error within 5 % at the limit that is greater than or equal to 2.2 % of the input range
Accuracy at 2.4 kHz (direct input)</td><td>Compliant within the range n the left column for direct input</td></tr>
<tr><td>Instrumental loss of the current input circuit</td><td>Voltage drop of 0.15 V or less</td><td>Instrumental loss: Approx. 6.5 mΩ + approx. 0.3 μH</td><td>Compliant up to 23 Apk for the 1st harmonic</td></tr>
<tr><td>Crest factor of the current input circuit</td><td>3
Overload display is necessary.</td><td>3 or 6
With overload display</td><td>Compliant</td></tr>
<tr><td rowspan="3">Range structure of the current input circuit and withstand overload input</td><td>Direct input range:
0.1, 0.2, 0.5, 1, 2, 5, 10, and 16A ranges are desirable</td><td>0.5, 1, 2, 5, 10, 20, and 30 A range (when the crest factor is 3)
0.25, 0.5, 1, 2.5, 5, 10, and 15 A range (when the crest factor is 6)</td><td rowspan="3">Compliant in the range indicated in the left column. To make accurate measurements, pay attention to the crest factor and range selections.</td></tr>
<tr><td>External sensor range:
0.1 V to 10 V are adequate.</td><td>0.05, 0.1, 0.2, 0.5, 1, 2, 5, and 10 V (when the crest factor is 3)
0.025, 0.05, 0.1, 0.25, 0.5, 1, 2.5 and 5 V (when the crest factor is 6)</td></tr>
<tr><td>Excessive input is 1.2 times the range (continuous) and 10 times (1 s)</td><td>Direct input
Peak value of 90 A or rms value of 33 A, whichever is less (continuous)
Peak value of 150 A or rms value of 50 A, whichever is less (1 s)
External sensor input
Peak value at 5 times the range or 25 V, whichever is less (continuous)
Peak value at 10 times the range or 25 V, whichever is less (1 second)</td></tr>
<tr><td>Anti-aliasing filter</td><td>50 dB or higher</td><td>50 dB or more for 8 kHz or less</td><td>Compliant</td></tr>
<tr><td>Window function shape</td><td>Rectangular</td><td>Rectangular</td><td>Compliant</td></tr>
<tr><td>Window width</td><td>16 cycles (50 Hz and 60Hz)</td><td>16 cycles (50 Hz and 60Hz)</td><td>Compliant</td></tr>
<tr><td>Relative deviation of the sampling frequency and fundamental frequency</td><td>Within ±0.03 %</td><td>Within ±0.03 %</td><td>Compliant</td></tr>
<tr><td>Grouping of interharmonics</td><td>Not necessary</td><td>No grouping function</td><td>Compliant</td></tr>
<tr><td>Smoothing</td><td>Time constant: 1.5 s</td><td>Time constant: 1.5 s</td><td>Compliant</td></tr>
<tr><td>Smoothing filter coefficient (window width: 200 ms)</td><td><table><tr><th></th><th>50 Hz</th><th>60 Hz</th></tr><tr><td>A</td><td>5.206</td><td>6.14</td></tr><tr><td>B</td><td>4.206</td><td>5.14</td></tr></table></td><td><table><tr><th></th><th>50 Hz</th><th>60 Hz</th></tr><tr><td>A</td><td>5.206</td><td>6.14</td></tr><tr><td>B</td><td>4.206</td><td>5.14</td></tr></table></td><td>Compliant</td></tr>
<tr><td>General Specifications</td><td>The effects of temperature, humidity, supply voltage, common-mode voltage, static electricity, and electromagnetic field must be specified.</td><td>See the items in the general specifications</td><td>Compliant in the range of the general specifications</td></tr>
</table>

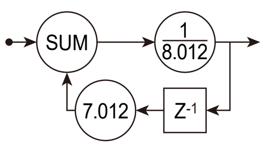
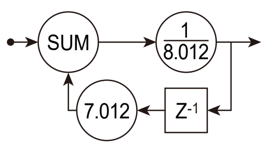
Standard Compliance Range 2

EN 61000-4-7:2002 (IEC 61000-4-7 Edition 2.0:2002) and JIS C 61000-4-7:2007

Item	EN 61000-4-7:2002 IEC 61000-4-7 Edition 2.0:2002 JIS C 61000-4-7:2007	WT5000	Compliance
Current measurement error	5 % of the permissible limits or 0.15 % Ir of the rated current Ir, whichever is greater	Frequency of the 40th order of the fundamental frequency 60 Hz When the crest factor is 3, 0.3 % of reading+0.05 % of range → Error within 5 % at the limit that is greater than or equal to 1.1 % of the input range When the crest factor is 6, 0.3 % of reading+0.1 % of range → Error within 5 % at the limit that is greater than or equal to 2.2 % of the input range Accuracy at 2.4 kHz (direct input)	Compliant within the range n the left column for direct input
Instrumental loss of the current input circuit	Voltage drop of 0.15 Vrms or less	Instrumental loss: Approx. 6.5 mΩ + approx. 0.3 μH	Compliant up to 23 Arms for the 1st harmonic
Crest factor of the current input circuit	5 Arms range or less: 4 10 Arms range or less: 3.5 Range above 10 Arms: 2.5 Overload display is necessary.	3 or 6 With overload display	Compliant
Range structure of the current input circuit and withstand overload input	Direct input range: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 A ranges are desirable	0.5, 1, 2, 5, 10, 20, and 30 A range (when the crest factor is 3) 0.25, 0.5, 1, 2.5, 5, 10, and 15 A range (when the crest factor is 6)	Compliant in the range indicated in the left column. To make accurate measurements, pay attention to the crest factor and range selections.
	External sensor range: 0.1 V to 10 V are adequate.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, and 10 V (when the crest factor is 3) 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2.5 and 5 V (when the crest factor is 6)	
	Excessive input is 1.2 times the range (continuous) and 10 times (1 s)	Direct input Peak value of 90 A or rms value of 33 A, whichever is less (continuous) Peak value of 150 A or rms value of 50 A, whichever is less (1 s) External sensor input Peak value at 5 times the range or 25 V, whichever is less (continuous) Peak value at 10 times the range or 25 V, whichever is less (1 second)	
Anti-aliasing filter	50 dB or higher	50 dB or more for 10 kHz or less	Compliant
Window function shape	Rectangular	Rectangular	Compliant
Window width	10 cycles (50 Hz)/12 cycles (60 Hz)	10 cycles (50 Hz)/12 cycles (60 Hz)	Compliant
Relative deviation of the sampling frequency and fundamental frequency	Within ±0.03 %	Within ±0.03 %	Compliant
Grouping of interharmonics	Required	Grouping function available	Compliant
Smoothing	Time constant: 1.5 s	Time constant: 1.5 s	Compliant
Smoothing filter coefficient (window width: 200 ms)			Compliant
General Specifications	The effects of temperature, humidity, supply voltage, common-mode voltage, static electricity, and electromagnetic field must be specified.	See the items in the general specifications	Compliant in the range of the general specifications

Standard Compliance Range 3

EN 61000-4-7:2002/A1:2009 (IEC 61000-4-7 Edition 2.0:2002/A1:2008)

Item	EN 61000-4-7:2002/A1:2009 IEC 61000-4-7 Edition 2.0:2002/A1:2008	WT5000	Compliance
Current measurement error	5 % of the permissible limits or 0.15 % Ir of the rated current Ir, whichever is greater	Frequency of the 40th order of the fundamental frequency 60 Hz When the crest factor is 3, 0.3 % of reading+0.05 % of range → Error within 5 % at the limit that is greater than or equal to 1.1 % of the input range When the crest factor is 6, 0.3 % of reading+0.1 % of range → Error within 5 % at the limit that is greater than or equal to 2.2 % of the input range Accuracy at 2.4 kHz (direct input)	Compliant within the range n the left column for direct input
Instrumental loss of the current input circuit	Voltage drop of 0.15 Vrms or less	Instrumental loss: Approx. 6.5 mΩ + approx. 0.3 μH	Compliant up to 23 Arms for the 1st harmonic
Crest factor of the current input circuit	5 Arms range or less: 4 10 Arms range or less: 3.5 Range above 10 Arms: 2.5 Overload display is necessary.	3 or 6 With overload display	Compliant
Range structure of the current input circuit and withstand overload input	Direct input range: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 A ranges are desirable	0.5, 1, 2, 5, 10, 20, and 30 A range (when the crest factor is 3) 0.25, 0.5, 1, 2.5, 5, 10, and 15 A range (when the crest factor is 6)	Compliant in the range indicated in the left column. To make accurate measurements, pay attention to the crest factor and range selections.
	External sensor range: 0.1 V to 10 V are adequate.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, and 10 V (when the crest factor is 3) 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2.5 and 5 V (when the crest factor is 6)	
	Excessive input is 1.2 times the range (continuous) and 10 times (1 s)	Direct input Peak value of 90 A or rms value of 33 A, whichever is less (continuous) Peak value of 150 A or rms value of 50 A, whichever is less (1 s) External sensor input Peak value at 5 times the range or 25 V, whichever is less (continuous) Peak value at 10 times the range or 25 V, whichever is less (1 second)	
Anti-aliasing filter	50 dB or higher	50 dB or more for 10 kHz or less	Compliant
Window function shape	Rectangular	Rectangular	Compliant
Window width	10 cycles (50 Hz)/12 cycles (60 Hz)	10 cycles (50 Hz)/12 cycles (60 Hz)	Compliant
Relative deviation of the sampling frequency and fundamental frequency	Within ±0.03 %	Within ±0.03 %	Compliant
Grouping of interharmonics	Required * Applies to the second and higher harmonics.	Grouping function available * Applies to the second and higher harmonics.	Compliant
Smoothing	Time constant: 1.5 s	Time constant: 1.5 s	Compliant
Smoothing filter coefficient (window width: 200 ms)			Compliant
General specifications	The effects of temperature, humidity, supply voltage, common-mode voltage, static electricity, and electromagnetic field must be specified.	See the items in the general specifications	Compliant in the range of the general specifications

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